



# Medium Power Film Capacitors



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# MEDIUM POWER FILM CAPACITORS

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\*RoHS Compliant Series as Standard

In 1979, TPC (formerly LCC, then THOMSON-CSF PASSIVE COMPONENTS) developed **CONTROLLED SELF-HEALING technology** for medium power capacitors.

These capacitors made great advances over previous technologies by combining the benefits of Controlled Self-Healing process with superior energy densities, making it one of the most compact capacitors on the market for 1/2 CV2.

TPC produces both dry-wound and impregnated capacitors for medium voltage filtering, covering the whole spectrum from 75Vdc to 3kVdc.

**With CONTROLLED SELF-HEALING**, the capacitance is divided into several million elementary capacitor elements protected by “fuse gates”. Weak points of the dielectric are insulated and the capacitor continues functioning normally without any short circuit or explosion.

The capacitor acts like a battery. It “consumes” a certain amount of the capacitance through the gradual breakdown of the individual capacitance cells. Over the operating life of the capacitor, the capacitance gradually decreases. At the end of the capacitor’s life, the nominal capacitance will decrease down to either 2%, 5% or can be determined per customer requirements.

# INTRODUCTION

## General Description

### DC FILTERING

The FF series use a wound metallized polypropylene or polyester dielectric. Dry segmented, wet segmented and wet non segmented metallization solutions have been developed to insure the controlled self healing process. The FF series are able to operate at a very high dielectric strength up to 105°C hot spot temperature. (see specific description) For more informations about the controlled self healing process and its features and advantages, see a complete presentation.

### AN ALTERNATIVE TO ELECTROLYTICS

FF series capacitors are an ideal alternative to electrolytic capacitors, because they can withstand much higher levels of surge voltage, very high rms currents and offer longer lifetimes (see section on lifetime as well as determination tables and application notes).

### APPLICATIONS

The FF series capacitors are specifically designed for DC filtering and low reactive power. Main applications are: power supplies, motors, drives, electric utilities, induction heating, people movers, tramways, metro systems, unit supported power supplies, etc.

### LIFETIME EXPECTANCY

One unique feature of the segmented metallized technology is how the capacitor acts at the end of its lifetime. Unlike electrolytic capacitors, which are a short circuit failure mode, film capacitors only experience a parametric loss of capacitance of about 2%, with no catastrophic failure mode. The capacitor gradually loses capacitance over its lifetime (like a battery), and eventually becomes an open circuit.

Lifetime, therefore, as it is defined here, is a function of several elements:

- Decrease in capacitance limit (-2% in the example above)
- Average applied voltage (expressed as a ratio vs nominal rated voltage)
- Average hot spot temperature

By changing any of these parameters we can change the defined "lifetime" of the capacitor. The capacitor will continue to function even beyond the preestablished limit for capacitance decrease. See lifetime expectancy tables in the individual series data sheets to help in this determination.

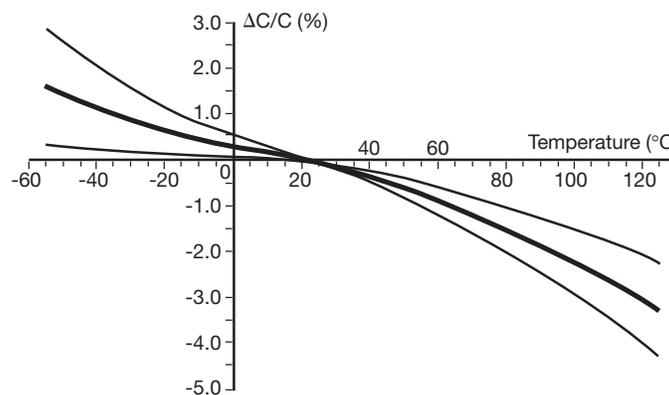
### STANDARDS

- IEC 61071-1, IEC 61071-2: Power electronic capacitors
- IEC 60068-1: Environmental testing
- IEC 60077: Rules for electric traction equipment
- UL 94: Fire requirements
- NF F 16-101: Fire and smoke requirements
- NF F 16-102: Fire and smoke requirements
- EN 45545-2: Railways applications – Fire protection on railway vehicles  
Part 2: Requirements for fire behavior of materials and components
- IEC 60384-2: Fixed metallized polyester capacitors
- IEC 61881: Railway applications, rolling stock equipment, capacitors for power electronics

### ELECTRICAL CHARACTERISTICS FOR POLYPROPYLENE AND POLYESTER DIELECTRIC CAPACITANCE FOR POLYPROPYLENE DIELECTRIC

Polypropylene has a constant dielectric constant, irrespective of frequency up to 1 MHz:  $\epsilon_r = 2.2$

#### POLYPROPYLENE DIELECTRIC CAPACITANCE vs TEMPERATURE



GRAPH 1

### TANGENT OF LOSS ANGLE (TAN $\delta_0$ ) FOR POLYPROPYLENE DIELECTRIC

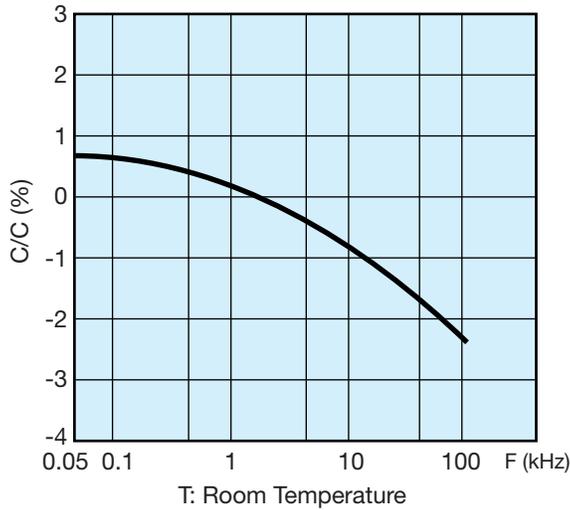
Polypropylene has a constant dielectric loss factor of  $2 \times 10^{-4}$  irrespective of temperature and frequency (up to 1 MHz).

# INTRODUCTION

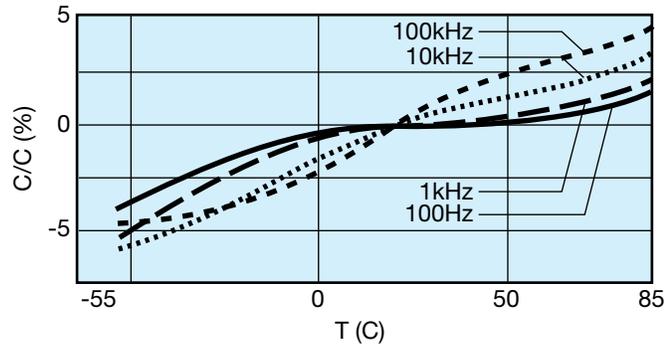
## General Description

### CAPACITANCE FOR POLYESTER DIELECTRIC

Capacitance of polyester capacitors is a function of temperature and frequency (see the curves).



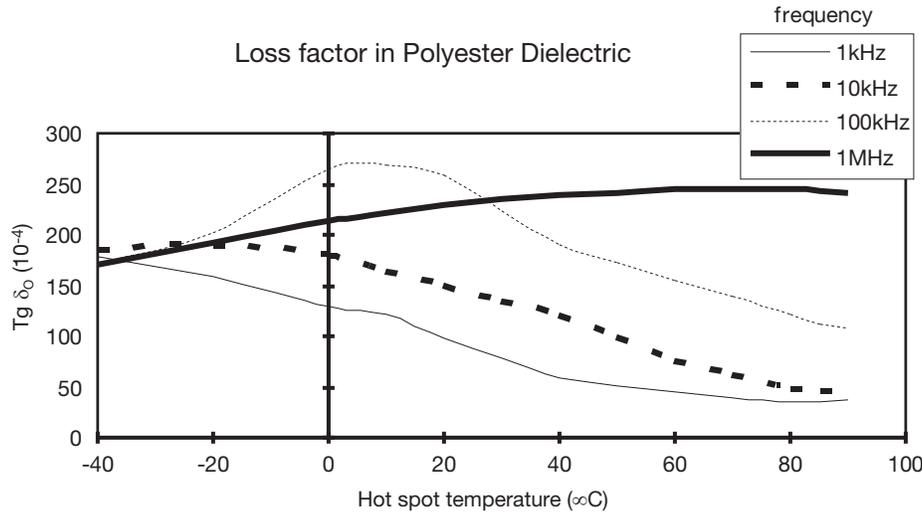
GRAPH 2



GRAPH 3

### TANGENT OF LOSS ANGLE (TAN δ<sub>0</sub>) FOR POLYESTER DIELECTRIC

Dielectric loss factor of polyester is a function of temperature and frequency (see the curves).



GRAPH 4

### HOT SPOT TEMPERATURE

The maximum operating (hot spot) temperature of film capacitors can be calculated in the following manner:

The loss factor of the capacitor is made up of the sum of two components. The first represents electrical losses in the dielectric and the second component represents the Joule heating effect in the external connection and foils ( $R_s \cdot C \cdot 2 \pi f$ ).

For all applications, the temperature in the hot spot must be lower than the maximum operating temperature for the particular capacitor series.

$$\theta_{\text{hot spot}} = \theta_{\text{ambient}} + [\text{tg} \delta_0 \cdot Q + R_s \cdot (I_{\text{rms}})^2] \cdot R_{\text{th}}$$

With:

Q : Reactive power in Var

$R_s$  in Ohm

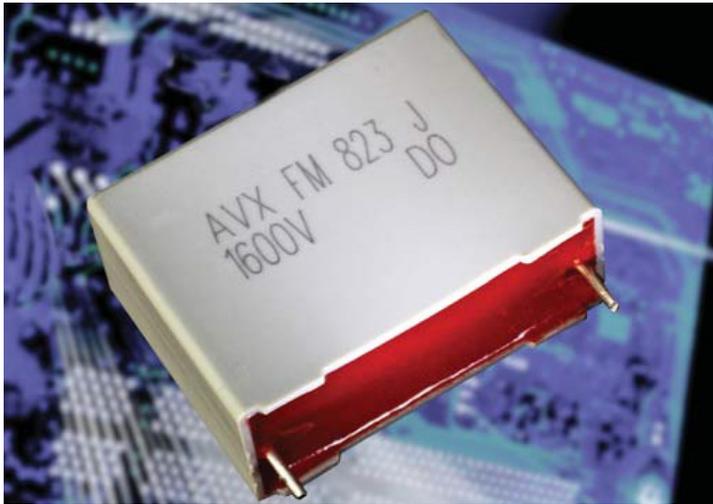
$I_{\text{rms}}$  in Ampere

$R_{\text{th}}$  :  $R_{\text{th}}$  ambient / hot spot in °C/W

$\text{tg} \delta_0 (10^{-4})$  is the tangent of loss angle [see  $\text{tan} \delta_0$  page 2 (polypropylene) and graph 4 above (polyester)]

# DC FILTERING

FM\* RoHS Compliant



FM is non-inductively wound with metallized polypropylene film as dielectric, encapsulated in plastic case and sealed with thermosetting resin. They are ideal for high frequency and high pulse-rise-time circuit, and find wide application in high voltage power supplies, snubber and electronic lighting ballasts.

## APPLICATIONS

- High reliability at high current stress
- Self-healing properties
- Flame retardant plastic case and epoxy resin
- Low losses, high dv/dt capability
- High moisture resistance
- High stability of capacitance and long life

## WORKING TEMPERATURE

Operating Temperature Range: -40°C to +105°C

## LIFETIME EXPECTANCY

One unique feature of this technology (as opposed to aluminum electrolytics) is how the capacitor reacts at the end of its lifetime.

Unlike aluminum electrolytic film capacitors do not have a catastrophic failure mode. Film capacitors simply experience a parametric loss of capacitance of about 2% from initial value, with no risk of short circuit.

The capacitor continues to be functional even after this 2% decrease.

## PACKAGING MATERIAL

- Self-extinguishing plastic case (V<sub>0</sub> = in accordance with UL 94) filled thermosetting resin.
- Self-extinguishing thermosetting resin (V<sub>0</sub> = in accordance with UL 94; I3F2 = in accordance with NF F 16-101).

## STANDARDS

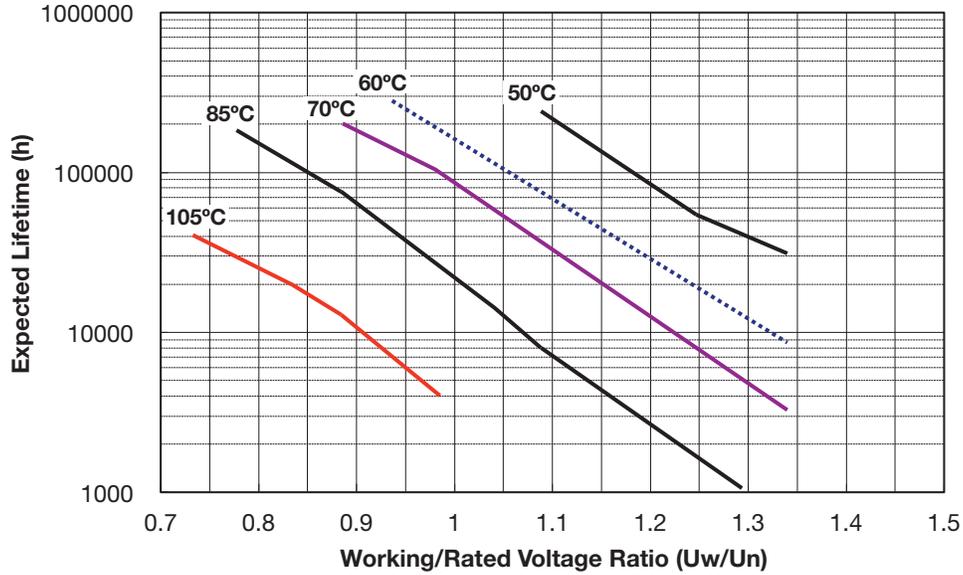
- IEC 61071-1, IEC 61071-2: Power electronic capacitors
- IEC 60384-16: Fixed metallized polypropylene film dielectric DC capacitors
- IEC 60384-16-1: Fixed metallized polypropylene film dielectric DC capacitors Assessment level E
- IEC 60384-17: Fixed metallized polypropylene film dielectric AC and pulse capacitors
- IEC 60384-17-1: Fixed metallized polypropylene film dielectric AC and pulse capacitors Assessment level E

## HOW TO ORDER

FM	A	6	V	0335	K	02	L
Series	Case	Dielectric	Voltage	Capacitance EIA Code	Tolerances	Lead Type	Lead Length
	A K	6 = Polypropylene	D = 250V	0103 = 0.01µF	J = ±5%	02 = 2 Leads	L = 22mm
	B L		I = 400V		K = ±10%		2 = 3.5 mm
	C M		J = 550V		M = ±20%		
	D N		Q = 600V				
	E P		E = 630V				
	F Q		A = 700V				
	G R		B = 800V				
	H S		C = 900V				
	J		K = 1000V				
			L = 1100V				
			P = 1200V				
			U = 1250V				
			M = 1600V				
			N = 2000V				

### LIFETIME EXPECTANCY VS HOT SPOT TEMPERATURE AND VOLTAGE

Expected Lifetime Curves (FM Series)



### DIMENSIONS

Case Ref	W (mm)	H (mm)	T (mm)	P (mm)	d (mm)
A	13	11	5	10	0.6
B	13	12	6	10	0.6
C	18	11	5	15	0.8
D	18	12	6	15	0.8
E	18	13.5	6	15	0.8
F	18	13.5	7.5	15	0.8
G	18	14.5	8	15z	0.8
H	18	14.5	8.5	15	0.8
J	18	16	10	15	0.8
K	18	18	10	15	0.8
L	18	19	11	15	0.8
M	26	13.5	6	22.5	0.8
N	26	16.5	7	22.5	0.8
P	26	17	8.5	22.5	0.8
Q	26	19	10	22.5	0.8
R	26	20	11	22.5	0.8
S	26	23	13	22.5	0.8

### GENERAL DESCRIPTION

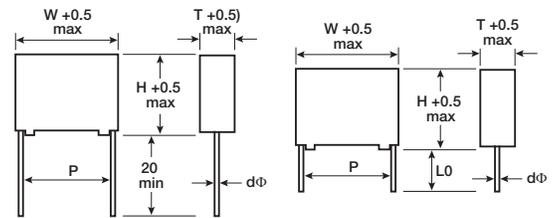


Fig. 1

Fig. 2

# DC FILTERING

FM\* RoHS Compliant



## ELECTRICAL CHARACTERISTICS

Items	Characteristics
Climatic category	40/105/56 (IEC 60068)
Test voltage between terminals @ 25°C	1.5 x V <sub>n,dc</sub>
Capacitance range C <sub>n</sub>	0.01µF to 0.47µF
Capacitance Tolerances:	±5%, ±10%
Rated DC Voltage:	250V to 2000V
Dielectric:	Polypropylene
Insulation Resistance:	> 30,000 MΩ (C ≤ 0.33µF), > 10,000 MΩ*µF/C after 1 minute

## RATINGS AND PART NUMBER REFERENCE – POLYPROPYLENE DIELECTRIC

Cap (µF) ±5%	Rated Voltage (V)	Part Number	Case Code	W ±0.50 (mm)	H ±0.50 (mm)	T ±0.50 (mm)	P ±1.00 (mm)	d ±0.50 (mm)	V/µs (Volt/sec)	I Peak (A)	I rms (A)	Packaging Method (Fig 1)		Packaging Method (Fig 2)	
												Qty	Box Dimension (mm)	Qty	Box Dimension (mm)
<b>V<sub>ndc</sub> = 250V Voltage Code: D</b>															
0.010	250	FMA6D0103 * 02L	A	13.0	11.0	5.0	10.0	0.6	76.0	0.8	1.0	1200	180*170*120	850	360*170*35
0.015	250	FMA6D0153 * 02L	A	13.0	11.0	5.0	10.0	0.6	76.0	1.1	1.2	1200	180*170*120	850	360*170*35
0.022	250	FMA6D0223 * 02L	A	13.0	11.0	5.0	10.0	0.6	76.0	1.7	1.5	1200	180*170*120	850	360*170*35
0.033	250	FMA6D0333 * 02L	A	13.0	11.0	5.0	10.0	0.6	76.0	2.5	1.8	1200	180*170*120	850	360*170*35
0.047	250	FMB6D0473 * 02L	B	13.0	12.0	6.0	10.0	0.6	76.0	3.6	2.1	1000	180*170*120	700	360*170*35
0.068	250	FMB6D0683 * 02L	B	13.0	12.0	6.0	10.0	0.6	76.0	5.2	2.3	1000	180*170*120	700	360*170*35
0.100	250	FMB6D0104 * 02L	B	13.0	12.0	6.0	10.0	0.6	76.0	7.6	2.4	1000	180*170*120	700	360*170*35
0.100	250	FMC6D0104 * 02L	C	18.0	11.0	5.0	15.0	0.6	45.0	4.5	2.4	1000	180*170*120	600	360*170*35
0.150	250	FMD6D0154 * 02L	D	18.0	12.0	6.0	15.0	0.8	45.0	6.8	2.8	800	180*170*120	500	360*170*35
0.220	250	FMF6D0224 * 02L	F	18.0	13.5	7.5	15.0	0.8	45.0	9.9	3.3	600	180*170*120	410	360*170*35
0.330	250	FMF6D0334 * 02L	F	18.0	13.5	7.5	15.0	0.8	45.0	14.9	3.7	600	180*170*120	410	360*170*35
0.470	250	FMG6D0474 * 02L	H	18.0	14.5	8.5	15.0	0.8	45.0	21.2	4.2	500	180*170*120	350	360*170*35
<b>V<sub>ndc</sub> = 630V Voltage Code: E</b>															
0.010	630	FMA6E0103 * 02L	A	13.0	11.0	5.0	10	0.6	3000	30.0	2.2	1200	180*170*120	850	360*170*35
0.012	630	FMA6E0123 * 02L	A	13.0	11.0	5.0	10	0.6	3000	36.0	2.5	1200	180*170*120	850	360*170*35
0.015	630	FMA6E0153 * 02L	A	13.0	11.0	5.0	10	0.6	3000	45.0	2.8	1200	180*170*120	850	360*170*35
0.018	630	FMA6E0183 * 02L	A	13.0	11.0	5.0	10	0.6	3000	54.0	3.0	1200	180*170*120	850	360*170*35
0.010	630	FMC6E0103 * 02L	C	18.0	11.0	5.0	15	0.8	2500	25.0	2.2	1000	180*170*120	600	360*170*35
0.012	630	FMC6E0123 * 02L	C	18.0	11.0	5.0	15	0.8	2500	30.0	2.5	1000	180*170*120	600	360*170*35
0.015	630	FMC6E0153 * 02L	C	18.0	11.0	5.0	15	0.8	2500	37.5	3.3	1000	180*170*120	600	360*170*35
0.018	630	FMC6E0183 * 02L	C	18.0	11.0	5.0	15	0.8	2500	45.0	3.4	1000	180*170*120	600	360*170*35
0.022	630	FMC6E0223 * 02L	C	18.0	11.0	5.0	15	0.8	2500	55.5	3.7	1000	180*170*120	600	360*170*35
0.027	630	FMD6E0273 * 02L	D	18.0	12.0	6.0	15	0.8	2500	67.5	4.0	800	180*170*120	500	360*170*35
0.030	630	FMD6E0303 * 02L	D	18.0	12.0	6.0	15	0.8	2500	75.0	4.3	800	180*170*120	500	360*170*35
0.033	630	FMD6E0333 * 02L	D	18.0	12.0	6.0	15	0.8	2500	82.5	4.5	800	180*170*120	500	360*170*35
0.039	630	FMF6E0393 * 02L	F	18.0	13.5	7.5	15	0.8	2500	97.5	4.8	600	180*170*120	410	360*170*35
0.047	630	FMF6E0473 * 02L	F	18.0	13.5	7.5	15	0.8	2500	117.5	5.3	600	180*170*120	410	360*170*35
0.051	630	FMF6E0513 * 02L	F	18.0	13.5	7.5	15	0.8	2500	127.5	5.8	600	180*170*120	410	360*170*35
0.056	630	FMF6E0563 * 02L	F	18.0	13.5	7.5	15	0.8	2500	140.0	6.3	600	180*170*120	410	360*170*35
0.068	630	FMG6E0683 * 02L	G	18.0	14.5	8.0	15	0.8	2500	170.0	6.7	500	180*170*120	380	360*170*35
0.082	630	FMH6E0823 * 02L	H	18.0	14.5	8.5	15	0.8	2500	205.0	7.2	500	180*170*120	350	360*170*35
0.100	630	FMJ6E0104 * 02L	J	18.0	16.0	10.0	15	0.8	2500	250.0	7.5	400	180*170*120	300	360*170*35
0.120	630	FML6E0124 * 02L	L	18.0	19.0	11.0	15	0.8	2500	300.0	8.0	300	180*170*120	270	360*170*35

\* Insert K for 10% capacitance tolerance (standard); J (+5%) and M (+20%) tolerances available on request.

Values outside this standard range may be available – please contact KYOCERA AVX for any special requirements.

KYOCERA AVX reserves the right to supply capacitors to a tighter capacitance tolerance or higher voltage rating, in the same case size.



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# DC FILTERING

FM\* RoHS Compliant



## RATINGS AND PART NUMBER REFERENCE – POLYPROPYLENE DIELECTRIC

Cap ( $\mu$ F) $\pm 5\%$	Rated Voltage (V)	Part Number	Case Code	W $\pm 0.50$ (mm)	H $\pm 0.50$ (mm)	T $\pm 0.50$ (mm)	P $\pm 1.00$ (mm)	d $\pm 0.50$ (mm)	V/ $\mu$ s (Volt/sec)	I Peak (A)	I rms (A)	Packaging Method (Fig 1)		Packaging Method (Fig 2)	
												Qty	Box Dimension (mm)	Qty	Box Dimension (mm)
<b>Vndc = 1000V Voltage Code: K</b>															
0.010	1000	FMA6K0103 * 02L	A	13.0	11.0	5.0	10	0.6	4500	45.0	2.6	1200	180*170*120	850	360*170*35
0.012	1000	FMA6K0123 * 02L	A	13.0	11.0	5.0	10	0.6	4500	54.0	2.9	1200	180*170*120	850	360*170*35
0.015	1000	FMA6K0153 * 02L	A	13.0	11.0	5.0	10	0.6	4500	67.5	3.2	1200	180*170*120	850	360*170*35
0.018	1000	FMA6K0183 * 02L	A	13.0	11.0	5.0	10	0.6	4500	81.0	3.4	1200	180*170*120	850	360*170*35
0.010	1000	FMC6K0103 * 02L	C	18.0	11.0	5.0	15	0.8	3200	32.0	2.4	1000	180*170*120	600	360*170*35
0.012	1000	FMC6K0123 * 02L	C	18.0	11.0	5.0	15	0.8	3200	38.4	2.7	1000	180*170*120	600	360*170*35
0.015	1000	FMC6K0153 * 02L	C	18.0	11.0	5.0	15	0.8	3200	48.0	3.0	1000	180*170*120	600	360*170*35
0.018	1000	FMC6K0183 * 02L	C	18.0	11.0	5.0	15	0.8	3200	57.6	3.2	1000	180*170*120	600	360*170*35
0.022	1000	FMC6K0223 * 02L	C	18.0	11.0	5.0	15	0.8	3200	70.4	3.6	1000	180*170*120	600	360*170*35
0.027	1000	FMD6K0273 * 02L	D	18.0	12.0	6.0	15	0.8	3200	86.4	3.9	800	180*170*120	500	360*170*35
0.030	1000	FMD6K0303 * 02L	D	18.0	12.0	6.0	15	0.8	3200	96.0	4.5	800	180*170*120	500	360*170*35
0.033	1000	FMD6K0333 * 02L	D	18.0	12.0	6.0	15	0.8	3200	105.6	5.1	800	180*170*120	500	360*170*35
0.039	1000	FMF6K0393 * 02L	F	18.0	13.5	7.5	15	0.8	3200	124.8	5.6	600	180*170*120	410	360*170*35
0.047	1000	FMF6K0473 * 02L	F	18.0	13.5	7.5	15	0.8	3200	150.4	6.0	600	180*170*120	410	360*170*35
0.051	1000	FMF6K0513 * 02L	F	18.0	13.5	7.5	15	0.8	3200	163.2	6.4	600	180*170*120	410	360*170*35
0.056	1000	FMF6K0563 * 02L	F	18.0	13.5	7.5	15	0.8	3200	179.2	6.7	600	180*170*120	410	360*170*35
0.068	1000	FMG6K0683 * 02L	G	18.0	14.5	8.0	15	0.8	3200	217.6	7.1	500	180*170*120	380	360*170*35
0.082	1000	FMH6K0823 * 02L	H	18.0	14.5	8.5	15	0.8	3200	262.4	7.4	500	180*170*120	350	360*170*35
0.100	1000	FMJ6K0104 * 02L	J	18.0	16.0	10.0	15	0.8	3200	320.0	7.8	400	180*170*120	300	360*170*35
0.120	1000	FML6K0124 * 02L	L	18.0	19.0	11.0	15	0.8	3200	384.0	8.5	300	180*170*120	270	360*170*35
<b>Vndc = 1250V Voltage Code: U</b>															
0.01	1250	FMA6U0103 * 02L	A	13.0	11.0	5.0	10.0	0.6	4600	46.0	2.8	1200	180*170*120	850	360*170*35
0.012	1250	FMA6U0123 * 02L	A	13.0	11.0	5.0	10.0	0.6	4600	55.2	3.1	1200	180*170*120	850	360*170*35
0.015	1250	FMA6U0153 * 02L	A	13.0	11.0	5.0	10.0	0.6	4600	69.0	3.3	1200	180*170*120	850	360*170*35
0.018	1250	FMA6U0183 * 02L	A	13.0	11.0	5.0	10.0	0.6	4600	82.8	2.6	1200	180*170*120	850	360*170*35
0.01	1250	FMC6U0103 * 02L	C	18.0	11.0	5.0	15.0	0.8	3300	33.0	2.8	1000	180*170*120	600	360*170*35
0.012	1250	FMC6U0123 * 02L	C	18.0	11.0	5.0	15.0	0.8	3300	39.6	3.0	1000	180*170*120	600	360*170*35
0.015	1250	FMC6U0153 * 02L	C	18.0	11.0	5.0	15.0	0.8	3300	49.5	3.2	1000	180*170*120	600	360*170*35
0.018	1250	FMC6U0183 * 02L	C	18.0	11.0	5.0	15.0	0.8	3300	59.4	3.6	1000	180*170*120	600	360*170*35
0.022	1250	FMD6U0223 * 02L	D	18.0	12.0	6.0	15.0	0.8	3300	72.6	4.0	800	180*170*120	500	360*170*35
0.027	1250	FME6U0273 * 02L	E	18.0	13.5	6.0	15.0	0.8	3300	89.1	4.5	600	180*170*120	500	360*170*35
0.030	1250	FMF6U0303 * 02L	F	18.0	13.5	7.5	15.0	0.8	3300	99.0	4.9	600	180*170*120	410	360*170*35
0.033	1250	FMF6U0333 * 02L	F	18.0	13.5	7.5	15.0	0.8	3300	108.9	5.4	600	180*170*120	410	360*170*35
0.039	1250	FMG6U0393 * 02L	G	18.0	14.5	8.0	15.0	0.8	3300	128.7	5.8	500	180*170*120	380	360*170*35
0.047	1250	FMG6U0473 * 02L	G	18.0	14.5	8.0	15.0	0.8	3300	155.1	6.3	500	180*170*120	380	360*170*35
0.051	1250	FMH6U0513 * 02L	H	18.0	14.5	8.5	15.0	0.8	3300	168.3	6.7	500	180*170*120	350	360*170*35
0.056	1250	FMH6U0563 * 02L	H	18.0	14.5	8.5	15.0	0.8	3300	184.8	7.0	500	180*170*120	350	360*170*35
0.068	1250	FMJ6U0683 * 02L	J	18.0	16.0	10.0	15.0	0.8	3300	224.4	7.4	400	180*170*120	300	360*170*35
0.082	1250	FMK6U0823 * 02L	K	18.0	18.0	10.0	15.0	0.8	3300	270.6	7.8	300	180*170*120	300	360*170*35
0.100	1250	FML6U0104 * 02L	L	18.0	19.0	11.0	15.0	0.8	3300	330.0	8.0	300	180*170*120	270	360*170*35

\* Insert K for 10% capacitance tolerance (standard); J (+5%) and M (+20%) tolerances available on request.

Values outside this standard range may be available – please contact KYOCERA AVX for any special requirements.

KYOCERA AVX reserves the right to supply capacitors to a tighter capacitance tolerance or higher voltage rating, in the same case size.

# DC FILTERING

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## RATINGS AND PART NUMBER REFERENCE – POLYPROPYLENE DIELECTRIC

Cap (µF) ±5%	Rated Voltage (V)	Part Number	Case Code	W ±0.50 (mm)	H ±0.50 (mm)	T ±0.50 (mm)	P ±1.00 (mm)	d ±0.50 (mm)	V/µs (Volt/sec)	I Peak (A)	I rms (A)	Packaging Method (Fig 1)		Packaging Method (Fig 2)	
												Qty	Box Dimension (mm)	Qty	Box Dimension (mm)
<b>Vndc = 1600V Voltage Code: M</b>															
0.01	1600	FMD6M0103 * 02L	D	18.0	12.0	6.0	15.0	0.8	5800	58.0	2.5	800	180*170*120	500	360*170*35
0.012	1600	FMF6M0123 * 02L	F	18.0	13.5	7.5	15.0	0.8	5800	69.6	2.9	600	180*170*120	410	360*170*35
0.015	1600	FMF6M0153 * 02L	F	18.0	13.5	7.5	15.0	0.8	5800	87.0	3.4	600	180*170*120	410	360*170*35
0.018	1600	FMH6M0183 * 02L	H	18.0	14.5	8.5	15.0	0.8	5800	104.4	3.8	500	180*170*120	350	360*170*35
0.022	1600	FMH6M0223 * 02L	H	18.0	14.5	8.5	15.0	0.8	5800	127.6	4.3	500	180*170*120	350	360*170*35
0.027	1600	FMJ6M0273 * 02L	J	18.0	16.0	10.0	15.0	0.8	5800	156.6	4.7	400	180*170*120	300	360*170*35
0.033	1600	FML6M0333 * 02L	L	18.0	19.0	11.0	15.0	0.8	5800	191.4	5.4	300	180*170*120	270	360*170*35
0.033	1600	FMN6M0333 * 02L	N	26.0	16.5	7.0	22.5	0.8	3000	99.0	5.8	400	180*170*120	290	360*170*35
0.039	1600	FMP6M0393 * 02L	P	26.0	17.0	8.5	22.5	0.8	3000	117.0	6.2	300	180*170*120	240	360*170*35
0.047	1600	FMP6M0473 * 02L	P	26.0	17.0	8.5	22.5	0.8	3000	141.0	6.5	300	180*170*120	240	360*170*35
0.056	1600	FMQ6M0563 * 02L	Q	26.0	19.0	10.0	22.5	0.8	3000	168.0	7.0	250	180*170*120	200	360*170*35
0.068	1600	FMR6M0683 * 02L	R	26.0	10.0	11.0	22.5	0.8	3000	204.0	7.6	200	180*170*120	180	360*170*35
0.082	1600	FMR6M0823 * 02L	R	26.0	20.0	11.0	22.5	0.8	3000	246.0	8.1	200	180*170*120	180	360*170*35
0.100	1600	FMS6M0104 * 02L	S	26.0	23.0	13.0	22.5	0.8	3000	300.0	8.7	100	180*170*120	150	360*170*35
<b>Vndc = 2000V Voltage Code: N</b>															
0.010	2000	FMF6N0103 * 02L	F	18.0	13.5	7.5	15.0	0.8	9000	90.0	3.0	600	180*170*120	410	360*170*35
0.012	2000	FMH6N0123 * 02L	H	18.0	14.5	8.5	15.0	0.8	9000	108.0	3.2	500	180*170*120	350	360*170*35
0.015	2000	FMJ6N0153 * 02L	J	18.0	16.0	10.0	15.0	0.8	9000	135.0	3.5	400	180*170*120	300	360*170*35
0.010	2000	FMM6N0103 * 02L	M	26.0	13.5	6.0	22.5	0.8	3500	35.0	2.8	400	180*170*120	350	360*170*35
0.012	2000	FMM6N0123 * 02L	M	26.0	13.5	6.0	22.5	0.8	3500	42.0	3.0	400	180*170*120	350	360*170*35
0.015	2000	FMN6N0153 * 02L	N	26.0	16.5	7.0	22.5	0.8	3500	52.5	3.3	400	180*170*120	290	360*170*35
0.018	2000	FMN6N0183 * 02L	N	26.0	16.5	7.0	22.5	0.8	3500	63.0	3.8	400	180*170*120	290	360*170*35
0.022	2000	FMP6N0223 * 02L	P	26.0	17.0	8.5	22.5	0.8	3500	77.0	4.3	300	180*170*120	240	360*170*35
0.027	2000	FMQ6N0273 * 02L	Q	26.0	19.0	10.0	22.5	0.8	3500	94.5	4.9	250	180*170*120	200	360*170*35
0.033	2000	FMQ6N0333 * 02L	Q	26.0	19.0	10.0	22.5	0.8	3500	115.5	5.7	250	180*170*120	200	360*170*35
0.039	2000	FMR6N0393 * 02L	R	26.0	20.0	11.0	22.5	0.8	3500	136.5	6.5	200	180*170*120	180	360*170*35
0.047	2000	FMS6N0473 * 02L	S	26.0	23.0	13.0	22.5	0.8	3500	164.5	7.0	100	180*170*120	150	360*170*35
0.056	2000	FMS6N0563 * 02L	S	26.0	23.0	13.0	22.5	0.8	3500	196.0	8.2	100	180*170*120	150	360*170*35

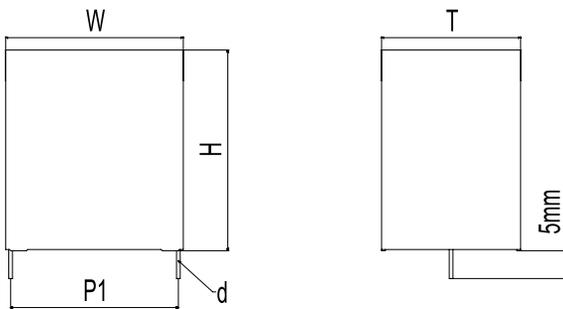
\* Insert K for 10% capacitance tolerance (standard); J (+5%) and M (+20%) tolerances available on request.  
 Values outside this standard range may be available – please contact KYOCERA AVX for any special requirements.  
 KYOCERA AVX reserves the right to supply capacitors to a tighter capacitance tolerance or higher voltage rating, in the same case size.

# DC FILTERING

FB\* RoHS Compliant



## DIMENSIONS



## STANDARDS

- IEC 61071-1: Power electronic capacitors
- IEC 61071-2: Power electronic capacitors
- IEC 60384-16: Fixed metallized polypropylene film dielectric DC capacitors
- IEC 60384-16-1: Fixed metallized polypropylene film dielectric DC capacitors Assessment level E
- IEC 60384-17: Fixed metallized polypropylene film dielectric AC and pulse capacitors
- IEC 60384-17-1: Fixed metallized polypropylene film dielectric AC and pulse capacitors
- EN CZDS2.E514026 Certificate: E514026 (approved by UL)

## HOW TO ORDER

FB	27	G*	6	K	0685	K	A
<b>Series</b>	<b>Pitch</b>	<b>Case Size</b>	<b>Type</b>	<b>Voltage</b>	<b>Cap</b> µF Code	<b>Tolerance</b>	<b>Pitch P2</b>
FB	27 = 27.5mm 37 = 37.5mm 52 = 52.5mm	E* for P=27.5mm F* for P=37.5mm G* for P=52.5mm	6 = Polypropylene 7 = Polypropylene THB 8 = Polypropylene Low Profile	I = 450V H = 500V J = 550V Q = 600V A = 700V B = 800V C = 900V K = 1000V L = 1100V P = 1200V		J = ± 5% K = ±10% M = ±20%	A = 10.2 B = 20.3 C = 2 pins

## GENERAL DESCRIPTION

The FB series uses a non-impregnated metallized polypropylene dielectric specially treated to have a very high dielectric strength in operation condition up to 105°C.

FB series performance characteristics make them a viable alternative to aluminum electrolytic technology due to much lower ESR and much higher surge voltage capability (dv/dt).

## GENERAL CHARACTERISTICS

- Able to Withstand Harsh Environment Conditions
- Low Profile Available

## FEATURES & BENEFITS

- High Performance DC Filter
- Low ESR, High Peak & RMS Current
- THB Compliance
- Able to Withstand Harsh Environment Conditions (THB Compliance)
- Low Profile Available

## APPLICATIONS

- Renewable Energy Inverter
- OBC & Automotive Applications
- Motor Drives
- Industrial Power Supply
- UPS System

## OPERATING TEMPERATURE RANGE

- Operating temperature range: -40°C to +100°C

## PACKAGING MATERIAL

Self-extinguishing plastic case (V0 = in accordance with UL 94) filled thermosetting resin.

Self-extinguishing thermosetting resin (V0 = in accordance with UL 94; I3F2 = in accordance with NF F 16-101).

## LIFE EXPECTANCY

One unique feature of this technology (versus aluminum electrolytics) is how the capacitor reacts at the end of its lifetime.

Unlike aluminum electrolytic film capacitors do not have a catastrophic failure mode. Film capacitors simply experience a parametric loss of capacitance of about 2% from initial value, with no risk of short circuit.

The capacitor continues to be functional even after this 2% decrease.

# DC FILTERING

FB\* RoHS Compliant



## POLYPROPYLENE DIELECTRIC FOR INDUSTRIAL DC FILTERING

These capacitors have been designed primarily for high and medium power DC filtering applications.

### ELECTRICAL CHARACTERISTICS – POLYPROPYLENE DIELECTRIC

Items	Characteristics
Application	DC Filtering / DC Link
Reference Standard	IEC 61071
Climatic Category	40/85/56 IEC 60068-1
Operating Temperature Range	-40~ +105°C (+85°C observing voltage must be de-rating at 1.35% per °C)
Upper Temperature Tmax	+85°C
Lower Temperature Tmin	-40°C
Rated Voltage	450Vdc ~ 1200Vdc
Capacitance Range	1μF ~ 80μF
Capacitance Tolerance	±5% or ±10% at +25°C
Dissipation Factor (DF)	≤ 0.002 (0.20%) at 1 KHz. C≤20μF at +25°C
	≤ 0.003 (0.30%) at 1 KHz. C>20μF at +25°C
Test Voltage Between Terminals	1.5 x rated voltage for 10s (terminal to terminal)
Test Voltage Terminal to Case	3.0kVrms 50 Hz for 10 sec at +25°C
Insulation Resistance	IR x C≥30,000 Seconds at 100VDC 1 minute at +25°C
Life Expectancy	100,000 hours at Un @ Hot-Spot temperature T=+70°C
Protection	Solvent resistant plastic case UL94 V-0
	Thermosetting resin sealing UL 94 V-0 compliant
Installation	Any position
Leads	Tinned copper wires, standard lead wire length 5 ±1mm
Packaging	Packed in cardboard boxes with protection for the terminals
RoHS Compliant	Compliant with the restricted substance requirements of Directive 2011/65/EU
Storage Conditions	Storage time: ≤ 24 months from the date marked on the label package
	Temperature and relative humidity should be -10°C ~ +40°C and not more than 75%RH.
	RH ≤ 85% for 30 days randomly distributed throughout the year
Humidity Test	Test conditions & performance:
	Temperature: +40°C±2°C Relative humidity (RH): 93% ±2%
	Test duration: 56 days
	Capacitance change: ≤±5% DF change (tgδ): ≤50 X 10 <sup>-4</sup> at 1KHz
	Insulation resistance: ≥50% of initial limit
Endurance Test	Test conditions & performance:
	Temperature: +85°C±2°C Voltage applied: 1.3 X VR (d.c.)
	Test duration: 1000 hours
	Capacitance change: ≤±5% DF change (tgδ): ≤50 X 10 <sup>-4</sup> at 1KHz
	Insulation resistance: ≥50% of initial limit

# DC FILTERING

FB - Standard \*RoHS Compliant



## CASE CODE

mm

Case Code	Dimensions			
	W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0
	mm	mm	mm	mm
EC	32.0	18.0	9.0	27.5
E1	32.0	20.0	11.0	27.5
E2	32.0	22.0	13.0	27.5
EE	32.0	24.5	15.0	27.5
E3	32.0	28.0	14.0	27.5
E4	32.0	28.0	18.0	27.5
EG	32.0	31.0	21.0	27.5
E6	32.0	33.0	18.0	27.5
EI	32.0	35.0	20.0	27.5
E9	32.0	37.0	22.0	27.5
FH	42.5	18.0	24.0	37.5
F3	42.5	32.0	19.0	37.5
FI	42.5	33.5	22.0	37.5
F4	42.5	36.0	19.0	37.5
F5	42.5	38.0	20.0	37.5
F6	42.5	40.0	20.0	37.5
F8	42.5	44.0	24.0	37.5
F9	42.5	45.0	30.0	37.5
FP	42.5	57.0	30.0	37.5
G9	57.5	45.0	25.0	52.5
GA	57.5	45.0	30.0	52.5
GC	57.5	50.0	35.0	52.5

## RATING & PART NUMBER REFERENCE

Cap uF	Rated Voltage V	PN	Voltage Code	Case Code	Dimensions					dv/dt V/us	Peak Current A	I <sub>rms</sub> A	ESR 10KHz mΩ	R <sub>th</sub> °C/W	ESL nH	SPQ pcs
					W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	d ± 0.05							
					mm	mm	mm	mm	mm							
<b>Voltage V<sub>ndc</sub> 450V</b>																
					<b>Voltage Code I</b>											
1.0	450	FB27EC6I0105*C	I	EC	32.0	18.0	9.0	27.5	0.8	60	60	2.5	45.0	53.3	25	180
2.0	450	FB27EC6I0205*C	I	EC	32.0	18.0	9.0	27.5	0.8	60	120	3.0	30.0	55.6	25	180
3.0	450	FB27E16I0305*C	I	E1	32.0	20.0	11.0	27.5	0.8	60	180	4.0	20.0	46.9	25	150
4.0	450	FB27E16I0405*C	I	E1	32.0	20.0	11.0	27.5	0.8	60	240	4.0	18.0	52.1	25	150
5.0	450	FB27E16I0505*C	I	E1	32.0	20.0	11.0	27.5	0.8	60	300	5.0	12.0	50.0	25	150
5.0	450	FB27E26I0505*C	I	E2	32.0	22.0	13.0	27.5	0.8	60	300	5.5	11.0	45.1	25	120
10.0	450	FB27E36I0106*C	I	E3	32.0	28.0	14.0	27.5	0.8	60	600	7.5	8.5	31.4	25	110
10.0	450	FB27E46I0106*C	I	E4	32.0	28.0	18.0	27.5	0.8	60	600	9.0	8.0	23.1	25	90
12.0	450	FB27E66I0126*C	I	E6	32.0	33.0	18.0	27.5	0.8	60	720	10.0	7.0	21.4	25	90
15.0	450	FB27E96I0156*C	I	E9	32.0	37.0	22.0	27.5	0.8	60	900	11.5	6.0	18.9	25	70
18.0	450	FB27E96I0186*C	I	E9	32.0	37.0	22.0	27.5	0.8	60	1080	10.0	6.0	25.0	25	70
20.0	450	FB27E96I0206*C	I	E9	32.0	37.0	22.0	27.5	0.8	60	1200	11.0	5.0	24.8	25	70
22.0	450	FB27E96I0226*C	I	E9	32.0	37.0	22.0	27.5	0.8	60	1320	12.5	5.0	19.2	25	70
15.0	450	FB37FH6I0156*C	I	FH	42.5	18.0	24.0	37.5	1.0	30	450	9.5	8.5	19.6	30	49
<b>Voltage V<sub>ndc</sub> 500V</b>																
					<b>Voltage Code J</b>											
3.0	550	FB27E16J0305*C	J	E1	32.0	20.0	11.0	27.5	0.8	60	180	4.0	28.0	33.5	25	150
5.0	550	FB27E26J0505*C	J	E2	32.0	22.0	13.0	27.5	0.8	60	300	6.0	14.0	29.8	25	120
8.0	550	FB27E36J0805*C	J	E3	32.0	28.0	14.0	27.5	0.8	60	480	8.5	12.5	16.6	25	110
10.0	550	FB27E66J0106*C	J	E6	32.0	33.0	18.0	27.5	0.8	60	600	10.0	8.0	18.8	25	90
15.0	550	FB27E96J0156*C	J	E9	32.0	37.0	22.0	27.5	0.8	60	900	12.0	6.5	16.0	25	70
15.0	550	FB37FH6J0156*C	J	FH	42.5	18.0	24.0	37.5	0.8	60	900	10.5	6.5	20.9	30	49
<b>Voltage V<sub>ndc</sub> 600V</b>																
					<b>Voltage Code Q</b>											
1.0	600	FB27EC6Q0105*C	Q	EC	32.0	18.0	9.0	27.5	0.8	50	50	2.5	55.0	43.6	25	180
2.0	600	FB27EC6Q0205*C	Q	EC	32.0	18.0	9.0	27.5	0.8	50	100	3.0	35.0	47.6	25	180
3.0	600	FB27E16Q0305*C	Q	E1	32.0	20.0	11.0	27.5	0.8	60	180	4.0	28.0	33.5	25	150
4.0	600	FB27E16Q0405*C	Q	E1	32.0	20.0	11.0	27.5	0.8	60	240	5.0	26.0	23.1	25	150
5.0	600	FB27E26Q0505*C	Q	E2	32.0	22.0	13.0	27.5	0.8	50	250	5.0	17.0	35.3	25	120
5.0	600	FB27E36Q0505*C	Q	E3	32.0	28.0	14.0	27.5	0.8	60	300	6.0	14.5	28.7	25	110

# DC FILTERING

FB - Standard \*RoHS Compliant



## RATING & PART NUMBER REFERENCE

Cap	Rated Voltage	PN	Voltage Code	Case Code	Dimensions					dv/dt	Peak Current	I <sub>rms</sub>	ESR 10KHz	R <sub>th</sub>	ESL	SPQ
					W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	d ± 0.05							
uF	V				mm	mm	mm	mm	mm	V/us	A	A	mΩ	°C/W	nH	pcs
6.0	600	FB27EE6Q0605°C	Q	EE	32.0	24.5	15.0	27.5	0.8	50	300	6.0	14.0	29.8	25	110
7.0	600	FB27EE6Q0705°C	Q	EE	32.0	24.5	15.0	27.5	0.8	50	350	6.0	12.0	34.7	25	110
8.0	600	FB27E36Q0805°C	Q	E3	32.0	28.0	14.0	27.5	0.8	60	480	7.5	12.0	22.2	25	110
8.0	600	FB27E46Q0805°C	Q	E4	32.0	28.0	18.0	27.5	0.8	50	400	8.0	9.0	26.0	25	90
9.0	600	FB27E46Q0905°C	Q	E4	32.0	28.0	18.0	27.5	0.8	50	450	8.0	9.0	26.0	25	90
10.0	600	FB27E46Q106°C	Q	E4	32.0	28.0	18.0	27.5	0.8	50	500	9.0	8.0	23.1	25	90
10.0	600	FB27E66Q106°C	Q	E6	32.0	33.0	18.0	27.5	0.8	60	600	8.5	7.5	27.7	25	90
12.0	600	FB27E66Q126°C	Q	E6	32.0	33.0	18.0	27.5	0.8	60	720	9.5	7.5	22.2	25	90
12.0	600	FB27E66Q126°C	Q	EG	32.0	31.0	21.0	27.5	0.8	50	600	10.0	7.0	21.4	25	80
15.0	600	FB27E96Q156°C	Q	E9	32.0	37.0	22.0	27.5	0.8	60	900	10.5	7.5	18.1	25	70
15.0	600	FB27E16Q156°C	Q	E1	32.0	35.0	20.0	27.5	0.8	50	750	10.0	6.0	25.0	25	80
10.0	600	FB37F46Q106°C	Q	F4	42.5	36.0	19.0	37.5	1.0	25	250	7.0	14.0	21.9	30	56
12.0	600	FB37F46Q126°C	Q	F4	42.5	36.0	19.0	37.5	1.0	25	300	8.0	12.0	19.5	30	56
12.0	600	FB37FH6Q126°C	Q	FH	42.5	18.0	24.0	37.5	1.0	35	420	8.0	9.5	24.7	30	49
15.0	600	FB37F46Q156°C	Q	F4	42.5	36.0	19.0	37.5	1.0	25	375	9.0	9.0	20.6	30	56
15.0	600	FB37FH6Q156°C	Q	FH	42.5	18.0	24.0	37.5	1.0	35	525	12.0	6.0	17.4	30	49
20.0	600	FB37F56Q206°C	Q	F5	42.5	38.0	20.0	37.5	1.0	25	500	11.0	7.0	17.7	30	56
22.0	600	FB37F56Q226°C	Q	F5	42.5	38.0	20.0	37.5	1.0	25	550	11.0	8.0	15.5	30	56
25.0	600	FB37F56Q256°C	Q	F5	42.5	38.0	20.0	37.5	1.0	25	625	11.0	7.0	17.7	30	56
30.0	600	FB37F86Q306°C	Q	F8	42.5	44.0	24.0	37.5	1.0	25	750	13.0	6.0	14.8	30	49
35.0	600	FB37F96Q356°C	Q	F9	42.5	45.0	30.0	37.5	1.0	25	875	17.0	4.0	13.0	30	35
40.0	600	FB37F96Q406°C	Q	F9	42.5	45.0	30.0	37.5	1.0	25	1000	17.0	4.0	13.0	30	35
45.0	600	FB37F96Q456°C	Q	F9	42.5	45.0	30.0	37.5	1.0	25	1125	17.0	4.0	13.0	30	35
50.0	600	FB37FP6Q506°C	Q	FP	42.5	57.0	30.0	37.5	1.0	25	1250	18.0	3.0	15.4	30	35
40.0	600	FB52G96Q0406°C	Q	G9	57.5	45.0	25.0	52.5	1.2	14	560	13.0	7.0	12.7	35	30
45.0	600	FB52G96Q0456°C	Q	G9	57.5	45.0	25.0	52.5	1.2	14	630	13.0	7.0	12.7	35	30
50.0	600	FB52GA6Q0506°C	Q	GA	57.5	45.0	30.0	52.5	1.2	14	700	15.0	6.0	11.1	35	25
55.0	600	FB52GA6Q0556°C	Q	GA	57.5	45.0	30.0	52.5	1.2	14	770	15.0	6.0	11.1	35	25
60.0	600	FB52GA6Q0606°C	Q	GA	57.5	45.0	30.0	52.5	1.2	14	840	15.0	5.0	13.3	35	25
65.0	600	FB52GC6Q0656°C	Q	GC	57.5	50.0	35.0	52.5	1.2	14	910	18.0	4.0	11.6	35	20
70.0	600	FB52GC6Q0706°C	Q	GC	57.5	50.0	35.0	52.5	1.2	14	980	18.0	4.5	10.3	35	20
75.0	600	FB52GC6Q0756°C	Q	GC	57.5	50.0	35.0	52.5	1.2	14	1050	18.0	4.0	11.6	35	20
80.0	600	FB52GC6Q0806°C	Q	GC	57.5	50.0	35.0	52.5	1.2	14	1120	18.0	4.0	11.6	35	20
					Voltage V <sub>ndc</sub> 700V			Voltage Code A								
1.0	700	FB27EC6A0105°C	A	EC	32.0	18.0	9.0	27.5	0.8	60	60	2.5	54.0	44.4	25	180
2.0	700	FB27EC6A0205°C	A	EC	32.0	18.0	9.0	27.5	0.8	60	120	3.0	35.0	47.6	25	180
3.0	700	FB27E16A0305°C	A	E1	32.0	20.0	11.0	27.5	0.8	60	180	4.5	28.0	26.5	25	150
3.3	700	FB27E36A0335°C	A	E3	32.0	28.0	14.0	27.5	0.8	60	198	5.5	26.0	19.1	25	110
5.0	700	FB27E36A0505°C	A	E3	32.0	28.0	14.0	27.5	0.8	60	300	6.0	14.0	29.8	25	110
6.0	700	FB27E46A0605°C	A	E4	32.0	28.0	18.0	27.5	0.8	60	360	6.0	14.0	29.8	25	90
8.0	700	FB27E66A0805°C	A	E6	32.0	33.0	18.0	27.5	0.8	60	480	9.0	10.0	18.5	25	90
10.0	700	FB27E66A106°C	A	E6	32.0	33.0	18.0	27.5	0.8	60	600	10.0	7.0	21.4	25	90
10.0	700	FB27E96A106°C	A	E9	32.0	37.0	22.0	27.5	0.8	60	600	12.0	6.5	16.0	25	70
12.0	700	FB27E96A126°C	A	E9	32.0	37.0	22.0	27.5	0.8	60	720	12.5	6.0	16.0	25	70
10.0	700	FB37FH6A106°C	A	FH	42.5	18.0	24.0	37.5	1.0	35	350	11.5	7.5	15.1	30	49
12.0	700	FB37FH6A126°C	A	FH	42.5	18.0	24.0	37.5	1.0	35	420	12.0	7.0	14.9	30	49
15.0	700	FB37FI6A156°C	A	FI	42.5	33.5	22.0	37.5	1.0	35	525	9.0	9.0	20.6	30	49
					Voltage V <sub>ndc</sub> 800V			Voltage Code B								
1.0	800	FB27EC6B0105°C	B	EC	32.0	18.0	9.0	27.5	0.8	60	60	2.0	62.0	60.5	25	180
2.0	800	FB27E16B0205°C	B	E1	32.0	20.0	11.0	27.5	0.8	60	120	3.5	31.0	39.5	25	150
2.0	800	FB27EC6B0205°C	B	EC	32.0	18.0	9.0	27.5	0.8	60	120	3.0	35.0	47.6	25	180
3.0	800	FB27E16B0305°C	B	E1	32.0	20.0	11.0	27.5	0.8	60	180	4.0	23.0	40.8	25	150
3.0	800	FB27E26B0305°C	B	E2	32.0	22.0	13.0	27.5	0.8	60	180	4.5	21.0	35.3	25	120
3.3	800	FB27E36B0335°C	B	E3	32.0	28.0	14.0	27.5	0.8	60	198	4.0	25.0	37.5	25	110
4.0	800	FB27E26B0405°C	B	E2	32.0	22.0	13.0	27.5	0.8	60	240	5.0	17.0	35.3	25	120
5.0	800	FB27E36B0505°C	B	E3	32.0	28.0	14.0	27.5	0.8	60	300	6.0	12.0	34.7	25	110
5.0	800	FB27EE6B0505°C	B	EE	32.0	24.5	15.0	27.5	0.8	60	300	6.0	14.0	29.8	25	110
6.0	800	FB27E46B0605°C	B	E4	32.0	28.0	18.0	27.5	0.8	60	360	7.5	10.5	25.4	25	90
7.0	800	FB27E46B0705°C	B	E4	32.0	28.0	18.0	27.5	0.8	60	420	8.0	10.0	23.4	25	90
8.0	800	FB27E46B0805°C	B	E4	32.0	28.0	18.0	27.5	0.8	60	480	8.0	9.0	26.0	25	90
8.0	800	FB27E66B0805°C	B	E6	32.0	33.0	18.0	27.5	0.8	60	480	9.5	9.5	17.5	25	90
9.0	800	FB27E66B0905°C	B	E6	32.0	33.0	18.0	27.5	0.8	60	540	10.0	8.5	17.6	25	90

# DC FILTERING

FB - Standard \*RoHS Compliant



## RATING & PART NUMBER REFERENCE

Cap	Rated Voltage	PN	Voltage Code	Case Code	Dimensions					dv/dt	Peak Current	I <sub>rms</sub>	ESR 10KHz	R <sub>th</sub>	ESL	SPQ	
					W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	d ± 0.05								
uF	V				mm	mm	mm	mm	mm	V/us	A	A	mΩ	°C/W	nH	pcs	
9.0	800	FB27EG6B0905*C	B	EG	32.0	31.0	21.0	27.5	0.8	60	540	10.0	7.5	20.0	25	80	
10.0	800	FB27E96B0106*C	B	E9	32.0	37.0	22.0	27.5	0.8	60	600	11.5	9.5	11.9	25	70	
10.0	800	FB27EG6B0106*C	B	EG	32.0	31.0	21.0	27.5	0.8	60	600	10.0	7.0	21.4	25	80	
12.0	800	FB27E16B0126*C	B	E1	32.0	35.0	20.0	27.5	0.8	60	720	11.0	6.0	20.7	25	80	
10.0	800	FB37F36B0106*C	B	F3	42.5	32.0	19.0	37.5	1.0	35	350	8.0	12.5	18.8	30	56	
10.0	800	FB37F46B0106*C	B	F4	42.5	36.0	19.0	37.5	1.0	35	350	7.0	14.0	21.9	30	56	
12.0	800	FB37F46B0126*C	B	F4	42.5	36.0	19.0	37.5	1.0	35	420	8.0	12.0	19.5	30	56	
15.0	800	FB37F46B0156*C	B	F4	42.5	36.0	19.0	37.5	1.0	35	525	9.0	9.0	20.6	30	56	
20.0	800	FB37F56B0206*C	B	F5	42.5	38.0	20.0	37.5	1.0	35	700	11.0	7.0	17.7	30	56	
22.0	800	FB37F86B0226*C	B	F8	42.5	44.0	24.0	37.5	1.0	35	770	13.0	6.0	14.8	30	49	
25.0	800	FB37F86B0256*C	B	F8	42.5	44.0	24.0	37.5	1.0	35	875	13.0	6.0	14.8	30	49	
30.0	800	FB37F96B0306*C	B	F9	42.5	45.0	30.0	37.5	1.0	35	1050	16.0	5.0	11.7	30	35	
35.0	800	FB37F96B0356*C	B	F9	42.5	45.0	30.0	37.5	1.0	35	1225	17.0	4.0	13.0	30	35	
40.0	800	FB37FP6B0406*C	B	FP	42.5	57.0	30.0	37.5	1.0	35	1400	18.0	3.0	15.4	30	35	
30.0	800	FB52G96B0306*C	B	G9	57.5	45.0	25.0	52.5	1.2	18	540	11.0	9.0	13.8	35	30	
35.0	800	FB52G96B0356*C	B	G9	57.5	45.0	25.0	52.5	1.2	18	630	12.0	8.0	13.0	35	30	
40.0	800	FB52G96B0406*C	B	G9	57.5	45.0	25.0	52.5	1.2	18	720	13.0	7.0	12.7	35	30	
45.0	800	FB52GA6B0456*C	B	GA	57.5	45.0	30.0	52.5	1.2	18	810	14.0	6.0	12.8	35	25	
50.0	800	FB52GA6B0506*C	B	GA	57.5	45.0	30.0	52.5	1.2	18	900	15.0	6.0	11.1	35	25	
55.0	800	FB52GC6B0556*C	B	GC	57.5	50.0	35.0	52.5	1.2	18	990	17.0	5.0	10.4	35	20	
60.0	800	FB52GC6B0606*C	B	GC	57.5	50.0	35.0	52.5	1.2	18	1080	18.0	5.0	9.3	35	20	
65.0	800	FB52GC6B0656*C	B	GC	57.5	50.0	35.0	52.5	1.2	18	1170	19.0	4.0	10.4	35	20	
					Voltage V <sub>ndc</sub> 900V			Voltage Code C									
1.0	900	FB27EC6C0105*C	C	EC	32.0	18.0	9.0	27.5	0.8	60	60	2.0	63.0	59.5	25	180	
2.0	900	FB27E16C0205*C	C	E1	32.0	20.0	11.0	27.5	0.8	60	120	3.0	25.0	66.7	25	150	
3.0	900	FB27E26C0305*C	C	E2	32.0	22.0	13.0	27.5	0.8	60	180	5.0	18.5	32.4	25	120	
3.3	900	FB27EE6C0335*C	C	EE	32.0	24.5	15.0	27.5	0.8	60	198	5.0	18.5	32.4	25	110	
4.0	900	FB27EE6C0405*C	C	EE	32.0	24.5	15.0	27.5	0.8	65	260	5.0	16.0	37.5	25	110	
5.0	900	FB27E46C0505*C	C	E4	32.0	28.0	18.0	27.5	0.8	60	300	7.0	12.5	24.5	25	90	
6.0	900	FB27E46C0605*C	C	E4	32.0	28.0	18.0	27.5	0.8	65	390	7.0	11.0	27.8	25	90	
6.0	900	FB27E66C0605*C	C	E6	32.0	33.0	18.0	27.5	0.8	60	360	8.0	11.0	21.3	25	90	
7.0	900	FB27EG6C0705*C	C	EG	32.0	31.0	21.0	27.5	0.8	65	455	9.0	9.0	20.6	25	80	
8.0	900	FB27E96C0805*C	C	E9	32.0	37.0	22.0	27.5	0.8	60	480	10.5	10.0	13.6	25	70	
8.0	900	FB27EG6C0805*C	C	EG	32.0	31.0	21.0	27.5	0.8	65	520	9.0	8.0	23.1	25	80	
9.0	900	FB27E16C0905*C	C	E1	32.0	35.0	20.0	27.5	0.8	65	585	9.0	7.0	26.5	25	80	
10.0	900	FB27E96C0106*C	C	E9	32.0	37.0	22.0	27.5	0.8	60	600	12.0	10.0	10.4	25	70	
10.0	900	FB27E16C0106*C	C	E1	32.0	35.0	20.0	27.5	0.8	65	650	9.0	7.0	26.5	25	80	
9.0	900	FB37F46C0905*C	C	F4	42.5	36.0	19.0	37.5	1.0	35	315	8.0	14.0	16.7	30	56	
10.0	900	FB37F46C0106*C	C	F4	42.5	36.0	19.0	37.5	1.0	35	350	8.0	13.0	18.0	30	56	
10.0	900	FB37F66C0106*C	C	F6	42.5	40.0	20.0	37.5	1.0	35	350	8.5	12.0	17.3	30	56	
12.0	900	FB37F46C0126*C	C	F4	42.5	36.0	19.0	37.5	1.0	35	420	8.0	11.0	21.3	30	56	
15.0	900	FB37F56C0156*C	C	F5	42.5	38.0	20.0	37.5	1.0	35	525	10.0	9.0	16.7	30	56	
15.0	900	FB37F86C0156*C	C	F8	42.5	44.0	24.0	37.5	1.0	35	525	10.5	8.0	17.0	30	49	
18.0	900	FB37F86C0186*C	C	F8	42.5	44.0	24.0	37.5	1.0	35	630	10.5	8.0	17.0	30	49	
20.0	900	FB37F86C0206*C	C	F8	42.5	44.0	24.0	37.5	1.0	35	700	13.0	6.0	14.8	30	49	
20.0	900	FB37F96C0206*C	C	F9	42.5	45.0	30.0	37.5	1.0	35	700	14.0	6.0	12.8	30	35	
22.0	900	FB37F96C0226*C	C	F9	42.5	45.0	30.0	37.5	1.0	35	770	14.0	6.0	12.8	30	35	
25.0	900	FB37F96C0256*C	C	F9	42.5	45.0	30.0	37.5	1.0	35	875	15.0	5.0	13.3	30	35	
30.0	900	FB37FP6C0306*C	C	FP	42.5	57.0	30.0	37.5	1.0	35	1050	17.0	4.5	11.5	30	35	
35.0	900	FB37FP6C0356*C	C	FP	42.5	57.0	30.0	37.5	1.0	35	1225	18.0	3.5	13.2	30	35	
30.0	900	FB52G96C0306*C	C	G9	57.5	45.0	25.0	52.5	1.2	18	540	12.0	8.0	13.0	35	30	
35.0	900	FB52GA6C0356*C	C	GA	57.5	45.0	30.0	52.5	1.2	18	630	13.0	7.0	12.7	35	25	
40.0	900	FB52GA6C0406*C	C	GA	57.5	45.0	30.0	52.5	1.2	18	720	14.0	6.0	12.8	35	25	
45.0	900	FB52GC6C0456*C	C	GC	57.5	50.0	35.0	52.5	1.2	18	810	16.0	6.0	9.8	35	20	
50.0	900	FB52GC6C0506*C	C	GC	57.5	50.0	35.0	52.5	1.2	18	900	17.0	5.0	10.4	35	20	
					Voltage V <sub>ndc</sub> 1000V			Voltage Code K									
1.0	1000	FB27E16K0105*C	K	E1	32.0	20.0	11.0	27.5	0.8	80	80	2.5	45.0	53.3	25	150	
1.0	1000	FB27EC6K0105*C	K	EC	32.0	18.0	9.0	27.5	0.8	70	70	2.0	65.0	57.7	25	180	
2.0	1000	FB27E26K0205*C	K	E2	32.0	22.0	13.0	27.5	0.8	80	160	3.5	30.0	40.8	25	120	
3.0	1000	FB27EE6K0305*C	K	EE	32.0	24.5	15.0	27.5	0.8	80	240	5.0	25.0	24.0	25	110	
4.0	1000	FB27E46K0405*C	K	E4	32.0	28.0	18.0	27.5	0.8	70	280	6.0	16.0	26.0	25	90	

# DC FILTERING

FB - Standard \*RoHS Compliant



## RATING & PART NUMBER REFERENCE

Cap	Rated Voltage	PN	Voltage Code	Case Code	Dimensions					dv/dt	Peak Current	Irms	ESR 10KHz	Rth	ESL	SPQ
					W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	d ± 0.05							
uF	V				mm	mm	mm	mm	mm	V/us	A	A	mΩ	°C/W	nH	pcs
5.0	1000	FB27E66K0505°C	K	E6	32.0	33.0	18.0	27.5	0.8	80	400	8.0	14.0	16.7	25	90
5.0	1000	FB27EG6K0505°C	K	EG	32.0	31.0	21.0	27.5	0.8	70	350	7.0	13.0	23.5	25	80
6.0	1000	FB27EG6K0605°C	K	EG	32.0	31.0	21.0	27.5	0.8	70	420	8.0	10.0	23.4	25	80
7.0	1000	FB27E16K0705°C	K	E1	32.0	35.0	20.0	27.5	0.8	70	490	9.0	9.0	20.6	25	80
8.0	1000	FB27E96K0805°C	K	E9	32.0	37.0	22.0	27.5	0.8	80	640	10.0	12.0	12.5	25	70
5.0	1000	FB37F46K0505°C	K	F4	42.5	36.0	19.0	37.5	1.0	35	175	6.0	21.0	19.8	30	56
6.0	1000	FB37F46K0605°C	K	F4	42.5	36.0	19.0	37.5	1.0	35	210	6.0	18.0	23.1	30	56
7.0	1000	FB37F46K0705°C	K	F4	42.5	36.0	19.0	37.5	1.0	35	245	6.0	18.0	23.1	30	56
8.0	1000	FB37F46K0805°C	K	F4	42.5	36.0	19.0	37.5	1.0	35	280	7.0	16.0	19.1	30	56
9.0	1000	FB37F46K0905°C	K	F4	42.5	36.0	19.0	37.5	1.0	35	315	7.0	14.0	21.9	30	56
10.0	1000	FB37F56K0106°C	K	F5	42.5	38.0	20.0	37.5	1.0	35	350	8.0	12.0	19.5	30	56
10.0	1000	FB37F66K0106°C	K	F6	42.5	40.0	20.0	37.5	1.0	40	400	8.5	12.0	17.3	30	56
12.0	1000	FB37F56K0126°C	K	F5	42.5	38.0	20.0	37.5	1.0	35	420	9.0	10.0	18.5	30	56
15.0	1000	FB37F86K0156°C	K	F8	42.5	44.0	24.0	37.5	1.0	40	600	10.5	8.0	17.0	30	49
20.0	1000	FB37F96K0206°C	K	F9	42.5	45.0	30.0	37.5	1.0	35	700	14.0	6.0	12.8	30	35
22.0	1000	FB37FP6K0226°C	K	FP	42.5	57.0	30.0	37.5	1.0	35	770	14.0	6.0	12.8	30	35
25.0	1000	FB37FP6K0256°C	K	FP	42.5	57.0	30.0	37.5	1.0	35	875	16.0	4.0	14.6	30	35
15.0	1000	FB52G96K0156°C	K	G9	57.5	45.0	25.0	52.5	1.2	18	270	9.0	14.0	13.2	35	30
20.0	1000	FB52G96K0206°C	K	G9	57.5	45.0	25.0	52.5	1.2	18	360	9.0	12.0	15.4	35	30
22.0	1000	FB52G96K0226°C	K	G9	57.5	45.0	25.0	52.5	1.2	18	396	10.0	11.0	13.6	35	30
25.0	1000	FB52GA6K0256°C	K	GA	57.5	45.0	30.0	52.5	1.2	18	450	11.0	10.0	12.4	35	25
30.0	1000	FB52GA6K0306°C	K	GA	57.5	45.0	30.0	52.5	1.2	18	540	12.0	8.0	13.0	35	25
35.0	1000	FB52GC6K0356°C	K	GC	57.5	50.0	35.0	52.5	1.2	18	630	14.0	7.0	10.9	35	20
40.0	1000	FB52GC6K0406°C	K	GC	57.5	50.0	35.0	52.5	1.2	18	720	15.0	6.0	11.1	35	20
					Voltage Vndc 1100V			Voltage Code L								
1.0	1100	FB27E16L0105°C	L	E1	32.0	20.0	11.0	27.5	0.8	80	80	2.5	45.0	53.3	25	150
1.5	1100	FB27E26L0155°C	L	E2	32.0	22.0	13.0	27.5	0.8	80	120	3.5	30.0	40.8	25	120
2.0	1100	FB27EE6L0205°C	L	EE	32.0	24.5	15.0	27.5	0.8	80	160	4.0	25.0	37.5	25	110
2.2	1100	FB27E36L0225°C	L	E3	32.0	28.0	14.0	27.5	0.8	80	176	5.0	16.5	36.4	25	110
3.3	1100	FB27E46L0335°C	L	E4	32.0	28.0	18.0	27.5	0.8	80	264	6.5	11.5	30.9	25	90
4.0	1100	FB27E66L0405°C	L	E6	32.0	33.0	18.0	27.5	0.8	80	320	8.0	10.5	22.3	25	90
5.0	1100	FB27E96L0505°C	L	E9	32.0	37.0	22.0	27.5	0.8	80	400	8.5	9.5	21.9	25	70
8.0	1100	FB37F66L0805°C	L	F6	42.5	40.0	20.0	37.5	1.0	40	320	10.5	14.0	9.7	30	56
10.0	1100	FB37F86L0106°C	L	F8	42.5	44.0	24.0	37.5	1.0	40	400	14.0	9.0	8.5	30	49
					Voltage Vndc1200V			Voltage Code P								
1.0	1200	FB27E16P0105°C	P	E1	32.0	20.0	11.0	27.5	0.8	90	90	4.5	32.5	22.8	25	150
2.0	1200	FB27EE6P0205°C	P	EE	32.0	24.5	15.0	27.5	0.8	90	180	5.0	32.5	18.5	25	110
2.2	1200	FB27E46P0225°C	P	E4	32.0	28.0	18.0	27.5	0.8	90	198	5.5	17.0	29.2	25	90
3.0	1200	FB27E46P0305°C	P	E4	32.0	28.0	18.0	27.5	0.8	90	270	7.0	16.0	19.1	25	90
3.3	1200	FB27E66P0335°C	P	E6	32.0	33.0	18.0	27.5	0.8	90	297	8.0	13.5	17.4	25	90
4.0	1200	FB27EG6P0405°C	P	EG	32.0	31.0	21.0	27.5	0.8	85	340	8.0	12.0	19.5	25	80
5.0	1200	FB27E96P0505°C	P	E9	32.0	37.0	22.0	27.5	0.8	90	450	10.0	12.0	12.5	25	70
5.0	1200	FB27E16P0505°C	P	E1	32.0	35.0	20.0	27.5	0.8	85	425	8.0	10.0	23.4	25	80
5.0	1200	FB37F46P0505°C	P	F4	42.5	36.0	19.0	37.5	1.0	40	200	6.0	18.0	23.1	30	56
5.0	1200	FB37F16P0505°C	P	F1	42.5	33.5	22.0	37.5	1.0	45	225	7.5	15.5	17.2	30	49
6.0	1200	FB37F46P0605°C	P	F4	42.5	36.0	19.0	37.5	1.0	40	240	7.0	15.0	20.4	30	56
6.0	1200	FB37F66P0605°C	P	F6	42.5	40.0	20.0	37.5	1.0	45	270	7.5	15.5	17.2	30	56
7.0	1200	FB37F56P0705°C	P	F5	42.5	38.0	20.0	37.5	1.0	40	280	8.0	13.0	18.0	30	56
8.0	1200	FB37F56P0805°C	P	F5	42.5	38.0	20.0	37.5	1.0	40	320	9.0	11.0	16.8	30	56
9.0	1200	FB37F86P0905°C	P	F8	42.5	44.0	24.0	37.5	1.0	40	360	10.0	10.0	15.0	30	49
10.0	1200	FB37F86P0106°C	P	F8	42.5	44.0	24.0	37.5	1.0	40	400	10.0	9.0	16.7	30	49
12.0	1200	FB37F96P0126°C	P	F9	42.5	45.0	30.0	37.5	1.0	40	480	12.0	8.0	13.0	30	35
15.0	1200	FB37FP6P0156°C	P	FP	42.5	57.0	30.0	37.5	1.0	40	600	14.0	6.0	12.8	30	35
10.0	1200	FB52G96P0106°C	P	G9	57.5	45.0	25.0	52.5	1.2	20	200	8.0	18.0	13.0	35	30
12.0	1200	FB52G96P0126°C	P	G9	57.5	45.0	25.0	52.5	1.2	20	240	8.0	15.0	15.6	35	30
15.0	1200	FB52G96P0156°C	P	G9	57.5	45.0	25.0	52.5	1.2	20	300	9.0	12.0	15.4	35	30
20.0	1200	FB52GA6P0206°C	P	GA	57.5	45.0	30.0	52.5	1.2	20	400	11.0	9.0	13.8	35	25
22.0	1200	FB52GC6P0226°C	P	GC	57.5	50.0	35.0	52.5	1.2	20	440	13.0	8.0	11.1	35	20
25.0	1200	FB52GC6P0256°C	P	GC	57.5	50.0	35.0	52.5	1.2	20	500	14.0	7.0	10.9	35	20

# DC FILTERING

FB - Low Profile \*RoHS Compliant



## CASE CODE

mm

Case Code	Dimensions			
	W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0
	mm	mm	mm	mm
EA	32.0	12.0	24.0	27.5
EB	32.0	15.0	27.0	27.5
FA	42.0	15.0	27.0	37.5
FB	42.0	15.0	33.0	37.5
FC	42.0	18.0	24.0	37.5
FD	42.0	18.0	27.0	37.5
FE	42.0	18.0	39.0	37.5
FF	42.0	24.0	30.0	37.5
FG	42.0	24.0	39.0	37.5
G1	57.5	15.0	33.0	52.5
G2	57.5	15.0	45.0	52.5
G4	57.5	18.0	35.0	52.5
G7	57.5	24.0	39.0	52.5

## RATING & PART NUMBER REFERENCE

Cap uF	Rated Voltage V	PN	Voltage Code	Case Code	Dimensions					dv/dt V/us	Peak Current A	Irms A	ESR 10KHz mΩ	Rth °C/W	ESL nH	SPQ pcs
					W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	d ± 0.05							
					mm	mm	mm	mm	mm							
					Voltage Vndc 500V											
					Voltage Code H											
5.0	500	FB27EA8H0505*C	H	EA	32.0	12.0	24.0	27.5	0.8	30	150	4.0	13.0	72.1	25	70
7.0	500	FB27EB8H0705*C	H	EB	32.0	15.0	27.0	27.5	0.8	30	210	5.0	10.0	60.0	25	60
10.0	500	FB37FA8H0106*C	H	FA	42.0	15.0	27.0	37.5	1.0	15	150	5.0	10.0	60.0	30	42
15.0	500	FB37FB8H0156*C	H	FB	42.0	15.0	33.0	37.5	1.0	15	225	6.5	7.0	50.7	30	35
20.0	500	FB52G18H0206*C	H	G1	57.5	15.0	33.0	52.5	1.2	7	140	6.0	9.5	43.9	35	30
30.0	500	FB52G28H0306*C	H	G2	57.5	15.0	45.0	52.5	1.2	7	210	8.5	6.5	31.9	35	15
10.0	500	FB37FC8H0106*C	H	FC	42.0	18.0	24.0	37.5	1.0	15	150	5.0	10.0	60.0	30	49
15.0	500	FB37FD8H0156*C	H	FD	42.0	18.0	27.0	37.5	1.0	15	225	6.5	6.5	54.6	30	42
20.0	500	FB37FE8H0206*C	H	FE	42.0	18.0	39.0	37.5	1.0	15	300	8.5	5.0	41.5	30	28
30.0	500	FB52G48H0306*C	H	G4	57.5	18.0	35.0	52.5	1.2	7	210	8.0	6.5	36.1	35	20
20.0	500	FB37FF8H0206*C	H	FF	42.0	24.0	30.0	37.5	1.0	15	300	8.5	5.0	41.5	30	35
30.0	500	FB37FG8H0306*C	H	FG	42.0	24.0	39.0	37.5	1.0	15	450	11.0	3.5	35.4	30	28
50.0	500	FB52G78H0506*C	H	G7	57.5	24.0	39.0	52.5	1.2	7	350	11.5	4.0	28.4	35	20
					Voltage Vndc 700V											
					Voltage Code A											
3.0	700	FB27EA8A0305*C	A	EA	32.0	12.0	24.0	27.5	0.8	35	105	3.5	14.0	87.5	25	70
5.0	700	FB27EB8A0505*C	A	EB	32.0	15.0	27.0	27.5	0.8	35	175	5.0	8.0	75.0	25	60
7.0	700	FB37FA8A0705*C	A	FA	42.0	15.0	27.0	37.5	1.0	17	119	5.0	15.0	40.0	30	42
10.0	700	FB37FB8A0106*C	A	FB	42.0	15.0	33.0	37.5	1.0	17	170	6.0	11.0	37.9	30	35
15.0	700	FB52G18A0156*C	A	G1	57.5	15.0	33.0	52.5	1.2	8	120	6.0	12.0	34.7	35	30
20.0	700	FB52G28A0206*C	A	G2	57.5	15.0	45.0	52.5	1.2	8	160	8.0	9.0	26.0	35	15
7.0	700	FB37FC8A0705*C	A	FC	42.0	18.0	24.0	37.5	1.0	17	119	5.0	15.0	40.0	30	49
10.0	700	FB37FD8A0106*C	A	FD	42.0	18.0	27.0	37.5	1.0	17	170	6.0	11.0	37.9	30	42
15.0	700	FB37FE8A0156*C	A	FE	42.0	18.0	39.0	37.5	1.0	17	255	8.5	7.0	29.7	30	28
20.0	700	FB52G48A0206*C	A	G4	57.5	18.0	35.0	52.5	1.2	8	160	7.5	9.0	29.6	35	20
15.0	700	FB37FF8A0156*C	A	FF	42.0	24.0	30.0	37.5	1.0	17	255	8.5	7.0	29.7	30	35
20.0	700	FB37FG8A0206*C	A	FG	42.0	24.0	39.0	37.5	1.0	17	340	10.5	6.0	22.7	30	28
30.0	700	FB52G78A0306*C	A	G7	57.5	24.0	39.0	52.5	1.2	8	240	10.5	6.0	22.7	35	20
					Voltage Vndc 1000V											
					Voltage Code K											
2.0	1000	FB27EA8K0205*C	K	EA	32.0	12.0	24.0	27.5	0.8	50	100	3.0	16.0	104.2	25	70
5.0	1000	FB37FA8K0505*C	K	FA	42.0	15.0	27.0	37.5	1.0	25	125	4.5	16.0	46.3	30	42
7.0	1000	FB37FB8K0705*C	K	FB	42.0	15.0	33.0	37.5	1.0	25	175	5.5	12.0	41.3	30	35
10.0	1000	FB52G18K0106*C	K	G1	57.5	15.0	33.0	52.5	1.2	12	120	5.5	13.0	38.1	35	30
15.0	1000	FB52G28K0156*C	K	G2	57.5	15.0	45.0	52.5	1.2	12	180	7.5	9.0	29.6	35	15
3.0	1000	FB37FC8K0305*C	K	FC	42.0	18.0	24.0	37.5	1.0	25	75	3.5	27.0	45.4	30	49

# DC FILTERING

FB - Low Profile \*RoHS Compliant



## RATING & PART NUMBER REFERENCE

Cap	Rated Voltage	PN	Voltage Code	Case Code	Dimensions					dv/dt	Peak Current	I <sub>rms</sub>	ESR 10KHz	R <sub>th</sub>	ESL	SPQ
					W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	d ± 0.05							
uF	V				mm	mm	mm	mm	mm	V/us	A	A	mΩ	°C/W	nH	pcs
5.0	1000	FB37FD8K0505*C	K	FD	42.0	18.0	27.0	37.5	1.0	25	125	4.5	16.0	46.3	30	42
7.0	1000	FB37FE8K0705*C	K	FE	42.0	18.0	39.0	37.5	1.0	25	175	6.5	12.0	29.6	30	28
10.0	1000	FB37FE8K0106*C	K	FE	42.0	18.0	39.0	37.5	1.0	25	250	7.5	8.0	33.3	30	28
7.0	1000	FB37FF8K0705*C	K	FF	42.0	24.0	30.0	37.5	1.0	25	175	6.5	12.0	29.6	30	35
10.0	1000	FB37FG8K0106*C	K	FG	42.0	24.0	39.0	37.5	1.0	25	250	8.5	8.0	26.0	30	28
15.0	1000	FB52G78K0156*C	K	G7	57.5	24.0	39.0	52.5	1.2	12	180	8.0	9.0	26.0	35	20
20.0	1000	FB52G78K0206*C	K	G7	57.5	24.0	39.0	52.5	1.2	12	240	9.5	7.0	23.7	35	20

# DC FILTERING

FB - THB \*RoHS Compliant



## CASE CODE

mm

Case Code	Dimensions			
	W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0
	mm	mm	mm	mm
EC	32.0	18.0	9.0	27.5
E1	32.0	20.0	11.0	27.5
E2	32.0	22.0	13.0	27.5
EE	32.0	24.5	15.0	27.5
E3	32.0	28.0	14.0	27.5
E4	32.0	28.0	18.0	27.5
E6	32.0	33.0	18.0	27.5
E9	32.0	37.0	22.0	27.5
FH	42.5	18.0	24.0	37.5
F3	42.5	32.0	19.0	37.5
FI	42.5	33.5	22.0	37.5
F6	42.5	40.0	20.0	37.5
F8	42.5	44.0	24.0	37.5
F9	42.5	45.0	30.0	37.5

## RATING & PART NUMBER REFERENCE

Cap uF	Rated Voltage V	PN	Voltage Code	Case Code	Dimensions					dv/dt V/us	Peak Current A	I <sub>rms</sub> A	ESR 10KHz mΩ	R <sub>th</sub> °C/W	ESL nH	SPQ pcs
					W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	d ± 0.05							
					mm	mm	mm	mm	mm							
<b>Voltage V<sub>ndc</sub> 450V</b>																
					<b>Voltage Code I</b>											
1.0	450	FB27EC7I0105°C	I	EC	32.0	18.0	9.0	27.5	0.8	60	60	2.5	45.0	53.3	25	180
2.0	450	FB27EC7I0205°C	I	EC	32.0	18.0	9.0	27.5	0.8	60	120	3.0	30.0	55.6	25	180
3.0	450	FB27E17I0305°C	I	E1	32.0	20.0	11.0	27.5	0.8	60	180	4.0	20.0	46.9	25	150
4.0	450	FB27E17I0405°C	I	E1	32.0	20.0	11.0	27.5	0.8	60	240	4.0	18.0	52.1	25	150
5.0	450	FB27E17I0505°C	I	E1	32.0	20.0	11.0	27.5	0.8	60	300	5.0	12.0	50.0	25	150
5.0	450	FB27E27I0505°C	I	E2	32.0	22.0	13.0	27.5	0.8	60	300	5.5	11.0	45.1	25	120
10.0	450	FB27E37I0106°C	I	E3	32.0	28.0	14.0	27.5	0.8	60	600	7.5	8.5	31.4	25	110
10.0	450	FB27E47I0106°C	I	E4	32.0	28.0	18.0	27.5	0.8	60	600	9.0	8.0	23.1	25	90
12.0	450	FB27E67I0126°C	I	E6	32.0	33.0	18.0	27.5	0.8	60	720	10.0	7.0	21.4	25	90
15.0	450	FB27E97I0156°C	I	E9	32.0	37.0	22.0	27.5	0.8	60	900	11.5	6.0	18.9	25	70
15.0	450	FB37FH7I0156°C	I	FH	42.5	18.0	24.0	37.5	1.0	30	450	9.5	8.5	19.6	30	49
18.0	450	FB27E97I0186°C	I	E9	32.0	37.0	22.0	27.5	0.8	60	1080	10.0	6.0	25.0	25	70
20.0	450	FB27E97I0206°C	I	E9	32.0	37.0	22.0	27.5	0.8	60	1200	11.0	5.0	24.8	25	70
22.0	450	FB27E97I0226°C	I	E9	32.0	37.0	22.0	27.5	0.8	60	1320	12.5	5.0	19.2	25	70
<b>Voltage V<sub>ndc</sub> 550V</b>																
					<b>Voltage Code J</b>											
3.0	550	FB27E17J0305°C	J	E1	32.0	20.0	11.0	27.5	0.8	60	180	4.0	28.0	33.5	25	150
5.0	550	FB27E27J0505°C	J	E2	32.0	22.0	13.0	27.5	0.8	60	300	6.0	14.0	29.8	25	120
8.0	550	FB27E37J0805°C	J	E3	32.0	28.0	14.0	27.5	0.8	60	480	8.5	12.5	16.6	25	110
10.0	550	FB27E67J0106°C	J	E6	32.0	33.0	18.0	27.5	0.8	60	600	10.0	8.0	18.8	25	90
15.0	550	FB27E97J0156°C	J	E9	32.0	37.0	22.0	27.5	0.8	60	900	12.0	6.5	16.0	25	70
15.0	550	FB37FH7J0156°C	J	FH	42.5	18.0	24.0	37.5	1.0	60	900	10.5	6.5	20.9	30	49
<b>Voltage V<sub>ndc</sub> 600V</b>																
					<b>Voltage Code Q</b>											
3.0	600	FB27E17Q0305°C	Q	E1	32.0	20.0	11.0	27.5	0.8	60	180	4.0	28.0	33.5	25	150
4.0	600	FB27E17Q0405°C	Q	E1	32.0	20.0	11.0	27.5	0.8	60	240	5.0	26.0	23.1	25	150
5.0	600	FB27E37Q0505°C	Q	E3	32.0	28.0	14.0	27.5	0.8	60	300	6.0	14.5	28.7	25	110
8.0	600	FB27E37Q0805°C	Q	E3	32.0	28.0	14.0	27.5	0.8	60	480	7.5	12.0	22.2	25	110
10.0	600	FB27E67Q0106°C	Q	E6	32.0	33.0	18.0	27.5	0.8	60	600	8.5	7.5	27.7	25	90
12.0	600	FB27E67Q0126°C	Q	E6	32.0	33.0	18.0	27.5	0.8	60	720	9.5	7.5	22.2	25	90
12.0	600	FB37FH7Q0126°C	Q	FH	42.5	18.0	24.0	37.5	1.0	35	420	8.0	9.5	24.7	30	49
15.0	600	FB27E97Q0156°C	Q	E9	32.0	37.0	22.0	27.5	0.8	60	900	10.5	7.5	18.1	25	70
15.0	600	FB37FH7Q0156°C	Q	FH	42.5	18.0	24.0	37.5	1.0	35	525	12.0	6.0	17.4	30	49

# DC FILTERING

FB - THB \*RoHS Compliant



## RATING & PART NUMBER REFERENCE

Cap	Rated Voltage	PN	Voltage Code	Case Code	Dimensions					dv/dt	Peak Current	I <sub>rms</sub>	ESR 10KHz	R <sub>th</sub>	ESL	SPQ
					W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	d ± 0.05							
uF	V				mm	mm	mm	mm	mm	V/us	A	A	mΩ	°C/W	nH	pcs
					<b>Voltage V<sub>ndc</sub> 700V</b>											
										<b>Voltage Code A</b>						
1.0	700	FB27EC7A0105*C	A	EC	32.0	18.0	9.0	27.5	0.8	60	60	2.5	54.0	44.4	25	180
2.0	700	FB27EC7A0205*C	A	EC	32.0	18.0	9.0	27.5	0.8	60	120	3.0	35.0	47.6	25	180
3.0	700	FB27E17A0305*C	A	E1	32.0	20.0	11.0	27.5	0.8	60	180	4.5	28.0	26.5	25	150
3.3	700	FB27E37A0335*C	A	E3	32.0	28.0	14.0	27.5	0.8	60	198	5.5	26.0	19.1	25	110
5.0	700	FB27E37A0505*C	A	E3	32.0	28.0	14.0	27.5	0.8	60	300	6.0	14.0	29.8	25	110
6.0	700	FB27E47A0605*C	A	E4	32.0	28.0	18.0	27.5	0.8	60	360	6.0	14.0	29.8	25	90
8.0	700	FB27E67A0805*C	A	E6	32.0	33.0	18.0	27.5	0.8	60	480	9.0	10.0	18.5	25	90
10.0	700	FB27E67A0106*C	A	E6	32.0	33.0	18.0	27.5	0.8	60	600	10.0	7.0	21.4	25	90
10.0	700	FB27E97A0106*C	A	E9	32.0	37.0	22.0	27.5	0.8	60	600	12.0	6.5	16.0	25	70
10.0	700	FB37FH7A0106*C	A	FH	42.5	18.0	24.0	37.5	1.0	35	350	11.5	7.5	15.1	30	49
12.0	700	FB27E97A0126*C	A	E9	32.0	37.0	22.0	27.5	0.8	60	720	12.5	6.0	16.0	25	70
12.0	700	FB37FH7A0126*C	A	FH	42.5	18.0	24.0	37.5	1.0	35	420	12.0	7.0	14.9	30	49
15.0	700	FB37FI7A0156*C	A	FI	42.5	33.5	22.0	37.5	1.0	35	525	9.0	9.0	20.6	30	49
					<b>Voltage V<sub>ndc</sub> 800V</b>											
										<b>Voltage Code B</b>						
1.0	800	FB27EC7B0105*C	B	EC	32.0	18.0	9.0	27.5	0.8	60	60	2.0	62.0	60.5	25	180
2.0	800	FB27E17B0205*C	B	E1	32.0	20.0	11.0	27.5	0.8	60	120	3.5	31.0	39.5	25	150
3.0	800	FB27E27B0305*C	B	E2	32.0	22.0	13.0	27.5	0.8	60	180	4.5	21.0	35.3	25	120
3.3	800	FB27E37B0335*C	B	E3	32.0	28.0	14.0	27.5	0.8	60	198	4.0	25.0	37.5	25	110
5.0	800	FB27E37B0505*C	B	E3	32.0	28.0	14.0	27.5	0.8	60	300	6.0	12.0	34.7	25	110
6.0	800	FB27E47B0605*C	B	E4	32.0	28.0	18.0	27.5	0.8	60	360	7.5	10.5	25.4	25	90
8.0	800	FB27E67B0805*C	B	E6	32.0	33.0	18.0	27.5	0.8	60	480	9.5	9.5	17.5	25	90
9.0	800	FB27E67B0905*C	B	E6	32.0	33.0	18.0	27.5	0.8	60	540	10.0	8.5	17.6	25	90
10.0	800	FB27E97B0106*C	B	E9	32.0	37.0	22.0	27.5	0.8	60	600	11.5	9.5	11.9	25	70
10.0	800	FB37F37B0106*C	B	F3	42.5	32.0	19.0	37.5	1.0	35	350	8.0	12.5	18.8	30	56
					<b>Voltage V<sub>ndc</sub> 900V</b>											
										<b>Voltage Code C</b>						
1.0	900	FB27EC7C0105*C	C	EC	32.0	18.0	9.0	27.5	0.8	60	60	2.0	63.0	59.5	25	180
2.0	900	FB27E17C0205*C	C	E1	32.0	20.0	11.0	27.5	0.8	60	120	3.0	25.0	66.7	25	150
3.0	900	FB27E27C0305*C	C	E2	32.0	22.0	13.0	27.5	0.8	60	180	5.0	18.5	32.4	25	120
3.3	900	FB27EE7C0335*C	C	EE	32.0	24.5	15.0	27.5	0.8	60	198	5.0	18.5	32.4	25	110
5.0	900	FB27E47C0505*C	C	E4	32.0	28.0	18.0	27.5	0.8	60	300	7.0	12.5	24.5	25	90
6.0	900	FB27E67C0605*C	C	E6	32.0	33.0	18.0	27.5	0.8	60	360	8.0	11.0	21.3	25	90
8.0	900	FB27E97C0805*C	C	E9	32.0	37.0	22.0	27.5	0.8	60	480	10.5	10.0	13.6	25	70
10.0	900	FB27E97C0106*C	C	E9	32.0	37.0	22.0	27.5	0.8	60	600	12.0	10.0	10.4	25	70
10.0	900	FB37F67C0106*C	C	F6	42.5	40.0	20.0	37.5	1.0	35	350	8.5	12.0	17.3	30	56
15.0	900	FB37F87C0156*C	C	F8	42.5	44.0	24.0	37.5	1.0	35	525	10.5	8.0	17.0	30	49
18.0	900	FB37F87C0186*C	C	F8	42.5	44.0	24.0	37.5	1.0	35	630	10.5	8.0	17.0	30	49
20.0	900	FB37F97C0206*C	C	F9	42.5	45.0	30.0	37.5	1.0	35	700	14.0	6.0	12.8	30	35
					<b>Voltage V<sub>ndc</sub> 1000V</b>											
										<b>Voltage Code K</b>						
1.0	1000	FB27E17K0105*C	K	E1	32.0	20.0	11.0	27.5	0.8	80	80	2.5	45.0	53.3	25	150
2.0	1000	FB27E27K0205*C	K	E2	32.0	22.0	13.0	27.5	0.8	80	160	3.5	30.0	40.8	25	120
3.0	1000	FB27E7K0305*C	K	EE	32.0	24.5	15.0	27.5	0.8	80	240	5.0	25.0	24.0	25	110
5.0	1000	FB27E67K0505*C	K	E6	32.0	33.0	18.0	27.5	0.8	80	400	8.0	14.0	16.7	25	90
8.0	1000	FB27E97K0805*C	K	E9	32.0	37.0	22.0	27.5	0.8	80	640	10.0	12.0	12.5	25	70
10.0	1000	FB37F67K0106*C	K	F6	42.5	40.0	20.0	37.5	1.0	40	400	8.5	12.0	17.3	30	56
15.0	1000	FB37F87K0156*C	K	F8	42.5	44.0	24.0	37.5	1.0	40	600	10.5	8.0	17.0	30	49
					<b>Voltage V<sub>ndc</sub> 1100V</b>											
										<b>Voltage Code L</b>						
1	1100	FB27E17L0105*C	L	E1	32.0	20.0	11.0	27.5	0.8	80	80	2.5	45.0	53.3	25	150
1.5	1100	FB27E27L0155*C	L	E2	32.0	22.0	13.0	27.5	0.8	80	120	3.5	30.0	40.8	25	120
2.0	1100	FB27EE7L0205*C	L	EE	32.0	24.5	15.0	27.5	0.8	80	160	4.0	25.0	37.5	25	110
2.2	1100	FB27E37L0225*C	L	E3	32.0	28.0	14.0	27.5	0.8	80	176	5.0	16.5	36.4	25	110
3.3	1100	FB27E47L0335*C	L	E4	32.0	28.0	18.0	27.5	0.8	80	264	6.5	11.5	30.9	25	90
4.0	1100	FB27E67L0405*C	L	E6	32.0	33.0	18.0	27.5	0.8	80	320	8.0	10.5	22.3	25	90
5.0	1100	FB27E97L0505*C	L	E9	32.0	37.0	22.0	27.5	0.8	80	400	8.5	9.5	21.9	25	70
8.0	1100	FB37F67L0805*C	L	F6	42.5	40.0	20.0	37.5	1.0	40	320	10.5	14.0	9.7	30	56
10.0	1100	FB37F87L0106*C	L	F8	42.5	44.0	24.0	37.5	1.0	40	400	14.0	9.0	8.5	30	49

# DC FILTERING

FB - THB \*RoHS Compliant

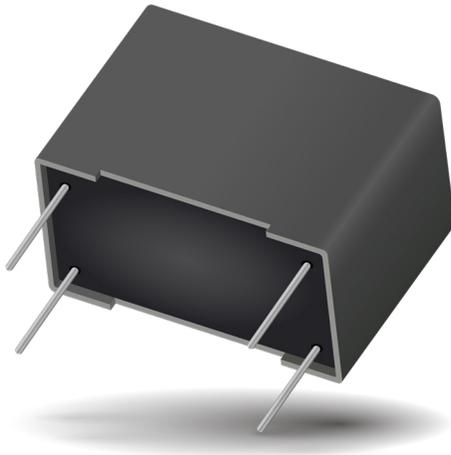


## RATING & PART NUMBER REFERENCE

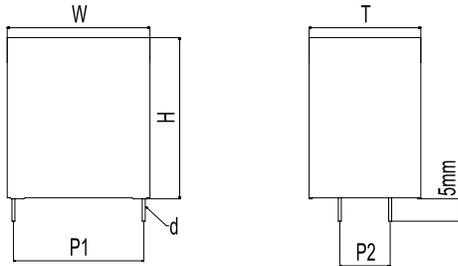
Cap	Rated Voltage	PN	Voltage Code	Case Code	Dimensions					dv/dt	Peak Current	I <sub>rms</sub>	ESR 10KHz	R <sub>th</sub>	ESL	SPQ	
					W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	d ± 0.05								
					mm	mm	mm	mm	mm								
uF	V				Voltage V <sub>ndc</sub> 1200V					V/us	A	A	mΩ	°C/W	nH	pcs	
					Voltage Code P												
1.0	1200	FB27E17P0105*C	P	E1	32.0	20.0	11.0	27.5	0.8	90	90	4.5	32.5	22.8	25	150	
2.0	1200	FB27EE7P0205*C	P	EE	32.0	24.5	15.0	27.5	0.8	90	180	5.0	32.5	18.5	25	110	
2.2	1200	FB27E47P0225*C	P	E4	32.0	28.0	18.0	27.5	0.8	90	198	5.5	17.0	29.2	25	90	
3.0	1200	FB27E47P0305*C	P	E4	32.0	28.0	18.0	27.5	0.8	90	270	7.0	16.0	19.1	25	90	
3.3	1200	FB27E67P0335*C	P	E6	32.0	33.0	18.0	27.5	0.8	90	297	8.0	13.5	17.4	25	90	
5.0	1200	FB27E97P0505*C	P	E9	32.0	37.0	22.0	27.5	0.8	90	450	10.0	12.0	12.5	25	70	
5.0	1200	FB37FI7P0505*C	P	FI	42.5	33.5	22.0	37.5	1.0	45	225	7.5	15.5	17.2	30	49	
6.0	1200	FB37F67P0605*C	P	F6	42.5	40.0	20.0	37.5	1.0	45	270	7.5	15.5	17.2	30	56	

# DC FILTERING

FE\* RoHS Compliant



## DIMENSIONS



## STANDARDS

- IEC 61071-1: Power electronic capacitors
- IEC 61071-2: Power electronic capacitors
- IEC 60384-16: Fixed metallized polypropylene film dielectric DC capacitors
- IEC 60384-16-1: Fixed metallized polypropylene film dielectric DC capacitors Assessment level E
- IEC 60384-17: Fixed metallized polypropylene film dielectric AC and pulse capacitors
- IEC 60384-17-1: Fixed metallized polypropylene film dielectric AC and pulse capacitors
- EN CZDS2.E514026 Certificate: E514026 (approved by UL)

## HOW TO ORDER

<b>FE</b>	<b>27</b>	<b>G*</b>	<b>6</b>	<b>K</b>	<b>0685</b>	<b>K</b>	<b>A</b>
<b>Series</b>	<b>Pitch</b>	<b>Case Size</b>	<b>Type</b>	<b>Voltage</b>	<b>Cap</b>	<b>Tolerance</b>	<b>Pitch P2</b>
FE	27 = 27.5mm 37 = 37.5mm 52 = 52.5mm	E* for P=27.5mm F* for P=37.5mm G* for P=52.5mm	6 = Polypropylene 7 = Polypropylene THB 8 = Polypropylene Low Profile	I = 450V H = 500V J = 550V Q = 600V A = 700V B = 800V C = 900V K = 1000V L = 1100V P = 1200V	µF Code	J = ± 5% K = ±10%	A = 10.2 B = 20.3

## GENERAL DESCRIPTION

The FE series uses a non-impregnated metallized polypropylene dielectric specially treated to have a very high dielectric strength in operation condition up to 105°C.

FE series performance characteristics make them a viable alternative to aluminum electrolytic technology due to much lower ESR and much higher surge voltage capability (dv/dt).

## GENERAL CHARACTERISTICS

- Able to Withstand Harsh Environment Conditions
- Low Profile Available

## FEATURES & BENEFITS

- High Performance DC Filter
- Low ESR, High Peak & RMS Current
- THB Compliance
- Able to Withstand Harsh Environment Conditions (THB Compliance)
- Low Profile Available

## APPLICATIONS

- Renewable Energy Inverter
- OBC & Automotive Applications
- Motor Drives
- Industrial Power Supply
- UPS System

## OPERATING TEMPERATURE RANGE

- Operating temperature range: -40°C to +100°C

## PACKAGING MATERIAL

Self-extinguishing plastic case (V0 = in accordance with UL 94) filled thermosetting resin.

Self-extinguishing thermosetting resin (V0 = in accordance with UL 94; I3F2 = in accordance with NF F 16-101).

## LIFE EXPECTANCY

One unique feature of this technology (versus aluminum electrolytics) is how the capacitor reacts at the end of its lifetime.

Unlike aluminum electrolytic film capacitors do not have a catastrophic failure mode. Film capacitors simply experience a parametric loss of capacitance of about 2% from initial value, with no risk of short circuit.

The capacitor continues to be functional even after this 2% decrease.

# DC FILTERING

FE\* RoHS Compliant



## POLYPROPYLENE DIELECTRIC FOR INDUSTRIAL DC FILTERING

These capacitors have been designed primarily for high and medium power DC filtering applications.

### ELECTRICAL CHARACTERISTICS – POLYPROPYLENE DIELECTRIC

Items	Characteristics
Application	DC Filtering / DC Link
Reference Standard	IEC 61071
Climatic Category	40/85/56 IEC 60068-1
Operating Temperature Range	-40~ +105°C (+85°C observing voltage must be de-rating at 1.35% per °C)
Upper Temperature Tmax	+85°C
Lower Temperature Tmin	-40°C
Rated Voltage	450Vdc ~ 1200Vdc
Capacitance Range	5µF ~ 1500µF
Capacitance Tolerance	±5% or ±10% at +25°C
Dissipation Factor (DF)	≤ 0.002 (0.20%) at 1 KHz. C≤20µF at +25°C
	≤ 0.003 (0.30%) at 1 KHz. C>20µF at +25°C
Test Voltage Between Terminals	1.5 x rated voltage for 10s (terminal to terminal)
Test Voltage Terminal to Case	3.0kVrms 50 Hz for 10 sec at +25°C
Insulation Resistance	IR x C≥30,000 Seconds at 100VDC 1 minute at +25°C
Life Expectancy	100,000 hours at Un @ Hot-Spot temperature T=+70°C
Protection	Solvent resistant plastic case UL94 V-0
	Thermosetting resin sealing UL 94 V-0 compliant
Installation	Any position
Leads	Tinned copper wires, standard lead wire length 5 ±1mm
Packaging	Packed in cardboard boxes with protection for the terminals
RoHS Compliant	Compliant with the restricted substance requirements of Directive 2011/65/EU
Storage Conditions	Storage time: ≤ 24 months from the date marked on the label package
	Temperature and relative humidity should be -10°C ~ +40°C and not more than 75%RH.
	RH ≤ 85% for 30 days randomly distributed throughout the year
Humidity Test	Test conditions & performance:
	Temperature: +40°C±2°C Relative humidity (RH): 93% ±2%
	Test duration: 56 days
	Capacitance change: ≤±5% DF change (Δtgδ): ≤50 X 10 <sup>-4</sup> at 1KHz Insulation resistance: ≥50% of initial limit
Endurance Test	Test conditions & performance:
	Temperature: +85°C±2°C Voltage applied: 1.3 X VR (d.c.)
	Test duration: 1000 hours
	Capacitance change: ≤±5% DF change (Δ tgδ): ≤50 X 10 <sup>-4</sup> at 1KHz Insulation resistance: ≥50% of initial limit

# DC FILTERING

FE - Standard \*RoHS Compliant



## CASE CODE

mm

Case Code	Dimensions					
	W ± 0.50	H ± 0.50	T ± 0.50	P1 ± 1.00	P2 ± 1.00	d ± 0.05
	mm	mm	mm	mm	mm	mm
FI	42.5	33.5	22.0	37.5	10.2	1.2
F4	42.5	36.0	19.0	37.5	10.2	1.2
FK	42.5	37.0	22.0	37.5	10.2	1.2
FL	42.5	37.0	28.0	37.5	10.2	1.2
F5	42.5	38.0	20.0	37.5	10.2	1.2
F6	42.5	40.0	20.0	37.5	10.2	1.2
F8	42.5	44.0	24.0	37.5	10.2	1.2
F9	42.5	45.0	30.0	37.5	20.3	1.2
FN	42.5	50.0	35.0	37.5	20.3	1.2
FP	42.5	57.0	30.0	37.5	20.3	1.2
G6	57.5	22.0	43.0	52.5	20.3	1.2
G9	57.5	45.0	25.0	52.5	10.2	1.2
GA	57.5	45.0	30.0	37.5	20.3	1.2
GB	57.5	45.0	45.0	52.5	20.3	1.2
GC	57.5	50.0	35.0	52.5	20.3	1.2
GD	57.5	53.0	50.0	52.5	20.3	1.2
GE	57.5	55.0	45.0	52.5	20.3	1.2
GF	57.5	60.0	35.0	52.5	20.3	1.2
GG	57.5	65.0	130.0	52.5	20.3	1.2
GH	57.5	65.0	35.0	52.5	20.3	1.2
GI	57.5	65.0	45.0	52.5	20.3	1.2
GJ	57.5	65.0	70.0	52.5	20.3	1.2
GK	57.5	70.0	35.0	52.5	20.3	1.2
GL	57.5	80.0	35.0	52.5	20.3	1.2

## RATING & PART NUMBER REFERENCE

Cap uF	Rated Voltage V	PN	Voltage Code	Case Code	Dimensions						dv/dt V/us	Peak Current A	I <sub>rms</sub> A	ESR 10KHz mΩ	R <sub>th</sub> °C/W	ESL nH	SPQ pcs
					W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	P2 ± 1.0	d ± 0.05							
					mm	mm	mm	mm	mm	mm							
					Voltage V <sub>ndc</sub> 450V												
25.0	450	FE37FK6I0256*A	I	FK	42.5	37.0	22.0	37.5	10.2	1.2	35	875	12.5	5.5	17.5	30	49
30.0	450	FE37F66I0306*A	I	F6	42.5	40.0	20.0	37.5	10.2	1.2	35	1050	12.0	6.0	17.4	30	56
40.0	450	FE37FL6I0406*A	I	FL	42.5	37.0	28.0	37.5	10.2	1.2	35	1400	14.0	5.5	13.9	30	42
40.0	450	FE37F86I0406*A	I	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	1400	15.0	5.2	12.8	30	49
50.0	450	FE37F96I0506*B	I	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	1750	15.0	4.0	16.7	30	35
60.0	450	FE37F96I0606*B	I	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	2100	16.5	4.0	13.8	30	35
40.0	450	FE52G66I0406*B	I	G6	57.5	22.0	43.0	52.5	20.3	1.2	35	1400	12.0	8.0	13.0	35	15
50.0	450	FE52G66I0506*B	I	G6	57.5	22.0	43.0	52.5	20.3	1.2	35	1750	14.0	6.5	11.8	35	15
55.0	450	FE37GA6I0556*B	I	GA	57.5	45.0	30.0	37.5	20.3	1.2	35	1925	15.5	5.0	12.5	35	25
60.0	450	FE37GA6I0606*B	I	GA	57.5	45.0	30.0	37.5	20.3	1.2	35	2100	16.5	4.5	12.2	35	25
80.0	450	FE52GA6I0806*B	I	GA	57.5	45.0	30.0	52.5	20.3	1.2	20	1600	16.0	4.0	14.6	35	25
100.0	450	FE52GC6I0107*B	I	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	2000	18.0	3.8	12.2	35	20
130.0	450	FE52GF6I0137*B	I	GF	57.5	60.0	35.0	52.5	20.3	1.2	20	2600	22.0	3.5	8.9	35	20
140.0	450	FE52GH6I0147*B	I	GH	57.5	65.0	35.0	52.5	20.3	1.2	20	2800	24.0	3.4	7.7	35	20
150.0	450	FE52GK6I0157*B	I	GK	57.5	70.0	35.0	52.5	20.3	1.2	20	3000	26.0	3.2	6.9	35	20
160.0	450	FE52GL6I0167*B	I	GL	57.5	80.0	35.0	52.5	20.3	1.2	20	3200	28.0	3.1	6.2	35	20
170.0	450	FE52GL6I0177*B	I	GL	57.5	80.0	35.0	52.5	20.3	1.2	20	3400	30.0	3.0	5.6	35	20
					Voltage V <sub>ndc</sub> 500V												
20.0	500	FE37F46H0206*B	H	F4	42.5	36.0	19.0	37.5	20.3	1.2	20	400	9.0	8.0	23.1	30	56
22.0	500	FE37F56H0226*B	H	F5	42.5	38.0	20.0	37.5	20.3	1.2	20	440	10.0	7.0	21.4	30	56
25.0	500	FE37F56H0256*B	H	F5	42.5	38.0	20.0	37.5	20.3	1.2	20	500	10.0	6.0	25.0	30	56
30.0	500	FE37F86H0306*B	H	F8	42.5	44.0	24.0	37.5	20.3	1.2	20	600	13.0	5.0	17.8	30	49
35.0	500	FE37F86H0356*B	H	F8	42.5	44.0	24.0	37.5	20.3	1.2	20	700	14.0	4.5	17.0	30	49



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# DC FILTERING

FE - Standard \*RoHS Compliant



## RATING & PART NUMBER REFERENCE

Cap	Rated Voltage	PN	Voltage Code	Case Code	Dimensions						dv/dt	Peak Current	Irms	ESR 10KHz	Rth	ESL	SPQ	
					W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	P2 ± 1.0	d ± 0.05								
µF	V				mm	mm	mm	mm	mm	mm	V/us	A	A	mΩ	°C/W	nH	pcs	
40.0	500	FE37F96H0406*B	H	F9	42.5	45.0	30.0	37.5	20.3	1.2	20	800	15.0	4.0	16.7	30	35	
45.0	500	FE37F96H0456*B	H	F9	42.5	45.0	30.0	37.5	20.3	1.2	20	900	16.0	3.5	16.7	30	35	
50.0	500	FE37F96H0506*B	H	F9	42.5	45.0	30.0	37.5	20.3	1.2	20	1000	17.0	3.0	17.3	30	35	
55.0	500	FE37FP6H0556*B	H	FP	42.5	57.0	30.0	37.5	20.3	1.2	20	1100	18.0	3.0	15.4	30	35	
60.0	500	FE37FP6H0606*B	H	FP	42.5	57.0	30.0	37.5	20.3	1.2	20	1200	18.0	3.0	15.4	30	35	
65.0	500	FE37FP6H0656*B	H	FP	42.5	57.0	30.0	37.5	20.3	1.2	20	1300	19.0	2.0	20.8	30	35	
50.0	500	FE52G96H0506*B	H	G9	57.5	45.0	25.0	52.5	10.2	1.2	10	500	11.0	6.0	20.7	35	30	
55.0	500	FE52G96H0556*B	H	G9	57.5	45.0	25.0	52.5	10.2	1.2	10	550	13.0	6.0	14.8	35	30	
60.0	500	FE52GA6H0606*B	H	GA	57.5	45.0	30.0	52.5	20.3	1.2	10	600	14.0	5.0	15.3	35	25	
65.0	500	FE52GA6H0656*B	H	GA	57.5	45.0	30.0	52.5	20.3	1.2	10	650	14.0	5.0	15.3	35	25	
70.0	500	FE52GA6H0706*B	H	GA	57.5	45.0	30.0	52.5	20.3	1.2	10	700	15.0	5.0	13.3	35	25	
75.0	500	FE52GC6H0756*B	H	GC	57.5	50.0	35.0	52.5	20.3	1.2	10	750	16.0	4.0	14.6	35	20	
80.0	500	FE52GC6H0806*B	H	GC	57.5	50.0	35.0	52.5	20.3	1.2	10	800	17.0	3.0	17.3	35	20	
90.0	500	FE52GC6H0906*B	H	GC	57.5	50.0	35.0	52.5	20.3	1.2	10	900	18.0	3.0	15.4	35	20	
100.0	500	FE52GC6H0107*B	H	GC	57.5	50.0	35.0	52.5	20.3	1.2	10	1000	19.0	3.0	13.9	35	20	
110.0	500	FE52GB6H0117*B	H	GB	57.5	45.0	45.0	52.5	20.3	1.2	10	1100	19.0	2.5	16.6	35	15	
120.0	500	FE52GB6H0127*B	H	GB	57.5	45.0	45.0	52.5	20.3	1.2	10	1200	19.0	2.5	16.6	35	15	
250.0	500	FE52GJ6H0257*B	H	GJ	57.5	65.0	70.0	52.5	20.3	1.2	4	1000	25.0	2.0	12.0	35	10	
500.0	500	FE52GG6H0507*B	H	GG	57.5	65.0	130.0	52.5	20.3	1.2	2	1000	45.0	1.5	4.9	35	5	
					Voltage Vndc 550V				Voltage Code J									
20.0	550	FE37F66J0206*A	J	F6	42.5	40.0	20.0	37.5	10.2	1.2	35	700	12.5	6.5	14.8	30	56	
22.0	550	FE37F66J0226*A	J	F6	42.5	40.0	20.0	37.5	10.2	1.2	35	770	13.5	6.5	12.7	30	56	
25.0	550	FE37F66J0256*A	J	F6	42.5	40.0	20.0	37.5	10.2	1.2	35	875	14.5	6.5	11.0	30	56	
30.0	550	FE37F86J0306*A	J	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	1050	16.0	6.0	9.8	30	49	
35.0	550	FE37F96J0356*B	J	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	1225	18.0	6.0	7.7	30	35	
40.0	550	FE37F96J0406*B	J	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	1400	18.0	5.5	8.4	30	35	
50.0	550	FE37FN6J0506*B	J	FN	42.5	50.0	35.0	37.5	20.3	1.2	35	1750	20.0	5.0	7.5	30	28	
40.0	550	FE57G66J0406*B	J	G6	57.5	22.0	43.0	57.5	20.3	1.2	35	1400	16.0	5.8	10.1	35	15	
60.0	550	FE37GA6J0606*B	J	GA	57.5	45.0	30.0	37.5	20.3	1.2	20	1200	18.0	4.8	9.6	35	25	
75.0	550	FE52GC6J0756*B	J	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1500	20.0	5.0	7.5	35	20	
100.0	550	FE52GE6J0107*B	J	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	2000	24.0	4.5	5.8	35	15	
110.0	550	FE52GE6J0117*B	J	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	2200	26.0	4.0	5.5	35	15	
130.0	550	FE52GF6J0137*B	J	GF	57.5	60.0	35.0	52.5	20.3	1.2	20	2600	23.0	3.4	8.3	35	20	
140.0	550	FE52GH6J0147*B	J	GH	57.5	65.0	35.0	52.5	20.3	1.2	20	2800	25.0	3.3	7.3	35	20	
150.0	550	FE52GK6J0157*B	J	GK	57.5	70.0	35.0	52.5	20.3	1.2	20	3000	27.0	3.1	6.6	35	20	
160.0	550	FE52GL6J0167*B	J	GL	57.5	80.0	35.0	52.5	20.3	1.2	20	3200	29.0	3.0	5.9	35	20	
170.0	550	FE52GL6J0177*B	J	GL	57.5	80.0	35.0	52.5	20.3	1.2	20	3400	32.0	2.8	5.2	35	20	
					Voltage Vndc 600V				Voltage Code Q									
10.0	600	FE37F46Q0106*A	Q	F4	42.5	36.0	19.0	37.5	10.2	1.2	25	250	8.0	12.0	19.5	30	56	
12.0	600	FE37F46Q0126*A	Q	F4	42.5	36.0	19.0	37.5	10.2	1.2	25	300	9.0	10.0	18.5	30	56	
15.0	600	FE37F46Q0156*A	Q	F4	42.5	36.0	19.0	37.5	10.2	1.2	25	375	10.0	8.0	18.8	30	56	
20.0	600	FE37F56Q0206*A	Q	F5	42.5	38.0	20.0	37.5	10.2	1.2	25	500	12.0	6.0	17.4	30	56	
20.0	600	FE37F66Q0206*A	Q	F6	42.5	40.0	20.0	37.5	10.2	1.2	35	700	11.0	6.0	20.7	30	56	
22.0	600	FE37F56Q0226*A	Q	F5	42.5	38.0	20.0	37.5	10.2	1.2	25	550	12.0	7.0	14.9	30	56	
25.0	600	FE37F56Q0256*A	Q	F5	42.5	38.0	20.0	37.5	10.2	1.2	25	625	13.0	6.0	14.8	30	56	
30.0	600	FE37F86Q0306*B	Q	F8	42.5	44.0	24.0	37.5	10.2	1.2	25	750	15.0	5.0	13.3	30	49	
30.0	600	FE37FL6Q0306*A	Q	FL	42.5	37.0	28.0	37.5	10.2	1.2	35	1050	13.0	5.5	16.1	30	42	
35.0	600	FE37F86Q0356*A	Q	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	1225	16.5	5.0	11.0	30	49	
35.0	600	FE37F96Q0356*B	Q	F9	42.5	45.0	30.0	37.5	20.3	1.2	25	875	18.0	3.5	13.2	30	35	
40.0	600	FE37F96Q0406*B	Q	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	1400	18.0	4.0	11.6	30	35	
45.0	600	FE37F96Q0456*B	Q	F9	42.5	45.0	30.0	37.5	20.3	1.2	25	1125	18.0	3.5	13.2	30	35	
50.0	600	FE37FP6Q0506*B	Q	FP	42.5	57.0	30.0	37.5	20.3	1.2	25	1250	19.0	2.5	16.6	30	35	
35.0	600	FE52G66Q0356*B	Q	G6	57.5	22.0	43.0	52.5	20.3	1.2	20	700	13.5	5.5	15.0	35	15	
40.0	600	FE52G96Q0406*B	Q	G9	57.5	45.0	25.0	52.5	20.3	1.2	14	560	14.0	6.0	12.8	35	30	
45.0	600	FE52G96Q0456*B	Q	G9	57.5	45.0	25.0	52.5	10.2	1.2	14	630	14.0	6.0	12.8	35	30	
50.0	600	FE52GA6Q0506*B	Q	GA	57.5	45.0	30.0	52.5	20.3	1.2	14	700	16.0	5.0	11.7	35	25	
50.0	600	FE52GC6Q0506*B	Q	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1000	14.0	6.5	11.8	35	20	

# DC FILTERING

FE - Standard \*RoHS Compliant



## RATING & PART NUMBER REFERENCE

Cap	Rated Voltage	PN	Voltage Code	Case Code	Dimensions						dv/dt	Peak Current	Irms	ESR 10KHz	Rth	ESL	SPQ	
					W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	P2 ± 1.0	d ± 0.05								
µF	V				mm	mm	mm	mm	mm	mm	V/us	A	A	mΩ	°C/W	nH	pcs	
55.0	600	FE52GA6Q0556*B	Q	GA	57.5	45.0	30.0	52.5	20.3	1.2	14	770	16.0	5.0	11.7	35	25	
60.0	600	FE52GA6Q0606*B	Q	GA	57.5	45.0	30.0	52.5	20.3	1.2	14	840	17.0	4.0	13.0	35	25	
60.0	600	FE52GC6Q0606*B	Q	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1200	16.0	5.0	11.7	35	20	
65.0	600	FE52GC6Q0656*B	Q	GC	57.5	50.0	35.0	52.5	20.3	1.2	14	910	20.0	3.5	10.7	35	20	
70.0	600	FE52GC6Q0706*B	Q	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1400	18.0	5.0	9.3	35	20	
75.0	600	FE52GC6Q0756*B	Q	GC	57.5	50.0	35.0	52.5	20.3	1.2	14	1050	21.0	3.5	9.7	35	20	
80.0	600	FE52GC6Q0806*B	Q	GC	57.5	50.0	35.0	52.5	20.3	1.2	14	1120	21.0	3.5	9.7	35	20	
80.0	600	FE52GE6Q0806*B	Q	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1600	20.0	4.0	9.4	35	15	
90.0	600	FE52GB6Q0906*B	Q	GB	57.5	45.0	45.0	52.5	20.3	1.2	14	1260	22.0	3.0	10.3	35	15	
90.0	600	FE52GE6Q0906*B	Q	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1800	24.0	4.0	6.5	35	15	
100.0	600	FE52GB6Q0107*B	Q	GB	57.5	45.0	45.0	52.5	20.3	1.2	14	1400	23.0	2.5	11.3	35	15	
100.0	600	FE52GD6Q0107*B	Q	GD	57.5	53.0	50.0	52.5	20.3	1.2	20	2000	26.0	4.0	5.5	35	15	
110.0	600	FE52GD6Q0117*B	Q	GD	57.5	53.0	50.0	52.5	20.3	1.2	20	2200	28.0	3.5	5.5	35	15	
120.0	600	FE52GF6Q0127*B	Q	GF	57.5	60.0	35.0	52.5	20.3	1.2	20	2400	30.0	3.4	4.9	35	20	
130.0	600	FE52GH6Q0137*B	Q	GH	57.5	65.0	35.0	52.5	20.3	1.2	20	2600	32.0	3.3	4.4	35	20	
140.0	600	FE52GI6Q0147*B	Q	GI	57.5	65.0	45.0	52.5	20.3	1.2	20	2800	34.0	3.2	4.1	35	15	
140.0	600	FE52GK6Q0147*B	Q	GK	57.5	70.0	35.0	52.5	20.3	1.2	20	2800	34.0	3.2	4.1	35	20	
150.0	600	FE52GL6Q0157*B	Q	GL	57.5	80.0	35.0	52.5	20.3	1.2	20	3000	36.0	3.0	3.9	35	20	
200.0	600	FE52GJ6Q0207*D	Q	GJ	57.5	65.0	70.0	52.5	20.3	1.2	5	1000	30.0	2.0	8.3	35	10	
400.0	600	FE52GG6Q0407*E	Q	GG	57.5	65.0	130.0	52.5	20.3	1.2	2.5	1000	50.0	1.5	4.0	35	5	
					Voltage Vndc 700V			Voltage Code A										
15.0	700	FE37F16A0156*A	A	F1	42.5	33.5	22.0	37.5	10.2	1.2	35	525	10.0	8.0	18.8	30	49	
15.0	700	FE37F66A0156*A	A	F6	42.5	40.0	20.0	37.5	10.2	1.2	35	525	10.0	8.0	18.8	30	56	
20.0	700	FE37FL6A0206*A	A	FL	42.5	37.0	28.0	37.5	10.2	1.2	35	700	12.0	7.5	13.9	30	42	
22.0	700	FE37F86A0226*A	A	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	770	14.0	6.5	11.8	30	49	
25.0	700	FE37F86A0256*A	A	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	875	16.0	6.0	9.8	30	49	
30.0	700	FE37F96A0306*B	A	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	1050	16.0	5.8	10.1	30	35	
35.0	700	FE37FN6A0356*B	A	FN	42.5	50.0	35.0	37.5	20.3	1.2	35	1225	20.0	5.5	6.8	30	28	
30.0	700	FE52G66A0306*B	A	G6	57.5	22.0	43.0	52.5	20.3	1.2	20	600	12.0	8.5	12.3	35	15	
40.0	700	FE52GA6A0406*B	A	GA	57.5	45.0	30.0	52.5	20.3	1.2	20	800	14.0	5.0	15.3	35	25	
45.0	700	FE52GA6A0456*B	A	GA	57.5	45.0	30.0	52.5	20.3	1.2	20	900	15.5	5.0	12.5	35	25	
50.0	700	FE52GC6A0506*B	A	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1000	15.0	4.8	13.9	35	20	
55.0	700	FE52GC6A0556*B	A	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1100	16.0	4.5	13.0	35	20	
60.0	700	FE52GC6A0606*B	A	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1200	18.0	4.0	11.6	35	20	
65.0	700	FE52GE6A0656*B	A	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1300	20.0	4.0	9.4	35	15	
70.0	700	FE52GE6A0706*B	A	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1400	20.0	3.8	9.9	35	15	
75.0	700	FE52GE6A0756*B	A	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1500	20.0	3.8	9.9	35	15	
80.0	700	FE52GE6A0806*B	A	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1600	22.0	3.5	8.9	35	15	
80.0	700	FE52GF6A0806*B	A	GF	57.5	60.0	35.0	52.5	20.3	1.2	20	1600	23.0	3.4	8.3	35	20	
90.0	700	FE52GE6A0906*B	A	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1800	24.0	3.5	7.4	35	15	
90.0	700	FE52GF6A0906*B	A	GF	57.5	60.0	35.0	52.5	20.3	1.2	20	1800	24.0	3.5	7.4	35	20	
100.0	700	FE52GH6A0107*B	A	GH	57.5	65.0	35.0	52.5	20.3	1.2	20	2000	26.0	3.5	6.3	35	20	
110.0	700	FE52GK6A0117*B	A	GK	57.5	70.0	35.0	52.5	20.3	1.2	20	2200	28.0	3.4	5.6	35	20	
120.0	700	FE52GL6A0127*B	A	GL	57.5	80.0	35.0	52.5	20.3	1.2	20	2400	30.0	3.0	5.6	35	20	
130.0	700	FE52GI6A0137*B	A	GI	57.5	65.0	45.0	52.5	20.3	1.2	20	2600	32.0	2.8	5.2	35	15	
					Voltage Vndc 800V			Voltage Code B										
10.0	800	FE37F46B0106*B	B	F4	42.5	36.0	19.0	37.5	10.2	1.2	35	350	8.0	12.0	19.5	30	56	
12.0	800	FE37F46B0126*B	B	F4	42.5	36.0	19.0	37.5	10.2	1.2	35	420	9.0	10.0	18.5	30	56	
15.0	800	FE37F46B0156*B	B	F4	42.5	36.0	19.0	37.5	10.2	1.2	35	525	10.0	8.0	18.8	30	56	
15.0	800	FE37F66B0156*A	B	F6	42.5	40.0	20.0	37.5	10.2	1.2	35	525	10.0	8.0	18.8	30	56	
20.0	800	FE37F56B0206*B	B	F5	42.5	38.0	20.0	37.5	10.2	1.2	35	700	12.0	6.0	17.4	30	56	
20.0	800	FE37F86B0206*A	B	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	700	13.5	6.5	12.7	30	49	
20.0	800	FE37FL6B0206*A	B	FL	42.5	37.0	28.0	37.5	10.2	1.2	35	700	12.0	7.0	14.9	30	42	
22.0	800	FE37F86B0226*A	B	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	770	14.0	6.0	12.8	30	49	
22.0	800	FE37F86B0226*B	B	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	770	14.0	5.0	15.3	30	49	
25.0	800	FE37F86B0256*B	B	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	875	14.0	5.0	15.3	30	49	
25.0	800	FE37F96B0256*B	B	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	875	14.0	5.5	13.9	30	35	

# DC FILTERING

FE - Standard \*RoHS Compliant



## RATING & PART NUMBER REFERENCE

Cap	Rated Voltage	PN	Voltage Code	Case Code	Dimensions						dv/dt	Peak Current	Irms	ESR 10KHz	Rth	ESL	SPQ	
					W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	P2 ± 1.0	d ± 0.05								
µF	V				mm	mm	mm	mm	mm	mm	V/us	A	A	mΩ	°C/W	nH	pcs	
30.0	800	FE37F96B0306*B	B	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	1050	16.0	4.5	13.0	30	35	
35.0	800	FE37F96B0356*B	B	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	1225	18.0	3.5	13.2	30	35	
40.0	800	FE37FP6B0406*B	B	FP	42.5	57.0	30.0	37.5	20.3	1.2	35	1400	19.0	2.5	16.6	30	35	
30.0	800	FE52G96B0306*B	B	G9	57.5	45.0	25.0	52.5	10.2	1.2	18	540	12.0	8.0	13.0	35	30	
35.0	800	FE52G96B0356*B	B	G9	57.5	45.0	25.0	52.5	10.2	1.2	18	630	13.0	7.0	12.7	35	30	
35.0	800	FE52GA6B0356*B	B	GA	57.5	45.0	30.0	52.5	20.3	1.2	20	700	14.2	6.5	11.4	35	25	
40.0	800	FE52G96B0406*B	B	G9	57.5	45.0	25.0	52.5	10.2	1.2	18	720	14.0	6.0	12.8	35	30	
40.0	800	FE52GA6B0406*B	B	GA	57.5	45.0	30.0	52.5	20.3	1.2	20	800	14.0	6.0	12.8	35	25	
45.0	800	FE52GA6B0456*B	B	GA	57.5	45.0	30.0	52.5	20.3	1.2	20	900	15.5	5.5	11.4	35	25	
47.0	800	FE52GC6B0476*B	B	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	940	17.5	5.0	9.8	35	20	
50.0	800	FE52GA6B0506*B	B	GA	57.5	45.0	30.0	52.5	20.3	1.2	18	900	16.0	5.0	11.7	35	25	
50.0	800	FE52GC6B0506*B	B	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1000	16.0	5.0	11.7	35	20	
55.0	800	FE52GC6B0556*B	B	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1100	17.0	4.6	11.3	35	20	
60.0	800	FE52GC6B0606*B	B	GC	57.5	50.0	35.0	52.5	20.3	1.2	18	1080	19.0	4.0	10.4	35	20	
65.0	800	FE52GC6B0656*B	B	GC	57.5	50.0	35.0	52.5	20.3	1.2	18	1170	20.0	3.5	10.9	35	20	
65.0	800	FE52GE6B0656*B	B	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1300	20.0	4.0	9.4	35	15	
65.0	800	FE52GF6B0656*B	B	GF	57.5	60.0	35.0	52.5	20.3	1.2	20	1300	19.0	4.0	10.4	35	20	
70.0	800	FE52GB6B0706*B	B	GB	57.5	45.0	45.0	52.5	20.3	1.2	18	1260	20.0	3.5	10.7	35	15	
70.0	800	FE52GE6B0706*B	B	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1400	20.0	3.8	9.9	35	15	
70.0	800	FE52GF6B0706*B	B	GF	57.5	60.0	35.0	52.5	20.3	1.2	20	1400	20.0	3.8	9.9	35	20	
75.0	800	FE52GB6B0756*B	B	GB	57.5	45.0	45.0	52.5	20.3	1.2	18	1350	22.0	3.0	10.3	35	15	
75.0	800	FE52GE6B0756*B	B	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1500	22.0	3.8	8.2	35	15	
75.0	800	FE52GH6B0756*B	B	GH	57.5	65.0	35.0	52.5	20.3	1.2	20	1500	22.0	3.8	8.2	35	20	
80.0	800	FE52GB6B0806*B	B	GB	57.5	45.0	45.0	52.5	20.3	1.2	18	1440	22.0	3.0	10.3	35	15	
80.0	800	FE52GI6B0806*B	B	GI	57.5	65.0	45.0	52.5	20.3	1.2	20	1600	23.0	3.5	8.1	35	15	
80.0	800	FE52GK6B0806*B	B	GK	57.5	70.0	35.0	52.5	20.3	1.2	20	1600	23.0	3.5	8.1	35	20	
90.0	800	FE52GI6B0906*B	B	GI	57.5	65.0	45.0	52.5	20.3	1.2	20	1800	25.0	3.3	7.3	35	15	
90.0	800	FE52GL6B0906*B	B	GL	57.5	80.0	35.0	52.5	20.3	1.2	20	1800	25.0	3.3	7.3	35	20	
100.0	800	FE52GI6B0107*B	B	GI	57.5	65.0	45.0	52.5	20.3	1.2	20	2000	28.0	3.2	6.0	35	15	
160.0	800	FE52GJ6B0167*D	B	GJ	57.5	65.0	70.0	52.5	20.3	1.2	8	1280	30.0	2.5	6.7	35	10	
320.0	800	FE52GG6B0327*E	B	GG	57.5	65.0	130.0	52.5	20.3	1.2	4	1280	55.0	1.5	3.3	35	5	
					Voltage Vndc 900V			Voltage Code C										
9.0	900	FE37F46C0905*B	C	F4	42.5	36.0	19.0	37.5	10.2	1.2	35	315	9.0	12.0	15.4	30	56	
10.0	900	FE37F46C0106*B	C	F4	42.5	36.0	19.0	37.5	10.2	1.2	35	350	9.0	11.0	16.8	30	56	
10.0	900	FE37F66C0106*A	C	F6	42.5	40.0	20.0	37.5	10.2	1.2	35	350	9.5	11.5	14.5	30	56	
12.0	900	FE37F46C0126*B	C	F4	42.5	36.0	19.0	37.5	10.2	1.2	35	420	9.0	9.0	20.6	30	56	
15.0	900	FE37F56C0156*B	C	F5	42.5	38.0	20.0	37.5	10.2	1.2	35	525	11.0	8.0	15.5	30	56	
15.0	900	FE37F86C0156*A	C	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	525	12.0	7.5	13.9	30	49	
18.0	900	FE37F86C0186*A	C	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	630	12.0	7.5	13.9	30	49	
20.0	900	FE37F86C0206*B	C	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	700	14.0	5.0	15.3	30	49	
20.0	900	FE37F96C0206*B	C	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	700	15.0	5.5	12.1	30	35	
22.0	900	FE37F96C0226*B	C	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	770	15.0	5.0	13.3	30	35	
25.0	900	FE37F96C0256*B	C	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	875	17.0	5.5	9.4	30	35	
30.0	900	FE37FN6C0306*B	C	FN	42.5	50.0	35.0	37.5	20.3	1.2	35	1050	19.0	5.0	8.3	30	28	
30.0	900	FE37FP6C0306*B	C	FP	42.5	57.0	30.0	37.5	20.3	1.2	35	1050	18.0	4.0	11.6	30	35	
35.0	900	FE37FP6C0356*B	C	FP	42.5	57.0	30.0	37.5	20.3	1.2	35	1225	19.0	3.0	13.9	30	35	
20.0	900	FE52G66C0206*B	C	G6	57.5	22.0	43.0	52.5	20.3	1.2	20	400	12.0	8.6	12.1	35	15	
30.0	900	FE52G96C0306*B	C	G9	57.5	45.0	25.0	52.5	10.2	1.2	18	540	13.0	7.0	12.7	35	30	
30.0	900	FE52GA6C0306*B	C	GA	57.5	45.0	30.0	52.5	20.3	1.2	20	600	15.0	5.5	12.1	35	25	
35.0	900	FE52GA6C0356*B	C	GA	57.5	45.0	30.0	52.5	20.3	1.2	18	630	14.0	6.0	12.8	35	25	
35.0	900	FE52GC6C0356*B	C	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	700	15.5	5.5	11.4	35	20	
40.0	900	FE52GA6C0406*B	C	GA	57.5	45.0	30.0	52.5	20.3	1.2	18	720	15.0	5.0	13.3	35	25	
40.0	900	FE52GC6C0406*B	C	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	800	16.0	6.5	9.0	35	20	
45.0	900	FE52GC6C0456*B	C	GC	57.5	50.0	35.0	52.5	20.3	1.2	18	810	17.0	5.0	10.4	35	20	
50.0	900	FE52GC6C0506*B	C	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1000	18.0	3.6	12.9	35	20	
55.0	900	FE52GB6C0556*B	C	GB	57.5	45.0	45.0	52.5	20.3	1.2	18	990	19.0	4.0	10.4	35	15	
55.0	900	FE52GE6C0556*B	C	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1100	20.0	3.4	11.0	35	15	

# DC FILTERING

FE - Standard \*RoHS Compliant



## RATING & PART NUMBER REFERENCE

Cap	Rated Voltage	PN	Voltage Code	Case Code	Dimensions						dv/dt	Peak Current	I <sub>rms</sub>	ESR 10KHz	R <sub>th</sub>	ESL	SPQ
					W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	P2 ± 1.0	d ± 0.05							
µF	V				mm	mm	mm	mm	mm	mm	V/us	A	A	mΩ	°C/W	nH	pcs
55.0	900	FE52GF6C0556*B	C	GF	57.5	60.0	35.0	52.5	20.3	1.2	20	1100	19.0	3.5	11.9	35	20
60	900	FE52GB6C0606*B	C	GB	57.5	45.0	45.0	52.5	20.3	1.2	18	1080	20.0	3.5	10.7	35	15
60.0	900	FE52GE6C0606*B	C	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1200	20.0	3.4	11.0	35	15
65.0	900	FE52GK6C0656*B	C	GK	57.5	70.0	35.0	52.5	20.3	1.2	20	1300	22.0	3.3	9.4	35	20
70.0	900	FE52GE6C0706*B	C	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1400	24.0	3.2	8.1	35	15
70.0	900	FE52GL6C0706*B	C	GL	57.5	80.0	35.0	52.5	20.3	1.2	20	1400	24.0	3.2	8.1	35	20
80.0	900	FE52GI6C0806*B	C	GI	57.5	65.0	45.0	52.5	20.3	1.2	20	1600	25.0	3.2	7.5	35	15
120	900	FE52GJ6C0127*D	C	GJ	57.5	65.0	70.0	52.5	20.3	1.2	13	1560	25.0	3.0	8.0	35	10
240	900	FE52GG6C0247*E	C	GG	57.5	65.0	130.0	52.5	20.3	1.2	6	1440	45.0	1.5	4.9	35	5
					Voltage V <sub>ndc</sub> 1000V			Voltage Code K									
5.0	1000	FE37F46K0505*B	K	F4	42.5	36.0	19.0	37.5	10.2	1.2	35	175	7.0	19.0	16.1	30	56
6.0	1000	FE37F46K0605*B	K	F4	42.5	36.0	19.0	37.5	10.2	1.2	35	210	7.0	16.0	19.1	30	56
7.0	1000	FE37F46K0705*B	K	F4	42.5	36.0	19.0	37.5	10.2	1.2	35	245	7.0	16.0	19.1	30	56
8.0	1000	FE37F46K0805*B	K	F4	42.5	36.0	19.0	37.5	10.2	1.2	35	280	8.0	14.0	16.7	30	56
9.0	1000	FE37F46K0905*B	K	F4	42.5	36.0	19.0	37.5	10.2	1.2	35	315	8.0	12.0	19.5	30	56
10.0	1000	FE37F56K0106*B	K	F5	42.5	38.0	20.0	37.5	10.2	1.2	35	350	9.0	11.0	16.8	30	56
10.0	1000	FE37F66K0106*A	K	F6	42.5	40.0	20.0	37.5	10.2	1.2	40	400	9.5	11.5	14.5	30	56
12.0	1000	FE37F56K0126*B	K	F5	42.5	38.0	20.0	37.5	10.2	1.2	35	420	10.0	9.0	16.7	30	56
12.0	1000	FE37F86K0126*A	K	F8	42.5	44.0	24.0	37.5	10.2	1.2	40	480	10.5	9.0	15.1	30	49
15.0	1000	FE37F86K0156*A	K	F8	42.5	44.0	24.0	37.5	10.2	1.2	40	600	12.0	7.5	13.9	30	49
15.0	1000	FE37F86K0156*B	K	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	525	12.0	7.0	14.9	30	49
15.0	1000	FE37F96K0156*B	K	F9	42.5	45.0	30.0	37.5	20.3	1.2	40	600	14.0	7.5	10.2	30	35
20.0	1000	FE37F96K0206*B	K	F9	42.5	45.0	30.0	37.5	20.3	1.2	40	800	15.0	6.5	10.3	30	35
22.0	1000	FE37FP6K0226*B	K	FP	42.5	57.0	30.0	37.5	20.3	1.2	35	770	15.0	5.0	13.3	30	35
25.0	1000	FE37FN6K0256*B	K	FN	42.5	50.0	35.0	37.5	20.3	1.2	40	1000	18.0	5.5	8.4	30	28
25.0	1000	FE37FP6K0256*B	K	FP	42.5	57.0	30.0	37.5	20.3	1.2	35	875	17.0	3.5	14.8	30	35
15.0	1000	FE52G66K0156*B	K	G6	57.5	22.0	43.0	52.5	20.3	1.2	40	600	12.0	8.5	12.3	35	15
15.0	1000	FE52G96K0156*B	K	G9	57.5	45.0	25.0	52.5	10.2	1.2	18	270	10.0	12.0	12.5	35	30
20.0	1000	FE52G96K0206*B	K	G9	57.5	45.0	25.0	52.5	10.2	1.2	18	360	10.0	11.0	13.6	35	30
22.0	1000	FE52G96K0226*B	K	G9	57.5	45.0	25.0	52.5	10.2	1.2	18	396	11.0	10.0	12.4	35	30
25.0	1000	FE52GA6K0256*B	K	GA	57.5	45.0	30.0	52.5	20.3	1.2	18	450	12.0	9.0	11.6	35	25
30.0	1000	FE52GA6K0306*B	K	GA	57.5	45.0	30.0	52.5	20.3	1.2	25	750	15.0	5.5	12.1	35	25
35.0	1000	FE52GC6K0356*B	K	GC	57.5	50.0	35.0	52.5	20.3	1.2	25	875	16.0	5.5	10.7	35	20
40.0	1000	FE52GC6K0406*B	K	GC	57.5	50.0	35.0	52.5	20.3	1.2	25	1000	16.0	5.0	11.7	35	20
40.0	1000	FE52GE6K0406*B	K	GE	57.5	55.0	45.0	52.5	20.3	1.2	25	1000	17.0	5.0	10.4	35	15
45.0	1000	FE52GB6K0456*B	K	GB	57.5	45.0	45.0	52.5	20.3	1.2	18	810	17.0	5.0	10.4	35	15
50.0	1000	FE52GB6K0506*B	K	GB	57.5	45.0	45.0	52.5	20.3	1.2	18	900	18.0	4.0	11.6	35	15
50.0	1000	FE52GE6K0506*B	K	GE	57.5	55.0	45.0	52.5	20.3	1.2	25	1250	19.0	4.5	9.2	35	15
50.0	1000	FE52GH6K0506*B	K	GH	57.5	65.0	35.0	52.5	20.3	1.2	25	1250	19.0	4.5	9.2	35	20
55.0	1000	FE52GK6K0556*B	K	GK	57.5	70.0	35.0	52.5	20.3	1.2	25	1375	20.0	4.4	8.5	35	20
60.0	1000	FE52GI6K0606*B	K	GI	57.5	65.0	45.0	52.5	20.3	1.2	25	1500	22.0	4.0	7.7	35	15
60.0	1000	FE52GL6K0606*B	K	GL	57.5	80.0	35.0	52.5	20.3	1.2	25	1500	22.0	4.0	7.7	35	20
100.0	1000	FE52GJ6K0107*D	K	GJ	57.5	65.0	70.0	52.5	20.3	1.2	15	1500	25.0	3.5	6.9	35	10
200.0	1000	FE52GG6K0207*E	K	GG	57.5	65.0	130.0	52.5	20.3	1.2	7	1400	45.0	1.5	4.9	35	5
					Voltage V <sub>ndc</sub> 1100V			Voltage Code L									
6.8	1100	FE37FI6L0685*A	L	FI	42.5	33.5	22.0	37.5	10.2	1.2	40	272	12.0	13.5	7.7	30	49
8.0	1100	FE37F66L0805*A	L	F6	42.5	40.0	20.0	37.5	10.2	1.2	40	320	12.5	12.5	7.7	30	56
8.0	1100	FE37FK6L0805*A	L	FK	42.5	37.0	22.0	37.5	10.2	1.2	40	320	12.5	12.5	7.7	30	49
9.0	1100	FE37FK6L0905*A	L	FK	42.5	37.0	22.0	37.5	10.2	1.2	40	360	12.8	12.2	7.5	30	49
10.0	1100	FE37F86L0106*A	L	F8	42.5	44.0	24.0	37.5	10.2	1.2	40	400	15.0	8.5	7.8	30	49
12.0	1100	FE37F96L0126*B	L	F9	42.5	45.0	30.0	37.5	20.3	1.2	40	480	15.5	7.5	8.3	30	35
15.0	1100	FE37F96L0156*B	L	F9	42.5	45.0	30.0	37.5	20.3	1.2	40	600	16.0	7.0	8.4	30	35
18.0	1100	FE37FN6L0186*B	L	FN	42.5	50.0	35.0	37.5	20.3	1.2	40	720	15.5	7.5	8.3	30	28
20.0	1100	FE37FN6L0206*B	L	FN	42.5	50.0	35.0	37.5	20.3	1.2	40	800	16.5	7.2	7.7	30	28
20.0	1100	FE52GA6L0206*B	L	GA	57.5	45.0	30.0	52.5	20.3	1.2	25	500	12.0	8.5	12.3	35	25
25.0	1100	FE52GC6L0256*B	L	GC	57.5	50.0	35.0	52.5	20.3	1.2	25	625	13.0	8.2	10.8	35	20
30.0	1100	FE52GC6L0306*B	L	GC	57.5	50.0	35.0	52.5	20.3	1.2	25	750	15.0	5.0	13.3	35	20

# DC FILTERING

FE - Standard \*RoHS Compliant



## RATING & PART NUMBER REFERENCE

Cap uF	Rated Voltage V	PN	Voltage Code	Case Code	Dimensions						dv/dt V/us	Peak Current A	I <sub>rms</sub> A	ESR 10KHz mΩ	R <sub>th</sub> °C/W	ESL nH	SPQ pcs
					W ± 0.5 mm	H ± 0.5 mm	T ± 0.5 mm	P1 ± 1.0 mm	P2 ± 1.0 mm	d ± 0.05 mm							
					Voltage V <sub>ndc</sub> 1200V			Voltage Code P									
35.0	1100	FE52GF6L0356*B	L	GF	57.5	60.0	35.0	52.5	20.3	1.2	25	875	16.0	4.9	12.0	35	20
40.0	1100	FE52GH6L0406*B	L	GH	57.5	65.0	35.0	52.5	20.3	1.2	25	1000	17.0	5.5	9.4	35	20
40.0	1100	FE52GE6L0406*B	L	GE	57.5	55.0	45.0	52.5	20.3	1.2	25	1000	17.0	5.5	9.4	35	15
45.0	1100	FE52GK6L0456*B	L	GK	57.5	70.0	35.0	52.5	20.3	1.2	25	1125	18.0	5.4	8.6	35	20
50.0	1100	FE52GI6L0506*B	L	GI	57.5	65.0	45.0	52.5	20.3	1.2	25	1250	19.5	5.2	7.6	35	15
5.0	1200	FE37F46P0505*B	P	F4	42.5	36.0	19.0	37.5	10.2	1.2	40	200	7.0	16.0	19.1	30	56
6.0	1200	FE37F46P0605*B	P	F4	42.5	36.0	19.0	37.5	10.2	1.2	40	240	8.0	14.0	16.7	30	56
7.0	1200	FE37F56P0705*B	P	F5	42.5	38.0	20.0	37.5	10.2	1.2	40	280	9.0	12.0	15.4	30	56
7.0	1200	FE37FK6P0705*A	P	FK	42.5	37.0	22.0	37.5	10.2	1.2	45	315	8.0	15.2	15.4	30	49
8.0	1200	FE37F56P0805*B	P	F5	42.5	38.0	20.0	37.5	10.2	1.2	40	320	10.0	10.0	15.0	30	56
8.0	1200	FE37F86P0805*A	P	F8	42.5	44.0	24.0	37.5	10.2	1.2	45	360	9.0	12.5	14.8	30	49
9.0	1200	FE37F86P0905*B	P	F8	42.5	44.0	24.0	37.5	10.2	1.2	40	360	11.0	9.0	13.8	30	49
10.0	1200	FE37F86P0106*A	P	F8	42.5	44.0	24.0	37.5	10.2	1.2	45	450	10.0	10.5	14.3	30	49
10.0	1200	FE37F86P0106*B	P	F8	42.5	44.0	24.0	37.5	10.2	1.2	40	400	11.0	8.0	15.5	30	49
10.0	1200	FE37F96P0106*B	P	F9	42.5	45.0	30.0	37.5	20.3	1.2	45	450	12.0	8.0	13.0	30	35
12.0	1200	FE37F96P0126*B	P	F9	42.5	45.0	30.0	37.5	20.3	1.2	40	480	13.0	7.0	12.7	30	35
15.0	1200	FE37FN6P0156*B	P	FN	42.5	50.0	35.0	37.5	20.3	1.2	45	675	15.0	6.5	10.3	30	28
15.0	1200	FE37FP6P0156*B	P	FP	42.5	57.0	30.0	37.5	20.3	1.2	40	600	14.0	5.0	15.3	30	35
10.0	1200	FE52G96P0106*B	P	G9	57.5	45.0	25.0	52.5	10.2	1.2	20	200	9.0	16.0	11.6	35	30
12.0	1200	FE52G96P0126*B	P	G9	57.5	45.0	25.0	52.5	10.2	1.2	20	240	9.0	13.0	14.2	35	30
15.0	1200	FE52G96P0156*B	P	G9	57.5	45.0	25.0	52.5	10.2	1.2	20	300	10.0	11.0	13.6	35	30
20.0	1200	FE52GA6P0206*B	P	GA	57.5	45.0	30.0	52.5	20.3	1.2	30	600	13.0	8.5	10.4	35	25
22.0	1200	FE52GC6P0226*B	P	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	440	14.0	7.0	10.9	35	20
25.0	1200	FE52GC6P0256*B	P	GC	57.5	50.0	35.0	52.5	20.3	1.2	30	750	15.0	6.5	10.3	35	20
30.0	1200	FE52GB6P0306*B	P	GB	57.5	45.0	45.0	52.5	20.3	1.2	20	600	16.0	5.0	11.7	35	15
30.0	1200	FE52GE6P0306*B	P	GE	57.5	55.0	45.0	52.5	20.3	1.2	30	900	17.0	5.5	9.4	35	15
30.0	1200	FE52GF6P0306*B	P	GF	57.5	60.0	35.0	52.5	20.3	1.2	30	900	17.0	5.5	9.4	35	20
35.0	1200	FE52GE6P0356*B	P	GE	57.5	55.0	45.0	52.5	20.3	1.2	30	1050	18.0	5.0	9.3	35	15
35.0	1200	FE52GK6P0356*B	P	GK	57.5	70.0	35.0	52.5	20.3	1.2	30	1050	18.0	5.0	9.3	35	20
40.0	1200	FE52GI6P0406*B	P	GI	57.5	65.0	45.0	52.5	20.3	1.2	30	1200	20.0	4.5	8.3	35	15
45.0	1200	FE52GI6P0456*B	P	GI	57.5	65.0	45.0	52.5	20.3	1.2	30	1350	22.0	4.3	7.2	35	15
60.0	1200	FE52GJ6P0606*D	P	GJ	57.5	65.0	70.0	52.5	20.3	1.2	20	1200	40.0	2.5	3.8	35	10
65.0	1200	FE52GJ6P0656*D	P	GJ	57.5	65.0	70.0	52.5	20.3	1.2	18	1170	40.0	2.0	4.7	35	10
140.0	1200	FE52GG6P0147*E	P	GG	57.5	65.0	130.0	52.5	20.3	1.2	10	1400	45.0	1.5	4.9	35	5

# DC FILTERING

FE - Low Profile \*RoHS Compliant



## CASE CODE

mm

Case Code	Dimensions					
	W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	P2 ± 1.0	d ± 0.05
	mm	mm	mm	mm	mm	mm
FA	42.0	15.0	27.0	37.5	10.2	1.2
FB	42.0	15.0	33.0	37.5	10.2	1.2
FC	42.0	18.0	24.0	37.5	10.2	1.2
FD	42.0	18.0	27.0	37.5	10.2	1.2
FE	42.0	18.0	39.0	37.5	10.2	1.2
FF	42.0	24.0	30.0	37.5	10.2	1.2
FG	42.0	24.0	39.0	37.5	10.2	1.2
G1	57.5	15.0	33.0	52.5	20.3	1.2
G2	57.5	15.0	45.0	52.5	20.3	1.2
G3	57.5	15.0	62.0	52.5	20.3	1.2
G4	57.5	18.0	35.0	52.5	20.3	1.2
G5	57.5	18.0	50.0	52.5	20.3	1.2
G7	57.5	24.0	39.0	52.5	20.3	1.2
G8	57.5	24.0	70.0	52.5	20.3	1.2

## LOW PROFILE RATING & PART NUMBER REFERENCE

Cap uF	Rated Voltage V	PN	Voltage Code	Case Code	Dimensions						dv/dt V/us	Peak Current A	Irms A	ESR 10KHz mΩ	Rth °C/W	ESL nH	SPQ pcs
					W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	P2 ± 1.0	d ± 0.05							
					mm	mm	mm	mm	mm	mm							
					Voltage Vndc 500V			Voltage Code H									
10.0	500	FE37FA8H0106*A	H	FA	42.0	15.0	27.0	37.5	10.2	1.2	15	150	5.0	7.5	80.0	30	42
15.0	500	FE37FB8H0156*A	H	FB	42.0	15.0	33.0	37.5	10.2	1.2	15	225	7.0	5.0	61.2	30	35
20.0	500	FE52G18H0206*B	H	G1	57.5	15.0	33.0	52.5	20.3	1.2	7	140	6.5	8.0	44.4	35	30
30.0	500	FE52G28H0306*B	H	G2	57.5	15.0	45.0	52.5	20.3	1.2	7	210	9.0	5.5	33.7	35	15
50.0	500	FE52G38H0506*D	H	G3	57.5	15.0	62.0	52.5	20.3	1.2	7	350	13.5	3.5	23.5	35	10
10.0	500	FE37FC8H0106*A	H	FC	42.0	18.0	24.0	37.5	10.2	1.2	15	150	5.5	7.5	66.1	30	49
15.0	500	FE37FD8H0156*A	H	FD	42.0	18.0	27.0	37.5	10.2	1.2	15	225	7.0	5.0	61.2	30	42
20.0	500	FE37FE8H0206*A	H	FE	42.0	18.0	39.0	37.5	10.2	1.2	15	300	9.0	4.0	46.3	30	28
30.0	500	FE52G48H0306*B	H	G4	57.5	18.0	35.0	52.5	20.3	1.2	7	210	8.5	5.5	37.7	35	20
50.0	500	FE52G58H0506*B	H	G5	57.5	18.0	50.0	52.5	20.3	1.2	7	350	12.5	3.5	27.4	35	15
20.0	500	FE37FF8H0206*A	H	FF	42.0	24.0	30.0	37.5	10.2	1.2	15	300	9.0	4.0	46.3	30	35
30.0	500	FE37FG8H0306*A	H	FG	42.0	24.0	39.0	37.5	10.2	1.2	15	450	12.0	2.5	41.7	30	28
50.0	500	FE52G78H0506*B	H	G7	57.5	24.0	39.0	52.5	20.3	1.2	7	350	12.5	3.5	27.4	35	20
100.0	500	FE52G88H0107*D	H	G8	57.5	24.0	70.0	52.5	20.3	1.2	7	700	22.0	2.0	15.5	35	10
					Voltage Vndc 700V			Voltage Code A									
7.0	700	FE37FA8A0705*A	A	FA	42.0	15.0	27.0	37.5	10.2	1.2	17	119	5.0	11.5	52.2	30	42
10.0	700	FE37FB8A0106*A	A	FB	42.0	15.0	33.0	37.5	10.2	1.2	17	170	6.5	8.0	44.4	30	35
15.0	700	FE52G18A0156*B	A	G1	57.5	15.0	33.0	52.5	20.3	1.2	8	120	6.5	10.0	35.5	35	30
20.0	700	FE52G28A0206*B	A	G2	57.5	15.0	45.0	52.5	20.3	1.2	8	160	8.5	7.5	27.7	35	15
30.0	700	FE52G38A0306*D	A	G3	57.5	15.0	62.0	52.5	20.3	1.2	8	240	12.0	5.0	20.8	35	10
7.0	700	FE37FC8A0705*A	A	FC	42.0	18.0	24.0	37.5	10.2	1.2	17	119	5.0	11.5	52.2	30	49
10.0	700	FE37FD8A0106*A	A	FD	42.0	18.0	27.0	37.5	10.2	1.2	17	170	6.5	8.0	44.4	30	42
15.0	700	FE37FE8A0156*A	A	FE	42.0	18.0	39.0	37.5	10.2	1.2	17	255	9.0	5.5	33.7	30	28
20.0	700	FE52G48A0206*B	A	G4	57.5	18.0	35.0	52.5	20.3	1.2	8	160	8.0	7.5	31.3	35	20
30.0	700	FE52G58A0306*B	A	G5	57.5	18.0	50.0	52.5	20.3	1.2	8	240	11.5	5.0	22.7	35	15
15.0	700	FE37FF8A0156*A	A	FF	42.0	24.0	30.0	37.5	10.2	1.2	17	255	9.0	5.5	33.7	30	35
20.0	700	FE37FG8A0206*A	A	FG	42.0	24.0	39.0	37.5	10.2	1.2	17	340	11.5	4.0	28.4	30	28
30.0	700	FE52G78A0306*B	A	G7	57.5	24.0	39.0	52.5	20.3	1.2	8	240	11.0	5.0	24.8	35	20
50.0	700	FE52G88A0506*D	A	G8	57.5	24.0	70.0	52.5	20.3	1.2	8	400	18.0	3.0	15.4	35	10
					Voltage Vndc 1000V			Voltage Code K									
5.0	1000	FE37FA8K0505*A	K	FA	42.0	15.0	27.0	37.5	10.2	1.2	25	125	4.5	11.5	64.4	30	42
7.0	1000	FE37FB8K0705*A	K	FB	42.0	15.0	33.0	37.5	10.2	1.2	25	175	6.0	8.0	52.1	30	35
10.0	1000	FE52G18K0106*B	K	G1	57.5	15.0	33.0	52.5	20.3	1.2	12	120	6.0	10.0	41.7	35	30

# DC FILTERING

FE - Low Profile \*RoHS Compliant



## LOW PROFILE RATING & PART NUMBER REFERENCE

Cap	Rated Voltage	PN	Voltage Code	Case Code	Dimensions						dv/dt	Peak Current	I <sub>rms</sub>	ESR 10KHz	R <sub>th</sub>	ESL	SPQ
					W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	P2 ± 1.0	d ± 0.05							
µF	V				mm	mm	mm	mm	mm	mm	V/us	A	A	mΩ	°C/W	nH	pcs
15.0	1000	FE52G28K0156*B	K	G2	57.5	15.0	45.0	52.5	20.3	1.2	12	180	8.0	6.5	36.1	35	15
20.0	1000	FE52G38K0206*D	K	G3	57.5	15.0	62.0	52.5	20.3	1.2	12	240	11.0	5.0	24.8	35	10
3.0	1000	FE37FC8K0305*A	K	FC	42.0	18.0	24.0	37.5	10.2	1.2	25	75	3.5	19.0	64.4	30	49
5.0	1000	FE37FD8K0505*A	K	FD	42.0	18.0	27.0	37.5	10.2	1.2	25	125	5.0	11.5	52.2	30	42
7.0	1000	FE37FE8K0705*A	K	FE	42.0	18.0	39.0	37.5	10.2	1.2	25	175	7.0	8.0	38.3	30	28
10.0	1000	FE37FE8K0106*A	K	FE	42.0	18.0	39.0	37.5	10.2	1.2	25	250	8.0	6.0	39.1	30	28
15.0	1000	FE52G58K0156*B	K	G5	57.5	18.0	50.0	52.5	20.3	1.2	12	180	9.0	6.5	28.5	35	15
20.0	1000	FE52G58K0206*B	K	G5	57.5	18.0	50.0	52.5	20.3	1.2	12	240	10.0	5.0	30.0	35	15
7.0	1000	FE37FF8K0705*A	K	FF	42.0	24.0	30.0	37.5	10.2	1.2	25	175	6.5	8.0	44.4	30	35
10.0	1000	FE37FG8K0106*A	K	FG	42.0	24.0	39.0	37.5	10.2	0.5	25	250	9.0	6.0	30.9	30	28
15.0	1000	FE52G78K0156*B	K	G7	57.5	24.0	39.0	52.5	20.3	1.2	12	180	8.5	6.5	31.9	35	20
20.0	1000	FE52G78K0206*B	K	G7	57.5	24.0	39.0	52.5	20.3	1.2	12	240	10.0	5.0	30.0	35	20
30.0	1000	FE52G88K0306*D	K	G8	57.5	24.0	70.0	52.5	20.3	1.2	12	360	15.5	4.0	15.6	35	10

# DC FILTERING

FE - THB \*RoHS Compliant



## CASE CODE

mm

Case Code	Dimensions					
	W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	P2 ± 1.0	d ± 0.05
	mm	mm	mm	mm	mm	mm
FI	42.5	33.5	22.0	37.5	10.2	1.2
FK	42.5	37.0	22.0	37.5	10.2	1.2
FL	42.5	37.0	28.0	37.5	10.2	1.2
F6	42.5	40.0	20.0	37.5	10.2	1.2
F8	42.5	44.0	24.0	37.5	10.2	1.2
F9	42.5	45.0	30.0	37.5	20.3	1.2
FN	42.5	50.0	35.0	37.5	20.3	1.2
G6	57.5	22.0	43.0	52.5	20.3	1.2
GA	57.5	45.0	30.0	52.5	20.3	1.2
GC	57.5	50.0	35.0	52.5	20.3	1.2
GD	57.5	53.0	50.0	52.5	20.3	1.2
GE	57.5	55.0	45.0	52.5	20.3	1.2
GF	57.5	60.0	35.0	52.5	20.3	1.2
GH	57.5	65.0	35.0	52.5	20.3	1.2
GI	57.5	65.0	45.0	52.5	20.3	1.2
GK	57.5	70.0	35.0	52.5	20.3	1.2
GL	57.5	80.0	35.0	52.5	20.3	1.2

## RATING & PART NUMBER REFERENCE

Cap uF	Rated Voltage V	PN	Voltage Code	Case Code	Dimensions						dv/dt V/us	Peak Current A	I <sub>rms</sub> A	ESR 10KHz mΩ	R <sub>th</sub> °C/W	ESL nH	SPQ pcs
					W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	P2 ± 1.0	d ± 0.05							
					mm	mm	mm	mm	mm	mm							
<b>Voltage V<sub>ndc</sub> 450V</b>																	
25.0	450	FE37FK7I0256*A	I	FK	42.5	37.0	22.0	37.5	10.2	1.2	35	875	12.5	5.5	17.5	30	49
30.0	450	FE37F67I0306*A	I	F6	42.5	40.0	20.0	37.5	10.2	1.2	35	1050	12.0	6.0	17.4	30	56
40.0	450	FE37FL7I0406*A	I	FL	42.5	37.0	28.0	37.5	10.2	1.2	35	1400	14.0	5.5	13.9	30	42
40.0	450	FE37F87I0406*A	I	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	1400	15.0	5.2	12.8	30	49
40.0	450	FE52G67I0406*B	I	G6	57.5	22.0	43.0	52.5	20.3	1.2	35	1400	12.0	8.0	13.0	35	15
50.0	450	FE37F97I0506*B	I	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	1750	15.0	4.0	16.7	30	35
50.0	450	FE52G67I0506*B	I	G6	57.5	22.0	43.0	52.5	20.3	1.2	35	1750	14.0	6.5	11.8	35	15
55.0	450	FE52GA7I0556*B	I	GA	57.5	45.0	30.0	52.5	20.3	1.2	35	1925	15.5	5.0	12.5	35	25
60.0	450	FE52GA7I0606*B	I	GA	57.5	45.0	30.0	52.5	20.3	1.2	35	2100	16.5	4.5	12.2	35	25
60.0	450	FE37F97I0606*B	I	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	2100	16.5	4.0	13.8	30	35
80.0	450	FE52GA7I0806*B	I	GA	57.5	45.0	30.0	52.5	20.3	1.2	20	1600	16.0	4.0	14.6	35	25
100.0	450	FE52GC7I0107*B	I	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	2000	18.0	3.8	12.2	35	20
130.0	450	FE52GF7I0137*B	I	GF	57.5	60.0	35.0	52.5	20.3	1.2	20	2600	22.0	3.5	8.9	35	20
140.0	450	FE52GH7I0147*B	I	GH	57.5	65.0	35.0	52.5	20.3	1.2	20	2800	24.0	3.4	7.7	35	20
150.0	450	FE52GK7I0157*B	I	GK	57.5	70.0	35.0	52.5	20.3	1.2	20	3000	26.0	3.2	6.9	35	20
160.0	450	FE52GL7I0167*B	I	GL	57.5	80.0	35.0	52.5	20.3	1.2	20	3200	28.0	3.1	6.2	35	20
170.0	450	FE52GL7I0177*B	I	GL	57.5	80.0	35.0	52.5	20.3	1.2	20	3400	30.0	3.0	5.6	35	20
<b>Voltage V<sub>ndc</sub> 550V</b>																	
20.0	550	FE37F67J0206*A	J	F6	42.5	40.0	20.0	37.5	10.2	1.2	35	700	12.5	6.5	14.8	30	56
22.0	550	FE37F67J0226*A	J	F6	42.5	40.0	20.0	37.5	10.2	1.2	35	770	13.5	6.5	12.7	30	56
25.0	550	FE37F67J0256*A	J	F6	42.5	40.0	20.0	37.5	10.2	1.2	35	875	14.5	6.5	11.0	30	56
30.0	550	FE37F87J0306*A	J	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	1050	16.0	6.0	9.8	30	49
35.0	550	FE37F97J0356*B	J	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	1225	18.0	6.0	7.7	30	35
40.0	550	FE37F97J0406*B	J	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	1400	18.0	5.5	8.4	30	35
40.0	550	FE52G67J0406*B	J	G6	57.5	22.0	43.0	52.5	20.3	1.2	35	1400	16.0	5.8	10.1	35	15
50.0	550	FE37FN7J0506*B	J	FN	42.5	50.0	35.0	37.5	20.3	1.2	35	1750	20.0	5.0	7.5	30	28
60.0	550	FE37GA7J0606*B	J	GA	57.5	45.0	30.0	37.5	20.3	1.2	20	1200	18.0	4.8	9.6	35	25
75.0	550	FE52GC7J0756*B	J	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1500	20.0	5.0	7.5	35	20
100.0	550	FE52GE7J0107*B	J	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	2000	24.0	4.5	5.8	35	15
110.0	550	FE52GE7J0117*B	J	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	2200	26.0	4.0	5.5	35	15
130.0	550	FE52GF7J0137*B	J	GF	57.5	60.0	35.0	52.5	20.3	1.2	20	2600	23.0	3.4	8.3	35	20

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# DC FILTERING

FE - THB \*RoHS Compliant



## RATING & PART NUMBER REFERENCE

Cap	Rated Voltage	PN	Voltage Code	Case Code	Dimensions						dv/dt	Peak Current	Irms	ESR 10KHz	Rth	ESL	SPQ
					W	H	T	P1	P2	d							
					± 0.5	± 0.5	± 0.5	± 1.0	± 1.0	± 0.05							
µF	V				mm	mm	mm	mm	mm	mm	V/us	A	A	mΩ	°C/W	nH	pcs
140.0	550	FE52GH7J0147*B	J	GH	57.5	65.0	35.0	52.5	20.3	1.2	20	2800	25.0	3.3	7.3	35	20
150.0	550	FE52GK7J0157*B	J	GK	57.5	70.0	35.0	52.5	20.3	1.2	20	3000	27.0	3.1	6.6	35	20
160.0	550	FE52GL7J0167*B	J	GL	57.5	80.0	35.0	52.5	20.3	1.2	20	3200	29.0	3.0	5.9	35	20
170.0	550	FE52GL7J0177*B	J	GL	57.5	80x.0	35.0	52.5	20.3	1.2	20	3400	32.0	2.8	5.2	35	20
					Voltage Vndc 600V			Voltage Code Q									
20.0	600	FE37F67Q0206*A	Q	F6	42.5	40.0	20.0	37.5	10.2	1.2	35	700	11.0	6.0	20.7	30	56
30.0	600	FE37FL7Q0306*A	Q	FL	42.5	37.0	28.0	37.5	10.2	1.2	35	1050	13.0	5.5	16.1	30	42
35.0	600	FE37F87Q0356*A	Q	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	1225	16.5	5.0	11.0	30	49
35.0	600	FE52G67Q0356*B	Q	G6	57.5	22.0	43.0	52.5	20.3	1.2	20	700	13.5	5.5	15.0	35	15
40.0	600	FE37F97Q0406*B	Q	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	1400	18.0	4.0	11.6	30	35
50.0	600	FE52GC7Q0506*B	Q	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1000	14.0	6.5	11.8	35	20
60.0	600	FE52GC7Q0606*B	Q	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1200	16.0	5.0	11.7	35	20
70.0	600	FE52GC7Q0706*B	Q	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1400	18.0	5.0	9.3	35	20
80.0	600	FE52GE7Q0806*B	Q	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1600	20.0	4.0	9.4	35	15
90.0	600	FE52GE7Q0906*B	Q	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1800	24.0	4.0	6.5	35	15
100.0	600	FE52GD7Q107*B	Q	GD	57.5	53.0	50.0	52.5	20.3	1.2	20	2000	26.0	4.0	5.5	35	15
110.0	600	FE52GD7Q0117*B	Q	GD	57.5	53.0	50.0	52.5	20.3	1.2	20	2200	28.0	3.5	5.5	35	15
120.0	600	FE52GF7Q0127*B	Q	GF	57.5	60.0	35.0	52.5	20.3	1.2	20	2400	30.0	3.4	4.9	35	20
130.0	600	FE52GH7Q0137*B	Q	GH	57.5	65.0	35.0	52.5	20.3	1.2	20	2600	32.0	3.3	4.4	35	20
140.0	600	FE52GK7Q0147*B	Q	GK	57.5	70.0	35.0	52.5	20.3	1.2	20	2800	34.0	3.2	4.1	35	20
140.0	600	FE52GI7Q0147*B	Q	GI	57.5	65.0	45.0	52.5	20.3	1.2	20	2800	34.0	3.2	4.1	35	15
150.0	600	FE52GL7Q0157*B	Q	GL	57.5	80.0	35.0	52.5	20.3	1.2	20	3000	36.0	3.0	3.9	35	20
					Voltage Vndc 700V			Voltage Code A									
15.0	700	FE37FI7A0156*A	A	FI	42.5	33.5	22.0	37.5	10.2	1.2	35	525	10.0	8.0	18.8	30	49
15.0	700	FE37F67A0156*A	A	F6	42.5	40.0	20.0	37.5	10.2	1.2	35	525	10.0	8.0	18.8	30	56
20.0	700	FE37FL7A0206*A	A	FL	42.5	37.0	28.0	37.5	10.2	1.2	35	700	12.0	7.5	13.9	30	42
22.0	700	FE37F87A0226*A	A	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	770	14.0	6.5	11.8	30	49
25.0	700	FE37F87A0256*A	A	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	875	16.0	6.0	9.8	30	49
30.0	700	FE37F97A0306*B	A	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	1050	16.0	5.8	10.1	30	35
30.0	700	FE52G67A0306*B	A	G6	57.5	22.0	43.0	52.5	20.3	1.2	20	600	12.0	8.5	12.3	35	15
35.0	700	FE37FN7A0356*B	A	FN	42.5	50.0	35.0	37.5	20.3	1.2	35	1225	20.0	5.5	6.8	30	28
40.0	700	FE52GA7A0406*B	A	GA	57.5	45.0	30.0	52.5	20.3	1.2	20	800	14.0	5.0	15.3	35	25
45.0	700	FE52GA7A0456*B	A	GA	57.5	45.0	30.0	52.5	20.3	1.2	20	900	15.5	5.0	12.5	35	25
50.0	700	FE52GC7A0506*B	A	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1000	15.0	4.8	13.9	35	20
55.0	700	FE52GC7A0556*B	A	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1100	16.0	4.5	13.0	35	20
60.0	700	FE52GC7A0606*B	A	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1200	18.0	4.0	11.6	35	20
65.0	700	FE52GE7A0656*B	A	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1300	20.0	4.0	9.4	35	15
70.0	700	FE52GE7A0706*B	A	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1400	20.0	3.8	9.9	35	15
75.0	700	FE52GE7A0756*B	A	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1500	20.0	3.8	9.9	35	15
80.0	700	FE52GE7A0806*B	A	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1600	22.0	3.5	8.9	35	15
80.0	700	FE52GF7A0806*B	A	GF	57.5	60.0	35.0	52.5	20.3	1.2	20	1600	23.0	3.4	8.3	35	20
90.0	700	FE52GE7A0906*B	A	GE	57.5	55.0	45.0	52.5	20.3	1.2	20.0	1800	24.0	3.5	7.4	35	15
90.0	700	FE52GF7A0906*B	A	GF	57.5	60.0	35.0	52.5	20.3	1.2	20	1800	24.0	3.5	7.4	35	20
100.0	700	FE52GH7A0107*B	A	GH	57.5	65.0	35.0	52.5	20.3	1.2	20	2000	26.0	3.5	6.3	35	20
110.0	700	FE52GK7A0117*B	A	GK	57.5	70.0	35.0	52.5	20.3	1.2	20	2200	28.0	3.4	5.6	35	20
120.0	700	FE52GL7A0127*B	A	GL	57.5	80.0	35.0	52.5	20.3	1.2	20	2400	30.0	3.0	5.6	35	20
130.0	700	FE52GI7A0137*B	A	GI	57.5	65.0	45.0	52.5	20.3	1.2	20	2600	32.0	2.8	5.2	35	15
					Voltage Vndc 800V			Voltage Code B									
15.0	800	FE37F67B0156*A	B	F6	42.5	40.0	20.0	37.5	10.2	1.2	35	525	10.0	8.0	18.8	30	56
20.0	800	FE37FL7B0206*A	B	FL	42.5	37.0	28.0	37.5	10.2	1.2	35	700	12.0	7.0	14.9	30	42
20.0	800	FE37F87B0206*A	B	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	700	13.5	6.5	12.7	30	49
22.0	800	FE37F87B0226*A	B	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	770	14.0	6.0	12.8	30	49
25.0	800	FE37F97B0256*B	B	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	875	14.0	5.5	13.9	30	35
30.0	800	FE37F97B0306*B	B	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	1050	16.0	4.5	13.0	30	35
35.0	800	FE52GA7B0356*B	B	GA	57.5	45.0	30.0	52.5	20.3	1.2	20	700	14.2	6.5	11.4	35	25
40.0	800	FE52GA7B0406*B	B	GA	57.5	45.0	30.0	52.5	20.3	1.2	20	800	14.0	6.0	12.8	35	25
45.0	800	FE52GA7B0456*B	B	GA	57.5	45.0	30.0	52.5	20.3	1.2	20	900	15.5	5.5	11.4	35	25

# DC FILTERING

FE - THB \*RoHS Compliant



## RATING & PART NUMBER REFERENCE

Cap	Rated Voltage	PN	Voltage Code	Case Code	Dimensions						dv/dt	Peak Current	Irms	ESR 10KHz	Rth	ESL	SPQ
					W ± 0.5	H ± 0.5	T ± 0.5	P1 ± 1.0	P2 ± 1.0	d ± 0.05							
					mm	mm	mm	mm	mm	mm							
47.0	800	FE52GC7B0476*B	B	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	940	17.5	5.0	9.8	35	20
50.0	800	FE52GC7B0506*B	B	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1000	16.0	5.0	11.7	35	20
55.0	800	FE52GC7B0556*B	B	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1100	17.0	4.6	11.3	35	20
65.0	800	FE52GF7B0656*B	B	GF	57.5	60.0	35.0	52.5	20.3	1.2	20	1300	19.0	4.0	10.4	35	20
65.0	800	FE52GE7B0656*B	B	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1300	20.0	4.0	9.4	35	15
70.0	800	FE52GE7B0706*B	B	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1400	20.0	3.8	9.9	35	15
70.0	800	FE52GF7B0706*B	B	GF	57.5	60.0	35.0	52.5	20.3	1.2	20	1400	20.0	3.8	9.9	35	20
75.0	800	FE52GE7B0756*B	B	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1500	22.0	3.8	8.2	35	15
75.0	800	FE52GH7B0756*B	B	GH	57.5	65.0	35.0	52.5	20.3	1.2	20	1500	22.0	3.8	8.2	35	20
80.0	800	FE52GI7B0806*B	B	GI	57.5	65.0	45.0	52.5	20.3	1.2	20	1600	23.0	3.5	8.1	35	15
80.0	800	FE52GK7B0806*B	B	GK	57.5	70.0	35.0	52.5	20.3	1.2	20	1600	23.0	3.5	8.1	35	20
90.0	800	FE52GI7B0906*B	B	GI	57.5	65.0	45.0	52.5	20.3	1.2	20	1800	25.0	3.3	7.3	35	15
90.0	800	FE52GL7B0906*B	B	GL	57.5	80.0	35.0	52.5	20.3	1.2	20	1800	25.0	3.3	7.3	35	20
100.0	800	FE52GI7B0107*B	B	GI	57.5	65.0	45.0	52.5	20.3	1.2	20	2000	28.0	3.2	6.0	35	15
					Voltage Vndc 900V			Voltage Code C									
10.0	900	FE37F67C0106*A	C	F6	42.5	40.0	20.0	37.5	10.2	1.2	35	350	9.5	11.5	14.5	30	56
15.0	900	FE37F87C0156*A	C	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	525	12.0	7.5	13.9	30	49
18.0	900	FE37F87C0186*A	C	F8	42.5	44.0	24.0	37.5	10.2	1.2	35	630	12.0	7.5	13.9	30	49
20.0	900	FE37F97C0206*B	C	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	700	15.0	5.5	12.1	30	35
20.0	900	FE52G67C0206*B	C	G6	57.5	22.0	43.0	52.5	20.3	1.2	20	400	12.0	8.6	12.1	35	15
25.0	900	FE37F97C0256*B	C	F9	42.5	45.0	30.0	37.5	20.3	1.2	35	875	17.0	5.5	9.4	30	35
30.0	900	FE37FN7C0306*B	C	FN	42.5	50.0	35.0	37.5	20.3	1.2	35	1050	19.0	5.0	8.3	30	28
30.0	900	FE52GA7C0306*B	C	GA	57.5	45.0	30.0	52.5	20.3	1.2	20	600	15.0	5.5	12.1	35	25
35.0	900	FE52GC7C0356*B	C	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	700	15.5	5.5	11.4	35	20
40.0	900	FE52GC7C0406*B	C	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	800	16.0	6.5	9.0	35	20
50.0	900	FE52GC7C0506*B	C	GC	57.5	50.0	35.0	52.5	20.3	1.2	20	1000	18.0	3.6	12.9	35	20
55.0	900	FE52GF7C0556*B	C	GF	57.5	60.0	35.0	52.5	20.3	1.2	20	1100	19.0	3.5	11.9	35	20
55.0	900	FE52GE7C0556*B	C	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1100	20.0	3.4	11.0	35	15
60.0	900	FE52GE7C0606*B	C	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1200	20.0	3.4	11.0	35	15
65.0	900	FE52GK7C0656*B	C	GK	57.5	70.0	35.0	52.5	20.3	1.2	20	1300	22.0	3.3	9.4	35	20
70.0	900	FE52GE7C0706*B	C	GE	57.5	55.0	45.0	52.5	20.3	1.2	20	1400	24.0	3.2	8.1	35	15
70.0	900	FE52GL7C0706*B	C	GL	57.5	80.0	35.0	52.5	20.3	1.2	20	1400	24.0	3.2	8.1	35	20
80.0	900	FE52GI7C0806*B	C	GI	57.5	65.0	45.0	52.5	20.3	1.2	20	1600	25.0	3.2	7.5	35	15
					Voltage Vndc 1000V			Voltage Code K									
10.0	1000	FE37F67K0106*A	K	F6	42.5	40.0	20.0	37.5	10.2	1.2	40	400	9.5	11.5	14.5	30	56
12.0	1000	FE37F87K0126*A	K	F8	42.5	44.0	24.0	37.5	10.2	1.2	40	480	10.5	9.0	15.1	30	49
15.0	1000	FE37F87K0156*A	K	F8	42.5	44.0	24.0	37.5	10.2	1.2	40	600	12.0	7.5	13.9	30	49
15.0	1000	FE37F97K0156*B	K	F9	42.5	45.0	30.0	37.5	20.3	1.2	40	600	14.0	7.5	10.2	30	35
15.0	1000	FE52G67K0156*B	K	G6	57.5	22.0	43.0	52.5	20.3	1.2	40	600	12.0	8.5	12.3	35	15
20.0	1000	FE37F97K0206*B	K	F9	42.5	45.0	30.0	37.5	20.3	1.2	40	800	15.0	6.5	10.3	30	35
25.0	1000	FE37FN7K0256*B	K	FN	42.5	50.0	35.0	37.5	20.3	1.2	40	1000	18.0	5.5	8.4	30	28
30.0	1000	FE52GA7K0306*B	K	GA	57.5	45.0	30.0	52.5	20.3	1.2	25	750	15.0	5.5	12.1	35	25
35.0	1000	FE52GC7K0356*B	K	GC	57.5	50.0	35.0	52.5	20.3	1.2	25	875	16.0	5.5	10.7	35	20
40.0	1000	FE52GC7K0406*B	K	GC	57.5	50.0	35.0	52.5	20.3	1.2	25	1000	16.0	5.0	11.7	35	20
40.0	1000	FE52GE7K0406*B	K	GE	57.5	55.0	45.0	52.5	20.3	1.2	25	1000	17.0	5.0	10.4	35	15
50.0	1000	FE52GE7K0506*B	K	GE	57.5	55.0	45.0	52.5	20.3	1.2	25	1250	19.0	4.5	9.2	35	15
50.0	1000	FE52GH7K0506*B	K	GH	57.5	65.0	35.0	52.5	20.3	1.2	25	1250	19.0	4.5	9.2	35	20
55.0	1000	FE52GK7K0556*B	K	GK	57.5	70.0	35.0	52.5	20.3	1.2	25	1375	20.0	4.4	8.5	35	20
60	1000	FE52GL7K0606*B	K	GL	57.5	80.0	35.0	52.5	20.3	1.2	25	1500	22.0	4.0	7.7	35	20
60	1000	FE52GI7K0606*B	K	GI	57.5	65.0	45.0	52.5	20.3	1.2	25	1500	22.0	4.0	7.7	35	15
					Voltage Vndc 1100V			Voltage Code L									
6.8	1100	FE37FI7L0685*A	L	FI	42.5	33.5	22.0	37.5	10.2	1.2	40	272	12.0	13.5	7.7	30	49
8.0	1100	FE37F67L0805*A	L	F6	42.5	40.0	20.0	37.5	10.2	1.2	40	320	12.5	12.5	7.7	30	56
8.0	1100	FE37FK7L0805*A	L	FK	42.5	37.0	22.0	37.5	10.2	1.2	40	320	12.5	12.5	7.7	30	49
9.0	1100	FE37FK7L0905*A	L	FK	42.5	37.0	22.0	37.5	10.2	1.2	40	360	12.8	12.2	7.5	30	49
10.0	1100	FE37F87L0106*A	L	F8	42.5	44.0	24.0	37.5	10.2	1.2	40	400	15.0	8.5	7.8	30	49
12.0	1100	FE37F97L0126*B	L	F9	42.5	45.0	30.0	37.5	20.3	1.2	40	480	15.5	7.5	8.3	30	35

# DC FILTERING

FE - THB \*RoHS Compliant

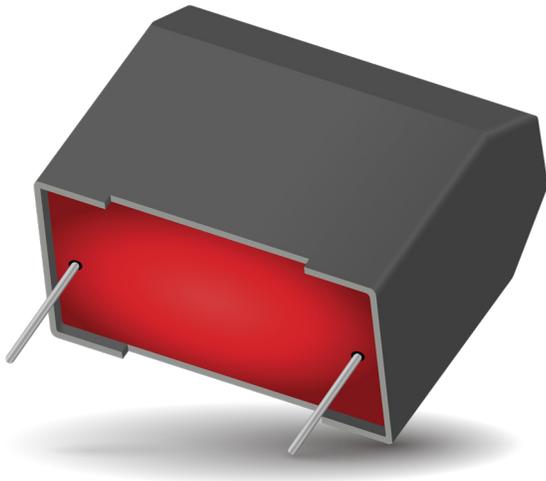


## RATING & PART NUMBER REFERENCE

Cap	Rated Voltage	PN	Voltage Code	Case Code	Dimensions						dv/dt	Peak Current	I <sub>rms</sub>	ESR 10KHz	R <sub>th</sub>	ESL	SPQ	
					W	H	T	P1	P2	d								
					± 0.5	± 0.5	± 0.5	± 1.0	± 1.0	± 0.05								
uF	V				mm	mm	mm	mm	mm	mm	V/us	A	A	mΩ	°C/W	nH	pcs	
15.0	1100	FE37F97L0156*B	L	F9	42.5	45.0	30.0	37.5	20.3	1.2	40	600	16.0	7.0	8.4	30	35	
18.0	1100	FE37FN7L0186*B	L	FN	42.5	50.0	35.0	37.5	20.3	1.2	40	720	15.5	7.5	8.3	30	28	
20.0	1100	FE37FN7L0206*B	L	FN	42.5	50.0	35.0	37.5	20.3	1.2	40	800	16.5	7.2	7.7	30	28	
20.0	1100	FE52GA7L0206*B	L	GA	57.5	45.0	30.0	52.5	20.3	1.2	25	500	12.0	8.5	12.3	35	25	
25.0	1100	FE52GC7L0256*B	L	GC	57.5	50.0	35.0	52.5	20.3	1.2	25	625	13.0	8.2	10.8	35	20	
30.0	1100	FE52GC7L0306*B	L	GC	57.5	50.0	35.0	52.5	20.3	1.2	25	750	15.0	5.0	13.3	35	20	
35.0	1100	FE52GF7L0356*B	L	GF	57.5	60.0	35.0	52.5	20.3	1.2	25	875	16.0	4.9	12.0	35	20	
40.0	1100	FE52GH7L0406*B	L	GH	57.5	65.0	35.0	52.5	20.3	1.2	25	1000	17.0	5.5	9.4	35	20	
40.0	1100	FE52GE7L0406*B	L	GE	57.5	55.0	45.0	52.5	20.3	1.2	25	1000	17.0	5.5	9.4	35	15	
45.0	1100	FE52GK7L0456*B	L	GK	57.5	70.0	35.0	52.5	20.3	1.2	25	1125	18.0	5.4	8.6	35	20	
50.0	1100	FE52GI7L0506*B	L	GI	57.5	65.0	45.0	52.5	20.3	1.2	25	1250	19.5	5.2	7.6	35	15	
					Voltage Vndc 1200V				Voltage Code P									
7.0	1200	FE37FK7P0705*A	P	FK	42.5	37.0	22.0	37.5	10.2	1.2	45	315	8.0	15.2	15.4	30	49	
8.0	1200	FE37F87P0805*A	P	F8	42.5	44.0	24.0	37.5	10.2	1.2	45	360	9.0	12.5	14.8	30	49	
10.0	1200	FE37F87P0106*A	P	F8	42.5	44.0	24.0	37.5	10.2	1.2	45	450	10.0	10.5	14.3	30	49	
10.0	1200	FE37F97P0106*B	P	F9	42.5	45.0	30.0	37.5	20.3	1.2	45	450	12.0	8.0	13.0	30	35	
15.0	1200	FE37FN7P0156*B	P	FN	42.5	50.0	35.0	37.5	20.3	1.2	45	675	15.0	6.5	10.3	30	28	
20.0	1200	FE52GA7P0206*B	P	GA	57.5	45.0	30.0	52.5	20.3	1.2	30	600	13.0	8.5	10.4	35	25	
25.0	1200	FE52GC7P0256*B	P	GC	57.5	50.0	35.0	52.5	20.3	1.2	30	750	15.0	6.5	10.3	35	20	
30.0	1200	FE52GE7P0306*B	P	GE	57.5	55.0	45.0	52.5	20.3	1.2	30	900	17.0	5.5	9.4	35	15	
30.0	1200	FE52GF7P0306*B	P	GF	57.5	60.0	35.0	52.5	20.3	1.2	30	900	17.0	5.5	9.4	35	20	
35.0	1200	FE52GE7P0356*B	P	GE	57.5	55.0	45.0	52.5	20.3	1.2	30	1050	18.0	5.0	9.3	35	15	
35.0	1200	FE52GK7P0356*B	P	GK	57.5	70.0	35.0	52.5	20.3	1.2	30	1050	18.0	5.0	9.3	35	20	
40.0	1200	FE52GI7P0406*B	P	GI	57.5	65.0	45.0	52.5	20.3	1.2	30	1200	20.0	4.5	8.3	35	15	
45.0	1200	FE52GI7P0456*B	P	GI	57.5	65.0	45.0	52.5	20.3	1.2	30	1350	22.0	4.3	7.2	35	15	

# DC FILTERING

FFB\* RoHS Compliant



## PACKAGING MATERIAL

Self-extinguishing plastic case (V0 = in accordance with UL 94) filled thermosetting resin.

Self-extinguishing thermosetting resin (V0 = in accordance with UL 94; I3F2 = in accordance with NF F 16-101).

## STANDARDS

- IEC 61071-1, IEC 61071-2: Power electronic capacitors
- IEC 60384-16: Fixed metallized polypropylene film dielectric DC capacitors
- IEC 60384-16-1: Fixed metallized polypropylene film dielectric DC capacitors Assessment level E
- IEC 60384-17: Fixed metallized polypropylene film dielectric AC and pulse capacitors
- IEC 60384-17-1: Fixed metallized polypropylene film dielectric AC and pulse capacitors Assessment level E
- IEC 60384-2: Fixed metallized polyester capacitors

The FFB series uses a metallized polypropylene or polyester dielectric with the controlled self-healing process, specially treated to have a very high dielectric strength in operating conditions up to 105°C.

This is a dry solution for polypropylene and dry or wet for polyester.

The FFB has been designed for printed circuit board mounting. Furthermore, their performances allow to be a very interesting alternative to electrolytic technology because they can withstand much higher levels of surge voltage.

## APPLICATIONS

The FFB capacitor is particularly designed for DC filtering, low reactive power.

## HOT SPOT CALCULATION

See *Hot Spot Temperature*, page 3.

$$\theta_{\text{hot spot}} = \theta_{\text{ambient}} + (P_d + P_t) \times R_{\text{th}}$$

with  $P_d$  (Dielectric losses) =  $Q \times \text{tg}\delta_0$   
 $Q \times \text{tg}\delta_0 \Rightarrow [ \frac{1}{2} \times C_n \times (V_{\text{peak to peak}})^2 \times f ] \times \text{tg}\delta_0$   
 $\text{tg}\delta_0$  (tan delta)

For polypropylene,  $\text{tg}\delta_0 = 2 \times 10^{-4}$  for frequencies up to 1MHz and is independent of temperatures.

For polyester,  $\text{tg}\delta_0$  values are shown in graph 4 on page 3.

$$P_t \text{ (Thermal losses)} = R_s \times (I_{\text{rms}})^2$$

where  $C_n$  in Farad       $I_{\text{rms}}$  in Ampere       $f$  in Hertz  
 $V$  in Volt       $R_s$  in Ohm       $\theta$  in °C  
 $R_{\text{th}}$  in °C/W

## OPERATING TEMPERATURE RANGE

(according to the power to be dissipated) -55°C to +105°C

## LIFETIME EXPECTANCY

One unique feature of this technology (as opposed to electrolytics) is how the capacitor reacts at the end of its lifetime. Unlike aluminum, electrolytics film capacitors do not have a catastrophic failure mode. Film capacitors simply experience a parametric loss of capacitance of about 2%, with no risk of short circuit.

Please note that this is theoretical, however, as the capacitor continues to be functional even after this 2% decrease.

# DC FILTERING

FFB\* RoHS Compliant

## HOW TO ORDER

**FFB**  
Series

**1**  
Case Size  
1  
2  
3  
4  
5

**4**  
Dielectric  
4 = Polyester  
6 = Polypropylene

**D**  
Voltage Code  
D = 75Vdc  
E = 100Vdc  
H = 300Vdc  
I = 400Vdc  
J = 525Vdc  
A = 720Vdc  
C = 900Vdc  
L = 1100Vdc

**0336**  
Capacitance Code  
0 + pF code  
0336 = 33µF  
0686 = 68µF  
0117 = 110µF  
etc.

**K**  
Capacitance Tolerances  
K = ±10%

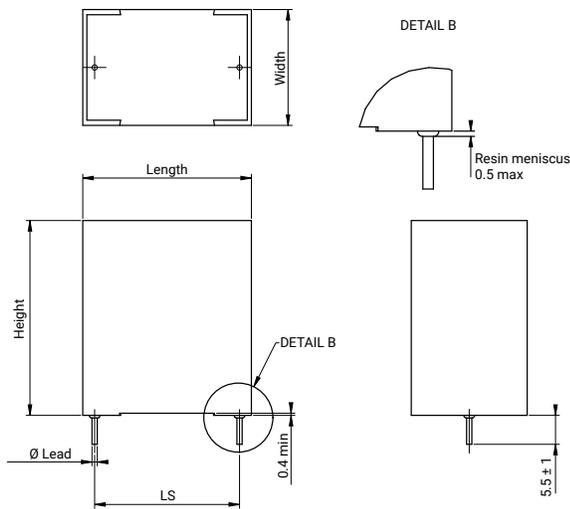
**--**  
Lead Styles  
-- = 2 Leaded  
JC = 4 Leaded

Consult Factory for Special Options



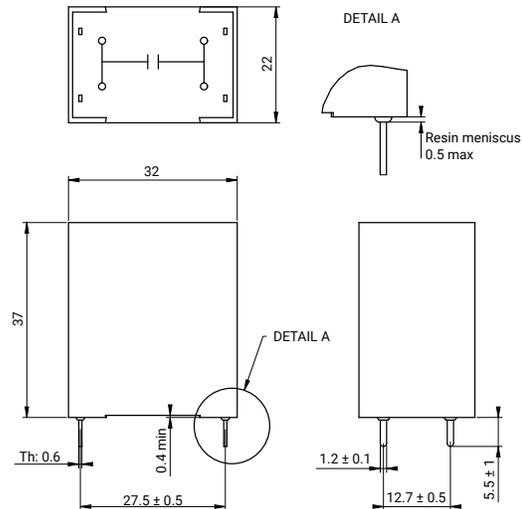
## GENERAL DESCRIPTION

### CASE STYLE: P0; 18; 19; 26; R68 2 LEADED STYLE



General Tolerance: ± 0.5mm

### CASE STYLE: R68 4 LEADED STYLE



General Tolerance: ± 0.5mm

## DIMENSIONS: millimeters

Case Size	Case Style	Length (mm)	Width (mm)	Height (mm)	Dimensions lead (mm)	LS (mm)
1	P0	31.1	13.0	22.4	Ø 0.80	27.5
2	18	31.1	14.9	25.7	Ø 0.80	27.5
3	19	31.1	17.3	29.8	Ø 0.80	27.5
4	26	31.1	20.8	31.3	Ø 1.00	27.5
5	R68 2 Leaded Style	32.0	22.0	37.0	Ø 1.00	27.5
	R68 4 Leaded Style	32.0	22.0	37.0	1.20 x 0.60	27.5

# DC FILTERING

FFB\* – Polyester Dielectric **RoHS Compliant**

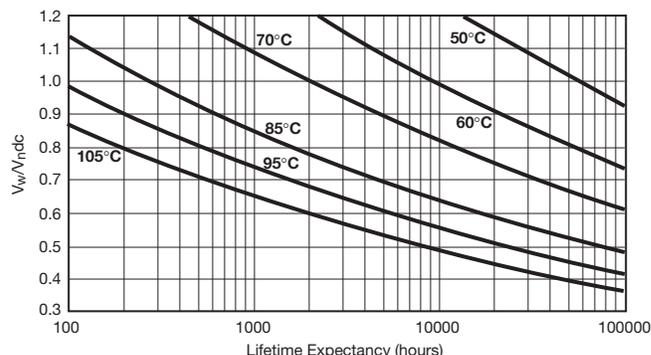


## POLYESTER DIELECTRIC FOR LOW VOLTAGE DC FILTERING

### ELECTRICAL CHARACTERISTICS – POLYESTER DIELECTRIC

Items	Characteristics
Climatic category	55/105/56 (IEC 60068)
Test voltage between terminals @ 25°C	1.5 x V <sub>n</sub> dc
Capacitance range C <sub>n</sub>	6.2µF to 110µF
Tolerance on C <sub>n</sub>	±10%
Rated DC voltage V <sub>n</sub> dc	75 to 400 V
Dielectric	polyester
Max Stray Inductance	20nH

### LIFETIME EXPECTANCY vs VOLTAGE AND HOT SPOT TEMPERATURE – POLYESTER DIELECTRIC



V<sub>w</sub> = Permanent working or operating DC voltage.

### RATINGS AND PART NUMBER REFERENCE – POLYESTER DIELECTRIC

Part Number	Capacitance (µF)	Case Style	I <sub>rms</sub> max. (A)	R <sub>s</sub> (mΩ)	R <sub>th</sub> (°C/W)	Typical Weight (g)
<b>V<sub>n</sub>dc 75V Vrms max.: 45 volts Voltage Code: D</b>						
FFB14D0336K-	33	PO	3	3	40.7	15
FFB24D0476K-	47	18	4.3	2	33.3	20
FFB34D0686K-	68	19	6.2	1.7	29.9	25
FFB44D0826K-	82	26	7.4	1.6	26.7	32
FFB54D0117K-	110	R68 (2 terminals)	10	1.4	22.9	40
FFB54D0117KJC	110	R68 (4 terminals)	10	1.4	22.9	40
<b>V<sub>n</sub>dc 100V Vrms max.: 60 volts Voltage Code: E</b>						
FFB14E0206K-	20	PO	2.6	3	40.5	15
FFB24E0276K-	27	18	3.5	2.5	33.3	20
FFB34E0396K-	39	19	5	2	29.8	25
FFB44E0476K-	47	26	6	1.7	26.6	32
FFB54E0686K-	68	R68 (2 terminals)	9	1.4	22.8	40
FFB54E0686KJC	68	R68 (4 terminals)	9	1.4	22.8	40
<b>V<sub>n</sub>dc 300V Vrms max.: 90 volts Voltage Code: H</b>						
FFB14H0755K-	7.5	PO	2.4	16	40.7	15
FFB24H0116K-	11	18	3.6	11	33.5	20
FFB34H0166K-	16	19	5.2	8	29.9	25
FFB44H0186K-	18	26	6	7	27.1	32
FFB54H0276K-	27	R68 (2 terminals)	9	5	22.9	40
FFB54H0276KJC	27	R68 (4 terminals)	9	5	22.9	40
<b>V<sub>n</sub>dc 400V Vrms max.: 105 volts Voltage Code: I</b>						
FFB14I0625K-*	6.2	PO	2.5	17	40.5	15
FFB24I0755K-*	7.5	18	3.1	14	33.5	20
FFB34I0126K-*	12	19	5	9	29.9	25
FFB44I0156K-*	15	26	6.2	7	26.4	32
FFB54I0206K-*	20	R68 (2 terminals)	8.2	5.5	22.8	40
FFB54I0206KJC*	20	R68 (4 terminals)	8.2	5.5	22.8	40

(\* Polyester dielectric film wet silicone)

# DC FILTERING

## FFB\* – Polypropylene Dielectric **RoHS Compliant**



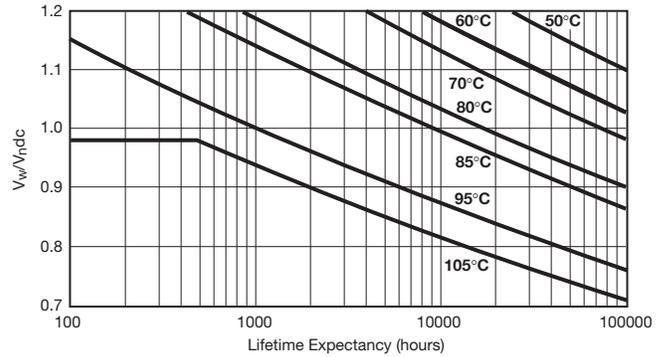
### POLYPROPYLENE DIELECTRIC FOR INDUSTRIAL DC FILTERING

These capacitors have been designed principally for high and medium power DC filtering applications.

#### ELECTRICAL CHARACTERISTICS – POLYPROPYLENE DIELECTRIC

Climatic category	55/105/56 (IEC 60068)
Test voltage between terminals @ 25°C	1.5 x V <sub>n</sub> dc
Capacitance range C <sub>n</sub>	1.5µF to 13µF
Tolerance on C <sub>n</sub>	±10%
Rated DC voltage V <sub>n</sub> dc	525 to 1100 V
Dielectric	polypropylene

#### LIFETIME EXPECTANCY VS VOLTAGE AND HOT SPOT TEMPERATURE – POLYPROPYLENE DIELECTRIC



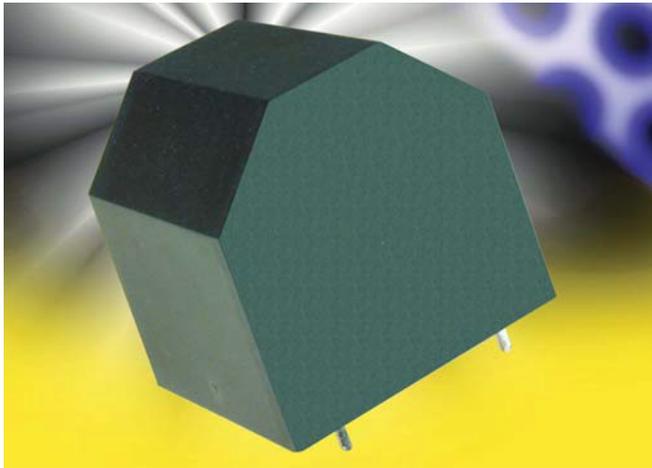
V<sub>w</sub> = Working DC Voltage • V<sub>n</sub> = Rated DC Voltage

#### RATINGS AND PART NUMBER REFERENCE – POLYPROPYLENE DIELECTRIC

Part Number	Capacitance (µF)	Case Style	I <sub>rms</sub> max. (A)	R <sub>s</sub> (mΩ)	R <sub>th</sub> (°C/W)	Typical Weight (g)
<b>V<sub>n</sub>dc 525V Vrms max.: 105 volts Voltage Code: J</b>						
FFB16J0395K-	3.9	PO	5.1	30	45.7	15
FFB26J0565K-	5.6	18	7.4	21	36.4	20
FFB36J0825K-	8.2	19	10.9	15	32.6	25
FFB46J0106K-	10	26	12	12	29.8	32
FFB56J0136K-	13	R68 (2 terminals)	12	9	24.3	40
FFB56J0136KJC	13	R68 (4 terminals)	16.7	9	24.3	40
<b>V<sub>n</sub>dc 720V Vrms max.: 120 volts Voltage Code: A</b>						
FFB16A0335K-	3.3	PO	5.0	31	45.0	15
FFB26A0435K-	4.3	18	6.5	24	36.2	20
FFB36A0625K-	6.2	19	9.4	17	32.7	25
FFB46A0755K-	7.5	26	11.4	14	29.9	32
FFB56A0106K-	10	R68 (2 terminals)	12	11	24.2	40
FFB56A0106KJC	10	R68 (4 terminals)	15.2	11	24.2	40
<b>V<sub>n</sub>dc 900V Vrms max.: 150 volts Voltage Code: C</b>						
FFB16C0205K-	2	PO	3.6	41	45.7	15
FFB26C0275K-	2.7	18	4.9	30	36.6	20
FFB36C0395K-	3.9	19	7.2	21	32.9	25
FFB46C0515K-	5.1	26	9.3	16	29.7	32
FFB56C0685K-	6.8	R68 (2 terminals)	12	12	24.1	40
FFB56C0685KJC	6.8	R68 (4 terminals)	12.5	12	24.1	40
<b>V<sub>n</sub>dc 1100V Vrms max.: 180 volts Voltage Code: L</b>						
FFB16L0155K-	1.5	PO	3.3	45	45.2	15
FFB26L0185K-	1.8	18	3.9	40	36.5	20
FFB36L0245K-	2.4	19	5.3	28	33.4	25
FFB46L0305K-	3	26	6.6	23	30.2	32
FFB56L0475K-	4.7	R68 (2 terminals)	10.3	15	24.1	40
FFB56L0475KJC	4.7	R68 (4 terminals)	10.3	15	24.1	40

# DC FILTERING

## FFV3\* RoHS Compliant



The series uses a metallized polypropylene or polyester dielectric, with the controlled self-healing process, specially treated to have a very high dielectric strength in operating conditions up to 105°C. This is a dry solution for polypropylene and dry or wet for polyester. The FFV3 has been designed for printed circuit board mounting.

### APPLICATIONS

The FFV3 capacitors are particularly designed for DC filtering, low reactive power.

### STANDARDS

- IEC 61071-1, IEC 61071-2: Power electronic capacitors
- IEC 60384-16: Fixed metallized polypropylene film dielectric DC capacitors
- IEC 60384-16-1: Fixed metallized polypropylene film dielectric DC capacitors Assessment level E
- IEC 60384-17: Fixed metallized polypropylene film dielectric AC and pulse capacitors
- IEC 60384-17-1: Fixed metallized polypropylene film dielectric AC and pulse capacitors Assessment level E
- IEC 60384-2: Fixed metallized polyester capacitors

### LIFETIME EXPECTANCY

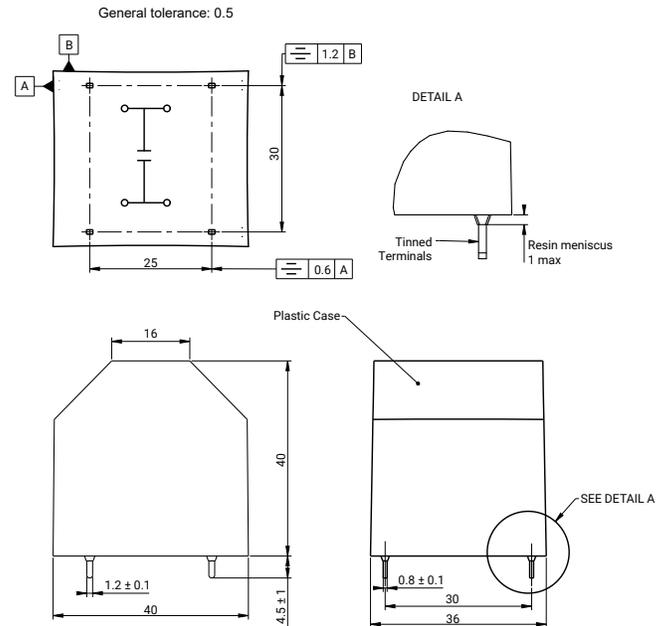
One unique feature of this technology (as opposed to electrolytics) is how the capacitor reacts at the end of its lifetime. Unlike aluminum, electrolytics film capacitors do not have a catastrophic failure mode. Film capacitors simply experience a parametric loss of capacitance of about 2%, with no risk of short circuit.

Please note that this is theoretical, however, as the capacitor continues to be functional even after this 2% decrease.

### PACKAGING MATERIAL

Self-extinguishing plastic case (V0 = in accordance with UL 94) filled thermosetting resin.

Self-extinguishing thermosetting resin (V0 = in accordance with UL 94; I3F2 = in accordance with NF F 16-101).



### HOT SPOT TEMPERATURE CALCULATION

$$\Theta_{\text{hot spot}} = \Theta_{\text{ambient}} + (P_d + P_j) \times (R_{\text{th}} + 7.4) \text{ or}$$

$$\Theta_{\text{hot spot}} = \Theta_{\text{case}} + (P_d + P_j) \times R_{\text{th}}$$

$$\text{Dielectric losses} = P_d = Q \times \text{tg} \delta_0$$

$$P_d = [1/2 \times C_n \times (V_{\text{peak to peak}})^2 \times f] \times \text{tg} \delta_0$$

for polypropylene  $\text{tg} \delta_0 = 2.10^{-4}$   
 for polyester  $\text{tg} \delta_0$  value is shown in graph 4 page 3

$$\text{Joules losses } P_j = R_s \times I_{\text{rms}}^2$$

- $C_n$  in Farad
- $V$  in Volt
- $R_{\text{th}}$  in °C/W
- $I_{\text{rms}}$  in Ampere
- $R_s$  in Ohm
- $R_{\text{th}}$  :  $R_{\text{th}}$  case/hot spot in °C/W
- $f$  in Hertz
- $\theta$  in °C

# DC FILTERING

## FFV3\* for Low Voltage Applications **RoHS Compliant**



### HOW TO ORDER

**FFV3**

Series

**4**

Dielectric

4 = Polyester  
6 = Polypropylene

**D**

Voltage Code

D = 75Vdc J = 525Vdc  
E = 100Vdc A = 720Vdc  
F = 160Vdc C = 900Vdc  
H = 300Vdc L = 1100Vdc  
I = 400Vdc

**K**

Capacitance Tolerances

K = ±10%

**--**

Lead Styles  
-- = Standard

Consult Factory  
for Special  
Options



### ELECTRICAL CHARACTERISTICS – POLYESTER DIELECTRIC

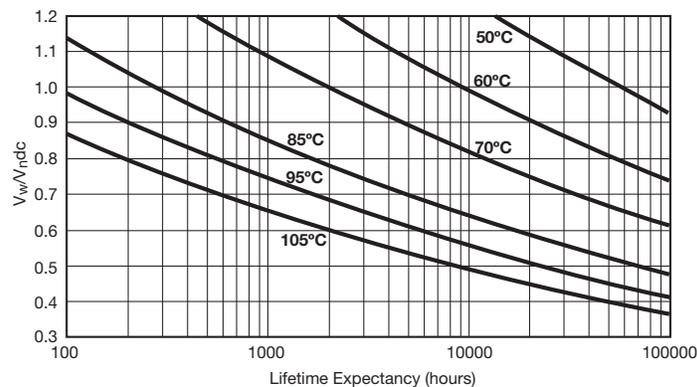
Items	Characteristics
Climatic category	40/105/56 (IEC 60068)
Test voltage between terminals @ 25°C	1.5 x V <sub>n,dc</sub> during 10s
Test voltage between terminals and case @ 25°C "	@ 4 kVrms @ 50 Hz during 1 min.
Capacitance range C <sub>n</sub>	30µF to 160µF
Tolerance on C <sub>n</sub>	±10%
Rated DC voltage V <sub>n,dc</sub>	75 to 400 V
Dielectric	Polyester
Max Stray Inductance	15nH

### RATINGS AND PART NUMBER REFERENCE – POLYESTER DIELECTRIC

Part Number	Capacitance (µF)	I <sub>rms max.</sub> (A)	I <sup>2</sup> t <sub>10 shots</sub> (A <sup>2</sup> s)	I <sup>2</sup> t <sub>1000 shots</sub> (A <sup>2</sup> s)	R <sub>s</sub> (mΩ)	R <sub>th</sub> (°C/W)	Typical Weight (g)
<b>V<sub>n,dc</sub> = 75 V Vrms = 45 v max Voltage Code: D</b>							
FFV34D0137K--	130	23	370	37	0.56	5.6	90
FFV34D0167K--	160	28	560	56	0.47	5	90
<b>V<sub>n,dc</sub> = 100 V Vrms = 60 v max Voltage Code: E</b>							
FFV34E0806K--	80	19	250	25	0.67	6.2	90
FFV34E0107K--	100	24	390	39	0.55	5.4	90
<b>V<sub>n,dc</sub> = 160 V Vrms = 75 v max Voltage Code: F</b>							
FFV34F0556K--	55	17	180	18	0.77	6.6	90
FFV34F0656K--	65	20	260	26	0.66	6	90
<b>V<sub>n,dc</sub> = 300 V Vrms = 90 v max Voltage Code: H</b>							
FFV34H0406K--	40	20	150	15	2.80	9.6	90
FFV34H0506K--	50	26	230	23	2.25	8.5	90
<b>V<sub>n,dc</sub> = 400 V Vrms = 105 v max Voltage Code: I</b>							
FFV34I0306K--*	30	17	110	11	2.93	9.9	90
FFV34I0406K--*	40	23	200	20	2.21	8.4	90

(\*) Polyester dielectric film wet silicone

### LIFETIME EXPECTANCY VS V<sub>w</sub>/V<sub>n</sub> AND HOT SPOT TEMPERATURE POLYESTER DIELECTRIC



V<sub>w</sub> = Permanent working or operating DC voltage.

# DC FILTERING

FFV3\* DC for Medium and High Voltage Applications **RoHS Compliant**



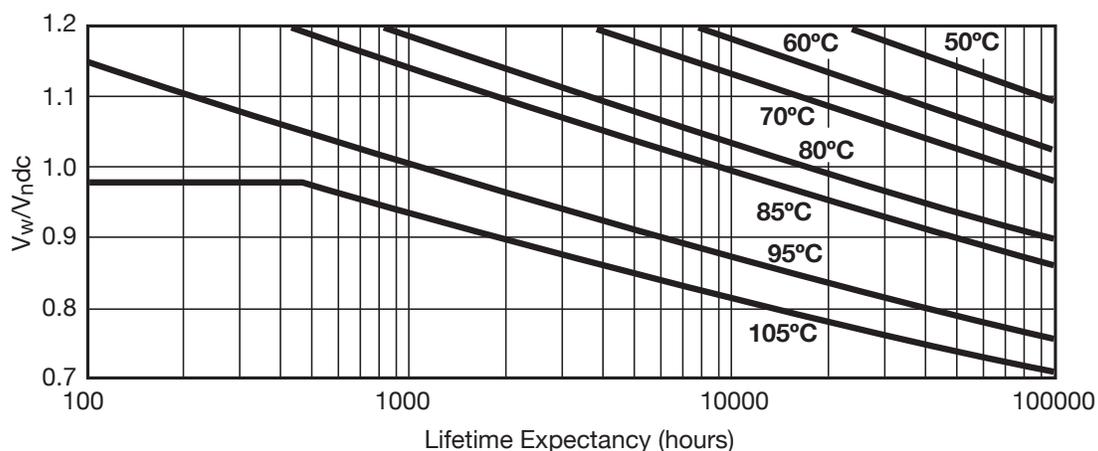
## DC FILTERING ELECTRICAL CHARACTERISTICS – POLYPROPYLENE DIELECTRIC

Items	Characteristics
Climatic category	40/105/56 (IEC 60068)
Test voltage between terminals @ 25°C	1.5 x V <sub>n,dc</sub> during 10s
Test voltage between terminals and case @ 25°C "	@ 4 kVrms @ 50 Hz during 1 min.
Capacitance range C <sub>n</sub>	6μF to 25μF
Tolerance on C <sub>n</sub>	±10%
Rated DC voltage V <sub>n,dc</sub>	500 to 1100 V
Dielectric	Polypropylene
Max Stray Inductance	15nH

## RATINGS AND PART NUMBER REFERENCE – POLYPROPYLENE DIELECTRIC

Part Number	Capacitance (μF)	I <sub>rms max.</sub> (A)	I <sup>2</sup> t <sub>10 shots</sub> (A <sup>2</sup> s)	I <sup>2</sup> t <sub>1000 shots</sub> (A <sup>2</sup> s)	R <sub>s</sub> (mΩ)	R <sub>th</sub> (°C/W)	Typical Weight (g)
<b>V<sub>n,dc</sub> = 500 V Vrms = 105 v max Voltage Code: J</b>							
FFV36J0206K-	20	27	3200	320	5.88	3.5	90
FFV36J0256K-	25	33	5000	500	4.72	3.1	90
<b>V<sub>n,dc</sub> = 700 V Vrms = 120 v max Voltage Code: A</b>							
FFV36A0146K-	14	21	2000	200	7.34	3.7	90
FFV36A0206K-	20	30	4200	420	5.15	3.1	90
<b>V<sub>n,dc</sub> = 900 V Vrms = 150 v max Voltage Code: C</b>							
FFV36C0106K-	10	19	1600	160	8.21	3.4	90
FFV36C0136K-	13	25	2800	280	6.33	2.9	90
<b>V<sub>n,dc</sub> = 1100 V Vrms = 180 v max Voltage Code: L</b>							
FFV36L0605K-	6	13	800	80	11.4	3.7	90
FFV36L0905K-	9	20	1900	190	7.61	2.9	90

## LIFETIME EXPECTANCY VS V<sub>w</sub>/V<sub>n</sub> AND HOT SPOT TEMPERATURE POLYPROPYLENE DIELECTRIC



V<sub>w</sub> = Permanent working or operating DC voltage.

# DC FILTERING

## FFG Design (FFH-RoHS Compliant)

### DC FILTERING



### GENERAL DESCRIPTION

The FFG series uses a non-impregnated metallized dielectric, which features a controlled self-healing process.

### PACKAGING MATERIAL

Self-extinguishing plastic case (V0 = in accordance with UL 94) filled thermosetting resin. Self-extinguishing thermosetting resin (V0 = in accordance with UL 94; I3F1 = in accordance with NF F 16-101).

### STANDARDS

- IEC 61071-1, IEC 61071-2: Power electronic capacitors
- IEC 60068-1: Environmental testing
- UL 94: Fire requirement

### HOT SPOT CALCULATION

$$\theta_{\text{hot spot}} = \theta_{\text{terminal}} + (P_d + P_t) \times R_{\text{th}}$$

with  $P_d$  (Dielectric losses) =  $Q \times \text{tg}\delta_0$  and  $\text{tg}\delta_0 = 2.10$ , where  $Q = \frac{I_{\text{rms}}^2}{C \cdot 2 \cdot \pi \cdot f}$

$P_t$  (Thermal losses) =  $R_s \times I_{\text{rms}}^2$

where  $C_n$  in Farad     $I_{\text{rms}}$  in Ampere     $f$  in Hertz  
 $V$  in Volt     $R_s$  in Ohm     $\theta$  in °C  
 $R_{\text{th}}$  in °C/W

### HOW TO ORDER

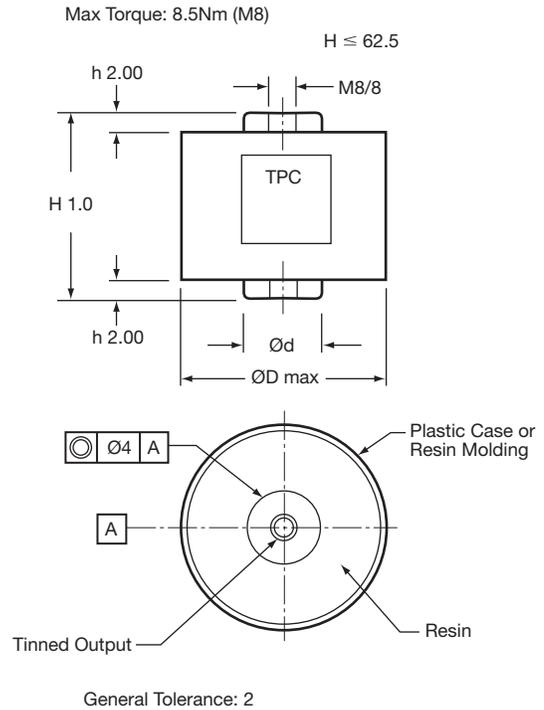
<b>FFG</b>	<b>8</b>	<b>6</b>	<b>K</b>	<b>0376</b>	<b>K</b>	<b>--</b>
Series	Case Size	Dielectric	Voltage Code	Capacitance Code	Capacitance Tolerances	Voltage Range
FFG = Standard FFH = RoHS Compliant	8	6 = Polypropylene	K = 600Vdc B = 800Vdc C = 900Vdc L = 1000Vdc U = 1200Vdc N = 1900Vdc	0 + pF code 0376 = 36µF 0256 = 25µF 0505 = 5µF etc.	K = ±10%	-- = < 1kV J7 = ≥ 1kV

**Not RoHS Compliant**



### DIMENSIONS (CASE SIZES)

plastic case – Outputs: threaded insert M8 filled with thermosetting resin



# DC FILTERING

## FFG (FFH RoHS Compliant)

### ELECTRICAL CHARACTERISTICS

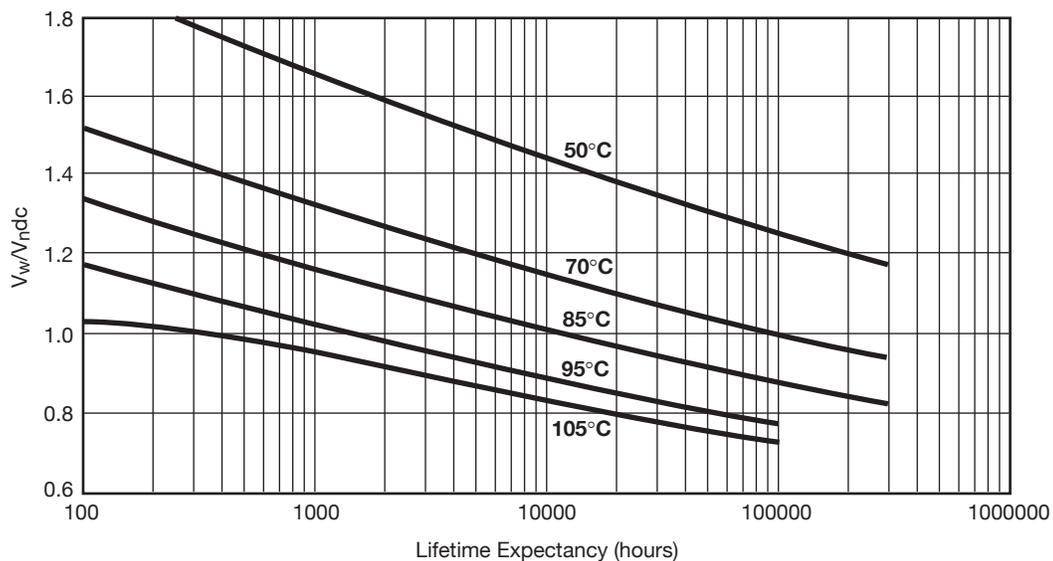
Items	Characteristics
Operating temperature:	-40°C + 105°C
Storage temperature:	-55°C + 85°C
Capacitance range:	5µF to 160µF
Rated DC voltage V <sub>ndc</sub> :	600 to 900 V
Capacitance tolerance:	±10%
Test voltage between terminals:	@ 25°C: 1.5 x U <sub>n,dc</sub> during 10s
Test voltage between terminals and case:	@ 25°C: @ 4 kVrms @ 50 Hz during 1 mn (test type)
Dielectric:	Polypropylene

### RATINGS AND PART NUMBER REFERENCE (600V TO 900V)

Part Number	C <sub>n</sub> (µF)	Height ±1 (mm)	h ±2 (mm)	D max (mm)	d ±0.50 (mm)	I <sup>2</sup> t max (A <sup>2</sup> s)	I <sub>rms</sub> max (A)	R <sub>s</sub> (mΩ)	R <sub>th</sub> (°C/W)	Typical Weight (g)
<b>U<sub>n,dc</sub> 600 V (Voltage Code K)</b>										
FFG86K0376K-	37	52	5	60	22	4	28	1.3	10.1	190
FFG86K0586K-	58	52	5	72	22	10	44	1	6.4	260
FFG86K0806K-	80	52	5	82	22	20	61	0.7	4.9	320
FFG86K0167K-	160	62.5	5	92	22	32	76	0.8	5.8	475
<b>U<sub>n,dc</sub> 800 V (Voltage Code B)</b>										
FFG86B0236K-	23	52	5	60	22	3	26	1.7	10.1	190
FFG86B0376K-	37	52	5	72	22	8	43	1.2	6.5	260
FFG86B0516K-	51	52	5	82	22	15	59	0.9	4.8	320
FFG86B0107K-	100	62.5	5	92	22	24	73	1	5.9	475
<b>U<sub>n,dc</sub> 900 V (Voltage Code C)</b>										
FFG86C0166K-	16	52	5	60	22	2.8	27	2	9.8	190
FFG86C0266K-	26	52	5	72	22	7	44	1.3	6.5	260
FFG86C0356K-	35	52	5	82	22	13	60	1	4.8	320
FFG86C0706K-	70	62.5	5	92	22	20	75	1.2	5.8	475

Dimensions millimeters

### LIFETIME EXPECTANCY vs HOT SPOT TEMPERATURE AND VOLTAGE



V<sub>w</sub> = Permanent working or operating DC voltage.

# DC FILTERING

## FFG (FFH RoHS Compliant)



### ELECTRICAL CHARACTERISTICS

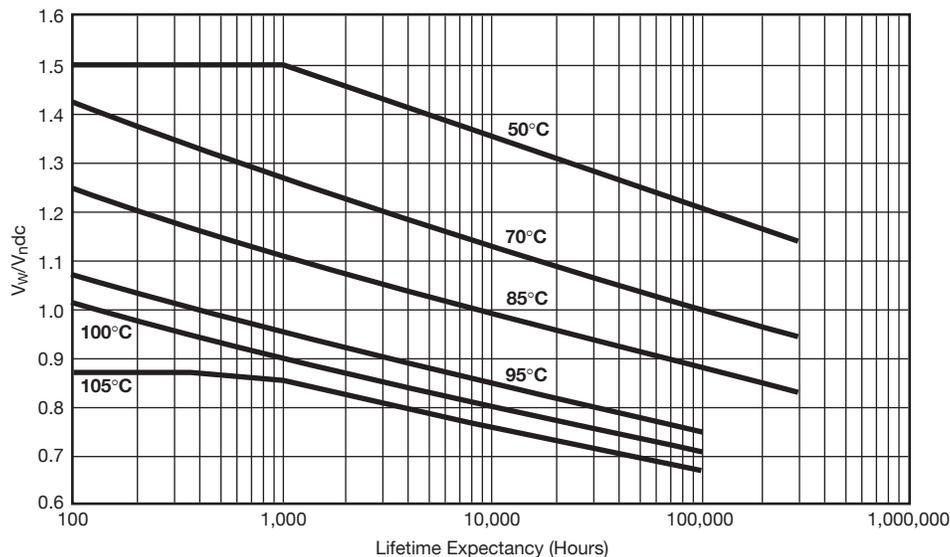
Items	Characteristics
Operating temperature:	-40°C + 105°C
Storage temperature:	-55°C + 85°C
Capacitance range:	5μF to 160μF
Rated DC voltage V <sub>ndc</sub> :	1000 to 1900 V
Capacitance tolerance:	±10%
Test voltage between terminals:	@ 25°C: 1.5 x U <sub>n,dc</sub> during 10s
Test voltage between terminals and case:	@ 25°C: @ 4 kVrms @ 50 Hz during 1 mn (test type)
Dielectric:	Polypropylene

### RATINGS AND PART NUMBER REFERENCE (1000V TO 1900V)

Part Number	C <sub>n</sub> (μF)	Height ±1 (mm)	h ±2 (mm)	D max (mm)	d ±0.50 (mm)	I <sup>2</sup> t max (A2s)	I <sub>rms</sub> max (A)	R <sub>s</sub> (mΩ)	R <sub>th</sub> (°C/W)	Typical Weight (g)
<b>U<sub>n,dc</sub> 600 V (Voltage Code K)</b>										
FFG86K0376K-	37	52	5	60	22	4	28	1.3	10.1	190
FFG86K0586K-	58	52	5	72	22	10	44	1	6.4	260
FFG86K0806K-	80	52	5	82	22	20	61	0.7	4.9	320
FFG86K0167K-	160	62.5	5	92	22	32	76	0.8	5.8	475
<b>U<sub>n,dc</sub> 800 V (Voltage Code B)</b>										
FFG86B0236K-	23	52	5	60	22	3	26	1.7	10.1	190
FFG86B0376K-	37	52	5	72	22	8	43	1.2	6.5	260
FFG86B0516K-	51	52	5	82	22	15	59	0.9	4.8	320
FFG86B0107K-	100	62.5	5	92	22	24	73	1	5.9	475
<b>U<sub>n,dc</sub> 900 V (Voltage Code C)</b>										
FFG86C0166K-	16	52	5	60	22	2.8	27	2	9.8	190
FFG86C0266K-	26	52	5	72	22	7	44	1.3	6.5	260
FFG86C0356K-	35	52	5	82	22	13	60	1	4.8	320
FFG86C0706K-	70	62.5	5	92	22	20	75	1.2	5.8	475

Dimensions millimeters

### LIFETIME EXPECTANCY vs HOT SPOT TEMPERATURE AND VOLTAGE



V<sub>w</sub> = Permanent working or operating DC voltage.

# DC FILTERING

## FFVE/FFVI (FFWE/FFWI RoHS Compliant)



**Not RoHS Compliant**



Please select correct termination style.

### GENERAL DESCRIPTION

The FFV capacitor is specifically designed for DC filtering, low reactive power.

The series uses a non-impregnated metallized polypropylene or polyester dielectric, which features a controlled self-healing process, specially treated to have a very high dielectric strength in operating conditions up to 105°C.

The FFV special design gives this series a very low level of stray inductance (18 nH to 40 nH).

Furthermore, the performance levels of the FFVE capacitor makes them a very interesting alternative to electrolytic technology, because they can withstand much higher levels of surge voltage, very high rms current ratings, and longer lifetimes.

### PACKAGING MATERIAL

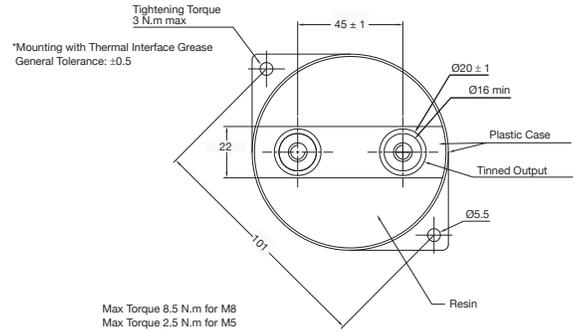
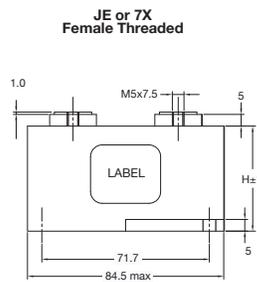
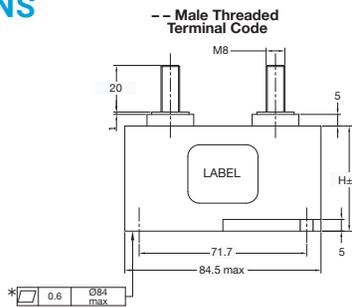
Self-extinguishing plastic case (V0 = in accordance with UL 94) filled thermosetting resin.

Self-extinguishing thermosetting resin (V0 = in accordance with UL 94; I3F1 = in accordance with NF F 16-101).

FFVE capacitors meet the Level 2 requirement of the fire behavior standard NF F 16-102.

### DIMENSIONS

Also available with threaded female connections - M5 x 7.5mm max Torque 2.5Nm



### HOW TO ORDER

**FFVE**

**Series**

FFVE = Standard  
FFVI = Standard  
FFWE = RoHS Compliant  
FFWI = RoHS Compliant

**6**

**Dielectric**

4 = Polyester  
6 = Polypropylene

**H**

**Voltage Code**

H = 300V L = 1000V  
I = 400V (FFVE/FFWE)  
J = 500V L = 1100V  
K = 600V (FFVI/FFWI)  
A = 700V U = 1200V  
B = 800V N = 1900V  
C = 900V

**0187**

**Capacitance Code**

0 + pF code  
0187 = 180µF  
0356 = 35µF etc.

**K**

**Capacitance Tolerances**

K = ±10%

**--**

**Terminal Code**

-- or J7 = Male Threaded  
JE or 7X = Female Threaded

See Ratings and Part Reference Tables for details

### HOT SPOT CALCULATION

See Hot Spot Temperature, page 3.

$$\theta_{hot\ spot} = \theta_{case} + (P_d + P_t) \times R_{th}$$

with  $P_d$  (Dielectric losses) =  $Q \times tg\delta_0$   
 $Q \times tg\delta_0 \Rightarrow [\frac{1}{2} \times C_n \times (V_{peak\ to\ peak})^2 \times f] \times tg\delta_0$   
 $tg\delta_0$  (tan delta)

For polypropylene,  $tg\delta_0 = 2 \times 10^{-4}$  for frequencies up to 1MHz and is independent of temperatures. For polyester,  $tg\delta_0$  values are shown in graph 4 on page 3.

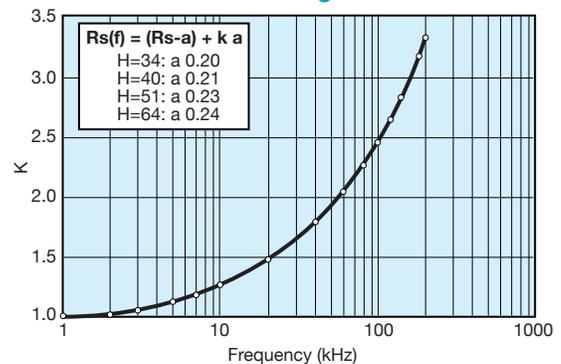
$$P_t \text{ (Thermal losses)} = R_s \times (I_{rms})^2$$

where  $C_n$  in Farad  $I_{rms}$  in Ampere  $f$  in Hertz  
 $V$  in Volt  $R_s$  in Ohm  $\theta$  in °C  
 $R_{th}$  in °C/W

$\theta_{case}$  = bottom center of case

### Rs(f) vs FREQUENCY

For frequency higher than 1 kHz use following curve



# DC FILTERING

## FFVE/FFVI (FFWE/FFWI RoHS Compliant)

### ELECTRICAL CHARACTERISTICS – FFVE/FFWE POLYESTER DIELECTRIC

Items	Characteristics
Working temperature	-40°C to +105°C (according to the power to be dissipated)
Capacitance range	100µF to 400µF
Capacitance tolerance	±10%
Rated DC voltage	300 to 400 V
Test voltage between terminals @ 25°C	1.5 x V <sub>n,dc</sub> 10s
Insulation voltage between shorted terminals and earth	7 kVrms/60sec/50Hz
Dielectric	Polyester

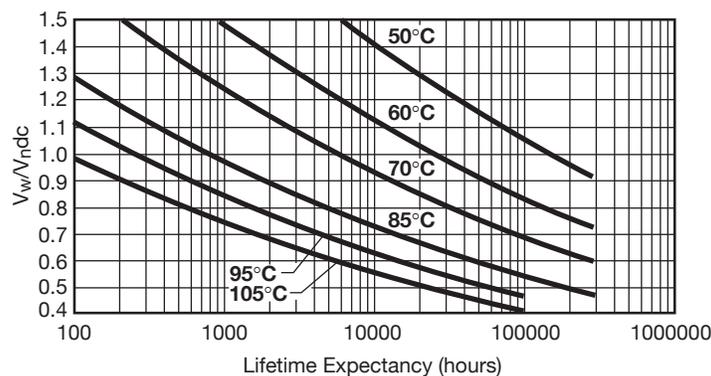
### RATINGS AND PART NUMBER REFERENCE – POLYESTER DIELECTRIC

Part Number*	Capacitance (µF)	Height (mm)	I <sub>rms</sub> max. (A)	L <sub>s</sub> max. (nH)	R <sub>s</sub> (mΩ)	R <sub>th</sub> (°C/W)	Typical Weight (g)
<b>V<sub>n,dc</sub> 300 volts (Voltage Code H)</b>							
FFVE4H0187K-	180	34	100	18	0.8	4.7	300
FFVE4H1956K-	195	34	100	18	0.8	4.4	300
FFVE4H0257K-	250	40	100	25	0.6	5.2	350
FFVE4H0357K-	350	51	100	32	0.8	7.2	420
FFVE4H0407K-	400	51	110	32	0.8	7.1	420
<b>V<sub>n,dc</sub> 400 volts (Voltage Code I)</b>							
FFVE4I0107K-	100	34	80	18	0.7	4.7	300
FFVE4I0127K-	120	34	100	18	0.6	4.1	300
FFVE4I0157K-	150	40	100	25	0.7	5.0	350
FFVE4I0187K-	180	51	80	32	1.0	8.5	420
FFVE4I0227K-	220	51	100	32	0.9	7.2	420

\*Change "--" to "JE" for female connectors M5 x 7.5mm

Dimensions millimeters

### LIFETIME EXPECTANCY FFVE POLYESTER



V<sub>w</sub> = Permanent working or operating DC voltage.

# DC FILTERING

## FFVE/FFVI (FFWE/FFWI RoHS Compliant)

### ELECTRICAL CHARACTERISTICS – FFVE/FFWE POLYPROPYLENE DIELECTRIC

Items	Characteristics
Working temperature	-40°C to +105°C (according to the power to be dissipated)
Capacitance range	12μF to 220μF
Capacitance tolerance	±10%
Rated DC voltage	600 to 1900 V
Test voltage between terminals @ 25°C	1.5 x $V_{n,dc}$ 10s
Insulation voltage between shorted terminals and earth	7 kVrms/60sec/50Hz
Dielectric	Polypropylene

### RATINGS AND PART NUMBER REFERENCE – POLYPROPYLENE DIELECTRIC

Part Number*	Capacitance (μF)	Height (mm)	Irms max. (A)	Ls max. (nH)	Rs (mΩ)	Rth (°C/W)	Typical Weight (g)
<b><math>V_{n,dc}</math> 600 volts (Voltage Code K)</b>							
FFVE6K0256K--	25	34	90	18	0.7	4.3	300
FFVE6K0107K--	100	40	100	25	0.6	4.8	350
FFVE6K0157K--	150	51	110	32	0.9	6.9	420
FFVE6K0227K--	220	64	100	40	1.0	8.4	500
<b><math>V_{n,dc}</math> 800 volts (Voltage Code B)</b>							
FFVE6B0666K--	66	40	100	25	0.7	4.7	350
FFVE6B0107K--	100	51	90	32	1.0	6.7	420
FFVE6B0147K--	140	64	100	40	1.3	8.4	500
<b><math>V_{n,dc}</math> 900 volts (Voltage Code C)</b>							
FFVE6C0126K--	12	34	70	18	0.9	4.4	300
FFVE6C0386K--	38	34	100	18	1.6	3.9	300
FFVE6C0476K--	47	40	100	25	0.8	4.6	350
FFVE6C0706K--	70	51	100	32	1.2	6.7	420
FFVE6C0107K--	100	64	90	40	1.1	8.2	500
<b><math>V_{n,dc}</math> 1000 volts (Voltage Code L)</b>							
FFVE6L0666KJ7	66	40	70	25	1.5	5.1	350
FFVE6L0107KJ7	100	51	64	32	2.0	7.3	420
FFVE6L0147KJ7	140	64	51	40	2.5	9.2	500
<b><math>V_{n,dc}</math> 1200 volts (Voltage Code U)</b>							
FFVE6U0476KJ7	47	40	66	25	1.7	4.9	350
FFVE6U0706KJ7	70	51	59	32	2.4	7.2	420
FFVE6U0107KJ7	100	64	49	40	2.9	8.9	500
<b><math>V_{n,dc}</math> 1900 volts (Voltage Code N)</b>							
FFVE6N0156KJ7	15	40	73	25	1.1	5.2	350
FFVE6N0246KJ7	24	51	73	32	1.3	6.5	420
FFVE6N0356KJ7	35	64	67	40	1.6	8.4	500

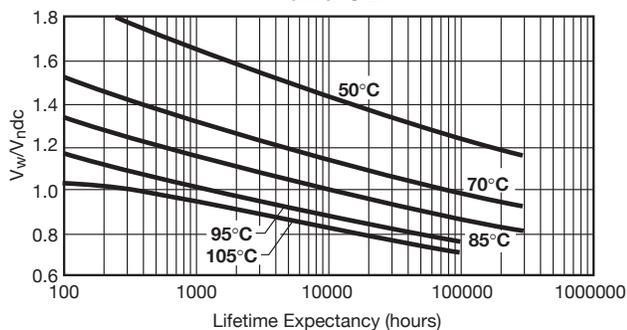
\*Change "--" to "JE" for female connectors M5 x 7.5mm

Dimensions millimeters

\*Change "J7" to "7X" for female connectors M5 x 7.5mm

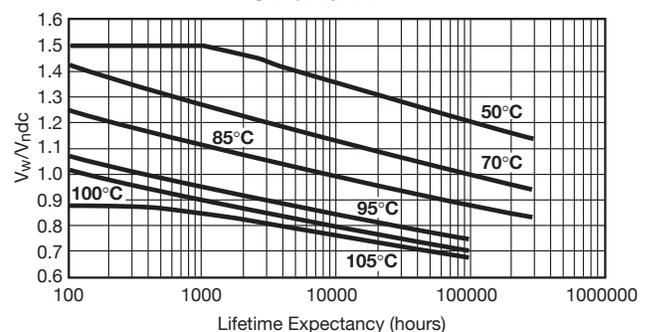
### LIFETIME EXPECTANCY FOR FFVE POLYPROPYLENE

-- and JE



$V_w$ : permanent working or operating DC-voltage.

J7 and 7X



$V_w$ : permanent working or operating DC-voltage.

# DC FILTERING

FFVE/FFVI (FFWE/FFWI RoHS Compliant)



## ELECTRICAL CHARACTERISTICS – FFVE/FFWE POLYPROPYLENE DIELECTRIC

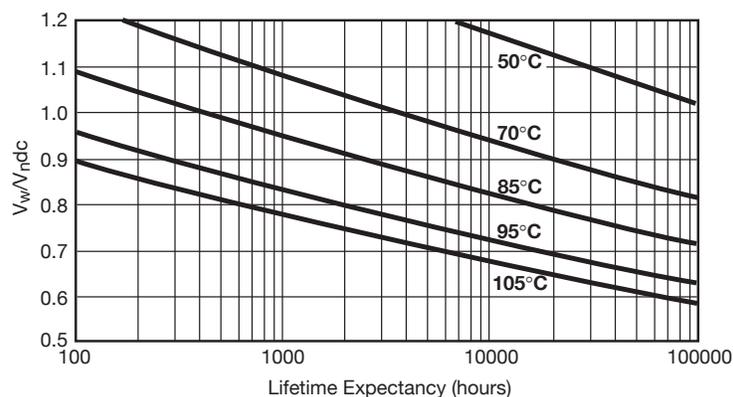
Items	Characteristics
Working temperature	-40°C to +105°C (according to the power to be dissipated)
Capacitance range	47µF to 275µF
Capacitance tolerance	±10%
Rated DC voltage	500 to 1100V
Test voltage between terminals @ 25°C	1.25 x $V_{n,dc}$ 10s
Insulation voltage between shorted terminals and earth	7 kVrms/60sec/50Hz
Dielectric	Polypropylene

## RATINGS AND PART NUMBER REFERENCE – POLYPROPYLENE DIELECTRIC

Part Number*	Capacitance (µF)	Height (mm)	Irms max. (A)	Ls max. (nH)	Rs (mΩ)	Rth (°C/W)	Typical Weight (g)
<b><math>V_{n,dc}</math> 500 volts (Voltage Code J)</b>							
FFVI6J1256K-	125	40	90	25	0.6	5.0	350
FFVI6J0207K-	200	51	90	32	0.8	6.7	420
FFVI6J2756K-	275	64	90	40	0.9	8.7	500
<b><math>V_{n,dc}</math> 700 volts (Voltage Code A)</b>							
FFVI6A0107K-	100	40	100	25	0.6	4.8	350
FFVI6A0157K-	150	51	100	32	0.9	6.9	420
FFVI6A0227K-	220	64	100	40	1.0	8.4	500
<b><math>V_{n,dc}</math> 900 volts (Voltage Code C)</b>							
FFVI6C0666K-	66	40	100	25	0.7	4.7	350
FFVI6C0107K-	100	51	90	32	1.0	6.7	420
FFVI6C0147K-	140	64	100	40	1.3	8.4	500
<b><math>V_{n,dc}</math> 1100 volts (Voltage Code L)</b>							
FFVI6L0476K-	47	40	100	25	0.8	4.6	350
FFVI6L0706K-	70	51	100	32	1.2	6.7	420
FFVI6L0107K-	100	64	90	40	1.1	8.2	500

Dimensions millimeters

## LIFETIME EXPECTANCY FOR FFVI



$V_w$ : permanent working or operating DC-voltage.

# DC FILTERING

FFVS\* RoHS Compliant

## Low Inductance Range Capacitor for Power Electronics



FFVS series is a specific range of DC filtering capacitors designed for use in high frequency, high ripple applications beyond the limits of standard FFVE or FFVI.

Typical applications include DC power supply for induction heating, resonant DC power supply for scanner, X-ray machines, etc.

Due to the sophisticated internal design, stray inductance is extremely low, between 8 and 13nH.

FFVS products are RoHS compliant.

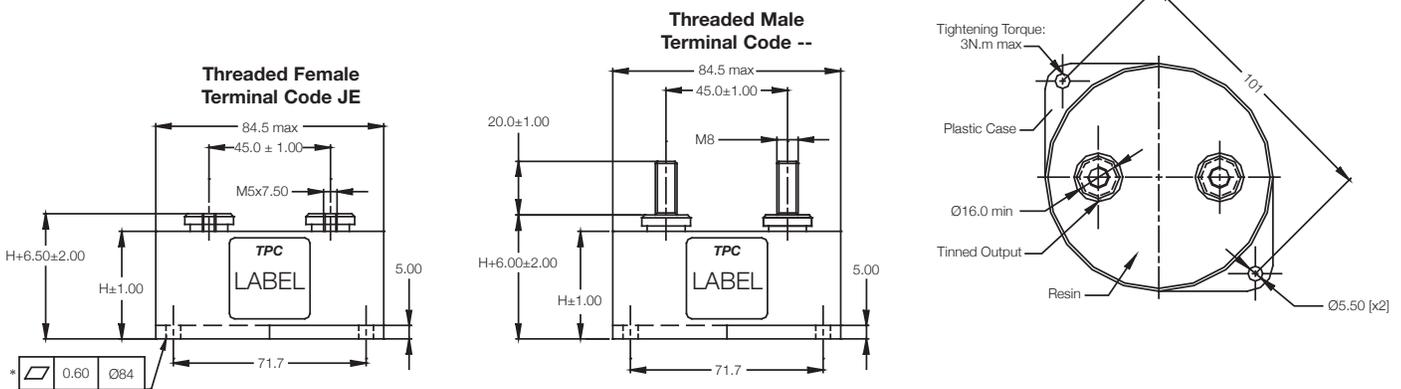
### PACKAGING MATERIAL

Self extinguishing plastic case (V0: in accordance with UL 94) filled thermosetting resin.

Self extinguishing thermosetting resin (V0: in accordance with UL 94; I3F1: in accordance with NF F 16-101).

### DIMENSIONS

Threaded female terminals version M5 x 7.5mm are also available, To order, the suffix becomes "JE" instead of "--"



### HOW TO ORDER

<b>FFVS</b>	<b>6</b>	<b>K</b>	<b>0226</b>	<b>K</b>	<b>--</b>	
<b>Series</b>	<b>Dielectric</b> 6 = Polypropylene	<b>Voltage Code</b> K = 600V B = 800V C = 900V L = 1000V U = 1200V N = 1900V	<b>Capacitance Code</b> Capacitance Values with 2 significant digits: 0 + pF code 0226 = 22µF 0147 = 140µF etc.	<b>Capacitance Tolerances</b> K = ±10%	<b>Terminal Code</b> -- = Male Threaded JE = Female Threaded	

### HOT SPOT CALCULATION

See Hot Spot Temperature, page 3.

$$\theta_{hot\ spot} = \theta_{case} + (P_d + P_t) \times R_{th}$$

with  $P_d$  (Dielectric losses) =  $Q \times tg\delta_0$   
 $Q \times tg\delta_0 \Rightarrow [\frac{1}{2} \times C_n \times (V_{peak\ to\ peak})^2 \times f] \times tg\delta_0$   
 $tg\delta_0$  (tan delta)

For polypropylene,  $tg\delta_0 = 2 \times 10^{-4}$  for frequencies up to 1MHz and is independent of temperatures. For polyester,  $tg\delta_0$  values are shown in graph 4 on page 3.

$$P_t \text{ (Thermal losses)} = R_s \times (I_{rms})^2$$

where  $C_n$  in Farad  
 $V$  in Volt  
 $R_{th}$  in °C/W  
 $I_{rms}$  in Ampere  
 $R_s$  in Ohm  
 $f$  in Hertz  
 $\theta$  in °C

$\theta_{case}$  = bottom center of case

# DC FILTERING

FFVS\* RoHS Compliant

Low Inductance Range Capacitor for Power Electronics



## ELECTRICAL CHARACTERISTICS

Items	Characteristics
Working temperature	-40°C +105°C (according to the power to be dissipated)
Capacitance range $C_N$	22 $\mu$ F to 200 $\mu$ F
Tolerance on $C_N$	$\pm 10\%$
Rated dc voltage $U_{N,dc}$	600V to 1900V
Test voltage between terminals @ 25°C: 1.5 x $U_{N,dc}$ during 10s	
Insulation voltage between shorted terminals and earth (type test) @ 4 kVrms @ 50Hz during 1 min.	

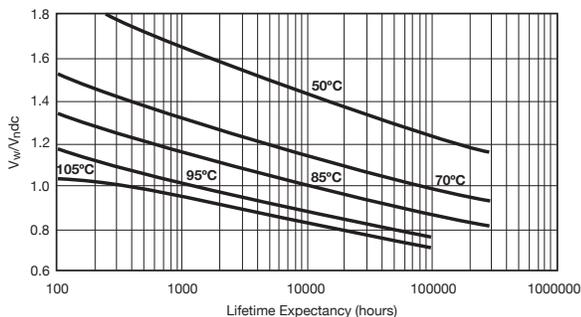
## RATINGS AND PART NUMBER REFERENCE

Part Number	Capacitance ( $\mu$ F)	Height mm	$I_{rms}$ (A)	$I^2t$ (A <sup>2</sup> s)	$L_s$ max. (nH)	$R_s$ (m $\Omega$ )	$R_{th}$ ( $^{\circ}$ C/W)	Typical Weight (g)
<b><math>U_{n,dc}</math> 600 volts (Voltage Code K)</b>								
FFVS6K0226K--	22	34	78	11.5	8	0.74	4.2	320
FFVS6K0906K--	90	40	84	24	9	0.60	4.9	345
FFVS6K0147K--	140	51	82	23.5	11	0.83	6.8	405
FFVS6K1956K--	195	64	84	24	13	1.04	8.6	475
<b><math>U_{n,dc}</math> 800 volts (Voltage Code B)</b>								
FFVS6B0586K--	58	40	83	19	9	0.72	4.9	345
FFVS6B0926K--	92	51	83	19	11	0.99	6.7	405
FFVS6B1286K--	128	64	84	19.5	13	1.25	8.5	475
<b><math>U_{n,dc}</math> 900 volts (Voltage Code C)</b>								
FFVS6C0306K--	30	34	56	7	8	1.55	4.2	320
FFVS6C0406K--	40	40	85	16.5	9	0.85	5.0	345
FFVS6C0656K--	65	51	86	17	11	1.15	6.7	405
FFVS6C0906K--	90	64	87	17	13	1.46	8.5	475
<b><math>U_{n,dc}</math> 1000 volts (Voltage Code L)</b>								
FFVS6L0536K--	53	40	61	9.5	9	1.56	4.9	345
FFVS6L0956K--	95	51	63	11	11	1.98	6.7	405
FFVS6L1356K--	135	64	65	11.5	13	2.42	8.3	475
<b><math>U_{n,dc}</math> 1200 volts (Voltage Code U)</b>								
FFVS6U0406K--	40	40	57	7.5	9	1.77	4.9	345
FFVS6U0656K--	65	51	57	7.5	11	2.38	6.8	405
FFVS6U0866K--	86	64	58	7	13	3.02	8.5	475
<b><math>U_{n,dc}</math> 1900 volts (Voltage Code N)</b>								
FFVS6N0146K--	14	40	66	12.5	10	1.05	4.9	345
FFVS6N0226K--	22	51	68	13.5	13	1.26	6.3	405
FFVS6N0326K--	32	64	68	13.5	16	1.58	8.1	475

Dimensions millimeters

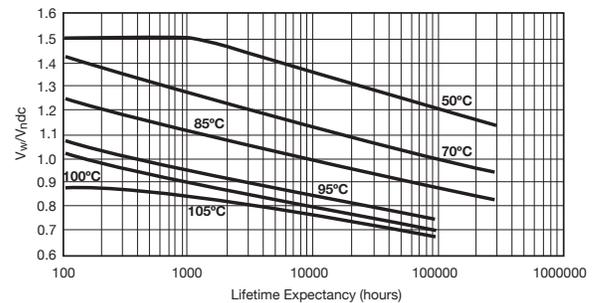
## LIFETIME EXPECTANCY

FFVS for 600V, 800V and 900V



$V_w$ : permanent working or operating DC-voltage.

FFVS for 1000V, 1200V and 1900V



$V_w$ : permanent working or operating DC-voltage.

# DC FILTERING

## FFLR 600Vdc to 3800Vdc\* RoHS Compliant



The FFLR series is specifically designed for DC filtering applications such as DC link. This range offers solutions for voltage from 600V up to 3800V.

The Self Healing Technology, essential to ensure a safe and reliable behavior, is achieved using a fully dry solution with polypropylene metalized film. Standard designs proposed in this catalogue are covering a wide range of voltage and capacitance values.

In case of specific requirements about shape and performances, please feel free to contact your local KYOCERA AVX representative.

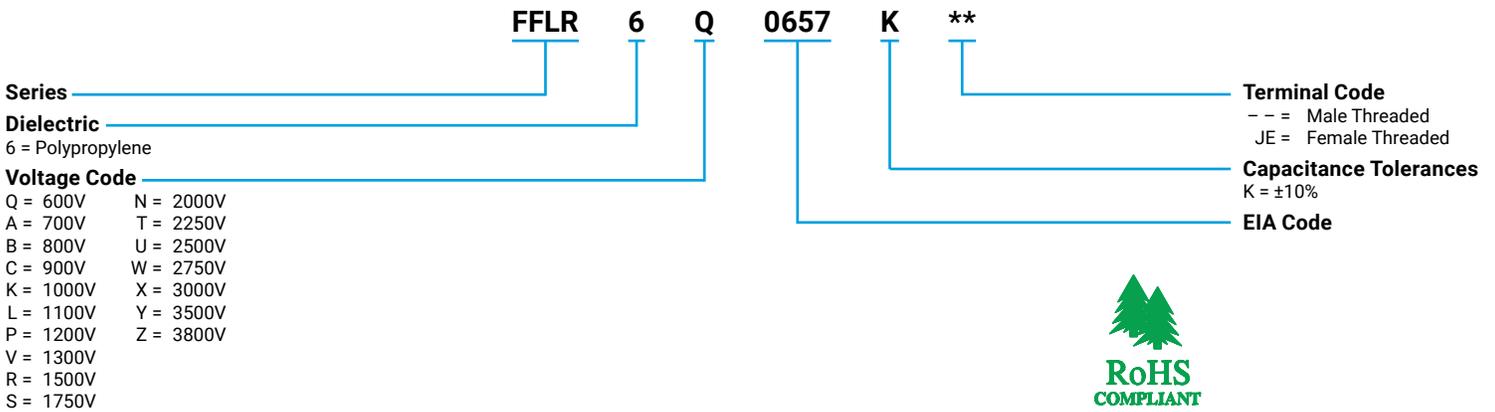
### STANDARDS

- IEC 61071: Power electronic capacitors
- IEC 60068-2: Environmental testing
- IEC 61373: Shock and vibrations
- UL 94: Fire requirements
- UL810:

### PACKAGING MATERIAL

- Aluminum cylindrical case filled polyurethane resin.
- Self extinguishing polyurethane resin (V0 : in accordance with UL94)
- Self extinguishing plastic cover (V0 : in accordance with UL94)
- RoHS components
- M6/10 Female connections or M8/20 Male connections

### HOW TO ORDER



### DEFINITIONS

<b>C<sub>n</sub> (μF)</b>	capacitance	nominal value of the capacitance measured at $\theta_{amb} = 25 \pm 10^\circ\text{C}$
<b>U<sub>r</sub> (V)</b>	rated DC voltage	maximum operating peak voltage of either polarity (non-reversing type waveform), for which the capacitor has been designed for continuous operation
<b>U<sub>w</sub> (V)</b>	working voltage	value of the maximum operating recurrent voltage for a given hot spot temperature and an expected lifetime
<b>U<sub>p</sub> (V)</b>	ripple voltage	peak-to-peak alternating component of the unidirectional voltage
<b>L<sub>s</sub> (nH)</b>	parasitic inductance	capacitor series self-inductance
<b>R<sub>s</sub> (mΩ)</b>	series resistance	capacitor series resistance due to galvanic circuit
<b>I<sub>rms</sub> (A)</b>	RMS current	RMS current value for continuous operation under natural convection generating 40°C overheating
<b>θ<sub>amb</sub> (°C)</b>	cooling air temperature	Temperature of the cooling air measured at the hottest position of the capacitor, under steady-state conditions, midway between two units Note If only one unit is involved, it is the temperature measured at a point approximately 0.1 m away from the capacitor container and at two-thirds of the height from its base
<b>θ<sub>HS</sub> (°C)</b>	hot spot temperature	highest temperature obtained inside the case of the capacitor in thermal equilibrium
<b>I²t (A²s)</b>	integral of action	maximum repetitive integral of action that galvanic circuit is able to withstand

### CHARACTERISTICS

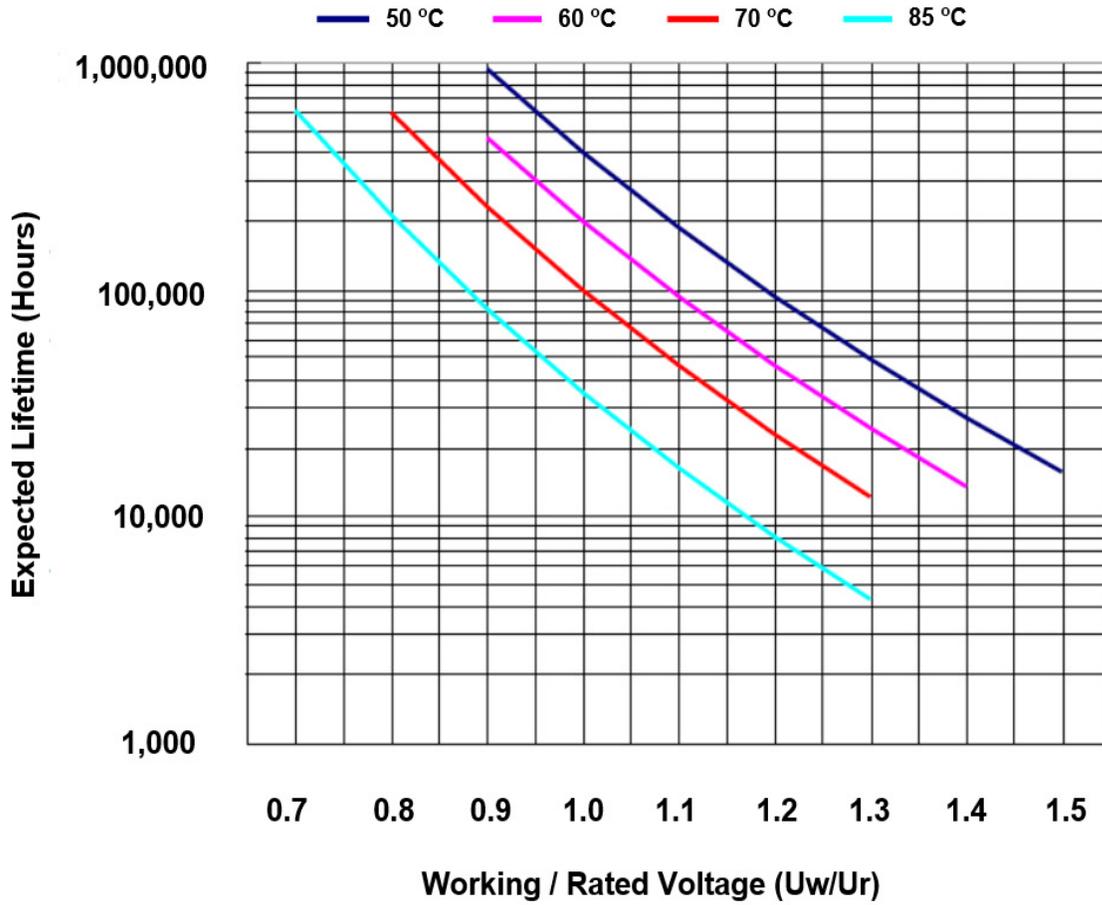
<b>Capacitance range C<sub>n</sub></b>	105μF to 3000μF
<b>Tolerance on C<sub>n</sub></b>	±10%
<b>Rated DC voltage U<sub>n</sub></b>	600 to 3800V
<b>Lifetime at U<sub>n</sub> and 65°C hot-spot temperature and ΔC / C &lt; 2%</b>	100,000h
<b>Parasitic inductance L<sub>s</sub></b>	35 to 60nH
<b>Maximum rms current I<sub>rms</sub></b>	up to 112A <sub>rms</sub>
<b>Test voltage between terminals @ 25°C</b>	1.5 x U <sub>n</sub> for 10s
<b>Test voltage between terminals and Case @ 25°C</b>	4kVrms @ 50Hz for 10s
<b>Dielectric</b>	polypropylene
<b>Climatic Category</b>	40 / 85 / 56 (IEC 60068)
<b>Working temperature</b>	-40°C / +85°C (according to the power dissipated)
<b>Storage temperature</b>	-40°C / +85°C
<b>Calorific value</b>	40 MJ/kg

# DC FILTERING

FFLR 600Vdc to 3800Vdc\* RoHS Compliant



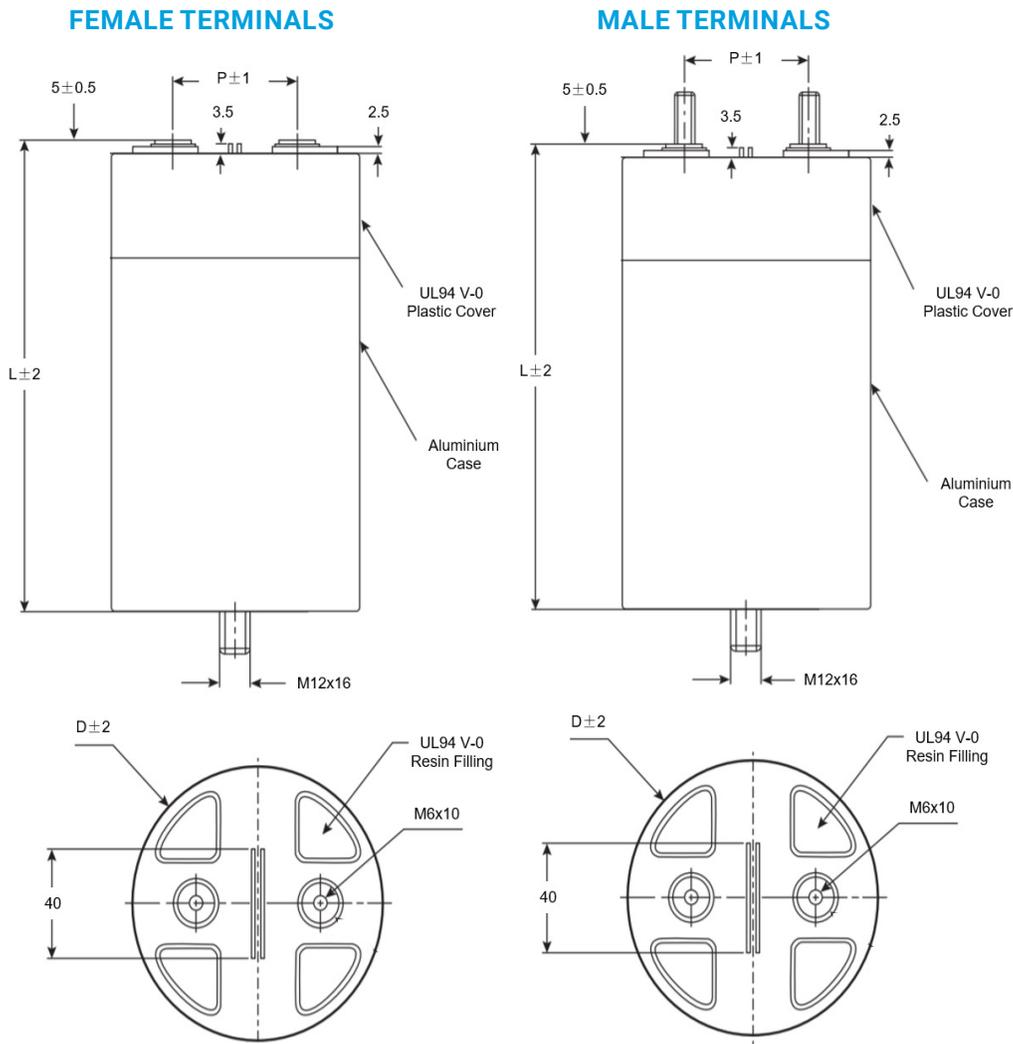
## LIFETIME EXPECTANCY VS HOT SPOT TEMPERATURE AND VOLTAGE



# DC FILTERING

FFLR 600Vdc to 3800Vdc\* RoHS Compliant

## DIMENSIONS



D (mm)	86	100	116	136
P (mm)	32	50	50	50
Dt (mm)	12	15	15	15
Hc (mm)	30	40	40	40

	Max Torque (Nm)
M6	4.5
M8	8.5
M12	15

D (mm)	Distance terminal to terminal (mm)		Distance terminal to case (mm)	
	Creepage	Clearance	Creepage	Clearance
76	35	20	48	46
86	35	20	52	50
100	50	35	59	57
116	50	35	67	65
136	50	35	77	75

## MECHANICAL MOUNTING

Capacitors enclosure presents a M12 x 16 bolt in order to fix the capacitor. Over height (H) more than 1.5 x D (diameter of tube), we recommend to clamp (constraint < 35daN), just below the plastic cover, the capacitor in order to limit oscillations in case of potential Shock&Vibration stress.

# DC FILTERING

FFLR 600Vdc to 3800Vdc\* RoHS Compliant

## RATINGS AND PART NUMBER REFERENCE

C (μF)	Un (V)	PN	Voltage Code	Dimensions			Irms	Peak	ESR	ESL	Thermal Res	dv/dt	SPQ	MOQ
				D	L	P	10KHz	Current	1KHz					
				mm	mm	mm	A	A	mΩ					
650	600	FFLR6Q0657K**	Q	86	105	32	70	3900	1.2	60	5	6	8	240
800	600	FFLR6Q0807K**	Q	86	142.5	32	75	6400	1.5	60	3.6	8	8	240
1000	600	FFLR6Q0108K**	Q	86	161	32	60	7500	1	65	3.7	8	8	240
220	700	FFLR6A0227K**	A	76	80	32	50	3080	2.6	40	7.2	14	12	360
300	700	FFLR6A0307K**	A	86	80	32	55	4200	2.4	40	6.5	14	8	240
420	700	FFLR6A0427K**	A	86	105	32	58	2940	2.5	50	4.2	7	8	240
450	700	FFLR6A0457K**	A	86	126	32	65	3150	2.3	50	4.6	7	8	240
550	700	FFLR6A0557K**	A	86	142.5	32	65	3300	2.5	60	4.1	6	8	240
290	800	FFLR6B0297K**	B	76	105	32	50	3045	4	60	4	11	12	360
300	800	FFLR6B0307K**	B	86	105	32	60	2550	2.5	60	3.8	9	8	240
390	800	FFLR6B0397K**	B	86	105	32	62	3315	2.9	60	3.6	9	8	240
450	800	FFLR6B0457K**	B	86	142.5	32	65	3600	2.4	60	3.2	8	8	240
460	800	FFLR6B0467K**	B	86	151	50	70	3680	2.3	50	3.4	8	8	240
850	800	FFLR6B0857K**	B	86	205	50	60	4250	1.8	50	3.6	5	8	240
1000	800	FFLR6B0108K**	B	116	155	50	65	7000	1.8	60	2.6	7	5	150
1600	800	FFLR6B0168K**	B	116	180	50	75	9600	3	65	3.4	6	5	150
480	900	FFLR6C0487K**	C	86	142.5	32	65	4080	2	50	4.2	9	8	240
1000	900	FFLR6C0108K**	C	116	155	50	68	7000	1.6	80	3	7	5	150
1500	900	FFLR6C0158K**	C	116	185	50	60	12000	2	65	4.8	8	5	150
1800	900	FFLR6C0188K**	C	116	235	50	100	14400	0.8	60	2.4	8	5	150
900	1000	FFLR6K0907K**	K	116	155	50	72	10800	2.9	85	2.6	12	5	150
1300	1000	FFLR6K0138K**	K	116	230	50	100	9750	1.5	100	2.4	8	5	150
1600	1000	FFLR6K0168K**	K	116	230	50	100	8000	1.5	75	2.1	5	5	150
170	1100	FFLR6L0177K**	L	76	105	32	50	1700	3.2	60	3.8	10	12	360
240	1100	FFLR6L0247K**	L	86	105	32	55	3000	1.7	50	3.8	13	8	240
300	1100	FFLR6L0307K**	L	86	142.5	32	58	2550	2	60	2.7	9	8	240
330	1100	FFLR6L0337K**	L	86	142.5	32	60	2805	3	60	3.3	9	8	240
400	1100	FFLR6L0407K**	L	86	142.5	32	60	3400	2.8	60	3.3	9	8	240
420	1100	FFLR6L0427K**	L	86	142.5	32	58	3570	2.3	85	3	9	8	240
500	1100	FFLR6L0507K**	L	86	180	32	72	6000	1.5	80	3	12	8	240
600	1100	FFLR6L0607K**	L	86	225	32	65	6300	2.5	60	2	11	8	240
720	1100	FFLR6L0727K**	L	116	155	50	69	9360	3.2	85	2.6	13	5	150
800	1100	FFLR6L0807K**	L	116	170	50	80	8800	1.5	55	2.4	11	5	150
1000	1100	FFLR6L0108K**	L	116	205	50	85	10000	2.2	50	2.5	10	5	150
1100	1100	FFLR6L0118K**	L	116	230	50	90	9900	1.3	60	2.1	9	5	150
1600	1100	FFLR6L0168K**	L	116	340	50	100	12000	2.3	100	2.4	8	5	150
1700	1100	FFLR6L0178K**	L	136	235	50	110	10200	1.5	60	1.7	6	2	60
2000	1100	FFLR6L0208K**	L	136	265	50	120	12000	1.2	60	1.3	6	2	60
2200	1100	FFLR6L0228K**	L	136	340	50	120	13200	1.2	60	1	6	2	60
420	1200	FFLR6P0427K**	P	86	180	32	60	4200	3	70	3.2	10	8	240
540	1200	FFLR6P0547K**	P	86	225	32	60	5400	2.5	85	3.3	10	8	240
950	1200	FFLR6P0957K**	P	116	235	50	90	9500	1.5	75	2.1	10	5	150
1000	1200	FFLR6P0108K**	P	116	235	50	90	10000	1.5	75	2.1	10	5	150
1200	1200	FFLR6P0128K**	P	116	265	50	70	12000	0.8	50	1.5	10	5	150
250	1300	FFLR6V0257K**	V	86	142	32	40	2000	4	85	5.4	8	8	240
330	1300	FFLR6V0337K**	V	86	180	32	55	4950	2.6	80	3.4	15	8	240
420	1300	FFLR6V0427K**	V	116	105	32	50	6300	2.3	40	2.1	15	5	150
470	1300	FFLR6V0477K**	V	116	161	50	65	5640	1.5	80	7.1	12	5	150
1100	1300	FFLR6V0118K**	V	116	330	50	85	9900	2.7	200	2.1	9	5	150
250	1500	FFLR6R0257K**	R	86	155	32	51	3000	3.2	50	3.6	12	8	240

\*\*Insert -- for male terminals or JE for female terminals

# DC FILTERING

FFLR 600Vdc to 3800Vdc\* RoHS Compliant



## RATINGS AND PART NUMBER REFERENCE

C (μF)	Un (V)	PN	Voltage Code	Dimensions			Irms 10KHz 50°C	Peak Current	ESR 1KHz	ESL	Thermal Res	dv/dt	SPQ	MOQ
				D	L	P								
				mm	mm	mm	A	A	mΩ	nH	*C/W	V/us	pcs	pcs
310	1500	FFLR6R0317K**	R	86	180	32	49	3720	3.8	60	3.3	12	8	240
370	1500	FFLR6R0377K**	R	100	155	50	62	4440	2.3	50	3.3	12	5	150
450	1500	FFLR6R0457K**	R	100	180	50	59	5400	2.7	60	3.1	12	5	150
510	1500	FFLR6R0517K**	R	116	155	50	74	6120	1.8	50	3.1	12	5	150
620	1500	FFLR6R0627K**	R	116	180	50	70	6200	2.1	60	2.9	10	5	150
700	1500	FFLR6R0707K**	R	116	240	50	92	7000	1.1	40	3.2	10	5	150
900	1500	FFLR6R0907K**	R	116	290	50	90	7200	1.3	50	2.9	8	5	150
1100	1500	FFLR6R0118K**	R	116	340	50	89	7700	1.5	60	2.5	7	5	150
185	1750	FFLR6S1856K**	S	86	155	32	48	2775	3.7	50	3.6	15	8	240
225	1750	FFLR6S2256K**	S	86	180	32	46	3375	4.4	60	3.3	15	8	240
270	1750	FFLR6S0277K**	S	100	155	50	58	4050	2.6	50	3.3	15	5	150
330	1750	FFLR6S0337K**	S	100	180	50	56	4950	3.1	60	3.1	15	5	150
370	1750	FFLR6S0377K**	S	116	155	50	69	5550	2	50	3.1	15	5	150
450	1750	FFLR6S0457K**	S	116	180	50	65	5850	2.4	60	2.9	13	5	150
520	1750	FFLR6S0527K**	S	116	240	50	89	5720	1.2	40	3.2	11	5	150
670	1750	FFLR6S0677K**	S	116	290	50	86	6030	1.4	50	2.9	9	5	150
820	1750	FFLR6S0827K**	S	116	340	50	85	6560	1.7	60	2.5	8	5	150
140	2000	FFLR6N0147K**	N	86	155	32	45	2520	4.2	50	3.6	18	8	240
170	2000	FFLR6N0177K**	N	86	180	32	43	3060	5	60	3.3	18	8	240
205	2000	FFLR6N2056K**	N	100	155	50	55	3690	3	50	3.3	18	5	150
250	2000	FFLR6N0257K**	N	100	180	50	52	4000	3.5	60	3.1	16	5	150
280	2000	FFLR6N0287K**	N	116	155	50	65	4480	2.3	50	3.1	16	5	150
350	2000	FFLR6N0357K**	N	116	180	50	62	5250	2.6	60	2.9	15	5	150
400	2000	FFLR6N0407K**	N	116	240	50	85	5600	1.3	40	3.2	14	5	150
510	2000	FFLR6N0517K**	N	116	290	50	82	6630	1.5	50	2.9	13	5	150
620	2000	FFLR6N0627K**	N	116	340	50	81	7440	1.8	60	2.5	12	5	150
110	2250	FFLR6T0117K**	T	86	155	32	43	1760	4.7	50	3.6	16	8	240
135	2250	FFLR6T1356K**	T	86	180	32	41	2160	5.5	60	3.3	16	8	240
160	2250	FFLR6T0167K**	T	100	155	50	52	2560	3.3	50	3.3	16	5	150
195	2250	FFLR6T1956K**	T	100	180	50	49	2925	4	60	3.1	15	5	150
220	2250	FFLR6T0227K**	T	116	155	50	62	3300	2.5	50	3.1	15	5	150
270	2250	FFLR6T0277K**	T	116	180	50	59	4050	3	60	2.9	15	5	150
310	2250	FFLR6T0317K**	T	116	240	50	81	4340	1.4	40	3.2	14	5	150
400	2250	FFLR6T0407K**	T	116	290	50	79	5200	1.7	50	2.9	13	5	150
490	2250	FFLR6T0497K**	T	116	340	50	78	6125	2	60	2.5	12.5	5	150
85	2500	FFLR6U0856K**	U	86	155	32	40	1530	5.2	50	3.6	18	8	240
105	2500	FFLR6U1056K**	U	86	180	32	39	1890	6.1	60	3.3	18	8	240
120	2500	FFLR6U0127K**	U	100	155	50	49	2160	3.8	50	3.3	18	5	150
150	2500	FFLR6U0157K**	U	100	180	50	47	2700	4.4	60	3.1	18	5	150
170	2500	FFLR6U0177K**	U	116	155	50	59	3400	2.8	50	3.1	20	5	150
210	2500	FFLR6U0217K**	U	116	180	50	56	4200	3.3	60	2.9	20	5	150
230	2500	FFLR6U0237K**	U	116	240	50	77	4600	1.6	40	3.2	20	5	150
300	2500	FFLR6U0307K**	U	116	290	50	75	5400	1.9	50	2.9	18	5	150
380	2500	FFLR6U0387K**	U	116	340	50	75	6460	2.2	60	2.5	17	5	150
70	2750	FFLR6W0706K**	W	86	155	32	39	1400	5.7	50	3.6	20	8	240
85	2750	FFLR6W0856K**	W	86	180	32	37	1700	6.8	60	3.3	20	8	240
100	2750	FFLR6W0107K**	W	100	155	50	47	2000	4.1	50	3.3	20	5	150
125	2750	FFLR6W1256K**	W	100	180	50	45	2500	4.8	60	3.1	20	5	150
140	2750	FFLR6W0147K**	W	116	155	50	56	2800	3	50	3.1	20	5	150

\*\*Insert -- for male terminals or JE for female terminals

# DC FILTERING

FFLR 600Vdc to 3800Vdc\* RoHS Compliant



## RATINGS AND PART NUMBER REFERENCE

C (μF)	Un (V)	PN	Voltage Code	Dimensions			Irms	Peak	ESR	ESL	Thermal Res	dv/dt	SPQ	MOQ
				D	L	P	10KHz 50°C	Current	1KHz					
				mm	mm	mm	A	A	mΩ					
170	2750	FFLR6W0177K**	W	116	180	50	53	3060	3.6	60	2.9	18	5	150
190	2750	FFLR6W0197K**	W	116	240	50	74	3230	1.7	40	3.2	17	5	150
250	2750	FFLR6W0257K**	W	116	290	50	73	4000	2	50	2.9	16	5	150
310	2750	FFLR6W0317K**	W	116	340	50	72	4960	2.4	60	2.5	16	5	150
58	3000	FFLR6X0586K**	X	86	155	32	37	1276	6.3	50	3.6	22	8	240
70	3000	FFLR6X0706K**	X	86	180	32	35	1540	7.6	60	3.3	22	8	240
85	3000	FFLR6X0856K**	X	100	155	50	45	2040	4.4	50	3.3	24	5	150
105	3000	FFLR6X1056K**	X	100	180	50	43	2520	5.2	60	3.1	24	5	150
115	3000	FFLR6X1156K**	X	116	155	50	54	2760	3.3	50	3.1	24	5	150
145	3000	FFLR6X1456K**	X	116	180	50	51	3480	3.9	60	2.9	24	5	150
160	3000	FFLR6X0167K**	X	116	240	50	72	3520	1.8	40	3.2	22	5	150
210	3000	FFLR6X0217K**	X	116	290	50	70	4620	2.1	50	2.9	22	5	150
260	3000	FFLR6X0267K**	X	116	340	50	69	5460	2.5	60	2.5	21	5	150
60	3500	FFLR6Y0606K**	Y	100	155	50	60	1500	2.5	50	3.3	25	5	150
75	3500	FFLR6Y0756K**	Y	100	180	50	58	1875	2.9	60	3.1	25	5	150
85	3500	FFLR6Y0856K**	Y	116	155	50	72	2210	1.9	50	3.1	26	5	150
105	3500	FFLR6Y1056K**	Y	116	180	50	68	2730	2.2	60	3	26	5	150
115	3500	FFLR6Y1156K**	Y	116	240	50	89	2875	1.2	40	3.3	25	5	150
150	3500	FFLR6Y0157K**	Y	116	290	50	88	3750	1.3	50	2.9	25	5	150
190	3500	FFLR6Y0197K**	Y	116	340	50	88	4560	1.6	60	2.5	24	5	150
53	3800	FFLR6Z0536K**	Z	100	155	50	59	1484	2.6	50	3.3	28	5	150
66	3800	FFLR6Z0666K**	Z	100	180	50	56	1848	3	60	3.1	28	5	150
72	3800	FFLR6Z0726K**	Z	116	155	50	69	2160	2	50	3.1	30	5	150
90	3800	FFLR6Z0906K**	Z	116	180	50	66	2700	2.3	60	3	30	5	150
100	3800	FFLR6Z0107K**	Z	116	240	50	88	2700	1.2	40	3.3	27	5	150
130	3800	FFLR6Z0137K**	Z	116	290	50	86	3380	1.4	50	2.9	26	5	150
165	3800	FFLR6Z1656K**	Z	116	340	50	87	4125	1.6	60	2.5	25	5	150

\*\*Insert - - for male terminals or JE for female terminals

# DC FILTERING

FFLI 800V to 1400Vdc\* RoHS Compliant



The FFLI series is specifically designed for DC filtering applications such as DC link. This range offers solutions for voltage from 800V up to 1400V.

The Controlled Self Healing Technology, essential to ensure a safe and reliable behaviour, is achieved using a fully dry solution with polypropylene metallized and segmented film. Standard designs proposed in this catalogue are covering a wide range of voltage and capacitance values.

In case of specific requirements about shape and performances, please feel free to contact your local KYOCERA AVX representative.

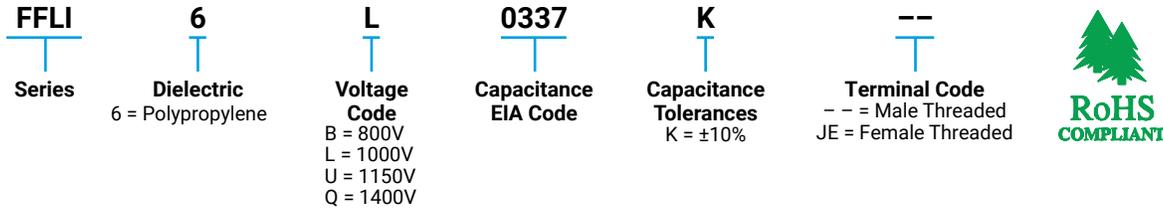
## STANDARDS

- IEC 61071: Power electronic capacitors
- IEC 61881: Railway applications, rolling stock equipment, capacitors for power electronics
- IEC 60068-2: Environmental testing
- IEC 61373: Shock and vibrations
- UL 94: Fire requirements

## PACKAGING MATERIAL

- Aluminium cylindrical case filled polyurethane resin.
- Self extinguishing polyurethane resin (V0 : in accordance with UL94)
- Self extinguishing plastic cover (V0 : in accordance with UL94)
- RoHS components
- M6/10 Female connections or M8/20 Male connections

## HOW TO ORDER



## DEFINITIONS

<b>C<sub>n</sub> (μF)</b>	capacitance	nominal value of the capacitance measured at $\theta_{amb} = 25 \pm 10^{\circ}\text{C}$
<b>U<sub>n</sub> (V)</b>	rated DC voltage	maximum operating peak voltage of either polarity (non-reversing type waveform), for which the capacitor has been designed for continuous operation
<b>U<sub>w</sub> (V)</b>	working voltage	value of the maximum operating recurrent voltage for a given hot spot temperature and an expected lifetime
<b>U<sub>r</sub> (V)</b>	ripple voltage	peak-to-peak alternating component of the unidirectional voltage
<b>L<sub>s</sub> (nH)</b>	parasitic inductance	capacitor series self-inductance
<b>R<sub>s</sub> (mΩ)</b>	series resistance	capacitor series resistance due to galvanic circuit
<b>I<sub>rms</sub> (A)</b>	RMS current	RMS current value for continuous operation under natural convection generating 40°C overheating
<b>θ<sub>amb</sub> (°C)</b>	cooling air temperature	temperature of the cooling air measured at the hottest position of the capacitor, under steady-state conditions, midway between two units NOTE If only one unit is involved, it is the temperature measured at a point approximately 0.1 m away from the capacitor container and at two-thirds of the height from its base
<b>θ<sub>HS</sub> (°C)</b>	hot spot temperature	highest temperature obtained inside the case of the capacitor in thermal equilibrium
<b>I²t (A²s)</b>	integral of action	maximum repetitive integral of action that galvanic circuit is able to withstand

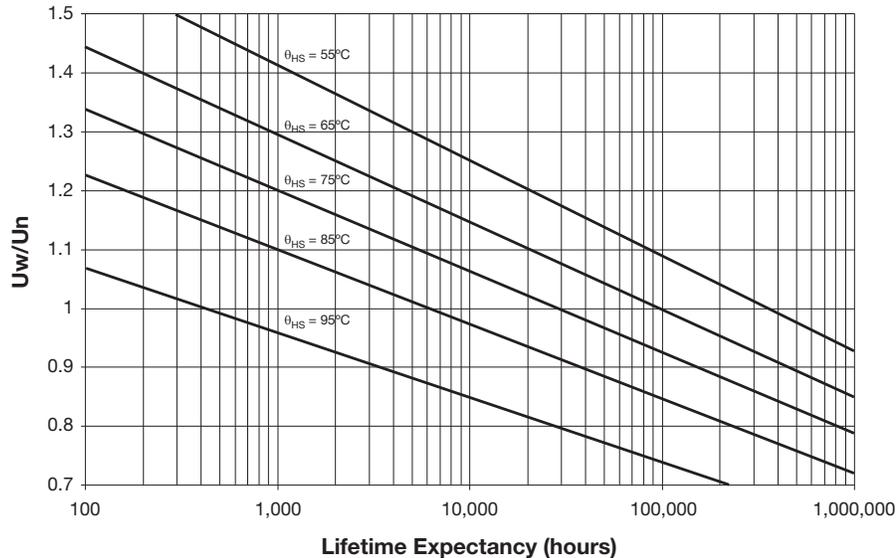
## CHARACTERISTICS

<b>Capacitance range C<sub>n</sub></b>	105μF to 3000μF
<b>Tolerance on C<sub>n</sub></b>	±10%
<b>Rated DC voltage U<sub>n</sub></b>	800 to 1400V
<b>Lifetime at U<sub>n</sub> and 65°C hot-spot temperature and ΔC / C &lt; 2%</b>	100,000h
<b>Parasitic inductance L<sub>s</sub></b>	35 to 60nH
<b>Maximum rms current I<sub>rms</sub></b>	up to 112A <sub>rms</sub>
<b>Test voltage between terminals @ 25°C</b>	1.5 x U <sub>n</sub> for 10s
<b>Test voltage between terminals and Case @ 25°C</b>	4kVrms @ 50Hz for 10s
<b>Dielectric</b>	polypropylene
<b>Climatic Category</b>	40 / 95 / 56 (IEC 60068)
<b>Working temperature</b>	-40°C / +95°C (according to the power dissipated)
<b>Storage temperature</b>	-40°C / +85°C
<b>Calorific value</b>	40 MJ/kg

# DC FILTERING

FFLI 800V to 1400Vdc\* RoHS Compliant

## LIFETIME EXPECTANCY VS HOT SPOT TEMPERATURE AND VOLTAGE



## HOW TO CHOSE THE RIGHT CAPACITOR

The capacitor lifetime depends on the working voltage and the hot spot temperature.

Our caps are designed to meet 100000 hours lifetime at rated voltage and  $65^\circ\text{C}$  hot spot temperature. In accordance with operating conditions, please calculate the hot spot temperature and deduce from this calculation if the obtained lifetime can suit the application.

### 1. From the tables, select a capacitor with required capacitance

$C_n$  and voltage  $U_n$ .

Calculate the maximum ripple voltage allowed for the selected cap:

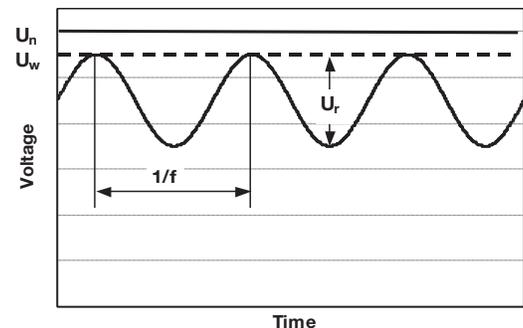
$$U_{rmax} = 0.2U_n$$

If  $U_r > U_{rmax}$ , select a capacitor with higher rated voltage

Make sure  $I_{rms}$  application  $<$   $I_{rms}$  table

Copy out:

- serial resistance ( $R_s$ ): see table of values
- thermal resistances  $R_{th}$



### 2. Hot spot temperature calculation

Total losses are calculated as follow:  $P_t = P_j + P_d$

Joule losses:  $P_j = R_s \times I_{rms}^2$

Dielectric losses:  $P_d = Q \times \text{tg}\delta_0$  with

•  $Q$  (reactive power)  $= \frac{I_{rms}^2}{C\omega}$  for a sinusoidal waveform

•  $\text{tg}\delta_0 = 2 \times 10^{-4}$  (dielectric losses of polypropylene)

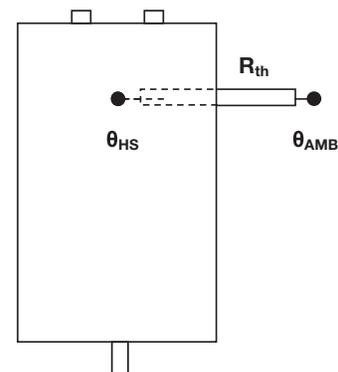
Hot spot temperature will be:

$$\theta_{HS} = \theta_{amb} + (P_j + P_d) \times R_{th}$$

$\theta_{HS}$  **absolute maximum is  $95^\circ\text{C}$**

If temperature is higher than  $95^\circ\text{C}$ , come back to #1 and start again with another selection.

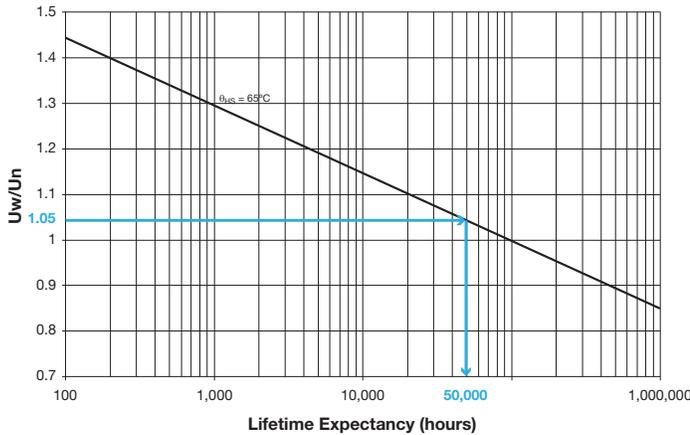
$R_{th}$ : thermal resistance between case and ambient air



# DC FILTERING

FFLI 800V to 1400Vdc\* RoHS Compliant

### 3. Refer to the curve and deduce the lifetime vs $U_w/U_n$ ratio



eg: rated voltage 1000V  
 working voltage 1050V  
 $\rho = 1.05 \Rightarrow$  lifetime 50,000 hours  
 @ 65°C hot spot temperature

Please, find a calculation form at the end of the catalog

## MTBF CALCULATION

Based on Return Of Experience from the field of more than 30 years, we have established the following relation. The failure rate  $\lambda_B$  depends on hot spot temperature  $\theta_{HS}$  and charge ratio  $\rho$ .

$$\rho = U_w/U_n$$

$$\lambda_B = 3 \times 10^{2.75(\rho-1)} \times e^{\left(3.2 \left(\frac{\theta_{HS} + 273}{358}\right)^{30}\right)} \times 10^{-9} \text{ in failures/hour}$$

## GENERAL FAILURE RATE

$\lambda = \lambda_B \times \pi_Q \times \pi_B \times \pi_E$  failures/hour •  $\pi_Q$ ,  $\pi_B$  and  $\pi_E$  see following tables

Qualification	Qualification factor $\pi_Q$
Product qualified on IEC61071 and internal qualification	1
Product qualified on IEC61071	2
Product answering on another norm	5
Product without qualification	15

Environment	Environment factor $\pi_E$
On ground (good conditions)	1
On ground (fixed materials)	2
On ground (on board)	4
On ship	9
On plane	15

Environment	Environment factor $\pi_B$
Favorable	1
Unfavourable	5

## MEAN TIME BETWEEN FAILURE (MTBF)

MTBF =  $1/\lambda$  hours

## SURVIVAL FUNCTION

$$N = N_0 \times \exp(-\lambda t)$$

N is the number of pieces still working after t hours.

$N_0$  is the number of pieces at the origin (t = 0)

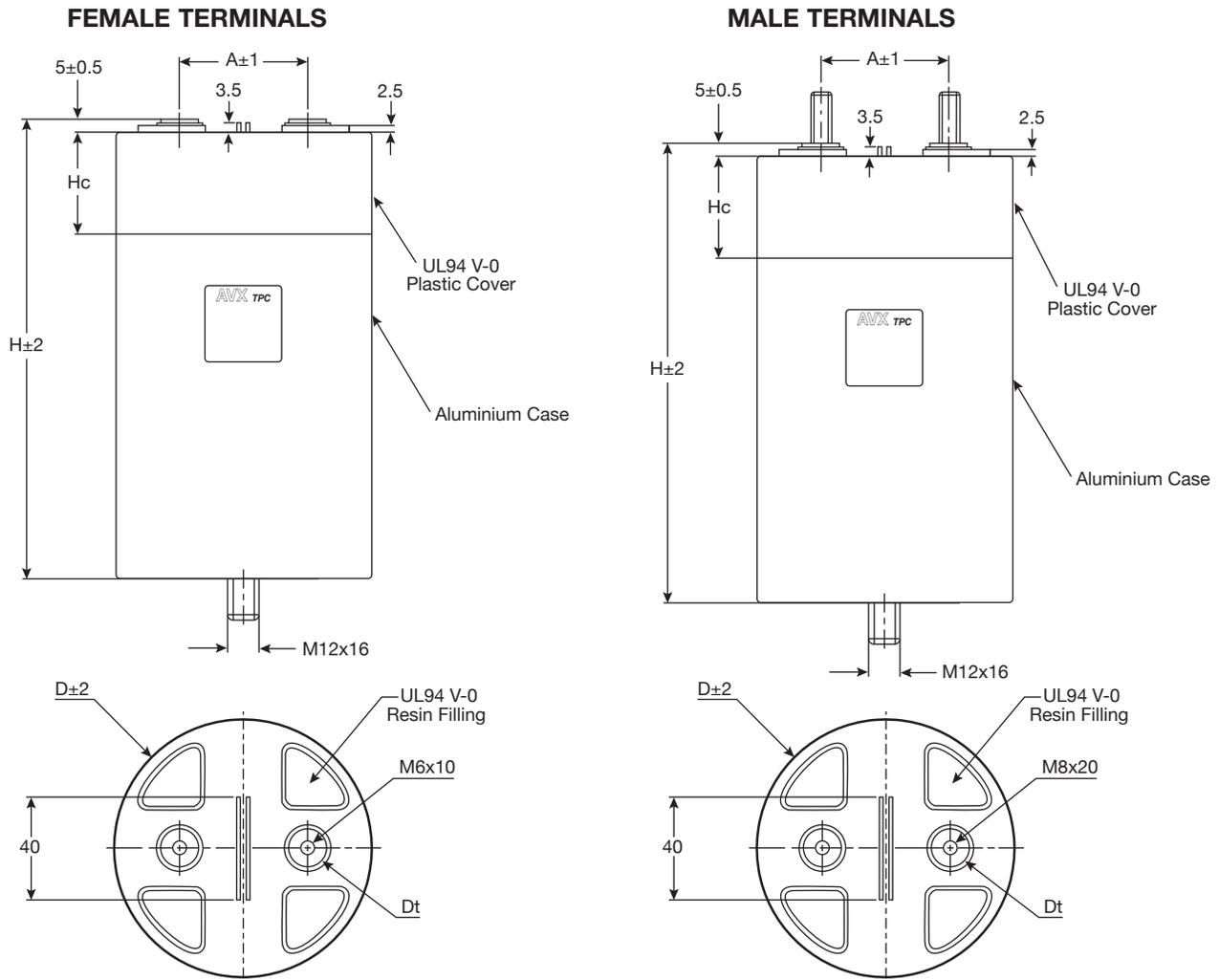
## FAILURE MODE

Main failure mode due to KYOCERA AVX's **Controlled Self-Healing Technology** is only losses of capacitance. Thanks to **Controlled Self-Healing solution** to interrupt self-healing process in order to prevent avalanche effect due to polypropylene molecular cracking producing gas and potential explosion in confined box for none **Controlled Self-Healing capacitors**.

# DC FILTERING

FFLI 800V to 1400Vdc\* RoHS Compliant

## DIMENSIONS



D (mm)	75	85	100	116
A (mm)	32	32	50	50
Dt (mm)	12	12	15	15
Hc (mm)	30	30	40	40

	Max Torque (Nm)
M6	4.5
M8	8.5
M12	15

D (mm)	Distance terminal to terminal (mm)		Distance terminal to case (mm)	
	creepage	clearance	creepage	clearance
75	40	19	47	45
85	40	19	52	50
100	55	34	59	57
116	55	34	67	65

## MECHANICAL MOUNTING

Capacitors enclosure presents a M12 x 16 bolt in order to fix the capacitor. Over height (H) more than 1.5 x D (diameter of tube), we recommend to clamp (constraint < 35daN), just below the plastic cover, the capacitor in order to limit oscillations in case of potential Shock&Vibration stress.

# DC FILTERING

FFLI 800V to 1400Vdc\* RoHS Compliant



## RATINGS AND PART NUMBER REFERENCE

Part Number	Capacitance (μF)	D	H	I <sub>rms</sub> (A)	I <sup>2</sup> t (A <sup>2</sup> s)	Typical L <sub>s</sub> (nH)	Typical R <sub>s</sub> (mΩ)	R <sub>th</sub> (°C/W)	Typical Weight (g)
<b>U<sub>n</sub>dc 800V</b>									
FFLI6B0297K**	290	75	105	54	13	35	3.1	4.5	600
FFLI6B0397K**	390	85	105	66	24	35	2.3	4.0	700
FFLI6B0507K**	500	75	155	49	13	50	4.1	4.0	850
FFLI6B0687K**	680	85	155	59	24	50	3.1	3.7	1100
FFLI6B0817K**	810	85	180	58	24	60	3.5	3.4	1300
FFLI6B1007K**	1000	100	155	73	52	50	2.2	3.4	1500
FFLI6B1207K**	1200	100	180	70	52	60	2.5	3.3	1800
FFLI6B1357K**	1350	116	155	86	95	50	1.7	3.2	2000
FFLI6B1607K**	1600	116	180	80	95	60	2.0	3.1	2400
FFLI6B1907K**	1900	116	240	112	320	40	1.1	2.9	3200
FFLI6B2407K**	2400	116	290	111	320	50	1.2	2.7	3900
FFLI6B3007K**	3000	116	340	109	320	60	1.4	2.4	4500
<b>U<sub>n</sub>dc 1000V</b>									
FFLI6L0197K**	190	75	105	49	8	35	3.7	4.5	600
FFLI6L0267K**	260	85	105	60	16	35	2.8	4.0	700
FFLI6L0337K**	330	75	155	45	8	50	4.9	4.0	850
FFLI6L0457K**	450	85	155	54	16	50	3.7	3.7	1100
FFLI6L0547K**	540	85	180	53	16	60	4.2	3.4	1300
FFLI6L0657K**	650	100	155	66	33	50	2.7	3.4	1500
FFLI6L0787K**	780	100	180	64	33	60	3.0	3.3	1800
FFLI6L0907K**	900	116	155	79	66	50	2.0	3.2	2000
FFLI6L1107K**	1100	116	180	75	66	60	2.3	3.1	2400
FFLI6L1307K**	1300	116	240	107	210	40	1.2	2.9	3200
FFLI6L1607K**	1600	116	290	103	210	50	1.4	2.7	3900
FFLI6L2007K**	2000	116	340	102	210	60	1.6	2.4	4500
<b>U<sub>n</sub>dc 1150V</b>									
FFLI6U0157K**	150	75	105	46	7	35	4.2	4.5	600
FFLI6U0207K**	200	85	105	56	12	35	3.2	4.0	700
FFLI6U0267K**	260	75	155	42	7	50	5.6	4.0	850
FFLI6U0357K**	350	85	155	51	12	50	4.2	3.7	1100
FFLI6U0437K**	430	85	180	50	12	60	4.7	3.4	1300
FFLI6U0537K**	530	100	155	64	27	50	2.9	3.4	1500
FFLI6U0637K**	630	100	180	61	27	60	3.3	3.3	1800
FFLI6U0727K**	720	116	155	75	51	50	2.2	3.2	2000
FFLI6U0867K**	860	116	180	72	51	60	2.5	3.1	2400
FFLI6U1007K**	1000	116	240	99	160	40	1.4	2.9	3200
FFLI6U1307K**	1300	116	290	99	160	50	1.5	2.7	3900
FFLI6U1607K**	1600	116	340	99	160	60	1.7	2.4	4500
<b>U<sub>n</sub>dc 1400V</b>									
FFLI6Q1056K**	105	75	105	43	5	35	4.9	4.5	600
FFLI6Q0147K**	140	85	105	51	9	35	3.8	4.0	700
FFLI6Q1856K**	185	75	155	40	5	50	6.4	4.0	850
FFLI6Q0257K**	250	85	155	47	9	50	4.8	3.7	1100
FFLI6Q0307K**	300	85	180	46	9	60	5.5	3.4	1300
FFLI6Q0367K**	360	100	155	58	19	50	3.5	3.4	1500
FFLI6Q0447K**	440	100	180	56	19	60	3.9	3.3	1800
FFLI6Q0507K**	500	116	155	69	36	50	2.6	3.2	2000
FFLI6Q0607K**	600	116	180	66	36	60	3.0	3.1	2400
FFLI6Q0707K**	700	116	240	96	120	40	1.5	2.9	3200
FFLI6Q0907K**	900	116	290	93	120	50	1.7	2.7	3900
FFLI6Q1107K**	1100	116	340	91	120	60	2.0	2.4	4500

\*\*Insert - - for male terminals or JE for female terminals



The Important Information/Disclaimer is incorporated in the catalog where these specifications came from or available online at [www.avx.com/disclaimer/](http://www.avx.com/disclaimer/) by reference and should be reviewed in full before placing any order.

# DC FILTERING

FFLI 800V to 1400Vdc\* RoHS Compliant



## CALCULATION FORM SPECIFICATION

Capacitance	C (μF)	
Working voltage	U <sub>w</sub> (V)	
Rms current	I <sub>rms</sub> (A <sub>rms</sub> )	
Frequency	f (Hz)	
Ripple voltage	U <sub>r</sub> (V)	
Ambient temperature	θ <sub>amb</sub> (°C)	
Lifetime @ U <sub>w</sub> , I <sub>rms</sub> and θ <sub>amb</sub>	hours	
Parasitic inductance	L (nH)	
Cooling conditions		

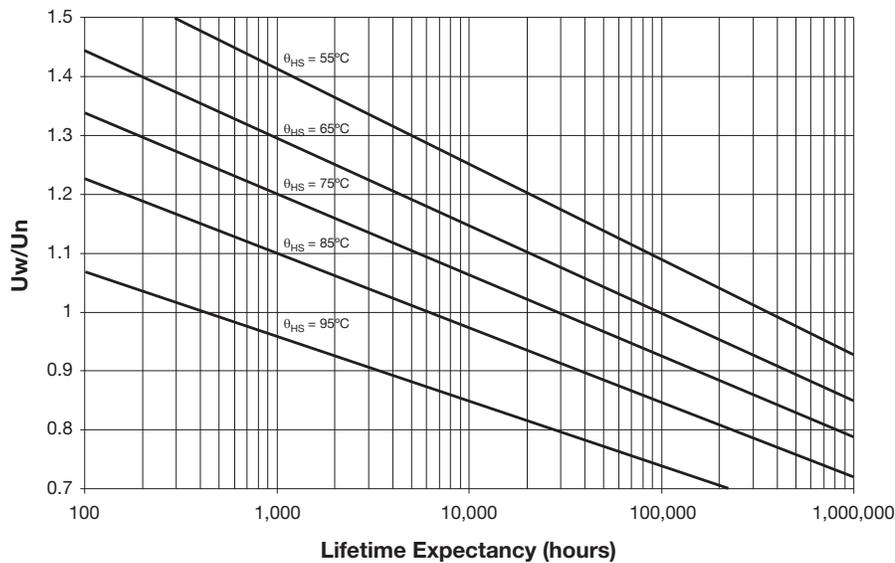
### Your choice

PN		
Capacitance	C (μF)	
Rated voltage	U <sub>n</sub> (V)	
Serial resistance	R <sub>s</sub> (mΩ)	
between hot spot and case	R <sub>th</sub> (°C/W)	

## CALCULATIONS

Maximum ripple voltage	$U_{rmax} = 0.2 U_n$	$U_{rmax} =$	V
<i>The maximum ripple voltage of the selected capacitor must be in any case higher than the ripple voltage of your application</i>			
Ratio U <sub>w</sub> /U <sub>n</sub>	$\rho = U_w/U_n$	$\rho =$	
Joule losses	$P_j = R_s \times I_{rms}^2$	$P_j =$	W
Dielectric losses	$P_d = Q \times t \times g \times \delta = Q \times 2.10^{-4}$	$P_d =$	W
Hot spot temperature	$\theta_{HS} = \theta_{amb} + (P_j + P_d) \times R_{th}$	$\theta_{HS} =$	°C
<i>The hot spot temperature must be in any case lower than 95°C</i>			

## LIFETIME EXPECTANCY VS HOT SPOT TEMPERATURE AND VOLTAGE



Expected lifetime at hot spot calculated and U = U <sub>w</sub>	
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# DC FILTERING

FFLI HV 1500V to 3800Vdc\* RoHS Compliant



The FFLI series is specifically designed for DC filtering applications such as DC link. This high voltage range offers solutions for voltage from 1500V up to 3800V.

The **Controlled Self Healing Technology**, essential to ensure a safe and reliable behavior, is achieved using a wet solution with both polypropylene metallized film and oil (without free oil). Standard designs proposed in this catalogue are covering a wide range of voltage and capacitance values.

In case of specific requirements about shape and performances, please feel free to contact your local KYOCERA AVX representative.

## PACKAGING MATERIAL

Aluminium cylindrical case filled polyurethane resin.

Self extinguishing polyurethane resin (V0 : in accordance with UL94)

Self extinguishing plastic cover (V0: in accordance with UL94)  
RoHS components

M6/10 Female connections or M8/20 Male connections

## HOW TO ORDER

<b>FFLI</b>	<b>6</b>	<b>L</b>	<b>0257</b>	<b>K</b>	<b>--</b>
Series	Dielectric 6 = Polypropylene	Voltage Code R = 1500V S = 1750V N = 2000V T = 2250V P = 2500V W = 2750V X = 3000V Y = 3500V Z = 3800V	Capacitance EIA Code 	Capacitance Tolerances K = ±10%	Terminal Code -- = Male Threaded JE = Female Threaded

## STANDARDS

- IEC 61071: Power electronic capacitors
- IEC 61881: Railway applications, rolling stock equipment, capacitors for power electronics
- IEC 60068-2: Environmental testing
- IEC 61373: Shock and vibrations
- UL 94: Fire requirements

## DEFINITIONS

$C_n$ (μF)	capacitance	nominal value of the capacitance measured at $\theta_{amb} = 25 \pm 10^\circ\text{C}$
$U_n$ (V)	rated DC voltage	maximum operating peak voltage of either polarity (non-reversing type waveform), for which the capacitor has been designed for continuous operation
$U_w$ (V)	working voltage	value of the maximum operating recurrent voltage for a given hot spot temperature and an expected lifetime
$U_r$ (V)	ripple voltage	peak-to-peak alternating component of the unidirectional voltage
$L_s$ (nH)	parasitic inductance	capacitor series self-inductance
$R_s$ (mΩ)	series resistance	capacitor series resistance due to galvanic circuit
$I_{rms}$ (A)	RMS current	RMS current value for continuous operation under natural convection generating 30°C overheating
$\theta_{amb}$ (°C)	cooling air temperature	temperature of the cooling air measured at the hottest position of the capacitor, under steady-state conditions, midway between two units NOTE If only one unit is involved, it is the temperature measured at a point approximately 0.1 m away from the capacitor container and at two-thirds of the height from its base
$\theta_{HS}$ (°C)	hot spot temperature	highest temperature obtained inside the case of the capacitor in thermal equilibrium
$I^2t$ (A²s)	integral of action	maximum repetitive integral of action that galvanic circuit is able to withstand

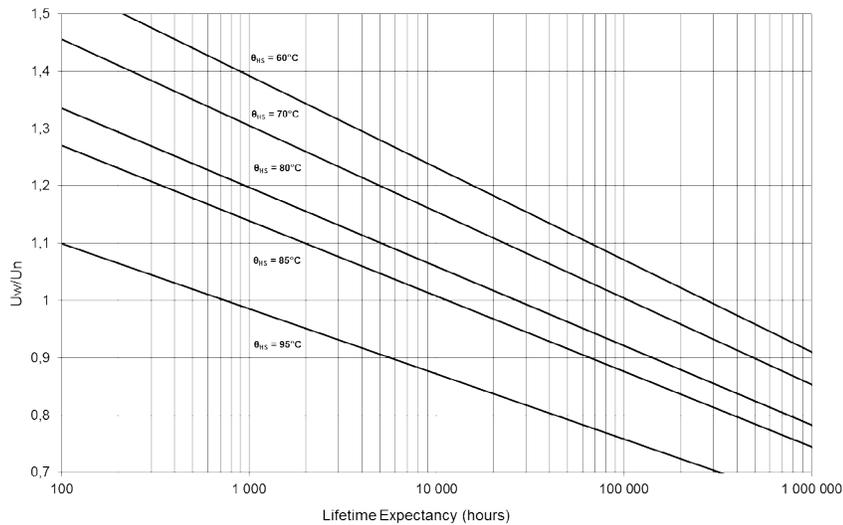
## CHARACTERISTICS

Capacitance range $C_n$	53μF to 1100μF
Tolerance on $C_n$	±10%
Rated DC voltage $U_n$	1500 to 3800V
Lifetime at $U_n$ and 70°C hot-spot temperature and $\Delta C / C < 2\%$	100,000h
Parasitic inductance $L_s$	40 to 60nH
Maximum rms current $I_{rms}$	up to 92A <sub>rms</sub>
Test voltage between terminals @ 25°C	1.5 x $U_n$ for 10 <sub>s</sub>
Test voltage between terminals and Case @ 25°C	9kV <sub>rms</sub> @ 50Hz for 10s
Dielectric	polypropylene
Climatic Category	40 / 95 / 56 (IEC 60068)
Working temperature	-40°C / +95°C (according to the power dissipated)
Storage temperature	-40°C / +95°C
Calorific value	40 MJ/kg

# DC FILTERING

FFLI HV 1500V to 3800Vdc\* RoHS Compliant

## LIFETIME EXPECTANCY VS HOT SPOT TEMPERATURE AND VOLTAGE



### HOW TO CHOSE THE RIGHT CAPACITOR

The capacitor lifetime depends on the working voltage and the hot spot temperature.

Our caps are designed to meet 100000 hours lifetime at rated voltage and 70°C hot spot temperature. In accordance with operating conditions, please calculate the hot spot temperature and deduce from this calculation if the obtained lifetime can suit the application.

#### 1. From the tables, select a capacitor with required capacitance

$C_n$  and voltage  $U_n$ .

Calculate the maximum ripple voltage allowed for the selected cap:

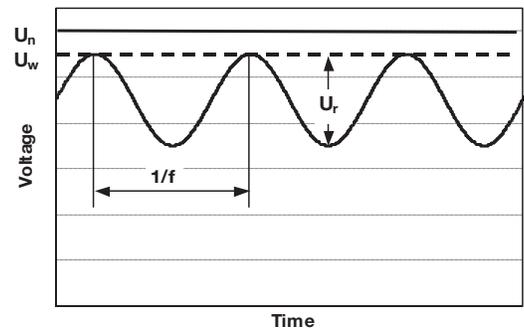
$$U_{rmax} = 0.2U_n$$

If  $U_r > U_{rmax}$ , select a capacitor with higher rated voltage

Make sure  $I_{rms}$  application <  $I_{rms}$  table

Copy out:

- serial resistance ( $R_s$ ): see table of values
- thermal resistances  $R_{th}$



#### 2. Hot spot temperature calculation

Total losses are calculated as follow:  $P_t = P_j + P_d$

Joule losses:  $P_j = R_s \times I_{rms}^2$

Dielectric losses:  $P_d = Q \times \text{tg} \delta_0$  with

- $Q$  (reactive power) =  $\frac{I_{rms}^2}{C\omega}$  for a sinusoidal waveform

- $\text{tg} \delta_0 = 2 \times 10^{-4}$  (dielectric losses of polypropylene)

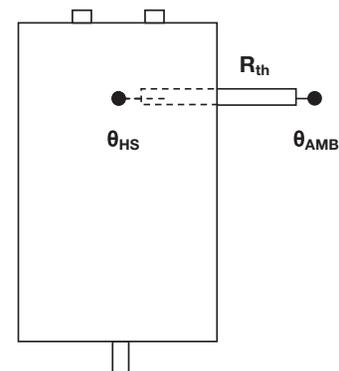
Hot spot temperature will be:

$$\theta_{HS} = \theta_{amb} + (P_j + P_d) \times R_{th}$$

$\theta_{HS}$  **absolute maximum is 95°C**

If temperature is higher than 95°C, come back to #1 and start again with another selection.

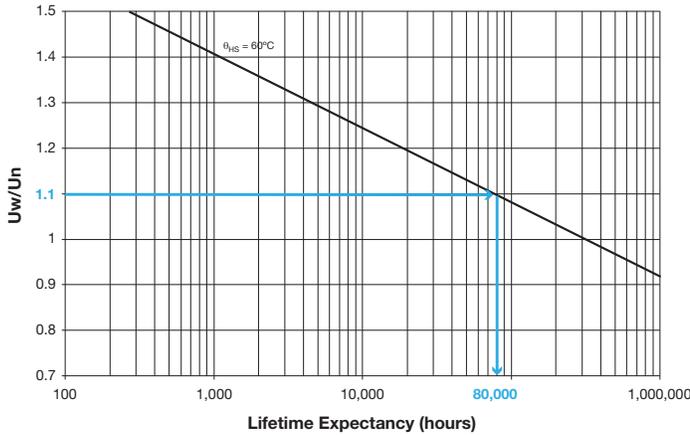
$R_{th}$ : between case and ambient air



# DC FILTERING

## FFLI HV 1500V to 3800Vdc\* RoHS Compliant

### 3. Refer to the curve and deduce the lifetime vs $U_w/U_n$ ratio



eg: rated voltage 2000V  
 working voltage 2200V  
 $\rho = 1.1 \Rightarrow$  lifetime 80,000 hours @ 60°C hot spot temperature

Please, find a calculation form at the end of the catalog

### MTBF CALCULATION

The failure rate  $\lambda_B$  depends on hot spot temperature  $\theta_{HS}$  and charge ratio  $\rho$ .

$$\rho = U_w/U_n$$

$$\lambda_B = 3 \times 10^{2,75(\rho-1)} \times e^{\left(3,2 \left(\frac{\theta_{HS} + 273}{358}\right)^{30}\right)} \times 10^{-9} \text{ in failures/hour}$$

### GENERAL FAILURE RATE

$\lambda = \lambda_B \times \pi_Q \times \pi_B \times \pi_E$  failures/hour •  $\pi_Q$ ,  $\pi_B$  and  $\pi_E$  see following tables

Qualification	Qualification factor $\pi_Q$
Product qualified on IEC61071 and internal qualification	1
Product qualified on IEC61071	2
Product answering on another norm	5
Product without qualification	15

Environment	Environment factor $\pi_E$
On ground (good conditions)	1
On ground (fixed materials)	2
On ground (on board)	4
On ship	9
On plane	15

Environment	Environment factor $\pi_B$
Favorable	1
Unfavourable	5

### MEAN TIME BETWEEN FAILURE (MTBF)

$$MTBF = 1/\lambda \text{ hours}$$

### SURVIVAL FUNCTION

$$N = N_0 \times \exp(-\lambda t)$$

N is the number of pieces still working after t hours.

$N_0$  is the number of pieces at the origin (t = 0)

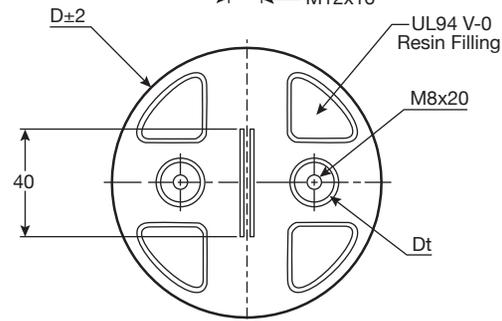
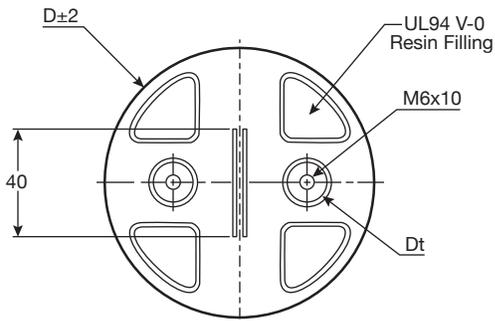
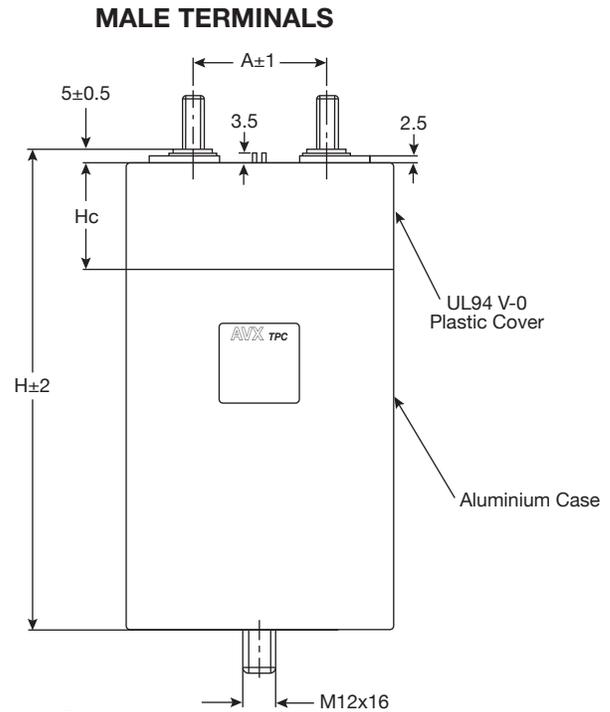
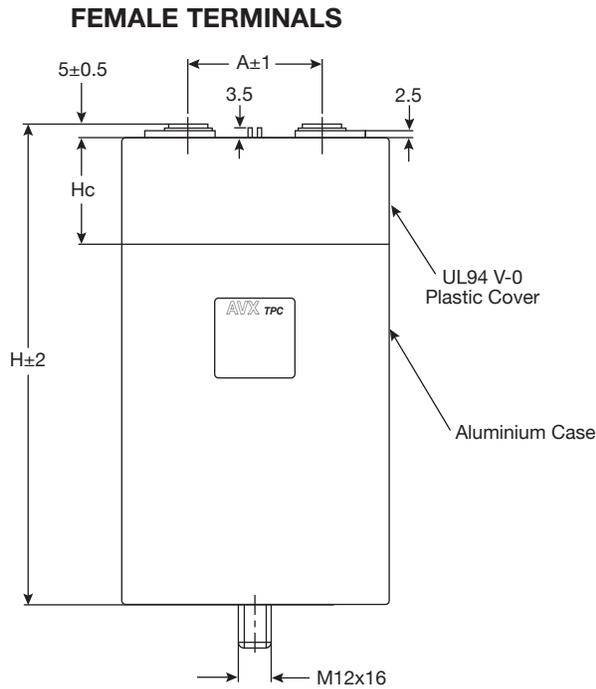
### FAILURE MODE

Main failure mode due to KYOCERA AVX's **Controlled Self-Healing Technology** is only losses of capacitance. Thanks to **Controlled Self-Healing** solution to interrupt self-healing process in order to prevent avalanche effect due to polypropylene molecular cracking producing gas and potential explosion in confined box for none **Controlled Self-Healing capacitors**.

# DC FILTERING

FFLI HV 1500V to 3800Vdc\* RoHS Compliant

## DIMENSIONS



D (mm)	85	100	116	116
A (mm)	32	50	50	50
Dt (mm)	12	15	15	15
Hc (mm)	30	40	40	40

	Max Torque (Nm)
M6	4.5
M8	8.5
M12	15

D (mm)	Distance terminal to terminal (mm)		Distance terminal to case (mm)	
	creepage	clearance	creepage	clearance
85	40	19	52	50
100	55	34	59	57
116	55	34	67	65

## MECHANICAL MOUNTING

Capacitors enclosure presents a M12 x 16 bolt in order to fix the capacitor. Over height (H) more than 1.5 x D (diameter of tube), we recommend to clamp (constraint < 35daN), just below the plastic cover, the capacitor in order to limit oscillations in case of potential Shock&Vibration stress.

# DC FILTERING

FFLI HV 1500V to 3800Vdc\* RoHS Compliant



## RATINGS AND PART NUMBER REFERENCE

Part Number	Capacitance (µF)	D	H	I <sub>rms</sub> (A)	I <sup>2</sup> t (A <sup>2</sup> s)	Typical L <sub>s</sub> (nH)	Typical R <sub>s</sub> (mΩ)	R <sub>th</sub> (°C/W)	Typical Weight (g)
<b>U<sub>n</sub> = 1500V</b>									
FFLI6R0257K**	250	85	155	51	11	50	3.2	3.6	1100
FFLI6R0317K**	310	85	180	49	11	60	3.8	3.3	1300
FFLI6R0377K**	370	100	155	62	24	50	2.3	3.3	1500
FFLI6R0457K**	450	100	180	59	24	60	2.7	3.1	1800
FFLI6R0517K**	510	116	155	74	45	50	1.8	3.1	2000
FFLI6R0627K**	620	116	180	70	45	60	2.1	2.9	2400
FFLI6R0707K**	700	116	240	92	140	40	1.1	3.2	3200
FFLI6R0907K**	900	116	290	90	140	50	1.3	2.9	3900
FFLI6R1107K**	1100	116	340	89	140	60	1.5	2.5	4500
<b>U<sub>n</sub> = 1750Vdc</b>									
FFLI6S1856K**	185	85	155	48	8	50	3.7	3.6	1100
FFLI6S2256K**	225	85	180	46	8	60	4.4	3.3	1300
FFLI6S0277K**	270	100	155	58	18	50	2.6	3.3	1500
FFLI6S0337K**	330	100	180	56	18	60	3.1	3.1	1800
FFLI6S0377K**	370	116	155	69	33	50	2.0	3.1	2000
FFLI6S0457K**	450	116	180	65	33	60	2.4	2.9	2400
FFLI6S0527K**	520	116	240	89	108	40	1.2	3.2	3200
FFLI6S0677K**	670	116	290	86	108	50	1.4	2.9	3900
FFLI6S0827K**	820	116	340	85	108	60	1.7	2.5	4500
<b>U<sub>n</sub> = 2000Vdc</b>									
FFLI6N0147K**	140	85	155	45	6	50	4.2	3.6	1100
FFLI6N0177K**	170	85	180	43	6	60	5.0	3.3	1300
FFLI6N02056K**	205	100	155	55	13	50	3.0	3.3	1500
FFLI6N0257K**	250	100	180	52	13	60	3.5	3.1	1800
FFLI6N0287K**	280	116	155	65	25	50	2.3	3.1	2000
FFLI6N0357K**	350	116	180	62	25	60	2.6	2.9	2400
FFLI6N0407K**	400	116	240	85	82	40	1.3	3.2	3200
FFLI6N0517K**	510	116	290	82	82	50	1.5	2.9	3900
FFLI6N0627K**	620	116	340	81	82	60	1.8	2.5	4500
<b>U<sub>n</sub> = 2250Vdc</b>									
FFLI6T0117K**	110	85	155	43	5	50	4.7	3.6	1100
FFLI6T1356K**	135	85	180	41	5	60	5.5	3.3	1300
FFLI6T0167K**	160	100	155	52	10	50	3.3	3.3	1500
FFLI6T0187K**	195	100	180	49	10	60	4.0	3.1	1800
FFLI6T0227K**	220	116	155	62	20	50	2.5	3.1	2000
FFLI6T0277K**	270	116	180	59	20	60	3.0	2.9	2400
FFLI6T0317K**	310	116	240	81	64	40	1.4	3.2	3200
FFLI6T0407K**	400	116	290	79	64	50	1.7	2.9	3900
FFLI6T0497K**	490	116	340	78	64	60	2.0	2.5	4500
<b>U<sub>n</sub> = 2500Vdc</b>									
FFLI6P0856K**	85	85	155	40	4	50	5.2	3.6	1100
FFLI6P1056K**	105	85	180	39	4	60	6.1	3.3	1300
FFLI6P0127K**	120	100	155	49	8	50	3.8	3.3	1500
FFLI6P0157K**	150	100	180	47	8	60	4.4	3.1	1800
FFLI6P0177K**	170	116	155	59	16	50	2.8	3.1	2000
FFLI6P0217K**	210	116	180	56	16	60	3.3	2.9	2400
FFLI6P0237K**	230	116	240	77	50	40	1.6	3.2	3200
FFLI6P0307K**	300	116	290	75	50	50	1.9	2.9	3900
FFLI6P0387K**	380	116	340	75	50	60	2.2	2.5	4500
<b>U<sub>n</sub> = 2750Vdc</b>									
FFLI6W0706K**	70	85	155	39	3.3	50	5.7	3.6	1100
FFLI6W0856K**	85	85	180	37	3.3	60	6.8	3.3	1300
FFLI6W0107K**	100	100	155	47	7	50	4.1	3.3	1500
FFLI6W1256K**	125	100	180	45	7	60	4.8	3.1	1800
FFLI6W0147K**	140	116	155	56	13	50	3.0	3.1	2000
FFLI6W0177K**	170	116	180	53	13	60	3.6	2.9	2400
FFLI6W0197K**	190	116	240	74	42	40	1.7	3.2	3200
FFLI6W0257K**	250	116	290	73	42	50	2.0	2.9	3900
FFLI6W0317K**	310	116	340	72	42	60	2.4	2.5	4500
<b>U<sub>n</sub> = 3000Vdc</b>									
FFLI6X0586K**	58	85	155	37	2.7	50	6.3	3.6	1100
FFLI6X0706K**	70	85	180	35	2.7	60	7.6	3.3	1300
FFLI6X0856K**	85	100	155	45	6	50	4.4	3.3	1500
FFLI6X1056K**	105	100	180	43	6	60	5.2	3.1	1800
FFLI6X1156K**	115	116	155	54	11	50	3.3	3.1	2000
FFLI6X1456K**	145	116	180	51	11	60	3.9	2.9	2400
FFLI6X0167K**	160	116	240	72	35	40	1.8	3.2	3200
FFLI6X0217K**	210	116	290	70	35	50	2.1	2.9	3900
FFLI6X0267K**	260	116	340	69	35	60	2.5	2.5	4500
<b>U<sub>n</sub> = 3500Vdc</b>									
FFLI6Y0606K**	60	100	155	60	17	50	2.5	3.3	1500
FFLI6Y0756K**	75	100	180	58	17	60	2.9	3.1	1800
FFLI6Y0856K**	85	116	155	72	34	50	1.9	3.1	2000
FFLI6Y1056K**	105	116	180	68	34	60	2.2	3.0	2400
FFLI6Y1156K**	115	116	240	89	110	40	1.2	3.3	3200
FFLI6Y0157K**	150	116	290	88	106	50	1.3	2.9	3900
FFLI6Y0197K**	190	116	340	88	110	60	1.6	2.5	4500
<b>U<sub>n</sub> = 3800Vdc</b>									
FFLI6Z0536K**	53	100	155	59	15	50	2.6	3.3	1500
FFLI6Z0666K**	66	100	180	56	15	60	3.0	3.1	1800
FFLI6Z0726K**	72	116	155	69	28	50	2.0	3.1	2000
FFLI6Z0906K**	90	116	188	66	28	60	2.3	3.0	2400
FFLI6Z0107K**	100	116	240	88	95	40	1.2	3.3	3200
FFLI6Z0137K**	130	116	290	86	92	50	1.4	2.9	3900
FFLI6Z1656K**	165	116	340	87	95	60	1.5	2.5	4500

\*\*Insert - - for male terminals or JE for female terminals

**KYOCERA** | The Important Information/Disclaimer is incorporated in the catalog where these specifications came from or available online at [www.avx.com/disclaimer/](http://www.avx.com/disclaimer/) by reference and should be reviewed in full before placing any order.

# DC FILTERING

FFLI HV 1500V to 3800Vdc\* RoHS Compliant



## CALCULATION FORM SPECIFICATION

Capacitance	C (μF)	
Working voltage	U <sub>w</sub> (V)	
Rms current	I <sub>rms</sub> (Arms)	
Frequency	f (Hz)	
Ripple voltage	U <sub>r</sub> (V)	
Ambient temperature	θ <sub>amb</sub> (°C)	
Lifetime @ U <sub>w</sub> , I <sub>rms</sub> and θ <sub>amb</sub>	hours	
Parasitic inductance	L (nH)	

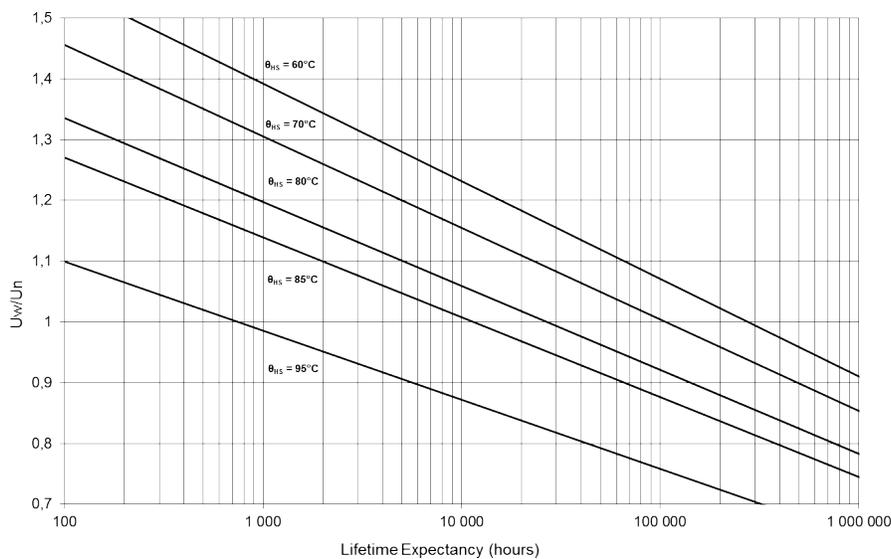
### Your choice

PN		
Capacitance	C (μF)	
Rated voltage	U <sub>n</sub> (V)	
Serial resistance	R <sub>s</sub> (mΩ)	
between hot spot and case	R <sub>th</sub> (°C/W)	

## CALCULATIONS

Maximum ripple voltage	U <sub>rmax</sub> = 0.2 U <sub>n</sub>	U <sub>rmax</sub> =	V
<i>The maximum ripple voltage of the selected capacitor must be in any case higher than the ripple voltage of your application</i>			
Ratio U <sub>w</sub> /U <sub>n</sub>	ρ = U <sub>w</sub> /U <sub>n</sub>	ρ =	
Joule losses	P <sub>j</sub> = R <sub>s</sub> × I <sub>rms</sub> <sup>2</sup>	P <sub>j</sub> =	W
Dielectric losses	P <sub>d</sub> = Q × t × g × δ × 0 = Q × 2.10 <sup>-4</sup>	P <sub>d</sub> =	W
Hot spot temperature	θ <sub>HS</sub> = θ <sub>amb</sub> + (P <sub>j</sub> + P <sub>d</sub> ) × R <sub>th</sub>	θ <sub>HS</sub> =	°C
<i>The hot spot temperature must be in any case lower than 95°C</i>			

## LIFETIME EXPECTANCY VS HOT SPOT TEMPERATURE AND VOLTAGE



Expected lifetime at hot spot calculated at U <sub>w</sub>
--

# Medium Power Film Capacitors

## FFPC 800Vdc to 3800Vdc



### GENERAL DESCRIPTION

The FFPC series is specifically designed for DC filtering applications such as DC link or resonant filters for voltages up to 3800V.

The safe and reliable **Controlled Self Healing Technology** makes this series particularly suitable for power converters in traction, drives and renewable energy areas.

FFPC use a dry solution or a wet solution (without free oil) with polypropylene metallized film.

Standard designs proposed in this catalogue are covering a wide range of voltage and capacitance values.

In case of specific requirements about shape and performances, feel free to contact your local KYOCERA AVX representative.

Rectangular resin filled plastic case (PA66 30% GF) 2 or 4 terminals M12x30mm

### STANDARDS

- IEC 61071 :** Power electronic capacitors
- IEC 61881 :** Railway applications, rolling stock equipment, capacitors for power electronics
- IEC 60068-2 :** Environmental testing
- UL 94:** Test for Flammability of Plastic Materials for Parts in Devices and Appliances.
- EN 45545-2:** Railway applications – Fire protection on railway vehicles  
Part 2: Requirements for fire behavior of materials and components

### HOW TO ORDER

<b>FFPC</b>	<b>2</b>	<b>B</b>	<b>1697</b>	<b>K</b>	<b>°°</b>
Series	Terminals Numbers	Voltage	Capacitance EIA code	Capacitance tolerance	Terminal Code
	2 4	B = 800V S = 1900V C = 900V N = 2000V L = 1000V T = 2300V U = 1100V P = 2550V V = 1250V W = 2800V Q = 1350V X = 3000V R = 1500V Y = 3500V M = 1750V Z = 3800V		K = ±10%	-- = Male Threaded JE = Female Threaded

# Medium Power Film Capacitors

## FFPC 800Vdc to 3800Vdc

### DEFINITIONS

$C_n$ ( $\mu\text{F}$ )	capacitance	nominal value of the capacitance measured at $\theta_{amb} = 25 \pm 10^\circ\text{C}$
$U_n$ (V)	rated DC voltage	maximum operating peak voltage of either polarity (non-reversing type waveform), for which the capacitor has been designed for continuous operation
$U_w$ (V)	working voltage	value of the maximum operating recurrent voltage for a given hot spot temperature and an expected lifetime
$U_r$ (V)	ripple voltage	peak-to-peak alternating component of the unidirectional voltage
$L_s$ (nH)	parasitic inductance	capacitor series self-inductance
$R_s$ (m $\Omega$ )	series resistance	capacitor series resistance due to galvanic circuit
$I_{rms}$ (A)	RMS current	rms current value @ 100Hz for continuous operation under natural convection generating 20°C overheating
$\theta_{amb}$ ( $^\circ\text{C}$ )	cooling air temperature	temperature of the cooling air measured at the hottest position of the capacitor, under steady-state conditions, midway between two units NOTE If only one unit is involved, it is the temperature measured at a point approximately 0,1 m away from the capacitor container and at two-thirds of the height from its base
$\theta_{HS}$ ( $^\circ\text{C}$ )	hot spot temperature	highest temperature obtained inside the case of the capacitor in thermal equilibrium

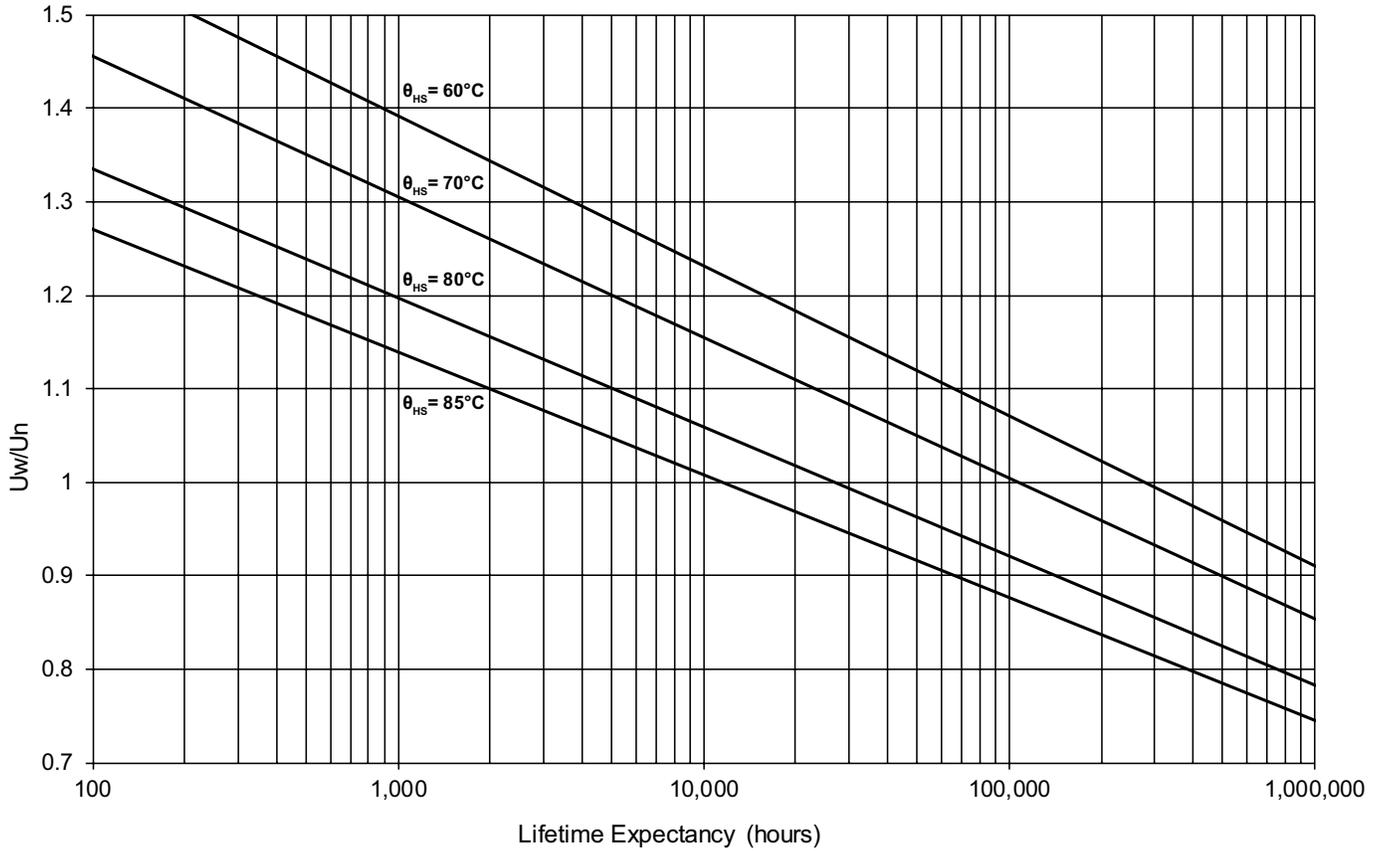
### CHARACTERISTICS

Capacitance range $C_n$	95 $\mu\text{F}$ to 5060 $\mu\text{F}$
Tolerance on $C_n$	$\pm 10\%$
Rated DC voltage $U_n$	800 to 3800V
Lifetime at $U_n$ and 70°C hot-spot temperature and $\Delta C/C < 2\%$	100,000h
Typical parasitic inductance $L_s$	35nH to 85nH
Maximum rms current $I_{rms\ max}$	up to 155A <sub>rms</sub> for 2 terminals up to 300A <sub>rms</sub> for 4 terminals
Test voltage between terminals @ 25°C	1.5 x $U_n$ for 10s
Test voltage between terminals and Case @ 25°C	9 kV <sub>rms</sub> @ 50Hz for 10s
Dielectric	polypropylene
Climatic Category	40 / 85 / 56 (IEC 60068)
Working temperature	-40°C / +85°C (according to the power dissipated)
Storage temperature	-40°C / +85°C
Calorific value	40 MJ/kg

# Medium Power Film Capacitors

FFPC 800Vdc to 3800Vdc

## LIFETIME EXPECTANCY VS HOT SPOT TEMPERATURES



## HOW TO CHOOSE THE RIGHT CAPACITOR

The capacitor lifetime depends on the working voltage and the hot spot temperature.

Our caps are designed to meet 100000 hours lifetime at rated voltage and 70°C hot spot temperature. In accordance with operating conditions, please calculate the hot spot temperature and deduce from this calculation if the obtained lifetime can suit the application.

**1- From the tables, select a capacitor with required capacitance  $C_n$  and voltage  $U_n$ .**

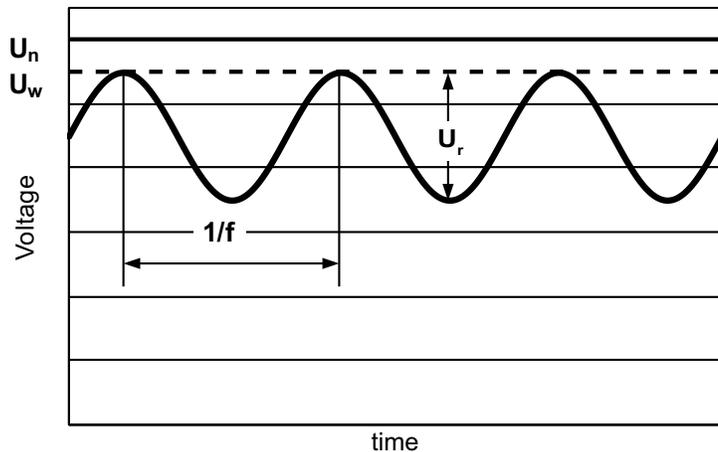
Calculate the maximum ripple voltage allowed for the selected cap :  $U_{rmax} = 0,2U_n$

If  $U_r > U_{rmax}$ , select a capacitor with higher rated voltage

Make sure  $I_{rms\ application} < I_{rms\ table}$

Copy out:

- serial resistance ( $R_s$ ) : see table of values
- thermal resistance  $R_{th}$  : see table of values



# Medium Power Film Capacitors

## FFPC 800Vdc to 3800Vdc

### 2- Hot spot temperature calculation

Total losses are calculated as follow:  $P_t = P_j + P_d$

Joule losses:  $P_j = R_s \times I_{rms}^2$

Dielectric losses:  $P_d = Q \times \text{tg}\delta\omega$  with

- Q(reactive power)  $\frac{I_{rms}^2}{\omega C}$  for a sinusoidal waveform

-  $\text{tg}\delta\omega = 2 \times 10^{-4}$  (dielectric losses of polypropylene)

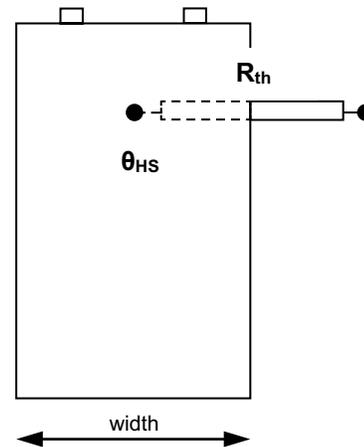
Hot spot temperature will be:

$$\theta_{HS} = \theta_{amb} + (P_j + P_d) \times R_{th}$$

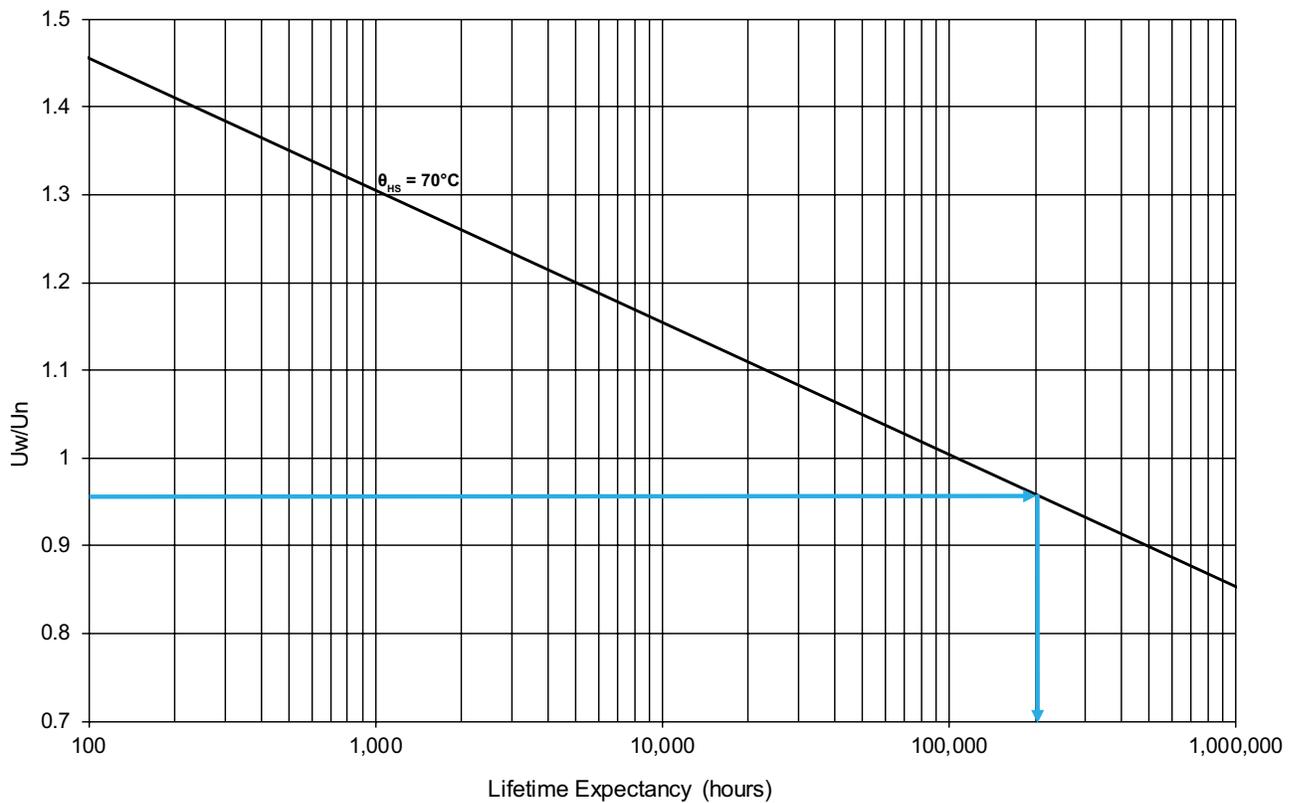
**$\theta_{HS}$  absolute maximum is 85°C**

If temperature is higher than 85°C, come back to #1 and start again with another selection.

$R_{th}$ : thermal resistance between hot spot and ambient air



### 3- Refer to the curve and deduce the lifetime vs $U_w/U_n$ ratio



Eg: rated voltage 2000V  
 working voltage 1900V  
 $\rho = U_w / U_n = 0,95$  lifetime is 200 000hours @ 70°C hot spot temperature

You will find a calculation form at the end of the catalogue

# Medium Power Film Capacitors

## FFPC 800Vdc to 3800Vdc

### THERMAL RESISTANCE

$R_{th}$  (°C/W): Thermal resistance between hot spot and ambient temperatures (Natural air cooling)

Height (mm)	$R_{th}$ (°C/W)
109	2,9
187	2,2
262,5	1,4



For confined area, capacitor working in a closed cabinet, a thermal test under real conditions is necessary to evaluate the thermal resistance.

### PARASITIC INDUCTANCE

Measurement @ 1MHz

Height (mm)	Typical Ls (nH)	
	2 terminals	4 terminals
109	45	35
187	65	55
262,5	85	75

### MTBF CALCULATION

The failure rate  $\lambda_B$  depends on hot spot temperature  $\theta_{HS}$  and charge ratio  $\rho$ .

$$\rho = U_w / U_n$$

$$\lambda_B \text{ in failures/hour} = 3 \times 10^{2,75(\rho-1)} \times e^{\left(3,2 \left( \frac{\theta_{HS} + 273}{358} \right)^{30}\right)} \times 10^{-9}$$

### GENERAL FAILURE RATE

$\lambda = \lambda_B \times \pi_Q \times \pi_B \times \pi_E$  failures/hour     $\pi_Q, \pi_B$  and  $\pi_E$  see following tables

Qualification	Qualification factor $\pi_Q$
Product qualified on IEC61071 and internal qualification	1
Product qualified on IEC61071	2
Product answering on another norm	5
Product without qualification	15

Environment	Environment factor $\pi_E$
On ground (good conditions)	1
On ground (fixed materials)	2
On ground (on board)	4
On ship	9
On plane	15

Environment	Environment factor $\pi_B$
Favorable	1
Unfavorable	5

### MEAN TIME BETWEEN FAILURE (MTBF)

MTBF = 1/ $\lambda$  hours

### SURVIVAL FUNCTION

$$N = N_0 \times \exp(-\lambda t)$$

N is the number of pieces still working after t hours

$N_0$  is the number of pieces at the origin (t=0)

### FAILURE MODE

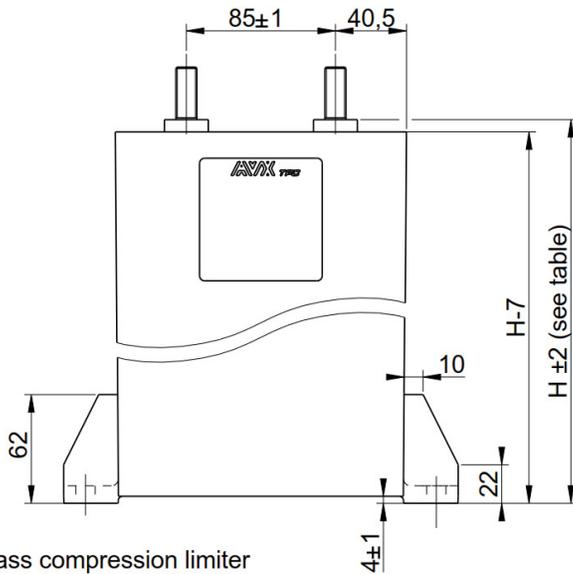
Main failure mode due to KYOCERA AVX's **Controlled Self-Healing Technology** is only losses of capacitance.

Thanks to **Controlled Self-healing** solution to interrupt self-healing process in order to prevent avalanche effect due to polypropylene molecular cracking producing gas and potential explosion in confined box for none **Controlled Self-Healing capacitors**.

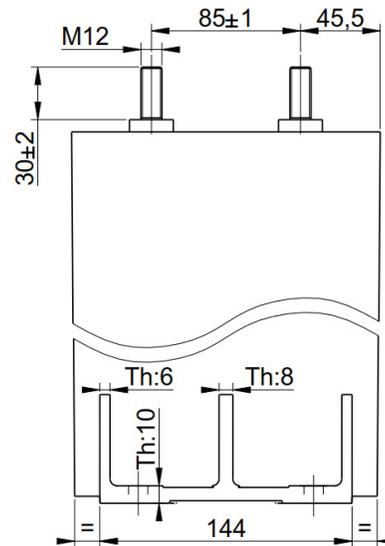
# Medium Power Film Capacitors

FFPC 800Vdc to 3800Vdc

## MALE TERMINALS VERSION DIMENSIONS

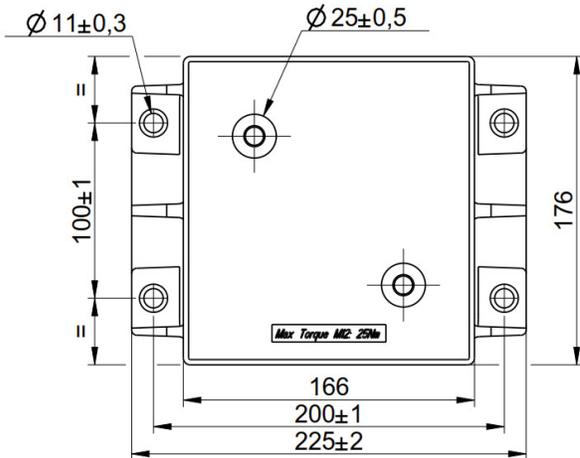


Brass compression limiter  
Max Torque: 15Nm



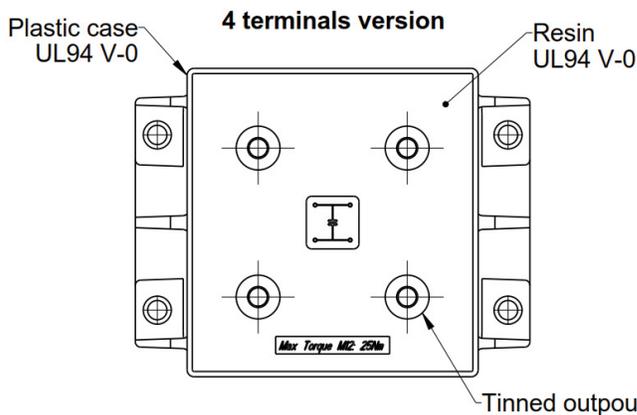
Max Torque M12: 25Nm

General tolerances: ±3



H (mm)	Weight (Kg)
109	4.2
187	6.8
262.5	9.3

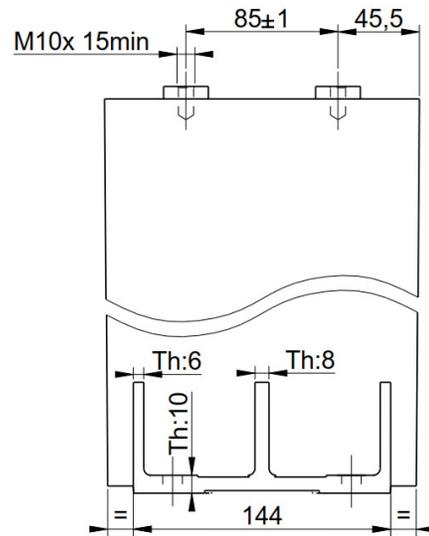
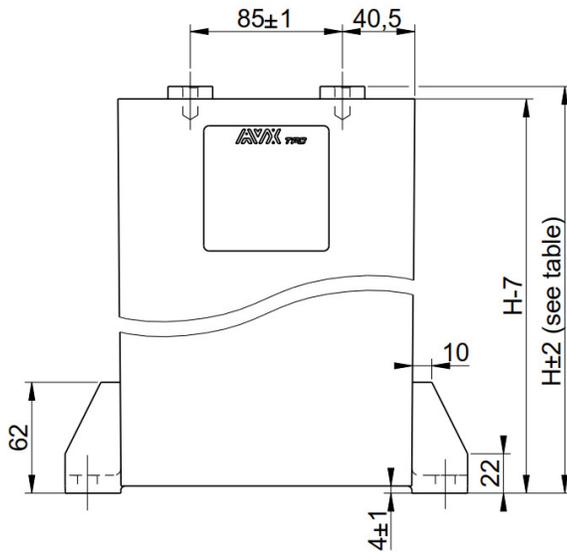
Distance terminals to terminals	
Terminals number	Creepage and clearance (mm)
2	93
4	58



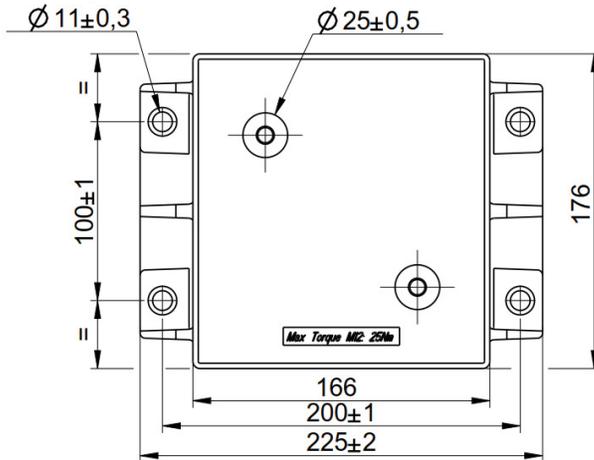
# Medium Power Film Capacitors

FFPC 800Vdc to 3800Vdc

## FEMALE TERMINALS VERSION DIMENSIONS



Brass compression limiter  
Max Torque: 15Nm

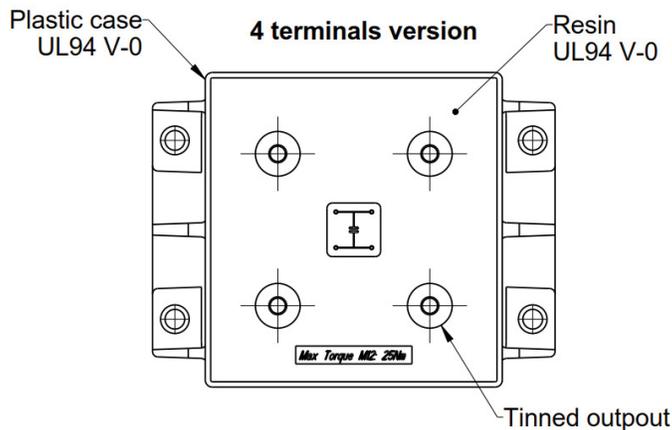


Max Torque M10: 15Nm

General tolerances: ±3

H (mm)	Weight (Kg)
109	4.2
187	6.8
262.5	9.3

Distance terminals to terminals	
Terminals number	Creepage and clearance (mm)
2	93
4	58



# Medium Power Film Capacitors

## FFPC 800Vdc to 3800Vdc



### TABLE OF VALUES

Part Number	U <sub>n</sub> (Vdc)	C (μF)	H (mm)	R <sub>s</sub> (mΩ)	I <sub>rms</sub> (A)
FFPC*B1697K <sup>oo</sup>	800	1690	109	1,50	65
FFPC*B3377K <sup>oo</sup>	800	3370	187	0,78	103
FFPC*B5067K <sup>oo</sup>	800	5060	262,5	0,56	155
FFPC*C1367K <sup>oo</sup>	900	1360	109	1,67	61
FFPC*C2727K <sup>oo</sup>	900	2720	187	0,87	97
FFPC*C4087K <sup>oo</sup>	900	4080	262,5	0,61	146
FFPC*L1127K <sup>oo</sup>	1000	1120	109	1,83	58
FFPC*L2237K <sup>oo</sup>	1000	2230	187	0,95	92
FFPC*L3357K <sup>oo</sup>	1000	3350	262,5	0,67	139
FFPC*U0907K <sup>oo</sup>	1100	900	109	2,05	54
FFPC*U1797K <sup>oo</sup>	1100	1790	187	1,06	87
FFPC*U2687K <sup>oo</sup>	1100	2680	262,5	0,74	131
FFPC*V0697K <sup>oo</sup>	1250	690	109	2,32	50
FFPC*V1387K <sup>oo</sup>	1250	1380	187	1,19	81
FFPC*V2067K <sup>oo</sup>	1250	2060	262,5	0,83	123
FFPC*Q0627K <sup>oo</sup>	1350	620	109	2,44	49
FFPC*Q1247K <sup>oo</sup>	1350	1240	187	1,26	78
FFPC*Q1857K <sup>oo</sup>	1350	1850	262,5	0,87	119
FFPC*R0647K <sup>oo</sup>	1500	640	109	1,68	57
FFPC*R1287K <sup>oo</sup>	1500	1280	187	0,88	91
FFPC*R1917K <sup>oo</sup>	1500	1910	262,5	0,62	137
FFPC*M0477K <sup>oo</sup>	1750	470	109	1,94	52
FFPC*M0947K <sup>oo</sup>	1750	940	187	1,01	83
FFPC*M1417K <sup>oo</sup>	1750	1410	262,5	0,70	126
FFPC*S0417K <sup>oo</sup>	1900	410	109	2,08	50
FFPC*S0827K <sup>oo</sup>	1900	820	187	1,08	80
FFPC*S1227K <sup>oo</sup>	1900	1220	262,5	0,75	121
FFPC*N0367K <sup>oo</sup>	2000	360	109	2,23	47
FFPC*N0717K <sup>oo</sup>	2000	710	187	1,15	76
FFPC*N1077K <sup>oo</sup>	2000	1070	262,5	0,80	116
FFPC*T0287K <sup>oo</sup>	2300	280	109	2,51	44
FFPC*T0567K <sup>oo</sup>	2300	560	187	1,29	71
FFPC*T0847K <sup>oo</sup>	2300	840	262,5	0,89	108
FFPC*P0227K <sup>oo</sup>	2550	220	109	2,83	40
FFPC*P0437K <sup>oo</sup>	2550	430	187	1,45	65
FFPC*P0657K <sup>oo</sup>	2550	650	262,5	1,00	100
FFPC*W0187K <sup>oo</sup>	2800	180	109	3,12	38
FFPC*W0367K <sup>oo</sup>	2800	360	187	1,59	61
FFPC*W0537K <sup>oo</sup>	2800	530	262,5	1,10	93
FFPC*X0157K <sup>oo</sup>	3000	150	109	3,40	36
FFPC*X0307K <sup>oo</sup>	3000	300	187	1,74	58
FFPC*X0457K <sup>oo</sup>	3000	450	262,5	1,19	88
FFPC*Y0117K <sup>oo</sup>	3500	110	109	1,76	39
FFPC*Y0227K <sup>oo</sup>	3500	220	187	0,91	63
FFPC*Y0337K <sup>oo</sup>	3500	330	262,5	0,64	96
FFPC*Z0956K <sup>oo</sup>	3800	95	109	1,90	37
FFPC*Z0197K <sup>oo</sup>	3800	190	187	0,98	59
FFPC*Z2856K <sup>oo</sup>	3800	285	262,5	0,69	91

\* Insert terminal number (2 or 4)

<sup>oo</sup> insert "-" for male terminals or "JE" for female terminals

# Medium Power Film Capacitors

FFPC 800Vdc to 3800Vdc

## CALCULATION FORM SPECIFICATION

Capacitance	C (μF)	
Working voltage	U <sub>w</sub> (V)	
Rms current	I <sub>rms</sub> (A <sub>rms</sub> )	
Frequency	f (Hz)	
Ripple voltage	U <sub>r</sub> (V)	
Ambient temperature	θ <sub>amb</sub> (°C)	
Lifetime @ U <sub>w</sub> , I <sub>rms</sub> and θ <sub>amb</sub>	hours	
Parasitic inductance	L (nH)	

## YOUR CHOICE

PN		
Capacitance	C (μF)	
Rated voltage	U <sub>n</sub> (V)	
Serial resistance	R <sub>s</sub> (mΩ)	
Thermal resistance between hot spot and ambient air	R <sub>th</sub> (°C/W)	

## CALCULATIONS

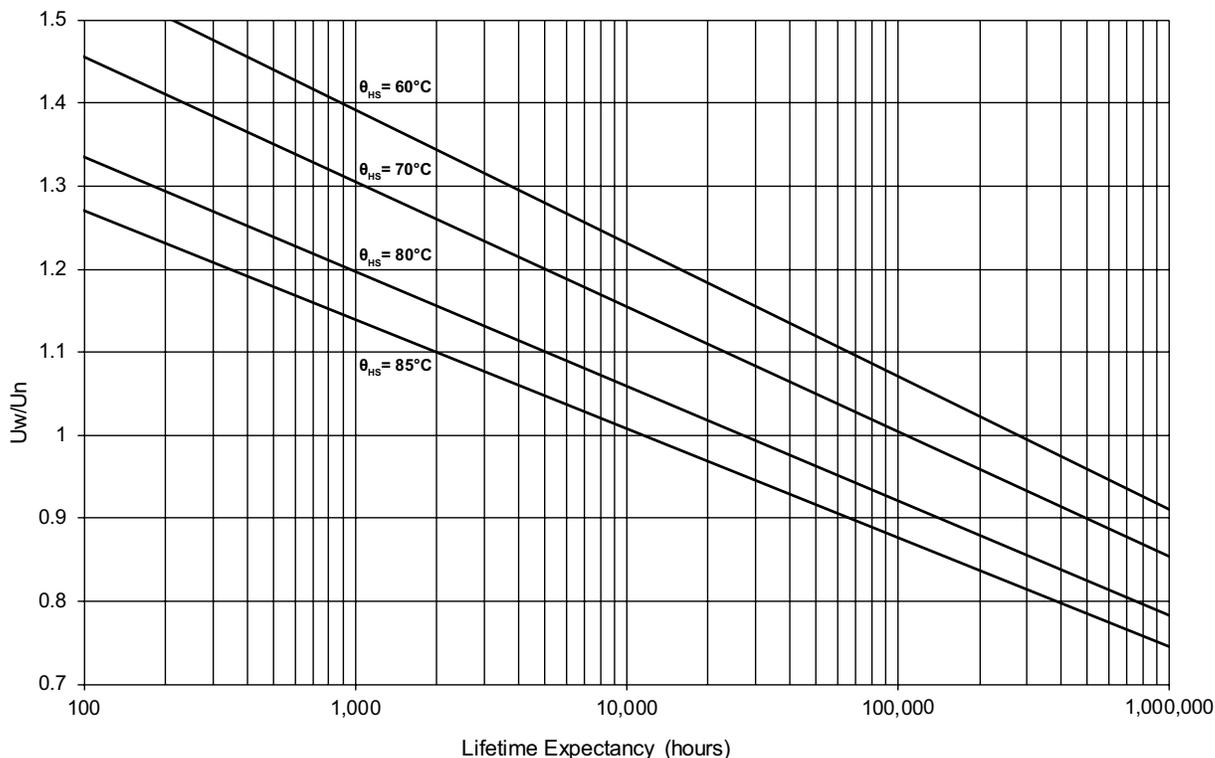
Maximum ripple voltage	$U_{rmax} = 0,2 \times U_n$	U <sub>rmax</sub> =	V
------------------------	-----------------------------	---------------------	---

*The maximum ripple voltage of the selected capacitor must be in any case higher than the ripple voltage of your application*

Ratio U <sub>w</sub> / U <sub>n</sub>	$\rho = U_w / U_n$	ρ =	
Joule losses	$P_j = R_s \times I_{rms}^2$	P <sub>j</sub> =	W
Dielectric losses	$P_d = Q \times \text{tg}\delta_0 = Q \times 2 \cdot 10^{-4}$	P <sub>d</sub> =	W
Hot spot temperature	$\theta_{HS} = \theta_{amb} + (P_j + P_d) \times R_{th}$	θ <sub>HS</sub> =	°C

*The hot spot temperature must be in any case lower than 85°C*

## LIFETIME EXPECTANCY VS HOT SPOT TEMPERATURE



Expected lifetime at hot spot calculated and U=U <sub>w</sub>	
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# Medium Power Film Capacitors

## FFPC 800Vdc to 3800Vdc



This questionnaire lists the information we require to prepare an offer according to your exact requirements

Company / Name / Email	Project / Quantity
------------------------	--------------------

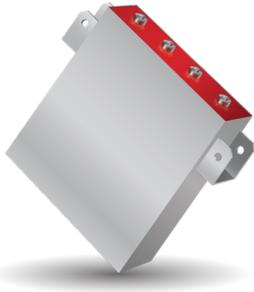
Applications	DC Filtering		Discharge*		Protection*		Tuning
Capacitance (µF)							
Tolerance (%)							
Operating Voltage	Vpeak		Vch		Vpeak	Vdc	Vrms
Ripple Voltage (peak to peak)	V						
Working frequency (Hz)							
Operating current	Arms		Apeak		Arms		Arms
Maximum Current/Duration	Arms	s			Apeak		
Discharge			Aperiodic	Oscillatory			
Pulse Duration (5% Ipeak)							
Time to Ipeak (µs)							
Ringing Frequency (Hz)							
Reversal Voltage (%)							
Repetition Rate			shots/min/hour/day		Hz		
Hold Time @ Full Voltage (s)							
Fault Peak Current/nb shots	Apeak	shots	Apeak	shots			
Fault Reversal Voltage (%)							
Lifetime Expectancy	hours		shots		hours		hours
Maximum Inductance (nH)							
Test Voltage between Terminals (V)							
Test Voltage between Shorted Terminals and Case (V)							
Maximum Surge Voltage (MSV)							
MSV Duration / Frequency	s	/years			s	/year	

Due to the particularities of varying waveforms in such application, more information on the exact nature of waveform is generally required for a full analysis.

Description			
Dimensions (mm) / Shape		Operating Position	Terminas
Section:	Height	vertical, horizontal, inclined, and upside down	Type
rectangular, cylindrical			Quantity

Thermal Characteristics					
Storage Temperature (°C)		Operating Temperature (°C)		Cooling Method	
min.		min.		Natural Convection	
average		average		Forced Air (m/s)	
max.		max.		Water	

<b>Remarks</b>
----------------



### GENERAL DESCRIPTION

The FFLC series is specifically designed for DC filtering applications such as DC link or resonant filters.

Large case sizes up to 35 liters and high specific energy up to 240J/l together with safe and reliable **Controlled Self Healing Technology** make this series particularly suitable for power converters in traction, drives and renewable energy areas.

FFLC uses polypropylene metallized segmented film and it is fully dry technology.

Standard designs proposed in this catalogue are covering a wide range of voltage and capacitance.

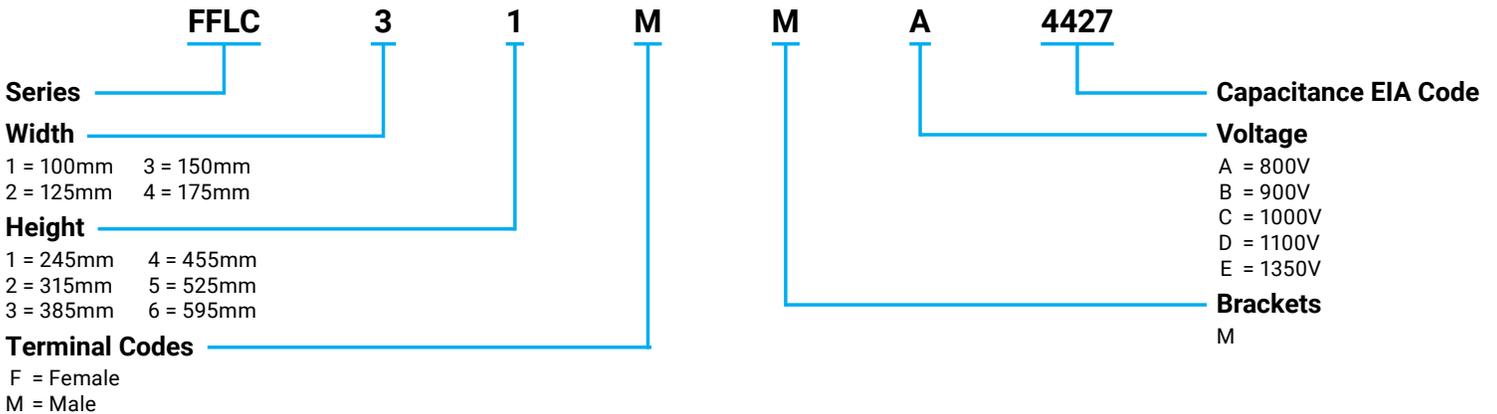
### STANDARDS

- IEC 61071: Power electronic capacitors
- IEC 61881: Railway applications, rolling stock equipment, capacitors for power electronics
- IEC 60068-2: Environmental testing
  - UL 94: Fire requirements
- NF F 16-101: Rolling stock – Fire behaviour – Materials choosing
- NF F 16-102: Rolling stock – Fire behaviour – Materials choosing, application for electric equipments
- EN 45545-2: Railways applications – Fire protection on railway vehicles Part 2 : Requirements for fire behaviour of materials and components

### PACKAGING MATERIAL

- Non-painted rectangular resin filled aluminum case
- Mounting brackets
- 4 M8/15 Female connections or M12/30 Male connections

### HOW TO ORDER



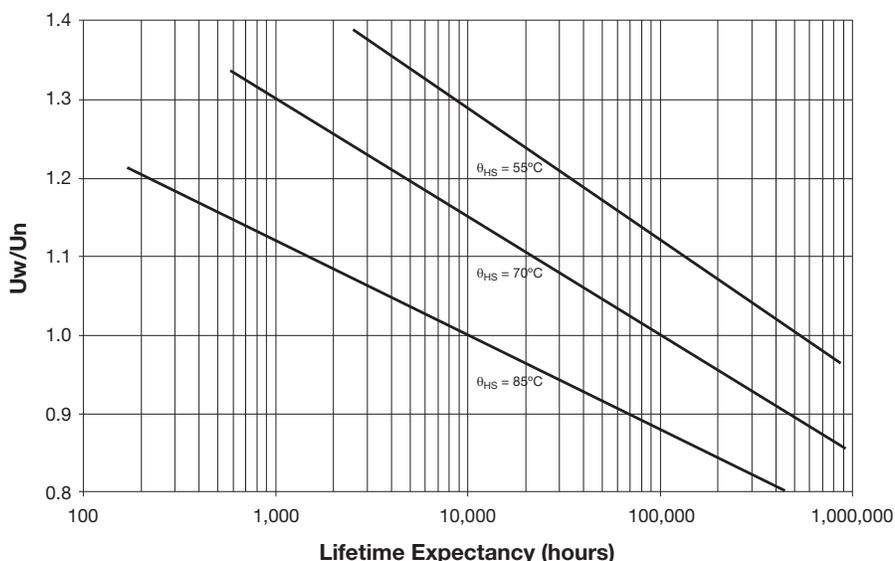
### DEFINITIONS

$C_n$	capacitance	nominal value of the capacitance measured at $\theta_{amb} = 25 \pm 10^\circ\text{C}$
$U_n$	rated DC voltage	maximum operating peak voltage of either polarity (non-reversing type waveform), for which the capacitor has been designed for continuous operation
$U_w$	working voltage	value of the maximum operating recurrent voltage for a given hot spot temperature and an expected lifetime
$U_r$	ripple voltage	peak-to-peak alternating component of the unidirectional voltage
$L_s$	parasitic inductance	capacitor series self-inductance
$R_s$	capacitor series resistance	capacitor series resistance due to galvanic circuit
$I_{rms}$	thermal 1	RMS current value for continuous operation under natural convection generating $20^\circ\text{C}$ overheating
$I_{rms}$	thermal 2	rms current value for continuous operation under forced air generating $20^\circ\text{C}$ overheating
$\theta_{amb} (^\circ\text{C})$	cooling air temperature	temperature of the cooling air measured at the hottest position of the capacitor, under steady-state conditions, midway between two units <b>NOTE</b> If only one unit is involved, it is the temperature measured at a point approximately 0.1 m away from the capacitor container and at two-thirds of the height from its base
$\theta_{HS} (^\circ\text{C})$	hot spot temperature	highest temperature obtained inside the case of the capacitor in thermal equilibrium

### CHARACTERISTICS

Capacitance range $C_n$	1750 $\mu\text{F}$ to 20600 $\mu\text{F}$
Tolerance on $C_n$	$\pm 10\%$
Rated DC voltage $U_n$	800 to 1350V
Lifetime at $U_n$ and $70^\circ\text{C}$ hot-spot temperature and $\Delta C / C < 2\%$	100,000h
Parasitic inductance $L_s$	32 to 55nH
Maximum rms current $I_{rms}$	up to 400A <sub>rms</sub>
Test voltage between terminals @ $25^\circ\text{C}$	$1.5 \times U_n$ for 10s
Test voltage between terminals and Case @ $25^\circ\text{C}$	4kV <sub>rms</sub> @ 50Hz for 10s
Dielectric	polypropylene
Climatic Category	40 / 85 / 56 (IEC 60068)
Working temperature	$-40^\circ\text{C} / +85^\circ\text{C}$ (according to the power dissipated)
Storage temperature	$-40^\circ\text{C} / +85^\circ\text{C}$
Calorific value	27 MJ/kg

### LIFETIME EXPECTANCY VS. HOT SPOT TEMPERATURE AND VOLTAGE



# DC FILTERING

## FFLC

### HOW TO CHOSE THE RIGHT CAPACITOR

The capacitor lifetime depends on the working voltage and the hot spot temperature.

Our caps are designed to meet 100000 hours lifetime at rated voltage and 70°C hot spot temperature. In accordance with operating conditions, please calculate the hot spot temperature and deduce from this calculation if the obtained lifetime can suit the application.

#### 1. From the tables, select a capacitor with required capacitance

$C_n$  and voltage  $U_n$ .

Calculate the maximum ripple voltage allowed for the selected cap:

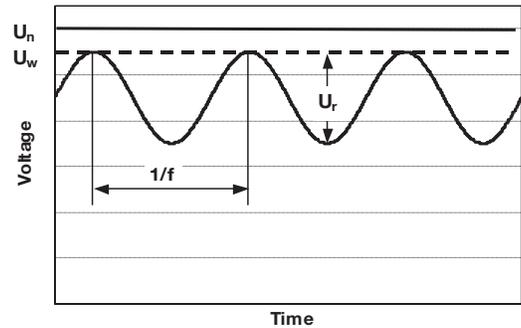
$$U_{rmax} = 0.2U_n$$

If  $U_r > U_{rmax}$ , select a capacitor with higher rated voltage

Make sure  $I_{rms}$  application  $<$   $I_{rms}$  table

Copy out:

- serial resistance ( $R_s$ ): see table of values
- thermal resistances  $R_{th1}$  and  $R_{th2}$  (depending on cooling conditions)



#### 2. Hot spot temperature calculation

Total losses are calculated as follow:  $P_t = P_j + P_d$

Joule losses:  $P_j = R_s \times I_{rms}^2$

Dielectric losses:  $P_d = Q \times \text{tg}\delta_0$  with

- $Q$  (reactive power) =  $\frac{I_{rms}^2}{C\omega}$  for a sinusoidal waveform

- $\text{tg}\delta_0 = 2 \times 10^{-4}$  (dielectric losses of polypropylene)

Hot spot temperature will be:

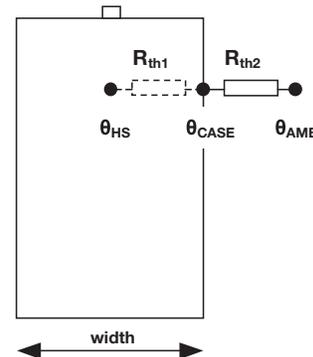
$$\theta_{HS} = \theta_{amb} + (P_j + P_d) \times (R_{th1} + R_{th2})$$

$\theta_{HS}$  **absolute maximum is 85°C**

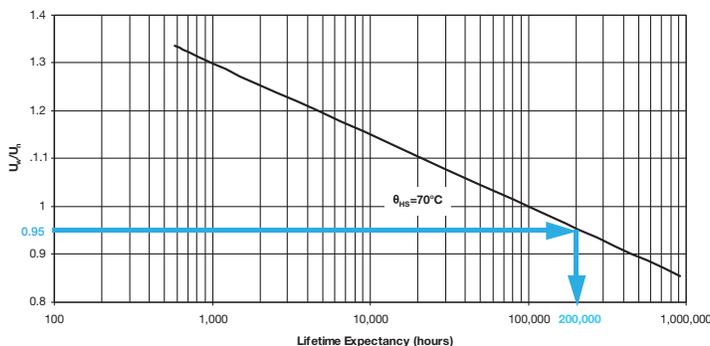
If temperature is higher than 85°C, come back to #1 and start again with another selection.

$R_{th1}$ : Thermal resistance between hot spot and case

$R_{th2}$ : Thermal resistance between case and ambient air



#### 3. Refer to the curve and deduce the lifetime vs $U_w/U_n$ ratio



eg: rated voltage 1000V  
 working voltage 950V  
 $\rho = 0.95 \Rightarrow$  lifetime 200,000 hours  
 @ 70°C hot spot temperature

Please, find a calculation form at the end of the catalog

### THERMAL RESISTANCES

$R_{th1}$  (°C/W): Thermal resistance between hot spot and case

Height (mm)	Rth1 (°C/W)			
	Width (mm)			
	100	125	150	175
245	0.56	0.67	0.76	0.82
315	0.41	0.49	0.56	0.6
385	0.3	0.36	0.41	0.44
455	0.25	0.3	0.34	0.37
525	0.2	0.24	0.27	0.3
595	0.17	0.21	0.24	0.26

$R_{th2}$  (°C/W): Thermal resistance between case and ambient air under natural convection and forced air

Height (mm)	Rth2 (°C)							
	Natural air cooling				Forced air cooling >2m/s			
	Width (mm)				Width (mm)			
	100	125	150	175	100	125	150	175
245	0.47	0.44	0.42	0.40	0.23	0.22	0.21	0.20
315	0.36	0.35	0.33	0.31	0.18	0.17	0.16	0.16
385	0.30	0.28	0.27	0.25	0.15	0.14	0.13	0.13
455	0.25	0.24	0.23	0.22	0.13	0.12	0.11	0.11
525	0.22	0.21	0.20	0.19	0.11	0.10	0.10	0.09
595	0.19	0.18	0.17	0.16	0.10	0.09	0.09	0.08



For confined area, capacitor working in a closed cabinet, a thermal test under real conditions is necessary to evaluate the thermal resistance.

### PARASITIC INDUCTANCE VS SIZE

Measurement @ 1MHz

Height (mm)	$L_s$ (nH)			
	Width (mm)			
	100	125	150	175
245	32	34	35	37
315	34	36	38	40
385	36	39	41	44
455	38	41	44	48
525	40	43	47	51
595	42	46	51	55

Low inductance design available on request

### MTBF CALCULATION

Based on Return Of Experience from the field of more than 30 years, we have established the following relation.

$$\rho = U_w / U_n$$

$$\lambda_B = 3 \times 10^{2.75(\rho-1)} \times e^{\left(3.2 \left(\frac{0_{HS} + 273}{358}\right)^{30}\right)} \times 10^{-9}$$

in failures/hour

### GENERAL FAILURE RATE

$\lambda = \lambda_B \times \pi_Q \times \pi_B \times \pi_E$  failures/hour •  $\pi_Q$ ,  $\pi_B$  and  $\pi_E$  see following tables

Qualification	Qualification factor $\pi_Q$
Product qualified on IEC61071 and internal qualification	1
Product qualified on IEC61071	2
Product answering on another norm	5
Product without qualification	15

Environment	Environment factor $\pi_E$
On ground (good conditions)	1
On ground (fixed materials)	2
On ground (on board)	4
On ship	9
On plane	15

Environment	Environment factor $\pi_B$
Favorable	1
Unfavourable	5

### MEAN TIME BETWEEN FAILURE (MTBF)

MTBF = 1/λ hours

### SURVIVAL FUNCTION

$$N = N_0 \times \exp(-\lambda t)$$

N is the number of pieces still working after t hours.

$N_0$  is the number of pieces at the origin (t = 0)

### FAILURE MODE

Main failure mode due to KYOCERA AVX's **Controlled Self-Healing Technology** is only losses of capacitance. Thanks to **Controlled Self-Healing solution** to interrupt self-healing process in order to prevent avalanche effect due to polypropylene molecular cracking producing gas and potential explosion in confined box for none **Controlled Self-Healing capacitors**.



# DC FILTERING

## FFLC



### TABLE OF VALUES

Part Number	Capacitance (μF)	Width (mm)	Height (mm)	R <sub>s</sub> (mΩ)	I <sub>rms</sub> Thermal 1 (A)	I <sub>rms</sub> Thermal 2 (A)
<b>U<sub>n</sub> = 800Vdc</b>						
FFLC11 * MA4777	4,770	100	245	0.27	270	306
FFLC12 * MA6087	6,080	100	315	0.23	333	380
FFLC21 * MA6557	6,550	125	245	0.29	249	276
FFLC13 * MA7817	7,810	100	385	0.20	400	400
FFLC31 * MA8317	8,310	150	245	0.32	231	255
FFLC22 * MA8337	8,330	125	315	0.25	310	348
FFLC14 * MA9117	9,110	100	455	0.19	400	400
FFLC41 * MA1008	10,000	175	245	0.35	218	240
FFLC32 * MA1068	10,600	150	315	0.27	288	320
FFLC23 * MA1078	10,700	125	385	0.22	380	400
FFLC15 * MA1098	10,900	100	525	0.17	400	400
FFLC16 * MA1228	12,200	100	595	0.17	400	400
FFLC24 * MA1258	12,500	125	455	0.20	400	400
FFLC42 * MA1278	12,700	175	315	0.29	274	299
FFLC33 * MA1368	13,600	150	385	0.23	355	395
FFLC25 * MA1498	14,900	125	525	0.18	400	400
FFLC34 * MA1598	15,900	150	455	0.21	400	400
FFLC43 * MA1648	16,400	175	385	0.25	338	374
FFLC26 * MA1678	16,700	125	595	0.22	400	400
FFLC35 * MA1898	18,900	150	525	0.20	400	400
FFLC44 * MA1918	19,100	175	455	0.23	385	400
FFLC36 * MA2118	21,100	150	595	0.19	400	400
FFLC45 * MA2288	22,800	175	525	0.21	400	400
FFLC46 * MA2558	25,500	175	595	0.20	400	400
<b>U<sub>n</sub> = 900Vdc</b>						
FFLC11 * MB3847	3,840	100	245	0.29	261	296
FFLC12 * MB4897	4,890	100	315	0.25	323	368
FFLC21 * MB5277	5,270	125	245	0.31	240	267
FFLC13 * MB6287	6,280	100	385	0.21	310	400
FFLC31 * MB6707	6,700	150	245	0.34	222	245
FFLC22 * MB6717	6,710	125	315	0.27	300	337
FFLC14 * MB7337	7,330	100	455	0.20	400	400
FFLC41 * MB8077	8,070	175	245	0.37	209	231
FFLC32 * MB8537	8,530	150	315	0.29	278	309
FFLC23 * MB8627	8,620	125	385	0.23	369	400
FFLC15 * MB8737	8,730	100	525	0.18	400	400
FFLC16 * MB9777	9,770	100	595	0.17	400	400
FFLC24 * MB1018	10,100	125	455	0.21	400	400
FFLC42 * MB1038	10,300	175	315	0.32	264	289
FFLC33 * MB1108	11,000	150	385	0.25	344	383
FFLC25 * MB1258	12,500	125	525	0.19	400	400
FFLC34 * MB1288	12,800	150	455	0.23	393	400
FFLC43 * MB1328	13,200	175	385	0.27	327	362
FFLC26 * MB1348	13,400	125	595	0.18	400	400
FFLC35 * MB1528	15,200	150	525	0.21	400	400
FFLC44 * MB1548	15,400	175	455	0.24	373	400
FFLC36 * MB1718	17,100	150	595	0.20	400	400
FFLC45 * MB1848	18,400	175	525	0.22	400	400
FFLC46 * MB2068	20,600	175	595	0.21	400	400

\* Insert F for female terminals or M for male terminals

# DC FILTERING

## FFLC

### TABLE OF VALUES

Part Number	Capacitance (μF)	Width (mm)	Height (mm)	R <sub>s</sub> (mΩ)	I <sub>rms</sub> Thermal 1 (A)	I <sub>rms</sub> Thermal 2 (A)
<b>U<sub>n</sub> = 1000Vdc</b>						
FFLC11 * MC3167	3,160	100	245	0.30	253	287
FFLC12 * MC4027	4,020	100	315	0.26	314	358
FFLC21 * MC4337	4,330	125	245	0.33	232	258
FFLC13 * MC5177	5,170	100	385	0.23	385	400
FFLC31 * MC5517	5,510	150	245	0.37	215	237
FFLC22 * MC5527	5,520	125	315	0.28	291	326
FFLC14 * MC6037	6,030	100	455	0.21	400	400
FFLC41 * MC6647	6,640	175	245	0.40	202	223
FFLC32 * MC7017	7,010	150	315	0.31	269	299
FFLC23 * MC7097	7,090	125	385	0.24	358	400
FFLC15 * MC7187	7,180	100	525	0.19	400	400
FFLC16 * MC8047	8,040	100	595	0.18	400	400
FFLC24 * MC8277	8,270	125	455	0.22	400	400
FFLC42 * MC8467	8,460	175	315	0.34	255	279
FFLC33 * MC9027	9,020	150	385	0.26	334	372
FFLC25 * MC9857	9,850	125	525	0.20	400	400
FFLC34 * MC1058	10,500	150	455	0.24	382	400
FFLC43 * MC1098	10,900	175	385	0.29	317	351
FFLC26 * MC1108	11,000	125	595	0.19	400	400
FFLC35 * MC1258	12,500	150	525	0.22	400	400
FFLC44 * MC1278	12,700	175	455	0.26	362	400
FFLC36 * MC1408	14,000	150	595	0.21	400	400
FFLC45 * MC1518	15,100	175	525	0.23	400	400
FFLC46 * MC1698	16,900	175	595	0.22	400	400
<b>U<sub>n</sub> = 1100Vdc</b>						
FFLC11 * MD2537	2,530	100	245	0.33	243	276
FFLC12 * MD3227	3,220	100	315	0.28	303	345
FFLC21 * MD3487	3,480	125	245	0.36	223	248
FFLC13 * MD4147	4,140	100	385	0.24	373	400
FFLC31 * MD4427	4,420	150	245	0.40	206	227
FFLC22 * MD4437	4,430	125	315	0.31	280	314
FFLC14 * MD4837	4,830	100	455	0.22	400	400
FFLC41 * MD5347	5,340	175	245	0.44	194	214
FFLC32 * MD5637	5,630	150	315	0.34	259	288
FFLC23 * MD5697	5,690	125	385	0.26	346	392
FFLC15 * MD5757	5,750	100	525	0.20	400	400
FFLC16 * MD6447	6,440	100	595	0.19	400	400
FFLC24 * MD6647	6,640	125	455	0.24	395	400
FFLC42 * MD6797	6,790	175	315	0.37	245	269
FFLC33 * MD7247	7,240	150	385	0.28	323	359
FFLC25 * MD7907	7,900	125	525	0.22	400	400
FFLC34 * MD8447	8,440	150	455	0.26	370	400
FFLC43 * MD8737	8,730	175	385	0.31	306	339
FFLC26 * MD8857	8,850	125	595	0.20	400	400
FFLC35 * MD1018	10,100	150	525	0.23	400	400
FFLC44 * MD1028	10,200	175	455	0.28	350	388
FFLC36 * MD1138	11,300	150	595	0.22	400	400
FFLC45 * MD1218	12,100	175	525	0.25	400	400
FFLC46 * MD1368	13,600	175	595	0.23	400	400

\* Insert F for female terminals or M for male terminals

# DC FILTERING

## FFLC

### TABLE OF VALUES

Part Number	Capacitance (μF)	Width (mm)	Height (mm)	R <sub>s</sub> (mΩ)	I <sub>rms</sub> Thermal 1 (A)	I <sub>rms</sub> Thermal 2 (A)
<b>U<sub>n</sub> = 1350Vdc</b>						
FFLC11 * ME1757	1,750	100	245	0.37	228	259
FFLC12 * ME2237	2,230	100	315	0.32	285	325
FFLC21 * ME2407	2,400	125	245	0.41	208	232
FFLC13 * ME2867	2,860	100	385	0.27	353	400
FFLC31 * ME3057	3,050	150	245	0.46	192	212
FFLC22 * ME3067	3,060	125	315	0.35	263	210
FFLC14 * ME3347	3,340	100	455	0.24	400	400
FFLC41 * ME3677	3,670	175	245	0.51	180	199
FFLC32 * ME3887	3,880	150	315	0.38	242	270
FFLC23 * ME3927	3,920	125	385	0.28	334	378
FFLC15 * ME3987	3,980	100	525	0.22	400	400
FFLC16 * ME4457	4,450	100	595	0.21	400	400
FFLC24 * ME4587	4,580	125	455	0.26	374	400
FFLC42 * ME4687	4,680	175	315	0.42	229	251
FFLC33 * ME4997	4,990	150	385	0.32	303	337
FFLC25 * ME5457	5,450	125	525	0.24	400	400
FFLC34 * ME5827	5,820	150	455	0.29	349	393
FFLC43 * ME6017	6,010	175	385	0.35	287	318
FFLC26 * ME6107	6,100	125	595	0.22	400	400
FFLC35 * ME6937	6,930	150	525	0.26	400	400
FFLC44 * ME7017	7,010	175	455	0.31	329	365
FFLC36 * ME7767	7,760	150	595	0.24	400	400
FFLC45 * ME8357	8,350	175	525	0.28	383	400
FFLC46 * ME9357	9,350	175	595	0.26	400	400

\* Insert F for female terminals or M for male terminals

# DC FILTERING

## FFLC

### CALCULATION FORM SPECIFICATION

Capacitance	C (μF)	
Working voltage	$U_w$ (V)	
Rms current	$I_{rms}$ (Arms)	
Frequency	f (Hz)	
Ripple voltage	$U_r$ (V)	
Ambient temperature	$\theta_{amb}$ (°C)	
Lifetime @ $U_w, I_{rms}$ and $\theta_{amb}$	hours	
Parasitic inductance	L (nH)	
Cooling conditions		

#### Your choice

PN		
Capacitance	C (μF)	
Rated voltage	$U_n$ (V)	
Serial resistance	$R_s$ (mΩ)	
Thermal resistance between hot spot and case	$R_{th1}$ (°C/W)	
Thermal resistance between case and ambient air	$R_{th2}$ (°C/W)	

### CALCULATIONS

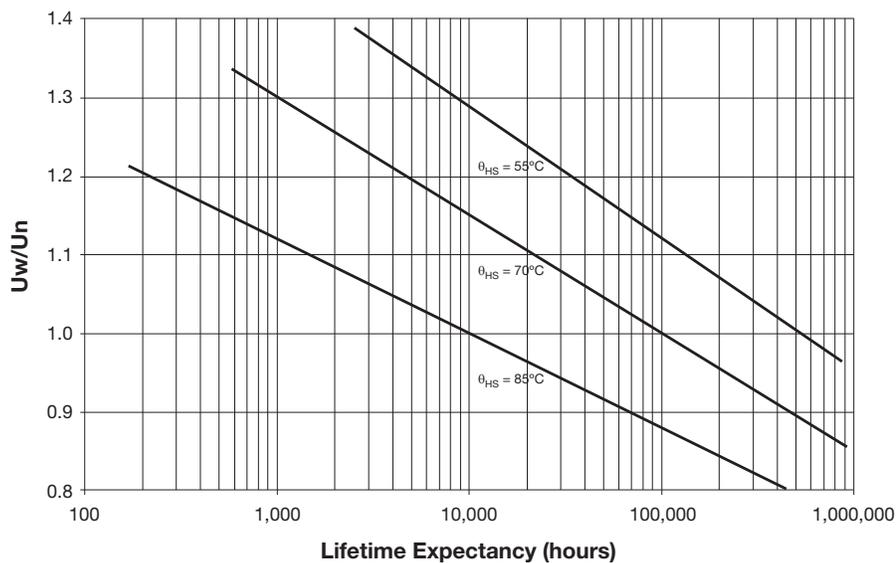
Maximum ripple voltage	$U_{rmax} = 0.2 U_n$	$U_{rmax} =$	V
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The maximum ripple voltage of the selected capacitor must be in any case higher than the ripple voltage of your application

Ratio $V_w/V_n$	$\rho = U_w/U_n$	$\rho =$	
Joule losses	$P_j = R_s \times I_{rms}^2$	$P_j =$	W
Dielectric losses	$P_d = Q \times t \times g \times \delta = Q \times 2.10^{-4}$	$P_d =$	W
Hot spot temperature	$\theta_{HS} = \theta_{amb} + (P_j + P_d) \times (R_{th1} + R_{th2})$	$\theta_{HS} =$	°C

The hot spot temperature must be in any case lower than 85°C

### LIFETIME EXPECTANCY VS HOT SPOT TEMPERATURE AND VOLTAGE



Expected lifetime at hot spot calculated and  $U = U_w$

# DC FILTERING

## FFHV/FTHV 1600Vdc to 3000Vdc



The FFHV and FTHV series are specifically designed for DC filtering applications such as DC link or resonant filters for voltages up to 3000V.

These capacitors are proposed in 2 different versions: resin top for the FFHV series and hermetic case for the FTHV.

Large case sizes up to 36 liters and high specific energy up to 455J/l\* together with safe and reliable **Controlled Self Healing Technology** make this series particularly suitable for power converters in traction, drives, renewable energy and power transmission areas.

\*for 100,000 hours and 70°C hot spot temperature

FFHV and FTHV use a wet solution with polypropylene metallized film and oil (without free oil).

Standard designs proposed in this catalogue are covering a wide range of voltage and capacitance values.

In case of specific requirements about shape and performances, feel free to contact your local KYOCERA AVX representative.

### PACKAGING MATERIAL

FFHV	FTHV
Non-painted rectangular resin filled aluminium case Mounting brackets M8/17 female connections or M12/30 male connections 2 or 4 connections	Non-painted rectangular aluminium hermetic case Mounting brackets M8/17 female terminals or M12/30 male terminals 2 or 4 terminals

### STANDARDS

FFHV	FTHV
<p><b>IEC 61071:</b> Power electronic capacitors</p> <p><b>IEC 61881:</b> Railway applications, rolling stock equipment, capacitors for power electronics</p> <p><b>IEC 61373:</b> Railways application, rolling stock equipment, shock and vibrations tests</p> <p><b>IEC 60068-2:</b> Environmental testing. Part2: Tests</p> <p><b>UL 94:</b> Test for flammability of Plastic Materials for Parts in Devices and Appliances</p> <p><b>EN 45545-2:</b> Railways applications – Fire protection on railway vehicles. <b>Part 2 :</b> Requirements for fire behaviour of materials and components</p>	<p><b>IEC 61071:</b> Power electronic capacitors</p> <p><b>IEC 61881:</b> Railway applications, rolling stock equipment, capacitors for power electronics</p> <p><b>IEC61373:</b> Railways application, rolling stock equipment, shock and vibrations tests</p> <p><b>IEC 60068-2:</b> Environmental testing. Part 2: Tests</p> <p><b>EN 45545-2:</b> Railways applications – Fire protection on railway vehicles. <b>Part 2:</b> Requirements for fire behaviour of materials and components</p>

### HOW TO ORDER

<b>D</b> 	<b>FFHV</b> 	<b>1</b> 	<b>1</b> 	<b>M</b> 	<b>R</b> 	<b>2637</b> 
	<b>Series</b> FFHV: resin top	<b>Section and Option</b> 1 = 340x125 2 connexions 2 = 340x125 4 connexions 3 = 340x175 2 connexions 4 = 340x175 4 connexions	<b>Height</b> 1 = 230mm 2 = 295mm 3 = 370mm 4 = 450mm 5 = 530mm 6 = 610mm	<b>Terminal Code</b> F = Female M = Male	<b>Voltage</b> A = 1600V B = 1900V C = 2000V D = 2150V E = 2450V F = 2750V G = 3000V	<b>Capacitance EIA Code</b>
<b>D</b> 	<b>FTHV</b> 	<b>1</b> 	<b>1</b> 	<b>M</b> 	<b>R</b> 	<b>2637</b> 
	<b>Series</b> FTHV: hermetic case	<b>Section and Option</b> 1 = 340x125 2 connexions 2 = 340x125 4 connexions 3 = 340x175 2 connexions 4 = 340x175 4 connexions	<b>Height</b> 1 = 240mm 2 = 305mm 3 = 380mm 4 = 460mm 5 = 540mm 6 = 620mm	<b>Terminal Code</b> F = Female M = Male	<b>Voltage</b> A = 1600V B = 1900V C = 2000V D = 2150V E = 2450V F = 2750V G = 3000V	<b>Capacitance EIA Code</b>

# DC FILTERING

## FFHV/FTHV 1600Vdc to 3000Vdc

### DEFINITIONS

<b>C<sub>n</sub> (μF)</b>	capacitance	nominal value of the capacitance measured at $\theta_{amb} = 25 \pm 10^{\circ}\text{C}$
<b>U<sub>n</sub> (V)</b>	rated DC voltage	maximum operating peak voltage of either polarity (non-reversing type waveform), for which the capacitor has been designed for continuous operation
<b>U<sub>w</sub> (V)</b>	working voltage	value of the maximum operating recurrent voltage for a given hot spot temperature and an expected lifetime
<b>U<sub>r</sub> (V)</b>	ripple voltage	peak-to-peak alternating component of the unidirectional voltage
<b>L<sub>s</sub> (nH)</b>	parasitic inductance	capacitor series self-inductance
<b>R<sub>s</sub> (mΩ)</b>	series resistance	capacitor series resistance due to galvanic circuit @ ambient temperature
<b>I<sub>rms thermal 1</sub> (A)</b>	RMS current	rms current value @ 100Hz for continuous operation under natural convection generating 20°C overheating (255A <sub>rms</sub> maximum for 2 connexions or terminals and 400A <sub>rms</sub> maximum for 4 connexions or terminals)
<b>I<sub>rms thermal 2</sub> (A)</b>	RMS current	rms current value @ 100Hz for continuous operation under forced air generating 20°C overheating (255A <sub>rms</sub> maximum for 2 connexions or terminals and 400A <sub>rms</sub> maximum for 4 connexions or terminals)
<b>θ<sub>amb</sub> (°C)</b>	cooling air temperature	temperature of the cooling air measured at the hottest position of the capacitor, under steady-state conditions, midway between two units NOTE If only one unit is involved, it is the temperature measured at a point approximately 0,1 m away from the capacitor container and at two-thirds of the height from its base
<b>θ<sub>HS</sub> (°C)</b>	hot spot temperature	highest temperature obtained inside the case of the capacitor in thermal equilibrium

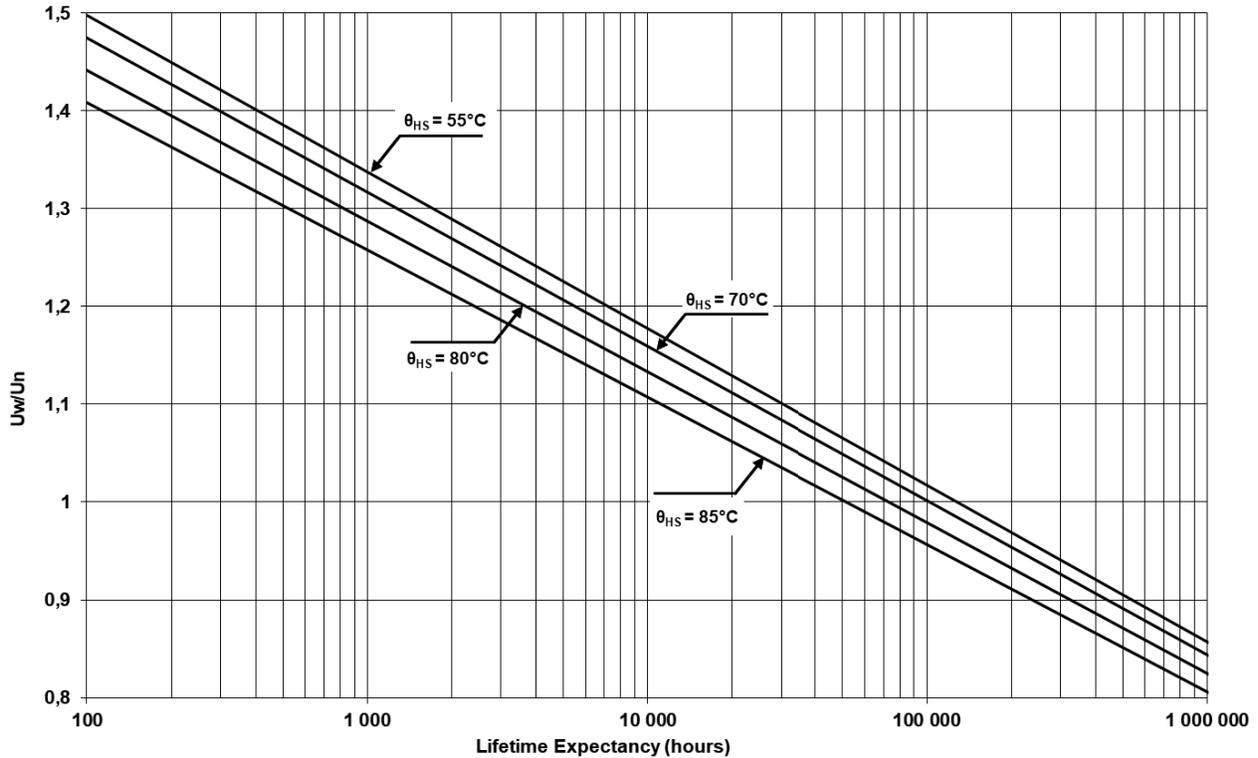
### CHARACTERISTICS

<b>Capacitance range C<sub>n</sub></b>	590μF to 12600μF
<b>Tolerance on C<sub>n</sub></b>	±10%
<b>Rated DC voltage U<sub>n</sub></b>	1600 to 3000V
<b>Lifetime at U<sub>n</sub> and ΔC / C &lt; 2%</b>	FFHV: 100,000h @ 70°C hot spot temperature FTHV: 100,000h @ 85°C hot spot temperature
<b>Parasitic inductance L<sub>s</sub></b>	27nH to 88nH
<b>Maximum rms current I<sub>rms</sub></b>	up to 400A <sub>rms</sub>
<b>Test voltage between terminals @ 25°C</b>	1.5 x U <sub>n</sub> for 10s
<b>Test voltage between terminals and Case @ 25°C</b>	7kV <sub>rms</sub> @ 50Hz for 10s
<b>Dielectric</b>	polypropylene
<b>Climatic Category</b>	FFHV: 40 / 85 / 56 (IEC 60068) FTHV: 40 / 95 / 56 (IEC 60068)
<b>Working temperature</b>	FFHV: -40°C / +85°C (according to the power dissipated) FTHV: -40°C / +95°C (according to the power dissipated)
<b>Storage temperature</b>	-40°C / +85°C
<b>Calorific value</b>	34 MJ/kg

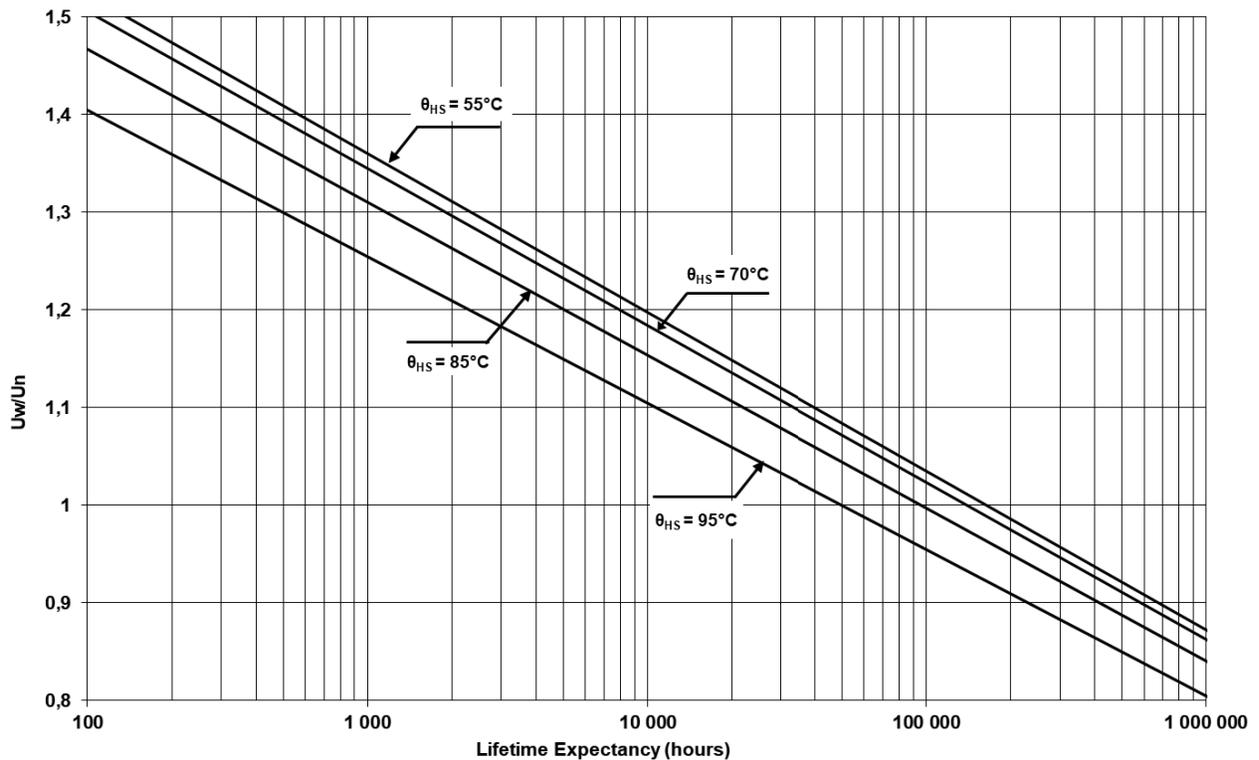
# DC FILTERING

FFHV/FTHV 1600Vdc to 3000Vdc

## FFHV LIFETIME EXPECTANCY VS HOT SPOT TEMPERATURE AND VOLTAGE



## FTHV LIFETIME EXPECTANCY VS HOT SPOT TEMPERATURE AND VOLTAGE



# DC FILTERING

## FFHV/FTHV 1600Vdc to 3000Vdc

### HOW TO CHOSE THE RIGHT CAPACITOR

The capacitor lifetime depends on the working voltage and the hot spot temperature.

Our caps are designed to meet 100000 hours lifetime at rated voltage and 70°C (for FFHV) or 85°C (for FTHV) hot spot temperature. In accordance with operating conditions, please calculate the hot spot temperature and deduce from this calculation if the obtained lifetime can suit the application.

#### 1. From the tables, select a capacitor with required capacitance

**C<sub>n</sub> and voltage U<sub>n</sub>.**

Calculate the maximum ripple voltage allowed for the selected cap:

$$U_{rmax} = 0.2U_n$$

If  $U_r > U_{rmax}$ , select a capacitor with higher rated voltage

Make sure  $I_{rms}$  application <  $I_{rms}$  table

Copy out:

- serial resistance ( $R_s$ ): see table of values
- thermal resistances  $R_{th1}$  and  $R_{th2}$  (depending on cooling conditions)

#### 2. Hot spot temperature calculation

Total losses are calculated as follow:  $P_t = P_j + P_d$

Joule losses:  $P_j = R_s \times I_{rms}^2$

Dielectric losses:  $P_d = Q \times \text{tg}\delta_0$  with

- $Q$ (reactive power) =  $\frac{I_{rms}^2}{C\omega}$  for a sinusoidal waveform

- $\text{tg}\delta_0 = 3 \times 10^{-4}$  (dielectric losses of polypropylene)

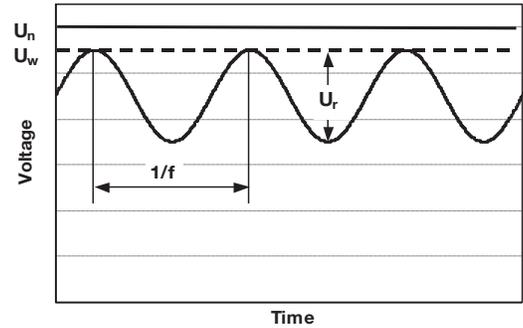
Hot spot temperature will be:

$$\theta_{HS} = \theta_{amb} + (P_j + P_d) \times (R_{th1} + R_{th2})$$

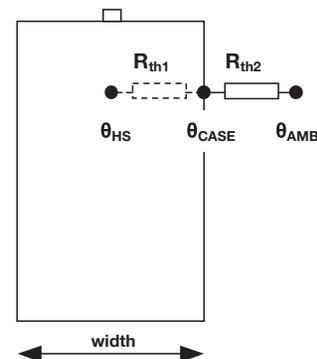
$\theta_{HS}$  **absolute maximum is:**

**85°C for FFHV  
or 95°C for FTHV**

If temperature is higher than 85°C, come back to #1 and start again with another selection.



$R_{th1}$ : Thermal resistance between hot spot and case  
 $R_{th2}$ : Thermal resistance between case and ambient air

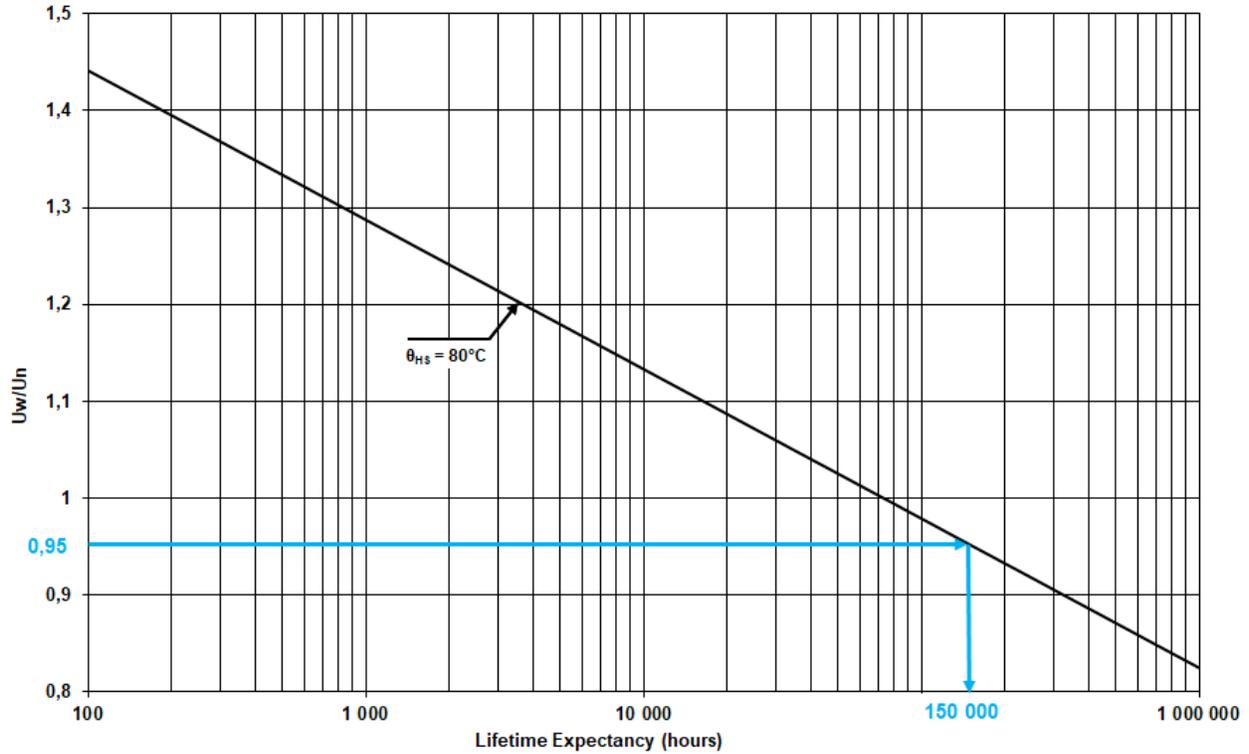


# DC FILTERING

## FFHV/FTHV 1600Vdc to 3000Vdc

3. Refer to the curve and deduce the lifetime vs  $U_w/U_n$  ratio

### FFHV LIFETIME EXPECTANCY VS HOT SPOT TEMPERATURE AND VOLTAGE



eg: rated voltage 2000V  
working voltage 1900V  
 $\rho = 0.95 \Rightarrow$  lifetime 150,000 hours @ 80°C hot spot temperature

Please, find a calculation form at the end of the catalog

# DC FILTERING

## FFHV/FTHV 1600Vdc to 3000Vdc

### THERMAL RESISTANCES

$R_{th1}$  (°C/W): Thermal resistance between hot spot and case

Rth1 (°C/W)		
Height (mm)	Width (mm)	
	125	175
230/240	0.40	0.41
295/305	0.33	0.36
370/380	0.27	0.30
450/460	0.22	0.26
530/540	0.19	0.22
610/620	0.17	0.19

$R_{th2}$  (°C/W): Thermal resistance between case and ambient air under natural convection and forced air

Height (mm)	Rth2 (°C/W)			
	Natural air cooling		Forced air cooling >2m/s	
	Width (mm)		Width (mm)	
	125	175	125	175
230/240	0.3	0.26	0.15	0.13
295/305	0.25	0.21	0.13	0.11
370/380	0.2	0.18	0.1	0.09
450/460	0.17	0.15	0.09	0.08
530/540	0.15	0.13	0.08	0.07
610/620	0.13	0.11	0.07	0.06



For confined area, capacitor working in a closed cabinet, a thermal test under real conditions is necessary to evaluate the thermal resistance.

### PARASITIC INDUCTANCE VS SIZE

Measurement @ 1MHz

Height (mm)	$L_s$ (nH) FFHV resin top			
	Width (mm)			
	2 Connections		4 Connections	
	125	175	125	175
230	70	73	27	30
295	72	77	29	34
370	75	82	32	39
450	79	86	36	43
530	82	91	39	48
610	85	96	42	53

Height (mm)	$L_s$ (nH) FTHV hermetic case			
	Width (mm)			
	2 Connections		4 Connections	
	125	175	125	175
240	73	76	28	31
305	75	80	30	35
380	78	85	33	40
460	82	89	37	44
540	85	94	40	49
620	88	99	43	54

# DC FILTERING

## FFHV/FTHV 1600Vdc to 3000Vdc

### MTBF CALCULATION

Based on Return Of Experience from the field of more than 30 years, we have established the following relation. The failure rate  $\lambda_B$  depends on hot spot temperature  $\theta_{HS}$  and charge ratio  $\rho$ .

$$\rho = U_w / U_n$$

$$\lambda_B = 3.10^{3.66(\rho-1)} \times e^{4.5 \left( \frac{273 + \theta_{HS}}{368} \right)^{25}} \times 10^{-9} \text{ in failures/hour}$$

### GENERAL FAILURE RATE

$\lambda = \lambda_B \times \pi_Q \times \pi_B \times \pi_E$  failures/hour •  $\pi_Q$ ,  $\pi_B$  and  $\pi_E$  see following tables

Qualification	Qualification factor $\pi_Q$
Product qualified on IEC61071 and internal qualification	1
Product qualified on IEC61071	2
Product answering on another norm	5
Product without qualification	15

Environment	Environment factor $\pi_E$
On ground (good conditions)	1
On ground (fixed materials)	2
On ground (on board)	4
On ship	9
On plane	15

Environment	Environment factor $\pi_B$
Favorable	1
Unfavourable	5

### MEAN TIME BETWEEN FAILURE (MTBF)

$$MTBF = 1/\lambda \text{ hours}$$

### SURVIVAL FUNCTION

$$N = N_0 \times \exp(-\lambda t)$$

N is the number of pieces still working after t hours.

$N_0$  is the number of pieces at the origin (t = 0)

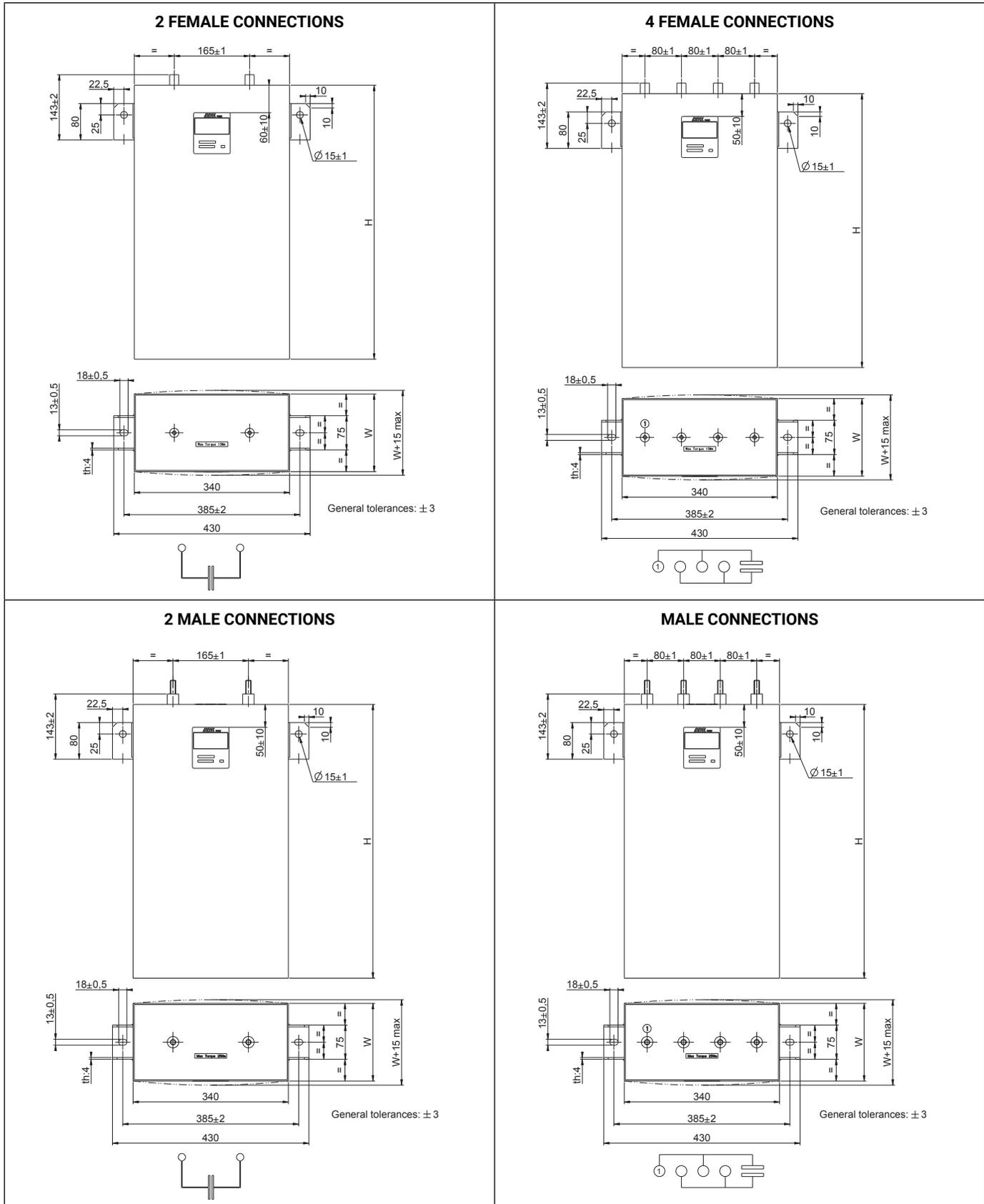
### FAILURE MODE

Main failure mode due to KYOCERA AVX's **Controlled Self-Healing Technology** is only losses of capacitance. Thanks to **Controlled Self-Healing** solution to interrupt self-healing process in order to prevent avalanche effect due to polypropylene molecular cracking producing gas and potential explosion in confined box for none **Controlled Self-Healing capacitors**.

# DC FILTERING

FFHV/FTHV 1600Vdc to 3000Vdc

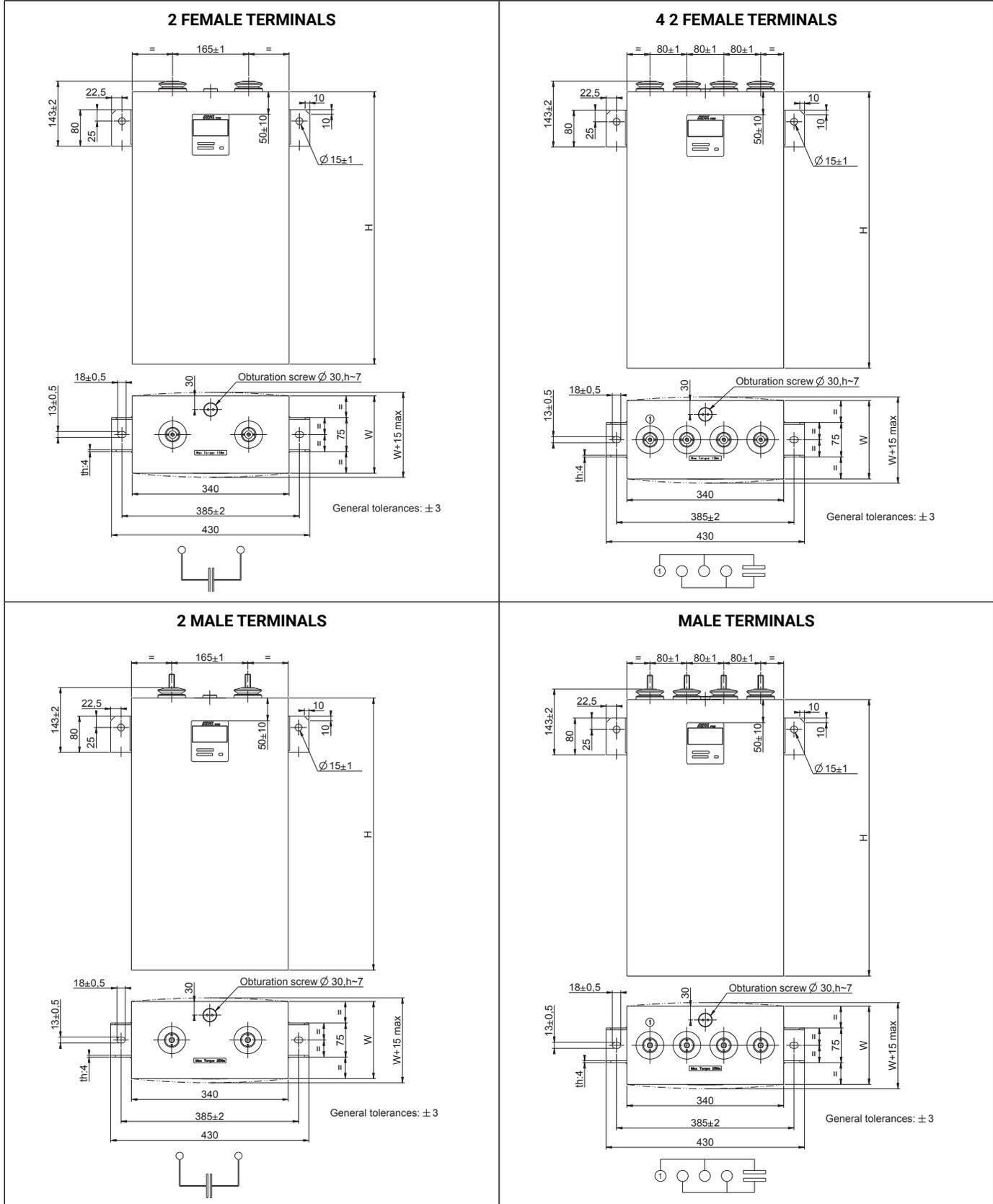
## DIMENSIONS



# DC FILTERING

FFHV/FTHV 1600Vdc to 3000Vdc

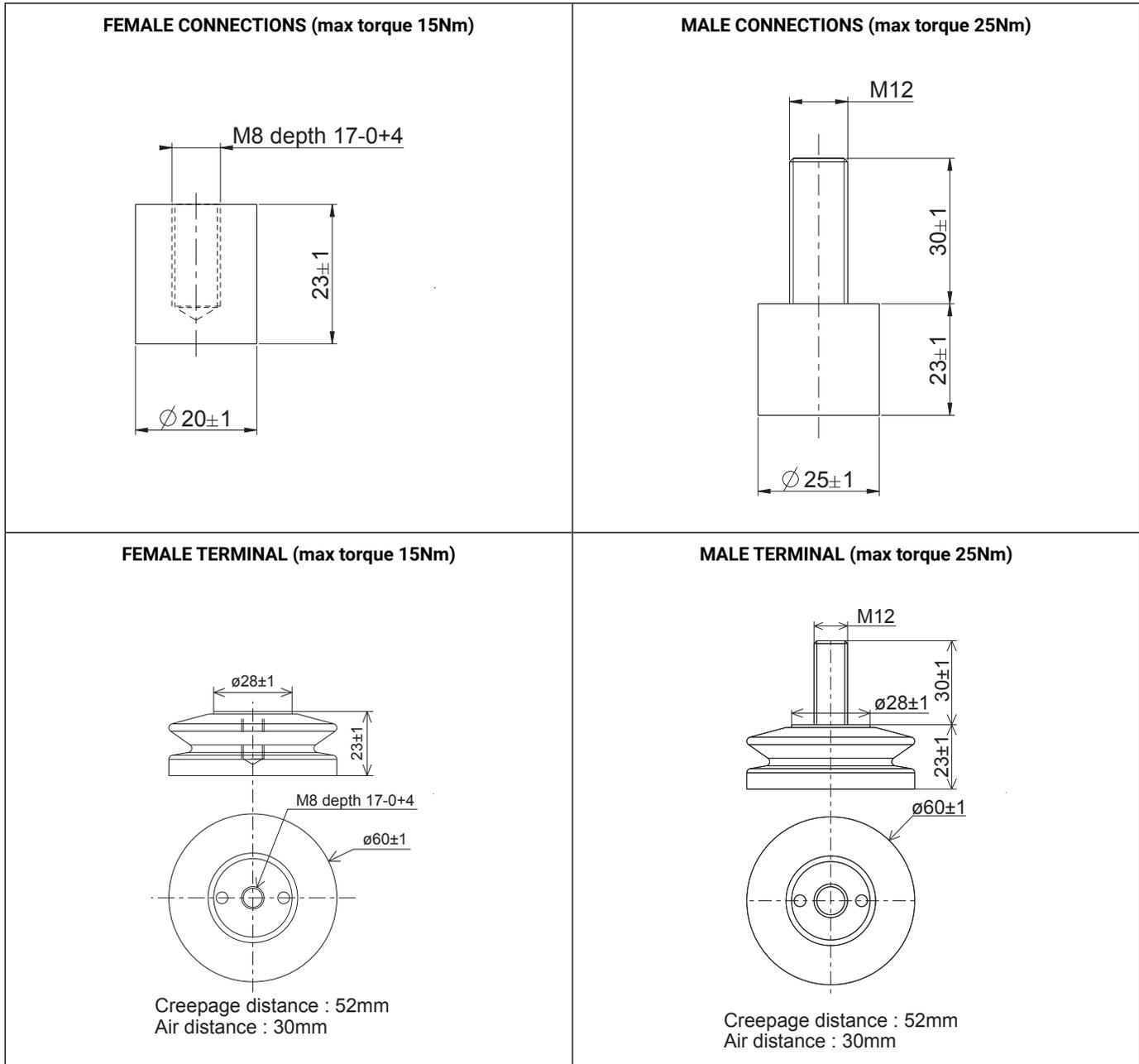
## DIMENSIONS



# DC FILTERING

FFHV/FTHV 1600Vdc to 3000Vdc

## DIMENSIONS



## WEIGHT VS SIZE

Height (mm)	Weight (kg) FFHV resin top			
	Width (mm)			
	2 Connections		4 Connections	
	125	175	125	175
230	13	17.5	13.5	18
295	17	22.5	17.5	23
370	21	27.5	21.5	28
450	25	33.5	25.5	34
530	29	39	29.5	39.5
610	33.5	44.5	34	45

Height (mm)	Weight (kg) FTHV hermetic case			
	Width (mm)			
	2 Connections		4 Connections	
	125	175	125	175
240	14.5	19	15	19.5
305	18	24	18.5	24.5
380	22	29.5	22.5	30
460	26.5	35	27	35.5
540	30.5	40.5	31	41
620	34.5	46	35	46.5

# DC FILTERING

## FFHV/FTHV 1600Vdc to 3000Vdc



### TABLE OF VALUES

Part Number	Capacitance (µF)	Width (mm)	Height (mm)		R <sub>s</sub> (mΩ)	I <sub>rms</sub> Thermal 1 (A)	I <sub>rms</sub> Thermal 2 (A)
			FFHV	FTHV			
<b>Un = 1600Vdc</b>							
DF*HV11°A2637	2630	125	230	240	0,42	215	240
DF*HV21°A2637	2630	125	230	240	0,35	230	255
DF*HV12°A3447	3440	125	295	305	0,36	255	255
DF*HV22°A3447	3440	125	295	305	0,29	285	320
DF*HV31°A4127	4120	175	230	240	0,57	205	230
DF*HV41°A4127	4120	175	230	240	0,48	220	245
DF*HV13°A4597	4590	125	370	380	0,32	255	255
DF*HV23°A4597	4590	125	370	380	0,25	345	390
DF*HV32°A5407	5400	175	295	305	0,48	245	255
DF*HV42°A5407	5400	175	295	305	0,39	270	300
DF*HV14°A5747	5740	125	450	460	0,30	255	255
DF*HV24°A5747	5740	125	450	460	0,23	400	400
DF*HV15°A6897	6890	125	530	540	0,29	255	255
DF*HV25°A6897	6890	125	530	540	0,22	400	400
DF*HV33°A7207	7200	175	370	380	0,42	255	255
DF*HV43°A7207	7200	175	370	380	0,33	325	360
DF*HV16°A8047	8040	125	610	620	0,28	255	255
DF*HV26°A8047	8040	125	610	620	0,21	400	400
DF*HV34°A9007	9000	175	450	460	0,39	255	255
DF*HV44°A9007	9000	175	450	460	0,30	375	400
DF*HV35°A1088	10800	175	530	540	0,37	255	255
DF*HV45°A1088	10800	175	530	540	0,28	400	400
DF*HV36°A1268	12600	175	610	620	0,36	255	255
DF*HV46°A1268	12600	175	610	620	0,27	400	400
<b>Un = 1900Vdc</b>							
DF*HV11°B1917	1910	125	230	240	0,46	200	225
DF*HV21°B1917	1910	125	230	240	0,39	210	235
DF*HV12°B2507	2500	125	295	305	0,39	245	255
DF*HV22°B2507	2500	125	295	305	0,32	260	295
DF*HV31°B3007	3000	175	230	240	0,63	195	215
DF*HV41°B3007	3000	175	230	240	0,54	205	225
DF*HV13°B3347	3340	125	370	380	0,34	255	255
DF*HV23°B3347	3340	125	370	380	0,27	320	360
DF*HV32°B3927	3920	175	295	305	0,53	230	255
DF*HV42°B3927	3920	175	295	305	0,44	250	275
DF*HV14°B4177	4170	125	450	460	0,32	255	255
DF*HV24°B4177	4170	125	450	460	0,25	375	400
DF*HV15°B5017	5010	125	530	540	0,31	255	255
DF*HV25°B5017	5010	125	530	540	0,24	400	400
DF*HV33°B5227	5220	175	370	380	0,46	255	255
DF*HV43°B5227	5220	175	370	380	0,37	300	335
DF*HV16°B5847	5840	125	610	620	0,30	255	255
DF*HV26°B5847	5840	125	610	620	0,23	400	400
DF*HV34°B6537	6530	175	450	460	0,42	255	255
DF*HV44°B6537	6530	175	450	460	0,33	350	390
DF*HV35°B7837	7830	175	530	540	0,39	255	255
DF*HV45°B7837	7830	175	530	540	0,30	395	400
DF*HV36°B9147	9140	175	610	620	0,38	255	255
DF*HV46°B9147	9140	175	610	620	0,29	400	400

\* Insert F for resin top or T for hermetic case

° Insert F for female terminals or M for male terminals

# DC FILTERING

## FFHV/FTHV 1600Vdc to 3000Vdc

### TABLE OF VALUES

Part Number	Capacitance (μF)	Width (mm)	Height (mm)		R <sub>s</sub> (mΩ)	I <sub>rms</sub> Thermal 1 (A)	I <sub>rms</sub> Thermal 2 (A)
			FFHV	FTHV			
<b>Un = 2000Vdc</b>							
DF*HV11°C1627	1620	125	230	240	0.49	190	215
DF*HV21°C1627	1620	125	230	240	0.41	200	225
DF*HV12°C2137	2130	125	295	305	0.42	230	255
DF*HV22°C2137	2130	125	295	305	0.34	245	280
DF*HV31°C2547	2540	175	230	240	0.65	185	210
DF*HV41°C2547	2540	175	230	240	0.56	200	220
DF*HV13°C2847	2840	125	370	380	0.37	255	255
DF*HV23°C2847	2840	125	370	380	0.29	305	340
DF*HV32°C3337	3330	175	295	305	0.55	225	250
DF*HV42°C3337	3330	175	295	305	0.46	240	265
DF*HV14°C3547	3540	125	450	460	0.35	255	255
DF*HV24°C3547	3540	125	450	460	0.27	355	400
DF*HV15°C4257	4250	125	530	540	0.33	255	255
DF*HV25°C4257	4250	125	530	540	0.25	400	400
DF*HV33°C4447	4440	175	370	380	0.48	255	255
DF*HV43°C4447	4440	175	370	380	0.39	290	320
DF*HV16°C4967	4960	125	610	620	0.32	255	255
DF*HV26°C4967	4960	125	610	620	0.24	400	400
DF*HV34°C5557	5550	175	450	460	0.43	255	255
DF*HV44°C5557	5550	175	450	460	0.34	340	375
DF*HV35°C6657	6650	175	530	540	0.41	255	255
DF*HV45°C6657	6650	175	530	540	0.32	385	400
DF*HV36°C7767	7760	175	610	620	0.39	255	255
DF*HV46°C7767	7760	175	610	620	0.3	400	400
<b>Un = 2150Vdc</b>							
DF*HV11°D1447	1440	125	230	240	0,50	180	200
DF*HV21°D1447	1440	125	230	240	0,43	185	210
DF*HV12°D1887	1880	125	295	305	0,42	225	255
DF*HV22°D1887	1880	125	295	305	0,35	240	270
DF*HV31°D2257	2250	175	230	240	0,69	175	195
DF*HV41°D2257	2250	175	230	240	0,60	185	205
DF*HV13°D2517	2510	125	370	380	0,37	255	255
DF*HV23°D2517	2510	125	370	380	0,30	295	335
DF*HV32°D2957	2950	175	295	305	0,57	215	240
DF*HV42°D2957	2950	175	295	305	0,48	230	260
DF*HV14°D3147	3140	125	450	460	0,34	255	255
DF*HV24°D3147	3140	125	450	460	0,27	345	390
DF*HV15°D3777	3770	125	530	540	0,32	255	255
DF*HV25°D3777	3770	125	530	540	0,25	395	400
DF*HV33°D3937	3930	175	370	380	0,49	255	255
DF*HV43°D3937	3930	175	370	380	0,40	280	310
DF*HV16°D4407	4400	125	610	620	0,31	255	255
DF*HV26°D4407	4400	125	610	620	0,24	400	400
DF*HV34°D4917	4910	175	450	460	0,44	255	255
DF*HV44°D4917	4910	175	450	460	0,35	330	365
DF*HV35°D5907	5900	175	530	540	0,42	255	255
DF*HV45°D5907	5900	175	530	540	0,33	375	400
DF*HV36°D6887	6880	175	610	620	0,40	255	255
DF*HV46°D6887	6880	175	610	620	0,31	400	400

\* Insert F for resin top or T for hermetic case

° Insert F for female terminals or M for male terminals

# DC FILTERING

## FFHV/FTHV 1600Vdc to 3000Vdc



### TABLE OF VALUES

Part Number	Capacitance (µF)	Width (mm)	Height (mm)		R <sub>s</sub> (mΩ)	I <sub>rms</sub> Thermal 1 (A)	I <sub>rms</sub> Thermal 2 (A)
			FFHV	FTHV			
<b>Un = 2450Vdc</b>							
DF*HV11°E1067	1060	125	230	240	0,56	165	190
DF*HV21°E1067	1060	125	230	240	0,48	175	195
DF*HV12°E1377	1370	125	295	305	0,47	205	230
DF*HV22°E1377	1370	125	295	305	0,40	215	240
DF*HV31°E1707	1700	175	230	240	0,75	165	185
DF*HV41°E1707	1700	175	230	240	0,66	175	195
DF*HV13°E1847	1840	125	370	380	0,41	250	255
DF*HV23°E1847	1840	125	370	380	0,33	265	300
DF*HV32°E2207	2200	175	295	305	0,63	200	225
DF*HV42°E2207	2200	175	295	305	0,54	215	240
DF*HV14°E2307	2300	125	450	460	0,38	255	255
DF*HV24°E2307	2300	125	450	460	0,30	315	355
DF*HV15°E2757	2750	125	530	540	0,36	255	255
DF*HV25°E2757	2750	125	530	540	0,28	360	400
DF*HV33°E2947	2940	175	370	380	0,53	245	255
DF*HV43°E2947	2940	175	370	380	0,44	260	290
DF*HV16°E3217	3210	125	610	620	0,34	255	255
DF*HV26°E3217	3210	125	610	620	0,26	400	400
DF*HV34°E3687	3680	175	450	460	0,48	255	255
DF*HV44°E3687	3680	175	450	460	0,39	310	340
DF*HV35°E4427	4420	175	530	540	0,44	255	255
DF*HV45°E4427	4420	175	530	540	0,35	350	390
DF*HV36°E5157	5150	175	610	620	0,42	255	255
DF*HV46°E5157	5150	175	610	620	0,33	390	400
<b>Un = 2750Vdc</b>							
DF*HV11°F0877	870	125	230	240	0,57	155	175
DF*HV21°F0877	870	125	230	240	0,50	160	185
DF*HV12°F1137	1130	125	295	305	0,48	200	225
DF*HV22°F1137	1130	125	295	305	0,41	205	235
DF*HV31°F1397	1390	175	230	240	0,80	160	175
DF*HV41°F1397	1390	175	230	240	0,71	165	185
DF*HV13°F1517	1510	125	370	380	0,41	245	255
DF*HV23°F1517	1510	125	370	380	0,34	260	290
DF*HV32°F1827	1820	175	295	305	0,65	195	215
DF*HV42°F1827	1820	175	295	305	0,56	205	230
DF*HV14°F1897	1890	125	450	460	0,37	255	255
DF*HV24°F1897	1890	125	450	460	0,30	305	345
DF*HV15°F2277	2270	125	530	540	0,35	255	255
DF*HV25°F2277	2270	125	530	540	0,28	350	400
DF*HV33°F2427	2420	175	370	380	0,55	235	255
DF*HV43°F2427	2420	175	370	380	0,46	250	280
DF*HV16°F2657	2650	125	610	620	0,33	255	255
DF*HV26°F2657	2650	125	610	620	0,26	400	400
DF*HV34°F3037	3030	175	450	460	0,49	255	255
DF*HV44°F3037	3030	175	450	460	0,40	295	330
DF*HV35°F3647	3640	175	530	540	0,46	255	255
DF*HV45°F3647	3640	175	530	540	0,37	340	375
DF*HV36°F4257	4250	175	610	620	0,43	255	255
DF*HV46°F4257	4250	175	610	620	0,34	380	400

\* Insert F for resin top or T for hermetic case

° Insert F for female terminals or M for male terminals

# DC FILTERING

## FFHV/FTHV 1600Vdc to 3000Vdc

### TABLE OF VALUES

Part Number	Capacitance (µF)	Width (mm)	Height (mm)		R <sub>s</sub> (mΩ)	I <sub>rms</sub> Thermal 1 (A)	I <sub>rms</sub> Thermal 2 (A)
			FFHV	FTHV			
<b>Un = 3000Vdc</b>							
DF*HV11°G0717	710	125	230	240	0,61	145	165
DF*HV21°G0717	710	125	230	240	0,54	150	170
DF*HV12°G0937	930	125	295	305	0,51	185	210
DF*HV22°G0937	930	125	295	305	0,44	195	220
DF*HV31°G1147	1140	175	230	240	0,85	150	165
DF*HV41°G1147	1140	175	230	240	0,76	155	175
DF*HV13°G1247	1240	125	370	380	0,43	230	255
DF*HV23°G1247	1240	125	370	380	0,36	240	275
DF*HV32°G1497	1490	175	295	305	0,70	185	205
DF*HV42°G1497	1490	175	295	305	0,61	195	215
DF*HV14°G1557	1550	125	450	460	0,39	255	255
DF*HV24°G1557	1550	125	450	460	0,32	285	325
DF*HV15°G1867	1860	125	530	540	0,36	255	255
DF*HV25°G1867	1860	125	530	540	0,29	330	375
DF*HV33°G1997	1990	175	370	380	0,58	225	250
DF*HV43°G1997	1990	175	370	380	0,48	240	265
DF*HV16°G2177	2170	125	610	620	0,35	255	255
DF*HV26°G2177	2170	125	610	620	0,28	375	400
DF*HV34°G2497	2490	175	450	460	0,52	255	255
DF*HV44°G2497	2490	175	450	460	0,43	280	310
DF*HV35°G2997	2990	175	530	540	0,48	255	255
DF*HV45°G2997	2990	175	530	540	0,39	320	360
DF*HV36°G3487	3480	175	610	620	0,45	255	255
DF*HV46°G3487	3480	175	610	620	0,36	360	400

\* Insert F for resin top or T for hermetic case

° Insert F for female terminals or M for male terminals

# DC FILTERING

## FFHV/FTHV 1600Vdc to 3000Vdc

### CALCULATION FORM SPECIFICATION

Capacitance	C (μF)	
Working voltage	U <sub>w</sub> (V)	
Rms current	I <sub>rms</sub> (Arms)	
Frequency	f (Hz)	
Ripple voltage	U <sub>r</sub> (V)	
Ambient temperature	θ <sub>amb</sub> (°C)	
Lifetime @ U <sub>w</sub> , I <sub>rms</sub> and θ <sub>amb</sub>	hours	
Parasitic inductance	L (nH)	
Cooling conditions		

### Your choice

PN		
Capacitance	C (μF)	
Rated voltage	U <sub>n</sub> (V)	
Serial resistance	R <sub>s</sub> (mΩ)	
Thermal resistance between hot spot and case	R <sub>th1</sub> (°C/W)	
Thermal resistance between case and ambient air	R <sub>th2</sub> (°C/W)	

### CALCULATIONS

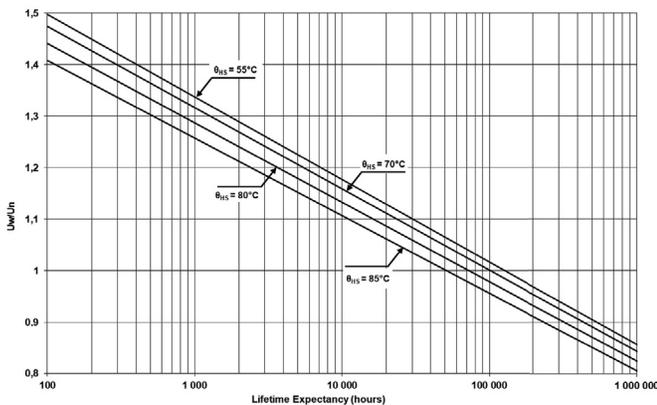
Maximum ripple voltage	$U_{rmax} = 0.2 U_n$	U <sub>rmax</sub> =	V
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*The maximum ripple voltage of the selected capacitor must be in any case higher than the ripple voltage of your application*

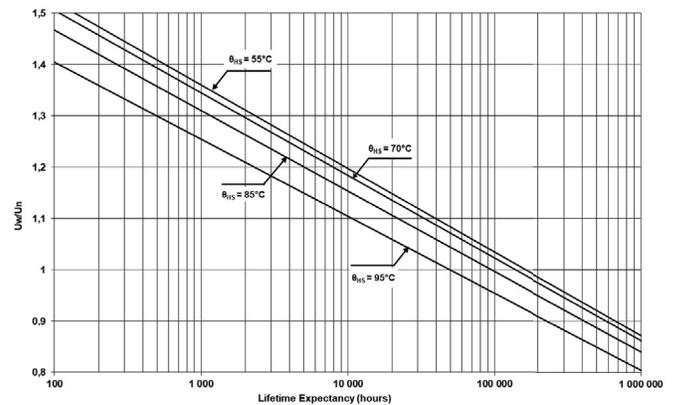
Ratio U <sub>w</sub> /U <sub>n</sub>	$\rho = U_w/U_n$	ρ =	
Joule losses	$P_j = R_s \times I_{rms}^2$	P <sub>j</sub> =	W
Dielectric losses	$P_d = Q \times t \times g \times \delta \times 0 = Q \times 3.10^{-4}$	P <sub>d</sub> =	W
Hot spot temperature	$\theta_{HS} = \theta_{amb} + (P_j + P_d) \times R_{th}$	θ <sub>HS</sub> =	°C

*The hot spot temperature must be in any case lower than 85°C for FFHV and 95°C for FTHV*

### FFHV LIFETIME EXPECTANCY



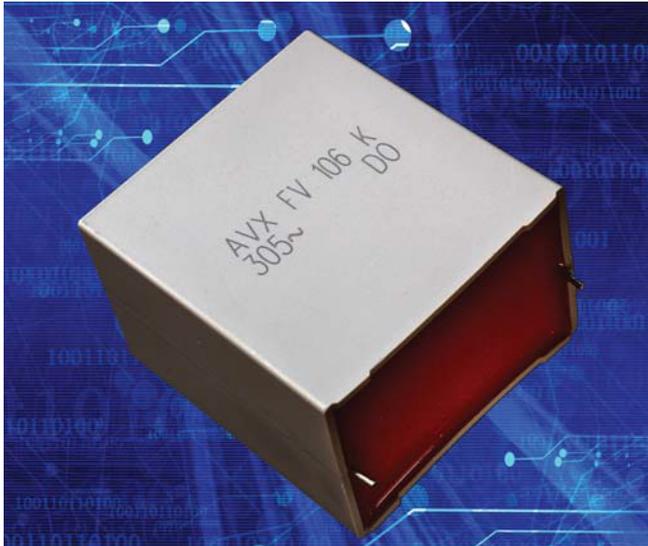
### FTHV LIFETIME EXPECTANCY



Expected lifetime at hot spot calculated and U = U<sub>w</sub>

# AC FILTERING

## FV X2\* RoHS Compliant



FV are non-inductively wound with metallized polypropylene film as dielectric and electrode, encapsulated in solventresistant and self - extinguishing UL94v0 thermoplastic case, with epoxy resin sealed. They provide interference Suppression with safety approvals. They are suitable for Across-the-line Capacitors, EMI Filters, Spark-Killer Circuits, etc.

### APPLICATIONS

- The FV capacitor is suitable for Across-the-line, EMI Filters
- Capacitance Range: 0.01uF ~ 10.0uF
- Capacitance Tolerance:  $\pm 10\%$  (K),  $\pm 20\%$  (M)
- Rated Voltage: 305Vrms
- Frequency: 50Hz, 60Hz
- Insulation Resistance:  $> 15,000M\Omega (\leq 0.33uF)$   
 $> 5,000M\Omega (> 0.33uF)$
- Dielectric Strength: 1312VDC for 60sec.  
Or 2000vdc for 2sec

Climatic Category: 40/110/56

Passive Flammability Category: B

### WORKING TEMPERATURE

Operating Temperature Range:  $-40^{\circ}C$  to  $+110^{\circ}C$

### FEATURES

- Self-healing properties.
- High moisture resistance.
- Over voltage stress withstanding.
- Excellent active and passive flame resistant abilities
- Widely used in across-the-line, interference suppression circuit, etc.

### STANDARDS

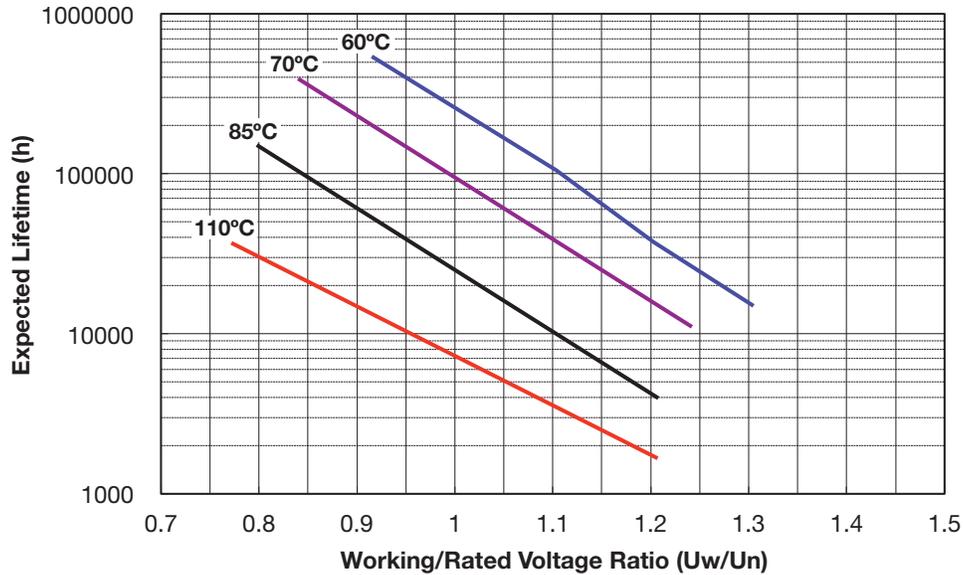
ENEC-VDE: EN60384-14(2005)  
 UL/CUL: UL60384-14 / CSA E60384-14  
 KC: K60384-14  
 CQC: GB/T 14472

### HOW TO ORDER

<b>FV</b>	<b>A1</b>	<b>6</b>	<b>H</b>	<b>0103</b>	<b>M</b>	<b>2</b>	<b>L</b>
Series	Case	Dielectric	Voltage	Capacitance EIA Code	Tolerances	Environment Type	Lead Length
	A1-A3 B1 C1-C9 D1-D6 E1-E9 F1-F9	6 = Polypropylene	H = 305V	0103 = 0.01 $\mu$ F	K = $\pm 10\%$ M = $\pm 20\%$	2 = standard environment H = THB (temperature humidity bias)	L = 22mm 2 = 3.5 mm T = Tape packaging

### LIFETIME EXPECTANCY VS HOT SPOT TEMPERATURE AND VOLTAGE

#### Expected Lifetime Curves



### DIMENSIONS

Case Ref	W (mm)	H (mm)	T (mm)	P (mm)	d (mm)
A1	13	11	5	10	0.6
A2	13	12	6	10	0.6
A3	13	16	8	10	0.6
B1	15	13.5	7	12.5	0.8
C1	18	11	5	15	0.6
C2	18	12	6	15	0.6
C3	18	12	6	15	0.8
C4	18	13.5	7.5	15	0.8
C5	18	14	8	15	0.8
C6	18	16	10	15	0.8
C7	18	18	9	15	0.8
C8	18	18	10	15	0.8
C9	18	19	11	15	0.8
D1	26	17	8.5	22.5	0.8
D2	26	19	10	22.5	0.8
D3	26	20	11	22.5	0.8
D4	26	22	12	22.5	0.8
D5	26	23	13	22.5	0.8
D6	26	25	15	22.5	0.8
E1	31	20	11	27.5	0.8
E2	31	22	13	27.5	0.8
E3	31	28	14	27.5	0.8
E4	31	28	18	27.5	0.8
E5	31	28	19.5	27.5	0.8
E6	31	33	18	27.5	0.8
E7	31	35	26	27.5	0.8
E8	31	31	23	27.5	0.8
E9	31	36	22	27.5	0.8
F1	41.5	32	16	37.5	1
F2	41.5	28	19	37.5	1
F3	41.5	32	19	37.5	1
F4	41.5	36	19	37.5	1
F5	41.5	38	20	37.5	1
F6	41.5	40	20	37.5	1
F7	41.5	43	28	37.5	1
F8	41.5	44	24	37.5	1
F9	41.5	45	30	37.5	1

### GENERAL DESCRIPTION

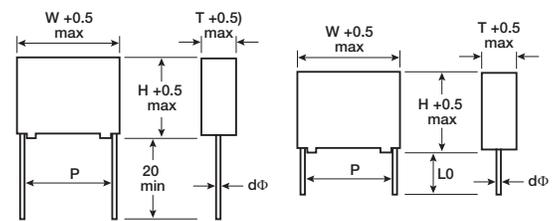


Fig. 1

Fig. 2

# AC FILTERING

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## ELECTRICAL CHARACTERISTICS

Climatic category	40/110/56 (IEC 60384-14)
Test voltage between terminals @ 25°C	1312Vdc, 60sec
Capacitance range C <sub>n</sub>	0.01µF to 10.0µF
Capacitance Tolerances:	±10%, ±20%
Rated AC Voltage:	305V <sub>rms</sub>
Dielectric:	Polypropylene
Insulation Resistance:	> 15,000MΩ (≤0.33µF), > 5,000MΩ (> 0.33µF) after 1 minute electrification @ 100 Vdc & 25 °C
Lifetime (ΔC/C < 10%):	100,000hrs @ U, & 70°C

## RATINGS AND PART NUMBER REFERENCE – POLYPROPYLENE DIELECTRIC

Cap (µF) ±10%	Rated Voltage (V)	Part Number	Case Code	W ±0.50 (mm)	H ±0.50 (mm)	T ±0.50 (mm)	P ±1.00 (mm)	d ±0.50 (mm)	V/µs (Volt/sec)	I <sub>peak</sub> (A)	Packaging Method (Fig 1)	Packaging Method (Fig 2)	Packaging Method (Taping)			
V <sub>rms</sub> = 305V Voltage Code: H											Qty	Box Dimension (mm)	Qty	Box Dimension (mm)	Qty	Box Dimension (mm)
0.010	305	FVA16H0103*22	A1	13.0	11.0	5.0	10.0	0.6	100.0	1.0	NA	NA	850	360*170*35	NA	NA
0.010	305	FVA16H0103*2L	A1	13.0	11.0	5.0	10.0	0.6	100.0	1.0	1200	180*170*120	NA	NA	NA	NA
0.010	305	FVA16H0103*2T	A1	13.0	11.0	5.0	10.0	0.6	100.0	1.0	NA	NA	NA	NA	600	335*265*55
0.015	305	FVA16H0153*22	A1	13.0	11.0	5.0	10.0	0.6	100.0	1.5	NA	NA	850	360*170*35	NA	NA
0.015	305	FVA16H0153*2L	A1	13.0	11.0	5.0	10.0	0.6	100.0	1.5	1200	180*170*120	NA	NA	NA	NA
0.015	305	FVA16H0153*2T	A1	13.0	11.0	5.0	10.0	0.6	100.0	1.5	NA	NA	NA	NA	600	335*265*55
0.022	305	FVA16H0223*22	A1	13.0	11.0	5.0	10.0	0.6	100.0	2.2	NA	NA	850	360*170*35	NA	NA
0.022	305	FVA16H0223*2L	A1	13.0	11.0	5.0	10.0	0.6	100.0	2.2	1200	180*170*120	NA	NA	NA	NA
0.022	305	FVA16H0223*2T	A1	13.0	11.0	5.0	10.0	0.6	100.0	2.2	NA	NA	NA	NA	600	335*265*55
0.033	305	FVA16H0333*22	A1	13.0	11.0	5.0	10.0	0.6	100.0	3.3	NA	NA	850	360*170*35	NA	NA
0.033	305	FVA16H0333*2L	A1	13.0	11.0	5.0	10.0	0.6	100.0	3.3	1200	180*170*120	NA	NA	NA	NA
0.033	305	FVA16H0333*2T	A1	13.0	11.0	5.0	10.0	0.6	100.0	3.3	NA	NA	NA	NA	600	335*265*55
0.047	305	FVA16H0473*22	A1	13.0	11.0	5.0	10.0	0.6	100.0	4.7	NA	NA	850	360*170*35	NA	NA
0.047	305	FVA16H0473*2L	A1	13.0	11.0	5.0	10.0	0.6	100.0	4.7	1200	180*170*120	NA	NA	NA	NA
0.047	305	FVA16H0473*2T	A1	13.0	11.0	5.0	10.0	0.6	100.0	4.7	NA	NA	NA	NA	600	335*265*55
0.047	305	FVA26H0473*22	A2	13.0	12.0	6.0	10.0	0.6	100.0	4.7	NA	NA	700	360*170*35	NA	NA
0.047	305	FVA26H0473*2L	A2	13.0	12.0	6.0	10.0	0.6	100.0	4.7	1000	180*170*120	NA	NA	NA	NA
0.047	305	FVA26H0473*2T	A2	13.0	12.0	6.0	10.0	0.6	100.0	4.7	NA	NA	NA	NA	500	335*265*55
0.056	305	FVA26H0563*22	A2	13.0	12.0	6.0	10.0	0.6	100.0	5.6	NA	NA	700	360*170*35	NA	NA
0.056	305	FVA26H0563*2L	A2	13.0	12.0	6.0	10.0	0.6	100.0	5.6	1000	180*170*120	NA	NA	NA	NA
0.056	305	FVA26H0563*2T	A2	13.0	12.0	6.0	10.0	0.6	100.0	5.6	NA	NA	NA	NA	500	335*265*55
0.068	305	FVA26H0683*22	A2	13.0	12.0	6.0	10.0	0.6	100.0	6.8	NA	NA	700	360*170*35	NA	NA
0.068	305	FVA26H0683*2L	A2	13.0	12.0	6.0	10.0	0.6	100.0	6.8	1000	180*170*120	NA	NA	NA	NA
0.068	305	FVA26H0683*2T	A2	13.0	12.0	6.0	10.0	0.6	100.0	6.8	NA	NA	NA	NA	500	335*265*55
0.082	305	FVA26H0823*22	A2	13.0	12.0	6.0	10.0	0.6	100.0	8.2	NA	NA	700	360*170*35	NA	NA
0.082	305	FVA26H0823*2L	A2	13.0	12.0	6.0	10.0	0.6	100.0	8.2	1000	180*170*120	NA	NA	NA	NA
0.082	305	FVA26H0823*2T	A2	13.0	12.0	6.0	10.0	0.6	100.0	8.2	NA	NA	NA	NA	500	335*265*55
0.100	305	FVA26H0104*22	A2	13.0	12.0	6.0	10.0	0.6	100.0	10.0	NA	NA	700	360*170*35	NA	NA
0.100	305	FVA26H0104*2L	A2	13.0	12.0	6.0	10.0	0.6	100.0	10.0	1000	180*170*120	NA	NA	NA	NA
0.100	305	FVA26H0104*2T	A2	13.0	12.0	6.0	10.0	0.6	100.0	10.0	NA	NA	NA	NA	500	335*265*55
0.220	305	FVA36H0224*22	A3	13.0	16.0	8.0	10.0	0.6	100.0	22.0	NA	NA	500	360*170*35	NA	NA
0.220	305	FVA36H0224*2L	A3	13.0	16.0	8.0	10.0	0.6	100.0	22.0	600	180*170*120	NA	NA	NA	NA
0.220	305	FVA36H0224*2T	A3	13.0	16.0	8.0	10.0	0.6	100.0	22.0	NA	NA	NA	NA	NA	335*265*55
0.220	305	FVB16H0224*22	B1	15.0	13.5	7.0	12.5	0.8	100.0	22.0	NA	NA	520	360*170*35	NA	NA
0.220	305	FVB16H0224*2L	B1	15.0	13.5	7.0	12.5	0.8	100.0	22.0	800	180*170*120	NA	NA	NA	NA

\* Insert K for 10% capacitance tolerance (standard); J (+5%) and M (+20%) tolerances available on request.

Second to last digit "2" can be replaced with "H" for THB version

Values outside this standard range may be available – please contact KYOCERA AVX for any special requirements.

KYOCERA AVX reserves the right to supply capacitors to a tighter capacitance tolerance or higher voltage rating, in the same case size.



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## RATINGS AND PART NUMBER REFERENCE – POLYPROPYLENE DIELECTRIC

Cap (µF) ±10%	Rated Voltage (V)	Part Number	Case Code	W ±0.50 (mm)	H ±0.50 (mm)	T ±0.50 (mm)	P ±1.00 (mm)	d ±0.50 (mm)	V/µs (Volt/sec)	I peak (A)	Packaging Method (Fig 1)	Packaging Method (Fig 2)	Packaging Method (Taping)			
V <sub>rms</sub> = 305V Voltage Code: H											Qty	Box Dimension (mm)	Qty	Box Dimension (mm)	Qty	Box Dimension (mm)
0.220	305	FVB16H0224*2T	B1	15.0	13.5	7.0	12.5	0.8	100.0	22.0	NA	NA	NA	400	335*265*55	
0.015	305	FVC16H0153*22	C1	18.0	11.0	5.0	15.0	0.6	100.0	1.5	NA	NA	600	360*170*35	NA	NA
0.015	305	FVC16H0153*2L	C1	18.0	11.0	5.0	15.0	0.6	100.0	1.5	1000	180*170*120	NA	NA	NA	NA
0.015	305	FVC16H0153*2T	C1	18.0	11.0	5.0	15.0	0.6	100.0	1.5	NA	NA	NA	600	335*265*55	
0.047	305	FVC16H0473*22	C1	18.0	11.0	5.0	15.0	0.6	100.0	4.7	NA	NA	600	360*170*35	NA	NA
0.047	305	FVC16H0473*2L	C1	18.0	11.0	5.0	15.0	0.6	100.0	4.7	1000	180*170*120	NA	NA	NA	NA
0.047	305	FVC16H0473*2T	C1	18.0	11.0	5.0	15.0	0.6	100.0	4.7	NA	NA	NA	600	335*265*55	
0.056	305	FVC16H0563*22	C1	18.0	11.0	5.0	15.0	0.6	100.0	5.6	NA	NA	600	360*170*35	NA	NA
0.056	305	FVC16H0563*2L	C1	18.0	11.0	5.0	15.0	0.6	100.0	5.6	1000	180*170*120	NA	NA	NA	NA
0.056	305	FVC16H0563*2T	C1	18.0	11.0	5.0	15.0	0.6	100.0	5.6	NA	NA	NA	600	335*265*55	
0.100	305	FVC16H0104*22	C1	18.0	11.0	5.0	15.0	0.6	100.0	10.0	NA	NA	600	360*170*35	NA	NA
0.100	305	FVC16H0104*2L	C1	18.0	11.0	5.0	15.0	0.6	100.0	10.0	1000	180*170*120	NA	NA	NA	NA
0.100	305	FVC16H0104*2T	C1	18.0	11.0	5.0	15.0	0.6	100.0	10.0	NA	NA	NA	600	335*265*55	
0.068	305	FVC26H0683*22	C2	18.0	12.0	6.0	15.0	0.6	100.0	6.8	NA	NA	500	360*170*35	NA	NA
0.068	305	FVC26H0683*2L	C2	18.0	12.0	6.0	15.0	0.6	100.0	6.8	800	180*170*120	NA	NA	NA	NA
0.068	305	FVC26H0683*2T	C2	18.0	12.0	6.0	15.0	0.6	100.0	6.8	NA	NA	NA	500	335*265*55	
0.082	305	FVC26H0823*22	C2	18.0	11.0	5.0	15.0	0.6	100.0	8.2	NA	NA	600	360*170*35	NA	NA
0.082	305	FVC26H0823*2L	C2	18.0	11.0	5.0	15.0	0.6	100.0	8.2	1000	180*170*120	NA	NA	NA	NA
0.082	305	FVC26H0823*2T	C2	18.0	11.0	5.0	15.0	0.6	100.0	8.2	NA	NA	NA	600	335*265*55	
0.150	305	FVC36H0154*22	C3	18.0	12.0	6.0	15.0	0.8	100.0	15.0	NA	NA	500	360*170*35	NA	NA
0.150	305	FVC36H0154*2L	C3	18.0	12.0	6.0	15.0	0.8	100.0	15.0	800	180*170*120	NA	NA	NA	NA
0.150	305	FVC36H0154*2T	C3	18.0	12.0	6.0	15.0	0.8	100.0	15.0	NA	NA	NA	500	335*265*55	
0.220	305	FVC46H0224*22	C4	18.0	13.5	7.5	15.0	0.8	100.0	22.0	NA	NA	410	360*170*35	NA	NA
0.220	305	FVC46H0224*2L	C4	18.0	13.5	7.5	15.0	0.8	100.0	22.0	600	180*170*120	NA	NA	NA	NA
0.220	305	FVC46H0224*2T	C4	18.0	13.5	7.5	15.0	0.8	100.0	22.0	NA	NA	NA	400	335*265*55	
0.330	305	FVC56H0334*22	C5	18.0	14.0	8.0	15.0	0.8	100.0	33.0	NA	NA	380	360*170*35	NA	NA
0.330	305	FVC56H0334*2L	C5	18.0	14.0	8.0	15.0	0.8	100.0	33.0	500	180*170*120	NA	NA	NA	NA
0.330	305	FVC56H0334*2T	C5	18.0	14.0	8.0	15.0	0.8	100.0	33.0	NA	NA	NA	350	335*265*55	
0.470	305	FVC66H0474*22	C6	18.0	16.0	10.0	15.0	0.8	100.0	47.0	NA	NA	300	360*170*35	NA	NA
0.470	305	FVC66H0474*2L	C6	18.0	16.0	10.0	15.0	0.8	100.0	47.0	400	180*170*120	NA	NA	NA	NA
0.470	305	FVC66H0474*2T	C6	18.0	16.0	10.0	15.0	0.8	100.0	47.0	NA	NA	NA	300	335*265*55	
0.470	305	FVC76H0474*22	C7	18.0	18.0	9.0	15.0	0.8	100.0	47.0	NA	NA	340	360*170*35	NA	NA
0.470	305	FVC76H0474*2L	C7	18.0	18.0	9.0	15.0	0.8	100.0	47.0	400	180*170*120	NA	NA	NA	NA
0.470	305	FVC76H0474*2T	C7	18.0	18.0	9.0	15.0	0.8	100.0	47.0	NA	NA	NA	300	335*265*55	
0.560	305	FVC86H0564*22	C8	18.0	18.0	10.0	15.0	0.8	100.0	56.0	NA	NA	300	360*170*35	NA	NA
0.560	305	FVC86H0564*2L	C8	18.0	18.0	10.0	15.0	0.8	100.0	56.0	300	180*170*120	NA	NA	NA	NA
0.560	305	FVC86H0564*2T	C8	18.0	18.0	10.0	15.0	0.8	100.0	56.0	NA	NA	NA	300	335*265*55	
0.680	305	FVC96H0684*22	C9	18.0	19.0	11.0	15.0	0.8	100.0	68.0	NA	NA	270	360*170*35	NA	NA
0.680	305	FVC96H0684*2L	C9	18.0	19.0	11.0	15.0	0.8	100.0	68.0	300	180*170*120	NA	NA	NA	NA
0.680	305	FVC96H0684*2T	C9	18.0	19.0	11.0	15.0	0.8	100.0	68.0	NA	NA	NA	250	335*265*55	
0.820	305	FVC96H0824*22	C9	18.0	19.0	11.0	15.0	0.8	100.0	82.0	NA	NA	270	360*170*35	NA	NA
0.820	305	FVC96H0824*2L	C9	18.0	19.0	11.0	15.0	0.8	100.0	82.0	300	180*170*120	NA	NA	NA	NA
0.820	305	FVC96H0824*2T	C9	18.0	19.0	11.0	15.0	0.8	100.0	82.0	NA	NA	NA	250	335*265*55	
0.330	305	FVD16H0334*22	D1	26.0	17.0	8.5	22.5	0.8	100.0	33.0	NA	NA	240	360*170*35	NA	NA
0.330	305	FVD16H0334*2L	D1	26.0	17.0	8.5	22.5	0.8	100.0	33.0	300	180*170*120	NA	NA	NA	NA
0.470	305	FVD16H0474*22	D1	26.0	17.0	8.5	22.5	0.8	100.0	47.0	NA	NA	240	360*170*35	NA	NA
0.470	305	FVD16H0474*2L	D1	26.0	17.0	8.5	22.5	0.8	100.0	47.0	300	180*170*120	NA	NA	NA	NA

\* Insert K for 10% capacitance tolerance (standard); J (+5%) and M (+20%) tolerances available on request.

Second to last digit "2" can be replaced with "H" for THB version

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## RATINGS AND PART NUMBER REFERENCE – POLYPROPYLENE DIELECTRIC

Cap (µF) ±10%	Rated Voltage (V)	Part Number	Case Code	W ±0.50 (mm)	H ±0.50 (mm)	T ±0.50 (mm)	P ±1.00 (mm)	d ±0.50 (mm)	V/µs (Volt/sec)	I peak (A)	Packaging Method (Fig 1)	Packaging Method (Fig 2)	Packaging Method (Taping)			
V <sub>rms</sub> = 305V Voltage Code: H											Qty	Box Dimension (mm)	Qty	Box Dimension (mm)	Qty	Box Dimension (mm)
0.680	305	FVD26H0684*22	D2	26.0	19.0	10.0	22.5	0.8	100.0	68.0	NA	NA	200	360*170*35	NA	NA
0.680	305	FVD26H0684*2L	D2	26.0	19.0	10.0	22.5	0.8	100.0	68.0	250	180*170*120	NA	NA	NA	NA
0.820	305	FVD26H0824*22	D2	26.0	19.0	10.0	22.5	0.8	100.0	82.0	NA	NA	200	360*170*35	NA	NA
0.820	305	FVD26H0824*2L	D2	26.0	19.0	10.0	22.5	0.8	100.0	82.0	250	180*170*120	NA	NA	NA	NA
1.000	305	FVD36H0105*22	D3	26.0	20.0	11.0	22.5	0.8	100.0	100.0	NA	NA	180	360*170*35	NA	NA
1.000	305	FVD36H0105*2L	D3	26.0	20.0	11.0	22.5	0.8	100.0	100.0	200	180*170*120	NA	NA	NA	NA
1.200	305	FVD46H0125*22	D4	26.0	22.0	12.0	22.5	0.8	100.0	120.0	NA	NA	160	360*170*35	NA	NA
1.200	305	FVD46H0125*2L	D4	26.0	22.0	12.0	22.5	0.8	100.0	120.0	100	180*170*120	NA	NA	NA	NA
1.500	305	FVD56H0155*22	D5	26.0	23.0	13.0	22.5	0.8	100.0	150.0	NA	NA	150	360*170*35	NA	NA
1.500	305	FVD56H0155*2L	D5	26.0	23.0	13.0	22.5	0.8	100.0	150.0	100	180*170*120	NA	NA	NA	NA
1.800	305	FVD56H0185*22	D5	26.0	23.0	13.0	22.5	0.8	100.0	180.0	NA	NA	150	360*170*35	NA	NA
1.800	305	FVD56H0185*2L	D5	26.0	23.0	13.0	22.5	0.8	100.0	180.0	100	180*170*120	NA	NA	NA	NA
2.200	305	FVD66H0225*22	D6	26.0	25.0	15.0	22.5	0.8	100.0	220.0	NA	NA	138	360*170*50	NA	NA
2.200	305	FVD66H0225*2L	D6	26.0	25.0	15.0	22.5	0.8	100.0	220.0	100	180*170*120	NA	NA	NA	NA
1.000	305	FVE16H0105*22	E1	31.0	20.0	11.0	27.5	0.8	100.0	100.0	NA	NA	150	360*170*35	NA	NA
1.200	305	FVE26H0125*22	E2	31.0	22.0	13.0	27.5	0.8	100.0	120.0	NA	NA	130	360*170*35	NA	NA
1.500	305	FVE26H0155*22	E2	31.0	22.0	13.0	27.5	0.8	100.0	150.0	NA	NA	130	360*170*35	NA	NA
1.800	305	FVE36H0185*22	E3	31.0	28.0	14.0	27.5	0.8	100.0	180.0	NA	NA	125	360*170*50	NA	NA
2.200	305	FVE36H0225*22	E3	31.0	28.0	14.0	27.5	0.8	100.0	220.0	NA	NA	125	360*170*50	NA	NA
2.700	305	FVE46H0275*22	E4	31.0	28.0	18.0	27.5	0.8	100.0	270.0	NA	NA	95	360*170*50	NA	NA
3.000	305	FVE56H0305*22	E5	31.0	28.0	19.5	27.5	0.8	100.0	300.0	NA	NA	85	360*170*50	NA	NA
3.300	305	FVE66H0335*22	E6	31.0	33.0	18.0	27.5	0.8	100.0	330.0	NA	NA	95	360*170*50	NA	NA
3.900	305	FVE76H0395*22	E7	31.0	35.0	26.0	27.5	0.8	100.0	390.0	NA	NA	65	360*170*50	NA	NA
3.900	305	FVE86H0395*22	E8	31.0	31.0	23.0	27.5	0.8	100.0	390.0	NA	NA	75	360*170*50	NA	NA
3.900	305	FVF16H0395*22	F1	41.5	32.0	16.0	37.5	1.0	100.0	390.0	NA	NA	84	360*170*50	NA	NA
3.900	305	FVF26H0395*22	F2	41.5	28.0	19.0	37.5	1.0	100.0	390.0	NA	NA	72	360*170*50	NA	NA
4.700	305	FVE76H0475*22	E7	31.0	35.0	26.0	27.5	0.8	100.0	470.0	NA	NA	65	360*170*50	NA	NA
4.700	305	FVE96H0475*22	E9	31.0	36.0	22.0	27.5	0.8	100.0	470.0	NA	NA	75	360*170*50	NA	NA
4.700	305	FVF36H0475*22	F3	41.5	32.0	19.0	37.5	1.0	100.0	470.0	NA	NA	72	360*170*50	NA	NA
4.700	305	FVF46H0475*22	F4	41.5	36.0	19.0	37.5	1.0	100.0	470.0	NA	NA	72	360*170*50	NA	NA
5.600	305	FVF36H0565*22	F3	41.5	32.0	19.0	37.5	1.0	100.0	560.0	NA	NA	72	360*170*50	NA	NA
5.600	305	FVF56H0565*22	F5	41.5	38.0	20.0	37.5	1.0	100.0	560.0	NA	NA	68	360*170*50	NA	NA
5.600	305	FVF66H0565*22	F6	41.5	40.0	20.0	37.5	1.0	100.0	560.0	NA	NA	56	350*170*80	NA	NA
6.800	305	FVF56H0685*22	F5	41.5	38.0	20.0	37.5	1.0	100.0	680.0	NA	NA	68	360*170*50	NA	NA
6.800	305	FVF76H0685*22	F7	41.5	43.0	28.0	37.5	1.0	100.0	680.0	NA	NA	48	350*170*80	NA	NA
6.800	305	FVF86H0685*22	F8	41.5	44.0	24.0	37.5	1.0	100.0	680.0	NA	NA	42	350*170*80	NA	NA
8.200	305	FVF56H0825*22	F5	41.5	38.0	25.0	37.5	1.0	100.0	820.0	NA	NA	56	360*170*50	NA	NA
8.200	305	FVF66H0825*22	F6	41.5	40.0	20.0	37.5	1.0	100.0	820.0	NA	NA	56	350*170*80	NA	NA
8.200	305	FVF76H0825*22	F7	41.5	43.0	28.0	37.5	1.0	100.0	820.0	NA	NA	48	350*170*80	NA	NA
10.000	305	FVF76H0106*22	F7	41.5	43.0	28.0	37.5	1.0	100.0	1000	NA	NA	48	350*170*80	NA	NA
10.000	305	FVF96H0106*22	F9	41.5	45.0	30.0	37.5	1.0	100.0	1000	NA	NA	44	350*170*80	NA	NA

\* Insert K for 10% capacitance tolerance (standard); J (+5%) and M (+20%) tolerances available on request.

Second to last digit "2" can be replaced with "H" for THB version

Values outside this standard range may be available – please contact KYOCERA AVX for any special requirements.

KYOCERA AVX reserves the right to supply capacitors to a tighter capacitance tolerance or higher voltage rating, in the same case size.

# AC FILTERING

FLC\* RoHS Compliant



## PACKAGING MATERIAL

- Self-extinguishing plastic case (V<sub>0</sub> = in accordance with UL 94) filled thermosetting resin.
- Self-extinguishing thermosetting resin (V<sub>0</sub> = in accordance with UL 94).

## STANDARDS

IEC 61071-1, IEC 61071-2: Power electronic capacitors  
 IEC 60384-17: Fixed metallized polypropylene film dielectric AC and pulse capacitors  
 IEC 60384-17-1: Fixed metallized polypropylene film dielectric AC and pulse capacitors Assessment level E  
 EN CZDS2.E514026 Certificate: E514026 (approved by UL)

The FLC series uses a non-impregnated metallized polypropylene dielectric specially treated to have a very high dielectric strength in operating conditions up to 85°C.

The FLC has been designed for printed circuit board mounting. They are suitable for output AC filtering for power converters, UPS systems, solar inverters and motor drives etc.

## APPLICATIONS

- The FLC capacitor is particularly designed for AC filtering.

## HOT SPOT CALCULATION

See *Hot Spot Temperature*, page 66.

$$\theta_{\text{hot spot}} = \theta_{\text{ambient}} + (P_d + P_t) \times R_{\text{th}}$$

with  $P_d$  (Dielectric losses) =  $Q \times \text{tg}\delta_0$   
 $Q \times \text{tg}\delta_0 \Rightarrow \left[ \frac{1}{2} \times C_n \times (V_{\text{peak to peak}})^2 \times f \right] \times \text{tg}\delta_0$   
 $\text{tg}\delta_0$  (tan delta)  
 For polypropylene,  $\text{tg}\delta_0 = 2 \times 10^{-4}$  for frequencies up to 1MHz and is independent of temperatures.  
 $P_t$  (Thermal losses) =  $R_s \times (I_{\text{rms}})^2$

where  $C_n$  in Farad       $I_{\text{rms}}$  in Ampere       $f$  in Hertz  
 $V$  in Volt               $R_s$  in Ohm               $\theta$  in °C  
 $R_{\text{th}}$  in °C/W

## WORKING TEMPERATURE

According to the power to be dissipated  
 -40°C to +85°C

## LIFETIME EXPECTANCY

One unique feature of this technology (as opposed to aluminum electrolytics) is how the capacitor reacts at the end of its lifetime.

Unlike aluminum electrolytic film capacitors do not have a catastrophic failure mode. Film capacitors simply experience a parametric loss of capacitance of about 5% from initial value, with no risk of short circuit.

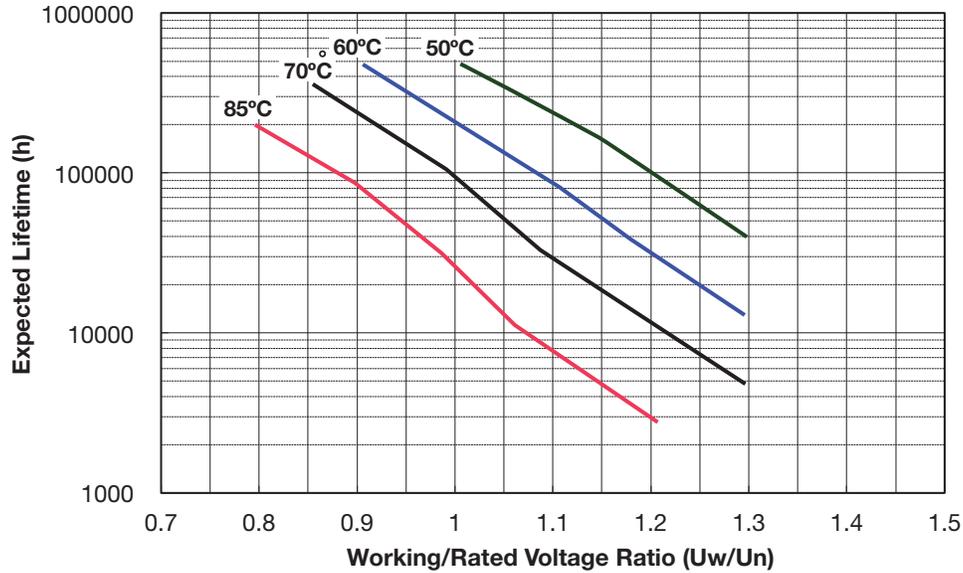
The capacitor continues to be functional even after this 5% decrease.

## HOW TO ORDER

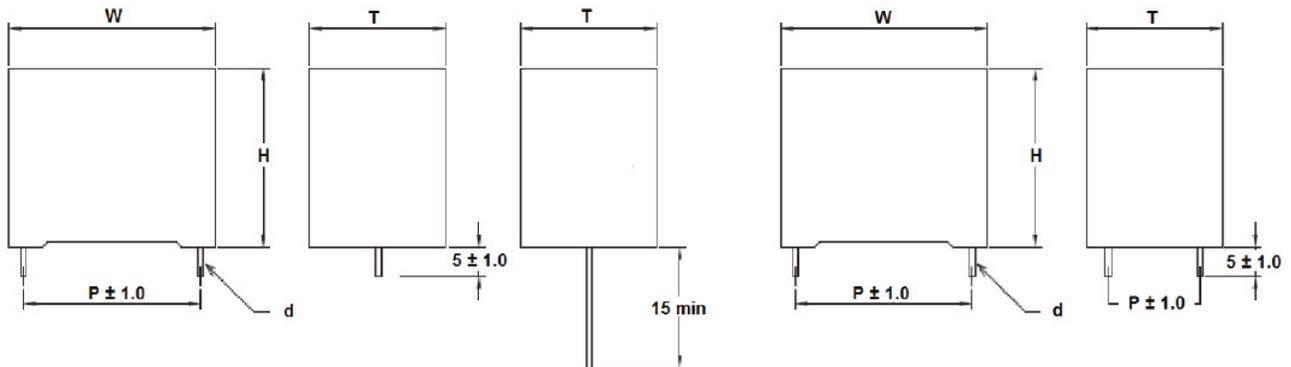
<b>FLC</b>	<b>A</b>	<b>6</b>	<b>V</b>	<b>0225</b>	<b>K</b>	<b>2</b>	<b>C</b>	
Series	Case	Dielectric 6 = Polypropylene	Voltage H = 300V I = 350V A = 250V L = 400V M = 450V	Cap µF Code 0225 = 2.5µF 0106 = 10µF	Tolerances J = ±5% K = ±10%	Lead Type 2 = 2 Leads 4 = 4 Leads	Lead Length C = 5mm L = 15mm	

**LIFETIME EXPECTANCY VS HOT SPOT TEMPERATURE AND VOLTAGE**

**Expected Lifetime Curves (FLC Series)**



**GENERAL DESCRIPTION**



**DIMENSIONS**

**Two Terminal Version**

Case Ref	W (mm)	H (mm)	T (mm)	P (mm)	d (mm)
A	32	22	13	27.5	0.8
B	32	28	14	27.5	0.8
C	32	33	18	27.5	0.8
D	42.5	40	20	37.5	1.0
E	42.5	43	28	37.5	1.0
F	42.5	44	24	37.5	1.0
G	42.5	45	30	37.5	1.2
H	57.5	45	30	52.5	1.2
I	57.5	50	35	52.5	1.2

**Four Terminal Version**

Case Ref	W (mm)	H (mm)	T (mm)	P (mm)	P1 (mm)	d (mm)
J	42.5	40	20	37.5	10.2	1.2
K	42.5	43	28	37.5	10.2	1.2
L	42.5	44	24	37.5	10.2	1.2
M	42.5	45	30	37.5	20.3	1.2
N	57.5	45	30	52.5	20.3	1.2
O	57.5	50	35	52.5	20.3	1.2

# AC FILTERING

FLC\* RoHS Compliant



## ELECTRICAL CHARACTERISTICS

Climatic category	40/85/56 (IEC 60068)
Test voltage between terminals @ 25°C	2.15 x V <sub>rms</sub>
Capacitance range C <sub>n</sub>	1.0µF to 50µF
Capacitance Tolerances:	±5%, ±10%
Rated AC Voltage:	V <sub>rms</sub> 250V to 350V
Dielectric:	Polypropylene
Insulation Resistance:	> 3,000MΩ µF/C after 1 minute electrification @ 100 Vdc & 25°C
Lifetime (ΔC/C < 5%):	100,000hrs @ U <sub>r</sub> & 70°C

## RATINGS AND PART NUMBER REFERENCE – POLYPROPYLENE DIELECTRIC

### TWO TERMINAL

Cap (µF)	Rated Voltage (V)	Part Number	Case Code	W ±0.50 (mm)	H ±0.50 (mm)	T ±0.50 (mm)	P ±1.00 (mm)	d ±0.50 (mm)	V/µs (Volt/sec)	I peak (A)	I rms (A)	R <sub>s</sub> (mΩ)	ESL (nH)	Rth (°C/W)	Packaging Method	
															Box Qty (mm)	Dimensions
<b>V<sub>rms</sub> = 250V Voltage Code: A</b>																
2.2	250	FLCA6A0225K2C	A	32.0	22	13.0	27.5	0.8	25.0	55.0	4.0	17.0	24.0	36.8	130	350*170*80
3.3	250	FLCB6A0335K2C	B	32.0	28	14.0	27.5	0.8	25.0	82.5	6.0	11.6	24.0	23.9	110	350*170*80
5.0	250	FLCC6A0505K2C	C	32.0	33	18.0	27.5	0.8	25.0	125	8.0	8.0	27.0	19.5	95	350*170*80
10.0	250	FLCD6A0106K2C	D	42.5	40	20.0	37.5	1.0	17.0	170	11.0	7.4	30.0	11.2	56	350*170*80
18.0	250	FLCE6A0186K2C	E	42.5	43	28.0	37.5	1.0	17.0	306	12.0	4.0	30.0	17.4	35	350*170*80
20.0	250	FLCG6A0206K2C	G	42.5	45	30.0	37.5	1.2	17.0	340	14.0	3.8	33.0	13.4	44	350*170*80
25.0	250	FLCH6A0256K2C	H	57.5	45	30.0	52.5	1.2	11.0	275	17.0	6.5	35.0	5.3	25	350*170*80
30.0	250	FLCI6A0306K2C	I	57.5	50	35.0	52.5	1.2	11.0	330	20.0	5.4	38.0	4.6	20	350*170*80
40.0	250	FLCI6A0406K2C	I	57.5	50	35.0	52.5	1.2	11.0	440	19.0	5.8	38.0	4.8	20	350*170*80
50.0	250	FLCI6A0506K2C	I	57.5	50	35.0	52.5	1.2	12.0	600	21.0	5.5	38.0	4.1	20	350*170*80
<b>V<sub>rms</sub> = 300V Voltage Code: H</b>																
1.5	300	FLCA6H0155K2C	A	32.0	22	13.0	27.5	0.8	28.0	42.0	4.0	21.2	24.0	29.5	130	350*170*80
2.5	300	FLCB6H0255K2C	B	32.0	28	14.0	27.5	0.8	28.0	70.0	6.0	14.4	24.0	19.3	110	350*170*80
3.3	300	FLCC6H0335K2C	C	32.0	33	18.0	27.5	0.8	28.0	92.4	8.0	10.6	27.0	14.7	95	350*170*80
10.0	300	FLCF6H0106K2C	F	42.5	44	24.0	37.5	1.0	19.0	190	12.0	6.0	30.0	11.6	42	350*170*80
12.0	300	FLCE6H0126K2C	E	42.5	43	28.0	37.5	1.0	19.0	228	12.0	5.0	30.0	13.9	35	350*170*80
15.0	300	FLCG6H0156K2C	G	42.5	45	30.0	37.5	1.2	19.0	285	12.0	4.2	33.0	16.5	44	350*170*80
20.0	300	FLCH6H0206K2C	H	57.5	45	30.0	52.5	1.2	13.0	260	16.0	6.8	35.0	5.7	25	350*170*80
25.0	300	FLCI6H0256K2C	I	57.5	50	35.0	52.5	1.2	13.0	325	19.0	5.4	38.0	5.1	20	350*170*80
<b>V<sub>rms</sub> = 350V Voltage Code: I</b>																
1.0	350	FLCA6I0105K2C	A	32.0	22	13.0	27.5	0.8	35.0	35.0	4.0	23.5	24.0	26.6	130	350*170*80
1.8	350	FLCB6I0185K2C	B	32.0	28	14.0	27.5	0.8	35.0	63.0	6.0	16.5	24.0	16.8	110	350*170*80
2.5	350	FLCC6I0255K2C	C	32.0	33	18.0	27.5	0.8	35.0	87.5	8.0	11.3	27.0	13.8	95	350*170*80
7.5	350	FLCF6I0755K2C	F	42.5	44	24.0	37.5	1.0	24.0	180	10.0	7.5	30.0	13.3	42	350*170*80
9.0	350	FLCE6I0905K2C	E	42.5	43	28.0	37.5	1.0	24.0	216	10.0	6.2	30.0	16.1	35	350*170*80
10.0	350	FLCG6I0106K2C	G	42.5	45	30.0	37.5	1.2	24.0	240	10.0	4.8	33.0	20.8	44	350*170*80
12.0	350	FLCH6I0126K2C	H	57.5	45	30.0	52.5	1.2	17.0	204	17.0	6.5	35.0	5.3	25	350*170*80
20.0	350	FLCI6I0206K2C	I	57.5	50	35.0	52.5	1.2	17.0	340	20.0	5.8	38.0	4.3	20	350*170*80
<b>V<sub>rms</sub> = 400V Voltage Code: L</b>																
1.5	400	FLCA6L0155K2C	A	32.0	22	13.0	27.5	0.8	36.0	54.0	4.0	15.0	25.0	41.6	130	350*170*80
2.2	400	FLCB6L0225K2C	B	32.0	28	14.0	27.5	0.8	36.0	79.2	6.0	11.0	26.0	25.2	110	350*170*80
3.5	400	FLCC6L0355K2C	C	32.0	33	18.0	27.5	0.8	36.0	126.0	8.0	7.0	27.0	22.3	95	350*170*80
7.5	400	FLCD6L0755K2C	D	42.5	40	20.0	37.5	1.0	25.0	187.5	10.0	5.5	30.0	18.1	56	350*170*80
10.0	400	FLCE6L0106K2C	E	42.5	43	28.0	37.5	1.0	25.0	250.0	13.0	4.5	30.0	13.1	35	350*170*80
12.0	400	FLCG6L0126K2C	G	42.5	45	30.0	37.5	1.2	25.0	300.0	16.0	3.5	33.0	11.1	44	350*170*80
16.0	400	FLCH6L0166K2C	H	57.5	45	30.0	52.5	1.2	20.0	320.0	13.0	4.5	35.0	13.1	25	350*170*80
20.0	400	FLCI6L0206K2C	I	57.5	50	35.0	52.5	1.2	20.0	400.0	16.0	3.5	38.0	11.1	20	350*170*80
<b>V<sub>rms</sub> = 450V Voltage Code: M</b>																
1.00	450	FLCA6M0105K2C	A	32.0	22	13.0	27.5	0.8	40.0	40.0	4.0	12.0	25.0	52.0	130	350*170*80
1.50	450	FLCB6M0155K2C	B	32.0	28	14.0	27.5	0.8	40.0	60.0	6.0	10.0	26.0	27.7	110	350*170*80
2.20	450	FLCC6M0225K2C	C	32.0	33	18.0	27.5	0.8	40.0	88.0	8.0	6.5	27.0	24.0	95	350*170*80
4.70	450	FLCD6M0475K2C	D	42.5	40	20.0	37.5	1.0	35.0	164.5	10.0	5.3	30.0	18.8	56	350*170*80
7.50	450	FLCE6M0755K2C	E	42.5	43	28.0	37.5	1.0	35.0	262.5	12.0	4.6	30.0	15.0	35	350*170*80
8.50	450	FLCG6M0855K2C	G	42.5	45	30.0	37.5	1.2	35.0	297.5	13.0	4.0	33.0	14.8	44	350*170*80
12.0	450	FLCH6M0126K2C	H	57.5	45	30.0	52.5	1.2	28.0	336.0	13.0	4.5	35.0	13.1	25	350*170*80
16.0	450	FLCI6M0166K2C	I	57.5	50	35.0	52.5	1.2	28.0	448.0	16.0	3.5	38.0	11.1	20	350*170*80

\* Insert K for 10% capacitance tolerance (standard); J (+5%) and M (+20%) tolerances available on request.

Values outside this standard range may be available – please contact KYOCERA AVX for any special requirements.

KYOCERA AVX reserves the right to supply capacitors to a tighter capacitance tolerance or higher voltage rating, in the same case size.

# AC FILTERING

## FLC\* RoHS Compliant



### FOUR TERMINAL

Cap (µF)	Rated Voltage (V)	Part Number	Case Code	W ±0.50 (mm)	H ±0.50 (mm)	T ±0.50 (mm)	P ±1.00 (mm)	P1 ±1.00 (mm)	d ±0.50 (mm)	V/µs (Volt/sec)	I peak (A)	I rms (A)	R <sub>s</sub> (mΩ)	ESL (nH)	Rth (°C/W)	Box Qty (mm)	Dimensions
<b>V<sub>rms</sub> = 250V Voltage Code: A</b>																	
10.0	250	FLCJ6A0106K4C	J	42.5	40	20.0	37.5	10.2	1.2	17.0	170.0	12.0	6.9	30.0	10.1	56	350*170*80
18.0	250	FLCK6A0186K4C	K	42.5	43	28.0	37.5	10.2	1.2	17.0	306.0	13.0	3.5	30.0	16.9	35	350*170*80
20.0	250	FLCM6A0206K4C	M	42.5	45	30.0	37.5	20.3	1.2	17.0	340.0	15.0	3.3	33.0	13.5	44	350*170*80
25.0	250	FLCN6A0256K4C	N	57.5	45	30.0	52.5	20.3	1.2	11.0	275.0	18.0	6.0	35.0	5.1	25	350*170*80
30.0	250	FLCN6A0306K4C	N	57.5	45	30.0	52.5	20.3	1.2	11.0	330.0	21.0	4.9	35.0	4.6	20	350*170*80
40.0	250	FLCO6A0406K4C	O	57.5	50	35.0	52.5	20.3	1.2	11.0	440.0	20.0	5.3	38.0	4.7	20	350*170*80
50.0	250	FLCO6A0506K4C	O	57.5	50	35.0	52.5	20.3	1.2	12.0	600.0	22.0	5.0	38.0	4.1	20	350*170*80
<b>V<sub>rms</sub> = 300V Voltage Code: H</b>																	
10.0	300	FLCL6H0106K4C	L	42.5	44	24.0	37.5	10.2	1.2	19.0	190.0	13.0	5.5	30.0	10.8	42	350*170*80
12.0	300	FLCK6H0126K4C	K	42.5	43	28.0	37.5	10.2	1.2	19.0	228.0	13.0	4.5	30.0	13.1	35	350*170*80
15.0	300	FLCM6H0156K4C	M	42.5	45	30.0	37.5	20.3	1.2	19.0	285.0	13.0	3.8	33.0	15.6	44	350*170*80
20.0	300	FLCN6H0206K4C	N	57.5	45	30.0	52.5	20.3	1.2	13.0	260.0	17.0	6.3	35.0	5.5	25	350*170*80
25.0	300	FLCO6H0256K4C	O	57.5	50	35.0	52.5	20.3	1.2	13.0	325.0	20.0	4.9	38.0	5.1	20	350*170*80
<b>V<sub>rms</sub> = 350V Voltage Code: I</b>																	
7.5	350	FLCL6I0755K4C	L	42.5	44	24.0	37.5	10.2	1.2	24.0	180.0	11.0	7.0	30.0	11.8	42	350*170*80
9.0	350	FLCK6I0905K4C	K	42.5	43	28.0	37.5	10.2	1.2	24.0	216.0	11.0	5.7	30.0	14.5	35	350*170*80
10.0	350	FLCM6I0106K4C	M	42.5	45	30.0	37.5	20.3	1.2	24.0	240.0	11.0	4.3	33.0	19.2	44	350*170*80
12.0	350	FLCN6I0126K4C	N	57.5	45	30.0	52.5	20.3	1.2	17.0	204.0	18.0	6.0	35.0	5.1	25	350*170*80
20.0	350	FLCO6I0206K4C	O	57.5	50	35.0	52.5	20.3	1.2	17.0	340.0	21.0	5.3	38.0	4.3	20	350*170*80
<b>V<sub>rms</sub> = 400V Voltage Code: L</b>																	
7.5	400	FLCJ6L0755K4C	J	42.5	40	20.0	37.5	10.2	1.0	25.0	187.5	11.0	5.5	30.0	15.00	56	350*170*80
10.0	400	FLCK6L0106K4C	K	42.5	43	28.0	37.5	10.2	1.0	25.0	250.0	14.0	4.5	30.0	11.30	35	350*170*80
13.0	400	FLCM6L0136K4C	M	42.5	45	30.0	37.5	20.3	1.2	25.0	325.0	17.0	4.0	33.0	8.60	44	350*170*80
16.0	400	FLCN6L0166K4C	N	57.5	45	30.0	52.5	20.3	1.2	20.0	320.0	14.0	5.0	35.0	10.20	25	350*170*80
20.0	400	FLCO6L0206K4C	O	57.5	50	35.0	52.5	20.3	1.2	20.0	400.0	20.0	4.0	38.0	6.20	20	350*170*80
<b>V<sub>rms</sub> = 450V Voltage Code: M</b>																	
4.70	450	FLCJ6M0475K4C	J	42.5	40	20.0	37.5	10.2	1.0	35.0	164.5	12.0	5.0	30.0	13.80	56	350*170*80
7.50	450	FLCK6M0755K4C	K	42.5	43	28.0	37.5	10.2	1.0	35.0	262.5	14.0	4.0	30.0	12.70	35	350*170*80
8.50	450	FLCM6M0855K4C	M	42.5	45	30.0	37.5	20.3	1.2	35.0	297.5	14.0	3.5	33.0	14.50	44	350*170*80
12.0	450	FLCN6M0126K4C	N	57.5	45	30.0	52.5	20.3	1.2	28.0	336.0	14.0	4.0	35.0	12.70	25	350*170*80
16.0	450	FLCO6M0166K4C	O	57.5	50	35.0	52.5	20.3	1.2	28.0	448.0	17.0	3.0	38.0	11.50	20	350*170*80

\* Insert K for 10% capacitance tolerance (standard); J (+5%) and M (+20%) tolerances available on request.

Values outside this standard range may be available – please contact KYOCERA AVX for any special requirements.

KYOCERA AVX reserves the right to supply capacitors to a tighter capacitance tolerance or higher voltage rating, in the same case size.

# AC FILTERING

FLA\* RoHS Compliant



The FLA series uses metallized polypropylene dielectric, aluminum can, impregnated with soft PU specially treated to have a very high dielectric strength in operating conditions up to 85°C.

The FLA has been designed with overpressure disconnected device. They are suitable for output AC filtering for power converters, UPS systems, solar inverters and motor drives etc.

## APPLICATIONS

- The FLA capacitor is particularly designed for AC filtering.

## HOT SPOT CALCULATION

See *Hot Spot Temperature*, page 70.

$$\theta_{hot\ spot} = \theta_{ambient} + (P_d + P_t) \times R_{th}$$

with  $P_d$  (Dielectric losses) =  $Q \times tg\delta_0$   
 $Q \times tg\delta_0 \Rightarrow [ \frac{1}{2} \times C_n \times (V_{peak\ to\ peak})^2 \times f ] \times tg\delta_0$   
 $tg\delta_0$  (tan delta)  
 For polypropylene,  $tg\delta_0 = 2 \times 10^{-4}$  for frequencies up to 1MHz and is independent of temperatures.  
 $P_t$  (Thermal losses) =  $R_s \times (I_{rms})^2$

where  $C_n$  in Farad       $I_{rms}$  in Ampere       $f$  in Hertz  
 $V$  in Volt               $R_s$  in Ohm               $\theta$  in °C  
 $R_{th}$  in °C/W

## WORKING TEMPERATURE

According to the power to be dissipated  
 -40°C to +85°C

## LIFETIME EXPECTANCY

One unique feature of this technology (as opposed to aluminum electrolytics) is how the capacitor reacts at the end of its lifetime.

Unlike aluminum electrolytic film capacitors do not have a catastrophic failure mode. Film capacitors simply experience a parametric loss of capacitance of about 5% from initial value, with no risk of short circuit.

The capacitor continues to be functional even after this 5% decrease.

## PACKAGING MATERIAL

- Aluminium can with soft PU

## STANDARDS

IEC 61071-1, IEC 61071-2: Power electronic capacitors  
 EN CYWT2.E514025 Certificate: E514025 (approved by UL)

## HOW TO ORDER

**FLA**



Series

**A1**



Case

- A1-A2
- B1-B4
- C1
- D1
- E1-E8
- F1-F5
- G1-G6
- H1-H2

**6**



Dielectric

- 6 = Polypropylene

**V**



Voltage

- A = 250V
- H = 330V
- L = 450V
- M = 480V
- J = 550V
- R = 600V
- N = 660V
- O = 690V

**0606**



Capacitance  
 EIA Code  
 0606 = 60uF

**K**



Tolerances

- J = ±5%
- K = ±10%

**C**



Terminal Code

- F = Fast-on terminals
- H = M8 screw terminals

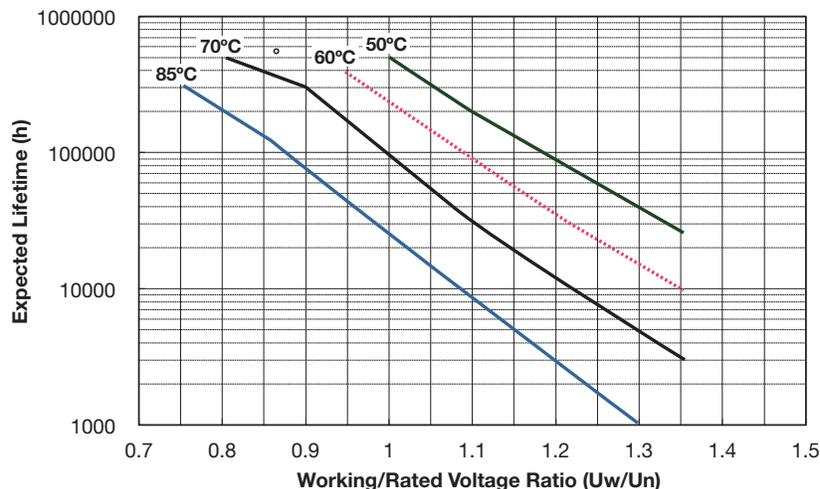


# AC FILTERING

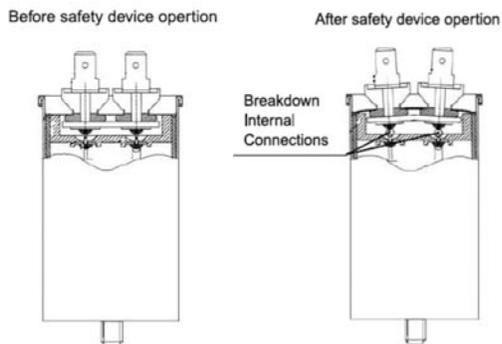
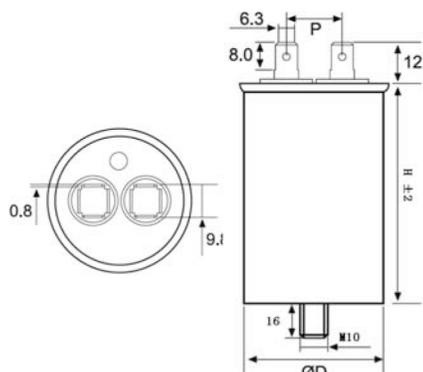
FLA\* RoHS Compliant

## LIFETIME EXPECTANCY VS HOT SPOT TEMPERATURE AND VOLTAGE

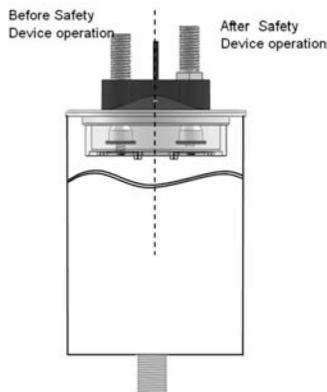
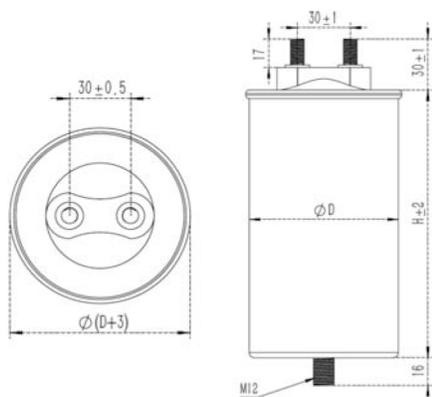
Expected Lifetime Curves (FLA Series)



## GENERAL DESCRIPTION



### Fast-on terminals



### M 8 screw terminals

## DIMENSIONS

Case Ref	OD (mm)	H (mm)
A1	45	100
A2	45	125
B1	50	75
B2	50	100
B3	50	125
B4	50	150
C1	55	125
D1	60	130
E1	63.5	70
E2	63.5	75
E3	63.5	80
E4	63.5	100
E5	63.5	125
E6	63.5	150
E7	63.5	165
E8	63.5	197
F1	75	107
F2	75	122
F3	75	152
F4	75	180
F5	75	197
G1	85	122
G2	85	152
G3	85	180
G4	85	197
G5	85	210
G6	85	247
H1	106	210
H2	106	247

## INSTALLATION TORQUE

Terminals	Torque Nm
Terminals	Torque Nm
M8	6
Stud of Case	Torque Nm
M10	10
M12	15

# AC FILTERING

FLA\* RoHS Compliant



## POLYPROPYLENE DIELECTRIC FOR INDUSTRIAL AC FILTERING

These capacitors have been designed principally for high and medium power AC filtering applications.

### ELECTRICAL CHARACTERISTICS

Climatic category	40/85/56 (IEC 60068)
Test voltage between terminals @ 25°C	2.15 x V <sub>rms</sub>
Capacitance range C <sub>n</sub>	10µF to 600µF
Capacitance Tolerances:	±5%, ±10%
Rated AC Voltage:	V <sub>rms</sub> 250V to 690V
Dielectric:	Polypropylene
Lifetime (ΔC/C < 5%):	100,000hrs @ U <sub>f</sub> & 70°C

### RATINGS AND PART NUMBER REFERENCE – POLYPROPYLENE DIELECTRIC

Cap (µF)	Rated Voltage (V)	Part No.	Case Code	OD ±2 (mm)	H ±2 (mm)	V/µs (Volt/sec)	I Peak (A)	I rms (A)	R <sub>s</sub> (mΩ)	ESL (nH)	Rth (°C/W)	Packaging Method	
												Qty	Box Dimension (mm)
<b>V<sub>rms</sub> = 250V Voltage Code: A</b>													
60.0	250	FLAB26A0606KF	B2	50.0	100.0	16.7	999.0	16.0	6.2	175.0	7.6	20	375*285*235
80.0	250	FLAB26A0806KF	B2	50.0	100.0	16.7	1332.0	16.0	5.6	175.0	8.4	20	375*285*235
100.0	250	FLAB36A0107KF	B3	50.0	125.0	12.6	1260.0	16.0	7.5	175.0	6.3	20	375*285*235
120.0	250	FLAC16A0127KF	C1	55.0	125.0	12.6	1512.0	16.0	7.1	175.0	6.6	20	375*285*235
150.0	250	FLAD16A0157KF	D1	60.0	130.0	12.6	1890.0	18.5	7.5	175.0	4.7	20	375*285*235
150.0	250	FLAF26A0157KH	F2	75.0	122.0	10.8	1620.0	28.0	3.0	190.0	5.1	10	375*285*235
175.0	250	FLAE56A1756KF	E5	63.5	125.0	12.6	2205.0	20.0	7.5	180.0	4.0	12	375*285*235
200.0	250	FLAE76A0207KF	E7	63.5	165.0	11.3	2268.0	20.0	7.5	180.0	4.0	12	375*285*365
200.0	250	FLAG16A0207KH	G1	85.0	122.0	11.7	2340.0	40.0	2.5	200.0	3.0	8	375*285*235
230.0	250	FLAF36A0237KH	F3	75.0	152.0	8.6	1987.2	35.0	3.5	190.0	2.8	10	375*285*365
250.0	250	FLAF36A0257KH	F3	75.0	152.0	8.6	2160.0	32.0	3.6	190.0	3.3	10	375*285*365
300.0	250	FLAF46A0307KH	F4	75.0	180.0	8.6	2592.0	40.0	2.1	190.0	3.6	10	375*285*365
350.0	250	FLAG36A0357KH	G3	85.0	180.0	10.4	3622.5	44.0	1.9	200.0	3.3	8	375*285*365
400.0	250	FLAG36A0407KH	G3	85.0	180.0	10.4	4140.0	45.0	1.8	200.0	3.3	8	375*285*365
500.0	250	FLAG56A0507KH	G5	85.0	210.0	10.8	5400.0	50.0	2.3	220.0	2.1	8	375*285*365
600.0	250	FLAG66A0607KH	G6	85.0	247.0	8.0	4806.0	45.0	2.2	200.0	2.7	8	375*285*365
<b>V<sub>rms</sub> = 330V Voltage Code: H</b>													
50.0	330	FLAB26H0506KF	B2	50.0	100.0	16.7	832.5	16.0	8.7	175.0	5.4	20	375*285*235
60.0	330	FLAB36H0606KF	B3	50.0	125.0	12.6	756.0	16.0	8.2	175.0	5.7	20	375*285*235
100.0	330	FLAD16H0107KF	D1	60.0	130.0	12.6	1260.0	16.0	8.0	175.0	5.9	20	375*285*235
100.0	330	FLAF26H0107KH	F2	75.0	122.0	13.1	1305.0	25.0	3.4	190.0	5.6	10	375*285*235
120.0	330	FLAD16H0127KF	D1	60.0	130.0	7.2	864.0	18.5	7.4	175.0	4.7	20	375*285*235
150.0	330	FLAE66H0157KF	E6	63.5	150.0	8.7	1309.5	20.0	6.8	175.0	4.4	12	375*285*235
150.0	330	FLAF36H0157KH	F3	75.0	152.0	9.0	1350.0	25.0	4.4	190.0	4.4	10	375*285*235
175.0	330	FLAE76H1756KF	E7	63.5	165.0	8.6	1496.3	20.0	6.8	175.0	4.4	12	375*285*365
200.0	330	FLAF46H0207KH	F4	75.0	180.0	13.1	2610.0	35.0	3.7	190.0	2.6	10	375*285*365
200.0	330	FLAG26H0207KH	G2	85.0	152.0	13.1	2610.0	35.0	3.3	200.0	3.0	8	375*285*235
250.0	330	FLAF46H0257KH	F4	75.0	180.0	8.6	2137.5	40.0	2.1	190.0	3.6	10	375*285*365
300.0	330	FLAG36H0307KH	G3	85.0	180.0	13.1	3915.0	40.0	2.0	200.0	3.8	8	375*285*365
350.0	330	FLAG56H0357KH	G5	85.0	210.0	13.1	4567.5	40.0	1.9	200.0	3.9	8	375*285*365
400.0	330	FLAG66H0407KH	G6	85.0	247.0	8.1	3240.0	45.0	2.5	200.0	2.4	8	375*285*365
450.0	330	FLAG66H0457KH	G6	85.0	247.0	8.1	3645.0	45.0	2.2	200.0	2.7	8	375*285*365
<b>V<sub>rms</sub> = 450V Voltage Code: L</b>													
20.0	450	FLAB16L0206KF	B1	50.0	75.0	35.0	700.0	12.0	9.5	175.0	8.8	20	375*285*235
30.0	450	FLAB26L0306KF	B2	50.0	100.0	23.3	700.0	12.0	9.2	175.0	9.1	20	375*285*235
33.0	450	FLAB26L0336KF	B2	50.0	100.0	21.2	700.0	16.0	7.2	175.0	6.5	12	375*285*235
40.0	450	FLAB26L0406KF	B2	50.0	100.0	13.5	540.0	16.0	8.2	175.0	5.7	20	375*285*235
50.0	450	FLAB36L0506KF	B3	50.0	125.0	10.8	540.0	16.0	8.7	175.0	5.4	20	375*285*235
50.0	450	FLAF16L0506KH	F1	75.0	107.0	17.1	855.0	25.0	7.1	190.0	2.7	10	375*285*235
70.0	450	FLAE56L0706KF	E5	63.5	125.0	13.0	907.0	20.0	6.8	175.0	4.4	12	375*285*235

\* Insert K for 10% capacitance tolerance (standard); J (+5%) and M (+20%) tolerances available on request.  
 Values outside this standard range may be available – please contact KYOCERA AVX for any special requirements.  
 KYOCERA AVX reserves the right to supply capacitors to a tighter capacitance tolerance or higher voltage rating, in the same case size.

# AC FILTERING

FLA\* RoHS Compliant



## RATINGS AND PART NUMBER REFERENCE – POLYPROPYLENE DIELECTRIC

Cap (µF)	Rated Voltage (V)	Part No.	Case Code	OD ±2 (mm)	H ±2 (mm)	V/µs (Volt/sec)	I Peak (A)	I rms (A)	R <sub>s</sub> (mΩ)	ESL (nH)	Rth (°C/W)	Packaging Method	
												Qty	Box Dimension (mm)
80.0	450	FLAE56L0806KF	E5	63.5	125.0	11.3	907.2	20.0	6.8	175.0	4.4	12	375*285*235
90.0	450	FLAE56L0906KF	E5	63.5	125.0	11.3	1020.6	20.0	6.8	175.0	4.4	12	375*285*365
100.0	450	FLAF36L0107KH	F3	75.0	152.0	10.8	1080.0	40.0	2.8	190.0	2.7	10	375*285*365
150.0	450	FLAG26L0157KH	G2	85.0	152.0	13.1	1957.5	40.0	2.3	200.0	3.3	8	375*285*365
200.0	450	FLAG56L0207KH	G5	85.0	210.0	13.5	2700.0	50.0	2.0	220.0	2.4	6	375*285*365
250.0	450	FLAG66L0257KH	G6	85.0	247.0	8.1	2025.0	45.0	2.8	200.0	2.1	8	375*285*365
300.0	450	FLAG66L0307KH	G6	85.0	247.0	8.0	2403.0	50.0	2.4	220.0	2.0	6	375*285*365
<b>V<sub>rms</sub> = 480V Voltage Code: M</b>													
20.0	480	FLAE16M0206KF	E1	63.5	70.0	37.5	750.0	16.0	5.2	175.0	9.0	12	375*285*235
25.0	480	FLAE36M0256KF	E3	63.5	80.0	30.0	750.0	16.0	6.3	175.0	7.4	12	375*285*235
30.0	480	FLAE36M0306KF	E3	63.5	80.0	25.0	750.0	16.0	5.8	175.0	8.1	12	375*285*235
40.0	480	FLAE46M0406KF	E4	63.5	100.0	21.3	850.0	16.0	7.9	175.0	5.9	12	375*285*235
50.0	480	FLAE46M0506KF	E4	63.5	100.0	17.0	850.0	20.0	7.2	175.0	4.2	12	375*285*235
50.0	480	FLAF16M0506KH	F1	75.0	107.0	19.0	950.0	25.0	3.8	190.0	5.1	10	375*285*235
60.0	480	FLAF26M0606KH	F2	75.0	122.0	17.6	1053.0	25.0	3.8	190.0	5.1	10	375*285*235
70.0	480	FLAF36M0706KH	F3	75.0	152.0	22.5	1575.0	40.0	2.1	190.0	3.6	10	375*285*235
80.0	480	FLAF36M0806KH	F3	75.0	152.0	15.3	1224.0	40.0	1.9	190.0	3.9	10	375*285*235
100.0	480	FLAF56M0107KH	F5	75.0	197.0	17.1	1710.0	40.0	2.8	190.0	2.7	10	375*285*365
150.0	480	FLAG46M0157KH	G4	85.0	197.0	17.1	2565.0	45.0	2.3	200.0	2.6	8	375*285*365
200.0	480	FLAG66M0207KH	G6	85.0	247.0	13.1	2610.0	45.0	2.8	200.0	2.1	8	375*285*365
250.0	480	FLAG66M0257KH	G6	85.0	247.0	11.7	2925.0	45.0	2.8	200.0	2.1	8	375*285*365
<b>V<sub>rms</sub> = 550V Voltage Code: J</b>													
20.0	550	FLAB26J0206KF	B2	50.0	100.0	30.0	600.0	12.0	8.0	175.0	10.4	20	375*285*235
30.0	550	FLAB36J0306KF	B3	50.0	125.0	25.0	750.0	12.0	8.6	175.0	9.7	20	375*285*235
40.0	550	FLAC16J0406KF	C1	55.0	125.0	18.8	750.0	12.0	7.9	175.0	10.5	20	375*285*235
50.0	550	FLAD16J0506KF	D1	60.0	130.0	17.0	850.0	18.5	7.2	175.0	4.9	20	375*285*235
70.0	550	FLAE76J0706KF	E7	63.5	165.0	12.9	900.0	20.0	5.4	175.0	5.6	12	375*285*365
80.0	550	FLAF46J0806KH	F4	75.0	180.0	22.5	1800.0	30.0	3.0	190.0	4.4	10	375*285*365
100.0	550	FLAG36J0107KH	G3	85.0	180.0	28.2	2821.0	40.0	2.8	200.0	2.7	8	375*285*365
125.0	550	FLAG36J1256KH	G3	85.0	180.0	22.6	2821.0	40.0	2.4	200.0	3.1	8	375*285*365
150.0	550	FLAG66J0157KH	G6	85.0	247.0	21.4	3217.0	45.0	2.6	200.0	2.3	8	375*285*365
200.0	550	FLAG66J0207KH	G6	85.0	247.0	16.1	3217.0	45.0	2.4	200.0	2.5	8	375*285*365
250.0	550	FLAH26J0257KH	H2	106.0	247.0	14.0	3500.0	50.0	2.8	240.0	1.7	6	375*285*365
300.0	550	FLAH26J0307KH	H2	106.0	247.0	11.7	3500.0	50.0	2.7	240.0	1.8	6	375*285*365
<b>V<sub>rms</sub> = 600V Voltage Code: R</b>													
10.0	600	FLAB16R0106KF	B1	50.0	75.0	35.0	350.0	6.5	9.5	160.0	29.9	30	375*285*235
20.0	600	FLAB36R0206KF	B3	50.0	125.0	25.0	500.0	12.0	8.4	160.0	9.9	20	375*285*235
25.0	600	FLAB36R0256KF	B3	50.0	125.0	20.0	500.0	12.0	8.4	160.0	9.9	20	375*285*235
25.0	600	FLAE46R0256KF	E4	63.5	100.0	24.0	600.0	18.0	7.6	175.0	4.9	12	375*285*235
30.0	600	FLAE46R0306KF	E4	63.5	100.0	20.0	600.0	18.0	7.6	175.0	4.9	12	375*285*235
35.0	600	FLAE56R0356KF	E5	63.5	125.0	20.0	700.0	18.0	7.2	175.0	5.1	12	375*285*235
40.0	600	FLAE56R0406KF	E5	63.5	125.0	17.5	700.0	20.0	5.8	175.0	5.2	12	375*285*235
45.0	600	FLAE56R0456KF	E5	63.5	125.0	15.6	700.0	20.0	5.8	175.0	5.2	12	375*285*235
50.0	600	FLAE66R0506KF	E6	63.5	150.0	17.0	850.0	20.0	5.4	175.0	5.6	12	375*285*235
<b>V<sub>rms</sub> = 660V Voltage Code: N</b>													
10.0	660	FLAA16N0106KF	A1	45.0	100.0	40.0	400.0	6.5	9.5	160.0	29.9	30	375*285*235
10.0	660	FLAB16N0106KF	B1	50.0	75.0	55.0	550.0	8.0	8.5	160.0	22.1	20	375*285*235
12.0	660	FLAA16N0126KF	A1	45.0	100.0	35.0	420.0	6.5	9.5	160.0	29.9	30	375*285*235
15.0	660	FLAA26N0156KF	A2	45.0	125.0	28.0	420.0	6.5	9.5	160.0	29.9	30	375*285*235
15.0	660	FLAB26N0156KF	B2	50.0	100.0	36.7	550.0	8.0	8.5	160.0	22.1	20	375*285*235
18.0	660	FLAA26N0186KF	A2	45.0	125.0	25.0	450.0	6.5	9.5	160.0	29.9	30	375*285*235
18.0	660	FLAE26N0186KF	E2	63.5	75.0	36.1	650.0	12.0	7.8	175.0	10.7	12	375*285*235
20.0	660	FLAB36N0206KF	B3	50.0	125.0	27.5	550.0	12.0	7.8	175.0	10.7	20	375*285*235
20.0	660	FLAE26N0206KF	E2	63.5	75.0	32.5	650.0	12.0	7.8	175.0	10.7	12	375*285*235
25.0	660	FLAB46N0256KF	B4	50.0	150.0	22.0	550.0	12.0	7.8	175.0	10.7	20	375*285*235
25.0	660	FLAE46N0256KF	E4	63.5	100.0	26.0	650.0	16.0	7.0	175.0	6.7	12	375*285*235
30.0	660	FLAE56N0306KF	E5	63.5	125.0	25.0	750.0	16.0	7.0	175.0	6.7	12	375*285*235
35.0	660	FLAE56N0356KF	E5	63.5	125.0	21.4	750.0	16.0	7.0	175.0	6.7	12	375*285*235

\* Insert K for 10% capacitance tolerance (standard); J (+5%) and M (+20%) tolerances available on request.

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The Important Information/Disclaimer is incorporated in the catalog where these specifications came from or available online at [www.avx.com/disclaimer/](http://www.avx.com/disclaimer/) by reference and should be reviewed in full before placing any order.

# AC FILTERING

FLA\* RoHS Compliant



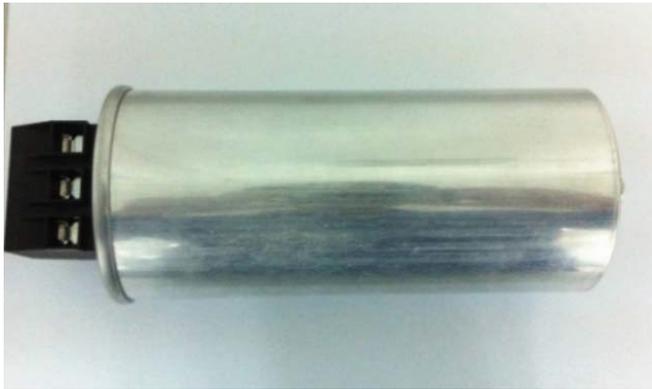
## RATINGS AND PART NUMBER REFERENCE – POLYPROPYLENE DIELECTRIC

Cap (µF)	Rated Voltage (V)	Part No.	Case Code	OD ±2 (mm)	H ±2 (mm)	V/µs (Volt/sec)	I Peak (A)	I rms (A)	R <sub>s</sub> (mΩ)	ESL (nH)	Rth (°C/W)	Packaging Method	
												Qty	Box Dimension (mm)
40.0	660	FLAE66N0406KF	E6	63.5	150.0	22.5	900.0	16.0	7.0	175.0	6.7	12	375*285*235
45.0	660	FLAE66N0456KF	E6	63.5	150.0	20.0	900.0	16.0	6.8	175.0	6.9	12	375*285*235
50.0	660	FLAE66N0506KF	E8	63.5	194.0	20.0	1000.0	18.0	6.0	175.0	6.2	12	375*285*365
<b>V<sub>rms</sub> = 690V Voltage Code: 0</b>													
10.0	690	FLAB36O0106KF	B3	50.0	125.0	75.0	750.0	12.0	8.9	175.0	9.4	20	375*285*235
15.0	690	FLAB36O0156KF	B3	50.0	125.0	50.0	750.0	12.0	8.3	175.0	10.0	20	375*285*235
20.0	690	FLAE56R0206KF	E5	63.5	125.0	45.0	900.0	16.0	6.5	175.0	7.2	12	375*285*235
30.0	690	FLAE56O0306KF	E5	63.5	125.0	30.0	900.0	16.0	6.5	175.0	7.2	12	375*285*365
40.0	690	FLAF46O0406KH	F4	75.0	180.0	28.8	1150.0	25.0	5.8	190.0	3.3	10	375*285*365
50.0	690	FLAF46O0506KH	F4	75.0	180.0	23.0	1150.0	25.0	5.4	190.0	3.6	10	375*285*365
70.0	690	FLAG56O0706KH	G5	85.0	210.0	18.0	1260.0	40.0	3.4	200.0	2.2	8	375*285*365
85.0	690	FLAG56O0856KH	G5	85.0	210.0	18.0	1530.0	50.0	3.0	220.0	1.6	6	375*285*365
100.0	690	FLAH16O0107KH	H1	106.0	210.0	18.0	1800.0	50.0	2.7	240.0	1.8	6	375*285*365
125.0	690	FLAH26O1256KH	H2	106.0	247.0	12.5	1563.0	50.0	2.6	220.0	1.8	6	375*285*365
150.0	690	FLAH26O0157KH	H2	106.0	247.0	12.5	1875.0	50.0	2.4	240.0	2.0	6	375*285*365
170.0	690	FLAH26O0177KH	H2	106.0	247.0	12.5	2125.0	50.0	2.2	240.0	2.2	6	375*285*365

\* Insert K for 10% capacitance tolerance (standard); J (+5%) and M (+20%) tolerances available on request.  
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 KYOCERA AVX reserves the right to supply capacitors to a tighter capacitance tolerance or higher voltage rating, in the same case size.

# AC FILTERING

FLB\* RoHS Compliant



## PACKAGING MATERIAL

- Aluminium can with soft PU

## STANDARDS

IEC 61071-1, IEC 61071-2: Power electronic capacitors  
 IEC 60831: Shunt power capacitors of selfhealing type for ac systems having a rated voltage up to and including 1kv  
 EN CYWT2.E514025 Certificate: E514025 (approved by UL)

## LIFETIME EXPECTANCY

One unique feature of this technology (as opposed to aluminum electrolytic) is how the capacitor reacts at the end of its lifetime.

Unlike aluminum electrolytic film capacitors do not have a catastrophic failure mode. Film capacitors simply experience a parametric loss of capacitance of about 5% from initial value, with no risk of short circuit.

The capacitor continues to be functional even after this 5% decrease.

The FLB series uses metallized polypropylene dielectric, aluminum can, impregnated with soft PU specially treated to have a very high dielectric strength in operating conditions up to 85°C.

The FLB has been designed with overpressure disconnected device. They are suitable for power factor correction and output AC filtering for power converters, UPS systems, solar inverters and motor drives etc.

## APPLICATIONS

- The FLB capacitor is particularly designed for AC filtering and power factor correction.

## HOT SPOT CALCULATION

See *Hot Spot Temperature*, page 75.

$$\theta_{\text{hot spot}} = \theta_{\text{ambient}} + (P_d + P_t) \times R_{th}$$

with  $P_d$  (Dielectric losses) =  $Q \times \text{tg}\delta_0$   
 $Q \times \text{tg}\delta_0 \Rightarrow [ \frac{1}{2} \times C_n \times (V_{\text{peak to peak}})^2 \times f ] \times \text{tg}\delta_0$   
 $\text{tg}\delta_0$  (tan delta)  
 For polypropylene,  $\text{tg}\delta_0 = 2 \times 10^{-4}$  for frequencies up to 1MHz and is independent of temperatures.  
 $P_t$  (Thermal losses) =  $R_s \times (I_{\text{rms}})^2$

where  $C_n$  in Farad     $I_{\text{rms}}$  in Ampere     $f$  in Hertz  
 $V$  in Volt     $R_s$  in Ohm     $\theta$  in °C  
 $R_{th}$  in °C/W

## WORKING TEMPERATURE

According to the power to be dissipated  
 -40°C to +85°C

## HOW TO ORDER

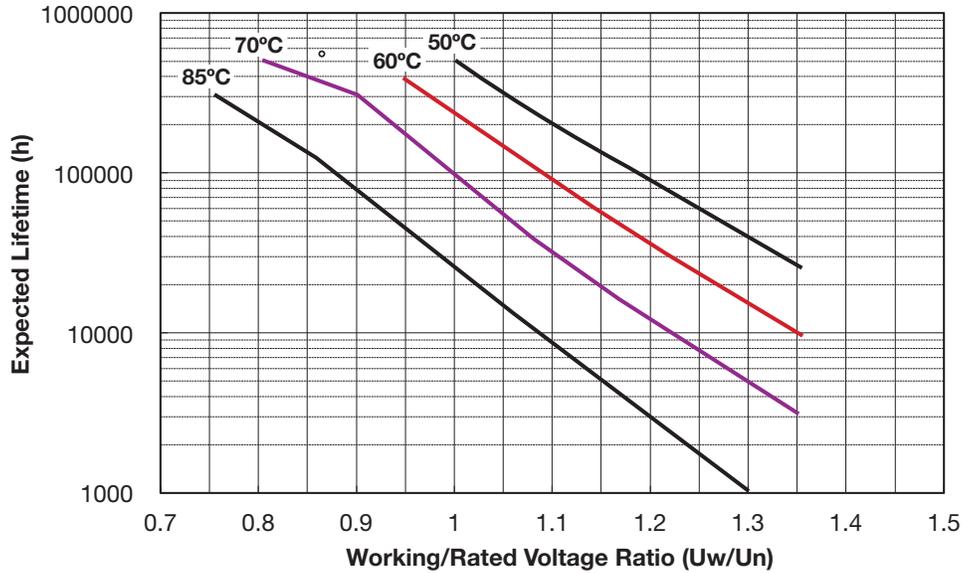
<b>FLB</b>	<b>A</b>	<b>6</b>	<b>V</b>	<b>0335</b>	<b>K</b>	<b>03</b>
Series	Case	Dielectric	Voltage	Capacitance EIA Code	Tolerances	Terminal Code
	A B C D E F G H J	6 = Polypropylene	A = 230V I = 400V L = 440V J = 525V N = 660V O = 690V	0103 = 0.01µF	J = ±5% K = ±10%	03 = 3 phase

# AC FILTERING

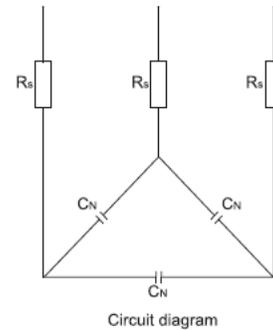
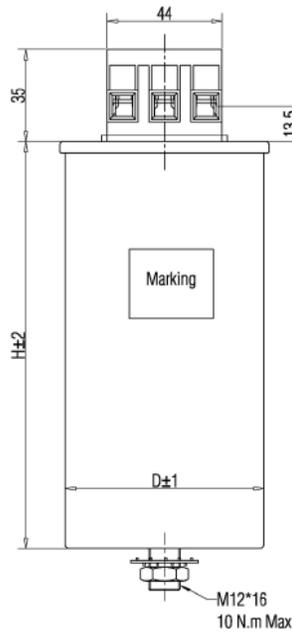
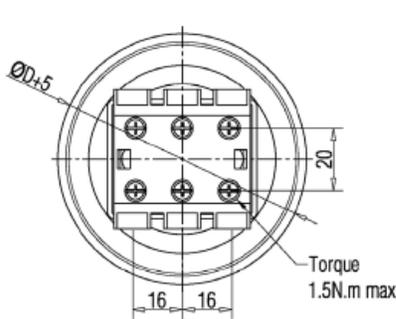
FLB\* RoHS Compliant

## LIFETIME EXPECTANCY VS HOT SPOT TEMPERATURE AND VOLTAGE

Expected Lifetime Curves (FLB Series)



## GENERAL DESCRIPTION



\* Rs is external discharge resistor selected from following range by customer. KYOCERA AVX does not provide external discharge capacitor.

## DIMENSIONS

Case Ref	OD (mm)	H (mm)
A	85	200
B	85	265
C	85	350
D	116	160
E	116	200
F	116	230
G	116	265
H	136	200
J	136	230

Vrms	Resistor Range
230V	220kΩ~400kΩ
400V	270kΩ~800kΩ
440V	270kΩ~800kΩ
525V	270kΩ~1200kΩ
660V	800kΩ~2000kΩ
690V	800kΩ~1500kΩ

# AC FILTERING

FLB\* RoHS Compliant



## ELECTRICAL CHARACTERISTICS

Climatic category	-40/D (IEC 60068)
Test voltage between terminals @ 25°C	2.15 x V <sub>rms</sub>
Capacitance range C <sub>n</sub>	3*20.3μF to 3*335μF
Capacitance Tolerances:	±5%, ±10%
Rated AC Voltage:	V <sub>rms</sub> 230V to 690V
Dielectric:	Polypropylene
Lifetime (ΔC/C ≤ 5%):	100,000hrs @ U <sub>i</sub> & 70°C

## RATINGS AND PART NUMBER REFERENCE – POLYPROPYLENE DIELECTRIC

Cap (μF)	Rated Voltage (V)	Part No.	Case Code	Diameter ±2 (mm)	H ±2 (mm)	Output (kvar)	I rms (A)	V/μs (Volt/sec)	I Peak (A)	Packaging Method	
										Box Qty (mm)	Dimension
<b>V<sub>rms</sub> = 230V Voltage Code: A</b>											
3 x 200.6	230	FLBB6A0207K03	B	85.0	265.0	10.0	25.1	37.0	7530	8	375*285*365
3 x 200.6	230	FLBD6A0207K03	D	116.0	160.0	10.0	25.1	37.0	7530	5	375*285*235
3 x 250.7	230	FLBC6A0257K03	C	85.0	350.0	12.5	31.4	37.0	9420	8	375*285*435
3 x 250.7	230	FLBE6A0257K03	E	116.0	200.0	12.5	31.4	37.0	9420	5	375*285*365
3 x 300.9	230	FLBC6A0307K03	C	85.0	350.0	15.0	37.7	37.0	11310	8	375*285*435
3 x 300.9	230	FLBE6A0307K03	E	116.0	200.0	15.0	37.7	37.0	11310	5	375*285*365
3 x 335.0	230	FLBF6A3356K03	F	116.0	230.0	16.7	41.9	37.0	12570	5	375*285*365
<b>V<sub>rms</sub> = 400V Voltage Code: I</b>											
3 x 66.3	400	FLBA6I0666K03	A	85.0	200.0	10.0	14.4	65.0	4320	8	375*285*365
3 x 82.9	400	FLBA6I0826K03	A	85.0	200.0	12.5	18.0	65.0	5400	8	375*285*365
3 x 99.5	400	FLBA6I0996K03	A	85.0	200.0	15.0	21.6	65.0	6480	8	375*285*365
3 x 110.7	400	FLBB6I0117K03	B	85.0	265.0	16.7	24.1	65.0	7230	8	375*285*365
3 x 110.7	400	FLBD6I0117K03	D	116.0	160.0	16.7	24.1	65.0	7230	5	375*285*235
3 x 132.6	400	FLBB6I1326K03	B	85.0	265.0	20.0	28.8	65.0	8640	8	375*285*365
3 x 132.6	400	FLBD6I1326K03	D	116.0	160.0	20.0	28.8	65.0	8640	5	375*285*235
3 x 165.8	400	FLBB6I1656K03	B	85.0	265.0	25.0	36.1	65.0	10830	8	375*285*365
3 x 165.8	400	FLBE6I1656K03	E	116.0	200.0	25.0	36.1	65.0	10830	5	375*285*365
3 x 198.9	400	FLBH6I1986K03	H	136.0	200.0	30.0	43.3	65.0	12990	4	375*285*365
<b>V<sub>rms</sub> = 440V Voltage Code: L</b>											
3 x 68.5	440	FLBA6L0686K03	A	85.0	200.0	12.5	16.4	72.0	4920	8	375*285*365
3 x 77.0	440	FLBA6L0776K03	A	85.0	200.0	14.1	18.5	72.0	5550	8	375*285*365
3 x 77.0	440	FLBD6L0776K03	D	116.0	160.0	14.1	18.5	72.0	5550	5	375*285*235
3 x 82.2	440	FLBA6L0826K03	A	85.0	200.0	15.0	19.7	72.0	5910	8	375*285*365
3 x 92.6	440	FLBA6L0926K03	A	85.0	200.0	16.9	22.2	72.0	6660	8	375*285*365
3 x 103.0	440	FLBB6L1036K03	B	85.0	265.0	18.8	24.7	72.0	7410	8	375*285*365
3 x 103.0	440	FLBD6L1036K03	D	116.0	160.0	18.8	24.7	72.0	7410	5	375*285*235
3 x 109.0	440	FLBB6L1096K03	B	85.0	265.0	20.0	26.2	72.0	7860	8	375*285*365
3 x 109.0	440	FLBD6L1096K03	D	116.0	160.0	20.0	26.2	72.0	7860	5	375*285*235
3 x 123.3	440	FLBB6L1236K03	B	85.0	265.0	22.5	29.5	72.0	8850	8	375*285*365
3 x 123.3	440	FLBD6L1236K03	D	116.0	160.0	22.5	29.5	72.0	8850	5	375*285*235
3 x 137.0	440	FLBB6L1376K03	B	85.0	265.0	25.0	32.8	72.0	9840	8	375*285*365
3 x 137.0	440	FLBE6L1376K03	E	116.0	200.0	25.0	32.8	72.0	9840	5	375*285*365
3 x 154.0	440	FLBB6L1546K03	B	85.0	265.0	28.1	36.9	72.0	11070	8	375*285*365
3 x 154.0	440	FLBE6L1546K03	E	116.0	200.0	28.1	36.9	72.0	11070	5	375*285*365
3 x 164.4	440	FLBC6L1646K03	C	85.0	350.0	30.0	39.4	72.0	11820	8	375*285*435
3 x 164.4	440	FLBE6L1646K03	E	116.0	200.0	30.0	39.4	72.0	11820	5	375*285*365
3 x 180.9	440	FLBH6L1806K03	H	136.0	200.0	33.0	43.3	72.0	12990	2	375*285*365

\* Insert K for 10% capacitance tolerance (standard); J (+5%) and M (+20%) tolerances available on request.

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# AC FILTERING

FLB\* RoHS Compliant



## RATINGS AND PART NUMBER REFERENCE – POLYPROPYLENE DIELECTRIC

Cap (µF)	Rated Voltage (V)	Part No.	Case Code	Diameter ±2 (mm)	H ±2 (mm)	Output (kvar)	I rms (A)	V/µs (Volt/sec)	I Peak (A)	Packaging Method	
										Box Qty (mm)	Dimension
<b>V<sub>rms</sub> = 525V Voltage Code: J</b>											
3 x 38.5	525	FLBA6J0386K03	A	85.0	200.0	10	11.0	86.0	3300	8	375*285*365
3 x 48.1	525	FLBA6J0486K03	A	85.0	200.0	12.5	13.7	86.0	4110	8	375*285*365
3 x 53.1	525	FLBA6J0536K03	A	85.0	200.0	13.8	15.2	86.0	4560	8	375*285*365
3 x 57.7	525	FLBA6J0576K03	A	85.0	200.0	15.0	16.5	86.0	4950	8	375*285*365
3 x 77.0	525	FLBB6J0776K03	B	85.0	265.0	20.0	22.0	86.0	6600	8	375*285*365
3 x 77.0	525	FLBD6J0776K03	D	116.0	160.0	20.0	22.0	86.0	6600	5	375*285*235
3 x 96.2	525	FLBB6J0966K03	B	85.0	265.0	25.0	27.5	86.0	8250	8	375*285*365
3 x 96.2	525	FLBE6J0966K03	E	116.0	200.0	25.0	27.5	86.0	8250	5	375*285*365
3 x 115.4	525	FLBF6J1156K03	F	116.0	230.0	30.0	33.0	86.0	9900	5	375*285*365
3 x 115.4	525	FLBH6J1156K03	H	136.0	200.0	30.0	33.0	86.0	9900	2	375*285*365
3 x 138.2	525	FLBG6J1386K03	G	116.0	265.0	35.9	39.5	86.0	11850	5	375*285*365
3 x 138.2	525	FLBJ6J1386K03	J	136.0	230.0	35.9	39.5	86.0	11850	2	375*285*365
3 x 142.8	525	FLBG6J1426K03	G	116.0	265.0	37.1	40.8	86.0	12240	5	375*285*365
3 x 142.8	525	FLBJ6J1426K03	J	136.0	230.0	37.1	40.8	86.0	12240	2	375*285*365
<b>V<sub>rms</sub> = 660V Voltage Code: N</b>											
3 x 20.3	660	FLBA6N0206K03	A	85.0	200.0	8.33	7.3	108.0	2190	8	375*285*365
3 x 24.4	660	FLBa6N0246K03	A	85.0	200.0	10.0	8.7	108.0	2610	8	375*285*365
3 x 30.4	660	FLBB6N0306K03	B	85.0	265.0	12.5	10.9	108.0	3270	8	375*285*365
3 x 36.5	660	FLBB6N0366K03	B	85.0	265.0	15.0	13.1	108.0	3930	8	375*285*365
3 x 40.7	660	FLBB6N0406K03	B	85.0	265.0	16.7	14.6	108.0	4380	8	375*285*365
3 x 48.7	660	FLBC6N0486K03	C	85.0	350.0	20.0	17.5	108.0	5250	8	375*285*435
3 x 55.8	660	FLBC6N0556K03	C	85.0	350.0	22.9	20.0	108.0	6000	8	375*285*435
<b>V<sub>rms</sub> = 690V Voltage Code: O</b>											
3 x 27.9	690	FLBB6O0276K03	B	85.0	265.0	12.5	10.5	112.0	3150	8	375*285*365
3 x 33.4	690	FLBB6O0336K03	B	85.0	265.0	15.0	12.5	112.0	3750	8	375*285*365
3 x 44.6	690	FLBC6O0446K03	C	85.0	350.0	20.0	16.7	112.0	5010	8	375*285*435
3 x 55.7	690	FLBC6O0556K03	C	85.0	350.0	25.0	20.9	112.0	6270	8	375*285*435

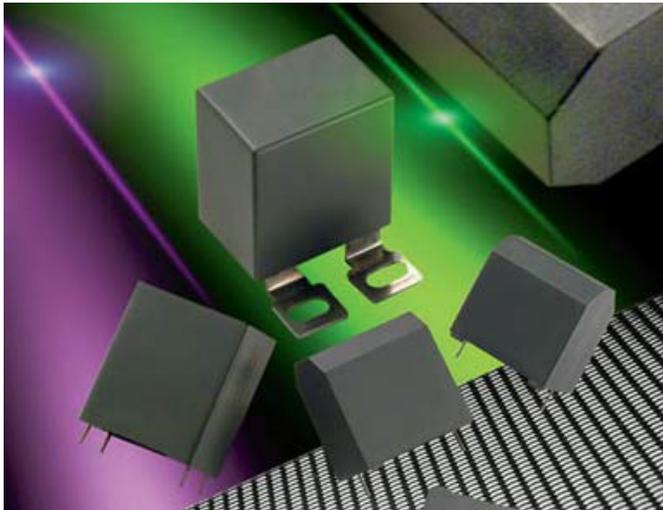
\* Insert K for 10% capacitance tolerance (standard); J (+5%) and M (+20%) tolerances available on request.

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# PROTECTION

FSB\* RoHS Compliant



## GENERAL DESCRIPTION

Metallized polypropylene dielectric capacitor with controlled self-healing.

Reinforced metallization developed for high impulse currents.

## APPLICATIONS

- IGBT protection
- IGBT clamping

## PACKAGING MATERIAL

- Plastic case backfilled with thermosetting resin

## HOW TO ORDER

**FSB**

Series

**1**

Case Size

- 1 = PO Style
- 2 = 18 Style
- 3 = 19 Style
- 4 = 26 style
- 5 = R28 Style (2 terminal or 4 terminal)
- 6-C (Lug Terminals)

**6**

Dielectric

- 6 = Polypropylene

**U**

Voltage Code

- A = 700V
- B = 850V
- C = 1000V
- U = 1200V
- G = 1500V
- N = 2000V

**0154**

Capacitance Code

- 0 + pF code
- 0154 = 0.15 $\mu$ F
- 0334 = 0.33 $\mu$ F
- 0255 = 2.5 $\mu$ F etc.

**J**

Capacitance Tolerances

- J =  $\pm$  5%
- K =  $\pm$  10% (Case size 6 only)

**--**

Terminal Code

- = 2 Terminal
- JC = 4 Terminal (Case Size 5 option only)
- 90 = 90° Terminals
- 18 = 180° Terminals (Case size 6-C options only)



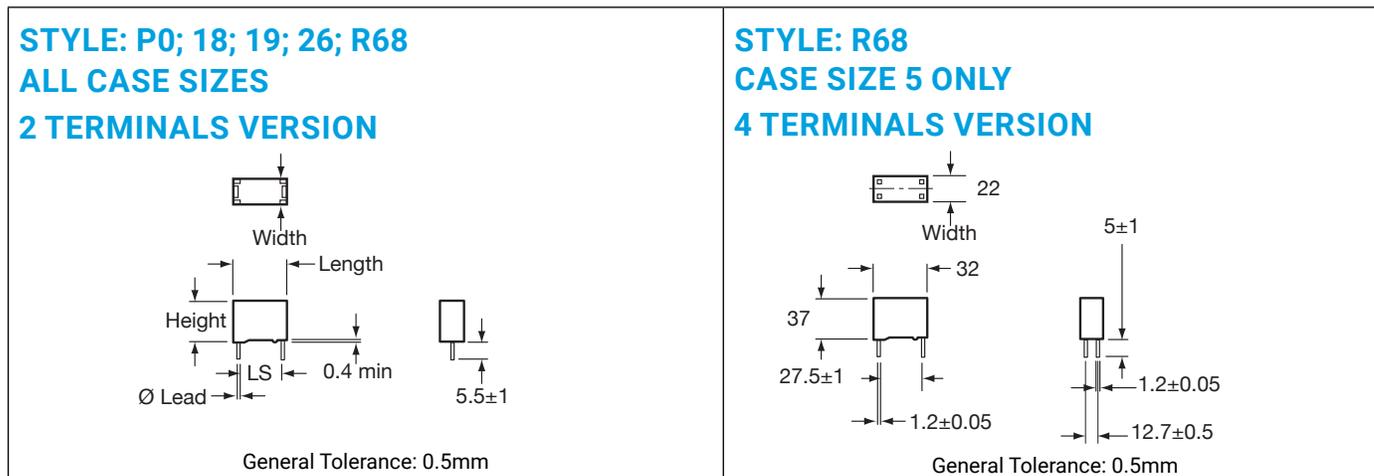
## ELECTRICAL CHARACTERISTICS

Capacitance Range $C_n$	0.10 $\mu$ F to 5.6 $\mu$ F
Tolerance on $C_n$	$\pm$ 5%, $\pm$ 10%
Rated DC Voltage $V_n$ ,dc	700 to 2000 V
Stray Inductance	$\leq$ 25 nH
RMS Current	$I_{rms}$ max. = up to 28A The currents shown in the tables are maximum. It is necessary to maintain operation within the maximum temperature of the dielectric 85°C. See "Hot spot temperature calculation"
Insulation Resistance	$R_i \times C \geq 30,000$ s
Impulse Current	$I^2.t$ max. = up to 1.69 A <sup>2</sup> s Spikes or peak currents in the capacitors may cause a deterioration of the bonding between the metallization and the connections. These bonds are capable of withstanding only a limited amount of energy for each spike. The table shows the maximum energy permitted in the form ( $I^2.t$ ), where I is in Amperes, and t is in seconds.
<b>Note:</b> The formula ( $I^2.t$ ) replaces dv/dt which is less easy to use as it is not an expression of energy ( $I = C.dv/dt$ ). This type of capacitor has been designed to withstand high ( $I^2.t$ ) values.	
Variation of Capacitance with Temperature	$\frac{\Delta C}{C} \leq \pm 2\%$ between -40 and +85°C
Climatic Category	40/085/56 (IEC 68)
Test Voltage Between Terminals @ 25°C	1.6 $V_n$ ,dc during 10s
Withstanding Voltage Between Terminals and Case @ 25°C	@ 3 kVrms @ 50Hz during 1 min.

# PROTECTION

FSB\* RoHS Compliant

## GENERAL DESCRIPTION



## DIMENSIONS

Case Size	Case Style	Length ±0.50 mm	Width ±0.50 mm	Height ±0.50 mm	Dimensions lead -0.05 mm	LS ±1.00 mm
1	P0	32	13.0	22.0	Ø 0.80	27.5
2	18	32	16.0	25.0	Ø 0.80	27.5
3	19	32	18.0	28.0	Ø 0.80	27.5
4	26	32	21.0	31.0	Ø 1.00	27.5
5	R68 2 Terminals Version	32	22.0	37.0	Ø 1.00	27.5
	R68 4 Terminals Version	32	2.0	37.0	Ø 1.20	27.5

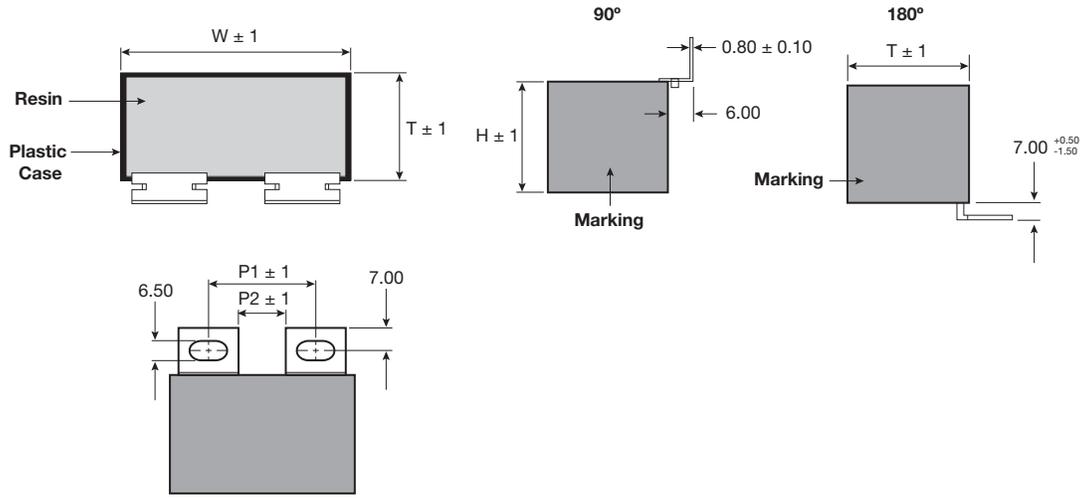
## RATINGS AND PART NUMBER REFERENCE

Part Number	Capacitance (µF)	Case Style	Dv/Dt	I <sub>rms</sub> (A)	R <sub>s</sub> (mΩ)	R <sub>th</sub> (hotspot/amb.)	ESL (nH)
<b>V<sub>ndc</sub>=1200V V<sub>peak</sub>=1600V V<sub>rms</sub>=560v V<sub>s</sub>=2000V</b>				<b>Voltage Code: U</b>			
FSB16U0154J--	0.15	PO	500	3.0	14.3	45.9	25.0
FSB26U0274J--	0.27	18	500	7.6	8.4	36.8	25.0
FSB36U0394J--	0.39	19	500	11.0	6.2	32.2	25.0
FSB46U0474J--	0.47	26	500	12.0	5.6	29.4	25.0
FSB56U0684J--	0.68	R68 (2 terminals)	500	12.0	3.8	23.7	25.0
FSB56U0684JJC	0.68	R68 (4 terminals)	500	16.7	3.8	23.7	25.0
<b>V<sub>ndc</sub>=1600V V<sub>peak</sub>=2000V V<sub>rms</sub>=630v V<sub>s</sub>=2300V</b>				<b>Voltage Code: M</b>			
FSB16M0134J--	0.13	PO	600	4.6	13.3	44.9	25.0
FSB26M0184J--	0.18	18	600	6.4	9.9	35.9	25.0
FSB36M0244J--	0.24	19	600	8.5	7.8	32.4	25.0
FSB46M0334J--	0.33	26	600	11.7	5.6	28.6	25.0
FSB56M0434J--	0.43	R68 (2 terminals)	600	12.0	4.6	23.8	25.0
FSB56M0434JJC	0.43	R68 (4 terminals)	600	15.2	4.6	23.8	25.0
<b>V<sub>ndc</sub>=2000V V<sub>peak</sub>=2400V V<sub>rms</sub>=700v V<sub>s</sub>=2600V</b>				<b>Voltage Code: N</b>			
FSB16N0104J--	0.10	PO	700	4.2	14.3	44.6	25.0
FSB26N0134J--	0.13	18	700	5.5	11.3	35.7	25.0
FSB36N0184J--	0.18	19	700	7.6	8.5	32.1	25.0
FSB46N0224J--	0.22	26	700	9.3	6.8	29.1	25.0
FSB56N0304J--	0.30	R68 (2 terminals)	700	12.0	5.3	23.8	25.0
FSB56N0304JJC	0.30	R68 (4 terminals)	700	12.7	5.3	23.8	25.0

# PROTECTION

FSB\* RoHS Compliant

## CASE SIZE 6-C



## RATINGS AND PART NUMBER REFERENCE FOR LUG TERMINALS

Cap (µF) ±10%	Rated Voltage (V)	Part Number		Case Size	W ±0.50 (mm)	H ±0.50 (mm)	T ±0.50 (mm)	P1 ±0.50 (mm)	P2 ±0.50 (mm)	dv/dt Volt/sec	I peak Amps	I rms Amps	Rs mΩ	ESL nH	Rth °C/W	Packaging Inner Box				
		90°	180°													Qty	Size			
<b>V<sub>ndc</sub> = 700V V<sub>peak</sub> = ?V V<sub>rms</sub> = ?v V<sub>s</sub> = ?V</b>																	<b>Voltage Code: A</b>		<b>Qty</b>	<b>Size</b>
1.20	700	FSBA6A0125K90	FSBA6A0125K18	A	42.50	27.5	24.5	23~28	11.0	600.0	720.0	17.5	4.0	18.0	16.4	42	360*170*80			
2.00	700	FSBB6A0205K90	FSBB6A0205K18	B	42.50	35.5	33.5	23~28	11.0	600.0	1200.0	23.5	3.3	20.0	11.3	35	360*170*80			
2.20	700	FSBB6A0225K90	FSBB6A0225K18	B	42.50	35.5	33.5	23~28	11.0	600.0	1320.0	24.0	3.1	20.0	10.8	35	360*170*80			
2.50	700	FSBB6A0255K90	FSBB6A0255K18	B	42.50	35.5	33.5	23~28	11.0	600.0	1500.0	24.5	2.9	20.0	10.1	35	360*170*80			
3.00	700	FSBB6A0305K90	FSBB6A0305K18	B	42.50	45.0	33.0	23~28	11.0	600.0	1800.0	27.5	2.7	20.0	7.7	40	360*170*80			
3.30	700	FSB96A0335K90	FSB96A0335K18	9	42.50	45.0	33.0	23~28	11.0	600.0	1980.0	28.0	2.7	25.0	7.2	40	360*170*80			
3.50	700	FSB96A0355K90	FSB96A0355K18	9	42.50	45.0	33.0	23~28	11.0	600.0	2100.0	28.5	2.6	25.0	7.4	40	360*170*80			
4.00	700	FSB86A0405K90	FSB86A0405K18	8	57.50	45.0	30.0	37~39	24.0	360.0	1440.0	29.0	4.4	35.0	7.9	25	360*170*80			
4.70	700	FSB76A0475K90	FSB76A0475K18	7	57.50	50.0	35.0	37~39	24.0	360.0	1692.0	35.0	4.1	38.0	6.9	20	360*170*80			
5.00	700	FSB76A0505K90	FSB76A0505K18	7	57.50	50.0	35.0	37~39	24.0	360.0	1800.0	37.0	3.9	38.0	6.9	20	360*170*80			
5.60	700	FSB76A0565K90	FSB76A0565K18	7	57.50	50.0	35.0	37~39	24.0	360.0	2016.0	39.0	3.7	38.0	6.5	20	360*170*80			
<b>V<sub>ndc</sub> = 850V V<sub>peak</sub> = 1200V V<sub>rms</sub> = 450V V<sub>s</sub> = 1500V</b>																	<b>Voltage Code: B</b>		<b>Qty</b>	<b>Size</b>
0.82	850	FSBA6B0824K90	FSBA6B0824K18	A	42.5	27.5	24.5	23~28	11.0	750.0	615.0	13.0	6.7	18.0	20.7	42	360*170*80			
1.00	850	FSBA6B0105K90	FSBA6B0105K18	A	42.5	27.5	24.5	23~28	11.0	750.0	750.0	15.0	5.5	18.0	18.8	42	360*170*80			
1.50	850	FSBB6B0155K90	FSBB6B0155K18	B	42.5	35.5	33.5	23~28	11.0	750.0	1125.0	22.0	3.9	20.0	13.9	35	360*170*80			
1.75	850	FSBB6B0175K90	FSBB6B0175K18	B	42.5	35.5	33.5	23~28	11.0	750.0	1312.5	24.0	3.4	20.0	12.6	35	360*170*80			
2.00	850	FSB66B0205K90	FSB66B0205K18	6	42.5	45.0	30.0	23~28	11.0	750.0	1500.0	25.0	3.4	25.0	19.1	40	360*170*80			
2.20	850	FSB66B0225K90	FSB66B0225K18	6	42.5	45.0	30.0	23~28	11.0	750.0	1650.0	28.0	3.1	25.0	18.6	40	360*170*80			
2.50	850	FSB66B0255K90	FSB66B0255K18	6	42.5	45.0	30.0	23~28	11.0	750.0	1875.0	28.0	2.7	25.0	17.8	40	360*170*80			
2.50	850	FSB76B0255K90	FSB76B0255K18	7	57.5	50.0	35.0	37~39	24.0	469.0	1172.5	24.0	5.3	38.0	10.7	20	360*170*80			
3.00	850	FSB86B0305K90	FSB86B0305K18	8	57.5	45.0	30.0	37~39	24.0	469.0	1407.0	27.0	4.5	35.0	9.9	25	360*170*80			
3.30	850	FSB86B0335K90	FSB86B0335K18	8	57.5	45.0	30.0	37~39	24.0	469.0	1547.7	27.5	4.1	35.0	9.3	25	360*170*80			
4.00	850	FSB76B0405K90	FSB76B0405K18	7	57.5	50.0	35.0	37~39	24.0	469.0	1876.0	33.0	3.5	38.0	8.0	20	360*170*80			
5.00	850	FSB66B0505K90	FSB66B0505K18	7	57.5	50.0	35.0	37~39	24.0	469.0	2345.0	37.0	2.9	38.0	6.9	20	360*170*80			
<b>V<sub>ndc</sub> = 1000V V<sub>peak</sub> = ?V V<sub>rms</sub> = ?v V<sub>s</sub> = ?V</b>																	<b>Voltage Code: C</b>		<b>Qty</b>	<b>Size</b>
0.68	1000	FSBA6C0684K90	FSBA6C0684K18	A	42.5	27.5	24.5	23~28	11.0	870.0	591.6	16.5	4.3	18.0	14.6	42	360*170*80			
0.75	1000	FSBA6C0754K90	FSBA6C0754K18	A	42.5	27.5	24.5	23~28	11.0	870.0	652.5	17.5	4.0	18.0	14.2	42	360*170*80			
1.20	1000	FSBB6C0125K90	FSBB6C0125K18	B	42.5	35.5	33.5	23~28	11.0	870.0	1044.0	23.5	3.3	20.0	9.2	35	360*170*80			
1.50	1000	FSBB6C0155K90	FSBB6C0155K18	B	42.5	35.5	33.5	23~28	11.0	870.0	1305.0	25.0	2.9	20.0	8.9	35	360*170*80			
1.75	1000	FSB96C0175K90	FSB96C0175K18	9	42.5	45.0	33.0	23~28	11.0	870.0	1522.5	27.0	2.7	25.0	7.0	40	360*170*80			
2.00	1000	FSB96C0205K90	FSB96C0205K18	9	42.5	45.0	33.0	23~28	11.0	870.0	1740.0	28.0	2.6	25.0	6.9	40	360*170*80			
2.20	1000	FSB86C0225K90	FSB86C0225K18	8	57.5	45.0	30.0	37~39	24.0	500.0	1100.0	27.5	3.3	35.0	8.1	25	360*170*80			
2.50	1000	FSB96C0255K90	FSB96C0255K18	9	42.5	45.0	33.0	23~28	11.0	750.0	1875.0	24.5	4.0	25.0	6.0	40	360*170*80			
3.00	1000	FSB86C0305K90	FSB86C0305K18	8	57.5	45.0	30.0	37~39	24.0	450.0	1350.0	24.5	4.8	35.0	6.4	25	360*170*80			
3.00	1000	FSB76C0305K90	FSB76C0305K18	7	57.5	50.0	35.0	37~39	24.0	500.0	1500.0	32.0	2.7	38.0	5.7	20	360*170*80			
3.30	1000	FSB86C0335K90	FSB86C0335K18	8	57.5	45.0	30.0	37~39	24.0	450.0	1485.0	25.5	4.6	35.0	6.9	25	360*170*80			

# PROTECTION

FSB\* RoHS Compliant



## RATINGS AND PART NUMBER REFERENCE FOR LUG TERMINALS

Cap (µF) ±10%	Rated Voltage (V)	Part Number		Case Size	W ±0.50 (mm)	H ±0.50 (mm)	T ±0.50 (mm)	P1 ±0.50 (mm)	P2 ±0.50 (mm)	dv/dt Volt/sec	I peak Amps	I rms Amps	Rs mΩ	ESL nH	Rth °C/W	Packaging Inner Box	
		90°	180°													Qty	Size
3.30	1000	FSB76C0335K90	FSB76C0335K18	7	57.5	50.0	35.0	37~39	24.0	450.0	1485.0	32.5	2.6	38.0	5.5	20	360*170*80
4.00	1000	FSB76C0405K90	FSB76C0405K18	7	57.5	50.0	35.0	37~39	24.0	450.0	1800.0	29.5	4.0	38.0	5.6	20	360*170*80
<b>V<sub>ndc</sub> = 1200V V<sub>peak</sub> = 1600V Vr<sub>ms</sub> = 560v Vs = 2000V Voltage Code: U</b>																<b>Qty</b>	<b>Size</b>
0.33	1200	FSBA6U0334K90	FSBA6U0334K18	A	42.5	27.5	24.5	23~28	11.0	1000.0	330.0	9.3	7.4	18.0	20.3	42	360*170*80
0.39	1200	FSBA6U0394K90	FSBA6U0394K18	A	42.5	27.5	24.5	23~28	11.0	1000.0	390.0	10.5	6.4	18.0	18.7	42	360*170*80
0.47	1200	FSBA6U0474K90	FSBA6U0474K18	A	42.5	27.5	24.5	23~28	11.0	1000.0	470.0	11.9	5.5	18.0	16.3	42	360*170*80
0.56	1200	FSBA6U0564K90	FSBA6U0564K18	A	42.5	27.5	24.5	23~28	11.0	1000.0	560.0	13.7	4.8	18.0	14.9	42	360*170*80
0.68	1200	FSBB6U0684K90	FSBB6U0684K18	B	42.5	35.5	33.5	23~28	11.0	1000.0	680.0	16.5	4.1	20.0	12.0	35	360*170*80
0.82	1200	FSBB6U0824K90	FSBB6U0824K18	B	42.5	35.5	33.5	23~28	11.0	1000.0	820.0	18.5	3.6	20.0	11.0	35	360*170*80
1.00	1200	FSB66U0105K90	FSB66U0105K18	6	42.5	45.0	30.0	23~28	11.0	1000.0	1000.0	17.3	3.7	25.0	12.3	40	360*170*80
1.20	1200	FSBB6U0125K90	FSBB6U0125K18	B	42.5	35.5	33.5	23~28	11.0	1000.0	1200.0	18.4	3.3	20.0	12.4	35	360*170*80
1.20	1200	FSB66U0125K90	FSB66U0125K18	6	42.5	45.0	30.0	23~28	11.0	1200.0	1440.0	26.0	3.4	25.0	17.5	40	360*170*80
1.50	1200	FSB66U0155K90	FSB66U0155K18	6	42.5	45.0	30.0	23~28	11.0	870.0	1305.0	26.0	3.4	25.0	17.5	40	360*170*80
1.50	1200	FSBB6U0155K90	FSBB6U0155K18	B	42.5	35.5	33.5	23~28	11.0	1000.0	1500.0	21.0	2.8	20.0	11.2	35	360*170*80
2.00	1200	FSB96U0205K90	FSB96U0205K18	9	42.5	45.0	30.0	23~28	11.0	870.0	1740.0	28.0	2.8	25.0	7.2	25	360*170*80
2.00	1200	FSB86U0205K90	FSB86U0205K18	8	57.5	45.0	30.0	37~39	24.0	575.0	1150.0	19.7	2.4	35.0	8.8	25	360*170*80
2.20	1200	FSB86U0225K90	FSB86U0225K18	8	57.5	45.0	30.0	37~39	24.0	500.0	1100.0	21.0	4.2	35.0	8.1	25	360*170*80
2.20	1200	FSB76U0225K90	FSB76U0225K18	7	57.5	50.0	35.0	37~39	24.0	575.0	1265.0	21.4	3.9	38.0	7.6	20	360*170*80
2.50	1200	FSB86U0255K90	FSB86U0255K18	8	57.5	45.0	30.0	37~39	24.0	500.0	1250.0	21.2	4.9	35.0	7.9	25	360*170*80
3.00	1200	FSB76U0305K90	FSB76U0305K18	7	57.5	50.0	35.0	37~39	24.0	575.0	1725.0	32.8	4.3	38.0	6.5	20	360*170*80
3.30	1200	FSB76U0335K90	FSB76U0335K18	7	57.5	50.0	35.0	37~39	24.0	500.0	1650.0	28.2	3.0	38.0	6.2	20	360*170*80
<b>V<sub>ndc</sub> = 1500V V<sub>peak</sub> = ?V Vr<sub>ms</sub> = ?v Vs = ?V Voltage Code: G</b>																<b>Qty</b>	<b>Size</b>
0.33	1500	FSBA6G0334K90	FSBA6G0334K18	A	42.5	27.5	24.5	23~28	11.00	1220.0	402.6	14.0	6.0	18.0	17.0	42	360*170*80
0.39	1500	FSBA6G0394K90	FSBA6G0394K18	A	42.5	27.5	24.5	23~28	11.00	1220.0	475.8	14.5	5.6	18.0	15.9	42	360*170*80
0.47	1500	FSBB6G0474K90	FSBB6G0474K18	B	42.5	35.5	33.5	23~28	11.00	1220.0	573.4	19.0	4.8	20.0	11.0	35	360*170*80
0.68	1500	FSBB6G0684K90	FSBB6G0684K18	B	42.5	35.5	33.5	23~28	11.00	1220.0	829.6	21.0	4.0	20.0	9.8	35	360*170*80
0.75	1500	FSBB6G0754K90	FSBB6G0754K18	B	42.5	35.5	33.5	23~28	11.00	1220.0	915.0	22.0	3.6	20.0	9.4	35	360*170*80
1.00	1500	FSB96G0105K90	FSB96G0105K18	9	42.5	45.0	33.0	23~28	11.00	1220.0	1220.0	23.0	3.3	25.0	7.4	40	360*170*80
1.20	1500	FSB86G0125K90	FSB86G0125K18	8	57.5	45.0	30.0	37~39	24.00	870.0	1044.0	26.0	3.6	35.0	7.3	25	360*170*80
1.50	1500	FSB76G0155K90	FSB76G0155K18	7	57.5	50.0	35.0	37~39	24.00	725.0	1087.5	29.5	3.3	38.0	5.9	20	360*170*80
1.80	1500	FSB76G0185K90	FSB76G0185K18	7	57.5	50.0	35.0	37~39	24.00	725.0	1305.0	30.5	3.0	38.0	5.6	20	360*170*80
<b>V<sub>ndc</sub> = 2000V V<sub>peak</sub> = 2400V Vr<sub>ms</sub> = 700v Vs = 2600V Voltage Code: N</b>																<b>Qty</b>	<b>Size</b>
0.10	2000	FSBA6N0104K90	FSBA6N0104K18	A	42.5	27.5	24.5	23~28	11.0	1600.0	160.0	8.5	16.3	18.0	23.6	42	360*170*80
0.15	2000	FSBA6N0154K90	FSBA6N0154K18	A	42.5	27.5	24.5	23~28	11.0	1600.0	240.0	11.0	9.8	18.0	18.8	42	360*170*80
0.22	2000	FSBA6N0224K90	FSBA6N0224K18	A	42.5	27.5	24.5	23~28	11.0	1600.0	352.0	13.5	6.6	18.0	15.3	42	360*170*80
0.33	2000	FSBA6N0334K90	FSBA6N0334K18	A	42.5	27.5	24.5	23~28	11.0	1220.0	402.6	12.5	9.6	18.0	15.1	42	360*170*80
0.33	2000	FSBB6N0334K90	FSBB6N0334K18	B	42.5	35.5	33.5	23~28	11.0	1600.0	528.0	18.0	5.3	20.0	9.8	35	360*170*80
0.39	2000	FSBB6N0394K90	FSBB6N0394K18	B	42.5	35.5	33.5	23~28	11.0	1000.0	390.0	17.5	4.7	20.0	9.4	35	360*170*80
0.47	2000	FSB66N0474K90	FSB66N0474K18	6	42.5	45.0	30.0	23~28	11.0	1600.0	752.0	22.0	6.3	25.0	19.4	40	360*170*80
0.56	2000	FSB66N0564K90	FSB66N0564K18	6	42.5	45.0	30.0	23~28	11.0	1600.0	896.0	23.0	5.2	25.0	17.9	40	360*170*80
0.68	2000	FSB66N0684K90	FSB66N0684K18	6	42.5	45.0	30.0	23~28	11.0	1200.0	816.0	24.0	4.4	25.0	17.3	40	360*170*80
0.68	2000	FSBB6N0684K90	FSBB6N0684K18	B	42.5	35.5	33.5	23~28	11.0	1220.0	829.6	18.0	6.5	20.0	7.1	35	360*170*80
0.82	2000	FSB96N0824K90	FSB96N0824K18	9	42.5	45.0	33.0	23~28	11.0	1220.0	1000.4	20.0	6.0	25.0	7.0	40	360*170*80
0.82	2000	FSB86N0824K90	FSB86N0824K18	8	57.5	45.0	30.0	37~39	24.0	930.0	762.6	24.5	4.0	35.0	7.4	25	360*170*80
1.00	2000	FSB96N0105K90	FSB96N0105K18	9	42.5	45.0	33.0	23~28	11.0	1220.0	1220.0	21.5	5.3	25.0	6.9	40	360*170*80
1.00	2000	FSB76N0105K90	FSB76N0105K18	7	57.5	50.0	35.0	37~39	24.0	930.0	930.0	28.0	3.6	38.0	6.0	20	360*170*80
1.20	2000	FSB86N0125K90	FSB86N0125K18	8	57.5	45.0	30.0	37~39	24.0	725.0	870.0	22.5	5.9	35.0	6.6	25	360*170*80
1.50	2000	FSB76N0155K90	FSB76N0155K18	7	57.5	50.0	35.0	37~39	24.0	725.0	1087.5	26.0	5.2	38.0	4.9	20	360*170*80

\* Insert K for 10% capacitance tolerance (standard): J = +5% tolerances available on request.

Last two characters terminal styles 90 = 90° terminals insert 18 = 180°

Values outside this standard range may be available – please contact KYOCERA AVX for any special requirements.

KYOCERA AVX reserves the right to supply capacitors to a tighter capacitance tolerance or higher voltage rating, in the same case size.

# PROTECTION

FSB\* RoHS Compliant

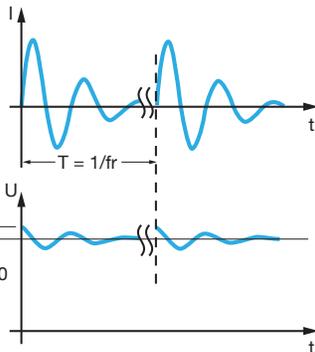
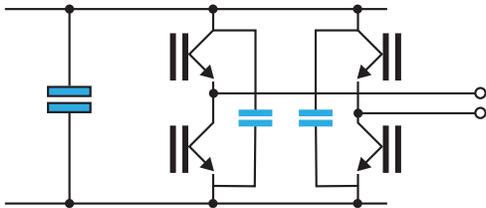
## STANDARDS

IEC 61071-1, IEC 61071-2: Power electronic capacitors

## TANGENT OF LOSS ANGLE (TANδ<sub>0</sub>) FOR POLYPROPYLENE DIELECTRIC

Polypropylene has a constant dielectric loss factor of 2x10<sup>-4</sup> irrespective of temperature and frequency (up to 1 MHz).

## IGBT SNUBBER



With

L = stray inductance IGBT + capacitor

R = serial resistance IGBT + capacitor

$$I_{eff} = \sqrt{\left[ \frac{C\beta_0^2 \times U_0}{2j\beta} \right]^2 \times \frac{1}{T} \times \left[ \frac{e^{-2\alpha \times T}}{\beta^2 + \alpha^2} \times [\beta \sin(2\beta \times T) - \alpha \times \cos(2\beta \times T)] + \frac{1}{\alpha} \times e^{-2\alpha \times T} + \frac{\alpha}{\beta^2 + \alpha^2} - \frac{1}{\alpha} \right]}$$

with  $\beta_0 = \sqrt{\frac{1}{LC}}$ ;  $\alpha = \frac{R}{2L}$ ;  $\beta = \sqrt{\beta_0^2 - \alpha^2}$

## HOT SPOT TEMPERATURE CALCULATION

See *Hot Spot Temperature*, page 3.

$$\theta_{hot\ spot} = \theta_{ambient} + (P_d + P_t) \times R_{th}$$

with  $P_d$  (Dielectric losses) =  $Q \times \text{tg}\delta_0$   
 $\Rightarrow [ \frac{1}{2} \times C_n \times (V_{ripple\ peak\ to\ peak})^2 \times f ] \times (2 \times 10^{-4})$   
 $P_t$  (Thermal losses) =  $R_s \times (I_{rms})^2$   
 $R_{th}$  :  $R_{th\ ambient} / \text{hot spot}$  in °C/W

where  $C_n$  in Farad  $I_{rms}$  in Ampere  $f$  in Hertz  
 $V$  in Volt  $R_s$  in Ohm  $\theta$  in °C

Due to the design of the capacitor and its technology, the thermal impedance between the terminations and the core of the capacitor is low, it is necessary to take care that the capacitor is never overheated by use of wrongly sized connections.

Do not use the capacitor as a heat sink.

Due to the complexity of the IGBT / capacitor thermal exchanges, we recommend that thermal measurements shall be made on the different components. We would be pleased to advise you on specific applications.

## WORKING TEMPERATURE

(according to the power to be dissipated) -40°C to +85°C

## MARKING

KYOCERA AVX logo

Capacitance and tolerance in clear

Nominal DC voltage in clear

RMS current in clear

Date of manufacture (IEC coding)

# PROTECTION

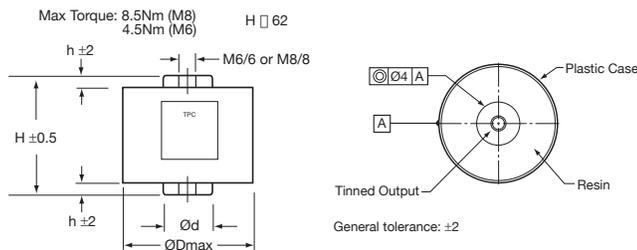
## FPX (FPY RoHS Compliant)

### PROTECTION

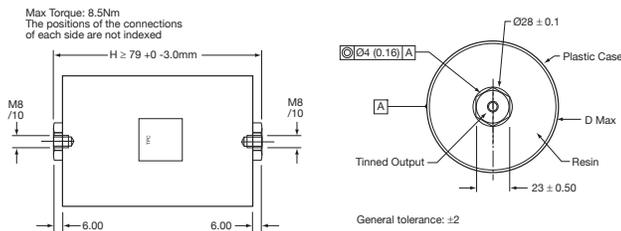


### PROTECTION

#### Plastic Case Style M6 / 6 or M8 / 8



#### Plastic Case Style M8 / 10



### MARKING

- Logo
- Withstanding surge voltage
- Capacitance and tolerance in clear
- Nominal DC voltage in clear
- RMS current in clear
- Date of manufacture (IEC coding)

### HOW TO ORDER

<b>FPX</b>	<b>6</b>	<b>6</b>	<b>N</b>	<b>0154</b>	<b>J</b>	<b>--</b>
<b>Series</b> FPX = Standard FPY = RoHS Compliant	<b>Case Size</b> Case Size 6 Case Size 8 (See Case Style)	<b>Dielectric</b> 6 = Polypropylene	<b>Voltage Code</b> N = 2000V P = 2500V X = 3500V Z = 4500V Y = 4600V	<b>Capacitance Code</b> 0 + pF code 0105 = 1.0µF 0335 = 3.5µF 0504 = 0.5µF etc.	<b>Capacitance Tolerances</b> J = ± 5%	<b>Terminal Code</b> -- = Standard

Not RoHS Compliant



### APPLICATIONS

- Protection of Thyristors
- Protection of Gate Turn-off Thyristor (G.T.O.)
- Clamping (Secondary Snubber)

### TECHNOLOGY

Metallized polypropylene dielectric capacitor with controlled self-healing.

Reinforced metallization developed for high impulse currents.

Axial connections specially developed to reduce series inductance and to provide rigid mechanical mounting.

### PACKAGING MATERIAL

Cylindrical in plastic case filled with thermosetting resin. Outputs: threaded inserts either M6 or M8.

### HOT SPOT TEMPERATURE CALCULATION

See *Hot Spot Temperature*, page 3.

$$\theta_{\text{hot spot}} = \theta_{\text{ambient}} + (P_d + P_t) \times R_{\text{th}}$$

with

$$P_d \text{ (Dielectric losses)} = Q \times \text{tg}\delta_0$$

$$\Rightarrow \left[ \frac{1}{2} \times C_n \times (V_{\text{peak to peak}})^2 \times f \right] \times (2 \times 10^{-4})$$

$$P_t \text{ (Thermal losses)} = R_s \times (I_{\text{rms}})^2$$

where

$C_n$  in Farads

$V$  in Volts

$I_{\text{rms}}$  in Amperes

$R_s$  in Ohms

$f$  in Hertz

$\theta$  in °C

$R_{\text{th}}$  in °C/W

Due to the design of the capacitor and its technology, the thermal impedance between the terminations and the core of the capacitor is low, it is necessary to take care that the capacitor is never overheated by use of incorrect sized connections.

In the case where the series diodes are screwed to the capacitor, cooling of the diodes must be taken in account.

Do not use the capacitor as a heat sink.

Due to the complexity of the diode/capacitor thermal exchanges, we recommend that thermal measurements shall be made on the different components. We would be pleased to advise you on specific problems.

### WORKING TEMPERATURE

(according to the power to be dissipated)

-40°C to +85°C

# PROTECTION

## FPX (FPY RoHS Compliant)

### ELECTRICAL CHARACTERISTICS

Capacitance range $C_n$	0.5 $\mu$ F to 6 $\mu$ F
Tolerance on $C_n$	$\pm$ 5%
Rated DC voltage $V_{n,dc}$	1000 to 3000 V
Peak voltage $V_{peak}$	1600 to 4000 V
Allowable overvoltage $V_s$ (for 10 s/day)	2000 to 4600 V
Stray inductance	5 to 20 nH
RMS current	$I_{rms}$ max. = up to 160 A The currents shown in the tables are maximum. It is necessary to respect the thermal limits of the dielectric 85°C see "Hot spot temperature calculation"
Insulation resistance	$R_i \times C \geq 30,000$ s
Impulse current	$I^2.t$ maxi. = up to 729 A <sup>2</sup> .s Spikes or peak currents in the capacitors may cause a deterioration of the bonding between the metallization and the connections. These bonds are capable of withstanding only a limited amount of energy for each spike. The table shows the maximum energy permitted in the form ( $I^2.t$ ), where I is in Ampere, and t is in seconds.
<b>Note:</b> The formula ( $I^2.t$ ) replaces $dV/dt$ which is less easy to use as it is not an expression of energy ( $I = C.dV/dt$ ). This type of capacitor has been designed to withstand high ( $I^2.t$ ) values.	
Variation of capacitance with temperature	$\frac{\Delta C}{C} \leq \pm 2\%$ between -40 and +85°C
Climatic category	40/085/56 (IEC 60068)
Test voltage between terminals @ 25°C	$V_s$ for 10s
Test voltage between terminals and case @ 25°C (Type test)	@ 7 kV <sub>rms</sub> @ 50 Hz for 1 min.
Dielectric	Polypropylene

# PROTECTION

## FPX (FPY RoHS Compliant) Table of Values

### PROTECTION

Part Number	Cn (µF)	Dimensions					I <sup>2</sup> .t max. (A <sup>2</sup> .s)	I <sub>rms</sub> max. (A)	R <sub>s</sub> (mΩ)	R <sub>th</sub> (°C/W)	Typical Weight (g)
		Case Style	H* ±0.5 (mm)	h ±2 (mm)	D max. (mm)	d ±0.5 (mm)					
<b>FPX 2000V V<sub>n,dc</sub> = 1000V V<sub>peak</sub> = 1600V V<sub>rms</sub> = 560V V<sub>s</sub> = 2000V (Voltage Code N)</b>											
FPX66N0105J-	1	Plastic case M6/6	52	5	40	18	2	15	2.4	14)	120
FPX86N0205J-	2	Plastic case M8/8	52	5	60	22	8	30	1.2	6.1	190
FPX86N0305J-	3	Plastic case M8/8	52	5	72	22	18	45	0.9	4.5	260
FPX86N0355J-	3.5	Plastic case M8/8	52	5	72	22	25	50	0.85	4.5	260
FPX86N0405J-	4	Plastic case M8/8	52	5	82	22	32	60	0.75	3.5	320
FPX86N0505J-	5	Plastic case M8/8	52	5	82	22	50	70	0.65	2.5	320
<b>FPX 2500V V<sub>n,dc</sub> = 1300V V<sub>peak</sub> = 2000V V<sub>rms</sub> = 700V V<sub>s</sub> = 2500V (Voltage Code P)</b>											
FPX66P0504J-	0.5	Plastic case M6/6	52	5	40	18	1	15	3	14	120
FPX86P0105J-	1	Plastic case M8/8	52	5	60	22	3	20	2.3	10.5	190
FPX86P0155J-	1.5	Plastic case M8/8	52	5	60	22	7	30	1.5	6.1	190
FPX86P0205J-	2	Plastic case M8/8	52	5	72	22	12.7	40	1.1	4.5	260
FPX86P0255J-	2.5	Plastic case M8/8	52	5	72	22	20	60	0.89	3.7	260
FPX86P0305J-	3	Plastic case M8/8	52	5	82	22	28	60	0.85	3.2	320
FPX86P0355J-	3.5	Plastic case M8/8	52	5	82	22	39	65	0.78	2.9	320
<b>FPX 3500V V<sub>n,dc</sub> = 2000V V<sub>peak</sub> = 2400V V<sub>rms</sub> = 850V V<sub>s</sub> = 3500V (Voltage Code X)</b>											
FPX86X0205J-	2	Plastic case M8/8	62	5	72	22	23	41	1.24	6.1	310
FPX86X0305J-	3	Plastic case M8/8	62	5	92	22	50	62	0.92	3.9	475
FPX86X0355J-	3.5	Plastic case M8/8	62	5	92	22	70	72	0.83	3.4	475
FPX86X0405J-	4	Plastic case M8/8	62	5	92	22	85	80	0.78	3.1	475
<b>FPX 4500V V<sub>n,dc</sub> = 2500V V<sub>peak</sub> = 3200V V<sub>rms</sub> = 1130V V<sub>s</sub> = 4500V (Voltage Code Z)</b>											
FPX86Z0904J-	0.9	Plastic case M8/8	62	5	72	22	15	40	1.5	6.2	310
FPX86Z0105J-	1	Plastic case M8/8	62	5	72	22	15	38	1.4	6.2	310
FPX86Z0205J-	2	Plastic case M8/8	62	5	92	22	70	75	0.85	3.1	475
<b>FPX 4600V V<sub>n,dc</sub> = 3000V V<sub>peak</sub> = 4000V V<sub>rms</sub> = 1400V V<sub>s</sub> = 4600V (Voltage Code Y)</b>											
FPX86Y0504J-	0.5	Plastic case M8/8	62	5	72	22	7	40	1.7	12	310
FPX86Y0684J-	0.68	Plastic case M8/8	62	5	72	22	14	35	1.59	6.2	310
FPX86Y1254J-	1.25	Plastic case M8/8	62	5	92	22	50	65	1	3.3	475
FPX86Y0155J-	1.5	Plastic case M8/10	79	6	98	-	32	60	1.4	8.3	630
FPX86Y0175J-	1.7	Plastic case M8/10	79	6	98	-	40	70	1.3	7.4	630
FPX86Y0205J-	2	Plastic case M8/10	79	6	98	-	56	80	1.1	6.3	630
FPX86Y0255J-	2.5	Plastic case M8/10	118	6	98	-	200	130	0.8	1.1	1020
FPX86Y0275J-	2.7	Plastic case M8/10	118	6	98	-	232	140	0.7	1.1	1020
FPX86Y0305J-	3	Plastic case M8/10	143	6	98	-	128	100	0.9	1.5	1280
FPX86Y0355J-	3.5	Plastic case M8/10	143	6	98	-	170	110	0.8	1.4	1280
FPX86Y0405J-	4	Plastic case M8/10	143	6	98	-	224	115	0.8	1.4	1280
FPX86Y0455J-	4.5	Plastic case M8/10	163	6	98	-	522	120	0.6	1.7	1500
FPX86Y0505J-	5	Plastic case M8/10	163	6	98	-	600	130	0.6	1.7	1500
FPX86Y0605J-	6	Plastic case M8/10	163	6	98	-	729	160	0.5	1.7	1500

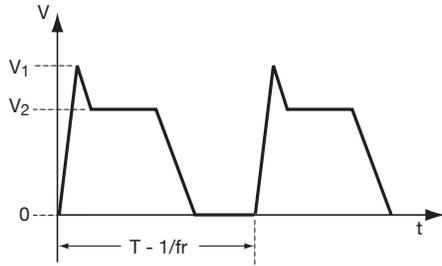
\* Tol: +0 / -3mm for H ≥ 118mm

# PROTECTION

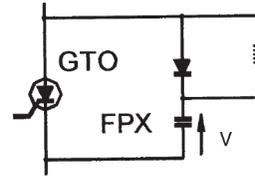
## FPX (FPY RoHS Compliant) General / Application Notes

### PROTECTION

#### G.T.O.

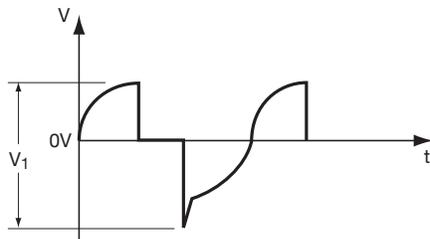


Choice of voltage:  $V_1 \leq V_{peak}$   
 $V_2 \leq V_{n,dc}$



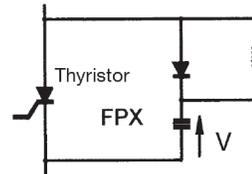
Nominal DC voltage ( $V_{n,dc}$ ) and peak voltage ( $V_{peak}$ ) are given in the tables.

#### THYRISTOR



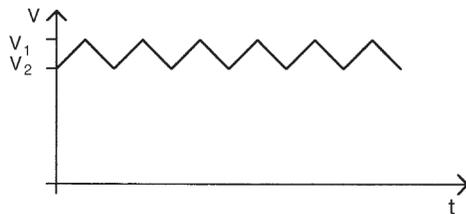
Choice of voltage:  $V_1 \leq V_{peak}$

Note that  $V_1$  is the voltage peak to peak and cannot be symmetrical vs 0 V

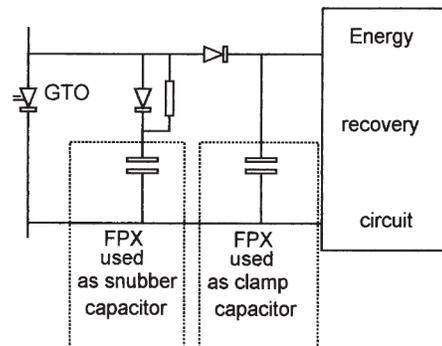


Peak voltage is given in the tables.

#### CLAMPING



Choice of voltage:  $V_1 \leq V_{peak}$   
 $V_2 \leq V_{n,dc}$



Nominal DC voltage ( $V_{n,dc}$ ) and peak voltage ( $V_{peak}$ ) are given in the tables.

# PROTECTION

## FPG (FPH RoHS Compliant)

### PROTECTION



Metallized polypropylene dielectric capacitor with controlled self-healing.  
 Reinforced metallization on margins developed for high impulse currents.  
 Axial connections specially developed to reduce series inductance and to provide rigid mechanical mounting.

### APPLICATIONS

- Protection of Gate Turn-off Thyristor (G.T.O.)
- Medium Frequency Tuning

### HOT SPOT TEMPERATURE CALCULATION

See *Hot Spot Temperature*, page 3.

$$\theta_{\text{hot spot}} = \theta_{\text{ambient}} + (P_d + P_t) \times R_{\text{th}}$$

with

$$P_d \text{ (Dielectric losses)} = Q \times \text{tg}\delta_0 \\ \Rightarrow [ \frac{1}{2} \times C_n \times (V_{\text{peak to peak}})^2 \times f ] \times (2 \times 10^{-4})$$

$$P_t \text{ (Thermal losses)} = R_s \times (I_{\text{rms}})^2$$

where

- $C_n$  in Farads
- $V$  in Volts
- $I_{\text{rms}}$  in Amperes
- $R_s$  in Ohms
- $f$  in Hertz
- $\theta$  in °C
- $R_{\text{th}}$  in °C/W

Due to the design of the capacitor and its technology, the thermal impedance between the terminations and the core of the capacitor is low, it is necessary to take care that the capacitor is never overheated by use of incorrect sized connections.

In the case where the series diodes are screwed to the capacitor, cooling of the diodes must be taken in account.

Do not use the capacitor as a heat sink.

Due to the complexity of the diode/capacitor thermal exchanges, we recommend that thermal measurements shall be made on the different components. We would be pleased to advise you on specific problems.

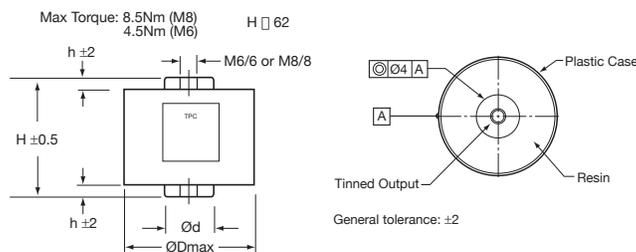
### WORKING TEMPERATURE

(according to the power to be dissipated)

-40°C to +85°C

### DIMENSIONS

millimeters



### MARKING

Logo

Withstanding surge voltage

Capacitance and tolerance in clear

Nominal DC voltage in clear

RMS current in clear

Date of manufacture (IEC coding)

### PACKAGING MATERIAL

Cylindrical in plastic case filled with thermosetting resin.

Outputs: threaded inserts either M6 or M8.

### HOW TO ORDER

<b>FPG</b>	<b>8</b>	<b>6</b>	<b>R</b>	<b>0105</b>	<b>J</b>	<b>--</b>
Series	Case Size	Dielectric	Voltage Code	Capacitance Code	Capacitance Tolerances	Terminal Code
FPG = Standard FPH = RoHS Compliant	Case Size 8	6 = Polypropylene	R = 1500V N = 2000V P = 2500V W = 2600V X = 3500V Z = 4500V Y = 4600V	0 + pF code 0105 = 1.0µF 0405 = 4.0µF 0604 = 0.6µF etc.	J = ± 5%	-- = Standard

Not RoHS Compliant



# PROTECTION

## FPG (FPH RoHS Compliant)

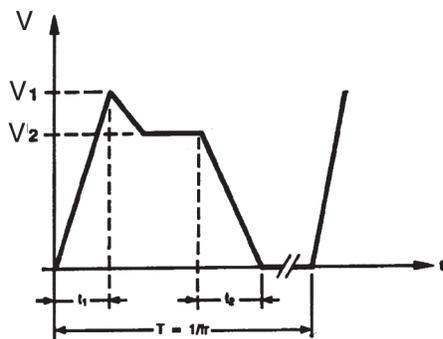
### ELECTRICAL CHARACTERISTICS

Capacitance range $C_n$	0.12 $\mu$ F to 6 $\mu$ F
Tolerance on $C_n$	$\pm 5\%$
Rated DC voltage $V_{n,dc}$	800 to 3000 V
Peak voltage $V_{peak}$	1200 to 4000 V
Allowable overvoltage $V_s$ (for 10 s/day)	1500 to 4600 V
Nominal RMS voltage $V_{n,dc}$	500 to 1400 V
Stray inductance	$\approx 10$ nH
RMS current	$I_{rms}$ max. = up to 80 A The currents shown in the tables are maximum. It is necessary to respect the thermal limits of the dielectric 85°C see "Hot spot temperature calculation"
Insulation resistance	$R_i \times C \geq 30,000$ s
Impulse current	$I^2.t$ max. given in the tables Spikes or peak currents in the capacitors may cause a deterioration of the bonding between the metallization and the connections. These bonds are capable of withstanding only a limited amount of energy for each spike. The table shows the maximum energy permitted in the form ( $I^2.t$ ), where I is in Ampere, and t is in seconds.
<b>Note:</b> The formula ( $I^2.t$ ) replaces $dV/dt$ which is less easy to use as it is not an expression of energy ( $I = C.dV/dt$ ). This type of capacitor has been designed to withstand high ( $I^2.t$ ) values.	
Variation of capacitance with temperature	$\frac{\Delta C}{C} \leq \pm 2\%$ between -40 and +85°C
Climatic category	40/085/56 (IEC 60068)
Test voltage between terminals @ 25°C	$V_s$ during 10s
Test voltage between terminals and case @ 25°C (Type test)	@ 4 kVrms @ 50 Hz during 1 min.
Dielectric	Polypropylene

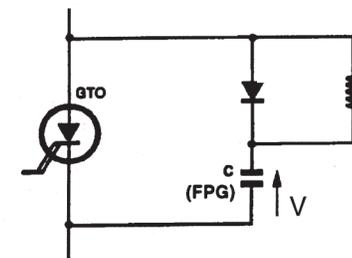
### PROTECTION

#### APPLICATION NOTES

##### G.T.O. PROTECTION



Choice of voltage:  $V_1 \leq V_{peak}$   
 $V_2 \leq V_{n,dc}$   
 Maximum overvoltage  $\leq V_s$  (10 s/day)



FPG: Snubber capacitor

Nominal DC voltage ( $V_{n,dc}$ ) and peak voltage ( $V_{peak}$ ) are given in the table of values.

# PROTECTION

## FPG (FPH RoHS Compliant) Table of Values

### PROTECTION

Part Number	Cn (μF)	Dimensions					I <sup>2</sup> t max. (A <sup>2</sup> .s)	I <sub>rms</sub> max. (A)	R <sub>s</sub> (mΩ)	R <sub>th</sub> (°C/W)	Typical Weight (g)
		Case Style	H* ±0.5 (mm)	h ±2 (mm)	D max. (mm)	d ±0.5 (mm)					
<b>FPG 1500V V<sub>n,dc</sub> = 800V V<sub>peak</sub> = 1200V V<sub>rms</sub> = 500V V<sub>s</sub> = 1500V (Voltage Code R)</b>											
FPG66R0105J-	1	Plastic Case M6/6	52	5	40	18	2	15	2.4	14	120
FPG66R0155J-	1.5	Plastic Case M6/6	52	5	55	18	4.6	20	1.6	10.5	160
FPG86R0205J-	2	Plastic Case M8/8	52	5	60	22	8	30	1.2	6.1	190
FPG86R0305J-	3	Plastic Case M8/8	52	5	72	22	18	45	0.9	4.5	260
FPG86R0355J-	3.5	Plastic Case M8/8	52	5	72	22	25	50	0.85	4.5	260
FPG86R0405J-	4	Plastic Case M8/8	52	5	82	22	32	60	0.75	3.5	320
FPG86R0505J-	5	Plastic Case M8/8	52	5	82	22	50	70	0.65	2.5	320
FPG86R0605J-	6	Plastic Case M8/8	52	5	92	22	73	75	0.6	2.5	400
<b>FPG 2000V V<sub>n,dc</sub> = 1000V V<sub>peak</sub> = 1600V V<sub>rms</sub> = 600V V<sub>s</sub> = 2000V (Voltage Code N)</b>											
FPG66N0504J-	0.5	Plastic Case M6/6	52	5	40	18	1	15	3	14	120
FPG86N0105J-	1	Plastic Case M8/8	52	5	60	22	3	20	2.3	10.5	190
FPG86N0155J-	1.5	Plastic Case M8/8	52	5	60	22	7	30	1.5	6.1	190
FPG86N0205J-	2	Plastic Case M8/8	52	5	72	22	12.7	40	1.1	4.5	260
FPG86N0255J-	2.5	Plastic Case M8/8	52	5	72	22	20	60	0.89	3.7	260
FPG86N0305J-	3	Plastic Case M8/8	52	5	82	22	28	60	0.85	3.2	320
FPG86N0355J-	3.5	Plastic Case M8/8	52	5	82	22	39	65	0.78	2.9	320
FPG86N0405J-	4	Plastic Case M8/8	52	5	92	22	50	70	0.7	2.5	400
<b>FPG 2500V V<sub>n,dc</sub> = 1300V V<sub>peak</sub> = 2000V V<sub>rms</sub> = 700V V<sub>s</sub> = 2500V (Voltage Code P)</b>											
FPG66P0474J-	0.47	Plastic Case M6/6	62	5	40	18	0.7	15	6	25	160
FPG66P0105J-	1	Plastic Case M6/6	62	5	55	18	2	18	3	13	180
FPG66P0155J-	1.5	Plastic Case M6/6	62	5	60	22	4.5	25	2	10	220
FPG86P0205J-	2	Plastic Case M8/8	62	5	72	22	8	35	1.5	6.5	310
FPG86P0255J-	2.5	Plastic Case M8/8	62	5	72	22	12.5	40	1.3	4.8	310
FPG86P0305J-	3	Plastic Case M8/8	62	5	82	22	18	50	1.15	4.4	410
FPG86P0405J-	4	Plastic Case M8/8	62	5	92	22	32	65	0.95	3.4	475
<b>FPG 2600V V<sub>n,dc</sub> = 1750V V<sub>peak</sub> = 2000V V<sub>rms</sub> = 800V V<sub>s</sub> = 2600V (Voltage Code W)</b>											
FPG66W0474J-	0.47	Plastic Case M6/6	62	5	40	18	1.4	12	4.04	28	160
FPG66W0105J-	1	Plastic Case M6/6	62	5	55	18	5.7	21	2.17	10.9	180
FPG66W0155J-	1.5	Plastic Case M6/6	62	5	60	18	12.9	31	1.55	7.7	220
FPG86W0205J-	2	Plastic Case M8/8	62	5	72	22	23	41	1.24	6.1	310
FPG86W0255J-	2.5	Plastic Case M8/8	62	5	82	22	36	51	1.05	4.5	410
FPG86W0305J-	3	Plastic Case M8/8	62	5	92	22	50	62	0.92	3.9	475
FPG86W0355J-	3.5	Plastic Case M8/8	62	5	92	22	70	72	0.83	3.4	475
FPG86W0395J-	3.9	Plastic Case M8/8	62	5	92	22	85	80	0.78	3.1	475
<b>FPG 3500V V<sub>n,dc</sub> = 2000V V<sub>peak</sub> = 2400V V<sub>rms</sub> = 1000V V<sub>s</sub> = 3500V (Voltage Code X)</b>											
FPG66X0334J-	0.33	Plastic Case M6/6	62	5	40	18	2	15	2.5	28	160
FPG66X0504J-	0.5	Plastic Case M6/6	62	5	55	18	5	19	2.5	11.2	180
FPG86X0105J-	1	Plastic Case M8/8	62	5	72	22	15	38	1.4	6.2	310
FPG86X0155J-	1.5	Plastic Case M8/8	62	5	82	22	40	56	1.03	3.9	410
FPG86X0205J-	2	Plastic Case M8/8	62	5	92	22	70	75	0.85	3.1	475
<b>FPG 4500V V<sub>n,dc</sub> = 2500V V<sub>peak</sub> = 3200V V<sub>rms</sub> = 1200V V<sub>s</sub> = 4500V (Voltage Code Z)</b>											
FPG66Z0224J-	0.22	Plastic Case M6/6	62	5	40	18	1.5	15	3.8	25	160
FPG66Z0474J-	0.47	Plastic Case M6/6	62	5	60	18	7	24	2.16	8.5	220
FPG86Z0684J-	0.68	Plastic Case M8/8	62	5	72	22	14	35	1.59	6.2	310
FPG86Z0105J-	1	Plastic Case M8/8	62	5	82	22	30	52	1.18	4	410
FPG86Z1254J-	1.25	Plastic Case M8/8	62	5	92	22	50	65	1	3.3	475
<b>FPG 4600V V<sub>n,dc</sub> = 3000V V<sub>peak</sub> = 4000V V<sub>rms</sub> = 1400V V<sub>s</sub> = 4600V (Voltage Code Y)</b>											
FPG66Y0124J-	0.12	Plastic Case M6/6	62	5	40	18	0.8	15	6	28	160
FPG66Y0224J-	0.22	Plastic Case M6/6	62	5	60	18	3	20	3.48	11	220
FPG86Y0334J-	0.33	Plastic Case M8/8	62	5	72	22	6.8	25	2.42	7.7	310
FPG86Y0474J-	0.47	Plastic Case M8/8	62	5	82	22	13.8	35	1.79	5.2	410
FPG86Y0604J-	0.60	Plastic Case M8/8	62	5	92	22	22	45	1.47	4.2	475

# TUNING

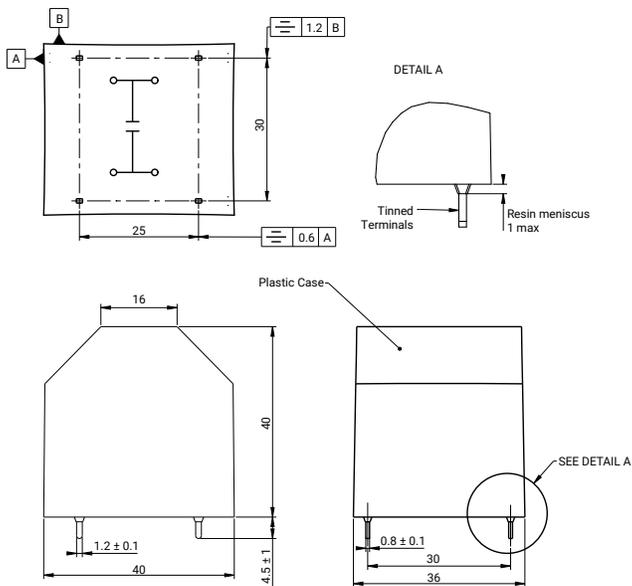
FAV\* RoHS Compliant



## DIMENSIONS

### Case Size 3

General tolerance: 0.5



## APPLICATIONS

- High Reactive Energy Tuning for Convertors
- Protection of Semi-Conductors

## TECHNOLOGY

Metallized polypropylene film and metal foil.

Dry capacitor.

## PACKAGING

Rectangular resin case.

4 leads 1.2 x 0.8mm for printed circuit board mounting.

Self-extinguishing plastic case (V0 = in accordance with UL 94) filled thermosetting resin.

Self-extinguishing thermosetting resin (V0 = in accordance with UL 94; I3F2 = in accordance with NF F 16-101).

(Note that FFV3 and FAV3 are in the same packaging.)

## STANDARDS

IEC 61071-1: IEC 61071-2: Power electronic capacitors

IEC 60068-1: Environmental testing

IEC 60077: Rules for electric traction equipment

UL 94: Fire requirements

NF F 16-101

NF F 16-102: Fire and smoke requirements

## HOT SPOT TEMPERATURE CALCULATION

$$\Theta_{\text{hot spot}} = \Theta_{\text{ambient}} + (P_d + P_j) \times (R_{\text{th}} + 7.4) \text{ or}$$

$$\Theta_{\text{hot spot}} = \Theta_{\text{case}} + (P_d + P_j) \times R_{\text{th}}$$

$$\text{Dielectric losses} = P_d = Q \times \text{tg} \delta_0$$

for tuning applications:

$$P_d = (V_{\text{rms}}^2 \times C \times 2 \times \pi \times f) \times 2.10^{-4}$$

For protection applications:

$$P_d = [1/2 \times C_n \times (V_{\text{peak to peak}})^2 \times f] \times 2.10^{-4}$$

$$\text{Joules losses } P_j = R_s \times I_{\text{rms}}^2$$

$C_n$  in Farad       $I_{\text{rms}}$  in Ampere       $f$  in Hertz

$V$  in Volt       $R_s$  in Ohm       $\theta$  in °C

$R_{\text{th}}$  in °C/W       $R_{\text{th}}$ :  $R_{\text{th case/hot spot}}$  in °C/W

## HOW TO ORDER

**FAV**

Series

**3**

Case Size  
Case Size 3

**6**

Dielectric  
6 = Polypropylene

**K**

Voltage  
Code  
K = 600Vdc  
B = 800Vdc  
L = 1000Vdc  
U = 1200Vdc  
R = 1500Vdc  
N = 2000Vdc

**0125**

Capacitance Code  
0 + pF code  
0125 = 1.2µF (1200nF)  
0105 = 1.0µF (1000nF)  
0154 = 0.15µF (150nF)  
etc.

**K**

Capacitance  
Tolerances  
K = ±10%

**--**

Terminal Code  
-- = Standard



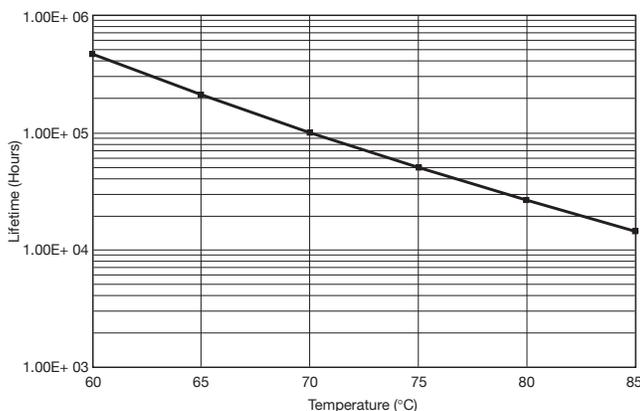
### ELECTRICAL CHARACTERISTICS

<b>Climatic category</b>	40/085/56 (IEC 60068)
<b>Working temperature</b>	hot spot temperature: -40°C to +85°C
<b>Hot spot temperature</b>	≤85°C (must be calculated: see below)
<b>Capacitance range C<sub>n</sub></b>	80 to 1200nF
<b>Tolerance</b>	±10%
<b>Rated AC voltage</b>	V <sub>n,rms</sub> = 300 to 650 V
<b>Rated DC voltage</b>	V <sub>n,dc</sub> = 600 to 2000 V
<b>Maximum rms current</b>	I <sub>rms max</sub> = 10 to 40 Arms
<b>Maximum reactive power</b>	Q max = 7 to 14 kvar
<b>Stray inductance</b>	15 nH
<b>Test voltage between terminals</b>	1.5 x V <sub>n,dc</sub> 10s
<b>Withstanding voltage between terminals and case</b>	3000 V <sub>rms</sub> 60s
<b>Dielectric</b>	Polypropylene

### RATINGS AND PART NUMBER REFERENCE

Part Number	Capacitance (nF)	I rms max (A)	Q max (kV)	Rs (mΩ)	Ls (nH)	Rth (°C/W)	Typical Weight (g)
<b>V<sub>n,dc</sub> 600V Vrms: 300V</b>							
FAV36K0125K-	1200	40	12	0.85	5	4	90
FAV36K0105K-	1000	32	10	1	5	4.1	90
<b>V<sub>n,dc</sub> 800V Vrms: 400V</b>							
FAV36B0804K-	800	35	14	0.9	5	4	90
FAV36B0624K-	620	27	11	1.1	5	4.1	90
<b>V<sub>n,dc</sub> 1000V Vrms: 450V</b>							
FAV36L0564K-	560	30	14	1	5	4	90
FAV36L0474K-	470	25	12	1.2	5	4.1	90
<b>V<sub>n,dc</sub> 1200V Vrms: 500V</b>							
FAV36U0334K-	330	21	11	1.4	5	4.2	90
FAV36U0274K-	270	17	9	1.7	5	4.4	90
<b>V<sub>n,dc</sub> 1500V Vrms: 600V</b>							
FAV36R0184K-	180	16	10	1.7	5	4.4	90
FAV36R0154K-	150	13	8	2	5	4.5	90
<b>V<sub>n,dc</sub> 2000V Vrms: 650V</b>							
FAV36N0124K-	120	15	10	1.7	5	4.6	90
FAV36N0104K-	100	12	8	1.9	5	4.9	90
FAV36N0803K-	80	10	7	2	5	5.2	90

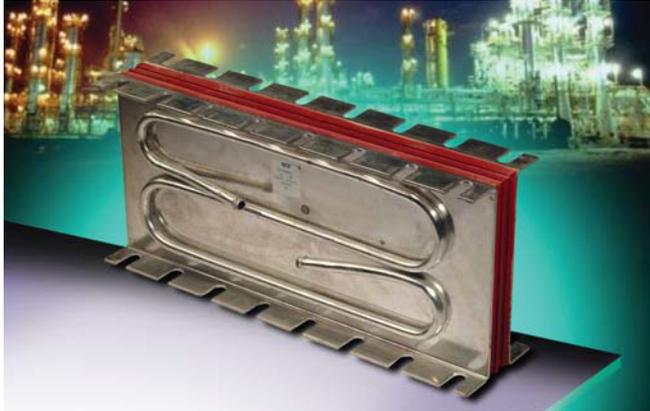
### LIFETIME EXPECTANCY



# TUNING

FAI\* RoHS Compliant

## TUNING



The FAI series uses metallized polypropylene dielectric specifically designed for very high reactive power.

The FAI's special design gives to this series a very low level of stray inductance.

### APPLICATIONS

These capacitors have been designed principally for: low and medium frequency applications (10 kHz to 500 kHz).

### MAXIMUM WORKING TEMPERATURE (HOT SPOT)

+85°C: Hot spot temperature must be calculated as function of power dissipation.

### HOT SPOT (THERMAL) CALCULATION

See Hot Spot Temperature page 3.

You can calculate the maximum operating (hot spot) temperature of this capacitor in the following manner:

Polypropylene has a constant loss factor ( $tg\delta_0$ ) of  $2 \times 10^{-4}$  irrespective of temperature and frequency (up to 1 MHz).

The loss factor of the capacitor is made up of the sum of two components. The first represents electrical losses ( $tg\delta_0 = 2.10^{-4}$ ) and the second represents Joule effect in the connection and foils:  $R_s \cdot C \cdot 2\pi F$ .

For all applications, the temperature in the hot spot capacitor must be lower than 85°C.

$$\theta_{hot\ spot} = \theta_{terminals} + (tg\delta_0 \cdot Q + R_s \cdot (I_{rms})^2) \cdot R_{th}$$

Heating calculation of hot spot capacitor: FAI6

$$\theta_{hot\ spot} = \theta_{water} + (tg\delta_0 \cdot Q + R_s \cdot (I_{rms})^2) \cdot R_{th}$$

With:  $tg\delta_0 = 2.10^{-4}$

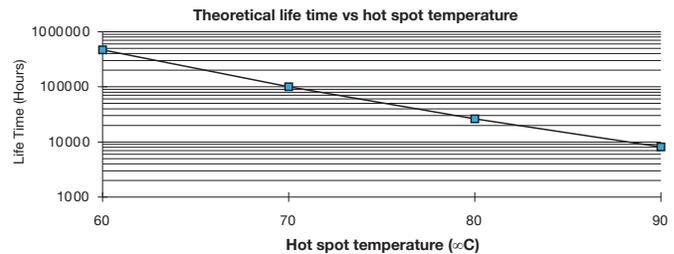
Q in Var

$R_s$  in Ohms

$I_{rms}$  in Amperes

$R_{th}$  in °C/W (water flow = 10 dm<sup>3</sup>/minute)

**Note:** The life time depends of hot spot temperature, see following curve.



### ELECTRICAL CHARACTERISTICS

Capacitance range $C_n$	110nF to 60µF
Tolerance	±10%
Rated AC voltage	200 to 650 Vrms
Series parasitic inductance	< 5 nH
Test voltage between terminals @ 25°C	1.2 Vrms 50/60 Hz 10s
Dielectric	Polypropylene

### HOW TO ORDER

**FAI**

Series

**1**

Case Size

1  
2  
3  
4  
5  
6

**6**

Dielectric  
6 = Polypropylene

**J**

Voltage Code

H = 300 Vrms  
I = 350 Vrms (Case size 3)  
J = 400 Vrms (Case size 4)  
K = 500 Vrms  
K = 60 Vrms

**0114**

Capacitance Code

0 + pF code  
0114 = 0.11µF (110nF)  
0245 = 2.4µF (2400nF)  
0405 = 4.0µF (4000nF)  
etc.

**K**

Capacitance Tolerances

K = ±10%

**--**

Terminal Code

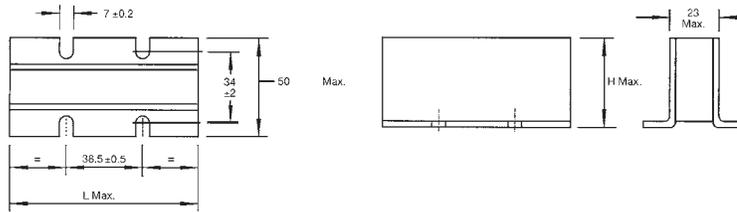
-- = Standard



# TUNING

FAI\* RoHS Compliant

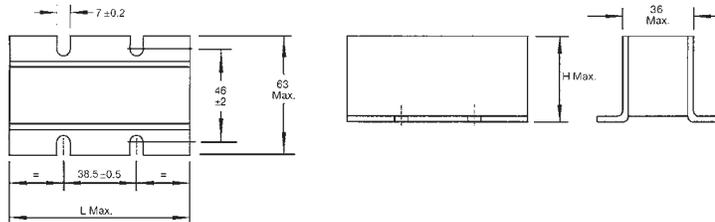
## TUNING FAI1 STYLE CASE SIZE 1 DIMENSIONS



Part Number	C (nF)	Irms max (A)	Vrms max (V)	Q max kVARs	Rs (mΩ)	Rth (°C/W)	L max (mm)	H max (mm)	Typical Weight (g)
FAI16J0114K-	110	180	500	100	$8 \times 10^{-4} \times \sqrt{F} + 0.19$	0.86	55	35	125
FAI16J0214K-	210	300	500	150	$5 \times 10^{-4} \times \sqrt{F} + 0.12$	0.67	75	40	195
FAI16J0334K-	330	350	500	175	$5 \times 10^{-4} \times \sqrt{F} + 0.15$	0.54	75	40	195
FAI16J0514K-	510	500	500	250	$4 \times 10^{-4} \times \sqrt{F} + 0.08$	0.49	95	45	275
FAI16J0664K-	660	600	500	300	$3.5 \times 10^{-4} \times \sqrt{F} + 0.06$	0.38	95	45	275

With F in Hz

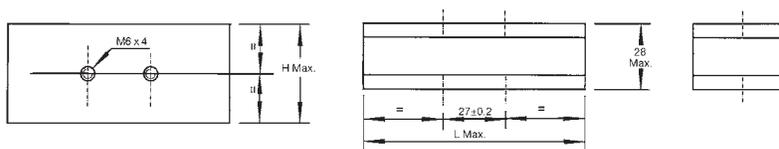
## FAI2 STYLE CASE SIZE 2 DIMENSIONS



Part Number	C (nF)	Irms max (A)	Vrms max (V)	Q max kVARs	Rs (mΩ)	Rth (°C/W)	L max (mm)	H max (mm)	Typical Weight (g)
FAI26J0664K-	660	300	500	180	$5 \times 10^{-4} \times \sqrt{F} + 0.25$	0.6	75	40	300
FAI26J0125K-	1200	400	500	200	$5 \times 10^{-4} \times \sqrt{F} + 0.20$	0.56	75	40	300
FAI26I0245K-	2400	500	350	175	$5 \times 10^{-4} \times \sqrt{F} + 0.17$	0.55	75	40	300

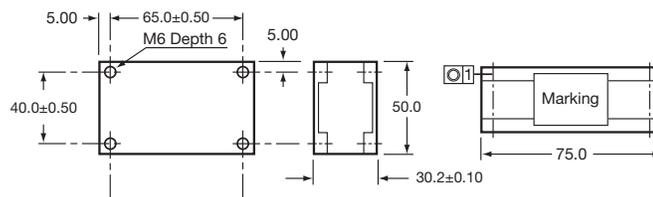
With F in Hz

## FAI3 STYLE CASE SIZE 3 DIMENSIONS



Part Number	C (nF)	Irms max (A)	Vrms max (V)	Q max kVARs	Rs (mΩ)	Rth (°C/W)	L max (mm)	H max (mm)	Typical Weight (g)
FAI36J0114K-	110	180	500	100	0.3	0.82	55	35	150
FAI36J0334K-	330	350	500	175	0.15	0.55	75	37	220
FAI36J0514K-	510	500	500	250	0.1	0.3	95	42	315
FAI36J0664K-	660	600	500	300	0.1	0.24	95	42	315

## FAI4 STYLE CASE SIZE 4 DIMENSIONS



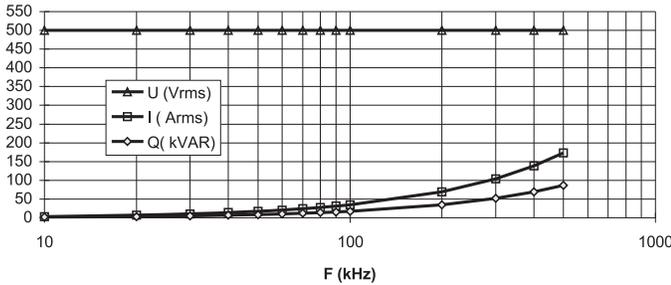
Part Number	C (nF)	Irms max (A)	Vrms max (V)	Q max kVARs	Rs (mΩ)	Rth (°C/W)	Typical Weight (g)
FAI46H0405K-	4000	600	300	180	0.13	0.15	315
FAI46I0245K-	2400	500	400	200	0.15	0.20	315
FAI46J0185K-	1800	550	450	230	0.35	0.38	315
FAI46J0125K-	1200	500	500	200	0.20	0.22	315
FAI46J0664K-	660	450	500	220	0.26	0.32	315
FAI46K0334K-	330	380	600	220	0.315	0.315	315
FAI46K0284K-	280	320	600	190	0.37	0.375	315

# TUNING

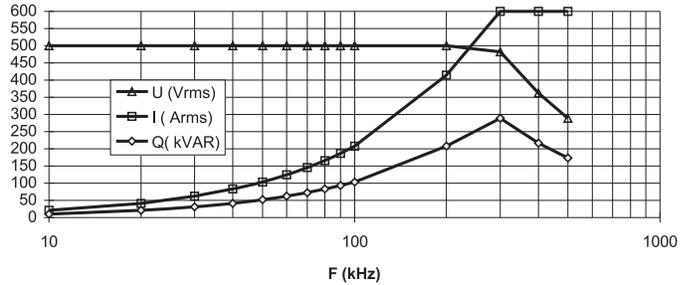
FAI\* RoHS Compliant

## TUNING

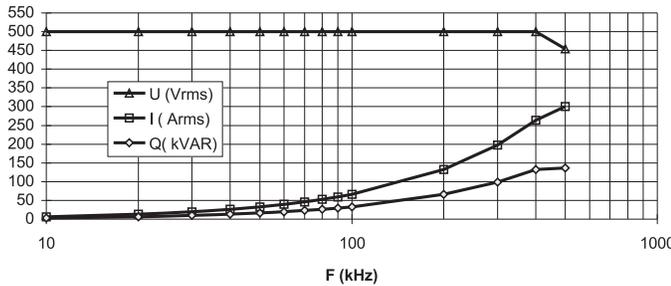
**110 nF 500 Vrms**  
FAI16J0114K--  
FAI36J0114K--



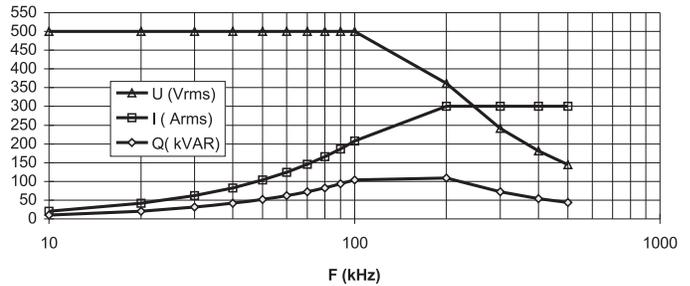
**660 nF 500 Vrms**  
FAI16J0664K--  
FAI36J0664K--



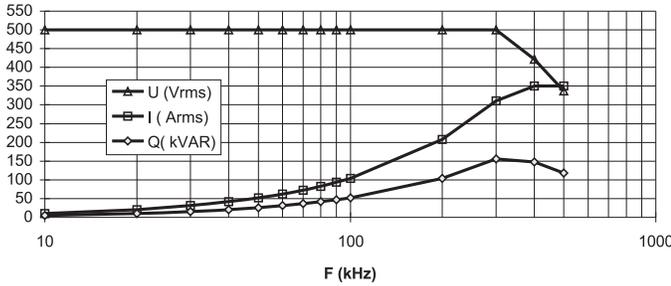
**210 nF 500 Vrms**  
FAI16J0214K--



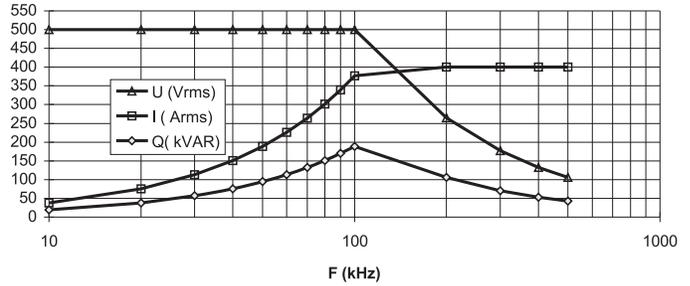
**660 nF 500 Vrms**  
FAI26J0664K--



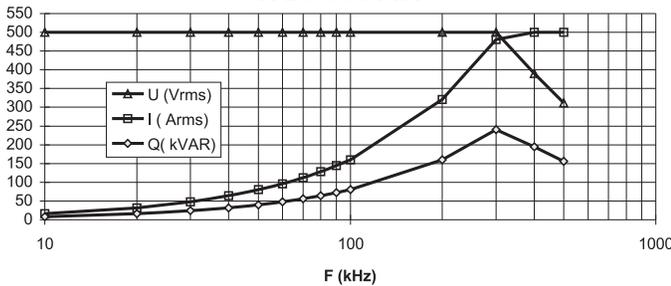
**330 nF 500 Vrms**  
FAI16J0334K--  
FAI36J0334K--



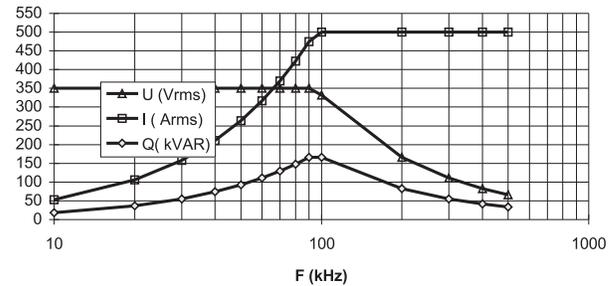
**1200 nF 500 Vrms**  
FAI26J0125K--



**510 nF 500 Vrms**  
FAI16J0514K--  
FAI36J0514K--



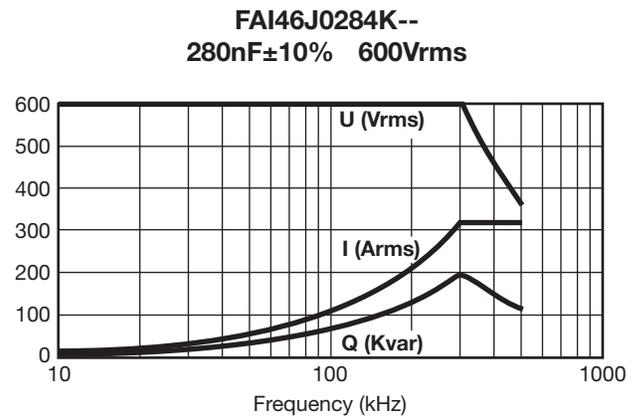
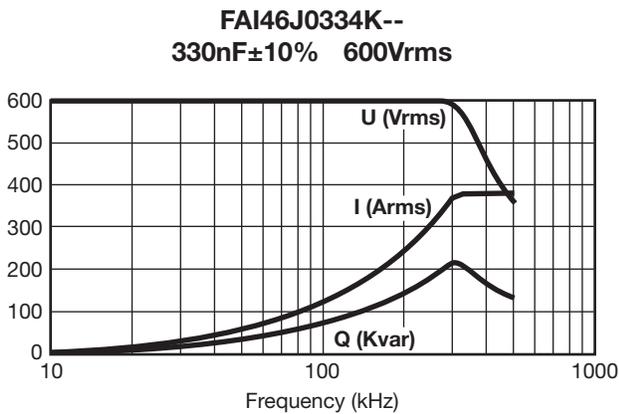
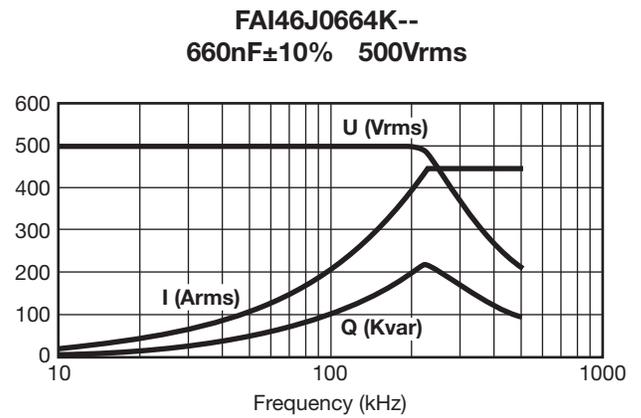
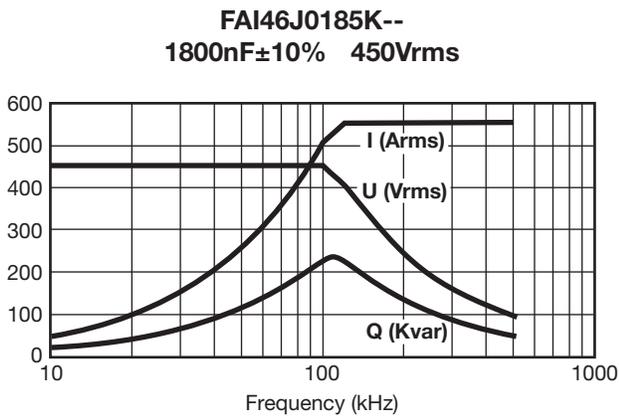
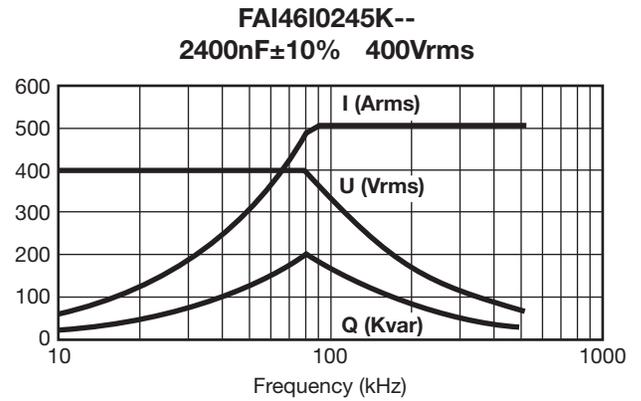
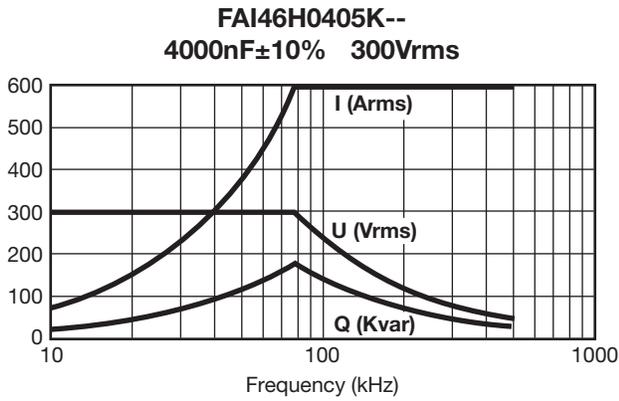
**2400 nF 350 Vrms**  
FAI26J0245K--



# TUNING

FAI\* RoHS Compliant

## TUNING



# TUNING

FAI\* RoHS Compliant

## TUNING

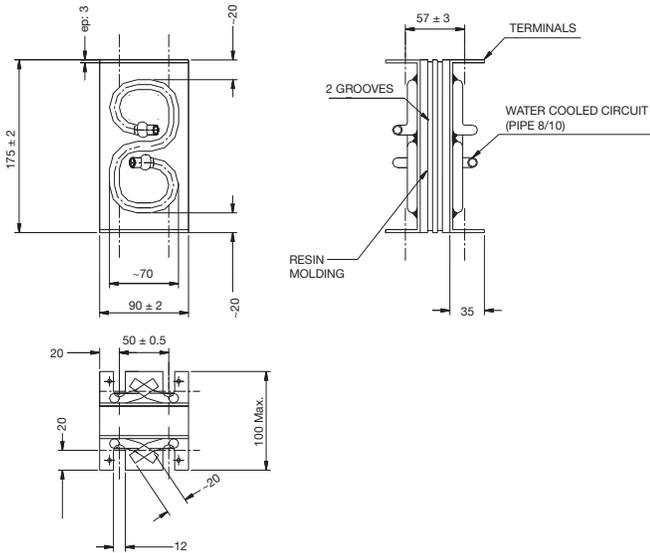
### FAI6

Part Number	Width (mm)	Vrms max (V)	C (μF)	Qmax (kVAR)	Irms max (A)	Rs (mΩ)	Rth (°C/W)	Typical Weight (g)
FAI66F0156K-	90	200	15	160	800	$5.10^{-4} \times \sqrt{f(\text{Hz})} + 0.025$	0.104	1900
FAI66H0126K-		300	12	240	800	$5.10^{-4} \times \sqrt{f(\text{Hz})} + 0.03$	0.104	1900
FAI66I0705K-		400	7	320	800	$5.10^{-4} \times \sqrt{f(\text{Hz})} + 0.035$	0.114	1900
FAI66J0505K-		500	5	320	640	$5.10^{-4} \times \sqrt{f(\text{Hz})} + 0.04$	0.114	1900
FAI66K0355K-		600	3.5	320	530	$5.10^{-4} \times \sqrt{f(\text{Hz})} + 0.05$	0.124	1900
FAI66A0155K-		650	1.5	320	490	$5.10^{-4} \times \sqrt{f(\text{Hz})} + 0.07$	0.134	1900
FAI66F0306K-	190	200	30	240	1200	$2.5.10^{-4} \times \sqrt{f(\text{Hz})} + 0.0125$	0.079	3950
FAI66H0246K-		300	24	360	1200	$2.5.10^{-4} \times \sqrt{f(\text{Hz})} + 0.015$	0.079	3950
FAI66I0146K-		400	14	480	1200	$2.5.10^{-4} \times \sqrt{f(\text{Hz})} + 0.0175$	0.084	3950
FAI66J0106K-		500	10	600	1200	$2.5.10^{-4} \times \sqrt{f(\text{Hz})} + 0.02$	0.084	3950
FAI66K0705K-		600	7	640	1070	$2.5.10^{-4} \times \sqrt{f(\text{Hz})} + 0.025$	0.089	3950
FAI66A0305K-		650	3	640	985	$2.5.10^{-4} \times \sqrt{f(\text{Hz})} + 0.035$	0.094	3950
FAI66F0456K-	290	200	45	320	1600	$2.10^{-4} \times \sqrt{f(\text{Hz})} + 0.0083$	0.072	6100
FAI66H0366K-		300	36	480	1600	$2.10^{-4} \times \sqrt{f(\text{Hz})} + 0.01$	0.072	6100
FAI66I0216K-		400	21	640	1600	$2.10^{-4} \times \sqrt{f(\text{Hz})} + 0.0117$	0.075	6100
FAI66J0156K-		500	15	800	1600	$2.10^{-4} \times \sqrt{f(\text{Hz})} + 0.0133$	0.075	6100
FAI66K1055K-		600	10.5	960	1600	$2.10^{-4} \times \sqrt{f(\text{Hz})} + 0.0167$	0.078	6100
FAI66A0455K-		650	4.5	960	1480	$2.10^{-4} \times \sqrt{f(\text{Hz})} + 0.0233$	0.082	6100
FAI66F0606K-	390	200	60	400	2000	$1.5.10^{-4} \times \sqrt{f(\text{Hz})} + 0.00625$	0.067	8200
FAI66H0486K-		300	48	600	2000	$1.5.10^{-4} \times \sqrt{f(\text{Hz})} + 0.0075$	0.067	8200
FAI66I0286K-		400	28	800	2000	$1.5.10^{-4} \times \sqrt{f(\text{Hz})} + 0.00875$	0.070	8200
FAI66J0206K-		500	20	1000	2000	$1.5.10^{-4} \times \sqrt{f(\text{Hz})} + 0.01$	0.070	8200
FAI66K0146K-		600	14	1200	2000	$1.5.10^{-4} \times \sqrt{f(\text{Hz})} + 0.0125$	0.072	8200
FAI66A0605K-		650	6	1280	1970	$1.5.10^{-4} \times \sqrt{f(\text{Hz})} + 0.0175$	0.075	8200

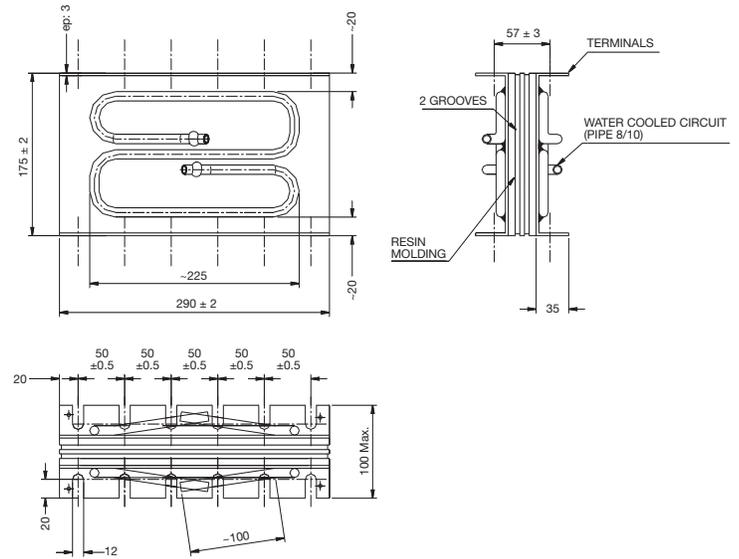
### TUNING

#### CASE SIZE 6 DIMENSIONS

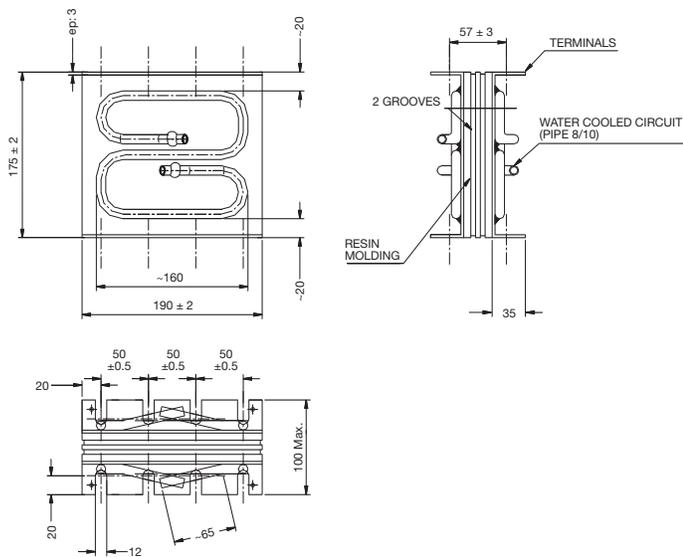
##### FAI6 WIDTH: 90 (3.543)



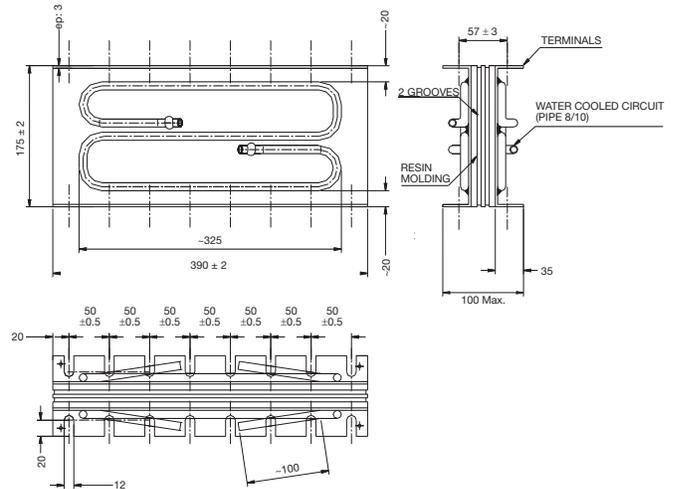
##### FAI6 WIDTH: 290 (11.417)



##### FAI6 WIDTH: 190 (7.480)



##### FAI6 WIDTH: 390 (15.354)

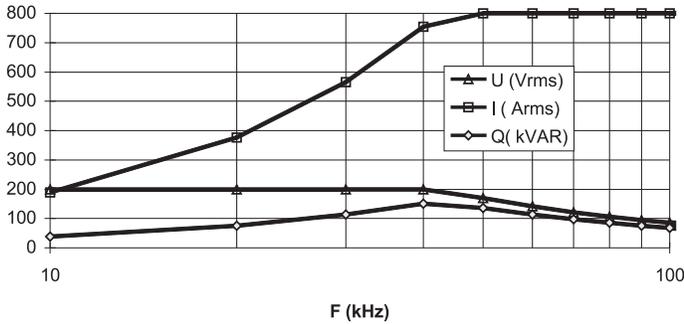


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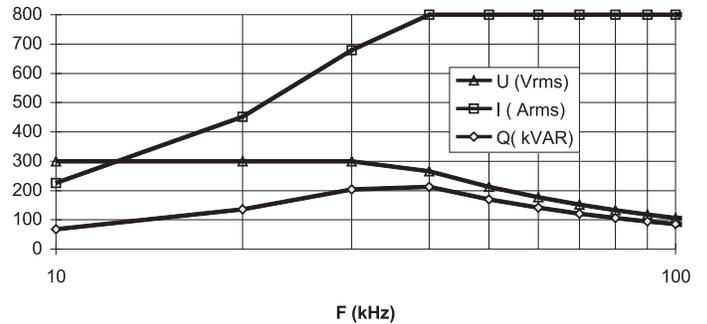
FAI\* RoHS Compliant

## TUNING

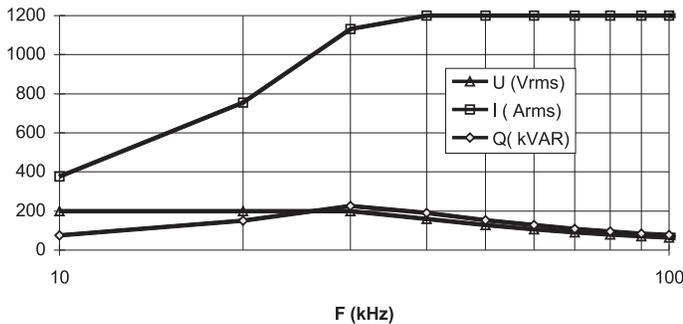
15  $\mu$ F 200 Vrms Width 90 mm  
FAI66F0156K--



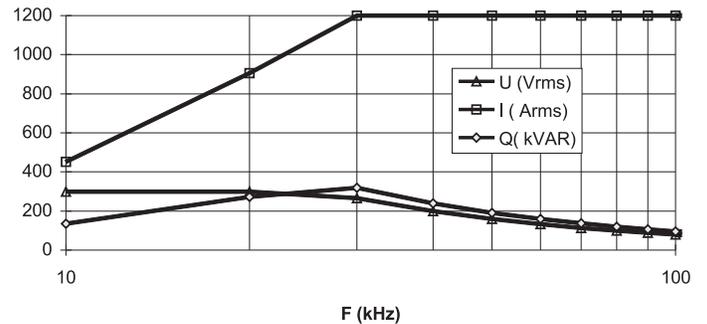
12  $\mu$ F 300 Vrms Width 90 mm  
FAI66H0126K--



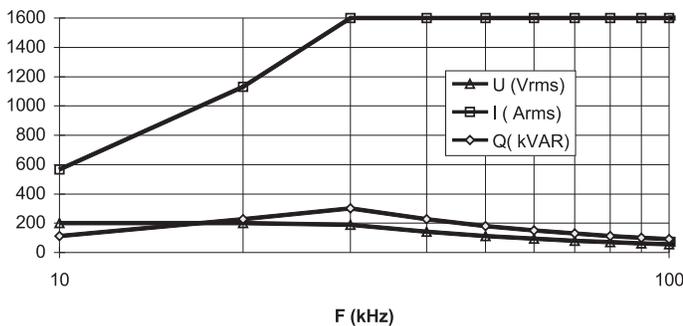
30  $\mu$ F 200 Vrms Width 190 mm  
FAI66F0306K--



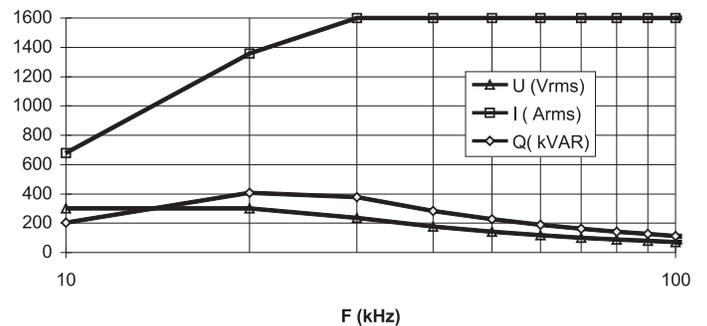
24  $\mu$ F 300 Vrms Width 190 mm  
FAI66H0246K--



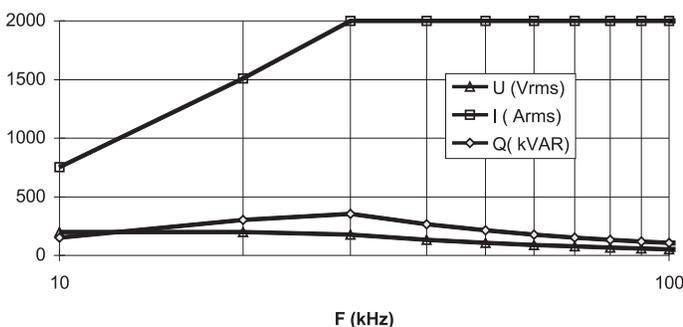
45  $\mu$ F 200 Vrms Width 290 mm  
FAI66F0456K--



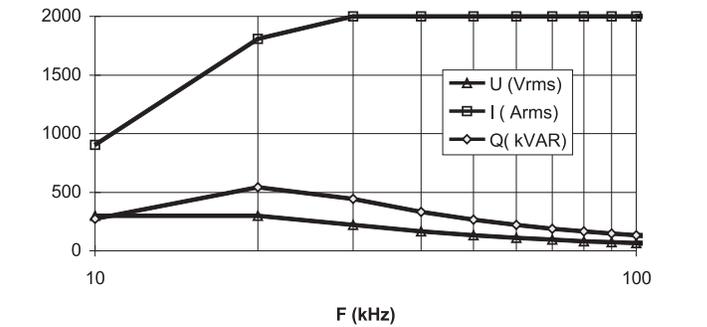
36  $\mu$ F 300 Vrms Width 290 mm  
FAI66H0366K--



60  $\mu$ F 200 Vrms Width 390 mm  
FAI66F0606K--



48  $\mu$ F 300 Vrms Width 390 mm  
FAI66H0486K--

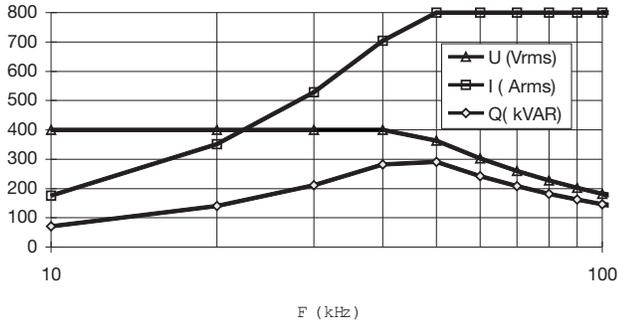


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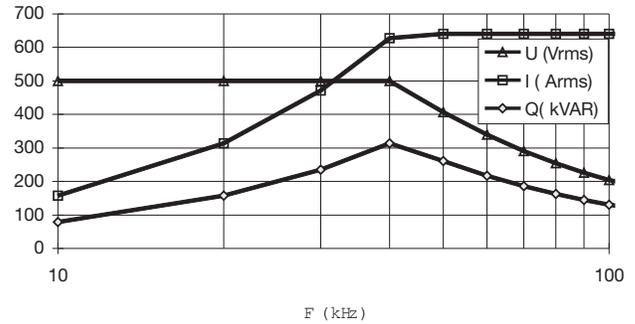
FAI\* RoHS Compliant

## TUNING

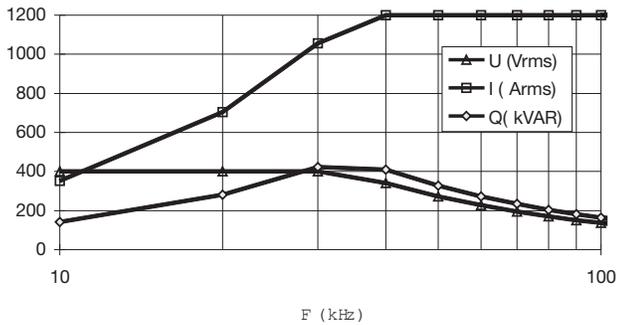
7  $\mu$ F 400 Vrms Width 90 mm  
FAI66I0705K--



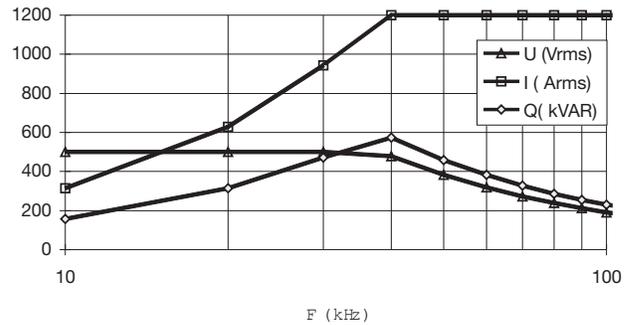
5  $\mu$ F 500 Vrms Width 90 mm  
FAI66J0505K--



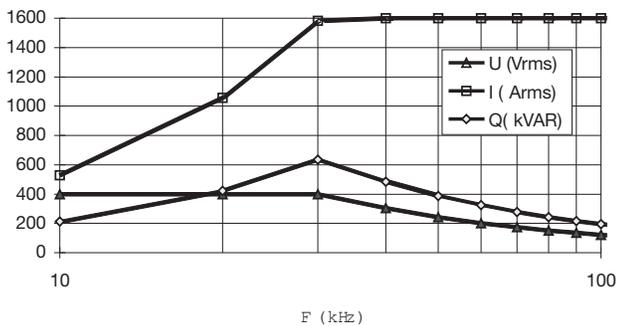
14  $\mu$ F 400 Vrms Width 190 mm  
FAI66I0146K--



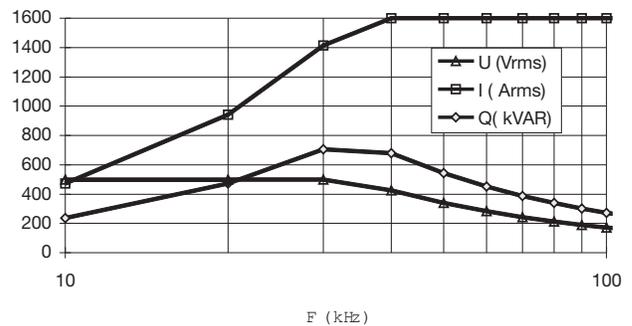
10  $\mu$ F 500 Vrms Width 190 mm  
FAI66J0106K--



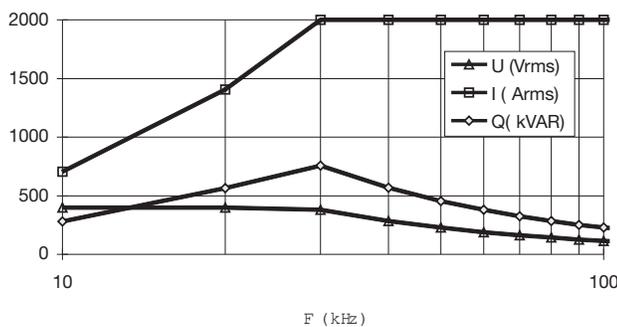
21  $\mu$ F 400 Vrms Width 290 mm  
FAI66I0216K--



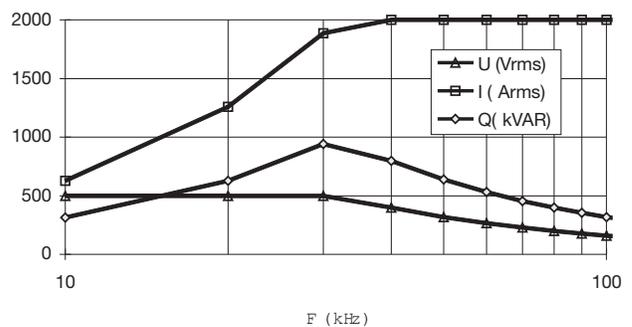
15  $\mu$ F 500 Vrms Width 290 mm  
FAI66J0156K--



28  $\mu$ F 400 Vrms Width 390 mm  
FAI66I0286K--



20  $\mu$ F 500 Vrms Width 390 mm  
FAI66J0206K--

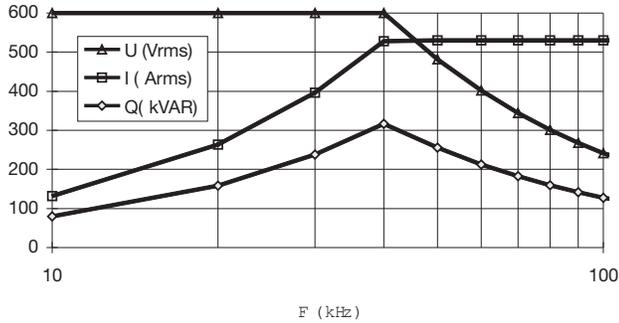


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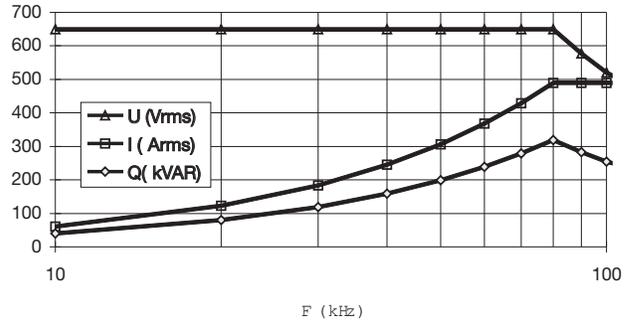
FAI\* RoHS Compliant

## TUNING

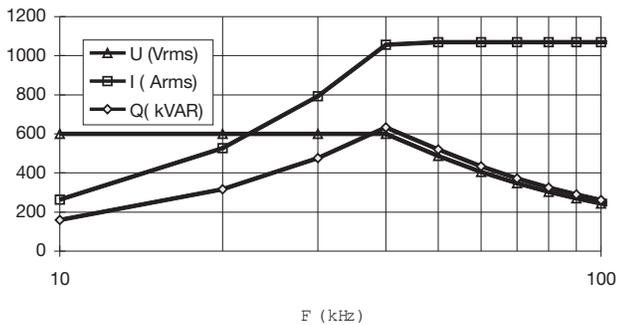
**3.5  $\mu$ F 600 Vrms Width 90 mm  
FAI66K0355K--**



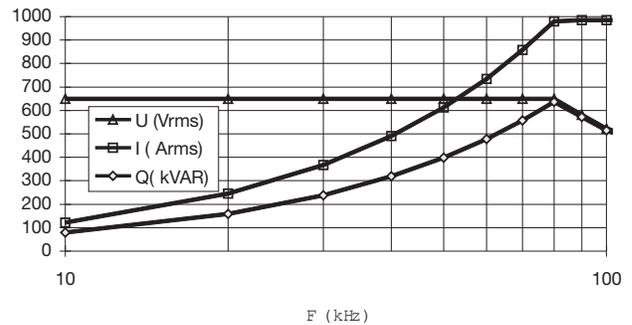
**1.5  $\mu$ F 650 Vrms Width 90 mm  
FAI66A0155K--**



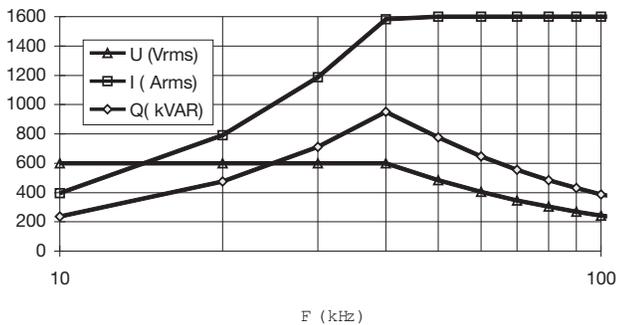
**7  $\mu$ F 600 Vrms Width 190 mm  
FAI66K0705K--**



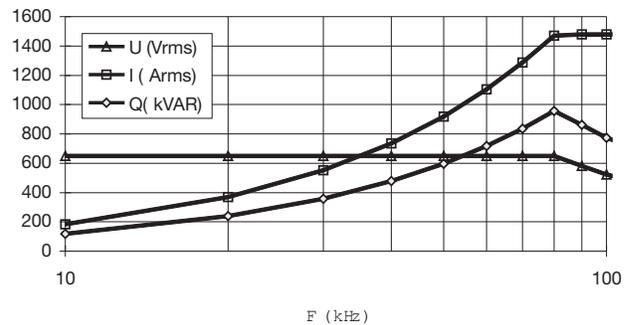
**3  $\mu$ F 650 Vrms Width 190 mm  
FAI66A0305K--**



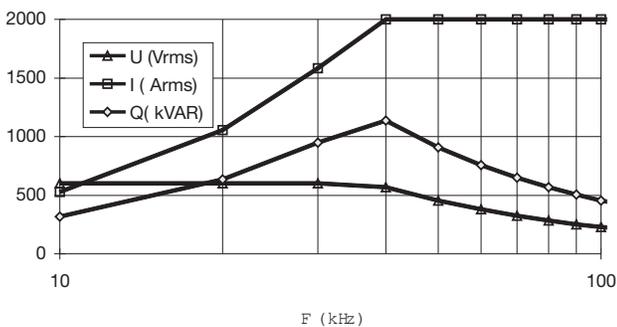
**10.5  $\mu$ F 600 Vrms Width 290 mm  
FAI66K1055K--**



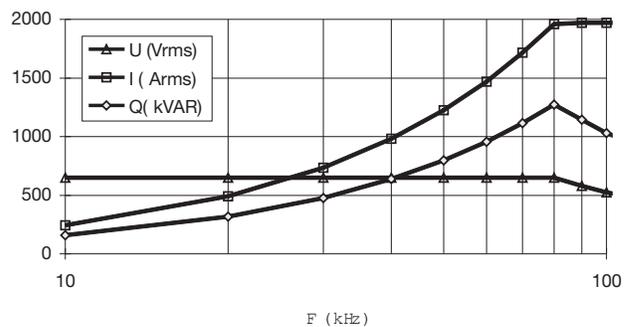
**4.5  $\mu$ F 650 Vrms Width 290 mm  
FAI66A0455K--**



**14  $\mu$ F 600 Vrms Width 390 mm  
FAI66K0146K--**



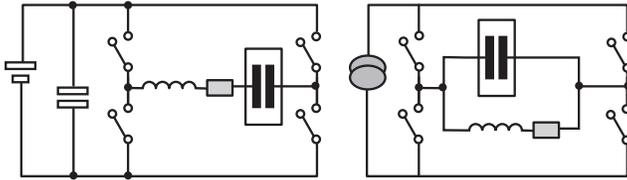
**6  $\mu$ F 650 Vrms Width 390 mm  
FAI66A0605K--**



## INDUCTION HEATING

### APPLICATIONS

Local thermal treatment, metallic surface hardening, pipe welding, tin coating treatment,...



### FUNCTION, PRODUCTS

#### DC Filtering

The purpose of this filter is to smooth the low frequency ripple coming from the bridge (up to 360 Hz) and to filter the high frequency ripple coming from the converter (15/20 kHz)\*.

\*Frequency will be lower than capacitor resonance frequency, on request, TPC can propose specific models for high frequency.

Main criteria are: High rms. current and good behavior against overvoltage are needed.

#### Products to offer

<b>FFG/FFH</b>	5 to 160µF	600 to 1900Vdc
<b>FFVE/FFWE</b>	12 to 400µF	300 to 1900Vdc
<b>FFVI/FFWI</b>	47 to 275µF	500 to 1100Vdc
<b>FLLI/FFLB</b>	58 to 800µF	680 to 1900Vdc
<b>FFLC</b>	1120 to 8800µF	680 to 1200Vdc

#### Tuning

In order to obtain the requested frequency, a capacitor is needed to tune with the inductance. The main characteristic of this capacitor is the reactive power (express in kVar) versus frequency.

#### Products to offer

### TRACTION

<b>FAI6</b>	10 kHz ≤ F ≤ 100 kHz	1.5 to 60µF 200 to 650Vrms 160 to 1280kVar
<b>FAI1 to 4</b>	100 kHz ≤ F ≤ 500 kHz	110 to 4000nF 300 to 600Vrms 100 to 300kVar

### APPLICATIONS

Speed converter for power for mass transit and/or people mover system.

### FUNCTION, PRODUCTS

#### DC Filtering

The purpose of the product is to filter the high frequency ripple coming from the converter in order to avoid rejection and perturbation on the network.

TPC has developed controlled-self healing range allowing reliable and competitive solution compare electrolytic technology.

See calculation example how to replace electrolytic technology.

Note that on new developments based on IGBT converter, manufacturer wish to have a main DC filter close to the converter and some light filters sprayed on the line.

#### Products to offer

Main DC Filter	<b>FFLC</b>	1120 to 8800µF	up to 1200Vdc
Additional	<b>FLLI/FFLB</b>	58 to 800µF	up to 1900Vdc
DC Filter	<b>FFVE/FFWE</b>	12 to 400µF	up to 1900Vdc
	<b>FFG/FFV</b>	5 to 160µF	up to 1900Vdc

#### Protection of semi-conductors

Overvoltage and clamping due to switching of semi-conductors.

#### Products to offer

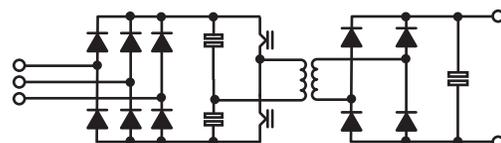
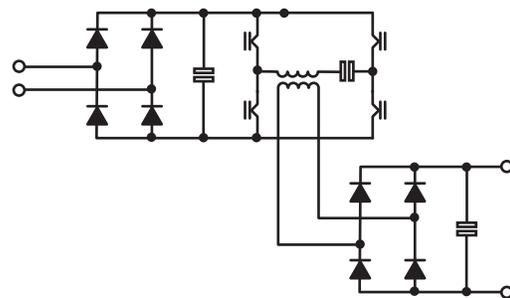
Thyristors and GTO snubbers	<b>FPX/FPY</b>	0.5µF to 6µF	up to 4600V*
IGBT clamping	<b>FSB</b>	0.1 to 2.5µF	up to 2kVdc
	<b>FFVE</b>	12 to 400µF	up to 1.9kVdc

\*higher voltage on request

## POWER SUPPLIES AND RESONANT CONVERTER

### APPLICATIONS

- Medical X-ray, scanner power supplies
- Traction Battery charger
- Industrial All application requesting power supplies



## FUNCTION, PRODUCTS

### DC Filtering

The purpose of this filter is to smooth the low frequency ripple coming from the bridge (up to 360 Hz) and to filter the high frequency ripple coming from the converter (15/20 kHz).

High rms. current and good behavior against overvoltage are needed.

#### Products to offer

<b>FFB/FFV3</b>	1.5 to 160 $\mu$ F	75 to 1100Vdc
<b>FFG/FFH</b>	5 to 160 $\mu$ F	600 to 1900Vdc
<b>FFVE/FFWE</b>	12 to 400 $\mu$ F	300 to 1900Vdc
<b>FFVI/FFWI</b>	47 to 275 $\mu$ F	500 to 1100Vdc
<b>FFLI/FFLB</b>	58 to 800 $\mu$ F	680 to 1900Vdc

### Tuning

In order to obtain the requested frequency, a capacitor is needed to tune with the inductance transformer.

The main characteristic of this capacitor is the reactive power and rms. current.

#### Products to offer

<b>FAV</b>	80 to 1200nF	up to 650Vrms
<b>FAI1 to 4</b>	110 to 4000nF	up to 600Vrms

### Protection of semi-conductors

Overvoltage and clamping due to switching of semi-conductors.

#### Products to offer

IGBT clamping	<b>FSB</b>	0.1 to 3 $\mu$ F	up to 2kVdc
Mos-Fet transistor protection	<b>FSV</b>	10nF to 150nF	up to 2kVdc

## SPEED CONVERTER

### APPLICATIONS

Speed converter for medium power (20 to 100kW) Traction: auxiliary converter for air cooling system, light,... Industrial: speed variation

## FUNCTION, PRODUCTS

### DC Filtering

The purpose of this product is to filter the high frequency ripple coming from the converter in order to avoid rejection and perturbation on the network.

Due to IGBT converter, heavy rms. current and very compact product is requested; film technology is able to achieve these 2 targets.

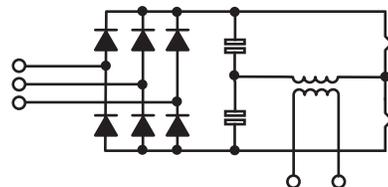
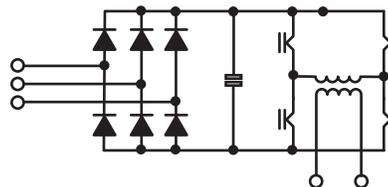
#### Products to offer

<b>FFLI/FFLB</b>	58 to 800 $\mu$ F	680 to 1900Vdc
<b>FFVE/FFWE</b>	12 to 400 $\mu$ F	300 to 1900Vdc
<b>FFVI/FFWI</b>	47 to 275 $\mu$ F	500 to 1100Vdc
<b>FFB/FFV3</b>	1.5 to 160 $\mu$ F	75 to 1100Vdc

## WELDING

### APPLICATIONS

Generate, out of the main supply, through a converter (chopper) and a transformer an overvoltage able to create an electrical arc.



## FUNCTION, PRODUCTS

### DC Filtering

The purpose of this filter is to smooth the low frequency ripple coming from the rectifier (up to 360 Hz) and to filter the high frequency ripple coming from the converter (15/20 kHz).

#### Products to offer

<b>FFVE/FFWE</b>	12 to 400 $\mu$ F	300 to 1900V
<b>FFVI/FFWI</b>	47 to 275 $\mu$ F	500 to 1100V
<b>FFB/FFV3</b>	1.5 to 160 $\mu$ F	75 to 1100V

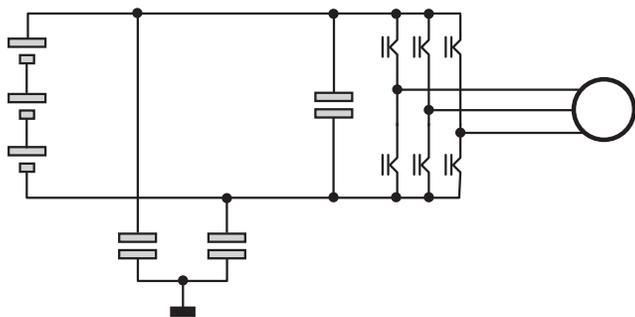
## ELECTRICAL VEHICLE

### APPLICATIONS

Battery powered car, electric fork lift truck and hybrid electric vehicle.

Due to high rms. current needed through the capacitor, metallized controlled self-healing technology will be an excellent solution.

See calculation example on page 105 .



## FUNCTION, PRODUCTS

### DC Filtering

Between battery and converter, a capacitor is needed.

Its main purpose is to filter the ripple coming from the converter, to avoid damaging the battery.

Metallized Film Capacitors are able to fulfill this function using 2 or 3 cases (only electrolytic can not).

#### Products to offer

<b>FFVE/FFWE</b>	12 to 400 $\mu$ F	300 to 1900Vdc
<b>FFVI/FFWI</b>	47 to 275 $\mu$ F	500 to 1100Vdc

According to quantity, a custom design could be developed, achieving the total function with a single case.

## WIND MILL

### APPLICATIONS

Energy power supplied by the wind, new wind mill generation use electronic converter in order to control power, phase and voltage.

## FUNCTION, PRODUCTS

### DC Filtering

The purpose of the product is to filter voltage ripple.

TPC has developed controlled self-healing range allowing reliable and competitive solution compare electrolytic technology.

See calculation example how to replace electrolytic technology on pages 104 and 105.

#### Products to offer

<b>FFLC</b>	1120 to 8800 $\mu$ F	up to 1200Vdc
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### Protection of semi-conductors

Overvoltage and clamping due to switching of semi-conductors.

#### Products to offer

Snubbers	<b>FSB</b>	0.1 to 3 $\mu$ F	up to 2kVdc
Clamping	<b>FFVE/FFWE</b>	12 to 400 $\mu$ F	up to 1.9kVdc

## ENERGY STORAGE

### APPLICATIONS

Medical: cardiac defibrillator

Industrial and military: laser telemetry, flash lamp

## FUNCTION, PRODUCTS

### DC Filtering

Stored energy is used to generate electrical pulse.

#### Products to offer

FDV1	5 to 80 $\mu$ F	1000 to 1700V
FDBB	70 to 150 $\mu$ F	1800 to 3000V*

\*Specific FDBB can be offered with energy density over more than 1.5J per cc.

## FILM TECHNOLOGY TO REPLACE ALUMINUM ELECTROLYTIC TECHNOLOGY

The trend in the industrial and traction market for power conversion is to replace electrolytic capacitors by film technology.

This trend is generated by the many advantages that film technology offers. Among these advantages, we have:

- \*High rms. current capabilities up to 1Arms. per  $\mu$ F
- \*Overvoltage withstanding up to 2 times the rated voltage
- \*Handle a reversal voltage
- \*High peak current capabilities
- \*No acid inside
- \*Long lifetime
- \*No storage problem

However, this replacement is not necessarily capacitance but for capacitance by application/Function.

Despite the advantages of film technology, replacement solutions won't be possible for each application, there will be several approaches to do this.

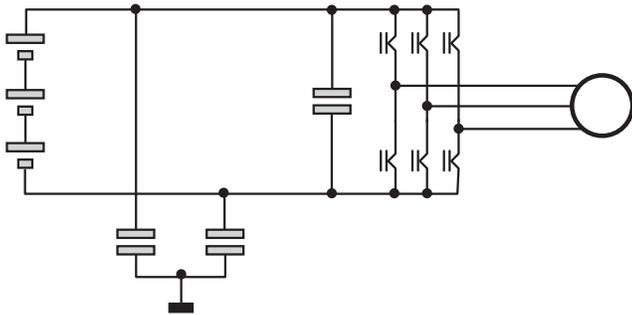
In order to help the use, we will present some examples where film gives a major benefit over electrolytic technology.

## 1) DC LINK FILTER: HIGH CURRENT DESIGN & CAPACITANCE VALUE DESIGN

### 1a) Energy supplied with batteries

Applications will be:

electric car  
electric fork lift truck



In that case, capacitor will be used as a decoupling capacitor.

Film capacitor is particularly well adapted for this use, because main criteria for DC link capacitor will be rms. current withstanding.

It means that DC link capacitor can be designed on rms. current value.

If we take an electric car in account as example:

Requirement data:

Working voltage:	120Vdc
Ripple voltage allowed:	4Vrms
Rms. current:	80 Arms. @ 20kHz

Minimum capacitance value will be:

$$C = \frac{I_{rms}}{U_{ripple} \times 2 \times \pi \times f} = 159 \mu F$$

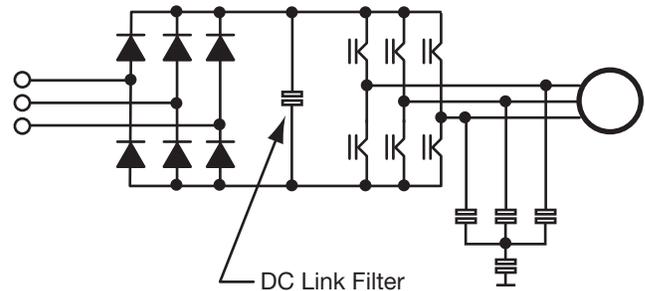
So, it will be easy to find a capacitance value close to these values.

Comparison with electrolytic capacitor.

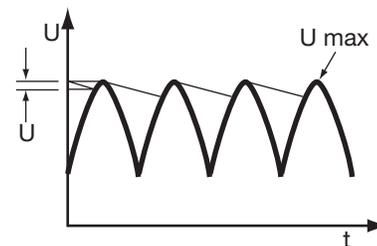
If we take in account 20mA per  $\mu F$  for example, in order to handle 80 Arms, capacitance value minimum would be:

$$C = \frac{80}{0.02} = 4000 \mu F$$

### 1b) Industrial motor drive, energy supplied from supply network



DC link voltage waveform:



Capacitance value will be defined taken in account that supply frequency is lower than converter frequency.

To determine needed capacitance, we can use the following approached equation:

$$C = \frac{P_{load}}{U_{ripple} \times \left[ U_{max} - \frac{U_{ripple}}{2} \right] \times F_{rectifier}}$$

Irms. through capacitor will be (approached expression):

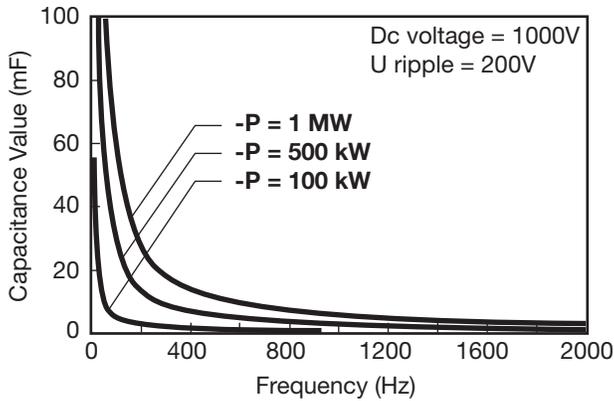
Of course this current doesn't take in account frequency converter current

$$I_{rms} = \frac{U_{ripple}}{2 \times \sqrt{2}} \times C \times 2 \times \pi \times F_{rectifier} = \frac{P_{load} \times \pi}{\left[ U_{max} - \frac{U_{ripple}}{2} \right] \sqrt{2}}$$

So, with this approximation, Irms. through the capacitor will be depending of the Power of load, Umax and U ripple.

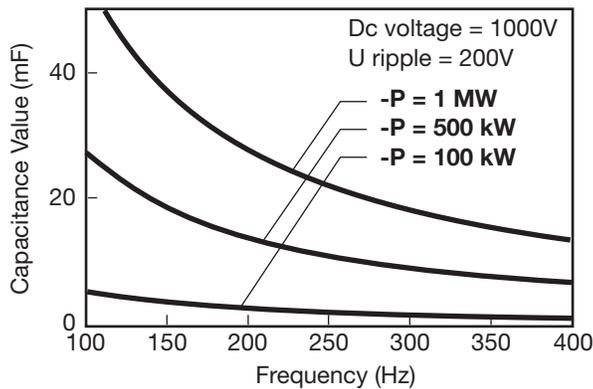
To illustrate, we will take a concrete example:

DC voltage 1000 Volts  
U ripple 200 volts



P	I <sub>rms</sub>
1 MW	2468 Arms
500 kW	1234 Arms
100 kW	247 Arms

It becomes necessary to have a zoom on low frequency:



To compare with electrolytic solution, we will take a current capability of 20mA per  $\mu\text{F}$  for electrolytic capacitors. First case, power at 1Mwatt:

Rms. current is 2468 Arms, which would impose minimum capacitance value of 123.4mF (taking into account 0.02Arms. per  $\mu\text{F}$ ).

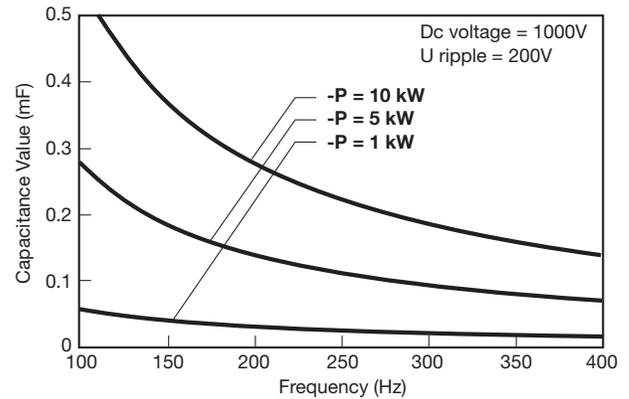
If we look at this value on the curve, we can see that this capacitance value is needed (the given example for film technology) for a rectifier frequency lower than 100Hz.

So, with 3 phases, 6 diodes rectifier, frequency will be 300Hz.

We can see on the 1 megawatt curve that capacitance needed is 18.5mF. Film solution will be almost 4 times smaller than electrolytic solution, with high reliability in addition.

Lower power will give similar results, and for power up to 10 kwatts, capacitance value becomes so small that film technology still constitutes the best solution.

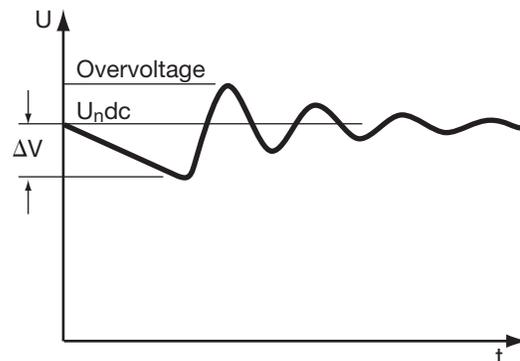
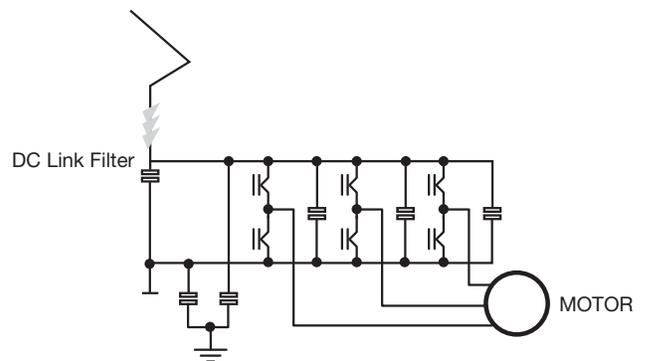
Even at 100Hz rectifier frequency, no more than 555 $\mu\text{F}$  are needed, supply voltage and ripple still the same than previously.



## 2) OVERVOLTAGE DESIGN

We will consider light traction application, like metro, tramway, electric buses, ...

DC link voltage wave form:



Due to the principle of carrying the power from the catenary to the train, some contact discontinuity appears between pantograph and catenary.

When contact is not done, energy come from DC link filter, with for effect, to decrease the voltage. So, as soon as the contact is re-established, an overvoltage appears.

$$V(t) = U_{ndc} - \Delta V \times e^{-\alpha t} \times \left( \cos \omega t + \frac{\alpha}{\omega} \sin \omega t \right)$$

$$\text{with } \omega = \sqrt{\beta_0^2 - \alpha^2}$$

$$\beta_0 = \frac{1}{\sqrt{L \times C}}$$

$$\alpha = \frac{R}{2 \times L}$$

Worse case would be  $\Delta V =$  catenary voltage, because overvoltage could almost reach 2 times the rated voltage.

So, film capacitor can handle this kind of overvoltage.

Comparison with electrolytic technology:

Electrolytic handle 1.2 DC voltage max:

So minimum voltage that electrolytic should handle would be:

$$\text{DC voltage of electrolytic technology: } \frac{2 \times 1000V}{1.2} = 1670V$$

4 capacitors 450 Volts in series would be needed.

Volume occupied for 10mF with electrolytic would be: 26 l and Irms. max would be 220Arms.

With film, volume occupied would be 25 l, and rms. current capability would be higher than 500Arms.

In other hand, link to these overvoltages, peak current appear through the capacitor:

So, we have to calculate the energy generated by this overvoltage

$$E^2t = \int i^2(t) dt.$$

$$i(t) = \frac{C \beta_0^2 V_0}{\omega} e^{-\alpha t} \sin \omega t$$

$$i^2(t) = \frac{C^2 \beta_0^4 V_0^2}{\omega^2} e^{-2\alpha t} \sin^2 \omega t$$

$$\int_0^{\infty} i^2(t) dt = \left[ \frac{1}{4} \frac{e^{-2\alpha t} C^2 \beta_0^4 V_0^2 (-\alpha^2 - \omega^2 + \alpha^2 \cos 2\omega t - \alpha \omega \sin 2\omega t)}{\alpha \omega^2 (\alpha^2 + \omega^2)} \right]_0^{\infty}$$

After few periods, current becomes null, then:

$$\int_0^{\infty} i^2(t) dt = [0] - \left[ -\frac{1}{4} \frac{C^2 \beta_0^4 V_0^2}{\alpha (\alpha^2 + \omega^2)} \right] = \frac{1}{4} \frac{C^2 \beta_0^4 V_0^2}{\alpha (\alpha^2 + \omega^2)}$$

$$\text{with: } \beta_0 = \frac{1}{\sqrt{L \times C}}; \alpha = \frac{R}{2 \times L}; \omega = \sqrt{\beta_0^2 - \alpha^2}$$

This energy calculation will be used for short circuit discharge between terminal as well. Such discharge will generate a very high peak current and some ringing that electrolytic could not handle.

### 3) VOLTAGE RATING

Function of the voltage rating needed, film solution will become more and more interesting.

If high capacitance value is requested, film solution will be less competitive. Indeed, if there is no overvoltage, low rms. current, large capacitance value, it will be difficult for film technology to be competitive below 900 volts.

### LIFETIME CALCULATION

Film technology allows a very long lifetime expectancy, depending on voltage load conditions (working voltage) and hot spot temperature.

For DC filtering, lifetime meets the curves shown in this catalog.

End of life criteria is a decrease of capacitance value of 2%. However, this is a theoretical end of life, because capacitor can be still used after this point. If application can allow 5% capacitance decrease, lifetime will be widely increased.

Hot spot temperature will be determined with the following expression:

$$\theta_{max,hotspot} = \theta_{ambient} + I_{rms}^2 \times \left[ R_s + \frac{1}{C \times 2 \times \pi} \times \text{tg} \delta_0 \right] \times R_{th}$$

with:  $\theta_{max,hotspot}$ : the maximum hot spot temperature

$\text{tg} \delta_0$ : dielectric losses

Rth: Thermal resistance

Rs: Serial resistance

$\theta_{hot spot}$  will be 85°C or 105°C function of the application and the technology.

### 4) CONCLUSION

This document gives some ways for the engineer designer to do their choice. Of course, for each case a complete calculation will have to be done.

Anyway, if the request is only capacitance value, low voltage, low rms. Current, no overvoltage, no reversal voltage, no peak current, film technology certainly won't be a good solution.

# SPECIFIC PRODUCT REQUEST



This questionnaire lists the information we require to prepare an offer according to your exact requirements

Company / Name / Email	Project / Quantity
------------------------	--------------------

Applications	DC Filtering	Discharge*	Protection*	Tuning
Capacitance (µF)				
Tolerance (%)				
Operating Voltage	Vpeak	Vch	Vpeak Vdc	Vrms
Ripple Voltage (peak to peak)	V			
Working Frequency (Hz)				
Operating Current	Arms	Apeak	Arms	Arms
Maximum Current/Duration	Arms s		Apeak	
Discharge		Aperiodic Oscillatory		
Pulse Duration (5% Ipeak)				
Time to Ipeak (µs)				
Ringing Frequency (Hz)				
Reversal Voltage (%)				
Repetition Rate		shots/min/hour/day		Hz
Hold Time @ Full Voltage (s)				
Fault Peak Current / nb shots	Apeak shots	Apeak shots		
Fault Reversal Voltage (%)				
Lifetime Expectancy	hours	shots	hours	hours
Maximum Inductance (nH)				
Test Voltage between Terminals (V)				
Test Voltage between Shorted Terminals and Case (V)				
Maximum Surge Voltage (MSV)				
MSV Duration / Frequency	s /year		s /year	

\*Due to the particularities of varying waveforms in such application, more information on the exact nature of waveform is generally required for a full analysis.

Description				
Dimensions (mm) / Shape		Operating Position	Terminals	
Section:	Height:	vertical, horizontal inclined, upside down	type	quantity
rectangular, cylindrical				

Thermal Characteristics				
Storage Temperature (°C)		Operating Temperature (°C)		Cooling Method
min.		min.		Natural Convection
average		average		Forced Air (m/s)
max.		max.		Water

**Remarks**



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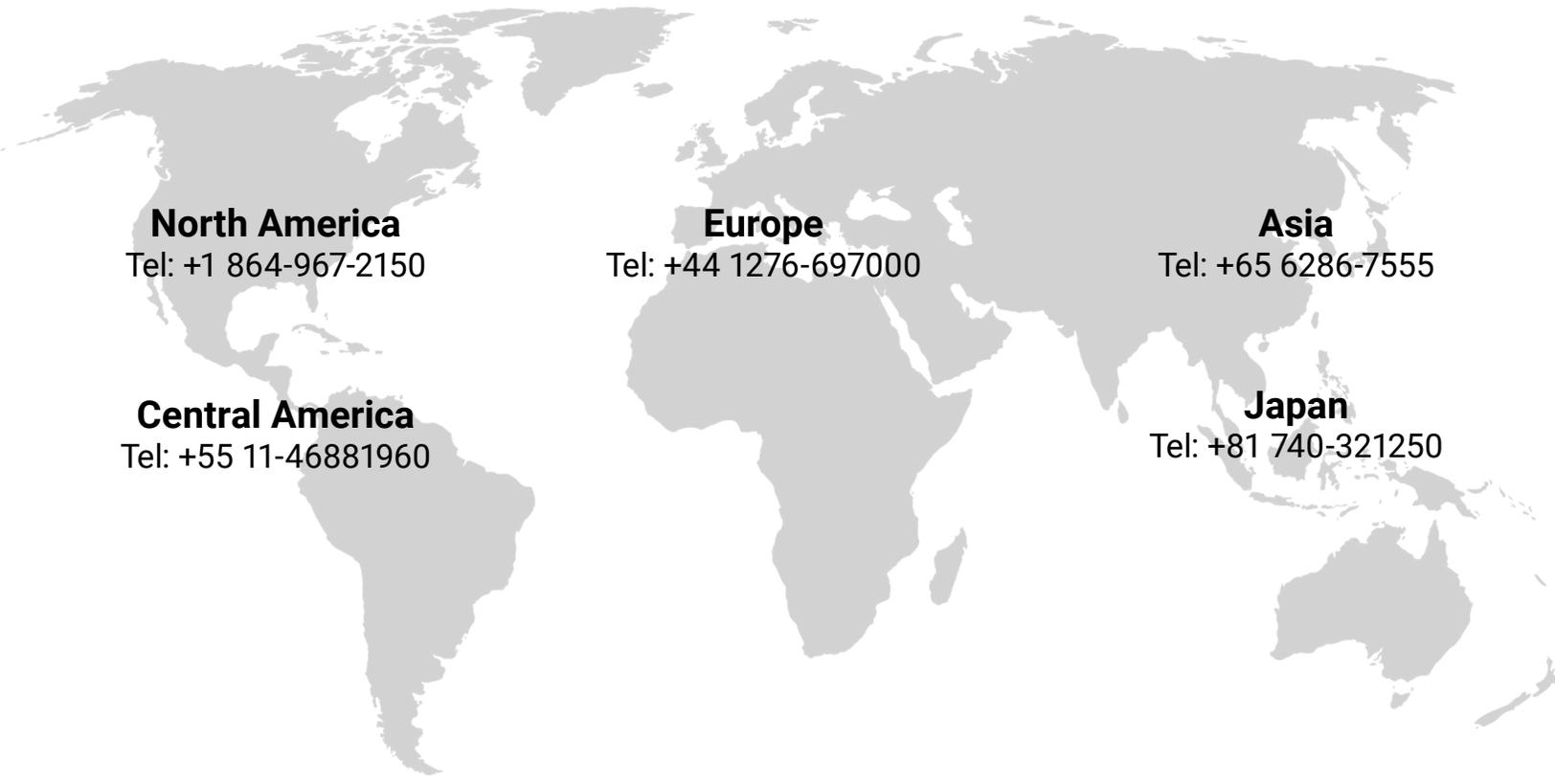
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