

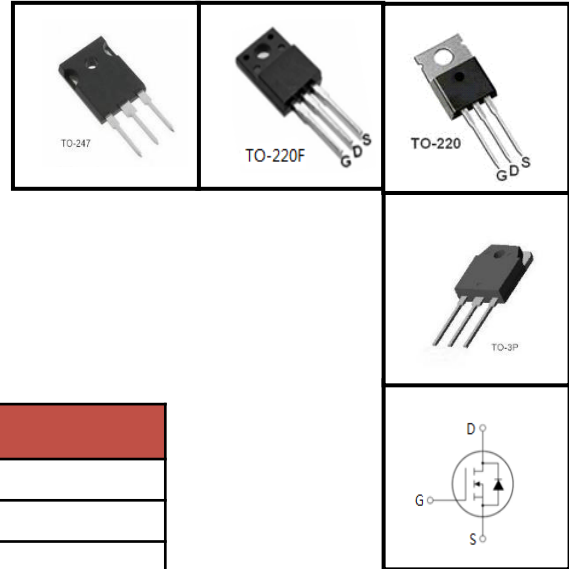
600V N-Channel MOSFET

FEATURES

- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)



Device Marking and Package Information		
Device	Package	Marking
CS20N60F	TO-220F	CS20N60F
CS20N60P	TO-220	CS20N60P
CS20N60W	TO-247	CS20N60W
CS20N60V	TO-3P	CS20N60V

Absolute Maximum Ratings T _C = 25°C, unless otherwise noted						
Parameter	Symbol	Value				Unit
		TO-220F	TO-220	TO-247	TO-3P	
Drain-Source Voltage (V _{GS} = 0V)	V _{DSS}	600				V
Continuous Drain Current	I _D	20				A
Pulsed Drain Current (note1)	I _{DM}	80				A
Gate-Source Voltage	V _{GSS}	± 30				V
Single Pulse Avalanche Energy (note2)	E _{AS}	605				mJ
Avalanche Current (note1)	I _{AS}	11				A
Repetitive Avalanche Energy (note1)	E _{AR}	302.5				mJ
Power Dissipation (T _C = 25°C)	P _D	65.7	104			W
Operating Junction and Storage Temperature Range	T _J , T _{stg}	-55~+150				°C

Thermal Resistance						
Parameter	Symbol	Value				Unit
		TO-220F	TO-220	TO247	TO-3P	
Thermal Resistance, Junction-to-Case	R _{thJC}	1.9	1.2			°C/W
Thermal Resistance, Junction-to-Ambient	R _{thJA}	62.5	60			

Specifications $T_J = 25^{\circ}\text{C}$, unless otherwise noted

Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static						
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0V, I _D = 250μA	600	--	--	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 600V, V _{GS} = 0V, T _J = 25°C	--	--	1	μA
Gate-Source Leakage	I _{GSS}	V _{GS} = ±30V	--	--	±100	nA
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250μA	3.0	--	4.0	V
Drain-Source On-Resistance (Note3)	R _{DS(on)}	V _{GS} = 10V, I _D = 10A	--	0.32	0.40	Ω
Dynamic						
Input Capacitance	C _{iss}	V _{GS} = 0V, V _{DS} = 25V, f = 1.0MHz	--	2521	--	pF
Output Capacitance	C _{oss}		--	264	--	
Reverse Transfer Capacitance	C _{rss}		--	35	--	
Total Gate Charge	Q _g	V _{DD} = 480V, I _D = 20A, V _{GS} = 10V	--	76	--	nC
Gate-Source Charge	Q _{gs}		--	13	--	
Gate-Drain Charge	Q _{gd}		--	32	--	
Turn-on Delay Time	t _{d(on)}	V _{DD} = 300V, I _D = 20A, R _G = 25 Ω	--	53	--	ns
Turn-on Rise Time	t _r		--	44	--	
Turn-off Delay Time	t _{d(off)}		--	321	--	
Turn-off Fall Time	t _f		--	80	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I _S	T _C = 25 °C	--	--	20	A
Pulsed Diode Forward Current	I _{SM}		--	--	80	
Body Diode Voltage	V _{SD}	T _J = 25°C, I _{SD} = 10A, V _{GS} = 0V	--	--	1.4	V
Reverse Recovery Time	t _{rr}	V _{GS} = 0V, I _S = 20A, di _F /dt =100A /μs	--	733	--	ns
Reverse Recovery Charge	Q _{rr}		--	6.5	--	μC

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L=10mH, V_{DD} = 50V, R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$
3. Pulse Test: Pulse width $\leq 300\mu s$, Duty Cycle $\leq 1\%$

Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 1. Output Characteristics ($T_J = 25^\circ\text{C}$)

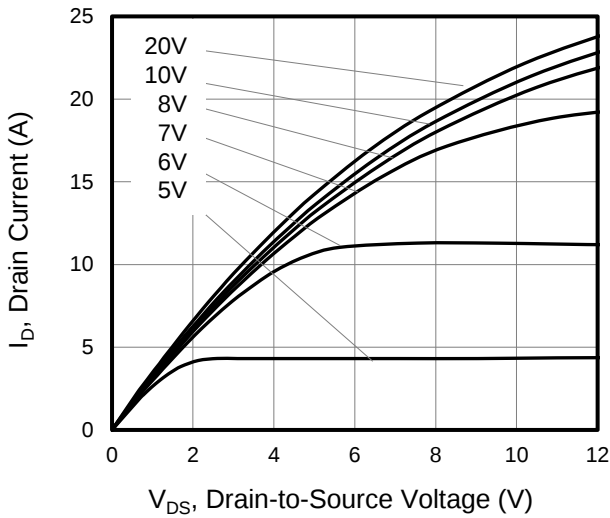


Figure 2. Body Diode Forward Voltage

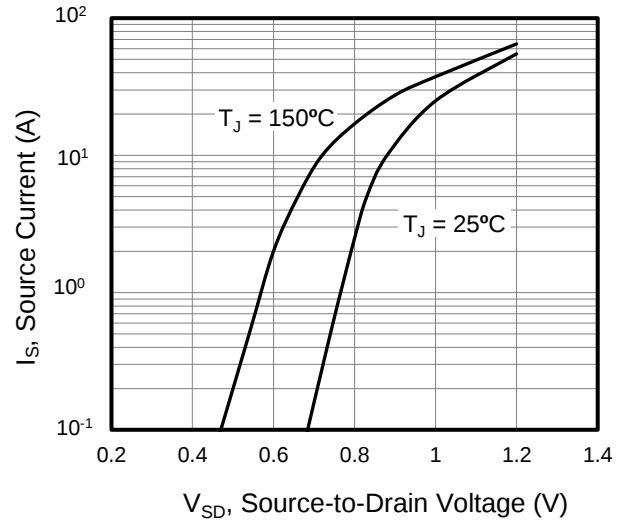


Figure 3. Drain Current vs. Temperature

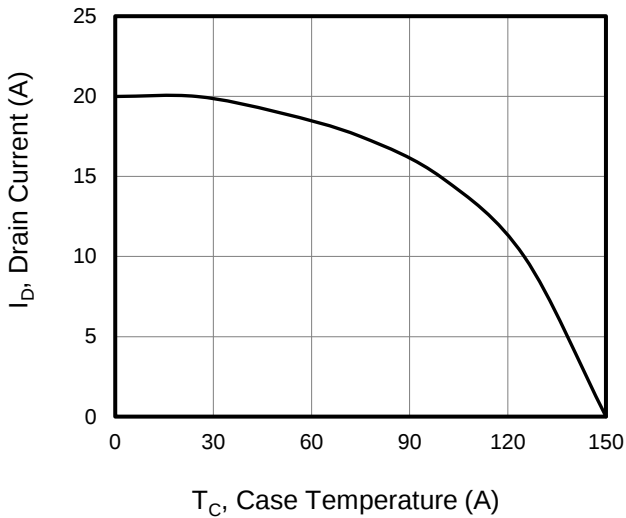


Figure 4. BV_{DSS} Variation vs. Temperature

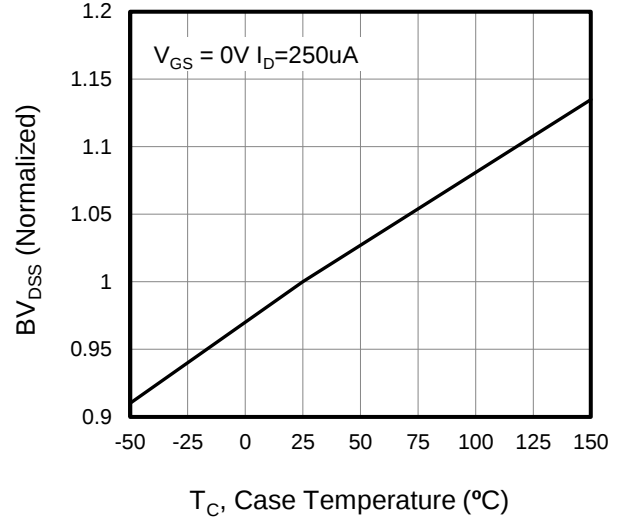


Figure 5. Transfer Characteristics

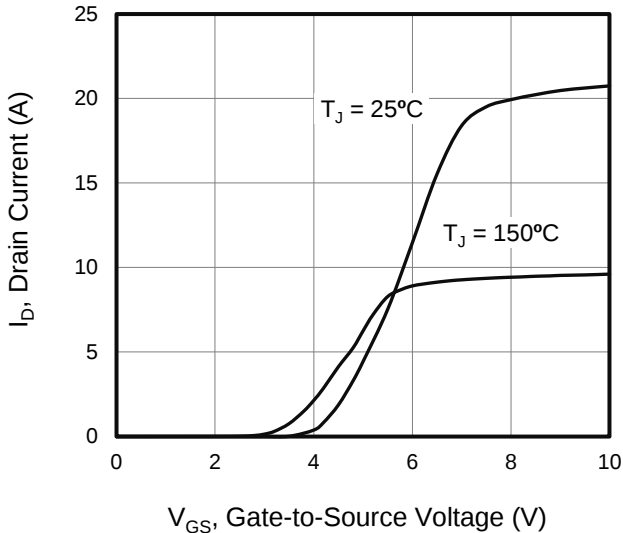
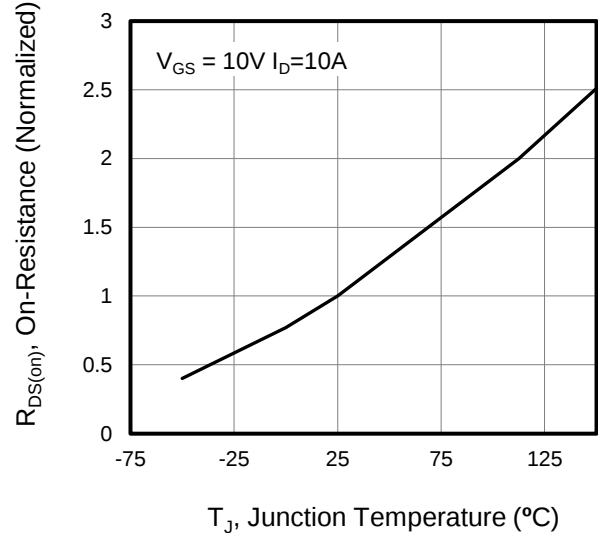


Figure 6. On-Resistance vs. Temperature



Typical Characteristics $T_j = 25^\circ\text{C}$, unless otherwise noted

Figure 7. Capacitance

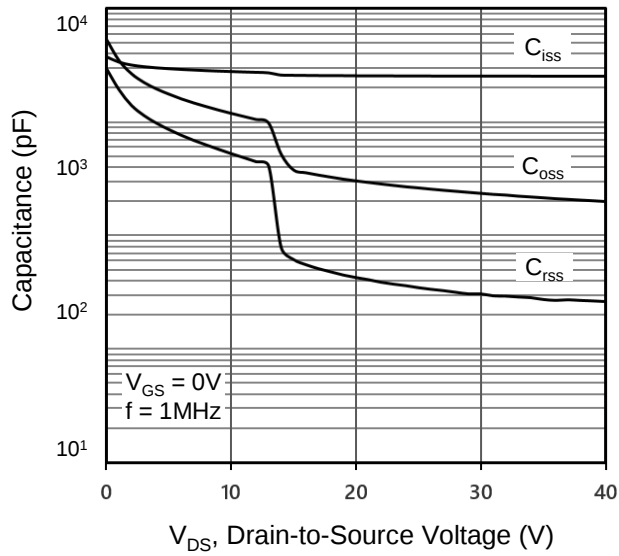


Figure 8. Gate Charge

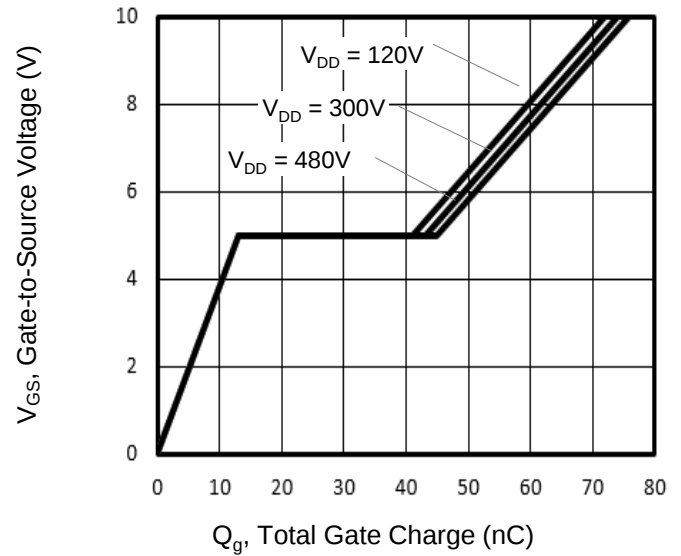


Figure 9. Transient Thermal Impedance
TO-220/ TO-247/ TO-3P

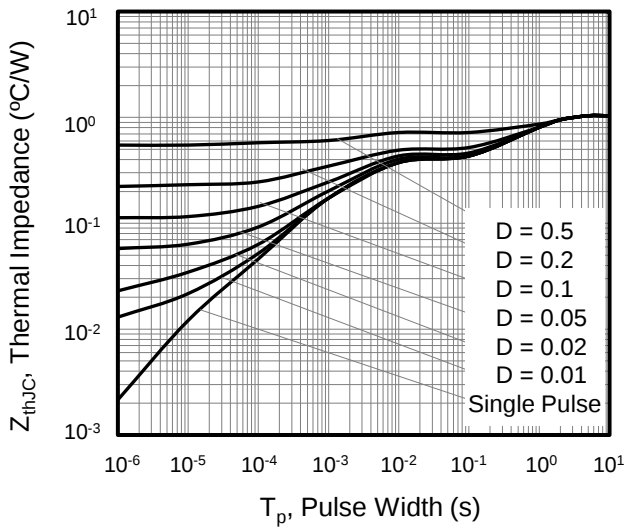


Figure 9. Transient Thermal Impedance
TO-220F

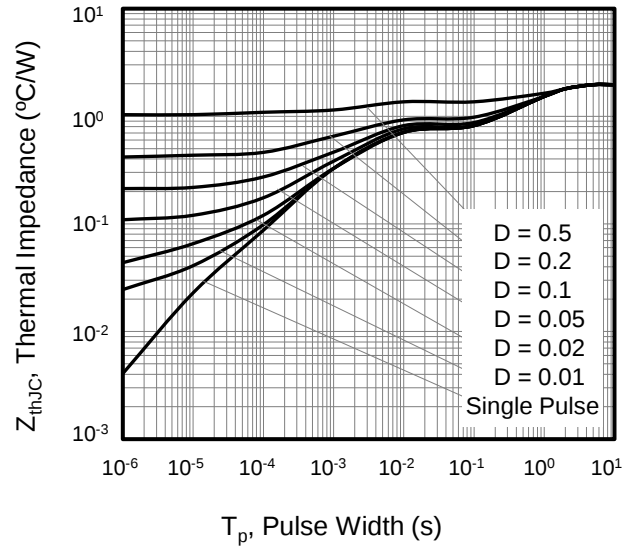


Figure A: Gate Charge Test Circuit and Waveform

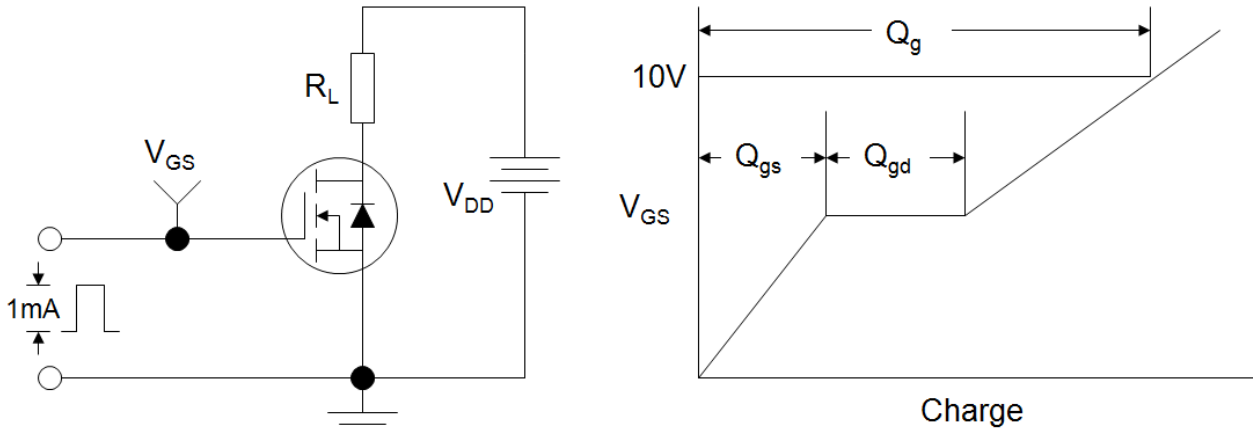


Figure B: Resistive Switching Test Circuit and Waveform

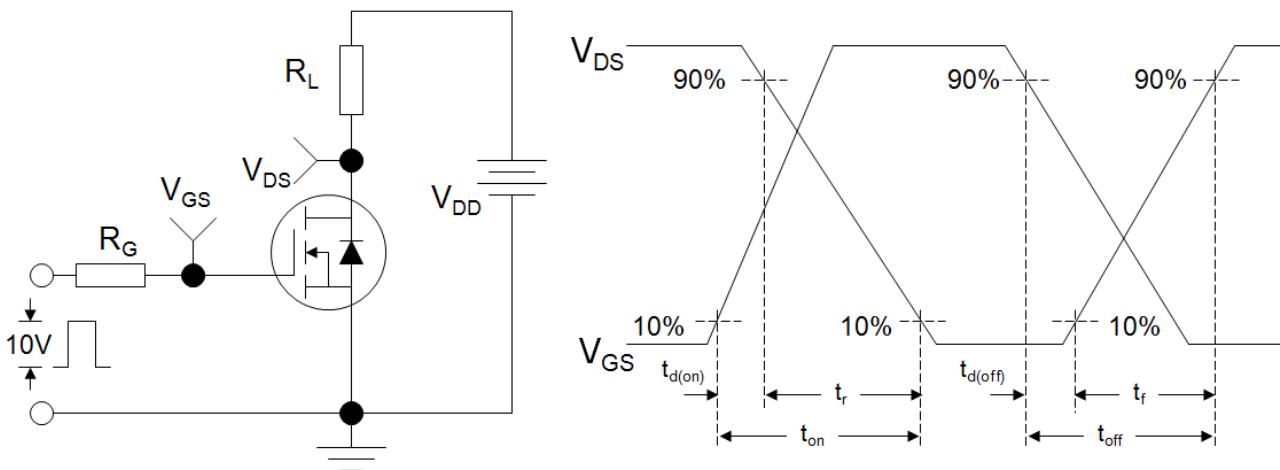
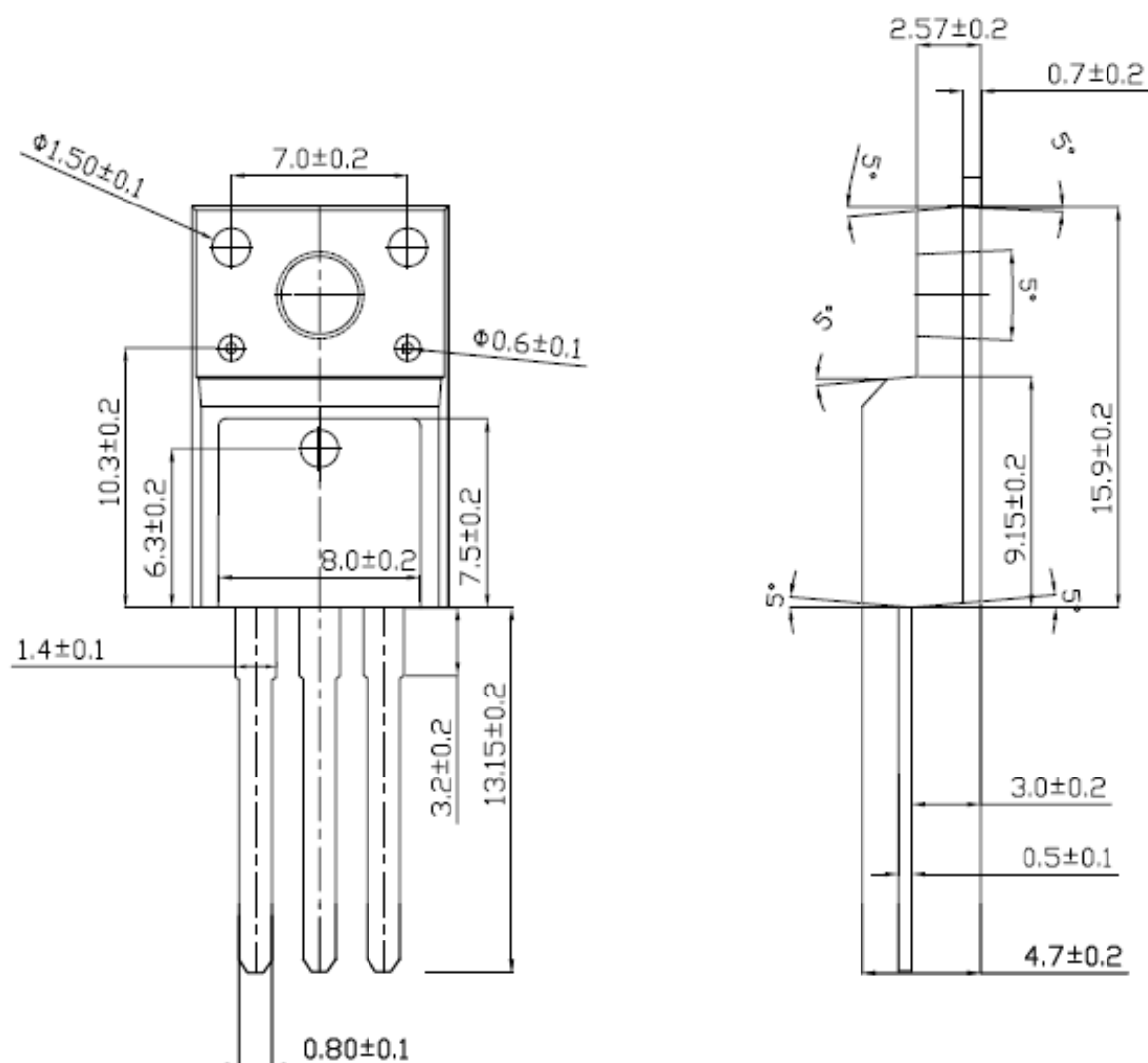


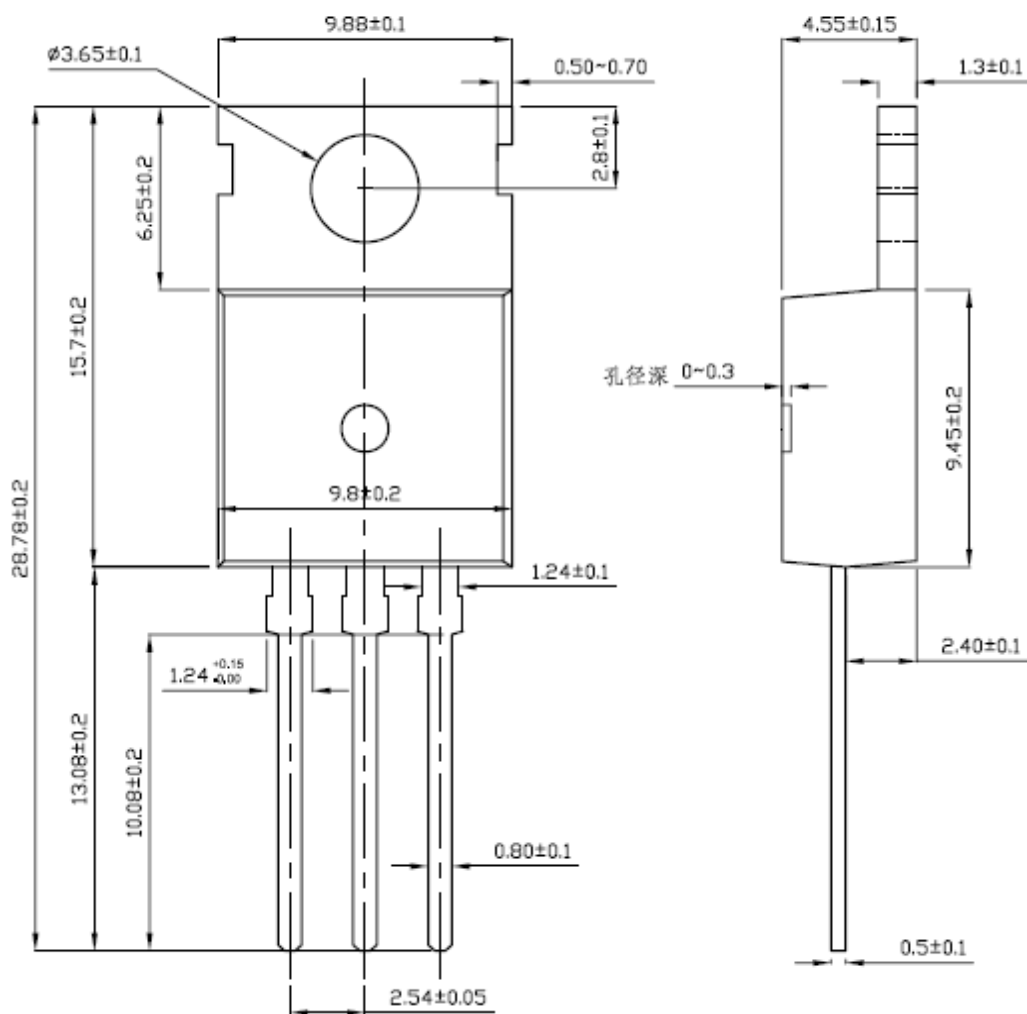
Figure C: Unclamped Inductive Switching Test Circuit and Waveform



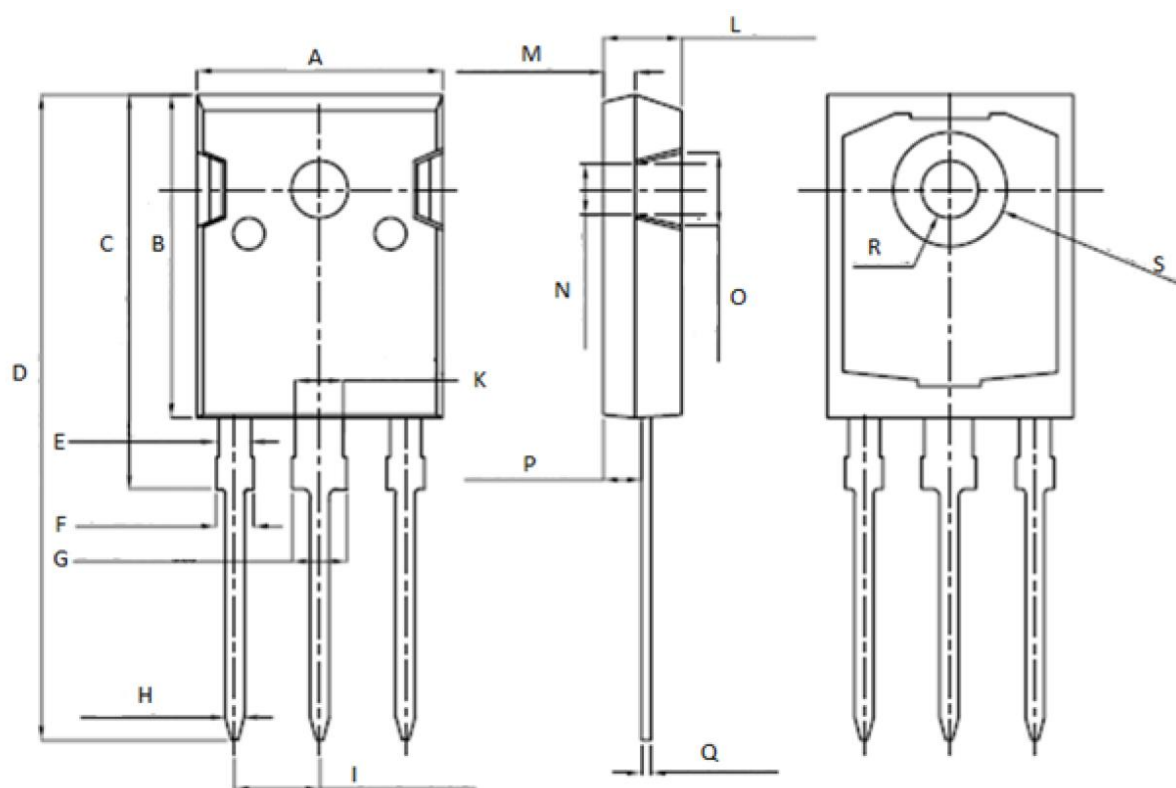
TO-220F



TO-220



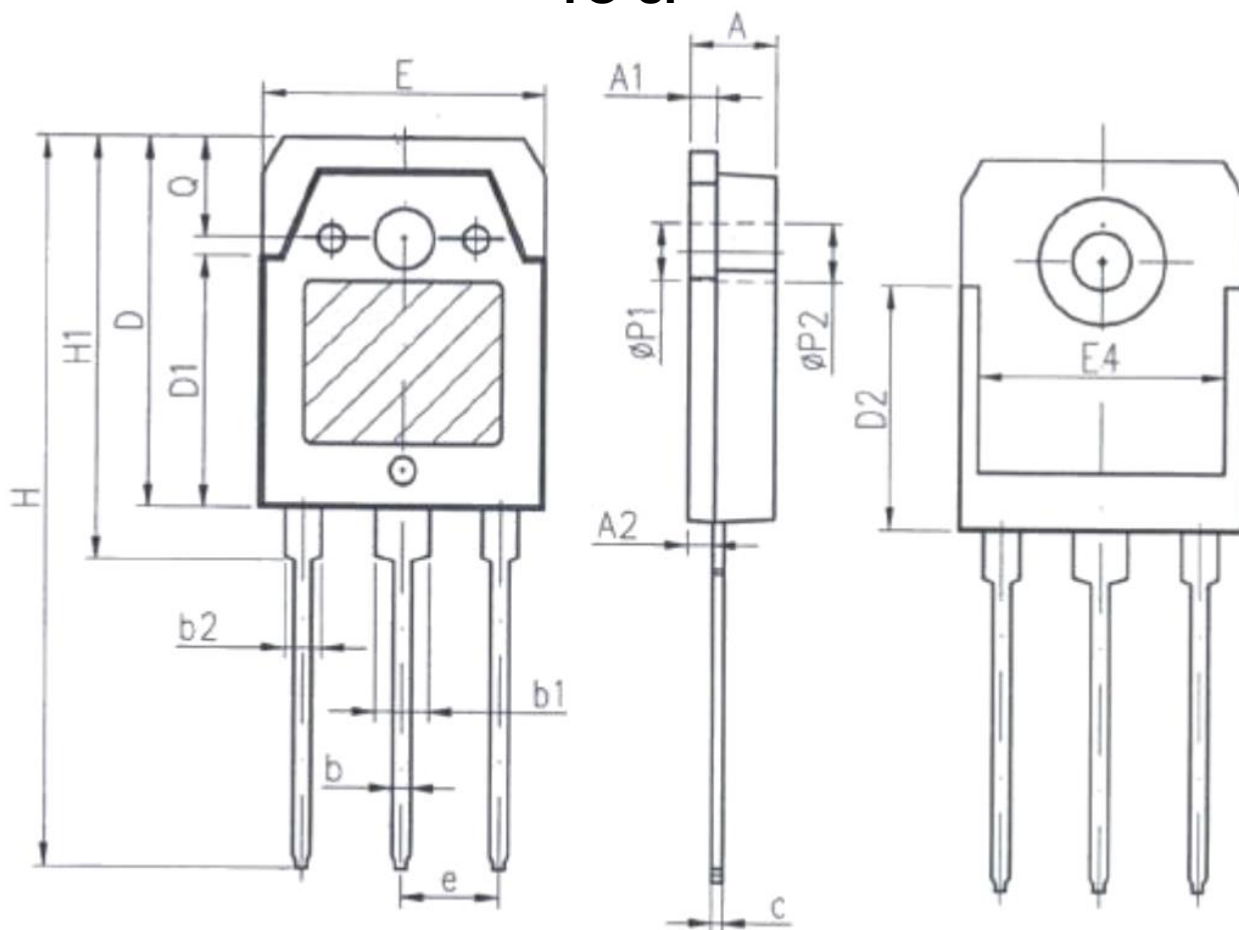
TO-247



Unit: mm		
Symbol	Min.	Max.
A	15.95	16.25
B	20.85	21.25
C	20.95	21.35
D	40.5	40.9
E	1.9	2.1
F	2.1	2.25
G	3.1	3.25
H	1.1	1.3
I	5.40	5.50

Unit: mm		
Symbol	Min.	Max.
K	2.90	3.10
L	4.90	5.30
M	1.90	2.10
N	4.50	4.70
O	5.40	5.60
P	2.29	2.49
Q	0.51	0.71
R	φ 3.5	φ 3.7
S	φ 7.1	φ 7.3

TO-3P



Unit:mm		
Symbol	Min.	Max.
A	4.6	5
A1	1.4	1.65
A2	1.18	1.58
b	0.8	1.2
b1	2.8	3.2
b2	1.8	2.2
c	0.5	0.75
D	19.6	20.2
D1	13.55	14.25
D2	12.9REF	
E	15.35	15.85
E4	12.6	-
e	5.45TYP	
H	40.1	40.9
H1	23.15	23.65
P1	3.2REF	
P2	3.5REF	

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