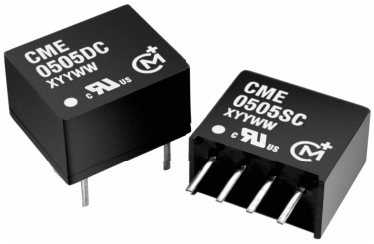
Murata Power Solutions

CME Series

Isolated 0.75W Single Output Isolated DC/DC Converters



FEATURES

- Short circuit protection options
- UL 60950 recognised
- Single Isolated output
- 1kVDC or 3kVDC option 'Hi Pot Test'
- Wide temperature performance at full 0.75W load -40°C to 85°C
- Industry Standard Pinout
- 3.3V and 5V Inputs
- 3.3V, 5V & 12V outputs
- Pin Compatible with LME, MEE1, MEE3, NKE, NME, & NML series

PRODUCT OVERVIEW

The CME series are a cost effective 0.75W DC/DC converter series, in industry standard packages with industry standard pinout, Popular input and output voltages are available as a lower power alternative to a 1W DC/DC converter. The galvanic isolation allows the device to be configured to provide an isolated negative rail in systems where only positive rails exist. The wide temperature range guarantees startup from –40°C and full 0.75 watt output at 85°C. For the short circuit protected parts (PC) protection is continuous and auto-resetting on removal of the short circuit.

SELECTION GUIDE

Order Code	Nominal Input Voltage	Output Voltage	Output Current	Input Current at Rated Load	Load Regulation		Ripple & Noise		Efficiency		Isolation Capacitance	MTTF[1]	
	V	V	mA	mA	%		mV p-p		%		pF	MIL.	Tel.
					Typ.	Max.	Typ.	Max.	Min.	Typ.		kHrs	
CME0505DC	5	5	150	218	10	12	15	25	67	70	30	3400	
CME0505SC	5	5	150	218	10	12	15	25	67	70	30	3400	
CME0512SC	5	12	63	195	5	7	20	30	72	77	33	2200	
3KVDC isolation options													
CME0303S3C	3.3	3.3	227	300	9	12	15	25	66	73	30	1230	
CME0305S3C	3.3	5	150	300	9	12	15	25	68	73	35	630	
CME0505S3C	5	5	150	218	9	12	15	25	65	70	28	2400	
CME0512S3C	5	12	63	200	5	7	10	15	70	75	30	630	
Short Circuit Protection Options													
CME0505SPC	5	5	150	195	7.5	9	11	25	74	76.5	22	2887	47047
CME0505DPC	5	5	150	195	7.5	9	11	25	74	76.5	22	2887	47047

INPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Voltage range	Continuous operation, 3.3V input types	2.97	3.3	3.63	V
	Continuous operation, 5V input types	4.5	5.0	5.5	
Input short circuit current	Short circuit variants		95		mA
Input reflected ripple current	3.3V input types		1.5	2	mA p-p
	5V input types		2	2.5	
	Short circuit types		3	15	

OUTPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Rated Power[2]	T_A=-40°C to 85°C, see derating graphs			0.75	W
Voltage Set Point Accuracy	See tolerance envelope				
Line regulation	High V_{IN} to low V_{IN}; Short circuit types		1.15	1.2	%/%
	High V_{IN} to low V_{IN}; All other output types		1.0	1.2	

ISOLATION CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation test voltage	C Versions Flash tested for 1 second	1000			VDC
	3C Versions Flash tested for 1 second	3000			
Resistance	Viso= 1000VDC		10		GΩ

GENERAL CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Switching frequency	CME0505XC		120		kHz
	Short circuit types		91		
	All other types		135		

ABSOLUTE MAXIMUM RATINGS

Lead temperature 1.5mm from case for 10 seconds	260°C
Input voltage V_{IN}, 3.3V input	5.5V
Input voltage V_{IN}, 5V input	7V

RoHS COMPLIANT

For full details go to www.murata-ps.com/rohs

c UL us

1. Calculated using MIL-HDBK-217 FN2 and Telcordia SR-332 calculation model with nominal input voltage at full load.
2. See derating curve.

All specifications typical at T_A=25°C, nominal input voltage and rated output current unless otherwise specified.

TEMPERATURE CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Specification	All output types	-40		85	°C
Storage		-50		130	
Case temperature rise above ambient	3.3V & 5V output types			41	
	12V output types			32	
	Short circuit types (DIP)		23		
	Short circuit types (SIP)		24		
Cooling	Free air convection				

TECHNICAL NOTES

ISOLATION VOLTAGE

'Hi Pot Test', 'Flash Tested', 'Withstand Voltage', 'Proof Voltage', 'Dielectric Withstand Voltage' & 'Isolation Test Voltage' are all terms that relate to the same thing, a test voltage, applied for a specified time, across a component designed to provide electrical isolation, to verify the integrity of that isolation.

Murata Power Solutions CME series of DC/DC converters are all 100% production tested at their stated isolation voltage. This is 1kVDC for 1 second for C versions and 3kVDC for 1 second for 3C versions.

A question commonly asked is, "What is the continuous voltage that can be applied across the part in normal operation?"

The CME has been recognised by Underwriters Laboratory for functional insulation, both input and output should normally be maintained within SELV limits i.e. less than 42.4V peak, or 60VDC. The isolation test voltage represents a measure of immunity to transient voltages and the part should never be used as an element of a safety isolation system. The part could be expected to function correctly with several hundred volts offset applied continuously across the isolation barrier; but then the circuitry on both sides of the barrier must be regarded as operating at an unsafe voltage and further isolation/insulation systems must form a barrier between these circuits and any user-accessible circuitry according to safety standard requirements.

REPEATED HIGH-VOLTAGE ISOLATION TESTING

It is well known that repeated high-voltage isolation testing of a barrier component can actually degrade isolation capability, to a lesser or greater degree depending on materials, construction and environment. The CME series has toroidal isolation transformers, with no additional insulation between primary and secondary windings of enameled wire. While parts can be expected to withstand several times the stated test voltage, the isolation capability does depend on the wire insulation. Any material, including this enamel (typically polyurethane) is susceptible to eventual chemical degradation when subject to very high applied voltages thus implying that the number of tests should be strictly limited. We therefore strongly advise against repeated high voltage isolation testing, but if it is absolutely required, that the voltage be reduced by 20% from specified test voltage.

This consideration equally applies to agency recognized parts rated for better than functional isolation where the wire enamel insulation is always supplemented by a further insulation system of physical spacing or barriers.

SAFETY APPROVAL

The CME series has been recognised by Underwriters Laboratory (UL) to UL 60950 for functional insulation in a maximum ambient temperature of 85ºC and/or case temperature limit of 100ºC for CMExxxxxC, 130ºC for CMExxxxS3C. Case temperature measured on the face opposite the pins.

The CME series of converters are not internally fused so to meet the requirements of UL 60950 an anti-surge input line fuse should always be used with ratings as defined below.
CME03xxS3C: 0.9A
CME05xxxxC: 0.5A

All fuses should be UL recognized and rated to 125V.

File number E151252 applies.

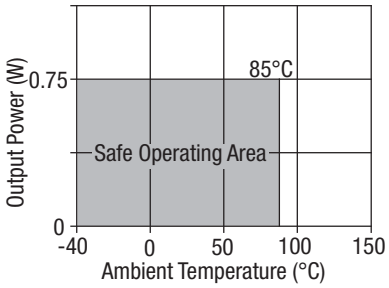
RoHS COMPLIANCE INFORMATION

This series is compatible with RoHS soldering systems with a peak wave solder temperature of 260°C for 10 seconds. The pin termination finish on the SIP package type is Tin Plate, Hot Dipped over Matte Tin with Nickel Preplate. The DIP types are Matte Tin over Nickel Preplate. Both types in this series are backward compatible with Sn/Pb soldering systems.

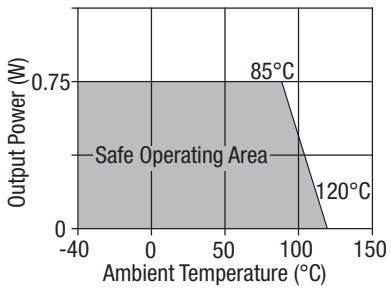
For further information, please visit www.murata-ps.com/rohs

TEMPERATURE DERATING GRAPHS

0303, 0305 & Short Circuit types.



All other types.



EFFICIENCY VS LOAD

CME0505XC

CME0512SC

CME0303S3C

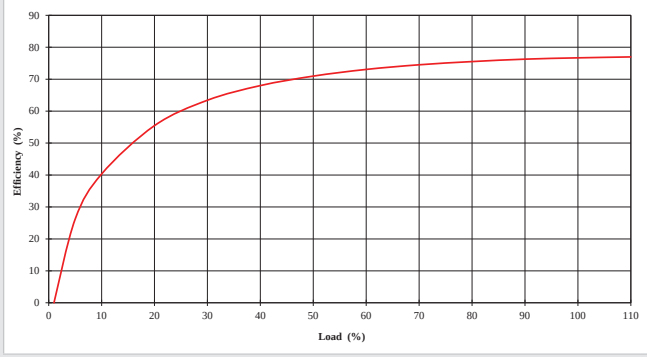
CME0305S3C

CME0505S3C

CME0512S3C

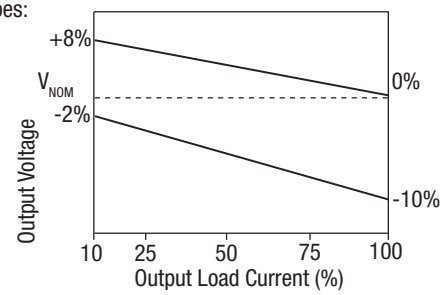
EFFICIENCY VS LOAD CONTINUED

CME0505XPC

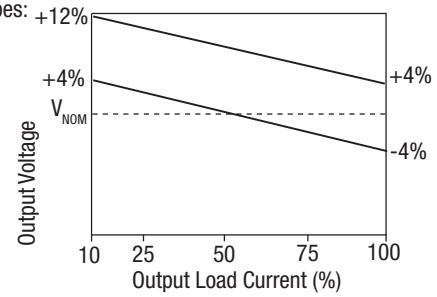


TOLERANCE ENVELOPES

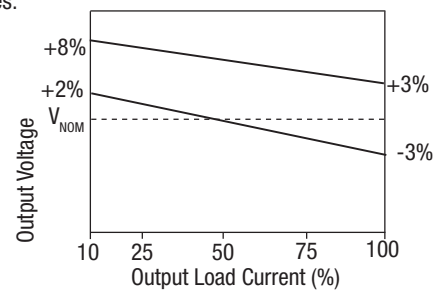
3.3V output types:



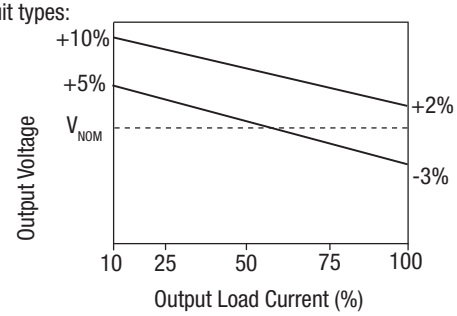
5V output types:



12V output types:



Short circuit types:



The voltage tolerance envelope shows typical load regulation characteristics for this product series. The tolerance envelope is the maximum output voltage variation due to changes in output loading.

APPLICATION NOTES

Minimum load

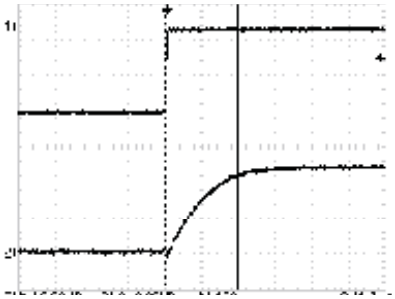
The minimum load to meet datasheet specification is 10% of the full rated load across the specified input voltage range. Lower than 10% minimum loading will result in an increase in output voltage, which may rise to typically double the specified output voltage if the output load falls to less than 5%.

Capacitive loading and start up

Typical start up times for this series, with a typical input voltage rise time of 2.2µs and output capacitance of 10µF, are shown in the table below. The product series will start into a capacitance of 47µF with an increased start time, however, the maximum recommended output capacitance is 10µF.

	Start-up time
	µs
CME0505DC	1000
CME0505SC	1000
CME0512SC	5600
CME0303S3C	540
CME0305S3C	1300
CME0505S3C	1080
CME0512S3C	5000
CME0505XPC	350

Typical Start-Up Wave Form

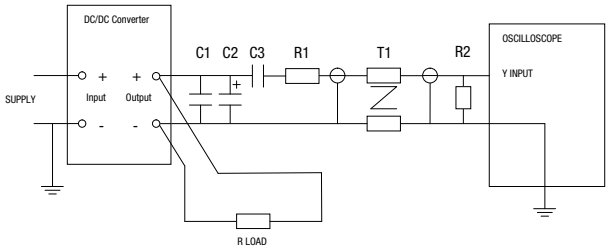


Ripple & Noise Characterisation Method

Ripple and noise measurements are performed with the following test configuration.

C1	1µF X7R multilayer ceramic capacitor, voltage rating to be a minimum of 3 times the output voltage of the DC/DC converter
C2	10µF tantalum capacitor, voltage rating to be a minimum of 1.5 times the output voltage of the DC/DC converter with an ESR of less than 100mΩ at 100 kHz
C3	100nF multilayer ceramic capacitor, general purpose
R1	450Ω resistor, carbon film, ±1% tolerance
R2	50Ω BNC termination
T1	3T of the coax cable through a ferrite toroid
RLOAD	Resistive load to the maximum power rating of the DC/DC converter. Connections should be made via twisted wires
Measured values are multiplied by 10 to obtain the specified values.	

Differential Mode Noise Test Schematic



APPLICATION NOTES (continued)

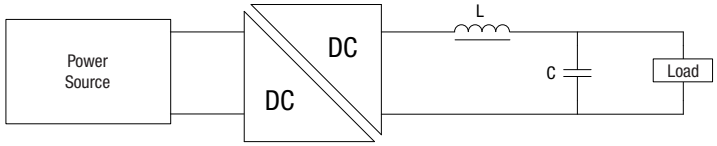
Output Ripple Reduction

By using the values of inductance and capacitance stated, the output ripple at the rated load is lowered to 5mV p-p max.

Component selection

Capacitor: It is required that the ESR (Equivalent Series Resistance) should be as low as possible, ceramic types are recommended.
The voltage rating should be at least twice (except for 15V output), the rated output voltage of the DC/DC converter.

Inductor: The rated current of the inductor should not be less than that of the output of the DC/DC converter. At the rated current, the DC resistance of the inductor should be such that the voltage drop across the inductor is <2% of the rated voltage of the DC/DC converter. The SRF (Self Resonant Frequency) should be >20MHz.

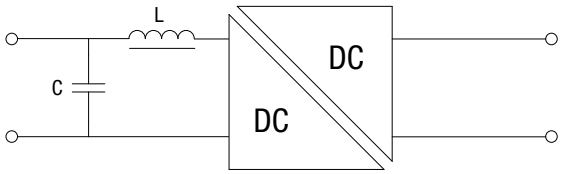


	Inductor			Capacitor
	L, µH	SMD	Through Hole	C, µF
CME0505DC	47	82473C	11R473C	4.7
CME0505SC	47	82473C	11R473C	4.7
CME0512SC	68	82683C	11R683C	1
CME0303S3C	10	82103C	11R103C	4.7
CME0305S3C	47	82473C	11R473C	4.7
CME0505S3C	10	82103C	11R103C	4.7
CME0512S3C	68	82683C	11R683C	0.68
CME0505XPC	22	82223C	11R223C	1

EMC FILTERING AND SPECTRA

FILTERING

The following filter circuit and filter table shows the input filters typically required to meet EN 55022 Curve B, Quasi-Peak EMC limit, as shown in the following plots. The following plots show positive and negative quasi peak and CISPR22 Average Limit B (pink line) and Quasi Peak Limit B (green line) adherence limits.



	Inductor			Capacitor
Part Number	L, µH	SMD	Through Hole	C, µF
CME0505XC				
CME0512SC				
CME0303S3C				
CME0305S3C				
CME0505S3C				
CME0512S3C				
CME0505XPC	10	82103C	13R103C	1

CME0505XC

CME0512SC

CME0303S3C

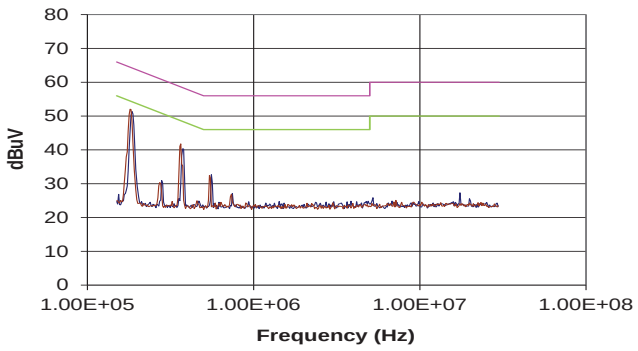
CME0305S3C

EMC FILTERING AND SPECTRA

CME0505S3C

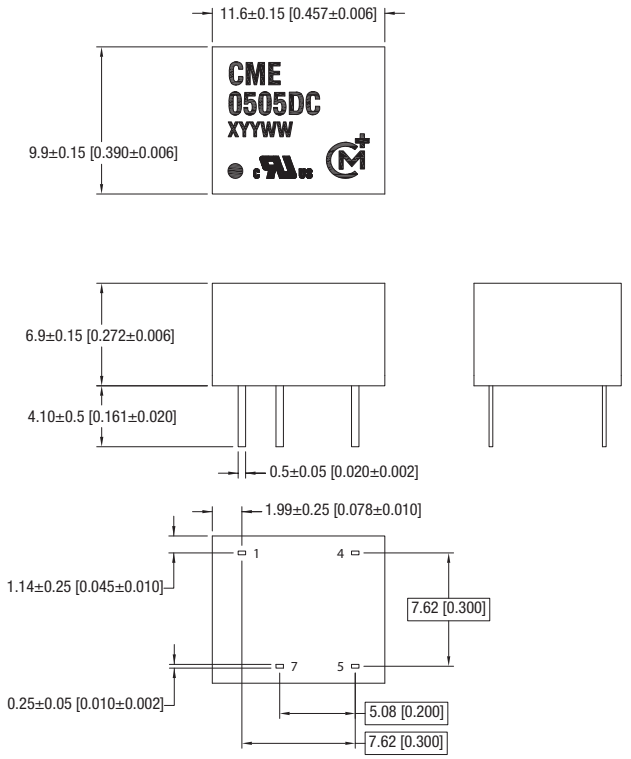
CME0512S3C

CME0505XPC

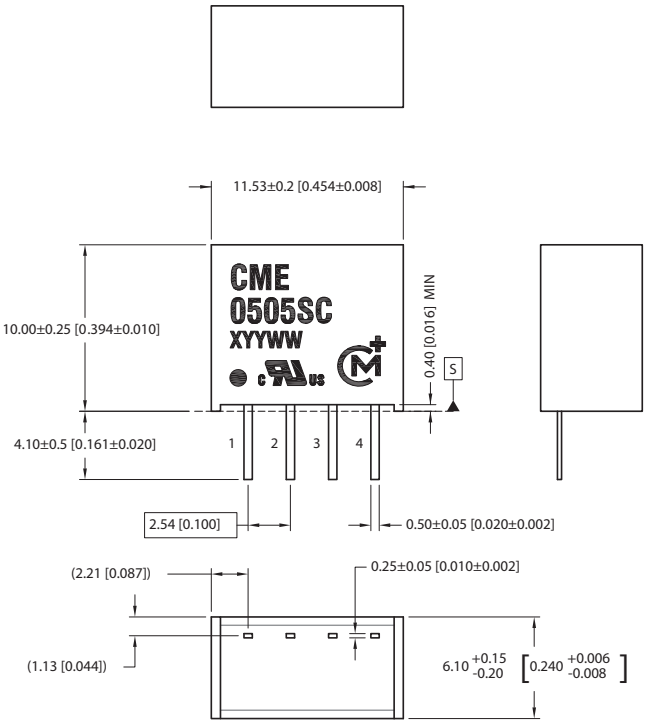


PACKAGE SPECIFICATIONS

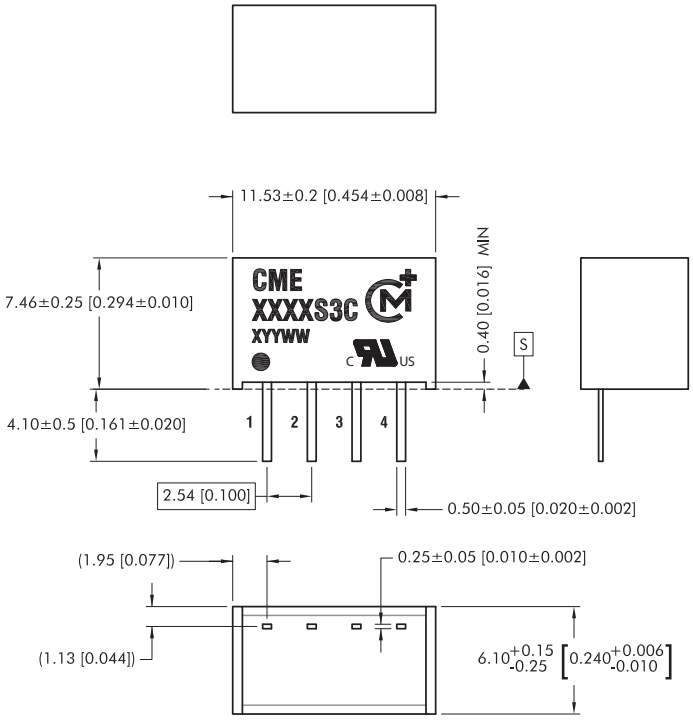
DC Package



SC Package



3C Package



PIN CONNECTIONS - 4 PIN SIP

Pin	Function
1	$-V_{IN}$
2	$+V_{IN}$
3	$-V_{OUT}$
4	$+V_{OUT}$

PIN CONNECTIONS - 8 PIN DIP

Pin	Function
1	$-V_{IN}$
4	$+V_{IN}$
5	$+V_{OUT}$
7	$-V_{OUT}$

All dimensions in mm (inches) Controlling dimension is mm.

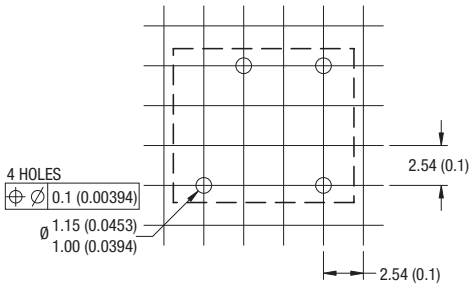
All pins on a 2.54 (0.100) pitch and within ±0. l (0.004) of true position from pin l at seating plane 'S'

Weight: 1.09g (3C) 1.30g (SC) 1.38g (DC) 1.5g (DPC)

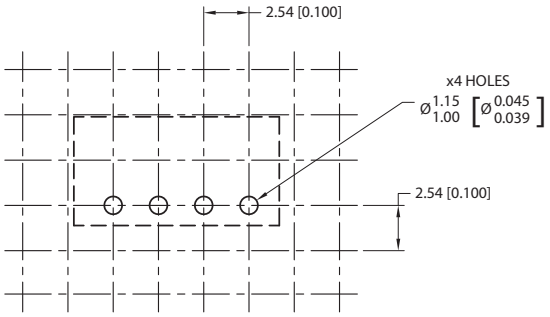
PACKAGE SPECIFICATIONS (continued)

RECOMMENDED FOOTPRINT DETAILS

8 Pin DIP Package

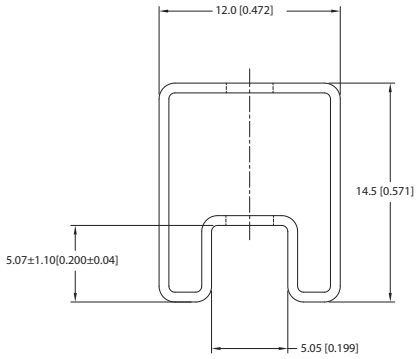


4 Pin SIP Package

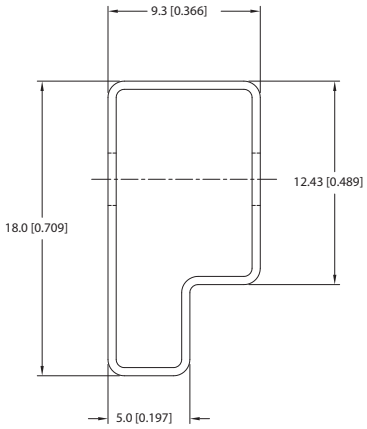


TUBE OUTLINE DIMENSIONS

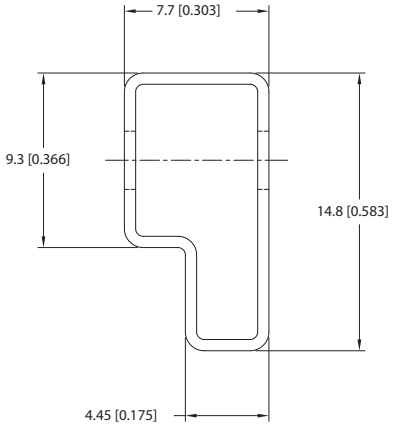
8 Pin DIP Package



4 Pin SIP



3C SIP



Unless otherwise specified all dimensions in mm [inches] ±0.55mm [0.022].
Tube Length (DC&SC): 520mm [20.472] ±2.0 [0.079].
Tube Length (3C): 525mm [20.669] ±2.0 [0.079].

Tube Quantity(DC&SC): 35
(3C) : 40