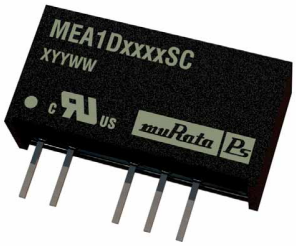
Murata Power Solutions

MEA1 Series

1kVDC Isolated 1W Dual Output DC-DC Converters



FEATURES

- UL 60950 recognised
- Typical efficiency to 89.5%
- 1kVDC isolation 'Hi Pot Test'
- Wide temperature performance at full 1 Watt load, –40°C to 85°C
- Industry standard pinout
- Power sharing on output
- 5V, 12V, 15V, 24V & 48V inputs
- 5V, 9V, 12V & 15V outputs
- No external components required
- No electrolytic or tantalum capacitors
- Pin compatible with NKA & NMA series

PRODUCT OVERVIEW

The MEA series is the new high performance version of our 1W NMA series. The MEA series is more efficient and offers improved regulation performance ≤5% for applications where a wide output voltage variation cannot be tolerated. They are ideally suited for providing dual rail supplies with the added benefit of galvanic isolation to reduce switching noise. All of the rated power may be drawn from a single output providing the total load does not exceed 1 Watt.

SELECTION GUIDE

Order Code	Nominal Input Voltage	Output Voltage	Output Current	Input Current at Rated Load	Load Regulation (Typ)	Load Regulation (Max)	Ripple & Noise (Typ)[1]	Ripple & Noise (Max)[1]	Efficiency (Min.)	Efficiency (Typ.)	Isolation Capacitance	MTTF[2]		Recommended Alternative
	V	V	mA	mA	%		mVp-p		%	%	pF	MIL. kHrs	Tel. kHrs	
Recommended / In Production														
MEA1D0505SC	5	±5	±100	233	4.8	5.4	12	25	82	85	53	3663	79541	
MEA1D0509SC	5	±9	±56	228	3.7	4.5	8	20	84	86.5	51	3291	80891	
MEA1D0512SC	5	±12	±42	228	4	5	6	20	84	87	45	2860	80521	
MEA1D0515SC	5	±15	±33	225	3.8	4.5	6	20	84	87	46	2374	77687	
MEA1D1205SC	12	±5	±100	98	3.5	4	9	20	81	85	44	3352	75377	
MEA1D1209SC	12	±9	±56	95	2.5	3	7	20	83	86.5	61	3083	79125	
MEA1D1212SC	12	±12	±42	93	2.6	3.5	6	20	85	89	88	2701	78770	
MEA1D1215SC	12	±15	±33	94	2.2	3	5	20	84	88	78	2267	76058	
MEA1D1509SC	15	±9	±56	76	2.1	2.5	7	20	82	87	65	4691	125575	
MEA1D1512SC	15	±12	±42	76	2	2.5	5	20	83	87.5	75	4028	126626	
MEA1D1515SC	15	±15	±33	75	2	2.5	5	20	85	89.5	104	4103	74686	
MEA1D2405SC	24	±5	±100	49	2.8	3.5	9	20	81	84.5	47	4581	110817	
MEA1D2409SC	24	±9	±56	47	1.8	2.5	7	20	84	87.5	80	3942	102064	
MEA1D2412SC	24	±12	±42	47	1.6	2.5	4	20	84	87	85	3247	97979	
MEA1D2415SC	24	±15	±33	47	1.5	2.5	3	20	85	88.5	106	3658	108331	
MEA1D4805SC	48	±5	±100	26	2.6	4	14	25	77	80	44	4332	121907	
MEA1D0505DC	5	±5	±100	232	5	6.2	12	25	82	85	52	2978	88417	
MEA1D0515DC	5	±15	±33	224	4.1	5.3	6	20	84	87.5	46	2641	105112	
MEA1D1212DC	12	±12	±42	93	2.7	3.5	6	20	85	89	89	3267	69830	
MEA1D2405DC	24	±5	±100	49	2.8	4	10	20	81	84.5	47	3427	95206	
MEA1D2412DC	24	±12	±42	47	1.6	2.5	6	20	84	87	83	2855	62894	
MEA1D2415DC	24	±15	±33	47	1.5	2.3	6	20	85	88	100	2435	90783	
To be discontinued														
MEA1D4809SC	48	±9	±56	25	1.6	3	8	20	79	82	72	6067	147429	MEV1D4809SC
MEA1D4812SC	48	±12	±42	25	1.6	3	7	20	78	83	91	3675	139747	MEV1D4812SC
MEA1D4815SC	48	±15	±33	25	1.3	2.5	6	20	80	83.5	109	3492	73859	MEV1D4815SC
MEA1D0509DC	5	±9	±56	227	3.9	5	9	20	84	86.7	49	4087	130861	NMA0509DC
MEA1D0512DC	5	±12	±42	226	4.2	5.3	7	20	84	87	47	3394	121694	NMA0512DC
MEA1D1205DC	12	±5	±100	97	3.6	4.5	9	20	81	84.5	43	3465	112889	NMA1205DC
MEA1D1209DC	12	±9	±56	95	2.6	3.5	7	20	83	86.5	64	3623	69665	NMA1209DC
MEA1D1215DC	12	±15	±33	94	2.3	3	6	20	84	88	76	2339	95016	NMA1215DC
MEA1D1505SC	15	±5	±100	78	3	3.5	8	20	80	84	40	4063	113571	Contact Murata
MEA1D1505DC	15	±5	±100	78	3.1	4	9	20	80	84	42	2929	59216	Contact Murata
MEA1D1509DC	15	±9	±56	76	2.2	3	6	20	82	87	50	2551	96783	MEA1D1509SC
MEA1D1512DC	15	±12	±42	76	2	2.7	6	20	83	87.5	77	2665	102007	NMA1512DC
MEA1D1515DC	15	±15	±33	75	2	2.7	6	20	85	89.5	106	2192	87932	NMA1515DC
MEA1D2409DC	24	±9	±56	48	2	3.8	8	20	84	87	77	3686	110546	MEA1D2409SC

RoHS COMPLIANT

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

c UL us

1. See Ripple & Noise characterisation method.
2. Calculated using MIL-HDBK-217 FN2 and Telcordia SR-332 calculation model with nominal input voltage at full load.

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

INPUT CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Voltage range	Continuous operation, 5V input types	4.5	5	5.5	V
	Continuous operation, 12V input types	10.8	12	13.2	
	Continuous operation, 15V input types	13.5	15	16.5	
	Continuous operation, 24V input types	21.6	24	26.4	
	Continuous operation, 48V input types	43.2	48	52.8	
Reflected ripple current	5V input types		4	12	mA p-p
	12V input types		4	12	
	15V input types		3	10	
	24V input types		3	10	
	48V input types		22	35	

OUTPUT CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Rated Power	T_A=-40°C to 85°C			1	W
Voltage Set Point Accuracy	See tolerance envelope				
Line regulation	High V_{IN} to low V_{IN}		1.05	1.1	%/%

ISOLATION CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation test voltage	Flash tested for 1 second	1000			VDC
Resistance	Viso= 1000VDC	10			GΩ

GENERAL CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Switching frequency	MEA1D05xxxC, MEA1D1212xC, MEA1D1515xC		65		kHz
	MEA1D1205xC, MEA1D1209xC, MEA1D1215xC, MEA1D1505xC, MEA1D1509xC, MEA1D1512xC, MEA1D24xxxC		85		
	MEA1D48xxxC		60		

TEMPERATURE CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Specification	All output types, added see safety notes to temp characteristics	-40		85	°C
Storage		-50		125	
Case Temperature above ambient				20	
Cooling	Free air convection				

ABSOLUTE MAXIMUM RATINGS	
Lead temperature 1mm from case for 10 seconds	260°C
Wave Solder	Wave Solder profile not to exceed the profile recommended in IEC 61760-1 Section 6.1.3. Please refer to application notes for further information.
Input voltage VIN, 5Vin types	7V
Input voltage VIN, 12Vin types	15V
Input voltage VIN, 15Vin types	18V
Input voltage VIN, 24Vin types	28V
Input voltage VIN, 48Vin types	54V

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 MEA1 series of DC-DC converters are all 100% production tested at their stated isolation voltage. This is 1kVDC for 1 second.

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

The MEA1 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 MEA1 series has toroidal isolation transformers, with no additional insulation between primary and secondary windings of enamelled 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 recognised 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 MEA1 series has been recognised by Underwriters Laboratory (UL) to UL 60950 for functional insulation in a maximum ambient temperature of 85°C and/or case temperature limit of 130°C (case temperature measured on the face opposite the pins). File number E151252 applies.

The MEA1 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.
MEA1D05xxxC: 1A
MEA1D12xxxC: 0.375A
MEA1D15xxxC: 0.375A
MEA1D24xxxC: 0.2A
MEA1D48xxSC: 0.1A

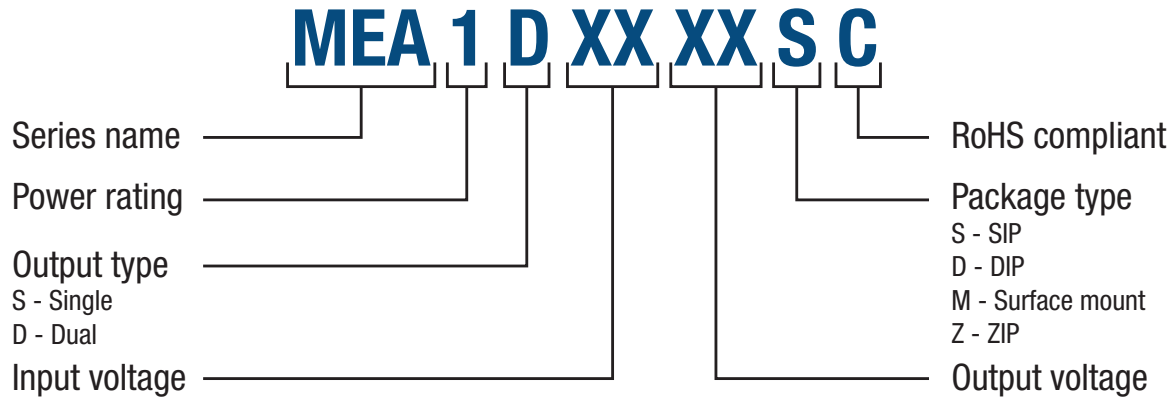
All fuses should be UL approved and rated to at least the maximum allowable DC input voltage.

RoHS COMPLIANT INFORMATION

RoHS COMPLIANT

This series is compatible with RoHS soldering systems with a peak wave solder temperature of 260°C for 10 seconds. Please refer to application notes for further information. 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

PART NUMBER STRUCTURE



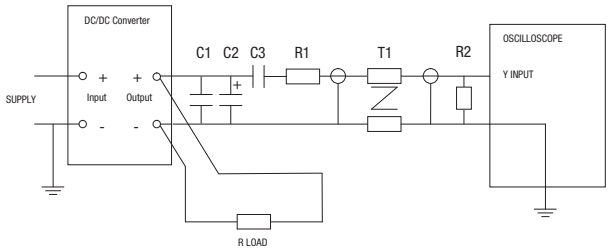
CHARACTERISATION TEST METHODS

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

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%.

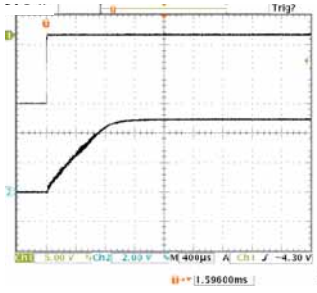
Capacitive loading and start up

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
MEA1D0505xC	939
MEA1D0509xC	2872
MEA1D0512xC	5325
MEA1D0515xC	8895
MEA1D1205xC	1150
MEA1D1209xC	3716
MEA1D1212xC	6912
MEA1D1215xC	10810
MEA1D1505xC	883
MEA1D1509xC	3160

	Start-up time µs
MEA1D1512xC	5630
MEA1D1515xC	8585
MEA1D2405xC	472
MEA1D2409xC	1473
MEA1D2412xC	2643
MEA1D2415xC	4348
MEA1D4805xC	586
MEA1D4809xC	1705
MEA1D4812xC	2995
MEA1D4815xC	4722

Typical Start-Up Wave Form



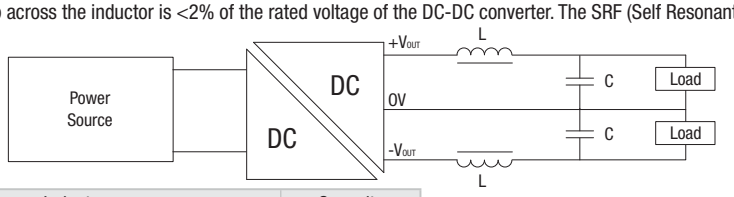
APPLICATION NOTES (Continued)

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.

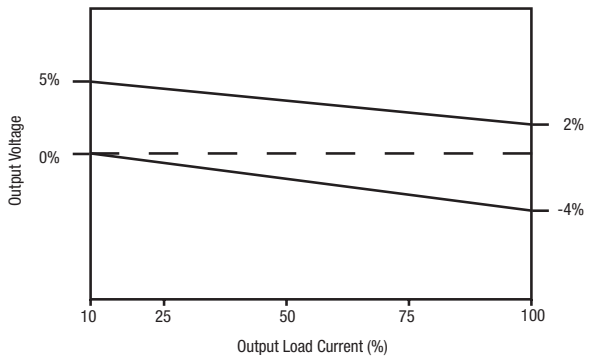


	Inductor			Capacitor
	L, µH	SMD	Through Hole	C, µF
MEA1D0505xC	10	82103C	11R103C	4.7
MEA1D0509xC	22	82223C	11R223C	2.2
MEA1D0512xC	47	82473C	11R473C	1
MEA1D0515xC	47	82473C	11R473C	1
MEA1D1205xC	10	82103C	11R103C	4.7
MEA1D1209xC	22	82223C	11R223C	2.2
MEA1D1212xC	47	82473C	11R473C	1
MEA1D1215xC	47	82473C	11R473C	1
MEA1D1505xC	10	82103C	11R103C	4.7
MEA1D1509xC	22	82223C	11R223C	2.2
MEA1D1512xC	47	82473C	11R473C	1
MEA1D1515xC	47	82473C	11R473C	1
MEA1D2405xC	10	82103C	11R103C	4.7
MEA1D2409xC	22	82223C	11R223C	2.2
MEA1D2412xC	47	82473C	11R473C	1
MEA1D2415xC	47	82473C	11R473C	1
MEA1D4805xC	10	82103C	11R103C	4.7
MEA1D4809xC	22	82223C	11R223C	2.2
MEA1D4812xC	47	82473C	11R473C	1
MEA1D4815xC	47	82473C	11R473C	1

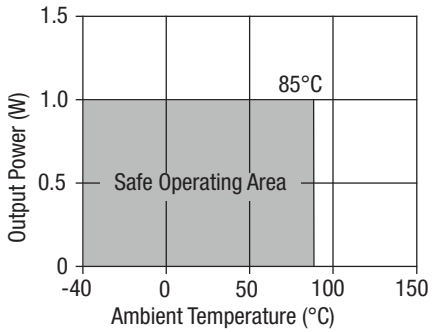
TOLERANCE ENVELOPES

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

MEA1

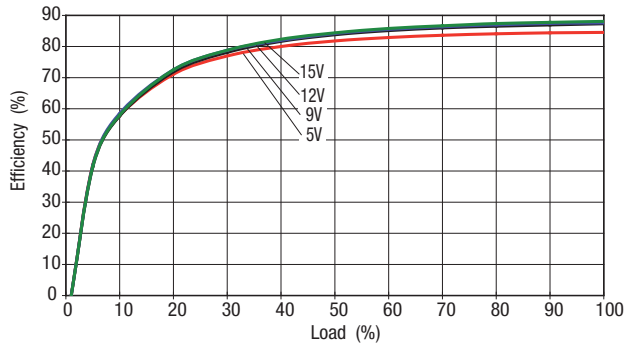


TEMPERATURE DERATING GRAPH

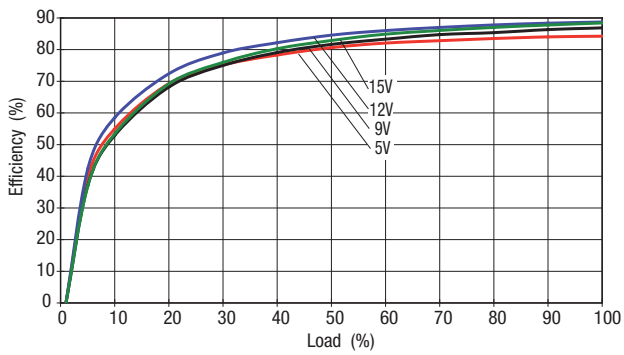


EFFICIENCY VS LOAD

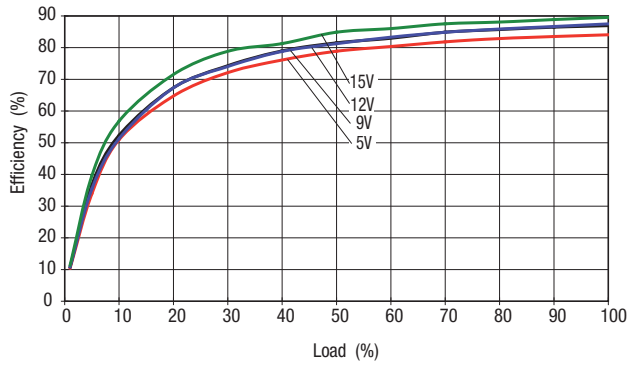
5V Input



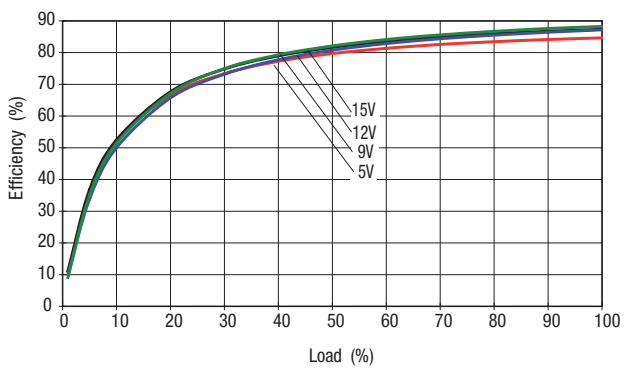
12V Input



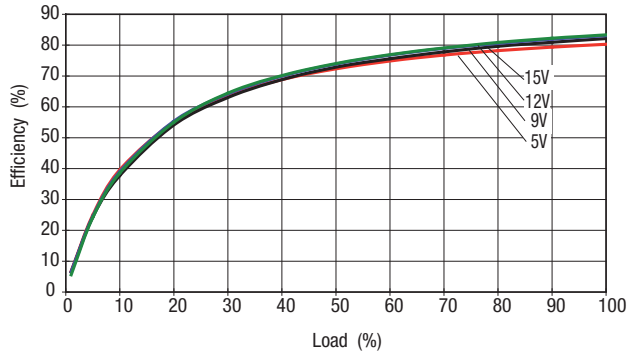
15V Input



24V Input



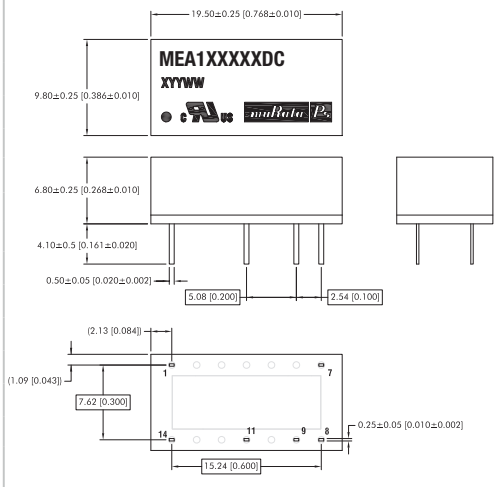
48V Input



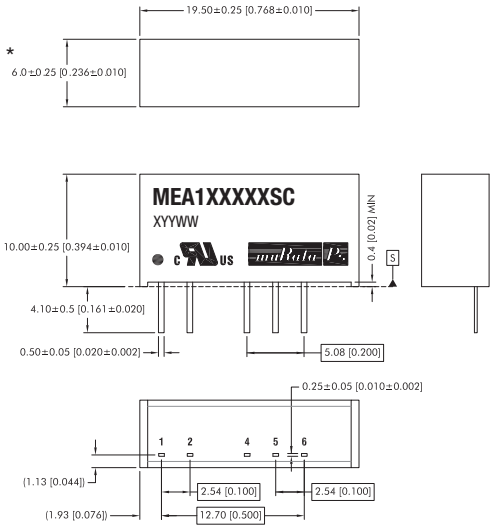
PACKAGE SPECIFICATIONS

MECHANICAL DIMENSIONS

DIP package



SIP package



*48V input variants 7.5 (0.295)

All dimensions in mm (inches). Controlling dimension is mm.
All pins on a 2.54 (0.100") pitch and within ±0.1 (0.004") of true position from pin 1 at seating plane 'S'.

Weight: 2.5g (DIP) 2.3g (SIP)
48V input: 2.8g

PIN CONNECTIONS - 14 PIN DIP

Pin	Function
1	$-V_{IN}$
7	NC
8	0V
9	$+V_{OUT}$
11	$-V_{OUT}$
14	$+V_{IN}$

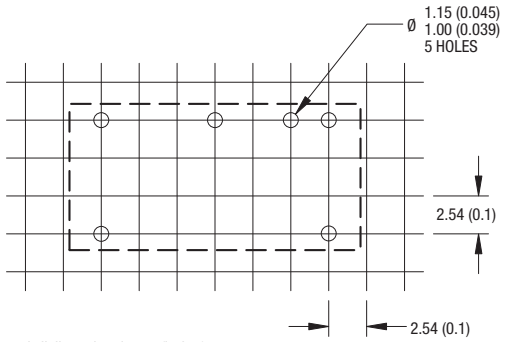
PIN CONNECTIONS - 7 PIN SIP

Pin	Function
1	$+V_{IN}$
2	$-V_{IN}$
4	$-V_{OUT}$
5	0V
6	$+V_{OUT}$

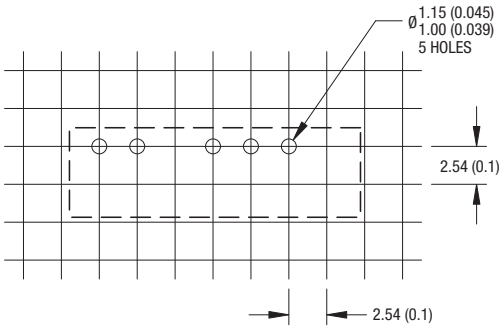
PACKAGE SPECIFICATIONS (Continued)

RECOMMENDED FOOTPRINT DETAILS

14 Pin DIP Package



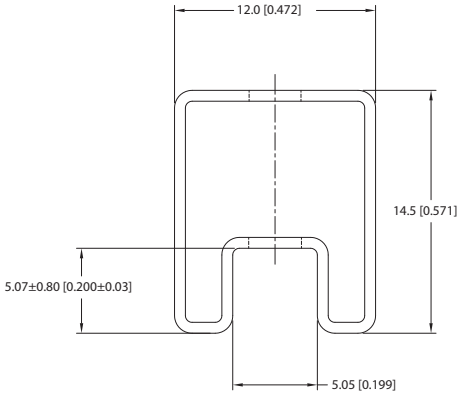
7 Pin SIP Package



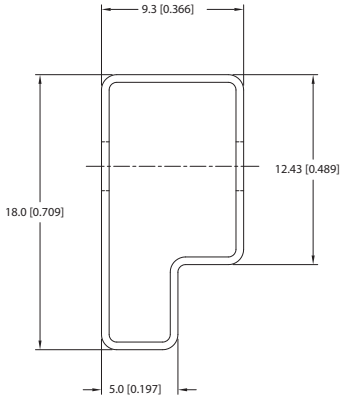
Unless otherwise stated all dimensions in mm (inches) ±0.5mm.

TUBE OUTLINE DIMENSIONS

14 Pin DIP Tube



7 Pin SIP Tube



Unless otherwise specified all dimensions in mm [inches] ±0.55mm [0.022]..
Tube length (14 Pin DIP) : 520mm [20.472] ±2.0 [0.079].
Tube length (7 Pin SIP) : 520mm [20.472] ±2.0 [0.079].

Tube Quantity : 25

DISCLAIMER

Unless otherwise stated in the datasheet, all products are designed for standard commercial and industrial applications and NOT for safety-critical and/or life-critical applications.

Particularly for safety-critical and/or life-critical applications, i.e. applications that may directly endanger or cause the loss of life, inflict bodily harm and/or loss or severe damage to equipment/property, and severely harm the environment, a prior explicit written approval from Murata is strictly required. Any use of Murata standard products for any safety-critical, life-critical or any related applications without any prior explicit written approval from Murata shall be deemed unauthorised use.

These applications include but are not limited to:

- Aircraft equipment
- Aerospace equipment
- Undersea equipment
- Power plant control equipment
- Medical equipment
- Transportation equipment (automobiles, trains, ships, etc.)
- Traffic signal equipment
- Disaster prevention / crime prevention equipment
- Data Processing equipment

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