



FEATURES

- RoHS compliant
- Typical efficiency to 89.5%
- Power density to 0.85W/cm³
- Wide temperature performance at full 1 Watt load, -40°C to 85°C
- UL 94V-0 package material
- No heatsink required
- Industry standard pinout
- Power sharing on output
- 5V, 12V, 15V, 24V, & 48V input
- 5V, 9V, 12V, & 15V output
- Fully encapsulated with toroidal magnetics
- No external components required
- No electrolytic or tantalum capacitors

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 $\leq 5\%$ for applications where a wide output voltage variation can not 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
	V	V	mA	mA	%	%	mVp-p	mVp-p	%	%	pF	kHrs
MEA1D0505SC	5	±5	±100	233	4.8	5.4	12	25	82	85	53	3663
MEA1D0509SC	5	±9	±56	228	3.7	4.5	8	20	84	86.5	51	3291
MEA1D0512SC	5	±12	±42	228	4	5	6	20	84	87	45	2860
MEA1D0515SC	5	±15	±33	225	3.8	4.5	6	20	84	87	46	2374
MEA1D1205SC	12	±5	±100	98	3.5	4	9	20	81	85	44	3352
MEA1D1209SC	12	±9	±56	95	2.5	3	7	20	83	86.5	61	3083
MEA1D1212SC	12	±12	±42	93	2.6	3.5	6	20	85	89	88	2701
MEA1D1215SC	12	±15	±33	94	2.2	3	5	20	84	88	78	2264
MEA1D1505SC	15	±5	±100	78	3	3.5	8	20	80	84	40	
MEA1D1509SC	15	±9	±56	76	2.1	2.5	7	20	82	87	65	
MEA1D1512SC	15	±12	±42	76	2	2.5	5	20	83	87.5	75	
MEA1D1515SC	15	±15	±33	75	2	2.5	5	20	85	89.5	104	
MEA1D2405SC	24	±5	±100	49	2.8	3.5	9	20	81	84.5	47	
MEA1D2409SC	24	±9	±56	47	1.8	2.5	7	20	84	87.5	80	
MEA1D2412SC	24	±12	±42	47	1.6	2.5	4	20	84	87	85	
MEA1D2415SC	24	±15	±33	47	1.5	2.5	3	20	85	88.5	106	
MEA1D4805SC	48	±5	±100	26	2.6	4	14	25	77	80	44	
MEA1D4809SC	48	±9	±56	25	1.6	3	8	20	79	82	72	
MEA1D4812SC	48	±12	±42	25	1.6	3	7	20	78	83	91	
MEA1D4815SC	48	±15	±33	25	1.3	2.5	6	20	80	83.5	109	

When operated with additional external load capacitance the rise time of the input voltage will determine the maximum external capacitance value for guaranteed start up. The slower the rise time of the input voltage the greater the maximum value of the additional external capacitance for reliable start up.

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

1. See Ripple & Noise characterisation method.

2. Calculated using MIL-HDBK-217F FN2 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.

GENERAL CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Switching frequency	MEA1D05xxSC		60		kHz
	MEA1D12xxSC, MEA1D1515SC		70		
	MEA1D1505SC, MEA1D1509SC, & MEA1D1512SC		85		
	MEA1D24xxSC		85		
	MEA1D48xxSC		60		

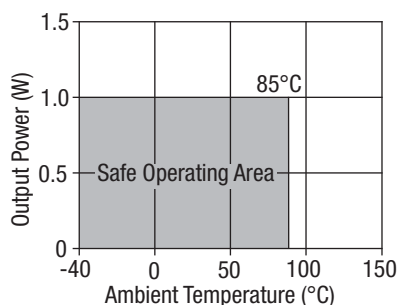
TEMPERATURE CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Specification	All output types	-40		85	°C
Storage		-50		125	
Case Temperature above ambient				20	
Cooling	Free air convection				

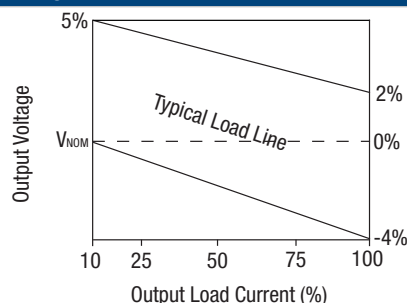
ABSOLUTE MAXIMUM RATINGS

Lead temperature 1.5mm from case for 10 seconds	300°C
Internal power dissipation for 5V, 12V, 15V & 24V input types	300mW
Internal power dissipation for 48V input types	340mW
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

TEMPERATURE DERATING GRAPH



TOLERANCE ENVELOPE



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.

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 MEA series of DC/DC converters are all 100% production tested at their stated isolation voltage. This is 1kVDC for 1 minute.

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

For a part holding no specific agency approvals, such as the MEA series, 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 MEA 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.

APPLICATION NOTES

Minimum load

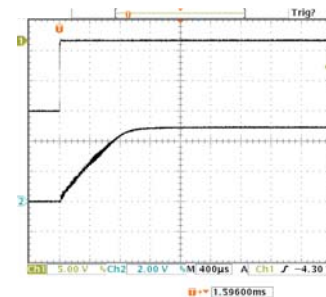
The minimum load to meet datasheet specification is 10% of the full rated load across the specified input voltage range. Lower than 10% minimum loading will result in an increase in output voltage, which may rise to typically double the specified output voltage if the output load falls to less than 5%.

Capacitive loading and start up

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

	Start-up time μ s		Start-up time μ s
MEA1D0505SC	939	MEA1D1512SC	5630
MEA1D0509SC	2872	MEA1D1515SC	8585
MEA1D0512SC	5325	MEA1D2405SC	472
MEA1D0515SC	8895	MEA1D2409SC	1473
MEA1D1205SC	1150	MEA1D2412SC	2643
MEA1D1209SC	3716	MEA1D2415SC	4348
MEA1D1212SC	6912	MEA1D4805SC	586
MEA1D1215SC	10810	MEA1D4809SC	1705
MEA1D1505SC	883	MEA1D4812SC	2995
MEA1D1509SC	3160	MEA1D4815SC	4722

Typical Start-Up Wave Form

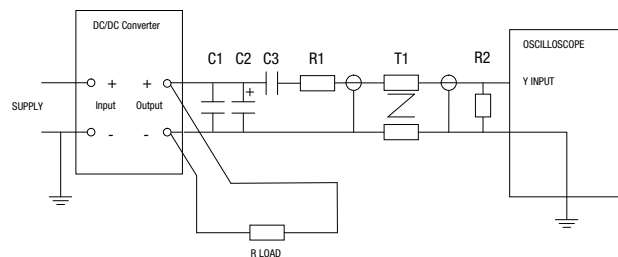


Ripple & Noise Characterisation Method

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

C1	1 μ F X7R multilayer ceramic capacitor, voltage rating to be a minimum of 3 times the output voltage of the DC/DC converter
C2	10 μ F 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 100m Ω at 100 kHz
C3	100nF multilayer ceramic capacitor, general purpose
R1	450 Ω resistor, carbon film, $\pm$ 1% tolerance
R2	50 Ω 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

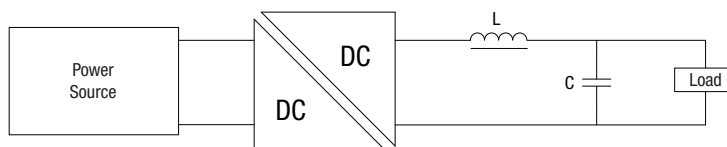
By using the values of inductance and capacitance stated, the output ripple at the rated load is lowered to 5mV p-p max.

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, μ H	SMD	Through Hole	C, μ F
MEA1D0505SC	10	82103C	11R103C	4.7
MEA1D0509SC	22	82223C	11R223C	2.2
MEA1D0512SC	47	82473C	11R473C	1
MEA1D0515SC	47	82473C	11R473C	1
MEA1D1205SC	10	82103C	11R103C	4.7
MEA1D1209SC	22	82223C	11R223C	2.2
MEA1D1212SC	47	82473C	11R473C	1
MEA1D1215SC	47	82473C	11R473C	1
MEA1D1505SC	10	82103C	11R103C	4.7
MEA1D1509SC	22	82223C	11R223C	2.2
MEA1D1512SC	47	82473C	11R473C	1
MEA1D1515SC	47	82473C	11R473C	1
MEA1D2405SC	10	82103C	11R103C	4.7
MEA1D2409SC	22	82223C	11R223C	2.2
MEA1D2412SC	47	82473C	11R473C	1
MEA1D2415SC	47	82473C	11R473C	1
MEA1D4805SC	10	82103C	11R103C	4.7
MEA1D4809SC	22	82223C	11R223C	2.2
MEA1D4812SC	47	82473C	11R473C	1
MEA1D4815SC	47	82473C	11R473C	1

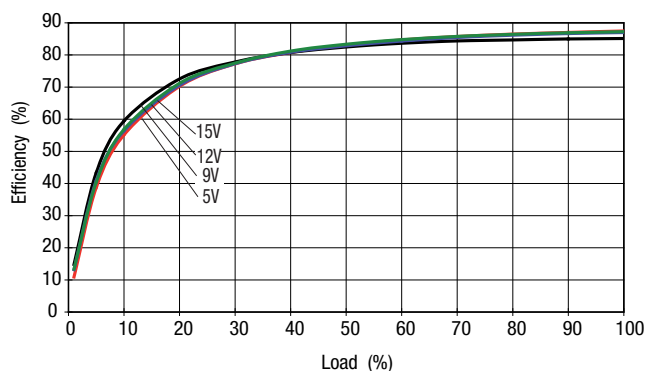
RoHS COMPLIANT INFORMATION



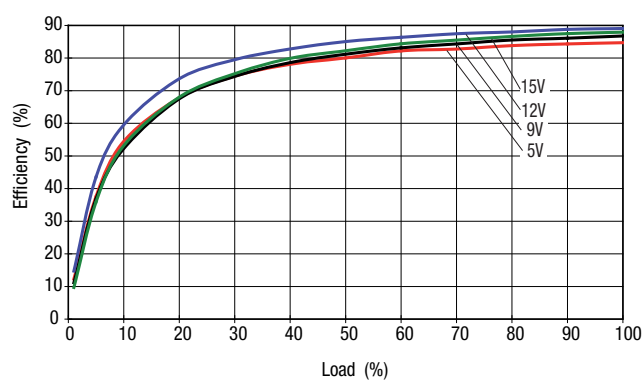
This series is compatible with RoHS soldering systems with a peak wave solder temperature of 300°C for 10 seconds. The pin termination finish on the SIP package type is Tin Plate, Hot Dipped over Matte Tin with Nickel Preplate. The DIP types are Matte Tin over Nickel Preplate. Both types in this series are backward compatible with Sn/Pb soldering systems.
For further information, please visit www.murata-ps.com/rohs

EFFICIENCY VS LOAD

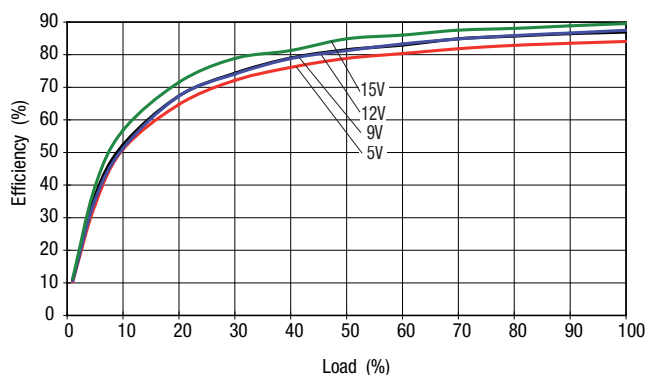
MEA 5V Input Voltage



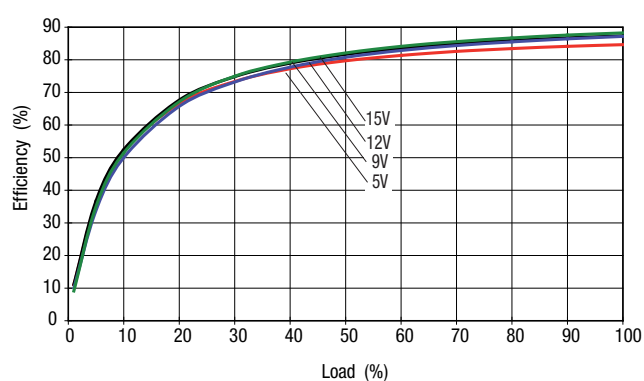
MEA 12V Input Voltage



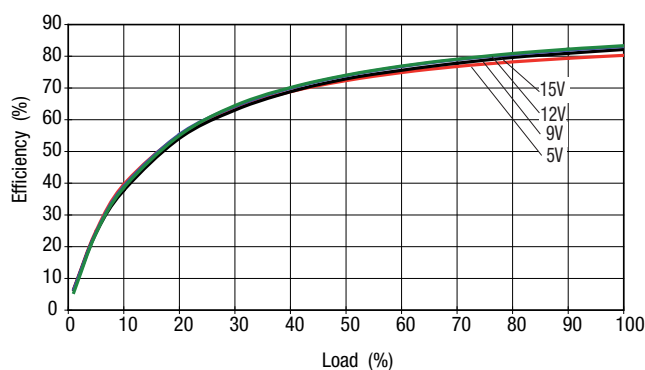
MEA 15V Input Voltage



MEA 24V Input Voltage

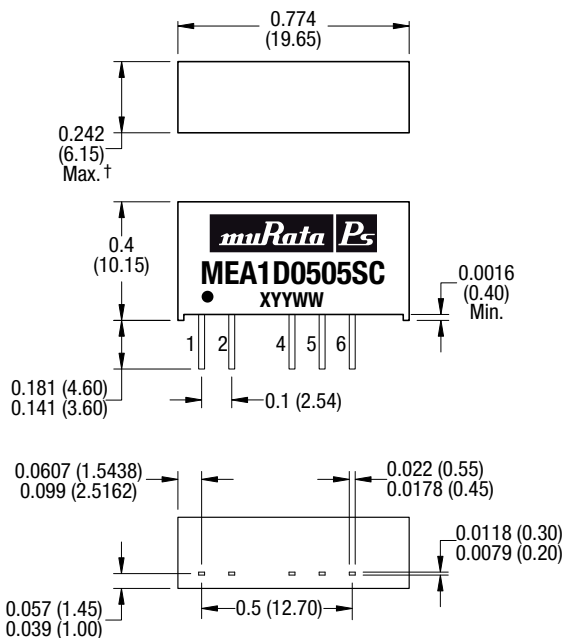


MEA 48V Input Voltage



PACKAGE SPECIFICATIONS

MECHANICAL DIMENSIONS



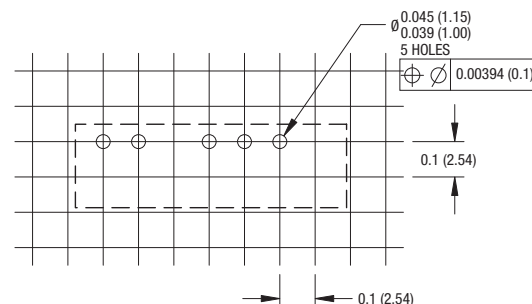
All dimensions in inches ± 0.01 (mm ± 0.25 mm). All pins on a 0.1 (2.54) pitch and within ± 0.01 (0.25) of true position.
† 48V input variants 0.301 (7.65)

PIN CONNECTIONS

Pin	Function
1	+VIN
2	-VIN
4	-VOUT
5	OV
6	+VOUT

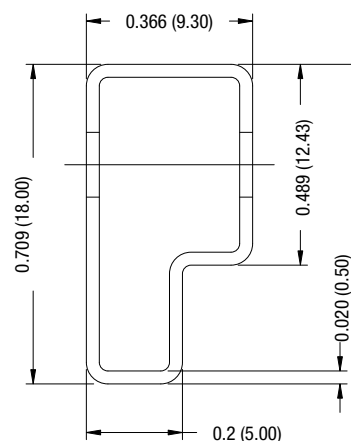
Weight: 2.3g
48V input: 2.8g

RECOMMENDED FOOTPRINT DETAILS



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

TUBE OUTLINE DIMENSIONS



Unless otherwise stated all dimensions in inches (mm) ± 0.5 mm.
Tube length : 20.47 (520mm ± 2 mm).

Tube Quantity : 25