INPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Voltage range	Continuous operation, 3V input types	2.97	3.3	3.63	V
	Continuous operation, 5V input types	4.5	5	5.5	
	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	
Input reflected ripple	3.3V input types		40		mA
	5V input types		24		
	12V & 15V input types		12		
	24V input types		8		

OUTPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Rated Power[2]	T_A=-40°C to 85°C			1	W
Voltage Set Point Accuracy	See tolerance envelopes				
Line regulation	High V_{IN} to low V_{IN}		1.1	1.2	%/%

ISOLATION CHARACTERISTICS

Parameter		Conditions	Min.	Typ.	Max.	Units
Isolation test voltage		Production tested for 1 second	5200			VDC
		Qualification tested for 1 second	7000			
		Qualification tested for 1 minute	5200			
Resistance		Viso= 500VDC		1		GΩ
Isolation capacitance				3		pF
Continuous barrier withstand voltage		Non-safety barrier application			2400	V
Safety standard	UL60950-1	Basic/supplementary			200	Vrms
	ANSI/AAMI ES60601-1	1 MOOP			200	

GENERAL CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Switching frequency	All types		50		kHz

TEMPERATURE CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Specification	All output types, (see safety approval section for limitations)	-40		85	°C
Storage		-55		125	
Case Temperature above ambient	MEJ1S1212SC, MEJ1S1512SC, MEJ1S2412SC, MEJ1D1215SC, MEJ1D1512SC, MEJ1D2412SC, MEJ1D2415SC, MEJ1S1215SC, MEJ1S1509SC, MEJ1S2409SC		13		
	MEJ1D1205SC, MEJ1D1209SC, MEJ1D2405SC, MEJ1D2409SC, MEJ1S1209SC, MEJ1S1515SC, MEJ1S2415SC, MEJ1D1212SC, MEJ1D1509SC, MEJ1S0515SC, MEJ1S2405SC, MEJ1D0512SC, MEJ1D0515SC, MEJ1D1515SC, MEJ1S1505SC , MEJ1D0505SC, MEJ1D0509SC, MEJ1D1203SC, MEJ1D1505SC, MEJ1S0509SC, MEJ1S0512SC, MEJ1S1205SC		17		
	MEJ1S0505SC, MEJ1S1203SC, MEJ1D0503SC, MEJ1S0303SC, MEJ1S0305SC, MEJ1S0503SC		21		
Cooling	Free air convection				

ABSOLUTE MAXIMUM RATINGS

Short-circuit protection	48 Hours
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 V_{IN}, MEJ1x03xxSC	5V
Input voltage V_{IN}, MEJ1x05xxSC	7V
Input voltage V_{IN}, MEJ1x12xxSC	15V
Input voltage V_{IN}, MEJ1x15xxSC	18V
Input voltage V_{IN}, MEJ1x24xxSC	28V

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 MEJ1 series of DC-DC converters are all 100% production tested at 5.2kVDC for 1 second and qualification tested at 7kVDC for 1 second, 5.2kVDC for 1 minute.

The MEJ1 series is recognised by Underwriters Laboratory, please see safety approval section for more information. When the insulation in the MEJ1 series is not used as a safety barrier, i.e. provides functional isolation only, continuous or switched voltages across the barrier up to 2.4kV are sustainable. This is established by measuring the partial discharge Inception voltage in accordance with IEC 60270. Please contact Murata for further information.

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. 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.

SAFETY APPROVAL

ANSI/AAMI ES60601-1

The MEJ1 series have recognised by Underwriters Laboratory (UL) to ANSI/AAMI ES60601-1 and provides 1 MOOP (Means Of Operator Protection) based upon a working voltage of 200 Vrms max and 280 Vpk max., between Primary and Secondary and between Primary and its Enclosure, 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 E202895 applies.

UL60950

The MEJ1 series have been recognised by Underwriters Laboratory (UL) to UL60950 for basic/supplementary insulation to a working voltage of 200Vrms 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.
Creepage and clearance 2mm
Working altitude 4000m

FUSING

The MEJ1 Series of converters are not internally fused so to meet the requirements of UL an anti-surge input line fuse should always be used with ratings as defined below.
MEJ1x03xxSC 1A
MEJ1x05xxSC 1A
MEJ1x12xxSC 500mA
MEJ1x15xxSC 500mA
MEJ1x24xxSC 200mA
All fuses should be UL recognised and rated to at least the maximum allowable DC input voltage.

RoHS COMPLIANCE INFORMATION

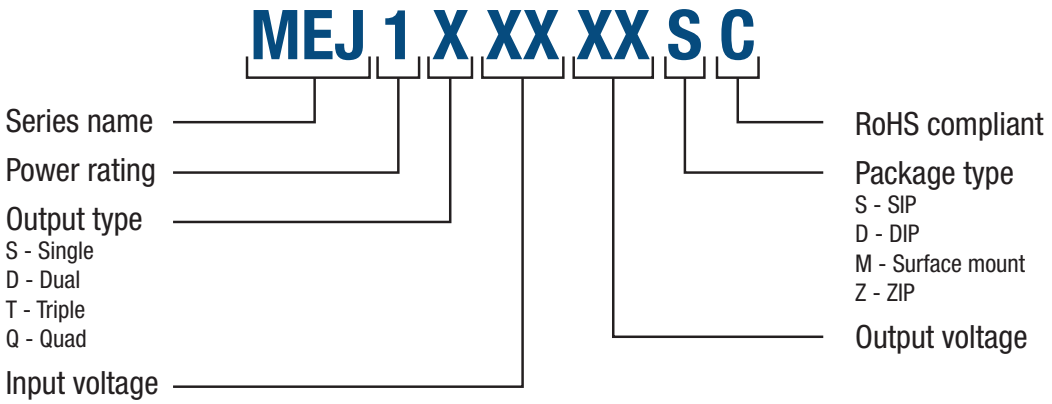
This series is compatible with RoHS soldering systems with a peak wave solder temperature of 260ºC for 10 seconds. Please refer to application notes for further information. The pin termination finish on this product series is Tin Plate, Hot Dipped over Matte Tin with Nickel Preplate. The series is backward compatible with Sn/Pb soldering systems. For further information, please visit www.murata-ps.com/rohs

ENVIRONMENTAL VALIDATION TESTING

The following tests have been conducted on this product series, as part of our design verification process. The datasheet characteristics specify user operating conditions for this series, please contact Murata if further information about the tests is required.

Test	Standard	Condition
Temperature cycling	MIL-STD-883 Method 1010, Condition B	10 cycles between two chambers set to achieve -55°C and +125°C. The dwell time shall not be less than 10min.
Humidity bias	JEDEC JESD22-A101	85°C ± 2°C, 85% ± 5% R.H. for >1000 hours.
Storage life	JEDEC JESD22-A103, Condition A	125°C +10/-0°C for ≥1000 hours.
Vibration	MIL-STD-883 Method 2007, Condition A	1.5mm pk-pk / 20g pk min, 20-2000Hz, 4 sweeps in each of 3 mutually perpendicular axis at 3 oct/min.
Shock	MIL-STD-883 Method 2002, Condition A	500g 1.0ms half sine, 5 shocks in each direction of 3 mutually perpendicular axes.
ESD	JEDEC JESD22-A114	HBM Testing Standard at 3 stress levels; 2.0kV, 4.0kV and 8.0kV.
Bump	IEC Class 4M5 ofETS 300 019-2-4	Shock Spectrum Type II, 6mS duration, 250m/s^2 500 bumps in 6 directions.
Solderability	IPC/ECA J-STD-002, Test A and A1	SnPb (Test A) For leaded solderability the parts are conditioned in a steam ager for 8 hours ±15 min. at a temperature of 93±3°C. Dipped in solder at 245°C ±5°C for 5 +0/-0.5 seconds. Pb-free (Test A1) For lead free solderability the parts are conditioned in a steam ager for 8 hours ± 15 min. at a temperature of 93±3°C. Dipped in solder at 255°C ±5°C for 5 +0/-0.5 seconds.
Solder heat	JEDEC JESD22-B106	The test sample is subjected to a molten solder bath at 260 ±5°C for 10 seconds (96SC tin/ silver/copper).
Solder heat (hand)	MIL-STD-202 Method 210, Condition A	The soldering iron is heated to 350°C ± 10°C and applied to the terminations for a duration of 4 to 5 seconds.
Solvent cleaning	Resistance to cleaning agents.	Solvent – Novec 71IPA & Topklean EL-20A. Pulsed ultrasonic immersion 45°C- 65°C.
Solvent Resistance	MIL-STD-883 Method 2015	Separate samples subjected to solvent A, solvent B and solvent D.
Lead Integrity (Adhesion)	MIL-STD-883 Method 2025	Leads are bent through 90º until a fracture occurs.
Lead Integrity (Fatigue)	MIL-STD-883 Method 2004, condition B_2	The leads are bent to an angle of 15º. Each lead is subjected to 3 cycles.
Lead Integrity (Tension/Pull)	MIL-STD-883 Method 2004, Condition A_1	Pull of 0.227kg applied for 30 seconds. The force is then increased until the pins snap.

PART NUMBER STRUCTURE



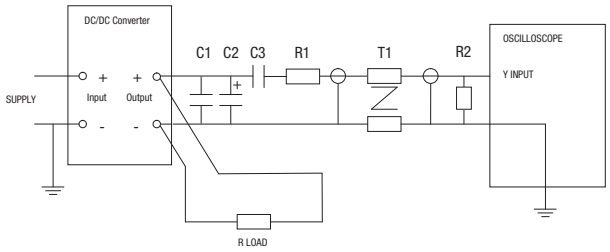
CHARACTERISATION TEST METHODS

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%.

Gate Drive Applications Advisory Note

For general guidence for product usage in gate drive applications please refer to "gate drive application notes".

Capacitive loading and start up

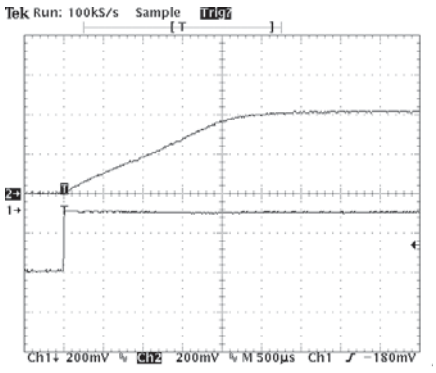
Typical start up times for this series, with a typical input voltage rise time of 2.2µs and output capacitance of 10µF, are shown in the table below. The product series will start into a capacitance of 47µF with an increased start time, however, the maximum recommended output capacitance is 10µF.

	Start-up time µs
MEJ1S0303SC	900
MEJ1S0305SC	2000
MEJ1S0503SC	500
MEJ1S0505SC	2000
MEJ1S0509SC	3200
MEJ1S0512SC	7500
MEJ1S0515SC	10500
MEJ1S1203SC	600
MEJ1S1205SC	1200
MEJ1S1209SC	2900
MEJ1S1212SC	2900
MEJ1S1215SC	3900
MEJ1S1505SC	1100

	Start-up time µs
MEJ1S1509SC	2400
MEJ1S1512SC	2700
MEJ1S1515SC	3800
MEJ1S2405SC	1700
MEJ1S2409SC	2300
MEJ1S2412SC	2200
MEJ1S2415SC	3600
MEJ1D0503SC	700
MEJ1D0505SC	1600
MEJ1D0509SC	3700
MEJ1D0512SC	4200
MEJ1D0515SC	7000
MEJ1D1203SC	600

	Start-up time µs
MEJ1D1205SC	1200
MEJ1D1209SC	3600
MEJ1D1212SC	3900
MEJ1D1215SC	6000
MEJ1D1505SC	1200
MEJ1D1509SC	3200
MEJ1D1512SC	3300
MEJ1D1515SC	4800
MEJ1D2405SC	1100
MEJ1D2409SC	2000
MEJ1D2412SC	3300
MEJ1D2415SC	6400

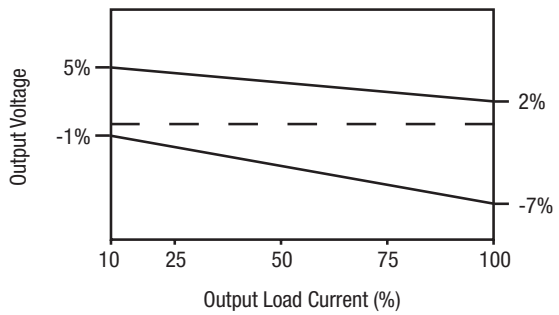
Typical Start-Up Wave Form



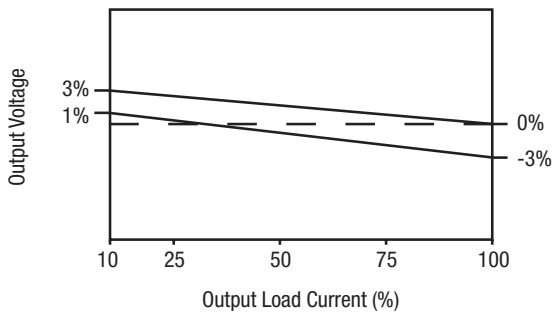
TOLERANCE ENVELOPES

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.

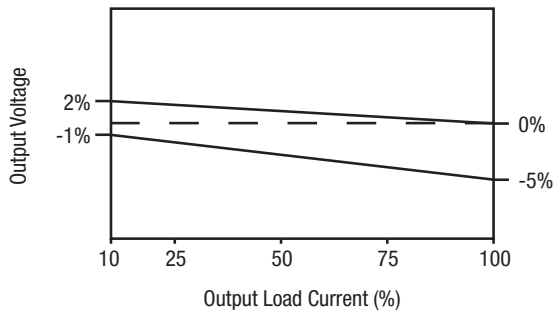
DUAL 1203, 1515, 2412, SINGLE 0303, 0305, 1203



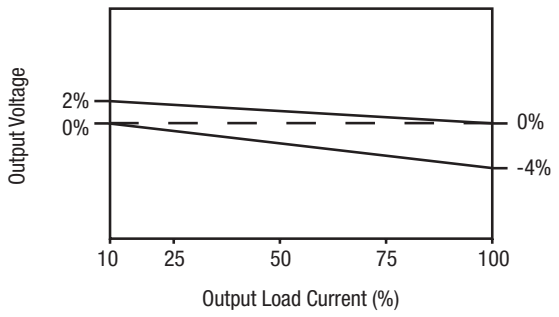
DUAL 1209, 1509, 2409



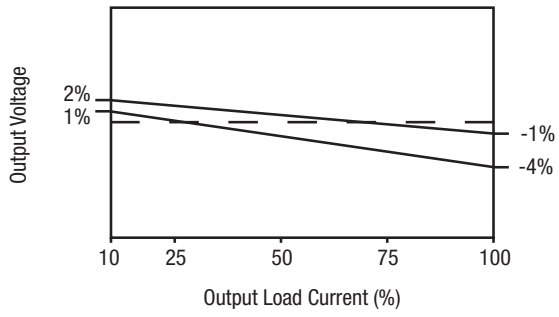
DUAL 0515, SINGLE 1515, 2415



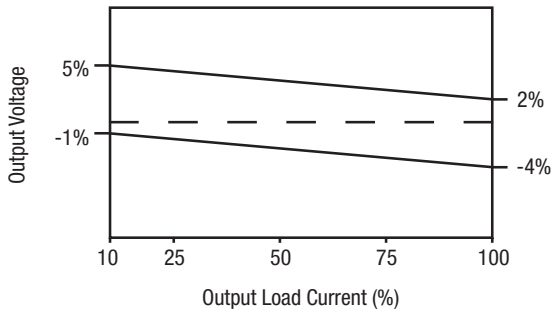
DUAL 1512, SINGLE 1212, 1512, 2412



DUAL 0512, SINGLE 1209, 1509

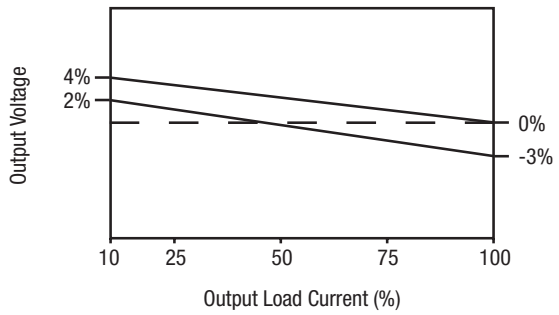


DUAL 1212, 1215, 2415, SINGLE 0509, 0512, 1215, 2409

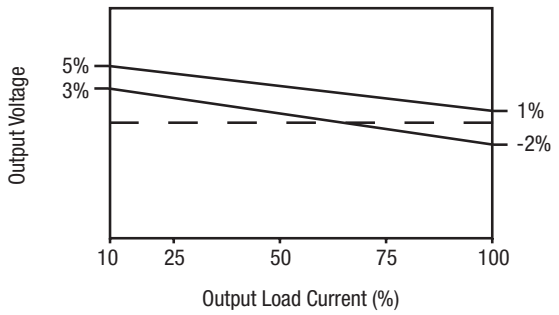


TOLERANCE ENVELOPES (Continued)

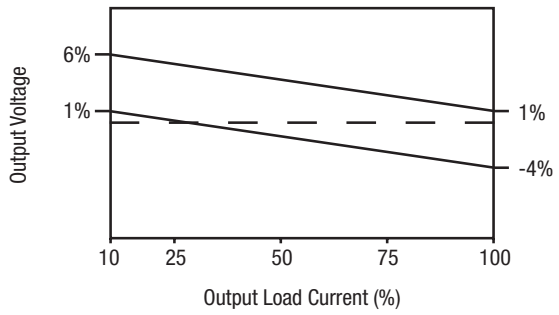
SINGLE 1205, 1505, 2405, 0515



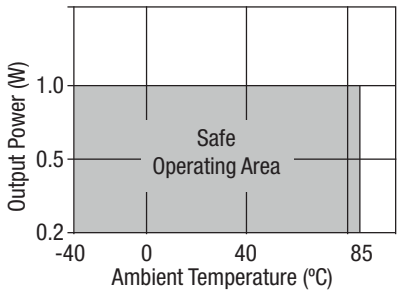
DUAL 1205, 0505, 1505, 2405



DUAL 0509, 0503, SINGLE 0503, 0505

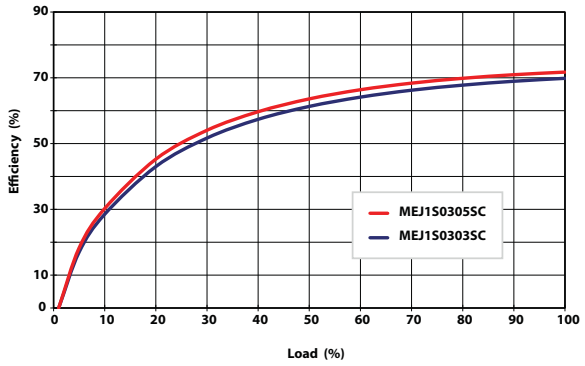


TEMPERATURE DERATING GRAPH

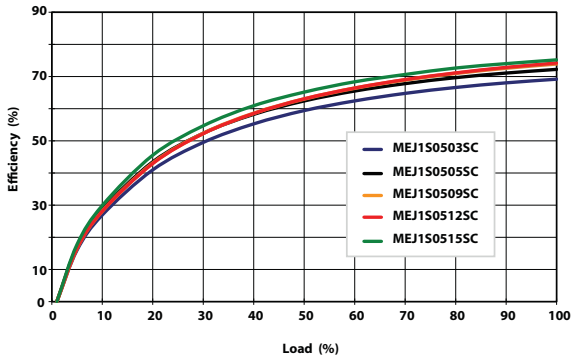


EFFICIENCY VS LOAD Single Output

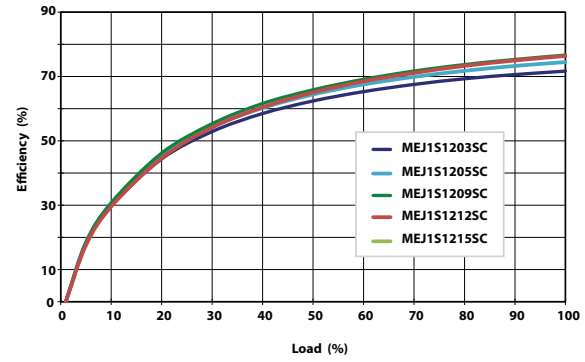
3.3V Input



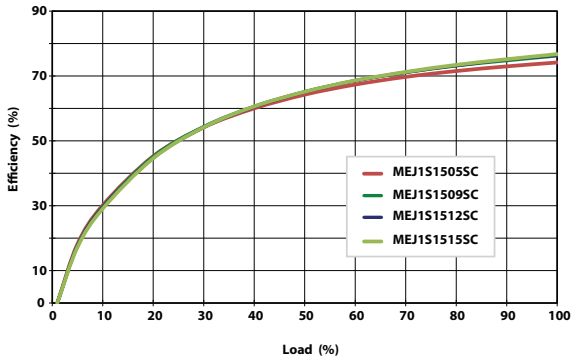
5V Input



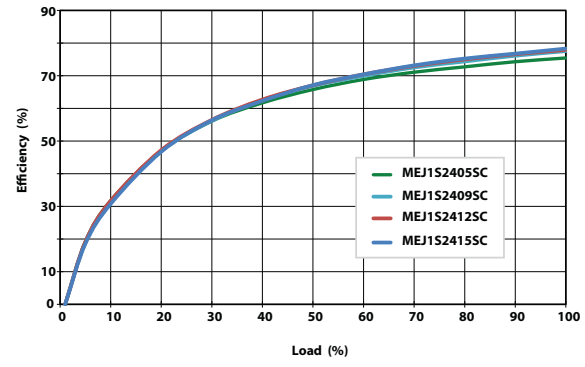
12V Input



15V Input

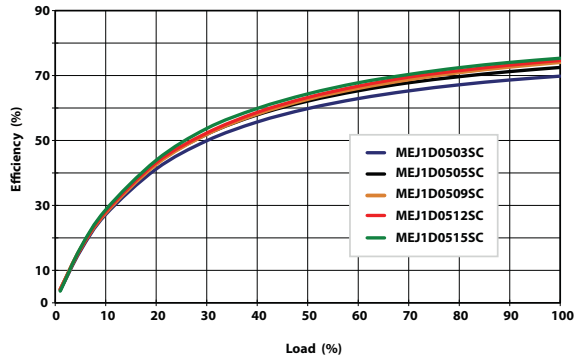


24V Input

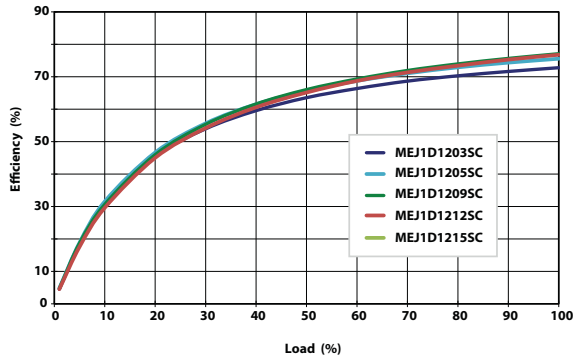


EFFICIENCY VS LOAD Dual Output

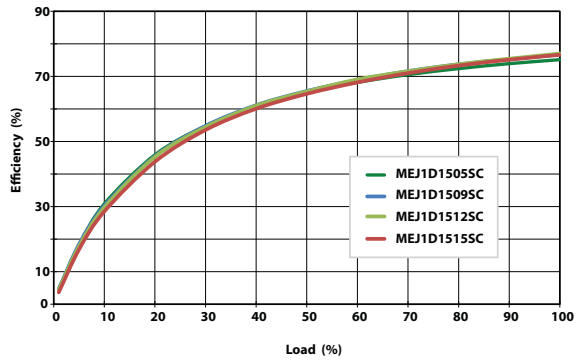
5V Input



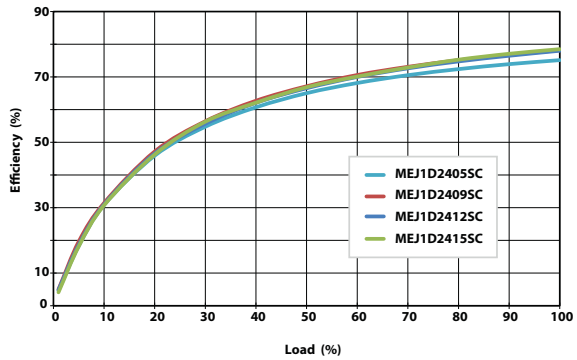
12V Input



15V Input

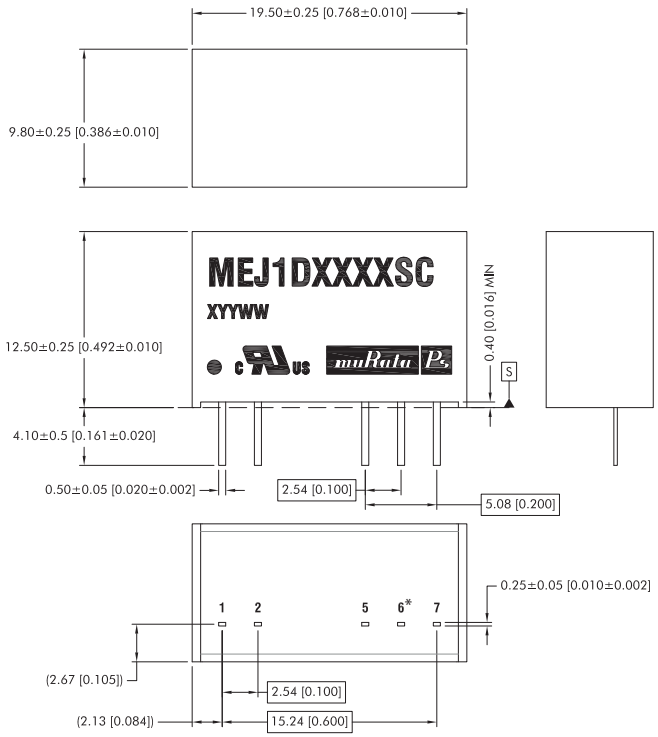


24V Input



PACKAGE SPECIFICATIONS

MECHANICAL DIMENSIONS



All dimensions in mm ±0.25mm (inches ±0.01). All pins on a 2.54 (0.1) pitch and within ±0.25 (0.01) of true position.
* Pin not fitted on single output variants.

Weight: 4.3g

PIN CONNECTIONS

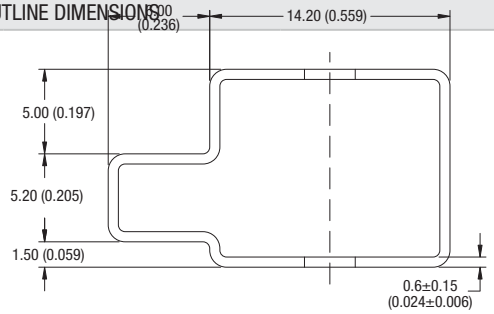
Single Output

Pin	Function
1	+Vin
2	-Vin
5	-Vout
7	+Vout

Dual Output

Pin	Function
1	$+V_{IN}$
2	$-V_{IN}$
5	$-V_{OUT}$
6*	0V
7	$+V_{OUT}$

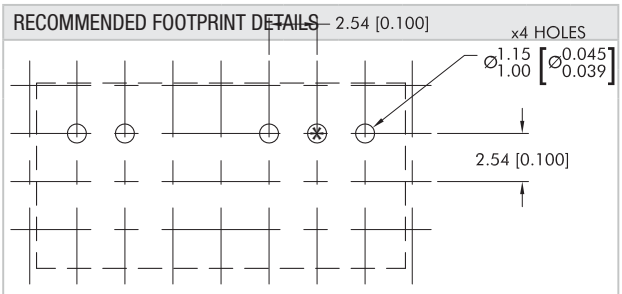
TUBE OUTLINE DIMENSIONS



Unless otherwise stated all dimensions in mm ±0.5mm (inches ±0.02).
Tube length : 20.669±0.079 (525mm±2mm).

Tube Quantity : 25

RECOMMENDED FOOTPRINT DETAILS



* Hole not required for single output variants.
All dimensions in mm ±0.25mm (inches ±0.01).

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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Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards that anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm, and take appropriate remedial actions. Buyer will fully indemnify and hold Murata, its affiliated companies, and its representatives harmless against any damages arising out of unauthorised use of any Murata products in any safety-critical and/or life-critical applications.

Remark: Murata in this section refers to Murata Manufacturing Company and its affiliated companies worldwide including, but not limited to, Murata Power Solutions.