



FEATURES

- Basic/supplementary isolation to UL60950²
- ANSI/AAMI ES60601-1
- Single and dual outputs
- UL 94V-0 package material
- SIP package style
- 5.2kVDC isolation 'Hi Pot Test'
- 3.3V, 5V, 12V, 15V & 24V inputs
- 3.3V, 5V, 9V, 12V & 15V output
- Internal SMD construction
- Fully encapsulated with toroidal magnetics
- Pin compatible with the MEV, NMV, NMK, MEJ2, & NMJ series
- Characterised CMTI >200kV/μS
- Continuous barrier withstand voltage 2.4kVDC

PRODUCT OVERVIEW

The MEJ1 series are single and dual output DC-DC converters in a 7 pin SIP package style offering an isolation and insulation upgrade path from the NMV & MEV1 series'. The MEJ1 series has UL60950 and ANSI/AAMI ES60601-1 recognition, which makes it ideal for applications where safety and miniaturisation are of paramount importance.

SELECTION GUIDE

| Order Code | Nominal Input Voltage | Output Voltage | Output Current | Input Current (Typ) | Load Regulation (Typ) | Load Regulation (Max) | Ripple & Noise (Typ) ³ | Ripple & Noise (Max) ³ | Efficiency (Min) | Efficiency (Typ) | MTTF |
|-------------|-----------------------|----------------|----------------|---------------------|-----------------------|-----------------------|-----------------------------------|-----------------------------------|------------------|------------------|------|
| | V | V | mA | | % | | mVp-p | | % | kHrs | |
| MEJ1S0303SC | 3.3 | 3.3 | 303 | 410 | 8.5 | 11 | 42 | 55 | 67 | 70 | 3653 |
| MEJ1S0305SC | 3.3 | 5 | 200 | 400 | 9 | 10 | 33 | 45 | 68 | 71.5 | 3810 |
| MEJ1S0503SC | 5 | 3.3 | 303 | 280 | 6.5 | 8 | 20 | 40 | 66 | 69 | 4117 |
| MEJ1S0505SC | 5 | 5 | 200 | 270 | 5.5 | 7 | 24 | 40 | 68 | 72 | 4082 |
| MEJ1S0509SC | 5 | 9 | 111 | 265 | 4.5 | 5 | 20 | 40 | 70 | 74 | 3939 |
| MEJ1S0512SC | 5 | 12 | 83 | 260 | 4.5 | 7 | 22 | 40 | 71 | 74 | 3816 |
| MEJ1S0515SC | 5 | 15 | 66 | 260 | 5 | 6 | 22 | 40 | 72 | 75 | 3412 |
| MEJ1S1203SC | 12 | 3.3 | 303 | 110 | 6 | 7 | 25 | 45 | 69 | 72 | 3461 |
| MEJ1S1205SC | 12 | 5 | 200 | 110 | 5 | 6 | 21 | 40 | 71 | 74.5 | 3319 |
| MEJ1S1209SC | 12 | 9 | 111 | 105 | 4 | 5 | 18 | 40 | 73 | 76.5 | 3218 |
| MEJ1S1212SC | 12 | 12 | 83 | 105 | 3.5 | 5 | 19 | 40 | 73 | 76.5 | 3494 |
| MEJ1S1215SC | 12 | 15 | 66 | 105 | 4 | 5 | 16 | 40 | 73 | 77 | 3150 |
| MEJ1S1505SC | 15 | 5 | 200 | 90 | 5 | 6 | 23 | 45 | 70 | 74 | 3048 |
| MEJ1S1509SC | 15 | 9 | 111 | 85 | 4 | 5 | 18 | 40 | 72 | 76 | 2963 |
| MEJ1S1512SC | 15 | 12 | 83 | 85 | 4 | 5 | 20 | 40 | 72 | 76.5 | 2733 |
| MEJ1S1515SC | 15 | 15 | 66 | 85 | 4 | 5 | 19 | 35 | 73 | 76.5 | 2333 |
| MEJ1S2405SC | 24 | 5 | 200 | 55 | 5 | 6 | 23 | 40 | 71 | 75 | 3353 |
| MEJ1S2409SC | 24 | 9 | 111 | 55 | 4 | 7 | 17 | 40 | 72 | 77 | 2940 |
| MEJ1S2412SC | 24 | 12 | 83 | 55 | 4 | 5 | 19 | 40 | 72 | 78 | 2987 |
| MEJ1S2415SC | 24 | 15 | 66 | 55 | 3.5 | 5 | 17 | 40 | 74 | 78 | 2517 |
| MEJ1D0503SC | 5 | ±3.3 | ±151 | 280 | 6 | 8 | 19 | 40 | 67 | 70 | 4511 |
| MEJ1D0505SC | 5 | ±5 | ±100 | 275 | 5 | 6 | 23 | 35 | 69 | 72 | 4012 |
| MEJ1D0509SC | 5 | ±9 | ±55 | 265 | 4 | 6 | 16 | 35 | 69 | 74 | 3492 |
| MEJ1D0512SC | 5 | ±12 | ±42 | 260 | 4 | 5 | 15 | 30 | 72 | 74.5 | 3485 |
| MEJ1D0515SC | 5 | ±15 | ±33 | 260 | 4 | 5 | 13 | 35 | 71 | 75.5 | 2844 |
| MEJ1D1203SC | 12 | ±3.3 | ±151 | 110 | 5.5 | 6 | 19 | 40 | 70 | 73 | 3461 |
| MEJ1D1205SC | 12 | ±5 | ±100 | 110 | 4.5 | 5 | 18 | 40 | 72 | 75.5 | 3317 |
| MEJ1D1209SC | 12 | ±9 | ±55 | 110 | 4 | 5 | 15 | 35 | 73 | 77 | 2908 |
| MEJ1D1212SC | 12 | ±12 | ±42 | 110 | 3.5 | 5 | 14 | 30 | 74 | 76.5 | 2911 |
| MEJ1D1215SC | 12 | ±15 | ±33 | 110 | 4 | 5 | 11 | 35 | 73 | 77 | 2713 |
| MEJ1D1505SC | 15 | ±5 | ±100 | 90 | 4.5 | 5 | 19 | 40 | 72 | 75 | 3274 |
| MEJ1D1509SC | 15 | ±9 | ±55 | 85 | 4 | 5 | 14 | 35 | 73 | 76.5 | 3229 |
| MEJ1D1512SC | 15 | ±12 | ±42 | 85 | 3.5 | 5 | 13 | 35 | 73 | 77 | 2872 |
| MEJ1D1515SC | 15 | ±15 | ±33 | 85 | 3.5 | 5 | 20 | 35 | 73 | 76.5 | 2440 |
| MEJ1D2405SC | 24 | ±5 | ±100 | 55 | 4.5 | 5 | 19 | 40 | 72 | 76.5 | 3316 |
| MEJ1D2409SC | 24 | ±9 | ±55 | 55 | 3.5 | 5 | 17 | 35 | 73 | 78 | 3208 |
| MEJ1D2412SC | 24 | ±12 | ±42 | 55 | 3.5 | 5 | 12 | 35 | 74 | 78 | 3362 |
| MEJ1D2415SC | 24 | ±15 | ±33 | 55 | 3.5 | 5 | 14 | 35 | 74 | 78.5 | 2697 |

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 | | |

1. Calculated using MIL-HDBK-217 FN2 calculation model with nominal input voltage at full load.

2. See safety approvals section for limitations of use.

3. See ripple & noise test method.

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



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



| 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 | 1 MOOP | | | 200 | |
| | ES60601-1 | | | | | |

| 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 | %/% |

| 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 | | | | | |

| GENERAL CHARACTERISTICS | | | | | | |
|-------------------------|------------|--|------|------|------|-------|
| Parameter | Conditions | | Min. | Typ. | Max. | Units |
| Switching frequency | All types | | | 50 | | kHz |

| 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 recognized 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 260°C 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

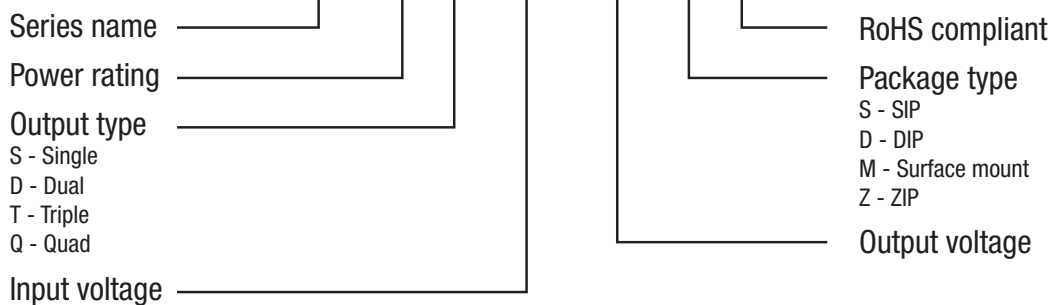
ENVIRONMENTAL VALIDATION TESTING

The following tests have been conducted on this product series, please contact Murata if further information about the tests is required.

| Test | Standard | Condition |
|-------------------------------|---|---|
| Temperature cycling | MIL-STD 883 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 STD 22-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 axes 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 | JESD22-A114 | HBM Testing Standard at 3 stress levels; 2.0kV, 4.0kV and 8.0kV. |
| Bump | IEC Class 4M5 of ETS 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 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. 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 |
| 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 90° until a fracture occurs. |
| Lead Integrity (Fatigue) | MIL-STD 883 Method 2004, condition B ₂ | The leads are bent to an angle of 15°. 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

MEJ 1 X XX XX S C



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

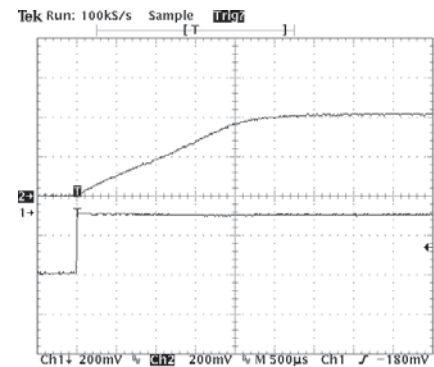
For general guidance for product usage in gate drive applications please refer to ["gate drive application notes"](#).

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 | | Start-up time | | Start-up time | |
|---------------|-------|---------------|------|---------------|------|
| µs | | µs | | µs | |
| MEJ1S0303SC | 900 | MEJ1S1509SC | 2400 | MEJ1D1205SC | 1200 |
| MEJ1S0305SC | 2000 | MEJ1S1512SC | 2700 | MEJ1D1209SC | 3600 |
| MEJ1S0503SC | 500 | MEJ1S1515SC | 3800 | MEJ1D1212SC | 3900 |
| MEJ1S0505SC | 2000 | MEJ1S2405SC | 1700 | MEJ1D1215SC | 6000 |
| MEJ1S0509SC | 3200 | MEJ1S2409SC | 2300 | MEJ1D1505SC | 1200 |
| MEJ1S0512SC | 7500 | MEJ1S2412SC | 2200 | MEJ1D1509SC | 3200 |
| MEJ1S0515SC | 10500 | MEJ1S2415SC | 3600 | MEJ1D1512SC | 3300 |
| MEJ1S1203SC | 600 | MEJ1D0503SC | 700 | MEJ1D1515SC | 4800 |
| MEJ1S1205SC | 1200 | MEJ1D0505SC | 1600 | MEJ1D2405SC | 1100 |
| MEJ1S1209SC | 2900 | MEJ1D0509SC | 3700 | MEJ1D2409SC | 2000 |
| MEJ1S1212SC | 2900 | MEJ1D0512SC | 4200 | MEJ1D2412SC | 3300 |
| MEJ1S1215SC | 3900 | MEJ1D0515SC | 7000 | MEJ1D2415SC | 6400 |
| MEJ1S1505SC | 1100 | MEJ1D1203SC | 600 | | |

Typical Start-Up Wave Form



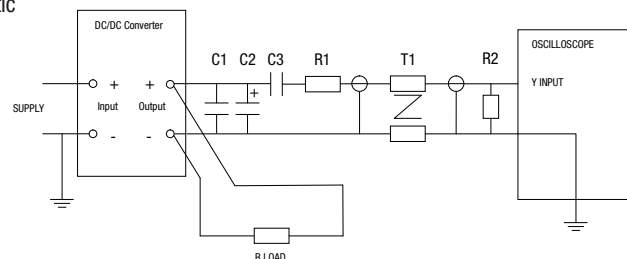
Ripple & Noise Characterisation Method

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.

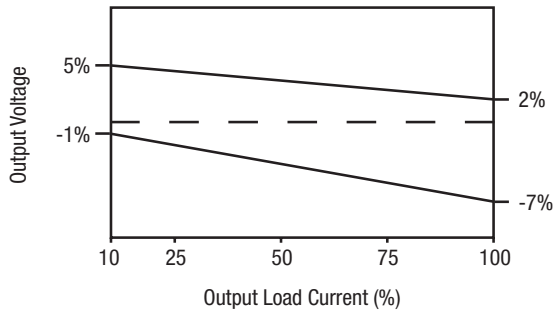
Differential Mode Noise Test Schematic



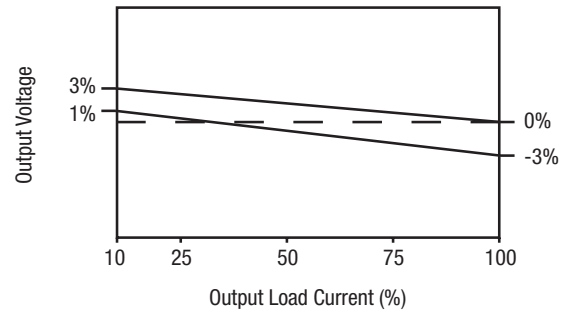
TOLERANCE ENVELOPES

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.

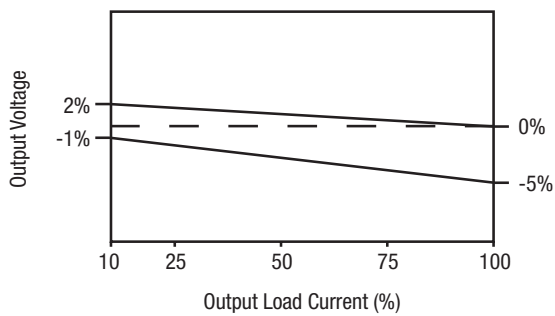
DUAL 1203,1515, 2412, SINGLE 0303, 0305, 1203



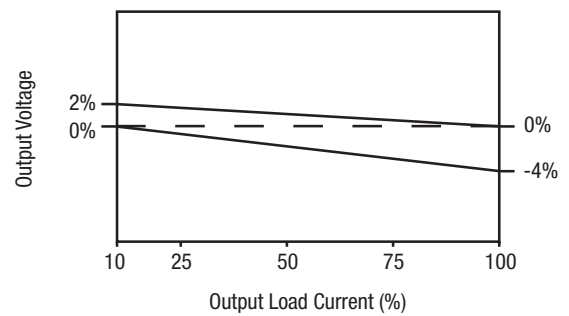
DUAL 1209, 1509, 2409



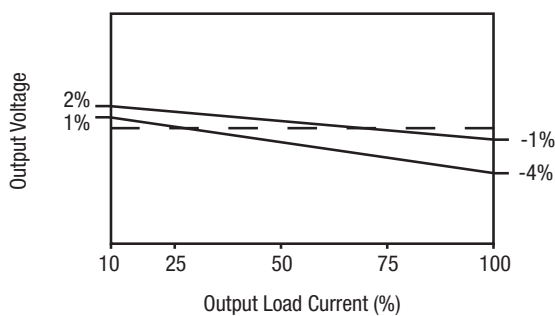
DUAL 0515, SINGLE 1515, 2415



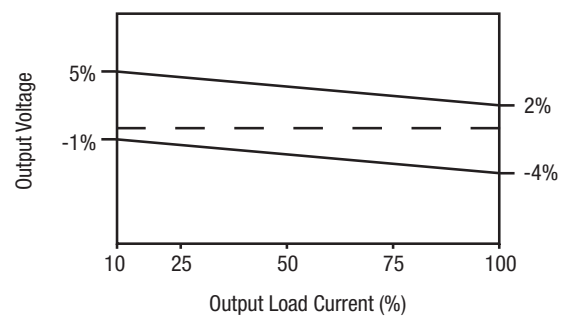
DUAL 1512, SINGLE 1212, 1512, 2412



DUAL 0512, SINGLE 1209, 1509

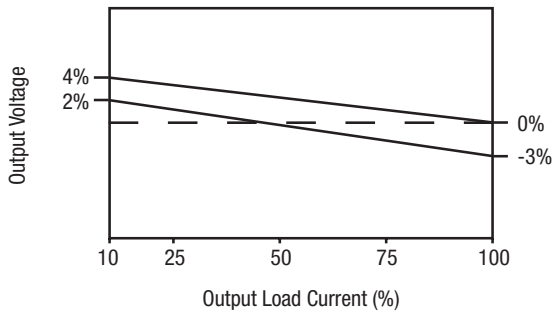


DUAL 1212, 1215, 2415, SINGLE 0509, 0512, 1215, 2409

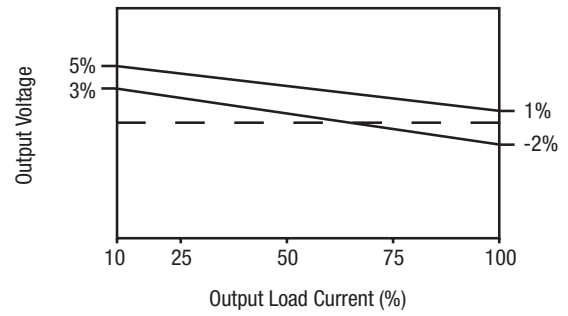


TOLERANCE ENVELOPES

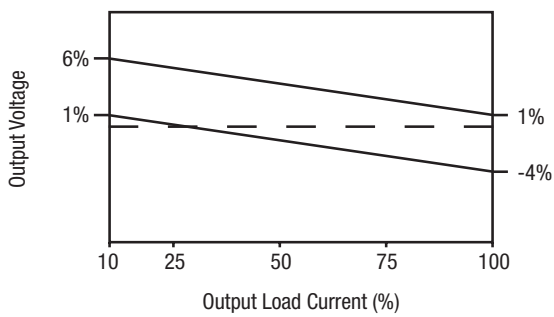
SINGLE 1205, 1505, 2405, 0515



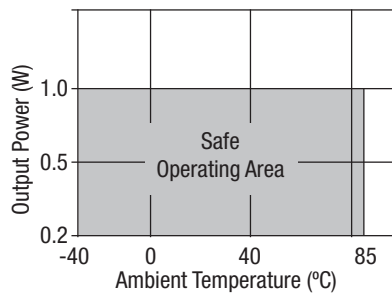
DUAL 1205, 0505, 1505, 2405



DUAL 0509, 0503, SINGLE 0503, 0505

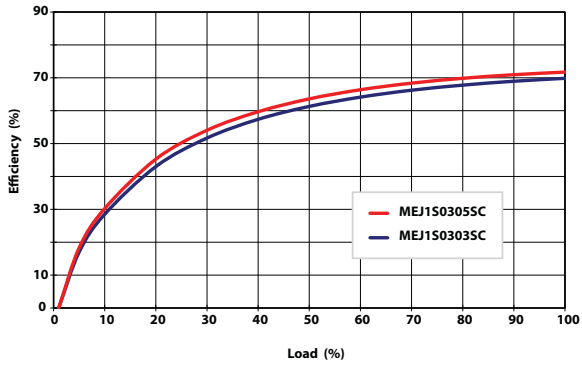


TEMPERATURE DERATING GRAPH

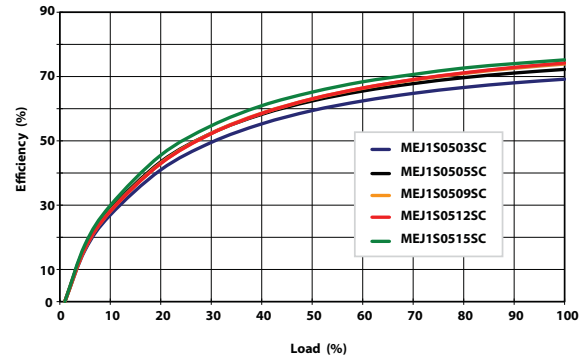


EFFICIENCY VS LOAD Single Output

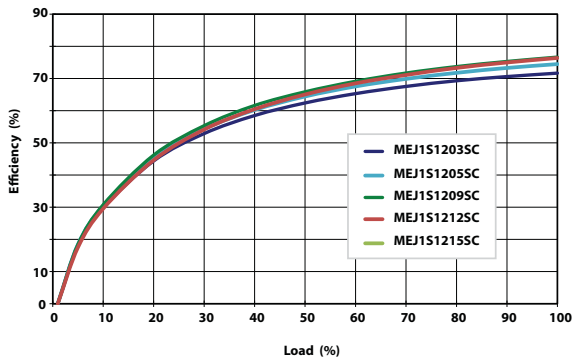
3.3V Input



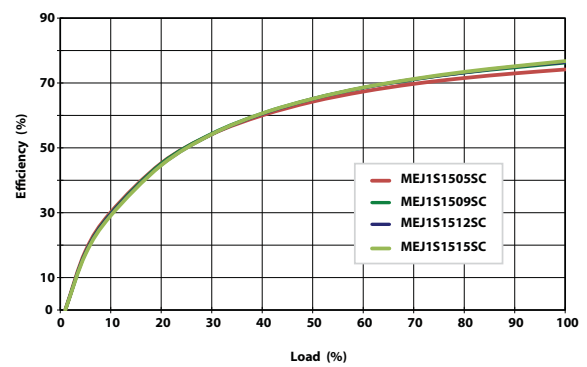
5V Input



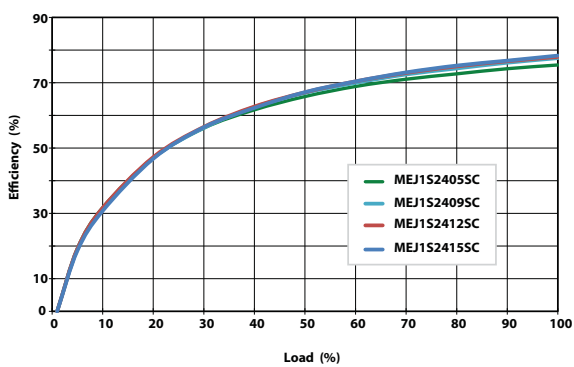
12V Input



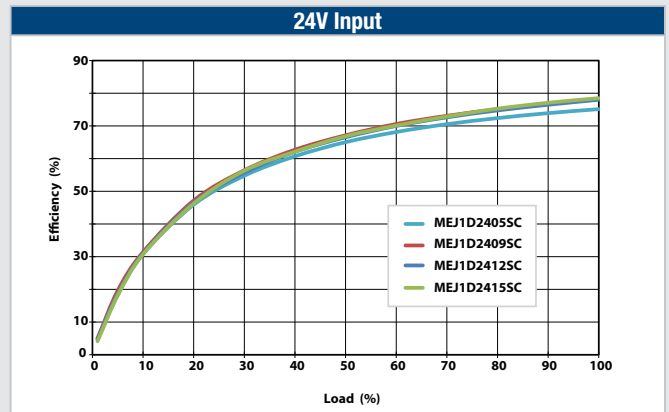
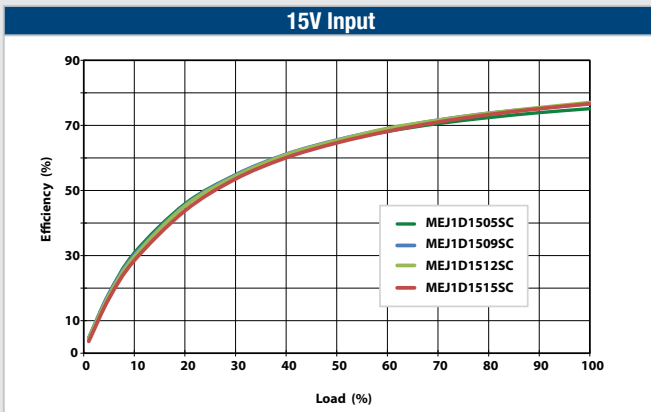
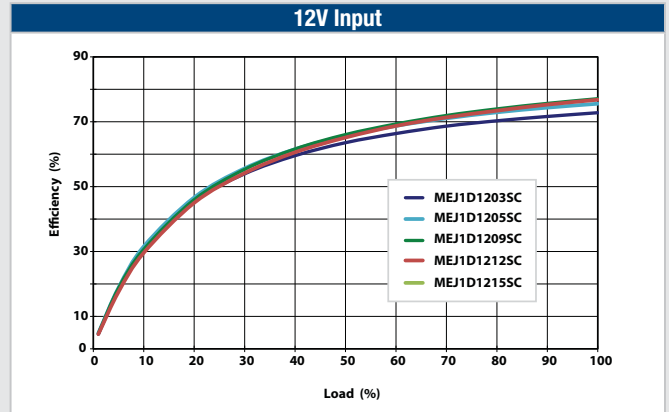
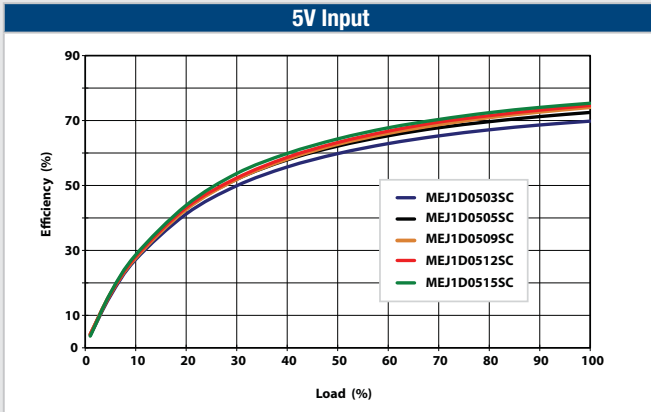
15V Input



24V Input

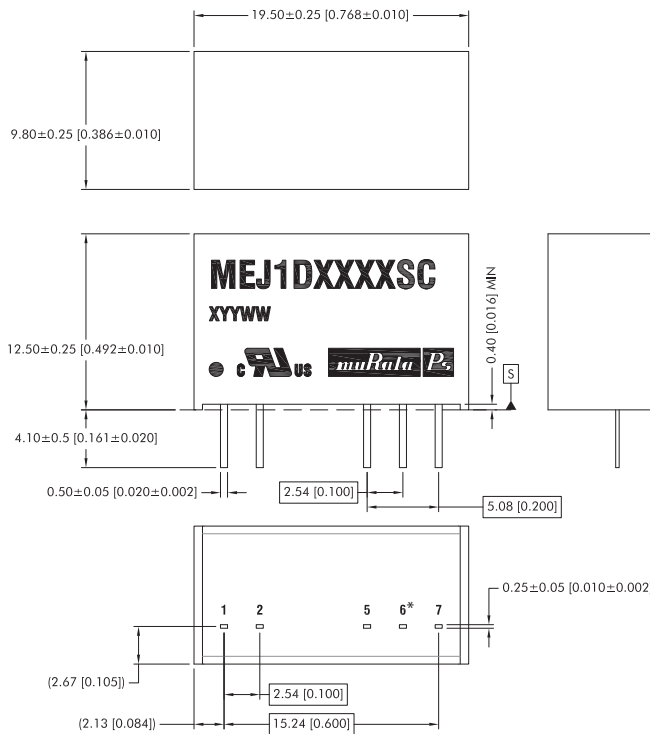


EFFICIENCY VS LOAD Dual Output



PACKAGE SPECIFICATIONS

MECHANICAL DIMENSIONS



All dimensions in mm ± 0.25 mm (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

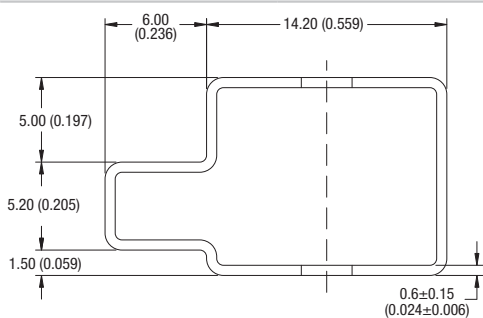
Single Output

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

Dual Output

| Pin | Function |
|-----|----------|
| 1 | +VIN |
| 2 | -VIN |
| 5 | -VOUT |
| 6* | OV |
| 7 | +VOUT |

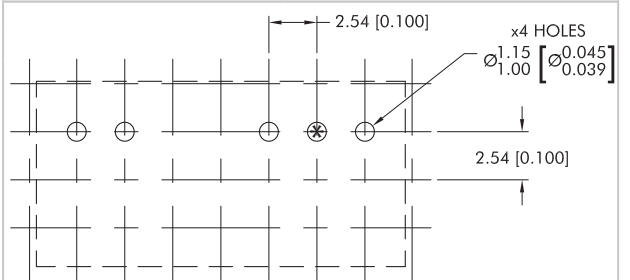
TUBE OUTLINE DIMENSIONS



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

Tube Quantity : 25

RECOMMENDED FOOTPRINT DETAILS



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



This product is subject to the following **operating requirements** and the **Life and Safety Critical Application Sales Policy**:
Refer to: <http://www.murata-ps.com/requirements/>

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