

FEATURES

- UL60950 recognised
- Short circuit protection
- Operation to zero load
- Output regulation <1%
- Single isolated output
- 1kVDC or 3.5kVDC isolation options 'Hi Pot Test'
- 3.3V, 5V, 12V & 24V inputs
- 3.3V & 5V outputs
- SMD construction
- Fully encapsulated with toroidal magnetics

DESCRIPTION

The MEF1 series of DC-DC converters is used where a tightly regulated supply is required. They are ideal for situations where the input voltage is not tightly controlled. The single rail regulated output makes the ideal choice to power sensors, such as pressure transducers, hall effect sensors and mass airflow sensors.

SELECTION GUIDE

| Order Code | Nominal Input Voltage | Output Voltage | Output Current | Ripple & Noise (Typ.) | Ripple & Noise (Max.) | Input Current (Typ.) | Efficiency (Min.) | Efficiency (Typ.) | Isolation Capacitance | MTTF |
|---------------------------------------|-----------------------|----------------|----------------|-----------------------|-----------------------|----------------------|-------------------|-------------------|-----------------------|------|
| | V | V | mA | mVp-p | mVp-p | mA | % | % | pF | kHrs |
| MEF1S0303SPC | 3.3 | 3.3 | 303 | 11 | 35 | 460 | 63 | 66 | 40 | 495 |
| MEF1S0305SPC | 3.3 | 5 | 200 | 9 | 35 | 430 | 68 | 71 | 30 | 867 |
| MEF1S0503SPC | 5 | 3.3 | 303 | 8 | 30 | 290 | 65 | 68.5 | 40 | 665 |
| MEF1S0505SPC | 5 | 5 | 200 | 10 | 40 | 275 | 69 | 73 | 50 | 1051 |
| MEF1S1203SPC | 12 | 3.3 | 303 | 11 | 35 | 120 | 65 | 69 | 40 | 511 |
| MEF1S1205SPC | 12 | 5 | 200 | 10 | 35 | 115 | 69 | 73.5 | 60 | 1044 |
| MEF1S2403SPC | 24 | 3.3 | 303 | 13 | 40 | 60 | 64 | 69 | 35 | 580 |
| MEF1S2405SPC | 24 | 5 | 200 | 13 | 40 | 55 | 68 | 73 | 45 | 834 |
| 3.5kVDC Isolation Part Numbers | | | | | | | | | | |
| MEF1S0303SP3C | 3.3 | 3.3 | 303 | 11 | 35 | 460 | 63 | 66 | 40 | 495 |
| MEF1S0305SP3C | 3.3 | 5 | 200 | 9 | 35 | 430 | 68 | 71 | 30 | 867 |
| MEF1S0503SP3C | 5 | 3.3 | 303 | 8 | 30 | 290 | 65 | 68.5 | 40 | 665 |
| MEF1S0505SP3C | 5 | 5 | 200 | 10 | 40 | 275 | 69 | 73 | 50 | 1051 |
| MEF1S1203SP3C | 12 | 3.3 | 303 | 11 | 35 | 120 | 65 | 69 | 40 | 511 |
| MEF1S1205SP3C | 12 | 5 | 200 | 10 | 35 | 115 | 69 | 73.5 | 60 | 1044 |
| MEF1S2403SP3C | 24 | 3.3 | 303 | 13 | 40 | 60 | 64 | 69 | 35 | 580 |
| MEF1S2405SP3C | 24 | 5 | 200 | 13 | 40 | 55 | 68 | 73 | 45 | 834 |

INPUT CHARACTERISTICS

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|--------------------------|--|-------|------|-------|--------|
| Voltage range | Continuous operation, 3.3V input types | 3.135 | 3.3 | 3.465 | V |
| | Continuous operation, 5V input types | 4.75 | 5 | 5.25 | |
| | Continuous operation, 12V input types | 11.4 | 12 | 12.6 | |
| | Continuous operation, 24V input types | 22.8 | 24 | 25.2 | |
| Reflected ripple current | | | 5 | 20 | mA p-p |

OUTPUT CHARACTERISTICS

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|----------------------------|---|------|------|-------|-------|
| Voltage set point accuracy | 3.3V Output | | | ± 2.5 | % |
| | 5V Output | | | ± 2 | |
| Rated power | T _A = -40°C to 85°C | | | 1 | W |
| Line regulation | High V _{IN} to low V _{IN} | | | 0.25 | %/% |
| Load regulation | 10% load to rated load | | 0.3 | 1 | % |

ISOLATION CHARACTERISTICS

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|------------------------|---|------|------|------|-------|
| Isolation test voltage | SPC Versions Flash tested for 1 second | 1000 | | | VDC |
| | SP3C Versions Flash tested for 1 minute | 3500 | | | |
| Resistance | Viso= 1kVDC | 10 | | | GΩ |

GENERAL CHARACTERISTICS

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---------------------|------------------------|------|------|------|-------|
| Switching frequency | 0303 | | 45 | | kHz |
| | 5V input types | | 50 | | |
| | 12V input types & 0305 | | 60 | | |
| | 24V input types | | 75 | | |

1. Calculated using MIL-HDBK-217F 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.



For full details go to
<https://www.murata.com/en-global/products/power/rohs>



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

| ABSOLUTE MAXIMUM RATINGS | |
|---|--|
| Short-circuit protection | Continuous |
| Lead temperature 1.5mm 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} , MEF1S03 types | 4V |
| Input voltage V_{IN} , MEF1S05 types | 7V |
| Input voltage V_{IN} , MEF1S12 types | 18V |
| Input voltage V_{IN} , MEF1S24 types | 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 MEF1 series of DC-DC converters are all 100% production tested at their stated isolation voltage. This is 1kVDC for 1 second for SPC versions and 3.5kVDC for 1 minute for SP3C versions.

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

The MEF1 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 MEF1 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 MEF1 series has been recognised by Underwriters Laboratory (UL) to UL 60950 for functional insulation, file number E151252 applies. The MEF1 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.

- MEF1S03xxxC: 600mA
- MEF1S05xxxC: 400mA
- MEF1S12xxxC: 160mA
- MEF1S24xxxC: 100mA

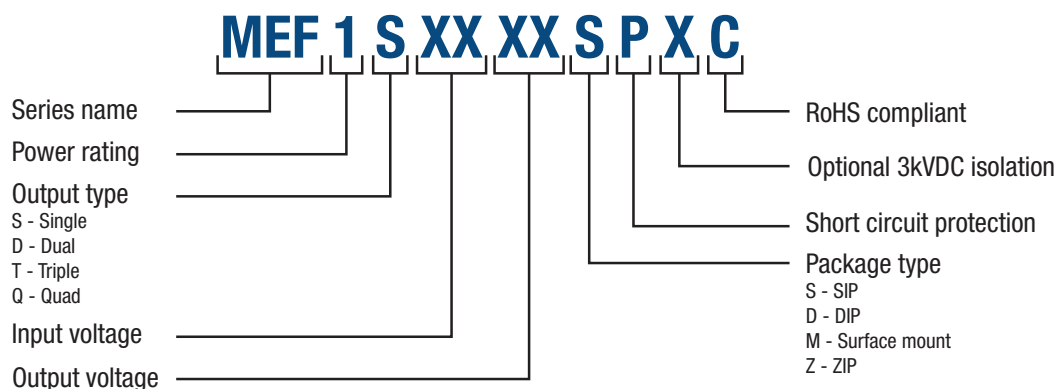
All fuses should be UL approved and rated to at least the maximum allowable DC input voltage.

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 the SIP package type is Tin Plate, Hot Dipped over Matte Tin over Nickel Preplate. This series is backward compatible with Sn/Pb soldering systems. For further information, please visit www.murata-ps.com/rohs

PART NUMBER STRUCTURE



CHARACTERISATION TEST METHODS

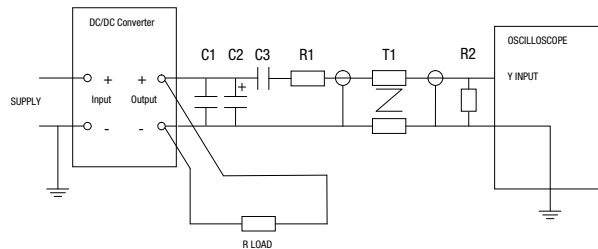
Ripple & Noise Characterisation Method

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



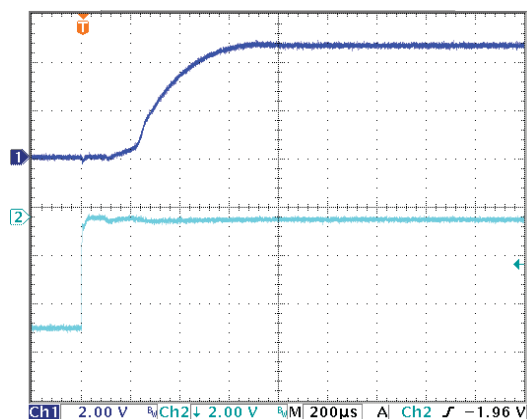
APPLICATION NOTES

Capacitive loading and start up

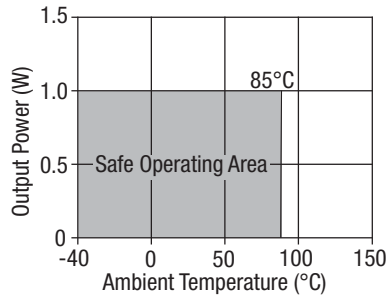
Typical start up times for this series, with a typical input voltage rise time of 2.2µs and output capacitance of 10µF, are shown in the table below. The product series will start into a capacitance of 47µF with an increased start time, however, the maximum recommended output capacitance is 10µF.

| | Start-up time | |
|---------------|---------------|--|
| | µs | |
| MEF1S0303SPC | 310 | |
| MEF1S0305SPC | 550 | |
| MEF1S0503SPC | 225 | |
| MEF1S0505SPC | 460 | |
| MEF1S1203SPC | 185 | |
| MEF1S1205SPC | 390 | |
| MEF1S2403SPC | 160 | |
| MEF1S2405SPC | 430 | |
| MEF1S0303SP3C | 310 | |
| MEF1S0305SP3C | 550 | |
| MEF1S0503SP3C | 225 | |
| MEF1S0505SP3C | 460 | |
| MEF1S1203SP3C | 185 | |
| MEF1S1205SP3C | 390 | |
| MEF1S2403SP3C | 160 | |
| MEF1S2405SP3C | 430 | |

MEF1S0305SP3C

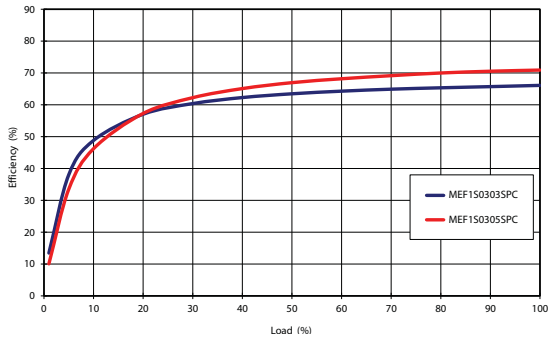


TEMPERATURE DERATING GRAPH

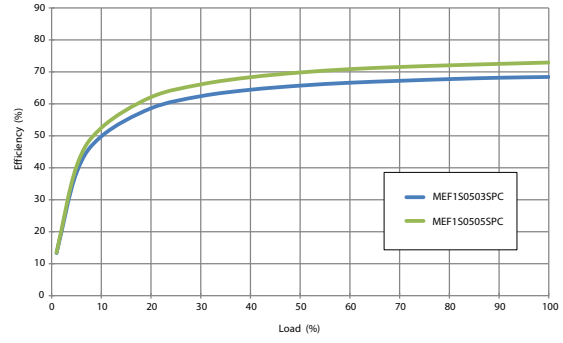


EFFICIENCY VS LOAD

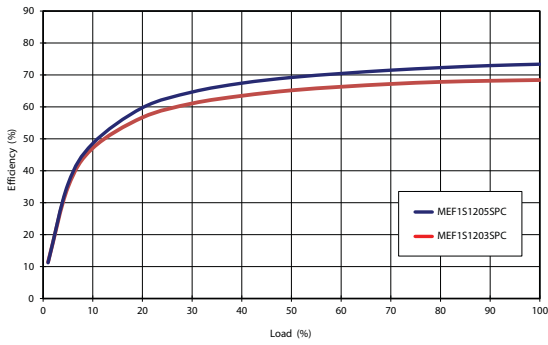
3.3V Input



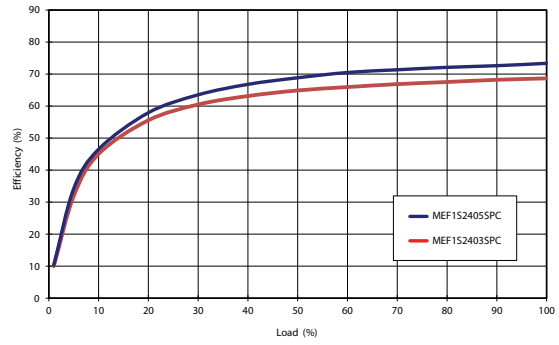
5V Input



12V Input

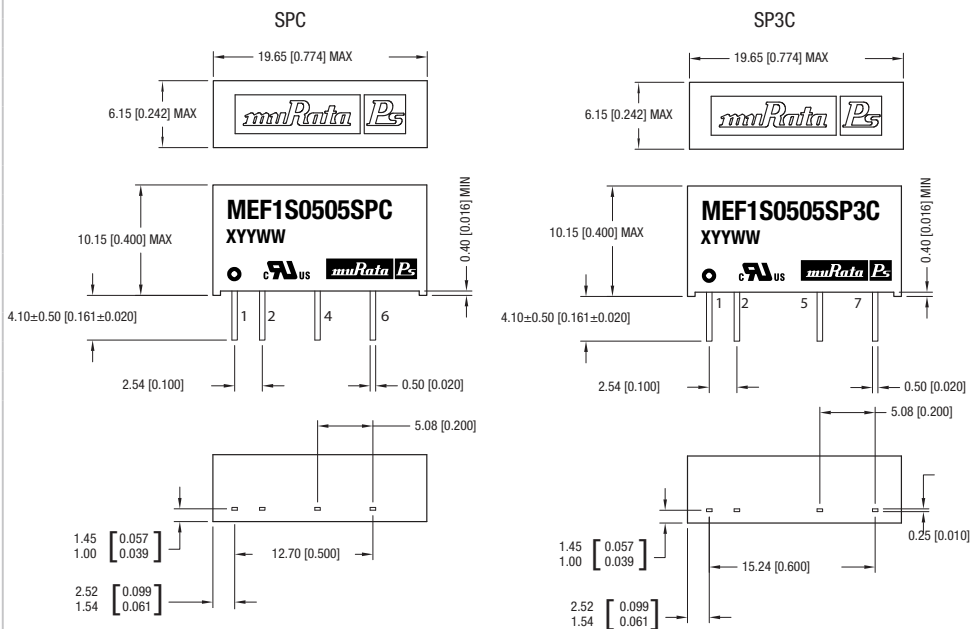


24V Input



PACKAGE SPECIFICATIONS

MECHANICAL DIMENSIONS



Unless otherwise stated all dimensions in mm (inches) ±0.05mm (0.002"). Controlling dimension is mm.
 All pins on a 2.54mm (0.100") pitch and within 0.25mm (0.010") of true position.
 For SIP products, from date code D2224 onwards, products have an embossed logo on the top of the case.
 Prior to this date, SIP products have a flat surface finish.

Weight: 1.6g

PIN CONNECTIONS - SPC

| Pin | Function |
|-----|----------|
| 1 | +VIN |
| 2 | -VIN |
| 4 | -VOUT |
| 6 | +VOUT |

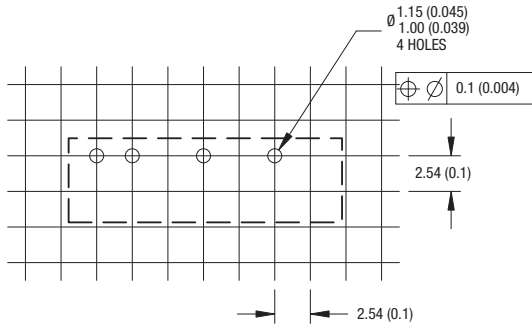
PIN CONNECTIONS - SP3C

| Pin | Function |
|-----|----------|
| 1 | +VIN |
| 2 | -VIN |
| 5 | -VOUT |
| 7 | +VOUT |

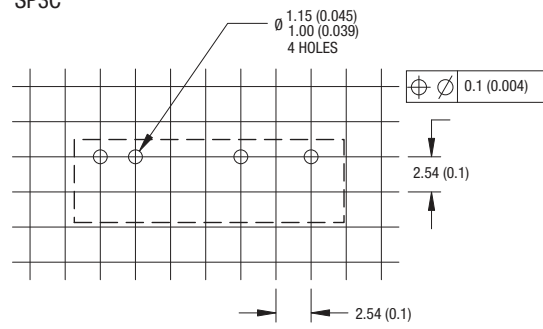
PACKAGE SPECIFICATIONS (Continued)

RECOMMENDED FOOTPRINT DETAILS

SPC



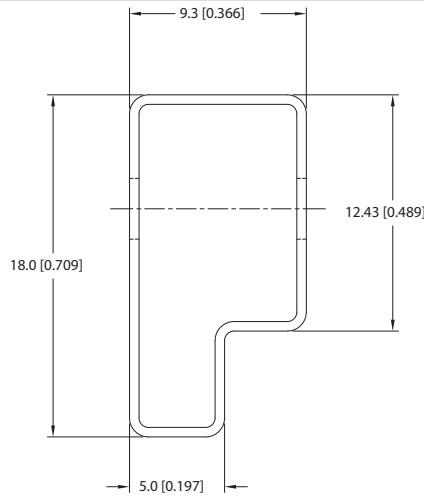
SP3C



All dimensions in mm ± 0.25 mm (inches ± 0.01).

TUBE OUTLINE DIMENSIONS

7 Pin SIP Tube



Unless otherwise specified all dimensions in mm [inches] ± 0.55 mm [0.022].
Tube Length : 520mm [20.472] ± 2.0 [0.079].

Tube Quantity : 25

DISCLAIMER

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- Undersea equipment
- Power plant control equipment
- Medical equipment
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- Traffic signal equipment
- Disaster prevention / crime prevention equipment
- Data Processing equipment

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