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	5V & 48V input types		62		kHz
	12V & 15V input types		75		
	24V input types		82		

TEMPERATURE CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Specification	All output types	-40		85	°C
Storage		-50		125	
Case Temperature rise above ambient	5V, 12V, & 15V input types			15	
	24V & 48V input types			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 V_{IN}, 5Vin types	7V
Input voltage V_{IN}, 12Vin types	15V
Input voltage V_{IN}, 15Vin types	18V
Input voltage V_{IN}, 24Vin types	28V
Input voltage V_{IN}, 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 MER1 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 MER1 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 MER1 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 MER1 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 MER1 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.
MER1S05xxSC: 1A
MER1S12xxSC: 0.375A
MER1S15xxSC: 0.375A
MER1S24xxSC: 0.2A
MER1S48xxSC: 0.1A

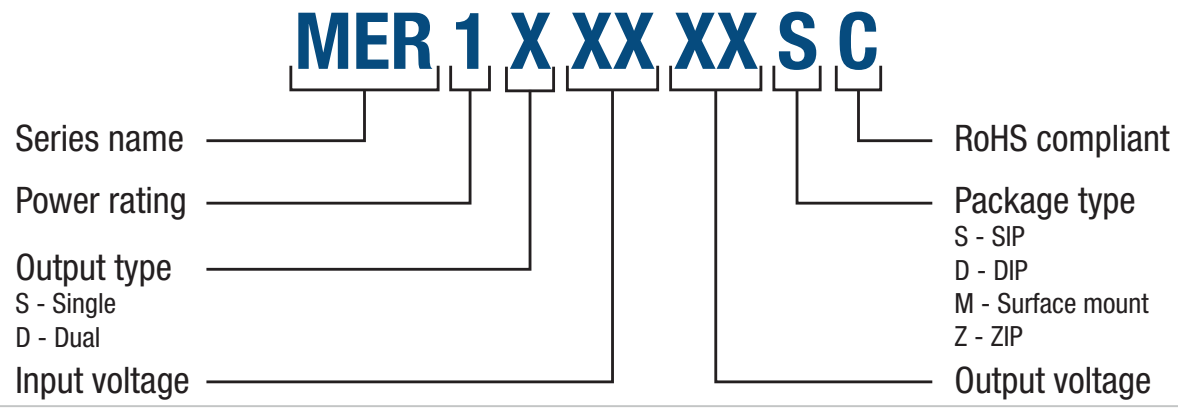
All fuses should be UL approved and rated to at least the maximum allowable DC input voltage.

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. They are backward compatible with Sn/Pb soldering systems.
For further information, please visit www.murata-ps.com/rohs

PART NUMBER STRUCTURE



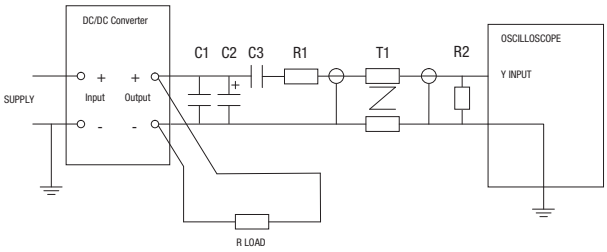
CHARACTERISATION TEST METHODS

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

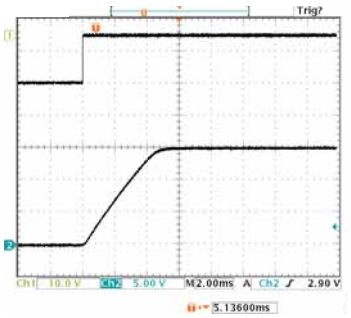
The minimum load to meet datasheet specification is 10% of the full rated load across the specified input voltage range. Lower than 10% minimum loading will result in an increase in output voltage, which may rise to typically double the specified output voltage if the output load falls to less than 5%.

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		Start-up time µs
MER1S0505SC	600	MER1S1512SC	3375
MER1S0509SC	1730	MER1S1515SC	5090
MER1S0512SC	3780	MER1S2405SC	431
MER1S0515SC	6700	MER1S2409SC	245
MER1S1205SC	750	MER1S2412SC	1634
MER1S1209SC	2605	MER1S2415SC	2682
MER1S1212SC	3754	MER1S4805SC	512
MER1S1215SC	5280	MER1S4809SC	1432
MER1S1505SC	704	MER1S4812SC	2528
MER1S1509SC	1859	MER1S4815SC	3884

Typical Start-Up Wave Form



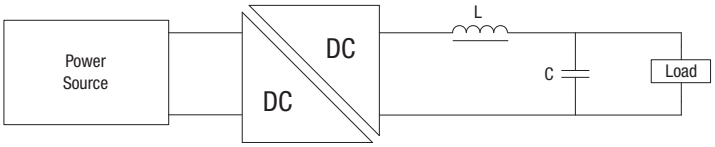
APPLICATION NOTES (Continued)

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.

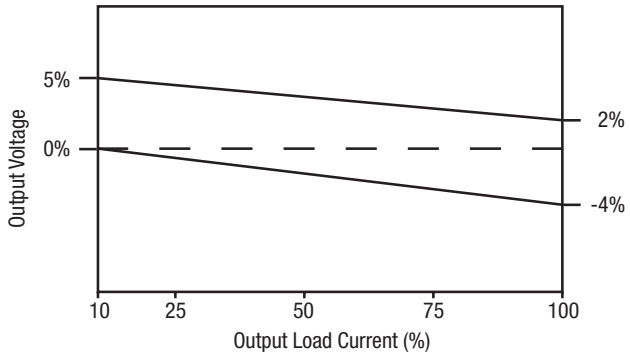


	Inductor			Capacitor
	L, µH	SMD	Through Hole	C, µF
MER1S0505SC	10	82103C	11R103C	4.7
MER1S0509SC	22	82223C	11R223C	2.2
MER1S0512SC	47	82473C	11R473C	1
MER1S0515SC	47	82473C	11R473C	1
MER1S1205SC	10	82103C	11R103C	4.7
MER1S1209SC	22	82223C	11R223C	2.2
MER1S1212SC	47	82473C	11R473C	1
MER1S1215SC	47	82473C	11R473C	1
MER1S1505SC	10	82103C	11R103C	4.7
MER1S1509SC	22	82223C	11R223C	2.2
MER1S1512SC	47	82473C	11R473C	1
MER1S1515SC	47	82473C	11R473C	1
MER1S2405SC	10	82103C	11R103C	4.7
MER1S2409SC	22	82223C	11R223C	2.2
MER1S2412SC	47	82473C	11R473C	1
MER1S2415SC	47	82473C	11R473C	1
MER1S4805SC	10	82103C	11R103C	4.7
MER1S4809SC	22	82223C	11R223C	2.2
MER1S4812SC	47	82473C	11R473C	1
MER1S4815SC	47	82473C	11R473C	1

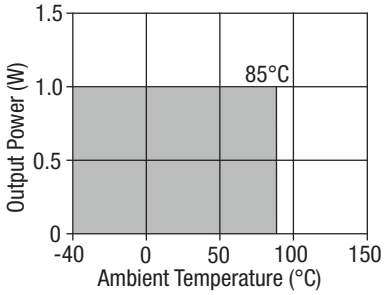
TOLERANCE ENVELOPES

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.

All versions

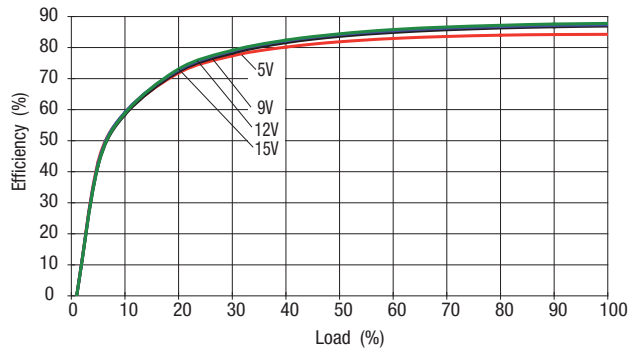


TEMPERATURE DERATING GRAPH

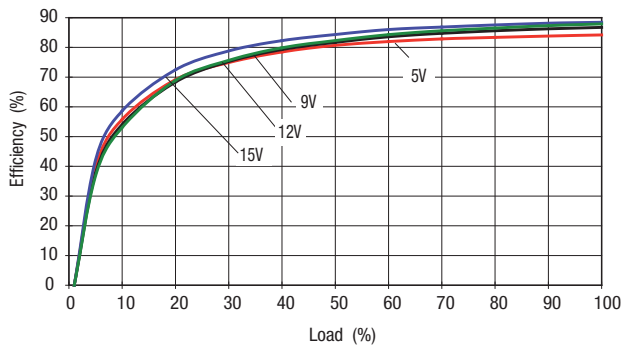


EFFICIENCY VS LOAD

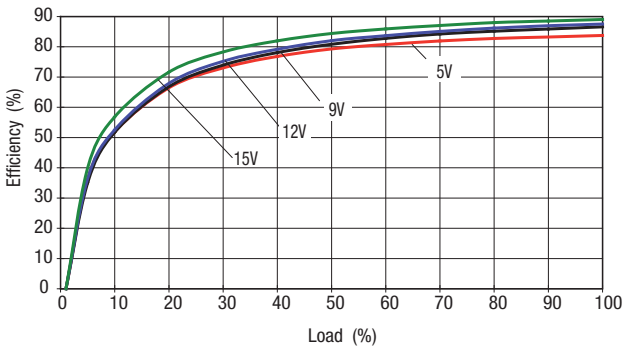
MER1S05XXSC



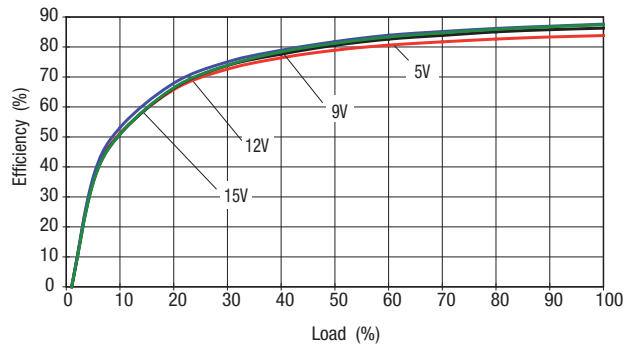
MER1S12XXSC



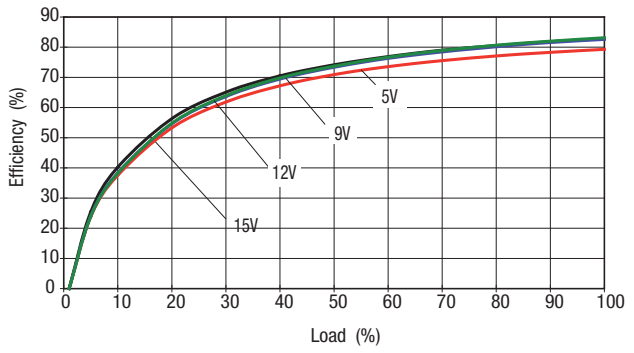
MER1S15XXSC



MER1S24XXSC



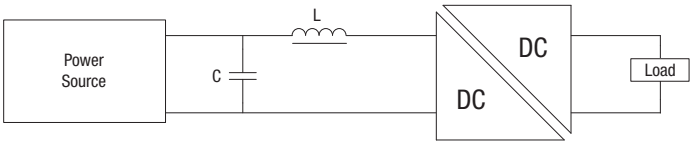
MER1S48XXSC



EMC FILTERING AND SPECTRA

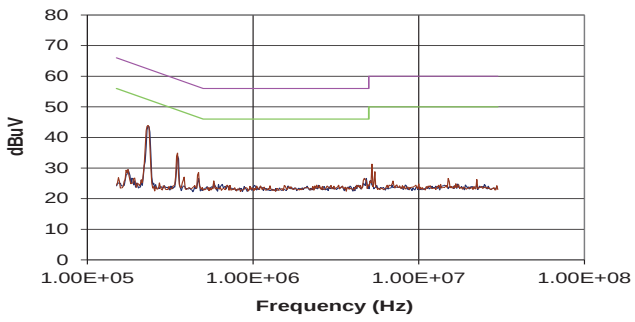
FILTERING

An input capacitor and inductor is required to meet EN 55022 Curve B, Quasi-Peak EMC limit, as shown in the following plots. The following plots show positive and negative quasi peak and CISPR22 Average Limit B (green line) and Quasi Peak Limit B (pink line) adherence limits.

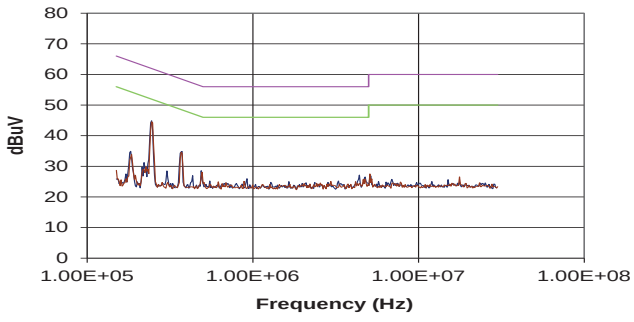


	Inductor			Capacitor
	L, µH	SMD	Through Hole	C, µF
MER1S0505SC	10	82103C	11R103C	2.2
MER1S0509SC	10	82103C	11R103C	2.2
MER1S0512SC	10	82103C	11R103C	1
MER1S0515SC	10	82103C	11R103C	2.2
MER1S1205SC	10	82103C	11R103C	2.2
MER1S1209SC	10	82103C	11R103C	2.2
MER1S1212SC	10	82103C	11R103C	0.68
MER1S1215SC	10	82103C	11R103C	2.2
MER1S1505SC	10	82103C	11R103C	2.2
MER1S1509SC	10	82103C	11R103C	1
MER1S1512SC	10	82103C	11R103C	1
MER1S1515SC	10	82103C	11R103C	1
MER1S2405SC	10	82103C	11R103C	2.2
MER1S2409SC	10	82103C	11R103C	2.2
MER1S2412SC	10	82103C	11R103C	2.2
MER1S2415SC	10	82103C	11R103C	2.2
MER1S4805SC	10	82103C	11R103C	4.7
MER1S4809SC	10	82103C	11R103C	4.7
MER1S4812SC	10	82103C	11R103C	4.7
MER1S4815SC	10	82103C	11R103C	4.7

MER1S0505SC

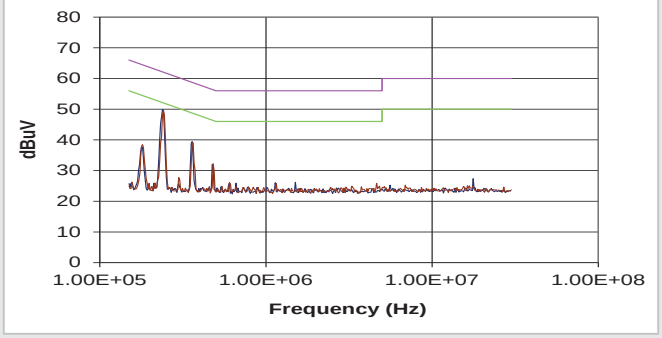


MER1S0509SC

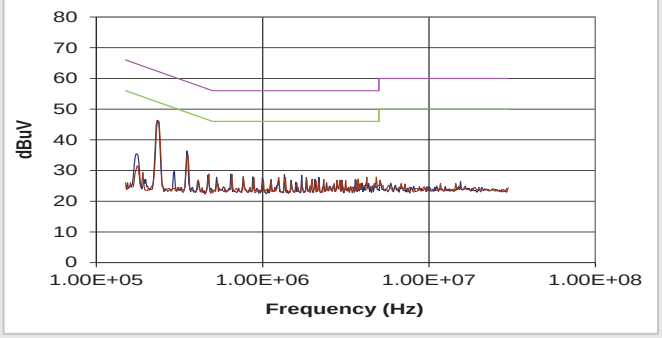


EMC FILTERING AND SPECTRA (Continued)

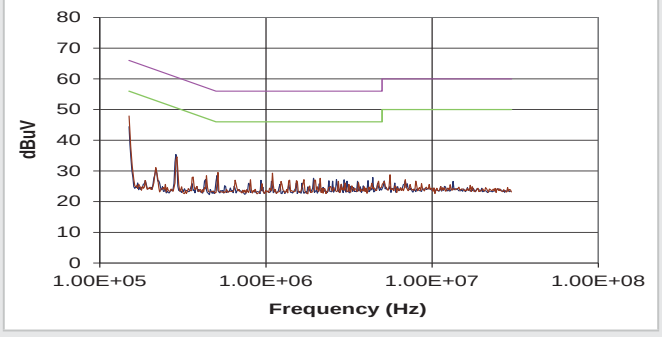
MER1S0512SC



MER1S0515SC



MER1S1205SC



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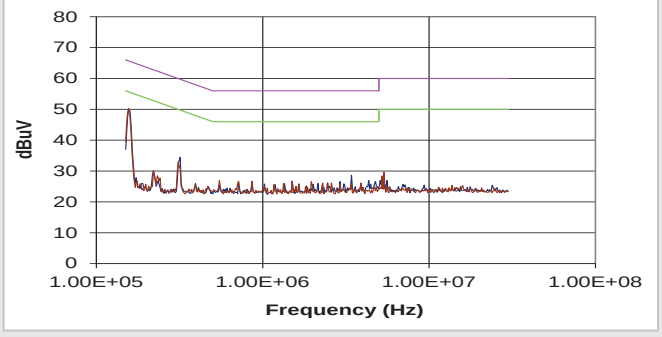

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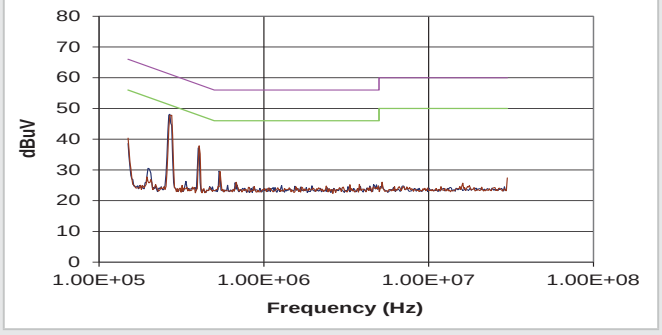

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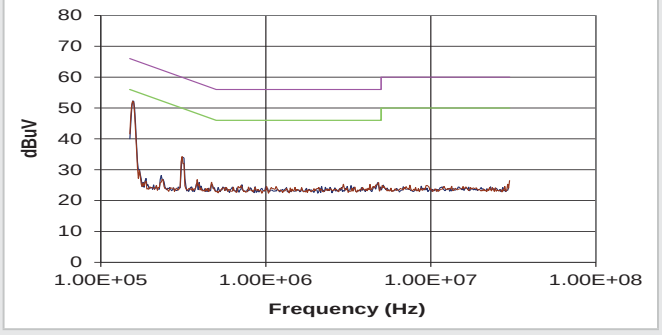
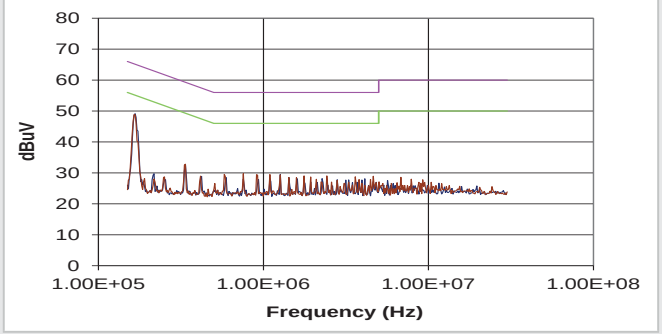
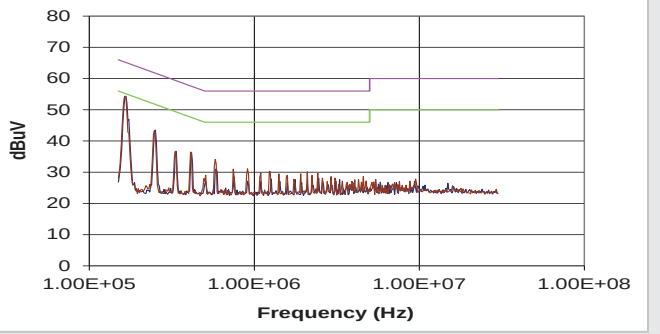


EMC FILTERING AND SPECTRA (Continued)

MER1S1505SC



MER1S1509SC



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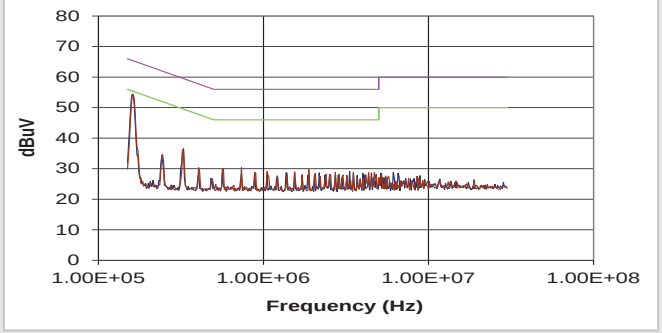
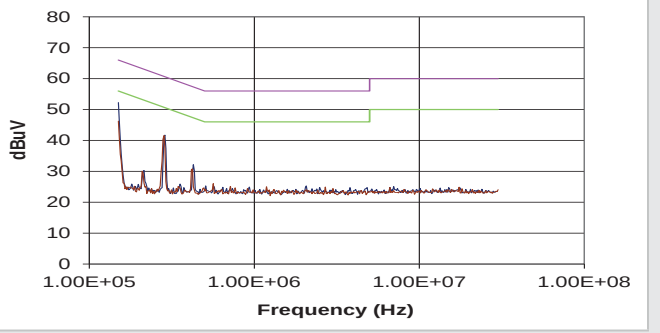
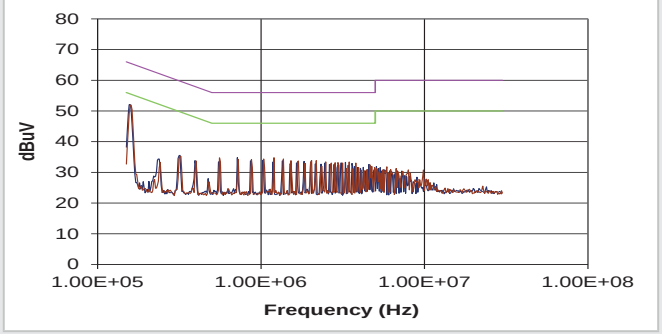


MER1S1515SC



MER1S2405SC



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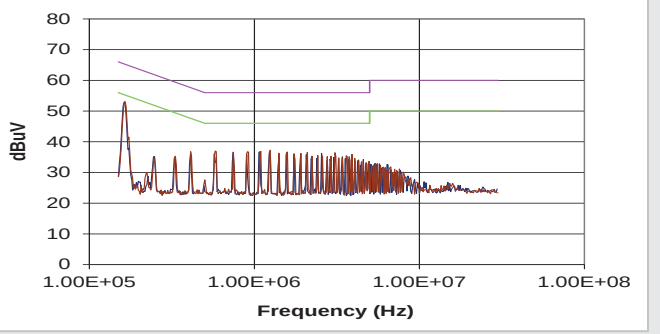

EMC FILTERING AND SPECTRA (Continued)

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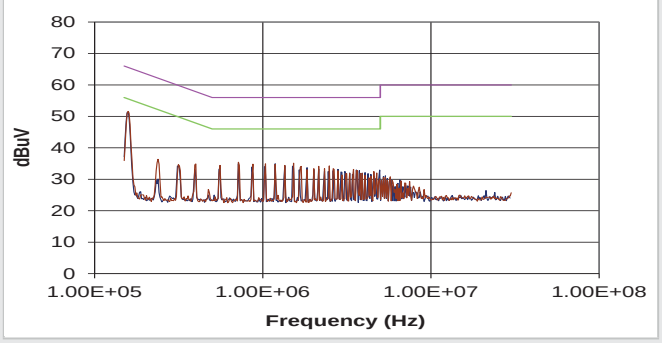
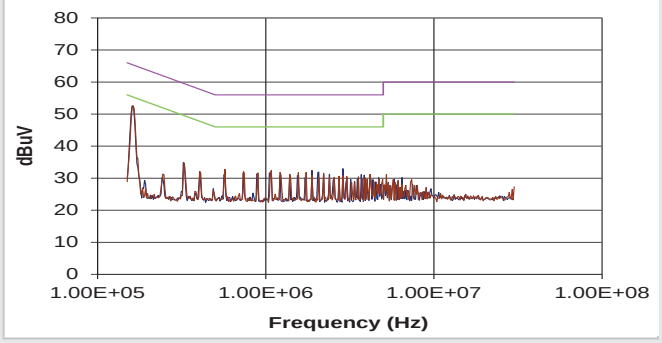
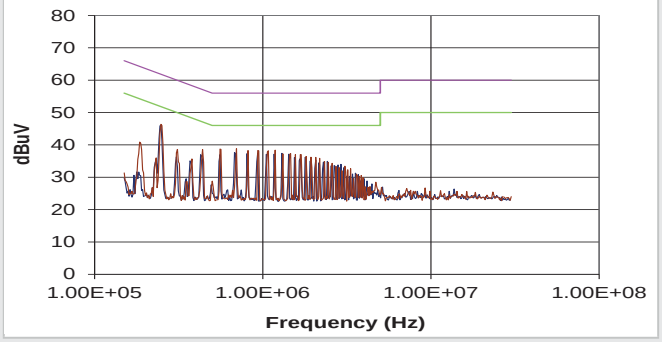


MER1S2415SC



MER1S4805SC



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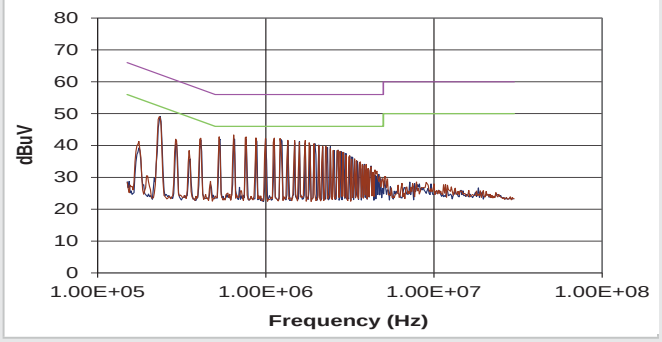

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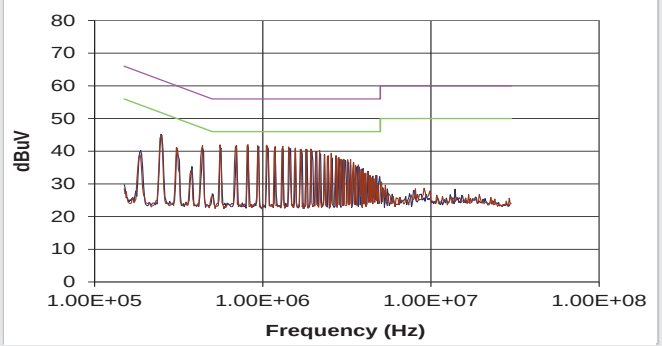
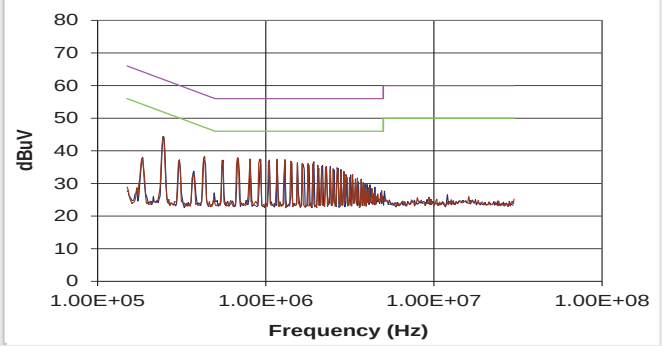
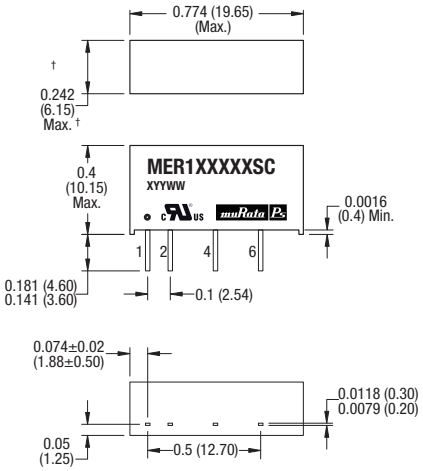


MER1S4815SC



PACKAGE SPECIFICATIONS

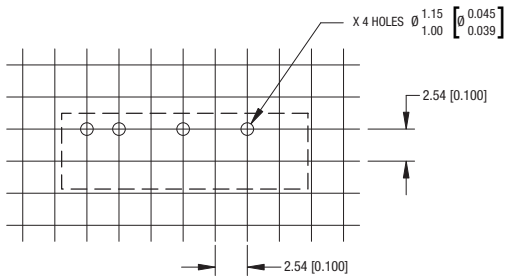
MECHANICAL DIMENSIONS



† 48V input variants: 7.65 (0.301) MAX.
Unless otherwise stated, all dimensions in 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.

Weight: 48Vin types: 2.75g (Typ.)
All other types: 2.25g (Typ.)

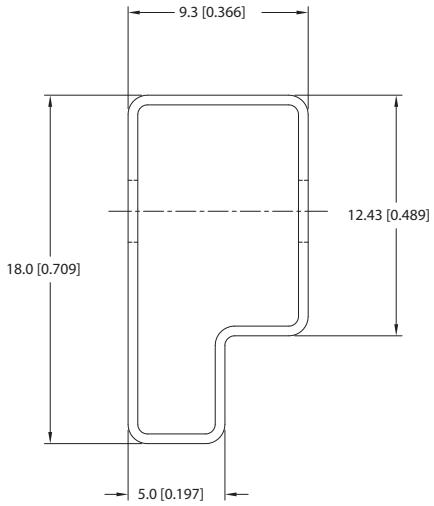
RECOMMENDED FOOTPRINT DETAILS



PIN CONNECTIONS

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

TUBE OUTLINE DIMENSIONS



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

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- 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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