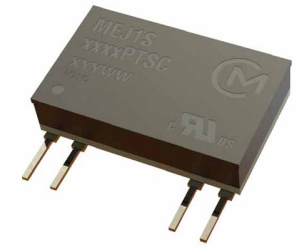
MEJ1T Series

6kVDC Isolated 1W DC-DC Converters



FEATURES

- Patent protected
- UL62368-1 recognised
- Reinforced Insulation 800Vrms
- Basic Insulation 1600Vrms
- Operational temperature -40 up to 125°C
- Ultra low isolation capacitance 2.5pF
- 6kVDC isolation "Hi Pot Test"
- Automated manufacture
- Industry standard footprint
- Short circuit protection
- Manufactured in the UK
- Characterised CMTI >200kV/µS

PRODUCT OVERVIEW

The MEJIT series utilizing innovative moulded package construction incorporating proprietary block-coil transformer technology in a SIP package, providing high isolation, low leakage current, and exceptional performance. Manufactured in the UK, in an industry standard SIP footprint with 800Vrms reinforced insulation.

The MEJ1T provides high isolation, low leakage current, and exceptional temperature cycling performance in harsh industrial environments.

SELECTION GUIDE

Order Code	Nominal Input Voltage	Output Voltage	Rated Input Current	Output Current	Load Regulation (Typ)	Load Regulation (Max)	Output Ripple & Noise (Typ)[2]	Output Ripple & Noise (Max)[2]	Efficiency (Min)	Efficiency (Typ)	Switching Frequency (Typ)	Isolation Capacitance	MTTF[1]	
													MIL.	Tel.
	V	V	mA	mA	%	%	mVp-p		%	%	MHz	pF	kHrs	
MEJ1S0505PTSC	5	5	250	200	24	35	5	20	71	76	1.5	2.5	2241	34888

INPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Voltage range	Continuous operation, 5V input type	4.5	5.0	5.5	V
Input reflected ripple current	5V input		10		mA p-p
Leakage current	250VAC/60Hz		<1		µA

ISOLATION CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation test voltage	Production tested for 1 second	6000			VDC
	Qualification tested for 1 minute	6000			VDC
Resistance	Viso= 1000VDC	1			GΩ
Continuous barrier withstand voltage				2200	VDC
External clearance	Shortest terminal-to-terminal distance through air	8.15			mm
External creepage	Shortest terminal-to-terminal distance across the package surface	8.15			
Working voltage	Basic (UL62368-1)			1600	Vrms
				2200	Vpk
	Reinforced (UL62368-1)			800	Vrms
				1131	Vpk
Comparative tracking index		>600			V
Material group				1	
Pollution degree				2	
Overvoltage category[3]	Rated mains voltage ≤ 300 VRMS (basic)	I		IV	
	Rated mains voltage ≤ 600 VRMS (basic)	I		III	
	Rated mains voltage ≤ 300 VRMS (reinforced)	I		III	
	Rated mains voltage ≤ 600 VRMS (reinforced)	I		II	
Operating altitude				5000	m
Transient voltage		6000			VDC

RoHS COMPLIANT

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

1. Calculated using MIL-HDBK-217 FN2 and Telcordia SR-332 calculation model with nominal input voltage at full load.
2. See ripple & noise test method.
3. 300Vrms system voltage includes 230/400V and 277/480V. 600Vrms system voltage includes 400/690V.

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

OUTPUT CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Rated power	T_A=-40°C to 115°C			1.0	W
Voltage set point accuracy	See tolerance envelope				
Line regulation	High V_{IN} to low V_{IN}		0.01	0.05	%/%

TEMPERATURE CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Specification[1]	see derating curves	-40		125	°C
Storage		-40		125	
Product temperature rise above ambient			20		
Cooling	Free air convection				

ABSOLUTE MAXIMUM RATINGS	
Short Circuit protection	Continuous
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 5V_{IN}	7V

1. At an ambient temperature of 125°C, a 5% load is required. Please contact Murata for further information.

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 MEJ1T series of DC-DC converters are all 100% production tested at 6kVDC for 1 second and have been qualification tested at 6kVDC for 1 minute.

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

The MEJ1T series has been recognised by Underwriters Laboratory to 800Vrms Reinforced insulation and 1600Vrms Basic insulatin, please see safety approval section for more 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. The MEJ1T series has a proprietary block-coil transformer, While parts can be expected to withstand several times the stated test voltage, Any material 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 should be reduced by 20% from specified test voltage.

This consideration equally applies to agency recognised parts rated for better than functional isolation where the insulation is always supplemented by a further insulation system of physical spacing or barriers.

SAFETY APPROVAL

UL62368-1

The MEJ1T series is recognised by Underwriters Laboratory (UL) to UL62368-1 for reinforced insulation to a working voltage of 800Vrms and for basic insulation to a working voltage of 1600Vrms

Creepage and clearance is 8.15mm.

FUSING

The MEJ1T 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.
Input Voltage, 5V: T500mA

All fuses should be UL recognised and suitably rated to meet application requirements.

RoHS COMPLIANCE AND MSL INFORMATION

RoHS COMPLIANT

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 copper alloy with nickel preplate and matte tin finish. The series is backward compatible with Sn/Pb soldering systems.

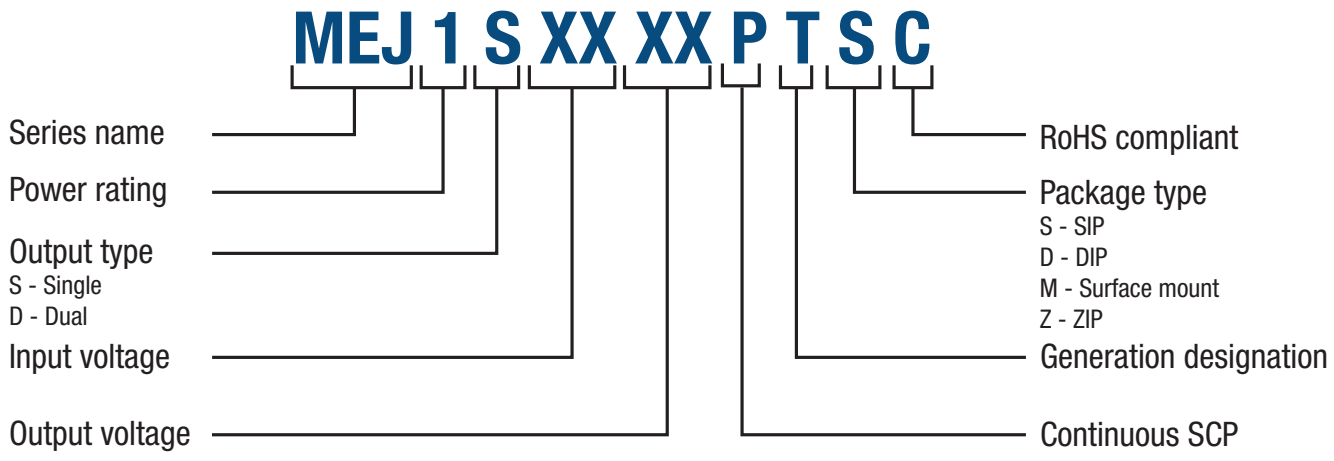
For further information please visit www.murata.com/en-global/products/power/rohs

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	JEDEC JESD22-A104	1000 cycles between two temperature extremes set to achieve -40°C and +125°C. 2 full cycles per hour.
HAST (Unbiased)	JEDEC JESD22-A118	96 hours at 130°C ±2°C, 85% ±5% R.H.
High temperature Storage life	JEDEC JESD22-A103	1000 hours at 125°C (-0/+10)°C.
Solderability	IPC/ECA J-STD-002, Test A1	Pb-free (Test A1) For lead free solderability the parts are conditioned for 4 hours ±15 min. at a temperature of 155°C. Dipped in solder at 245°C ±5°C for 5 +0/-0.5 seconds.
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.
Solder heat (through hole)	JEDEC JESD22-B106	The leads are dipped in solder at 270°C ±5°C for 7 (+2/-0) seconds.
Shock	JEDEC JESD22-B110	1500g (± 10%), 5 x 0.5ms (±15%) half sine pulses in each of 6 planes (± X, ± Y, ± Z) 30 pulses in total.
Vibration	JEDEC JESD22-B103	20Hz to 2kHz to 20Hz (logarithmic variation) in >4 minutes, 4 times in each orientation (i.e. 12times), 20G (±10%) peak acceleration.
Resistance to cleaning agents	Internal reference standard	Step 1: Solvent washed – Novec 71IPA & Topklean EL-20A. Pulsed ultrasonic immersion Step 2: Parts rubbed with a cloth soaked with water for 15 seconds. Repeated 3 times Step 3: Tape applied across the parts printed side and then removed. Repeated 3 times Step 4: Parts rubbed with a cloth soaked with petroleum spirit for 15 seconds. Repeated 3 times.
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 B2	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	Pull of 0.227kg applied for 30 seconds. The force is then increased until the pins snap.
ESD	ANSI/ESDA/JEDEC JS-001	HBM Testing Standard at 3 stress levels; 2kV, 4kV, and 8kV.
	ANSI/ESDA/JEDEC JS-002	CDM Testing Standard at 5 stress levels; 0.5kV, 0.75kV, 1kV,1.5kV and 2kV.

PART NUMBER STRUCTURE



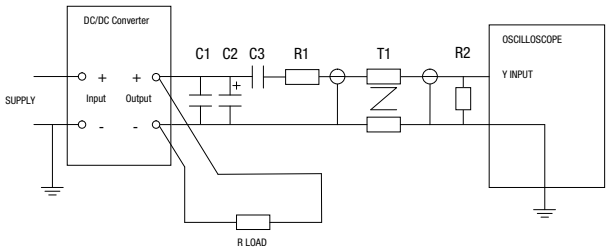
CHARACTERISATION TEST METHODS

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

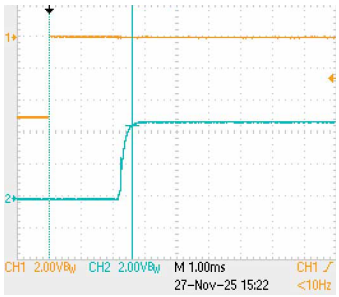
The minimum load to meet datasheet specification is 10% of the full rated load across the specified input voltage range. Lower than 10% minimum loading will result in an increase in output voltage, which may rise to typically double the specified output voltage if the output load falls to less than 5%.

Capacitive Loading & Start Up

Typical start up times for this series, with a typical input voltage rise time of 3ms with resistive only load, and with added output capacitance of 10µF, are shown in the table below. The product series will start into capacitance up to 3300µF with increased start times.

Part Number	Start-up time (mS)
MEJ1S0505PTSC	3

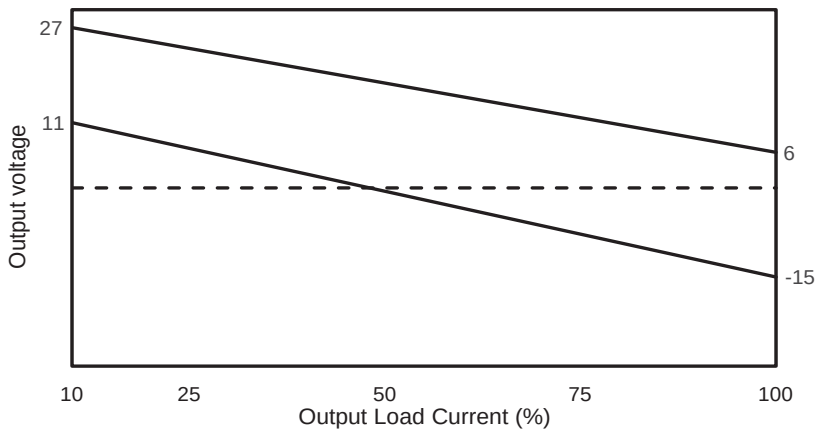
Typical Start-Up Wave Form



TOLERANCE ENVELOPES

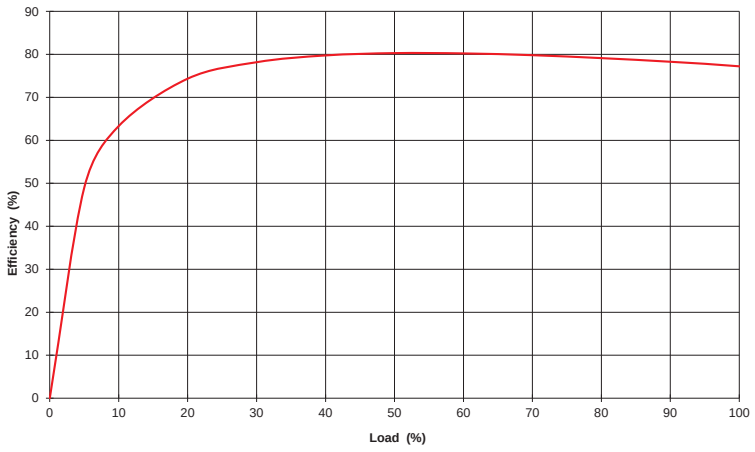
The voltage tolerance envelope shows typical load regulation characteristics for this product series. The tolerance envelope is the maximum output voltage variation due to changes in output loading.

5V Input

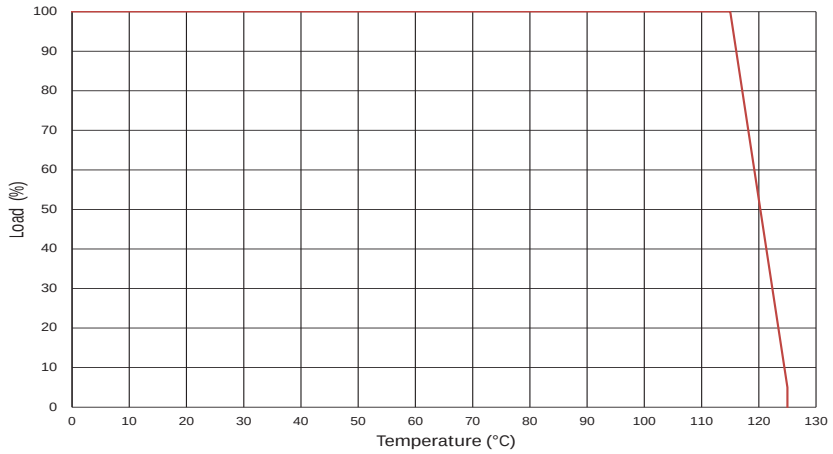


EFFICIENCY VS LOAD

5V Input



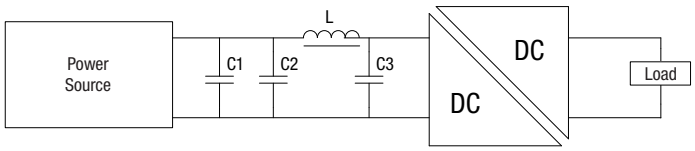
TEMPERATURE DERATING GRAPH



EMC FILTERING AND SPECTRA

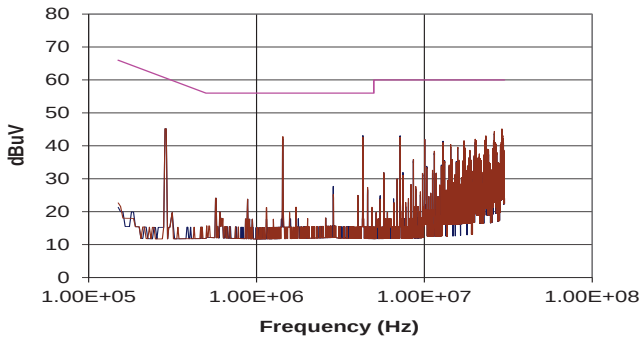
FILTERING

An input capacitor and inductor is required to meet EN 55032 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. Filter suitability should be evaluated in application.

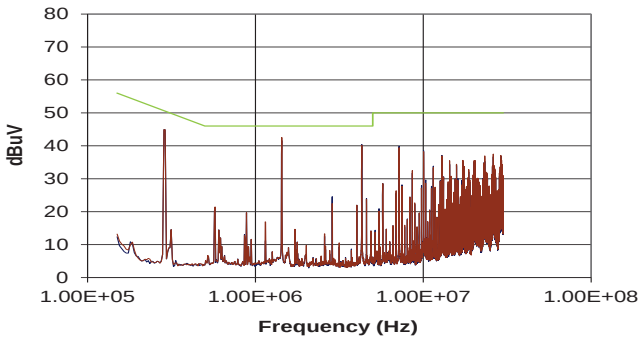


	Inductor			Capacitor		
	L, µH	SMD	Through Hole	C1, µF	C2, pF	C3, pF
MEJ1S0505PTSC	10	84103C	11R103C	47	22	4.7

MEJ1S0505PTSC (Quasi-Peak)

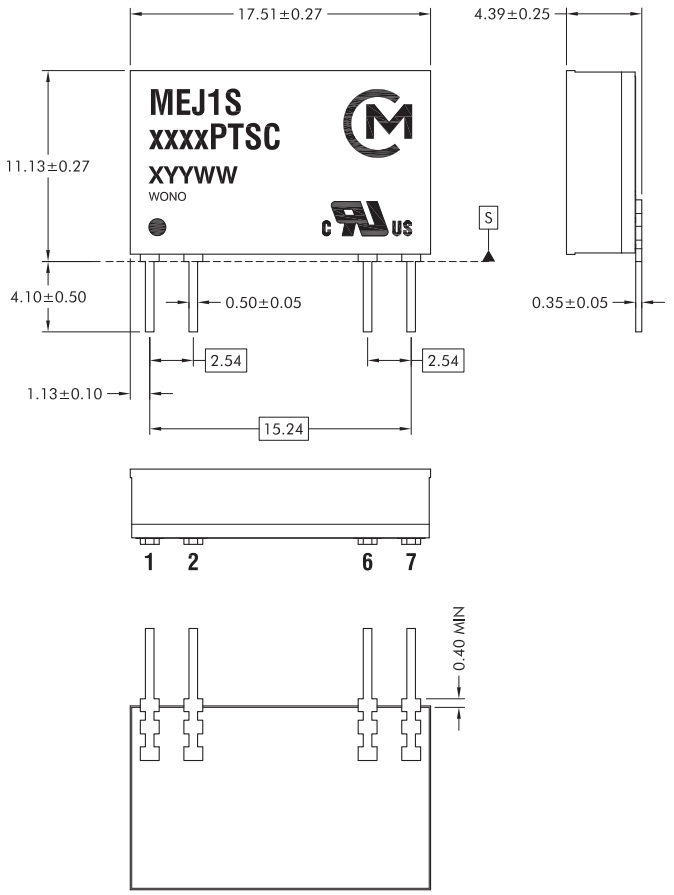


MEJ1S0505PTSC (Average)



PACKAGE SPECIFICATIONS

Mechanical Dimensions



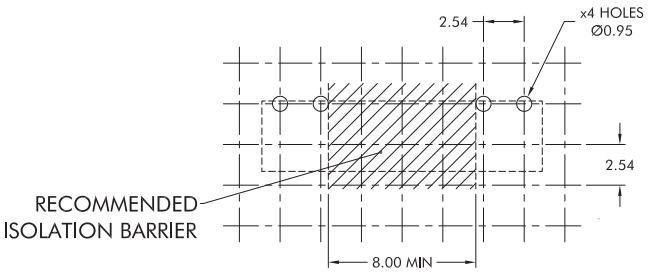
All dimensions in mm. Tolerances (unless otherwise stated) ±0.1.

Weight: 1.9g

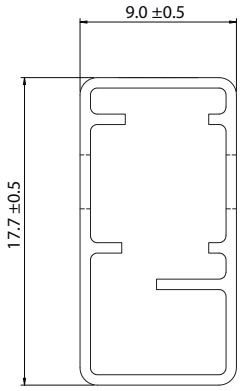
Pin Connections

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

Recommended Footprint Details



Tube Outline Dimensions



All dimensions in mm.
Tube Length : 525±2mm

Tube Quantity: 28

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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.

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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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