

FEATURES

- Ultra low isolation capacitance
- Characterised CMTI >200kV/μS
- Continuous barrier withstand voltage 1.5kVDC
- Characterised partial discharge performance
- Optimised bipolar output voltages for SiC & MOSFET gate drives: +15V/-3V, +15V/-5V & +18V/-2.5V
- UL62368 recognised for reinforced insulation
- 5.2kVDC isolation test voltage 'Hi Pot Test'
- 12V, 15V & 24V inputs
- Operation to 105°C
- Short circuit protection
- Patent protected

PRODUCT OVERVIEW

The MGJ1V series of DC-DC converters are ideal for powering 'high side' and 'low side' gate drive circuits for SiC and MOSFETs in bridge circuits. A choice of asymmetric output voltages allows optimum drive levels for best system efficiency. The MGJ1V series is characterised for high isolation requirements commonly seen in bridge circuits used in motor drives and inverters, while the MGJ1V extended temperature range and construction gives long service life and reliability.

SELECTION GUIDE

Order Code ¹	Nominal Input Voltage	Output Voltage 1	Output Voltage 2	Output Current 1	Output Current 2	Input Current at Rated Load	Output 1		Output 2	
	V	V	V				Load Regulation (Typ)	Load Regulation (Max)	Load Regulation (Typ)	Load Regulation (Max)
				mA			%			
MGJ1D121503VMC	12	15	-3	56	56	115	4	7	0.5	2
MGJ1D121505VMC	12	15	-5	50	50	115	5	7	0.1	1
MGJ1D121802VMC	12	18	-2.5	49	49	130	4	6	0.5	2
MGJ1D151503VMC	15	15	-3	56	56	100	3	6	0.5	3
MGJ1D151802VMC	15	18	-2.5	49	49	110	3	6	0.5	3
MGJ1D241503VMC	24	15	-3	56	56	60	3	6	0.5	2
MGJ1D241505VMC	24	15	-5	50	50	60	4	6	0.1	2
MGJ1D241802VMC	24	18	-2.5	49	49	60	3	6	0.5	2

SELECTION GUIDE (Continued)

Order Code ¹	Ripple & Noise (Typ) ³	Ripple & Noise (Max) ³	Efficiency (Min)	Efficiency (Typ)	Isolation Capacitance	MTTF ²	
	mVp-p		%		pF	MIL. kHrs	Tel.
MGJ1D121503VMC	10	30	67	72	2.5	1809	83335
MGJ1D121505VMC	10	30	65	72	2.5	1774	82634
MGJ1D121802VMC	10	30	62	67	2.5	1783	83130
MGJ1D151503VMC	10	30	63	69	2.5	2041	79981
MGJ1D151802VMC	10	30	64	71	2.5	1963	84643
MGJ1D241503VMC	10	30	62	68	2.5	1943	64101
MGJ1D241505VMC	10	30	63	70	2.5	1946	76408
MGJ1D241802VMC	10	30	63	69	2.5	1693	69828

INPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Voltage range	Continuous operation, 12V input types	10.8	12	13.2	V
	Continuous operation, 15V input types	13.5	15	16.5	
	Continuous operation, 24V input types	21.6	24	26.4	
Input short circuit current I _{sc}	12/1802		55		mA
	12/15V input types		40		
	24V input types		25		
Input reflected ripple	12V input types		2		mA p-p
	15V input types		2		
	24V input types		2		



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



1. Components are supplied in tape and reel packaging, please refer to package specification section. Orderable part numbers are MGJ1DXXXXXVMC-R7 (135 pieces per reel), or MGJ1DXXXXXVMC-R13 (595 pieces per reel).
2. Calculated using MIL-HDBK-217 FN2 and Telcordia SR-332 calculation model with nominal input voltage at full load.
3. See ripple & noise test method.

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	$T_A = -40^{\circ}\text{C}$ to 105°C			1.0	W
Voltage Set Point Accuracy	See tolerance envelopes				
Line regulation	Output 1	121503	1.25	1.4	%
		121505 & 241505	1.4	1.5	
		All other output types	1.2	1.3	
	Output 2	All output types	0.2	0.5	

ISOLATION CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation test voltage	Production tested for 1 second	5200			VDC
	Qualification tested for 1 minute	5200			VDC
Resistance	Viso= 1000VDC	1			GΩ
Continuous barrier withstand voltage	Non-safety barrier application			1500	VDC
Safety standard	UL62368-1	Reinforced	Creepage and clearance 6.9mm	250	Vrms
		Basic		690	

GENERAL CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Switching frequency	121802		175		kHz
	12V/15V input types		150		
	24V input types		125		

TEMPERATURE CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Specification	All output types (see derating curves)	-40		105	°C
Storage		-50		125	
Product temperature above ambient			20		
Cooling	Free air convection				

ABSOLUTE MAXIMUM RATINGS	
Input voltage V_{IN} , MGJ1D12	15V
Input voltage V_{IN} , MGJ1D15	18V
Input voltage V_{IN} , MGJ1D24	28V
Short circuit protection ¹	Continuous

1. Please refer to application notes 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 MGJ1V series of DC-DC converters are all 100% production tested at 5.2kVDC for 1 second and have been qualification tested at 5.2kVDC for 1 minute.

The MGJ1V series is recognised by Underwriters Laboratory, please see safety approval section for more information. When the insulation in the MGJ1V series is not used as a safety barrier, i.e. provides functional isolation only, continuous or switched voltages across the barrier up to 1.5kVDC 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**UL 62368**

The MGJ1V series is recognised by Underwriters Laboratory (UL) to UL62368 for reinforced insulation to a working voltage of 250Vrms or basic insulation to a working voltage of 690Vrms.

Creepage and clearance 6.9mm.

FUSING

The MGJ1V 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, 12V 250mA

Input Voltage, 15V 200mA

Input Voltage, 24V 125mA

All fuses should be Anti-Surge and UL rated.

RoHS COMPLIANCE, MSL, PSL AND REFLOW SOLDERING INFORMATION

This series is compatible with Pb-Free soldering systems and is also backward compatible with Sn/Pb soldering systems. The MGJ1V series can be soldered in accordance with J-STD-020 and have a classification temperature of 260°C and moisture sensitivity level 2. The termination finish on this product is Gold with plating thickness 0.12 microns.

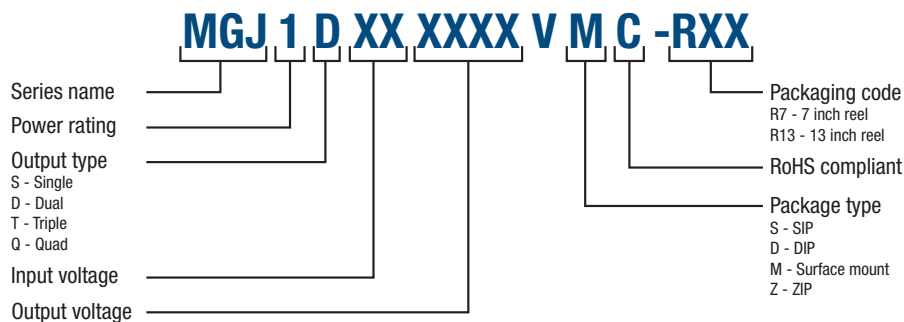
For further information, please visit www.murata-ps.com/global/products/power//rohs.

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	JEDEC JESD22-A104	500 cycles in a dual zone chamber from -40 (+5/-10)°C to 105 (+10/-5)°C. 15mins dwell at each (inclusive of ramps). 2 cycles per hour
HAST (unbiased)	JEDEC JESD22-A118	130±2°C, 85±5% R.H. for 96 (+2/-0) hours
Storage life (high temperature)	JEDEC JESD22-A103, Condition A	125°C +10/-0°C for ≥1000 hours
Storage life (low temperature)	JEDEC JESD22-A119	-40°C -10/+0°C for ≥1000 hours
MSL	IPC/JEDEC J-STD-020	Bake samples at 125 +5/-0°C for 24 hours minimum before conditioning in the temperature/humidity chamber for 168 hours at 85°C/60%RH and Pb Free JEDEC Max profile conditioning with electrical testing, co-planarity, visual inspection before and after.
Vibration	JEDEC JESD22-B103	20Hz to 2 kHz to 20Hz (logarithmic variation) in >4 minutes, 4 times in each orientation (i.e. 12times), 50G (±10%) peak acceleration. Sinusoidal Vibration.
Shock	JEDEC JESD22-B110	5 pulses half sine pulses of 0.5msec (±15%) duration, 1500g (±10%) peak acceleration. This equates to free state test level B in JESD22-B110 which states an Equivalent drop height of 112cm and a Velocity change 468cm/s (±10%).
Solvent cleaning	Resistance to cleaning agents.	Solvent – Novec 71IPA & Topklean EL-20A. Pulsed ultrasonic immersion 45°C - 65°C

PART NUMBER STRUCTURE



CHARACTERISATION TEST METHODS

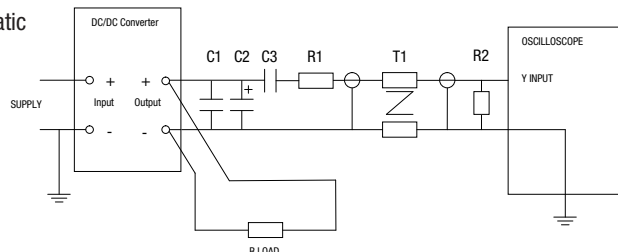
Ripple & Noise Characterisation Method

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 1.25 times the specified output voltage if the output load falls to less than 5%.

Short circuit protection

MGJ1V series offers short circuit protection which is continuous with nominal input voltage across operating temperature. At maximum input voltage, temperatures of 90°C and above, short circuit duration will be limited.

Gate Drive Applications Advisory Note

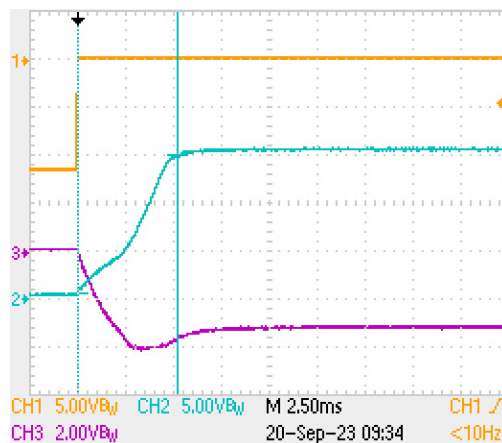
For general guidance for product usage in gate drive applications please refer to "[gate drive application notes](#)".

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 capacitance ranging up to 47µF (Capacitor across +V to -V or 100µF across each output) with increased start times.

	Start-up time
	ms
MGJ1D121503VMC	5
MGJ1D121505VMC	5
MGJ1D121802VMC	5
MGJ1D151503VMC	5
MGJ1D151802VMC	5
MGJ1D241503VMC	5
MGJ1D241505VMC	5
MGJ1D241802VMC	5

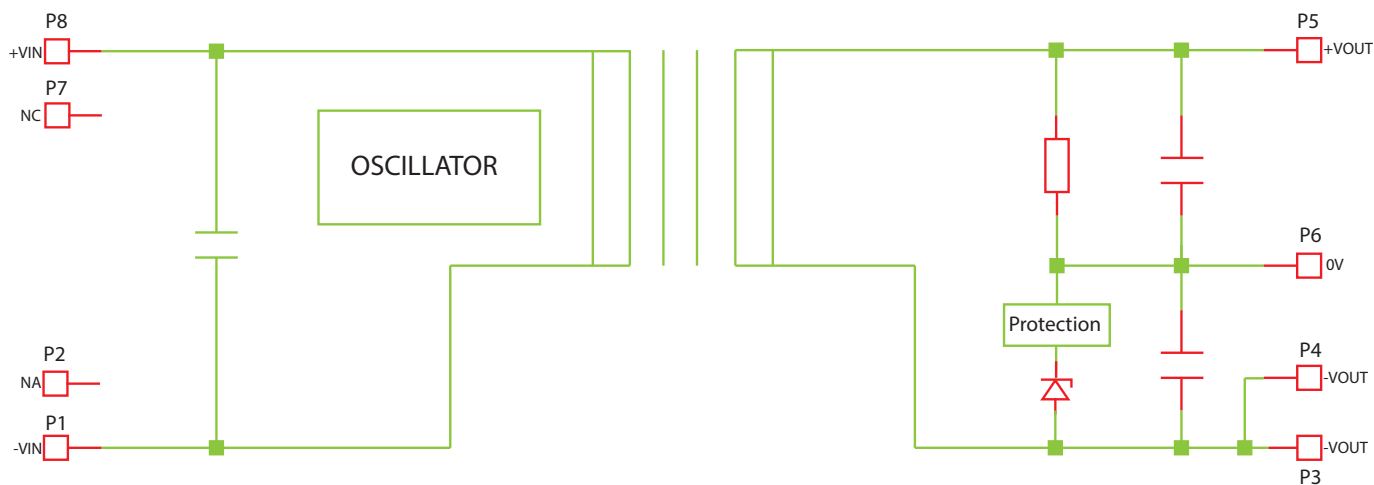
Typical Start-Up Wave Form



APPLICATION NOTES (Continued)

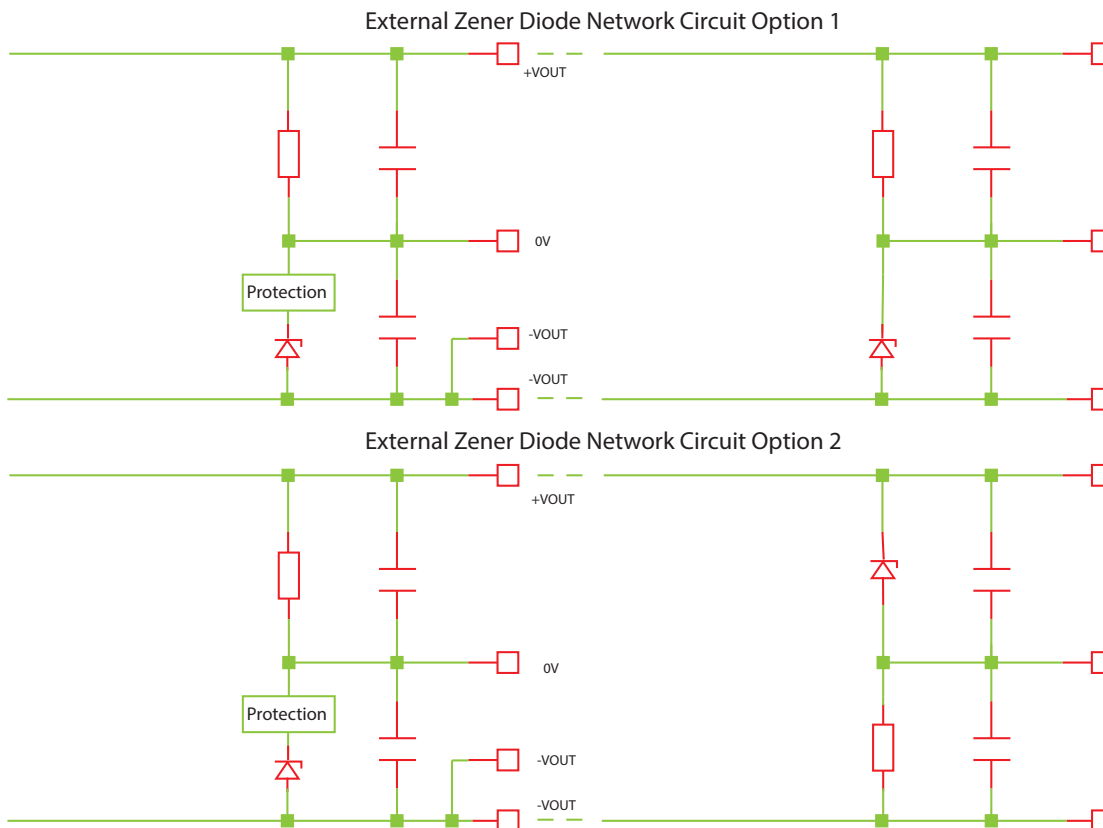
The MGJ1V series is a dual output DC-DC specifically designed for gate drive applications and its output configuration is not suitable for application usage as a general dual output DC-DC converter. However the MGJ1V series can be used as a general purpose single output converter, by loading from +Vout to -Vout.

The MGJ1V series provides a dual output by using a zener voltage divider network, the negative output is obtained by using a zener diode as a voltage regulator. If a short circuit occurs, the zener diode is protected. A 5V1 zener diode is used to set the -5 Vout, a 2V7 Zener diode is used to set the -2.5 Vout and 3V3 Zener Diode is used to set the -3Vout. A tolerance of 2% should be taken into consideration for the zener diodes. The 2V7, 3V3 and 5V1 zener diodes are rated at 400mW.



Optional Configuration:

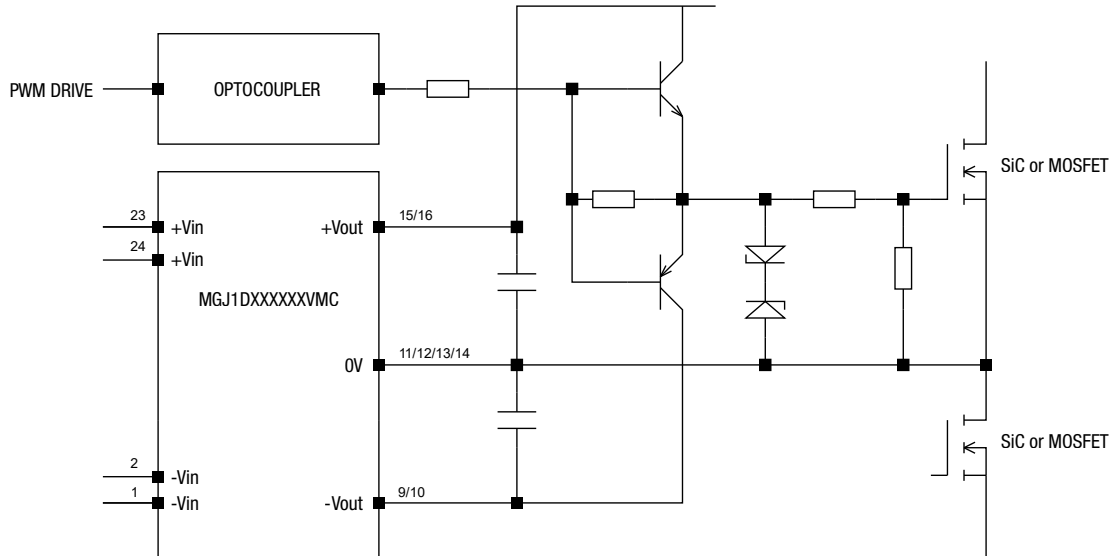
For optional configuration where alternative negative output voltages are required, an external zener diode network can be connected across the main 18V, 20V or 20.5V output. However this zener diode will no longer be protected from short circuits as the internal short circuit protection is bypassed.



APPLICATION NOTES (Continued)

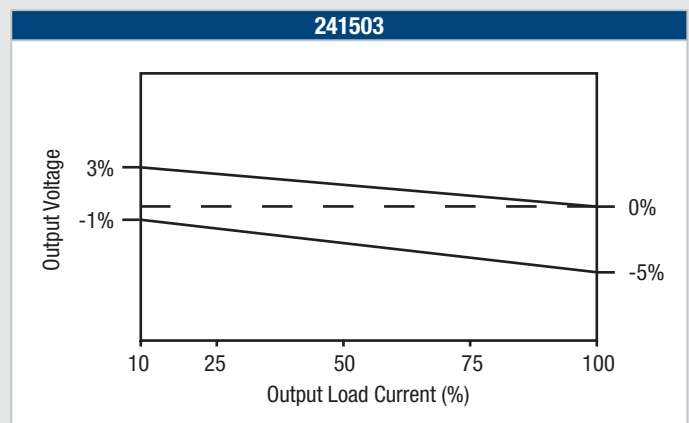
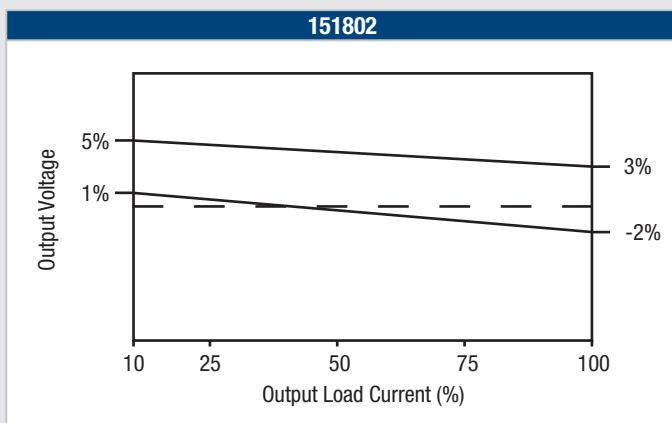
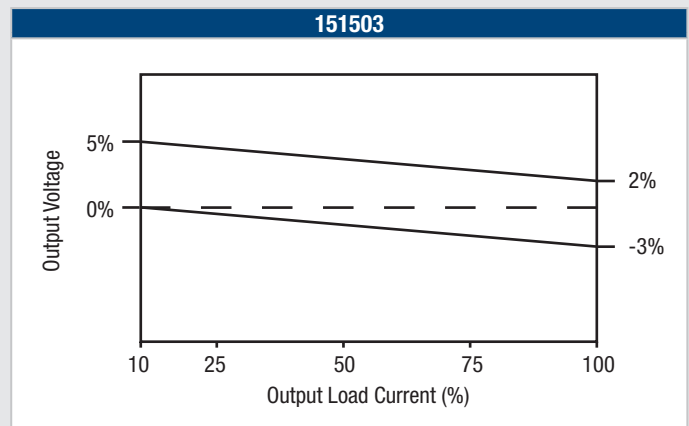
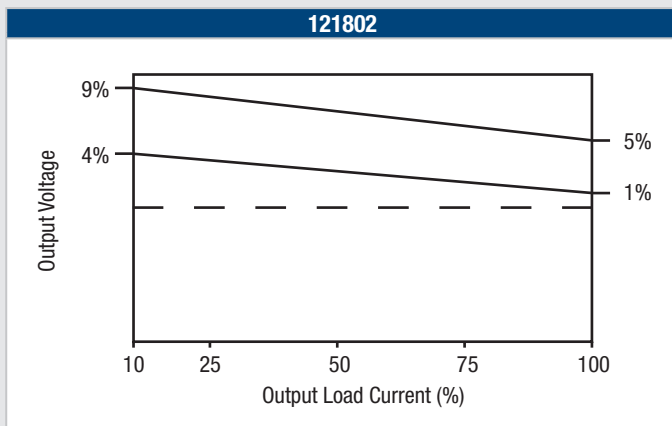
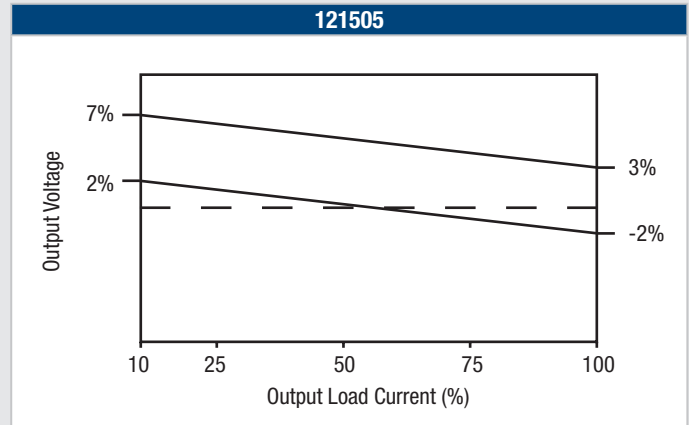
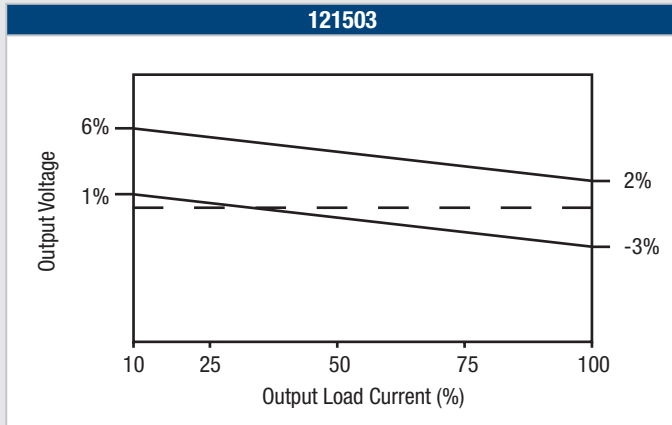
Schematic for driving SiC & MOSFET

MGJ1V DC-DC CONNECTIONS FOR DRIVING SiC & MOSFET DEVICES

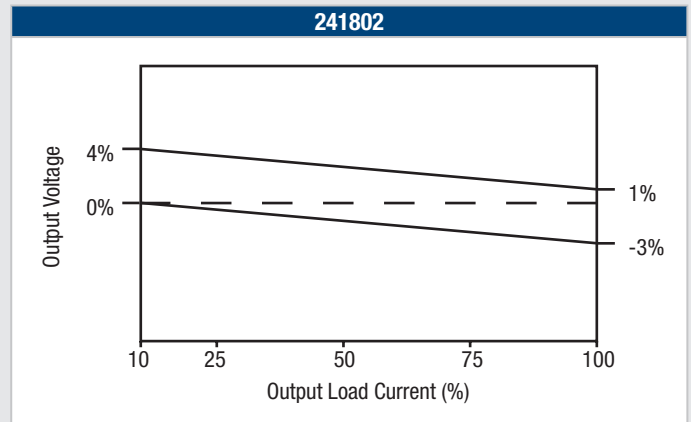
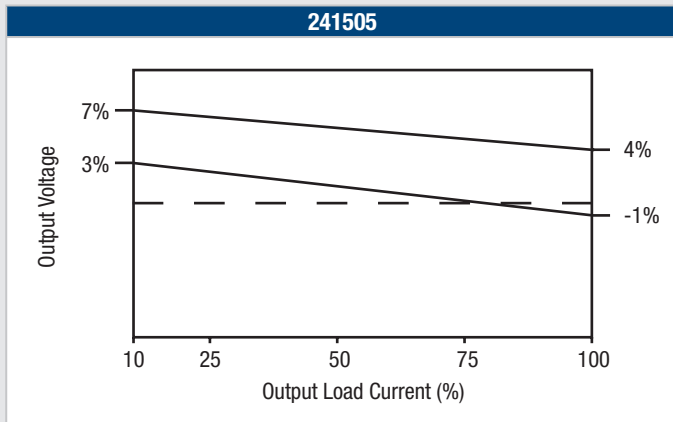


POSITIVE OUTPUT VOLTAGE TOLERANCE ENVELOPES

The voltage tolerance envelopes show typical load regulation characteristics for this product series. The tolerance envelope is the maximum output voltage variation due to changes in output loading and set point accuracy.

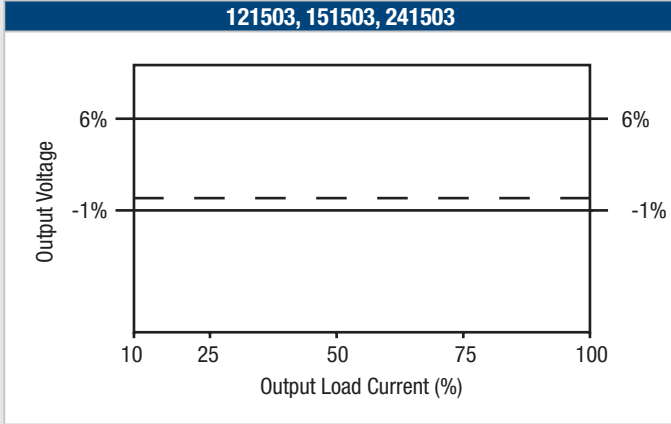


POSITIVE OUTPUT VOLTAGE TOLERANCE ENVELOPES (Continued)

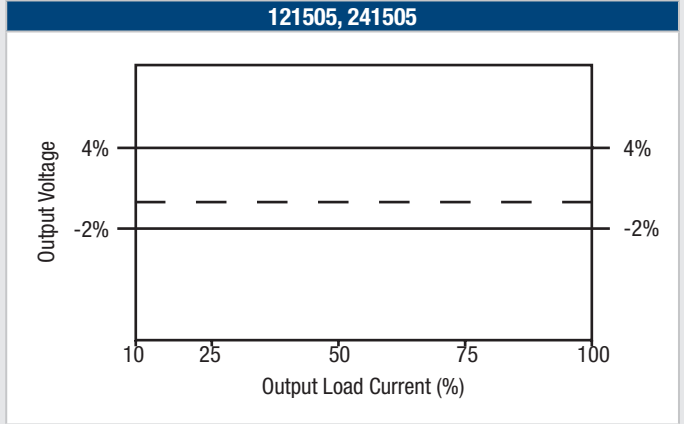


NEGATIVE OUTPUT VOLTAGE TOLERANCE ENVELOPES

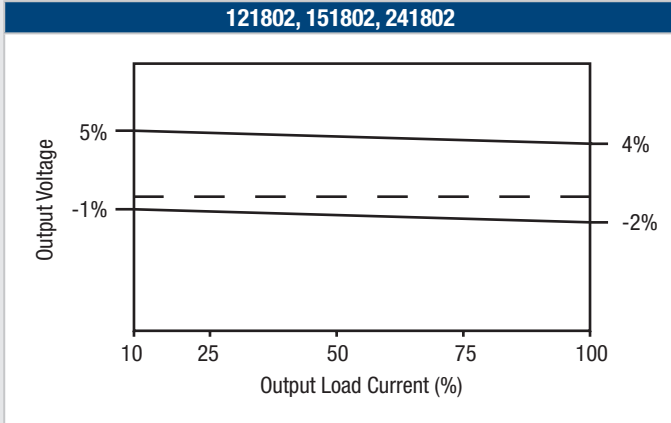
121503, 151503, 241503



121505, 241505

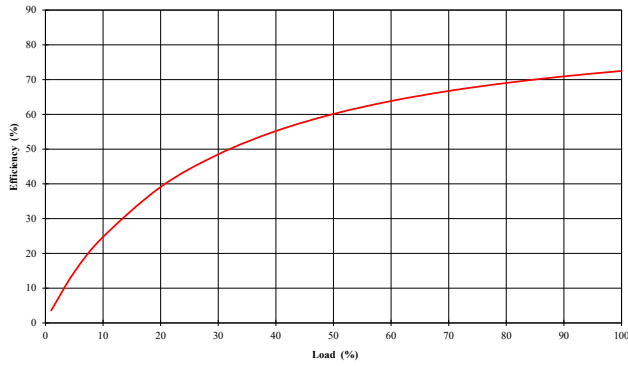


121802, 151802, 241802

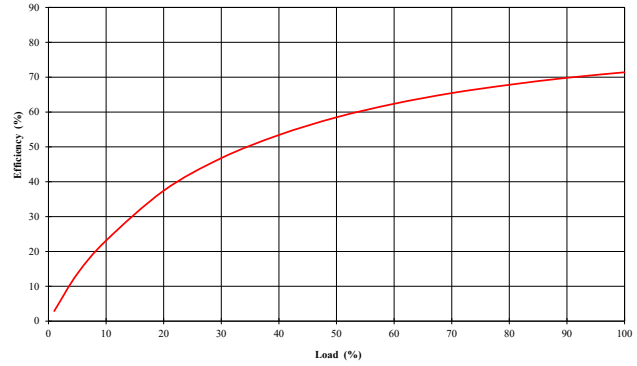


EFFICIENCY VS LOAD

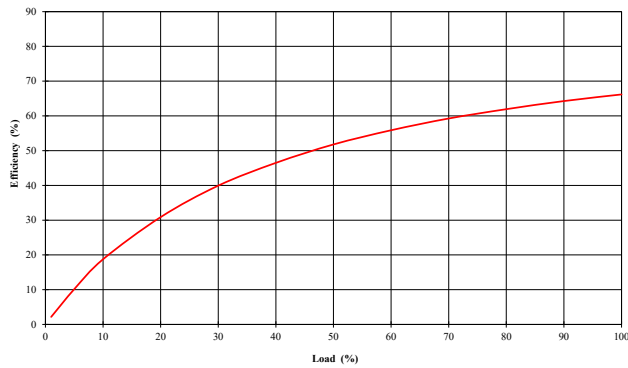
MGJ1D121503VMC



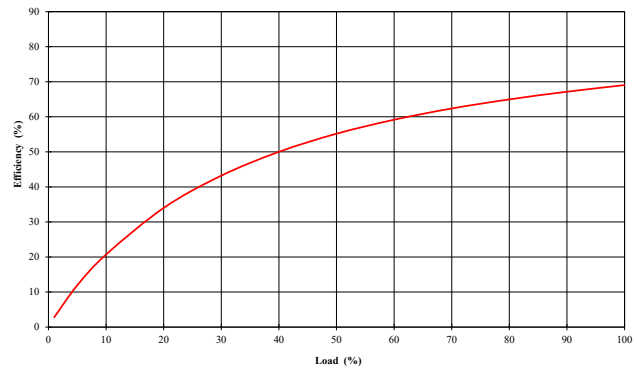
MGJ1D121505VMC



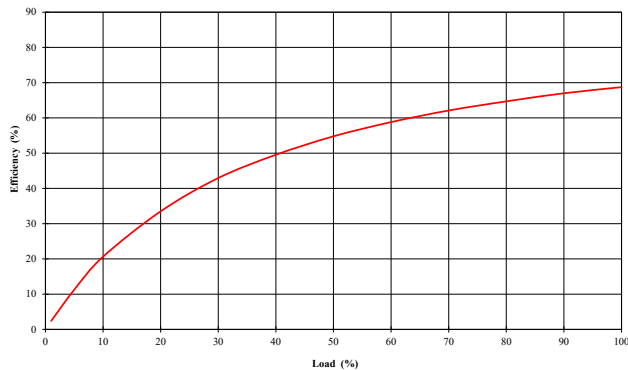
MGJ1D121802VMC



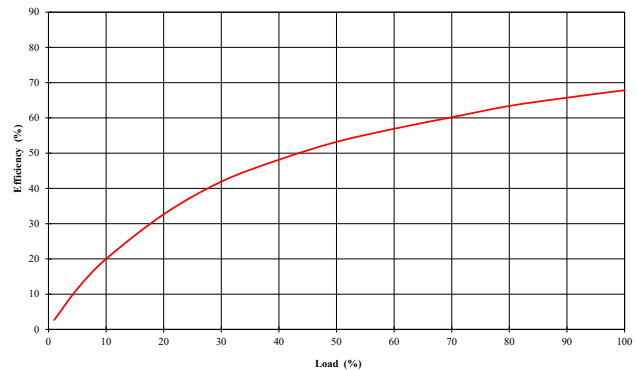
MGJ1D151503VMC



MGJ1D151802VMC

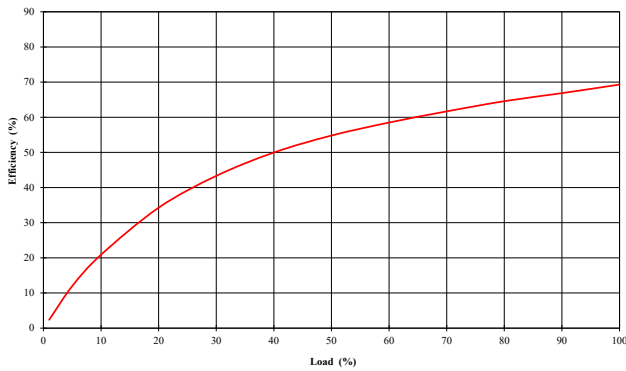


MGJ1D241503VMC

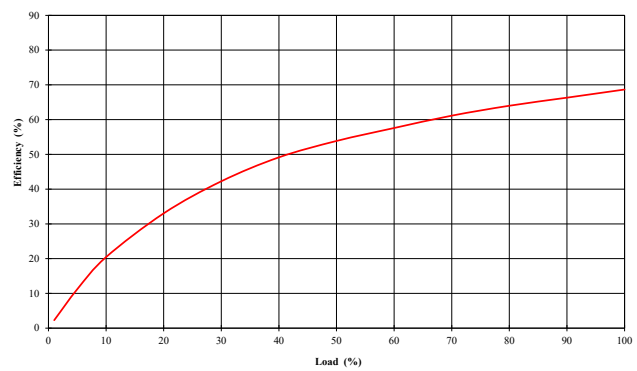


EFFICIENCY VS LOAD (Continued)

MGJ1D241505VMC

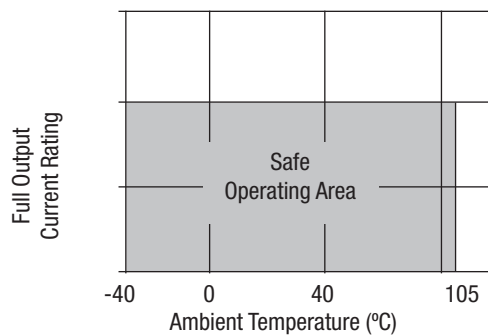


MGJ1D241802VMC



TEMPERATURE DERATING GRAPH

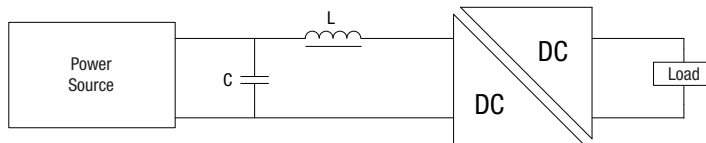
The MGJ1V series has been designed to minimise the thermal impedance when mounted onto a customers application PCB by using multiple surface mount pads for each connection. All thermal measurements were carried out in still air using a test pcb designed in accordance with standard JESD51-9 (Test Boards for Area Array Surface Mount Package Thermal Measurements). A 4 layer PCB has been used and this demonstrates that a higher operating temperature can be achieved when the customers application pcb is designed to incorporate multiple layers and large copper planes. Please contact Murata for further information.



EMC FILTERING AND SPECTRA

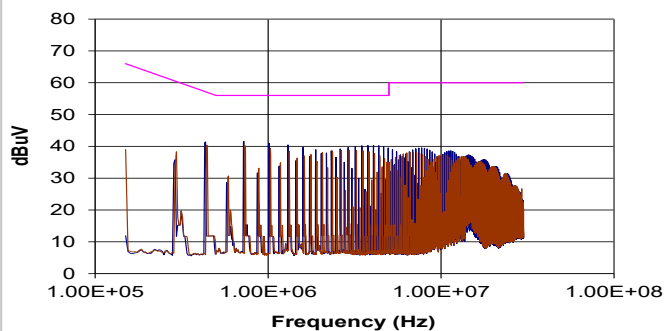
FILTERING

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. If a high dv/dt above 80kV/us is expected from output to input it is advised that a common mode filter is used on the input without Y capacitors. This will reduce the common mode current and reduce interference with primary side circuits.

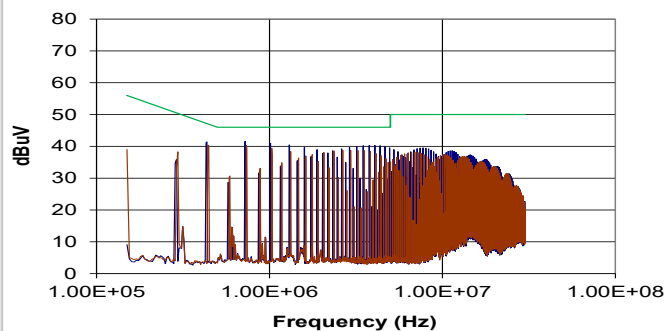


	Inductor			Capacitor	
	L, μ H	SMD	Through Hole	C, μ F	SMD
MGJ1D121503VMC	10	46103C	13R103C	10	GRM21BC81E106ME51
MGJ1D121505VMC	10	46103C	13R103C	10	GRM21BC81E106ME51
MGJ1D121802VMC	10	46103C	13R103C	10	GRM21BC81E106ME51
MGJ1D151503VMC	10	46103C	13R103C	10	GRM21BC81E106ME51
MGJ1D151802VMC	10	46103C	13R103C	10	GRM21BC81E106ME51
MGJ1D241503VMC	22	46223C	13R223C	10	GRM31CD71H106KE11
MGJ1D241505VMC	10	46103C	13R103C	10	GRM31CD71H106KE11
MGJ1D241802VMC	10	46103C	13R103C	10	GRM31CD71H106KE11

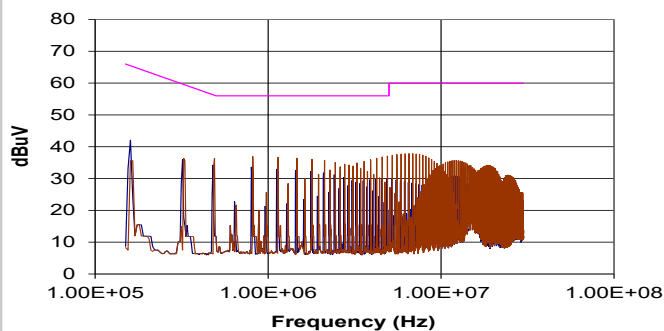
MGJ1D121503VMC (Quasi-Peak)



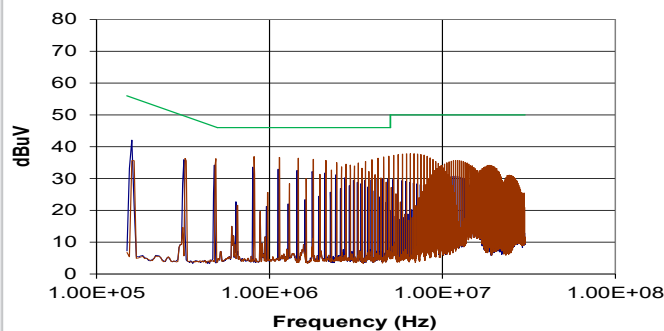
MGJ1D121503VMC (Average)



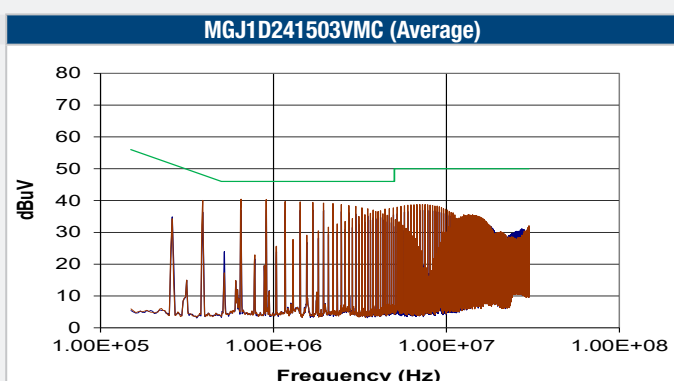
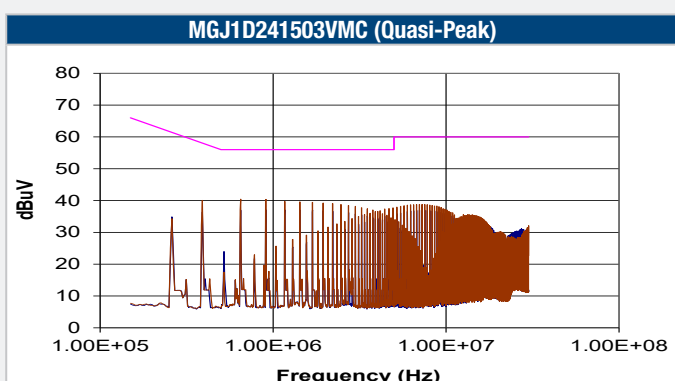
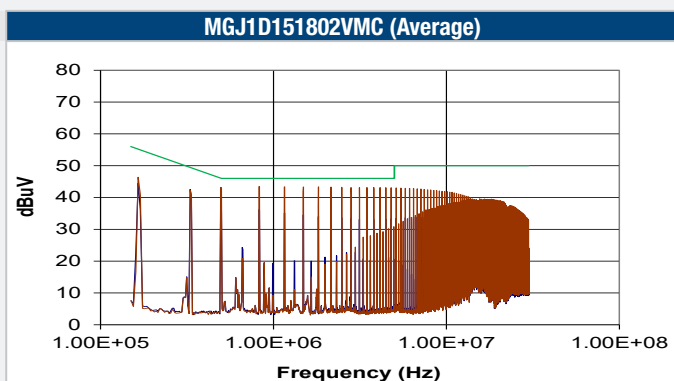
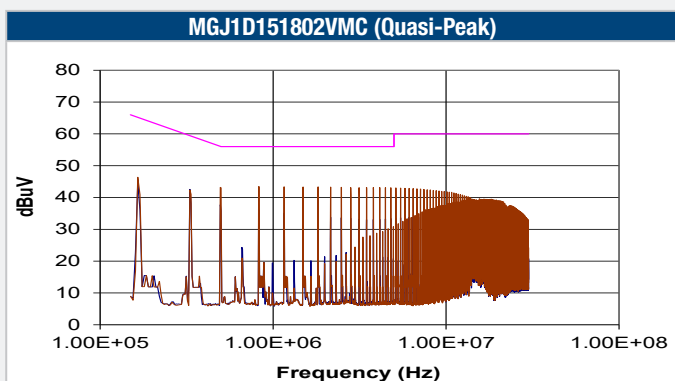
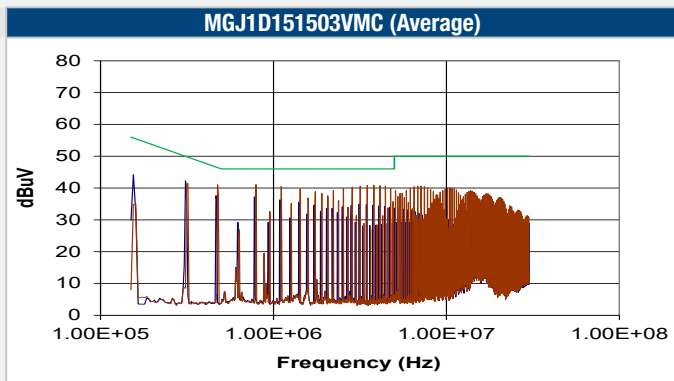
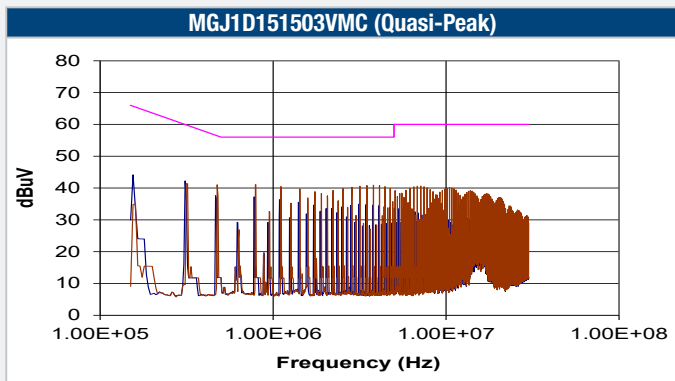
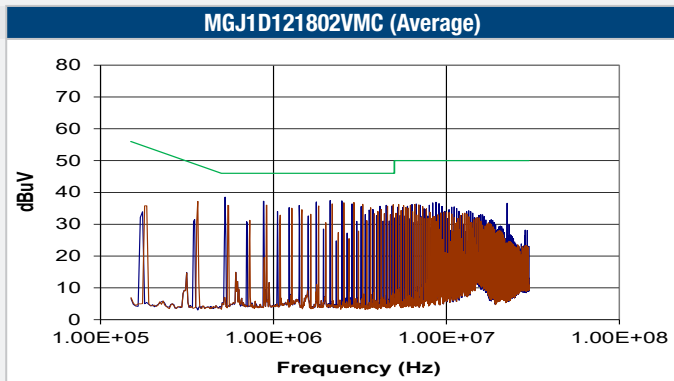
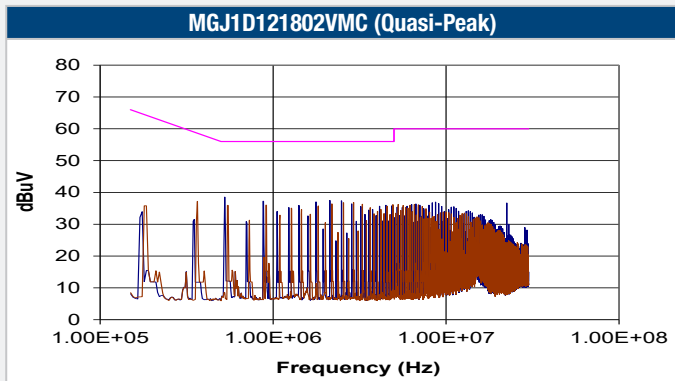
MGJ1D121505VMC (Quasi-Peak)



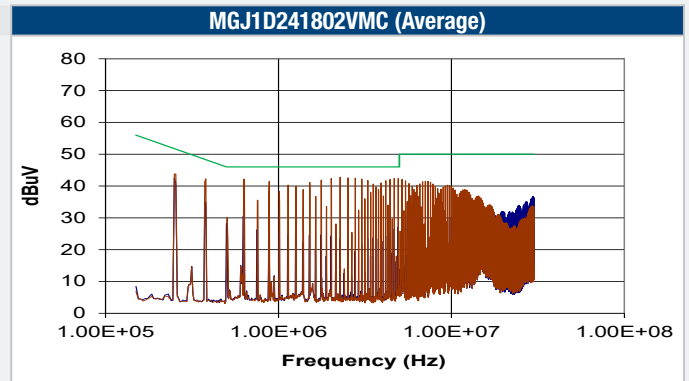
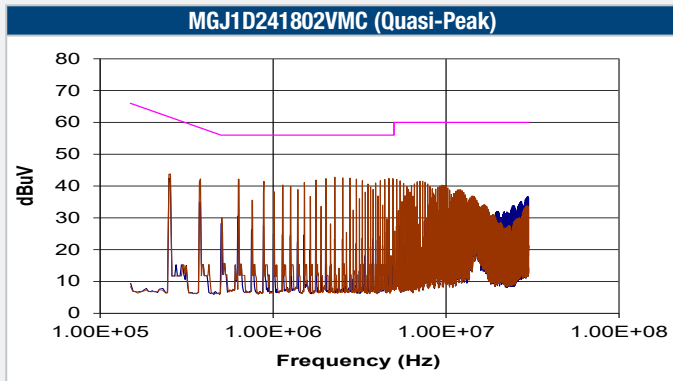
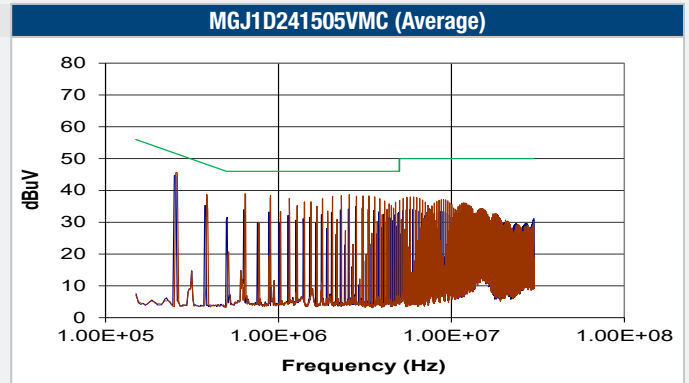
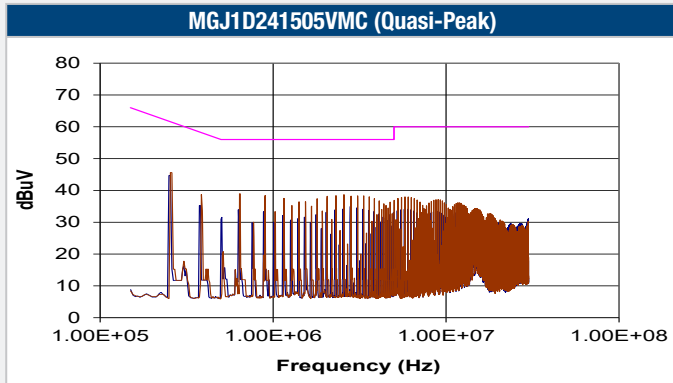
MGJ1D121505VMC (Average)



EMC FILTERING AND SPECTRA (Continued)

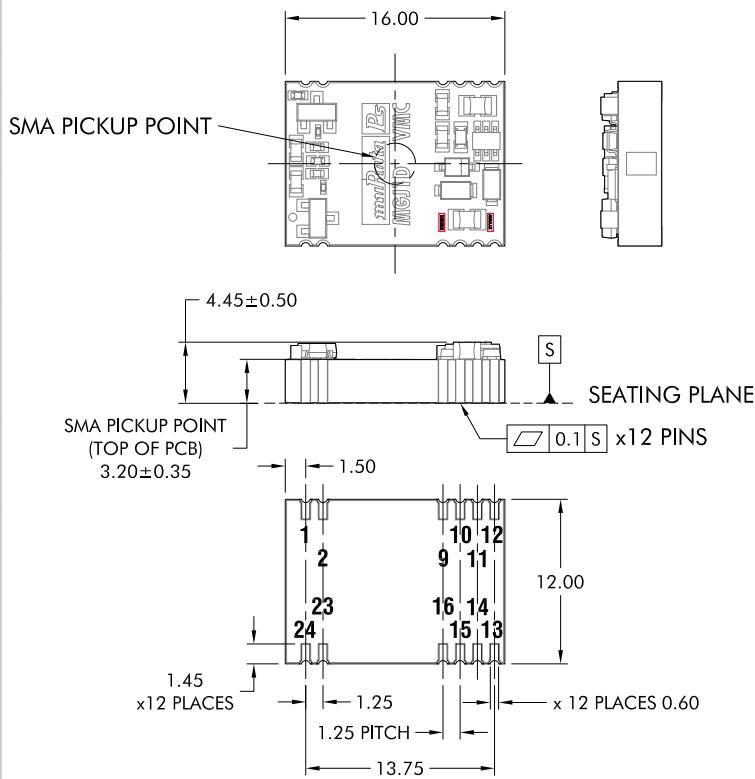


EMC FILTERING AND SPECTRA (Continued)



PACKAGE SPECIFICATIONS

MECHANICAL DIMENSIONS - 12V AND 15V INPUT TYPES



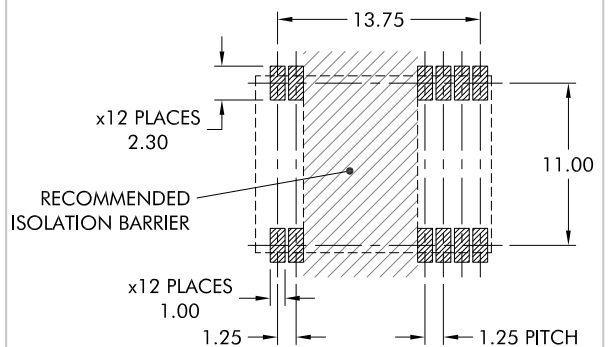
All dimensions in mm.
 Tolerance (unless otherwise stated) ±0.20.
 Components shown for reference only.
 Part number and date code are highlighted with a red box on the above drawing, positioning may vary depending on variant.

Weight: 1.5g

PIN CONNECTIONS

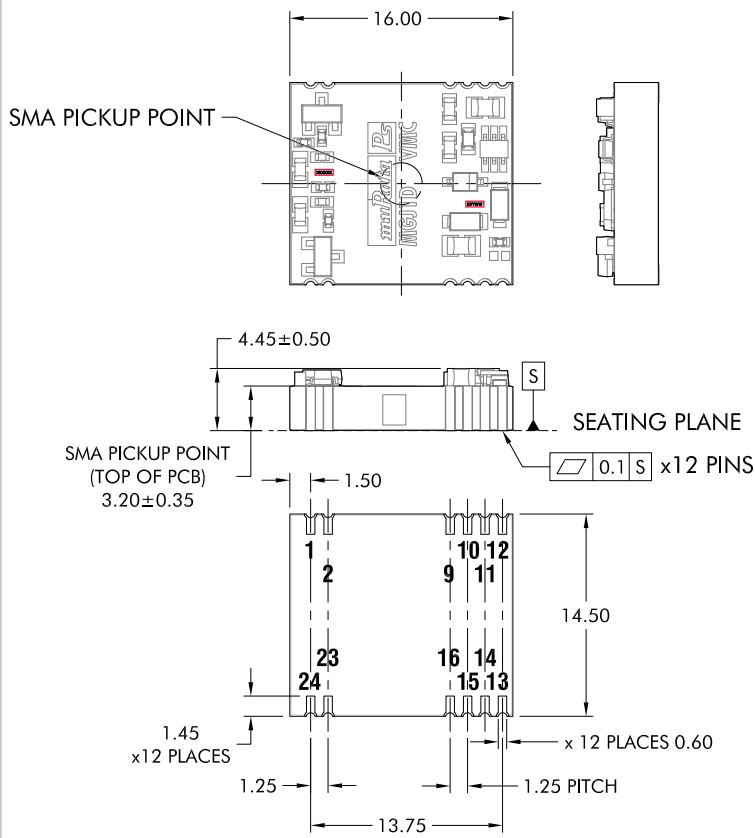
Pin	Function
1	-Vin
2	-Vin
9	-VOUT
10	-VOUT
11	0V
12	0V
13	0V
14	0V
15	+VOUT
16	+VOUT
23	+VIN
24	+VIN

RECOMMENDED FOOTPRINT DETAILS



PACKAGE SPECIFICATIONS

MECHANICAL DIMENSIONS - 24V INPUT TYPES



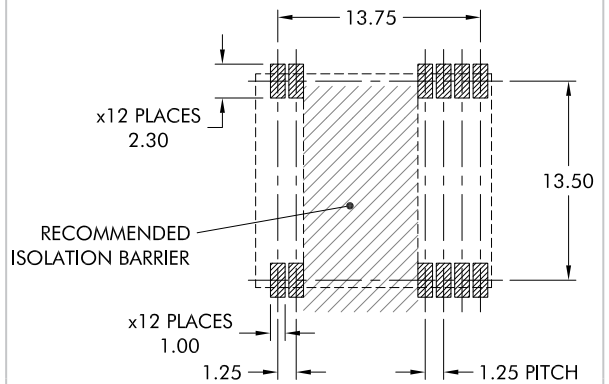
All dimensions in mm.
 Tolerance (unless otherwise stated) ± 0.20 .
 Components shown for reference only.
 Part number and date code are highlighted with a red box on the above drawing, positioning may vary depending on variant.

Weight: 1.9g

PIN CONNECTIONS

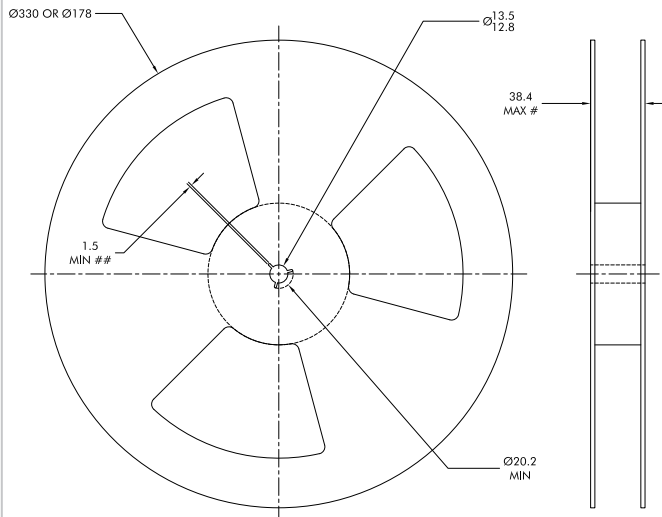
Pin	Function
1	-Vin
2	-Vin
9	-VOUT
10	-VOUT
11	0V
12	0V
13	0V
14	0V
15	+VOUT
16	+VOUT
23	+VIN
24	+VIN

RECOMMENDED FOOTPRINT DETAILS



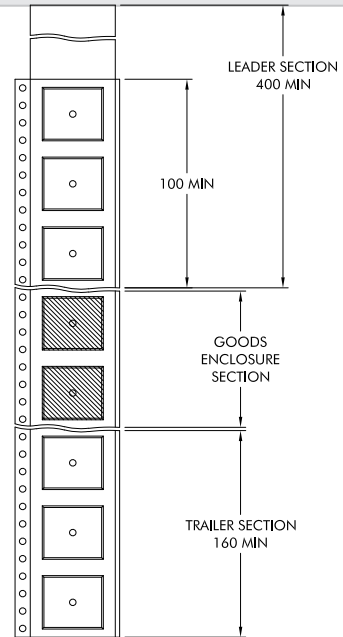
TAPE & REEL SPECIFICATIONS

REEL OUTLINE DIMENSIONS



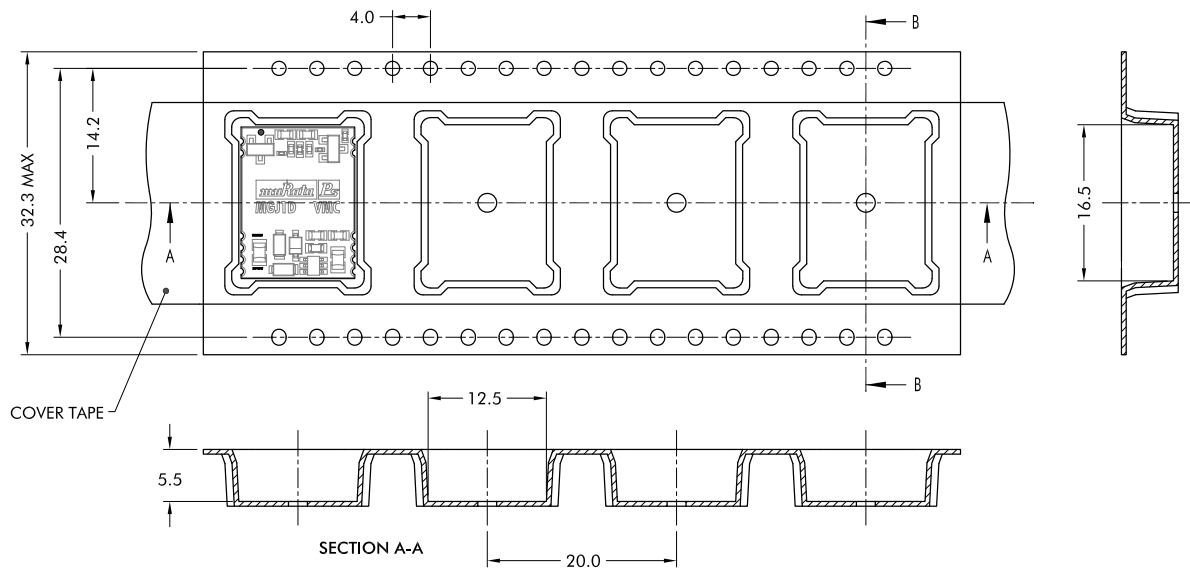
All dimensions in mm
 # Measured at hub
 ## Six equi-spaced slots on 180mm/7" reel
 Carrier tape pockets shown are illustrative only - refer to carrier tape diagram for actual pocket details

REEL PACKAGING DETAILS



Reel Quantity: 7" - 135 or 13" - 595

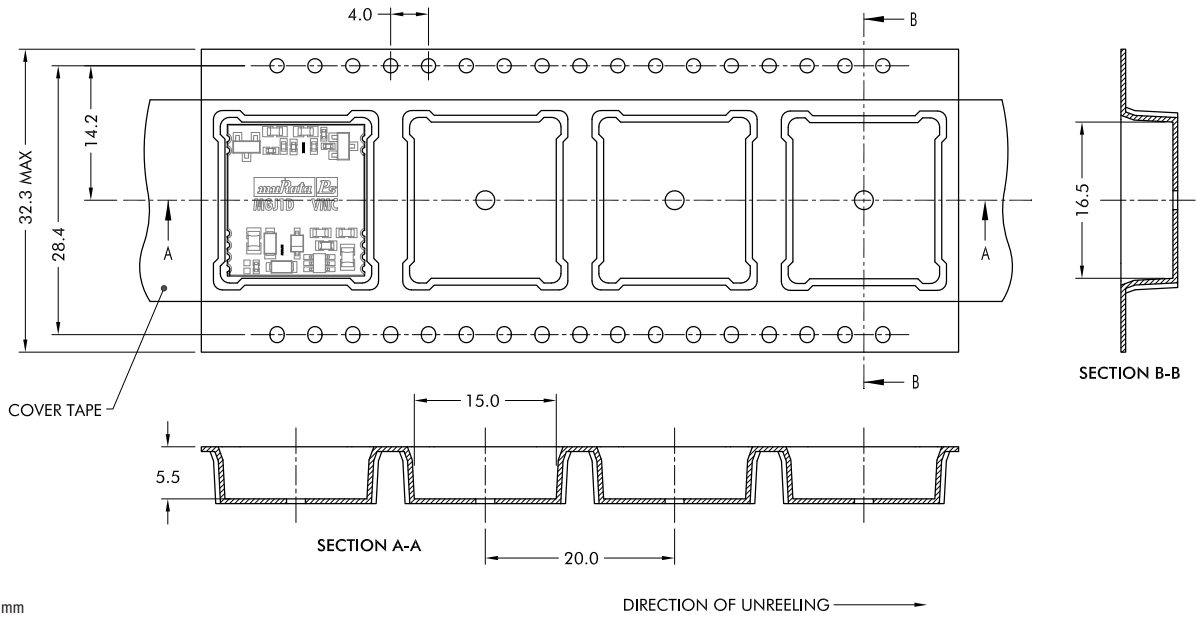
TAPE OUTLINE DIMENSIONS - 12V AND 15V INPUT TYPES



All dimensions in mm
 Components shall be orientated within the carrier tape as indicated
 Tape & Reel specifications shall conform with current EIA-481 standard

TAPE & REEL SPECIFICATIONS

TAPE OUTLINE DIMENSIONS - 24V INPUT TYPES



All dimensions in mm
 Components shall be orientated within the carrier tape as indicated
 Tape & Reel specifications shall conform with current EIA-481 standard

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

Murata makes no express or implied warranty, representation, or guarantee of suitability, fitness for any particular use/purpose and/or compatibility with any application or device of the buyer, nor does Murata assume any liability whatsoever arising out of unauthorised use of any Murata product for the application of the buyer. The suitability, fitness for any particular use/purpose and/or compatibility of Murata product with any application or device of the buyer remain to be the responsibility and liability of the buyer.

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.



This product is subject to the following [operating requirements](#) and the [Life and Safety Critical Application Sales Policy](#):

Refer to: <https://www.murata.com/en-eu/products/power/requirements>

Murata Power Solutions (Milton Keynes) Ltd. makes no representation that the use of its products in the circuits described herein, or the use of other technical information contained herein, will not infringe upon existing or future patent rights. The descriptions contained herein do not imply the granting of licenses to make, use, or sell equipment constructed in accordance therewith. Specifications are subject to change without notice.

© 2024 Murata Power Solutions (Milton Keynes) Ltd.