



FEATURES

- UL62368-1 recognised
- 1kVDC isolation 'Hi Pot Test'
- Operation up to 115°C (with derating)
- Industry standard pinout
- Fully encapsulated with toroidal magnetics
- No electrolytic or tantalum capacitors
- Pin compatible with NMG, NMR & CRR

PRODUCT OVERVIEW

The NMR1 series of extended industrial temperature range DC-DC converters are the standard building blocks for on-board distributed power systems. They are ideally suited for providing single rail supplies on primarily digital boards with the added benefit of galvanic isolation to reduce switching noise. Surface mount technology and advanced packaging materials produce rugged reliable performance over an extended temperature range from -40°C up to 115°C.

SELECTION GUIDE

Order Code	Nominal Input Voltage	Output Voltage	Output Current	Input Current at Rated Load	Load Regulation		Ripple & Noise		Efficiency (Min)	Efficiency (Typ)	Isolation Capacitance	MTTF ¹	
					%		mV p-p		%	pF		MIL.	Tel.
					Typ.	Max.	Typ.	Max.	%	pF		kHrs	kHrs
NMR1S0505SC	5	5	200	275	11	14	15	30	67	72	15	4083	37011

INPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Voltage range	Continuous operation	4.5	5	5.5	V
Input reflected ripple current			5		mA p-p

GENERAL CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Switching frequency			120		kHz

OUTPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Rated Power	T _A = -40°C to 105°C, see derating graph			1.0	W
Voltage Set Point Accuracy	See tolerance envelope				
Line regulation	High V _{IN} to low V _{IN}		1.1	1.2	%/%

ISOLATION CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation voltage	Flash tested for 1 second	1000			VDC
Resistance	Viso=1000VDC	10			GΩ

TEMPERATURE CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Specification	See safety approval section for UL temperature specification	-40		115	°C
Storage		-50		125	
Case Temperature above ambient				28	
Cooling	Free air convection				

ABSOLUTE MAXIMUM RATINGS

Input voltage V _{IN}	7V
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.



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



1. Calculated using MIL-HDBK-217 and Telcordia SR-332 calculation model 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.

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	200 cycles in a dual zone chamber from -40 (+5/-10)°C to 105 (+10/-5)°C. 15 mins dwell at each (inclusive of ramps). 2 cycles per hour.
Humidity	JEDEC JESD22-A101	Run powered samples at 85±2°C/85±5% RH for 1000 (-24/+168) hours.
Storage life (high temperature)	JEDEC JESD22-A103, Condition A	125°C +10/-0°C for ≥1000 hours.
Solderability	EIA/IPC/JEDEC J-STD-002	SnPb (Test A) For leaded solderability the parts are conditioned in a steam ager for 8 hours ±15 min. at a temperature of 93°C ±3°C. Dipped in solder at 245°C ±5°C for 5 (+0/-0.5) seconds. Pb-free (Test A1) For lead free solderability the parts are conditioned in a steam ager for 8 hours ±15 min. at a temperature of 93°C ±3°C. Dipped in solder at 255°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 270°C ±5°C for 7 (+2/-0) seconds (96SC tin/silver/copper).
Hand solder heat	MIL-STD-202 Method 210, Test 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.
Shock	BS EN 61373	Test is 30ms duration, 3 shocks in each sense of 3 mutually perpendicular axes (18 shocks total). Level at each axis: Vertical, Traverse and Longitudinal: 50m/s ² . Device is secured via the pins.
Vibration	BS EN 61373 with respect to BS EN 60068-2-64	5 – 150Hz. Level at each axis – Vertical, Traverse and Longitudinal: 5.72m/s ² rms. 5 hours in each axis. Device is secured via the pins.
Solvent resistance	MIL-STD-883, Method 2015	Separate samples subjected to IPA.
Solvent cleaning	Resistance to cleaning agents	Solvent – Novec 71IPA & Topklean EL-20A. Pulsed ultrasonic immersion 45°C - 60°C.
ESD	JEDEC JESD22-A114	HBM at 8.0kV.
Lead integrity: pull	MIL-STD 883 Method 2004 Test Condition A	A pull of 0.227kg applied for 30 seconds. The force is then increased until the pins snap.
Lead integrity: fatigue	MIL-STD 883 Method 2004 Test condition B ₂	The leads are bent to an angle of 15°. Each lead is subjected to 3 cycles.
Lead integrity: adhesion	MIL-STD 883 Method 2025	Leads are bent through 90° until a fracture occurs.

CHARACTERISATION TEST METHODS

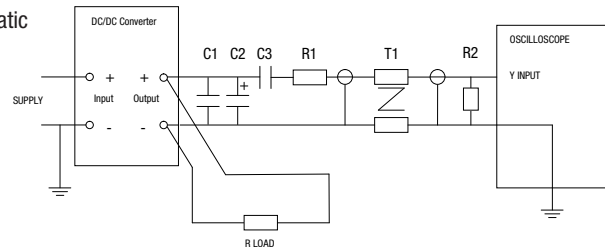
Ripple & Noise Characterisation Method

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 100kHz
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

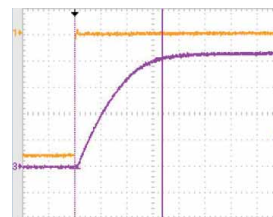
The minimum load to meet datasheet specification is 10% of the full rated load across the specified input voltage range. Lower than 10% minimum loading will result in an increase in output voltage, which may rise to typically double the specified output voltage if the output load falls to less than 5%.

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
NMR1S0505SC	300

Typical Start-Up Wave Form



APPLICATION NOTES (Continued)

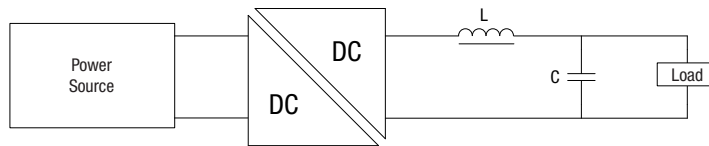
Output Ripple Reduction

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 the rated output voltage of the DC-DC converter.

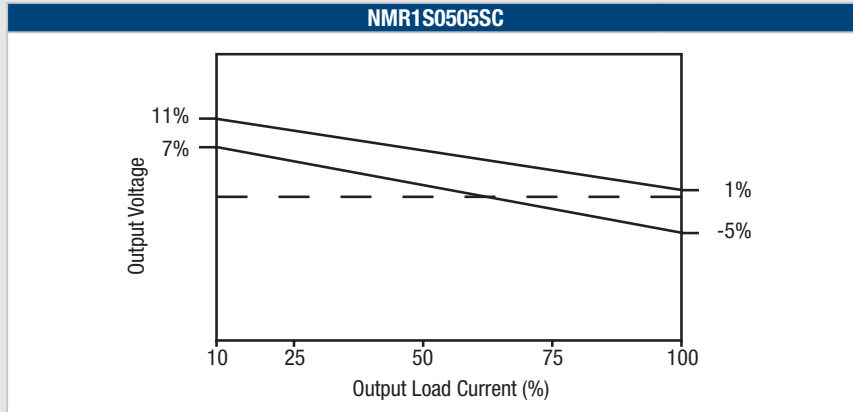
Inductor: The rated current of the inductor should not be less than that of the output of the DC-DC converter. At the rated current, the DC resistance of the inductor should be such that the voltage drop across the inductor is <2% of the rated voltage of the DC-DC converter. The SRF (Self Resonant Frequency) should be >20MHz.



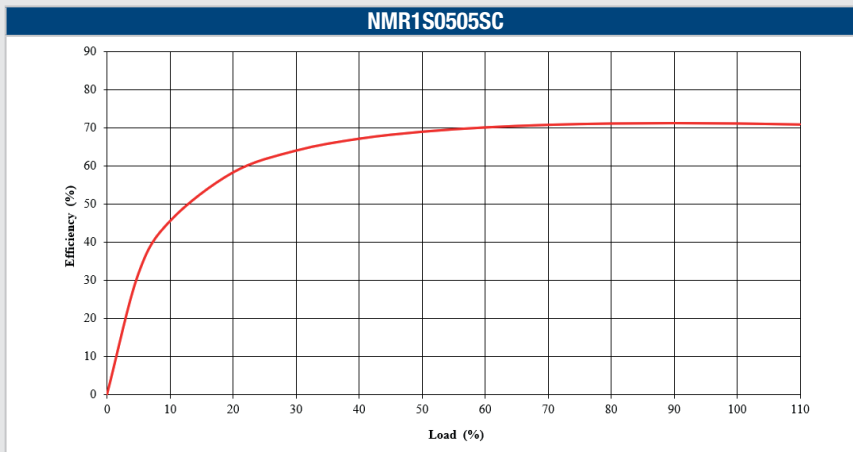
	Inductor		Capacitor	
	L, μ H	Through Hole	C, μ F	SMD
NMR1S0505SC	10	11R103C	4.7	GRM21BC71H475KE11L

TOLERANCE ENVELOPE

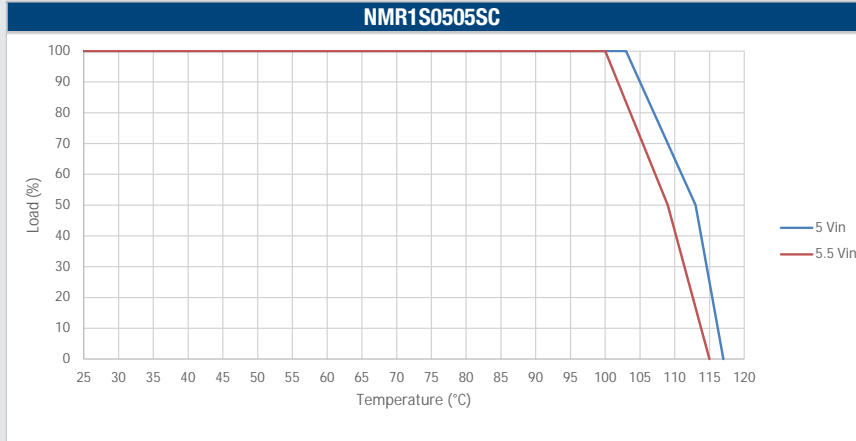
The voltage tolerance envelope shows typical load regulation characteristics for this product series. The tolerance envelope is the maximum output voltage variation due to changes in output loading.



EFFICIENCY VS LOAD



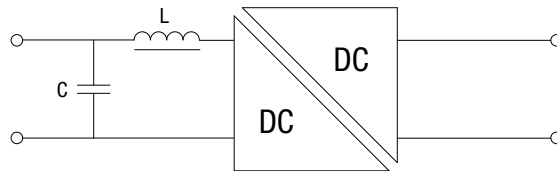
TEMPERATURE DERATING



EMC FILTERING AND SPECTRA

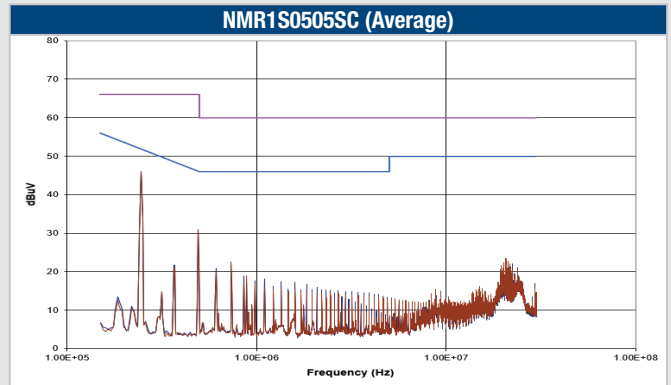
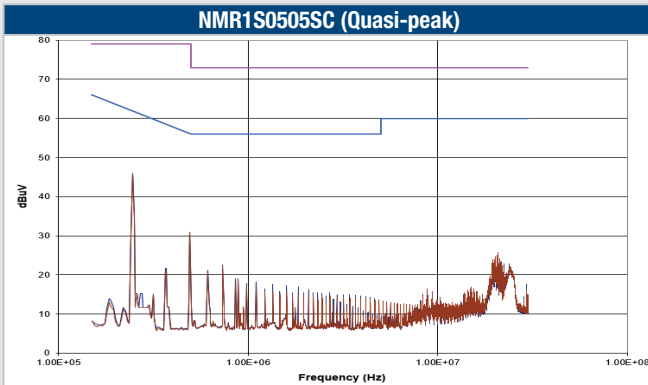
FILTERING

The following filter circuit and filter table shows the input filters typically 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 (pink line) and Quasi Peak Limit B (green line) adherence limits.



C Ceramic capacitor

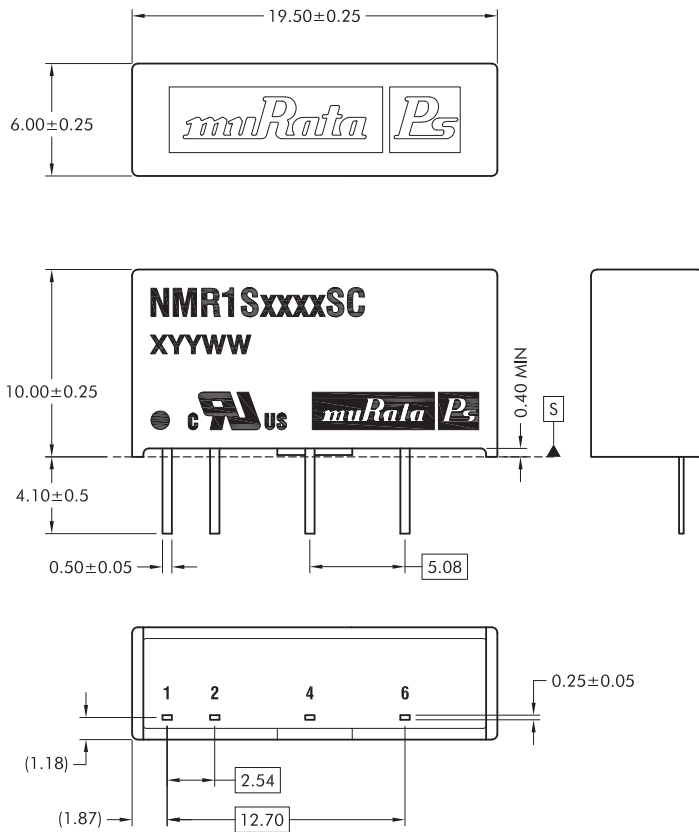
Part Number	Inductor		Capacitor	
	L, μ H	SMD	C, μ F	SMD
NMR1S0505SC	10	23100C	2.2	GRM188C71E225KE11D



PACKAGE SPECIFICATIONS

MECHANICAL DIMENSIONS

7 Pin SIP Package



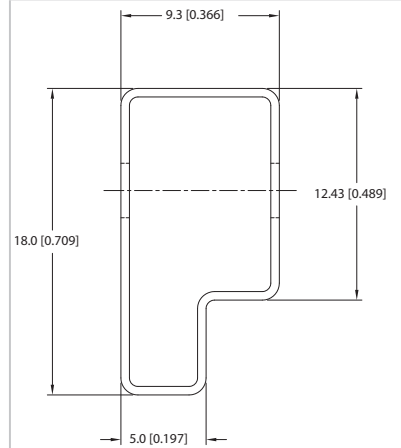
All dimensions in mm. Controlling dimension is mm.
All pins on a 2.54 pitch and within ±0.1 of true position from pin 1 at seating plane 'S'

Weight: 1.90g

PIN CONNECTIONS - 7 PIN SIP

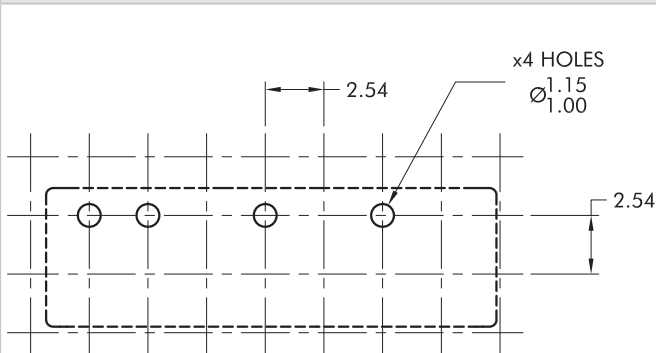
Pin	Function
1	+VIN
2	-VIN
4	-VOUT
6	+VOUT

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

RECOMMENDED FOOTPRINT DETAILS



All dimensions in mm. Controlling dimension is mm.

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