

Murata Power Solutions

NMG Series

Isolated 2W Single Output DC/DC Converters

35

25

25

25

60

35

25

25

25

40

60

40

40

40

70

50

50

50

Efficiency (Min.

%

81

84

84

84

82

81

83

85

85

84

80

82

84

84

80

84

84

85

Efficiency (Typ.

%

83

86.5

87.5

87.5

85

83.5

87

88

88

86.5

83

86.5

87.5

88

84

87.5

88

88.5

33

40

40

40

35

40

61

74

68

60

40

55

65

75

45

55

75

kHrs

3956

3682

3299

2833

2189

2519

2405

2235

2011

2189

3963

3176

2875

2483

3659

2496

3824

3500

Ripple & Noise (Typ)¹

28

20

18

16

35

22

16

13

12

25

40

25

25

25

40

30

25

30



FEATURES

- UL 60950 recognised
- Efficiency from 80%
- Wide temperature performance at full 2 Watt load, −40°C to 85°C
- UL 94V-0 package material
- Industry standard pinout
- 1kVDC isolation
- 5V, 12V, 15V & 24V input
- 5V, 9V, 12V, & 15V output
- Internal SMD construction
- Fully encapsulated with toroidal magnetics
- No external components required
- MTTF up to 3.9 million hours
- Pin compatible with NMR series
- No electrolytic or tantalum capacitors

Parameter Min. Max. Units Тур. Continuous operation, 5V input types 4.5 5 5.5 V 12 Continuous operation, 12V input types 10.8 13.2 Voltage range 15 16.5 Continuous operation, 15V input types 13.5 Continuous operation, 24V input types 21.6 24 26.4 Reflected ripple current 7.5 15 mA p-p

Input Current at Rated Load

mΑ

470

455

450

450

465

200

190

190

185

190

160

155

150

150

100

95

95

95

oad

5.7

4.2

3.8

3.4

4.3

4.2

2.6

2.4

2.0

2.6

4.3

2.9

2.4

2.3

4.1

2.6

2.1

2

When operated with additional external load capacitance the rise time of the input voltage will determine the maximum external

capacitance value for guaranteed start up. The slower the rise time of the input voltage the greater the maximum value of the

7.3

5.9

5.1

4.5

6

4.9

3.1

2.9

2.4

4

6

4.5

3.5

6

4

3.5

3.5

Jutput Current

mA

400

222

167

133

83

400

222

167

133

83

400

222

167

133

400

222

167

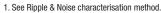
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PRODUCT OVERVIEW

The NMG series of DC/DC Converters is particularly suited to isolating and/or converting DC power rails. The galvanic isolation allows the device to be configured to provide an isolated negative rail in systems where only positive rails exist. The wide temperature range guarantees startup from –40°C and full 2 watt output at 85°C. Pin compatibility with the NMR and MER1 series ensures ease of upgradeability.

ABSOLUTE MAXIMUM RATINGS	
Lead temperature 1.5mm from case for 10 seconds	260°C
Internal power dissipation	550mW
Input voltage V _{IN} , NMG05 types	7V
Input voltage V _{IN} , NMG12 types	15V
Input voltage V _{IN} , NMG15 types	18V
Input voltage V _{IN.} NMG24 types	28V





SELECTION GUIDE

Order Code

NMG0505SC

NMG0509SC

NMG0512SC

NMG0515SC

NMG0524SC

NMG1205SC

NMG1209SC

NMG1212SC

NMG1215SC

NMG1224SC

NMG1505SC

NMG1509SC

NMG1512SC

NMG1515SC

NMG2405SC

NMG2409SC

NMG2412SC

NMG2415SC

Nominal Input

٧

5

5

5

5

5

12

12

12

12

12

15

15

15

15

24

24

24

24

additional external capacitance for reliable start up.

INPUT CHARACTERISTICS

٧

5

9

12

15

24

5

9

12

15

24

5

9

12

15

5

9

12

15

2. Calculated using MIL-HDBK-217F FN2 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.







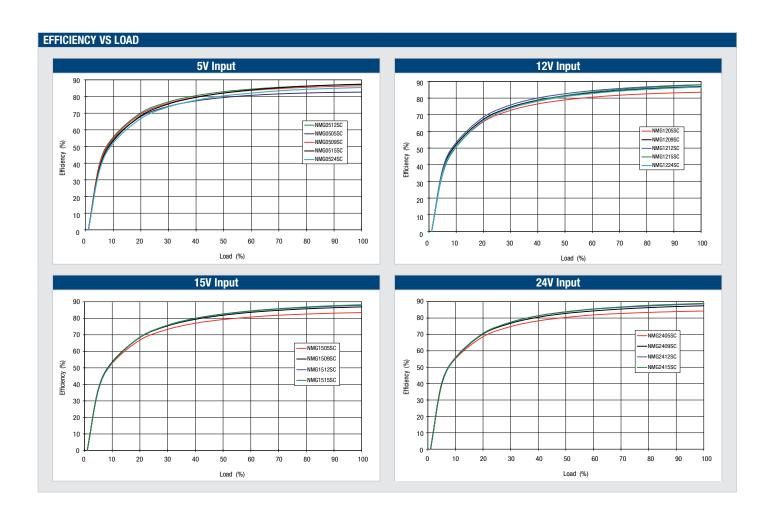




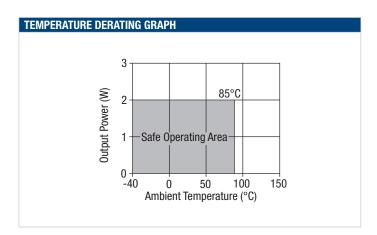
ISOLATION CHARACTERISTICS					
Parameter	Conditions	Min.	Тур.	Max.	Units
Isolation test voltage	Flash tested for 1 second	1000			VDC
Resistance	Viso= 1000VDC	10			GΩ

GENERAL CHARACTERISTICS					
Parameter	Conditions	Min.	Тур.	Max.	Units
Switching frequency	24V output types		70		kHz
	All other types		60		KΠZ

TEMPERATURE CHARACTERISTICS					
Parameter	Conditions	Min.	Тур.	Max.	Units
Specification	All output types	-40		85	
Storage		-50		125	00
Case Temperature above	5V input types and 5V output types			30	
ambient	All other types			25	
Cooling	Free air convection				







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 NMG series of DC/DC converters are all 100% production tested at their stated isolation voltage. This is 1kVDC for 1 minute.

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

The NMG series has been recognized 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 NMG series has toroidal isolation transformers, with no additional insulation between primary and secondary windings of enameled 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 recognized 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 NMG 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 NMG Series of converters are not internally fused so to meet the requirements of UL 60950 an input line fuse should always be used. An anti-surge 2A should be used for NMG05xxSC models, and an anti-surge 0.75A should be used for NMG12xxSC models. 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. The pin termination finish is Tin Plate, Hot Dipped over Matte Tin with Nickel Preplate. This series are backward compatible with Sn/Pb soldering systems. For further information, please visit www.murata-ps.com/rohs



APPLICATION NOTES

Minimum load

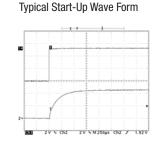
The minimum load to meet datasheet specification is 10% of the full rated load across the specified input voltage range. Lower than 10% minimum loading will result in an increase in output voltage, which may rise to typically double the specified output voltage if the output load falls to less than 5%.

Capacitive loading and start up

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

	Start-up time		
	μs		
NMG0505SC	444		
NMG0509SC	1120		
NMG0512SC	1930		
NMG0515SC	3470		
NMG1205SC	409		
NMG1209SC	1320		
NMG1212SC	1320		
NMG1215SC	2270		
NMG0524SC	2200		
NMG1224SC	1400		

	Start-up time		
	μs		
NMG1505SC	100		
NMG1509SC	170		
NMG1512SC	300		
NMG1515SC	450		
NMG2405SC	80		
NMG2409SC	130		
NMG2412SC	220		
NMG2415SC	330		

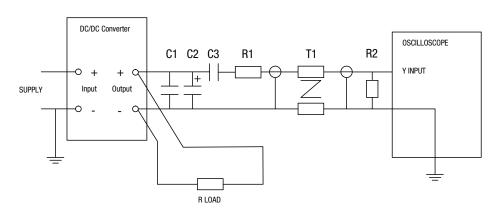


Ripple & Noise Characterisation Method

All measurement to be taken with the following components connected to the UUT as detailed below. 50 0hm coax cable, solder connections one end, BNC plug at the other end.

C1	1μF X7R multilayer ceramic capacitor rated at minimum 3 x the output voltage of the UUT
C2	10μF tantalum capacitor rated at minimum 1.5 x the output voltage of the UUT with ESR of less than 100 milliohms at 100 kHz e.g. AVX TPS series.
C3	100nF multilayer ceramic capacitor, general purpose
R1	450 Ohm resistor, carbon film, ±1%
R2	50 Ohm BNC termination
T1	3T of the coax cable through a ferrite toroid eg Ferroxcube TN32/19/13-3E25
RLOAD	Resistive load at the UUT maximum rating. Connections via twisted wires.
Measured va	lues are multiplied by 10 to obtain the specified values.

Differential Mode Noise Test Schematic





APPLICATION NOTES (continued)

Output Ripple Reduction

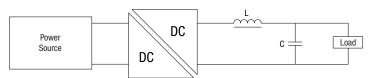
By using the values of inductance and capacitance stated, the output ripple at the rated load is lowered to 5mV p-p max.

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 <pre>>20MHz

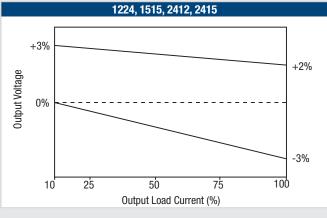


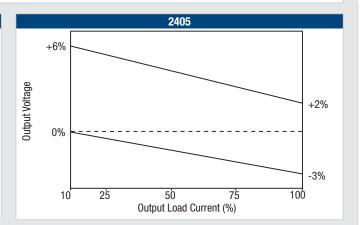
	Inductor			Capacitor
	L, μH	SMD	Through Hole	C, μF
NMG0505SC	4.7	82472C	11R472C	10
NMG0509SC	10	82103C	11R103C	4.7
NMG0512SC	22	82223C	11R223C	2.2
NMG0515SC	47	82473C	11R473C	1
NMG0524SC	47	82473C	11R473C	1
NMG1205SC	4.7	82472C	11R472C	10
NMG1209SC	10	82103C	11R103C	4.7
NMG1212SC	22	82223C	11R223C	2.2
NMG1215SC	47	82473C	11R473C	1
NMG1224SC	47	82473C	11R473C	1
NMG1505SC	4.7	82472C	11R472C	10
NMG1509SC	10	82103C	11R103C	4.7
NMG1512SC	22	82223C	11R223C	2.2
NMG1515SC	47	82473C	11R473C	1
NMG2405SC	4.7	82472C	11R472C	10
NMG2409SC	10	82103C	11R103C	4.7
NMG2412SC	22	82223C	11R223C	2.2

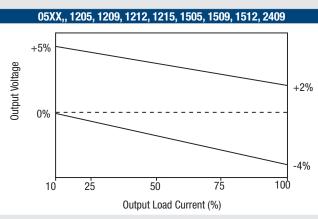


TOLERANCE ENVELOPES

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.

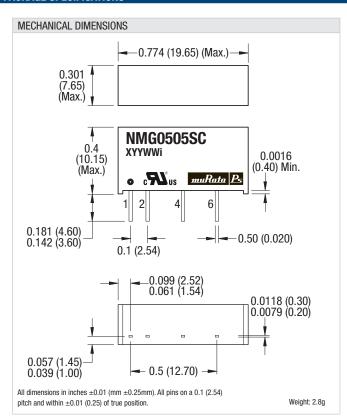


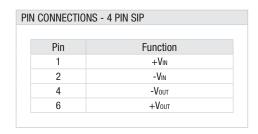


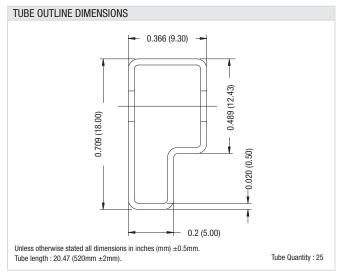


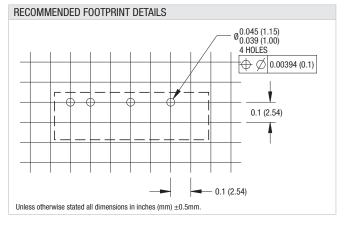


PACKAGE SPECIFICATIONS









Murata Power Solutions, Inc. 11 Cabot Boulevard, Mansfield, MA 02048-1151 U.S.A. ISO 9001 and 14001 REGISTERED



This product is subject to the following <u>operating requirements</u> and the <u>Life and Safety Critical Application Sales Policy</u>:

Refer to: http://www.murata-ps.com/requirements/

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