



### FEATURES

- RoHS compliant
- Single isolated output
- 1kVDC isolation
- Efficiency up to 85%
- Wide temperature performance at full 2 watt load, -40°C to 85°C
- Power density 2.01W/cm<sup>3</sup>
- UL 94V-0 package material
- Footprint from 1.05cm<sup>2</sup>
- Industry standard pinout
- 5V & 12V input
- 5V, 9V, 12V and 15V output
- No heatsink required
- Internal SMD construction
- Fully encapsulated with toroidal magnetics
- No external components required
- MTTF up to 2.3 million hours
- Custom solutions available
- Pin compatible with LME & NME series
- No electrolytic or tantalum capacitors

### DESCRIPTION

The NML 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 NME and LME ensures ease of upgrade-ability.



SELECTION GUIDE							
Order Code	Nominal Input Voltage	Output Voltage	Output Current	Input Current at Rated Load	Efficiency	Isolation Capacitance	MTTF <sup>1</sup>
	(V)	(V)	(mA)	(mA)	%	pF	kHrs
NML0505SC	5	5	400	513	78	19	2327
NML0509SC	5	9	222	492	81	27	1393
NML0512SC	5	12	167	479	84	32	832
NML0515SC	5	15	133	481	83	27	481
NML1205SC	12	5	400	207	81	28	716
NML1209SC	12	9	222	198	84	42	593
NML1212SC	12	12	167	197	85	46	461
NML1215SC	12	15	133	197	85	54	328

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 additional external capacitance for reliable start up.

INPUT CHARACTERISTICS						
Parameter	Conditions	MIN.	TYP.	MAX.	Units	
Voltage range	Continuous operation, 5V input types	4.5	5.0	5.5	V	
	Continuous operation, 12V input types	10.8	12.0	13.2		
Reflected ripple current	5V input types		33		mA p-p	
	12V input types		38			

OUTPUT CHARACTERISTICS						
Parameter	Conditions	MIN.	TYP.	MAX.	Units	
Rated Power <sup>2</sup>	T <sub>A</sub> =-40°C to 85°C			2.0	W	
Voltage Set Point Accuracy	See tolerance envelope					
Line regulation	High V <sub>IN</sub> to low V <sub>IN</sub>		1.0	1.2	%/%	
Load Regulation <sup>2</sup>	10% load to rated load, 5V output types		7.0	8.5	%	
	10% load to rated load, 9V output types		4.5	5.2		
	10% load to rated load, 12V output types		4.5	5.5		
	10% load to rated load, 15V output types		3.7	8.5		
Ripple and Noise	NML0505SC, BW=DC to 20MHz		96	200	mV p-p	
	NML0509SC, BW=DC to 20MHz		67			
	NML0512SC, BW=DC to 20MHz		59			
	NML0515SC, BW=DC to 20MHz		53			
	NML1205SC, BW=DC to 20MHz		76			
	NML1209SC, BW=DC to 20MHz		63			
	NML1212SC, BW=DC to 20MHz		53			
	NML1215SC, BW=DC to 20MHz		45			

ISOLATION CHARACTERISTICS						
Parameter	Conditions	MIN.	TYP.	MAX.	Units	
Isolation test voltage	Flash tested for 1 second	1000			VDC	
Resistance	Viso= 500VDC	10			GΩ	

ABSOLUTE MAXIMUM RATINGS	
Lead temperature 1.5mm from case for 10 seconds	300°C
Internal power dissipation	805mW
Input voltage V <sub>IN</sub> , NML05 types	7V
Input voltage V <sub>IN</sub> , NML12 types	15V

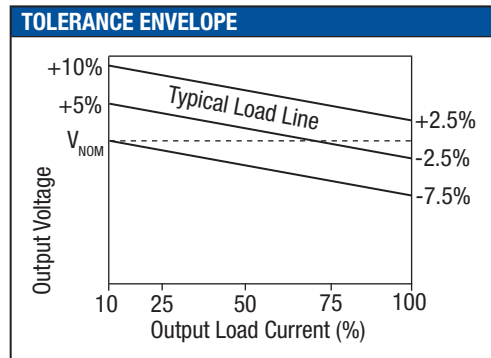
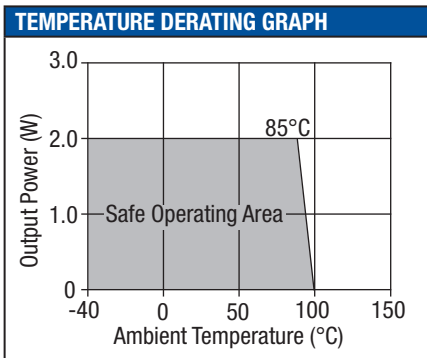
1. Calculated using MIL-HDBK-217F with nominal input voltage at full load.

2. See derating curve.

All specifications typical at T<sub>A</sub>=25°C, nominal input voltage and rated output current unless otherwise specified.

GENERAL CHARACTERISTICS					
Parameter	Conditions	MIN.	TYP.	MAX.	Units
Switching frequency	5V input types		90		kHz
	12V input types		90		

TEMPERATURE CHARACTERISTICS					
Parameter	Conditions	MIN.	TYP.	MAX.	Units
Specification	All output types	-40		85	°C
Storage		-50		130	
Case Temperature above ambient	5V output types			45	
	All other output types			36	
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.

SHINHOM Technologies NML 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?"

For a part holding no specific agency approvals, such as the NML series, 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

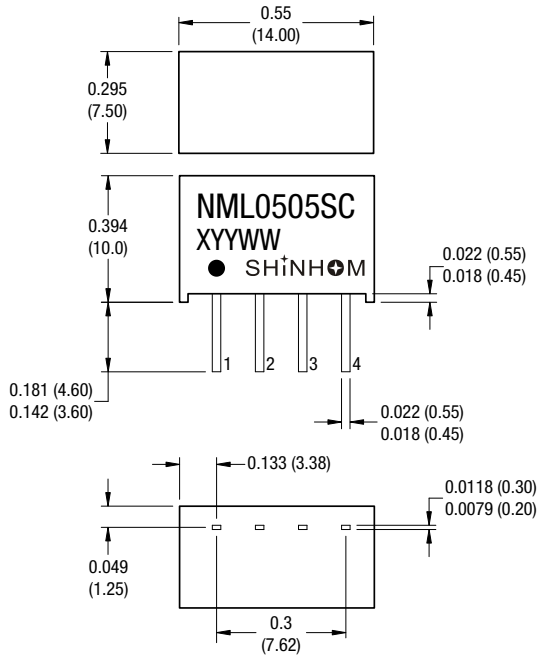
It is well known that repeated high-voltage isolation testing of a barrier component can actually degrade isolation capability, to a lesser or greater degree depending on materials, construction and environment. The NML series has toroidal isolation transformers, with no additional insulation between 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.

### PACKAGE SPECIFICATIONS

#### MECHANICAL DIMENSIONS

SIP Package



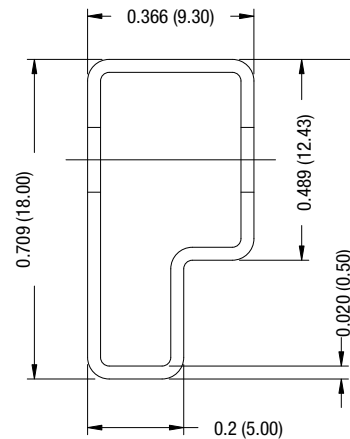
All dimensions in inches  $\pm 0.01$  (mm  $\pm 0.25$ mm). All pins on a 0.1 (2.54) pitch and within  $\pm 0.01$  (0.25) of true position.

Weight: 2.0g

#### PIN CONNECTIONS - 4 PIN SIP

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

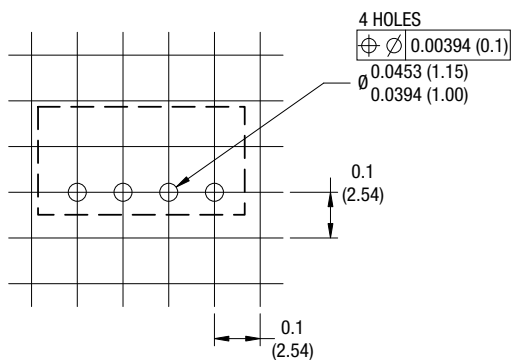
#### TUBE OUTLINE DIMENSIONS



Unless otherwise stated all dimensions in inches (mm)  $\pm 0.5$ mm.  
Tube length : 20.47 (520mm  $\pm 2$ mm).

Tube Quantity : 35

#### RECOMMENDED FOOTPRINT DETAILS



Unless otherwise stated all dimensions in inches (mm)  $\pm 0.5$ mm.

#### RoHS COMPLIANT INFORMATION



This series is compatible with RoHS soldering systems with a peak wave solder temperature of 300°C for 10 seconds. The pin termination finish on this product series is Tin Plate, Hot Dipped over Matte Tin with Nickel Preplate. The series is backward compatible with Sn/Pb soldering systems.