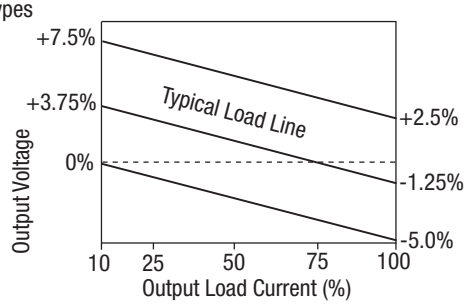
TEMPERATURE CHARACTERISTICS

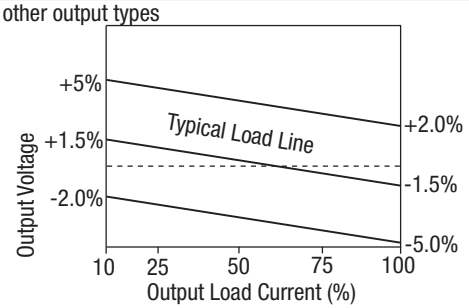
Parameter	Conditions	Min.	Typ.	Max.	Units
Specification	All output types	-40		85	°C
Storage		-55		125	
Case temperature rise above ambient	5V output types		30		
	All other output types		25		
Cooling	Free air convection				

TOLERANCE ENVELOPE

5V output types



All other output types



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.

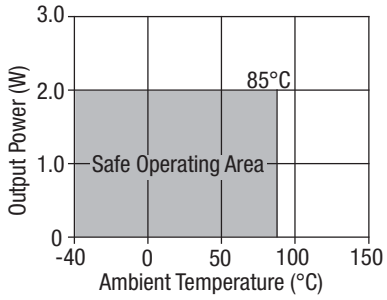
RoHS COMPLIANCE INFORMATION

RoHS COMPLIANT

This series is compatible with RoHS soldering systems with a peak reflow solder temperature of 245ºC and time above liquidus of 217ºC for 60 seconds. The pin termination finish on this product series is Gold, plating thickness 0.1 microns minimum. The series is backward compatible with Sn/Pb soldering systems.

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

TEMPERATURE DERATING GRAPH



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 NTH 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 NTH 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 NTH 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.

APPLICATION NOTES

Minimum load

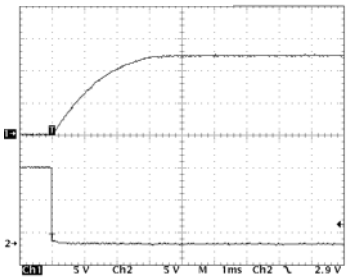
The minimum load to meet datasheet specification is 10% of the full rated load across the specified input voltage range. Lower than 10% minimum loading will result in an increase in output voltage, which may rise to typically double the specified output voltage if the output load falls to less than 5%.

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
NTH0505MC	1026
NTH0509MC	3625
NTH0512MC	5750
NTH0515MC	8330
NTH1205MC	691
NTH1209MC	2645
NTH1212MC	3285
NTH1215MC	6120

Typical Start-Up Wave Form

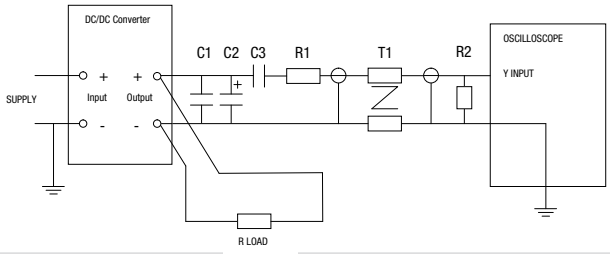


Ripple & Noise Characterisation Method

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 (continued)

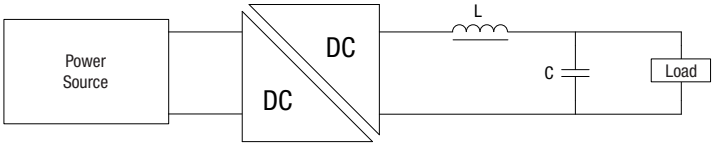
Output Ripple Reduction

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.

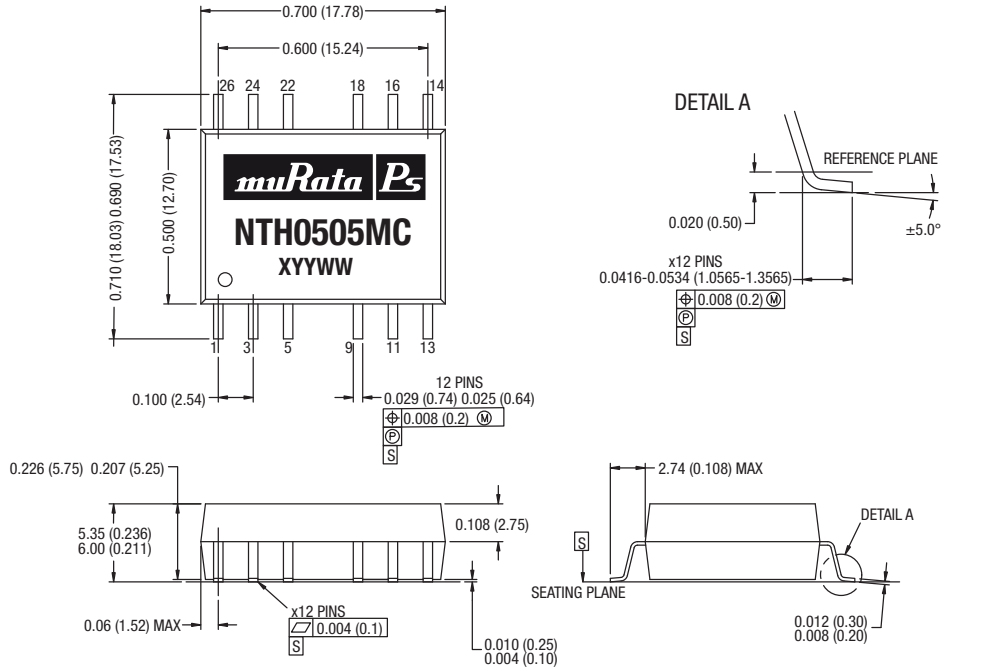
Inductor: The rated current of the inductor should not be less than that of the output of the DC/DC converter. At the rated current, the DC resistance of the inductor should be such that the voltage drop across the inductor is <2% of the rated voltage of the DC/DC converter. The SRF (Self Resonant Frequency)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



	Inductor			Capacitor
	L, µH	SMD	Through Hole	C, µF
NTH0505MC	10	82103C	11R103C	4.7
NTH0509MC	22	82223C	11R223C	2.2
NTH0512MC	47	82473C	11R473C	1
NTH0515MC	220	82474C	11R474C	0.22
NTH1205MC	10	82103C	11R103C	4.7
NTH1209MC	22	82223C	11R223C	2.2
NTH1212MC	47	82473C	11R473C	1
NTH1215MC	220	82474C	11R474C	0.22

PACKAGE SPECIFICATIONS

MECHANICAL DIMENSIONS



All dimensions in inches ±0.01 (mm ±0.25mm). All pins on a 0.1 (2.54) pitch.

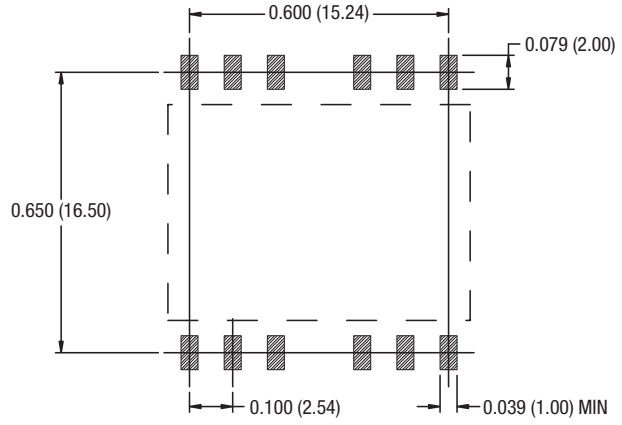
Weight: 2.75g

PIN CONNECTIONS

Pin	Function
1	$-V_{IN}$
3	$+V_{IN}$
5	NA
9	$-V_{OUT}$
11	0V
13	$+V_{OUT}$
14	NA
16	NA
18	$-V_{OUT}$
22	NC
24	NA
26	NA

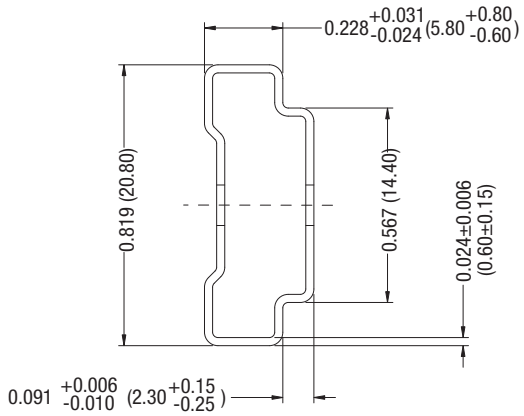
NA - Not available for electrical connection.
NC - No internal electrical connection.-

RECOMMENDED FOOTPRINT DETAILS



All dimensions in inches ±0.02 (mm±0.5)

TUBE OUTLINE DIMENSIONS

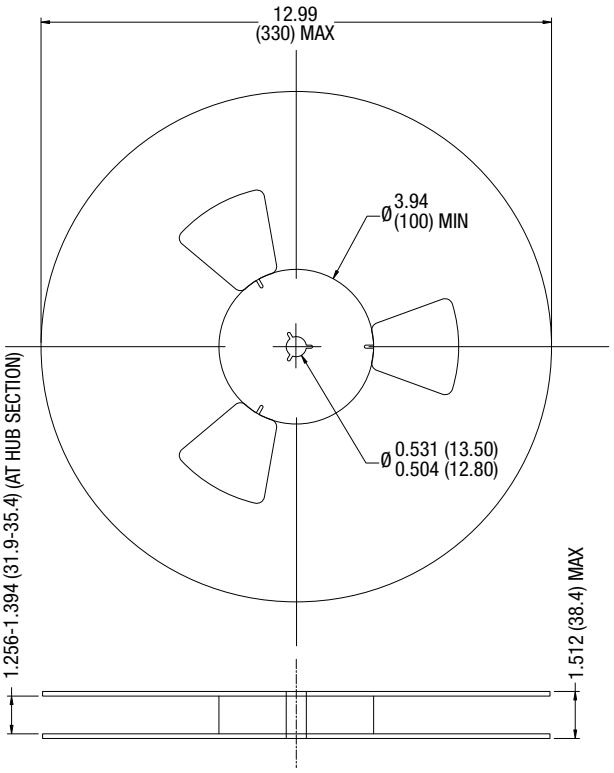


All dimensions in inches ±0.02 (mm±0.5).
Tube length : 18.70±0.079 (475±2.0).

Tube Quantity : 25

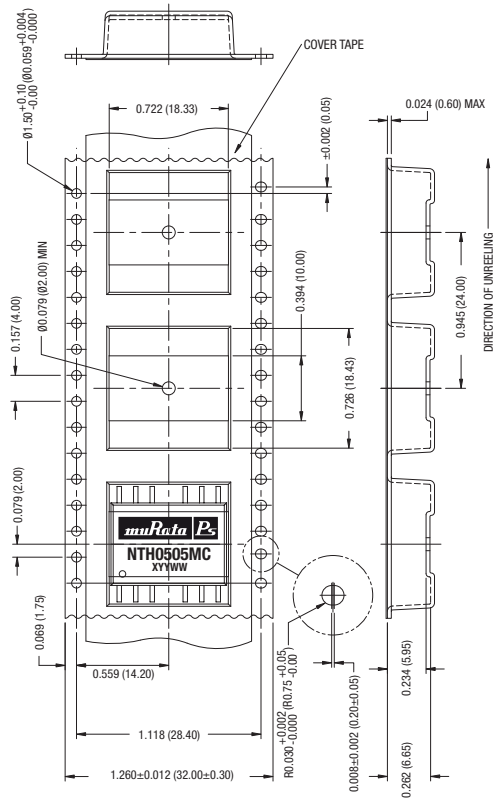
TAPE & REEL SPECIFICATIONS

REEL OUTLINE DIMENSIONS



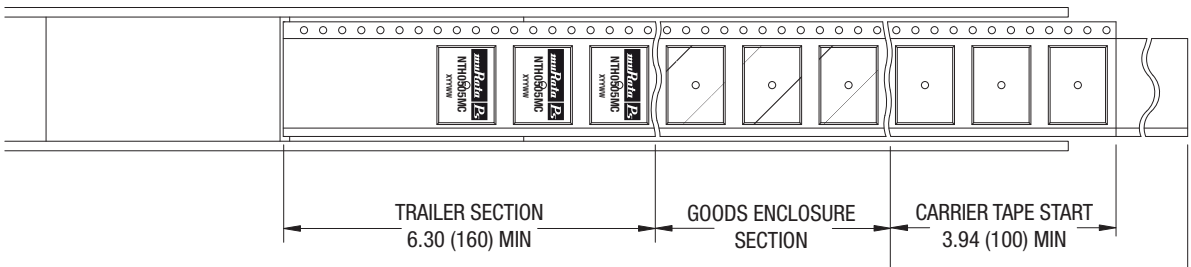
All dimensions in inches ±0.02 (mm±0.5)

TAPE OUTLINE DIMENSIONS



All dimensions in inches ±0.02 (mm±0.5)

REEL PACKAGING DETAILS



All dimensions in inches ±0.02 (mm±0.5)

Reel Quantity : 400

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