



### FEATURES

- RoHS compliant
- Efficiency up to 82%
- Wide temperature performance at full 1 Watt load, -40°C to 85°C
- UL 94V-0 package material
- Footprint over pins 1.64cm<sup>2</sup>
- Lead frame technology
- Dual isolated output
- 5V & 12V input
- 5V, 9V, 12V and 15V output
- Internal SMD construction
- Toroidal magnetics
- Plastic encapsulated
- 3kVDC isolation (1 minute)
- MTTF up to 1.7 million hours
- Power density 1.36W/cm<sup>3</sup>
- No heatsink required
- Custom solutions available
- Multi layer ceramic capacitors

### PRODUCT OVERVIEW

The NTV series of 3kV isolation miniature surface mounted DC/DC converters employ leadframe technology and transfer moulding techniques to bring all of the benefits of IC style packaging to hybrid circuitry. The co-planarity of the pin positions is based upon IEC 191-6:1990. The devices are suitable for all applications where high volume production is envisaged.



For full details go to  
[www.murata-ps.com/rohs](http://www.murata-ps.com/rohs)

### SELECTION GUIDE

| Order Code <sup>1</sup> | Nominal Input Voltage | Output Voltage | Output Current | Input Current at Rated Load | Efficiency | Isolation Capacitance | MTTF <sup>2</sup> |
|-------------------------|-----------------------|----------------|----------------|-----------------------------|------------|-----------------------|-------------------|
|                         | V                     | V              | mA             | mA                          | %          | pF                    | kHrs              |
| NTV0505MC               | 5                     | ±5             | ±100           | 282                         | 71         | 33                    | 1697              |
| NTV0509MC               | 5                     | ±9             | ±55            | 260                         | 77         | 38                    | 682               |
| NTV0512MC               | 5                     | ±12            | ±42            | 253                         | 79         | 44                    | 343               |
| NTV0515MC               | 5                     | ±15            | ±33            | 250                         | 80         | 43                    | 188               |
| NTV1205MC               | 12                    | ±5             | ±100           | 114                         | 73         | 50                    | 559               |
| NTV1209MC               | 12                    | ±9             | ±55            | 105                         | 79         | 72                    | 375               |
| NTV1212MC               | 12                    | ±12            | ±42            | 104                         | 80         | 89                    | 243               |
| NTV1215MC               | 12                    | ±15            | ±33            | 101                         | 82         | 100                   | 154               |

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    | 5.5  | V      |
|                          | Continuous operation, 12V input types | 10.8 | 12   | 13.2 |        |
| Reflected ripple current |                                       |      | 41   | 47   | mA p-p |

### OUTPUT CHARACTERISTICS

| Parameter                    | Conditions                                  | Min. | Typ. | Max. | Units  |
|------------------------------|---|------|------|------|--------|
| Rated Power                  | T <sub>A</sub> = -40°C to 85°C              |      |      | 1.0  | 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>3</sup> | 10% load to rated load, 5V output types     |      | 10   | 12   | %      |
|                              | 10% load to rated load, 9V output types     |      | 6.5  | 8.0  |        |
|                              | 10% load to rated load, 12V output types    |      | 6.0  | 8.5  |        |
|                              | 10% load to rated load, 15V output types    |      | 6.0  | 7.0  |        |
| Ripple and Noise             | BW=DC to 20MHz, 5V output types             |      | 50   | 75   | mV p-p |
|                              | BW=DC to 20MHz, 9V output types             |      | 40   | 65   |        |
|                              | BW=DC to 20MHz, 12V output types            |      | 40   | 60   |        |
|                              | BW=DC to 20MHz, 15V output types            |      | 40   | 60   |        |

### ABSOLUTE MAXIMUM RATINGS

|   |       |
|---|-------|
| Internal power dissipation                  | 550mW |
| Input voltage V <sub>IN</sub> , NTV05 types | 7V    |
| Input voltage V <sub>IN</sub> , NTV12 types | 15V   |

1. If components are required in tape and reel format suffix order code code with -R, e.g. NTV0505MC-R.
  2. Calculated using MIL-HDBK-217F with nominal input voltage at full load.
  3. 12V input types have typically 3% less load regulation change.
- All specifications typical at T<sub>A</sub>=25°C, nominal input voltage and rated output current unless otherwise specified.

**ISOLATION CHARACTERISTICS**

| Parameter              | Conditions                | Min. | Typ. | Max. | Units |
|------------------------|---------------------------|------|------|------|-------|
| Isolation test voltage | Flash tested for 1 minute | 3000 |      |      | VDC   |
| Resistance             | Viso= 1000VDC             | 10   |      |      | GΩ    |

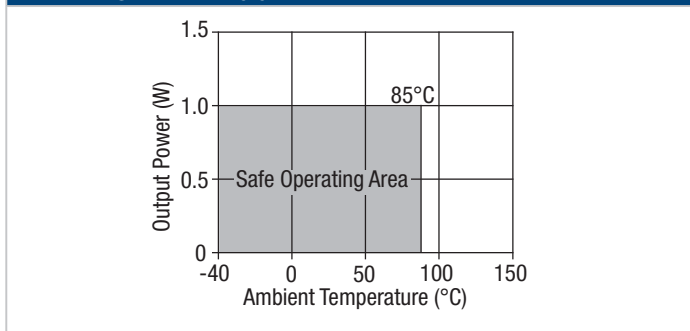
**GENERAL CHARACTERISTICS**

| Parameter           | Conditions      | Min. | Typ. | Max. | Units |
|---------------------|-----------------|------|------|------|-------|
| Switching frequency | 5V input types  |      | 115  |      | kHz   |
|                     | 12V input types |      | 120  |      |       |

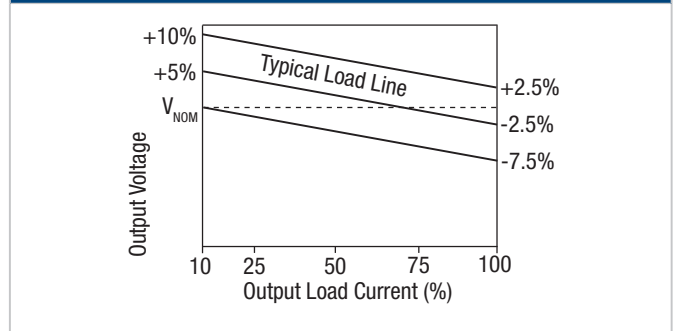
**TEMPERATURE CHARACTERISTICS**

| Parameter                      | Conditions             | Min. | Typ. | Max. | Units |
|--------------------------------|------------------------|------|------|------|-------|
| Specification                  | All output types       | -40  |      | 85   | °C    |
| Storage                        |                        | -55  |      | 125  |       |
| Case temperature above ambient | 5V output types        |      | 33   |      |       |
|                                | All other output types |      | 25   |      |       |
| Cooling                        | Free air convection    |      |      |      |       |

**TEMPERATURE DERATING GRAPH**



**TOLERANCE ENVELOPE**



**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 NTV series of DC/DC converters are all 100% production tested at their stated isolation voltage. This is 3kVDC for 1 minute.

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 NTV 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 NTV 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.

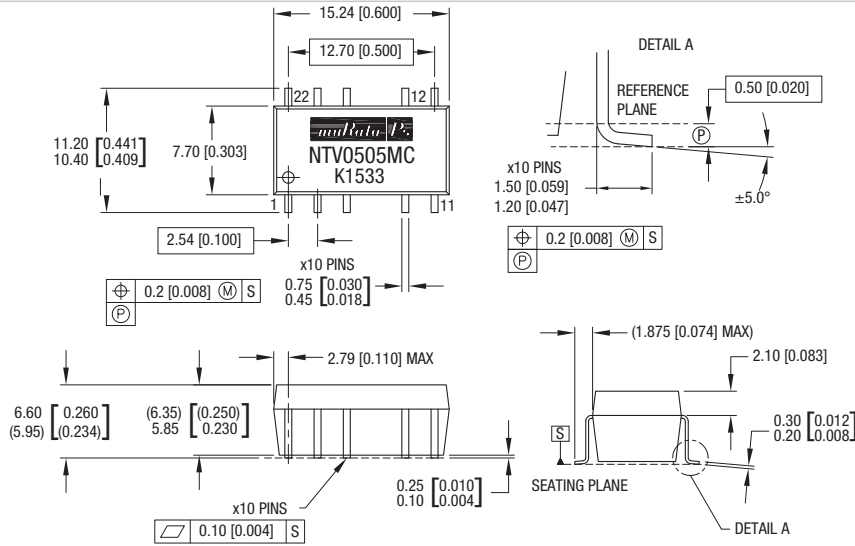
This consideration equally applies to agency recognized parts rated for better than functional isolation where the wire enamel insulation is always supplemented by a further insulation system of physical spacing or barriers.

**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%.

**PACKAGE SPECIFICATIONS**

**MECHANICAL DIMENSIONS**



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

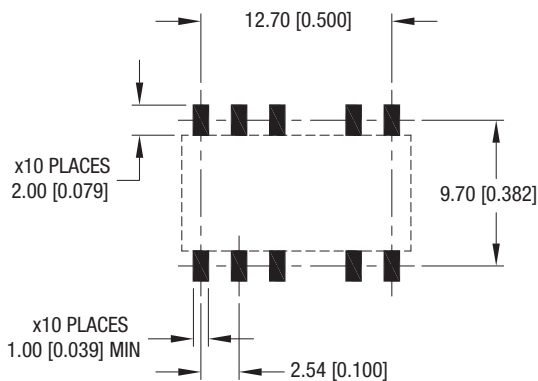
Weight: 1.53g

**PIN CONNECTIONS**

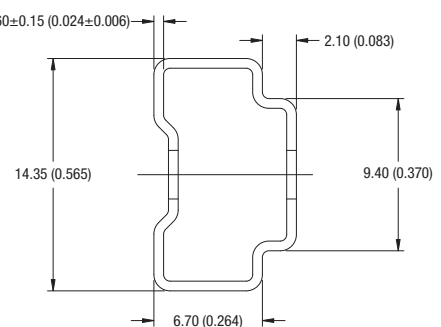
| Pin | Function |
|-----|----------|
| 1   | -VIN     |
| 3   | +VIN     |
| 5   | NA       |
| 9   | OV       |
| 11  | -VOUT    |
| 12  | NA       |
| 14  | +VOUT    |
| 18  | NA       |
| 20  | NA       |
| 22  | NA       |

NA - Not available for electrical connection.

**RECOMMENDED FOOTPRINT DETAILS**



**TUBE OUTLINE DIMENSIONS**



Unless otherwise stated all dimensions in mm±0.5 (inches ±0.02).  
Tube length : 475±2.0 (18.70±0.07).

Tube Quantity : 25

**RoHS COMPLIANCE, MSL AND PSL INFORMATION**

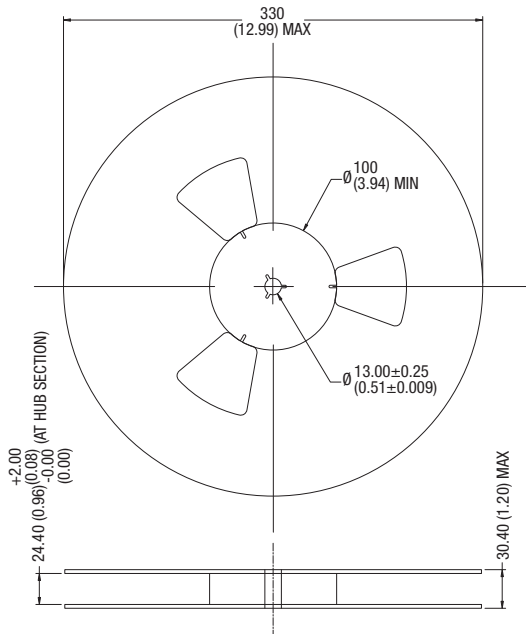


This series is compatible with RoHS soldering systems and is also backward compatible with Sn/Pb soldering systems. The NTV series has a process, moisture, and reflow sensitivity classification of MSL1 PSL R7F as defined in J-STD-020 and J-STD-075. This translates to: MSL1 = unlimited floor life, PSL R7F = Peak reflow temperature 245°C with a limitation on the time above liquidus (217°C) which for this series is 60sec max. The pin termination finish on this product series is Gold with a plating thickness of 0.05 microns minimum.

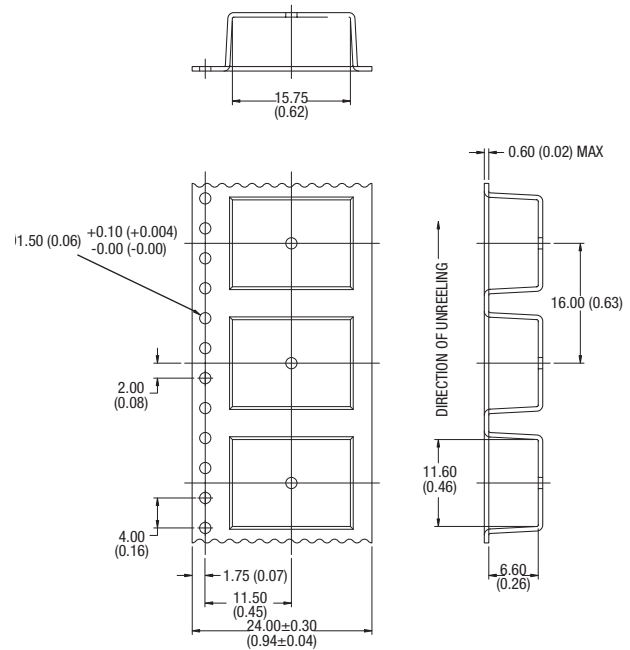
For further information please visit [www.murata-ps.com/rohs](http://www.murata-ps.com/rohs)

**TAPE & REEL SPECIFICATIONS**

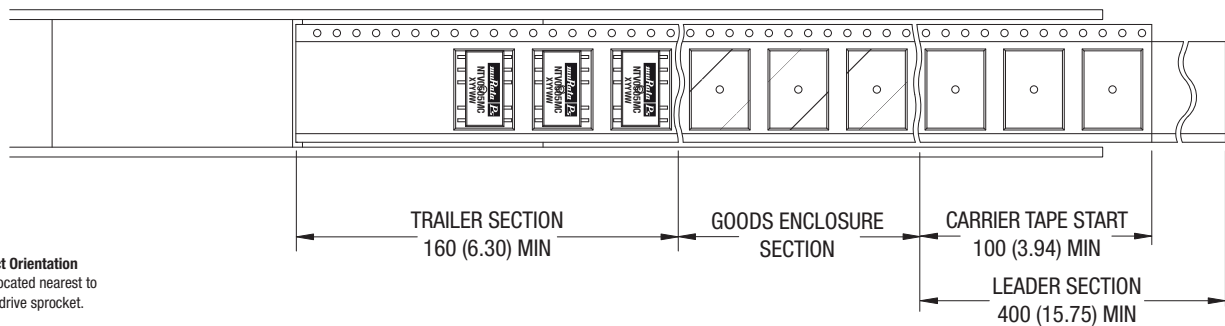
**REEL OUTLINE DIMENSIONS**



**TAPE OUTLINE DIMENSIONS**



**REEL PACKAGING DETAILS**



**Product Orientation**  
Pin 1, located nearest to carrier drive sprocket.

Reel Quantity : 500

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ISO 9001 and 14001 REGISTERED



This product is subject to the following **operating requirements** and the **Life and Safety Critical Application Sales Policy**:

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

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