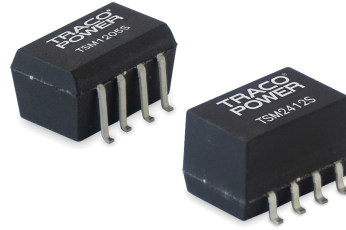


- SMD package (SOIC-8/10)
- Construction in lead frame technology
- I/O isolation 1000 VDC
- Efficiency up to 82 %
- Operating temperature -40°C to $+85^{\circ}\text{C}$
- Reflow solder temperature up to 245°C
- High accuracy of Pin coplanarity
- Available in tape and reel package
- 3-years product warranty



The TSM series are isolated DC/DC converters with 1W output power implemented in a molded plastic package with a pin accuracy suitable for automated SMD-production. The devices can be soldered without any problems in a high temperature lead free solder process. With their small footprint these converters are the economical solution for point of load power conversion, ground loop elimination, noise reduction and digital interface applications.

Models

| Order Code | Input Voltage Range | Output 1 | | Output 2 | | Efficiency typ. |
|------------|----------------------------------|----------|------------------|----------|------------------|-----------------|
| | | Vnom | I _{max} | Vnom | I _{max} | |
| TSM 0505S | 4.5 - 5.5 VDC (5 VDC nom.) | 5 VDC | 200 mA | | | 80 % |
| TSM 0509S | | 9 VDC | 110 mA | | | 78 % |
| TSM 0512S | | 12 VDC | 84 mA | | | 80 % |
| TSM 0515S | | 15 VDC | 67 mA | | | 81 % |
| TSM 0505D | | +5 VDC | 100 mA | -5 VDC | 100 mA | 75 % |
| TSM 0512D | | +12 VDC | 42 mA | -12 VDC | 42 mA | 79 % |
| TSM 0515D | | +15 VDC | 33 mA | -15 VDC | 33 mA | 79 % |
| TSM 1205S | 10.8 - 13.2 VDC (12 VDC nom.) | 5 VDC | 200 mA | | | 81 % |
| TSM 1209S | | 9 VDC | 110 mA | | | 78 % |
| TSM 1212S | | 12 VDC | 84 mA | | | 81 % |
| TSM 1215S | | 15 VDC | 67 mA | | | 82 % |
| TSM 1205D | | +5 VDC | 100 mA | -5 VDC | 100 mA | 75 % |
| TSM 1212D | | +12 VDC | 42 mA | -12 VDC | 42 mA | 80 % |
| TSM 1215D | | +15 VDC | 33 mA | -15 VDC | 33 mA | 80 % |
| TSM 2405S | 21.6 - 26.4 VDC (24 VDC nom.) | 5 VDC | 200 mA | | | 79 % |
| TSM 2409S | | 9 VDC | 110 mA | | | 77 % |
| TSM 2412S | | 12 VDC | 84 mA | | | 80 % |
| TSM 2415S | | 15 VDC | 67 mA | | | 80 % |
| TSM 2405D | | +5 VDC | 100 mA | -5 VDC | 100 mA | 74 % |
| TSM 2412D | | +12 VDC | 42 mA | -12 VDC | 42 mA | 79 % |
| TSM 2415D | | +15 VDC | 33 mA | -15 VDC | 33 mA | 79 % |

Input Specifications

| | | |
|------------------------|----------------|---|
| Input Current | - At no load | 5 Vin models: 30 mA typ. 12 Vin models: 15 mA typ. 24 Vin models: 8 mA typ. |
| | - At full load | 5 Vin models: 250 mA typ. (5 Vout model) 254 mA typ. (9 Vout model) 252 mA typ. (12 Vout model) 248 mA typ. (15 Vout model) 267 mA typ. (5 / -5 Vout model) 255 mA typ. (12 / -12 Vout model) 251 mA typ. (15 / -15 Vout model) 12 Vin models: 103 mA typ. (5 Vout model) 106 mA typ. (9 Vout model) 104 mA typ. (12 Vout model) 102 mA typ. (15 Vout model) 111 mA typ. (5 / -5 Vout model) 105 mA typ. (12 / -12 Vout model) 103 mA typ. (15 / -15 Vout model) 24 Vin models: 53 mA typ. (5 Vout model) 54 mA typ. (9 Vout model) 53 mA typ. (12 Vout model) 52 mA typ. (15 Vout model) 56 mA typ. (5 / -5 Vout model) 53 mA typ. (12 / -12 Vout model) 52 mA typ. (15 / -15 Vout model) |
| Surge Voltage | | 5 Vin models: 9 VDC max. (1 s max.) 12 Vin models: 18 VDC max. (1 s max.) 24 Vin models: 30 VDC max. (1 s max.) |
| Recommended Input Fuse | | 5 Vin models: 500 mA (slow blow) 12 Vin models: 200 mA (slow blow) 24 Vin models: 100 mA (slow blow) (The need of an external fuse has to be assessed in the final application.) |
| Input Filter | | Internal Capacitor |

Output Specifications

| | | |
|--------------------------|--------------------------------------|---|
| Voltage Set Accuracy | | ±3% max. |
| Regulation | - Input Variation (1% Vin step) | single output models: 1.5% max. dual output models: 1.5% max. |
| | - Load Variation (20 - 100%) | single output models: 10% max. dual output models: 10% max. (Output 1) 10% max. (Output 2) |
| | - Voltage Balance (symmetrical load) | dual output models: 1% max. |
| | Ripple and Noise | - 20 MHz Bandwidth 120 mVp-p max. (To further reduce Ripple and Noise, a capacitor with 0.47 µF X7R is recommended.) |
| Capacitive Load | | 33 µF max. |
| Minimum Load | | 2.2 % of Iout max. (Operation at lower load will not damage the converter, but it may not meet all specifications) |
| Temperature Coefficient | | ±0.02 %/K max. |
| Start-up Time | | 280 ms max. |
| Short Circuit Protection | | Limited 0.5 s max., Automatic recovery |

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

General Specifications

| | | |
|----------------------------|--|---|
| Relative Humidity | | 95% max. (non condensing) |
| Temperature Ranges | - Operating Temperature - Case Temperature - Storage Temperature | -40°C to +85°C +105°C max. -50°C to +125°C |
| Power Derating | - High Temperature | 2.5 %/K above 65°C (24 Vin single models) 4 %/K above 80°C (other models) |
| Cooling System | | Natural convection (20 LFM) |
| Switching Frequency | | 50 - 140 kHz (PFM) 100 kHz typ. (PFM) |
| Insulation System | | Functional Insulation |
| Isolation Test Voltage | - Input to Output, 60 s - Input to Output, 1 s | 1'000 VDC 1'200 VDC |
| Isolation Resistance | - Input to Output, 500 VDC | 1'000 MΩ min. |
| Isolation Capacitance | - Input to Output, 100 kHz, 1 V | 40 pF typ. 100 pF max. |
| Reliability | - Calculated MTBF | 2'000'000 h (MIL-HDBK-217F, ground benign) |
| Moisture Sensitivity (MSL) | | Level 3 (J-STD-033C) |
| Washing Process | | Allowed (hermetical product) |
| | See Cleaning Guideline: | www.tracopower.com/info/cleaning.pdf |
| Housing Material | | Epoxy (UL 94 V-0 rated) |
| Potting Material | | Overmold Compound |
| Pin Material | | Nickel-Iron (Alloy 42) |
| Pin Foundation Plating | | Nickel (2.5 - 3 μm) |
| Pin Surface Plating | | Tin (10 - 15 μm), matte |
| Housing Type | | Overmold |
| Mounting Type | | PCB Mount |
| Connection Type | | SMD (Surface-Mount Device) |
| Footprint Type | | SMD8 (single output models) SMD 10 Pin (dual output models) |
| Soldering Profile | | Reflow Soldering (J-STD-020E) 245°C / 10 s max. |
| Weight | - 5 Vin input - 12 Vin input - 24 Vin input - 5 Vin input - 12 Vin input - 24 Vin input | 5 Vout models: 1.5 g 9 Vout models: 1.5 g 12 Vout models: 1.5 g 15 Vout models: 1.5 g 5 Vout models: 1.5 g 9 Vout models: 1.5 g 12 Vout models: 1.5 g 15 Vout models: 1.5 g 5 Vout models: 1.8 g 9 Vout models: 1.8 g 12 Vout models: 1.8 g 15 Vout models: 1.8 g 5 / -5 Vout models: 1.8 g 12 / -12 Vout models: 1.8 g 15 / -15 Vout models: 1.8 g 5 / -5 Vout models: 1.8 g 12 / -12 Vout models: 1.8 g 15 / -15 Vout models: 1.8 g 5 / -5 Vout models: 2.2 g 12 / -12 Vout models: 2.2 g 15 / -15 Vout models: 2.2 g |
| Thermal Impedance | - Case to Ambient | 67.6 K/W typ. |

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

Environmental Compliance - REACH Declaration

www.tracopower.com/info/reach-declaration.pdf

REACH SVHC list compliant

REACH Annex XVII compliant

- RoHS Declaration

www.tracopower.com/info/rohs-declaration.pdf

Exemptions: No Exemptions

Supporting Documents

Overview Link (for additional Documents)

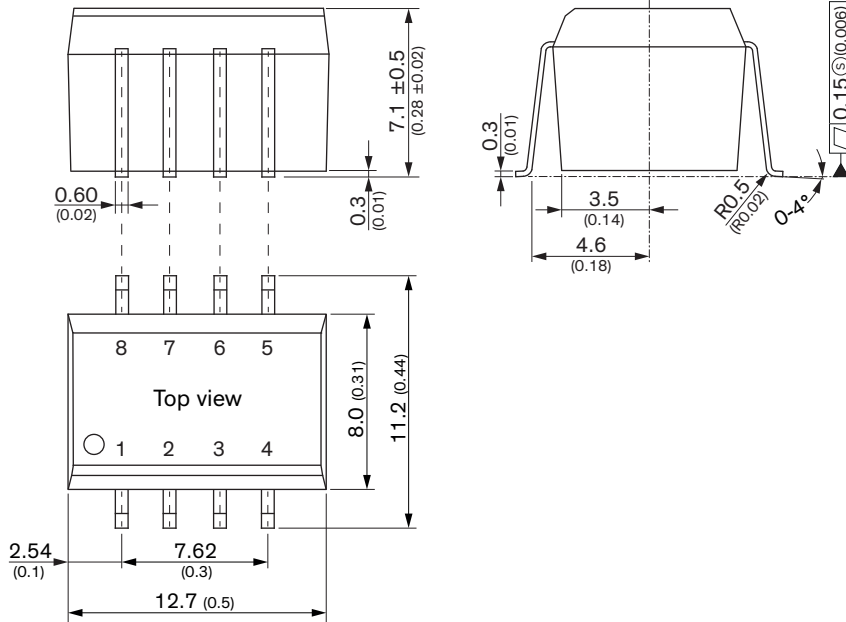
www.tracopower.com/overview/tsm

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

Outline Dimensions

Single Output Models

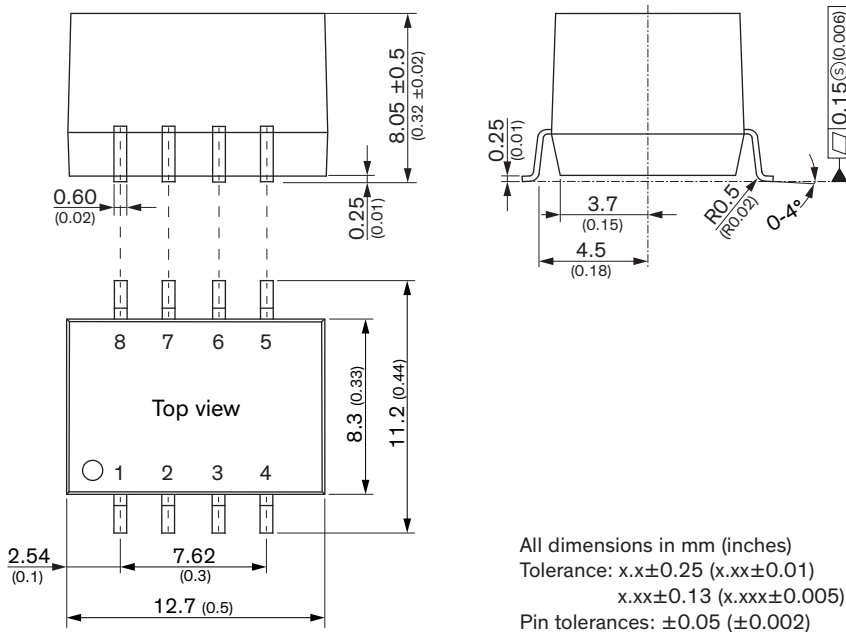
5 Vin & 12 Vin Models



| Pinout | |
|--------|------------|
| Pin | Function |
| 1 | -Vin (GND) |
| 2 | +Vin (Vcc) |
| 3 | NTC |
| 4 | -Vout |
| 5 | +Vout |
| 6 | NTC |
| 7 | NTC |
| 8 | NTC |

NTC: Not to connect

24 Vin Models

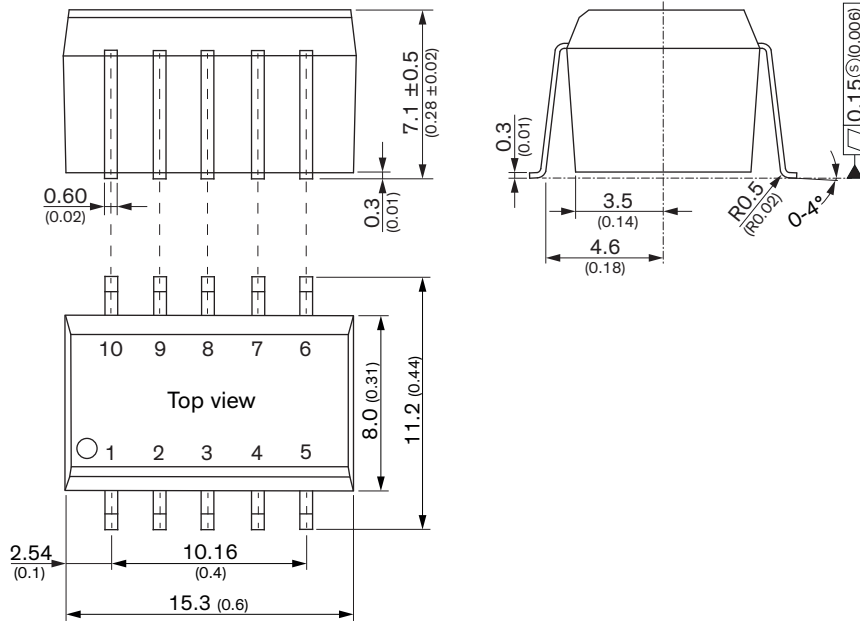


All dimensions in mm (inches)
 Tolerance: x.x±0.25 (x.xx±0.01)
 x.xx±0.13 (x.xxx±0.005)
 Pin tolerances: ±0.05 (±0.002)

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

Dual Output Models

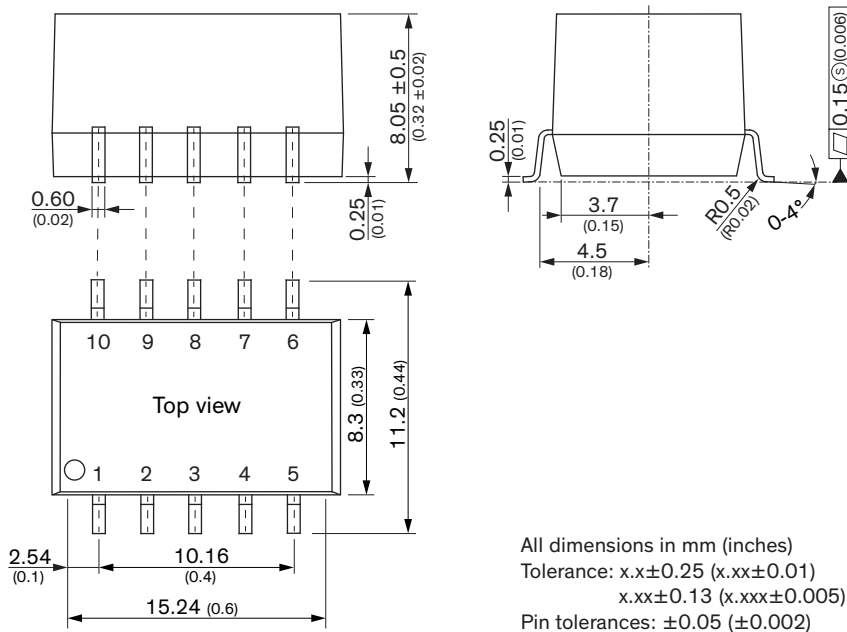
5 Vin & 12 Vin Models



| Pinout | |
|--------|------------|
| Pin | Function |
| 1 | -Vin (GND) |
| 2 | +Vin (Vcc) |
| 3 | NTC |
| 4 | Common |
| 5 | -Vout |
| 6 | NTC |
| 7 | +Vout |
| 8 | NTC |
| 9 | NTC |
| 10 | NTC |

NTC: Not to connect

24 Vin Models

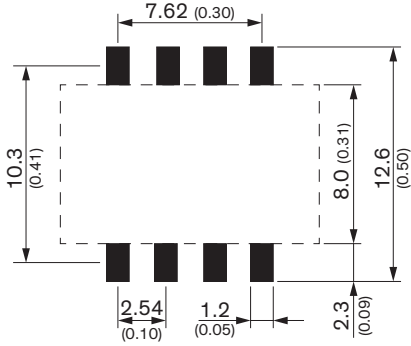


All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

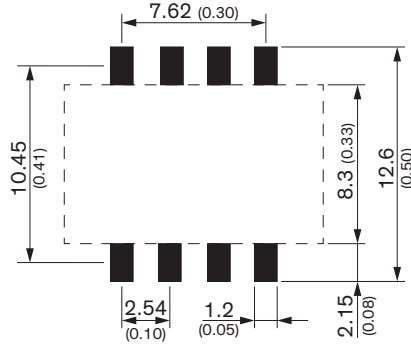
Recommended Solder Pad Layout

Single Output Models

5 Vin & 12 Vin Models

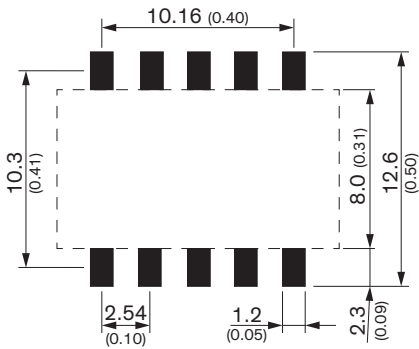


24 Vin Models

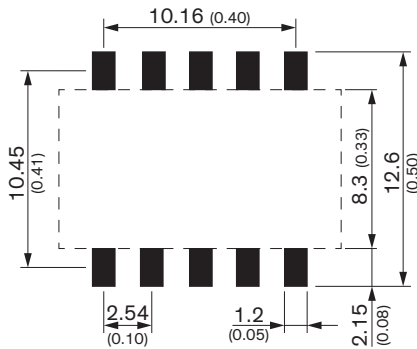


Dual Output Models

5 Vin & 12 Vin Models



24 Vin Models



Dimensions in mm (inch)