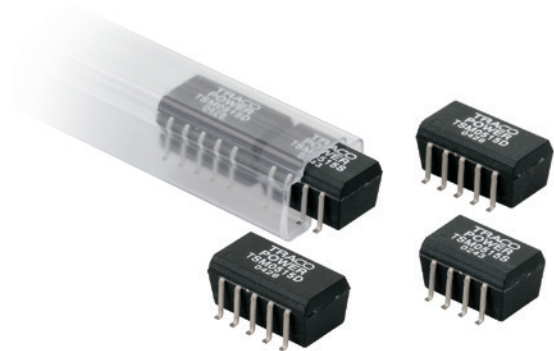


#### Features

- ◆ SMD package (SOIC-14/18)
- ◆ Construction in lead frame technology
- ◆ Isolated single and dual output
- ◆ I/O isolation 1'000 VDC
- ◆ High efficiency
- ◆ Operating temperature  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- ◆ Reflow solder temperature up to  $245^{\circ}\text{C}$
- ◆ High accuracy of Pin co-planarity
- ◆ Available in tape and reel package
- ◆ Lead free design, RoHS compliant
- ◆ 3-year 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

| Ordercode | Input voltage     | Output voltage | Output current max. | Efficiency typ. |
|-----------|-------------------|----------------|---------------------|-----------------|
| TSM 0505S | 5 VDC $\pm 10\%$  | 5 VDC          | 200 mA              | 80 %            |
| TSM 0509S |                   | 9 VDC          | 110 mA              | 78 %            |
| TSM 0512S |                   | 12 VDC         | 80 mA               | 80 %            |
| TSM 0515S |                   | 15 VDC         | 65 mA               | 81 %            |
| TSM 0505D |                   | $\pm 5$ VDC    | $\pm 100$ mA        | 75 %            |
| TSM 0512D |                   | $\pm 12$ VDC   | $\pm 40$ mA         | 79 %            |
| TSM 0515D |                   | $\pm 15$ VDC   | $\pm 30$ mA         | 79 %            |
| TSM 1205S | 12 VDC $\pm 10\%$ | 5 VDC          | 200 mA              | 81 %            |
| TSM 1209S |                   | 9 VDC          | 110 mA              | 78 %            |
| TSM 1212S |                   | 12 VDC         | 80 mA               | 81 %            |
| TSM 1215S |                   | 15 VDC         | 65 mA               | 82 %            |
| TSM 1205D |                   | $\pm 5$ VDC    | $\pm 100$ mA        | 75 %            |
| TSM 1212D |                   | $\pm 12$ VDC   | $\pm 40$ mA         | 80 %            |
| TSM 1215D |                   | $\pm 15$ VDC   | $\pm 30$ mA         | 80 %            |
| TSM 2405S | 24 VDC $\pm 10\%$ | 5 VDC          | 200 mA              | 81 %            |
| TSM 2409S |                   | 9 VDC          | 110 mA              | 78 %            |
| TSM 2412S |                   | 12 VDC         | 80 mA               | 81 %            |
| TSM 2415S |                   | 15 VDC         | 65 mA               | 82 %            |
| TSM 2405D |                   | $\pm 5$ VDC    | $\pm 100$ mA        | 75 %            |
| TSM 2412D |                   | $\pm 12$ VDC   | $\pm 40$ mA         | 80 %            |
| TSM 2415D |                   | $\pm 15$ VDC   | $\pm 30$ mA         | 80 %            |

## Input Specifications

|                                   |                                                                                                             |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------|
| Input current no load / full load | 5 Vin models: 30 mA / 260 mA typ.<br>12 Vin models: 15 mA / 110 mA typ.<br>24 Vin models: 8 mA / 55 mA typ. |
| Surge voltage (1 sec. max.)       | 5 Vin models: 9 V max.<br>12 Vin models: 18 V max.<br>24 Vin models: 30 V max.                              |
| Reverse voltage protection        | 0.3 A max.                                                                                                  |
| Reflected input ripple current    | can be reduced by ext. 1–2.2 µF polyester film capacitor                                                    |
| Input filter                      | internal capacitors                                                                                         |

## Output Specifications

|                                      |                                                                                   |
|--------------------------------------|-----------------------------------------------------------------------------------|
| Voltage set accuracy                 | ±3 %                                                                              |
| Voltage balance (dual output models) | ±1 % max.                                                                         |
| Regulation                           | – Input variation 1.2 % / 1 % change Vin<br>– Load variation 20 – 100 % 10 % max. |
| Ripple and noise (20 MHz Bandwidth)  | 120 mVpk-pk max.                                                                  |
| Temperature coefficient              | ±0.02 %/°C                                                                        |
| Short circuit protection             | limited 1 sec. max.                                                               |
| Capacitive load                      | single output models: 22 µF max.<br>dual output models: 10 µF max.                |

## General Specifications

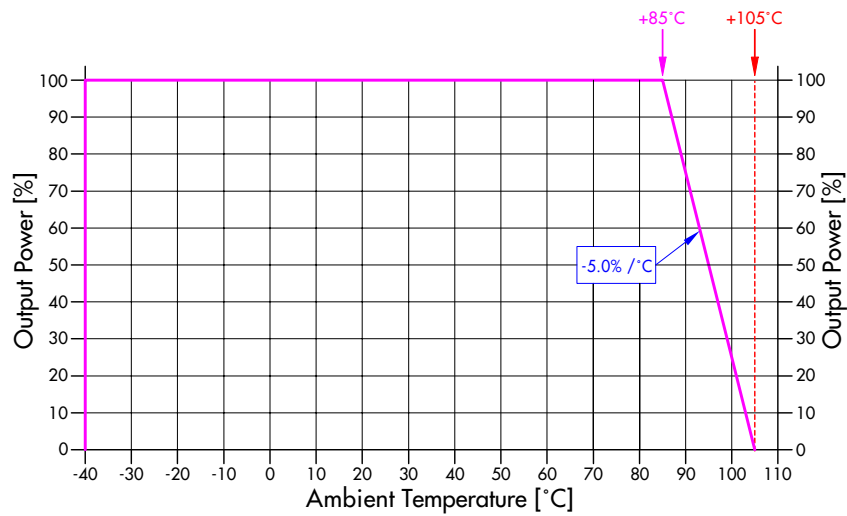
|                                                                       |                                                                                                                                                                      |
|-----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature ranges                                                    | – Operating (see also enclosed derating curve) –40°C to +85°C (no derating)<br>– Storage –55°C to +125°C                                                             |
| Humidity (non condensing)                                             | 95 % rel H max.                                                                                                                                                      |
| Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign) | >2'000'000 h                                                                                                                                                         |
| Isolation voltage (60 sec.)                                           | – Input/Output 1'000 VDC                                                                                                                                             |
| Isolation capacity                                                    | – Input/Output 40 pF typ.                                                                                                                                            |
| Isolation resistance                                                  | – Input/Output >1'000 Mohm                                                                                                                                           |
| Switching frequency                                                   | 100 kHz typ. (frequency modulation)                                                                                                                                  |
| Frequency change over line and load                                   | ±30 %                                                                                                                                                                |
| Environmental compliance                                              | – Reach <a href="http://www.tracopower.com/products/reach-declaration.pdf">www.tracopower.com/products/reach-declaration.pdf</a><br>– RoHS RoHS directive 2011/65/EU |

## Physical Specifications

|                                                 |                                                                                                              |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Casing material                                 | epoxy molding compound<br>(flammability to UL 94V-0 rated)                                                   |
| Package weight                                  | single output models: 1.2 g (0.04 oz)<br>dual output models: 1.5 g (0.05 oz)<br>24Vin modes: tba             |
| Reflow soldering profile (IPC/JEDEC J-STD-020D) | peak temp. 245°C (10 sec. max.)<br>217°C for 90 sec. max. Convection reflow<br>solder process is recommended |
| Packaging                                       | <a href="http://www.tracopower.com/products/tsm-pack.pdf">www.tracopower.com/products/tsm-pack.pdf</a>       |

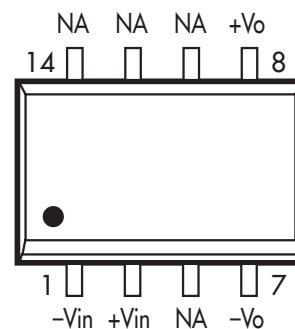
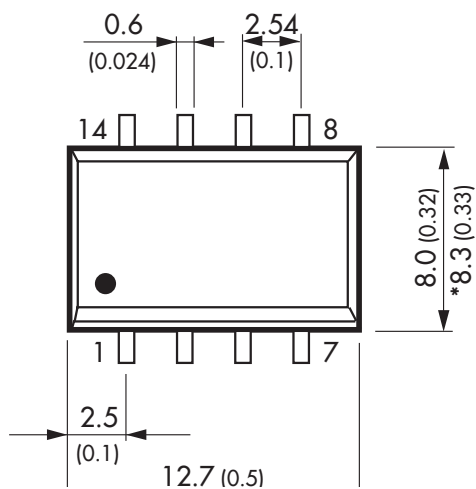
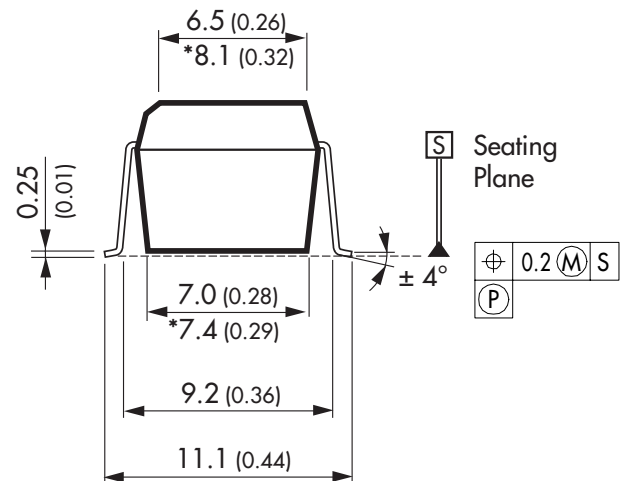
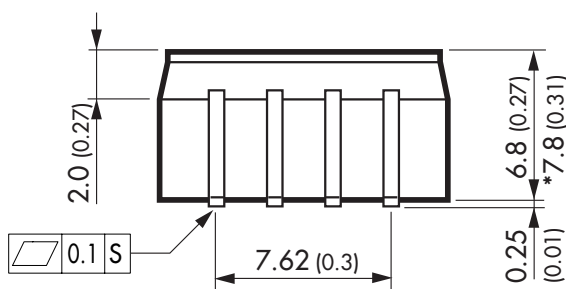
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

**Derating all TSM Models**



**Outline Dimensions**

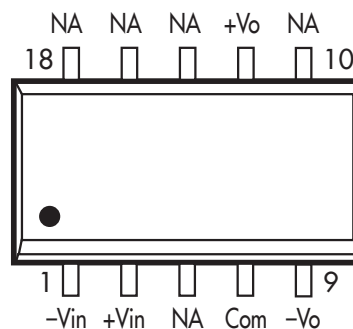
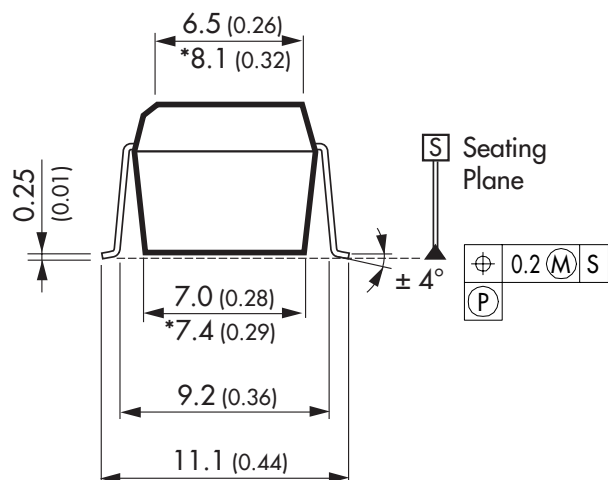
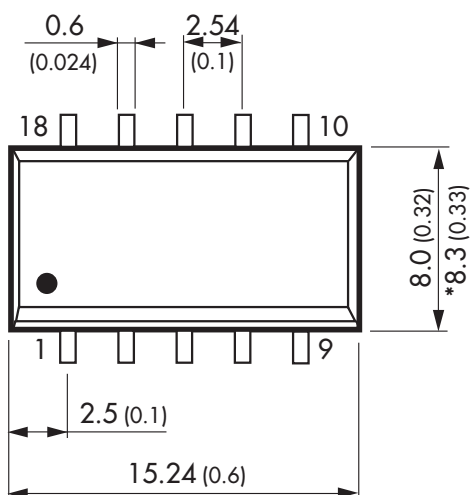
**TSM Single Output Models**



\* Dimensios for 24Vin models  
NA = not available for electrical connection

Dimensions in [mm], (I) = Inch  
Pin pitch tolerances:  $\pm 0.13$  ( $\pm 0.0051$ )  
Other tolerances:  $\pm 0.25$  ( $\pm 0.01$ )

## TSM Dual Output Models

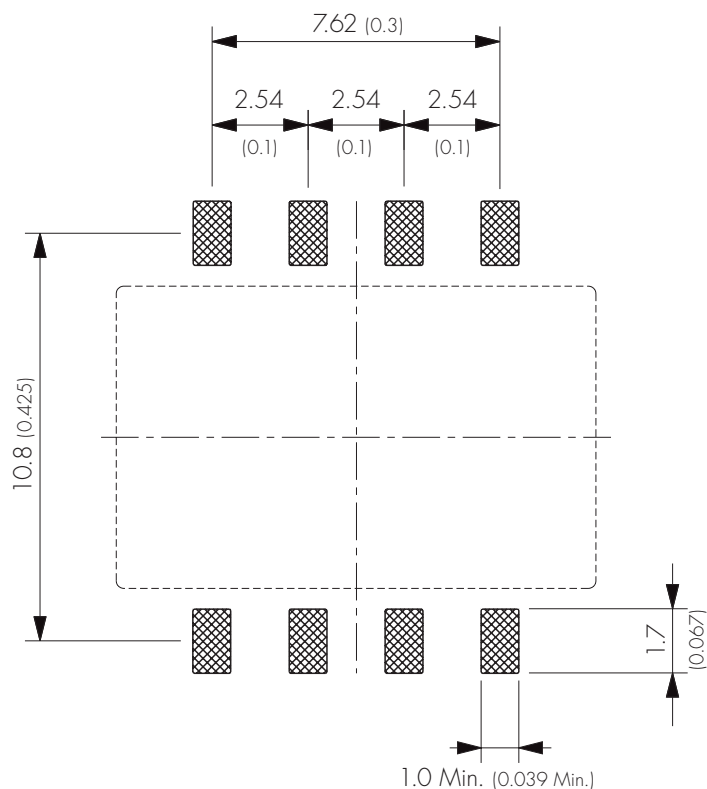


\* Dimensios for 24Vin models  
NA = not available for electrical connection

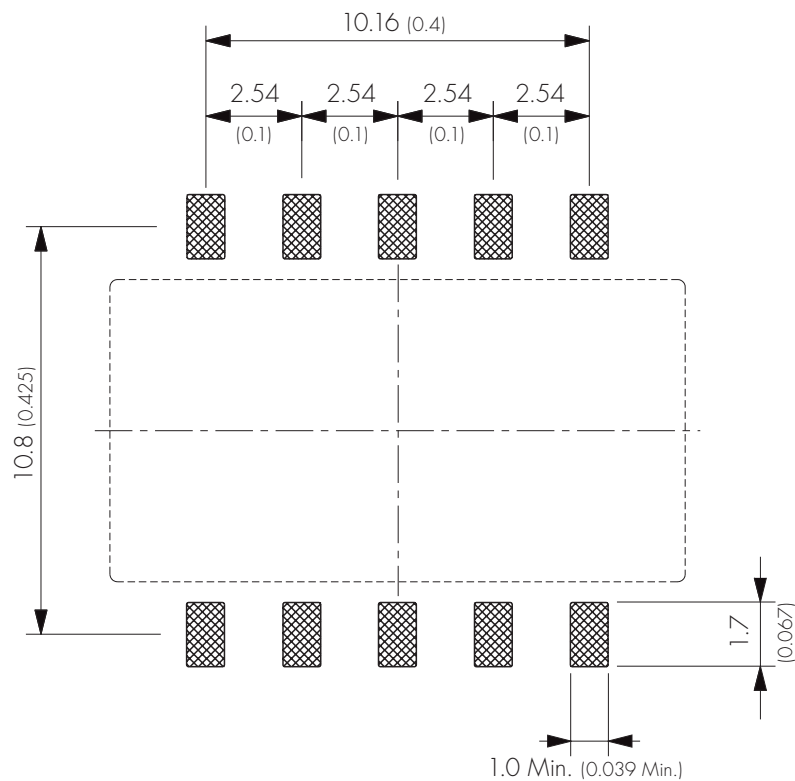
Dimensions in [mm], ( ) = Inch  
Pin pitch tolerances:  $\pm 0.13$  ( $\pm 0.0051$ )  
Other tolerances:  $\pm 0.25$  ( $\pm 0.01$ )

**Solder Pad Dimensions mm (inches)**

**TSM Single Output Models**



**TSM Dual Output Models**



Specifications can be changed without notice! Make sure you are using the latest documentation, downloadable at [www.tracopower.com](http://www.tracopower.com)