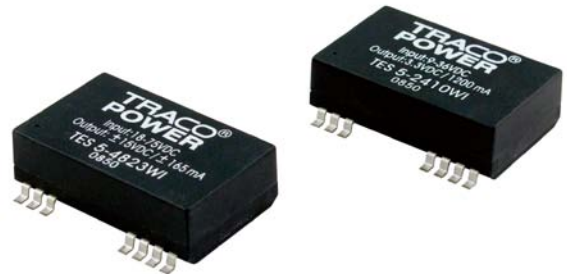


#### Features

- ◆ Compact SMD package
- ◆ 33.4 x 25.6 mm footprint
- ◆ Ultra-wide 4:1 input voltage range
- ◆ I/O isolation 1500 VDC
- ◆ Operating temp. range  $-40^{\circ}\text{C}$  to  $+71^{\circ}\text{C}$
- ◆ Short circuit protection
- ◆ Input filter to meet EN 55022, class A
- ◆ Remote On/Off
- ◆ High accuracy of pin co-planarity
- ◆ Qualified for leadfree reflow solder process according IPC/JEDEC J-STD-020D
- ◆ 3-year product warranty



The TES-5WI series is a family of high performance 5W dc/dc-converter modules in a low profile SMD package with compact dimensions. The 14 modules feature ultra-wide 4:1 input ranges with tightly regulated output voltage. High efficiency allows an operating temperature range of  $-40$  to  $+71^{\circ}\text{C}$  at full load.

Further features are built-in EMI-filter to meet EN 55022 class A without external components and remote On/Off control. The products comply with IPC J-STD-020D and are qualified for high temperature lead-free reflow solder process.

#### Models

| Order code   | Input voltage                          | Output voltage | Output current max. | Efficiency typ. |
|--------------|----------------------------------------|----------------|---------------------|-----------------|
| TES 5-2410WI | <b>9 – 36 VDC</b><br>(24 VDC nominal)  | 3.3 VDC        | 1'200 mA            | 76 %            |
| TES 5-2411WI |                                        | 5 VDC          | 1'000 mA            | 80 %            |
| TES 5-2412WI |                                        | 12 VDC         | 420 mA              | 83 %            |
| TES 5-2413WI |                                        | 15 VDC         | 335 mA              | 83 %            |
| TES 5-2421WI |                                        | $\pm 5$ VDC    | $\pm 500$ mA        | 80 %            |
| TES 5-2422WI |                                        | $\pm 12$ VDC   | $\pm 210$ mA        | 83 %            |
| TES 5-2423WI |                                        | $\pm 15$ VDC   | $\pm 165$ mA        | 83 %            |
| TES 5-4810WI | <b>18 – 75 VDC</b><br>(48 VDC nominal) | 3.3 VDC        | 1'200 mA            | 76 %            |
| TES 5-4811WI |                                        | 5 VDC          | 1'000 mA            | 80 %            |
| TES 5-4812WI |                                        | 12 VDC         | 420 mA              | 83 %            |
| TES 5-4813WI |                                        | 15 VDC         | 335 mA              | 83 %            |
| TES 5-4821WI |                                        | $\pm 5$ VDC    | $\pm 500$ mA        | 80 %            |
| TES 5-4822WI |                                        | $\pm 12$ VDC   | $\pm 210$ mA        | 83 %            |
| TES 5-4823WI |                                        | $\pm 15$ VDC   | $\pm 165$ mA        | 83 %            |

|                                            |                                                                     |
|--------------------------------------------|---------------------------------------------------------------------|
| Input current (full load)                  | 24 V models: 250 mA typ.<br>48 V models: 125 mA typ.                |
| Input current (no load)                    | 24 V models: 20 mA typ.<br>48 V models: 10 mA typ.                  |
| Start-up voltage / under voltage shut down | 24 V models: 9 VDC / 8 VDC typ.<br>48 V models: 18 VDC / 16 VDC typ |
| Surge voltage (1 sec. max.)                | 24 V models: 50 V max.<br>48 V models: 100 V max.                   |
| Reverse voltage protection                 | 1.0 A max.                                                          |
| Reflected input ripple current             | 24 V models: 10 mA typ.<br>48 V models: 5 mA typ.                   |
| Input filter                               | EN 55022 class A, FCC part 15, level A                              |

|                                           |                                                                                                                                       |                                                                                                                      |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Voltage set accuracy                      |                                                                                                                                       | ±2 %                                                                                                                 |
| Regulation                                | – Input variation Vin min. to Vin max.<br>– Load variation 10 – 100 %      single output models:<br>dual output models balanced load: | 1.0 % max.<br>1.0 % max.<br>3.0 % max.                                                                               |
| Minimum load                              |                                                                                                                                       | 10 % of rated max current (operation at lower load condition is safe but a higher output ripple will be experienced) |
| Temperature coefficient                   |                                                                                                                                       | ±0.02 %/°C max.                                                                                                      |
| Ripple and noise                          |                                                                                                                                       | 85 mVpk-pk max.                                                                                                      |
| Dynamic load response (25% load change)   |                                                                                                                                       | 6 % max. peak variation<br>500 µS max. response time                                                                 |
| Transient response (25% load step change) |                                                                                                                                       | 200 µs typ.                                                                                                          |
| Current limitation                        |                                                                                                                                       | >115 % of Iout max.                                                                                                  |
| Short circuit protection                  |                                                                                                                                       | indefinite, automatic recovery                                                                                       |
| Capacitive load                           | 3.3 & 5 VDC models:<br>12 VDC models:<br>15 VDC models:<br>±5 VDC models:<br>±12 VDC models:<br>±15 VDC models:                       | 2000 µF<br>470 µF<br>330 µF<br>±680 µF<br>±330 µF<br>±220 µF                                                         |
| Remote On/Off                             | – On:<br>– Off:<br>– Off idle current:                                                                                                | 2.5 to 5.5 V or open circuit<br>–0.7 to 0.8 V or short circuit pin 3 and pin 1/2<br>10 mA                            |

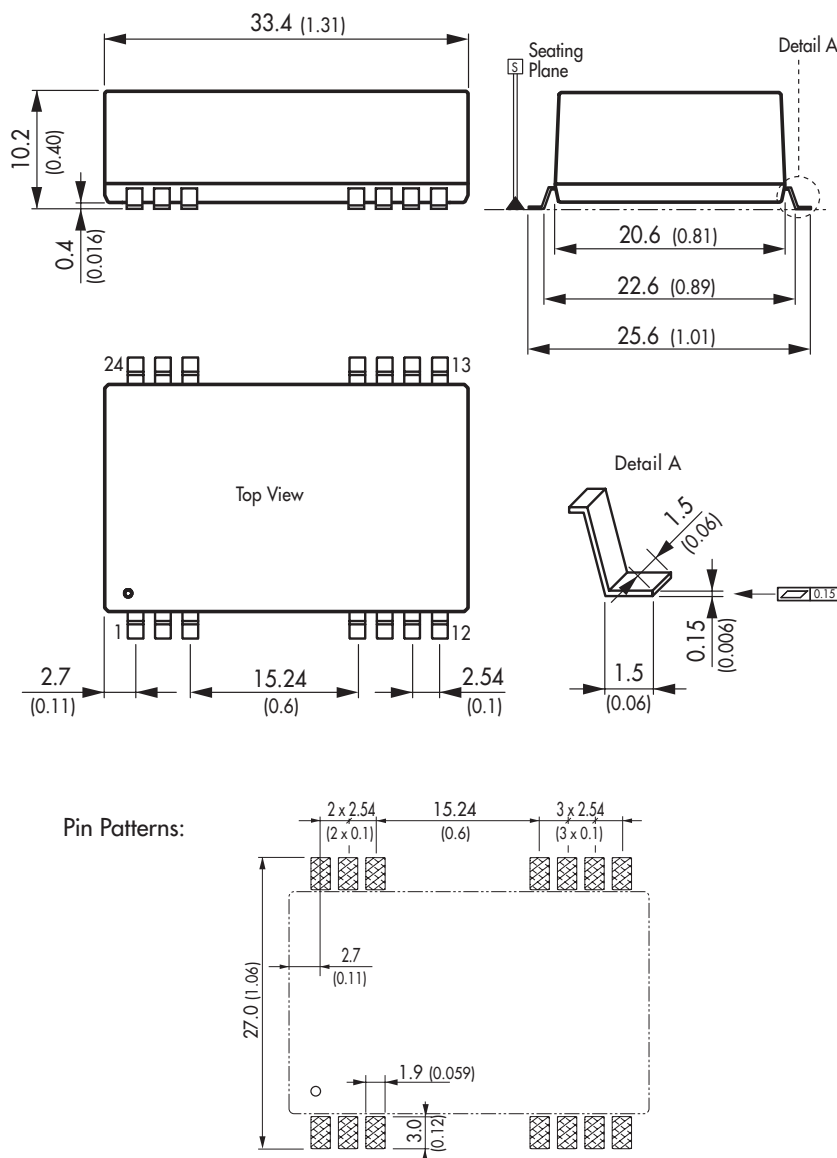
|                                                                     |                                                                                                              |                                                                                                                                           |
|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature ranges                                                  | <ul style="list-style-type: none"> <li>– Operating</li> <li>– Case temperature</li> <li>– Storage</li> </ul> | –40°C to +71°C<br>+100°C max.<br>–40°C to +125°C                                                                                          |
| Humidity (non condensing)                                           |                                                                                                              | 95 % rel H max.                                                                                                                           |
| Reliability, calculated MTTF (MIL-HDBK-217F, @+25°C, ground benign) |                                                                                                              | >1'000'000 h                                                                                                                              |
| Isolation voltage (60 sec.)                                         | – Input/Output                                                                                               | 1'500 VDC                                                                                                                                 |
| Isolation capacitance                                               | – Input/Output                                                                                               | 750 pF max.                                                                                                                               |
| Isolation resistance                                                | – Input/Output                                                                                               | >1'000 Mohm                                                                                                                               |
| Switching frequency                                                 |                                                                                                              | 340 kHz typ. (frequency modulation PFM)                                                                                                   |
| Safety standards                                                    |                                                                                                              | UL 60950-1, IEC/EN 60950-1                                                                                                                |
| Safety approvals                                                    |                                                                                                              | CSA File No. 226037<br><a href="http://directories.csa-international.org">http://directories.csa-international.org</a><br>(entry pending) |

<http://www.tracopower.com>

## Physical Specifications

|                                 |                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Casing material                 | non conductive plastic (UL 94V-0 rated)                                                                                     |
| Package weight                  | 14 g (0.49 oz)                                                                                                              |
| Lead-free reflow solder process | as per J-STD-020D.01 (to find at:<br><a href="http://www.jedec.org">www.jedec.org</a> - free registration required)         |
| Moisture sensivity level (MSL)  | level 2 as per J-STD-033B.01 (to find at:<br><a href="http://www.jedec.org">www.jedec.org</a> - free registration required) |
| Washing process                 | <a href="http://www.tracopower.com/products/smd-wash.pdf">www.tracopower.com/products/smd-wash.pdf</a>                      |
| Packaging                       | <a href="http://www.tracopower.com/products/tes5wi-pack.pdf">www.tracopower.com/products/tes5wi-pack.pdf</a>                |

## Outline Dimensions



| Pin-Out |               |               |
|---------|---------------|---------------|
| Pin     | Single        | Dual          |
| 1       | Remote On/Off | Remote On/Off |
| 2       | -Vin (GND)    | -Vin (GND)    |
| 3       | -Vin (GND)    | -Vin (GND)    |
| 9       | No con.       | Common        |
| 10      | No con.       | No con.       |
| 11      | No con.       | -Vout         |
| 12      | No con.       | No con.       |
| 13      | No con.       | No con.       |
| 14      | +Vout         | +Vout         |
| 15      | No con.       | No con.       |
| 16      | -Vout         | Common        |
| 22      | +Vin (Vcc)    | +Vin (Vcc)    |
| 23      | +Vin (Vcc)    | +Vin (Vcc)    |
| 24      | No con.       | No con.       |

Dimensions in [mm], ( ) = Inch  
Tolerances  $\pm 0.25$  ( $\pm 0.02$ )  
Pin pitch tolerances  $\pm 0.13$  ( $\pm 0.005$ )

Specifications can be changed any time without notice.