DC/DC Converter

- Small SMD package with standard footprint
- I/O isolation voltage 3000 VDC
- Unregulated device
- Single- and dual output models
- High efficiency up to 80%
- Operating temperature range –40°C to +90°C
- High accuracy of pin co-planarity
- Qualified for leadfree reflow solder process according IPC/JEDEC J-STD-020E
- Available in tape and reel package
- 3-year product warranty

The TES 1V series are miniature, 1W DC/DC-converters with high isolation in a SMD package. With a new package design these converters are qualified for the higher temperatures requested by lead-free reflow solder processes. With the small footprint, these converters are the ideal solution for board level power distribution, mainly for applications in the industrial- and telecom field. For automated SMD production lines the devices can be supplied in standard tape and reel package.

<table>
<thead>
<tr>
<th>Models</th>
<th>Order Code</th>
<th>Input Voltage Range</th>
<th>Output 1</th>
<th>Output 2</th>
<th>Efficiency typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Vnom</td>
<td>Imax</td>
<td>Vnom</td>
<td>Imax</td>
</tr>
<tr>
<td>TES 1-0510V</td>
<td>4.5 - 5.5 VDC</td>
<td>3.3 VDC</td>
<td>260 mA</td>
<td>5 VDC</td>
<td>200 mA</td>
</tr>
<tr>
<td>TES 1-0511V</td>
<td>(5 VDC nom.)</td>
<td>12 VDC</td>
<td>84 mA</td>
<td>15 VDC</td>
<td>67 mA</td>
</tr>
<tr>
<td>TES 1-0512V</td>
<td></td>
<td>+5 VDC</td>
<td>100 mA</td>
<td>−5 VDC</td>
<td>100 mA</td>
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<tr>
<td>TES 1-0513V</td>
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<td>+12 VDC</td>
<td>42 mA</td>
<td>−12 VDC</td>
<td>42 mA</td>
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<tr>
<td>TES 1-0521V</td>
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<td>+15 VDC</td>
<td>34 mA</td>
<td>−15 VDC</td>
<td>34 mA</td>
</tr>
<tr>
<td>TES 1-0522V</td>
<td>10.8 - 13.2 VDC</td>
<td>3.3 VDC</td>
<td>260 mA</td>
<td>5 VDC</td>
<td>200 mA</td>
</tr>
<tr>
<td>TES 1-0523V</td>
<td>(12 VDC nom.)</td>
<td>12 VDC</td>
<td>84 mA</td>
<td>15 VDC</td>
<td>67 mA</td>
</tr>
<tr>
<td>TES 1-1210V</td>
<td></td>
<td>+5 VDC</td>
<td>100 mA</td>
<td>−5 VDC</td>
<td>100 mA</td>
</tr>
<tr>
<td>TES 1-1211V</td>
<td></td>
<td>+12 VDC</td>
<td>42 mA</td>
<td>−12 VDC</td>
<td>42 mA</td>
</tr>
<tr>
<td>TES 1-1212V</td>
<td></td>
<td>+15 VDC</td>
<td>34 mA</td>
<td>−15 VDC</td>
<td>34 mA</td>
</tr>
<tr>
<td>TES 1-1213V</td>
<td></td>
<td>10.8 - 13.2 VDC</td>
<td>3.3 VDC</td>
<td>260 mA</td>
<td>5 VDC</td>
</tr>
<tr>
<td>TES 1-1221V</td>
<td>(24 VDC nom.)</td>
<td>12 VDC</td>
<td>84 mA</td>
<td>15 VDC</td>
<td>67 mA</td>
</tr>
<tr>
<td>TES 1-1222V</td>
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<td>+5 VDC</td>
<td>100 mA</td>
<td>−5 VDC</td>
<td>100 mA</td>
</tr>
<tr>
<td>TES 1-1223V</td>
<td></td>
<td>+12 VDC</td>
<td>42 mA</td>
<td>−12 VDC</td>
<td>42 mA</td>
</tr>
<tr>
<td>TES 1-2410V</td>
<td></td>
<td>+15 VDC</td>
<td>34 mA</td>
<td>−15 VDC</td>
<td>34 mA</td>
</tr>
</tbody>
</table>

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January 7, 2022
### 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: 260 mA max.  
|              | 12 Vin models: 110 mA max.  
|              | 24 Vin models: 55 mA max.  
| 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 |  - The need of an external fuse has to be assessed in the final application.  
| Input Filter |  - Internal Capacitor  

### Output Specifications

| Voltage Set Accuracy |  - Input Variation (1% Vin step) | ±3% max. (at 60% load, 3.3 & 5 Vout models)  
|                      |  - Load Variation | ±3% max. (at 100% load, other output models)  
|                      |  - Voltage Balance (symmetrical load) | 1.5% max.  
| Regulation |  - single output models:  | 1.5% max.  
|            |  - dual output models: | 1.5% max.  
|            |  - See application note: | www.tracopower.com/overview/tes1v  
| Ripple and Noise |  - 20 MHz Bandwidth | 100 mVpp max.  
| Capacitive Load |  - single output | 33 µF max.  
|                | 3.3 Vout models: | 33 µF max.  
|                | 5 Vout models: | 4.7 µF max.  
|                | 12 Vout models: | 10 / 10 µF max.  
|                | 5 / -5 Vout models: | 2.2 / 2.2 µF max.  
|                | 12 / -12 Vout models: | 2.2 / 2.2 µF max.  
|                | 15 / -15 Vout models: | 1% max.  
| Minimum Load |  - 2 % of Iout max.  
| Temperature Coefficient |  ±0.02 %/K max.  
| Start-up Time |  - Limited 0.5 s max., Automatic recovery  
| Short Circuit Protection |  400 ms max.  

### General Specifications

| Relative Humidity |  - 95% max. (non condensing)  
| Temperature Ranges |  - Operating Temperature | −40°C to +90°C  
|                   |  - Case Temperature | +105°C max.  
|                   |  - Storage Temperature | −50°C to +125°C  
| Power Derating |  - High Temperature | 3.3 %/K above 75°C  
| Cooling System |  - Natural convection (20 LFM)  
| Switching Frequency |  - 50 - 150 kHz (PFM)  
|                |  - 100 kHz typ. (PFM)  
| Insulation System | Functional Insulation  
| Isolation Test Voltage |  - Input to Output: 60 s | 3'000 VDC  
| Isolation Resistance |  - Input to Output: 500 VDC | 10'000 MO min.  
| Isolation Capacitance |  - Input to Output: 100 kHz, 1 V | 60 pF typ.  
|                |  - 100 pF max.  
| Reliability |  - Calculated MTBF | 2'000'000 h (MIL-HDBK-217F, ground benign)  
| Moisture Sensitivity (MSL) |  - Level 2 (J-STD-033C)  
| Washing Process | Not allowed (vent-hole without membrane)  
| Housing Material |  - Non-conductive Plastic (UL 94 V-0 rated)  
| Pin Material |  - Phosphor Bronze (C5191)  
| Pin Foundation Plating |  - Copper (1 - 3 µm)  

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.
Pin Surface Plating: Tin (7.5 µm min.), matte
Housing Type: Plastic Case
Mounting Type: PCB Mount
Connection Type: SMD (Surface-Mount Device)
Footprint Type: SMD 12 Pin
Soldering Profile: Reflow Soldering (J-STD-020E)
Weight: 2 g

Environmental Compliance:
- REACH Declaration: www.tracopower.com/info/reach-declaration.pdf
- REACH SVHC list compliant
- RoHS Declaration: www.tracopower.com/info/rohs-declaration.pdf
- Exemptions: No Exemptions

Supporting Documents:
Overview Link (for additional Documents): www.tracopower.com/overview/tes1v

Outline Dimensions:

Pinout:

<table>
<thead>
<tr>
<th>Pin</th>
<th>Single</th>
<th>Dual</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>–Vin (GND)</td>
<td>–Vin (GND)</td>
</tr>
<tr>
<td>2</td>
<td>+Vin (Vcc)</td>
<td>+Vin (Vcc)</td>
</tr>
<tr>
<td>3</td>
<td>NC</td>
<td>NC</td>
</tr>
<tr>
<td>5</td>
<td>–Vout Common</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>NC</td>
<td>–Vout</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>NC</td>
</tr>
<tr>
<td>8</td>
<td>+Vout</td>
<td>+Vout</td>
</tr>
<tr>
<td>10</td>
<td>NC</td>
<td>NC</td>
</tr>
<tr>
<td>11</td>
<td>NC</td>
<td>NC</td>
</tr>
<tr>
<td>12</td>
<td>NC</td>
<td>NC</td>
</tr>
</tbody>
</table>

NC: Pin to be isolated from circuitry

Pin pitch tolerances: ±0.13 (±0.005)
Other tolerances: ±0.25 (±0.01)

Recommended Solder Pad Layout:

Dimensions in mm (inch)