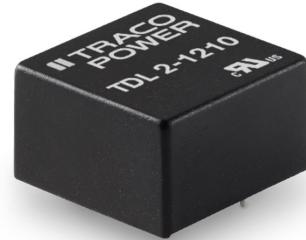




# THE DATASHEET OF TDL 2-2411



- Compact 2W Converter in DIP package
- I/O-isolation 1'500 VDC
- Fully regulated outputs
- Wide 2 : 1 input voltage range
- Operating temperature range -40°C to +80°C
- Short circuit protection
- 3-year product warranty



The TDL 2 series with 2:1 input voltage range is a selection of 2 Watt regulated dc/dc-converters. They come in a very compact DIP package (0.55 × 0.55 × 0.31 inch).

| Models     |  |                |                     |                 |
|------------|--|----------------|---------------------|-----------------|
| Order code | Input voltage                          | Output voltage | Output current max. | Efficiency typ. |
| TDL 2-0510 | <b>4.5 – 10 VDC</b><br>(5 VDC nominal) | 3.3 VDC        | 400 mA              | 79 %            |
| TDL 2-0511 |  | 5.0 VDC        | 400 mA              | 81 %            |
| TDL 2-0512 |  | 12 VDC         | 167 mA              | 85 %            |
| TDL 2-0513 |  | 15 VDC         | 134 mA              | 87 %            |
| TDL 2-0521 |  | ±5.0 VDC       | ±200 mA             | 83 %            |
| TDL 2-0522 |  | ±12 VDC        | ±83 mA              | 85 %            |
| TDL 2-0523 |  | ±15 VDC        | ±67 mA              | 85 %            |
| TDL 2-1210 | <b>9 – 18 VDC</b><br>(12 VDC nominal)  | 3.3 VDC        | 400 mA              | 80 %            |
| TDL 2-1211 |  | 5.0 VDC        | 400 mA              | 83 %            |
| TDL 2-1212 |  | 12 VDC         | 167 mA              | 87 %            |
| TDL 2-1213 |  | 15 VDC         | 134 mA              | 87 %            |
| TDL 2-1221 |  | ±5.0 VDC       | ±200 mA             | 84 %            |
| TDL 2-1222 |  | ±12 VDC        | ±83 mA              | 86 %            |
| TDL 2-1223 |  | ±15 VDC        | ±67 mA              | 86 %            |
| TDL 2-2410 | <b>18 – 36 VDC</b><br>(24 VDC nominal) | 3.3 VDC        | 400 mA              | 79 %            |
| TDL 2-2411 |  | 5.0 VDC        | 400 mA              | 84 %            |
| TDL 2-2412 |  | 12 VDC         | 167 mA              | 86 %            |
| TDL 2-2413 |  | 15 VDC         | 134 mA              | 87 %            |
| TDL 2-2421 |  | ±5.0 VDC       | ±200 mA             | 84 %            |
| TDL 2-2422 |  | ±12 VDC        | ±83 mA              | 86 %            |
| TDL 2-2423 |  | ±15 VDC        | ±67 mA              | 86 %            |
| TDL 2-4810 | <b>36 – 75 VDC</b><br>(48 VDC nominal) | 3.3 VDC        | 400 mA              | 79 %            |
| TDL 2-4811 |  | 5.0 VDC        | 400 mA              | 83 %            |
| TDL 2-4812 |  | 12 VDC         | 167 mA              | 85 %            |
| TDL 2-4813 |  | 15 VDC         | 134 mA              | 86 %            |
| TDL 2-4821 |  | ±5.0 VDC       | ±200 mA             | 82 %            |
| TDL 2-4822 |  | ±12 VDC        | ±83 mA              | 84 %            |
| TDL 2-4823 |  | ±15 VDC        | ±67 mA              | 84 %            |

## Input Specifications

|  |  |
|--|--|
| Input current no load                                  | 5 Vin models: 40 mA typ.<br>12 Vin models: 27 mA typ.<br>24 Vin models: 15 mA typ.<br>48 Vin models: 8 mA typ. |
| Surge voltage (1 sec. max.)                            | 5 Vin models: 12 V max.<br>12 Vin models: 25 V max.<br>24 Vin models: 50 V max.<br>48 Vin models: 100 V max.   |
| Input filter   | internal capacitor   |
| Conducted noise  | EN 55022 class A, B (with external components)   |
| ESD (electrostatic discharge)                          | EN 61000-4-2, ±8 kV / ±6 kV, perf. criteria A  |
| Radiated immunity                                      | EN 61000-4-3, 10 V/m, perf. criteria A   |
| Fast transient / surge (with external input capacitor) | EN 61000-4-4, ±2 kV, perf. criteria A<br>EN 61000-4-5, ±1 kV perf. criteria A                                  |
| – external input capacitor                             | all models: 220 µF/100V  |
| Conducted immunity                                     | EN 61000-4-6, 10 Vrms, perf. criteria A  |
| Magnetic field immunity                                | EN 61000-4-8, 3 A/m, perf. criteria A  |

## Output Specifications

|                                     |   |
|-------------------------------------|---|
| Voltage set accuracy                | ±1.5 % max.   |
| Regulation                          | – Input variation: 0.2 % max.<br>– Load variation 0 – 100 %: 1 % max.<br>dual output: 2 % max. (balanced load)<br>cross regulation - dual output: 5 % max. (asymmetrical load 25 % / 100 %) |
| Minimum load                        | no minimum load required  |
| Ripple and noise (20 MHz Bandwidth) | 70 mVp-p typ.   |
| Transient response                  | – Recovery time ( 25% load step change): 500 µs typ.<br>– Response deviation ( 25% load step change): 5 % max.  |
| Current limitation                  | at 180% of nominal Iout typ., foldback  |
| Short circuit protection            | continuous, automatic recovery  |
| Capacitive load                     | – Single output: all models: 100 µF max.<br>– Dual output: all models: 100 µF max. (each output)  |

## General Specifications

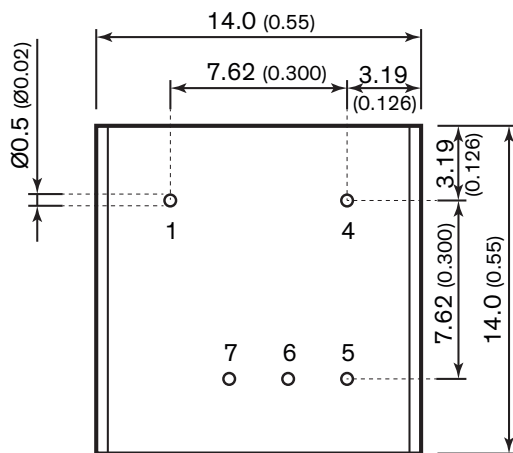
|  |  |
|--|--|
| Temperature ranges   | – Operating (convection cooling 20LFM, 0,1m/s): –40°C to +70°C (without derating)<br>– Case temperature: +90°C max.<br>– Storage temperature: –50°C to +125°C          |
| Derating   | 4.0%/K above 70°C  |
| Humidity (non condensing)  | 95 % rel H max.  |
| Isolation voltage  | – I/O isolation voltage (60 sec.): 1'500 VDC   |
| Isolation capacitance (input/output)                                 | 100 pF typ.  |
| Isolation resistance (input/output)                                  | >1 Gohm  |
| Altitude during operation  | 5'000 m  |
| Temperature coefficient  | ±0.02 %/K typ.   |
| Reliability, calculated MTBF (MIL-HDBK-217F at +25°C, ground benign) | >4'226'000 h   |
| Switching frequency  | 100 kHz min. (PFM)   |
| Safety standards   | UL 60950-1<br>IEC/EN 60950-1<br>– Certification documents: <a href="http://www.tracopower.com/overview/tdl2">www.tracopower.com/overview/tdl2</a>                      |
| 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 |

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

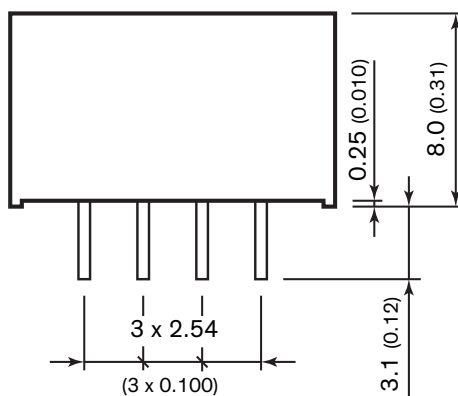
### Physical Specifications

|                       |   |
|-----------------------|---|
| Casing material       | Non-conducting Plastic (UL 94V-0 rated) |
| Potting material      | Epoxy (UL 94 V-0 rated)                 |
| Pin material          | tinned copper                           |
| Package weight        | 3.9 g (0.137 oz)                        |
| Soldering temperature | max. 260°C / 10 sec.                    |

### Outline Dimensions



bottom view



| Pin-Out |            |            |
|---------|------------|------------|
| Pin     | Single     | Dual       |
| 1       | -Vin (GND) | -Vin (GND) |
| 4       | +Vin (Vcc) | +Vin (Vcc) |
| 5       | +Vout      | +Vout      |
| 6       | no pin     | Common     |
| 7       | -Vout      | -Vout      |

Dimensions in mm (inch)



Tolerances:  $x.x \pm 0.5$  ( $x.xx \pm 0.02$ )

$x.xx \pm 0.25$  ( $x.xxx \pm 0.01$ )

Pin diameter tolerance:  $x.x \pm 0.05$  ( $x.xx \pm 0.002$ )

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