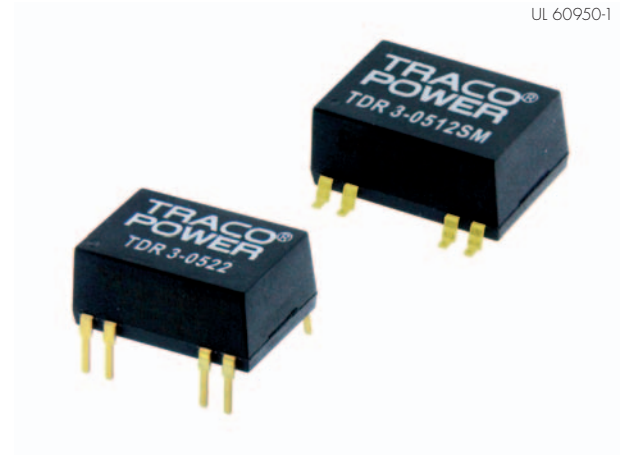


#### Features

- ◆ Compact design in SMD or DIP package
- ◆ Wide 2:1 input voltage range
- ◆ Fully regulated outputs
- ◆ Low ripple and noise
- ◆ No minimum load required
- ◆ Temperature range -40°C to +85°C
- ◆ I/O isolation 1500 VDC
- ◆ Continuous short-circuit protection
- ◆ Remote On/Off control
- ◆ Fully RoHS compliant
- ◆ 3-year product warranty



The TDR-3 series is a family of compact 3 W dc/dc-converters with 2:1 input voltage ranges and tightly regulated output voltages even under no load conditions. The product is available in SMD-package or in DIP-package. They work with high efficiency over the full load range and come with a remote On/Off input.

The usability in temperature ranges of up to 85°C, continuous short circuit protection and excellent immunity against environmental influences make these converters very reliable.

A TDR-3 converter is the ideal solution for space critical high end applications in communication equipment, instrumentation and industrial electronics.

#### Models

| Order code<br>DIP models | Order code<br>SMD models | Input voltage range                     | Output voltage | Output current<br>max. | Efficiency typ. |
|--------------------------|--------------------------|-----------------------------------------|----------------|------------------------|-----------------|
| TDR 3-0511               | TDR 3-0511SM             | <b>4.5 – 9.0 VDC</b><br>(5 VDC nominal) | 5.0 VDC        | 600 mA                 | 79 %            |
| TDR 3-0512               | TDR 3-0512SM             |                                         | 12 VDC         | 250 mA                 | 80 %            |
| TDR 3-0513               | TDR 3-0513SM             |                                         | 15 VDC         | 200 mA                 | 81 %            |
| TDR 3-0522               | TDR 3-0522SM             |                                         | ±12 VDC        | ±125 mA                | 80 %            |
| TDR 3-0523               | TDR 3-0523SM             |                                         | ±15 VDC        | ±100 mA                | 81 %            |
| TDR 3-1211               | TDR 3-1211SM             | <b>9 – 18 VDC</b><br>(12 VDC nominal)   | 5.0 VDC        | 600 mA                 | 81 %            |
| TDR 3-1212               | TDR 3-1212SM             |                                         | 12 VDC         | 250 mA                 | 82 %            |
| TDR 3-1213               | TDR 3-1213SM             |                                         | 15 VDC         | 200 mA                 | 82 %            |
| TDR 3-1222               | TDR 3-1222SM             |                                         | ±12 VDC        | ±125 mA                | 82 %            |
| TDR 3-1223               | TDR 3-1223SM             |                                         | ±15 VDC        | ±100 mA                | 83 %            |
| TDR 3-2411               | TDR 3-2411SM             | <b>18 – 36 VDC</b><br>(24 VDC nominal)  | 5.0 VDC        | 600 mA                 | 81 %            |
| TDR 3-2412               | TDR 3-2412SM             |                                         | 12 VDC         | 250 mA                 | 82 %            |
| TDR 3-2413               | TDR 3-2413SM             |                                         | 15 VDC         | 200 mA                 | 83 %            |
| TDR 3-2422               | TDR 3-2422SM             |                                         | ±12 VDC        | ±125 mA                | 83 %            |
| TDR 3-2423               | TDR 3-2423SM             |                                         | ±15 VDC        | ±100 mA                | 83 %            |
| TDR 3-4811               | TDR 3-4811SM             | <b>36 – 75 VDC</b><br>(48 VDC nominal)  | 5.0 VDC        | 600 mA                 | 81 %            |
| TDR 3-4812               | TDR 3-4812SM             |                                         | 12 VDC         | 250 mA                 | 82 %            |
| TDR 3-4813               | TDR 3-4813SM             |                                         | 15 VDC         | 200 mA                 | 82 %            |
| TDR 3-4822               | TDR 3-4822SM             |                                         | ±12 VDC        | ±125 mA                | 83 %            |
| TDR 3-4823               | TDR 3-4823SM             |                                         | ±15 VDC        | ±100 mA                | 83 %            |

## Input Specifications

|                                                                            |                                                                                                                                                                                   |
|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input current at no load (nominal input voltage)                           | 5 Vin models: 50 mA typ.<br>12 Vin models: 30 mA typ.<br>24 Vin models: 13 mA typ.<br>48 Vin models: 10 mA typ.                                                                   |
| Input current at full load (nominal input voltage)                         | 5 Vin models: 790 mA typ.<br>12 Vin models: 320 mA typ.<br>24 Vin models: 160 mA typ.<br>48 Vin models: 80 mA typ.                                                                |
| Surge voltage (1 sec. max.)                                                | 5 Vin models: 15 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                                                               | capacitor type (see EMC considerations page 3 for compliance to EN 55022 class A/B)                                                                                               |
| ESD (electrostatic discharge)                                              | EN 61000-4-2, air $\pm 8$ kV, contact $\pm 6$ kV, perf. criteria A                                                                                                                |
| Radiated immunity                                                          | EN 61000-4-3 10 V/m, perf. criteria A                                                                                                                                             |
| Fast transient / Surge                                                     | EN 61000-4-4, $\pm 2$ kV, perf. criteria A<br>EN 61000-4-5, $\pm 1$ kV perf. criteria A<br>with external input capacitor e.g. Nippon chemi-con KY 220 $\mu$ F, 100 V, ESR 48 mOhm |
| Conducted immunity                                                         | EN 61000-4-6, 10 Vrms, perf. criteria A                                                                                                                                           |
| Reflected ripple current<br>(measured with input filter according class A) | 5 Vin models: 80 mA <sub>p-p</sub> typ.<br>12 Vin models: 40 mA <sub>p-p</sub> typ.<br>24 Vin models: 30 mA <sub>p-p</sub> typ.<br>48 Vin models: 20 mA <sub>p-p</sub> typ.       |

## Output Specifications

|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Voltage set accuracy                                    | $\pm 1$ % max                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Regulation                                              | <div> <div> – Input variation Vin min. to Vin max.<br/>– Load variation 0 – 100 %<br/>– Load variation 10 – 90 %<br/>– Load cross regulation 25/100 % </div> <div> single output models:<br/>dual output models:<br/>single output models:<br/>dual output models: </div> <div> 0.2 % max.<br/>1.0 % max.<br/>1.0 % max. balanced load<br/>0.5 % max.<br/>0.8 % max. balanced load<br/>5.0 % max. (dual output models) </div> </div> |
| Minimum load                                            | 0 % of rated max. load                                                                                                                                                                                                                                                                                                                                                                                                               |
| Temperature coefficient                                 | $\pm 0.02$ %/K                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Ripple and noise (20 MHz bandwidth)                     | 30 mV <sub>p-p</sub> typ.                                                                                                                                                                                                                                                                                                                                                                                                            |
| Start up time<br>(constant resistive load)              | <div> – Power On<br/>– Remote On </div> <div> 5 ms typ.<br/>5 ms typ. </div>                                                                                                                                                                                                                                                                                                                                                         |
| Transient response setting time (25 % load step change) | 250 $\mu$ s typ.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Short circuit protection                                | continuous, automatic recovery                                                                                                                                                                                                                                                                                                                                                                                                       |
| Capacitive load                                         | <div> 5 VDC models:<br/>12 VDC models:<br/>15 VDC models:<br/><math>\pm 12</math> VDC models:<br/><math>\pm 15</math> VDC models: </div> <div> 1680 <math>\mu</math>F max.<br/>820 <math>\mu</math>F max.<br/>680 <math>\mu</math>F max.<br/><math>\pm 470</math> <math>\mu</math>F max.<br/><math>\pm 330</math> <math>\mu</math>F max. </div>                                                                                      |

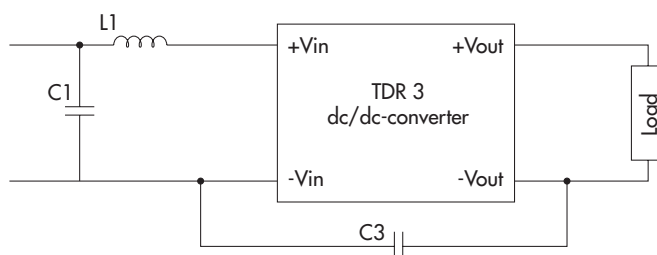
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

## General Specifications

|                                                                       |                                                                                                               |                                                                                      |
|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Temperature ranges                                                    | <ul style="list-style-type: none"> <li>– Operating</li> <li>– Storage</li> <li>– Case temperature</li> </ul>  | –40°C to +85°C<br>–55°C to +125°C<br>tba.                                            |
| Load derating                                                         |                                                                                                               | 3.3 %/K above +70°C                                                                  |
| Humidity (non condensing)                                             |                                                                                                               | 5 % to 90 % rel. H max.                                                              |
| Thermal shock                                                         |                                                                                                               | acc. MIL-STD-810F                                                                    |
| Vibration                                                             |                                                                                                               | acc. MIL-STD-810F                                                                    |
| Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign) |                                                                                                               | >2.4 Mio h                                                                           |
| Isolation voltage (60 sec.)                                           | – Input/Output                                                                                                | 1500 VDC                                                                             |
| Isolation capacitance                                                 | – Input/Output                                                                                                | 50 pF max.                                                                           |
| Isolation resistance                                                  | – Input/Output (500 VDC)                                                                                      | >10 GOhm                                                                             |
| Altitude during operation                                             |                                                                                                               | tba.                                                                                 |
| Safety standard (designed to meet)                                    |                                                                                                               | IEC/EN 60950-1, UL 60950-1                                                           |
| Safety approvals                                                      | – UL/cUL                                                                                                      | <a href="http://www.ul.com">www.ul.com</a> -> certifications -> File e188913         |
| Switching frequency                                                   |                                                                                                               | 100 kHz (PWM)                                                                        |
| Remote On/Off                                                         | <ul style="list-style-type: none"> <li>– On:</li> <li>– Off:</li> <li>– Off stand by input current</li> </ul> | open or high impedance<br>2...4 mA current applied via 1KOhm resistor<br>2.5 mA max. |

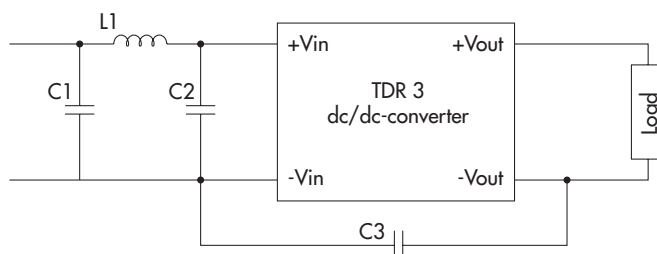
## EMC Consideration

Recommended filter for  
EN 55022 class A compliance



| Input models | C1                       | C3                     | L1    |                |                                                                                                    |
|--------------|--------------------------|------------------------|-------|----------------|----------------------------------------------------------------------------------------------------|
|              |                          |                        | value | order code     | datasheet                                                                                          |
| 5 VDC        | 4.7 µF / 25 V 1812 MLCC  | 220pF / 3 kV 1808 MLCC | 10 µH | <b>TCK-047</b> | <a href="http://www.tracopower.com/products/tck047.pdf">www.tracopower.com/products/tck047.pdf</a> |
| 12 VDC       | 6.8 µF / 50 V 1812 MLCC  |                        | 12 µH | <b>TCK-062</b> | <a href="http://www.tracopower.com/products/tck062.pdf">www.tracopower.com/products/tck062.pdf</a> |
| 24 VDC       | 4.7 µF / 50 V 1812 MLCC  |                        | 10 µH | <b>TCK-047</b> | <a href="http://www.tracopower.com/products/tck047.pdf">www.tracopower.com/products/tck047.pdf</a> |
| 48 VDC       | 4.7 µF / 100 V 1812 MLCC |                        | 10 µH |                |                                                                                                    |

Recommended filter for  
EN 55022 class B compliance



| Input models | C1 & C2                  | C3                     | L1<br>value | order code<br>(SMD type) | datasheet                                                                                          |
|--------------|--------------------------|------------------------|-------------|--------------------------|----------------------------------------------------------------------------------------------------|
| 5 VDC        | 6.8 µF / 25 V 1812 MLCC  | 220pF / 3 kV 1808 MLCC | 10 µH       | TCK-047                  | <a href="http://www.tracopower.com/products/tck047.pdf">www.tracopower.com/products/tck047.pdf</a> |
| 12 VDC       | 4.7 µF / 50 V 1812 MLCC  |                        | 12 µH       | TCK-062                  | <a href="http://www.tracopower.com/products/tck062.pdf">www.tracopower.com/products/tck062.pdf</a> |
| 24 VDC       |                          |                        | 18 µH       | TCK-046                  | <a href="http://www.tracopower.com/products/tck046.pdf">www.tracopower.com/products/tck046.pdf</a> |
| 48 VDC       | 4.7 µF / 100 V 1812 MLCC |                        | 18 µH       | TCK-046                  |                                                                                                    |

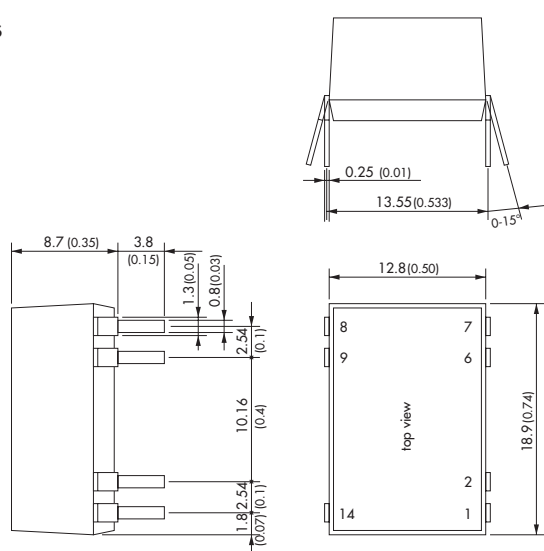
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

## Physical Specifications

|                                                        |                                                                                                                                                                  |
|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Casing material                                        | non-conductive plastic (UL94V-0 rated)                                                                                                                           |
| Package weight                                         | 4.5 g (0.16 oz)                                                                                                                                                  |
| Soldering profile for DIP-package models               | max. 265°C / 10 sec. (wave soldering)                                                                                                                            |
| Lead-free reflow solder process for SMD-package models | as per J-STD-020D.01 (to find at:<br><a href="http://www.jedec.org">www.jedec.org</a> - free registration required)                                              |
| Moisture sensitivity level (for SMD-package models)    | level 2a as per J-STD-033B.01 (to find at:<br><a href="http://www.jedec.org">www.jedec.org</a> - free registration required)                                     |
| Environmental compliance                               | – Reach<br>– RoHS<br><br><a href="http://www.tracopower.com/products/tdr3-reach.pdf">www.tracopower.com/products/tdr3-reach.pdf</a><br>RoHS directive 2011/65/EU |
| Packaging                                              | – Tube<br>– Tape & Reel (only SMD models, add suffix -TR)<br><br>10 pcs packing unit<br>200 pcs packing unit                                                     |

## Outline Dimensions

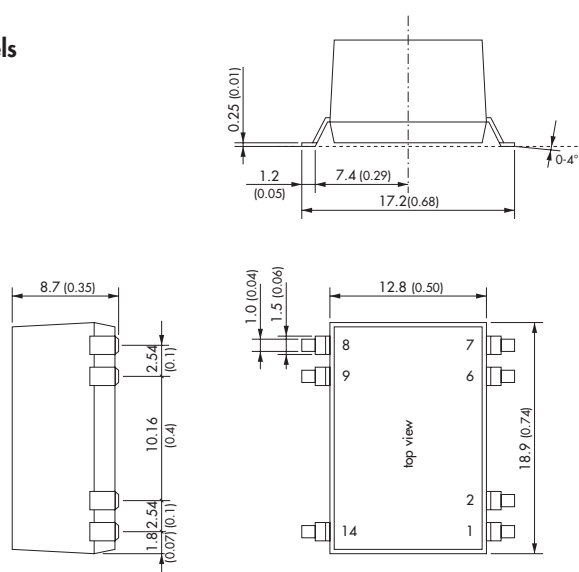
### DIP-Models



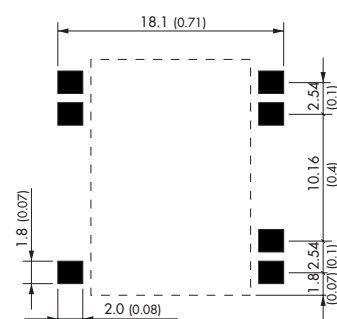
| Pin-Out |               |               |
|---------|---------------|---------------|
| Pin     | Single        | Dual          |
| 1       | –Vin (GND)    | –Vin (GND)    |
| 2       | Remote On/Off | Remote On/Off |
| 6       | NC            | Common        |
| 7       | NC            | –Vout         |
| 8       | +Vout         | +Vout         |
| 9       | –Vout         | Common        |
| 14      | +Vin (Vcc)    | +Vin (Vcc)    |

NC = not to connect

### SMD-Models



### Recommended Solder Pad Dimension:



Dimensions in [mm], ( ) = Inch  
Tolerances:  $\pm 0.5$  ( $\pm 0.02$ )  
Pin pitch tolerances:  $\pm 0.25$  ( $\pm 0.01$ )

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