DC/DC Converter

TDR 3SM Series, 3 Watt

- Compact design in SMD package
- Wide 2:1 input voltage range
- Fully regulated outputs
- Low ripple and noise
- Temperature range –40°C to +85°C without derating
- I/O isolation 1600 VDC
- Continuous short-circuit protection
- Remote On/Off control
- Fully RoHS compliant
- 3-year product warranty

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

<table>
<thead>
<tr>
<th>Models</th>
<th>Input Voltage Range</th>
<th>Output 1 Vnom</th>
<th>Imax</th>
<th>Output 2 Vnom</th>
<th>Imax</th>
<th>Efficiency typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDR 3-0511SM</td>
<td>4.5 - 9 VDC (5 VDC nom.)</td>
<td>5 VDC</td>
<td>600 mA</td>
<td>–12 VDC</td>
<td>125 mA</td>
<td>79 %</td>
</tr>
<tr>
<td>TDR 3-0512SM</td>
<td>12 VDC</td>
<td>600 mA</td>
<td></td>
<td>–12 VDC</td>
<td>125 mA</td>
<td>80 %</td>
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<tr>
<td>TDR 3-0513SM</td>
<td>15 VDC</td>
<td>200 mA</td>
<td>–15 VDC</td>
<td>100 mA</td>
<td></td>
<td>81 %</td>
</tr>
<tr>
<td>TDR 3-0522SM</td>
<td>+12 VDC</td>
<td>125 mA</td>
<td></td>
<td>–12 VDC</td>
<td>125 mA</td>
<td>80 %</td>
</tr>
<tr>
<td>TDR 3-0523SM</td>
<td>+15 VDC</td>
<td>100 mA</td>
<td></td>
<td>–15 VDC</td>
<td>100 mA</td>
<td>81 %</td>
</tr>
<tr>
<td>TDR 3-1211SM</td>
<td>9 - 18 VDC (12 VDC nom.)</td>
<td>5 VDC</td>
<td>600 mA</td>
<td>–12 VDC</td>
<td>125 mA</td>
<td>81 %</td>
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<tr>
<td>TDR 3-1212SM</td>
<td>12 VDC</td>
<td>250 mA</td>
<td></td>
<td>–12 VDC</td>
<td>125 mA</td>
<td>82 %</td>
</tr>
<tr>
<td>TDR 3-1213SM</td>
<td>15 VDC</td>
<td>200 mA</td>
<td>–15 VDC</td>
<td>100 mA</td>
<td></td>
<td>82 %</td>
</tr>
<tr>
<td>TDR 3-1222SM</td>
<td>+12 VDC</td>
<td>125 mA</td>
<td></td>
<td>–12 VDC</td>
<td>125 mA</td>
<td>82 %</td>
</tr>
<tr>
<td>TDR 3-1223SM</td>
<td>+15 VDC</td>
<td>100 mA</td>
<td></td>
<td>–15 VDC</td>
<td>100 mA</td>
<td>83 %</td>
</tr>
<tr>
<td>TDR 3-2411SM</td>
<td>18 - 36 VDC (24 VDC nom.)</td>
<td>5 VDC</td>
<td>600 mA</td>
<td>–12 VDC</td>
<td>125 mA</td>
<td>81 %</td>
</tr>
<tr>
<td>TDR 3-2412SM</td>
<td>12 VDC</td>
<td>250 mA</td>
<td></td>
<td>–12 VDC</td>
<td>125 mA</td>
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</tr>
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<td>–15 VDC</td>
<td>100 mA</td>
<td></td>
<td>83 %</td>
</tr>
<tr>
<td>TDR 3-2422SM</td>
<td>+12 VDC</td>
<td>125 mA</td>
<td></td>
<td>–12 VDC</td>
<td>125 mA</td>
<td>83 %</td>
</tr>
<tr>
<td>TDR 3-2423SM</td>
<td>+15 VDC</td>
<td>100 mA</td>
<td></td>
<td>–15 VDC</td>
<td>100 mA</td>
<td>83 %</td>
</tr>
<tr>
<td>TDR 3-4811SM</td>
<td>36 - 75 VDC (48 VDC nom.)</td>
<td>5 VDC</td>
<td>600 mA</td>
<td>–12 VDC</td>
<td>125 mA</td>
<td>81 %</td>
</tr>
<tr>
<td>TDR 3-4812SM</td>
<td>12 VDC</td>
<td>250 mA</td>
<td></td>
<td>–12 VDC</td>
<td>125 mA</td>
<td>82 %</td>
</tr>
<tr>
<td>TDR 3-4813SM</td>
<td>15 VDC</td>
<td>200 mA</td>
<td>–15 VDC</td>
<td>100 mA</td>
<td></td>
<td>83 %</td>
</tr>
<tr>
<td>TDR 3-4822SM</td>
<td>+12 VDC</td>
<td>125 mA</td>
<td></td>
<td>–12 VDC</td>
<td>125 mA</td>
<td>83 %</td>
</tr>
<tr>
<td>TDR 3-4823SM</td>
<td>+15 VDC</td>
<td>100 mA</td>
<td></td>
<td>–15 VDC</td>
<td>100 mA</td>
<td>83 %</td>
</tr>
</tbody>
</table>
## Input Specifications

### Input Current
- **At no load**
  - 5 Vin models: 50 mA typ.
  - 12 Vin models: 30 mA typ.
  - 24 Vin models: 13 mA typ.
  - 48 Vin models: 10 mA typ.
- **At full load**
  - 5 Vin models: 790 mA max.
  - 12 Vin models: 320 mA max.
  - 24 Vin models: 160 mA max.
  - 48 Vin models: 80 mA max.

### Surge Voltage
- 5 Vin models: 15 VDC max. (1 s max.)
- 12 Vin models: 25 VDC max. (1 s max.)
- 24 Vin models: 50 VDC max. (1 s max.)
- 48 Vin models: 100 VDC max. (1 s max.)

### Reflected Ripple Current
- 5 Vin models: 80 mAp-p typ.
- 12 Vin models: 40 mAp-p typ.
- 24 Vin models: 30 mAp-p typ.

### Recommended Input Fuse
- 5 Vin models: 3,000 mA (Slow blow)
- 12 Vin models: 3,000 mA (Slow blow)
- 24 Vin models: 1,500 mA (Slow blow)
- 48 Vin models: 1,500 mA (Slow blow)

(The need of an external fuse has to be assessed in the final application.)

### Input Filter
- Internal Capacitor

## Output Specifications

### Voltage Set Accuracy
- ±1% max.

### Regulation
- Input Variation (Vmin - Vmax)
  - single output models: 0.2% max.
  - dual output models: 1% max. (Output 1)
- Load Variation (0 - 100%)
  - single output models: 1% max.
  - dual output models: 1% max. (Output 1)
  - 1% max. (Output 2)
- Cross Regulation
  - single output models: 5% max.
  - dual output models: 5% max.

### Ripple and Noise
- 20 MHz Bandwidth
  - 30 mVp-p typ.

### Capacitive Load
- single output
  - 5 Vout models: 1,680 µF max.
  - 12 Vout models: 820 µF max.
  - 15 Vout models: 680 µF max.
- dual output
  - 12 / -12 Vout models: 470 / 470 µF max.

### Minimum Load
- Not required

### Temperature Coefficient
- ±0.02 %/K max.

### Start-up Time
- 5 ms typ.

### Short Circuit Protection
- Continuous, Automatic recovery

### Transient Response
- Response Time
  - 250 µs typ. (25% Load Step)

## Safety Specifications

### Safety Standards
- IT / Multimedia Equipment
  - EN 60950-1
  - IEC 60950-1
  - UL 60950-1
- Certification Documents
  - www.tracopower.com/overview/tdr3sm

### Pollution Degree
- PD 2

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

EMI Emissions
- Conducted Emissions
  - EN 55032 class A (with external filter)
  - EN 55032 class B (with external filter)
- Radiated Emissions
  - EN 55032 class A (with external filter)
  - EN 55032 class B (with external filter)

External filter proposal: www.tracopower.com/overview/tdr3sm

EMS Immunity
- Electrostatic Discharge
  - Air: EN 61000-4-2, ±8 kV, perf. criteria A
  - Contact: EN 61000-4-2, ±6 kV, perf. criteria A
- RF Electromagnetic Field
  - EN 61000-4-3, 10 V/m, perf. criteria A
- EFT (Burst) / Surge
  - EN 61000-4-4, ±2 kV, perf. criteria A
  - EN 61000-4-5, ±1 kV, perf. criteria A

Ext. input component:
- EN 61000-4-6, 10 Vrms, perf. criteria A

General Specifications

Relative Humidity 95% max. (non-condensing)
Temperature Ranges
- Operating Temperature: -40°C to +85°C
- Case Temperature: +100°C max.
- Storage Temperature: -55°C to +125°C
Power Derating
- High Temperature: 3.3 %/K above 70°C
Cooling System
- Natural convection (20 LFM)
Remote Control
- Current Controlled Remote:
  - On: open circuit
  - Off: 2 to 4 mA current (internal 1 kΩ resistor)
  - Off idle input current: 2.5 mA max.
Altitude During Operation 2'000 m max.
Switching Frequency 100 kHz min. (RCC)
Insulation System Basic Insulation
Isolation Test Voltage
- Input to Output, 60 s: 1'600 VDC
Isolation Resistance
- Input to Output, 500 VDC: 1'000 MΩ min.
Isolation Capacitance
- Input to Output, 100 kHz, 1 V: 50 pF max.
Reliability
- Calculated MTBF: 6'200'000 h (MIL-HDBK-217F, ground benign)
- MTBF: 6'200'000 h (MIL-HDBK-217F, ground benign)
Moisture Sensitivity (MSL)
- Level 2a (J-STD-033C)
Environment
- Vibration: MIL-STD-810F
- Thermal Shock: MIL-STD-810F
Housing Material Non-conductive Plastic (UL94 V-0 rated)
Pin Material Copper
Pin Foundation Plating Nickel (40 - 120 µm)
Pin Surface Plating Gold (25 - 75 nm), matte
Soldering Profile Reflow Soldering (J-STD-020E)
Connection Type SMD (Surface-Mount Device)
Weight 4.5 g
Environmental Compliance
- Reach: www.tracopower.com/info/reach-declaration.pdf
- RoHS: www.tracopower.com/info/rohs-declaration.pdf

Supporting Documents

Overview Link (for additional Documents) www.tracopower.com/overview/tdr3sm

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

TDR 3SM Series, 3 Watt

Dimensions in mm (inch)
Tolerances: ±0.5 (±0.02)
Pin pitch tolerances ±0.25 (±0.01)

Recommended Solder Pad Layout

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>Remote On/Off</td>
<td>Remote On/Off</td>
</tr>
<tr>
<td>6</td>
<td>NC</td>
<td>Common</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>–Vout</td>
</tr>
<tr>
<td>8</td>
<td>+Vout</td>
<td>+Vout</td>
</tr>
<tr>
<td>9</td>
<td>–Vout</td>
<td>Common</td>
</tr>
<tr>
<td>14</td>
<td>+Vin (Vcc)</td>
<td>+Vin (Vcc)</td>
</tr>
</tbody>
</table>

NC: Not connected

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