DC/DC Converter

- Ultra-wide 4:1 input range
- High efficiency up to 85%
- I/O isolation 1500V
- Remote On/Off
- Under voltage lock-out circuit
- Shielded metal case with insulated Baseplate
- Continuous short-circuit protection
- Operating temp. range –40°C to +85°C
- 3-year product warranty

The THD 12WI series is a range of high performance, isolated 12W DC/DC converter modules featuring ultra wide 4:1 input voltage ranges in a DIP-24 package with industry-standard footprint. Overload and overvoltage protection as well as remote On/Off are included as standard. Built-in filters for both input and output minimizes the need of external filtering. Full SMD-design with exclusive use of ceramic capacitors guarantees a high reliability and long product lifetime. Typical applications for these converters are industrial electronics, instrumentation, data communication systems and battery operated equipment with limited space available on the PCB.

### Models

<table>
<thead>
<tr>
<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>Vnom</td>
<td>Imax</td>
<td>Vnom</td>
<td>Imax</td>
</tr>
<tr>
<td>THD 12-2410WI</td>
<td>9 - 36 VDC (24 VDC nom.)</td>
<td>3.3 VDC</td>
<td>3'500 mA</td>
<td>84 %</td>
</tr>
<tr>
<td>THD 12-2411WI</td>
<td>5.1 VDC</td>
<td>2'400 mA</td>
<td>87 %</td>
<td></td>
</tr>
<tr>
<td>THD 12-2412WI</td>
<td>12 VDC</td>
<td>1'000 mA</td>
<td>87 %</td>
<td></td>
</tr>
<tr>
<td>THD 12-2413WI</td>
<td>15 VDC</td>
<td>800 mA</td>
<td>87 %</td>
<td></td>
</tr>
<tr>
<td>THD 12-2421WI</td>
<td>+5 VDC</td>
<td>1'200 mA</td>
<td>-5 VDC</td>
<td>84 %</td>
</tr>
<tr>
<td>THD 12-2422WI</td>
<td>+12 VDC</td>
<td>500 mA</td>
<td>-12 VDC</td>
<td>87 %</td>
</tr>
<tr>
<td>THD 12-2423WI</td>
<td>+15 VDC</td>
<td>400 mA</td>
<td>-15 VDC</td>
<td>87 %</td>
</tr>
<tr>
<td>THD 12-4810WI</td>
<td>18 - 75 VDC (48 VDC nom.)</td>
<td>3.3 VDC</td>
<td>3'500 mA</td>
<td>84 %</td>
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<tr>
<td>THD 12-4811WI</td>
<td>5.1 VDC</td>
<td>2'400 mA</td>
<td>87 %</td>
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<tr>
<td>THD 12-4812WI</td>
<td>12 VDC</td>
<td>1'000 mA</td>
<td>87 %</td>
<td></td>
</tr>
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</tr>
<tr>
<td>THD 12-4821WI</td>
<td>+5 VDC</td>
<td>1'200 mA</td>
<td>-5 VDC</td>
<td>85 %</td>
</tr>
<tr>
<td>THD 12-4822WI</td>
<td>+12 VDC</td>
<td>500 mA</td>
<td>-12 VDC</td>
<td>87 %</td>
</tr>
<tr>
<td>THD 12-4823WI</td>
<td>+15 VDC</td>
<td>400 mA</td>
<td>-15 VDC</td>
<td>87 %</td>
</tr>
</tbody>
</table>
### Input Specifications

**Input Current**
- At no load
  - 24 Vin models: 55 mA typ. (3.3 Vout model)
  - 48 Vin models: 20 mA typ. (3.3 Vout model)
- At full load
  - 24 Vin models: 55 mA typ. (5.1 Vout model)
  - 48 Vin models: 20 mA typ. (5.1 Vout model)

**Surge Voltage**
- 24 Vin models: 50 VDC max. (100 ms max.)
- 48 Vin models: 100 VDC max. (100 ms max.)

**Under Voltage Lockout**
- 24 Vin models: 7 VDC min. / 8 VDC typ. / 8.8 VDC max.
- 48 Vin models: 15 VDC min. / 16 VDC typ. / 17.5 VDC max.

**Recommended Input Fuse**
- 24 Vin models: 2'500 mA (slow blow)
- 48 Vin models: 1'250 mA (slow blow)

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

**Input Filter**
- Internal Pi-Type

### Output Specifications

**Voltage Set Accuracy**
- ±1.2% max.

**Regulation**
- Input Variation (Vmin - Vmax)
  - single output models: 0.2% max.
  - dual output models: 0.2% max.
- Load Variation (0 - 100%)
  - single output models: 0.5% max.
  - dual output models: 1% max. (Output 1)
  - 1% max. (Output 2)
- Cross Regulation (25% / 100% asym. load)
  - dual output models: 5% max.

**Ripple and Noise**
- - 20 MHz Bandwidth
  - 85 mV±p-p typ.

**Capacitive Load**
- single output
  - 3.3 Vout models: 2'000 μF max.
  - 5.1 Vout models: 2'000 μF max.
  - 12 Vout models: 430 μF max.
  - 15 Vout models: 300 μF max.
- dual output
  - 5/-5 Vout models: 1’250 / 1’250 μF max.
  - 12/-12 Vout models: 200 / 200 μF max.
  - 15/-15 Vout models: 120 / 120 μF max.

**Minimum Load**
- Not required

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

**Start-up Time**
- 450 ms typ. (Power On)
- 5 ms typ. (Remote On)

**Short Circuit Protection**
- Continuous. Automatic recovery

**Output Current Limitation**
- 150% typ. of lout max.

**Overvoltage Protection**
- 118 - 125% of Vout nom.
  - (depending on model)
    - 3.9 VDC typ. (3.3 Vout models)
    - 6.2 VDC typ. (5.1 Vout models)
    - 15 VDC typ. (12 Vout models)
    - 18 VDC typ. (15 Vout models)

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.
## Transient Response
- Response Deviation: 5% max. (75% to 100% Load Step)
- Response Time: 250 µs typ. (75% to 100% Load Step)

## Safety Specifications
### Safety Standards
- IT / Multimedia Equipment: EN 60950-1
- IEC 60950-1
- IEC 62368-1
- UL 60950-1
- UL 62368-1
- Certification Documents: www.tracopower.com/overview/thd12wi

### Pollution Degree
- PD 2

### Over Voltage Category
- Not mains connected

## EMC Specifications
### EMI Emissions
- Conducted Emissions: EN 55032 class A (with external filter)
- Radiated Emissions: EN 55032 class B (with external filter)
- Conducted RF Disturbances: Continuous
- PF Magnetic Field: 1 s: EN 61000-4-6, 10 Vrms, perf. criteria A

### EMS Immunity
- Electrostatic Discharge: Air: EN 61000-4-2, ±8 kV, perf. criteria A
- Contact: EN 61000-4-2, ±1 kV, perf. criteria A
- RF Electromagnetic Field: − EFT (Burst) / Surge
- Continuous: Ext. input component: Nippon chemi-con KY 220 µF, 100 V
- Conducted RF Disturbances: Continuous: Ext. input component: Nippon chemi-con KY 220 µF, 100 V
- PF Magnetic Field: 1 s: EN 61000-4-6, 100 A/m, perf. criteria A

## General Specifications
### Relative Humidity
- 95% max. (non condensing)

### Temperature Ranges
- Operating Temperature: −40°C to +85°C
- Case Temperature: +105°C max.
- Storage Temperature: −55°C to +125°C

### Power Derating
- High Temperature: Depending on model
  - See application note: www.tracopower.com/overview/thd12wi

### Cooling System
- Natural convection (20 LFM)

### Remote Control
- Voltage Controlled Remote
  - On: 3.0 to 12 VDC or open circuit
  - Off: 0 to 1.2 VDC or short circuit
  - Refers to 'Remote' and 'Vin' Pin
  - 2.5 mA typ.
  - - Off Idle Input Current: 0.5 mA
  - - Remote Pin Input Current: 4.0 mA

### Altitude During Operation
- 4'000 m max.

### Switching Frequency
- 360 - 440 kHz (PWM)
- 400 kHz typ. (PWM)

### Insulation System
- Functional Insulation

### Isolation Test Voltage
- Input to Output: 60 s
- Input to Case: 60 s
- Output to Case: 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
  - 1'500 pF max.

### Reliability
- Calculated MTBF
  - 2'090'000 h (MIL-HDBK-217F, ground benign)

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.
### Washing Process
According to Cleaning Guideline
www.tracopower.com/info/cleaning.pdf

<table>
<thead>
<tr>
<th>Environment</th>
<th>- Vibration</th>
<th>MIL-STD-810F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Thermal Shock</td>
<td>MIL-STD-810F</td>
</tr>
<tr>
<td>Housing Material</td>
<td>Copper, Nickel plated</td>
<td></td>
</tr>
<tr>
<td>Base Material</td>
<td>Non-conductive FR4 (UL 94 V-0 rated)</td>
<td></td>
</tr>
<tr>
<td>Potting Material</td>
<td>Epoxy (UL 94 V-0 rated)</td>
<td></td>
</tr>
<tr>
<td>Pin Material</td>
<td>Copper</td>
<td></td>
</tr>
<tr>
<td>Pin Foundation Plating</td>
<td>Nickel (2 - 3 µm)</td>
<td></td>
</tr>
<tr>
<td>Pin Surface Plating</td>
<td>Tin (3 - 5 µm), matte</td>
<td></td>
</tr>
<tr>
<td>Housing Type</td>
<td>Metal Case</td>
<td></td>
</tr>
<tr>
<td>Mounting Type</td>
<td>PCB Mount</td>
<td></td>
</tr>
<tr>
<td>Connection Type</td>
<td>THD (Through-Hole Device)</td>
<td></td>
</tr>
<tr>
<td>Footprint Type</td>
<td>DIP24</td>
<td></td>
</tr>
<tr>
<td>Soldering Profile</td>
<td>Lead-Free Wave Soldering 245°C / 10 s max.</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>18 g</td>
<td></td>
</tr>
<tr>
<td>Thermal Impedance</td>
<td>- Case to Ambient 20 K/W typ.</td>
<td></td>
</tr>
<tr>
<td>Environmental Compliance</td>
<td>- REACH Declaration <a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td>REACH SVHC list compliant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exemptions: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (OE5A rule))</td>
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<tr>
<td></td>
<td>- SCIP Reference Number 952e0754-9097-4042-a284-2f13a33dbf55</td>
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</table>

### Supporting Documents
Overview Link (for additional Documents) www.tracopower.com/overview/thd12wi

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

Insulated baseplate

Dimensions in mm (inch)
Tolerances: x.x ±0.5 (±0.02)
        x.xx ±0.25 (±0.01)
Pin Ø 0.5 ±0.1 (0.02 ±0.004)

Pinout

<table>
<thead>
<tr>
<th>Pin</th>
<th>Single</th>
<th>Dual</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Remote On/Off</td>
<td>Remote On/Off</td>
</tr>
<tr>
<td>2</td>
<td>–Vin (GND)</td>
<td>–Vin (GND)</td>
</tr>
<tr>
<td>3</td>
<td>–Vin (GND)</td>
<td>–Vin (GND)</td>
</tr>
<tr>
<td>9</td>
<td>NC</td>
<td>Common</td>
</tr>
<tr>
<td>11</td>
<td>NC</td>
<td>–Vout</td>
</tr>
<tr>
<td>14</td>
<td>+Vout</td>
<td>+Vout</td>
</tr>
<tr>
<td>16</td>
<td>–Vout</td>
<td>Common</td>
</tr>
<tr>
<td>22</td>
<td>+Vin (Vcc)</td>
<td>+Vin (Vcc)</td>
</tr>
<tr>
<td>23</td>
<td>+Vin (Vcc)</td>
<td>+Vin (Vcc)</td>
</tr>
</tbody>
</table>

NC: Not connected

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