

- **High power density: 40W in 2"x2"x0.4" metal package**
- **Ultra wide 4:1 input voltage range**
- **Very high efficiency up to 89 %**
- **No minimum load required for single output models**
- **Over temperature protection**
- **Under voltage lockout**
- **Remote On/Off**
- **Shielded metal case with insulated baseplate**
- **Optional heat-sink**
- **3-year product warranty**



The TEN 40WI series is a family of high performance 40W DC/DC converter modules featuring ultra wide 4:1 input voltage ranges in a compact low profile case with industry-standard footprint. A very high efficiency allows an operating temperature range of  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ . Further standard features include remote On/Off, output voltage trimming, over voltage protection, under voltage lockout, over temperature and short circuit protection. Typical applications for these products are battery operated equipment and distributed power architectures in communication and industrial electronics, everywhere where isolated, tightly regulated voltages are required and space is limited on the PCB.

### Models

| Order Code    | Input Voltage Range          | Output 1 |                  | Output 2 |                  | Efficiency typ. |
|---------------|------------------------------|----------|------------------|----------|------------------|-----------------|
|               |                              | Vnom     | I <sub>max</sub> | Vnom     | I <sub>max</sub> |                 |
| TEN 40-2410WI | 9 - 36 VDC<br>(24 VDC nom.)  | 3.3 VDC  | 10'000 mA        |          |                  | 87 %            |
| TEN 40-2411WI |                              | 5 VDC    | 8'000 mA         |          |                  | 88 %            |
| TEN 40-2412WI |                              | 12 VDC   | 3'330 mA         |          |                  | 87 %            |
| TEN 40-2413WI |                              | 15 VDC   | 2'670 mA         |          |                  | 87 %            |
| TEN 40-2422WI |                              | +12 VDC  | 1'670 mA         | -12 VDC  | 1'670 mA         | 86 %            |
| TEN 40-2423WI |                              | +15 VDC  | 1'330 mA         | -15 VDC  | 1'330 mA         | 86 %            |
| TEN 40-4810WI | 18 - 75 VDC<br>(48 VDC nom.) | 3.3 VDC  | 10'000 mA        |          |                  | 87 %            |
| TEN 40-4811WI |                              | 5 VDC    | 8'000 mA         |          |                  | 89 %            |
| TEN 40-4812WI |                              | 12 VDC   | 3'330 mA         |          |                  | 87 %            |
| TEN 40-4813WI |                              | 15 VDC   | 2'670 mA         |          |                  | 88 %            |
| TEN 40-4822WI |                              | +12 VDC  | 1'670 mA         | -12 VDC  | 1'670 mA         | 87 %            |
| TEN 40-4823WI |                              | +15 VDC  | 1'330 mA         | -15 VDC  | 1'330 mA         | 86 %            |

### Options

|         |  |
|---------|--|
| TEN-HS3 | - Optional Heat Sink: <a href="http://www.tracopower.com/products/ten-hs3.pdf">www.tracopower.com/products/ten-hs3.pdf</a> |
|---------|--|

## Input Specifications

|                        |                |   |
|------------------------|----------------|---|
| Input Current          | - At no load   | 24 Vin models: <b>75 mA typ.</b> (3.3 Vout model)<br><b>95 mA typ.</b> (5 Vout model)<br><b>50 mA typ.</b> (12 Vout model)<br><b>50 mA typ.</b> (15 Vout model)<br><b>60 mA typ.</b> (12 / -12 Vout model)<br><b>70 mA typ.</b> (15 / -15 Vout model) |
|                        | - At full load | 48 Vin models: <b>55 mA typ.</b> (3.3 Vout model)<br><b>60 mA typ.</b> (5 Vout model)<br><b>30 mA typ.</b> (12 Vout model)<br><b>25 mA typ.</b> (15 Vout model)<br><b>30 mA typ.</b> (12 / -12 Vout model)<br><b>30 mA typ.</b> (15 / -15 Vout model) |
| Surge Voltage          | - At no load   | 24 Vin models: <b>50 VDC max.</b> (100 ms max.)<br>48 Vin models: <b>100 VDC max.</b> (100 ms max.)   |
|                        | - At full load | 24 Vin models: <b>7 VDC min. / 8 VDC typ. / 8.8 VDC max.</b><br>48 Vin models: <b>15 VDC min. / 16 VDC typ. / 17.5 VDC max.</b>   |
| Under Voltage Lockout  |                | 24 Vin models: <b>7 VDC min. / 8 VDC typ. / 8.8 VDC max.</b><br>48 Vin models: <b>15 VDC min. / 16 VDC typ. / 17.5 VDC max.</b>   |
| Recommended Input Fuse |                | 24 Vin models: <b>8'000 mA</b> (fast acting)<br>48 Vin models: <b>4'000 mA</b> (slow blow)<br>(The need of an external fuse has to be assessed in the final application.)   |
| Input Filter           |                | <b>Internal Pi-Type</b>   |

## Output Specifications

|                                     |  |  |
|-------------------------------------|--|--|
| Output Voltage Adjustment           |  | <b>±10%</b> (By external trim resistor)<br>See application note: <a href="http://www.tracopower.com/overview/ten40wi">www.tracopower.com/overview/ten40wi</a><br>Output power must not exceed rated power! |
| Voltage Set Accuracy                |  | <b>±1% max.</b>  |
| Regulation                          | - Input Variation (Vmin - Vmax)            | single output models: <b>0.2% max.</b><br>dual output models: <b>0.2% max.</b>   |
|                                     | - Load Variation (0 - 100%)                | single output models: <b>0.5% max.</b><br>dual output models: <b>1% max.</b> (Output 1)<br><b>1% max.</b> (Output 2)   |
|                                     | - Cross Regulation (25% / 100% asym. load) | dual output models: <b>5% max.</b>   |
| Ripple and Noise (20 MHz Bandwidth) | - single output                            | 3.3 Vout models: <b>50 mVp-p typ.</b><br>5 Vout models: <b>50 mVp-p typ.</b><br>12 Vout models: <b>75 mVp-p typ.</b><br>15 Vout models: <b>75 mVp-p typ.</b>   |
|                                     | - dual output                              | 12 / -12 Vout models: <b>120 / 120 mVp-p typ.</b><br>15 / -15 Vout models: <b>150 / 150 mVp-p typ.</b>   |

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

|                           |                 |   |
|---------------------------|-----------------|---|
| Capacitive Load           | - single output | 3.3 Vout models: 25'750 µF max.<br>5 Vout models: 13'600 µF max.<br>12 Vout models: 2'360 µF max.<br>15 Vout models: 1'510 µF max.  |
|                           | - dual output   | 12 / -12 Vout models: 1'200 / 1'200 µF max.<br>15 / -15 Vout models: 750 / 750 µF max.  |
| Minimum Load              | - single output | 3.3 Vout models: 0 % of Iout max.<br>5 Vout models: 0 % of Iout max.<br>12 Vout models: 1.5 % of Iout max.<br>15 Vout models: 2 % of Iout max.  |
|                           | - dual output   | 12 / -12 Vout models: 4 % of Iout max.<br>15 / -15 Vout models: 4 % of Iout max.  |
| Temperature Coefficient   |                 | ±0.02 %/K max.  |
| Start-up Time             |                 | 20 ms max. (Power On)<br>20 ms typ. (Remote On)   |
| Short Circuit Protection  |                 | Continuous, Automatic recovery  |
| Output Current Limitation |                 | 150% max. of Iout max.  |
| Overvoltage Protection    |                 | 118 - 125% of Vout nom.<br>(depending on model)<br>3.9 VDC typ. (3.3 VDC single model)<br>6.2 VDC typ. (5 VDC single model)<br>15 VDC typ. (12 VDC single model)<br>18 VDC typ. (15 VDC single model)<br>(By Zener diode) |
| Transient Response        | - Response Time | 250 µs typ. (25% Load Step)   |

### Safety Specifications

|                       |                             |  |
|-----------------------|-----------------------------|--|
| Standards             | - IT / Multimedia Equipment | EN 60950-1<br>EN 62368-1<br>IEC 60950-1<br>IEC 62368-1<br>UL 60950-1<br>UL 62368-1           |
|                       | - Certification Documents   | <a href="http://www.tracopower.com/overview/ten40wi">www.tracopower.com/overview/ten40wi</a> |
| Pollution Degree      |                             | PD 2   |
| Over Voltage Category |                             | Not mains connected  |

### EMC Specifications

|               |                             |  |
|---------------|-----------------------------|--|
| EMI Emissions | - Conducted Emissions       | EN 55032 class A (with external filter)<br>EN 55032 class B (with external filter)                   |
|               | - Radiated Emissions        | EN 55032 class A (with external filter)<br>EN 55032 class B (with external filter)                   |
|               | External filter proposal:   | <a href="http://www.tracopower.com/overview/ten40wi">www.tracopower.com/overview/ten40wi</a>         |
| EMS Immunity  |                             | EN 55024 (IT Equipment)<br>EN 55035 (Multimedia)   |
|               | - Electrostatic Discharge   | Air: EN 61000-4-2, ±8 kV, perf. criteria A<br>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 B<br>EN 61000-4-5, ±1 kV, perf. criteria A                       |
|               | - Conducted RF Disturbances | Ext. input component: 220 µF / 100 V / KY<br>EN 61000-4-6, 10 Vrms, perf. criteria A                 |
|               | - PF Magnetic Field         | Continuous: EN 61000-4-8, 100 A/m, perf. criteria A<br>1 s: EN 61000-4-8, 1000 A/m, perf. criteria A |

### General Specifications

|                   |                           |
|-------------------|---------------------------|
| Relative Humidity | 95% max. (non condensing) |
|-------------------|---------------------------|

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

|  |  |  |
|--|--|--|
| Temperature Ranges                     | - Operating Temperature<br>- Case Temperature<br>- Storage Temperature                                       | -40°C to +85°C<br>+105°C max.<br>-55°C to +125°C   |
| Power Derating                         | - High Temperature   | Depending on model<br>See application note: <a href="http://www.tracopower.com/overview/ten40wi">www.tracopower.com/overview/ten40wi</a>   |
| Over Temperature Protection Switch Off | - Protection Mode  | 110°C typ.   |
| Cooling System                         |  | Natural convection (20 LFM)  |
| Sense Function                         |  | 10% max. of Vout nom.<br>(If sense function is not used, sense pins must be connected to corresponding polarity output pins.)  |
| Remote Control                         | - Voltage Controlled Remote (passive = on)<br><br>- Off Idle Input Current<br><br>- Remote Pin Input Current | On: 3.0 to 12 VDC or open circuit<br>Off: 0 to 1.2 VDC or short circuit<br>Refers to 'Remote' and '-Vin' Pin<br>10 mA typ. (24 Vin models)<br>5 mA (48 Vin models)<br>-0.5 to 0.5 mA |
| Altitude During Operation              |  | 2'000 m max.   |
| Switching Frequency                    |  | 270 - 330 kHz (PWM)<br>300 kHz typ. (PWM)  |
| Insulation System                      |  | Functional Insulation  |
| Isolation Test Voltage                 | - Input to Output, 60 s<br>- Input to Case, 60 s<br>- Output to Case, 60 s                                   | 1'600 VDC<br>1'600 VDC<br>1'600 VDC  |
| Isolation Resistance                   | - Input to Output, 500 VDC   | 1'000 MΩ min.  |
| Isolation Capacitance                  | - Input to Output, 100 kHz, 1 V  | 2'500 pF typ.  |
| Reliability                            | - Calculated MTBF  | 660'000 h (MIL-HDBK-217F, ground benign)   |
| Washing Process                        |  | According to Cleaning Guideline<br><a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>  |
| Environment                            | - Vibration<br><br>- Mechanical Shock<br><br>- Thermal Shock   | MIL-STD-810F<br>7.6 g, 3 axis, 60 min, 20-2000 Hz<br>MIL-STD-810F<br>40 g, 3 axis, half sine, 11 ms<br>MIL-STD-810F  |
| Housing Material                       |  | Copper, Nickel plated  |
| Base Material                          |  | Non-conductive FR4 (UL 94 V-0 rated)   |
| Potting Material                       |  | Epoxy (UL 94 V-0 rated)  |
| Pin Material                           |  | Copper   |
| Pin Foundation Plating                 |  | Nickel (2 - 3 μm)  |
| Pin Surface Plating                    |  | Tin (3 - 5 μm), matte  |
| Housing Type                           |  | Metal Case   |
| Mounting Type                          |  | PCB Mount  |
| Connection Type                        |  | THD (Through-Hole Device)  |
| Footprint Type                         |  | 2" x 2"  |
| Soldering Profile                      |  | Lead-Free Wave Soldering<br>265°C / 10 s max.  |
| Weight                                 |  | 60 g   |
| Thermal Impedance                      | - Case to Ambient  | 9.2 K/W typ.<br>7.6 K/W typ. (with Heat Sink)  |

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

Environmental Compliance - REACH Declaration

[www.tracopower.com/info/reach-declaration.pdf](http://www.tracopower.com/info/reach-declaration.pdf)

- RoHS Declaration

REACH SVHC list compliant

REACH Annex XVII compliant

[www.tracopower.com/info/rohs-declaration.pdf](http://www.tracopower.com/info/rohs-declaration.pdf)

Exemptions: 7a, 7c-I

(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule))

- SCIP Reference Number

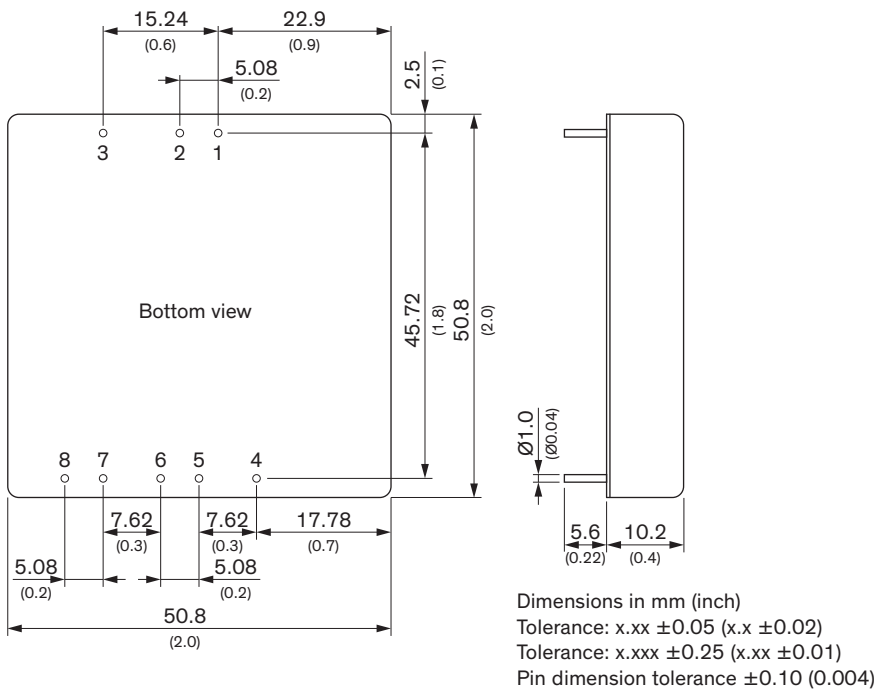
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### Supporting Documents

[Overview Link](#) (for additional Documents)

[www.tracopower.com/overview/ten40wi](http://www.tracopower.com/overview/ten40wi)

### Outline Dimensions



### Pinout

| Pin | Single        | Dual          |
|-----|---------------|---------------|
| 1   | +Vin (Vcc)    | +Vin (Vcc)    |
| 2   | -Vin (GND)    | -Vin (GND)    |
| 3   | Remote On/Off | Remote On/Off |
| 4   | -Sense*       | +Vout         |
| 5   | +Sense*       | Common        |
| 6   | +Vout         | Common        |
| 7   | -Vout         | -Vout         |
| 8   | Trim          | Trim          |

\*Sense line to be connected to the output either at the module or at the load under regard of polarity.