

#### Features

- ◆ High power density: 40W in 2"x2"x0.4" metal package
- ◆ Ultra wide 4:1 input voltage range
- ◆ Very high efficiency up to 87 %
- ◆ 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°C to 85°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

| Ordercode     | Input voltage range                    | Output voltage | Output current max. | Efficiency typ. |
|---------------|----------------------------------------|----------------|---------------------|-----------------|
| TEN 40-2410WI | <b>9 – 36 VDC</b><br>(24 VDC nominal)  | 3.3 VDC        | 10.0 A              | 86 %            |
| TEN 40-2411WI |                                        | 5.0 VDC        | 8.0 A               | 87 %            |
| TEN 40-2412WI |                                        | 12 VDC         | 3.35 A              | 87 %            |
| TEN 40-2413WI |                                        | 15 VDC         | 2.65 A              | 87 %            |
| TEN 40-2422WI |                                        | ±12 VDC        | ±1.65 A             | 86 %            |
| TEN 40-2423WI |                                        | ±15 VDC        | ±1.35 A             | 86 %            |
| TEN 40-4810WI | <b>18 – 75 VDC</b><br>(48 VDC nominal) | 3.3 VDC        | 10.0 A              | 86 %            |
| TEN 40-4811WI |                                        | 5.0 VDC        | 8.0 A               | 88 %            |
| TEN 40-4812WI |                                        | 12 VDC         | 3.35 A              | 87 %            |
| TEN 40-4813WI |                                        | 15 VDC         | 2.65 A              | 87 %            |
| TEN 40-4822WI |                                        | ±12 VDC        | ±1.65 A             | 86 %            |
| TEN 40-4823WI |                                        | ±15 VDC        | ±1.35 A             | 86 %            |

## Input Specifications

|                                                                                                                 |                                                                                     |                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input current (no load)                                                                                         | 24 Vin single output models:<br>48 Vin single output models:<br>dual output models: | 100 mA typ<br>60 mA typ<br>30 mA typ                                                                                                                                                                                                                                                                                  |
| Input current (full load) (nominal input 24/48 VDC)                                                             | 3.3 VDC models:<br>other models:                                                    | 1680 / 840 mA typ.<br>2000 / 1000 mA typ.                                                                                                                                                                                                                                                                             |
| Input voltage variation (dv/dt)                                                                                 |                                                                                     | 5 V/ms, max.<br>(complies with ETS300 132 part 4.4)                                                                                                                                                                                                                                                                   |
| Start-up voltage / under voltage lockout                                                                        | 24 Vin models:<br>48 Vin models:                                                    | 9 VDC / 8 VDC (typ.)<br>18 VDC / 16 VDC (typ.)                                                                                                                                                                                                                                                                        |
| Surge voltage (100 msec. max.)                                                                                  | 24 Vin models:<br>48 Vin models:                                                    | 50 V max.<br>100 V max.                                                                                                                                                                                                                                                                                               |
| EMC characteristics (with external capacitors)<br>– Conducted noise<br>– ESD<br><br>– Fast transient<br>– Surge | see application note:                                                               | <a href="http://www.tracopower.com/products/ten40wi-application.pdf">www.tracopower.com/products/ten40wi-application.pdf</a><br>EN 55022 level A, FCC part 15, level A<br>EN 61000-4-2, air: ±8 KV contact: ±6 KV, perf. criteria A<br>EN 61000-4-4, ±2 KV, perf. criteria B<br>EN 61000-4-5, ±1 KV, perf. criteria A |

## Output Specifications

|                                                         |                                                                                                              |                                                                                                                                                                      |
|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Voltage set accuracy (at nominal input and full load)   |                                                                                                              | ±1 %                                                                                                                                                                 |
| Output voltage adjustment                               |                                                                                                              | ±10 % (see application note)                                                                                                                                         |
| Regulation                                              | – Input variation Vin min. to Vin max.<br>– Load variation<br>– Load cross variation 25 % / 100 %            | 0.2 % max.<br>single output models: 0.5 % max. (0 – 100 % load)<br>dual output models balanced load: 1.0 % max. (4 – 100 % load)<br>5 % max.                         |
| Temperature coefficient                                 |                                                                                                              | 0.02 %/K max.                                                                                                                                                        |
| Ripple and noise (20 MHz Bandwidth)                     | 3.3 VDC & 5 VDC output models:<br>dual outputs:<br>all other outputs:                                        | 50 mVpk-pk max.<br>150 mVpk-pk max.<br>75 mVpk-pk max.                                                                                                               |
| Start up time (nominal Vin and constant resistive load) |                                                                                                              | 25 ms typ.                                                                                                                                                           |
| Transient response time (25 % load change)              |                                                                                                              | 250 µs typ.                                                                                                                                                          |
| Short circuit protection                                |                                                                                                              | indefinite (automatic recovery)                                                                                                                                      |
| Over load protection                                    |                                                                                                              | 150 % of lout max. typ. foldback                                                                                                                                     |
| Thermal shutdown                                        |                                                                                                              | @ +110°C typ.                                                                                                                                                        |
| Over voltage protection                                 | 3.3 VDC models:<br>5 VDC models:<br>12/±12 DC models:<br>15 VDC output:                                      | 3.9 V<br>6.2 V<br>15 /±15 V<br>18 /±18 V                                                                                                                             |
| Minimum load                                            | single output model:<br>dual output models:                                                                  | not required.<br>1 % of rated max current (operation at lower load condition will not damage these converters, however, they may not meet all listed specifications) |
| Capacitive load output models                           | 3.3 VDC models:<br>5.0 VDC models:<br>12 VDC models:<br>15 VDC models:<br>±12 VDC models:<br>±15 VDC models: | 25'000 µF max.<br>13'000 µF max.<br>2'300 µF max.<br>1'500 µF max.<br>1'200 µF max. (each output)<br>750 µF max. (each output)                                       |

## General Specifications

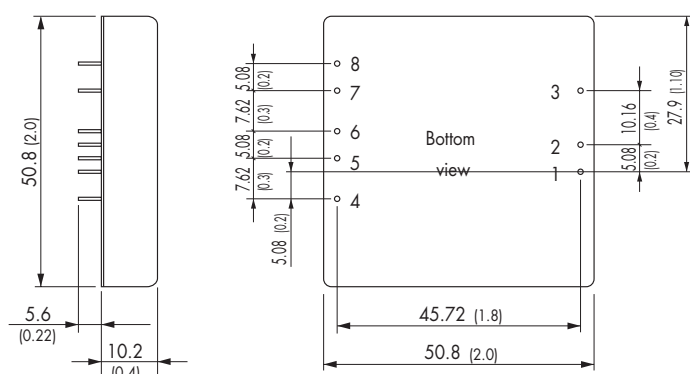
|                                                                       |                                                                                                              |                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature ranges                                                    | <ul style="list-style-type: none"> <li>– Operating</li> <li>– Case temperature</li> <li>– Storage</li> </ul> | –40°C to +85°C<br>+105°C max.<br>–55°C to +125°C                                                                                                                                                                                   |
| Derating                                                              |                                                                                                              | see application note                                                                                                                                                                                                               |
| Humidity (non condensing)                                             |                                                                                                              | 95 % rel H max.                                                                                                                                                                                                                    |
| Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign) |                                                                                                              | >150'000 h                                                                                                                                                                                                                         |
| Isolation voltage (60 sec.)                                           | – Input / Output                                                                                             | 1'500 VDC                                                                                                                                                                                                                          |
| Isolation resistance                                                  | – Input / Output                                                                                             | >1'000 M Ohm                                                                                                                                                                                                                       |
| Isolation capacitance                                                 | – Input / Output                                                                                             | 2500 pF max.                                                                                                                                                                                                                       |
| Remote On/Off                                                         | <ul style="list-style-type: none"> <li>– On:</li> <li>– Off:</li> <li>– Off idle current:</li> </ul>         | 3.0 ... 12 VDC or open circuit.<br>0 ... 1.2 VDC or short circuit pin 3 and pin 2<br>2.5 mA max.                                                                                                                                   |
| Switching frequency (fixed)                                           |                                                                                                              | 300 kHz typ. (Pulse width modulation PWM)                                                                                                                                                                                          |
| Vibration                                                             |                                                                                                              | 10 – 55 Hz, 10G, 30 minutes along X,Y,Z                                                                                                                                                                                            |
| Safety standards                                                      |                                                                                                              | UL 60950-1, IEC/EN 60950-1                                                                                                                                                                                                         |
| Safety approvals                                                      | – UL/cUL                                                                                                     | <a href="http://www.ul.com">www.ul.com</a> -> certifications -> File: e188913                                                                                                                                                      |
| Environmental compliance                                              | <ul style="list-style-type: none"> <li>– Reach</li> <li>– RoHs</li> </ul>                                    | <a href="http://www.tracopower.com/products/ten40wi-reach.pdf">www.tracopower.com/products/ten40wi-reach.pdf</a><br><a href="http://www.tracopower.com/products/ten40wi-rohs.pdf">www.tracopower.com/products/ten40wi-rohs.pdf</a> |

## Physical Specifications

|                       |                         |
|-----------------------|-------------------------|
| Casing material       | copper, nickel plated   |
| Baseplate material    | none conductive FR4     |
| Potting material      | epoxy (UL 94V-0 -rated) |
| Weight                | 60 g (2.1 oz)           |
| Soldering temperature | max. 265°C / 10 sec.    |

**Application note:** [www.tracopower.com/products/ten40wi-application.pdf](http://www.tracopower.com/products/ten40wi-application.pdf)

## Outline Dimensions



Dimensions in [mm], ( ) = Inch  
 Pin diameter:  $1.0 \pm 0.05$  ( $0.04 \pm 0.002$ )  
 Pin pitch tolerances:  $\pm 0.35$  ( $\pm 0.014$ )  
 Case tolerances:  $\pm 0.5$  ( $\pm 0.02$ )

## Pin-Out

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

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

## Heat-Sink (Option)

Order code: **TEN-HS3**

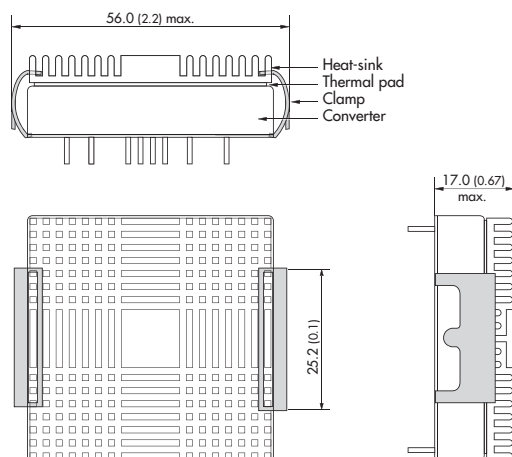
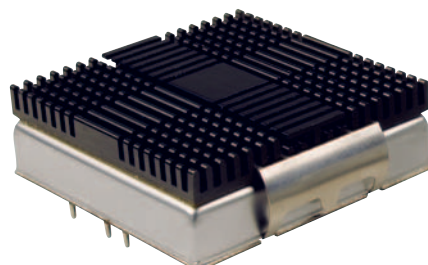
(cont.: heat-sink, thermal pad, 2 clamps)

Material: Aluminum

Finish: Anodic treatment (black)

Weight: 22 g (0.78oz) (without converter)

Thermal impedance after assembling: 7.6 K/W



### Note:

The product label on converter has to be removed before mounting the heat-sink.

For volume orders converters will be supplied with heat-sinks already mounted. Please contact factory for quotation.

Specifications can be changed any time without notice.