

- Ultra compact 6 Watt converter in DIP-16 metal casing
- High power density of 1,6W/cm<sup>3</sup>
- 6-side shielded metal case with insulated baseplate
- Wide 4:1 input voltage range: 4.5-18, 9-36, 18-75 VDC
- High efficiency (up to 87%) for low thermal loss
- Operating temperature range -40°C to +85°C
- Meets EN 55032 class A (conducted and radiated) with a single input capacitor
- Protection against short circuit
- 3-year product warranty



The TEL 6WI is an isolated 6 Watt converters series which comes in an ultra compact DIP-16 metal package. It solidifies the new package standard in this power range with a power density of 1,6 W/cm<sup>3</sup> which almost doubles the power density compared to 6 Watt converters in DIP-24 packages. The TEL 6WI offers a wide 4:1 input voltage range and featured a high efficiency of up to 87% which enables an operation temperature of up to +70°C at full load and up to 85°C with 60% load. With only a single input capacitor (SMD) the converters comply with conducted and radiated emission standard EN 55032 class A. Overall they feature an economical solution for space critical and cost sensitive applications in instrumentation, IT and industrial electronics.

### Models

| Order Code   | Input Voltage Range           | Output 1 |                  | Output 2 |                  | Efficiency typ. |
|--------------|-------------------------------|----------|------------------|----------|------------------|-----------------|
|              |                               | Vnom     | I <sub>max</sub> | Vnom     | I <sub>max</sub> |                 |
| TEL 6-1211WI | 4.5 - 18 VDC<br>(12 VDC nom.) | 5 VDC    | 1'200 mA         |          |                  | 82 %            |
| TEL 6-1212WI |                               | 12 VDC   | 500 mA           |          |                  | 85 %            |
| TEL 6-1213WI |                               | 15 VDC   | 400 mA           |          |                  | 86 %            |
| TEL 6-1215WI |                               | 24 VDC   | 250 mA           |          |                  | 87 %            |
| TEL 6-1222WI |                               | +12 VDC  | 250 mA           | -12 VDC  | 250 mA           | 85 %            |
| TEL 6-1223WI |                               | +15 VDC  | 200 mA           | -15 VDC  | 200 mA           | 85 %            |
| TEL 6-2411WI | 9 - 36 VDC<br>(24 VDC nom.)   | 5 VDC    | 1'200 mA         |          |                  | 81 %            |
| TEL 6-2412WI |                               | 12 VDC   | 500 mA           |          |                  | 84 %            |
| TEL 6-2413WI |                               | 15 VDC   | 400 mA           |          |                  | 84 %            |
| TEL 6-2415WI |                               | 24 VDC   | 250 mA           |          |                  | 85 %            |
| TEL 6-2422WI |                               | +12 VDC  | 250 mA           | -12 VDC  | 250 mA           | 85 %            |
| TEL 6-2423WI |                               | +15 VDC  | 200 mA           | -15 VDC  | 200 mA           | 84 %            |
| TEL 6-4811WI | 18 - 75 VDC<br>(48 VDC nom.)  | 5 VDC    | 1'200 mA         |          |                  | 81 %            |
| TEL 6-4812WI |                               | 12 VDC   | 500 mA           |          |                  | 85 %            |
| TEL 6-4813WI |                               | 15 VDC   | 400 mA           |          |                  | 85 %            |
| TEL 6-4815WI |                               | 24 VDC   | 250 mA           |          |                  | 85 %            |
| TEL 6-4822WI |                               | +12 VDC  | 250 mA           | -12 VDC  | 250 mA           | 86 %            |
| TEL 6-4823WI |                               | +15 VDC  | 200 mA           | -15 VDC  | 200 mA           | 86 %            |

## Input Specifications

|                          |                |   |
|--------------------------|----------------|---|
| Input Current            | - At no load   | 12 Vin models: <b>12 mA typ.</b><br>24 Vin models: <b>10 mA typ.</b><br>48 Vin models: <b>10 mA typ.</b>  |
|                          | - At full load | 12 Vin models: <b>587 mA typ.</b><br>24 Vin models: <b>299 mA typ.</b><br>48 Vin models: <b>148 mA typ.</b>   |
| Surge Voltage            |                | 12 Vin models: <b>25 VDC max.</b> (1 s max.)<br>24 Vin models: <b>50 VDC max.</b> (1 s max.)<br>48 Vin models: <b>100 VDC max.</b> (1 s max.)   |
| Under Voltage Lockout    |                | 12 Vin models: <b>3 VDC min. / 3.5 VDC typ.</b><br>24 Vin models: <b>5.5 VDC min. / 6.5 VDC typ.</b><br>48 Vin models: <b>12 VDC min. / 15.5 VDC typ.</b>   |
| Reflected Ripple Current |                | <b>50 mAp-p typ.</b>  |
| Recommended Input Fuse   |                | 12 Vin models: <b>3'150 mA</b> (slow blow)<br>24 Vin models: <b>2'000 mA</b> (slow blow)<br>48 Vin models: <b>1'000 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

|                           |   |   |
|---------------------------|---|---|
| Voltage Set Accuracy      |   | <b>±2% max.</b>   |
| Regulation                | - Input Variation (Vmin - Vmax)               | single output models: <b>0.5% max.</b><br>dual output models: <b>0.5% max.</b> (Output 1)<br><b>1% max.</b> (Output 2)                                |
|                           | - Load Variation (5 - 100%)                   | single output models: <b>1% max.</b><br>dual output models: <b>1% max.</b> (Output 1)<br><b>1.5% max.</b> (Output 2)                                  |
|                           | - Cross Regulation<br>(25% / 100% asym. load) | dual output models: <b>5% max.</b>  |
|                           |   |   |
| Ripple and Noise          | - 20 MHz Bandwidth                            | <b>100 mVp-p max.</b> (w/ 1 µF MLCC    10µF Tantalum)   |
| Capacitive Load           | - single output                               | 5 Vout models: <b>1'000 µF max.</b><br>12 Vout models: <b>470 µF max.</b><br>15 Vout models: <b>220 µF max.</b><br>24 Vout models: <b>100 µF max.</b> |
|                           | - dual output                                 | 12 / -12 Vout models: <b>330 / 330 µF max.</b><br>15 / -15 Vout models: <b>220 / 220 µF max.</b>  |
| Minimum Load              |   | <b>Not required</b>   |
| Temperature Coefficient   |   | <b>±0.03 %/K max.</b>   |
| Start-up Time             |   | <b>150 ms max.</b>  |
| Short Circuit Protection  |   | <b>Continuous, Automatic recovery</b>   |
| Output Current Limitation |   | <b>110 - 230% of Iout max.</b><br><b>160% typ. of Iout max.</b>   |
| Transient Response        | - Response Deviation                          | <b>5% typ. / 8% max.</b> (25% Load Step) (5 Vout models)<br><b>3% typ. / 5% max.</b> (25% Load Step) (other models)                                   |
|                           | - Response Time                               | <b>300 µs typ. / 500 µs max.</b> (25% Load Step)  |

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

## Safety Specifications

|                  |                             |   |
|------------------|-----------------------------|---|
| Safety Standards | - IT / Multimedia Equipment | EN 62368-1<br>IEC 62368-1<br>UL 62368-1   |
|                  | - Certification Documents   | <a href="http://www.tracopower.com/overview/tel6wi">www.tracopower.com/overview/tel6wi</a><br>(Max. 800 V transient on input side must be considered in final installation) |
| Pollution Degree |                             | PD 2  |

## 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/tel6wi">www.tracopower.com/overview/tel6wi</a><br>(Note: Class A emissions can be met using only a single input capacitor.) |
| EMS Immunity  | - Electrostatic Discharge   | Air: EN 61000-4-2, $\pm 8$ kV, perf. criteria A<br>Contact: EN 61000-4-2, $\pm 6$ kV, perf. criteria A  |
|               | - RF Electromagnetic Field  | EN 61000-4-3, 20 V/m, perf. criteria A  |
|               | - EFT (Burst) / Surge       | EN 61000-4-4, $\pm 2$ kV, perf. criteria A<br>EN 61000-4-5, $\pm 2$ kV, perf. criteria A  |
|               | - Conducted RF Disturbances | External filter proposal: <a href="http://www.tracopower.com/overview/tel6wi">www.tracopower.com/overview/tel6wi</a><br>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              | +105°C max.   |
|                           | - Storage Temperature           | -55°C to +125°C   |
| Power Derating            | - High Temperature              | Depending on model  |
|                           |                                 | See application note: <a href="http://www.tracopower.com/overview/tel6wi">www.tracopower.com/overview/tel6wi</a>  |
| Cooling System            |                                 | Natural convection (20 LFM)   |
| Altitude During Operation |                                 | 5'000 m max.  |
| Switching Frequency       |                                 | 150 - 402 kHz (PWM, PFM) (12 Vin models)<br>48 - 427 kHz (PWM, PFM) (24 Vin single models)<br>36 - 320 kHz (PWM, PFM) (48 Vin single models)<br>48 - 427 kHz (PWM, PFM) (24 & 48 Vin dual models)<br>(Above 50% load PWM is used, below 50% load PFM is used) |
| Insulation System         |                                 | Functional Insulation   |
| Isolation Test Voltage    | - Input to Output, 60 s         | 1'500 VDC   |
| Isolation Resistance      | - Input to Output, 500 VDC      | 1'000 M $\Omega$ min.   |
| Isolation Capacitance     | - Input to Output, 100 kHz, 1 V | 2'200 pF typ.   |
| Reliability               | - Calculated MTBF               | 1'000'000 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                     | IEC 60068-2-6<br>5 g, 3 axis, random waveform, 10-150 Hz  |
|                           | - Mechanical Shock              | IEC 60068-2-27<br>15 g, 3 axis, half sine, 11 ms  |
|                           | - Thermal Shock                 | IEC 60068-2-14  |
| Housing Material          |                                 | Alu alloy, black anodized coating   |
| Base Material             |                                 | Rynite® FR530 BK507   |
| Potting Material          |                                 | Epoxy (UL 94 V-0 rated)   |

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

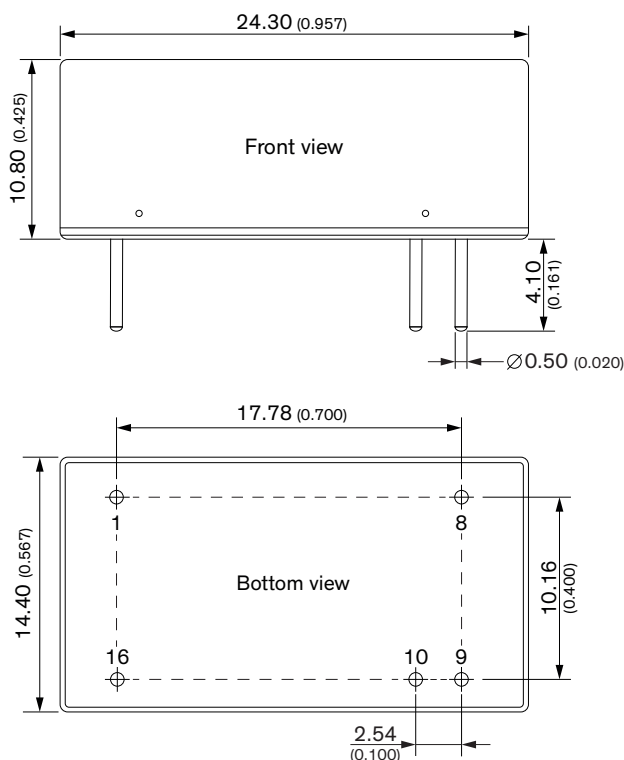
|                          |  |
|--------------------------|--|
| Pin Material             | Brass  |
| Pin Foundation Plating   | Nickel (1 - 3 $\mu\text{m}$ )  |
| Pin Surface Plating      | Gold (50 - 75 nm), glossy  |
| Housing Type             | Metal Case   |
| Mounting Type            | PCB Mount  |
| Connection Type          | THD (Through-Hole Device)  |
| Footprint Type           | DIP16  |
| Soldering Profile        | Lead-Free Wave Soldering<br>265°C / 10 s max.  |
| Weight                   | 7.5 g  |
| Thermal Impedance        | - Case to Ambient<br>20 K/W typ. (at $V_{in}$ min.)  |
| Environmental Compliance | - REACH Declaration<br><a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a><br>REACH SVHC list compliant<br>REACH Annex XVII compliant<br>- RoHS Declaration<br><a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a><br>Exemptions: 7a, 7c-I<br>(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule))<br>- SCIP Reference Number<br>d16381e8-40dd-4d44-9951-68eaf8f4e86c |

### Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tel6wi](http://www.tracopower.com/overview/tel6wi)

### Outline Dimensions



Dimensions in mm (inch)  
Pin diameter tolerances:  $\pm 0.10$  ( $\pm 0.004$ )  
General tolerances:  $\pm 0.50$  ( $\pm 0.020$ )

| Pinout |            |        |
|--------|------------|--------|
| Pin    | Single     | Dual   |
| 1      | -Vin (GND) |        |
| 8      | NTC        | Common |
| 9      | +Vout      |        |
| 10     | -Vout      |        |
| 16     | +Vin (Vcc) |        |

NTC: Not to connect