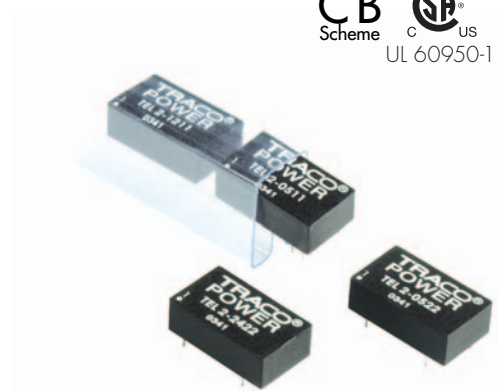


#### Features

- ◆ Ultracompact DIP-16 plastic package
- ◆ Wide 2:1 input range
- ◆ Regulated output
- ◆ I/O isolation 1500V
- ◆ Input filter meets EN55022, class A without ext. components
- ◆ Low ripple and noise
- ◆ Indefinite shortcircuit protection
- ◆ Operating temperature range -40°C to +75°C
- ◆ Lead free design, RoHS compliant
- ◆ 3-year product warranty



The TEL-2 series, comprising 28 models, is a range of isolated 2 Watt converters in a low profile DIP-16 package. Requiring only 3.25 cm<sup>2</sup> of space on the PCB they provide a complete DC/DC converter without need of any external components. Wide input range and tightly regulated output voltage qualifies these converters for many cost critical applications in industrial and consumer electronics.

#### Models

| Ordercode  | Input voltage range                    | Output voltage | Output current max. | Efficiency typ. |
|------------|----------------------------------------|----------------|---------------------|-----------------|
| TEL 2-0510 | <b>4.5 – 9 VDC</b><br>(nominal 5 VDC)  | 3.3 VDC        | 500 mA              | 70 %            |
| TEL 2-0511 |                                        | 5 VDC          | 400 mA              | 73 %            |
| TEL 2-0512 |                                        | 12 VDC         | 165 mA              | 75 %            |
| TEL 2-0513 |                                        | 15 VDC         | 135 mA              | 73 %            |
| TEL 2-0521 |                                        | ±5 VDC         | ±200 mA             | 64 %            |
| TEL 2-0522 |                                        | ±2 VDC         | ±85 mA              | 69 %            |
| TEL 2-0523 |                                        | ±15 VDC        | ±65 mA              | 71 %            |
| TEL 2-1210 | <b>9 – 18 VDC</b><br>(nominal 12 VDC)  | 3.3 VDC        | 500 mA              | 73 %            |
| TEL 2-1211 |                                        | 5 VDC          | 400 mA              | 77 %            |
| TEL 2-1212 |                                        | 12 VDC         | 165 mA              | 80 %            |
| TEL 2-1213 |                                        | 15 VDC         | 135 mA              | 80 %            |
| TEL 2-1221 |                                        | ±5 VDC         | ±200 mA             | 73 %            |
| TEL 2-1222 |                                        | ±12 VDC        | ±85 mA              | 78 %            |
| TEL 2-1223 |                                        | ±15 VDC        | ±65 mA              | 78 %            |
| TEL 2-2410 | <b>18 – 36 VDC</b><br>(nominal 24 VDC) | 3.3 VDC        | 500 mA              | 72 %            |
| TEL 2-2411 |                                        | 5 VDC          | 400 mA              | 77 %            |
| TEL 2-2412 |                                        | 12 VDC         | 165 mA              | 80 %            |
| TEL 2-2413 |                                        | 15 VDC         | 135 mA              | 81 %            |
| TEL 2-2421 |                                        | ±5 VDC         | ±200 mA             | 74 %            |
| TEL 2-2422 |                                        | ±12 VDC        | ±85 mA              | 78 %            |
| TEL 2-2423 |                                        | ±15 VDC        | ±65 mA              | 80 %            |
| TEL 2-4810 | <b>36 – 75 VDC</b><br>(nominal 48 VDC) | 3.3 VDC        | 500 mA              | 71 %            |
| TEL 2-4811 |                                        | 5 VDC          | 400 mA              | 73 %            |
| TEL 2-4812 |                                        | 12 VDC         | 165 mA              | 79 %            |
| TEL 2-4813 |                                        | 15 VDC         | 135 mA              | 79 %            |
| TEL 2-4821 |                                        | ±5 VDC         | ±200 mA             | 71 %            |
| TEL 2-4822 |                                        | ±12 VDC        | ±85 mA              | 77 %            |
| TEL 2-4823 |                                        | ±15 VDC        | ±65 mA              | 77 %            |

## Input Specifications

|                                                           |                                                                                                                                                         |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input current at full load / full load<br>(nominal input) | 5 Vin models: 600 mA / 40 mA typ.<br>12 Vin models: 220 mA / 20 mA typ.<br>24 Vin models: 110 mA / 10 mA typ.<br>48 Vin models: 55 mA / 8 mA typ.       |
| Start-up voltage /<br>under voltage shut down             | 5 Vin models: 4 VDC / 3.5 VDC typ.<br>12 Vin models: 7 VDC / 6.5 VDC typ.<br>24 Vin models: 12 VDC / 11 VDC typ.<br>48 Vin models: 24 VDC / 22 VDC typ. |
| Surge voltage (100 msec. max.)                            | 5 Vin models: 11 V max.<br>12 Vin models: 25 V max.<br>24 Vin models: 50 V max.<br>48 Vin models: 100 V max.                                            |
| Reverse voltage protection                                | 1.0 A max.                                                                                                                                              |
| Conducted noise (input)                                   | EN 55022 level A, FCC part 15, level A                                                                                                                  |

## Output Specifications

|                                     |                                                                                                                                                                                                                                                                      |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Voltage set accuracy                | ±2 % max.                                                                                                                                                                                                                                                            |
| Regulation                          | – Input variation Vin min. to Vin max. 0.5 % max.<br>– Load variation 25 – 100 % single output models: 0.75 % max.<br>dual output models: 2.0 % (balanced load)                                                                                                      |
| Ripple and noise (20 MHz Bandwidth) | 50 mVpk-pk max                                                                                                                                                                                                                                                       |
| Temperature coefficient             | ±0.02 %/K                                                                                                                                                                                                                                                            |
| Short circuit protection            | indefinite, automatic recovery                                                                                                                                                                                                                                       |
| Minimum load                        | 25 % of rated max current (operation at lower load condition is safe but a higher output ripple will be experienced)                                                                                                                                                 |
| Capacitive load                     | 3.3 VDC output models: 2'200 µF max.<br>5 VDC output models: 1'000 µF max.<br>12 VDC output models: 170 µF max.<br>15 VDC output models: 110 µF max.<br>±5 VDC output models: 470 µF max.<br>±12 VDC output models: 100 µF max.<br>±15 VDC output models: 47 µF max. |

## General Specifications

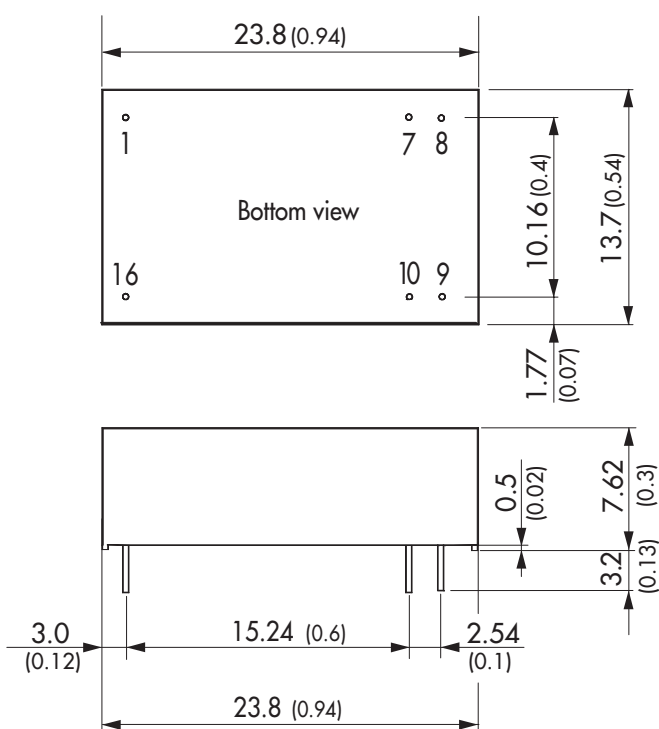
|                                                                      |                                                                                                                                            |
|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature ranges                                                   | – Operating –40°C to +75°C (no derating)<br>– Storage –55°C to +125°C                                                                      |
| Humidity (non condensing)                                            | 95 % rel. H max.                                                                                                                           |
| Reliability, calculated MTBF (MIL-HDBK-217F, @ +25°C, ground benign) | >1.2 Mio h                                                                                                                                 |
| Isolation voltage                                                    | Input/Output (60 sec.) 1'500 VDC                                                                                                           |
| Isolation capacity                                                   | Input/Output 250 pF max.                                                                                                                   |
| Isolation resistance                                                 | Input/Output (500 VDC) >1'000 M Ohm                                                                                                        |
| Switching frequency                                                  | 300 kHz (PFM)                                                                                                                              |
| Safety standards                                                     | UL/cUL 60950-1, IEC/EN 60950-1                                                                                                             |
| Safety approval                                                      | CSA 60950-1-03 (File no. 226037)<br><a href="http://www.tracopower.com/products/tel2-csa.pdf">www.tracopower.com/products/tel2-csa.pdf</a> |

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

## Physical Specifications

|                       |                        |
|-----------------------|------------------------|
| Casing material       | non conductive FR4     |
| Potting material      | epoxy, UL94V-0 - rated |
| Weight                | 5.1 g (0.17oz)         |
| Soldering temperature | max. 265°C / 10 sec.   |

## Outline Dimensions mm (inches)



| Pin-Out |            |            |
|---------|------------|------------|
| Pin     | Single     | Dual       |
| 1       | -Vin (GND) | -Vin (GND) |
| 7       | No con.    | No con.    |
| 8       | No con.    | Common     |
| 9       | +Vout      | +Vout      |
| 10      | -Vout      | -Vout      |
| 16      | +Vin       | +Vin       |

Pin diameter  $\varnothing 0.5 \pm 0.05$  (0.02)  $\pm 0.002$   
Tolerances  $\pm 0.25$  ( $\pm 0.01$ )

Specifications can be changed any time without notice.