

- Compact SIP-8 package
- I/O-isolation voltage 1'600 VDC
- Fully regulated outputs
- Operating temp range -40°C to $+95^{\circ}\text{C}$
- Continuous short circuit protection
- Remote On/Off
- 3-year product warranty
- Designed to meet UL 62368-1



TEC 2 is a new series with the design purpose to improve the prevalent 2 Watt SIP-8 DC/DC converters in terms of cost, efficiency and performance. The latest technology and components enable an increase in efficiency by more than 20%. With the reduction of thermal loss, the operating temperature range can be expanded from -40°C to $+95^{\circ}\text{C}$. The converters are fully regulated over 0 - 100% load (no minimum load is required). The low input range is extended from 4.5 to 13.2 VDC while models are also available with the standard 2:1 input ranges (see TEC 2WI series for 4:1 input ranges). The functional isolation system is designed to meet EN 62368-1 with 1600 VDC test voltage.

| Models | | | | | | |
|------------|--------------------------------|----------|------------------|----------|------------------|-----------------|
| Order Code | Input Voltage Range | Output 1 | | Output 2 | | Efficiency typ. |
| | | Vnom | I _{max} | Vnom | I _{max} | |
| TEC 2-0910 | 4.5 - 13.2 VDC (9 VDC nom.) | 3.3 VDC | 500 mA | | | 78 % |
| TEC 2-0911 | | 5 VDC | 400 mA | | | 81 % |
| TEC 2-0919 | | 9 VDC | 222 mA | | | 84 % |
| TEC 2-0912 | | 12 VDC | 167 mA | | | 84 % |
| TEC 2-0913 | | 15 VDC | 134 mA | | | 84 % |
| TEC 2-0915 | | 24 VDC | 83 mA | | | 85 % |
| TEC 2-0921 | | +5 VDC | 200 mA | -5 VDC | 200 mA | 81 % |
| TEC 2-0922 | | +12 VDC | 83 mA | -12 VDC | 83 mA | 85 % |
| TEC 2-0923 | | +15 VDC | 67 mA | -15 VDC | 67 mA | 84 % |
| TEC 2-1210 | 9 - 18 VDC (12 VDC nom.) | 3.3 VDC | 500 mA | | | 78 % |
| TEC 2-1211 | | 5 VDC | 400 mA | | | 82 % |
| TEC 2-1219 | | 9 VDC | 222 mA | | | 84 % |
| TEC 2-1212 | | 12 VDC | 167 mA | | | 85 % |
| TEC 2-1213 | | 15 VDC | 134 mA | | | 85 % |
| TEC 2-1215 | | 24 VDC | 83 mA | | | 85 % |
| TEC 2-1221 | | +5 VDC | 200 mA | -5 VDC | 200 mA | 82 % |
| TEC 2-1222 | | +12 VDC | 83 mA | -12 VDC | 83 mA | 85 % |
| TEC 2-1223 | | +15 VDC | 67 mA | -15 VDC | 67 mA | 84 % |
| TEC 2-2410 | 18 - 36 VDC (24 VDC nom.) | 3.3 VDC | 500 mA | | | 78 % |
| TEC 2-2411 | | 5 VDC | 400 mA | | | 83 % |
| TEC 2-2419 | | 9 VDC | 222 mA | | | 85 % |
| TEC 2-2412 | | 12 VDC | 167 mA | | | 86 % |
| TEC 2-2413 | | 15 VDC | 134 mA | | | 85 % |
| TEC 2-2415 | | 24 VDC | 83 mA | | | 85 % |
| TEC 2-2421 | | +5 VDC | 200 mA | -5 VDC | 200 mA | 83 % |
| TEC 2-2422 | | +12 VDC | 83 mA | -12 VDC | 83 mA | 85 % |
| TEC 2-2423 | | +15 VDC | 67 mA | -15 VDC | 67 mA | 86 % |
| TEC 2-4810 | 36 - 75 VDC (48 VDC nom.) | 3.3 VDC | 500 mA | | | 76 % |
| TEC 2-4811 | | 5 VDC | 400 mA | | | 80 % |
| TEC 2-4819 | | 9 VDC | 222 mA | | | 82 % |
| TEC 2-4812 | | 12 VDC | 167 mA | | | 84 % |
| TEC 2-4813 | | 15 VDC | 134 mA | | | 85 % |
| TEC 2-4815 | | 24 VDC | 83 mA | | | 85 % |
| TEC 2-4821 | | +5 VDC | 200 mA | -5 VDC | 200 mA | 80 % |
| TEC 2-4822 | | +12 VDC | 83 mA | -12 VDC | 83 mA | 85 % |
| TEC 2-4823 | | +15 VDC | 67 mA | -15 VDC | 67 mA | 83 % |

Input Specifications

| | | |
|------------------------|--------------|--|
| Input Current | - At no load | 9 Vin models: 45 mA typ. 12 Vin models: 25 mA typ. 24 Vin models: 10 mA typ. 48 Vin models: 8 mA typ. |
| Surge Voltage | | 9 Vin models: 15 VDC max. (1 s max.) 12 Vin models: 25 VDC max. (1 s max.) 24 Vin models: 50 VDC max. (1 s max.) 48 Vin models: 100 VDC max. (1 s max.) |
| Under Voltage Lockout | | 9 Vin models: 2 VDC min. / 3 VDC typ. / 4 VDC max. 12 Vin models: 6 VDC min. / 7 VDC typ. / 8 VDC max. 24 Vin models: 13 VDC min. / 15 VDC typ. / 17 VDC max. 48 Vin models: 29 VDC min. / 32 VDC typ. / 35 VDC max. |
| Recommended Input Fuse | | 9 Vin models: 1'000 mA (slow blow) 12 Vin models: 500 mA (slow blow) 24 Vin models: 315 mA (slow blow) 48 Vin models: 160 mA (slow blow) (The need of an external fuse has to be assessed in the final application.) |
| Input Filter | | Internal Capacitor |

Output Specifications

| | | |
|---------------------------|---|---|
| Voltage Set Accuracy | | ±1% 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: 1% 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 | 75 mVp-p typ. |
| Capacitive Load | - single output | 3.3 Vout models: 3'300 µF max. 5 Vout models: 1'680 µF max. 9 Vout models: 1'000 µF max. 12 Vout models: 820 µF max. 15 Vout models: 680 µF max. 24 Vout models: 220 µF max. |
| | - dual output | 5 / -5 Vout models: 1'000 / 1'000 µF max. 12 / -12 Vout models: 470 / 470 µF max. 15 / -15 Vout models: 330 / 330 µF max. |
| Minimum Load | | Not required |
| Temperature Coefficient | | ±0.02 %/K max. |
| Start-up Time | | 10 ms typ. / 20 ms max. |
| Short Circuit Protection | | Continuous, Automatic recovery |
| Output Current Limitation | | 140 - 240% of Iout max. 180% typ. of Iout max. |
| Transient Response | - Response Time | 500 µs typ. (25% Load Step) |

Safety Specifications

| | | |
|------------------|-----------------------------|---|
| Safety Standards | - IT / Multimedia Equipment | Designed for EN 62368-1 (no certification) |
|------------------|-----------------------------|---|

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

EMC Specifications

| | | |
|---------------|-----------------------------|--|
| EMI Emissions | - Conducted Emissions | EN 55032 class A (with external filter) EN 55032 class B (with external filter) |
| | - Radiated Emissions | EN 55032 class A (with external filter) EN 55032 class B (with external filter) |
| | | External filter proposal: www.tracopower.com/overview/tec2 |
| EMS Immunity | - Electrostatic Discharge | Air: EN 61000-4-2, ±8 kV, perf. criteria A 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 A EN 61000-4-5, ±1 kV, perf. criteria A |
| | - Conducted RF Disturbances | Ext. input component: KY 220 µF / 100 V EN 61000-4-6, 10 Vrms, perf. criteria A |
| | - PF Magnetic Field | Continuous: EN 61000-4-8, 100 A/m, perf. criteria A 1 s: EN 61000-4-8, 1000 A/m, perf. criteria A |

General Specifications

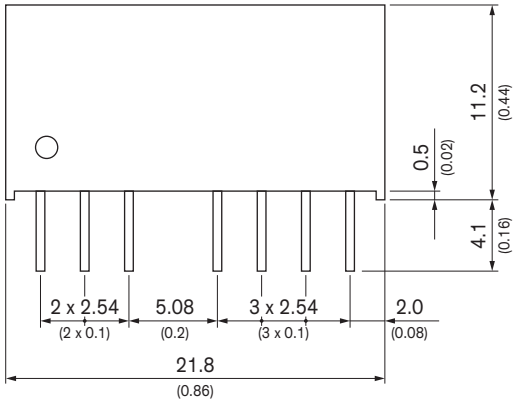
| | | |
|--------------------------|---------------------------------|--|
| Relative Humidity | | 95% max. (non condensing) |
| Temperature Ranges | - Operating Temperature | -40°C to +95°C |
| | - Case Temperature | +105°C max. |
| | - Storage Temperature | -55°C to +125°C |
| Power Derating | - High Temperature | 5.9 %/K above 88°C |
| Cooling System | | Natural convection (20 LFM) |
| Remote Control | - Current Controlled Remote | On: open circuit Off: 2 to 4 mA current (internal 1 kΩ resistor) |
| | - Off Idle Input Current | External circuit proposal: www.tracopower.com/info/current-remote.pdf 2.5 mA typ. |
| Switching Frequency | | 100 kHz min. (PFM) |
| Insulation System | | Functional Insulation |
| Isolation Test Voltage | - Input to Output, 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 | 50 pF max. |
| Reliability | - Calculated MTBF | 6'620'000 h (MIL-HDBK-217F, ground benign) |
| Environment | - Vibration | MIL-STD-810F |
| | - Mechanical Shock | MIL-STD-810F |
| | - Thermal Shock | MIL-STD-810F |
| Housing Material | | Non-conductive Plastic (UL94 V-0 rated) |
| Potting Material | | Silicone (UL 94 V-0 rated) |
| Pin Material | | Copper |
| Pin Foundation Plating | | Nickel (1 - 2 µm) |
| Pin Surface Plating | | Tin (3 - 5 µm), matte |
| Soldering Profile | | Wave Soldering 260°C / 10 s max. |
| Connection Type | | THD (Through-Hole Device) |
| Weight | | 4.5 g |
| Environmental Compliance | - Reach | www.tracopower.com/info/reach-declaration.pdf |
| | - RoHS | www.tracopower.com/info/rohs-declaration.pdf |

Supporting Documents

| | |
|--|--|
| Overview Link (for additional Documents) | www.tracopower.com/overview/tec2 |
|--|--|

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

Outline Dimensions



Dimensions in mm (inch)
 Tolerances: ± 0.5 (± 0.02)
 Pin pitch tolerances ± 0.25 (± 0.01)
 Pin dimension tolerance ± 0.1 (0.004)

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

NC: Not connected

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