

- 2" x 1" x 0.4" metal package
- Wide 2:1 input range
- Very high efficiency up to 91%
- Operating temperature range -40°C to +80°C
- Over-temperature protection
- I/O isolation 1600 VDC
- Adjustable output voltage
- Remote On/Off



The TEN 30 series is the latest generation of high performance DC/DC converter modules setting a new standard concerning power density. This product with 30W comes in an encapsulated, shielded metal package with a footprint of only 2.0" x 1.0". All models have wide 2:1 input voltage range and precisely regulated, isolated output voltages. Advanced circuit topology provides high efficiency up to 91% which allows an industrial operating temperature range of -40°C to +80°C (with derating). Further features include remote On/Off, adjustable output, under-voltage lockout and over-temperature protection. Typical applications for these converters are mobile equipment, instrumentation, distributed power architectures in communication and industrial electronics and everywhere where space on the PCB is critical.

| Models | | | | | | |
|-------------|------------------------------|----------|------------------|----------|------------------|-----------------|
| Order Code | Input Voltage Range | Output 1 | | Output 2 | | Efficiency typ. |
| | | Vnom | I _{max} | Vnom | I _{max} | |
| TEN 30-1210 | 9 - 18 VDC (12 VDC nom.) | 3.3 VDC | 8'000 mA | | | 85 % |
| TEN 30-1211 | | 5.1 VDC | 6'000 mA | | | 87 % |
| TEN 30-1212 | | 12 VDC | 2'500 mA | | | 89 % |
| TEN 30-1213 | | 15 VDC | 2'000 mA | | | 89 % |
| TEN 30-1221 | | +5 VDC | 3'000 mA | -5 VDC | 3'000 mA | 87 % |
| TEN 30-1222 | | +12 VDC | 1'250 mA | -12 VDC | 1'250 mA | 87 % |
| TEN 30-1223 | | +15 VDC | 1'000 mA | -15 VDC | 1'000 mA | 87 % |
| TEN 30-2410 | 18 - 36 VDC (24 VDC nom.) | 3.3 VDC | 8'000 mA | | | 87 % |
| TEN 30-2411 | | 5.1 VDC | 6'000 mA | | | 90 % |
| TEN 30-2412 | | 12 VDC | 2'500 mA | | | 91 % |
| TEN 30-2413 | | 15 VDC | 2'000 mA | | | 91 % |
| TEN 30-2421 | | +5 VDC | 3'000 mA | -5 VDC | 3'000 mA | 90 % |
| TEN 30-2422 | | +12 VDC | 1'250 mA | -12 VDC | 1'250 mA | 89 % |
| TEN 30-2423 | | +15 VDC | 1'000 mA | -15 VDC | 1'000 mA | 90 % |
| TEN 30-4810 | 36 - 75 VDC (48 VDC nom.) | 3.3 VDC | 8'000 mA | | | 87 % |
| TEN 30-4811 | | 5.1 VDC | 6'000 mA | | | 89 % |
| TEN 30-4812 | | 12 VDC | 2'500 mA | | | 91 % |
| TEN 30-4813 | | 15 VDC | 2'000 mA | | | 91 % |
| TEN 30-4821 | | +5 VDC | 3'000 mA | -5 VDC | 3'000 mA | 90 % |
| TEN 30-4822 | | +12 VDC | 1'250 mA | -12 VDC | 1'250 mA | 88 % |
| TEN 30-4823 | | +15 VDC | 1'000 mA | -15 VDC | 1'000 mA | 89 % |

| Options | |
|--|--|
| TEN-HS1 | - Optional Heat Sink with Height = 0.22 inch: www.tracopower.com/products/ten-hs1.pdf |
| on demand (backorder with MOQ non stocking item) | <ul style="list-style-type: none"> - Optional model with 1.5 VDC / 8'500 mA Output and 9 - 18 VDC Input - Optional model with 2.5 VDC / 8'000 mA Output and 9 - 18 VDC Input - Optional model with 1.5 VDC / 8'500 mA Output and 18 - 36 VDC Input - Optional model with 2.5 VDC / 8'000 mA Output and 18 - 36 VDC Input - Optional model with 1.5 VDC / 8'500 mA Output and 36 - 75 VDC Input - Optional model with 2.5 VDC / 8'000 mA Output and 36 - 75 VDC Input |

Input Specifications

| | | |
|--------------------------|----------------|--|
| Input Current | - At no load | 12 Vin models: 70 mA typ. (1.5 Vout model) 100 mA typ. (2.5 Vout model) 105 mA typ. (3.3 Vout model) 130 mA typ. (5.1 Vout model) 90 mA typ. (12 Vout model) 80 mA typ. (15 Vout model) 120 mA typ. (5 / -5 Vout model) 50 mA typ. (12 / -12 Vout model) 40 mA typ. (15 / -15 Vout model) 24 Vin models: 50 mA typ. (1.5 Vout model) 50 mA typ. (2.5 Vout model) 50 mA typ. (3.3 Vout model) 75 mA typ. (5.1 Vout model) 40 mA typ. (12 Vout model) 35 mA typ. (15 Vout model) 70 mA typ. (5 / -5 Vout model) 30 mA typ. (12 / -12 Vout model) 30 mA typ. (15 / -15 Vout model) 48 Vin models: 45 mA typ. (1.5 Vout model) 45 mA typ. (2.5 Vout model) 30 mA typ. (3.3 Vout model) 45 mA typ. (5.1 Vout model) 45 mA typ. (12 Vout model) 50 mA typ. (15 Vout model) 35 mA typ. (5 / -5 Vout model) 30 mA typ. (12 / -12 Vout model) 20 mA typ. (15 / -15 Vout model) |
| | - At full load | 12 Vin models: 3'000 mA typ. 24 Vin models: 1'500 mA typ. 48 Vin models: 750 mA typ. |
| Surge Voltage | | 12 Vin models: 25 VDC max. (100 ms max.) 24 Vin models: 50 VDC max. (100 ms max.) 48 Vin models: 100 VDC max. (100 ms max.) |
| Under Voltage Lockout | | 12 Vin models: 7 VDC min. / 8 VDC typ. / 8.8 VDC max. 24 Vin models: 15 VDC min. / 16 VDC typ. / 17.5 VDC max. 48 Vin models: 31.5 VDC min. / 33 VDC typ. / 34.5 VDC max. |
| Reflected Ripple Current | | 20 mA typ. |
| Recommended Input Fuse | | 12 Vin models: 6'300 mA (slow blow) 24 Vin models: 3'150 mA (slow blow) 48 Vin models: 1'600 mA (slow blow) (The need of an external fuse has to be assessed in the final application.) |
| Input Filter | | Internal Pi-Type |

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

Output Specifications

| | | |
|--|---|--|
| Output Voltage Adjustment | | $\pm 10\%$ (single output models only) (By external trim resistor) |
| | See application note: | www.tracopower.com/overview/ten30 Output power must not exceed rated power! |
| Voltage Set Accuracy | | $\pm 1\%$ 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: 0.5% 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) | - single output | 1.5 Vout models: 100 mVp-p typ. (w/ 1 μ F, 50 V MLCC) 2.5 Vout models: 100 mVp-p typ. (w/ 1 μ F, 50 V MLCC) 3.3 Vout models: 100 mVp-p typ. (w/ 1 μ F, 50 V MLCC) 5.1 Vout models: 100 mVp-p typ. (w/ 1 μ F, 50 V MLCC) 12 Vout models: 150 mVp-p typ. (w/ 1 μ F, 50 V MLCC) 15 Vout models: 150 mVp-p typ. (w/ 1 μ F, 50 V MLCC) |
| | - dual output | 5 / -5 Vout models: 100 / 100 mVp-p typ. (w/ 1 μ F, 50 V MLCC) 12 / -12 Vout models: 150 / 150 mVp-p typ. (w/ 1 μ F, 50 V MLCC) 15 / -15 Vout models: 150 / 150 mVp-p typ. (w/ 1 μ F, 50 V MLCC) |
| Capacitive Load | - single output | 1.5 Vout models: 20'000 μF max. 2.5 Vout models: 20'000 μF max. 3.3 Vout models: 20'000 μF max. 5.1 Vout models: 14'400 μF max. 12 Vout models: 3'000 μF max. 15 Vout models: 2'000 μF max. |
| | - dual output | 5 / -5 Vout models: 3'000 / 3'000 μF max. 12 / -12 Vout models: 2'000 / 2'000 μF max. 15 / -15 Vout models: 1'300 / 1'300 μF max. |
| Minimum Load | | Not required |
| Temperature Coefficient | | ± 0.02 %/K max. |
| Start-up Time | | 30 ms typ. |
| Short Circuit Protection | | Continuous, Automatic recovery |
| Overload Protection | | Indefinite Mode |
| Output Current Limitation | | 150% typ. of Iout max. |
| Overvoltage Protection | | 125% typ. of Vout nom. (depending on model) 2 VDC typ. (1.5 Vout models) 3.3 VDC typ. (2.5 Vout models) 3.9 VDC typ. (3.3 Vout models) 6.2 VDC typ. (± 5 & 5.1 Vout models) 15 VDC typ. (± 12 Vout models) 18 VDC typ. (± 15 Vout models) |
| Transient Response | - Peak Variation | 450 mV max. (25% Load Step) |
| | - Response Time | 250 μs typ. (25% Load Step) |

Safety Specifications

| | | |
|------------------|-----------------------------|--|
| Safety Standards | - IT / Multimedia Equipment | EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1 |
| | - Certification Documents | www.tracopower.com/overview/ten30 |

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

| | |
|-----------------------|-------|
| Pollution Degree | PD 2 |
| Over Voltage Category | OVC I |

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/ten30 |
| 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: 12 Vin & 24 Vin models (KY 330 µF / 50 V) 48 Vin models (KY 220 µF / 100V) 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 +80°C |
| | - Case Temperature | +105°C max. |
| | - Storage Temperature | -55°C to +125°C |
| Power Derating | - High Temperature | Depending on model Depending on model (with Heat Sink) |
| | | See application note: www.tracopower.com/overview/ten30 |
| Over Temperature Protection Switch Off | - Protection Mode - Measurement Point | 115°C typ. (Automatic recovery at 105°C typ.) Case |
| Cooling System | | Natural convection (20 LFM) |
| Remote Control | - Voltage Controlled Remote | On: 3.0 to 12 VDC or open circuit Off: 0 to 1.2 VDC or short circuit Refers to 'Remote' and '-Vin' Pin |
| | - Off Idle Input Current | 3 mA typ. |
| | - Remote Pin Input Current | -0.5 to 0.5 mA |
| Altitude During Operation | | 5'000 m max. |
| Switching Frequency | | 387 - 473 kHz (PWM) |
| | | 430 kHz typ. (PWM) |
| Insulation System | | Functional Insulation |
| Isolation Test Voltage | - Input to Output, 60 s | 1'600 VDC |
| | - Input to Case, 60 s | 1'600 VDC |
| | - Output to Case, 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 | 1'500 pF max. |
| Reliability | - Calculated MTBF | 1'450'000 h (MIL-HDBK-217F, ground benign) |
| Washing Process | | Allowed (hermetical product) |
| | | See Cleaning Guideline: www.tracopower.com/info/cleaning.pdf |
| Environment | - Vibration | MIL-STD-810F 7.7 g, 3 axis, random waveform, 60 min |
| | - Mechanical Shock | MIL-STD-810F 40 g, 3 axis, terminal peak sawtooth, 11 ms |
| | - Thermal Shock | MIL-STD-810F -55°C to +125°C, 72 cycles, 30 min each |
| | | |
| Housing Material | | Copper, Nickel plated |
| Base Material | | Non-conductive FR4 (UL 94 V-0 rated) |

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

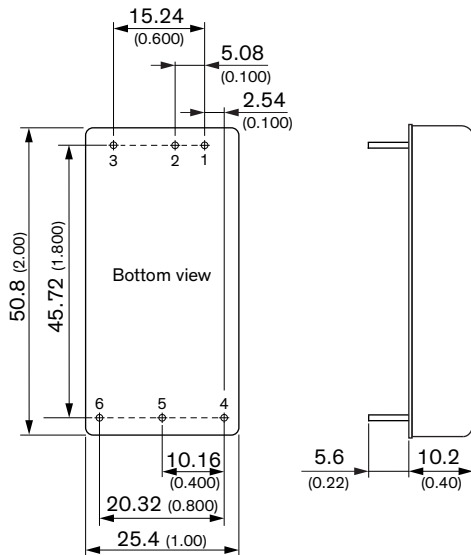
| | |
|--------------------------|---|
| Potting Material | Epoxy (UL 94 V-0 rated) |
| Pin Material | Copper |
| Pin Foundation Plating | Nickel (2 - 3 μm) |
| Pin Surface Plating | Tin (3 - 5 μm), matte |
| Housing Type | Metal Case |
| Mounting Type | PCB Mount |
| Connection Type | THD (Through-Hole Device) |
| Footprint Type | 2" x 1" |
| Soldering Profile | Wave Soldering 265°C / 10 s max. |
| Weight | 30.5 g |
| Thermal Impedance | - Case to Ambient 12 K/W typ. 10 K/W typ. (with Heat Sink) |
| Environmental Compliance | - REACH Declaration www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant - RoHS Declaration 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). The SCIP number is provided on request.) |

Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/ten30

Outline Dimensions



Dimensions in mm (inch)
Pin diameter: 1.0 \pm 0.1 (0.04 \pm 0.004)
Tolerances: x.x \pm 0.5 (x.xx \pm 0.02)
x.xx \pm 0.25 (x.xxx \pm 0.01)

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