

Features

- ◆ Smallest encapsulated 30 W converter
- ◆ 2" x 1" x 0.4" shielded metal package
- ◆ Ultra wide 4:1 input voltage range
- ◆ Single- dual- and triple output models
- ◆ Very high efficiency up to 91%
- ◆ Operating temp. range -40°C to $+75^{\circ}\text{C}$
- ◆ I/O isolation 1500 VDC
- ◆ Over temperature and short circuit protection
- ◆ Remote On/Off
- ◆ Adjustable output voltage
- ◆ 3-year product warranty



The TEN 30WIN series is a family of high performance 30W dc-dc converter modules featuring ultra wide 4:1 input voltage ranges in a compact low profile case with industry-standard footprint. 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

| Order code | Input voltage range | Output 1 | Output 2 | Output 3 | Efficiency typ. |
|-----------------|---------------------------------|-------------------|-------------------|-------------------|-----------------|
| TEN 30-2410WIN | 9 – 36 VDC (24 VDC nominal) | 3.3 VDC / 7.5 A | | | 86 % |
| TEN 30-2411WIN | | 5.1 VDC / 6.0 A | | | 88 % |
| TEN 30-2412WIN | | 12 VDC / 2.5 A | | | 89 % |
| TEN 30-2413WIN | | 15 VDC / 2.0 A | | | 89 % |
| TEN 30-2421WIN | | + 5 VDC / 3.0 A | -5 VDC / 3.0 A | | 88 % |
| TEN 30-2422WIN | | +12 VDC / 1.25 A | -12 VDC / 1.25 A | | 87 % |
| TEN 30-2423WIN | | +15 VDC / 1.0 A | -15 VDC / 1.0 A | | 87 % |
| TEN 30-2433WIN | | 3.3 VDC / 5.0 A | +12 VDC / 0.416 A | -12 VDC / 0.416 A | 86 % |
| TEN 30-2434WIN | | 3.3 VDC / 5.0 A | +15 VDC / 0.333 A | -15 VDC / 0.333 A | 86 % |
| TEN 30-2431WIN | | 5 VDC / 4.0 A | +12 VDC / 0.416 A | -12 VDC / 0.416 A | 88 % |
| TEN 30-2432WIN | 5 VDC / 4.0 A | +15 VDC / 0.333 A | -15 VDC / 0.333 A | 88 % | |
| TEN 30-4810 WIN | 18 – 75 VDC (48 VDC nominal) | 3.3 VDC / 7.5 A | | | 86 % |
| TEN 30-4811WIN | | 5.1 VDC / 6.0 A | | | 88 % |
| TEN 30-4812WIN | | 12 VDC / 2.5 A | | | 90 % |
| TEN 30-4813WIN | | 15 VDC / 2.0 A | | | 91 % |
| TEN 30-4821WIN | | + 5 VDC / 3.0 A | -5 VDC / 3.0 A | | 88 % |
| TEN 30-4822WIN | | +12 VDC / 1.25 A | -12 VDC / 1.25 A | | 88 % |
| TEN 30-4823WIN | | +15 VDC / 1.0 A | -15 VDC / 1.0 A | | 88 % |
| TEN 30-4833WIN | | 3.3 VDC / 5.0 A | +12 VDC / 0.416 A | -12 VDC / 0.416 A | 86 % |
| TEN 30-4834WIN | | 3.3 VDC / 5.0 A | +15 VDC / 0.333 A | -15 VDC / 0.333 A | 86 % |
| TEN 30-4831WIN | | 5 VDC / 4.0 A | +12 VDC / 0.416 A | -12 VDC / 0.416 A | 88 % |
| TEN 30-4832WIN | 5 VDC / 4.0 A | +15 VDC / 0.333 A | -15 VDC / 0.333 A | 88 % | |

Input Specifications

| | | |
|--|--|---|
| Input current at no load (nominal input) | ±12 & ±15 VDC models, 24 V: other models, 24 V: ±12 & ±15 V models, 48 V: other models, 48 V: | 30 mA typ. 100 mA typ. 15 mA typ. 55 mA typ. |
| Input current at full load | 3.3 VDC model, 24 V: other models, 24 V: 3.3 VDC model, 48 V: other models, 48 V: | 1250 mA typ. 1500 mA typ. 630 mA typ. 750 mA typ.) |
| Start-up voltage / under voltage lockout | 24 V models: 48 V models: | 9 VDC / 8 VDC (typ.) 18 VDC / 16 VDC (typ.) |
| Surge voltage (100 msec. max.) | 24 V models: 48 V models: | 50 VDC max. 100 VDC max |
| Conducted noise (input) | 24 V models: 48 V models: | EN 55022 class A with input capacitor 4.7 µF / 50 V 1812 MLCC 2.2 µF / 100 V 1812 MLCC) |
| ESD (electrostatic discharge) | | EN 61000-4-2, air ±8 kV, contact ±6 kV, perf. criteria A |
| Radiated immunity | | EN 61000-4-3, 10 V/m, perf. criteria A |
| Fast transient / Surge (with external capacitor) – external capacitor | 24 V models: 48 V models: | EN 61000-4-4, ±2 kV, perf. criteria A EN 61000-4-5, ±1 kV, perf. criteria A Nippon chemi-con KY, 330 µF / 50 V Nippon chemi-con KY, 220 µF / 100 V |
| Conducted immunity | | EN 61000-4-6, 10 Vrms, perf. criteria A |
| Magnetic field immunity | | EN 61000-4-8, 100 A/m, perf. criteria A |

Output Specifications

| | | |
|---|---|--|
| Voltage set accuracy | | ±1 % (±5 % for auxiliary outputs) |
| Output voltage adjustment (only for single output models) | | ±10 % with external resistor (see page 3) |
| Regulation | – Input variation – Load variation | single- and dual output models: 0.25 % max. triple output models: 1 % / 5 % max. (main / auxiliary) single output models: 0.5 % max. (0 – 100 %) dual output models balanced load: 1 % max. (0 – 100 %) dual output models unbalanced load: 5 % max. (25 / 100 %) triple output models (main/auxiliary): 1 % max. / 5 % max. (10 – 100 %) |
| Minimum load | single- and dual output models: triple output models: | not required 10% of rated max current on each output (operation at lower load condition will not damage the converters. However, they may not meet all listed specifications) |
| Temperature coefficient | | ±0.02 %/K max. |
| Ripple and noise (20 MHz Bandwidth) | 1.5 V – 5.1 VDC models: triple output models: other models: | 100 mVpk-pk. typ. 50 / 75 mVpk-pk typ. (main / auxiliary) 150 mVpk-pk typ. |
| Start up time (nominal Vin and constant resistive load) | | 30 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. |
| Thermal shutdown | | at +115°C typ. |

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

General Specifications (continued)

| | |
|-------------------------------|---|
| Over voltage protection | 3.3 VDC models: 3.9 V 5.1 VDC models: 6.2 V 12 VDC models: 15 V 15 VDC models: 18 V |
| Capacitive load output models | 3.3 VDC models: 20'000 µF max. 5.1 VDC models: 14'000 µF max. 12 & 15 VDC models: 2'000 µF max. ±5 VDC models: ±3'000 µF max. other dual output models: ±1'300 µF max. 3.3 VDC triple output models: 15'000 / ±220 µF max. (main / auxiliary) 5 VDC triple output models: 8'000 / ±220 µF max. (main / auxiliary) |

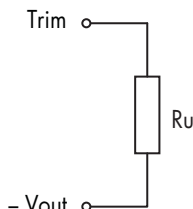
General Specifications

| | | |
|--|---|--|
| Temperature ranges | - Operating - Case temperature - Storage | -40°C to +75°C +105°C max. -55°C to +125°C |
| Derating | | 3.5 %/K above +60°C |
| Humidity (non condensing) | | 95 % rel. H max. |
| Thermal inpedance | - Natural convection - Natural convection with heat sink | 12°C/W 10°C/W |
| Reliability, calculated MTBF (MIL-HDBK-217F, at +70°C, ground benign) | single- and dual output models: triple output models: | 1.2 Mio. h 1.1 Mio. h |
| Isolation voltage (60 s) | - Input / Output | 1500 VDC |
| Isolation resistance | - Input / Output | 1000 MOhm min. |
| Isolation capacitance | - Input / Output | 1500 pF max. |
| Remote On/Off | - On: - Off: - Off idle current: | 3.0 to 12 VDC or open circuit. 0 to 1.2 VDC or short circuit pin 3 and pin 2 3 mA max. |
| Switching frequency (pulse width modulation PWM) | single- and dual output models: triple output models: | 430 kHz typ. 400 kHz typ. |
| Thermal shock, mechanical shock & vibration | - Test conditions | EN 61373, MIL-STD-810F www.tracopower.com/products/mil810.pdf |
| Safety standards | - Certification documents | UL 60950-1, IEC/EN 60950-1 www.tracopower.com/overview/ten30win |

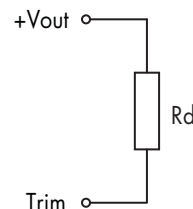
Application note: www.tracopower.com/overview/ten30win

Output Voltage Adjustment (for single output models only)

Trim up



Trim down



Nominal output voltage at open Trim input!

| Ru [kohm] | 3.3V | 5.1V | 12V | 15V |
|-----------|------|------|-----|-----|
| output | 3.3V | 5.1V | 12V | 15V |
| +5% | 6.8 | 5.1 | 43 | 47 |
| +10% | 0.75 | 0.75 | 4.3 | 1.8 |

| Rd [kohm] | 3.3V | 5.1V | 12V | 15V |
|-----------|------|------|-----|-----|
| output | 3.3V | 5.1V | 12V | 15V |
| -5% | 8.2 | 6.2 | 56 | 56 |
| -10% | 0.62 | 0.82 | 5.6 | 2.2 |

