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°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

<table>
<thead>
<tr>
<th>Order code</th>
<th>Input voltage range</th>
<th>Output 1</th>
<th>Output 2</th>
<th>Output 3</th>
<th>Efficiency typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEN 30-2410WIN</td>
<td>3.3 VDC / 7.5 A</td>
<td>5.1 VDC / 6.0 A</td>
<td></td>
<td></td>
<td>86 %</td>
</tr>
<tr>
<td>TEN 30-2411WIN</td>
<td>5.1 VDC / 6.0 A</td>
<td>12 VDC / 2.5 A</td>
<td></td>
<td></td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-2412WIN</td>
<td>15 VDC / 2.0 A</td>
<td>+5 VDC / 3.0 A</td>
<td></td>
<td></td>
<td>89 %</td>
</tr>
<tr>
<td>TEN 30-2413WIN</td>
<td>12 VDC / 2.5 A</td>
<td>+12 VDC / 1.25 A</td>
<td></td>
<td></td>
<td>89 %</td>
</tr>
<tr>
<td>TEN 30-2421WIN</td>
<td>15 VDC / 2.0 A</td>
<td>+15 VDC / 1.0 A</td>
<td></td>
<td></td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-2422WIN</td>
<td>9 – 36 VDC</td>
<td>+3.3 VDC / 5.0 A</td>
<td>+12 VDC / 0.416 A</td>
<td></td>
<td>86 %</td>
</tr>
<tr>
<td>TEN 30-2423WIN</td>
<td>(24 VDC nominal)</td>
<td>+15 VDC / 1.0 A</td>
<td>-12 VDC / 1.25 A</td>
<td></td>
<td>87 %</td>
</tr>
<tr>
<td>TEN 30-2424WIN</td>
<td>12 VDC / 2.5 A</td>
<td>-5 VDC / 3.0 A</td>
<td></td>
<td></td>
<td>87 %</td>
</tr>
<tr>
<td>TEN 30-2431WIN</td>
<td>15 VDC / 2.0 A</td>
<td>+5 VDC / 3.0 A</td>
<td></td>
<td></td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-2432WIN</td>
<td>5 VDC / 4.0 A</td>
<td>+12 VDC / 0.416 A</td>
<td></td>
<td></td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-2433WIN</td>
<td>3.3 VDC / 5.0 A</td>
<td>+15 VDC / 0.333 A</td>
<td></td>
<td></td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-2434WIN</td>
<td>5 VDC / 4.0 A</td>
<td>+12 VDC / 0.416 A</td>
<td></td>
<td></td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-4810WIN</td>
<td>3.3 VDC / 7.5 A</td>
<td>5.1 VDC / 6.0 A</td>
<td></td>
<td></td>
<td>86 %</td>
</tr>
<tr>
<td>TEN 30-4811WIN</td>
<td>5.1 VDC / 6.0 A</td>
<td>12 VDC / 2.5 A</td>
<td></td>
<td></td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-4812WIN</td>
<td>15 VDC / 2.0 A</td>
<td>+5 VDC / 3.0 A</td>
<td></td>
<td></td>
<td>90 %</td>
</tr>
<tr>
<td>TEN 30-4813WIN</td>
<td>12 VDC / 2.5 A</td>
<td>+12 VDC / 1.25 A</td>
<td></td>
<td></td>
<td>91 %</td>
</tr>
<tr>
<td>TEN 30-4821WIN</td>
<td>15 VDC / 2.0 A</td>
<td>+15 VDC / 1.0 A</td>
<td></td>
<td></td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-4822WIN</td>
<td>3.3 VDC / 5.0 A</td>
<td>+3.3 VDC / 5.0 A</td>
<td></td>
<td></td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-4823WIN</td>
<td>5 VDC / 4.0 A</td>
<td>+12 VDC / 0.416 A</td>
<td></td>
<td></td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-4831WIN</td>
<td>5 VDC / 4.0 A</td>
<td>+15 VDC / 0.333 A</td>
<td></td>
<td></td>
<td>88 %</td>
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<td></td>
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<td>+15 VDC / 0.333 A</td>
<td></td>
<td></td>
<td>88 %</td>
</tr>
</tbody>
</table>
## Input Specifications

| Input current at no load (nominal input) | ±12 & ±15 VDC models, 24 V: | 30 mA typ.  
| | other models, 24 V: | 100 mA typ.  
| | ±12 & ±15 V models, 48 V: | 15 mA typ.  
| | other models, 48 V: | 55 mA typ.  
| Input current at full load | 3.3 VDC model, 24 V: | 1250 mA typ.  
| | other models, 24 V: | 1500 mA typ.  
| | 3.3 VDC model, 48 V: | 630 mA typ.  
| | other models, 48 V: | 750 mA typ.  
| Start-up voltage / under voltage lockout | 24 V models: | 9 VDC / 8 VDC (typ.)  
| | 48 V models: | 18 VDC / 16 VDC (typ.)  
| Surge voltage (100 msec. max.) | 24 V models: | 50 VDC max.  
| | 48 V models: | 100 VDC max.  
| Conducted noise (input) | 24 V models: | EN 55022 class A with input capacitor  
| | 48 V models: | 2.2 µF / 100 V 1812 MLCC  
| ESD (electrostatic discharge) | EN 61000-4-2, ±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) | EN 61000-4-4, ±2 kV, perf. criteria A  
| | EN 61000-4-5, ±1 kV, perf. criteria A  
| | – external capacitor | Nippon chemi-con KY, 330 µF / 50 V  
| | 48 V models: | 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 | 0.25 % max.  
| | – Input variation (single- and dual output models) | 1 % / 5 % max. (main / auxiliary)  
| | | – Load variation (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 | not required  
| | single- and dual output models | 10% of rated max current on each output  
| | triple output models | (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) | 3.3 V & 5.1 VDC models: | 100 mVpk-pk typ. (w/ 1 µF/50 V MLCC)  
| | other single and dual output models: | 150 mVpk-pk typ. (w/ 1 µF/50 V MLCC)  
| | triple output models (main / auxiliary): | 50 / 75 mVpk-pk typ. (w/ 0.1 µF/50 V MLCC)  
| 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 Iout 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: -40°C to +75°C
- Case temperature: +105°C max.
- Storage: -55°C to +125°C

Humidity (non condensing)

95 % rel. H max.

Thermal impedance

- Natural convection: 12°C/W
- Natural convection with heat sink: 10°C/W

Reliability, calculated MTBF

- Single and dual output models: 1.2 Mio. h
- Triple output models: 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: 3.0 to 12 VDC or open circuit.
- Off: 0 to 1.2 VDC or short circuit pin 3 and pin 2
- Off idle current: 3 mA max.

Altitude during operation

5'000 m max.

Switching frequency (pulse width modulation PWM)

- Single and dual output models: 430 kHz typ.
- Triple output models: 400 kHz typ.

Thermal shock, mechanical shock & vibration

EN 61373, MIL-STD-810F

Safety standards

UL 60950-1, IEC/EN 60950-1
UL 62368-1, IEC/EN 62368-1
www.tracopower.com/overview/ten30win

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

Output Voltage Adjustment (for single output models only)

Trim up

Trim

R_u [kohm]

output 3.3V 5.1V 12V 15V
+5% 6.8 5.1 43 47
+10% 0.75 0.75 4.3 1.8

Trim down

+Vout

R_d [kohm]

output 3.3V 5.1V 12V 15V
-5% 8.2 6.2 56 56
-10% 0.62 0.82 5.6 2.2

Nominal output voltage at open Trim input!
**Physical Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Single- and dual output models</th>
<th>Triple output models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casing material</td>
<td>copper, nickel plated</td>
<td></td>
</tr>
<tr>
<td>Baseplate material</td>
<td>none conductive FR4</td>
<td></td>
</tr>
<tr>
<td>Potting material</td>
<td>epoxy (UL 94V-0 -rated)</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>31 g (1.1oz)</td>
<td></td>
</tr>
<tr>
<td>Soldering temperature</td>
<td>265°C / 10 s max.</td>
<td></td>
</tr>
<tr>
<td>Environmental compliance</td>
<td>Reach</td>
<td>RoHS Directive 2011/65/EU</td>
</tr>
<tr>
<td></td>
<td>RoHS</td>
<td></td>
</tr>
</tbody>
</table>

**Outline Dimensions**

**Pin-Out**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Single</th>
<th>Dual</th>
<th>Triple</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+Vin (Vcc)</td>
<td>+Vin (Vcc)</td>
<td>+Vin (Vcc)</td>
</tr>
<tr>
<td>2</td>
<td>–Vin (GND)</td>
<td>–Vin (GND)</td>
<td>–Vin (GND)</td>
</tr>
<tr>
<td>3</td>
<td>Remote On/Off</td>
<td>Remote On/Off</td>
<td>Remote On/Off</td>
</tr>
<tr>
<td>4</td>
<td>+Vout 1</td>
<td>Output 1</td>
<td>Output 2</td>
</tr>
<tr>
<td>5</td>
<td>–Vout 1</td>
<td>Common</td>
<td>Output 3</td>
</tr>
<tr>
<td>6</td>
<td>Trim</td>
<td>Output 2</td>
<td>Common</td>
</tr>
<tr>
<td>7</td>
<td>No pin</td>
<td>No pin</td>
<td>Output 1</td>
</tr>
</tbody>
</table>

Dimensions in [mm], () = Inch
Pin diameter: 1.0 ±0.1 (0.04 ±0.004)
Pin pitch tolerances: ±0.25 (±0.01)
Case tolerances: ±0.5 (±0.02)

**Heat-Sink (Option)**

Order code: TEN-HS1
(cont.: heat-sink, thermal pad, 2 clamps)
Material: Aluminum
Finish: Anodic treatment (black)
Weight: 17g (0.60oz) without converter
Thermal impedance after assembling: 10 K/W

**Note:**
Before attaching the heatsink, the product label on converter has to be removed for optimal performance.
For volume orders we can supply the converters with heatsink already mounted.
Please contact us for a relative quotation.

Specifications can be changed without notice! Make sure you are using the latest documentation, downloadable at www.tracopower.com

www.tracopower.com