## 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>12 VDC / 2.5 A</td>
<td>+15 VDC / 1.0 A</td>
<td>86 %</td>
</tr>
<tr>
<td>TEN 30-2411WIN</td>
<td>3.3 VDC / 7.5 A</td>
<td>5.1 VDC / 6.0 A</td>
<td>12 VDC / 2.5 A</td>
<td>+15 VDC / 1.0 A</td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-2412WIN</td>
<td>12 VDC / 2.5 A</td>
<td>3.3 VDC / 5.0 A</td>
<td>+15 VDC / 1.0 A</td>
<td>12 VDC / 0.416 A</td>
<td>87 %</td>
</tr>
<tr>
<td>TEN 30-2413WIN</td>
<td>15 VDC / 2.0 A</td>
<td>3.3 VDC / 5.0 A</td>
<td>+15 VDC / 1.0 A</td>
<td>12 VDC / 0.416 A</td>
<td>87 %</td>
</tr>
<tr>
<td>TEN 30-2421WIN</td>
<td>3.3 VDC / 1.25 A</td>
<td>+12 VDC / 0.416 A</td>
<td>+12 VDC / 0.416 A</td>
<td>12 VDC / 0.416 A</td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-2422WIN</td>
<td>12 VDC / 2.5 A</td>
<td>+15 VDC / 1.0 A</td>
<td>+12 VDC / 0.416 A</td>
<td>12 VDC / 0.416 A</td>
<td>87 %</td>
</tr>
<tr>
<td>TEN 30-2423WIN</td>
<td>15 VDC / 2.0 A</td>
<td>+15 VDC / 1.0 A</td>
<td>+15 VDC / 1.0 A</td>
<td>12 VDC / 0.416 A</td>
<td>87 %</td>
</tr>
<tr>
<td>TEN 30-2424WIN</td>
<td>9 – 36 VDC (24 VDC nominal)</td>
<td>+15 VDC / 1.0 A</td>
<td>+15 VDC / 1.0 A</td>
<td>12 VDC / 0.416 A</td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-2425WIN</td>
<td>12 VDC / 2.5 A</td>
<td>+15 VDC / 1.0 A</td>
<td>+15 VDC / 1.0 A</td>
<td>12 VDC / 0.416 A</td>
<td>87 %</td>
</tr>
<tr>
<td>TEN 30-2426WIN</td>
<td>15 VDC / 2.0 A</td>
<td>+15 VDC / 1.0 A</td>
<td>+15 VDC / 1.0 A</td>
<td>12 VDC / 0.416 A</td>
<td>87 %</td>
</tr>
<tr>
<td>TEN 30-2427WIN</td>
<td>3.3 VDC / 1.25 A</td>
<td>+12 VDC / 0.416 A</td>
<td>+12 VDC / 0.416 A</td>
<td>12 VDC / 0.416 A</td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-2428WIN</td>
<td>12 VDC / 2.5 A</td>
<td>+15 VDC / 1.0 A</td>
<td>+15 VDC / 1.0 A</td>
<td>12 VDC / 0.416 A</td>
<td>87 %</td>
</tr>
<tr>
<td>TEN 30-2429WIN</td>
<td>15 VDC / 2.0 A</td>
<td>+15 VDC / 1.0 A</td>
<td>+15 VDC / 1.0 A</td>
<td>12 VDC / 0.416 A</td>
<td>87 %</td>
</tr>
<tr>
<td>TEN 30-2430WIN</td>
<td>3.3 VDC / 1.25 A</td>
<td>+12 VDC / 0.416 A</td>
<td>+12 VDC / 0.416 A</td>
<td>12 VDC / 0.416 A</td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-2431WIN</td>
<td>12 VDC / 2.5 A</td>
<td>+15 VDC / 1.0 A</td>
<td>+15 VDC / 1.0 A</td>
<td>12 VDC / 0.416 A</td>
<td>87 %</td>
</tr>
<tr>
<td>TEN 30-2432WIN</td>
<td>15 VDC / 2.0 A</td>
<td>+15 VDC / 1.0 A</td>
<td>+15 VDC / 1.0 A</td>
<td>12 VDC / 0.416 A</td>
<td>87 %</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>12 VDC / 2.5 A</td>
<td>+15 VDC / 1.0 A</td>
<td>86 %</td>
</tr>
<tr>
<td>TEN 30-4811WIN</td>
<td>3.3 VDC / 7.5 A</td>
<td>5.1 VDC / 6.0 A</td>
<td>12 VDC / 2.5 A</td>
<td>+15 VDC / 1.0 A</td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-4812WIN</td>
<td>12 VDC / 2.5 A</td>
<td>3.3 VDC / 5.0 A</td>
<td>+15 VDC / 1.0 A</td>
<td>12 VDC / 0.416 A</td>
<td>87 %</td>
</tr>
<tr>
<td>TEN 30-4813WIN</td>
<td>15 VDC / 2.0 A</td>
<td>3.3 VDC / 5.0 A</td>
<td>+15 VDC / 1.0 A</td>
<td>12 VDC / 0.416 A</td>
<td>87 %</td>
</tr>
<tr>
<td>TEN 30-4821WIN</td>
<td>3.3 VDC / 1.25 A</td>
<td>+12 VDC / 0.416 A</td>
<td>+12 VDC / 0.416 A</td>
<td>12 VDC / 0.416 A</td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-4822WIN</td>
<td>12 VDC / 2.5 A</td>
<td>+15 VDC / 1.0 A</td>
<td>+12 VDC / 0.416 A</td>
<td>12 VDC / 0.416 A</td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-4823WIN</td>
<td>15 VDC / 2.0 A</td>
<td>+15 VDC / 1.0 A</td>
<td>+12 VDC / 0.416 A</td>
<td>12 VDC / 0.416 A</td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-4831WIN</td>
<td>3.3 VDC / 5.0 A</td>
<td>+15 VDC / 0.333 A</td>
<td>+15 VDC / 0.333 A</td>
<td>12 VDC / 0.416 A</td>
<td>86 %</td>
</tr>
<tr>
<td>TEN 30-4832WIN</td>
<td>5 VDC / 4.0 A</td>
<td>+12 VDC / 0.416 A</td>
<td>+12 VDC / 0.416 A</td>
<td>12 VDC / 0.416 A</td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-4833WIN</td>
<td>5 VDC / 4.0 A</td>
<td>+15 VDC / 0.333 A</td>
<td>+15 VDC / 0.333 A</td>
<td>12 VDC / 0.416 A</td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-4834WIN</td>
<td>5 VDC / 4.0 A</td>
<td>+15 VDC / 0.333 A</td>
<td>+15 VDC / 0.333 A</td>
<td>12 VDC / 0.416 A</td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-4835WIN</td>
<td>3.3 VDC / 5.0 A</td>
<td>+15 VDC / 0.333 A</td>
<td>+15 VDC / 0.333 A</td>
<td>12 VDC / 0.416 A</td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 30-4836WIN</td>
<td>3.3 VDC / 5.0 A</td>
<td>+15 VDC / 0.333 A</td>
<td>+15 VDC / 0.333 A</td>
<td>12 VDC / 0.416 A</td>
<td>88 %</td>
</tr>
</tbody>
</table>
**Input Specifications**

**Input current at no load**
- ±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: 4.7 µF / 50 V 1812 MLCC
- 48 V models: 2.2 µF / 100 V 1812 MLCC

**ESD** (electrostatic discharge)
- EN 55022 class A with input capacitor
- 24 V models: Nippon chemi-con KY, 330 µF / 50 V
- 48 V models: Nippon chemi-con KY, 220 µF / 100 V

**Radiated immunity**
- EN 61000-4-2, 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
- 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
  - single- and dual output models: 0.25 % max.
  - triple output models: 1 % / 5 % max. (main / auxiliary)
  - single output models: 0.5 % max. (0 – 100 %)
- Load variation
  - 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: not required
- triple output models: 10% of rated max current on each output

**Temperature coefficient**
- ±0.02 %/K max.

**Ripple and noise** (20 MHz Bandwidth)
- 1.5 V – 5.1 VDC models: 100 mV pk-pk typ.
- other models: 50 / 75 mV pk-pk typ. (main / auxiliary)
- triple output models: 150 mV pk-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 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.
DC/DC Converters
TEN 30WIN 30 Watt

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 (MIL-HDBK-217F, at +70°C, ground benign)
- Triple output models: 1.1 Mio. h

Isolation voltage (60 s)
- Input / Output: 1500 VDC

Isolation resistance
- Input / Output: 1000 MΩ 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.

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
www.tracopower.com/overview/ten30win

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

Output Voltage Adjustment (for single output models only)

Trim up

Trim

Ru

- Vout

Nominal output voltage at open Trim input!

Ru [kohm]

<table>
<thead>
<tr>
<th>output</th>
<th>3.3V</th>
<th>5.1V</th>
<th>12V</th>
<th>15V</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5%</td>
<td>6.8</td>
<td>5.1</td>
<td>43</td>
<td>47</td>
</tr>
<tr>
<td>+10%</td>
<td>0.75</td>
<td>0.75</td>
<td>4.3</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Trim down

+Vout

Rd

Trim

Rd [kohm]

<table>
<thead>
<tr>
<th>output</th>
<th>3.3V</th>
<th>5.1V</th>
<th>12V</th>
<th>15V</th>
</tr>
</thead>
<tbody>
<tr>
<td>-5%</td>
<td>8.2</td>
<td>6.2</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>-10%</td>
<td>0.62</td>
<td>0.82</td>
<td>5.6</td>
<td>2.2</td>
</tr>
</tbody>
</table>
**Physical Specifications**

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

**Outline Dimensions**

![Outline Dimensions](image)

**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.