

#### 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

| Order code     | Input voltage range                    | Output 1         | Output 2         | Output 3         | Efficiency typ. |
|----------------|----------------------------------------|------------------|------------------|------------------|-----------------|
| TEN 30-2407WIN | <b>9 – 36 VDC</b><br>(24 VDC nominal)  | 1.5 VDC / 8.5 A  |                  |                  | 80 %            |
| TEN 30-2409WIN |                                        | 2.5 VDC / 8.0 A  |                  |                  | 83 %            |
| TEN 30-2410WIN |                                        | 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 / 0.42 A | -12 VDC / 0.42 A | 86 %            |
| TEN 30-2434WIN |                                        | 3.3 VDC / 5.0 A  | +15 VDC / 0.33 A | -15 VDC / 0.33 A | 86 %            |
| TEN 30-2431WIN |                                        | 5 VDC / 4.0 A    | +12 VDC / 0.42 A | -12 VDC / 0.42 A | 88 %            |
| TEN 30-2432WIN |                                        | 5 VDC / 4.0 A    | +15 VDC / 0.33 A | -15 VDC / 0.33 A | 88 %            |
| TEN 30-4807WIN | <b>18 – 75 VDC</b><br>(48 VDC nominal) | 1.5 VDC / 8.5 A  |                  |                  | 80 %            |
| TEN 30-4809WIN |                                        | 2.5 VDC / 8.0 A  |                  |                  | 84 %            |
| TEN 30-4810WIN |                                        | 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 / 0.42 A | -12 VDC / 0.42 A | 86 %            |
| TEN 30-4834WIN |                                        | 3.3 VDC / 5.0 A  | +15 VDC / 0.33 A | -15 VDC / 0.33 A | 86 %            |
| TEN 30-4831WIN |                                        | 5 VDC / 4.0 A    | +12 VDC / 0.42 A | -12 VDC / 0.42 A | 88 %            |
| TEN 30-4832WIN |                                        | 5 VDC / 4.0 A    | +15 VDC / 0.33 A | -15 VDC / 0.33 A | 88 %            |

## Input Specifications

|                                               |                                                                                                                                                                                            |                                                                                                                         |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Input current at no load<br>(nominal input)   | 12 & 15 VDC / $\pm 12$ & $\pm 15$ VDC models, 24 V:<br>other models, 24 V:<br>$\pm 12$ & $\pm 15$ V models, 48 V:<br>other models, 48 V:                                                   | 30 mA typ.<br>100 mA typ.<br>15 mA typ.<br>55 mA typ.                                                                   |
| Input current at full load<br>(nominal input) | 1.5 VDC model, 24 V:<br>2.5 VDC model, 24 V:<br>3.3 VDC model, 24 V:<br>other models, 24 V:<br>1.5 VDC model, 48 V:<br>2.5 VDC model, 48 V:<br>3.3 VDC model, 48 V:<br>other models, 48 V: | 700 mA typ.<br>1050 mA typ.<br>1250 mA typ.<br>1500 mA typ.<br>350 mA typ.<br>520 mA typ.<br>630 mA typ.<br>750 mA typ. |
| Start-up voltage / under voltage lockout      | 24 V models:<br>48 V models:                                                                                                                                                               | 9 VDC / 8 VDC (typ.)<br>18 VDC / 16 VDC (typ.)                                                                          |
| Surge voltage (100 msec. max.)                | 24 V models:<br>48 V models:                                                                                                                                                               | 50 VDC max.<br>100 VDC max                                                                                              |
| Conducted noise (input)                       | 24 V models:<br>48 V models:                                                                                                                                                               | EN 55022 class A with input capacitor<br>4.7 $\mu$ F / 50 V 1812 MLCC<br>2.2 $\mu$ F / 100 V 1812 MLCC                  |

## Output Specifications

|                                                           |                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                       |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Voltage set accuracy                                      |                                                                                                                                                                                                                                                      | $\pm 1$ % ( $\pm 5$ % for auxiliary outputs)                                                                                                                                                                                          |
| Output voltage adjustment (only for single output models) |                                                                                                                                                                                                                                                      | $\pm 10$ % with external resistor (see page 3)                                                                                                                                                                                        |
| Regulation                                                | – Input variation      single- and dual output models:<br>triple output models:<br>– Load variation      single output models:<br>dual output models balanced load:<br>dual output models unbalanced load:<br>triple output models (main/auxiliary): | 0.2 % max.<br>1 % / 5 % max. (main / auxiliary)<br>0.5 % max. (0 – 100 %)<br>1 % max. (0 – 100 %)<br>5 % max. (25 / 100 %)<br>1 % max. / 5 % max. (10 – 100 %)                                                                        |
| Minimum load                                              | single- and dual output models:<br>triple output models:                                                                                                                                                                                             | not required<br>10% of rated max current (operation at lower load condition will not damage the converters. However, they may not meet all listed specifications)                                                                     |
| Temperature coefficient                                   |                                                                                                                                                                                                                                                      | $\pm 0.02$ %/K max.                                                                                                                                                                                                                   |
| Ripple and noise (20 MHz Bandwidth)                       | 1.5 V – 5.1 VDC models:<br>triple output models:<br>other models:                                                                                                                                                                                    | 100 mVpk-pk. typ.<br>50 / 75 mVpk-pk typ. (main / auxiliary)<br>150 mVpk-pk typ.                                                                                                                                                      |
| Start up time (nominal Vin and constant resistive load)   |                                                                                                                                                                                                                                                      | 30 ms typ.                                                                                                                                                                                                                            |
| Transient response time (25% load change)                 |                                                                                                                                                                                                                                                      | 250 $\mu$ s typ.                                                                                                                                                                                                                      |
| Short circuit protection                                  |                                                                                                                                                                                                                                                      | indefinite (automatic recovery)                                                                                                                                                                                                       |
| Over load protection                                      |                                                                                                                                                                                                                                                      | 150% of lout max. typ.                                                                                                                                                                                                                |
| Thermal shutdown                                          |                                                                                                                                                                                                                                                      | @ 115 °C typ.                                                                                                                                                                                                                         |
| Over voltage protection                                   | 1.5 VDC models:<br>2.5 VDC models:<br>3.3 VDC models:<br>5.1 VDC models:<br>12 VDC models:<br>15 VDC models:                                                                                                                                         | 2.0 V<br>3.3 V<br>3.9 V<br>6.2 V<br>15 V<br>18 V                                                                                                                                                                                      |
| Capacitive load output models                             | 1.5 – 3.3 VDC models:<br>5.1 VDC models:<br>12 & 15 VDC models:<br>$\pm 5$ VDC models:<br>other dual output models:<br>3.3 VDC triple output models:<br>5.1 VDC triple output models:                                                                | 20'000 $\mu$ F max.<br>14'000 $\mu$ F max.<br>2'000 $\mu$ F max.<br>$\pm 3$ '000 $\mu$ F max.<br>$\pm 1$ '300 $\mu$ F max.<br>15'000 / $\pm 220$ $\mu$ F max. (main / auxiliary)<br>8'000 / $\pm 220$ $\mu$ F max. (main / auxiliary) |

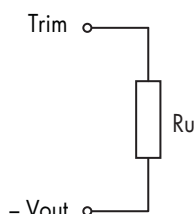
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

## General Specifications

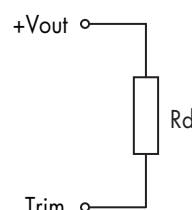
|                                                                        |                                                                                                                     |                                                                                              |
|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Temperature ranges                                                     | <ul style="list-style-type: none"> <li>– Operating</li> <li>– Case temperature</li> <li>– Storage</li> </ul>        | –40 °C to +75 °C<br>+105 °C max.<br>–55 °C to +125 °C                                        |
| Derating                                                               |                                                                                                                     | 3.5 %/K above 60 °C                                                                          |
| Humidity (non condensing)                                              |                                                                                                                     | 95 % rel. H max.                                                                             |
| Thermal inpedance                                                      | <ul style="list-style-type: none"> <li>– Natural convection</li> <li>– Natural convection with heat sink</li> </ul> | 12 °C/W<br>10 °C/W                                                                           |
| Reliability, calculated MTBF<br>(MIL-HDBK-217F, @ 25°C, ground benign) | single- and dual output models:<br>triple output models:                                                            | 435'000 h<br>320'000 h                                                                       |
| Isolation voltage (60 sec)                                             | – Input / Output                                                                                                    | 1500 VDC                                                                                     |
| Isolation resistance                                                   | – Input / Output                                                                                                    | >1000 M Ohm                                                                                  |
| Isolation capacity                                                     | – Input / Output                                                                                                    | 1500 pF max.                                                                                 |
| Remote On/Off                                                          | <ul style="list-style-type: none"> <li>– On:</li> <li>– Off:</li> <li>– Off idle current:</li> </ul>                | 3.0 to 12 VDC or open circuit.<br>0 to 1.2 VDC or short circuit pin 3 and pin 2<br>3 mA max. |
| Switching frequency (pulse width modulation PWM)                       | single- and dual output models:<br>triple output models:                                                            | 430 kHz typ.<br>400 kHz typ.                                                                 |
| Vibration and thermal shock                                            |                                                                                                                     | MIL-STD-810E                                                                                 |
| Safety standards                                                       |                                                                                                                     | UL 60950-1, EN 60950-1, IEC 60950-1                                                          |
| Safety approvals                                                       |                                                                                                                     | UL /cUL file pending                                                                         |

## Output Voltage Adjustment (for single output models only)

### Trim up



### Trim down



Nominal output voltage at open Trim input!

#### Ru [kohm]

| output | 1.5   | 2.5  | 3.3V | 5.1V | 12V | 15V |
|--------|-------|------|------|------|-----|-----|
| +5%    | 0.56  | 4.3  | 6.8  | 5.1  | 43  | 47  |
| +10%   | 0.051 | 0.33 | 0.75 | 0.75 | 4.3 | 1.8 |

#### Rd [kohm]

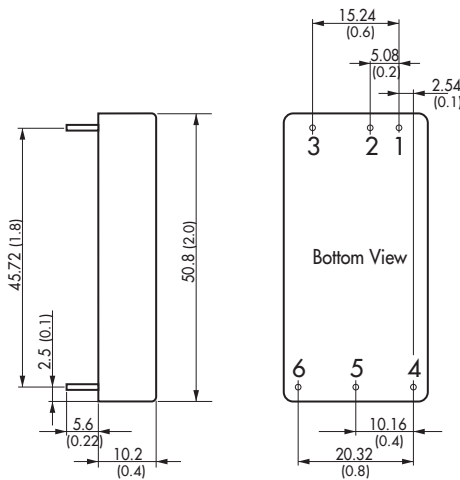
| output | 1.5   | 2.5  | 3.3V | 5.1V | 12V | 15V |
|--------|-------|------|------|------|-----|-----|
| –5%    | 0.68  | 6.2  | 8.2  | 6.2  | 56  | 56  |
| –10%   | 0.062 | 0.75 | 0.62 | 0.82 | 5.6 | 2.2 |

## Physical Specifications

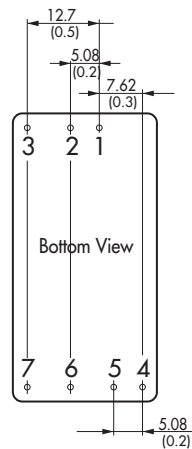
|                       |                         |
|-----------------------|-------------------------|
| Case material         | copper, nickel plated   |
| Baseplate material    | none conductive FR4     |
| Potting material      | epoxy (UL 94V-0 -rated) |
| Weight                | 31 g (1.1 oz)           |
| Soldering temperature | max. 265 °C / 10 sec.   |

## Outline Dimensions

Single- and dual  
output models



Triple output  
models



### Pin-Out

| Pin | Single        | Dual          | Triple        |
|-----|---------------|---------------|---------------|
| 1   | +Vin (Vcc)    | +Vin (Vcc)    | +Vin (Vcc)    |
| 2   | -Vin (GND)    | -Vin (GND)    | -Vin (GND)    |
| 3   | Remote On/Off | Remote On/Off | Remote On/Off |
| 4   | Output 1      | Output 1      | Output 2      |
| 5   | Common        | Common        | Output 3      |
| 6   | Trim          | Output 2      | Common        |
| 7   | No pin        | No pin        | Output 1      |

Dimensions in [mm], ( ) = Inch

Pin diameter: 1.0 ±0.05 (0.04 ±0.002)

Pin pitch tolerances: ±0.35 (±0.014)

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

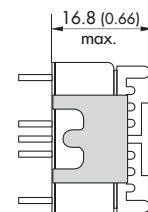
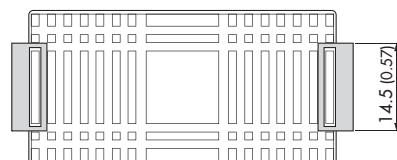
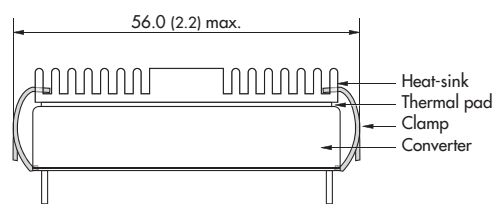


### Note:

The product label on converter has to be removed before mounting the heat-sink.

For volume orders converters will be supplied with heat-sinks already mounted. Please contact factory for quotation.

Separate heat-sinks are only available for prototypes and small quantity orders.



Specifications can be changed any time without notice.