

#### Features

- ◆ High power density in 1" x 2" metal package
- ◆ Ultra wide 4 : 1 input range
- ◆ Extended operating temperature range – 40°C to +85°C max.
- ◆ No minimum load required
- ◆ I/O-isolation 1500 VDC
- ◆ Remote On/Off
- ◆ Adjustable output voltage
- ◆ Industry standard footprint
- ◆ Shielded metal case with insulated baseplate
- ◆ Optional heatsink
- ◆ Lead free design - RoHS compliant
- ◆ 3-year product warranty



The TEN 20WIN series is a family of high performance 20W DC/DC converter modules featuring ultra wide 4:1 input voltage ranges in a ultra compact 2" x 1" low profile package with industry-standard footprint. A very high efficiency allows an operating temperature range of –40°C to 85°C. Further standard features include remote On/Off, output voltage trimming, over voltage protection and short-circuit protection.

Typical applications for these converters are battery operated equipment and distributed power architectures in communication and industrial electronics, everywhere where isolated, tightly regulated voltages are required.

#### Models

| Order code     | Input voltage range             | Output voltage | Output current max. | Efficiency typ. |
|----------------|---------------------------------|----------------|---------------------|-----------------|
| TEN 20-2410WIN | 9 – 36 VDC<br>(24 VDC nominal)  | 3.3 VDC        | 5'500 mA            | 85 %            |
| TEN 20-2411WIN |                                 | 5 VDC          | 4'000 mA            | 88 %            |
| TEN 20-2412WIN |                                 | 12 VDC         | 1'670 mA            | 86 %            |
| TEN 20-2413WIN |                                 | 15 VDC         | 1'330 mA            | 86 %            |
| TEN 20-2421WIN |                                 | ± 5 VDC        | ± 2'000 mA          | 88 %            |
| TEN 20-2422WIN |                                 | ± 12 VDC       | ± 835 mA            | 87 %            |
| TEN 20-2423WIN |                                 | ± 15 VDC       | ± 665 mA            | 87 %            |
| TEN 20-4810WIN | 18 – 75 VDC<br>(48 VDC nominal) | 3.3 VDC        | 5'500 mA            | 85 %            |
| TEN 20-4811WIN |                                 | 5 VDC          | 4'000 mA            | 88 %            |
| TEN 20-4812WIN |                                 | 12 VDC         | 1'670 mA            | 87 %            |
| TEN 20-4813WIN |                                 | 15 VDC         | 1'330 mA            | 87 %            |
| TEN 20-4821WIN |                                 | ± 5 VDC        | ± 2'000 mA          | 89 %            |
| TEN 20-4822WIN |                                 | ± 12 VDC       | ± 835 mA            | 88 %            |
| TEN 20-4823WIN |                                 | ± 15 VDC       | ± 665 mA            | 88 %            |

## Input Specifications

|                                          |                                                                                       |
|------------------------------------------|---------------------------------------------------------------------------------------|
| Input current at no load                 | 24 Vin models: 50 mA typ.<br>48 Vin models: 35 mA typ.                                |
| Input current at full load               | 24 Vin models: 1000 mA typ.<br>48 Vin models: 500 mA typ.                             |
| Surge voltage<br>(100 msec. max.)        | 24 Vin models: 50 V max.<br>48 Vin models: 100 V max.                                 |
| Input voltage variation (dv/dt)          | 5 V / ms, max.<br>(complies to ETS 300 132 part. 4.4)                                 |
| Start-up voltage / under voltage lockout | 24 Vin models: 9 VDC / 7.5 VDC typ.<br>48 Vin models: 18 VDC / 15 VDC typ.            |
| Conducted noise (input)                  | EN 55022 level A, FCC part 15, level A with external capacitor (see application note) |
| ESD (input)                              | EN 61000-4-2, perf. criteria B                                                        |
| Fast transient (input)                   | EN 61000-4-4, perf. criteria B                                                        |
| Surge (input)                            | EN 61000-4-5, perf. criteria B                                                        |

## Output Specifications

|                                                         |                                                                                                                                                                                                                                           |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Voltage set accuracy                                    | ±1 %                                                                                                                                                                                                                                      |
| Output voltage adjustment (single output models only)   | ±10 % by external resistor, see application note:<br><a href="http://www.tracopower.com/products/ten20win_application.pdf">www.tracopower.com/products/ten20win_application.pdf</a>                                                       |
| Regulation                                              | – Input variation Vin min. to Vin max.<br>– Load variation 0 – 100%:<br>single output models: 0.5 % max.<br>dual output models: 1 % max. (balanced load)<br>– Load cross variation 25 % / 100 % 5 % max.                                  |
| Temperature coefficient                                 | 0.02 % /K                                                                                                                                                                                                                                 |
| Ripple and noise (20 MHz Bandwidth)                     | single output models: 75 mVpk-pk max.<br>dual output models: 100 mVpk-pk max.                                                                                                                                                             |
| Start up time (nominal Vin and constant resistive load) | 20 ms typ.                                                                                                                                                                                                                                |
| Transient Response (25% load step change)               | 250 µs typ.                                                                                                                                                                                                                               |
| Short circuit protection                                | indefinite (automatic recovery)                                                                                                                                                                                                           |
| Over load protection                                    | 150% of lout max typ.                                                                                                                                                                                                                     |
| Over voltage protection                                 | 3.3 Vout models: 3.9 V<br>5 /±5 Vout models: 6.2 / ±6.2 V<br>12 /±12 Vout models: 15 / ±15 V<br>15 /±15 Vout models: 18 / ±18 V                                                                                                           |
| Capacitive load                                         | 3.3 Vout models: 18'000 µF max.<br>5 Vout models / ± 5 Vout models: 9'600 µF max. / ± 4'800 µF max.<br>12 Vout models / ±12 Vout models: 1'600 µF max. / ± 800 µF max.<br>15 Vout models / ±15 Vout models: 1'000 µF max. / ± 500 µF max. |

## General Specifications

|                           |                                                                                                                     |
|---------------------------|---------------------------------------------------------------------------------------------------------------------|
| Temperature ranges        | – Operating –40 °C to +85 °C (see power derating)<br>– Case temperature +105 °C max.<br>– Storage –55 °C to +125 °C |
| Humidity (non condensing) | 95 % rel H max.                                                                                                     |

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

## General Specifications

|                                                            |                                                                                                |
|------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| Reliability, calculated MTBF (MIL-HDBK-217F ground benign) | >560'000 h @ + 25 °C                                                                           |
| Isolation voltage (60 sec.) – Input/Output                 | 1'500 VDC                                                                                      |
| Isolation capacity – Input/Output                          | 1500 pF max                                                                                    |
| Isolation resistance – Input/Output                        | >1'000 M Ohm                                                                                   |
| Switching frequency (fixed)                                | 400 kHz typ. (pulse width modulation PWM)                                                      |
| Vibration                                                  | 10-55Hz, 10G, 30 minutes along X,Y,Z                                                           |
| Remote On/Off – On:<br>– Off:<br>– Off idle current:       | 3.0 to 12 VDC or open circuit.<br>0 to 1.2 VDC or short circuit pin 2 and pin 6<br>2.5 mA typ. |
| Safety standards                                           | UL 60950,-1 EN 60950-1, IEC 60950-1                                                            |
| Safety approvals – UL/cUL                                  | <a href="http://www.ul.com">www.ul.com</a> -> certifications -> File E188913                   |

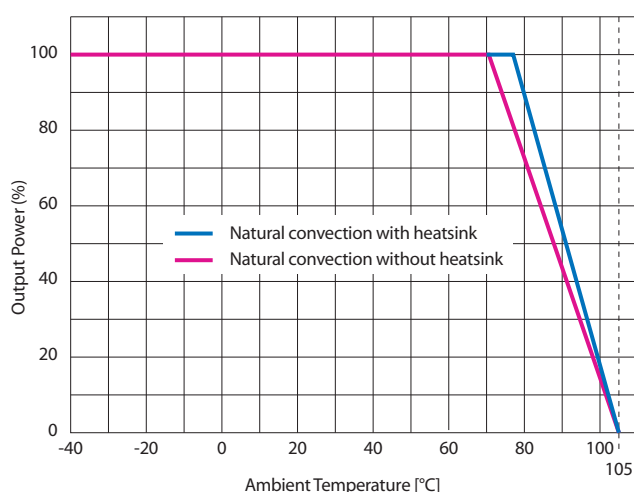
## Physical Specifications

|                       |                          |
|-----------------------|--------------------------|
| Case material         | copper, nickel plated    |
| Baseplate material    | non conductive FR4       |
| Potting material      | epoxy (UL 94V-0 - rated) |
| Weight                | 27 g (0.95 oz)           |
| Soldering temperature | max. 265 °C / 10 sec.    |

Application note can be downloaded under:

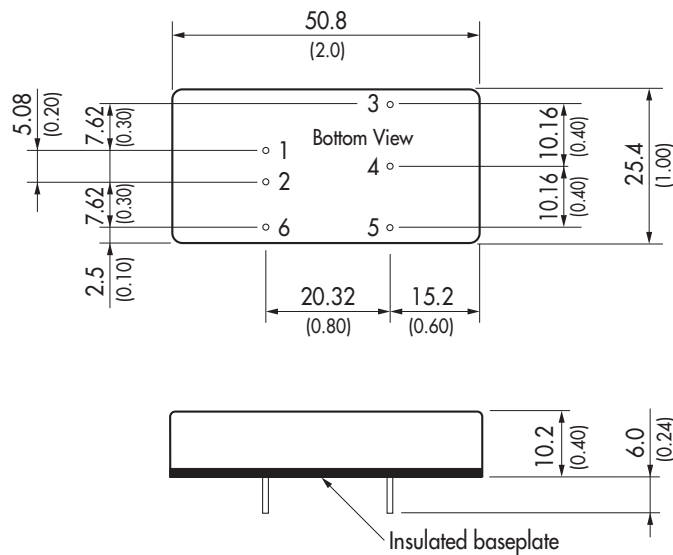
[www.tracopower.com/products/ten20win\\_application.pdf](http://www.tracopower.com/products/ten20win_application.pdf)

## Power Derating



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

## Outline Dimensions



### Pin-Out

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

Dimensions in [mm], ( ) = Inch  
Pin diameter: 1.0 ±0.05 (0.039 ±0.002)  
Pin pitch tolerances: ±0.35 (±0.014)  
Case tolerances: ±0.5 (±0.02)

## Heat-Sink (Option)

**Order code:** TEN-HS1

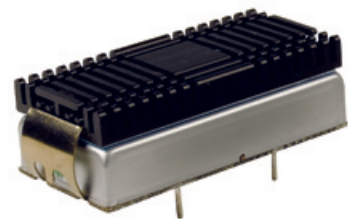
(cont.: heat-sink, thermal pad, 2 clamps)

**Material:** Aluminum

**Finish:** Anodic treatment (black)

**Weight:** 17g (0.60oz) without converter

Thermal impedance after assembling: 10 K/W

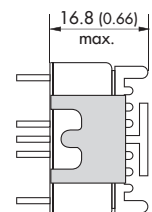
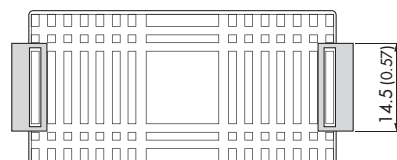
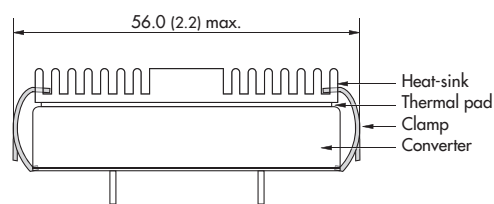


### Note:

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.