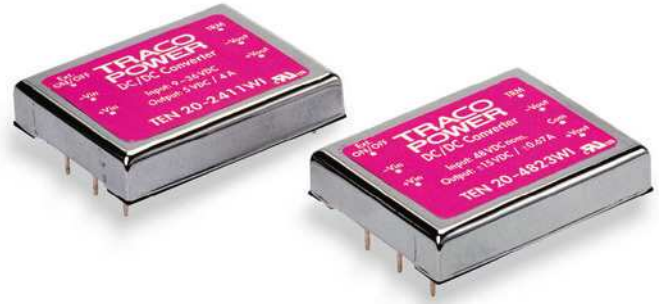


not recommended for new design in

Features

- ◆ Ultra wide 4 : 1 input range
- ◆ Extended operating temperature range
-40°C to +85°C
- ◆ I/O isolation 1500 VDC
- ◆ Input filter meets EN 55022, class A and FCC, Level A
- ◆ Remote On/Off
- ◆ Adjustable output
- ◆ Industry standard footprint
- ◆ Shielded metal case with insulated baseplate
- ◆ Optional heatsink
- ◆ Lead free design - RoHS compliant
- ◆ 3-year product warranty



The TEN 20WI series is a family of high performance 20W DC/DC converter modules featuring ultra wide 4:1 input voltage ranges in a compact 2" x 1.6" low profile package with industry-standard footprint. A very high efficiency allows an operating temperature range of -40°C to 85°C. A built-in EMI input filter complies with EN 55022, class A. 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 20-2411WI | 9 – 36 VDC (24 VDC nominal) | 5 VDC | 4'000 mA | 79 % |
| TEN 20-2412WI | | 12 VDC | 1'670 mA | 81 % |
| TEN 20-2413WI | | 15 VDC | 1'330 mA | 81 % |
| TEN 20-2421WI | | ±5 VDC | ±2'000 mA | 79 % |
| TEN 20-2422WI | | ±12 VDC | ±835 mA | 81 % |
| TEN 20-2423WI | | ±15 VDC | ±665 mA | 82 % |
| TEN 20-4811WI | 18 – 75 VDC (48 VDC nominal) | 5 VDC | 4'000 mA | 80 % |
| TEN 20-4812WI | | 12 VDC | 1'670 mA | 81 % |
| TEN 20-4813WI | | 15 VDC | 1'330 mA | 81 % |
| TEN 20-4821WI | | ±5 VDC | ±2'000 mA | 79 % |
| TEN 20-4822WI | | ±12 VDC | ±835 mA | 83 % |
| TEN 20-4823WI | | ±15 VDC | ±665 mA | 84 % |

Input Specifications

| | |
|-----------------------------------|--|
| Input current at no load | 24 Vin models: 35 mA typ. 48 Vin models: 25 mA typ. |
| Input current at full load | 24 Vin models: 1000 mA typ. 48 Vin models: 500 mA typ. |
| Surge voltage (100 msec. max.) | 24 Vin models: 50 V max. 48 Vin models: 100 V max. |
| Conducted noise (input) | 24 Vin models: EN 55022 level A, FCC part 15, level A without external components 48 Vin models: with capacitor 2.2 µF/100V, 1812 MLCC |
| 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 | ±2 % |
| Output voltage adjustment | ±10 % |
| Regulation | – Input variation Vin min. to Vin max. – Load variation 25 – 100%: single output models: ±0.5 % max. dual output models: ±3 % max. (balanced load) ±5 % max. (load cross variation 25 % / 100 %) |
| Temperature coefficient | ±0.02 %/K |
| Ripple and noise (20 MHz Bandwidth) | single output models: 75 mVpk-pk max. 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) | 500 µs typ. |
| Short circuit protection | indefinite (automatic recovery) |
| Over load protection | 150 % of Iout max typ. foldback |
| Over voltage protection | 5 Vout models: 6.2 V 12 Vout models: 15 V 15 Vout models: 18 V |
| Minimum load | 10% of rated max current (operation at lower load condition will not damage these converters, however, they may not meet all listed specifications) |
| Capacitive load | 5 Vout models / ± 5 Vout models: 6'800 µF max. / ±3'400 µF max. 12 Vout models / ±12 Vout models: 2'200 µF max. / ±680 µF max. 15 Vout models / ±15 Vout models: 755 µF max. / ±450 µF max. |

General Specifications

| | | |
|---|---|--|
| Temperature ranges | – Operating – Case temperature – Storage | –40°C to +85°C +100°C max. –55°C to +105°C |
| Thermal impedance | – with heat-sink TEN-HS2 – without heat-sink | 8.24 K/watt 10 K/watt |
| Derating | | see graphs on page 3 to 5 |
| Humidity (non condensing) | | 95 % rel H max. |
| Reliability, calculated MTBF (MIL-HDBK-217F, at +70°C, ground benign) | | >1.9 Mio. h |
| Isolation voltage (60 sec.) | – Input/Output | 1'500 VDC |
| Isolation capacitance | – Input/Output | 300 pF typ. |
| Isolation resistance | – Input/Output (500 VDC) | >1'000 M Ohm |

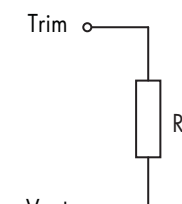
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

General Specifications

| | | |
|-----------------------------|--|---|
| Switching frequency (fixed) | | 300 kHz typ. (Pulse width modulation PWM) |
| Vibration | | 10–55Hz, 2G, 30 minutes along X,Y,Z |
| Remote On/Off | <ul style="list-style-type: none"> – ON: – OFF: – OFF idle current: | 3.5 ... 12 VDC or open circuit. 0 ... 1.2 VDC or short circuit pin 3 and pin 2 20 mA typ. |
| Safety standards | | UL 1950, IEC/EN 60950-1 compliance up to 60 VDC input voltage (SELV limit) |
| Safety approvals | – UL/cUL | www.ul.com > UL File no.: e188913 |
| Environmental compliance | <ul style="list-style-type: none"> – Reach – RoHS | www.tracopower.com/products/reach-declaration.pdf RoHS directive 2011/65/EU |

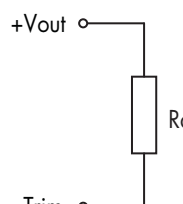
Output Voltage Adjustment

Trim up



| Ru [kohm]* | | output | 5V | 12V | 15V |
|------------|------|--------|-----|------|------|
| +5% | 3.9 | 56 | 470 | | |
| +10% | 0.47 | 6.8 | 2.2 | | |
| Ru [kohm]* | | output | ±5V | ±12V | ±15V |
| +5% | 10 | 22 | 39 | | |
| +10% | 0.82 | 1.5 | 6.8 | | |

Trim down

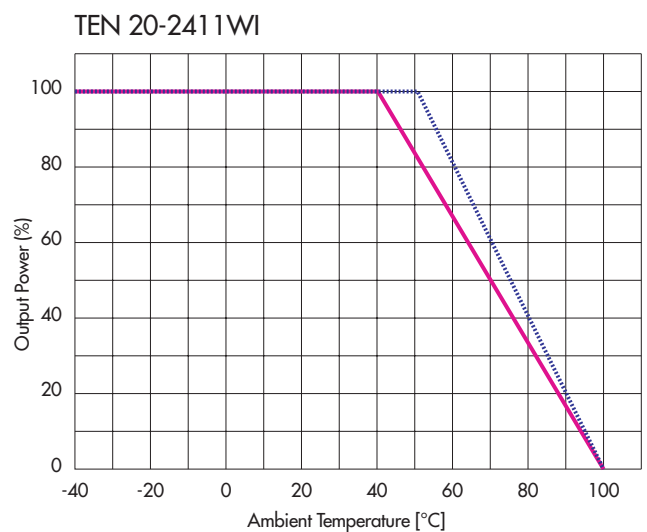
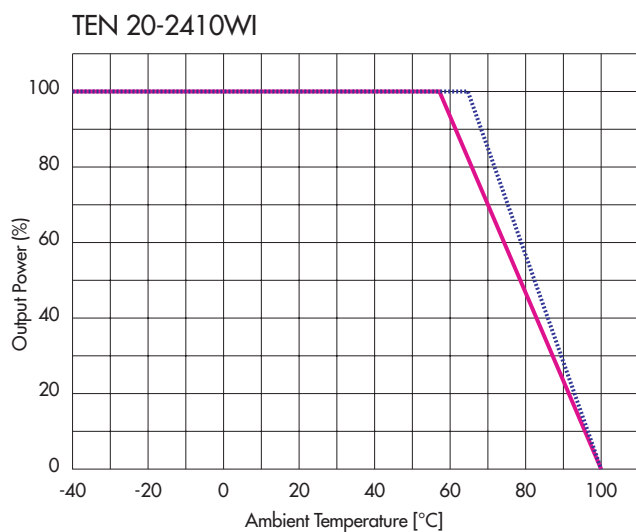


| Rd [kohm]* | | output | 5V | 12V | 15V |
|------------|------|--------|-----|------|------|
| -5% | 5.6 | 47 | 56 | | |
| -10% | 0.68 | 2.7 | 1.8 | | |
| Rd [kohm]* | | output | ±5V | ±12V | ±15V |
| -5% | 15 | 47 | 47 | | |
| -10% | 1.2 | 10 | 8.2 | | |

*approximate values

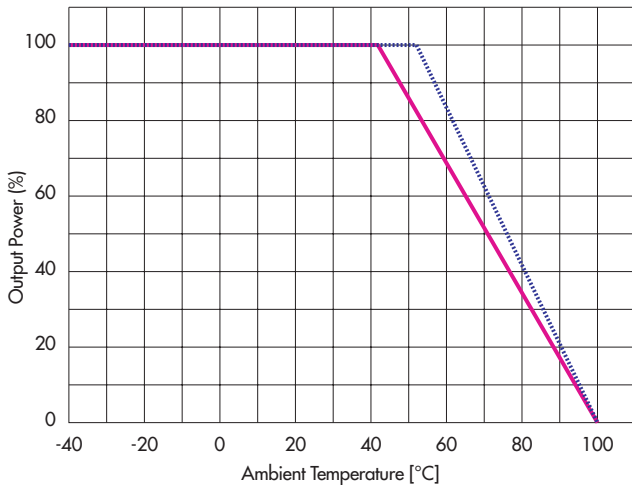
Power De-rating

- ⋯ Natural convection with heat-sink TEN-HS2
- Natural convection without heat-sink

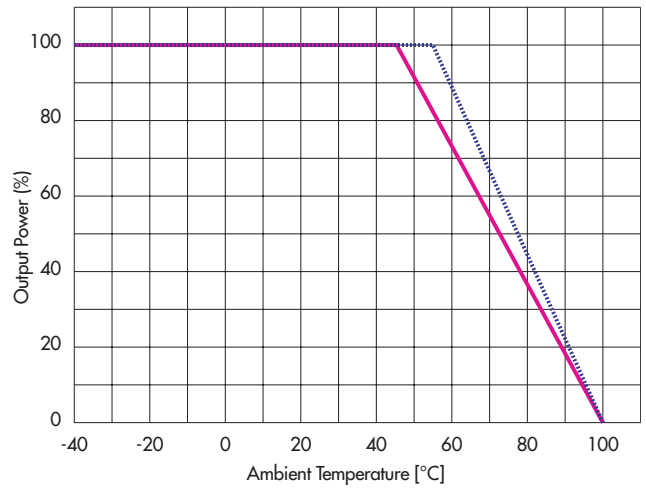


Power De-rating

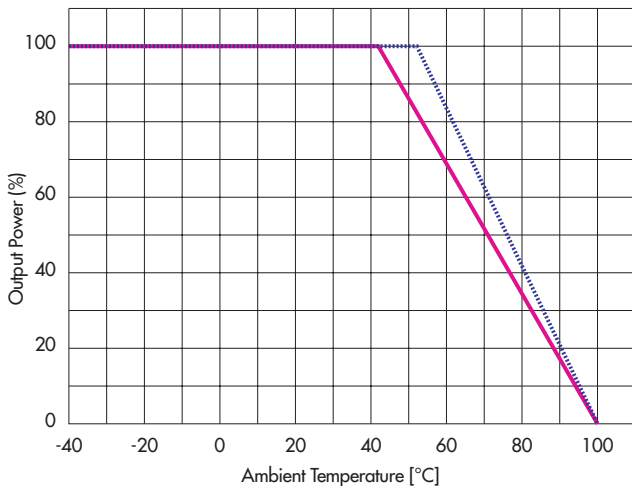
TEN 20-2412WI



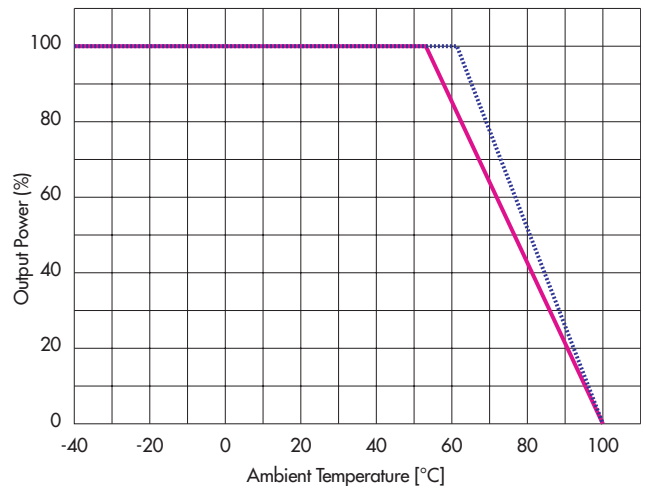
TEN 20-2413WI



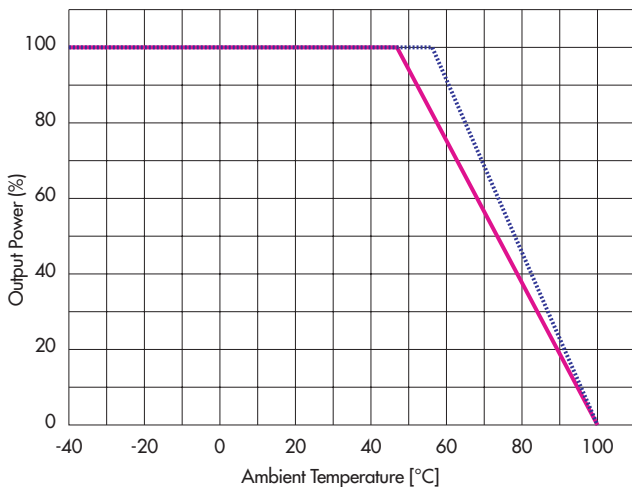
TEN 20-2421WI



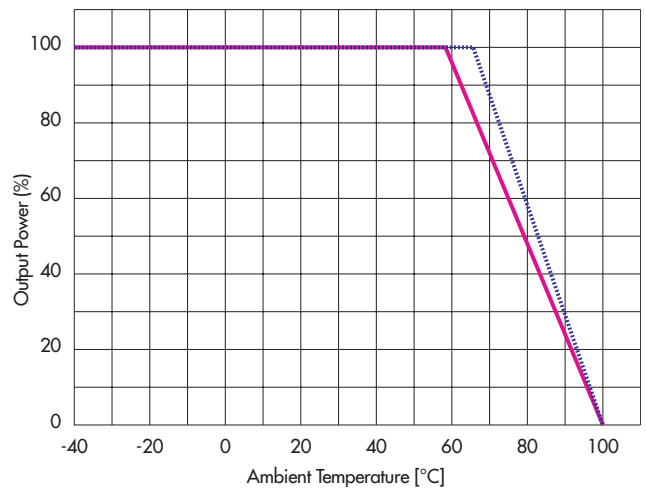
TEN 20-2422WI



TEN 20-2423WI

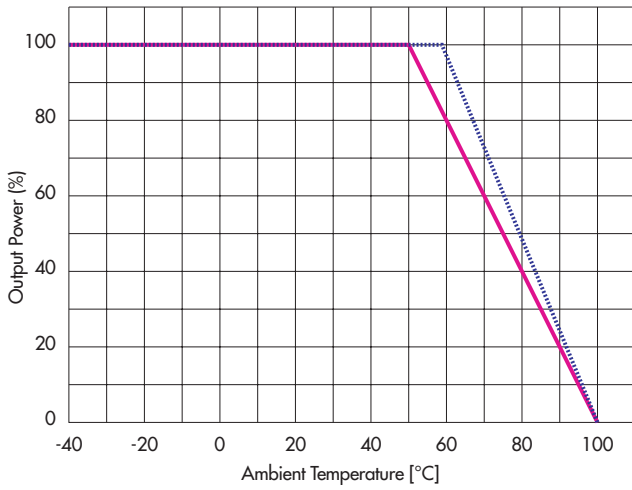


TEN 20-4810WI

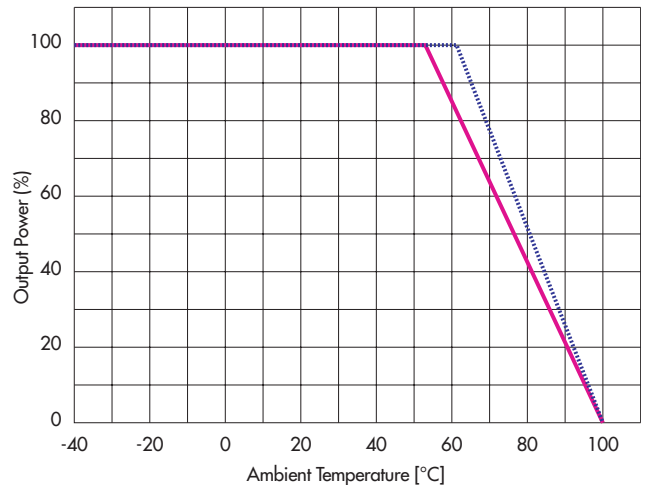


Power De-rating

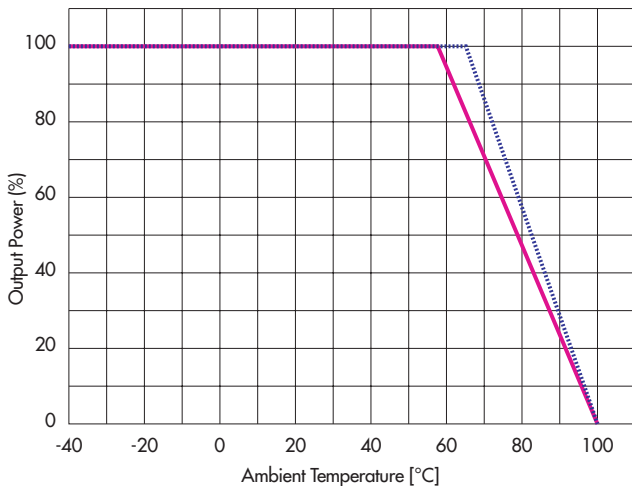
TEN 20-4811WI



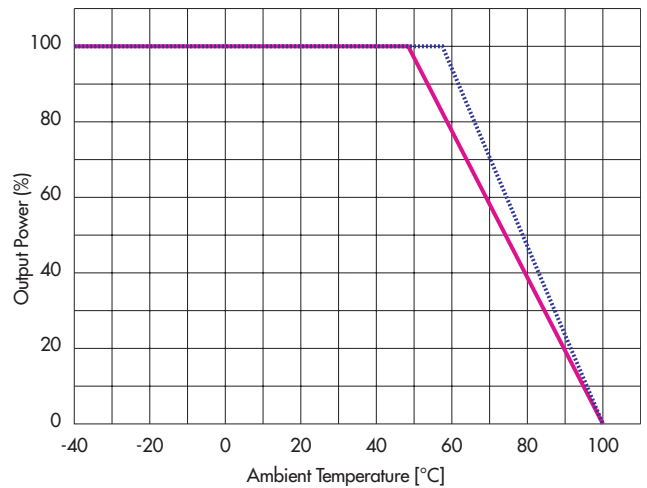
TEN 20-4812WI



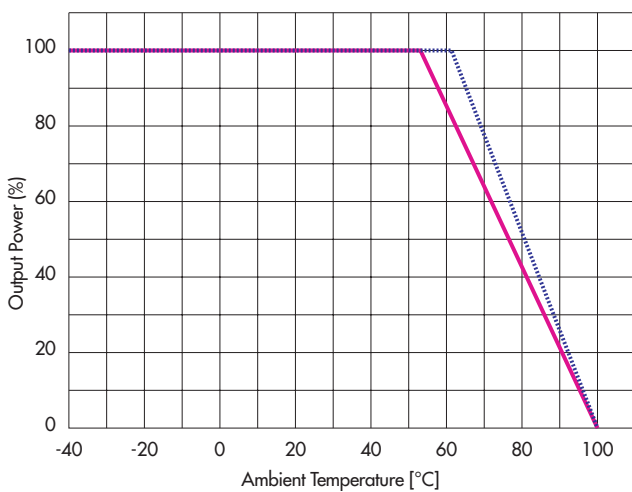
TEN 20-4813WI



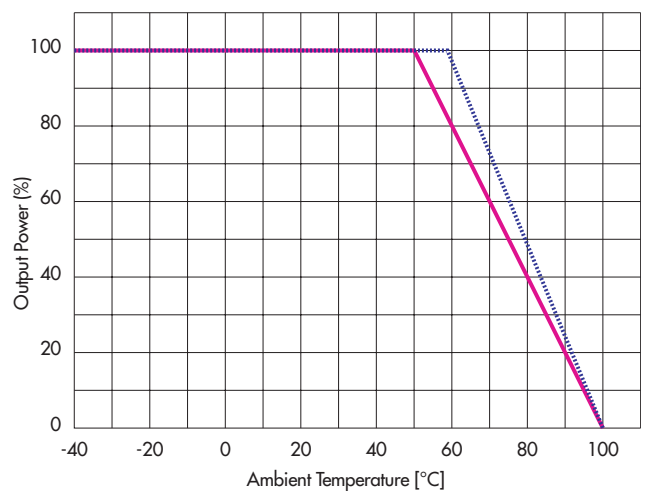
TEN 20-4821WI



TEN 20-4822WI



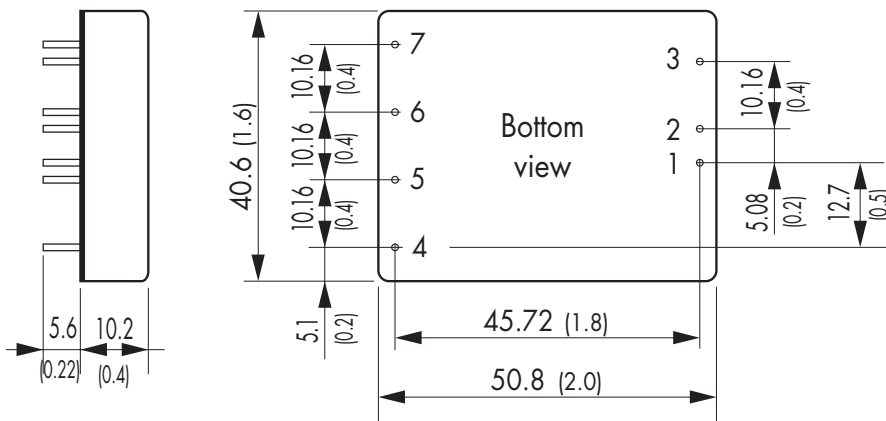
TEN 20-4823WI



Physical Specifications

| | |
|-----------------------|------------------------|
| Casing material | copper, nickel plated |
| Baseplate material | non conductive FR4 |
| Potting material | epoxy (UL 94V-0 rated) |
| Weight | 50 g (1.2oz) |
| Soldering temperature | max. 265°C / 10 sec. |

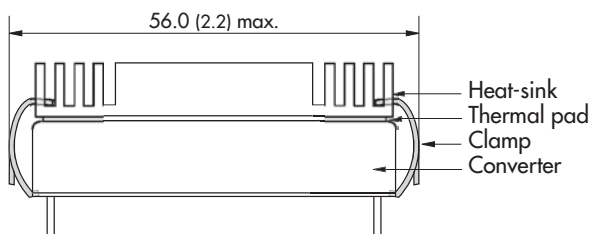
Outline Dimensions



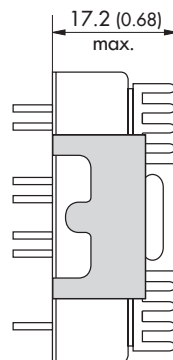
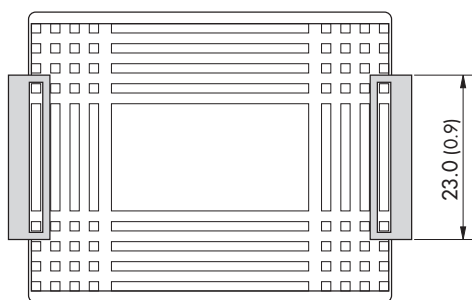
| Pin-Out | | |
|---------|---------------|------------|
| Pin | Single | Dual |
| 1 | +Vin (Vcc) | +Vin (Vcc) |
| 2 | -Vin (GND) | -Vin (GND) |
| 3 | Remote On/Off | |
| 4 | No pin | +Vout |
| 5 | +Vout | Common |
| 6 | -Vout | -Vout |
| 7 | Trim | |

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

Heat-sink TEN-HS2



Order code: TEN-HS2
 (cont.: heat-sink, thermal pad, 2 clamps)
Material: Aluminum
Finish: Anodic treatment (black)
Weight: 19 g (0.67oz) (without converter)



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