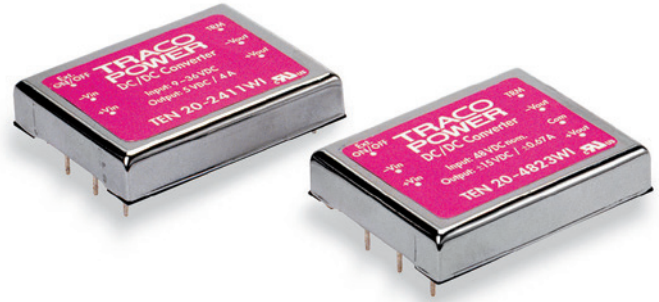


*not recommended for new design in*

#### 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	<b>9 – 36 VDC</b> (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	<b>18 – 75 VDC</b> (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

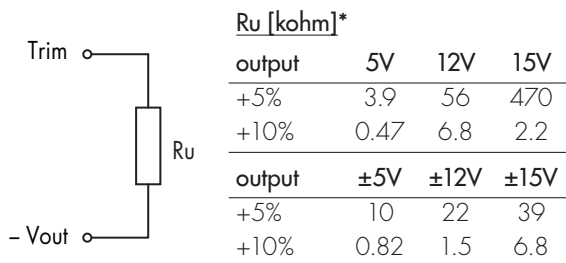
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

**General Specifications**

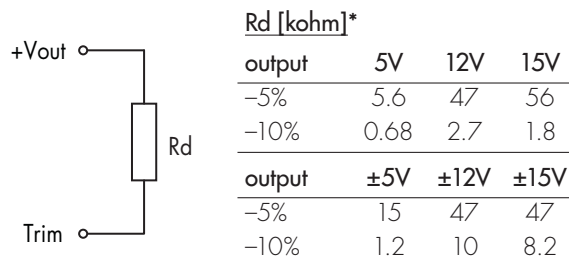
Switching frequency (fixed)		300 kHz typ. (Pulse width modulation PWM)
Vibration		10–55Hz, 2G, 30 minutes along X,Y,Z
Remote On/Off	<ul style="list-style-type: none"> <li>– ON:</li> <li>– OFF:</li> <li>– OFF idle current:</li> </ul>	3.5 ... 12 VDC or open circuit. 0 ... 1.2 VDC or short circuit pin 3 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	<a href="http://www.ul.com">www.ul.com</a> > UL File no.: e188913
Environmental compliance	<ul style="list-style-type: none"> <li>– Reach</li> <li>– RoHS</li> </ul>	<a href="http://www.tracopower.com/products/reach-declaration.pdf">www.tracopower.com/products/reach-declaration.pdf</a> RoHS directive 2011/65/EU

**Output Voltage Adjustment**

**Trim up**

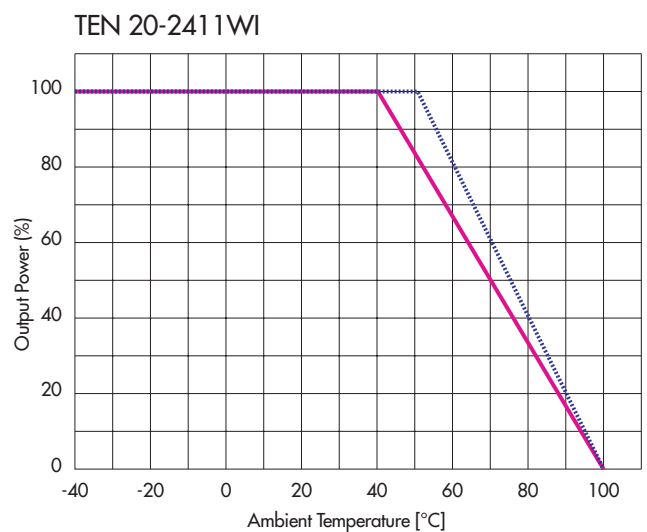
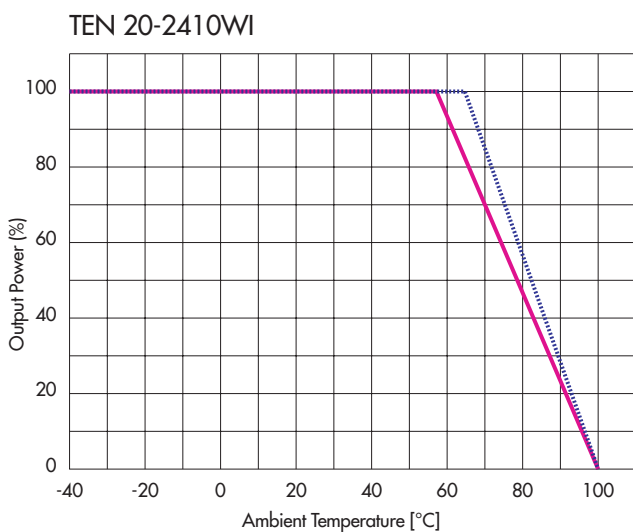
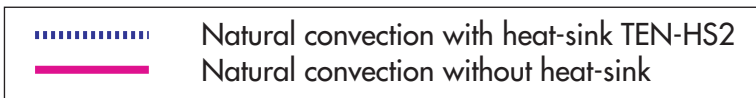


**Trim down**



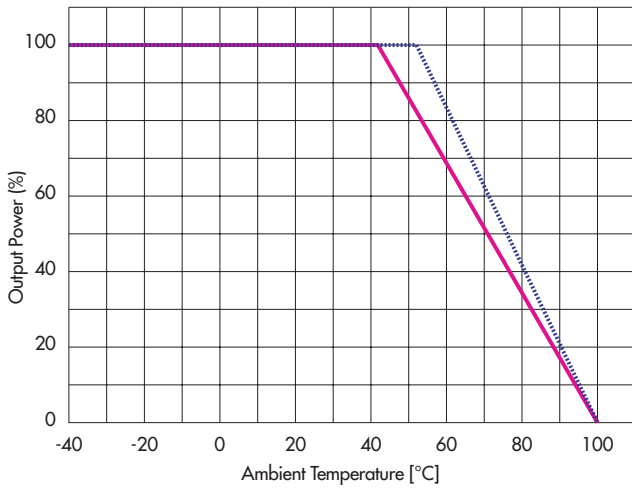
\*approximate values

**Power De-rating**

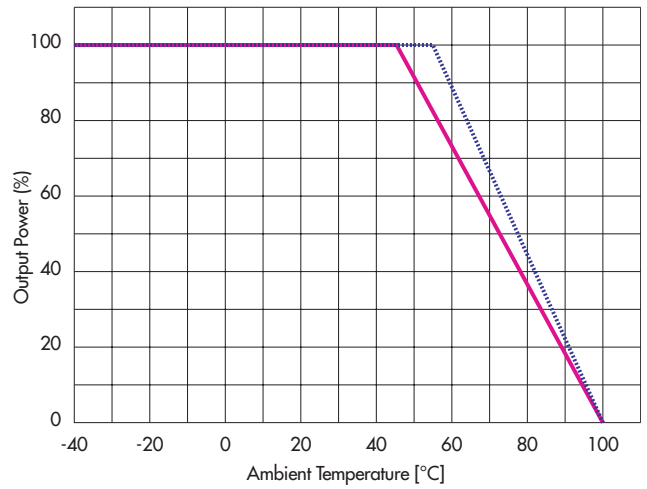


**Power De-rating**

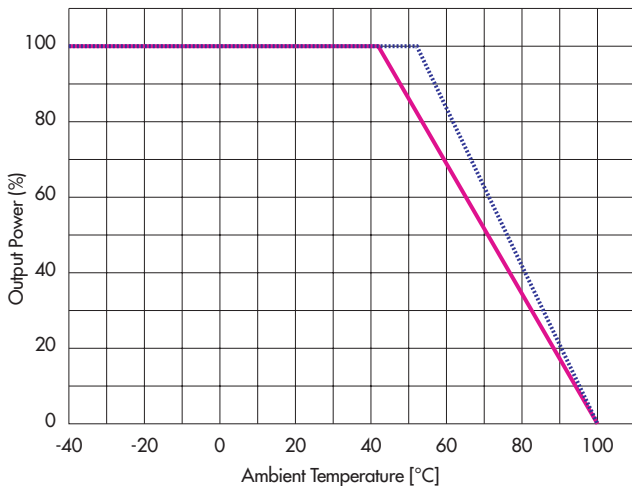
TEN 20-2412WI



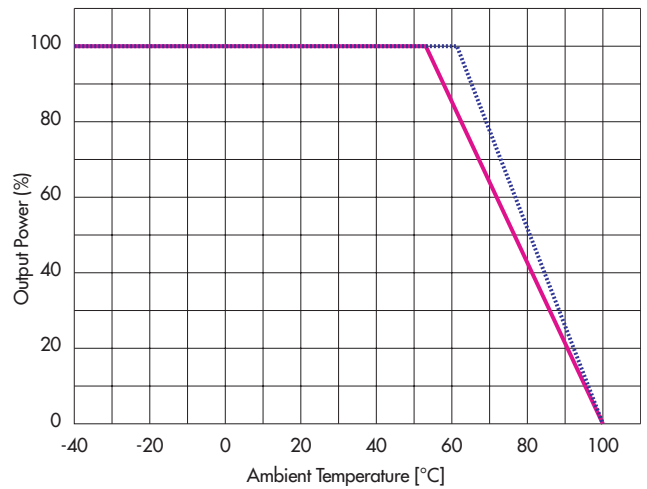
TEN 20-2413WI



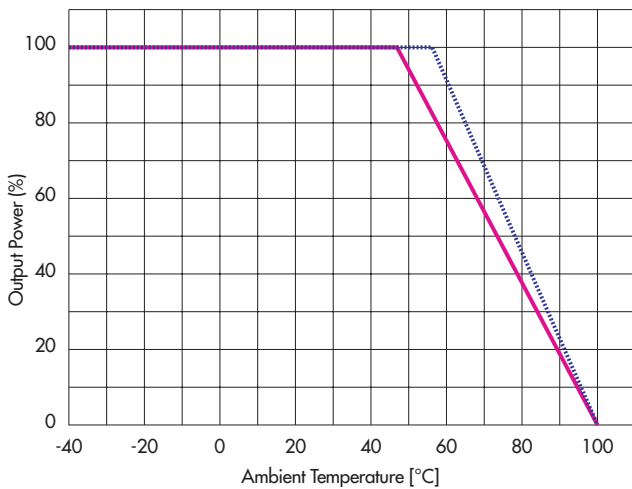
TEN 20-2421WI



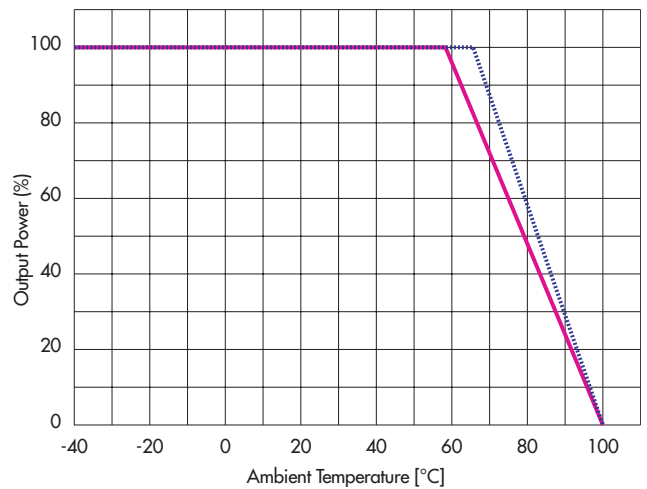
TEN 20-2422WI



TEN 20-2423WI

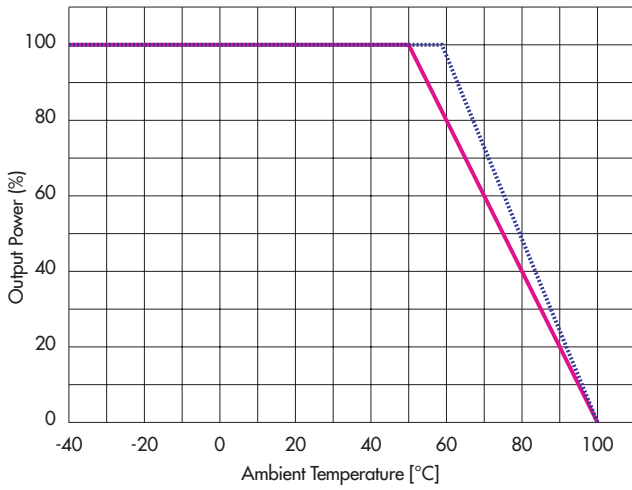


TEN 20-4810WI

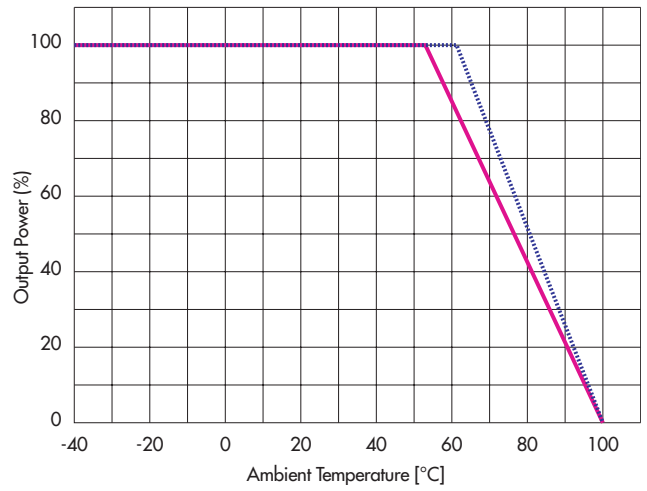


**Power De-rating**

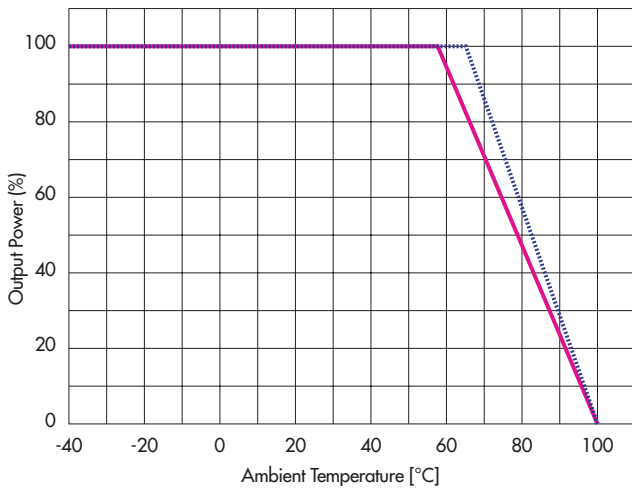
TEN 20-4811WI



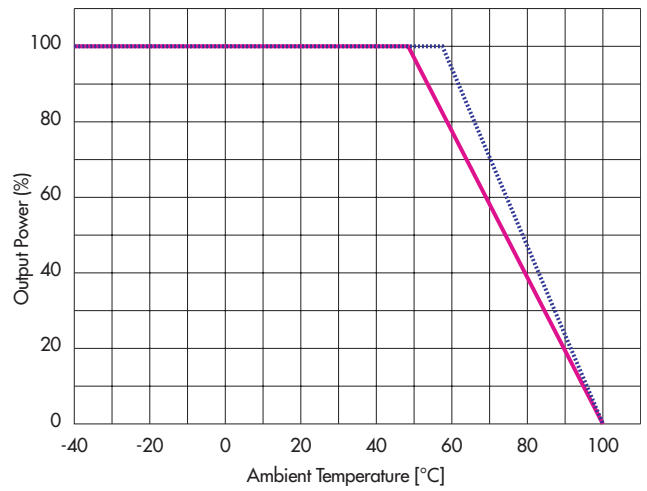
TEN 20-4812WI



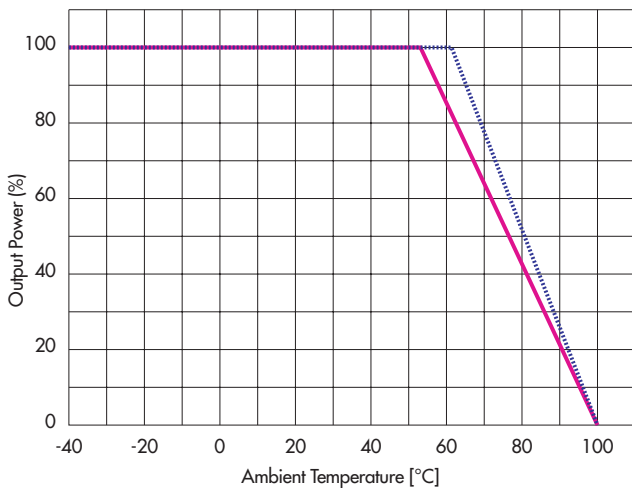
TEN 20-4813WI



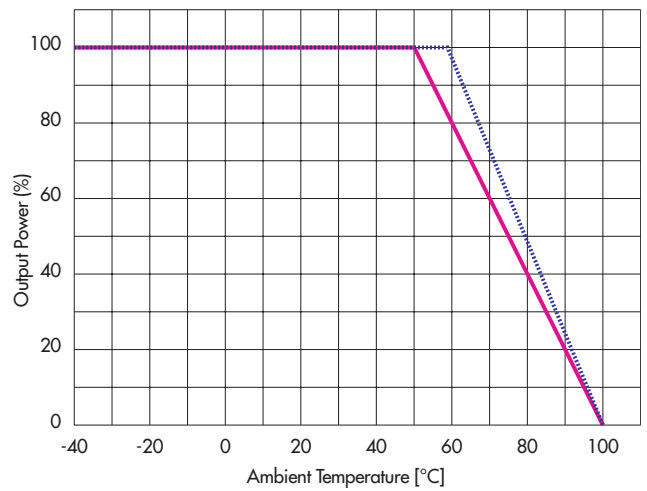
TEN 20-4821WI



TEN 20-4822WI



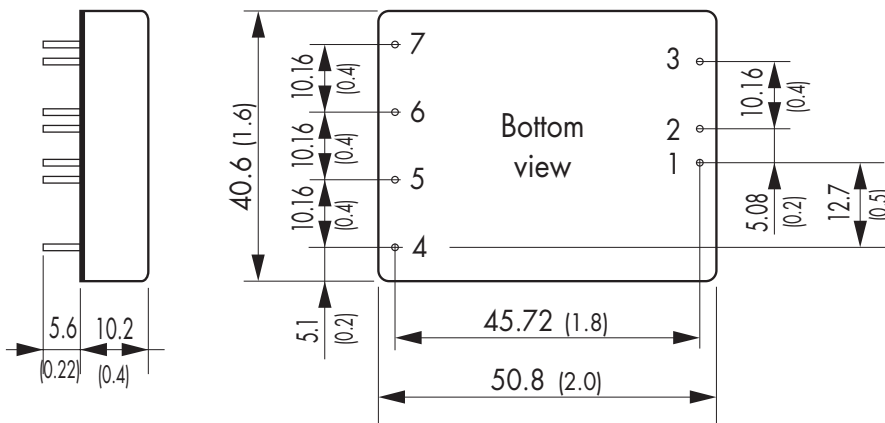
TEN 20-4823WI



**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.

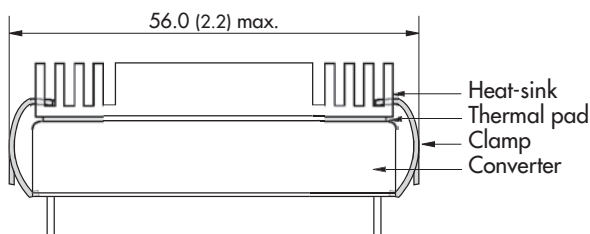
**Outline Dimensions**



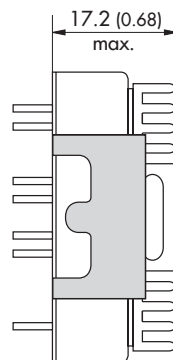
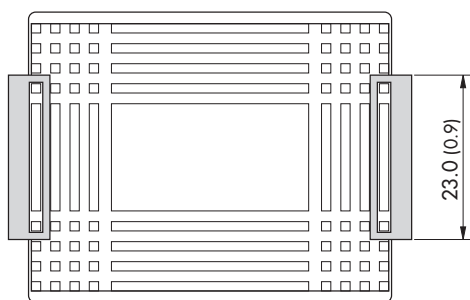
Pin-Out		
Pin	Single	Dual
1	+Vin (Vcc)	+Vin (Vcc)
2	-Vin (GND)	-Vin (GND)
3	Remote On/Off	
4	No pin	+Vout
5	+Vout	Common
6	-Vout	-Vout
7	Trim	

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](http://www.tracopower.com)

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