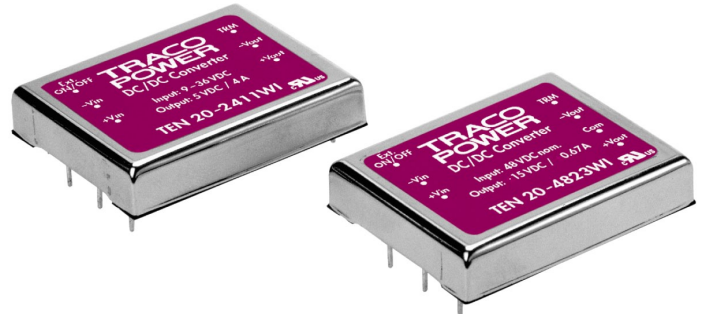




#### Features

- ◆ 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 without external Components
- ◆ 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 without external components. 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	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	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)	EN 55022 level A, FCC part 15, level A
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	<ul style="list-style-type: none"> <li>- Input variation Vin min. to Vin max.      ± 0.2 % max.</li> <li>- Load variation 25 – 100%: <ul style="list-style-type: none"> <li>single output models: ± 0.5 % max.</li> <li>dual output models: ± 3 % max.</li> </ul> </li> <li>- Load cross variation 25 % / 100 %      ± 5 % max.</li> </ul>
Temperature coefficient	± 0.02 % /K
Ripple and noise (20 MHz Bandwidth)	<ul style="list-style-type: none"> <li>single output models: 75 mVpk-pk max.</li> <li>dual output models: 100 mVpk-pk max.</li> </ul>
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	<ul style="list-style-type: none"> <li>5 Vout models: 6.2 V</li> <li>12 Vout models: 15 V</li> <li>15 Vout models: 18 V</li> </ul>
Minimum load (only for dual output models)	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	<ul style="list-style-type: none"> <li>5 Vout models / ± 5 Vout models: 6'800 µF max. / ± 3'400 µF max.</li> <li>12 Vout models / ±12 Vout models: 2'200 µF max. / ± 680 µF max.</li> <li>15 Vout models / ±15 Vout models: 755 µF max. / ± 450 µF max.</li> </ul>

### General Specifications

Temperature ranges	<ul style="list-style-type: none"> <li>- Operating      - 40 °C ... + 85 °C</li> <li>- Case temperature      + 100 °C max.</li> <li>- Storage      - 55 °C ... + 105 °C</li> </ul>
Thermal impedance	<ul style="list-style-type: none"> <li>- with heat-sink TEN-HS2      8.24 K /watt</li> <li>- without heat-sink      10 K /watt</li> </ul>
Derating	see graphs on page 3 to 5
Humidity (non condensing)	95 % rel H max.
Reliability, calculated MTBF (MIL-HDBK-217 E)	> 440'000 h @ + 25°C
Isolation (Input/Output)	<ul style="list-style-type: none"> <li>- Voltage      1'500 VDC</li> <li>- Capacity      300 pF max.</li> <li>- Resistance      &gt; 1'000 M Ohm</li> </ul>

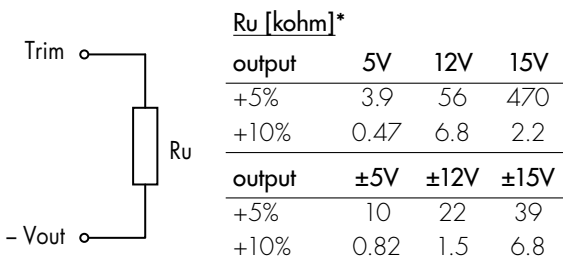
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

**General Specifications**

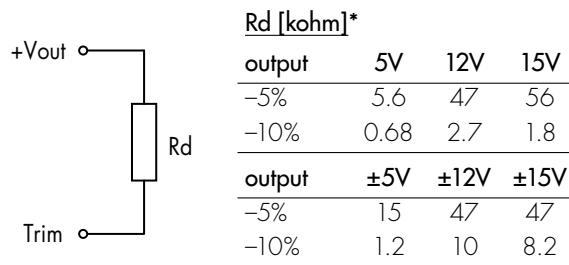
Switching frequency (fixed)		300 kHz typ. (Pulse width modulation PWM)
Vibration		10-55Hz, 2G, 30 minutes along X,Y,Z
Remote On/Off	<ul style="list-style-type: none"> <li>- ON:</li> <li>- OFF:</li> <li>- OFF idle current:</li> </ul>	3.5 ... 12 VDC or open circuit. 0 ... 1.2 VDC or short circuit pin 3 and pin 2 20 mA typ.
Safety standards		UL 1950, EN 60950, IEC 60950 compliance up to 60 VDC input voltage (SELV limit)
Safety approvals		UL /cUL File E 188913

**Output Voltage Adjustment**

**Trim up**

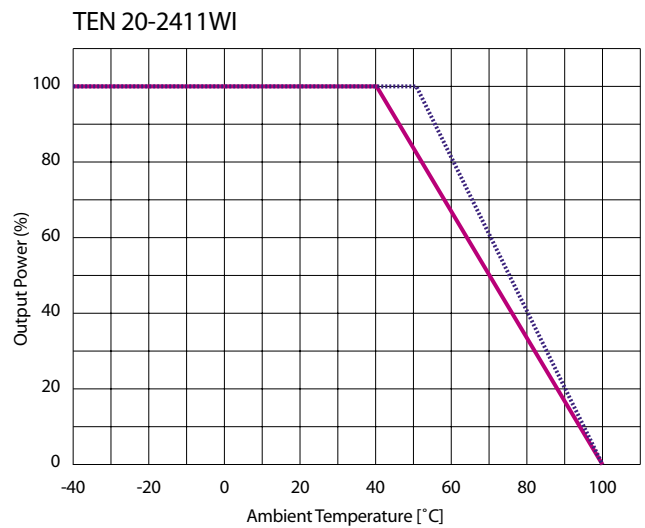
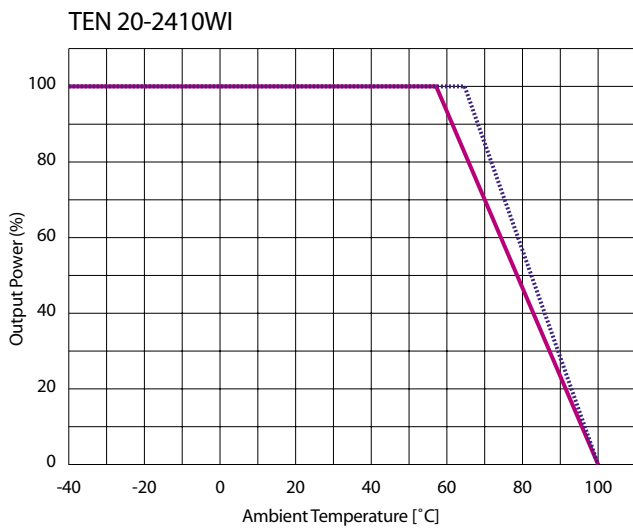
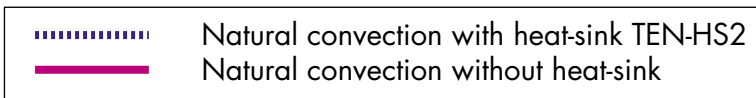


**Trim down**



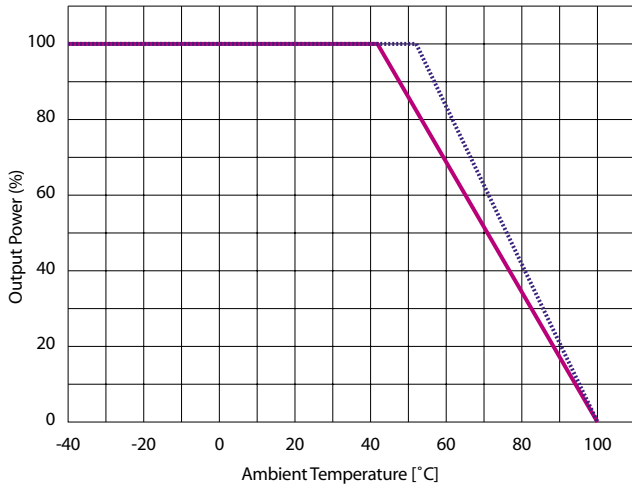
\*approximate values

**Power De-rating**

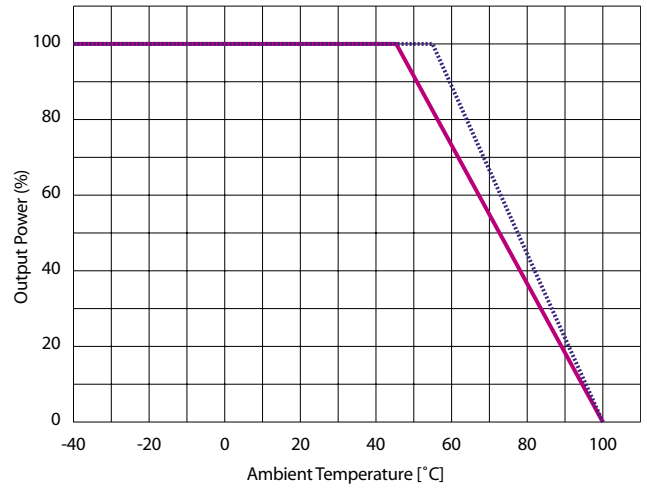


**Power De-rating**

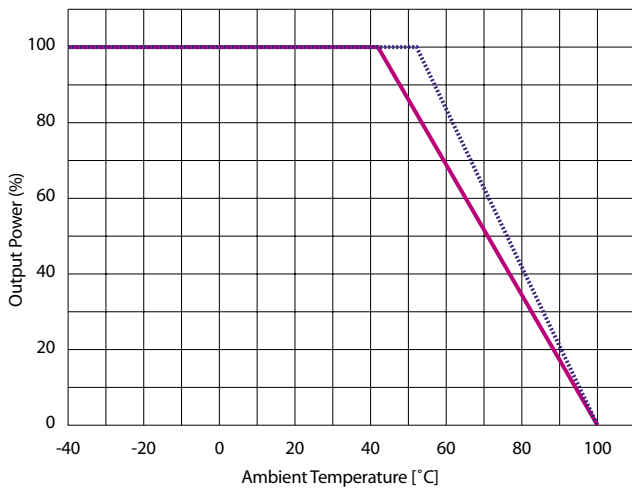
TEN 20-2412WI



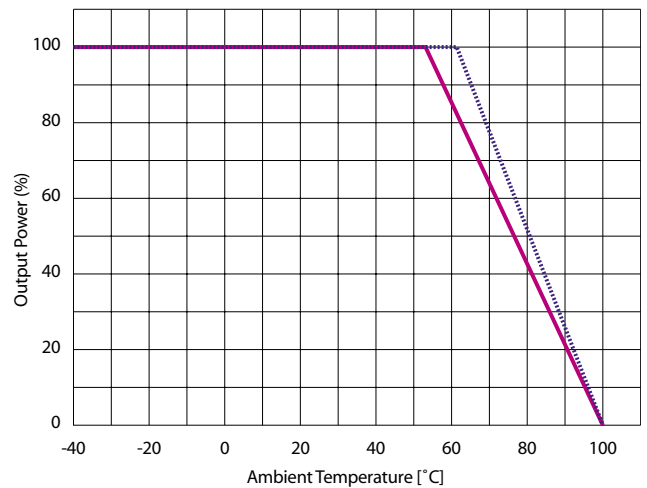
TEN 20-2413WI



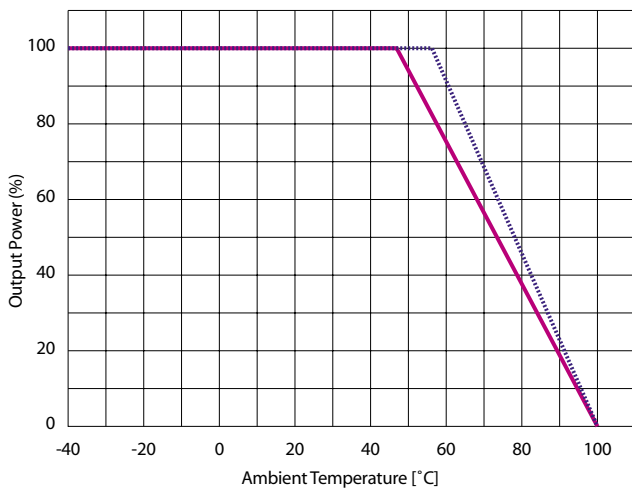
TEN 20-2421WI



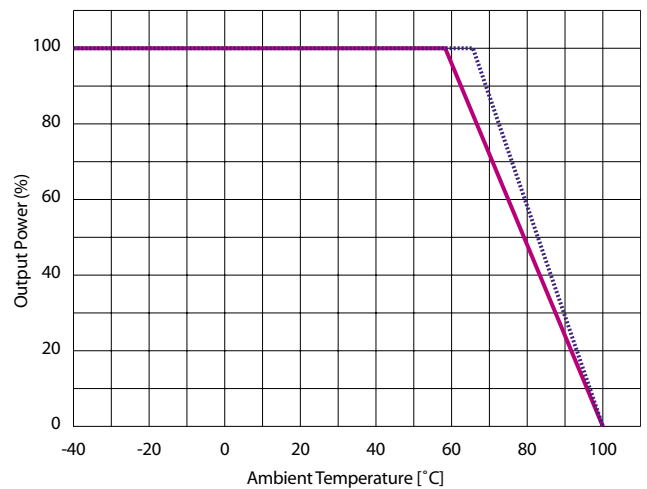
TEN 20-2422WI



TEN 20-2423WI

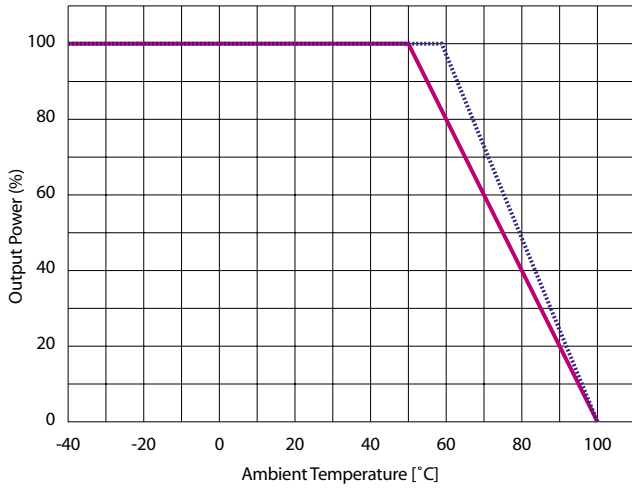


TEN 20-4810WI

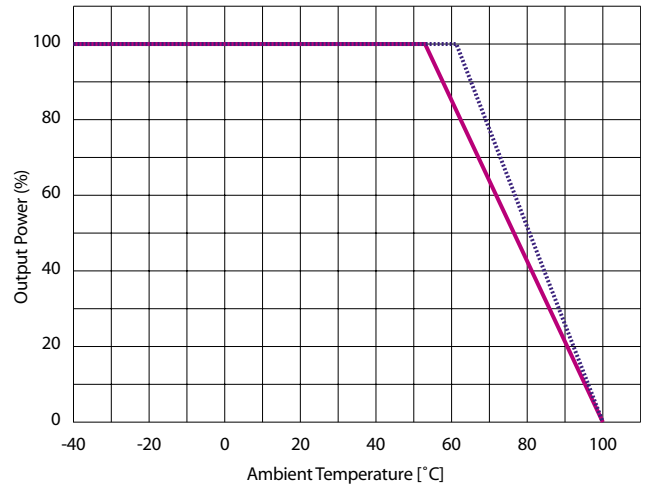


**Power De-rating**

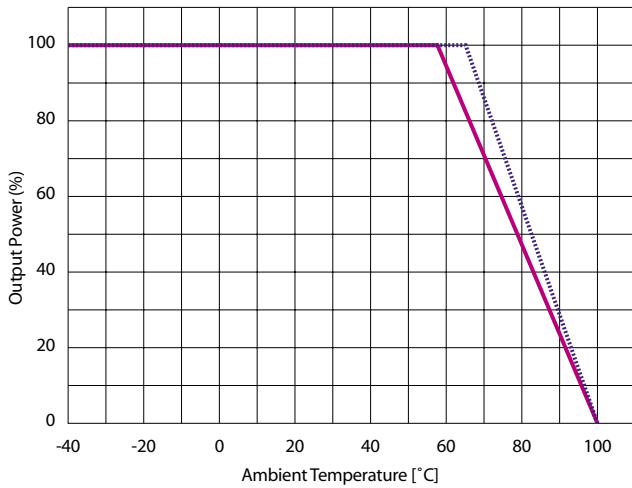
TEN 20-4811WI



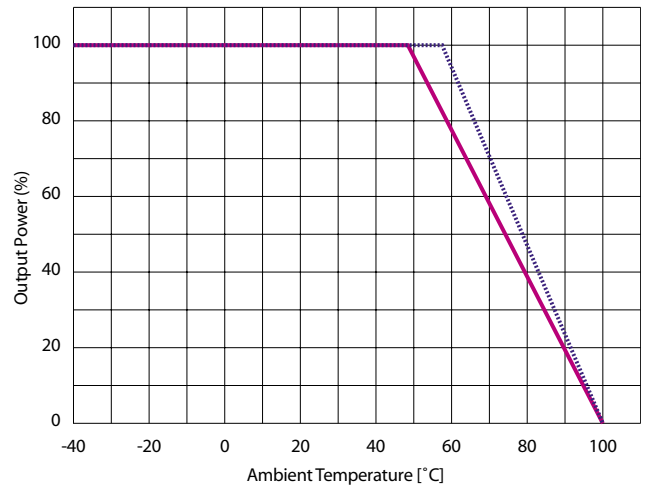
TEN 20-4812WI



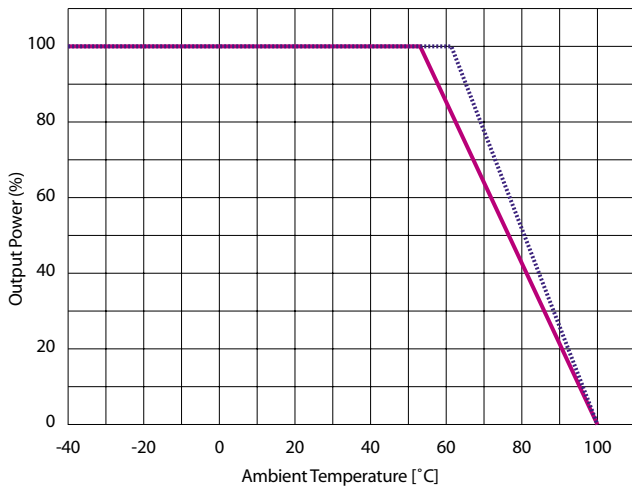
TEN 20-4813WI



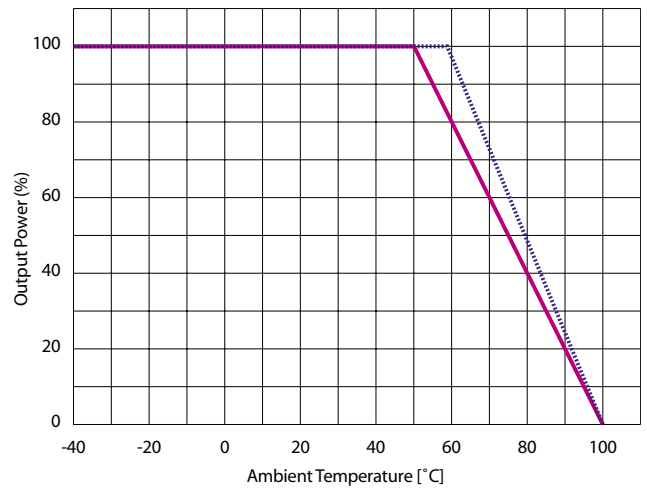
TEN 20-4821WI



TEN 20-4822WI



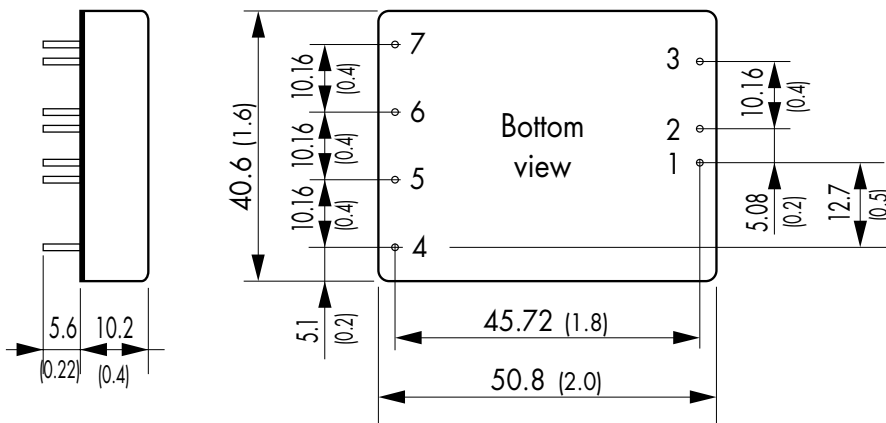
TEN 20-4823WI



**Physical Specifications**

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

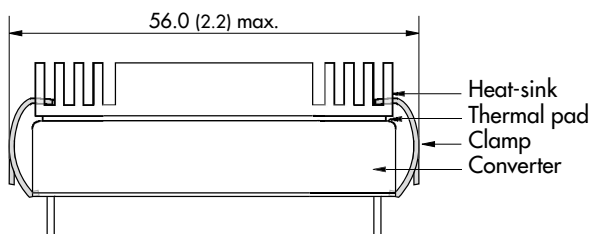
**Outline Dimensions**



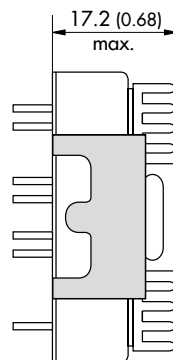
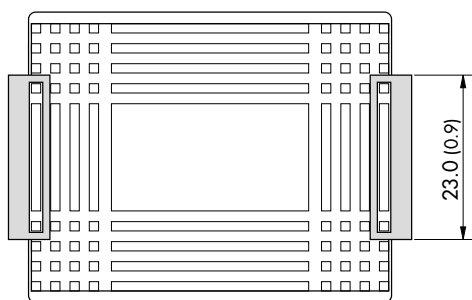
Pin-Out		
Pin	Single	Dual
1	+Vin (Vcc)	+Vin (Vcc)
2	-Vin (GND)	-Vin (GND)
3	Remote On/Off	
4	No pin	+ Vout
5	+ Vout	Common
6	-Vout	-Vout
7	Trim	

Dimensions in [mm], ( ) = Inch  
 Pin diameter: 1.0 ±0.05 (0.02 ±0.002)  
 Pin pitch tolerances: ±0.35 (±0.014)  
 Case 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:** 19g (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