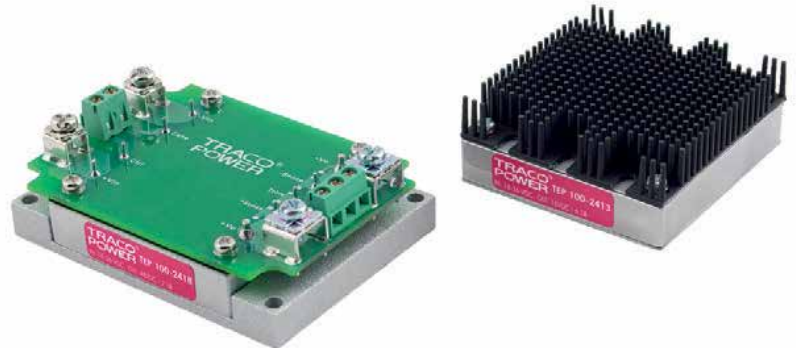




## Features

- ◆ Rugged, compact metal case
- ◆ Easy chassis mount
- ◆ Screw terminal adaptor available for easy connection
- ◆ Wide 2:1 input voltage range
- ◆ Full load operation up to 60°C with convection cooling
- ◆ Soft start
- ◆ Under voltage lock-out circuit
- ◆ Reverse input voltage protection
- ◆ Input protection filter
- ◆ 3-year product warranty



(Models pictured with chassis mount adaptor and optional heatsink)

The TEP-100 Series is a family of isolated high performance dc-dc converter modules with ultra-wide 2:1 input voltage ranges which come in a rugged, sealed metal case.

These converters are suitable for a wide range of applications, but the product is designed particularly also for industrial applications where often no PCB mounting is possible but the module has to be mounted on a chassis. Four threaded M3 inserts in the module makes chassis mount or attachment of a heatsink for

optimal thermal management very simple.

For easy connection there is also an unique adaptor available with screw terminals. A very high efficiency allows an operating temperature up to +60°C with natural convection cooling without power derating. Further features include output voltage trimming, Remote On/Off and under voltage lockout. The very wide input voltage range and reverse input voltage protection make these converters also an interesting solution for battery operated systems.

## Models

Order code*	Input voltage	Output voltage	Output current max.	Efficiency typ.
TEP 100-1210	9 – 18 VDC (12 VDC nominal)	3.3 VDC	25.0 A	90 %
TEP 100-1211		5.0 VDC	20.0 A	91 %
TEP 100-1212		12 VDC	8.4 A	91 %
TEP 100-1213		15 VDC	6.7 A	91 %
TEP 100-1215		24 VDC	4.2 A	90 %
TEP 100-1216		28 VDC	3.6 A	90 %
TEP 100-1218		48 VDC	2.1 A	90 %
TEP 100-2410		18 – 36 VDC (24 VDC nominal)	3.3 VDC	25.0 A
TEP 100-2411	5.0 VDC		20.0 A	93 %
TEP 100-2412	12 VDC		8.4 A	93 %
TEP 100-2413	15 VDC		6.7 A	93 %
TEP 100-2415	24 VDC		4.2 A	92 %
TEP 100-2416	28 VDC		3.6 A	92 %
TEP 100-2418	48 VDC		2.1 A	92 %
TEP 100-4810	36 – 75 VDC (48 VDC nominal)		3.3 VDC	25.0 A
TEP 100-4811		5.0 VDC	20.0 A	93 %
TEP 100-4812		12 VDC	8.4 A	93 %
TEP 100-4813		15 VDC	6.7 A	93 %
TEP 100-4815		24 VDC	4.2 A	92 %
TEP 100-4816		28 VDC	3.6 A	92 %
TEP 100-4818		48 VDC	2.1 A	92 %

\* – add suffix **-CM**, **-CMF** for models with chassis mount adaptor, see last page.  
– add suffix **-N** for negative remote control, see page 3 -> Remote On/Off

## Input Specifications

Input current at no load	12 Vin; 3.3 – 15 VDC models:	160 mA typ.
	12 Vin; 24 – 48 VDC models:	100 mA typ.
	24 Vin; 3.3 – 15 VDC models:	185 mA typ.
	24 Vin; 24 – 48 VDC models:	85 mA typ.
	48 Vin; 3.3 – 15 VDC models:	90 mA typ.
	48 Vin; 24 – 48 VDC models:	40 mA typ.
Input current at full load	12 Vin models:	9.4 A typ.
	24 Vin models:	4.6 A typ.
	48 Vin models:	2.3 A typ.
Start-up voltage	12 Vin models:	8.5 VDC (or lower)
	24 Vin models:	17.5 VDC (or lower)
	48 Vin models:	35.5 VDC (or lower)
Under voltage shut down (lock-out circuit)	12 Vin models:	7.5 VDC typ.
	24 Vin models:	16 VDC typ.
	48 Vin models:	34 VDC typ.
Surge voltage (100 msec. max.)	12 Vin models:	36 V max.
	24 Vin models:	50 V max.
	48 Vin models:	100 V max.
Conducted noise	EN 55022 level A, FCC part 15, level A (chassis mount option –CFM required)	
EMC immunity	<ul style="list-style-type: none"> <li>– ESD (electrostatic discharge)</li> <li>– Radiated immunity</li> <li>– Fast transient / surge (with external input capacitor)</li> </ul>	EN 50121-3-2
		EN 61000-4-2, air $\pm 8$ kV, contact $\pm 6$ kV, perf. criteria A
		EN 61000-4-3, 10 V/m, perf. criteria A
		EN 61000-4-4, $\pm 2$ kV, perf. criteria A
	EN 61000-4-5, $\pm 2$ kV perf. criteria A	
– Conducted immunity	Nippon chemi-con KY 200 $\mu$ F, 100 V, ESR 48 Ohm or with chassis mount option –CFM EN 61000-4-6, 10 Vrms, perf. criteria A	
Reverse voltage protection	parallel diode	

## Output Specifications

Voltage set accuracy	$\pm 1$ %	
Output voltage adjustment	+10 % / -20 % by external resistor see application note:	
Regulation	– Input variation Vin min. to Vin max.	0.2 % max.
	– Load variation (0 – 100 %) 3.3 – 15 VDC models:	0.3 % max.
	24 – 48 VDC models:	0.3 % max.
Temperature coefficient	$\pm 0.02$ %/K	
Minimum load	not required	
Remote sense	10 % max. of Vout nom. (including trim up value)	
Ripple and noise (20 MHz Bandwidth)	3.3 & 5 VDC models:	75 mVpk-pk max.
	12 & 15 VDC models:	100 mVpk-pk max.
	24 & 28 VDC models:	200 mVpk-pk max.
	48 VDC models:	300 mVpk-pk max.

## Output Specifications

Start up time (nominal Vin and constant resistive load)	25 ms typ. (at power On or remote On)
Transient response (25% load step change)	200 µs typ.
Output current limitation	at 110 -140 % of Iout max.
Over voltage protection	at 115 -130 % of Vout nom.
Short circuit protection	indefinite, automatic recovery
Capacitive load	3.3 & 5 VDC models: 40'000 µF max. 12 VDC models: 7'000 µF max. 15 VDC models: 4'460 µF max. 24 VDC models: 1'750 µF max. 28 VDC models: 1'280 µF max. 48 VDC models: 430 µF max.

## General Specifications

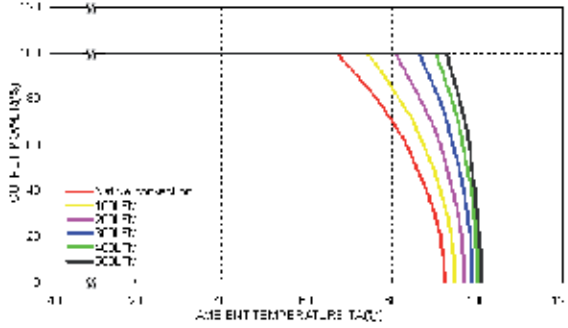
Temperature ranges	<ul style="list-style-type: none"> <li>- Operating</li> <li>- Case temperature</li> <li>- Storage</li> </ul>	-40°C to +75°C +105°C max. -55°C to +125°C
Thermal impedance	<ul style="list-style-type: none"> <li>- without Heatsink</li> <li>- with Heatsink</li> </ul>	6.7°C/W 4.7°C/W
Derating		See derating graphs page 4
Over temperature protection		at 115°C
Thermal shock		acc. MIL-STD-810F
Humidity (non condensing)		95 % rel H max.
Reliability, calculated MTBF (MIL-HDBK-217F, at +70°C, ground benign)		331'000 h
Isolation voltage (60sec.)	<ul style="list-style-type: none"> <li>- Input/Output</li> <li>- Input/Case</li> </ul>	2'250 VDC (basic insulation) 1'600 VDC
Isolation capacitance	- Input/Output	2500 pF max.
Isolation resistance	- Input/Output (500 VDC)	>1 GOhm min.
Switching frequency		300 kHz typ. (puls width modulation)
Safety standards		UL 60950-1 , IEC/EN 60950-1
Safety approvals	- UL/cUL	<a href="http://www.ul.com">www.ul.com</a> -> certifications -> File e188913
Remote On/Off	<ul style="list-style-type: none"> <li>- positive logic (standard)</li> <li>- negative logic (option -N)</li> <li>- Off idle current:</li> </ul>	<ul style="list-style-type: none"> <li>- On: 3 to 12 VDC or open circuit</li> <li>- Off: 0 to 1.2 VDC or short circuit pin 1 and 3</li> <li>- On: 0 to 1.2 VDC or short circuit pin 1 and 3</li> <li>- Off: 3 to 12 VDC or open circuit</li> <li>3 mA</li> </ul>
Environmental compliance	<ul style="list-style-type: none"> <li>- Reach</li> <li>- RoHS</li> </ul>	RoHS directive 2011/65/EU

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

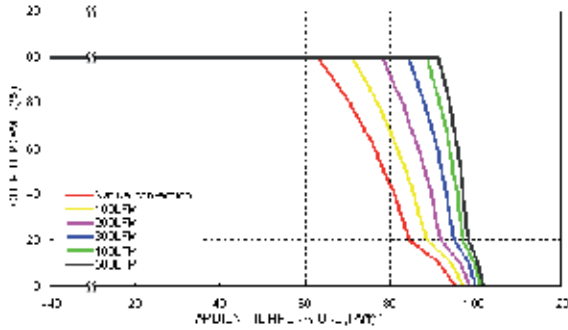
## Output Power Derating

Models with heatsink

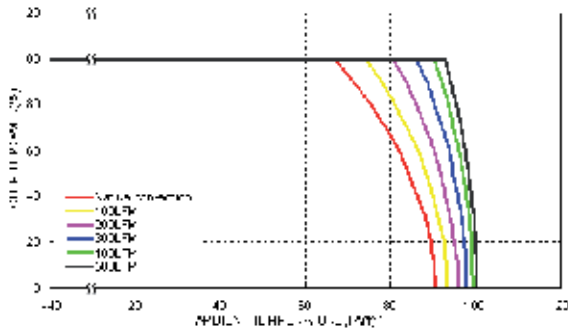
24 Vin models: Output 3.3–15 VDC



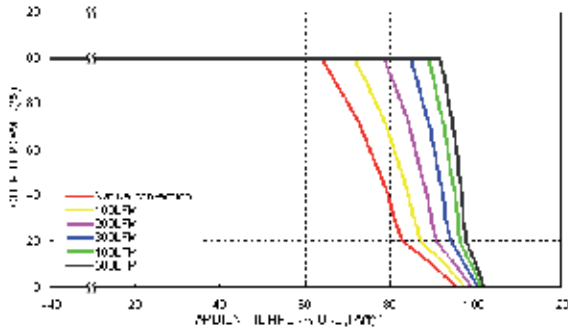
24 Vin models: Output 24–48 VDC



48 Vin models: Output 3.3–15 VDC

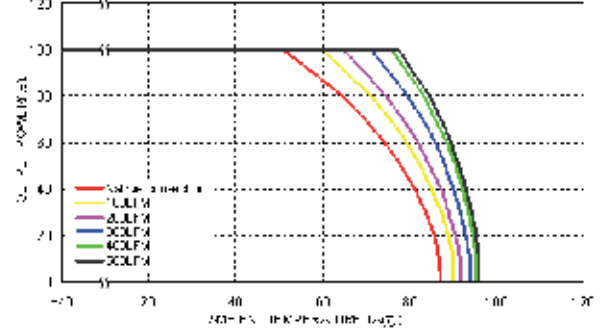


48 Vin models: Output 24–48 VDC

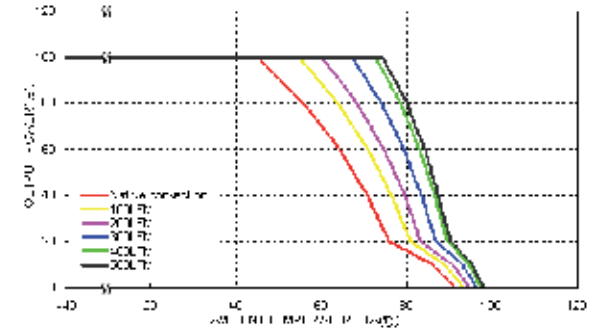


Models without heatsink

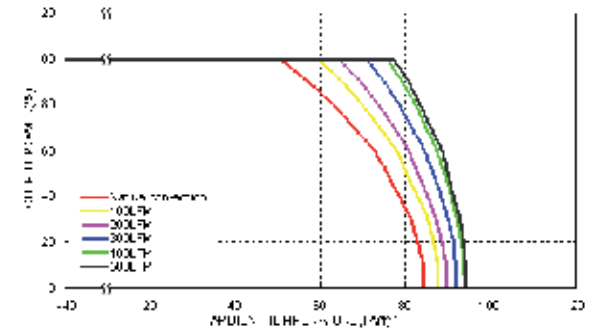
24 Vin models: Output 3.3–15 VDC



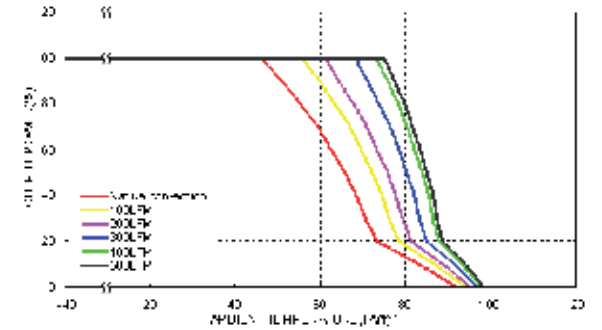
24 Vin models: Output 24–48 VDC



48 Vin models: Output 3.3–15 VDC



48 Vin models: Output 24–48 VDC

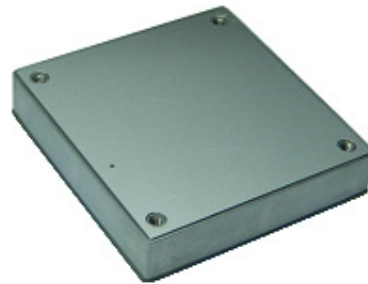
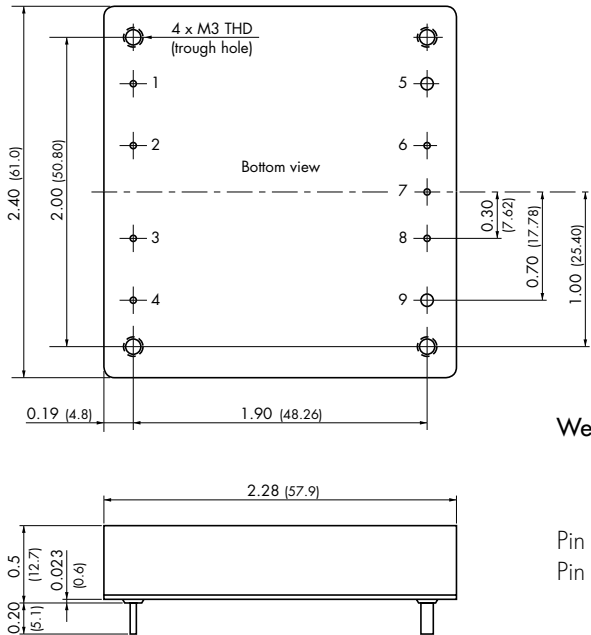


## Specifications

Casing material	metal
Potting material	silicone (UL94V-0 rated)
Base material	FR4
Vibration	acc. MIL-STD-810F

## Dimensions

TEP 100 module



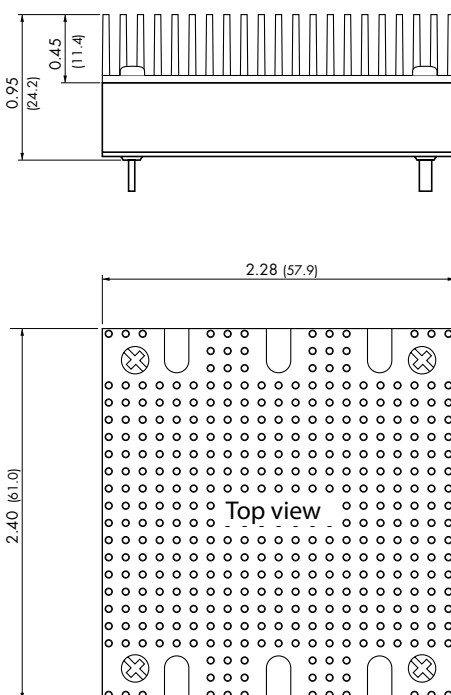
Weight: 97 g (3.42 oz)

### Pin-Out

Pin	Function
1	- Vin
2	Case
3	Remote On/Off
4	+ Vin
5	- Vout
6	- Sense*
7	Trim
8	+ Sense*
9	+ Vout

\*Sense line to be connected to the output either at the module or at the load under regard of polarity.

## TEP-HS1 Heatsink (pictured with heatsink mounted)



Order code: TEP-HS1

Includes heatsink with thermal pad and mounting screws  
 For to order modules with mounted heatsink ask factory.

Weight: 135 g (4.76oz)  
 (Heatsink + Converter)

Dimensions in Inch, ( ) = mm  
 Tolerances:  $\pm 0.02$  ( $\pm 0.5$ )  
 Pin pitch tolerances:  $\pm 0.01$  ( $\pm 0.25$ )  
 Mounting hole pitch tolerances:  $\pm 0.01$  ( $\pm 0.25$ )

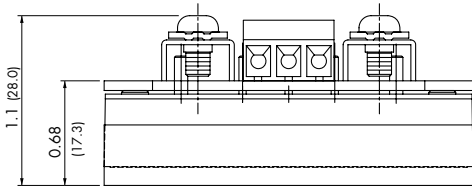
## Chassis Mount Adaptor

TEP 100 module with chassis mount adaptor (suffix –CM or –CMF)

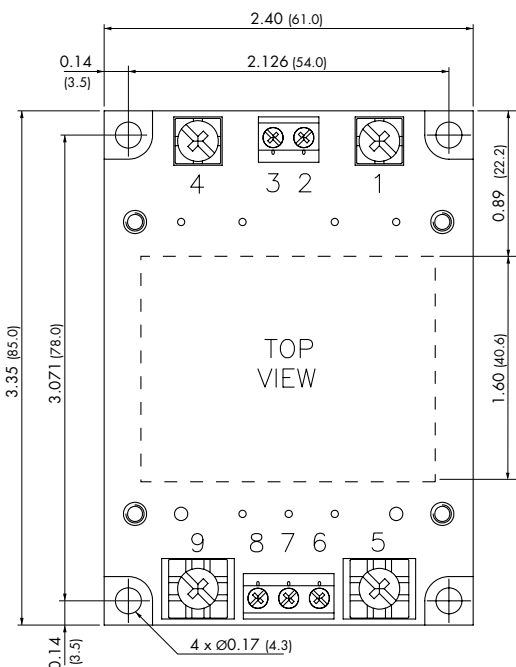
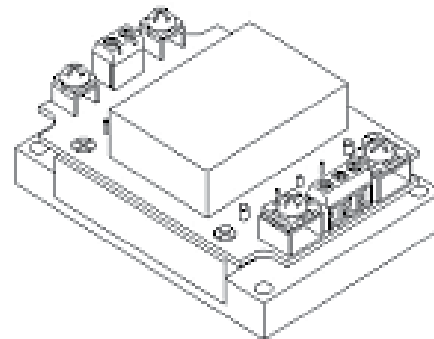
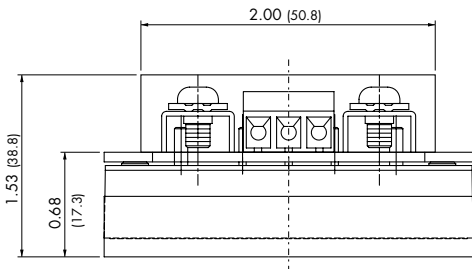
For easy chassis mounting the converter modules can be supplied with an adaptor option consisting of a screw terminal connection board (soldered to converter pins) and a chassis mount adaptor.

In addition this Chassis mount option is available with an EMI-filter (see EMI specification)

Suffix –CM: Chassis mount adaptor



Suffix –CMF: Chassis mount adaptor with EMI filter



Please note that adaptors cannot be ordered as separate items but are factory assembled.

Weight: –CM 200 g (7.05oz)  
Weight: –CMF 287 g (10.12oz)

\*Sense line to be connected to the output either at the module or at the load under regard of polarity.

Connection	
Pin	
1	– Vin
2	Case
3	Remote On/Off
4	+ Vin
5	– Vout
6	– Sense*
7	Trim
8	+ Sense*
9	+ Vout

Dimensions in Inch, ( ) = mm  
Tolerances  $\pm 0.02$  ( $\pm 0.5$ )  
Mounting hole pitch tolerances  $\pm 0.01$  ( $\pm 0.25$ )