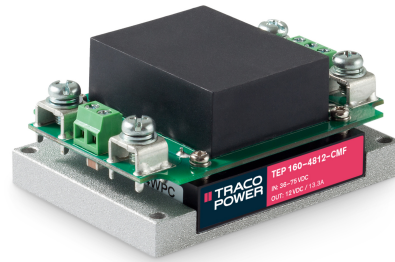


- Compact metal package
- Wide 2:1 input voltage ranges 16.5–36, 33–75 VDC
- Very high efficiency up to 93%
- No minimum load
- Soft start
- Adjustable output voltage +10/-20%
- Sense line
- Remote On/Off input
- Over temperature protection
- 3-year product warranty



The TEP 160 Series is a family of isolated high performance DC/DC converter modules with wide 2:1 input voltage ranges which come in a rugged, sealed industry standard half brick package.

A very high efficiency allows full power operation without forced air cooling at 25°C This temperature can be increased to 40°C with optional mounted heatsink or up to 60°C when mounted on an iron base plate. The very wide input voltage range makes these converters interesting solution for battery operated systems. Typical applications are in telecom/datacom, industry control and railway systems for on board power distribution. These series is available in many optional designs on demand --> see options.

Models				
Order Code	Input Voltage Range	Output Voltage nom. (adjustable)	Output Current max.	Efficiency typ.
TEP 160-2410-CMF	16.5 - 36 VDC (24 VDC nom.)	3.3 VDC (2.64 - 3.63 VDC)	40'000 mA	90 %
TEP 160-2411-CMF		5 VDC (4.0 - 5.5 VDC)	30'000 mA	91 %
TEP 160-2412-CMF		12 VDC (9.6 - 13.2 VDC)	13'000 mA	92 %
TEP 160-2413-CMF		15 VDC (12.0 - 16.5 VDC)	10'000 mA	92 %
TEP 160-2415-CMF		24 VDC (19.2 - 26.4 VDC)	6'500 mA	93 %
TEP 160-2416-CMF		28 VDC (22.4 - 30.8 VDC)	5'500 mA	93 %
TEP 160-2418-CMF		48 VDC (38.4 - 52.8 VDC)	3'300 mA	92 %
TEP 160-4810-CMF	33 - 75 VDC (48 VDC nom.)	3.3 VDC (2.64 - 3.63 VDC)	45'000 mA	91 %
TEP 160-4811-CMF		5 VDC (4.0 - 5.5 VDC)	34'000 mA	92 %
TEP 160-4812-CMF		12 VDC (9.6 - 13.2 VDC)	16'000 mA	92 %
TEP 160-4813-CMF		15 VDC (12.0 - 16.5 VDC)	13'000 mA	93 %
TEP 160-4815-CMF		24 VDC (19.2 - 26.4 VDC)	8'000 mA	92 %
TEP 160-4816-CMF		28 VDC (22.4 - 30.8 VDC)	7'000 mA	92 %
TEP 160-4818-CMF		48 VDC (38.4 - 52.8 VDC)	4'000 mA	92 %
TEP 160-48153-CMF		53 VDC (42.4 - 58.3 VDC)	3'700 mA	92 %

Options	
TEP-MK1	- Optional DIN-Rail Mounting Kit: www.tracopower.com/overview/tep-mk1
on demand (backorder with MOQ non stocking item)	- Optional models with Sync pin to synchronize switching frequency of up to 3 units (EMC reason)

Input Specifications

Input Current	- At no load	24 Vin models: 35 mA typ. 48 Vin models: 25 mA typ.
Surge Voltage		24 Vin models: 50 VDC max. (1 s max.) 48 Vin models: 100 VDC max. (1 s max.)
Under Voltage Lockout		24 Vin models: 15.5 VDC min. / 16 VDC typ. / 16.3 VDC max. 48 Vin models: 31.6 VDC min. / 32 VDC typ. / 32.5 VDC max.
Recommended Input Fuse		24 Vin models: 15'000 mA (fast acting) 48 Vin models: 10'000 mA (fast acting) <small>(The need of an external fuse has to be assessed in the final application.)</small>
Input Filter		Internal Pi-Type

Output Specifications

Output Voltage Adjustment		-20% to +10% (By external trim resistor) See application note: www.tracopower.com/overview/tep160cmf <small>Output power must not exceed rated power!</small>
Voltage Set Accuracy		±1% max.
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%)	0.1% max. 0.1% max.
Ripple and Noise (20 MHz Bandwidth)		3.3 Vout models: 75 mVp-p max. (w/ 1 μ F X7R 22 μ F poscap) 5 Vout models: 75 mVp-p max. (w/ 1 μ F X7R 22 μ F poscap) 12 Vout models: 100 mVp-p max. (w/ 1 μ F X7R 22 μ F poscap) 15 Vout models: 100 mVp-p max. (w/ 1 μ F X7R 22 μ F poscap) 24 Vout models: 200 mVp-p max. (w/ 4.7 μ F X7R) 28 Vout models: 200 mVp-p max. (w/ 4.7 μ F X7R) 48 Vout models: 300 mVp-p max. (w/ 2.2 μ F X7R) 53 Vout models: 300 mVp-p max. (w/ 2.2 μ F X7R)
Capacitive Load	- 24 Vin input - 48 Vin input	53 Vout models: 690 μF max. 3.3 Vout models: 121'000 μF max. 5 Vout models: 60'000 μF max. 12 Vout models: 10'800 μF max. 15 Vout models: 6'600 μF max. 24 Vout models: 2'700 μF max. 28 Vout models: 1'900 μF max. 48 Vout models: 680 μF max. 3.3 Vout models: 136'000 μF max. 5 Vout models: 68'000 μF max. 12 Vout models: 13'300 μF max. 15 Vout models: 8'600 μF max. 24 Vout models: 3'300 μF max. 28 Vout models: 2'500 μF max. 48 Vout models: 830 μF max.
Minimum Load		Not required
Temperature Coefficient		±0.02 %/K max.
Start-up Time		75 ms typ.
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		120 - 150% of Iout max.
Overvoltage Protection		115 - 130% of Vout nom.
Transient Response	- Response Time	200 μs typ. / 250 μs max. (25% Load Step)

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

Safety Specifications

Standards	- IT / Multimedia Equipment	EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1
	- Certification Documents	www.tracopower.com/overview/tep160cmf
Pollution Degree		PD 2
Over Voltage Category		OVC II

EMC Specifications

EMI (Emissions)	- Conducted Emissions	EN 55032 class A (internal filter)
	- Radiated Emissions	EN 55032 class A (internal filter)
EMS (Immunity)		EN 55024 (IT Equipment) EN 55035 (Multimedia)
	- Electrostatic Discharge	Air: EN 61000-4-2, ± 8 kV, perf. criteria A Contact: EN 61000-4-2, ± 6 kV, perf. criteria A
	- RF Electromagnetic Field	EN 61000-4-3, 20 V/m, perf. criteria A
	- EFT (Burst) / Surge	EN 61000-4-4, ± 2 kV, perf. criteria A EN 61000-4-5, ± 2 kV, perf. criteria A
	- Conducted RF Disturbances	Ext. input component: 2x KY 220 μ F EN 61000-4-6, 10 Vrms, perf. criteria A
	- PF Magnetic Field	Continuous: EN 61000-4-8, 100 A/m, perf. criteria A 1 s: EN 61000-4-8, 1000 A/m, perf. criteria A

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	-40°C to +75°C
	- Case Temperature	+115°C max.
	- Storage Temperature	-55°C to +125°C
Power Derating	- High Temperature	Depending on model
		See application note: www.tracopower.com/overview/tep160cmf
Over Temperature Protection Switch Off	- Protection Mode	120°C typ. (Automatic recovery at 105°C typ.)
	- Measurement Point	Case
Cooling System		Natural convection (20 LFM)
Sense Function		10% max. of Vout nom. (If sense function is not used, sense pins must be connected to corresponding polarity output pins.)
Remote Control	- Voltage Controlled Remote (passive = on)	On: 3.0 to 12 VDC or open circuit Off: 0 to 1.2 VDC or short circuit Refers to 'Remote' and '-Vin' Pin
	- Off Idle Input Current	3 mA typ.
	- Remote Pin Input Current	-0.5 to 1.0 mA
Altitude During Operation		5'000 m max. (for basic insulation) 2'000 m max. (for reinforced insulation)
Regulator Topology		Forward Converter
Switching Frequency		225 - 275 kHz (PWM) 250 kHz typ. (PWM)
Insulation System		Reinforced Insulation
Working Voltage (rated)		145 VAC (3.3 and 5 Vout models) 185 VAC (48 and 53 Vout models) 172 VAC (other output models)
Isolation Test Voltage	- Input to Output, 60 s	3'000 VAC
	- Input to Case, 60 s	1'600 VAC
	- Output to Case, 60 s	1'600 VAC

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

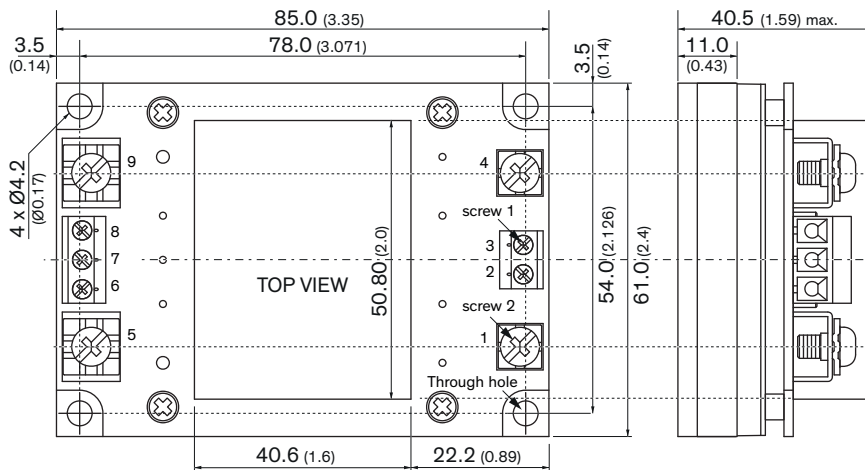
Isolation Resistance	- Input to Output, 500 VDC	1'000 M Ω min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	2'500 pF max.
Reliability	- Calculated MTBF	380'000 h (MIL-HDBK-217F, ground benign)
Environment	- Vibration - Thermal Shock	MIL-STD-810F MIL-STD-810F
Housing Material		Metal
Base Material		Non-conductive FR4 (UL 94 V-0 rated)
Potting Material		Silicone (UL 94 V-0 rated)
Pin Material		Copper
Pin Foundation Plating		Nickel (2 - 3 μ m)
Pin Surface Plating		Tin (3 - 5 μ m), matte
Housing Type		Metal Case
Mounting Type		Chassis Mount
Connection Type		Screw Terminal
Weight		287 g
Thermal Impedance	- Case to Ambient	6.1 K/W typ.
Environmental Compliance	- REACH Declaration	www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant
	- RoHS Declaration	www.tracopower.com/info/rohs-declaration.pdf Exemptions: 7a, 7c-l (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)
	- SCIP Reference Number	50980e87-b3bd-4fd0-97ad-bc2aa4f1d70a

Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/tep160cmf

Outline Dimensions



Pinout	
Pin	Single
1	-Vin (GND)
2	Case
3	Remote On/Off
4	+Vin (Vcc)
5	-Vout
6	-Sense
7	Trim
8	+Sense
9	+Vout

Dimensions in mm (inch)
 Tolerances x.x \pm 0.5 (x.xx \pm 0.02)
 x.xx \pm 0.25 (x.xxx \pm 0.01)
 Mounting hole pitch tolerances \pm 0.25 (\pm 0.01)

Screw 2:
 Type M5
 Head diameter 8.9 (0.350)
 Rated current: 65 A

Wire gauge range:
 AWG 14 - 26

The screw 1 locked torque: max. 5.2 kgfcm / 0.51 Nm
 The screw 2 locked torque: max. 16.5 kgfcm / 1.65 Nm

Mounting screw locked torque: max. 11.2 kgfcm / 1.10 Nm