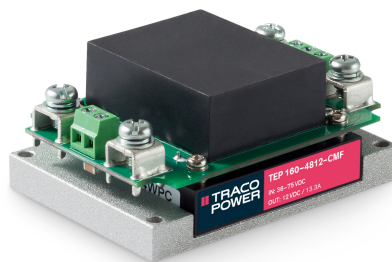


- Compact metal package
- Wide 2:1 input voltage ranges 16.5–36, 33–75 VDC
- Very high efficiency up to 93%
- No minimum load
- Soft start
- Adjustable output voltage +10/-20%
- Sense line
- Remote On/Off input
- Reverse input voltage protection
- Over temperature protection



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 and reverse input voltage protection make 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/products/tep-mk1.pdf
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) (The need of an external fuse has to be assessed in the final application.)
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 Output power must not exceed rated power!
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 µF X7R // 22 µF poscap) 5 Vout models: 75 mVp-p max. (w/ 1 µF X7R // 22 µF poscap) 12 Vout models: 100 mVp-p max. (w/ 1 µF X7R // 22 µF poscap) 15 Vout models: 100 mVp-p max. (w/ 1 µF X7R // 22 µF poscap) 24 Vout models: 200 mVp-p max. (w/ 4.7 µF X7R) 28 Vout models: 200 mVp-p max. (w/ 4.7 µF X7R) 48 Vout models: 300 mVp-p max. (w/ 2.2 µF X7R) 53 Vout models: 300 mVp-p max. (w/ 2.2 µF 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.

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

Overvoltage Protection	115 - 130% of Vout nom.
Transient Response	- Response Time 200 µs typ. / 250 µs max. (25% Load Step)

Safety Specifications

Safety 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 - Radiated Emissions	EN 55032 class A (internal filter) EN 55032 class A (internal filter)
EMS Immunity	- Electrostatic Discharge - RF Electromagnetic Field - EFT (Burst) / Surge - Conducted RF Disturbances - PF Magnetic Field	EN 55024 (IT Equipment) Air: EN 61000-4-2, ±8 kV, perf. criteria A Contact: EN 61000-4-2, ±6 kV, perf. criteria A EN 61000-4-3, 20 V/m, perf. criteria A EN 61000-4-4, ±2 kV, perf. criteria A EN 61000-4-5, ±2 kV, perf. criteria A Ext. input component: 2x KY 220 µF Continuous: EN 61000-4-6, 10 Vrms, perf. criteria A 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 - Case Temperature - Storage Temperature -40°C to +75°C +115°C max. -55°C to +125°C
Power Derating	- High Temperature See application note: www.tracopower.com/overview/tep160cmf
Over Temperature Protection Switch Off	- Protection Mode - Measurement Point 120°C typ. (Automatic recovery at 105°C typ.) Case
Cooling System	Natural convection (20 LFM)
Sense Function	10% max. of Vout nom. (Sense line to be connected to the output either at the module or at the load under regard of polarity.)
Remote Control	- Voltage Controlled Remote - Off Idle Input Current - Remote Pin Input Current On: 3.0 to 12 VDC or open circuit Off: 0 to 1.2 VDC or short circuit Refers to 'Remote' and '-Vin' Pin 3 mA typ. -0.5 to 1.0 mA
Altitude During Operation	5'000 m max. (for basic insulation) 2'000 m max. (for reinforced insulation)
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 (4.8 and 5.3 Vout models) 172 VAC (other output models)

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

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
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	2'500 pF max.
Reliability	- Calculated MTBF	380'000 h (MIL-HDBK-21 7F, ground benign)
Environment	- Vibration	MIL-STD-810F
	- Thermal Shock	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 μm)
Pin Surface Plating		Tin (3 - 5 μm), 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-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule). The SCIP number is provided on request.)

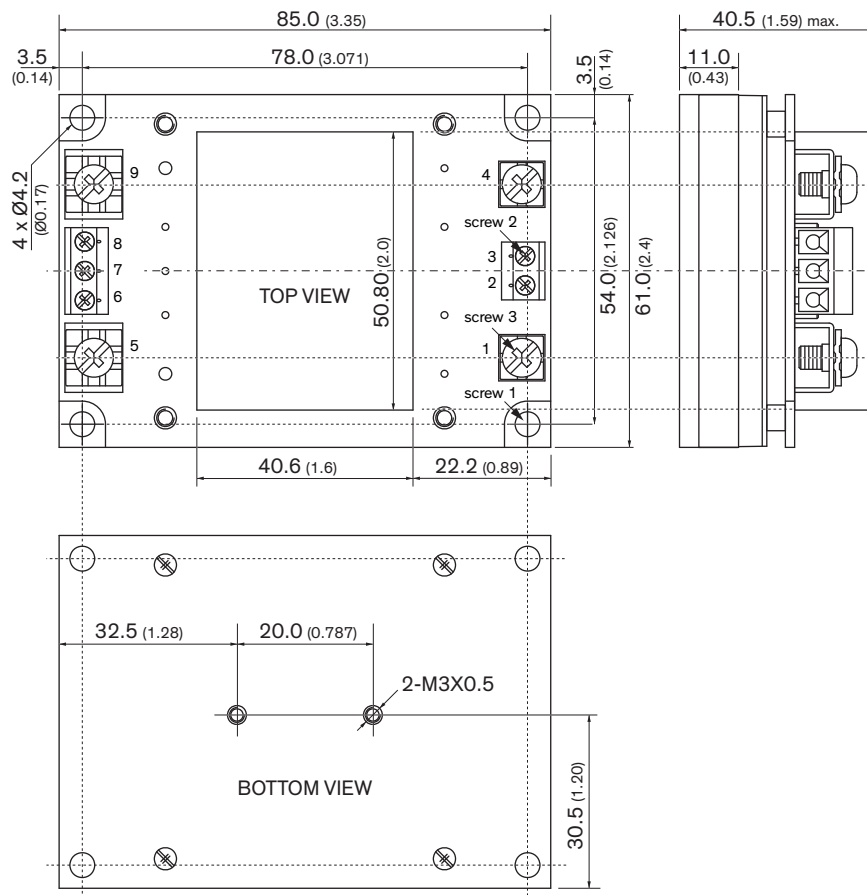
Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/tep160cmf

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

Outline Dimensions



Dimensions in mm (inch)

Tolerances x.x ±0.5 (x.xx ±0.02)

x.xx ±0.25 (x.xxx ±0.01)

Mounting hole pitch tolerances ±0.25 (±0.01)

Screw 3:

Type M5

Head diameter 8.9 (0.350)

Rated current: 65 A

The screw 1 locked torque: max. 11.2 kgfcm / 1.1 Nm

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

The screw 3 locked torque: max. 16.5 kgfcm / 1.65 Nm

Pinout

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

NC: Not connected