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TRACO POWER

DC/DC Converter

TEN 40E Series, 40 Watt

- **Developed to maximize quality in a cost efficient design**
- **Excellent temperature capabilities**
- **2” x 1” metal package (6-side shielded)**
- **Wide 2:1 input voltage range: 9-18, 18-36, 36-75 VDC**
- **Minimal heat development due to high efficiencies up to 93%**
- **Operating temperature range -40 to +85°C**
- **1600 VDC I/O-isolation**
- **Remote On/Off and Trim function**
- **Protection against short circuit, overvoltage and overtemperature**
- **3-year product warranty**



UL 62368-1 IEC 62368-1

The TEN 40E is rounding out Traco Power’s existing 40 Watt product range. Driven by current market trends this series was developed to maximize quality and cost efficiency in one product. Due to a new design approach the TEN 40E thus offers a cost efficient solution with not only no concession on quality or reliability but even improved specifications compared to its predecessor. It comes in a standard 2” x 1” metal package with a 2:1 input voltage range. High efficiencies of up to 93% allow for an operating temperature range (natural convection) of -40 to +70°C without power derating (model dependent). Certified according to the latest IT standard (IEC/EN/UL 62368-1) and equipped with additional features like remote on/off function and protection against short circuit, overvoltage and over temperature the TEN 40E series is suitable for many industrial applications.

Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency
		Vnom	Imax	Vnom	Imax	typ.
TEN 40-1210E	9 - 18 VDC (12 VDC nom.)	3.3 VDC	12'200 mA			89 %
TEN 40-1211E		5 VDC	8'000 mA			90 %
TEN 40-1212E		12 VDC	3'333 mA			91 %
TEN 40-1213E		15 VDC	2'666 mA			91 %
TEN 40-1215E		24 VDC	1'666 mA			90 %
TEN 40-1222E		+12 VDC	1'666 mA	−12 VDC	1'666 mA	90 %
TEN 40-1223E		+15 VDC	1'333 mA	−15 VDC	1'333 mA	90 %
TEN 40-1225E		+24 VDC	833 mA	−24 VDC	833 mA	91 %
TEN 40-2410E	18 - 36 VDC (24 VDC nom.)	3.3 VDC	12'200 mA			90 %
TEN 40-2411E		5 VDC	8'000 mA			92 %
TEN 40-2412E		12 VDC	3'333 mA			92 %
TEN 40-2413E		15 VDC	2'666 mA			93 %
TEN 40-2415E		24 VDC	1'666 mA			91 %
TEN 40-2422E		+12 VDC	1'666 mA	−12 VDC	1'666 mA	91 %
TEN 40-2423E		+15 VDC	1'333 mA	−15 VDC	1'333 mA	91 %
TEN 40-2425E		+24 VDC	833 mA	−24 VDC	833 mA	91 %
TEN 40-4810E	36 - 75 VDC (48 VDC nom.)	3.3 VDC	12'200 mA			90 %
TEN 40-4811E		5 VDC	8'000 mA			91 %
TEN 40-4812E		12 VDC	3'333 mA			92 %
TEN 40-4813E		15 VDC	2'666 mA			92 %
TEN 40-4815E		24 VDC	1'666 mA			92 %
TEN 40-4822E		+12 VDC	1'666 mA	−12 VDC	1'666 mA	91 %
TEN 40-4823E		+15 VDC	1'333 mA	−15 VDC	1'333 mA	91 %
TEN 40-4825E		+24 VDC	833 mA	−24 VDC	833 mA	92 %

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Options

TEN-HS1	- Optional Heat Sink with Height = 0.22 inch: www.tracopower.com/overview/ten-hs1
TEN-HS8	- Optional Heat Sink with Height = 0.3 inch: www.tracopower.com/overview/ten-hs8
on demand (backorder with MOQ non stocking item)	- Optional Heat Sink with Height = 0.8 inch: www.tracopower.com/overview/ten-hs10 - Optional Heat Sink with Height = 0.5 inch: www.tracopower.com/overview/ten-hs9 - Optional models with pre-assembled heatsink - Optional models with inverse Remote On/Off function (passive = off)

Input Specifications

Input Current	- At no load	12 Vin models:	20 mA typ.
		24 Vin models:	15 mA typ.
		48 Vin models:	10 mA typ.
Surge Voltage		12 Vin models:	25 VDC max. (1 s max.)
		24 Vin models:	50 VDC max. (1 s max.)
		48 Vin models:	100 VDC max. (1 s max.)
Under Voltage Lockout		12 Vin models:	7 VDC min. / 8 VDC typ. / 8.8 VDC max.
		24 Vin models:	15 VDC min. / 16 VDC typ. / 17.5 VDC max.
		48 Vin models:	32 VDC min. / 33 VDC typ. / 35 VDC max.
Recommended Input Fuse		12 Vin models:	8'000 mA (fast acting)
		24 Vin models:	4'000 mA (slow blow)
		48 Vin models:	2'000 mA (slow blow)
			(The need of an external fuse has to be assessed in the final application.)
Input Filter			Internal Pi-Type

Output Specifications

Output Voltage Adjustment			−10% to +20% (15 & 24 Vout models) ±10% (other models) (single output models only) (By external trim resistor)
		See application note:	www.tracopower.com/ten40e-adj/
			Output power must not exceed rated power!
Voltage Set Accuracy			±1% max.
Regulation	- Input Variation (Vmin - Vmax)	single output models:	0.2% max.
		dual output models:	0.2% max.
	- Load Variation (0 - 100%)	single output models:	0.3% max.
		dual output models:	0.5% max. (Output 1)
			0.5% max. (Output 2)
	- Cross Regulation (25% / 100% asym. load)	dual output models:	5% max.
Ripple and Noise (20 MHz Bandwidth)	- single output	3.3 Vout models:	75 mVp-p typ.
		5 Vout models:	75 mVp-p typ.
		12 Vout models:	100 mVp-p typ.
		15 Vout models:	100 mVp-p typ.
		24 Vout models:	150 mVp-p typ.
	- dual output	12 / -12 Vout models:	100 / 100 mVp-p typ.
		15 / -15 Vout models:	100 / 100 mVp-p typ.
		24 / -24 Vout models:	150 / 150 mVp-p typ.

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

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Capacitive Load	- single output	3.3 Vout models:	22'000 µF max.
		5 Vout models:	12'000 µF max.
		12 Vout models:	2'000 µF max.
		15 Vout models:	1'300 µF max.
		24 Vout models:	490 µF max.
	- dual output	12 / -12 Vout models:	980 / 980 µF max.
		15 / -15 Vout models:	630 / 630 µF max.
		24 / -24 Vout models:	250 / 250 µF max.
Minimum Load			Not required
Temperature Coefficient			±0.02 %/K max.
Start-up Time			30 ms typ. / 60 ms max.
Short Circuit Protection			Continuous, Automatic recovery
Output Current Limitation			150% typ. of Iout max.
Overvoltage Protection			125% typ. of Vout nom. (By Zener diode)
Transient Response	- Response Time		250 µs typ. (25% Load Step)

Safety Specifications

Standards	- IT / Multimedia Equipment		EN 62368-1 IEC 62368-1 UL 62368-1
	- Certification Documents		www.tracopower.com/ten40e-safety-cert/
Energy Source	- Output, acc. to 62368-1		ES1
Power Source	- Output, acc. to 62368-1		PS3
Pollution Degree			PD 2
Over Voltage Category			Not mains connected

EMC Specifications

EMI (Emissions)	- Conducted Emissions		EN 55032 class A (with external filter) EN 55032 class B (with external filter)
	- Radiated Emissions		EN 55032 class A (with external filter) EN 55032 class B (with external filter)
		External filter proposal:	www.tracopower.com/ten40e-emc-filter/
EMS (Immunity)	- 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, 10 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
		Ext. input component:	2 x KY 220 µF || SMDJ36A (12 Vin models) 2 x KY 220 µF || SMDJ58A (24 Vin models) 2 x KY 220 µF || SMDJ120A (48 Vin models)
	- Conducted RF Disturbances		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
EMC / Environmental	- Certification Documents		www.tracopower.com/ten40e-emc-cert/

General Specifications

Relative Humidity			95% max. (non condensing)
Temperature Ranges	- Operating Temperature		–40°C to +85°C
	- Case Temperature		+105°C max.
	- Storage Temperature		–55°C to +125°C
Power Derating	- High Temperature		Depending on model
		See application note:	www.tracopower.com/ten40e-cc/
Over Temperature Protection Switch Off	- Protection Mode		115°C typ. (Automatic recovery)
Cooling System			Natural convection (20 LFM)

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

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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 (Optional models with inverse Remote On/Off function (passive = off))
Switching Frequency		225 - 275 kHz (PWM) 250 kHz typ. (PWM)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s	1'600 VDC
	- Input to Case, 60 s	1'600 VDC
	- Output to Case, 60 s	1'600 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	1'500 pF max.
Reliability	- Calculated MTBF	1'245'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf
Environment	- Vibration	MIL-STD-810F
	- Mechanical Shock	MIL-STD-810F
	- Thermal Shock	MIL-STD-810F
Housing Material		Copper
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		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		2" x 1"
Soldering Profile		Lead-Free Wave Soldering 260°C / 6 s max.
Weight		34 g
Thermal Impedance	- Case to Ambient	10.8 K/W typ. 10.3 K/W typ. (with heatsink TEN-HS1) 9.3 K/W typ. (with heatsink TEN-HS8) 7.7 K/W typ. (with heatsink TEN-HS9) 6.2 K/W typ. (with heatsink TEN-HS10)
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: 7(a), 7(c)-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)
	- SCIP Reference Number	839c5ec8-798d-4d15-80e9-bb71025a4b99

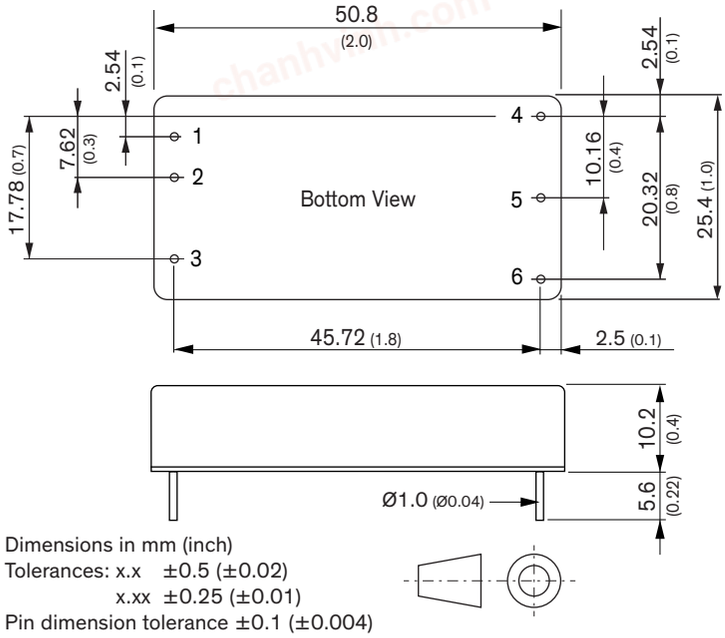
Additional Information

Supporting Documents	www.tracopower.com/overview/ten40e
Frequently Asked Questions	www.tracopower.com/glossary-faq
Glossary	www.tracopower.com/info/glossary.pdf
Service Portal	www.tracoserviceportal.com

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Outline Dimensions



Dimensions in mm (inch)
Tolerances: x.x ±0.5 (±0.02)
x.xx ±0.25 (±0.01)
Pin dimension tolerance ±0.1 (±0.004)

Pinout		
Pin	**Single**	**Dual**
1	+Vin (Vcc)	+Vin (Vcc)
2	–Vin (GND)	–Vin (GND)
3	Remote On/Off	Remote On/Off
4	+Vout	+Vout
5	–Vout	Common
6	Trim	–Vout

Avoid routing PCB traces under the converter.

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