

- **Highest power density:**
40 W in 1" x 2" x 0.4" package
- **Excellent efficiency up to 92 %**
- **Output voltage adjustable**
- **Remote On/Off**
- **Short circuit protection**
- **Over voltage protection**
- **I/O isolation 1500 VDC**
- **Operating temperature range**
-40°C to +80°C
- **Fully RoHS compliant**
- **3-year product warranty**



UL 62368-1 IEC 62368-1

The TEN 40N Series is a new range of isolated high performance DC/DC converter modules. Due to the very high efficiency of up to 92% these 40 W converters come with a footprint of only 1.0" x 2.0". The 15 models have a wide 2:1 input voltage range and a tight output voltage regulation. The output voltage is adjustable by external resistor. Remote On/Off and protection against overpower and overvoltage are standard features of these converters. Typical applications are in mobile equipment, instrumentation, distributed power architectures in communication and industrial electronics and everywhere where space on the PCB is critical.

Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency typ.
		Vnom	I _{max}	Vnom	I _{max}	
TEN 40-1210N	9 - 18 VDC (12 VDC nom.)	3.3 VDC	8'000 mA			89 %
TEN 40-1211N		5 VDC	8'000 mA			89 %
TEN 40-1212N		12 VDC	3'330 mA			89 %
TEN 40-1213N		15 VDC	2'670 mA			90 %
TEN 40-1215N		24 VDC	1'670 mA			91 %
TEN 40-1222N		+12 VDC	1'670 mA	-12 VDC	1'670 mA	88 %
TEN 40-1223N		+15 VDC	1'330 mA	-15 VDC	1'330 mA	88 %
TEN 40-2410N	18 - 36 VDC (24 VDC nom.)	3.3 VDC	8'000 mA			90 %
TEN 40-2411N		5 VDC	8'000 mA			91 %
TEN 40-2412N		12 VDC	3'330 mA			91 %
TEN 40-2413N		15 VDC	2'670 mA			91 %
TEN 40-2415N		24 VDC	1'670 mA			91 %
TEN 40-2422N		+12 VDC	1'670 mA	-12 VDC	1'670 mA	89 %
TEN 40-2423N		+15 VDC	1'330 mA	-15 VDC	1'330 mA	89 %
TEN 40-4810N	36 - 75 VDC (48 VDC nom.)	3.3 VDC	8'000 mA			90 %
TEN 40-4811N		5 VDC	8'000 mA			91 %
TEN 40-4812N		12 VDC	3'330 mA			92 %
TEN 40-4813N		15 VDC	2'670 mA			92 %
TEN 40-4815N		24 VDC	1'670 mA			91 %
TEN 40-4822N		+12 VDC	1'670 mA	-12 VDC	1'670 mA	89 %
TEN 40-4823N		+15 VDC	1'330 mA	-15 VDC	1'330 mA	89 %

Options

TEN-HS4	- Optional Heat Sink: www.tracopower.com/overview/ten-hs4
TEN-HS6	- Optional Heat Sink: www.tracopower.com/overview/ten-hs6

Input Specifications

Input Current	- At no load	12 Vin models: 120 mA typ. (3.3 Vout model) 160 mA typ. (5 Vout model) 160 mA typ. (12 Vout model) 150 mA typ. (15 Vout model) 160 mA typ. (24 Vout model) 70 mA typ. (12 / -12 Vout model) 60 mA typ. (15 / -15 Vout model)
		24 Vin models: 75 mA typ. (3.3 Vout model) 80 mA typ. (5 Vout model) 85 mA typ. (12 Vout model) 75 mA typ. (15 Vout model) 85 mA typ. (24 Vout model) 50 mA typ. (12 / -12 Vout model) 45 mA typ. (15 / -15 Vout model)
		48 Vin models: 40 mA typ. (3.3 Vout model) 50 mA typ. (5 Vout model) 50 mA typ. (12 Vout model) 50 mA typ. (15 Vout model) 50 mA typ. (24 Vout model) 65 mA typ. (12 / -12 Vout model) 65 mA typ. (15 / -15 Vout model)
	- At full load	12 Vin models: 2'470 mA max. (3.3 Vout model) 3'750 mA max. (5 Vout model) 3'750 mA max. (12 Vout model) 3'700 mA max. (15 Vout model) 3'670 mA max. (24 Vout model) 3'790 mA max. (12 / -12 Vout model) 3'790 mA max. (15 / -15 Vout model)
		24 Vin models: 1'220 mA max. (3.3 Vout model) 1'830 mA max. (5 Vout model) 1'830 mA max. (12 Vout model) 1'830 mA max. (15 Vout model) 1'835 mA max. (24 Vout model) 1'870 mA max. (12 / -12 Vout model) 1'870 mA max. (15 / -15 Vout model)
		48 Vin models: 610 mA max. (3.3 Vout model) 920 mA max. (5 Vout model) 910 mA max. (12 Vout model) 910 mA max. (15 Vout model) 918 mA max. (24 Vout model) 940 mA max. (12 / -12 Vout model) 940 mA max. (15 / -15 Vout model)
Surge Voltage		12 Vin models: 25 VDC max. (100 ms max.) 24 Vin models: 50 VDC max. (100 ms max.) 48 Vin models: 100 VDC max. (100 ms max.)
Under Voltage Lockout		12 Vin models: 8.3 VDC typ. 24 Vin models: 16.5 VDC typ. 48 Vin models: 33 VDC typ.
Reflected Ripple Current		12 Vin models: 50 mAp-p typ. 24 Vin models: 30 mAp-p typ. 48 Vin models: 20 mAp-p typ.

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

Recommended Input Fuse		12 Vin models: 8'000 mA (slow blow) 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 LC-Type
Output Specifications		
Output Voltage Adjustment		-10% to +20% (24 Vout models) ±10% (other models) (single output models only) (By external trim resistor) See application note: www.tracopower.com/ten40n-adj Output power must not exceed rated power!
Voltage Set Accuracy		±1% max.
Regulation	- Input Variation (Vmin - Vmax)	single output models: 0.5% max. dual output models: 0.5% max.
	- Load Variation (0 - 100%)	single output models: 0.5% max. dual output models: 1% max. (Output 1) 1% max. (Output 2)
	- Voltage Balance (symmetrical load)	dual output models: 2% max.
	- Cross Regulation (25% / 100% asym. load)	dual output models: 5% max.
Ripple and Noise (20 MHz Bandwidth)	- single output	3.3 Vout models: 100 mVp-p typ. (w/ 1 µF MC 10 µF TC) 5 Vout models: 100 mVp-p typ. (w/ 1 µF MC 10 µF TC) 12 Vout models: 150 mVp-p typ. (w/ 1 µF MC 10 µF TC) 15 Vout models: 150 mVp-p typ. (w/ 1 µF MC 10 µF TC) 24 Vout models: 150 mVp-p typ. (w/ 1 µF MC 10 µF TC)
	- dual output	12 / -12 Vout models: 150 / 150 mVp-p typ. (w/ 1 µF MC 10 µF TC) 15 / -15 Vout models: 150 / 150 mVp-p typ. (w/ 1 µF MC 10 µF TC)
Capacitive Load	- single output	3.3 Vout models: 21'000 µF max. 5 Vout models: 13'600 µF max. 12 Vout models: 2'400 µF max. 15 Vout models: 1'500 µF max. 24 Vout models: 600 µF max.
	- dual output	12 / -12 Vout models: 1'200 / 1'200 µF max. 15 / -15 Vout models: 750 / 750 µF max.
Minimum Load	- single output	3.3 Vout models: 0 % of Iout max. 5 Vout models: 0 % of Iout max. 12 Vout models: 0 % of Iout max. 15 Vout models: 0 % of Iout max. 24 Vout models: 0 % of Iout max.
	- dual output	12 / -12 Vout models: 9 % of Iout max. 15 / -15 Vout models: 8 % of Iout max.
Temperature Coefficient		±0.02 %/K max.
Start-up Time		30 ms max. (Power On) 30 ms max. (Remote On)
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		150% typ. of Iout max.
Overvoltage Protection		118 - 125% of Vout nom. (depending on model) 3.9 VDC typ. (3.3 VDC model) 6.2 VDC typ. (5 VDC model) 15 VDC typ. (12 VDC model) 18 VDC typ. (15 VDC model)
Transient Response	- Response Deviation	3% typ. / 5% max. (75% to 100% Load Step)
	- Response Time	250 µs typ. (75% to 100% 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	CSA-C22.2, No. 60950-1 EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1
	- Certification Documents	www.tracopower.com/ten40n-safety-cert
Energy Source	- Output, acc. to 62368-1	ES1
Power Source	- Output, acc. to 62368-1	PS3
Pollution Degree		PD 3
Over Voltage Category		Not mains connected

EMC Specifications

EMI (Emissions)	- Conducted Emissions	EN 55032 class A (with external filter)
	External filter proposal:	www.tracopower.com/ten40n-emc-filter
EMS (Immunity)		EN 55024 (IT Equipment) EN 55035 (Multimedia)
	- Electrostatic Discharge	Air: EN 61000-4-2, ± 8 kV, perf. criteria B
		Contact: EN 61000-4-2, ± 6 kV, perf. criteria B
	- 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, ± 1 kV, perf. criteria B
	Ext. input component:	KXG 330 μ F, 200 V
	- Conducted RF Disturbances	EN 61000-4-6, 10 Vrms, perf. criteria A

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +80°C +105°C max. -50°C to +125°C
Power Derating	- High Temperature	Depending on model
	See application note:	www.tracopower.com/ten40n-cc
Over Temperature Protection Switch Off	- Protection Mode	110°C typ.
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote (passive = on) - Off Idle Input Current - Remote Pin Input Current	On: 3.5 to 12 VDC or open circuit Off: 0 to 1.2 VDC or short circuit Refers to 'Remote' and '-Vin' Pin 2.5 mA typ. -0.5 to 0.5 mA
Altitude During Operation		6'000 m max.
Switching Frequency		285 kHz typ. (PWM) (24 Vout models) 320 kHz typ. (PWM) (other models)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s - Input to Output, 1 s	1'500 VDC 1'800 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 M Ω min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	1'500 pF max.
Reliability	- Calculated MTBF	328'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf
Housing Material		Alu alloy, black anodized coating
Base Material		Non-conductive FR4 (UL 94 V-0 rated)
Potting Material		Epoxy (UL 94 V-0 rated)

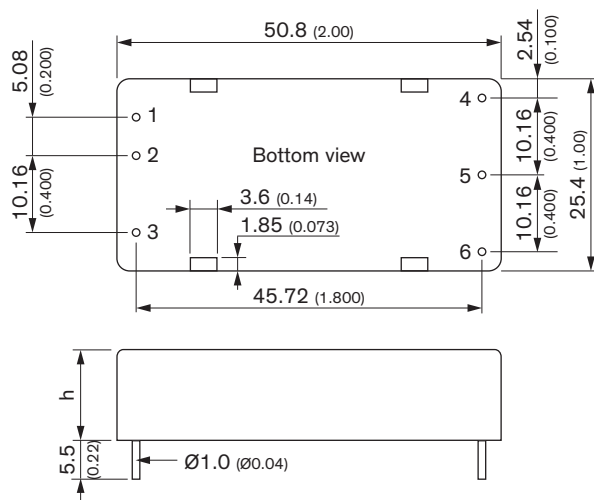
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Pin Material	Copper Alloy (C6801)
Pin Foundation Plating	Nickel (2.5 µm min.)
Pin Surface Plating	Gold (75 - 125 nm), glossy
Housing Type	Metal Case
Mounting Type	PCB Mount
Connection Type	THD (Through-Hole Device)
Footprint Type	2" x 1"
Soldering Profile	Lead-Free Wave Soldering 260°C / 10 s max.
Weight	30 g
Thermal Impedance	- Case to Ambient 12.0 K/W typ. 10.0 K/W typ. (with heatsink TEN-HS6) (24 Vout models) 10.0 K/W typ. (with heatsink TEN-HS4) (other models)
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) (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (Q5A rule).) - SCIP Reference Number 9975c105-3aca-40b8-82cc-db9489b95dde

Additional Information

Supporting Documents	www.tracopower.com/overview/ten40n
Frequently Asked Questions	www.tracopower.com/glossary-faq
Glossary	www.tracopower.com/info/glossary.pdf

Outline Dimensions



h=11.0 (0.43) for 24 VDC output models
h=10.2 (0.40) for other models

Dimensions in mm (inch)

Tolerances: x.x $\pm$ 0.25 (x.xx $\pm$ 0.01)

x.xx ±0.13 (x.xxx ±0.005)

Pin diameter tolerances: $x.x \pm 0.05$ ($x.xx \pm 0.002$)

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