DC/DC Converters

TEN 40WIR Series, 40 Watt

CB Scheme UL 60950-1

cULus UL 60950-1

Features

- 2" x 1" metal package
- Ultra wide 4:1 input voltage range 9–36, 18–75, 43–160 VDC
- EN 50155 approval for railway applications
- Thermal shock and vibration resistant according EN 61373
- High efficiency up to 92%
- No minimum load required
- Operating temperature range –40°C to +85°C
- Under voltage lock-out circuit
- Remote On/Off
- Output voltage adjustable
- Lead free design, RoHS compliant
- 3-year product warranty

The TEN 40WIR series is a family of high performance 40 Watt dc/dc converter modules featuring ultra wide 4:1 input voltage ranges in a 2" x 1" package with industry-standard footprint. Input voltages up to 160 VDC, excellent EMC characteristics and EN 50155 approval make this product the best choice for many demanding applications in railroad and transportation systems. Further standard features include remote On/Off, over voltage protection, under voltage lockout and short circuit protection. Low input current characteristics at minimal load make these converters also the ideal solution for battery-operated systems. Typical applications are in wireless networks, telecom/datacom, industry control systems and measurement equipments.

Models

Order code	Input voltage range	Output voltage	Output current max.	Efficiency typ.
TEN 40-2410WIR	9 – 36 VDC (24 VDC nominal)	3.3 VDC	10'000 mA	90 %
TEN 40-2411WIR		5.0 VDC	8000 mA	91 %
TEN 40-2412WIR		12 VDC	3333 mA	92 %
TEN 40-2413WIR		15 VDC	2666 mA	92 %
TEN 40-2415WIR		24 VDC	1666 mA	91 %
TEN 40-2422WIR		±12 VDC	±1666 mA	90 %
TEN 40-2423WIR		±15 VDC	±1333 mA	90 %
TEN 40-2425WIR		±24 VDC (48 VDC)*	±833 mA	91 %
TEN 40-4810WIR	18 – 75 VDC (48 VDC nominal)	3.3 VDC	10'000 mA	90 %
TEN 40-4811WIR		5.0 VDC	8000 mA	91 %
TEN 40-4812WIR		12 VDC	3333 mA	92 %
TEN 40-4813WIR		15 VDC	2666 mA	92 %
TEN 40-4815WIR		24 VDC	1666 mA	91 %
TEN 40-4822WIR		±12 VDC	±1666 mA	90 %
TEN 40-4823WIR		±15 VDC	±1333 mA	90 %
TEN 40-4825WIR		±24 VDC (48 VDC)*	±833 mA	91 %
TEN 40-7210WIR	43 – 160 VDC (110 VDC nominal)	3.3 VDC	10'000 mA	88 %
TEN 40-7211WIR		5.0 VDC	8000 mA	89 %
TEN 40-7212WIR		12 VDC	3333 mA	90 %
TEN 40-7213WIR		15 VDC	2666 mA	91 %
TEN 40-7215WIR		24 VDC	1666 mA	90 %
TEN 40-7222WIR		±12 VDC	±1666 mA	89 %
TEN 40-7223WIR		±15 VDC	±1333 mA	89 %
TEN 40-7225WIR		±24 VDC (48 VDC)*	±833 mA	91 %

* The outputs can also be used in serial circuit for single 48 VDC operation. Free-wheeling diodes are not necessary but recommended for increased performance for start-up with inductive/capacitive load and at dynamic load operation.

Input Specifications

Input current (no load)		24 Vin models:	15 mA typ.
		48 & 110 Vin models:	10 mA typ.
Start-up voltage		24 Vin models:	9.0 VDC (or lower)
		48 Vin models:	18 VDC (or lower)
		110 Vin models:	43 VDC (or lower)
Under voltage shut down (lock-out circuit)		24 Vin models:	8.0 VDC typ.
		48 Vin models:	16 VDC typ.
		110 Vin models:	40 VDC typ.
Surge voltage (1 sec.)		24 Vin models:	50 V max.
		48 Vin models:	100 V max.
		110 Vin models:	170 V max.
Reflected ripple current			20 mAp-p typ.
Conducted noise			EN 55022 class A with external components
	– see application note document		www.tracopower.com/overview/ten40wir
EMC immunity			EN 50155, EN 50121-3-2
	– ESD (electrostatic discharge)		EN 61000-4-2, air ±8 kV, contact ±6 kV, perf. criteria A
	– Radiated immunity		EN 61000-4-3, 20 V/m, perf. criteria A
	– Fast transient / surge (with external input capacitor)		EN 61000-4-4, ±2 kV, perf. criteria A EN 61000-4-5, ±2 kV perf. criteria A
		24 & 48 Vin models:	Nippon chemi-con KY 220 µF, 100 V, ESR 48 mOhm
		110 Vin models:	Ruby-con BXF 68 µF, 200 V, 3pcs in parallel.
	– Conducted immunity		EN 61000-4-6, 10 V, perf. criteria A

Output Specifications

Voltage set accuracy			±1 %
Voltage adjustment range (single output models only)		15 & 24 VDC models:	+20 %, -10 %
		other models:	±10 %
Regulation	– Input variation Vin min. to Vin max.		0.2 % max.
	– Load variation 0 – 100 %	single output models:	0.5 % max.
		dual output models:	1 % max. (balanced load) 5 % max. (Load cross variation 25 % / 100 %)
Minimum load			not required
Temperature coefficient			±0.02 %/K
Ripple and noise (20 MHz bandwidth, measured with 1 µF/ 50 V MLCC)		3.3 & 5.0 VDC models:	100 mVp-p max.
		24 VDC models:	200 mVp-p max.
		other models:	125 mVp-p max.
Start up time (constant resistive load)	– Power On		60 ms typ.
	– Remote On		60 ms typ.
Transient response (25% load step change)			250 µs typ.
Short circuit protection			indefinite (automatic recovery)
Over load protection			150 % of Iout max. typ.
Over voltage protection (only single output models)		3.3 VDC models:	3.9 V
		5 VDC models:	6.2 V
		12 VDC models:	15 V
		15 VDC models:	20 V
		24 VDC models:	30 V

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

Output Specifications

Capacitive load (max. values)	3.3 VDC models:	26'600 µF
	5.0 VDC models:	20'000 µF
	12 VDC models:	3900 µF
	15 VDC models:	2600 µF
	24 VDC models:	1300 µF
	±12 VDC models:	2600 µF (each output)
	±15 VDC models:	1600 µF (each output)
	±24 VDC models:	650 µF (each output)

General Specifications

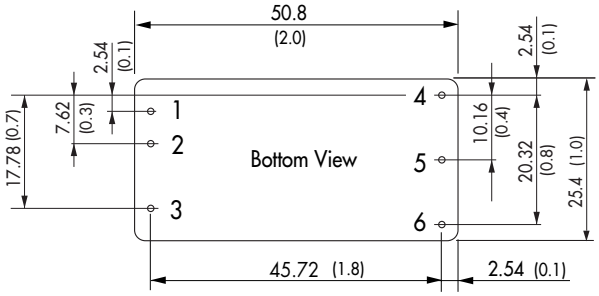
Temperature ranges	– Operating		–40°C to +85°C (with derating)
	– Casing temperature		+105°C max.
	– Storage		–55°C to +125°C
Power derating	– Natural convection		2.5 %/K above +60°C
	– Natural convection with heat sink (optional)		2.8 %/K above +65°C
Thermal impedance	– Natural convection		10.8 K/W
	– Natural convection with heat sink (optional)		10.3 K/W
Humidity (non condensing)			5 – 95 % rel. H
Isolation voltage (60 sec.)	– Input / Output	24 & 48 Vin models:	1600 VDC
		110 Vin models:	3000 VDC
Isolation resistance	– Input / Output		>1 G Ohm
Isolation capacitance	– Input / Output		1'500 pF max.
Switching frequency			250 kHz typ. (pulse width modulation PWM)
Thermal shock, mechanical shock & vibration			EN 50155, EN 61373
Safety approcals	– UL		UL/cUL 60950-1
	– CB test certificate		IEC/EN 60950-1
	– certification documents		www.tracopower.com/overview/ten40wir
Remote On/Off	– On:		3.0 ... 12 VDC or open circuit
	– Off:		0 ... 1.2 VDC or short circuit pin 3 and pin 2
	– Off idle current:		3.0 mA
Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign)			900'000 h
Environmental compliance	– Reach document		www.tracopower.com/info/reach-declaration.pdf
	– RoHS		RoHS directive 2011/65/EU
	– Flamability identified acc. EN 45545-2		www.tracopower.com/info/en45545-declaration.pdf

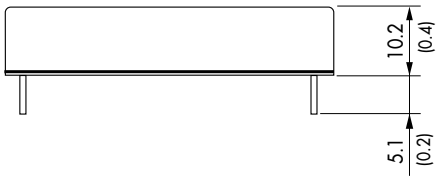
Physical Specifications

Casing material	copper
Baseplate material	non conductive FR4
Potting material	silicone (UL94V-0 rated)
Weight	32 g (1.13oz)
Soldering temperature	max. +265°C / 10 sec.

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

Outline Dimensions





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

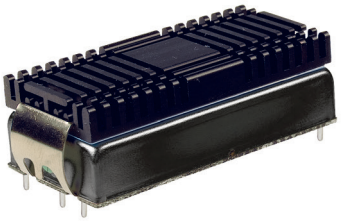
Dimensions in [mm], () = Inch
Pin diameter: 1.0 ±0.1 (0.04 ±0.004)
Pin pitch tolerances: ±0.25 (±0.01)
Case tolerances: ±0.5 (±0.02)

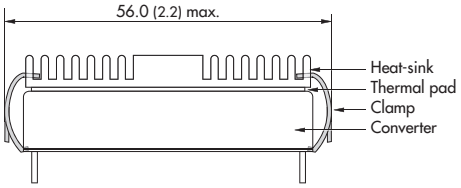
3D drawings and application note at: www.tracopower.com/overview/ten40wir

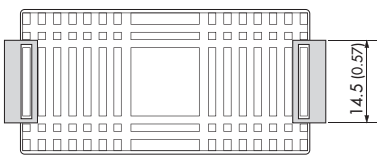
Heat-Sink (Option)

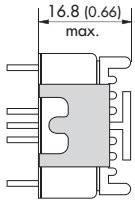
Order code: **TEN-HS1**
(cont.: heat-sink, thermal pad, 2 clamps)
Material: Aluminum
Finish: Anodic treatment (black)
Weight: 17 g (0.60oz) without converter
Thermal impedance after assembling: 10.3 K/W

Note:
Before attaching the heatsink, the product label on converter has to be removed for optimal performance.
For volume orders we can supply the converters with heatsink already mounted.
Please contact us for a relative quotation.









Dimensions in mm, () = Inch