DC/DC Converters

TEN 20WIR Series, 20 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
- Input filter meets EN 55022 class B without external components
- High efficiency up to 89%
- 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 20WIR series is a family of high performance 20 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 20-2410WIR		3.3 VDC	4500 mA	85 %
TEN 20-2411WIR		5.0 VDC	4000 mA	88 %
TEN 20-2412WIR	**9 – 36 VDC**	12 VDC	1670 mA	89 %
TEN 20-2413WIR	(24 VDC nominal)	15 VDC	1330 mA	88 %
TEN 20-2422WIR		±12 VDC	±833 mA	88 %
TEN 20-2423WIR		±15 VDC	±667 mA	89 %
TEN 20-4810WIR		3.3 VDC	4500 mA	85 %
TEN 20-4811WIR		5.0 VDC	4000 mA	88 %
TEN 20-4812WIR	**18 – 75 VDC**	12 VDC	1670 mA	89 %
TEN 20-4813WIR	(48 VDC nominal)	15 VDC	1330 mA	89 %
TEN 20-4822WIR		±12 VDC	±833 mA	88 %
TEN 20-4823WIR		±15 VDC	±667 mA	89 %
TEN 20-7210WIR		3.3 VDC	4500 mA	85 %
TEN 20-7211WIR		5.0 VDC	4000 mA	87 %
TEN 20-7212WIR	**43 – 160 VDC**	12 VDC	1670 mA	88 %
TEN 20-7213WIR	(110 VDC nominal)	15 VDC	1330 mA	89 %
TEN 20-7222WIR		±12 VDC	±833 mA	88 %
TEN 20-7223WIR		±15 VDC	±667 mA	89 %

Input Specifications

Input current (no load)		24 Vin models:	**6 mA typ.**
		48 Vin models:	**4 mA typ.**
		110 Vin models:	**3 mA typ.**
Input current (full load)		24 Vin, 3.3 VDC models:	**730 mA typ.**
		24 Vin, other models:	**950 mA typ.**
		48 Vin, 3.3 VDC models:	**365 mA typ.**
		48 Vin, other models:	**475 mA typ.**
		110 Vin, 3.3 VDC models:	**160 mA typ.**
		110 Vin, other models:	**210 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			**300 mAp-p typ.**
Conducted noise		24 & 48 Vin models:	**EN 55022 class B without external components**
		110 Vin models:	**EN 55022 class A without external components**
EMC immunity			**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:	Rubycon BXF series, 100 µF / 250 V
	– Conducted immunity		**EN 61000-4-6, 10 Vrms, perf. criteria A**

Output Specifications

Voltage set accuracy			**±1 %**
Voltage adjustment range			**±10 %** (single output models only)
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:	**75 mVp-p typ.**
		other models:	**100 mVp-p typ.**
Start up time (constant resistive load)	– Power On		**30 ms typ.**
	– Remote On		**30 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:	**3.7 – 5.4 V**
		5 VDC models:	**5.6 – 7.0 V**
		12 VDC models:	**13.5 – 19.6 V**
		15 VDC models:	**16.8 – 20.5 V**

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

Output Specifications

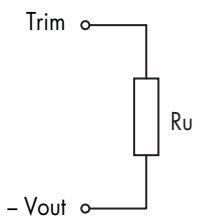
Capacitive load	3.3 VDC models:	7000 µF
	5.0 VDC models:	5000 µF
	12 VDC models:	850 µF
	15 VDC models:	700 µF
	±12 VDC models:	500 µF (each output)
	±15 VDC models:	350 µF (each output)

General Specifications

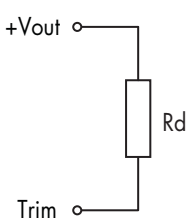
Temperature ranges	– Operating	–40°C to +85°C (with derating)
	– Case temperature	+105°C max.
	– Storage	–55°C to +125°C
Power derating	– Natural convection	4.5 %/K above 73°C
	– Natural convection with heat sink (optional)	5.3 %/K above 78°C
Thermal impedance	– Natural convection	12°C/W
	– Natural convection with heat sink (optional)	10°C/W
Humidity (non condensing)		5 – 95 % rel. H max.
Isolation voltage (60 sec.)	– Input / Output	2121 VDC
Isolation resistance	– Input / Output	>1000 M Ohm
Isolation capacitance	– Input / Output	3000 pF max.
Switching frequency		330 kHz typ. (pulse width modulation PWM)
Thermal shock, mechanical shock & vibration	– Test conditions	EN 61373, MIL-STD-810F www.tracopower.com/products/mil810.pdf
Safety standards	– Certification documents	UL/cUL 60950-1, IEC/EN 60950-1, EN 50155 www.tracopower.com/overview/ten20wir
Remote On/Off	– On: – Off: – Off idle current:	3.0 ... 15 VDC or open circuit 0 ... 1.2 VDC or short circuit pin 2 and pin 6 2.5 mA
Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign)		1.5 Mio. h
Environmental compliance	– Reach – RoHS	www.tracopower.com/overview/ten20wir RoHS directive 2011/65/EU

Output Voltage Adjustment (for single output models only)

Trim up



Trim down



Nominal output voltage at open Trim input
adjustment range ±10%, Ru, Rd to be adviced

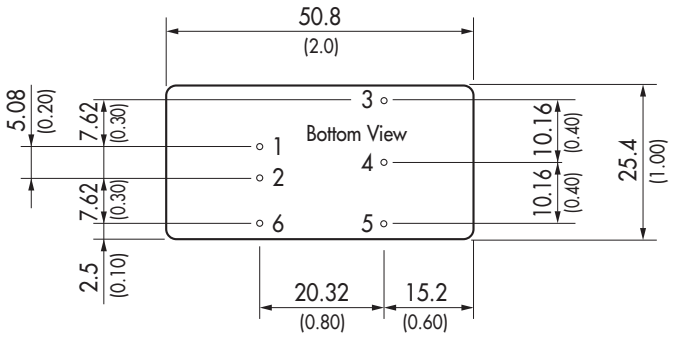
Application note: www.tracopower.com/products/ten20wir-application.pdf

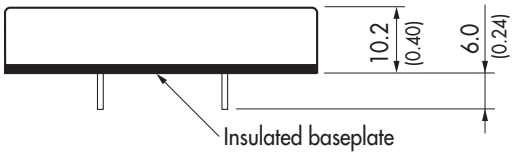
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

Physical Specifications

Casing material	copper, nickel plated
Baseplate material	non conductive FR4
Potting material	silicon (UL94V-0 rated)
Weight	30 g (1.06 oz)
Soldering temperature	max. +265°C / 10 sec.

Outline Dimensions





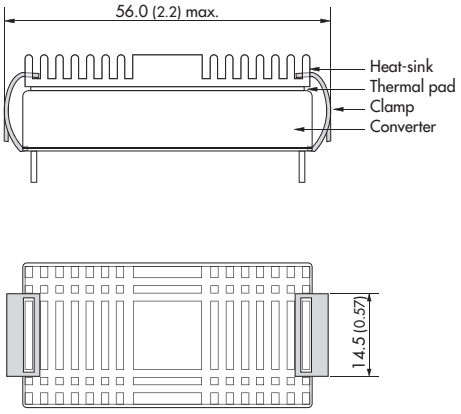
Pin-Out		
Pin	**Single**	**Dual**
1	+Vin (Vcc)	+Vin (Vcc)
2	–Vin (GND)	–Vin (GND)
3	+Vout	+Vout
4	Trim	Common
5	–Vout	–Vout
6	Remote On/Off	

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)

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 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