

Features

- ◆ Shielded metal case with screw terminals
- ◆ Ultra wide 4:1 input voltage ranges
9–36, 18–75, 43–160 VDC
- ◆ EN 50155 approval for railway applications
- ◆ Very high efficiency up to 89%
- ◆ Constant current output characteristic for battery load applications
- ◆ Optional with input filter to meet EN55022 class B
- ◆ Overtemperature protection
- ◆ Wide Operating temperature range:
–40°C to +75°C
- ◆ Reverse input protection
- ◆ Under voltage lock-out
- ◆ I/O isolation 2250 VDC
- ◆ Easy chassis and wall mounting
- ◆ 3-year product warranty



The modules have originally been designed for harsh industrial environment. High EMC immunity against surge, burst, radiated and conducted disturbances and the shock/ vibration and thermal shock resistance make them very popular for stringent requirements. With the extended input voltage ranges that cover the nominal 24, 36, 72 and 110 VDC with $\pm 40\%$ tolerance and the approval in accordance to EN50155 standard they now also offer a reliable solution for mobile and stationary railway applications. At 100% load the current characteristics goes from constant voltage to constant current what makes the units also suitable for battery charger applications. With protection against over-temperature, overload, short-circuit, reverse input, overvoltage and input under-voltage lock-out they are hard to destroy.

Models

Order code*	Input voltage	Output voltage	Output current max.	Efficiency typ.
TEP 150-2412WI	9 – 36 VDC (24 VDC nominal)	12 VDC	12.5 A	86 %
TEP 150-2413WI		15 VDC	10 A	86 %
TEP 150-2415WI		24 VDC	6.3 A	87 %
TEP 150-2416WI		28 VDC	5.4 A	87 %
TEP 150-2418WI		48 VDC	3.2 A	86 %
TEP 150-4812WI	18 – 75 VDC (48 VDC nominal)	12 VDC	12.5 A	88 %
TEP 150-4813WI		15 VDC	10 A	89 %
TEP 150-4815WI		24 VDC	6.3 A	89 %
TEP 150-4816WI		28 VDC	5.4 A	89 %
TEP 150-4818WI		48 VDC	3.2 A	88 %
TEP 150-7212WI	43 – 160 VDC (110 VDC nominal)	12 VDC	12.5 A	88 %
TEP 150-7213WI		15 VDC	10 A	89 %
TEP 150-7215WI		24 VDC	6.3 A	89 %
TEP 150-7216WI		28 VDC	5.4 A	89 %
TEP 150-7218WI		48 VDC	3.2 A	88 %

Options

suffix -F	Modules with input filter to meet EN 55022 class B, see page 5
on demand	Negative (passive = Off) remote On/Off function (standard is passive = On)range

Input Specifications

Input current (no load)	24 Vin, 12 – 24 VDC models:	80 mA typ.
	24 Vin, 28 – 48 VDC models:	130 mA typ.
	48 Vin, 12 – 24 VDC models:	60 mA typ.
	48 Vin, 28 – 48 VDC models:	70 mA typ.
	110 Vin, 12 – 24 VDC models:	25 mA typ.
	110 Vin, 28 – 48 VDC models:	35 mA typ.
Start-up voltage / under voltage lock-out	24 Vin models:	9 VDC / 8.2 VDC typ.
	48 Vin models:	18 VDC / 16.2 VDC typ.
	110 Vin models:	43 VDC / 34.5 VDC typ.
Surge voltage (1sec. max.)	24 Vin models:	50 V
	48 Vin models:	100 V
	110 Vin models:	185 V
Conducted noise (input)	EN 55022 class A, FCC part 15, class A without external components. optional filter for class B – suffix F	
EMC immunity	EN 50121-3-2	
	EN 61000-4-2, air ±8 kV, contact ±6 kV, perf. criteria A	
	EN 61000-4-3, 10 V/m, perf. criteria A	
	EN 61000-4-4, ±2 kV, perf. criteria A	
	EN 61000-4-5, ±1 kV perf. criteria A	
	– ESD (electrostatic discharge)	24 Vin models:
48 Vin models:		Nippon chemi-con KY 220 µF, 100 V, ESR 48 mOhm
110 Vin models:		Nippon chemi-con KXJ series, 150 µF, 200V
– Radiated immunity	no input capacitor required	
	EN 61000-4-6, 10 Vrms, perf. criteria A	
– Fast transient / surge (with input capacitor for models without filter module)		
– Input capacitor:		
– Conducted immunity		
Reverse voltage protection	parallel diode (input fuse required)	
Recommended input fuse (slow blow)	24 Vin models:	30 A
	48 Vin models:	15 A
	110 Vin models:	7 A

Output Specifications

Voltage set accuracy	1 %	
Output voltage adjustment	+20 % by external resistor (see application note)	
Regulation	– Input variation Vin min. to Vin max.	±0.2 % max.
	– Load variation 0 – 100 %	±0.4 % max.
Temperature coefficient	±0.02 %/K	
Minimum load	not required	
Ripple and noise (20 MHz Bandwidth)	12 & 15 VDC models:	100 mVpk-pk max.
	24 & 28 VDC models:	200 mVpk-pk max.
	48 VDC models:	350 mVpk-pk max.
Start up time (nominal Vin and constant resistive load)	35 ms typ. (at power On or remote On)	
Transient response (25 % load step change)	200 µs typ.	
Output current	– Constant voltage (CV)	up to 110 % of Iout max.
	– Constant current (CC)	above 110 % of Iout max.
Over voltage protection	at 125 –140 % of Vout nom.	
Short circuit protection	indefinite, automatic recovery	
Capacitive load	12 VDC models:	40'000 µF max.
	15 VDC models:	26'000 µF max.
	24 VDC models:	10'000 µF max.
	28 VDC models:	7'600 µF max.
	48 VDC models:	2'600 µF max.

General Specifications

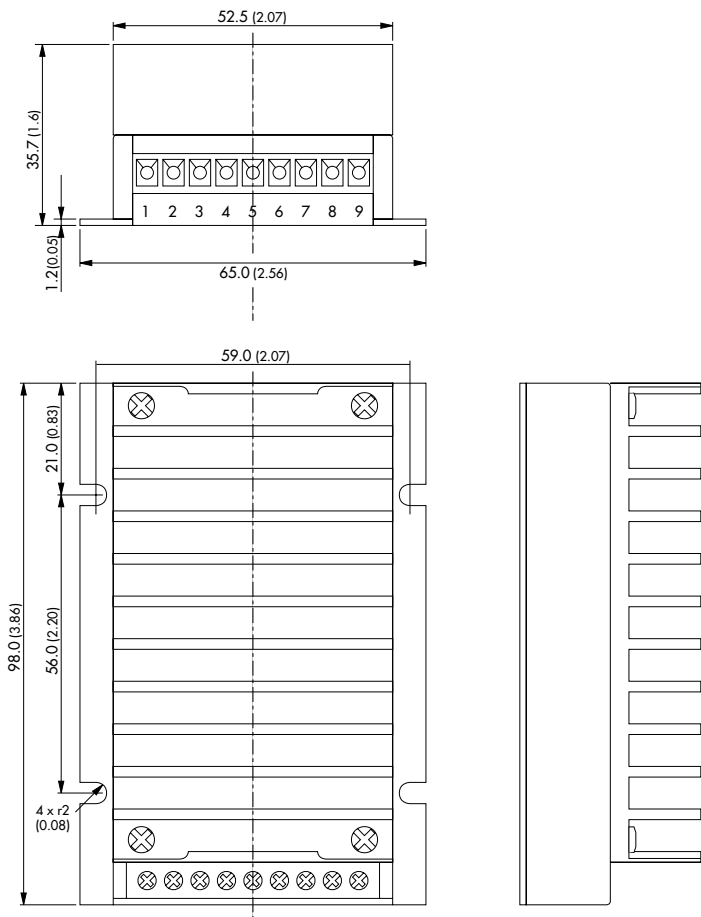
Temperature ranges	<ul style="list-style-type: none"> - Operating - Case temperature - Storage 	<p>-40°C to +75°C +100°C max. -55°C to +125°C</p>
Thermal consideration	<ul style="list-style-type: none"> - Mounting surface - Derating and temperature test point 	<p>Optimize thermal coupling to heat conducting surface. Not to mount on flammable surface! see application note</p>
Over temperature protection		at 110°C (auto restart)
Vibration and thermal shock		acc. MIL-STD-810F
Humidity (non condensing)		95 % rel H max.
Reliability, calculated MTBF (MIL-HDBK-217F, at +70°C, ground benign)		>495'000 h
Isolation voltage (60 sec.)	<ul style="list-style-type: none"> - Input/Output - Input/Case - Output/Case 	<p>2250 VDC (functional insulation) 1500 VDC 1500 VDC</p>
Isolation capacitance	- Input/Output	3500 pF max.
Isolation resistance	- Input/Output (500 VDC)	>1 GOhm min.
Switching frequency		220 – 330 kHz depending on model (puls width modulation)
Safety standards		UL 60950-1, IEC/EN 60950-1
Safety approvals	<ul style="list-style-type: none"> - UL/cUL 60950-1 - CB test certificate (IEC 60950-1) - Railway 	<p>www.ul.com -> certifications -> File e188913 (72 Vin models pending)</p>
Remote On/Off	<ul style="list-style-type: none"> - positive logic (standard) - negative logic (option -N) - Off idle current: 	<ul style="list-style-type: none"> - On: 3 to 12 VDC or open circuit - Off: 0 to 1.2 VDC or short circuit pin 5 and 3 - On: 0 to 1.2 VDC or short circuit pin 5 and 3 - Off: 3 to 12 VDC or open circuit 3 mA
Environmental compliance	<ul style="list-style-type: none"> - Reach - RoHS 	RoHS directive 2011/65/EU

Physical Specifications

Casing material	metal
Potting material	silicone (UL 94V-0 rated)
Case protection	IP 50 (in accordance to IEC/EN60529)
Weight	300 g (10.6oz)

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

Outline Dimensions

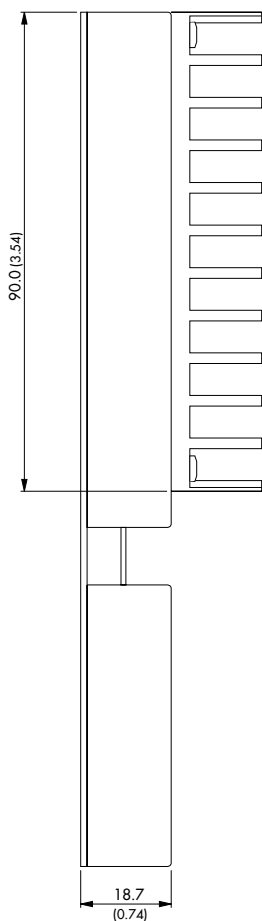
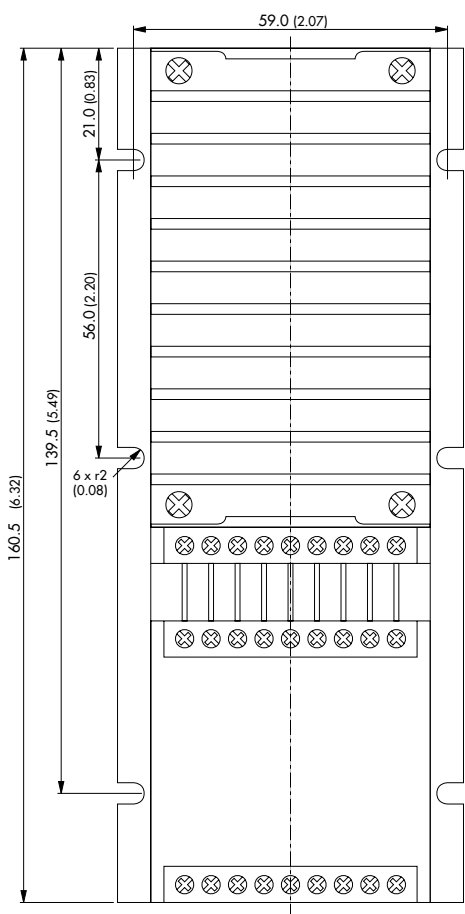
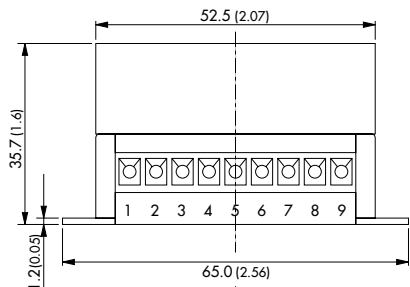


Pin Connection		
pin	function	recommended wire
1	+ Vin	14 – 16 AWG
2	+ Vin	14 – 16 AWG
3	- Vin	14 – 16 AWG
4	- Vin	14 – 16 AWG
5	Remote On/Off	14 – 24 AWG
6	+ Vout	14 – 16 AWG
7	- Vout	14 – 16 AWG
8	Trim	14 – 24 AWG
9	Trim	14 – 24 AWG

Weight: 300 g (10.6oz)

Dimensions in [mm], () = Inch
Mounting slot tolerance: ± 0.25 (± 0.001)
Case tolerances: ± 0.5 (± 0.02)

Outline Dimensions



Weight: 435 g (15.3oz)

Pin Connection		
pin	function	recommended wire
1	+ Vin	14 – 16 AWG
2	+ Vin	14 – 16 AWG
3	- Vin	14 – 16 AWG
4	- Vin	14 – 16 AWG
5	Remote On/Off	14 – 24 AWG
6	+ Vout	14 – 16 AWG
7	- Vout	14 – 16 AWG
8	Trim	14 – 24 AWG
9	Trim	14 – 24 AWG

Dimensions in [mm], () = Inch
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