



**THE DATASHEET OF  
TMR 3-7222WIR**



- Compact SIP-8 metal case
- EN 50155 railway approval
- Ultra wide 4:1 Input: 9–36, 18–75 and 43–160 VDC
- I/O-isolation 3'000 VDC
- Fully regulated outputs
- Operating temperature range –40°C to +90°C
- Short circuit protection and current limitation
- Remote On/Off
- 3-year product warranty



The TMR 3WIR series is a set of 3 Watt DC/DC converters in a SIP-8 metal case. They operate up to 78°C environment temperature at full load and up to 90°C with a 50% load derating. With EN 50155 and UL 60950-1 certification, 3'000 VDC I/O-isolation voltage, external On/Off, current limitation and short circuit protection they cover a wide range of application when space is limited. The input of the converters is designed for a wide voltage range (4:1) and minimum load is not required.

Models						
Order Code	Input Voltage Range	Output 1		Output 2		Efficiency typ.
		Vnom	I <sub>max</sub>	Vnom	I <sub>max</sub>	
TMR 3-2410WIR	9 - 36 VDC (24 VDC nom.)	3.3 VDC	700 mA			76 %
TMR 3-2411WIR		5 VDC	600 mA			81 %
TMR 3-2419WIR		9 VDC	333 mA			81 %
TMR 3-2412WIR		12 VDC	250 mA			83 %
TMR 3-2413WIR		15 VDC	200 mA			83 %
TMR 3-2415WIR		24 VDC	125 mA			82 %
TMR 3-2421WIR		+5 VDC	300 mA	-5 VDC	300 mA	80 %
TMR 3-2422WIR		+12 VDC	125 mA	-12 VDC	125 mA	82 %
TMR 3-2423WIR		+15 VDC	100 mA	-15 VDC	100 mA	82 %
TMR 3-4810WIR	18 - 75 VDC (48 VDC nom.)	3.3 VDC	700 mA			75 %
TMR 3-4811WIR		5 VDC	600 mA			81 %
TMR 3-4819WIR		9 VDC	333 mA			81 %
TMR 3-4812WIR		12 VDC	250 mA			82 %
TMR 3-4813WIR		15 VDC	200 mA			82 %
TMR 3-4815WIR		24 VDC	125 mA			82 %
TMR 3-4821WIR		+5 VDC	300 mA	-5 VDC	300 mA	80 %
TMR 3-4822WIR		+12 VDC	125 mA	-12 VDC	125 mA	82 %
TMR 3-4823WIR		+15 VDC	100 mA	-15 VDC	100 mA	82 %
TMR 3-7210WIR	43 - 160 VDC (110 VDC nom.)	3.3 VDC	700 mA			76 %
TMR 3-7211WIR		5 VDC	600 mA			80 %
TMR 3-7219WIR		9 VDC	333 mA			81 %
TMR 3-7212WIR		12 VDC	250 mA			82 %
TMR 3-7213WIR		15 VDC	200 mA			83 %
TMR 3-7215WIR		24 VDC	125 mA			83 %
TMR 3-7221WIR		+5 VDC	300 mA	-5 VDC	300 mA	80 %
TMR 3-7222WIR		+12 VDC	125 mA	-12 VDC	125 mA	83 %
TMR 3-7223WIR		+15 VDC	100 mA	-15 VDC	100 mA	81 %

### Input Specifications

Input Current	- At no load	24 Vin models: <b>4 mA typ.</b> 48 Vin models: <b>4 mA typ.</b> 110 Vin models: <b>2 mA typ.</b>
Surge Voltage		24 Vin models: <b>50 VDC max.</b> (1 s max.) 48 Vin models: <b>100 VDC max.</b> (1 s max.) 110 Vin models: <b>185 VDC max.</b> (1 s max.)
Recommended Input Fuse		24 Vin models: <b>800 mA</b> (slow blow) 48 Vin models: <b>500 mA</b> (slow blow) 110 Vin models: <b>160 mA</b> (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		<b>Internal Capacitor</b>

### Output Specifications

Voltage Set Accuracy		<b>±1% max.</b>
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%) - Cross Regulation (25% / 100% asym. load)	single output models: <b>0.2% max.</b> dual output models: <b>0.2% max.</b> single output models: <b>0.5% max.</b> dual output models: <b>1% max.</b> (Output 1) <b>1% max.</b> (Output 2) dual output models: <b>5% max.</b>
Ripple and Noise	- 20 MHz Bandwidth	<b>75 mVp-p max.</b> (w/ 1 µF) <b>50 mVp-p typ.</b> (w/ 1 µF)
Capacitive Load	- single output  - dual output	3.3 Vout models: <b>1'100 µF max.</b> 5 Vout models: <b>550 µF max.</b> 9 Vout models: <b>340 µF max.</b> 12 Vout models: <b>240 µF max.</b> 15 Vout models: <b>240 µF max.</b> 24 Vout models: <b>90 µF max.</b> 5 / -5 Vout models: <b>340 / 340 µF max.</b> 12 / -12 Vout models: <b>170 / 170 µF max.</b> 15 / -15 Vout models: <b>90 / 90 µF max.</b>
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.02 %/K max.</b>
Hold-up Time		<b>10 ms min.</b> (acc. to EN 50155 Class S2, see application note for ext. capacitor calculation: <a href="http://www.tracopower.com/info/holdup_en50155.pdf">www.tracopower.com/info/holdup_en50155.pdf</a> )
Start-up Time		<b>75 ms max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Output Current Limitation		<b>180% typ. of Iout max.</b>
Transient Response	- Response Time	<b>250 µs typ.</b> (25% Load Step)

### Safety Specifications

Standards	- IT / Multimedia Equipment  - Railway Applications - Certification Documents	<b>EN 62368-1</b> <b>IEC 62368-1</b> <b>UL 62368-1</b> <b>EN 50155</b> <a href="http://www.tracopower.com/overview/tmr3wir">www.tracopower.com/overview/tmr3wir</a>
Pollution Degree		<b>PD 2</b>

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

## EMC Specifications

<b>EMI Emissions</b>		EN 50121-3-2 (EMC for Rolling Stock)
- Conducted Emissions		EN 55011 class A (with external filter) EN 55011 class B (with external filter) EN 55032 class A (with external filter) EN 55032 class B (with external filter)
- Radiated Emissions		EN 55011 class A (with external filter) EN 55011 class B (with external filter) EN 55032 class A (with external filter) EN 55032 class B (with external filter)
		External filter proposal: <a href="http://www.tracopower.com/overview/tmr3wir">www.tracopower.com/overview/tmr3wir</a>
<b>EMS Immunity</b>		EN 50121-3-2 (EMC for Rolling Stock)
- Electrostatic Discharge	Air:	EN 61000-4-2, ±8 kV, perf. criteria A
	Contact:	EN 61000-4-2, ±6 kV, perf. criteria A EN 61000-4-3, 20 V/m, perf. criteria A EN 61000-4-4, ±2 kV, perf. criteria A EN 61000-4-5, ±2 kV, perf. criteria A
- RF Electromagnetic Field	Ext. input component:	24 Vin models: KY 220 µF    TVS SMDJ70A 48 Vin models: KY 220 µF    TVS SMDJ120A 110 Vin models: KY 150 µF    TVS SMDJ250A
- EFT (Burst) / Surge		EN 61000-4-6, 10 Vrms, perf. criteria A
	Continuous:	EN 61000-4-8, 100 A/m, perf. criteria A
- Conducted RF Disturbances	1 s:	EN 61000-4-8, 1000 A/m, perf. criteria A
- PF Magnetic Field		

## General Specifications

<b>Relative Humidity</b>		95% max. (non condensing)
<b>Temperature Ranges</b>	- Operating Temperature	-40°C to +90°C
	- Case Temperature	+100°C max.
	- Storage Temperature	-55°C to +125°C
<b>Power Derating</b>	- High Temperature	4.55 %/K above 78°C
		See application note: <a href="http://www.tracopower.com/overview/tmr3wir">www.tracopower.com/overview/tmr3wir</a>
<b>Cooling System</b>		Natural convection (20 LFM)
<b>Remote Control</b>	- Voltage Controlled Remote (passive = on)	On: 0 to 0.5 VDC or open circuit Off: 3 to 12 VDC
	- Off Idle Input Current	Refers to 'Remote' and '-Vin' Pin 2.5 mA typ.
	- Remote Pin Input Current	0.5 to 3.5 mA
<b>Altitude During Operation</b>		5'000 m max.
<b>Switching Frequency</b>		270 - 330 kHz (PWM) (110 Vin model) 360 - 440 kHz (PWM) (other input models)
<b>Insulation System</b>		Functional Insulation
<b>Isolation Test Voltage</b>	- Input to Output, 60 s	3'000 VDC
	- Input to Case, 60 s	1'500 VDC
	- Output to Case, 60 s	1'500 VDC
<b>Isolation Resistance</b>	- Input to Output, 500 VDC	1'000 MΩ min.
<b>Isolation Capacitance</b>	- Input to Output, 100 kHz, 1 V	100 pF max.
<b>Reliability</b>	- Calculated MTBF	5'535'000 h (MIL-HDBK-217F, ground benign)
<b>Washing Process</b>		According to Cleaning Guideline <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
<b>Environment</b>	- Vibration	MIL-STD-810F EN 61373
	- Mechanical Shock	MIL-STD-810F EN 61373
	- Thermal Shock	MIL-STD-810F
	- Flammability	EN 45545-2 <a href="http://www.tracopower.com/info/en45545-declaration.pdf">www.tracopower.com/info/en45545-declaration.pdf</a>
<b>Housing Material</b>		Copper

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

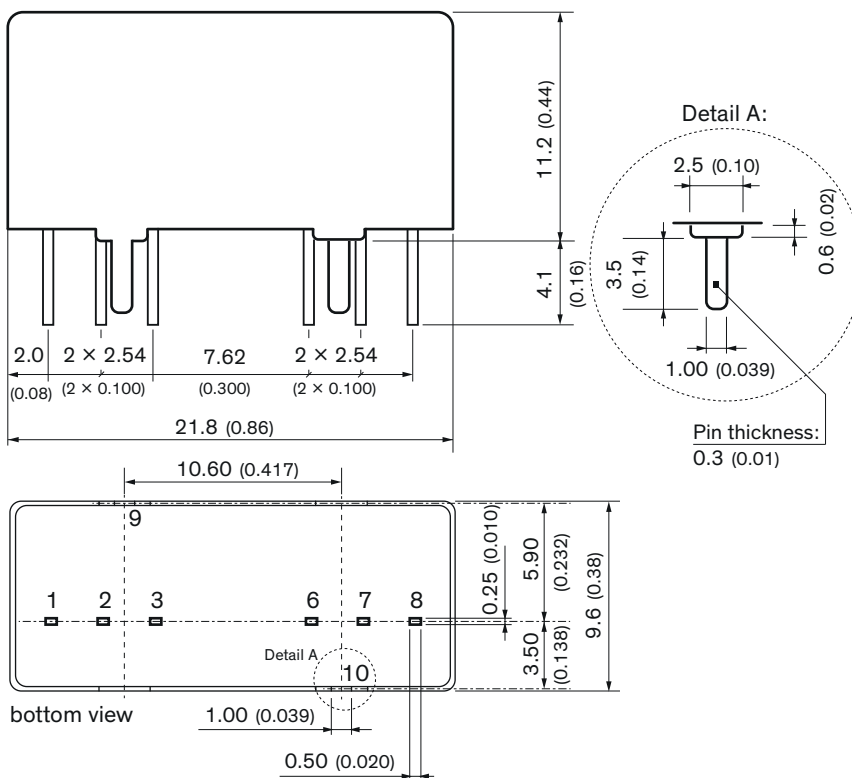
Potting Material	Silicone (UL 94 V-0 rated)
Pin Material	Copper
Pin Foundation Plating	Nickel (1 - 2 $\mu\text{m}$ )
Pin Surface Plating	Tin (3 - 5 $\mu\text{m}$ ), matte
Housing Type	Metal Case
Mounting Type	PCB Mount
Connection Type	THD (Through-Hole Device)
Footprint Type	SIP8
Soldering Profile	Lead-Free Wave Soldering 265°C / 10 s max.
Weight	5.9 g
Environmental Compliance	- REACH Declaration <a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant - RoHS Declaration <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule)) - SCIP Reference Number 09d8ed31-d8a4-4758-985e-946da87f5115

### Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tmr3wir](http://www.tracopower.com/overview/tmr3wir)

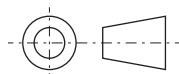
### Outline Dimensions



Pinout		
Pin	Single Output	Dual Output
1	-Vin (GND)	-Vin (GND)
2	+Vin (Vcc)	+Vin (Vcc)
3	Remote	Remote
6	+Vout	+Vout
7	-Vout	Common
8	NC	-Vout
9, 10	Case	Case



NC: Not connected

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



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