



**THE DATASHEET OF  
TMR 6-7221WIR**



- 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 +80°C
- Short circuit protection and current limitation
- Remote On/Off
- 3-year product warranty



The TMR 6WIR series is a set of 6 Watt DC/DC converters in a SIP-8 metal case. They operate up to 60°C environment temperature at full load and up to 80°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 6-2410WIR	9 - 36 VDC (24 VDC nom.)	3.3 VDC	1'500 mA			81 %
TMR 6-2411WIR		5 VDC	1'200 mA			84 %
TMR 6-2419WIR		9 VDC	666 mA			86 %
TMR 6-2412WIR		12 VDC	500 mA			87 %
TMR 6-2413WIR		15 VDC	400 mA			88 %
TMR 6-2415WIR		24 VDC	250 mA			87 %
TMR 6-2421WIR		+5 VDC	600 mA	-5 VDC	600 mA	84 %
TMR 6-2422WIR		+12 VDC	250 mA	-12 VDC	250 mA	87 %
TMR 6-2423WIR		+15 VDC	200 mA	-15 VDC	200 mA	87 %
TMR 6-4810WIR		18 - 75 VDC (48 VDC nom.)	3.3 VDC	1'500 mA		
TMR 6-4811WIR	5 VDC		1'200 mA			84 %
TMR 6-4819WIR	9 VDC		666 mA			85 %
TMR 6-4812WIR	12 VDC		500 mA			87 %
TMR 6-4813WIR	15 VDC		400 mA			87 %
TMR 6-4815WIR	24 VDC		250 mA			87 %
TMR 6-4821WIR	+5 VDC		600 mA	-5 VDC	600 mA	84 %
TMR 6-4822WIR	+12 VDC		250 mA	-12 VDC	250 mA	87 %
TMR 6-4823WIR	+15 VDC		200 mA	-15 VDC	200 mA	87 %
TMR 6-7210WIR	43 - 160 VDC (110 VDC nom.)		3.3 VDC	1'500 mA		
TMR 6-7211WIR		5 VDC	1'200 mA			83 %
TMR 6-7219WIR		9 VDC	666 mA			85 %
TMR 6-7212WIR		12 VDC	500 mA			86 %
TMR 6-7213WIR		15 VDC	400 mA			86 %
TMR 6-7215WIR		24 VDC	250 mA			86 %
TMR 6-7221WIR		+5 VDC	600 mA	-5 VDC	600 mA	83 %
TMR 6-7222WIR		+12 VDC	250 mA	-12 VDC	250 mA	86 %
TMR 6-7223WIR		+15 VDC	200 mA	-15 VDC	200 mA	86 %

### Input Specifications

Input Current	- At no load	24 Vin models: <b>6 mA typ.</b> 48 Vin models: <b>6 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>1'250 mA</b> (slow blow) 48 Vin models: <b>630 mA</b> (slow blow) 110 Vin models: <b>315 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> <b>50 mVp-p typ.</b>
Capacitive Load	- single output  - dual output	3.3 Vout models: <b>2'200 µF max.</b> 5 Vout models: <b>1'100 µF max.</b> 9 Vout models: <b>680 µF max.</b> 12 Vout models: <b>470 µF max.</b> 15 Vout models: <b>470 µF max.</b> 24 Vout models: <b>180 µF max.</b> 5 / -5 Vout models: <b>680 / 680 µF max.</b> 12 / -12 Vout models: <b>330 / 330 µF max.</b> 15 / -15 Vout models: <b>180 / 180 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>50 ms typ. / 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/tmr6wir">www.tracopower.com/overview/tmr6wir</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/tmr6wir">www.tracopower.com/overview/tmr6wir</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 (SMB250A)
- 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		
- PF Magnetic Field		

## General Specifications

<b>Relative Humidity</b>		95% max. (non condensing)
<b>Temperature Ranges</b>	- Operating Temperature	-40°C to +80°C
	- Case Temperature	+100°C max.
	- Storage Temperature	-55°C to +125°C
<b>Power Derating</b>	- High Temperature	2.5 %/K above 60°C
	See application note:	<a href="http://www.tracopower.com/overview/tmr6wir">www.tracopower.com/overview/tmr6wir</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 Refers to 'Remote' and '-Vin' Pin
	- Off Idle Input Current	2.5 mA typ.
<b>Altitude During Operation</b>		5'000 m max.
<b>Regulator Topology</b>		Flyback Converter
<b>Switching Frequency</b>		270 - 330 kHz (PWM) (110 Vin model) 520 - 640 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
<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	2'950'000 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
<b>Potting Material</b>		Silicone (UL 94 V-0 rated)

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

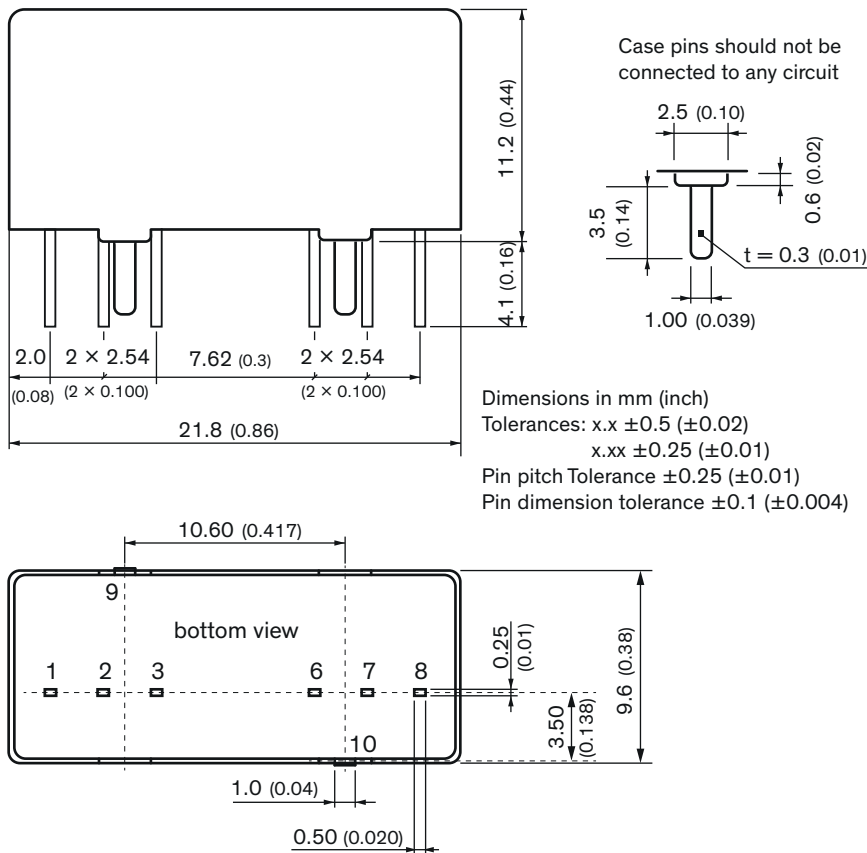
Pin Material	Copper
Pin Foundation Plating	Nickel (1 - 2 $\mu\text{m}$ )
Pin Surface Plating	Tin (3 - 5 $\mu\text{m}$ ), matte
Housing Type	Metal Case
Mounting Type	PCB Mount
Connection Type	THD (Through-Hole Device)
Footprint Type	SIP8
Soldering Profile	Lead-Free Wave Soldering 265°C / 10 s max.
Weight	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 3a804e11-6b21-4fc8-b610-94217363ca4a

### Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tmr6wir](http://www.tracopower.com/overview/tmr6wir)

### 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

## Looking for pricing, stock, or lifecycle information?

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