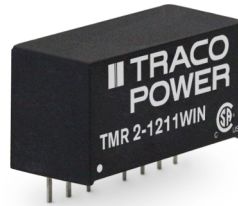


## DC/DC Converter

## TMR 2WIN Series, 2 Watt

Not recommended for new designs

- Ultra-wide 4:1 input range
- Compact SIP-8 package
- Temperature range  $-40$  to  $+90^{\circ}\text{C}$  (up to  $+75^{\circ}\text{C}$  at full load)
- High efficiency of 82%
- Excellent load and line regulation
- Continuous short-circuit protection
- Overload protection
- I/O isolation 1500 VDC
- Remote On/Off control
- 3-year product warranty



UL 62368-1 IEC 62368-1

The TMR 2WIN series is a family of isolated 2 W DC/DC converter modules with accurately regulated output voltages and ultra-wide 4:1 input voltage ranges. They require no minimum load and are protected against overload and short circuit.

An excellent efficiency along with the use of high grade components allows a compact construction in SIP-8 package. Even the converters can reliably operate in an ambient temperature of  $-40^{\circ}\text{C}$  to  $+75^{\circ}\text{C}$  at full load and up to  $90^{\circ}\text{C}$  with 50% power derating. Typical applications for these converters are distributed power architectures in communication, instrumentation and industrial electronics, everywhere where space on the PCB is critical.

### Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency typ.
		Vnom	I <sub>max</sub>	Vnom	I <sub>max</sub>	
TMR 2-1210WIN *	4.5 - 18 VDC (12 VDC nom.)	3.3 VDC	500 mA			75 %
TMR 2-1211WIN *		5 VDC	400 mA			80 %
TMR 2-1212WIN *		12 VDC	167 mA			82 %
TMR 2-1213WIN *		15 VDC	134 mA			82 %
TMR 2-1221WIN *		+5 VDC	200 mA	-5 VDC	200 mA	80 %
TMR 2-1222WIN *		+12 VDC	83 mA	-12 VDC	83 mA	82 %
TMR 2-1223WIN *		+15 VDC	67 mA	-15 VDC	67 mA	82 %
TMR 2-2410WIN *	9 - 36 VDC (24 VDC nom.)	3.3 VDC	500 mA			75 %
TMR 2-2411WIN *		5 VDC	400 mA			80 %
TMR 2-2412WIN *		12 VDC	167 mA			82 %
TMR 2-2413WIN *		15 VDC	134 mA			82 %
TMR 2-2421WIN *		+5 VDC	200 mA	-5 VDC	200 mA	80 %
TMR 2-2422WIN *		+12 VDC	83 mA	-12 VDC	83 mA	82 %
TMR 2-2423WIN *		+15 VDC	67 mA	-15 VDC	67 mA	82 %
TMR 2-4810WIN *	18 - 75 VDC (48 VDC nom.)	3.3 VDC	500 mA			74 %
TMR 2-4811WIN *		5 VDC	400 mA			80 %
TMR 2-4812WIN *		12 VDC	167 mA			82 %
TMR 2-4813WIN *		15 VDC	134 mA			82 %
TMR 2-4821WIN *		+5 VDC	200 mA	-5 VDC	200 mA	80 %
TMR 2-4822WIN *		+12 VDC	83 mA	-12 VDC	83 mA	82 %
TMR 2-4823WIN *		+15 VDC	67 mA	-15 VDC	67 mA	82 %

Note \* Not recommended for new designs

## Input Specifications

Input Current	- At no load	12 Vin models: <b>60 mA typ.</b> 24 Vin models: <b>30 mA typ.</b> 48 Vin models: <b>20 mA typ.</b>
	- At full load	12 Vin models: <b>200 mA typ.</b> 24 Vin models: <b>100 mA typ.</b> 48 Vin models: <b>50 mA typ.</b>
Surge Voltage		12 Vin models: <b>25 VDC max.</b> (1 s max.) 24 Vin models: <b>50 VDC max.</b> (1 s max.) 48 Vin models: <b>100 VDC max.</b> (1 s max.)
Start-up Voltage		12 Vin models: <b>3 VDC min. / 4 VDC typ. / 4.5 VDC max.</b> 24 Vin models: <b>4.5 VDC min. / 6 VDC typ. / 9 VDC max.</b> 48 Vin models: <b>8.5 VDC min. / 12 VDC typ. / 18 VDC max.</b>
Under Voltage Lockout		12 Vin models: <b>4 VDC max.</b> 24 Vin models: <b>8 VDC max.</b> 48 Vin models: <b>16 VDC max.</b>
Recommended Input Fuse		12 Vin models: <b>1'000 mA</b> (slow blow) 24 Vin models: <b>500 mA</b> (slow blow) 48 Vin models: <b>250 mA</b> (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		<b>Internal Capacitor</b>
Short Circuit Input Power		<b>1.5 W max.</b>

## Output Specifications

Voltage Set Accuracy		<b>±2% max.</b>
Regulation	- Input Variation (Vmin - Vmax)	single output models: <b>0.5% max.</b> dual output models: <b>0.5% max.</b>
	- Load Variation (0 - 100%)	single output models: <b>1% max.</b> dual output models: <b>1% max.</b> (Output 1) <b>1% max.</b> (Output 2)
	- Voltage Balance (symmetrical load)	dual output models: <b>2% max.</b>
Ripple and Noise	- 20 MHz Bandwidth	<b>100 mVp-p max.</b>
Capacitive Load	- single output	3.3 Vout models: <b>1'000 µF max.</b> 5 Vout models: <b>1'000 µF max.</b> 12 Vout models: <b>170 µF max.</b> 15 Vout models: <b>110 µF max.</b>
	- dual output	5 / -5 Vout models: <b>470 / 470 µF max.</b> 12 / -12 Vout models: <b>100 / 100 µF max.</b> 15 / -15 Vout models: <b>47 / 47 µF max.</b>
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.02 %/K max.</b>
Short Circuit Protection		<b>Automatic recovery</b>
Overload Protection		<b>Foldback Mode</b>
Output Current Limitation		<b>110% min. of Iout max.</b>
		<b>140% typ. of Iout max.</b>
Transient Response	- Response Deviation	<b>5% max.</b> (75% to 100% Load Step)
	- Response Time	<b>300 µs typ. / 500 µs max.</b> (75% to 100% Load Step)

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

## Safety Specifications

Standards	- IT / Multimedia Equipment	CSA-C22.2, No. 60950-1 EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1
	- Certification Documents	<a href="http://www.tracopower.com/overview/tmr2win">www.tracopower.com/overview/tmr2win</a>
Pollution Degree		PD 2

## EMC Specifications

EMI (Emissions)	- Conducted Emissions - Radiated Emissions	EN 61000-6-3 (Generic Residential) EN 55032 class A (with external filter) EN 55032 class A (with external filter)
	External filter proposal:	<a href="http://www.tracopower.com/overview/tmr2win">www.tracopower.com/overview/tmr2win</a>
EMS (Immunity)	- Electrostatic Discharge - RF Electromagnetic Field - EFT (Burst) / Surge - Conducted RF Disturbances - PF Magnetic Field	EN 61000-6-1 (Generic Residential) EN 55035 (Multimedia) Air: EN 61000-4-2, $\pm 8$ kV, perf. criteria A Contact: EN 61000-4-2, $\pm 4$ kV, perf. criteria A EN 61000-4-3, 10 V/m, perf. criteria A EN 61000-4-4, $\pm 2$ kV, perf. criteria A EN 61000-4-5, $\pm 1$ kV, perf. criteria A Ext. input component: 220 $\mu$ F / 100 V / KYA series Continuous: EN 61000-4-6, 10 Vrms, perf. criteria A EN 61000-4-8, 100 A/m, perf. criteria A

## General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +90°C +105°C max. -55°C to +125°C
Power Derating	- High Temperature	3.33 %/K above 75°C
	See application note:	<a href="http://www.tracopower.com/overview/tmr2win">www.tracopower.com/overview/tmr2win</a>
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote (passive = on) - Current Controlled Remote (passive = on) - Off Idle Input Current	On: open circuit Off: 6 to 9 VDC (via 1 kOhm resistor) Refers to 'Remote' and '-Vin' Pin On: open circuit Off: 2 to 4 mA current 3 mA max.
Altitude During Operation		6'000 m max.
Regulator Topology		RCC Converter
Switching Frequency		300 kHz typ. (PFM)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s - Input to Output, 1 s	1'500 VDC 1'800 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 M $\Omega$ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	250 pF typ. 500 pF max.
Reliability	- Calculated MTBF	3'430'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
Housing Material		Non-conductive Plastic (UL 94 V-0 rated)
Potting Material		Epoxy (UL 94 V-0 rated)
Pin Material		Nickel-Iron (Alloy 42)

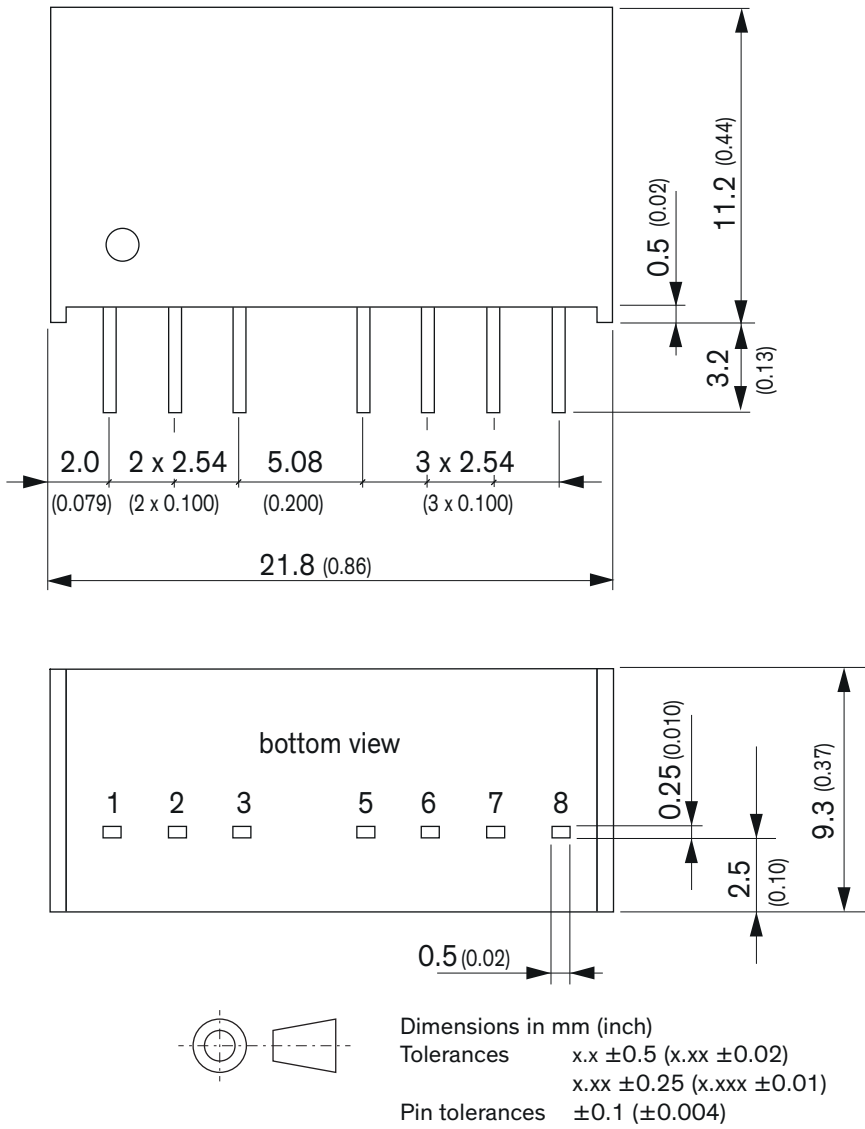
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

Pin Foundation Plating	Nickel (1 µm min.)
Pin Surface Plating	Tin (3 - 5 µm), matte
Housing Type	Plastic Case
Mounting Type	PCB Mount
Connection Type	THD (Through-Hole Device)
Footprint Type	SIP8
Soldering Profile	Lead-Free Wave Soldering 260°C / 10 s max.
Weight	4.66 g
Environmental Compliance	<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 <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7(a) (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).) d03e2461-f0b1-480d-9580-ce42a4dc9914
	- REACH Declaration
	- RoHS Declaration
	- SCIP Reference Number

<b>Additional Information</b>	
Supporting Documents	<a href="http://www.tracopower.com/overview/tmr2win">www.tracopower.com/overview/tmr2win</a>
Frequently Asked Questions	<a href="http://www.tracopower.com/glossary-faq">www.tracopower.com/glossary-faq</a>
Glossary	<a href="http://www.tracopower.com/info/glossary.pdf">www.tracopower.com/info/glossary.pdf</a>

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

**Outline Dimensions**



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

NC: Not connected