

## DC/DC Converter

## TMR 2E Series, 2 Watt

Not recommended for new designs

- Wide 2:1 input voltage range
- Compact SIP-8 package
- Cost optimized design
- Temperature range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- I/O isolation 1000 VDC
- Remote On/Off control
- Fully RoHS compliant
- 3-year product warranty



The TMR 2E series is a family of isolated 2 W DC/DC converter modules with regulated output, featuring wide 2:1 input voltage ranges. The product comes in a compact SIP-8 plastic package with small footprint occupying only 2.0 cm<sup>2</sup> (0.3 square in.) of board space.

An excellent efficiency allows  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  operation temperature. Further features include remote On/Off control and continuous short circuit protection. The compact dimensions and cost optimized design make this converters an ideal solution for applications in communication equipment, instrumentation and industrial electronics.

Models				
Order Code	Input Voltage Range	Output Voltage nom.	Output Current max.	Efficiency typ.
TMR 2-0510E*	4.5 - 9 VDC (5 VDC nom.)	3.3 VDC	500 mA	70 %
TMR 2-0511E*		5 VDC	400 mA	73 %
TMR 2-0512E*		12 VDC	167 mA	75 %
TMR 2-1210E*	9 - 18 VDC (12 VDC nom.)	3.3 VDC	500 mA	73 %
TMR 2-1211E*		5 VDC	400 mA	77 %
TMR 2-1212E*		12 VDC	167 mA	80 %
TMR 2-2410E*	18 - 36 VDC (24 VDC nom.)	3.3 VDC	500 mA	72 %
TMR 2-2411E*		5 VDC	400 mA	77 %
TMR 2-2412E*		12 VDC	167 mA	81 %
TMR 2-4810E*	36 - 75 VDC (48 VDC nom.)	3.3 VDC	500 mA	71 %
TMR 2-4811E*		5 VDC	400 mA	73 %
TMR 2-4812E*		12 VDC	167 mA	79 %

Note \* Not recommended for new designs

### Input Specifications

Input Current	- At no load	5 Vin models: 40 mA typ. 12 Vin models: 20 mA typ. 24 Vin models: 10 mA typ. 48 Vin models: 8 mA typ.
	- At full load	5 Vin models: 520 mA typ. 12 Vin models: 200 mA typ. 24 Vin models: 100 mA typ. 48 Vin models: 50 mA typ.
Surge Voltage		5 Vin models: 15 VDC max. (1 s max.) 12 Vin models: 25 VDC max. (1 s max.) 24 Vin models: 50 VDC max. (1 s max.) 48 Vin models: 100 VDC max. (1 s max.)
Start-up Voltage		5 Vin models: 3.5 VDC min. / 4 VDC typ. / 4.5 VDC max. 12 Vin models: 4.5 VDC min. / 7 VDC typ. / 9 VDC max. 24 Vin models: 8 VDC min. / 12 VDC typ. / 18 VDC max. 48 Vin models: 16 VDC min. / 24 VDC typ. / 36 VDC max.
Under Voltage Lockout		5 Vin models: 3.5 VDC typ. / 4 VDC max. 12 Vin models: 6.5 VDC typ. / 8.5 VDC max. 24 Vin models: 11 VDC typ. / 17 VDC max. 48 Vin models: 22 VDC typ. / 34 VDC max.
Reflected Ripple Current		5 Vin models: 400 mAp-p typ. 12 Vin models: 300 mAp-p typ. 24 Vin models: 200 mAp-p typ. 48 Vin models: 500 mAp-p typ.
Recommended Input Fuse		(The need of an external fuse has to be assessed in the final application.)
Input Filter		Internal Capacitor

### Output Specifications

Voltage Set Accuracy		±2% max.
Regulation	- Input Variation (Vmin - Vmax)	0.5% max.
	- Load Variation (25 - 100%)	0.75% max.
Ripple and Noise	- 20 MHz Bandwidth	50 mVp-p max.
		30 mVp-p typ.
Capacitive Load	3.3 Vout models:	2'200 µF max.
	5 Vout models:	1'000 µF max.
	12 Vout models:	170 µF max.
Minimum Load		25 % of Iout max.
Temperature Coefficient		±0.02 %/K max.
Short Circuit Protection		Continuous, Automatic recovery
Transient Response	- Response Deviation	5% max. (75% to 100% Load Step)
	- Response Time	100 µs typ. / 300 µs max. (75% to 100% Load Step)

### Safety Specifications

Standards	- IT / Multimedia Equipment	Designed for IEC/EN/UL 62368-1 (not certified)
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### EMC Specifications

EMI (Emissions)	- Conducted Emissions	EN 55032 class A (with external filter) FCC 47 Part 15 class A (with external filter)
	- Radiated Emissions	EN 55032 class A (with external filter) FCC 47 Part 15 class A (with external filter)

External filter proposal: [www.tracopower.com/overview/tmr2e](http://www.tracopower.com/overview/tmr2e)

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

## General Specifications

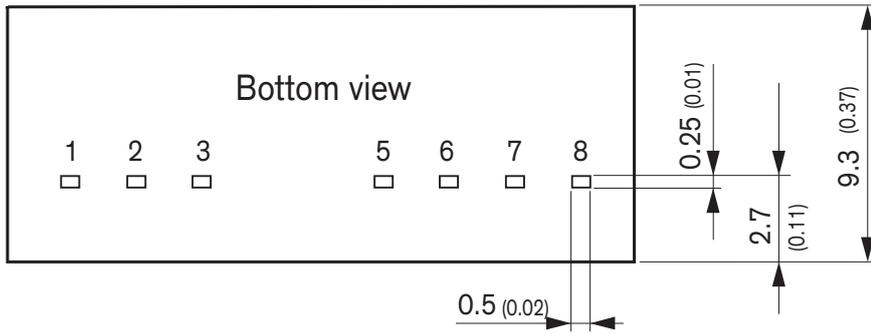
Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +85°C +90°C max. -55°C to +105°C
Power Derating	- High Temperature	2.86 %/K above 65°C See application note: <a href="http://www.tracopower.com/overview/tmr2e">www.tracopower.com/overview/tmr2e</a>
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote (passive = on)  - Off Idle Input Current - Remote Pin Input Current	On: < 0.6 VDC or open circuit Off: 2.7 to 15 VDC Refers to 'Remote' and '-Vin' Pin 0.2 mA max. -0.4 to 1.0 mA
Switching Frequency		100 - 650 kHz (RCC) 300 kHz typ. (RCC)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s - Input to Output, 1 s	1'000 VDC 1'200 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	65 pF typ. 120 pF max.
Reliability	- Calculated MTBF	1'000'000 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)
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 / 6 s max.
Weight		4.8 g
Environmental Compliance	- REACH Declaration  - RoHS Declaration  - SCIP Reference Number	<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).) 11b88fa2-0d4d-4b9e-8438-504c6688a2da

## Supporting Documents

Overview Link (for additional Documents)	<a href="http://www.tracopower.com/overview/tmr2e">www.tracopower.com/overview/tmr2e</a>
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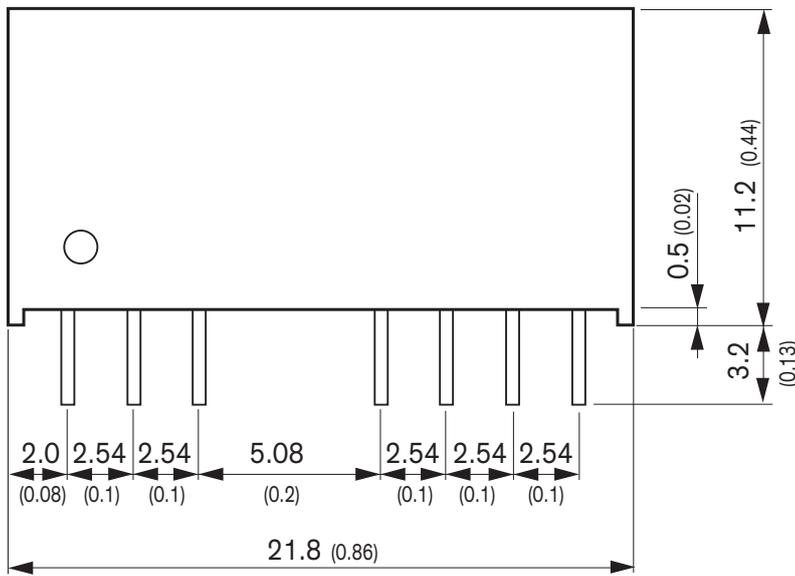
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**Outline Dimensions**



Pinout	
Pin	Function
1	-Vin (GND)
2	+Vin (Vcc)
3	Remote
5	NC
6	+Vout
7	-Vout
8	NC

NC: Not connected



Dimensions in mm (inch)  
 Tolerances:  $\pm 0.5$  ( $\pm 0.02$ )  
 Pin pitch Tolerance  $\pm 0.25$  ( $\pm 0.01$ )