

## Unregulated DC/DC Converter

## TMV-EN Series, 1 Watt

- Single-in-line package (SIP)
- Industrial safety to IEC/EN/UL 62368-1
- Reinforced insulation rated for 300 VAC working voltage
- I/O isolation voltage 3000 VACrms
- Operating temperature range  $-25\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$
- Unregulated outputs
- 3-year product warranty



The TMV-EN series is a range of 1 Watt unregulated DC/DC converters with high I/O isolation. This product features an isolation barrier which is approved for supplementary an reinforced insulation. SMD construction and a special designed toroidal transformer made it possible to built these converters in a standard SIP package with a very small footprint. These features making the TMV-EN series an economical solution in many DC/DC converter applications requiring safety agency approval.

Models						
Order Code	Input Voltage Range	Output 1		Output 2		Efficiency typ.
		Vnom	I <sub>max</sub>	Vnom	I <sub>max</sub>	
TMV 0505EN	4.5 - 5.5 VDC (5 VDC nom.)	5 VDC	200 mA			66 %
TMV 0512EN		12 VDC	80 mA			66 %
TMV 0515EN		15 VDC	65 mA			66 %
TMV 0505DEN		+5 VDC	100 mA	-5 VDC	100 mA	66 %
TMV 0512DEN		+12 VDC	40 mA	-12 VDC	40 mA	72 %
TMV 0515DEN		+15 VDC	35 mA	-15 VDC	35 mA	73 %
TMV 1205EN	10.8 - 13.2 VDC (12 VDC nom.)	5 VDC	200 mA			66 %
TMV 1212EN		12 VDC	80 mA			66 %
TMV 1215EN		15 VDC	65 mA			66 %
TMV 1205DEN		+5 VDC	100 mA	-5 VDC	100 mA	66 %
TMV 1212DEN		+12 VDC	40 mA	-12 VDC	40 mA	74 %
TMV 1215DEN		+15 VDC	35 mA	-15 VDC	35 mA	75 %

### Input Specifications

Input Current	- At no load	5 Vin models: <b>55 mA typ.</b> 12 Vin models: <b>30 mA typ.</b>
	- At full load	5 Vin models: <b>303 mA typ.</b> (5 Vout model) <b>291 mA typ.</b> (12 Vout model) <b>295 mA typ.</b> (15 Vout model) <b>303 mA typ.</b> (5 / -5 Vout model) <b>267 mA typ.</b> (12 / -12 Vout model) <b>287 mA typ.</b> (15 / -15 Vout model) 12 Vin models: <b>126 mA typ.</b> (5 Vout model) <b>121 mA typ.</b> (12 Vout model) <b>123 mA typ.</b> (15 Vout model) <b>126 mA typ.</b> (5 / -5 Vout model) <b>108 mA typ.</b> (12 / -12 Vout model) <b>117 mA typ.</b> (15 / -15 Vout model)
Surge Voltage		5 Vin models: <b>9 VDC max.</b> (1 s max.) 12 Vin models: <b>29 VDC max.</b> (1 s max.)
Recommended Input Fuse		5 Vin models: <b>500 mA</b> (slow blow) 12 Vin models: <b>200 mA</b> (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		<b>Internal LC-Type</b>

### Output Specifications

Voltage Set Accuracy		<b>±3% max.</b>
Regulation (Unregulated)	- Input Variation (1% Vin step)	single output models: <b>1.5% max.</b> dual output models: <b>1.5% max.</b>
	- Load Variation - Voltage Balance (symmetrical load)	See application note: <a href="http://www.tracopower.com/tmv-en-cc">www.tracopower.com/tmv-en-cc</a> dual output models: <b>1% max.</b>
Ripple and Noise	- 20 MHz Bandwidth	<b>150 mVp-p max.</b> (To further reduce Ripple and Noise, a capacitor with 1.5 µF X7R is recommended.)
Capacitive Load	- single output	5 Vout models: <b>680 µF max.</b> 12 Vout models: <b>680 µF max.</b> 15 Vout models: <b>680 µF max.</b>
	- dual output	5 / -5 Vout models: <b>220 / 220 µF max.</b> 12 / -12 Vout models: <b>220 / 220 µF max.</b> 15 / -15 Vout models: <b>220 / 220 µF max.</b>
Minimum Load		See application note: <a href="http://www.tracopower.com/tmv-en-cc">www.tracopower.com/tmv-en-cc</a> (Operation at lower load will not damage the converter, but it may not meet all specifications)
Temperature Coefficient		<b>±0.02 %/K max.</b>
Start-up Time		<b>270 ms max.</b>
Short Circuit Protection		<b>Limited 0.5 s max., Automatic recovery</b>

### Safety Specifications

Standards	- IT / Multimedia Equipment	<b>EN 60950-1</b> <b>EN 62368-1</b> <b>IEC 60950-1</b> <b>IEC 62368-1</b> <b>UL 60950-1</b> <b>UL 62368-1</b>
	- Certification Documents	<a href="http://www.tracopower.com/tmv-en-safety-cert">www.tracopower.com/tmv-en-safety-cert</a>
Pollution Degree		<b>PD 2</b>
Over Voltage Category		<b>Not mains connected</b>

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

### EMC Specifications

EMI (Emissions)	- Conducted Emissions	EN 55032 class A (with external filter)
	- Radiated Emissions	EN 55032 class A (internal filter)

External filter proposal: [www.tracopower.com/tmv-en-emc-filter](http://www.tracopower.com/tmv-en-emc-filter)

### General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	-25°C to +85°C
	- Case Temperature	+105°C max.
	- Storage Temperature	-50°C to +125°C
Power Derating	- High Temperature	2.85 %/K above 70°C
		See application note: <a href="http://www.tracopower.com/tmv-en-cc">www.tracopower.com/tmv-en-cc</a>
Cooling System		Natural convection (20 LFM)
Altitude During Operation		5'000 m max.
Regulator Topology		Push-Pull Converter
Switching Frequency		50 - 100 kHz (PFM)
		80 kHz typ. (PFM)
Insulation System		Reinforced Insulation
Working Voltage (rated)		300 VAC
Isolation Test Voltage	- Input to Output, 60 s	3'000 VAC
Isolation Resistance	- Input to Output, 500 VDC	10'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	15 pF typ.
		20 pF max.
Distance Through Isolation		2 mm
Reliability	- Calculated MTBF	2'000'000 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)
Base Material		Non-conductive Plastic (UL 94 V-0 rated)
Potting Material		Silicone (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		SIP7
Soldering Profile		Lead-Free Wave Soldering
		260°C / 10 s max.
Weight		3.9 g
Thermal Impedance	- Case to Ambient	65.0 K/W typ.
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: 7(a) (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)
	- SCIP Reference Number	8abcc5bc-907a-45fc-8026-2239f71e59cc

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

### Additional Information

Supporting Documents

[www.tracopower.com/overview/tmv-en](http://www.tracopower.com/overview/tmv-en)

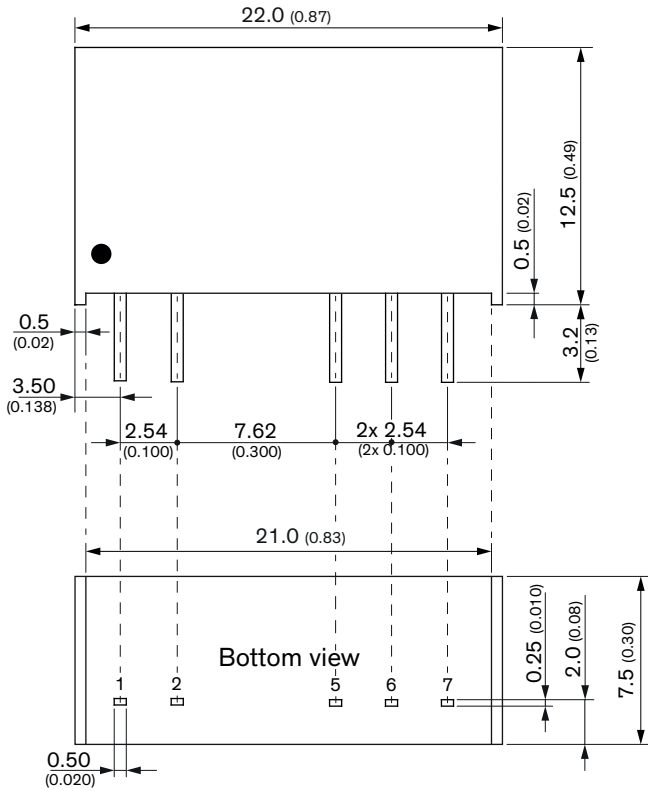
Frequently Asked Questions

[www.tracopower.com/glossary-faq](http://www.tracopower.com/glossary-faq)

Glossary

[www.tracopower.com/info/glossary.pdf](http://www.tracopower.com/info/glossary.pdf)

### Outline Dimensions



Pinout		
Pin	Single	Dual
1	+Vin (Vcc)	
2	-Vin (GND)	
5	-Vout	
6	No pin	Common
7	+Vout	

Dimensions in mm (inch)  
 Tolerance:  $x.x \pm 0.5$  ( $x.xx \pm 0.02$ )  
 $x.xx \pm 0.13$  ( $x.xxx \pm 0.005$ )  
 Pin tolerance:  $\pm 0.05$  ( $\pm 0.002$ )

