

#### Features

- ◆ Highest power density in SIP-8 metal package (optional plastic package)
- ◆ Wide 2:1 input voltage range
- ◆ Temperature range  $-40^{\circ}$  to  $+85^{\circ}\text{C}$
- ◆ High efficiency up to 89%
- ◆ Indefinite short-circuit protection
- ◆ I/O isolation 1600 VDC
- ◆ Remote On/Off control
- ◆ Fully RoHS compliant
- ◆ 3-year product warranty



The TMR-9 series is a new family of isolated 9W dc-dc converter modules with regulated output, featuring wide 2:1 input voltage ranges. The product comes in a ultra-compact SIP-8 metal package with a small footprint occupying only 2.0 cm<sup>2</sup> (0.3 square in.) of board space.

An excellent efficiency allows  $-40^{\circ}$  to  $+60^{\circ}\text{C}$  operation temperatures without derating. Further features include remote On/Off control and continuous short circuit protection. The very compact dimensions of these converters make them an ideal solution for many space critical applications in communication equipment, instrumentation and industrial electronics.

#### Models

Order code*	Input voltage range	Output voltage	Output current max.	Efficiency typ.
TMR 9-1210	9 – 18 VDC (12 VDC nominal)	3.3 VDC	2000 mA	81 %
TMR 9-1211		5 VDC	1600 mA	85 %
TMR 9-1219		9 VDC	1000 mA	87 %
TMR 9-1212		12 VDC	750 mA	88 %
TMR 9-1213		15 VDC	600 mA	89 %
TMR 9-1215		24 VDC	375 mA	89 %
TMR 9-1221		$\pm 5$ VDC	$\pm 800$ mA	85 %
TMR 9-1222		$\pm 12$ VDC	$\pm 375$ mA	88 %
TMR 9-1223		$\pm 15$ VDC	$\pm 300$ mA	89 %
TMR 9-2410	18 – 36 VDC (24 VDC nominal)	3.3 VDC	2000 mA	82 %
TMR 9-2411		5 VDC	1600 mA	85 %
TMR 9-2419		9 VDC	1000 mA	88 %
TMR 9-2412		12 VDC	750 mA	89 %
TMR 9-2413		15 VDC	600 mA	90 %
TMR 9-2415		24 VDC	375 mA	90 %
TMR 9-2421		$\pm 5$ VDC	$\pm 800$ mA	86 %
TMR 9-2422		$\pm 12$ VDC	$\pm 375$ mA	89 %
TMR 9-2423		$\pm 15$ VDC	$\pm 300$ mA	87 %
TMR 9-4810	36 – 75 VDC (48 VDC nominal)	3.3 VDC	2000 mA	82 %
TMR 9-4811		5 VDC	1600 mA	85 %
TMR 9-4819		9 VDC	1000 mA	88 %
TMR 9-4812		12 VDC	750 mA	89 %
TMR 9-4813		15 VDC	600 mA	89 %
TMR 9-4815		24 VDC	375 mA	89 %
TMR 9-4821		$\pm 5$ VDC	$\pm 800$ mA	86 %
TMR 9-4822		$\pm 12$ VDC	$\pm 375$ mA	87 %
TMR 9-4823		$\pm 15$ VDC	$\pm 300$ mA	87 %

\* Suffix -P for models with plastic casing

### Input Specifications

Input current at no load (nominal input voltage)	12 V models: 11 mA typ. 24 V models: 7 mA typ. 48 V models: 3 mA typ.
Surge voltage (1 sec. max.)	12 V models: 36 V max. 24 V models: 50 V max. 48 V models: 100 V max.
Conducted noise	EN 55022 class A internal filter
ESD (electrostatic discharge)	EN 61000-4-2, air $\pm 8$ kV, contact $\pm 6$ kV, perf. criteria A
Radiated immunity	EN 61000-4-3, 20 V/m, perf. criteria A
Fast transient / surge (with external input capacitor)	EN 61000-4-4, $\pm 2$ kV, perf. criteria A EN 61000-4-5, $\pm 2$ kV perf. criteria A
<ul style="list-style-type: none"> <li>- external input capacitor</li> <li>- external TVS</li> </ul>	all models: Nippon chemi-con KY 220 $\mu$ F, 100 V 12 & 24 V models: SMDJ70A, 70 V, 3000 W peak pulse power 48 V models: SMDJ120A, 120 V, 3000 W peak pulse power
Conducted immunity	EN 61000-4-6, 10 Vrms, perf. criteria A
PF Magnetic Field	EN 61000-4-8, 100 A/m, perf. criteria A

### Output Specifications

Voltage set accuracy	$\pm 1$ % max
Regulation	<ul style="list-style-type: none"> <li>- Input variation <math>V_{in}</math> min. to <math>V_{in}</math> max. 0.2 % max.</li> <li>- Load variation 0 – 100% single output models: 1.0 % max.</li> <li>- Load cross regulation 25/100% dual output models: 1.0 % max. balanced load</li> <li>5.0 % max. (dual output models)</li> </ul>
Minimum load	not required
Ripple and noise (20 MHz Bandwidth)	3.3, 5 & 9 VDC models: 50 mVp-p typ. with cap. 1 $\mu$ F/50V X7R MLCC 12, 15 & 24 VDC models: 75 mVp-p typ. with cap. 1 $\mu$ F/50V X7R MLCC
Temperature coefficient	$\pm 0.02$ %/K
Transient response setting time (25% load step change)	250 $\mu$ s typ.
Short circuit protection	continuous, automatic recovery
Current limitation	180 % of nom. I <sub>out</sub> typ. (hiccup)
Start up time	<ul style="list-style-type: none"> <li>- Power On 50 ms typ.</li> <li>- Remote On 50 ms typ.</li> </ul>
Capacitive load	3.3 VDC / 5 VDC output models: 2600 $\mu$ F max. / 1300 $\mu$ F max. 9 VDC output models: 800 $\mu$ F max. 12 VDC & 15 VDC output models: 560 $\mu$ F max. 24 VDC output models: 200 $\mu$ F max. $\pm 5$ VDC / $\pm 12$ VDC output models: $\pm 800$ $\mu$ F max. / $\pm 390$ $\mu$ F max. $\pm 15$ VDC output models: $\pm 200$ $\mu$ F max.

### General Specifications

Temperature ranges	<ul style="list-style-type: none"> <li>- Operating -40°C to +85°C</li> <li>- Case temperature +100°C max.</li> <li>- Storage -55°C to +125°C</li> </ul>
Load derating	3.3 VDC model: 2.0 %/K above 60°C (50°C for option -P) other models: 2.5 %/K above 70°C (60°C for option -P) - detailed thermal-consideration document <a href="http://www.tracopower.com/overview/tmr9">www.tracopower.com/overview/tmr9</a>
Thermal shock, mechanical shock & vibration	EN 61373, MIL-STD-810F <a href="http://www.tracopower.com/products/mil810.pdf">www.tracopower.com/products/mil810.pdf</a>
Humidity (non condensing)	5 – 95 % rel. H max.
Reliability, calculated MTBF (MIL-HDBK-217F)	>2.9 Mio h

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

