

### Features

- ◆ Wide 2:1 input voltage range
- ◆ Compact SIP-6 or SMD package
- ◆ Fully regulated outputs
- ◆ Cost optimised design
- ◆ No minimum load required
- ◆ Continuous short circuit protection
- ◆ Temperature range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- ◆ I/O isolation 1500 VDC
- ◆ Remote On/Off control (SMD)
- ◆ 3-year product warranty



The TMR-1 and TMR 1SM series are families of isolated 1 W dc-dc converter modules with regulated output, featuring wide 2:1 input voltage ranges. These products come in a compact SIP-6 or SMD package with small footprint occupying only 1.2 cm<sup>2</sup> (0.2 square inch) 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 (SMD-Version) and continuous short circuit protection. The compact dimensions and cost optimised design make this converters an ideal solution for applications in communication equipment, instrumentation and industrial electronics.

### Models

| Order code SIP-package | Order code SMD-package | Input voltage range              | Output voltage | Output current max. | Efficiency SIP typ. | Efficiency SMD typ. |
|------------------------|------------------------|----------------------------------|----------------|---------------------|---------------------|---------------------|
| TMR 1-0511             | TMR 1-0511SM           | 4.5 – 9.0 VDC<br>(5 VDC nominal) | 5.0 VDC        | 200 mA              | 76 %                | 78 %                |
| TMR 1-0512             | TMR 1-0512SM           |                                  | 12 VDC         | 83 mA               | 77 %                | 79 %                |
| TMR 1-0513             | TMR 1-0513SM           |                                  | 15 VDC         | 67 mA               | 79 %                | 81 %                |
| TMR 1-0515             |                        |                                  | 24 VDC         | 42 mA               | 76 %                |                     |
| TMR 1-0522             | TMR 1-0522SM           |                                  | $\pm 12$ VDC   | $\pm 42$ mA         | 77 %                | 79 %                |
| TMR 1-0523             | TMR 1-0523SM           |                                  | $\pm 15$ VDC   | $\pm 33$ mA         | 78 %                | 80 %                |
| TMR 1-1211             | TMR 1-1211SM           | 9.0 – 18 VDC<br>(12 VDC nominal) | 5.0 VDC        | 200 mA              | 77 %                | 79 %                |
| TMR 1-1212             | TMR 1-1212SM           |                                  | 12 VDC         | 83 mA               | 77 %                | 79 %                |
| TMR 1-1213             | TMR 1-1213SM           |                                  | 15 VDC         | 67 mA               | 80 %                | 82 %                |
| TMR 1-1215             |                        |                                  | 24 VDC         | 42 mA               | 77 %                |                     |
| TMR 1-1222             | TMR 1-1222SM           |                                  | $\pm 12$ VDC   | $\pm 42$ mA         | 79 %                | 81 %                |
| TMR 1-1223             | TMR 1-1223SM           |                                  | $\pm 15$ VDC   | $\pm 33$ mA         | 78 %                | 80 %                |
| TMR 1-2411             | TMR 1-2411SM           | 18 – 36 VDC<br>(24 VDC nominal)  | 5.0 VDC        | 200 mA              | 77 %                | 79 %                |
| TMR 1-2412             | TMR 1-2412SM           |                                  | 12 VDC         | 83 mA               | 80 %                | 82 %                |
| TMR 1-2413             | TMR 1-2413SM           |                                  | 15 VDC         | 67 mA               | 80 %                | 82 %                |
| TMR 1-2415             |                        |                                  | 24 VDC         | 42 mA               | 77 %                |                     |
| TMR 1-2422             | TMR 1-2422SM           |                                  | $\pm 12$ VDC   | $\pm 42$ mA         | 80 %                | 82 %                |
| TMR 1-2423             | TMR 1-2423SM           |                                  | $\pm 15$ VDC   | $\pm 33$ mA         | 80 %                | 82 %                |
| TMR 1-4811             | TMR 1-4811SM           | 36 – 75 VDC<br>(48 VDC nominal)  | 5.0 VDC        | 200 mA              | 77 %                | 79 %                |
| TMR 1-4812             | TMR 1-4812SM           |                                  | 12 VDC         | 83 mA               | 78 %                | 80 %                |
| TMR 1-4813             | TMR 1-4813SM           |                                  | 15 VDC         | 67 mA               | 78 %                | 80 %                |
| TMR 1-4815             |                        |                                  | 24 VDC         | 42 mA               | 76 %                |                     |
| TMR 1-4822             | TMR 1-4822SM           |                                  | $\pm 12$ VDC   | $\pm 42$ mA         | 79 %                | 81 %                |
| TMR 1-4823             | TMR 1-4823SM           |                                  | $\pm 15$ VDC   | $\pm 33$ mA         | 79 %                | 81 %                |

### Input Specifications

|  |   |
|--|---|
| Input current at no load (nominal input voltage) | 5.0 V models: 40 mA typ.<br>12 V models: 20 mA typ.<br>24 V models: 10 mA typ.<br>48 V models: 7 mA typ.  |
| Surge voltage (1 sec. max.)                      | 5.0 V models: 15 V max.<br>12 V models: 25 V max.<br>24 V models: 50 V max.<br>48 V models: 100 V max.  |
| Start-up voltage / under voltage lockout         | 5.0 V models: 4.5 VDC / 4 VDC or lower<br>12 V models: 9 VDC / 8.5 VDC or lower<br>24 V models: 18 VDC / 17 VDC or lower<br>48 V models: 36 VDC / 34 VDC or lower<br>long term operation at undervoltage will damage the converter! |
| Conducted noise (input)                          | EN 55022 level A, FCC part 15, level A with external capacitor. see EMC consideration   |
| Recommended input fuse (slow blow)               | 5 V models: 500 mA<br>12 V models: 250 mA<br>24 V models: 120 mA<br>48 V models: 60 mA  |

### Output Specifications

|  |  |
|--|--|
| Voltage set accuracy                                   | ±1 % max.  |
| Regulation   | – Input variation $V_{in \min.}$ to $V_{in \max.}$ : 0.2 % max.<br>– No load to full load Single & Dual output models: ±1.0 % max.<br>– Load variation 10 – 90% Single output models: ±0.5 % max.<br>Dual output models (balanced load): ±0.8 % max. |
| Minimum load   | no minimum load required   |
| Temperature coefficient                                | 0.02 %/K   |
| Ripple and noise (20 MHz bandwidth)                    | SMD models: 30 mVp-p max.<br>SIP models: 50 mVp-p max.   |
| Transient response setting time (25% load step change) | 250 µs typ. (PFM)  |
| Current limitation                                     | >120 % of $I_{out \max.}$  |
| Short circuit protection                               | continuous, automatic recovery   |
| Capacitive load  | 5 VDC models: 1'680 µF max.<br>12 VDC models: 820 µF max.<br>15 VDC models: 680 µF max.<br>24 VDC models: 470 µF max.<br>±12 VDC models: 470 µF max. (each output)<br>±15 VDC models: 330 µF max. (each output)                                      |

### General Specifications

|   |  |   |
|---|--|---|
| Temperature ranges  | – Operating<br>– Case temperature<br>– Storage | SIP models: –40°C to +85°C with no derating<br>SMD models: –40°C to +82°C with derating<br>+105°C (SIP) / +95°C (SMD) max.<br>–55°C to +125°C |
| Load derating   | SMD models: 7.2 %/K above +75°C                |   |
| Humidity (non condensing)   | 95 % rel. H max.                               |   |
| Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign) | >2.8 Mio h                                     |   |

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

**General Specifications**

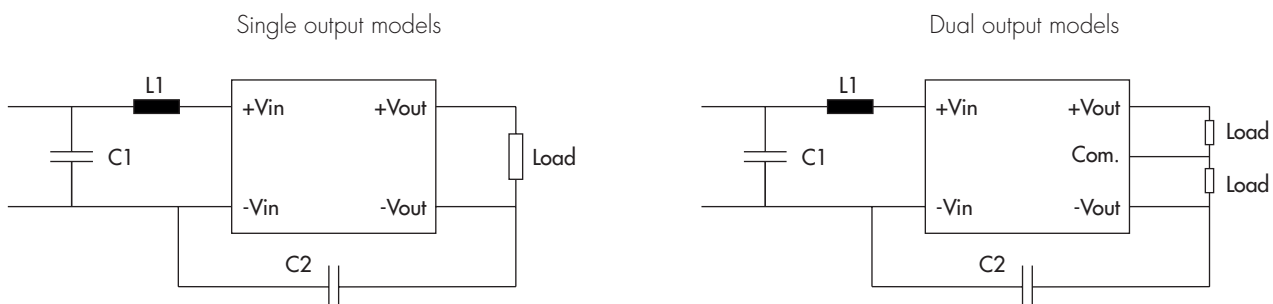
|                                 |   |  |
|---------------------------------|---|--|
| Isolation voltage (60 sec.)     | - Input/Output  | 1'500 VDC  |
| Isolation capacitance           | - Input/Output  | 50 pF max.   |
| Isolation resistance            | - Input/Output (500 VDC)  | >1 GOhm  |
| Switching frequency             |   | 220 kHz (PFM)  |
| Safety standards                |   | UL 60950-1, IEC/EN 60950-1<br>IEC 60950-1:2005 (2nd Edition); Am 1:2009<br>EN 60950-1:2006+A11:2009+A1:2010+A12:2011 |
| Safety approvals                | - CB test certificate (IEC 60950-1)                                       | <a href="http://www.tracopower.com/products/tmr1-cb.pdf">www.tracopower.com/products/tmr1-cb.pdf</a>                 |
| Remote On/Off (SMD models only) | - On:<br>- Off:<br>- Off standby current:<br>- Off control input current: | < 0.6 VDC or open circuit<br>2.7 to 15 VDC (ref. to -Vin)<br>2.5 mA max.<br>1 mA max.                                |

**Physical Specifications**

|  |                   |   |
|--|-------------------|---|
| Casing material  |                   | non-conductive plastic (UL94V-0 rated)  |
| Potting material                                       |                   | epoxy, (UL 94V-0 rated)   |
| Weight   |                   | 3.1 g (0.11oz) (SIP)/3.3 g (0.12oz) (SMD)   |
| Soldering profile for SIP-package models               |                   | max. 265°C / 10 sec. (wave soldering)   |
| Lead-free reflow solder process for SMD-package models |                   | as per J-STD-020D.01 (to find at:<br><a href="http://www.jedec.org">www.jedec.org</a> - free registration required)                                   |
| Moisture sensivity level (for SMD-package models)      |                   | level 2a as per J-STD-033B.01 (to find at:<br><a href="http://www.jedec.org">www.jedec.org</a> - free registration required)                          |
| Environmental compliance                               | - Reach<br>- RoHS | <a href="http://www.tracopower.com/products/reach-declaration.pdf">www.tracopower.com/products/reach-declaration.pdf</a><br>RoHS directive 2011/65/EU |

**EMC Consideration**

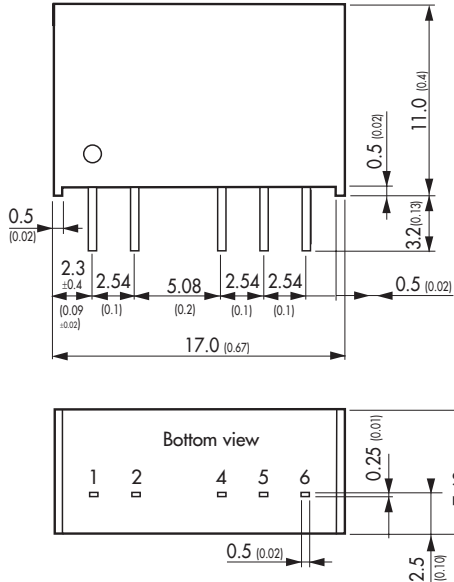
Filter suggestion for to comply with EN55022 class A conducted noise emission



| Input models | C1                   | C2                    | L1                    |
|--------------|----------------------|-----------------------|-----------------------|
| 5 VDC        | 4.7µF /50V, 1210 X7R | 220pF /2 kV, 1808 X7R | 4.7µH / 1.2 A, SR0302 |
| 12 VDC       | 4.7µF /50V, 1210 X7R |                       | 4.7µH / 1.2 A, SR0302 |
| 24 VDC SIP   | 4.7µF /50V, 1210 X7R |                       | 18µH / 0.58 A, SR0302 |
| 24 VDC SMD   | 4.7µF /50V, 1210 X7R |                       | 12µH / 0.75 A, SR0302 |
| 48 VDC SIP   | 4.7µF /100V 1210 X7R |                       | 18µH / 0.58A, SR0302  |
| 48 VDC SMD   | 2.2µF / 00V 1210 X7R |                       | 18µH / 0.58A, SR0302  |

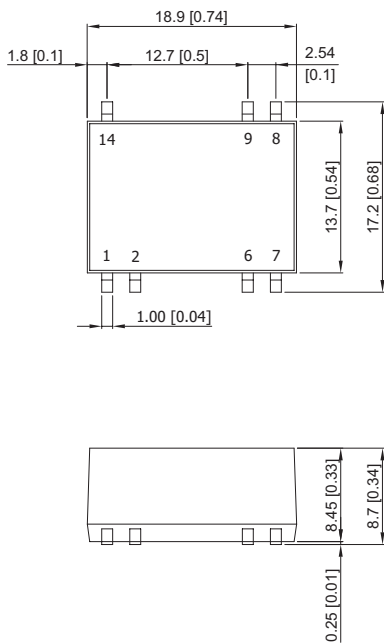
**Outline Dimensions mm (inches)**

**SIP-Package**



| Pinout |               |             |
|--------|---------------|-------------|
| Pin    | single output | dual output |
| 1      | -Vin (GND)    | -Vin (GND)  |
| 2      | +Vin (Vcc)    | +Vin (Vcc)  |
| 4      | +Vout         | +Vout       |
| 5      | No Pin        | Common      |
| 6      | -Vout         | -Vout       |

**SMD-Package**



| Pinout |               |               |
|--------|---------------|---------------|
| Pin    | single output | dual output   |
| 1      | -Vin (GND)    | -Vin (GND)    |
| 2      | Remote On/Off | Remote On/Off |
| 6      | ntc           | Common        |
| 7      | ntc           | -Vout         |
| 8      | +Vout         | +Vout         |
| 9      | -Vout         | Common        |
| 14     | +Vin          | +Vin          |

ntc = not to connect to electrical circuit

Dimensions in [mm], ( ) = Inch  
Tolerances:  $\pm 0.5$  ( $\pm 0.02$ )  
Pin pitch tolerances:  $\pm 0.25$  ( $\pm 0.01$ )



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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