

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°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 cm² (0.2 square inch) of board space.

An excellent efficiency allows -40°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 (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 | | ± 12 VDC | ± 42 mA | 77 % | 79 % |
| TMR 1-0523 | TMR 1-0523SM | | ± 15 VDC | ± 33 mA | 78 % | 80 % |
| TMR 1-1211 | TMR 1-1211SM | 9.0 – 18 VDC (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 | | ± 12 VDC | ± 42 mA | 79 % | 81 % |
| TMR 1-1223 | TMR 1-1223SM | | ± 15 VDC | ± 33 mA | 78 % | 80 % |
| TMR 1-2411 | TMR 1-2411SM | 18 – 36 VDC (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 | | ± 12 VDC | ± 42 mA | 80 % | 82 % |
| TMR 1-2423 | TMR 1-2423SM | | ± 15 VDC | ± 33 mA | 80 % | 82 % |
| TMR 1-4811 | TMR 1-4811SM | 36 – 75 VDC (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 | | ± 12 VDC | ± 42 mA | 79 % | 81 % |
| TMR 1-4823 | TMR 1-4823SM | | ± 15 VDC | ± 33 mA | 79 % | 81 % |

Input Specifications

| | |
|--|---|
| Input current at no load (nominal input voltage) | 5.0 V models: 40 mA typ. 12 V models: 20 mA typ. 24 V models: 10 mA typ. 48 V models: 7 mA typ. |
| Surge voltage (1 sec. max.) | 5.0 V models: 15 V max. 12 V models: 25 V max. 24 V models: 50 V max. 48 V models: 100 V max. |
| Start-up voltage / under voltage lockout | 5.0 V models: 4.5 VDC / 4 VDC or lower 12 V models: 9 VDC / 8.5 VDC or lower 24 V models: 18 VDC / 17 VDC or lower 48 V models: 36 VDC / 34 VDC or lower 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 12 V models: 250 mA 24 V models: 120 mA 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. – No load to full load Single & Dual output models: ±1.0 % max. – Load variation 10 – 90% Single output models: ±0.5 % max. Dual output models: ±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. SIP models: 50 mVp-p max. |
| Transient response setting time (25% load step change) | 250 µs typ. (PFM) |
| Transient response deviation | ±5 % max. |
| Current limitation | >120 % of $I_{out\ max.}$ |
| Over load protection (Foldback) | 130 % |
| Short circuit protection | continuous, automatic recovery |
| Capacitive load | 5 VDC models: 1'680 µF max. 12 VDC models: 820 µF max. 15 VDC models: 680 µF max. 24 VDC models: 470 µF max. ±12 VDC models: 470 µF max. (each output) ±15 VDC models: 330 µF max. (each output) |

General Specifications

| | |
|---|--|
| Temperature ranges | – Operating SIP models: –40°C to +85°C with no derating SMD models: –40°C to +82°C with derating – Case temperature +105°C (SIP) / +95°C (SMD) max. – Storage –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

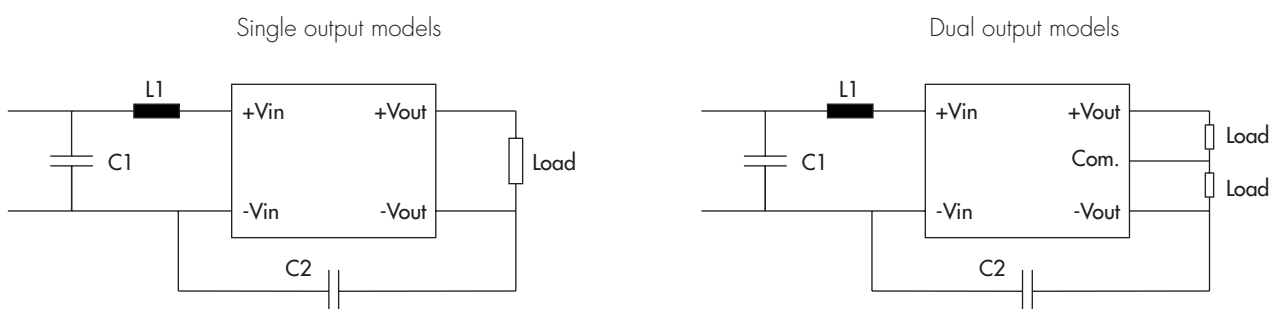
| | | |
|------------------------------------|---|---|
| Isolation voltage (60 sec.) | - Input/Output | 1'500 VDC |
| Isolation capacitance | - Input/Output | 50 pF max. |
| Isolation resistance | - Input/Output (500 VDC) | >1 GOhm |
| Switching frequency | | 220 kHz (PFM) |
| Safety standards | | CAN/CSA-C22.2 No 60950-1-07 Incl. AM1 (2011) ANSI/UL Std No 60950-1, 2nd Ed. Incl. AM1 (2011) IEC 60950-1:2005 (2nd Edition); +A1:2009 EN 60950-1:2006+A11:2009+A1:2010+A12:2011 www.tracopower.com/overview/tmr1 |
| | - Certification documents | |
| Remote On/Off (SMD models only) | - On: - Off: - Off standby current: - Off control input current: | < 0.6 VDC or open circuit 2.7 to 15 VDC (ref. to -Vin) 2.5 mA max. 1 mA max. |

Physical Specifications

| | | |
|--|-------------------|--|
| Casing material | | non-conductive plastic (UL94V-0 rated) |
| Potting material (for SIP-package models) | | 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: www.jedec.org - free registration required) |
| Washing Process (for SMD-package) | | not recommended. Product non-hermetical. |
| Moisture sensivity level (for SMD-package models) | | level 2a as per J-STD-033B.01 (to find at: www.jedec.org - free registration required) |
| Environmental compliance | - Reach - RoHS | www.tracopower.com/overview/tmr1 RoHS directive 2011/65/EU |

EMC Consideration

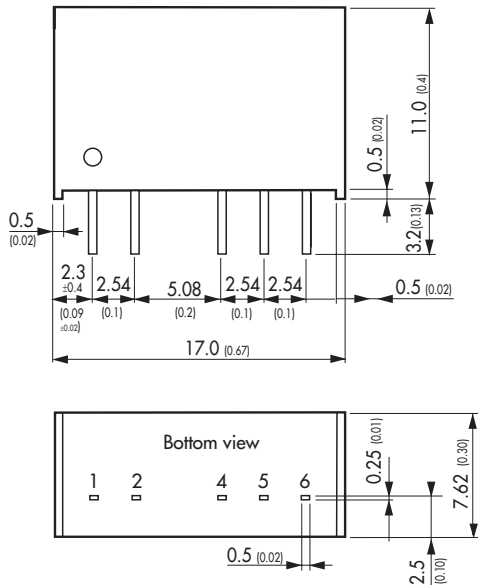
Filter suggestion for to comply with EN55022 class A conducted noise emission



| 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 |

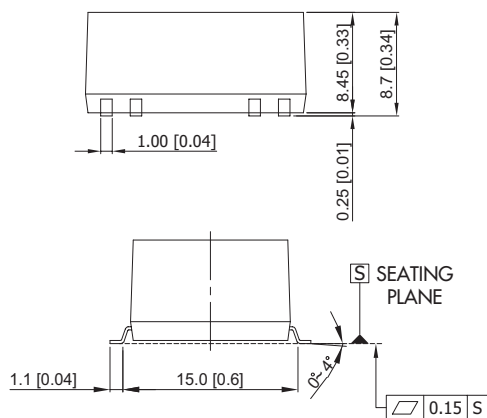
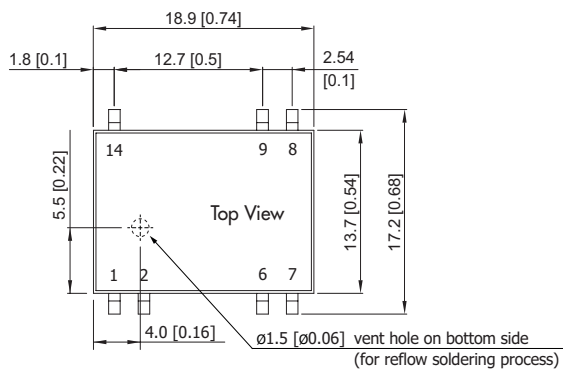
Outline Dimensions mm (inches)

SIP-Package

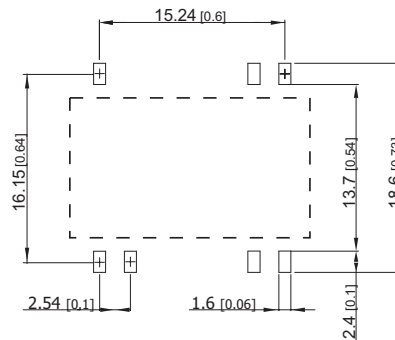


| Pinout | | |
|--------|---------------|-------------|
| Pin | single output | dual output |
| 1 | -Vin (GND) | -Vin (GND) |
| 2 | +Vin (Vcc) | +Vin (Vcc) |
| 4 | +Vout | +Vout |
| 5 | No Pin | Common |
| 6 | -Vout | -Vout |

SMD-Package



Solder Pad Dimensions



| 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: ± 0.5 (± 0.02)
Pin pitch tolerances: ± 0.25 (± 0.01)

Specifications can be changed without notice! Make sure you are using the latest documentation, downloadable at www.tracopower.com