

- Compact SMD-16-package
- I/O isolation 5000 VACrms rated for 250 VACrms working voltage
- Certification according to IEC/EN/ES 60601-1 3rd edition for 2×MOPP and operation to 5000 m altitude
- Low leakage current < 2 µA for BF-applications
- Extended operating temperature range -40°C to 90°C.
- EMC compliance to IEC 60601-1-2 4th edition and EN55032 class A
- 5-year product warranty



The TIM 3.5SM series is a range of 3.5 Watt DC/DC converters in compact SMD package and with reinforced isolation of 5000 VACrms for medical applications. With a low leakage current of less than 2 µA the converters are predestined to insulate electrical equipment from the applied parts to patient (BF classification). The models are approved to IEC/EN/ES 60601-1 3rd edition for 2×MOPP up to an altitude of 5000m and come along with an ISO 14971 risk management file.

| Models | | | | |
|----------------|----------------------------------|----------------|---------------------|-----------------|
| Order code | Input voltage range | Output voltage | Output current max. | Efficiency typ. |
| TIM 3.5-0911SM | 4.5 – 12 VDC (9 VDC nominal) | 5.0 VDC | 700 mA | 77 % |
| TIM 3.5-0919SM | | 9.0 VDC | 389 mA | 78 % |
| TIM 3.5-0912SM | | 12 VDC | 292 mA | 81 % |
| TIM 3.5-0913SM | | 15 VDC | 234 mA | 81 % |
| TIM 3.5-0915SM | | 24 VDC | 146 mA | 81 % |
| TIM 3.5-0922SM | | ±12 VDC | ±146 mA | 81 % |
| TIM 3.5-0923SM | | ±15 VDC | ±117 mA | 81 % |
| TIM 3.5-1211SM | 9.0 – 18 VDC (12 VDC nominal) | 5.0 VDC | 700 mA | 79 % |
| TIM 3.5-1219SM | | 9.0 VDC | 389 mA | 80 % |
| TIM 3.5-1212SM | | 12 VDC | 292 mA | 82 % |
| TIM 3.5-1213SM | | 15 VDC | 234 mA | 82 % |
| TIM 3.5-1215SM | | 24 VDC | 146 mA | 82 % |
| TIM 3.5-1222SM | | ±12 VDC | ±146 mA | 82 % |
| TIM 3.5-1223SM | | ±15 VDC | ±117 mA | 82 % |
| TIM 3.5-2411SM | 18 – 36 VDC (24 VDC nominal) | 5.0 VDC | 700 mA | 79 % |
| TIM 3.5-2419SM | | 9.0 VDC | 389 mA | 80 % |
| TIM 3.5-2412SM | | 12 VDC | 292 mA | 82 % |
| TIM 3.5-2413SM | | 15 VDC | 234 mA | 83 % |
| TIM 3.5-2415SM | | 24 VDC | 146 mA | 82 % |
| TIM 3.5-2422SM | | ±12 VDC | ±146 mA | 82 % |
| TIM 3.5-2423SM | | ±15 VDC | ±117 mA | 83 % |
| TIM 3.5-4811SM | 36 – 75 VDC (48 VDC nominal) | 5.0 VDC | 700 mA | 79 % |
| TIM 3.5-4819SM | | 9.0 VDC | 389 mA | 80 % |
| TIM 3.5-4812SM | | 12 VDC | 292 mA | 81 % |
| TIM 3.5-4813SM | | 15 VDC | 234 mA | 82 % |
| TIM 3.5-4815SM | | 24 VDC | 146 mA | 81 % |
| TIM 3.5-4822SM | | ±12 VDC | ±146 mA | 81 % |
| TIM 3.5-4823SM | | ±15 VDC | ±117 mA | 82 % |

Input Specifications

| | |
|------------------------------|---|
| Input current no load | 9 Vin models: 90 mA typ. 12 Vin models: 50 mA typ. 24 Vin models: 30 mA typ. 48 Vin models: 13 mA typ. |
| Surge voltage (1 s max.) | 9 Vin models: 15 V max. 12 Vin models: 25 V max. 24 Vin models: 50 V max. 48 Vin models: 100 V max. |
| Start-up voltage | 9 Vin models: 4.5 VDC (or lower) 12 Vin models: 9.0 VDC (or lower) 24 Vin models: 18 VDC (or lower) 48 Vin models: 36 VDC (or lower) |
| Startup time | 10 ms typ. / 20 ms max. |
| Under voltage shut down | 9 Vin models: 2 - 4 VDC 12 Vin models: 6 - 8 VDC 24 Vin models: 13 - 17 VDC 48 Vin models: 29 - 35 VDC |
| Input filter | capacitor type |
| Conducted noise | – Conducted & Radiated input suppression – Application note for filter class A/B proposal EN 55011 limits to IEC/EN 60601-1-2 4th edit. EN 55032 class A or B with external components www.tracopower.com/overview/tim3sm |
| EMC immunity | – Generic for Medical equipment – ESD (electrostatic discharge) – Radiated immunity – Fast transient / surge (with external input capacitor / diode) – Conducted immunity – Magnetic field immunity IEC/EN 60601-1-2 4th edition EN 61000-4-2, air ± 15 kV, contact ± 8 kV, perf. criteria A EN 61000-4-3, 10 V/m, perf. criteria A EN 61000-4-4, ± 2 kV, perf. criteria A EN 61000-4-5, ± 1 kV perf. criteria A 9 Vin models: Nippon chemi-con KY 1000 μ F / 25 V TVS - SMAJ18A, 18 V, 400 W 12 & 24 Vin models: Nippon chemi-con KY 470 μ F / 50 V 48 Vin models: Nippon chemi-con KY 220 μ F / 100 V EN 61000-4-6, 10 Vrms, perf. criteria A EN 61000-4-8 100 A/m, continuous, perf. criteria A 1000 A/m, 1 sec., perf. criteria A |
| External input fuse required | 9 Vin models: 1.6 A (slow blow) 12 Vin models: 0.8 A (slow blow) 24 Vin models: 0.5 A (slow blow) 48 Vin models: 0.315 A (slow blow) |

Output Specifications

| | |
|---|--|
| Voltage set accuracy | ± 1 % max. |
| Regulation | – Input variation (Vin min. to Vin max.) 0.2% max. – Load variation (0 – 100 %) 1% max. – Load variation (10 – 90 %) single output: 0.5% max. dual output: 0.8% max. – Cross regulation dual output: 5.0% max. (asymmetrical load 25 / 100%) |
| Minimum load | not required |
| Ripple and noise (20 MHz Bandwidth) | 5 - 15 Vout models: 50 mVp-p typ. 24, ± 12 & ± 15 Vout models: 75 mVp-p typ. |
| Transient response (25% load step change) | – Recovery time 500 μ s typ. |
| Short circuit protection | Continuous, automatic recovery |

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

General Specifications

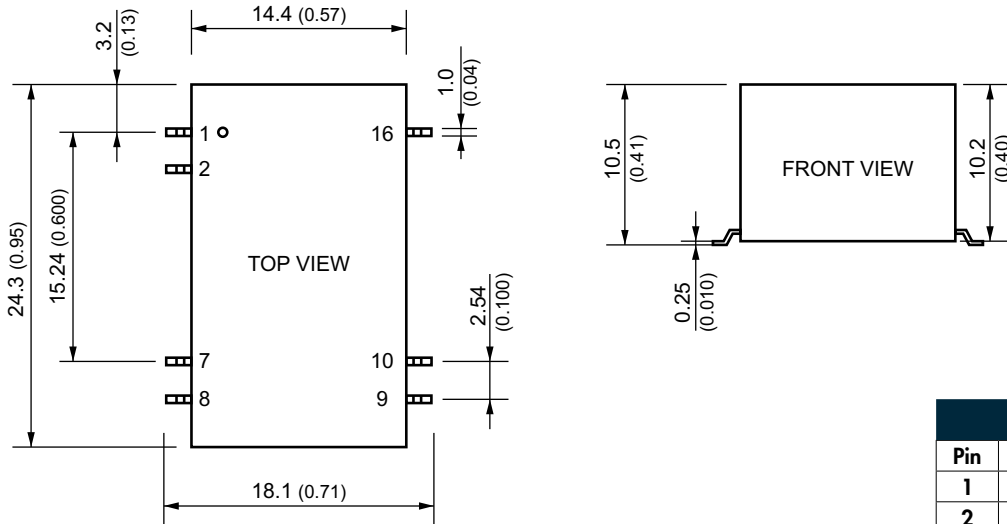
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|--|--|--|
| Overvoltage protection | | 5.0 VDC models: 6 - 8 VDC 9.0 VDC models: 10 - 14 VDC 12 VDC models: 13 - 19 VDC 15 VDC models: 16 - 22 VDC 24 VDC models: 25 - 35 VDC |
| Capacitive load | – Single output | 5.0 VDC models: 1'470 µF max. 9.0 VDC models: 680 µF max. 12 VDC models: 470 µF max. 15 VDC models: 330 µF max. 24 VDC models: 170 µF max. |
| | – Dual output | ±12 VDC models: 220 µF max. (each output) ±15 VDC models: 160 µF max. (each output) |
| Temperature ranges | – Operating (natural convection: 20 LFM, 0.1 m/s) – Case temperature – Storage temperature | –40°C to +90°C +105°C max. –55°C to +125°C |
| Derating | | 3.3 %/K above 75°C |
| Humidity (non condensing) | | 5 % to 95 % rel H max. |
| Moisture sensitivity level (MSL) | | IPC J-STD-033C Level 2 |
| Isolation voltage (50 Hz, 60 s) | | 5000 VAC (reinforced insulation) |
| Working voltage | | 250 VAC, 2 × MOPP |
| Isolation capacitance | | 20 pF max. |
| Clearance/creepage | | 8 mm min. |
| Leakage current (at 240 VAC, 60 Hz) | | 2 µA max. |
| Altitude during operation | | 5000 m max. |
| Temperature coefficient | | ±0.02 %/K max. |
| Reliability, calculated MTBF (MIL-HDBK-217F at +25°C, ground benign) | | 5'041'000 h |
| Switching frequency | | 100 kHz min. (frequency modulated) |
| Shock, vibration and thermal shock resistance | | according to MIL-STD-810F |
| Remote On/Off | – On: – Off: – Off idle current: | open circuit or high impedance 2 – 4 mA current applied via 1kOhm resistor 2.5 mA typ. |
| Safety standards/approvals | – Medical equipment – Certification documents | ANSI/AAMI ES60601-1:2005/(R)2012, IEC/EN60601-1 3rd edition www.tracopower.com/overview/tim3sm |
| Environmental compliance | – Reach – RoHS | www.tracopower.com/info/reach-declaration.pdf RoHS directive 2011/65/EU |

Physical Specifications

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|---------------------------------|------------------------------|
| Casing material | non-conductive black plastic |
| Base material | non-conductive black plastic |
| Potting material | silicone (UL94 V-0) |
| Package weight | 7.0 g (0.24 oz) |
| Lead-free reflow solder process | IPC J-STD-020E |

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

Outline Dimensions



Dimensions in mm (inch)
 Tolerances ± 0.5 (± 0.02)
 Pin dimension 0.5 ± 0.1 (0.02 ± 0.004)
 Pin pitch tolerances ± 0.25 (± 0.01)

| Standard Pinout | | |
|-----------------|------------|------------|
| Pin | Single | Dual |
| 1 | -Vin (GND) | -Vin (GND) |
| 2 | On/Off | On/Off |
| 7 | NC | NC |
| 8 | NC | Common |
| 9 | +Vout | +Vout |
| 10 | -Vout | -Vout |
| 16 | +Vin (Vcc) | +Vin (Vcc) |