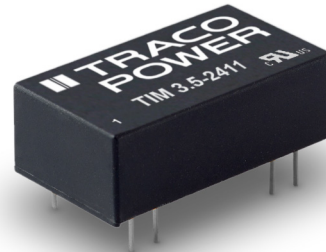


- Wide 2:1 input voltage
- I/O isolation 5000 VACrms rated for 250 VACrms working voltage
- 2 × MOPP Medical safety according to AAMI/ANSI ES 60601-1:2005(R) and IEC/EN 60601-1 3rd edition
- Low leakage current
- High efficiency up to 82%
- Extended operating temperature range
- 3-year product warranty



The TIM 3.5 series is a range of high performance, regulated 3.5 Watt DC/DC converters in a DIP-16 plastic package. The reinforced I/O-isolation system complies with the medical safety requirements for MOPP (Means Of Patient Protection). The converters constitute also a reliable solution for many demanding applications such as transportation systems, industrial control equipments, measurement equipments, and some IGBT driver applications.

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

Input Specifications

| | |
|--|--|
| Input current no load | 9 Vin models: 90 mA max. 12 Vin models: 50 mA max. 24 Vin models: 30 mA max. 48 Vin models: 13 mA max. |
| Surge voltage (3 sec. 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 | 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 EN 55011 limits to IEC 60601-1-2 4th edition EN55032 class A, B with external components |
| EMC immunity | – Generic for Medical equipment – ESD (electrostatic discharge) – Radiated immunity – Fast transient / surge (with external input capacitor / diode) – Conducted immunity – Magnetic field immunity 9 Vin models: Nippon chemi-con KY 1000 µF/ 25 V TVS - SMAJ18A, 18V, 4000 W 12 & 24 Vin models: Nippon chemi-con KY 470 µF/ 50 V 48 Vin models: Nippon chemi-con KY 220 µF/ 100 V 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 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 (recommended values, slow blow type) | 9 Vin models: 1.6 A 12 Vin models: 0.8 A 24 Vin models: 0.5 A 48 Vin models: 0.315 A |

Output Specifications

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

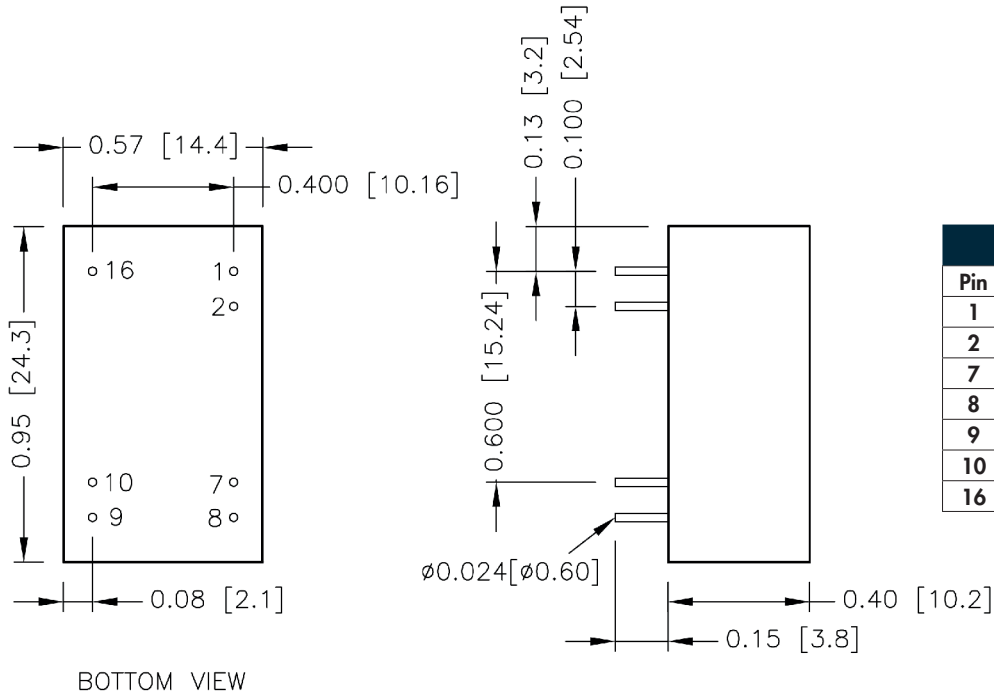
| | | |
|--|--|--|
| Overvoltage protection | | 5.0 VDC models: 6 - 8 VDC 9.0 VDC models: 10 - 14 VDC 12 VDC models: 13 - 19 VDC 15 VDC models: 16 - 22 VDC 24 VDC models: 25 - 35 VDC |
| Capacitive load | -Single output | 5.0 VDC models: 1'470 µF max. 9.0 VDC models: 680 µF max. 12 VDC models: 470 µF 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 - Case temperature - Storage temperature | -40°C to +105°C (with derating) +105°C max. -55°C to +125°C |
| Derating | | 3.3 %/K above 75°C |
| Humidity (non condensing) | | 5 % to 95 % rel H max. |
| Isolation voltage (50Hz, 60sec) | - to meet ES/IEC/EN 60601-1 | 5000 VACrms, rated for 250 VACrms working voltage, 2 × MOPP |
| Isolation capacitance | | 20 pF max. |
| Clearance/creepage | | 8 mm min. |
| Leakage current (at 240VAC, 60Hz) | | 2 µF max. |
| Altitude during operation | | 5000 m |
| Temperature coefficient | | ±0.02 %/K typ. |
| Reliability, calculated MTBF (MIL-HDBK-217F at +25°C, ground benign) | | 5'000'000 h |
| Switching frequency | | 100 kHz min. |
| Vibration and thermal shock resistance | | according to MIL-STD-810F |
| Remote On/Off | -On: | open circuit or high impedance |
| | -Off: | 2 - 4 mA current applied via 1kOhm resistor |
| | -Off idle current: | 2.5 mA |
| Safety standards/approvals | - Medical equipment | ANSI/AAMI ES60601-1:2005/(R)2012, IEC/EN60601-1 3rd edition |
| | - Certification documents | tbd |
| Environmental compliance | - Reach - RoHS | www.tracopower.com/products/reach-declaration.pdf RoHS directive 2011/65/EU |

Physical Specifications

| | |
|-----------------------|------------------------------|
| 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) |
| Soldering temperature | max. 265°C / 10 sec |

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

Outline Dimensions



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

Dimensions in [mm], () = Inch
 Tolerances ±0.5 (±0.02)
 Pin \varnothing 0.6 ±0.1 (0.024 ±0.004)
 Pin pitch tolerances ±0.25 (±0.01)