

- Compact SMD-16-package
- I/O isolation 5000 VAC rated for 250 VAC working voltage
- Certification according to IEC/EN/ES 60601-1 3rd edition for 2xMOPP and operation up to 5000 m altitude
- Low leakage current < 2 μ A
- Extended operating temperature range -40°C to 95°C.
- 5-year product warranty



ES 60601-1 IEC 60601-1
UL 62368-1 IEC 62368-1

The TIM 2SM series is a range of 2 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 μ A 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 2xMOPP up to an altitude of 5000m and come along with an ISO 14971 risk management file.

| Models | | | | | | |
|--------------|------------------------------|----------|------------------|----------|------------------|-----------------|
| Order Code | Input Voltage Range | Output 1 | | Output 2 | | Efficiency typ. |
| | | Vnom | I _{max} | Vnom | I _{max} | |
| TIM 2-0910SM | 4.5 - 12 VDC (9 VDC nom.) | 3.3 VDC | 600 mA | | | 75 % |
| TIM 2-0911SM | | 5 VDC | 400 mA | | | 78 % |
| TIM 2-0919SM | | 9 VDC | 222 mA | | | 78 % |
| TIM 2-0912SM | | 12 VDC | 167 mA | | | 82 % |
| TIM 2-0913SM | | 15 VDC | 134 mA | | | 82 % |
| TIM 2-0915SM | | 24 VDC | 83 mA | | | 82 % |
| TIM 2-0922SM | | +12 VDC | 83 mA | -12 VDC | 83 mA | 82 % |
| TIM 2-0923SM | | +15 VDC | 67 mA | -15 VDC | 67 mA | 80 % |
| TIM 2-1210SM | 9 - 18 VDC (12 VDC nom.) | 3.3 VDC | 600 mA | | | 76 % |
| TIM 2-1211SM | | 5 VDC | 400 mA | | | 78 % |
| TIM 2-1219SM | | 9 VDC | 222 mA | | | 79 % |
| TIM 2-1212SM | | 12 VDC | 167 mA | | | 82 % |
| TIM 2-1213SM | | 15 VDC | 134 mA | | | 82 % |
| TIM 2-1215SM | | 24 VDC | 83 mA | | | 81 % |
| TIM 2-1222SM | | +12 VDC | 83 mA | -12 VDC | 83 mA | 81 % |
| TIM 2-1223SM | | +15 VDC | 67 mA | -15 VDC | 67 mA | 81 % |
| TIM 2-2410SM | 18 - 36 VDC (24 VDC nom.) | 3.3 VDC | 600 mA | | | 76 % |
| TIM 2-2411SM | | 5 VDC | 400 mA | | | 79 % |
| TIM 2-2419SM | | 9 VDC | 222 mA | | | 80 % |
| TIM 2-2412SM | | 12 VDC | 167 mA | | | 81 % |
| TIM 2-2413SM | | 15 VDC | 134 mA | | | 81 % |
| TIM 2-2415SM | | 24 VDC | 83 mA | | | 81 % |
| TIM 2-2422SM | | +12 VDC | 83 mA | -12 VDC | 83 mA | 81 % |
| TIM 2-2423SM | | +15 VDC | 67 mA | -15 VDC | 67 mA | 81 % |
| TIM 2-4810SM | 36 - 75 VDC (48 VDC nom.) | 3.3 VDC | 600 mA | | | 76 % |
| TIM 2-4811SM | | 5 VDC | 400 mA | | | 78 % |
| TIM 2-4819SM | | 9 VDC | 222 mA | | | 79 % |
| TIM 2-4812SM | | 12 VDC | 167 mA | | | 80 % |
| TIM 2-4813SM | | 15 VDC | 134 mA | | | 82 % |
| TIM 2-4815SM | | 24 VDC | 83 mA | | | 81 % |
| TIM 2-4822SM | | +12 VDC | 83 mA | -12 VDC | 83 mA | 81 % |
| TIM 2-4823SM | | +15 VDC | 67 mA | -15 VDC | 67 mA | 81 % |

Input Specifications

| | | |
|------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input Current | - At no load | 9 Vin models: 80 mA typ. 12 Vin models: 40 mA typ. 24 Vin models: 25 mA typ. 48 Vin models: 12 mA typ. |
| Surge Voltage | | 9 Vin models: 15 VDC max. (1 s max.) 12 Vin models: 25 VDC max. (1 s max.) 24 Vin models: 50 VDC max. (1 s max.) 48 Vin models: 100 VDC max. (1 s max.) |
| Under Voltage Lockout | | 9 Vin models: 2 VDC min. / 3 VDC typ. / 4 VDC max. 12 Vin models: 6 VDC min. / 7 VDC typ. / 8 VDC max. 24 Vin models: 13 VDC min. / 15 VDC typ. / 17 VDC max. 48 Vin models: 29 VDC min. / 32 VDC typ. / 35 VDC max. |
| Recommended Input Fuse | | 9 Vin models: 1'000 mA (slow blow) 12 Vin models: 500 mA (slow blow) 24 Vin models: 315 mA (slow blow) 48 Vin models: 160 mA (slow blow) (The need of an external fuse has to be assessed in the final application.) |
| Input Filter | | Internal Capacitor |

Output Specifications

| | | |
|--------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Voltage Set Accuracy | | ±1% max. |
| Regulation | - Input Variation (Vmin - Vmax) | single output models: 0.2% max. dual output models: 0.2% max. |
| | - Load Variation (10 - 90%) | single output models: 0.5% max. dual output models: 0.8% max. (Output 1) 0.8% max. (Output 2) |
| | - Cross Regulation (25% / 100% asym. load) | dual output models: 5% max. |
| Ripple and Noise | - 20 MHz Bandwidth | 50 mVp-p typ. |
| Capacitive Load | - single output | 3.3 Vout models: 1'000 µF max. 5 Vout models: 1'000 µF max. 9 Vout models: 430 µF max. 12 Vout models: 220 µF max. 15 Vout models: 170 µF max. 24 Vout models: 100 µF max. |
| | - dual output | 12 / -12 Vout models: 170 / 170 µF max. 15 / -15 Vout models: 100 / 100 µF max. |
| Minimum Load | | Not required |
| Temperature Coefficient | | ±0.02 %/K max. |
| Start-up Time | | 10 ms typ. / 20 ms max. |
| Short Circuit Protection | | Continuous, Automatic recovery |
| Overload Protection | | Foldback Mode |
| Overvoltage Protection | | 104 - 197% of Vout nom. (depending on model) 4 - 6.5 VDC (3.3 Vout models) 6 - 8 VDC (5 Vout models) 10 - 14 VDC (9 Vout models) 13 - 19 VDC (12 Vout models) 16 - 22 VDC (15 Vout models) 25 - 35 VDC (24 Vout models) |
| Transient Response | - Response Time | 500 µs typ. (25% Load Step) |

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

Safety Specifications

| | | |
|------------------|-----------------------------|---------------------------------------------------------------------------------------------|
| Standards | - IT / Multimedia Equipment | EN 62368-1 IEC 62368-1 UL 62368-1 |
| | - Medical Equipment | EN 60601-1 IEC 60601-1 ANSI/AAMI ES 60601-1 2 x MOPP (Means Of Patient Protection) |
| | - Certification Documents | www.tracopower.com/overview/tim2sm |
| Pollution Degree | | PD 2 |

EMC Specifications

| | | |
|---------------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EMI Emissions | - Conducted Emissions | EN 60601-1-2 edition 4 (Medical Devices) EN 55011 class B (with external filter) EN 55032 class B (with external filter) FCC Part 18 class B (with external filter) |
| | - Radiated Emissions | EN 55011 class B (with external filter) EN 55032 class B (with external filter) FCC Part 18 class B (with external filter) |
| | | External filter proposal: www.tracopower.com/overview/tim2sm |
| EMS Immunity | - Electrostatic Discharge | EN 60601-1-2 edition 4 (Medical Devices) Air: EN 61000-4-2, ± 15 kV, perf. criteria A Contact: EN 61000-4-2, ± 8 kV, perf. criteria A |
| | - RF Electromagnetic Field | EN 61000-4-3, 10 V/m, perf. criteria A |
| | - EFT (Burst) / Surge | EN 61000-4-4, ± 2 kV, perf. criteria A EN 61000-4-5, ± 1 kV, perf. criteria A |
| | | Ext. input component: 9 Vin models: KY 1000 μ F TVS SMDJ18A 12 Vin models: KY 470 μ F 24 Vin models: KY 470 μ F 48 Vin models: KY 220 μ F |
| | - Conducted RF Disturbances | EN 61000-4-6, 10 Vrms, perf. criteria A |
| | - PF Magnetic Field | Continuous: EN 61000-4-8, 100 A/m, perf. criteria A 1 s: EN 61000-4-8, 1000 A/m, perf. criteria A |

General Specifications

| | | |
|---------------------------|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Relative Humidity | | 95% max. (non condensing) |
| Temperature Ranges | - Operating Temperature | -40°C to +95°C |
| | - Case Temperature | +105°C max. |
| | - Storage Temperature | -55°C to +125°C |
| Power Derating | - High Temperature | 6.67 %/K above 90°C |
| | | See application note: www.tracopower.com/overview/tim2sm |
| Cooling System | | Natural convection (20 LFM) |
| Remote Control | - Current Controlled Remote (passive = on) | On: open circuit Off: 2 to 4 mA current (internal 1 k Ω resistor) Refers to 'Remote' and '-Vin' Pin |
| | - Off Idle Input Current | External circuit proposal: www.tracopower.com/info/current-remote.pdf 2.5 mA typ. |
| Altitude During Operation | | 5'000 m max. |
| Regulator Topology | | Flyback Converter, RCC Converter |
| Switching Frequency | | 100 kHz min. (RCC) |
| Insulation System | | Reinforced Insulation |
| Working Voltage (rated) | | 250 VAC |
| Isolation Test Voltage | - Input to Output, 60 s | 5'000 VAC |
| Creepage | - Input to Output | 8 mm min. |
| Clearance | - Input to Output | 8 mm min. |
| Isolation Resistance | - Input to Output, 500 VDC | 10'000 M Ω min. |

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

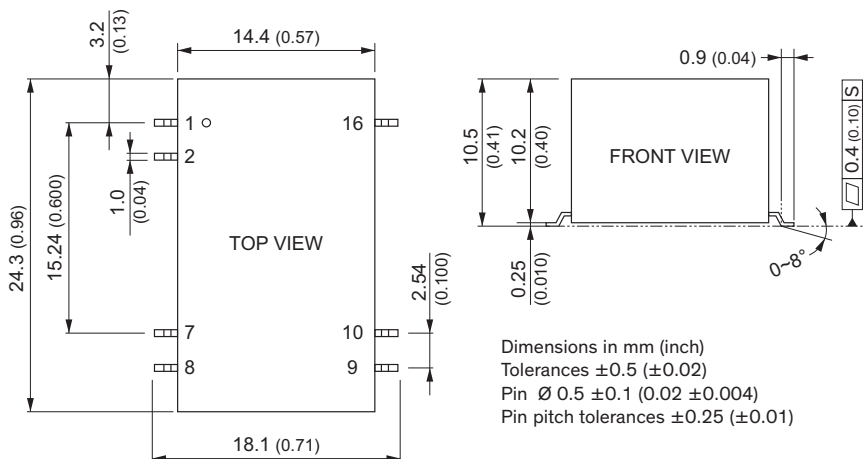
| | | |
|----------------------------|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Isolation Capacitance | - Input to Output, 100 kHz, 1 V | 16 pF typ. 20 pF max. |
| Leakage Current | - Touch Current | 2 μ A max. (at 240 VAC / 60 Hz) |
| Reliability | - Calculated MTBF | 6'809'000 h (MIL-HDBK-217F, ground benign) |
| Moisture Sensitivity (MSL) | | Level 2 (J-STD-033C) |
| Washing Process | | According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf |
| Environment | - Vibration - Mechanical Shock - Thermal Shock | MIL-STD-810F MIL-STD-810F MIL-STD-810F |
| Housing Material | | Non-conductive Plastic (UL 94 V-0 rated) |
| Base Material | | Non-conductive Plastic (UL 94 V-0 rated) |
| Potting Material | | Silicone (UL 94 V-0 rated) |
| Pin Material | | Copper |
| Pin Foundation Plating | | Nickel (1 - 3 μ m) |
| Pin Surface Plating | | Tin (7 - 12 μ m), matte |
| Housing Type | | Plastic Case |
| Mounting Type | | PCB Mount |
| Connection Type | | SMD (Surface-Mount Device) |
| Footprint Type | | SMD16 |
| Soldering Profile | | Lead-Free Reflow Soldering (acc. J-STD-020E) 245°C max. (Tp) 10 s max. (tp, at Tp - 5°C) |
| | See application note: | www.tracopower.com/info/reflow-soldering.pdf |
| Weight | | 7 g |
| Environmental Compliance | - REACH Declaration - RoHS Declaration - SCIP Reference Number | www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant www.tracopower.com/info/rohs-declaration.pdf Exemptions: 7a, 7c-l (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).) f17461b2-cd04-42f5-8ba9-89dfa697a6ff |

Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/tim2sm

Outline Dimensions



| Pinout | | |
|--------|---------------|-------------|
| Pin | Single Output | Dual Output |
| 1 | -Vin (GND) | -Vin (GND) |
| 2 | Remote | Remote |
| 7 | NC | NC |
| 8 | NC | Common |
| 9 | +Vout | +Vout |
| 10 | -Vout | -Vout |
| 16 | +Vin (Vcc) | +Vin (Vcc) |

NC: Not connected

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

Recommended Solder Pad Layout

