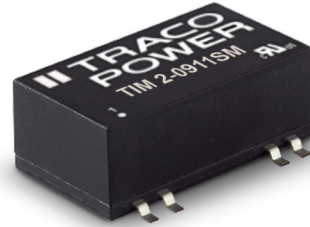


- Wide 2:1 input voltage
- I/O isolation 5000 VACrms rated for 250 VACrms working voltage
- 2 x MOPP Medical safety according to AAMI/ANSI ES 60601-1:2005(R) and IEC/EN 60601-1 3rd edition
- Low leakage current
- High efficiency up to 82%
- Extended operating temperature range
- 3-year product warranty



The TIM 2 series is a range of high performance, regulated 2 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 2-0910SM	4.5 – 12 VDC (9 VDC nominal)	3.3 VDC	500 mA	74 %
TIM 2-0911SM		5.0 VDC	400 mA	78 %
TIM 2-0919SM		9.0 VDC	222 mA	79 %
TIM 2-0912SM		12 VDC	167 mA	81 %
TIM 2-0913SM		15 VDC	134 mA	81 %
TIM 2-0915SM		24 VDC	83 mA	81 %
TIM 2-0922SM		±12 VDC	±83 mA	81 %
TIM 2-0923SM		±15 VDC	±67 mA	81 %
TIM 2-1210SM	9.0 – 18 VDC (12 VDC nominal)	3.3 VDC	500 mA	75 %
TIM 2-1211SM		5.0 VDC	400 mA	78 %
TIM 2-1219SM		9.0 VDC	222 mA	78 %
TIM 2-1212SM		12 VDC	167 mA	81 %
TIM 2-1213SM		15 VDC	134 mA	81 %
TIM 2-1215SM		24 VDC	83 mA	81 %
TIM 2-1222SM		±12 VDC	±83 mA	81 %
TIM 2-1223SM		±15 VDC	±67 mA	82 %
TIM 2-2410SM	18 – 36 VDC (24 VDC nominal)	3.3 VDC	500 mA	75 %
TIM 2-2411SM		5.0 VDC	400 mA	78 %
TIM 2-2419SM		9.0 VDC	222 mA	78 %
TIM 2-2412SM		12 VDC	167 mA	80 %
TIM 2-2413SM		15 VDC	134 mA	81 %
TIM 2-2415SM		24 VDC	83 mA	81 %
TIM 2-2422SM		±12 VDC	±83 mA	81 %
TIM 2-2423SM		±15 VDC	±67 mA	82 %
TIM 2-4810SM	36 – 75 VDC (48 VDC nominal)	3.3 VDC	500 mA	75 %
TIM 2-4811SM		5.0 VDC	400 mA	77 %
TIM 2-4819SM		9.0 VDC	222 mA	78 %
TIM 2-4812SM		12 VDC	167 mA	80 %
TIM 2-4813SM		15 VDC	134 mA	81 %
TIM 2-4815SM		24 VDC	83 mA	81 %
TIM 2-4822SM		±12 VDC	±83 mA	81 %
TIM 2-4823SM		±15 VDC	±67 mA	81 %

Input Specifications

Input current no load	9 Vin models: 90 mA max. 12 Vin models: 45 mA max. 24 Vin models: 25 mA max. 48 Vin models: 12 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: 1.0 A 12 Vin models: 0.5 A 24 Vin models: 0.315 A 48 Vin models: 0.16 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. 5.0 % max. (asymmetrical load 25/100%)
Minimum load	not required
Ripple and noise (20 MHz Bandwidth)	50 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

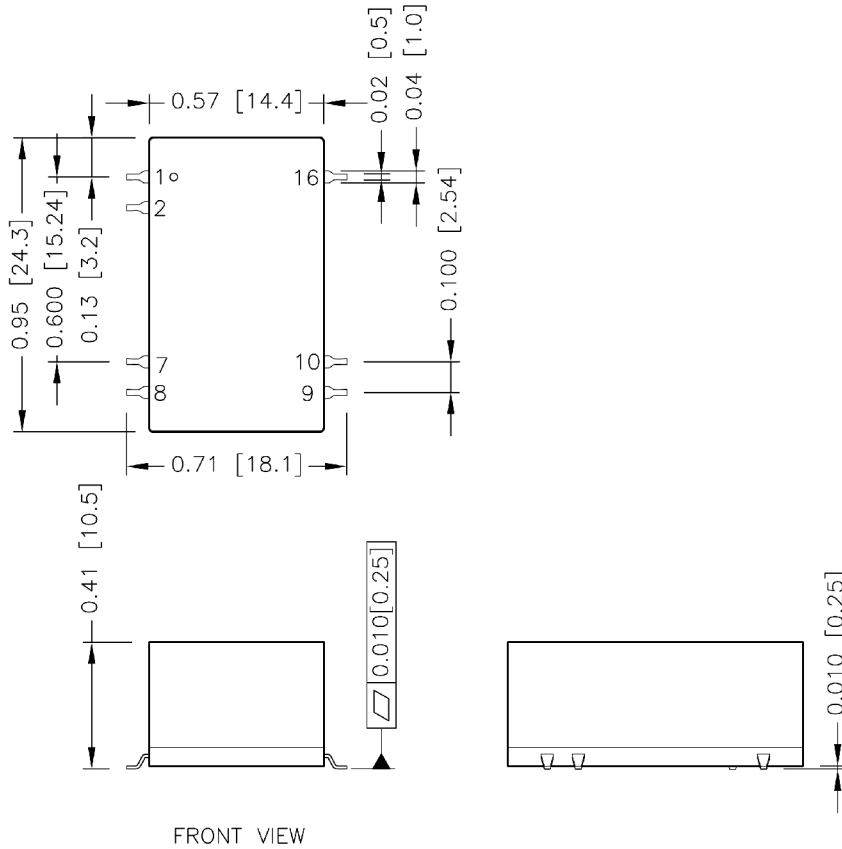
Overvoltage protection		3.3 VDC models: 4 - 6.5 VDC 5.0 VDC models: 6 - 8 VDC 9.0 VDC models: 10 - 14 VDC 12 VDC models: 13 - 19 VDC 15 VDC models: 16 - 22 VDC 24 VDC models: 25 - 35 VDC
Capacitive load	-Single output	3.3 & 5.0 VDC models: 1'000 µF max. 9.0 VDC models: 430 µF max. 12 VDC models: 220 µF max. 15 VDC models: 170 µF max. 24 VDC models: 100 µF max.
	-Dual output	±12 VDC models: ±170 µF max. (each output) ±15 VDC models: ±100 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		6.7 %/K above 90°C
Humidity (non condensing)		5 % to 95 % rel H max.
Isolation voltage	- to meet ES/IEC/EN 60601-1 (50Hz, 60sec)	5000 VACrms, rated for 250 VACrms working voltage, 2 × MOPP
Isolation capacitance		20 pF max.
Clearance/creepage		8 mm min.
Leakagecurrent (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)		6'800'000 h
Switching frequency		100 kHz min.
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
Safety standards/approvals	- Medical equipment - Certification documents	ANSI/AAMI ES60601-1:2005/(R)2012, IEC/EN60601-1 3rd edition 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 $\varnothing 0.6 \pm 0.1$ (0.024 ± 0.004)
 Pin pitch tolerances ± 0.25 (± 0.01)