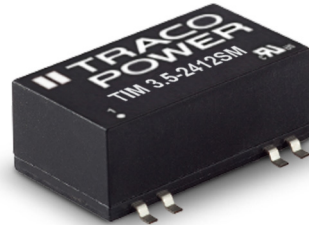


- Wide 2:1 input voltage
- I/O isolation 5000 VACrms rated for 250 VACrms working voltage
- 2 × MOPP Medical safety according to AAMI/ANSI ES 60601-1:2005(R) and IEC/EN 60601-1 3rd edition
- Low leakage current
- High efficiency up to 82%
- Extended operating temperature range
- 3-year product warranty



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 3.5-0911SM	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 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	IEC/EN 60601-1-2 4th edition
	– ESD (electrostatic discharge)	EN 61000-4-2, air ± 15 kV, contact ± 8 kV, perf. criteria A
	– Radiated immunity	EN 61000-4-3, 10 V/m, perf. criteria A
	– Fast transient / surge (with external input capacitor / diode)	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, 18V, 4000 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
	– Conducted immunity	EN 61000-4-6, 10 Vrms, perf. criteria A
	– Magnetic field immunity	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	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 VDC models:	50 mVp-p typ.
	24, ± 12 & ± 15 VDC 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

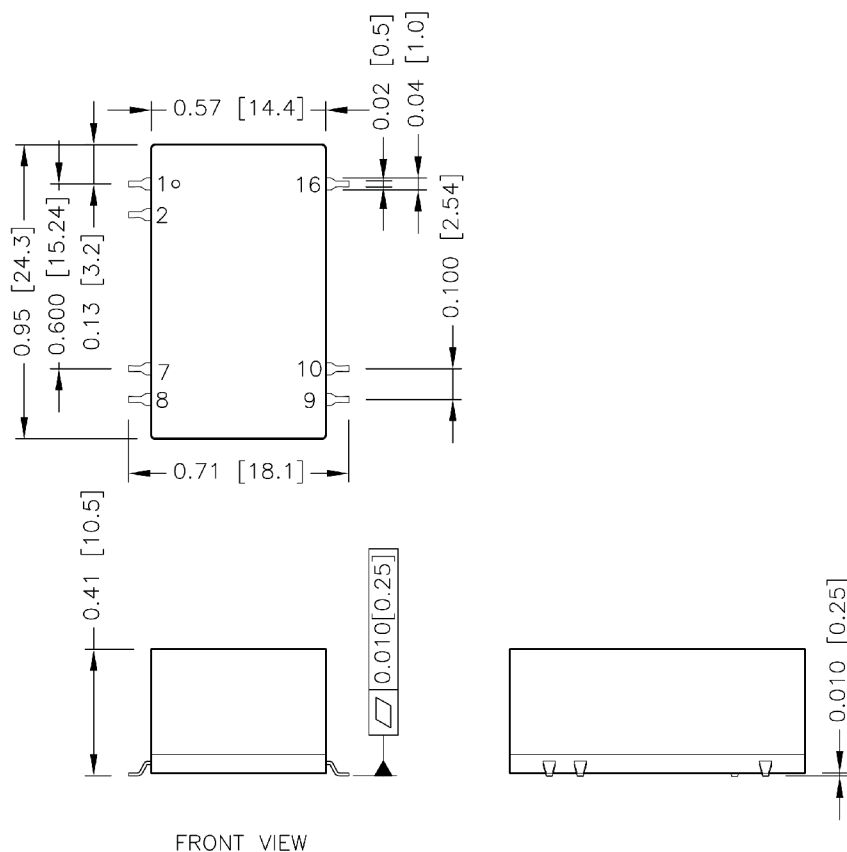
Overvoltage protection		5.0 VDC models:	6 - 8 VDC
		9.0 VDC models:	10 - 14 VDC
		12 VDC models:	13 - 19 VDC
		15 VDC models:	16 - 22 VDC
		24 VDC models:	25 - 35 VDC
Capacitive load	–Single output	5.0 VDC models:	1'470 µF max.
		9.0 VDC models:	680 µF max.
		12 VDC models:	470 µF max.
		15 VDC models:	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	–40°C to +105°C (with derating) +105°C max. –55°C to +125°C	
	– Case temperature		
	– Storage temperature		
Derating		3.3 %/K above 75°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.	
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 2 – 4 mA current applied via 1kOhm resistor 2.5 mA	
	–Off:		
	–Off idle current:		
Safety standards/approvals	– Medical equipment	ANSI/AAMI ES60601-1:2005/(R)2012, IEC/EN60601-1 3rd edition tbd	
	– Certification documents		
Environmental compliance	– Reach	www.tracopower.com/products/reach-declaration.pdf RoHS directive 2011/65/EU	
	– RoHS		

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)