

- Wide 2:1 input voltage 10 W DC/DC converter in a compact DIP-24 plastic case
- I/O isolation 5000 VACrms rated for 250 VACrms working voltage
- Certification according to IEC/EN/ES 60601-1 3rd edition for 2xMOPP
- Risk management process according to ISO 14971 including risk management file
- Acceptance criteria for electronic assemblies according to IPC-A-610 Level 3
- Low leakage current < 2µA
- Extended operating temperature range -40°C to 90°C.
- EMC compliance to IEC 60601-1-2 4th edition and EN55032 class A
- Operating up to 5000m altitude
- 5 year product warranty



CB
Scheme
IEC 606010-1 ES 60601-1

UL
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The THM-10 series is a range of medical 10 Watt DC/DC converters in DIP-24 plastic package and with wide 2:1 input voltage range. They provide a reinforced isolation system for 5000 VACrms isolation and a very low leakage current of less than 2 µA. The units are approved to IEC/EN/ES 60601-1 3rd edition for 2 x MOPP (Means Of Patient Protection) and come along with an ISO 14971 risk management file. Design and production conform to the quality management system ISO 13485. With a high efficiency of up to 89% and highest grade components the converters can reliably operate in an ambient temperature range of -40°C up to +90°C. They constitute a reliable solution not only for medical equipment but also for demanding ranges of application such as transportation, control & measurement or IGBT drivers.

Models

Order code*	Input voltage range	Output voltage	Output current max.	Efficiency typ.
THM 10-0510	4.5 – 9 VDC (5 VDC nominal)	3.3 VDC	2500 mA	80.0 %
THM 10-0511		5.0 VDC	2000 mA	84.0 %
THM 10-0512		12 VDC	830 mA	86.5 %
THM 10-0513		15 VDC	670 mA	87.0 %
THM 10-0515		24 VDC	416 mA	85.5 %
THM 10-0521		±5.0 VDC	±1000 mA	83.0 %
THM 10-0522		±12 VDC	±416 mA	85.5 %
THM 10-0523		±15 VDC	±333 mA	86.5 %
THM 10-1210	9.0 – 18 VDC (12 VDC nominal)	3.3 VDC	2500 mA	83.0 %
THM 10-1211		5.0 VDC	2000 mA	85.5 %
THM 10-1212		12 VDC	830 mA	88.0 %
THM 10-1213		15 VDC	670 mA	89.0 %
THM 10-1215		24 VDC	416 mA	89.0 %
THM 10-1221		±5.0 VDC	±1000 mA	84.0 %
THM 10-1222		±12 VDC	±416 mA	89.0 %
THM 10-1223		±15 VDC	±333 mA	88.0 %
THM 10-2410	18 – 36 VDC (24 VDC nominal)	3.3 VDC	2500 mA	83.0 %
THM 10-2411		5.0 VDC	2000 mA	86.5 %
THM 10-2412		12 VDC	830 mA	89.0 %
THM 10-2413		15 VDC	670 mA	89.0 %
THM 10-2415		24 VDC	416 mA	89.0 %
THM 10-2421		±5.0 VDC	±1000 mA	85.0 %
THM 10-2422		±12 VDC	±416 mA	89.0 %
THM 10-2423		±15 VDC	±333 mA	88.0 %
THM 10-4810	36 – 75 VDC (48 VDC nominal)	3.3 VDC	2500 mA	82.5 %
THM 10-4811		5.0 VDC	2000 mA	86.5 %
THM 10-4812		12 VDC	830 mA	89.0 %
THM 10-4813		15 VDC	670 mA	89.0 %
THM 10-4815		24 VDC	416 mA	88.5 %
THM 10-4821		±5.0 VDC	±1000 mA	85.0 %
THM 10-4822		±12 VDC	±416 mA	88.0 %
THM 10-4823		±15 VDC	±333 mA	88.0 %

* suffix -B2 for trim option with adjustable output
 suffix -B3 for remote control option
 suffix -B4 for trim + remote-control option

Input Specifications

Input current no load	5 Vin models: 20 mA typ. 12 Vin models: 10 mA typ. 24 Vin models: 6 mA typ. 48 Vin models: 4 mA typ.
Surge voltage (3 s max.)	5 Vin models: 16 V max. 12 Vin models: 25 V max. 24 Vin models: 50 V max. 48 Vin models: 100 V max.
Start-up voltage	5 Vin models: 4.5 VDC (or lower) 12 Vin models: 9 VDC (or lower) 24 Vin models: 18 VDC (or lower) 48 Vin models: 36 VDC (or lower)
Startup time	30 ms typ.
Under voltage shut down	5 Vin models: 3 – 4.4 VDC 12 Vin models: 7 – 8.8 VDC 24 Vin models: 15 – 17.5 VDC 48 Vin models: 31 – 34.5 VDC
Conducted noise	– Conducted & Radiated input suppression EN 55011 limits to IEC 60601-1-2 4th edition EN 55032 class A (internal filter) EN 55032 class 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 5 Vin models: Nippon chemi-con KY 1000 μ F/ 25 V and reverse diode (Vishay V10P45) in parallel 12 & 24 Vin models: Nippon chemi-con KY 470 μ F/ 50 V 48 Vin models: Nippon chemi-con KY 330 μ F/ 100 V IEC/EN 60601-1-2 4th edition EN 61000-4-2, air \pm8 kV, contact \pm6 kV, perf. criteria A EN 61000-4-3, 10 V/m, perf. criteria A EN 61000-4-4, \pm2 kV, perf. criteria A EN 61000-4-5, \pm2 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)	5 Vin models: 5 A 12 Vin models: 2 A 24 Vin models: 1 A 48 Vin models: 0.5 A

Output Specifications

Voltage set accuracy		$\pm 1\%$ max.
Output voltage adjustment (for THM 10 -B2 / -B4 option models only)		
– Single output	15 & 24 Vout models:	$-10 / +20\%$
	other models:	$\pm 10\%$
– Dual output	5, 12 & 15 Vout models:	$\pm 10\%$
Regulation		
– Input variation	single output:	0.2% max.
	dual output:	0.5% max.
– Load variation 0 – 100 %	single output:	0.2% max.
	dual output:	1.0% max.
– Cross regulation	dual output:	5.0% max. (asymmetrical load 25/100%)
Minimum load		not required
Ripple and noise (20 MHz Bandwidth)		
	3.3 & 5.0 VDC models:	30 mVp-p typ. with cap. 10 μ F/25 V X7R MLCC
	12 & 15 VDC models:	40 mVp-p typ. with cap. 10 μ F/25 V X7R MLCC
	24 VDC models:	50 mVp-p typ. with cap. 4.7 μ F/50 V X7R MLCC
Transient response (25% load step change)		
– Recovery time		250 μs typ.
Over current limitation		at 150 % typ. of Iout rated (hiccup mode)
Short circuit protection		Continuous, automatic recovery
Over voltage protection		
–Single output	3.3 VDC models:	3.7 – 5.0 VDC
	5.0 VDC models:	5.6 – 7.0 VDC
	12 VDC models:	13.5 – 16.0 VDC
	15 VDC models:	18.3 – 22.0 VDC
	24 VDC models:	29.1 – 34.5 VDC
	–Dual output	± 5 VDC models:
	± 12 VDC models:	13.5 – 18.2 VDC
	± 15 VDC models:	17.0 – 22.0 VDC
Capacitive load		
–Single output	3.3 VDC models:	3'000 μF max.
	5.0 VDC models:	2'500 μF max.
	12 VDC models:	430 μF max.
	15 VDC models:	350 μF max.
	24 VDC models:	125 μF max.
–Dual output	± 5 VDC models:	1'440 μF max. (each output)
	± 12 VDC models:	250 μF max. (each output)
	± 15 VDC models:	180 μF max. (each output)

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

General Specifications

Temperature ranges	<ul style="list-style-type: none"> - Operating - Rated according to IEC/EN 60601-1 - Case temperature - Storage temperature 	<ul style="list-style-type: none"> -40°C to +90°C (with derating) -40°C to +50°C (without derating) +105°C max. -55°C to +125°C
Derating		3.5 %/K above 75°C
Thermal impedance		18 K/W typ.
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
Clearance/creepage		8 mm min.
Leakage current (at 240VAC, 60Hz)		2 µA max.
Isolation capacitance (input/output)		17 pF max.
Altitude during operation		5000 m
Temperature coefficient		±0.02 %/K typ.
Reliability, calculated MTBF (MIL-HDBK-217F at +25°C, ground benign)		3'850'000 h
Switching frequency		300 kHz ±30 kHz (pulse width modulation)
Vibration and thermal shock resistance		according to MIL-STD-810F
Remote On/Off (for THM 10 -B3 / -B4 option models only)	<ul style="list-style-type: none"> - Off - On - Off idle current - Remote pin input current 	<ul style="list-style-type: none"> 2.2 – 12 VDC (referred to -Vin pin) open circuit or 0 – 1.2 VDC (referred to -Vin pin) 2.5 mA typ. -0.5 mA min. 1 mA max.
Safety standards/approvals	- Medical equipment	ANSI/AAMI ES60601-1:2005/(R)2012, IEC/EN60601-1 3rd edition
Environmental compliance	<ul style="list-style-type: none"> - Reach - RoHS 	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 rated)
Package weight	14 g (0.48oz)
Soldering temperature	max. 265°C / 10 sec

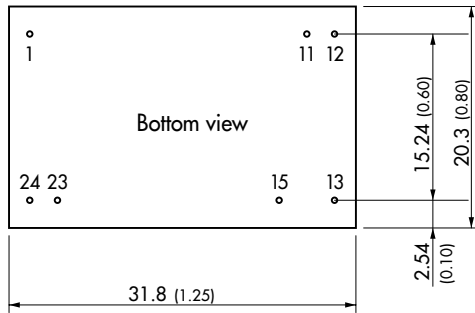


- The component is not be used in an oxygen rich environment.
- The component is not to be used in conjunction with flammable anaesthetics and agents.
- The component has to be disposed appropriately. Please refer to local regulations (Waste Electrical and Electronic Equipment).
- A modification of the component is not allowed.

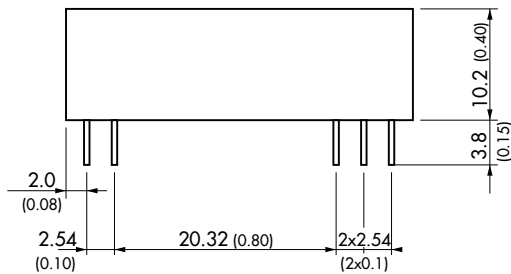
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

Outline Dimensions

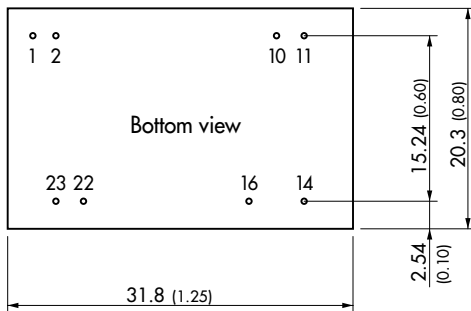
Standard pinning



Standard Pinout		
Pin	Single	Dual
1	+Vin (Vcc)	+Vin (Vcc)
11	No pin	Common
12	-Vout	No pin
13	+Vout	-Vout
15	No pin	+Vout
23	-Vin (GND)	-Vin (GND)
24	-Vin (GND)	-Vin (GND)



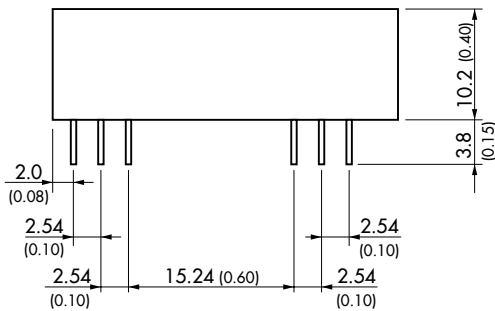
Optional pinning with options: suffix **-B1** (alternative pinning); **-B2** (with Trim); **-B3** (with Remote); **-B4** (with Trim and Remote)



Optional Pinout		
Pin	Single	Dual
1	No Pin*/Remote	No Pin*/Remote
2	-Vin (GND)	-Vin (GND)
10	No Pin*/Trim	No Pin*/Trim
11	No con.	-Vout
14	+Vout	+Vout
16	-Vout	Common
22	+Vin (Vcc)	+Vin (Vcc)
23	+Vin (Vcc)	+Vin (Vcc)

*If Remote or Trim is not selected there is no pin on corresponding number.

Remark: No suffix **-Bx** for 5 Vin models. Corresponding parts are with THM 10WI series by default.



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)