

- Wide 4:1 input voltage 60 W DC/DC converter in a compact 2.3 x 1.45" plastic case
- I/O isolation 5000 VAC rated for 250 VAC working voltage
- Certification according to IEC/EN/ES 60601-1 3rd edition for 2 x MOPP
- Risk management process according to ISO 14971
- Acceptance criteria for electronic assemblies acc. to IPC-A-610 Level 3
- Low leakage current <4.5  $\mu$ A
- Operating temperature range: -40 to +75°C
- EMC compliance according to IEC 60601-1-2 4th edition
- Operating up to 5000m altitude
- 5 year product warranty



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

The THM 60WI series is a range of medical 60 Watt DC/DC converters in a compact 2.3" x 1.45" plastic package and with wide 4:1 input voltage range. They provide a reinforced isolation system (5000 VAC) and a very low leakage current of less than 4.5  $\mu$ A. With a high efficiency of up to 92% and highest-grade components the converters can reliably operate in an ambient temperature range of -40°C up to +75°C with derating. For more demanding applications regarding temperature, Traco also offers a special heatsink which will greatly increase the thermal capabilities for natural convection conditions. The units are approved according to IEC/EN/ES 60601-1 3rd edition for 2 x MOPP as well as IEC/EN/UL 62368-1 and come along with an ISO 14971 risk management file. Design and production conform to the quality management system ISO 13485. The THM 60WI constitutes a reliable solution not only for medical equipment but also for demanding ranges of application such as control & measurement and transportation.

### Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency typ.
		Vnom	I <sub>max</sub>	Vnom	I <sub>max</sub>	
THM 60-2411WI	9 - 36 VDC (24 VDC nom.)	5.1 VDC	12'000 mA			90 %
THM 60-2412WI		12 VDC	5'000 mA			92 %
THM 60-2413WI		15 VDC	4'000 mA			90 %
THM 60-2415WI		24 VDC	2'500 mA			89 %
THM 60-2422WI		+12 VDC	2'500 mA	-12 VDC	2'500 mA	89 %
THM 60-2423WI		+15 VDC	2'000 mA	-15 VDC	2'000 mA	90 %
THM 60-4811WI	18 - 75 VDC (48 VDC nom.)	5.1 VDC	12'000 mA			90 %
THM 60-4812WI		12 VDC	5'000 mA			92 %
THM 60-4813WI		15 VDC	4'000 mA			93 %
THM 60-4815WI		24 VDC	2'500 mA			90 %
THM 60-4822WI		+12 VDC	2'500 mA	-12 VDC	2'500 mA	90 %
THM 60-4823WI		+15 VDC	2'000 mA	-15 VDC	2'000 mA	90 %

### Options

THM-HS1	- Optional Heat Sink: <a href="http://www.tracopower.com/products/thm-hs1.pdf">www.tracopower.com/products/thm-hs1.pdf</a>
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## Input Specifications

Input Current	- At no load	24 Vin models: <b>15 mA typ.</b> 48 Vin models: <b>12 mA typ.</b>
Surge Voltage		24 Vin models: <b>50 VDC max.</b> (3 s max.) 48 Vin models: <b>100 VDC max.</b> (3 s max.)
Under Voltage Lockout		24 Vin models: <b>7.8 VDC min. / 8 VDC typ. / 8.6 VDC max.</b> 48 Vin models: <b>15.8 VDC min. / 16 VDC typ. / 17.4 VDC max.</b>
Recommended Input Fuse		24 Vin models: <b>10'000 mA</b> (fast acting) 48 Vin models: <b>6'300 mA</b> (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		<b>Internal Pi-Type</b>

## Output Specifications

Output Voltage Adjustment		<b>±10%</b> (5.1 & 12 Vout models) <b>-10% to +20%</b> (other single output models) (By external trim resistor) See application note: <a href="http://www.tracopower.com/overview/thm60wi">www.tracopower.com/overview/thm60wi</a> Output power must not exceed rated power!
Voltage Set Accuracy		<b>±1% max.</b>
Regulation	- Input Variation (Vmin - Vmax)	single output models: <b>0.2% max.</b> dual output models: <b>0.5% max.</b>
	- Load Variation (0 - 100%)	single output models: <b>0.2% max.</b> dual output models: <b>1% max.</b> (Output 1) <b>1% max.</b> (Output 2)
	- Cross Regulation (25% / 100% asym. load)	dual output models: <b>5% max.</b>
Ripple and Noise (20 MHz Bandwidth)	- single output	5.1 Vout models: <b>75 mVp-p typ.</b> (w/ 10 µF, 25 V, X7R) 12 Vout models: <b>100 mVp-p typ.</b> (w/ 10 µF, 25 V, X7R) 15 Vout models: <b>100 mVp-p typ.</b> (w/ 10 µF, 25 V, X7R) 24 Vout models: <b>150 mVp-p typ.</b> (w/ 4.7 µF, 50 V, X7R)
	- dual output	12 / -12 Vout models: <b>100 / 100 mVp-p typ.</b> (w/ 10 µF, 25 V, X7R) 15 / -15 Vout models: <b>100 / 100 mVp-p typ.</b> (w/ 10 µF, 25 V, X7R)
Capacitive Load	- single output	5.1 Vout models: <b>17'000 µF max.</b> 12 Vout models: <b>3'000 µF max.</b> 15 Vout models: <b>1'900 µF max.</b> 24 Vout models: <b>730 µF max.</b>
	- dual output	12 / -12 Vout models: <b>1'500 / 1'500 µF max.</b> 15 / -15 Vout models: <b>940 / 940 µF max.</b>
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.02 %/K max.</b>
Start-up Time		<b>30 ms typ. / 60 ms max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Output Current Limitation		<b>195% max. of Iout max.</b> <b>150% typ. of Iout max.</b>
Overvoltage Protection		<b>130% typ. of Vout nom.</b> (15 and 24 Vout models) <b>120% typ. of Vout nom.</b> (5.1, 12, ±12 and ±15 Vout models)
Transient Response	- Response Time	<b>250 µs typ.</b> (25% Load Step)

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

### Safety Specifications

Safety 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	<a href="http://www.tracopower.com/overview/thm60wi">www.tracopower.com/overview/thm60wi</a>
Pollution Degree		PD 2

### EMC Specifications

EMI Emissions	- Conducted Emissions	EN 60601-1-2 edition 4 (Medical Devices) EN 55011 class A (with external filter) EN 55011 class B (with external filter) EN 55032 class A (with external filter) EN 55032 class B (with external filter) FCC Part 15 class A (with external filter) FCC Part 15 class B (with external filter) FCC Part 18 class A (with external filter) FCC Part 18 class B (with external filter)
	- Radiated Emissions	EN 55011 class A (with external filter) EN 55011 class B (with external filter) EN 55032 class A (with external filter) EN 55032 class B (with external filter) FCC Part 15 class A (with external filter) FCC Part 15 class B (with external filter) FCC Part 18 class A (with external filter) FCC Part 18 class B (with external filter)
		External filter proposal: <a href="http://www.tracopower.com/overview/thm60wi">www.tracopower.com/overview/thm60wi</a>
EMS Immunity	- Electrostatic Discharge	EN 55024 (IT Equipment) 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, ±2 kV, perf. criteria A
	- Conducted RF Disturbances	Ext. input component: 24 Vin models: 2 x 220 µF, 100 V // TVS SMDJ58A 48 Vin models: 2 x 220 µF, 100 V // TVS SMDJ120A 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 +75°C
	- Case Temperature	+105°C max.
	- Storage Temperature	-55°C to +125°C
Power Derating	- High Temperature	Depending on model Depending on model (with Heat Sink)
		See application note: <a href="http://www.tracopower.com/overview/thm60wi">www.tracopower.com/overview/thm60wi</a>
Over Temperature Protection Switch Off	- Protection Mode	108°C min. / 115°C typ. / 125°C max. (Automatic recovery at 100°C typ.)
	- Measurement Point	Case
Cooling System		Natural convection (20 LFM)

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

Sense Function		10% max. of Vout nom. (If sense function is not used, sense pins must be connected to corresponding polarity output pins)
Remote Control	- Voltage Controlled Remote  - Off Idle Input Current - Remote Pin Input Current	On: 3.0 to 12 VDC or open circuit Off: 0 to 1.2 VDC or short circuit Refers to 'Remote' and '-Vin' Pin 3 mA typ. -0.5 to 0.5 mA
Altitude During Operation		5'000 m max.
Switching Frequency		225 - 275 kHz (PWM) 250 kHz typ. (PWM)
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 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	40 pF typ.
Leakage Current	- Touch Current	4.5 μA max.
Reliability	- Calculated MTBF	1'064'000 h (MIL-HDBK-217F, ground benign)
Washing Process		Allowed (hermetical product)
	See Cleaning Guideline:	<a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
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 (2 - 3 μm)
Pin Surface Plating		Tin (3 - 5 μm), matte
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		Quarter-Brick
Soldering Profile		Wave Soldering 260°C / 6 s max.
Weight		51 g
Thermal Impedance	- Case to Ambient	9.7 K/W typ. 5.5 K/W typ. (with Heat Sink)
Environmental Compliance	- REACH Declaration  - RoHS Declaration	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule). The SCIP number is provided on request.)

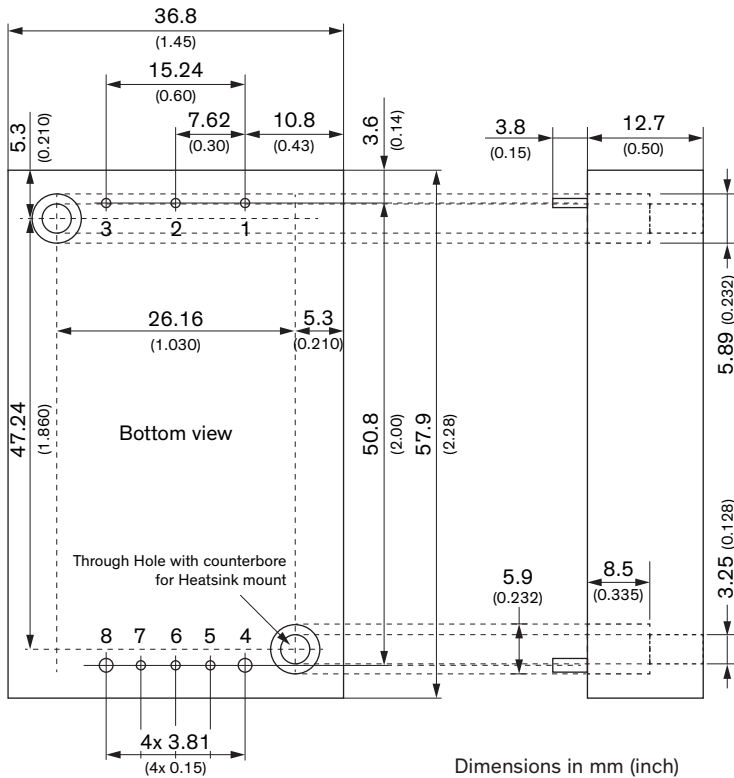
## Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/thm60wi](http://www.tracopower.com/overview/thm60wi)

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

**Outline Dimensions**



Pin (4, 8):  $\varnothing 1.5$  ( $\varnothing 0.06$ )  
 Pin (other):  $\varnothing 1.0$  ( $\varnothing 0.04$ )

Dimensions in mm (inch)  
 Tolerances: x.x  $\pm 0.50$  ( $\pm 0.02$ )  
 x.xx  $\pm 0.25$  ( $\pm 0.01$ )  
 Pin dimension tolerances  $\pm 0.1$  (0.004)

Pinout		
Pin	Single	Dual
1	-Vin (GND)	-Vin (GND)
2	Remote On/Off	Remote On/Off
3	+Vin (Vcc)	+Vin (Vcc)
4	-Vout	-Vout
5	-Sense	-Sense
6	Trim	Common
7	+Sense	+Sense
8	+Vout	+Vout