

- **Wide 2:1 input voltage 20 W DC/DC converter in a 1.6 x 1 " plastic case**
- **I/O isolation 5000 VAC rated for 250 VAC working voltage**
- **Certification according to IEC/EN/ES 60601-1 edition 3.2 for 2 x MOPP**
- **Risk management process according to ISO 14971 incl. risk management file**
- **Acceptance criteria for electronic assemblies acc. to IPC-A-610 Level 3**
- **Low leakage current <2.5  $\mu$ A**
- **Operating temperature -40°C to 80°C**
- **EMC compliance to IEC 60601-1-2 4th edition and EN55032 class A**
- **Operating up to 5000m altitude**
- **5-year product warranty**



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

The THM 20 series is a range of medical 20 Watt DC/DC converters in 1.6" x 1.0" plastic package and with wide 2:1 input voltage range. They provide a reinforced isolation system for 5000 VAC isolation and a very low leakage current of less than 2.5  $\mu$ A. The units are approved to IEC/EN/ES 60601-1 edition 3.2 for 2 x MOPP 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 +80°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 1		Output 2		Efficiency typ.
		Vnom	I <sub>max</sub>	Vnom	I <sub>max</sub>	
THM 20-1211	9 - 18 VDC (12 VDC nom.)	5 VDC	4'000 mA			89 %
THM 20-1212		12 VDC	1'670 mA			89 %
THM 20-1213		15 VDC	1'330 mA			89 %
THM 20-1215		24 VDC	833 mA			89 %
THM 20-1221		+5 VDC	2'000 mA	-5 VDC	2'000 mA	86 %
THM 20-1222		+12 VDC	833 mA	-12 VDC	833 mA	89 %
THM 20-1223		+15 VDC	667 mA	-15 VDC	667 mA	89 %
THM 20-2411	18 - 36 VDC (24 VDC nom.)	5 VDC	4'000 mA			90 %
THM 20-2412		12 VDC	1'670 mA			90 %
THM 20-2413		15 VDC	1'330 mA			90 %
THM 20-2415		24 VDC	833 mA			90 %
THM 20-2421		+5 VDC	2'000 mA	-5 VDC	2'000 mA	86 %
THM 20-2422		+12 VDC	833 mA	-12 VDC	833 mA	90 %
THM 20-2423		+15 VDC	667 mA	-15 VDC	667 mA	90 %
THM 20-4811	36 - 75 VDC (48 VDC nom.)	5 VDC	4'000 mA			90 %
THM 20-4812		12 VDC	1'670 mA			89 %
THM 20-4813		15 VDC	1'330 mA			89 %
THM 20-4815		24 VDC	833 mA			89 %
THM 20-4821		+5 VDC	2'000 mA	-5 VDC	2'000 mA	86 %
THM 20-4822		+12 VDC	833 mA	-12 VDC	833 mA	89 %
THM 20-4823		+15 VDC	667 mA	-15 VDC	667 mA	89 %

Options	
on demand (backorder with MOQ non stocking item)	- Optional models with Remote On/Off function - Optional models with inverse Remote On/Off function (passive = off)

## Input Specifications

Input Current	- At no load	12 Vin models: <b>11 mA typ.</b> 24 Vin models: <b>9 mA typ.</b> 48 Vin models: <b>9 mA typ.</b>
Surge Voltage		12 Vin models: <b>25 VDC max.</b> (3 s max.) 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		12 Vin models: <b>7.8 VDC min. / 8 VDC typ. / 8.6 VDC max.</b> 24 Vin models: <b>15.8 VDC min. / 16 VDC typ. / 17.4 VDC max.</b> 48 Vin models: <b>32 VDC min. / 33 VDC typ. / 34 VDC max.</b>
Recommended Input Fuse		12 Vin models: <b>4'000 mA</b> (slow blow) 24 Vin models: <b>2'000 mA</b> (slow blow) 48 Vin models: <b>1'000 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		-10% to +20% (15 & 24 Vout models) ±10% (other models) (single output models only) (By external trim resistor) See application note: <a href="http://www.tracopower.com/overview/thm20">www.tracopower.com/overview/thm20</a> Output power must not exceed rated power!
Voltage Set Accuracy		<b>±1% max.</b>
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%) - Cross Regulation (25% / 100% asym. load)	single output models: <b>0.2% max.</b> dual output models: <b>0.5% max.</b> single output models: <b>0.2% max.</b> dual output models: <b>1% max.</b> (Output 1) <b>1% max.</b> (Output 2) dual output models: <b>5% max.</b>
Ripple and Noise (20 MHz Bandwidth)	- single output - dual output	5 Vout models: <b>50 mVp-p typ.</b> (w/ 10 µF X7R) 12 Vout models: <b>75 mVp-p typ.</b> (w/ 10 µF X7R) 15 Vout models: <b>75 mVp-p typ.</b> (w/ 10 µF X7R) 24 Vout models: <b>100 mVp-p typ.</b> (w/ 4.7 µF X7R) 5 / -5 Vout models: <b>50 / 50 mVp-p typ.</b> (w/ 10 µF X7R) 12 / -12 Vout models: <b>75 / 75 mVp-p typ.</b> (w/ 10 µF X7R) 15 / -15 Vout models: <b>75 / 75 mVp-p typ.</b> (w/ 10 µF X7R)
Capacitive Load	- single output - dual output	5 Vout models: <b>5'000 µF max.</b> 12 Vout models: <b>850 µF max.</b> 15 Vout models: <b>700 µF max.</b> 24 Vout models: <b>220 µF max.</b> 5 / -5 Vout models: <b>2'500 / 2'500 µF max.</b> 12 / -12 Vout models: <b>500 / 500 µF max.</b> 15 / -15 Vout models: <b>350 / 350 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>185% max. of Iout max.</b> <b>150% typ. of Iout max.</b>

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

Overvoltage Protection		125% <b>typ.</b> of <b>Vout nom.</b> (depending on model) 6.2 VDC <b>typ.</b> (5 VDC model) 15 VDC <b>typ.</b> (12 VDC model) 20 VDC <b>typ.</b> (15 VDC model) 30 VDC <b>typ.</b> (24 VDC model) 6.2 VDC <b>typ.</b> ( $\pm 5$ VDC model) 15 VDC <b>typ.</b> ( $\pm 12$ VDC model) 20 VDC <b>typ.</b> ( $\pm 15$ VDC model)
Transient Response	- Response Time	250 $\mu$ s <b>typ.</b> (25% Load Step)

### 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	<a href="http://www.tracopower.com/overview/thm20">www.tracopower.com/overview/thm20</a>
Pollution Degree		PD 2
Over Voltage Category		OVC II

### EMC Specifications

EMI (Emissions)	- Conducted Emissions	EN 60601-1-2 edition 4 (Medical Devices) EN 55011 class A (internal filter) EN 55011 class B (with external filter) EN 55032 class A (internal filter) EN 55032 class B (with external filter) FCC 47 Part 18 class A (internal filter) FCC 47 Part 18 class B (with external filter)
	- Radiated Emissions	EN 55011 class A (internal filter) EN 55011 class B (with external filter) EN 55032 class A (internal filter) EN 55032 class B (with external filter) FCC 47 Part 18 class A (internal filter) FCC 47 Part 18 class B (with external filter)
		External filter proposal: <a href="http://www.tracopower.com/overview/thm20">www.tracopower.com/overview/thm20</a>
EMS (Immunity)	- Electrostatic Discharge	EN 60601-1-2 edition 4 (Medical Devices) Air: EN 61000-4-2, $\pm 15$ kV, perf. criteria A Contact: EN 61000-4-2, $\pm 8$ kV, perf. criteria A
	- RF Electromagnetic Field	EN 61000-4-3, 10 V/m, perf. criteria A
	- EFT (Burst) / Surge	EN 61000-4-4, $\pm 2$ kV, perf. criteria A EN 61000-4-5, $\pm 2$ kV, perf. criteria A
		Ext. input component: 12 Vin models: 2 x KY 220 $\mu$ F    TVS SMDJ36A 24 Vin models: 2 x KY 220 $\mu$ F    TVS SMDJ58A 48 Vin models: 2 x KY 220 $\mu$ F    TVS SMDJ120A
	- 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
EMC / Environmental	- Certification Documents	<a href="http://www.tracopower.com/overview/thm20">www.tracopower.com/overview/thm20</a>

### General Specifications

Relative Humidity		95% <b>max.</b> (non condensing)
Temperature Ranges	- Operating Temperature	-40°C to +80°C
	- Case Temperature	+105°C <b>max.</b>
	- Storage Temperature	-55°C to +125°C

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

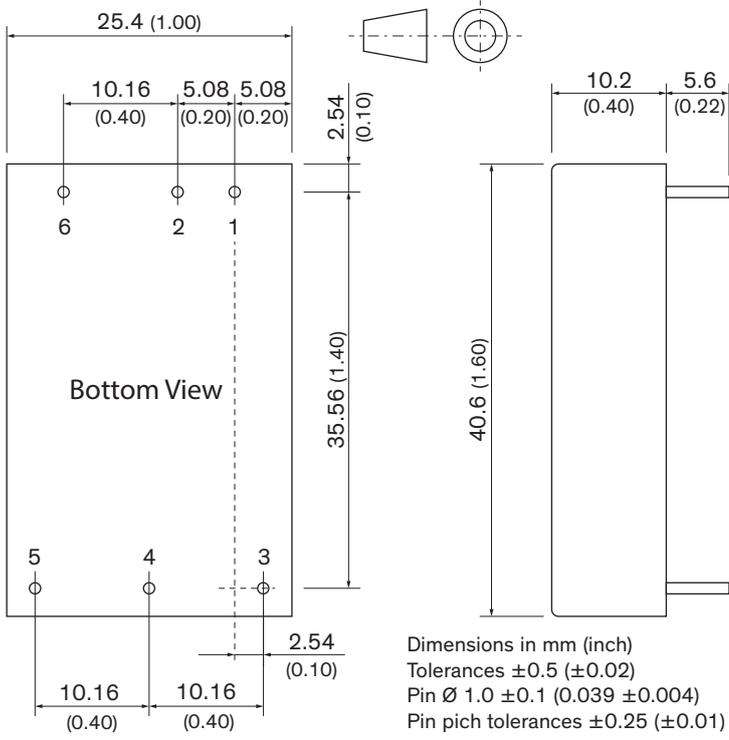
Power Derating	- High Temperature	2 %/K above 55°C See application note: <a href="http://www.tracopower.com/overview/thm20">www.tracopower.com/overview/thm20</a>
Over Temperature Protection Switch Off	- Protection Mode - Measurement Point	115°C max. (Automatic recovery) Case
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote (passive = on)  - Off Idle Input Current - Remote Pin Input Current	On: 3.5 to 12 VDC or open circuit Off: 0 to 1.2 VDC or short circuit Refers to 'Remote' and '-Vin' Pin 2.5 mA typ. -0.5 to 1.0 mA (Optional models with inverse Remote On/Off function (passive = off))
Altitude During Operation		5'000 m max.
Switching Frequency		225 - 285 kHz (PWM) 250 kHz typ. (PWM)
Insulation System		Reinforced Insulation
Working Voltage (rated)		250 VAC
Isolation Test Voltage	- Input to Output, 60 s - Input to Output, 1 s	5'000 VAC 10'000 VDC
Creepage	- Input to Output	8 mm min.
Clearance	- Input to Output	8 mm min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	20 pF typ.
Leakage Current	- Touch Current	2.5 µA max. (240 VAC, 60 Hz)
Reliability	- Calculated MTBF	1'712'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
Environment	- Vibration - Thermal Shock	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		1.6" x 1"
Soldering Profile		Lead-Free Wave Soldering 265°C / 10 s max.
Weight		24 g
Thermal Impedance	- Case to Ambient	14.4 K/W typ.
Environmental Compliance	- REACH Declaration  - RoHS Declaration  - SCIP Reference Number	<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: 7(a), 7(c)-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule.)) e6fcf163-9888-4f03-9c5e-6783f37ee014

### Additional Information

Supporting Documents	<a href="http://www.tracopower.com/overview/thm20">www.tracopower.com/overview/thm20</a>
Frequently Asked Questions	<a href="http://www.tracopower.com/glossary-faq">www.tracopower.com/glossary-faq</a>
Glossary	<a href="http://www.tracopower.com/info/glossary.pdf">www.tracopower.com/info/glossary.pdf</a>

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**Outline Dimensions**



Pinout		
Pin	Single Output	Dual Output
1	+Vin (Vcc)	+Vin (Vcc)
2	-Vin (GND)	-Vin (GND)
3	+Vout	+Vout
4	-Vout	Common
5	Trim	-Vout
6	No pin*/Remote	No pin*/Remote

\*If remote is not selected there will be no pin.