

- Wide 2:1 input range
- Very high efficiency up to 88%
- I/O isolation 1500V
- Input filter meets EN 55032, class A
- Remote On/Off
- Under voltage lock-out circuit
- Shielded metal case with insulated Baseplate
- Continuous short-circuit protection
- Operating temp. range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  (with derating)
- 3-year product warranty



The THD 12 series is a range of high performance, isolated 12W DC/DC converters. They come in a low profile, DIP-24 package with standard industry pin-out. Overload and overvoltage protection as well as remote On/Off are included as standard. Built-in filters for both input and output minimizes the need of external filtering. Full SMD-design with exclusive use of ceramic capacitors guarantees a high reliability and long product lifetime. Typical applications for these converters are industrial electronics, instrumentation, data communication systems and battery operated equipment with limited space available on the PCB

### Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency typ.
		Vnom	I <sub>max</sub>	Vnom	I <sub>max</sub>	
THD 12-1209	9 - 18 VDC (12 VDC nom.)	2.5 VDC	3'500 mA			82 %
THD 12-1210		3.3 VDC	3'500 mA			84 %
THD 12-1211		5.1 VDC	2'400 mA			86 %
THD 12-1212		12 VDC	1'000 mA			86 %
THD 12-1222		+12 VDC	500 mA	-12 VDC	500 mA	87 %
THD 12-1223		+15 VDC	400 mA	-15 VDC	400 mA	87 %
THD 12-2409	18 - 36 VDC (24 VDC nom.)	2.5 VDC	3'500 mA			83 %
THD 12-2410		3.3 VDC	3'500 mA			85 %
THD 12-2411		5.1 VDC	2'400 mA			87 %
THD 12-2412		12 VDC	1'000 mA			87 %
THD 12-2422		+12 VDC	500 mA	-12 VDC	500 mA	88 %
THD 12-2423		+15 VDC	400 mA	-15 VDC	400 mA	88 %
THD 12-4809	36 - 75 VDC (48 VDC nom.)	2.5 VDC	3'500 mA			83 %
THD 12-4810		3.3 VDC	3'500 mA			85 %
THD 12-4811		5.1 VDC	2'400 mA			87 %
THD 12-4812		12 VDC	1'000 mA			87 %
THD 12-4822		+12 VDC	500 mA	-12 VDC	500 mA	88 %
THD 12-4823		+15 VDC	400 mA	-15 VDC	400 mA	88 %

## Input Specifications

Input Current	- At no load	12 Vin models: <b>55 mA typ.</b> (2.5 Vout model) <b>55 mA typ.</b> (3.3 Vout model) <b>55 mA typ.</b> (5.1 Vout model) <b>20 mA typ.</b> (12 Vout model) <b>20 mA typ.</b> (12 / -12 Vout model) <b>20 mA typ.</b> (15 / -15 Vout model)
		24 Vin models: <b>35 mA typ.</b> (2.5 Vout model) <b>35 mA typ.</b> (3.3 Vout model) <b>35 mA typ.</b> (5.1 Vout model) <b>15 mA typ.</b> (12 Vout model) <b>15 mA typ.</b> (12 / -12 Vout model) <b>15 mA typ.</b> (15 / -15 Vout model)
		48 Vin models: <b>20 mA typ.</b> (2.5 Vout model) <b>20 mA typ.</b> (3.3 Vout model) <b>20 mA typ.</b> (5.1 Vout model) <b>6 mA typ.</b> (12 Vout model) <b>6 mA typ.</b> (12 / -12 Vout model) <b>6 mA typ.</b> (15 / -15 Vout model)
	- At full load	12 Vin models: <b>935 mA typ.</b> (2.5 Vout model) <b>1'250 mA typ.</b> (3.3 Vout model) <b>1'250 mA typ.</b> (5.1 Vout model) <b>1'250 mA typ.</b> (12 Vout model) <b>1'250 mA typ.</b> (12 / -12 Vout model) <b>1'250 mA typ.</b> (15 / -15 Vout model)
		24 Vin models: <b>460 mA typ.</b> (2.5 Vout model) <b>600 mA typ.</b> (3.3 Vout model) <b>600 mA typ.</b> (5.1 Vout model) <b>600 mA typ.</b> (12 Vout model) <b>600 mA typ.</b> (12 / -12 Vout model) <b>600 mA typ.</b> (15 / -15 Vout model)
		48 Vin models: <b>230 mA typ.</b> (2.5 Vout model) <b>300 mA typ.</b> (3.3 Vout model) <b>300 mA typ.</b> (5.1 Vout model) <b>300 mA typ.</b> (12 Vout model) <b>300 mA typ.</b> (12 / -12 Vout model) <b>300 mA typ.</b> (15 / -15 Vout model)
Surge Voltage		12 Vin models: <b>36 VDC max.</b> (100 ms max.) 24 Vin models: <b>50 VDC max.</b> (100 ms max.) 48 Vin models: <b>100 VDC max.</b> (100 ms max.)
Under Voltage Lockout		12 Vin models: <b>7 VDC min. / 8 VDC typ. / 8.8 VDC max.</b> 24 Vin models: <b>15 VDC min. / 16 VDC typ. / 17.5 VDC max.</b> 48 Vin models: <b>32 VDC min. / 33.5 VDC typ. / 35 VDC max.</b>
Reflected Ripple Current		<b>20 mAp-p typ.</b>
Recommended Input Fuse		12 Vin models: <b>2'500 mA</b> (slow blow) 24 Vin models: <b>1'250 mA</b> (slow blow) 48 Vin models: <b>800 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

Voltage Set Accuracy	<b>±1.2% max.</b>
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All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

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>1% max.</b> (2.5 Vout models) <b>0.5% max.</b> (other models) 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	<b>85 mVp-p typ.</b>
Capacitive Load	- single output	2.5 Vout models: <b>2'000 µF max.</b> 3.3 Vout models: <b>2'000 µF max.</b> 5.1 Vout models: <b>2'000 µF max.</b> 12 Vout models: <b>430 µF max.</b>
	- dual output	12 / -12 Vout models: <b>200 / 200 µF max.</b> 15 / -15 Vout models: <b>120 / 120 µF max.</b>
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.02 %/K max.</b>
Start-up Time		<b>450 ms typ.</b> (Power On)
		<b>5 ms typ.</b> (Remote On)
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Output Current Limitation		<b>150% typ. of Iout max.</b>
Overvoltage Protection		<b>118 - 156% of Vout nom.</b>
		(depending on model)
		<b>3.9 VDC typ.</b> (2.5 & 3.3 Vout models)
		<b>6.2 VDC typ.</b> (5.1 Vout models)
		<b>15 VDC typ.</b> (12 Vout models) <b>18 VDC typ.</b> (15 Vout models)
Transient Response	- Response Time	<b>250 µs typ.</b> (75% to 100% Load Step)

### Safety Specifications

Safety Standards	- IT / Multimedia Equipment	EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1
	- Certification Documents	<a href="http://www.tracopower.com/overview/thd12">www.tracopower.com/overview/thd12</a>
Pollution Degree		<b>PD 2</b>
Over Voltage Category		<b>Not mains connected</b>

### EMC Specifications

EMI Emissions	- Conducted Emissions	EN 55032 class A (with external filter) EN 55032 class B (with external filter)
	- Radiated Emissions	EN 55032 class A (with external filter) EN 55032 class B (with external filter)
	External filter proposal:	<a href="http://www.tracopower.com/overview/thd12">www.tracopower.com/overview/thd12</a>
EMS Immunity		EN 55024 (IT Equipment) EN 55035 (Multimedia)
	- Electrostatic Discharge	Air: EN 61000-4-2, ±8 kV, perf. criteria A Contact: EN 61000-4-2, ±6 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, ±1 kV, perf. criteria A
	- Conducted RF Disturbances	Ext. input component: Nippon chemi-con KY 220 µF, 100 V 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

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## General Specifications

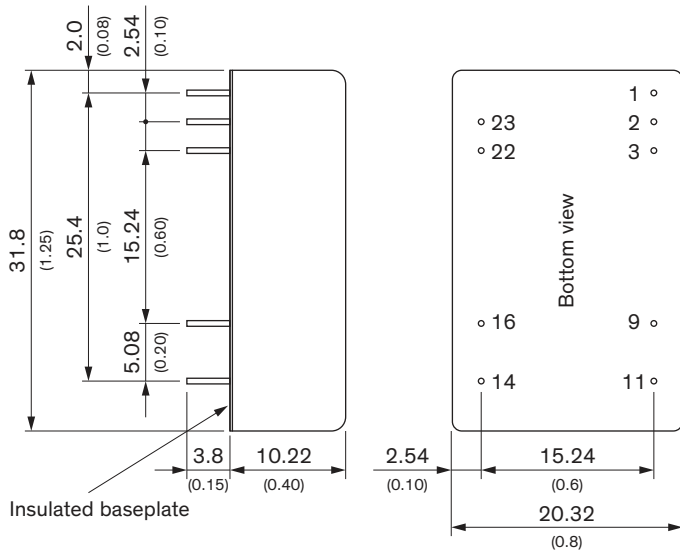
Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +85°C +100°C max. -55°C to +125°C
Power Derating	- High Temperature	Depending on model See application note: <a href="http://www.tracopower.com/overview/thd12">www.tracopower.com/overview/thd12</a>
Cooling System		Natural convection (20 LFM)
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 2.5 mA max. -0.5 to 0.5 mA
Altitude During Operation		4'000 m max.
Switching Frequency		360 - 440 kHz (PWM) 400 kHz typ. (PWM)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s - Input to Case, 60 s - Output to Case, 60 s	1'600 VDC 1'600 VDC 1'600 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	1'200 pF max.
Reliability	- Calculated MTBF	2'060'000 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		Copper, Nickel plated
Base Material		Non-conductive FR4 (UL 94 V-0 rated)
Potting Material		Epoxy (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		Metal Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		DIP24
Soldering Profile		245°C / 10 s max.
Weight		18 g
Thermal Impedance	- Case to Ambient	20 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: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule.)) adb1ecd6-a47c-48d4-9904-1399f0bad769

## Supporting Documents

Overview Link (for additional Documents)	<a href="http://www.tracopower.com/overview/thd12">www.tracopower.com/overview/thd12</a>
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### Outline Dimensions



Dimensions in mm (inch)  
 Tolerances: x.x ±0.5 (±0.02)  
 x.xx ±0.25 (±0.01)  
 Pin Ø 0.5 ±0.1 (0.02 ±0.004)

### Pinout

Pin	Single	Dual
1	Remote On/Off	Remote On/Off
2	-Vin (GND)	-Vin (GND)
3	-Vin (GND)	-Vin (GND)
9	NC	Common
11	NC	-Vout
14	+Vout	+Vout
16	-Vout	Common
22	+Vin (Vcc)	+Vin (Vcc)
23	+Vin (Vcc)	+Vin (Vcc)

NC: Not connected