

- 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		Lead-Free Wave Soldering 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-l (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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