THE DATASHEET OF

TEN 30-1222

TRACO POWER

DC/DC Converter

TEN 30 Series, 30 Watt

- **2" x 1" x 0.4" metal package**
- **Wide 2:1 input range**
- **Very high efficiency up to 91%**
- **Operating temperature range -40°C to +80°C**
- **Over-temperature protection**
- **I/O isolation 1600 VDC**
- **Adjustable output voltage**
- **Remote On/Off**
- **3-year product warranty**

UL 62368-1 IEC 62368-1

The TEN 30 series is the latest generation of high performance DC/DC converter modules setting a new standard concerning power density. This product with 30W comes in an encapsulated, shielded metal package with a footprint of only 2.0" x 1.0". All models have wide 2:1 input voltage range and precisely regulated, isolated output voltages. Advanced circuit topology provides high efficiency up to 91% which allows an industrial operating temperature range of −40°C to +80°C (with derating). Further features include remote On/Off, adjustable output, under-voltage lockout and over-temperature protection. Typical applications for these converters are mobile equipment, instrumentation, distributed power architectures in communication and industrial electronics and everywhere where space on the PCB is critical.

Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency
		Vnom	Imax	Vnom	Imax	typ.
TEN 30-1210	9 - 18 VDC (12 VDC nom.)	3.3 VDC	8'000 mA			85 %
TEN 30-1211		5.1 VDC	6'000 mA			87 %
TEN 30-1212		12 VDC	2'500 mA			89 %
TEN 30-1213		15 VDC	2'000 mA			89 %
TEN 30-1221		+5 VDC	3'000 mA	−5 VDC	3'000 mA	87 %
TEN 30-1222		+12 VDC	1'250 mA	−12 VDC	1'250 mA	87 %
TEN 30-1223		+15 VDC	1'000 mA	−15 VDC	1'000 mA	87 %
TEN 30-2410	18 - 36 VDC (24 VDC nom.)	3.3 VDC	8'000 mA			87 %
TEN 30-2411		5.1 VDC	6'000 mA			90 %
TEN 30-2412		12 VDC	2'500 mA			91 %
TEN 30-2413		15 VDC	2'000 mA			91 %
TEN 30-2421		+5 VDC	3'000 mA	−5 VDC	3'000 mA	90 %
TEN 30-2422		+12 VDC	1'250 mA	−12 VDC	1'250 mA	89 %
TEN 30-2423		+15 VDC	1'000 mA	−15 VDC	1'000 mA	90 %
TEN 30-4810	36 - 75 VDC (48 VDC nom.)	3.3 VDC	8'000 mA			87 %
TEN 30-4811		5.1 VDC	6'000 mA			89 %
TEN 30-4812		12 VDC	2'500 mA			91 %
TEN 30-4813		15 VDC	2'000 mA			91 %
TEN 30-4821		+5 VDC	3'000 mA	−5 VDC	3'000 mA	90 %
TEN 30-4822		+12 VDC	1'250 mA	−12 VDC	1'250 mA	88 %
TEN 30-4823		+15 VDC	1'000 mA	−15 VDC	1'000 mA	89 %

Options

TEN-HS1	- Optional Heat Sink with Height = 0.22 inch: www.tracopower.com/products/ten-hs1.pdf
on demand (backorder with MOQ non stocking item)	- Optional model with 1.5 VDC / 8'500 mA Output and 9 - 18 VDC Input - Optional model with 2.5 VDC / 8'000 mA Output and 9 - 18 VDC Input - Optional model with 1.5 VDC / 8'500 mA Output and 18 - 36 VDC Input - Optional model with 2.5 VDC / 8'000 mA Output and 18 - 36 VDC Input - Optional model with 1.5 VDC / 8'500 mA Output and 36 - 75 VDC Input - Optional model with 2.5 VDC / 8'000 mA Output and 36 - 75 VDC Input

Input Specifications

Input Current	- At no load	12 Vin models:	**70 mA typ.** (1.5 Vout model)
			100 mA typ. (2.5 Vout model)
			105 mA typ. (3.3 Vout model)
			130 mA typ. (5.1 Vout model)
			90 mA typ. (12 Vout model)
			80 mA typ. (15 Vout model)
			120 mA typ. (5 / -5 Vout model)
			50 mA typ. (12 / -12 Vout model)
			40 mA typ. (15 / -15 Vout model)
		24 Vin models:	**50 mA typ.** (1.5 Vout model)
			50 mA typ. (2.5 Vout model)
			50 mA typ. (3.3 Vout model)
			75 mA typ. (5.1 Vout model)
			40 mA typ. (12 Vout model)
			35 mA typ. (15 Vout model)
			70 mA typ. (5 / -5 Vout model)
			30 mA typ. (12 / -12 Vout model)
			30 mA typ. (15 / -15 Vout model)
		48 Vin models:	**45 mA typ.** (1.5 Vout model)
			45 mA typ. (2.5 Vout model)
			30 mA typ. (3.3 Vout model)
			45 mA typ. (5.1 Vout model)
			45 mA typ. (12 Vout model)
			50 mA typ. (15 Vout model)
			35 mA typ. (5 / -5 Vout model)
			30 mA typ. (12 / -12 Vout model)
			20 mA typ. (15 / -15 Vout model)
	- At full load	12 Vin models:	**3'000 mA typ.**
		24 Vin models:	**1'500 mA typ.**
		48 Vin models:	**750 mA typ.**
Surge Voltage		12 Vin models:	**25 VDC max.** (100 ms max.)
		24 Vin models:	**50 VDC max.** (100 ms max.)
		48 Vin models:	**100 VDC max.** (100 ms max.)
Under Voltage Lockout		12 Vin models:	**7 VDC min. / 8 VDC typ. / 8.8 VDC max.**
		24 Vin models:	**15 VDC min. / 16 VDC typ. / 17.5 VDC max.**
		48 Vin models:	**31.5 VDC min. / 33 VDC typ. / 34.5 VDC max.**
Reflected Ripple Current			**20 mA typ.**
Recommended Input Fuse		12 Vin models:	**6'300 mA** (slow blow)
		24 Vin models:	**3'150 mA** (slow blow)
		48 Vin models:	**1'600 mA** (slow blow)
			(The need of an external fuse has to be assessed in the final application.)
Input Filter			Internal Pi-Type

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

Output Specifications

Output Voltage Adjustment			±10% (single output models only) (By external trim resistor) See application note: www.tracopower.com/overview/ten30 Output power must not exceed rated power!
Voltage Set Accuracy			±1% max.
Regulation	- Input Variation (Vmin - Vmax)	single output models:	0.2% max.
		dual output models:	0.2% max.
	- Load Variation (0 - 100%)	single output models:	0.5% max.
		dual output models:	1% max. (Output 1)
			1% max. (Output 2)
	- Cross Regulation (25% / 100% asym. load)	dual output models:	5% max.
Ripple and Noise (20 MHz Bandwidth)	- single output	1.5 Vout models:	100 mVp-p typ. (w/ 1 µF, 50 V MLCC)
		2.5 Vout models:	100 mVp-p typ. (w/ 1 µF, 50 V MLCC)
		3.3 Vout models:	100 mVp-p typ. (w/ 1 µF, 50 V MLCC)
		5.1 Vout models:	100 mVp-p typ. (w/ 1 µF, 50 V MLCC)
		12 Vout models:	150 mVp-p typ. (w/ 1 µF, 50 V MLCC)
		15 Vout models:	150 mVp-p typ. (w/ 1 µF, 50 V MLCC)
	- dual output	5 / -5 Vout models:	100 / 100 mVp-p typ. (w/ 1 µF, 50 V MLCC)
		12 / -12 Vout models:	150 / 150 mVp-p typ. (w/ 1 µF, 50 V MLCC)
		15 / -15 Vout models:	150 / 150 mVp-p typ. (w/ 1 µF, 50 V MLCC)
Capacitive Load	- single output	1.5 Vout models:	20'000 µF max.
		2.5 Vout models:	20'000 µF max.
		3.3 Vout models:	20'000 µF max.
		5.1 Vout models:	14'400 µF max.
		12 Vout models:	3'000 µF max.
		15 Vout models:	2'000 µF max.
	- dual output	5 / -5 Vout models:	3'000 / 3'000 µF max.
		12 / -12 Vout models:	2'000 / 2'000 µF max.
		15 / -15 Vout models:	1'300 / 1'300 µF max.
Minimum Load			Not required
Temperature Coefficient			±0.02 %/K max.
Start-up Time			30 ms typ.
Short Circuit Protection			Continuous, Automatic recovery
Overload Protection			Indefinite Mode
Output Current Limitation			150% typ. of Iout max.
Overvoltage Protection			125% typ. of Vout nom. (depending on model) 2 VDC typ. (1.5 Vout models) 3.3 VDC typ. (2.5 Vout models) 3.9 VDC typ. (3.3 Vout models) 6.2 VDC typ. (±5 & 5.1 Vout models) 15 VDC typ. (±12 Vout models) 18 VDC typ. (±15 Vout models)
Transient Response	- Peak Variation		450 mV max. (25% Load Step)
	- Response Time		250 µs typ. (25% Load Step)

Safety Specifications

Standards	- IT / Multimedia Equipment	EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1
	- Certification Documents	www.tracopower.com/overview/ten30

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

Pollution Degree			PD 2
Over Voltage Category			OVC I

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:	www.tracopower.com/overview/ten30
EMS Immunity	- 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
		Ext. input component:	12 Vin & 24 Vin models (KY 330 µF / 50 V)
			48 Vin models (KY 220 µF / 100V)
	- 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

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	–40°C to +80°C
	- Case Temperature	+105°C max.
	- Storage Temperature	–55°C to +125°C
Power Derating	- High Temperature	Depending on model
	See application note:	www.tracopower.com/overview/ten30
Over Temperature Protection Switch Off	- Protection Mode	115°C typ. (Automatic recovery at 105°C typ.)
	- Measurement Point	Case
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote (passive = on)	On: 3.0 to 12 VDC or open circuit
		Off: 0 to 1.2 VDC or short circuit
		Refers to 'Remote' and '-Vin' Pin
	- Off Idle Input Current	3 mA typ.
	- Remote Pin Input Current	-0.5 to 0.5 mA
Altitude During Operation		5'000 m max.
Regulator Topology		Flyback Converter
Switching Frequency		387 - 473 kHz (PWM)
		430 kHz typ. (PWM)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s	1'600 VDC
	- Input to Case, 60 s	1'600 VDC
	- Output to Case, 60 s	1'600 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	1'500 pF max.
Reliability	- Calculated MTBF	1'450'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline
		www.tracopower.com/info/cleaning.pdf
Environment	- Vibration	MIL-STD-810F
		7.7 g, 3 axis, random waveform, 60 min
	- Mechanical Shock	MIL-STD-810F
		40 g, 3 axis, terminal peak sawtooth, 11 ms
	- Thermal Shock	MIL-STD-810F
		-55°C to +125°C, 72 cycles, 30 min each
Housing Material		Copper, Nickel plated
Base Material		Non-conductive FR4 (UL 94 V-0 rated)

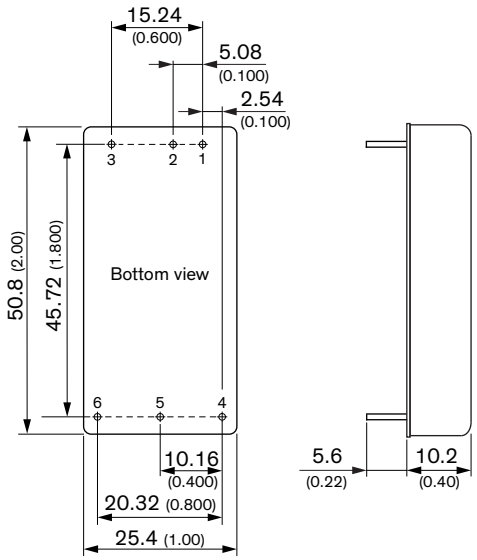
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

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		2" x 1"
Soldering Profile		Lead-Free Wave Soldering 265°C / 10 s max.
Weight		30.5 g
Thermal Impedance	- Case to Ambient	12 K/W typ. 10 K/W typ. (with Heat Sink)
Environmental Compliance	- REACH Declaration	www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant
	- RoHS Declaration	www.tracopower.com/info/rohs-declaration.pdf Exemptions: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)
	- SCIP Reference Number	8337096d-4657-4963-9344-853fadd7ae91

Supporting Documents

Overview Link (for additional Documents)	www.tracopower.com/overview/ten30

Outline Dimensions



Dimensions in mm (inch)
Pin diameter: 1.0 ±0.1 (0.04 ±0.004)
Tolerances: x.x ±0.5 (x.xx ±0.02)
x.xx ±0.25 (x.xxx ±0.01)

Pinout		
Pin	**Single**	**Dual**
1	+Vin (Vcc)	
2	–Vin (GND)	
3	Remote On/Off	
4	+Vout	
5	–Vout	Common
6	Trim	–Vout

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