

- 2" x 1" x 0.4" shielded metal package
- Ultra wide 4:1 input voltage range
- Single- dual- and triple output models
- Very high efficiency up to 91 %
- Operating temperature range -40 °C to +75 °C
- Over temperature protection
- I/O isolation 1600 VDC
- Remote On/Off
- Adjustable output voltage
- 3-years product warranty



The TEN 30WIN series is a family of high performance 30W DC/DC converter modules featuring ultra wide 4:1 input voltage ranges in a compact low profile case with industry-standard footprint. Standard features include remote On/Off, output voltage trimming, over voltage protection, under voltage lockout, over temperature and short circuit protection. Typical applications for these products are battery operated equipment and distributed power architectures in communication and industrial electronics, everywhere where isolated, tightly regulated voltages are required and space is limited on the PCB.

### Models

Order Code	Input Voltage Range	Output 1		Output 2		Output 3		Efficiency typ.
		Vnom	I <sub>max</sub>	Vnom	I <sub>max</sub>	Vnom	I <sub>max</sub>	
TEN 30-2410WIN	9 - 36 VDC (24 VDC nom.)	3.3 VDC	7'500 mA					86 %
TEN 30-2411WIN		5.1 VDC	6'000 mA					88 %
TEN 30-2412WIN		12 VDC	2'500 mA					89 %
TEN 30-2413WIN		15 VDC	2'000 mA					89 %
TEN 30-2421WIN		+5 VDC	3'000 mA	-5 VDC	3'000 mA			88 %
TEN 30-2422WIN		+12 VDC	1'250 mA	-12 VDC	1'250 mA			87 %
TEN 30-2423WIN		+15 VDC	1'000 mA	-15 VDC	1'000 mA			87 %
TEN 30-2431WIN		+5 VDC	4'000 mA	+12 VDC	416 mA	-12 VDC	416 mA	88 %
TEN 30-2432WIN		+5 VDC	4'000 mA	+15 VDC	333 mA	-15 VDC	333 mA	88 %
TEN 30-2433WIN		+3.3 VDC	5'000 mA	+12 VDC	416 mA	-12 VDC	416 mA	87 %
TEN 30-2434WIN		+3.3 VDC	5'000 mA	+15 VDC	333 mA	-15 VDC	333 mA	87 %
TEN 30-4810WIN		18 - 75 VDC (48 VDC nom.)	3.3 VDC	7'500 mA				
TEN 30-4811WIN	5.1 VDC		6'000 mA					88 %
TEN 30-4812WIN	12 VDC		2'500 mA					90 %
TEN 30-4813WIN	15 VDC		2'000 mA					91 %
TEN 30-4821WIN	+5 VDC		3'000 mA	-5 VDC	3'000 mA			88 %
TEN 30-4822WIN	+12 VDC		1'250 mA	-12 VDC	1'250 mA			88 %
TEN 30-4823WIN	+15 VDC		1'000 mA	-15 VDC	1'000 mA			88 %
TEN 30-4831WIN	+5 VDC		4'000 mA	+12 VDC	416 mA	-12 VDC	416 mA	88 %
TEN 30-4832WIN	+5 VDC		4'000 mA	+15 VDC	333 mA	-15 VDC	333 mA	88 %
TEN 30-4833WIN	+3.3 VDC		5'000 mA	+12 VDC	416 mA	-12 VDC	416 mA	87 %
TEN 30-4834WIN	+3.3 VDC		5'000 mA	+15 VDC	333 mA	-15 VDC	333 mA	87 %

### Options

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

## Input Specifications

Input Current	- At no load	24 Vin models: <b>70 mA typ.</b> (1.5 Vout model) <b>70 mA typ.</b> (2.5 Vout model) <b>85 mA typ.</b> (3.3 Vout model) <b>115 mA typ.</b> (5.1 Vout model) <b>20 mA typ.</b> (12 Vout model) <b>30 mA typ.</b> (15 Vout model) <b>90 mA typ.</b> (5 / -5 Vout model) <b>25 mA typ.</b> (12 / -12 Vout model) <b>25 mA typ.</b> (15 / -15 Vout model) <b>105 mA typ.</b> (5 / 12 / -12 Vout model) <b>105 mA typ.</b> (5 / 15 / -15 Vout model) <b>105 mA typ.</b> (3.3 / 12 / -12 Vout model) <b>105 mA typ.</b> (3.3 / 15 / -15 Vout model)
	- At full load	48 Vin models: <b>30 mA typ.</b> (1.5 Vout model) <b>45 mA typ.</b> (2.5 Vout model) <b>45 mA typ.</b> (3.3 Vout model) <b>65 mA typ.</b> (5.1 Vout model) <b>65 mA typ.</b> (12 Vout model) <b>50 mA typ.</b> (15 Vout model) <b>50 mA typ.</b> (5 / -5 Vout model) <b>15 mA typ.</b> (12 / -12 Vout model) <b>15 mA typ.</b> (15 / -15 Vout model) <b>55 mA typ.</b> (5 / 12 / -12 Vout model) <b>55 mA typ.</b> (5 / 15 / -15 Vout model) <b>55 mA typ.</b> (3.3 / 12 / -12 Vout model) <b>55 mA typ.</b> (3.3 / 15 / -15 Vout model)
Surge Voltage		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		24 Vin models: <b>7 VDC min. / 8 VDC typ. / 8.8 VDC max.</b> 48 Vin models: <b>15 VDC min. / 16 VDC typ. / 17.5 VDC max.</b>
Reflected Ripple Current		<b>20 mA typ.</b>
Recommended Input Fuse		24 Vin models: <b>6'300 mA</b> (slow blow) 48 Vin models: <b>3'150 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> (single output models only) (By external trim resistor) See application note: <a href="http://www.tracopower.com/overview/ten30win">www.tracopower.com/overview/ten30win</a> Output power must not exceed rated power!
Voltage Set Accuracy	<b>±1% max.</b> (±5 % for auxiliary outputs)

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

<b>Regulation</b>	- Input Variation (Vmin - Vmax)	single output models: <b>0.2% max.</b>
		dual output models: <b>0.25% max.</b> ( $\pm 5$ Vout models) <b>0.2% max.</b> (other dual models)
	- Load Variation (0 - 100%)	triple output models: <b>1% max.</b> <b>5% max.</b> (aux)
		single output models: <b>0.5% max.</b> dual output models: <b>1% max.</b> (Output 1) <b>1% max.</b> (Output 2) triple output models: <b>1% max.</b> (Output 1) <b>5% max.</b> (Output 2) <b>5% max.</b> (Output 3)
- Cross Regulation (25% / 100% asym. load)	dual output models: <b>5% max.</b>	
<b>Ripple and Noise</b> (20 MHz Bandwidth)	- single output	1.5 Vout: <b>100 mVp-p typ.</b> (w/ 1 $\mu$ F, 50 V MLCC)
		2.5 Vout: <b>100 mVp-p typ.</b> (w/ 1 $\mu$ F, 50 V MLCC)
		3.3 Vout: <b>100 mVp-p typ.</b> (w/ 1 $\mu$ F, 50 V MLCC)
		5.1 Vout: <b>100 mVp-p typ.</b> (w/ 1 $\mu$ F, 50 V MLCC)
		12 Vout: <b>150 mVp-p typ.</b> (w/ 1 $\mu$ F, 50 V MLCC)
	- dual output	15 Vout: <b>150 mVp-p typ.</b> (w/ 1 $\mu$ F, 50 V MLCC)
		5 / -5 Vout: <b>100 / 100 mVp-p typ.</b> (w/ 1 $\mu$ F, 50 V MLCC)
		12 / -12 Vout: <b>150 / 150 mVp-p typ.</b> (w/ 1 $\mu$ F, 50 V MLCC)
	- triple output	15 / -15 Vout: <b>150 / 150 mVp-p typ.</b> (w/ 1 $\mu$ F, 50 V MLCC)
		5 / 12 / -12 Vout: <b>50 / 75 / 75 mVp-p typ.</b> (w/ 0.1 $\mu$ F, 50 V MLCC)
	5 / 15 / -15 Vout: <b>50 / 75 / 75 mVp-p typ.</b> (w/ 0.1 $\mu$ F, 50 V MLCC)	
	3.3 / 12 / -12 Vout: <b>50 / 75 / 75 mVp-p typ.</b> (w/ 0.1 $\mu$ F, 50 V MLCC)	
	3.3 / 15 / -15 Vout: <b>50 / 75 / 75 mVp-p typ.</b> (w/ 0.1 $\mu$ F, 50 V MLCC)	
<b>Capacitive Load</b>	- single output	1.5 Vout: <b>20'000 <math>\mu</math>F max.</b>
		2.5 Vout: <b>20'000 <math>\mu</math>F max.</b>
		3.3 Vout: <b>20'000 <math>\mu</math>F max.</b>
		5.1 Vout: <b>14'400 <math>\mu</math>F max.</b>
		12 Vout: <b>3'000 <math>\mu</math>F max.</b>
	- dual output	15 Vout: <b>2'000 <math>\mu</math>F max.</b>
		5 / -5 Vout: <b>3'000 / 3'000 <math>\mu</math>F max.</b>
		12 / -12 Vout: <b>2'000 / 2'000 <math>\mu</math>F max.</b>
	- triple output	15 / -15 Vout: <b>1'300 / 1'300 <math>\mu</math>F max.</b>
		5 / 12 / -12 Vout: <b>8'000 / 340 / 340 <math>\mu</math>F max.</b>
	5 / 15 / -15 Vout: <b>8'000 / 220 / 220 <math>\mu</math>F max.</b>	
	3.3 / 12 / -12 Vout: <b>15'000 / 340 / 340 <math>\mu</math>F max.</b>	
	3.3 / 15 / -15 Vout: <b>15'000 / 220 / 220 <math>\mu</math>F max.</b>	
<b>Minimum Load</b>	- single output	1.5 Vout: <b>0 % of Iout max.</b>
		2.5 Vout: <b>0 % of Iout max.</b>
		3.3 Vout: <b>0 % of Iout max.</b>
		5.1 Vout: <b>0 % of Iout max.</b>
		12 Vout: <b>0 % of Iout max.</b>
	- dual output	15 Vout: <b>0 % of Iout max.</b>
		5 / -5 Vout: <b>0 % of Iout max.</b>
		12 / -12 Vout: <b>0 % of Iout max.</b>
	- triple output	15 / -15 Vout: <b>0 % of Iout max.</b>
		5 / 12 / -12 Vout: <b>10 % of Iout max.</b>
	5 / 15 / -15 Vout: <b>10 % of Iout max.</b>	
	3.3 / 12 / -12 Vout: <b>10 % of Iout max.</b>	
	3.3 / 15 / -15 Vout: <b>10 % of Iout max.</b>	
		(Operation at lower load will not damage the converter, but it may not meet all specifications)
<b>Temperature Coefficient</b>		<b><math>\pm 0.02</math> %/K max.</b>
<b>Start-up Time</b>		<b>50 ms max.</b> (single & dual models) <b>30 ms max.</b> (triple models)
<b>Short Circuit Protection</b>		<b>Continuous, Automatic recovery</b>

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

Output Current Limitation		150% typ. of I <sub>out</sub> max.
Overvoltage Protection		125% typ. of V <sub>out</sub> nom. (depending on model) 2 VDC (1.5 V <sub>out</sub> model) 3.3 VDC (2.5 V <sub>out</sub> model) 3.9 VDC (3.3 V <sub>out</sub> model) 6.2 VDC (5 / 5.1 V <sub>out</sub> model) 15 VDC (12 V <sub>out</sub> model) 18 VDC (15 V <sub>out</sub> model)
Transient Response	- Peak Variation - Response Time	370 mV max. (25% Load Step) 250 μs typ. (25% 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/ten30win">www.tracopower.com/overview/ten30win</a>
Pollution Degree		PD 2
Over Voltage Category		OVC I

### EMC Specifications

EMI Emissions	- Conducted Emissions  - Radiated Emissions	EN 55032 class A (with external filter) EN 55032 class B (with external filter) EN 55032 class A (with external filter) EN 55032 class B (with external filter)
		External filter proposal: <a href="http://www.tracopower.com/overview/ten30win">www.tracopower.com/overview/ten30win</a>
EMS Immunity	- Electrostatic Discharge  - RF Electromagnetic Field - EFT (Burst) / Surge  - Conducted RF Disturbances - PF Magnetic Field	Air: EN 61000-4-2, ±8 kV, perf. criteria A Contact: EN 61000-4-2, ±6 kV, perf. criteria A EN 61000-4-3, 10 V/m, perf. criteria A EN 61000-4-4, ±2 kV, perf. criteria A EN 61000-4-5, ±1 kV, perf. criteria A Ext. input component: 24 Vin models: KY 330 μF / 50 V 48 Vin models: KY 220 μF / 100 V Continuous: EN 61000-4-6, 10 V <sub>rms</sub> , perf. criteria A 1 s: EN 61000-4-8, 100 A/m, perf. criteria A EN 61000-4-8, 1000 A/m, perf. criteria A

### General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +75°C +105°C max. -55°C to +125°C
Power Derating	- High Temperature	See application note: <a href="http://www.tracopower.com/overview/ten30win">www.tracopower.com/overview/ten30win</a>
Over Temperature Protection Switch Off	- Protection Mode - Measurement Point	115°C max. (Automatic recovery at 105°C typ.) Case
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 3 mA typ. -0.5 to 0.5 mA
Altitude During Operation		5'000 m max.

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

Switching Frequency		387 - 473 kHz (PWM) (single, dual output models) 360 - 440 kHz (PWM) (triple output models)
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	1'500 pF max.
Reliability	- Calculated MTBF	1'300'000 h (single and dual output models) 1'200'000 h (triple output models) (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 7.6 g, 3 axis, 60 min, 20-2000 Hz MIL-STD-810F 40 g, 3 axis, terminal peak sawtooth, 11 ms 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)
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		Wave Soldering 260°C / 6 s max.
Weight		30.5 g
Thermal Impedance		12 K/W 10 K/W (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

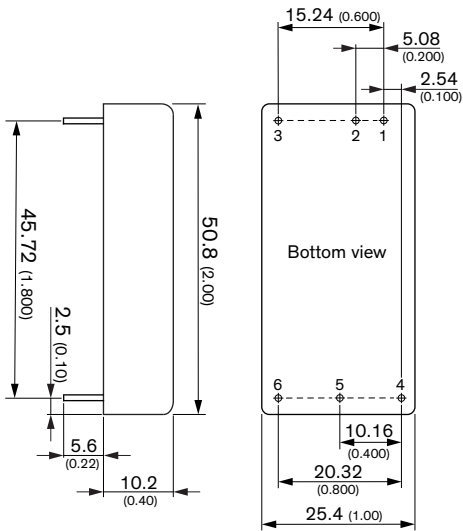
Overview Link (for additional Documents)

[www.tracopower.com/overview/ten30win](http://www.tracopower.com/overview/ten30win)

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

### Outline Dimensions

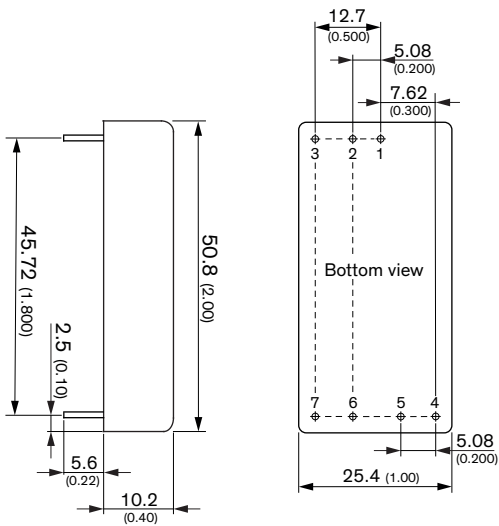
#### Single and dual output models



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

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

#### Triple output models



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

Pinout	
Pin	Triple
1	+Vin (Vcc)
2	-Vin (GND)
3	Remote On/Off
4	Output 2
5	Output 3
6	Common
7	Output 1