

DC/DC Converter

TEN 20WIN Series, 20 Watt

- 2" x 1" x 0.4" metal package
- Ultra wide 4:1 input range
- Operating temperature range -40°C to +85°C
- I/O isolation 1500 VDC
- Input filter to meet EN 55022 class A
- Adjustable output voltage
- Remote On/Off
- 3-year product warranty



The TEN 20WIN series is a family of high performance 20W DC/DC converter modules featuring ultra wide 4:1 input voltage ranges in a ultra compact 2" x 1" low profile package with industry-standard footprint. A very high efficiency allows an operating temperature range of -40°C to 85°C. Further standard features include remote On/Off, output voltage trimming, over voltage protection and short circuit protection. Typical applications for these converters are battery operated equipment and distributed power architectures in communication and industrial electronics, everywhere where isolated, tightly regulated voltages are required.

Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency typ.
		Vnom	I _{max}	Vnom	I _{max}	
TEN 20-2410WIN	9 - 36 VDC (24 VDC nom.)	3.3 VDC	5'500 mA			85 %
TEN 20-2411WIN		5 VDC	4'000 mA			88 %
TEN 20-2412WIN		12 VDC	1'670 mA			86 %
TEN 20-2413WIN		15 VDC	1'330 mA			86 %
TEN 20-2421WIN		+5 VDC	2'000 mA	-5 VDC	2'000 mA	88 %
TEN 20-2422WIN		+12 VDC	833 mA	-12 VDC	833 mA	87 %
TEN 20-2423WIN		+15 VDC	667 mA	-15 VDC	667 mA	87 %
TEN 20-4810WIN	18 - 75 VDC (48 VDC nom.)	3.3 VDC	5'500 mA			85 %
TEN 20-4811WIN		5 VDC	4'000 mA			88 %
TEN 20-4812WIN		12 VDC	1'670 mA			87 %
TEN 20-4813WIN		15 VDC	1'330 mA			87 %
TEN 20-4821WIN		+5 VDC	2'000 mA	-5 VDC	2'000 mA	89 %
TEN 20-4822WIN		+12 VDC	833 mA	-12 VDC	833 mA	88 %
TEN 20-4823WIN		+15 VDC	667 mA	-15 VDC	667 mA	88 %

Options

TEN-HS1	- Optional Heat Sink with Height = 0.22 inch: www.tracopower.com/overview/ten-hs1
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Input Specifications

Input Current	- At no load	24 Vin models:	50 mA typ. (3.3 Vout model) 65 mA typ. (5 Vout model) 22 mA typ. (12 Vout model) 22 mA typ. (15 Vout model) 55 mA typ. (5 / -5 Vout model) 30 mA typ. (12 / -12 Vout model) 30 mA typ. (15 / -15 Vout model)
		48 Vin models:	35 mA typ. (3.3 Vout model) 35 mA typ. (5 Vout model) 15 mA typ. (12 Vout model) 15 mA typ. (15 Vout model) 35 mA typ. (5 / -5 Vout model) 17 mA typ. (12 / -12 Vout model) 17 mA typ. (15 / -15 Vout model)
	- At full load	24 Vin models:	2'750 mA max.
		48 Vin models:	2'750 mA max.
Surge Voltage		24 Vin models:	50 VDC max. (100 ms max.)
		48 Vin models:	100 VDC max. (100 ms max.)
Under Voltage Lockout		24 Vin models:	7 VDC min. / 8 VDC typ. / 8.8 VDC max.
		48 Vin models:	14.5 VDC min. / 16 VDC typ. / 17.5 VDC max.
Reflected Ripple Current			20 mA typ.
Recommended Input Fuse		24 Vin models:	4'000 mA (slow blow)
		48 Vin models:	2'000 mA (slow blow)
			(The need of an external fuse has to be assessed in the final application.)
Input Filter			Internal Pi-Type

Output Specifications

Output Voltage Adjustment			±10% (By external trim resistor)
		See application note:	www.tracopower.com/overview/ten20win
			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:	0.5% 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	3.3 Vout models:	60 mVp-p typ. (w/ 0.1 µF, 50 V MLCC)
		5 Vout models:	75 mVp-p typ. (w/ 0.1 µF, 50 V MLCC)
		12 Vout models:	75 mVp-p typ. (w/ 0.1 µF, 50 V MLCC)
		15 Vout models:	75 mVp-p typ. (w/ 0.1 µF, 50 V MLCC)
	- dual output	5 / -5 Vout models:	100 / 100 mVp-p typ. (w/ 0.1 µF, 50 V MLCC)
		12 / -12 Vout models:	100 / 100 mVp-p typ. (w/ 0.1 µF, 50 V MLCC)
		15 / -15 Vout models:	100 / 100 mVp-p typ. (w/ 0.1 µF, 50 V MLCC)
Capacitive Load	- single output	3.3 Vout models:	18'000 µF max.
		5 Vout models:	9'600 µF max.
		12 Vout models:	1'650 µF max.
		15 Vout models:	1'050 µF max.
	- dual output	5 / -5 Vout models:	4'800 / 4'800 µF max.
		12 / -12 Vout models:	825 / 825 µF max.
		15 / -15 Vout models:	525 / 525 µF max.
Minimum Load			Not required
Temperature Coefficient			±0.02 %/K max.

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

Start-up Time	20 ms typ. / 60 ms max.
Short Circuit Protection	Continuous, Automatic recovery
Overload Protection	Indefinite Mode
Output Current Limitation	125 - 170% of I _{out} max. 150% typ. of I _{out} max.
Overvoltage Protection	122% typ. of V _{out} nom. (depending on model) 3.9 VDC (3.3 VDC model) 6.2 VDC (5 / ±5 VDC model) 15 VDC (12 / ±12 VDC model) 18 VDC (15 / ±15 VDC model)
Transient Response	- Peak Variation - Response Time
	220 mV max. (25% Load Step) 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/ten20win
Pollution Degree		PD 2
Over Voltage Category		Not mains connected

EMC Specifications

EMI (Emissions)	- Conducted Emissions - Radiated Emissions	EN 61204-3 (Low Voltage Power Supplies) 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: www.tracopower.com/overview/ten20win
EMS (Immunity)	- Electrostatic Discharge - RF Electromagnetic Field - EFT (Burst) / Surge - Conducted RF Disturbances - PF Magnetic Field	EN 61204-3 (Low Voltage Power Supplies) Air: EN 61000-4-2, ±8 kV, perf. criteria B Contact: EN 61000-4-2, ±6 kV, perf. criteria B EN 61000-4-3, 10 V/m, perf. criteria A EN 61000-4-4, ±2 kV, perf. criteria B EN 61000-4-5, ±1 kV, perf. criteria A Ext. input component: KY 220 µF / 100 V Continuous: EN 61000-4-6, 10 V _{rms} , perf. criteria A 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 - Case Temperature - Storage Temperature	-40°C to +85°C +105°C max. -55°C to +125°C
Power Derating	- High Temperature	Depending on model
		See application note: www.tracopower.com/overview/ten20win
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote (passive = on) - 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 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.

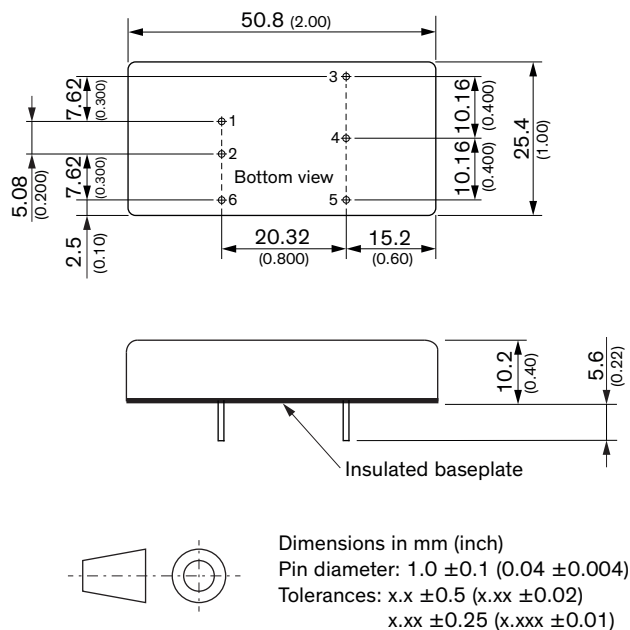
Regulator Topology	Flyback Converter
Switching Frequency	360 - 440 kHz (PWM) 400 kHz typ. (PWM)
Insulation System	Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s 1'600 VDC - Input to Case, 60 s 1'600 VDC - Output to Case, 60 s 1'600 VDC
Isolation Resistance	- Input to Output, 500 VDC 1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V 1'500 pF max.
Reliability	- Calculated MTBF 1'800'000 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)
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 260°C / 6 s max.
Weight	27 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: 7(a), 7(c)-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).) - SCIP Reference Number 60396226-142c-440a-8dd3-fb6921d2b8f5

Additional Information

Supporting Documents	www.tracopower.com/overview/ten20win
Frequently Asked Questions	www.tracopower.com/glossary-faq
Glossary	www.tracopower.com/info/glossary.pdf

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Outline Dimensions



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