THE DATASHEET OF

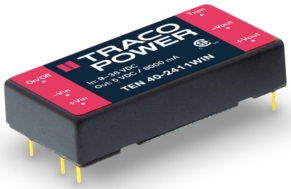
TEN 40-4823WIN

TRACO POWER

DC/DC Converter

TEN 40WIN Series, 40 Watt

- **Highest power density: 40 W in 1” x 2” x 0.4” package**
- **Ultra wide 4:1 input range**
- **Excellent efficiency up to 90 %**
- **Output voltage adjustable**
- **Remote On/Off**
- **Protection against short circuit and over voltage**
- **I/O isolation 1500 VDC**
- **Operating temperature range −40°C to +75°C**
- **3-year product warranty**



UL 62368-1 IEC 62368-1

The TEN 40WIN Series is a new range of isolated high performance DC/DC-converter modules. Due to the very high efficiency of up to 90% these 40 W converters come with a footprint of only 1.0” x 2.0”. The 12 models have an ultra wide 4:1 input voltage range and a tight output voltage regulation. The output voltage is adjustable by external resistor. Remote On/Off and protection against overpower and over voltage are standard features of these converters. Typical applications are in mobile equipment, instrumentation, distributed power architectures in communication and industrial electronics and everywhere where space on the PCB is limited.

Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency
		Vnom	Imax	Vnom	Imax	typ.
TEN 40-2410WIN	9 - 36 VDC (24 VDC nom.)	3.3 VDC	8'000 mA			89 %
TEN 40-2411WIN		5 VDC	8'000 mA			90 %
TEN 40-2412WIN		12 VDC	3'330 mA			89 %
TEN 40-2413WIN		15 VDC	2'670 mA			89 %
TEN 40-2415WIN		24 VDC	1'670 mA			91 %
TEN 40-2422WIN		+12 VDC	1'670 mA	−12 VDC	1'670 mA	88 %
TEN 40-2423WIN		+15 VDC	1'330 mA	−15 VDC	1'330 mA	88 %
TEN 40-4810WIN	18 - 75 VDC (48 VDC nom.)	3.3 VDC	8'000 mA			89 %
TEN 40-4811WIN		5 VDC	8'000 mA			90 %
TEN 40-4812WIN		12 VDC	3'330 mA			90 %
TEN 40-4813WIN		15 VDC	2'670 mA			90 %
TEN 40-4815WIN		24 VDC	1'670 mA			91 %
TEN 40-4822WIN		+12 VDC	1'670 mA	−12 VDC	1'670 mA	88 %
TEN 40-4823WIN		+15 VDC	1'330 mA	−15 VDC	1'330 mA	88 %

Options

TEN-HS4	- Optional Heat Sink: www.tracopower.com/products/ten-hs4.pdf
TEN-HS6	- Optional Heat Sink: www.tracopower.com/products/ten-hs6.pdf

Input Specifications

Input Current	- At no load	24 Vin models:	**90 mA typ.** (3.3 Vout model)
			90 mA typ. (5 Vout model)
			95 mA typ. (12 Vout model)
			105 mA typ. (15 Vout model)
			115 mA typ. (24 Vout model)
			65 mA typ. (12 / -12 Vout model)
			65 mA typ. (15 / -15 Vout model)
		48 Vin models:	**55 mA typ.** (3.3 Vout model)
			55 mA typ. (5 Vout model)
			60 mA typ. (12 Vout model)
			65 mA typ. (15 Vout model)
			75 mA typ. (24 Vout model)
			45 mA typ. (12 / -12 Vout model)
			45 mA typ. (15 / -15 Vout model)
	- At full load	24 Vin models:	**1'240 mA max.** (3.3 Vout model)
			1'850 mA max. (5 Vout model)
			1'870 mA max. (12 Vout model)
			1'870 mA max. (15 Vout model)
			1'835 mA max. (24 Vout model)
			1'890 mA max. (12 / -12 Vout model)
			1'890 mA max. (15 / -15 Vout model)
		48 Vin models:	**620 mA max.** (3.3 Vout model)
			930 mA max. (5 Vout model)
			930 mA max. (12 Vout model)
			930 mA max. (15 Vout model)
			920 mA max. (24 Vout model)
			950 mA max. (12 / -12 Vout model)
			950 mA max. (15 / -15 Vout model)
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:	**8.3 VDC typ.**
		48 Vin models:	**16.5 VDC typ.**
Reflected Ripple Current		24 Vin models:	**30 mAp-p typ.**
		48 Vin models:	**20 mAp-p typ.**
Recommended Input Fuse		24 Vin models:	**8'000 mA** (slow blow)
		48 Vin models:	**4'000 mA** (slow blow)
			(The need of an external fuse has to be assessed in the final application.)
Input Filter			Internal LC-Type

Output Specifications

Output Voltage Adjustment			**–10% to +20%** (24 Vout models)
			±10% (other models)
			(single output models only)
			(By external trim resistor)
		See application note:	www.tracopower.com/overview/ten40win
			Output power must not exceed rated power!
Voltage Set Accuracy			**±1% max.**
Regulation	- Input Variation (Vmin - Vmax)	single output models:	**0.5% 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)
	- Voltage Balance (symmetrical load)	dual output models:	**2% max.**

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

Ripple and Noise (20 MHz Bandwidth)	- single output	3.3 Vout models:	100 mVp-p max. (w/ 1µF MC || 10µF TC)
		5 Vout models:	100 mVp-p max. (w/ 1µF MC || 10µF TC)
		12 Vout models:	150 mVp-p max. (w/ 1µF MC || 10µF TC)
		15 Vout models:	150 mVp-p max. (w/ 1µF MC || 10µF TC)
		24 Vout models:	150 mVp-p max. (w/ 1µF MC || 10µF TC)
	- dual output	12 / -12 Vout models:	150 / 150 mVp-p max. (w/ 1µF MC || 10µF TC)
		15 / -15 Vout models:	150 / 150 mVp-p max. (w/ 1µF MC || 10µF TC)
Capacitive Load	- single output	3.3 Vout models:	21'000 µF max.
		5 Vout models:	13'600 µF max.
		12 Vout models:	2'400 µF max.
		15 Vout models:	1'500 µF max.
		24 Vout models:	600 µF max.
	- dual output	12 / -12 Vout models:	1'200 / 1'200 µF max.
		15 / -15 Vout models:	750 / 750 µF max.
Minimum Load	- single output	3.3 Vout models:	0 % of Iout max.
		5 Vout models:	0 % of Iout max.
		12 Vout models:	0 % of Iout max.
		15 Vout models:	0 % of Iout max.
		24 Vout models:	0 % of Iout max.
	- dual output	12 / -12 Vout models:	9 % of Iout max.
		15 / -15 Vout models:	8 % of Iout max.
Temperature Coefficient			±0.02 %/K max.
Start-up Time			30 ms max.
Short Circuit Protection			Continuous, Automatic recovery
Output Current Limitation			150% typ. of Iout max.
Transient Response	- Response Deviation		3% typ. / 5% max. (75% to 100% Load Step)
	- Response Time		250 µs typ. (75% to 100% Load Step)

Safety Specifications

Standards	- IT / Multimedia Equipment		CSA-C22.2, No. 60950-1
			EN 60950-1
			EN 62368-1
			IEC 60950-1
			IEC 62368-1
			UL 60950-1
			UL 62368-1
	- Certification Documents		www.tracopower.com/overview/ten40win
Pollution Degree			PD 3
Over Voltage Category			Not mains connected

EMC Specifications

EMI Emissions	- Conducted Emissions		EN 55032 class A (with external filter)
			FCC Part 15 class A (with external filter)
	- Radiated Emissions		EN 55032 class A (with external filter)
			FCC Part 15 class A (with external filter)
		External filter proposal:	www.tracopower.com/overview/ten40win
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		EN 61000-4-6, 10 Vrms, perf. criteria A
	- PF Magnetic Field	Continuous:	EN 61000-4-8, 3 A/m, perf. criteria A

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

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	–40°C to +75°C
	- Case Temperature	+105°C max.
	- Storage Temperature	–50°C to +125°C
Power Derating	- High Temperature	Depending on model
	See application note:	www.tracopower.com/overview/ten40win
Over Temperature Protection Switch Off	- Protection Mode	110°C typ.
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote (passive = on)	On: 3.5 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	2.5 mA max.
	- Remote Pin Input Current	-0.5 to 0.5 mA
Altitude During Operation		6'000 m max.
Switching Frequency		285 kHz typ. (PWM) (24 Vout models) 320 kHz typ. (PWM) (other models)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s	1'500 VDC
	- Input to Output, 1 s	1'800 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	1'500 pF typ.
Reliability	- Calculated MTBF	330'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf
Housing Material		Alu alloy, black anodized coating
Base Material		Non-conductive FR4 (UL 94 V-0 rated)
Potting Material		Epoxy (UL 94 V-0 rated)
Pin Material		Copper Alloy (C6801)
Pin Foundation Plating		Nickel (2.5 µm min.)
Pin Surface Plating		Gold (75 - 125 nm), glossy
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 / 10 s max.
Weight		30 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 (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)
	- SCIP Reference Number	14ea9ef9-80c5-4478-895c-1762f23c29c8

Supporting Documents

Overview Link (for additional Documents)	www.tracopower.com/overview/ten40win

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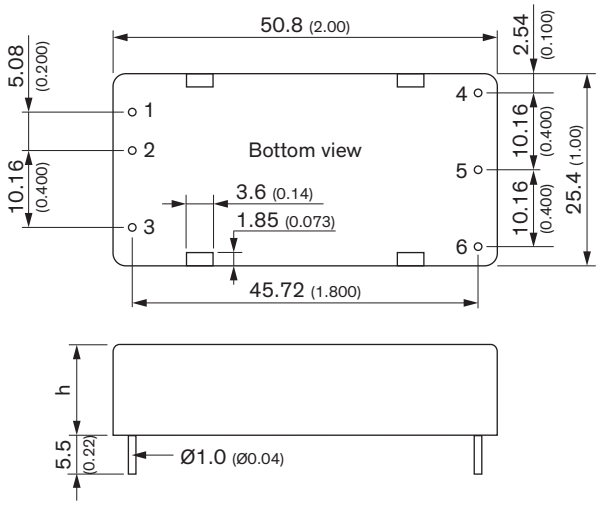
Outline Dimensions



h=11.0 (0.43) for 24 VDC output models
h=10.2 (0.40) for other models

Dimensions in mm (inch)
Tolerances: x.x ±0.25 (x.xx ±0.01)
x.xx ±0.13 (x.xxx ±0.005)
Pin diameter tolerances: x.x ±0.05 (x.xx ±0.002)

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

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- Alternative Solution
- Excess Inventory Management