cULus
UL 60950-1

Features

- High power density: 40W in 2"x2"x0.4" metal package
- Ultra wide 4:1 input voltage range
- Very high efficiency up to 87 %
- No minimum load required for single output models
- Over temperature protection
- Under voltage lockout
- Remote On/Off
- Shielded metal case with insulated baseplate
- Optional heat-sink
- 3-year product warranty

The TEN 40WI series is a family of high performance 40W dc-dc converter modules featuring ultra wide 4:1 input voltage ranges in a compact low profile case 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, 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

Ordercode	Input voltage range	Output voltage	Output current max.	Efficiency typ.
TEN 40-2410WI	**9 – 36 VDC** (24 VDC nominal)	3.3 VDC	10.0 A	86 %
TEN 40-2411WI		5.0 VDC	8.0 A	87 %
TEN 40-2412WI		12 VDC	3.35 A	87 %
TEN 40-2413WI		15 VDC	2.65 A	87 %
TEN 40-2422WI		±12 VDC	±1.65 A	86 %
TEN 40-2423WI		±15 VDC	±1.35 A	86 %
TEN 40-4810WI	**18 – 75 VDC** (48 VDC nominal)	3.3 VDC	10.0 A	86 %
TEN 40-4811WI		5.0 VDC	8.0 A	88 %
TEN 40-4812WI		12 VDC	3.35 A	87 %
TEN 40-4813WI		15 VDC	2.65 A	87 %
TEN 40-4822WI		±12 VDC	±1.65 A	86 %
TEN 40-4823WI		±15 VDC	±1.35 A	86 %

Input Specifications

Input current (no load)	24 Vin single output models:	100 mA typ
	48 Vin single output models:	60 mA typ
.	dual putput models:	30 mA typ
Input current (full load) (nominal input 24/48 VDC)	3.3 VDC models:	1680 / 840 mA typ.
	other models:	2000 / 1000 mA typ.
Input voltage variation (dv/dt)		5 V/ms, max. (complies with ETS300 132 part 4.4)
Start-up voltage / under voltage lockout	24 Vin models:	9 VDC / 8 VDC (typ.)
	48 Vin models:	18 VDC / 16 VDC (typ.)
Surge voltage (100 msec. max.)	24 Vin models:	50 V max.
	48 Vin models:	100 V max.
EMC characteristics (with external capacitors)		
– Conducted noise		EN 55022 level A, FCC part 15, level A
– ESD		EN 61000-4-2, air: ±8 KV contact: ±6 KV, perf. criteria A
– Fast transient		EN 61000-4-4, ±2 KV, perf. criteria B
– Surge		EN 61000-4-5, ±1 KV, perf. criteria A

Output Specifications

Voltage set accuracy (at nominal input and full load)		±1 %
Output voltage adjustment		±10 % (see application note)
Regulation – Input variation Vin min. to Vin max.		0.2 % max.
– Load variation	single output models:	0.5 % max. (0 – 100 % load)
	dual output models balanced load:	1.0 % max. (4 – 100 % load)
– Load cross variation 25 % / 100 %		5 % max.
Temperature coefficient		0.02 %/K max.
Ripple and noise (20 MHz Bandwidth)	3.3 VDC & 5 VDC output models:	50 mVpk-pk max.
	dual outputs:	150 mVpk-pk max.
	all other outputs:	75 mVpk-pk max.
Start up time (nominal Vin and constant resistive load)		25 ms typ.
Transient response time (25 % load change)		250 µs typ.
Short circuit protection		indefinite (automatic recovery)
Over load protection		150 % of Iout max. typ. foldback
Thermal shutdown		@ +110°C typ.
Over voltage protection	3.3 VDC models:	3.9 V
	5 VDC models	6.2 V
	12/±12 DC models:	15 /±15 V
	15 VDC output:	18 /±18 V
Minimum load	single output model:	not required.
	dual output models:	1 % of rated max current (operation at lower load condition will not damage these converters, however, they may not meet all listed specifications)
Capacitive load output models	3.3 VDC models:	25'000 µF max.
	5.0 VDC models:	13'000 µF max.
	12 VDC models:	2'300 µF max.
	15 VDC models:	1'500 µF max.
	±12 VDC models:	1'200 µF max. (each output)
	±15 VDC models:	750 µF max. (each output)

General Specifications

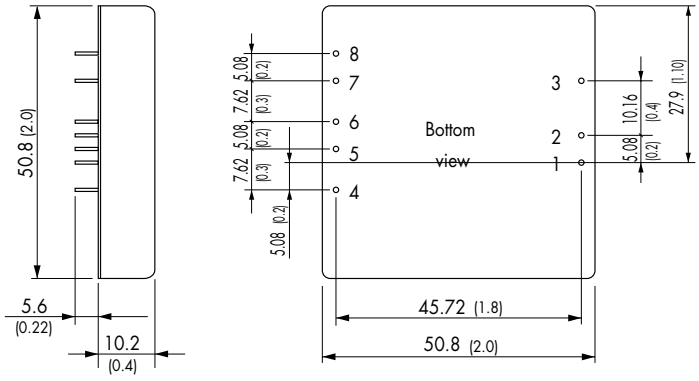
Temperature ranges	– Operating – Case temperature – Storage	–40°C to +85°C +105°C max. –55°C to +125°C
Derating		see application note
Humidity (non condensing)		95 % rel H max.
Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign)		>660'000 h
Isolation voltage (60 sec.)	– Input / Output	1'500 VDC
Isolation resistance	– Input / Output	>1'000 M Ohm
Isolation capacitance	– Input / Output	2500 pF max.
Remote On/Off	– On: – Off: – Off idle current:	3.0 ... 12 VDC or open circuit. 0 ... 1.2 VDC or short circuit pin 3 and pin 2 2.5 mA max.
Switching frequency (fixed)		300 kHz typ. (Pulse width modulation PWM)
Vibration		10 – 55 Hz, 10G, 30 minutes along X,Y,Z
Safety standards		UL 60950-1, IEC/EN 60950-1
Safety approvals	– UL/cUL	www.ul.com -> certifications -> File: e188913
Environmental compliance	– Reach – RoHs	 RoHS Directive 2011/65/EU

Physical Specifications

Casing material	copper, nickel plated
Baseplate material	none conductive FR4
Potting material	epoxy (UL 94V-0 -rated)
Weight	60 g (2.1 oz)
Soldering temperature	max. 265°C / 10 sec.

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

Outline Dimensions



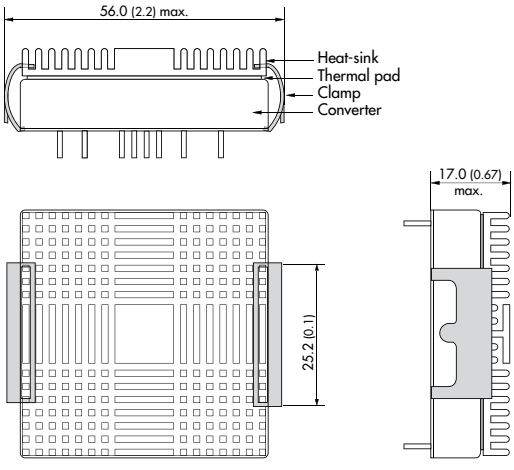
Dimensions in [mm], () = Inch
Pin diameter: 1.0 ±0.05 (0.04 ±0.002)
Pin pitch tolerances: ±0.35 (±0.014)
Case tolerances: ±0.5 (±0.02)

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

*Sense line to be connected to the output either at the module or at the load under regard of polarity.

Heat-Sink (Option)

Order code: **TEN-HS3**
(cont.: heat-sink, thermal pad, 2 clamps)
Material: Aluminum
Finish: Anodic treatment (black)
Weight: 22 g (0.78oz) (without converter)
Thermal impedance after assembling: 7.6 K/W



Note:
The product label on converter has to be removed before mounting the heat-sink.
For volume orders converters will be supplied with heat-sinks already mounted. Please contact factory for quotation.