DC/DC Converters

TEN 40WI Series, 40 Watt

RoHS compliant

cULus pending

Features

- High Power Density: 40W in 2"x2"x0.4" Metal Package
- Ultra wide 4:1 Input Voltage Range
- Very high Efficiency up to 88%
- No Minimum Load required for Single Output Models
- Over Temperature Protection
- Under Voltage Lockout
- Remote On/Off
- Shielded metal Case with insulated Baseplate
- Optional Heatsink
- Lead free Design - RoHS compliant
- 3 Years 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		3.3 VDC	10.0 A	86 %
TEN 40-2411WI		5.0 VDC	8.0 A	88 %
TEN 40-2412WI	**9 – 36 VDC**	12 VDC	3.35 A	88 %
TEN 40-2413WI	(24 VDC nominal)	15 VDC	2.65 A	88 %
TEN 40-2422WI		± 12 VDC	± 1.65 A	88 %
TEN 40-2423WI		± 15 VDC	± 1.35 A	88 %
TEN 40-4810WI		3.3 VDC	10.0 A	86 %
TEN 40-4811WI		5.0 VDC	8.0 A	88 %
TEN 40-4812WI	**18 – 75 VDC**	12 VDC	3.35 A	88 %
TEN 40-4813WI	(48 VDC nominal)	15 VDC	2.65 A	88 %
TEN 40-4822WI		± 12 VDC	± 1.65 A	88 %
TEN 40-4823WI		± 15 VDC	± 1.35 A	88 %

Input Specifications

Input current at 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 at 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.
Conducted noise (input)		EN 55022 level A, FCC part 15, level A with external capacitor (see note 1)
ESD (input)		EN 61000-4-2, perf. criteria B
Fast transient (input)		EN 61000-4-4, perf. criteria B
Surge (input)		EN 61000-4-5, perf. criteria B

Output Specifications

Voltage set accuracy (at nominal input and full load)		± 1%
Output voltage adjustment		± 10%
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. (1 – 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)

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

General Specifications

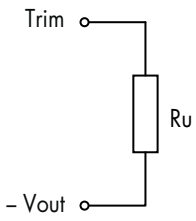
Temperature ranges	– Operating – Case temperature – Storage	– 40 °C ... + 85 °C (see derating) + 105 °C max. – 55 °C ... + 125 °C
Derating		see graphs on page 3 to 5
Humidity (non condensing)		95 % rel H max.
Reliability, calculated MTBF (MIL-HDBK-217F ground benign)		> 150'000 h @ + 25 °C
Isolation voltage (60 sec)	– Input / Output	1'500 VDC
Isolation resistance	– Input / Output	>1'000 M Ohm
Isolation capacity	– Input / Output	1500 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		10-55Hz, 10G, 30 minutes along X,Y,Z
Safety standards		UL 60950-1, EN 60950-1, IEC 60950-1
Safety approvals		UL /cUL pending

Note 1:

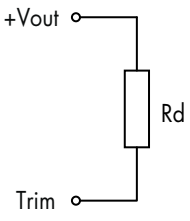
In order to meet conducted emissions EN55022-A and EN55011-A a capacitor between +Vin and -Vin has to be installed. The capacitor should be capable to handle 1 A ripple current. A suggestion is KMF Series of Nippon chemi-con, 220µF/100V, ESR 90mOhm.

Output Voltage Adjustment

Trim up



Trim down



Ru [kohm]*

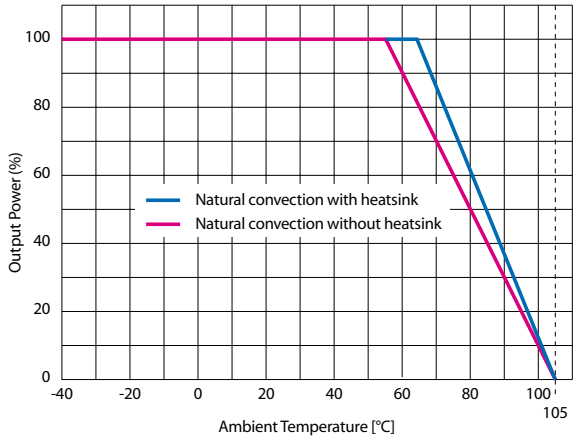
output	3.3V	5V	12V	15V	±12V	±15V
+5%	6.8	4.7	47	47	47	33
+10%	1.5	0.56	8.2	1.8	2.2	2.7

Rd [kohm]*

output	3.3V	5V	12V	15V	±12V	±15V
–5%	8.2	5.6	56	56	33	39
–10%	0.68	0.68	5.6	2.2	2.7	3.3

*approximate values

Power De-rating

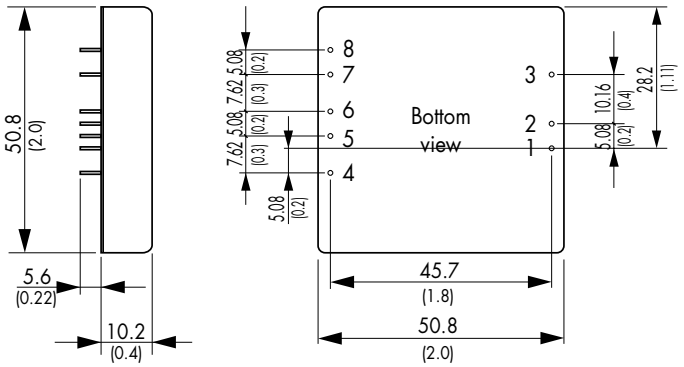


All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

Physical Specifications

Case 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.

Outline Dimensions



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

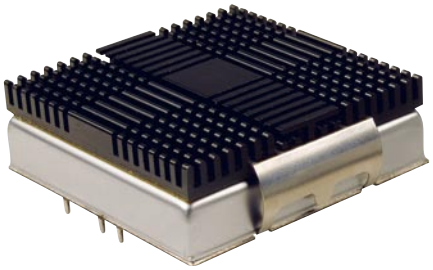
Pin-Out

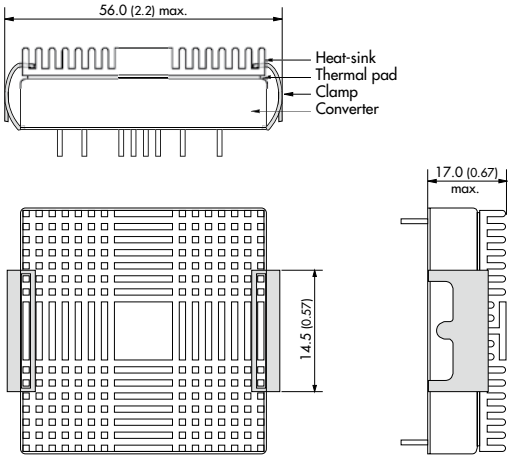
Pin	Single	Dual
1	+Vin (Vcc)	+Vin (Vcc)
2	–Vin (GND)	–Vin (GND)
3	Remote On/Off	
4	– Sense*	+ Vout
5	+ Sense*	Common
6	+ Vout	Common
7	– Vout	– Vout
8	Trim	

*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: 22g (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.
Separate heat-sinks are only available for prototypes and small quantity orders.

Specifications can be changed any time without notice