

Features

- High Power Density:
40W in a 51x51x10mm Package
- Wide 2:1 Input Voltage Range
- Models with Single-, Dual- and Triple Output
- Models with 2 independently regulated 3.3 and 5.0VDC Outputs
- Extended Operating Temperature Range -40°C to +85°C
- Over Temperature Protection
- Under Voltage Lockout
- Remote On/Off
- Shielded metal Case with insulated Baseplate
- 3 Years Product Warranty



The TEN 40 series is a family of high performance 40W dc-dc converter modules featuring 30 standard models with wide 2:1 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. Built-in filters for both input and output minimizes the need for external filtering. Further standard features include remote On/Off, output voltage trimming, over voltage protection, under voltage lockout 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 1	Output 2	Output 3	Efficiency typ.
TEN 40-1210	9 – 18 VDC	3.3 VDC / 8.0 A			86 %
TEN 40-1211		5 VDC / 8.0 A			86 %
TEN 40-1212		12 VDC / 3.3 A			86 %
TEN 40-1220		*3.3 VDC / 8.0 A	*5 VDC / 8.0 A		85 %
TEN 40-1222		+12 VDC / 1.8 A	-12 VDC / 1.8 A		85 %
TEN 40-1223		+15 VDC / 1.4 A	-15 VDC / 1.4 A		85 %
TEN 40-1233		3.3 VDC / 6.0 A	+12 VDC / 0.4 A	-12 VDC / 0.4 A	84 %
TEN 40-1234		3.3 VDC / 6.0 A	+15 VDC / 0.3 A	-15 VDC / 0.3 A	84 %
TEN 40-1231		5 VDC / 6.0 A	+12 VDC / 0.4 A	-12 VDC / 0.4 A	86 %
TEN 40-1232		5 VDC / 6.0 A	+15 VDC / 0.3 A	-15 VDC / 0.3 A	86 %
TEN 40-2410	18 – 36 VDC	3.3 VDC / 8.0 A			87 %
TEN 40-2411		5 VDC / 8.0 A			89 %
TEN 40-2412		12 VDC / 3.3 A			88 %
TEN 40-2420		*3.3 VDC / 8.0 A	*5 VDC / 8.0 A		86 %
TEN 40-2422		+12 VDC / 1.8 A	-12 VDC / 1.8 A		87 %
TEN 40-2423		+15 VDC / 1.4 A	-15 VDC / 1.4 A		87 %
TEN 40-2433		3.3 VDC / 6.0 A	+12 VDC / 0.4 A	-12 VDC / 0.4 A	85 %
TEN 40-2434		3.3 VDC / 6.0 A	+15 VDC / 0.3 A	-15 VDC / 0.3 A	85 %
TEN 40-2431		5 VDC / 6.0 A	+12 VDC / 0.4 A	-12 VDC / 0.4 A	87 %
TEN 40-2432		5 VDC / 6.0 A	+15 VDC / 0.3 A	-15 VDC / 0.3 A	87 %
TEN 40-4810	36 – 75 VDC	3.3 VDC / 8.0 A			88 %
TEN 40-4811		5 VDC / 8.0 A			90 %
TEN 40-4812		12 VDC / 3.3 A			89 %
TEN 40-4820		*3.3 VDC / 8.0 A	*5 VDC / 8.0 A		88 %
TEN 40-4822		+12 VDC / 1.8 A	-12 VDC / 1.8 A		87 %
TEN 40-4823		+15 VDC / 1.4 A	-15 VDC / 1.4 A		87 %
TEN 40-4833		3.3 VDC / 6.0 A	+12 VDC / 0.4 A	-12 VDC / 0.4 A	86 %
TEN 40-4834		3.3 VDC / 6.0 A	+15 VDC / 0.3 A	-15 VDC / 0.3 A	86 %
TEN 40-4831		5 VDC / 6.0 A	+12 VDC / 0.4 A	-12 VDC / 0.4 A	88 %
TEN 40-4832		5 VDC / 6.0 A	+15 VDC / 0.3 A	-15 VDC / 0.3 A	88 %

* dynamic current allocation, max. 8A total output current for both outputs together

Input Specifications

Input current at no load	12 V models: 24 V models: 48 V models:	200 mA typ. 100 mA typ. 50 mA typ.
Input current at full load (nominal input 12/24/48 Vin)	3.3 V single output models: 5.0 / 12 V single output models: 3.3 & 5 V dual output models: $\pm 12 / \pm 15$ V dual output models: 3.3 V triple output models: 5.0 V triple output models:	2680 / 1325 / 655 mA typ. 4065 / 2000 / 1000 mA typ. 3415 / 1685 / 825 mA typ. 4400 / 2100 / 1050 mA typ. 3000 / 1500 / 750 mA typ. 4000 / 1990 / 980 mA typ.
Input voltage variation (dv/dt)		5 V/ms, max. (complies with ETS300 132 part 4.4)
Start-up voltage / Under voltage lockout	12 Vin models: 24 Vin models: 48 Vin models:	9 VDC / 8 VDC (typ.) 17.8 VDC / 15.8 VDC (typ.) 36 VDC / 33 VDC (typ.)
Surge voltage (100 msec. max.)	12/24/48 Vin models:	25/50/100 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		$\pm 1\%$ ($\pm 5\%$ for auxiliary outputs)
Output voltage adjustment	(only single output models)	$\pm 10\%$
Regulation	– Input variation Vin min. to Vin max. single output models: dual output models: triple output models (main/auxiliary): – Load variation 10 – 100 % single output models: dual output models: triple output models: – Load cross variation 25 % / 100 % Dual output models: triple output models (main/auxiliary):	$\pm 0.5\%$ max. $\pm 1\%$ max. $\pm 1\%$ max. / 5% max. $\pm 0.5\%$ max. $\pm 1\%$ max. $\pm 2\%$ max. / $\pm 5\%$ max. $\pm 5\%$ max. $\pm 1\%$ max. / 5% max.
Temperature coefficient		$\pm 0.02\%$ /K max.
Ripple and noise (20 MHz Bandwidth)	3.3 V & 5 V outputs: dual outputs: all other outputs:	50 mVpk-pk max. 150 mVpk-pk max. 75 mVpk-pk max.
Start up time (nominal Vin and constant resistive load)		25 ms typ.
Transient response time (25% load change)		300 μ s typ.
Short circuit protection		indefinite (automatic recovery)
Over load protection		150% of Iout max typ. foldback
Thermal shutdown		@ 115°C typ

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

Output Specifications

Over Voltage protection	3.3 V output: 5 V output: 12 V output: 15 V output:	3.9 V 6.2 V 15 V 18 V
Minimum load (only for dual- and triple output models)		10% 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 V / 5 V / 12 V / 15 V): dual output models (3.3 V / 5 V): dual output models (± 12 V / ± 15V): 3.3 V triple output models:	21'000 / 13'600 / 2'360 / 1510 µF max. 11'000 / 6'800 µF max. 1'200 / 750 µF max. (on each output) 13'000 / 330 µF max. (main / on each auxiliary)

General Specifications

Temperature ranges	- Operating - Case temperature - Storage	- 40 °C ... + 85 °C + 100 °C max. - 55 °C ... + 125 °C
Derating		download model specific derating curves under: www.tracopower.com/products/ten40_derating.pdf
Humidity (non condensing)		95 % rel H max.
Reliability, calculated MTBF (MIL-HDBK-217 E)		> 510'000 h @ + 25 °C
Isolation (Input/Output)	- Voltage - Capacity - Resistance	1'500 VDC 1000 pF max. > 1'000 M Ohm
Remote On/Off	On: Off: Off idle current:	3.5 ... 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, 2G, 30 minutes along X,Y,Z
Safety standards		UL 60950, EN 60950, IEC 60950 Compliance up to 60 VDC input voltage(SELV limit)
Safety approvals		UL /cUL File E188913

Physical Specifications

Case material	Copper, Nickel plated
Baseplate material	non conductive FR4
Potting material	Epoxy (UL 94V-0 – rated)
Weight	48 g (1.69 oz)
Soldering temperature	max. 260 °C / 10 sec.

Note 1:

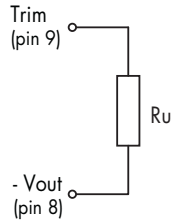
In order to meet conducted emissions EN55022-A and EN55011-A a capacitor between +Vin and -Vin has to be installed. The capacitor should be capable to handle 1 A ripple current. A suggestion is KMF Series of Nippon chemi-con, 220µF/100V, ESR 90mOhm.

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

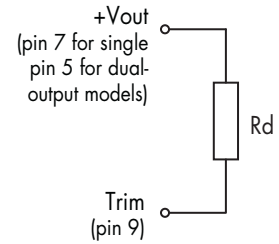
Output Voltage Adjustment

(Only for single output models and dual symmetric output models)

Trim up



Trim down

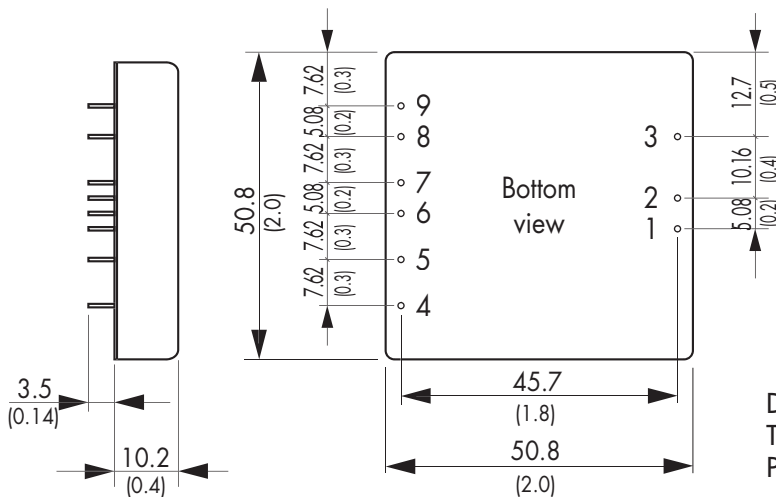


output	3.3V	5V	12V	±12V	±15V
Ru [kohm]*					
+5%	6.8	4.7	56	tba	tba
+10%	0.68	0.68	6.8	tba	tba

output	3.3V	5V	12V	±12V	±15V
Rd [kohm]*					
-5%	8.2	5.6	47	tba	tba
-10%	0.68	0.68	2.7	tba	tba

* approximate values

Outline Dimensions mm (inches)



Dimensions in mm; () = Inches
Tolerances: ±0.5 (±0.02); Pin pitch: ±0.35 (±0.014)
Pin diameter: 1.0 ±0.05 (0.039 ±0.002)

Pin-Out				
Pin	Single	Dual (sym.)	Dual (asym.)	Triple
1	+Vin (Vcc)	+Vin (Vcc)	+Vin (Vcc)	+Vin (Vcc)
2	-Vin (GND)	-Vin (GND)	-Vin (GND)	-Vin (GND)
3	Remote on/off	Remote on/off	Remote on/off	Remote on/off
4	No con.	No Pin	+Vout 1	+Vout 2
5	-Sense	+Vout	-Vout 1	Common 2/3
6	+Sense	Common	No con.	-Vout 3
7	+Vout	Common	No con.	+Vout 1
8	-Vout	-Vout	+Vout 2	-Vout 1
9	Trim	Trim	-Vout 2	No con.

Specifications can be changed without notice