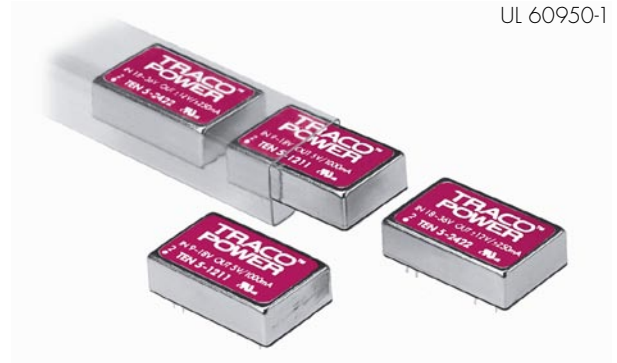




UL 60950-1

#### Features

- ◆ Wide 2:1 Input Range
- ◆ Full SMD-Design
- ◆ High Efficiency up to 86%
- ◆ Extended Operating Temperature Range -40°C to 85°C
- ◆ I/O-isolation 1'500 VDC
- ◆ Indefinite Short-Circuit Protection
- ◆ Input Filter meets EN 55022, Class A and FCC, Level A without external Components
- ◆ Shielded Metal Case with insulated Baseplate
- ◆ 24-pin DIP with Industry Standard Pinout
- ◆ High Reliability, MTBF >1 Mio. h
- ◆ 3 Year Product Warranty



The TEN 5 Series is a range of DC/DC-converter modules with wide input range of 2:1. State of the art SMD-technology guarantees a product with very high reliability and good cost /performance ratio. High efficiency allows an operating temperature range of -40°C to +85°C. I/O-isolation of 1'500 VDC together with conducted noise compliance to EN 55022-A and FCC, level A makes these converters ideal for a wide range of applications in communications, mobile battery powered equipments and industrial systems.

#### Models

Ordercode	Input voltage range	Output voltage	Output current max.	Efficiency typ.
TEN 5-0510	4.5 – 7 VDC	3.3 VDC	1200 mA	75 %
TEN 5-0511		5 VDC	1000 mA	79 %
TEN 5-0512		12 VDC	500 mA	82 %
TEN 5-0513		15 VDC	400 mA	82 %
TEN 5-0521		± 5 VDC	± 500 mA	79 %
TEN 5-0522		± 12 VDC	± 250 mA	82 %
TEN 5-0523		± 15 VDC	± 200 mA	82 %
TEN 5-1210	9 – 18 VDC	3.3 VDC	1200 mA	77 %
TEN 5-1211		5 VDC	1000 mA	81 %
TEN 5-1212		12 VDC	500 mA	84 %
TEN 5-1213		15 VDC	400 mA	84 %
TEN 5-1221		± 5 VDC	± 500 mA	81 %
TEN 5-1222		± 12 VDC	± 250 mA	84 %
TEN 5-1223		± 15 VDC	± 200 mA	84 %
TEN 5-2410	18 – 36 VDC	3.3 VDC	1200 mA	79 %
TEN 5-2411		5 VDC	1000 mA	83 %
TEN 5-2412		12 VDC	500 mA	86 %
TEN 5-2413		15 VDC	400 mA	86 %
TEN 5-2421		± 5 VDC	± 500 mA	83 %
TEN 5-2422		± 12 VDC	± 250 mA	86 %
TEN 5-2423		± 15 VDC	± 200 mA	86 %
TEN 5-4810	36 – 75 VDC	3.3 VDC	1200 mA	79 %
TEN 5-4811		5 VDC	1000 mA	83 %
TEN 5-4812		12 VDC	500 mA	86 %
TEN 5-4813		15 VDC	400 mA	86 %
TEN 5-4821		± 5 VDC	± 500 mA	83 %
TEN 5-4822		± 12 VDC	± 250 mA	86 %
TEN 5-4823		± 15 VDC	± 200 mA	86 %

### Input Specifications

Input current no load /full load	5 Vin models: 50 mA / 1460 mA typ. 12 Vin models: 20 mA / 590 mA typ. 24 Vin models: 5 mA / 290 mA typ. 48 Vin models: 3 mA / 145 mA typ.
Start-up voltage / under voltage shut down	5 Vin models: 4.4 VDC / 4.0 VDC 12 Vin models: 8.0 VDC / 8.0 VDC 24 Vin models: 16.0 VDC / 16.0 VDC 48 Vin models: 32.0 VDC / 32.0 VDC
Surge voltage (1 sec. max.)	5 Vin models: 10 V max. 12 Vin models: 25 V max. 24 Vin models: 50 V max. 48 Vin models: 100 V max.
Reverse voltage protection	1.0 A max.
Conducted noise (input)	EN 55022 level A, FCC part 15, level A

### Output Specifications

Voltage set accuracy	1.0 %
Regulation	<ul style="list-style-type: none"> <li>- Input variation Vin min. to Vin max.      0.3 % max.</li> <li>- Load variation 20 – 100 %</li> <li style="padding-left: 150px;">single output models: 1.0 % max.</li> <li style="padding-left: 150px;">dual output models balanced load: 2.0 % max.</li> <li style="padding-left: 150px;">dual output models unbalanced load: 5.0 % max.</li> </ul>
Ripple and noise (20 MHz Bandwidth)	50 mVpk-pk max.
Temperature coefficient	± 0.02 % /K
Output current limitation	>120 % of Iout max., constant current
Short-circuit protection	indefinite (automatic recovery)
Capacitive load	<ul style="list-style-type: none"> <li>single output models: 6800 µF max.</li> <li>dual output models: 1000 µF max. (each output)</li> </ul>

### General Specifications

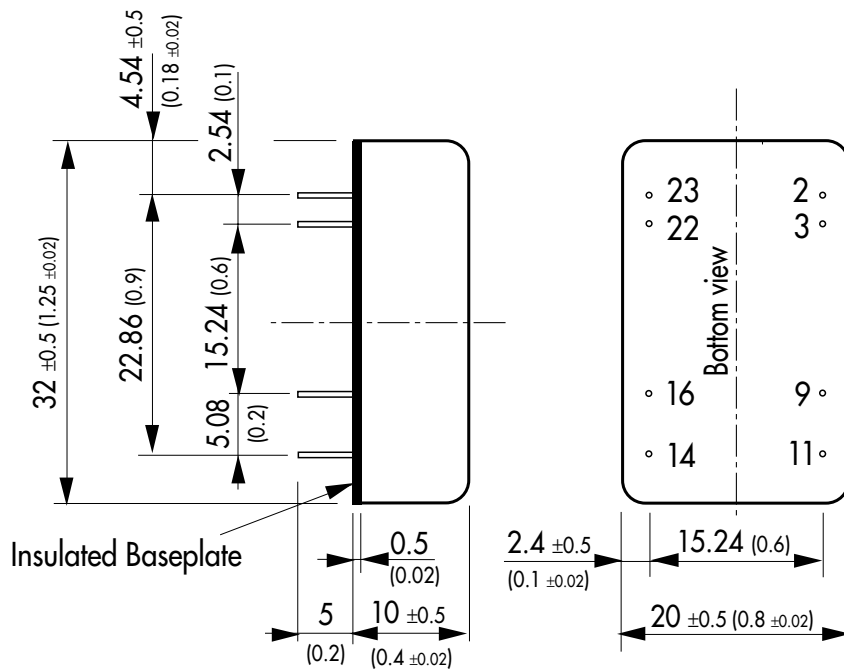
Temperature ranges	<ul style="list-style-type: none"> <li>- Operating      - 40 °C ... + 85 °C</li> <li>- Case temperature      + 100 °C max.</li> <li>- Storage      - 55 °C ... + 125 °C</li> </ul>
Derating	3.5% /K above 70°C
Humidity (non condensing)	95 % rel H max.
Reliability, calculated MTBF (MIL-HDBK-217E ground benign)	>1 Mio. h @ + 25 °C
Isolation voltage (60 sec) - Input/Output	1'500 VDC
Isolation capacity - Input/Output	380 pF typ.
Isolation resistance - Input/Output	> 1'000 M Ohm (500 VDC)
Switching frequency	300 kHz typ. (Pulse frequency modulation PFM)
Safety standards	UL 60950-1, IEC 60950-1, EN 60950-1
Safety approval	CSA File No. 226037 <a href="http://directories.csa-international.org">http://directories.csa-international.org</a>

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

**Physical Specifications**

Case material	steel, nickel plated
Baseplate material	non conductive FR4
Potting material	epoxy (UL 94V-0 rated)
Weight	14 g (0.55 oz)
Soldering temperature	max. 265 °C / 10 sec.

**Outline Dimensions mm (inches)**



Pin-Out		
Pin	Single	Dual
2	-Vin (GND)	-Vin (GND)
3	-Vin (GND)	-Vin (GND)
9	No pin	Common
11	No con.	-Vout
14	+Vout	+Vout
16	-Vout	Common
22	+Vin (Vcc)	+Vin (Vcc)
23	+Vin (Vcc)	+Vin (Vcc)

Pin diameter  $\varnothing 0.5 \pm 0.05$  (0.02  $\pm 0.002$ )  
Tolerances  $\pm 0.5$  (0.02)

Specifications can be changed any time without notice