DC/DC Converters
TEN 4 Series, 4 Watt

Features

- Ultra-wide 4:1 input range
  9 – 36 VDC or 18 – 75 VDC
- Full SMD design
- High efficiency up to 85%
- Indefinite short circuit protection
- I/O isolation 1'500 VDC
- 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
- MTTF >1 Mio. h
- 3-year product warranty

The TEN 4 series DC/DC converter is designed for applications requiring very wide operating voltage range. Typical applications are tele-and data communication systems, mobile battery powered equipments and industrial process control systems with operation from different input voltages i.e. 12/24 VDC or 24/48 VDC battery voltages. High efficiency allows operation up to +75°C at full load. Input filtering according to EN 55022-A and FCC, level A. Low output ripple minimise design-in time and cost.

Models

<table>
<thead>
<tr>
<th>Ordercode</th>
<th>Input voltage range</th>
<th>Output voltage</th>
<th>Output current max.</th>
<th>Efficiency typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEN 4-2410</td>
<td>9 – 36 VDC (24 VDC nominal)</td>
<td>3.3 VDC</td>
<td>900 mA</td>
<td>77 %</td>
</tr>
<tr>
<td>TEN 4-2411</td>
<td></td>
<td>5 VDC</td>
<td>660 mA</td>
<td>81 %</td>
</tr>
<tr>
<td>TEN 4-2412</td>
<td></td>
<td>12 VDC</td>
<td>330 mA</td>
<td>83 %</td>
</tr>
<tr>
<td>TEN 4-2413</td>
<td></td>
<td>15 VDC</td>
<td>265 mA</td>
<td>83 %</td>
</tr>
<tr>
<td>TEN 4-2421</td>
<td></td>
<td>±5 VDC</td>
<td>±300 mA</td>
<td>80 %</td>
</tr>
<tr>
<td>TEN 4-2422</td>
<td></td>
<td>±12 VDC</td>
<td>±165 mA</td>
<td>83 %</td>
</tr>
<tr>
<td>TEN 4-2423</td>
<td></td>
<td>±15 VDC</td>
<td>±130 mA</td>
<td>83 %</td>
</tr>
<tr>
<td>TEN 4-4810</td>
<td>18 – 75 VDC (48 VDC nominal)</td>
<td>3.3 VDC</td>
<td>900 mA</td>
<td>78 %</td>
</tr>
<tr>
<td>TEN 4-4811</td>
<td></td>
<td>5 VDC</td>
<td>660 mA</td>
<td>82 %</td>
</tr>
<tr>
<td>TEN 4-4812</td>
<td></td>
<td>12 VDC</td>
<td>330 mA</td>
<td>85 %</td>
</tr>
<tr>
<td>TEN 4-4813</td>
<td></td>
<td>15 VDC</td>
<td>265 mA</td>
<td>85 %</td>
</tr>
<tr>
<td>TEN 4-4821</td>
<td></td>
<td>±5 VDC</td>
<td>±300 mA</td>
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<td>TEN 4-4823</td>
<td></td>
<td>±15 VDC</td>
<td>±130 mA</td>
<td>85 %</td>
</tr>
</tbody>
</table>

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

Input Specifications

Input current no load / full load
- 24 Vin models: 20 mA typ. / 400 mA typ. (at 12 VDC Vin)
- 20 mA typ. / 200 mA typ. (at 24 VDC Vin)
- 48 Vin models: 6 mA typ. / 200 mA typ. (at 24 VDC Vin)
- 6 mA typ. / 100 mA typ. (at 48 VDC Vin)

Start-up voltage / under voltage shut down
- 24 Vin models: 8.5 VDC / 8.0 VDC typ.
- 48 Vin models: 17 VDC / 16 VDC typ.

Surge voltage (1 sec. 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

Output Specifications

Voltage set accuracy
- ±1.0 %

Regulation
- Input variation: Vin min. to Vin max.
- Load variation: 10 – 100 %
- Single output models: 1.0 % max.
- Dual output models: 1.0 % max. balanced load
- 3.0 % max. unbalanced load

Ripple and noise (20 MHz Bandwidth)
- 50 mVpk-pk max.

Temperature coefficient
- ±0.02 %/K

Current limitation
- >110 % of I_{out} max., constant current

Short circuit protection
- Hiccup mode, indefinite (automatic recovery)

Capacitive load
- Single output models: 3000 µF max.
- Dual output models: 680 µF max.

General Specifications

Temperature ranges
- Operating: -40°C to +75°C
- Casing temperature: +95°C max.
- Storage: -40°C to +125°C

Humidity (non condensing)
- 95 % rel H max.

Reliability, calculated MTTF (MIL-HDBK-217F @ +25°C, ground benign)
- >1 Mio. h

Isolation voltage (60 sec.)
- Input/Output: 1500 VDC

Isolation capacity

Isolation resistance
- Input/Output (500 VDC): >1000 M Ohm

Switching frequency
- 350 kHz typ. [Pulse frequency modulation PFM]

Safety standards
- UL 1950, IEC/EN 60950
- Compliance up to 60 VDC input voltage (SELV limit)

Safety approvals
- UL/cUL
- www.ul.com > UL File no.: E188913
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Physical Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casing material</td>
<td>Steel chrome-nickel plated</td>
</tr>
<tr>
<td>Baseplate material</td>
<td>Epoxy</td>
</tr>
<tr>
<td>Potting material</td>
<td>Epoxy (UL 94 V-0 rated)</td>
</tr>
<tr>
<td>Weight</td>
<td>16.2 g (0.57 oz)</td>
</tr>
<tr>
<td>Soldering temperature</td>
<td>max. 265°C / 10 sec.</td>
</tr>
</tbody>
</table>

Outline Dimensions

![Outline Dimensions Diagram]

Pin-Out

<table>
<thead>
<tr>
<th>Pin</th>
<th>Single</th>
<th>Dual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>−Vin (GND)</td>
<td>−Vin (GND)</td>
</tr>
<tr>
<td>3</td>
<td>−Vin (GND)</td>
<td>−Vin (GND)</td>
</tr>
<tr>
<td>9</td>
<td>No pin</td>
<td>Common</td>
</tr>
<tr>
<td>11</td>
<td>No function</td>
<td>−Vout</td>
</tr>
<tr>
<td>14</td>
<td>+Vout</td>
<td>+Vout</td>
</tr>
<tr>
<td>16</td>
<td>−Vout</td>
<td>Common</td>
</tr>
<tr>
<td>22</td>
<td>+Vin (Vcc)</td>
<td>+Vin (Vcc)</td>
</tr>
<tr>
<td>23</td>
<td>+Vin (Vcc)</td>
<td>+Vin (Vcc)</td>
</tr>
</tbody>
</table>

Dimensions in [mm], | = Inch
Pin diameter ø 0.5 ±0.05 (0.02 ±0.002)
Tolerances ±0.5 ±0.02
Pin pitch tolerances ±0.35 ±0.014