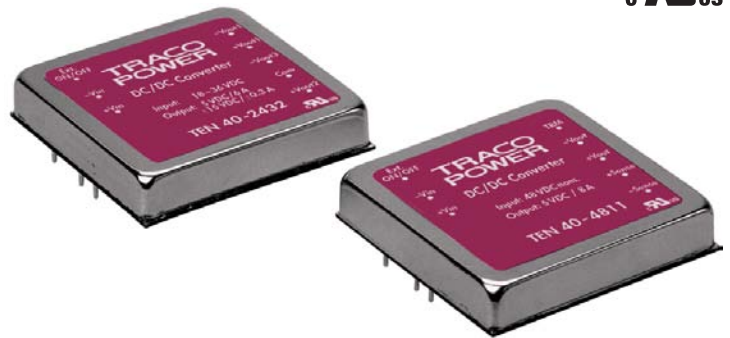


Features

- ◆ High power density: 40 W in a 51x51x10mm (2"x2"x0.4") package
- ◆ Wide 2:1 input voltage range
- ◆ Models with single-, dual- and triple output
- ◆ Models with 2 independently regulated 3.3 and 5.0 VDC outputs
- ◆ Extended operating temperature range: -40°C to +75°C
- ◆ 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 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 +75°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

| Order code | Input voltage range | Output 1 | Output 2 | Output 3 | Efficiency typ.. |
|-------------|---------------------------------|------------------|-----------------|-----------------|------------------|
| TEN 40-1210 | 9 – 18 VDC (nominal 12 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 (nominal 24 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 (nominal 48 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: 200 mA typ. 24 V models: 100 mA typ. 48 V models: 50 mA typ. |
| Input current at full load (nominal input 12/24/48 Vin) | 3.3 V single output models: 2680 / 1325 / 655 mA typ. 5.0 / 12 V single output models: 4065 / 2000 / 1000 mA typ. 3.3 & 5 V dual output models: 3415 / 1685 / 825 mA typ. ±12 / ±15 V dual output models: 4400 / 2100 / 1050 mA typ. 3.3 V triple output models: 3000 / 1500 / 750 mA typ. 5.0 V triple output models: 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: 9 VDC / 8 VDC (typ.) 24 Vin models: 17.8 VDC / 15.8 VDC (typ.) 48 Vin models: 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 | ±1 % (±5 % for auxiliary outputs) |
| Output voltage adjustment | ±10 % (only for single output models and symmetric dual output models) |
| Regulation | <ul style="list-style-type: none"> – Input variation Vin min. to Vin max. <ul style="list-style-type: none"> single output models: 0.5 % max. dual output models: 1 % max. triple output models (main/auxiliary): 1 % max. / 5 % max. – Load variation 10 – 100 % <ul style="list-style-type: none"> single output models: 0.5 % max. dual output models: 1 % max. triple output models (main/auxiliary): 2 % max. / 5 % max. – Load cross variation 25 % /100 % <ul style="list-style-type: none"> Dual output models: 5 % max. triple output models (main/auxiliary): 1 % max. / 5 % max. |
| Temperature coefficient | ±0.02 %/K max. |
| Ripple and noise (20 MHz Bandwidth) | 3.3 V & 5 V outputs: 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) | 300 µs typ. |
| Short circuit protection | indefinite (automatic recovery) |
| Over load protection | 150 % of lout max typ. foldback |
| Thermal shutdown | @ 115°C typ. |
| Over voltage protection | 3.3 V output: 3.9 V 5 V output: 6.2 V 12 V output: 15 V 15 V output: 18 V |

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

Output Specifications

| | |
|--|---|
| Minimum load (only for dual 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: 21'000 / 13'600 / 2'360 / 1510 μ F max. |
| | dual output models (3.3 V / 5 V): 11'000 / 6'800 μ F max. |
| | dual output models (\pm 12 V / \pm 15 V): 1'200 / 750 μ F max. (on each output) |
| | 3.3 V triple output models: 13'000 / 330 μ F max. (main-/output 2 & 3) |

General Specifications

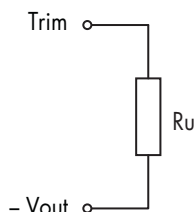
| | | |
|---|--|--|
| Temperature ranges | - Operating - Case temperature - Storage | -40°C to +75°C +100°C max. -55°C to +125°C |
| Derating | | see graphs on page 3 to 5 |
| Humidity (non condensing) | | 95 % rel H max. |
| Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign) | | >360'000 h |
| Isolation voltage (60 sec) | - Input / Output | 1'500 VDC |
| Isolation resistance | - Input / Output | >1'000 M Ohm |
| Isolation capacitance | - Input / Output | 1000 pF max. |
| 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 | | 10-55 Hz, 10G, 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 | www.ul.com -> certifications -> File: e188913 |

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, 220 μ F/100V, ESR 90mOhm.

Output Voltage Adjustment

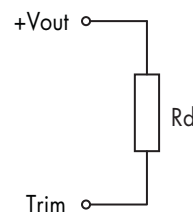
Trim up



Ru [kohm]*

| output | 3.3V | 5V | 12V | \pm 12V | \pm 15V |
|--------|------|------|-----|-----------|-----------|
| +5% | 6.8 | 4.7 | 47 | 47 | 33 |
| +10% | 1.5 | 0.56 | 8.2 | 2.2 | 2.7 |

Trim down



Ru [kohm]*

| output | 3.3V | 5V | 12V | \pm 12V | \pm 15V |
|--------|------|------|-----|-----------|-----------|
| -5% | 8.2 | 5.6 | 56 | 33 | 39 |
| -10% | 0.68 | 0.68 | 5.6 | 2.7 | 3.3 |

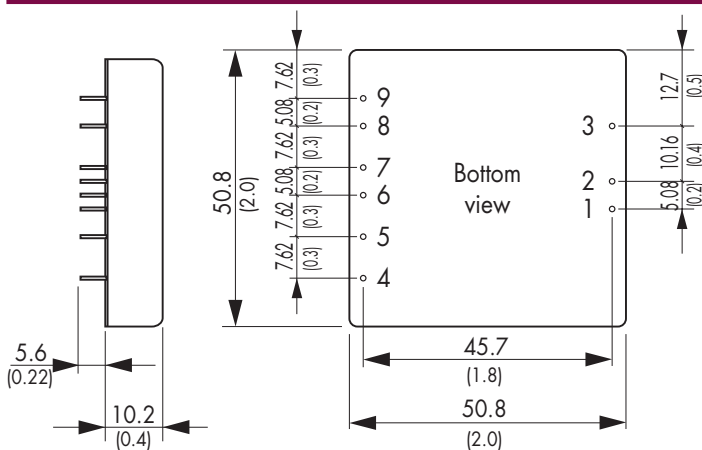
*approximate values

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

Physical Specifications

| | |
|--------------------------|---|
| Casing material | copper, nickel plated |
| Baseplate material | none conductive FR4 |
| Potting material | epoxy (UL 94V-0 -rated) |
| Weight | 65 g (2.3 oz) |
| Soldering temperature | max. 265°C / 10 sec. |
| Environmental compliance | - Reach - RoHS |
| | www.tracopower.com/products/ten40-reach.pdf RoHS directive 2002/95/EC |

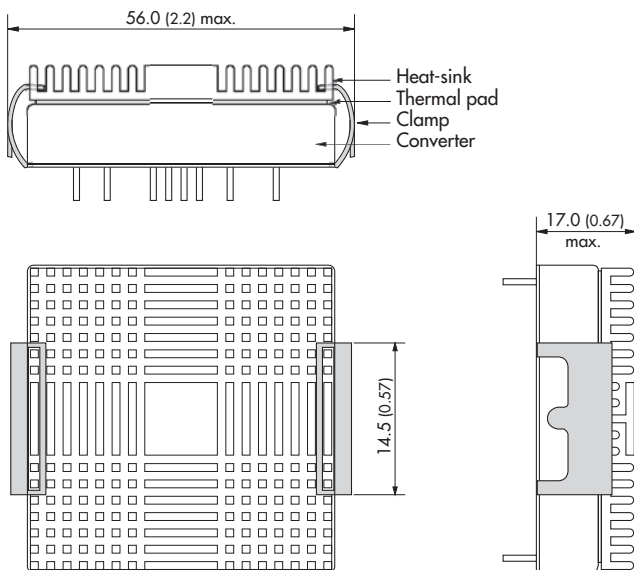
Outline Dimensions



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 symmetric | Dual asymmetric | Triple |
| 1 | +Vin (Vcc) | +Vin (Vcc) | +Vin (Vcc) | +Vin (Vcc) |
| 2 | -Vin (GND) | -Vin (GND) | -Vin (GND) | -Vin (GND) |
| 3 | Remote On/Off | | | |
| 4 | No con. | No pin | +Vout 1 | Vout 2 |
| 5 | -Sense | Vout 1 | -Vout 1 | Common 2/3 |
| 6 | +Sense | Common 1/2 | No con. | Vout 3 |
| 7 | +Vout | Common 1/2 | No con. | +Vout 1 |
| 8 | -Vout | Vout 2 | +Vout 2 | -Vout 1 |
| 9 | Trim | Trim | -Vout2 | No con. |

Heat-sink TEN-HS3



Order code: TEN-HS3
 (cont.: heat-sink, thermal pad, 2 clamps)
Material: Aluminum
Finish: Anodic treatment (black)
Weight: 22 g (0.78oz) (without converter)

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.