

- 40 Watt in a 2"x2" package
- Wide 2:1 input voltage range
- Extended operating temperature range: -40°C to +75°C
- Over temperature protection, under voltage lockout and 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 a wide 2:1 input voltage range in a 2"x2" package. Typical applications for these products are battery operated equipment and distributed power architectures in communication and industrial electronics.

| Models | | | | | | | | |
|-------------|------------------------------|----------|------------------|----------|------------------|----------|------------------|-----------------|
| Order Code | Input Voltage Range | Output 1 | | Output 2 | | Output 3 | | Efficiency typ. |
| | | Vnom | I _{max} | Vnom | I _{max} | Vnom | I _{max} | |
| TEN 40-1210 | 9 - 18 VDC (12 VDC nom.) | 3.3 VDC | 8'000 mA | | | | | 86 % |
| TEN 40-1211 | | 5 VDC | 8'000 mA | | | | | 86 % |
| TEN 40-1212 | | 12 VDC | 3'300 mA | | | | | 86 % |
| TEN 40-1220 | | +3.3 VDC | 8'000 mA | +5 VDC | 8'000 mA | | | 85 % |
| TEN 40-1222 | | +12 VDC | 1'800 mA | -12 VDC | 1'800 mA | | | 85 % |
| TEN 40-1223 | | +15 VDC | 1'400 mA | -15 VDC | 1'400 mA | | | 85 % |
| TEN 40-1233 | | +3.3 VDC | 6'000 mA | +12 VDC | 400 mA | -12 VDC | 400 mA | 84 % |
| TEN 40-1234 | | +3.3 VDC | 6'000 mA | +15 VDC | 300 mA | -15 VDC | 300 mA | 84 % |
| TEN 40-1231 | | +5 VDC | 6'000 mA | +12 VDC | 400 mA | -12 VDC | 400 mA | 86 % |
| TEN 40-1232 | | +5 VDC | 6'000 mA | +15 VDC | 300 mA | -15 VDC | 300 mA | 86 % |
| TEN 40-2410 | 18 - 36 VDC (24 VDC nom.) | 3.3 VDC | 8'000 mA | | | | | 87 % |
| TEN 40-2411 | | 5 VDC | 8'000 mA | | | | | 89 % |
| TEN 40-2412 | | 12 VDC | 3'300 mA | | | | | 88 % |
| TEN 40-2420 | | +3.3 VDC | 8'000 mA | +5 VDC | 8'000 mA | | | 86 % |
| TEN 40-2422 | | +12 VDC | 1'800 mA | -12 VDC | 1'800 mA | | | 87 % |
| TEN 40-2423 | | +15 VDC | 1'400 mA | -15 VDC | 1'400 mA | | | 87 % |
| TEN 40-2433 | | +3.3 VDC | 6'000 mA | +12 VDC | 400 mA | -12 VDC | 400 mA | 85 % |
| TEN 40-2434 | | +3.3 VDC | 6'000 mA | +15 VDC | 300 mA | -15 VDC | 300 mA | 85 % |
| TEN 40-2431 | | +5 VDC | 6'000 mA | +12 VDC | 400 mA | -12 VDC | 400 mA | 87 % |
| TEN 40-2432 | | +5 VDC | 6'000 mA | +15 VDC | 300 mA | -15 VDC | 300 mA | 87 % |
| TEN 40-4810 | 36 - 75 VDC (48 VDC nom.) | 3.3 VDC | 8'000 mA | | | | | 88 % |
| TEN 40-4811 | | 5 VDC | 8'000 mA | | | | | 90 % |
| TEN 40-4812 | | 12 VDC | 3'300 mA | | | | | 89 % |
| TEN 40-4820 | | +3.3 VDC | 8'000 mA | +5 VDC | 8'000 mA | | | 88 % |
| TEN 40-4822 | | +12 VDC | 1'800 mA | -12 VDC | 1'800 mA | | | 87 % |
| TEN 40-4823 | | +15 VDC | 1'400 mA | -15 VDC | 1'400 mA | | | 87 % |
| TEN 40-4833 | | +3.3 VDC | 6'000 mA | +12 VDC | 400 mA | -12 VDC | 400 mA | 86 % |
| TEN 40-4834 | | +3.3 VDC | 6'000 mA | +15 VDC | 300 mA | -15 VDC | 300 mA | 86 % |
| TEN 40-4831 | | +5 VDC | 6'000 mA | +12 VDC | 400 mA | -12 VDC | 400 mA | 88 % |
| TEN 40-4832 | | +5 VDC | 6'000 mA | +15 VDC | 300 mA | -15 VDC | 300 mA | 88 % |

| Options | |
|---------|--|
| TEN-HS3 | - Optional Heat Sink: www.tracopower.com/products/ten-hs3.pdf |

Note - TEN 40-xx20: Dynamic current allocation, 8 A total output current for both outputs together

Input Specifications

| | | |
|------------------------|----------------|--|
| Input Current | - At no load | 12 Vin models: 200 mA typ. 24 Vin models: 80 mA typ. 48 Vin models: 50 mA typ. |
| | - At full load | 12 Vin models: 2'680 mA typ. (3.3 Vout model) 4'065 mA typ. (5 Vout model) 4'065 mA typ. (12 Vout model) 3'415 mA typ. (3.3 / 5 Vout model) 4'400 mA typ. (12 / -12 Vout model) 4'400 mA typ. (15 / -15 Vout model) 3'000 mA typ. (3.3 / 12 / -12 Vout model) 3'000 mA typ. (3.3 / 15 / -15 Vout model) 4'000 mA typ. (5 / 12 / -12 Vout model) 4'000 mA typ. (5 / 15 / -15 Vout model) 24 Vin models: 1'325 mA typ. (3.3 Vout model) 2'000 mA typ. (5 Vout model) 2'000 mA typ. (12 Vout model) 1'685 mA typ. (3.3 / 5 Vout model) 2'100 mA typ. (12 / -12 Vout model) 2'100 mA typ. (15 / -15 Vout model) 1'500 mA typ. (3.3 / 12 / -12 Vout model) 1'500 mA typ. (3.3 / 15 / -15 Vout model) 1'990 mA typ. (5 / 12 / -12 Vout model) 1'990 mA typ. (5 / 15 / -15 Vout model) 48 Vin models: 655 mA typ. (3.3 Vout model) 1'000 mA typ. (5 Vout model) 1'000 mA typ. (12 Vout model) 825 mA typ. (3.3 / 5 Vout model) 1'050 mA typ. (12 / -12 Vout model) 1'050 mA typ. (15 / -15 Vout model) 750 mA typ. (3.3 / 12 / -12 Vout model) 750 mA typ. (3.3 / 15 / -15 Vout model) 980 mA typ. (5 / 12 / -12 Vout model) 980 mA typ. (5 / 15 / -15 Vout model) |
| Surge Voltage | | 12 Vin models: 36 VDC max. (100 ms max.) 24 Vin models: 50 VDC max. (100 ms max.) 48 Vin models: 100 VDC max. (100 ms max.) |
| Under Voltage Lockout | | 12 Vin models: 7 VDC min. / 8 VDC typ. / 8.8 VDC max. 24 Vin models: 15 VDC min. / 16 VDC typ. / 17.5 VDC max. 48 Vin models: 32.5 VDC min. / 34 VDC typ. / 35.5 VDC max. |
| Recommended Input Fuse | | 12 Vin models: 8'000 mA (fast acting) 24 Vin models: 4'000 mA (slow blow) 48 Vin models: 2'000 mA (slow blow) (The need of an external fuse has to be assessed in the final application.) |
| Input Filter | | Internal LC-Type |

Output Specifications

| | |
|---------------------------|---|
| Output Voltage Adjustment | ±10% (single output and dual symmetric output models only) (By external trim resistor) See application note: www.tracopower.com/overview/ten40 Output power must not exceed rated power! |
| Voltage Set Accuracy | ±1% max. (±5% for triple models, (aux)) |

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

| | | |
|--|---|--|
| Regulation | - Input Variation (Vmin - Vmax) | single output models: 0.5% max. dual output models: 0.5% max. triple output models: 1% max. 5% max. (aux) |
| | - Load Variation (0 - 100%) | single output models: 0.5% max. dual output models: 1% max. (Output 1) 1% max. (Output 2) triple output models: 2% max. (Output 1) 5% max. (Output 2) 5% max. (Output 3) |
| | - Cross Regulation (25% / 100% asym. load) | dual output models: 5% max. triple output models: 1% max. 5% max. (aux) |
| | | |
| Ripple and Noise (20 MHz Bandwidth) | - single output | 3.3 Vout: 50 mVp-p typ. (w/ 0.1 µF MLCC) 5 Vout: 50 mVp-p typ. (w/ 0.1 µF MLCC) 12 Vout: 75 mVp-p typ. (w/ 0.1 µF MLCC) |
| | - dual output | 3.3 / 5 Vout: 100 / 100 mVp-p typ. (w/ 1 µF MLCC) 12 / -12 Vout: 120 / 120 mVp-p typ. (w/ 0.1 µF MLCC) 15 / -15 Vout: 150 / 150 mVp-p typ. (w/ 0.1 µF MLCC) |
| | - triple output | 3.3 / 12 / -12 Vout: 50 / 75 / 75 mVp-p typ. (w/ 0.1 µF MLCC) 3.3 / 15 / -15 Vout: 50 / 75 / 75 mVp-p typ. (w/ 0.1 µF MLCC) 5 / 12 / -12 Vout: 50 / 75 / 75 mVp-p typ. (w/ 0.1 µF MLCC) 5 / 15 / -15 Vout: 50 / 75 / 75 mVp-p typ. (w/ 0.1 µF MLCC) |
| | | |
| | | |
| | | |
| | | |
| Capacitive Load | - single output | 3.3 Vout: 21'000 µF max. 5 Vout: 13'600 µF max. 12 Vout: 2'360 µF max. |
| | - dual output | 3.3 / 5 Vout: 11'000 / 6'800 µF max. 12 / -12 Vout: 1'200 / 1'200 µF max. 15 / -15 Vout: 750 / 750 µF max. |
| | - triple output | 3.3 / 12 / -12 Vout: 13'000 / 330 / 330 µF max. 3.3 / 15 / -15 Vout: 13'000 / 110 / 110 µF max. 5 / 12 / -12 Vout: 6'800 / 330 / 330 µF max. 5 / 15 / -15 Vout: 6'800 / 110 / 110 µF max. |
| | | |
| | | |
| | | |
| Minimum Load | - single output | 3.3 Vout: 0 % of Iout max. 5 Vout: 0 % of Iout max. 12 Vout: 0 % of Iout max. |
| | - dual output | 3.3 / 5 Vout: 0 % of Iout max. 12 / -12 Vout: 8 % of Iout max. 15 / -15 Vout: 8 % of Iout max. |
| | - triple output | 3.3 / 12 / -12 Vout: 10 % of Iout max. 3.3 / 15 / -15 Vout: 10 % of Iout max. 5 / 12 / -12 Vout: 10 % of Iout max. 5 / 15 / -15 Vout: 10 % of Iout max. |
| | | |
| | | |
| | | |
| Temperature Coefficient | | ±0.02 %/K max. |
| Start-up Time | | 25 ms typ. (Power On) 25 ms typ. (Remote On) |
| Short Circuit Protection | | Continuous, Automatic recovery |
| Output Current Limitation | | 150% max. of Iout max. |
| Overvoltage Protection | | 118 - 125% of Vout nom. (depending on model) 3.9 VDC typ. (3.3 VDC outputs) 6.2 VDC typ. (5 VDC outputs) 15 VDC typ. (12 VDC outputs) 18 VDC typ. (15 VDC outputs) (By Zener diode) |
| Transient Response | - Response Time | 250 µs typ. (25% Load Step) |

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

Safety Specifications

| | | |
|-----------------------|-----------------------------|--|
| Safety Standards | - IT / Multimedia Equipment | EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1 |
| | - Certification Documents | www.tracopower.com/overview/ten40 |
| Pollution Degree | | PD 2 |
| Over Voltage Category | | Not mains connected |

EMC Specifications

| | | |
|---------------|-----------------------------|---|
| EMI Emissions | - Conducted Emissions | EN 55032 class A (with external filter) EN 55032 class B (with external filter) |
| | - Radiated Emissions | EN 55032 class A (with external filter) EN 55032 class B (with external filter) |
| | External filter proposal: | www.tracopower.com/overview/ten40 |
| EMS Immunity | - Electrostatic Discharge | EN 55024 (IT Equipment) Air: EN 61000-4-2, ± 8 kV, perf. criteria B Contact: EN 61000-4-2, ± 6 kV, perf. criteria B |
| | - RF Electromagnetic Field | EN 61000-4-3, 10 V/m, perf. criteria A |
| | - EFT (Burst) / Surge | EN 61000-4-4, ± 2 kV, perf. criteria B EN 61000-4-5, ± 1 kV, perf. criteria B |
| | - Conducted RF Disturbances | Ext. input component: 220 μ F / 100 V / kV EN 61000-4-6, 10 Vrms, perf. criteria A |
| | - PF Magnetic Field | Continuous: EN 61000-4-8, 100 A/m, perf. criteria A 1 s: EN 61000-4-8, 1000 A/m, perf. criteria A |

General Specifications

| | | |
|--|---------------------------------|---|
| Relative Humidity | | 95% max. (non condensing) |
| Temperature Ranges | - Operating Temperature | -40°C to +75°C |
| | - Case Temperature | +100°C max. |
| | - Storage Temperature | -55°C to +125°C |
| Power Derating | - High Temperature | Depending on model Depending on model (with Heat Sink) |
| | | See application note: www.tracopower.com/overview/ten40 |
| Over Temperature Protection Switch Off | - Protection Mode | 115°C typ. |
| Cooling System | | Natural convection (20 LFM) |
| Remote Control | - Voltage Controlled Remote | On: 3.5 to 12 VDC or open circuit Off: 0 to 1.2 VDC or short circuit Refers to 'Remote' and '-Vin' Pin |
| | - Off Idle Input Current | 2.5 mA typ. |
| | - Remote Pin Input Current | -0.5 to 0.5 mA |
| Altitude During Operation | | 5'000 m max. |
| Switching Frequency | | 450 - 550 kHz (PWM) (500 kHz typ.) (Dual models, 3.3 VDC output) 270 - 330 kHz (PWM) (300 kHz typ.) (other models / outputs) |
| Insulation System | | Functional Insulation |
| Isolation Test Voltage | - Input to Output, 60 s | 1'600 VDC |
| | - Input to Case, 60 s | 1'600 VDC |
| | - Output to Case, 60 s | 1'600 VDC |
| Isolation Resistance | - Input to Output, 500 VDC | 1'000 M Ω min. |
| Isolation Capacitance | - Input to Output, 100 kHz, 1 V | 1'000 pF max. |
| Reliability | - Calculated MTBF | 920'000 h (MIL-HDBK-217F, ground benign) |

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

| | | |
|--------------------------|--|--|
| Washing Process | | Allowed (hermetical product) See Cleaning Guideline: www.tracopower.com/info/cleaning.pdf |
| Environment | - Vibration - Mechanical Shock - Thermal Shock | MIL-STD-810F 7.6 g, 3 axis, 60 min, 20-2000 Hz MIL-STD-810F 40 g, 3 axis, half sine, 11 ms MIL-STD-810F |
| Housing Material | | Copper, Nickel plated |
| Base Material | | Non-conductive FR4 (UL 94 V-0 rated) |
| Potting Material | | Epoxy (UL 94 V-0 rated) |
| Pin Material | | Copper |
| Pin Foundation Plating | | Nickel (2 - 3 µm) |
| Pin Surface Plating | | Tin (3 - 5 µm), matte |
| Housing Type | | Metal Case |
| Mounting Type | | PCB Mount |
| Connection Type | | THD (Through-Hole Device) |
| Footprint Type | | 2" x 2" |
| Soldering Profile | | 265°C / 10 s max. |
| Weight | | 60 g |
| Thermal Impedance | - Case to Ambient | 9.2 K/W typ. 7.6 K/W typ. (with Heat Sink) |
| Environmental Compliance | - REACH Declaration - RoHS Declaration | www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant www.tracopower.com/info/rohs-declaration.pdf Exemptions: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule). The SCIP number is provided on request.) |

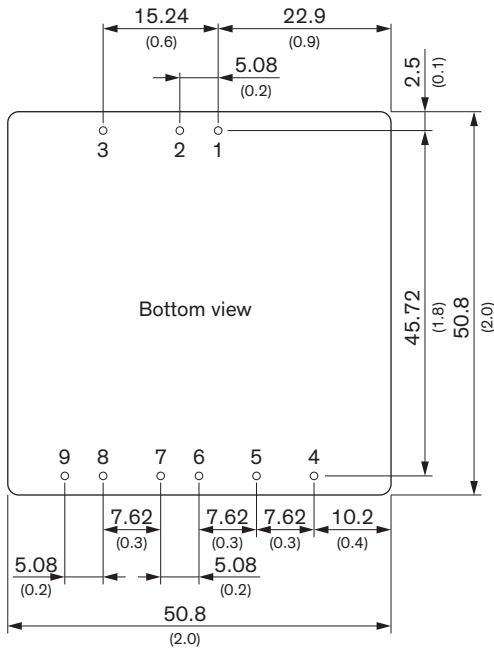
Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/ten40

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

Outline Dimensions



Dimensions in mm (inch)
 Tolerance: x.xx ±0.05 (x.x ±0.02)
 Tolerance: x.xxx ±0.25 (x.xx ±0.01)
 Pin dimension tolerance ±0.10 (0.004)

| Pinout | | | | |
|--------|---------------|----------------|-----------------|------------|
| 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 | NC | No pin | Vout 1 | Vout 2 |
| 5 | -Sense* | Vout 1 | Common | Common |
| 6 | +Sense* | Common | NC | Vout 3 |
| 7 | +Vout | Common | NC | Vout 1 |
| 8 | -Vout | Vout 2 | Vout 2 | Common |
| 9 | Trim | Trim | Common | NC |

NC: Not connected

*Sense line to be connected to the output under regard of polarity