The TEN 40WIR series is a family of high performance 40 Watt DC/DC converter modules featuring ultra wide 4:1 input voltage ranges in a 2” x 1” x 0.4” metal package. Input voltages up to 160 VDC, excellent EMC characteristics and EN 50155 approval make this product the best choice for many demanding applications in railroad and transportation systems. Further standard features include remote On/Off, over voltage protection, under voltage lockout and short circuit protection. Low input current characteristics at minimal load make these converters also the ideal solution for battery-operated systems. Typical applications are in wireless networks, telecom/datacom, industry control systems and measurement equipment.

## Models

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Input Voltage Range</th>
<th>Output 1</th>
<th>Output 2</th>
<th>Efficiency typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEN 40-2410WIR</td>
<td>9 - 36 VDC (24 VDC nom.)</td>
<td>3.3 VDC</td>
<td>10'000 mA</td>
<td>90 %</td>
</tr>
<tr>
<td>TEN 40-2411WIR</td>
<td></td>
<td>5 VDC</td>
<td>8’000 mA</td>
<td>91 %</td>
</tr>
<tr>
<td>TEN 40-2412WIR</td>
<td></td>
<td>12 VDC</td>
<td>3’333 mA</td>
<td>92 %</td>
</tr>
<tr>
<td>TEN 40-2413WIR</td>
<td></td>
<td>15 VDC</td>
<td>2’666 mA</td>
<td>92 %</td>
</tr>
<tr>
<td>TEN 40-2415WIR</td>
<td></td>
<td>24 VDC</td>
<td>1’666 mA</td>
<td>91 %</td>
</tr>
<tr>
<td>TEN 40-2422WIR</td>
<td></td>
<td>+12 VDC</td>
<td>1’666 mA</td>
<td>90 %</td>
</tr>
<tr>
<td>TEN 40-2423WIR</td>
<td></td>
<td>+15 VDC</td>
<td>1’333 mA</td>
<td>90 %</td>
</tr>
<tr>
<td>TEN 40-2425WIR</td>
<td></td>
<td>+24 VDC</td>
<td>833 mA</td>
<td>91 %</td>
</tr>
<tr>
<td>TEN 40-4810WIR</td>
<td>18 - 75 VDC (48 VDC nom.)</td>
<td>3.3 VDC</td>
<td>10’000 mA</td>
<td>90 %</td>
</tr>
<tr>
<td>TEN 40-4811WIR</td>
<td></td>
<td>5 VDC</td>
<td>8’000 mA</td>
<td>91 %</td>
</tr>
<tr>
<td>TEN 40-4812WIR</td>
<td></td>
<td>12 VDC</td>
<td>3’333 mA</td>
<td>92 %</td>
</tr>
<tr>
<td>TEN 40-4813WIR</td>
<td></td>
<td>15 VDC</td>
<td>2’666 mA</td>
<td>92 %</td>
</tr>
<tr>
<td>TEN 40-4815WIR</td>
<td></td>
<td>24 VDC</td>
<td>1’666 mA</td>
<td>91 %</td>
</tr>
<tr>
<td>TEN 40-4822WIR</td>
<td></td>
<td>+12 VDC</td>
<td>1’666 mA</td>
<td>90 %</td>
</tr>
<tr>
<td>TEN 40-4823WIR</td>
<td></td>
<td>+15 VDC</td>
<td>1’333 mA</td>
<td>90 %</td>
</tr>
<tr>
<td>TEN 40-4825WIR</td>
<td></td>
<td>+24 VDC</td>
<td>833 mA</td>
<td>91 %</td>
</tr>
<tr>
<td>TEN 40-7210WIR</td>
<td>43 - 160 VDC (110 VDC nom.)</td>
<td>3.3 VDC</td>
<td>10’000 mA</td>
<td>88 %</td>
</tr>
<tr>
<td>TEN 40-7211WIR</td>
<td></td>
<td>5 VDC</td>
<td>8’000 mA</td>
<td>89 %</td>
</tr>
<tr>
<td>TEN 40-7212WIR</td>
<td></td>
<td>12 VDC</td>
<td>3’333 mA</td>
<td>91 %</td>
</tr>
<tr>
<td>TEN 40-7213WIR</td>
<td></td>
<td>15 VDC</td>
<td>2’666 mA</td>
<td>91 %</td>
</tr>
<tr>
<td>TEN 40-7215WIR</td>
<td></td>
<td>24 VDC</td>
<td>1’666 mA</td>
<td>90 %</td>
</tr>
<tr>
<td>TEN 40-7222WIR</td>
<td></td>
<td>+12 VDC</td>
<td>1’666 mA</td>
<td>89 %</td>
</tr>
<tr>
<td>TEN 40-7223WIR</td>
<td></td>
<td>+15 VDC</td>
<td>1’333 mA</td>
<td>89 %</td>
</tr>
<tr>
<td>TEN 40-7225WIR</td>
<td></td>
<td>+24 VDC</td>
<td>833 mA</td>
<td>91 %</td>
</tr>
</tbody>
</table>

## Options

| TEN-HS1 | - Optional Heat Sink with Height = 0.22 inch: [www.tracopower.com/products/ten-hs1.pdf](http://www.tracopower.com/products/ten-hs1.pdf) |

Note: The outputs of the ±24 Vout models can also be used in serial circuit for 48 VDC operation. Free-wheeling diodes are not necessary but recommended for increased performance for start-up with inductive / capacitive load operation.

www.tracopower.com
## Input Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>24 Vin models</th>
<th>48 Vin models</th>
<th>110 Vin models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Current (At no load)</td>
<td>15 mA typ.</td>
<td>10 mA typ.</td>
<td>10 mA typ.</td>
</tr>
<tr>
<td>Surge Voltage</td>
<td>50 VDC max.</td>
<td>100 VDC max.</td>
<td>170 VDC max.</td>
</tr>
<tr>
<td>Under Voltage Lockout</td>
<td>7.5 VDC min.</td>
<td>15 VDC min.</td>
<td>37 VDC min.</td>
</tr>
<tr>
<td>Recommended Input Fuse</td>
<td>8'000 mA (fast acting)</td>
<td>4'000 mA (slow blow)</td>
<td>3'150 mA (slow blow)</td>
</tr>
<tr>
<td>Reflected Ripple Current</td>
<td>20 mA typ.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Voltage Adjustment</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Output Specifications

### Output Voltage Adjustments

<table>
<thead>
<tr>
<th>Specification</th>
<th>Single Output</th>
<th>Dual Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Set Accuracy</td>
<td>±1% max.</td>
<td>±1% max.</td>
</tr>
<tr>
<td>Regulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Input Variation (Vmin - Vmax)</td>
<td>0.2% max.</td>
<td>0.2% max.</td>
</tr>
<tr>
<td>- Load Variation (0 - 100%)</td>
<td>0.5% max.</td>
<td>1%% max. (Output 1)</td>
</tr>
<tr>
<td>- Cross Regulation (25% / 100% asym. load)</td>
<td>1% max. (Output 2)</td>
<td>5% max.</td>
</tr>
</tbody>
</table>

### Ripple and Noise (20 MHz Bandwidth)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Single Output</th>
<th>Dual Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 3.3 Vout models</td>
<td>75 mVp-p typ.</td>
<td>100 mVp-p typ.</td>
</tr>
<tr>
<td>- 5 Vout models</td>
<td>75 mVp-p typ.</td>
<td>100 mVp-p typ.</td>
</tr>
<tr>
<td>- 12 Vout models</td>
<td>100 mVp-p typ.</td>
<td>100 mVp-p typ.</td>
</tr>
<tr>
<td>- 15 Vout models</td>
<td>100 mVp-p typ.</td>
<td>100 mVp-p typ.</td>
</tr>
<tr>
<td>- 24 Vout models</td>
<td>150 mVp-p typ.</td>
<td>150 mVp-p typ.</td>
</tr>
<tr>
<td>- 12 / -12 Vout models</td>
<td>100 / 100 mVp-p typ.</td>
<td>100 / 100 mVp-p typ.</td>
</tr>
<tr>
<td>- 15 / -15 Vout models</td>
<td>100 / 100 mVp-p typ.</td>
<td>100 / 100 mVp-p typ.</td>
</tr>
<tr>
<td>- 24 / -24 Vout models</td>
<td>150 / 150 mVp-p typ.</td>
<td>150 / 150 mVp-p typ.</td>
</tr>
</tbody>
</table>

### Capacitive Load

<table>
<thead>
<tr>
<th>Specification</th>
<th>Single Output</th>
<th>Dual Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 3.3 Vout models</td>
<td>26'600 µF max.</td>
<td>100 µF X7R</td>
</tr>
<tr>
<td>- 5 Vout models</td>
<td>20'000 µF max.</td>
<td>100 µF X7R</td>
</tr>
<tr>
<td>- 12 Vout models</td>
<td>3'900 µF max.</td>
<td>100 µF X7R</td>
</tr>
<tr>
<td>- 15 Vout models</td>
<td>2'600 µF max.</td>
<td>100 µF X7R</td>
</tr>
<tr>
<td>- 24 Vout models</td>
<td>1'300 µF max.</td>
<td>100 µF X7R</td>
</tr>
</tbody>
</table>

---

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.
### Minimum Load
Not required

### Temperature Coefficient
±0.02 %/K max.

### Hold-up Time
10 ms min. (acc. to EN 50155 Class S2, see application note for ext. capacitor calculation: www.tracopower.com/info/holdup_en50155.pdf)

### Start-up Time
60 ms typ.

### Short Circuit Protection
Continuous, Automatic recovery

### Overload Protection
Indefinite Mode

### Output Current Limitation
125 - 210% of Iout max.
150% typ. of Iout max.

### Overvoltage Protection
125% typ. of Vout nom. (By Zener diode)

### Transient Response
- Response Deviation: 10% max. (25% Load Step)
- Response Time: 250 µs typ. (25% Load Step)

### Safety Standards
- IT / Multimedia Equipment
  - EN 60950-1
  - EN 62368-1
  - IEC 60950-1
  - IEC 62368-1
  - UL 60950-1
  - UL 62368-1
- Railway Applications
  - EN 50155

### Pollution Degree
PD 2

### EMC Specifications
- 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)

### EMS Immunity
- Electrostatic Discharge
  - Air: EN 61000-4-2, ±8 kV, perf. criteria A
  - Contact: EN 61000-4-2, ±6 kV, perf. criteria A
- RF Electromagnetic Field
  - EFT (Burst) / Surge
    - EN 61000-4-4, ±2 kV, perf. criteria A
    - EN 61000-4-5, ±2 kV, perf. criteria A
- Conducted RF Disturbances
  - 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 +85°C
  - Case Temperature
    - -40°C to +90°C (with Heat Sink)
  - Storage Temperature
    - +105°C max.
    - -55°C to +125°C
- Power Derating
  - High Temperature
    - 2.5 %/K above 60°C
    - 2.8 %/K above 65°C (with Heat Sink)

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

www.tracopower.com July 18, 2023
### Cooling System
- Natural convection (20 LFM)

### Remote Control
- Voltage Controlled Remote
  - Off Idle Input Current
  - Remote Pin Input Current
    - On: 3.5 to 12 VDC or open circuit
    - Off: 0 to 1.2 VDC or short circuit
    - Refers to 'Remote' and '-Vin' Pin
    - 3 mA max.
    - -0.5 to 0.5 mA

### Altitude During Operation
- 5'000 m max.

### Switching Frequency
- 225 - 275 kHz (PWM)
- 250 kHz typ. (PWM)

### Insulation System
- Functional Insulation

### Isolation Test Voltage
- Input to Output, 60 s
  - 3'000 VDC (110 Vin models)
  - 1'600 VDC (other models)

### Isolation Resistance
- Input to Output, 500 VDC
  - 1'000 MΩ min.

### Isolation Capacitance
- Input to Output, 100 kHz, 1 V
  - 1'500 pF max.

### Reliability
- Calculated MTBF
  - 900'000 h (MIL-HDBK-217F, ground benign)

### Washing Process
- According to Cleaning Guideline
  - www.tracopower.com/info/cleaning.pdf

### Environment
- Vibration
  - MIL-STD-810F
  - EN 61373
- Mechanical Shock
  - MIL-STD-810F
  - EN 61373
- Thermal Shock
  - MIL-STD-810F
  - EN 50155

### Housing Material
- Copper

### Base Material
- Non-conductive FR4 (UL 94 V-0 rated)

### Potting Material
- Silicone (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 1"

### Soldering Profile
- Lead-Free Wave Soldering
  - 265°C / 10 s max.

### Weight
- 32 g

### Thermal Impedance
- Case to Ambient
  - 10.8 K/W typ. (without heatsink)
  - 10.3 W/K typ. (with heatsink TEN-HS1)

### Environmental Compliance
- REACH Declaration
  - www.tracopower.com/info/reach-declaration.pdf
- RoHS Declaration
  - 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))
  - SCIR Reference Number
    - 00c7ae50-3d8c-4682-88e1-0d2e69ce3142

### Supporting Documents
- Overview Link (for additional Documents)
  - www.tracopower.com/overview/ten40wir

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.x ±0.50 (±0.02)
- Tolerance: x.xx ±0.25 (±0.01)
- Pin pitch tolerance ±0.25 (0.01)
- Pin dimension tolerance ±0.10 (0.04)

**Pinout**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Single</th>
<th>Dual</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+Vin (Vcc)</td>
<td>+Vin (Vcc)</td>
</tr>
<tr>
<td>2</td>
<td>–Vin (GND)</td>
<td>–Vin (GND)</td>
</tr>
<tr>
<td>3</td>
<td>Remote On/Off</td>
<td>Remote On/Off</td>
</tr>
<tr>
<td>4</td>
<td>+Vout</td>
<td>+Vout</td>
</tr>
<tr>
<td>5</td>
<td>–Vout</td>
<td>Common</td>
</tr>
<tr>
<td>6</td>
<td>Trim</td>
<td>–Vout</td>
</tr>
</tbody>
</table>