

- Ultra low ripple and noise 10mVp-p typ.
- Compact SIP-8 package
- Input Voltage range 4.5-13.2, 9-18, 18-36, 36-75 VDC
- I/O isolation 1600 VDC
- Operating temperature range -40 to +75°C without derating
- Fully regulated outputs
- Short circuit protection
- 3-year product warranty



The TVN 3 Series comprises ultra low ripple and noise 3 Watt DC/DC converters. They come in a compact SIP-8 package with fully regulated outputs. Apart from the standard 2:1 input voltage range, the low input voltage models feature an extended input voltage range from 4.5-13.2 VDC (3:1). Full load operation is reliable up to 75°C environment temperature without derating and up to 90°C with 50% derating. With 1'600 VDC I/O-isolation voltage, and short current protection they cover a wide range of applications when space is limited.

### Models

| Order Code | Input Voltage Range            | Output 1 |                  | Output 2 |                  | Efficiency typ. |
|------------|--------------------------------|----------|------------------|----------|------------------|-----------------|
|            |                                | Vnom     | I <sub>max</sub> | Vnom     | I <sub>max</sub> |                 |
| TVN 3-0910 | 4.5 - 13.2 VDC<br>(9 VDC nom.) | 3.3 VDC  | 700 mA           |          |                  | 75 %            |
| TVN 3-0911 |                                | 5 VDC    | 600 mA           |          |                  | 79 %            |
| TVN 3-0919 |                                | 9 VDC    | 333 mA           |          |                  | 81 %            |
| TVN 3-0912 |                                | 12 VDC   | 250 mA           |          |                  | 83 %            |
| TVN 3-0913 |                                | 15 VDC   | 200 mA           |          |                  | 83 %            |
| TVN 3-0915 |                                | 24 VDC   | 125 mA           |          |                  | 82 %            |
| TVN 3-0921 |                                | +5 VDC   | 300 mA           | -5 VDC   | 300 mA           | 78 %            |
| TVN 3-0922 |                                | +12 VDC  | 125 mA           | -12 VDC  | 125 mA           | 82 %            |
| TVN 3-0923 |                                | +15 VDC  | 100 mA           | -15 VDC  | 100 mA           | 82 %            |
| TVN 3-1210 | 9 - 18 VDC<br>(12 VDC nom.)    | 3.3 VDC  | 700 mA           |          |                  | 77 %            |
| TVN 3-1211 |                                | 5 VDC    | 600 mA           |          |                  | 81 %            |
| TVN 3-1219 |                                | 9 VDC    | 333 mA           |          |                  | 83 %            |
| TVN 3-1212 |                                | 12 VDC   | 250 mA           |          |                  | 85 %            |
| TVN 3-1213 |                                | 15 VDC   | 200 mA           |          |                  | 85 %            |
| TVN 3-1215 |                                | 24 VDC   | 125 mA           |          |                  | 84 %            |
| TVN 3-1221 |                                | +5 VDC   | 300 mA           | -5 VDC   | 300 mA           | 80 %            |
| TVN 3-1222 |                                | +12 VDC  | 125 mA           | -12 VDC  | 125 mA           | 84 %            |
| TVN 3-1223 |                                | +15 VDC  | 100 mA           | -15 VDC  | 100 mA           | 83 %            |
| TVN 3-2410 | 18 - 36 VDC<br>(24 VDC nom.)   | 3.3 VDC  | 700 mA           |          |                  | 77 %            |
| TVN 3-2411 |                                | 5 VDC    | 600 mA           |          |                  | 82 %            |
| TVN 3-2419 |                                | 9 VDC    | 333 mA           |          |                  | 85 %            |
| TVN 3-2412 |                                | 12 VDC   | 250 mA           |          |                  | 85 %            |
| TVN 3-2413 |                                | 15 VDC   | 200 mA           |          |                  | 85 %            |
| TVN 3-2415 |                                | 24 VDC   | 125 mA           |          |                  | 85 %            |
| TVN 3-2421 |                                | +5 VDC   | 300 mA           | -5 VDC   | 300 mA           | 80 %            |
| TVN 3-2422 |                                | +12 VDC  | 125 mA           | -12 VDC  | 125 mA           | 85 %            |
| TVN 3-2423 |                                | +15 VDC  | 100 mA           | -15 VDC  | 100 mA           | 85 %            |
| TVN 3-4810 | 36 - 75 VDC<br>(48 VDC nom.)   | 3.3 VDC  | 700 mA           |          |                  | 75 %            |
| TVN 3-4811 |                                | 5 VDC    | 600 mA           |          |                  | 80 %            |
| TVN 3-4819 |                                | 9 VDC    | 333 mA           |          |                  | 83 %            |
| TVN 3-4812 |                                | 12 VDC   | 250 mA           |          |                  | 84 %            |
| TVN 3-4813 |                                | 15 VDC   | 200 mA           |          |                  | 85 %            |
| TVN 3-4815 |                                | 24 VDC   | 125 mA           |          |                  | 84 %            |
| TVN 3-4821 |                                | +5 VDC   | 300 mA           | -5 VDC   | 300 mA           | 80 %            |
| TVN 3-4822 |                                | +12 VDC  | 125 mA           | -12 VDC  | 125 mA           | 85 %            |
| TVN 3-4823 |                                | +15 VDC  | 100 mA           | -15 VDC  | 100 mA           | 83 %            |

## Input Specifications

|                        |              |                                                                                                                                                                                                                                                           |
|------------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input Current          | - At no load | 9 Vin models: <b>55 mA typ.</b><br>12 Vin models: <b>30 mA typ.</b><br>24 Vin models: <b>16 mA typ.</b><br>48 Vin models: <b>12 mA typ.</b>                                                                                                               |
| Surge Voltage          |              | 9 Vin models: <b>15 VDC max.</b> (1 s max.)<br>12 Vin models: <b>25 VDC max.</b> (1 s max.)<br>24 Vin models: <b>50 VDC max.</b> (1 s max.)<br>48 Vin models: <b>100 VDC max.</b> (1 s max.)                                                              |
| Under Voltage Lockout  |              | 9 Vin models: <b>2 VDC min. / 3 VDC typ. / 4 VDC max.</b><br>12 Vin models: <b>6 VDC min. / 7 VDC typ. / 8 VDC max.</b><br>24 Vin models: <b>13 VDC min. / 15 VDC typ. / 17 VDC max.</b><br>48 Vin models: <b>29 VDC min. / 32 VDC typ. / 35 VDC max.</b> |
| Recommended Input Fuse |              | (The need of an external fuse has to be assessed in the final application.)                                                                                                                                                                               |
| Input Filter           |              | Internal Capacitor                                                                                                                                                                                                                                        |

## Output Specifications

|                          |                                            |                                                                                                                                                                                                                                         |
|--------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Voltage Set Accuracy     |                                            | <b>±1% max.</b>                                                                                                                                                                                                                         |
| Regulation               | - Input Variation (Vmin - Vmax)            | single output models: <b>0.2% max.</b><br>dual output models: <b>0.2% max.</b>                                                                                                                                                          |
|                          | - Load Variation (0 - 100%)                | single output models: <b>1% max.</b><br>dual output models: <b>1% max. (Output 1)</b><br><b>1% max. (Output 2)</b>                                                                                                                      |
|                          | - Cross Regulation (25% / 100% asym. load) | dual output models: <b>5% max.</b>                                                                                                                                                                                                      |
| Ripple and Noise         | - 20 MHz Bandwidth                         | <b>15 mVp-p max.</b><br><b>10 mVp-p typ.</b>                                                                                                                                                                                            |
| Capacitive Load          | - single output                            | 3.3 Vout models: <b>4'400 µF max.</b><br>5 Vout models: <b>2'200 µF max.</b><br>9 Vout models: <b>1'300 µF max.</b><br>12 Vout models: <b>1'000 µF max.</b><br>15 Vout models: <b>820 µF max.</b><br>24 Vout models: <b>470 µF max.</b> |
|                          | - dual output                              | 5 / -5 Vout models: <b>1'200 / 1'200 µF max.</b><br>12 / -12 Vout models: <b>520 / 520 µF max.</b><br>15 / -15 Vout models: <b>440 / 440 µF max.</b>                                                                                    |
| Minimum Load             |                                            | Not required                                                                                                                                                                                                                            |
| Temperature Coefficient  |                                            | <b>±0.02 %/K max.</b>                                                                                                                                                                                                                   |
| Start-up Time            |                                            | <b>30 ms typ.</b>                                                                                                                                                                                                                       |
| Short Circuit Protection |                                            | Continuous, Automatic recovery                                                                                                                                                                                                          |
| Transient Response       | - Response Time                            | <b>500 µs typ.</b> (25% Load Step)                                                                                                                                                                                                      |

## Safety Specifications

|                       |                             |                                                |
|-----------------------|-----------------------------|------------------------------------------------|
| Standards             | - IT / Multimedia Equipment | Designed for IEC/EN/UL 62368-1 (not certified) |
| Over Voltage Category |                             | Not mains connected                            |

## EMC Specifications

|                                                                                                                        |                       |                                                                                    |
|------------------------------------------------------------------------------------------------------------------------|-----------------------|------------------------------------------------------------------------------------|
| EMI (Emissions)                                                                                                        | - Conducted Emissions | EN 55032 class A (with external filter)<br>EN 55032 class B (with external filter) |
|                                                                                                                        | - Radiated Emissions  | EN 55032 class A (with external filter)<br>EN 55032 class B (with external filter) |
| External filter proposal: <a href="http://www.tracopower.com/tvn3-emc-filter/">www.tracopower.com/tvn3-emc-filter/</a> |                       |                                                                                    |

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

|                |                             |                       |                                            |
|----------------|-----------------------------|-----------------------|--------------------------------------------|
| EMS (Immunity) | - Electrostatic Discharge   | Air:                  | EN 61000-4-2, $\pm 8$ kV, perf. criteria A |
|                |                             | Contact:              | EN 61000-4-2, $\pm 6$ kV, perf. criteria A |
|                | - RF Electromagnetic Field  |                       | EN 61000-4-3, 10 V/m, perf. criteria A     |
|                | - EFT (Burst) / Surge       |                       | EN 61000-4-4, $\pm 2$ kV, perf. criteria A |
|                |                             |                       | EN 61000-4-5, $\pm 1$ kV, perf. criteria A |
|                |                             | Ext. input component: | 220 $\mu$ F, 100 V                         |
|                | - 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 +90°C                                                                                                           |
|                          | - Case Temperature                                                                                                                    | +105°C max.                                                                                                              |
|                          | - Storage Temperature                                                                                                                 | -55°C to +125°C                                                                                                          |
| Power Derating           | - High Temperature                                                                                                                    | 3.33 %/K above 75°C                                                                                                      |
|                          | See application note: <a href="http://www.tracopower.com/tvn3-cc/">www.tracopower.com/tvn3-cc/</a>                                    |                                                                                                                          |
| Cooling System           |                                                                                                                                       | Natural convection (20 LFM)                                                                                              |
| Remote Control           | - Current Controlled Remote (passive = on)                                                                                            | On: open circuit                                                                                                         |
|                          |                                                                                                                                       | Off: 2 to 4 mA current (internal 1 k $\Omega$ resistor)                                                                  |
|                          |                                                                                                                                       | Refers to 'Remote' and '-Vin' Pin                                                                                        |
|                          | External circuit proposal: <a href="http://www.tracopower.com/info/current-remote.pdf">www.tracopower.com/info/current-remote.pdf</a> |                                                                                                                          |
|                          | - Off Idle Input Current                                                                                                              | 2.5 mA max.                                                                                                              |
| Switching Frequency      |                                                                                                                                       | 100 kHz min. (PFM)                                                                                                       |
| Insulation System        |                                                                                                                                       | Functional Insulation                                                                                                    |
| Isolation Test Voltage   | - Input to Output, 60 s                                                                                                               | 1'600 VDC                                                                                                                |
|                          | - Input to Case, 60 s                                                                                                                 | 1'000 VDC                                                                                                                |
|                          | - Output to Case, 60 s                                                                                                                | 1'000 VDC                                                                                                                |
| Isolation Resistance     | - Input to Output, 500 VDC                                                                                                            | 1'000 M $\Omega$ min.                                                                                                    |
| Isolation Capacitance    | - Input to Output, 100 kHz, 1 V                                                                                                       | 1'500 pF max.                                                                                                            |
| Reliability              | - Calculated MTBF                                                                                                                     | 5'600'000 h (MIL-HDBK-217F, ground benign)                                                                               |
| Washing Process          |                                                                                                                                       | According to Cleaning Guideline                                                                                          |
|                          |                                                                                                                                       | <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>                           |
| Environment              | - Vibration                                                                                                                           | MIL-STD-810F                                                                                                             |
|                          | - Thermal Shock                                                                                                                       | MIL-STD-810F                                                                                                             |
| Housing Material         |                                                                                                                                       | Copper                                                                                                                   |
| Potting Material         |                                                                                                                                       | Silicone (UL 94 V-0 rated)                                                                                               |
| Pin Material             |                                                                                                                                       | Copper                                                                                                                   |
| Pin Foundation Plating   |                                                                                                                                       | Nickel (1 - 2 $\mu$ m)                                                                                                   |
| Pin Surface Plating      |                                                                                                                                       | Tin (3 - 5 $\mu$ m), matte                                                                                               |
| Housing Type             |                                                                                                                                       | Metal Case                                                                                                               |
| Mounting Type            |                                                                                                                                       | PCB Mount                                                                                                                |
| Connection Type          |                                                                                                                                       | THD (Through-Hole Device)                                                                                                |
| Footprint Type           |                                                                                                                                       | SIP8                                                                                                                     |
| Soldering Profile        |                                                                                                                                       | Lead-Free Wave Soldering                                                                                                 |
|                          |                                                                                                                                       | 260°C / 6 s max.                                                                                                         |
| Weight                   |                                                                                                                                       | 5.9 g                                                                                                                    |
| Environmental Compliance | - REACH Declaration                                                                                                                   | <a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a>         |
|                          |                                                                                                                                       | REACH SVHC list compliant                                                                                                |
|                          |                                                                                                                                       | REACH Annex XVII compliant                                                                                               |
|                          | - RoHS Declaration                                                                                                                    | <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a>           |
|                          |                                                                                                                                       | Exemptions: 7(a), 7(c)-I                                                                                                 |
|                          |                                                                                                                                       | (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (Q5A rule).) |
|                          | - SCIP Reference Number                                                                                                               | ce8b5bb4-e67d-46c3-91a3-fc42031b3311                                                                                     |

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

### Additional Information

Supporting Documents

[www.tracopower.com/overview/tvn3](http://www.tracopower.com/overview/tvn3)

Frequently Asked Questions

[www.tracopower.com/glossary-faq](http://www.tracopower.com/glossary-faq)

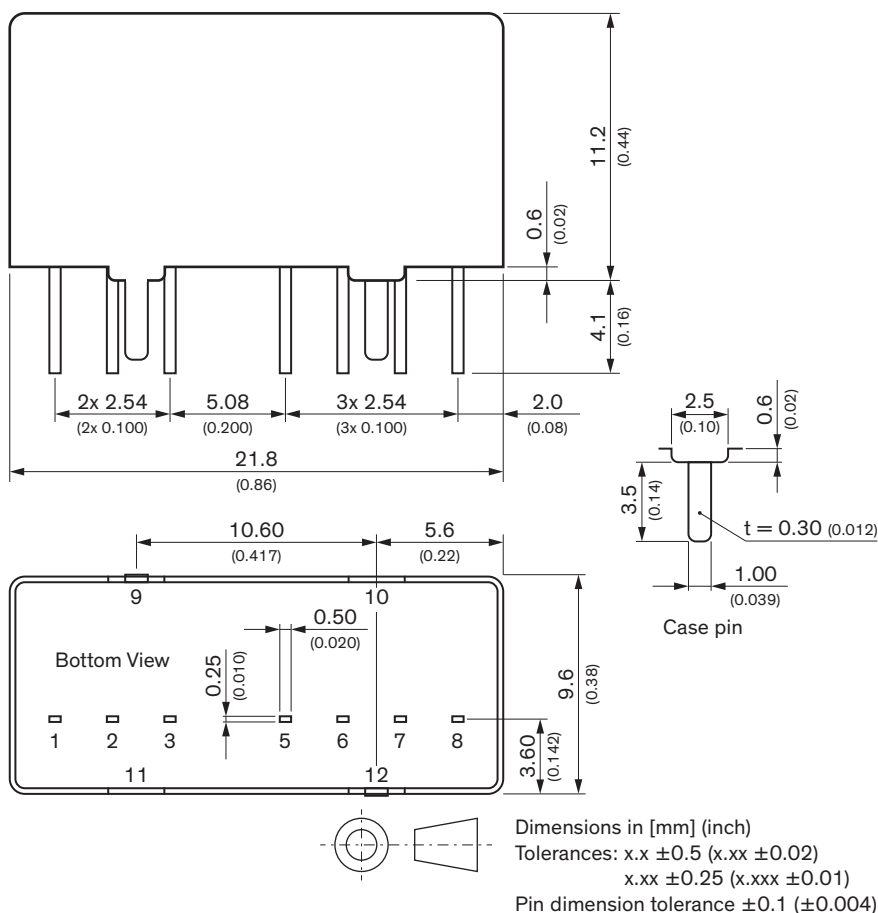
Glossary

[www.tracopower.com/info/glossary.pdf](http://www.tracopower.com/info/glossary.pdf)

Service Portal

[www.tracoserviceportal.com](http://www.tracoserviceportal.com)

### Outline Dimensions



### Pinout

| Pin | Single        | Dual          |
|-----|---------------|---------------|
| 1   | –Vin (GND)    | –Vin (GND)    |
| 2   | +Vin (Vcc)    | +Vin (Vcc)    |
| 3   | Remote On/Off | Remote On/Off |
| 5   | NC            | NC            |
| 6   | +Vout         | +Vout         |
| 7   | –Vout         | Common        |
| 8   | NC            | –Vout         |
| 9   | Case*         | Case*         |
| 10  | Stand off     | Stand off     |
| 11  | Stand off     | Stand off     |
| 12  | Case*         | Case*         |

NC: Not connected

\*Case pins must not be connected to any circuit.

Avoid routing PCB traces under the converter.