

- Compact SIP-8 metal case
- EN 50155 railway approval
- Ultra wide 4:1 Input: 9–36, 18–75 and 43–160 VDC
- I/O-isolation 3'000 VDC
- Fully regulated outputs
- Operating temperature range –40°C to +90°C
- Short circuit protection and current limitation
- Remote On/Off
- 3-year product warranty



The TMR 3WIR series is a set of 3 Watt DC/DC converters in a SIP-8 metal case. They operate up to 78°C environment temperature at full load and up to 90°C with a 50% load derating. With EN 50155 and UL 60950-1 certification, 3'000 VDC I/O-isolation voltage, external On/Off, current limitation and short circuit protection they cover a wide range of application when space is limited. The input of the converters is designed for a wide voltage range (4:1) and minimum load is not required.

| Models        |                                |          |                  |          |                  |                 |
|---------------|--------------------------------|----------|------------------|----------|------------------|-----------------|
| Order Code    | Input Voltage Range            | Output 1 |                  | Output 2 |                  | Efficiency typ. |
|               |                                | Vnom     | I <sub>max</sub> | Vnom     | I <sub>max</sub> |                 |
| TMR 3-2410WIR | 9 - 36 VDC<br>(24 VDC nom.)    | 3.3 VDC  | 700 mA           |          |                  | 76 %            |
| TMR 3-2411WIR |                                | 5 VDC    | 600 mA           |          |                  | 81 %            |
| TMR 3-2419WIR |                                | 9 VDC    | 333 mA           |          |                  | 81 %            |
| TMR 3-2412WIR |                                | 12 VDC   | 250 mA           |          |                  | 83 %            |
| TMR 3-2413WIR |                                | 15 VDC   | 200 mA           |          |                  | 83 %            |
| TMR 3-2415WIR |                                | 24 VDC   | 125 mA           |          |                  | 82 %            |
| TMR 3-2421WIR |                                | +5 VDC   | 300 mA           | –5 VDC   | 300 mA           | 80 %            |
| TMR 3-2422WIR |                                | +12 VDC  | 125 mA           | –12 VDC  | 125 mA           | 82 %            |
| TMR 3-2423WIR |                                | +15 VDC  | 100 mA           | –15 VDC  | 100 mA           | 82 %            |
| TMR 3-4810WIR | 18 - 75 VDC<br>(48 VDC nom.)   | 3.3 VDC  | 700 mA           |          |                  | 75 %            |
| TMR 3-4811WIR |                                | 5 VDC    | 600 mA           |          |                  | 81 %            |
| TMR 3-4819WIR |                                | 9 VDC    | 333 mA           |          |                  | 81 %            |
| TMR 3-4812WIR |                                | 12 VDC   | 250 mA           |          |                  | 82 %            |
| TMR 3-4813WIR |                                | 15 VDC   | 200 mA           |          |                  | 82 %            |
| TMR 3-4815WIR |                                | 24 VDC   | 125 mA           |          |                  | 82 %            |
| TMR 3-4821WIR |                                | +5 VDC   | 300 mA           | –5 VDC   | 300 mA           | 80 %            |
| TMR 3-4822WIR |                                | +12 VDC  | 125 mA           | –12 VDC  | 125 mA           | 82 %            |
| TMR 3-4823WIR |                                | +15 VDC  | 100 mA           | –15 VDC  | 100 mA           | 82 %            |
| TMR 3-7210WIR | 43 - 160 VDC<br>(110 VDC nom.) | 3.3 VDC  | 700 mA           |          |                  | 76 %            |
| TMR 3-7211WIR |                                | 5 VDC    | 600 mA           |          |                  | 80 %            |
| TMR 3-7219WIR |                                | 9 VDC    | 333 mA           |          |                  | 81 %            |
| TMR 3-7212WIR |                                | 12 VDC   | 250 mA           |          |                  | 82 %            |
| TMR 3-7213WIR |                                | 15 VDC   | 200 mA           |          |                  | 83 %            |
| TMR 3-7215WIR |                                | 24 VDC   | 125 mA           |          |                  | 83 %            |
| TMR 3-7221WIR |                                | +5 VDC   | 300 mA           | –5 VDC   | 300 mA           | 80 %            |
| TMR 3-7222WIR |                                | +12 VDC  | 125 mA           | –12 VDC  | 125 mA           | 83 %            |
| TMR 3-7223WIR |                                | +15 VDC  | 100 mA           | –15 VDC  | 100 mA           | 81 %            |

## Input Specifications

|                        |              |                                                                                                                                                                                                                  |
|------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input Current          | - At no load | 24 Vin models: <b>4 mA typ.</b><br>48 Vin models: <b>4 mA typ.</b><br>110 Vin models: <b>2 mA typ.</b>                                                                                                           |
| Surge Voltage          |              | 24 Vin models: <b>50 VDC max.</b> (1 s max.)<br>48 Vin models: <b>100 VDC max.</b> (1 s max.)<br>110 Vin models: <b>185 VDC max.</b> (1 s max.)                                                                  |
| Recommended Input Fuse |              | 24 Vin models: <b>800 mA</b> (slow blow)<br>48 Vin models: <b>500 mA</b> (slow blow)<br>110 Vin models: <b>160 mA</b> (slow blow)<br>(The need of an external fuse has to be assessed in the final application.) |
| Input Filter           |              | <b>Internal Capacitor</b>                                                                                                                                                                                        |

## Output Specifications

|                           |                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Voltage Set Accuracy      |                                                                                                              | <b>±1% max.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Regulation                | - Input Variation (Vmin - Vmax)<br>- Load Variation (0 - 100%)<br>- Cross Regulation (25% / 100% asym. load) | single output models: <b>0.2% max.</b><br>dual output models: <b>0.2% max.</b><br>single output models: <b>0.5% max.</b><br>dual output models: <b>1% max.</b> (Output 1)<br><b>1% max.</b> (Output 2)<br>dual output models: <b>5% max.</b>                                                                                                                                                                                                                                                                              |
| Ripple and Noise          | - 20 MHz Bandwidth                                                                                           | <b>75 mVp-p max.</b> (w/ 1 $\mu$ F)<br><b>50 mVp-p typ.</b> (w/ 1 $\mu$ F)                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Capacitive Load           | - single output<br><br><br><br><br><br>- dual output                                                         | 3.3 Vout models: <b>1'100 <math>\mu</math>F max.</b><br>5 Vout models: <b>550 <math>\mu</math>F max.</b><br>9 Vout models: <b>340 <math>\mu</math>F max.</b><br>12 Vout models: <b>240 <math>\mu</math>F max.</b><br>15 Vout models: <b>240 <math>\mu</math>F max.</b><br>24 Vout models: <b>90 <math>\mu</math>F max.</b><br>5 / -5 Vout models: <b>340 / 340 <math>\mu</math>F max.</b><br>12 / -12 Vout models: <b>170 / 170 <math>\mu</math>F max.</b><br>15 / -15 Vout models: <b>90 / 90 <math>\mu</math>F max.</b> |
| Minimum Load              |                                                                                                              | <b>Not required</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Temperature Coefficient   |                                                                                                              | <b>±0.02 %/K max.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Hold-up Time              |                                                                                                              | <b>10 ms min.</b> (acc. to EN 50155 Class S2, see application note for ext. capacitor calculation:<br><a href="http://www.tracopower.com/info/holdup_en50155.pdf">www.tracopower.com/info/holdup_en50155.pdf</a> )                                                                                                                                                                                                                                                                                                        |
| Start-up Time             |                                                                                                              | <b>75 ms max.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Short Circuit Protection  |                                                                                                              | <b>Continuous, Automatic recovery</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Output Current Limitation |                                                                                                              | <b>180% typ. of Iout max.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Transient Response        | - Response Time                                                                                              | <b>250 <math>\mu</math>s typ.</b> (25% Load Step)                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## Safety Specifications

|                  |                                                                                        |                                                                                                                                                     |
|------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Standards        | - IT / Multimedia Equipment<br><br>- Railway Applications<br>- Certification Documents | EN 62368-1<br>IEC 62368-1<br>UL 62368-1<br>EN 50155<br><a href="http://www.tracopower.com/overview/tmr3wir">www.tracopower.com/overview/tmr3wir</a> |
| Pollution Degree |                                                                                        | <b>PD 2</b>                                                                                                                                         |

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

## EMC Specifications

|                                                                                                                                            |                                                     |                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EMI (Emissions)                                                                                                                            | - Conducted Emissions                               | EN 50121-3-2 (EMC for Rolling Stock)<br>EN 55011 class A (with external filter)<br>EN 55011 class B (with external filter)<br>EN 55032 class A (with external filter)<br>EN 55032 class B (with external filter)                                                                                                         |
|                                                                                                                                            | - Radiated Emissions                                | EN 55011 class A (with external filter)<br>EN 55011 class B (with external filter)<br>EN 55032 class A (with external filter)<br>EN 55032 class B (with external filter)                                                                                                                                                 |
| External filter proposal: <a href="http://www.tracopower.com/overview/tmr3wir">www.tracopower.com/overview/tmr3wir</a>                     |                                                     |                                                                                                                                                                                                                                                                                                                          |
| EMS (Immunity)                                                                                                                             | - Electrostatic Discharge                           | Air: EN 50121-3-2 (EMC for Rolling Stock)<br>Contact: EN 61000-4-2, $\pm 8$ kV, perf. criteria A<br>EN 61000-4-2, $\pm 6$ kV, perf. criteria A<br>EN 61000-4-3, 20 V/m, perf. criteria A<br>EN 61000-4-4, $\pm 2$ kV, perf. criteria A<br>EN 61000-4-5, $\pm 2$ kV, perf. criteria A                                     |
|                                                                                                                                            | - RF Electromagnetic Field<br>- EFT (Burst) / Surge | Ext. input component: 24 Vin models: KY 220 $\mu$ F    TVS SMDJ70A<br>48 Vin models: KY 220 $\mu$ F    TVS SMDJ120A<br>110 Vin models: KY 150 $\mu$ F    TVS SMDJ250A<br>Continuous: EN 61000-4-6, 10 Vrms, perf. criteria A<br>1 s: EN 61000-4-8, 100 A/m, perf. criteria A<br>EN 61000-4-8, 1000 A/m, perf. criteria A |
| EMC / Environmental - Certification Documents <a href="http://www.tracopower.com/overview/tmr3wir">www.tracopower.com/overview/tmr3wir</a> |                                                     |                                                                                                                                                                                                                                                                                                                          |

## General Specifications

|                                                                                                                    |                                            |                                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Relative Humidity                                                                                                  |                                            | 95% max. (non condensing)                                                                                                         |
| Temperature Ranges                                                                                                 | - Operating Temperature                    | -40°C to +90°C                                                                                                                    |
|                                                                                                                    | - Case Temperature                         | +100°C max.                                                                                                                       |
|                                                                                                                    | - Storage Temperature                      | -55°C to +125°C                                                                                                                   |
| Power Derating                                                                                                     | - High Temperature                         | 4.55 %/K above 78°C                                                                                                               |
| See application note: <a href="http://www.tracopower.com/overview/tmr3wir">www.tracopower.com/overview/tmr3wir</a> |                                            |                                                                                                                                   |
| Cooling System                                                                                                     |                                            | Natural convection (20 LFM)                                                                                                       |
| Remote Control                                                                                                     | - Voltage Controlled Remote (passive = on) | On: 0 to 0.5 VDC or open circuit<br>Off: 3 to 12 VDC<br>Refers to 'Remote' and '-Vin' Pin                                         |
|                                                                                                                    | - Off Idle Input Current                   | 2.5 mA typ.                                                                                                                       |
|                                                                                                                    | - Remote Pin Input Current                 | 0.5 to 3.5 mA                                                                                                                     |
| Altitude During Operation                                                                                          |                                            | 5'000 m max.                                                                                                                      |
| Switching Frequency                                                                                                |                                            | 270 - 330 kHz (PWM) (110 Vin model)                                                                                               |
|                                                                                                                    |                                            | 360 - 440 kHz (PWM) (other input models)                                                                                          |
| Insulation System                                                                                                  |                                            | Functional Insulation                                                                                                             |
| Isolation Test Voltage                                                                                             | - Input to Output, 60 s                    | 3'000 VDC                                                                                                                         |
|                                                                                                                    | - Input to Case, 60 s                      | 1'500 VDC                                                                                                                         |
|                                                                                                                    | - Output to Case, 60 s                     | 1'500 VDC                                                                                                                         |
| Isolation Resistance                                                                                               | - Input to Output, 500 VDC                 | 1'000 M $\Omega$ min.                                                                                                             |
| Isolation Capacitance                                                                                              | - Input to Output, 100 kHz, 1 V            | 100 pF max.                                                                                                                       |
| Reliability                                                                                                        | - Calculated MTBF                          | 5'535'000 h (MIL-HDBK-217F, ground benign)                                                                                        |
| Washing Process                                                                                                    |                                            | According to Cleaning Guideline<br><a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a> |
| Environment                                                                                                        | - Vibration                                | MIL-STD-810F<br>EN 61373                                                                                                          |
|                                                                                                                    | - Mechanical Shock                         | MIL-STD-810F<br>EN 61373                                                                                                          |
|                                                                                                                    | - Thermal Shock                            | MIL-STD-810F                                                                                                                      |
|                                                                                                                    | - Flammability                             | EN 45545-2                                                                                                                        |
|                                                                                                                    |                                            | <a href="http://www.tracopower.com/info/en45545-declaration.pdf">www.tracopower.com/info/en45545-declaration.pdf</a>              |

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

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Housing Material         | Copper                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Potting Material         | Silicone (UL 94 V-0 rated)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Pin Material             | Copper                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Pin Foundation Plating   | Nickel (1 - 2 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           | SIP8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Soldering Profile        | Lead-Free Wave Soldering<br>265°C / 10 s max.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Weight                   | 5.9 g                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Environmental Compliance | - REACH Declaration<br><a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a><br>REACH SVHC list compliant<br>REACH Annex XVII compliant<br>- RoHS Declaration<br><a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a><br>Exemptions: 7a, 7c-I<br>(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)<br>- SCIP Reference Number<br>09d8ed31-d8a4-4758-985e-946da87f5115 |

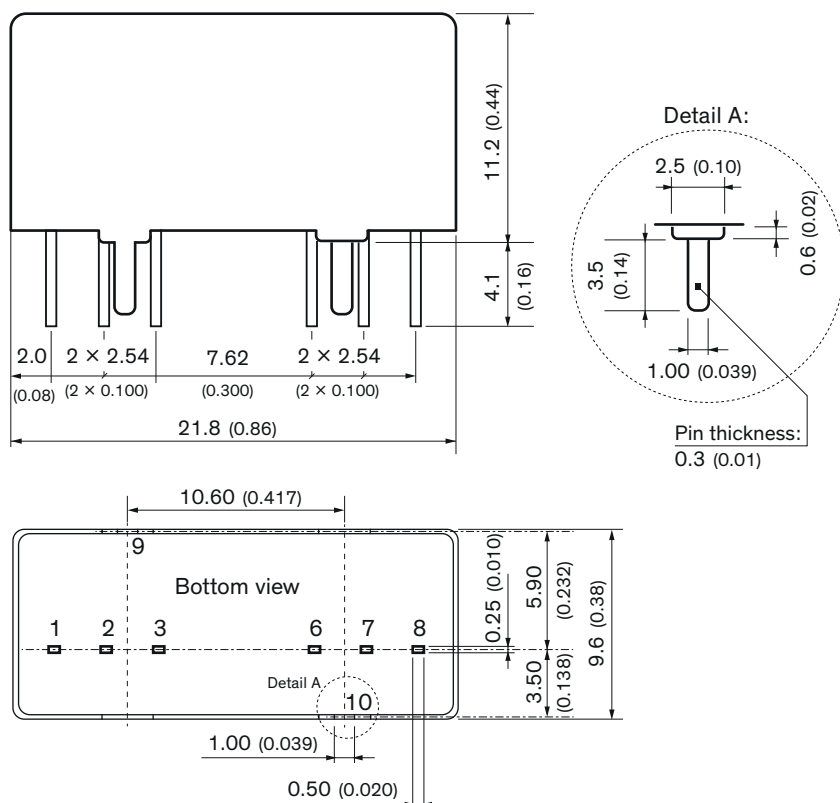
## Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tmr3wir](http://www.tracopower.com/overview/tmr3wir)

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### Outline Dimensions



| Pinout |               |             |
|--------|---------------|-------------|
| Pin    | Single Output | Dual Output |
| 1      | -Vin (GND)    | -Vin (GND)  |
| 2      | +Vin (Vcc)    | +Vin (Vcc)  |
| 3      | Remote        | Remote      |
| 6      | +Vout         | +Vout       |
| 7      | -Vout         | Common      |
| 8      | NC            | -Vout       |
| 9, 10  | Case          | Case        |

NC: Not connected

Dimensions in mm (inch)

Tolerances: x.x ±0.5 (x.xx ±0.02)

x.xx ±0.25 (x.xxx ±0.01)

Pin dimension tolerance ±0.1 (±0.004)

