



**DESCRIPTION:**

**1W 3KVDC Isolated Single Output DC/DC Converters**

The TPR-1W series are miniature, isolated 1W DC/DC converters in a SIP package. They offer the ideal solution in many space critical applications for board level power distribution. The internal SMD construction makes it possible to offer a product with high performance at low cost. The series offers smaller size, improved efficiency, lower output ripple noise and 3KVDC isolation.

**FEATURES**

|   |   |  |
|---|---|--|
| RoHS compliant                            | 3KVDC isolation                           | Efficiency up to 80%                     |
| Operating temperature: -40°C to 105°C     | Power density up to 0.90W/cm <sup>3</sup> | UL 94V-0 package material                |
| Footprint from 1.17cm <sup>2</sup>        | Industry standard pinout                  | Input voltage:3.3V,5V,9V,12V,15V,24V,48V |
| Output voltage: 3.3V,5V, 9V,12V, 15V, 24V | Custom solutions available                | CE certification                         |

**SELECTION GUIDE**

| Part Number | Nominal Input Voltage | Output Voltage | Output Current (Max./Min) | Efficiency |
|-------------|-----------------------|----------------|---------------------------|------------|
|             | V                     | V              | mA                        | %          |
| TPR0303S-1W | 3.3                   | 3.3            | 303/30.3                  | 72         |
| TPR0305S-1W | 3.3                   | 5              | 200/20                    | 74         |
| TPR0503S-1W | 5                     | 3.3            | 303/30.3                  | 72         |
| TPR0505S-1W | 5                     | 5              | 200/20                    | 68         |
| TPR0509S-1W | 5                     | 9              | 111/11.1                  | 78         |
| TPR0512S-1W | 5                     | 12             | 84/8.1                    | 76         |
| TPR0515S-1W | 5                     | 15             | 68/6.8                    | 79         |
| TPR0524S-1W | 5                     | 24             | 42/4.2                    | 81         |
| TPR0905S-1W | 9                     | 5              | 200/20                    | 74         |
| TPR1203S-1W | 12                    | 3.3            | 303/30.3                  | 74         |
| TPR1205S-1W | 12                    | 5              | 200/20                    | 69         |
| TPR1209S-1W | 12                    | 9              | 111/11.1                  | 76         |
| TPR1212S-1W | 12                    | 12             | 84/8.4                    | 77         |
| TPR1215S-1W | 12                    | 15             | 68/6.8                    | 76         |
| TPR1224S-1W | 12                    | 24             | 42/4.2                    | 84         |
| TPR1505S-1W | 15                    | 5              | 200/20                    | 69         |
| TPR1509S-1W | 15                    | 9              | 111/11.1                  | 76         |
| TPR1512S-1W | 15                    | 12             | 83/8.3                    | 76         |
| TPR1515S-1W | 15                    | 15             | 67/6.7                    | 75         |
| TPR2405S-1W | 24                    | 5              | 200/20                    | 71         |
| TPR2409S-1W | 24                    | 9              | 111/11.1                  | 78         |
| TPR2412S-1W | 24                    | 12             | 84/8.4                    | 78         |
| TPR2415S-1W | 24                    | 15             | 68/6.8                    | 80         |
| TPR2424S-1W | 24                    | 24             | 42/4.2                    | 80         |
| TPR4805S-1W | 48                    | 5              | 200/20                    | 71         |

Add suffix "P" for continuous short circuit protection, for example TPR0505SP-1W.

**INPUT CHARACTERISTICS**

| Parameter     | Conditions | Min. | Typ. | Max. | Units |
|---------------|------------|------|------|------|-------|
| Voltage range | 3.3V input | 2.9  | 3.3  | 3.6  | V     |
| Voltage range | 5V input   | 4.5  | 5    | 5.5  | V     |
| Voltage range | 9V input   | 8.03 | 9    | 10   | V     |
| Voltage range | 12V input  | 11   | 12   | 13.3 | V     |
| Voltage range | 15V input  | 13.4 | 15   | 16.4 | V     |
| Voltage range | 24V input  | 22   | 24   | 26.6 | V     |
| Voltage range | 48V input  | 44   | 48   | 53   | V     |

**ISOLATION CHARACTERISTICS**

| Parameter         | Conditions          | Min. | Typ. | Max. | Units |
|-------------------|---------------------|------|------|------|-------|
| Isolation voltage | Tested for 1 second | 3000 |      |      | VDC   |
| Resistance        | Viso=1000VDC        | 1    |      |      | GΩ    |

**OUTPUT CHARACTERISTICS**

| Parameter                               | Conditions                                    | Min. | Typ. | Max. | Units |
|---|---|------|------|------|-------|
| Rated Power                             | TA=-40°C to 85°C                              |      |      | 1    | W     |
| Voltage Set Point Accuracy              | See tolerance envelope                        |      |      |      |       |
| Line regulation                         | High VIN to low VIN (voltage variation +/-5%) |      | 1.2  |      | %/%   |
| Load Regulation(10% load to rated load) | TPRXX03S-1W ,TPRXX05S-1W,TPRXX09S-1W          |      | 13   |      | %     |
| Load Regulation(10% load to rated load) | TPRXX12S-1W                                   |      | 7    |      | %     |
| Load Regulation(10% load to rated load) | TPRXX15S-1W                                   |      | 7    |      | %     |
| Load Regulation(10% load to rated load) | TPRXX24S-1W                                   |      | 7    |      | %     |
| Ripple & Noise                          | 20MHz bandwidth                               |      | 50   | 150  | mvp-p |

**ABSOLUTE MAXIMUM RATINGS**

|   |          |
|---|----------|
| Short-circuit protection                        | 1 second |
| Lead temperature 1.5mm from case for 10 seconds | 300°C    |
| Internal power dissipation                      | 540mW    |
| Input voltage Vin, TPR03 variants               | 5.5V     |
| Input voltage Vin, TPR05 variants               | 7V       |
| Input voltage Vin, TPR09 variants               | 11.5V    |
| Input voltage Vin, TPR12 variants               | 15V      |
| Input voltage Vin, TPR15 variants               | 18V      |
| Input voltage Vin, TPR24 variants               | 28V      |
| Input voltage Vin, TPR48 variants               | 54V      |

All specifications typical at TA=25° C, nominal input voltage and rated output current unless otherwise specified.

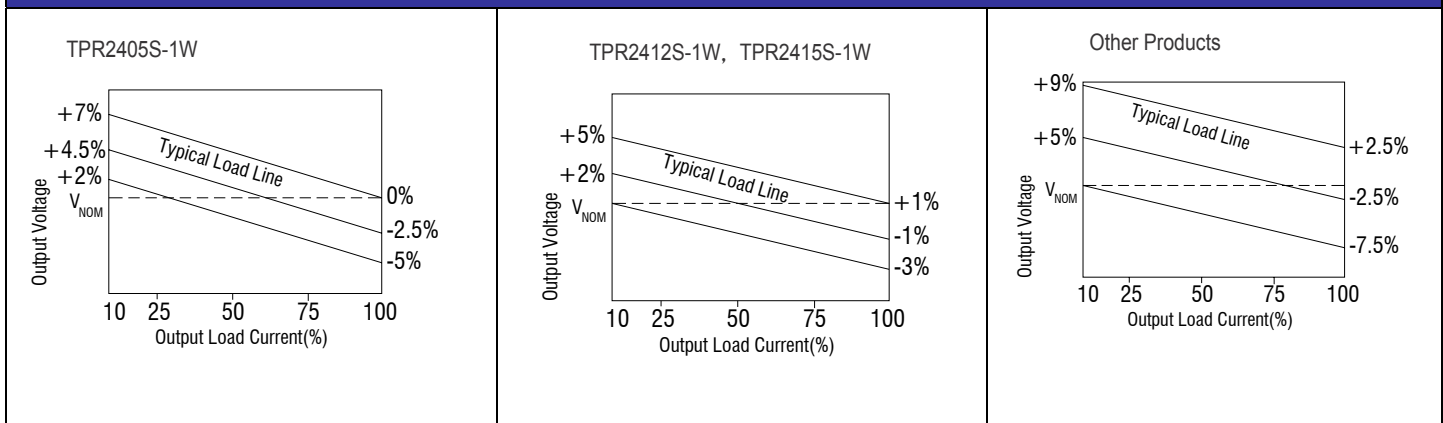
**GENERAL CHARACTERISTICS**

| Parameter           | Conditions | Typ. | Max. | Units |
|---------------------|------------|------|------|-------|
| Switching frequency | 3.3V input | 120  |      | kHz   |
| Switching frequency | 5V input   | 120  |      | kHz   |
| Switching frequency | 9V input   | 120  |      | kHz   |
| Switching frequency | 12V input  | 160  |      | kHz   |
| Switching frequency | 15V input  | 90   |      | kHz   |
| Switching frequency | 24V input  | 90   |      | kHz   |
| Switching frequency | 48V input  | 90   |      | kHz   |

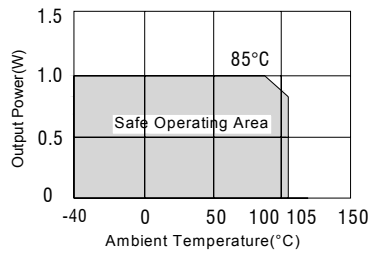
**TEMPERATURE CHARACTERISTICS**

| Parameter                      | Conditions                        | Min. | Typ. | Max. | Units |
|--------------------------------|-----------------------------------|------|------|------|-------|
| Specification                  | Derating if the temperature ≥85°C | -40  |      | 105  | °C    |
| Storage                        |                                   | -50  |      | 130  | °C    |
| Case Temperature above ambient | 5V output types                   |      | 35   |      | °C    |
| Case Temperature above ambient | All other output types            |      | 30   |      | °C    |
| Cooling                        | Free air convection               |      |      |      |       |

**TOLERANCE ENVELOPES**



**TEMPERATURE DERATING GRAPHS**



**EMC SPECIFICATIONS**

|     |     |  |
|-----|-----|--|
| EMI | CE  | CISPR22/EN55032 CLASS B (see Fig. 2 for recommended circuit) |
| EMI | RE  | CISPR22/EN55032 CLASS B (see Fig. 2 for recommended circuit) |
| EMS | ESD | IEC/EN61000-4-2 Contact ±8KV perf. Criteria B                |

**DESIGN REFERENCE**

**Typical application circuit**

If it is required to further reduce input and output ripple, a filter capacitor may be connected to the input and output terminals, see Fig.1 Moreover, choosing a suitable filter capacitor is very important, start-up problems may be caused if the capacitance is too large. Under the condition of safe and reliable operation, the recommended capacitive load values are shown in Table 1.

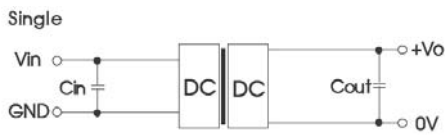


Fig 1

Recommended capacitive load value table (Table 1)

| Vin (VDC) | Cin (µF) | Single Vout (VDC) | Cout (µF) |
|-----------|----------|-------------------|-----------|
| 3.3/5     | 4.7      | 3.3/5             | 10        |
| 9/12      | 2.2      | 9/12              | 2.2       |
| 15        | 2.2      | 15/24             | 1         |
| 24        | 1        | --                | --        |

**EMC solution-recommended circuit**

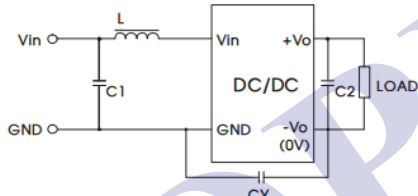


Fig 2

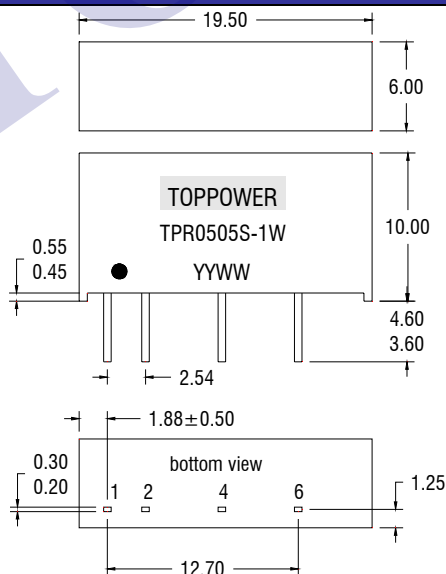
| Input voltage (VDC) | 3.3/5/9/12                 | 15/24   |
|---------------------|----------------------------|---------|
| C1                  | 4.7µF /50V                 |         |
| C2                  | Refer to the Cout in Fig.3 |         |
| CY                  | --                         | 1nF/2KV |
| LDM                 | 6.8µH                      |         |

Output load should be at min. load 10%.

**MECHANICAL DIMENSIONS**

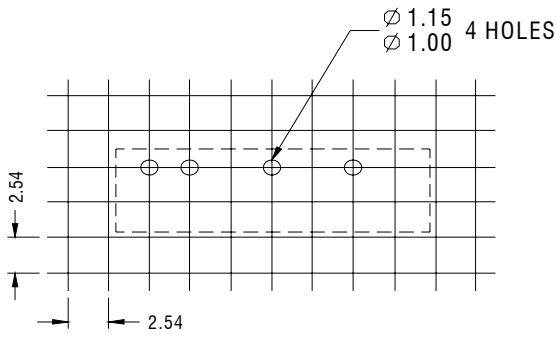
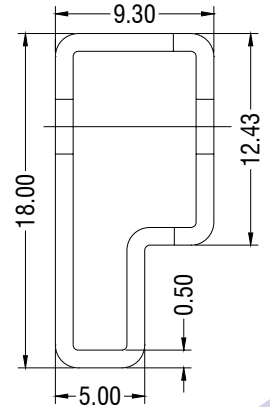
**PIN CONNECTIONS**

**SIP Package**



All dimensions in mm ±0.25mm. All pins on a 2.54mm pitch and within ±0.25mm of true position.

| 7 PIN SIP |          |
|-----------|----------|
| Pin       | Function |
| 1         | +Vin     |
| 2         | -Vin     |
| 4         | -Vout    |
| 6         | +Vout    |

| RECOMMENDED FOOTPRINT DETAILS   | TUBE OUTLINE DIMENSIONS   |
|---|---|
|  <p>Ø 1.15<br/>Ø 1.00 4 HOLES</p> <p>2.54</p> <p>2.54</p> <p>All dimensions in mm±0.25mm</p> |  <p>9.30</p> <p>18.00</p> <p>12.43</p> <p>5.00</p> <p>0.50</p> <p>All dimensions in mm±0.25mm</p> <p>Tube Quantity : 25PCS</p> |

TOPPOWER