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# Features

# Regulated Converters

- 2:1 Wide Input Voltage Range
- 1.6kVDC Isolation
- UL Certified
- Efficiency up to 91%
- Six-Sided Continuous Shield
- No Minimum Load Required

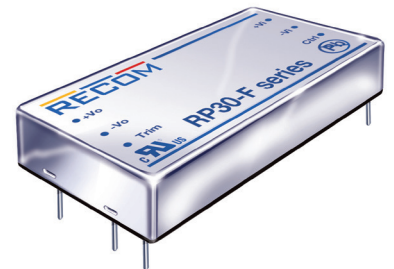


## RP30-F

30 Watt



2"x1" Package  
Single & Dual Output



### Description

The RP30-F series DC/DC converters are designed to meet to UL 60950-1 and to cUL60950-1. This makes them ideal for all telecom and industrial applications where approved safety standards are required. The industry standard 2" x 1" package meets military standards for thermal shock and vibration tolerance.

### Selection Guide

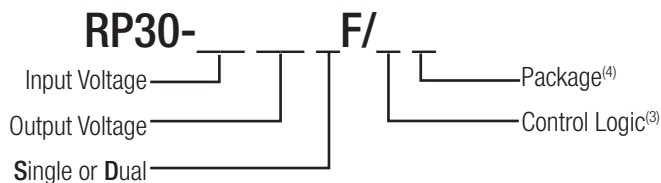
| Part Number                   | Input Voltage Range [VDC] | Output Voltage [VDC] | Output Current [mA] | Input <sup>(1)</sup> Current [mA] | Efficiency <sup>(1)</sup> typ. [%] | Max. Capacitive Load <sup>(2)</sup> [μF] |
|-------------------------------|---------------------------|----------------------|---------------------|-----------------------------------|------------------------------------|--|
| RP30-123.3SF <sup>(3,4)</sup> | 9-18                      | 3.3                  | 8000                | 2588                              | 85                                 | 20000                                    |
| RP30-1205SF <sup>(3,4)</sup>  | 9-18                      | 5                    | 6000                | 2874                              | 87                                 | 14400                                    |
| RP30-1212SF <sup>(3,4)</sup>  | 9-18                      | 12                   | 2500                | 2809                              | 89                                 | 3000                                     |
| RP30-1215SF <sup>(3,4)</sup>  | 9-18                      | 15                   | 2000                | 2809                              | 89                                 | 2000                                     |
| RP30-243.3SF <sup>(3,4)</sup> | 18-36                     | 3.3                  | 8000                | 1264                              | 87                                 | 20000                                    |
| RP30-2405SF <sup>(3,4)</sup>  | 18-36                     | 5                    | 6000                | 1389                              | 90                                 | 14400                                    |
| RP30-2412SF <sup>(3,4)</sup>  | 18-36                     | 12                   | 2500                | 1374                              | 91                                 | 3000                                     |
| RP30-2415SF <sup>(3,4)</sup>  | 18-36                     | 15                   | 2000                | 1374                              | 91                                 | 2000                                     |
| RP30-483.3SF <sup>(3,4)</sup> | 36-75                     | 3.3                  | 8000                | 632                               | 87                                 | 20000                                    |
| RP30-4805SF <sup>(3,4)</sup>  | 36-75                     | 5                    | 6000                | 694                               | 90                                 | 14400                                    |
| RP30-4812SF <sup>(3,4)</sup>  | 36-75                     | 12                   | 2500                | 687                               | 91                                 | 3000                                     |
| RP30-4815SF <sup>(3,4)</sup>  | 36-75                     | 15                   | 2000                | 687                               | 91                                 | 2000                                     |
| RP30-1205DF <sup>(3,4)</sup>  | 9-18                      | ±5                   | ±3000               | 2874                              | 87                                 | ±3000                                    |
| RP30-1212DF <sup>(3,4)</sup>  | 9-18                      | ±12                  | ±1250               | 2874                              | 87                                 | ±2000                                    |
| RP30-1215DF <sup>(3,4)</sup>  | 9-18                      | ±15                  | ±1000               | 2874                              | 87                                 | ±1300                                    |
| RP30-2405DF <sup>(3,4)</sup>  | 18-36                     | ±5                   | ±3000               | 1389                              | 90                                 | ±3000                                    |
| RP30-2412DF <sup>(3,4)</sup>  | 18-36                     | ±12                  | ±1250               | 1404                              | 89                                 | ±2000                                    |
| RP30-2415DF <sup>(3,4)</sup>  | 18-36                     | ±15                  | ±1000               | 1389                              | 90                                 | ±1300                                    |
| RP30-4805DF <sup>(3,4)</sup>  | 36-75                     | ±5                   | ±3000               | 694                               | 90                                 | ±3000                                    |
| RP30-4812DF <sup>(3,4)</sup>  | 36-75                     | ±12                  | ±1250               | 710                               | 88                                 | ±2000                                    |
| RP30-4815DF <sup>(3,4)</sup>  | 36-75                     | ±15                  | ±1000               | 702                               | 89                                 | ±1300                                    |

#### Notes:

- Note1: Typical value at nominal input voltage and full load.  
 Note2: Test by minimum Vin and constant resistor load.



### Model Numbering



#### Ordering Examples

RP30-2405SF = 24V Input, 5V Output, Positive Logic CTRL pin fitted  
 RP30-4812DF/N-HC = 48V Input, ±12V Output, Negative Logic CTRL pin fitted, Heat-sink fitted

#### Notes:

- Note3: no suffix for CTRL function with Positive Logic (1=ON, 0=OFF)  
 add "N" for CTRL function with Negative Logic (0=ON, 1=OFF)  
 Note4: add suffix -HC for premounted Heat-sink and clips

UL60950-1 Certified

**Specifications** measured at Ta = 25°C, nominal input voltage, full load otherwise noted

**BASIC CHARACTERISTICS**

| Parameter                                     | Condition   | Min.   | Typ.                    | Max.   |
|---|---|--|-------------------------|--|
| Input Voltage Range                           | nom. Vin = 12V<br>nom. Vin = 24V<br>nom. Vin = 48V                      | 9VDC<br>18VDC<br>36VDC   | 12VDC<br>24VDC<br>48VDC | 18VDC<br>36VDC<br>75VDC                            |
| Under Voltage Lockout (UVLO)                  | Vin = 12V<br>DC-DC ON<br>DC-DC OFF                                      |  | 8VDC                    | 9VDC   |
|   | Vin = 24V<br>DC-DC ON<br>DC-DC OFF                                      |  | 16VDC                   | 18VDC  |
|   | Vin = 48V<br>DC-DC ON<br>DC-DC OFF                                      |  | 32VDC                   | 36VDC  |
| Input Filter                                  |   |  |                         | Pi-Type  |
| Input Reflected Ripple Current <sup>(5)</sup> | nominal Vin and full load   |  | 20mA <sub>p-p</sub>     |  |
| Input Surge Voltage                           | Vin = 12V, 100ms max.<br>Vin = 24V, 100ms max.<br>Vin = 48V, 100ms max. |  |                         | 25VDC<br>50VDC<br>100VDC                           |
| Start-up time                                 | Power up<br>Remote ON/OFF   |  | 30ms<br>30ms            |  |
| Operating Frequency Range                     |   | 387kHz   | 430kHz                  | 473kHz   |
| Minimum Load                                  |   | 0%   |                         |  |
| Ripple and Noise                              | measured by 20Mhz bandwidth<br>with a 1µF/50V MLCC                      | 3.3V <sub>out</sub> , 5V <sub>out</sub><br>12V <sub>out</sub> , 15V <sub>out</sub> |                         | 100mV <sub>p-p</sub><br>150mV <sub>p-p</sub>       |
| Remote ON/OFF <sup>(6)</sup>                  | Positive Logic  | DC-DC ON<br>DC-DC OFF  |                         | Open or 3.0V < Vr < 12V<br>Short or 0V < Vr < 1.2V |
|   | Negative Logic  | DC-DC ON<br>DC-DC OFF  |                         | Short or 0V < Vr < 1.2V<br>Open or 3.0V < Vr < 12V |
| Input current of Remote pin (CTRL)            |   | DC-DC OFF  |                         | 3mA  |
|   |   | DC-DC ON   | -0.5mA                  | 0.5mA  |

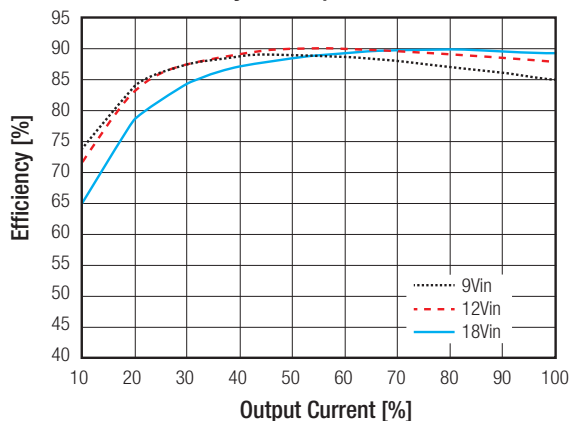
**Notes:**

Note5: Simulated source impedance of 12µH. 12µH inductor in series with +Vin.

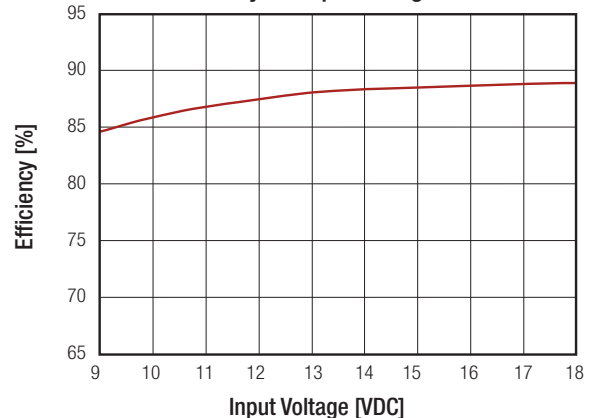
Note6: The ON/OFF control function can be positive or negative logic. The pin voltage is referenced to -Vin pin.

**RP30-1205SF**

**Efficiency vs. Output Current**



**Efficiency vs. Input Voltage**



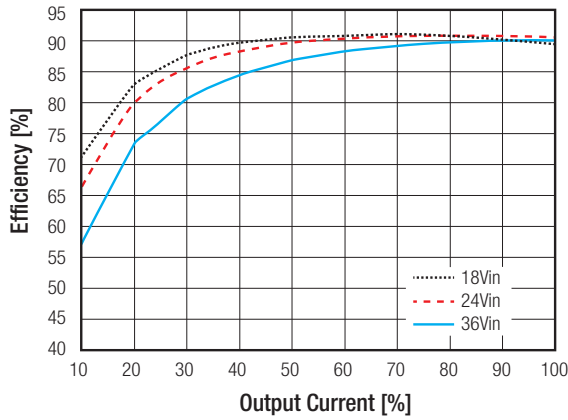
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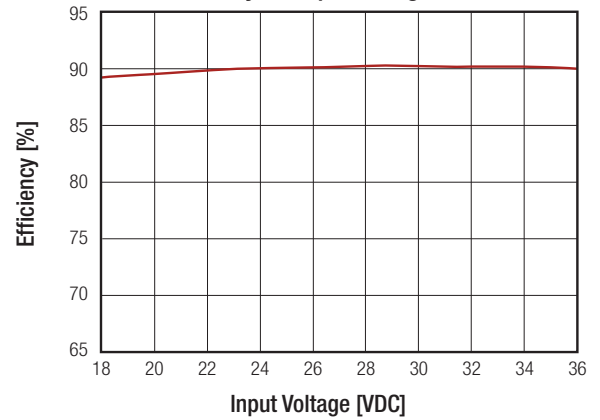
Specifications measured at Ta = 25°C, nominal input voltage, full load otherwise noted

**RP30-2405SF**

Efficiency vs. Output Current

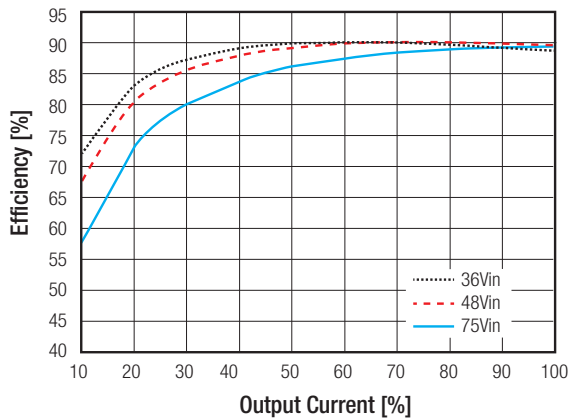


Efficiency vs. Input Voltage

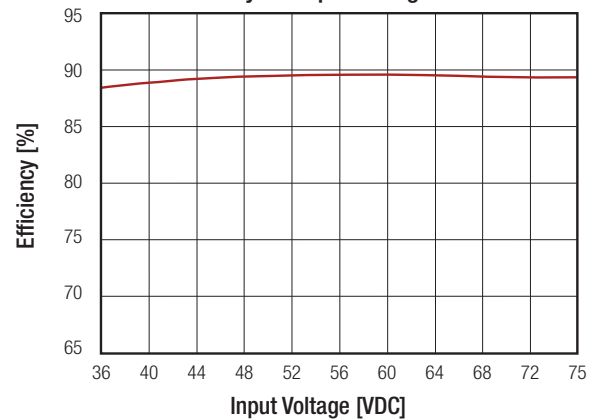


**RP30-4805SF**

Efficiency vs. Output Current



Efficiency vs. Input Voltage



**REGULATIONS**

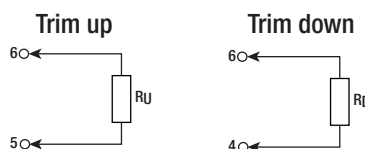
| Parameter                        | Condition                          | Value          |                |
|----------------------------------|------------------------------------|----------------|----------------|
| Output Voltage Accuracy          |                                    | ±1%            |                |
| Voltage Adjustability            | Single Output                      | ±10%           |                |
| Line Voltage Regulation          | low line to high line at full load | ±0.2%          |                |
| Load Voltage Regulation          | no load to full load               | Single<br>Dual | ±0.5%<br>±1.0% |
| Cross Regulation                 | asymmetrical 25% <-> 100% load     | ±5%            |                |
| Transient Response recovery time | 25% load step change               | 250µs          |                |

**External Output Trimming**

**Output Voltage Trimming**

Single output Powerline converters offer the feature of trimming the output voltage over a certain range around the nominal value by using external trim resistors. No general equation can be given for calculating the trim resistors, but the following trimtables give typical values for choosing these trimming resistors. If voltages between the given trim points are required, extrapolate between the two nearest given values to work out the resistor required or use a variable resistor to set the output voltage.

Output can be externally trimmed by using the method shown below.



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**Specifications** measured at Ta = 25°C, nominal input voltage, full load otherwise noted

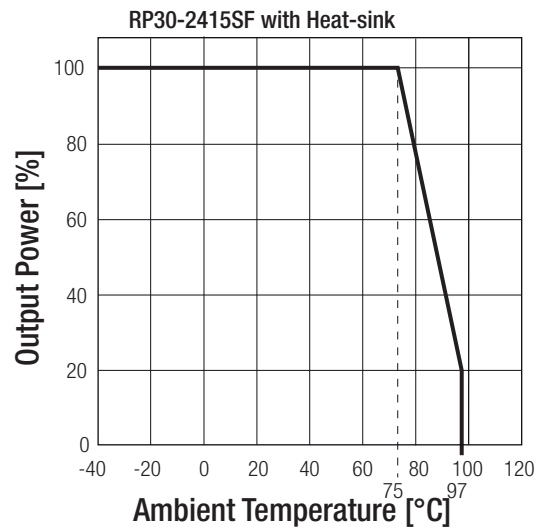
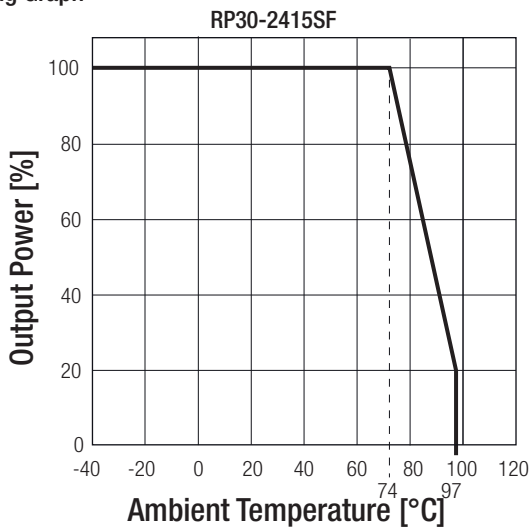
| RP30-xx3.3SF     |        |        |        |       |       |       |       |       |       |       |       |
|------------------|--------|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| Trim up          | 1      | 2      | 3      | 4     | 5     | 6     | 7     | 8     | 9     | 10    | %     |
| Vout =           | 3.333  | 3.366  | 3.399  | 3.432 | 3.465 | 3.498 | 3.531 | 3.564 | 3.597 | 3.63  | Volts |
| R <sub>l</sub> = | 57.93  | 26.16  | 15.58  | 10.28 | 7.11  | 4.99  | 3.48  | 2.34  | 1.46  | 0.75  | kOhms |
|                  |        |        |        |       |       |       |       |       |       |       |       |
| Trim down        | 1      | 2      | 3      | 4     | 5     | 6     | 7     | 8     | 9     | 10    | %     |
| Vout =           | 3.267  | 3.234  | 3.201  | 3.168 | 3.135 | 3.102 | 3.069 | 3.036 | 3.003 | 2.97  | Volts |
| R <sub>l</sub> = | 69.47  | 31.23  | 18.49  | 12.12 | 8.29  | 5.74  | 3.92  | 2.56  | 1.50  | 0.65  | kOhms |
| RP30-xx05SF      |        |        |        |       |       |       |       |       |       |       |       |
| Trim up          | 1      | 2      | 3      | 4     | 5     | 6     | 7     | 8     | 9     | 10    | %     |
| Vout =           | 5.05   | 5.10   | 5.15   | 5.20  | 5.25  | 5.30  | 5.35  | 5.4   | 5.45  | 5.50  | Volts |
| R <sub>l</sub> = | 36.57  | 16.58  | 9.92   | 6.58  | 4.59  | 3.25  | 2.30  | 1.59  | 1.03  | 0.59  | kOhms |
|                  |        |        |        |       |       |       |       |       |       |       |       |
| Trim down        | 1      | 2      | 3      | 4     | 5     | 6     | 7     | 8     | 9     | 10    | %     |
| Vout =           | 4.95   | 4.90   | 4.85   | 4.80  | 4.75  | 4.70  | 4.65  | 4.60  | 4.55  | 4.50  | Volts |
| R <sub>l</sub> = | 45.53  | 20.61  | 12.31  | 8.15  | 5.66  | 4.00  | 2.81  | 1.92  | 1.23  | 0.68  | kOhms |
| RP30-xx12SF      |        |        |        |       |       |       |       |       |       |       |       |
| Trim up          | 1      | 2      | 3      | 4     | 5     | 6     | 7     | 8     | 9     | 10    | %     |
| Vout =           | 12.12  | 12.24  | 12.36  | 12.48 | 12.60 | 12.72 | 12.84 | 12.96 | 13.08 | 13.20 | Volts |
| R <sub>l</sub> = | 367.91 | 165.95 | 98.64  | 64.98 | 44.78 | 31.32 | 21.70 | 14.49 | 8.88  | 4.39  | kOhms |
|                  |        |        |        |       |       |       |       |       |       |       |       |
| Trim down        | 1      | 2      | 3      | 4     | 5     | 6     | 7     | 8     | 9     | 10    | %     |
| Vout =           | 11.88  | 11.76  | 11.64  | 11.52 | 11.40 | 11.28 | 11.16 | 11.04 | 10.92 | 10.8  | Volts |
| R <sub>l</sub> = | 460.99 | 207.95 | 123.60 | 81.42 | 56.12 | 39.25 | 27.20 | 18.16 | 11.13 | 5.51  | kOhms |
| RP30-xx15SF      |        |        |        |       |       |       |       |       |       |       |       |
| Trim up          | 1      | 2      | 3      | 4     | 5     | 6     | 7     | 8     | 9     | 10    | %     |
| Vout =           | 15.15  | 15.3   | 15.45  | 15.60 | 15.75 | 15.90 | 16.05 | 16.20 | 16.35 | 16.50 | Volts |
| R <sub>l</sub> = | 404.18 | 180.59 | 106.06 | 68.80 | 46.44 | 31.53 | 20.88 | 12.90 | 6.69  | 1.72  | kOhms |
|                  |        |        |        |       |       |       |       |       |       |       |       |
| Trim down        | 1      | 2      | 3      | 4     | 5     | 6     | 7     | 8     | 9     | 10    | %     |
| Vout =           | 14.85  | 14.70  | 14.55  | 14.40 | 14.25 | 14.10 | 13.95 | 13.80 | 13.65 | 13.50 | Volts |
| R <sub>l</sub> = | 499.82 | 223.41 | 131.27 | 85.20 | 57.56 | 39.14 | 25.97 | 16.10 | 8.42  | 2.282 | kOhms |

| PROTECTIONS  |                    |                                |        |
|--|--------------------|--------------------------------|--------|
| Parameter  | Condition          | Value                          |        |
| Short Circuit Protection (SCP)   |                    | Continuous, automatic recovery |        |
| Over Voltage Protection (OVP)  | Zener Diode Clamp  | 3.3Vout                        | 3.9VDC |
|  |                    | 5Vout                          | 6.2VDC |
|  |                    | 12Vout                         | 15VDC  |
|  |                    | 15Vout                         | 18VDC  |
| Over Load Protection (OLP)   | % of Iout rated    | 150% typ.                      |        |
| Over Temperature Protection (OTP)  |                    | 115°C typ.                     |        |
| Isolation Voltage  | I/P to O/P         | 1.6kVDC/1 minute               |        |
|  | I/P to O/P to case | 1.6kVDC/1 minute               |        |
| Isolation Resistance   | 500VDC             | 1GΩ min.                       |        |
| Isolation Capacitance  |                    | 1500pF max.                    |        |
| <b>Notes:</b><br>Note8: This power module is not internally fused. An input line fuse must always be used. |                    |                                |        |

**Specifications** measured at Ta = 25°C, nominal input voltage, full load otherwise noted

| ENVIRONMENTAL               |   |                              |
|-----------------------------|---|------------------------------|
| Parameter                   | Condition                                 | Value                        |
| Operating Temperature Range | without derating                          | -40°C o +74°C                |
|                             | with derating                             | -40°C to +97°C               |
| Maximum Case Temperature    |   | +105°C                       |
| Temperature Coefficient     |   | ±0.02%/°C max.               |
| Thermal Impedance           | Natural convection (20LFM)                | 12°C/Watt                    |
|                             | Natural convection (20LFM) with Heat-sink | 10°C/Watt                    |
| Operating Humidity          |   | 5% - 95% RH                  |
| Thermal Shock               |   | MIL-STD-810F                 |
| Vibration                   |   | MIL-STD-810F                 |
| MTBF                        | MIL-HDBK-217F                             | 1453 x 10 <sup>3</sup> hours |
|                             | Bellcore TR-NWT-000332 <sup>(9)</sup>     | 3173 x 10 <sup>3</sup> hours |

**Derating Graph<sup>(10)</sup>**



**Notes:**

Note9: BELLCORE TR-NWT-000332. Case I: 50% Stress, Temperature at 40°C (Ground fixed and controlled environment)  
MIL-HDBK-217F Notice2 @ TA= 25°C, Full load (Ground, Benign, controlled environment)

Note10: Derating graphs are valid only for the shown part numbers. If you need detailed derating-information about a part-number not shown here please contact our technical support service at techsupportAT@recom-power.com

**SAFETY AND CERTIFICATIONS**

| Certificate Type (Safety)      | Report / File Number      | Standard   |
|--------------------------------|---------------------------|--|
| UL General Safety              | E196683                   | UL60950-1 1st. Ed.: 2003<br>C22.2 No. 60950 1st. Ed.: 2003 |
| EMC Compliance                 | Condition                 | Standard / Criterion                                       |
| EMI Standard <sup>(11)</sup>   | with external filter      | EN55022, Class A or B                                      |
| ESD                            | Air ±8kV and Contact ±6kC | EN61000-4-2, Criteria A                                    |
| Radiated Immunity              | 10 V/m                    | EN61000-4-3, Criteria A                                    |
| Fast Transient <sup>(12)</sup> | ±2kV                      | EN61000-4-4, Criteria A                                    |
| Surge <sup>(12)</sup>          | ±1kV                      | EN61000-4-5, Criteria A                                    |
| Conducted Immunity             | 10 Vr.m.s                 | EN61000-4-6, Criteria A                                    |

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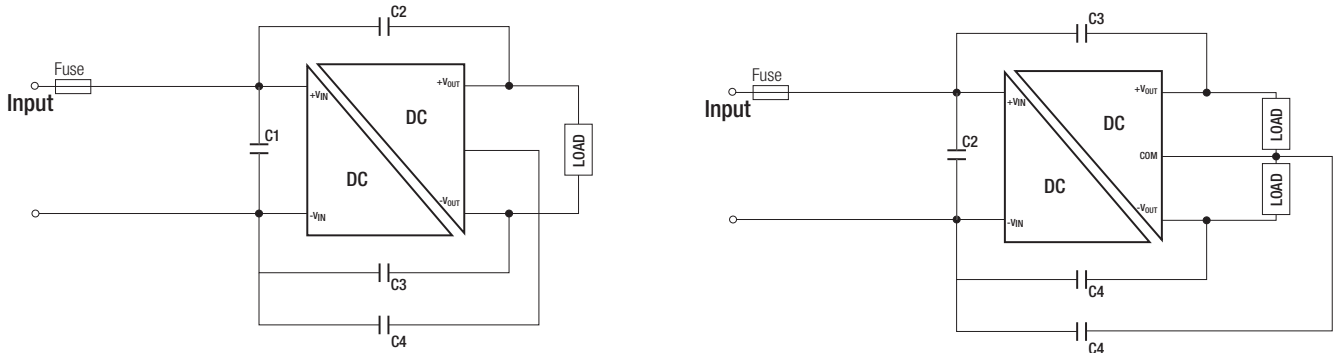
**Specifications** measured at  $T_a = 25^\circ\text{C}$ , nominal input voltage, full load otherwise noted

**Notes:**

Note12: The standard modules meet EMI Class A or Class B with external components, see filter suggestions below.

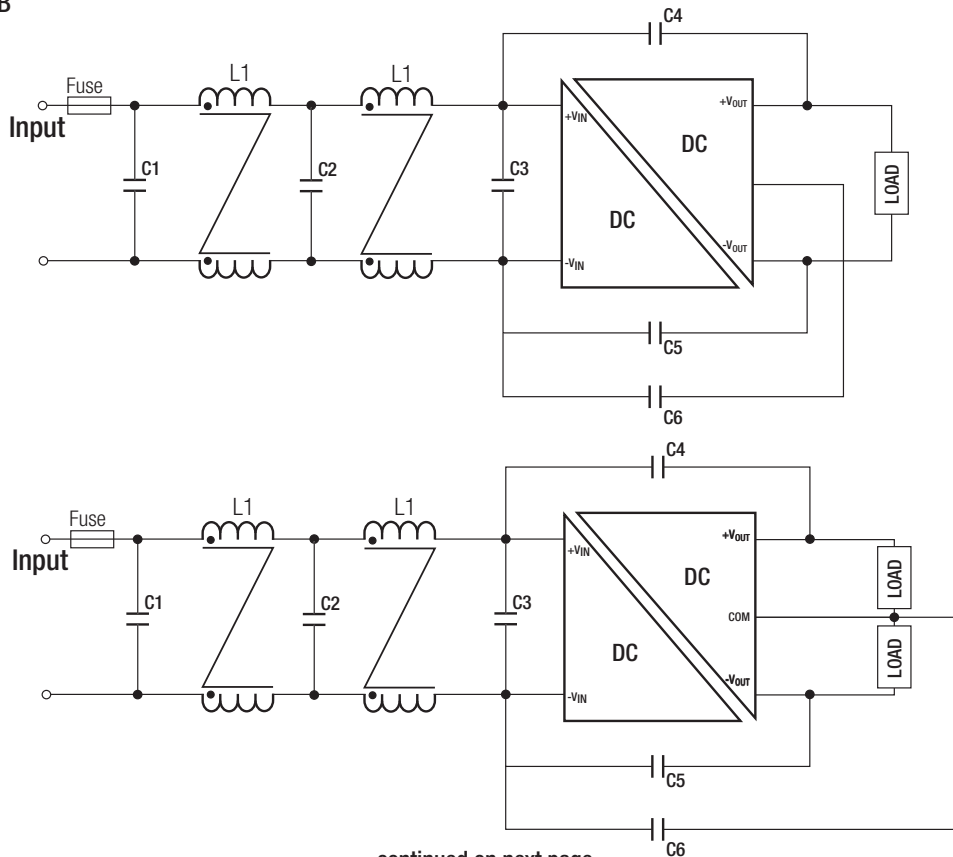
Note13: An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5. The filter capacitor Recom suggests: 12VDC & 24VDC input Nippon chemi-con KY series, 330 $\mu\text{F}/50\text{V}$   
48VDC input Nippon chemi-con KY series, 220 $\mu\text{F}/100\text{V}$

**EMI Filtering Class A**



| MODEL                      | C1   | C2/C3/C4                |
|----------------------------|--|-------------------------|
| RP30-12xxSF<br>RP30-12xxDF | 10 $\mu\text{F}/25\text{V}$<br>1812 MLCC   | 1000pF/2kV<br>1808 MLCC |
| RP30-24xxSF<br>RP30-24xxDF | 4.7 $\mu\text{F}/50\text{V}$<br>1812 MLCC  | 1000pF/2kV<br>1808 MLCC |
| RP30-48xxSF<br>RP30-48xxDF | 2.2 $\mu\text{F}/100\text{V}$<br>1812 MLCC | 1000pF/2kV<br>1808 MLCC |

**EMI Filtering Class B**



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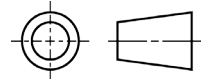
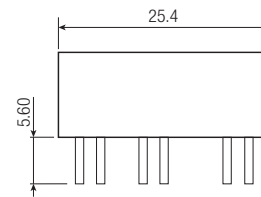
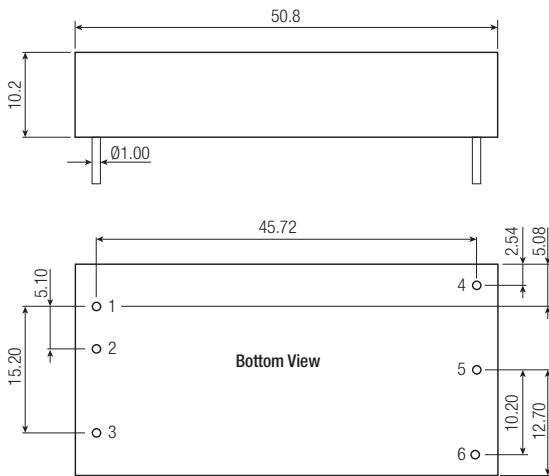
Specifications measured at Ta = 25°C, nominal input voltage, full load otherwise noted

| MODEL                      | C1/C2/C3                | C4/C5/C6                | L1  | L2  |
|----------------------------|-------------------------|-------------------------|---|---|
| RP30-12xxSF<br>RP30-12xxDF | 10µF/25V<br>1812 MLCC   | 1000pF/2kV<br>1808 MLCC | CMC: 33.3µH<br>ref.: WE 744842932<br>ref.: CMC-09 | CMC: 55µH<br>ref.: WE 744290560<br>ref.: CMC-10 |
| RP30-24xxSF<br>RP30-24xxDF | 4.7µF/50V<br>1812 MLCC  | 1000pF/2kV<br>1808 MLCC | CMC: 33.3µH<br>ref.: WE 744842932<br>ref.: CMC-09 | CMC: 55µH<br>ref.: WE 744290560<br>ref.: CMC-10 |
| RP30-48xxSF<br>RP30-48xxDF | 2.2µF/100V<br>1812 MLCC | 1000pF/2kV<br>1808 MLCC | CMC: 33.3µH<br>ref.: WE 744842932<br>ref.: CMC-09 | CMC: 55µH<br>ref.: WE 744290560<br>ref.: CMC-10 |

**DIMENSION and PHYSICAL CHARACTERISTICS**

| Parameter                  | Type                                | Value  |
|----------------------------|-------------------------------------|--|
| Material                   | Case<br>Base<br>Potting             | Nickel coated copper<br>FR4 PCB<br>Epoxy (UL94-V0) |
| Package Dimensions (LxWxH) | without Heat-sink<br>with Heat-sink | 50.8 x 25.4 x 10.2mm<br>56.8 x 25.4 x 16.8mm       |
| Package Weight             | without Heat-sink<br>with Heat-sink | 30.5g<br>41.39g                                    |

**Dimension Drawing (mm)**

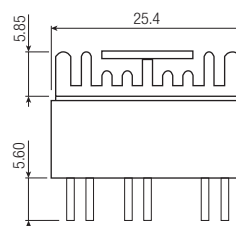
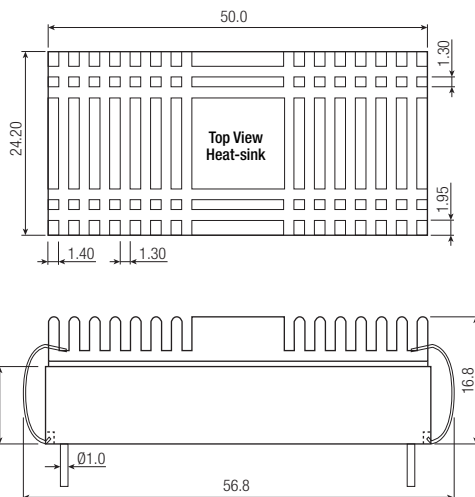


**Pin Connections**

| Pin # | Single | Dual  |
|-------|--------|-------|
| 1     | +Vin   | +Vin  |
| 2     | -Vin   | -Vin  |
| 3     | CTRL   | CTRL  |
| 4     | +Vout  | +Vout |
| 5     | -Vout  | Com   |
| 6     | Trim   | -Vout |

Pin Pitch Tolerance ±0.25 mm  
Pin Dimension Tolerance ±0.1mm  
Tolerance: X.X ±0.5mm  
X.XX ±0.25mm

**Dimension Drawing (mm) with Heat-sink**





**Specifications** measured at Ta = 25°C, nominal input voltage, full load otherwise noted

| PACKAGING INFORMATION     |                   |                 |
|---------------------------|-------------------|-----------------|
| Parameter                 | Type              | Value           |
| Packaging Quantity        | without Heat-sink | Tube<br>9pcs.   |
|                           | with Heat-sink    | Tray<br>20pcs.  |
| Storage Temperature Range |                   | -55°C to +125°C |
| Storage Humidity          |                   | 5% - 95% RH     |