

# Features

- 2:1 input voltage range
- 1.6kVDC isolation
- UL certified

# Regulated Converter

- Efficiency up to 91%
- Six-sided continuous shield
- No minimum load required

# RECOM DC/DC Converter

## RP30-F

30 Watt

2" x 1"

Single and 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                                    |

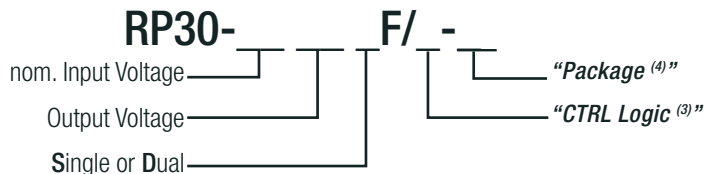


UL60950-1 certified  
EN55032 compliant

### Notes:

- Note1: Maximum values at nominal input voltage and full load  
 Note2: Max. Cap load is tested at minimum input and constant resistive load

### Model Numbering



### Notes:

- Note3: no suffix for CTRL function with positive logic (1=ON, 0=OFF)  
 add suffix “N” for CTRL function with negative logic (0=ON, 1=OFF)  
 Note4: add suffix “-HC” for premounted Heat-sink with clips

### Ordering Examples

- RP30-2405SF = 24V input, 5V output, single, positive Logic CTRL pin  
 RP30-4812DF/N-HC = 48V input, ±12V output, dual, negative Logic CTRL pin, Heat-sink premounted

**Specifications** (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

**BASIC CHARACTERISTICS**

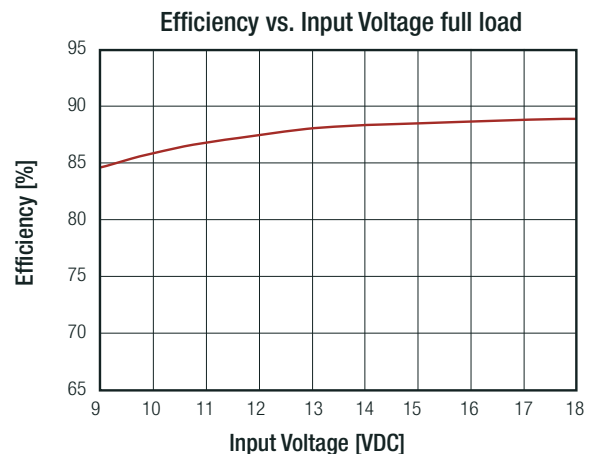
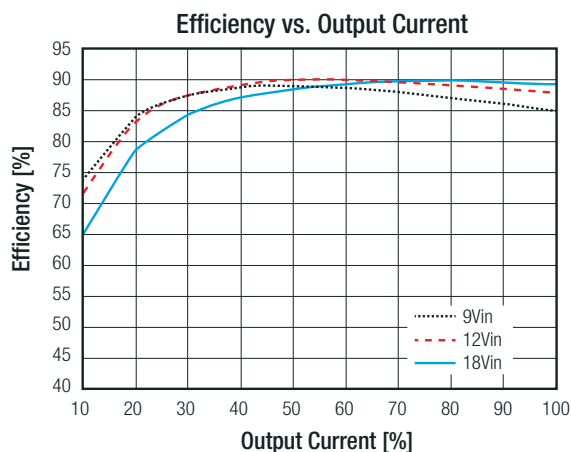
| Parameter                                     | Condition  |  | Min.   | Typ.   | Max.                     |
|---|--|--|--|--|--------------------------|
| Input Filter                                  |  |  | Pi-Type  |  |                          |
| Input Voltage Range                           | nom. Vin = 12VDC<br>nom. Vin = 24VDC<br>nom. Vin = 48VDC |  | 9VDC<br>18VDC<br>36VDC   | 12VDC<br>24VDC<br>48VDC                      | 18VDC<br>36VDC<br>75VDC  |
| Input Surge Voltage                           | 100ms max.   | nom. Vin = 12VDC<br>nom. Vin = 24VDC<br>nom. Vin = 48VDC                           |  |  | 25VDC<br>50VDC<br>100VDC |
| Under Voltage Lockout (UVLO)                  | nom. Vin = 12VDC   | DC-DC ON<br>DC-DC OFF  |  | 8VDC   | 9VDC                     |
|   | nom. Vin = 24VDC   | DC-DC ON<br>DC-DC OFF  |  | 16VDC  | 18VDC                    |
|   | nom. Vin = 48VDC   | DC-DC ON<br>DC-DC OFF  |  | 32VDC  | 36VDC                    |
| Output Voltage Trimming                       | refer to <b>"OUTPUT VOLTAGE TRIMMING"</b>                |  | -10%   |  | +10%                     |
| Input Reflected Ripple Current <sup>(5)</sup> |  |  |  | 20mA <sub>p-p</sub>                          |                          |
| Minimum Load                                  |  |  | 0%   |  |                          |
| Start-up Time                                 | Power up<br>ON/OFF CTRL                                  |  |  | 30ms<br>30ms                                 |                          |
| ON/OFF CTRL <sup>(6)</sup>                    | Positive Logic   | DC-DC ON<br>DC-DC OFF  | Open or 3.0VDC < V <sub>CTRL</sub> < 12VDC<br>Short or 0VDC < V <sub>CTRL</sub> < 1.2VDC |  |                          |
|   | Negative Logic   | DC-DC ON<br>DC-DC OFF  | Short or 0VDC < V <sub>CTRL</sub> < 1.2VDC<br>Open or 3.0VDC < V <sub>CTRL</sub> < 12VDC |  |                          |
| Input Current of CTRL pin                     | DC-DC ON   |  | -0.5mA   |  | +0.5mA                   |
| Standby Current                               | DC-DC OFF  |  |  | 3mA  |                          |
| Internal Operating Frequency                  |  |  | 387kHz   | 430kHz                                       | 473kHz                   |
| Ripple and Noise                              | measured at 20MHz BW<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> |                          |

**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

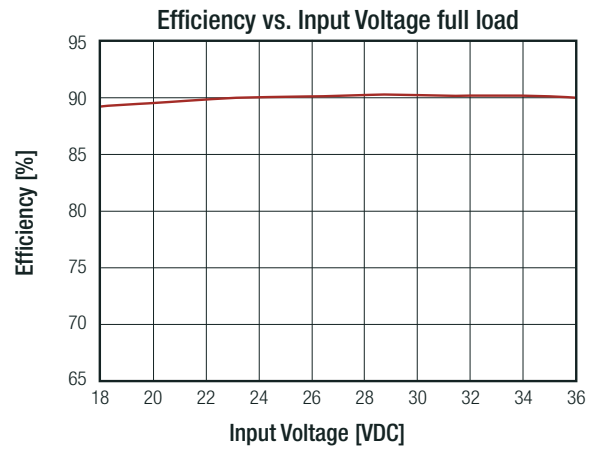
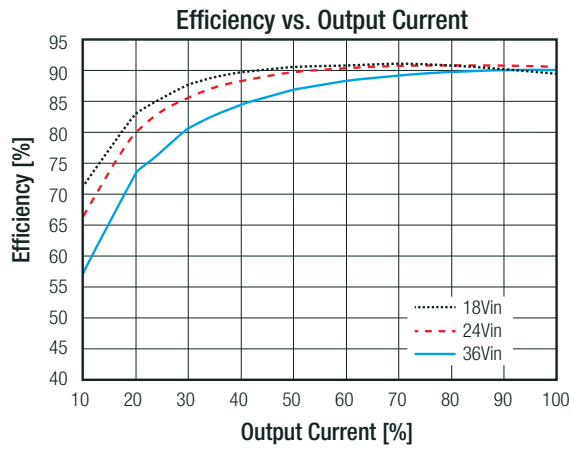
**RP30-1205SF**



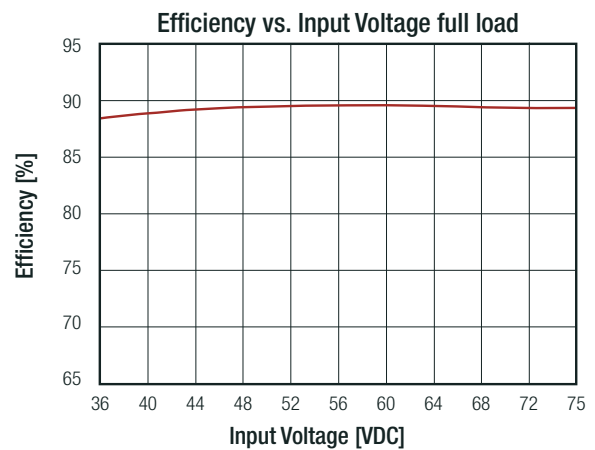
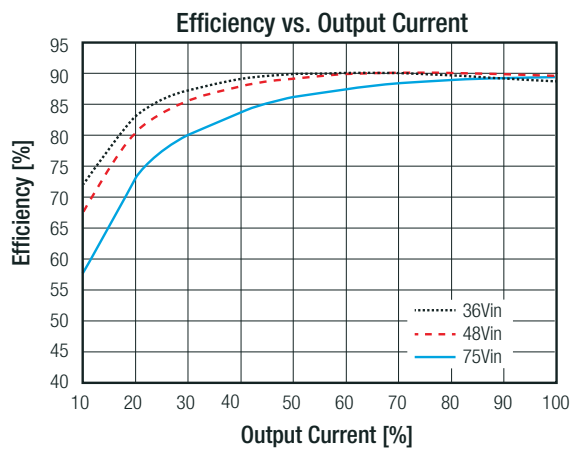
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Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

**RP30-2405SF**



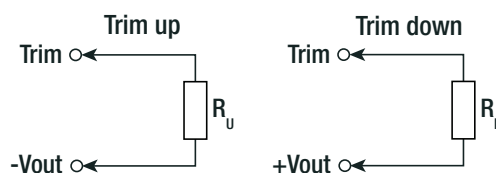
**RP30-4805SF**



**OUTPUT VOLTAGE 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.



continued on next page

**Specifications** (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

| 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  | [VDC] |
| R <sub>u</sub> = | 57.93  | 26.16  | 15.58  | 10.28 | 7.11  | 4.99  | 3.48  | 2.34  | 1.46  | 0.75  | [kΩ]  |
|                  |        |        |        |       |       |       |       |       |       |       |       |
| 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  | [VDC] |
| R <sub>d</sub> = | 69.47  | 31.23  | 18.49  | 12.12 | 8.29  | 5.74  | 3.92  | 2.56  | 1.50  | 0.65  | [kΩ]  |
|                  |        |        |        |       |       |       |       |       |       |       |       |
| 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  | [VDC] |
| R <sub>u</sub> = | 36.57  | 16.58  | 9.92   | 6.58  | 4.59  | 3.25  | 2.30  | 1.59  | 1.03  | 0.59  | [kΩ]  |
|                  |        |        |        |       |       |       |       |       |       |       |       |
| 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  | [VDC] |
| R <sub>d</sub> = | 45.53  | 20.61  | 12.31  | 8.15  | 5.66  | 4.00  | 2.81  | 1.92  | 1.23  | 0.68  | [kΩ]  |
|                  |        |        |        |       |       |       |       |       |       |       |       |
| 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 | [VDC] |
| R <sub>u</sub> = | 367.91 | 165.95 | 98.64  | 64.98 | 44.78 | 31.32 | 21.70 | 14.49 | 8.88  | 4.39  | [kΩ]  |
|                  |        |        |        |       |       |       |       |       |       |       |       |
| 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  | [VDC] |
| R <sub>d</sub> = | 460.99 | 207.95 | 123.60 | 81.42 | 56.12 | 39.25 | 27.20 | 18.16 | 11.13 | 5.51  | [kΩ]  |
|                  |        |        |        |       |       |       |       |       |       |       |       |
| 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 | [VDC] |
| R <sub>u</sub> = | 404.18 | 180.59 | 106.06 | 68.80 | 46.44 | 31.53 | 20.88 | 12.90 | 6.69  | 1.72  | [kΩ]  |
|                  |        |        |        |       |       |       |       |       |       |       |       |
| 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 | [VDC] |
| R <sub>d</sub> = | 499.82 | 223.41 | 131.27 | 85.20 | 57.56 | 39.14 | 25.97 | 16.10 | 8.42  | 2.282 | [kΩ]  |

| REGULATIONS                      |                                  |                |
|----------------------------------|----------------------------------|----------------|
| Parameter                        | Condition                        | Value          |
| Output Accuracy                  |                                  | ±1.0% max.     |
| Line Regulation                  | low line to high line, full load | ±0.2% max.     |
| Load Regulation                  | 0% to 100% load                  | ±0.5%<br>±1.0% |
|                                  | Single<br>Dual                   |                |
| Cross Regulation                 | asymmetrical 25%<->100% load     | ±5.0%          |
| Transient Response Recovery Time | 25% load step change             | 250µs typ.     |

**Specifications** (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

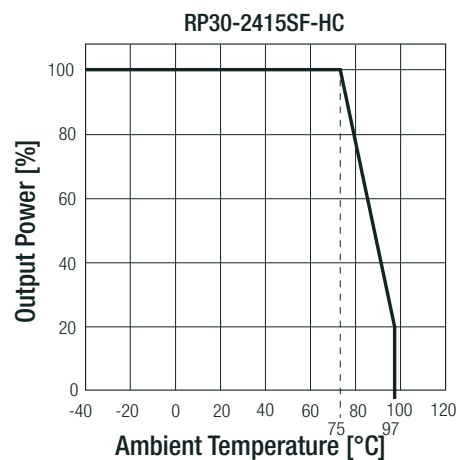
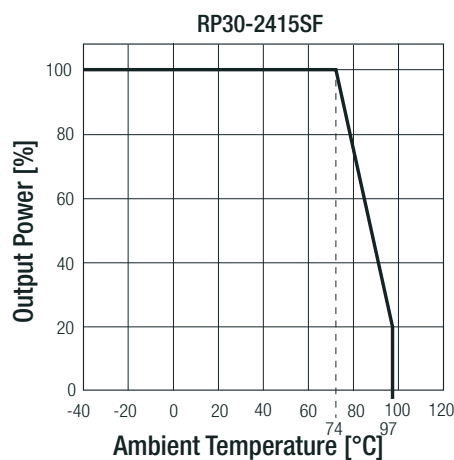
**PROTECTIONS**

| 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)   | % Iout rated       |         | 150% typ.                      |
| Over Temperature Protection (OTP)  |                    |         | 115°C typ.                     |
| Isolation Voltage <sup>(7)</sup>   | I/P to O/P         |         | 1.6kVDC/ 1 minute              |
|  | I/P to O/P to case |         | 1.6kVDC/ 1 minute              |
| Isolation Resistance   | Viso= 500VDC       |         | 1GΩ min.                       |
| Isolation Capacitance  |                    |         | 1500pF max.                    |
| <b>Notes:</b>  |                    |         |                                |
| Note7: For repeat Hi-Pot testing, reduce the time and/or the test voltage                |                    |         |                                |
| Note8: This power module is not internally fused. An input line fuse must always be used |                    |         |                                |

**ENVIRONMENTAL**

| Parameter                   | Condition                             |                   | Value                        |
|-----------------------------|---------------------------------------|-------------------|------------------------------|
| Operating Temperature Range | without derating                      |                   | -40°C to +74°C               |
|                             | with derating                         |                   | -40°C to +97°C               |
| Maximum Case Temperature    |                                       |                   | +105°C                       |
| Temperature Coefficient     |                                       |                   | ±0.02%/K max.                |
| Thermal Impedance           | @ natural convection                  | without heat-sink | 12K/W                        |
|                             | 0.1m/s                                | with heat-sink    | 10K/W                        |
| Operating Humidity          | non-condensing                        |                   | 5% - 95% RH                  |
| Thermal Shock               |                                       |                   | according to MIL-STD-810F    |
| Vibration                   |                                       |                   | according to MIL-STD-810F    |
| MTBF                        | MIL-HDBK-217F, G.B.                   |                   | 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 RECOM Techsupport for detailed information

### Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

#### SAFETY AND CERTIFICATIONS

| Certificate Type (Safety)   | Condition      | Standard   |
|---|----------------|--|
| Information Technology Equipment, General Requirements for Safety | E196683        | UL60950-1, 2nd Edition 2011<br>CAN/CSA-C22.2 No. 60950-1, 2nd Edition 2011 |
| EAC   | RU-AT.49.09571 | TP TC 004/2011   |
| RoHS2   |                | RoHS-2011/65/EU + AM-2015/863  |

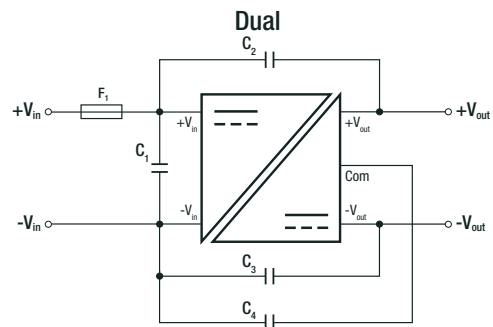
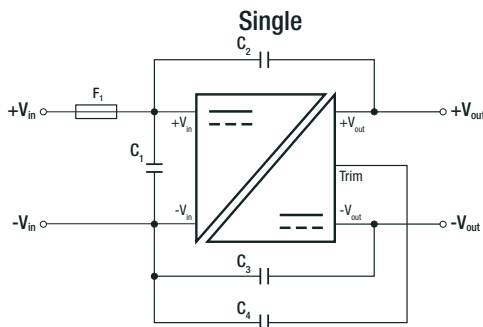
#### EMC Compliance

| EMC Compliance  | Condition   | Standard / Criterion                    |
|---|---|---|
| Electromagnetic compatibility of multimedia equipment - Emission requirements                   | with external filter<br>(see filter suggestion below) | EN55032, Class A and B                  |
| Information technology equipment - Immunity characteristics - Limits and methods of measurement |   | EN55024:2010 + A1:2015                  |
| ESD Electrostatic discharge immunity test   | Air ±8kV and Contact ±6kV                             | IEC61000-4-2:2008, Criteria A           |
| Radiated, radio-frequency, electromagnetic field immunity test                                  | 10 V/m  | IEC61000-4-3:2006 + A2:2010, Criteria A |
| Fast Transient and Burst Immunity <sup>(1)</sup>  | ±2kV  | IEC61000-4-4:2012, Criteria A           |
| Surge Immunity <sup>(1)</sup>   | ±1kV  | IEC61000-4-5:2005, Criteria A           |
| Immunity to conducted disturbances, induced by radio-frequency fields                           | 10 Vr.m.s   | IEC61000-4-6:2008, Criteria A           |

#### Notes:

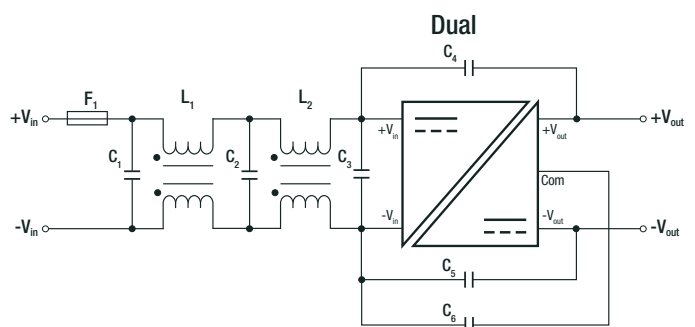
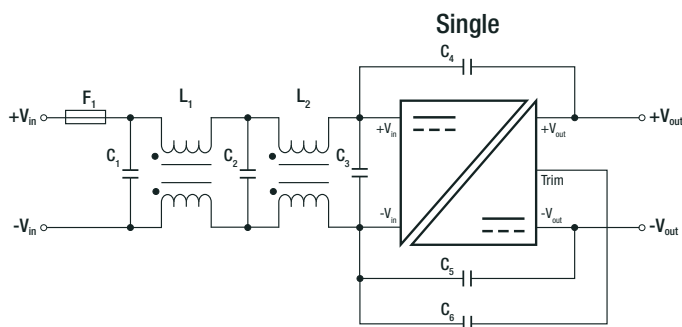
Note11: An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5  
Recom suggests Nippon chemi-con KY series 12Vin, 24Vin=330µF/50V or 48Vin=220µF/100V

#### EMC Filtering Suggestions according to EN55032



#### Component List Class A

| MODEL                    | C1                    | C2                    | C3/C4                 |
|--------------------------|-----------------------|-----------------------|-----------------------|
| RP30-12xxSF, RP30-12xxDF | 10µF/25V, 1812 MLCC   | 1000pF/2kV, 1808 MLCC | 1000pF/2kV, 1808 MLCC |
| RP30-24xxSF, RP30-24xxDF | 4.7µF/50V, 1812 MLCC  | 1000pF/2kV, 1808 MLCC | 1000pF/2kV, 1808 MLCC |
| RP30-48xxSF, RP30-48xxDF | 2.2µF/100V, 1812 MLCC | 1000pF/2kV, 1808 MLCC | 1000pF/2kV, 1808 MLCC |



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**Specifications** (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

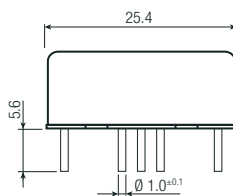
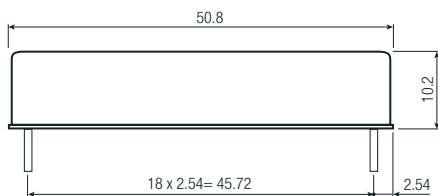
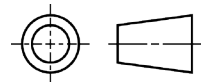
**Component List Class B**

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

**DIMENSIONS and PHYSICAL CHARACTERISTICS**

| Parameter          | Type              | Value                |
|--------------------|-------------------|----------------------|
| Material           | case              | nickel coated copper |
|                    | base              | FR4 PCB              |
|                    | potting           | epoxy (UL94V-0)      |
| Dimensions (LxWxH) | without Heat-sink | 50.8 x 25.4 x 10.2mm |
|                    | with Heat-sink    | 56.8 x 25.4 x 16.8mm |
| Weight             | without Heat-sink | 30.5g                |
|                    | with Heat-sink    | 41.39g               |

**Dimension Drawing (mm)**

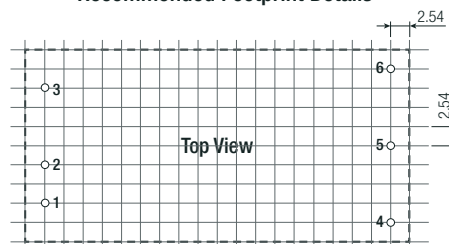
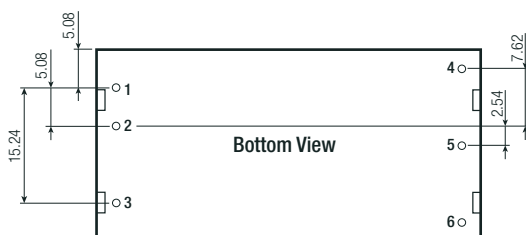


**Pinning Information**

| Pin # | Single              | Dual                |
|-------|---------------------|---------------------|
| 1     | +Vin                | +Vin                |
| 2     | -Vin                | -Vin                |
| 3     | CTRL <sup>(3)</sup> | CTRL <sup>(3)</sup> |
| 4     | +Vout               | +Vout               |
| 5     | -Vout               | Com                 |
| 6     | Trim                | -Vout               |

Tolerance: xx.x= ±0.5mm  
xx.xx= ±0.25mm

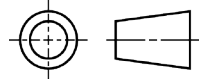
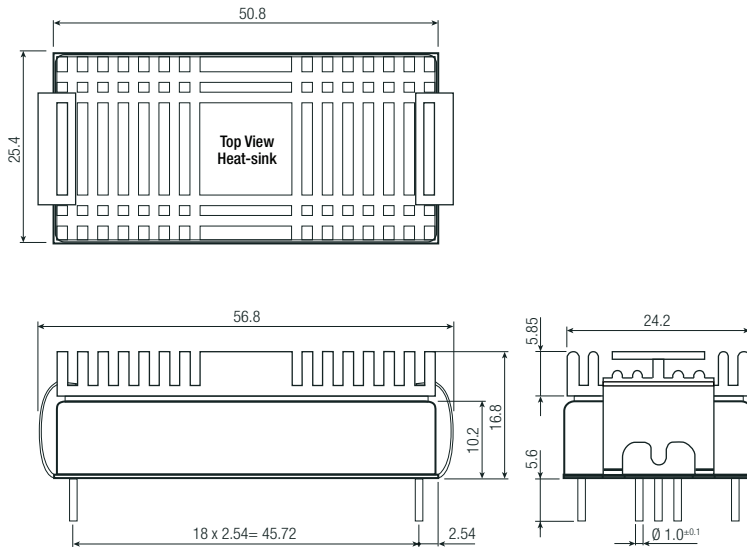
**Recommended Footprint Details**



continued on next page

**Specifications** (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

Dimension Drawing with Heat-sink (mm)



**Pinning Information**

| Pin # | Single              | Dual                |
|-------|---------------------|---------------------|
| 1     | +Vin                | +Vin                |
| 2     | -Vin                | -Vin                |
| 3     | CTRL <sup>(3)</sup> | CTRL <sup>(3)</sup> |
| 4     | +Vout               | +Vout               |
| 5     | -Vout               | Com                 |
| 6     | Trim                | -Vout               |

Tolerance: xx.x= ±0.5mm  
xx.xx= ±0.25mm

**PACKAGING INFORMATION**

| Parameter                   | Type           |                   | Value                  |
|-----------------------------|----------------|-------------------|------------------------|
| Packaging Dimension (LxWxH) | tube           | without heat-sink | 255.0 x 54.0 x 22.0mm  |
|                             | tray           | with heat-sink    | 302.5 x 222.0 x 20.0mm |
| Packaging Quantity          | tube           | without heat-sink | 9pcs                   |
|                             | tray           | with heat-sink    | 20pcs                  |
| Storage Temperature Range   |                |                   | -55°C to +125°C        |
| Storage Humidity            | non-condensing |                   | 5% - 95% RH            |

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