

Features

Regulated Converters

- 4:1 wide input voltage range
- 1.6kVDC isolation
- UL certified
- Efficiency up to 88%
- Fixed operating frequency
- Six-Sided continuous shield
- No minimum load required



RP15-AW

15 Watt

1" x 1"

Single & Dual Output



Description

The RP15-AW series are ultraminiature wide input voltage range power DC/DC converters in a case half the size of industry standard 15W converters. Despite their small size, the RP15-AW converters are fully specified devices with output currents up to 4 Amps, no minimum load, 1600VDC isolation and low ripple/noise figures. The outputs are also fully protected against short circuits, overcurrent and overvoltage. The RP15-AW series will find many uses in applications where board space and/or board height is at a premium.

Selection Guide

| Part Number | Input Voltage Range [VDC] | Output Voltage [VDC] | Output Current [mA] | Input Current [mA] ⁽¹⁾ | Efficiency typ. [%] ⁽¹⁾ | Max. Capacitive Load [μF] ⁽²⁾ |
|--------------------------------|---------------------------|----------------------|---------------------|-----------------------------------|------------------------------------|--|
| RP15-243.3SAW ^(3,4) | 9-36 | 3.3 | 4000 | 640 | 86 | 12000 |
| RP15-2405SAW ^(3,4) | 9-36 | 5 | 3000 | 727 | 86 | 6000 |
| RP15-2412SAW ^(3,4) | 9-36 | 12 | 1300 | 747 | 87 | 1000 |
| RP15-2415SAW ^(3,4) | 9-36 | 15 | 1000 | 718 | 87 | 660 |
| RP15-483.3SAW ^(3,4) | 18-75 | 3.3 | 4000 | 320 | 86 | 12000 |
| RP15-4805SAW ^(3,4) | 18-75 | 5 | 3000 | 359 | 87 | 6000 |
| RP15-4812SAW ^(3,4) | 18-75 | 12 | 1300 | 374 | 87 | 1000 |
| RP15-4815SAW ^(3,4) | 18-75 | 15 | 1000 | 359 | 87 | 660 |
| RP15-2405DAW ^(3,4) | 9-36 | ±5 | ±1500 | 735 | 85 | ±3000 |
| RP15-2412DAW ^(3,4) | 9-36 | ±12 | ±625 | 718 | 87 | ±520 |
| RP15-2415DAW ^(3,4) | 9-36 | ±15 | ±500 | 710 | 88 | ±330 |
| RP15-4805DAW ^(3,4) | 18-75 | ±5 | ±1500 | 368 | 85 | ±3000 |
| RP15-4812DAW ^(3,4) | 18-75 | ±12 | ±625 | 363 | 86 | ±520 |
| RP15-4815DAW ^(3,4) | 18-75 | ±15 | ±500 | 359 | 87 | ±330 |

Notes:

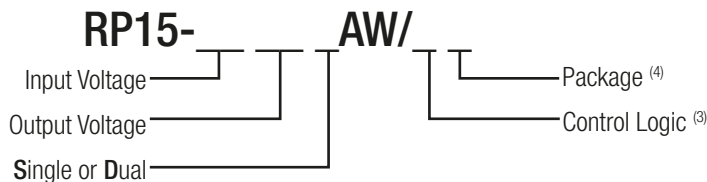
- Note1: Measured at nominal input voltage and full load
 Note2: Measured at minimum input voltage and constant resistive load



C **UL** US
E196683

UL60950-1 Certified

Model Numbering



Ordering Examples

- RP15-2405SAW/P = 24V 4:1 Input, 5V Output, Positive Logic CTRL pin and Trim pin fitted.
 RP15-4805DAW-HC = 48V 4:1 Input, ±5V Output, Premounted Heat-sink (no trim pin with dual output)

Notes:

- Note3: standard part is without suffix "P" or "N" = without CTRL & Trim function
 Trim function is only available for single output with /P or /N suffix
 add suffix "P" for CTRL function with positive logic (1=ON, 0=OFF) and trim pin for single output
 add suffix "N" for CTRL function with negative logic (0=ON, 1=OFF) and trim pin for single output
 Note4: add suffix -HC for premounted Heat-sink and clips

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

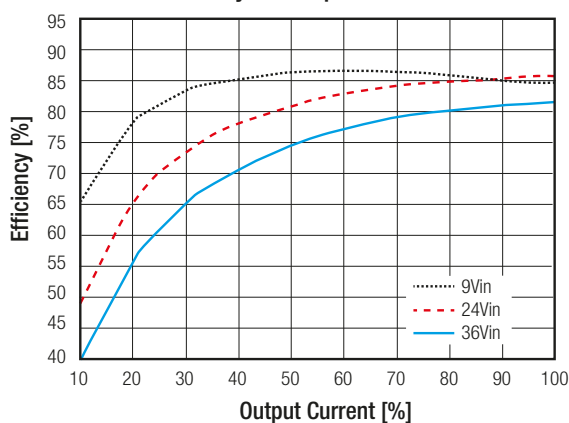
| BASIC CHARACTERISTICS | | | | | | |
|---|--|---|--------|--|---|-----------------|
| Parameter | Condition | | | Min. | Typ. | Max. |
| Internal Input Filter | | | | Pi-Type | | |
| Input Voltage Range | nom. $V_{in} = 24\text{V}$ nom. $V_{in} = 48\text{V}$ | | | 9VDC 18VDC | 24VDC 48VDC | 36VDC 75VDC |
| Input Surge Voltage | $V_{in} = 24\text{V}$, 100ms max. $V_{in} = 48\text{V}$, 100ms max. | | | | | 50VDC 100VDC |
| Under Voltage Lockout (UVLO) | $V_{in} = 24\text{V}$ | DC-DC ON DC-DC OFF | | | 8VDC | 9VDC |
| | $V_{in} = 48\text{V}$ | DC-DC ON DC-DC OFF | | | 16VDC | 18VDC |
| Input Reflected Ripple Current ⁽⁵⁾ | | | | | 30mA _{p-p} | |
| Output Voltage Trimming ⁽⁶⁾ | Single Output | | | ±10.0% | | |
| Minimum Load | | | | 0% | | |
| Start-up time | Power up ON/OFF CTRL | | | | | 30ms 30ms |
| ON/OFF Control ⁽⁷⁾ | Positive Logic | DC-DC ON DC-DC OFF | | Open or $3 < V_r < 15\text{VDC}$ Short or $0 < V_r < 1.2\text{VDC}$ | | |
| | Negative Logic | DC-DC ON DC-DC OFF | | Short or $0 < V_r < 1.2\text{VDC}$ Open or $3 < V_r < 15\text{VDC}$ | | |
| Input Current of CTRL Pin | DC-DC ON | | | -0.5mA | | 1.0mA |
| Standby Current | DC-DC OFF | | | | 2.5mA | |
| Internal Operating Frequency | | | | 360kHz | 400kHz | 440kHz |
| Ripple and Noise | measured by 20MHz bandwidth | with a 1 μF M/C X7R and 10 μF T/C | Single | 3.3V _{out} , 5V _{out} | 75mV _{p-p} 100mV _{p-p} | |
| | | with a 1 μF M/C X7R and 10 μF T/C | | 12V _{out} , 15V _{out} | | |
| | | with a 1 μF M/C X7R and 10 μF T/C | Dual | all models | 100mV _{p-p} | |

Notes:

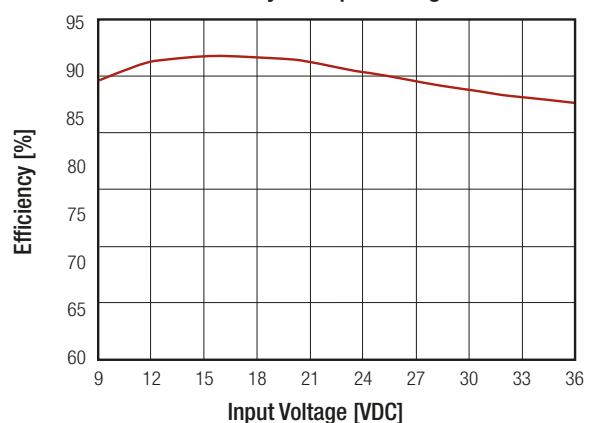
- Note5: Simulated source impedance of 12 μH . 12 μH inductor in series with +Vin
- Note6: Trimming allows the user to increase or decrease the output voltage set point of the module. This is accomplished by connecting an external resistor between the Trim pin and either +Vout pin or -Vout pin
- Note7: The ON/OFF control function can be positive or negative logic. The pin voltage is referenced to -Vin pin. If no suffix is specified, the control pin will be omitted

RP15-2405SAW

Efficiency vs. Output Current



Efficiency vs. Input Voltage

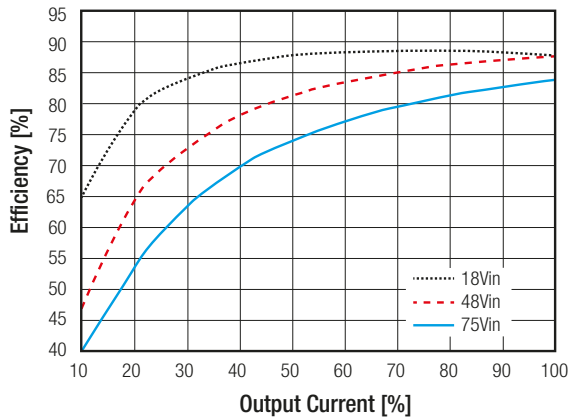


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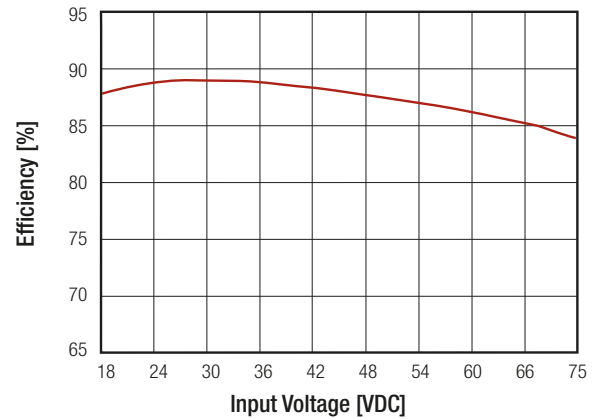
Specifications (measured at Ta = 25°C, nominal input voltage, full load otherwise noted)

RP15-4805SAW

Efficiency vs. Output Current



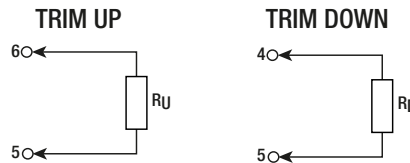
Efficiency vs. Input Voltage



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.



RP15-xx3.3SAW

| 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 _U = | 385.071 | 191.511 | 126.990 | 94.730 | 75.374 | 62.470 | 53.253 | 46.340 | 40.963 | 36.662 | 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 _D = | 116.719 | 54.779 | 34.133 | 23.810 | 17.616 | 13.486 | 10.537 | 8.325 | 6.604 | 5.228 | kOhms |

RP15-xx05SAW

| 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 _U = | 253.450 | 125.700 | 83.117 | 61.825 | 49.050 | 40.533 | 34.450 | 29.888 | 26.339 | 23.500 | 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 _D = | 248.340 | 120.590 | 78.007 | 56.715 | 43.940 | 35.423 | 29.340 | 24.778 | 21.229 | 18.390 | kOhms |

RP15-xx12SAW

| 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 _U = | 203.223 | 99.057 | 64.334 | 46.973 | 36.557 | 29.612 | 24.652 | 20.932 | 18.038 | 15.723 | 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 _D = | 776.557 | 308.723 | 248.779 | 182.807 | 143.223 | 116.834 | 97.985 | 83.848 | 72.853 | 64.057 | kOhms |

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

| RP15-xx15SAW | | | | | | | | | | | |
|------------------|---------|---------|---------|---------|---------|---------|---------|--------|--------|--------|-------|
| 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 _l = | 161.557 | 78.223 | 50.446 | 36.557 | 28.223 | 22.668 | 18.700 | 15.723 | 13.409 | 11.557 | 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 _o = | 818.223 | 401.557 | 262.668 | 193.223 | 151.557 | 123.779 | 103.938 | 89.057 | 77.483 | 68.223 | kOhms |

| REGULATIONS | | | |
|-------------------------|-----------------------------|---------------|------------|
| Parameter | Condition | | Value |
| Output Voltage Accuracy | | | ±1.0% |
| Line Voltage Regulation | Single | | ±0.2% |
| | Dual | | ±0.5% |
| Load Voltage Regulation | 0% to 100% load | Single | ±0.2% |
| | | Dual | ±1.0% |
| Cross Regulation | asymmetrical 25%<>100% load | | ±5.0% |
| Transient Response | 25% load step change | recovery time | 250µs typ. |

| PROTECTIONS | | | |
|--------------------------------|---------------------|-------------------|--------------------------------------|
| Parameter | Condition | | Value |
| Short Circuit Protection (SCP) | | | continuous, automatic recovery |
| Over Voltage Protection (OVP) | Zener Diode Clamp | 3.3Vout | 3.7 - 5.4VDC |
| | | 5Vout | 5.6 - 7.0VDC |
| | | 12Vout | 13.5 - 19.6VDC |
| | | 15Vout | 16.8 - 20.5VDC |
| Over Load Protection (OLP) | | | Hiccup mode, 150% of rated Iout typ. |
| Isolation Voltage | tested for 1 minute | I/P to O/P | 1.6kVDC |
| | | I/P (O/P) to case | 1.0kVDC |
| Isolation Resistance | tested with 500VDC | | 1GΩ min. |
| Isolation Capacitance | | | 1000pF max. |

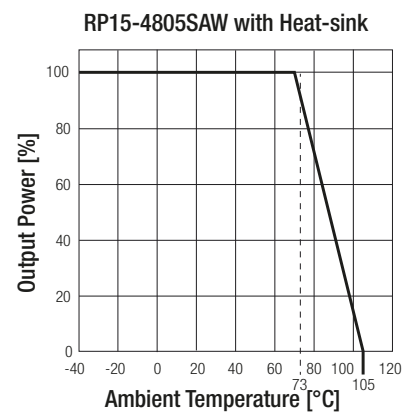
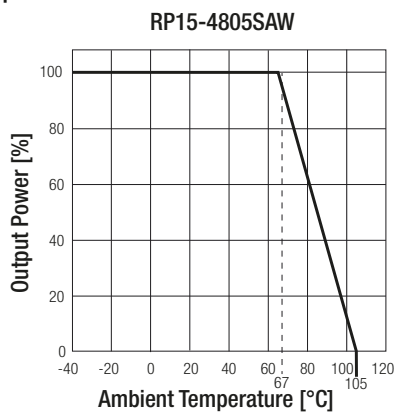
Notes:

Note8: This power module is not internally fused. An input line fuse must always be used. Recom suggests:
24Vin= T3.15A; 48Vin= T1.6A slow blow types

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

| ENVIRONMENTAL | | | |
|-----------------------------|---|-------------------|------------------------------|
| Parameter | Condition | | Value |
| Operating Temperature Range | without derating | | -40°C to +67°C |
| | with derating | | -40°C to +105°C |
| Maximum Case Temperature | | | +105°C |
| Temperature Coefficient | | | ±0.02%/°C max. |
| Thermal Impedance | natural convection 0.1m/s (20LFM) | without Heat-sink | 18.2°C/Watt |
| | | with Heat-sink | 15.8°C/Watt |
| Operating Humidity | | | 5% - 95% RH |
| Thermal Shock | | | according to MIL-STD-810F |
| Vibration | | | according to MIL-STD-810F |
| MTBF | according to MIL-HDBK-217F, G.B. Bellcore TR-NWT-000332 ⁽⁹⁾ | +25°C | 1459 x 10 ³ hours |
| | | | 1330 x 10 ³ hours |

Derating Graph ⁽¹⁰⁾



Notes:

- Note9: BELLCORE TR-NWT-000332. Case I: 50% Stress, Ta= 40°C. MIL-HDBK 217F Notice 2. Ta = 25°C, full load, (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 |
| Information Technology Equipment, General Requirements for Safety | E196683 | UL60950-1 1st. Ed.: 2003 C22.2 No. 60950 1st. Ed.: 2003 |
| EMC Compliance | Condition | Standard / Criterion |
| Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement | with external filter | EN55022, Class A or B |
| ESD Electrostatic discharge immunity test | Air ±8kV and Contact ±6kV | EN61000-4-2, Criteria A |
| Radiated, radio-frequency, electromagnetic field immunity test | 10V/m | EN61000-4-3, Criteria A |
| Fast Transient and Burst Immunity ⁽¹¹⁾ | ±2kV | EN61000-4-4, Criteria A |
| Surge Immunity ⁽¹¹⁾ | ±1kV | EN61000-4-5, Criteria A |
| Immunity to conducted disturbances, induced by radio-frequency fields | 3Vr.m.s | EN61000-4-6, Criteria A |

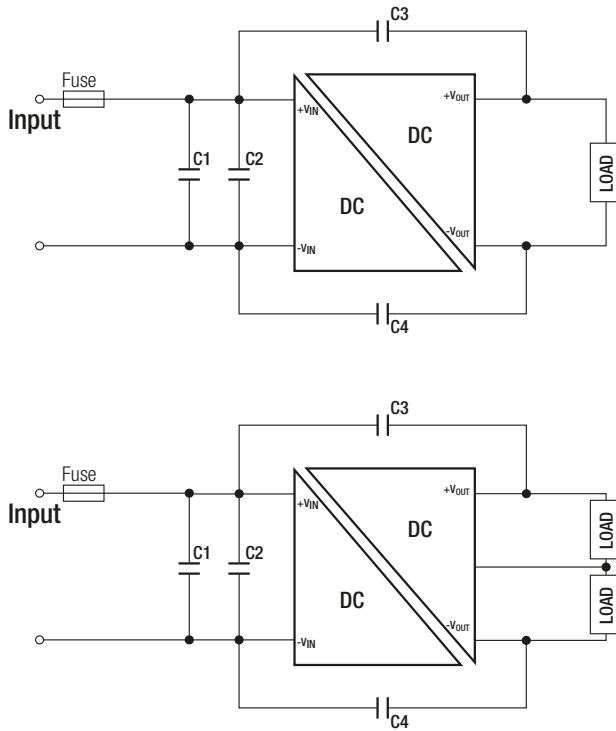
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Specifications (measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted)

Notes:

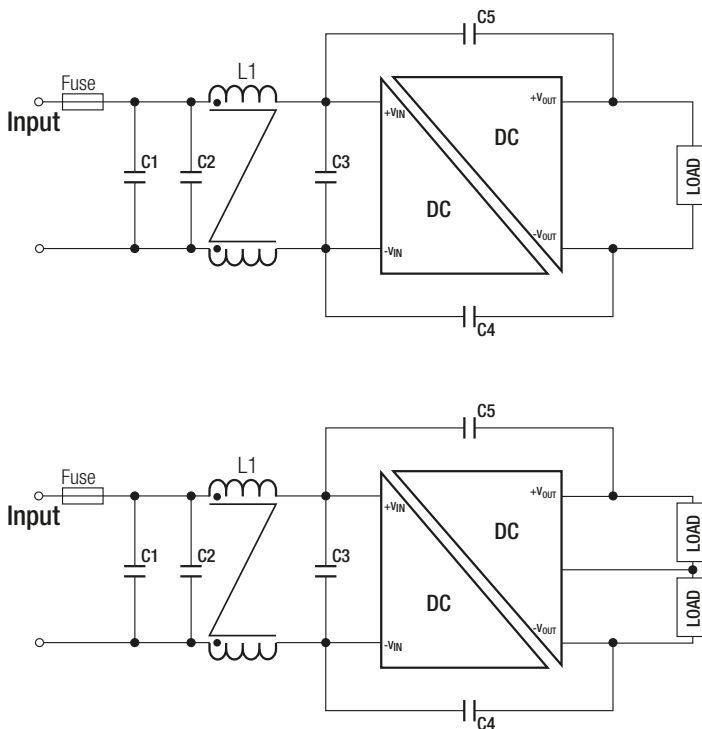
Note11: An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5. The filter capacitor Recom suggests: Nippon chemi-con KY series, $220\mu\text{F}/100\text{V}$

EMI Filtering Class A



| MODEL | C1 | C2 | C3/C4 |
|----------------|--|--|------------------------|
| RP15-24xxS_DAW | 6.8 $\mu\text{F}/50\text{V}$ 1812 MLCC | 6.8 $\mu\text{F}/50\text{V}$ 1812 MLCC | 470pF/2kV 1808 MLCC |
| RP15-48xxS_DAW | 2.2 $\mu\text{F}/100\text{V}$ 1812 MLCC | 2.2 $\mu\text{F}/100\text{V}$ 1812 MLCC | 470pF/2kV 1808 MLCC |

EMI Filtering Class B



| MODEL | C1 | C2 | C3 |
|----------------|--|--|--|
| RP15-24xxS_DAW | 6.8 $\mu\text{F}/50\text{V}$ 1812 MLCC | N/A | 6.8 $\mu\text{F}/50\text{V}$ 1812 MLCC |
| RP15-48xxS_DAW | 2.2 $\mu\text{F}/100\text{V}$ 1812 MLCC | 2.2 $\mu\text{F}/100\text{V}$ 1812 MLCC | 2.2 $\mu\text{F}/100\text{V}$ 1812 MLCC |

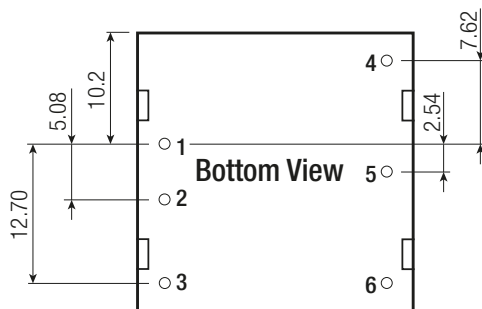
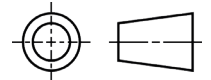
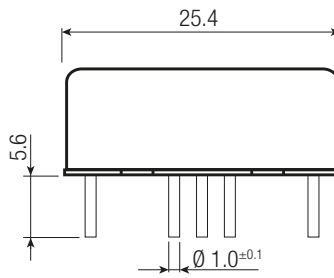
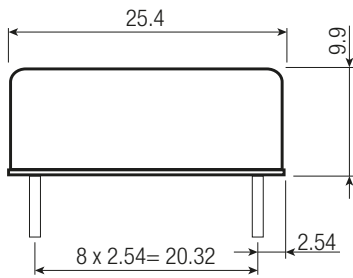
| MODEL | C4/C5 | L1 |
|----------------|-------------------------|---|
| RP15-24xxS_DAW | 470pF/2kV 1808 MLCC | CMC: 325 μH ref: WE 744290321; ref.: CMC-06 |
| RP15-48xxS_DAW | 1000pF/2kV 1808 MLCC | 325 μH ref: WE 744290321; ref.: CMC-06 |

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

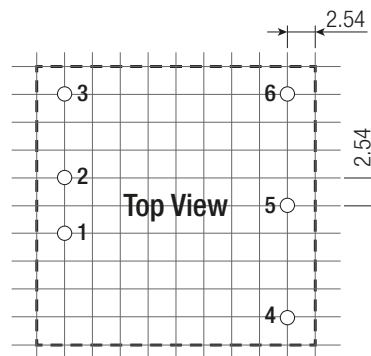
DIMENSIONS and PHYSICAL CHARACTERISTICS

| Parameter | Type | Value |
|----------------------------|-------------------|----------------------|
| Material | Case | Nickel coated copper |
| | Base | FR4 PCB |
| | Potting | Epoxy (UL94-V0) |
| Package Dimensions (LxWxH) | without Heat-sink | 25.4 x 25.4 x 9.9mm |
| | with Heat-sink | 31.4 x 25.4 x 16.5mm |
| Package Weight | without Heat-sink | 15g |
| | with Heat-sink | 21.5g |

Dimension Drawing (mm)



Recommended Footprint Details



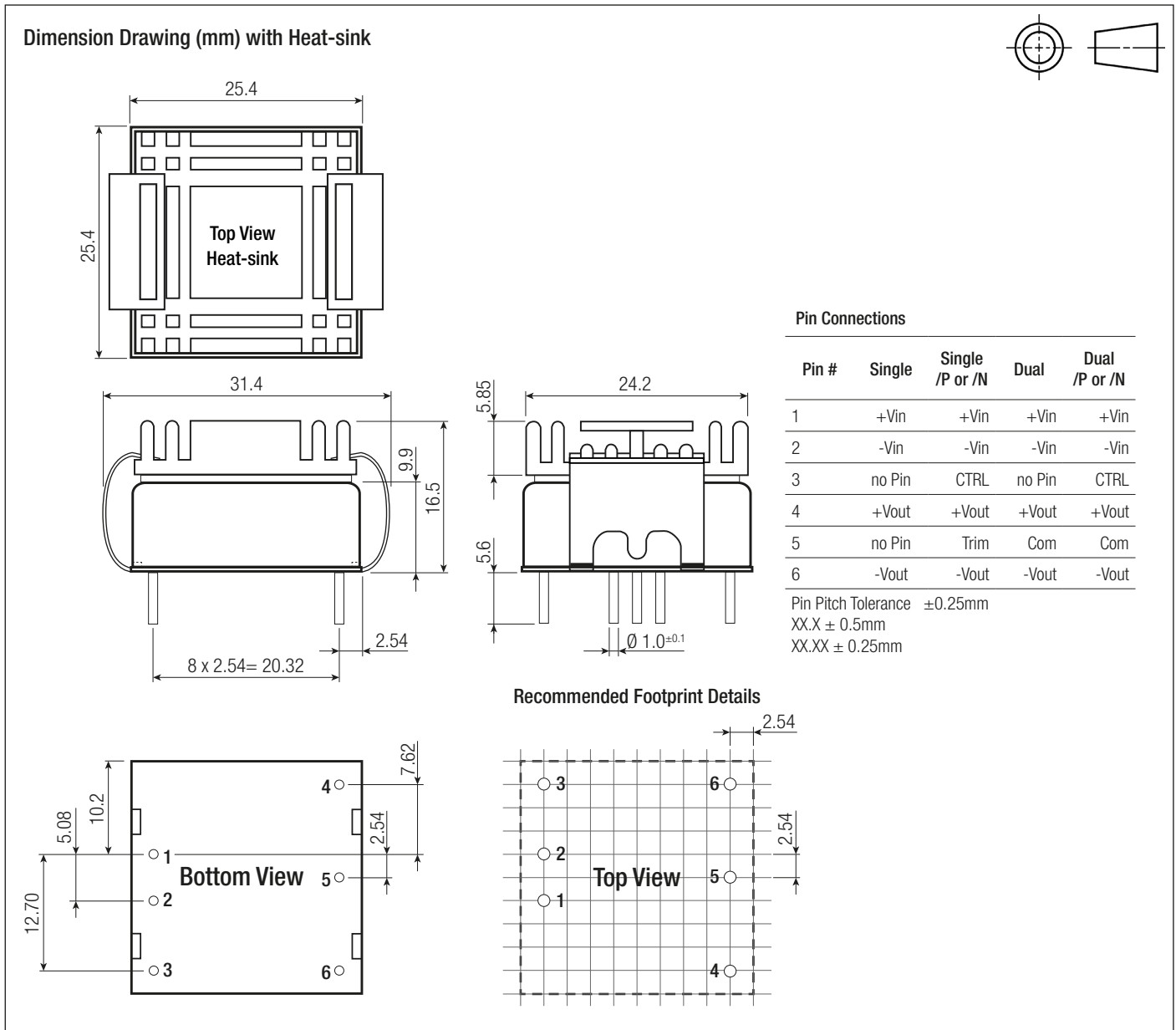
Pin Connections

| Pin # | Single | Single /P or /N | Dual | Dual /P or /N |
|-------|--------|-----------------|--------|---------------|
| 1 | +Vin | +Vin | +Vin | +Vin |
| 2 | -Vin | -Vin | -Vin | -Vin |
| 3 | no Pin | CTRL | no Pin | CTRL |
| 4 | +Vout | +Vout | +Vout | +Vout |
| 5 | no Pin | Trim | Com | Com |
| 6 | -Vout | -Vout | -Vout | -Vout |

Pin Pitch Tolerance ±0.25mm
XX.X ± 0.5mm
XX.XX ± 0.25mm

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



PACKAGING INFORMATION

| Parameter | Type | Value |
|------------------------------|-------------------|--------------------------------|
| Packaging Dimensions (LxWxH) | without Heat-sink | Tube 230.0 x 180.0 x 28.0mm |
| | with Heat-sink | Tray 230.0 x 180.0 x 28.0mm |
| Packaging Quantity | without Heat-sink | Tube 8pcs |
| | with Heat-sink | Tray 20pcs |
| Storage Temperature Range | | -55°C to +125°C |
| Storage Humidity | | 5% - 95% RH |

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