

RW-20W Series

20W Ultra Wide Input Range Regulated Single & Dual output

Features

- Ultra Wide Input Range
- 3000 VDC Isolation
- Efficiency up to 90%
- -40°C~ 100°C Operation Temperature Range
- Adjustable Output Voltage
- Remote On/Off Control (CTRL)
- Continuous Short Circuit Protection
- Over Load Protection
- Over Voltage Protection
- Under voltage lock-out circuit
- Built-in EMI filter meets EN50121-3-2 without external components
- EN 50155 approval for railway applications



The RW-20W series are high performance 20W single & dual output DC-DC converters. These converters combine copper package in a 1.09"x1.09" case with high performance features such as high efficiency, continuous short circuit protection with automatic restart and tight line / load regulation. Devices are encapsulated using flame retardant resin. Compliance with railway Input voltages of 24, 36, 48, 72, 96 and 110Vdc with output voltage of 3.3, 5, 12, 15, ± 5 , ± 12 , ± 15 . High performance features include high efficiency operation up to 90% and output voltage accuracy of $\pm 1\%$ maximum.

ALL SPECIFICATIONS ARE TYPICAL AT 25°C, NOMINAL INPUT AND FULL LOAD UNLESS OTHERWISE NOTED.

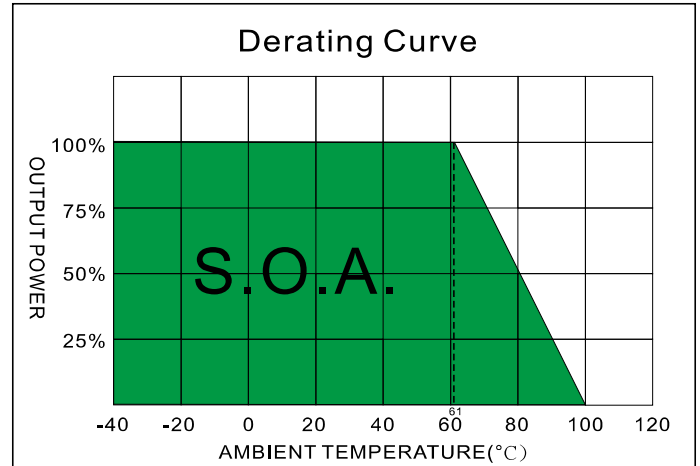
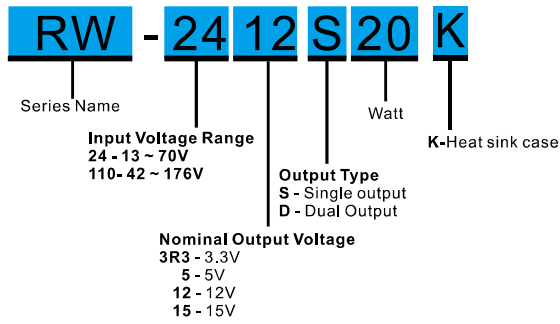
| OUTPUT SPECIFICATIONS | | | |
|--|---|--|--|
| Output Voltage Accuracy | | ±1% | |
| Output Voltage Adjustability(Trim) | | Single output: ±10%, max. | |
| Maximum Output Current | | See table | |
| Line Regulation | | ±0.5%, max. | |
| Load Regulation(Io=0% to 100%) | | Single: ±0.5%, max. Dual:±1%, max.(balanced load) | |
| Cross Regulation (Dual Output) (1) | | ±5% | |
| Ripple&Noise | | | |
| Measured by 20MHz bandwidth | | | |
| With a 10uF/25V X7R MLCC | | Single output:75mVpk-pk,max. | |
| With a 10uF/25V X7R MLCC for each output | | Dual output:75mVpk-pk,max. | |
| | 3.3V output | 3.9V | |
| | 5V output | 6.2V | |
| Over Voltage Protection (Zener diode clamp) | 12V output | 15V | |
| | 15V output | 18V | |
| | ±12V output | ±15V | |
| | ±15V output | ±18V | |
| Over Load Protection | | 170% of FL, typ. | |
| Short Circuit Protection | | Indefinite(hiccup) (Automatic Recovery) | |
| Temperature Coefficient | | ±0.02%/°C | |
| Capacitive Load (2) | | See table | |
| Transient Recovery Time (3) | | 250us, typ. | |
| Transient Response Deviation(3) | | ±3%, max. Single Output 3.3V:±5%, max. | |
| INPUT SPECIFICATIONS | | | |
| Input Voltage Range | | See table | |
| Under Voltage Lockout | | | |
| 24V Modes | Module ON / OFF | 12.3Vdc / 11.6Vdc, typ. | |
| 110V Modes | Module ON / OFF | 40.5Vdc / 38.4Vdc, typ. | |
| Start up Time | | 30mS, typ. | |
| (Nominal Vin and constant resistive load) | | | |
| Input Filter | | Pi Type | |
| Input Current(No-Load) | | See table, max. | |
| Input Current(Full-Load) | | See table, typ. | |
| Input Reflected Ripple Current(4) | | 20mA _{p-p} , typ. | |
| Remote On/Off (Positive logic)(5) | | | |
| ON: | 3.0 ... 12Vdc or open circuit | | |
| OFF: | 0 ... 1.2Vdc or Short circuit pin2 and pin3 | | |
| OFF idle current: | | 3 mA, typ. | |
| ABSOLUTE SPECIFICATIONS (6) | | | |
| These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability. | | | |
| Input Voltage(100mS) | | | |
| 24 Modes | 100 Vdc, max. | | |
| 110 Modes | 185 Vdc, max. | | |
| Soldering Temperature(1.5mm from case 10 sec. Max.) | | 260°C , max. | |

| GENERAL SPECIFICATIONS | | | |
|---|-------------|--|--|
| Efficiency | | See table, typ. | |
| I/O Isolation Voltage(60 sec) | | | |
| Input/Output | | 3000Vdc | |
| Case/Input & Output | | 1600Vdc | |
| Isolation Resistance | | 1000 MΩ, min. | |
| Isolation Capacitance | | 2000 pF, typ. | |
| Switching Frequency | 24V Models | 330kHz, typ. | |
| | 110V Models | 245kHz, typ. | |
| Humidity | | 95% rel H | |
| Reliability Calculated MTBF(MIL-HDBK-217 F) | | >190 KHrs | |
| Safety Standard : | | IEC/EN 60950-1;EN50155 IEC/EN 62368-1 | |
| Safety Approvals : | | IEC/EN 60950-1;EN50155 IEC/EN 62368-1 | |
| PHYSICAL SPECIFICATIONS | | | |
| Case Material | | Aluminum | |
| Base Material | | Non-conductive Black Plastic(UL94V-0 rated) | |
| Pin Material | | Φ1.0mm Brass Solder-coated | |
| Potting Material | | Epoxy (UL94V-0 rated) | |
| Weight | | 22.7g | |
| Dimensions | | 1.09"x1.09"x0.65" | |
| ENVIRONMENTAL SPECIFICATIONS | | | |
| Operating Ambient Temperature | | -40°C ~ +100°C(See Derating Curve) -40°C ~ +61°C(For 100% load) | |
| Maximum Case Temperature | | 105°C | |
| Thermal Impedance | | Heat sink case 11.5°C/W, min. | |
| Storage Temperature | | -55°C ~ +125°C | |
| Cooling(7) | | Nature Convection | |
| Thermal shock | | IEC60068 | |
| Shock | | EN61373 | |
| Vibration | | EN61373 | |
| EMC SPECIFICATIONS | | | |
| Radiated Emissions | | EN50121-3-2 | 40dBuV from 30-230MHZ 47dBuV from 230-1000MHZ |
| Conducted Emissions(8) | | EN50121-3-2 | 99dBuV from 0.15-0.5MHZ 93dBuV from 0.5-30MHZ |
| ESD | EN50121-3-2 | Air ± 8KV Contact ± 6KV | Perf. Criteria A |
| RS | EN50121-3-2 | 20V/m | Perf. Criteria A |
| EFT (9) | EN50121-3-2 | 2.0KV | Perf. Criteria A |
| Surge (9) | EN50121-3-2 | 2.0KV | Perf. Criteria A |
| CS | EN50121-3-2 | 10V | Perf. Criteria A |
| PFMF | EN61000-4-8 | 100A/m | Perf. Criteria A |

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RW - 20W 4:1 Regulated Single & Dual output

PART NUMBER STRUCTURE



MODEL SELECTION GUIDE

| MODEL NUMBER | INPUT Voltage Range (Vdc) | INPUT Current | | OUTPUT Voltage (Vdc) | OUTPUT Current | | EFFICIENCY @ FL(%) | Capacitor Load(uF) |
|---------------|-----------------------------|---------------|----------------|----------------------|----------------|----------------|--------------------|--------------------|
| | | No-Load (mA) | Full Load (mA) | | Min. load (mA) | Full load (mA) | | |
| RW-243R3S20K | 13.0 ~ 70.0VDC or 24.0VDC | 10 | 711.20 | 3.3 | 0 | 4500 | 87 | 7000 |
| RW-2405S20K | 13.0 ~ 70.0VDC or 24.0VDC | 10 | 946.96 | 5 | 0 | 4000 | 88 | 5000 |
| RW-2412S20K | 13.0 ~ 70.0VDC or 24.0VDC | 10 | 936.33 | 12 | 0 | 1670 | 89 | 850 |
| RW-2415S20K | 13.0 ~ 70.0VDC or 24.0VDC | 10 | 925.92 | 15 | 0 | 1330 | 90 | 700 |
| RW-2405D20K | 13.0 ~ 70.0VDC or 24.0VDC | 10 | 968.99 | ±5 | 0 | ±2000 | 86 | ±1000 |
| RW-2412D20K | 13.0 ~ 70.0VDC or 24.0VDC | 10 | 925.92 | ±12 | 0 | ±833 | 90 | ±680 |
| RW-2415D20K | 13.0 ~ 70.0VDC or 24.0VDC | 10 | 925.92 | ±15 | 0 | ±666 | 90 | ±470 |
| RW-1103R3S20K | 42.0 ~ 176.0VDC or 110.0VDC | 10 | 156.97 | 3.3 | 0 | 4500 | 86 | 7000 |
| RW-11005S20K | 42.0 ~ 176.0VDC or 110.0VDC | 10 | 206.61 | 5 | 0 | 4000 | 88 | 5000 |
| RW-11012S20K | 42.0 ~ 176.0VDC or 110.0VDC | 10 | 211.41 | 12 | 0 | 1670 | 86 | 850 |
| RW-11015S20K | 42.0 ~ 176.0VDC or 110.0VDC | 10 | 211.41 | 15 | 0 | 1330 | 86 | 700 |
| RW-11005D20K | 42.0 ~ 176.0VDC or 110.0VDC | 10 | 216.45 | ±5 | 0 | ±2000 | 84 | ±1000 |
| RW-11012D20K | 42.0 ~ 176.0VDC or 110.0VDC | 10 | 208.98 | ±12 | 0 | ±833 | 87 | ±680 |
| RW-11015D20K | 42.0 ~ 176.0VDC or 110.0VDC | 10 | 208.98 | ±15 | 0 | ±666 | 87 | ±470 |

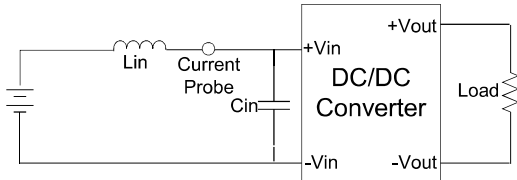
NOTE

- One load is 25% to 100% load, the other load is 100% load, the output voltage variable rate is within ±5%.
- Test by nominal input voltage and constant resistor load.
- Tested by normal Vin and 25% load step change (75%-50%-25% of Io).
- Measured Input reflected ripple current with a simulated source inductance of 26μH and a source capacitor Cin(33μF, ESR<1.0Ω at 100KHz).
- The remote on/off control pin is referenced to -Vin(pin2).
- Exceeding the absolute ratings of the unit could cause damage. It is not allowed for continuous operating.
- "Nature Convection" is usually about 30-65 LFM but is not equal to still air (0 LFM).
- Input filter components are used to help meet conducted emissions 79dBμV from 0.15-0.5MHZ and 73dBμV from 0.5-30MHZ requirement for the module, Which application refer to the EMI Filter of design & feature configuration.
- An external filter capacitor is required if the module has to meet EFT and Surge in EN50121-3-2.
The filter capacitor Motien suggest:
RW-24XXX20K : one electrolytic capacitor (Nippon - chemi - con KY series, 330μF/100V).
RW-110XXX20K : two electrolytic capacitors (Ruby-con BXF series, 100μF/250V) in parallel.

TEST CONFIGURATIONS

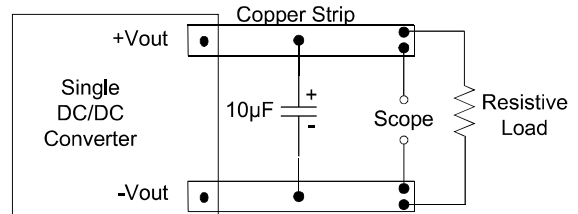
Input Reflected Ripple Current Test Step

Input reflected ripple current is measured through a source inductor L_{in} (26 μ H) and a source capacitor C_{in} (33 μ F, ESR<1.0 Ω at 100KHz) at nominal input and full load.



Output Ripple & Noise Measurement Test

To reduce ripple and noise, it is recommended to use a 10 μ F ceramic disk capacitor to at the output.



DESIGN & FEATURE CONFIGURATIONS

Over Voltage Protection

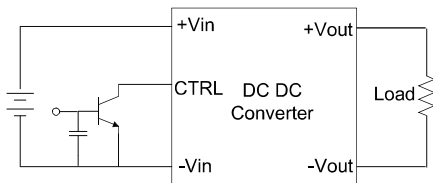
The module includes an internal output over voltage protection circuit, which monitors the voltage on the output terminals. If this voltage exceeds the over voltage set point, the module will activate the control loop of internal circuit to clamp the output voltage.

CTRL Module ON / OFF

Positive logic turns on the module during high logic and off during low logic.

Ctrl module on/off can be controlled by an external switch between the ctrl terminal and -Vin terminal. The switch can be an open collector or open drain.

For positive logic if the ctrl feature is not used, please leave the ctrl pin floating.



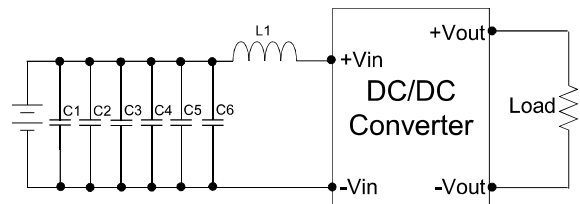
Over Load Protection

The module includes an internal over current protection circuit, which will endure current limiting for an unlimited duration during output over load condition. If the output current exceeds the OCP set point, the module will shut down automatically (hiccup).

The module will try to restart after shut down. If the over load condition still exists, the module will shut down again.

EMI Filter

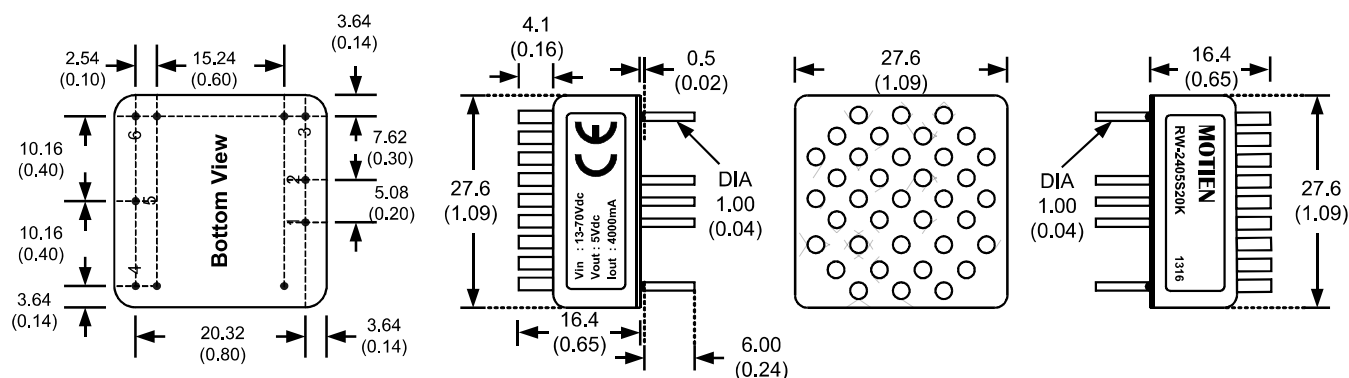
Input filter components (C1,C2,C3,C4,C5,C6) are used to help meet conducted emissions 79dB μ V from 0.15-0.5MHZ and 73dB μ V from 0.5-30MHZ requirement for the module. These components should be mounted as close as possible to the module; and all leads should be minimized to decrease radiated noise.



| | C1、C2、C3、C4、C5、C6 | L1 |
|--------------|----------------------|------------|
| RW-24XXX20K | None | None |
| RW-110XXX20K | 1812,1 μ F, 250V | 12 μ H |

MECHANICAL SPECIFICATIONS

Heat sink case



All dimensions are typical in millimeters (inches).

1. Pin diameter: 1.0 ± 0.05 (0.04 ± 0.002)
2. Pin pitch tolerance: ± 0.35 (± 0.014)
3. Pin to case tolerance: ± 0.5 (± 0.02)
4. Case Tolerance: ± 0.5 (± 0.02)
5. Stand-off tolerance: ± 0.1 (± 0.004)

PIN CONNECTIONS

| PIN NUMBER | SINGLE | DUAL |
|------------|--------|-------|
| 1 | +Vin | +Vin |
| 2 | -Vin | -Vin |
| 3 | CTRL | CTRL |
| 4 | +Vout | +Vout |
| 5 | Trim | Com |
| 6 | -Vout | -Vout |

EXTERNAL OUTPUT TRIMMING

Output can be externally trimmed by using the method as below. (single output models only)

