Wall Industries, Inc.

# RGW3 SERIES

**2:1 Wide Input Voltage Range**
**DIP and SMT Packages**
**Single and Dual Outputs**
**3 Watt DC/DC Power Converters**




## APPLICATIONS

- Wireless Networks
- Telecom / Datacom
- Industry Control Systems
- Measurement Equipment
- Semiconductor Equipment

## OPTIONS

- 3000VDC I/O Isolation (Suffix “H”)
- Surface Mount Package (Suffix “S”)

## FEATURES

- 3 Watts Maximum Output Power
- Single and Dual Outputs
- SMT & DIP Packages: 0.74 x 0.50 x 0.33 Inches
- SMT Package Qualified for Lead Free Reflow Solder Process According to IPC J-STD-020D
- 2:1 Wide Input Voltage Range
- High Efficiency up to 83%
- 1600VDC I/O Isolation (3000VDC I/O Isolation Available)
- Low Ripple & Noise
- External ON/OFF Control
- Switching Frequency (100KHz, min)
- Continuous Short Circuit Protection
- UL94V-V0 Package Materials
- CE Mark Meets 2006/95/EC, 93/68/EEC, and 2004/108EC
- UL60950-1, EN60950-1, and IEC60950-1 Safety Approvals (Pending)
- Compliant to RoHS EU Directive 2002/95/EC

## DESCRIPTION

The RGW3 series of DC/DC power converters provides 3 watts of output power in a 0.74 x 0.50 x 0.33 inch DIP or SMT package without derating up to 71°C. This series has single and dual output models with 2:1 wide input voltage ranges of 4.5-9VDC, 9-18VDC, 18-36VDC, and 36-75VDC. Some features include high efficiency, low ripple and noise, 3000VDC I/O isolation option, remote ON/OFF, and continuous short circuit protection. All models are RoHS compliant.

## SPECIFICATIONS: RGW3 Series

All specifications are based on 25°C, Nominal Input Voltage, and Maximum Output Current unless otherwise noted.
We reserve the right to change specifications based on technological advances.

| SPECIFICATION | TEST CONDITIONS | | Min | Nom | Max | Unit |
|---|---|---|---|---|---|---|
| **INPUT SPECIFICATIONS** | | | | | | |
| Input Voltage Range | 5VDC nominal input models | | 4.5 | 5 | 9 | VDC |
| | 12VDC nominal input models | | 9 | 12 | 18 | |
| | 24VDC nominal input models | | 18 | 24 | 36 | |
| | 48VDC nominal input models | | 36 | 48 | 75 | |
| Input Surge Voltage (1 sec max) | 5VDC nominal input models | | | | 15 | VDC |
| | 12VDC nominal input models | | | | 25 | |
| | 24VDC nominal input models | | | | 50 | |
| | 48VDC nominal input models | | | | 100 | |
| Input Reflected Ripple Current *(See Note 6)* | 5VDC nominal input models | | | 80 | | mAp-p |
| | 12VDC nominal input models | | | 40 | | |
| | 24VDC nominal input models | | | 30 | | |
| | 48VDC nominal input models | | | 20 | | |
| Input Filter | | | Capacitor type | | | |
| **OUTPUT SPECIFICATIONS** | | | | | | |
| Output Voltage | | | See Table | | | |
| Line Regulation | Low line to high line at full load | | -0.2 | | +0.2 | % |
| Load Regulation | No load to full load | Single Output Models | -1.0 | | +1.0 | % |
| | | Dual Output Models | -1.0 | | +1.0 | |
| | 10% load to 90% load | Single Output Models | -0.5 | | +0.5 | |
| | | Dual Output Models | -0.8 | | +0.8 | |
| Cross Regulation (Dual Output Models) | Asymmetrical load 25% to 100% full load | | -5 | | +5 | % |
| Voltage Accuracy | Full load an nominal Vin | | -1 | | +1 | % |
| Output Power | | | | | 3 | W |
| Output Current | | | See Table | | | |
| Ripple & Noise (20MHz Bandwidth) | Nominal Vin and full load | | | 30 | | mVp-p |
| Transient Response Recovery Time | 25% load step change | | | 250 | | µs |
| Start-Up Time | Nominal Vin and constant resistive load | Power Up | | 5 | | ms |
| | | Remote ON/OFF | | 5 | | |
| Minimum Load | | | 0 | | | % |
| Temperature Coefficient | | | -0.02 | | +0.02 | %/°C |
| **PROTECTION** | | | | | | |
| Short Circuit Protection | | | continuous, automatic recovery | | | |
| **GENERAL SPECIFICATIONS** | | | | | | |
| Efficiency | Nominal Vin and full load | | See Table | | | |
| Switching Frequency | Full load to minimum load | | 100 | | | KHz |
| Isolation Voltage (Input to Output) | Standard | | 1600 | | | VDC |
| | Suffix "H" | | 3000 | | | |
| Isolation Resistance | | | 10 | | | GΩ |
| Isolation Capacitance | Standard | | | | 50 | pF |
| | Suffix "H" *(See Note 9)* | | | | 50 | |
| **REMOTE ON/OFF** *(See Page 4 for application circuits)* | | | | | | |
| Remote ON/OFF | DC/DC ON | | Open or high impedance | | | |
| | DC/DC OFF | | Control pin applied current 2 ~ 4mA max. (via 1KΩ) | | | |
| Remote Off State Input Current | Nominal Vin | | | | 2.5 | mA |
| **ENVIRONMENTAL SPECIFICATIONS** | | | | | | |
| Operating Ambient Temperature | Without derating | | -40 | | +71 | °C |
| | With derating | | +71 | | +85 | |
| Storage Temperature | | | -55 | | +125 | °C |
| Relative Humidity (non-condensing) | | | 5 | | 90 | % RH |
| Thermal Shock | | | MIL-STD-810F | | | |
| Vibration | | | MIL-STD-810F | | | |
| Lead-Free Reflow Solder Process | | | IPC J-STD-020D | | | |
| Moisture Sensitivity Level (MSL) | | | IPC J-STD-033B; Level 2A | | | |
| MTBF *(See Note 1)* | BELLCORE TR-NWT-000332 | | 4,386,000 hours | | | |
| | MIL-HDBK-217F | | 2,401,000 hours | | | |
| **PHYSICAL SPECIFICATIONS** | | | | | | |
| Weight | | | 0.16oz (4.5g) | | | |
| Dimensions (L x W x H) | | | 0.74 x 0.50 x 0.33 inches (18.9 x 12.8 x 8.4 mm) | | | |
| **SAFETY & EMC CHARACTERISTICS** | | | | | | |
| Safety Approvals (Pending) | | | IEC60950-1, UL60950-1, EN60950-1 | | | |
| EMI *(See Note 6)* | EN55022 | | Class A | | | |
| ESD | EN61000-4-2 | Air ±8KV<br>Contact ±6KV | Perf. Criteria A | | | |
| Radiated Immunity | EN61000-4-3 | 10 V/m | Perf. Criteria A | | | |
| Fast Transient *(See Note 7)* | EN61000-4-4 | ±2KV | Perf. Criteria A | | | |
| Surge *(See Note 7)* | EN61000-4-5 | ±1KV | Perf. Criteria A | | | |
| Conducted Immunity | EN61000-4-6 | 10 Vrms | Perf. Criteria A | | | |

# MODEL SELECTION TABLES

| SINGLE OUTPUT MODELS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Model Number | Input Voltage Range | Output Voltage | Output Current | | Input Current | | Output [4] Ripple & Noise | Output Power | Efficiency [4] | Maximum [5] Capacitive Load |
| | | | Min. Load | Full Load | No Load [3] | Full Load [2] | | | | |
| RG5S3.3W3 | 5 VDC (4.5 – 9 VDC) | 3.3 VDC | 0mA | 700mA | 40mA | 650mA | 30mVp-p | 2.3W | 75% | 3300µF |
| RG5S5W3 | | 5 VDC | 0mA | 600mA | 40mA | 800mA | 30mVp-p | 3W | 79% | 1680µF |
| RG5S9W3 | | 9 VDC | 0mA | 333mA | 40mA | 800mA | 30mVp-p | 3W | 79% | 1000µF |
| RG5S12W3 | | 12 VDC | 0mA | 250mA | 40mA | 790mA | 30mVp-p | 3W | 80% | 820µF |
| RG5S15W3 | | 15 VDC | 0mA | 200mA | 50mA | 780mA | 30mVp-p | 3W | 81% | 680µF |
| RG12S3.3W3 | 12 VDC (9 – 18 VDC) | 3.3 VDC | 0mA | 700mA | 30mA | 267mA | 30mVp-p | 2.3W | 76% | 3300µF |
| RG12S5W3 | | 5 VDC | 0mA | 600mA | 30mA | 324mA | 30mVp-p | 3W | 81% | 1680µF |
| RG12S9W3 | | 9 VDC | 0mA | 333mA | 30mA | 329mA | 30mVp-p | 3W | 80% | 1000µF |
| RG12S12W3 | | 12 VDC | 0mA | 250mA | 30mA | 320mA | 30mVp-p | 3W | 82% | 820µF |
| RG12S15W3 | | 15 VDC | 0mA | 200mA | 30mA | 320mA | 30mVp-p | 3W | 82% | 680µF |
| RG24S3.3W3 | 24 VDC (18 – 36 VDC) | 3.3 VDC | 0mA | 700mA | 13mA | 134mA | 30mVp-p | 2.3W | 76% | 3300µF |
| RG24S5W3 | | 5 VDC | 0mA | 600mA | 13mA | 162mA | 30mVp-p | 3W | 81% | 1680µF |
| RG24S9W3 | | 9 VDC | 0mA | 333mA | 13mA | 160mA | 30mVp-p | 3W | 82% | 1000µF |
| RG24S12W3 | | 12 VDC | 0mA | 250mA | 13mA | 160mA | 30mVp-p | 3W | 82% | 820µF |
| RG24S15W3 | | 15 VDC | 0mA | 200mA | 13mA | 158mA | 30mVp-p | 3W | 83% | 680µF |
| RG48S3.3W3 | 48 VDC (36 – 75 VDC) | 3.3 VDC | 0mA | 700mA | 10mA | 67mA | 30mVp-p | 2.3W | 76% | 3300µF |
| RG48S5W3 | | 5 VDC | 0mA | 600mA | 10mA | 81mA | 30mVp-p | 3W | 81% | 1680µF |
| RG48S9W3 | | 9 VDC | 0mA | 333mA | 10mA | 82mA | 30mVp-p | 3W | 80% | 1000µF |
| RG48S12W3 | | 12 VDC | 0mA | 250mA | 10mA | 80mA | 30mVp-p | 3W | 82% | 820µF |
| RG48S15W3 | | 15 VDC | 0mA | 200mA | 10mA | 80mA | 30mVp-p | 3W | 82% | 680µF |

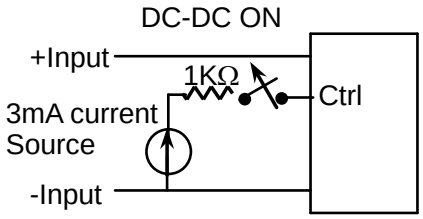
| DUAL OUTPUT MODELS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Model Number | Input Voltage Range | Output Voltage | Output Current | | Input Current | | Output [4] Ripple & Noise | Output Power | Efficiency [4] | Maximum [5] Capacitive Load |
| | | | Min. Load | Full Load | No Load [3] | Full Load [2] | | | | |
| RG5D5W3 | 5 VDC (4.5 – 9 VDC) | ±5 VDC | 0mA | ±300mA | 50mA | 790mA | 30mVp-p | 3W | 80% | ±1000µF |
| RG5D12W3 | | ±12 VDC | 0mA | ±125mA | 50mA | 790mA | 30mVp-p | 3W | 80% | ±470µF |
| RG5D15W3 | | ±15 VDC | 0mA | ±100mA | 55mA | 780mA | 30mVp-p | 3W | 81% | ±330µF |
| RG12D5W3 | 12 VDC (9 – 18 VDC) | ±5 VDC | 0mA | ±300mA | 30mA | 329mA | 30mVp-p | 3W | 80% | ±1000µF |
| RG12D12W3 | | ±12 VDC | 0mA | ±125mA | 30mA | 320mA | 30mVp-p | 3W | 82% | ±470µF |
| RG12D15W3 | | ±15 VDC | 0mA | ±100mA | 30mA | 316mA | 30mVp-p | 3W | 83% | ±330µF |
| RG24D5W3 | 24 VDC (18 – 36 VDC) | ±5 VDC | 0mA | ±300mA | 13mA | 164mA | 30mVp-p | 3W | 80% | ±1000µF |
| RG24D12W3 | | ±12 VDC | 0mA | ±125mA | 13mA | 158mA | 30mVp-p | 3W | 83% | ±470µF |
| RG24D15W3 | | ±15 VDC | 0mA | ±100mA | 13mA | 158mA | 30mVp-p | 3W | 83% | ±330µF |
| RG48D5W3 | 48 VDC (36 – 75 VDC) | ±5 VDC | 0mA | ±300mA | 10mA | 81mA | 30mVp-p | 3W | 81% | ±1000µF |
| RG48D12W3 | | ±12 VDC | 0mA | ±125mA | 10mA | 79mA | 30mVp-p | 3W | 83% | ±470µF |
| RG48D15W3 | | ±15 VDC | 0mA | ±100mA | 10mA | 79mA | 30mVp-p | 3W | 83% | ±330µF |

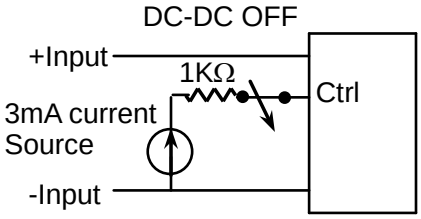
## NOTES

1. BELLCORE TR-NWT-000332. Case 1: 50% Stress, Temperature at 40°C.
   MIL-HDBK-217F Notice2 @Ta=25°C, Full load (Ground, Benign, controlled environment).
2. Maximum value at nominal input voltage and full load.
3. Typical value at nominal input voltage and no load.
4. Typical value at nominal input voltage and full load.
5. Test by minimum Vin and constant resistive load.
6. The RGW3 series meets EN55022 Class A and input reflected ripple current with an external L-C filter before the input pins to the converter. (See Class B figure for connecting network)
   Recommended: 5Vin: C1=4.7µF/25V 1812 MLCC C3=220pF/3KV 1808 MLCC L1=10µH 0504 SMD Inductor P/N: PMT-047
   12Vin: C1=6.8µF/50V 1812 MLCC C3=220pF/3KV 1808 MLCC L1=12µH 0504 SMD Inductor P/N: PMT-062
   24Vin: C1=4.7µF/50V 1812 MLCC C3=220pF/3KV 1808 MLCC L1=10µH 0504 SMD Inductor P/N: PMT-047
   48Vin: C1=4.7µF/100V 1812 MLCC C3=220pF/3KV 1808 MLCC L1=10µH 0504 SMD Inductor P/N: PMT-047
7. An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5. The filter capacitor suggested is Nippon chemi-con KY series, 220µF /100V, ESR 48mΩ.
8. To order surface mount version, add the suffix "S" to the model number (Ex: RG12S12W3S).
9. To order 3000VDC I/O isolation version, add the suffix "H" to the model number (Ex: RG12S12W3H).
10. **CAUTION:** This power module is not internally fused. An input line fuse must always be used.

**Due to advances in technology, specifications subject to change without notice.*

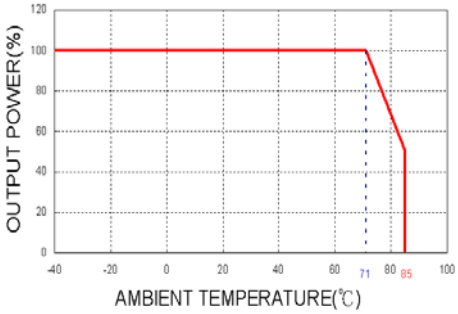
## REMOTE ON/OFF APPLICATION CIRCUITS



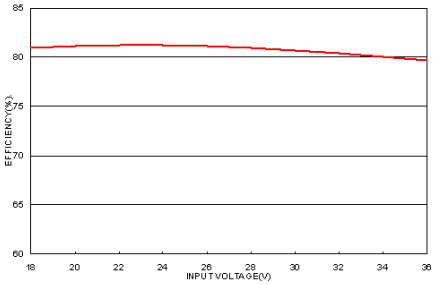




## CHARACTERISTICS

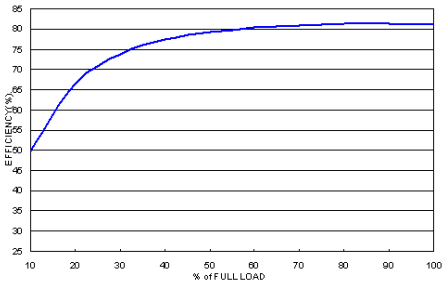
**RG24S5W3 Derating Curve**



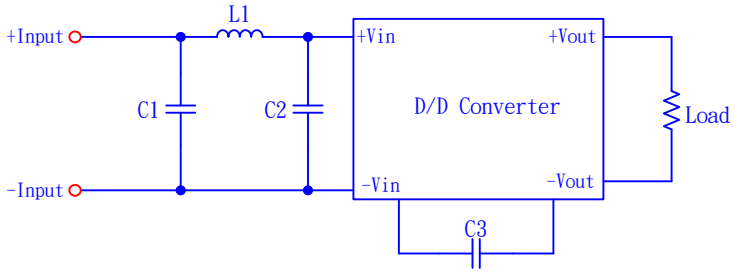

**RG24S5W3 Efficiency vs Input Voltage**



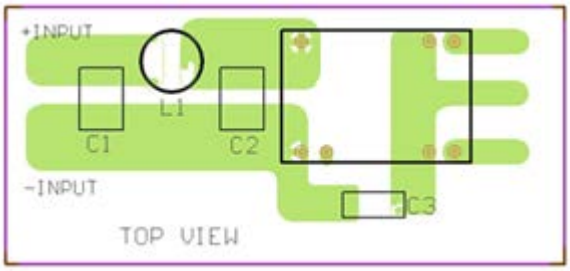

**RG24S5W3 Efficiency vs Output Load**



### Recommended Filter for EN55022 Class B Compliance




### Recommended EN55022 Class B Filter Circuit Layout

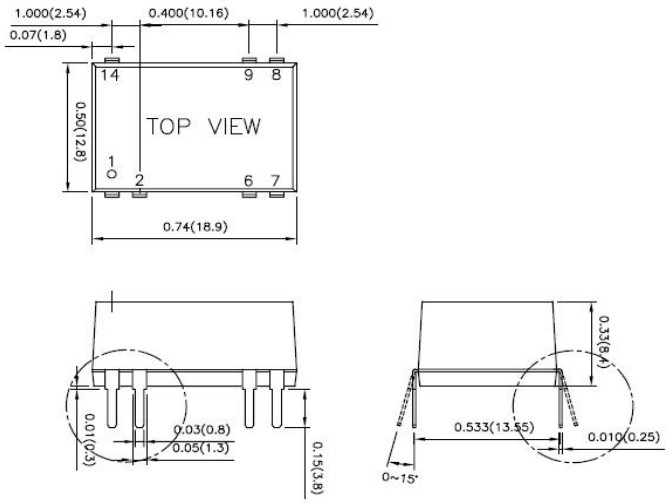



| | C1 | C2 | C3 | L1 |
|---|---|---|---|---|
| RG5xxxW3 | 6.8µF/25V 1812 MLCC | N/A | 220pF/3KV 1808 MLCC | 10µH 0504 SMD Inductor PMT-059 |
| RG12xxxW3 | 4.7µF/50V 1812 MLCC | 4.7µF/50V 1812 MLCC | 220pF/3KV 1808 MLCC | 12µH 0504 SMD Inductor PMT-062 |
| RG24xxxW3 | 4.7µF/50V 1812 MLCC | 4.7µF/50V 1812 MLCC | 220pF/3KV 1808 MLCC | 18µH 0504 SMD Inductor PMT-046 |
| RG48xxxW3 | 4.7µF/100V 1812 MLCC | 4.7µF/100V 1812 MLCC | 220pF/3KV 1808 MLCC | 18µH 0504 SMD Inductor PMT-046 |

## MECHANICAL DRAWINGS

### DIP TYPE

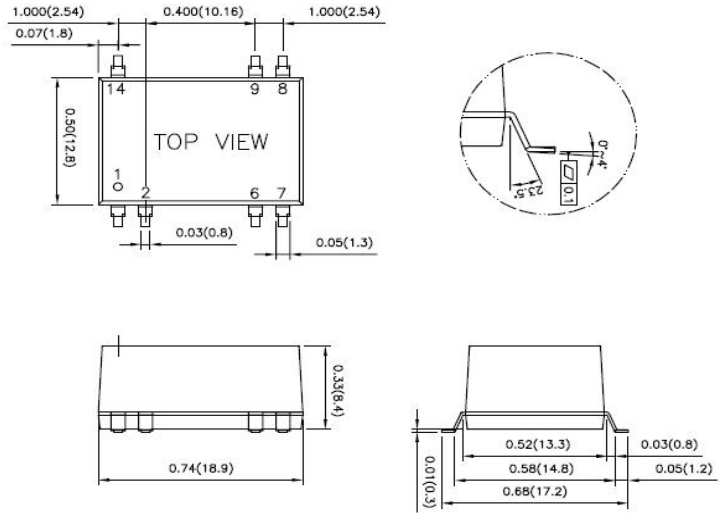
Unit: inches (mm)




| PIN CONNECTIONS | | |
|---|---|---|
| Pin | Single | Dual |
| 1 | -Input | -Input |
| 2 | ON/OFF | ON/OFF |
| 6 | NC | Common |
| 7 | NC | -Output |
| 8 | +Output | +Output |
| 9 | -Output | Common |
| 14 | +Input | +Input |

### SMT TYPE (Suffix “S”)

Unit: inches (mm)




| PIN CONNECTIONS | | |
|---|---|---|
| Pin | Single | Dual |
| 1 | -Input | -Input |
| 2 | ON/OFF | ON/OFF |
| 6 | NC | Common |
| 7 | NC | -Output |
| 8 | +Output | +Output |
| 9 | -Output | Common |
| 14 | +Input | +Input |

1. Tolerance: x.xx±0.02 (x.x±0.5)
   x.xxx±0.01 (x.xx±0.25)
2. Pin Pitch Tolerance: ±0.01 (0.25)
3. Pin Dimension Tolerance: ±0.004 (0.1)

## COMPANY INFORMATION

Wall Industries, Inc. has created custom and modified units for over 50 years. Our in-house research and development engineers will provide a solution that exceeds your performance requirements on-time and on budget. Our ISO9001-2008 certification is just one example of our commitment to producing a high quality, well-documented product for our customers.

Our past projects demonstrate our commitment to you, our customer. Wall Industries, Inc. has a reputation for working closely with its customers to ensure each solution meets or exceeds form, fit and function requirements. We will continue to provide ongoing support for your project above and beyond the design and production phases. Give us a call today to discuss your future projects.

Contact **Wall Industries** for further information:


| | |
|---|---|
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