**Features**

- 4:1 wide Input range: 9~36V, 18~75V & 43~160VDC
- Single output, up to 12.5A / 150 watts
- Rail EN50155 compliance
- High power density package
- High efficiency up to 88%
- Regulated output & Short circuit protection
- 2250VDC isolation
- Remote ON / OFF, Positive Logic (Negative Logic option)
- High operating temperature up to +85°C
- Zero load operation
- External Output voltage trim
- Heatsink – HC or DIN Rail Mount option - DN
- EMC EN55022 Class A (Class B option)

**Specifications**

**Input Voltage**

- 24VDC (9 ~ 36)
- 48VDC (18 ~ 75)
- 110VDC (43~160)

**Input Filter**

Common choke +Pi type

**Start-up Voltage**

- 24V input: 8.8V typ.
- 48V input: 17.6V typ.

**Shutdown Voltage**

- 24V input: 8.2V typ.
- 110V input: 36V typ.

**Input Surge Voltage**

- 24V: 50VDC
- 48V: 100VDC
- 110V: 185VDC

**Input Reverse Voltage**

- Protection: External input fuse required
- Start Up time: Typically 35mS constant resistive load

**Remote ON/OFF**

- DC-DC ON: Open or 3.0V < Vr < 12V
- DC-DC OFF: Short or 0V < Vr < 1.2V

**Positive Logic - Standard**

- DC-DC ON: Short or 0V < Vr < 1.2V
- DC-DC OFF: Open or 3.0V < Vr < 12V

**Input Reverse Voltage Protection**

- Input current of remote control pin: 0.5mA~ 1.0mA
- Remote off state input current: 3.5mA
- Output power: 150 watts
- Voltage Accuracy: ±1.0%
- Output Voltage Trim: +0% to +20% External voltage trim
- Minim Load: Zero
- Line Regulation: ±0.2% Low line to High Line @ FL
- Load Regulation: ±0.4% No load to Full load
- Remote Sense: N/A
- Ripple & noise: See table. 20MHZ bandwidth
- Temp. Coefficient: ±0.02% / °C
- Transient Response: 200uS (25% load step change)
- Over Voltage Protection: Set at 125 ~140% of Voltage output nominal. Hiccup type
- Overload Protection: Set at 105 ~ 120% of output current, Constant Current. (note 9)
- Short Circuit protection: Continuous hiccup mode

**Efficiency**

Model dependant 86 ~ 88%

**Isolation**

- Input – Output: 2250VDC
- Input / Output – Case: 1600VDC
- Input Surge Voltage: 24V: 50VDC
- 48V: 100VDC
- 110V: 185VDC

**Efficiency**

3500pF

**Switching Freq.**

225-330KHz

**Safety**

EN60950-1, UL60950-1

**Case Material**

Aluminium

**Base Material**

Aluminium

**Potting**

Silicon UL94-V0

**Dimensions**

98 x 65 x 35mm (with HC Heatsink)

**Weight**

225g

**MTBF**

1.353 x 10^5Hrs

**Operating Temp**

-40°C to +85°C (with derating)

**Case Temp**

+100°C maximum case temperature

**Over Temp. Protection**

Shutdown approx 110°C case temperature

**Thermal Impedance**

2.73°C / watt without heatsink

2.18°C / watt with optional heatsink

**Thermal shock**

MIL-STD-810F

**Vibration**

MIL-STD-810F

**Humidity**

5-95% RH

**EMC**

EN55022 Class A (see note 6)

**ESD**

EN61000-4-2

**Radiated Immunity**

EN61000-4-3

**Fast Transients**

EN61000-4-4

**Surge**

EN61000-4-5

**Conducted Immunity**

EN61000-4-6

**REV (07-01-14)**

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## WAF150 SERIES

**DC/DC Converter Single Output: 150 Watts**

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Input Range</th>
<th>Output Voltage</th>
<th>Output Current</th>
<th>Output (3)</th>
<th>No load (2)</th>
<th>Eff (3) (%)</th>
<th>Capacitor Load max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAF150-24S12W-HC</td>
<td>9 ~ 36 V</td>
<td>12 VDC</td>
<td>0mA</td>
<td>12.5 A</td>
<td>100mVp-p</td>
<td>70mA</td>
<td>86</td>
</tr>
<tr>
<td>WAF150-24S15W-HC</td>
<td>9 ~ 36 V</td>
<td>15 VDC</td>
<td>0mA</td>
<td>10 A</td>
<td>100mVp-p</td>
<td>80mA</td>
<td>86</td>
</tr>
<tr>
<td>WAF150-24S24W-HC</td>
<td>9 ~ 36 V</td>
<td>24 VDC</td>
<td>0mA</td>
<td>6.3 A</td>
<td>200mVp-p</td>
<td>95mA</td>
<td>87</td>
</tr>
<tr>
<td>WAF150-24S28W-HC</td>
<td>9 ~ 36 V</td>
<td>28 VDC</td>
<td>0mA</td>
<td>5.4 A</td>
<td>200mVp-p</td>
<td>120mA</td>
<td>87</td>
</tr>
<tr>
<td>WAF150-24S48W-HC</td>
<td>9 ~ 36 V</td>
<td>48 VDC</td>
<td>0mA</td>
<td>3.2 A</td>
<td>350mVp-p</td>
<td>130mA</td>
<td>86</td>
</tr>
<tr>
<td>WAF150-48S12W-HC</td>
<td>18 ~ 75 V</td>
<td>12 VDC</td>
<td>0mA</td>
<td>12.5 A</td>
<td>100mVp-p</td>
<td>50mA</td>
<td>87</td>
</tr>
<tr>
<td>WAF150-48S15W-HC</td>
<td>18 ~ 75 V</td>
<td>15 VDC</td>
<td>0mA</td>
<td>10 A</td>
<td>100mVp-p</td>
<td>60mA</td>
<td>87</td>
</tr>
<tr>
<td>WAF150-48S24W-HC</td>
<td>18 ~ 75 V</td>
<td>24 VDC</td>
<td>0mA</td>
<td>6.3 A</td>
<td>200mVp-p</td>
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<td>88</td>
</tr>
<tr>
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<td>18 ~ 75 V</td>
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</tr>
<tr>
<td>WAF150-48S48W-HC</td>
<td>18 ~ 75 V</td>
<td>48 VDC</td>
<td>0mA</td>
<td>3.2 A</td>
<td>350mVp-p</td>
<td>70mA</td>
<td>87</td>
</tr>
<tr>
<td>WAF150-110S12W-HC</td>
<td>43 ~ 160 V</td>
<td>12 VDC</td>
<td>0mA</td>
<td>12.5 A</td>
<td>100mVp-p</td>
<td>25mA</td>
<td>87</td>
</tr>
<tr>
<td>WAF150-110S15W-HC</td>
<td>43 ~ 160 V</td>
<td>15 VDC</td>
<td>0mA</td>
<td>10 A</td>
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<td>87</td>
</tr>
<tr>
<td>WAF150-110S24W-HC</td>
<td>43 ~ 160 V</td>
<td>24 VDC</td>
<td>0mA</td>
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</tr>
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<td>3.2 A</td>
<td>350mVp-p</td>
<td>35mA</td>
<td>87</td>
</tr>
</tbody>
</table>

### Notes:
1. **BELLCORE TR-NWT-00032**: Case 1: 50% Stress, Temperature at 40°C.
   MIL-HDBK-217F Notice2 @Ta=40 ºC, Full load , Air Flow = 400LFM (Ground, Benign, controlled environment).
2. Typical value at nominal input and no load.
3. Typical value at nominal input and full load. (20MHz BW.)
4. Test by minimum input and constant resistive load.
5. The CTRL pin voltage is referenced to -VIN. The negative logic is optional.
6. To order negative logic ON-OFF control adds the suffix -N (Ex: WAF150-24S24W-N).
7. An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5.
   The filter capacitor Power Mate suggest: 24V input : Nippon chemi-con KY series, 470μF/50V, ESR 45mΩ.
   48VDC input : Nippon chemi-con KY series, 220μF/100V, ESR 48mΩ.
   110VDC input : Nippon chemi-con KXJ series, 150μF/200V.
8. Use a resistor across on the Trim1 and Trim2 to adjust the output voltage.
9. The CC Mode is Constant Current Mode and test by nominal input.
10. Thermal test at WAF(D)150 mount on metal base-plate. (The base-plate dimension is 19” * 3.5” * 0.063” The height is EIA standard 2U.)
    Heat-sink is optional and P/N is “7G-0058A-F”.

### CAUTION:
This power module is not internally fused, an input line fuse must always be used. If the load was having sourcing capability (Ex: Battery or Super Capacitor), an output line fuse must always be used.

### Part No & Options:

<table>
<thead>
<tr>
<th>WAF</th>
<th>150</th>
<th>24</th>
<th>S</th>
<th>12</th>
<th>W</th>
<th>N</th>
<th>F</th>
<th>HC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series Name</td>
<td>Power</td>
<td>Input Voltage</td>
<td>Single Output</td>
<td>Output Voltage</td>
<td>Wide Input</td>
<td>Logic Option</td>
<td>Filter Option</td>
<td>Top Heatsink</td>
</tr>
<tr>
<td>WAF 150</td>
<td>24</td>
<td>9-36V</td>
<td>12</td>
<td>15</td>
<td>24</td>
<td>28</td>
<td>48</td>
<td>Std F Class B</td>
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<tr>
<td>WAD 48</td>
<td>18-75V</td>
<td>43-160V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## WAF150 SERIES

**DC/DC Converter Single Output: 150 Watts**

### WAF(D)150-24S12W Derating Curve

![WAF(D)150-24S12W Derating Curve](image1)

**Derating Output Current versus Ambient Temperature with iron base-plate and Airflow, Vin = Vin(nom)**

(The base-plate dimension is 19” * 3.5” * 0.063”. The height is EIA standard 2U.)

### WAF(D)150-48S24W Derating Curve

![WAF(D)150-48S24W Derating Curve](image2)

**Derating Output Current Versus Ambient Temperature with iron base-plate, heat-sink and Airflow, Vin = Vin(nom)**

(The base-plate dimension is 19” * 3.5” * 0.063”. The height is EIA standard 2U. Heat-sink is optional and P/N: 7G-0058A-F.)

### WAF(D)150-xxxS12W, Vout & Iout Curve

![WAF(D)150-xxxS12W Vout & Iout Curve](image3)

**CV Region:** In normal operation. The output current in spec.

**Condition:** Resistance Load > Vout / Iout (CC Point)

**CC Region:** If the output load current are over rating. The output current will keep in a constant value. And output voltage will fall.

**Condition:** Resistance Load < Vout / Iout (CC Point)

**Hiccup Protection:** If the output resistance is become short. It will operate in hiccup protection.

**Condition:** Vout < 4.3V (typ.) to Output Short. (WAF(D)150-xxxS12W, WAF(D)150-xxxS15W)

Vout < 8.0V (typ.) to Output Short. (WAF(D)150-xxxS24W, WAF(D)150-xxxS28W)

Vout < 13V (typ.) to Output Short. (WAF(D)150-xxxS48W)

### WAF(D)150-xxxS15W, Vout & Iout Curve

![WAF(D)150-xxxS15W Vout & Iout Curve](image4)

### WAF(D)150-xxxS24W, Vout & Iout Curve

![WAF(D)150-xxxS24W Vout & Iout Curve](image5)

### WAF(D)150-xxxS28W, Vout & Iout Curve

![WAF(D)150-xxxS28W Vout & Iout Curve](image6)

### WAF(D)150-xxxS48W, Vout & Iout Curve

![WAF(D)150-xxxS48W Vout & Iout Curve](image7)

### Note:

- **CV Region:** In normal operation. The output current in spec.
  - **Condition:** Resistance Load > Vout / Iout (CC Point)

- **CC Region:** If the output load current are over rating. The output current will keep in a constant value. And output voltage will fall.
  - **Condition:** Resistance Load < Vout / Iout (CC Point)

- **Hiccup Protection:** If the output resistance is become short. It will operate in hiccup protection.
  - **Condition:** Vout < 4.3V (typ.) to Output Short. (WAF(D)150-xxxS12W, WAF(D)150-xxxS15W)
    - Vout < 8.0V (typ.) to Output Short. (WAF(D)150-xxxS24W, WAF(D)150-xxxS28W)
    - Vout < 13V (typ.) to Output Short. (WAF(D)150-xxxS48W)

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WAF150 SERIES
DC/DC Converter Single Output: 150 Watts

WAD150 with meet EN55022 class B Filter Module dimensions

Heat-sink Type: 7G-0058A-F

Pin Connections

<table>
<thead>
<tr>
<th>PIN</th>
<th>Define</th>
<th>Recommend Matching Wire</th>
<th>Recommend Screwing Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+VIN</td>
<td>14~16AWG</td>
<td>0.25N.M (2.5kgf.cm)</td>
</tr>
<tr>
<td>2</td>
<td>+VIN</td>
<td>14~16AWG</td>
<td>0.25N.M (2.5kgf.cm)</td>
</tr>
<tr>
<td>3</td>
<td>-VIN</td>
<td>14~16AWG</td>
<td>0.25N.M (2.5kgf.cm)</td>
</tr>
<tr>
<td>4</td>
<td>-VIN</td>
<td>14~16AWG</td>
<td>0.25N.M (2.5kgf.cm)</td>
</tr>
<tr>
<td>5</td>
<td>CTRL</td>
<td>14~24AWG</td>
<td>0.25N.M (2.5kgf.cm)</td>
</tr>
<tr>
<td>6</td>
<td>+VOUT</td>
<td>14~16AWG</td>
<td>0.25N.M (2.5kgf.cm)</td>
</tr>
<tr>
<td>7</td>
<td>-VOUT</td>
<td>14~16AWG</td>
<td>0.25N.M (2.5kgf.cm)</td>
</tr>
<tr>
<td>8</td>
<td>TRIM 1</td>
<td>14~24AWG</td>
<td>0.25N.M (2.5kgf.cm)</td>
</tr>
<tr>
<td>9</td>
<td>TRIM 2</td>
<td>14~24AWG</td>
<td>0.25N.M (2.5kgf.cm)</td>
</tr>
</tbody>
</table>

External Output V Trim

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