



WAF150



WAD150

APPLICATIONS

Wireless Network
Telecom/Datacom
Industry Control System
Distributed Power Architectures
Semiconductor Equipment
Battery charger

FEATURES

- 200 WATTS MAXIMUM OUTPUT POWER
- 4:1 ULTRA WIDE INPUT RANGE
- HIGH EFFICIENCY UP TO 89%
- CV+CC MODE
- NO MINIMUM LOAD REQUIRED
- ADJUSTABLE OUTPUT VOLTAGE
- INPUT UNDER-VOLTAGE LOCKOUT
- INPUT REVERSE PROTECTION
- MEET EN55022 CLASS A WITHOUT EXTERNAL COMPONENTS
- CE MARK MEETS 2006/95/EC, 2011/95/EC AND 2004/108/EC
- SAFETY MEETS UL60950-1, EN60950-1 AND IEC60950-1
- SIX-SIDED METAL SHIELDING
- WALL MOUNT APPLICATION
- TOP SIDE AND BOTTOM SIDE HEAT DISSIPATION

OPTIONS

- Negative logic remote ON/OFF
- WAD150 with EMI Filter Module
- Heat-sinks available for extended operation

DESCRIPTION

WAF(D)150-SERIES DC/DC converters provide up to 200 watts of output power. All model features a ultra wide input range, adjustable output voltage and constant current mode output limit. The WAF(D)150 converters are especially suited to telecom, networking and industrial applications.

TECHNICAL SPECIFICATION

All specifications are typical at nominal input, full load and 25°C otherwise noted

OUTPUT SPECIFICATIONS

| | | |
|-----------------------------------|--|--------------------------------|
| Output power (Rated) | Normal Vout and Iout | 150 Watts |
| Output power (Maximum) | Vout trim to maximum. and CC mode Iout | 200 Watts |
| Voltage accuracy | | ± 1.0% |
| Minimum load | | 0% |
| Voltage adjustability (Note 8) | | 0% ~ +20% |
| Line regulation | LL to HL at FL | ± 0.2% |
| Load regulation | No Load to Full Load | ± 0.4% |
| Temperature coefficient | | ±0.02% / °C, max. |
| Transient response recovery time | 25% load step change | 200µs |
| Over voltage protection threshold | Hiccup | 125% ~ 140% of Vout(nom) |
| Over Load protection threshold | CC Mode (Note 9) | 105% ~ 120% of Full Load |
| Short circuit protection | | Continuous, automatic recovery |

GENERAL SPECIFICATIONS

| | | |
|-----------------------------|--|--|
| Efficiency | | See table |
| Isolation voltage | Input to Output Input(Output) to Case | 2250VDC, min. 1minute 1600VDC, min. 1minute |
| Isolation resistance | 500VDC | 10 ⁹ ohms ,min. |
| Isolation capacitance | | 3500pF, max. |
| Switching frequency | 24VDC input | 48Vout 275kHz±10% |
| | 48VDC input | Others 300kHz±10% |
| | 110VDC input | 225kHz±10% |
| Design meet safety standard | | IEC60950-1, UL60950-1, EN60950-1 |
| Case material | | Aluminum |
| Base material | | Aluminum |
| Potting material | | Silicone (UL94-V0) |
| Dimensions | WAF150 | 3.86X2.560X0.67 Inch (98X65.0X17 mm) |
| | WAD150 | 3.86X2.067X0.67 Inch (98X52.5X17 mm) |
| Weight | WAF150 | 225g (7.94oz.) |
| | WAD150 | 220g (7.76oz.) |
| MTBF (Note 1) | MIL-HDBK-217F | 4.954 x 10 ⁵ hrs |

INPUT SPECIFICATIONS

| | | |
|-------------------------------------|---|--------------------------|
| Input voltage range | 24VDC nominal input | 9 ~ 36VDC |
| | 48VDC nominal input | 18 ~ 75VDC |
| | 110VDC nominal input | 43 ~ 160VDC |
| Start-up voltage | 24VDC input | 9VDC, max. |
| | 48VDC input | 18VDC, max. |
| | 110VDC input | 43VDC, max. |
| Shutdown voltage | 24VDC input | 7.9 ~ 8.5VDC |
| | 48VDC input | 15.6 ~ 16.8VDC |
| | 110VDC input | 33.0 ~ 36.0VDC |
| Input filter | | Common choke + PI type |
| Input surge voltage | 24VDC input | 50VDC 1sec, max. |
| | 48VDC input | 100VDC 1sec, max. |
| | 110VDC input | 185VDC 1sec, max. |
| Input reverse polarity protection | | Input Parallel diode |
| Start up time | Nominal input and constant resistive load | Power up 35ms, max. |
| | | Remote ON/OFF 35ms, max. |
| Remote ON/OFF (Note 5) | | |
| Positive logic (standard) | DC-DC ON | Open or 3V < Vr < 12V |
| | DC-DC OFF | Short or 0V < Vr < 1.2V |
| Negative logic (option) | DC-DC ON | Short or 0V < Vr < 1.2V |
| | DC-DC OFF | Open or 3V < Vr < 12V |
| Input current of remote control pin | Nominal input | -0.5mA ~ 1.0mA |
| Remote off state input current | Nominal input | 3.5mA |

ENVIRONMENTAL SPECIFICATIONS

| | | |
|--|---|----------------|
| Operating case temperature | | -40°C ~ +100°C |
| Maximum case temperature | | +100°C |
| Storage temperature range | | -55°C ~ +125°C |
| Over temperature protection (case temperature) | | 110°C |
| Thermal impedance (Note 10) | Only mount on the iron base-plate. | 2.55°C/Watt |
| | Mount on the iron base-plate and top side with 7G-0058A Heat-sink | 2.0°C/Watt |
| Thermal shock | | MIL-STD-810F |
| Vibration | | MIL-STD-810F |
| Relative humidity | | 5% to 95% RH |

EMC CHARACTERISTICS

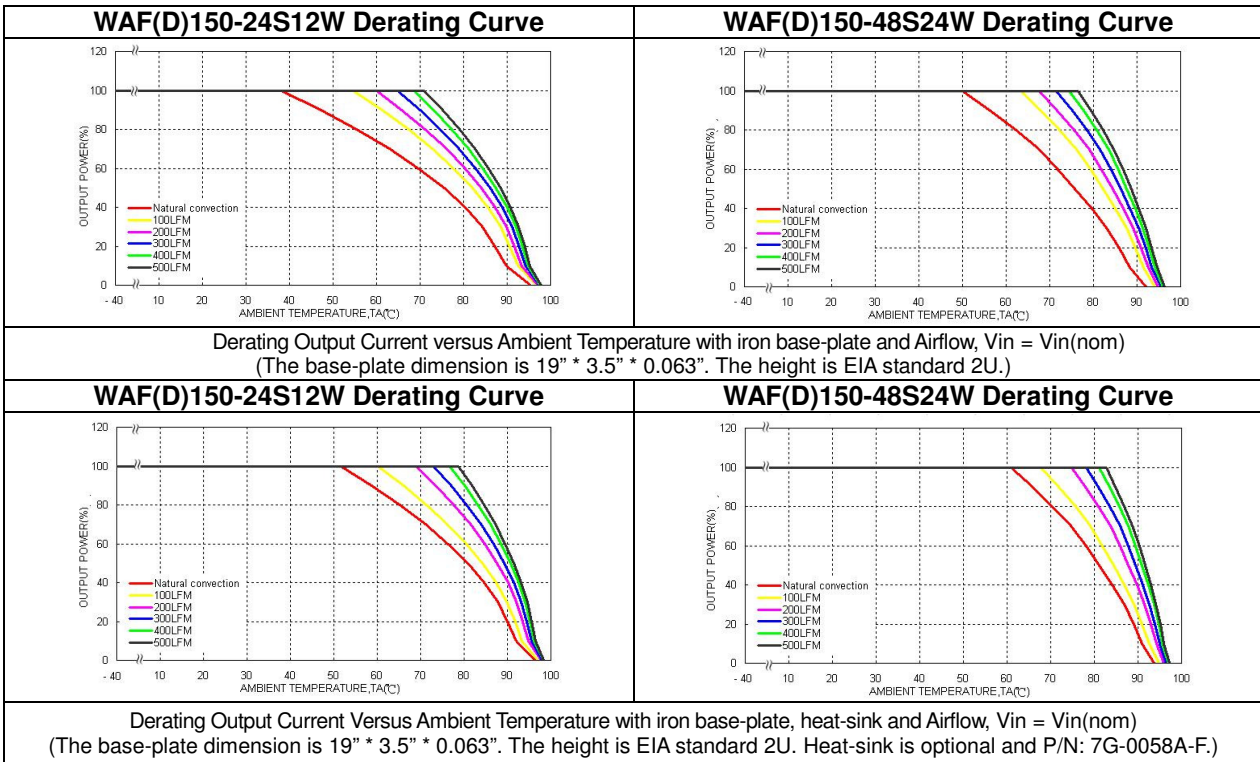
| | | | |
|-------------------------|-------------|------------------|------------------|
| EMI (Note 6) | EN55022 | | Class A |
| ESD | EN61000-4-2 | Air Contact | ± 8kV ± 6kV |
| | | Perf. Criteria A | |
| Radiated immunity | EN61000-4-3 | 10 V/m | Perf. Criteria A |
| Fast transient (Note 7) | EN61000-4-4 | ± 2kV | Perf. Criteria A |
| Surge (Note 7) | EN61000-4-5 | ± 1kV | Perf. Criteria A |
| Conducted immunity | EN61000-4-6 | 10 Vr.m.s | Perf. Criteria A |

| Model Number | Input Range | Output Voltage | Output Current | | Output ⁽³⁾ Ripple & Noise | No load ⁽²⁾ Input Current | Eff ⁽³⁾ (%) | Capacitor ⁽⁴⁾ Load max. |
|----------------------------------|--------------|----------------|----------------|-----------|---|---|---------------------------|---------------------------------------|
| | | | Min. load | Full load | | | | |
| WAF150-24S12W WAD150-24S12W | 9 ~ 36 VDC | 12 VDC | 0mA | 12.5 A | 100mVp-p | 70mA | 86 | 40000μF |
| WAF150-24S15W WAD150-24S15W | 9 ~ 36 VDC | 15 VDC | 0mA | 10 A | 100mVp-p | 80mA | 86 | 26000μF |
| WAF150-24S24W WAD150-24S24W | 9 ~ 36 VDC | 24 VDC | 0mA | 6.3 A | 200mVp-p | 95mA | 87 | 10000μF |
| WAF150-24S28W WAD150-24S28W | 9 ~ 36 VDC | 28 VDC | 0mA | 5.4 A | 200mVp-p | 120mA | 87 | 7600μF |
| WAF150-24S48W WAD150-24S48W | 9 ~ 36 VDC | 48 VDC | 0mA | 3.2 A | 350mVp-p | 130mA | 86 | 2600μF |
| WAF150-48S12W WAD150-48S12W | 18 ~ 75 VDC | 12 VDC | 0mA | 12.5 A | 100mVp-p | 50mA | 87 | 40000μF |
| WAF150-48S15W WAD150-48S15W | 18 ~ 75 VDC | 15 VDC | 0mA | 10 A | 100mVp-p | 60mA | 87 | 26000μF |
| WAF150-48S24W WAD150-48S24W | 18 ~ 75 VDC | 24 VDC | 0mA | 6.3 A | 200mVp-p | 60mA | 88 | 10000μF |
| WAF150-48S28W WAD150-48S28W | 18 ~ 75 VDC | 28 VDC | 0mA | 5.4 A | 200mVp-p | 70mA | 88 | 7600μF |
| WAF150-48S48W WAD150-48S48W | 18 ~ 75 VDC | 48 VDC | 0mA | 3.2 A | 350mVp-p | 70mA | 87 | 2600μF |
| WAF150-110S12W WAD150-110S12W | 43 ~ 160 VDC | 12 VDC | 0mA | 12.5 A | 100mVp-p | 25mA | 87 | 40000μF |
| WAF150-110S15W WAD150-110S15W | 43 ~ 160 VDC | 15 VDC | 0mA | 10 A | 100mVp-p | 25mA | 88 | 26000μF |
| WAF150-110S24W WAD150-110S24W | 43 ~ 160 VDC | 24 VDC | 0mA | 6.3 A | 200mVp-p | 25mA | 88 | 10000μF |
| WAF150-110S28W WAD150-110S28W | 43 ~ 160 VDC | 28 VDC | 0mA | 5.4 A | 200mVp-p | 25mA | 89 | 7600μF |
| WAF150-110S48W WAD150-110S48W | 43 ~ 160 VDC | 48 VDC | 0mA | 3.2 A | 350mVp-p | 35mA | 87 | 2600μF |

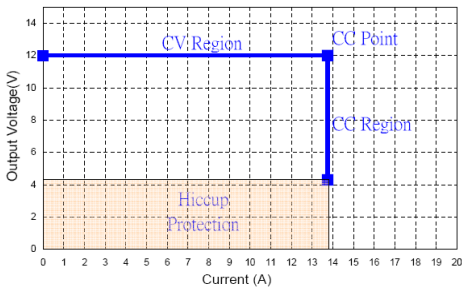
Note:

- MIL-HDBK-217F @Tc=70 °C, Full load.
- Typical value at nominal input and no load.
- Typical value at nominal input and full load. (20MHz BW.)
- Test by minimum input and constant resistive load.
- The CTRL pin voltage is referenced to -VIN. The negative logic is optional.
To order negative logic ON-OFF control adds the suffix -N (Ex: WAF150-24S24W-N).
- The WAF(D)150 series meets EN55022 class A without external components.
- 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: 24VDC input : Nippon chemi-con KY series, 470μF/50V.
48VDC input : Nippon chemi-con KY series, 220μF/100V.
110VDC input : Nippon chemi-con KXJ series, 150μF/200V.
- Use a resistor across on the Trim1 and Trim2 to adjust the output voltage.
- The CC Mode is Constant Current Mode and test by nominal input.
- Thermal test at WAF(D)150 mount on the iron base-plate. (The iron 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".

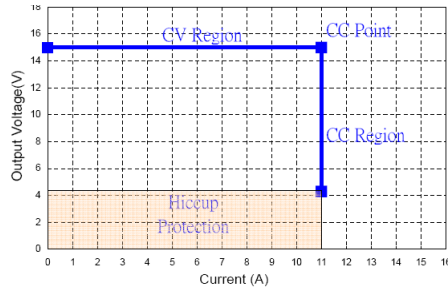
CAUTION: This power module is not internally fused, an input line fuse must always be used. If the load was having sourcing capability (Ex: Battery or Super Capacitor), an output line fuse must always be used.



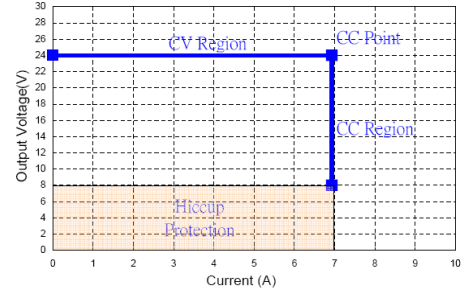
WAF(D)150-xxxS12W Vout & Iout Curve



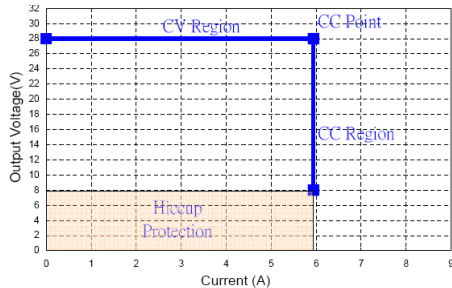
WAF(D)150-xxxS15W Vout & Iout Curve



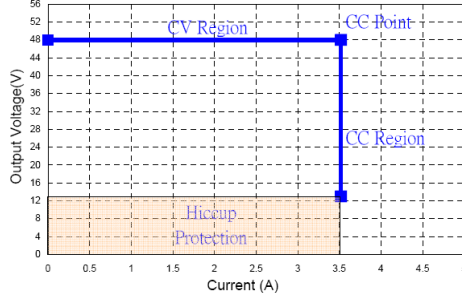
WAF(D)150-xxxS24W Vout & Iout Curve



WAF(D)150-xxxS28W Vout & Iout Curve



WAF(D)150-xxxS48W Vout & Iout Curve

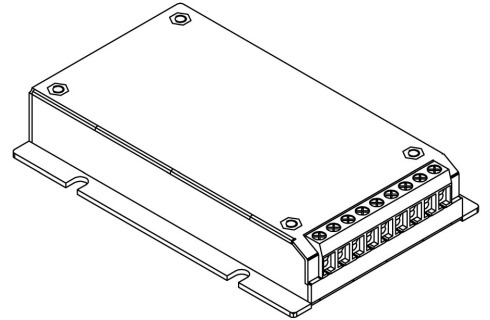
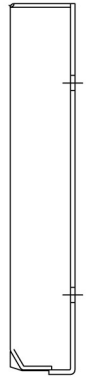
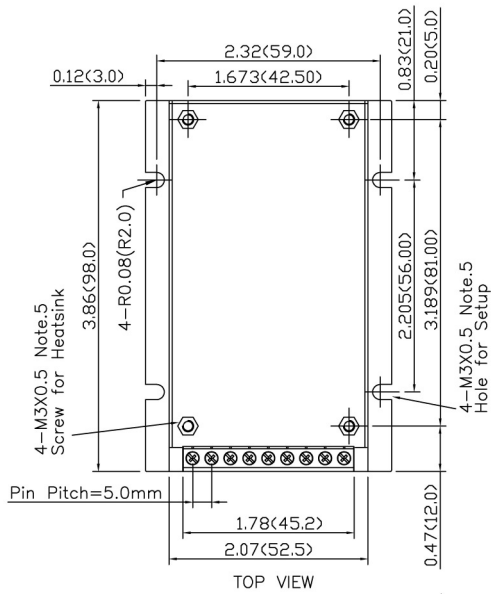


Note:

- CV Region: In normal operation. The output current in spec.
Condition: Resistance Load > V_{out} / I_{out} (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 < V_{out} / I_{out} (CC Point)
- Hiccup Protection: If the output resistance is become short. It will operate in hiccup protection.
Condition: $V_{out} < 4.3V$ (typ.) to Output Short. (WAF(D)150-xxxS12W, WAF(D)150-xxxS15W)
 $V_{out} < 8.0V$ (typ.) to Output Short. (WAF(D)150-xxxS24W, WAF(D)150-xxxS28W)
 $V_{out} < 13V$ (typ.) to Output Short. (WAF(D)150-xxxS48W)

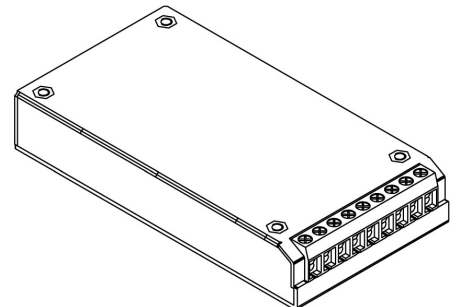
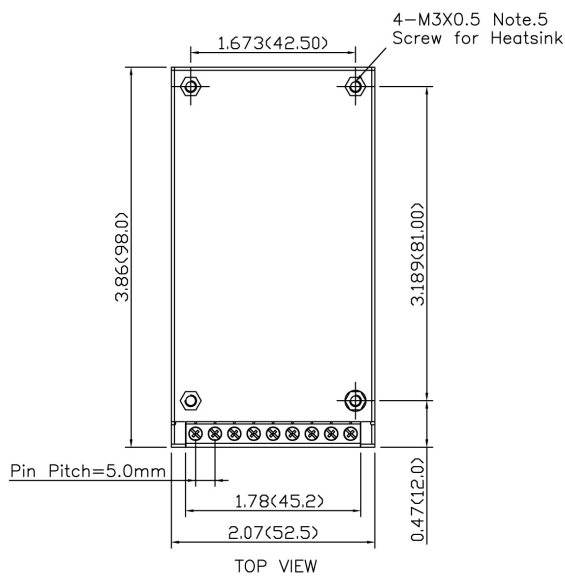
Mechanical Drawing:

WAF150 dimensions



- Note:1.All dimensions in Inch(mm)
 2.Pin pitch tolerance $\pm 0.25\text{mm}$
 3.Tolerance : $x.xx \pm 0.02(x.x \pm 0.5)$
 $x.xxx \pm 0.01(x.xx \pm 0.25)$
 4.Terminal Block Pin Pitch:5.0mm
 5.The screw locked torque:
 MAX 5.0kgf-cm/0.49N-m

WAD150 dimensions

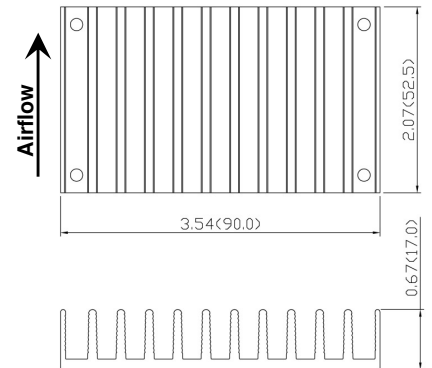
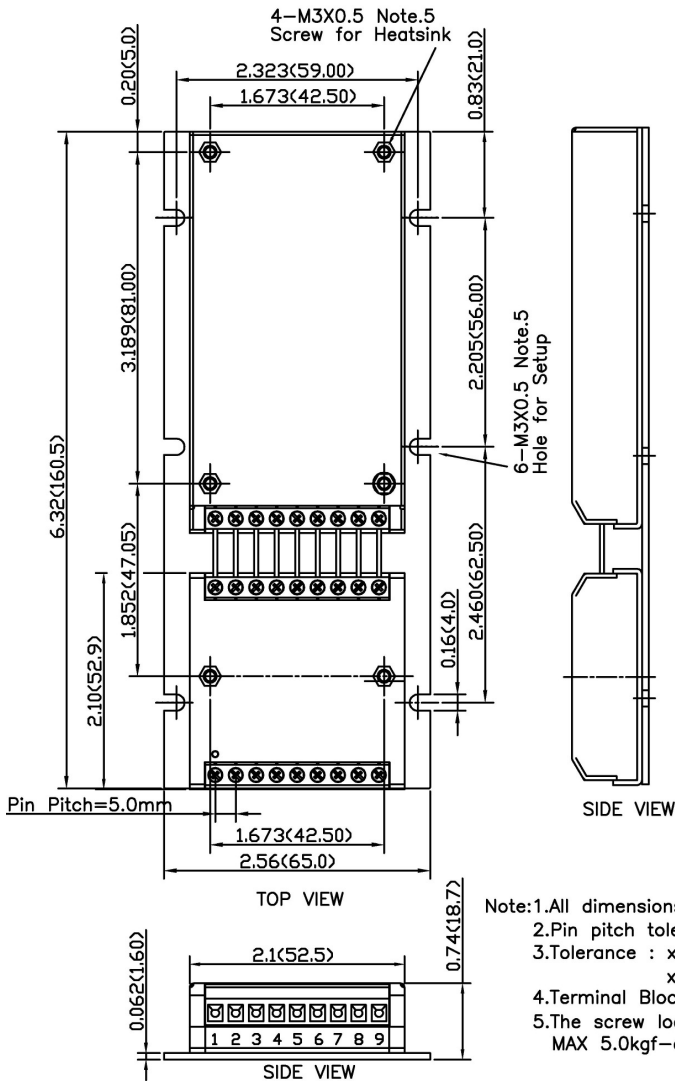


- Note:1.All dimensions in Inch(mm)
 2.Pin pitch tolerance $\pm 0.25\text{mm}$
 3.Tolerance : $x.xx \pm 0.02(x.x \pm 0.5)$
 $x.xxx \pm 0.01(x.xx \pm 0.25)$
 4.Terminal Block Pin Pitch:5.0mm
 5.The screw locked torque:
 MAX 5.0kgf-cm/0.49N-m

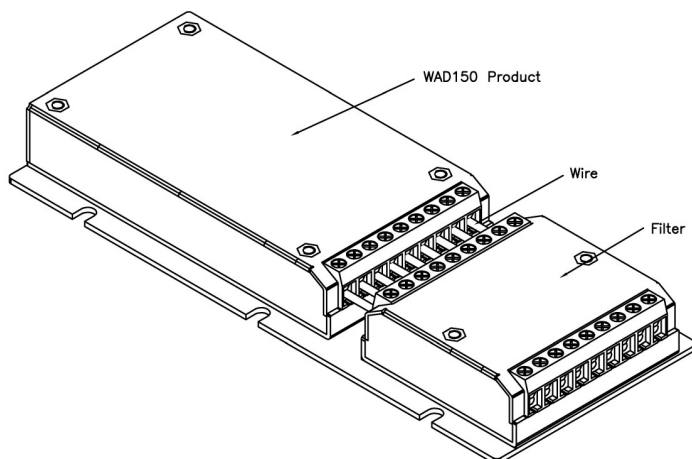
WAD150 with meet EN55022 class B Filter Module dimensions

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

Suffix:-HC

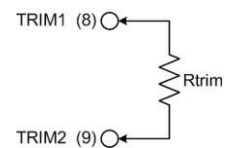


| PIN CONNECTION | | | |
|----------------|--------|-------------------------|---------------------------|
| PIN | Define | Recommend Matching Wire | Recommend Screwing Torque |
| 1 | +VIN | 14~16AWG | 0.25N.M(2.5kgf.cm) |
| 2 | +VIN | 14~16AWG | 0.25N.M(2.5kgf.cm) |
| 3 | -VIN | 14~16AWG | 0.25N.M(2.5kgf.cm) |
| 4 | -VIN | 14~16AWG | 0.25N.M(2.5kgf.cm) |
| 5 | CTRL | 14~24AWG | 0.25N.M(2.5kgf.cm) |
| 6 | +VOUT | 14~16AWG | 0.25N.M(2.5kgf.cm) |
| 7 | -VOUT | 14~16AWG | 0.25N.M(2.5kgf.cm) |
| 8 | TRIM 1 | 14~24AWG | 0.25N.M(2.5kgf.cm) |
| 9 | TRIM 2 | 14~24AWG | 0.25N.M(2.5kgf.cm) |



EXTERNAL OUTPUT TRIMMING

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





Part number structure:

WAF WAD 150 - 24 S 12 W - N F HC

Series Name

Max. Output Power
150Watts

Input Voltage
24 : 9 ~ 36VDC
48 : 18 ~ 75VDC
110 : 43 ~ 160VDC

Single Output

Output Voltage
12 : 12VDC
15 : 15VDC
24 : 24VDC
28 : 28VDC
48 : 48VDC

| PRODUCT OPTION | | Suffix |
|----------------|--------------------------------|--------|
| Heat-sink | H=0.670" Horizontal 7G-0058A-F | -HC |

| PRODUCT OPTION | | Suffix |
|------------------------------------|--|--------|
| Meet EN55022 Class B Filter Module | | -F |

| PRODUCT OPTION | | Suffix |
|------------------------------------|--|--------|
| Positive logic remote ON/OFF logic | | - |
| Negative logic remote ON/OFF logic | | -N |

4 : 1 Wide Input Voltage Range

Note: The EN55022 Class B filter module (suffix -F) for WAD150 series adds only, not for WAF150 series. (Ex: WAD150-24S24W-F)