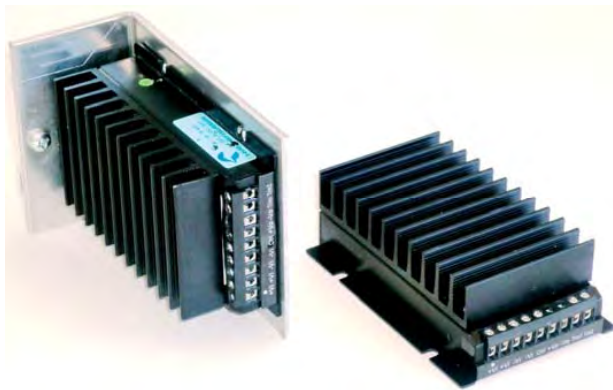
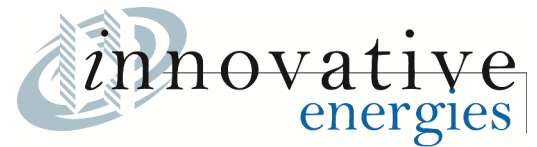


# WAF150 SERIES

DC/DC Converter Single Output: 150 Watts



DIN Rail -Option

STD-Panel Mount / HC

## 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

<b>Input Voltage</b>	24VDC ( 9 ~ 36 ) 48VDC ( 18 ~ 75 ) 110VDC ( 43~160 )	<b>Efficiency</b>	Model dependant 86 ~ 88%
<b>Input Filter</b>	Common choke +Pi type	<b>Isolation</b>	Input – Output: 2250VDC Input / Output – Case: 1600VDC
<b>Start-up Voltage</b>	24V input: 8.8V typ. 48V input: 17.6V typ. 110V input: 43V typ.	<b>Isolation Cap.</b>	3500pF
<b>Shutdown Voltage</b>	24V input: 8.2V typ. 48V input: 16.2V typ. 110V input: 36V typ.	<b>Switching Freq.</b>	225-330KHz
<b>Input Surge Voltage.</b> ( 1 sec )	24V: 50VDC. 48V: 100VDC 110V: 185VDC	<b>Safety</b>	EN60950-1, UL60950-1 EN50155 ( with optional filter )
<b>Input Reverse Voltage Protection</b>	Input Parallel Diode External input fuse required	<b>Case Material</b>	Aluminium
<b>Start Up time</b>	Typically 35mS constant resistive load	<b>Base Material</b>	Aluminium
<b>Remote ON/OFF</b>	DC-DC ON Open or $3.0V < V_r < 12V$ DC-DC OFF Short or $0V < V_r < 1.2V$	<b>Potting</b>	Silicon UL94-V0
Positive Logic - Standard		<b>Dimensions</b>	98 x 65 x 35mm ( with HC Heatsink )
Negative Logic -Option )	DC-DC ON Short or $0V < V_r < 1.2V$ DC-DC OFF Open or $3.0V < V_r < 12V$	<b>Weight</b>	225g
	Input current of remote control pin: 0.5mA~ 1.0mA Remote off state input current: 3.5mA	<b>MTBF</b>	1.353 x 10 <sup>5</sup> Hrs
<b>Output power</b>	150 watts	<b>Operating Temp</b>	-40°C to +85°C ( with derating ) See derating graphs  Note: Unit must be mounted on metal plate fro conduction cooling at maximum power.
<b>Voltage Accuracy</b>	±1.0%	<b>Case Temp</b>	+100°C maximum case temperature
<b>Output Voltage Trim</b>	+0% to +20% External voltage trim	<b>Over Temp. Protection</b>	Shutdown approx 110°C case temperature
<b>Minim Load</b>	Zero	<b>Thermal Impedance</b>	2.73°C / watt without heatsink 2.18°C / watt with optional heatsink
<b>Line Regulation</b>	±0.2% Low line to High Line @ FL	<b>Thermal shock</b>	MIL-STD-810F
<b>Load Regulation</b>	±0.4% No load to Full load	<b>Vibration</b>	MIL-STD-810F
<b>Remote Sense</b>	N/A	<b>Humidity</b>	5-95% RH
<b>Ripple &amp; noise</b>	See table. 20MHZ bandwidth	<b>EMC</b>	EN55022 Class A ( see note 6 )
<b>Temp. Coefficient</b>	±0.02% / °C	<b>ESD</b>	EN61000-4-2
<b>Transient Response</b>	200uS ( 25% load step change )	<b>Radiated Immunity</b>	EN61000-4-3
<b>Over Voltage Protection</b>	Set at 125 ~140% of Voltage output nominal. Hiccup type	<b>Fast Transients</b>	EN61000-4-4
<b>Overload Protection</b>	Set at 105 ~ 120% of output current, Constant Current. ( note 9 )	<b>Surge</b>	EN61000-4-5
<b>Short Circuit protection</b>	Continuous hiccup mode	<b>Conducted Immunity</b>	EN61000-4-6

REV (E) (REV)

# WAF150 SERIES

DC/DC Converter Single Output: 150 Watts

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

**Notes:**

- BELLCORE TR-NWT-000332. Case 1: 50% Stress, Temperature at 40°C.  
MIL-HDBK-217F Notice2 @Ta=40 °C, Full load , Air Flow = 400LFM (Ground, Benign, controlled environment).
- 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, ESR 45mΩ.  
48VDC input : Nippon chemi-con KY series, 220µF/100V, ESR 48mΩ.  
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 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".

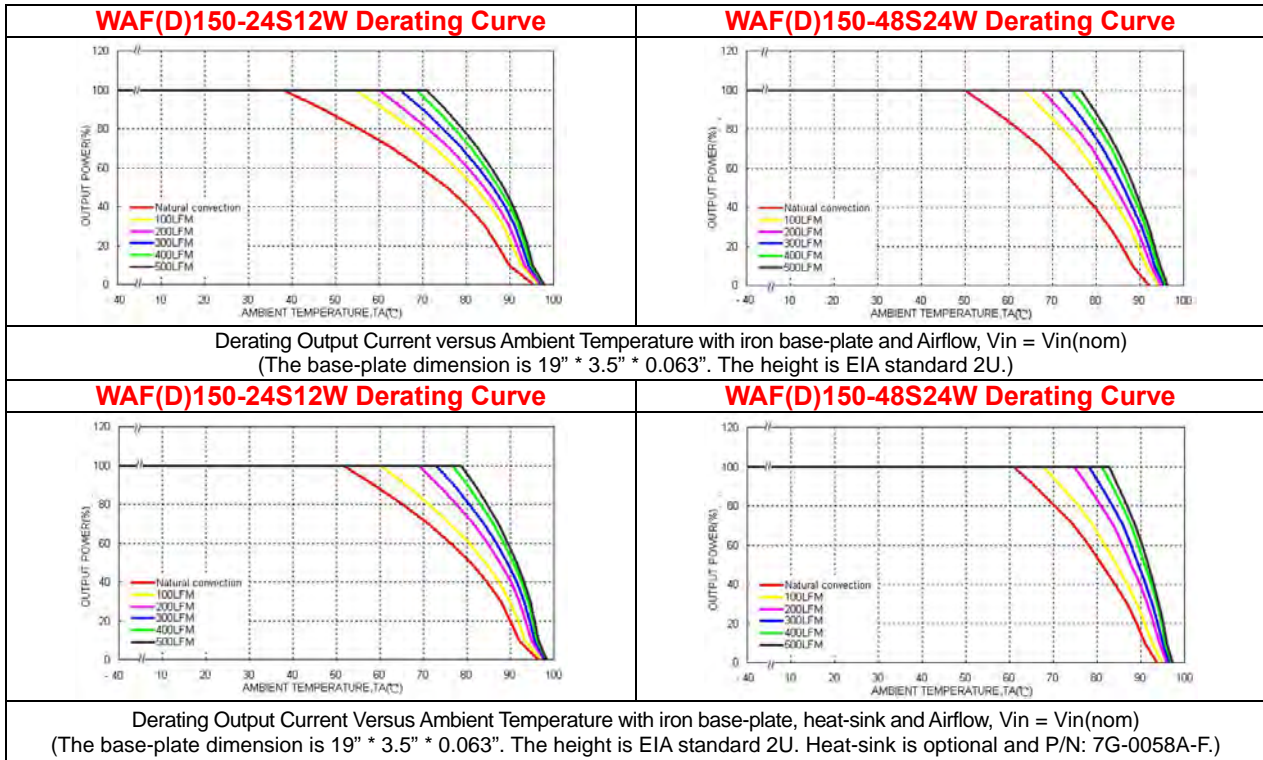
**CAUTION:** This power module is not internally fused, an input line fuse must always be used. If the load was having sourcing capability (Ex: Battery or Super Capacitor), an output line fuse must always be used.

**Part No & Options:**

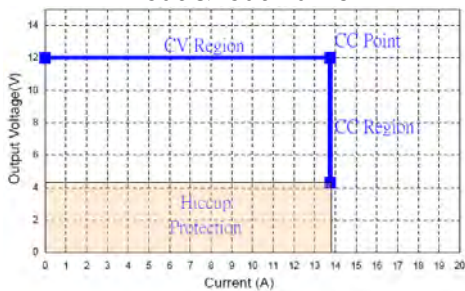
WAF	150	24	S	12	W	N	F	HC
Series Name	Power	Input Voltage	Single Output	Output Voltage	Wide Input	Logic Option	Filter Option	Top Heatsink
WAF	150	24 9-36V		12			Std	HC
WAD		48 18-75V	S	15	W	- Std	F Class B	
		110 43-160V		24		N Negative		
				28				
				48				

# WAF150 SERIES

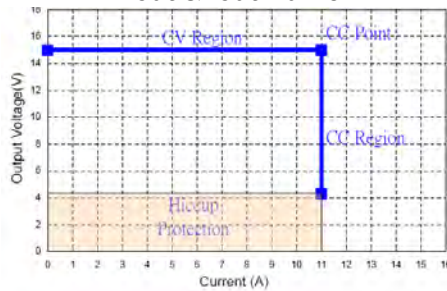
DC/DC Converter Single Output: 150 Watts



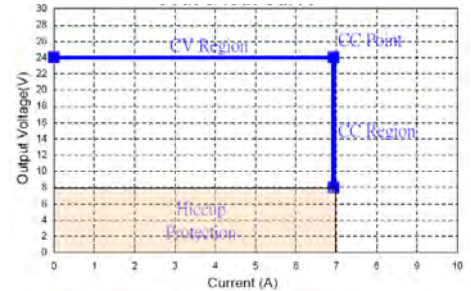
**WAF(D)150-xxxS12W Vout & Iout Curve**



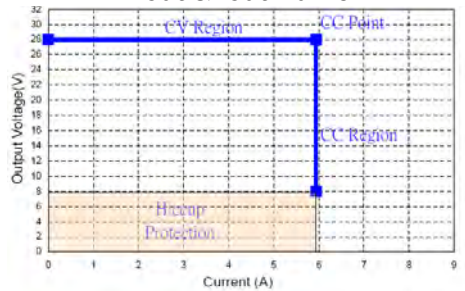
**WAF(D)150-xxxS15W Vout & Iout Curve**



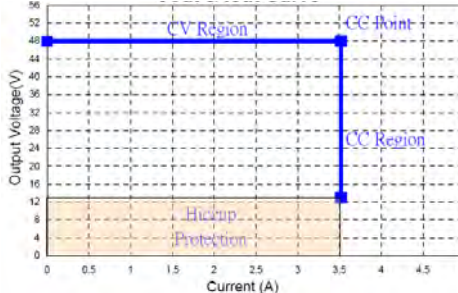
**WAF(D)150-xxxS24W Vout & Iout Curve**



**WAF(D)150-xxxS28W Vout & Iout Curve**



**WAF(D)150-xxxS48W Vout & Iout Curve**



Note:

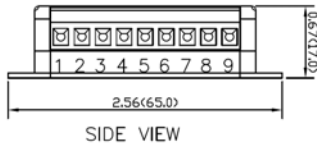
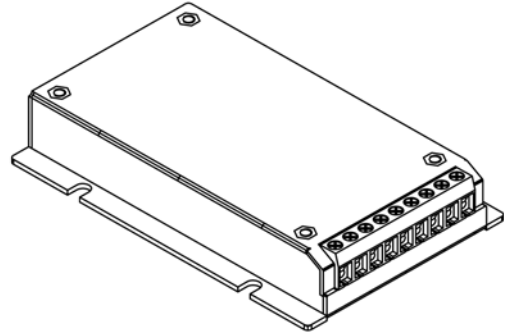
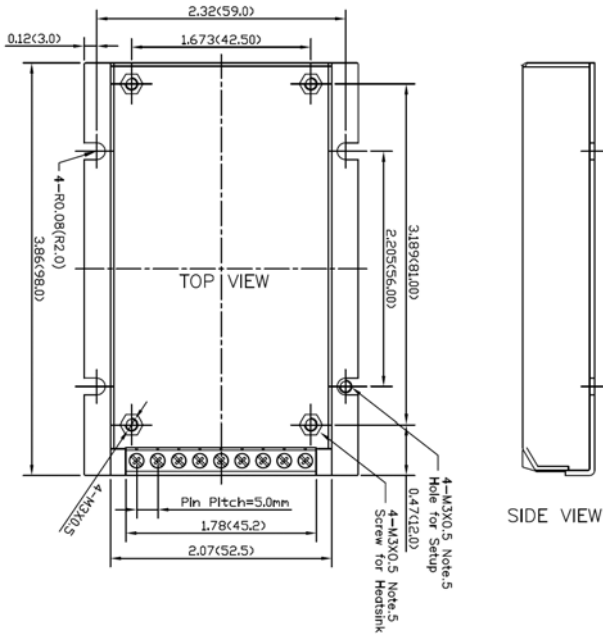
- CV Region: In normal operation. The output current in spec.  
Condition: Resistance Load >  $V_{out} / I_{out}$  (CC Point)
- CC Region: If the output load current are over rating. The output current will keep in a constant value. And output voltage will fall.  
Condition: Resistance Load <  $V_{out} / I_{out}$  (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)

# WAF150 SERIES

## Mechanical Drawings:

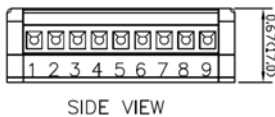
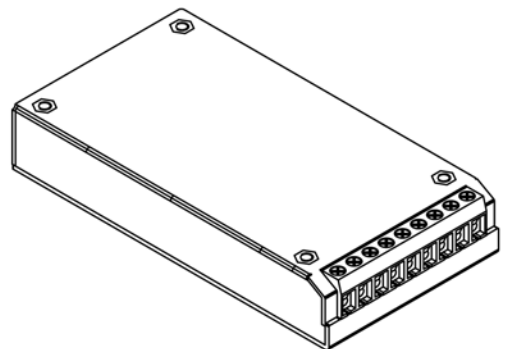
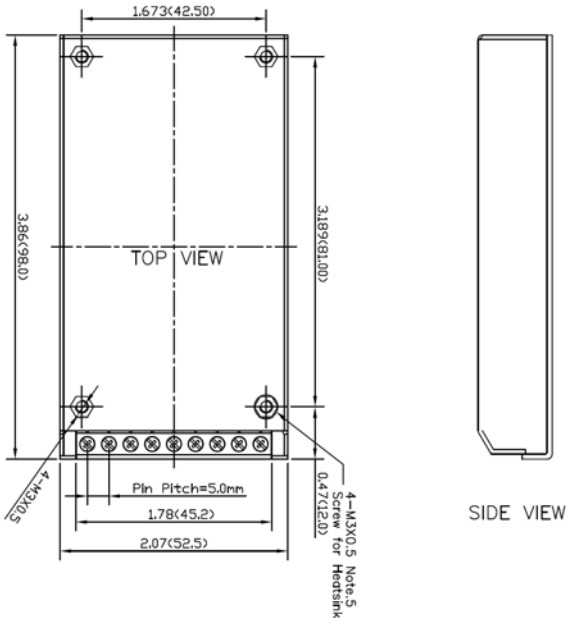
DC/DC Converter Single Output: 150 Watts

### WAF150 dimensions (Standard Model)



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

### WAD150 dimensions (Optional case, without flanges)

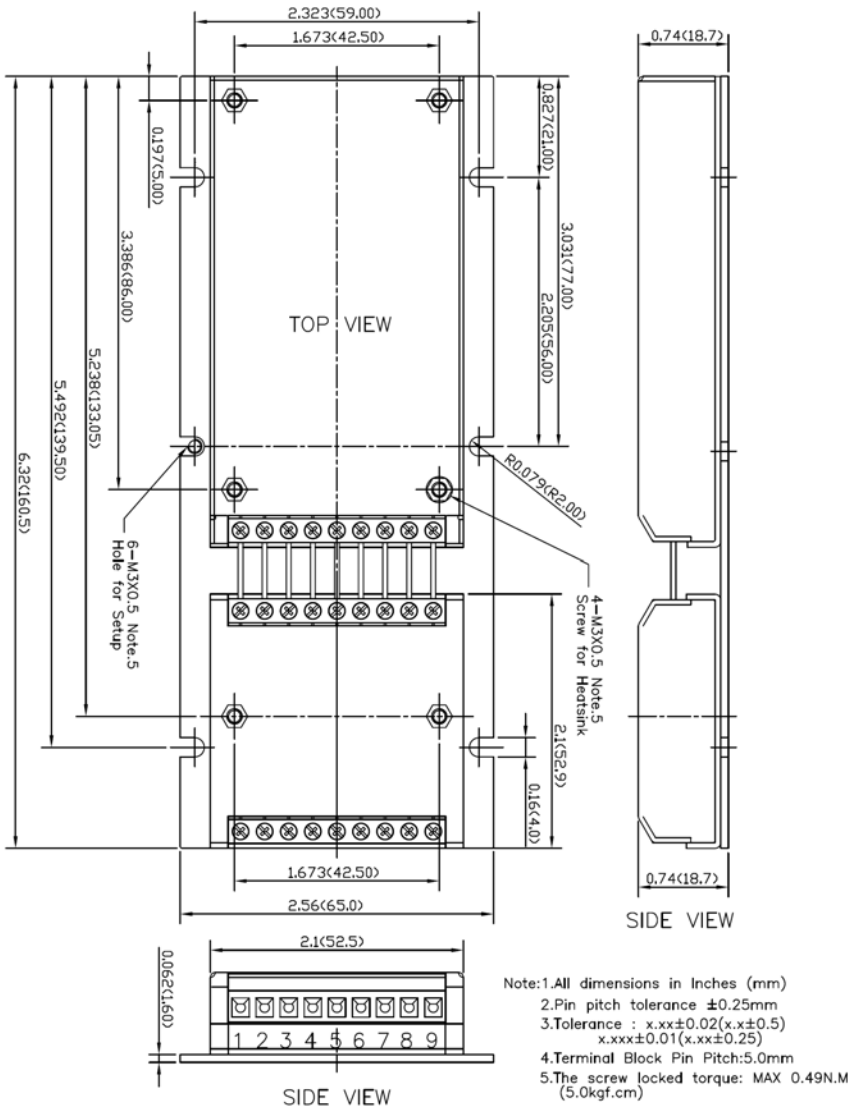


- Note: 1.All dimensions in Inches (mm)  
 2.Pin pitch tolerance  $\pm 0.25$ mm  
 3.Tolerance :  $x.xx \pm 0.02(x.xx \pm 0.5)$   
 $x.xxx \pm 0.01(x.xx \pm 0.25)$   
 4.Terminal Block Pin Pitch: 5.0mm  
 5.The screw locked torque: MAX 0.49N.M  
 (5.0kgf.cm)

# WAF150 SERIES

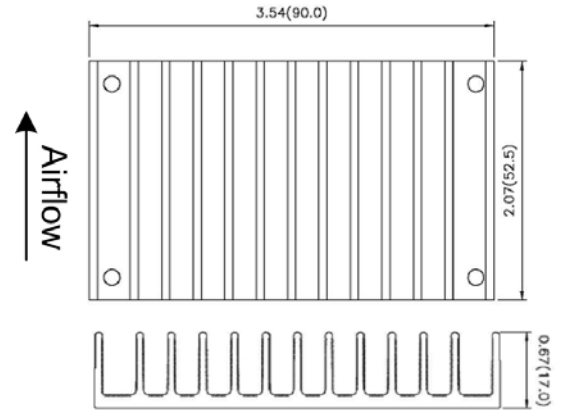
DC/DC Converter Single Output: 150 Watts

## WAD150 with meet EN55022 class B Filter Module dimensions

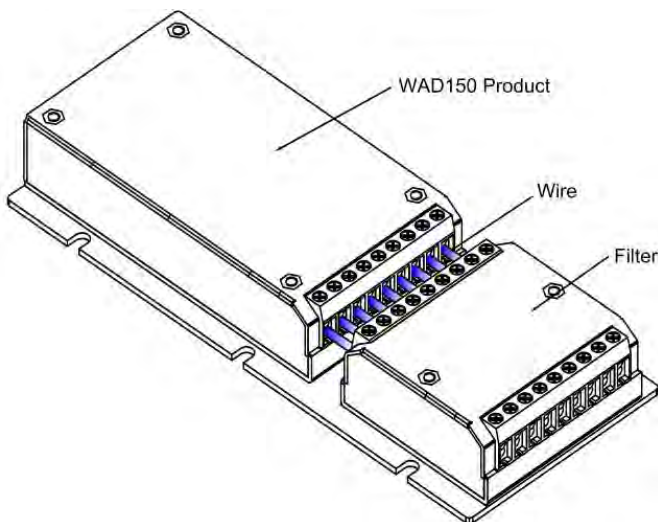


## Heat-sink Type: 7G-0058A-F

Suffix: -HC

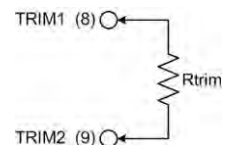


Pin Connections			
PIN	Define	Recommend Matching Wire	Recommend Screwing Torque
1	+VIN	14~16AWG	0.25N.M(2.5kgf.cm)
2	+VIN	14~16AWG	0.25N.M(2.5kgf.cm)
3	-VIN	14~16AWG	0.25N.M(2.5kgf.cm)
4	-VIN	14~16AWG	0.25N.M(2.5kgf.cm)
5	CTRL	14~24AWG	0.25N.M(2.5kgf.cm)
6	+VOUT	14~16AWG	0.25N.M(2.5kgf.cm)
7	-VOUT	14~16AWG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

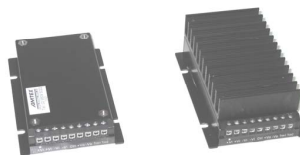


## External Output V Trim

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



## TRIM UP Table: WAF(D)150 series



### XXS12W

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
Rx=	222.64	105.09	66.35	47.06	35.51	27.83	22.34	18.23	15.03	12.48	K $\Omega$
Trim up	11	12	13	14	15	16	17	18	19	20	%
Vout=	13.32	13.44	13.56	13.68	13.80	13.92	14.04	14.16	14.28	14.40	Volts
Rx=	10.39	8.65	7.18	5.91	4.82	3.86	3.02	2.27	1.60	0.99	K $\Omega$

### XXS15W

Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout=	15.15	15.30	15.45	15.60	15.75	15.90	16.05	16.20	16.35	16.50	Volts
Rx=	238.62	113.62	71.95	51.12	38.62	30.29	24.33	19.87	16.40	13.62	K $\Omega$
Trim up	11	12	13	14	15	16	17	18	19	20	%
Vout=	16.65	16.80	16.95	17.10	17.25	17.40	17.55	17.70	17.85	18.00	Volts
Rx=	11.35	9.45	7.85	6.48	5.29	4.25	3.33	2.51	1.78	1.12	K $\Omega$

### XXS24W

Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout=	24.24	24.48	24.72	24.96	25.20	25.44	25.68	25.92	26.16	26.40	Volts
Rx=	212.47	106.69	68.79	49.30	37.43	29.44	23.70	19.37	15.99	13.28	K $\Omega$
Trim up	11	12	13	14	15	16	17	18	19	20	%
Vout=	26.64	26.88	27.12	27.36	27.60	27.84	28.08	28.32	28.56	28.80	Volts
Rx=	11.06	9.20	7.63	6.28	5.11	4.08	3.18	2.37	1.65	1.00	K $\Omega$

**XXS28W**

Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout=	28.28	28.56	28.84	29.12	29.40	29.68	29.96	30.24	30.52	30.80	Volts
Rx=	255.65	121.72	77.08	54.76	41.36	32.44	26.06	21.28	17.56	14.58	K $\Omega$
Trim up	11	12	13	14	15	16	17	18	19	20	%
Vout=	31.08	31.36	31.64	31.92	32.20	32.48	32.76	33.04	33.32	33.60	Volts
Rx=	12.14	10.11	8.40	6.93	5.65	4.53	3.55	2.67	1.89	1.19	K $\Omega$

**XXS48W**

Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout=	48.48	48.96	49.44	49.92	50.40	50.88	51.36	51.84	52.32	52.80	Volts
Rx=	268.86	127.44	80.57	57.19	43.17	33.84	27.17	22.18	18.29	15.18	K $\Omega$
Trim up	11	12	13	14	15	16	17	18	19	20	%
Vout=	53.28	53.76	54.24	54.72	55.20	55.68	56.16	56.64	57.12	57.60	Volts
Rx=	12.64	10.52	8.73	7.20	5.87	4.70	3.67	2.76	1.94	1.21	K $\Omega$