

## DC-DC CONVERTER

**4:1 ULTRA WIDE INPUT RANGE  
UP TO 200Watts**



PD150WAF



PD150WAD



## FEATURES

- NO MINIMUM LOAD REQUIRED
- 2250VDC INPUT TO OUTPUT INSULATION
- WAF150:3.86X2.560X0.67 INCH / WAD150:3.86X2.067X0.67 INCH
- CV+CC MODE
- BUILT-IN EN55011 & EN55022 CLASS A FILTER
- SIX-SIDED CONTINUOUS SHIELD
- WALL MOUNT APPLICATION
- TOP SIDE AND BOTTOM SIDE HEAT DISSIPATION
- ADJUSTABLE OUTPUT VOLTAGE
- INPUT REVERSE PROTECTION
- UL60950-1, EN60950-1, & IEC60950-1 SAFETY APPROVALS
- COMPLIANCE TO EN50155 AND EN45545-2 RAILWAY STANDARD
- CE MARKED
- COMPLIANT TO RoHS II & REACH

## APPLICATIONS

- RAILWAY SYSTEM WIRELESS NETWORK
- TELECOM/DATACOM
- INDUSTRY CONTROL SYSTEM
- DISTRIBUTED POWER ARCHITECTURES
- SEMICONDUCTOR EQUIPMENT
- BATTERY CHARGER

2250VDC ISOLATION	REMOTE CONTROL	UVP	OCP	SCP	OVP	OTP
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## TECHNICAL SPECIFICATION

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

Model Number	Input Range	Output Voltage	Output Current @Full Load	Input Current @ No Load	Efficiency	Maximum Capacitor Load
	VDC	VDC	A	mA	%	µF
PD150WAF(D)24S12W	9 ~ 36	12	12.5	70	86	40000
PD150WAF(D)24S15W	9 ~ 36	15	10	80	86	26000
PD150WAF(D)24S24W	9 ~ 36	24	6.3	95	87	10000
PD150WAF(D)24S28W	9 ~ 36	28	5.4	120	87	7600
PD150WAF(D)24S48W	9 ~ 36	48	3.2	130	86	2600
PD150WAF(D)48S12W	18 ~ 75	12	12.5	50	88	40000
PD150WAF(D)48S15W	18 ~ 75	15	10	60	89	26000
PD150WAF(D)48S24W	18 ~ 75	24	6.3	60	89	10000
PD150WAF(D)48S28W	18 ~ 75	28	5.4	70	89	7600
PD150WAF(D)48S48W	18 ~ 75	48	3.2	70	88	2600
PD150WAF(D)110S12W	43 ~ 160	12	12.5	25	88	40000
PD150WAF(D)110S15W	43 ~ 160	15	10	25	89	26000
PD150WAF(D)110S24W	43 ~ 160	24	6.3	25	89	10000
PD150WAF(D)110S28W	43 ~ 160	28	5.4	25	89	7600
PD150WAF(D)110S48W	43 ~ 160	48	3.2	35	88	2600

## PART NUMBER STRUCTURE

PD150WAF(D)	-	24	S	12	W	-	N	F	HC
Series Name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Input Range	Remote Control Option	Filter Option	Assembly Option		
	24:9~36 48:16.5~75 110:43~160	S:Single	12:12 15:15 24:24 28:28 48:48	4:1	O:Positive logic N:Negative logic	O:NC F:With EMI filter module	O:None HC: H=0.670" Horizontal, 7G-0058A-F		

(1) EMI filter meet EN55022 Class B.  
This EMI filter is used for PD150WAD-24SxxW and PD150WAD-48SxxW only, not for other items. (Ex: PD150WAD-24S24W-F)

## INPUT SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating input voltage range	24Vin(nom)		9	24	36	VDC
	48Vin(nom)		18	48	75	
	110Vin(nom)		43	110	160	
Start-up voltage	24Vin(nom)				9	VDC
	48Vin(nom)				18	
	110Vin(nom)				43	
Shutdown voltage	24Vin(nom)		7.9		8.5	VDC
	48Vin(nom)		15.6		16.8	
	110Vin(nom)		33.0		36.0	
Start up time	Constant resistive load	Power up		35		ms
		Remote ON/OFF		35		
Input surge voltage	1 second, max.	24Vin(nom)			50	VDC
		48Vin(nom)			100	
		110Vin(nom)			185	
Input filter				Pi type		
Remote ON/OFF	Referred to -Vin pin	Positive logic	DC-DC ON		Open or 3 ~ 12VDC	
		(Standard)	DC-DC OFF		Short or 0 ~ 1.2VDC	
		Negative logic	DC-DC ON		Short or 0 ~ 1.2VDC	
		(Option)	DC-DC OFF		Open or 3 ~ 12VDC	
		Input current of Ctrl pin		-0.5		1
Remote off input current				3.5	mA	

## OUTPUT SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Voltage accuracy			-1.0		+1.0	%
Line regulation	Low Line to High Line at Full Load		-0.2		+0.2	%
Load regulation	No Load to Full Load		-0.4		+0.4	%
Voltage adjustability	Use a resistor across on the Trim1 and Trim2 to adjust the output voltage.				+20	%
Ripple and noise	Measured by 20MHz bandwidth			100		mVp-p
		12Vout, 15Vout		200		
		24Vout, 28Vout		350		
		48Vout				
Temperature coefficient			-0.02		+0.02	%/C
Transient response recovery time	25% load step change			200		μs
Over voltage protection	% of Vout(nom); Hiccup mode		125		140	%
Over load protection	% of Iout rated; CC Mode		105		120	%
Short circuit protection			Continuous, automatic recovery			

## GENERAL SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Isolation voltage	1 minute	Input to Output	2250			VDC
		Input (Output) to Case	1600			
Isolation resistance	500VDC		1			GΩ
Isolation capacitance					3500	pF
Switching frequency	24VDC input	48Vout	248	275	303	kHz
		Others	270	300	330	
	48VDC input	48Vout	248	275	303	
		Others	270	300	330	
	110VDC input	All	203	225	248	
Safety approvals						UL60950-1 EN60950-1 IEC60950-1
Case material						Aluminum
Base material						Aluminum
Potting material						Silicone (UL94 V-0)
Weight	PD150WAF					225g (7.94oz.)
	PD150WAD					220g (7.76oz.)
MTBF	MIL-HDBK-217F, Full load					4.954 x 10 <sup>5</sup> hrs

## ENVIRONMENTAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating case temperature		-40		+100	C
Maximum case temperature			+100		
Over temperature protection			+110		C
Storage temperature range		-55		+125	C
Thermal impedance <sup>(1)</sup>	Vertical direction by natural convection (20LFM) Only mount on the iron base-plate Mount on the iron base-plate and top side with 7G-0058A Heat-sink		2.55 2.0		C/W
Thermal shock					MIL-STD-810F
Shock					EN61373, MIL-STD-810F
Vibration					EN61373, MIL-STD-810F
Relative humidity					5% to 95% RH

## EMC SPECIFICATIONS

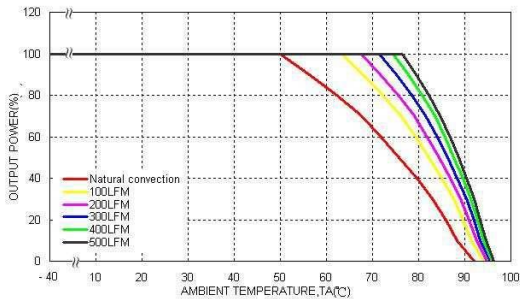
Parameter	Conditions	Level
EMI <sup>(2)</sup>	EN55011, EN55022	DC-DC module Class A
ESD	EN61000-4-2 Air ± 8kV and Contact ± 6kV	Perf. Criteria A
Radiated immunity	EN61000-4-3 10 V/m	Perf. Criteria A
Fast transient <sup>(3)</sup>	EN61000-4-4 ± 2kV	Perf. Criteria A
Surge <sup>(3)</sup>	EN61000-4-5 EN55024 ±1kV and EN50155 ±2kV	Perf. Criteria A
Conducted immunity	EN61000-4-6 10 Vr.m.s	Perf. Criteria A
Power frequency magnetic field	EN61000-4-8 100A/m continuous; 1000A/m 1 second	Perf. Criteria A

### Note:

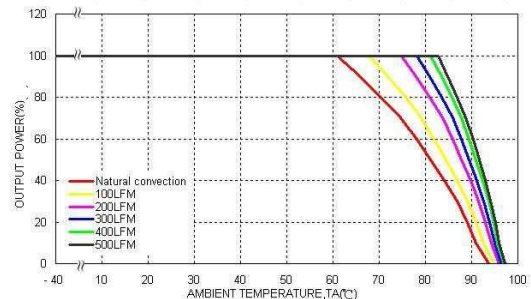
- (1)The iron base-plate dimension is 19" \* 3.5" \* 0.063" (The height is EIA standard 2U).  
(2)The heat-sink is optional and P/N is 7G-0058A-F.
- The standard module meets EMI Class A without external components.
- An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5.  
The filter capacitor MEGA suggest: PD150WAF(D)24SxxW : Nippon chemi-con KY series, 470µF/50V.  
PD150WAF(D)24xxW :: Nippon chemi-con KY series, 220µF/100V.  
PD150WAF(D)110xxW : Nippon chemi-con KXJ series, 150µF/200V.

**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.

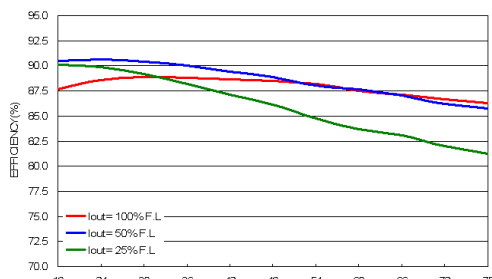
## CHARACTERISTIC CURVE



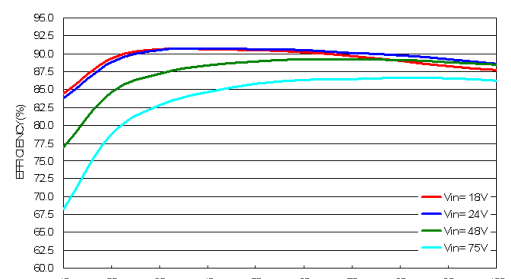
PD150WAF(D)48S24W Derating Curve (Note 1)



PD150WAF(D)48S24W Derating Curve (Note 1) With Heat-sink

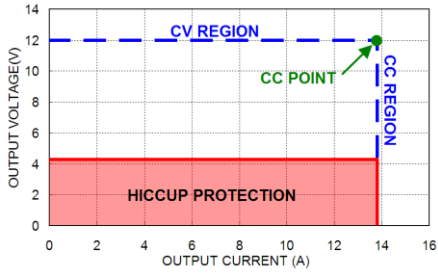


PD150WAF(D)48S24W Efficiency vs. Input Voltage

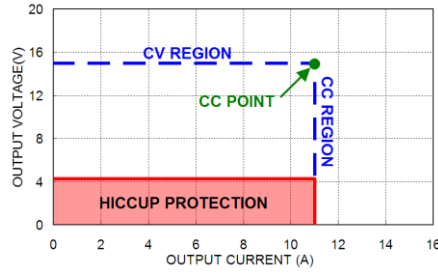


PD150WAF(D)48S24W Efficiency vs. Output Load

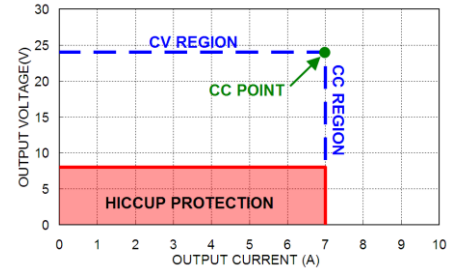
## CHARACTERISTIC CURVE (CONTINUED)



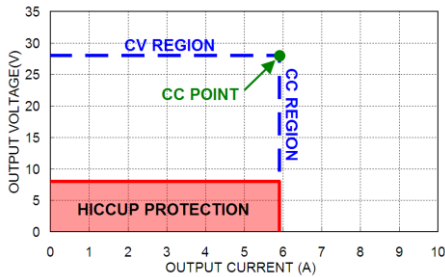
PD150WAF(D)xxS12  
W Vout vs. Iout



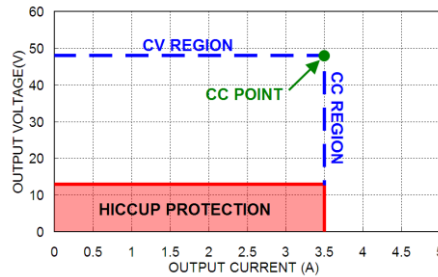
PD150WAF(D)xxS15  
W Vout vs. Iout



PD150WAF(D)xxS24  
W Vout vs. Iout



PD150WAF(D)xxS28  
W Vout vs. Iout

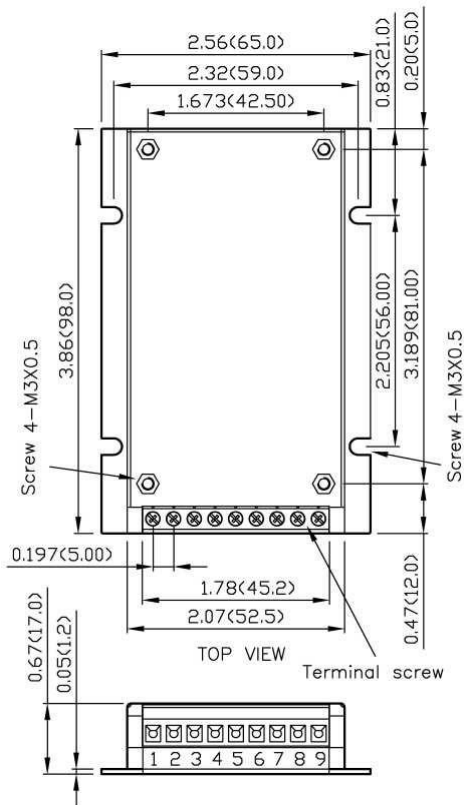


PD150WAF(D)xxS48  
W Vout vs. Iout

MODE	DESCRIPTION	CONDITION
CV Region	In normal operation. The output current in datasheet	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.	Resistance Load < Vout / Iout (CC Point)
Hiccup Protection	If the output resistance is become short. It will operate in hiccup protection.	PD150WAF(D)xxS12W, PD150WAF(D)xxS15W: Vout < 4.3V (typ.) to Output Short.  PD150WAF(D)xxS24W, PD150WAF(D)xxS28W: Vout < 8.0V (typ.) to Output Short.  PD150WAF(D)xxS48W: Vout < 13V (typ.) to Output Short.

**MECHANICAL DRAWING**

WAF

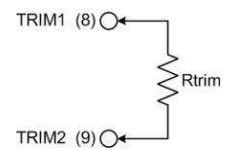


**TERMINAL CONNECTION**

PIN	DEFINE	WIRE GAUGE RECOMMENDATIONS
1	+Vin	14~16AWG
2	+Vin	14~16AWG
3	-Vin	14~16AWG
4	-Vin	14~16AWG
5	Ctrl	14~24AWG
6	+Vout	14~16AWG
7	-Vout	14~16AWG
8	Trim 1	14~24AWG
9	Trim 2	14~24AWG

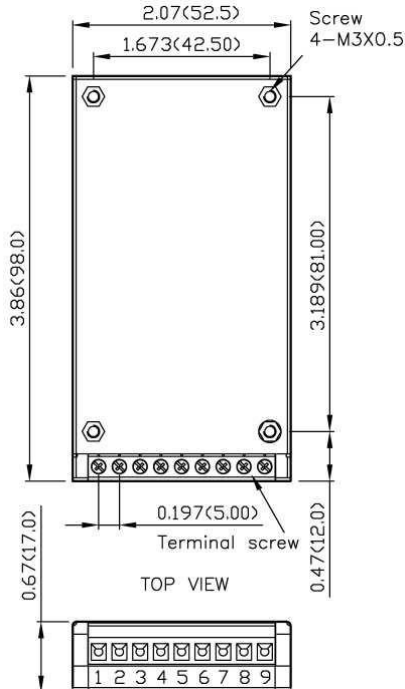
**EXTERNAL OUTPUT TRIMMING**

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



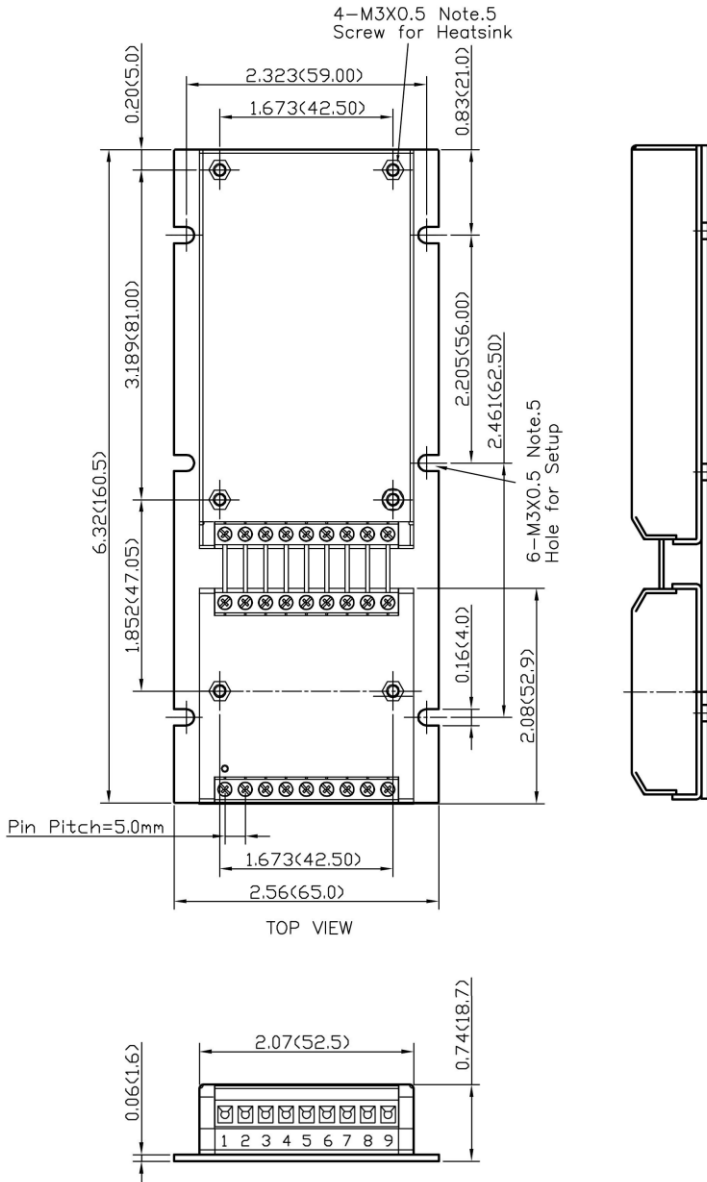
1. All dimensions in inch (mm)
2. Tolerance :x.xx±0.02 (x.x±0.5)  
x.xxx±0.01 (x.xx±0.25)
3. Pole pitch tolerance ±0.01 (0.25)
4. Screw locked torque: MAX 5.0kgf-cm(0.49N-m)
5. Terminal screw locked torque:  
MAX 2.5kgf-cm(0.25N-m)

WAD



**MECHANICAL DRAWING (CONTINUED)**

PD150WAD24SxxW-F  
PD150WAD48SxxW-F

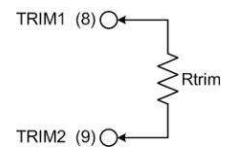


**TERMINAL CONNECTION**

PIN	DEFINE	WIRE GAUGE RECOMMENDATIONS
1	+Vin	14~16AWG
2	+Vin	14~16AWG
3	-Vin	14~16AWG
4	-Vin	14~16AWG
5	Ctrl	14~24AWG
6	+Vout	14~16AWG
7	-Vout	14~16AWG
8	Trim 1	14~24AWG
9	Trim 2	14~24AWG

**EXTERNAL OUTPUT TRIMMING**

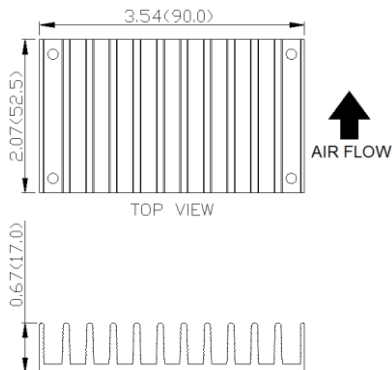
Output can be externally trimmed by using the method shown below.



1. All dimensions in inch (mm)
2. Tolerance :x.xx±0.02 (x.x±0.5)  
x.xxx±0.01 (x.xx±0.25)
3. Pole pitch tolerance ±0.01 (0.25)
4. Screw locked torque: MAX 5.0kgf-cm(0.49N-m)
5. Terminal screw locked torque:  
MAX 2.5kgf-cm(0.25N-m)

**HEAT-SINK OPTION**

Heat-sink Part No: 7G-0058A-F, Suffix:-HC



1. All dimensions in inch (mm)
2. Tolerance :x.xx±0.02 (x.x±0.5)  
x.xxx±0.01 (x.xx±0.25)