DC/DC Converter

PFD15-XXSXXA3(C)2(-XXX) Series

Typical Features

- Wide input voltage range (4:1), Output Power 15W
- Transfer Efficiency up to 91%
- Stand-by Power Consumption as low as 0.1W
- Output fast start up
- Continuous Short Circuit protection, Self-recovery
- Input under voltage, output over voltage, short circuit, over current protection
- Isolation Voltage 1500VDC
- Operating Temperature: -40°C~+105°C
- Good EMI performance
- International standard pin-out

Application Field

PFD15-XXSXXA3(C)2 *is a newly designed DIP 1X1 packed,15W output power, ultra wide input range 4:1, low stand-by power consumption, isolated regulated output DC-DC converter, could be widely used for industrial control, instrument, communication, power electricity, internet of things field ect. For harsh EMC environment, the application circuit in the datasheet is strongly recommended.*

Typical Product List

Certification	Part no.	Input Voltage Range (VDC)		Output Voltage/Current(Vo/Io)		Input Current (mA) (Nominal Voltage)		Max. Capacitive Load	Ripple & Noise		Full load Efficiency (%)	
		Nominal	Range	Voltage(VDC)	Current (mA)MAX./Min	Full load typ.	No Load typ.	uF	mVp-p Typ	mVp-p Max	Min	Typ
-	PFD15-18S3V3A3(C)2	24	9-36	3.3	4000/0	625	33	10000	50	100	86	88
-	PFD15-18S04A3(C)2	24	9-36	4	3750/0	702	33	8000	50	100	87	89
-	PFD15-18S05A3(C)2	24	9-36	5	3000/0	694	33	5000	50	100	88	90
-	PFD15-18S09A3(C)2	24	9-36	9	1667/0	694	33	3000	50	100	88	90
-	PFD15-18S12A3(C)2	24	9-36	12	1250/0	694	5	1000	50	100	88	90
-	PFD15-18S12V2A3(C)2	24	9-36	12.2	1229/0	69	5	1000	50	100	88	90
-	PFD15-18S15A3(C)2	24	9-36	15	1000/0	694	5	800	50	100	88	90
-	PFD15-18S24A3(C)2	24	9-36	24	625/0	686	5	500	50	100	89	91
-	PFD15-36S3V3A3(C)2	48	18-75	3.3	4000/0	312	17	10000	50	100	86	88
-	PFD15-36S05A3(C)2	48	18-75	5	3000/0	347	17	5000	50	100	88	90
-	PFD15-36S09A3(C)2	48	18-75	9	1667/0	347	17	3000	50	100	88	90
-	PFD15-36S12A3(C)2	48	18-75	12	1250/0	343	5	1000	50	100	88	91
-	PFD15-36S15A3(C)2	48	18-75	15	1000/0	343	5	800	50	100	88	91
-	PFD15-36S24A3(C)2	48	18-75	24	625/0	343	5	500	50	100	88	91

Note 1: Suffix “R” is with control pin and adjustment pin together, ”C” is for control function only, ”-T” for adjustment function, no suffix mean no extra functions;
Note 2: Suffix “-H” is with heatsink, “-TH” for chassis mounting with heatsink, -TSH” for DIN-Rail mounting with heatsink, DIN-Rail width is: 35mm;
Note 3: Max capacitive load is, when the power supply is fully loaded, the max capacity could be connected to output, if exceed, the power supply cannot start-up;
Note 4: In order to reduce no-load power consumption and improve light-load efficiency, the IC will reduce frequency when it is no-load or light-loaded.
Note 5: Due to limited space, the above is only a partial list of products. If you need products outside the list, please contact our sales department.

Input Specification

Item	Operating Condition	Min.	Typ.	Max.	Unit
Stand-by Consumption	Input voltage range	/	0.1	/	W
Reflected ripple current	Nominal input voltage	/	30	/	mA
Input Under-Voltage Protection	24V nominal input	5	7	9	VDC
	48V nominal input	11	13	18	
Hot Plug	Unavailable				
Input Filter	π filter				
CTRL*	Module turn-on	CTRL suspended or TTL high level (3.3-12VDC)			
	Module turn-off	CTRL connect to -Vin or low level (0-1.2VDC)			
	Input current when switched off	2mA (TYP)			

Note: *The voltage of CTRL pin is relative to -Vin pin.

Output Specification

Item	Operating Condition		Min.	Typ.	Max.	Unit
Output Voltage Accuracy	Input voltage range, nominal load		/	±1	±3	%
Voltage Regulation	Nominal load, full voltage range		/	±0.2	±0.5	%
Load Regulation	5%-100% rated load		/	±0.5	±1	%
Ripple & Noise	10%-100% load, 20MHz bandwidth		/	50	100	mVp-p
Dynamic recovery time	25% of nominal load step, nominal input voltage		/	250	500	us
Dynamic response deviation		3.3V、5V output	/	±5	±8	%
		Other output	/	±3	±5	%
Turn-on delay time	Input nominal voltage		/	10	/	ms
Output voltage adjustable (Trim)	Input voltage range		90	/	110	%Vo
Output Over-voltage Protection			110	160	200	%Vo
Output Over-current Protection			110	150	220	%Io
Output Short circuit Protection	Input voltage range		Continuous, self-recovery			

Note: 0% -10% load ripple & noise is less than or equal to 5%Vo; ripple & noise test adopts twisted pair test method, see ripple & noise test instructions for details.

General Specification

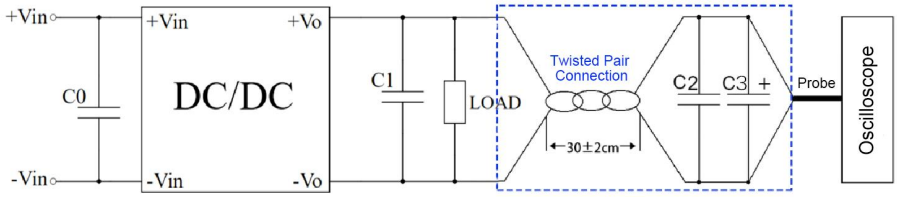
Item	Operating Condition	Min.	Typ.	Max.	Unit
Switching Frequency	Working mode (PWM)	/	280	/	KHz
Operating Temperature	Refer to Temperature Derating Curve	-40	/	+105	℃
Storage Temperature	/	-55	/	+125	
Max Case Temperature	Within Operating Curve	/	/	+105	
Pin resistance soldering temperature	The distance to shell is 1.5mm, 10 seconds	/	/	300	
Relative Humidity	No condensing	5	/	95	%RH
Isolation Voltage	I/P-O/P, test for 1min, leakage current ＜0.5mA	1500	/	/	VDC
	Input/output-case, tested for 1 minute, leakage current ＜0.5mA	1000	/	/	
Isolation capacitor	I/P-O/P, 100KHz/0.1V	/	1000	/	pF
Insulation Resistance	I/P-O/P, @500Vdc	1000	/	/	MΩ
Meantime Between Failure	MIL-HDBK-217F@25℃	1000		/	K hours
Cooling Method	Free air convection				
Case Material	Aluminum Metal Case				

Product Weight	Part No.	Weight Typ.	L x W x H	
	PFD15-XXSXXA3(C)2	15g	25.4X 25.4X12.5 mm	1X1X0.492inch
	PFD15-XXSXXA3(C)2-H	19g	25.4X25.4X18.0mm	1X1X0.708inch
	PFD15-XXSXXA3(C)2-T	37g	76X31.5X21.3mm	2.99X1.24X0.838inch
	PFD15-XXSXXA3(C)2-TH	40g	76X31.5X26.0mm	2.99X1.24X1.023inch
	PFD15-XXSXXA3(C)2-TS	57g	76X31.5X26mm	2.99X1.24X1.023inch
	PFD15-XXSXXA3(C)2-TSH	60g	76X31.5X30.8mm	2.99X1.24X1.212inch

EMC Characteristics

Total Items		Sub Items	Test Standard	Class
EMC	EMI	CE	CISPR32/EN55032	CLASS B (EMC Recommended Circuit)
		RE	CISPR32/EN55032	CLASS B (EMC Recommended Circuit)
	EMS	RS	IEC/EN61000-4-3	10V/m Perf.Criteria B (EMC Recommended Circuit)
		CS	IEC/EN61000-4-6	3Vr.m.s Perf.Criteria B (EMC Recommended Circuit)
		ESD	IEC/EN61000-4-2	Contact ±6KV / Air ±8KV Perf.Criteria B
		Surge	IEC/EN61000-4-5	±2KV Perf.Criteria B (EMC Recommended Circuit)
		EFT	IEC/EN61000-4-4	±2KV Perf.Criteria B (EMC Recommended Circuit)
		Voltage dips, short interruptions and voltage variations immunity	IEC/EN61000-4-11	0%~70% Perf.Criteria B

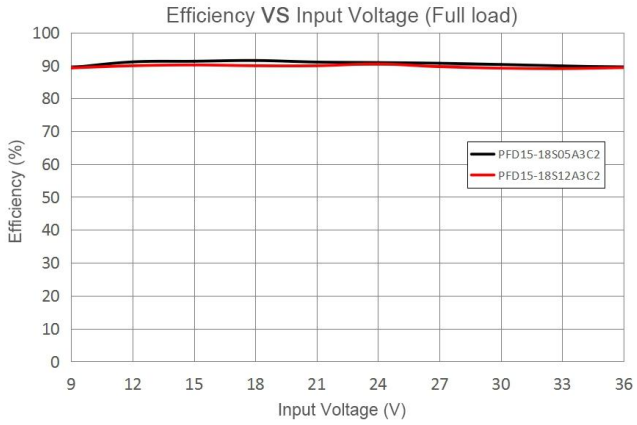
Ripple & Noise Test Description (Twisted Pair Method 20MHz Bandwidth)

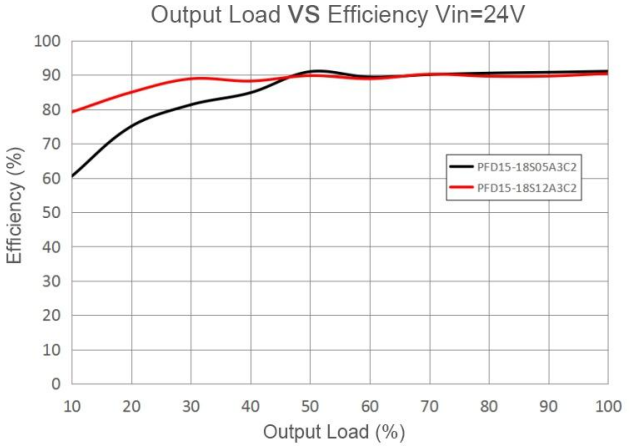


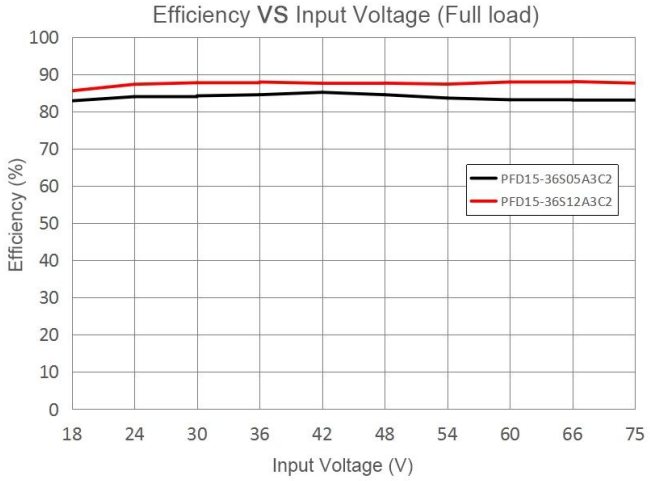
Test conditions:

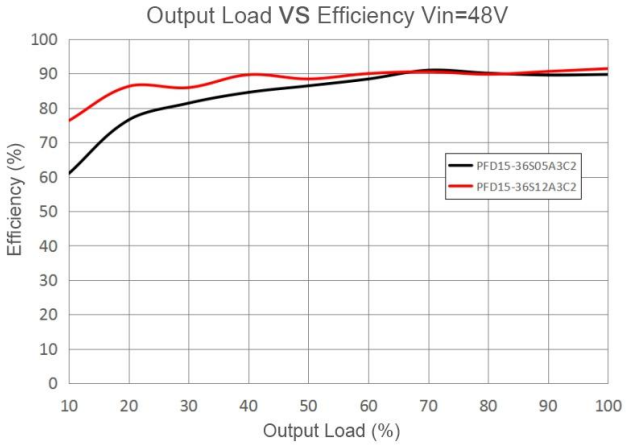
1. Ripple noise is connected using 12# twisted pair cable, oscilloscope sampling uses sampling mode, oscilloscope bandwidth is set to 20MHz, 100M bandwidth probe is used, probe cap and ground clip are removed; and C2 (0.1uF) polypropylene capacitor and C3 (10uF) high-frequency low-resistance electrolytic capacitor are connected in parallel at the probe end of the twisted pair cable, and the capacitance values of C0 and C1 refer to the design application circuit data;
2. Ripple noise test: The module input end (INPUT) is connected to the input power supply, and the power supply output is connected to the electronic load (LOAD) through the power line. The test is sampled from the power supply output port using a 30±2 cm twisted pair cable alone, and connected to the oscilloscope probe according to polarity.
3. It is recommended to output a minimum 10% load or connect an electrolytic capacitor with a high-frequency resistance of more than 470uF, otherwise the output voltage ripple will increase;

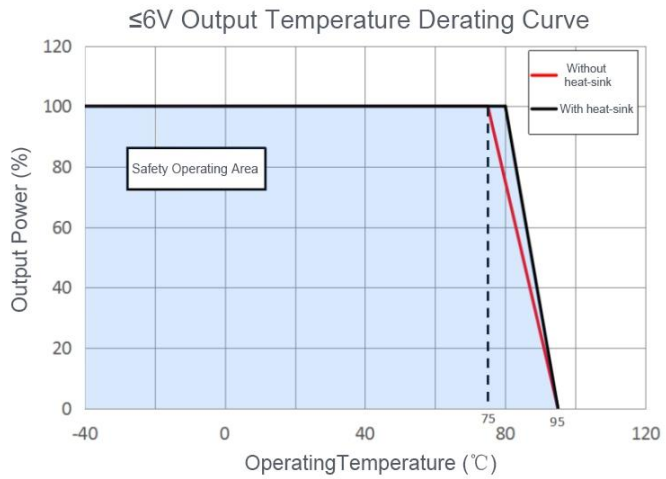
Product Characteristic Curve

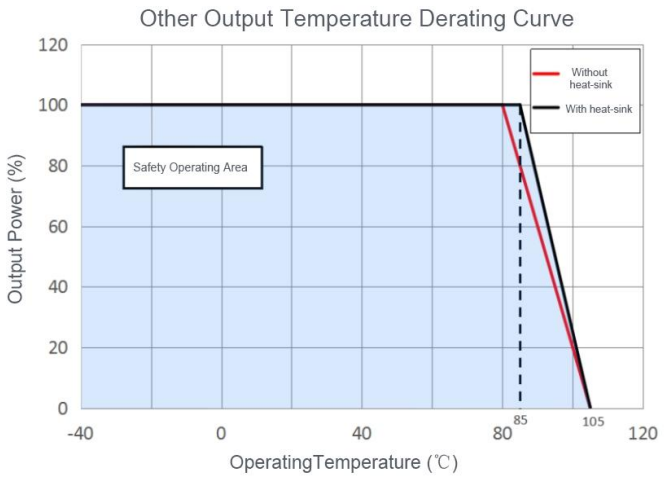








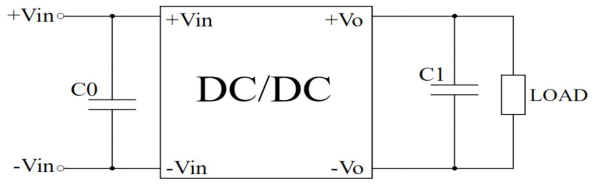




Design Reference Applications

Recommended circuit

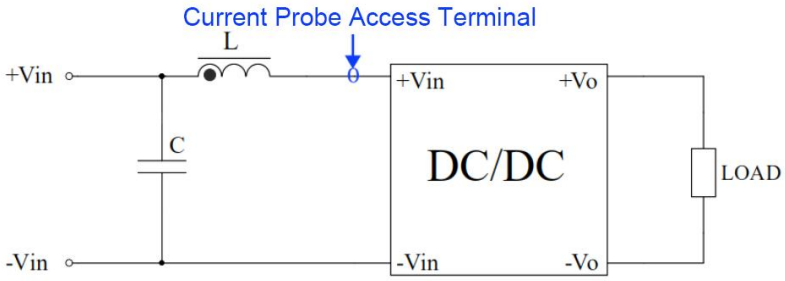
1. DC/DC test circuit:



Component	Parameter
C0	100uF/100V
C1	47uF/50V

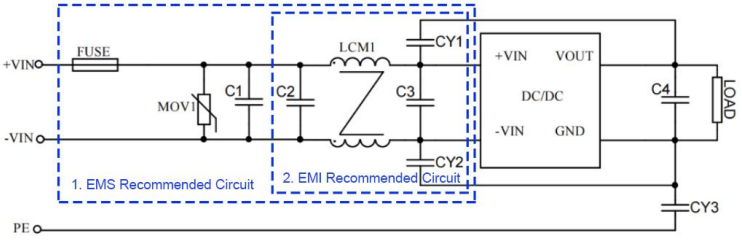
2. Input reflected ripple current test circuit:

Capacitor C needs to be a low ESR type capacitor, and the withstand voltage value should be greater than the maximum input voltage of the product;



Component	Parameter
C	220uF/100V
L	4.7uH

3. Recommended EMC peripheral circuits:

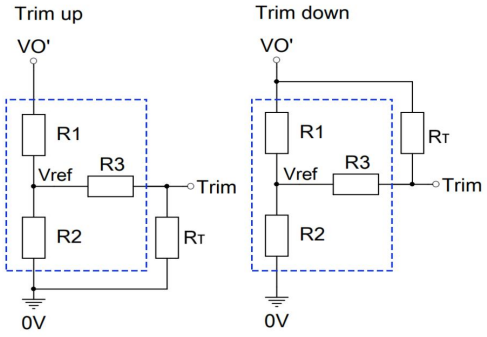


EMC Recommended Circuit

Component	24V Input	48V Input
FUSE	Connect the corresponding fuse according to customer needs	
MOV1	14D560K	14D101K
LCM1	5mH	5mH
C1,C2,C3	330uF/50V	330uF/100V
C4	47uF/50V	47uF/50V
CY1,CY2	2.2nF/2000V	

Note: Part 1 in the figure is for EMS testing, and part 2 in the figure is for EMI filtering, which can be adjusted according to the situation.

4. Use of Trim resistor and calculation of Trim resistor:



Note: Trim uses circuits, and the dotted box area is the interior of the product.

Trim resistance calculation formula:

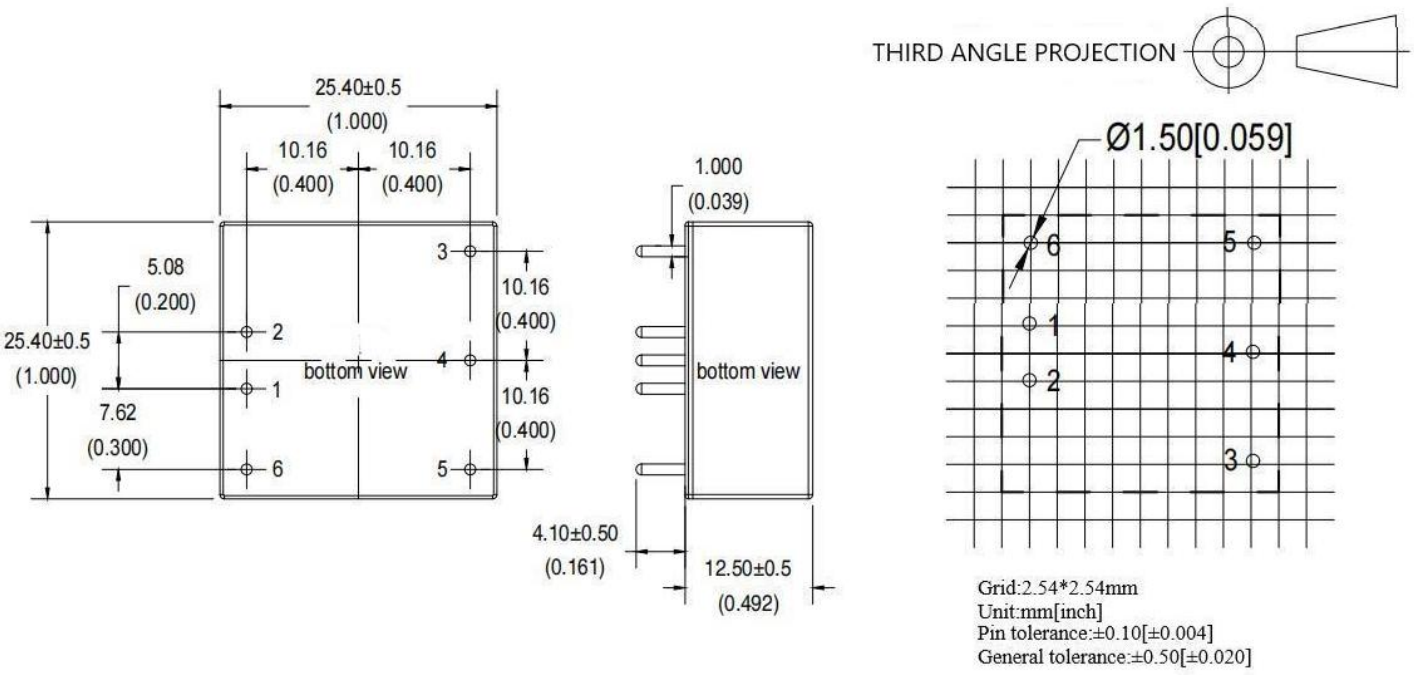
$$up{:}R_T=\frac{aR2}{R2-a}-R3 \qquad a=\frac{Vref}{Vo'-Vref}\cdot R1$$

$$down{:}R_T=\frac{aR1}{R1-a}-R3 \qquad a=\frac{Vo'-Vref}{Vref}\cdot R1$$

RT is the Trim resistor, a is a custom parameter, and Vo' is the actual required up or down voltage

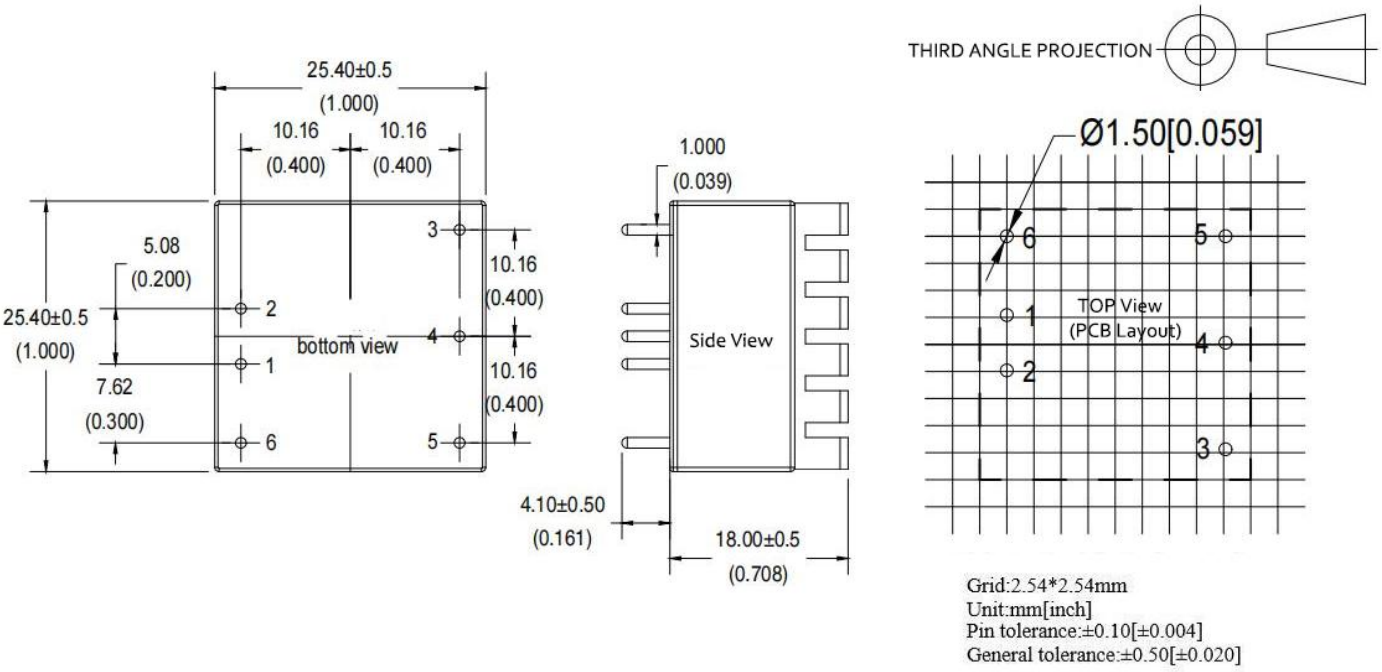
Output Voltage	Trim uses internal circuit parameters			
Vout(VDC)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	4.22	2.55	18	1.25
5	5.1	5.1	20	2.5
9	9.31	3.58	24	2.5
12	18	4.75	33	2.5
15	18	3.6	30	2.5
24	30	3.48	30	2.5

A3 Packing Dimension(Without Heat Sink)



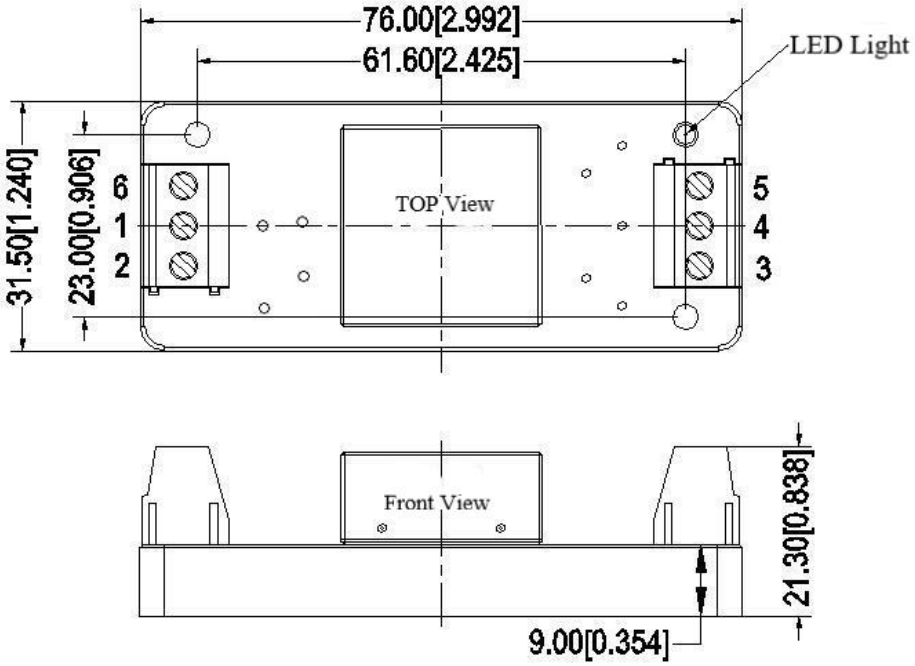
Pin	1	2	3	4	5	6
PFD15-XXSXXA3R2	-Vin	+Vin	+Vout	Trim	GND	Ctrl

A3-H Packing Dimension (With heat sink)



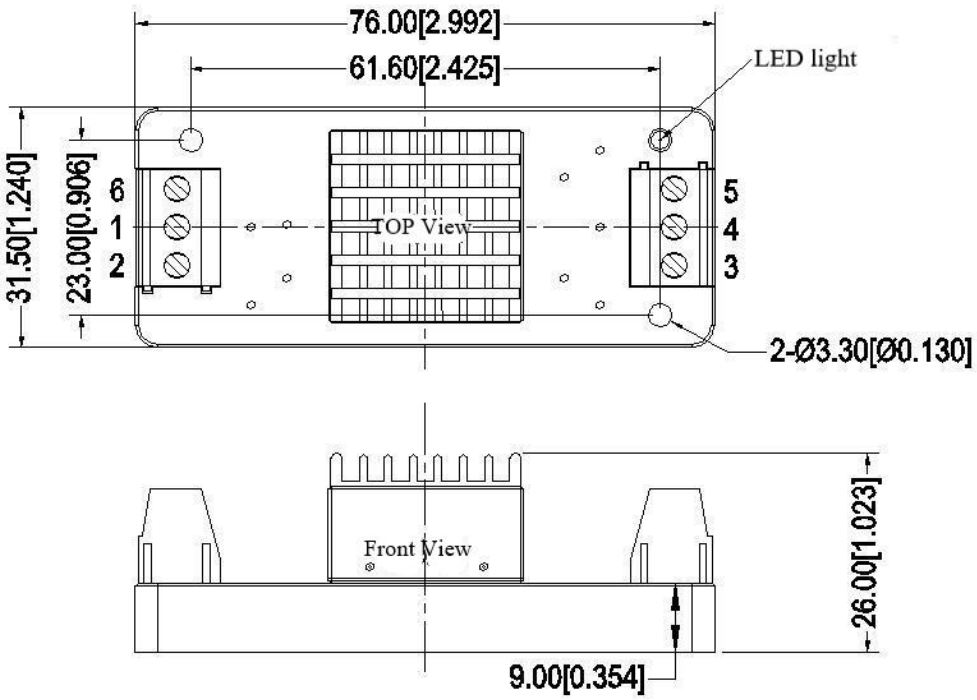
Pin	1	2	3	4	5	6
PFD15-XXSXXA3R2	-Vin	+Vin	+Vout	Trim	GND	Ctrl

A3-T Packing Dimension (Without heat sink)



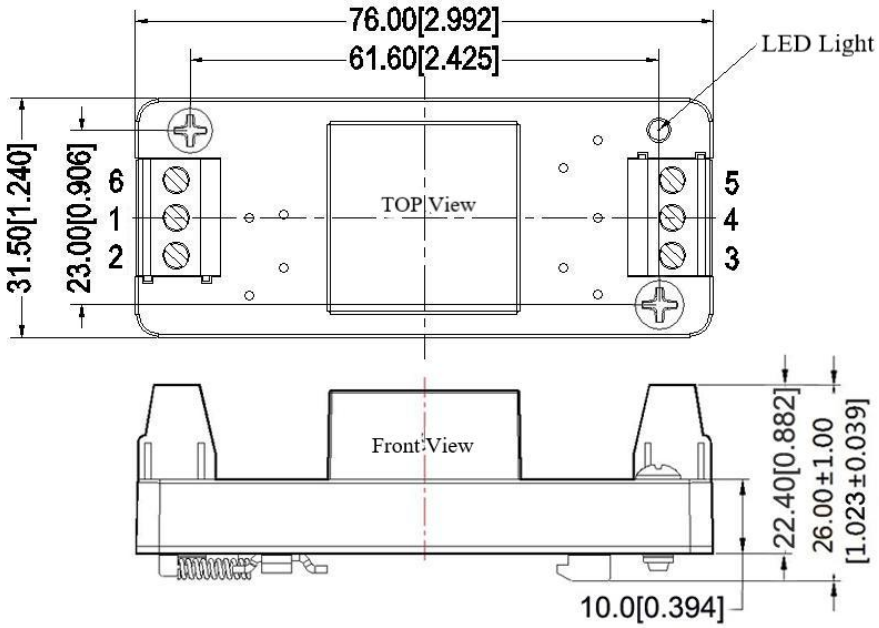
Pin	1	2	3	4	5	6
PFD15-XXSXXA3R2	-Vin	+Vin	+Vout	Trim	GND	Ctrl

A3-TH Packing Dimension (With heat sink)



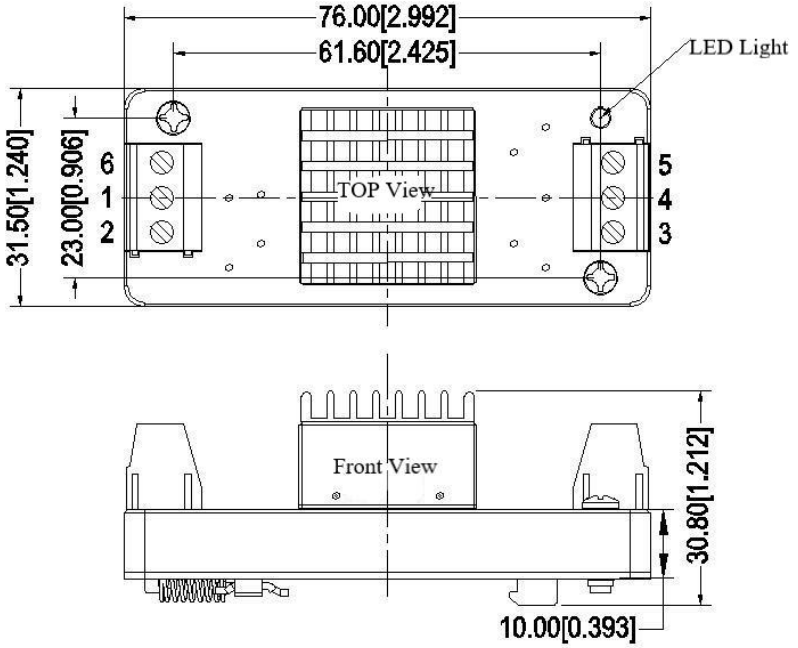
Pin	1	2	3	4	5	6
PFD15-XXSXXA3R2	-Vin	+Vin	+Vout	Trim	GND	Ctrl

A3-TS Packing Dimension (Without heat sink)



Pin	1	2	3	4	5	6
PFD15-XXSXXA3R2	-Vin	+Vin	+Vout	Trim	GND	Ctrl

A3-TSH Packing Dimension (With heat sink)



Pin	1	2	3	4	5	6
PFD15-XXSXXA3R2	-Vin	+Vin	+Vout	Trim	GND	Ctrl

Pin out Specifications

Pin	1	2	3	4	5	6
PFD15-XXSXXA3N2	-Vin	+Vin	+Vout	NP	GND	NP
PFD15-XXSXXA3C2	-Vin	+Vin	+Vout	NP	GND	Ctrl
PFD15-XXSXXA3T2	-Vin	+Vin	+Vout	Trim	GND	NP

Note:

1. The product should be used within the specification range, otherwise it will cause permanent damage to the product;
2. If the product works below the minimum required load, it cannot be guaranteed that the product performance meets all the performance indicators in this manual;
3. If the product works beyond the product load range, it cannot be guaranteed that the product performance meets all the performance indicators in this manual;
4. Unless otherwise specified, the above data are measured at Ta=25℃, humidity<75%, input nominal voltage and output rated load (pure resistance load);
5. All the above index test methods are based on our company's standards;
6. The above are the performance indicators of the product models listed in this manual. Some indicators of non-standard model products will exceed the above requirements. For specific circumstances, please contact our technical personnel directly;
7. Our company can provide product customization;
8. Product specifications are subject to change without prior notice. Please pay attention to the latest manual published on our official website.

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