Typical Feature

- Wide input voltage range (4:1),Output Power 12W
- Transfer Efficiency up to 89%
- Stand-by Power Consumption as low as 0.15W
- Output ultra fast start: Start time as low as 10ms
- Continuous Short Circuit protection, Self-recovery
- Input under voltage, output over voltage, short circuit, over current protection
- Switching Frequency 330KHz
- Isolation Voltage 1500VDC
- Operating Temperature: -40°C~+85°C
- Good EMI performance
- International standard pin-out

Application Field

PFD12-XXSXXA3(C)2(-XXX) *is a newly designed DIP 1X1 packed, 12W 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. For harsh EMC environment.*

Typical Product List

Certificate	Part NO.	Input Voltage Range (VDC)		Output Voltage/Current（Vo/Io）		Input Current (mA) @Nominal Voltage		Max. Capacitive Load	Ripple & Noise (mVp-p)		Full load efficiency（%）	
		Nominal	(Range)	Voltage (VDC)	Current（mA）	Full load Typ	Empty Load Typ	uF	Typ	Max	Min	Typ
-	PFD12-18S3V3A3(C)2	24	9-36	3.3	2400/0	407	2	5000	50	100	79	81
-	PFD12-18S05A3(C)2	24	9-36	5	2000/0	502	2	3000	50	100	81	83
-	PFD12-18S06A3(C)2	24	9-36	6	2000/0	588	2	3000	50	100	83	85
-	PFD12-18S09A3(C)2	24	9-36	9	1333/0	581	2	1500	50	100	84	86
-	PFD12-18S12A3(C)2	24	9-36	12	1000/0	575	2	1000	50	100	85	87
-	PFD12-18S15A3(C)2	24	9-36	15	800/0	568	2	1000	50	100	86	88
-	PFD12-18S17A3(C)2	24	9-36	17	706/0	568	2	1000	50	100	86	88
-	PFD12-18S20A3(C)2	24	9-36	20	600/0	581	2	680	50	100	84	86
-	PFD12-18S24A3(C)2	24	9-36	24	500/0	568	2	470	50	100	86	88
-	PFD12-18S48A3(C)2	24	9-36	48	250/0	575	2	100	50	100	85	87
-	PFD12-36S3V3A3(C)2	48	18-75	3.3	2400/0	211	2	5000	50	100	76	78
-	PFD12-36S05A3(C)2	48	18-75	5	2000/0	251	2	3000	50	100	81	83
-	PFD12-36S5V1A3(C)2	48	18-75	5.1	2353/0	301	2	3000	50	100	81	83
-	PFD12-36S5V5A3(C)2	48	18-75	5.5	2181/0	297	2	3000	50	100	82	84
-	PFD12-36S09A3(C)2	48	18-75	9	1333/0	291	2	1500	50	100	84	86

-	PFD12-36S12A3(C)2	48	18-75	12	1000/0	287	2	1000	50	100	85	87
-	PFD12-36S15A3(C)2	48	18-75	15	800/0	281	2	1000	50	100	87	89
-	PFD12-36S24A3(C)2	48	18-75	24	500/0	284	2	470	50	100	86	88
-	PFD12-36S48A3(C)2	48	18-75	48	250/0	287	2	100	50	100	85	87

Note:

1.Part No. Description- PFD12-XXSXXA3(C)2 PFD12-XXSXXA3(T)2 PFD12-XXSXXA3(R)2 PFD12-XXSXXA3(N)2

C - with remote control pin, **T** - with output voltage adjustment pin, **R** - with remote control pin and output voltage adjustment pin, **N**- without remote control pin and output voltage adjustment pin; **-T** is a wiring type packaging, **- TS** is a rail type packaging, with a rail width of 35mm;

2.The maximum capacity load refers to the allowable connected capacitor capacity when the power supply starts at full load. If it exceeds this capacity, the power supply may not be able to start;

3.Due to limited space, the above is only a partial product list. If you need products outside the list, please contact our sales department;

4.PFD12-36S5V1A3 (C) 2 needs to be derated to 10W for use with 18-24V input.

Input Specification

Item	Operating Condition	Min	Typ	Max	Unit
Standby power consumption	Input voltage range	/	0.15	/	W
Reflected ripple current	24V nominal input, nominal input voltage	/	40	/	mA
	48V nominal input, nominal input voltage	/	30	/	
Input undervoltage protection	24V nominal input	5.5	6.5	/	VDC
	48V nominal input	12	13	/	
Input surge voltage (1sec.max)	24V nominal input	-0.7	/	50	
	48V nominal input	-0.7	/	100	
Input filter	/	π filter			
Ctrl*	Turn on	CTRL is left floating or connected to TTL high level（3.3VDC-12VDC）			
	Turn off	CTRL connected to -Vin or low level（0-1.2VDC）			
	Input current at shutdown	2mA(Typ)			

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

Output Specification

Item	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	Input voltage range	/	±1	±3	%
Voltage Regulation	Nominal load, full voltage range	/	±0.2	±0.5	%
Load Regulation	Nominal input, 5% ~ 100% rated load	/	±0.5	±1	%
Ripple & Noise	5% ~ 100% load, 20MHz bandwidth	/	50	100	mVp-p
Dynamic response time	25% nominal load step, input voltage range	/	250	500	us
Dynamic response deviation	25% of nominal load step, nominal input voltage	/	±3	±5	%
Start-up delay time	Nominal input voltage	/	10	/	ms
Output Over-voltage Protection	Input voltage range	110	160	200	%Vo
Output start-up overshoot voltage		/	/	10	%Vo
Output voltage Regulation (Trim)		90	/	110	%Vo

Output Over-current Protection		110	180	250	%Io
Output Short Circuit Protection		Continuous, self-recovery			
Note: 0% - 5% load ripple & noise is less than or equal to 5%Vo; the ripple & noise test adopts the twisted pair test method, see the ripple & noise test instructions for details.					

General Specification

Item	Test Conditions	Min.	Typ.	Max.	Unit
Switching Frequency	Working mode (PWM)	/	330	/	KHz
Operating Temperature	Refer to temperature derating curve	-40	/	+85	℃
Storage Temperature	-	-55	/	+125	
Relative Humidity	No condensation	5	/	95	%RH
Isolation Voltage	I/P-O/P, test for 1min, leakage current is less than 1mA	1500	/	/	VDC
Insulation Resistance	I/P-O/P, 500VDC	1000	/	/	MΩ
Isolation Capacity	I/P-O/P, 100KHz/0.1V	/	1000	/	pF
Mean Time Between Failures	MIL-HDBK-217F@25℃	1000	/	/	K hours
Cooling Method	Natural cooling				
Case Material	Aluminum metal casing				

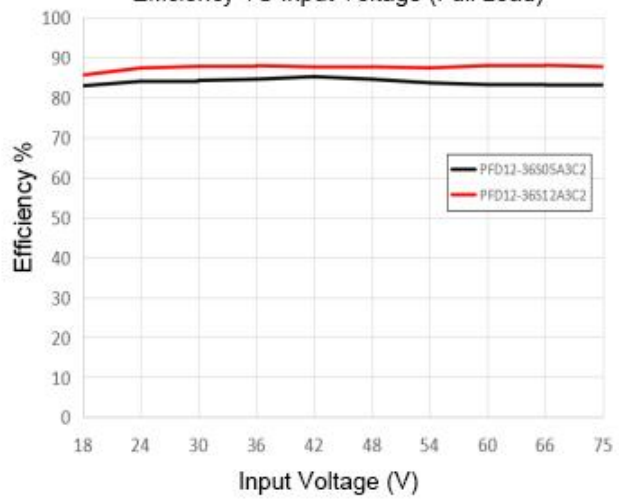
Weight/ Dimension	Part No.	Weight (Typ.)	L x W x H	
	PFD12-XXSXXA3(C)2	15g	25.4X 25.4X11.0mm	1.00X1.00 X0.433inch
	PFD12-XXSXXA3(C)2-H	18g	25.4X 25.4X16.5mm	1.00X1.00 X0.649inch
	PFD12-XXSXXA3(C)2 -T	36g	76.0X31.5X21.3mm	2.99X1.24X0.838inch
	PFD12-XXSXXA3(C)2 -TH	39g	76.0X31.5X25.5mm	2.99X1.24X1.003inch
	PFD12-XXSXXA3(C)2 -TS	56g	76.0X31.5X26.0mm	2.99X1.24X1.023inch
	PFD12-XXSXXA3(C)2 -TSH	59g	76.0X31.5X30.8mm	2.99X1.24X1.212inch

EMC Characteristics

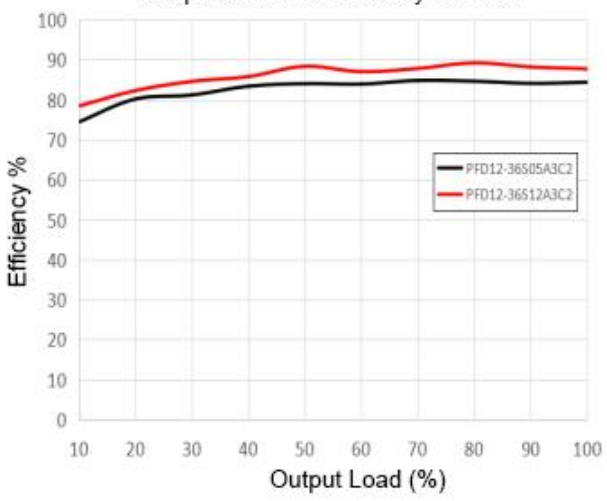
Total Items		Sub Items	Test Standard	Class
EMC	EMI	CE	CISPR22/EN55032	CLASS B （see Recommended Circuit 2）
		RE	CISPR22/EN55032	CLASS B （see Recommended Circuit 2）
	EMS	RS	IEC/EN61000-4-3	10V/m Perf.Criteria B
		CS	IEC/EN61000-4-6	3Vr.m.s Perf.Criteria B
		ESD	IEC/EN61000-4-2	Contact ±4KV Perf.Criteria B
		Surge	IEC/EN61000-4-5	±2KV Perf.Criteria B （see Recommended Circuit 1）
		EFT	IEC/EN61000-4-4	±2KV Perf.Criteria B （see Recommended Circuit 1）
		CE	IEC/EN61000-4-11	0%，70% Perf.Criteria B

Product Characteristic Curve

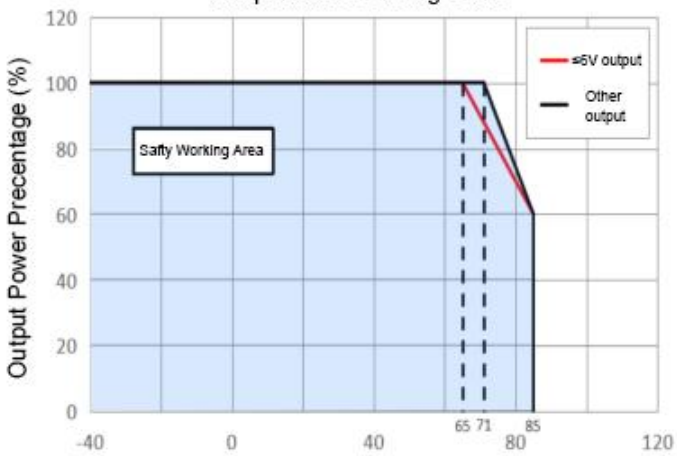
Efficiency VS Input Voltage (Full Load)



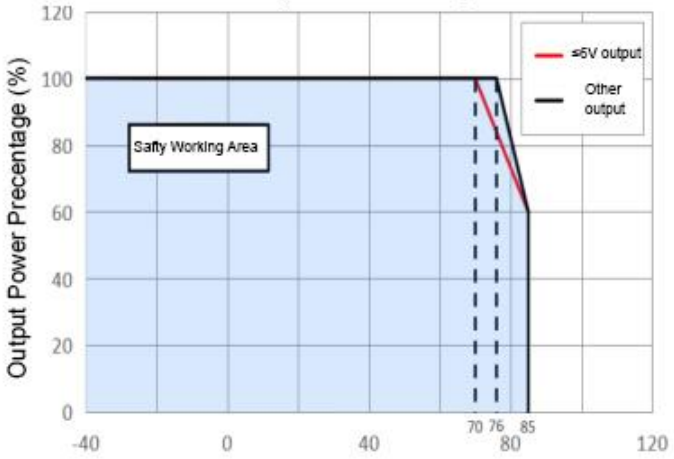
Output Load VS Efficiency Vin=48V



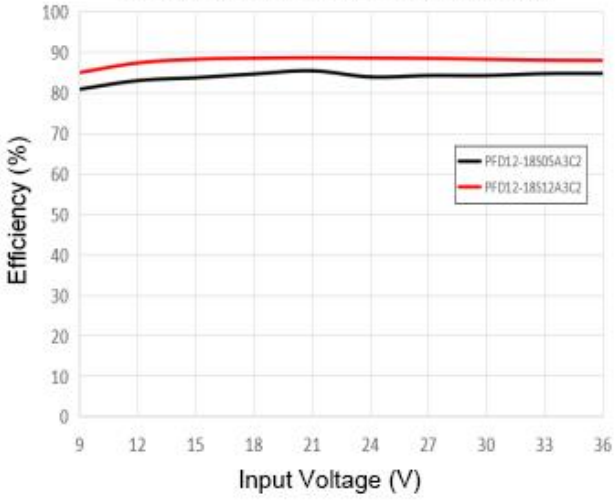
PFD12-XXSXXA3C2(without heatsink)
Temperature DeratingCurve



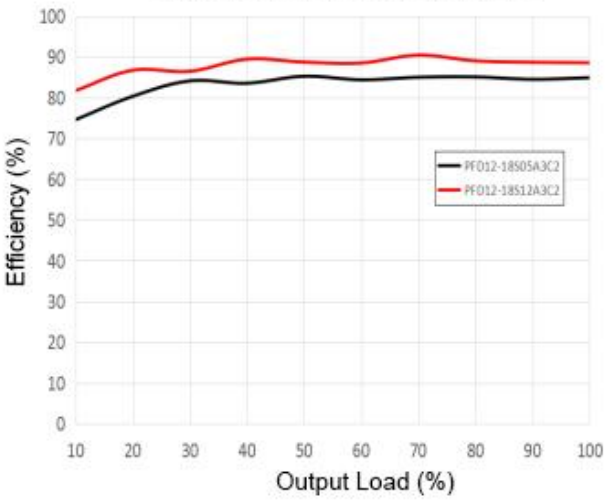
PFD12-XXSXXA3C2-H(with heatsink)
Temperature DeratingCurve



Efficiency VS Input Voltage (Full Load)



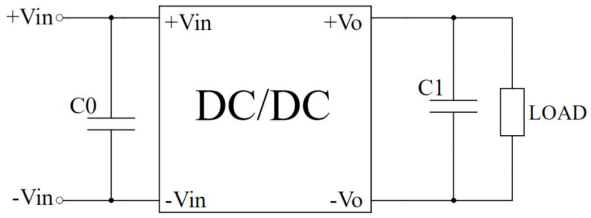
Output Load VS Efficiency Vin=24V



Design and Application Reference

Recommended circuit

1. DC/DC test circuit:

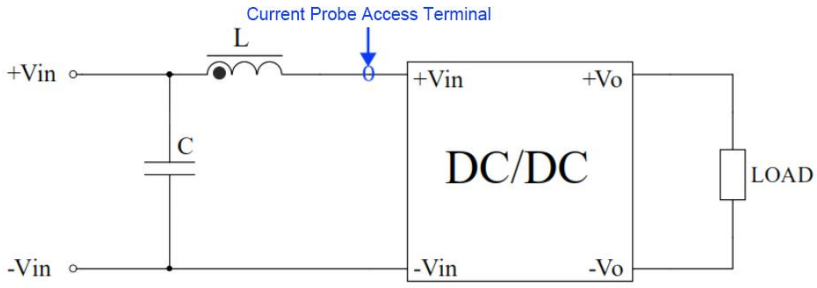


Parameter Description:

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

2. Input reflected ripple current test circuit:

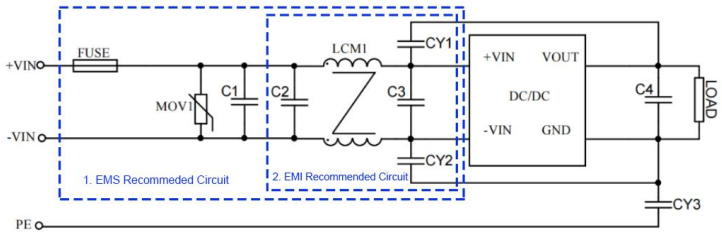
Capacitor C needs to be a low ESR type capacitor, and the withstand voltage value should be greater than the maximum input voltage of the product;



Parameter Description:

Components	Parameter
C	220uF
L	4.7uH

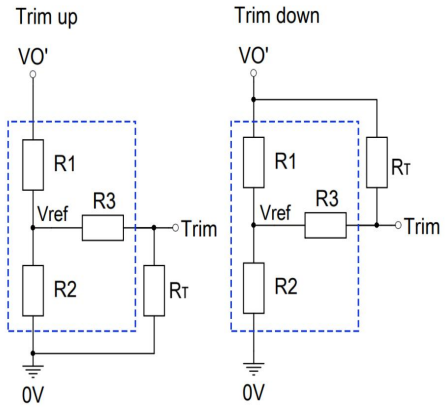
3. Recommended peripheral circuits (Figure 1 and Figure 2):



Parameter Description:

Components	Norminal Voltage 24V Input	Norminal Voltage 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 testing, which can be adjusted according to the situation.



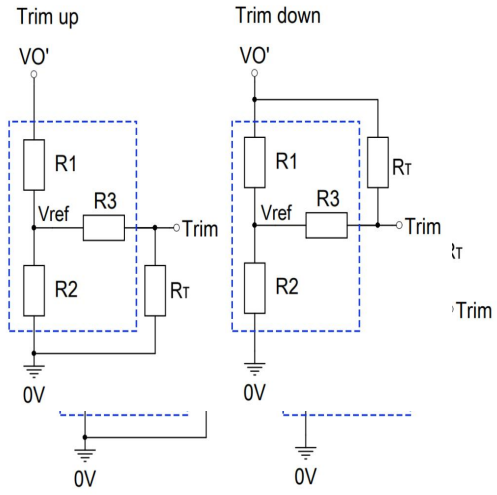
Trim resistance calculation formula:

$$up:\ R_T=\frac{aR_2}{R_2-a}-R_3 \qquad a=\frac{Vref}{Vo'-Vref}\cdot R_1$$

$$down:\ R_T=\frac{aR_1}{R_1-a}-R_3 \qquad a=\frac{Vo'-Vref}{Vref}\cdot R_2$$

RT is the Trim resistor, a is a custom parameter, and Vo' is the actual voltage that needs to be adjusted up or down.

4. Use of Trim and calculation of Trim resistance



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

Trim resistance calculation formula:

$$up:\ R_T=\frac{aR_2}{R_2-a}-R_3 \qquad a=\frac{V_{ref}}{V_o'-V_{ref}}\cdot R_1$$

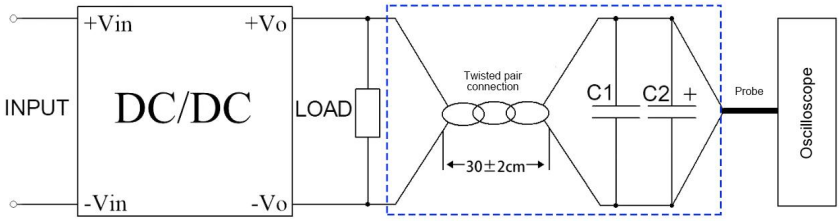
$$down:\ R_T=\frac{aR_1}{R_1-a}-R_3 \qquad a=\frac{V_o'-V_{ref}}{V_{ref}}\cdot R_2$$

RT is the Trim resistor, a is a custom parameter, and Vo' is the actual voltage that needs to be adjusted up or down.

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
48	45.3	2.47	18	2.5
Note: The Trim adjustment function is only applicable to the above output voltages.				

Ripple& Noise Test: (Twisted Pair Method 20MHZ bandwidth)

Test Methods:

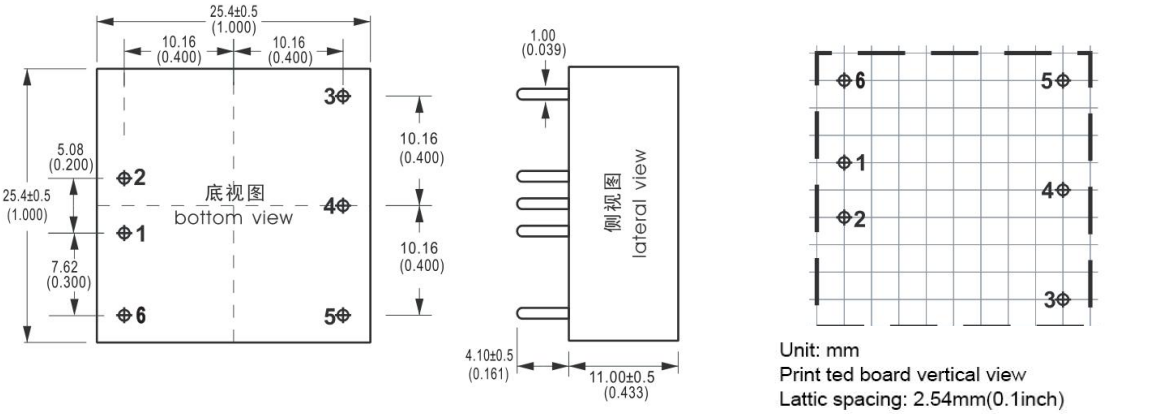


1. Ripple noise is connected using 12# twisted pair cable, the oscilloscope bandwidth is set to 20MHz, 100M bandwidth, the probe cap and ground wire are removed, and C1 (0.1uF polypropylene capacitor) and C2 (10uF high-frequency low-resistance electrolytic capacitor) are connected in parallel on the probe end, and the oscilloscope sampling uses the Sample sampling mode.
2. Output ripple noise test diagram: Connect the power input end to the input power supply, and the power output is connected to the electronic load through the fixture board. The test is to use a 30cm±2 cm sampling line to directly sample from the power output port. The power line selects the corresponding wire diameter with an insulated wire according to the output current.

Application reference:

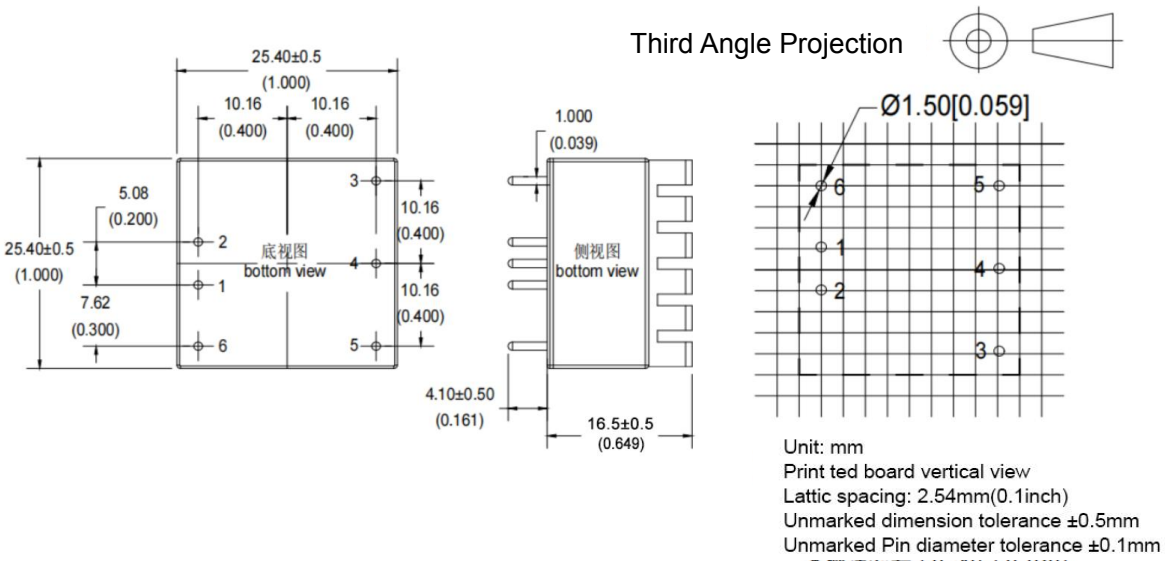
1. The maximum capacitive load is obtained by testing under pure resistive full load conditions;
2. It is recommended to output a minimum 5% load or connect a high-frequency low-resistance electrolytic capacitor of more than 100uF, otherwise it will cause the output voltage ripple & noise to increase;
3. Our company can provide an overall power supply solution or product customization; due to limited space, if you have other questions, please contact our relevant personnel.

A3 Packing Dimension (without heat sink)



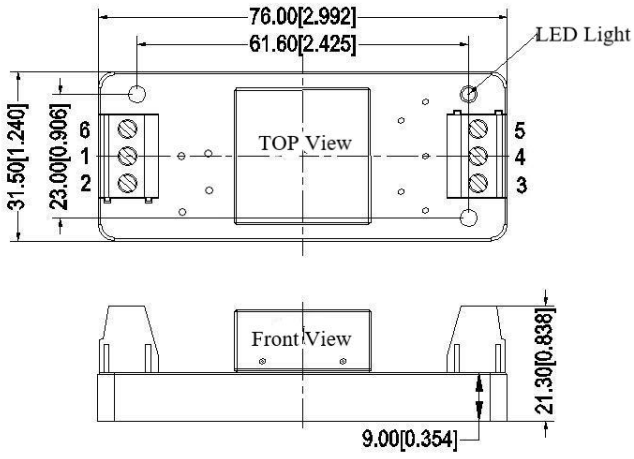
Part No.	1	2	3	4	5	6
PFD12-XXSXXA3R2	-Vin	+Vin	+Vout	Trim	GND	Ctrl

A3-H Packing Dimension (with heat sink)



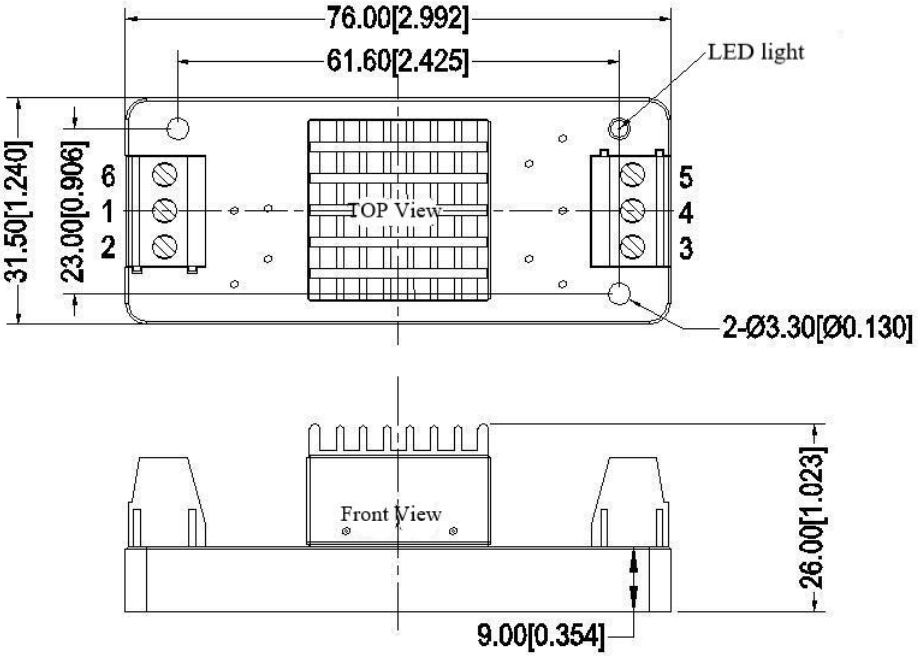
Pin	1	2	3	4	5	6
PFD12-XXSXXA3R2	-Vin	+Vin	+Vout	Trim	GND	Ctrl

A3-H Packing Dimension (without heat sink)



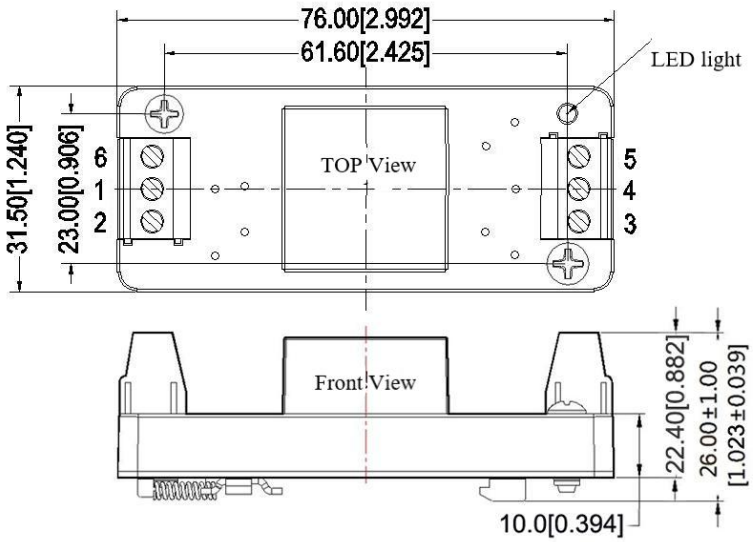
Pin	1	2	3	4	5	6
PFD12-XXSXXA3R2	-Vin	+Vin	+Vout	Trim	GND	Ctrl

A3-TH Packing Dimension (with heat sink)



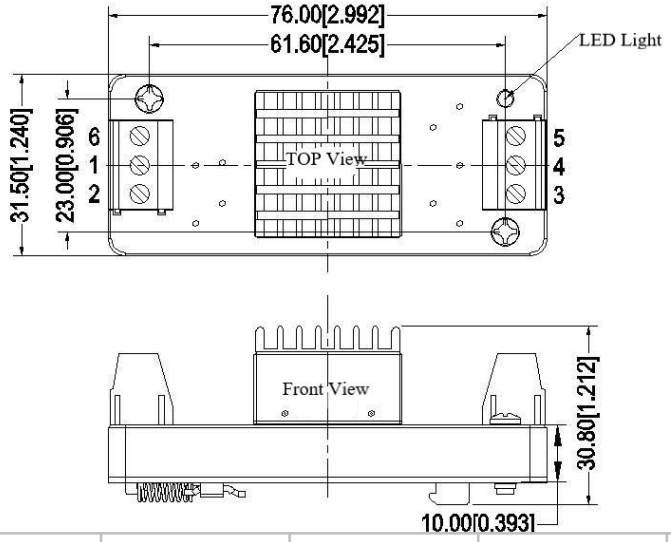
Pin	1	2	3	4	5	6
PFD12-XXSXXA3R2	-Vin	+Vin	+Vout	Trim	GND	Ctrl

A3-TS Packing Dimension (without heat sink)



Pin	1	2	3	4	5	6
PFD12-XXSXXA3R2	-Vin	+Vin	+Vout	Trim	GND	Ctrl

A3-TSH Packing Dimension (with heat sink)



Pin	1	2	3	4	5	6
PFD12-XXSXXA3R2	-Vin	+Vin	+Vout	Trim	GND	Ctrl

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 models will exceed the above requirements. For specific details, please contact our technical personnel directly;
7. We can provide customized product service;
8. The product specification may be changed at any time without prior notice.

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