Typical Features

- ◆ Wide input voltage range (4:1), output power 30W
- ◆ Efficiency up to 91% (Typ.)
- ◆ Standby power consumption as low as 0.08W
- ◆ Continuous short circuit protection, Self-recovery
- ◆ Input under voltage protection, output over voltage, short circuit & over current protections
- ◆ Isolation voltage 1500VDC
- ◆ Operating temperature from -40°C to +105°C
- ◆Excellent EMC performance
- ◆International standard in-out alignment

Application Field

PFD30-XXSXXA3(R)2 series --- *Standard 1"X1" size DIP package DC-DC modular converters with wide input voltage range (4:1), low standby power consumption, isolated & regulated single output 30W. This series of products can be widely used in the fields of Industrial control, Instrument, Communication, Electric power and IoT, etc. The additional circuit for EMC is recommended for the application with higher EMC requirement.*

Typical Product List

Certificate	Part No	Input Voltage Range		Output Voltage/Current (Vo/Io)		Input Current (mA) Typ. @nominal volt.		Max. Capacitive Load	Efficiency (%) @full load, nominal volt.	
		Nominal (VDC)	Range (VDC)	Vo (VDC)	Io (mA)	Full load	No load	(μF)	Min	Typ.
-	PFD30-18S3V3A3R2	24	9-36	3.3	6000/0	948	40	10000	85	87
RoHS	PFD30-18S05A3R2			5	6000/0	1420	40	10000	86	88
RoHS	PFD30-18S06A3R2			6	5000/0	1404	40	8000	87	89
RoHS	PFD30-18S09A3R2			9	3333/0	1388	40	3000	88	90
RoHS	PFD30-18S12A3R2			12	2500/0	1388	40	2000	89	90
RoHS	PFD30-18S15A3R2			15	2000/0	1388	40	1500	89	90
RoHS	PFD30-18S24A3R2			24	1250/0	1388	3	750	88	90
-	PFD30-18S48A3R2			48	625/0	1420	8	330	86	88
-	PFD30-36S3V3A3R2	48	18-75	3.3	6000/0	474	40	10000	85	87
-	PFD30-36S05A3R2			5	6000/0	710	40	10000	87	88
-	PFD30-36S09A3R2			9	3333/0	694	40	3000	88	90
-	PFD30-36S12A3R2			12	2500/0	694	40	2000	89	91
-	PFD30-36S15A3R2			15	2000/0	694	40	1500	89	91
-	PFD30-36S24A3R2			24	1250/0	694	2	750	88	90
-	PFD30-36S48A3R2			48	625/0	710	4	330	86	88

Note 1: The part number letter R indicates the part with both ON/OFF Control & Trim functions, C indicates the part with ON/OFF Control, T indicates the part with Trim, N indicates the part with None of Control or Trim.

Note 2: The sμFfix -H indicates the part with Heat sink, -T (H) indicates the chassis package (with heat sink), -TS (H) indicates the package of DIN Rail (with heat sink).
Note 3: The efficiency is tested at nominal input voltage and output rated load.
Note 4: The maximum capacitive load is the capacitance allowed to be used when the power supply starts at full load. The converter may not start up if the capacitor exceeds this value.
Note 5: The chip could work at lower frequency with no load or low load to decrease the no load power and improve the efficiency.
Note 6: Please contact Aipu sales for other output voltages requirements of this series but not listed in this table.

Input Specifications

Items	Test Conditions	Min.	Typ.	Max.	Unit
Standby power consumption	24V output	/	0.08	/	W
	48V output	/	0.2	/	
	Others output	/	1	/	
Max input current	Full input voltage range	/	/	3.9	A
Start-up voltage	Nominal 24V input	/	8	9	VDC
	Nominal 48V input	/	15	18	
Under voltage protection	Nominal 24V input	5	7	9	VDC
	Nominal 48V input	11	13	18	
Input inrush voltage (1sec.max)	Nominal 24V input	-0.7	/	50	VDC
	Nominal 48V input	-0.7	/	100	VDC
Reflected ripple current	Nominal input voltage	/	30	/	mA
Input filter	/	Pi filter			
Hot Plug	/	N/A			
ON/OFF control (Ctrl)	Turn ON the converter	No connection or connected to high level (3.3-12VDC)			
	Turn OFF the converter	Connected to -Vin or low level (0-1.2VDC)			
	The current value for switching off	/	2	/	mA

Note: The voltage of the Ctrl is relative to the input -Vin.

Output Specifications

Items	Test Conditions		Min.	Typ.	Max.	Unit
Output voltage accuracy	Full input voltage range		/	±1	±3	%
Voltage regulation	Full input voltage range, rated load		/	±0.2	±0.5	
Load regulation	Nominal input voltage, 10%-100% load		/	±0.5	±1	
Ripple & Noise	0%-100% load, 20MHz bandwidth		/	50	100	mVp-p
Dynamic response time	25% load change step, full input voltage range		/	300	500	uS
Dynamic response deviation	25% load change step, nominal input voltage	Vo ≤6V	/	±5	±8	%
		Others	/	±3	±5	
Temperature drift coefficient	Full load		/	/	±0.03	%/℃
Turn-on delay time	Nominal input voltage		/	20	/	mS
Output voltage Trim	Full input voltage range		90	/	110	%Vo
Output overshoot			/	/	10	

Over voltage protection	Full input voltage range	120	140	200	%Vo
Over current protection		110	140	260	%Io
Short circuit protection		Hiccup, continuous, self-recovery			
Note: The Ripple and Noise is tested by the Parallel-line method, please refer to the following test instruction.					

General Specifications

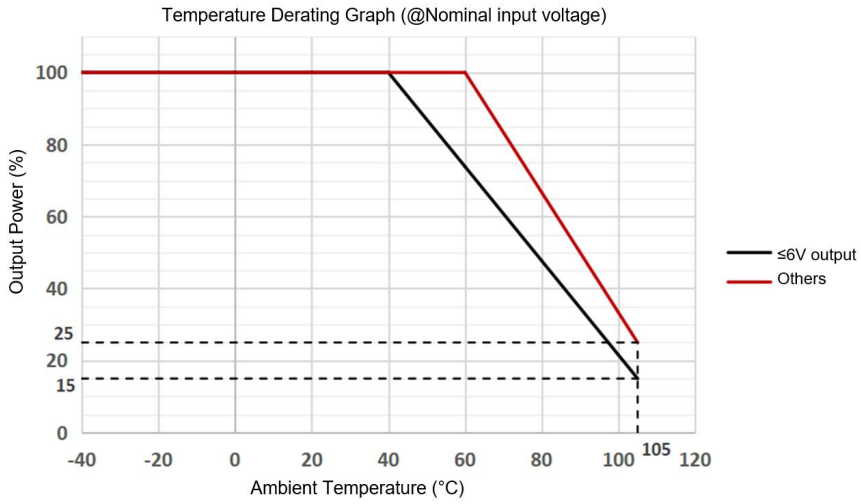
Items	Test Conditions		Min.	Typ.	Max.	Unit
Switching frequency	Operating mode (PWM)		/	280	/	KHz
Operating temperature	Refer to Temperature Derating Graph		-40	/	+105	℃
Storage temperature	/		-55	/	+125	
Max case temperature	Within the operating derating range		/	/	+105	
Pin soldering temperature	1.5mm from the case, soldering time 10 sec.		/	/	300	
Relative humidity	No condensing		5	/	95	%RH
Isolation voltage	I/P-O/P	Dielectric test 1min, leakage current <1mA	1500	/	/	VDC
	I/P&O/P-Case		1000	/	/	VDC
Insulation resistance	I/P-O/P	@500VDC	1000	/	/	MΩ
Isolation capacitance	I/P-O/P	100KHz/0.1V	/	1000	/	pF
MTBF	MIL-HDBK-217F@25℃		1000	/	/	KHrs
Cooling method	Nature convention					
Vibration	10-150Hz, 5G, 0.75mm, along X, Y and Z					
Case material	Aluminum					

Weights/Dimensions	Part No.	Weight (Typ.)	Dimensions L x W x H	
	PFD30-XXSXXA3(R)2	18g	25.40X 25.40X12.50 mm	1.000X1.000X0.492 inch
	PFD30-XXSXXA3(R)2-H	21g	25.40X25.40X18.00 mm	1.000X1.000X0.708 inch
	PFD30-XXSXXA3(R)2-T	39g	76.00X31.50X21.30 mm	2.992X1.24X0.838 inch
	PFD30-XXSXXA3(R)2-TH	42g	76.00X31.50X26.00 mm	2.992X1.24X1.023 inch
	PFD30-XXSXXA3(R)2-TS	59g	76.00X31.50X26.00 mm	2.992X1.24X1.023 inch
	PFD30-XXSXXA3(R)2-TSH	62g	76.00X31.50X30.80 mm	2.992X1.24X1.212 inch

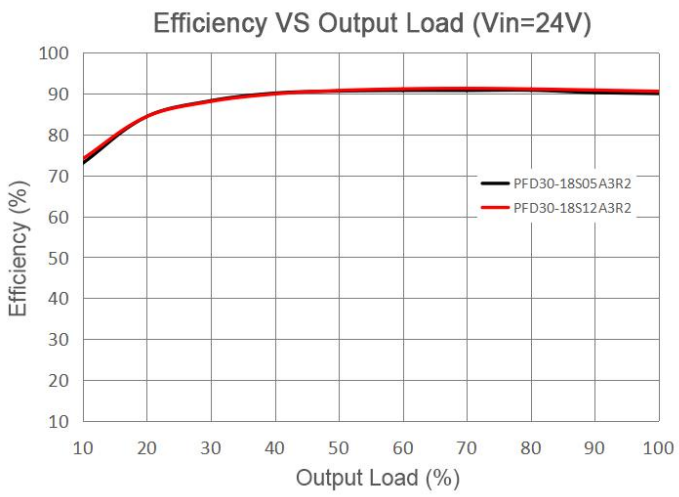
EMC Performances

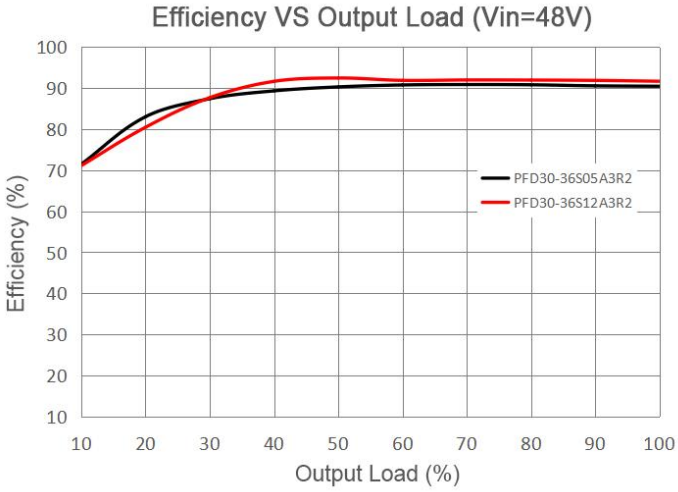
Items			Test Standard	Performance/Class
EMC	EMI	CE	CISPR32/EN55032	CLASS B (with the Recommended EMC Circuit)
		RE	CISPR32/EN55032	CLASS B (with the Recommended EMC Circuit)
	EMS	RS	IEC/EN61000-4-3	10V/m Perf. Criteria A (with the Recommended EMC Circuit)
		CS	IEC/EN61000-4-6	3Vr.m.s Perf. Criteria A (with the Recommended EMC Circuit)
		ESD	IEC/EN61000-4-2	Contact ±6KV Perf. Criteria B
		Surge	IEC/EN61000-4-5	±2KV Perf. Criteria B (with the Recommended EMC Circuit)
		EFT	IEC/EN61000-4-4	±2KV Perf. Criteria B (with the Recommended EMC Circuit)

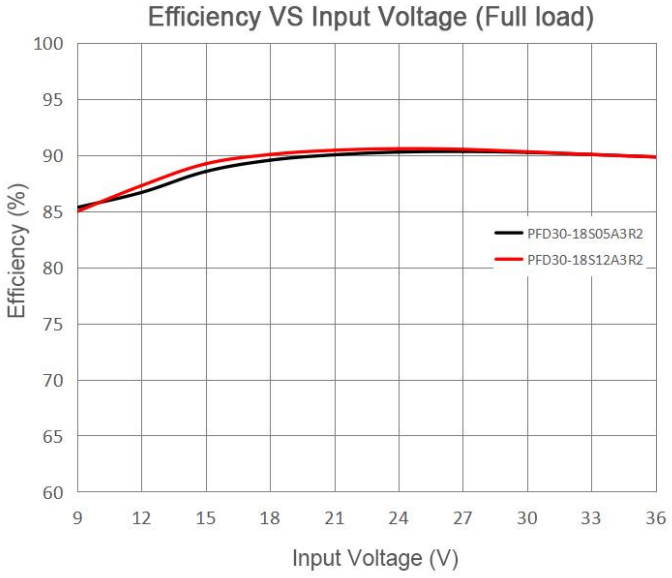
Temperature Derating Curve

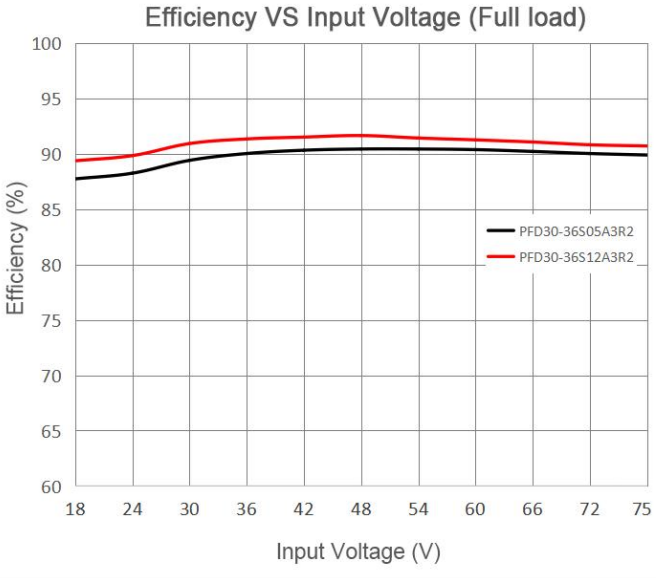


Efficiency Curve

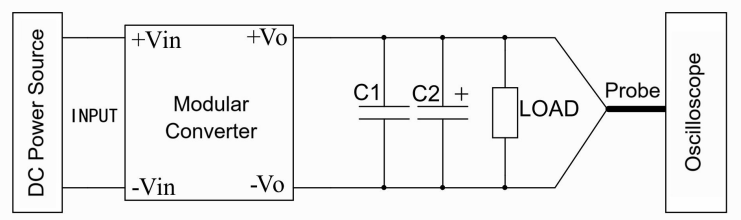








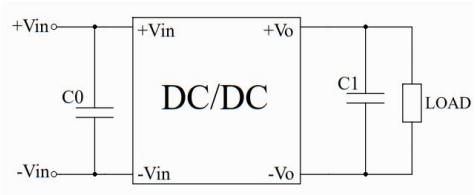
Ripple& Noise Test Instruction (Parallel-line Method, 20MHZ bandwidth)



1. The Ripple & Noise test needs the cables in parallel, an oscilloscope that should be set at the Sample Mode, bandwidth 20MHz. 100M bandwidth probe with cap and ground removed. One polypropylene capacitor C1(0.1μF) and one high-frequency low-resistance electrolytic capacitor C2(10μF) are connected in parallel with the probe.
2. Refer to the test diagram, the converter output connects to the electronic load by the jig with cables which size should be defined according to the output current value. The test can start at the converter output terminals after the input power on.

Recommended Circuits for Application

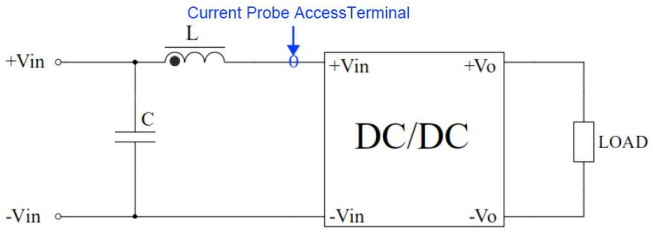
1. DC/DC test circuit diagram



Component	Parameter
C0	100μF/100V
C1	100μF/50V

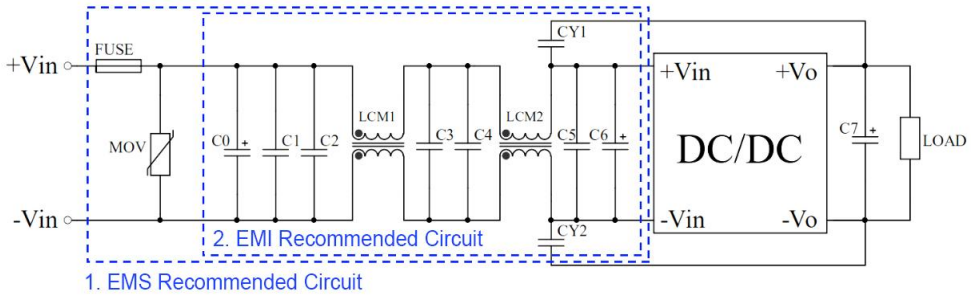
2. Input reflected ripple current test circuit diagram

Low ESR capacitor is recommended for C which withstand voltage should be more than the Maximum input voltage.



Component	Parameter
C	220μF/100V
L	4.7uH/15A

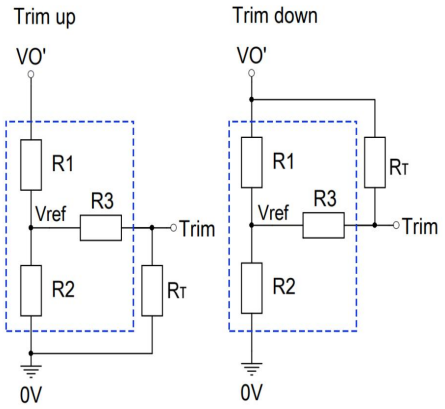
3. Recommended EMC circuit diagram



Note: Part 1 circuit is for EMS test, part 2 is for EMI filtering, both can be adjusted according to the actual situation.

Component	Vin 24V	Vin 48V
FUSE	TBD by the customer	
MOV	14D560K	14D101K
LCM1	5mH	
LCM2	250uH	
C0	1000μF/50V	470μF/100V
C1, C2, C3, C4, C5	10μF/50V	10μF/100V
C6	470μF/50V	470μF/100V
C7	100μF/50V	
CY1, CY2	2.2nF/2KV	

4. Output voltage Trim and calculation of Trim resistance



Note: Trim up & down circuits, the components in the dotted area are inside of the converter.

Calculation formula of Trim resistance:

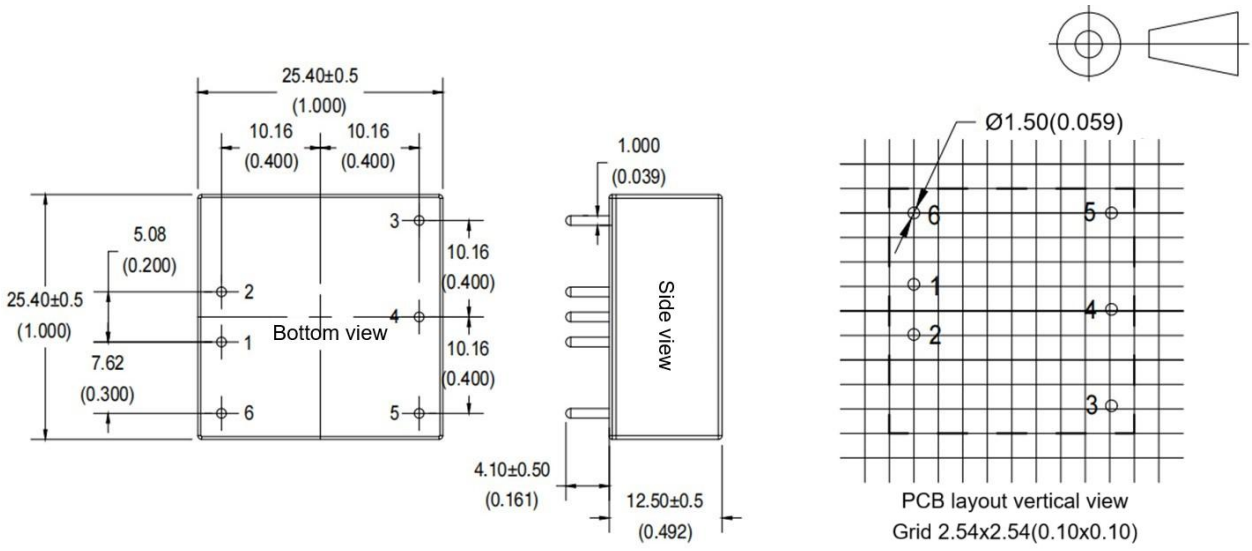
$$\text{up: } R_T = \frac{aR_2}{R_2-a} - R_3 \qquad a = \frac{Vref}{Vo'-Vref} \cdot R_1$$

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

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

Output Voltage	Internal circuit parameters for Trim			
Vout (DC)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	4.22	2.55	12	1.25
5	5.1	5.1	20	2.5
6	6.2	4.44	20	2.5
9	9.31	3.58	24	2.5
12	18	4.75	33	2.5
15	18	3.6	25.5	2.5
24	30	3.48	30	2.5
48	45.3	2.47	18	2.5
Note: The Trim function works only for above output voltages				

Mechanical Dimensions (Without Heat Sink)

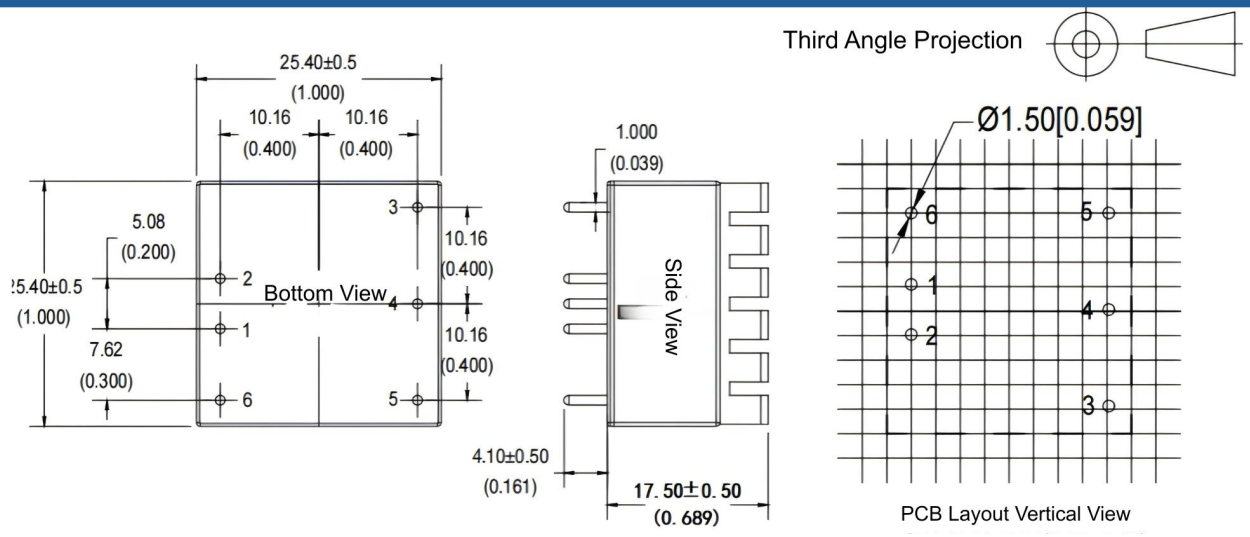


Unit: mm(inch)
General tolerance: ±0.10(±0.004)
Pin diameter tolerance: ±0.50(±0.020)

Pin-out Function Description

Pin No.	1	2	3	4	5	6
PFD30-XXSXXA3R2	-Vin	+Vin	+Vo	Trim	GND	Ctrl
	Input Negative	Input Positive	Output Positive	Output Trim	Output Ground	Remote Control

-H Package Mechanical Dimensions (With Heat Sink)

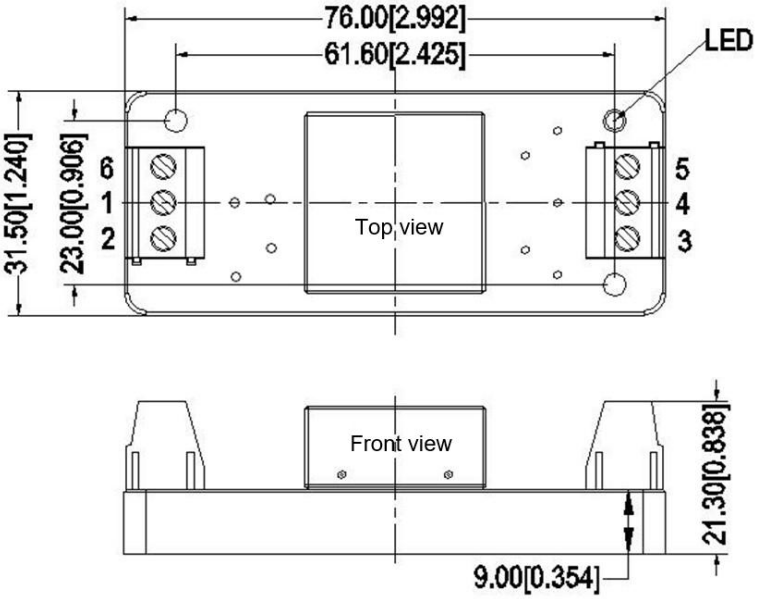


Unit: mm(inch)
General tolerance: ±0.10(±0.004)
Pin diameter tolerance: ±0.50(±0.020)

Pin-out Function Description

Pin No.	1	2	3	4	5	6
PFD30-XXSXXA3R2	-Vin	+Vin	+Vo	Trim	GND	Ctrl
	Input Negative	Input Positive	Output Positive	Output Trim	Output Ground	Remote Control

-T Package Mechanical Dimensions (Without Heat Sink)

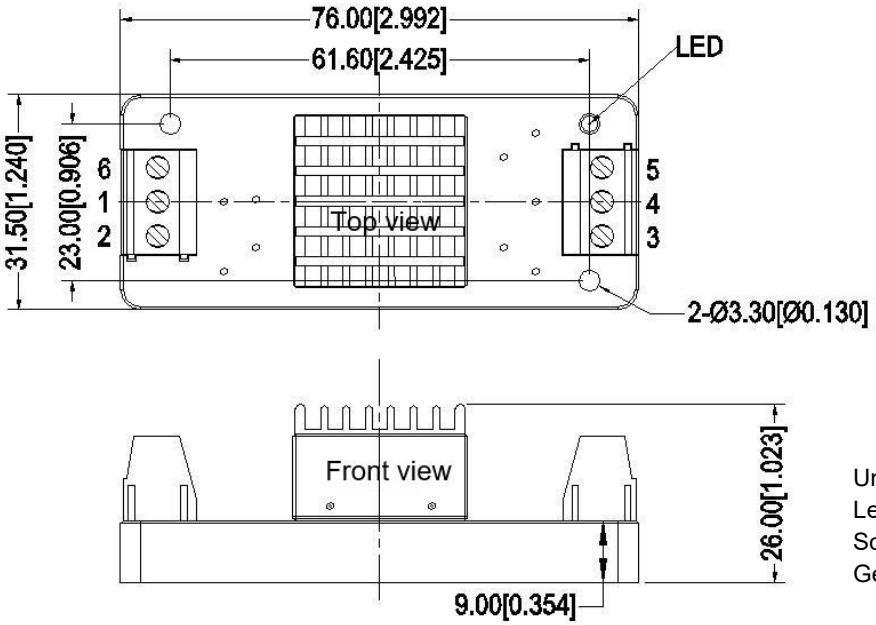


Unit: mm[inch]
Lead wires gauge: 24-12AWG
Screwing torque: 0.4N.m Max
General tolerance ±1.00[±0.039]

Terminal Function Description

Terminal No.	1	2	3	4	5	6
PFD30-XXSXXA3R2	-Vin	+Vin	+Vo	Trim	GND	Ctrl
	Input Negative	Input Positive	Output Positive	Output Trim	Output Ground	Remote Control

-TH Package Mechanical Dimensions (With Heat Sink)

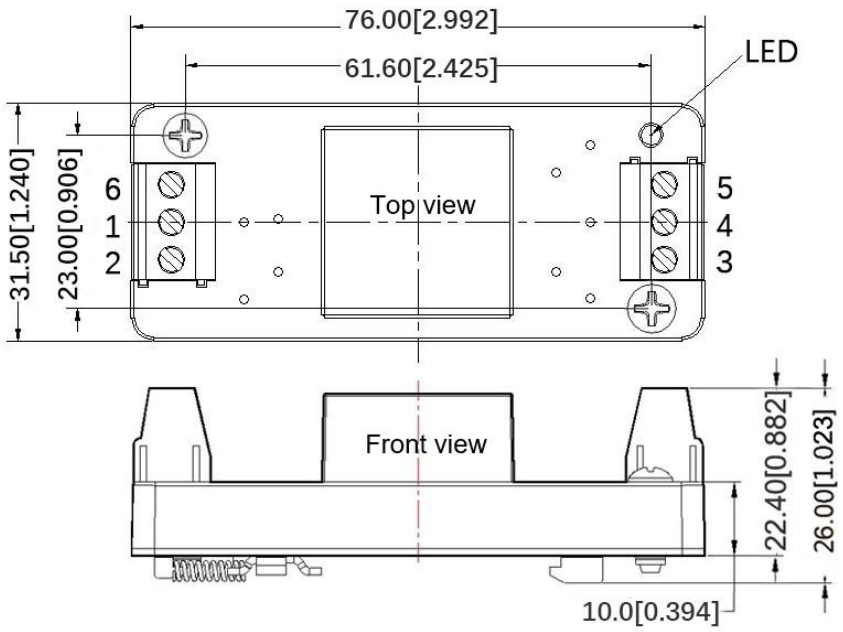


Unit: mm[inch]
Lead wires gauge: 24-12AWG
Screwing torque: 0.4N.m Max
General tolerance ±1.00[±0.039]

Terminal Function Description

Terminal No.	1	2	3	4	5	6
PFD30-XXSXXA3R2	-Vin	+Vin	+Vo	Trim	GND	Ctrl
	Input Negative	Input Positive	Output Positive	Output Trim	Output Ground	Remote Control

-TS Package Mechanical Dimensions (Without Heat Sink)

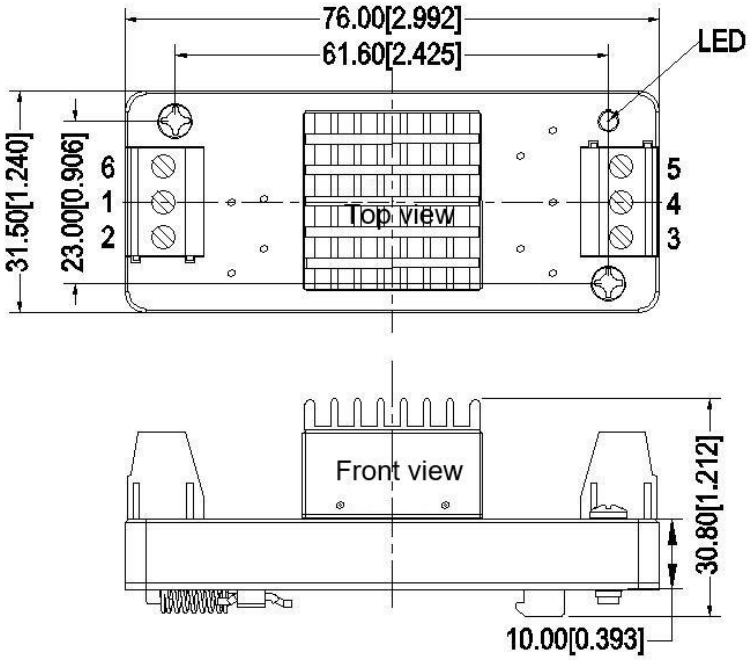


Unit: mm[inch]
Lead wires gauge: 24-12AWG
Screwing torque: 0.4N.m Max
General tolerance ±1.00[±0.039]

Terminal Function Description

Terminal No.	1	2	3	4	5	6
PFD30-XXSXXA3R2	-Vin	+Vin	+Vo	Trim	GND	Ctrl
	Input Negative	Input Positive	Output Positive	Output Trim	Output Ground	Remote Control

-TSH Package Mechanical Dimensions (With Heat Sink)



Unit: mm[inch]
Lead wires gauge: 24-12AWG
Screwing torque: 0.4N.m Max
General tolerance ±1.00[±0.039]

Terminal Function Description

Terminal No.	1	2	3	4	5	6
PFD30-XXSXXA3R2	-Vin	+Vin	+Vo	Trim	GND	Ctrl
	Input Negative	Input Positive	Output Positive	Output Trim	Output Ground	Remote Control

Other Models Terminal Function Description						
Pin/Terminal No.	1	2	3	4	5	6
PFD30-XXSXXA3C2	-Vin	+Vin	+Vo	NP	GND	Ctrl
	Input Negative	Input Positive	Output Positive	No Pin	Output Ground	Remote Control
PFD30-XXSXXA3T2	-Vin	+Vin	+Vo	Trim	GND	NP
	Input Negative	Input Positive	Output Positive	Output Trim	Output Ground	No Pin
PFD30-XXSXXA3N2	-Vin	+Vin	+Vo	NP	GND	NP
	Input Negative	Input Positive	Output Positive	No Pin	Output Ground	No Pin

Application Notice

1.The product should be used according to the specification, otherwise it could be permanently damaged.

2. The product performance cannot be guaranteed if it works at a lower load than the minimum load defined.

3. The product performance cannot be guaranteed if it works under over-load condition.

4. Unless otherwise specified, all values or indicators on this datasheet are tested at Ta=25℃, humidity<75%RH, nominal input voltage and rated load (pure resistance load).

5. All values or indicators on this datasheet have been tested based on Aipupower test specifications.

6.All specifications listed in this manual apply to the standard models only. Certain parameters for non-standard models may vary from these requirements; please contact our technical team for specific details.

7. Aipupower can provide customization service.

8. This product is designed for natural convection cooling. Please consult our technical team if it is to be used in an enclosed environment.

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