

Typical Features

- ◆ Wide input voltage range (4:1), output power 50W
- ◆ Efficiency up to 92%
- ◆ Standby power consumption 0.1W (Typ.)
- ◆ Continuous short circuit protection, Self-recovery
- ◆ Over voltage, short circuit, over current protections
- ◆ Isolation voltage 1500VDC
- ◆ Operating temperature from -40°C to +105°C
- ◆ Good EMC performance
- ◆ With CE certificate
- ◆ Standard pin-out alignment



EN62368-1

Application Field

PFD50-XXSXXB3R2 Series ---- DIP mounting standard 2"X1" package DC-DC modular converters with wide input voltage range 4:1, low stand-by power consumption, isolated & regulated single output 50W. This series of products can be widely used in the fields of Industrial control, Instrument, Communication, Electricity power and IoT, etc. The additional EMC circuit diagram is recommended for the application with high 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	uF	Min	Typ.
CE	PFD50-18S05B3R2	24	9-36	5	10000	2264	8	10000	90	92
CE	PFD50-18S12B3R2			12	4167	2264	4	3700	90	92
CE	PFD50-18S15B3R2			15	3333	2264	4	2000	90	92
CE	PFD50-18S24B3R2			24	2083	2264	3	1000	90	92
CE	PFD50-36S05B3R2	48	18-75	5	10000	1133	4	10000	90	92
CE	PFD50-36S12B3R2			12	4167	1133	4	3700	90	92
CE	PFD50-36S15B3R2			15	3333	1133	4	2000	90	92
CE	PFD50-36S24B3R2			24	2083	1133	3	1000	90	92

Note 1: The suffix -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) which width is 35mm.

Note 2: The maximum capacitive load is the capacitance allowed to be used when the power supply starts at full load. The converter may not start if the capacitor exceeds this value.

Note 3: The typical value of efficiency is tested at nominal input voltage and rated load.

Note 4: 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
Stand-by power consumption	Full input voltage range	/	0.1	/	W
Input current Max	Full input voltage range (24V series)	/	/	6.4	A
	Full input voltage range (48V series)	/	/	3.0	
Start-up voltage	Nominal 24V input series	/	8	/	VDC
	Nominal 48V input series	/	16	/	
Under voltage protection	Nominal 24V input series	/	7	/	VDC
	Nominal 48V input series	/	15	/	
Input inrush voltage (1Sec.max.)	Nominal 24V input series	-0.7	/	50	VDC
	Nominal 48V input series	-0.7	/	100	
Hot plug	/	N/A			
Input filter	/	Pi filter			
ON/OFF Control (Ctrl)	Turn ON the converter	No connection or connected to high level (3V-12VDC)			
	Turn OFF the converter	Connected to -Vin or low level (0-1.2VDC)			
	Current value for switching OFF	/	10	/	mA

Note: The voltage of 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	Rated load, full input voltage range		/	±0.2	±0.5	%
Load regulation	Nominal input voltage, 5%-100% load		/	±0.5	±1	%
Ripple & Noise	5%-100% load, 20MHz bandwidth	Output 12V & 15V	/	200	250	mVp-p
		Output 5V & 24V	/	180	350	
Dynamic recovery time	25% load step, full input voltage range		/	300	500	uS
Dynamic response deviation	25% load step, nominal input voltage	Output 5V	/	±5	±10	%
		Others	/	±3	±5	%
Temperature drift coefficient	/		/	/	±0.03	%/°C
Turn on delay time	Nominal input voltage		/	20	100	mS
Output voltage Trim		Full input voltage range	90	/	110	%Vo
Output voltage overshoot			/	/	10	%Vo
Over voltage protection			110	130	160	%Vo
Over current protection	Output 5V		110	150	240	%Io
	Others		110	150	200	%Io
Short circuit protection			Hiccup, continuous, self-recovery			

Note: Ripple & Noise ≤5%Vo at 0% - 5% load, it is tested by the Parallel-line method (refer to the following test instruction).

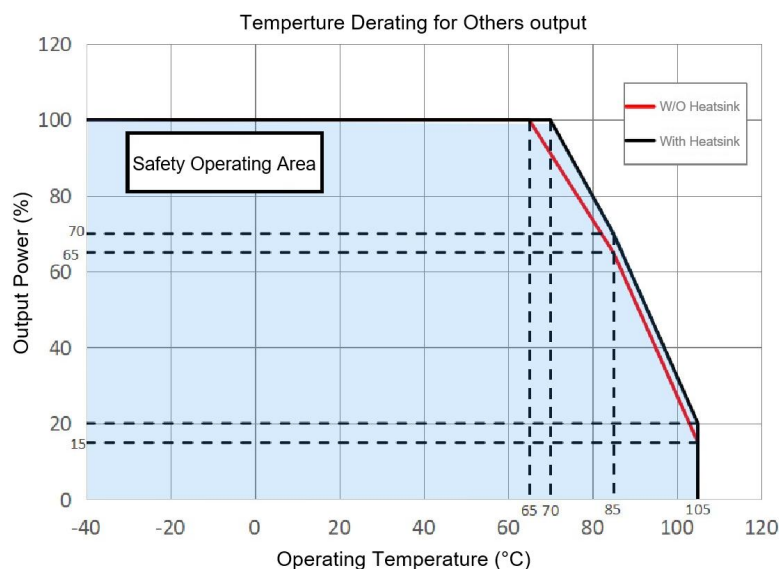
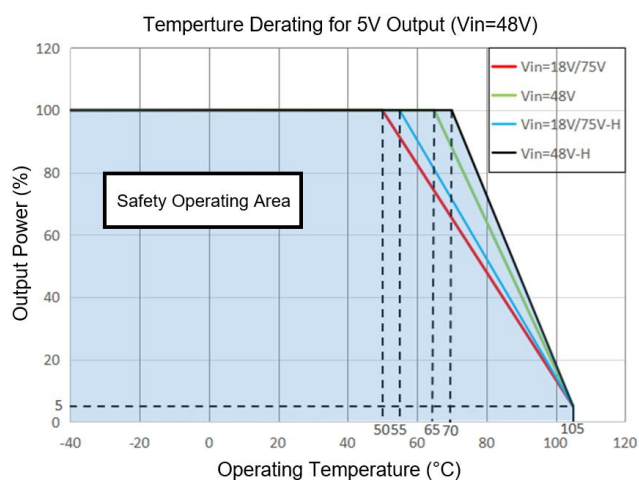
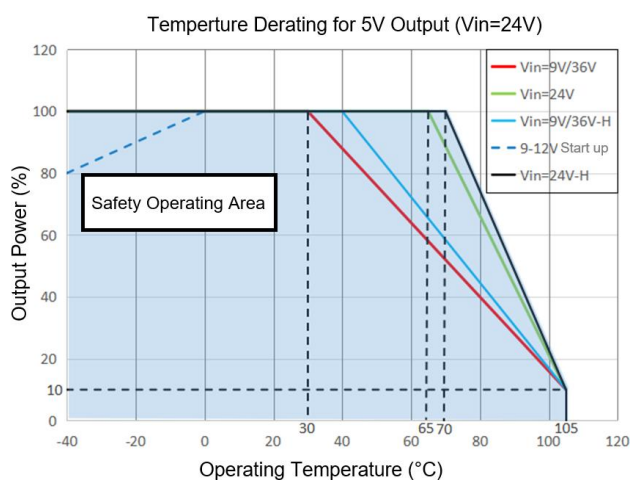
General Specifications

Items	Test Conditions	Min.	Typ.	Max.	Unit
Switching frequency	Operating Mode (PWM)	/	300	/	KHz
Operating temperature	Refer to the Temperature Derating Graphs	-40	/	+105	°C
Storage temperature	/	-55	/	+125	°C
Max case temperature	Within the operation derating range	/	/	+105	°C
Pin soldering temperature	1.5mm from the case, 10 seconds	/	/	300	°C
Relative humidity	No condensing	5	/	95	%RH
Isolation voltage	I/P - O/P, test 1min, leakage current <1mA	1500	/	/	VDC
	I/P&O/P - Case, test 1min, leakage current <1mA	1000	/	/	
Isolation capacitance	I/P - O/P, 100KHz/0.1V	/	1000	/	pF
Insulation resistance	I/P - O/P, @ 500VDC	100	/	/	MΩ
MTBF	MIL-HDBK-217F@25°C	1000	/	/	K hours
Vibration	10-150Hz, 5G, 0.75mm, Along X, Y and Z				
Cooling method	Nature air				
Case material	Aluminum				
Weights/Dimensions	Part No.	Weight (Typ.)	Dimensions L x W x H		
	PFD50-XXSXXB3R2	36g	50.8 X 25.4 X 11.8 mm	2.00 X 1.00 X 0.464 inch	
	PFD50-XXSXXB3R2-H	48g	50.8 X 25.4 X 21.8 mm	2.00 X 1.00 X 0.858 inch	
	PFD50-XXSXXB3R2-T	57g	76.0 X 31.5 X 21.3 mm	2.99 X 1.24 X 0.838 inch	
	PFD50-XXSXXB3R2-TH	69g	76.0 X 31.5 X 31.0 mm	2.99 X 1.24 X 1.220 inch	
	PFD50-XXSXXB3R2-TS	77g	76.0 X 31.5 X 26.0 mm	2.99 X 1.24 X 1.023 inch	
	PFD50-XXSXXB3R2-TSH	89g	76.0 X 31.5 X 35.5 mm	2.99 X 1.24 X 1.397 inch	

EMC Performances

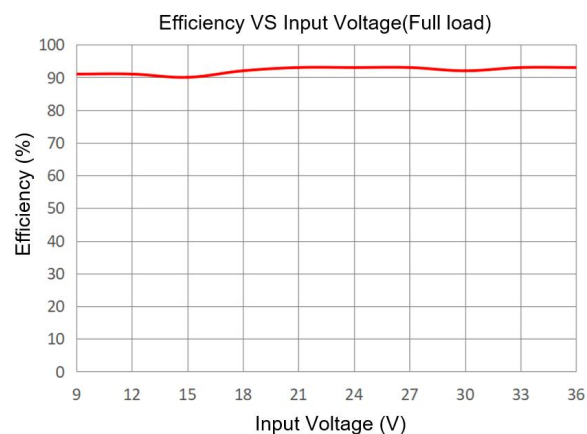
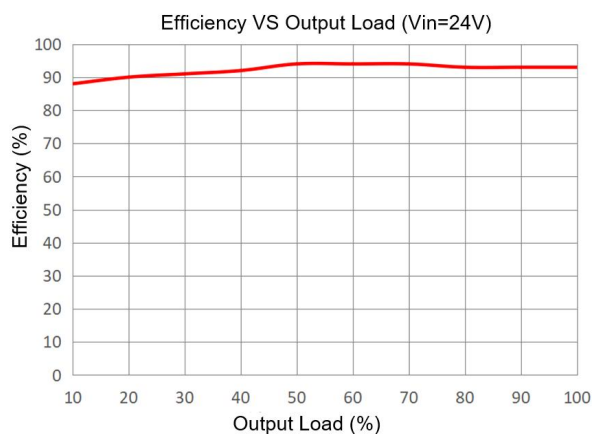
Items			Test Standard	Performance/Class
EMC	EMI	CE	CISPR32/EN55032	CLASS B (with the Recommended EMC circuit)
		RE	CISPR32/EN55032	CLASS B (with the Recommended EMC circuit)
	EMS	RS	IEC/EN61000-4-3	10V/m Perf. Criteria A (with the Recommended EMC circuit)
		CS	IEC/EN61000-4-6	10V r.m.s Perf. Criteria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

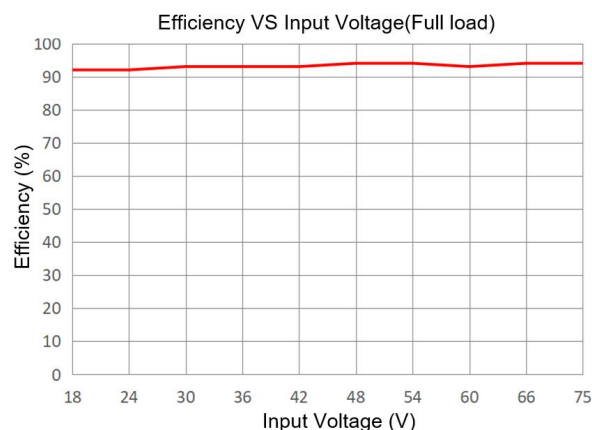
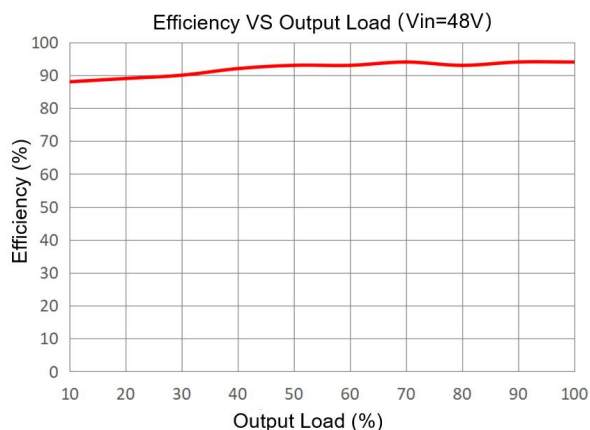
Temperature Derating Graphs



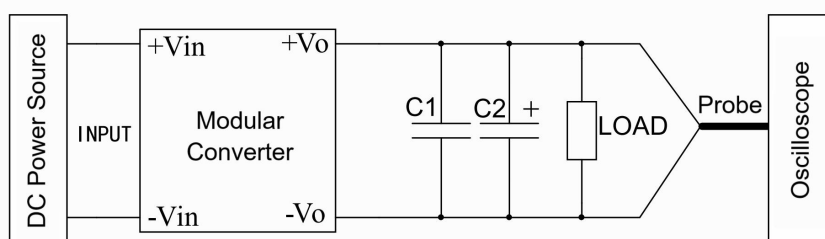
Note: The product should operate under the condition of nature air, please contact us if it could be used at a closed space.

Efficiency Graphs





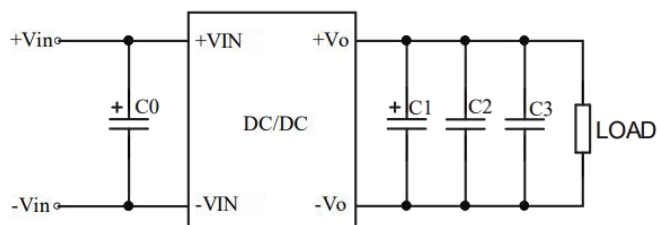
Ripple & Noise Test Instruction (Parallel-line Method, 20MHz Bandwidth)



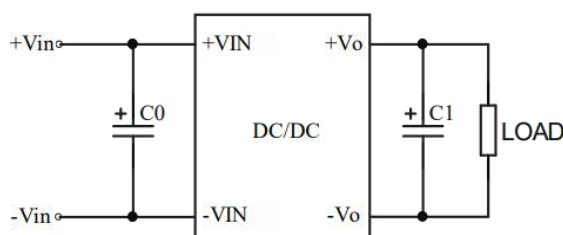
1. The Ripple & Noise test needs the cables in parallel, an oscilloscope that should be set at the Sample Mode, bandwidth 20MHz. 100M bandwidth probe with cap and ground removed. One polypropylene capacitor C1(0.1uF) and one high frequency low impedance electrolytic capacitor C2(10uF) are connected in 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.
3. It is recommended to connect a $\geq 5\%$ load or a high frequency low impedance electrolytic capacitor ($\geq 470\mu\text{F}$) load to the output to avoid the output Ripple increasing.

Recommended Circuits Diagrams for Application

1. DC/DC test circuit diagrams



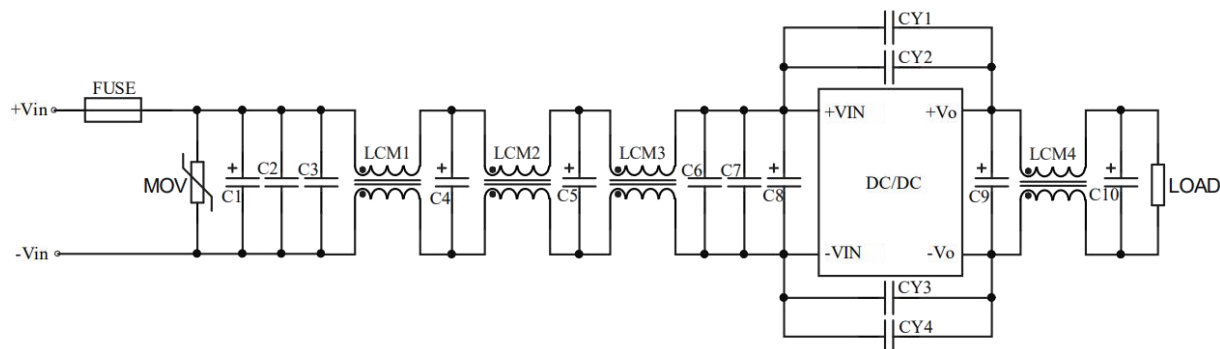
Output Voltage	C0	C1	C2	C3
5V	100uF /100V	330uF /50V	1uF /16V	10uF /16V



Output Voltage	C0	C1
12V & 15V	100uF/100V	100uF/25V
24V		47uF/50V

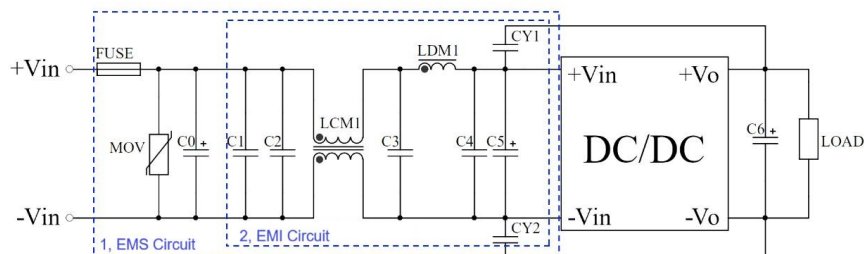
2. Recommended circuits diagrams for EMC

For Vout 5V



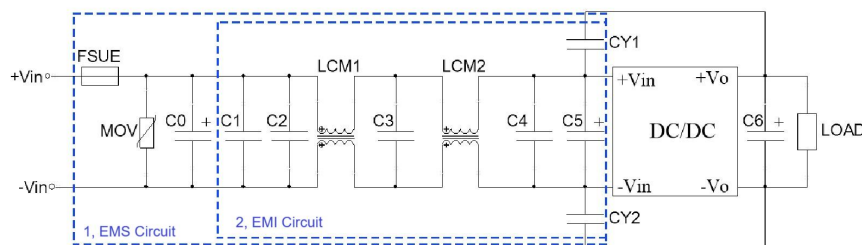
Components	Nominal 24V series	Nominal 48V series
FUSE	TBD by the customer	
MOV	14D470K	14D101K
LCM1	2.2mH	
LCM2	1.0mH	
LCM3, LCM4	270uH	
C1, C4, C5, C8	330uF/100V	
C2, C3	4.7uF/100V	
C6, C7	10uF/100V	
C9, C10	100uF/100V	
CY1, CY3	2.2nF/2KV	
CY2, CY4	10nF/2KV	

For Vout 12V & 15V



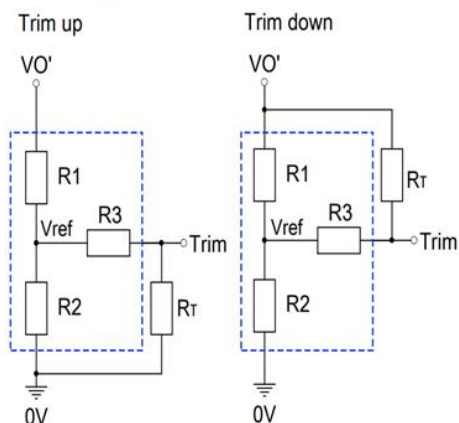
Components	Vout 12V/15V	Vout 24V
FUSE	TBD by the customer	
MOV	14D470K	14D470K
LDM1	2.2uH	/
LCM1	2.2mH	10mH
LCM2	/	10mH
C0	680uF/100V	680uF/100V
C1, C2	4.7uF/100V	4.7uF/100V
C3	10uF/100V	10uF/100V
C4	10uF/100V	47uF/100V
C5	330uF/100V	330uF/100V
C6	100uF/50V	100uF/50V
CY1, CY2	2.2nF/2KV	

For Vout 24V



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

3. Output voltage Trim and calculation of Trim resistance



Trim Resistance calculating formula

$$\text{up: } R_T = \frac{\alpha R_2}{R_2 - \alpha} - R_3 \quad \alpha = \frac{V_{ref}}{V_{O'} - V_{ref}} \cdot R_1$$

$$\text{down: } R_T = \frac{\alpha R_1}{R_1 - \alpha} - R_3 \quad \alpha = \frac{V_{O'} - V_{ref}}{V_{ref}} \cdot R_2$$

R_T is the Trim resistance

α is a self-defined parameter

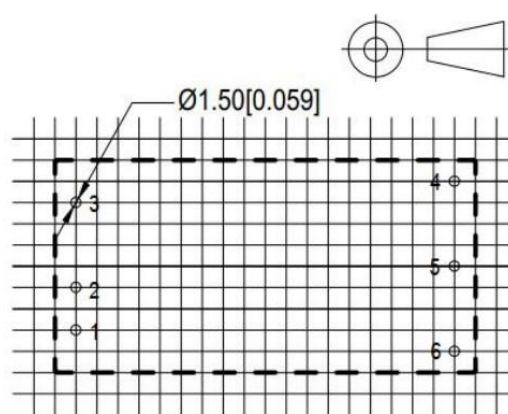
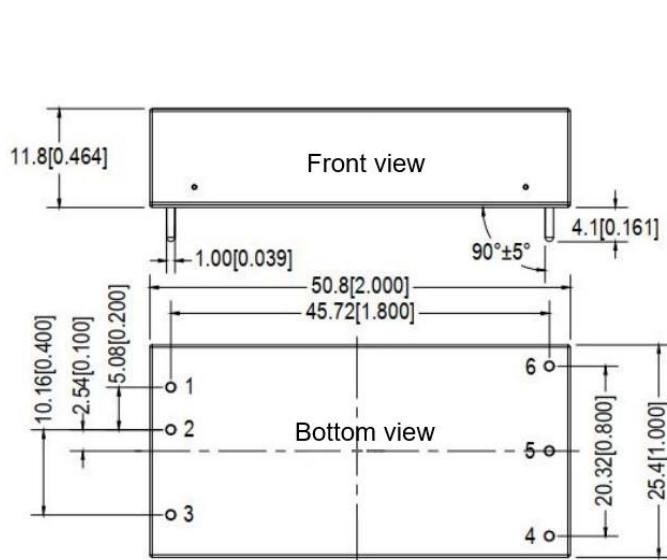
$V_{O'}$ is the required Up-voltage or Down-voltage

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

Output volt.	Trim internal circuit parameters			
V_O (VDC)	R_1 (K Ω)	R_2 (K Ω)	R_3 (K Ω)	V_{ref} (V)
5	2.91	2.87	6.1	2.5
12	9.53	2.51	33	2.5
15	18	3.59	33	2.5
24	25.5	2.96	30	2.5

Note: The Trim function works only for above output voltages

Mechanical Dimensions (Without heat-sink)



PCB layout vertical view
Grid 2.54x2.54[0.10x0.10]

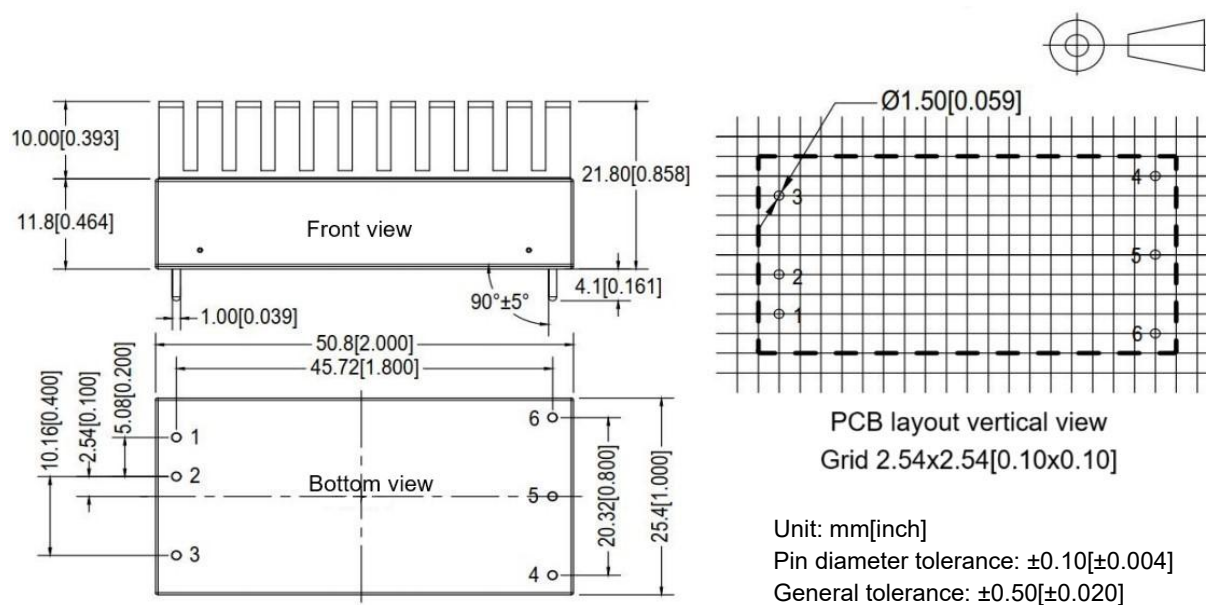
Unit: mm[inch]

Pin diameter tolerance: ± 0.10 [± 0.004]

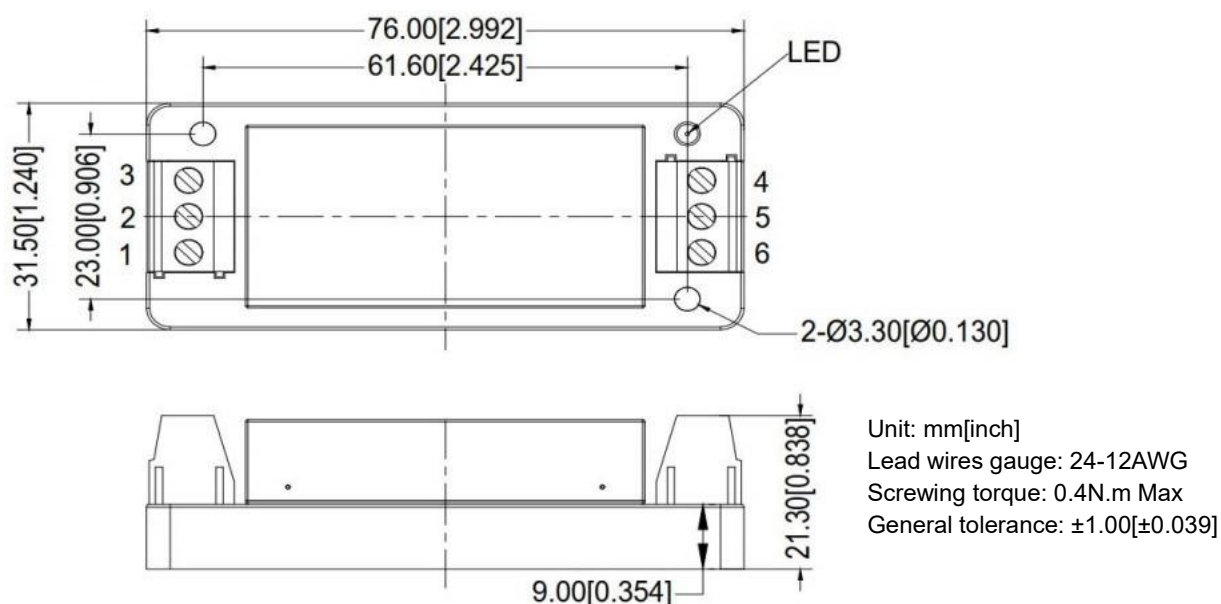
General tolerance: ± 0.50 [± 0.020]

Pin-out Function Description

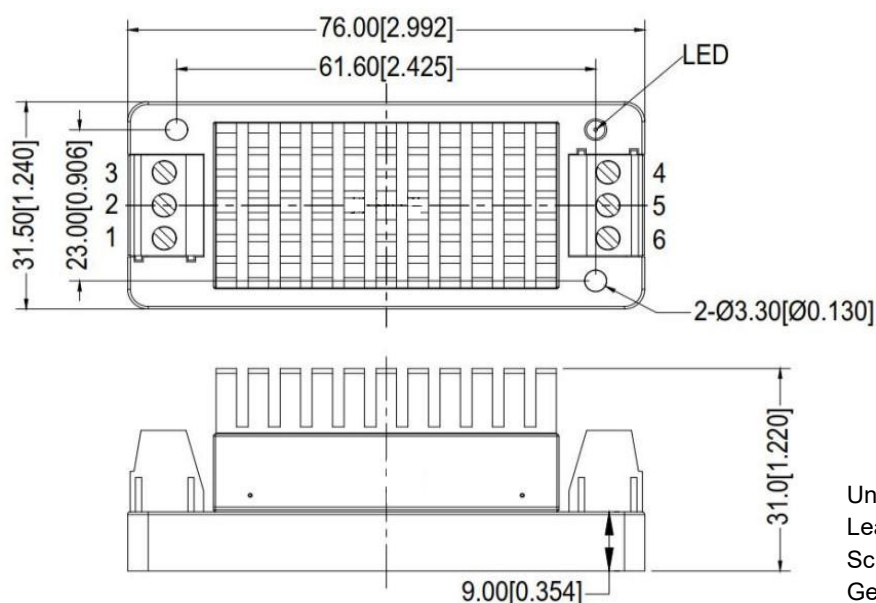
Pin No.	1	2	3	4	5	6
PFD50-XXSXXB3R2	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

-H Mechanical Dimensions (With heat-sink)**Pin-out Function Description**

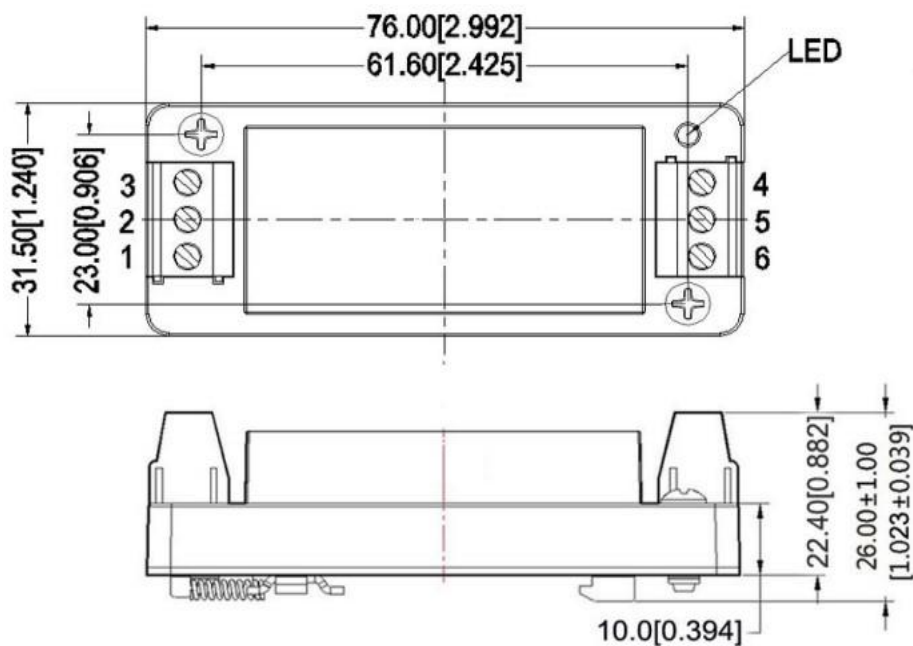
Pin No.	1	2	3	4	5	6
PFD50-XXSXXB3R2	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

-T Mechanical Dimensions (Without heat-sink)**Terminal Function Description**

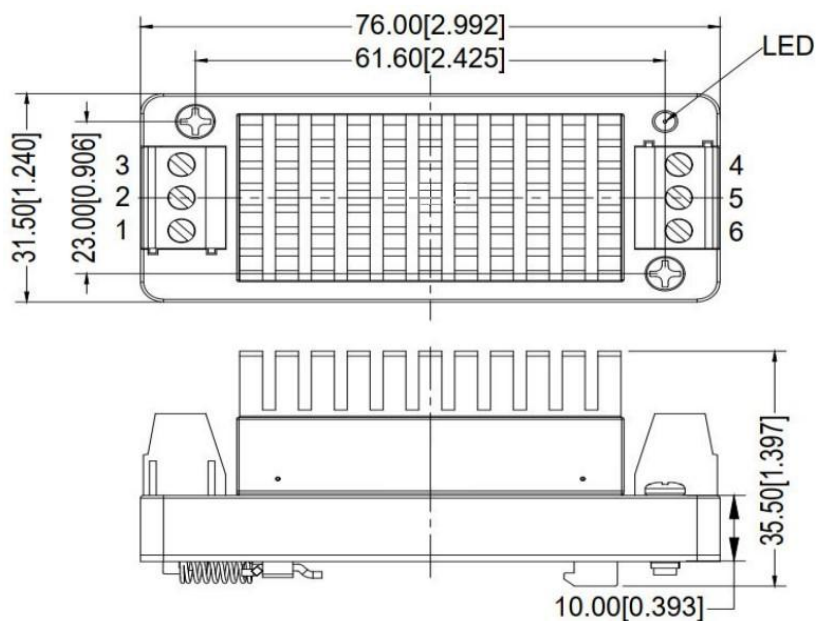
Terminal No.	1	2	3	4	5	6
PFD50-XXSXXB3R2	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

-TH Mechanical Dimensions (With heat-sink)**Terminal Function Description**

Terminal No.	1	2	3	4	5	6
PFD50-XXSXXB3R2	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

-TS Mechanical Dimensions (Without heat-sink)**Terminal Function Description**

Terminal No.	1	2	3	4	5	6
PFD50-XXSXXB3R2	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

-TSH Mechanical Dimensions (With heat-sink)

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

Terminal Function Description

Terminal No.	1	2	3	4	5	6
PFD50-XXSXXB3R2	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

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 at over-load condition.
4. Unless otherwise specified, all values or indicators on this datasheet are tested at $T_a=25^{\circ}\text{C}$, humidity $<75\%\text{RH}$, 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. The specifications are specially for the parts listed on this datasheet, any other non-standard model performances could be out of the specifications. Please contact our technician for specific requirements.
7. Aipupower can provide customization service.

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