

**Typical Features**

- ◆ Wide input voltage range (4:1), output power 40W
- ◆ Efficiency up to 90% (Typ.)
- ◆ Standby power consumption 3W (Typ.)
- ◆ Input under voltage protection
- ◆ Continuous short circuit protection, self-recovery
- ◆ Output over voltage & over current protections
- ◆ Isolation voltage 3000VDC/1500VAC
- ◆ Operating temperature from -40°C to +85°C
- ◆ Good EMI performance
- ◆ Standard pin-out alignment



**Application Field**

**PFD40-110SXXB3C3(-XXX) Series** --- Super-fast start-up DC-DC modular Converters with wide input voltage range (4:1), isolated & regulated single output 40W, DIP/chassis/DIN-Rail flexible mounting options, input under voltage protection, output over current, short circuit and over voltage protections. This series of products can be widely used for 72V, 96V and 110V Industrial control, Electrical power, Communication, Train engine, Industrial robot and Railway devices, etc. Additional circuit diagram for EMC 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 (uF)	Efficiency (%) @Full load, nominal volt.	
		Nominal (VDC)	Range (VDC)	Vo (VDC)	Io (mA)	Full Load	No Load		Min	Typ.
-	*PFD40-110S3V3B3C3	110	40-160	3.3	10000	345	25	10000	85	88
-	PFD40-110S05B3C3			5	8000	420	25	8000	86	89
-	PFD40-110S12B3C3			12	3333	420	2	3300	87	90
-	*PFD40-110S15B3C3			15	2667	420	2	1200	87	90
-	*PFD40-110S24B3C3			24	1667	420	2	680	87	90
-	*PFD40-110S48B3C3			48	833	420	2	470	86	89

Note 1: The \* marked parts have been developed in process. 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 rail 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 chip could operate under a jitter frequency situation at no load or light load to decrease no-load power consumption, so no load is not available. ≥5% load or a high-frequency resistance E-cap(≥470uF) load is recommended, to avoid the output ripple increasing.

Note 4: Please contact Aipu sales for other output voltages requirement of this series but not listed in this table.

Input Specifications					
Item	Test conditions	Min	Typ.	Max	Unit
Standby power consumption	Full input voltage range	/	3	/	W
Maximum input current	Full input voltage range	/	/	1.2	A
Start-up voltage	110V nominal input series	/	/	40	VDC
Under voltage protection	110V nominal input series	28	32	/	VDC
Input inrush voltage (1sec.max)	110V nominal input series	-0.7	/	180	VDC
Reflected ripple current	Nominal input voltage	/	100	/	mA
Hot plug	/	Unavailable			
Input Filter	/	Pi filter			
ON/OFF Control (*Ctrl)	Turn ON the converter	No connection or connected to High level (3.5V-12VDC)			
	Turn OFF the converter	Connected to -Vin or connected to low level 0-1.2VDC)			
	Current value for switching off	/	1	/	mA

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

Output Specifications						
Item	Test conditions	Min	Typ.	Max	Unit	
Output Voltage Accuracy	Full input voltage range	/	±1	±2	%	
Voltage Regulation	Full input voltage range, rated load	/	±0.5	±1	%	
Load Regulation	Nominal input voltage, 10%~100% load	/	±0.5	±1	%	
Ripple & Noise	5%-100%load, 20MHz bandwidth	3.3V, 5V output	/	50	100	mVp-p
		Others	/	150	200	
Dynamic recovery time	25% rated load step, full input voltage range	/	300	500	uS	
Dynamic response deviation	25% rated load step, nominal input voltage	3.3V, 5V output	/	±5	±8	%
		Others	/	±3	±5	%
Temperature drift coefficient	Full load	/	/	±0.03	%/°C	
Turn-on delay time	Nominal input voltage	/	10	/	mS	
Output voltage Trim	Full input voltage range	90	/	110	%Vo	
Output overshoot		/	/	10	%Vo	
Over voltage Protection		110	150	190	%Vo	
Over current Protection		120	150	220	%Io	
Short circuit Protection		Hiccup, continuous, self-recovery				

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

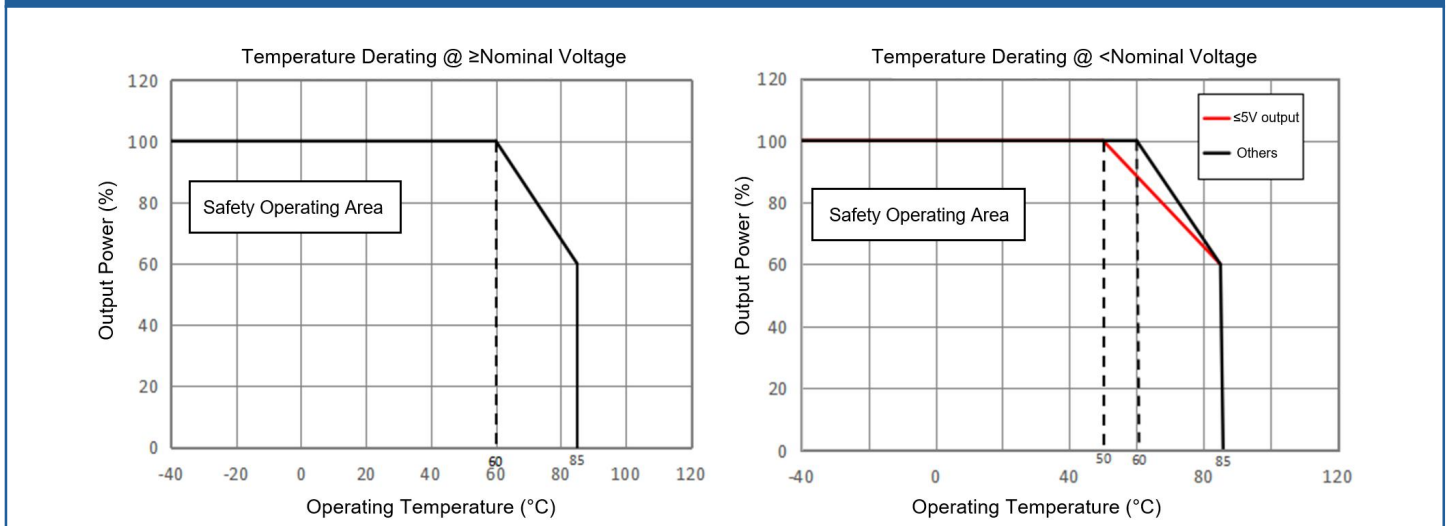
General Specifications					
Item	Test conditions	Min	Typ.	Max	Unit
Switching Frequency	Operating mode (PWM)	/	300	/	KHz
Operating Temperature	Refer to the temperature derating graph	-40	/	+85	°C
Storage Temperature	/	-55	/	+125	
Case temperature	Within the operation derating range	/	/	+105	°C

Pin soldering temperature	1.5mm from the case, soldering time 10S	/	/	300	°C
Relative Humidity	No condensation	5	/	95	%RH
Isolation Voltage	I/P-O/P, test 1min, leakage current <1mA	3000	/	/	VDC
		1500	/	/	VAC
	I/P&O/P-Case, test 1min, leakage current <1mA	1000	/	/	VDC
Isolation capacitance	I/P-O/P, 100KHz/0.1V	/	2000	/	pF
Insulation resistance	I/P-O/P, @500VDC	1000	/	/	MΩ
MTBF	MIL-HDBK-217F@25°C	1000	/	/	K hours
Cooling method	Nature air				
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		
	PFD40-110SXXB3C3	28g	50.8 X 25.4 X 11.8 mm	2.00 X 1.00 X 0.464 inch	
	PFD40-110SXXB3C3-H	40g	50.8 X 25.4 X 21.8 mm	2.00 X 1.00 X 0.858 inch	
	PFD40-110SXXB3C3-T	49g	76.0 X 31.5 X 21.3 mm	2.99 X 1.24 X 0.838 inch	
	PFD40-110SXXB3C3-TH	61g	76.0 X 31.5 X 31.0 mm	2.99 X 1.24 X 1.220 inch	
	PFD40-110SXXB3C3-TS	69g	76.0 X 31.5 X 26.0 mm	2.99 X 1.24 X 1.023 inch	
	PFD40-110XXSXXB3C3-TSH	81g	76.0 X 31.5 X 35.5 mm	2.99 X 1.24 X 1.397 inch	

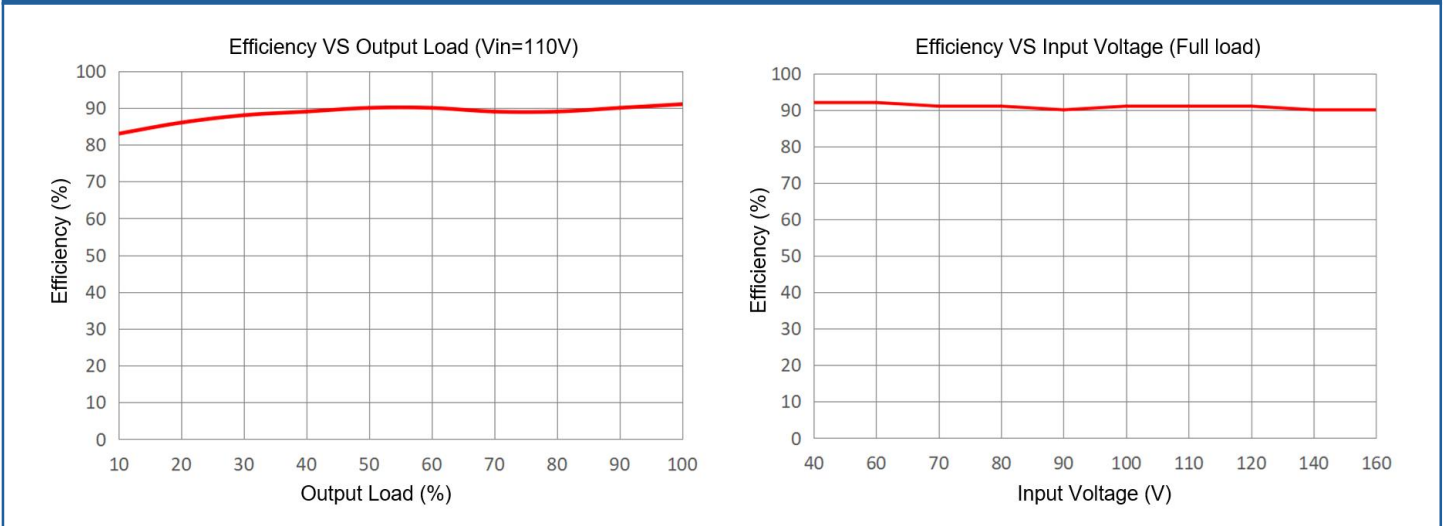
### EMC Performance

Items		Testing 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 ±4KV Perf. Criteria B
		EFT	IEC/EN61000-4-4 ±2KV Perf. Criteria B (with the Recommended EMC circuit)

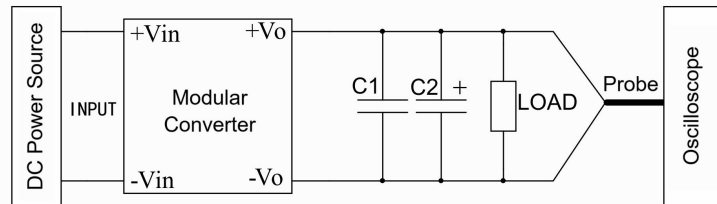
### Temperature Derating Graphs



**Efficiency Graphs**



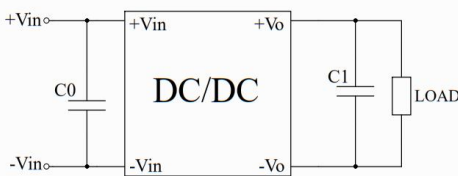
**Ripple & Noise Test Instruction (Parallel-line Method, 20MHz Bandwidth)**



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-resistance 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 use a ≥5% load or a high-frequency low resistance electrolytic capacitor (≥470uF) load at the output to avoid the output ripple increasing.

**Recommended Circuits Diagrams for Application**

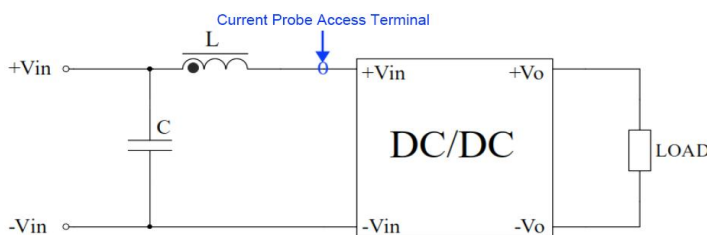
**1. DC-DC test circuit diagram**



Components	Parameters
C0	100uF/200V
C1	47uF/50V

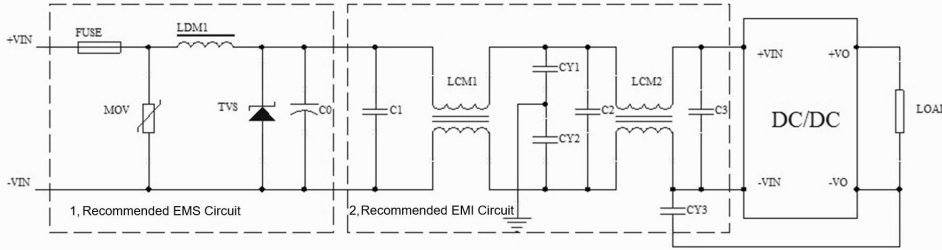
**2. Input reflected ripple current test circuit diagram**

A low ESR capacitor is recommended for C which withstand voltage should be more than the maximum input voltage.



Components	Parameters
C	220uF/200V
L	4.7uH/15A

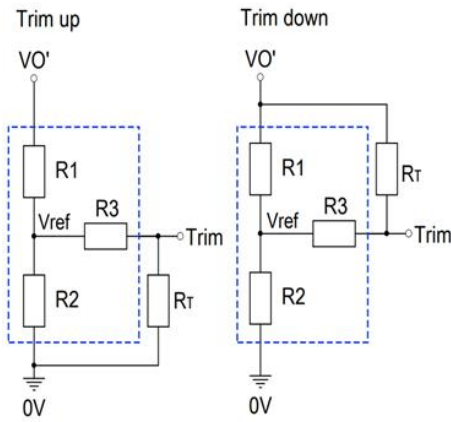
**3. Recommended external circuit diagram for EMC**



Components	Vin 110VDC
FUSE	TBD by customer
MOV	14D201K
LDM1	56uH
TVS	SMCJ170A
C0	560uF/200V
C1, C2, C3	4.7uF/200V
LCM1	15mH
LCM2	56uH
CY1, CY2, CY3	1nF/3KV

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

**4. Output voltage Trim and Trim resistance calculation**



**Trim Resistance calculating fomula**

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

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

$R_T$  is the Trim resistance  
 $\alpha$  is a self-defined parameter  
 $V_{o'}$  is the required Up-voltage or Down-voltage

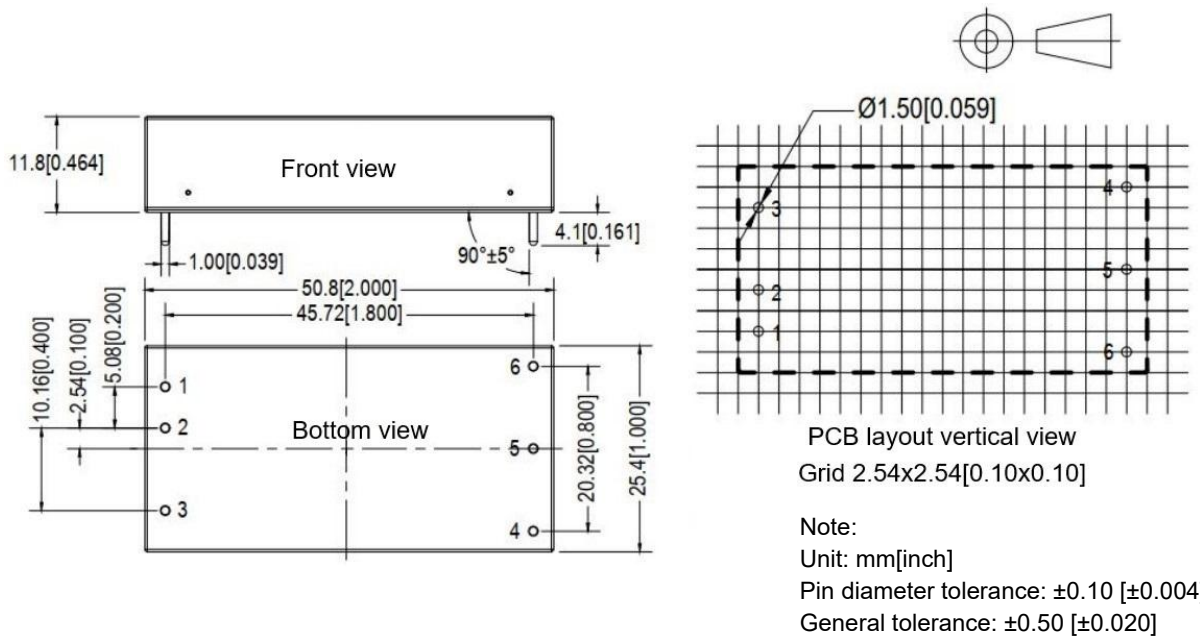
Note: Trim up & down circuits diagrams

The components in the dotted area are inside of the converter.

Output Voltage	Trim 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
12	18	4.75	33	2.5
15	18	3.6	30	2.5
24	30	3.48	30	2.5

The Trim function works only for above output voltages.

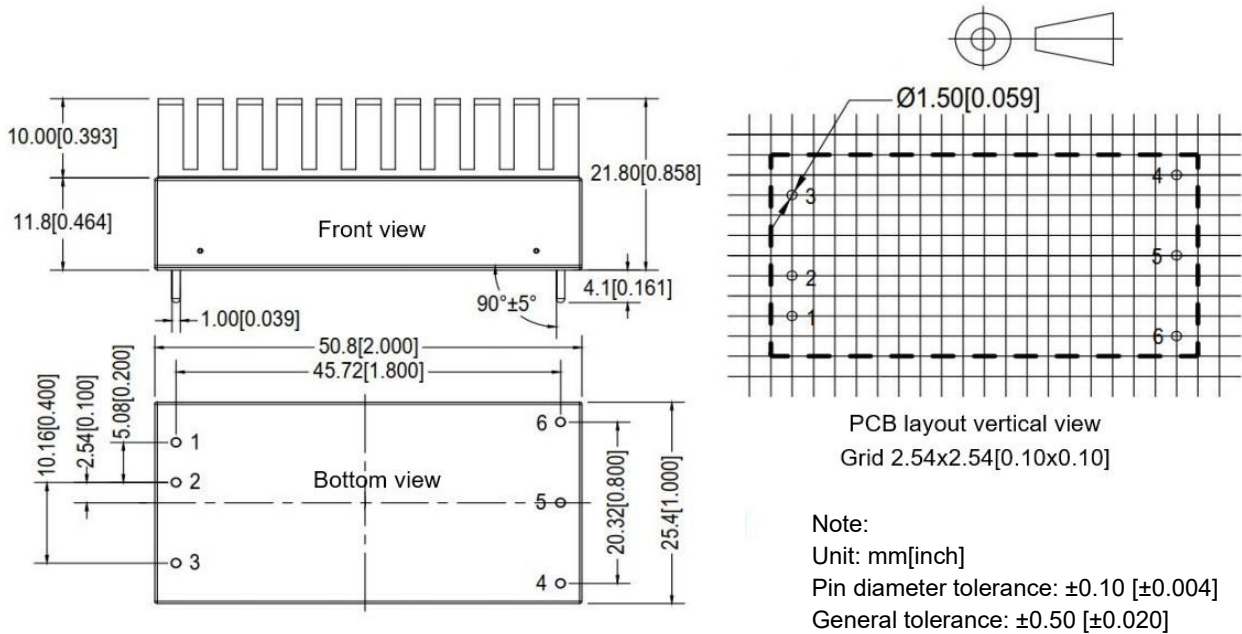
**Mechanical Dimensions (without Heat Sink)**



**Pin-out Function Description**

Pin No.	1	2	3	4	5	6
PFD40-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

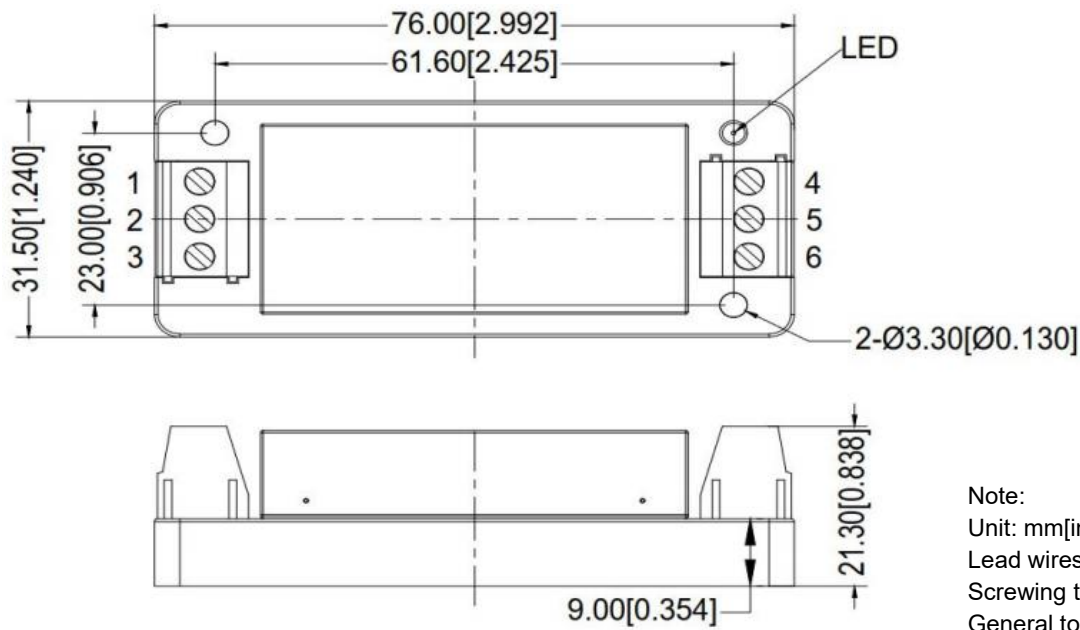
**-H Mechanical Dimensions (with Heat Sink)**



**Pin-out Function Description**

Pin No.	1	2	3	4	5	6
PFD40-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

**-T Mechanical Dimensions (without Heat Sink)**

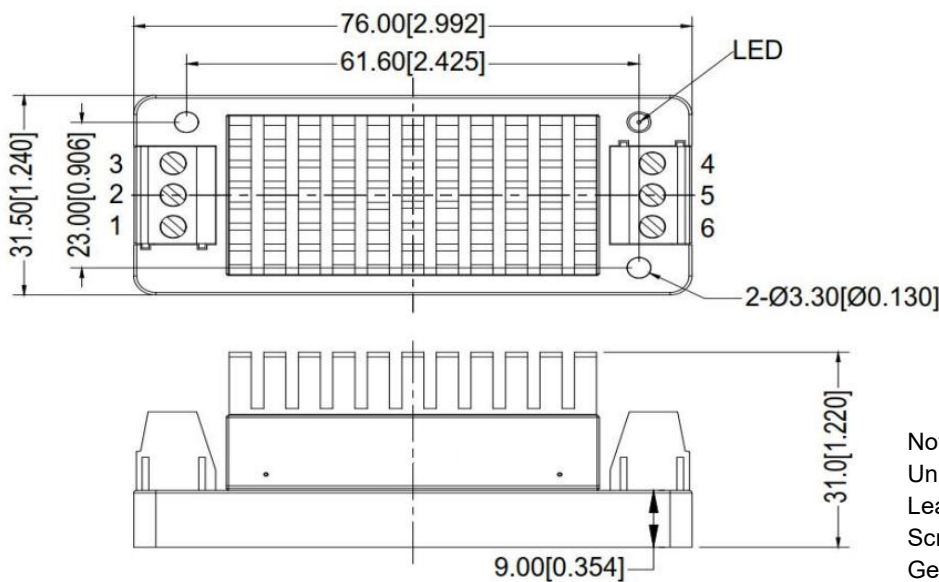


Note:  
 Unit: mm[inch]  
 Lead wires gauge: 24-12AWG  
 Screwing torque: 0.4 N.m Max  
 General tolerance: ±1.00 [±0.039]

**Terminal Function Description**

Terminal No.	1	2	3	4	5	6
PFD40-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

**-TH Mechanical Dimensions (with Heat Sink)**

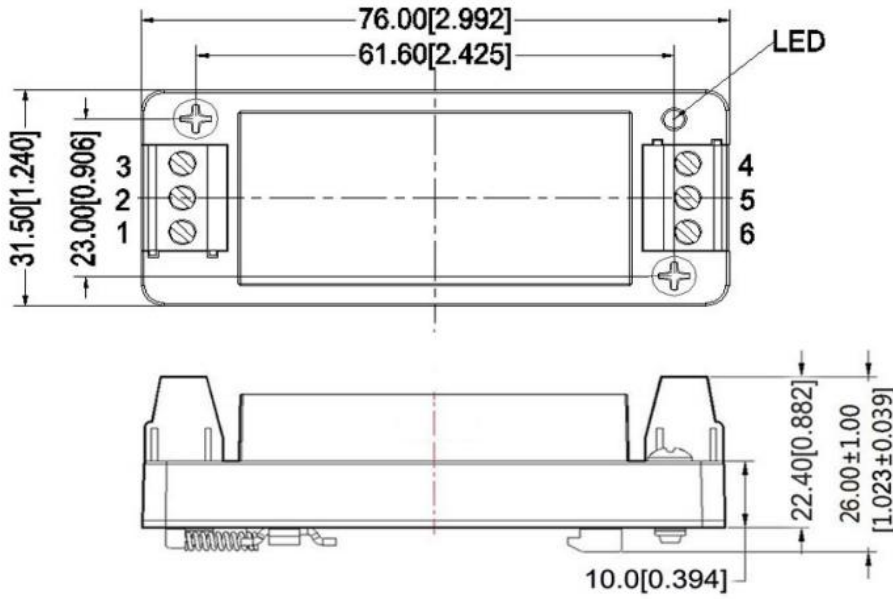


Note:  
 Unit: mm[inch]  
 Lead wires gauge: 24-12AWG  
 Screwing torque: 0.4 N.m Max  
 General tolerance: ±1.00 [±0.039]

**Terminal Function Description**

Terminal No.	1	2	3	4	5	6
PFD40-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

**-TS Mechanical Dimensions (without Heat Sink)**

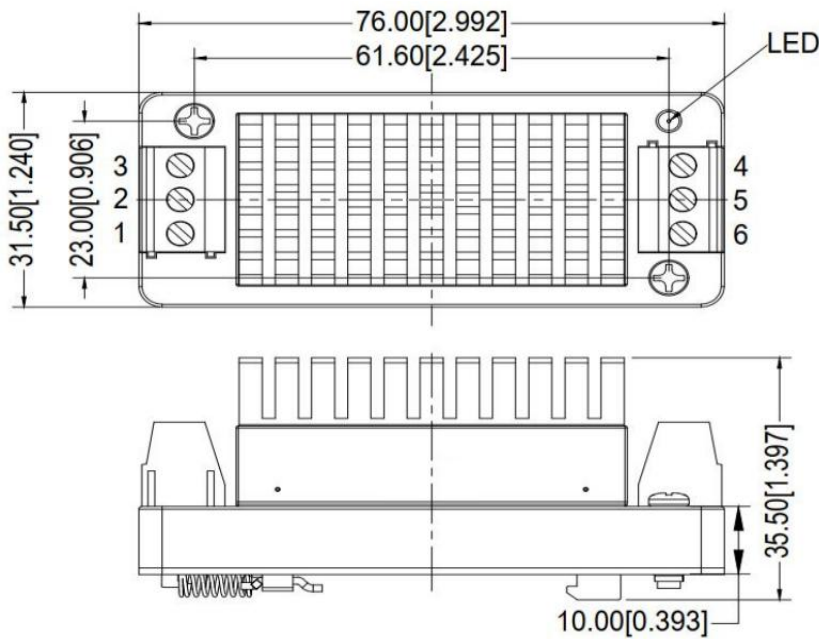


Note:  
 Unit: mm[inch]  
 Lead wires gauge: 24-12AWG  
 Screwing torque: 0.4 N.m Max  
 General tolerance: ±1.00 [±0.039]

**Terminal Function Description**

Terminal No.	1	2	3	4	5	6
PFD40-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

**-TSH Mechanical Dimensions (with Heat Sink)**



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

**Terminal Function Description**

Terminal No.	1	2	3	4	5	6
PFD40-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

**Application Notice**

1. The product should be used according to the specifications, 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°C, 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. 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.
8. The product should be used under the condition of nature air, please contact us if it could be used at a closed space.

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