

Typical Features

- ◆ Wide input voltage range (4:1), Output Power 40W
- ◆ Efficiency 90% (Typ.)
- ◆ Stand-by power consumption 3W (Typ.)
- ◆ Output fast start-up
- ◆ Continuous short circuit protection, self-recovery
- ◆ Input under voltage, output over voltage, short circuit, 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 mounting, input under-voltage protection, output over current, short circuit and over voltage protections. This series of products can be widely used in 72V, 96V and 110V industrial control, electrical power, communication, train engine, industrial robot and railway electronic devices, etc. The additional circuit for EMC is recommended in this data sheet for the application with higher EMC requirement.

Typical Product List

Certificate	Part No.	Input Voltage Range (VDC)		Output Voltage/Current (Vo/Io)		Input Current (mA) Typ. @ Nominal voltage		Max. Capacitive Load	Ripple & Noise (mVp-p)		Efficiency @ Full load (%)	
		Nom.	Range	Vo (VDC)	Io(A) Max/Min	Full Load	No Load	u F	Typ	Max	Min	Typ.
--	*PFD40-110S3V3B3C3	110	40 - 160	3.3	10	345	25	10000	50	100	85	88
	PFD40-110S05B3C3			5	8.0	420	25	8000	50	100	86	89
	PFD40-110S12B3C3			12	3.333	420	2	3300	150	200	87	90
	*PFD40-110S15B3C3			15	2.667	420	2	1200	150	200	87	90
	*PFD40-110S24B3C3			24	1.667	420	2	680	150	200	87	90
	*PFD40-110S48B3C3			48	0.833	420	2	470	150	200	86	89

Note 1 - * marked part has been developed in process. The suffix -H indicates the part with Heat sink, -T (H) indicates a kind of chassis packaging (with heat sink), -TS (H) indicates a kind of packaging 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 operates at full load. The converter may not start if the capacitor exceeds this value.

Note 3 - The chip could operate at jitter frequency situation at no load or light load to decrease no-load power consumption, so no load is not available. $\geq 5\%$ load or a high-frequency resistance E-cap ($\geq 470\mu\text{F}$) load is recommended, to avoid the output ripple increasing.

Note 5 - Please contact Aipu sales for other output voltages requirement in this series but not listed in this table.

Input Specifications

Item	Operating conditions	Min	Typ.	Max	Unit
Standby power consumption	Full input voltage range	/	3	/	W
Input under-voltage protection	110V Nominal Input	32	/	40	VDC
Input inrush voltage (1sec.max)	110V Nominal Input	-0.7	/	160	VDC
Start-up time	/	/	10	/	mS
Hot plug	/	Unavailable			
Input Filter	/	Pi filter			
Reflected ripple current	110V Nominal Input	100mA (Typ)			
CTRL*	Turn-on the converter	No connection or connect to High level (3.5V-12VDC)			
	Shut-off the converter	Connect to -Vin or connect to low level 0-1.2VDC)			
	Current value for shutting off	1mA (Typ)			

*The voltage of CTRL is relative to -Vin.

Output Specifications

Item	Operating conditions		Min	Typ.	Max	Unit
Output Voltage Accuracy	Input voltage range		/	±1	±2	%
Voltage Regulation	Full voltage range, full load		/	±0.5	±1	%
Load Regulation	10%~100% load		/	±0.5	±1	%
Ripple & Noise	20%-100%load, 20MHz bandwidth	3.3V, 5V output	/	50	100	mVp-p
		Other output	/	150	200	
Dynamic recovery time	25% rated load step, nominal input voltage	/	/	300	500	uS
Dynamic response deviation		3.3V, 5V output	/	±5	±8	%
		Others output	/	±3	±5	%
Turn-on delay time	Nominal input voltage		/	10	/	mS
Output voltage adjustment (Trim)	Input voltage range		/	/	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, please refer to the following Ripple & Noise test Instructions.

General Specifications

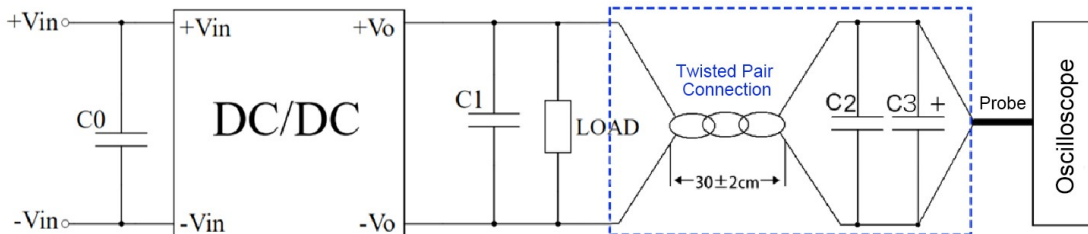
Item	Operating conditions	Min	Typ.	Max	Unit
Switching Frequency	Operating mode (PWM)	/	300	/	KHz
Operating Temperature	Refer to the temperature derating curve	-40	/	+85	°C
Storage Temperature	/	-55	/	+125	
Case temperature	Refer to the product performance curve	/	/	+105	°C

Pin soldering temperature	1.5mm from the case, 10S	/	/	300	
Relative Humidity	No condensation	5	/	95	%RH
Isolation Voltage	I/P-O/P, test 1min, leakage current <0.5mA	3000	/	/	VDC
	I/P-O/P, test 1min, leakage current <5mA	1500	/	/	VAC
Isolation capacitor	Typical	/	2000	/	pF
MTBF	MIL-HDBK-217F@25°C	1000	/	/	K hours
Cooling method	Nature air				
Case material	Aluminum				
Weight/Dimension	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

Total Item		Sub Item	Testing standard	Performance/Class	
EMC	EMI	CE	CISPR32/EN55032	CLASS A	(with EMC Recommended Circuit)
	EMS	RS	IEC/EN61000-4-3	10V/m	Perf.Criteria A (with EMC Recommended Circuit)
		CS	IEC/EN61000-4-6	3Vr.m.s	Perf.Criteria A (with EMC Recommended Circuit)
		ESD	IEC/EN61000-4-2	Contact ±4KV	Perf.Criteria B
		EFT	IEC/EN61000-4-4	±2KV	Perf.Criteria B (with EMC Recommended Circuit)
		Voltage dips & interruptions	IEC/EN61000-4-11	0%~70%	Perf.Criteria B

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

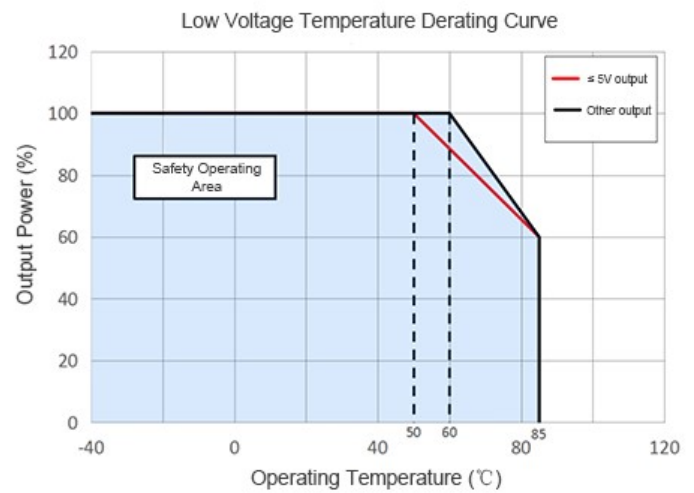
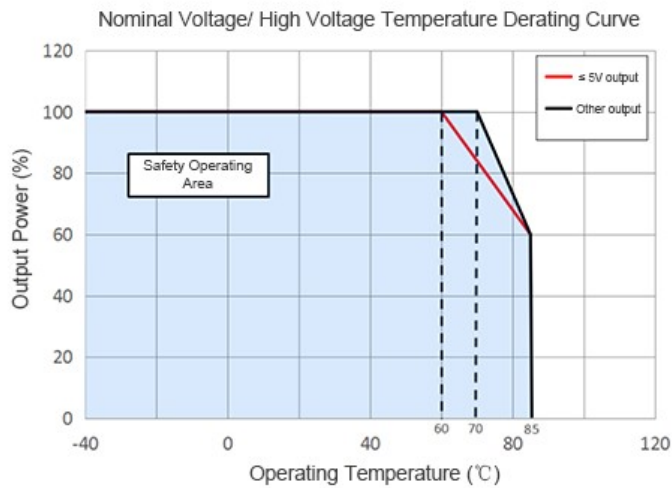


1) The Ripple & noise test needs 12# twisted pair cables, an oscilloscope which should be set at the Sample Mode, bandwidth 20MHz. 100M bandwidth probe with cap and ground removed. C2(0.1uF) polypropylene capacitor and C3(10uF) high-frequency low-resistance electrolytic capacitor are connected in parallel with the probes and one side of the twisted pair. C0 & C1 refer to the application circuit recommended.

2) The power supply output connects to the load by the cables. The other side of the twisted pair (length 30cm±2 cm) should be connected in parallel with the load, the polarity of the output and the oscilloscope probe should not be reversed. The test can be started after input power on.

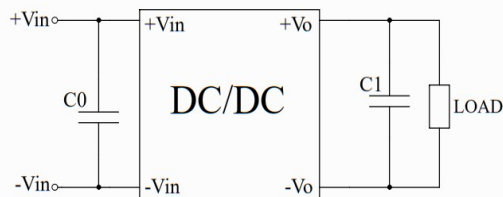
3) ≥5% load or a high-frequency resistance E-cap(≥470uF) load is recommended, to avoid the output ripple increasing.

Product Performance Curves



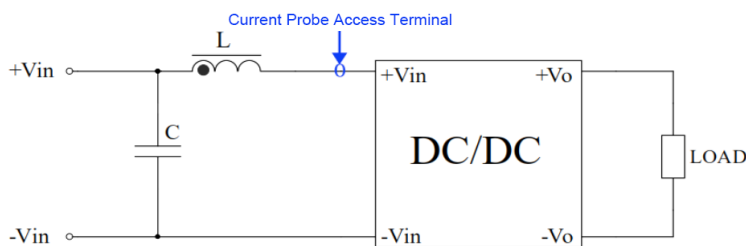
Recommended Circuits for Application

1. All this series of converters will be tested according to this circuit below before shipping. The output ripple could be decreased with C0 or C1 capacitance increased, the output capacitance must be less than the maximum capacitive load.



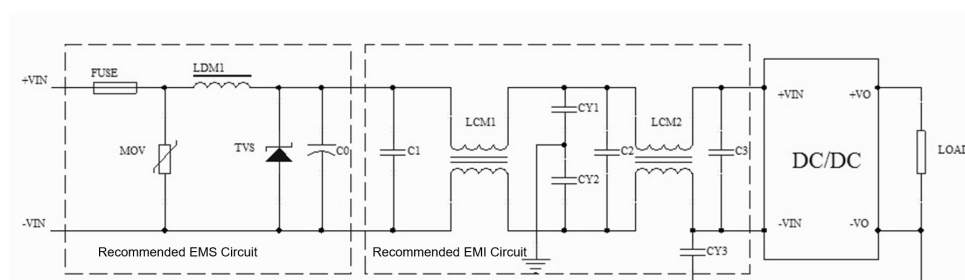
Components	Parameter
C0	47-100uF/200V
C1	470uF/50V

2. Input reflected ripple current test circuit



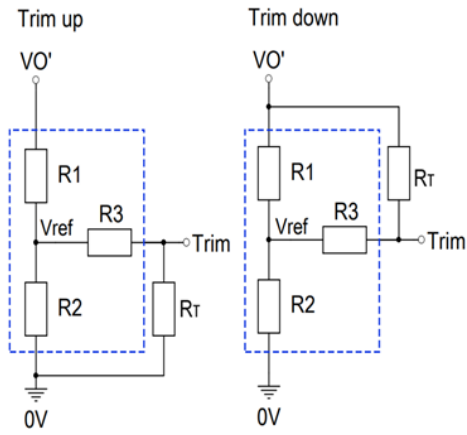
Components	Parameter
C	220uF/200V
L	4.7uH/15A

3. Recommended circuit for EMC



Components	110V nominal input
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

4. Trim and Trim resistance calculation.



Rrim Resistance calculating fomula

up: $R_T = \frac{\alpha R_2}{R_2 - \alpha} - R_3$

down: $R_T = \frac{\alpha R_1}{R_1 - \alpha} - R_3$

$\alpha = \frac{V_{ref}}{V_{O'} - V_{ref}} \cdot R_1$

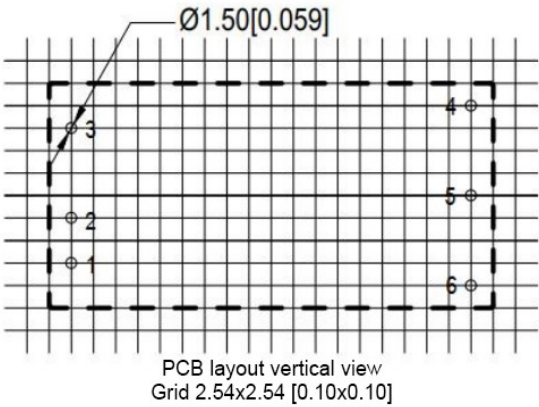
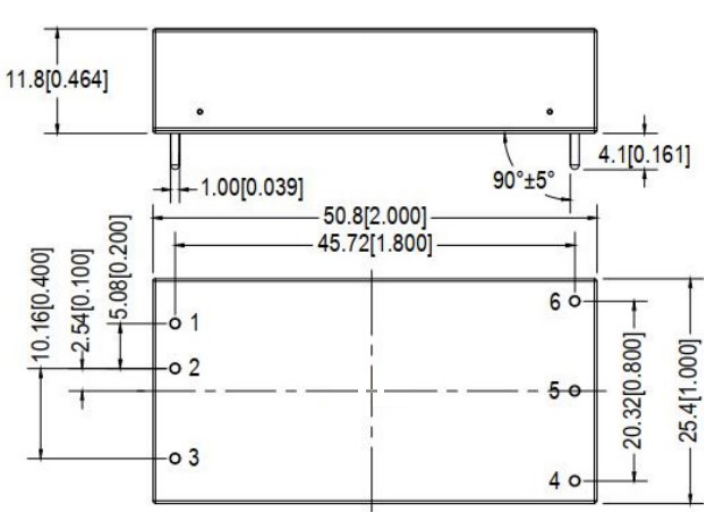
$\alpha = \frac{V_{O'} - V_{ref}}{V_{ref}} \cdot R_2$

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 Voltage	Trim internal circuit parameters			
Vout(VDC)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	24	14.53	68	1.25
5	20	20	68	2.5
12	18	4.7	30	2.5
15	25.5	5.1	30	2.5
24	25.5	2.95	18	2.5

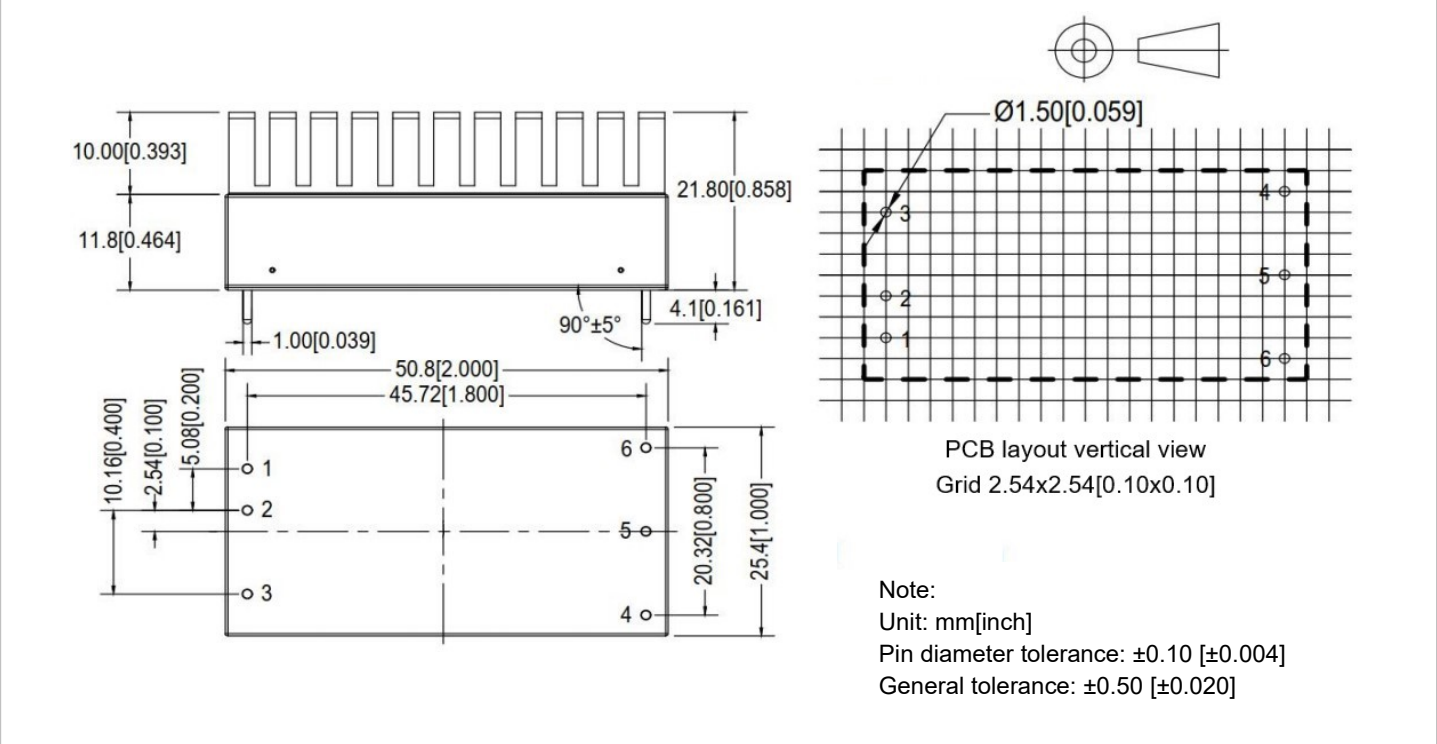
B3C3 Mechanical Dimensions (without Heat Sink)



Note:
Unit: mm[inch]
Pin diameter tolerance: ±0.10 [±0.004]
General tolerance: ±0.50 [±0.020]

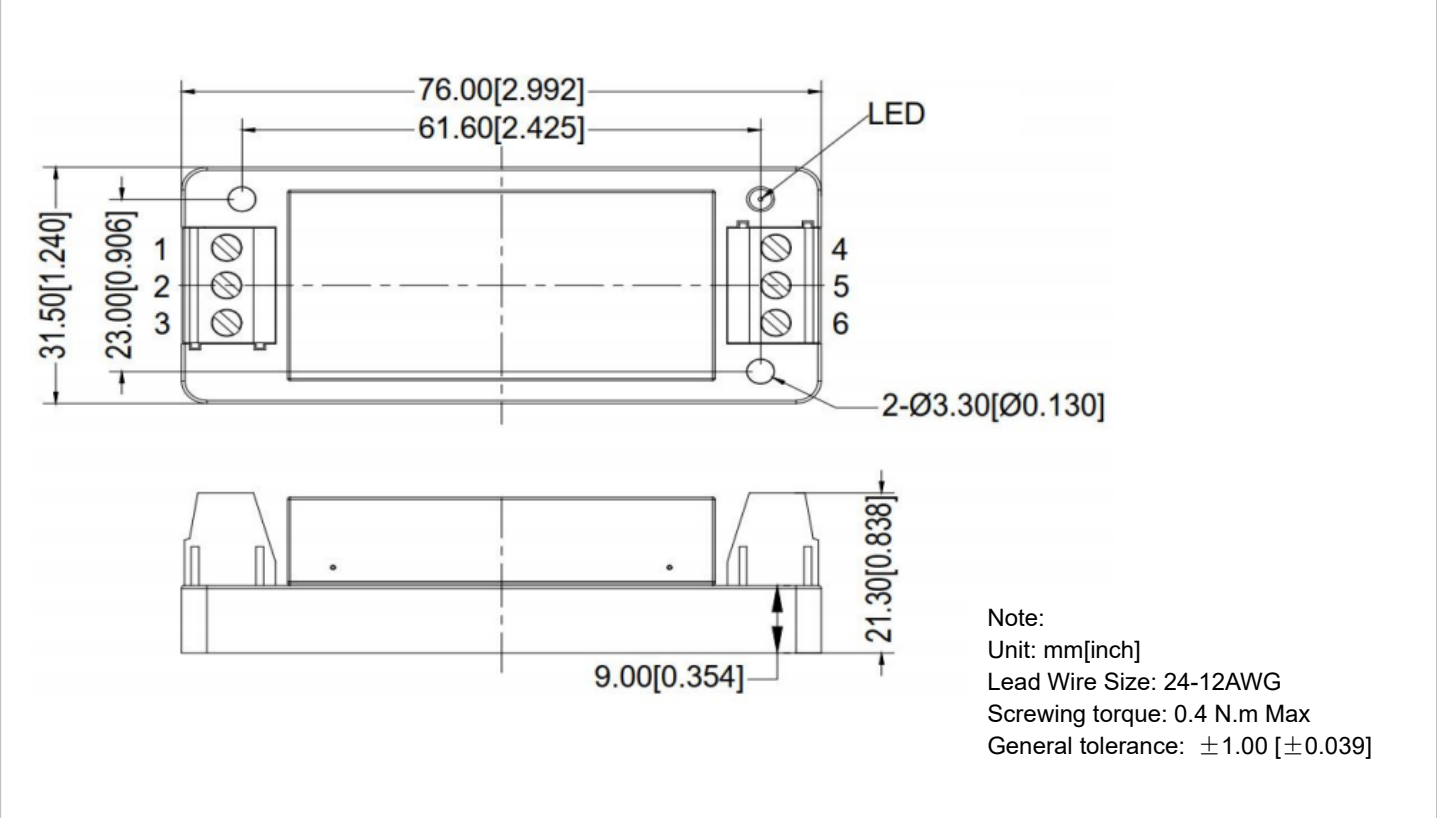
Pin No.	1	2	3	4	5	6
PFD40-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

B3C3-H Mechanical Dimensions (with Heat Sink)



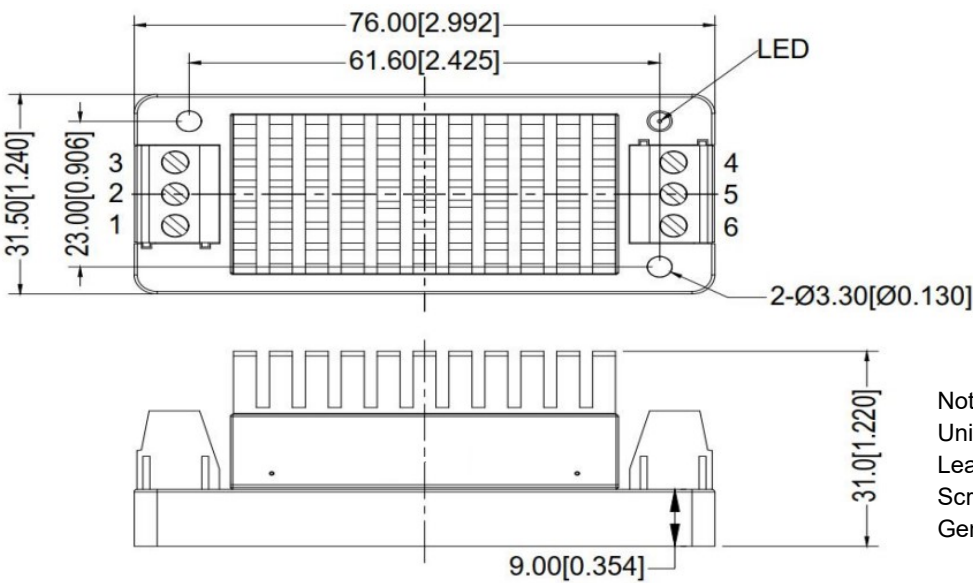
Pin No.	1	2	3	4	5	6
PFD40-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

B3C3-T Mechanical Dimensions (without Heat Sink)



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

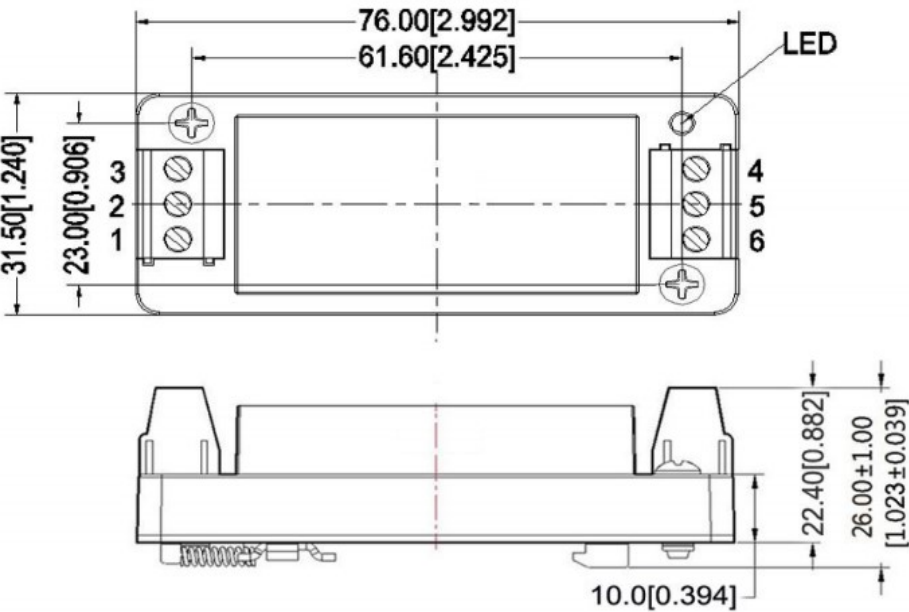
B3C3-TH Mechanical Dimensions (with Heat Sink)



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

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

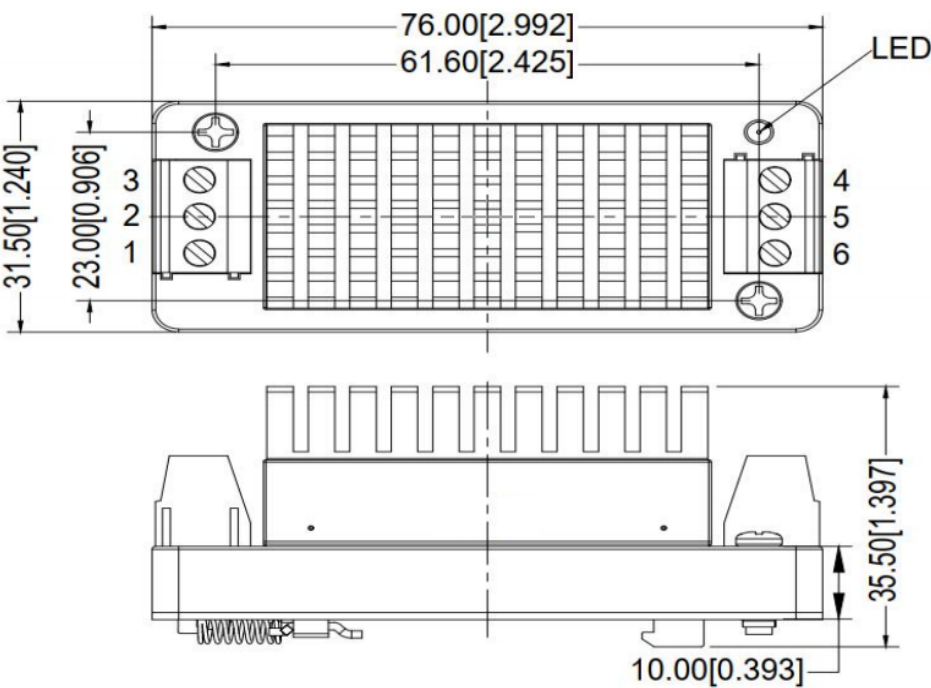
B3C3-TS Mechanical Dimensions (without Heat Sink)



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

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

B3C3-TSH Mechanical Dimensions (with Heat Sink)



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

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

Application Notice

- 1.The products should be used according to the specifications in this datasheet, otherwise it could be permanently damaged.
2. The product performance in this datasheet cannot be guaranteed if it works at a lower load than the minimum load defined.
3. The product performance in this datasheet cannot be guaranteed if it works at over-load condition.
4. Unless otherwise specified, all values or indicators in this datasheet are tested at Ta=25℃, humidity<75%RH, nominal input voltage and rated load (pure resistance load).
5. All values or indicators in this datasheet had been tested based on Aipupower test specifications.
- 6.The specifications are specially for the parts listed in 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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