Typical Features

- Wide input voltage range (4:1)
- Efficiency up to 90%(Typ.)
- Standby power consumption as low as 0.15W
- Output fast start up
- Continuous Short Circuit protection, Self-recovery
- Input under-voltage protection, output over voltage, short circuit, over current protections
- Isolation Voltage 1500VDC
- Operating Temperature: -40°C~+105°C
- Good EMC performance
- International standard pin-out

Application Field

PFD20-XXSXXB3(C)2 series *products are new designed DIP 2"X1" size packaging, 20W power output DC-DC converters with the advantages of wide input range 4:1, low stand-by power consumption, isolated & regulated output. They can be widely used for industrial control, instrumentation, communication, electric power and IoT, 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 (VDC/mA)		Input Current @Rated voltage (mA)Typ.		Max. Capacitive Load(uF)	Ripple & Noise (mVp-p)		Efficiency (%) @full load	
		Rated	Range	Voltage	Current	Full load	No load	Max	Typ	Max	Min	Typ
-	*PFD20-18S3V3B3(C)2	24	9-36	3.3	5000/0	818	45	10000	50	100	84	86
-	PFD20-18S05B3(C)2	24	9-36	5	4000/0	993	80	10000	50	100	86	88
-	*PFD20-18S09B3(C)2	24	9-36	9	2222/0	969	10	4700	50	100	86	88
-	*PFD20-18S12B3(C)2	24	9-36	12	1667/0	969	10	1600	50	100	87	89
-	*PFD20-18S15B3(C)2	24	9-36	15	1333/0	969	10	1000	50	100	88	90
-	*PFD20-18S24B3(C)2	24	9-36	24	833/0	969	10	500	50	100	88	90
-	*PFD20-36S3V3B3(C)2	48	18-75	3.3	5000/0	409	25	10000	50	100	84	86
-	*PFD20-36S05B3(C)2	48	18-75	5	4000/0	497	60	10000	50	100	84	86
-	*PFD20-36S09B3(C)2	48	18-75	9	2222/0	485	9	4700	50	100	87	89
-	*PFD20-36S12B3(C)2	48	18-75	12	1667/0	485	9	1600	50	100	85	87
-	*PFD20-36S15B3(C)2	48	18-75	15	1333/0	485	9	1000	50	100	88	90
-	*PFD20-36S24B3(C)2	48	18-75	24	833/0	485	9	500	50	100	86	88

Note

1. * marked part has been developed in process.
2. In the part numbers C indicates the part with Control function, R indicates the part with both Control & Trim functions, N indicates with None of Control or Trim.
3. The suffix -H indicates the part with Heat sink, -T indicates a kind of chassis packaging with terminals, -TS indicates a kind of packaging of DIN Rail which width 35mm.
4. The above efficiency is tested at Rated input voltage and rated load.

5. The maximum capacitive load is the capacitance allowed to be used when the power supply operates at full load. The converter may not start up if the capacitor exceeds this value.
6. Please contact with Aipu sales for other output voltages requirement in this series but not in this table.

Input Specifications

Items	Test Conditions	Min.	Typ.	Max.	Unit
Stand-by power Consumption	Full input voltage range	/	0.15	/	W
Input inrush voltage (1Sec. Max)	Vin=24V	-0.7	/	50	VDC
	Vin=48V	-0.7	/	100	
Start-up voltage	Vin=24V	/	/	9	
	Vin=48V	/	/	18	
Input Under-Voltage Protection	Vin=24V	5	6.5	9	
	Vin=48V	12	15.5	18	
Turn-on delay	Rated input, constant-resistance load	/	10	/	mS
Input Filter	/	π filter			
Hot Plug	/	Unavailable			
CTRL*	Turn-on the converter	No connection or connect to a high level (3.5-12VDC)			
	Shut off the converter	Connect to -Vin or a low level (0-1.2VDC)			
	The current value to shut off	4mA (Typ.)			

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

Output Specifications

Items	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	Input voltage range, rated load	/	±1	±3	%
Voltage Regulation	Full voltage range, Rated load	/	±0.2	±0.5	
Load Regulation	5%-100% rated load	/	±0.5	±1	
Ripple & Noise	0%-100% load, Rated voltage (20MHz bandwidth)	/	50	100	mVp-p
Dynamic Response Deviation	25% Rated load step, 3.3V & 5V output voltage	/	±3	±8	%
	25% Rated load step, other output voltages	/	±3	±5	
Dynamic Response Time	25% Rated load step, Rated input voltage	/	300	500	uS
Temperature Drift Coefficient	Full load	/	/	±0.03	%/°C
O/P voltage adjustable (Trim)	Input voltage range, rated load	90	/	110	%Vo
O/P Over voltage protection		110	140	160	
O/P Over current protection		110	150	190	%Io
Short Circuit Protection		Hiccup, continuous, self-recovery			

General Specifications

Items	Test Conditions	Min.	Typ.	Max.	Unit
Switching Frequency	Operating Mode (PWM)	/	270	/	KHz

Operating Temperature	Refer to Temperature Derating Curve		-40	/	+105	°C
Storage Temperature	/		-55	/	+125	
Case Temperature	Refer to Product Performance Curve		/	/	+105	
Pin Soldering Temperature	1.5mm from soldering to case, 10 sec.		/	/	300	
Relative Humidity	No condensing		5	/	95	%RH
Isolation Voltage	I/P-O/P, test 1min, leakage current <1mA		1500	/	/	VDC
Insulation Resistance	I/P-O/P, @500VDC		1000	/	/	MΩ
Isolation Capacitance	I/P-O/P, 100KHz/0.1V	PFD20-18S24B3C2	/	2050	/	pF
		Others	/	1050	/	
MTBF	MIL-HDBK-217F@25℃		1000	/	/	KHrs
Vibration	/		IEC/EN 61373 C1/Body Mounted Class B			
Cooling Method	Nature air					
Case Material	Aluminum					

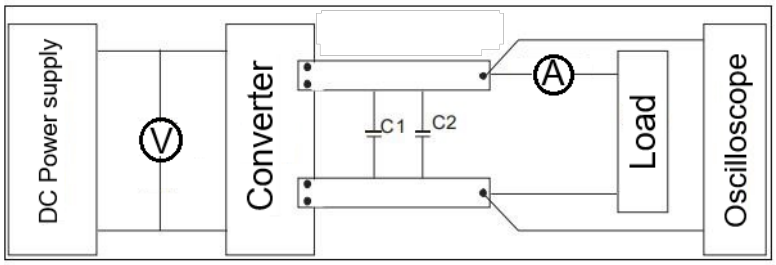
Weight/ Dimension	Part No.	Weight Typ.	Dimensions L x W x H	
	PFD20-XXSXXB3(C)2	22g	50.8 X 25.4 X 11.8 mm	2.00 X 1.00 X 0.464 inch
	PFD20-XXSXXB3(C)2-H	34g	50.8 X 25.4 X 21.8 mm	2.00 X 1.00 X 0.858 inch
	PFD20-XXSXXB3(C)2-T	43g	76.0 X 31.5 X 21.3 mm	2.99 X 1.24 X 0.838 inch
	PFD20-XXSXXB3(C)2-TH	55g	76.0 X 31.5 X 31.0 mm	2.99 X 1.24 X 1.220 inch
	PFD20-XXSXXB3(C)2-TS	63g	76.0 X 31.5 X 26.0 mm	2.99 X 1.24 X 1.023 inch
	PFD20-XXSXXB3(C)2-TSH	75g	76.0 X 31.5 X 35.5 mm	2.99 X 1.24 X 1.397 inch

EMC Performances

Total Items		Sub Items	Test Standard	Performance/Class
EMC	EMI	CE	CISPR22/EN55032	CLASS A, (CLASS B with Recommended EMC Circuit)
		RE	CISPR22/EN55032	CLASS A, (CLASS B with Recommended EMC Circuit)
	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 (With Recommended EMC Circuit)
		EFT	IEC/EN61000-4-4	±2KV Perf.Criteria B (With Recommended EMC Circuit)
		Voltage dips, short interruptions and voltage variations immunity	IEC/EN61000-4-11	0%~70% Perf.Criteria B

Ripple & Noise Test Instruction (Parallel-line Method)

Test Diagram:

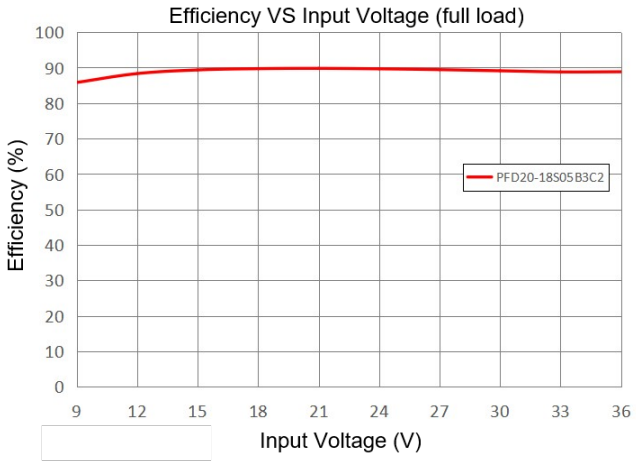


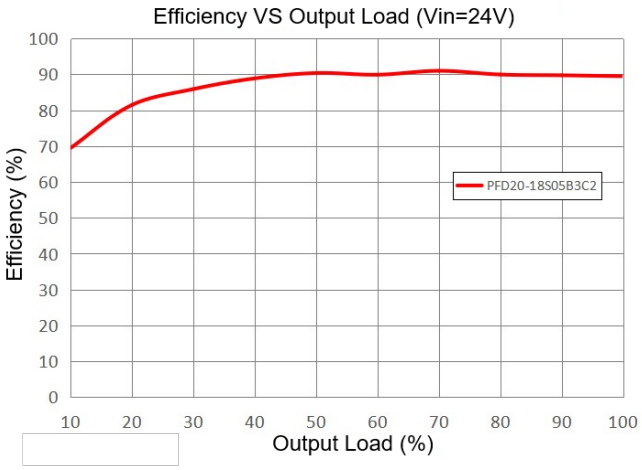
Test conditions

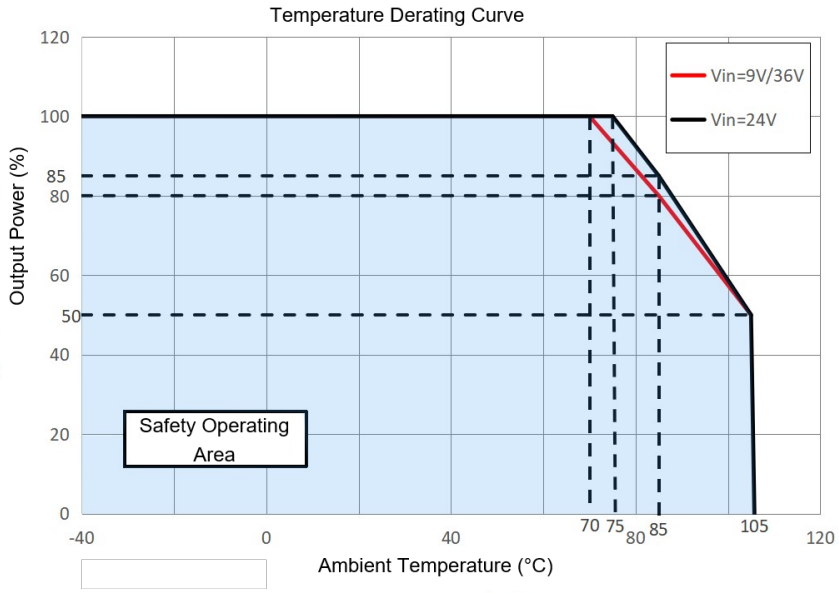
1, C1=1uF, C2=10uF, the capacitor withstand voltage should be more than the converter output voltage.

2, The maximum capacitive load is tested at the full load (pure resistance load).

Product Performance Curves

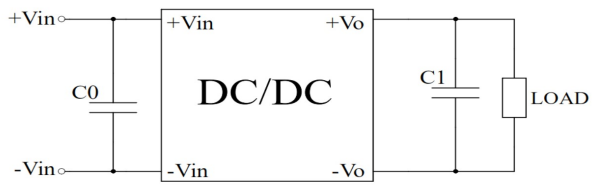






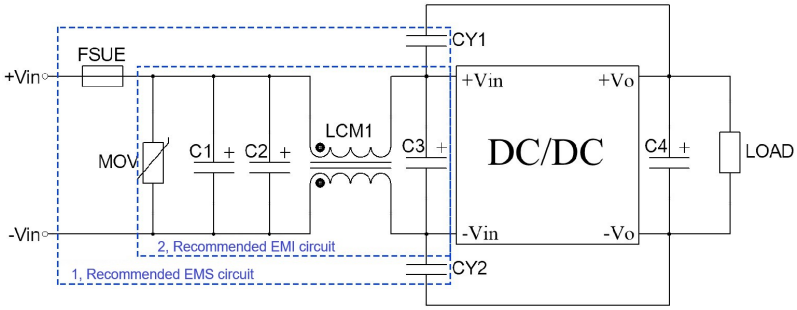
Recommended Circuits for Application

1. DC-DC test circuit



Component	Vin=24V	Vin=48V
C0	100uF/50V	100uF/100V
C1	100~470uF/50V	

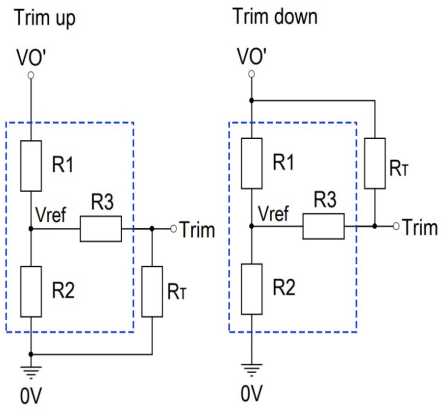
2. Recommended EMC circuit



Component	Vin=24V	Vin=48V
FUSE	TBD by customer	
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 circuit is for EMS, part 2 for EMI, both can be adjusted according to the actual situation.

3. Trim and Trim resistance calculation



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

Calculation formula of the Trim resistance:

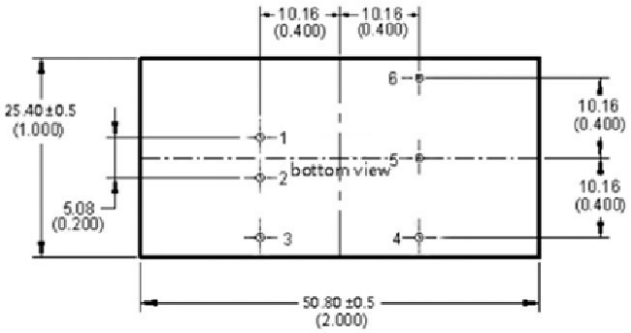
$$up:\ R_T=\frac{aR_2}{R_2-a}-R_3 \qquad a=\frac{Vref}{Vo'-Vref}\cdot R_1$$

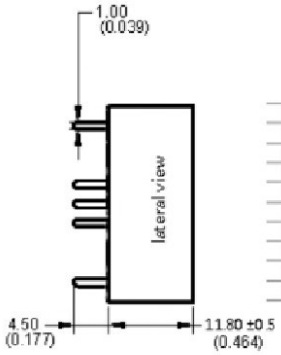
$$down:\ R_T=\frac{aR_1}{R_1-a}-R_3 \qquad a=\frac{Vo'-Vref}{Vref}\cdot R_2$$

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

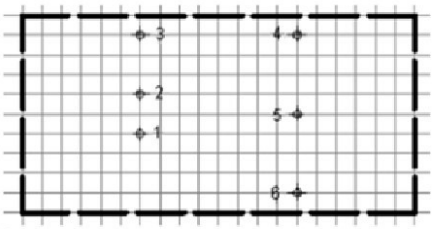
Output Voltage	Internal circuit parameters for Trim			
Vout(DC)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	4.22	2.55	18	1.25
5	5.1	5.07	20	2.5
9	9.31	3.58	24	2.5
12	18	4.75	33	2.5
15	18	3.6	30	2.5
24	30	3.48	30	2.5

B3 Dimensions (Without Heat Sink)





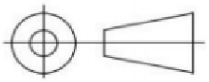
Note:
Unit: mm (inch)
Grid: 2.54x2.54 (0.10x0.10)
General tolerance: ±0.25 (±0.010)
Pin diameter tolerance: ±0.10 (±0.004)

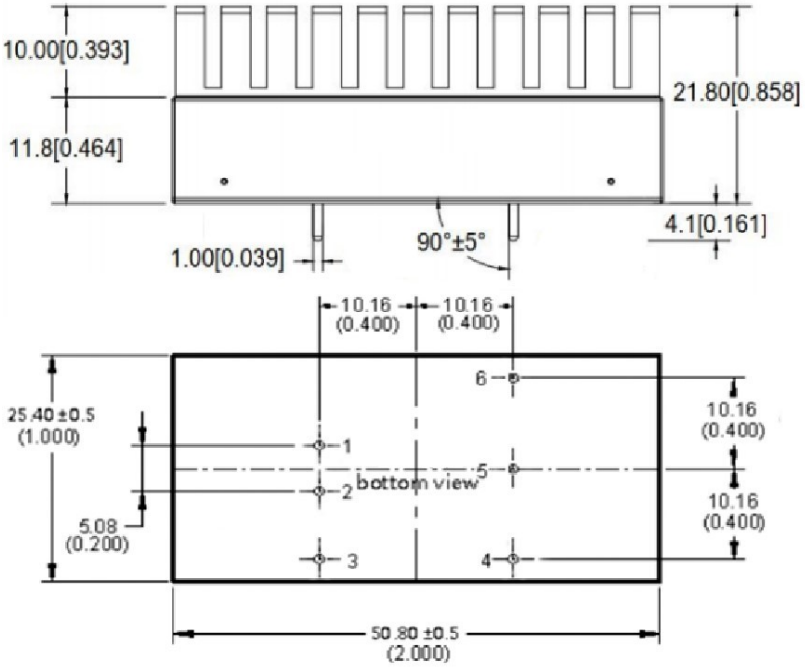


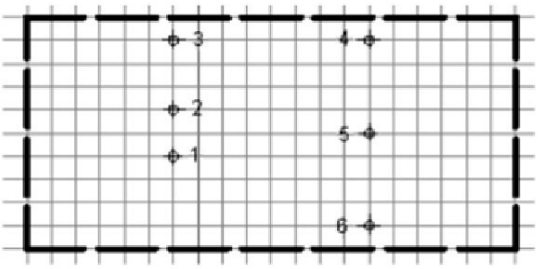
PCB layout vertical view

Pin function definition						
Pin No.	1	2	3	4	5	6
PFD20-XXSXXB3(R)2	+Vin	-Vin	Ctrl	-Vo	Trim	+Vo

B3-H Dimensions (With Heat Sink)





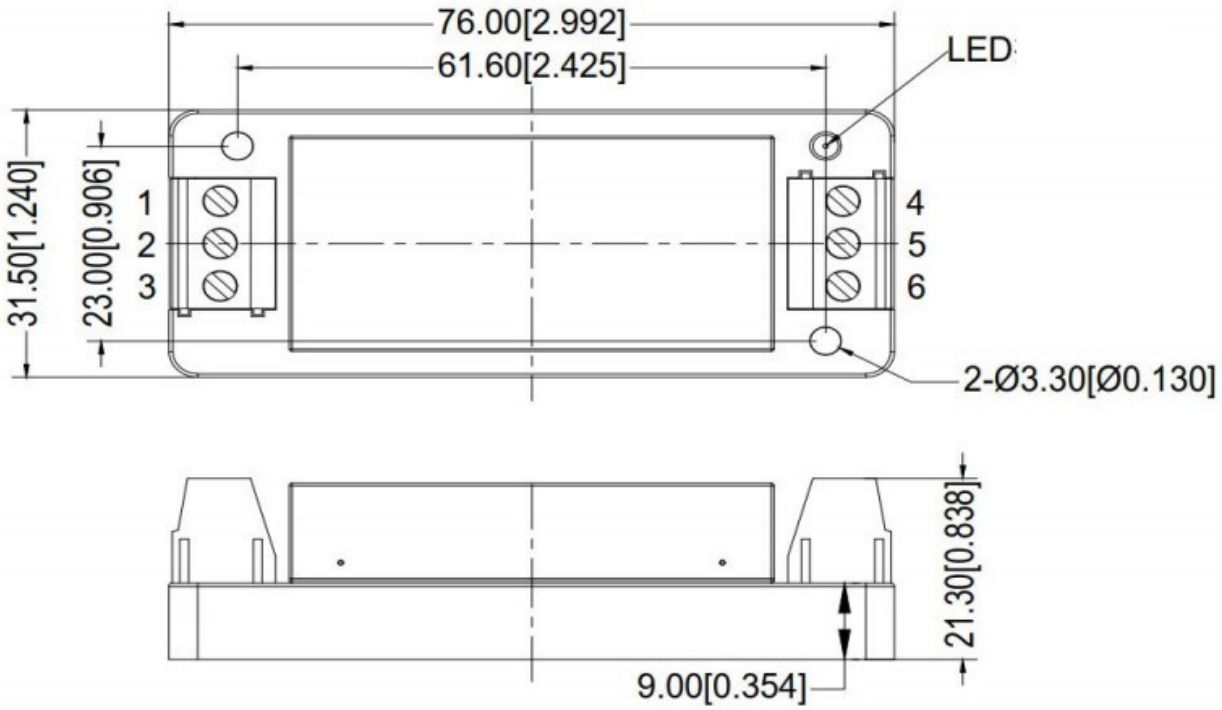


PCB layout vertical view

Note:
Unit: mm [inch]
Grid: 2.54x2.54 [0.10x0.10]
General tolerance: ±0.50 [±0.020]
Pin diameter tolerance: ±0.10 [±0.004]

Pin function definition						
Pin No.	1	2	3	4	5	6
PFD20-XXSXXB3(R)2	+Vin	-Vin	Ctrl	-Vo	Trim	+Vo

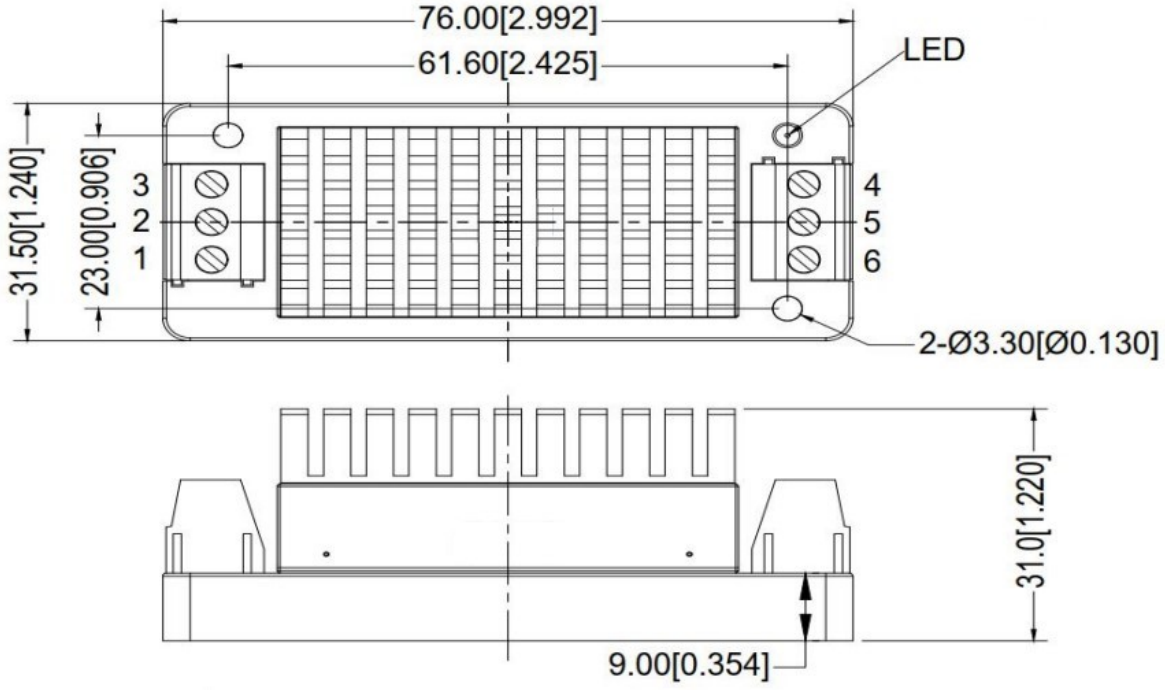
B3-T Dimensions (Without Heat Sink)



Pin function definition

Pin No.	1	2	3	4	5	6
PFD20-XXSXXB3(R)2	+Vin	-Vin	Ctrl	-Vo	Trim	+Vo

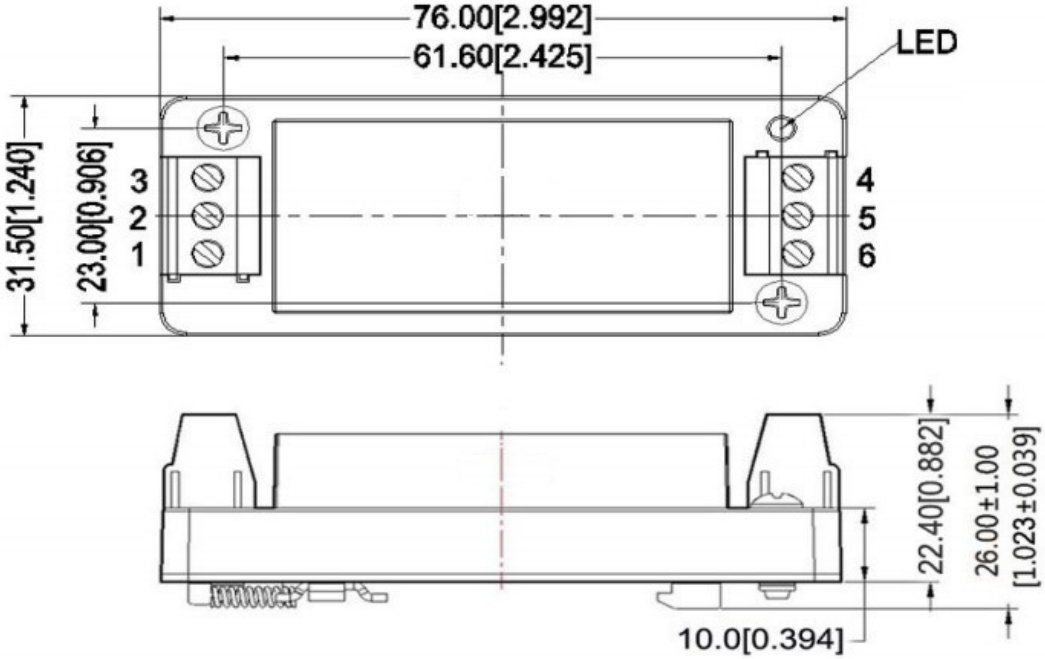
B3-TH Dimensions (With Heat Sink)



Pin function definition

Pin No.	1	2	3	4	5	6
PFD20-XXSXXB3(R)2	+Vin	-Vin	Ctrl	-Vo	Trim	+Vo

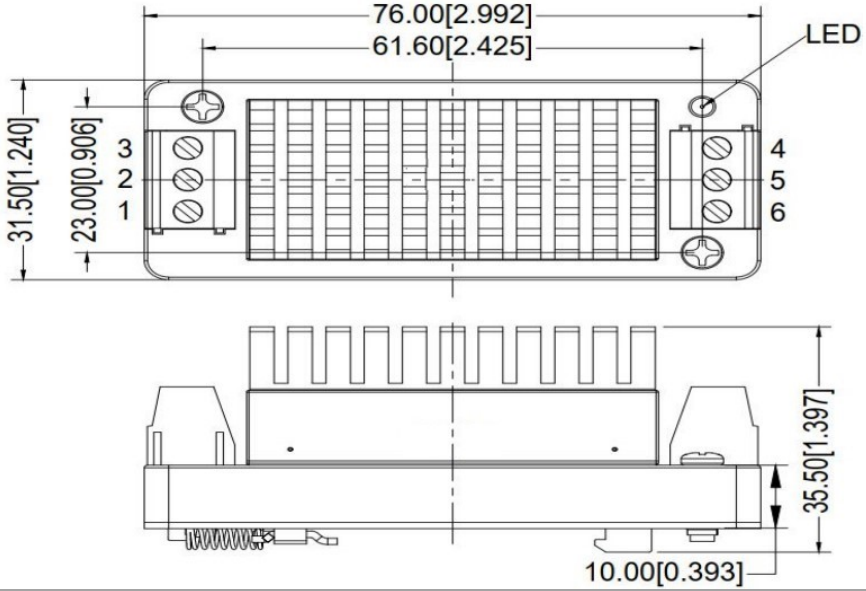
B3-TS Dimensions (Without Heat Sink)



Pin function definition

Pin No.	1	2	3	4	5	6
PFD20-XXSXXB3(R)2	+Vin	-Vin	Ctrl	-Vo	Trim	+Vo

B3-TSH Dimensions (With Heat Sink)



Pin function definition

Pin No.	1	2	3	4	5	6
PFD20-XXSXXB3(R)2	+Vin	-Vin	Ctrl	-Vo	Trim	+Vo

Other Models Pin Function Definition

Pin No.	1	2	3	4	5	6
PFD20-XXSXXB3C2	+Vin	-Vin	Ctrl	-Vo	No pin	+Vo
PFD20-XXSXXB3N2	+Vin	-Vin	No pin	-Vo	No pin	+Vo

Note:

1. The products should be used according to the specifications in this manual, otherwise it could be permanently damaged.
2. It is not recommended to connect the power supply outputs in parallel to achieve a bigger power output.
3. The product performance in this manual cannot be guaranteed if it works at a lower load than the minimum load defined.
4. The product performance in this manual cannot be guaranteed if it works at over-load condition.
5. Unless otherwise specified, all values or indicators in this manual are tested at Ta=25℃, humidity<75%RH, rated input voltage and rated load (pure resistance load).
6. All values or indicators in this manual had been tested based on Aipupower test specifications.
7. The specifications are specially for the parts listed in this manual, any other non-standard model performances could be out of the specifications. Please contact our technician for specific requirements.
8. Aipupower can provide customization service.
9. The product specifications may be modified without prior notice. Please refer to the published data sheet at Aipupower website.

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