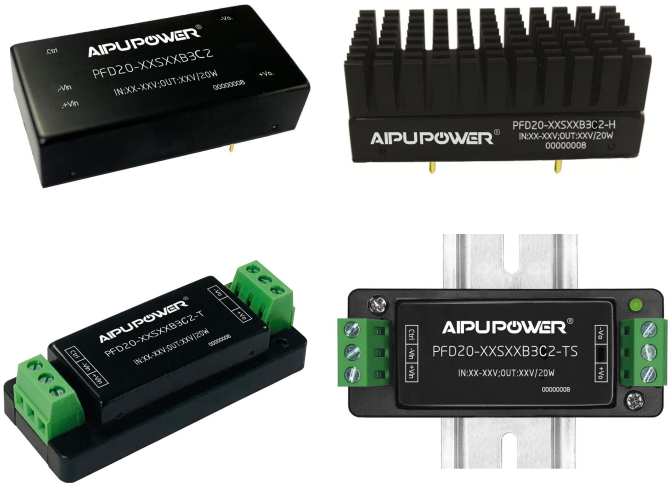
Typical Features

- Wide input voltage range (4:1)
- Efficiency 90% (Typ.)
- Standby power consumption 0.15W (Typ.)
- 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 from -40°C to +105°C
- Excellent EMC Performance
- International Standard Pin-out



Application Field

PFD20-XXSXXB3(C)2 series --- *DIP mounting standard 2"X1" size modular DC-DC converters with wide input voltage range 4:1, low stand-by power consumption, isolated & regulated single output 20W. This series of products can be widely used in the fields of industrial control, instrumentation, communication, electric power and IoT, etc. The additional circuit for EMC is recommended in this data sheet for the application with high EMC requirement.*

Selection Guide

Certificate	Part No.	Input Voltage Range (VDC)		Output Voltage/Current (VDC/mA)		Input Current @Nominal voltage (mA)Typ.		Max. Capacitive Load(μF)	Ripple & Noise (mVp-p)		Efficiency (%) @full load	
		Nom.	Range	Voltage	Current	Full load	No load	Max	Typ	Max	Min	Typ
-	PFD20-18S3V3B3(C)2	24	9-36	3.3	5000	818	45	10000	50	100	84	86
-	PFD20-18S05B3(C)2	24	9-36	5	4000	993	80	10000	50	100	86	88
-	PFD20-18S09B3(C)2	24	9-36	9	2222	969	10	4700	50	100	86	88
-	PFD20-18S12B3(C)2	24	9-36	12	1667	969	10	1600	50	100	87	89
-	PFD20-18S15B3(C)2	24	9-36	15	1333	969	10	1000	50	100	88	90
-	PFD20-18S24B3(C)2	24	9-36	24	833	969	10	500	50	100	88	90
-	PFD20-36S3V3B3(C)2	48	18-75	3.3	5000	409	25	10000	50	100	84	86
-	PFD20-36S05B3(C)2	48	18-75	5	4000	497	60	10000	50	100	84	86
-	*PFD20-36S09B3(C)2	48	18-75	9	2222	485	9	4700	50	100	87	89
-	PFD20-36S12B3(C)2	48	18-75	12	1667	485	9	1600	50	100	85	87
-	*PFD20-36S15B3(C)2	48	18-75	15	1333	485	9	1000	50	100	88	90
-	*PFD20-36S24B3(C)2	48	18-75	24	833	485	9	500	50	100	86	88

Note

1. * marked part has been developed in process.
2. In the part numbers R indicates the part with both Remote Control & Trim functions, C indicates the part with Control function, N indicates with None of Control or Trim.

3. The sμFfix -H indicates the part with Heat sink, -T indicates a kind of chassis packaging, -TS indicates a kind of packaging of DIN Rail which width is 35mm.

4. The above efficiency is tested at Nominal 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 if the capacitor exceeds this value.

6. This is a partial product list only. For models or specifications not listed, please contact our Sales Department.

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	Nominal input, constant-resistance load	/	10	/	mS
Input Filter	/	π filter			
Hot Plug	/	N/A			
CTRL*	Turn-on the converter	No connection or connect to a high level (3.5-12VDC)			
	Shut off the converter	Connect to -Vin or connect to low level (0-1.2VDC)			
	Current value to shut off the converter	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	Full input voltage range, rated load		/	±1	±3	%
Voltage Regulation	Full input voltage range, Rated load		/	±0.2	±0.5	
Load Regulation	5%-100% rated load		/	±0.5	±1	
Ripple & Noise	0-100% load, Nominal voltage (20MHz bandwidth)		/	50	100	mVp-p
Dynamic Response Deviation	25% rated load step, nominal input voltage	3.3V & 5V output	/	±3	±8	%
		others output	/	±3	±5	
Dynamic Response Time	25% Rated load step, nominal input voltage		/	300	500	uS
Temperature Drift Coefficient	Full load		/	/	±0.03	%/°C
O/P voltage adjustable (Trim)	Full input voltage range, rated load		90	/	110	%Vo
Over voltage protection			110	140	160	

Over current protection		110	150	190	%Io
Short Circuit Protection		Hiccup, continuous, self-recovery			
Note: The ripple and noise are tested by the twisted pair method, bandwidth 20MHz.					

General Specifications

Items	Test Conditions		Min.	Typ.	Max.	Unit
Switching Frequency	Operating Mode (PWM)		/	270	/	KHz
Operating Temperature	Refer to the Temperature Derating Curve		-40	/	+105	℃
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					

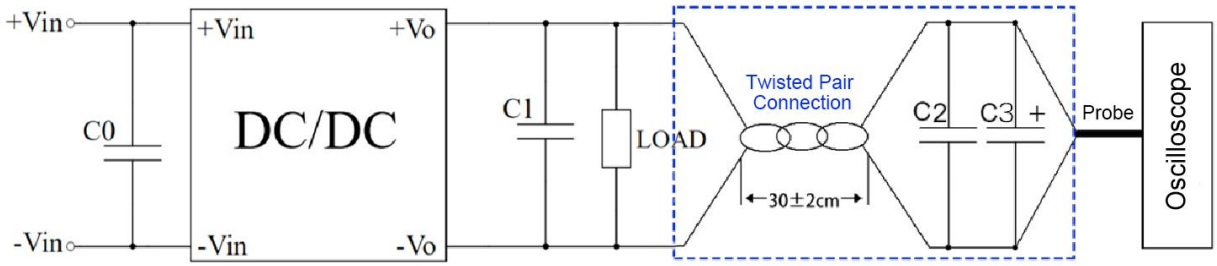
Weight/Dimension	Part No.	Weight Typ.	Dimensions L x W x H	
	PFD20-XXSXXB3(C)2	22g	50.8 X 25.4 X 11.8 mm	2.00 X 1.00 X 0.465 inch
	PFD20-XXSXXB3(C)2-H	34g	50.8 X 25.4 X 21.8 mm	2.00 X 1.00 X 0.858 inch
	PFD20-XXSXXB3(C)2-T	43g	76.0 X 31.5 X 21.3 mm	2.99 X 1.24 X 0.838 inch
	PFD20-XXSXXB3(C)2-TH	55g	76.0 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	1. CLASS A 2. CLASS B (with EMC Recommended Circuit)
		RE	CISPR22/EN55032	1. CLASS A 2. CLASS B (with EMC Recommended 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 EMC Recommended Circuit)
		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

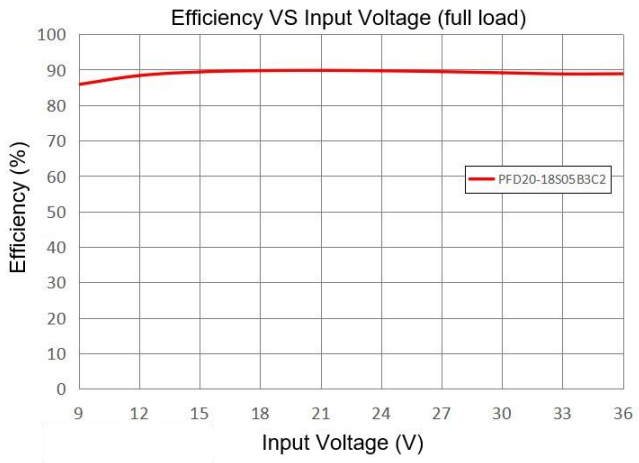
Ripple & Noise Test Instructions (Twisted Pair Method, 20MHz Bandwidth)

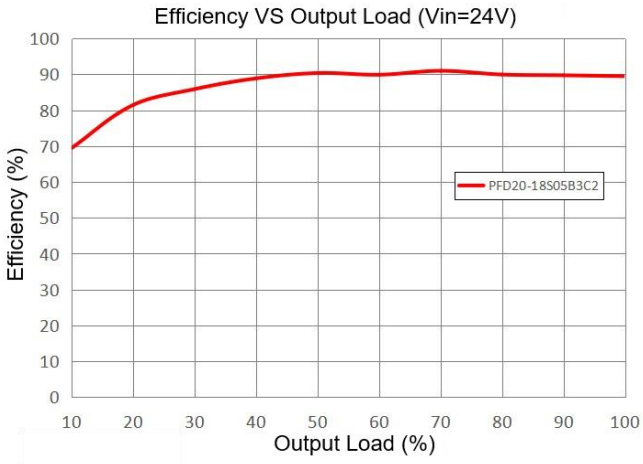


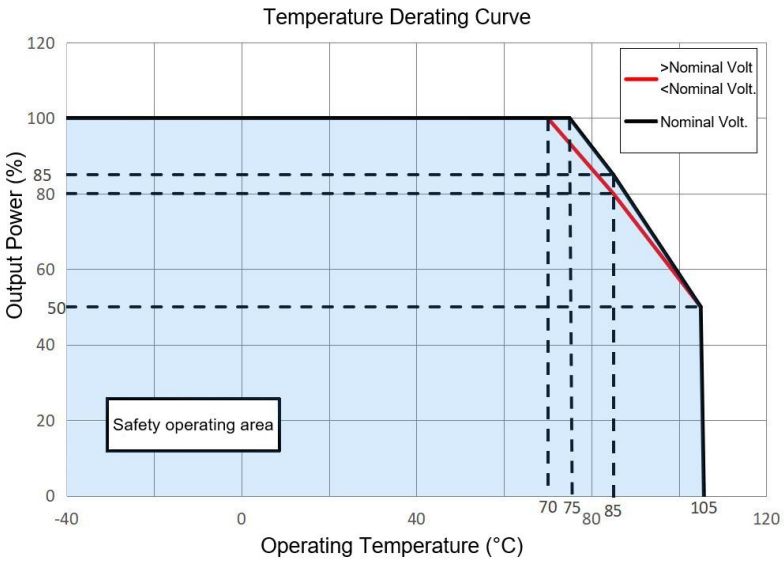
1) The Ripple & noise test need 12# twisted pair cables, an oscilloscope which should be set at the Sample Mode, bandwidth 20MHz. 100M bandwidth probe with cap and ground removed. C2(0.1μF) polypropylene capacitor and C3(10μF) high-frequency low-resistance electrolytic capacitor are connected in parallel 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.

Product Performance Curves

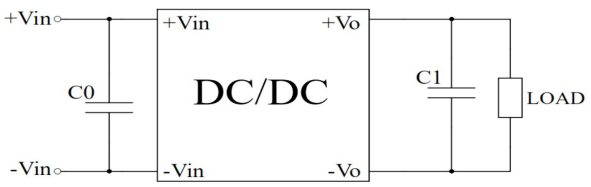






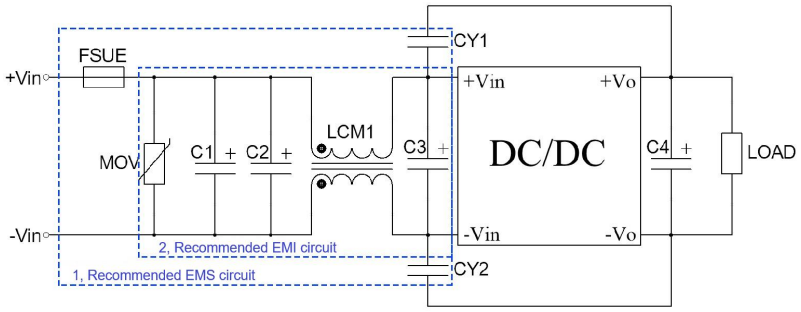
Recommended Circuits for Application

1. DC-DC test circuit



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

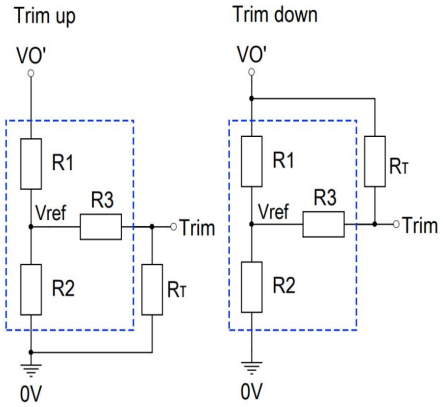
2. Recommended EMC circuit



Component	Vin=24V	Vin=48V
FUSE	TBD by customer	
MOV	14D560K	14D101K
LCM1	5mH	5mH
C1,C2,C3	330μF/50V	330μF/100V
C4	47μF/50V	47μF/50V
CY1,CY2,	2.2nF/2000V	

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

3. Trim and Trim resistance calculation



Calculation formula of the Trim resistance:

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

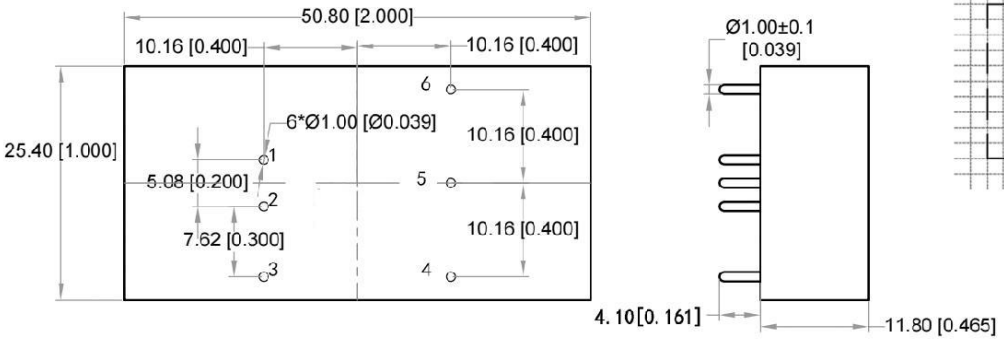
$$down:\ R_T=\frac{aR_1}{R_1-a}-R_3 \qquad a=\frac{Vo'-Vref}{Vref}\cdot R_2$$

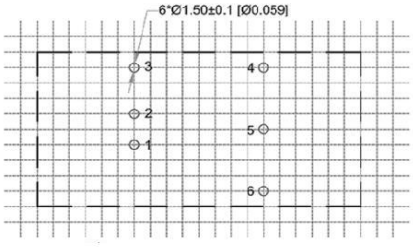
R_T is the Trim resistor, a is a custom parameter, and Vo' is the actual voltage of Trim up or Trim down.

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

Output Voltage	Internal circuit parameters for Trim			
Vout(DC)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	4.22	2.54	18	1.25
5	5.1	5.07	20	2.5
9	9.31	3.56	24	2.5
12	18	4.73	33	2.5
15	18	3.59	25.5	2.5
24	30	3.47	30	2.5

B3 Dimensions (Without Heat Sink)





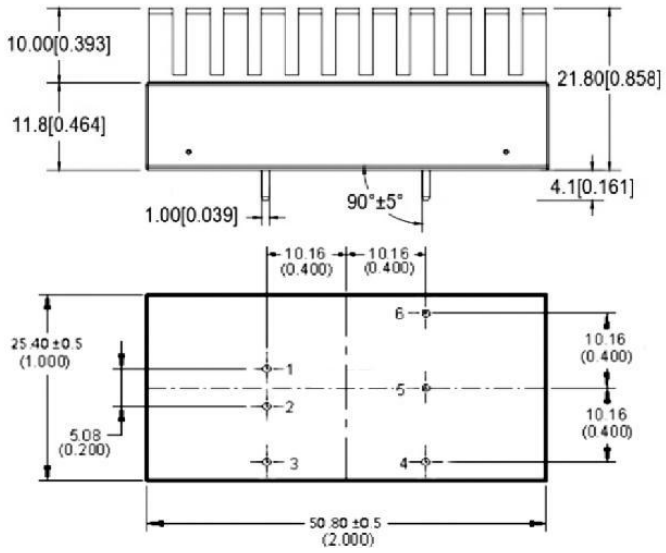
PCB layout vertical view
Grid 2.54x2.54[0.10x0.10]

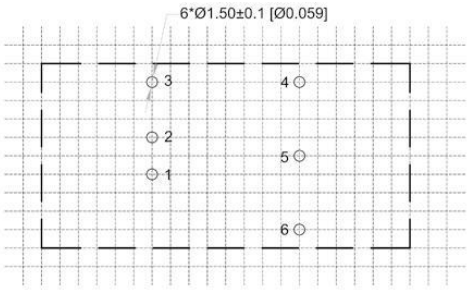
Unit: mm[inch]
Pin diameter tolerance ±0.10[±0.004]
General tolerance ±0.50[±0.020]

Pin function definition

Pin No.	1	2	3	4	5	6
PFD20-XXSXXB3(R)2	+Vin	-Vin	Ctrl	-Vo	Trim	+Vo
	Positive Input	Negative Input	Remote Control	Output Negative	Output Trim	Output Positive

B3-H Dimensions (With Heat Sink)





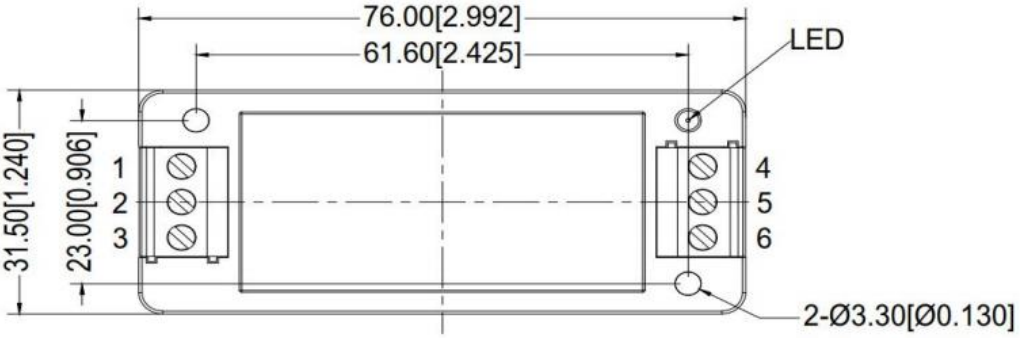
PCB layout vertical view
Grid 2.54x2.54[0.10x0.10]

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

Pin function definition

Pin No.	1	2	3	4	5	6
PFD20-XXSXXB3(R)2	+Vin	-Vin	Ctrl	-Vo	Trim	+Vo
	Input Positive	Input Negative	Remote Control	Output Negative	Output Trim	Output Positive

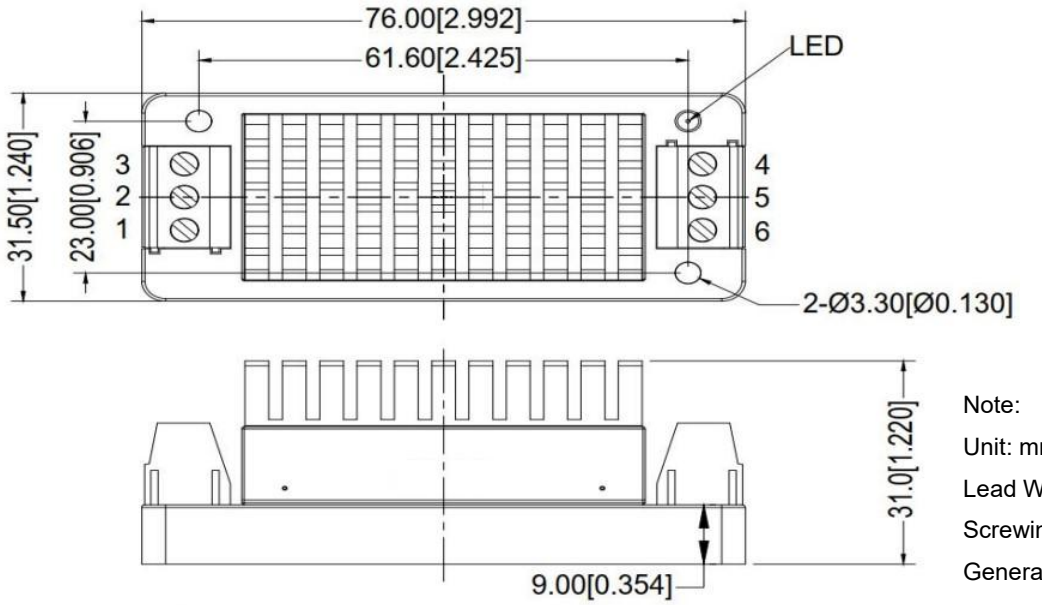
B3-T Dimensions (Without Heat Sink)



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
PFD20-XXSXXB3(R)2	+Vin	-Vin	Ctrl	-Vo	Trim	+Vo
	Input Positive	Input Negative	Remote Control	Output Negative	Output Trim	Output Positive

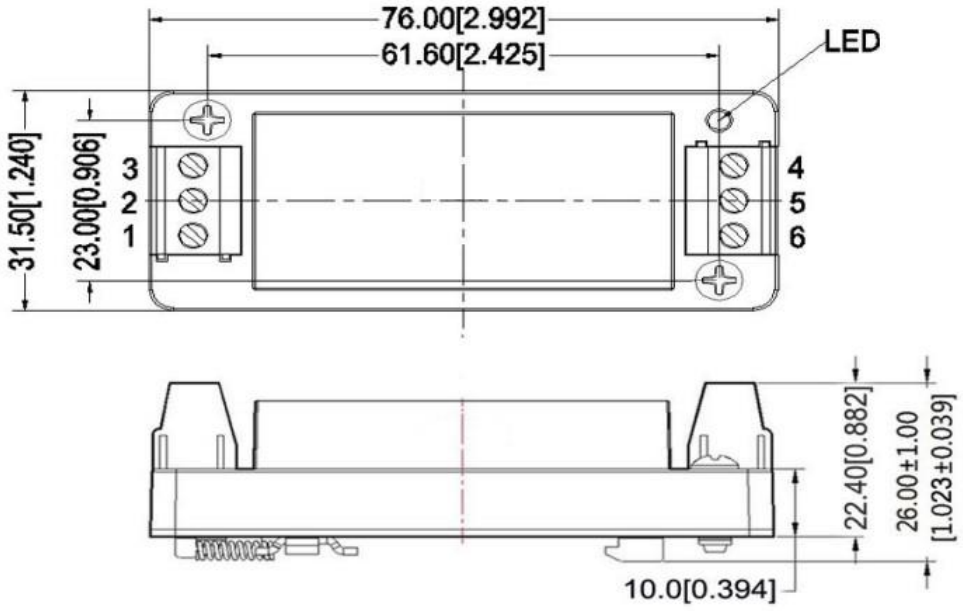
B3-TH Dimensions (With Heat Sink)



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
PFD20-XXSXXB3(R)2	+Vin	-Vin	Ctrl	-Vo	Trim	+Vo
	Input Positive	Input Negative	Remote Control	Output Negative	Output Trim	Output Positive

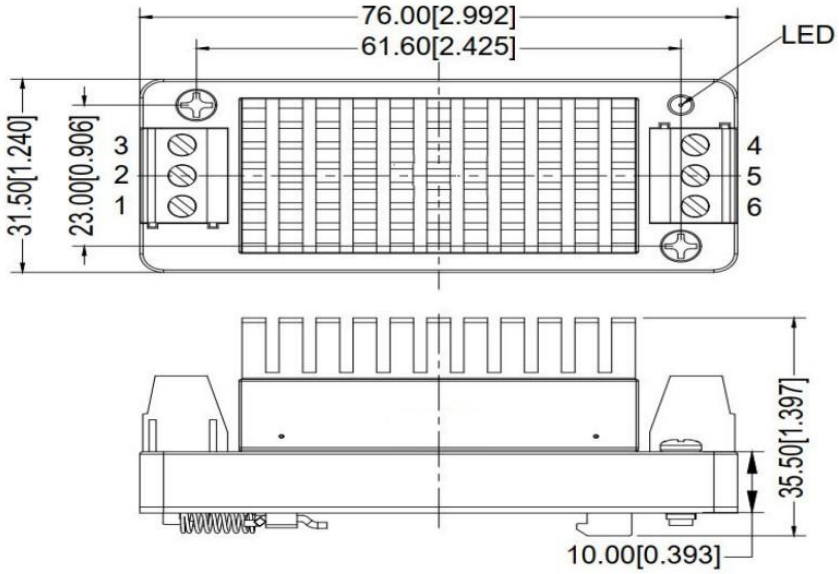
B3-TS Dimensions (Without Heat Sink)



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
PFD20-XXSXXB3(R)2	+Vin	-Vin	Ctrl	-Vo	Trim	+Vo
	Input Positive	Input Negative	Remote Control	Output Negative	Output Trim	Output Positive

B3-TSH 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
PFD20-XXSXXB3(R)2	+Vin	-Vin	Ctrl	-Vo	Trim	+Vo
	Input Positive	Input Negative	Remote Control	Output Negative	Output Trim	Output Positive

Other Models Pin Function Definition

Pin No.	1	2	3	4	5	6
PFD20-XXSXXB3C2	+Vin	-Vin	Ctrl	-Vo	NP	+Vo
	Input Positive	Input Negative	Remote Control	Output Negative	No Pin	Output Positive
PFD20-XXSXXB3N2	+Vin	-Vin	NP	-Vo	NP	+Vo
	Input Positive	Input Negative	Remote Control	Output Negative	No Pin	Output Positive

Application Notice

1.The product must be used within specified ranges; operation beyond these limits may cause permanent damage.

2.Parallel output connection for power expansion is not supported.

3. If operating below the minimum required load, the product's performance is not guaranteed to meet all specifications in this manual.

4. Performance is not guaranteed if the product is operated beyond its specified load range.

5. Unless otherwise specified, all data are measured at Ta=25°C, humidity < 75%RH, nominal input voltage, and rated resistive load.

6. All measurement and testing methods are based on our corporate standards.

7.Specifications apply to the standard models listed in this manual. For non-standard models, some parameters may vary; please contact our technical team for details.

8.This product is designed for natural air-cooling environments. Please contact us for applications in sealed or confined spaces.

9.Customized products are available upon request

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