

Typical Features

- ◆ Wide Input Voltage Range (4:1), Output power 20W
- ◆ Efficiency up to 89% (Typ.)
- ◆ Output fast start-up
- ◆ Continuous Short Circuit protection, Self-recovery
- ◆ Input under voltage, output over voltage, short circuit, over current protections
- ◆ Isolation Voltage 5000VDC
- ◆ Operating temperature from -40°C to +85°C
- ◆ Creepage distance 3.7mm, clearance distance 5mm
- ◆ Good EMC performance
- ◆ International standard pin-out



Application Field

PFD20-XXSXXB2(C)5 series ---- DIP mounting standard 2"X1" package DC-DC modular converters with wide input voltage range 4:1, low standby power consumption, isolated & regulated single output 20W. This series of products can be widely used in the fields of industrial control, instrument, communication, electricity power and IoT, etc. The additional circuit for EMC is recommended in this data sheet for the application with high EMC requirement.

Typical Product List

Certificate	Part No.	Input Voltage Range (VDC)		Output Voltage/ Current (Vo/Io)		Input Current (mA)Typ. @Nomimal Voltage		Max Capacitive Load	Ripple & Noise (mVp-p)		Efficiency (%) @full load	
		Nom.	Range	Vo (VDC)	Io(mA) Max/Min	Full Load	No Load	uF	Typ.	Max	Min	Typ.
-	*PFD20-18S3V3B2(C)5	24	9-36	3.3	5000/0	799	33	10000	50	100	84	86
-	PFD20-18S05B2(C)5	24	9-36	5	4000/0	936	33	10000	50	100	87	89
-	PFD20-18S09B2(C)5	24	9-36	9	2222/0	947	33	2000	50	100	85	87
-	PFD20-18S12B2(C)5	24	9-36	12	1667/0	936	6	1600	50	100	87	89
-	PFD20-18S15B2(C)5	24	9-36	15	1333/0	936	6	1000	50	100	87	89
-	PFD20-18S24B2(C)5	24	9-36	24	800/0	936	6	500	50	100	87	89
-	*PFD20-36S3V3B2(C)5	48	18-75	3.3	4000/0	404	33	10000	50	100	83	85
-	PFD20-36S05B2(C)5	48	18-75	5	4000/0	473	33	10000	50	100	86	88
-	*PFD20-36S09B2(C)5	48	18-75	9	2222/0	473	33	2000	50	100	86	88
-	*PFD20-36S12B2(C)5	48	18-75	12	1667/0	473	3	1600	50	100	86	88
-	*PFD20-36S15B2(C)5	48	18-75	15	1333/0	468	3	1000	50	100	87	89
-	PFD20-36S24B2(C)5	48	18-75	24	833/0	468	3	500	50	100	87	89

Note 1 - * marked part has been developed in process.

Note 2 - In the part numbers R indicates the part with both remote Control & Trim functions, C indicates the part with Control function, T indicates with Trim function, N indicates with none of Control or Trim.

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

Note 4 - 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 5 - The control chip could work at lower frequency at no load or low load to decrease the no load power and improve the efficiency.

Note 6 - Please contact Aipu sales for other output voltages requirement in this series but not listed in this table.

Input Specifications

Items	Test Conditions	Min.	Typ.	Max.	Unit
Stand-by power	Full input voltage range	/	0.1	/	W
Input Inrush Voltage (1Sec.max.)	24V input series	-0.7	/	50	VDC
	48V input series	-0.7	/	100	
Start-up Voltage	24V input series	/	/	9	
	48V input series	/	/	18	
Input Under-Voltage Protection	24V input series	6.5	7	/	
	48V input series	12	14	/	
Hot Plug	/	N/A			
Input Filter	/	Pi filter			
Remote Control (*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 to shut off the converter	3mA (Typ.)			

Note - * Ctrl voltage 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	Rated load, full voltage range		/	±0.2	±0.5	%
Load Regulation	5%-100% load		/	±0.5	±1	%
Ripple & Noise	0%-100% load, 20MHz bandwidth		/	50	100	mVp-p
Transient Recovery Time	25% rated load step, nominal input voltage	/	/	300	500	uS
Transient Response Deviation		3.3V, 5V output	/	±5	±8	%
		Others output	/	±3	±5	%
Turn on Delay Time	Nominal input voltage		/	20	/	mS
Output voltage Trim	Full input voltage range		90	/	110	%Vo
Over voltage protection			110	160	200	%Vo
Over current protection			110	150	250	%Io
Short Circuit Protection			Hiccup, continuous, self-recovery			

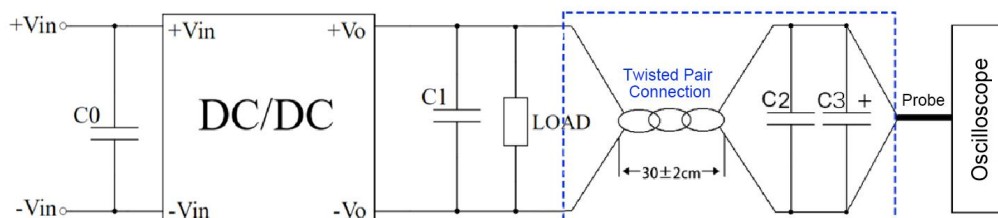
General Specifications

Items	Test Conditions	Min.	Typ.	Max.	Unit
Switching Frequency	Operating Mode (PWM)	/	280	/	KHz
Operating Temperature	Refer to the Temperature Derating Graph	-40	/	+85	°C
Storage Temperature		-55	/	+125	
Pin Soldering Temperature	1.5mm from the case, 10S	/	/	300	°C
Relative Humidity	No condensing	5	/	95	%RH
Isolation Voltage	I/P – O/P, test 1min, leakage current <1mA	5000	/	/	VDC
Isolation Capacitance	I/P – O/P, 100KHz/0.1V	/	1000	/	pF
Insulation Resistance	I/P – O/P, @ 500VDC	1000	/	/	MΩ
MTBF	MIL-HDBK-217F@25°C	1000	/	/	K hours
Cooling Method	Nature air				
Case Material	Plastic in black, flame class UL94 V-0				
Weight/ Dimension	Part No.	Weight Typ.	Dimensions L x W x H		
	PFD20-XXSXXB2(C)5	24g	50.8X25.4X15.6 mm	2.000X1.000X0.614 inch	

EMC Performance

Total Item	Sub Item	Test Standard	Performance/Class
EMC	EMI	CE	CISPR32/EN55032 CLASS B (with the EMC Recommended Circuit)
		RE	CISPR32/EN55032 CLASS B (with the EMC Recommended Circuit)
	EMS	RS	IEC/EN61000-4-3 10V/m Perf.Criteria A
		CS	IEC/EN61000-4-6 3Vr.m.s Perf.Criteria A
		ESD	IEC/EN61000-4-2 Contact / ±4KV Perf.Criteria B
		Surge	IEC/EN61000-4-5 ±2KV Perf.Criteria B (with the EMC Recommended Circuit)
		EFT	IEC/EN61000-4-4 ±2KV Perf.Criteria B (with the EMC Recommended Circuit)

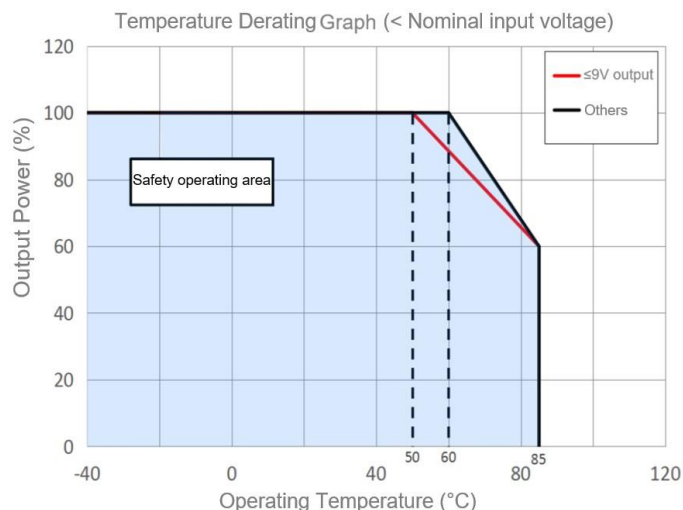
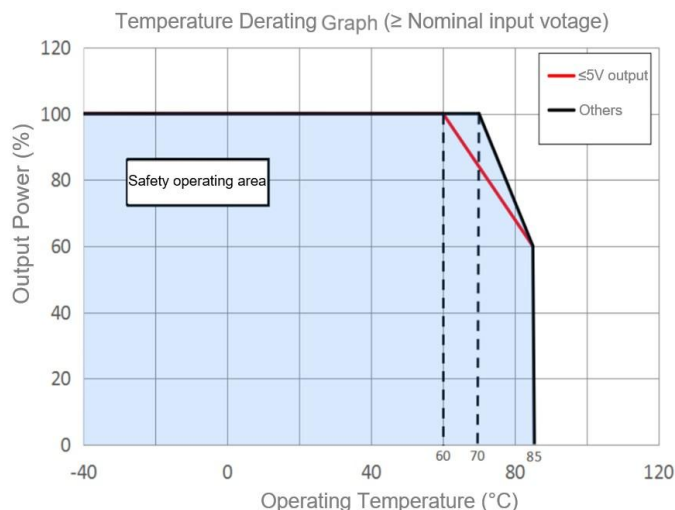
Ripple & Noise Test Instructions (Twisted Pair Method, 20MHz Bandwidth)



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.

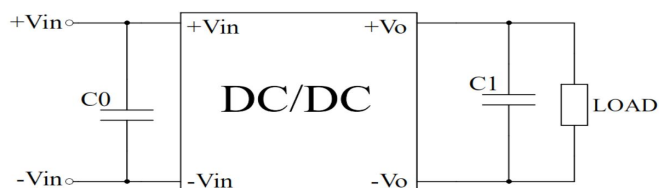
2) The power supply output connects to the load by the cables. The other side of the twisted pair (length 30cm±2 cm) should be connected in parallel with the load, the polarity of the output and the oscilloscope probe should not be reversed. The test can be started after input power on.

Product Characteristics Graphs



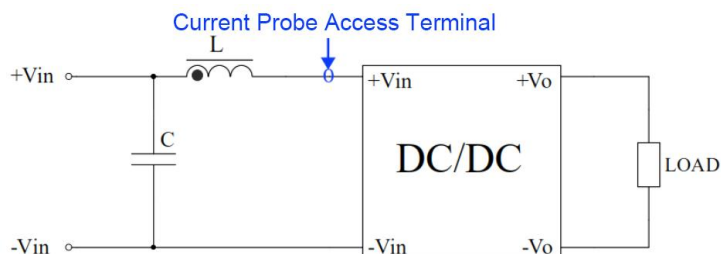
Recommended Circuits for Application

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



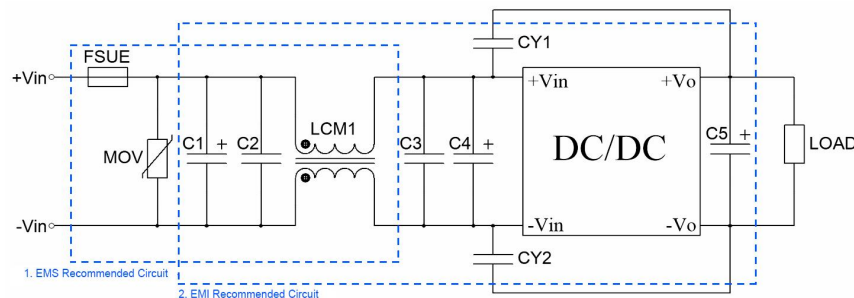
Component	Parameter
C0	100uF/100V
C1	100uF/50V

2. Input reflected ripple current test circuit



Component	Parameter
C	220uF/100V
L	4.7uH

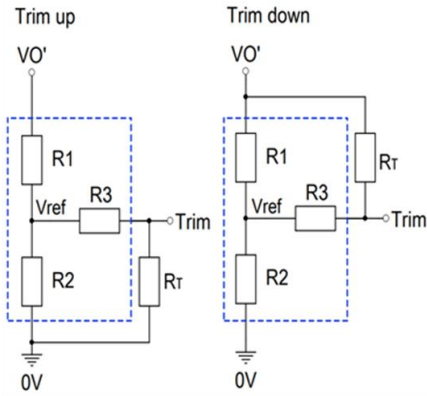
3. Recommended EMC circuit



Component	Vin=24VDC	Vin=48VDC
FUSE	TBD by customer	
MOV	14D470K	14D101K
C1, C4	330uF/50V	330uF/100V
LCM1	5mH	5mH
C2, C3	10uF/50V	10uF/100V
C5	100uF/ 50V	100uF/ 50V
CY1, CY2	Y1 / 2.2nF / 400VAC	

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

4. 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

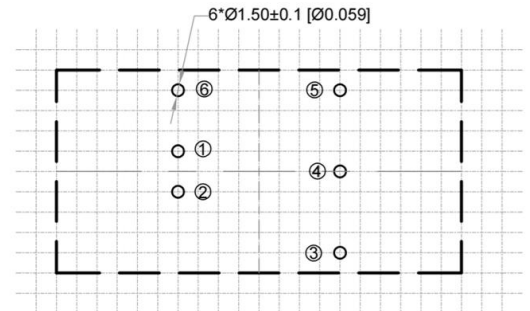
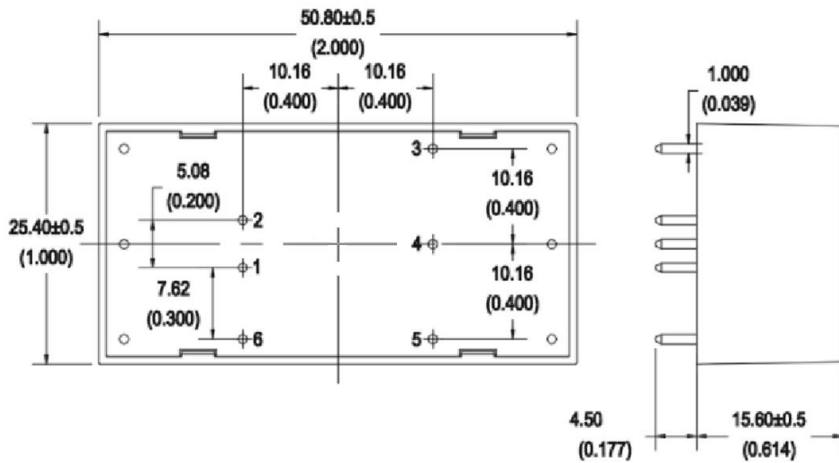
α is a self-defined parameter

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

Output Voltage	Trim internal circuit parameters			
V_o (VDC)	R_1 (K Ω)	R_2 (K Ω)	R_3 (K Ω)	V_{ref} (V)
3.3	4.22	2.55	18	1.25
5	5.1	5.1	20	2.5
9	9.31	3.58	24	2.5
12	18	4.73	33	2.5
15	18	3.6	25.5	2.5
24	30	3.47	30	2.5

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

B2 Mechanical Dimensions



PCB layout vertical view
Grid 2.54x2.54(0.10x0.10)

Unit: mm(inch)

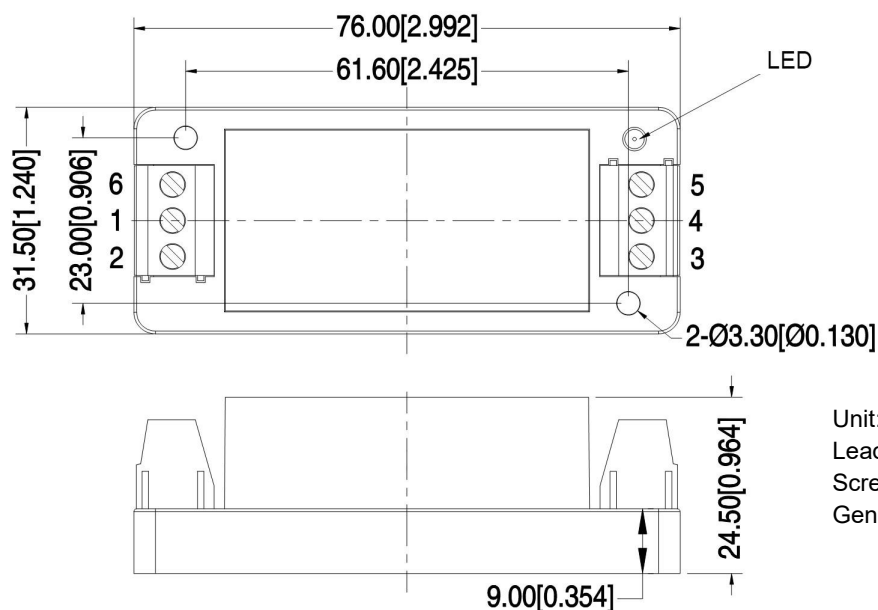
Pin diameter tolerance ± 0.10 (± 0.004)

General tolerance ± 0.50 (± 0.020)

Pin Function definition

Pin No.	1	2	3	4	5	6
PFD20-XXSXXB2C5	-Vin	+Vin	+Vo	NP	GND	Ctrl
	Input V-	Input V+	Output V+	No Pin	Output GND	Remote control

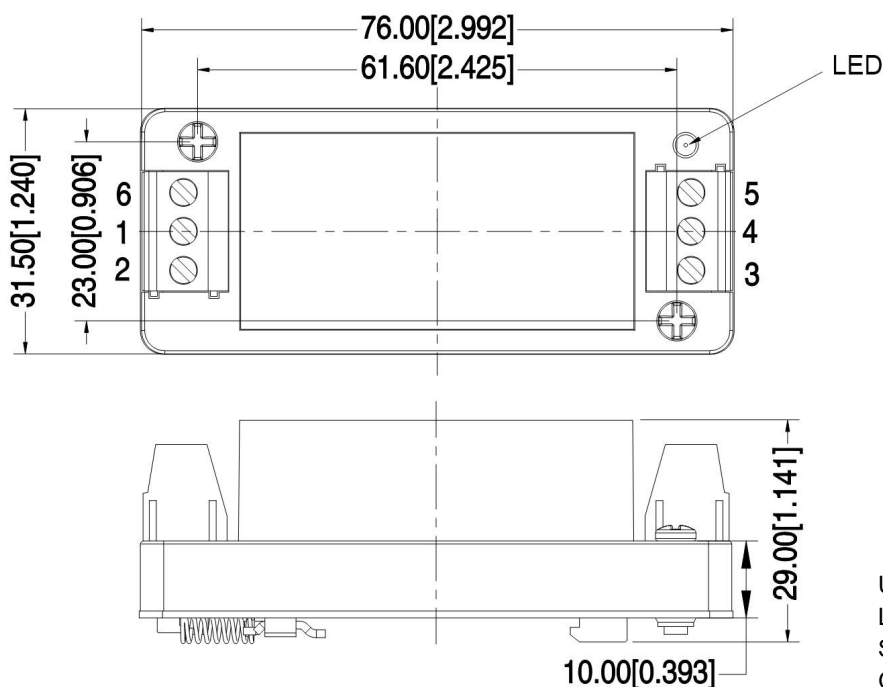
B2-T Mechanical Dimensions



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

Terminal No.	1	2	3	4	5	6
PFD20-XXSXXB2C5	-Vin	+Vin	+Vo	NC	GND	Ctrl
	Input V-	Input V+	Output V+	No Connection	Output GND	Remote control

B2-TS Mechanical Dimensions



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

Terminal No.	1	2	3	4	5	6
PFD20-XXSXXB2C5	-Vin	+Vin	+Vo	NC	GND	Ctrl
	Input V-	Input V+	Output V+	No Connection	Output GND	Remote control

Others Pin function Definition

Pin No.	1	2	3	4	5	6
PFD20-XXSXXB2T5	-Vin	+Vin	+Vo	Trim	GND	NP
PFD20-XXSXXB2R5	-Vin	+Vin	+Vo	Trim	GND	Ctrl
PFD20-XXSXXB2N5	-Vin	+Vin	+Vo	NP	GND	NP

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 under 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.

Guangzhou Aipu Electron Technology Co., Ltd

Address: Building 4, HEDY Park, No.63, Punan Road, Huangpu Dist, Guangzhou, China.

Tel: 86-20-84206763 Fax: 86-20-84206762 HOTLINE: 400-889-8821

E-mail: sales@aipu-elec.com Website: <https://www.aipupower.com>