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
- Encapsulated CR distance 3.7mm, CL distance 5mm
- Good EMC performance
- Standard pin-out alignment

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 diagram for EMC is recommended for the application with high EMC requirement.

Typical Product List

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

Note:

1, The * marked parts have been developed in process.

2, In the part numbers R indicates the part with both ON/OFF Control & Trim functions, C indicates the part with Control function, T

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indicates with Trim function, N indicates with None of Control or Trim.

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

4, The suffix -T indicates the chassis package, -TS indicates the package of DIN Rail which rail width is 35mm.

5, 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.

6, The control chip could work at lower frequency at no load or low load to decrease the no load power and improve the efficiency.

7, Please contact Aipu sales for other output voltages requirements in this series but not listed in this table.

Input Specifications

Items	Test Conditions	Min	Typ.	Max	Unit
Standby power	Full input voltage range	/	0.1	/	W
Input current Max	Full input voltage range	/	/	2.8	A
Start-up voltage	24V nominal input series	/	/	9	VDC
	48V nominal input series	/	/	18	VDC
Input under-voltage protection	24V nominal input series	6.5	7	/	VDC
	48V nominal input series	12	14	/	VDC
Input inrush voltage (1sec.max)	24V nominal input series	-0.7	/	50	VDC
	48V nominal input series	-0.7	/	100	VDC
Input filter	/	Pi type filter			
Hot-plug	/	NA			
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 the low voltage level (0-1.2VDC)			
	Input current for switching off	/	3	/	mA
*Note: The Ctrl voltage is relative to the input -Vin.					

Output Specifications

Items	Test Conditions		Min	Typ.	Max	Unit
Output voltage accuracy	Full input voltage range		/	±1	±3	%
Voltage regulation	Full input voltage range, rated load		/	±0.2	±0.5	%
Load regulation	Nominal input voltage, 5%-100% load		/	±0.5	±1	%
Ripple & noise	5%-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	/	±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			Continuous, self-recovery			
Note: Ripple & Noise ≤5%Vo at 0% - 5% load, it is tested by the Twisted Pair Method (refer to the following test instruction).						

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General Specifications

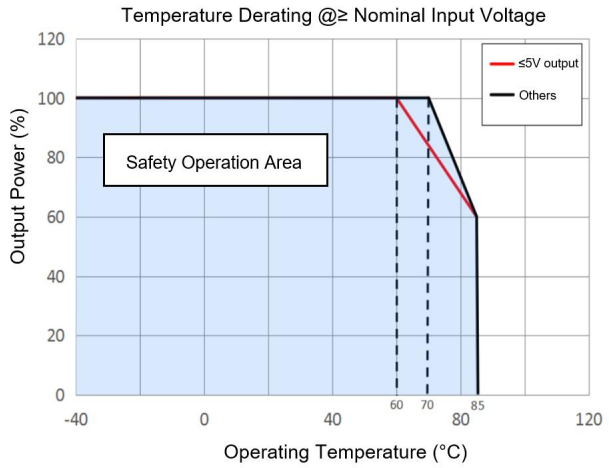
Items	Test Conditions	Min	Typ.	Max	Unit
Switching frequency	Operating Mode (PWM)	/	280	/	KHz
Operating temperature	Refer to the Temperature Derating Graph	-40	/	+85	℃
Storage temperature		-55	/	+125	
Pin soldering temperature	1.5mm from the case, 10S	/	/	300	
Relative humidity	No condensing	5	/	95	%RH
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℃	1000	/	/	K hours
Cooling method	Nature air				
Case material	10-150Hz, 5G, 0.75mm, along X, Y and Z				
Switching frequency	Plastic in black, flame class UL94-V0				

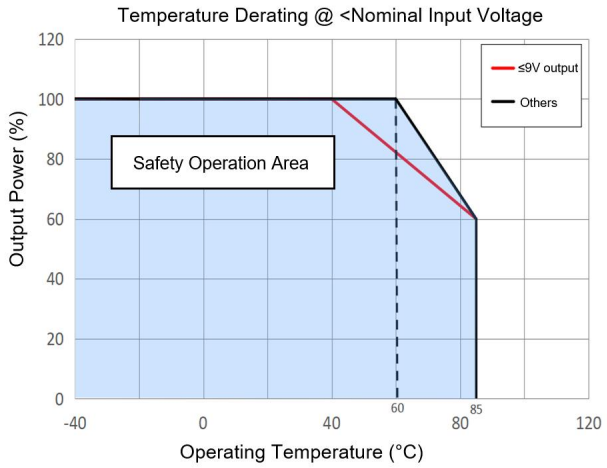
Unit weight/Dimensions	Part No.	Weight (Typ)	Dimensions L x W x H	
	PFD20-XXSXXB2(C)5	24g	50.8 X 25.4 X 15.6 mm	2.000 X 1.000 X 0.614 inch
	PFD20-XXSXXB2(C)5-T	45g	76.0 X 31.5 X 24.5 mm	2.992 X 1.240 X 0.964 inch
	PFD20-XXSXXB2(C)5-TS	65g	76.0 X 31.5 X 29.0 mm	2.992 X 1.240 X 1.141 inch

EMC Performance

Total Item		Sub Item	Test 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
		CS	IEC/EN61000-4-6	3V r.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 Recommended EMC Circuit)
		EFT	IEC/EN61000-4-4	±2KV Perf.Criteria B (with the Recommended EMC Circuit)

Temperature Derating Graphs





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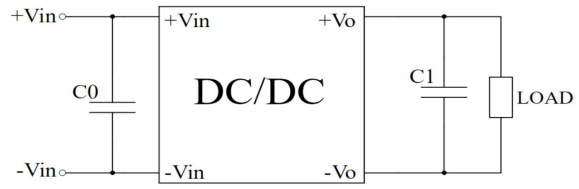
Recommended Circuits for Application

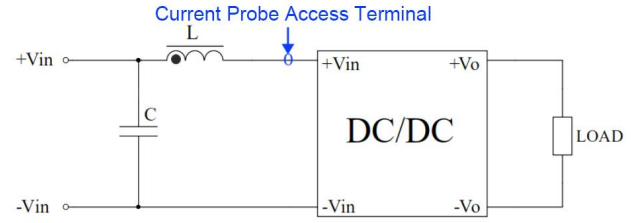
1, DC/DC test circuit diagram



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

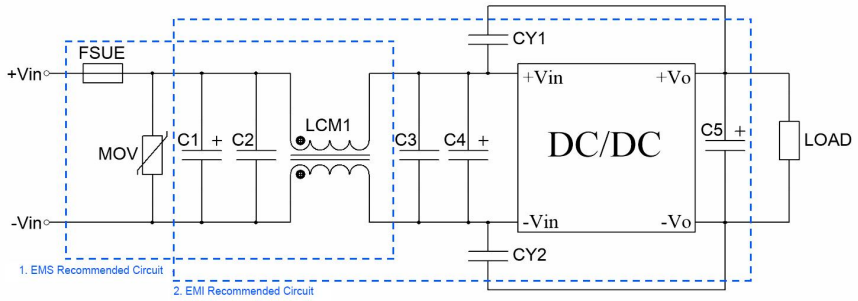
2, Input reflected ripple current test circuit diagram

Low ESR capacitor is recommended for C which withstand voltage should be more than the max of input voltage.



Component	Parameter
C	220uF/100V
L	4.7uH

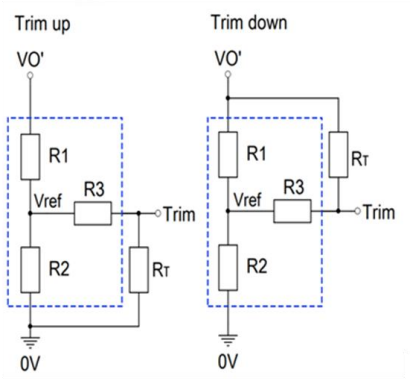
3, Recommended EMC circuit diagram



Component	Vin=24V	Vin=48V
FUSE	TBD by the customer	
MOV1	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 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



Rrim Resistance calculating fomula

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

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

R_T is the Trim resistance
a is a self-defined parameter
Vo' is the required Up-voltage or Down-voltage

Output voltage	Trim internal circuit parameters			
Vo (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
9	9.31	3.58	24	2.5
12	18	4.75	33	2.5
15	18	3.6	25.5	2.5
24	30	3.48	30	2.5
Note: The Trim function works for only the above output voltages				

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

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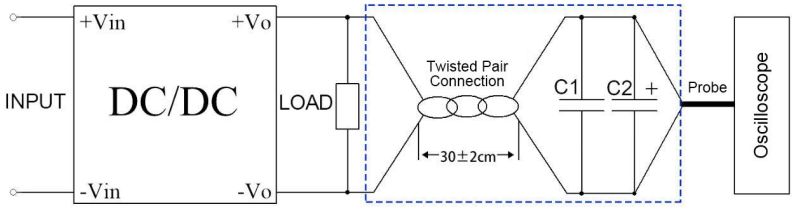
Ripple & Noise Test Instruction (Twisted Pair Method, 20MHz Bandwidth)



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. C1(0.1uF) polypropylene capacitor and C2(10uF) high-frequency low-resistance electrolytic capacitor are connected in parallel with the probes and one side of the twisted pair.

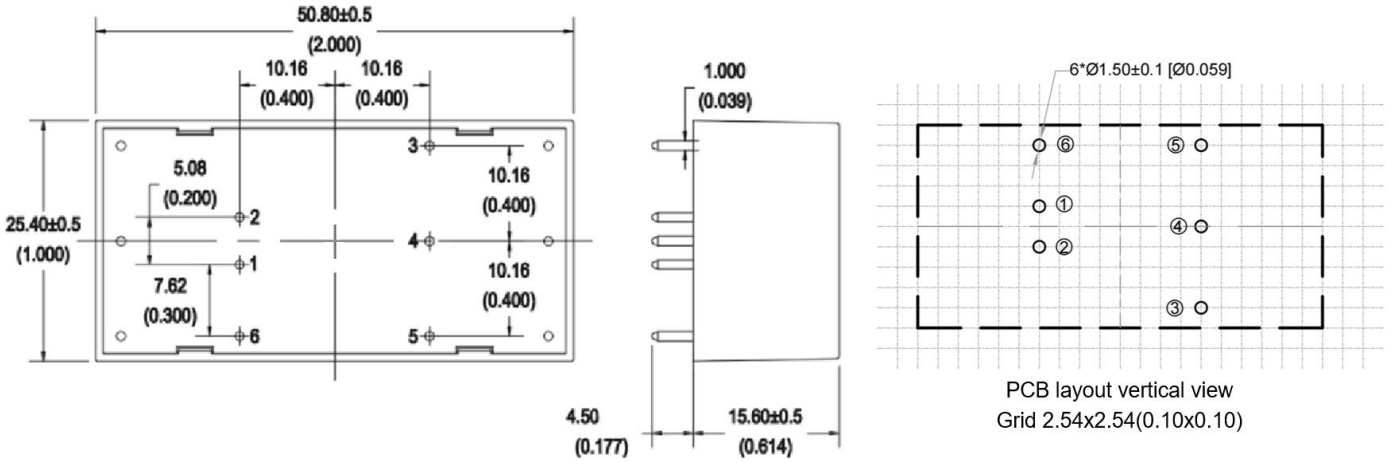
2) The power supply output connects to the load by the cables. The other side of the twisted pair (length 30cm±2 cm) should be connected in parallel with the load, the polarity of the output and the oscilloscope probe should not be reversed. The test can be start after input power on.

Note:

The Max capacitive load is tested at full load (pure resistance load).

It is recommended to connect a ≥5% load or a high-frequency low resistance E-cap(≥100uF) load at output to avoid the output ripple increasing.

Mechanical Dimensions



Unit: mm(inch)
Pin diameter tolerance: ±0.10(±0.004)
General tolerance: ±0.50(±0.020)

Pin-out Function Description

Pin No.	1	2	3	4	5	6
PFD20-XXSXXB2C5	-Vin	+Vin	+Vo	No Pin	GND	Ctrl

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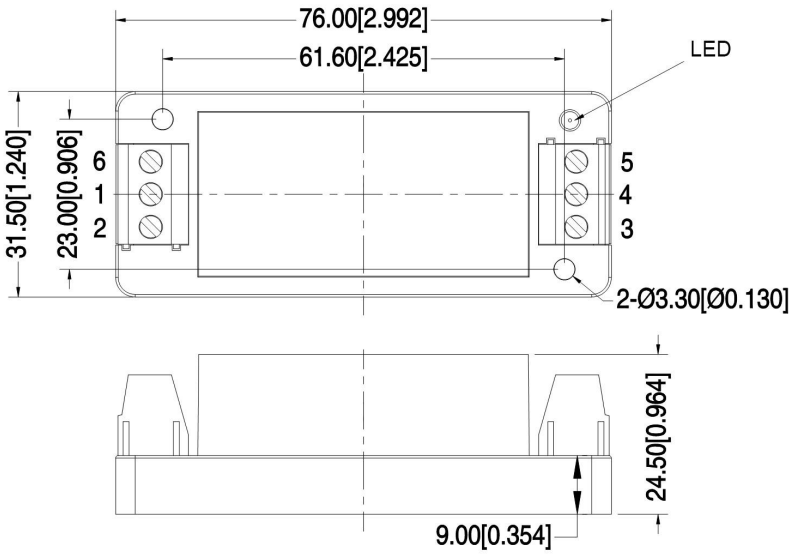
-T Package Dimensions

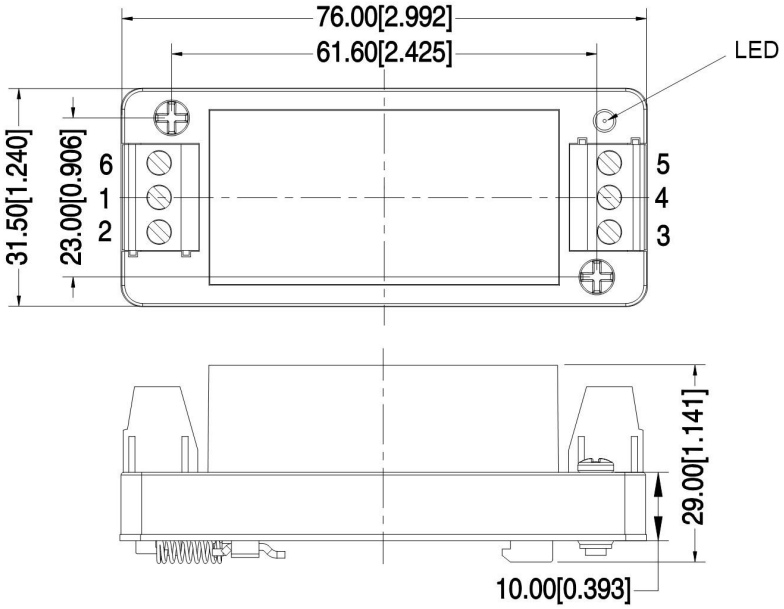


Unit: mm[inch]
Lead wires gauge: 24-12AWG
Screwing torque: 0.4N.m Max
General tolerance: ±1.00[±0.039]

Pin-out Function Description

Pin No.	1	2	3	4	5	6
PFD20-XXSXXB2C5	-Vin	+Vin	+Vo	No Pin	GND	Ctrl

-TS Package Dimensions



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

Pin-out Function Description

Pin No.	1	2	3	4	5	6
PFD20-XXSXXB2C5	-Vin	+Vin	+Vo	No Pin	GND	Ctrl

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Other Models Pin-out Function Description						
Pin No.	1	2	3	4	5	6
PFD20-XXSXXB2T5	-Vin	+Vin	+Vo	Trim	GND	No Pin
PFD20-XXSXXB2R5	-Vin	+Vin	+Vo	Trim	GND	Ctrl
PFD20-XXSXXB2N5	-Vin	+Vin	+Vo	No Pin	GND	No Pin

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.

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