

Typical Features

- ◆ Wide input voltage range (4:1), Output Power 20W
- ◆ Efficiency up to 91%(Typ.)
- ◆ Stand-by Power Consumption 0.1W (Typ.)
- ◆ Output fast start up
- ◆ Continuous Short Circuit protection, self-recovery
- ◆ Input under voltage, output over voltage, short circuit, over current protections
- ◆ Isolation Voltage 1500VDC
- ◆ Operating Temperature from -40°C to +85°C
- ◆ Good EMC performance
- ◆ International standard pin-out



Application Field

PFD20-XXSXXA3(C)2 series --- DIP standard 1"X1" size DC-DC converters with wide input range 4:1, low stand-by power consumption, isolated & regulated single output power 20W. This series of productions can be widely used in the fields of industrial control, instrument, communication, electricity power & internet of things, 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) @Nom. Voltage		Capacitive Load	Ripple & Noise (mVp-p)		Efficiency (%) @full load	
		Nom.	Range	Vo (VDC)	Io(mA) Max/Min	Full Load	No Load	(uF) Max	Typ.	Max	Min	Typ
CE	PFD20-18S3V3A3(C)2	24	9-36	3.3	5000/0	781	33	10000	50	100	86	88
	PFD20-18S05A3(C)2	24	9-36	5	4000/0	926	33	5000	50	100	88	90
	PFD20-18S09A3(C)2	24	9-36	9	2222/0	926	33	3000	50	100	88	90
	PFD20-18S12A3(C)2	24	9-36	12	1667/0	926	5	1000	50	100	88	90
	PFD20-18S15A3(C)2	24	9-36	15	1333/0	926	5	800	50	100	88	90
	PFD20-18S24A3(C)2	24	9-36	24	833/0	915	5	500	50	100	89	91
--	PFD20-18S18A3(C)2	24	9-36	18	1111/0	936	5	600	50	100	87	89
--	PFD20-18S28A3(C)2	24	9-36	28	714/0	915	5	500	50	100	89	91
CE	PFD20-36S3V3A3(C)2	48	18-75	3.3	5000/0	390	17	10000	50	100	86	88
	PFD20-36S05A3(C)2	48	18-75	5	4000/0	463	17	5000	50	100	88	90
	PFD20-36S09A3(C)2	48	18-75	9	2222/0	463	17	3000	50	100	88	90
	PFD20-36S12A3(C)2	48	18-75	12	1667/0	457	5	1000	50	100	88	91
	PFD20-36S15A3(C)2	48	18-75	15	1333/0	457	5	800	50	100	88	91
	PFD20-36S24A3(C)2	48	18-75	24	833/0	457	5	500	50	100	88	91

Note 1 - In the part numbers R indicates the part with both Control & Trim functions, C indicates the part with Control function, T indicates with Trim function, N indicates with none of Control or Trim.

Note 2 - 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 width is 35mm.

Note 3 - 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 4 - The chip could work at lower frequency at no load or low load to decrease the no load power and improve the efficiency.

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

Input Specifications

Item	Test Conditions	Min.	Typ.	Max.	Unit
Stand-by power Consumption	Full input Voltage Range	/	0.1	/	W
Under-Voltage Protection	24V Rated Input	5	7	9	VDC
	48V Rated Input	11	13	18	
Hot Plug	/	Unavailable			
Input Filter	/	π filter			
CTRL*	Turn-on the converter	No connection or connect to high level (2.5V-12VDC)			
	Shut-off the converter	Connect to -Vin or connect to low level (0-1.2VDC)			
	Current value for switching off	3mA (TYP)			

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

Output Specifications

Item	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy	Full input voltage range		/	±1	±2	%
Voltage Regulation	Rated load, full input voltage range		/	±0.2	±0.5	%
Load Regulation	5% ~ 100% load		/	±0.5	±1	%
Ripple & Noise	10% ~ 100% load, 20MHz bandwidth		/	50	100	mVp-p
Dynamic Recovery Time	25% of rated load step, nominal input voltage	/	/	250	500	uS
Transient Response Deviation		3.3V, 5V output	/	±5	±8	%
		Others output	/	±3	±5	%
Turn-on delay time	Nominal input voltage		/	10	/	mS
Output voltage adjustable (Trim)	Input voltage range		90	/	110	%Vo
Output Over-voltage Protection	Input voltage range		110	160	200	%Vo
Output Over-current Protection			110	150	220	%Io
Short circuit Protection			Continuous, Self-recovery			

Note: the ripple & noise $\leq 5\%V_o$ @0% -10% load, it is tested by the twisted pair test method, please refer to the Ripple & Noise Test Instructions in this data sheet.

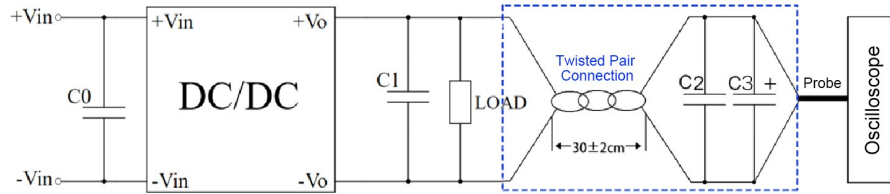
General Specifications

Item	Test Conditions	Min.	Typ.	Max.	Unit
Switching Frequency	Operating Mode (PWM)	/	280	/	KHz
Operating Temperature	Refer to the Temperature Derating Curve	-40	/	+85	°C
Storage Temperature	/	-55	/	+125	
Case Temperature	Within the Temperature Curve	/	/	+105	
Pin Soldering Temperature	1.5mm from the case, 10S	/	/	300	
Relative Humidity	No condensing	5	/	95	%RH
Isolation Voltage	Input - output, test 1Min, leakage current $\leq 5\text{mA}$	1500	/	/	VDC
	Input & output - case, test 1 Min, leakage current $\leq 5\text{mA}$	1000	/	/	
Isolation Capacitance	Input - output, 100KHz/0.1V	/	1000	/	pF
Insulation Resistance	Input - output, @ 500VDC	1000	/	/	MΩ
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		
	PFD20-XXSXXA3(C)2	15g	25.4X 25.4X12.5 mm	1.00X1.00X0.492 inch	
	PFD20-XXSXXA3(C)2-H	19g	25.4X25.4X18.0 mm	1.00X1.00X0.708 inch	
	PFD20-XXSXXA3(C)2-T	37g	76.0X31.5X21.3 mm	2.99X1.24X0.838 inch	
	PFD20-XXSXXA3(C)2-TH	40g	76.0X31.5X26.0 mm	2.99X1.24X1.023 inch	
	PFD20-XXSXXA3(C)2-TS	57g	76.0X31.5X26.0 mm	2.99X1.24X1.023 inch	
	PFD20-XXSXXA3(C)2-TSH	60g	76.0X31.5X30.8 mm	2.99X1.24X1.212 inch	

EMC Performance

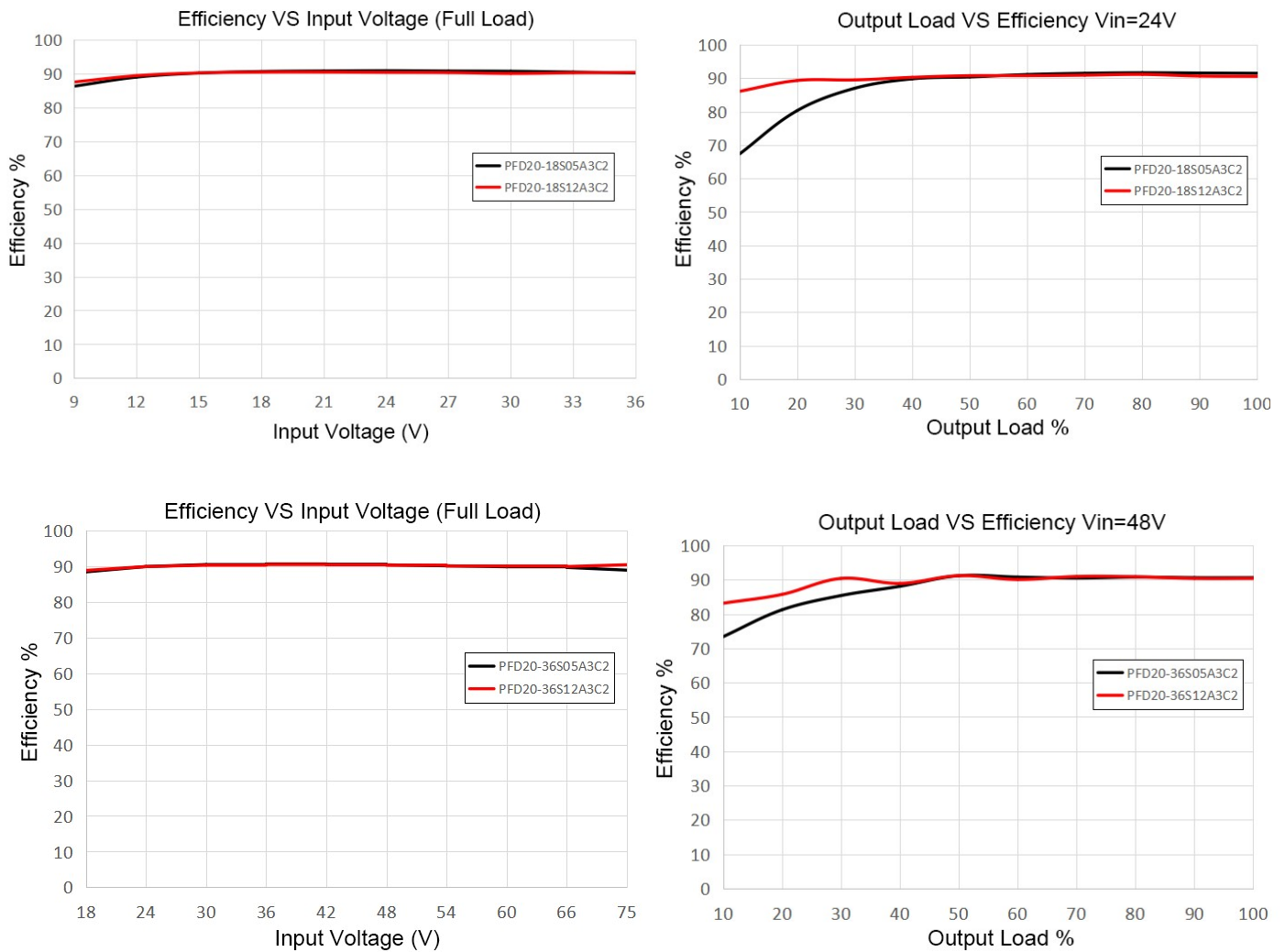
Total Items		Sub Items	Test Standard	Performance/Class	
EMC	EMI	CE	CISPR32/EN55032	CLASS B	(with Recommended EMC Circuit)
		RE	CISPR32/EN55032	CLASS B	(with Recommended EMC Circuit)
	EMS	RS	IEC/EN61000-4-3	10V/m	Perf.Criteria B (with Recommended EMC Circuit)
		CS	IEC/EN61000-4-6	3Vr.m.s	Perf.Criteria B (with Recommended EMC Circuit)
		ESD	IEC/EN61000-4-2	Contact $\pm 6\text{KV}$ / Air $\pm 8\text{KV}$ Perf.Criteria B	
		Surge	IEC/EN61000-4-5	$\pm 2\text{KV}$	Perf.Criteria B (with Recommended EMC Circuit)
		EFT	IEC/EN61000-4-4	$\pm 2\text{KV}$	Perf.Criteria B (with Recommended EMC Circuit)
		Voltage dips & interruptions	IEC/EN61000-4-11	0%~70%	Perf.Criteria B

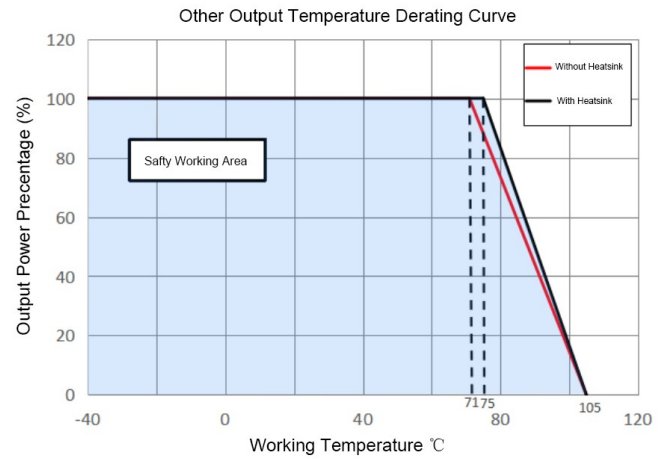
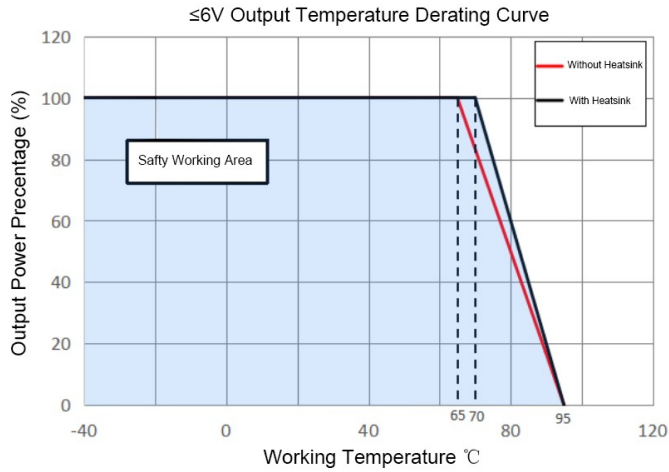
Ripple & Noise Test Instructions (Twisted Pair Method, 20MHz Bandwidth)



- 1) The Ripple & noise test 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 Performance Curves

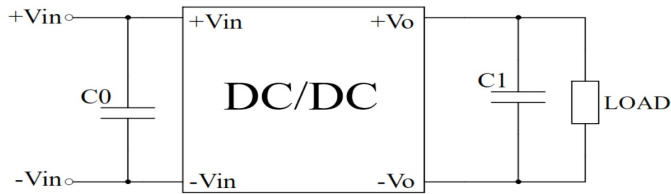




Recommended Circuits for Application

1. DC/DC test circuit

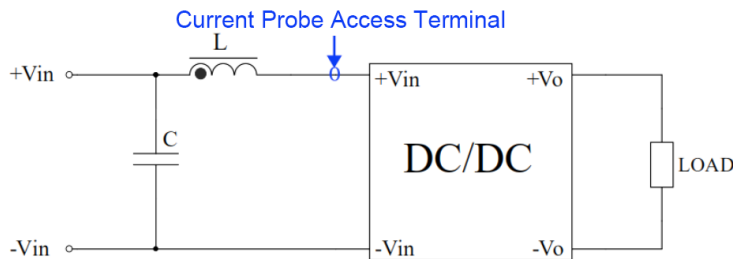
Recommended capacitors: C0 (47-100uF) & C1(10-22uF)



Component	Parameter
C0	100uF/100V
C1	22uF/100V

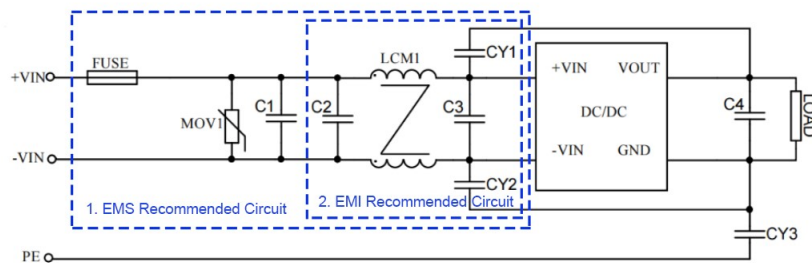
2. Input reflected ripple current test circuit

C should be a low ESR capacitor, the withstand voltage should be more than the maximum input voltage.



Component	Parameter
C	220uF/100V
L	4.7uH/15A

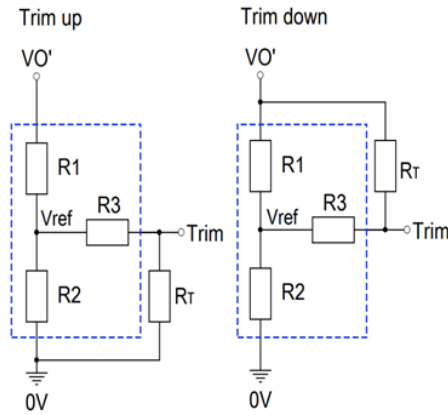
3. Recommended EMC circuit



Component	24V Input	48V Input
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 testing, part 2 for EMI filtering, both can be adjusted according to the actual situation.

4. Trim and calculation of Trim resistance



Trim Resistance calculating fomula

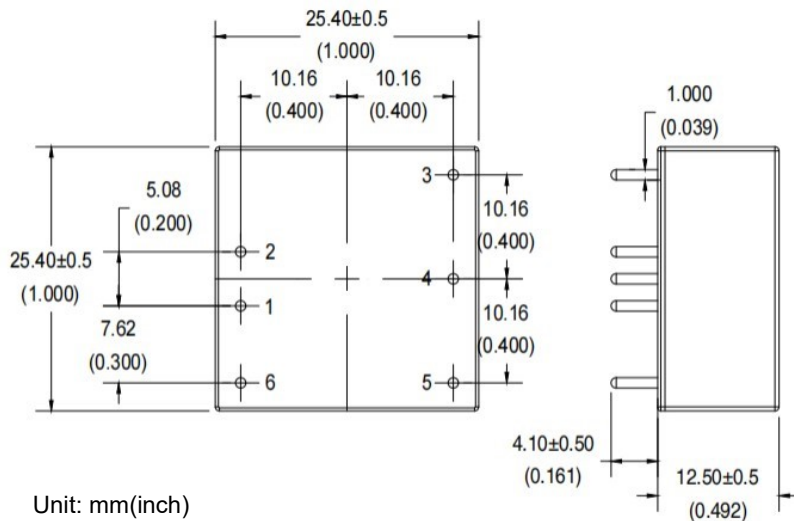
$$\begin{aligned} \text{up: } R_T &= \frac{\alpha R_2}{R_2 - \alpha} - R_3 & \alpha &= \frac{V_{ref}}{V_{o'} - V_{ref}} \cdot R_1 \\ \text{down: } R_T &= \frac{\alpha R_1}{R_1 - \alpha} - R_3 & \alpha &= \frac{V_{o'} - V_{ref}}{V_{ref}} \cdot R_2 \end{aligned}$$

R_T is the Trim resistance
 α is a self-defined parameter
 $V_{o'}$ is the required Up-voltage or Down-voltage

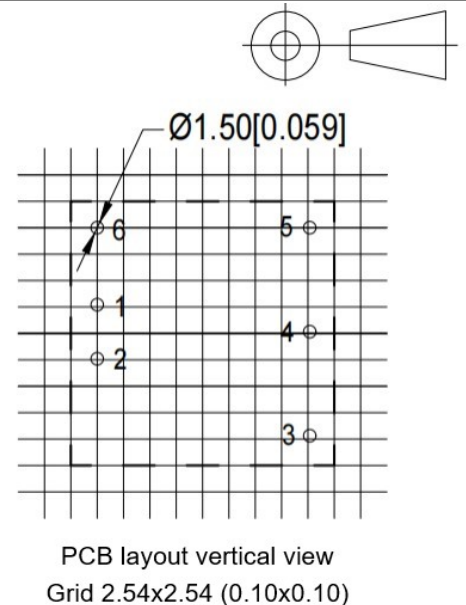
Note: Trim up & down circuits, the components in the dotted area are inside of the converter.

Output Voltage	Trim internal circuit parameters			
Vout (VDC)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	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	30	2.5
18	25.5	4.083	30	2.5
24	30	3.48	30	2.5
28	20	2.94	30	2.5

A3 Mechanical Dimensions (Without Heat Sink)

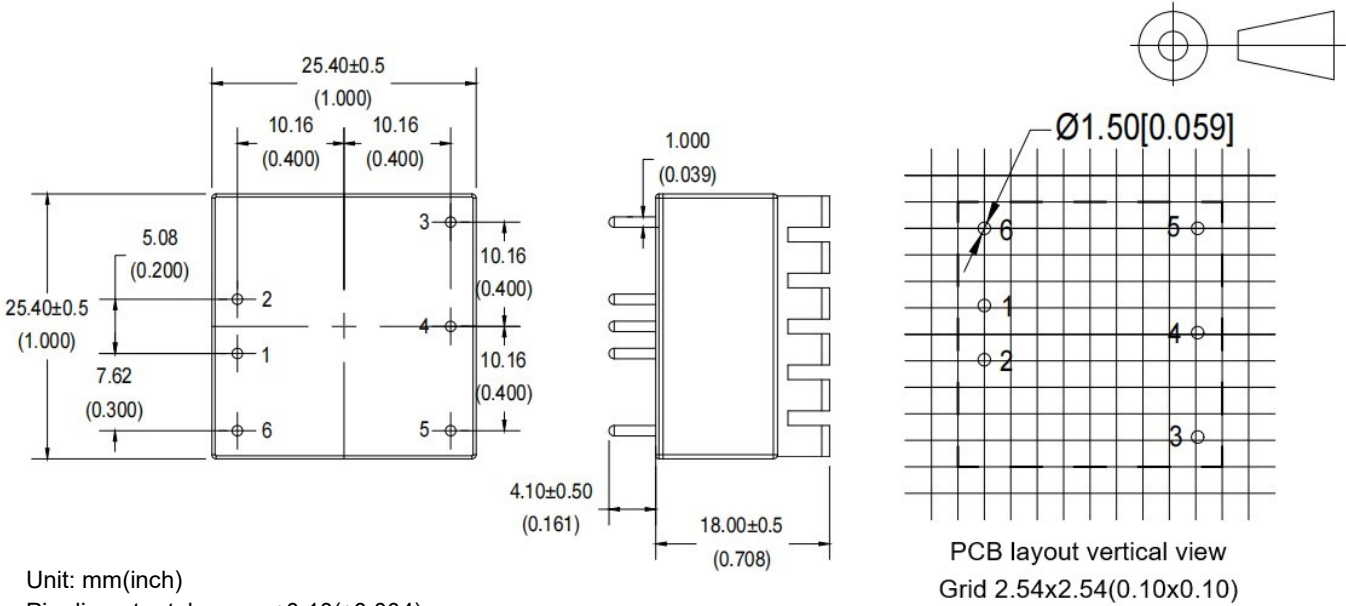


Unit: mm(inch)
 Pin diameter tolerance $\pm 0.10(\pm 0.004)$
 General tolerance $\pm 0.50(\pm 0.020)$



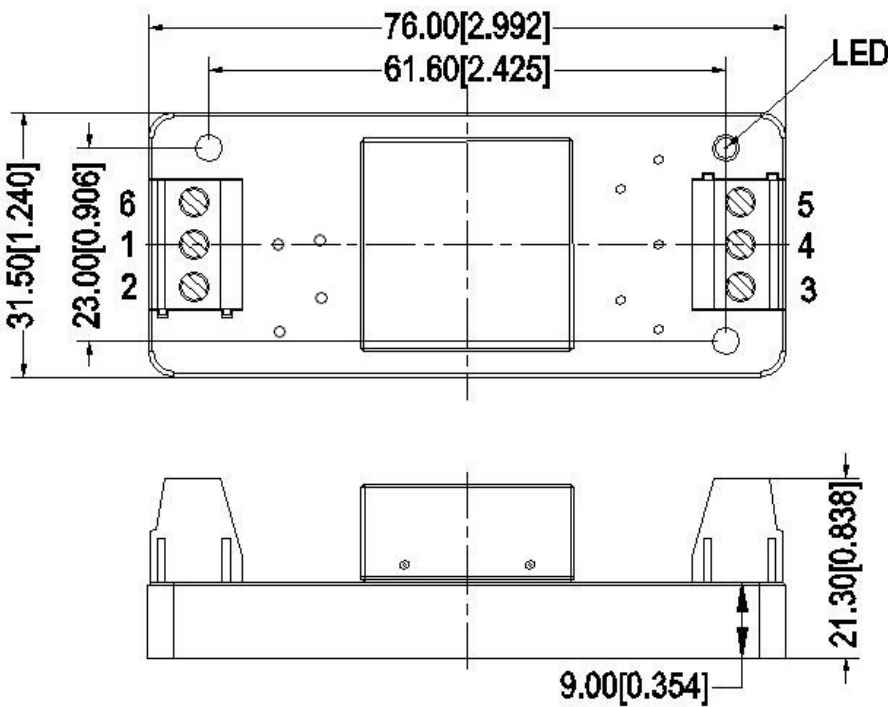
Pin No.	1	2	3	4	5	6
PFD20-XXSXXA3R2	-Vin	+Vin	+Vo	Trim	GND	Ctrl
	Input V-	Input V+	Output V+	Output Trim	Output V-	Remote control

A3-H Mechanical Dimensions (With Heat Sink)



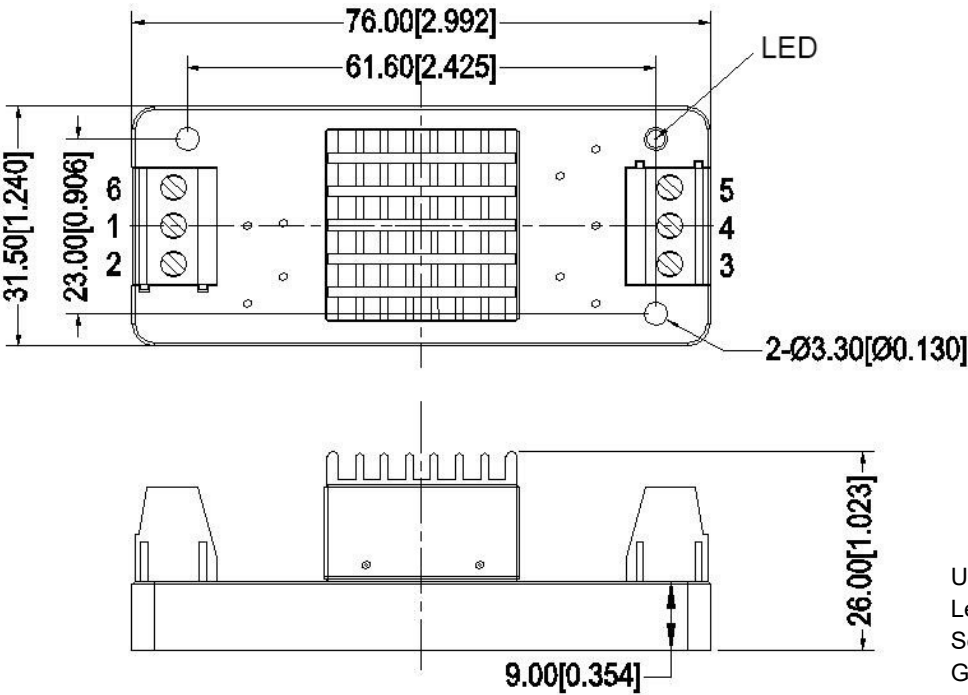
Pin No.	1	2	3	4	5	6
PFD20-XXSXXA3R2	-Vin	+Vin	+Vo	Trim	GND	Ctrl
	Input V-	Input V+	Output V+	Output Trim	Output V-	Remote control

A3-T Mechanical Dimensions (Without Heat Sink)



Terminal No.	1	2	3	4	5	6
PFD20-XXSXXA3R2	-Vin	+Vin	+Vo	Trim	GND	Ctrl
	Input V-	Input V+	Output V+	Output Trim	Output V-	Remote control

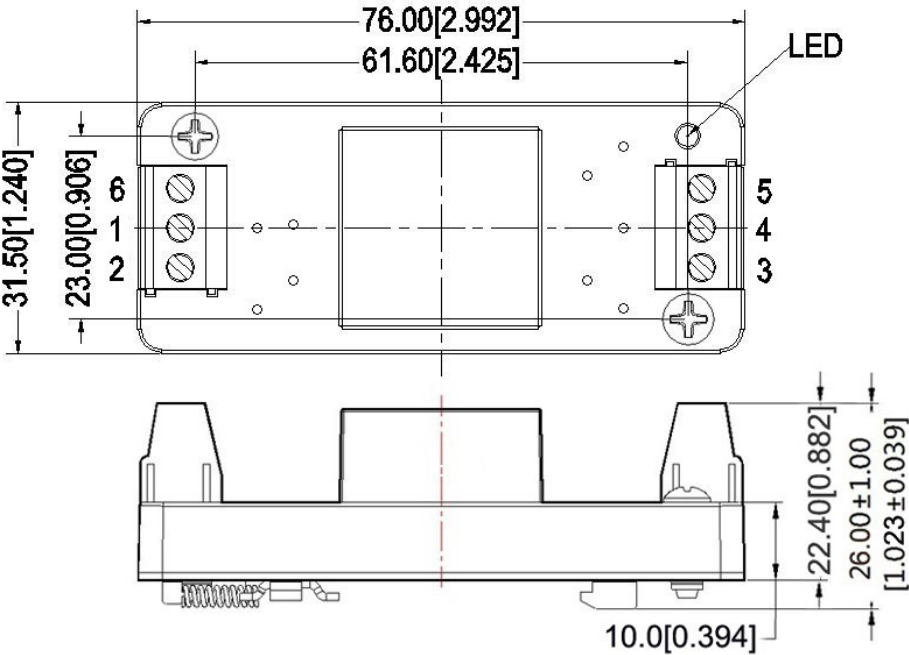
A3-TH Mechanical Dimensions (With Heat Sink)



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

Terminal No.	1	2	3	4	5	6
PFD20-XXSXXA3R2	-Vin	+Vin	+Vo	Trim	GND	Ctrl
	Input V-	Input V+	Output V+	Output Trim	Output V-	Remote control

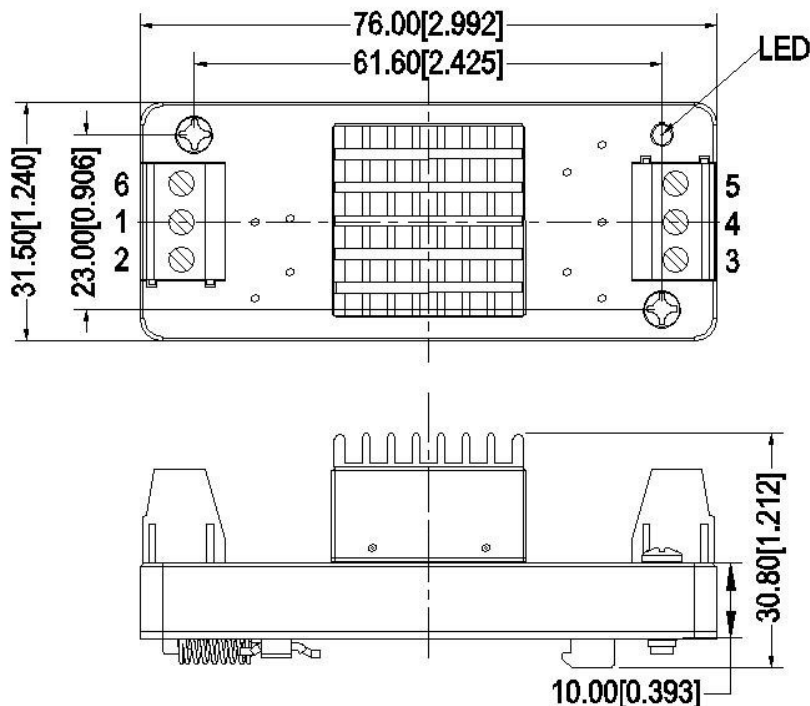
A3-TS Mechanical Dimensions (Without Heat Sink)



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

Terminal No.	1	2	3	4	5	6
PFD20-XXSXXA3R2	-Vin	+Vin	+Vo	Trim	GND	Ctrl
	Input V-	Input V+	Output V+	Output Trim	Output V-	Remote control

A3-TSH Mechanical Dimensions (With Heat Sink)



Terminal No.	1	2	3	4	5	6
PFD20-XXSXXA3R2	-Vin	+Vin	+Vo	Trim	GND	Ctrl
	Input V-	Input V+	Output V+	Output Trim	Output V-	Remote control

Other Models Pin Definition

Pin No.	1	2	3	4	5	6
PFD20-XXSXXA3N2	-Vin	+Vin	+Vo	No Pin	GND	No Pin
PFD20-XXSXXA3C2	-Vin	+Vin	+Vo	No Pin	GND	Ctrl
PFD20-XXSXXA3T2	-Vin	+Vin	+Vo	Trim	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 $T_a=25^{\circ}\text{C}$, humidity<75%RH, rated 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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