DC/DC Converter
PFD15-XXSXXA3(C)2(-XXX) Series

Typical Features

- Wide input voltage range (4:1), Output Power 15W
- Efficiency up to 91% (Typ.)
- Stand-by power consumption 0.1W (Typ.)
- Fast start-up
- Continuous short circuit protection, self-recovery
- Input under-voltage, output over-voltage, short-circuit and over-current protections
- Isolation voltage 1500VDC
- Operating temperature from -40°C to +105°C
- Good EMI performance
- Standard pin-out alignment

Application Field

PFD15-XXSXXA3(C)2(-XXX) Series ---- *PCB DIP mounted standard 1"X1" size DC-DC modular converters with wide input range 4:1, low stand-by power consumption, isolated & regulated 15W output power. This series of products can be widely used in the fields of Industrial control, Instrument, Communication, Electricity power, Internet of things, etc. The additional circuit diagram for EMC is recommended for the application with high EMC requirement.*

Typical Product List

Certificate	Part No.	Input Voltage (VDC)		Output Voltage/Current (Vo/Io)		Input Current (mA) Typ. @Nominal Volt.		Max. Capacitive Load	Ripple & Noise (mVp-p)		Full load efficiency (%)	
		Nom.	Range	Vo (VDC)	Io(mA) Max/Min	Full load	No load	uF	Typ	Max	Min	Typ
CE	PFD15-18S3V3A3(C)2	24	9-36	3.3	4000/0	625	33	10000	50	100	86	88
	PFD15-18S04A3(C)2	24	9-36	4	3750/0	702	33	8000	50	100	87	89
	PFD15-18S05A3(C)2	24	9-36	5	3000/0	694	33	5000	50	100	88	90
	PFD15-18S09A3(C)2	24	9-36	9	1667/0	694	33	3000	50	100	88	90
	PFD15-18S12A3(C)2	24	9-36	12	1250/0	694	5	1000	50	100	88	90
	PFD15-18S12V2A3(C)2	24	9-36	12.2	1229/0	690	5	1000	50	100	88	90
	PFD15-18S15A3(C)2	24	9-36	15	1000/0	694	5	800	50	100	88	90
	PFD15-18S24A3(C)2	24	9-36	24	625/0	686	5	500	50	100	89	91
	PFD15-36S3V3A3(C)2	48	18-75	3.3	4000/0	312	17	10000	50	100	86	88
	PFD15-36S05A3(C)2	48	18-75	5	3000/0	347	17	5000	50	100	88	90
	PFD15-36S09A3(C)2	48	18-75	9	1667/0	347	17	3000	50	100	88	90
	PFD15-36S12A3(C)2	48	18-75	12	1250/0	343	5	1000	50	100	88	91
	PFD15-36S15A3(C)2	48	18-75	15	1000/0	343	5	800	50	100	88	91
	PFD15-36S24A3(C)2	48	18-75	24	625/0	343	5	500	50	100	88	91

Note 1: In the parts numbers R indicates the part with both ON/OFF Control & Trim functions, C indicates the part with ON/OFF Control, 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 the chassis package (with heat sink), -TS (H) indicates the package 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 control 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
Standby power consumption	Full input voltage range	/	0.1	/	W
Reflected ripple current	Nominal input voltage	/	30	/	mA
Under-voltage protection	Nominal 24V input series	5	7	9	VDC
	Nomina 48V input series	11	13	18	
Hot-plug	/	NA			
Input filter	/	Pi filter			
Remote Control (Ctrl*)	Turn-on the converter	No connection or connect to high level (3.3V-12VDC)			
	Turn-off the converter	Connect to -Vin or connect to low level (0-1.2VDC)			
	Current value for switching off	2mA (Typ.)			

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

Output Specifications

Item	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% load		/	±0.5	±1	%
Ripple & Noise	10% - 100% load, 20MHz bandwidth		/	50	100	mVp-p
Transient recovery time	25% load step, nominal input voltage		/	250	500	uS
Transient response deviation	25% load step, nominal input voltage	3.3V/5V output	/	±5	±8	%
		Others	/	±3	±5	%
Turn-on delay time	Nominal input voltage		/	10	/	mS
Over-voltage protection	Full input voltage range		110	160	200	%Vo
Output voltage adjustment (Trim)			90	/	110	%Vo
Over-current protection			110	150	220	%Io
Short circuit protection			Continuous, self-recovery			

Note: Ripple & noise ≤5%Vo at 0% - 10% load, it is tested by the twisted pair method (please refer to the following test instruction).

General Specifications

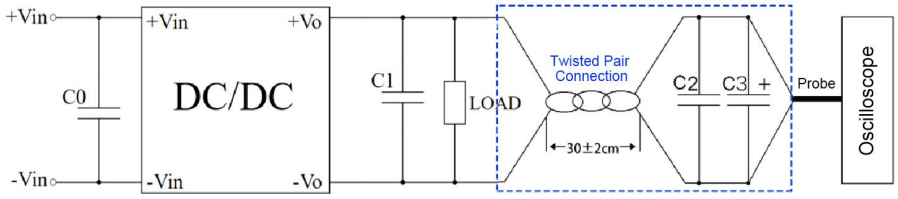
Item	Test Conditions	Min	Typ.	Max	Unit
Switching Frequency	Operating mode (PWM)	/	280	/	KHz
Operating Temperature	Refer to the temperature derating graph	-40	/	+105	°C
Storage Temperature		-55	/	+125	
Relative Humidity	No condensation	5	/	95	%RH
Case Temperature	Within the temperature derating range	/	/	105	°C
Pin Soldering Temperature	1.5mm from the case, 10 seconds	/	/	300	
Isolation Voltage	I/P-O/P, test 1min, leakage current ≤0.5mA	1500	/	/	VDC
	I/P&O/P-Case, test 1min, leakage current ≤0.5mA	1000	/	/	VDC
Insulation Resistance	I/P-O/P @500VDC	1000	/	/	MΩ
Isolation Capacitance	I/P-O/P, 100KHz/0.1V	/	1000	/	pF
MBTF	MIL-HDBK-217F@25℃	1000	/	/	K hours
Cooling Method	Natural air				
Case Material	Aluminum				

Weight/Dimension	Part No.	Weight (Typ.)	Dimensions L x W x H	
	PFD15-XXSXXA3(C)2	15g	25.4X 25.4X12.5 mm	1.00X1.00X0.492 inch
	PFD15-XXSXXA3(C)2-H	19g	25.4X25.4X18.0 mm	1.00X1.00X0.708 inch
	PFD15-XXSXXA3(C)2-T	37g	76.0X31.5X21.3 mm	2.99X1.24X0.838 inch
	PFD15-XXSXXA3(C)2-TH	40g	76.0X31.5X26.0 mm	2.99X1.24X1.023 inch
	PFD15-XXSXXA3(C)2-TS	57g	76.0X31.5X26.0 mm	2.99X1.24X1.023 inch
	PFD15-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	CISPR22/EN55032	CLASS B (with the Recommended EMC circuit)
		RE	CISPR22/EN55032	CLASS B (with the Recommended EMC circuit)
	EMS	RS	IEC/EN61000-4-3	10V/m Perf.Criteria B (with the Recommended EMC circuit)
		CS	IEC/EN61000-4-6	3Vr.m.s Perf.Criteria B (with the Recommended EMC circuit)
		ESD	IEC/EN61000-4-2	Contact ±6KV/Air ±8KV 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)

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

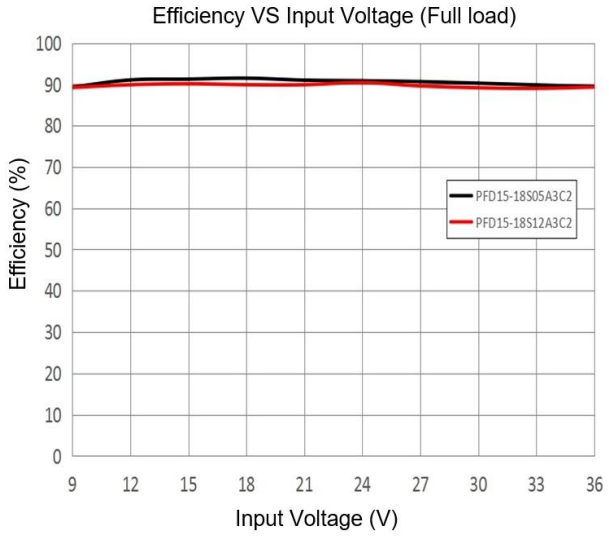


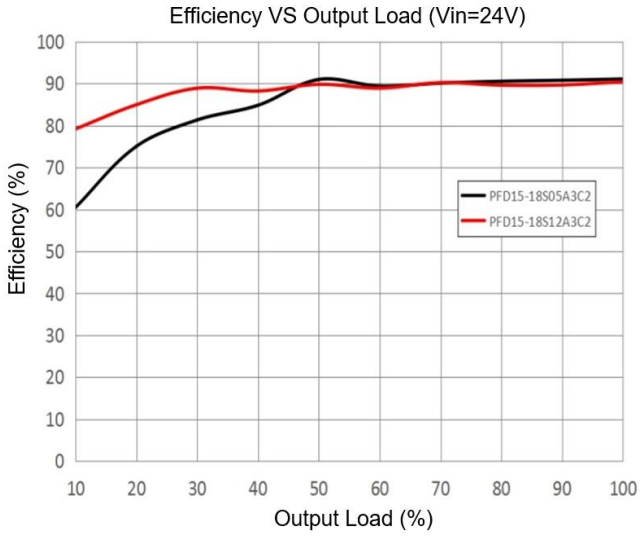
1) The Ripple & noise test needs 12# twisted pair cables, an oscilloscope which should be set at the Sample Mode, bandwidth 20MHz. 100M bandwidth probe with cap and ground removed. C2(0.1uF) polypropylene capacitor and C3(10uF) high-frequency low-resistance electrolytic capacitor are connected in parallel with the probes and one side of the twisted pair. C0 & C1 refer to the application circuit recommended.

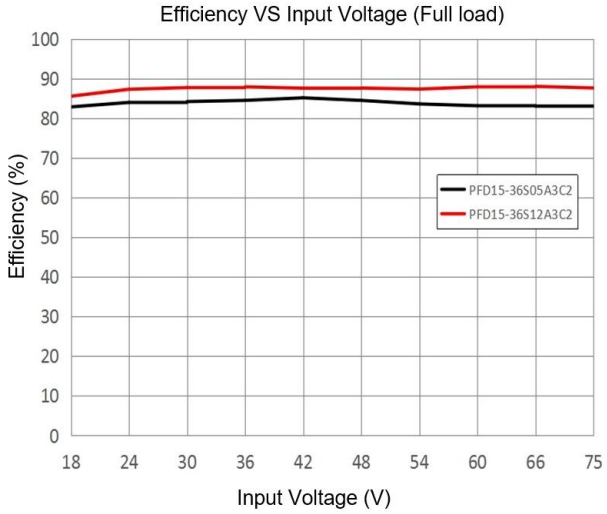
2) The power supply output connects to the load by the cables. The other side of the twisted pair (length 30cm±2 cm) should be connected in parallel with the load, the polarity of the output and the oscilloscope probe should not be reversed. The test can be start after input power on.

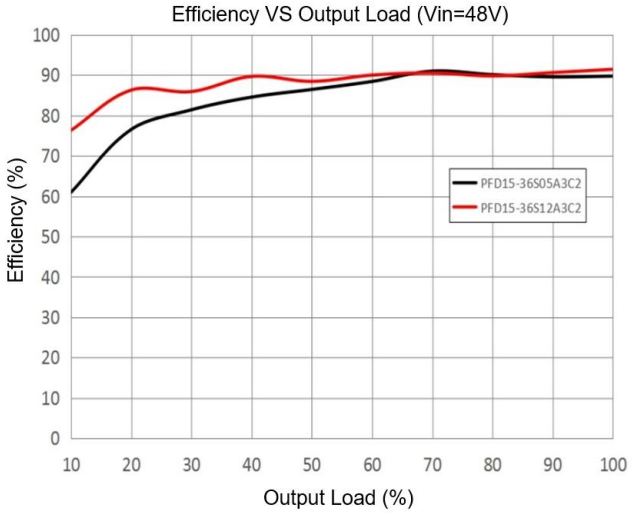
3) It is recommended to connect ≥10% load or a high-frequency low resistance E-cap(≥470uF) load at output to avoid the output ripple increasing.

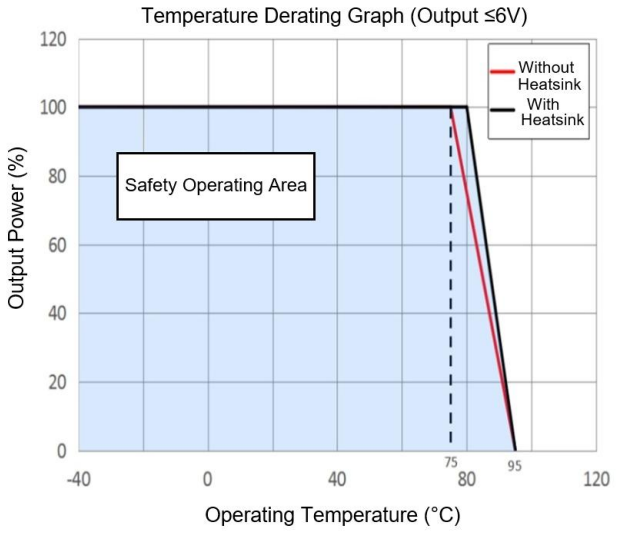
Product Characteristics Graphs

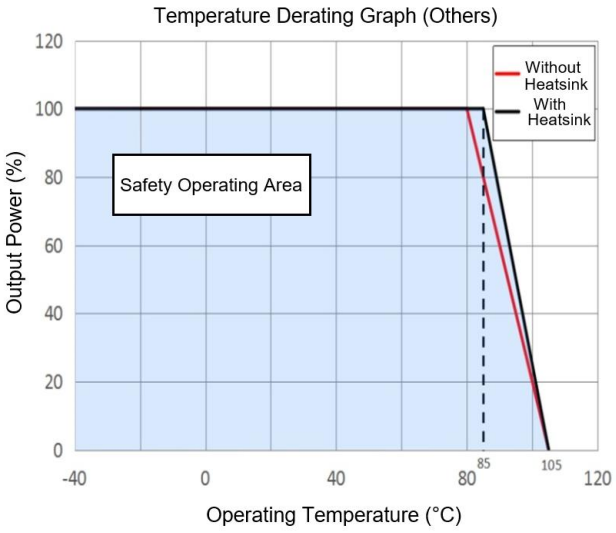






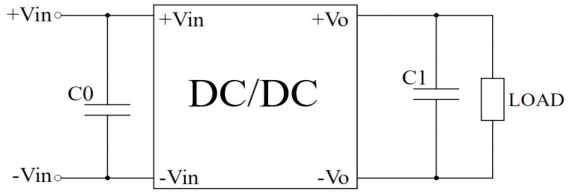






Recommended Circuits Diagrams for Application

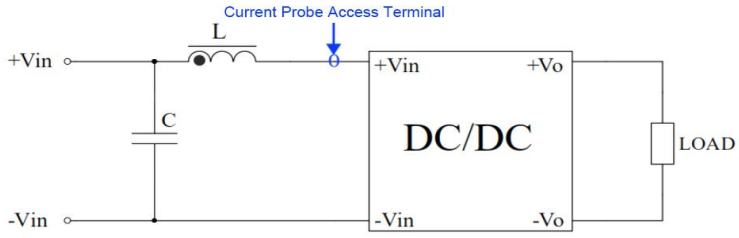
1. DC/DC test circuit diagram



Components	Parameters
C0	100uF/100V
C1	47uF/50V

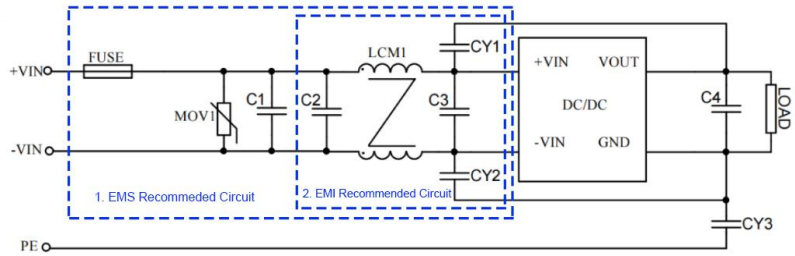
2. Input reflected ripple current test circuit diagram

A low ESR capacitor is recommended for C which withstand voltage should be more than the maximum input voltage.



Components	Parameters
C	220uF/100V
L	4.7uH

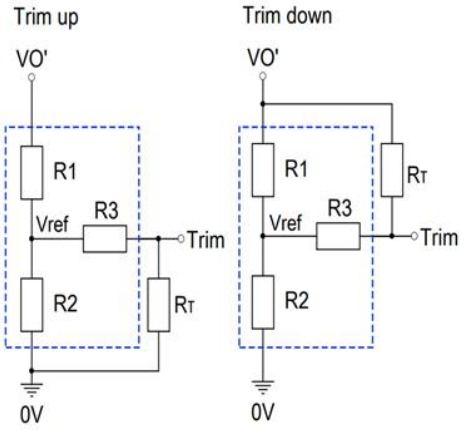
3. Recommended EMC circuit diagram



Components	24V input series	48V input series
FUSE	TBD by the 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 test, 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

$$\text{up: } R_T = \frac{aR_2}{R_2 - a} - R_3 \qquad a = \frac{V_{ref}}{V_o' - V_{ref}} \cdot R_1$$

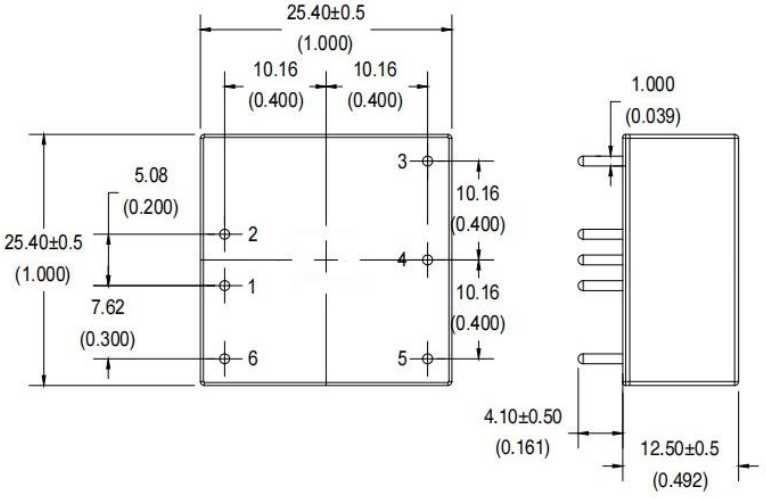
$$\text{down: } R_T = \frac{aR_1}{R_1 - a} - R_3 \qquad a = \frac{V_o' - V_{ref}}{V_{ref}} \cdot R_2$$

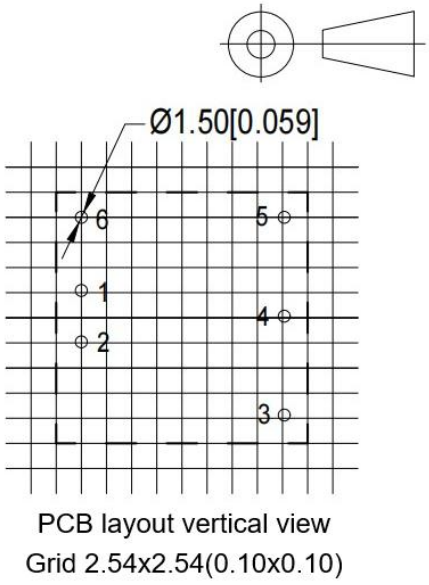
R_T is the Trim resistance
a is a self-defined parameter
Vo' is the required Up-voltage or Down-voltage

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

Output Voltage	Internal circuit parameters for Trim			
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
24	30	3.48	30	2.5

A3 Package Dimensions (without heat sink)



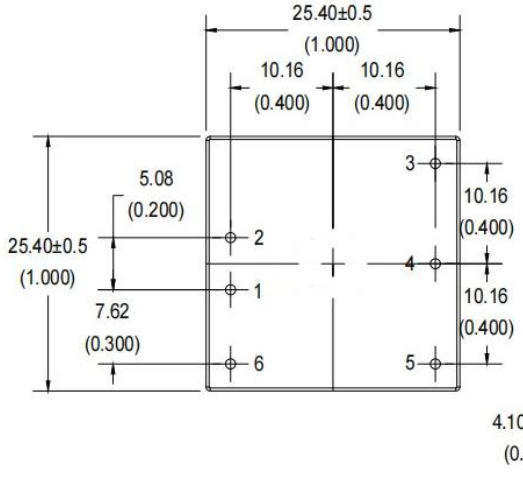


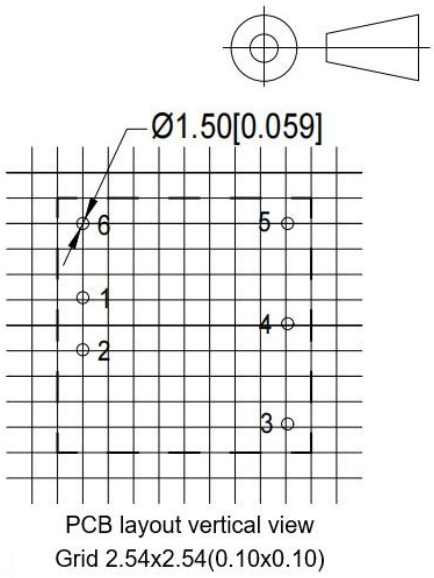
PCB layout vertical view
Grid 2.54x2.54(0.10x0.10)

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

Pin No.	1	2	3	4	5	6
PFD15-XXSXXA3R2	-Vin	+Vin	+Vout	Trim	GND	Ctrl

A3-H Package Dimensions (with heat sink)



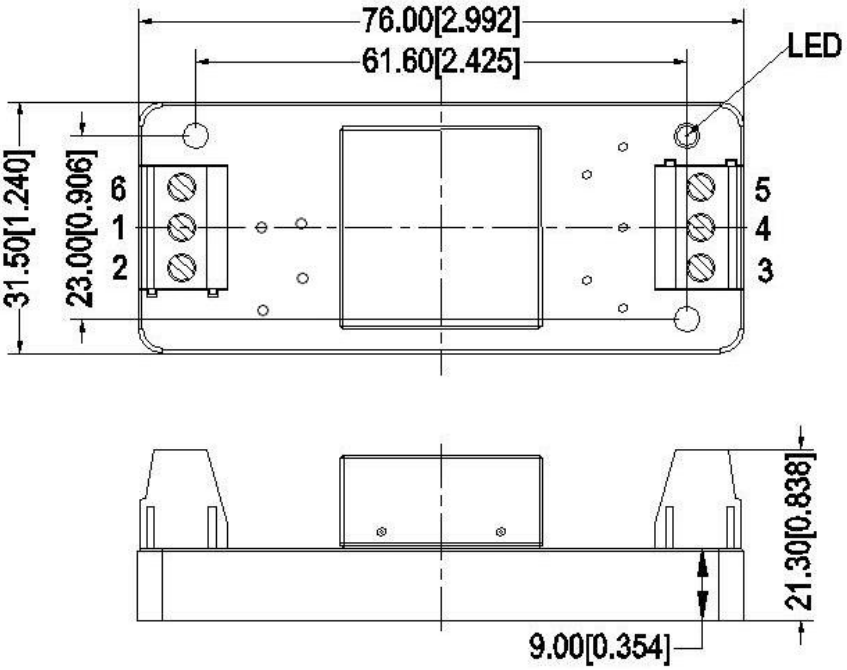


PCB layout vertical view
Grid 2.54x2.54(0.10x0.10)

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

Pin No.	1	2	3	4	5	6
PFD15-XXSXXA3R2	-Vin	+Vin	+Vout	Trim	GND	Ctrl

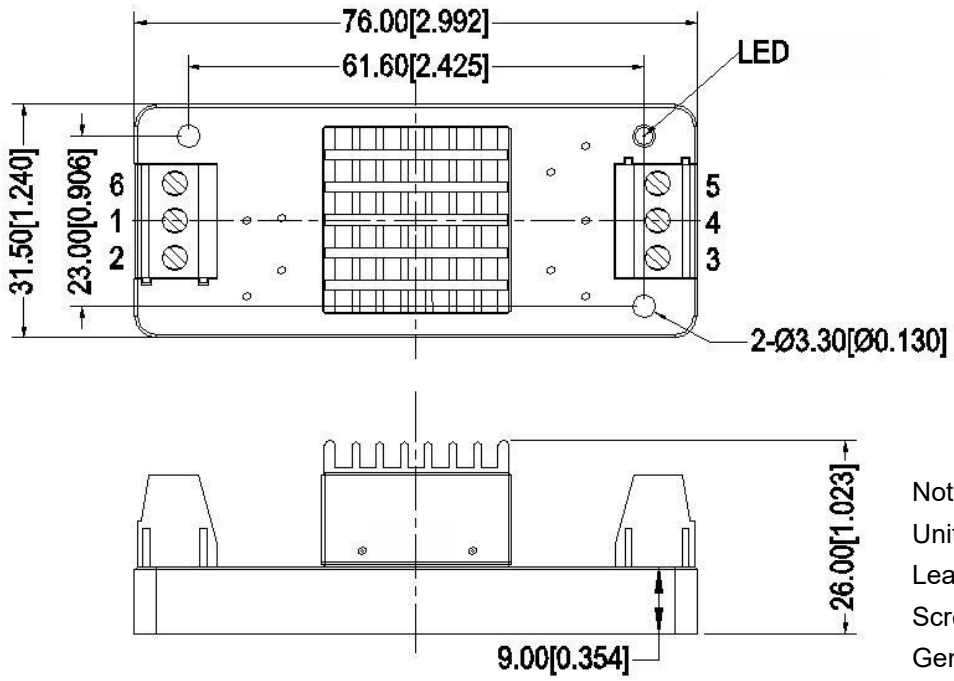
A3-T Package Dimensions (without heat sink)



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

Terminal No.	1	2	3	4	5	6
PFD15-XXSXXA3R2	-Vin	+Vin	+Vout	Trim	GND	Ctrl

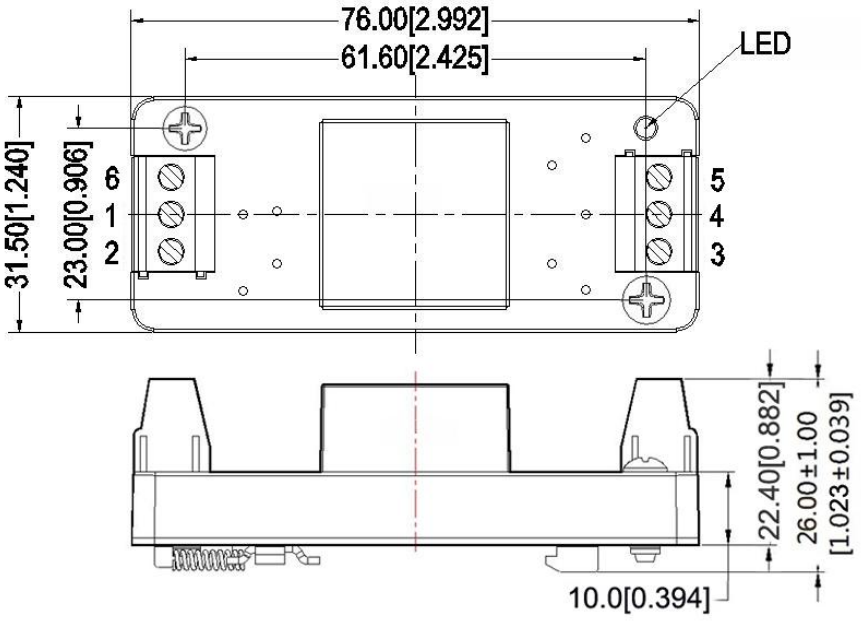
A3-TH Package Dimensions (with heat sink)



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

Terminal No.	1	2	3	4	5	6
PFD15-XXSXXA3R2	-Vin	+Vin	+Vout	Trim	GND	Ctrl

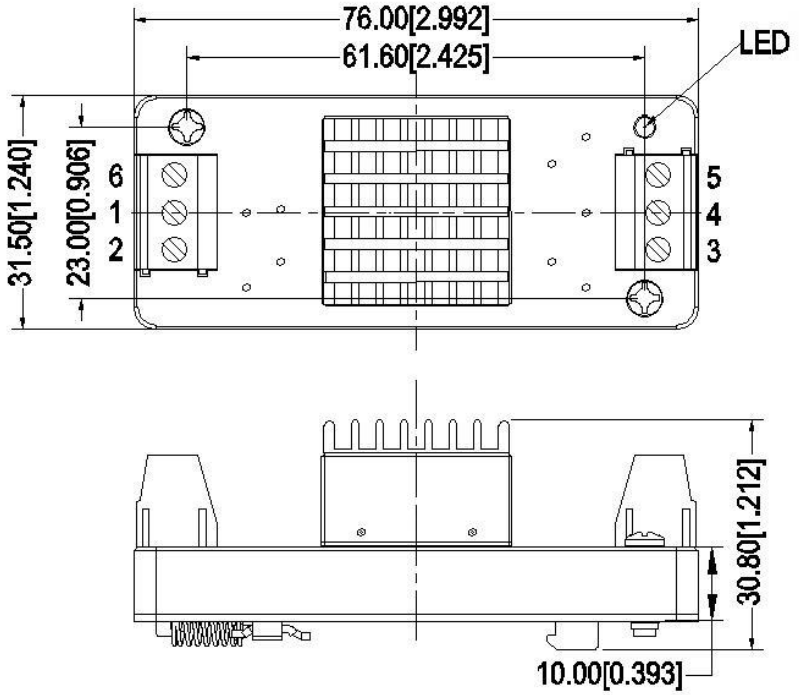
A3-TS Package Dimensions (without heat sink)



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

Terminal No.	1	2	3	4	5	6
PFD15-XXSXXA3R2	-Vin	+Vin	+Vout	Trim	GND	Ctrl

A3-TSH Package Dimensions (with heat sink)



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

Terminal No.	1	2	3	4	5	6
PFD15-XXSXXA3R2	-Vin	+Vin	+Vout	Trim	GND	Ctrl

Other Models Pin-out Function Description

Pin/Terminal No.	1	2	3	4	5	6
PFD15-XXSXXA3N2	-Vin	+Vin	+Vout	No Pin	GND	No Pin
PFD15-XXSXXA3C2	-Vin	+Vin	+Vout	No Pin	GND	Ctrl
PFD15-XXSXXA3T2	-Vin	+Vin	+Vout	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 at 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

