

Typical Features

- ◆ Wide input voltage range (4:1), output power 20W
- ◆ Efficiency up to 90% (Typ.)
- ◆ Stand-by power consumption 0.10W (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 EMI performance
- ◆ Standard pin-out alignment



Application Field

PFD20-XXDXXA3(C)2 series ---- DIP mounting standard 2"X1" size DC-DC modular converters with wide input voltage range 4:1, low standby power consumption, isolated & regulated dual outputs 20W. This series of products can be widely used in the fields of Industrial control, Instrument, Communication, Electric 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 Range (VDC)		Output Voltage/ Current (Vo/Io)		Input Current (mA) Typ. @Nominal 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.
CE	PFD20-18D05A3(C)2	24	9 - 36	±5	2000/0	957	33	5000	100	200	85	87
	PFD20-18D09A3(C)2			±9	1111/0	946	6	2000	100	200	85	87
	PFD20-18D12A3(C)2			±12	833/0	926	5	1000	100	200	88	90
	PFD20-18D15A3(C)2			±15	667/0	926	5	800	100	200	88	90
	PFD20-18D24A3(C)2			±24	416/0	947	5	500	100	200	86	88
	PFD20-36D05A3(C)2	48	18 - 75	±5	2000/0	484	17	5000	100	200	84	86
	PFD20-36D09A3(C)2			±9	1111/0	472	5	2000	100	200	85	87
	PFD20-36D12A3(C)2			±12	833/0	468	5	1000	100	200	87	89
	PFD20-36D15A3(C)2			±15	667/0	468	5	800	100	200	87	89
	PFD20-36D24A3(C)2			±24	416/0	463	5	500	100	200	88	90

Note 1: In the part numbers C indicates the part with ON/OFF control function, N indicates without Control.

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 rail width is 35mm.

Note 3: 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.

Note 4: 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 Consumption	Full input voltage range	/	0.1	/	W
Under-Voltage Protection	24V input series	5	/	9	VDC
	48V input series	11	/	18	
Input Inrush Voltage (1Sec. max.)	24V input series	-0.7	/	50	
	48V input series	-0.7	/	100	
Hot Plug	/	N/A			
Input Filter	/	Pi filter			
ON/OFF Control (*Ctrl)	Turn ON the converter	No connection or connected to high level (3.3V-12VDC)			
	Turn OFF the converter	Connected to -Vin or the low voltage level (0-1.2VDC)			
	Current value for switching off	2mA (Typ.)			

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

Output Specifications

Items	Test Conditions	Min.	Typ.	Max.	Unit	
Output Voltage Accuracy	Full input voltage range	Vo1	/	±1	±2	%
		Vo2	/	±1.5	±3	%
Cross regulation	Vo1: 50% load; Vo2: 10~100% load	/	±3	±5	%	
Voltage Regulation	Full voltage range, full load	Vo1	/	±0.2	±0.5	%
		Vo2	/	±0.5	±1	%
Load Regulation	5%-100% load	Vo1	/	±0.5	±1	%
		Vo2	/	±1	±1.5	%
Ripple & Noise	5%-100% load, 20MHz bandwidth	/	100	200	mVp-p	
Transient Recovery Time	25% load step, nominal input voltage	/	/	300	500	uS
Transient Response Deviation		±5V output	/	±5	±8	%
		Others	/	±3	±5	%
Turn on Delay Time	Nominal input voltage	/	10	/	mS	
Over voltage protection	Full input voltage range	120	160	200	%Vo	
Over current protection		110	160	220	%Io	
Start-up overshoot voltage		/	/	10	%Vo	
Short Circuit Protection		Hiccup, continuous, self-recovery				

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

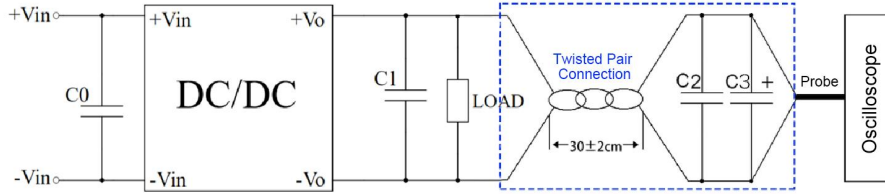
General Specifications

Items	Test Conditions	Min.	Typ.	Max.	Unit
Switching Frequency	Operating Mode (PWM)	/	280	/	KHz
Operating Temperature	Refer to Temperature Derating Graph	-40	/	+85	°C
Storage Temperature	/	-55	/	+125	
Case Temperature	Within the operating derating range	/	/	+105	
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 <0.5mA	1500	/	/	VDC
Insulation Resistance	I/P-O/P, @ 500VDC	1000	/	/	MΩ
Isolation Capacitance	Typical value	/	1000	/	pF
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-XXDXXA3(C)2	18g	25.4 X 25.4 X 12.5 mm	2.00 X 1.00 X 0.492 inch	
	PFD20-XXDXXA3(C)2-H	21g	25.4 X 25.4 X 18.0 mm	2.00 X 1.00 X 0.708 inch	
	PFD20-XXDXXA3(C)2-T	39g	76.0 X 31.5 X 21.3 mm	2.99 X 1.24 X 0.838 inch	
	PFD20-XXDXXA3(C)2-TH	42g	76.0 X 31.5 X 26.0 mm	2.99 X 1.24 X 1.023 inch	
	PFD20-XXDXXA3(C)2-TS	59g	76.0 X 31.5 X 26.0 mm	2.99 X 1.24 X 1.023 inch	
	PFD20-XXDXXA3(C)2-TSH	62g	76.0 X 31.5 X 30.8 mm	2.99 X 1.24 X 1.212 inch	

EMC Performance

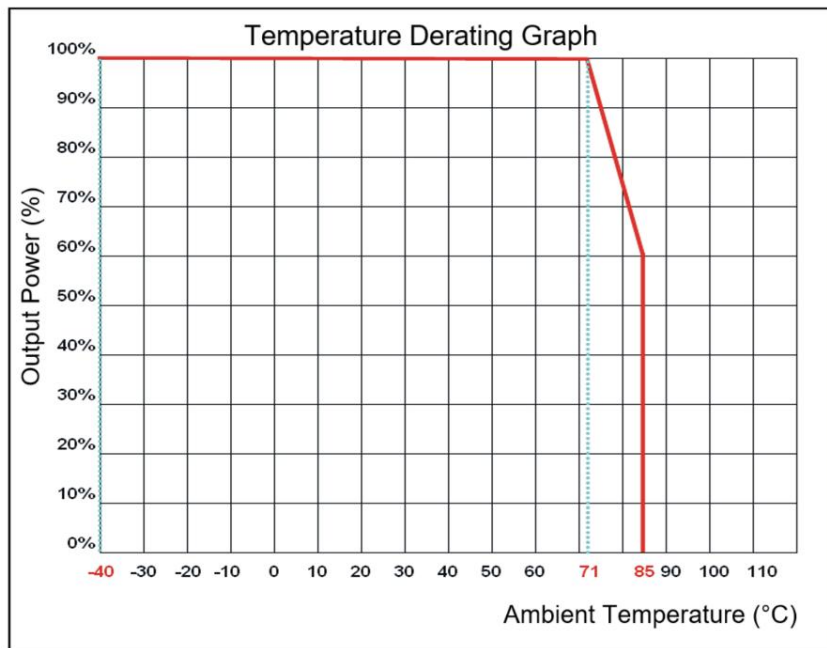
Total Item	Sub Item	Test Standard	Performance/Class
EMC	EMI	CE	CISPR32/EN55032 CLASS B (with the Recommended EMC Circuit)
		RE	CISPR32/EN55032 CLASS B (with the Recommended EMC Circuit)
	EMS	RS	IEC/EN61000-4-3 10V/m Perf.Criteria A (With the Recommended EMC Circuit)
		CS	IEC/EN61000-4-6 3Vr.m.s Perf.Criteria A (With the Recommended EMC Circuit)
		ESD	IEC/EN61000-4-2 Contact ±4KV/ Air ±8KV Perf.Criteria B (With the Recommended EMC Circuit)
		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)



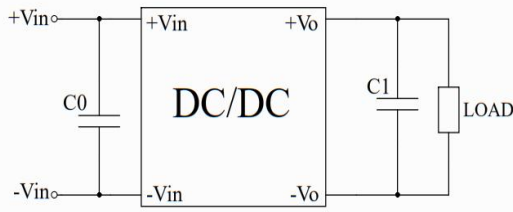
- 1) The Ripple & noise test needs 12# twisted pair cables, an oscilloscope which should be set at the Sample Mode, bandwidth 20MHz. 100M bandwidth probe with cap and ground removed. C2(0.1uF) polypropylene capacitor and C3(10uF) high-frequency low-resistance electrolytic capacitor are connected in parallel 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 the input power on.
- 3) It is recommended to connect a $\geq 5\%$ load or a high-frequency low resistance E-cap($\geq 470\mu\text{F}$) load at output to avoid the output ripple increasing.
- 4) The load imbalance of Dual outputs should be less than $\pm 5\%$ deviation.

Product Characteristics Graph



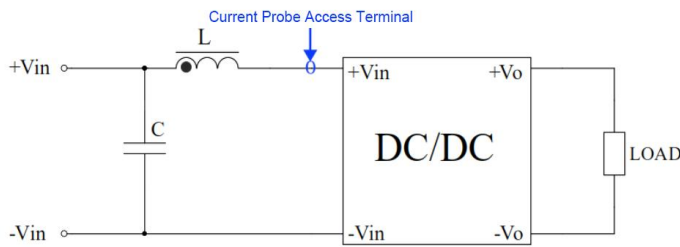
Recommended Circuits for Application

1. All this series of converters will be tested according to the circuit diagram below before shipping. The output ripple could be decreased with C0 or C1 capacitances increased, the output capacitance must be less than the maximum capacitive load.



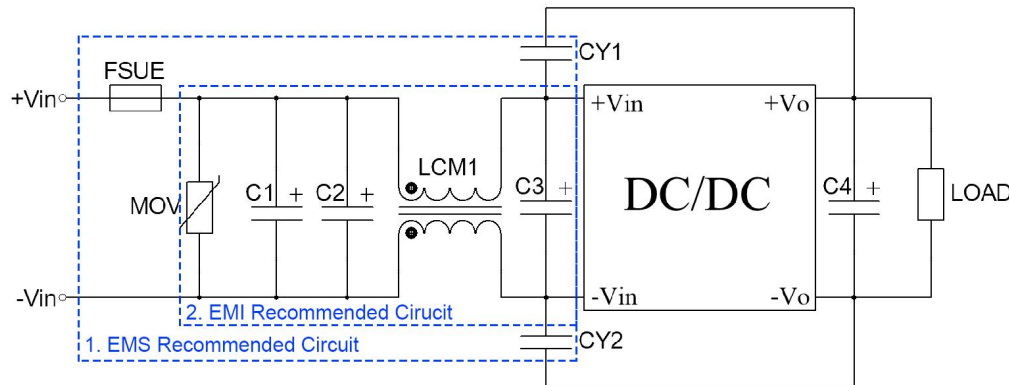
Component	Parameter
C0	47-100uF/100V
C1	100uF/100V

2. Input reflected ripple current test circuit diagram



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

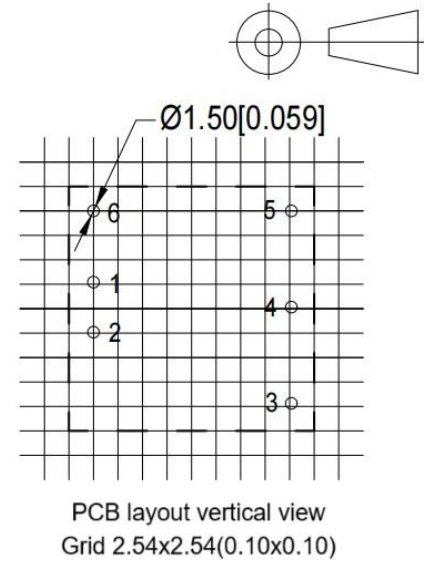
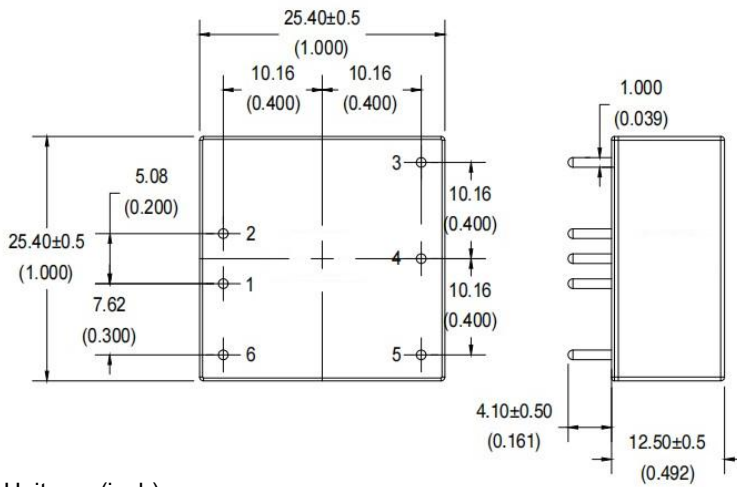
3. The Recommended EMC circuit



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

Components	Vin=24VDC	Vin=48VDC
FUSE	TBD by the customer	
MOV	14D560K	14D101K
C1, C2, C3	330uF/50V	330uF/100V
C4	47uF/50V	
LCM1	5mH	
CY1, CY2	2.2nF/2KV	

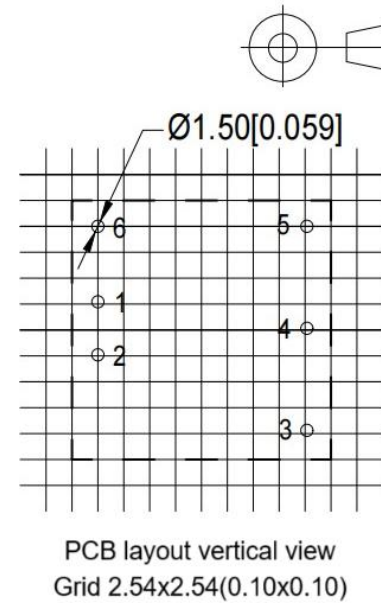
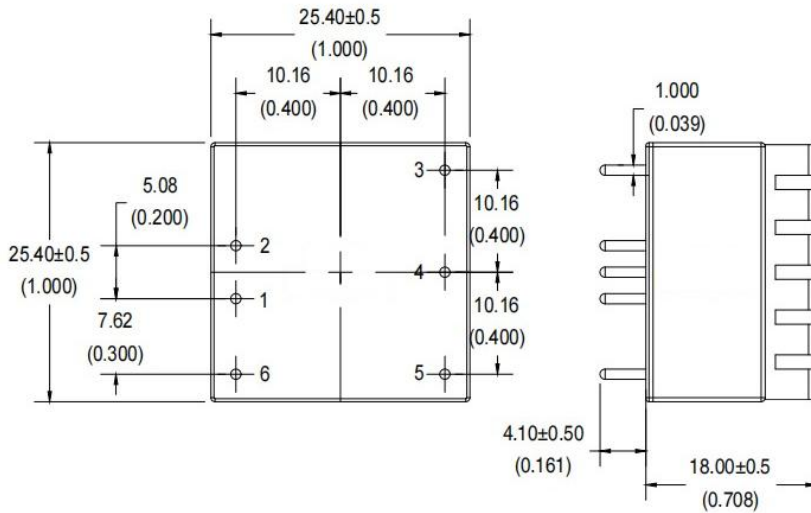
A3 Mechanical Dimensions (without heat sink)



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-XXDXXA3C2	-Vin	+Vin	+Vo	COM	-Vo	Ctrl

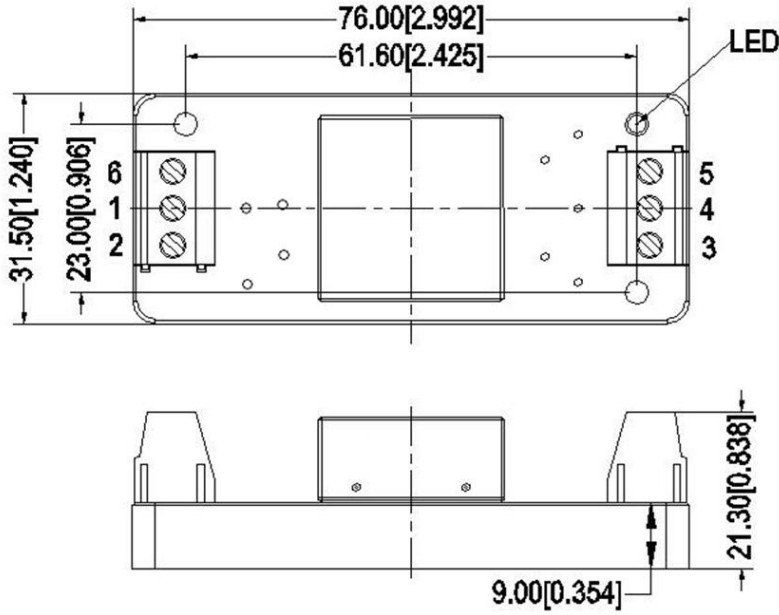
A3-H Mechanical Dimensions (with heat sink)



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-XXDXXA3C2	-Vin	+Vin	+Vo	COM	-Vo	Ctrl

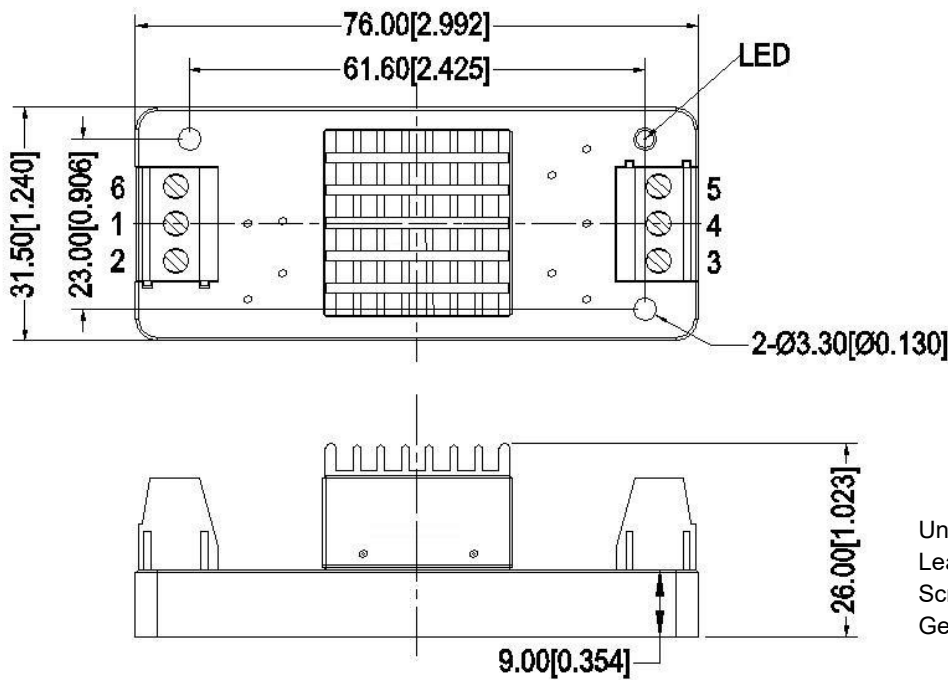
A3-T Mechanical Dimensions (without heat sink)



Unit: mm[inch]
 Lead wires gauge: 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-XXDXXA3C2	-Vin	+Vin	+Vo	COM	-Vo	Ctrl

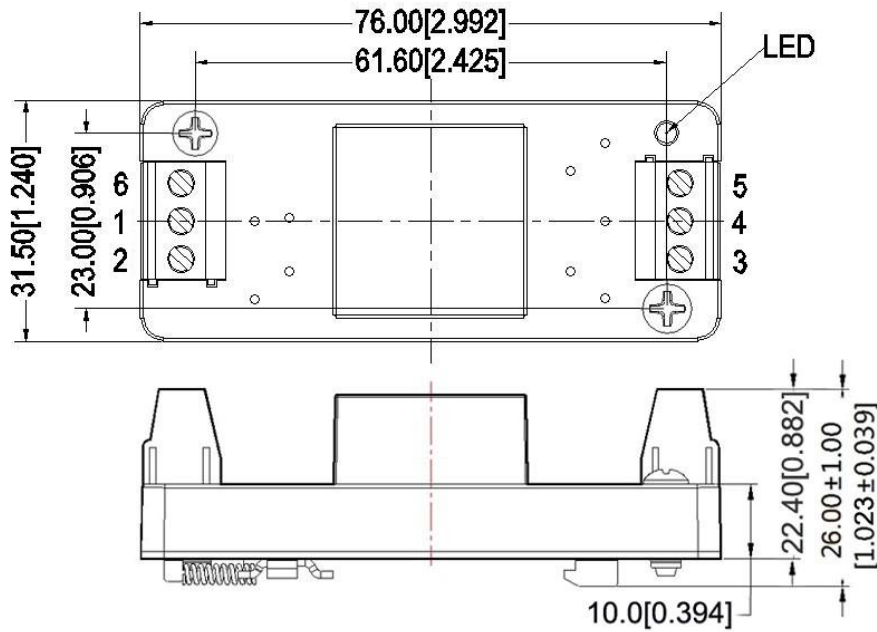
A3-TH Mechanical Dimensions (with heat sink)



Unit: mm[inch]
 Lead wires gauge: 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-XXDXXA3C2	-Vin	+Vin	+Vo	COM	-Vo	Ctrl

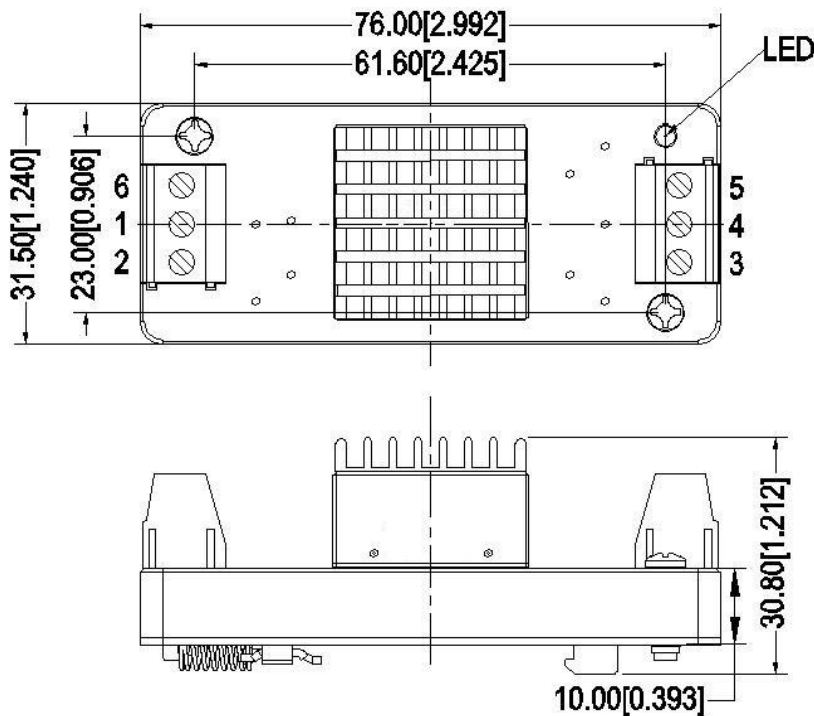
A3-TS Mechanical Dimensions (without heat sink)



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
PFD20-XXDXXA3C2	-Vin	+Vin	+Vo	COM	-Vo	Ctrl

A3-TSH Mechanical Dimensions (with heat sink)



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
PFD20-XXDXXA3C2	-Vin	+Vin	+Vo	COM	-Vo	Ctrl

Other Models Pin-out Function Description

Pin/Terminal No.	1	2	3	4	5	6
PFD20-XXDXXA3N2	-Vin	+Vin	+Vo	COM	-Vo	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°C, 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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