

Typical Features

- ◆ Wide input voltage range (4:1), output power 20W
- ◆ Efficiency up to 90%(Typ.)
- ◆ Stand-by power consumption 0.2W (Typ.)
- ◆ 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 Filed

FD20-XXSXXB1(C)2 Series --- Standard 2"x1" size 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, 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 Volt.		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.
-	FD20-18S3V3B1C2	24	9 - 36	3.3	4000/0	650	50	8000	50	100	82	84
-	FD20-18S05B1C2			5	4000/0	934	57	6000	50	100	85	87
-	FD20-18S09B1C2			9	2222/0	936	30	2000	50	100	87	89
-	FD20-18S12B1C2			12	1667/0	940	5	500	50	100	86	88
-	FD20-18S15B1C2			15	1333/0	928	7	1000	50	100	87	89
-	FD20-18S18B1C2			18	1111/0	940	5	500	50	100	87	89
-	FD20-18S24B1C2			24	833/0	926	2	500	50	100	88	90
-	FD20-18S28B1C2			28	714/0	950	8	500	50	100	87	89

Note 1: In the part numbers C indicates the part with ON/OFF Control function, N indicates No Control function.

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 starts up at full load. The converter may not start if the capacitor exceeds this value.

Note 4: The chip could operate at jitter frequency situation with no load or light load to decrease the no-load power consumption, so no load is not available. A $\geq 15\%$ load or a high-frequency low resistance E-cap($\geq 470\mu\text{F}$) load is recommended, to avoid the output ripple increasing.

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	Full input voltage rang	/	0.2	/	W
Input Inrush Voltage (1Sec Max.)	24Vdc Input	-0.7	/	50	VDC
	48Vdc Input	-0.7	/	100	
Under-voltage protection	24Vdc Input	5	/	9	
	48Vdc Input	11	/	18	
Input filter	/	Pi filter			
ON/OFF Control (Ctrl)	Turn ON the converter	No connection or connect to high level (2.5V-12VDC)			
	Turn OFF the converter	Connect to -Vin or low level (0-1.2VDC)			
	Current value for switching off	5mA (Typ.)			

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

Output Specifications

Item	Test conditions		Min	Typ.	Max	Unit
Output Voltage Accuracy	Full input voltage range		/	±1	±2	%
Voltage Regulation	Full input voltage range, full load		/	±0.2	±0.5	%
Load Regulation	5% ~ 100% load		/	±0.2	±0.5	%
Ripple & Noise	15%~100% load, 20MHz		/	50	100	mVp-p
Transient Recovery Time	25% rated load step, nominal input voltage	/	/	300	500	uS
Transient Response Deviation		3.3V&5V output	/	±3	±8	%
		others	/	±3	±5	%
Turn-on Delay	Nominal input voltage		/	150	/	mS
Over voltage protection	Full input voltage range		110	150	200	%Vo
Over current protection			110	160	220	%Io
Overshoot Voltage			/	/	10	%Vo
Short circuit protection			Hiccup, continuous, self-recovery			

Note: Ripple & Noise ≤5%Vo at 0%-15% load, it is tested by the twisted pair method according to the following test instruction.

General Specifications

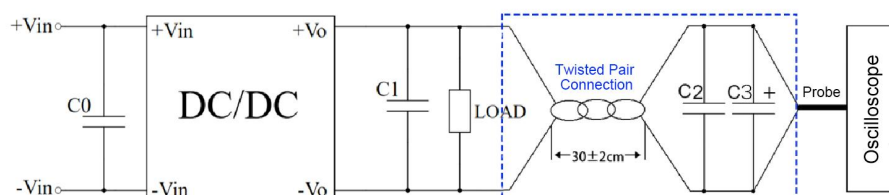
Item	Test conditions	Min	Typ.	Max	Unit
Switching Frequency	Operating Mode (PWM)	/	300	/	KHz
Operating Temperature	Refer to the Temperature Derating Graph	-40	/	+85	°C
Storage Temperature	/	-55	/	+125	
Max Case Temperature	Within the temperature derating range	/	/	+105	
Pin Soldering temperature	1.5mm 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
MTBF	MIL-HDBK-217F@25°C	1000	/	/	KHrs
Cooling Method	Nature air				
Case Material	Aluminum				
Weight/Dimension	Part Number	Weight (Typ.)	Dimensions L x W x H		
	FD20-XXSXXB1(C)2	30g	50.8 X 25.4 X 10.5 mm	2.00 X 1.00 X 0.413 inch	
	FD20-XXSXXB1(C)2-H	42g	50.8 X 25.4 X 20.5 mm	2.00 X 1.00 X 0.807 inch	
	FD20-XXSXXB1(C)2-T	51g	76.0 X 31.5 X 21.3 mm	2.99 X 1.24 X 0.838 inch	
	FD20-XXSXXB1(C)2-TH	63g	76.0 X 31.5 X 30.5 mm	2.99 X 1.24 X 1.200 inch	
	FD20-XXSXXB1(C)2-TS	71g	76.0 X 31.5 X 26.0 mm	2.99 X 1.24 X 1.023 inch	
	FD20-XXSXXB1(C)2-TSH	83g	76.0 X 31.5 X 34.0 mm	2.99 X 1.24 X 1.338 inch	

EMC Performances

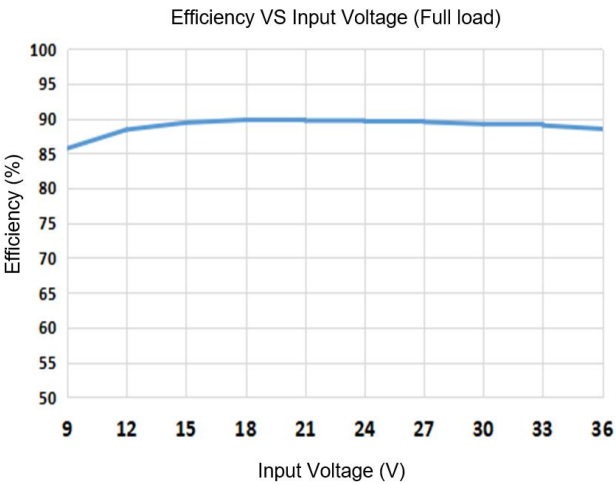
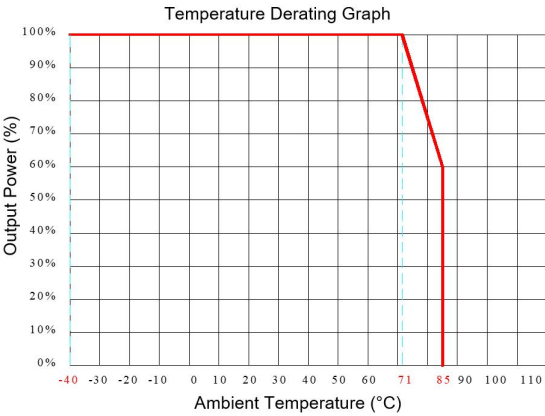
Total Items	Sub Items	Test Standard	Performance/Class
EMC	EMI	CE	CISPR32/EN55032
		RE	CISPR32/EN55032
	EMS	RS	IEC/EN61000-4-3
		CS	IEC/EN61000-4-6
		ESD	IEC/EN61000-4-2
		Surge	IEC/EN61000-4-5
		EFT	IEC/EN61000-4-4

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

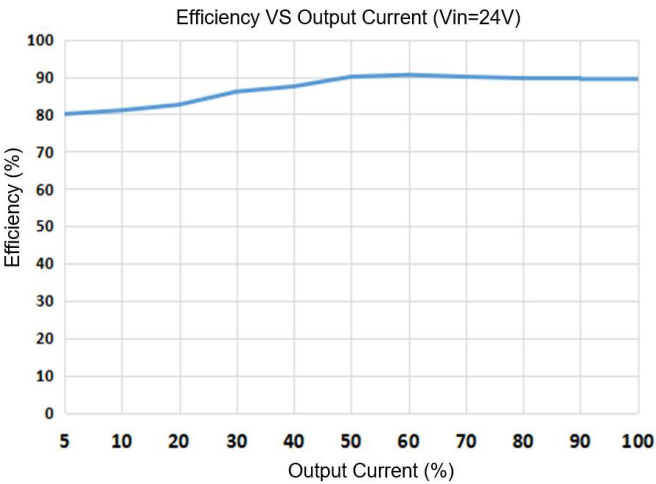


- 1) The Ripple & noise test needs 12# twisted pair cables, an oscilloscope which should be set at the Sample Mode, bandwidth 20MHz. 100M bandwidth probe with cap and ground removed. C2(0.1uF) polypropylene capacitor and C3(10uF) high-frequency low-resistance electrolytic capacitor are connected in parallel 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) $\geq 15\%$ load or a high-frequency low resistance E-cap($\geq 470\mu\text{F}$) load is recommended to avoid the output ripple increasing.

Product Characteristics Graphs



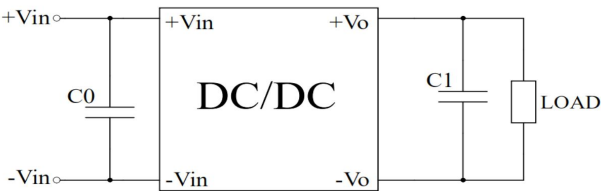
FD20-18S28B1C2



FD20-18S28B1C2

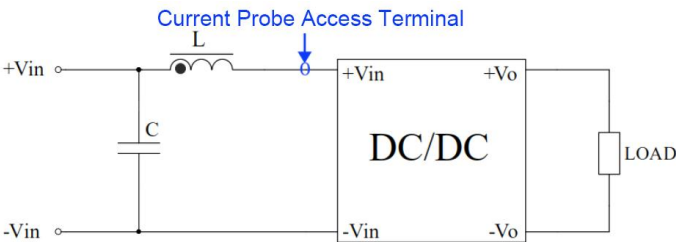
Recommended Circuits for Application

1. All this series of converters will be tested with this circuit diagram below before shipping. Increasing the capacitance of C0 or C1 can decrease the output ripple, but the capacitance must be less than the maximum capacitive load.



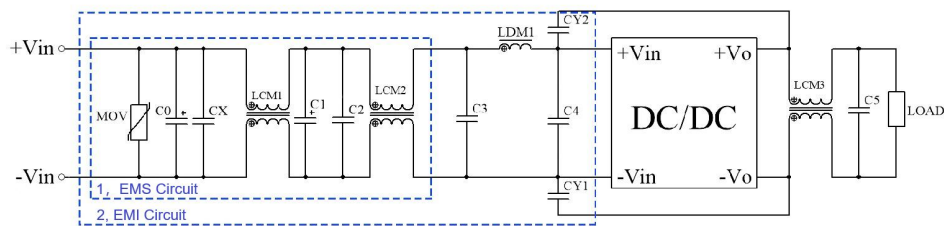
Components	Parameters
C0	47-100uF/100V
C1	330uF/50V

2. Input reflected ripple current test circuit diagram



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

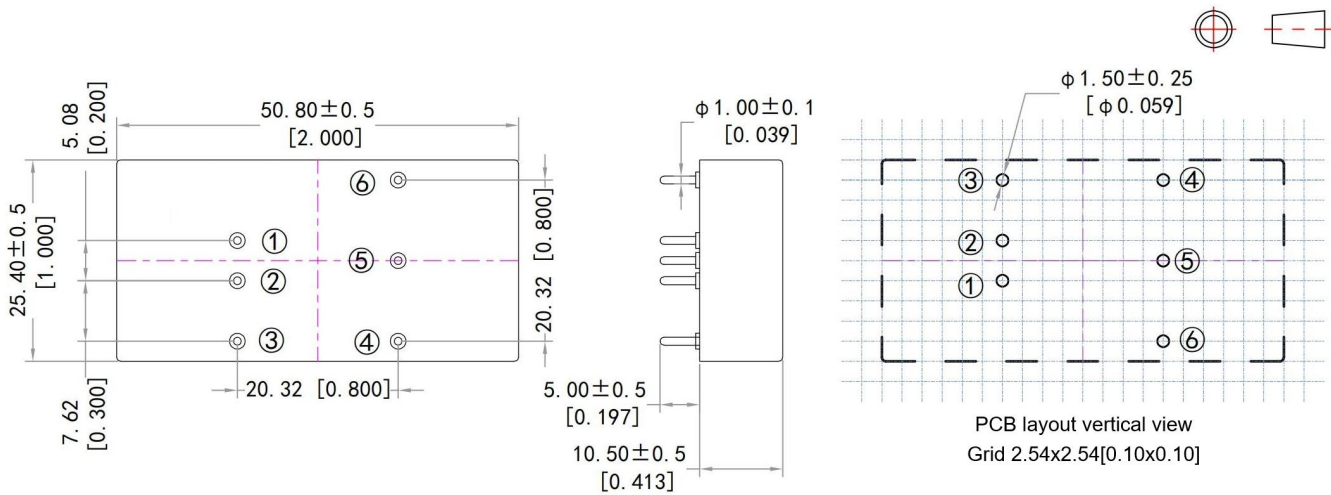
3. Recommended EMC circuit diagram



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

Component	Vin 24VDC	Vin 48VDC
FUSE	TBD by the customer	
MOV	14D560K	14D101K
CX	0.47uF	0.47uF
LDM1	56uH	56uH
C0, C1	220uF/50V	220uF/100V
C2, C3, C4	1uF/50V	1uF/100V
C5	10uF/50V	10uF/50V
LCM1	10mH	10mH
LCM2	1mH	1mH
LCM3	50uH	30uH
CY1, CY2	2.2nF/2KV	2.2nF/2KV

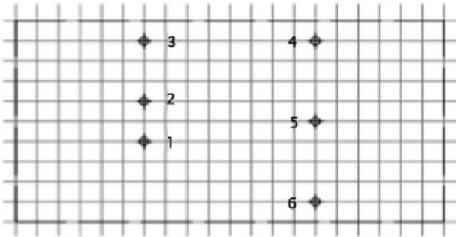
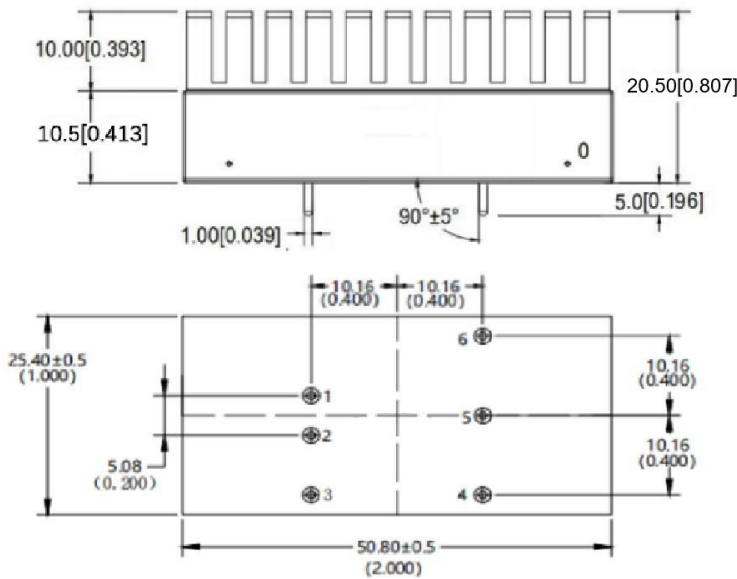
B1 Mechanical Dimensions (Without Heat Sink)



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
FD20-XXSXXB1C2	+Vin	-Vin	Ctrl	GND	No Pin	+Vo

B1-H Mechanical Dimensions (With Heat Sink)

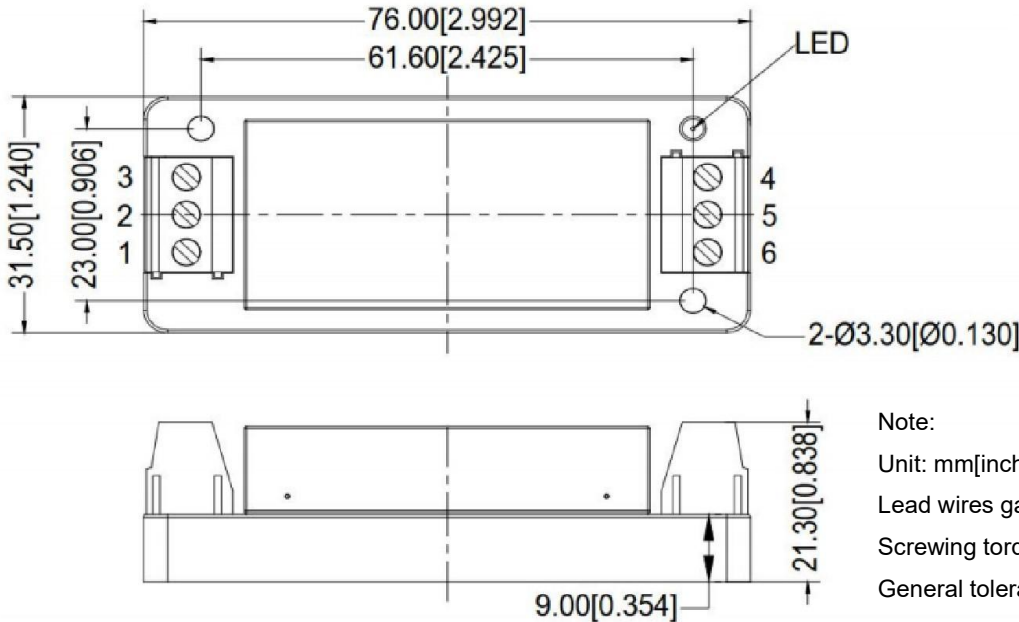


PCB layout vertical view
Grid 2.54x2.54[0.10x0.10]

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
FD20-XXSXXB1C2	+Vin	-Vin	Ctrl	GND	No Pin	+Vo

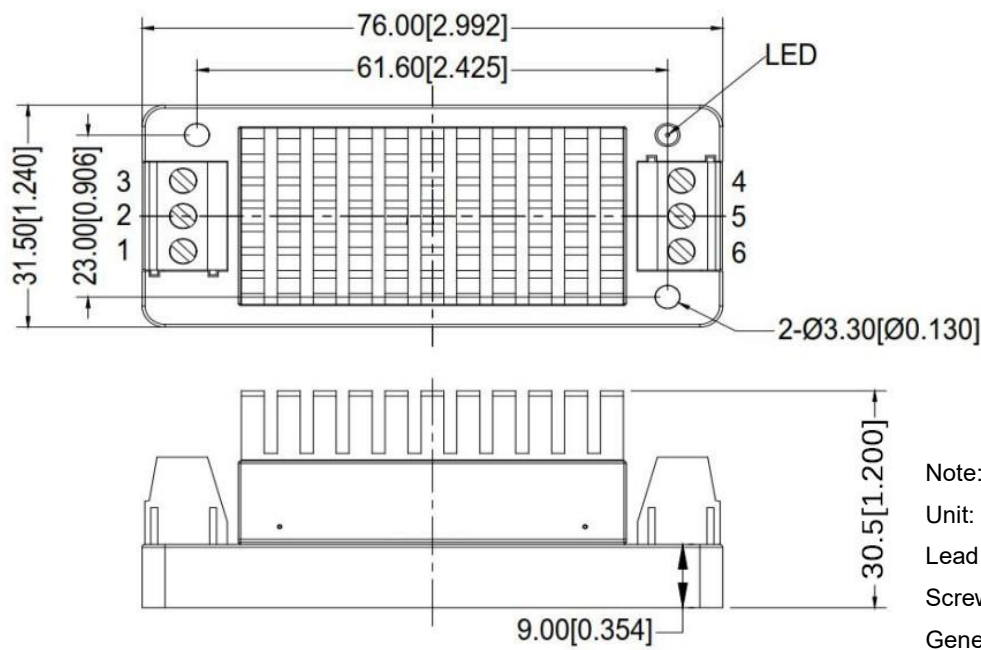
B1-T Mechanical Dimensions (Without Heat Sink)



Note:
Unit: mm[inch]
Lead wires gauge: 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
FD20-XXSXXB1C2	+Vin	-Vin	Ctrl	GND	No Connection	+Vo

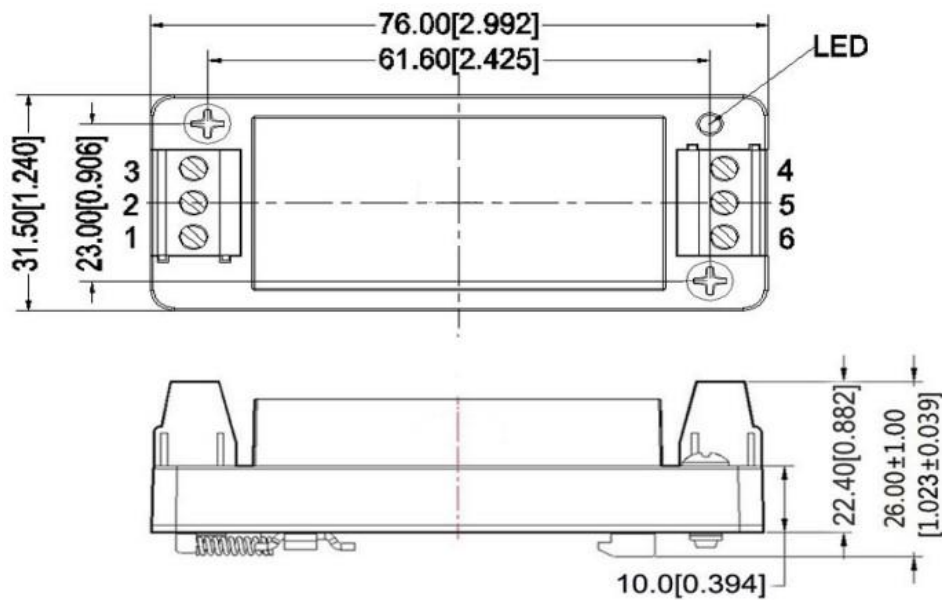
B1-TH Mechanical Dimensions (With Heat Sink)



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

Terminal No.	1	2	3	4	5	6
FD20-XXSXXB1C2	+Vin	-Vin	Ctrl	GND	No Connection	+Vo

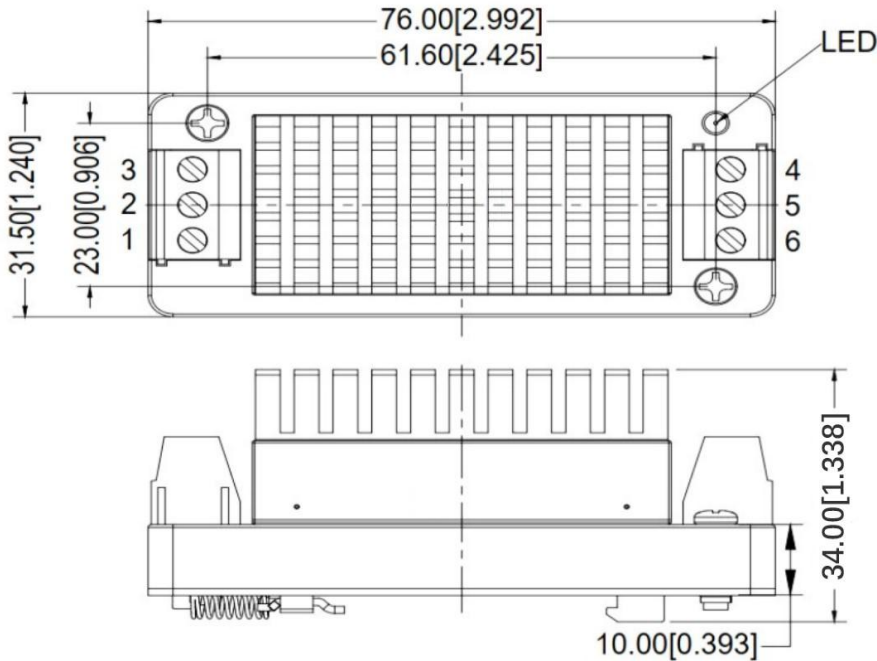
B1-TS Mechanical Dimensions (Without Heat Sink)



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

Terminal No.	1	2	3	4	5	6
FD20-XXSXXB1C2	+Vin	-Vin	Ctrl	GND	No Connection	+Vo

B1-TSH Mechanical Dimensions (With Heat Sink)



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

Terminal No.	1	2	3	4	5	6
FD20-XXSXXB1C2	+Vin	-Vin	Ctrl	GND	No Connection	+Vo

Other Models Pin-out Function Description

Pin/Terminal No.	1	2	3	4	5	6
FD20-XXSXXB1N2	+Vin	-Vin	No Pin	GND	No Pin	+Vo

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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