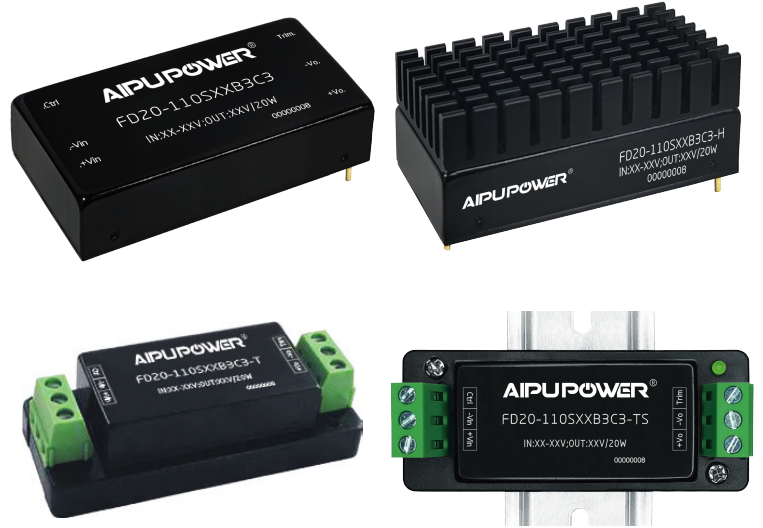


Typical Features

- ◆ Wide input voltage range (4:1), Output Power 20W
- ◆ Efficiency up to 89%(Typ.)
- ◆ Stand-by Power Consumption 0.2W(Typ.)
- ◆ Fast start-up output
- ◆ Continuous Short Circuit protection, Self-recovery
- ◆ Input under-voltage, output over voltage, short circuit & over current protections
- ◆ Isolation Voltage 2250VDC/1500VAC
- ◆ Operating Temperature from -40°C to +85°C
- ◆ Good EMC performance
- ◆ International standard pin-out



FD20-110SXXB3(C)3 Series ----- DIP mounted DC-DC modular converters with wide input voltage 40-160VDC, low standby power consumption, fast start-up, isolated & regulated single output 20W. This series of products can be widely used in the fields of industrial control, instrumentation, communications, electricity power, IoT & railway, etc. The additional circuit for EMC is recommended in this data sheet for the application with higher 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)		Full Load Efficiency (%)	
		Nom.	Range	Vo (VDC)	Io(mA) Max	Full load	No Load		u F	Typ.	Max	Min
		-	*FD20-110S3V3B3C3	110	40-160	3.3	5000	175	30	10000	80	140
-	FD20-110S05B3C3			5	4000	207	30	8000	80	140	86	88
-	*FD20-110S09B3C3			9	2222	204	30	4000	80	140	87	89
-	FD20-110S12B3C3			12	1667	207	2	2000	80	140	86	88
-	FD20-110S15B3C3			15	1333	202	2	1000	80	140	87	89
-	FD20-110S24B3C3			24	833	204	2	600	80	140	87	89
-	FD20-110S40B3C3			40	500	207	2	500	80	140	86	88

Note 1 - * marked part has been developed in process, C indicates the part with Remote Control, and N indicates the part without Control.

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 rail 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 operate at jitter frequency situation at no load or light load to decrease the no-load power consumption, so no load is not available. ≥20% load or a high-frequency resistance E-cap(≥ 330uF) load is recommended, to avoid the output ripple increasing.

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

Input Specifications

Item	Operating conditions	Min	Typ.	Max	Unit
Standby power consumption	Full input voltage range	/	0.2	/	W
Under-voltage protection	110V Nominal Input	32	/	40	VDC
Input inrush voltage (1sec.max)	110V Nominal Input	-0.7	/	180	VDC
Start-up time	/	/	50	/	mS
Hot plug	/	N/A			
Input filter	/	π filter			
Reflected ripple current	110V Nominal Input	30mA (Typ)			
CTRL	Turn-on the converter	No connection or connect to High level voltage (3.5V-12VDC)			
	Shut-off the converter	Connect to -Vin or connect to low level voltage (0-1.2VDC)			
	Current value for switching off	3mA (Typ.)			

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

Output Specifications

Item	Operating conditions	Min	Typ.	Max	Unit	
Output Voltage Accuracy	Full input voltage range	/	±1	±2	%	
Voltage Regulation	Full voltage range, full load	/	±0.2	±0.5	%	
Load Regulation	10%~100% load	/	±0.5	±1	%	
Ripple & Noise	20%-100%load, 20MHz bandwidth	/	80	140	mVp-p	
Dynamic recovery time	/	/	300	500	uS	
Dynamic response deviation	25% of rated load step, Nominal input voltage	3.3V, 5V output	/	±5	±8	%
		Other outputs	/	±3	±5	%
Turn on delay	Input nominal voltage	/	50	/	mS	
Output volt. adjustable (Trim)	Full input voltage range	/	/	10	%Vo	
Over-voltage Protection		110	150	230	%Vo	
Over-current Protection		110	160	220	%Io	
Short circuit Protection		Continuous, self-recovery				

Note: The ripple & noise ≤ 5%Vo at 0% - 20% load, the ripple and noise are tested by the twisted pair method. For detailed understood, please refer to the Ripple & Noise test Instructions in this manual.

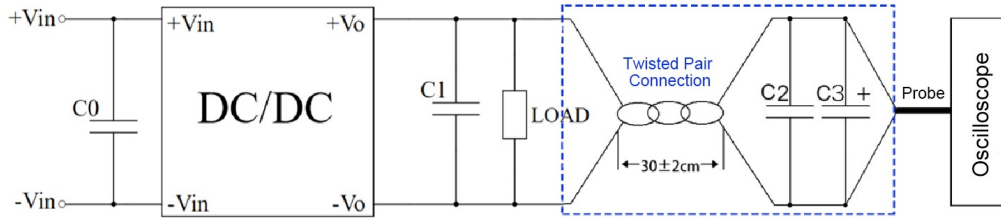
General Specifications

Item	Operating conditions	Min	Typ.	Max	Unit
Switching Frequency	Operating mode (PWM)	/	230	/	KHz
Operating Temperature	Refer to the temperature derating curve	-40	/	+85	°C
Storage Temperature	/	-55	/	+125	
Temperature of case	Within the temperature curve	/	/	+105	
Pin soldering temperature	1.5mm from the case, 10 seconds	/	/	300	
Relative Humidity	No condensation	5	/	95	%RH
Isolation Voltage	I/P-O/P, test for 1min, leakage current < 0.5mA	2250	/	/	VDC
	I/P-O/P, test for 1min, leakage current < 5mA	1500	/	/	VAC
Isolation capacitance	/	/	2200	/	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		
	FD20-110SXXB3(C)3	28g	50.8X25.4X13.0 mm	2.00X1.00X0.511 inch	
	FD20-110SXXB3(C)3-H	40g	50.8X25.4X23.0 mm	2.00X1.00X0.906 inch	
	FD20-110SXXB3(C)3-T	49g	76.0X31.5X22.3 mm	2.99X1.24X0.877 inch	
	FD20-110SXXB3(C)3-TH	61g	76.0X31.5X32.5 mm	2.99X1.24X1.279 inch	
	FD20-110SXXB3(C)3-TS	69g	76.0X31.5X27.0 mm	2.99X1.24X1.063 inch	
	FD20-110SXXB3(C)3-TSH	81g	76.0X31.5X36.5 mm	2.99X1.24X1.437 inch	

EMC Performances

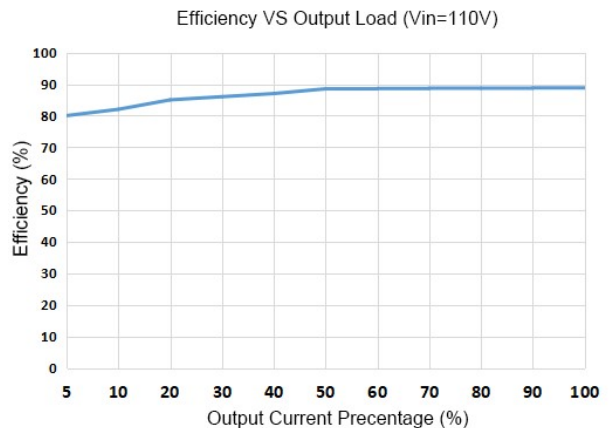
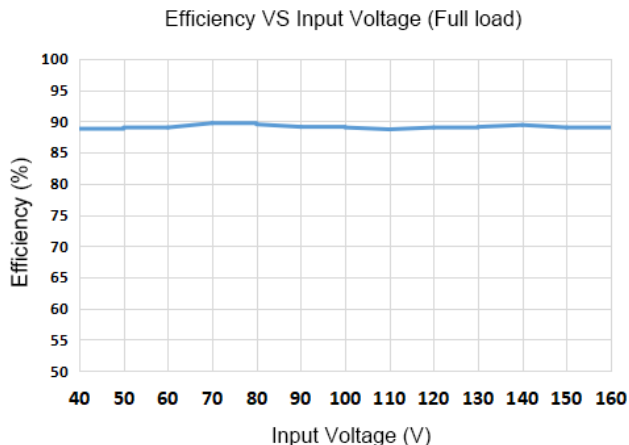
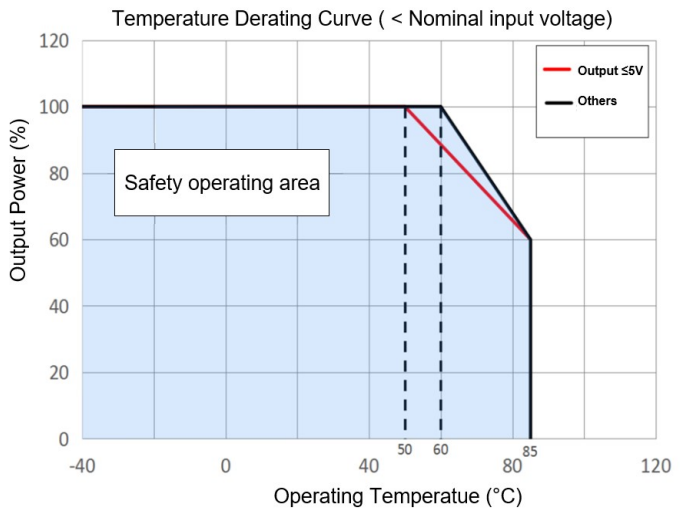
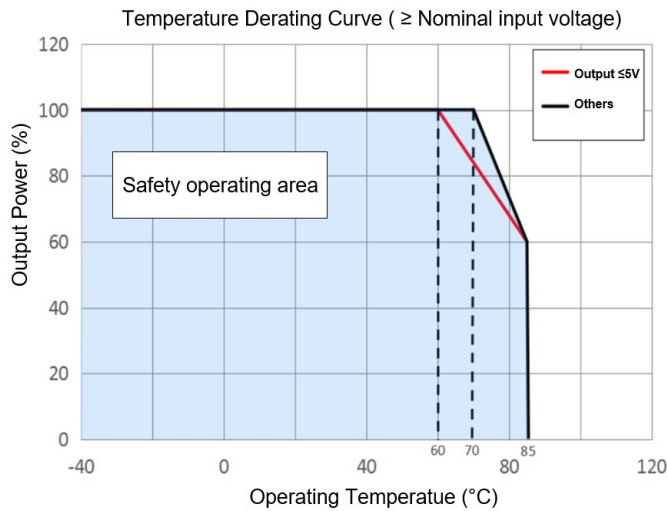
Total Item	Sub Item	Testing standard	Performance/Class
EMC	EMI	CE	CISPR32/EN55032 CLASS B (With Recommended EMC Circuit)
	EMS	RS	IEC/EN61000-4-3 10V/m Perf.Criteria A (With Recommended EMC Circuit)
		CS	IEC/EN61000-4-6 3Vr.m.s Perf.Criteria A (With Recommended EMC Circuit)
		ESD	IEC/EN61000-4-2 Contact ±4KV, Air ±6KV Perf.Criteria B
		Surge	IEC/EN61000-4-5 ±2KV Perf.Criteria B (With Recommended EMC Circuit)
		EFT	IEC/EN61000-4-4 ±2KV Perf.Criteria B (With Recommended EMC Circuit)
		Voltage dips & interruptions	IEC/EN61000-4-11 0%~70% Perf.Criteria B

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 started after input power on.
- 3) ≥20% load or a high-frequency low resistance E-cap(≥330uF) load is recommended, to avoid the output ripple increasing.

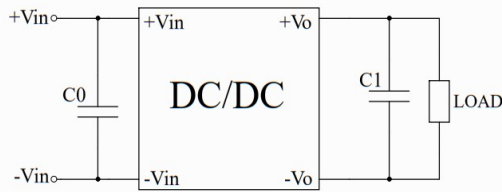
Product Performance Curves



FD20-110S24B3C3

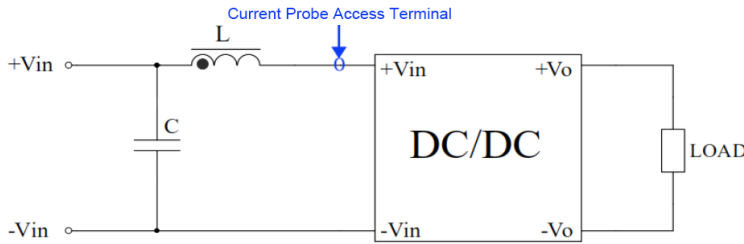
Recommended Circuits for Application

1. This series of converters will be tested with this circuit before shipping. The output ripple can be decreased with C0 or C1 capacitance increased, but the output capacitance must be less than the maximum capacitive load.



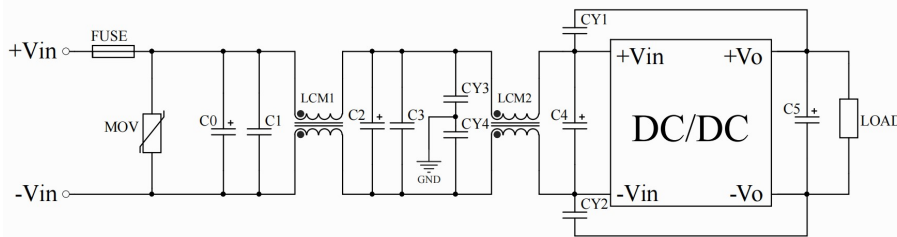
Components	Parameter
C0	47-100uF/200V
C1	330uF/50V

2. Input reflected ripple current test circuit



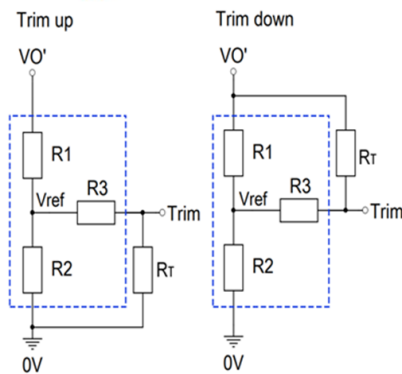
Components	Parameter
C	220uF/200V
L	4.7uH/15A

3. Recommended EMC circuit



Component	Parameter
FUSE	TBD by customer
MOV	14D201K
C0, C2, C4	330uF/200V
C1, C3	0.22uF/250V
LCM1, LCM2	15mH
C5	330uF/50V
CY1, CY2, CY3, CY4	Y1/222M/400VAC

4. Trim and Trim resistance calculation



Output Voltage	Trim internal circuit parameters			
	Vout (VDC)	R1(KΩ)	R2(KΩ)	R3(KΩ)
3.3	24	14.53	68	1.25
5	20	20	68	2.5
9	25.5	9.79	30	2.5
12	18	4.7	30	2.5
15	25.5	5.1	30	2.5
24	25.5	2.95	18	2.5
40	30	2	10	2.5

Rrim Resistance calculating fomula

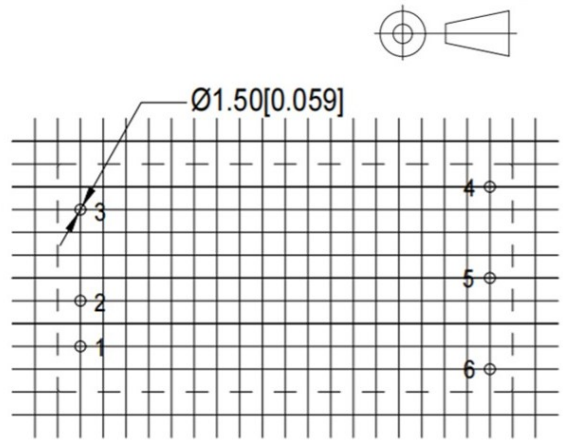
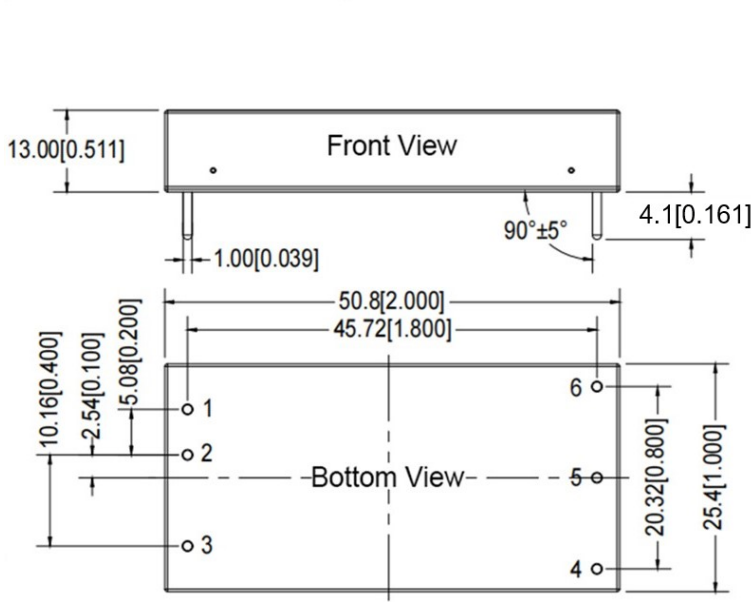
$$\text{up: } R_T = \frac{\alpha R_2}{R_2 - \alpha} - R_3 \quad \alpha = \frac{V_{ref}}{V_{o'} - V_{ref}} \cdot R_1$$

$$\text{down: } R_T = \frac{\alpha R_1}{R_1 - \alpha} - R_3 \quad \alpha = \frac{V_{o'} - V_{ref}}{V_{ref}} \cdot R_2$$

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

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

B3 Mechanical dimensions (without Heat Sink)

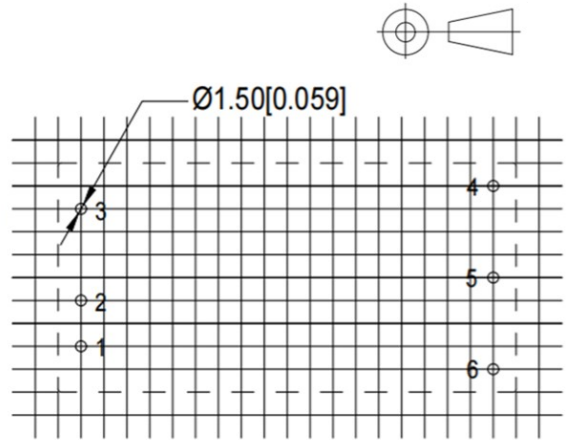
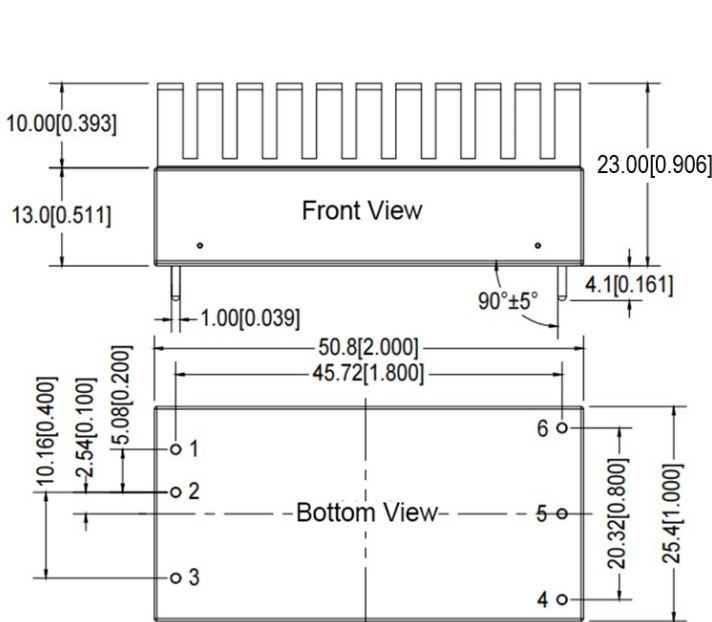


PCB layout vertical view
 Grid 2.54x2.54[0.10x0.10]

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
FD20-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

B3-H Mechanical dimensions (with Heat Sink)

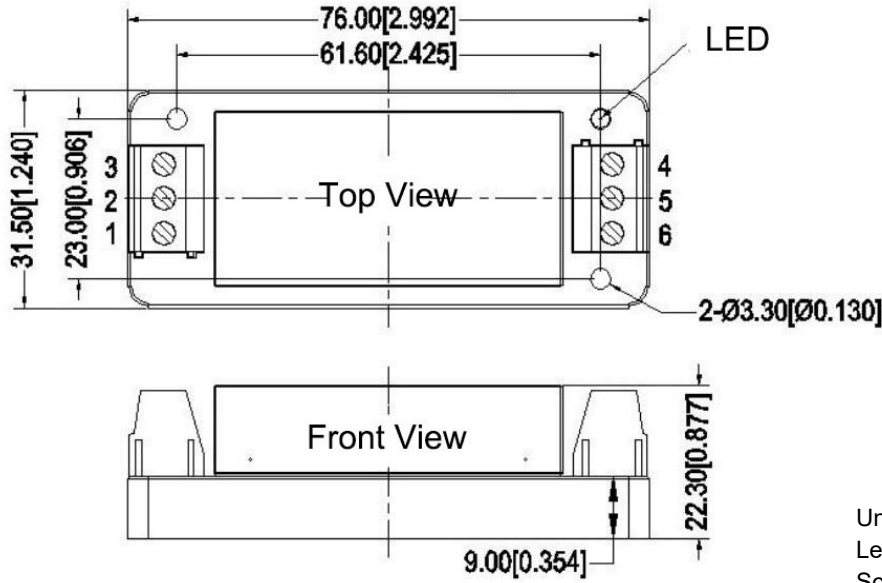


PCB layout vertical view
 Grid 2.54x2.54[0.10x0.10]

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
FD20-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

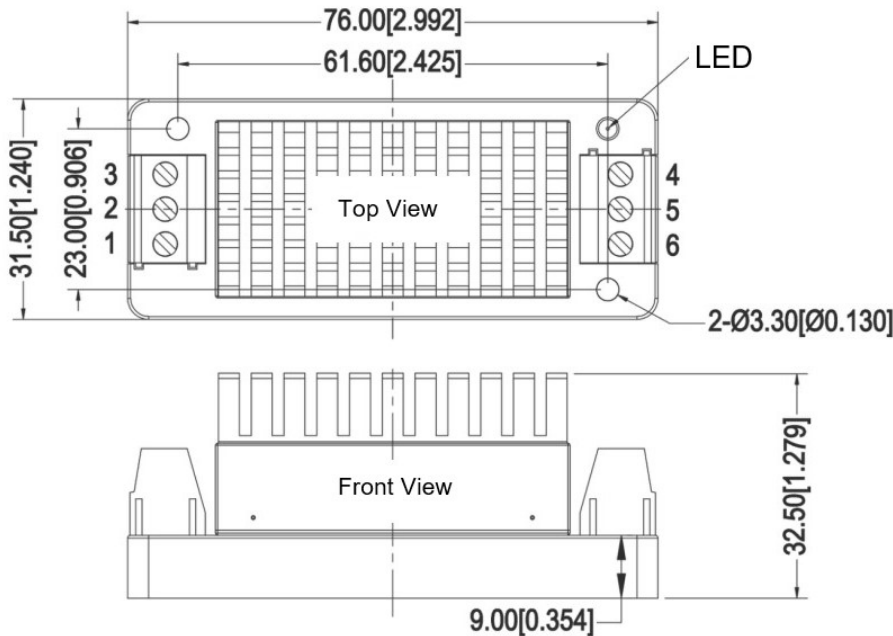
B3-T Mechanical dimensions (without Heat Sink)



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

Terminal No.	1	2	3	4	5	6
FD20-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

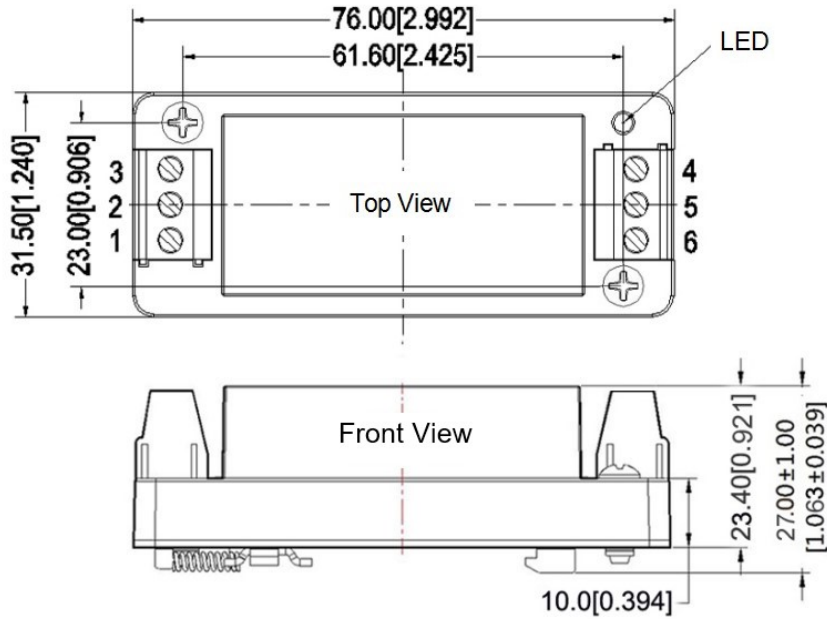
B3-TH Mechanical dimensions (with Heat Sink)



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

Terminal No.	1	2	3	4	5	6
FD20-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

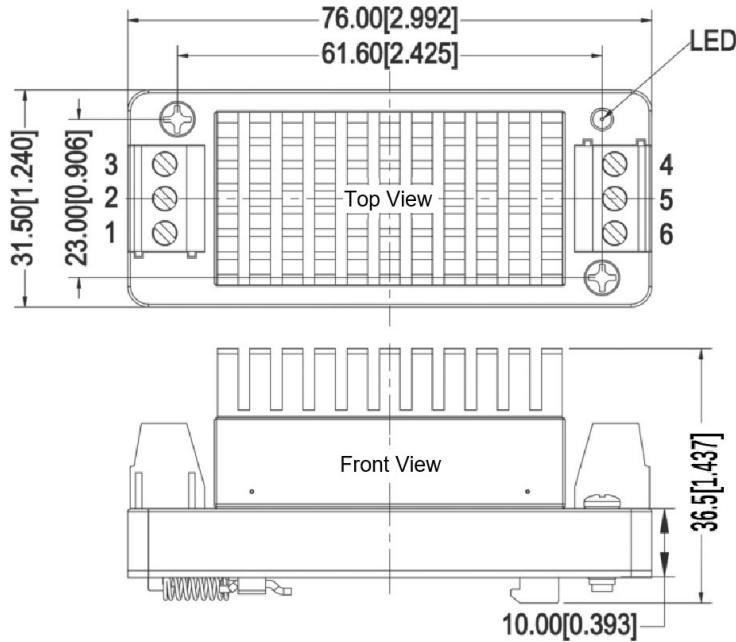
B3-TS Mechanical dimensions (without Heat Sink)



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
FD20-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

B3-TSH 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
FD20-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+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 $T_a=25^{\circ}\text{C}$, 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.
8. The product specifications may be modified without prior notice. Please refer to the published data sheet at Aipupower website.

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>