

Product Typical Features

- ◆ Wide input voltage range (4:1), Output Power 20W
- ◆ Efficiency up to 89%
- ◆ 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: -40°C~+85°C
- ◆ Good EMC performance
- ◆ International standard pin-out



FD20-110SXXB3(C)3 Series ----- Output power 20W DC-DC module convertor, ultra-wide input voltage 40-160VDC, low standby power consumption, fast start-up, isolated & regulated output, DIP package. Be widely used in industrial control, instrumentation, communications, electricity power, IoT, railways and other fields. 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) @ Nominal Voltage		Max. Capacitive Load	Ripple & Noise (mVp-p)		Full Load Efficiency (%)	
		Rated	Range	Voltage (VDC)	Current (mA) Max./ Min.	Full load (Typ.)	No Load (Typ.)		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 Control pin, and N indicates the part without Control pin.
 Note 2: The suffix -H indicates the part with Heat sink, -T (H) indicates a kind of packaging with terminals & heat sink, -TS (H) indicates a kind of packaging of DIN Rail & heat sink.
 Note 3: The maximum capacitive load is the capacitance allowed to be used when the power supply operate at full load. The convertor may not start up if the capacitor exceeds this value.
 Note 4: The chip could operate at jitter frequency situation at no load or light load in order to decrease 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	Working conditions	Min	Typ.	Max	Unit
Standby power consumption	Input voltage range	/	0.2	/	W
Input under-voltage protection	110V Rated Input	32	/	40	VDC
Input surge voltage (1sec.max)	110V Rated Input	-0.7	/	180	VDC
Start-up time	/	/	50	/	ms
Hot plug	/	N/A			
Input filter	/	π filter			
Reflected ripple current	110V Rated Input	30mA (Typ)			
CTRL	Module turn-on	Not connected or connect to High level voltage (3.5V-12VDC)			
	Module shut-off	Connect to -Vin or connect to low level voltage (0-1.2VDC)			
	Current value to shut off the input	3mA(Typ)			

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

Output Specifications

Item	Working conditions	Min	Typ.	Max	Unit	
Output Voltage Accuracy	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, rated input voltage	3.3V, 5V output	/	±5	±8	%
		Other output	/	±3	±5	%
Turn on delay	Input rated voltage	/	50	/	ms	
Output voltage adjustable (Trim)	Input voltage range	/	/	10	%Vo	
Output over-voltage Protection		110	150	200	%Vo	
Output over-current Protection		110	160	220	%Io	
Output 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 details understood, please refer to the Ripple & Noise test Instructions in this manual.

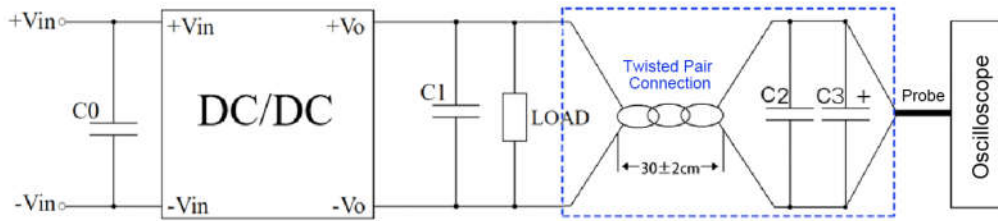
General Specifications

Item	Working conditions	Min	Typ.	Max	Unit
Switching Frequency	Operating mode (PWM)	/	230	/	KHz
Operating Temperature	Refer to temperature derating curve	-40	/	+85	°C
Storage Temperature	/	-55	/	+125	
Temperature of case	Refer to product performance curve	/	/	+105	
Pin soldering temperature	1.5mm between the soldering point and 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 capacitor	Typical	/	2200	/	pF
MTBF	MIL-HDBK-217F@25°C	1000	/	/	K hours
Cooling method	Nature air				
Case material	Aluminum				
Weight/ Dimension	Model No.	Weight (Typ)	L x W x H		
	FD20-110SXXB3(C)3	28g	50.80X25.40X13 mm		2.00X1.00X0.511 inch
	FD20-110SXXB3(C)3-H	40g	50.80X25.40X23 mm		2.00X1.00X0.905 inch
	FD20-110SXXB3(C)3-T	49g	76X31.5X22.3 mm		2.99X1.24X0.877 inch
	FD20-110SXXB3(C)3-TH	61g	76X31.5X32.5 mm		2.99X1.24X1.279 inch
	FD20-110SXXB3(C)3-TS	69g	76X31.5X27 mm		2.99X1.24X1.063 inch
	FD20-110SXXB3(C)3-TSH	81g	76X31.5X37.2 mm		2.99X1.24X1.464 inch

EMC Performances

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

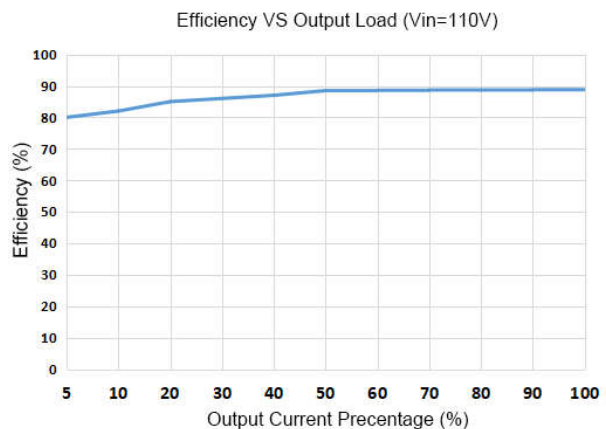
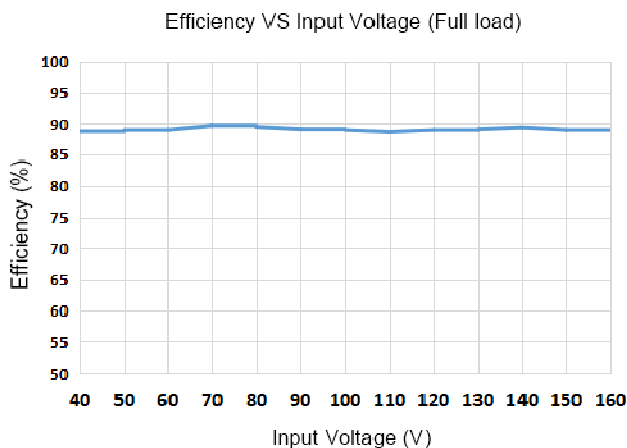
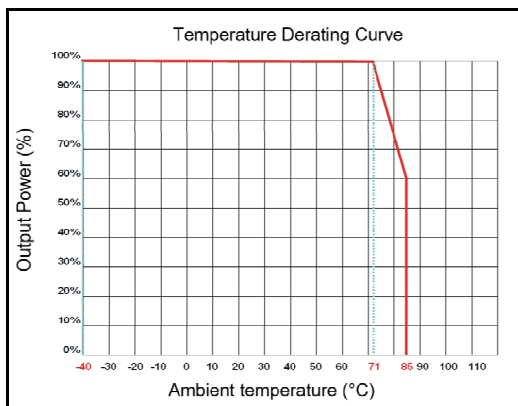
Ripple & Noise Test Instruction (Twisted Pair Method, 20MHz Bandwidth)



Test conditions:

- 1) Ripple noise test need 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 reverse. The test can be started after input power on.
- 3) ≥20% load or a high-frequency resistance E-cap(≥ 330uF) load is recommended, to avoid the output ripple increasing.

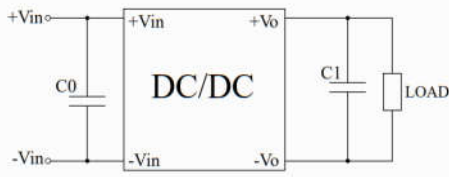
Product Performance Curve



FD20-110S24B3C3

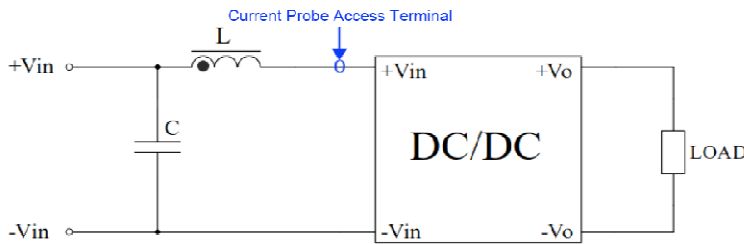
Recommended Circuits for Application

1. This series of converters are tested with this circuit by FQC before shipping. The output ripple could be improved with C0 or C1 capacitance increased, but the output capacitance must be less than the maximum capacitive load.



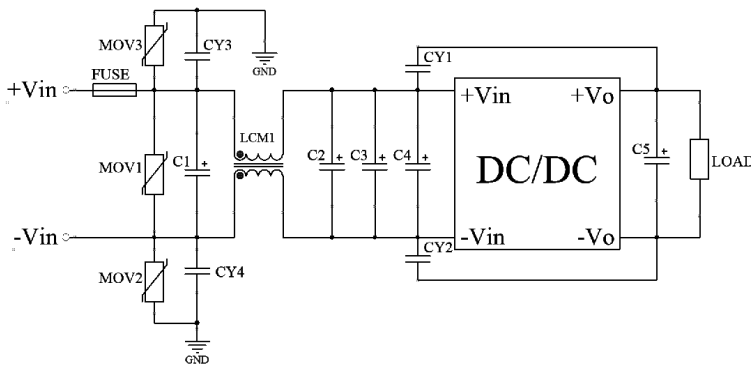
Components	Parameter
C0	47-100uF/200V
C1	330uF/50V

2. Input reflected ripple current test circuit



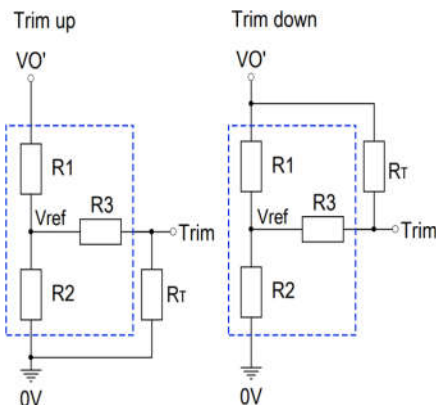
Components	Parameter
C	220uF/200V
L	4.7uH/15A

3. Recommended circuit for EMC.



Components	Parameter
FUSE	TBD by customer
MOV1, MOV2, MOV3	14D201K
C1, C2, C3	100uF/200V
LCM1	15mH
C4	47uF/200V
C5	100uF/50V
CY1,CY2,CY3,CY4	2.2nF/2KV

4. Trim and Trim resistance calculation.



Note: The dotted area is an internal part of the product.

Trim resistance calculation formula:

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

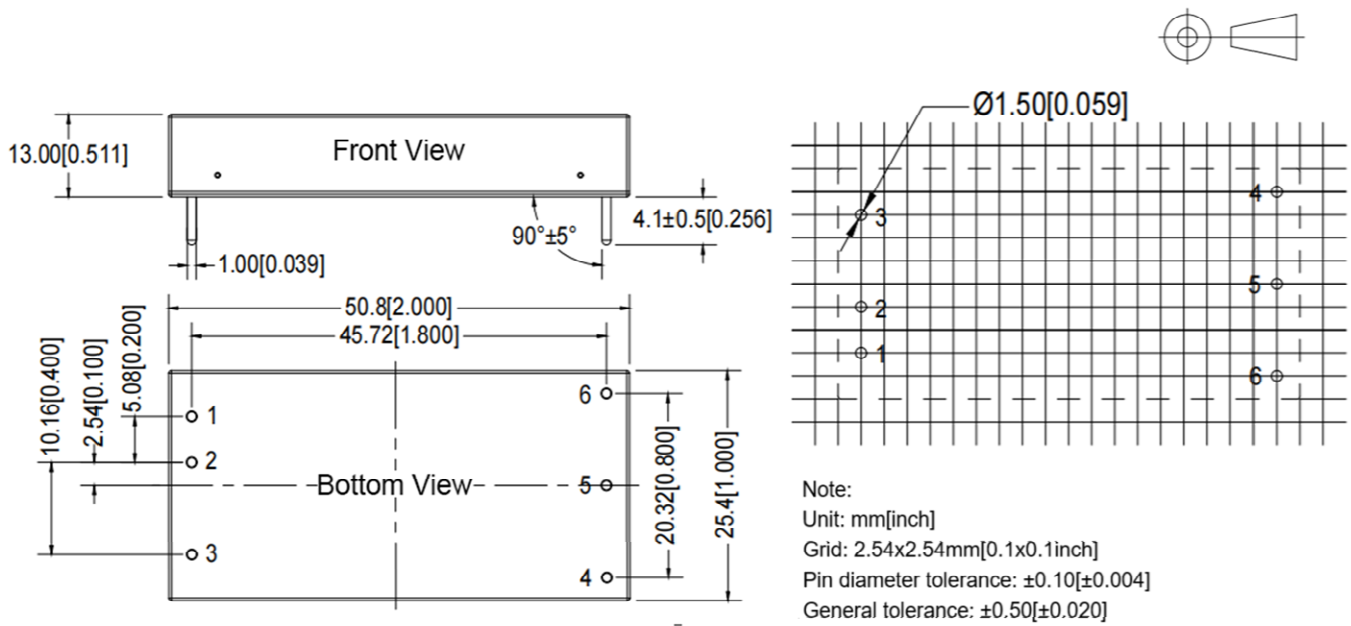
RT is the Trim resistance

α is a custom parameter

Vo' is the actual adjustable voltage

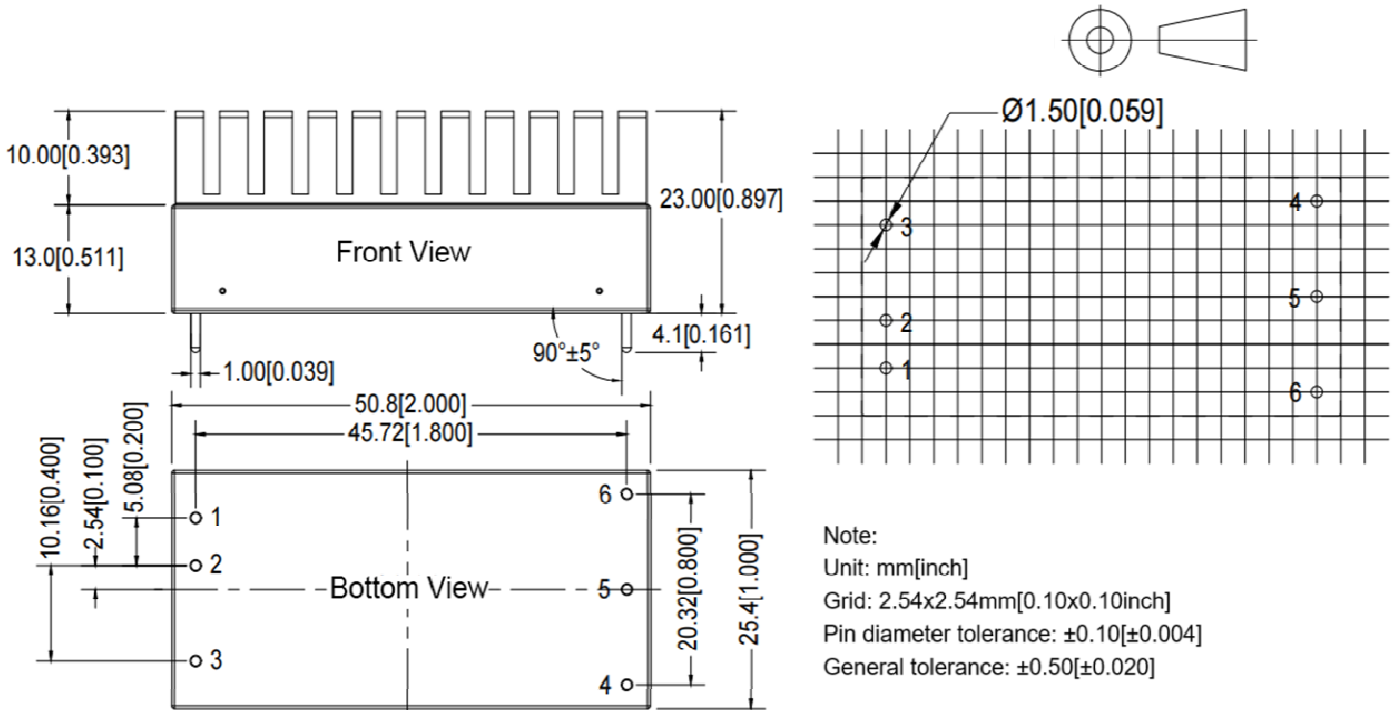
Output Voltage	Trim internal circuit parameters			
	Vout(VDC)	R1(KΩ)	R2(KΩ)	R3(KΩ)
3.3	24	14.53	68	1.25
5	20	20	68	2.5
9	25.5	9.79	30	2.5
12	18	4.7	30	2.5
15	25.5	5.1	30	2.5
24	25.5	2.95	18	2.5
40	30	2	10	2.5

B3 Packaging (without Heat Sink)



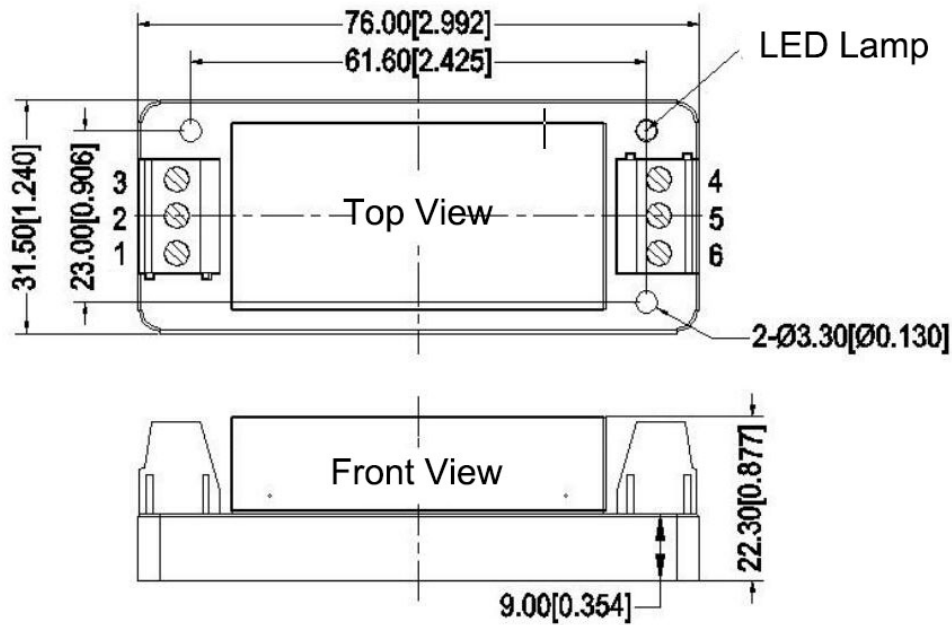
Pin	1	2	3	4	5	6
FD20-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

B3-H Packaging (with Heat Sink)



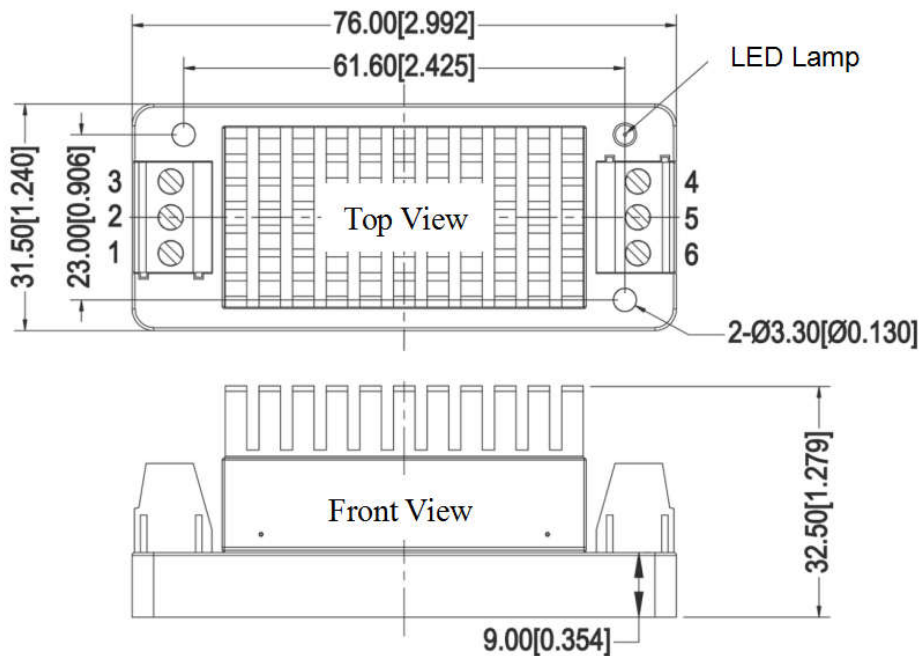
Pin	1	2	3	4	5	6
FD20-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

B3-T Packaging (without Heat Sink)



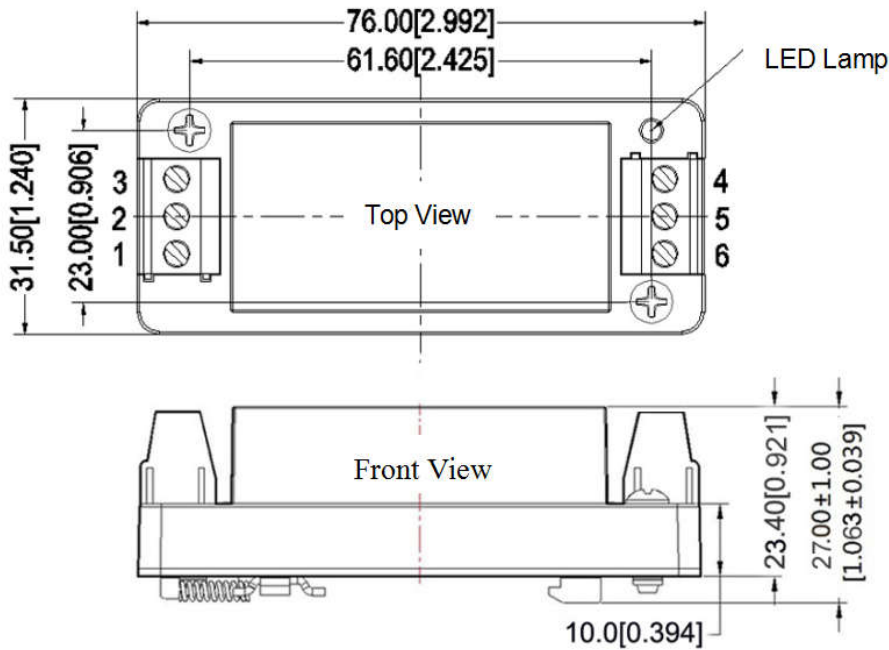
Pin	1	2	3	4	5	6
FD20-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

B3-TH Packaging (with Heat Sink)



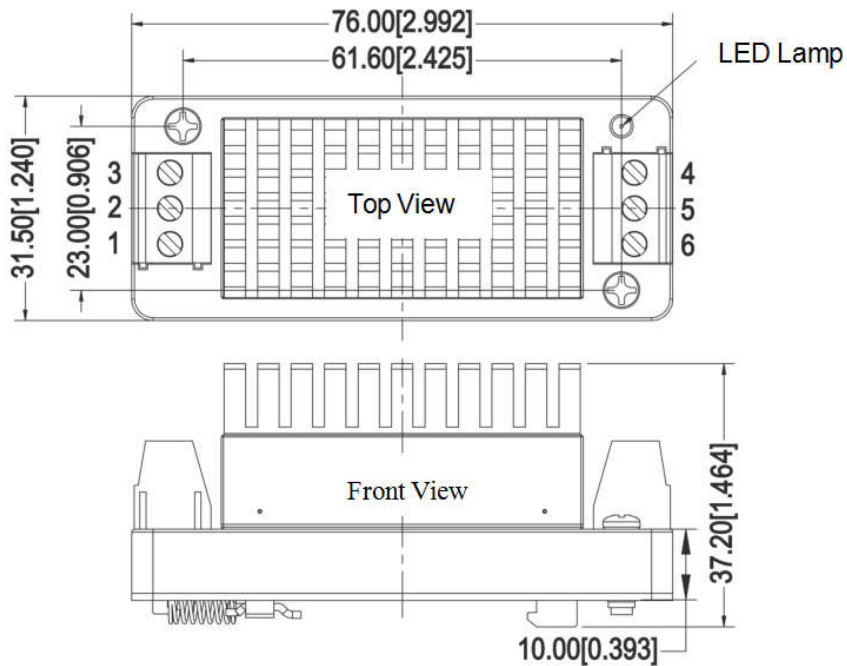
Pin	1	2	3	4	5	6
FD20-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

B3-TS Packaging (without Heat Sink)



Pin	1	2	3	4	5	6
FD20-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

B3-TSH Packaging (with Heat Sink)



Pin	1	2	3	4	5	6
FD20-110SXXB3C3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

Other Models Pin Definition

Pin	1	2	3	4	5	6
FD20-110SXXB3N3	+Vin	-Vin	NP	Trim	-Vo	+Vo

Note:

1. The products should be used according to the specifications in this manual, otherwise it could be permanently damaged.
2. The product performances in this manual cannot be guaranteed if it works at a lower load than the minimum load defined.
3. The product performances in this manual cannot be guaranteed if it works at over-load condition.
4. Unless otherwise specified, all values or indicators in this manual are tested at Ta=25°C, humidity<75%RH, rated input voltage and rated load (pure resistance load).
5. All values or indicators in this manual had been tested based on Aipupower test specifications.
6. The specifications are specially for the parts listed in this manual, any other non-standard model performances could be out of the specifications. Please contact our technician for specific requirement.
7. Aipupower can provide customization service.
8. The product specifications may be modified without a prior notice. Please refer to the published data sheet in Aipupower website.

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