

**Product Typical Features**

- ◆ Wide Input Voltage Range (4:1), output power 50W
- ◆ Efficiency up to 89%(Typ.)
- ◆ Standby power consumption 3W(Typ.)
- ◆ Output fast startup
- ◆ Continuous Short Circuit protection, Self-recovery
- ◆ Input under voltage, output over voltage, short circuit, over current protections
- ◆ Isolation Voltage 3000VDC / 1500VAC
- ◆ Operating temperature: -40°C~+85°C
- ◆ Good EMC performance
- ◆ International standard pin-out



**Application Field**

**FD50-110SXXB3C3(-XXX) Series** --- 50W DC-DC module power supply with 4:1 wide range input voltage, fast startup, isolated & regulated output, DIP/Terminal Chassis/DIN rail packages. The products are widely used in 72V, 96V, 110V industrial control, Electric power equipment, communications, robots and railway electronic equipment. 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) @Rated Voltage		Max Capacitive Load (uF)	Ripple & Noise (mVp-p)		Efficiency @ output full load (%)	
		Rated	Range	Voltage (VDC)	Current (mA) Max./Min.	Full Load Typ.	No Load Typ.	Max	Typ.	Max.	Min.	Typ.
		-	FD50-110S3V3B3C3	110	40-160	3.3	10	345	25	10000	50	100
-	FD50-110S05B3C3	5	10			525	25	8000	50	100	84	86
-	FD50-110S12B3C3	12	4.167			525	2	3300	150	200	86	88
-	FD50-110S15B3C3	15	3.333			525	2	1200	150	200	86	88
-	FD50-110S24B3C3	24	2.083			525	2	680	150	200	87	89
-	FD50-110S48B3C3	48	1.042			525	2	470	150	200	87	89

Note 1: The suffix -H indicates the part with Heat sink, -T (H) indicates a kind of packaging with terminals (with heat sink), -TS (H) indicates a kind of packaging of DIN Rail (with heat sink).

Note 2: The maximum capacitive load is the capacitance allowed to be used when the power supply operate at full load. The converter may not start up if the capacitor exceeds this value.

Note 3: In The chip could operate at jitter frequency situation at no load or light load to decrease no-load power consumption, so no load is not available.  $\geq 5\%$  load or a high-frequency resistance E-cap( $\geq 470\mu F$ ) load is recommended, to avoid the output ripple increasing.

Note 4: Please contact with Aipu sales for other output voltages requirement in this series but not in this table.

Input Specifications					
Items	Test Conditions	Min.	Typ.	Max.	Unit
Stand-by Power Consumption	Input voltage range	/	3	/	W
Input Under-Voltage Protection	110V rated input	32	/	40	VDC
Input inrush voltage (1sec.max)		-0.7	/	160	VDC
Turn on delay	/	/	10	/	ms
Hot plug	/	Unavailable			
Input Filter	/	π filter			
Reflected ripple current	110V rated input	100mA (Typ.)			
Control (*Ctrl)	turn on the power module	No connection or connect to high level(3.5V-12VDC)			
	shut off the power module	Connect to -Vin or low level(0-1.2VDC)			
	the current value to shut off input	1mA(Typ.)			

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

Output Specifications						
Items	Test Conditions	Min.	Typ.	Max.	Unit	
Output Voltage Accuracy	Input voltage range	/	±1	±2	%	
Voltage Regulation	Full voltage range, full load	/	±0.5	±1	%	
Load Regulation	10%-100% load	/	±0.5	±1	%	
Ripple & Noise	5%-100% load, 20MHz bandwidth	3.3V/ 5V output	/	50	100	mVp-p
		Other output	/	150	200	
Dynamic Recovery Time	25% rated load	/	300	500	uS	
Dynamic Response Deviation	step, rated input voltage	3.3V/ 5V output	/	±5	±8	%
		Other output	/	±3	±5	
O/P voltage adjustable (Trim)	Input voltage range	/	/	10	%Vo	
O/P Over voltage protection		110	150	190	%Vo	
O/P Over current protection		120	150	200	%Io	
Short Circuit Protection		Hiccup, continuous, self-recovery				

Note: 0-5% load ripple & noise ≤5%Vo; The ripple and noise are tested by the twisted pair method according to the Ripple & Noise Test Instructions in the manual.

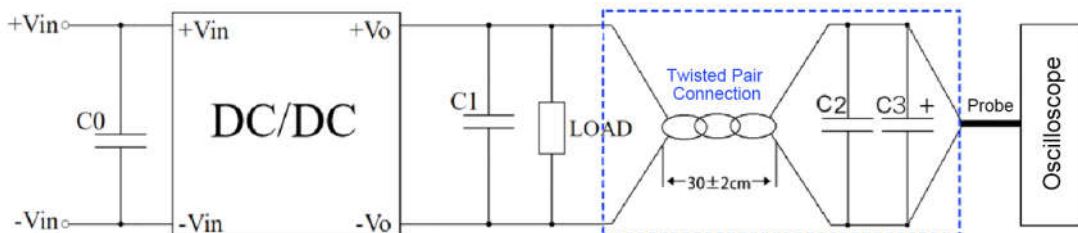
General Specifications					
Items	Test Conditions	Min.	Typ.	Max.	Unit
Switching Frequency	Operating Mode(PWM)	/	300	/	KHz
Operating Temperature	Refer to Temperature Derating Curve	-40	/	+85	°C
Storage Temperature	/	-55	/	+125	
Max case temperature	Refer to product performance curve	/	/	+105	
Pin Soldering Temperature	1.5mm from the case, 10 seconds	/	/	300	
Relative Humidity	No condensing	5	/	95	%RH
Isolation Voltage	Input-output, test 1min, leakage current<0.5mA	3000	/	/	VDC

	Input-output, test 1min, leakage current<5mA	1500	/	/	VAC
Isolation Capacitance	Typical	/	2000	/	pF
MTBF	MIL-HDBK-217F@25°C	1000	/	/	K hours
Cooling Method	Nature air				
Case Material	Aluminum				
Weight/ Dimension	Part No.	Weight Typ.	L x W x H		
	FD50-110SXXB3C3	30g	50.80X25.40X13mm		2.00X1.00X0.511inch
	FD50-110SXXB3C3-H	42g	50.80X25.40X23mm		2.00X1.00X0.905inch
	FD50-110SXXB3C3-T	51g	76X31.5X22.3mm		2.99X1.24X0.877inch
	FD50-110SXXB3C3-TH	63g	76X31.5X32.5mm		2.99X1.24X1.279inch
	FD50-110SXXB3C3-TS	71g	76X31.5X27mm		2.99X1.24X1.063inch
	FD50-110XXSXXB3C3-TSH	83g	76X31.5X36.5mm		2.99X1.24X1.437inch

**EMC Performance**

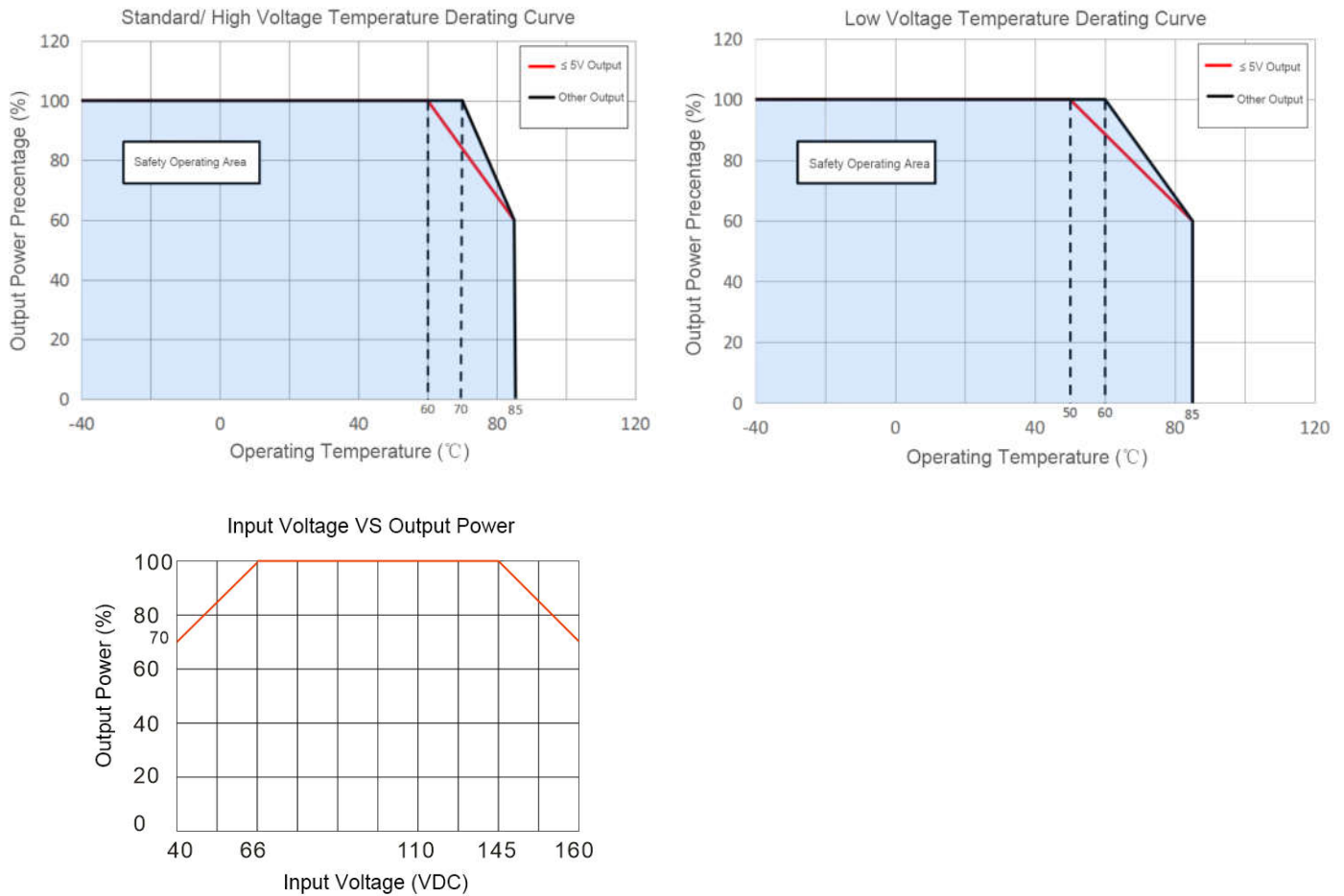
Total Item	Sub Item	Test Standard	Performance/Class
EMC	EMI	CE	CISPR32/EN55032 CLASS A (EMC Recommended Circuit)
	EMS	RS	IEC/EN61000-4-3 10V/m Perf.Criteria A (EMC Recommended Circuit)
		CS	IEC/EN61000-4-6 3Vr.m.s Perf.Criteria A (EMC Recommended Circuit)
		ESD	IEC/EN61000-4-2 Contact ±4KV Perf.Criteria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

**Ripple & Noise Test Instruction (Twisted Pair Method, 20MHZ bandwidth)**



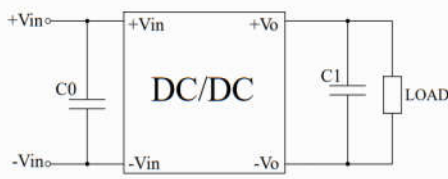
- 1) Ripple noise test need 12# twisted pair cables, an oscilloscope which should be set at the Sample Mode, bandwidth 20MHz. 100M bandwidth probe with cap and ground removed. C2(0.1uF) polypropylene capacitor and C3(10uF) high-frequency low-resistance electrolytic capacitor are connected in parallel 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) It is recommended to connect a ≥5% load or a high-frequency resistance E-cap(≥470uF) load at output to avoid the output ripple increasing.

**Product Performance Curve**



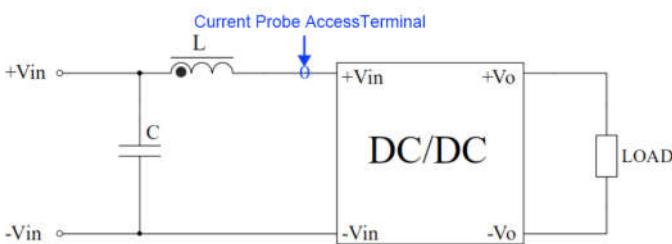
**Recommended Circuits for Application**

1. This series of power supplies are tested according to this circuit before shipping. Increasing the capacity of C0 or C1 can reduce the output ripple, but the output capacity must be less than the maximum capacitive load.



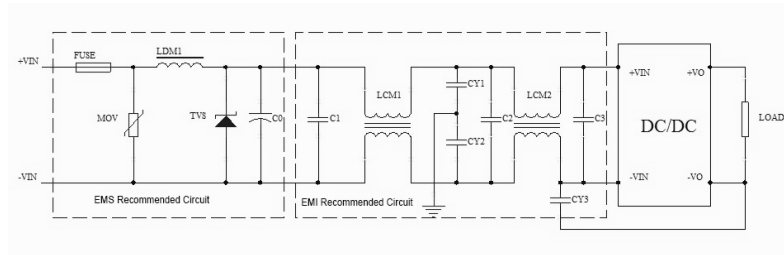
Component	Parameter
C0	47-100uF/100V
C1	470uF/50V

2. Input reflected ripple current test circuit.



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

**3. Recommended EMC circuits**



Component	Parameter
FUSE	TBD by customer
MOV	14D201K
LDM1	56uH
TVS	SMCJ170A
C0	560uF/200V
C1,C2,C3	4.7uF/200V
LCM1	15mH
LCM2	56uH
CY1,CY2,CY3	1nF/3KV

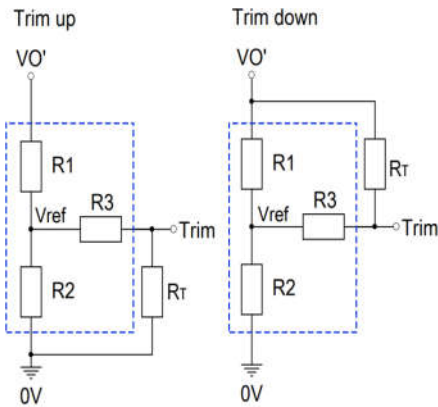
**4. Trim and calculation of Trim resistance**

Calculation formula of Trim resistance:

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

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

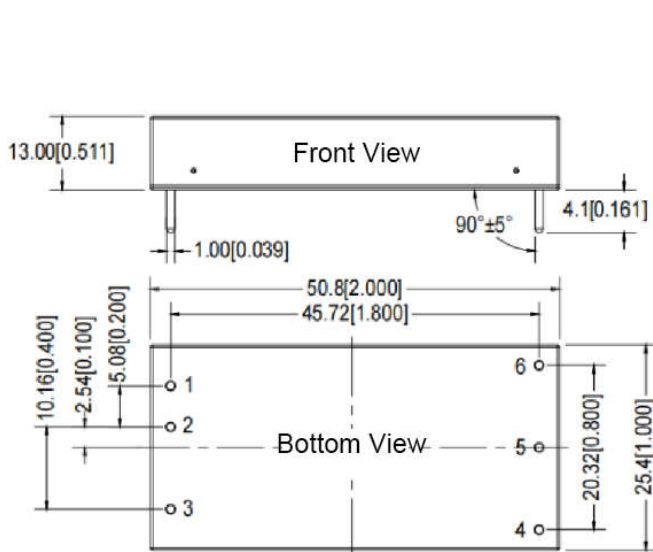
$R_T$  is the Trim resistor,  $\alpha$  is a custom parameter, and  $V_{o'}$  is the actual voltage of Trim up or Trim down.



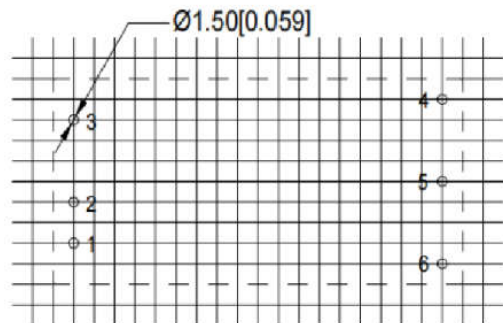
Note: Trim up & down circuits, the components in the dotted area are inside of the convertor.

Output Voltage	Trim uses internal circuit parameters			
Vout(DC)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	24	14.53	68	1.25
5	24	24	68	2.5
12	18	4.7	30	2.5
15	24	4.78	30	2.5
24	25.5	2.955	18	2.5

**B3 Packaging Dimension (Without heat-sink)**



Third Angle Projection

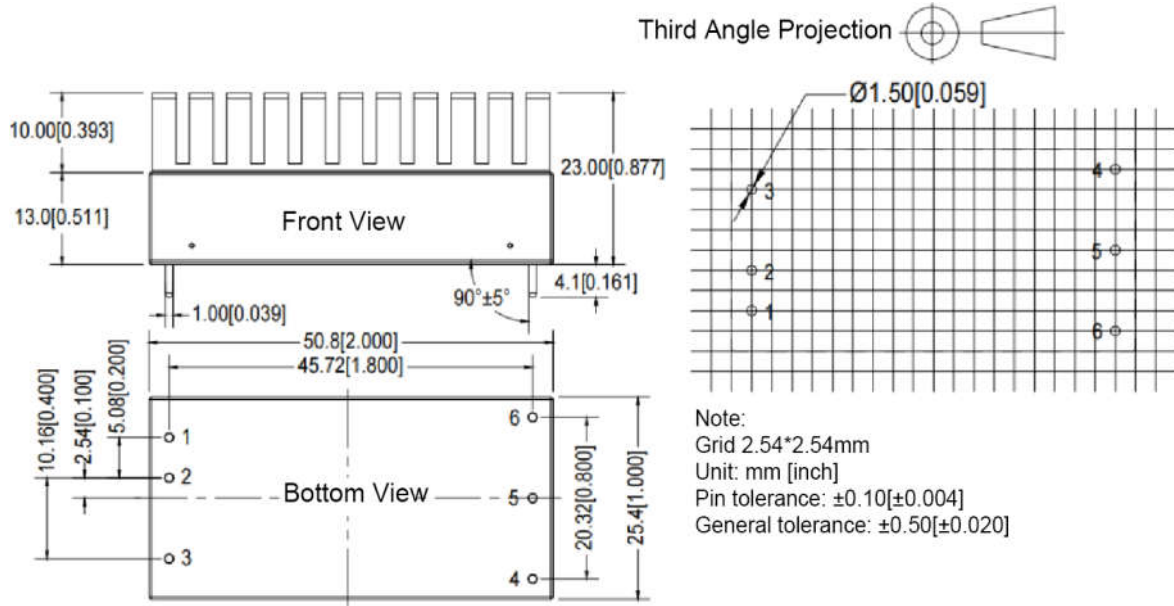


Note:  
Grid 2.54\*2.54mm  
Unit: mm [inch]  
Pin tolerance: ±0.10[±0.004]  
General tolerance: ±0.50[±0.020]

Pin No.	1	2	3	4	5	6
FD50-110SXXB3C3	+Vin	-Vin	Ctrl	NC	-Vo	+Vo

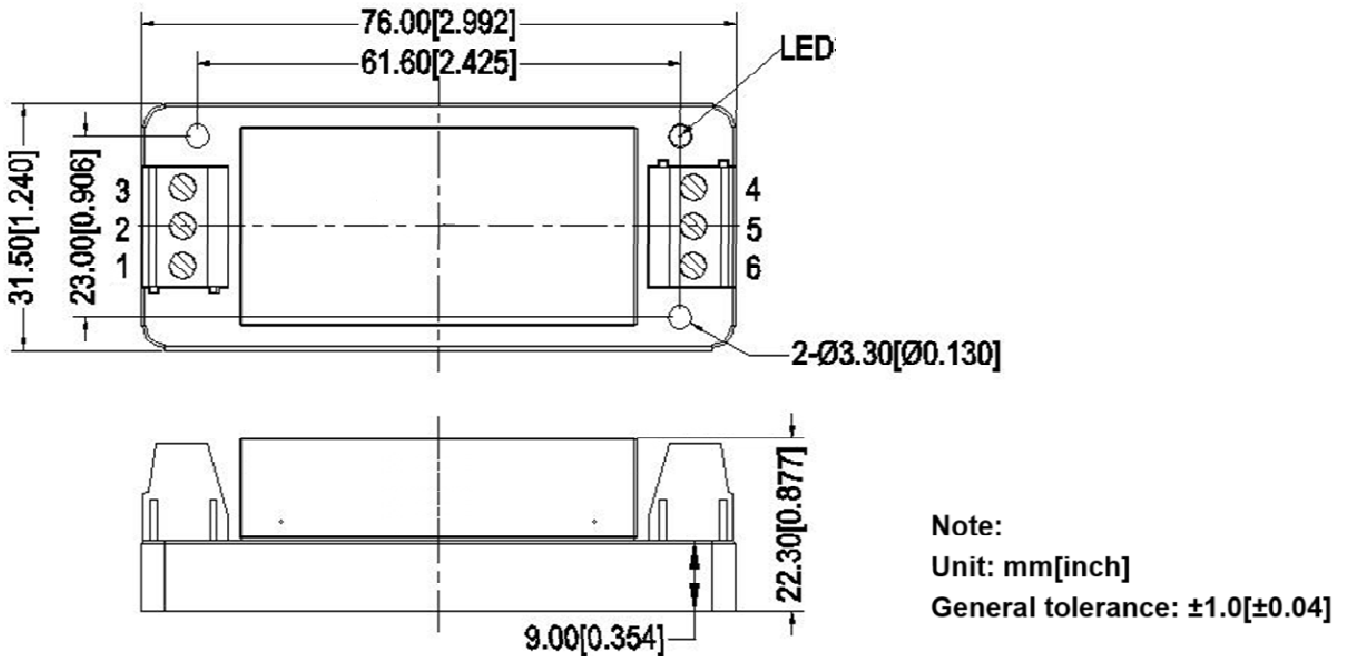


**B3-H Packaging Dimension (With heat-sink)**



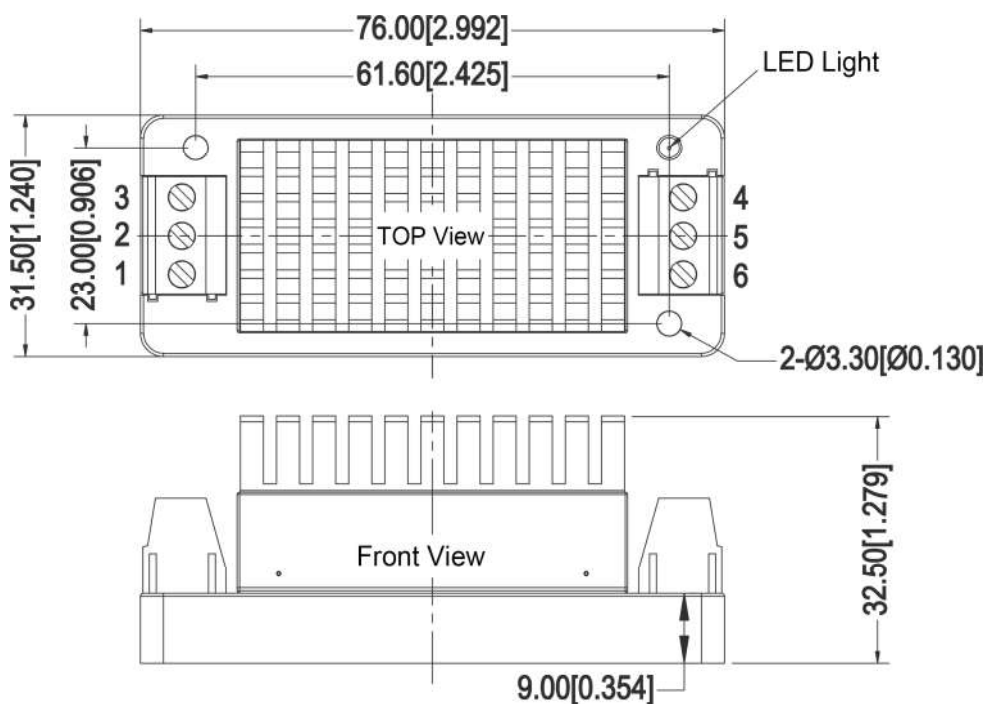
Pin No.	1	2	3	4	5	6
FD50-110SXXB3C3	+Vin	-Vin	Ctrl	NC	-Vo	+Vo

**B3-T Packing Dimension (Without heat-sink)**



Pin No.	1	2	3	4	5	6
FD50-110SXXB3C3	+Vin	-Vin	Ctrl	NC	-Vo	+Vo

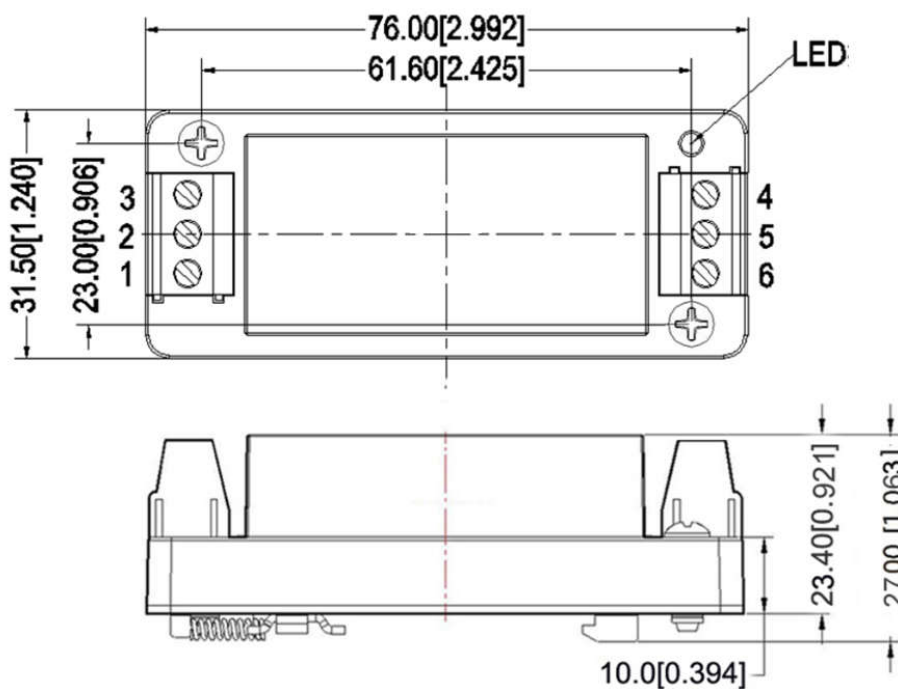
**B3-TH Packaging Dimension (With heat-sink)**



**Note:**  
 Unit: mm[inch]  
 General tolerance:  $\pm 1.0[\pm 0.04]$

Pin No.	1	2	3	4	5	6
FD50-110SXXB3C3	+Vin	-Vin	Ctrl	NC	-Vo	+Vo

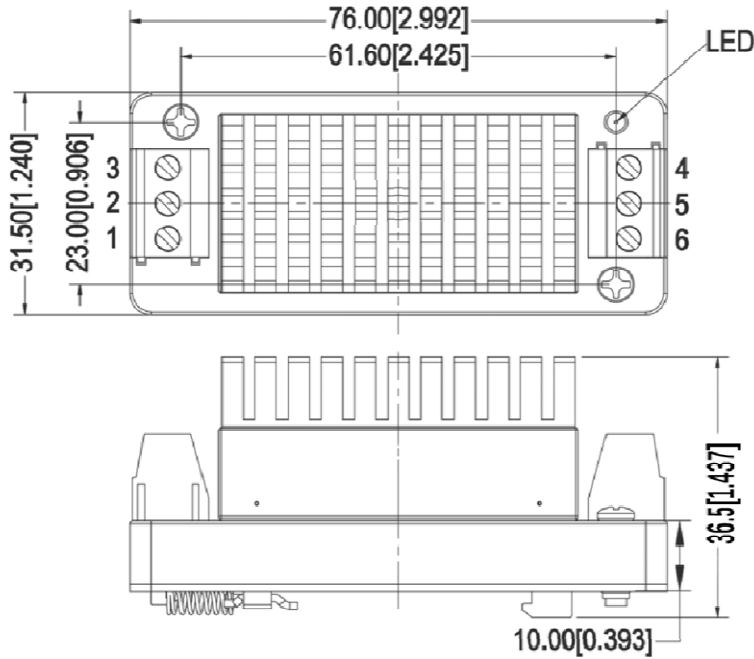
**B3-TS Packaging Dimension (Without heat-sink)**



**Note:**  
 Unit: mm[inch]  
 General tolerance:  $\pm 1.0[\pm 0.04]$

Pin No.	1	2	3	4	5	6
FD50-110SXXB3C3	+Vin	-Vin	Ctrl	NC	-Vo	+Vo

**B3-TSH Packaging Dimension (With heat-sink)**



**Note:**  
**Unit: mm[inch]**  
**General tolerance: ±1.0[±0.04]**

Pin No.	1	2	3	4	5	6
FD50-110SXXB3C3	+Vin	-Vin	Ctrl	NC	-Vo	+Vo

**Other Models Pin Definition**

Pin No.	1	2	3	4	5	6
FD50-110SXXB3R3	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo
FD50-110SXXB3T3	+Vin	-Vin	NP	Trim	-Vo	+Vo
FD50-110SXXB3N3	+Vin	-Vin	NP	NC	-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.

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