

Typical Features

- ◆ Wide input voltage range (2:1), output power 50W
- ◆ Ultra-thin package, thickness 9.5mm
- ◆ Efficiency up to 90% (Typ.)
- ◆ Stand-by power consumption 0.3W (Typ.)
- ◆ Continuous short circuit protection, self-recovery
- ◆ Output over voltage & over current protections
- ◆ Isolation voltage 1500VDC
- ◆ Operating temperature from -40°C to +105°C
- ◆ Good EMI performance
- ◆ Standard Pin-out alignment



EN62368-1

Application Filed

FD50-XXSXXB3(C) Series --- Standard 2"x1" size DC-DC modular converters with wide input voltage range 2:1, fast start-up, flexible DIP/Chassis/DIN Rail mounting options, isolated & regulated single output 50W. This series of products can be widely used in the fields of Industrial control, Electric power, Communication, Railway and Industry robot, 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		Output Voltage/Current (Vo/Io)		Input Current (mA) Typ. @nominal volt.		Max Capacitive Load	Efficiency (%) @full load, nominal volt.	
		Nominal (VDC)	Range (VDC)	Vo (VDC)	Io (mA)	Full load	No Load	(uF)	Min	Typ.
CE	FD50-24S3V3B3(C)	24	18-36	3.3	12000	1885	50	10000	84	87
CE	FD50-24S05B3(C)			5	10000	2315	50	8000	87	90
-	FD50-24S09B3(C)			9	5560	2367	2	5000	86	88
CE	FD50-24S12B3(C)			12	4160	2350	2	2000	86	89
CE	FD50-24S15B3(C)			15	3330	2315	2	1680	87	90
CE	FD50-24S24B3(C)			24	2080	2315	2	500	87	90
CE	FD50-48S3V3B3(C)	48	36-75	3.3	10000	790	50	10000	84	87
CE	FD50-48S05B3(C)			5	10000	1158	50	8000	85	87
-	FD50-48S09B3(C)			9	5560	1184	2	5000	86	88
CE	FD50-48S12B3(C)			12	4160	1158	2	2000	87	89
CE	FD50-48S15B3(C)			15	3330	1158	2	1680	87	90
CE	FD50-48S24B3(C)			24	2080	1158	2	500	87	90

Note 1: The part number letter C indicates the part with ON/OFF control function, without C 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 efficiency is tested at nominal input voltage and rated load.

Note 4: 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 5: Please contact Aipu sales for other output voltages requirement of this series but not listed in this table.

Input Specifications

Item	Test conditions	Min	Typ.	Max	Unit
Standby power consumption	Full input voltage rang	/	0.3	/	W
Max input current	Full input voltage rang	/	/	3.2	A
Start-up voltage	Nominal 24V series	/	17	/	VDC
	Nominal 48V series	/	34	/	
Input inrush voltage (1Sec Max.)	Nominal 24V series	-0.7	/	50	VDC
	Nominal 48V series	-0.7	/	100	
Under voltage protection	Nominal 24V series	14	16	/	VDC
	Nominal 48V series	30	32	/	
Reflected ripple current	Nominal input voltage	/	150	/	mA
Input filter	/	Pi filter			
Hot plug	/	NA			
ON/OFF control (Ctrl)	Turn ON the converter	No connection or connected to high level (3.5V-12VDC)			
	Turn OFF the converter	Connected to -Vin or low level (0-1.2VDC)			
	Current value for switching OFF	/	1	/	mA

Note: The voltage of Ctrl is relative to the 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, rated load	/	±0.5	±1	%
Load regulation	Nominal input voltage, 10% ~ 100% load	/	±1	±2	%
Ripple & Noise	0%~100% load, 20MHz bandwidth	/	50	100	mVp-p
Dynamic response deviation	25% load step, nominal input voltage	/	±5	±8	%
Dynamic response time	25% load step, full input voltage range	/	300	500	μS
Temperature drift coefficient	/	/	/	±0.03	%/°C
Turn-on delay time	Nominal input voltage	/	20	/	mS
Output voltage Trim	Full input voltage range	90	/	110	%Vo
Output overshoot		/	/	10	%Vo
Over voltage protection		110	160	200	%Vo
Over current protection		110	150	200	%Io
Short circuit protection		Hiccup, continuous, self-recovery			

Note: The Ripple and Noise is tested by the Parallel-line method, please refer to the following test instruction.

General Specifications

Item	Test conditions	Min	Typ.	Max	Unit
Switching frequency	Operating Mode (PWM)	/	350	/	KHz
Operating temperature	Refer to the Temperature Derating Graph	-40	/	+105	°C
Storage temperature	/	-55	/	+125	
Case temperature	Within the operation 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 <1mA	1500	/	/	VDC
	I/P&O/P-Case, test 1min, leakage current <1mA	1000	/	/	VDC
Isolation capacitance	I/P-O/P, 100kHz/0.1V	/	2000	/	pF
Insulation resistance	I/P-O/P, @500VDC	100	/	/	MΩ
MTBF	MIL-HDBK-217F@25°C	1000	/	/	K Hours
Cooling method	Nature air				
Vibration	10-150Hz, 5G, 0.75mm, along X, Y and Z				
Case material	Aluminum				
Weight/Dimensions	Part Number	Weight (Typ.)	Dimensions L x W x H		
	FD50-XXSXXB3(C)	28g	50.80X25.40X9.50 mm	2.000X1.000X0.374 inch	
	FD50-XXSXXB3(C)-H	40g	50.80X25.40X20.00 mm	2.000X1.000X0.787 inch	
	FD50-XXSXXB3(C)-T	49g	76.00X31.50X21.30 mm	2.992X1.240X0.838 inch	
	FD50-XXSXXB3(C)-TH	61g	76.00X31.50X28.50 mm	2.992X1.240X1.122 inch	
	FD50-XXSXXB3(C)-TS	69g	76.00X31.50X26.00 mm	2.992X1.240X1.023 inch	
	FD50-XXSXXB3(C)-TSH	81g	76.00X31.50X33.20mm	2.992X1.240X1.307 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

Temperature Derating Graphs

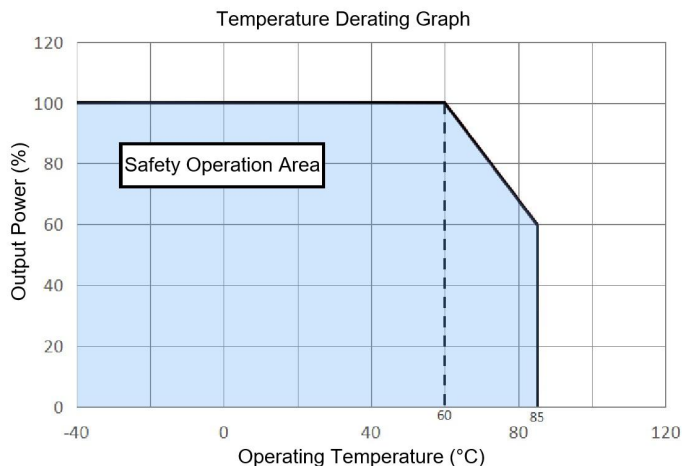


Figure 1

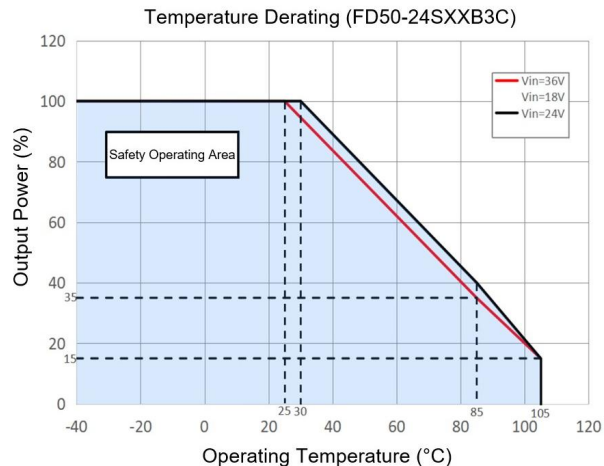


Figure 2

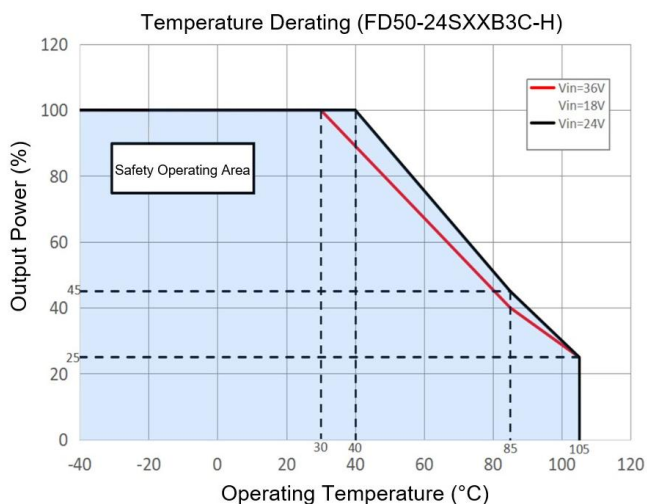


Figure 3

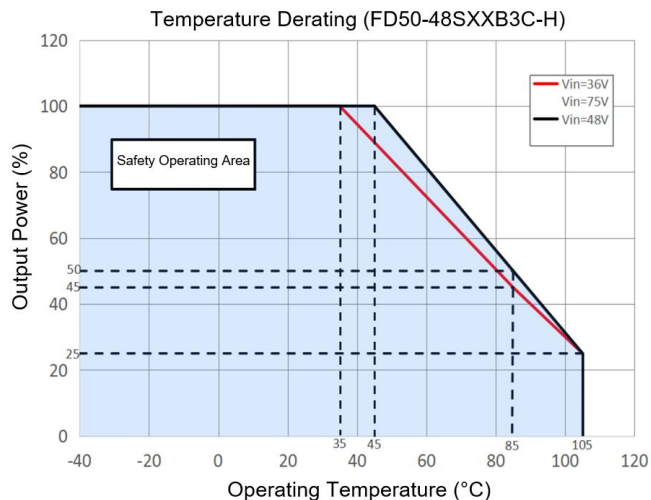
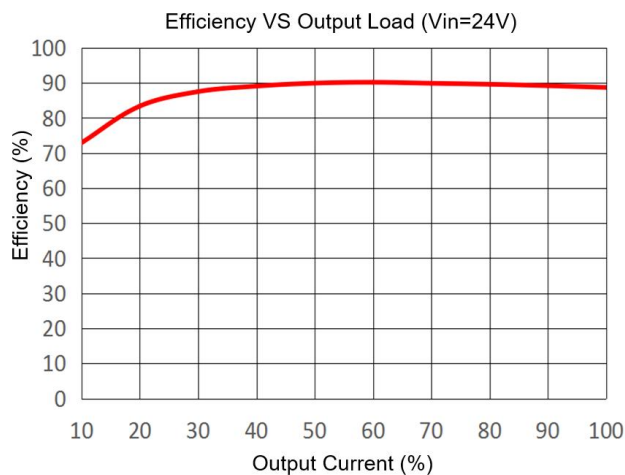
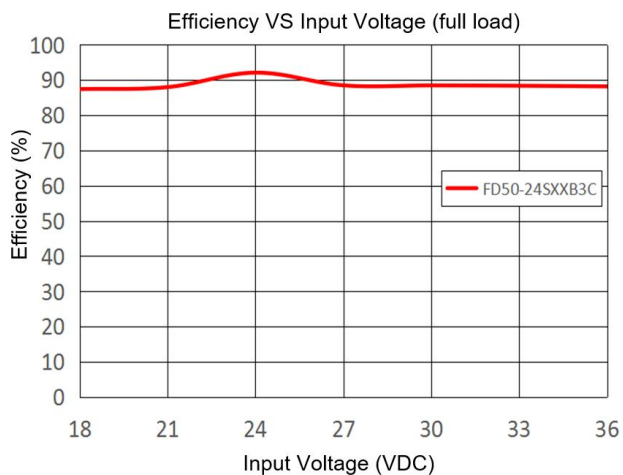


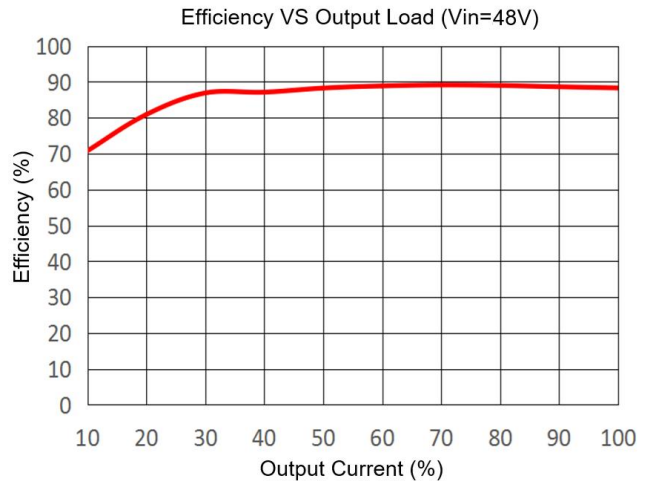
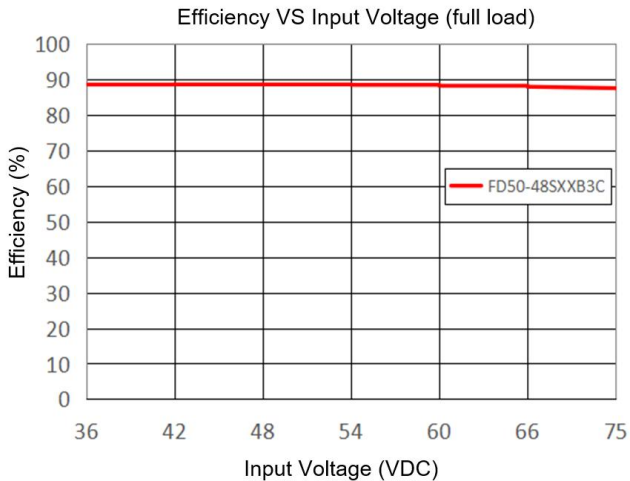
Figure 4

Note 1: Ambient condition of wind speed $\geq 200\text{ft}/\text{Min}$ is required for temperature test of Figure 1.

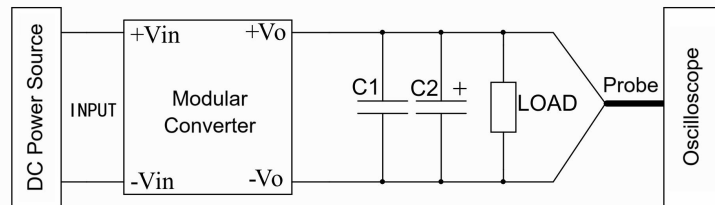
Note 2: The temperature tests of Figure 2,3 & 4 have been done under the condition of winding speed $\leq 20\text{ft}/\text{Min}$.

Efficiency Graphs





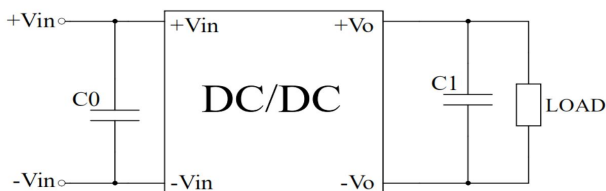
Ripple & Noise Test Instruction (Parallel-line Method, 20MHz Bandwidth)



1. The Ripple & Noise test needs the cables in parallel, an oscilloscope that should be set at the Sample Mode, bandwidth 20MHz. 100M bandwidth probe with cap and ground removed. One polypropylene capacitor C1(0.1uF) and one high-frequency low-resistance electrolytic capacitor C2(10uF) are connected in parallel with the probe.
2. Refer to the test diagram, the converter output connects to the electronic load by the jig with cables which size should be defined according to the output current value. The test can start at the converter output terminals after the input power on.

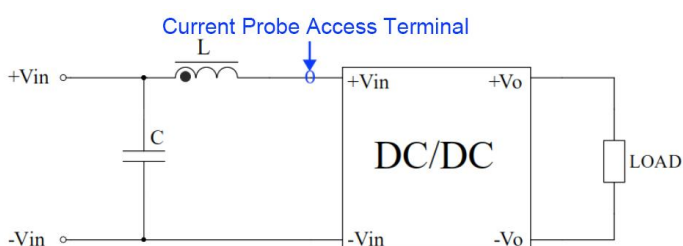
Recommended Circuits for Application

1. All this series of converters will be tested by 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.



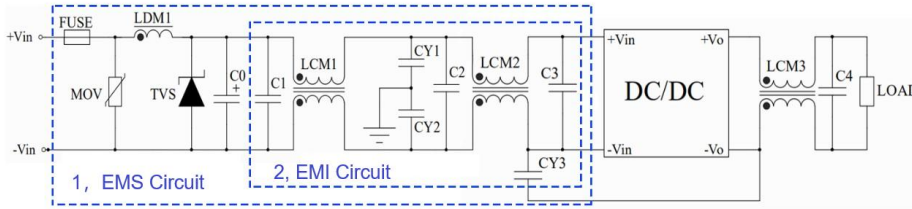
Component	Parameters
C0	47-100uF/100V
C1	22uF/100V

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 circuit is for EMS test, part 2 for EMI filtering, both can be adjusted according to the actual situation.

4. Trim Application & Trim resistance calculation

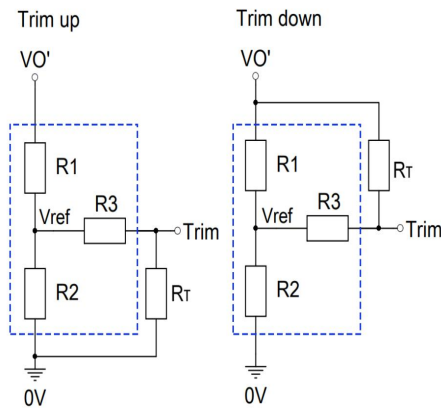
Components	Vin=24VDC	Vin=48VDC
FUSE	TBD by the customer	
MOV	14D470K	14D101K
LDM1	56uH	56uH
TVS	SMCJ40A	SMCJ80A
C0	680uF/100V	560uF/100V
C1,C2,C3	4.7uF/100V	4.7uF/100V
LCM1	15mH	15mH
LCM2	56uH	56uH
LCM3	20uH~30uH	20uH~30uH
C4	47uF/50V	47uF/50V
CY1,CY2,CY3	1nF/2KV	

Calculation formula of the Trim resistance:

$$\text{up: } R_T = \frac{aR_2}{R_2 - a} - R_3 \quad a = \frac{V_{ref}}{V_{o'} - V_{ref}} \cdot R_1$$

$$\text{down: } R_T = \frac{aR_1}{R_1 - a} - R_3 \quad a = \frac{V_{o'} - V_{ref}}{V_{ref}} \cdot R_2$$

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

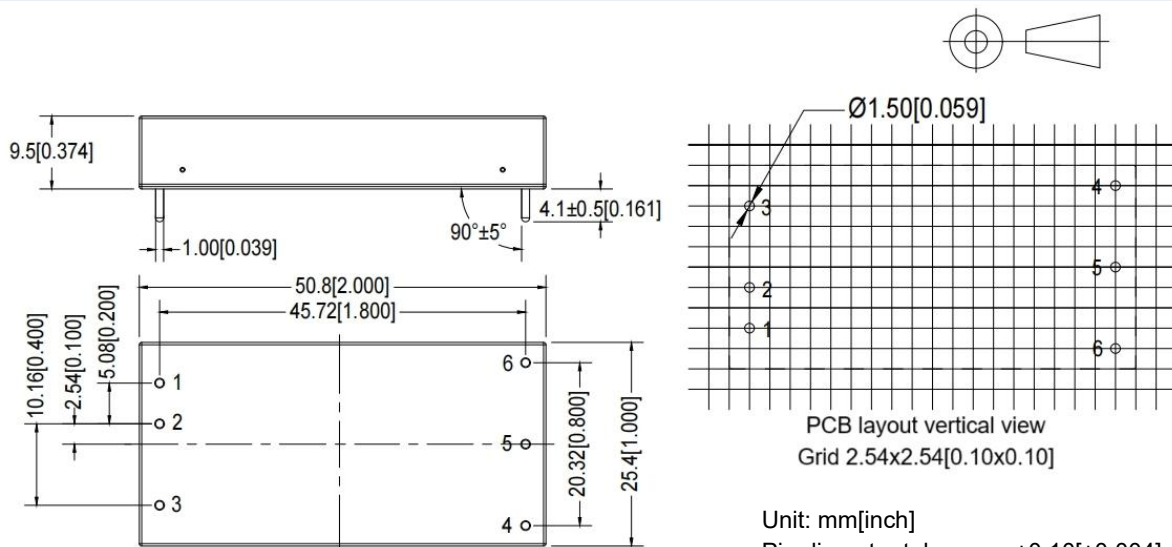


Note:

Trim up & down circuits, The components in the dotted area are inside of the converter.

Output Voltage	Internal circuit parameters for Trim			
Vout (DC)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	24	14.53	68	1.25
5	24	24	68	2.5
9	12.1	4.62	30	2.5
12	18	4.7	30	2.5
15	24	4.78	30	2.5
24	25.5	2.955	18	2.5

Mechanical Dimensions (Without Heat Sink)

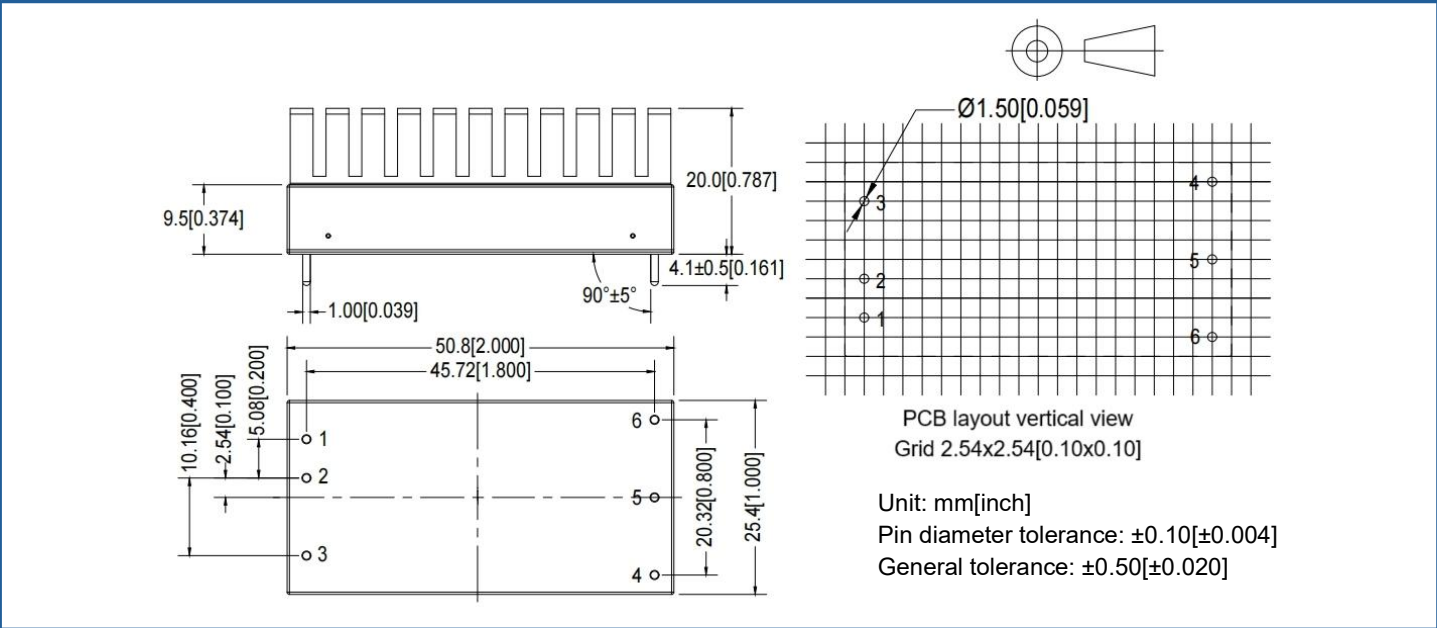


Unit: mm[inch]
Pin diameter tolerance: $\pm 0.10[\pm 0.004]$
General tolerance: $\pm 0.50[\pm 0.020]$

Pin-out Function Description

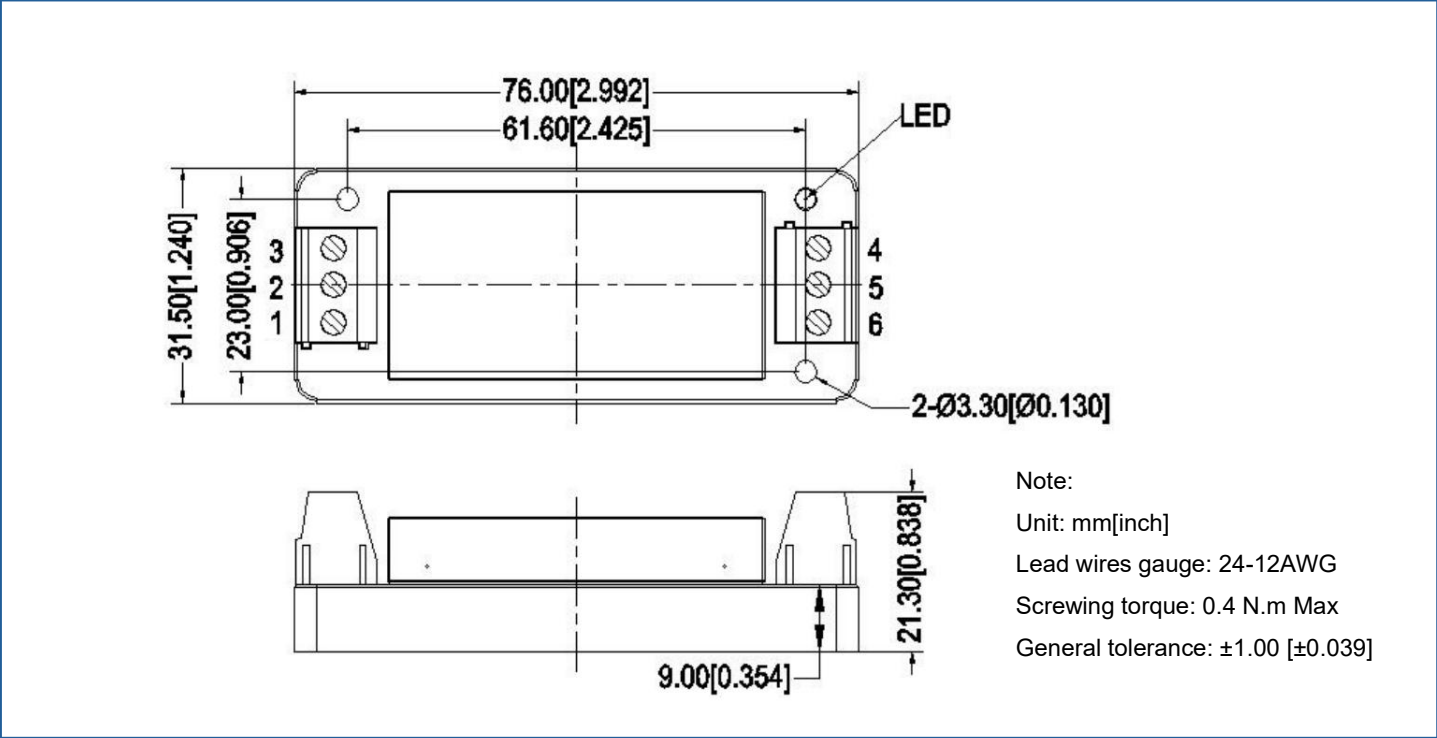
Pin No.	1	2	3	4	5	6
FD50-XXSXXB3C	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

-H Package Dimensions (With Heat Sink)



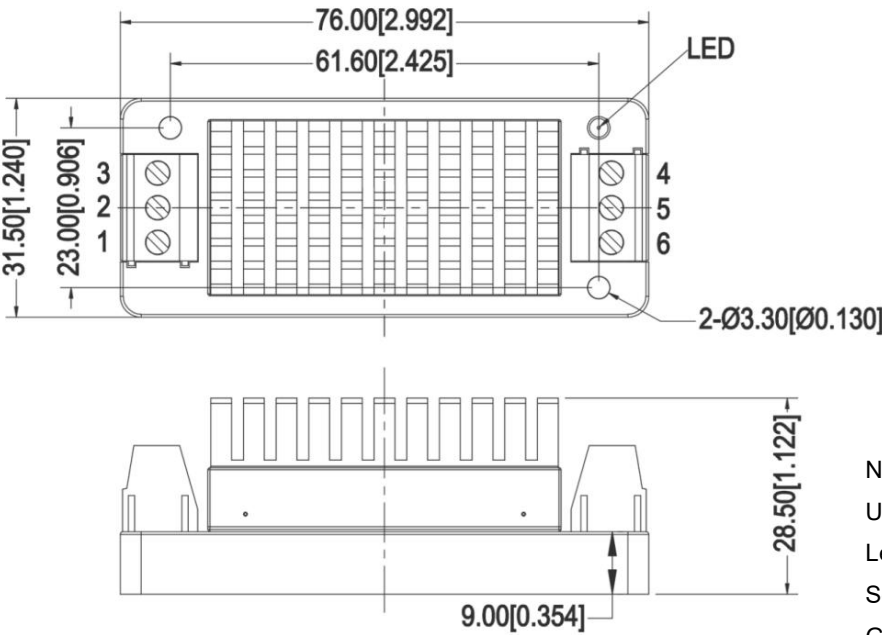
Pin-out Function Description						
Pin No.	1	2	3	4	5	6
FD50-XXSXXB3C	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

-T Package Dimensions (Without Heat Sink)



Terminal Function Description						
Terminal No.	1	2	3	4	5	6
FD50-XXSXXB3C	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

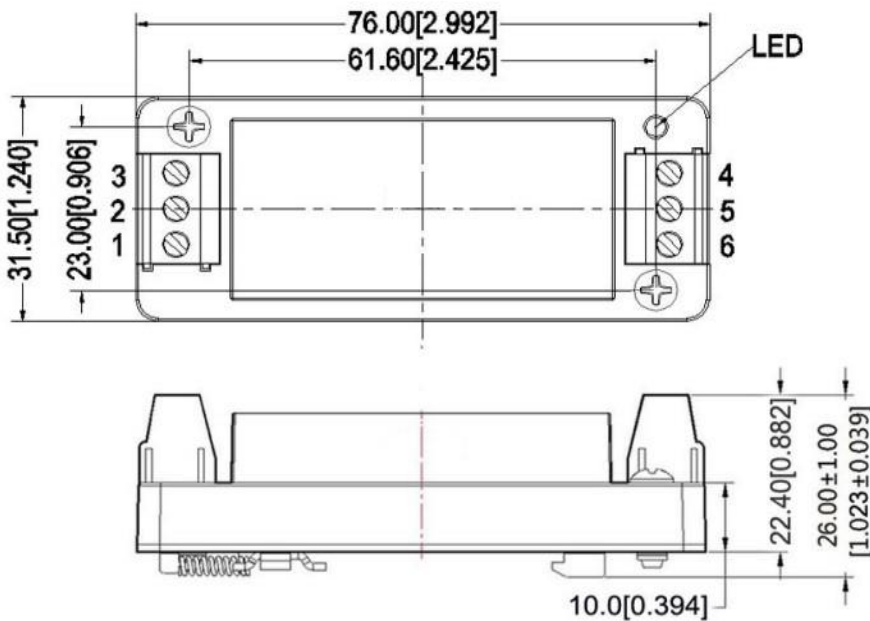
-TH Package Dimensions (With Heat Sink)



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

Terminal Function Description						
Terminal No.	1	2	3	4	5	6
FD50-XXSXXB3C	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

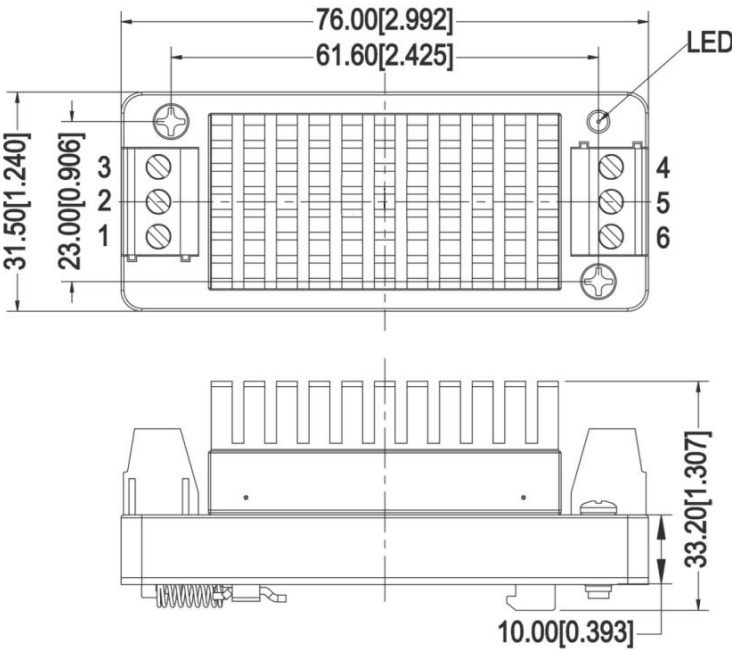
-TS Package Dimensions (Without Heat Sink)



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

Terminal Function Description						
Terminal No.	1	2	3	4	5	6
FD50-XXSXXB3C	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

-TSH Package 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 Function Description

Terminal No.	1	2	3	4	5	6
FD50-XXSXXB3C	+Vin	-Vin	Ctrl	Trim	-Vo	+Vo

Other Models Pin-out Function Description

Pin/Terminal No.	1	2	3	4	5	6
FD50-XXSXXB3	+Vin	-Vin	No Pin	Trim	-Vo	+Vo

Application Notice

1. The product should be used according to the specifications, otherwise it could be permanently damaged.
2. The product performance cannot be guaranteed if it works at a lower load than the minimum load defined.
3. The product performance cannot be guaranteed if it works under over-load condition.
4. Unless otherwise specified, all values or indicators on this datasheet are tested at $T_a=25^{\circ}\text{C}$, humidity $<75\%\text{RH}$, nominal input voltage and rated load (pure resistance load).
5. All values or indicators on this datasheet have been tested based on Aipupower test specifications.
6. The specifications are specially for the parts listed on 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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