

Typical Features

- ◆ Wide input voltage range (4:1), Output power 30W
- ◆ Ultra-thin Package, thickness 9.5mm
- ◆ Efficiency up to 90%(Typ.)
- ◆ Stand-by Power Consumption 0.2W (Typ.)
- ◆ Fast start-up, typical 20mS
- ◆ Continuous Short Circuit protection, Self-recovery
- ◆ Input under voltage, output over voltage, short-circuit & over current protections
- ◆ Operating Temperature from -40°C to +85°C
- ◆ Good EMI performance
- ◆ Standard Pin-out alignment
- ◆ Conform to CE & RoHS regulation



CE

RoHS

Application Filed

FD30-XXSXXB3(C) Series ----- DIP mounting standard 2"x1" packaging DC-DC modular converters with wide input voltage range 4:1, low stand-by power consumption, isolated & regulated single output 30W. This series of products can be widely used in the fields of industrial control, instrument, communication, electricity power and IoT, etc. The additional circuit for EMC is recommended in this data sheet 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) (Nominal Volt.)		Max Capacitive Load (uF)	Ripple & Noise (mVp-p)		Efficiency (%)	
		Nom.	Range	Vo(V)	Io(mA)	Full load	No Load	Max	Typ.	Max	Min	Typ.
CE	FD30-18S3V3B3(C)	24	9-36	3.3	6000	948	30	10000	50	100	84	87
CE	FD30-18S05B3(C)			5.0	6000	1388	30	8000	50	100	87	90
CE	FD30-18S09B3(C)			9.0	3333	1480	2	3300	50	100	86	89
CE	FD30-18S12B3(C)			12	2500	1388	2	2000	50	100	87	90
CE	FD30-18S15B3(C)			15	2000	1388	2	1000	50	100	87	90
CE	FD30-18S18B3(C)			18	1667	1388	2	1000	50	100	85	88
CE	FD30-18S24B3(C)			24	1250	1396	8	500	50	100	87	90
CE	FD30-36S3V3B3(C)	48	18-75	3.3	6000	474	30	10000	50	100	84	87
CE	FD30-36S05B3(C)			5.0	6000	694	30	7000	50	100	87	90
CE	FD30-36S09B3(C)			9.0	3333	730	2	3300	50	100	86	89
CE	FD30-36S12B3(C)			12	2500	694	2	2000	50	100	87	90
CE	FD30-36S15B3(C)			15	2000	694	2	1000	50	100	87	90
CE	FD30-36S18B3(C)			18	1667	730	2	1000	50	100	85	88
CE	FD30-36S24B3(C)			24	1250	694	2	500	50	100	87	90

Note 1 - In the part numbers C indicates the part with remote Control function, without C indicates No Control function.

Note 2 - The suffix -T indicates a kind of chassis packaging, -TS indicates a kind of packaging of DIN Rail which width is 35mm, H means Heat sink.

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 or improve the efficiency at the light load.

Note 5 - Output will not be available at no load, $\geq 10\%$ load or a high-frequency low resistance E-cap($\geq 470\mu\text{F}$) load is recommended, to avoid the output ripple increasing.

Note 6 - 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	
Start-up voltage	24Vdc Input	/	/	9	
	48Vdc Input	/	/	18	
Under-voltage protection	24Vdc Input	6	/	8	
	48Vdc Input	15	/	17	
Turn on delay Time	Nominal input voltage, Constant-resistor load	/	20	/	mS
Input filter	/	Pi filter			
Reflected Ripple Current	Full input voltage, with the test circuit	100mA			
Hot Plug	/	NA			
Remote control (Ctrl)	Turn-on the converter	No connection or connect to high level (3.5V-12VDC)			
	Shut-off the converter	Connect to -Vin or low level (0-1.2VDC)			
	Current value to shut off the converter	1mA (Typ.)			

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

Output Specifications

Item	Test conditions		Min	Typ.	Max	Unit
Output Voltage Accuracy	Full input voltage range, rated load		/	±1	±2	%
Voltage Regulation	Full input voltage range, rated load		/	±0.5	±1	%
Load Regulation	5% ~ 100% rated load		/	±1	±2	%
Ripple & Noise	10% ~ 100% load, nominal voltage (20MHz)		/	50	100	mVp-p
Dynamic Response Deviation	25% rated load step, nominal input voltage	3.3V, 5V output	/	±3	±8	%
		Others output	/	±3	±5	%
Dynamic Response Time	25% rated load step, nominal input voltage		/	300	500	uS
Output voltage Trim	Full input voltage range, rated load		90	/	110	%Vo
Over voltage protection			110	140	200	%Vo

Over current protection		110	200	300	%Io
Short circuit protection		Hiccup, continuous, self-recovery			

Note: The Ripple & Noise $\leq 5\%V_o$ @0-10% load, it is tested by the twisted pair method, bandwidth 20MHz.

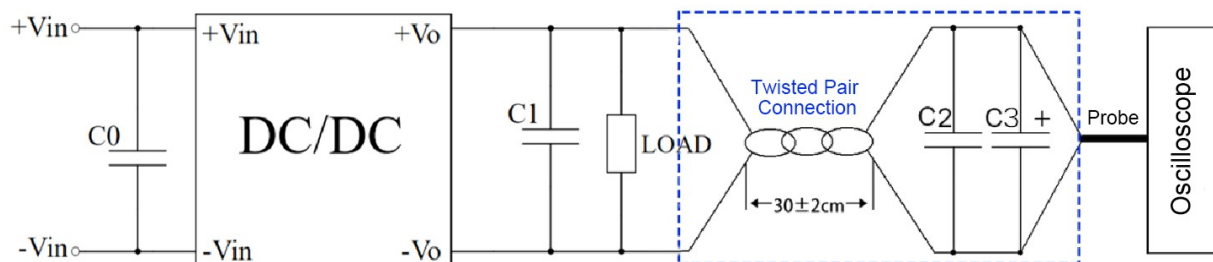
General Specifications

Item	Test conditions	Min	Typ.	Max	Unit
Switching Frequency	Operating Mode (PWM)	/	350	/	KHz
Operating Temperature	Refer to the Temperature Derating Curve	-40	/	+85	°C
Storage Temperature	/	-55	/	+125	
Case Temperature	Refer to the Product Performance Curve	/	/	+105	
Pin Soldering temperature	1.5mm from the case, 10 sec.	/	/	300	
Relative Humidity	No condensing	5	/	95	%RH
Isolation Voltage	I/P-O/P, test 1min, leakage current <1mA	1500	/	/	VDC
Insulation Capacitance	I/P-O/P, 100kHz/0.1V	/	2000	/	pF
MTBF	MIL-HDBK-217F@25°C	1000	/	/	KHrs
Vibration	/	IEC/EN 61373 C1/Body Mounted Class B			
Cooling Method	Nature air				
Case Material	Aluminum				
Weight/Dimension	Part Number	Weight (Typ.)	Dimensions L x W x H		
	FD30-XXSXXB3(C)	28g	50.80X25.40X9.50 mm		2.000X1.000X0.374 inch
	FD30-XXSXXB3(C)-H	40g	50.80X25.40X20.00 mm		2.000X1.000X0.787 inch
	FD30-XXSXXB3(C)-T	49g	76.00X31.50X21.30 mm		2.992X1.240X0.838 inch
	FD30-XXSXXB3(C)-TH	61g	76.00X31.50X28.50 mm		2.992X1.240X1.122 inch
	FD30-XXSXXB3(C)-TS	69g	76.00X31.50X26.00 mm		2.992X1.240X1.023 inch
	FD30-XXSXXB3(C)-TSH	81g	76.00X31.50X33.20mm		2.992X1.240X1.307 inch

EMC Performances

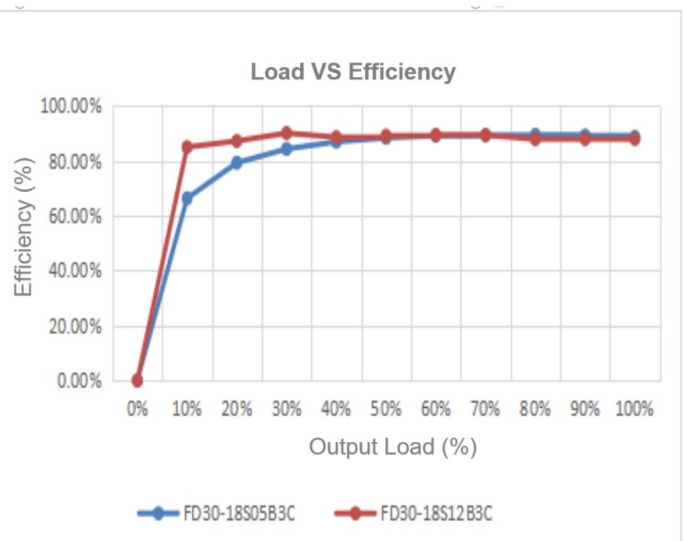
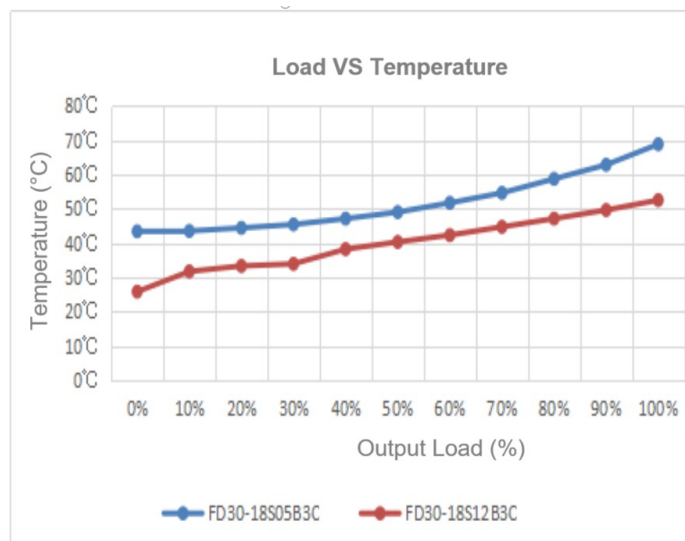
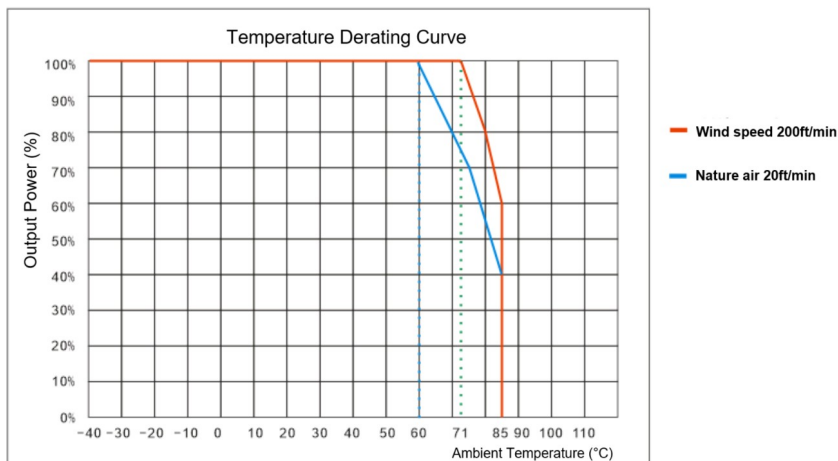
Total Items		Sub Items	Test Standard	Performance/Class	
EMC	EMI	CE	CISPR22/EN55032	CLASS B (with EMC Recommended Circuit)	
		RE	CISPR22/EN55032	CLASS B (with EMC Recommended Circuit)	
	EMS	RS	IEC/EN61000-4-3	10V/m	Perf.Criteria A
		CS	IEC/EN61000-4-6	3Vr.m.s	Perf.Criteria A
		ESD	IEC/EN61000-4-2	Contact $\pm 4\text{KV}$ /Air $\pm 6\text{KV}$	Perf.Criteria B
		Surge	IEC/EN61000-4-5	$\pm 2\text{KV}$ Perf.Criteria B (with EMC Recommended Circuit)	
		EFT	IEC/EN61000-4-4	$\pm 2\text{KV}$ Perf.Criteria B (with EMC Recommended Circuit)	
		Voltage dips & interruptions	IEC/EN61000-4-11	0%~70%	Perf.Criteria B

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



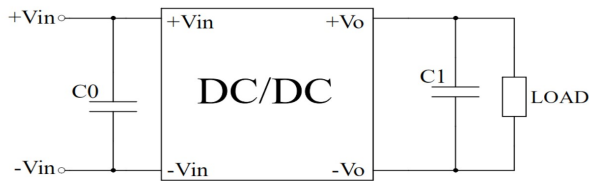
- 1) The Ripple & noise test need 12# twisted pair cables, an oscilloscope which should be set at the Sample Mode, bandwidth 20MHz. 100M bandwidth probe with cap and ground removed. C2(0.1uF) polypropylene capacitor and C3(10uF) high-frequency low-resistance electrolytic capacitor are connected in parallel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

Product Performance Curves



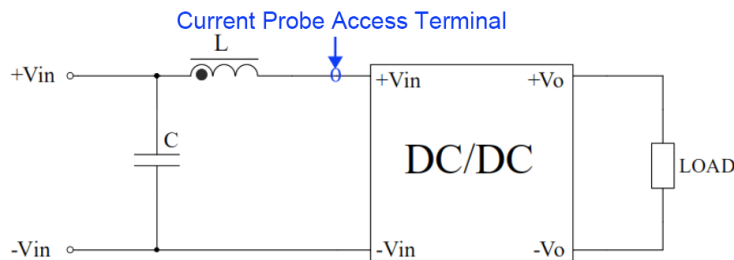
Recommended Circuits for Application

1. DC-DC test circuit



Component	Vin=24V	Vin=48V
C0	47-100uF/50V	47-100uF/100V
C1	10~22uF/50V	

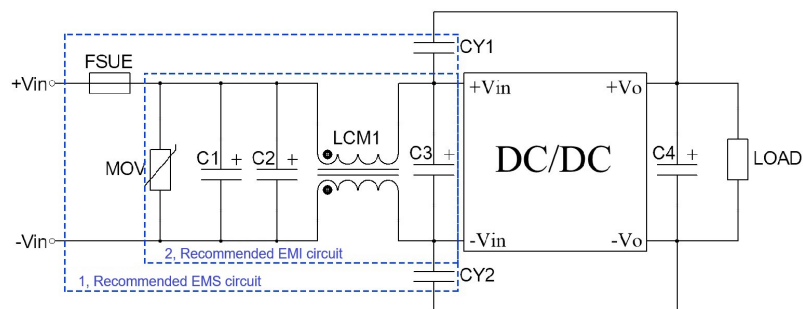
2. Input reflected ripple current test circuit



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

Low ESR capacitor is recommended for C which withstand voltage should be more than the input voltage.

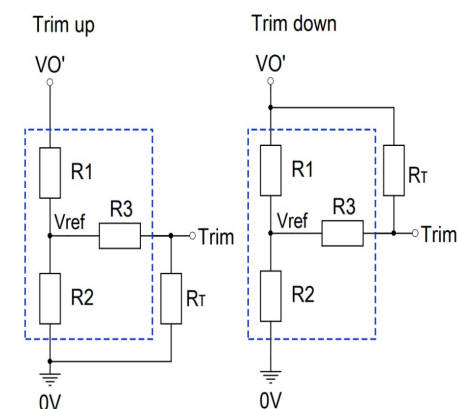
3. Recommended EMC circuit



Component	Vin=24V	Vin=48V
FUSE	TBD by customer	
MOV	14D560K	14D101K
LCM1	5mH	5mH
C1, C2, C3	330uF/50V	330uF/100V
C4	47uF/50V	47uF/50V
CY1, CY2,	2.2nF/2000V	

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

4. Trim and Trim resistance calculation



Note:

Trim up & down circuits,

The components in the dotted area are inside of the converter.

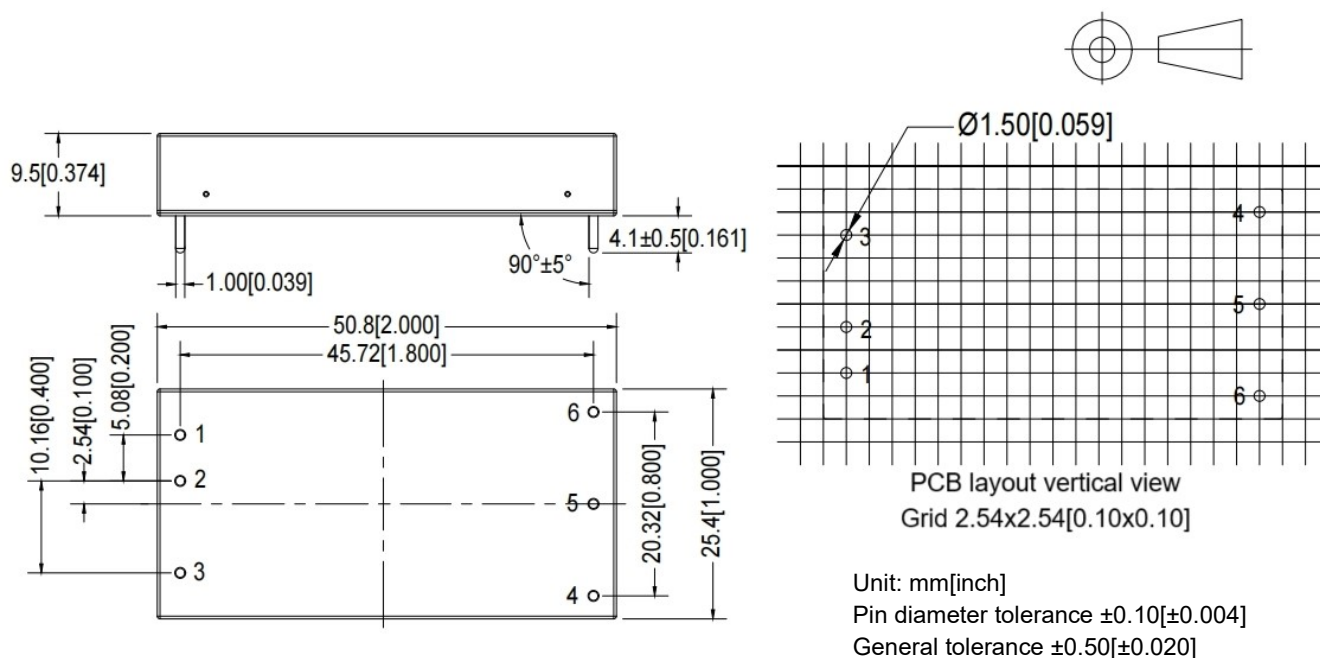
Calculation formula of the Trim resistance:

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

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

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
18	30	4.78	30	2.5

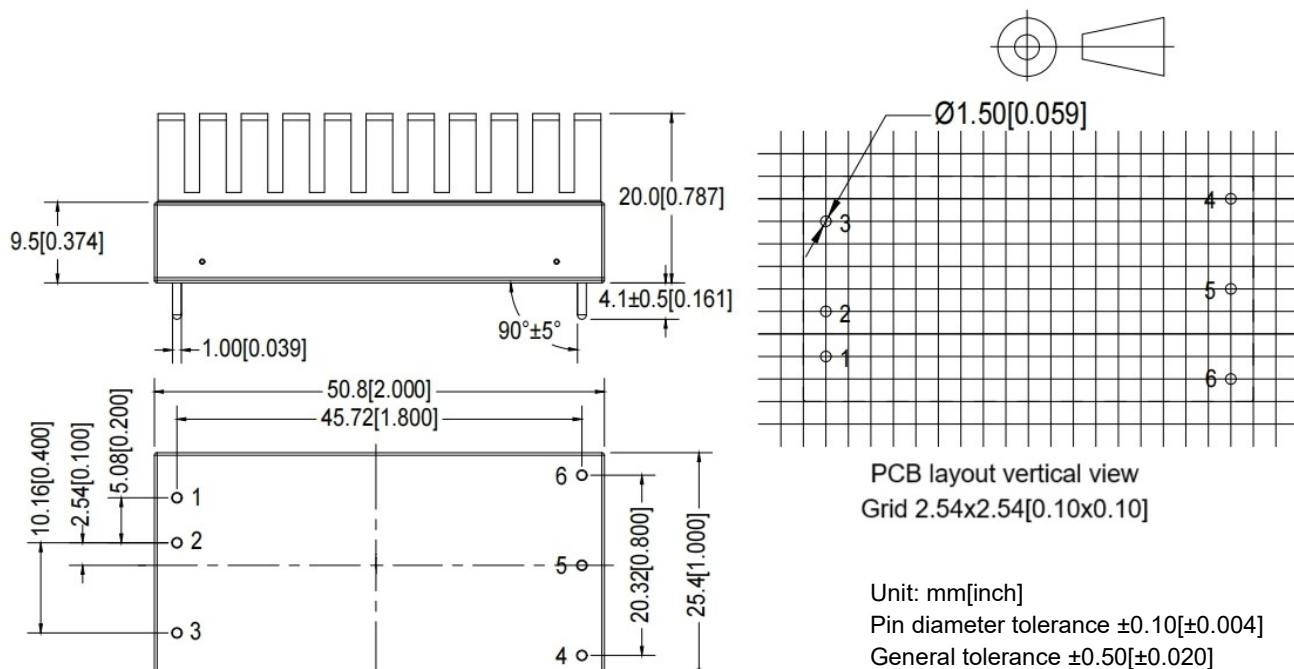
B3 Dimensions (Without Heat Sink)



Pin function definition

Pin No.	1	2	3	4	5	6
FD30-XXSXXB3C	+Vin	-Vin	Ctrl	Trim	-Vout	+Vout

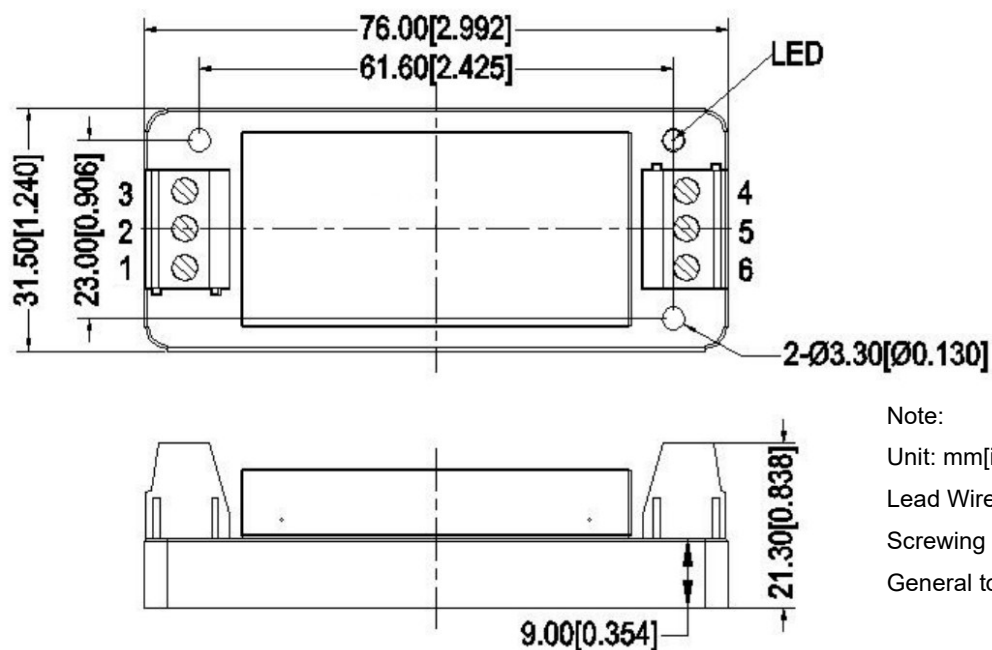
B3-H Dimensions (With Heat Sink)



Pin function definition

Pin No.	1	2	3	4	5	6
FD30-XXSXXB3C	+Vin	-Vin	Ctrl	Trim	-Vout	+Vout

B3-T Dimensions (Without Heat Sink)



Note:

Unit: mm[inch]

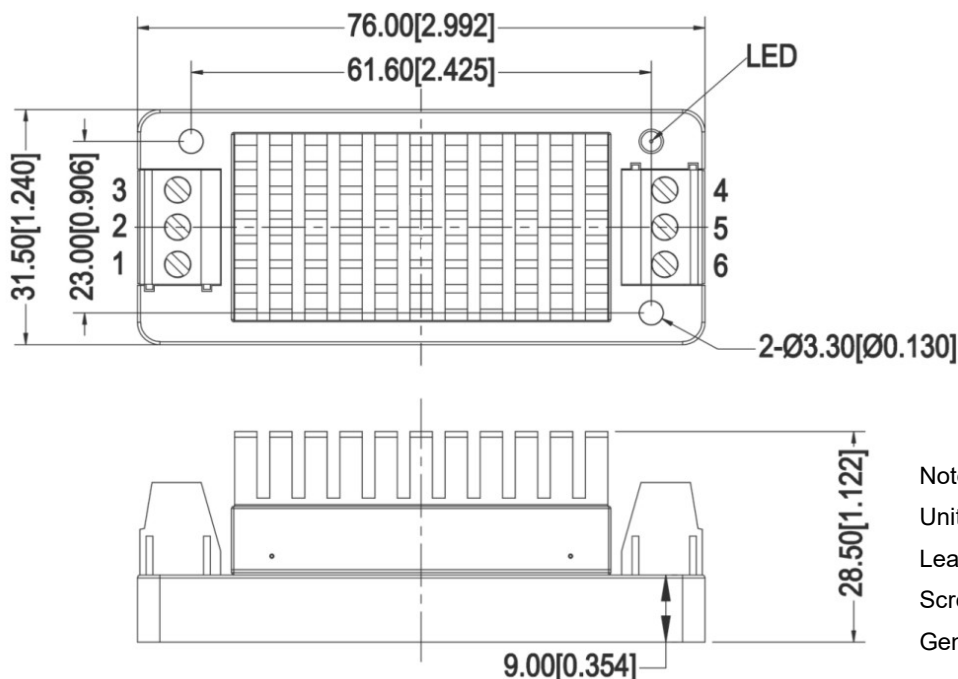
Lead Wire Size: 24-12AWG

Screwing torque: 0.4 N.m Max

General tolerance: ± 1.00 [± 0.039]

Terminal No.	1	2	3	4	5	6
FD30-XXSXXB3C	+Vin	-Vin	Ctrl	Trim	-Vout	+Vout

B3-TH Dimensions (With Heat Sink)



Note:

Unit: mm[inch]

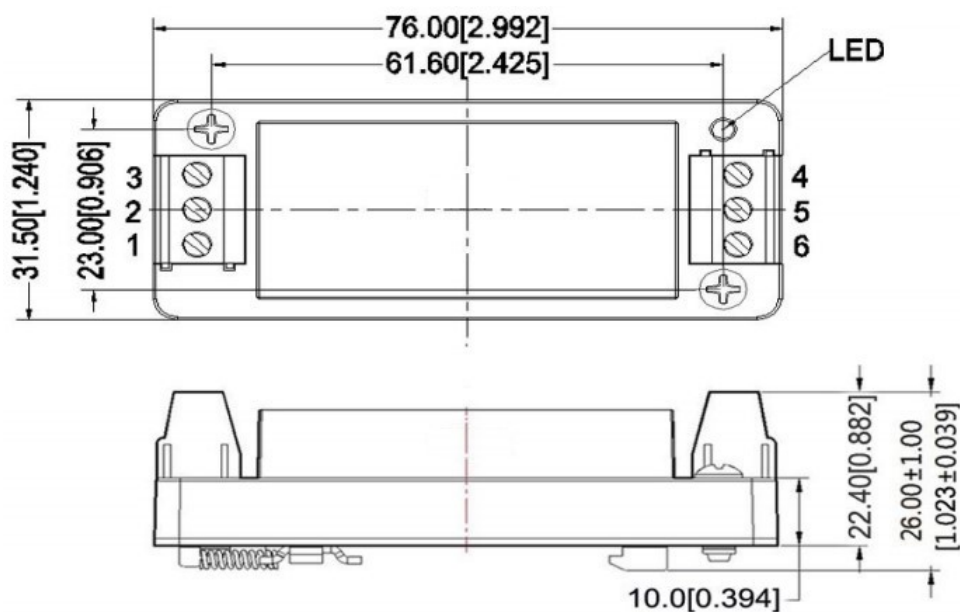
Lead Wire Size: 24-12AWG

Screwing torque: 0.4 N.m Max

General tolerance: ± 1.00 [± 0.039]

Terminal No.	1	2	3	4	5	6
FD30-XXSXXB3C	+Vin	-Vin	Ctrl	Trim	-Vout	+Vout

B3-TS Dimensions (Without Heat Sink)



Note:

Unit: mm[inch]

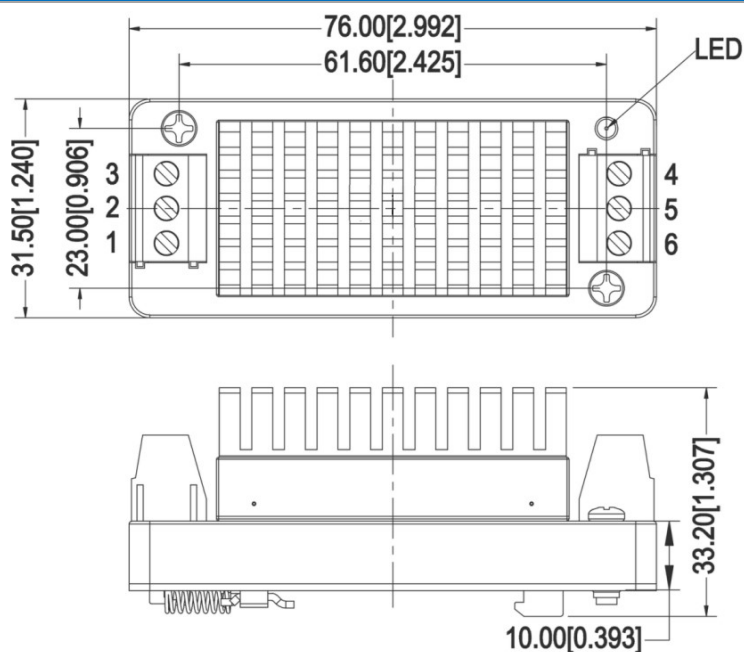
Lead Wire size: 24-12AWG

Screwing torque: 0.4 N.m Max

General tolerance: ±1.00 [±0.039]

Terminal No.	1	2	3	4	5	6
FD30-XXSXXB3C	+Vin	-Vin	Ctrl	Trim	-Vout	+Vout

B3-TSH Dimensions (With Heat Sink)



Note:

Unit: mm[inch]

Lead Wire Size: 24-12AWG

Screwing torque: 0.4 N.m Max

General tolerance: ±1.00 [±0.039]

Terminal No.	1	2	3	4	5	6
FD30-XXSXXB3C	+Vin	-Vin	Ctrl	Trim	-Vout	+Vout

Other Models Pin Function Definition

Pin No.	1	2	3	4	5	6
FD30-XXSXXB3	+Vin	-Vin	No Pin	Trim	-Vout	+Vout

Application Notice

1. The products should be used according to the specifications in this datasheet, otherwise it could be permanently damaged.
2. It is not recommended to connect the converters in parallel to achieve a bigger power output.
3. The product performance in this datasheet cannot be guaranteed if it works at a lower load than the minimum load defined.
4. The product performance in this datasheet cannot be guaranteed if it works under over-load condition.
5. 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).
6. All values or indicators in this datasheet had been tested based on Aipupower test specifications.
7. 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.
8. Aipupower can provide customization service.

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