DC/DC Converter
FD40-110SXXB3C3(-T)(-TS) Series

Product Typical Features

- ◆ Wide input voltage range (4:1), Output Power 40W
- ◆ Ultra-thin package：13mm
- ◆ Efficiency up to 90%
- ◆ Stand-by power consumption as low as 3W
- ◆ Output super-fast start up as low as10ms
- ◆ Continuous Short circuit protection, self-recovery
- ◆ Input under voltage, output over voltage, short circuit, over current protections
- ◆ Switching frequency 300KHz
- ◆ Isolation voltage 3000VDC/1500VAC
- ◆ Operating Temperature: -40°C~+85°C
- ◆ Good EMI performance
- ◆ International standard pin-out

FD40-110SXXB3C3 Series --- are 40W output DC-DC Converters with wide input voltage range (4:1), super-fast start up, isolated & regulated single output, DIP/chassis mounting/DIN-Rail mounting. They have multi-protection of under-voltage, output over current, output short circuit and output over voltage, can be widely used in the 72V, 96V and 110V of industrial control, electrical power, communication, train engine, industrial robot and rail-way electronic devices, etc. The additional EMC circuit 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	Ripple & Noise 20MHz	Efficiency (%)	
		Rated	Range	Voltage (V)	Current (A)	Full Load	No Load	u F	(MAX) mVp-p	Min.	Typ.
--	FD40-110S3V3B3C3	110	40-160	3.3	10	345	25	10000	100	85	88
	FD40-110S05B3C3			5	8.0	420	25	8000	100	86	89
	FD40-110S12B3C3			12	3.333	420	2	3300	200	87	90
	FD40-110S15B3C3			15	2.667	420	2	1200	200	87	90
	FD40-110S24B3C3			24	1.667	420	2	680	200	87	90
	FD40-110S48B3C3			48	0.833	420	2	470	200	86	89

Note 1: The suffix -H indicates the part with Heat sink, -T (H) indicates a kind of chassis package(with heat sink), -TS (H) indicates a kind of packaging of DIN Rail (with heat sink), the rail width is 35mm.

Note 2: 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 3: The control chip could work at lower frequency at no load or low load to decrease the no load power and improve the efficiency.

Note 4: The output should not be no-load. 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.

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

Input Specifications			
Input Surge Voltage（1Sec）	110Vdc Input	160Vdc（Max）	
Under-Voltage Turn-off	36VDC		
Turn-on delay Time	10ms (Typ)		
Input Filter	Pi filter		
CTRL	Module turn-on	No connection or connect to High level（3.5V-12VDC）	
	Module shut-off	Connect to -Vin or connect to low level 0-1.2VDC）	
	Current value for shut off	1mA(Typ)	
Reflected Ripple Current	Input full range, connect to test fixture	100mA	
Note: *The voltage of CTRL is relative to -Vin.			

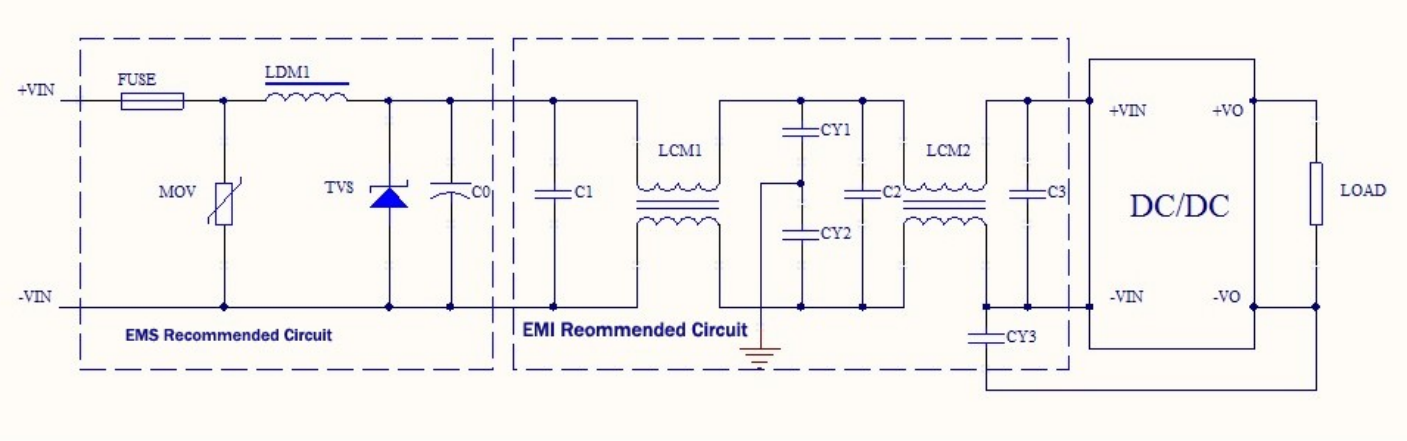
Output Specifications			
Output Voltage Accuracy	Full voltage, full load	Vo	≤±2.0% （Max）
Line Voltage Regulation	Rated load, full voltage range	Vo	≤±1.0%
Load Regulation	10% ~ 100% Rated load	Vo	≤±1.0%
Ripple & Noise	Rated load, Rated voltage	≤200mVp-p （20MHz bandwidth）	
Output Over-voltage Protection	110%~190%Vo		
Output Voltage Adjustment	Trim function	±10%（Typ）	
Output Short circuit Protection	Hiccup, continuous, self-recovery		
Output Over-current protection	≥ 120%		
Dynamic Response	25% Rated load step change	△Vo/△t	≤±5.0%/500μs; (3V3,5.0V Series≤±8.0%/500μs)

General Specifications		
Switching Frequency	Typical	300KHz
Isolation Capacitor	Typical	2000pF
Operating Temperature	Refer to Temperature Derating Curve	-40℃ ~ +85℃
Storage Temperature	-	-55℃ ~ +125℃
Max Case Temperature	Within Operating Curve	+105℃
Relative Humidity	No condensing	5%~95%
Case Material	-	Aluminum
Isolation Voltage	Input to Output	3000VDC ≤ 0.5mA / 1min 1500VAc ≤ 5mA / 1min
MTBF	MIL-HDBK-217F@25℃	≥2X10^{5}Hrs
Product Weight	Average	30g

EMC Performance

EMI	CE	CISPR22/EN55032 CLASS A （external circuit is needed）	
EMS	ESD	IEC/EN61000-4-2 Contact ±4KV	perf.Criteria B
	RS	IEC/EN61000-4-3 10V/m	perf.Criteria A
	EFT	IEC/EN61000-4-4 ±2KV （external circuit is needed）	perf.Criteria B
	CS	IEC/EN61000-4-6 3Vr.m.s	perf.Criteria A
	Voltage dips, short interruptions and voltage variations immunity	IEC/EN61000-4-29 0%-70%	perf.Criteria B

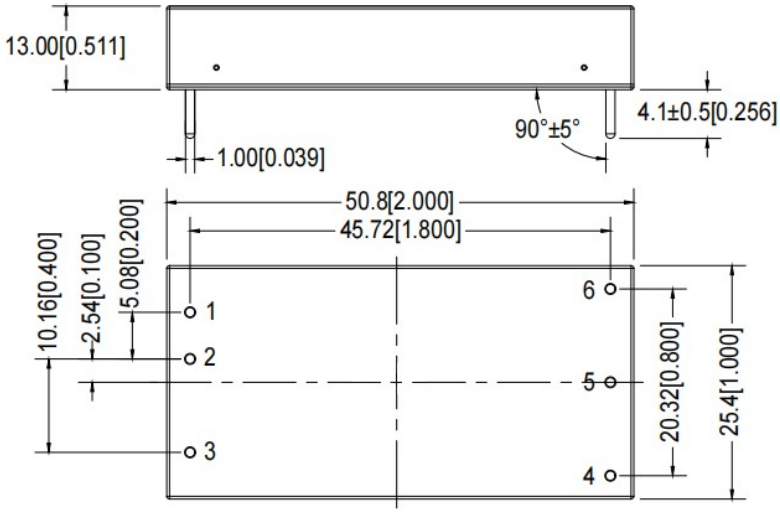
Recommended EMC External Circuit

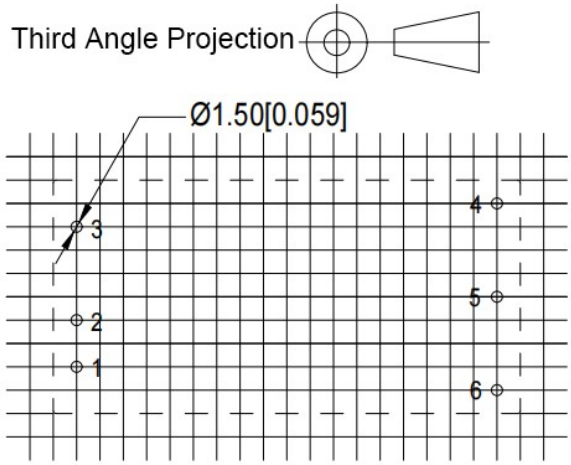


Recommended Parameter:

Component	110V Input
FUSE	TBD by customer according to the actual situation
MOV	14D201K
LDM1	56uH
TVS	SMCJ170A
C0	560uF/200V
C1,C2,C3	4.7uF/200V
LCM1	15mH
LCM2	56uH
CY1,CY2,CY3	1nF/3KV

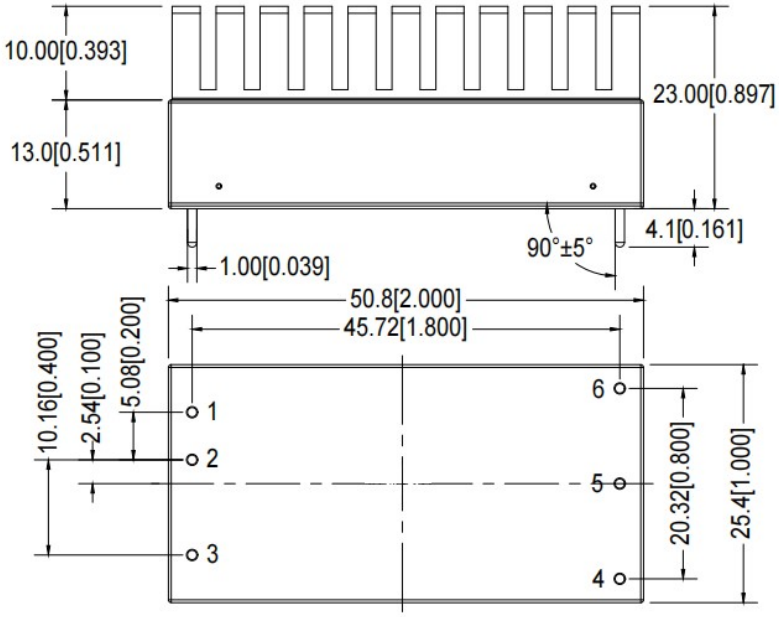
B3 Package (without Heat Sink) Dimensions

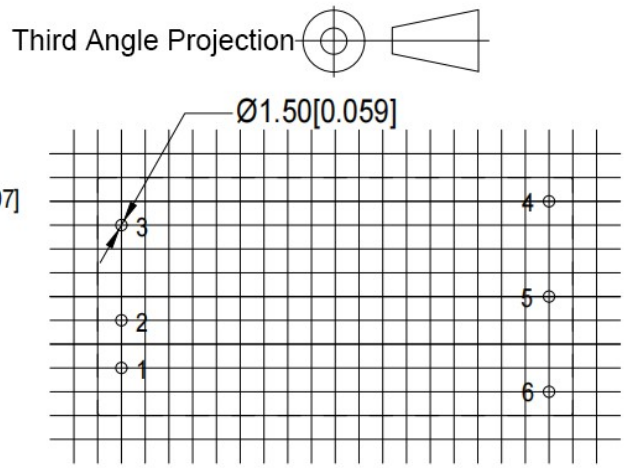




Note:
Grid 2.54*2.54mm
Unit: mm[inch]
Pin diameter tolerance ±0.10[±0.004]
General tolerance: ±0.50[±0.020]

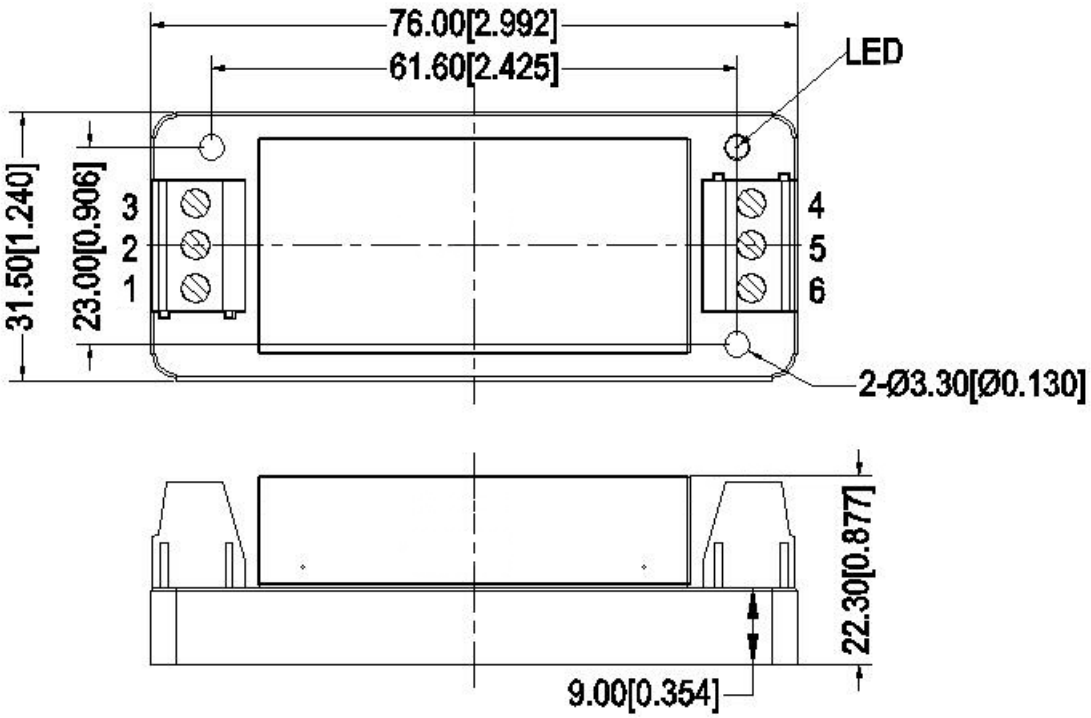
B3-H Package (with Heat Sink) Dimensions



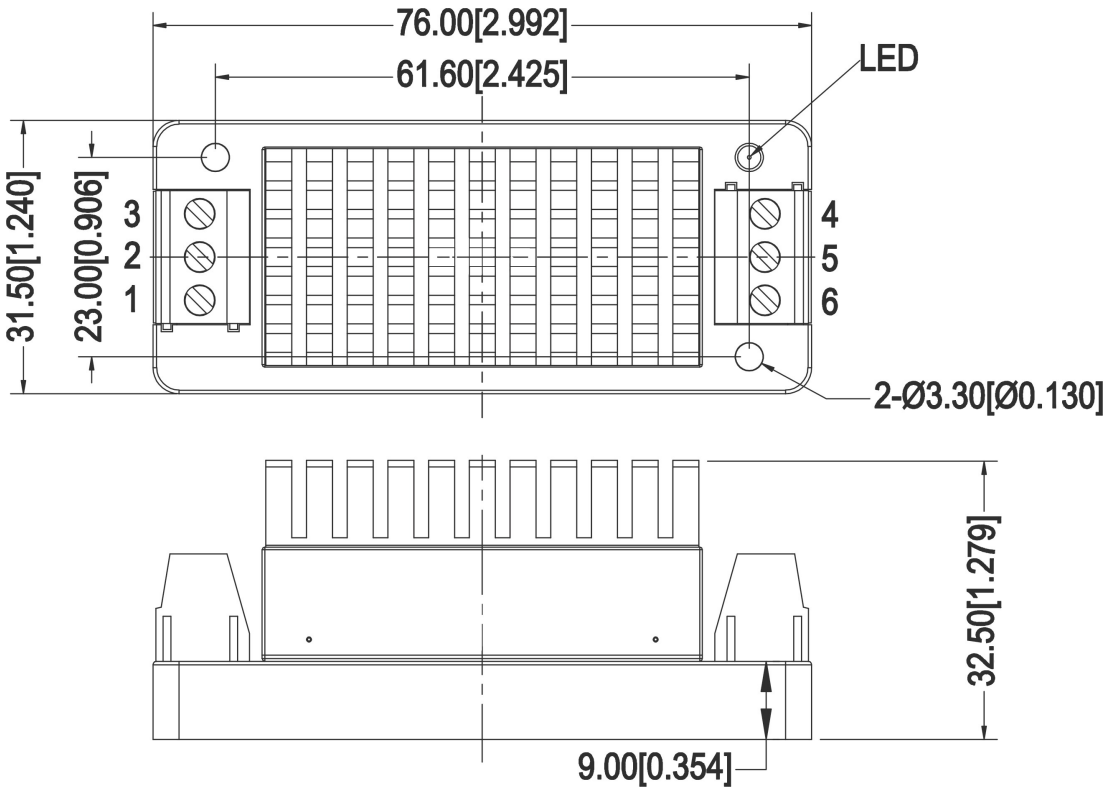


Note:
Grid 2.54*2.54mm
Unit: mm[inch]
Pin diameter tolerance ±0.10[±0.004]
General tolerance: ±0.50[±0.020]

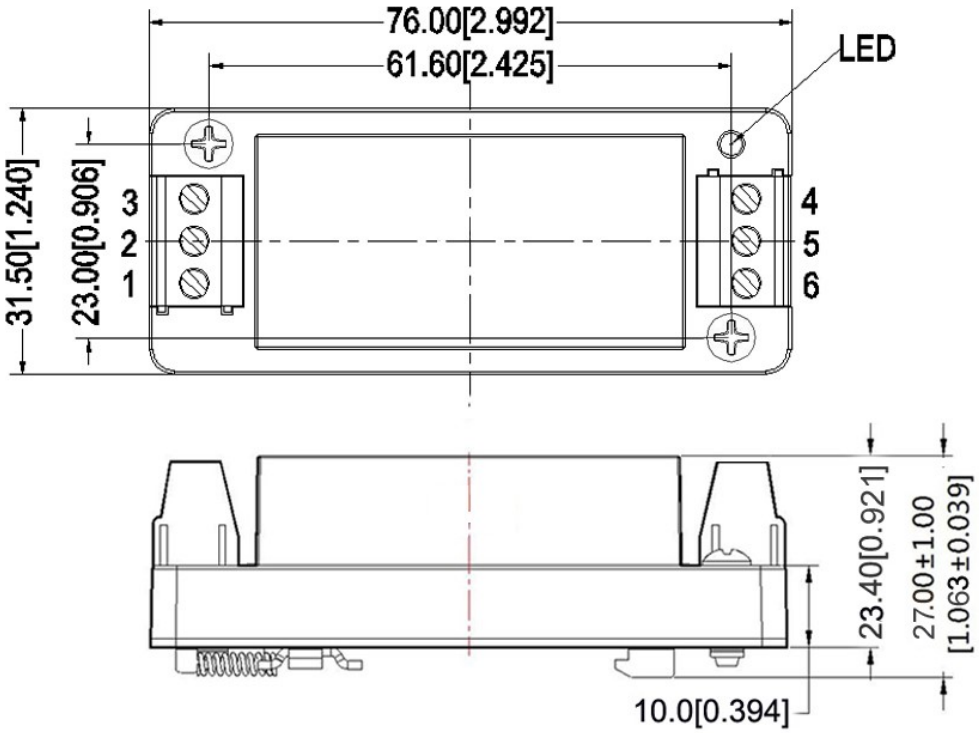
B3-T Package (without Heat Sink) Dimensions



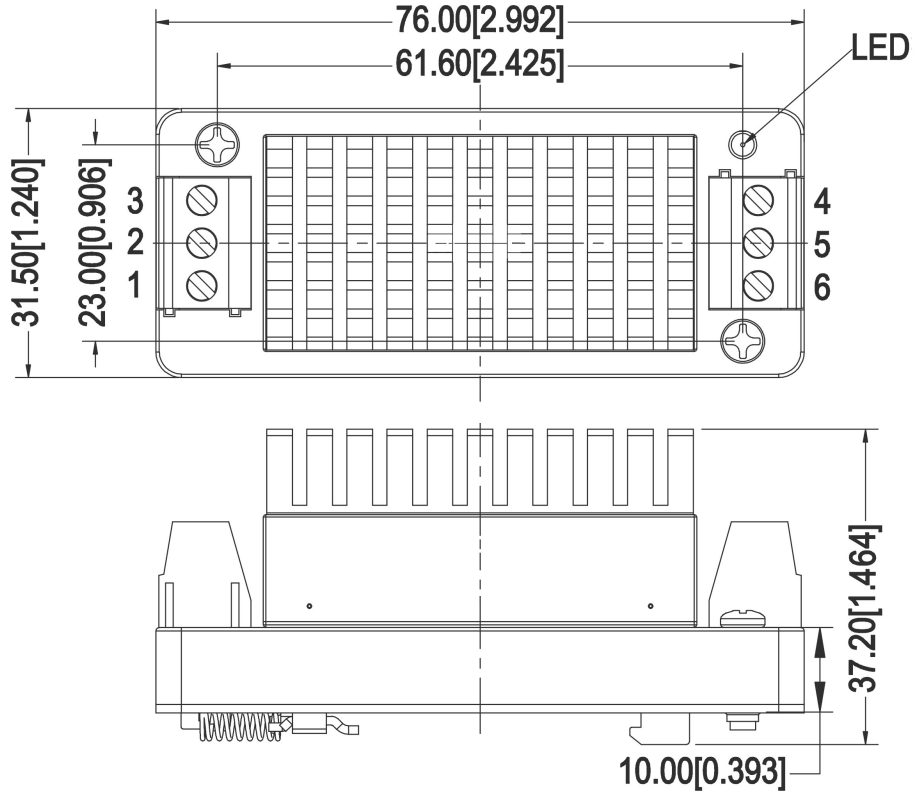
B3-TH Package (with Heat Sink) Dimensions



B3-TS Package (without Heat Sink) Dimensions



B3-TSH Package (with Heat Sink) Dimensions



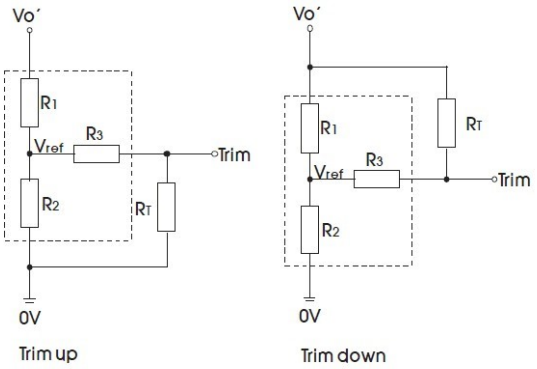
Package Description

Packing Code	L x W x H	
B3(without Heat Sink)	50.80X25.40X13 mm	2.000X1.000X0.511 inch
B3-H (with Heat Sink)	50.80X25.40X23 mm	2.000X1.000X0.905 inch
B3-T (without Heat Sink)	76X31.5X22.3 mm	2.99X1.24X0.877 inch
B3-TH (with Heat Sink)	76X31.5X32.5 mm	2.99X1.24X1.279 inch
B3-TS (without Heat Sink)	76X31.5X27 mm	2.99X1.24X1.063 inch
B3-TSH (with Heat Sink)	76X31.5X37.2 mm	2.99X1.24X1.464 inch

Pin Definition

Pin No.	1	2	3	4	5	6
Function	+Vin	-Vin	CTRL	Trim	-Vo	+Vo

Trim and Trim Resistance Calculation



Rrim Resistance calculating fomula

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

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

R_T is the Trim resistance
a is a self-defined parameter
Vo' is the required Up-voltage or Down-voltage

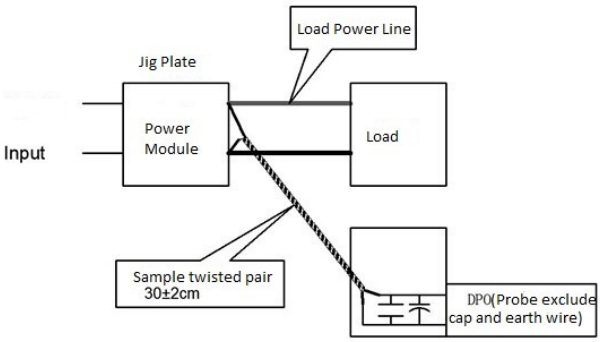
Trim up & down circuits, the components in the dotted area are inside of the converter.

Vout(VDC)	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

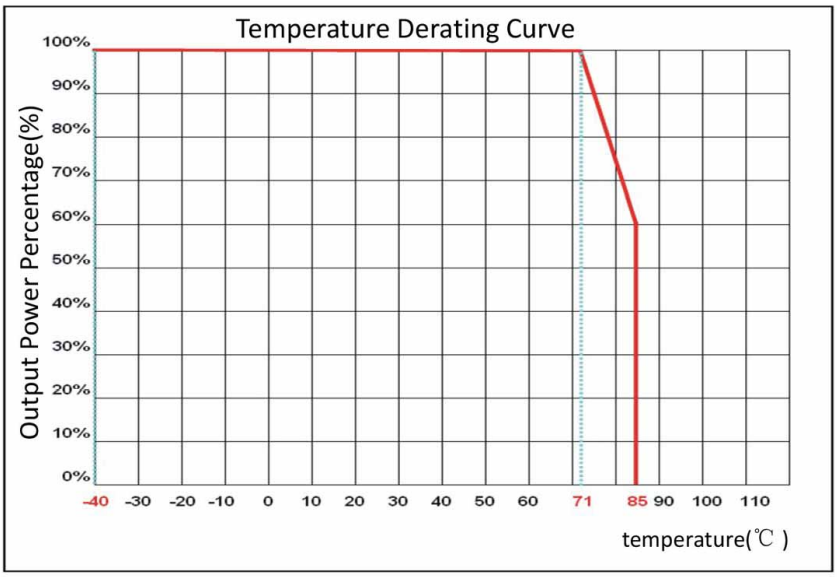
Ripple & Noise Test Instruction (Twisted Pair Method, 20MHz Bandwidth)

1) Ripple noise test need 12# twisted pair cables, an oscilloscope which bandwidth should be set to 20MHz, 0.1uF polypropylene capacitor and 47uF high-frequency low-resistance electrolytic capacitor are connected in parallel with the probes (100M bandwidth). The oscilloscope should be set at the Sample Mode.

2) The output ripple noise test diagram is shown on the right. 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 twisted pair (length 30cm±2 cm) should be connected in parallel with the load, the location is as close as possible to the output pins or terminals. The test can be started after input power on.



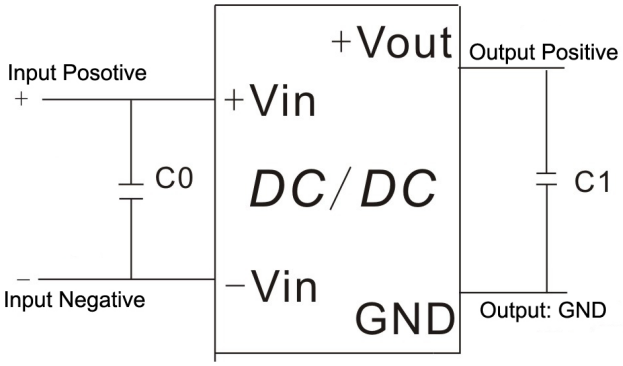
Temperature Derating Curve



Recommended Circuits for Application

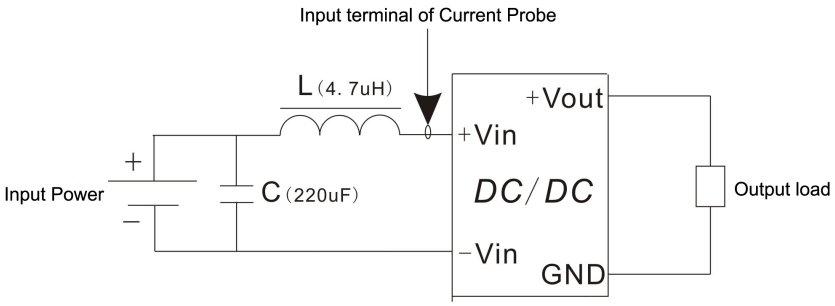
1. **DC/DC test circuit**

Recommended capacitors: C0 (47-100uF), C1 (10-22uF)



2. Input reflecting ripple current test circuit

C should be a low ESR capacitor which withstand voltage is more than the max input voltage.



Application Notice

1. It is recommended that output should be at least 10% of rated load or connect a high-frequency resistance E-cap(≥470uF) load at output to avoid the output ripple increasing.
2. It is recommended that the load imbalance of Dual output products should be less than ±5%.
3. The maximum capacitive load is tested at full load pure resistance condition.
4. Unless otherwise specified, all values or indicators in this manual are tested at Ta=25℃, 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 datasheet, any other non-standard model performances could be out of the specifications. Please contact our technician for specific requirements.
7. Aipupower can provide overall power supply solutions and customization service.
8. The product specifications may be modified without prior notice. Please refer to the published data sheet at Aipupower website.

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