

VB15-xxDxxMD Series

DC-DC Converter | 15W | 1"X1"DIP | 4: 1 Wide Input Voltage, Regulated Output | 1600VDC



Features

- International Standard Pinout
- 1"X 1"DIP Package
- Operating Temperature Range: -40℃ to +105℃
- 4:1 Wide Input Voltage Range
- Isolation Voltage: 1600VDC
- Full Load Efficiency: 90% (Typ.)
- Output Short Circuit Protection, Over-current Protection, and Over-voltage Protection
- Design to meet IEC/EN/UL62368 Standards

Product Description



The VB15-xxDxxMD series is a 15W high density DC DC converter with 1" x 1" DIP package. It features high efficiency, wide operating temperature range of -40℃ to 105℃, 1600VDC isolation, full protections and compact size, making it an ideal solution for where board space is at a premium, such as industrial control equipment, communication equipment, instrumentation, and industrial electronics applications.

Selection Guide

Certification	Part No.	Input Voltage (VDC)		Output		Full Load Efficiency (%)	Capacitive Load (μF)
		Nomina (Range)	Max.	Voltage (VDC)	Current (mA) Max.		
EN/UL pending	VB15-24D03MD	24 (9~36)	40	±3.3	±2000	83	2000
	VB15-24D05MD	24 (9~36)	40	±5	±1500	87	2000
	VB15-24D06MD	24 (9~36)	40	±6	±1250	86	1500
	VB15-24D09MD	24(9~36)	40	±9	±833	88	1000
	VB15-24D12MD	24(9~36)	40	±12	±625	90	800
	VB15-24D15MD	24(9~36)	40	±15	±500	89	600
	VB15-24D18MD	24(9~36)	40	±18	±417	88	470
	VB15-24D24MD	24(9~36)	40	±24	±312	90	300
	VB15-48D03MD	48 (18~75)	80	±3.3	±2000	81	2000
	VB15-48D05MD	48 (18~75)	80	±5	±1500	85	2000
	VB15-48D06MD	48 (18~75)	80	±6	±1250	84	1500

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Certification	Part No.	Input Voltage (VDC)		Output		Full Load Efficiency (%) Typ.	Capacitive Load (μF) Max.
		Nomina (Range)	Max.	Voltage (VDC)	Current (mA) Max.		
EN/UL pending	VB15-48D09MD	48 (18~75)	80	±9	±833	88	1000
	VB15-48D12MD	48 (18~75)	80	± 12	±625	89	800
	VB15-48D15MD	48 (18~75)	80	±15	±500	89	600
	VB15-48D18MD	48 (18~75)	80	±18	±417	88	470
	VB15-48D24MD	48 (18~75)	80	±24	±312	89	300

Note:

1. *The capacitive load for both positive and negative outputs is the same;
2. Suffix "H" indicates heat sink packaging, suffix "-T" indicates extension for chassis mount packaging, suffix "-DIN" indicates extension for Din-rail mount packaging;
3. The extension for chassis mount packaging has reverse polarity protection added internally at the input, and its full load efficiency will decrease by 2%.
4. The "-T" and "DIN" Model's start-up and minimum input voltages are increased by 1VDC due to the input reverse polarity protection circuit.
5. Exceeding the maximum input voltage may cause permanent damage.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (Full Load/No-load)	24VDC Nominal Input Series Nominal Input Voltage	3.3V Output	--	663/8	679/18	mA
		5V/6V Output	--	727/10	744/20	mA
		Others	--	710/20	726/30	mA
	48VDC Nominal Input Series Nominal Input Voltage	3.3V Output	--	340/6	348/16	mA
		5V/6V Output	--	372/8	381/18	mA
		Others	--	355/15	363/25	mA
Reflected Ripple Current	Nominal Input Voltage		--	30	--	mA
Surge Voltage (1sec.max)	24VDC Nominal Input Series		-0.7	--	50	VDC
	48VDC Nominal Input Series		-0.7	--	100	VDC
Start-up Voltage	24VDC Nominal Input Series		--	--	9	VDC
	48VDC Nominal Input Series		--	--	18	VDC
Input Under-voltage Protection	24VDC Nominal Input Series		5.5	6.5	--	VDC
	48VDC Nominal Input Series		12	15.5	--	VDC
Start-up Time	Nominal Input and Constant Resistive Load		--	10	--	ms
Remote On/Off Pin (Ctrl)	Turn on module		Ctrl pin open or pulled high (TTL2. 7-12VDC)			
	Turn off module		Ctrl pin pulled low to GND (0-1. 2VDC)			
Input Filter Type			PI filter			
Hot Plug			Unavailable			

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy	0%~100% Load	Vo1	--	±1.0	±3.0	%
		Vo2	--	±3.0	±5.0	%
Line Regulation	Vin=Min.to Max., @FullLoad	Vo1	--	±0.2	±0.5	%
		Vo2	--	±0.4	±1.0	%
Load Regulation	5%-100% Load		--	±0.5	±1.0	%
	0%-5% Load		--	±3.0	±5.0	%
Ripple & Noise	20MHz bandwidth (peak-to-peak)	5%-100% load	--	100	200	mVp-p
		0%-5% load	--		5	%Vo.
Transient Recovery Time	25% Load Step Change, Nominal Input Voltage		--	300	500	μs
Transient Response Deviation			--	±5.0	±8.0	%
Temperature Coefficient	Full Load		--	--	±0.03	%/°C
Over-voltage Protection	Input Voltage Range		110	--	160	%Vo
Over-current Protection	Input Voltage Range		110	--	--	%Vo
Short Circuit Protection	Input Voltage Range		Continuous Short Circuit, Self-Recovery			

Note: Ripple & noise are measured at 20MHz of bandwidth with a 10uF electrolytic capacitor and a 1uF ceramic capacitor connected in parallel at the output.

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	Input-Output, Test Time 1 Minute, Leakage Current < 1mA	1600	---	---	VDC
	Input/Output-Case, Test Time 1 Minute, Leakage Current < 1mA	1000	---	---	VDC
Insulation Resistance	Input-Output, Insulation Voltage 500VDC	1000	---	---	MΩ
Isolation Capacitance	Input-Output, 100KHz/0.1V	---	2000	---	pF
Operating Temperature	See below: Temperature Derating Curve	-40	---	105	°C
Storage Temperature		-55	---	125	°C
Storage Humidity	No condensation	5	---	95	%RH
Soldering Profile	Wave-soldering	260±5°C; Time 5 - 10s			
	Manual soldering	360± 10°C; Time 3 - 5s			
Switching Frequency	PWM Mode	---	300	---	kHz
Vibration		IEC/EN61373-Category 1, Grade B			
MTBF	MIL-HDBK-217F@25°C	>1000Kh			

Mechanical Specifications

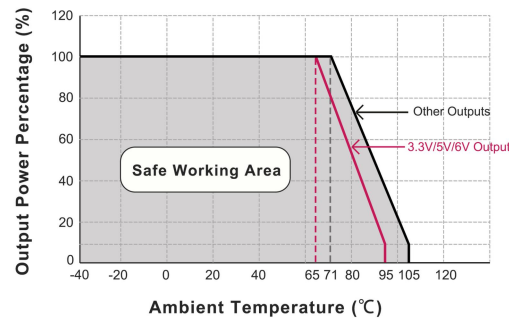
Case material	Aluminum alloy		
Mechanical Dimensions	Horizontal package (without heat sink)	25.40×25.40×12.00mm	
	Horizontal package (with heat sink)	25.40×25.40×18.60mm	
	Chassis mounting (without heat sink)	76.00×31.50×21.20mm	
	DIN-rail mounting (without heat sink)	76.00×31.50×25.80mm	
	Chassis mounting (with heat sink)	76.00×31.50×28.40mm	
	DIN-rail mounting (with heat sink)	76.00×31.50×32.00mm	
Weight	Horizontal package/Chassis mounting/DIN-Rail mounting	without heat sink	15.3g/38.7g/58.7g(typ.)
	Horizontal package/Chassis mounting/DIN-Rail mounting	with heat sink	22.5g/45.5g/66.0g(typ.)
Cooling Method	Free air convection		

Electromagnetic Compatibility (EMC)

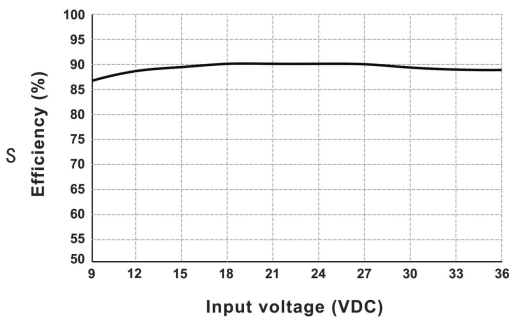
EMI	CE	CISPR32/EN55032	CLASS B (Recommended circuit see Figure 2-②)	
	RE	CISPR32/EN55032	CLASS B (Recommended circuit see Figure 2-②)	
EMS	ESD	IEC/EN61000-4-2	Contact±6KV, Air ±8KV	perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±2KV (Recommended circuit see Figure 2-①)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line±2KV (Recommended circuit see Figure 2-①)	perf. Criteria B
	CS	IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A

Product Characteristic Curve

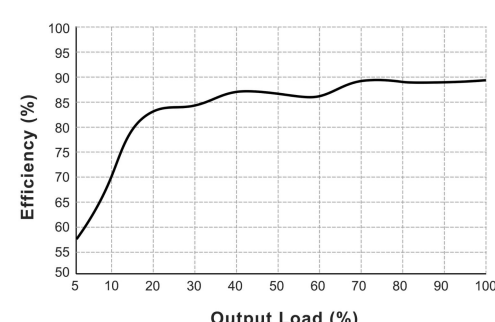
Temperature Derating Curve



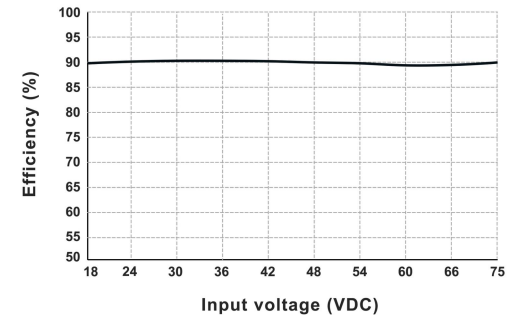
Efficiency VS Input Voltage Curve (Full Load, VB15-24D05MD)



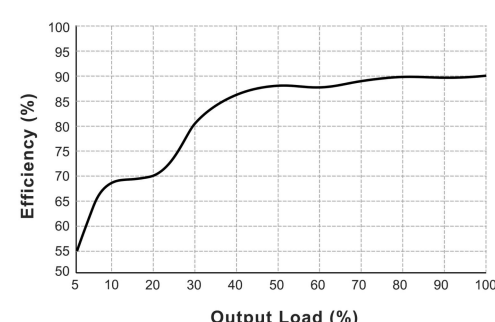
Efficiency VS Output Load Curve (Vin=24V, VB15-24D05MD)



Efficiency VS Input Voltage Curve (Full Load, VB15-48D05MD)

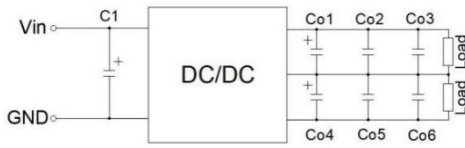


Efficiency VS Output Load Curve (Vin=48V, VB15-48D05MD)



Design Reference - Application Circuit - Typical Circuit

Typical Application Circuit Design



(Figure 1)

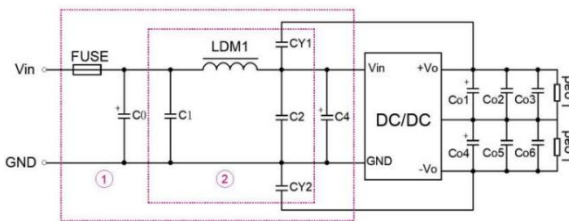
Recommended Capacitive Load Value Table

Vout(VDC)	C1(μF)	Co1/Co4(μF)	Co2/Co5(μF)	Co3/Co6(μF)
3.3/5/6	100μF/100V	100μF/16V	10μF/50V	0.1μF/16V
9/12/15	100μF/100V	100μF/25V	10μF/50V	0.1μF/25V
18/24	100μF/100V	47μF/50V	10μF/50V	0.1μF/50V

If further reduction of input and output ripple is required, the external capacitors C1, Co1, Co2, Co3, Co4, Co5, Co6 can be increased or capacitors with lower series equivalent impedance can be selected. For each output, under safe and reliable operating conditions, the maximum capacitance of the filter capacitor must not exceed the maximum capacitive load of the product.

Design Reference - EMC Recommended Circuit

EMI Recommended Circuit Design and Application



(Figure 2)

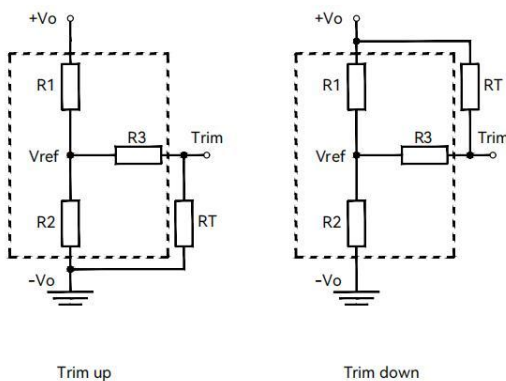
Part ① is used for EMC testing; Part ② is used for EMI filtering, can be selected as needed.

Recommended Parameter Table

Input Voltage	Vin:24V	Vin:48V
FUSE	Select according to actual input current	
C0, C4	330uF/50V	330uF/100V
C1, C2	4.7uF/50V	4.7uF/100V
LDM1	10uH/4A	10uH/2A
Co1, 2, 3, 4, 5, 6	Refer to Figure 1	
CY1, CY2	1nF/2KVDC	

Design Reference - Trim Circuit Usage

Trim Circuit Design and Application



(Figure 3)

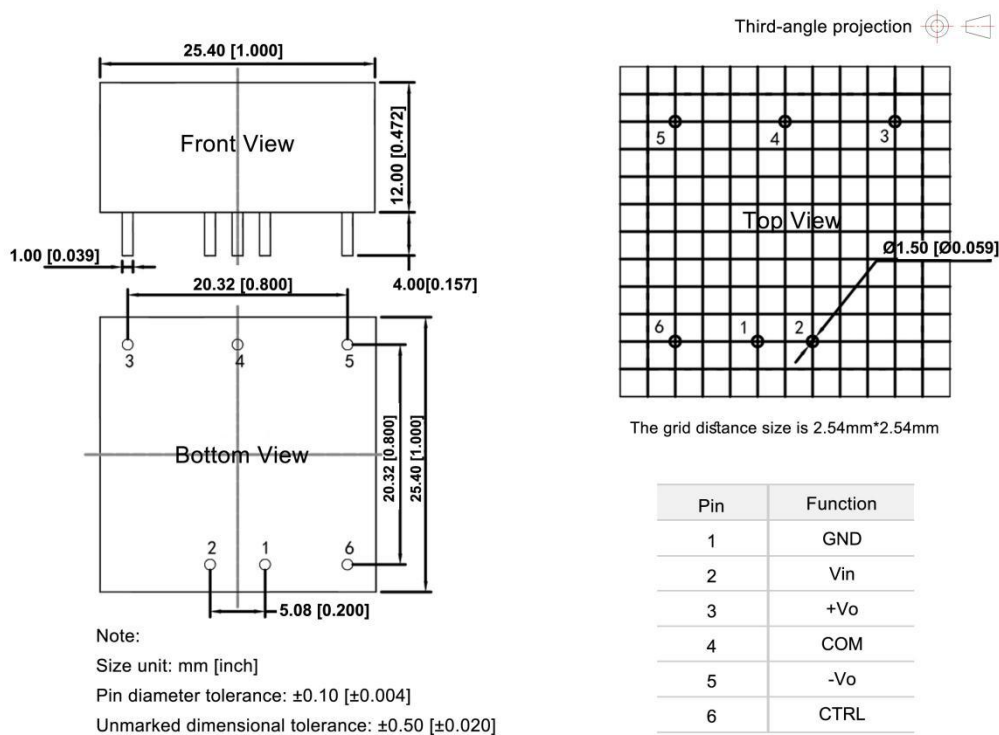
Calculation of Trim Resistor

Vout(V)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	10	6.064	13.622	1.24
5	2.4	2.344	13.622	2.5
6	10	6.982	13.622	2.5
9	12	4.602	17.346	2.5
12	8.2	2.153	17.346	2.5
15	12	2.388	21.016	2.5
18	24	3.868	33.275	2.5
24	10	1.158	10.714	2.5

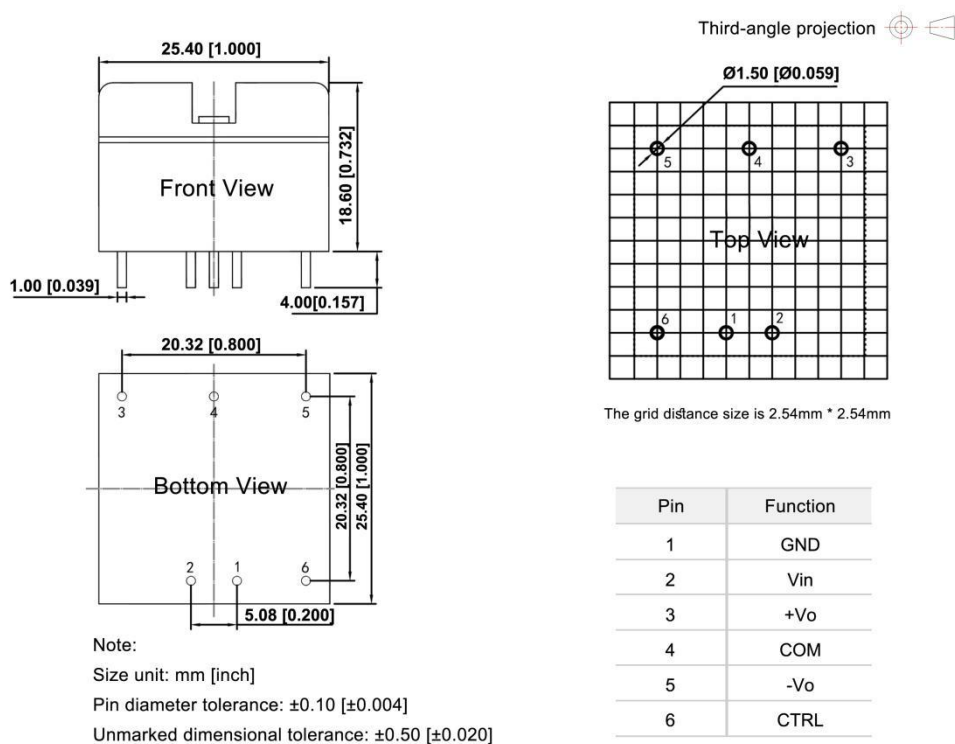
$$\begin{aligned} \text{Up: } R_t &= \frac{nR_2}{R_2 - n} - R_3 & n &= \frac{V_{ref}}{V_o - V_{ref}} * R_1 \\ \text{Down: } R_t &= \frac{nR_1}{R_1 - n} - R_3 & n &= \frac{V_o - V_{ref}}{V_{ref}} * R_2 \end{aligned}$$

Dimensions and Recommended Layout

VB15-xxDxxMD Dimensions and Recommended Layout



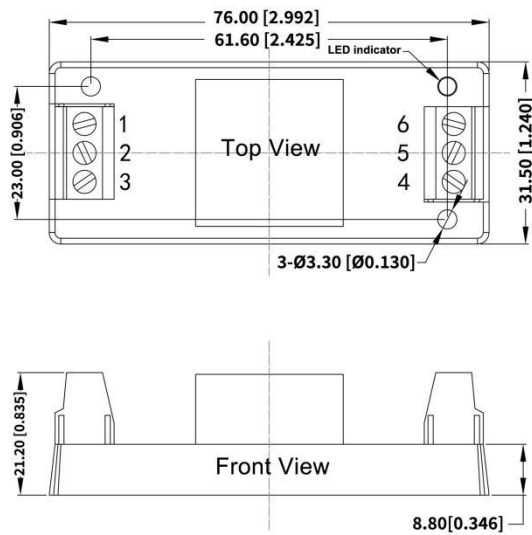
VB15-xxDxxMDH Dimensions and Recommended Layout



Dimensions and Recommended Layout

VB15-xxDxxMD-T Dimensions and Recommended Layout

Third-angle projection 

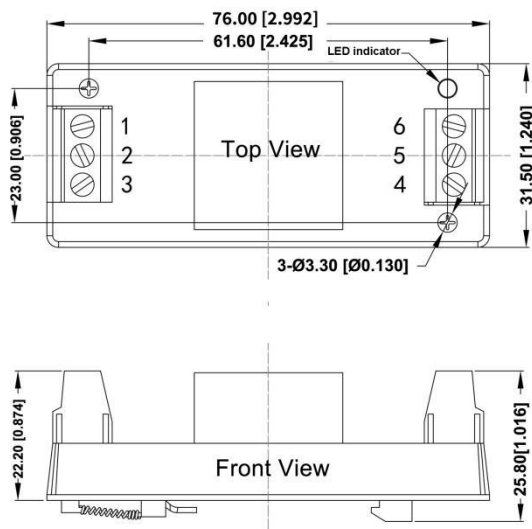


Pin	Function
1	CTRL
2	GND
3	Vin
4	+Vo
5	COM
6	-Vo

Note:
Size unit: mm [inch]
Wire diameter: 24-12
AWGTightening torque: Max 0.4 N · m
Unmarked dimensional tolerance: $\pm 1.00 [\pm 0.039]$

VB15-xxDxxMD-DIN Dimensions and Recommended Layout

Third-angle projection 



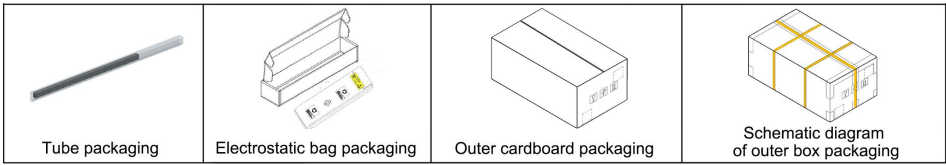
Pin	Function
1	CTRL
2	GND
3	Vin
4	+Vo
5	COM
6	-Vo

Note:
Size unit: mm [inch]
Rail type: TS35
Wire diameter: 24-12
AWGTightening torque: Max 0.4 N · m
Unmarked dimensional tolerance: $\pm 1.00 [\pm 0.039]$

Packaging Information

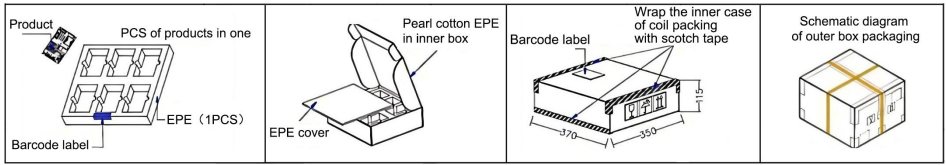
Model Series (Tube Packaging)	Quantity per Tube (pcs/tube)	Quantity per Anti-static Bag (pcs/bag)	Inner Carton Quantity (pcs/carton)	Full Carton Quantity(pcs)
VB15-xxDxxMD	19	76	228	912
VB15-xxDxxMDH	19	76	228	912

The schematic diagram of tube packaging is shown below:



Model Series (Pearl Cotton)	Quantity (pcs/Tray)	Inner Carton Quantity (pcs/carton)	Outer Carton Quantity (pcs/carton)
VB15-xxDxxMD-T	28	84	168
VB15-xxDxxMD-DIN	28	84	168

The schematic diagram of pearl cotton packaging is shown below :



Product precautions

1. The input voltage should not exceed the specified range value, otherwise it may cause permanent and irreparable damage;
2. It is recommended to use at a load of over 5%. If the load is below 5%, the ripple index of the product may exceed the specifications, but it does not affect the reliability of the product;
3. The maximum capacitive load is tested within the input voltage range and under full load conditions;
4. Unless otherwise specified, all indicators in this manual are measured at $T_a=25\text{ }^{\circ}\text{C}$, humidity<75% RH, nominal input voltage, and output rated load;
5. All indicator testing methods in this manual are based on our company's corporate standards;
6. Our company can provide product customization, and specific requirements can be directly contacted by our technical personnel;
7. Product specifications are subject to change without prior notice.

Manufacturer contact information

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