

VB15-xxSxxMD Series

DC-DC Converter | 15W | 1"X1"DIP | 4:1 Wide Input Voltage, Regulated Output | 1500VDC



Features

- 1"X 1"DIP Package
- Operating Temperature Range: -40°C ~ +85°C
- Ultra-Wide 4:1 Input voltage range
- Isolation Voltage: 1500VDC
- Full Load Efficiency: 90% (typ.)
- Output Over-voltage Protection, Output Short Circuit Protection, and Over-current Protection Mechanisms
- Designed to meet IEC/EN/BS EN/UL 62368

Product Description



The VB15-xxSxxMD series adopts 1"X 1" DIP Package form DC-DC converter, with high efficiency, operating temperature range of -40°C to +85°C, compact size, making this converter an ideal solution for 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	VB15-24S03MD	24 (9~36)	40	3.3	4000	88	10000
	VB15-24S05MD	24 (9~36)	40	5	3000	89	10000
	VB15-24S06MD	24 (9~36)	40	6	2500	89	8200
	VB15-24S09MD	24 (9~36)	40	9	1667	88	6800
	VB15-24S12MD	24 (9~36)	40	12	1250	90	1600
	VB15-24S15MD	24 (9~36)	40	15	1000	89	1000
	VB15-24S18MD	24(9~36)	40	18	833	88	820
	VB15-24S24MD	24(9~36)	40	24	625	91	500
	VB15-24S28MD	24(9~36)	40	28	536	90	470
	VB15-48S03MD	48 (18~75)	80	3.3	4000	89	10000
	VB15-48S05MD	48 (18~75)	80	5	3000	90	10000
	VB15-48S06MD	48 (18~75)	80	6	2500	89	8200

Selection Guide

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	VB15-48S09MD	48 (18~75)	80	9	1667	88	6800
	VB15-48S12MD	48 (18~75)	80	12	1250	90	1600
	VB15-48S15MD	48 (18~75)	80	15	1000	90	1000
	VB15-48S18MD	48 (18~75)	80	18	833	88	820
	VB15-48S24MD	48 (18~75)	80	24	625	91	500
	VB15-48S28MD	48 (18~75)	80	28	536	90	470

- Note:
- 1、The suffix "H" indicates a heatsink package, "-T" indicates an extension for chassis mount packaging, and "-DIN" indicates an extension for Din-rail mount packaging.
 - 2、Since the "-T" and "-DIN" models feature input reverse polarity protection, the minimum input voltage range and startup voltage are increased by 1 VDC.
 - 3、The input voltage must not exceed this value, otherwise it may cause permanent and irreparable damage.
 - 4. The extension for chassis mount packaging and extension for Din-rail mount packaging have input reverse polarity protection added internally, and their full load efficiency will decrease by 2%.

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	--	625/30	640/50	mA
		5V/6V Output	--	702/35	718/55	mA
		Others	--	710/6	727/24	mA
	48VDC Nominal Input Series Nominal Input Voltage	3.3V Output	--	309/15	316/30	mA
		5V/6V Output	--	351/20	359/30	mA
		Others	--	355/3	363/15	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
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	--	±1.0	±3.0	%
Line Regulation	Full load, input voltage from low limit to high limit	--	±0.2	±0.5	%
Load Regulation	5%-100% Load	--	±0.5	±1.0	%
	0%-5% Load	--	±1.0	±3.0	%
Ripple & Noise	5%-100% Load	--	80	120	mVp-p
	0%-5% Load	--	--	5	%Vo
Transient Recovery Time	25% Load Step Change	--	300	500	μs
Transient Response Deviation		--	±5.0	±8.0	%
Temperature Coefficient	Full Load	--	--	±0.03	%/℃
Output Voltage Trim		90	--	110	%Vo
Over-voltage Protection		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 inparallel at the output.

General Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Isolation Voltage	Input-Output, test time 1 minute, leakage current < 1mA		1500	--	--	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	3.3V, 5V Output	-40	--	95	°C
		Other Output	-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/EN 61373 -Category 1, Grade B					
MTBF	MIL-HDBK-217F@25°C		>1000Kh			

Mechanical Specifications

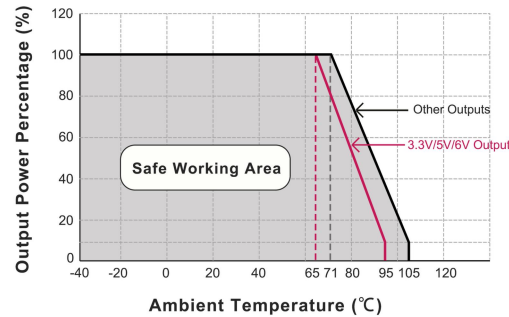
Case material	Aluminum alloy		
Mechanical Dimensions	Horizontal package (without heat sink)		25.40×25.40×12.00mm
	Horizontal package (with heat sink)		25.40×25.40×18.60mm
	Chassis mounting (without heat sink)		76.00×31.50×21.20mm
	DIN-rail mounting (without heat sink)		76.00×31.50×25.80mm
	Chassis mounting (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)

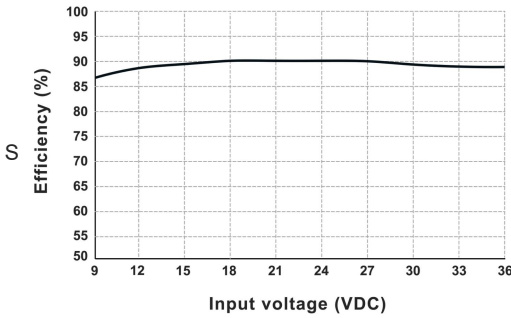
EMI	CE	CISPR32/EN55032 CLASS B (Recommended circuit see Figure 2-②)		
	RE	CISPR32/EN55032 CLASS B (Recommended circuit see Figure 2-②)		
EMS	ESD	IEC/EN61000-4-2	Contact±6KV, Air ±8KV	perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±2KV (Recommended circuit see Figure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

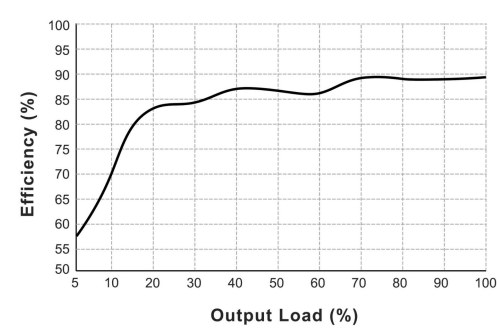
Temperature Derating Curve



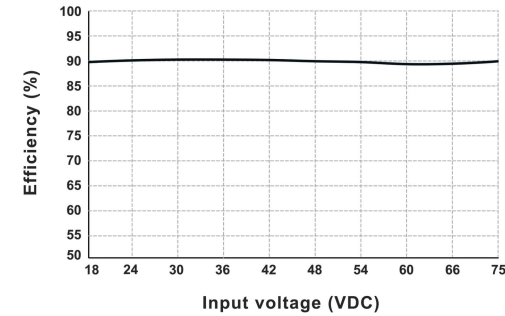
Efficiency VS Input Voltage Curve (Full Load, VB15-24S05MD)



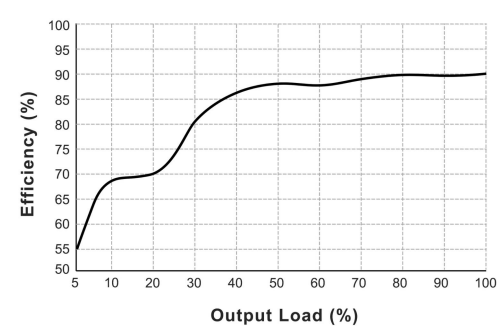
Efficiency VS Output Load Curve (Vin=24V, VB15-24S05MD)



Efficiency VS Input Voltage Curve (Full Load, VB15-48S05MD)

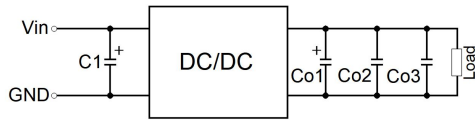


Efficiency VS Output Load Curve (Vin=48V, VB15-48S05MD)



Design Reference - Application Circuit

Typical Application Circuit



(Figure 1)

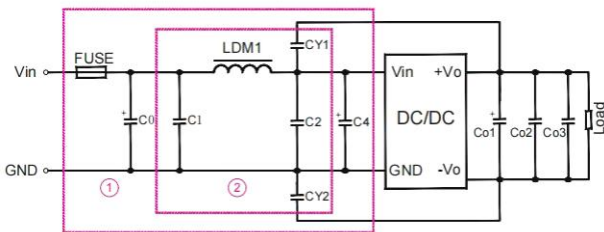
Recommended Capacitive Load Value Table

Vout(VDC)	C1(μF)	Co1(μF)	Co2(μF)	Co3(μF)
3.3/5/6VDC	100μF/100V	100μF/16V	10μF/50V	0.1μF/16V
9/12/15VDC	100μF/100V	100μF/25V	10μF/50V	0.1μF/25V
18/24/28VDC	100μF/100V	47μF/50V	10μF/50V	0.1μF/50V

To further reduce input and output ripple, the external input and output capacitors C1, Co1, Co2, Co3 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 Solutions - Recommended Circuits

EMI Recommended Circuit Design and Application



(Figure 2)

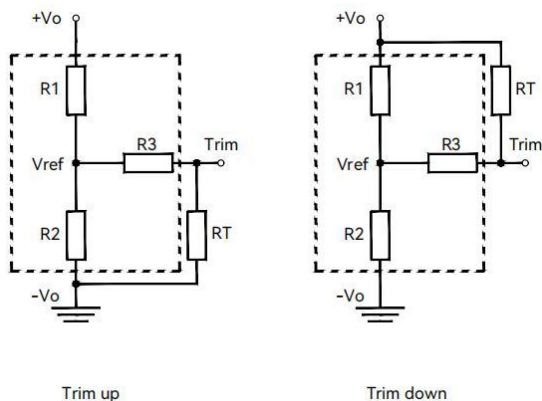
Part ① is used for EMC testing. Part ② is used for EMI filtering, selectable based on requirements.

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/Co2/Co3	Refer to the capacitive load value table in Figure 1	
CY1, CY2	2.2nF/2KVDC	

Peripheral Circuit Design and Application - Trim Application Circuit

Trim Application Circuit Design and Application



Trim Application Circuit Diagram

(Dashed box indicates internal product components)

(Figure 3)

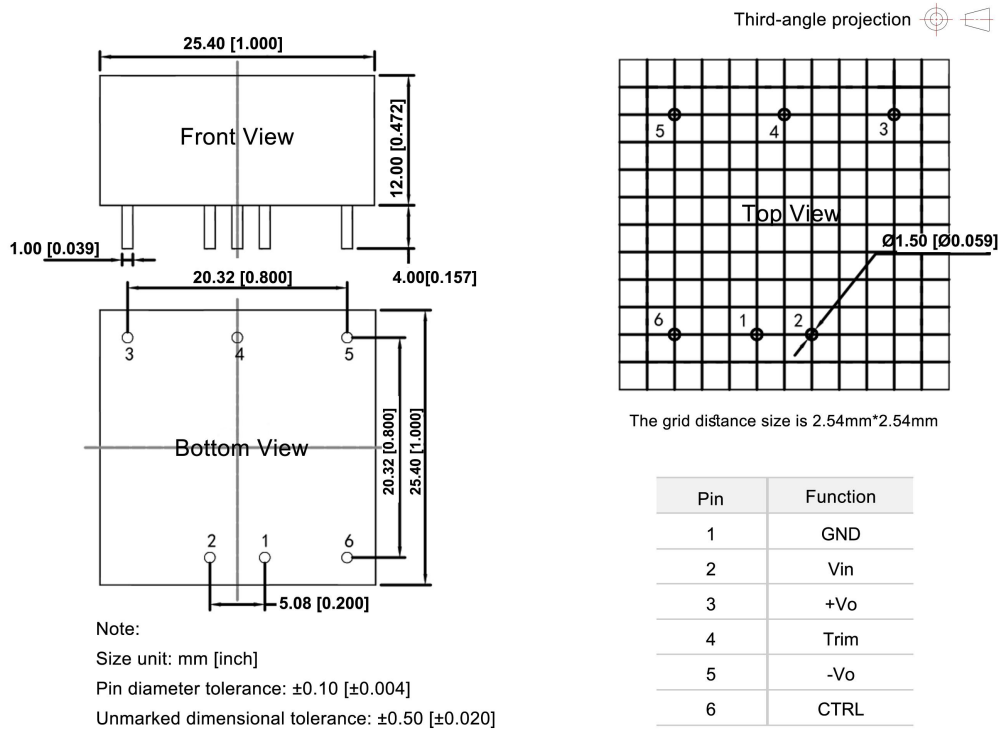
Trim Resistor Calculation

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	22	2.525	10.714	2.5
28	27	2.641	10.714	2.5

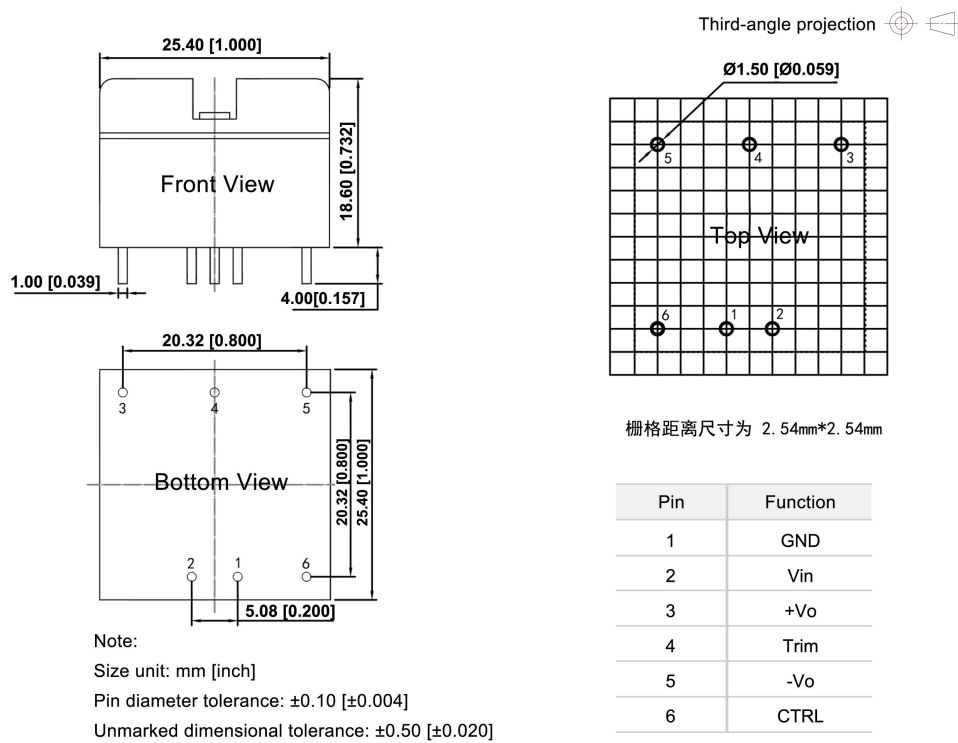
$$\begin{aligned} \text{Up: } R_t &= \frac{nR_2}{R_2 - n} - R_3 & n &= \frac{V_{ref}}{V_o - V_{ref}} * R_1 \\ \text{Down: } R_t &= \frac{nR_1}{R_1 - n} - R_3 & n &= \frac{V_o - V_{ref}}{V_{ref}} * R_2 \end{aligned}$$

Dimensions and Recommended Layout

VB15-xxSxxMD Dimensions and Recommended Layout

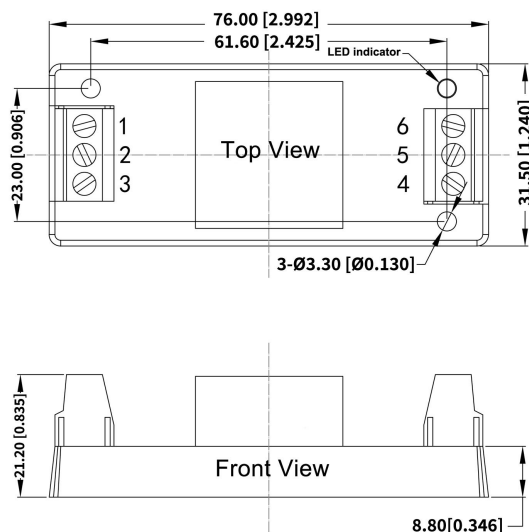


VB15-xxSxxMDH Dimensions and Recommended Layout



Dimensions and Recommended Layout

VB15-xxSxxMD-T Dimensions and Recommended Layout

Third-angle projection 

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

Note:

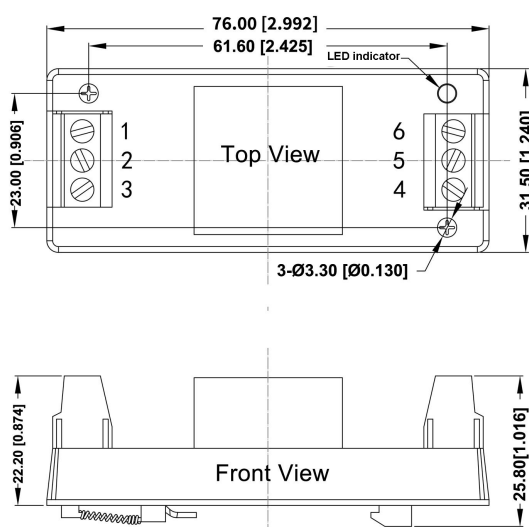
Size unit: mm [inch]

Wire diameter: 24-12

AWG Tightening torque: Max 0.4 N · m

Unmarked dimensional tolerance: $\pm 1.00 [\pm 0.039]$

VB15-xxSxxMD-DIN Dimensions and Recommended Layout

Third-angle projection 

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

Note:

Size unit: mm [inch]

Rail type: TS35

Wire diameter: 24-12

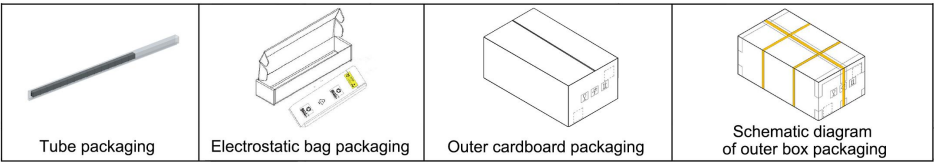
AWG Tightening torque: Max 0.4 N · m

Unmarked dimensional tolerance: $\pm 1.00 [\pm 0.039]$

Packaging Information

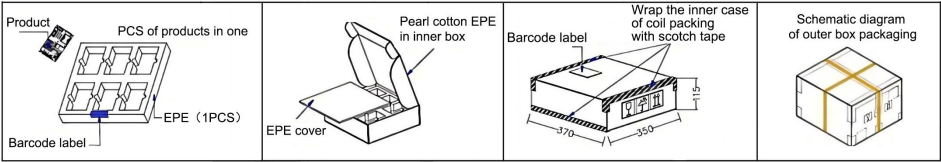
Model Series (Tube Packaging)	Quantity per Tube (pcs/tube)	Quantity per ESD Bag (pcs/bag)	Inner Carton Quantity (pcs/carton)	Full Carton Quantity(pcs)
VB15-xxSxxMD	19	76	228	912
VB15-xxSxxMDH	19	76	228	912

The schematic diagram of tube packaging is shown below:



Model series (Pearl cotton)	Product quantity (pcs/Tray)	Inner carton quantity (pcs/carton)	OuterCarton quantity (pcs/carton)
VB15-xxSxxMD-T	28	84	168
VB15-xxSxxMD-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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