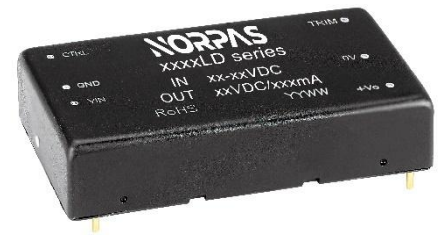


FEATURES

1. Ultra-wide 4:1 input voltage range
2. High efficiency up to 93.3%
3. I/O isolation test voltage 1.5K VDC
4. Input under-voltage protection, output short-circuit, over-current, over-voltage protection
5. Operating ambient temperature range:-40°C to+105°C
6. Six-sided metal shielding package
7. Industry standard pin-out
8. Meet EN62368 standards



3 years
Warranty

Selection Guide

Part No.	Input Voltage (VDC)		Output		Full Load Efficiency(%) Min./Typ.	Capacitive Load (μF)Max.
	Nominal (Range)	Max.	Voltage (VDC)	Current(mA) Max./Min.		
ZYB2405LD-60W(H)R3	24(9-36)	40	05	12000/600	90/92	20000
ZYB2412LD-60W(H)R3			12	5000/250	91/93	6000
ZYB2415LD-60W(H)R3			15	4000/200	91/93.3	4000
ZYB2424LD-60W(H)R3			24	2500/125	91/93	2000

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	Nominal input voltage	--	2718/25	2748/30	mA
Surge Voltage (1sec. max.)		-0.7	--	50	VDC
Start-up Voltage		--	--	9	
Input Filter		PI filter			
Hot Plug		Unavailable			
Ctrl*	Module on	Ctrl pin open or pulled high TTL (3-12VDC)			
	Module off	Ctrl pin pulled low to GND (0-1.2VDC)			
Note: *The Ctrl pin voltage is referenced to input GND.					

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Voltage Accuracy	5%-100% load	--	±1	±2	%
	0%-5% load	--	±2	±5	
Linear Regulation	Input voltage variation from low to high at full load	--	±0.2	±0.5	
Load Regulation	5%-100% load	--	±0.5	±1	
Transient Response Deviation	25% load step change, input	5V output	--	±3	±10

	voltage range	Other output	--	±3	±5	
Transient Recovery Time	25% load step change, nominal input voltage		--	250	500	μs
Temperature Coefficient	Full load		--	--	±0.03	%/°C
Ripple & Noise ^①	20MHz bandwidth, nominal input voltage, 5%-100% load	5V/12V/15V output	--	100	--	mV p-p
		24V output	--	130	--	
	20MHz bandwidth, nominal input, voltage, 0%-5% load		--	--	3	%Vo
Over-voltage Protection	Input voltage range	110	140	160		
Over-current Protection		110	140	200	%Io	
Short-circuit Protection		Continuous, self-recovery				
Note: ①By measuring method is used for Ripple and Noise test, please refer to Fig. 2. for recommended circuit.						

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation	Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max.	1500	--	--	VDC
	Input/output-Case Electric Strength Test for 1 minute with a leakage current of 1mA max.	1000	--	--	
Insulation Resistance	Input-output resistance at 500VDC	100	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100KHz/0.1V	--	2200	--	pF
Operating Temperature	See Fig. 1	-40	--	+105	°C
Storage Temperature		-55	--	+125	
Storage Humidity	Non-condensing	5	--	95	%RH
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	--	--	+300	°C
Vibration		10-150Hz, 5G, 0.75mm. along X, Y and Z			
Switching Frequency ^①	PWM mode	--	370	--	KHz
MTBF	MIL-HDBK-217F@25°C	1000	--	--	K hours
Note: ①Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.					

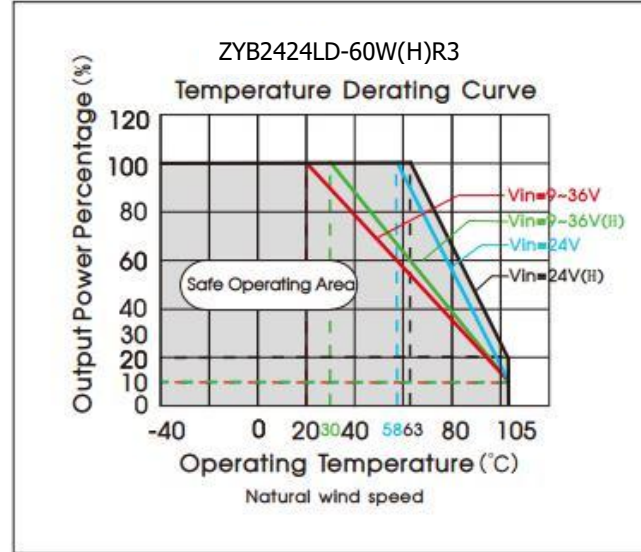
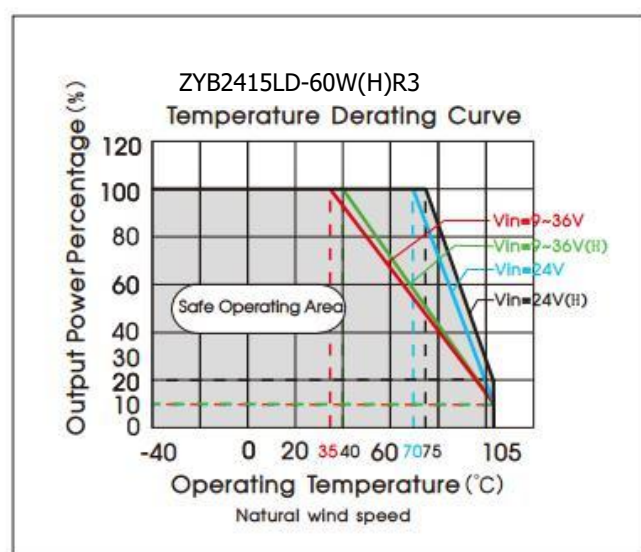
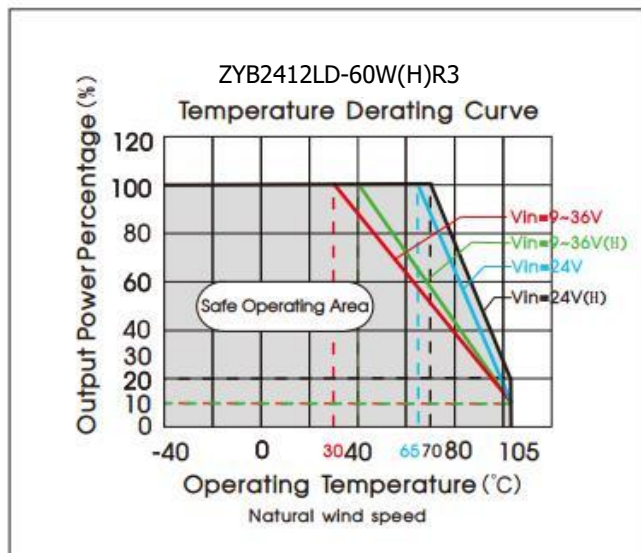
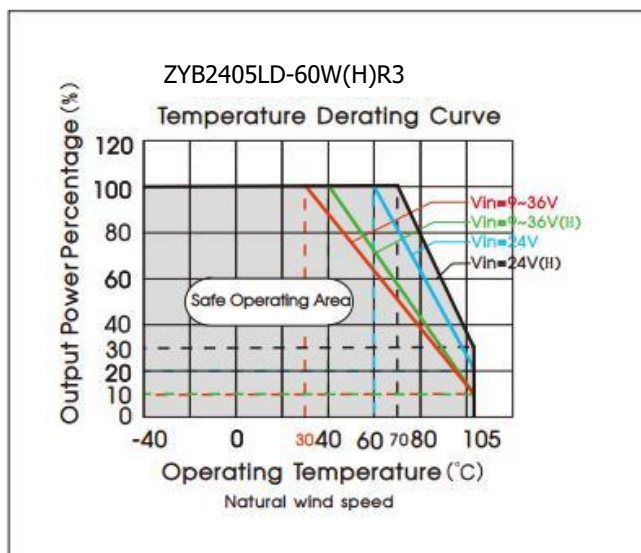
Mechanical Specifications

Case Material	Aluminum alloy		
Dimensions	Without heat sink	Horizontal package	50.80 × 25.40 × 11.80 mm
	Heat sink	Horizontal package	51.40 × 26.20 × 16.50 mm
Weight	Without heat sink	Horizontal package	41.0g
	Heat sink	Horizontal package	50.8g
Cooling Method	Free air convection		

EMC Specifications

Emissions	CE	CISPR32/EN55032 CLASS A (Vout=12/15V see Fig. 3-① for recommended circuit, Vout=05/24V see Fig. 3-③ for recommended circuit) / CLASS B (Vout=12/15V see Fig. 3-② for recommended circuit, Vout=05/24V see Fig. 3-④ for recommended circuit)		
	RE	CISPR32/EN55032 CLASS A (Vout=12/15V see Fig. 3-① for recommended circuit, Vout=05/24V see Fig. 3-③ for recommended circuit) / CLASS B (Vout=12/15V see Fig. 3-② for recommended circuit, Vout=05/24V see Fig. 3-④ for recommended circuit)		
Immunity	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	100KHz ±2KV (Vout=12/15V see Fig. 3-② for recommended circuit, Vout=05/24V see Fig. 3-④ for recommended circuit)	perf. Criteria A
	Surge	IEC/EN61000-4-5	line to line ±2KV (Vout=12/15V see Fig. 3-② for recommended circuit, Vout=05/24V see Fig. 3-④ for recommended circuit)	perf. Criteria A
	CS	IEC/EN61000-4-6	10 Vr.m.s	perf. Criteria A

Typical Characteristic Curves



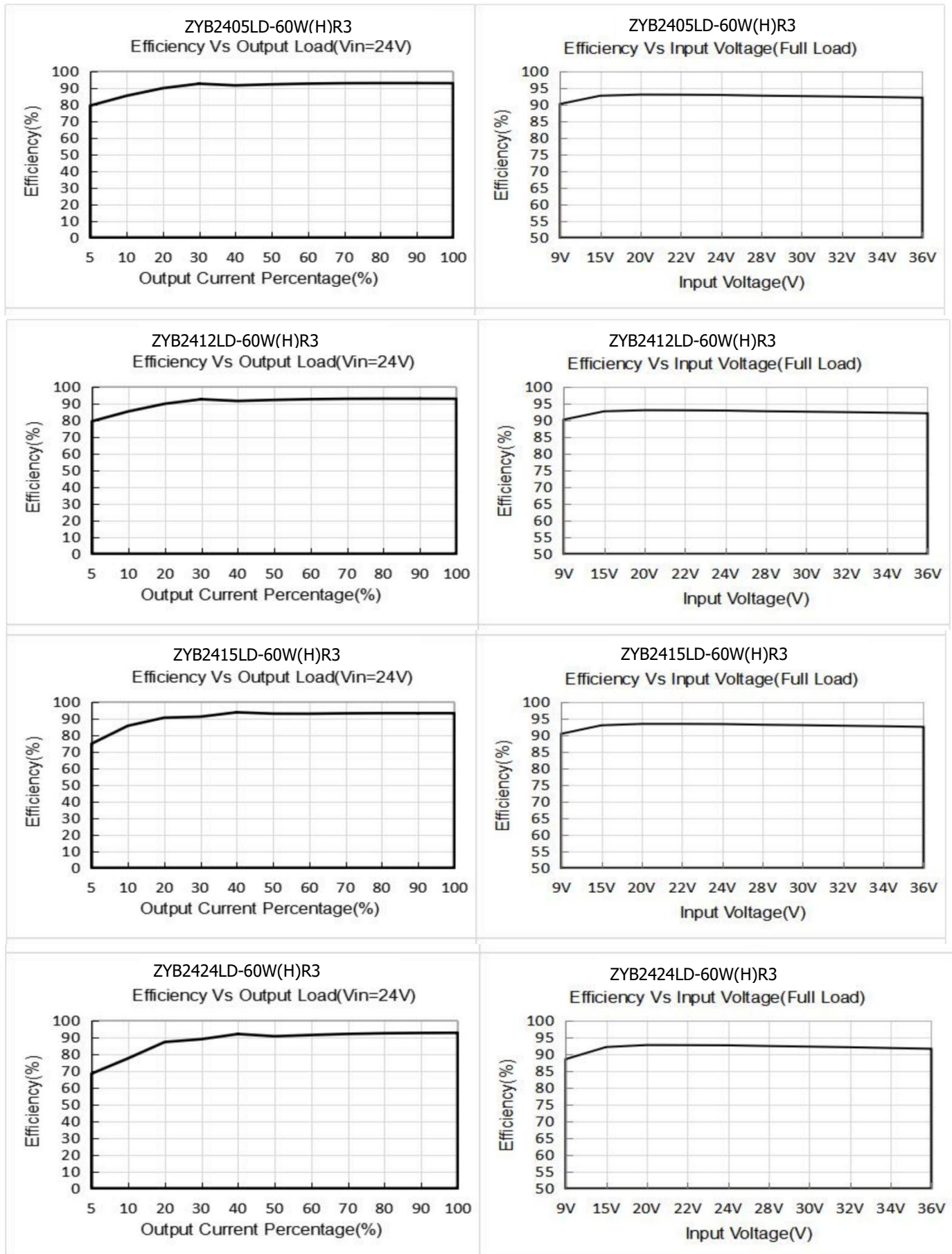


Fig. 1

Circuit Design and Application

1. Typical application

All the DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2.

Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values C_{in} and C_{out} and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product.



Fig. 2

Vout (VDC)	Cin (μF)	Cout (μF)
5	100μF/50V	220μF/16V
12/15		100μF/50V
24		47μF/50V

2. EMC compliance circuit

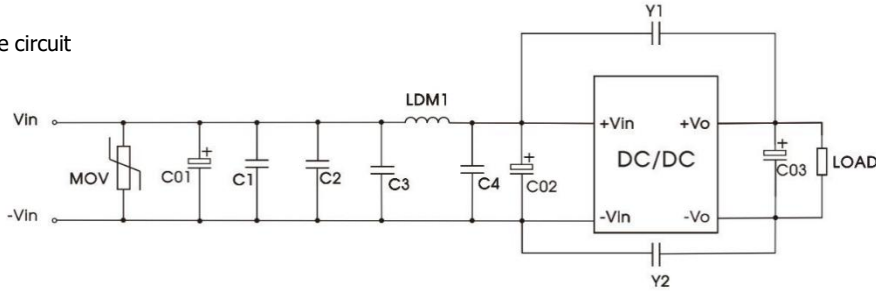


Fig. 3-①

Table 1: recommended component parameters

Model	Parameter	Parameter description
C1/C2	4.7uF	50V
C3/C4	10uF	50V
C01	680uF	50V
C02	330uF	50V
C03	100uF	100V
Y1/Y2	2.2nF	Y1
LDM1	2.2uH	/
MOV	14D470	/

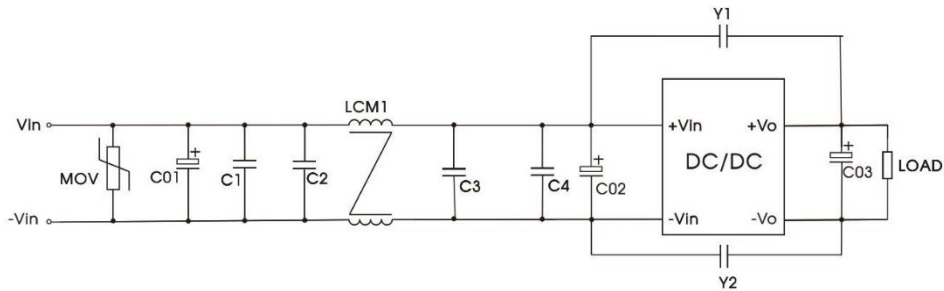


Fig. 3-②

Table 2: recommended component parameters

Model	Parameter	Parameter description
C1/C2	4.7uF	50V
C3/C4	10uF	50V
C01	680uF	50V
C02	330uF	50V
C03	100uF	100V
Y1/Y2	2.2nF	Y1
LCM1	2.2mH	/
LDM1	2.2uH	/
MOV	14D470	/

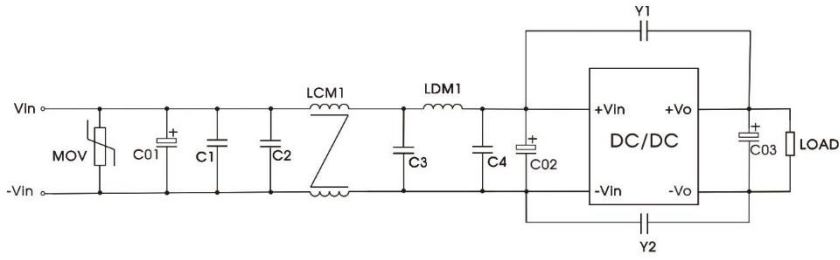


Fig. 3-③

Table 3: recommended component parameters

Model	Parameter	Parameter description
C1/C2	4.7uF	50V
C3/C4	10uF	50V
C01	680uF	50V
C02	330uF	50V
C03	100uF	100V
Y1/Y2	2.2nF	Y1
LCM1	10mH	10.0mH MIN/180mΩ Max
MOV	14D470	/

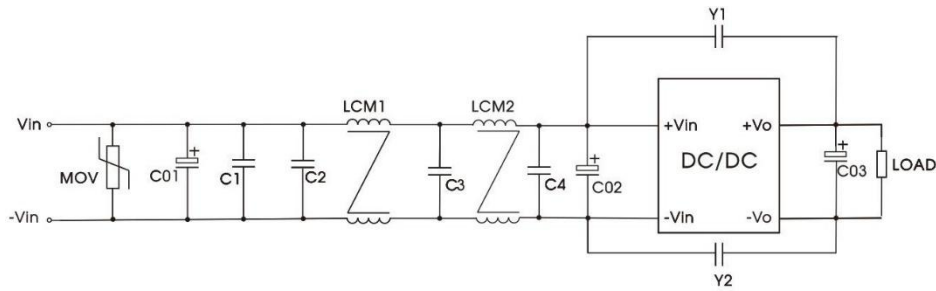
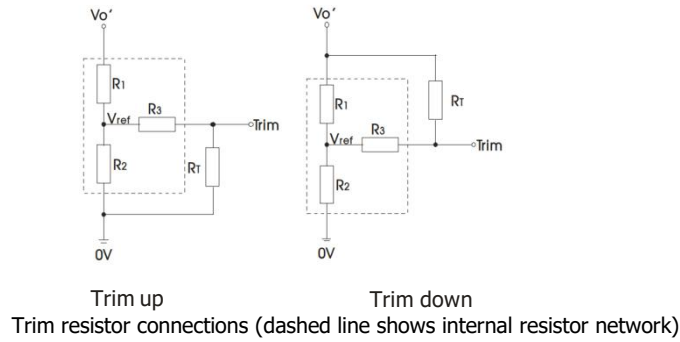


Fig. 3-④

Table 4: recommended component parameters

Model	Parameter	Parameter description
C1/C2	4.7uF	50V
C3	10uF	50V
C4	ZYB2405LD-60WR3	10uF
	ZYB2424LD-60WR3	47uF
C01	680uF	50V
C02	330uF	50V
C03	100uF	100V
Y1/Y2	2.2nF	Y1
LCM1/LCM2	10mH	10.0mH MIN/180mΩ Max
MOV	14D470	/

3.Trim Function for Output Voltage Adjustment (open if unused)



Calculating Trim resistor values:

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

R_T = Trim Resistor value
 α = self-defined parameter
 $V_{o'}$ = desired output voltage

Vout(VDC)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
05	2.97	2.87	6.1	2.5
12	10.91	2.87	6.1	2.5
15	14.35	2.87	6.1	2.5
24	24.77	2.87	6.1	2.5

4.Reflected ripple current test circuit

All DC-DC converters of this series are tested using the recommended circuit shown in Fig. 5. Test point,

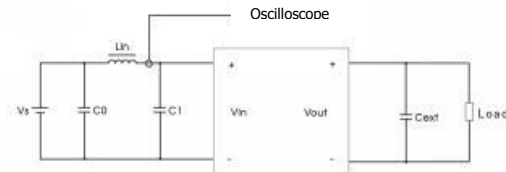
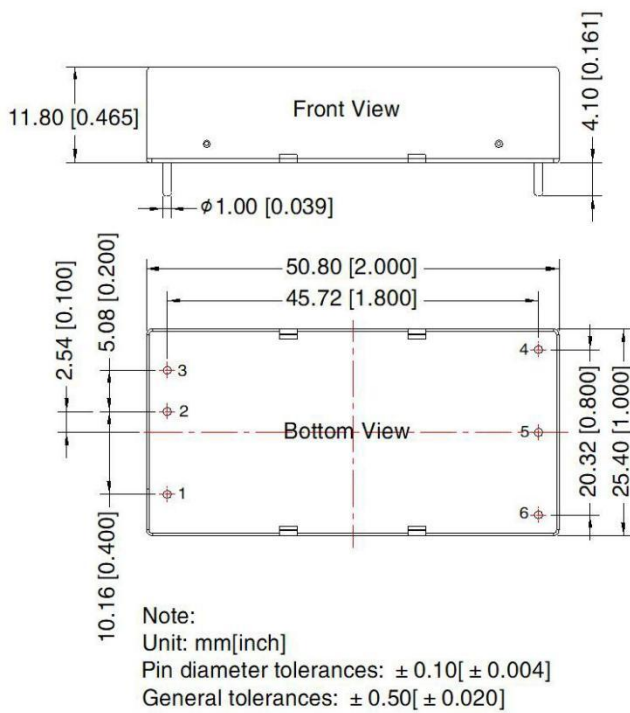


Fig. 5

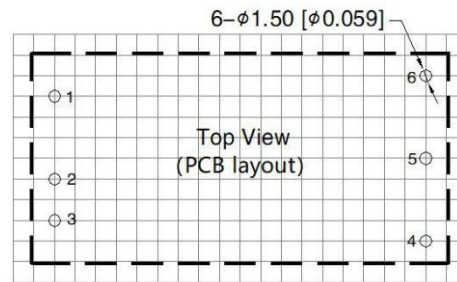
Components	Recommended Component Value
C0	220μF/100V
Lin	10uH/15A
C1	470μF/100V
Cext	470μF/63V

5.The products do not support parallel connection of their output

ZYB24_LD-60WR3 Dimensions and Recommended Layout



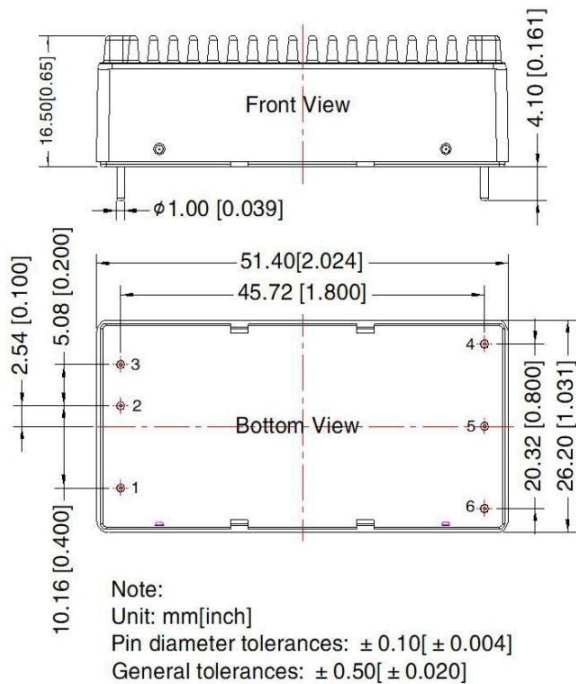
THIRD ANGLE PROJECTION



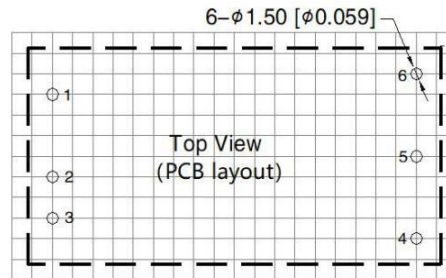
Note: Grid 2.54*2.54mm

Pin-Out	
Pin	Mark
1	Ctrl
2	GND
3	Vin
4	+Vo
5	0V
6	Trim

ZYB24_LD-60WHR3 Dimensions and Recommended Layout



THIRD ANGLE PROJECTION



Note: Grid 2.54*2.54mm

Pin-Out	
Pin	Mark
1	Ctrl
2	GND
3	Vin
4	+Vo
5	0V
6	Trim

Note:

1. If the product works under the minimum required load, it cannot guarantee that the performance of the product complies with all the performance indicators in this manual;
2. The maximum capacitive load is tested under the input voltage range and full load condition;
3. Unless otherwise stated, all indexes in this manual are measured at $T_a=25^{\circ}\text{C}$, humidity $<75\%\text{RH}$, nominal input voltage and rated output load;
4. All index testing methods in this manual are based on the enterprise standards of the company;
5. Our company can provide product customization, specific needs can directly contact our technical staff.