

# 30W Isolated DC to DC Converters

## Single and Dual Output

**multicomp** PRO

30W isolated DC-DC converter Ultra-wide input and regulated dual/single output



**UL** **CE** **CB** Patent Protection

### Features

- Ultra-wide 4:1 input voltage range
- High efficiency up to 90% with full load
- High efficiency up to 82% with 5% load
- No-load power consumption as low as 0.14W
- I/O isolation test voltage 1.5K VDC
- Input under-voltage protection, output shortcircuit, over-voltage, over-current protection
- Operating ambient temperature range: -40°C to +80°C
- Meets CISPR32/EN55032 CLASS A without extra components
- Meets EN50155 railway standard
- Six-sided metal shielded package
- IEC60950, UL60950, EN60950 approved
- Meets EN62368 standard

**RoHS**  
**Compliant**

These series of isolated 30W DC-DC converter products with an ultra-wide 4:1 input voltage and feature efficiencies of up to 90%, input to output isolation is tested with 1500VDC and the converters safely operate ambient temperature of -40°C to +80°C, input under-voltage protection, output short-circuit, over-voltage, over-current protection. They meet CLASS A of CISPR32/EN55032 EMI standards without external components, adding additional input reverse polarity protection and they are widely used in applications such as data transmission device, battery power supply device, telecommunication device, distributed power supply system, hybrid module system, remote control system, industrial robot and railway fields. Selection

### Selection Guide

Certification	Part Number	Input Voltage (VDC)		Output		Full Load Efficiency (%) Min./Typ.	Capacitive Load(μF)* Max.
		Nominal (Range)	Max.	Voltage (VDC)	Current (mA) Max./Min.		
UL/CE/CB	MPRB2403LD-30W	24 (9 to 36)	40	3.3	6000/0	83/85	10000
	MPRB2405LD-30W			5	6000/0	84/86	10000
	MPRB2412LD-30W			12	2500/0	88/90	2700
	MPRB2415LD-30W			15	2000/0	88/90	1680
	MPRB2424LD-30W			24	1250/0	88/90	680
CE	MPRA2405LD-30W			±5	±3000/0	84/86	2000
	MPRA2412LD-30W			±12	±1250/0	87/89	1250
	MPRA2415LD-30W			±15	±1000/0	87/89	680
	MPRA2424LD-30W			±24	±625/0	87/89	470
UL/CE/CB	MPRB4803LD-30W	48 (18 to 75)	80	3.3	6000/0	84/86	10000
	MPRB4805LD-30W			5	6000/0	85/87	10000
	MPRB4812LD-30W			12	2500/0	86/88	2700
	MPRB4815LD-30W			15	2000/0	87/89	1680
	MPRB4824LD-30W			24	1250/0	85/87	680
CE	MPRA4805LD-30W			±5	±3000/0	84/86	2000
	MPRA4812LD-30W			±12	±1250/0	86/88	1250
	MPRA4815LD-30W			±15	±1000/0	86/88	680

**Notes:**

Use "H" suffix for heat sink mounting, "A2S" suffix for chassis mounting and "A4S" suffix for DIN-Rail mounting. We recommend to choose modules with a heat sink for enhanced heat dissipation and applications with extreme temperature requirements;  
The minimum input voltage and starting voltage of A2S and A4S Model are 1VDC higher than those of DIP package due to input reverse polarity protection function;  
Exceeding the maximum input voltage may cause permanent damage;  
Efficiency is measured at nominal input voltage and rated output load; efficiencies for A2S and A4S Model's is decreased by 2% due to the input reverse

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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	--	970/60	993/100	
		5V output	--	1454/60	1488/100	
		Others	--	1388/6	1488/16	
	48VDC nominal input series, nominal input voltage	3.3V output	--	474/20	485/30	
		5V output	--	710/20	726/35	
		Others	--	702/5	744/10	
Reflected Ripple Current	Nominal input voltage		--	40	--	
Surge Voltage(1sec. max.)	24VDC nominal input series		-0.7	--	50	
	48VDC nominal input series		-0.7	--	100	
Start-up Voltage	24VDC nominal input series		--	--	9	
	48VDC nominal input series		--	--	18	
Input Under-voltage Protection	24VDC nominal input series		5.5	6.5	--	
	48VDC nominal input series		12.0	15.5	--	
Start-up Time	Nominal input voltage & constant resistance load		--	10	--	
Input Filter			Pi filter			
Hot Plug			Unavailable			
Ctrl *	Module on		Ctrl pin open or pulled high (3.5-12VDC)			
	Module off		Ctrl pin pulled low to GND (0-1.2VDC)			
	Input current when off		--	5	8	mA

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	±3	%
	0%-5% load			±1	±5	
Linear Regulation	Input voltage variation from low to high at full load	Vo1		±0.2	±0.5	
		Vo2		±0.5	±1	
Load Regulation	5%-100% load	Vo1		±0.5	±1	
		Vo2		±0.5	±1.5	
Cross Regulation	Dual output, Vo1 load at 50%, Vo2 load at range of 10%-100%			--	±5	
Transient Recovery Time	25% load step change, nominal input voltage			300	500	µs
Transient Response Deviation	25% load step change, nominal input voltage	3.3V/5V/±5V output		±5	±8	%
		Others		±3	±5	
Temperature Coefficient	Full load			--	±0.03	%/°C
Ripple & Noise*	20MHz bandwidth, nominal input voltage, 100% load	Singe output		50	100	mVp-p
		Dual output		50	150	

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Item	Operating Conditions	Min.	Typ.	Max.	Unit
Trim	Input voltage range		±10	--	%Vo
Over-voltage Protection		110	--	160	
Over-current Protection		110	--	190	%Io
Short-circuit Protection		Hiccup, continuous, self-recovery			

Note: 1. Load regulation for 0%-100% load is ±5%;  
 2. The "parallel cable" method is used for ripple and noise test, please refer to DC-DC Converter Application Notes for specific information.

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
Insulation Resistance	Input-output resistance at 500VDC/60sec	1000	-	-	MΩ
Isolation Capacitance	Input-output capacitance at 100KHz/0.1V	-	2000	-	pF
Operating Temperature	See Fig. 1, Fig. 2, Fig. 3 and Fig. 4	-40	-	+80	°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		IEC/EN61373 - Category 1, Grade B			
Switching Frequency	PWM mode	-	300	-	kHz
MTBF	MIL-HDBK-217F@25°C	1000	-	-	k hours

Note:\* Switching 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	Horizontal package (without heat sink)	50.8mm × 25.4mm × 11.8mm
Weight	Without heat sink	Horizontal package/A2S chassis mounting/A4S Din-rail mounting 27.8g/52g/72g(Typ.)
Cooling Method	Free air convection	

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### Electromagnetic Compatibility (EMC)

Emissions	CE	Single output	CISPR32/EN55032	CLASS A (without external components)/ CLASS B (see Fig.6-2 for recommended circuit)	
		Dual output	CISPR32/EN55032	CLASS A (without external components)/ CLASS B (see Fig.7-2 for recommended circuit)	
	RE	Single output	CISPR32/EN55032	CLASS A (without external components)/ CLASS B (see Fig.6-2 for recommended circuit)	
		Dual output	CISPR32/EN55032	CLASS A (without external components)/ CLASS B (see Fig.7-2 for recommended circuit)	
Immunity	ESD		IEC/EN61000-4-2 Contact $\pm 4$ KV	perf. Criteria B	
	RS		IEC/EN61000-4-3 10V/m	perf. Criteria A	
	EFT	Single output	IEC/EN61000-4-4 $\pm 2$ KV (see Fig.6-1 for recommended circuit)		perf. Criteria B
		Dual output	IEC/EN61000-4-4 $\pm 2$ KV (see Fig.7-1 for recommended circuit)		perf. Criteria B
	Surge	Single output	IEC/EN61000-4-5 line to line $\pm 2$ KV (see Fig.6-1 for recommended circuit)		perf. Criteria B
		Dual output	IEC/EN61000-4-5 line to line $\pm 2$ KV (see Fig.7-1 for recommended circuit)		perf. Criteria B
	CS	Single output	IEC/EN61000-4-63 Vr.m.s		perf. Criteria A
		Dual output	IEC/EN61000-4-6 10Vr.m.s		perf. Criteria A

### Electromagnetic Compatibility (EMC) (EN50155)

Emissions	CE	Single output	EN50121-3-2 150kHz-500kHz 99dB $\mu$ V (see Fig.6-2 for recommended circuit)		
		Dual output	EN55016-2-1 500kHz-30MHz 93dB $\mu$ V (see Fig.6-2 for recommended circuit)		
	RE	Single output	EN50121-3-2 30MHz-230MHz 40dB $\mu$ V/m at 10m (see Fig.6-2 for recommended circuit)		
		Dual output	EN55016-2-1 230MHz-1GHz 47dB $\mu$ V/m at 10m (see Fig.6-2 for recommended circuit)		
Immunity	ESD		EN50121-3-2 Contact $\pm 6$ KV/Air $\pm 8$ KV	perf. Criteria A	
	RS		EN50121-3-2 20V/m	perf. Criteria A	
	EFT	Single output	EN50121-3-2 $\pm 2$ kV 5/50ns 5kHz (see Fig.6-1 for recommended circuit)		perf. Criteria A
		Dual output	EN50121-3-2 $\pm 2$ kV 5/50ns 5kHz (see Fig.7-1 for recommended circuit)		perf. Criteria A
	Surge	Single output	EN50121-3-2 line to line $\pm 1$ KV (42 $\Omega$ , 0.5 $\mu$ F) (see Fig.6-1 for recommended circuit)		perf. Criteria A
		Dual output	EN50121-3-2 line to line $\pm 1$ KV (42 $\Omega$ , 0.5 $\mu$ F) (see Fig.7-1 for recommended circuit)		perf. Criteria A
	CS	Single output	EN50121-3-2 0.15MHz-80MHz 10V r.m.s		perf. Criteria A
		Dual output	EN50121-3-2 0.15MHz-80MHz 10V r.m.s		perf. Criteria A

# 30W Isolated DC to DC Converters Single and Dual Output



## Typical Performance Curves

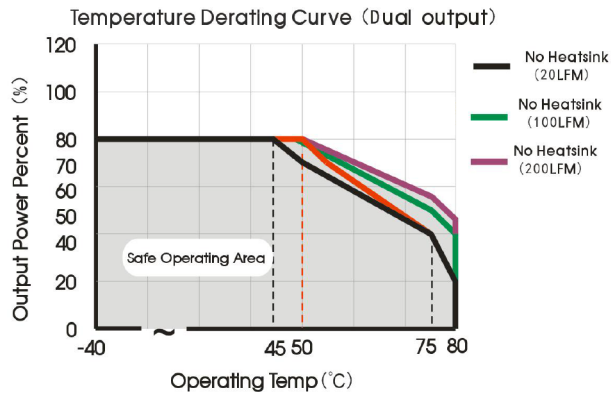


Fig. 1

Apply model: MPRA2405LD-30W (H)R3 (9-18V input voltage)  
 MPRA2424LD-30W(H)R3 (9-18V input voltage)  
 MPRA4805LD-30W(H)R3 (18-36V input voltage)

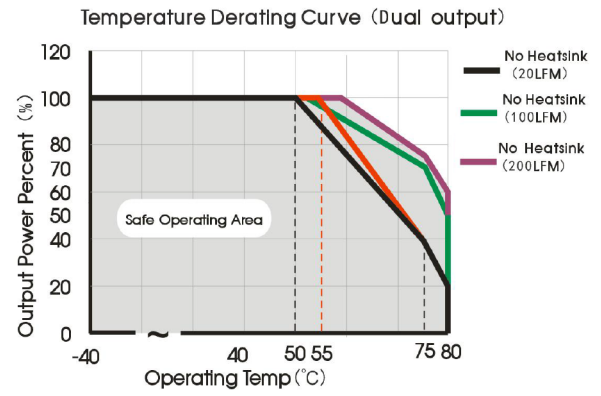


Fig. 2

Apply model: MPRA2405LD-30W (H)R3 (18-36V input voltage)  
 MPRA2424LD-30W(H)R3 (18-36V input voltage)  
 MPRA4805LD-30W(H)R3 (36-75V input voltage)  
 MPRA2412LD-30W (H)R3 MPRA2415LD-30W(H)R3  
 MPRA4812LD-30W(H)R3 MPRA4815LD-30W (H)R3

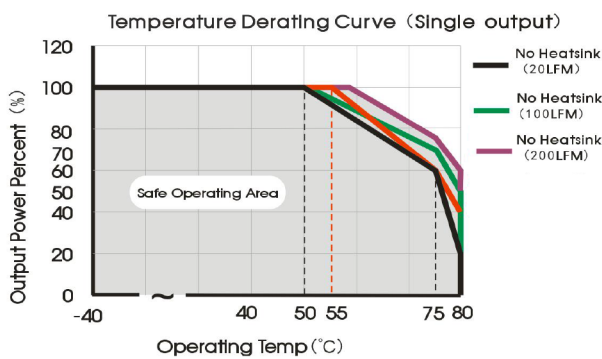


Fig. 3

Apply model: MPRB2403LD-30W (H)R3 MPRB2405LD-30W (H)R3  
 MPRB4803LD-30W (H)R3 MPRB4805LD-30W (H)R3

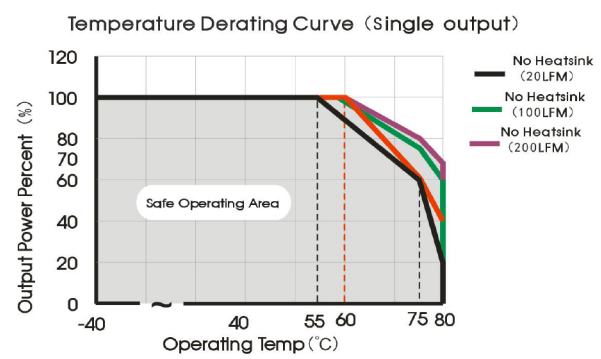
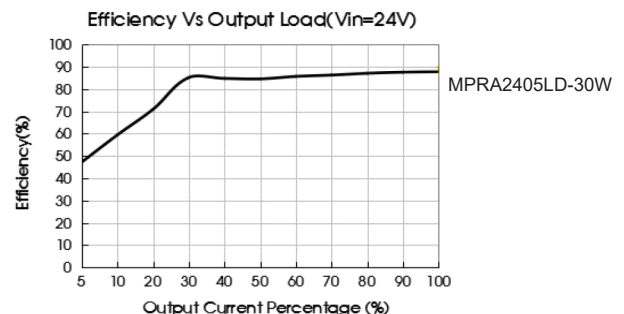
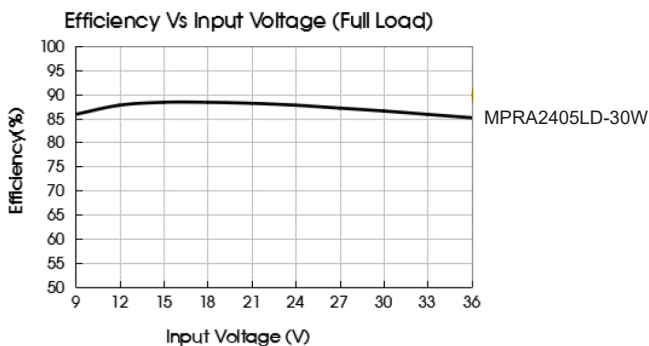


Fig. 4

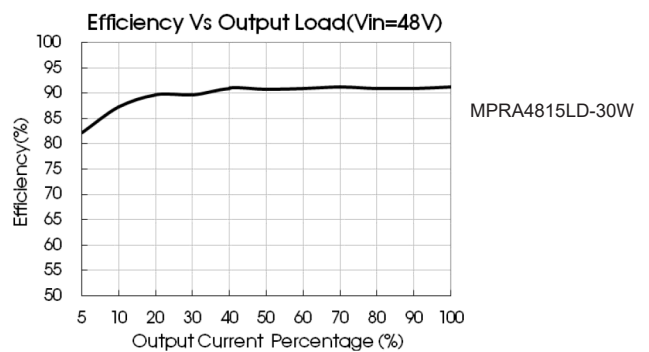
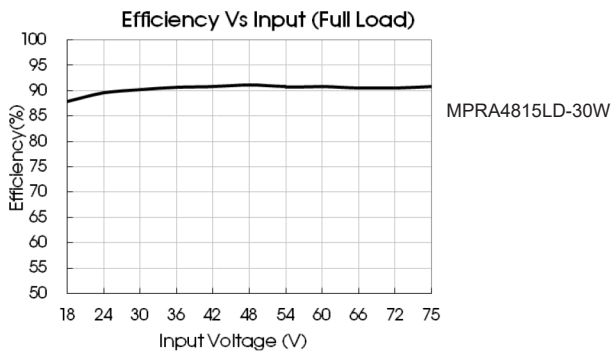
Apply model: MPRB2412LD-30W (H)R3 MPRB2415LD-30W (H)R3  
 MPRB2424LD-30W (H)R3 MPRA4812LD-30W (H)R3  
 MPRA4815LD-30W (H)R3 MPRB4824LD-30W (H)R3



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## Single and Dual Output

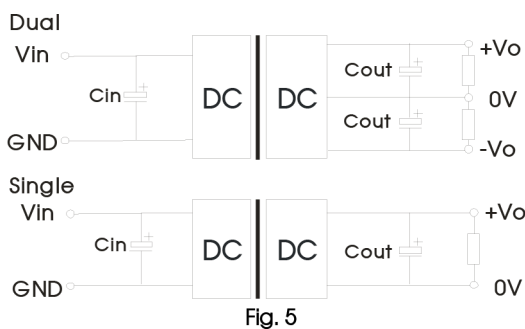
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### Design Reference

#### Typical application

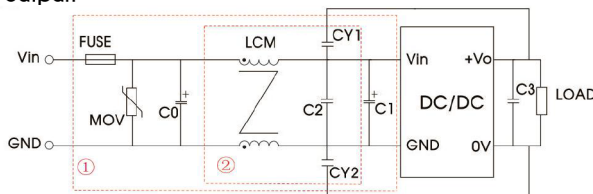
All the DC/DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 5. Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values  $C_{in}$  and  $C_{out}$  and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product.



Single output voltage (VDC)	$C_{out}$ ( $\mu F$ )	$C_{in}$ ( $\mu F$ )	Dual output voltage (VDC)	$C_{out}$ ( $\mu F$ )	$C_{in}$ ( $\mu F$ )
3.3/5/9	220	100	$\pm 5/\pm 12/\pm 15$	220	100
12/15/24	100		$\pm 24$	100	

### EMC compliance circuit

#### Single output:



#### Parameter description:

Model	$V_{in}:24VDC$	$V_{in}:48VDC$
FUSE	Choose according to actual input current	
MOV	S20K30	S14K60
C0	680 $\mu F$ /50V	330 $\mu F$ /100V
C1	330 $\mu F$ /50V	330 $\mu F$ /100V
C2	4.7 $\mu F$ /50V	2.2 $\mu F$ /100V
C3	Refer to the $C_{out}$ in Fig.5	
LCM	1mH, recommended to use MORNSUN's FL2D-30-102	
CY1/CY2	1nF/2KV	

Notes: We use Part 1 in Fig. 6 for immunity and part 2 for emissions test.  
Selecting based on needs.

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Dual output:

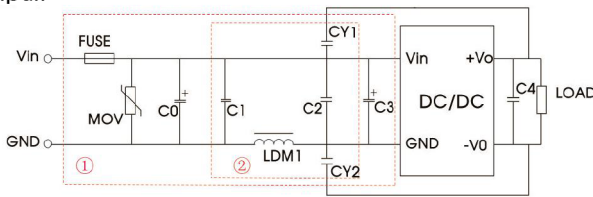
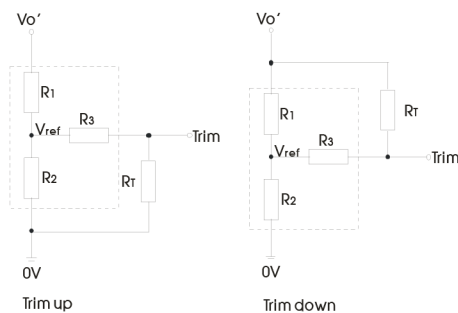


Fig.7

Notes: We use Part ① in Fig. 7 for immunity and part ② for emissions test. Selecting based on needs.

Model	Vin:24VDC	Vin:48VDC
FUSE	Choose according to actual input current	
MOV	S20K30	S14K60
C0	680µF/50V	330µF/100V
C1/C2	2.2µF/50V	2.2µF/100V
C3	330µF/50V	330µF/100V
C4	Refer to the Cout in Fig.5	
LDM1	3.3µH	
CY1/CY2	2.2nF/400VAC Safety Y Capacitor	

## 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<sub>T</sub> = Trim Resistor value  
α = self-defined parameter  
V<sub>o'</sub> = desired output voltage

TRIM resistor connection (dashed line shows internal resistor network)

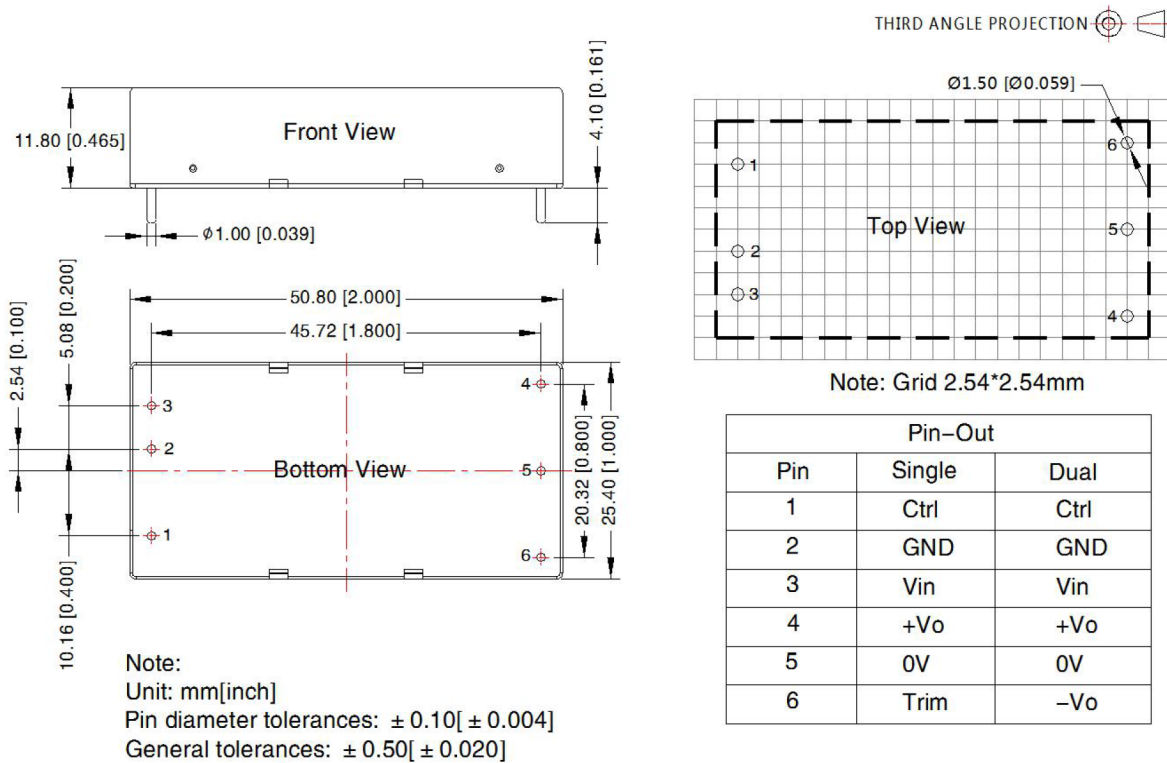
Vout(VDC)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	4.801	2.87	12.4	1.24
5	2.883	2.87	10	2.5
9	7.500	2.87	15	2.5
12	11.000	2.87	15	2.5
15	14.494	2.87	15	2.5
24	24.872	2.87	17.8	2.5

The products do not support parallel connection of their output

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## Horizontal Package (without heat sink) Dimensions and Recommended Layout



### Notes:

1. The maximum capacitive load offered were tested at input voltage range and full load;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of  $T_a=25^\circ\text{C}$ , humidity<75%RH with nominal input voltage and rated output load;
4. All index testing methods in this datasheet are based on company corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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