DC/DC Converter

URB24_LN-10WR3G Series

MORNSUN®

10W isolated DC-DC converter wide input and regulated single output DIP package

Patent Protection RoHS

FEATURES

- Wide 4:1 input voltage range
- High efficiency up to 87%
- /O isolation test voltage 1.5kVDC
- High power density
- Input under-voltage protection, output short-circuit, over-current protection
- Operating ambient temperature range: -55℃ to +105℃
- Small DIP packaging
- Industry standard package and pin-out

URB24_LN-10WR3 Gseries are isolated 10W DC-DC converter products with a 4:1 input voltage range. They feature efficiencies of up to 87%, 1500VDC input to output isolation, operating ambient temperature of -55℃ to +105℃, input under-voltage protection, output over-current, short-circuit protection, which is widely used in medical, industrial controls, electricity, instrumentation, communications and other fields.

Selection Guide

Certification	Part No.	Input Voltage (VDC)		Output		Full Load Efficiency② (%) Min./Typ.	Capacitive Load (μF)Max.
		Nominal (Range)	Max. ①	Voltage (VDC)	Current(mA) Max./Min.		
--	URB2403LN-10WR3G	24/28 (9-40)	40	3.3	3000/0	83/85	1000
	URB2405LN-10WR3G			5	2000/0	84/86	1000
	URB2406LN-10WR3G			6	1667/0	84/86	1000
	URB2409LN-10WR3G			9	1111/0	85/87	1000
	URB2412LN-10WR3G			12	833/0	85/87	470
	URB2415LN-10WR3G			15	667/0	85/87	470
	URB2424LN-10WR3G			24	416/0	85/87	470
	URB2428LN-10WR3G			28	357/0	85/87	220

Note:
①Exceeding the maximum input voltage may cause permanent damage;
②The above efficiency values are measured within 10 seconds of starting the product under the nominal input voltage and output rated load;

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (full load /no load)	3.3VDC Ouput	--	485/12	497/45	mA
	5/6VDC Ouput	--	485/12	496/45	
	9/12/15/24/28VDC Ouput	--	479/9	490/18	
Reflected Ripple Current		--	50	--	
Surge Voltage (1sec. max.)		-0.7	--	50	VDC
Start-up Voltage		--	--	9	
Input Under-voltage Protection		6	7	--	VDC
Input Filter		Capacitive 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	--	6	12	mA

Note: *The Ctrl pin voltage is referenced to input GND.

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy	0% -100% load		--	±1.5	±2	%
Linear Regulation	Input voltage variation from low to high at full load		--	±0.5	±1	
Load Regulation①	5%-100% load		--	±1	±1.5	
Transient Recovery Time	25% load step change, nominal input voltage		--	300	500	μs
Transient Response Deviation	25% load step change, nominal input voltage	3.3VDC/5VDC/6VDC output	--	±5	±8	%
		Others	--	±3	±5	
Temperature Coefficient	Full load		--	--	±0.03	%/℃
Ripple & Noise②	20MHz bandwidth, 10%-100% load		--	100	200	mVp-p
Over-current Protection	Input voltage range		110	--	230	%Io
Short-circuit Protection			Continuous, self-recovery			

Note:
①Load regulation for 0%-100% load is ±5%;
②Under 0%-10% load conditions, ripple & noise does not exceed 300mV.The test method of ripple and noise is shown in Fig. 2 parallel plate test method. Peripheral parameters of ripple & noise test are shown in Fig. 3 .

General Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Isolation voltage	Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max.		1500	--	--	VDC
Insulation Resistance	Input-output resistance at 500VDC		1000	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100kHz/0.1V	3.3/5/6/9/12VDC	--	2200	--	pF
		15/24/28VDC	--	4700	--	
Operating Temperature	See Fig. 1		-55	--	+105	℃
Storage Humidity	Non-condensing		5	--	95	%RH
Storage Temperature			-55	--	+125	℃
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds		--	--	+300	
Vibration			10-150Hz, 0.75mm, 5G, 90Min. along X, Y and Z			
Switching Frequency *	PWM mode		--	300	--	kHz
MTBF	MIL-HDBK-217F@25℃		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	25.40 x 12.70 x 10.80 mm
Weight	7.0 g (Typ.)
Cooling Method	Free air convection (20LFM)

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032 CLASS B（see Fig.4-② for recommended circuit）	
	RE	CISPR32/EN55032 CLASS B（see Fig.4-② for recommended circuit）	
Immunity	ESD	IEC/EN61000-4-2 Contact ±6kV	perf. Criteria B
	RS	IEC/EN61000-4-3 10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4 ±2kV（see Fig.4-① for recommended circuit）	perf. Criteria B
	Surge	IEC/EN61000-4-5 line to line ±2kV（see Fig.4-① for recommended circuit）	perf. Criteria B
	CS	IEC/EN61000-4-6 3 Vr.m.s	perf. Criteria A

Typical Characteristic Curves

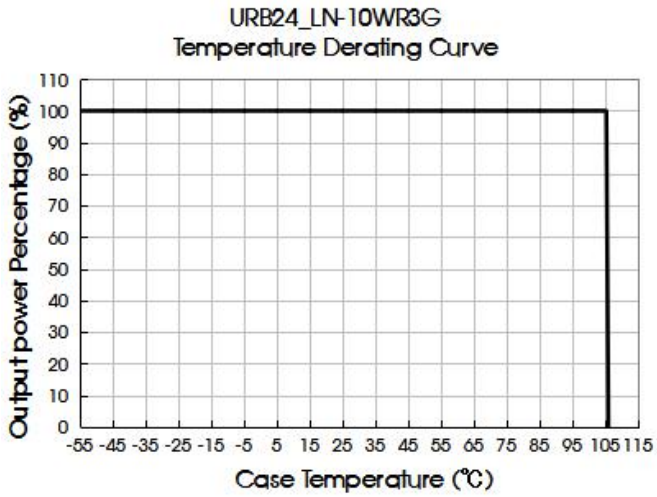
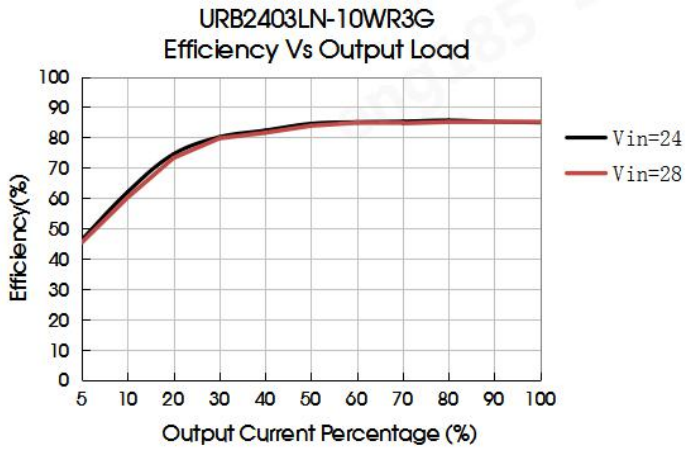
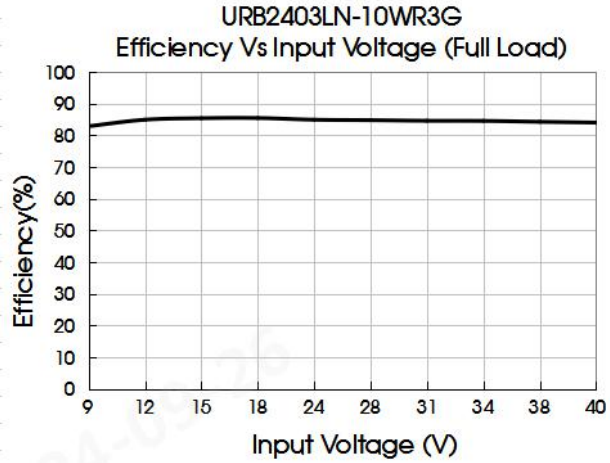
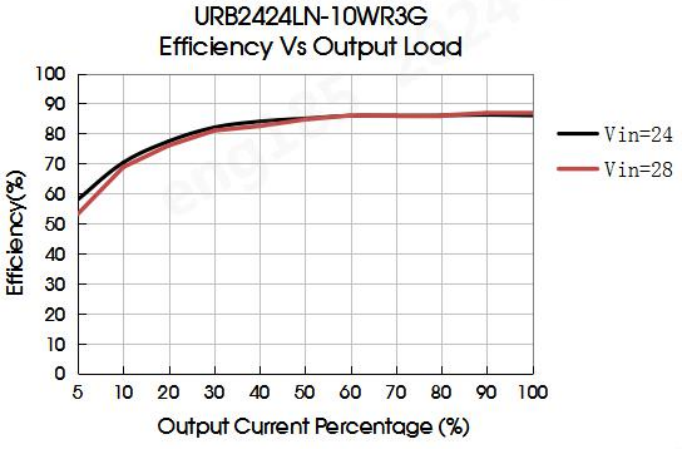
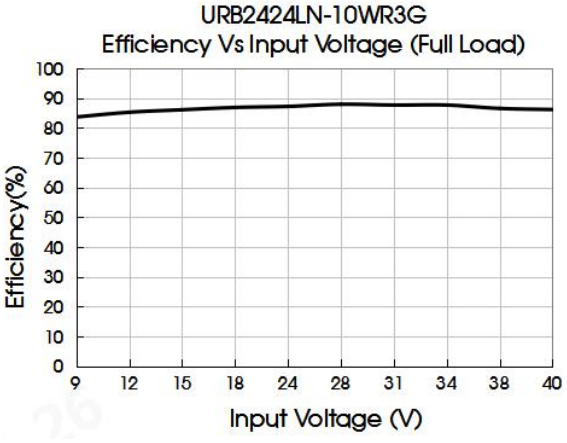


Fig.1









Design Reference

1. Ripple & Noise

All the DC/DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2., with the probe to copper foil connection as short as possible.

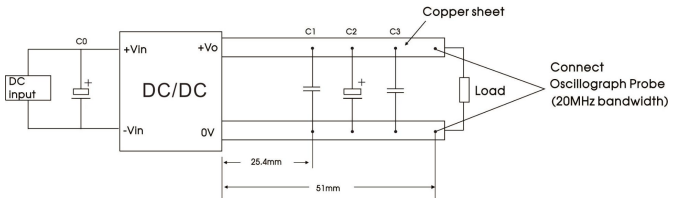


Fig. 2

Vin	C0	Vout	C1	C2	C3
24VDC	47μF /100V	3.3/5/6/9VDC	1μF/16V	10μF/16V	44μF/16V
		12/15VDC	1μF/25V	10μF/25V	44μF/25V
		24/28VDC	1μF/50V	10μF/50V	44μF/50V

2. Typical application

If it is required to further reduce the input and output ripple, the differential mode inductor filter can be added to the output end, and the input and output external capacitors Cin and Cout can be increased or a capacitor with a small series equivalent impedance value can be selected, but the capacitance value cannot be greater than the maximum capacitive load of the product.

Fig. 3

Parameter description:

Vin	Cin	Vout	Cout
24VDC	47μF/50V	3.3/5/6/9VDC	44μF/16V
		12/15VDC	44μF/25V
		24/28VDC	44μF/50V

3. EMC compliance circuit

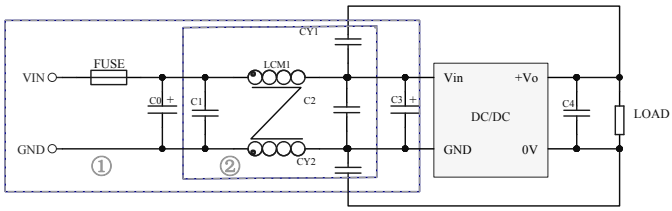


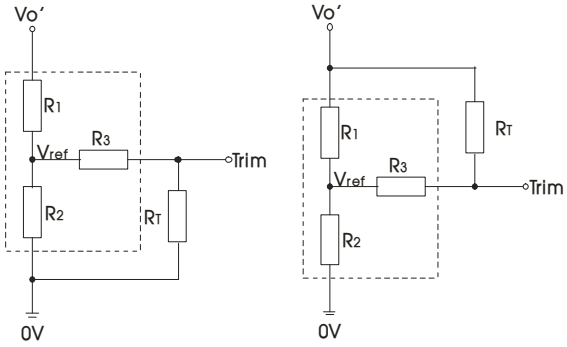
Fig. 4

Notes: We use Part ① in Fig. 4 for Immunity test and part ② for Emissions test. Selecting based on needs.

Parameter description:

Model	Vin: 24VDC
FUSE	Choose according to actual input current
C0/C4	330μF/50V
C1/C2/C3	44μF/50V
C5	Refer to the C3 parameter in Fig. 2
LCM1	470μH, recommended to use MORNSUN's FL2D-13-471R3）
CY1/CY2	1nF/2000VDC

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



Trim up　　Trim down

TRIM resistor connection (dashed line shows internal resistor network)

TCalculation formula of Trim resistance:

$$\text{up: } R_T = \frac{aR_2}{R_2-a} - R_3 \qquad a = \frac{Vref}{Vo'-Vref} \cdot R_1$$

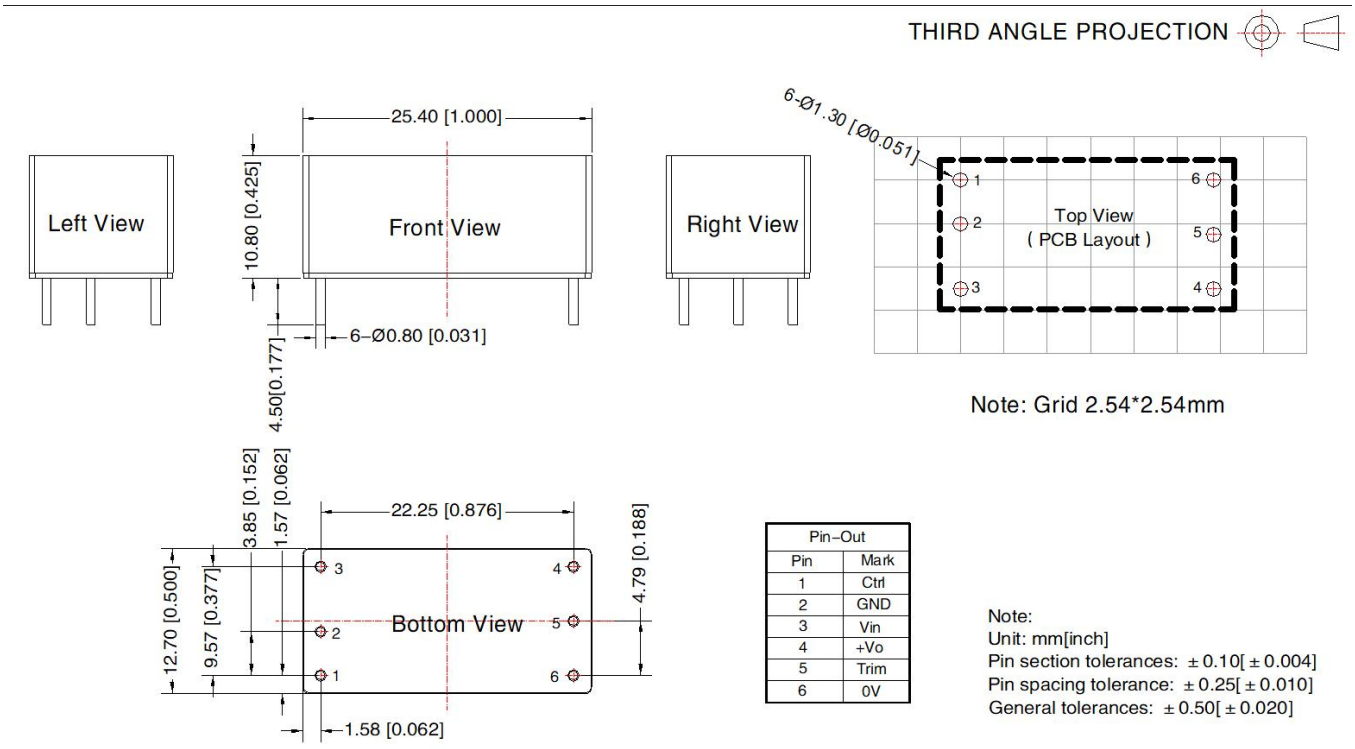
$$\text{down: } R_T = \frac{aR_1}{R_1-a} - R_3 \qquad a = \frac{Vo'-Vref}{Vref} \cdot R_2$$

R_T: Resistance of Trim.
a = Self-defined parameter ， has no practical meaning
Vo 'is the up or down voltage that is actually required

Vout(V)	R1(kΩ)	R2(kΩ)	R3(kΩ)	Vref(V)
3.3	4.772	2.87	12	1.25
5	2.91	2.87	9.1	2.5
6	4.064	2.87	10	2.5
9	7.500	2.87	15	2.5
12	10.91	2.87	17.4	2.5
15	14.354	2.87	17.4	2.5
24	24.77	2.87	20	2.5
28	29.729	2.87	12	2.5

5. The products do not support parallel connection of their output
6. For additional information please refer to DC-DC converter application notes on www.mornsun-power.com

Dimensions and Recommended Layout



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

Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
Pin spacing tolerance: ±0.25[±0.010]
General tolerances: ±0.50[±0.020]

Note:
1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58210431;
2. 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 Ta=25℃, 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. The products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified companies.

Mornsun Guangzhou Science & Technology Co., Ltd.
Address: No. 8 Nanyun 4th Road, Huangpu District, Guangzhou, China
Tel: 86-20-38601850 Fax: 86-20-38601272 E-mail: info@mornsun.cn www.mornsun-power.com