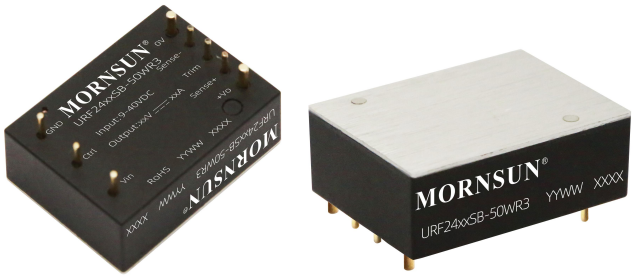
50W isolated DC-DC converter DIP package
Wide input and regulated single output



Patent Protection RoHS

FEATURES

- Wide input voltage range: 9-40VDC
- High efficiency up to 91%
- I/O isolation test voltage 2250VDC
- Input under-voltage protection, output short-circuit, over-current, over–voltage protection
- Operating ambient temperature range: -40℃ to +105℃
- Industry standard pin-out

URF24_SB-50WR3 series of isolated 50W DC-DC converter products with an wide 9-40VDC input voltage range. They feature efficiencies up to 91%, input to output isolation is tested with 2250VDC and the converter safety operate ambient temperature of -40℃ to +105℃, input under-voltage protection, output short-circuit, over-current, over-voltage protection. They are widely used in communication, industrial control applications.

Selection Guide

Certification	Part No.	Input Voltage (VDC)		Output		Full Load Efficiency② (%) Min./Typ.	Capacitive Load (uF)Max.
		Nominal (Range)	Max.①	Voltage (VDC)	Current(mA) Max./Min.		
--	URF2405SB-50WR3	24 (9-40)	45	5	10000	87/89	6000
		28 (9-40)					
	URF2406SB-50WR3	24 (9-40)		6	8333	87/89	5000
		28 (9-40)					
	URF2412SB-50WR3	24 (9-40)		12	4167	89/91	2000
		28 (9-40)					
	URF2415SB-50WR3	24 (9-40)		15	3333	88/90	1500
		28 (9-40)					
	URF2424SB-50WR3	24 (9-40)		24	2083	88/90	600
		28 (9-40)					
	URF2428SB-50WR3	24 (9-40)		28	1786	88/90	470
		28 (9-40)					
	URF2448SB-50WR3	24 (9-40)		48	1042	89/91	100
		28 (9-40)					

Note:
① Exceeding the maximum input voltage may cause permanent damage;
② Efficiency is measured in nominal input voltage and rated output load.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (full load/no-load)	Nominal input voltage	--	2289/--	2341/137	mA
Reflected Ripple Current	Nominal input voltage, full load	--	50	--	
Surge Voltage (1sec. max.)		-0.7	--	50	VDC
Start-up Voltage		--	--	9	

Input Under-voltage Protection		5.5	7.5	--	
Start-up Time	Nominal input voltage & constant resistance load	--	30	100	ms
Input Filter		C filter			
Hot Plug		Unavailable			
Ctrl*	Module on	Ctrl pin open or pulled high (3.5-12VDC)			
	Module off	Ctrl pin pulled low to TTL (0-1.2VDC)			
	Input current when off	--	20	50	mA

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

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy①	5%-100% load		--	±1	±3	%
Linear Regulation	Input voltage variation from low to high at full load		--	±0.2	±0.5	
Load Regulation②	5%-100% load		--	±0.5	±1	
Transient Recovery Time	25% load step change, nominal input voltage		--	--	0.5	ms
Transient Response Deviation	25% load step change, nominal input voltage	5V/6V output	--	±5	±8	%
		Others	--	±3	±5	
Temperature Coefficient	Full load		--	--	±0.03	%/℃
Ripple & Noise③	20MHz bandwidth, 5%-100% load		--	--	250	mVp-p
Trim	Input voltage range		85	--	110	%Vo
Sense			--	--	105	
Over-voltage Protection			110	--	160	
Over-current Protection			110	--	260	%Io
Short-circuit Protection			Continuous, self-recovery			

Note:
①Output voltage accuracy for 0%-5% load is ±5% max;
②Load regulation for 0% -100% load increases to ±3%;
③Under 0% -5% load conditions, ripple & noise does not exceed 5%Vo. The "tip and barrel" 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.	2250	--	--	VDC
	Input/output-case Electric Strength Test for 1 minute with a leakage current of 1mA max.	2250	--	--	
Insulation Resistance	Input-output resistance at 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100kHz/0.1V	--	4700	--	pF
Operating Temperature	See Fig.1	-40	--	+105	℃
Storage Temperature		-55	--	+125	
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	--	--	+300	
Storage Humidity	Non-condensing	5	--	95	%RH
Vibration		10-150Hz, 5G, 0.75mm. along X, Y and Z			
Switching Frequency *	PWM mode	--	500	--	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	Black flame retardant and heat resistant plastic (UL94 V-0), aluminum alloy
Dimensions	35.00 x 25.86 x 12.70 mm
Weight	31.8g (Typ.)
Cooling method	Free air convection

Electromagnetic Compatibility (EMC)

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

Temperature Derating Curve

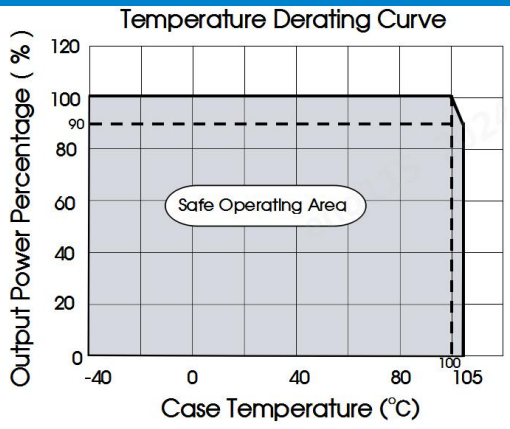
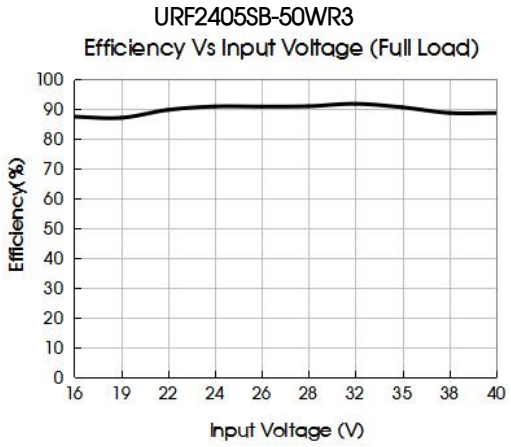
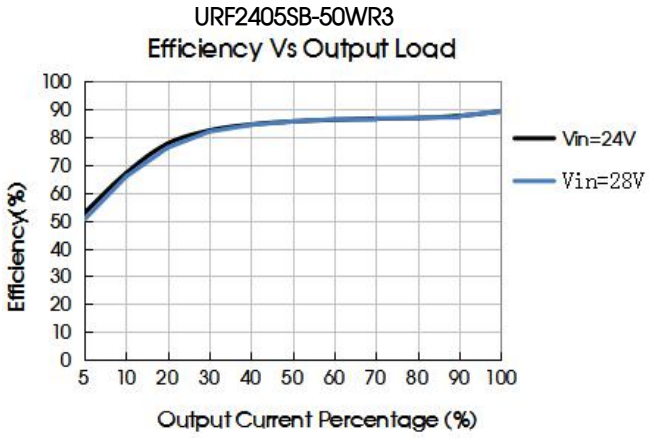
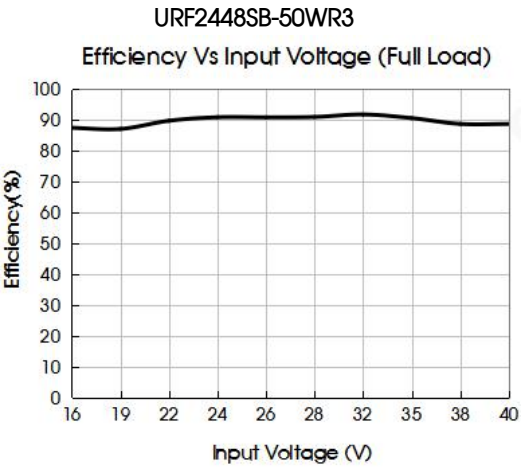
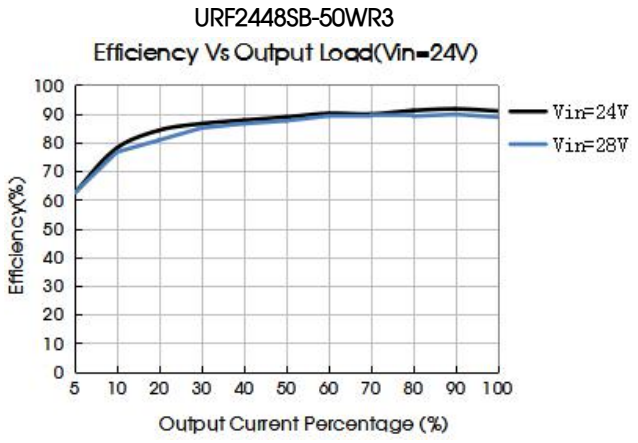


Fig.1



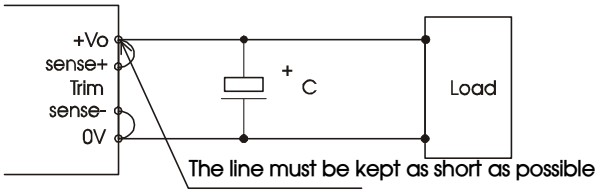






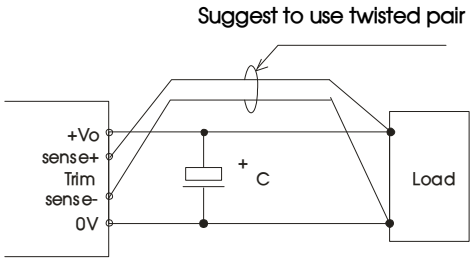
Remote Sense Application

1. Remote Sense Connection if not used



Note：
(1) If the sense function is not used for remote regulation the user must connect the +Sense to + Vo and -Sense to 0V at the DC-DC converter pins and will compensate for voltage drop across pins only.
(2) The connection between +Vo and Sense+, 0V and Sense- is as short as possible and close to the terminal. Avoid forming a large loop area, when the noise enters the loop, it may cause instability of the module.

2. Remote Sense Connection used for Compensation



Note:
(1) Using remote sense with long wires may cause unstable output, please contact technical support if long wires must be used.
(2) PCB-tracks or cables/wires for Remote Sense must be kept as short as possible. Twisted pair or shielded wires are suggested for remote compensation and must be kept as short as possible.
(3) We recommend using adequate cross section for PCB-track layout and/or cables to connect the power supply module to the load in order to keep the voltage drop below 0.3V and to make sure the power supply's output voltage remains within the specified range.
(4) Note that large wire impedance may cause oscillation of the output voltage and/or increased ripple. Consult technical support or factory for further advice of sense operation.

Design Reference

1. Typical application

All 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 Cin and Cout 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.

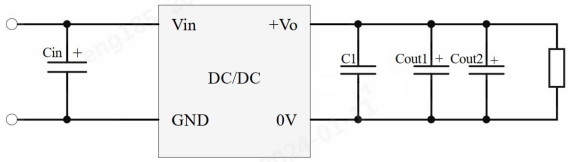


Fig. 2

Vin (VDC)	Vout (VDC)	Cin	Cout1/2	C1
24	5/6	100μF/63V	330uF/63V	10uF/50V
	12/15			
	24/28			
	48			10uF/63V

2. EMC compliance recommended circuit

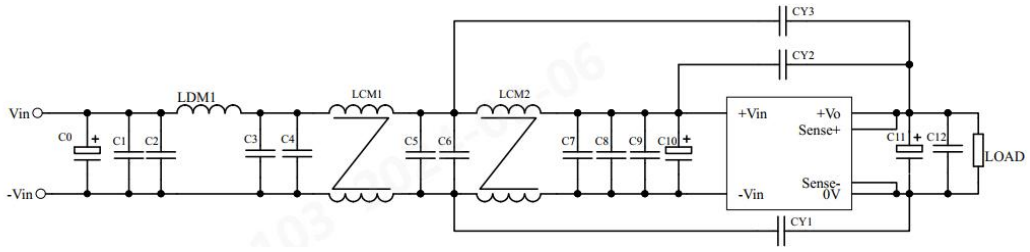


Fig. 3

Model	Others Output
C0	1000μF/100V electrolytic capacitor
C10	330μF/100V electrolytic capacitor
C11	470uF/50V electrolytic capacitor
C1,C2,C3,C4, C5,C6,C7,C8,C9,C12	22μF/50V ceramic capacitor
LDM1	4.7uH
LCM1	90uH/10A, recommended to use MORNSUN FL2D-A0-900
LCM2	2mH/10A, recommended to use MORNSUN FL2D-A3-202
CY1, CY3	2.2nF/400VAC Y safety capacitor
CY2	500pF/400VAC Y safety capacitor

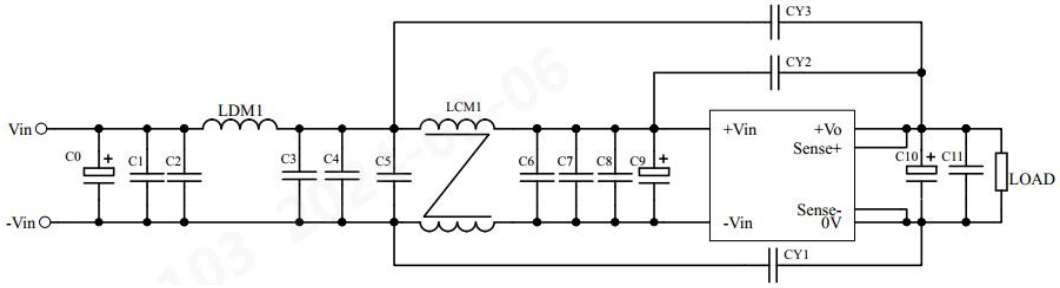
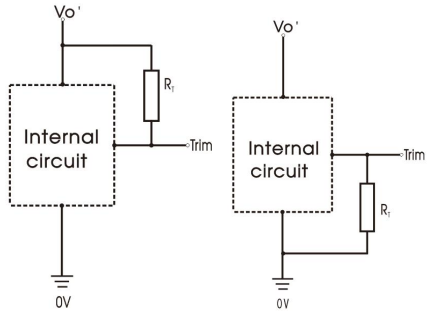


Fig. 4

Model	Parameter description
C0	100μF/100V electrolytic capacitor
C9	330μF/100V electrolytic capacitor
C10	470uF/50V electrolytic capacitor
C1, C2, C3, C4, C5,C6,C7,C8,C11	22μF/50V ceramic capacitor
LDM1	4.7uH
LCM2	2mH/10A, recommended to use MORNSUN FL2D-A3-202
CY1, CY3	2.2nF/400VAC Y safety capacitor
CY2	500pF/400VAC Y safety capacitor

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



Trim up Trim down

Fig.5 TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

Trim up

$$R_T = \left(\frac{5.11 V_{nom}(100+\Delta\%)}{1.225\Delta\%} - \frac{511}{\Delta\%} - 10.22 \right) (k\Omega)$$

Trim down

$$R_T = \left(\frac{511}{\Delta\%} \right) - 10.22 (k\Omega)$$

Note:

RT = Trim Resistor value

$$\Delta\% = \left| \frac{V_{nom} - V_{out}}{V_{nom}} \right| \times 100$$

V_{nom} = nominal output voltage

V_{out} = desired output voltage

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

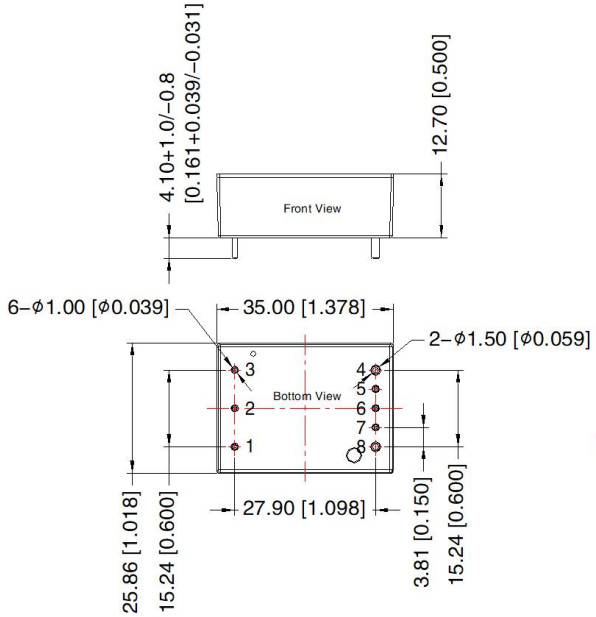
5. Recommended scheme for thermal testing

In the application process, the thermal design of the product can be evaluated with the product temperature derating curve; or by testing the temperature of point A in Fig.8 to determine the stable working range of the product, when the temperature of point A is lower than 105℃, it is the stable working range of the product.

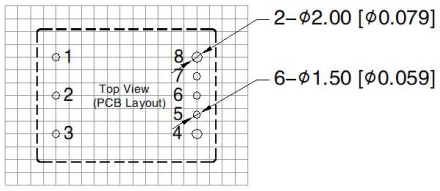
图 6

6. For additional information please refer to DC-DC converter application notes on www.mornsun-power.com

Dimensions and Recommended Layout



THIRD ANGLE PROJECTION



Note: Grid 2.54*2.54mm

Note:
Unit: mm[inch]
1, 2, 3, 5, 6, 7diameter: 1.00 [0.039]
4, 8diameter: 1.50 [0.059]
Pin diameter tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]

Pin−Out			
Pin	Mark	Pin	Mark
1	Vin	6	Trim
2	Ctrl	7	Sense+
3	GND	8	+Vo
4	0V		
5	Sense−		

Note:
1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58200055;
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. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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