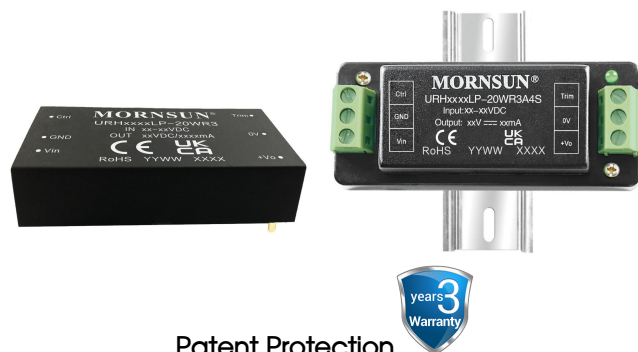


20W Isolated DC-DC converter in DIP package
Ultra-wide input, regulated single output



Patent Protection
CE Report EN62368-1 EN60601-1
UKCA Report BS EN62368-1
RoHS

FEATURES

- Ultra-wide 4:1 input voltage range
- High efficiency up to 89%
- No-load power consumption as low as 0.12W
- Operating ambient temperature range: -40℃ to +85℃
- Reinforced insulation, I/O isolation test voltage 5k VAC, rated for 250VAC working voltage
- Transformer creepage 8mm, Transformer clearance 8mm
- Low leakage current < 5 μ A
- Meets CISPR32/EN55032 CLASS A, without extra components
- Input under-voltage protection, output short-circuit, over-current, over-voltage protection
- Input reverse polarity protection available with rail mounting(A4S) version
- Industry standard pin-out

URH_LP-20WR3 series of isolated 20W DC-DC products with an ultra-wide 4:1 input voltage range. They feature efficiencies of up to 89%, 5000VAC input to output isolation. Input under-voltage protection, output short-circuit, over-current, over-voltage protection. They meet CLASS A of CISPR32/EN55032 EMI standards without extra components. Optional packages are for rail mounting (A4S), adding additional input reverse polarity protection. They are widely used in high isolation required area such as medical application.

Selection Guide

Certification	Part No. ^①	Input Voltage (VDC)		Output		Full Load Efficiency ^③ (%) Min./Typ.	Capacitive Load (μF)Max.
		Nominal ^② (Range)	Max. ^③	Voltage (VDC)	Current (mA) Max./Min.		
EN/BS EN	URH2403LP-20WR3	24 (9-36)	40	3.3	5000/0	83/85	10000
	URH2405LP-20WR3			5	4000/0	83/85	10000
	URH2412LP-20WR3*			12	1666/0	84/86	4700
	URH2415LP-20WR3			15	1333/0	85/87	1600
	URH2424LP-20WR3*			24	833/0	87/89	470
	URH4803LP-20WR3	48 (18-75)	80	3.3	5000/0	83/85	10000
	URH4805LP-20WR3			5	4000/0	85/87	10000
	URH4812LP-20WR3			12	1666/0	84/86	4700
	URH4815LP-20WR3			15	1333/0	84/86	1600
	URH4824LP-20WR3			24	833/0	87/89	470

Note:
① Product model suffix plus *** for rail type package expansion;
② A4S Model's start-up and minimum input voltages are increased by 1VDC due to the input reverse polarity protection circuit;
③ Exceeding the maximum input voltage may cause permanent damage;
④ The above efficiency values are measured at the input nominal voltage and output rated load; A4S(guide rail) product model is qualified because of the input reverse protection, and the minimum efficiency is greater than min-2.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load/no-load)	24VDC input	3.3V, 5V output	--	969/40	992/50	mA
		Others	--	958/8	992/15	
	48VDC input	3.3V, 5V output	--	479/20	491/30	
		Others	--	473/5	491/10	
Reflected Ripple Current	24VDC input		--	30	--	VDC
	48VDC input		--	30	--	
Surge Voltage (1sec. max.)	24VDC input		-0.7	--	50	
	48VDC input		-0.7	--	100	
Start-up Voltage	24VDC input		--	--	9	
	48VDC input		--	--	18	

Input Under-voltage Protection	24VDC input	5.5	6.5	--	VDC
	48VDC input	12	15.5	--	
Input Filter		PI filter			
Hot Plug		Unavailable			
Ctrl ①	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	--	4	8	mA
Note: ①The Ctrl pin voltage is referenced to input GND.					

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy			--	±1	±2	%
Linear Regulation	Input voltage variation from low to high at full load		--	±0.2	±0.5	
Load Regulation ^①	5%-100% load		--	±0.5	±1	
Transient Recovery Time	25% load step change, nominal input voltage		--	300	500	μs
Transient Response Deviation		3.3V [®] , 5V output	--	±5	±8	%
		Others	--	±3	±5	
Temperature Coefficient	Full load		--	--	±0.03	%/°C
Ripple & Noise ^②	20MHz bandwidth	3.3V, 5V output	--	100	200	mVp-p
		URH2415LP-20WR3 URH2424LP-20WR3* URH4824LP-20WR3	--	80	150	
		URH2412LP-20WR3* URH4812LP-20WR3 URH4815LP-20WR3	--	50	100	
Over-current Protection	Input voltage range		110	180	260	%Io
Over-voltage Protection			110	--	160	%Vo
Short-circuit Protection			Continuous, self-recovery			
Trim			90	--	110	%Vo

Notes:
 ①Load regulation for 0%-100% load is ±5% max.;
 ②Ripple & Noise of 3.3VDC/5VDC output converter for 0%-5% load is ±10% max; Ripple & Noise of other output converter for 0%-5% load is 5%Vo max. The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information;
 ③It is required connecting an external 270uF electrolytic capacitor for 3.3V output voltage model.

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.	5000	--	--	VAC
Insulation Resistance	Input-output resistance at 500VDC	10000	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100kHz/0.1V	--	40	--	pF
Patient Leakage Current	240VAC/60Hz	--	3.6	5	uA
Reinforced Insulation	Transformer creepage	8.0	--	--	mm
	Transformer clearance	8.0	--	--	
Operating Temperature	See Fig. 1	-40	--	85	℃
Storage Humidity	Non-condensing	5	--	95	%RH
Storage Temperature		-55	--	125	℃
Pin Soldering Resistance Temperature	Wave-soldering (Soldering time: 10s)	--	--	260	
	Soldering spot is 1.5mm away from case for 10 seconds	--	--	300	
Vibration		10-150Hz, 5G, 0.75mm. along X, Y and Z			
Switching Frequency ^①	PWM mode(nominal input voltage, full load)	--	280	--	kHz
MTBF	MIL-HDBK-217F@25℃	1000	--	--	k hours

Note: ①Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.

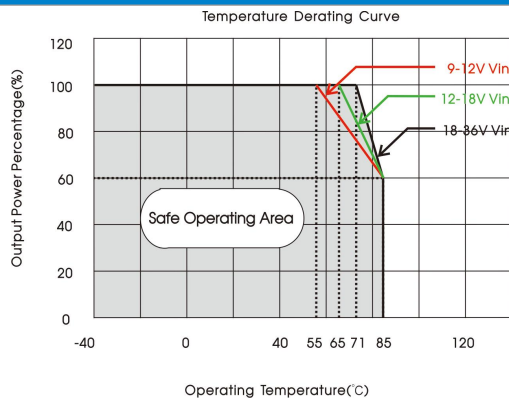
Mechanical Specifications

Case Material	Black plastic; flame-retardant and heat-resistant (UL94-V0)	
Dimensions	Horizontal package	51.50 x 26.50 x 12.00 mm
	A4S rail package	76.00 x 31.50 x 25.80 mm
Weight	Horizontal package/A4S rail package	27.0g/71g(Typ.)
Cooling Method	Free air convection	

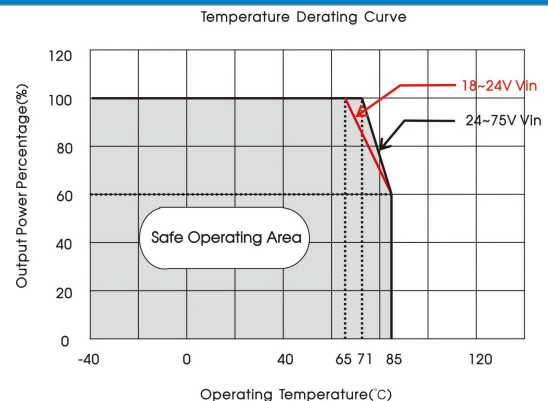
Electromagnetic Compatibility (EMC)

Emissions	CE	URH2412LP-20WR3*	CISPR32/EN55032	CLASS A (without extra components) CLASS B (see Fig.3 for recommended circuit)	
		Others	CISPR32/EN55032	CLASS A (without extra components) CLASS B (see Fig.4-② for recommended circuit)	
	RE	URH2412LP-20WR3*	CISPR32/EN55032	CLASS B (without extra components)	
		Others	CISPR32/EN55032	CLASS A (without extra components) CLASS B (see Fig.4-② for recommended circuit)	
Immunity	ESD		IEC/EN61000-4-2	air ±15kV, contact ±8kV	perf. Criteria B
	RS		IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT		IEC/EN61000-4-4	100kHz ±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	10 Vr.m.s	perf. Criteria A
	PFM		IEC/EN61000-4-8	30 A/m, continuous	perf. Criteria A

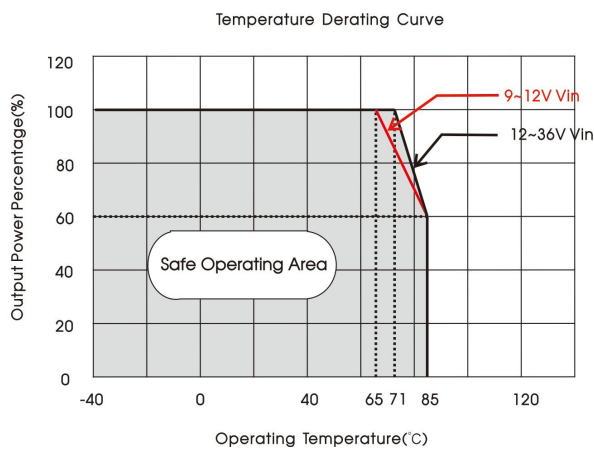
Typical Characteristic Curves



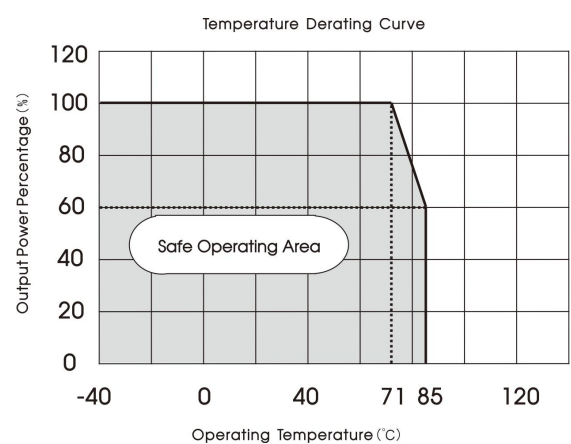
URH2403LP-20WR3, URH2405LP-20WR3 Temperature Derating Curve



URH4803LP-20WR3, URH4805LP-20WR3 Temperature Derating Curve

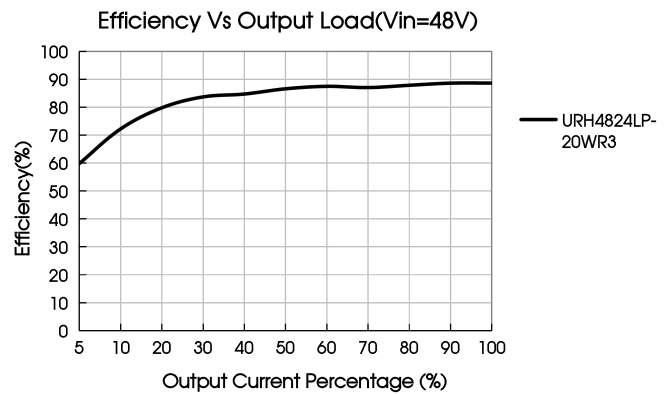
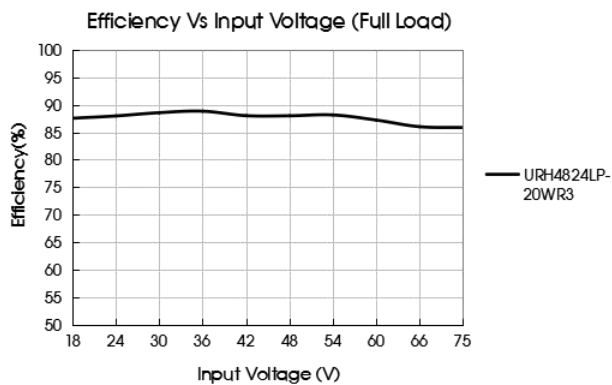
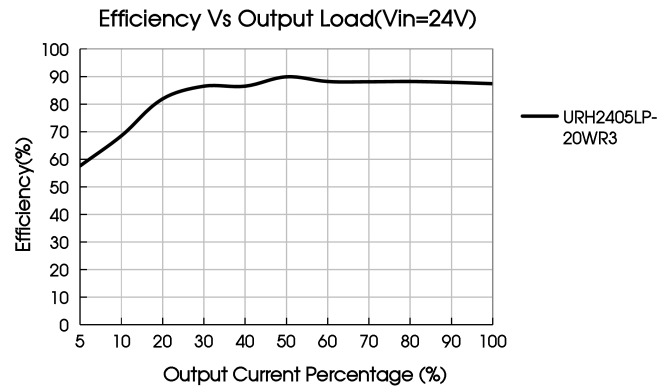
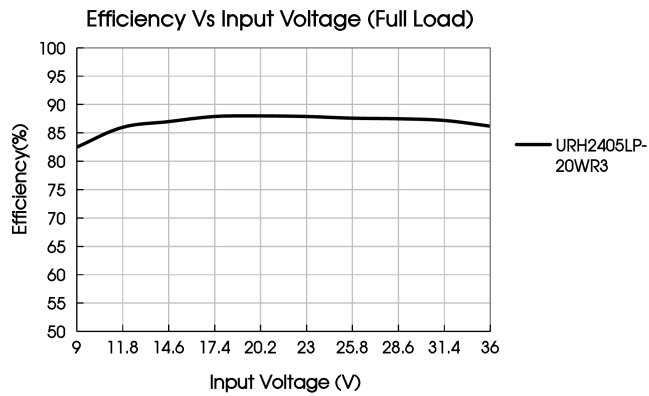


URH2412LP-20WR3*, URH2415LP-20WR3 Temperature Derating Curve



URH2424LP-20WR3*, URH4812LP-20WR3
URH4815LP-20WR3, URH4824LP-20WR3 Temperature Derating Curve

Fig. 1

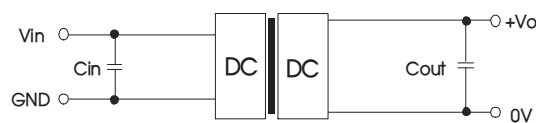


Design Reference

1. Typical application

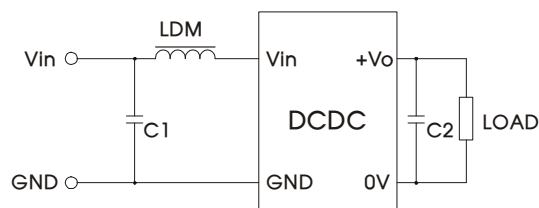
All the DC/DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2.

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.



Vin (VDC)	Vout (VDC)	Cin	Cout
24	3.3	100μF/50VDC	270μF/16VDC
	5		10μF/16VDC
	12/15		10μF/25VDC
	24		10μF/50VDC
48	3.3	10~47μF/100VDC	270μF/16VDC
	5		10μF/16VDC
	12/15		10μF/25VDC
	24		10μF/50VDC

2. EMC compliance circuit



Parameter description

Model	URH2412LP-20WR3*
C1	10μF/50V
C2	Refer to the Cout in Fig.2
LDM	4.7μH



Fig. 4

Parameter description

Model	Vin: 24VDC	Vin: 48VDC
C1/C2	680μF/50V	330μF/100V
C3/C4 C5/C6	10uF/50V	10uF/100V
C7	Refer to the Cout in Fig.2	
LCM1	2.2mH	
CY1/ CY2	Y1: 47pF/400VAC (12V/15V/24V output no need)	

TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

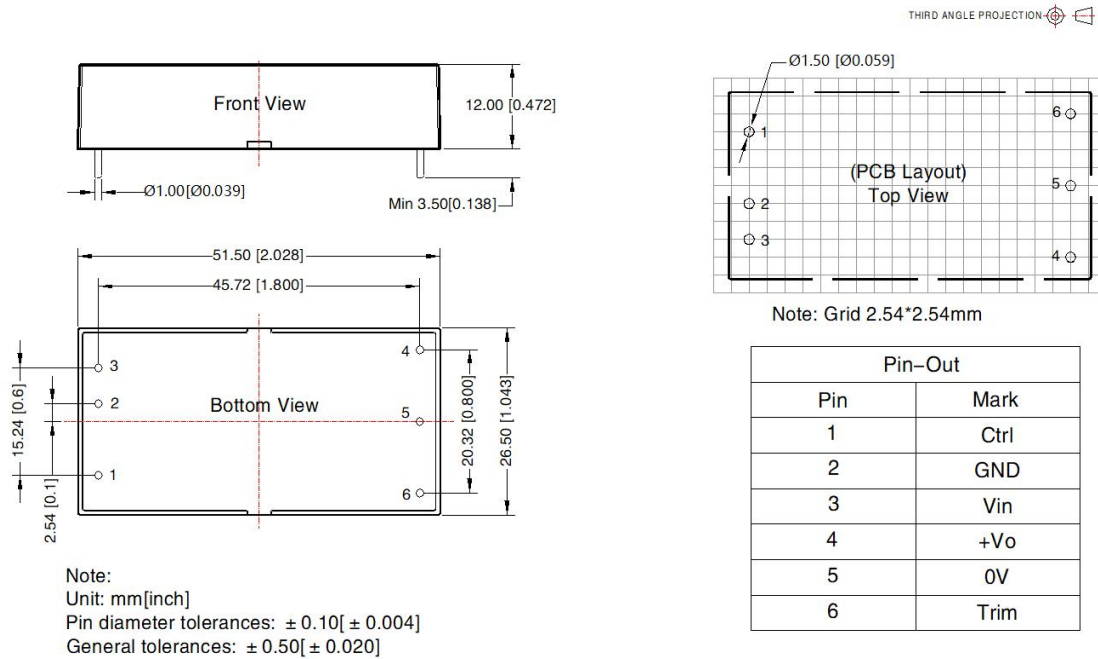
$$\begin{aligned} \text{up: } R_T &= \frac{aR_2}{R_2 - a} - R_3 & a &= \frac{V_{ref}}{V_o' - V_{ref}} \cdot R_1 \\ \text{down: } R_T &= \frac{aR_1}{R_1 - a} - R_3 & a &= \frac{V_o' - V_{ref}}{V_{ref}} \cdot R_2 \end{aligned}$$

R_1 = Trim Resistor value;
 a = self-defined parameter;
 V_o' = desired output voltage.

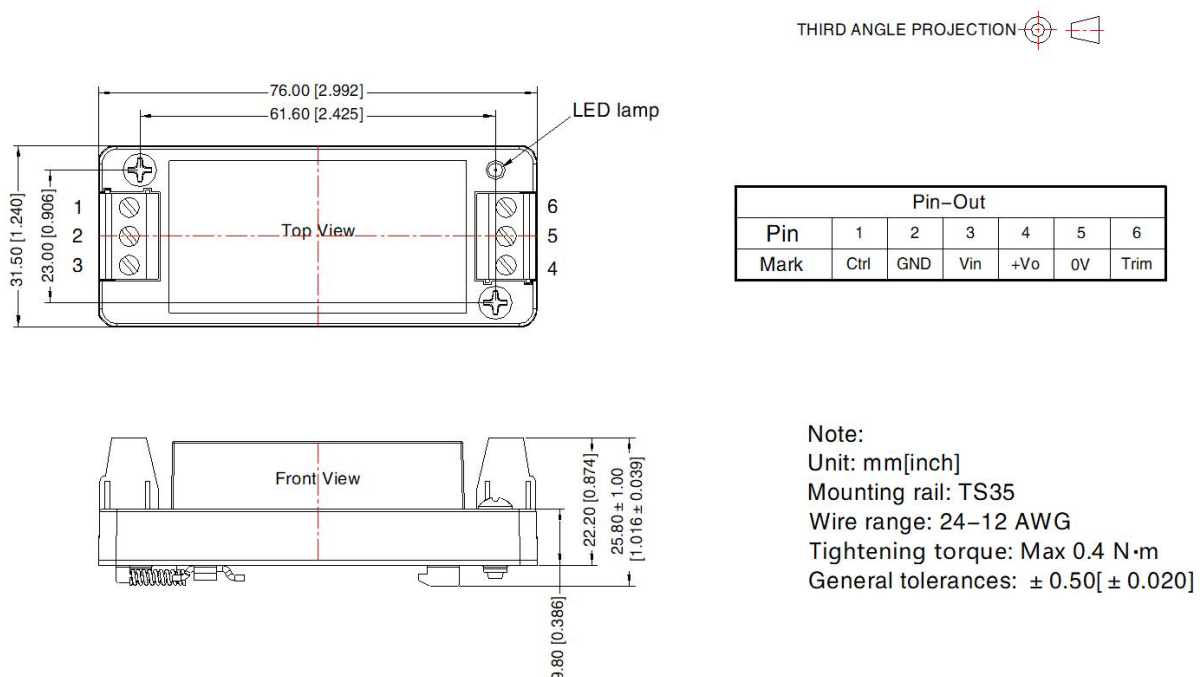
Vout(V)	R1(k Ω)	R2(k Ω)	R3(k Ω)	Vref(V)
3.3	4.801	2.87	10	1.24
5	2.883	2.87	8.2	2.5
12	10.909	2.87	15	2.5
15	14.354	2.87	15	2.5
24	24.771	2.87	17.4	2.5

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

URH_LP-20WR3 Dimensions and Recommended Layout



URH LP-20WR3A4S Dimensions and recommended printing layout



Note:

1. For packaging information, please refer to the "Product Shipping Packaging Information", package number: 58210039(horizontal package), 58220022(A4S package);
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 $T_a=25^{\circ}\text{C}$, 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.

Mornsun Guangzhou Science & Technology Co., Ltd.

Address: No. 5, Kehui St. 1, Kehui Development Center, Science Ave., Guangzhou Science City, Huangpu District, Guangzhou, P. R. China
Tel: 86-20-38601850 Fax: 86-20-38601272 E-mail: info@mornsun.cn www.mornsun-power.com