

250W isolated DC-DC converter
Ultra-wide input and regulated single output



Patent Protection RoHS



FEATURES

- Ultra-wide input voltage range: 43 -160VDC
- High efficiency up to 89%
- Reinforced insulation, I/O isolation test voltage 3K VAC
- Operating ambient temperature range -40°C to +100°C
- Input under-voltage protection, reverse polarity protection, output over-voltage, over-current, short-circuit protection, over-temperature protection
- EN50155 approved

URF1D_HB-250WR3A7 series is a high-performance product with an integrated EMC solution designed for railway applications. The DC-DC converters feature 250W output power with no requirement for minimum load, wide input voltage from 43-160VDC, and allowing operating temperature as high as 100°C. Additional product features include input under-voltage protection, reverse polarity protection, output over-voltage, over-current, short-circuit and over-temperature protection, remote On/Off control, output voltage trim adjustment. EN50155 approved and they are widely used in the centralized lighting, air conditioning and related in on-board equipment.

Selection Guide

Certification	Part No.	Ctrl Logic ^①	Input Voltage (VDC)			Output		Full Load Efficiency(%) Min./Typ.	Max. Capacitive Load(μF)
			Nominal	Range	Max. ^②	Voltage (VDC)	Current (mA) Max./Min.		
CE	URF1D05HB-250WR3A7	P	110	43-66	170	5	40000/0	86/87	22000
				66-160			16670/0		
	URF1D12HB-250WR3A7	P		43-66		12	20840/0	87/89	10000
				66-160					
	URF1D15HB-250WR3A7	P		43-66		15	13330/0	87/89	6800
				66-160			16670/0		
	URF1D24HB-250WR3A7	P		43-66		24	8330/0	87/89	4000
				66-160			10420/0		
	URF1D48HB-250WR3A7	P		43-66		48	4160/0	87/89	680
				66-160			5200/0		
	URF1D54HB-250WR3A7	P		43-66		54	3700/0	87/89	680
				66-160			4630/0		

Note:

① "P" means positive logic, "N" means negative logic;

② Exceeding the maximum input voltage may cause permanent damage.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (full load/no-load)	Nominal input voltage	--	2554/65	2643/80	mA
Reflected Ripple Current	Nominal input voltage	--	80	--	
Surge Current	Nominal input voltage	--	15	30	A
Surge Voltage (1sec. max.)		-0.7	--	185	VDC
Start-up Voltage		--	--	43	
Input Under-voltage Protection		32	37	--	
Start-up Time	Nominal input voltage, constant resistance load	--	40	100	ms
Hot Plug		Unavailable			

Ctrl ^①	Module on	Ctrl open circuit or connected to TTL high level (3.5-12VDC)			
	Module off	Ctrl pin connected to -Vin or low level(0-1.2VDC)			
	Input current when off	--	2	10	mA

Note: ①The Ctrl pin voltage is referenced to input -Vin.

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Voltage Accuracy		--	±1	±3		
Linear Regulation	Input voltage variation from low to high at full load	--	±0.2	±0.5	%	
Load Regulation	Nominal input voltage, 0%-100% load	5V output	--	±1.5		
		others	--	±0.5		
Transient Recovery Time	25% load step change @25°C	--	200	500	μs	
Transient Response Deviation		--	±3	±5	%	
Temperature Coefficient	Full load	--	--	±0.03	%/°C	
Ripple & Noise	20MHz bandwidth, 0%-100%load	--	120	200	mVp-p	
Trim	Full Input voltage, full output power. See Trim in the design reference for details.	90	--	110	%Vo	
Over-temperature Protection	Max. Case Temperature	--	105	--	°C	
Over-voltage Protection	Input voltage range	24V output	110	130	140	%Vo
		others	110	130	160	
Over-current Protection		110	140	150	%Io	
Short-circuit Protection		Continuous, self-recovery				

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Isolation	Electric Strength Test for 1 minute with a leakage current of 5mA max	Input-output	3000	--	--	VAC
		Input-case	1500	--	--	
		Output-case	1500	--	--	
Insulation Resistance	Input-output resistance at 500VDC	100	--	--	MΩ	
Isolation Capacitance	Input-output capacitance at 1KHz/0.1V	--	6000	--	pF	
	Input-case capacitance at 1KHz/0.1V	05V/12V/48V/54V	--	6000		--
		15V/24V	--	7000		--
	output-case capacitance at 1KHz/0.1V	--	4000	--		
Operating Temperature		-40	--	+100	°C	
Storage Temperature		-55	--	+125		
Storage Humidity	Non-condensing	5	--	95	%RH	
Shock and Vibration Test		IEC/EN61373 - Category 1, Grade B				
Switching Frequency	PWM mode	--	260	--	KHz	
MTBF	MIL-HDBK-217F@25°C	250	--	--	K hours	

Mechanical Specifications

Case Material	Aluminum alloy case
Dimension	165.0 x 78.0 x 41.5 mm
Weight	418g (Typ.)
Cooling Method	Free air convection (20LFM) or forced air convection

Electromagnetic Compatibility (EMC)

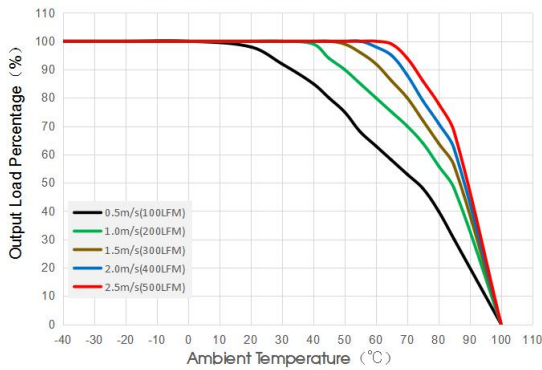
Emissions	CE	CISPR32/EN55032	CLASS A	
	RE	CISPR32/EN55032	CLASS A	
Immunity	ESD	IEC/EN61000-4-2	Contact ±6KV Air ±8KV	perf.Criteria A
	RS	IEC/EN61000-4-3	20V/m	perf.Criteria A
	CS	IEC/EN61000-4-6	10 Vr.m.s	perf.Criteria A
	EFT	IEC/EN61000-4-4	±2KV	perf.Criteria A
	Surge	IEC/EN61000-4-5	line to line ±1KV (1.2 μS/50 μS 2 Ω) line to ground ±2KV (1.2 μS/50 μS 12 Ω)	perf.Criteria A

Electromagnetic Compatibility (EMC) (EN50155)

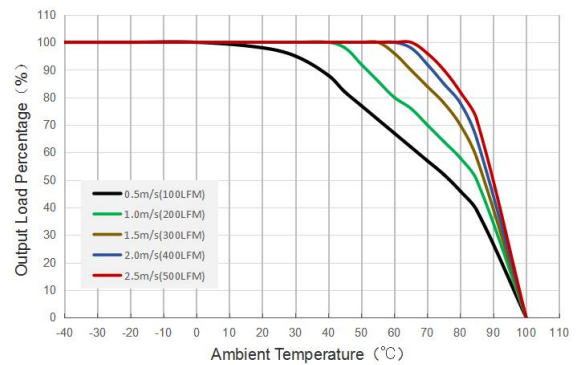
Emissions	CE	EN50121-3-2 EN55016-2-1	150kHz-500kHz 99dBuV 500kHz-30MHz 93dBuV	
	RE	EN50121-3-2 EN55016-2-1	30MHz-230MHz 40dBuV/m at 10m 230MHz-1GHz 47dBuV/m at 10m	
Immunity	ESD	EN50121-3-2	Contact ±6KV/Air ±8KV	perf. Criteria A
	RS	EN50121-3-2	20V/m	perf. Criteria A
	EFT	EN50121-3-2	±2KV 5/50ns 5kHz	perf. Criteria A
	Surge	EN50121-3-2	line to line ±1KV (42 Ω, 0.5 μF) line to ground ±2KV (42 Ω, 0.5 μF)	perf. Criteria A
	CS	EN50121-3-2	0.15MHz-80MHz 10 Vr.m.s	perf. Criteria A

Typical Performance Curves

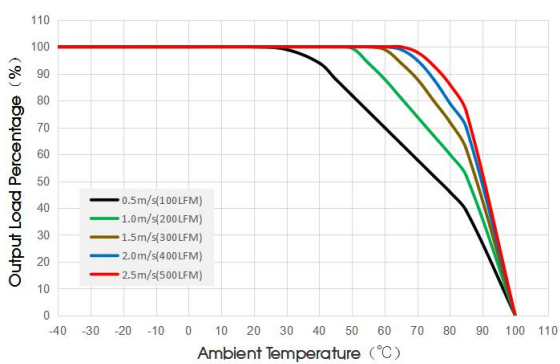
URF1D05HB-250WR3A7 Thermal Curves



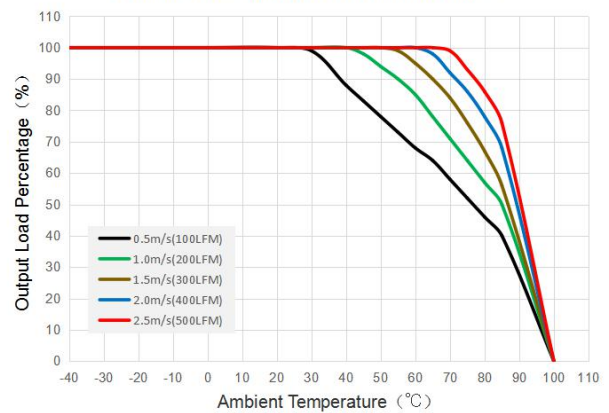
URF1D12HB-250WR3A7 Thermal Curves



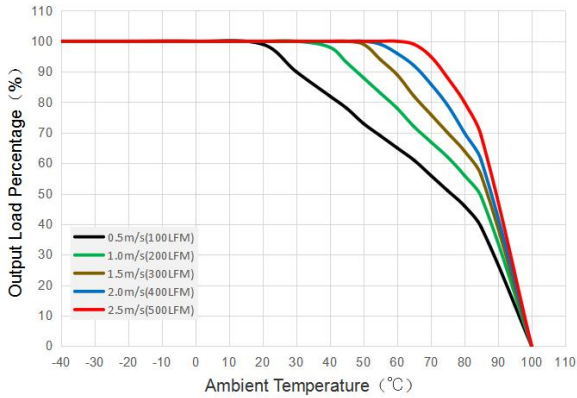
URF1D15HB-250WR3A7 Thermal Curves



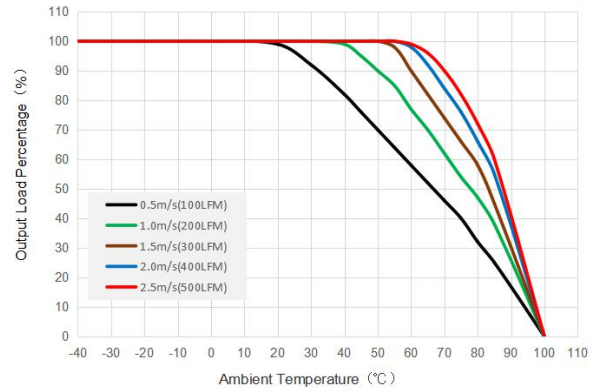
URF1D24HB-250WR3A7 Thermal Curves



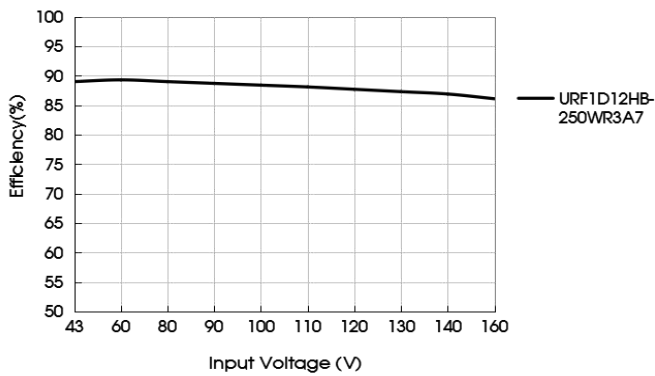
URF1D48HB-250WR3A7 Thermal Curves



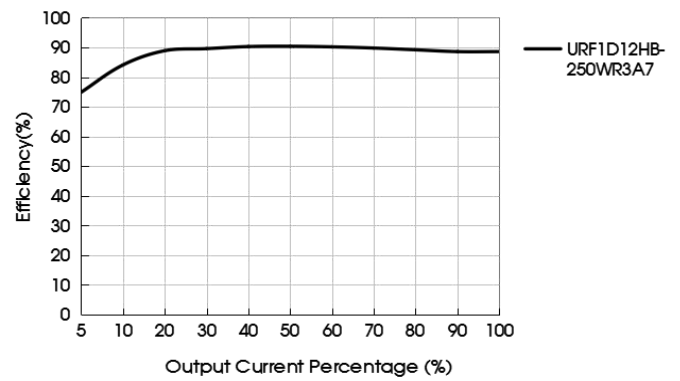
URF1D54HB-250WR3A7 Thermal Curves



Efficiency Vs Input Voltage (Full Load)



Efficiency Vs Output Load (Vin=110V)



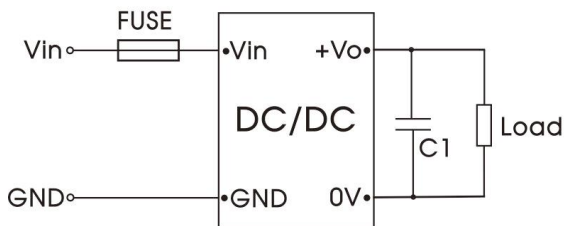
Notes: Temperature derating curves are typical test values (Vin=110V).

Design Reference

1. Typical application

In order to meet the safety requirements and system protection, the fuse at the input must be connected.

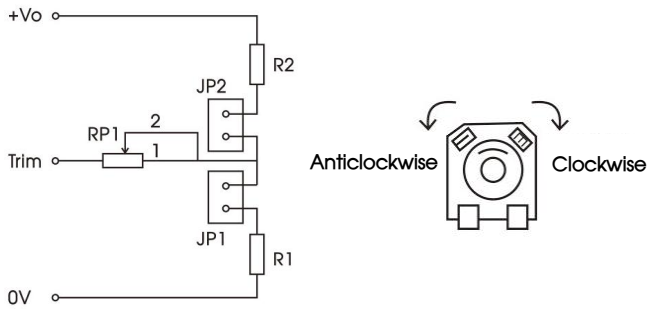
Output ripple can be further reduced by appropriately increasing the output capacitor values C1 and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product.



Parameter description:

Fuse	10A, slow fusing
C1	220uF/100V

2. Trim function for output voltage adjustment



Output voltage can at $\pm 10\%$ change to regulate the adjustable resistor RP1.

How to use Trim:

Output voltage up: Short-circuit JP1, rotate RP1 clockwise to increase the output voltage, anticlockwise to reduce the output voltage.

Output voltage down: Short-circuit JP2, rotate RP1 clockwise to reduce the output voltage, anticlockwise to increase the output voltage.

Note:

Adjustable Voltage range will be slightly greater than $\pm 10\%V_o$. In order to ensure reliable use of the product, please adjust the output voltage range within $\pm 10\%V_o$.

Table.1

Vo Res	5(VDC)	12(VDC)	15(VDC)	24(VDC)	48(VDC)	54(VDC)
R1(K Ω)	0	0	0	0	0	0
R2(K Ω)	0	51	51	120	432	432
RP1(K Ω)	250	250	250	250	250	250

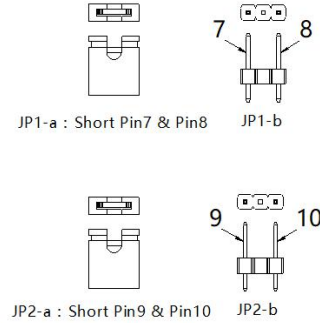
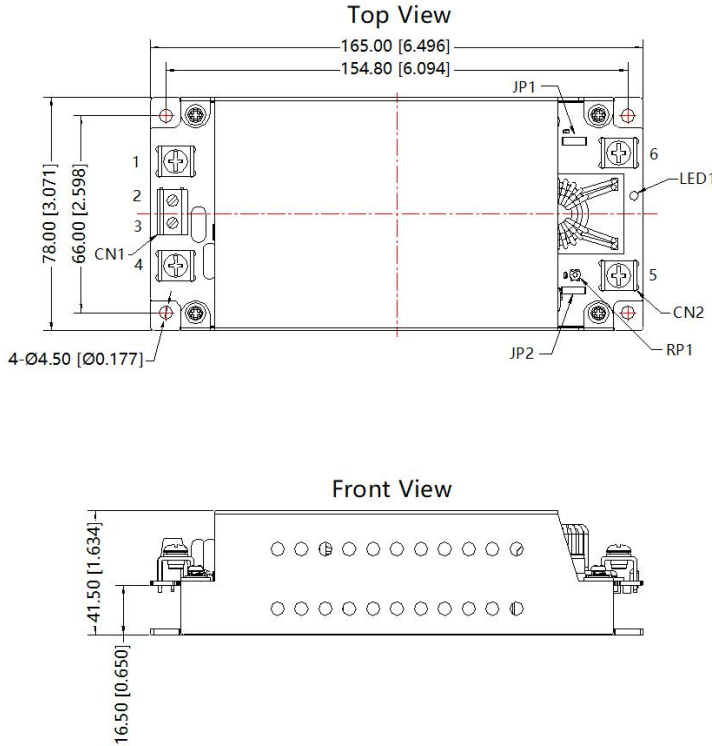
Note: Value for R1, R2 refer to the table 1;

RP1: Adjustable resistance, range 0 to 500K Ω , Initial value is 250K Ω .

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

URF1D_HB-250WR3A7 Dimensions and Recommended Layout

THIRD ANGLE PROJECTION 



Pin-Out	
Pin	Function
1	GND
2	Ctrl
3	Ctrl
4	Vin
5	+Vo
6	0V
7	0V
8	Trim
9	+Vo
10	Trim

Note:
Unit: mm[inch]
Wire range: 22-12AWG
Tightening torque: CN1 M2.5 Max 0.4 N·m
CN2 M5 Max 1.9 N·m
General tolerances: ±1.00[±0.039]

- Note:
1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58210104;
 2. The maximum capacitive load offered were tested at input voltage range and full load;
 3. Unless otherwise specified, data in this datasheet should be tested under the conditions of $T_a=25^{\circ}\text{C}$, humidity<75%RH with nominal input voltage and rated load;
 4. All index testing methods in this datasheet are based on our company corporate standards;
 5. We can provide product customization service and match filter module;
 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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