10W isolated DC-DC converter
Ultra-wide Input and Regulated Single Output

Patent Protection RoHS

FEATURES

- Ultra-wide 4:1 input voltage range
- High efficiency up to 85%
- Reinforced I/O isolation test voltage 3k VAC
- Operating ambient temperature range -40℃ to +85℃
- Input under-voltage protection, output short-circuit, over-current, over–voltage protection
- Low output Ripple & Noise
- EN50121-3-2 & CISPR32/EN55032 CLASS A EMI compliant without external components
- Meets EN50155/EN62368 standard
- Meets UL62368/IEC62368 standard
- Industry standard pin-out

URF1D_LMD-10W(H)R3G series of isolated 10W DC-DC converter products with an ultra-wide 4:1 input voltage and feature efficiencies of up to 85%, input to output isolation is tested with 3000VAC and the converter safely operate ambient temperature of -40 ℃ to +85℃, input under-voltage protection, output short-circuit, over-voltage, over-current protection and are offered with various mounting options ideally suiting electronic equipment and railway vehicle applications using 72V, 96V and 110V battery voltages.

Selection Guide

Certification	Part No. ①	Input Voltage (VDC)		Output		Full Load Efficiency ③ (%) Min./Typ.	Capacitive Load (μF)Max.
		Nominal (Range)	Max. ②	Voltage (VDC)	Current (mA) Max./Min.		
--	URF1D03LMD-10W(H)R3G	110 (40-160)	170	3.3	2400/0	74/76	5400
	URF1D05LMD-10W(H)R3G			5	2000/0	78/80	5400
	URF1D12LMD-10W(H)R3G			12	833/0	82/84	470
	URF1D15LMD-10W(H)R3G			15	667/0	82/84	330
	URF1D24LMD-10W(H)R3G			24	417/0	83/85	100

Note:
①Use "H" suffix for heat sink mounting, We recommend to choose modules with a heat sink for enhanced heat dissipation and applications with extreme temperature requirements;
②Exceeding the maximum input voltage may cause permanent damage;
③Efficiency is measured at 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	3.3V output	--	95/3	98/8	mA
		Others	--	110/3	117/8	
Reflected Ripple Current	Nominal input voltage		--	25	--	
Surge Voltage (1sec. max.)			-0.7	--	180	VDC
Start-up Voltage	Full load		--	--	40	
Input Under-voltage Protection			24	33	--	
Start-up Time	Nominal input voltage & constant resistance load		--	10	--	ms
Input Filter			Pi filter			
Hot Plug			Unavailable			

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy	0%-100% load		--	±1	±3	%
Linear Regulation	Input voltage variation from low to high at full load		--	±0.2	±0.5	
Load Regulation	0%-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	--	±3	±8	%
		Others	--	±3	±5	

Temperature Coefficient	Full load	--	±0.02	±0.03	%/℃
Ripple & Noise①	20MHz bandwidth, 5%-100% load	--	50	100	mV p-p
Over-voltage Protection	Input voltage range	110	--	160	%Vo
Over-current Protection		120	--	260	%Io
Short-circuit Protection		Continuous, self-recovery			

Note: ①Under 0% -5% load conditions, ripple & noise does not exceed 5%Vo. The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific informationn.

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation	Input-output Electric Strength Test for 1 minute with a leakage current of 5mA max.	3000	--	--	VAC
	Input/output-case Electric Strength Test for 1 minute with a leakage current of 1mA max.	1600	--	--	VDC
Insulation Resistance	Input-output resistance at 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100kHz/0.1V	--	2200	--	pF
Operating Temperature	See Fig.1	-40	--	+85	℃
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		IEC61373 - Category 1, Grade B			
Switching Frequency①	PWM Mode	--	300	--	kHz
MTBF	MIL-HDBK-217F@25℃	1000	--	--	k hours

Note:① 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	without heat sink	50.80 x 25.40 x 11.80 mm
	with heat sink	51.40 x 26.20 x 16.50 mm
Weight	without heat sink	26.0g(Typ.)
	with heat sink	34.0g(Typ.)
Cooling Methods	Free air convection	

Electromagnetic compatibility (EMC) (EN62368)

Emissions	CE	CISPR32/EN55032	CLASS A (without external components)/CLASS B (see Fig.3 or Fig.4 for recommended circuit)	
	RE	CISPR32/EN55032	CLASS A (without external components)/CLASS B (see Fig.3 or Fig.4 for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2	Contact ±6kV/Air ±8kV	perf. Criteria B
	RS	IEC/EN61000-4-3	20V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±4kV (see Fig.3 or Fig.4 for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±2kV (2Ω 18uF see Fig.3 for recommended circuit) line to ground ±4kV (12Ω 9uF see Fig.3 for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	10 Vr.m.s	perf. Criteria A

Electromagnetic Compatibility (EMC) (EN50155)

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

Note: All the tests are measured under the conditions of inputs capacitor 100uF/200V or FC-CX1D.

Typical Characteristic Curves

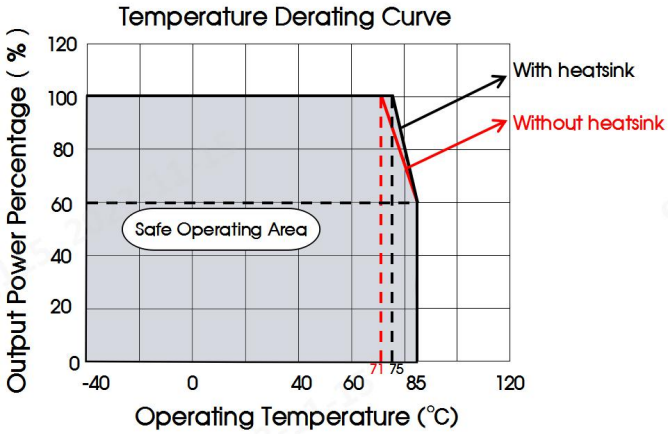
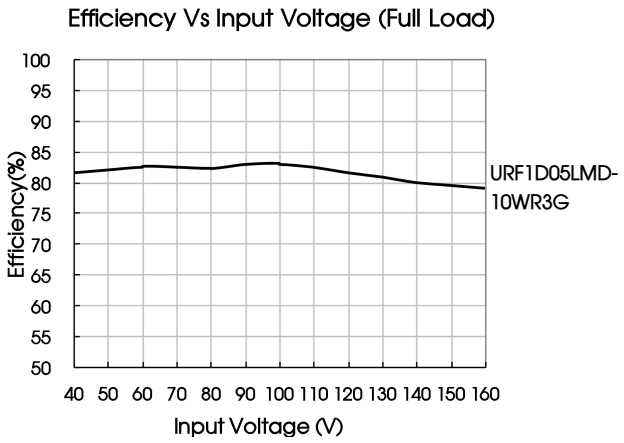
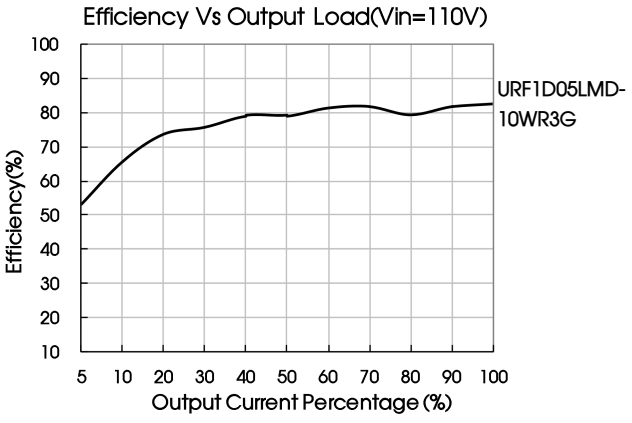
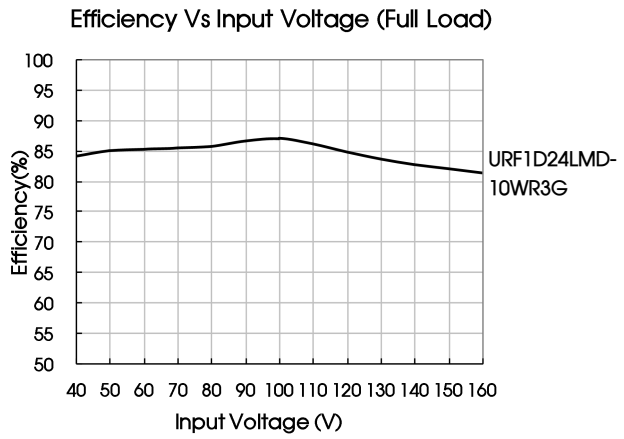
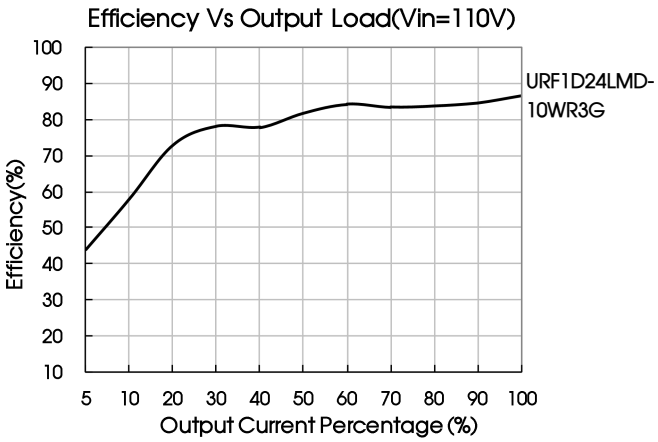


Fig. 1









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 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 max. capacitive load value of the product.

Fig. 2

Vout(VDC)	Fuse	Cin	Cout
3.3/5	2A, slow blow	1007μF/200V	100μF/15V
12/15			47μF/25V
24			22μF/50V

2. EMC compliance circuit

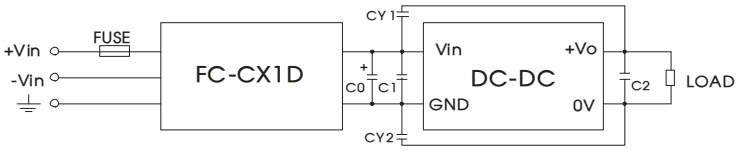


Fig. 3

Fig. 3 List of components:

FUSE	Choose according to actual input current
FC-CX1D	FC-CX1D is the EMC auxiliary component of our company. Input voltage range: 40V-160V
C0	100μF/200V
C1	Refer to the Cin in Fig.2
C2	Refer to the Cout in Fig.2
CY1/CY2	1000pF/400VAC

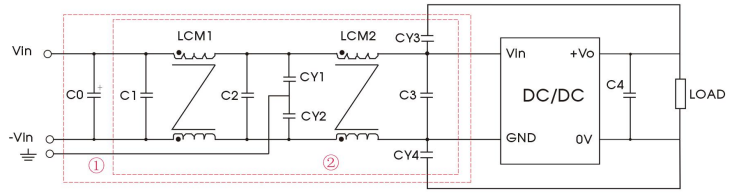


Fig. 4
Notes: Part ① in the Fig. 4 is used for EMC test and part ② for EMI test

Fig. 4 List of components:

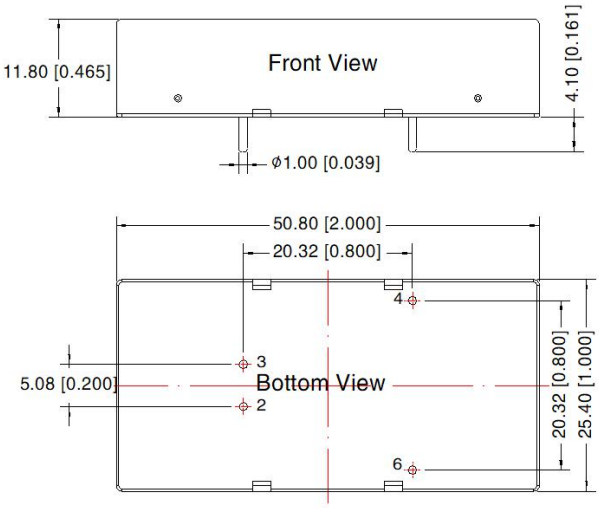
C0	100μF/200V
C1/C2	0.22μF/250V
C3	Refer to the Cin in Fig.2
LCM1	2.2mH(FL2D-10-222)
LCM2	1.1mH (material:TN150P-RH12.7*12.7*7.9)
CY1/CY2/CY3/CY4	1000pF/400VAC
C4	Refer to the Cout in Fig.2
Notes: FL2D-10-222 is the EMC auxiliary component of our company.	

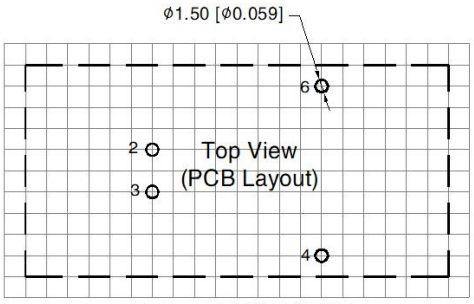
3. The products do not support parallel connection of their output

4. For additional information about Mornsun EMC Filter products please refer to www.mornsun-power.com to download the Selection Guide of EMC Filter

URF1D_LMD-10WR3G Dimensions and Recommended Layout

THIRD ANGLE PROJECTION





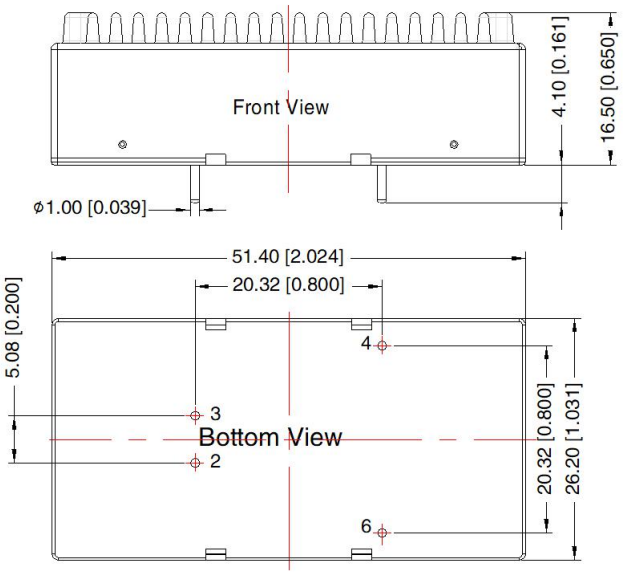
Note：Grid 2.54*2.54mm

Pin–Out	
Pin	Mark
2	GND
3	Vin
4	+Vo
6	0V

Note:
Unit: mm[inch]
Pin2/3/4/6: ϕ 1mm
Pin diameter tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]

URF1D_LMD-10WHR3G Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



Pin–Out	
Pin	Mark
2	GND
3	Vin
4	+Vo
6	0V

Note:
Unit: mm[inch]
Pin2/3/4/6: ϕ 1mm
Pin diameter tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. The Packaging bag number of Horizontal packaging: 58200035(without heat sink), 58200051(with heat sink);
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. Other product application information, please see DC-DC（railway power supply）Converter Application Notes for specific operation methods;
6. We can provide product customization service, please contact our technicians directly for specific information;
7. Products are related to laws and regulations: see "Features" and "EMC";
8. 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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