10W isolated DC-DC converter
Ultra-wide input and regulated dual output

CE RoHS Patent Protection 3 years Warranty

FEATURES

- Ultra-wide input voltage range: 40VDC-160VDC
- No-load power consumption as low as 0.3W
- Reinforced I/O isolation test voltage 2.25k VDC
- Operating ambient temperature range: -40℃ ~ +85℃
- Input under-voltage protection, output short circuit, over-current, over–voltage protection
- Meets EN50121-3-2 & CISPR32/EN55032 CLASS A, without extra components
- EN62368 approved
- Approved EN50155 requirements for railway applications
- Designed to meet IEC62368 safety standard
- Industry standard pin-out

URA1D_(X)LMD-10WR3 series of isolated 10W DC-DC converter products with an ultra-wide input voltage from 40VDC to 160VDC and feature efficiencies of up to 84%, input to output isolation is tested with 2250VDC and the converter safety operate ambient temperature of -40 ℃ to +85℃, input under-voltage protection, output short-circuit, over-voltage, over-current protection. "XLMD" means product without Ctrl pin, "LMD" means product with Ctrl pin and they are widely used in railway vehicle applications using 72V, 96V and 110V battery voltages.

Selection Guide

Certification	Part No. 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	URA1D05(X)LMD-10WR3	110 (40-160)	170	±5	±1000/0	78/80	1000
	URA1D12(X)LMD-10WR3			±12	±417/0	82/84	470
	URA1D15(X)LMD-10WR3			±15	±334/0	82/84	330

Note:
①"X" means product without Ctrl pin;
②Exceeding 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	±5VDC output	--	113/3	117/8	mA
		±12VDC, ±15VDC output	--	108/3	111/8	
Reflected Ripple Current	Nominal input voltage		--	25	--	
Surge Voltage (1sec. max.)			-0.7	--	180	VDC
Start-up Voltage			--	--	40	
Shut-down Voltage			28	33	--	
Start-up Time	Nominal input voltage & constant resistance load		--	10	--	ms
Input Filter			Pi filter			
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		--	2	7	mA
Hot Plug			Unavailable			

Note:*The Ctrl pin voltage is referenced to input GND; URA1D_XLMD series without Ctrl pin.

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy	±5VDC output	5%-100% load	--	±1	±3	%
		0%-5% load	--	±3	±5	
	±12VDC, ±15VDC output	0%-100% load	--	±1	±3	
Linear Regulation	Input voltage variation from low to high at full load	Vo1	--	±0.2	±0.5	
		Vo2	--	±0.5	±1	
Load Regulation①	5%-100% load	Vo1	--	±0.5	±1	%
		Vo2	--	±0.5	±1.5	
Cross Regulation	Vo1 load at 50%, Vo2 load at range of 25%-100%		--	--	±5	%
Transient Recovery Time	25% load step change, nominal input voltage		--	300	500	μs
Transient Response Deviation		5VDC output	--	±4	±8	%
		±12DC, ±15VDC output	--	±3	±5	
Temperature Coefficient	Full load		--	±0.02	±0.03	%/℃
Ripple & Noise②	20MHz bandwidth, 5%-100% load		--	50	100	mV p-p
Over-voltage Protection	Input voltage range		110	--	160	%Vo
Over-current Protection			110	--	210	%Io
Short-circuit Protection			Continuous, self-recovery			

Note: ①Load regulation for 0%-100% load is ±5%;
②Ripple & Noise at＜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.

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.	1500	--	--	
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	50.80 x 25.40 x 11.80 mm
Weight	27.0g (Typ.)
Cooling Methods	Free air convection

Electromagnetic compatibility (EMC) (EN62368)

Emissions	CE	CISPR32/EN55032	CLASS A (without extra components)/ CLASS B (see Fig.3 or Fig.4 for recommended circuit)	
	RE	CISPR32/EN55032	CLASS A (without extra 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 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 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-C01D.

Typical Characteristic Curve

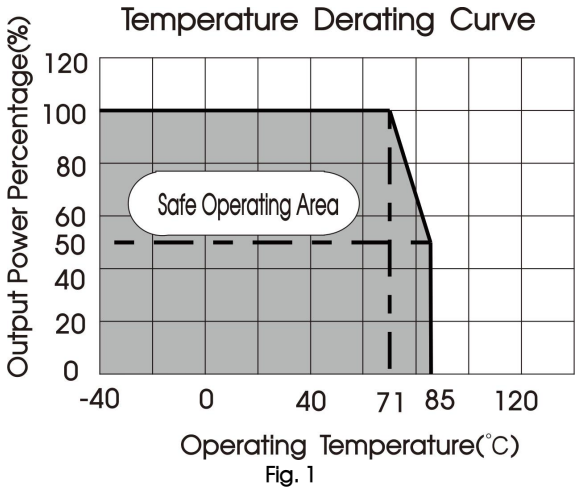
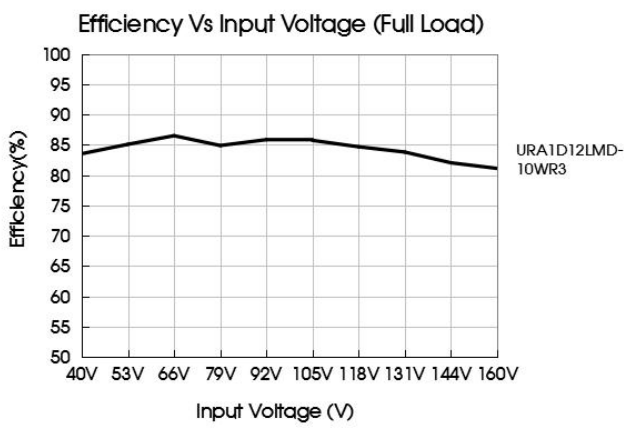
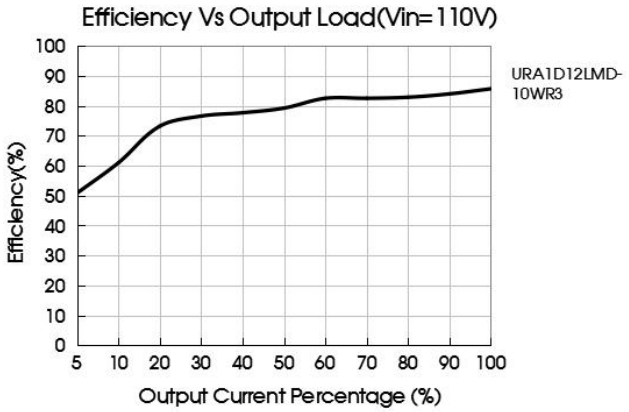


Fig. 1





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 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.

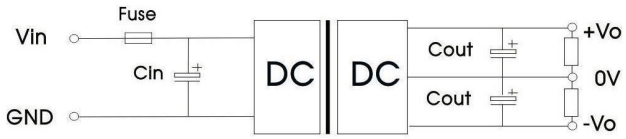


Fig. 2

Vout(VDC)	Fuse	Cin	Cout
±5, ±12, ±15	2A, slow blow	100μF/200V	100μF

2. EMC compliance circuit

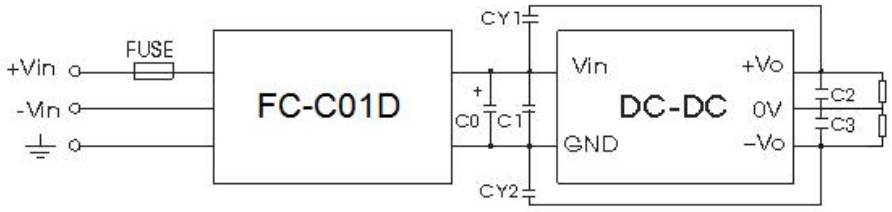


Fig. 3

Table. 3 List of components:

FUSE	Choose according to actual input current
FC-C01D	FC-C01D is the EMC auxiliary component of our company. Input voltage range: 40V-160V
C0	Refer to the Cin in Fig.2
C1	0.22μF/250V
C2, C3	Refer to the Cout in Fig.2
CY1, CY2	1000pF/400VAC

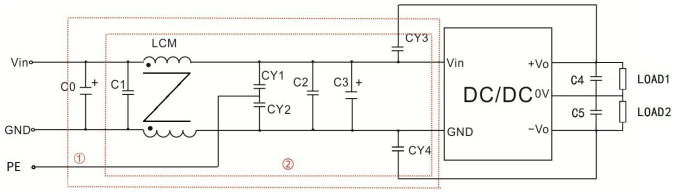


Fig. 4
Notes: For EMC tests we use part ① in Fig. 4 for immunity and part ② for emissions test. Selecting based on needs.

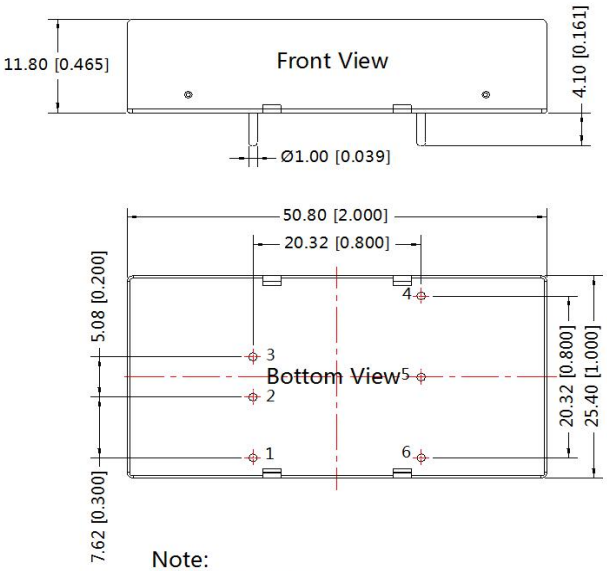
Fig. 4 List of components:

C0	330μF/200V
C1	0.47μF/250V
C2	0.22μF/250V
C3	Refer to the Cin in Fig.2
LCM	2.2mH(FL2D-10-222)
CY1, CY2, CY3, CY4	1000pF/400VAC
C4, C5	Refer to the Cout in Fig.2
Notes: FL2D-10-222 is the EMC auxiliary component of our company.	

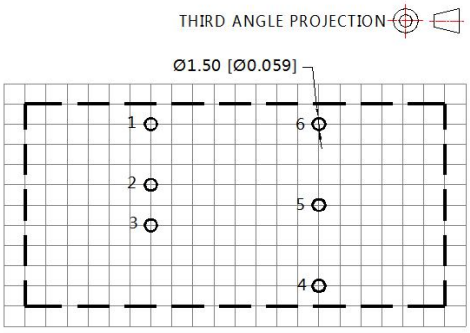
3. The products do not support parallel connection of their output

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

URA1D_LMD-10WR3 Dimensions and Recommended Layout



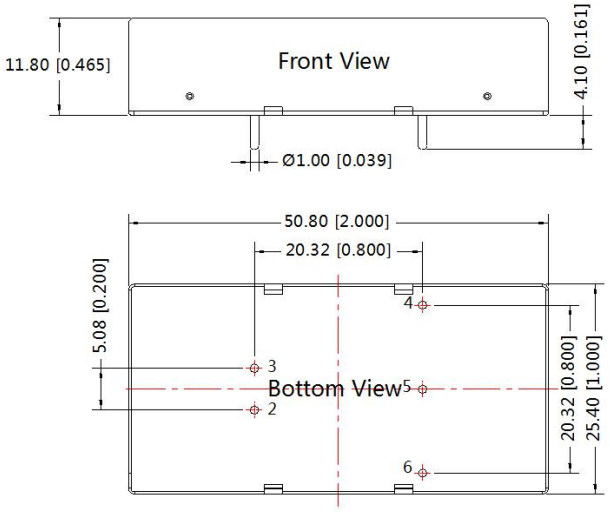
Note:
Unit: mm[inch]
Pin diameter tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]



Note : Grid 2.54*2.54mm

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

URA1D_XLMD-10WR3 Dimensions and Recommended Layout



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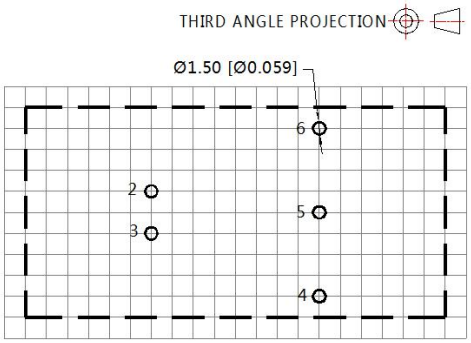

Note : Grid 2.54*2.54mm

Pin-Out	
Pin	Function
2	GND
3	Vin
4	+Vo
5	0V
6	–Vo

Note:
1. For additional information on Product Packaging please refer to www.mornsun-power.com. The Packaging bag number of Horizontal packaging: 58200035;
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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