TRC ELECTRONICS

10W isolated DC-DC converter in DIP package
Ultra-wide input and regulated dual/single output

Patent Protection RoHS

FEATURES

- Ultra-wide 4:1 input voltage range
- High efficiency up to 88%
- No-load power consumption as low as 0.12W
- I/O isolation test voltage1.5K VDC
- Input under-voltage protection, output short circuit, over-current, over-voltage protection
- Operating ambient temperature range: -40℃ to +85℃
- Meets CISPR32/EN55032 CLASS A, without extra components
- Input reverse polarity protection available with Chassis (A2S) or 35mm DIN-Rail mounting (A4S) version
- IEC60950, UL60950, EN62368 approved
- Meets EN50155 railway standard
- Industry standard pin-out

URA_YMD-10WR3 & URB_YMD-10WR3 series of isolated 10W DC-DC converter products feature an ultra-wide with 4:1 input voltage with efficiencies of up to 88%, 1500VDC input to output isolation, operating ambient temperature range of -40℃ to +85℃, input under-voltage protection, output over-voltage, over-current, short circuit protection. They meet CLASS A of CISPR32/EN55032 EMI standards without external components, optional packages are offered for chassis or DIN-rail mounting (A2S, A4S), adding additional input reverse polarity protection and they are widely used in applications such as industrial control, electric power, instruments, communication and railway applications.

Selection Guide

Certification	Part No.[1]	Input Voltage (VDC)		Output		Full Load Efficiency[4] (%) Min./Typ.	Max. Capacitive Load[5] (µF)
		Nominal[2] (Range)	Max.[3]	Voltage (VDC)	Current (mA) Max./Min.		
UL/CE/CB	*URA2405YMD-10WR3	24 (9-36)	40	±5	±1000/0	81/83	1000
	URA2409YMD-10WR3			±9	±555/0	84/86	680
	*URA2412YMD-10WR3			±12	±416/0	85/87	470
	URA2415YMD-10WR3			±15	±333/0	85/87	330
	*URA2424YMD-10WR3			±24	±208/0	85/87	100
	URB2403YMD-10WR3			3.3	2400/0	76/78	2200
	URB2405YMD-10WR3			5	2000/0	81/83	2200
	URB2409YMD-10WR3			9	1111/0	83/85	680
	URB2412YMD-10WR3			12	833/0	84/86	470
	URB2415YMD-10WR3			15	667/0	84/86	330
	URB2424YMD-10WR3			24	416/0	86/88	100
	*URA4805YMD-10WR3	48 (18-75)	80	±5	±1000/0	81/83	1000
	*URA4812YMD-10WR3			±12	±416/0	85/87	470
	*URA4815YMD-10WR3			±15	±333/0	85/87	330
	*URA4824YMD-10WR3			±24	±208/0	85/87	100
	*URB4803YMD-10WR3			3.3	2400/0	77/79	2200
	*URB4805YMD-10WR3			5	2000/0	81/83	2200
	*URB4812YMD-10WR3			12	833/0	85/87	470
	*URB4815YMD-10WR3			15	667/0	85/87	330
	*URB4824YMD-10WR3			24	416/0	86/88	100

Notes:
1. Use "A2S" suffix for chassis mounting and "A4S" suffix for DIN-Rail mounting;
2. The A2S and 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. Efficiency is measured at nominal input voltage and rated output load; efficiencies for A2S and A4S Model's is decreased by 2% due to the input reverse

⑤   polarity protection circuit;
The specified maximum capacitive load value for positive and negative output is identical;

⑥   Products marked with "**"need an input capacitor in order to meet conducted specifications of CISPR32/EN55032 CLASS A.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	24VDC nominal input series, nominal input voltage	3.3VDC output	--	423/5	434/12	mA
		Others	--	502/5	514/12	
	48VDC nominal input series, nominal input voltage	3.3VDC output	--	190/4	215/8	
		Others	--	251/4	258/8	
Reflected Ripple Current	24VDC nominal input series, nominal input voltage		--	40	--	
	48VDC nominal input series, nominal input voltage		--	30	--	
Surge Voltage (1sec. max.)	24VDC nominal input series		-0.7	--	50	VDC
	48VDC nominal input series		-0.7	--	100	
Start-up Voltage	24VDC nominal input series		--	--	9	
	48VDC nominal input series		--	--	18	
Input Under-voltage Protection	24VDC nominal input series		5.5	6.5	--	VDC
	48VDC nominal input series		12	15.5	--	
Start-up Time	Nominal input voltage & constant resistance load		--	10	--	ms
Input Filter	Pi filter					
Hot Plug	Unavailable					
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		--	6	10	mA

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

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy①	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 Regulation②	5%-100% load	Vo1	--	±0.5	±1	
		Vo2	--	±0.5	±1.5	
Cross Regulation	Vo1 load at 50%, Vo2 load at range of 10%-100%		--	--	±5	
Transient Recovery Time	25% load step change, nominal input voltage		--	300	500	µs
Transient Response Deviation			--	±3	±5	%
Temperature Coefficient	Full load		--	--	±0.03	%/℃
Ripple & Noise③	20MHz bandwidth, 5%-100% load		--	40	80	mV p-p
Over-voltage Protection	Input voltage range		110	--	160	%Vo
Over-current Protection			110	140	190	%Io
Short-circuit Protection	Continuous, self-recovery					

Note: ①Output voltage accuracy of ±5VDC/±9VDC output converter for 0%-5% load is ±5% max;
②Load regulation for 0%-100% load is ±5%;
③Ripple & 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.	1500	--	--	VDC
Insulation Resistance	Input-output resistance at 500VDC	1000	--	--	MΩ

Isolation Capacitance	Input-output capacitance at 100KHz/0.1V	--	1000	--	pF
Operating Temperature	See Fig. 1	-40	--	+85	℃
Storage Temperature		-55	--	+125	
Storage Humidity	Non-condensing	5	--	95	%RH
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	--	--	+300	℃
Vibration		IEC/EN61373 - Category 1, Grade B			
Switching Frequency*	PWM mode	--	350	--	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	Aluminum alloy	
Dimensions	Horizontal package	25.40 x 25.40 x 11.70 mm
	A2S chassis mounting	76.00 x 31.50 x 21.20 mm
	A4S DIN-rail mounting	76.00 x 31.50 x 25.80 mm
Weight	Horizontal package/A2S chassis mounting/A4S Din-rail mounting	12.5g/36.0g/56.0g (Typ.)
Cooling method	Free air convection	

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS A (Without extra components)/ CLASS B (see Fig.3-② for recommended circuit)	
	RE	CISPR32/EN55032	CLASS A (Without extra components)/ CLASS B (see Fig.3-② for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2	Contact ±4KV	perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±2KV (see Fig.3-① for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±2KV (see Fig.3-①for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A
	Voltage dips, short interruptions and voltage variations immunity	IEC/EN61000-4-29	0%, 70%	perf. Criteria B

Electromagnetic Compatibility (EMC) (EN50155)

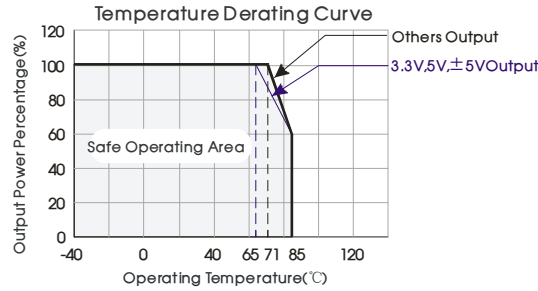| Emissions	CE	EN50121-3-2 150kHz-500kHz 99dBuV (see Fig.3-② for recommended circuit) EN55016-2-1 500kHz-30MHz 93dBuV (see Fig.3-② for recommended circuit)	
	RE	EN50121-3-2 30MHz-230MHz 40dBuV/m at 10m (see Fig.3-② for recommended circuit) EN55016-2-1 230MHz-1GHz 47dBuV/m at 10m (see Fig.3-② for recommended circuit)	
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 (see Fig.3-① for recommended circuit)	perf. Criteria A
	Surge	EN50121-3-2 line to line ±1KV (42Ω, 0.5μF) (see Fig.3-① for recommended circuit)	perf. Criteria A
	CS	EN50121-3-2 0.15MHz-80MHz 10V r.m.s	perf. Criteria A

Typical Characteristic Curves

Temperature Derating Curve

Fig. 1

Efficiency Vs Input Voltage (Full Load)

URA4815YMD-10WR3

Efficiency Vs Output Load(Vin=48)

URA4815YMD-10WR3

Efficiency Vs Input Voltage (Full Load)

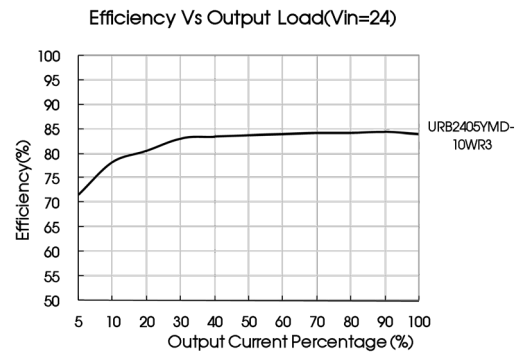URB2405YMD-10WR3

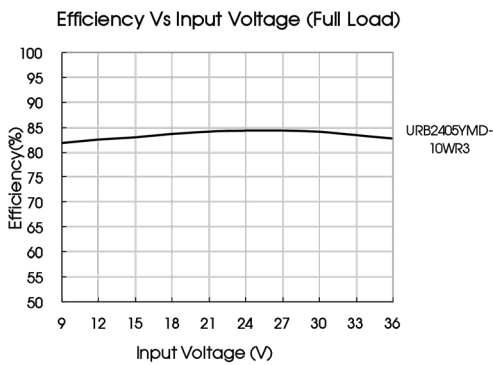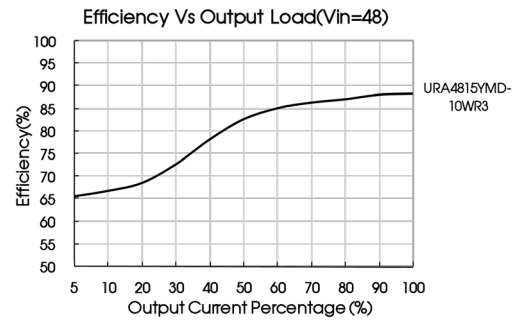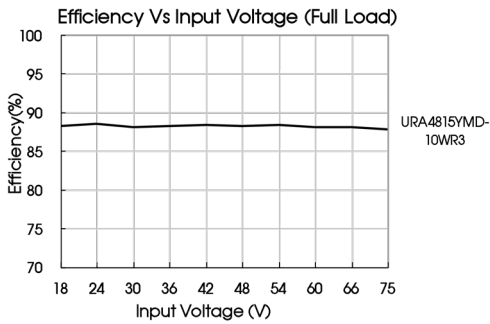### Efficiency Vs Output Load(Vin=24)

URB2405YMD-10WR3

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 specified max. capacitive load value of the product.
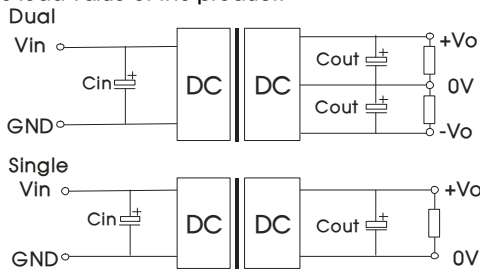

Fig. 2

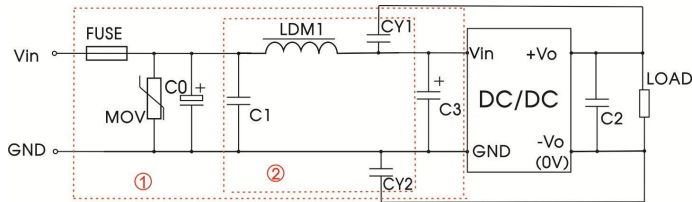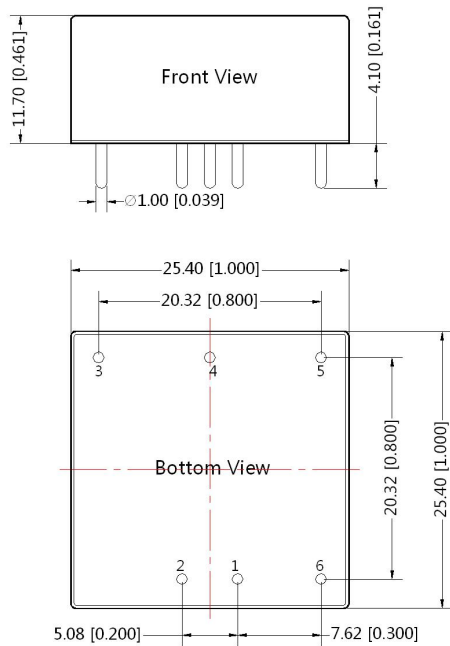| Vin	24V	48V
Cin	100µF	10µF -47µF
Cout	10µF	

2. EMC compliance circuit

Fig. 3

Notes: For EMC tests we use Part ① in Fig. 3 for immunity and part ② for emissions test. Selecting based on needs.
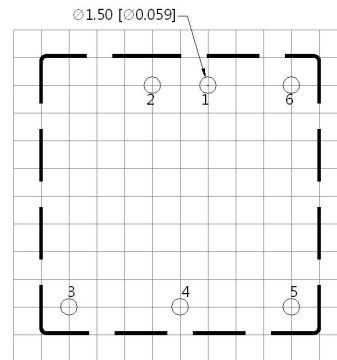
Parameter description:

Model	Vin:24V	Vin:48V
FUSE	Choose according to actual input current	
MOV	S20K30	S14K60
C0, C3	330μF/50V	330μF/100V
C1	1μF/50V	1μF/100V
C2	Refer to the Cout in Fig.2	
LDM1	4.7μH	
CY1, CY2	1nF/2KV	

Dimensions and Recommended Layout

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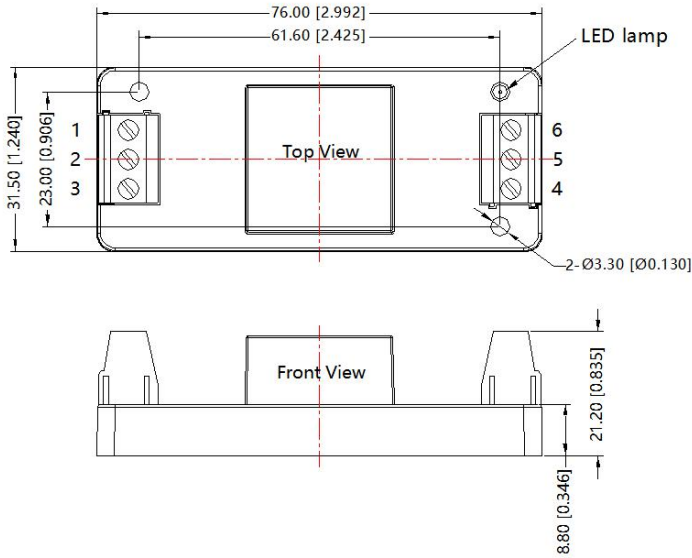General tolerances:±0.50[±0.020]

THIRD ANGLE PROJECTION

Note:Grid 2.54*2.54mm

Pin-Out		
Pin	Single	Dual
1	GND	GND
2	Vin	Vin
3	+Vo	+Vo
4	No Pin	0V
5	0V	-Vo
6	Ctrl	Ctrl

URA_YMD-10WR3A2S & URB_YMD-10WR3A2S Dimensions

THIRD ANGLE PROJECTION

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

Note:
Unit: mm[inch]
Wire range: 24-12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: ±1.00[±0.039]

URA_YMD-10WR3A4S & URB_YMD-10WR3A4S Dimensions

THIRD ANGLE PROJECTION

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

Note:
Unit: mm[inch]
Mounting rail: TS35
Wire range: 24-12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: ±1.00[±0.039]