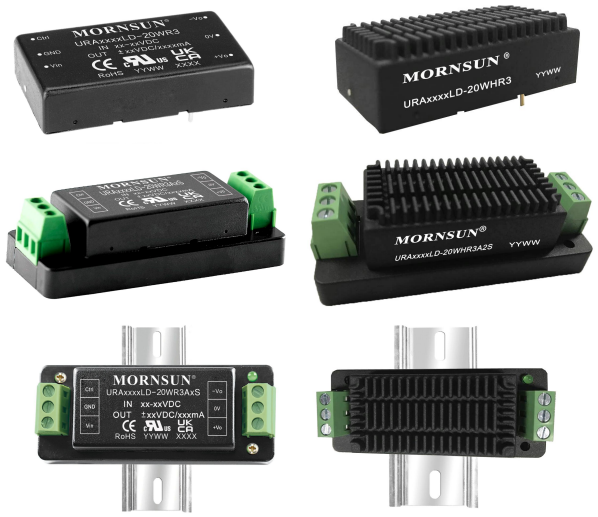
DC/DC Converter

URA_LD-20WR3 & URB_LD-20WR3 Series

MORNSUN®

20W isolated DC-DC converter

Ultra-wide input and regulated dual/single output



Patent Protection

3 years Warranty

c UL us Report UL60950-1 | CE Report EN62368-1 | UKCA Report BS EN62368-1 | CB Report IEC60950-1 | RoHS

FEATURES

- Ultra-wide 4:1 input voltage range
- High efficiency up to 90%
- No-load power consumption as low as 0.15W
- I/O isolation test voltage1.5k VDC
- Input under-voltage protection, output short-circuit, over-voltage, over-current protection
- Operating ambient temperature range: -40℃ to +85℃
- Meets CISPR32/EN55032 CLASS A, without extra components
- Six-sided metal shielding package
- Input reverse polarity protection available with chassis(A2S) or Din-Rail mounting (A4S) version
- Meets EN50155 railway standard

URA_LD-20WR3 & URB_LD-20WR3 series of isolated 20W DC-DC products with an ultra 4:1 input voltage range. They feature efficiencies up to 90%, input to output isolation is tested with 1500VDC, operating ambient temperature range of -40℃ to +85℃, input under-voltage protection, output short-circuit, over-voltage, over-current protection. They meet CLASS A of CISPR32/EN55032 standards without extra 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 data transmission device, battery power supplies, telecommunication device, distributed power supply system, hybrid module system, remote control system, industrial robot system and railway fields.

Selection Guide

Certification	Part No. ①	Input Voltage (VDC)		Output		Full Load Efficiency④ (%) Min./Typ.	Capacitive Load⑤ (μF)Max.
		Nominal② (Range)	Max. ③	Voltage (VDC)	Current (mA) Max./Min.		
UL/EN/BS EN/IEC	URA2405LD-20WR3	24 (9-36)	40	±5	±2000/0	84/86	4800
	URA2409LD-20WR3			±9	±1111/0	86/88	1000
	URA2412LD-20WR3			±12	±834/0	86/88	800
	URA2415LD-20WR3			±15	±667/0	86/88	625
	URB2403LD-20WR3			3.3	5000/0	84/86	10000
	URB2405LD-20WR3			5	4000/0	86/88	10000
	URB2409LD-20WR3			9	2222/0	87/89	4700
	URB2412LD-20WR3			12	1667/0	87/89	1600
	URB2415LD-20WR3			15	1333/0	88/90	1000
	URB2424LD-20WR3			24	834/0	88/90	500
	URA4805LD-20WR3	48 (18-75)	80	±5	±2000/0	84/86	4800
	URA4812LD-20WR3			±12	±834/0	86/88	800
	URA4815LD-20WR3			±15	±667/0	87/89	625
	URB4803LD-20WR3			3.3	5000/0	84/86	10000
	URB4805LD-20WR3			5	4000/0	84/86	10000
	URB4809LD-20WR3			9	2222/0	87/89	4700
	URB4812LD-20WR3			12	1667/0	85/87	1600
	URB4815LD-20WR3			15	1333/0	88/90	1000
	URB4824LD-20WR3			24	834/0	86/88	500

Notes:
①Use "H" suffix for heat sink mounting, "A2S" suffix for chassis mounting and "A4S" suffix for DIN-Rail mounting. We recommend to choose modules with a heat sink for enhanced heat dissipation and applications with extreme temperature requirements;
②The minimum input voltage and starting voltage of A2S and A4S Model are 1VDC higher than those of DIP package due to input reverse polarity protection function;
③Exceeding the maximum input voltage may cause permanent damage;
④Efficiency 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 polarity protection circuit;
⑤The specified maximum capacitive load for positive and negative output is identical.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	24VDC input	3.3V output	--	799/40	818/45	mA
		5V output	--	969/40	993/80	
		Others	--	947/6	969/10	
	48VDC input	3.3V output	--	400/20	409/25	
		5V output	--	485/20	497/60	
		Others	--	474/5	485/9	
Reflected Ripple Current	24VDC input		--	30	--	
	48VDC input		--	30	--	
Surge Voltage (1sec. max.)	24VDC input		-0.7	--	50	VDC
	48VDC input		-0.7	--	100	
Start-up Voltage	24VDC input		--	--	9	
	48VDC input		--	--	18	
Input Under-voltage Protection	24VDC input		5.5	6.5	--	
	48VDC input		12	15.5	--	
Start-up Time	Nominal input & 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		--	4	7	mA
Hot Plug			Unavailable			

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	Positive Output	--	±0.2	±0.5	
		Negative Output	--	±0.5	±1	
Load Regulation②	5%-100% load	Positive Output	--	±0.5	±1	
		Negative Output	--	±0.5	±1.5	
Cross Regulation	Dual output with Positive output at 50% load and Negative output from 10%-100% load		--	--	±5	
Transient Recovery Time	25% load step change, nominal input voltage		--	300	500	μs
Transient Response Deviation		3.3V/5V/±5V output	--	±5	±8	%
		Others	--	±3	±5	
Temperature Coefficient	Full load		--	--	±0.03	%/℃
Ripple & Noise③	20MHz bandwidth, 5%-100% load		--	50	100	mVp-p
Trim	Input voltage range		--	±10	--	%Vo
Over-voltage Protection			110	--	160	
Over-current Protection			110	--	190	%Io
Short-circuit Protection			Hiccup, 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%;
③Under 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 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	URB2424LD-20WR3	--	2050	--	pF
		Others	--	1050	--	
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		--	270	--	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 (without heat sink)		50.80 x 25.40 x 11.80 mm
	Horizontal package (with heat sink)		51.40 x 26.20 x 16.50mm
	A2S chassis mounting (without heat sink)		76.00 x 31.50 x 21.20 mm
	A2S chassis mounting (with heat sink)		76.00 x 31.50 x 25.30 mm
	A4S Din-rail mounting (without heat sink)		76.00 x 31.50 x 25.80 mm
	A4S Din-rail mounting (with heat sink)		76.00 x 31.50 x 29.90 mm
Weight	Without heat sink	Horizontal package/A2S chassis mounting/A4S Din-rail mounting	25.0g/48.0g/68.0g(Typ.)
	With heat sink	Horizontal package/A2S chassis mounting/A4S Din-rail mounting	34.0g/56.0g/76.0g(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 99dBμV (see Fig.3-② for recommended circuit) EN55016-2-1 500kHz-30MHz 93dBμV (see Fig.3-② for recommended circuit)	
	RE	EN50121-3-2 30MHz-230MHz 40dBμV/m at 10m (see Fig.3-② for recommended circuit) EN55016-2-1 230MHz-1GHz 47dBμV/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

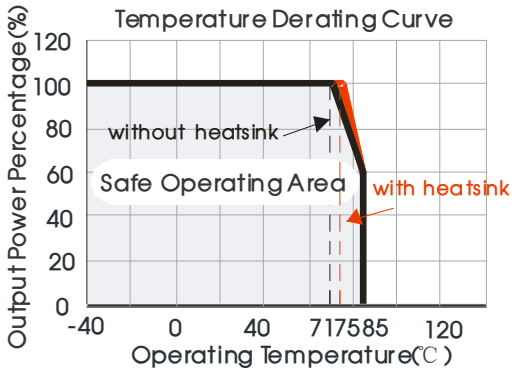
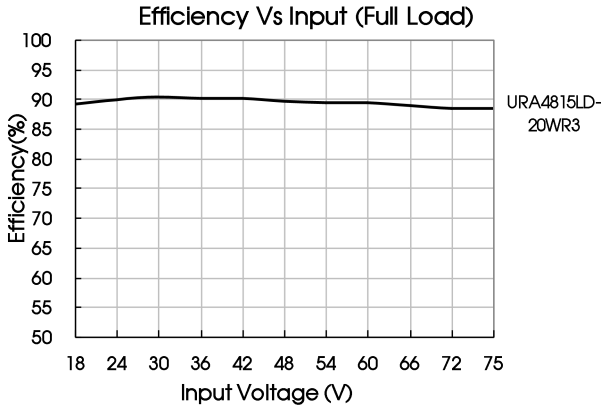
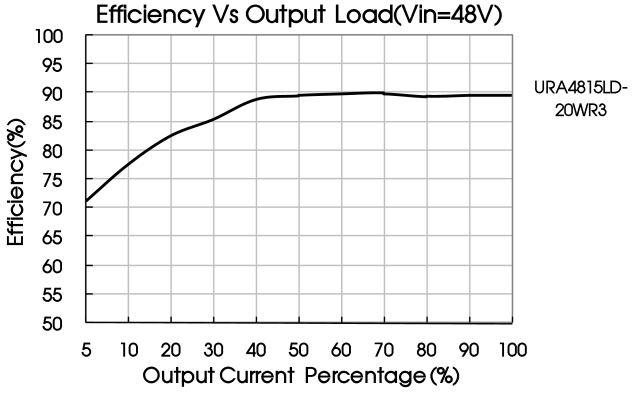
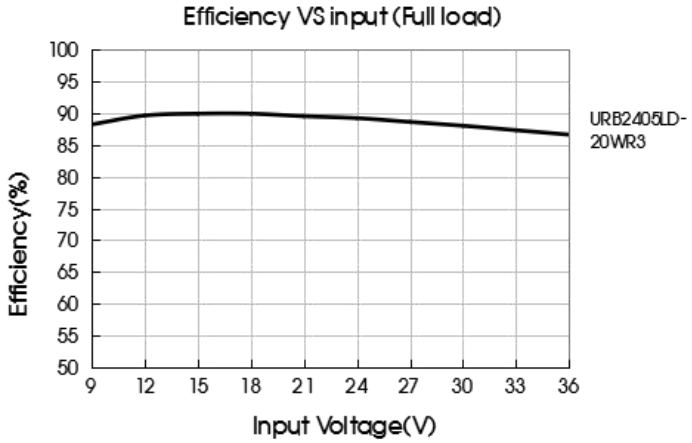
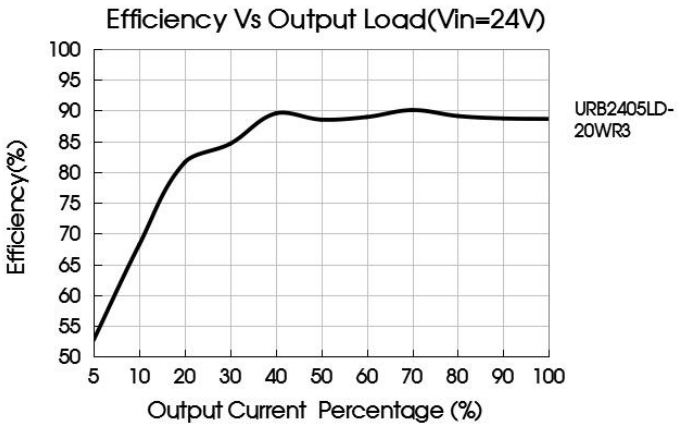


Fig. 1









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 specified max. capacitive load value of the product.

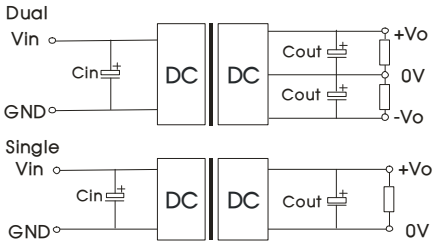
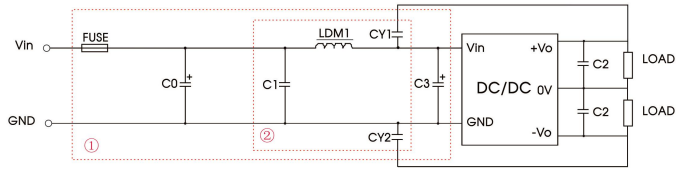


Fig. 2

Cin		Single Vo (VDC)	Cout	Dual Vo (VDC)	Cout
Vin: 24VDC	Vin: 48VDC				
100μF/50V	100μF/100V	3.3/5	470μF/16V	±5	220μF/16V
		9	220μF/16V	±9	100μF/16V
		12/15	220μF/25V	±12/±15	100μF/25V
		24	100μF/50V	--	--

2. EMC compliance circuit

Dual



Single

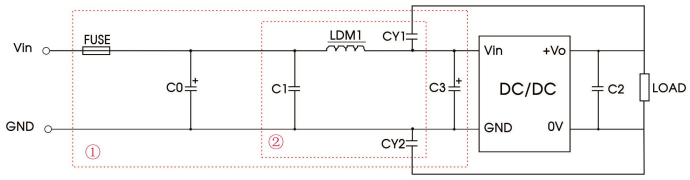


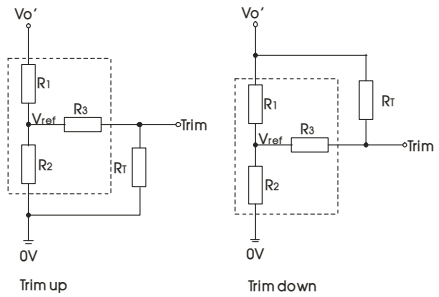
Fig. 3

Notes: We use Part ① in Fig. 3 for Immunity tests and Part ② for Emissions test. Selecting based on needs.

Parameter description:

Model	Vin: 24VDC	Vin: 48VDC
FUSE	Choose according to actual input current	
C0/C3	330μF/50V	330μF/100V
C1	1μF/50V	1μF/100V
C2	Refer to the Cout in Fig.2	
LDM1	4.7μH/3.1A	
CY1/CY2	1nF/2kV	

3. Trim Function for Output Voltage Adjustment (open if unused)



TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

$$\text{up: } R_T = \frac{aR_2}{R_2-a} - R_3 \qquad a = \frac{V_{ref}}{V_o'-V_{ref}} \cdot R_1$$

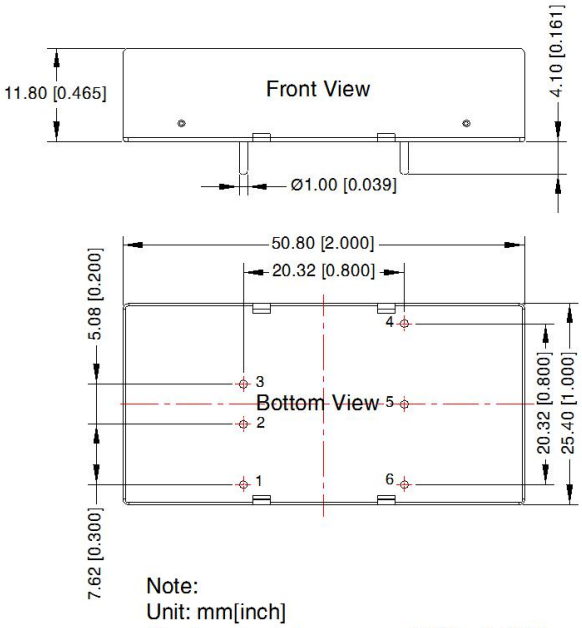
$$\text{down: } R_T = \frac{aR_1}{R_1-a} - R_3 \qquad a = \frac{V_o'-V_{ref}}{V_{ref}} \cdot R_2$$

R_T= Trim Resistor value
a= self-defined parameter

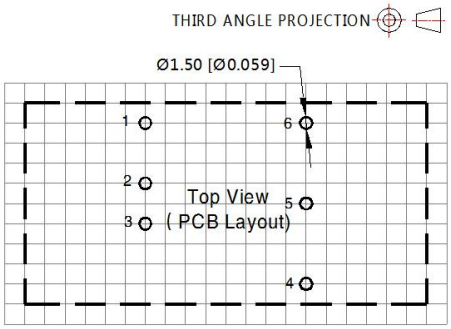
Vout(V)	R1(kΩ)	R2(kΩ)	R3(kΩ)	Vref(V)
3.3	4.772	2.87	12.4	1.25
5	2.883	2.87	10	2.5
9	7.500	2.87	15	2.5
12	11.000	2.87	15	2.5
15	14.494	2.87	15	2.5
24	24.872	2.87	17.8	2.5

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

Horizontal Package (without heat sink) Dimensions and Recommended Layout



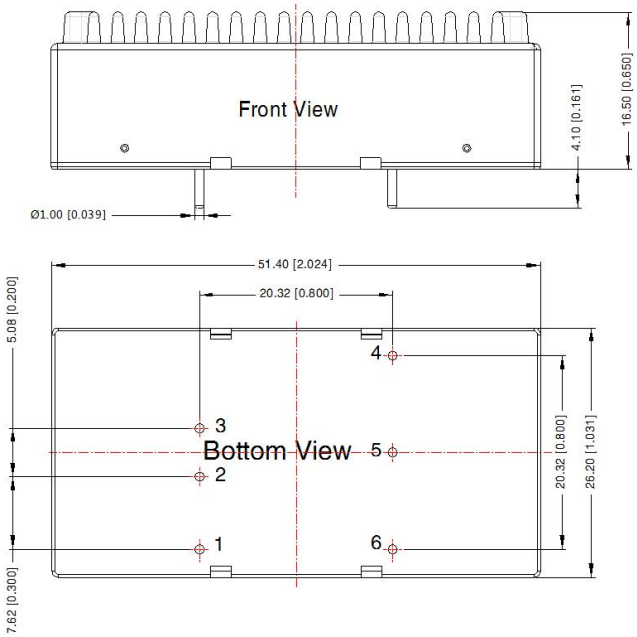
Note:
Unit: mm[inch]
Pin diameter tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]



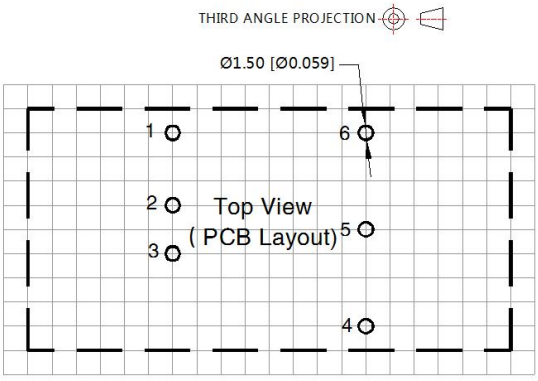
Note: Grid 2.54*2.54mm

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

Horizontal Package (with heat sink) Dimensions



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

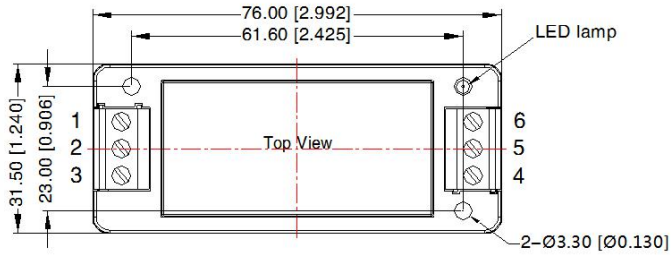


Note: Grid 2.54*2.54mm

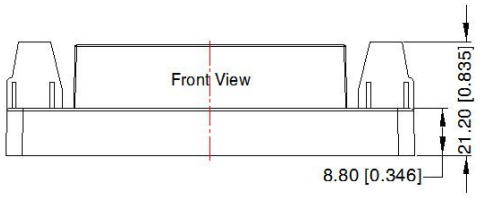
Pin–Out		
Pin	Single	Dual
1	Ctrl	Ctrl
2	GND	GND
3	Vin	Vin
4	+Vo	+Vo
5	Trim	0V
6	0V	–Vo

URA_LD-20WR3A2S & URB_LD-20WR3A2S(without heat sink) Dimensions

THIRD ANGLE PROJECTION



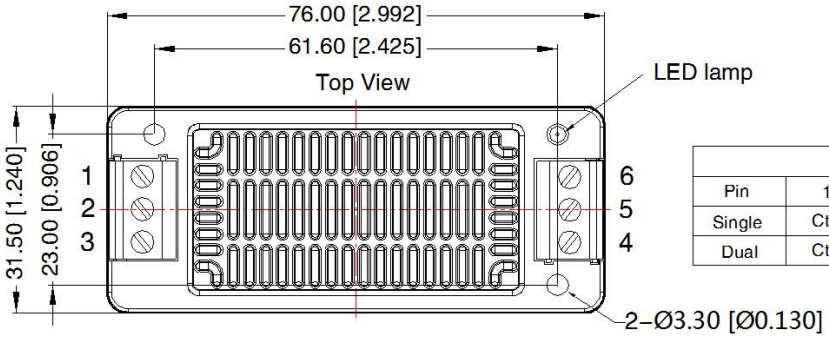
Pin–Out						
Pin	1	2	3	4	5	6
Dual	Ctrl	GND	Vin	+Vo	0V	–Vo
Single	Ctrl	GND	Vin	+Vo	Trim	0V



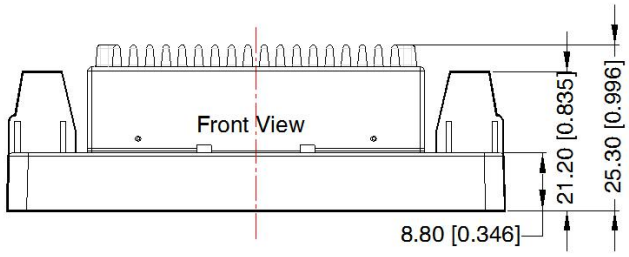
Note:
Unit: mm[inch]
Wire range: 24–12 AWG
Tightening torque: Max 0.4 N ▪ m
General tolerances: ± 1.0[± 0.039]

URA_LD-20WHR3A2S & URB_LD-20WHR3A2S(with heat sink) Dimensions

THIRD ANGLE PROJECTION



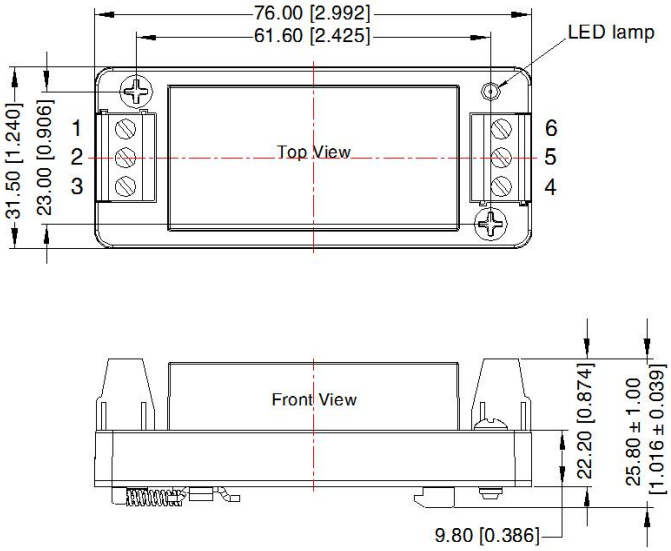
Pin–Out						
Pin	1	2	3	4	5	6
Single	Ctrl	GND	Vin	+Vo	Trim	0V
Dual	Ctrl	GND	Vin	+Vo	0V	–Vo



Note:
Unit: mm[inch]
Wire range: 24–12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: ± 1.0[± 0.039]

URA_LD-20WR3A4S & URB_LD-20WR3A4S(without heat sink) Dimensions

THIRD ANGLE PROJECTION

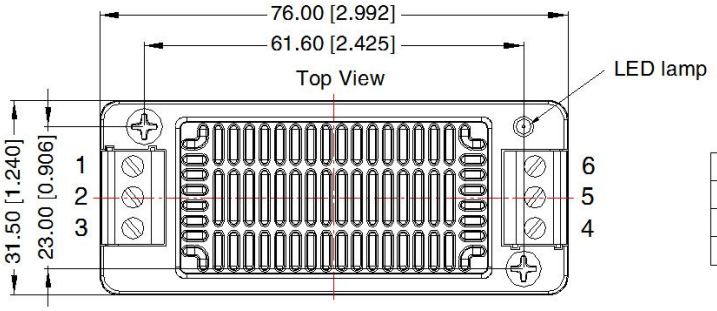


Pin–Out						
Pin	1	2	3	4	5	6
Dual	Ctrl	GND	Vin	+Vo	0V	–Vo
Single	Ctrl	GND	Vin	+Vo	Trim	0V

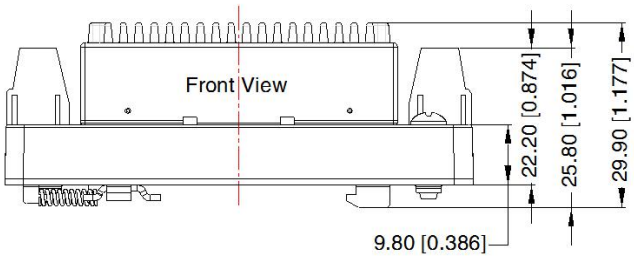
Note:
Unit: mm[inch]
Mounting rail: TS35
Wire range: 24–12 AWG
Tightening torque: Max 0.4 N • m
General tolerances: ± 1.00[± 0.039]

URA_LD-20WHR3A4S & URB_LD-20WHR3A4S(with heat sink) Dimensions

THIRD ANGLE PROJECTION



Pin–Out						
Pin	1	2	3	4	5	6
Single	Ctrl	GND	Vin	+Vo	Trim	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]

Notes:

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), A2S/A4S packaging number: 58220022;
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. 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.

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