

20W isolated DC-DC converter DIP package,
Ultra-wide input and regulated single output



UL **CE** **CB** Patent Protection **RoHS**

URB_YMD-20WR3 series of isolated DC-DC converter products feature an ultra-wide 4:1 input voltage with efficiency of up to 91%, 1500VDC input to output isolation, an operating ambient temperature range of -40°C to +105°C, input under-voltage protection, output over-voltage, overcurrent, short circuit protection, which makes them widely used in industrial control, electric power, instruments, communication and railway applications. Optional packages are offered for chassis or DIN-rail mounting (A2S, A4S), adding additional input reverse polarity protection.

FEATURES

- Ultra-wide 4:1 input voltage range
- High efficiency up to 91%
- I/O isolation test voltage 1.5k VDC
- Input under-voltage protection, output short circuit, over-current, over-voltage protection
- Operating ambient temperature range -40°C to +105°C
- Input reverse polarity protection available with chassis(A2S) or 35mm DIN-rail mounting(A4S) version
- IEC62368, UL62368, EN62368 approved
- Meets EN50155 railway standard

Selection Guide

Certification	Part No. ^①	Input Voltage (VDC)		Output		Full Load Efficiency ^④ (%) Min./Typ.	Max. Capacitive Load(μF)
		Nominal ^② (Range)	Max. ^③	Voltage (VDC)	Current(mA) Max./Min.		
UL/CE/CB	URB2403YMD-20WR3	24 (9-36)	40	3.3	5000/0	86/88	10000
	URB2405YMD-20WR3			5	4000/0	88/90	10000
	URB2406YMD-20WR3			6	3333/0	87/89	10000
UL/CE/CB	URB2412YMD-20WR3			12	1667/0	88/90	1600
	URB2415YMD-20WR3			15	1333/0	89/91	1000
	URB2424YMD-20WR3			24	833/0	89/91	500
	URB4803YMD-20WR3	48 (18-75)	80	3.3	5000/0	86/88	10000
	URB4805YMD-20WR3			5	4000/0	88/90	10000
	URB4812YMD-20WR3			12	1667/0	89/91	1600
	URB4815YMD-20WR3			15	1333/0	89/91	1000
	URB4824YMD-20WR3			24	833/0	89/91	500

Notes:

- ① Use "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;
- 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 Absolute maximum stress rating without damage (not recommended);
- 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 polarity protection circuit.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	24VDC nominal input series, nominal input voltage	3.3V output	--	782/30	800/50
		5V output	--	926/35	947/55
		6V output	--	936/50	958/70
		12V output	--	926/6	947/15
		15V output	--	916/6	937/15
		24V output	--	916/10	937/20
	48VDC nominal input series, nominal input voltage	3.3V output	--	391/15	400/30
		5V output	--	463/20	474/30
		12V output	--	458/3	469/15
		15V output	--	458/3	469/15
		24V output	--	458/4	469/15
Reflected Ripple Current	Nominal input series,	--	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	
Under-voltage Protection	24VDC nominal input series	5.5	6.5	--	
	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 (TTL 3.5-12VDC)			
	Module off	Ctrl pin pulled low to GND (0-1.2VDC)			
	Input current when off	--	2	7	mA

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

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	5%-100% load		--	±0.5	±1	
Transient Recovery Time	25% load step change, nominal input voltage		--	300	500	μs
Transient Response Deviation		3.3V/ 5V/ 6V output	--	±5	±8	%
		Others	--	±3	±5	
Temperature Coefficient	Full load		--	--	±0.03	%/°C
Ripple & Noise*	20MHz bandwidth, 5%-100% load		--	50	100	mV p-p
Trim	Input voltage range		90	--	110	%Vo
Over-voltage Protection			110	--	160	
Over-current Protection			110	150	190	%Io
Short-circuit Protection			Hiccup, continuous, self-recovery			

Note:

*Ripple & 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
	Input/output-case Electric Strength Test for 1 minute with a leakage current of 1mA max.		1000	--	--	
Insulation Resistance	Input-output resistance at 500VDC		1000	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100KHz/0.1V		--	2000	--	pF
Operating Temperature	See Fig. 1	3.3V/ 5V /6V output	-40	--	+95	°C
		Others	-40	--	+105	
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	°C
Vibration			IEC/EN61373 - Category 1, Grade B			
Switching Frequency*	PWM mode	3.3V/ 5V/ 6V output	--	300	--	KHz
		Others	--	270	--	
MTBF	MIL-HDBK-217F@25°C		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)		25.40 × 25.40 × 11.70 mm
	Horizontal package (with heat sink)		25.40 × 25.40 × 16.20 mm
	A2S wiring package (without heat sink)		76.00 × 31.50 × 21.20 mm
	A2S wiring package (with heat sink)		76.00 × 31.50 × 25.20 mm
	A4S Din-rail package (without heat sink)		76.00 × 31.50 × 25.80 mm
	A4S Din-rail package (with heat sink)		76.00 × 31.50 × 29.80 mm
Weight	without heat sink	Horizontal package/A2S wiring package/A4S Din-rail package	15.0g/38.0g/58.0g(Typ.)
	with heat sink	Horizontal package/A2S wiring package/A4S Din-rail package	20.0g/40.0g/60.0g(Typ.)
Cooling method	Free air convection		

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)		
	RE	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)		
Immunity	ESD	IEC/EN61000-4-2	Contact ±6KV, Air ±8KV		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 A
	Surge	IEC/EN61000-4-5	line to line ±2KV (see Fig.3-① for recommended circuit)		perf. Criteria B
	CS	IEC/EN61000-4-6	3 V _{r.m.s}		perf. Criteria A

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)	
Immunity	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)	
	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

Immunity	CS	EN50121-3-2 0.15MHz-80MHz	10V r.m.s	perf. Criteria A
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Typical Characteristic Curves

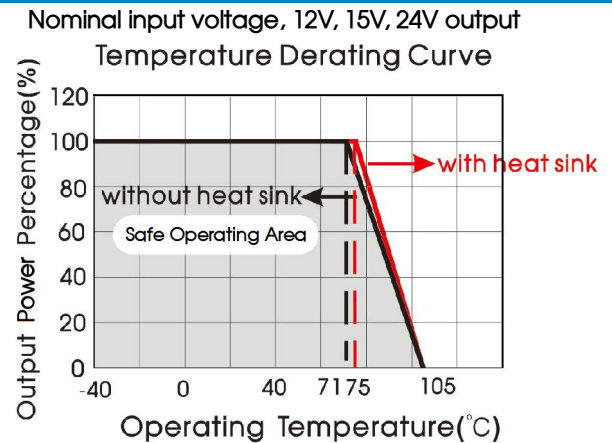
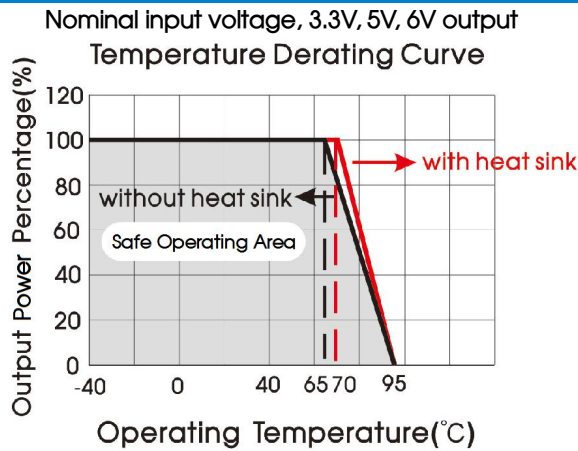
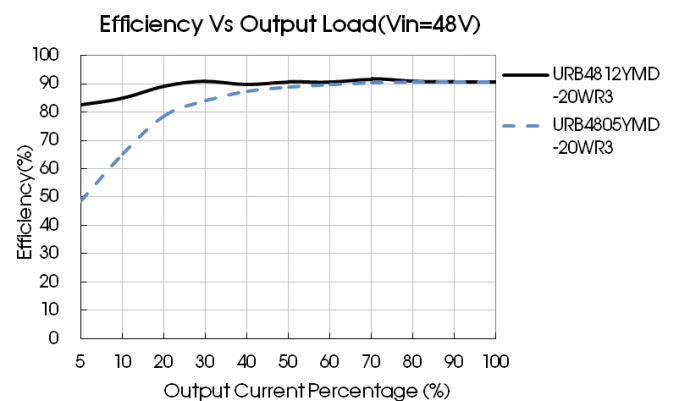
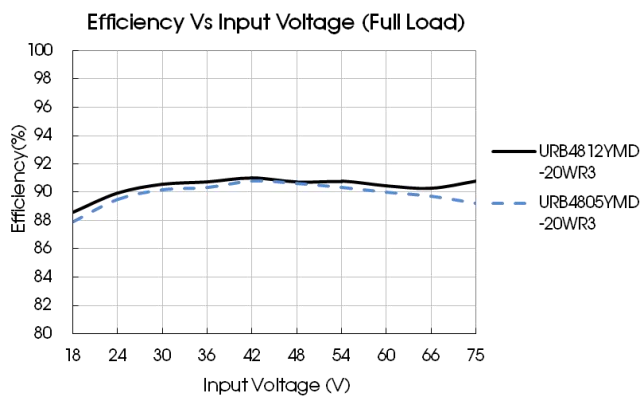
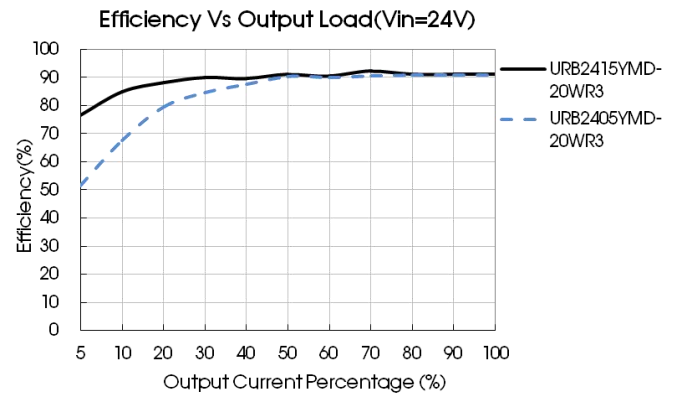
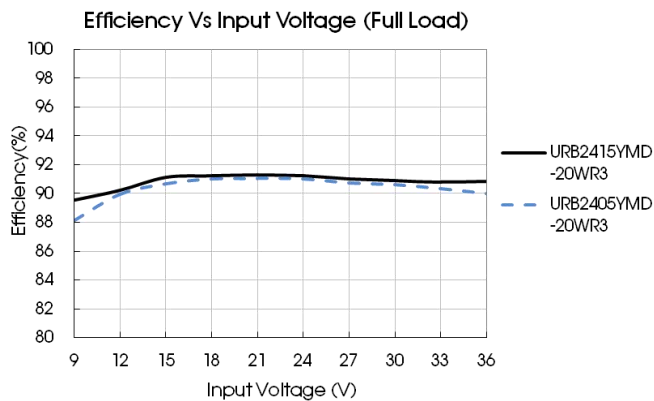


Fig. 1



Design Reference

1. Typical application

All 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 C_{in} and C_{out} 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

Vout (VDC)	Cin (μF)	Cout (μF)
3.3/5/6/12/15	100	100
24		47

2. EMC compliance circuit

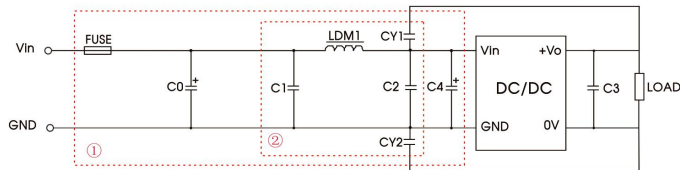


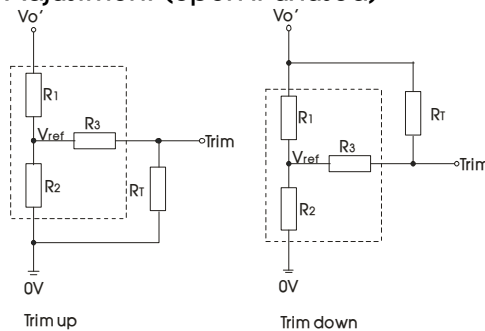
Fig. 3

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:24V	Vin:48V
FUSE	Select fuse value according to actual input current	
C0, C4	330μF/50V	330μF/100V
C1, C2	4.7μF/50V	4.7μF/100V
C3	Refer to the Cout in Fig.2	
LDM1	2.2μH/4A	2.2μH/2A
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:

$$\begin{aligned} \text{up: } R_t &= \frac{aR_2}{R_2-a} - R_3 & a &= \frac{V_{ref}}{V_o' - V_{ref}} \cdot R_1 \\ \text{down: } R_t &= \frac{aR_1}{R_1-a} - R_3 & a &= \frac{V_o' - V_{ref}}{V_{ref}} \cdot R_2 \end{aligned}$$

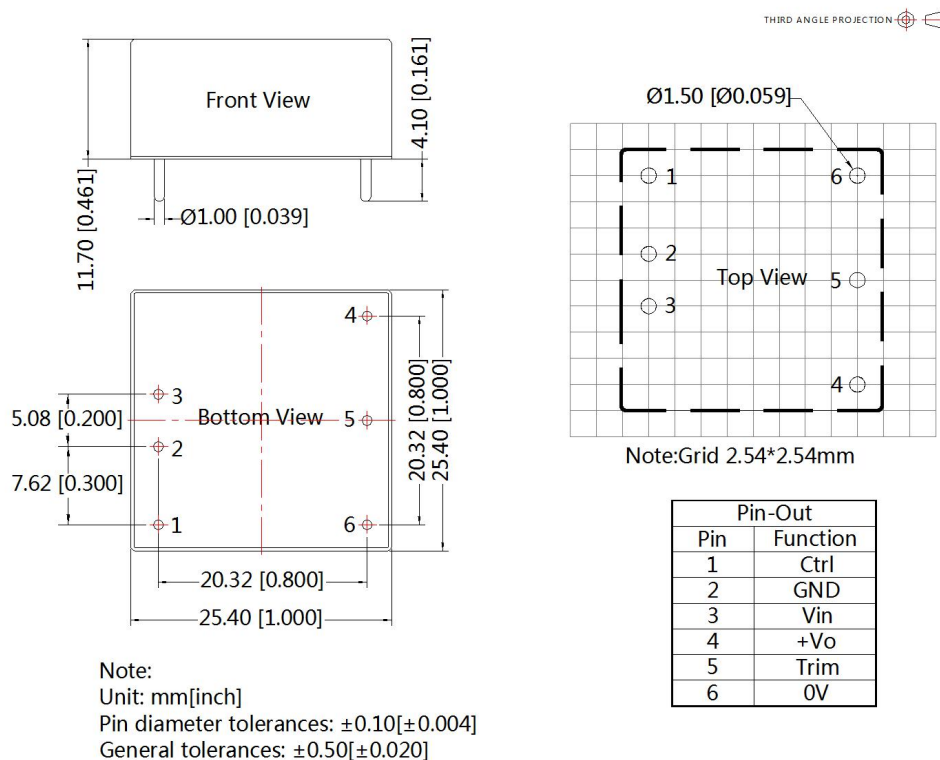
R_t = Trim Resistor value;
 a = self-defined parameter;
 V_o' = desired output voltage

Vout(V)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	4.829	2.87	15	1.24
5	2.894	2.87	10	2.5
6	4.064	2.87	10	2.5
12	11.000	2.87	17.4	2.5
15	14.494	2.87	17.4	2.5
24	24.872	2.87	20	2.5

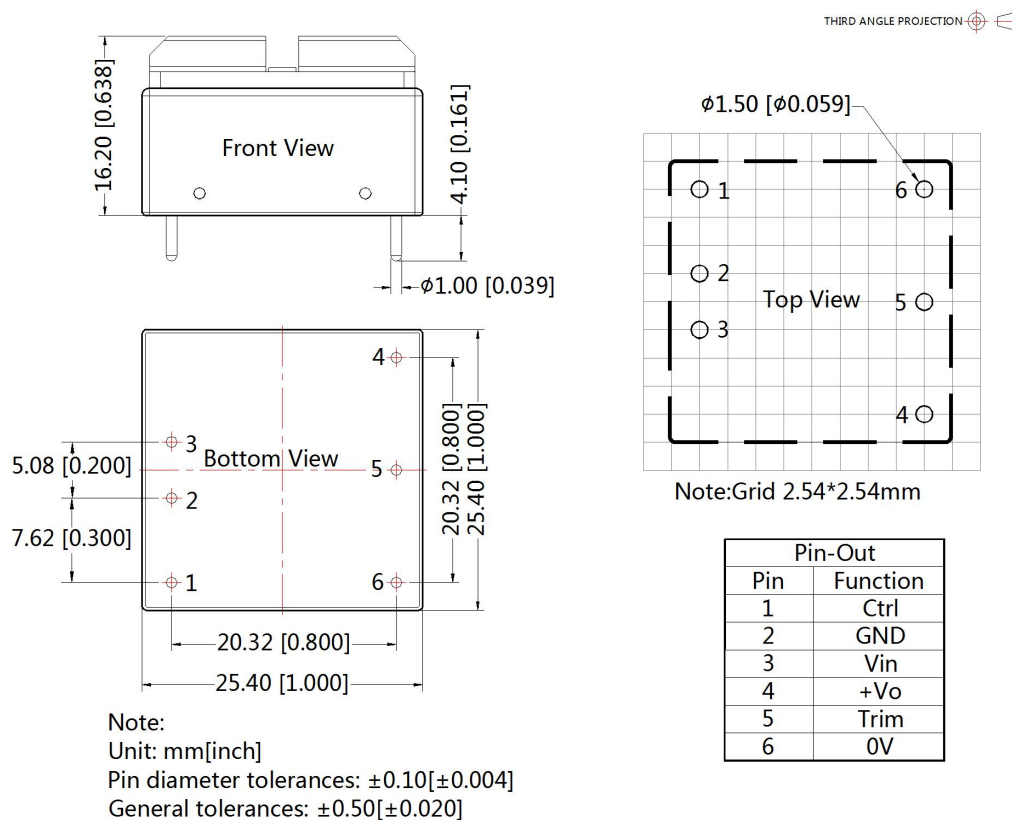
4. The products do not support parallel connection of their output

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

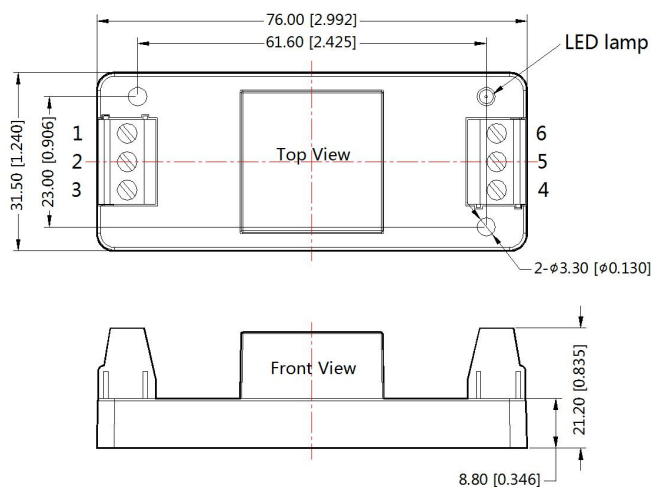


Horizontal Package (with heat sink) Dimensions



URB_YMD-20WR3A2S Dimensions

THIRD ANGLE PROJECTION

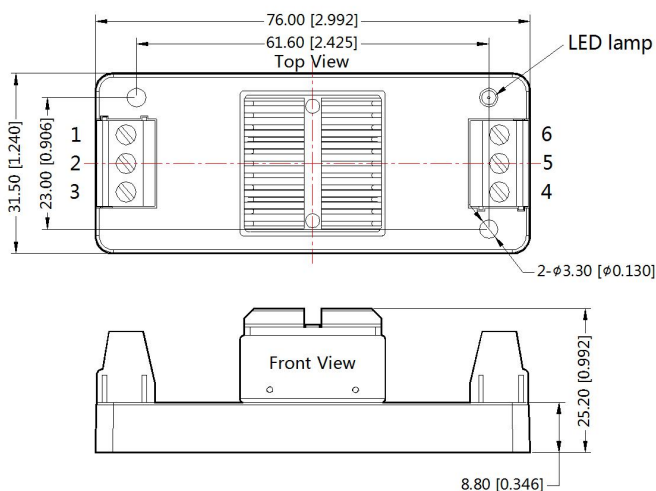


Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	+Vo	Trim	0V

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

URB_YMD-20WHR3A2S (with heat sink) Dimensions

THIRD ANGLE PROJECTION

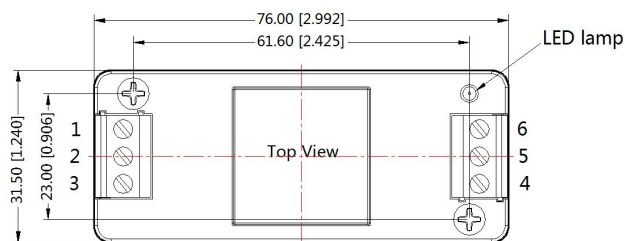


Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	+Vo	Trim	0V

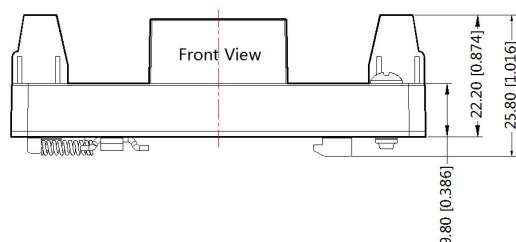
Note:
Unit: mm[inch]
Wire range: 24-12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: $\pm 1.00[\pm 0.039]$

URB_YMD-20WR3A4S Dimensions

THIRD ANGLE PROJECTION



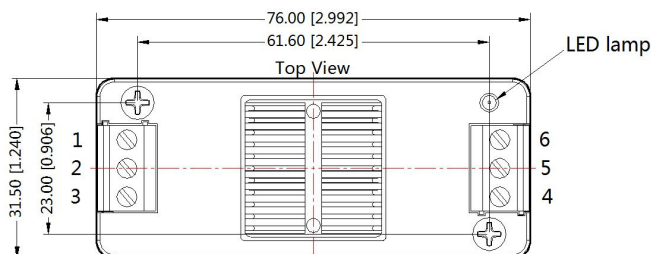
Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	+Vo	Trim	0V



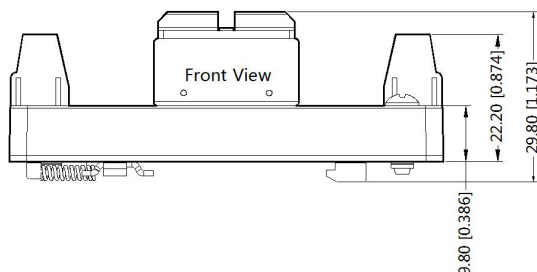
Note:
Unit: mm[inch]
Wire range: 24-12 AWG
Tightening torque: Max 0.4 N·m
Mounting rail: TS35
General tolerances: $\pm 1.00[\pm 0.039]$

URB_YMD-20WHR3A4S(with heat sink) Dimensions

THIRD ANGLE PROJECTION



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



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

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58210003 (DIP), 58200048 (with heat sink), 58220022 (A2S/A4S package);
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 $T_a=25^{\circ}\text{C}$, 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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