

# SURA YMD-10WR4



## Product Feature

- ◆ Ultra-Wide Input voltage range: 4: 1
- ◆ Operating ambient temperature range: -40°C - +85°C
- ◆ Isolation voltage: 1600VDC
- ◆ Full load efficiency: 87% (Typ.)
- ◆ Output short-circuit protection, over-current protection, and over-voltage protection mechanisms.
- ◆ Application areas: Industry, Power, Instrumentation, Communication, Rail transit.



## Selection Guide

| Certification | Part No. <sup>①</sup> | Input Voltage (VDC)          |                   | Output        |                   | Full Load Efficiency <sup>④</sup> (%)Typ. | Capacitive Load <sup>⑤</sup> (μF)Max. |
|---------------|-----------------------|------------------------------|-------------------|---------------|-------------------|-------------------------------------------|---------------------------------------|
|               |                       | Nominal <sup>②</sup> (Range) | Max. <sup>③</sup> | Voltage (VDC) | Current (mA) Max. |                                           |                                       |
| EN            | SURA 2403-YMD-10WR4   | 24<br>(9-36)                 | 40                | ±3.3          | ±1200             | 77                                        | 1000                                  |
|               | SURA 2405-YMD-10WR4   |                              |                   | ±5            | ±1000             | 82                                        | 1000                                  |
|               | SURA 2406-YMD-10WR4   |                              |                   | ±6            | ±833              | 83                                        | 820                                   |
|               | SURA 2409-YMD-10WR4   |                              |                   | ±9            | ±556              | 85                                        | 680                                   |
|               | SURA 2412-YMD-10WR4   |                              |                   | ±12           | ±417              | 86                                        | 470                                   |
|               | SURA 2415-YMD-10WR4   |                              |                   | ±15           | ±333              | 86                                        | 330                                   |
|               | SURA 2418-YMD-10WR4   |                              |                   | ±18           | ±278              | 86                                        | 220                                   |
|               | SURA 2424-YMD-10WR4   |                              |                   | ±24           | ±208              | 86                                        | 100                                   |
|               | SURA 4803-YMD-10WR4   | 48<br>(18-75)                | 80                | ±3.3          | ±1200             | 78                                        | 1000                                  |
|               | SURA 4805-YMD-10WR4   |                              |                   | ±5            | ±1000             | 82                                        | 1000                                  |
|               | SURA 4806-YMD-10WR4   |                              |                   | ±6            | ±833              | 83                                        | 820                                   |
|               | SURA 4809-YMD-10WR4   |                              |                   | ±9            | ±556              | 85                                        | 680                                   |
|               | SURA 4812-YMD-10WR4   |                              |                   | ±12           | ±417              | 87                                        | 470                                   |
|               | SURA 4815-YMD-10WR4   |                              |                   | ±15           | ±333              | 87                                        | 330                                   |
|               | SURA 4818-YMD-10WR4   |                              |                   | ±18           | ±278              | 87                                        | 220                                   |
|               | SURA 4824-YMD-10WR4   |                              |                   | ±24           | ±208              | 87                                        | 100                                   |

Note:

- ①. Suffix plus "H" means plus heat sink package, plus "A2S" for extended wiring package, suffix plus "A4S" or extended rail type package;
- 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 polarity protection circuit.
- ⑤. The specified maximum capacitive load value for positive and negative output is identical.

## Input Specifications

| Item                                 | Operating Conditions                                 | Min.                                        | Typ. | Max.   | Unit   |
|--------------------------------------|------------------------------------------------------|---------------------------------------------|------|--------|--------|
| Input Current<br>(Full Load/No-Load) | 24VDC nominal input series,<br>nominal input voltage | 3.3V Output                                 | --   | 429/5  | 440/12 |
|                                      |                                                      | 5/6V Output                                 | --   | 508/8  | 521/15 |
|                                      |                                                      | Other Output                                | --   | 490/10 | 502/20 |
|                                      | 48VDC nominal input series,<br>nominal input voltage | 3.3V Output                                 | --   | 212/4  | 217/8  |
|                                      |                                                      | 5/6V Output                                 | --   | 254/4  | 260/8  |
|                                      |                                                      | Other Output                                | --   | 245/5  | 251/10 |
| Reflected Ripple Current             | Nominal input voltage                                | --                                          | 20   | --     |        |
| 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  | --     |        |
|                                      | 48VDC Nominal input series                           | 12                                          | 15.5 | --     |        |
| Start Time                           | Nominal input and constant resistance load           | --                                          | 10   | --     | ms     |
| Ctrl                                 | Turn on module                                       | Ctrl pin open or pulled high (TTL2.7-12VDC) |      |        |        |
|                                      | Turn off module                                      | Ctrl pin pulled low to GND (0-1.2VDC)       |      |        |        |
|                                      | Cut-off input current                                | --                                          | 2    | 7      | mA     |
| Input Filter                         |                                                      | PI filter                                   |      |        |        |
| Hot Plug                             |                                                      | Unavailable                                 |      |        |        |

## Output Specification

| Item                                                                                                                          | Operating Conditions                            |                 | Min.                     | Typ. | Max.  | Unit  |
|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-----------------|--------------------------|------|-------|-------|
| Output Voltage Accuracy                                                                                                       | 0%-100% load                                    | Vo1             | --                       | ±1.0 | ±3.0  | %     |
|                                                                                                                               |                                                 | Vo2             | --                       | ±3.0 | ±5.0  |       |
| Linear Regulation                                                                                                             | Vin=Min. to Max. @Full Load                     | Vo1             | --                       | ±0.2 | ±0.5  |       |
|                                                                                                                               |                                                 | Vo2             | --                       | ±0.5 | ±1.0  |       |
| Load Regulation                                                                                                               | 5%-100% load                                    | Vo1             | --                       | ±0.5 | ±1.0  |       |
|                                                                                                                               |                                                 | Vo2             | --                       | ±0.5 | ±1.5  |       |
|                                                                                                                               | 0%-100% load                                    |                 | --                       | ±0.5 | ±5.0  |       |
| Ripple & Noise <sup>①</sup>                                                                                                   | 20MHz bandwidth,100% load,parallel cable method |                 | --                       | 65   | 120   | mVp-p |
| Transient Recovery Time                                                                                                       | 25% Load Step Change,nominal input voltage      |                 | --                       | 300  | 500   | μs    |
| Transient Response Deviation                                                                                                  | 25% Load step change, nominal input voltage     | 3.3/5/6V Output | --                       | ±5.0 | ±8.0  | %     |
|                                                                                                                               |                                                 | Others          | --                       | ±3.0 | ±5.0  |       |
| Temperature Coefficient                                                                                                       | Full load                                       |                 | --                       | --   | ±0.03 | %/°C  |
| Over-Voltage Protection                                                                                                       | Input voltage range                             |                 | 110                      | --   | 160   | %Vo   |
| Over-Current Protection                                                                                                       |                                                 |                 | 110                      | 140  | --    | %Io   |
| Short-Circuit Protection                                                                                                      |                                                 |                 | Continuous,Self-Recovery |      |       |       |
| ①The test method for ripples and noise adopts the parallel line test method. The test results of the other methods will vary. |                                                 |                 |                          |      |       |       |

## General Specifications

| Item                  | Operating Conditions                                            | Min.                  | Typ. | Max. | Unit    |
|-----------------------|-----------------------------------------------------------------|-----------------------|------|------|---------|
| Isolation Voltage     | Input-output, test time 1 minute, leakage current less than 1mA | 1600                  | --   | --   | VDC     |
| Insulation Resistance | Input-output, resistance at 500VDC                              | 1000                  | --   | --   | MΩ      |
| Isolation Capacitance | Input-output, 100KHz/0.1V                                       | --                    | 1000 | --   | pF      |
| Operating Temperature | See Fig.1                                                       | -40                   | --   | +85  | °C      |
| Storage Temperature   |                                                                 | -55                   | --   | +125 |         |
| Storage Humidity      | Non-condensing                                                  | 5                     | --   | 95   | %RH     |
| Soldering Profile     | Wave-soldering                                                  | 260±5°C; time:5 - 10s |      |      |         |
|                       | Manual-welding                                                  | 360±10°C; time:3 - 5s |      |      |         |
| Switching Frequency   | PWM                                                             | --                    | 300  | --   | kHz     |
| Vibration             | IEC/EN 61373 -Category 1,Grade B                                |                       |      |      |         |
| MTBF                  | MIL-HDBK-217F@25°C                                              | 1000                  | --   | --   | K Hours |

## Mechanical Specifications

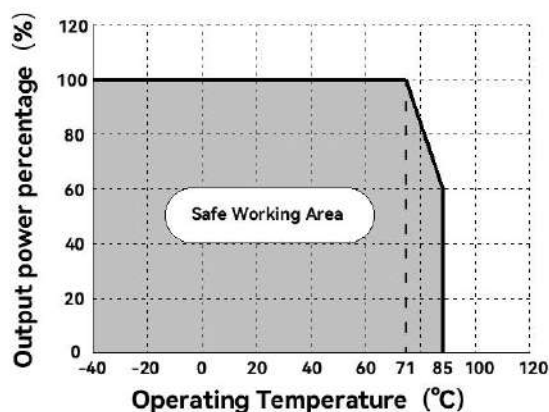
|                    |                                          |                                                             |                         |
|--------------------|------------------------------------------|-------------------------------------------------------------|-------------------------|
| Case Material      | Aluminum alloy                           |                                                             |                         |
| Package Dimensions | Horizontal package (without heat sink)   |                                                             | 25.40×25.40×12.00mm     |
|                    | Horizontal package (with heat sink)      |                                                             | 25.40×25.40×18.60mm     |
|                    | CW chassis mounting (without heat sink)  |                                                             | 76.00×31.50×21.20mm     |
|                    | CR DIN-rail mounting (without heat sink) |                                                             | 76.00×31.50×25.80mm     |
|                    | CW chassis mounting (with heat sink)     |                                                             | 76.00×31.50×28.40mm     |
|                    | CR DIN-rail mounting (with heat sink)    |                                                             | 76.00×31.50×32.00mm     |
| Weight             | without heat sink                        | Horizontal package/CW chassis mounting/CR DIN-Rail mounting | 12.6g/36.0g/56.0g(Typ.) |
|                    | with heat sink                           | Horizontal package/CW chassis mounting/CR DIN-Rail mounting | 18.5g/41.5g/61.0g(Typ.) |
| Cooling Method     | Free air convection                      |                                                             |                         |

## EMC Specifications

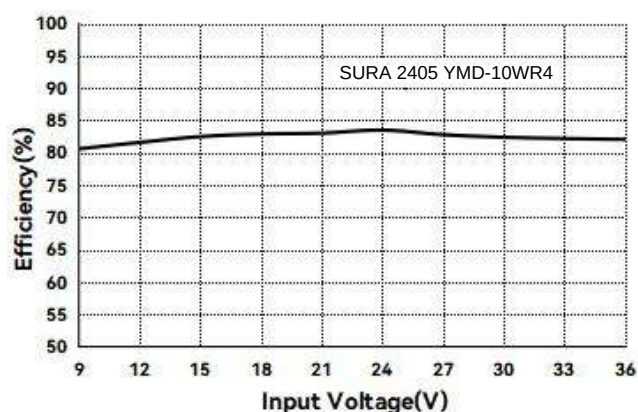
|     |       |                                                                                                   |                 |
|-----|-------|---------------------------------------------------------------------------------------------------|-----------------|
| EMI | CE    | CISPR32/EN55032 CLASS 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) |                 |
| EMS | 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. 3-① for recommended circuit)                           | Perf.Criteria B |
|     | CS    | IEC/EN61000-4-6 3Vr.m.s                                                                           | Perf.Criteria A |

## Typical Characteristic Curves

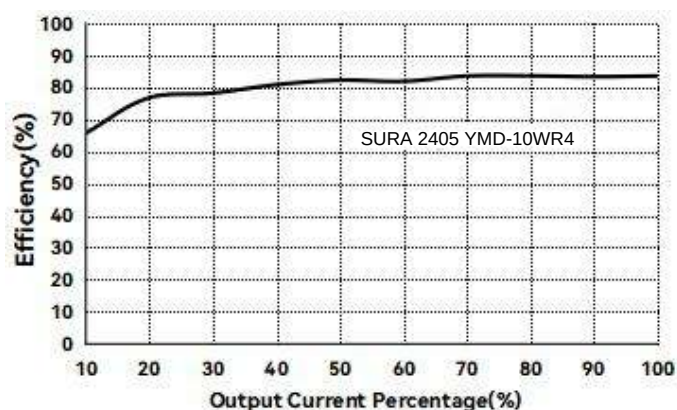
Temperature Derating Curve (Fig. 1)



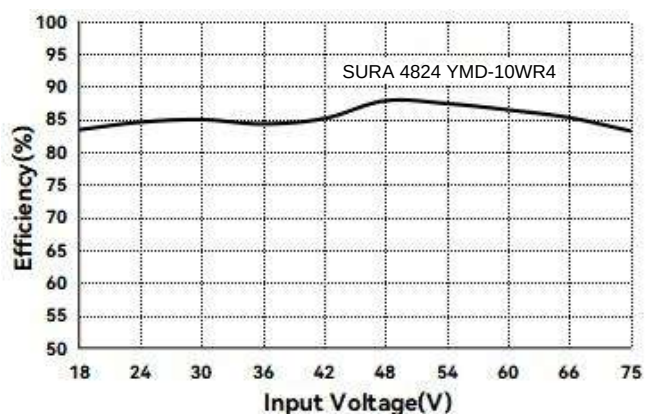
Efficiency VS Input Voltage (Full load)



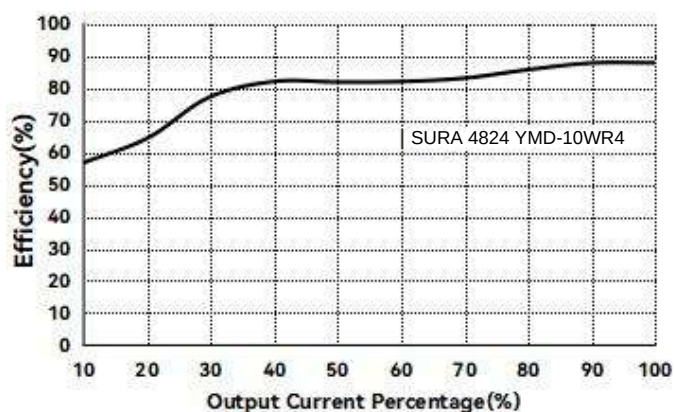
Efficiency VS Output Load (Vin=24V)



Efficiency VS Input Voltage (Full load)



Efficiency VS Output Load (Vin=48V)

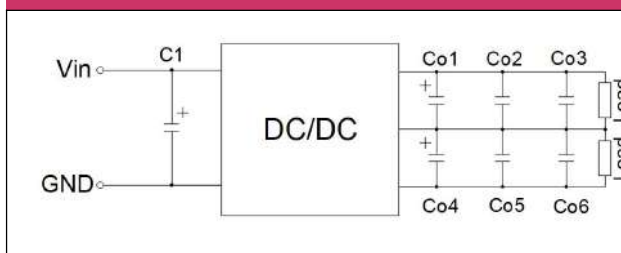




## Typical Circuit Design And Application

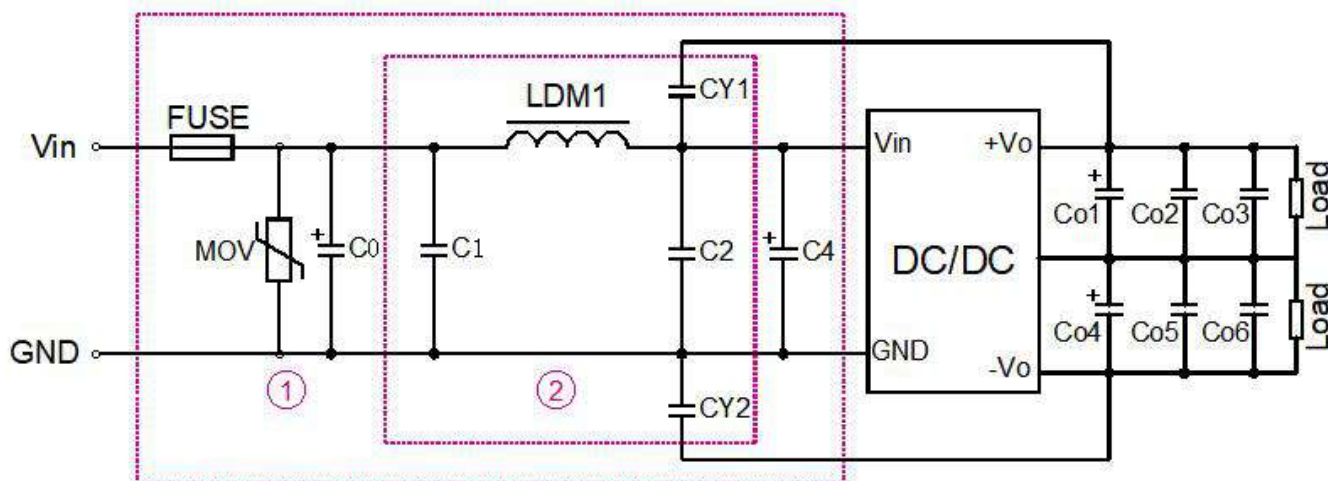
Recommended Circuit (Fig.2)

Recommended Capacitive Load Value Table

|  | Vout       | C1         | Co1/Co4   | Co2/Co5   | Co3/Co6  |
|----------------------------------------------------------------------------------|------------|------------|-----------|-----------|----------|
|                                                                                  | 3.3/5/6VDC | 100μF/100V | 100uF/16V | 0.1uF/50V | 10uF/50V |
|                                                                                  | 9/12/15VDC | 100μF/100V | 47μF/25V  | 0.1uF/50V | 10μF/50V |
|                                                                                  | 18/24VDC   | 100μF/100V | 47μF/50V  | 0.1uF/50V | 10μF/50V |

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 C1 and Co1/Co2/Co3/Co4/Co5/Co6 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.

EMC Recommended 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.

EMC Recommended Parameter Table

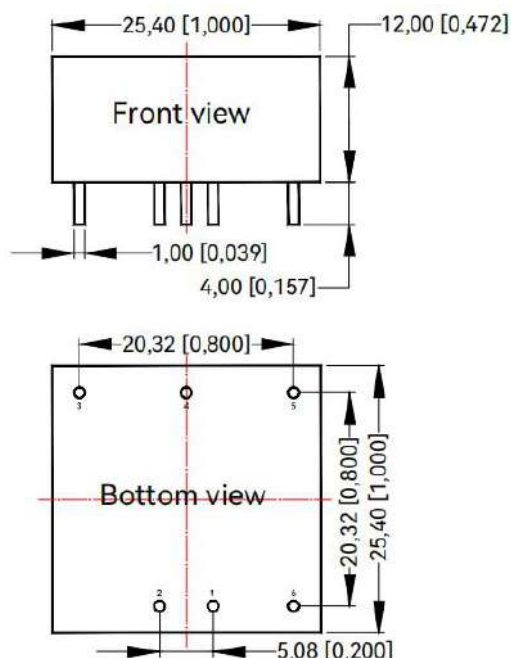
| Model                   | Vin: 24V                                                     | Vin: 48V   |
|-------------------------|--------------------------------------------------------------|------------|
| FUSE                    | Select according to the actual input current of the customer |            |
| MOV                     | 20D470K                                                      | 14D101K    |
| C0                      | 680uF/50V                                                    | 680uF/100V |
| C1                      | 1uF/50V                                                      | 1uF/100V   |
| C2                      | 4.7uF/50V                                                    | 4.7uF/100V |
| C4                      | 470uF/50V                                                    | 470uF/100V |
| LDM1                    | 10uH                                                         |            |
| Co1/Co2/Co3/Co4/Co5/Co6 | Refer Fig. 2 Capacitive load value table                     |            |
| CY1/CY2                 | 2.2nF/2KVDC                                                  |            |

# SURA YMD-10WR4



## Dimension Diagram and Recommended PCB Layout

Dimensions



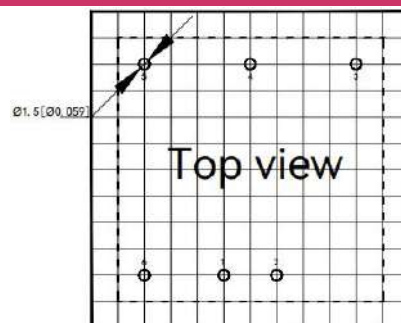
Note:

Unit: mm[inch]

Pin section tolerances:  $\pm 0.10 [\pm 0.004]$

General tolerances:  $\pm 0.50 [\pm 0.020]$

PCB Printing Layout

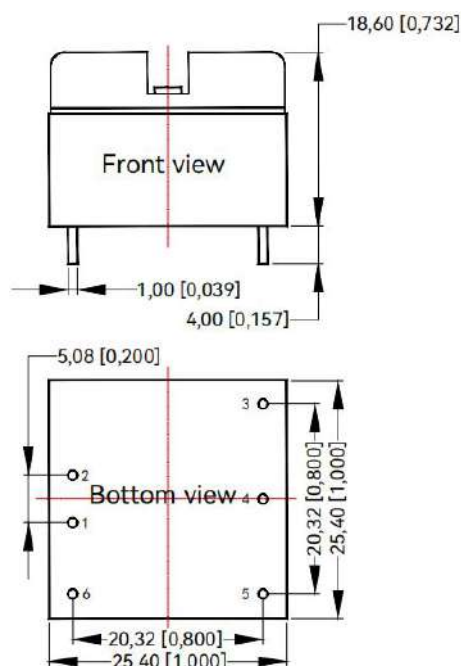


The grid distance is 2.54mm x 2.54mm

Pin Definition Table

| Pin | Dual |
|-----|------|
| 1   | GND  |
| 2   | Vin  |
| 3   | +Vo  |
| 4   | COM  |
| 5   | -Vo  |
| 6   | Ctrl |

H Dimensions



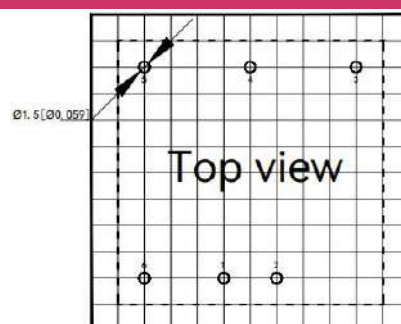
Note:

Unit: mm[inch]

Pin section tolerances:  $\pm 0.10 [\pm 0.004]$

General tolerances:  $\pm 0.50 [\pm 0.020]$

PCB Printing Layout



The grid distance is 2.54mm x 2.54mm

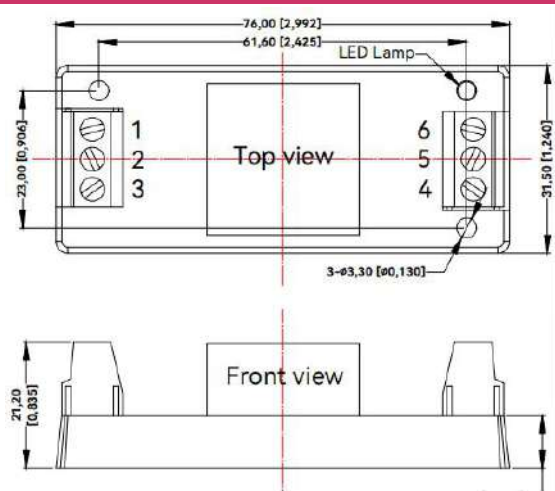
Pin Definition Table

| Pin | Dual |
|-----|------|
| 1   | GND  |
| 2   | Vin  |
| 3   | +Vo  |
| 4   | COM  |
| 5   | -Vo  |
| 6   | Ctrl |

# SURA YMD-10WR4



A2S Dimensions



Pin Definition Table

| Pin | Dual |
|-----|------|
| 1   | Ctrl |
| 2   | GND  |
| 3   | Vin  |
| 4   | +Vo  |
| 5   | COM  |
| 6   | -Vo  |

Note:

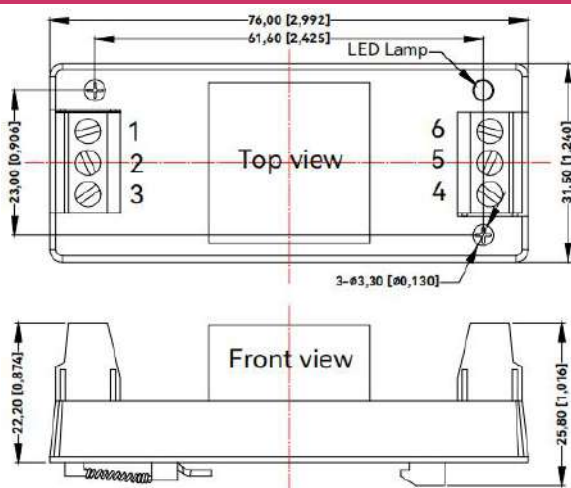
Unit: mm[inch]

Wire range: 24-12 AWG

Tightening torque: Max 0.4 N·m

General tolerances: ±1.00[±0.039]

A4S Dimensions



Pin Definition Table

| Pin | Dual |
|-----|------|
| 1   | Ctrl |
| 2   | GND  |
| 3   | Vin  |
| 4   | +Vo  |
| 5   | COM  |
| 6   | -Vo  |

Note:

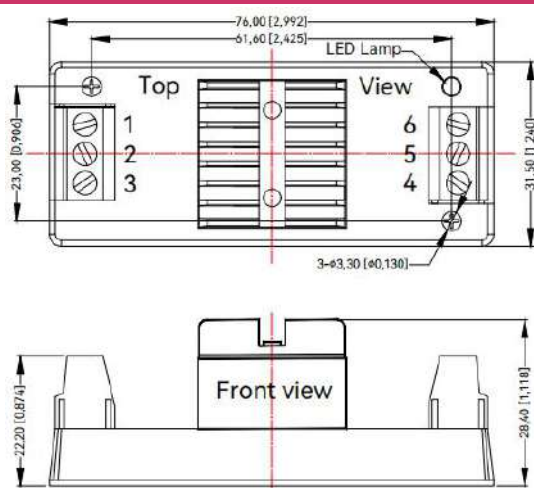
Unit: mm[inch]

Wire range: 24-12 AWG

Tightening torque: Max 0.4 N·m

General tolerances: ±1.00[±0.039]

H A2S Dimensions



Pin Definition Table

| Pin | Dual |
|-----|------|
| 1   | Ctrl |
| 2   | GND  |
| 3   | Vin  |
| 4   | +Vo  |
| 5   | COM  |
| 6   | -Vo  |

Note:

Unit: mm[inch]

Wire range: 24-12 AWG

Tightening torque: Max 0.4 N·m

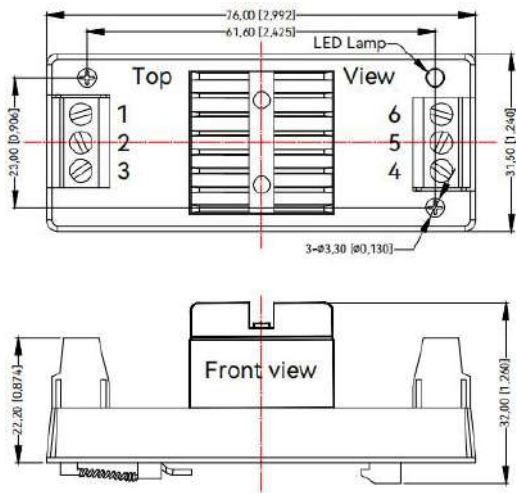
General tolerances: ±1.00[±0.039]



# SURA YMD-10WR4



H A4S Dimensions



Pin Definition Table

| Pin | Dual |
|-----|------|
| 1   | Ctrl |
| 2   | GND  |
| 3   | Vin  |
| 4   | +Vo  |
| 5   | COM  |
| 6   | -Vo  |

Note:

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

**Note:**

- ✧ The input voltage should not exceed the specified range value, otherwise it may cause permanent and irreparable damage;
- ✧ It is recommended to use at a load of over 5%. If the load is below 5%, the ripple index of the product may exceed the specifications, but it does not affect the reliability of the product;
- ✧ Suggested dual output module load imbalance:  $\leq \pm 5\%$ . If it exceeds  $\pm 5\%$ , it cannot be guaranteed that the product performance meets all performance indicators in this manual;
- ✧ The maximum capacitive load is tested within the input voltage range and under full load conditions;
- ✧ Unless otherwise specified, all indicators in this manual are measured at  $T_a=25\text{ }^{\circ}\text{C}$ , humidity  $<75\%$  RH, nominal input voltage, and output rated load;
- ✧ All indicator testing methods in this manual are based on our company's corporate standards;
- ✧ Our company can provide product customization, and specific requirements can be directly contacted by our technical personnel;
- ✧ Product specifications are subject to change without prior notice.