



## 6DAW\_1.5 series

6W - Single/Dual Output - Wide Input - Isolated & Regulated  
DIP DC-DC Converter

## DC-DC Converter

6 Watt

- ⊕ Efficiency up to 88%
- ⊕ 2:1 wide input voltage range
- ⊕ 1.5kVDC input/output isolation
- ⊕ Short circuit protection (SCP)
- ⊕ Low ripple & noise
- ⊕ International standard pin-out
- ⊕ EN62368 approved
- ⊕ Operating temperature: -40°C ~ +85°C
- ⊕ Input under-voltage, over-current, over-voltage protection
- ⊕ Meet CISPR32/EN55032 CLASS A, without extra components (except for 5VDC input)

The 6DAW\_1.5 series are products of 6W output power, wide range of voltage input of 4.5-9VDC, 9-18VDC, 18-36VDC, 36-75VDC, isolation voltage of 1500VDC, input under-voltage protection, output over-voltage, over-current, short circuit protection and EMI meets CISPR32/EN55032 CLASS A without external components (except for 5VDC input); these products are widely used in fields such as industrial control, electric power, instruments and communication.



| Common specifications        |  |
|------------------------------|--|
| Short circuit protection:    | Continuous, automatic recovery         |
| Cooling:                     | Free air convection                    |
| Operation temperature range: | -40°C~+85°C                            |
| Storage temperature range:   | -55°C ~+125°C                          |
| Lead temperature range:      | 300°C MAX, 1.5mm from case for 10 sec  |
| Storage humidity range:      | < 95%                                  |
| Vibration:                   | 10-150Hz, 5G, 30 Min. along X, Y and Z |
| Switching frequency:         | 300KHz, PWM mode                       |
| Case material:               | Aluminium alloy                        |
| MTBF (M1L-HDBK-217F @25°C):  | >1,000,000 hours                       |
| Weight:                      | 5VDC: 12g / Others: 14g                |
| Dimensions:                  | 32.00 × 20.00 × 10.80mm                |

| Input specifications              |                 |       |         |         |       |
|-----------------------------------|-----------------|-------|---------|---------|-------|
| Item                              | Test condition  | Min   | Typ     | Max     | Units |
| Input current (full load/no load) | 5VDC input      |       |         |         |       |
|                                   | • 5V/±5V output |       | 1538/10 | 1578/30 | mA    |
|                                   | • others        |       | 1428/10 | 1463/30 | mA    |
|                                   | 12VDC input     |       |         |         |       |
| • 3.3V output                     |                 | 550/7 | 566/25  |         | mA    |
|                                   | • others        | 607/7 | 641/25  |         | mA    |
| 24VDC input                       |                 |       |         |         |       |
|                                   | • 3.3V output   |       | 265/7   | 272/25  | mA    |
| • others                          |                 | 296/7 | 313/25  |         | mA    |
| 48VDC input                       |                 |       |         |         |       |
|                                   | • 3.3V output   |       | 131/7   | 134/25  | mA    |
| • others                          |                 | 147/7 | 155/25  |         | mA    |
| Reflected Ripple Current          | • 5VDC output   |       | 50      |         | mA    |
|                                   | • others        |       | 20      |         | mA    |
| Surge voltage (1sec. max.)        | • 5VDC input    | -0.7  |         | 16      | VDC   |
|                                   | • 12VDC input   | -0.7  |         | 25      | VDC   |
|                                   | • 24VDC input   | -0.7  |         | 50      | VDC   |
|                                   | • 48VDC input   | -0.7  |         | 100     | VDC   |
| Start-up Voltage                  | • 5VDC input    |       |         | 4.5     | VDC   |
|                                   | • 12VDC input   |       |         | 9       | VDC   |
|                                   | • 24VDC input   |       |         | 18      | VDC   |
|                                   | • 48VDC input   |       |         | 36      | VDC   |
| Under-voltage protection          | • 5VDC input    | 3     | 3.5     |         | VDC   |
|                                   | • 12VDC input   | 5.5   | 6.5     |         | VDC   |
|                                   | • 24VDC input   | 13    | 15      |         | VDC   |
|                                   | • 48VDC input   | 26    | 30      |         | VDC   |
| Input filter                      | Pi filter       |       |         |         |       |
| Hot plug                          | Unavailable     |       |         |         |       |

| Output specifications                 |  |                        |     |     |       |       |       |   |
|---------------------------------------|--|------------------------|-----|-----|-------|-------|-------|---|
| Item                                  | Test condition   | Min                    | Typ | Max | Units |       |       |   |
| Output voltage accuracy <sup>1)</sup> | 5VDC, 0%-100% load   |                        |     |     | ±1    | ±2    | %     |   |
|                                       |  | • positive output      |     |     | ±1    | ±3    | %     |   |
|                                       | others, 5%-100% load   | • positive output      |     |     |       | ±1    | ±3    | % |
|                                       |  | • negative output      |     |     |       | ±1    | ±3    | % |
| Line regulation (at full load)        | Input voltage low to high  | • positive output      |     |     | ±0.2  | ±0.5  | %     |   |
|                                       |  | • negative output      |     |     | ±0.5  | ±1    | %     |   |
| Load regulation <sup>2)</sup>         | 5VDC, 0%-100% load   |                        |     |     |       | ±1    | %     |   |
|                                       |  | • positive output      |     |     |       |       | ±1.5  | % |
|                                       | others, 5%-100% load   | • positive output      |     |     |       | ±0.5  | ±1    | % |
|                                       |  | • negative output      |     |     |       | ±0.5  | ±1.5  | % |
| Cross regulation                      | Dual output, primary output 50% loading, auxiliary output 10%-100% loading |                        |     |     |       | ±5    | %     |   |
| Transient Recovery Time               | 25% load step change   |                        | 300 | 500 |       |       | µs    |   |
| Transient Response Deviation          | 25% load step change   | • 3.3V, 5V, ±5V output |     |     | ±5    | ±8    | %     |   |
|                                       |  | • others               |     |     | ±3    | ±5    | %     |   |
| Temperature coefficient               | Full load  |                        |     |     |       | ±0.03 | %/°C  |   |
| Ripple&Noise <sup>3)</sup>            | 20MHz Bandwidth  |                        |     |     |       | 100   | mVp-p |   |
| Over-voltage protection               | Input voltage range  |                        | 110 |     |       | 160   | %Vo   |   |
| Over-current protection               | Input voltage range  |                        | 110 | 140 | 190   |       | %Io   |   |

- 1) At 0%~5% load, the max. output voltage accuracy of ±5VDC output converter is ±5%.
- 2) When testing from 0% to 100% load working conditions load regulation index of ±5%
- 3) Ripple & Noise at < 5% load is 5%Vo max. The "parallel cable" method is used for Ripple and Noise test.

| Isolation specifications |                                 |      |      |     |       |
|--------------------------|---------------------------------|------|------|-----|-------|
| Item                     | Test condition                  | Min  | Typ  | Max | Units |
| Isolation voltage        | Tested for 1 minute and 1mA max | 1500 |      |     | VDC   |
| Isolation resistance     | Test at 500VDC                  | 1000 |      |     | MΩ    |
| Isolation capacitance    | Input-output, 100KHz/0.1V       |      | 1000 |     | pF    |

### Example:

#### 6DAW\_2405D1.5

6 = 6Watt; D = DIP; A = series; W = wide input (2:1); 24 = 18-36Vin;  
05 = 5Vout; D = Dual Output; 1.5 = 1500VDC isolation

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| EMC specifications |       |  |                   |   |
|--------------------|-------|--|-------------------|---|
| EMI                | CE    | 5VDC input: CISPR32/EN55032 CLASS B (see EMC recommended circuit, ②)<br>Others: CISPR32/EN55032 CLASS A (without external components) / CLASS B (see EMC recommended circuit, ②) |                   |   |
| EMI                | RE    | 5VDC input: CISPR32/EN55032 CLASS B (see EMC recommended circuit, ②)<br>Others: CISPR32/EN55032 CLASS A (without external components) / CLASS B (see EMC recommended circuit, ②) |                   |   |
| EMS                | ESD   | IEC/EN61000-4-2  | Contact ±4KV      | perf. Criteria B                                  |
| EMS                | RS    | IEC/EN61000-4-3  | 10V/m             | perf. Criteria A                                  |
| EMS                | EFT   | IEC/EN61000-4-4  | ±2KV              | perf. Criteria B (see EMC recommended circuit, ①) |
| EMS                | Surge | IEC/EN61000-4-5  | line to line ±2KV | perf. Criteria B (see EMC recommended circuit, ①) |
| EMS                | CS    | IEC/EN61000-4-6  | 3 Vr.m.s          | perf. Criteria A                                  |

## Product Selection Guide

| Part Number   | Input Voltage [VDC] |       |                   | Output Voltage [VDC] | Current [mA, max.] | Efficiency <sup>2)</sup> [%, Typ.] | Capacitive load <sup>3)</sup> [µF, max.] |
|---------------|---------------------|-------|-------------------|----------------------|--------------------|------------------------------------|--|
|               | Nominal             | Range | Max <sup>1)</sup> |                      |                    |                                    |  |
| 6DAW_0505S1.5 | 5                   | 4.5-9 | 12                | 5                    | 1200               | 78                                 | 1000                                     |
| 6DAW_0512S1.5 | 5                   | 4.5-9 | 12                | 12                   | 500                | 84                                 | 470                                      |
| 6DAW_0515S1.5 | 5                   | 4.5-9 | 12                | 15                   | 400                | 84                                 | 220                                      |
| 6DAW_0524S1.5 | 5                   | 4.5-9 | 12                | 24                   | 250                | 84                                 | 100                                      |
| 6DAW_1203S1.5 | 12                  | 9-18  | 20                | 3.3                  | 1500               | 75                                 | 1800                                     |
| 6DAW_1205S1.5 | 12                  | 9-18  | 20                | 5                    | 1200               | 80                                 | 1000                                     |
| 6DAW_1212S1.5 | 12                  | 9-18  | 20                | 12                   | 500                | 84                                 | 470                                      |
| 6DAW_1215S1.5 | 12                  | 9-18  | 20                | 15                   | 400                | 85                                 | 220                                      |
| 6DAW_1224S1.5 | 12                  | 9-18  | 20                | 24                   | 250                | 85                                 | 100                                      |
| 6DAW_2403S1.5 | 24                  | 18-36 | 40                | 3.3                  | 1500               | 78                                 | 1800                                     |
| 6DAW_2405S1.5 | 24                  | 18-36 | 40                | 5                    | 1200               | 82                                 | 1000                                     |
| 6DAW_2412S1.5 | 24                  | 18-36 | 40                | 12                   | 500                | 85                                 | 470                                      |
| 6DAW_2415S1.5 | 24                  | 18-36 | 40                | 15                   | 400                | 86                                 | 220                                      |
| 6DAW_2424S1.5 | 24                  | 18-36 | 40                | 24                   | 250                | 86                                 | 100                                      |
| 6DAW_4803S1.5 | 48                  | 36-72 | 80                | 3.3                  | 1500               | 79                                 | 1800                                     |
| 6DAW_4805S1.5 | 48                  | 36-72 | 80                | 5                    | 1200               | 83                                 | 1000                                     |
| 6DAW_4812S1.5 | 48                  | 36-72 | 80                | 12                   | 500                | 87                                 | 470                                      |
| 6DAW_4815S1.5 | 48                  | 36-72 | 80                | 15                   | 400                | 88                                 | 220                                      |
| 6DAW_4824S1.5 | 48                  | 36-72 | 80                | 24                   | 250                | 87                                 | 100                                      |

| Part Number   | Input Voltage [VDC] |       |                   | Output Voltage [VDC] | Current [mA, max.] | Efficiency <sup>2)</sup> [%, Typ.] | Capacitive load <sup>3)</sup> [µF, max.] |
|---------------|---------------------|-------|-------------------|----------------------|--------------------|------------------------------------|--|
|               | Nominal             | Range | Max <sup>1)</sup> |                      |                    |                                    |  |
| 6DAW_0505D1.5 | 5                   | 4.5-9 | 12                | ±5                   | ±600               | 78                                 | 1000                                     |
| 6DAW_0512D1.5 | 5                   | 4.5-9 | 12                | ±12                  | ±250               | 84                                 | 470                                      |
| 6DAW_0515D1.5 | 5                   | 4.5-9 | 12                | ±15                  | ±200               | 84                                 | 220                                      |
| 6DAW_0524D1.5 | 5                   | 4.5-9 | 12                | ±24                  | ±125               | 84                                 | 100                                      |
| 6DAW_1205D1.5 | 12                  | 9-18  | 20                | ±5                   | ±600               | 80                                 | 680                                      |
| 6DAW_1212D1.5 | 12                  | 9-18  | 20                | ±12                  | ±250               | 84                                 | 330                                      |
| 6DAW_1215D1.5 | 12                  | 9-18  | 20                | ±15                  | ±200               | 85                                 | 220                                      |
| 6DAW_1224D1.5 | 12                  | 9-18  | 20                | ±24                  | ±125               | 84                                 | 100                                      |
| 6DAW_2405D1.5 | 24                  | 18-36 | 40                | ±5                   | ±600               | 83                                 | 680                                      |
| 6DAW_2412D1.5 | 24                  | 18-36 | 40                | ±12                  | ±250               | 86                                 | 330                                      |
| 6DAW_2415D1.5 | 24                  | 18-36 | 40                | ±15                  | ±200               | 87                                 | 220                                      |
| 6DAW_2424D1.5 | 24                  | 18-36 | 40                | ±24                  | ±125               | 85                                 | 100                                      |
| 6DAW_4805D1.5 | 48                  | 36-72 | 80                | ±5                   | ±600               | 83                                 | 680                                      |
| 6DAW_4812D1.5 | 48                  | 36-72 | 80                | ±12                  | ±250               | 87                                 | 330                                      |
| 6DAW_4815D1.5 | 48                  | 36-72 | 80                | ±15                  | ±200               | 85                                 | 220                                      |
| 6DAW_4824D1.5 | 48                  | 36-72 | 80                | ±24                  | ±125               | 85                                 | 100                                      |

1) Exceeding the maximum input voltage may cause permanent damage;

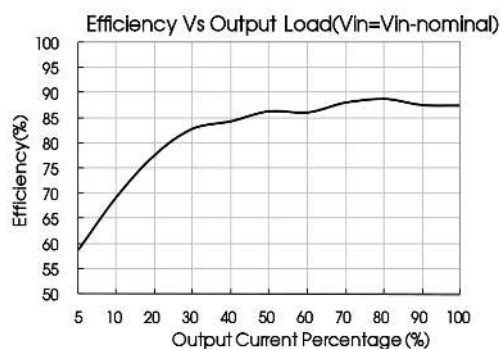
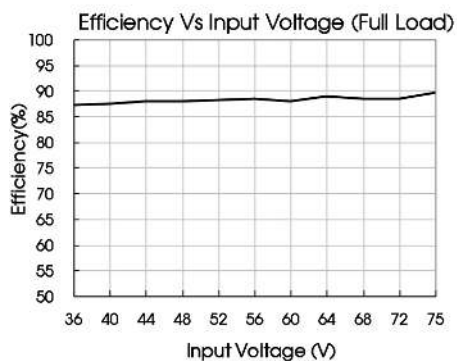
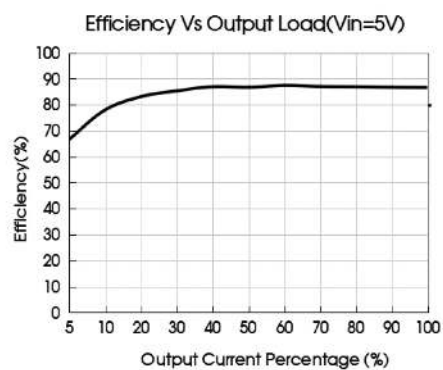
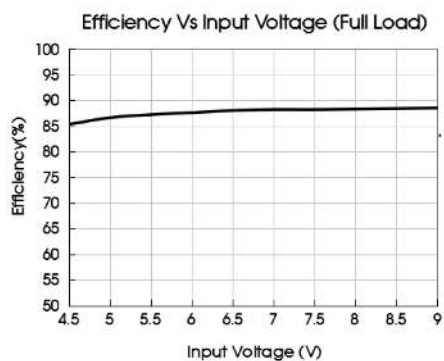
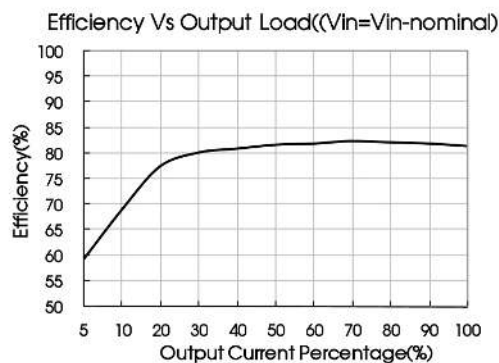
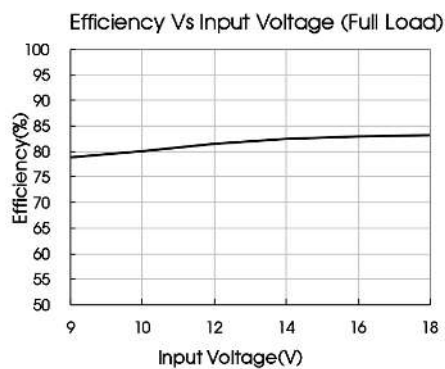
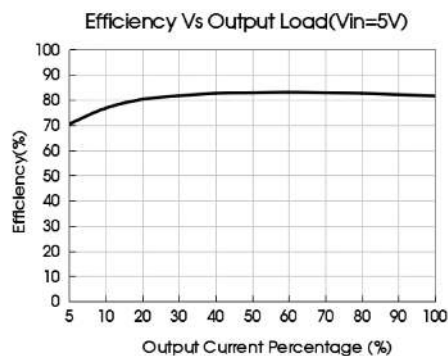
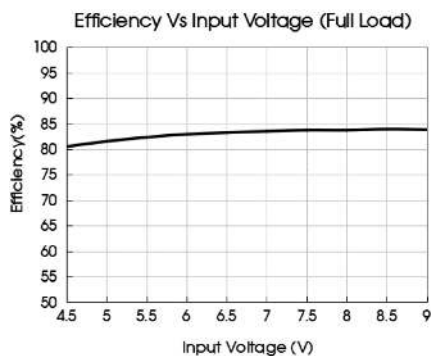
2) Efficiency is measured in nominal input voltage and rated output load;

3) The specified maximum capacitive load for positive and negative output is identical.

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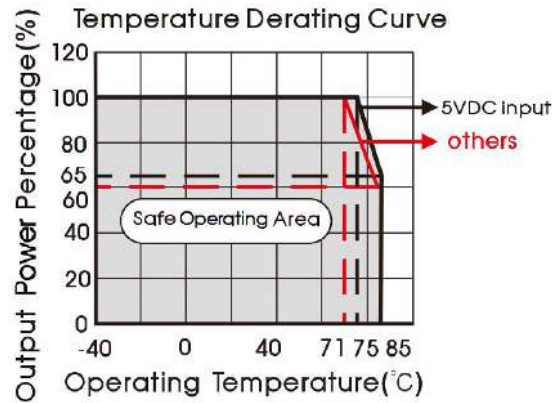
### Efficiency



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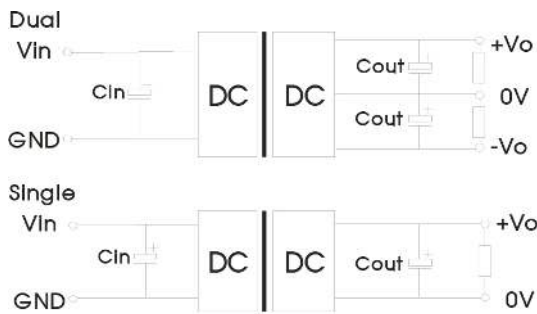
### Typical characteristics



### Typical application

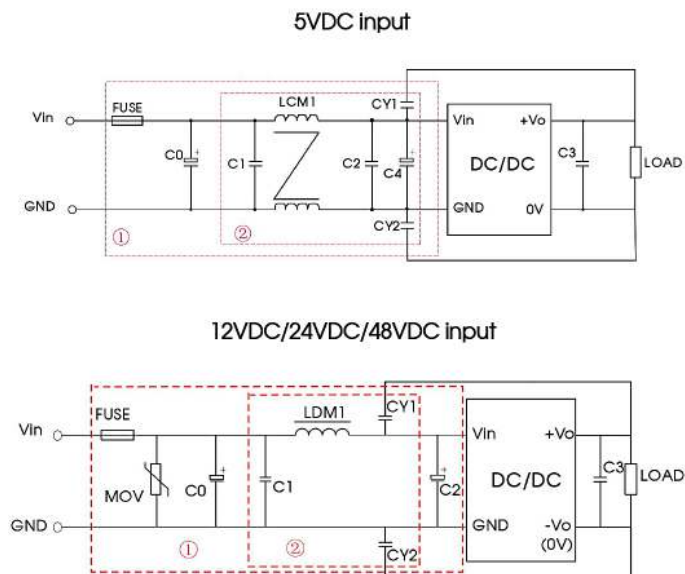
All the DC/DC converters of this series are tested according to the recommended circuit before delivery.

If it is required to further reduce input and output ripple, properly increase the input & output of additional capacitors  $C_{in}$  and  $C_{out}$  or select capacitors of low equivalent impedance provided that the capacitance is no larger than the max. capacitive load of the product.



| $V_{in}(VDC)$ | $C_{in}$                | $C_{out}$  |
|---------------|-------------------------|------------|
| 5/12/24       | 100 $\mu F$             | 10 $\mu F$ |
| 48            | 10 $\mu F$ - 47 $\mu F$ |            |

### EMC recommended circuit



For EMC tests we use Part ① for immunity and part ② for emissions test. Selecting based on needs.

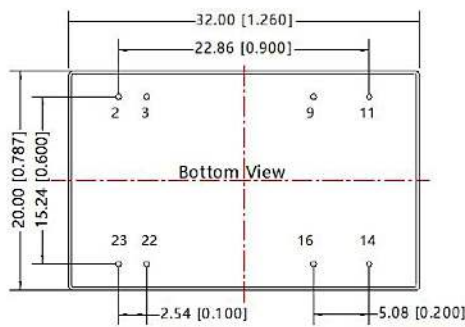
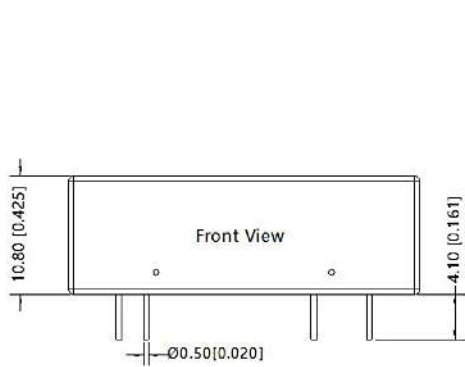
| Model     | $V_{in}: 5V$                                  |
|-----------|---|
| FUSE      | Choose according to actual input current      |
| $C_0$     | 2200 $\mu F/35V$                              |
| $C_1/C_2$ | 4.7 $\mu F/50V$                               |
| $C_3$     | Refer to the $C_{out}$ in Typical application |
| $C_4$     | 100 $\mu F/35V$                               |
| LCM1      | 2.2 $\mu H$                                   |
| CY1, CY2  | 2.2nF/2kV                                     |

| Model    | $V_{in}: 12V$                                 | $V_{in}: 24V$    | $V_{in}: 48V$    |
|----------|---|------------------|------------------|
| FUSE     | Choose according to actual input current      |                  |                  |
| MOV      | S14K20  | S20K30           | S14K60           |
| $C_0$    | 1000 $\mu F/35V$                              | 1000 $\mu F/50V$ | 680 $\mu F/100V$ |
| $C_1$    | 1 $\mu F/50V$                                 |                  | 1 $\mu F/100V$   |
| $C_2$    | 100 $\mu F/35V$                               | 100 $\mu F/50V$  | 100 $\mu F/100V$ |
| $C_3$    | Refer to the $C_{out}$ in recommended circuit |                  |                  |
| LDM1     | 4.7 $\mu H$                                   |                  |                  |
| CY1, CY2 | 1nF/2kV                                       |                  |                  |

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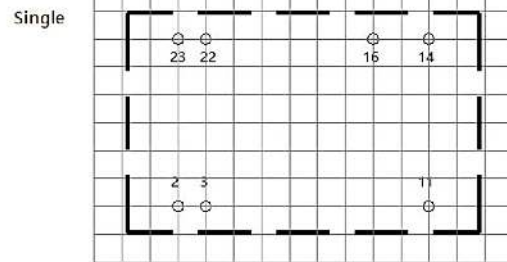
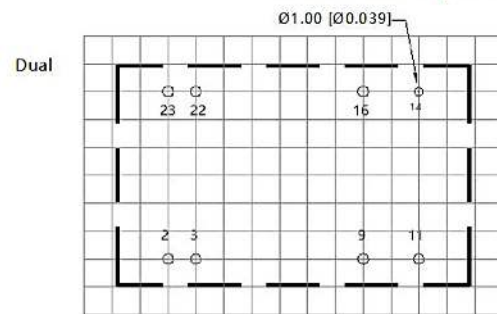
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### Mechanical dimensions



**Note:**  
Unit :mm [inch]  
Pin diamm 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 |
| 2,3     | GND    | GND  |
| 9*      | No Pin | 0V   |
| 11      | NC     | -Vo  |
| 14      | +Vo    | +Vo  |
| 16      | 0V     | 0V   |
| 22,23   | Vin    | Vin  |

\* Note: 5V input product without 9th pin  
NC: Pin to be isolated from circuit

#### Note:

1. The maximum capacitive load offered were tested at input voltage range and full load;
2. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta = 25°C, humidity <75%RH with nominal input voltage and rated output load;
3. All index testing methods in this datasheet are based on company corporate standards;
4. We can provide product customization service, please contact our technicians directly for specific information;
5. Products are related to laws and regulations: see „Features“ and „EMC“;
6. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.