

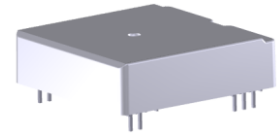
## ISOLATION TYPE DC/DC CONVERTER 2DD180407C

**■ Overview**

2DDxxxxxC series are insulated DC/DC converters for gate drivers such as SiC MOSFET and IGBT.  
 The high breakdown voltage and low parasitic capacitance make it suitable for gate drives such as SiC MOSFET and IGBT.

**■ Feature**

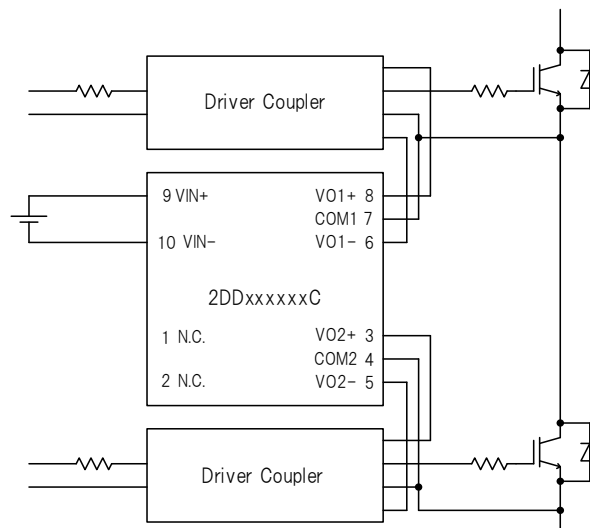
- Ideal for gate drive power supply
- Ideal for half-bridge operation by dual output
- Gate voltage : +18V/-4V
- Low parasitic capacitance (about 9 pF); highly resistant to common-mode noise.
- Input-to-Output dielectric withstand voltage : AC5000V
- Output-to-Output dielectric withstand voltage : AC4000V
- Input-to-Output insulation distance : 14mm (clearance·creepage)
- Output-to-Output insulation distance : 12mm (clearance·creepage)
- Input voltage : 13.5~26.4V
- Over load protection
- Over heat protection
- Filling structure
- Safety standards:UL508(file no.E243511)



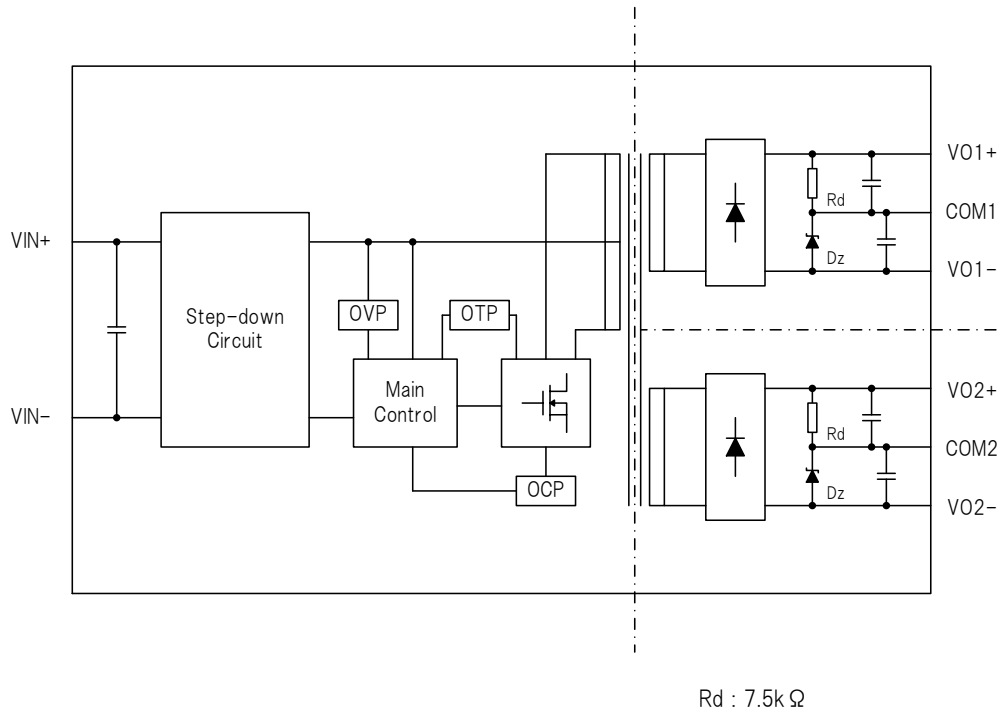
**■ Applications**

Inverters for industrial equipment, power conditioners, etc...

**■ Connection example**



■Block diagram



■Pin connection

| Pin No. | Name | Explanation of pins                         |
|---------|------|---|
| 1       | N.C. | Unused ※Unable to connect to other circuits |
| 2       | N.C. | Unused ※Unable to connect to other circuits |
| 3       | V02+ | Output2 plus                                |
| 4       | COM2 | Output2 common                              |
| 5       | V02- | Output2 minus                               |
| 6       | V01- | Output1 minus                               |
| 7       | COM1 | Output1 common                              |
| 8       | V01+ | Output1 plus                                |
| 9       | VIN+ | Input plus                                  |
| 10      | VIN- | Input minus                                 |

**■ Absolute maximum rating**

| Item                                | Symbol   | Min  | Max | Unit               | Conditions·Note               |
|-------------------------------------|--|------|-----|--------------------|-------------------------------|
| Input voltage                       | $V_{IN}$                                       | -0.3 | 28  | Vdc                | Between $V_{IN+}$ — $V_{IN-}$ |
| Output power                        | $T_a=75/85^{\circ}\text{C}$<br>$P_{OUT}$       | -    | 3.5 | W                  | Per output circuit            |
|                                     | $T_a=60^{\circ}\text{C}$<br>$P_{OUT}$          | -    | 4.4 | W                  |                               |
| Output current                      | $T_a=75/85^{\circ}\text{C}$<br>$I_{OUT1,2}$    | 0    | 160 | mA                 | Per output circuit            |
|                                     | $T_a=60^{\circ}\text{C}$<br>$I_{OUT1,2}$       | 0    | 200 | mA                 |                               |
| COM sink current                    | $I_{COM1,2}$                                   | 0    | 10  | mA                 | Per output circuit            |
| Operating ambient temperature range | $V_{IN}=13\text{V}\sim 18\text{V}$<br>$T_{OP}$ | -40  | 85  | $^{\circ}\text{C}$ |                               |
|                                     | $V_{IN}=18\text{V}\sim 28\text{V}$<br>$T_{OP}$ | -40  | 75  | $^{\circ}\text{C}$ |                               |
| Operating ambient humidity range    | $RH_{OP}$                                      | 20   | 95  | %RH                | No condensation               |
| Storage temperature range           | $T_{STG}$                                      | -40  | 90  | $^{\circ}\text{C}$ |                               |
| Storage humidity range              | $RH_{STG}$                                     | 5    | 95  | %RH                | No condensation               |

**■ Recommended Operating Voltage**

| Item                     | Symbol       | Min  | Max  | Unit | Conditions·Note                                   |
|--------------------------|--------------|------|------|------|---|
| Input voltage range      | $V_{IN}$     | 13.5 | 26.4 | Vdc  | By temperature derating                           |
| Output power             | $P_{OUT}$    | -    | 3.5  | W    | Per output circuit. $I_{COM1}=I_{COM2}=0\text{A}$ |
| Output current           | $I_{OUT1,2}$ | 10   | 160  | mA   | Per output circuit. $I_{COM1}=I_{COM2}=0\text{A}$ |
| Number of output circuit | N            | -    | 2    | -    |   |

**■ Electrical Specification ( $V_{IN}=24\text{V}$ ,  $I_{OUT1}=I_{OUT2}=160\text{mA}$ ,  $I_{COM1}=I_{COM2}=0\text{A}$ ,  $T_a=25^{\circ}\text{C}$ . Unless otherwise specified)**

| Item              | Symbol                            | Min              | Typ  | Max  | Unit  | Conditions·Note  |  |
|-------------------|-----------------------------------|------------------|------|------|-------|--|--|
| Start-up voltage  | $V_{START}$                       | -                | -    | 13   | V     |  |  |
| Efficiency        | $V_{IN}=15\text{V}$<br>Effi       | 75               | 80.5 | -    | %     |  |  |
|                   | $V_{IN}=24\text{V}$<br>Effi       | 75               | 79.0 | -    |       |  |  |
| Standby power     | $V_{IN}=15\text{V}$<br>$P_{STBY}$ | -                | 0.6  | -    | W     | No-load  |  |
|                   | $V_{IN}=24\text{V}$<br>$P_{STBY}$ | -                | 0.8  | 1.2  |       |  |  |
| Output voltage(+) | Range                             | $V_{1+}, V_{2+}$ | 17   | 18   | 19    | V  | $I_{OUT1}=I_{OUT2}=10\sim 160\text{mA}$  |
|                   |                                   | $V_{1+}, V_{2+}$ | 17   | 18   | 19.5  | V  | $I_{OUT1}=I_{OUT2}=0\sim 10\text{mA}$  |
|                   | Input regulation                  | -                | -    | 50   | mV    |  |  |
|                   | Load regulation                   | -                | -    | 500  | mV    | $I_{OUT1}=I_{OUT2}=10\sim 160\text{mA}$  |  |
|                   |                                   | -                | -    | 1200 | mV    | $I_{OUT1}=I_{OUT2}=0\sim 160\text{mA}$   |  |
|                   | Ripple                            | -                | -    | 150  | mVp-p |  |  |
|                   | Ripple noise                      | -                | -    | 200  | mVp-p |  |  |
| Load imbalance    | $V_{1+}, V_{2+}$                  | -                | -    | 20   | V     | $I_{OUT1}=160\text{mA}$ , $I_{OUT2}=0\text{A}$ or $I_{OUT1}=0\text{A}$ , $I_{OUT2}=160\text{mA}$ |  |
| Output voltage(-) | Range                             | $V_{1-}, V_{2-}$ | -5   | -4   | -3    | V  | $I_{OUT1}=I_{OUT2}=0\sim 160\text{mA}$   |
|                   |                                   | $V_{1-}, V_{2-}$ | -    | -    | -     | V  |  |
|                   | Input regulation                  | -                | -    | 20   | mV    |  |  |
|                   | Load regulation                   | -                | -    | 100  | mV    |  |  |
|                   | Ripple                            | -                | -    | 100  | mVp-p |  |  |
|                   | Ripple noise                      | -                | -    | 150  | mVp-p |  |  |
|                   | Load imbalance                    | $V_{1-}, V_{2-}$ | -6   | -    | -     | V  | $I_{OUT1}=160\text{mA}$ , $I_{OUT2}=0\text{A}$ or $I_{OUT1}=0\text{A}$ , $I_{OUT2}=160\text{mA}$ |

■Protection function

| Item                 | Symbol | Min | Typ | Max | Unit | Conditions·Note                         |
|----------------------|--------|-----|-----|-----|------|---|
| Over load protection | -      | 9.2 | -   | -   | W    | Auto recovery                           |
| Over heat protection | -      | 120 | -   | 150 | °C   | Auto recovery /Case surface temperature |

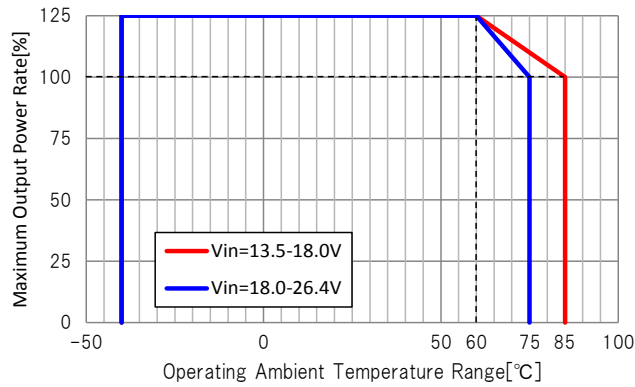
■Insulation

| Item                         | Specification | Conditions·Note                |
|------------------------------|---------------|--------------------------------|
| Between Input-Output1,2      |               |                                |
| Dielectric withstand voltage | AC5000V       | 1min, Leak Current 2mA or less |
| Insulation resistance        | 100MΩ or more | DC500V                         |
| Minimum clearance distances  | 14mm          |                                |
| Minimum creepage distances   | 14mm          |                                |
| Between Output1-Output2      |               |                                |
| Dielectric withstand voltage | AC4000V       | 1min, Leak Current 2mA or less |
| Insulation resistance        | 100MΩ or more | DC500V                         |
| Minimum clearance distances  | 12mm          |                                |
| Minimum creepage distances   | 12mm          |                                |

■Temperature derating

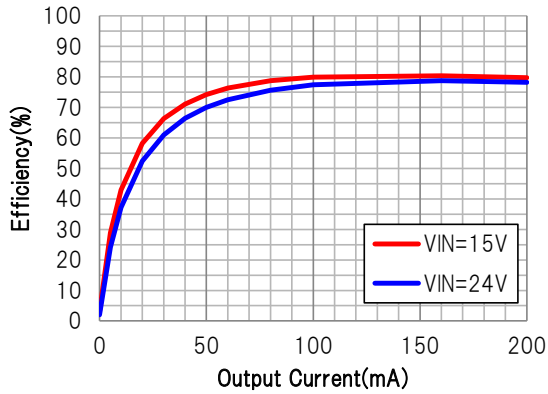
Load power shall be reduced according to temperature derating.

Output Power 100% = Output Current 160mA

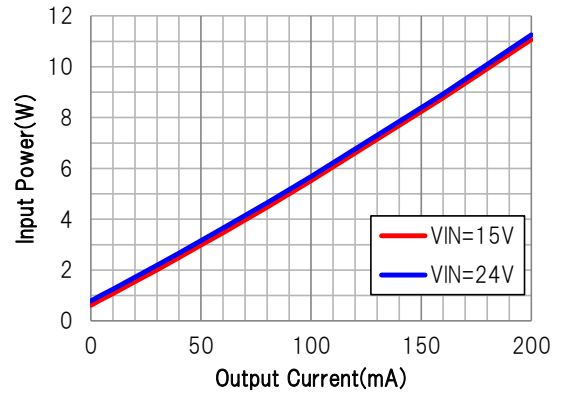


■ Typical characteristics (Ta=25°C, I<sub>COM1</sub>=I<sub>COM2</sub>=0A)

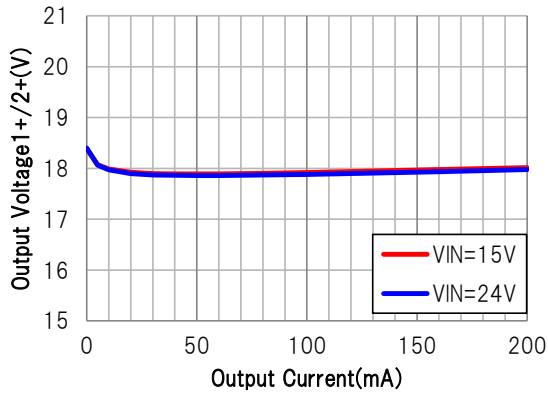
Output Current vs. Efficiency



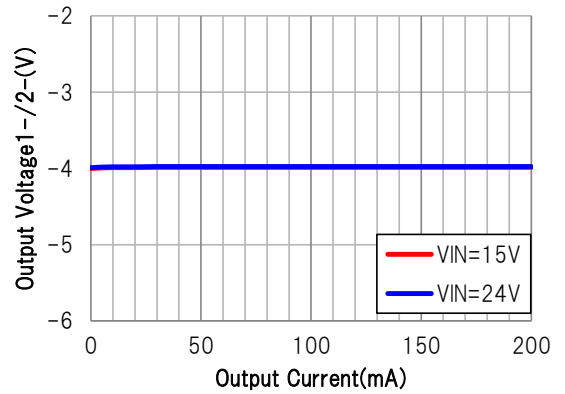
Output Current vs. Input Power



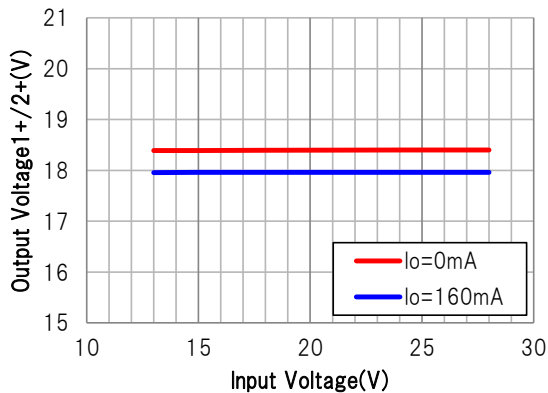
Output Current vs. Output Voltage 1+/2+



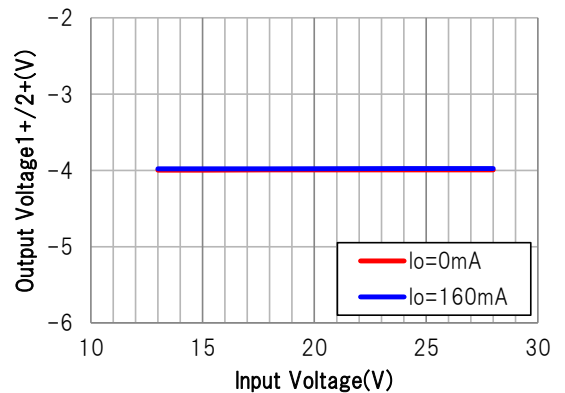
Output Current vs. Output Voltage 1-/2-



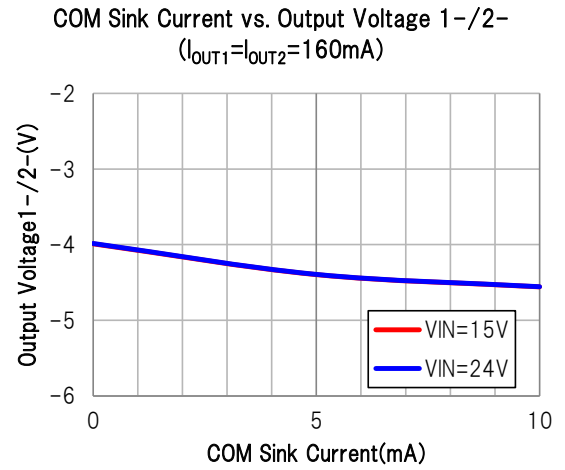
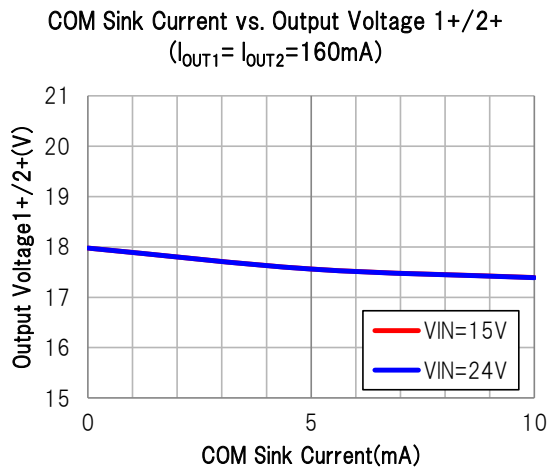
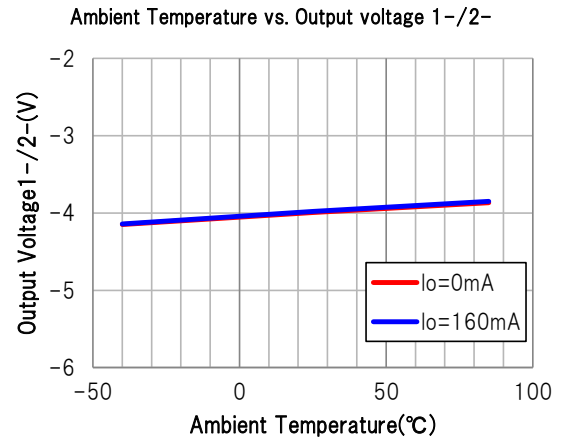
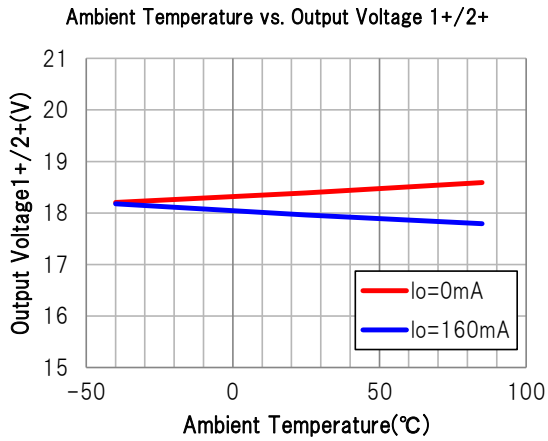
Input Voltage vs. Output Voltage 1+/2+



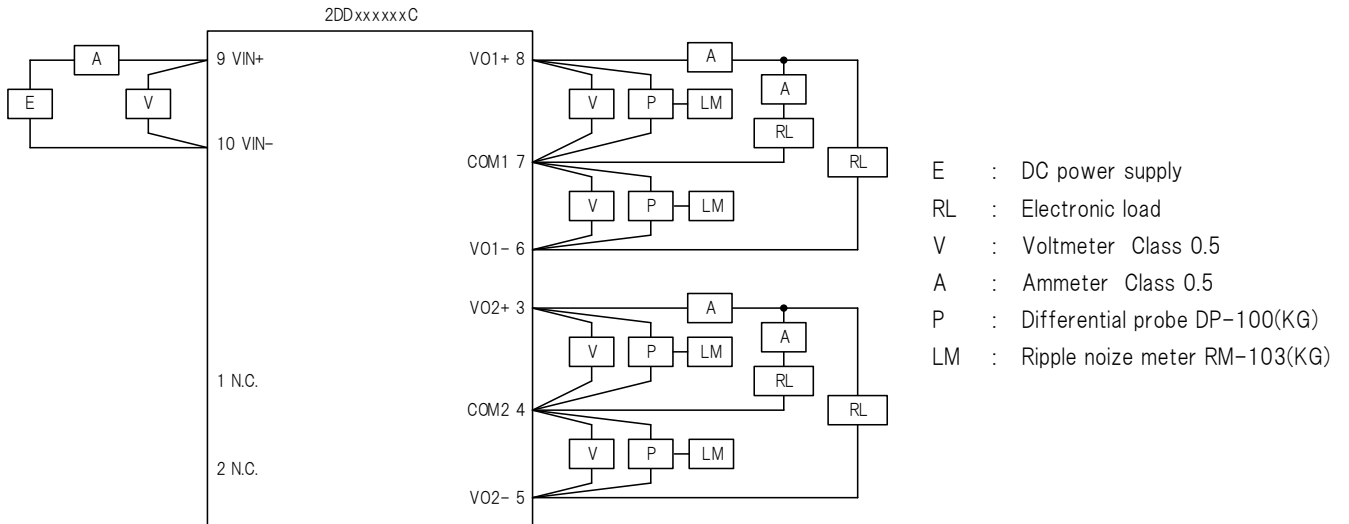
Input Voltage vs. Output Voltage 1-/2-



■ Typical characteristics (Ta=25°C, I<sub>COM1</sub>=I<sub>COM2</sub>=0A)



■ Measurement circuit



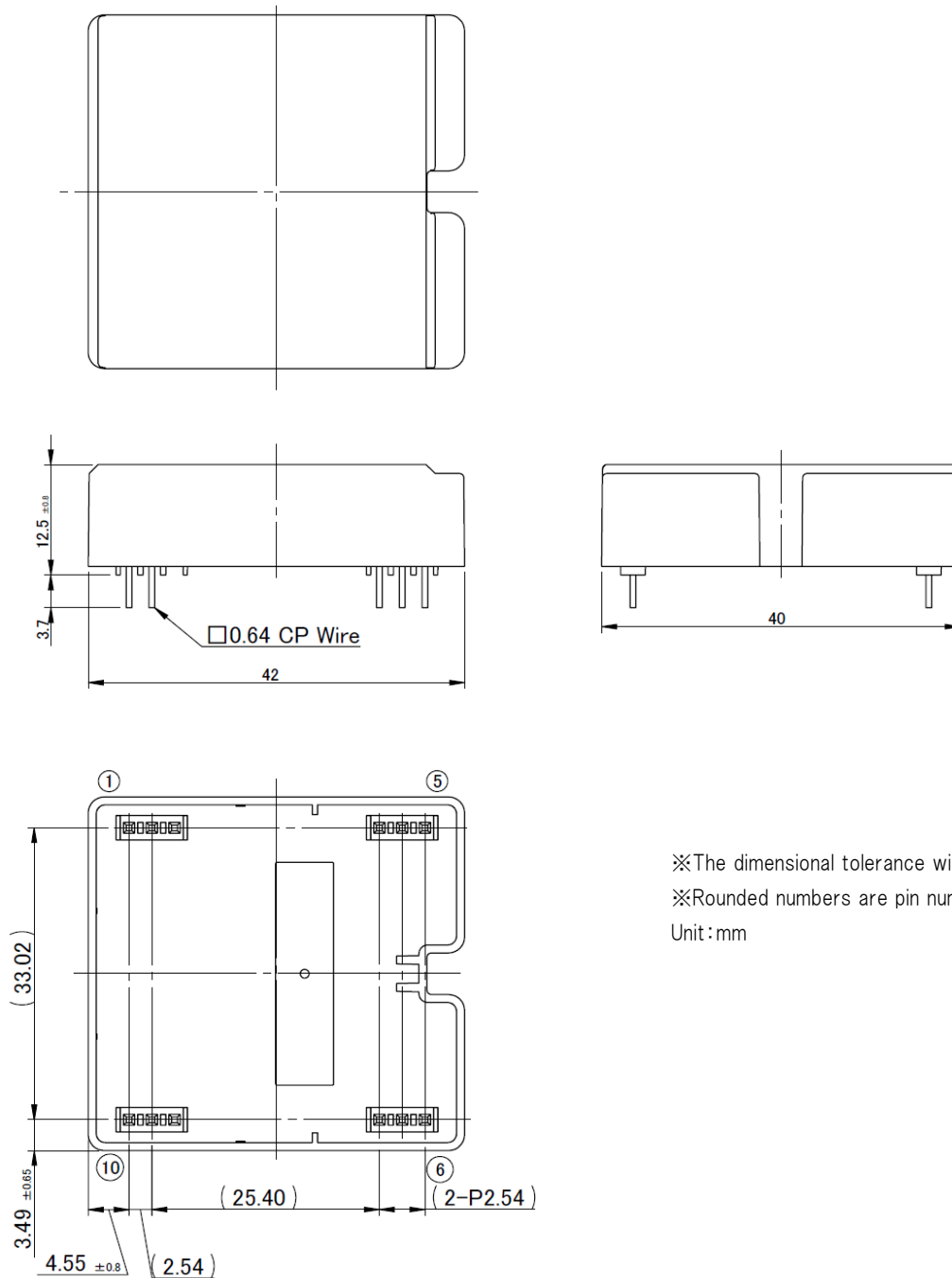
## ■ Reliability

| Item   | Test condition and acceptance criterion  |
|--|--|
| Exposure in high temperature                   | 90°C, 240H, ※  |
| Exposure in low temperature                    | -40°C, 240H, ※   |
| Exposure in high temperature and high humidity | 85°C, 85%RH, 240H, ※   |
| Thermal shock                                  | -40°C/30min to 125°C/30min, 500cycles, ※   |
| Low temperature operation                      | Input voltage:DC24V, Output current:Rated Load<br>-40°C, 240H, ※   |
| High temperature operation                     | Input voltage:DC15V, Output current:Rated Load<br>85°C, 240H, ※  |
| high temperature and high humidity operation   | Input voltage:DC15V, Output current:Rated Load<br>85°C, 85%RH, 240H, ※   |
| Vibration                                      | Vibration amplitude:1.5mm(peak to peak), Vibration Frequency:10 to 55Hz, Sweeping:1min.<br>In each X, Y and Z direction:once, 120min. ※  |
| Impact   | Acceleration:490m/s <sup>2</sup> (50G), Operating time:11ms<br>In each ±X, Y and Z direction:3 times, ※  |
| Drop test for packaged freights                | Dorp to concrete. Height:40cm<br>Dorp surface:1 corner, 3 spines, 6 surfaces, 1 time each.   |
| Solderblity                                    | Sample shall be dipped into the solution of Methanol and Rosin (having 75% Methanol and having 25% Rosin by weight measuring) and shall be dippend into the solder bath having the solder Sn-3Ag-0.5Cu of 250±5°C to the position to 3mm from the end of terminal for 3.0±0.5 seconds, and pulled up. After above treatment, the sample shall be coveredby solder uniformly at more than 75% of circumference and shall not show any unusual appearance. |
| Resistance to soldering heat                   | Sample shall be dipped into the solution of Methanol and Rosin (having 75% Methanol and having 25% Rosin by weight measuring) and shall be dippend into the solder bath having the solder Sn-3Ag-0.5Cu of 260±5°C to the position to 3mm from the end of terminal for 10.0±0.5 seconds, and pulled up. After that sample shall be replace in normal ambient for 1~2 hours and shall not show any unusual appearance.                                     |

※After each test, exposure at room temperature and humidity condition for 24 hours.

There shall be no abnormality on the electrical specification and appearance.

■Dimensional outline drawing



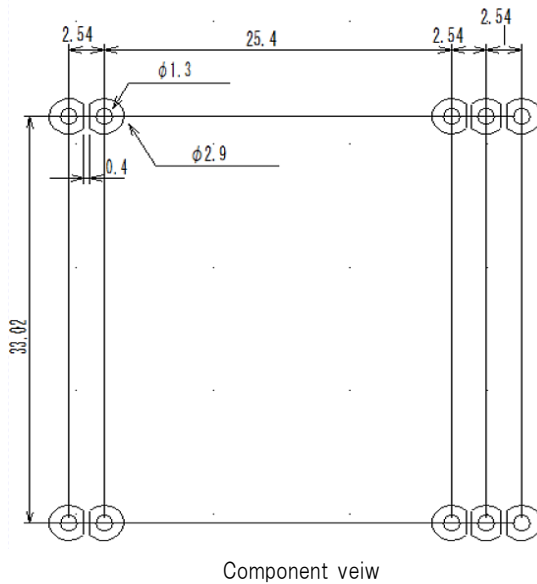
※The dimensional tolerance without directions is  $\pm 0.5$ mm.  
 ※Rounded numbers are pin numbers.  
 Unit: mm

■Product Weight

30g(TYP)



■ Recommended hole diameter and land size



※ 1pin and 2pin are connected by providing land.  
Mechanical strength may decrease.

Unit: mm

■ Recommended Soldering Condition

- Flow solder conditions : 255±3°C 5sec or less  
Preheat temperature 110°C~130°C  
Preheat end 110°C±10°C
- Soldering condition of hand work : 350°C(MAX) 4sec or less

■ Storage condition

| Item                | Min | Max | Unit | Conditions·Note   |
|---------------------|-----|-----|------|-------------------|
| Storage temperature | -25 | 60  | °C   | Packing condition |

※If you want to use past the long period there is a concern that the solder non-wetting by terminal oxidation to occur.  
Therefore, please use from taking enough tests.

■ Usage Cautions

- Always mount fuse on the plus side of input for ensuring safety because the fuse is not built-in the product.  
Please select the fuse considering conditions such as steady current, inrush current, and ambient temperature.  
When using a fuse having large rated current or high capacity input electrolytic condenser, by combining another converter and input line and input electrolytic condenser, fuse may not blow off in the case of abnormality.  
Do not combine high voltage line and fuse.
- The output voltage accuracy may be affected by the COM sink current.  
If you want to maintain the accuracy of the output voltage, adjust the current value between VO+~COM and COM~Vo- by adding a resistor or the like so that the current value is the same between VO+~COM and COM~VO-.

## ■ Important Notice

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  - Use that involves exposure to direct sunlight, outdoor exposure, or dusty conditions.
  - Use in locations where corrosive gases such as salt air, C12, H2S, NH3, SO2, or NO2, are present.
  - Use in environments with strong static electricity or electromagnetic radiation.
  - Use that involves placing inflammable material next to the product.
  - Use of this product either sealed with a resin filling or coated with resin.
  - Use of water or a water soluble detergent for flux cleaning.
  - Use in locations where condensation is liable to occur.
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