

# RV1S2251A

R08DS0305EJ0100

LOW FORWARD-CURRENT(I<sub>F</sub>), OPERATING AMBIENT TEMPERATURE 115 °C,  
4-PIN SSOP WITH 8.2 mm CREEPAGE DISTANCE (LSSOP) PHOTOCOUPLER

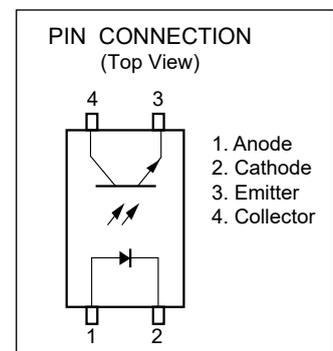
Rev.1.00  
Jun. 20, 2024

## DESCRIPTION

The RV1S2251A is an optically coupled isolator in an LSSOP package containing an AlGaAs LED on the input side and an NPN silicon phototransistor on the output side. This LSSOP package is very slim and thin with long creepage distance (8.2 mm). This downsized photocoupler enables high-density surface mounting for various interface circuits layout.

## FEATURES

- Small and long creepage distance (8.2 mm, LSSOP)
- High current transfer ratio (CTR = 300 % MIN. @ I<sub>F</sub> = 50 μA)
- Operating ambient temperature (115 °C MAX.)
- High isolation voltage (BV = 5 000 Vr.m.s.)
- Embossed tape product:  
RV1S2251ACCSP-10Yx#KC0: 3 500 pcs/reel
- Pb-free product
- Safety standard
  - UL : UL1577, Double protection
  - CSA : CAN/CSA-C22.2 No.62368-1, Reinforced insulation
  - CQC : GB4943.1-2022, Reinforced insulation
  - VDE : DIN EN IEC 60747-5-5 (Option)

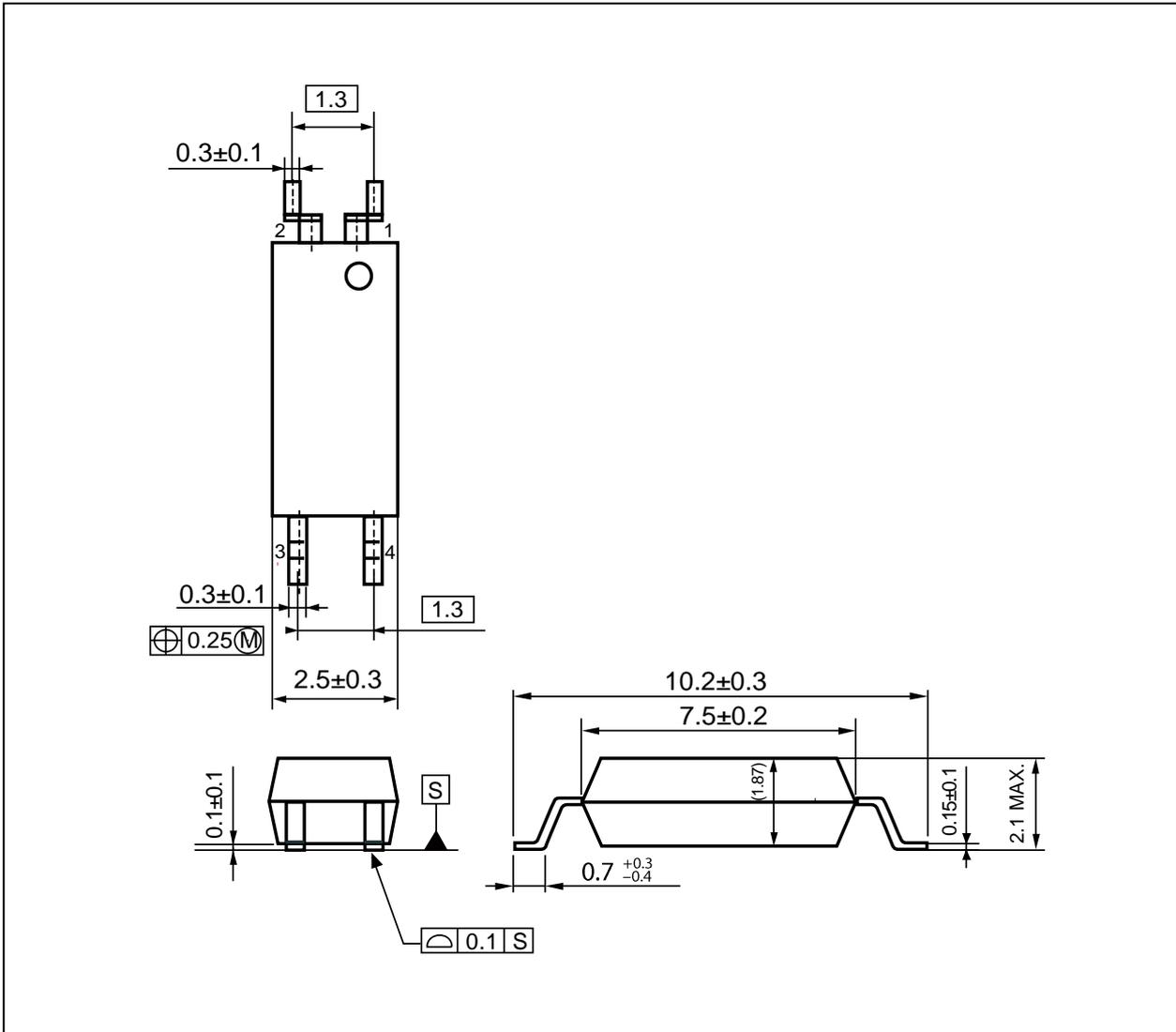


## APPLICATIONS

- Air conditioner
- Measurement equipment
- Power supply

Start of mass production  
Jul. 2024

PACKAGE DIMENSIONS (UNIT: mm)

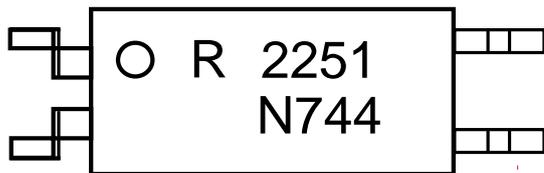


Weight : 0.075 g (TYP.)

PHOTOCOUPLER CONSTRUCTION

| Parameter          | MIN.    |
|--------------------|---------|
| Air Distance       | 8.2 mm  |
| Creepage Distance  | 8.2 mm  |
| Isolation Distance | 0.15 mm |

MARKING EXAMPLE



|      |     |                         |                                 |
|------|-----|-------------------------|---------------------------------|
| R    |     | An initial of "Renesas" |                                 |
| 2251 |     | Product Part Number *   |                                 |
| ○    |     | No.1 pin Mark           |                                 |
| N744 | N   | Rank Code               |                                 |
|      | 744 | Assembly Lot            |                                 |
|      |     | 7                       | Last one-digit of Assembly Year |
|      |     | 44                      | Weekly Serial Code              |

\* ) Applicable type number listed below

RV1S 2251 ACCSP-10Yx

Marking type number. "RV1S" and "ACCSP-10Yx" are omitted from original type number

ORDERING INFORMATION

| Part Number        | Order Number           | Solder Plating Specification        | Packing Style                   | Safety Standard Approval   | Application Part Number *1 |
|--------------------|------------------------|-------------------------------------|---------------------------------|----------------------------|----------------------------|
| RV1S2251ACCSP-10YC | RV1S2251ACCSP-10YC#SC0 | Pb-Free and Halogen Free (Ni/Pd/Au) | Embossed Tape<br>20 pcs         | UL, CSA, CQC Approved      | RV1S2251A                  |
|                    | RV1S2251ACCSP-10YC#KC0 |                                     | Embossed Tape<br>3 500 pcs/reel |                            |                            |
| RV1S2251ACCSP-10YV | RV1S2251ACCSP-10YV#SC0 |                                     | Embossed Tape<br>20 pcs         | UL, CSA, CQC, VDE Approved |                            |
|                    | RV1S2251ACCSP-10YV#KC0 |                                     | Embossed Tape<br>3 500 pcs/reel |                            |                            |

Notes: \*1. For the application of the safety standard, the following part number should be used.

ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25 °C, unless otherwise specified)

| Parameter                     |                               | Symbol              | Ratings     | Unit    |
|-------------------------------|-------------------------------|---------------------|-------------|---------|
| Diode                         | Forward Current (DC)          | I <sub>F</sub>      | 2.5         | mA      |
|                               | Reverse Voltage               | V <sub>R</sub>      | 5           | V       |
|                               | Power Dissipation             | P <sub>D</sub>      | 3.5         | mW      |
|                               | Peak Forward Current *1       | I <sub>FP</sub>     | 1.0         | A       |
| Transistor                    | Collector to Emitter Voltage  | V <sub>CEO</sub>    | 40          | V       |
|                               | Emitter to Collector Voltage  | V <sub>ECO</sub>    | 6           | V       |
|                               | Collector Current             | I <sub>C</sub>      | 80          | mA      |
|                               | Power Dissipation Derating *2 | ΔP <sub>C</sub> /°C | 1.5         | mW/°C   |
|                               | Power Dissipation             | P <sub>C</sub>      | 150         | mW      |
| Isolation Voltage *3          |                               | BV                  | 5 000       | Vr.m.s. |
| Operating Ambient Temperature |                               | T <sub>A</sub>      | -40 to +115 | °C      |
| Storage Temperature           |                               | T <sub>stg</sub>    | -40 to +125 | °C      |

Notes: \*1. PW = 100 μs, duty cycle = 1 %

\*2. Reduced at a rate of 1.5 mW/°C above T<sub>A</sub> = 80 °C

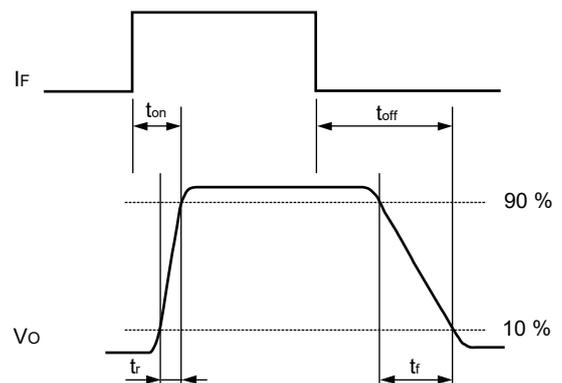
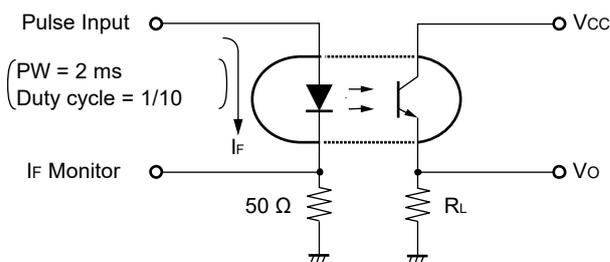
\*3. AC voltage for 1 minute at T<sub>A</sub> = 25 °C, RH = 60 % between input and output.

Pins 1-2 shorted together, 3-4 shorted together.

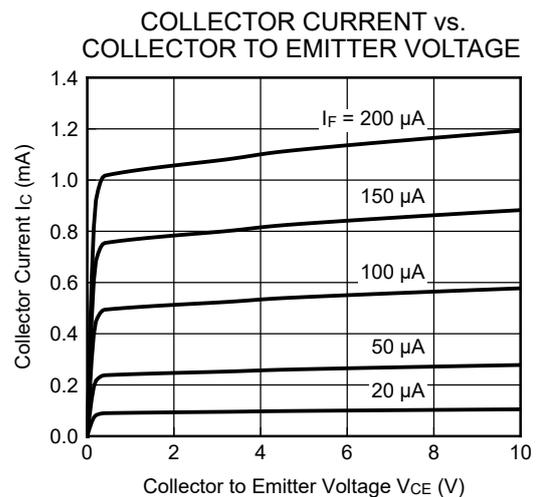
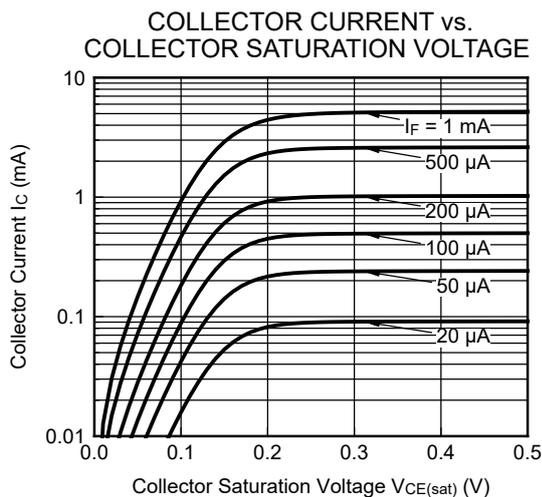
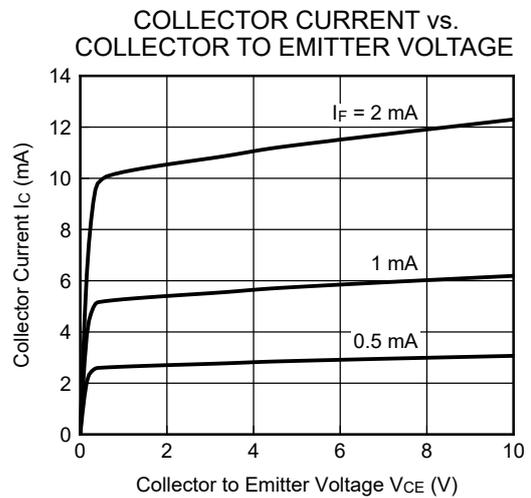
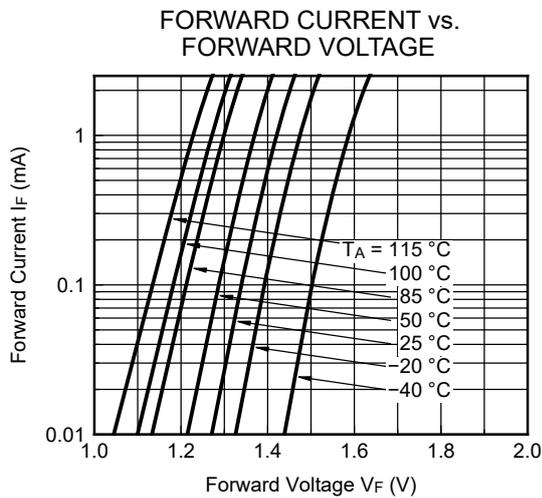
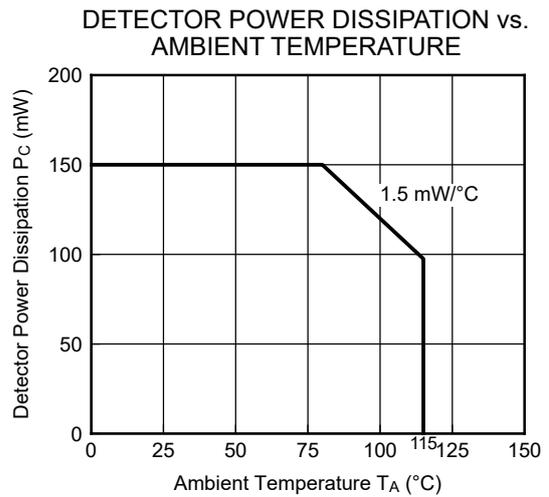
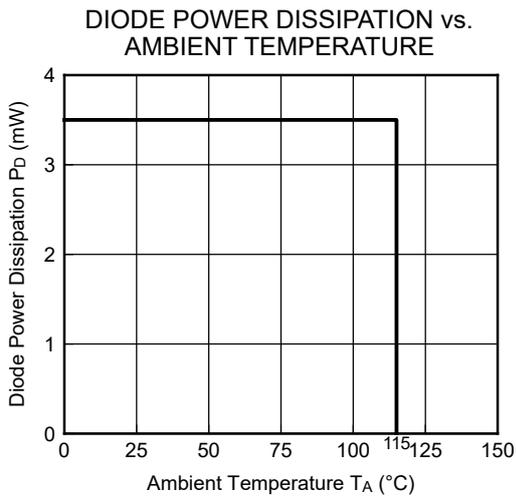
ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)

| Parameter    |   | Symbol   | Conditions   | MIN.             | TYP.  | MAX.  | Unit |
|--------------|---|--|--|------------------|-------|-------|------|
| Diode        | Forward Voltage   | V <sub>F</sub>   | I <sub>F</sub> = 0.1 mA  | 1.22             | 1.37  | 1.52  | V    |
|              | Reverse Current   | I <sub>R</sub>   | V <sub>R</sub> = 3 V   |                  |       | 10    | μA   |
|              | Input Capacitance   | C <sub>t</sub>   | V = 0 V, f = 1 MHz   |                  | 30    |       | pF   |
| Transistor   | Collector to Emitter Dark Current                           | I <sub>CEO</sub>   | I <sub>F</sub> = 0 mA, V <sub>CE</sub> = 40 V                          |                  |       | 50    | nA   |
| Coupled      | Current Transfer Ratio (I <sub>C</sub> /I <sub>F</sub> ) *1 | CTR1   | I <sub>F</sub> = 50 μA, V <sub>CE</sub> = 5 V                          | 300              |       | 1 000 | %    |
|              |   | CTR2   | I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 5 V                           | 300              |       | 1 000 | %    |
|              | Collector Saturation Voltage                                | V <sub>CE(sat)</sub>   | I <sub>F</sub> = 0.1 mA, I <sub>C</sub> = 0.2 mA                       |                  |       | 0.3   | V    |
|              | Isolation Resistance  | R <sub>I-O</sub>   | V <sub>I-O</sub> = 1kV <sub>DC</sub>                                   | 10 <sup>11</sup> |       |       | Ω    |
|              | Isolation Capacitance                                       | C <sub>I-O</sub>   | V = 0 V, f = 1 MHz   |                  | 0.4   |       | pF   |
|              | Rise Time *1  | t <sub>r</sub>   | V <sub>CC</sub> = 5 V, I <sub>F</sub> = 0.1 mA, R <sub>L</sub> = 51 kΩ |                  | 85    |       | μs   |
|              | Fall Time *1  | t <sub>f</sub>   |  |                  | 960   |       |      |
|              | Turn-on Time *1   | t <sub>on</sub>  |  |                  | 100   |       |      |
|              | Turn-off Time *1  | t <sub>off</sub>   |  |                  | 1 050 |       |      |
| Rise Time *1 | t <sub>r</sub>  | V <sub>CC</sub> = 5 V, I <sub>C</sub> = 2 mA, R <sub>L</sub> = 100 Ω |  | 5                |       |       |      |
| Fall Time *1 | t <sub>f</sub>  |  |  | 6                |       |       |      |

Notes: \*1. Test circuit for switching time

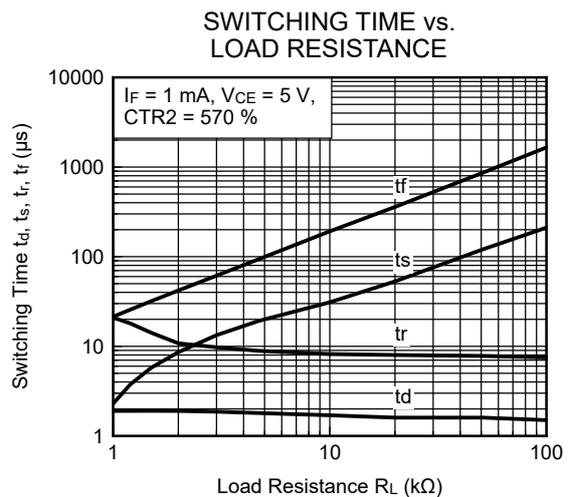
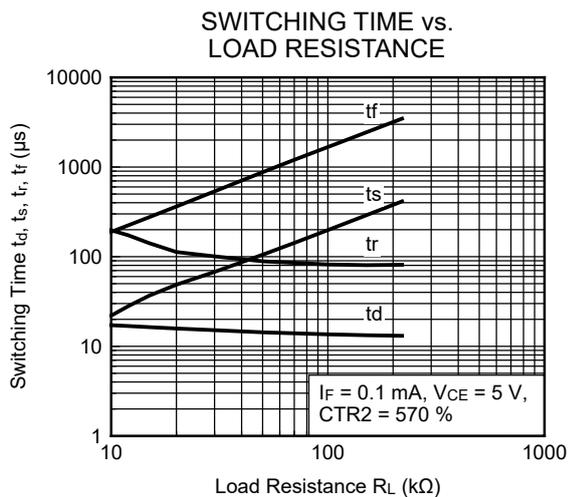
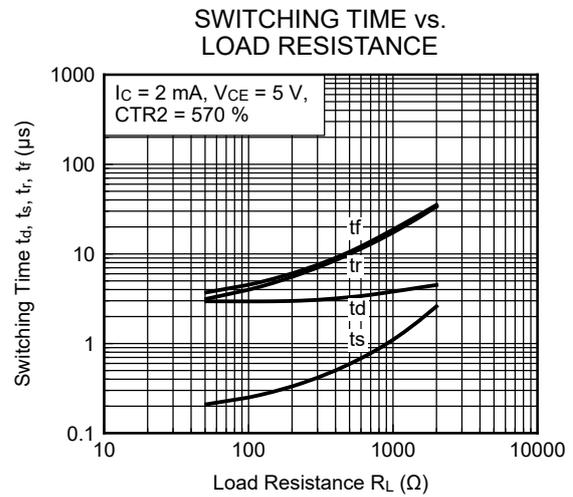
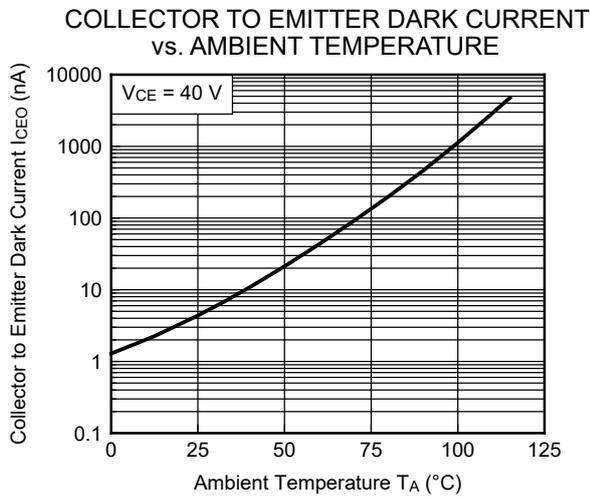
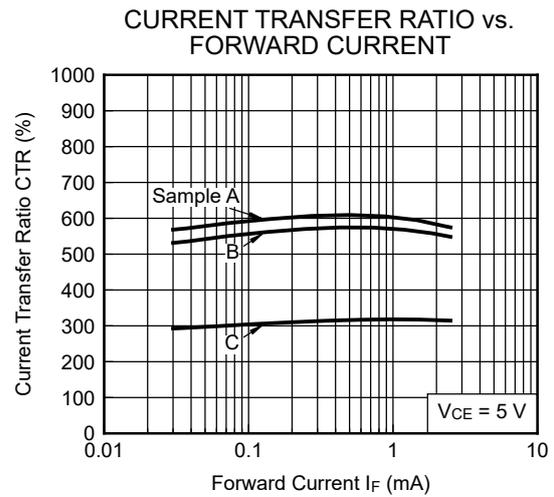
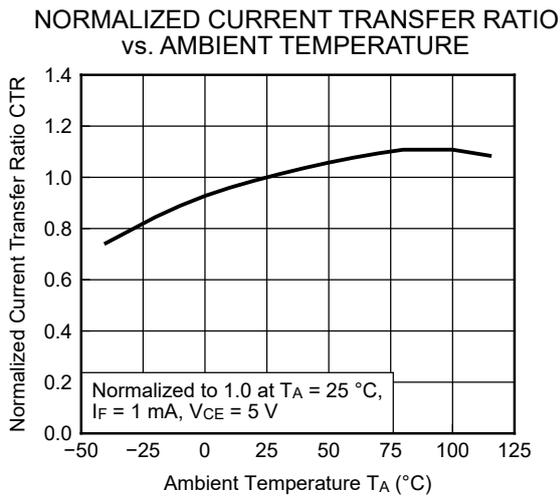


TYPICAL CHARACTERISTICS ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified)



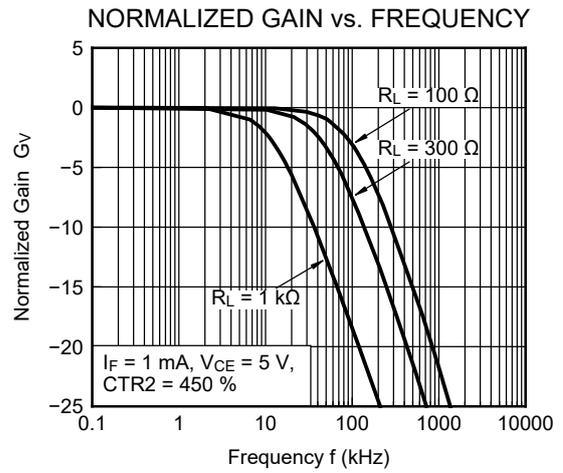
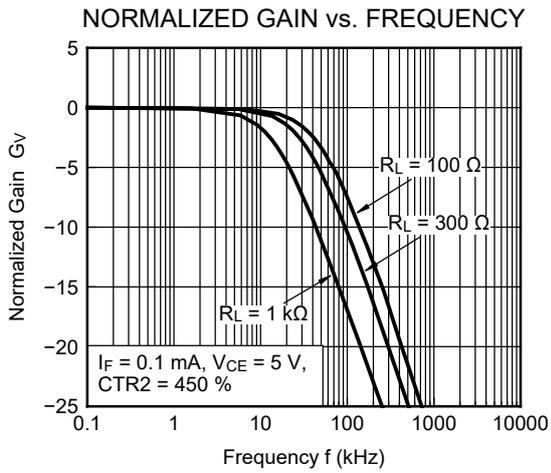
Remark The graphs indicate nominal characteristics.

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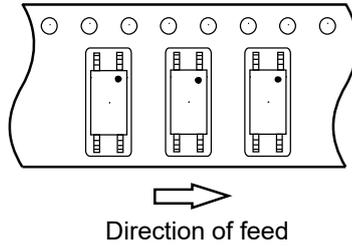
TYPICAL CHARACTERISTICS ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified)



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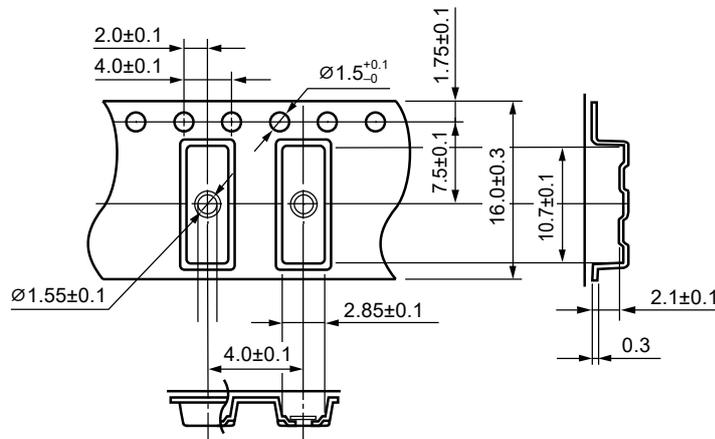
TAPING SPECIFICATIONS (UNIT: mm)

Tape Direction



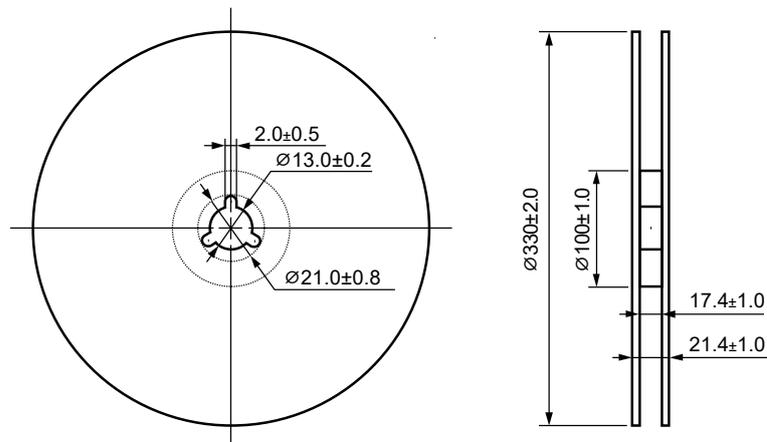
Outline and Dimensions (Tape)

(Unit : mm)



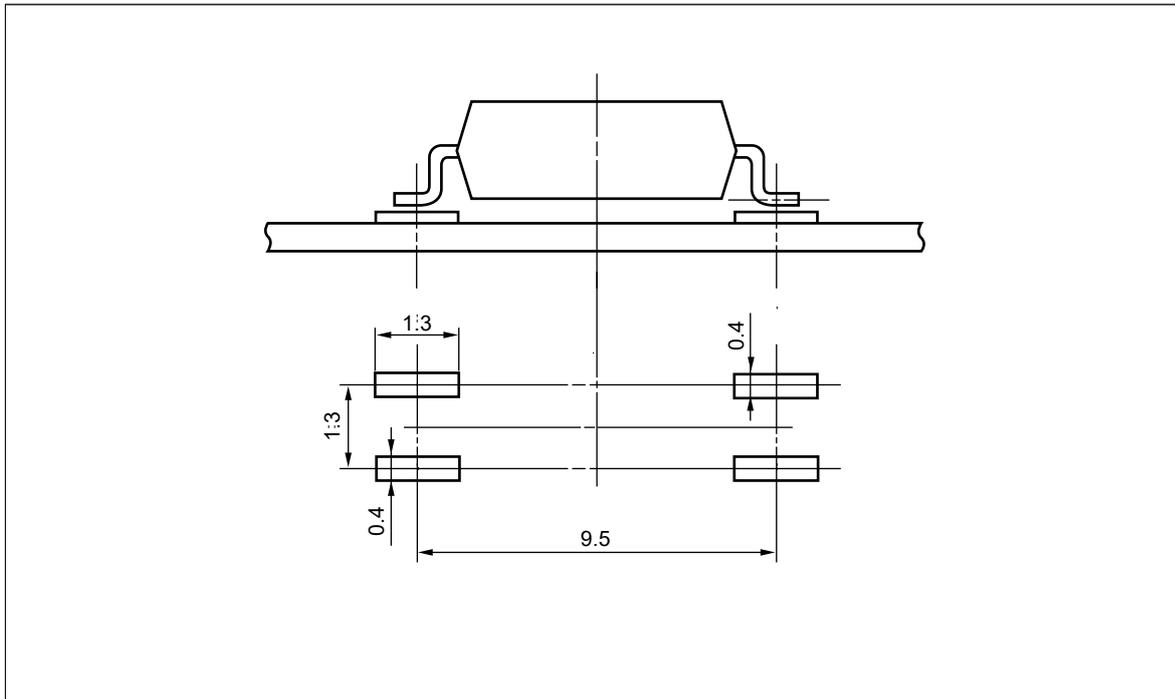
Outline and Dimensions (Reel)

(Unit : mm)



Packing: 3 500 pcs/reel

RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)



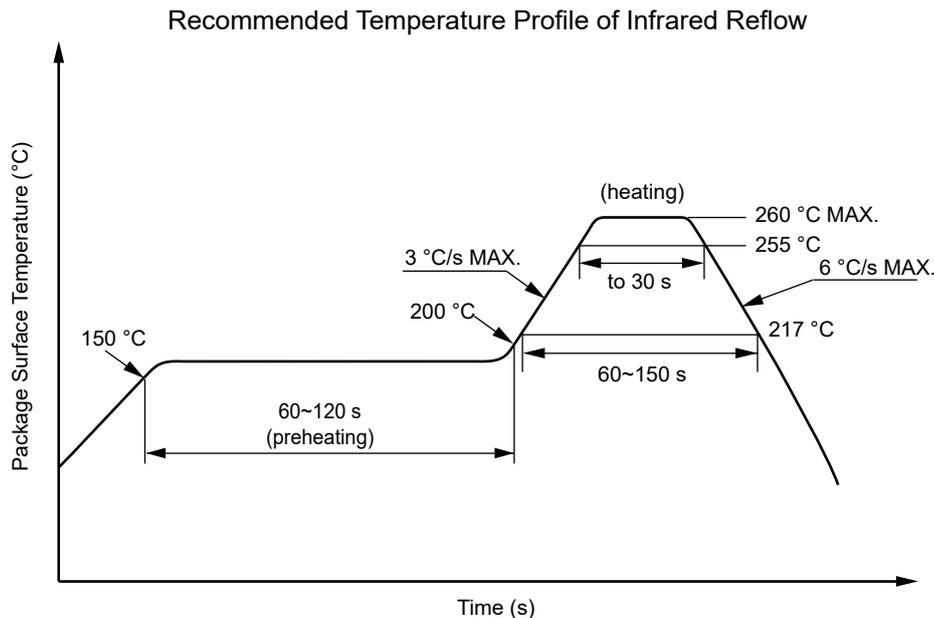
Remark All dimensions in this figure must be evaluated before use.

## NOTES ON HANDLING

## 1. Recommended soldering conditions

## (1) Infrared reflow soldering

- Peak reflow temperature 260 °C or below (package surface temperature)
- Time of peak reflow temperature -5 °C (255 °C) 30 seconds or less
- Time of temperature higher than 217 °C 60 to 150 seconds
- Time to preheat temperature from 150 to 200 °C 60 to 120 seconds
- Number of reflows Three
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)



## (2) Wave soldering

- Temperature 260 °C or below (molten solder temperature)
- Time 10 seconds or less
- Preheating conditions 120 °C or below (package surface temperature)
- Number of times One (Allowed to be dipped in solder including plastic mold portion.)
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

## (3) Soldering by Soldering Iron

- Peak temperature (lead part temperature) 350 °C or below
- Time (per one side) 3 s or less
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt % is recommended.)
- Place 1.5 to 2.0 mm or more away from the root of the lead

## (4) Cautions

- Flux cleaning Avoid cleaning with Freon- or halogen-based (chlorinated etc.) solvents.
- Fixing/Coating Do not use fixing agents or coatings containing halogen-based substances.

### 2. Cautions regarding noise

Be aware that when voltage is applied suddenly between the photocoupler's input and output or between collector-emitters at startup, the output transistor may enter the on state, even if the voltage is within the absolute maximum ratings.

### 3. Measurement conditions of current transfer ratios (CTR), which differ according to photocoupler

Check the setting values before use, since the forward current conditions at CTR measurement differ according to product.

When using products other than at the specified forward current, the characteristics curves may differ from the standard curves due to CTR value variations or the like. Therefore, check the characteristics under the actual operating conditions and thoroughly take variations of the like into consideration before use.

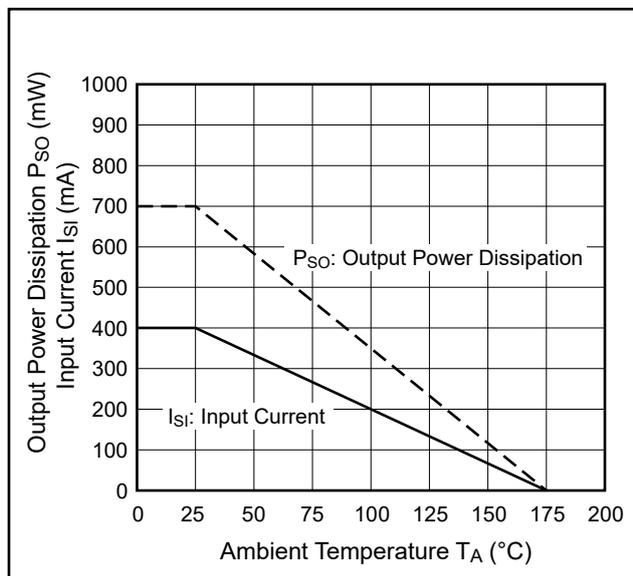
## USAGE CAUTIONS

1. Product against static electricity when handling.
2. Avoid storage at a high temperature and high humidity.

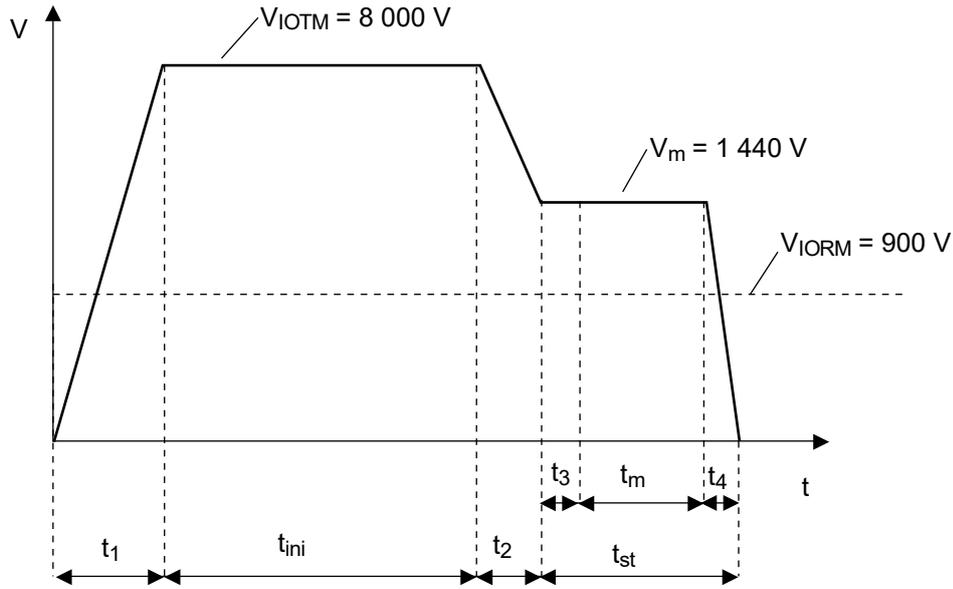
SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

| Parameter  | Symbol                 | Rating      | Unit       |
|--|------------------------|-------------|------------|
| Climatic test class (IEC 60068-1/DIN EN 60068-1)   |                        | 40/115/21   |            |
| Dielectric strength  |                        |             |            |
| maximum operating isolation voltage  | $V_{IORM}$             | 900         | $V_{peak}$ |
| Test voltage (partial discharge test, procedure a for type test and random test)                   | $V_m$                  | 1 440       | $V_{peak}$ |
| $V_m = 1.6 \times V_{IORM}, q_{pd} < 5 \text{ pC}$   |                        |             |            |
| Test voltage (partial discharge test, procedure b for all devices)                                 | $V_m$                  | 1 688       | $V_{peak}$ |
| $V_m = 1.875 \times V_{IORM}, q_{pd} < 5 \text{ pC}$   |                        |             |            |
| Highest permissible overvoltage  | $V_{IOTM}$             | 8 000       | $V_{peak}$ |
| Degree of pollution (IEC 60664-1/DIN EN 60664-1 (VDE 0110-1))                                      |                        | 2           |            |
| Comparative tracking index (IEC 60112/DIN EN 60112 (VDE 0303-11))                                  | CTI                    | 400         |            |
| Material group (IEC 60664-1/DIN EN 60664-1 (VDE 0110-1))   |                        | II          |            |
| Storage temperature range  | $T_{stg}$              | -40 to +125 | °C         |
| Operating temperature range  | $T_A$                  | -40 to +115 | °C         |
| Isolation resistance, minimum value  |                        |             |            |
| $V_{I-O} = 500 \text{ V dc}, T_A = 25 \text{ °C}$  | $R_{I-O \text{ MIN.}}$ | $10^{12}$   | $\Omega$   |
| $V_{I-O} = 500 \text{ V dc}, T_A = \text{maximum temperature of rating, at least } 100 \text{ °C}$ | $R_{I-O \text{ MIN.}}$ | $10^{11}$   | $\Omega$   |
| Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve)          |                        |             |            |
| Maximum ambient temperature  | $T_s$                  | 175         | °C         |
| Maximum input current  | $I_{SI}$               | 400         | mA         |
| Maximum output power dissipation   | $P_{SO}$               | 700         | mW         |
| Isolation resistance, minimum value at $V_{I-O} = 500 \text{ V dc}, T_A = T_s$                     | $R_{I-O \text{ MIN.}}$ | $10^9$      | $\Omega$   |

Dependence of maximum safety ratings with package temperature

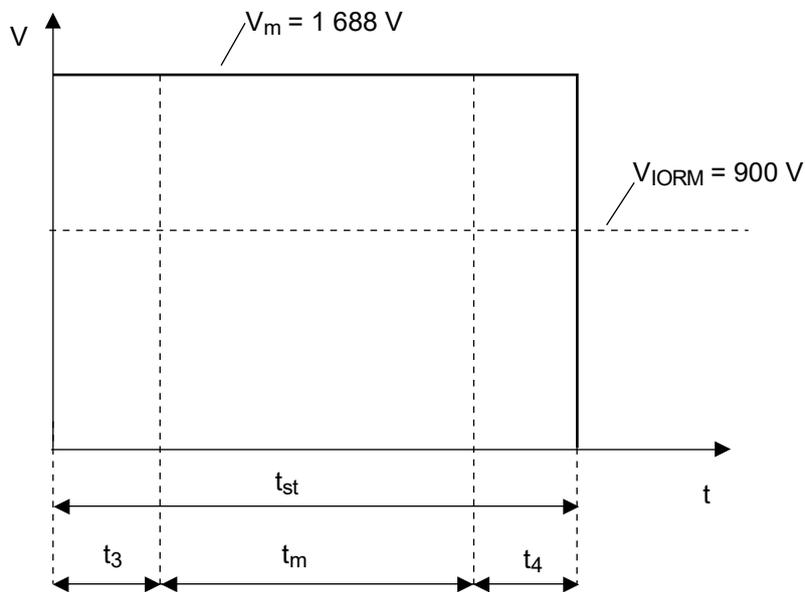


Method a) Destructive Test, Type and Sample Test



$t_1, t_2 = 1 \text{ to } 10 \text{ sec}$   
 $t_3, t_4 = 1 \text{ sec}$   
 $t_m = 10 \text{ sec}$   
 $t_{st} = 12 \text{ sec}$   
 $t_{ini} = 60 \text{ sec}$

Method b) Non-destructive Test, 100% Production Test



$t_3, t_4 = 0.1 \text{ sec}$   
 $t_m = 1.0 \text{ sec}$   
 $t_{st} = 1.2 \text{ sec}$

|                                     |  |
|-------------------------------------|--|
| <p><b>Caution</b> GaAs Products</p> | <p>This product uses gallium arsenide (GaAs).<br/>GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points.</p> <ul style="list-style-type: none"><li>• Follow related laws and ordinances when disposing of the product. If there are no applicable laws and/or ordinances, dispose of the product as recommended below.<ol style="list-style-type: none"><li>1. Commission a disposal company able to (with a license to) collect, transport and dispose of materials that contain arsenic and other such industrial waste materials.</li><li>2. Exclude the product from general industrial waste and household garbage, and ensure that the product is controlled (as industrial waste subject to special control) up until final disposal.</li></ol></li><li>• Do not burn, destroy, cut, crush, or chemically dissolve the product.</li><li>• Do not lick the product or in any way allow it to enter the mouth.</li></ul> |
|-------------------------------------|--|

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(Rev.5.0-1 October 2020)

## Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,  
Koto-ku, Tokyo 135-0061, Japan  
[www.renesas.com](http://www.renesas.com)

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