

**HIGH ISOLATION VOLTAGE  
SOP PHOTOCOUPLER**

–NEPOC Series–

**DESCRIPTION**

The PS2701A-1 is an optically coupled isolator containing a GaAs light emitting diode and an NPN silicon phototransistor to realize an excellent cost performance.

This package is SOP (Small Outline Package) type and has shield effect to cut off ambient light.

It is designed for high density mounting applications.

**FEATURES**

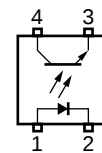
- High isolation voltage (BV = 3 750 Vr.m.s.)
- SOP (Small Outline Package) type
- Ordering number of taping product: PS2701A-1-F3, F4
- ★ • Pb-Free product
- Safety standards
  - UL approved: File No. E72422
  - DIN EN60747-5-2 (VDE0884 Part2) approved (Option)

**APPLICATIONS**

- Hybrid IC
- Measuring instruments
- Power supply
- Programmable logic controllers

**PIN CONNECTION**

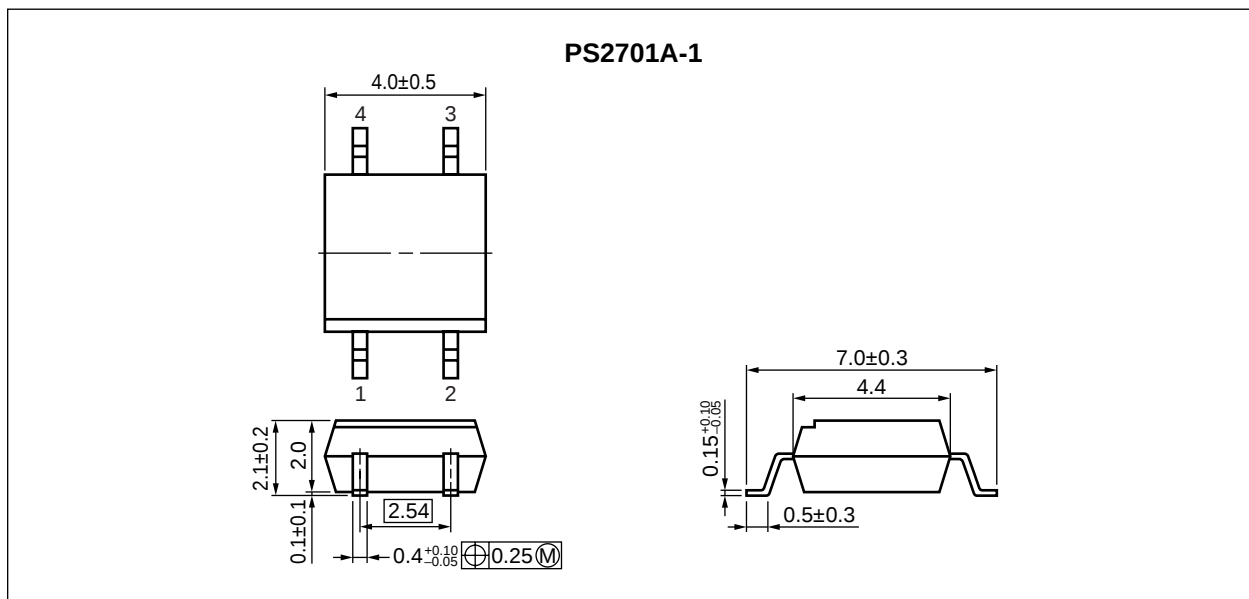
(Top View)



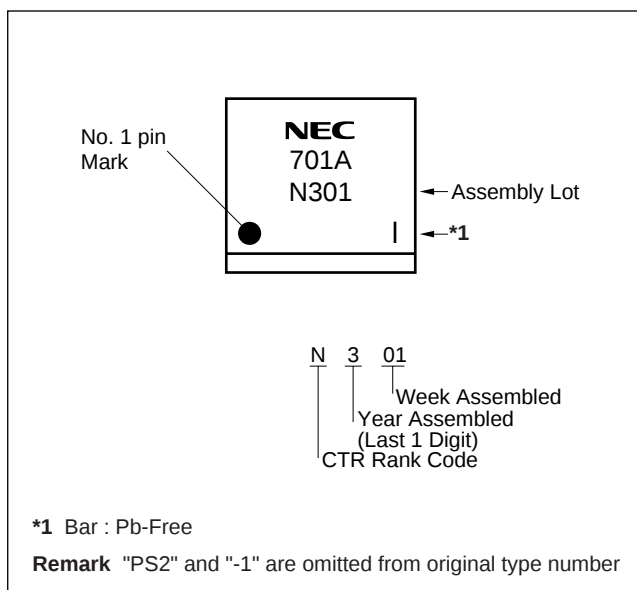
1. Anode
2. Cathode
3. Emitter
4. Collector

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.

## PACKAGE DIMENSIONS (in millimeters)



## MARKING EXAMPLE



## ★ ORDERING INFORMATION

| Part Number    | Order Number     | Solder Plating Specification | Packing Style                | Safety Standard Approval               | Application Part Number <sup>*1</sup> |
|----------------|------------------|------------------------------|------------------------------|----------------------------------------|---------------------------------------|
| PS2701A-1      | PS2701A-1        | Solder<br><br>contains lead  | Magazine case 100 pcs        | Standard products<br><br>(UL approved) | PS2701A-1                             |
| PS2701A-1-F3   | PS2701A-1-F3     |                              | Embossed Tape 3 500 pcs/reel |                                        |                                       |
| PS2701A-1-F4   | PS2701A-1-F4     |                              |                              |                                        |                                       |
| PS2701A-1-V    | PS2701A-1-V      |                              | Magazine case 100 pcs        | DIN EN60747-5-2                        |                                       |
| PS2701A-1-V-F3 | PS2701A-1-V-F3   |                              | Embossed Tape 3 500 pcs/reel | (VDE0884 Part2)                        |                                       |
| PS2701A-1-V-F4 | PS2701A-1-V-F4   |                              |                              | Approved (Option)                      |                                       |
| PS2701A-1      | PS2701A-1-A      | Pb-Free                      | Magazine case 100 pcs        | Standard products                      |                                       |
| PS2701A-1-F3   | PS2701A-1-F3-A   |                              | Embossed Tape 3 500 pcs/reel | (UL approved)                          |                                       |
| PS2701A-1-F4   | PS2701A-1-F4-A   |                              |                              |                                        |                                       |
| PS2701A-1-V    | PS2701A-1-V-A    |                              | Magazine case 100 pcs        | DIN EN60747-5-2                        |                                       |
| PS2701A-1-V-F3 | PS2701A-1-V-F3-A |                              | Embossed Tape 3 500 pcs/reel | (VDE0884 Part2)                        |                                       |
| PS2701A-1-V-F4 | PS2701A-1-V-F4-A |                              |                              | Approved (Option)                      |                                       |

<sup>\*1</sup> For the application of the Safety Standard, following part number should be used.

**ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)**

| Parameter                       |                                    | Symbol                      | Ratings     | Unit                 |
|---------------------------------|------------------------------------|-----------------------------|-------------|----------------------|
| Diode                           | Forward Current (DC)               | $I_F$                       | 30          | mA                   |
|                                 | Reverse Voltage                    | $V_R$                       | 6           | V                    |
|                                 | Power Dissipation Derating         | $\Delta P_D/^\circ\text{C}$ | 0.8         | mW/ $^\circ\text{C}$ |
|                                 | Power Dissipation                  | $P_D$                       | 80          | mW                   |
|                                 | Peak Forward Current <sup>*1</sup> | $I_{FP}$                    | 0.5         | A                    |
| Transistor                      | Collector to Emitter Voltage       | $V_{CEO}$                   | 70          | V                    |
|                                 | Emitter to Collector Voltage       | $V_{ECO}$                   | 5           | V                    |
|                                 | Collector Current                  | $I_C$                       | 30          | mA                   |
|                                 | Power Dissipation Derating         | $\Delta P_C/^\circ\text{C}$ | 1.5         | mW/ $^\circ\text{C}$ |
|                                 | Power Dissipation                  | $P_C$                       | 150         | mW                   |
| Isolation Voltage <sup>*2</sup> |                                    | BV                          | 3 750       | Vr.m.s.              |
| Operating Ambient Temperature   |                                    | $T_A$                       | -55 to +100 | $^\circ\text{C}$     |
| Storage Temperature             |                                    | $T_{stg}$                   | -55 to +150 | $^\circ\text{C}$     |

\*1 PW = 100  $\mu\text{s}$ , Duty Cycle = 1%

\*2 AC voltage for 1 minute at  $T_A = 25^\circ\text{C}$ , RH = 60% between input and output

**ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )**

| Parameter  |                                                    | Symbol        | Conditions                                                        | MIN.      | TYP. | MAX. | Unit          |
|------------|----------------------------------------------------|---------------|-------------------------------------------------------------------|-----------|------|------|---------------|
| Diode      | Forward Voltage                                    | $V_F$         | $I_F = 5\text{ mA}$                                               |           | 1.2  | 1.4  | V             |
|            | Reverse Current                                    | $I_R$         | $V_R = 5\text{ V}$                                                |           |      | 5    | $\mu\text{A}$ |
|            | Terminal Capacitance                               | $C_t$         | $V = 0\text{ V}$ , $f = 1.0\text{ MHz}$                           |           | 10   |      | pF            |
| Transistor | Collector to Emitter Dark Current                  | $I_{CEO}$     | $I_F = 0\text{ mA}$ , $V_{CE} = 70\text{ V}$                      |           |      | 100  | nA            |
| Coupled    | Current Transfer Ratio ( $I_C/I_F$ )* <sup>1</sup> | CTR           | $I_F = 5\text{ mA}$ , $V_{CE} = 5\text{ V}$                       | 50        |      | 300  | %             |
|            | Collector Saturation Voltage                       | $V_{CE(sat)}$ | $I_F = 10\text{ mA}$ , $I_C = 2\text{ mA}$                        |           | 0.13 | 0.3  | V             |
|            | Isolation Resistance                               | $R_{I-O}$     | $V_{I-O} = 1.0\text{ kV}_{DC}$                                    | $10^{11}$ |      |      | $\Omega$      |
|            | Isolation Capacitance                              | $C_{I-O}$     | $V = 0\text{ V}$ , $f = 1.0\text{ MHz}$                           |           | 0.4  |      | pF            |
|            | Rise Time * <sup>2</sup>                           | $t_r$         | $V_{CC} = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\ \Omega$ |           | 5    |      | $\mu\text{s}$ |
|            | Fall Time * <sup>2</sup>                           | $t_f$         |                                                                   |           | 7    |      |               |

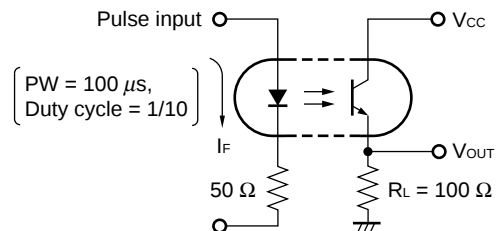
**\*1 CTR rank**

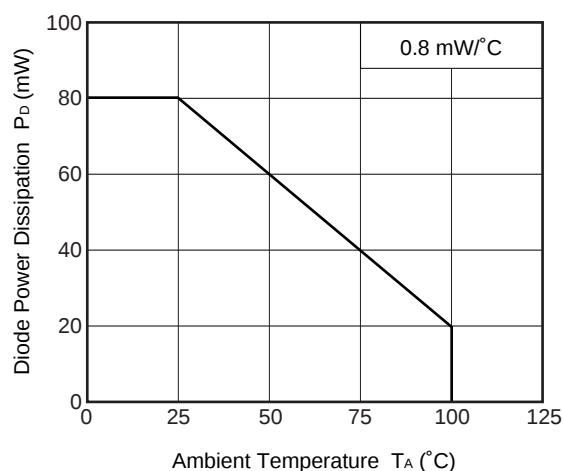
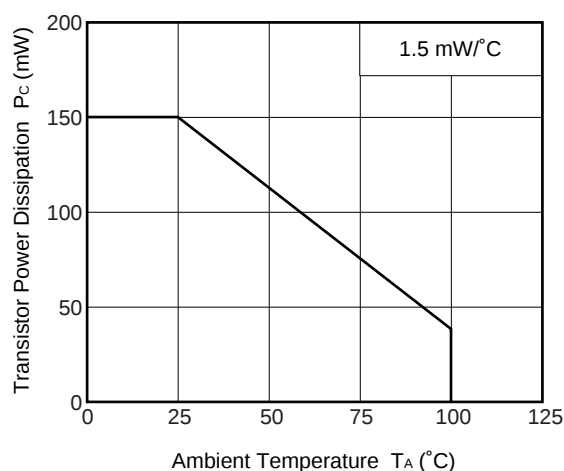
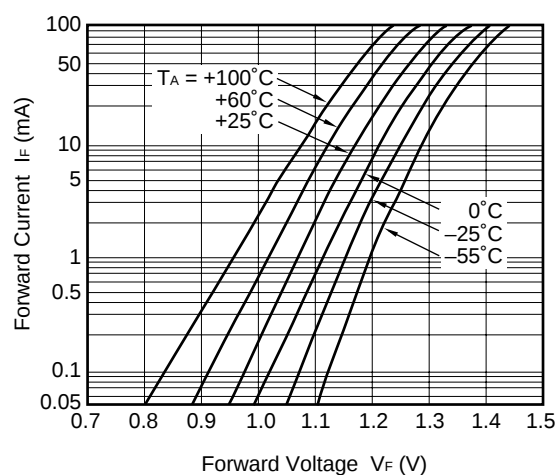
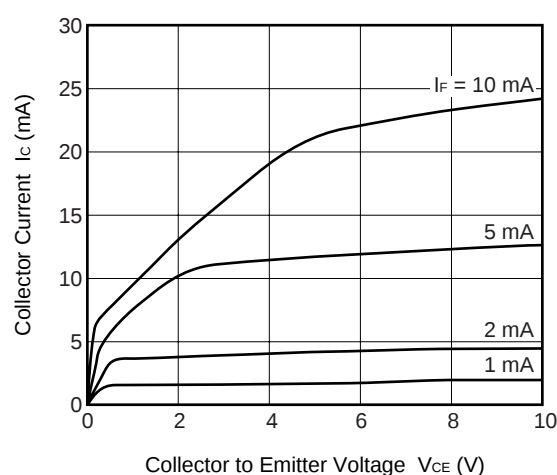
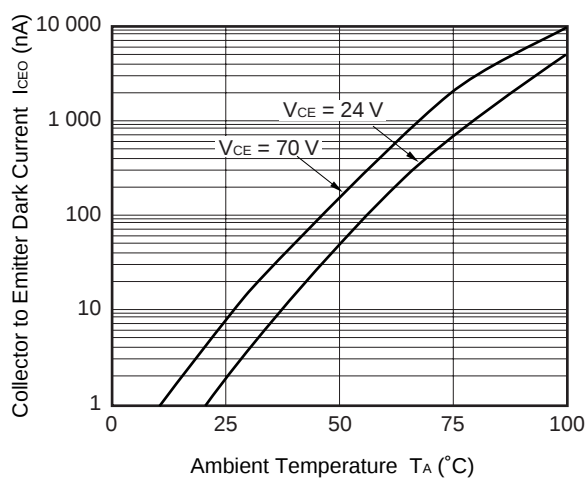
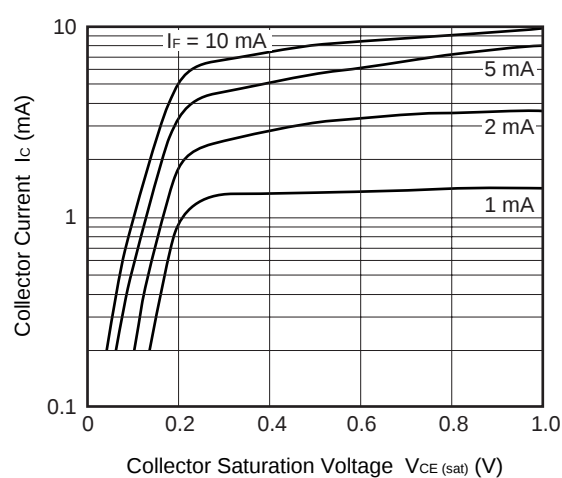
N: 50 to 300 (%)

P: 150 to 300 (%)

L: 100 to 300 (%)

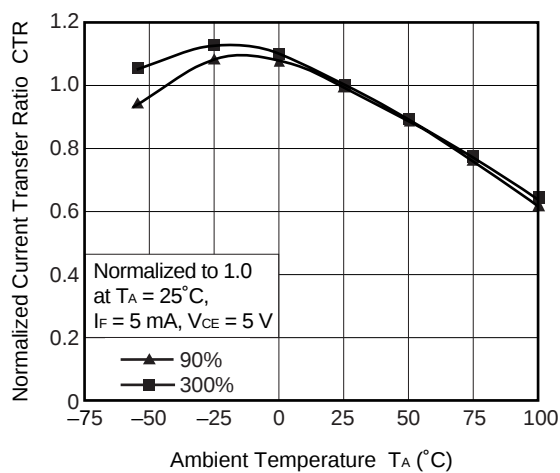
M: 50 to 150 (%)

**\*2 Test circuit for switching time**

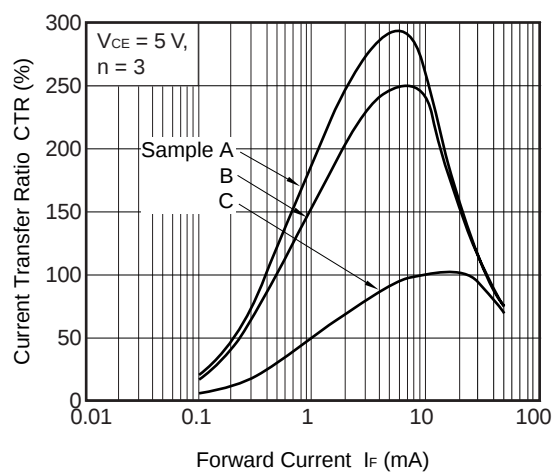
★ TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)DIODE POWER DISSIPATION vs.  
AMBIENT TEMPERATURETRANSISTOR POWER DISSIPATION vs.  
AMBIENT TEMPERATUREFORWARD CURRENT vs.  
FORWARD VOLTAGECOLLECTOR CURRENT vs.  
COLLECTOR TO EMITTER VOLTAGECOLLECTOR TO EMITTER DARK  
CURRENT vs. AMBIENT TEMPERATURECOLLECTOR CURRENT vs.  
COLLECTOR SATURATION VOLTAGE

**Remark** The graphs indicate nominal characteristics.

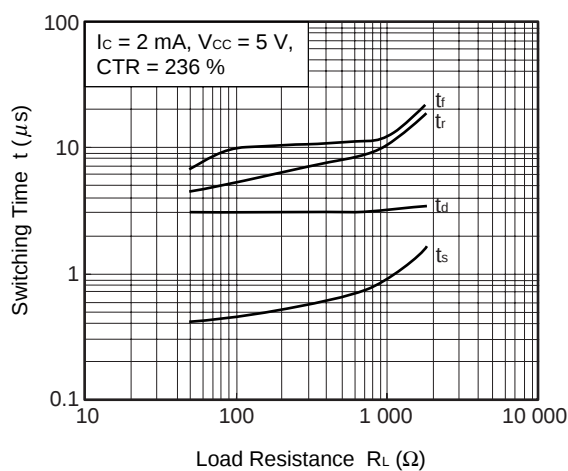
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



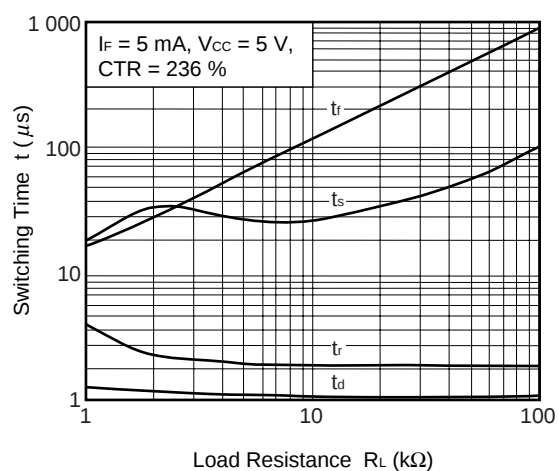
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



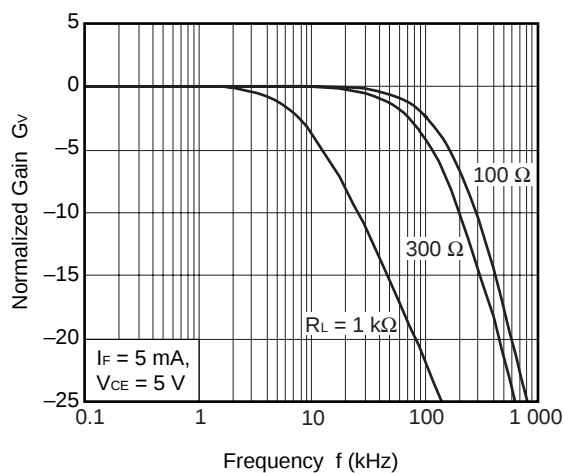
SWITCHING TIME vs. LOAD RESISTANCE



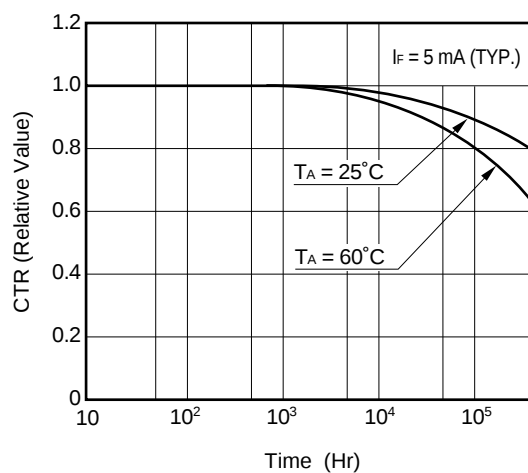
SWITCHING TIME vs. LOAD RESISTANCE



FREQUENCY RESPONSE



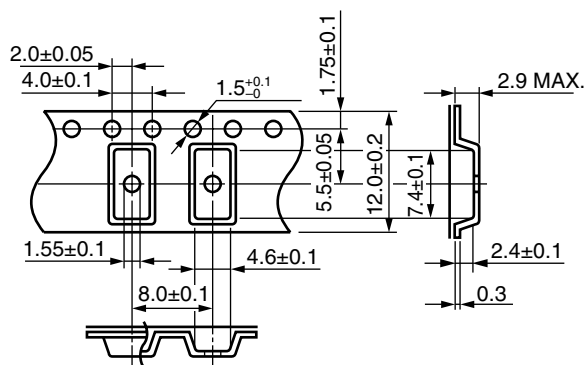
LONG TERM CTR DEGRADATION



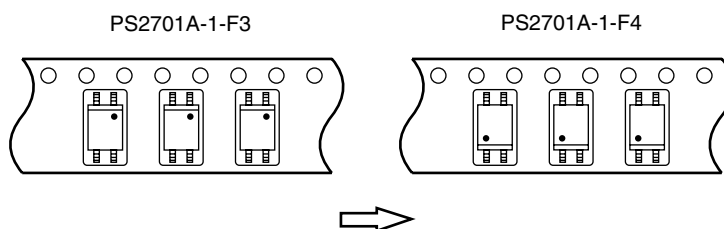
**Remark** The graphs indicate nominal characteristics.

## TAPING SPECIFICATIONS (in millimeters)

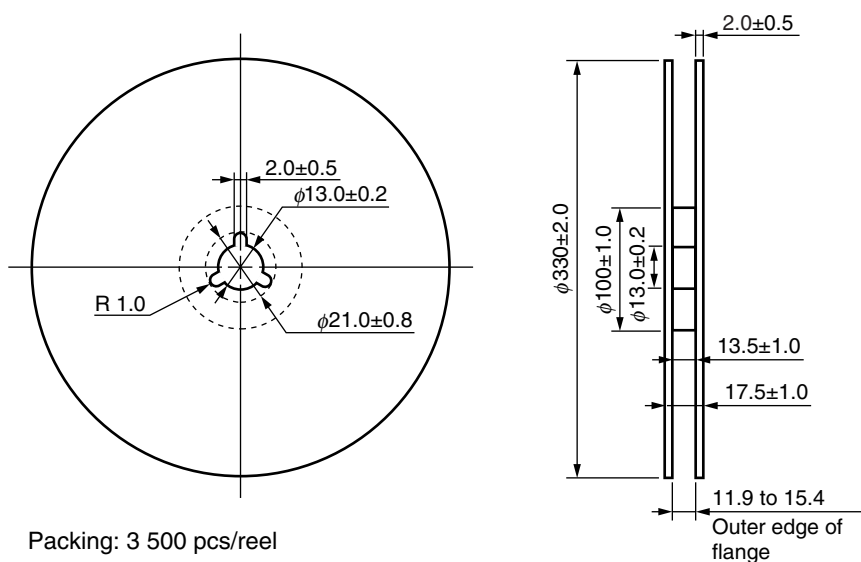
## Outline and Dimensions (Tape)



## Tape Direction



## Outline and Dimensions (Reel)



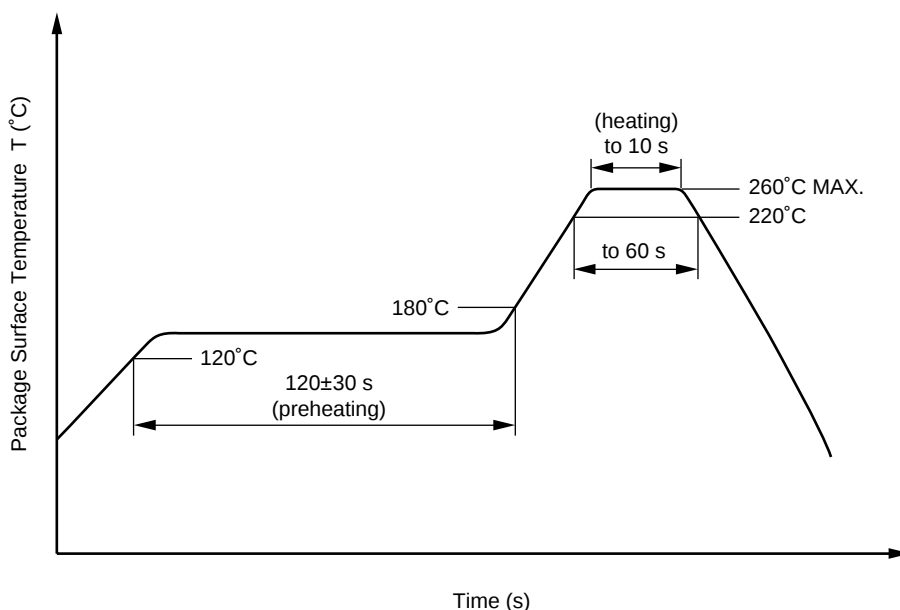
## NOTES ON HANDLING

## 1. Recommended soldering conditions

## (1) Infrared reflow soldering

- Peak reflow temperature 260°C or below (package surface temperature)
- Time of peak reflow temperature 10 seconds or less
- Time of temperature higher than 220°C 60 seconds or less
- Time to preheat temperature from 120 to 180°C 120±30 s
- 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.)

Recommended Temperature Profile of Infrared Reflow



## (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 (each pins) 3 seconds or less
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

(a) Soldering of leads should be made at the point 1.5 to 2.0 mm from the root of the lead.

(b) Please be sure that the temperature of the package would not be heated over 100°C.

**(4) Cautions**

- Fluxes

Avoid removing the residual flux with freon-based and chlorine-based cleaning solvent.

**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.

**USAGE CAUTIONS**

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

Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (\*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL's understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

| Restricted Substance per RoHS | Concentration Limit per RoHS (values are not yet fixed) | Concentration contained in CEL devices |     |
|-------------------------------|---------------------------------------------------------|----------------------------------------|-----|
|                               |                                                         | -A                                     | -AZ |
| Lead (Pb)                     | < 1000 PPM                                              | Not Detected                           | (*) |
| Mercury                       | < 1000 PPM                                              | Not Detected                           |     |
| Cadmium                       | < 100 PPM                                               | Not Detected                           |     |
| Hexavalent Chromium           | < 1000 PPM                                              | Not Detected                           |     |
| PBB                           | < 1000 PPM                                              | Not Detected                           |     |
| PBDE                          | < 1000 PPM                                              | Not Detected                           |     |

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.

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