CEL

# PHOTOCOUPLER
# PS8103

## HIGH-SPEED (200 kbps) ANALOG OUTPUT TYPE 5-PIN SOP (SO-5) PHOTOCOUPLER

–NEPOC Series–

### DESCRIPTION

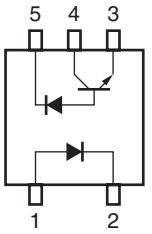
The PS8103 is an optically coupled isolator containing a GaAs LED on the light emitting diode (input side) and a PIN photodiode and a high-speed amplifier transistor on the output side on one chip.

This is a plastic SOP (Small Out-line Package) type for high density applications.

### FEATURES

- Wide operating $V_{CC}$ range ($V_{CC}$ = –0.5 to +15 V)
- Small package (SO-5)
<R> • High isolation voltage (BV = 3 750 Vr.m.s.)
- High-speed response ($t_{PHL}$, $t_{PLH}$ = 5 $\mu$s MAX. (@$R_L$ = 4.1 kΩ))
- Ordering number of taping product: PS8103-F3, F4: 2 500 pcs/reel
- Pb-Free product
- Safety standards
  - UL approved: File No. E72422

**PIN CONNECTION**
(Top View)




1. Anode
2. Cathode
3. GND
4. $V_O$
5. $V_{CC}$

### APPLICATIONS

- Computer and peripheral manufactures
- General purpose inverter
- Substitutions for relays and pulse transformers
- Power supply



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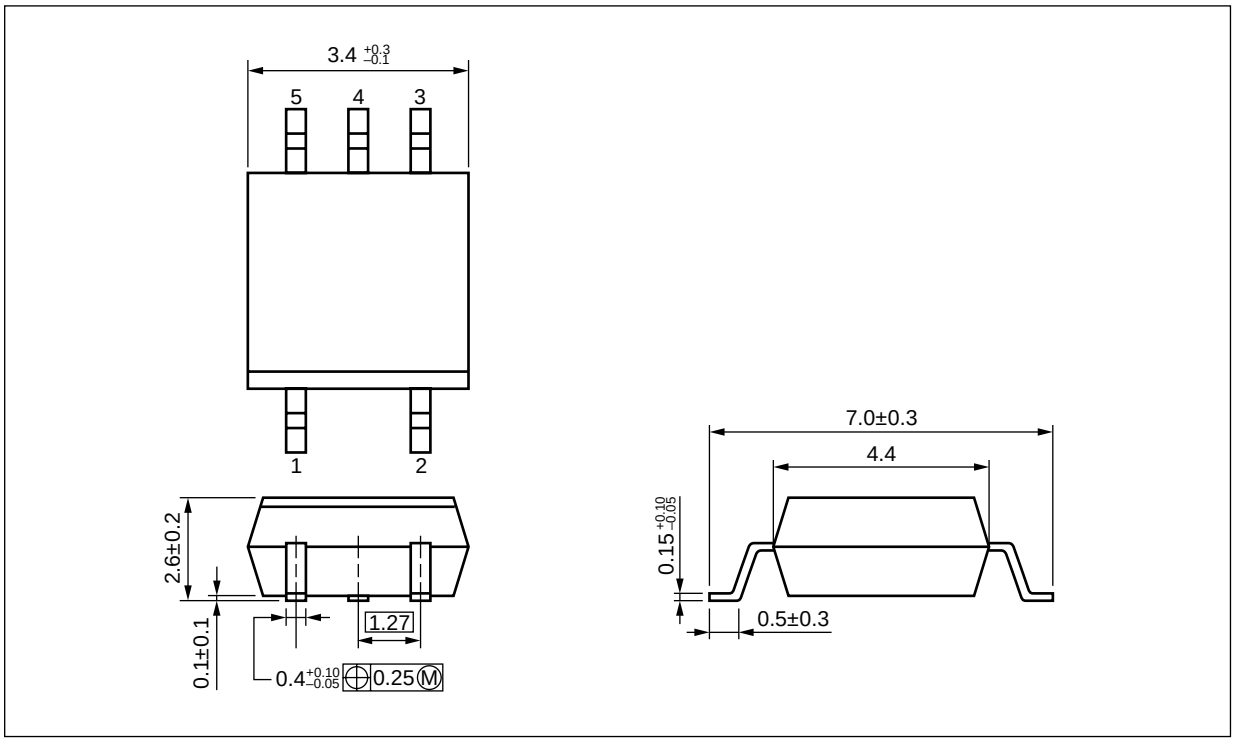
The mark <R> shows major revised points.

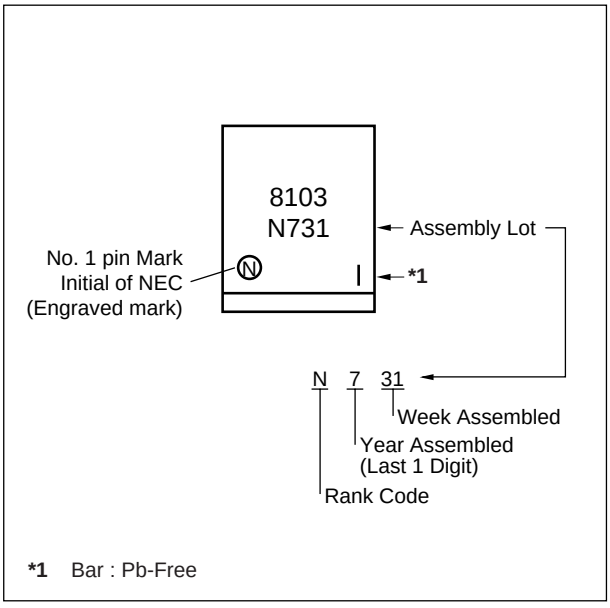


The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

<R> **PACKAGE DIMENSIONS (UNIT: mm)**




**MARKING EXAMPLE**




***1*** Bar : Pb-Free

## ORDERING INFORMATION

| Part Number | Order Number | Solder Plating Specification | Packing Style | Safety Standard Approval | Application Part Number*1 |
|---|---|---|---|---|---|
| PS8103 | PS8103-A | Pb-Free | 20 pcs (Tape 20 pcs cut) | Standard products | PS8103 |
| PS8103-F3 | PS8103-F3-A | | Embossed Tape 2 500 pcs/reel | (UL approved) | |
| PS8103-F4 | PS8103-F4-A | | | | |

***1** For the application of the Safety Standard, following part number should be used.

## ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C, unless otherwise specified)

<R>

| Parameter | | Symbol | Ratings | Unit |
|---|---|---|---|---|
| Diode | Forward Current | $I_F$ | 50 | mA |
| | Reverse Voltage | $V_R$ | 5 | V |
| | Power Dissipation *1 | $P_D$ | 50 | mW |
| Detector | Supply Voltage | $V_{CC}$ | –0.5 to +15 | V |
| | Output Voltage | $V_O$ | –0.5 to +15 | V |
| | Output Current | $I_O$ | 8 | mA |
| | Power Dissipation *2 | $P_C$ | 80 | mW |
| Isolation Voltage *3 | | BV | 3 750 | Vr.m.s. |
| Operating Ambient Temperature | | $T_A$ | –40 to +100 | °C |
| Storage Temperature | | $T_{stg}$ | –55 to +125 | °C |

***1** Reduced to 0.5 mW/°C at $T_A$ = 25°C or more.

***2** Applies to output pin $V_O$. Reduced to 0.8 mW/°C at $T_A$ = 25°C or more.

***3** AC voltage for 1 minute at $T_A$ = 25°C, RH = 60% between input and output.
Pins 1-2 shorted together, 3-5 shorted together.

## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C)

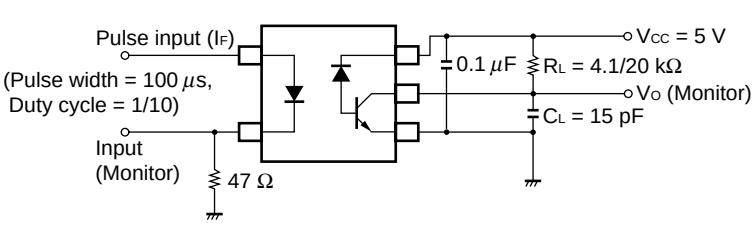
| Parameter | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|---|
| Diode | Forward Voltage | $V_F$ | $I_F$ = 16 mA | | 1.2 | 1.5 | V |
| | Reverse Current | $I_R$ | $V_R$ = 3 V | | | 10 | μA |
| | Terminal Capacitance | $C_t$ | V = 0 V, f = 1 MHz | | 30 | | pF |
| Detector | High Level Output Current | $I_{OH}$ (1) | $I_F$ = 0 mA, $V_{CC}$ = $V_O$ = 5.5 V | | 7 | 500 | nA |
| | High Level Output Current | $I_{OH}$ (2) | $I_F$ = 0 mA, $V_{CC}$ = $V_O$ = 15 V | | | 100 | μA |
| | Low Level Output Voltage | $V_{OL}$ | $I_F$ = 16 mA, $V_{CC}$ = 4.5 V, $I_{OL}$ = 1.1 mA | | 0.1 | 0.4 | V |
| | High Level Supply Current | $I_{CCH}$ | $I_F$ = 0 mA, $V_O$ = open, $V_{CC}$ = 15 V | | 0.01 | 1 | μA |
| | Low Level Supply Current | $I_{CCL}$ | $I_F$ = 16 mA, $V_O$ = open, $V_{CC}$ = 15 V | | 150 | 800 | |
| Coupled | Current Transfer Ratio ($I_C/I_F$) *1 | CTR | $I_F$ = 16 mA, $V_{CC}$ = 4.5 V, $V_O$ = 0.4 V | 10 | 23 | 30 | % |
| | Isolation Resistance | $R_{I-O}$ | $V_{I-O}$ = 1 $kV_{DC}$, RH = 40 to 60% | $10^{11}$ | | | Ω |
| | Isolation Capacitance | $C_{I-O}$ | V = 0 V, f = 1 MHz | | 0.4 | | pF |
| | Propagation Delay Time (H → L) *2 | $t_{PHL}$ | $I_F$ = 16 mA, $V_{CC}$ = 5 V, $R_L$ = 4.1 kΩ, $C_L$ = 15 pF | | 1 | 5 | μs |
| | Propagation Delay Time (L → H) *2 | $t_{PLH}$ | | | 2 | 5 | |
| | Propagation Delay Time (H → L) *2 | $t_{PHL}$ | $I_F$ = 16 mA, $V_{CC}$ = 5 V, $R_L$ = 20 kΩ, $C_L$ = 15 pF | | 1 | 15 | |
| | Propagation Delay Time (L → H) *2 | $t_{PLH}$ | | | 7 | 15 | |

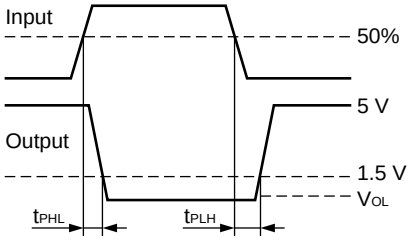
***1** CTR rank

L : 15 to 30 (%)

N : 10 to 30 (%)

***2** Test circuit for propagation delay time



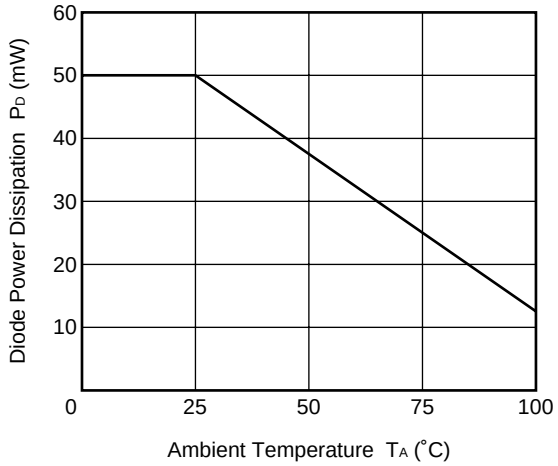

$C_L$ includes probe and stray wiring capacitance.

## USAGE CAUTIONS

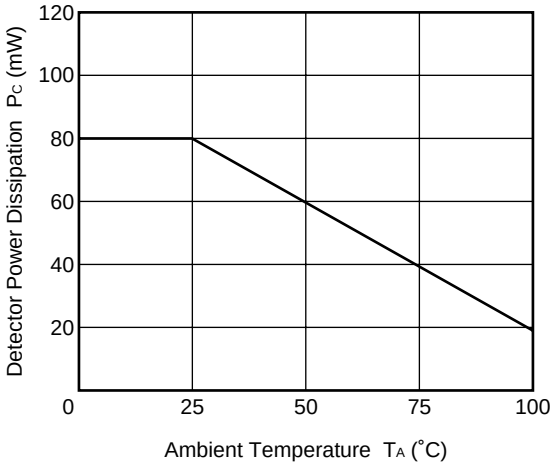
1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. By-pass capacitor of 0.1 μF is used between $V_{CC}$ and GND near device. Also, ensure that the distance between the leads of the photocoupler and capacitor is no more than 10 mm.
3. Avoid storage at a high temperature and high humidity.

**TYPICAL CHARACTERISTICS ($T_A$ = 25°C, unless otherwise specified)**

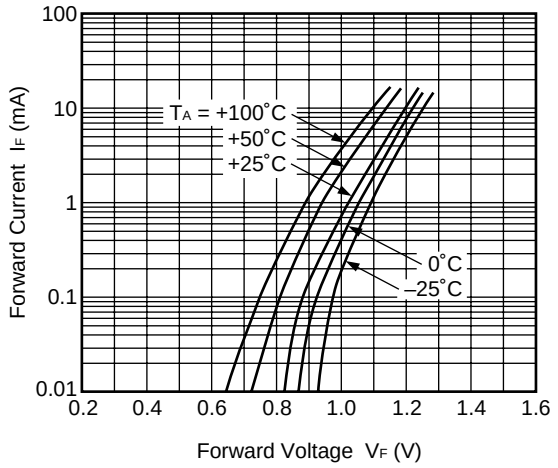
DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE



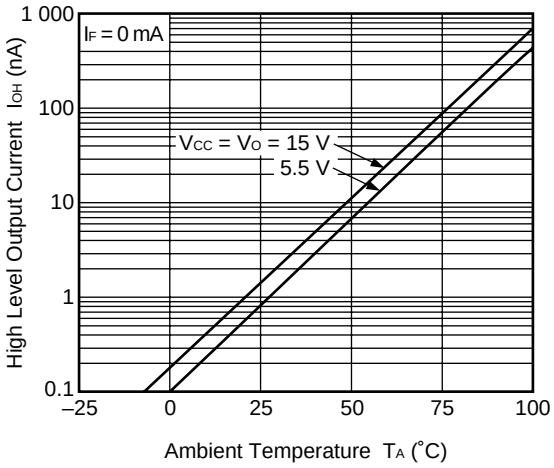

DETECTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



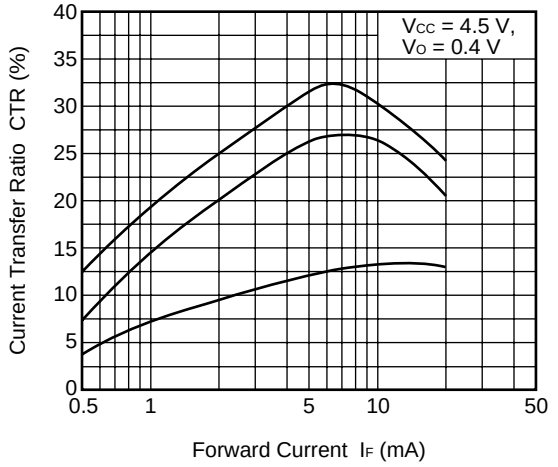

FORWARD CURRENT vs. FORWARD VOLTAGE



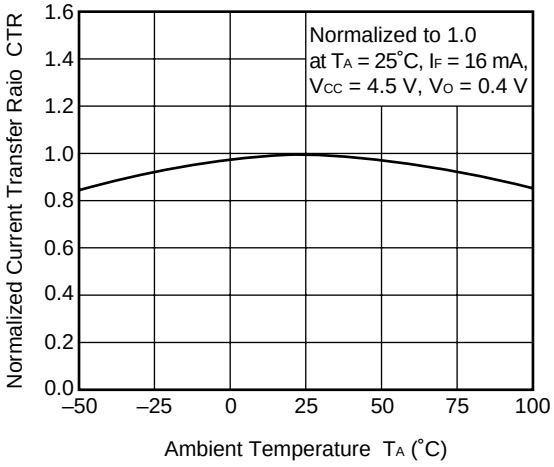

HIGH LEVEL OUTPUT CURRENT vs. AMBIENT TEMPERATURE




CURRENT TRANSFER RATIO vs. FORWARD CURRENT

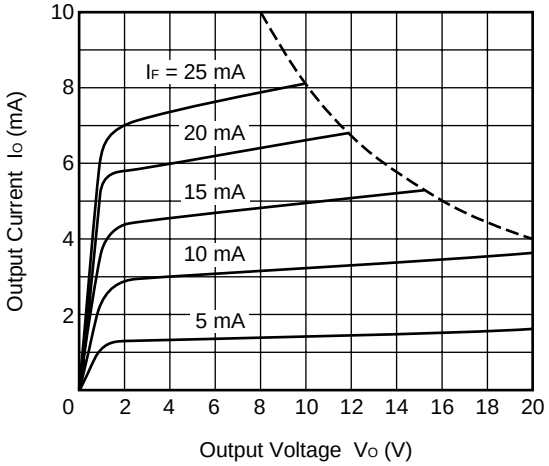



NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE

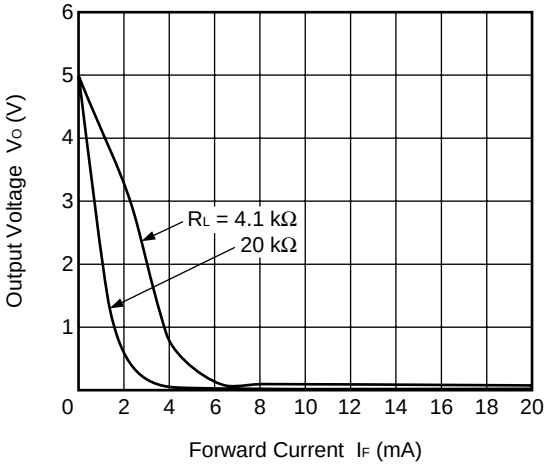



**Remark** The graphs indicate nominal characteristics.

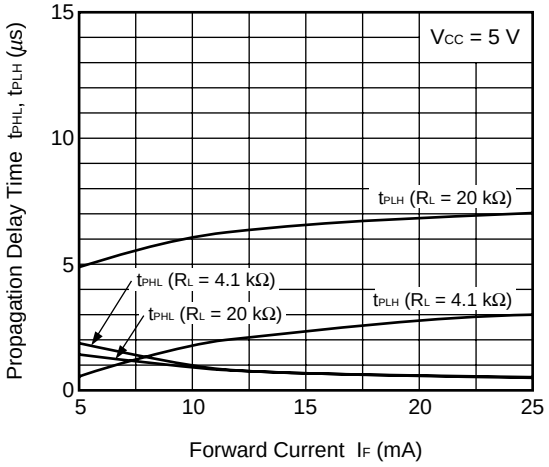
OUTPUT CURRENT vs.
OUTPUT VOLTAGE



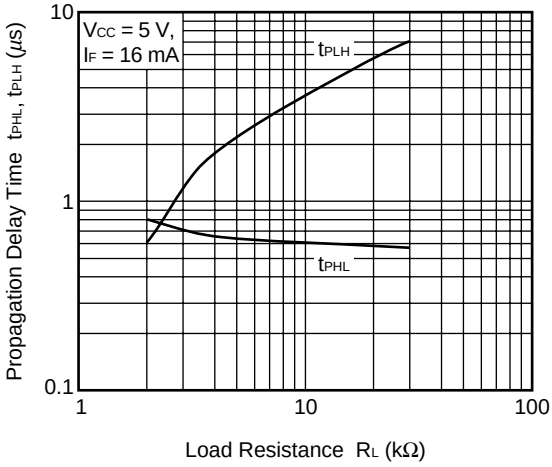

OUTPUT VOLTAGE vs.
FORWARD CURRENT



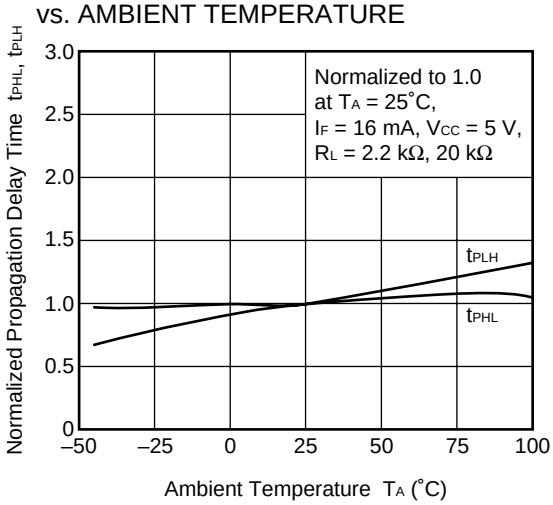

PROPAGATION DELAY TIME vs.
FORWARD CURRENT




PROPAGATION DELAY TIME vs.
LOAD RESISTANCE



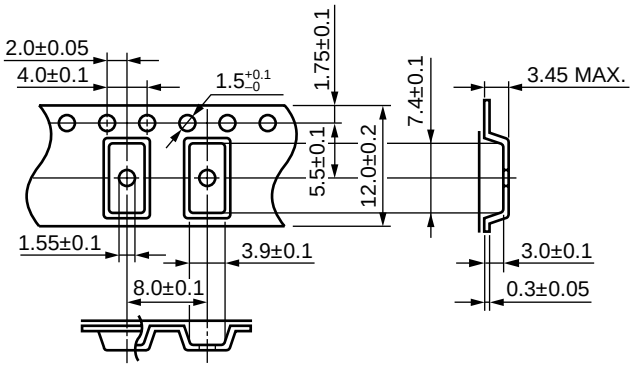

NORMALIZED PROPAGATION DELAY TIME
vs. AMBIENT TEMPERATURE



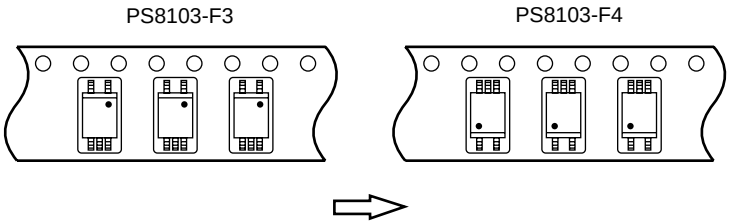

**Remark** The graphs indicate nominal characteristics.

**TAPING SPECIFICATIONS (UNIT: mm)**

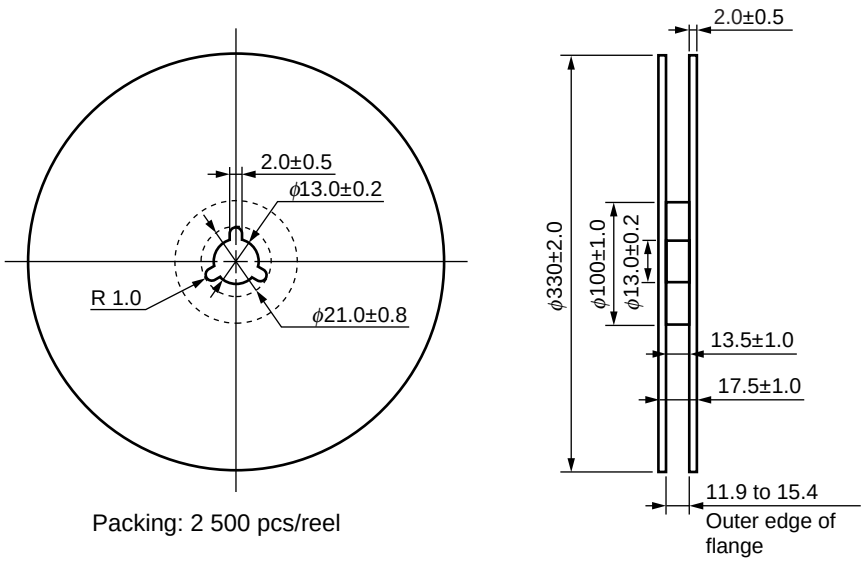
Outline and Dimensions (Tape)




Tape Direction




Outline and Dimensions (Reel)




Packing: 2 500 pcs/reel

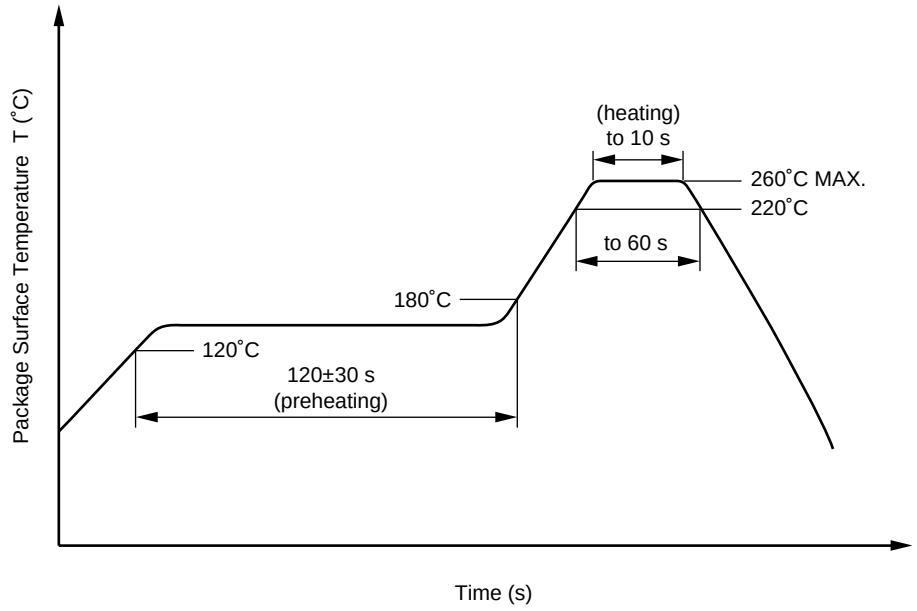
## NOTES ON HANDLING

### 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.

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M8E 02. 11-1

| | |
|---|---|
| **Caution** GaAs Products | 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.<br>• 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.<br>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.<br>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.<br>• Do not burn, destroy, cut, crush, or chemically dissolve the product.<br>• Do not lick the product or in any way allow it to enter the mouth. |

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Subject: Compliance with EU Directives

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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 | |
|---|---|---|---|
| Lead (Pb) | < 1000 PPM | -A | -AZ |
| | | 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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Authorized Distributor

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