CEL

# PHOTOCOUPLER
# PS2815-1,PS2815-4

## LOW (AC) INPUT CURRENT, HIGH CTR 4, 16-PIN SSOP PHOTOCOUPLER

–NEPOC Series–

### DESCRIPTION

The PS2815-1 and PS2815-4 are optically coupled isolators containing GaAs light emitting diodes and an NPN silicon phototransistor in a plastic SSOP for high density applications.

The package is a Small SOP (Small Outline Package) type for high density mounting applications.

### FEATURES

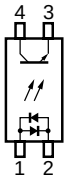
- AC input response
- High current transfer ratio (CTR = 200% TYP. @ $I_F$ = ±1 mA)
- High isolation voltage (BV = 2 500 Vr.m.s.)
- Small and thin package (4, 16-pin SSOP, Pin pitch 1.27 mm)
- Ordering number of tape product: PS2815-1-F3, F4, PS2815-4-F3, F4
- ★ Pb-Free product
- ★ Safety standards: PS2815-1, -4
  - UL approved: File No. E72422
  - DIN EN60747-5-2 (VDE0884 Part2) approved (Option)

### APPLICATIONS

- Programmable logic controllers
- Modem/FAX

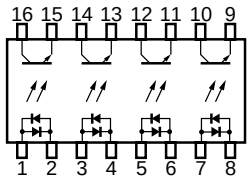
**PIN CONNECTION**
(Top View)

**PS2815-1**




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

**PS2815-4**




1. 3. 5. 7. Anode, Cathode
2. 4. 6. 8. Cathode, Anode
9. 11. 13. 15. Emitter
10. 12. 14. 16. Collector



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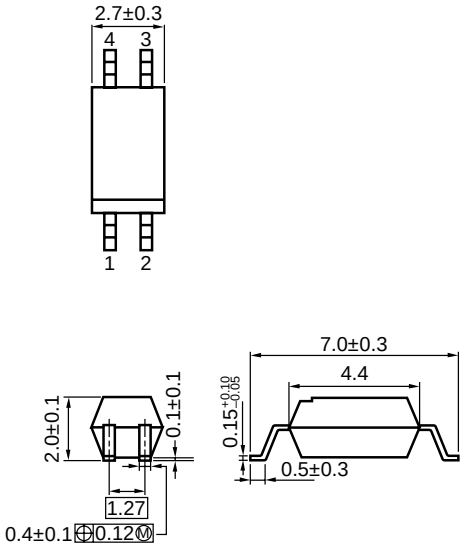
Date Published April 2005 CP(K)

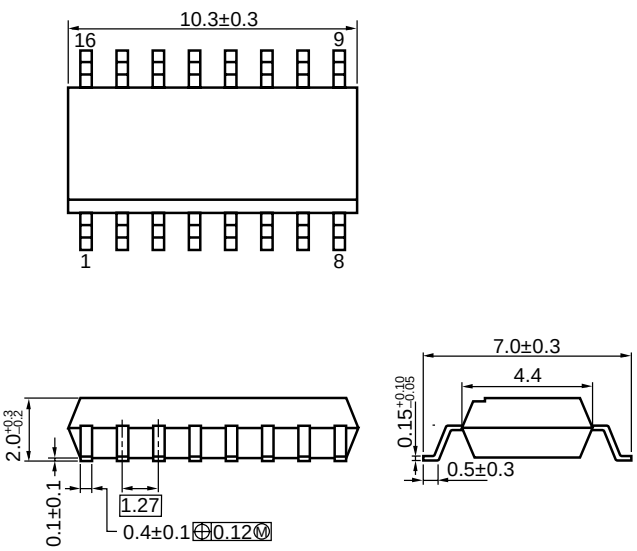
**The mark ★ shows major revised points.**

## PACKAGE DIMENSIONS (UNIT: mm)

**PS2815-1**

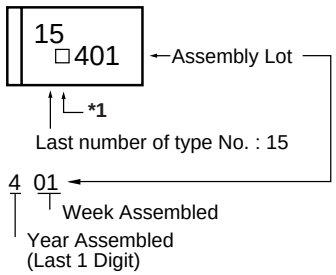



**PS2815-4**



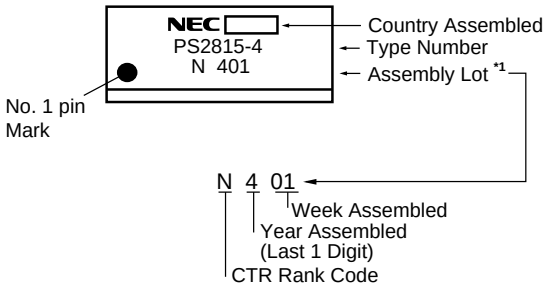

## ★ MARKING EXAMPLE

**PS2815-1**




***1** For external plating Pb-Free products, perform marking to indicate that these are Pb-Free products.

**PS2815-4**




***1** For the external plating Pb-Free product, L is indicated at the second digit of the rank.

## ★ ORDERING INFORMATION

| Part Number | Order Number | Solder Plating Specification | Packing Style | Safety Standard Approval | Application Part Number *1 |
|---|---|---|---|---|---|
| PS2815-1 | PS2815-1 | Solder | 50 pcs (Tape 50 pcs cut) | Standard products | PS2815-1 |
| PS2815-1-F3 | PS2815-1-F3 | contains lead | Embossed Tape 3 500 pcs/reel | (UL approved) | |
| PS2815-1-F4 | PS2815-1-F4 | | | | |
| PS2815-1-V | PS2815-1-V | | 50 pcs (Tape 50 pcs cut) | DIN EN60747-5-2 | |
| PS2815-1-V-F3 | PS2815-1-V-F3 | | Embossed Tape 3 500 pcs/reel | (VDE0884 Part2) | |
| PS2815-1-V-F4 | PS2815-1-V-F4 | | | Approved (Option) | |
| PS2815-4 | PS2815-4 | | Magazine Case 45 pcs | Standard products | PS2815-4 |
| PS2815-4-F3 | PS2815-4-F3 | | Embossed Tape 2 500 pcs/reel | (UL approved) | |
| PS2815-4-F4 | PS2815-4-F4 | | | | |
| PS2815-4-V | PS2815-4-V | | Magazine Case 45 pcs | DIN EN60747-5-2 | |
| PS2815-4-V-F3 | PS2815-4-V-F3 | | Embossed Tape 2 500 pcs/reel | (VDE0884 Part2) | |
| PS2815-4-V-F4 | PS2815-4-V-F4 | | | Approved (Option) | |
| PS2815-1 | PS2815-1-A | Pb-Free | 50 pcs (Tape 50 pcs cut) | Standard products | PS2815-1 |
| PS2815-1-F3 | PS2815-1-F3-A | | Embossed Tape 3 500 pcs/reel | (UL approved) | |
| PS2815-1-F4 | PS2815-1-F4-A | | | | |
| PS2815-1-V | PS2815-1-V-A | | 50 pcs (Tape 50 pcs cut) | DIN EN60747-5-2 | |
| PS2815-1-V-F3 | PS2815-1-V-F3-A | | Embossed Tape 3 500 pcs/reel | (VDE0884 Part2) | |
| PS2815-1-V-F4 | PS2815-1-V-F4-A | | | Approved (Option) | |
| PS2815-4 | PS2815-4-A | | Magazine Case 45 pcs | Standard products | PS2815-4 |
| PS2815-4-F3 | PS2815-4-F3-A | | Embossed Tape 2 500 pcs/reel | (UL approved) | |
| PS2815-4-F4 | PS2815-4-F4-A | | | | |
| PS2815-4-V | PS2815-4-V-A | | Magazine Case 45 pcs | DIN EN60747-5-2 | |
| PS2815-4-V-F3 | PS2815-4-V-F3-A | | Embossed Tape 2 500 pcs/reel | (VDE0884 Part2) | |
| PS2815-4-V-F4 | PS2815-4-V-F4-A | | | Approved (Option) | |

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

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

| Parameter | | Symbol | Ratings | | Unit |
|---|---|---|---|---|---|
| | | | PS2815-1 | PS2815-4 | |
| Diode | Forward Current (DC) | $I_F$ | ±50 | | mA |
| | Power Dissipation Derating | $\Delta P_D$/°C | 0.6 | 0.7 | mW/°C |
| | Power Dissipation | $P_D$ | 60 | 70 | mW/ch |
| | Peak Forward Current*1 | $I_{FP}$ | ±1.0 | | A |
| Transistor | Collector to Emitter Voltage | $V_{CEO}$ | 40 | | V |
| | Emitter to Collector Voltage | $V_{ECO}$ | 5 | | V |
| | Collector Current | $I_C$ | 40 | | mA/ch |
| | Power Dissipation Derating | $\Delta P_C$/°C | 1.2 | | mW/°C |
| | Power Dissipation | $P_C$ | 120 | | mW/ch |
| Isolation Voltage*2 | | BV | 2 500 | | Vr.m.s. |
| Operating Ambient Temperature | | $T_A$ | −55 to +100 | | °C |
| Storage Temperature | | $T_{stg}$ | −55 to +150 | | °C |

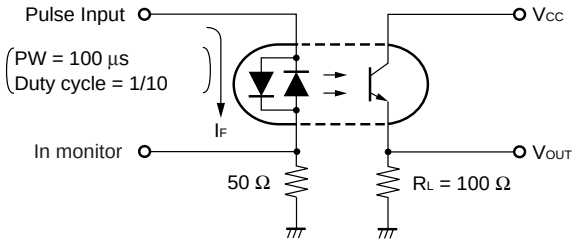
***1** PW = 100 μs, Duty Cycle = 1%

***2** AC voltage for 1 minute at $T_A$ = 25°C, RH = 60% between input and output.
Pins 1-2 shorted together, 3-4 shorted together (PS2815-1).
Pins 1-8 shorted together, 9-16 shorted together (PS2815-4).

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

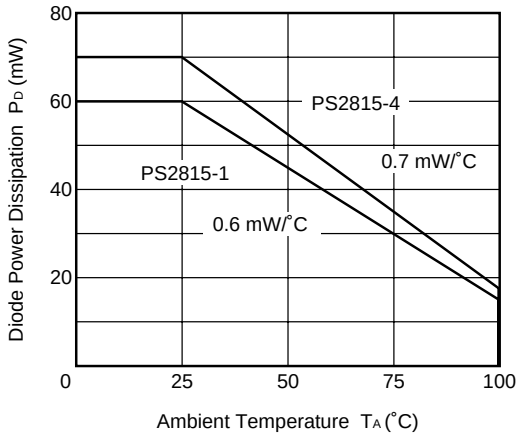
| Parameter | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|---|
| Diode | Forward Voltage | $V_F$ | $I_F$ = ±5 mA | | 1.15 | 1.4 | V |
| | Terminal Capacitance | $C_t$ | V = 0 V, f = 1 MHz | | 30 | | pF |
| Transistor | Collector to Emitter Dark Current | $I_{CEO}$ | $I_F$ = 0 mA, $V_{CE}$ = 40 V | | | 100 | nA |
| Coupled | Current Transfer Ratio ($I_C/I_F$) | CTR | $I_F$ = ±1 mA, $V_{CE}$ = 5 V | 100 | 200 | 400 | % |
| | Collector Saturation Voltage | $V_{CE\ (sat)}$ | $I_F$ = ±1 mA, $I_C$ = 0.2 mA | | | 0.3 | V |
| | Isolation Resistance | $R_{I-O}$ | $V_{I-O}$ = 1 $kV_{DC}$ | $10^{11}$ | | | Ω |
| | Isolation Capacitance | $C_{I-O}$ | V = 0 V, f = 1 MHz | | 0.4 | | pF |
| | Rise Time *1 | $t_r$ | $V_{CC}$ = 5 V, $I_C$ = 2 mA, $R_L$ = 100 Ω | | 4 | | μs |
| | Fall Time *1 | $t_f$ | | | 5 | | |

***1** Test circuit for switching time

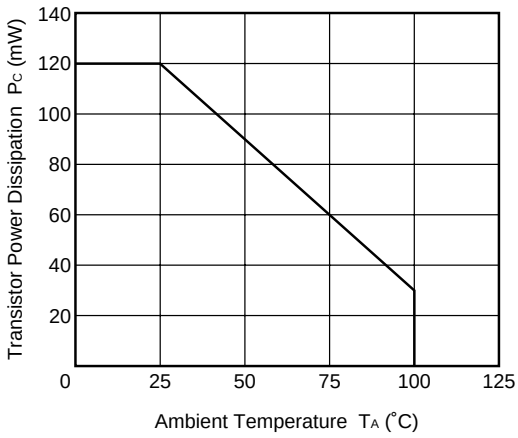


**TYPICAL CHARACTERISTICS (Unless otherwise specified, $T_A$ = 25°C)**

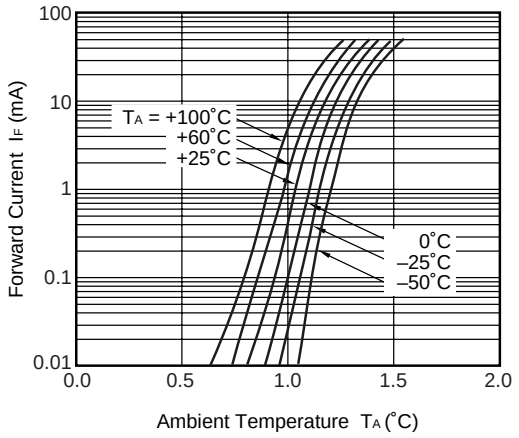
DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE



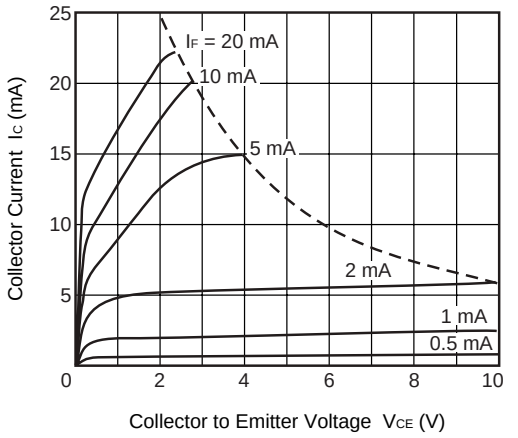

TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



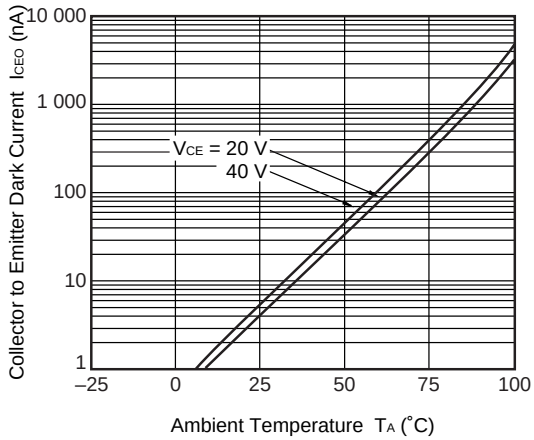

FORWARD CURRENT vs. AMBIENT TEMPERATURE



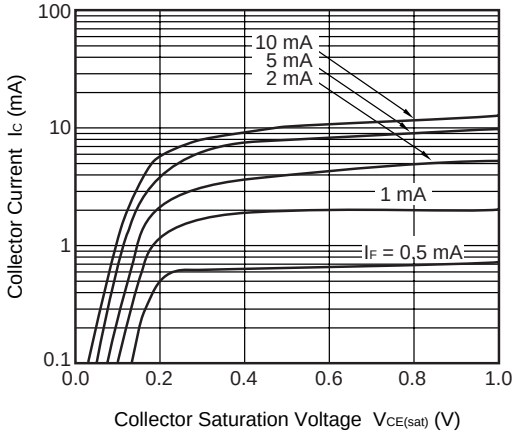

COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE




COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE

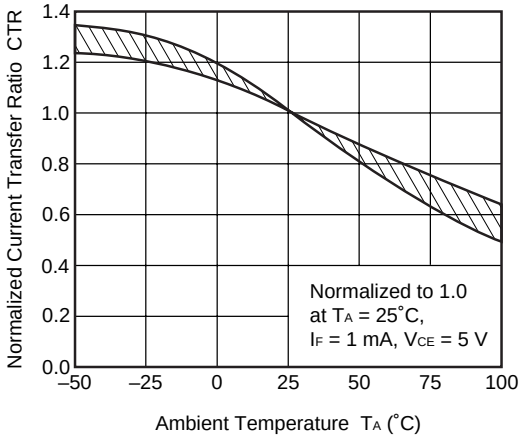



COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE

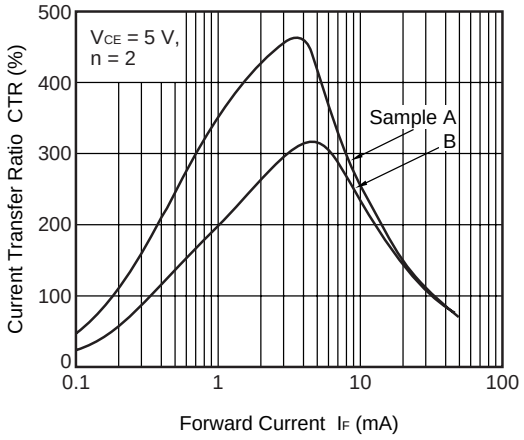



**Remark** The graphs indicate nominal characteristics.

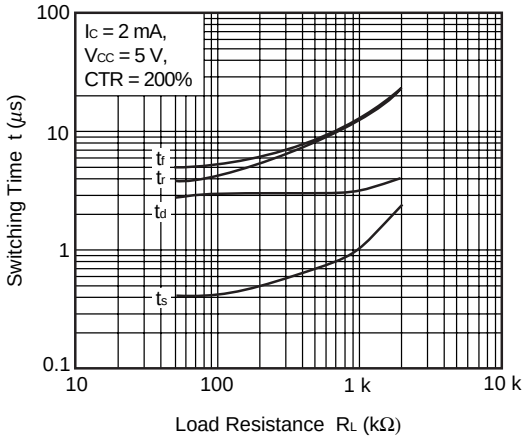
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



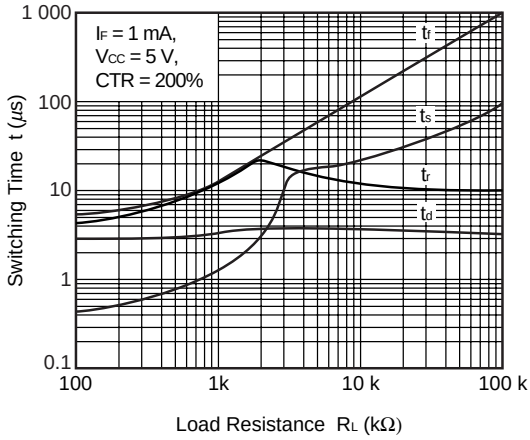

CURRENT TRANSFER RATIO vs. FORWARD CURRENT



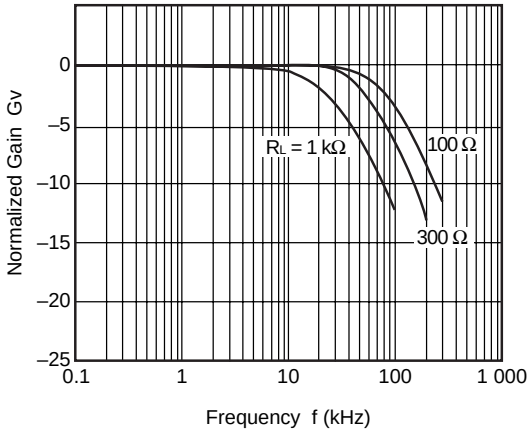

SWITCHING TIME vs. LOAD RESISTANCE



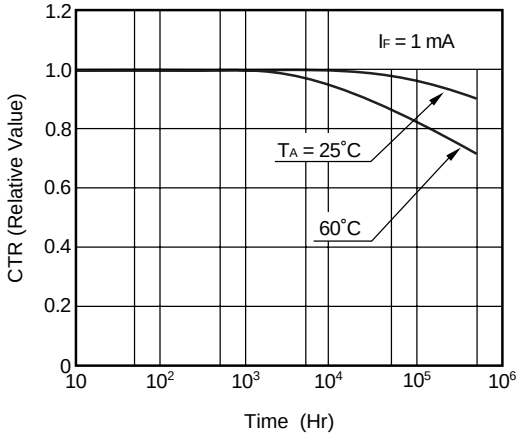

SWITCHING TIME vs. LOAD RESISTANCE




FREQUENCY RESPONSE



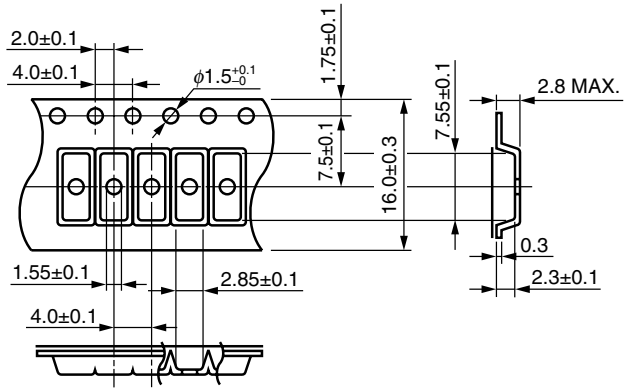

LONG TERM CTR DEGRADATION



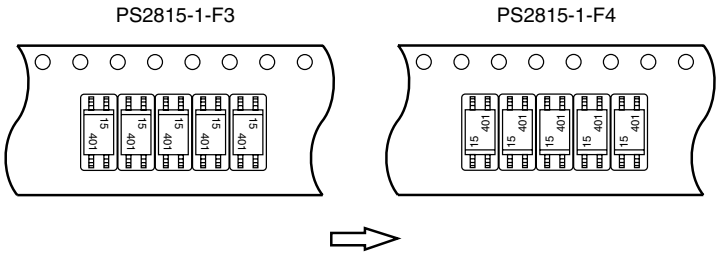

**Remark** The graphs indicate nominal characteristics.

**TAPING SPECIFICATIONS (UNIT: mm)**

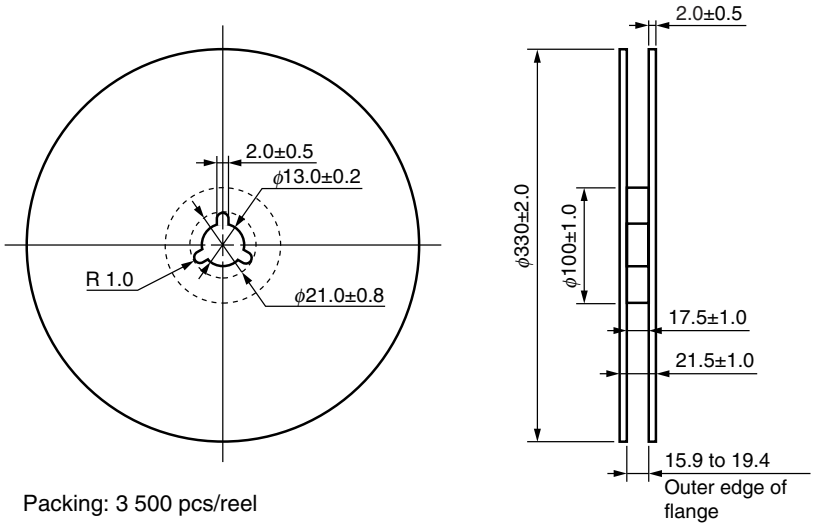
Outline and Dimensions (Tape)




Tape Direction

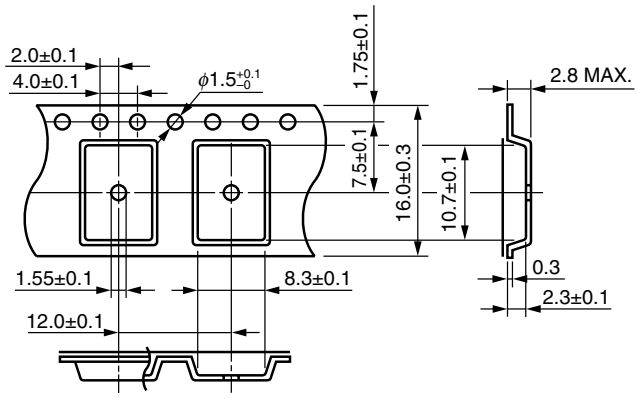



Outline and Dimensions (Reel)

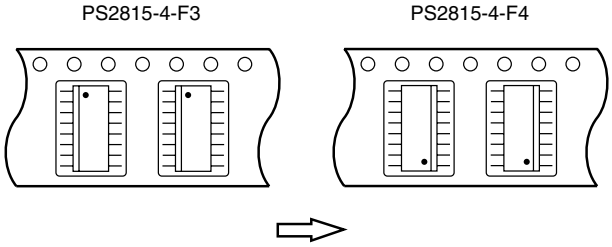



Packing: 3 500 pcs/reel

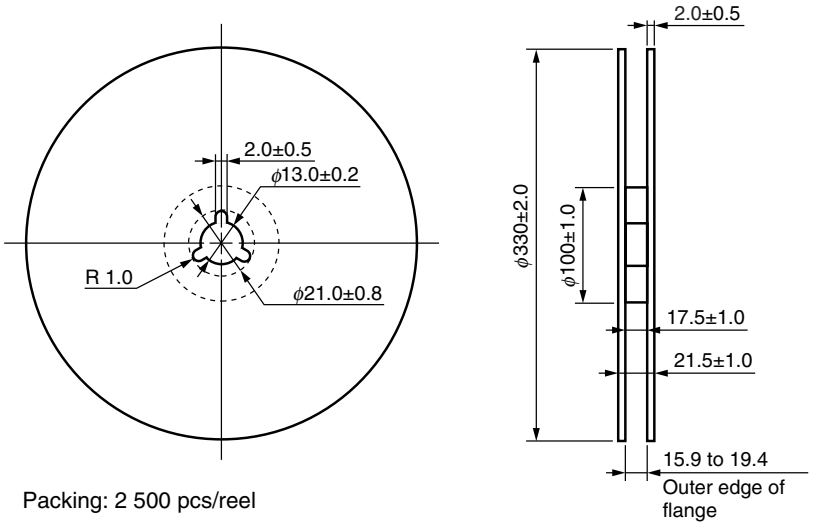
Outline and Dimensions (Tape)




Tape Direction




Outline and Dimensions (Reel)




Packing: 2 500 pcs/reel

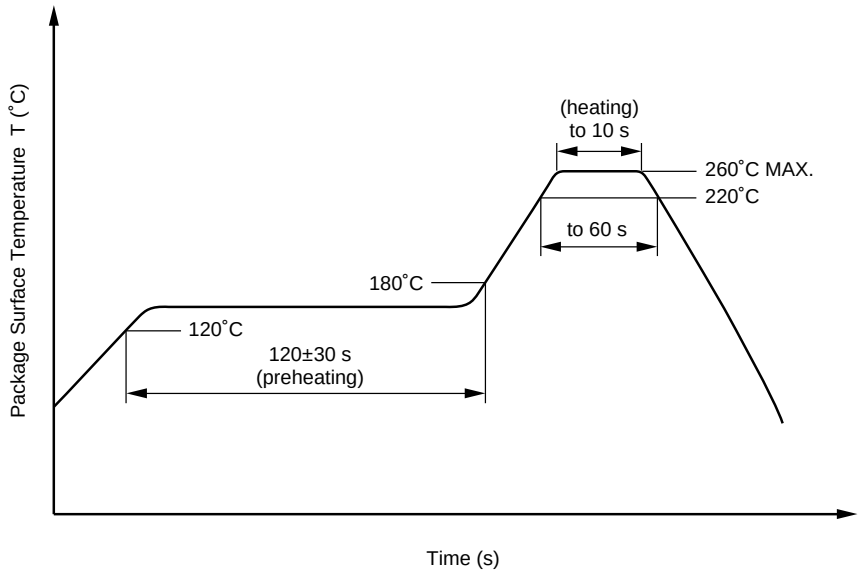
## ★ NOTES ON HANDLING

### 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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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 | |
|---|---|---|---|
| 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.