CEL

Solid State Relay
OCMOS FET

# PS7142-1C,PS7142L-1C

## 8-PIN DIP, 400 V BREAK DOWN VOLTAGE, TRANSFER TYPE 2-ch Optical Coupled MOS FET

### DESCRIPTION

The PS7142-1C and PS7142L-1C are transfer type solid state relays containing normally open (N.O.) contact and normally close (N.C.) contact on output side.

They are suitable for analog signal control because of their low offset and high linearity.

The PS7142L-1C has a surface mount type lead.

### FEATURES

- 2 channel type (1 a + 1 b output)
- Low LED operating current ($I_F$ = 2 mA)
- Designed for AC/DC switching line changer
- Small package (8-pin DIP)
- Low offset voltage
- PS7142L-1C: Surface mount type

### APPLICATIONS

- Exchange equipment
- Measurement equipment
- FA/OA equipment

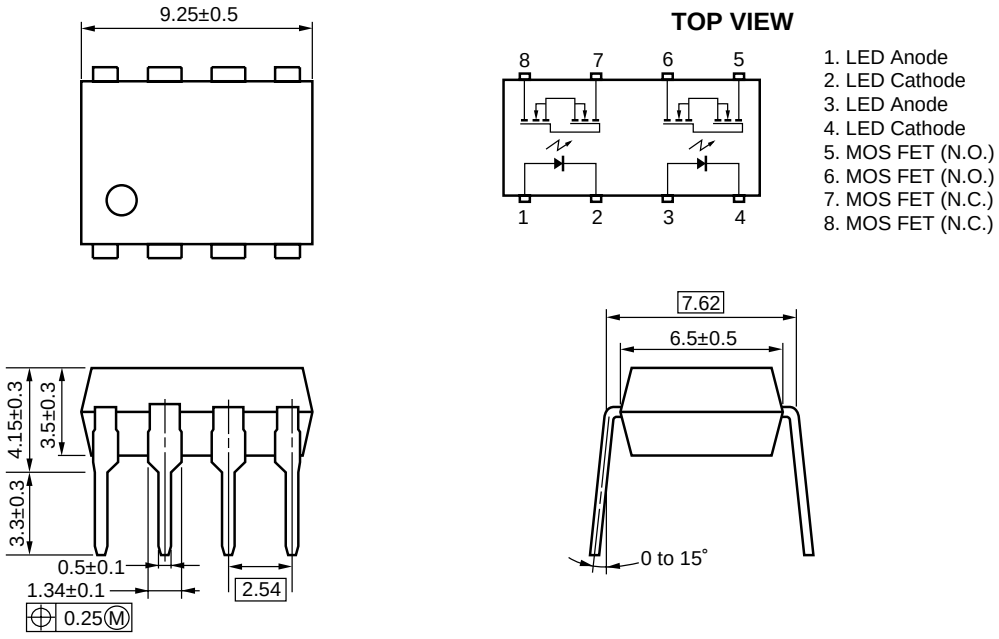


Document No. PN10286EJ01V1DS (1st edition)
(Previous No. P13863EJ4V0DS00)
Date Published February 2003 CP(K)

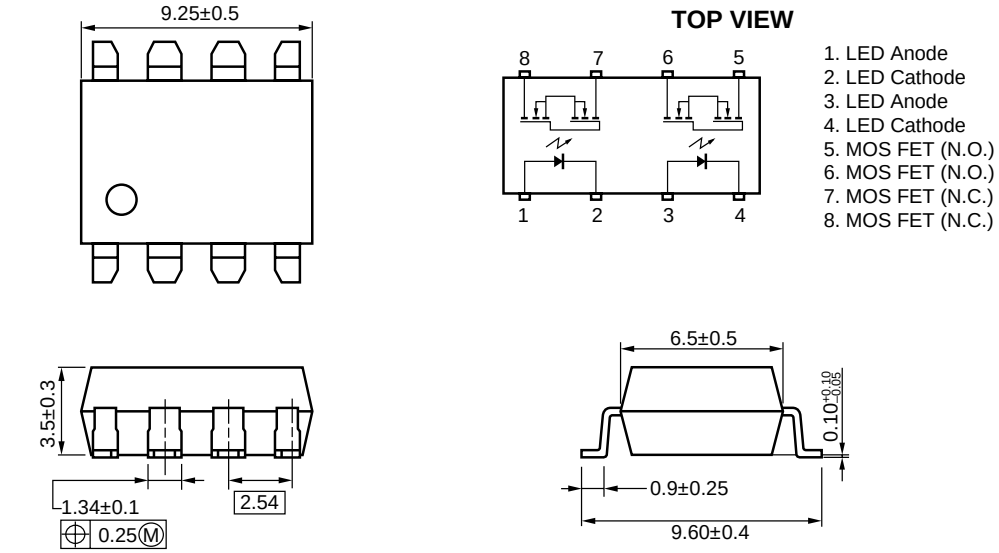
**The mark ★ shows major revised points.**

**PACKAGE DIMENSIONS (in millimeters)**

**PS7142-1C**




**PS7142L-1C**



## ORDERING INFORMATION (Solder Contains Lead)

| Part Number | Package | Packing Style | Application Part Number *1 |
|---|---|---|---|
| PS7142-1C | 8-pin DIP | Magazine case 50 pcs | PS7142-1C |
| PS7142L-1C | | | PS7142L-1C |
| PS7142L-1C-E3 | | Embossed Tape 1 000 pcs/reel | |
| PS7142L-1C-E4 | | | |

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

## ORDERING INFORMATION (Pb-Free)

| Part Number | Package | Packing Style | Application Part Number *1 |
|---|---|---|---|
| PS7142-1C-A | 8-pin DIP | Magazine case 50 pcs | PS7142-1C |
| PS7142L-1C-A | | | PS7142L-1C |
| PS7142L-1C-E3-A | | Embossed Tape 1 000 pcs/reel | |
| PS7142L-1C-E4-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)

| Parameter | | Symbol | Ratings | Unit |
|---|---|---|---|---|
| Diode | Forward Current (DC) | $I_F$ | 50 | mA |
| | Reverse Voltage | $V_R$ | 5.0 | V |
| | Power Dissipation | $P_D$ | 50 | mW/ch |
| | Peak Forward Current *1 | $I_{FP}$ | 1 | A |
| MOS FET | Break Down Voltage | $V_L$ | 400 | V |
| | Continuous Load Current | $I_L$ | 200 | mA |
| | Pulse Load Current *2 (AC/DC Connection) | $I_{LP}$ | 400 | mA |
| | Power Dissipation | $P_D$ | 375 | mW/ch |
| Isolation Voltage *3 | | BV | 1 500 | Vr.m.s. |
| Total Power Dissipation | | $P_T$ | 850 | mW |
| ★ Operating Ambient Temperature | | $T_A$ | −40 to +85 | °C |
| Storage Temperature | | $T_{stg}$ | −40 to +100 | °C |

***1** PW = 100 μs, Duty Cycle = 1 %

***2** PW = 100 ms, 1 shot

***3** AC voltage for 1 minute at $T_A$ = 25 °C, RH = 60 % between input and output

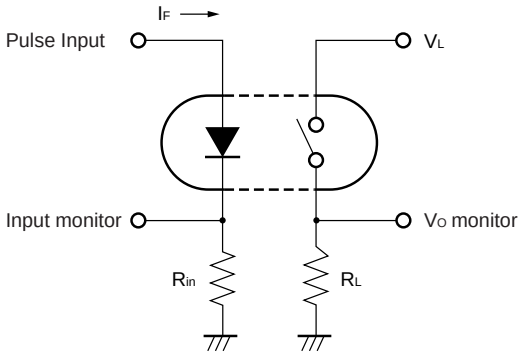
## RECOMMENDED OPERATING CONDITIONS ($T_A$ = 25 °C)

| Parameter | Symbol | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|
| LED Operating Current | $I_F$ | 2 | 10 | 20 | mA |
| LED Off Voltage | $V_F$ | 0 | | 0.5 | V |

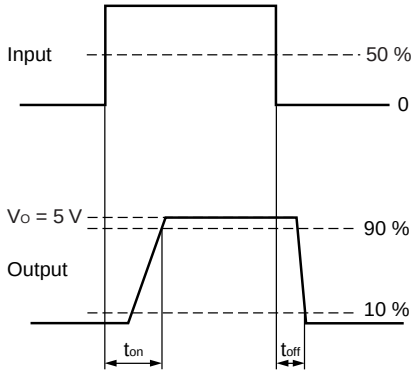
## ELECTRICAL CHARACTERISTICS ($T_A$ = 25 °C)

| Parameter | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|---|
| Diode | Forward Voltage | $V_F$ | $I_F$ = 10 mA | | 1.2 | 1.4 | V |
| | Reverse Current | $I_R$ | $V_R$ = 5 V | | | 5.0 | μA |
| MOS FET | Off-state Leakage Current | $I_{Loff}$ | N.O. : $I_F$ = 0 mA, $V_D$ = 400 V | | 0.03 | 1.0 | μA |
| | | | N.C. : $I_F$ = 10 mA, $V_D$ = 400 V | | | | |
| | Output Capacitance | $C_{out}$ | N.O. : $V_D$ = 0 V, f = 1 MHz | | 140 | | pF/ch |
| | | | N.C. : $V_D$ = 0 V, f = 1 MHz, $I_F$ = 10 mA | | 430 | | |
| Coupled | LED On-state Current | $I_{Fon}$ | N.O. : $I_L$ = 200 mA | | | 2.0 | mA |
| | LED Off-state Current | $I_{Foff}$ | N.C. : $I_L$ = 200 mA | | | 2.0 | |
| | On-state Resistance | $R_{on1}$ | N.O. : $I_F$ = 10 mA, $I_L$ = 10 mA | | 8 | 12 | Ω |
| | | | N.C. : $I_F$ = 0 mA, $I_L$ = 10 mA | | 7 | 12 | |
| | | $R_{on2}$ | N.O. : $I_F$ = 10 mA, $I_L$ = 200 mA, t ≤ 10 ms | | 7 | 10 | |
| | | | N.C. : $I_F$ = 0 mA, $I_L$ = 200 mA, t ≤ 10 ms | | 7 | 10 | |
| ★ | Turn-on Time *1 | $t_{on (N.O.)}$ | $I_F$ = 10 mA, $V_O$ = 5 V, $R_L$ = 500 Ω, PW ≥ 10 ms | | 0.3 | 2.0 | ms |
| | | $t_{on (N.C.)}$ | | | 0.03 | 0.2 | |
| | Turn-off Time *1 | $t_{off (N.O.)}$ | | | 0.03 | 0.2 | |
| | | $t_{off (N.C.)}$ | | | 0.6 | 2.0 | |
| | Isolation Resistance | $R_{I-O}$ | $V_{I-O}$ = 1.0 $kV_{DC}$ | $10^9$ | | | Ω |
| | Isolation Capacitance | $C_{I-O}$ | V = 0 V, f = 1 MHz | | 1.1 | | pF/ch |

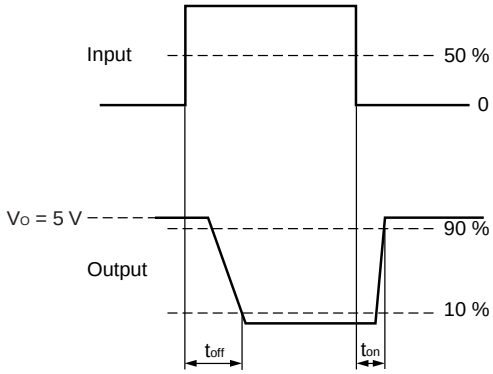
***1** Test Circuit for Switching Time



N.O. (between pin 5 and 6)

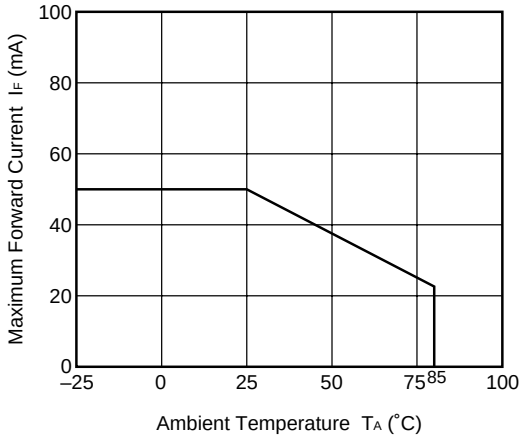



N.C. (between pin 7 and 8)

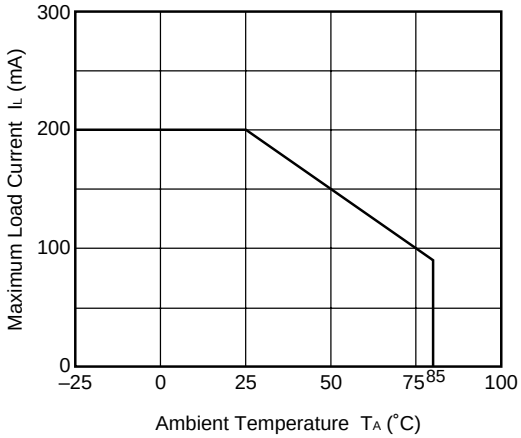


## ★ TYPICAL CHARACTERISTICS ($T_A$ = 25 °C, unless otherwise specified)

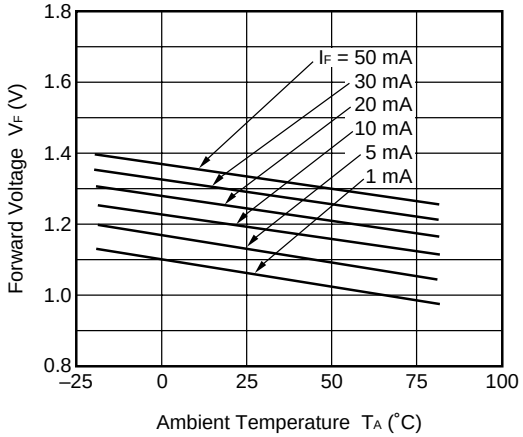
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



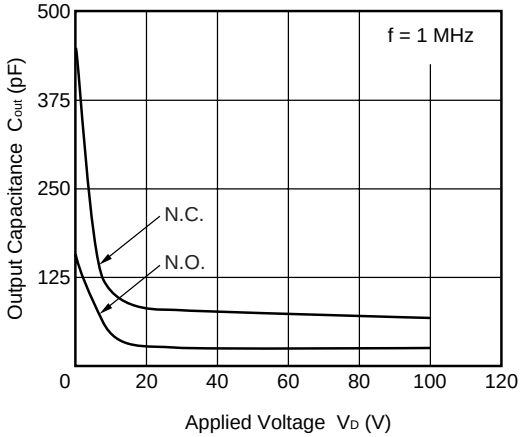

MAXIMUM LOAD CURRENT vs. AMBIENT TEMPERATURE



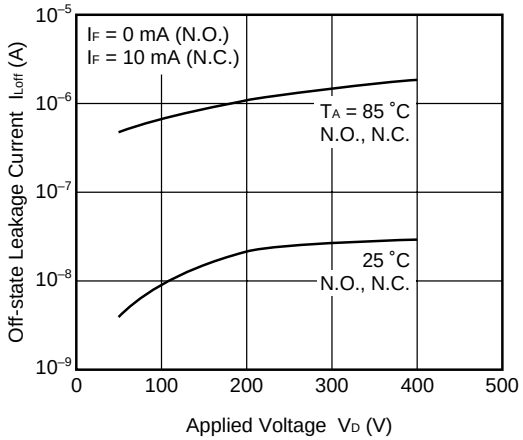

FORWARD VOLTAGE vs. AMBIENT TEMPERATURE



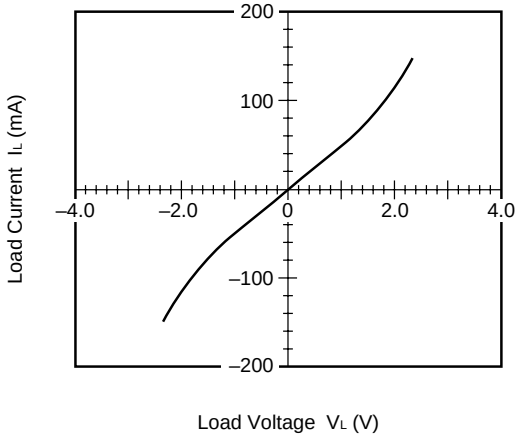

OUTPUT CAPACITANCE vs. APPLIED VOLTAGE



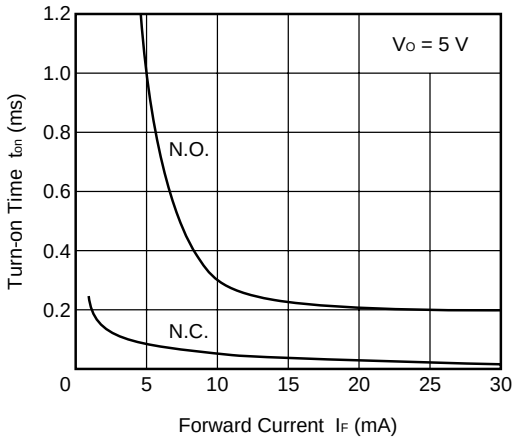

OFF-STATE LEAKAGE CURRENT vs. APPLIED VOLTAGE



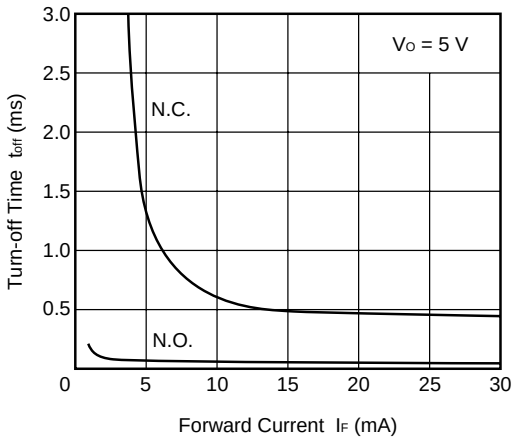

LOAD CURRENT vs. LOAD VOLTAGE



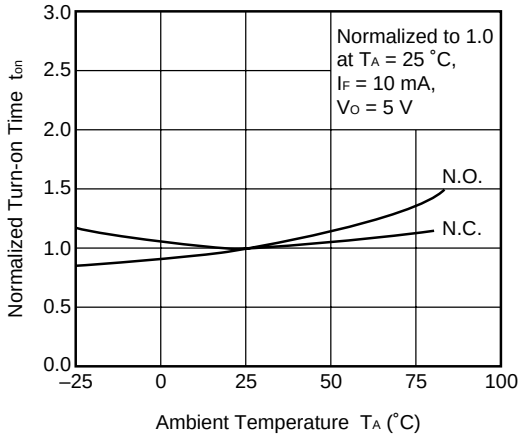
TURN-ON TIME vs. FORWARD CURRENT



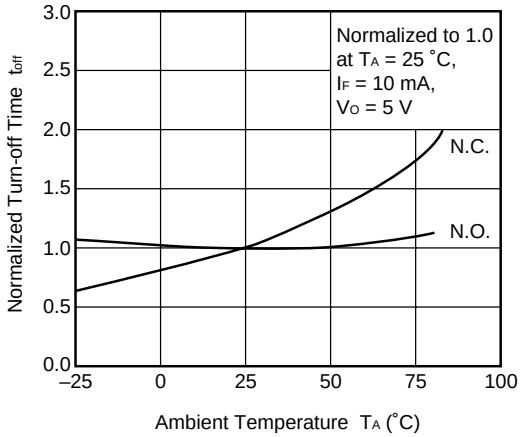

TURN-OFF TIME vs. FORWARD CURRENT



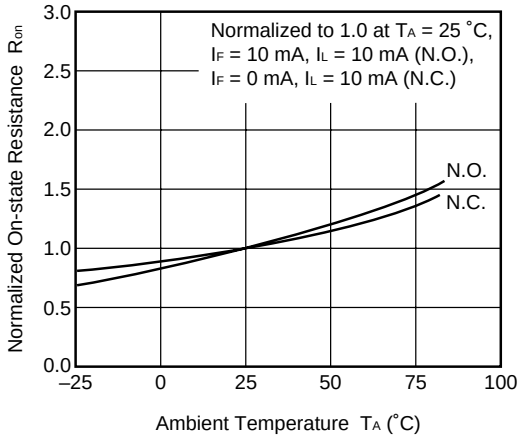

NORMALIZED TURN-ON TIME vs. AMBIENT TEMPERATURE



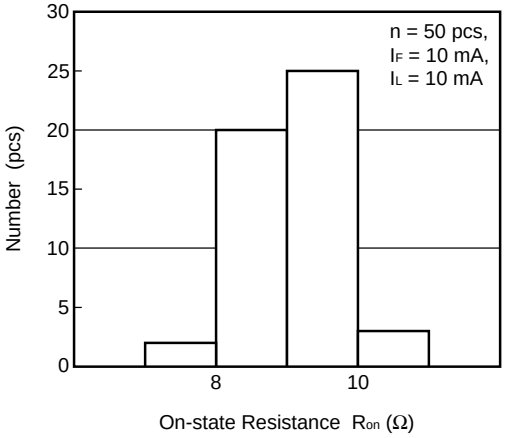

NORMALIZED TURN-OFF TIME vs. AMBIENT TEMPERATURE



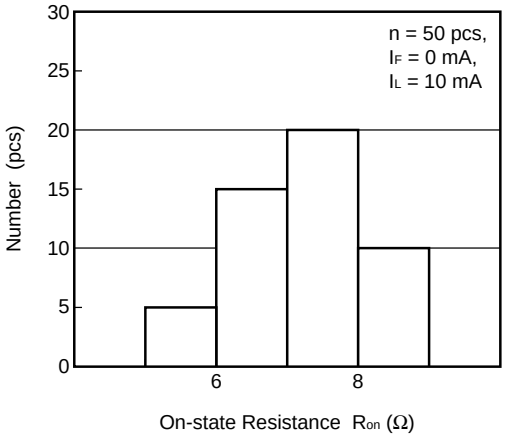

NORMALIZED ON-STATE RESISTANCE vs. AMBIENT TEMPERATURE



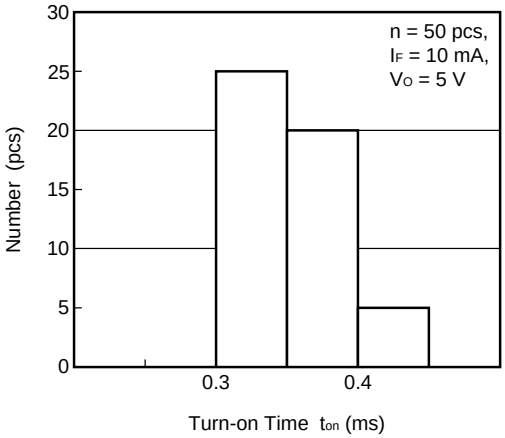
ON-STATE RESISTANCE (N.O.) DISTRIBUTION



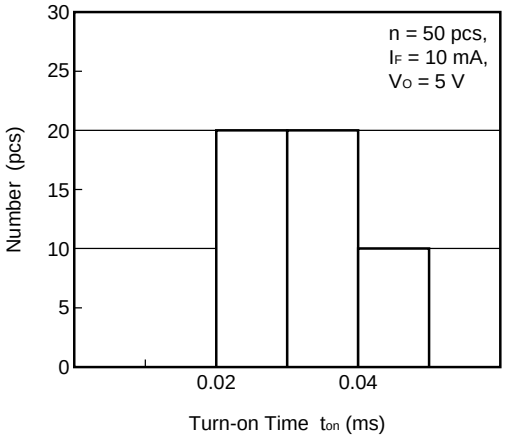

ON-STATE RESISTANCE (N.C.) DISTRIBUTION



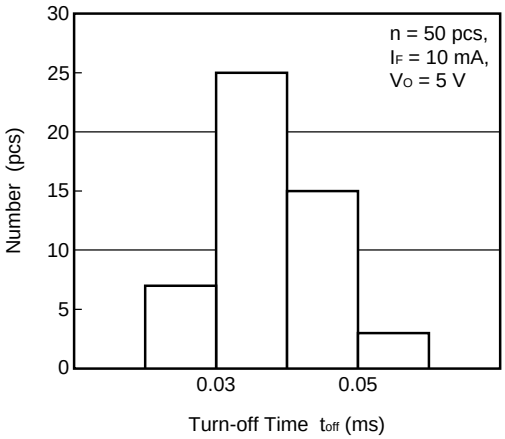

TURN-ON TIME (N.O.) DISTRIBUTION



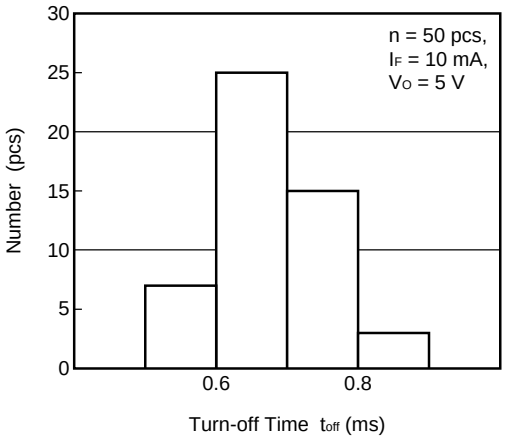

TURN-ON TIME (N.C.) DISTRIBUTION




TURN-OFF TIME (N.O.) DISTRIBUTION



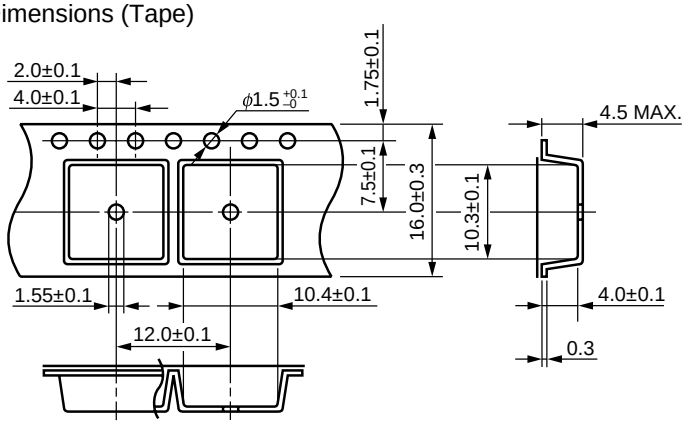

TURN-OFF TIME (N.C.) DISTRIBUTION



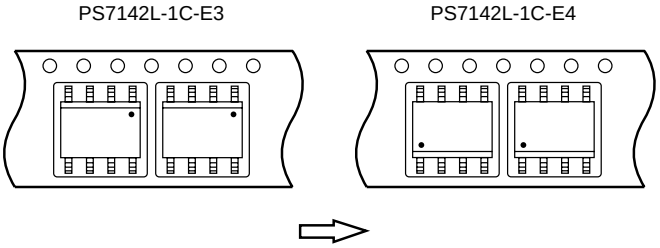

**Remark** The graphs indicate nominal characteristics.

★ **TAPING SPECIFICATIONS (in millimeters)**

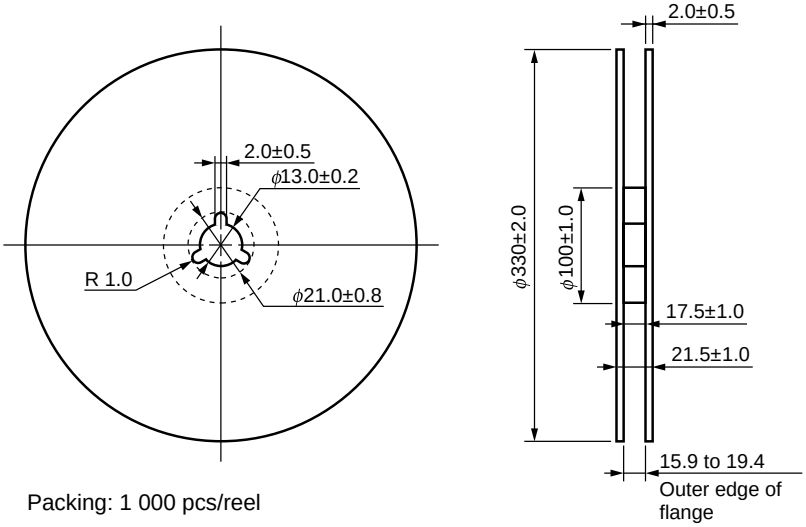
Outline and Dimensions (Tape)




Tape Direction




Outline and Dimensions (Reel)



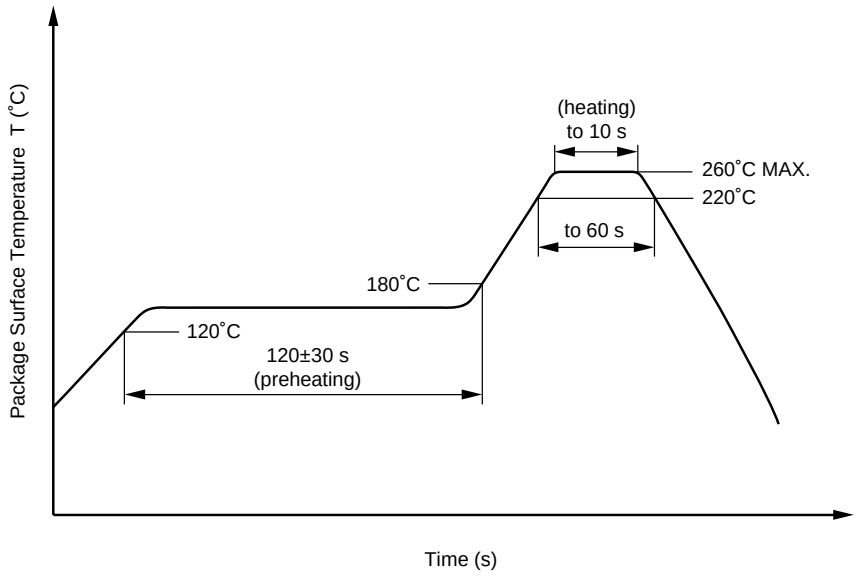

Packing: 1 000 pcs/reel

## ★ 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 |
| • Flux | Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.) |

### (3) Cautions

• Fluxes

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

CEL California Eastern Laboratories

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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.