



Solid State Relay  
OCMOS FET

# PS7241-1A

## 4-PIN SOP 400 V BREAK DOWN VOLTAGE 1-ch Optical Coupled MOS FET

### DESCRIPTION

The PS7241-1A is a solid state relay containing GaAs LEDs on the light emitting side (input side) and normally open (N.O.) contact MOS FETs on the output side.

It is suitable for analog signal control because of its low offset and high linearity.

### FEATURES

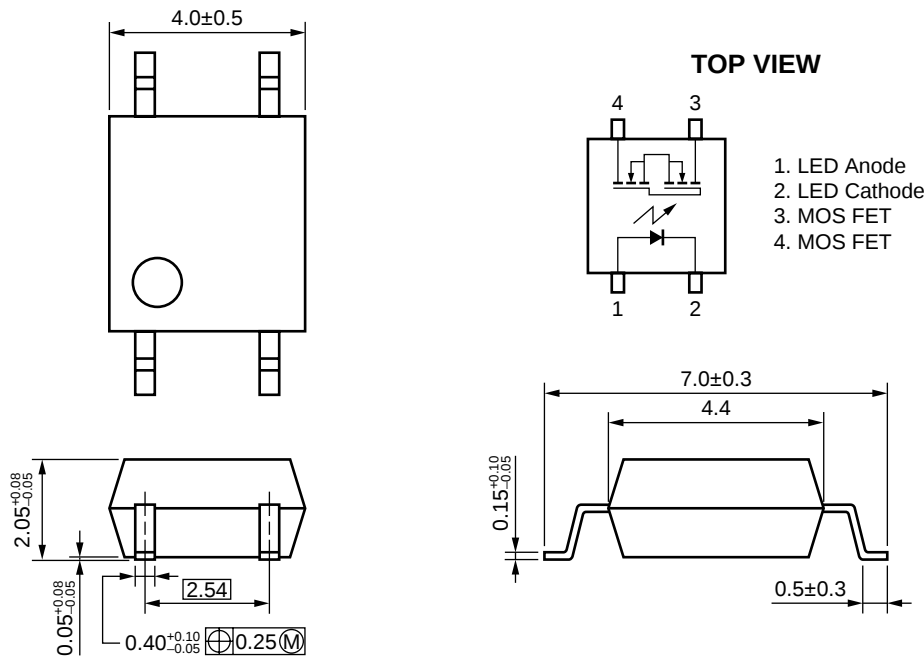
- Small and thin package (4-pin SOP, Height = 2.1 mm)
- 1 channel type (1 a output)
- Low LED operating current ( $I_F = 2 \text{ mA}$ )
- Designed for AC/DC switching line changer
- Low offset voltage
- Ordering number of taping product: PS7241-1A-E3, E4, E5, F3, F4
- UL approved: File No. E72422 (S)
- BSI approved: No. 8241/8242
- CSA approved: No. CA 101391
- VDE approved: No. 121302 ÜG

### APPLICATIONS

- Laptop PC, PDA
- Modem card
- Telephone, FAX
- Measurement equipment

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



**ORDERING INFORMATION (Solder Contains Lead)**

| Part Number  | Package   | Packing Style                | Application Part Number <sup>*1</sup> |
|--------------|-----------|------------------------------|---------------------------------------|
| PS7241-1A    | 4-pin SOP | Magazine case 100 pcs        | PS7241-1A                             |
| PS7241-1A-E3 |           | Embossed Tape 900 pcs/reel   |                                       |
| PS7241-1A-E4 |           |                              |                                       |
| PS7241-1A-E5 |           | Embossed Tape 1 000 pcs/reel |                                       |
| PS7241-1A-F3 |           | Embossed Tape 3 500 pcs/reel |                                       |
| PS7241-1A-F4 |           |                              |                                       |

<sup>\*1</sup> 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 <sup>*1</sup> |
|----------------|-----------|------------------------------|---------------------------------------|
| PS7241-1A-A    | 4-pin SOP | Magazine case 100 pcs        | PS7241-1A                             |
| PS7241-1A-E3-A |           | Embossed Tape 900 pcs/reel   |                                       |
| PS7241-1A-E4-A |           |                              |                                       |
| PS7241-1A-E5-A |           | Embossed Tape 1 000 pcs/reel |                                       |
| PS7241-1A-F3-A |           | Embossed Tape 3 500 pcs/reel |                                       |
| PS7241-1A-F4-A |           |                              |                                       |

<sup>\*1</sup> For the application of the Safety Standard, 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>   | 50          | mA      |
|                                 | Reverse Voltage                                        | V <sub>R</sub>   | 5.0         | V       |
|                                 | Power Dissipation                                      | P <sub>D</sub>   | 50          | mW      |
|                                 | Peak Forward Current <sup>*1</sup>                     | I <sub>FP</sub>  | 1           | A       |
| MOS FET                         | Break Down Voltage                                     | V <sub>L</sub>   | 400         | V       |
|                                 | Continuous Load Current                                | I <sub>L</sub>   | 120         | mA      |
|                                 | Pulse Load Current <sup>*2</sup><br>(AC/DC Connection) | I <sub>LP</sub>  | 240         | mA      |
|                                 | Power Dissipation                                      | P <sub>D</sub>   | 300         | mW      |
| Isolation Voltage <sup>*3</sup> |                                                        | BV               | 1 500       | Vr.m.s. |
| Total Power Dissipation         |                                                        | P <sub>T</sub>   | 350         | mW      |
| ★                               | Operating Ambient Temperature                          | T <sub>A</sub>   | −40 to +85  | °C      |
|                                 | Storage Temperature                                    | T <sub>stg</sub> | −40 to +100 | °C      |

<sup>\*1</sup> PW = 100 μs, Duty Cycle = 1 %

<sup>\*2</sup> PW = 100 ms, 1 shot

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

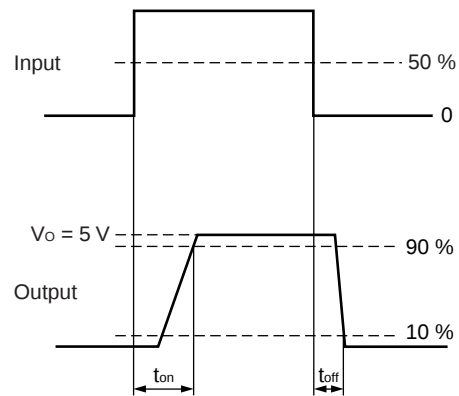
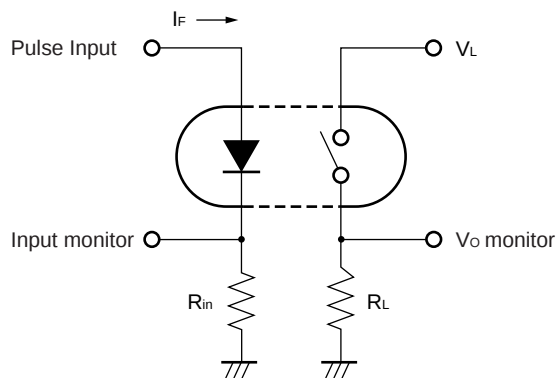
**RECOMMENDED OPERATING CONDITIONS ( $T_A = 25\text{ }^\circ\text{C}$ )**

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

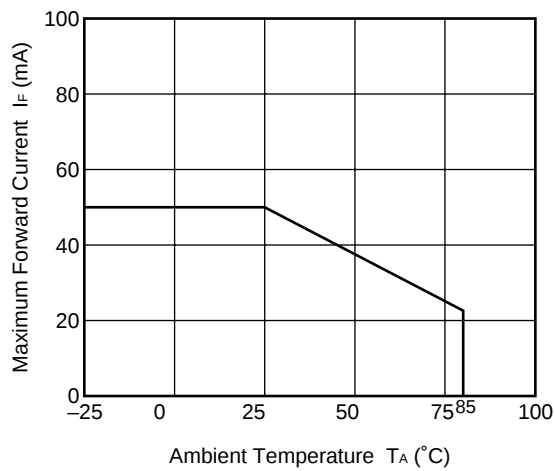
| Parameter |                             | Symbol            | Conditions                                                                                 | MIN.   | TYP. | MAX. | Unit          |
|-----------|-----------------------------|-------------------|--------------------------------------------------------------------------------------------|--------|------|------|---------------|
| Diode     | Forward Voltage             | $V_F$             | $I_F = 10\text{ mA}$                                                                       |        | 1.2  | 1.4  | V             |
|           | Reverse Current             | $I_R$             | $V_R = 5\text{ V}$                                                                         |        |      | 5.0  | $\mu\text{A}$ |
| MOS FET   | Off-state Leakage Current   | $I_{\text{Leak}}$ | $V_D = 400\text{ V}$                                                                       |        | 0.03 | 1.0  | $\mu\text{A}$ |
|           | Output Capacitance          | $C_{\text{out}}$  | $V_D = 0\text{ V}, f = 1\text{ MHz}$                                                       |        | 54   |      | pF            |
| Coupled   | LED On-state Current        | $I_{\text{Fon}}$  | $I_L = 120\text{ mA}$                                                                      |        |      | 2.0  | mA            |
|           | On-state Resistance         | $R_{\text{on1}}$  | $I_F = 10\text{ mA}, I_L = 10\text{ mA}$                                                   |        | 18   | 30   | $\Omega$      |
|           |                             | $R_{\text{on2}}$  | $I_F = 10\text{ mA}, I_L = 120\text{ mA}, t \leq 10\text{ ms}$                             |        | 15   | 25   |               |
|           | Turn-on Time <sup>*1</sup>  | $t_{\text{on}}$   | $I_F = 10\text{ mA}, V_O = 5\text{ V}, R_L = 500\text{ }\Omega,$<br>$PW \geq 10\text{ ms}$ |        | 0.5  | 2.0  | ms            |
|           | Turn-off Time <sup>*1</sup> | $t_{\text{off}}$  |                                                                                            |        | 0.07 | 0.2  |               |
|           | Isolation Resistance        | $R_{\text{I-O}}$  | $V_{\text{I-O}} = 1.0\text{ kV}_{\text{DC}}$                                               | $10^9$ |      |      | $\Omega$      |
|           | Isolation Capacitance       | $C_{\text{I-O}}$  | $V = 0\text{ V}, f = 1\text{ MHz}$                                                         |        | 0.5  |      | pF            |

**\*1 Test Circuit for Switching Time**

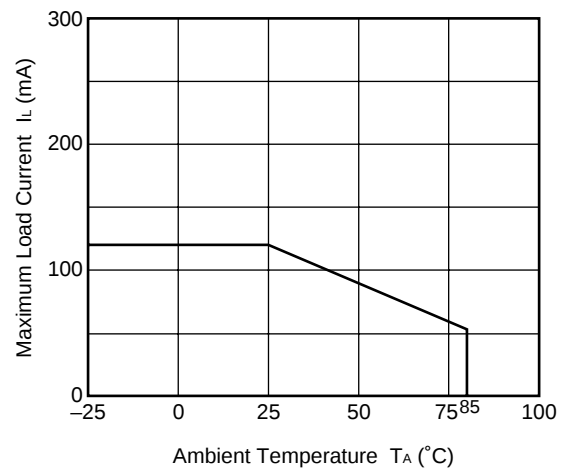


★ TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)

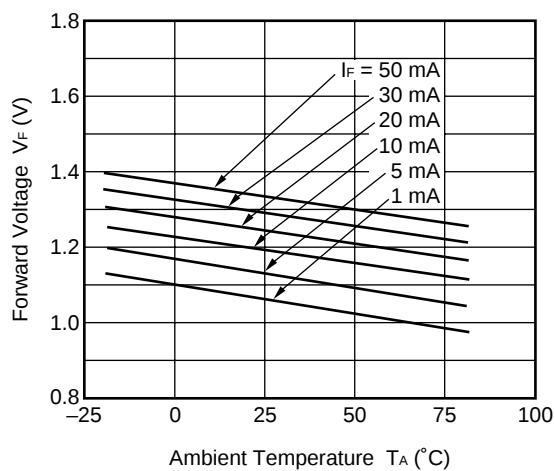
MAXIMUM FORWARD CURRENT vs.  
AMBIENT TEMPERATURE



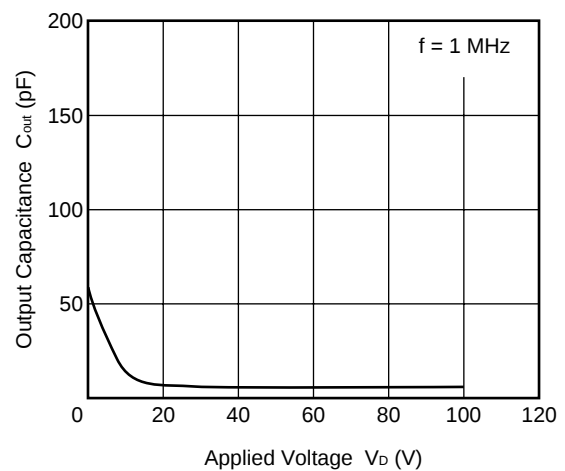
MAXIMUM LOAD CURRENT vs.  
AMBIENT TEMPERATURE



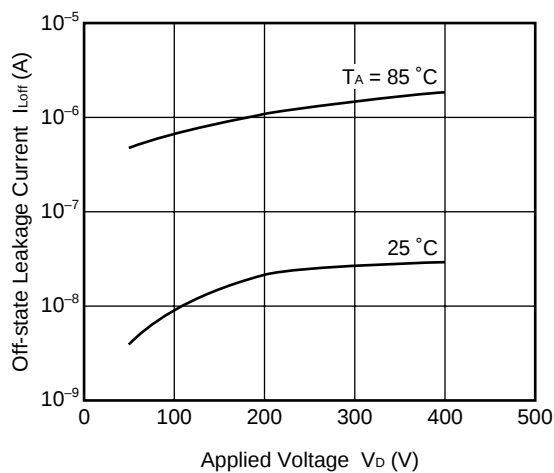
FORWARD VOLTAGE vs.  
AMBIENT TEMPERATURE



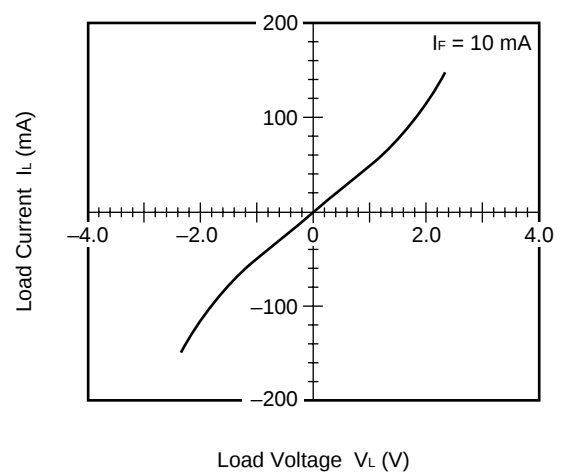
OUTPUT CAPACITANCE vs.  
APPLIED VOLTAGE



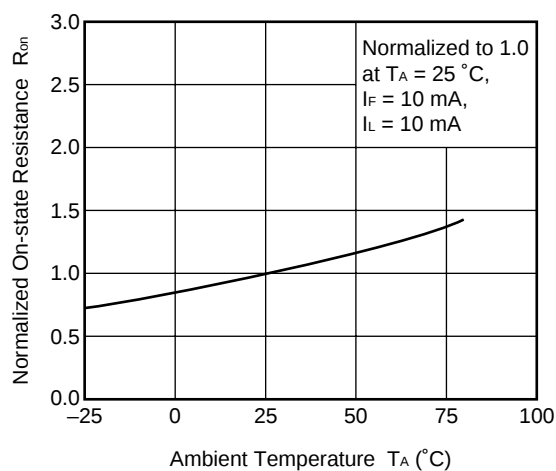
OFF-STATE LEAKAGE CURRENT vs.  
APPLIED VOLTAGE



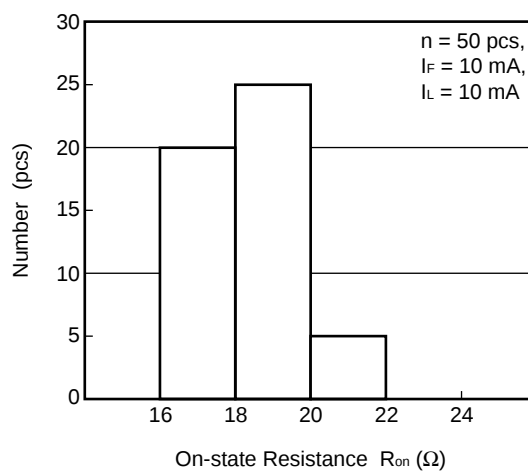
LOAD CURRENT vs. LOAD VOLTAGE



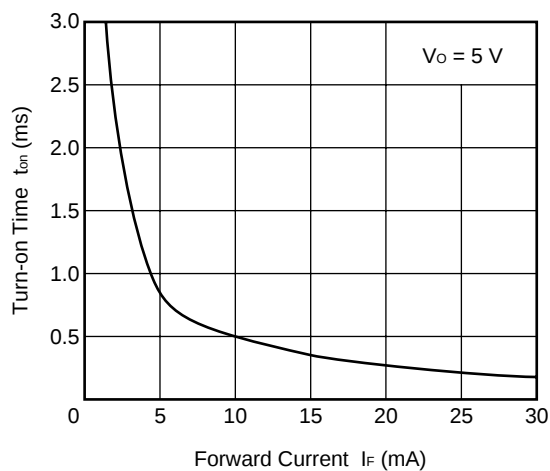
NORMALIZED ON-STATE RESISTANCE vs. AMBIENT TEMPERATURE



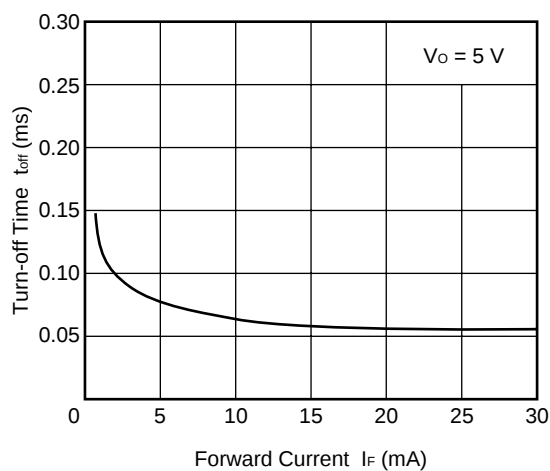
ON-STATE RESISTANCE DISTRIBUTION



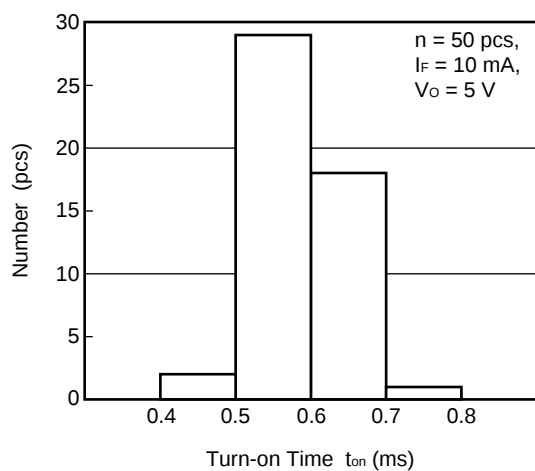
TURN-ON TIME vs. FORWARD CURRENT



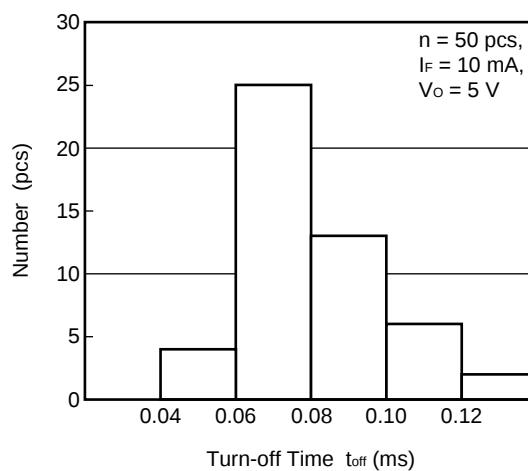
TURN-OFF TIME vs. FORWARD CURRENT

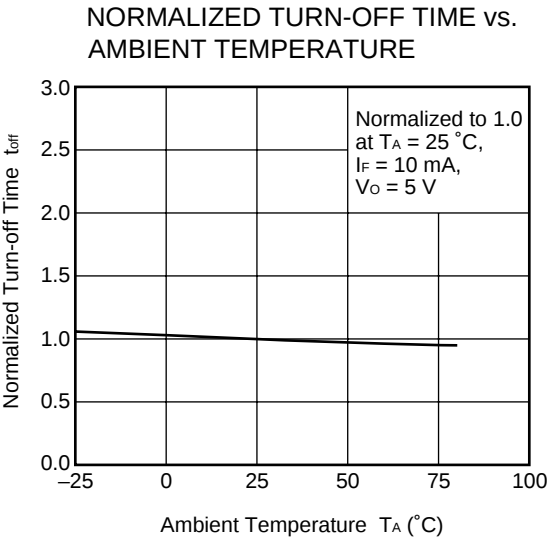
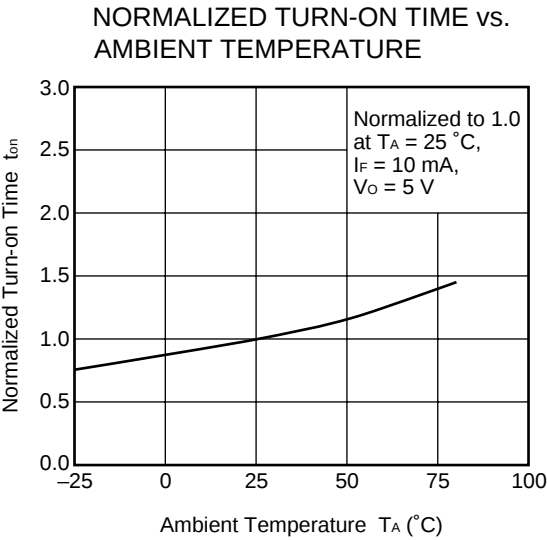


TURN-ON TIME DISTRIBUTION



TURN-OFF TIME DISTRIBUTION

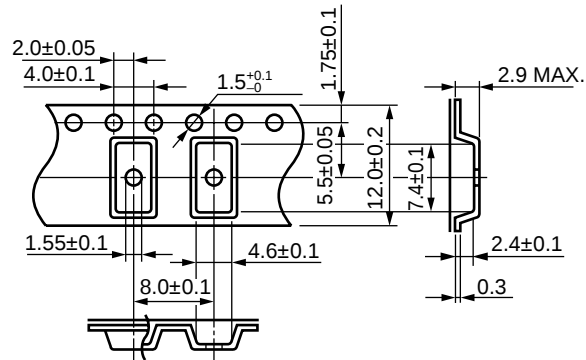




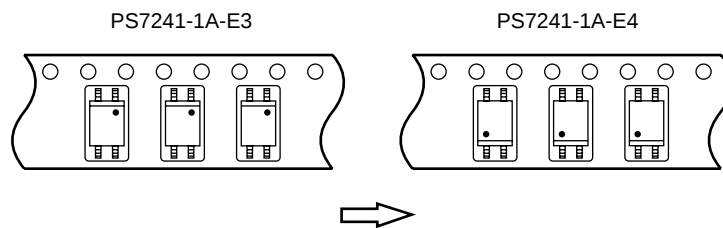
**Remark** The graphs indicate nominal characteristics.

★ TAPING SPECIFICATIONS (in millimeters)

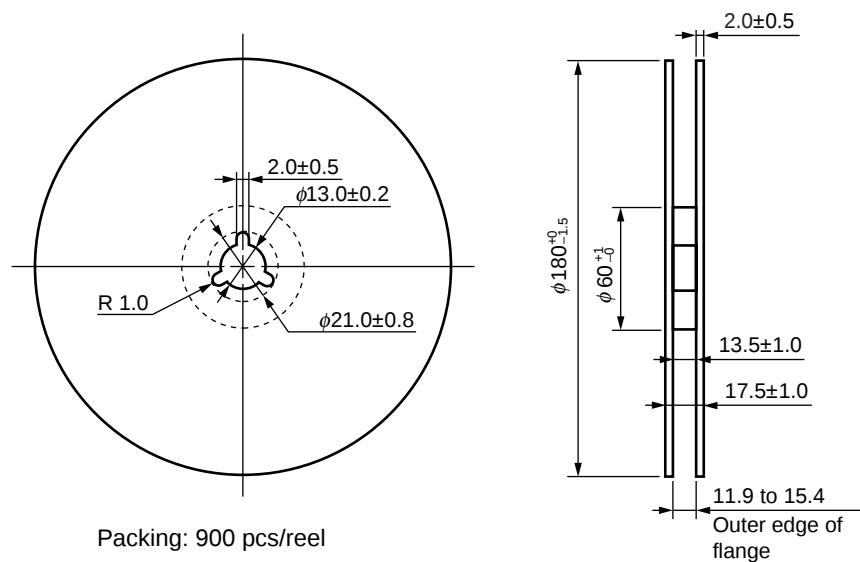
Outline and Dimensions (Tape)



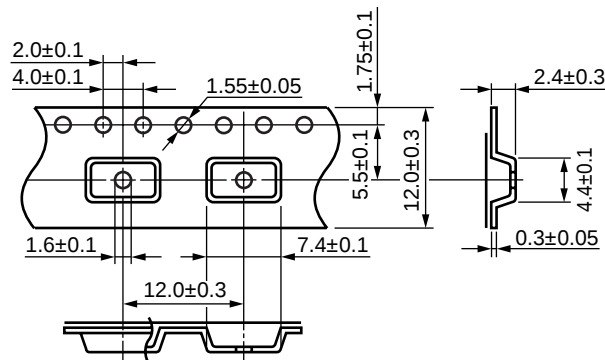
Tape Direction



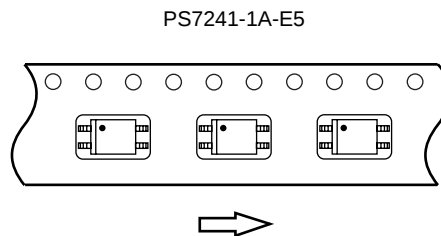
Outline and Dimensions (Reel)



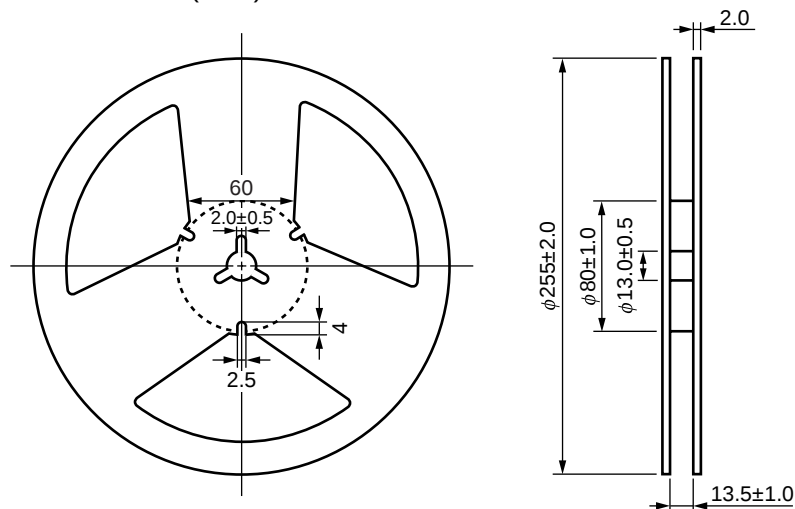
### Outline and Dimensions (Tape)



### Tape Direction

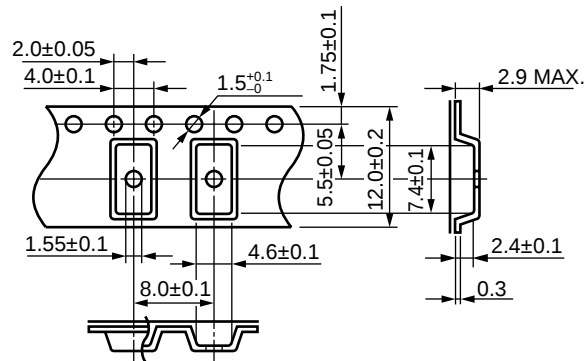


### Outline and Dimensions (Reel)

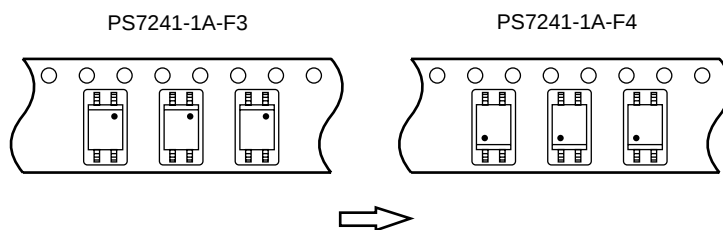


Packing: 1 000 pcs/reel

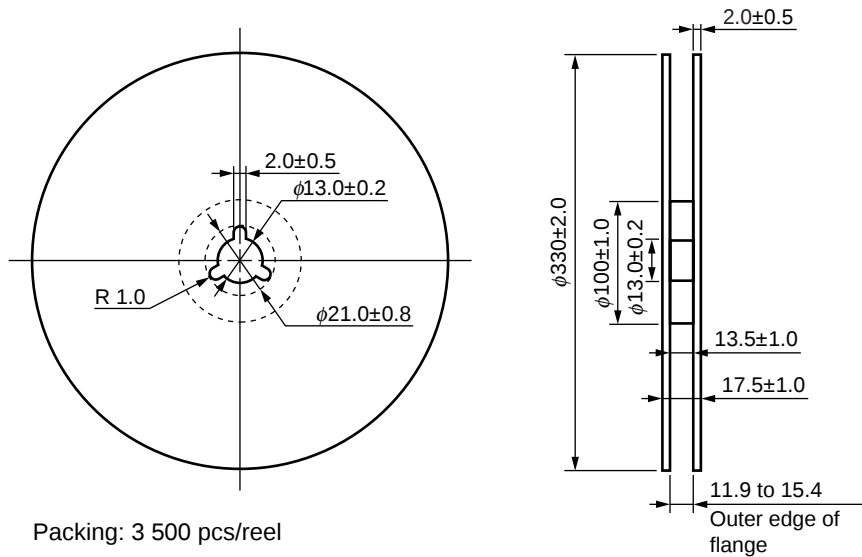
### Outline and Dimensions (Tape)



### Tape Direction



### Outline and Dimensions (Reel)



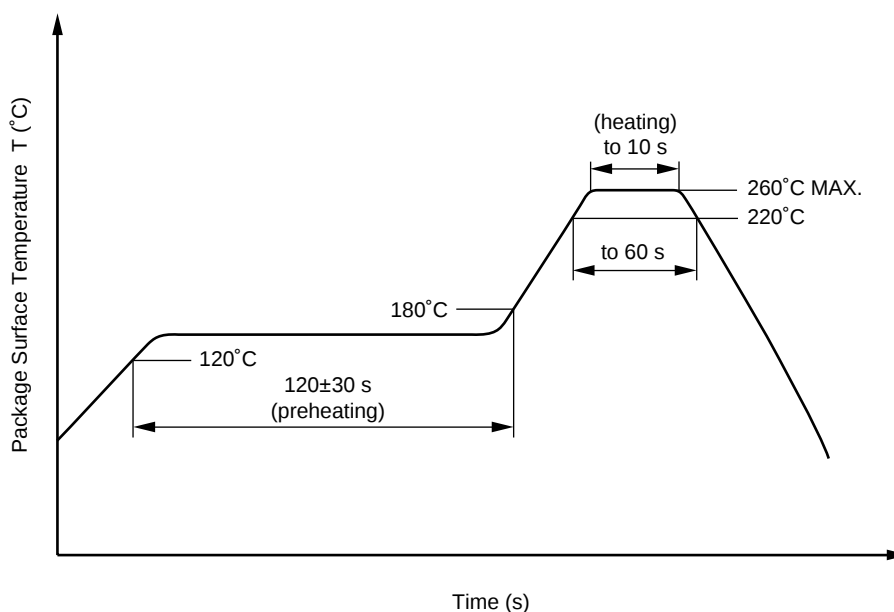
Packing: 3 500 pcs/reel

★ **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.

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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