

To our customers,

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## Old Company Name in Catalogs and Other Documents

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On April 1<sup>st</sup>, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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# PS7241E-1A

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

—NEPOC Series—

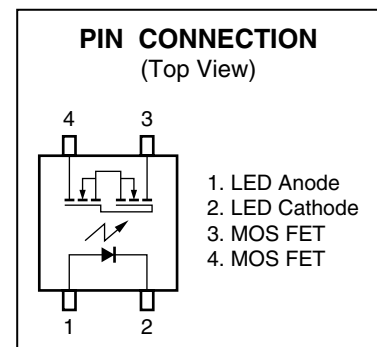
### DESCRIPTION

The PS7241E-1A is an optically coupled element that combines a GaAs infrared LED on the input side with a normally-open MOS FET on the output side to realize an excellent cost performance.

The small, thin package and high sensitivity of this element makes it ideal for battery-driven mobile devices, and its small offset voltage at power-on and good linearity are also make it suitable for controlling micro analog signals.

### FEATURES

- Small and thin package (4-pin SOP, Height = 2.1 mm)
- 1 channel type (1 a output)
- Designed for AC/DC switching line changer
- Low offset voltage
- <R> • Ordering number of taping product: PS7241E-1A-E3, E4: 900 pcs/reel  
: PS7241E-1A-F3, F4: 3 500 pcs/reel
- Pb-Free product
- Safety standards
  - UL approved: No. E72422
  - BSI approved: No. 8241/8242

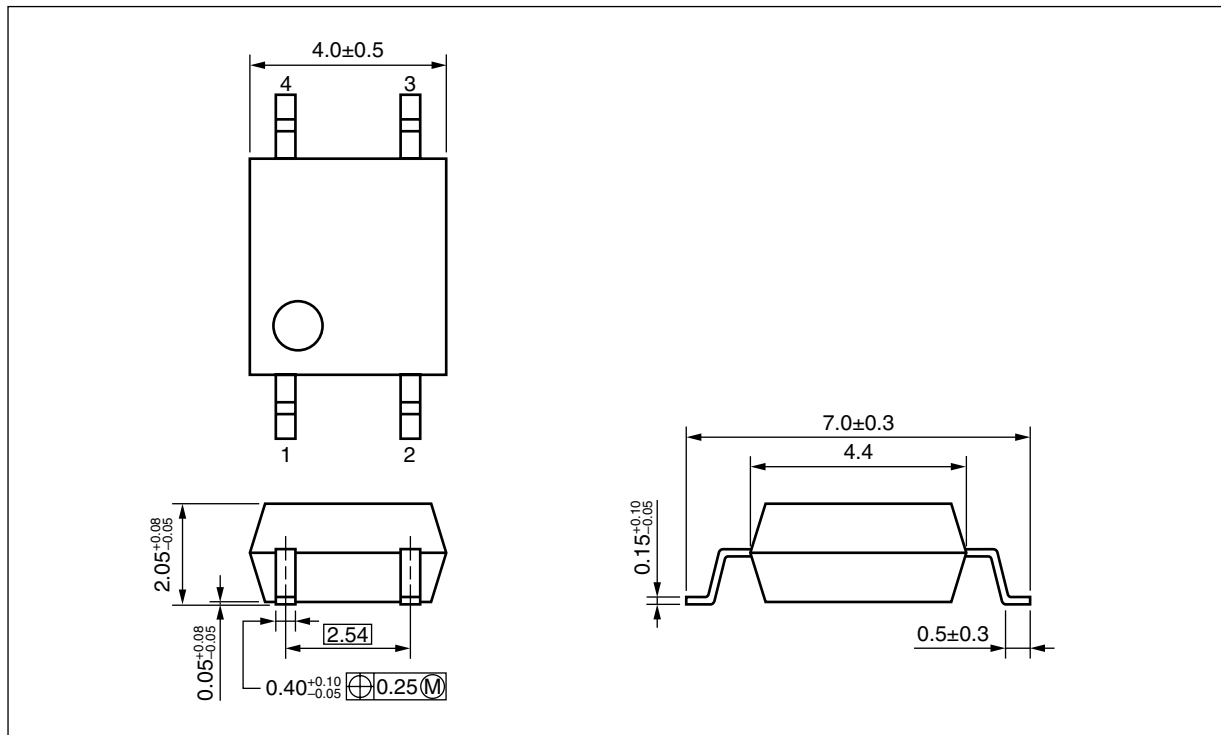


### APPLICATIONS

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

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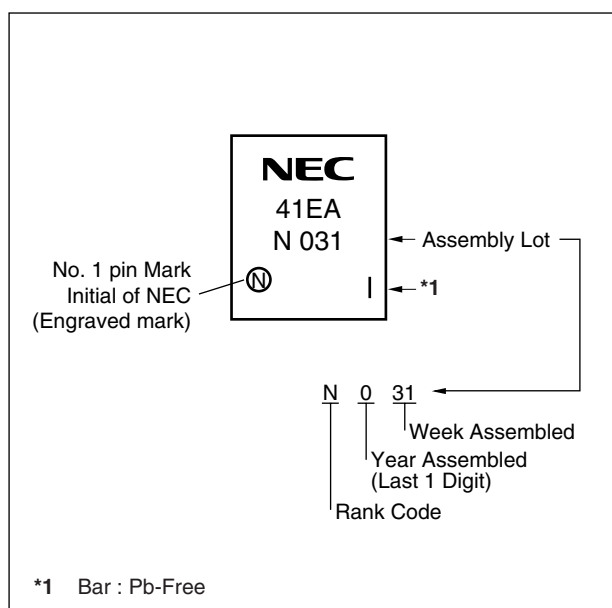
PACKAGE DIMENSIONS (UNIT: mm)



<R> PHOTOCOUPLER CONSTRUCTION

| Parameter               | Unit (MIN.) |
|-------------------------|-------------|
| Air Distance            | 5 mm        |
| Outer Creepage Distance | 5 mm        |
| Isolation Distance      | 0.4 mm      |

<R> MARKING EXAMPLE



# ORDERING INFORMATION

| Part Number   | Order Number    | Solder Plating Specification | Packing Style                | Safety Standard Approval                | Application Part Number <sup>*1</sup> |
|---------------|-----------------|------------------------------|------------------------------|-----------------------------------------|---------------------------------------|
| PS7241E-1A    | PS7241E-1A-A    | Pb-Free                      | Magazine case 100 pcs        | Standard products<br>(UL, BSI approved) | PS7241E-1A                            |
| PS7241E-1A-E3 | PS7241E-1A-E3-A |                              | Embossed Tape 900 pcs/reel   |                                         |                                       |
| PS7241E-1A-E4 | PS7241E-1A-E4-A |                              |                              |                                         |                                       |
| PS7241E-1A-F3 | PS7241E-1A-F3-A |                              | Embossed Tape 3 500 pcs/reel |                                         |                                       |
| PS7241E-1A-F4 | PS7241E-1A-F4-A |                              |                              |                                         |                                       |

\*1 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      |

\*1 PW = 100 μs, Duty Cycle = 1%

\*2 PW = 100 ms, 1 shot

\*3 AC voltage for 1 minute at T<sub>A</sub> = 25°C, RH = 60% between input and output.  
Pins 1-2 shorted together, 3-4 shorted together.

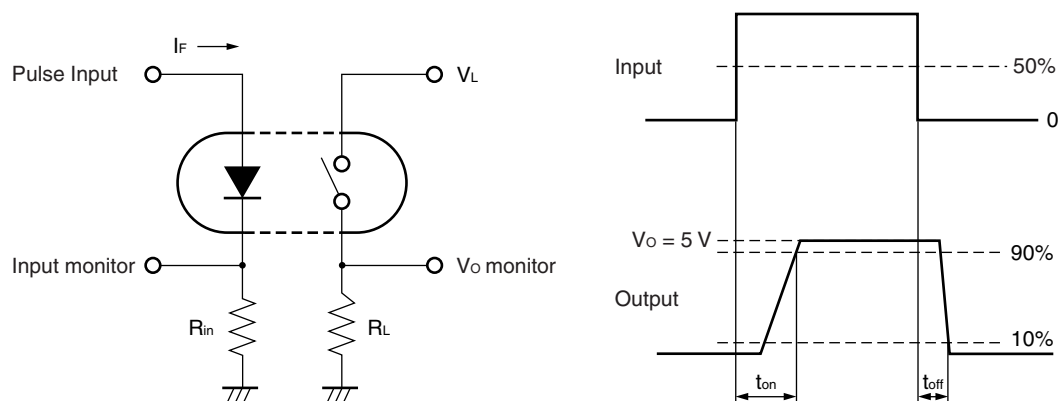
RECOMMENDED OPERATING CONDITIONS (T<sub>A</sub> = 25°C)

| Parameter             | Symbol         | MIN. | TYP. | MAX. | Unit |
|-----------------------|----------------|------|------|------|------|
| LED Operating Current | I <sub>F</sub> | 4    | 10   | 20   | mA   |
| LED Off Voltage       | V <sub>F</sub> | 0    |      | 0.5  | V    |

ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

| Parameter |                               | Symbol            | Conditions                                                                          | MIN.            | TYP. | MAX. | Unit |
|-----------|-------------------------------|-------------------|-------------------------------------------------------------------------------------|-----------------|------|------|------|
| Diode     | Forward Voltage               | V <sub>F</sub>    | I <sub>F</sub> = 10 mA                                                              |                 | 1.2  | 1.4  | V    |
|           | Reverse Current               | I <sub>R</sub>    | V <sub>R</sub> = 5 V                                                                |                 |      | 5.0  | μA   |
| MOS FET   | Off-state Leakage Current     | I <sub>Loff</sub> | V <sub>D</sub> = 400 V                                                              |                 |      | 1.0  | μA   |
|           | Output Capacitance            | C <sub>out</sub>  | V <sub>D</sub> = 0 V, f = 1 MHz                                                     |                 | 50   |      | pF   |
| Coupled   | LED On-state Current          | I <sub>Fon</sub>  | I <sub>L</sub> = 120 mA                                                             |                 |      | 4.0  | mA   |
|           | On-state Resistance           | R <sub>on1</sub>  | I <sub>F</sub> = 10 mA, I <sub>L</sub> = 10 mA                                      |                 | 22   | 30   | Ω    |
|           |                               | R <sub>on2</sub>  | I <sub>F</sub> = 10 mA, I <sub>L</sub> = 120 mA, t ≤ 10 ms                          |                 | 17   | 23   |      |
|           | Turn-on Time <sup>*1,2</sup>  | t <sub>on</sub>   | I <sub>F</sub> = 10 mA, V <sub>O</sub> = 5 V, R <sub>L</sub> = 500 Ω,<br>PW ≥ 10 ms |                 | 0.5  | 1.0  | ms   |
|           | Turn-off Time <sup>*1,2</sup> | t <sub>off</sub>  |                                                                                     |                 | 0.07 | 0.2  |      |
|           | Isolation Resistance          | R <sub>I-O</sub>  | V <sub>I-O</sub> = 1.0 kV <sub>DC</sub>                                             | 10 <sup>9</sup> |      |      | Ω    |
|           | Isolation Capacitance         | C <sub>I-O</sub>  | V = 0 V, f = 1 MHz                                                                  |                 | 0.5  |      | pF   |

\*1 Test Circuit for Switching Time

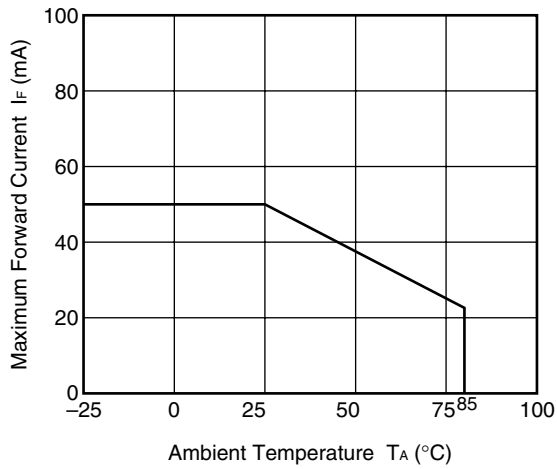


\*2 The turn-on time and turn-off time are specified as input-pulse width ≥ 10 ms.

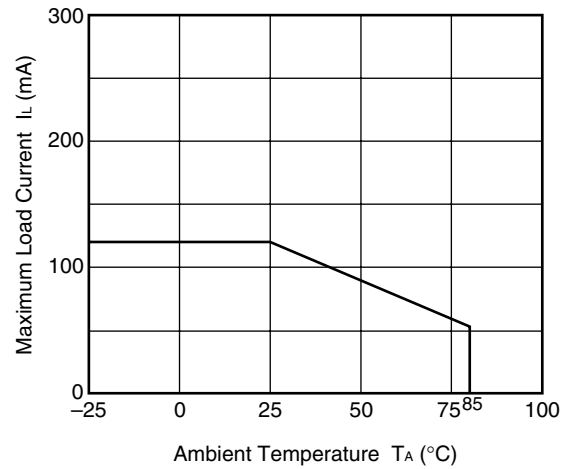
Be aware that when the device operates with an input-pulse width less than 10 ms, the turn-on time and turn-off time will increase.

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

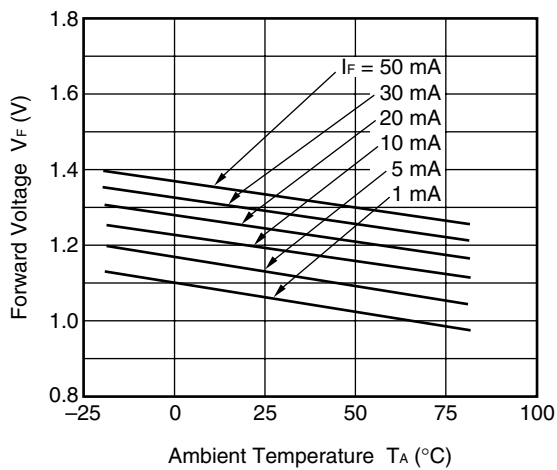
**MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE**



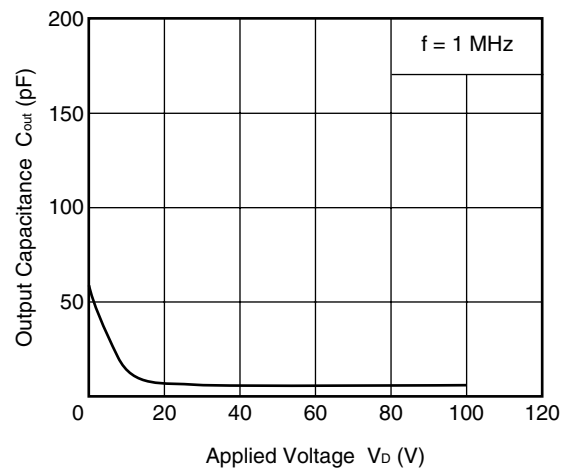
**MAXIMUM LOAD CURRENT vs. AMBIENT TEMPERATURE**



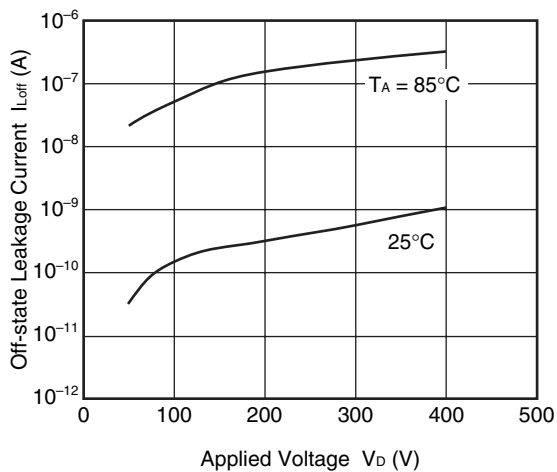
**FORWARD VOLTAGE vs. AMBIENT TEMPERATURE**



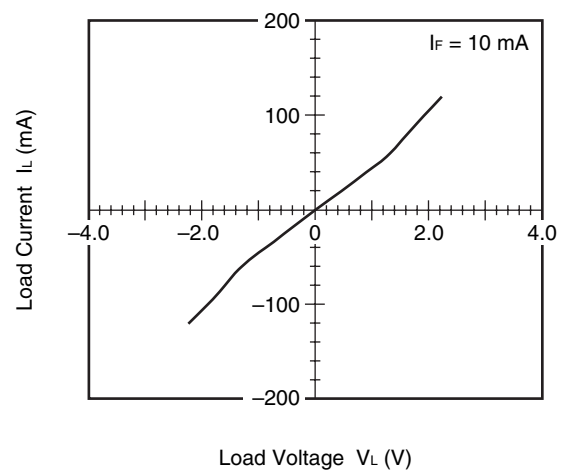
**OUTPUT CAPACITANCE vs. APPLIED VOLTAGE**



**OFF-STATE LEAKAGE CURRENT vs. APPLIED VOLTAGE**

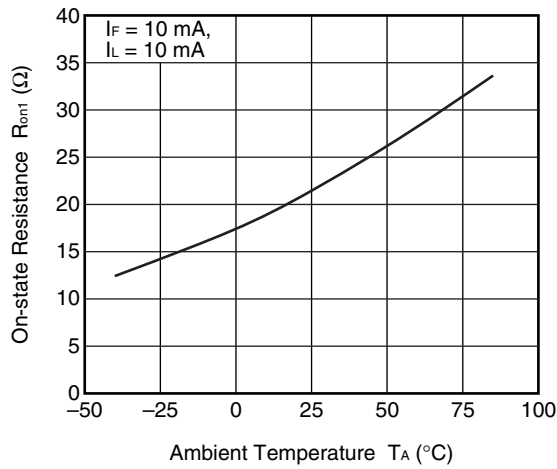


**LOAD CURRENT vs. LOAD VOLTAGE**

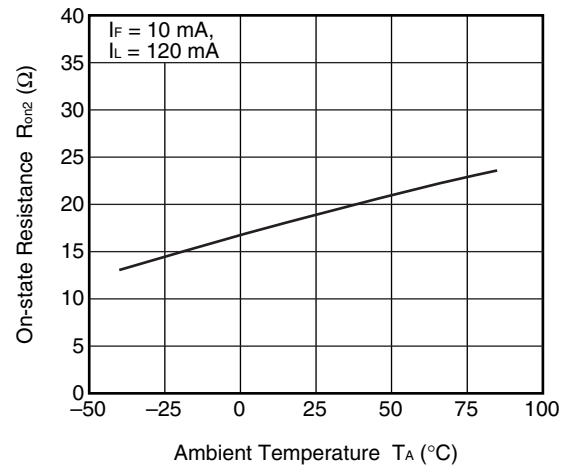


**Remark** The graphs indicate nominal characteristics.

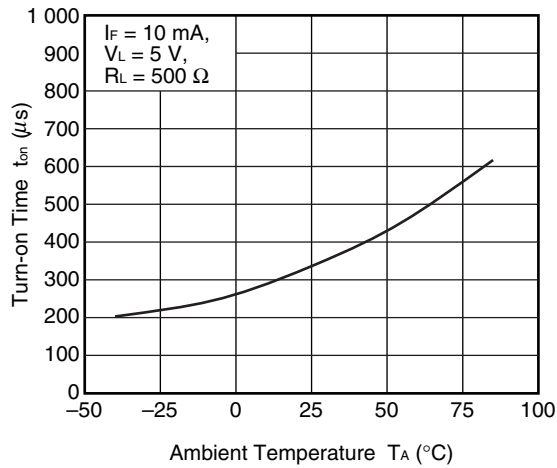
ON-STATE RESISTANCE vs.  
AMBIENT TEMPERATURE



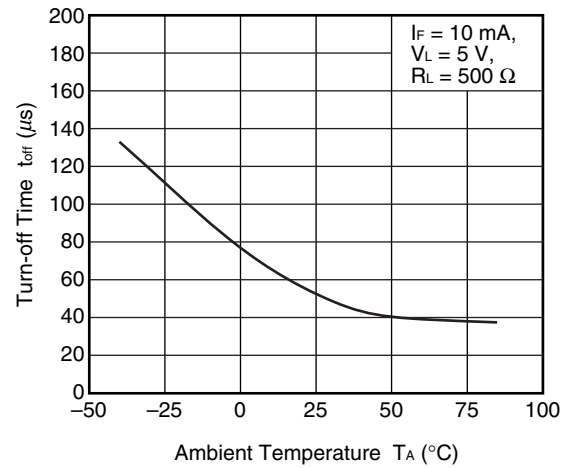
ON-STATE RESISTANCE vs.  
AMBIENT TEMPERATURE



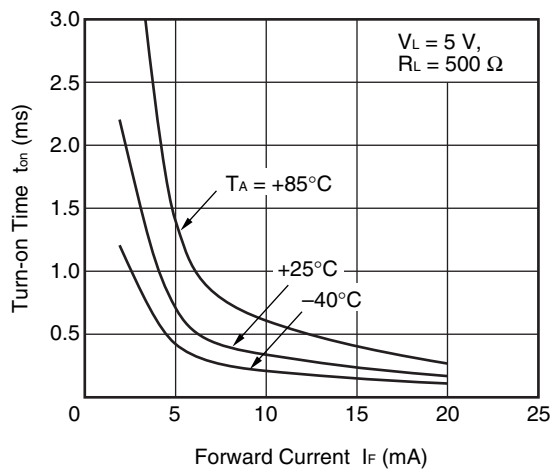
TURN-ON TIME vs.  
AMBIENT TEMPERATURE



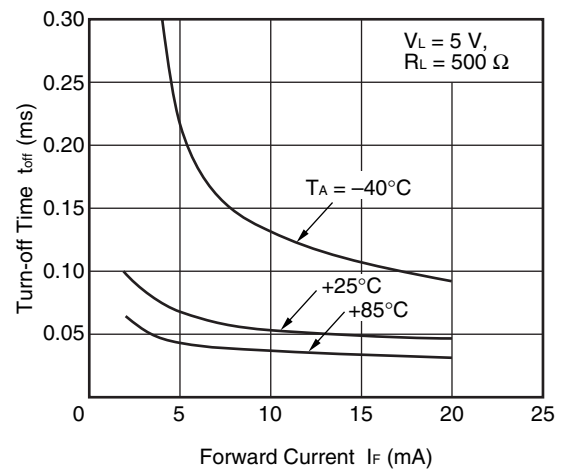
TURN-OFF TIME vs.  
AMBIENT TEMPERATURE



TURN-ON TIME vs. FORWARD CURRENT

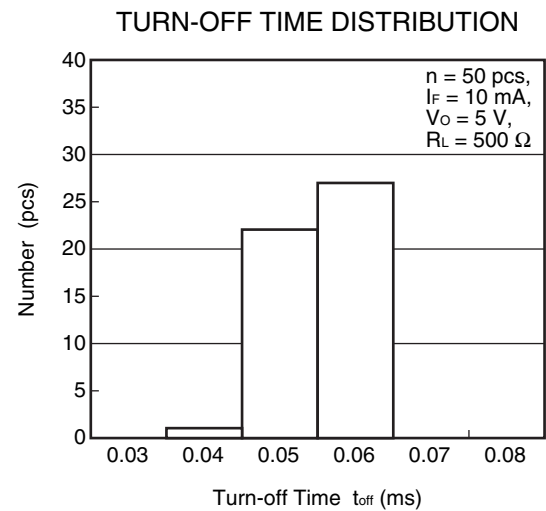
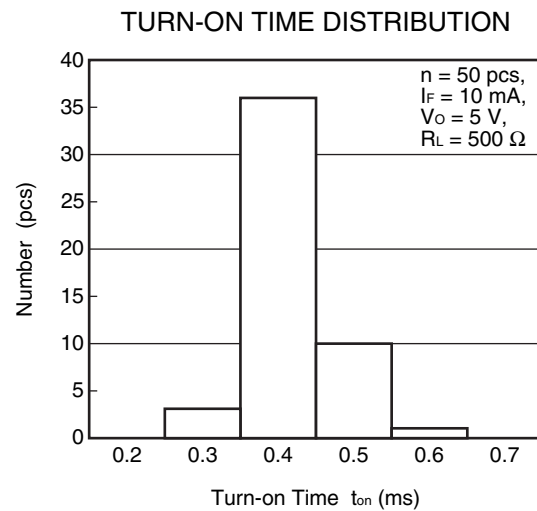
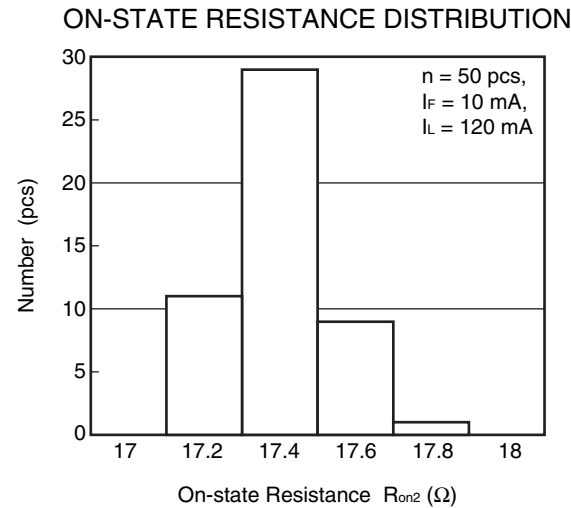
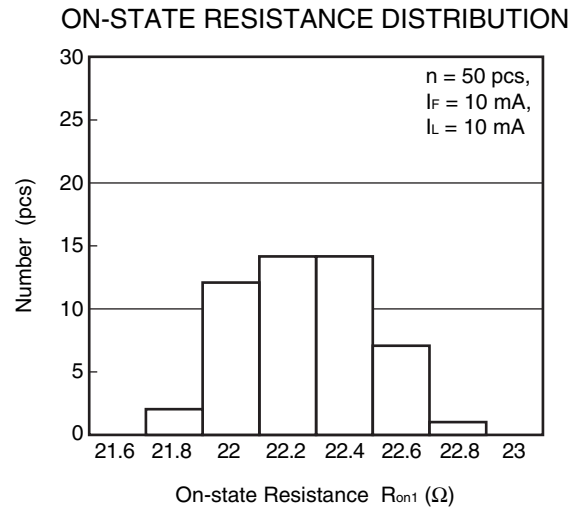


TURN-OFF TIME vs. FORWARD CURRENT



**Remark** The graphs indicate nominal characteristics.

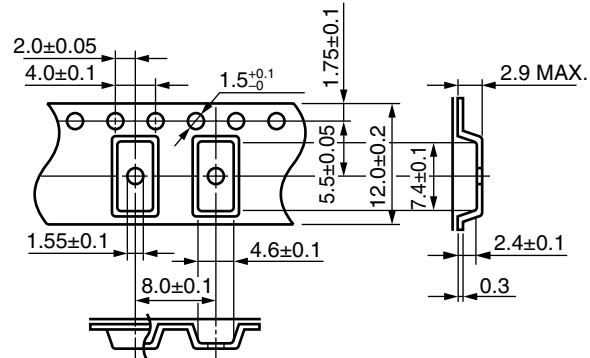




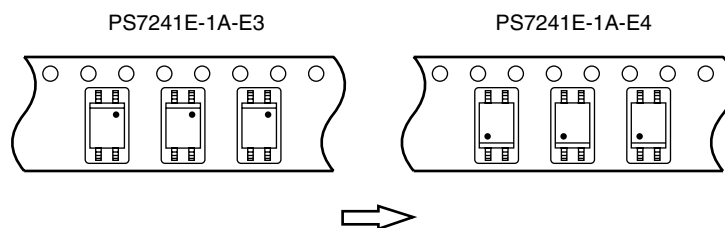
**Remark** The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (in millimeters)

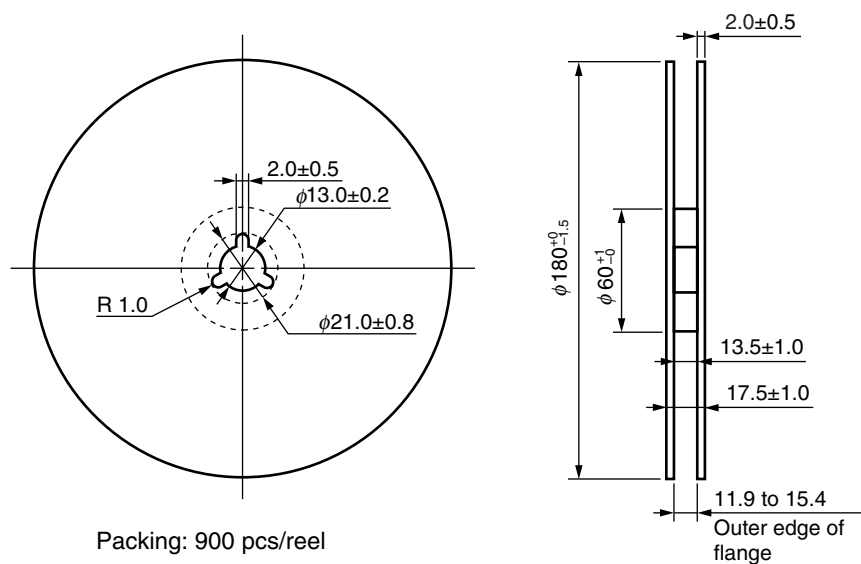
Outline and Dimensions (Tape)



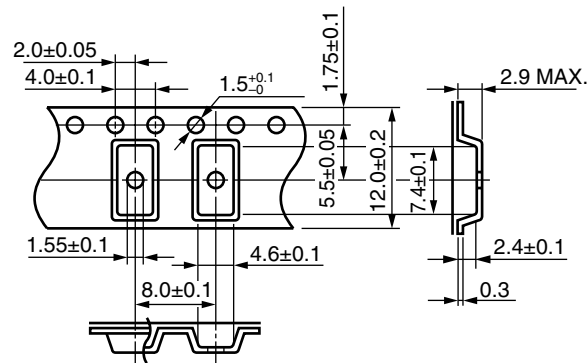
Tape Direction



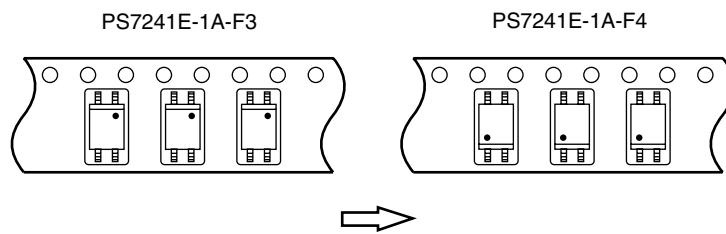
Outline and Dimensions (Reel)



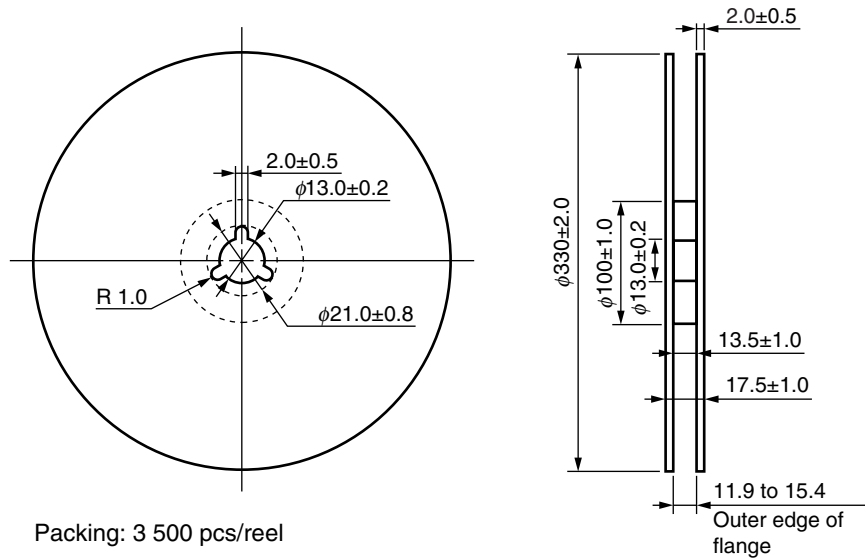
# Outline and Dimensions (Tape)



## Tape Direction



# Outline and Dimensions (Reel)

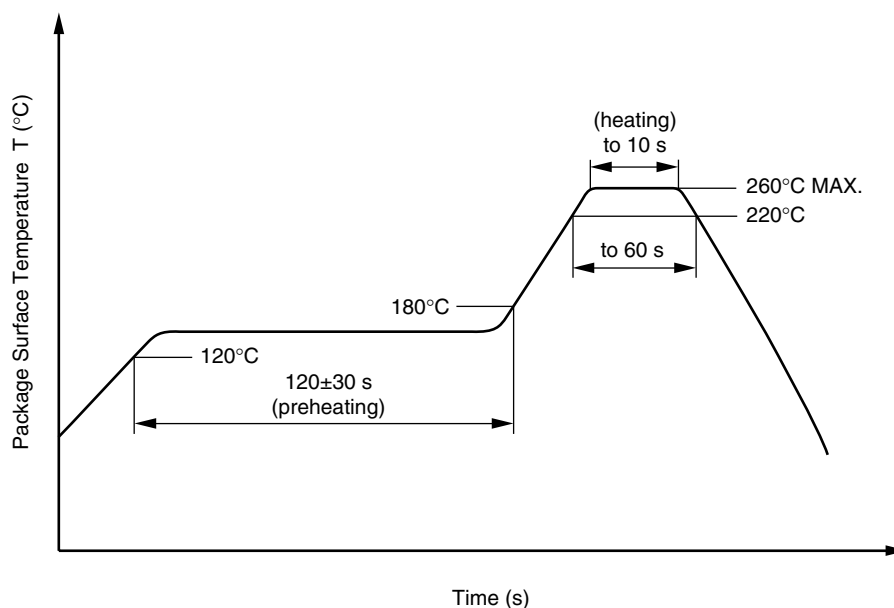


## RECOMMENDED SOLDERING CONDITIONS

### (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) 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.

**USAGE CAUTIONS**

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

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|--------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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