NEC

Solid State Relay
OCMOS FET

# PS710E-1A,PS710EL-1A

## 6-PIN DIP, 0.08 Ω LOW ON-STATE RESISTANCE 2.0 A CONTINUOUS LOAD CURRENT 1-ch Optical Coupled MOS FET

–NEPOC Series–

### DESCRIPTION

The PS710E-1A and PS710EL-1A are solid state relays containing a GaAs LED on the input side and MOS FETs on the output side.

It is suitable for PLC, etc. because of its large continuous load current and low on-state resistance.

The PS710EL-1A has a surface mount type lead.

### FEATURES

- Low on-state resistance ($R_{on}$ = 0.08 Ω TYP.)
- Large continuous load current ($I_L$ = 2.0 A)
- 1 channel type (1 a output)
- Low LED operating current ($I_F$ = 2 mA)
- Designed for AC/DC switching line changer
- Small package (6-pin DIP)
- Low offset voltage
- Ordering number of taping product: PS710EL-1A-E3, E4: 1 000 pcs/reel

<R> • Pb-Free product

<R> • Safety standards
  - UL approved: File No. E72422

### APPLICATIONS

- Measurement equipment
- FA equipment

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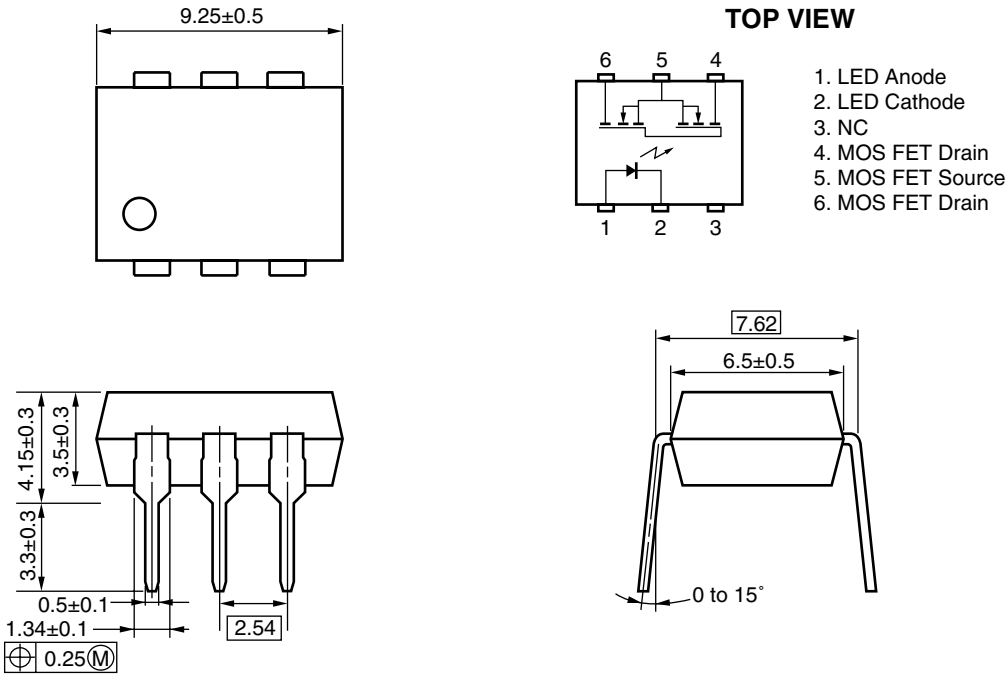
The mark <R> shows major revised points.

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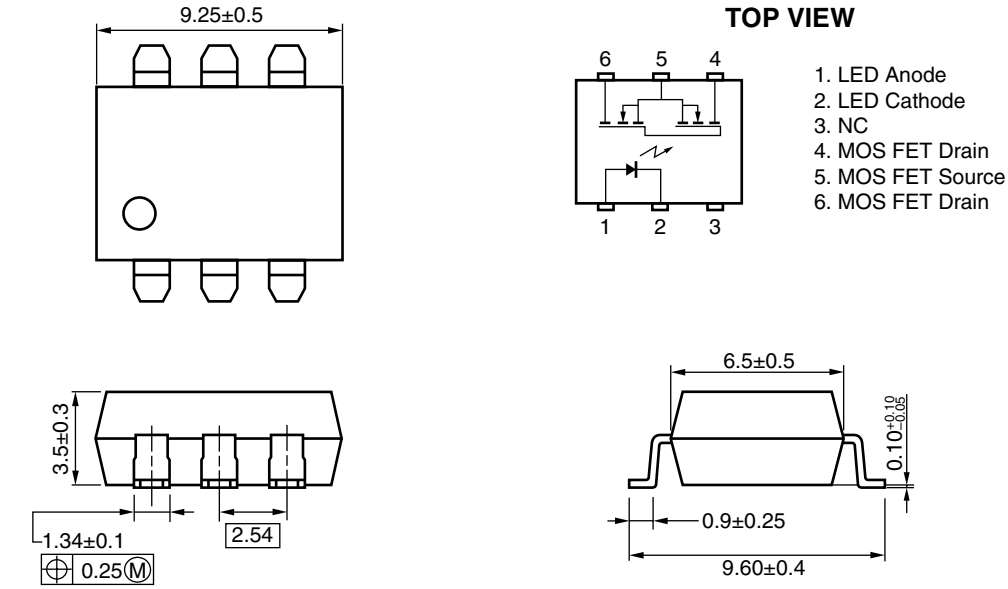
The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

**PACKAGE DIMENSIONS (UNIT: mm)**

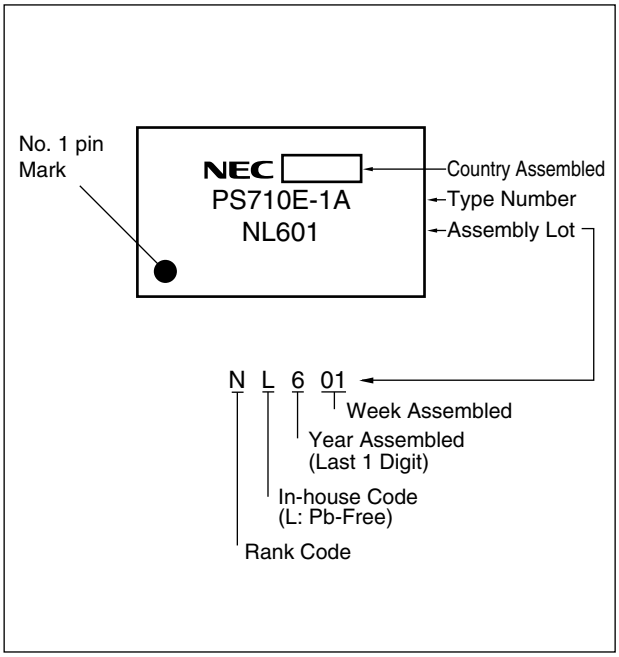
**PS710E-1A**




**PS710EL-1A**



<R> **MARKING EXAMPLE**



<R> **ORDERING INFORMATION**

| Part Number | Order Number | Solder Plating Specification | Packing Style | Safety Standard Approval | Application Part Number*1 |
|---|---|---|---|---|---|
| PS710E-1A | PS710E-1A-A | Pb-Free | Magazine case 50 pcs | Standard products (UL approved) | PS710E-1A |
| PS710EL-1A | PS710EL-1A-A | | | | |
| PS710EL-1A-E3 | PS710EL-1A-E3-A | | Embossed Tape 1 000 pcs/reel | | |
| PS710EL-1A-E4 | PS710EL-1A-E4-A | | | | |

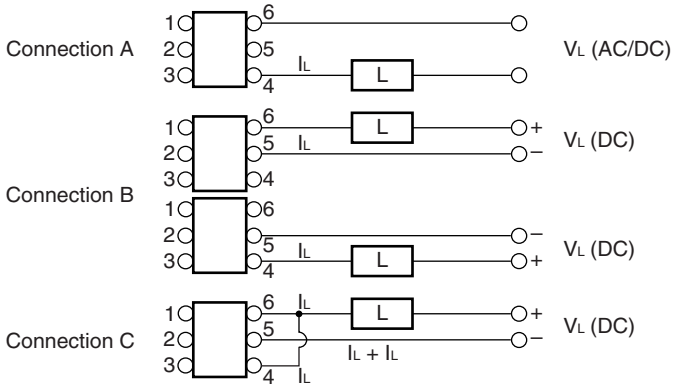
***1** For the application of the Safety Standard, following part number should be used.

## 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 |
| | Peak Forward Current*1 | | $I_{FP}$ | 1 | A |
| MOS FET | Load Voltage | | $V_L$ | 80 | V |
| | Continuous Load Current*2 | Connection A | $I_L$ | 2.0 | A |
| | | Connection B | | 3.0 | |
| | | Connection C | | 4.0 | |
| | Pulse Load Current*3 (AC/DC Connection) | | $I_{LP}$ | 4.0 | A |
| | Power Dissipation | | $P_D$ | 600 | mW |
| Isolation Voltage*4 | | | BV | 1 500 | Vr.m.s. |
| Total Power Dissipation | | | $P_T$ | 650 | mW |
| Operating Ambient Temperature | | | $T_A$ | –40 to +85 | °C |
| Storage Temperature | | | $T_{stg}$ | –40 to +100 | °C |

***1** PW = 100 $\mu$s, Duty Cycle = 1%

***2** Conditions: $I_F \geq 2$ mA. The following types of load connections are available.




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

***4** AC voltage for 1 minute at $T_A$ = 25°C, RH = 60% between input and output
Pins 1-3 shorted together, 4-6 shorted together.

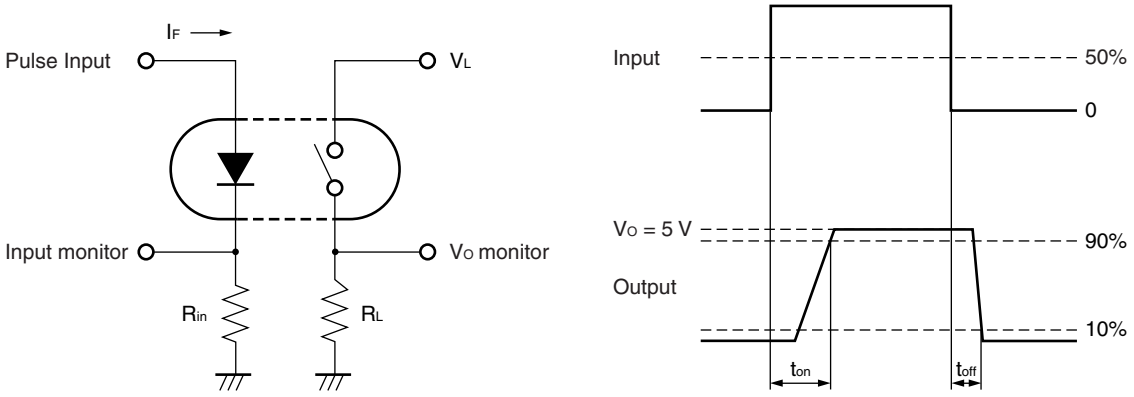
## RECOMMENDED OPERATING CONDITIONS ($T_A$ = 25°C)

| 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 | $\mu$A |
| MOS FET | Off-state Leakage Current | $I_{Loff}$ | $V_D$ = 80 V | | | 50 | nA |
| | Output Capacitance | $C_{out}$ | $V_D$ = 0 V, f = 1 MHz | | 480 | | pF |
| Coupled | LED On-state Current | $I_{Fon}$ | $I_L$ = 2.0 A | | | 2.0 | mA |
| | On-state Resistance | $R_{on}$ | $I_F$ = 10 mA, $I_L$ = 2.0 A, t ≤ 10 ms | | 0.083 | 0.15 | Ω |
| | Turn-on Time*1, 2 | $t_{on}$ | $I_F$ = 10 mA, $V_O$ = 5 V, $R_L$ = 500 Ω, | | 1.0 | 2.0 | ms |
| | Turn-off Time*1, 2 | $t_{off}$ | PW ≥ 10 ms | | 0.02 | 0.2 | |
| | 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 | | 0.5 | | pF |

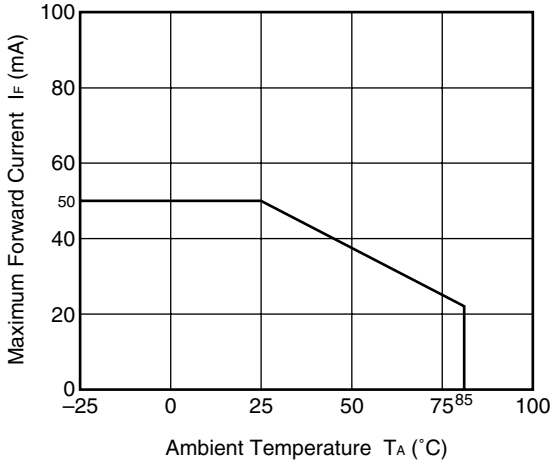
***1** Test Circuit for Switching Time



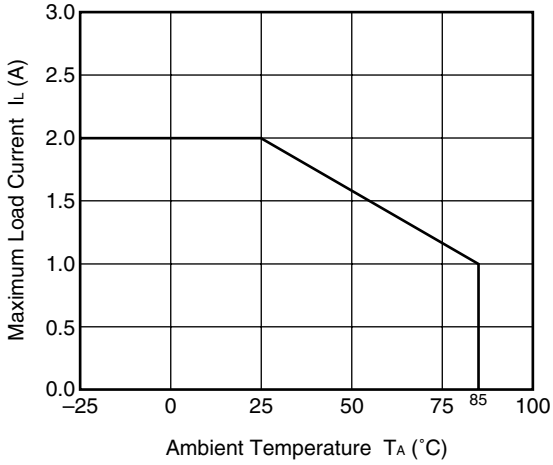

***2** The turn-on time and turn-off time are specified as input-pulse width ≥ 10 ms.
Be aware that when the device operates with an input-pulse width less than 10 ms, the turn-on time and turn-off time will increase.

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

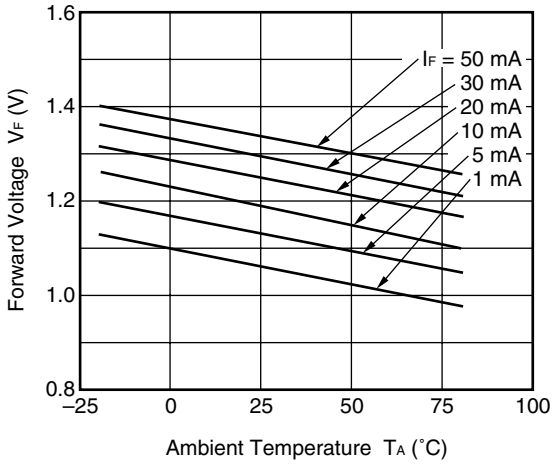
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



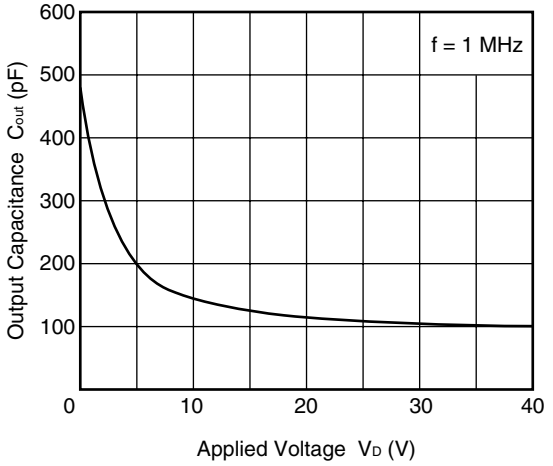

MAXIMUM LOAD CURRENT vs. AMBIENT TEMPERATURE



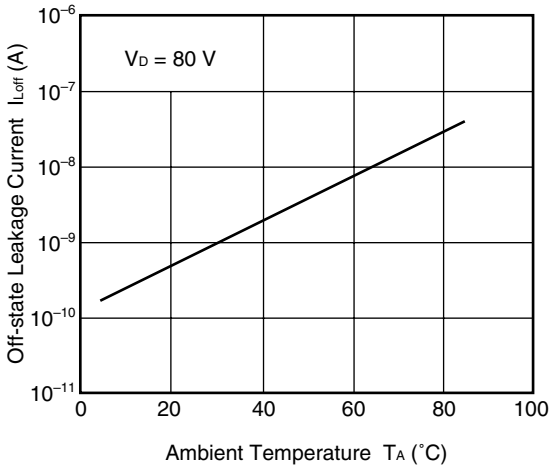

FORWARD VOLTAGE vs. AMBIENT TEMPERATURE



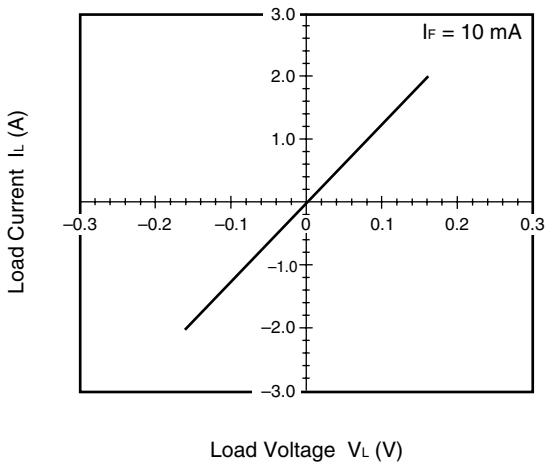

OUTPUT CAPACITANCE vs. APPLIED VOLTAGE




OFF-STATE LEAKAGE CURRENT vs. AMBIENT TEMPERATURE

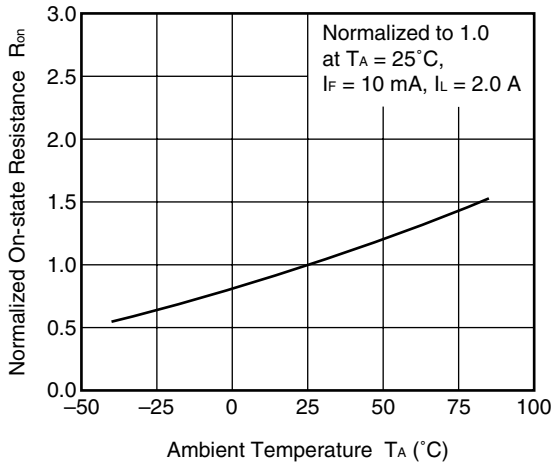



LOAD CURRENT vs. LOAD VOLTAGE

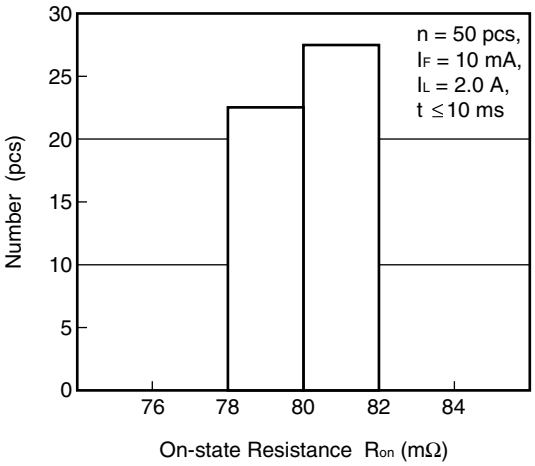



**Remark** The graphs indicate nominal characteristics.

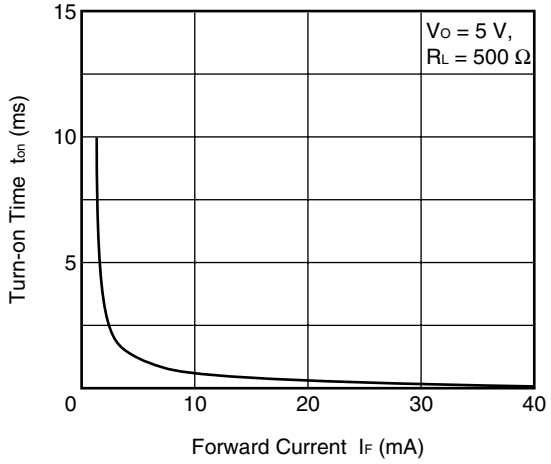
NORMALIZED ON-STATE RESISTANCE vs. AMBIENT TEMPERATURE



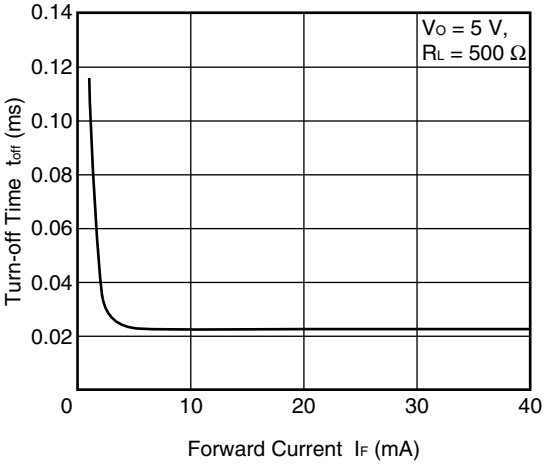

ON-STATE RESISTANCE DISTRIBUTION



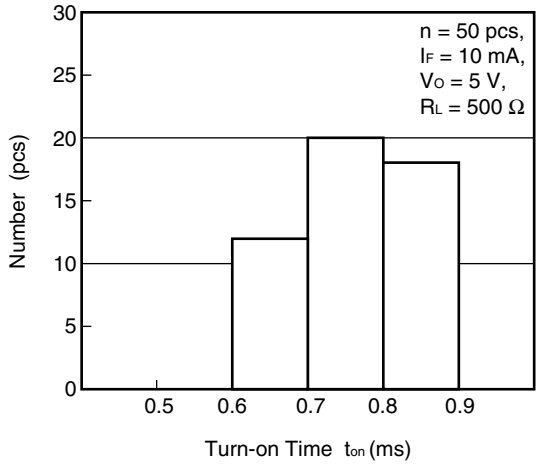

TURN-ON TIME vs. FORWARD CURRENT



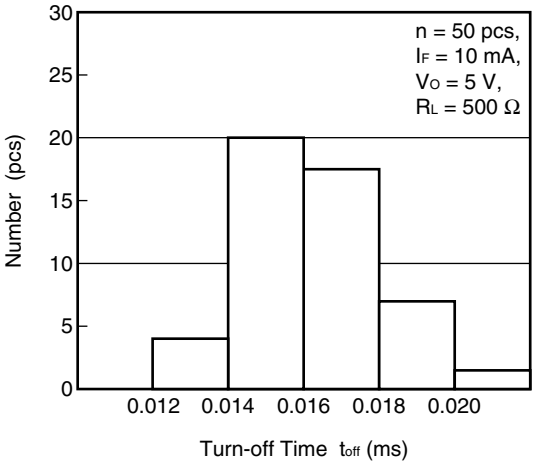

TURN-OFF TIME vs. FORWARD CURRENT




TURN-ON TIME DISTRIBUTION

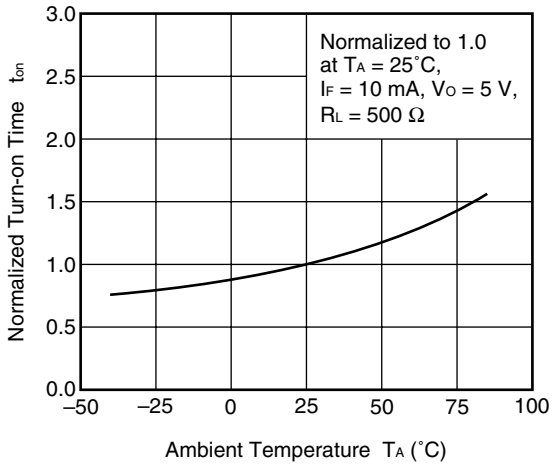



TURN-OFF TIME DISTRIBUTION

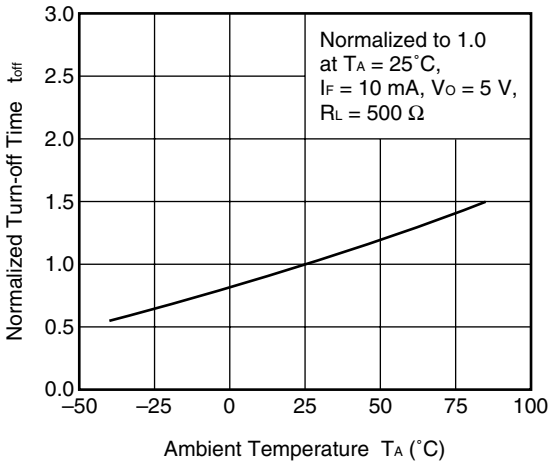



**Remark** The graphs indicate nominal characteristics.

NORMALIZED TURN-ON TIME vs.
AMBIENT TEMPERATURE



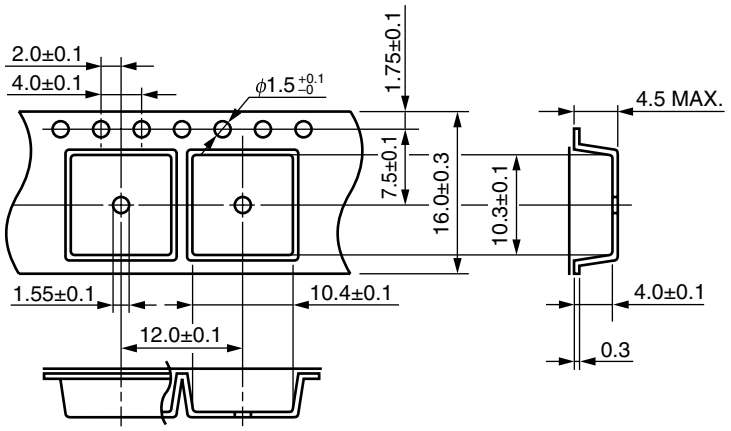

NORMALIZED TURN-OFF TIME vs.
AMBIENT TEMPERATURE



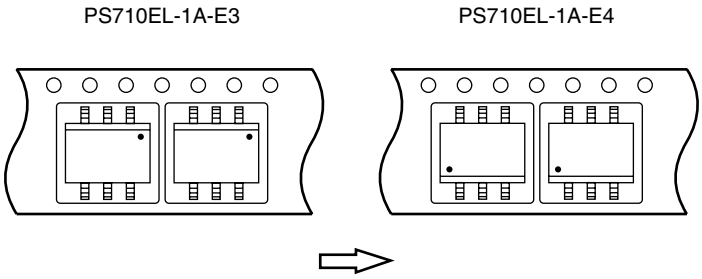

**Remark** The graphs indicate nominal characteristics.

**TAPING SPECIFICATIONS (UNIT: mm)**

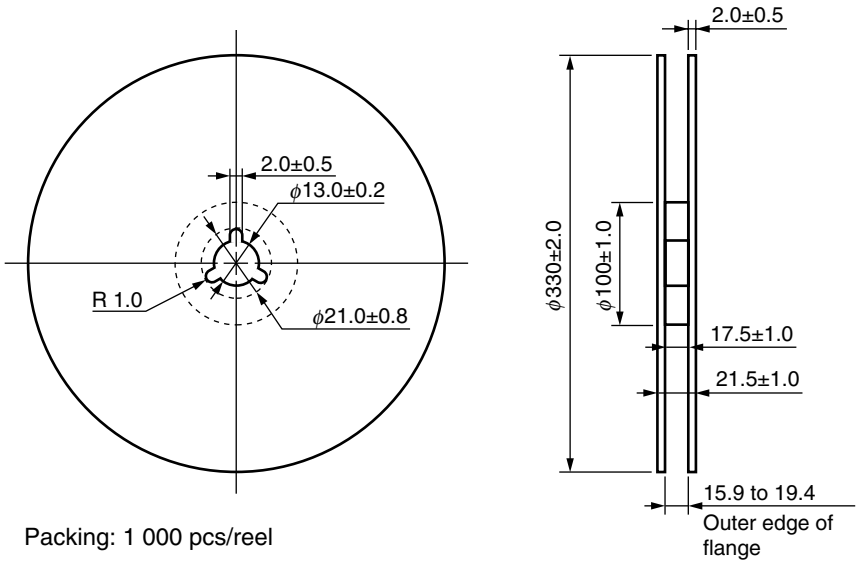
Outline and Dimensions (Tape)




Tape Direction




Outline and Dimensions (Reel)



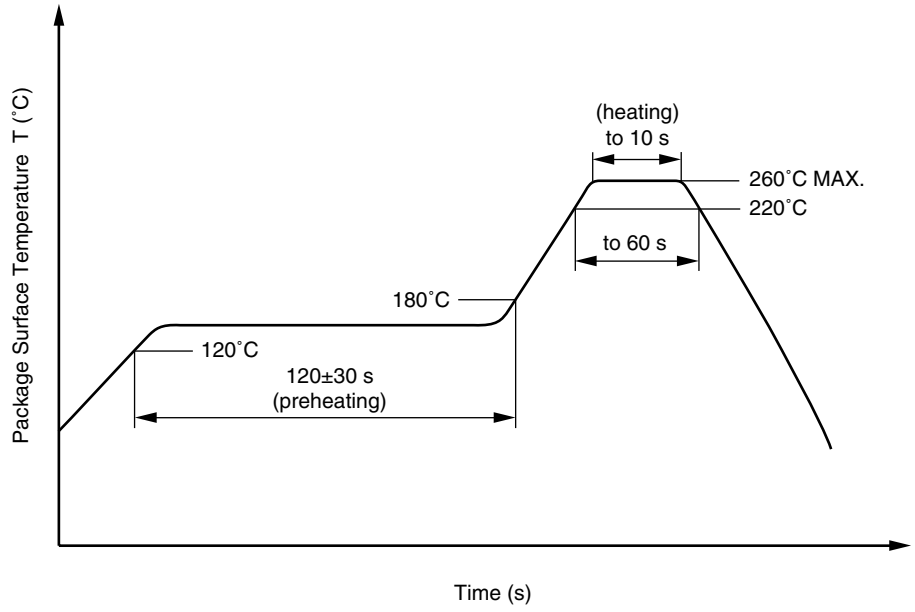

Packing: 1 000 pcs/reel

## 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.)

<R> **(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.

<R> **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. |

▶**For further information, please contact**

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