

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

–NEPOC Series–

## DESCRIPTION

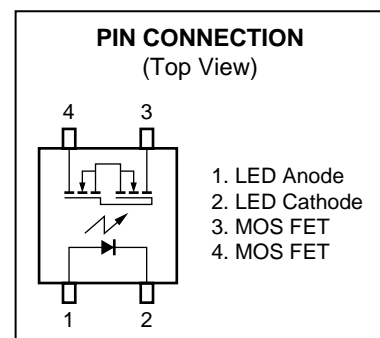
The PS7241E-1B is an optically coupled element that combines a GaAs infrared LED on the input side with a normally close MOS FET on the output side to realize an excellent cost performance.

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 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 b output)
- Low LED operating current ( $I_f = 3 \text{ mA}$ )
- Designed for AC/DC switching line changer
- Low offset voltage
- Ordering number of taping product: PS7241E-1B-E3, E4, F3, F4
- Pb-Free product
- Safety standards
  - UL approved: File No. E72422
  - BSI approved: File No. 8241/8242

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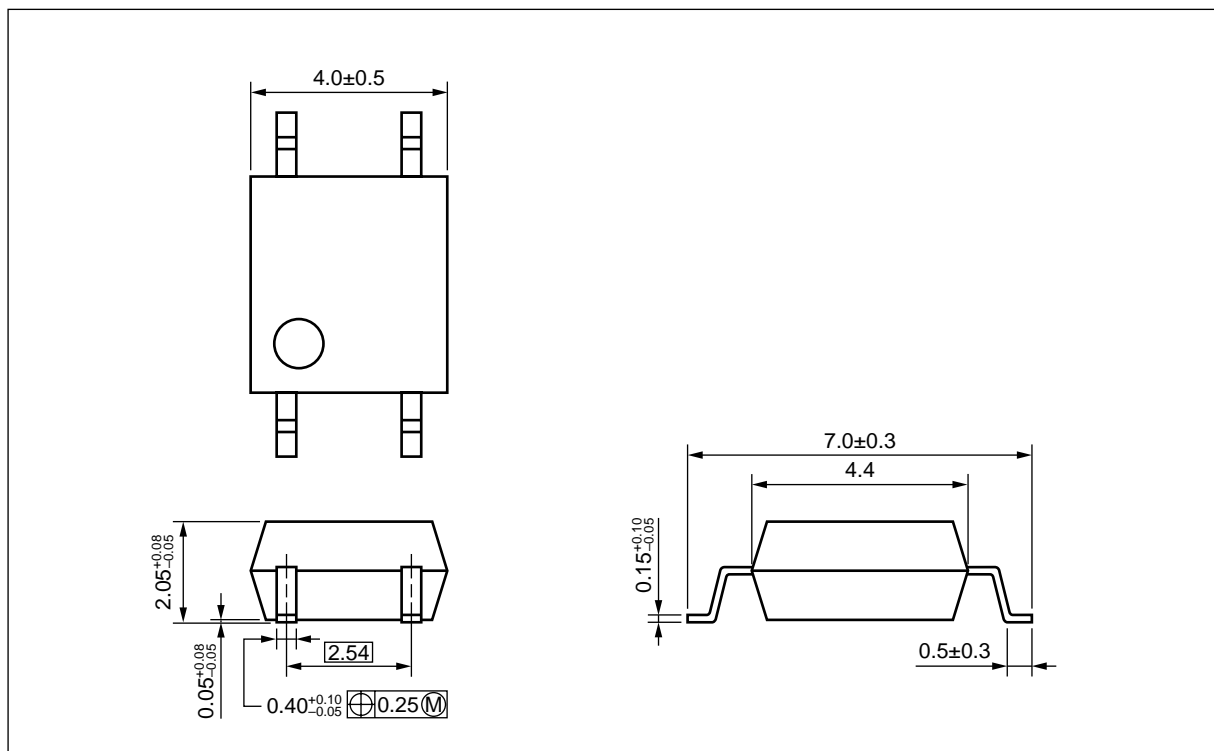


## APPLICATIONS

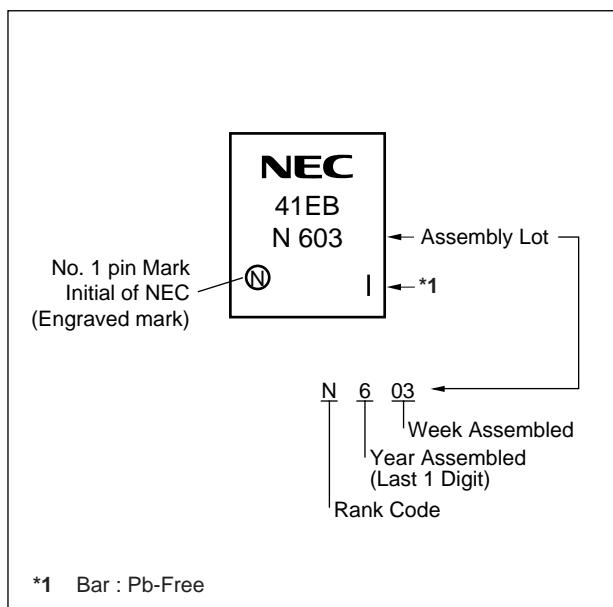
- Laptop PC, PDA
- Modem card
- Telephone, FAX
- Measurement equipment

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**PACKAGE DIMENSIONS (UNIT: mm)**



**MARKING EXAMPLE**



**<R> ORDERING INFORMATION**

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

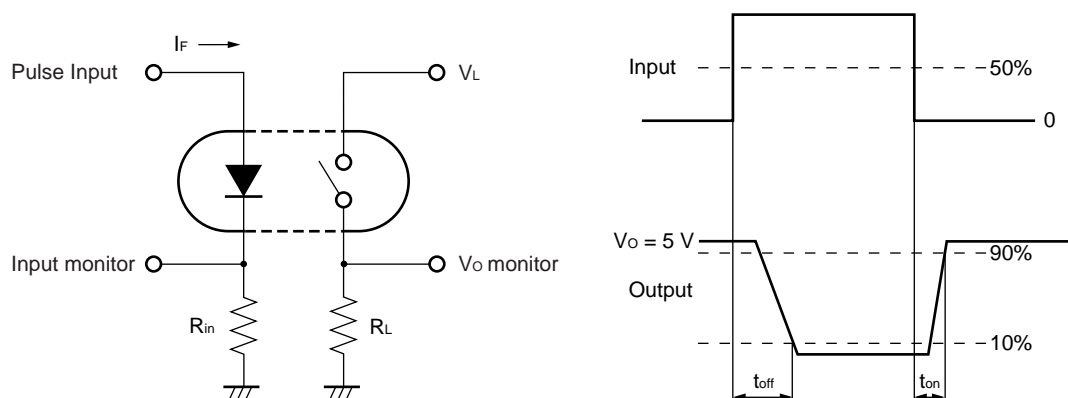
<sup>\*3</sup> AC voltage for 1 minute at T<sub>A</sub> = 25°C, RH = 60% between input and output  
Pins 1-2 shorted together, 3-4 shorted together.

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

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
LED Operating Current	$I_F$	3	10	20	mA
LED Off Voltage	$V_F$	0		0.5	V

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

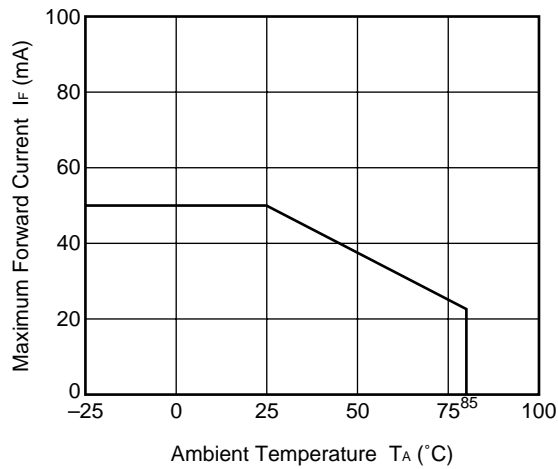
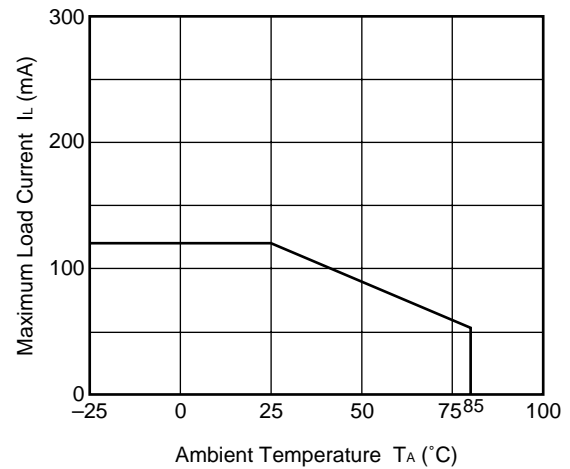
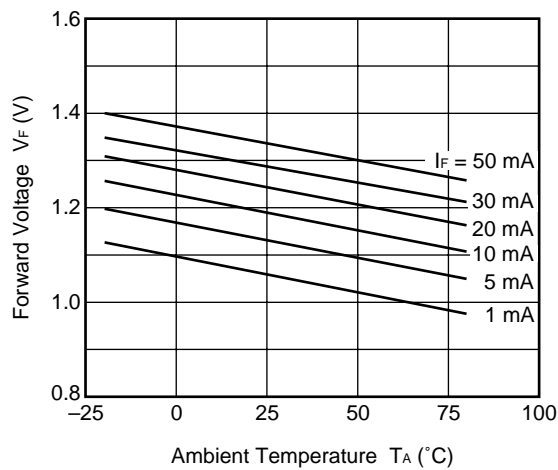
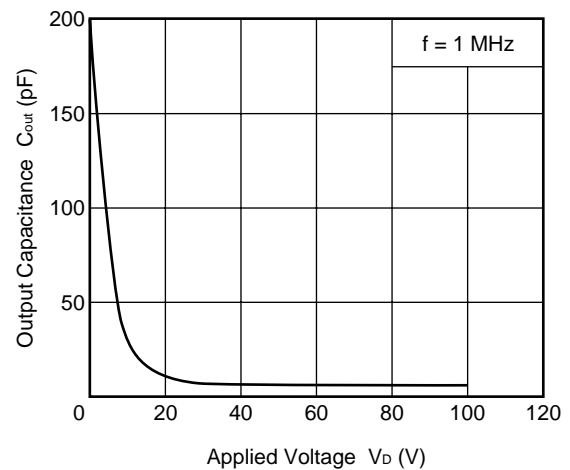
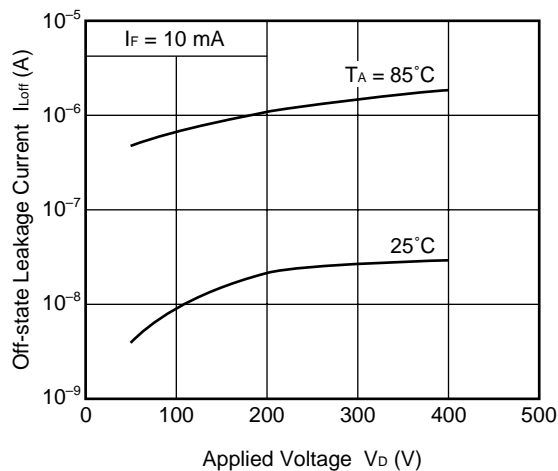
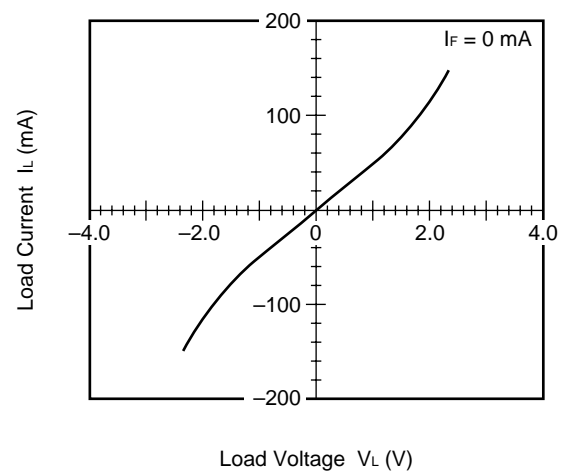
Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	$V_F$	$I_F = 10\text{ mA}$		1.2	1.4	V
	Reverse Current	$I_R$	$V_R = 5\text{ V}$			5.0	$\mu\text{A}$
MOS FET	Off-state Leakage Current	$I_{Loff}$	$I_F = 10\text{ mA}$ , $V_D = 400\text{ V}$		0.03	1.0	$\mu\text{A}$
	Output Capacitance	$C_{out}$	$I_F = 10\text{ mA}$ , $V_D = 0\text{ V}$ , $f = 1\text{ MHz}$		206		pF
Coupled	LED Off-state Current	$I_{Foff}$	$I_L = 120\text{ mA}$			3.0	mA
	On-state Resistance	$R_{on1}$	$I_F = 0\text{ mA}$ , $I_L = 10\text{ mA}$		22	35	$\Omega$
		$R_{on2}$	$I_F = 0\text{ mA}$ , $I_L = 120\text{ mA}$ , $t \leq 10\text{ ms}$		17	24	
	Turn-on Time <sup>*1,2</sup>	$t_{on}$	$I_F = 10\text{ mA}$ , $V_O = 5\text{ V}$ , $R_L = 500\text{ }\Omega$ , $PW \geq 10\text{ ms}$		0.07	0.2	ms
	Turn-off Time <sup>*1,2</sup>	$t_{off}$			1.0	3.0	
	Isolation Resistance	$R_{I-O}$	$V_{I-O} = 1.0\text{ kVDC}$	$10^9$			$\Omega$
	Isolation Capacitance	$C_{I-O}$	$V = 0\text{ V}$ , $f = 1\text{ MHz}$		0.5		pF

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

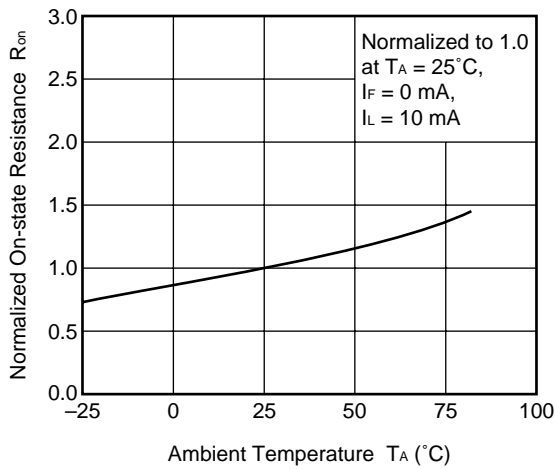
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**\*2 The turn-on time and turn-off time are specified as input-pulse width  $\geq 10\text{ ms}$ .**

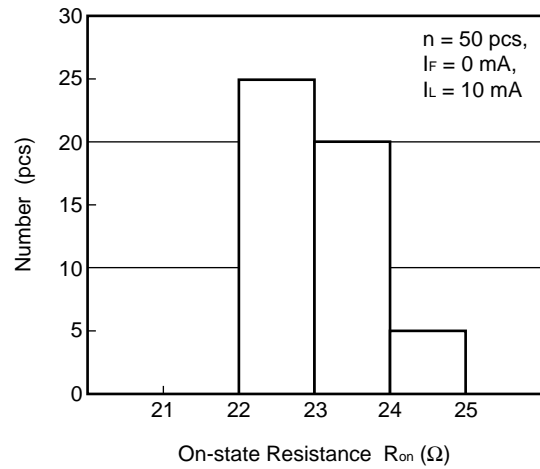
Be aware that when the device operates with an input-pulse width less than  $10\text{ ms}$ , the turn-on time and turn-off time will increase.

<R> **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.

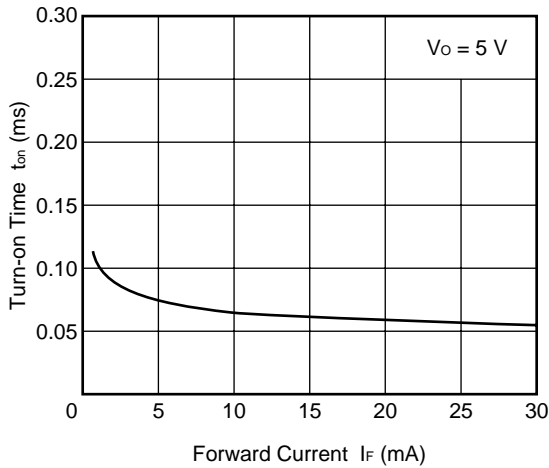
NORMALIZED ON-STATE RESISTANCE vs. AMBIENT TEMPERATURE



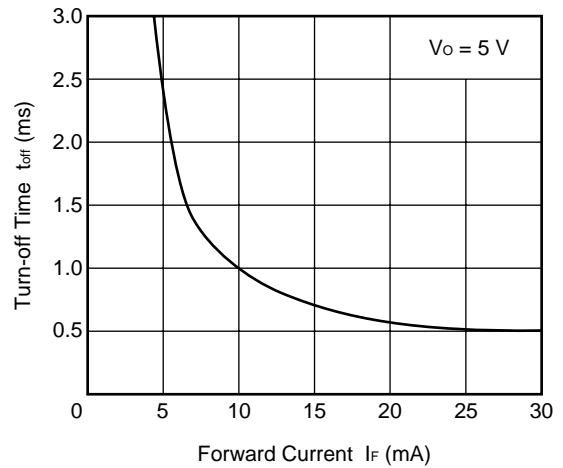
ON-STATE RESISTANCE DISTRIBUTION



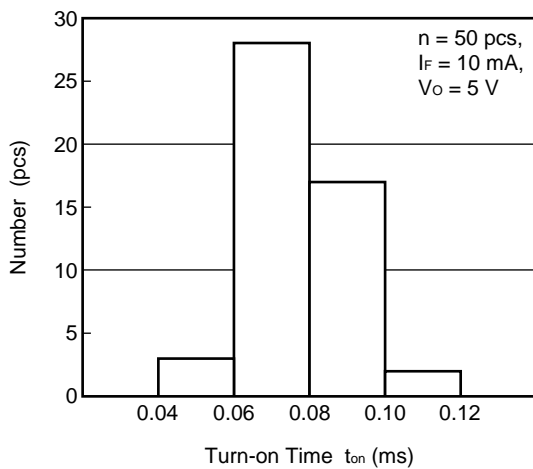
TURN-ON TIME vs. FORWARD CURRENT



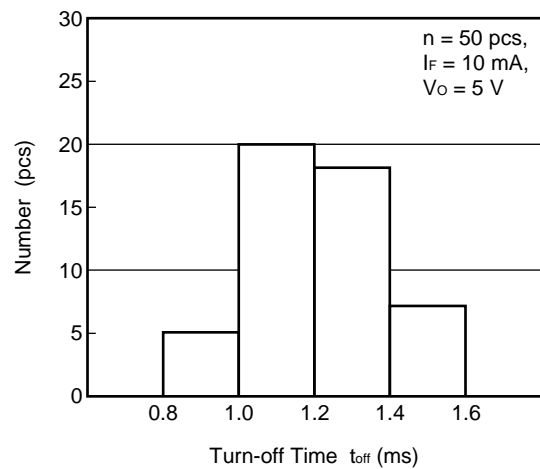
TURN-OFF TIME vs. FORWARD CURRENT



TURN-ON TIME DISTRIBUTION

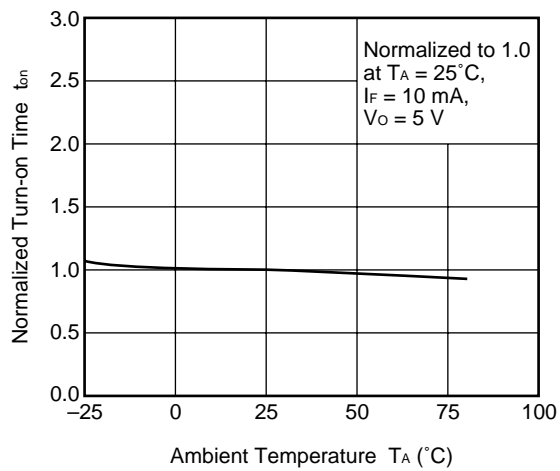


TURN-OFF TIME DISTRIBUTION

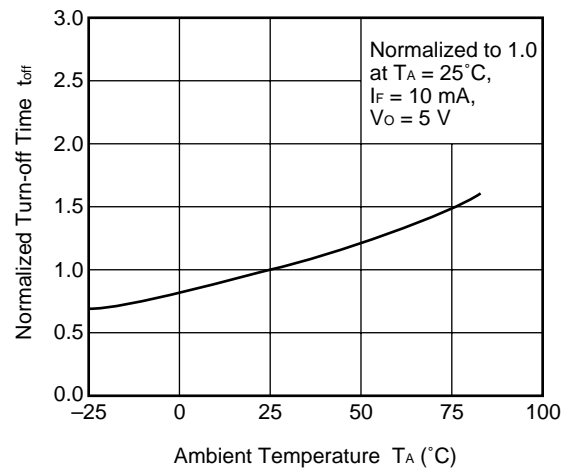


**Remark** The graphs indicate nominal characteristics.

NORMALIZED TURN-ON TIME vs.  
AMBIENT TEMPERATURE



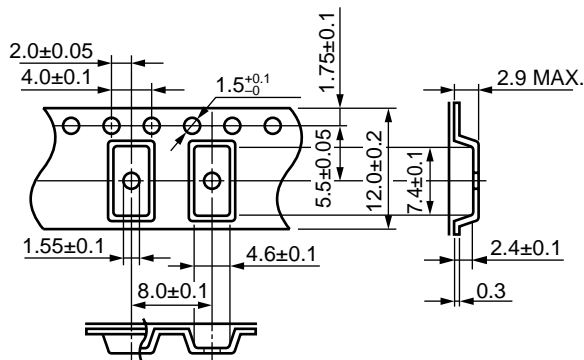
NORMALIZED TURN-OFF TIME vs.  
AMBIENT TEMPERATURE



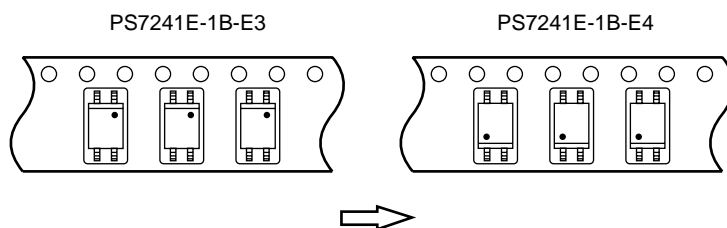
**Remark** The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (in millimeters)

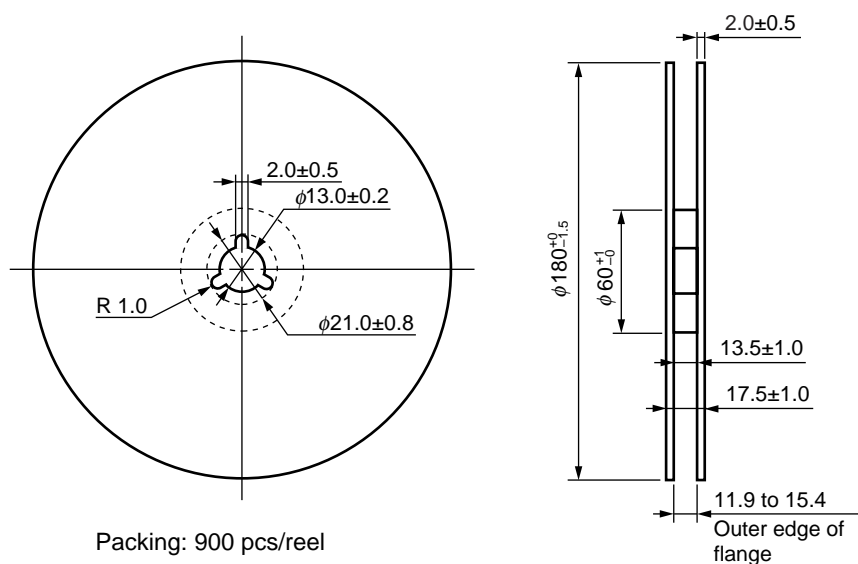
Outline and Dimensions (Tape)



Tape Direction

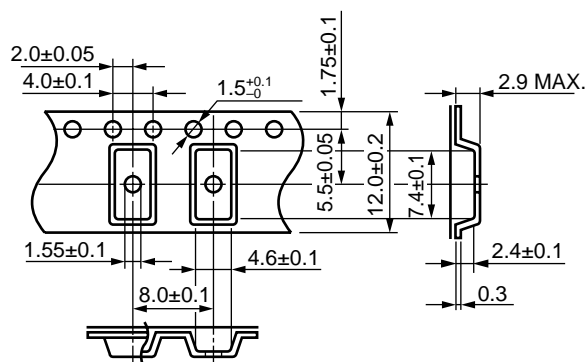


Outline and Dimensions (Reel)

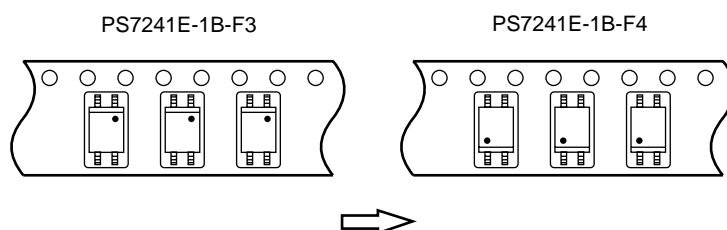




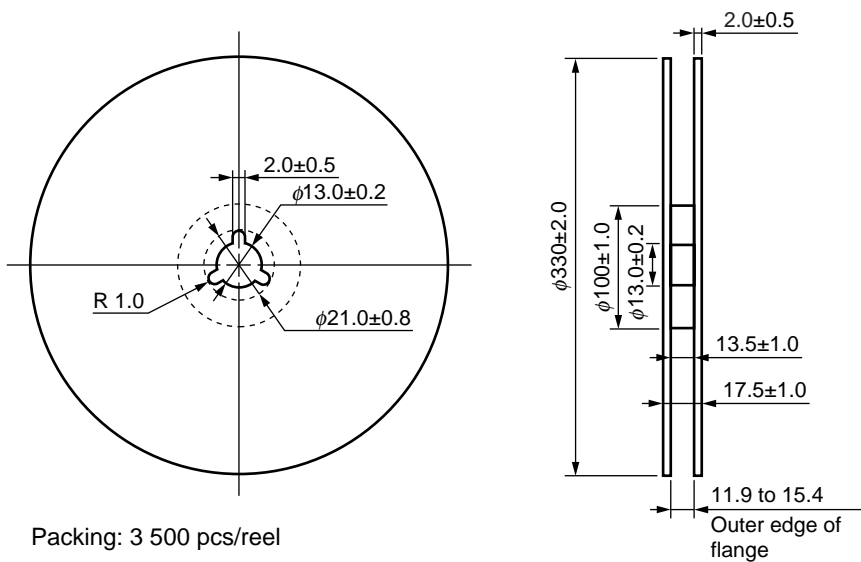
### Outline and Dimensions (Tape)



### Tape Direction



### Outline and Dimensions (Reel)

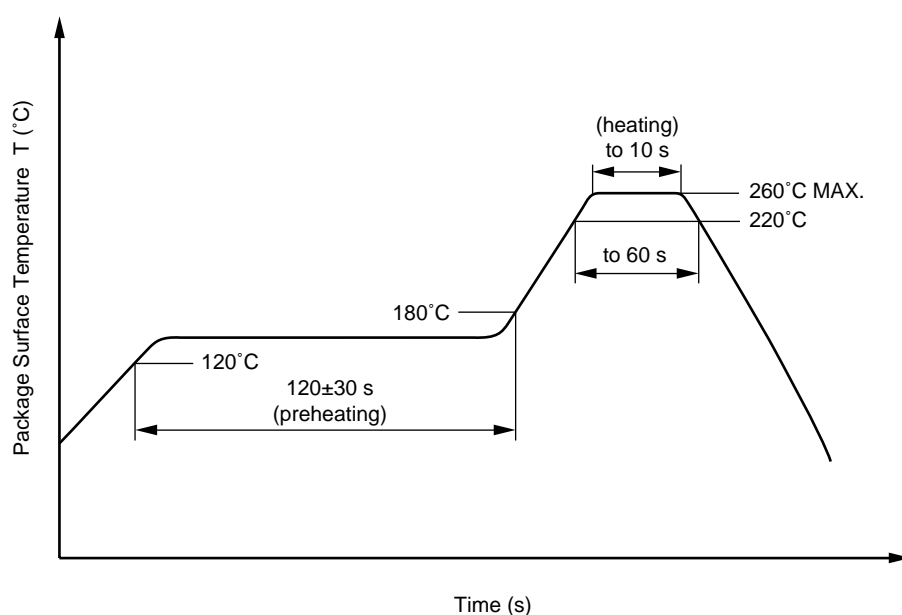


Packing: 3 500 pcs/reel

**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.)

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**(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.

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**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).

GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points.

- 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.
  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.
  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.
- Do not burn, destroy, cut, crush, or chemically dissolve the product.
- Do not lick the product or in any way allow it to enter the mouth.

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► For further information, please contact

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**Compound Semiconductor Devices Division****NEC Electronics Corporation**URL: <http://www.ncsd.necel.com/>

Subject: Compliance with EU Directives

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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	

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