

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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**4-PIN SOP, HIGH ISOLATION VOLTAGE 3 000 Vr.m.s.  
1-ch Optical Coupled MOS FET**

–NEPOC Series–

## DESCRIPTION

The PS7431-1A is a solid state relay containing GaAs a LED 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

- High isolation voltage (BV = 3 000 Vr.m.s.)
- Small and thin package (4-pin SOP, Height = 2.1 mm)
- 1 channel type (1 a output)
- Low LED operating current (If = 2 mA)
- Designed for AC/DC switching line changer
- Low offset voltage
- Ordering number of taping product : PS7431-1A-E3, E4: 900 pcs/reel  
: PS7431-1A-F3, F4: 3 500 pcs/reel

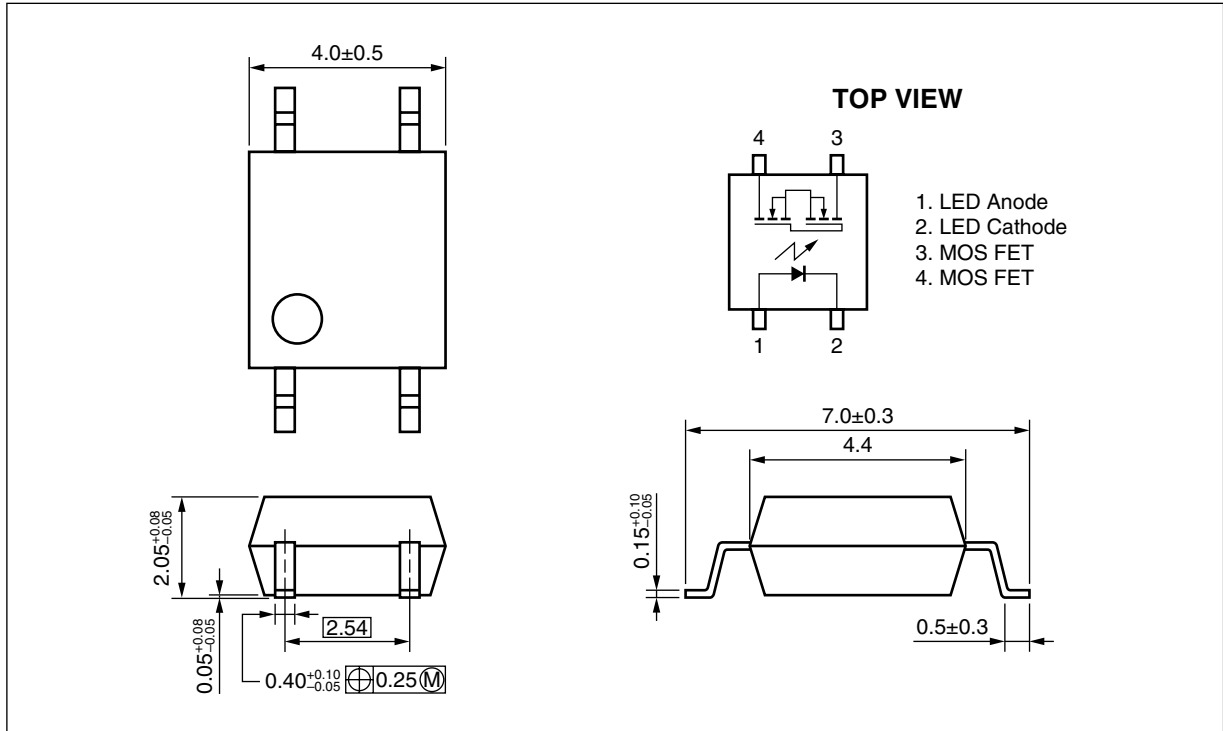
- <R> • Pb-Free product
- <R> • Safety standards
  - UL approved: File No. E72422
  - BSI approved: No. 8767/8768

## APPLICATIONS

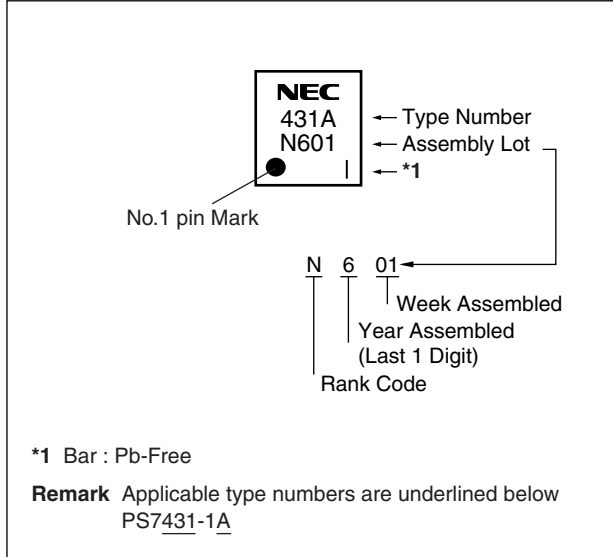
- Laptop PC, PDA
- Modem card
- Telephone, FAX
- Measurement equipment

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PACKAGE DIMENSIONS (UNIT: mm)



<R> MARKING EXAMPLE (LASER MARKING)



<R> **ORDERING INFORMATION**

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number <sup>1</sup>
PS7431-1A	PS7431-1A-A	Pb-Free	Magazine case 100 pcs	Standard products (UL, BSI approved)	PS7431-1A
PS7431-1A-E3	PS7431-1A-E3-A		Embossed Tape 900 pcs/reel		
PS7431-1A-E4	PS7431-1A-E4-A				
PS7431-1A-F3	PS7431-1A-F3-A		Embossed Tape 3 500 pcs/reel		
PS7431-1A-F4	PS7431-1A-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>	350	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>	310	mW
Isolation Voltage <sup>*3</sup>		BV	3 000	Vr.m.s.
Total Power Dissipation		P <sub>T</sub>	360	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.

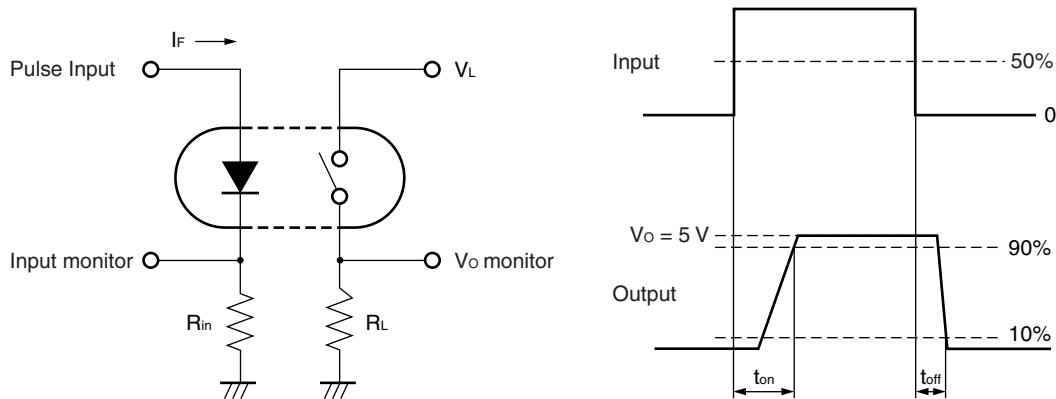
**RECOMMENDED OPERATING CONDITIONS (T<sub>A</sub> = 25°C)**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
LED Operating Current	I <sub>F</sub>	2	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> = 350 V		0.03	1.0	μA
	Output Capacitance	C <sub>out</sub>	V <sub>D</sub> = 0 V, f = 1 MHz		35		pF
Coupled	LED On-state Current	I <sub>Fon</sub>	I <sub>L</sub> = 120 mA			2.0	mA
	On-state Resistance	R <sub>on1</sub>	I <sub>F</sub> = 10 mA, I <sub>L</sub> = 10 mA		26	33	Ω
		R <sub>on2</sub>	I <sub>F</sub> = 10 mA, I <sub>L</sub> = 120 mA, t ≤ 10 ms		20	26	
	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,		0.3	2.0	ms
	Turn-off Time <sup>*1,2</sup>	t <sub>off</sub>	PW ≥ 10 ms		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**



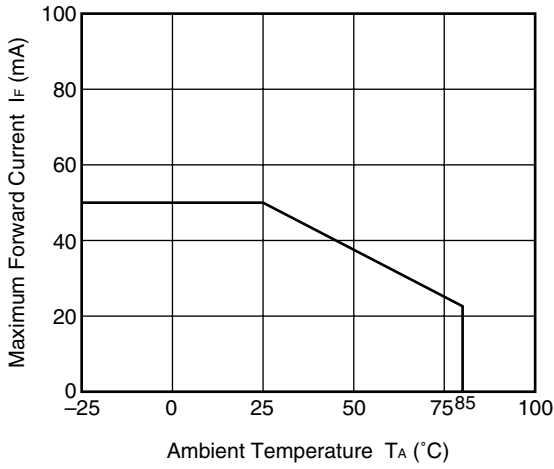
<R>

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

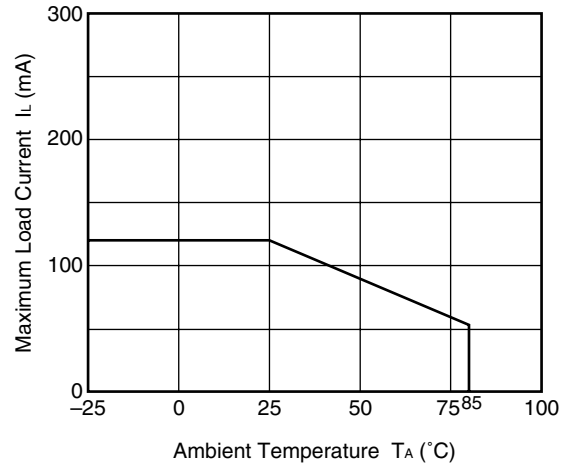
Be aware that when the device operates with an input-pulse width less than 10 ms, the turn-on time and turn-off time will increase.

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

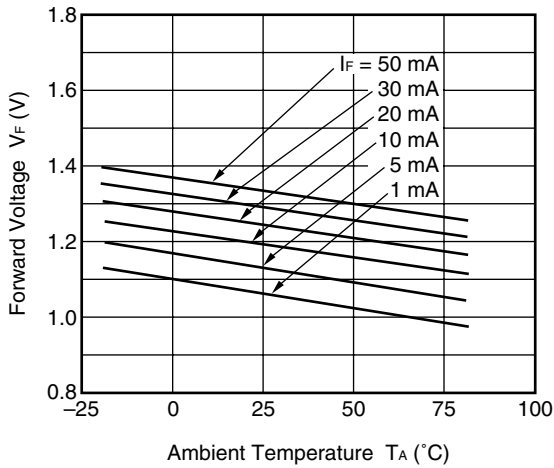
**MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE**



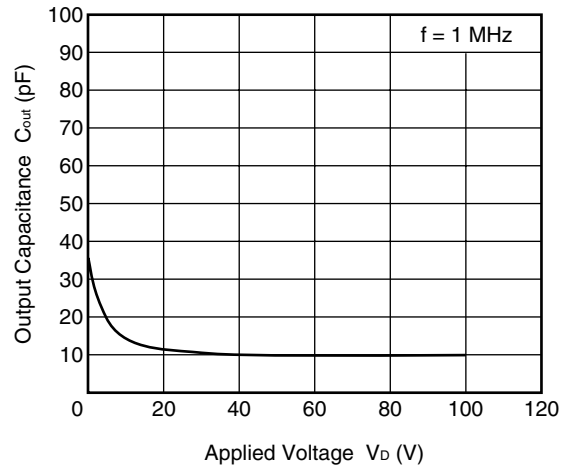
**MAXIMUM LOAD CURRENT vs. AMBIENT TEMPERATURE**



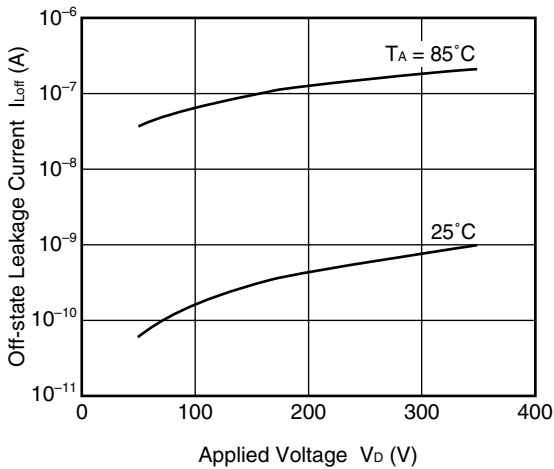
**FORWARD VOLTAGE vs. AMBIENT TEMPERATURE**



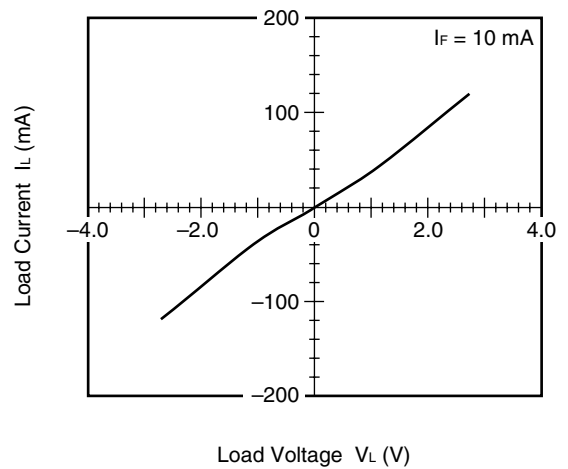
**OUTPUT CAPACITANCE vs. APPLIED VOLTAGE**



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

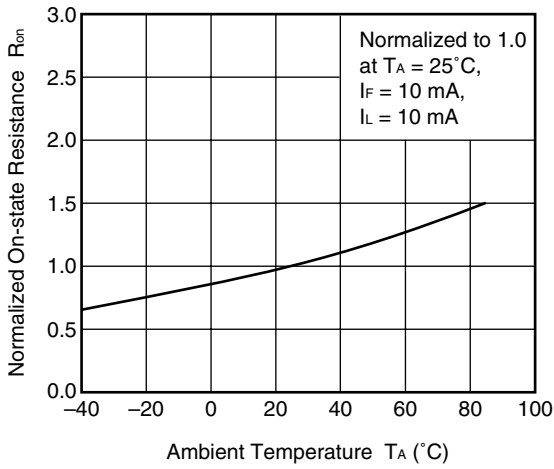


**LOAD CURRENT vs. LOAD VOLTAGE**

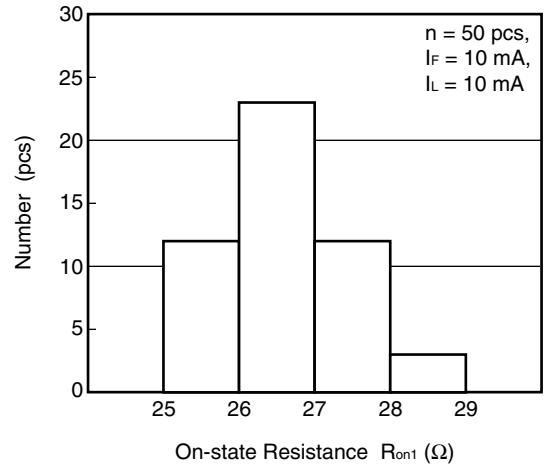


**Remark** The graphs indicate nominal characteristics.

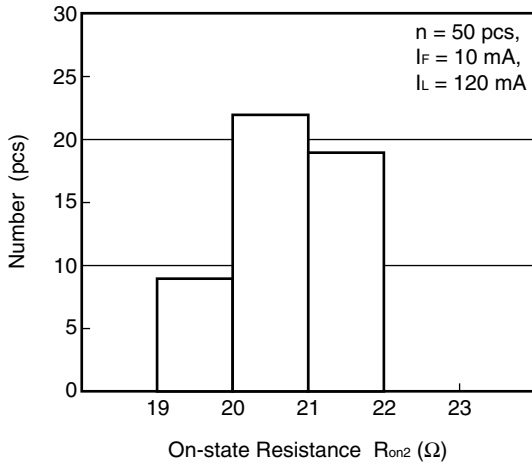
NORMALIZED ON-STATE RESISTANCE vs. AMBIENT TEMPERATURE



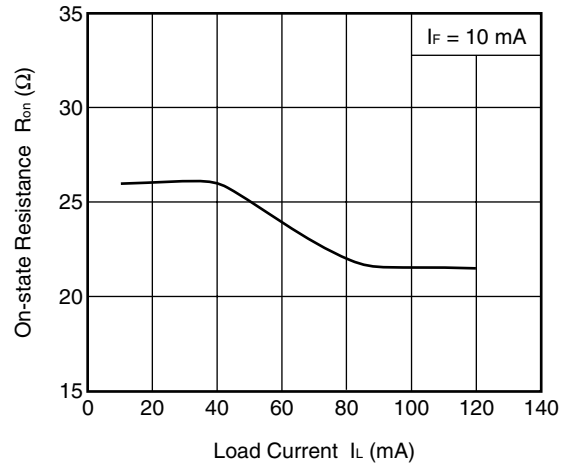
ON-STATE RESISTANCE DISTRIBUTION



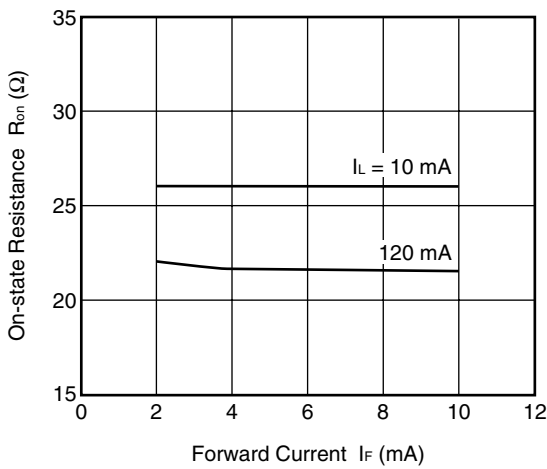
ON-STATE RESISTANCE DISTRIBUTION



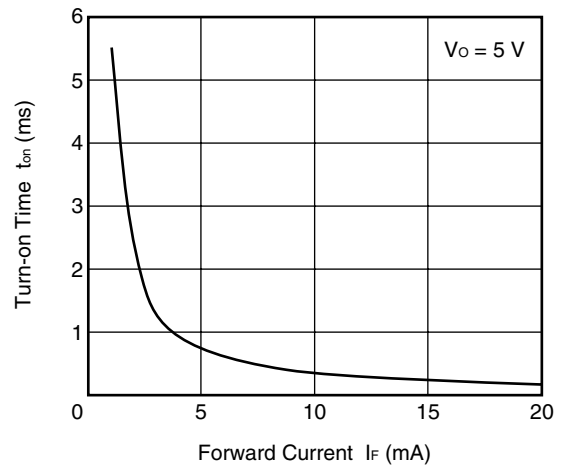
ON-STATE RESISTANCE vs. LOAD CURRENT



ON-STATE RESISTANCE vs. LOAD CURRENT



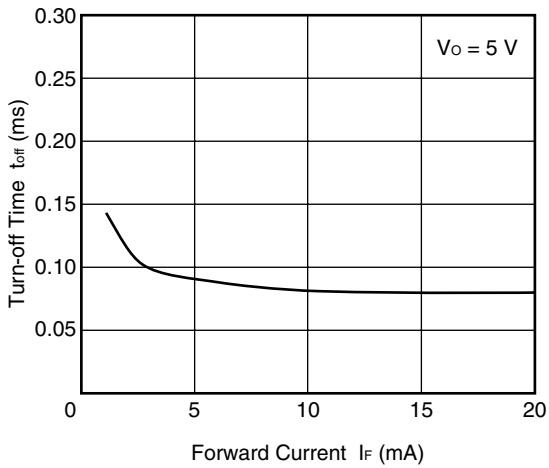
TURN-ON TIME vs. FORWARD CURRENT



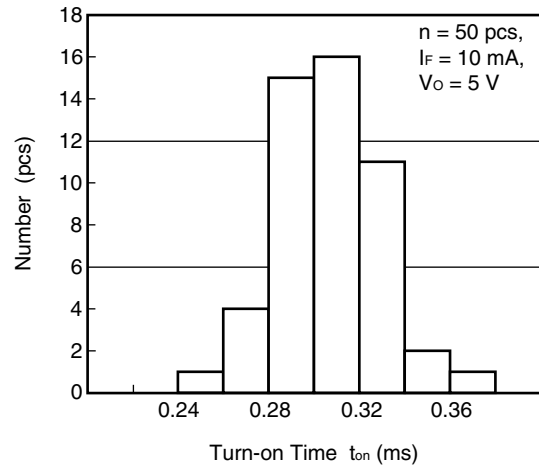
**Remark** The graphs indicate nominal characteristics.



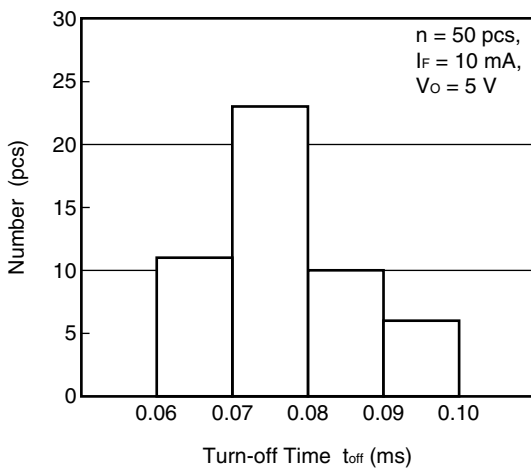
TURN-OFF TIME vs. FORWARD CURRENT



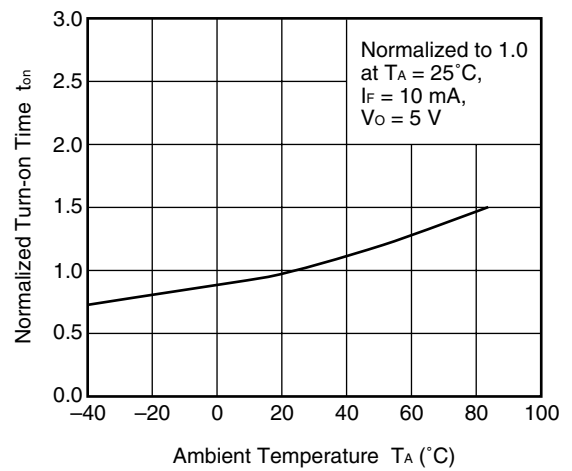
TURN-ON TIME DISTRIBUTION



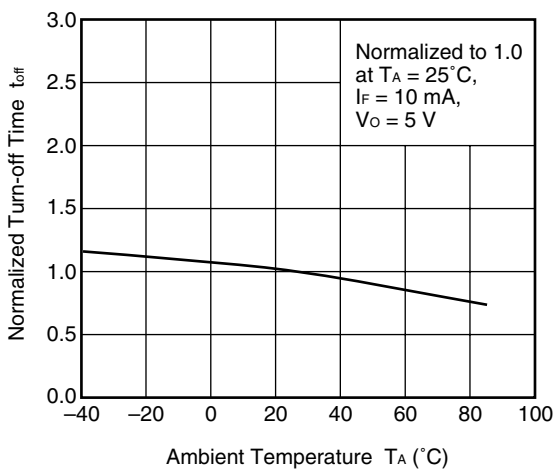
TURN-OFF TIME DISTRIBUTION



NORMALIZED TURN-ON TIME vs. AMBIENT TEMPERATURE



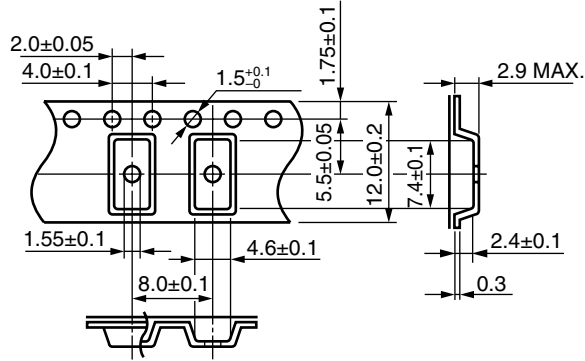
NORMALIZED TURN-OFF TIME vs. AMBIENT TEMPERATURE



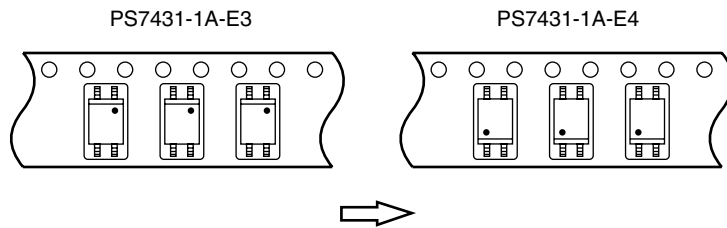
**Remark** The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (in millimeters)

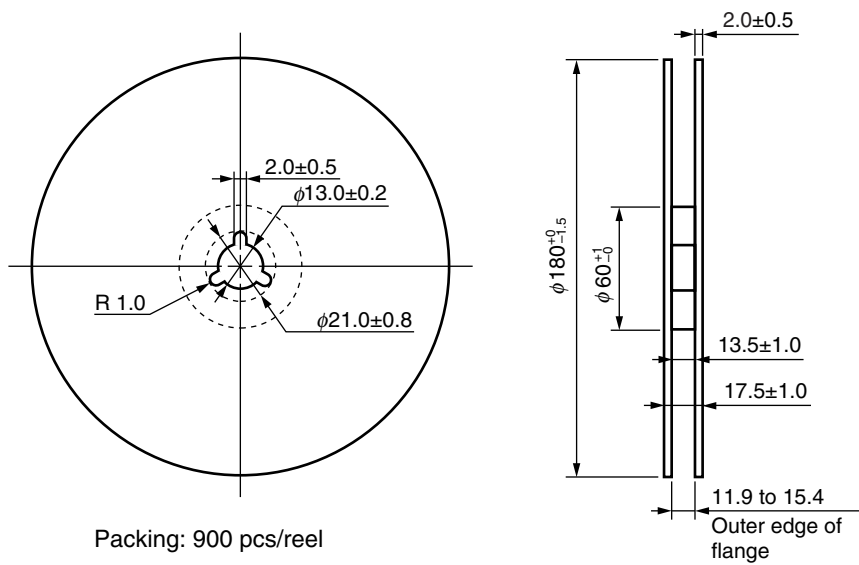
Outline and Dimensions (Tape)



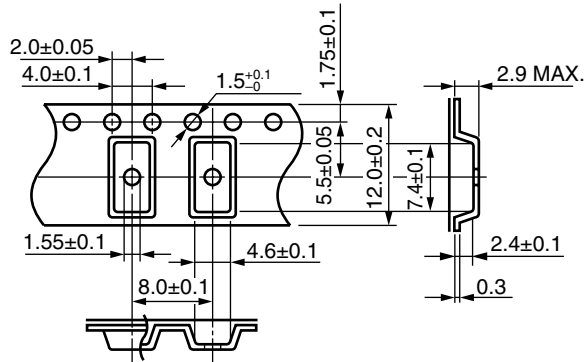
Tape Direction



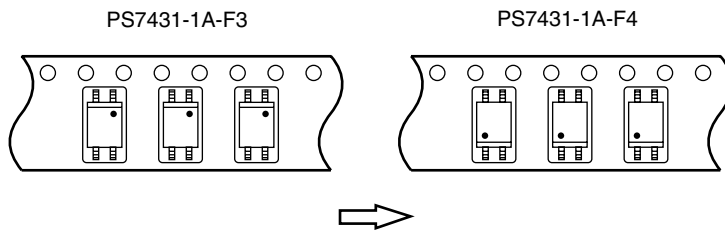
Outline and Dimensions (Reel)



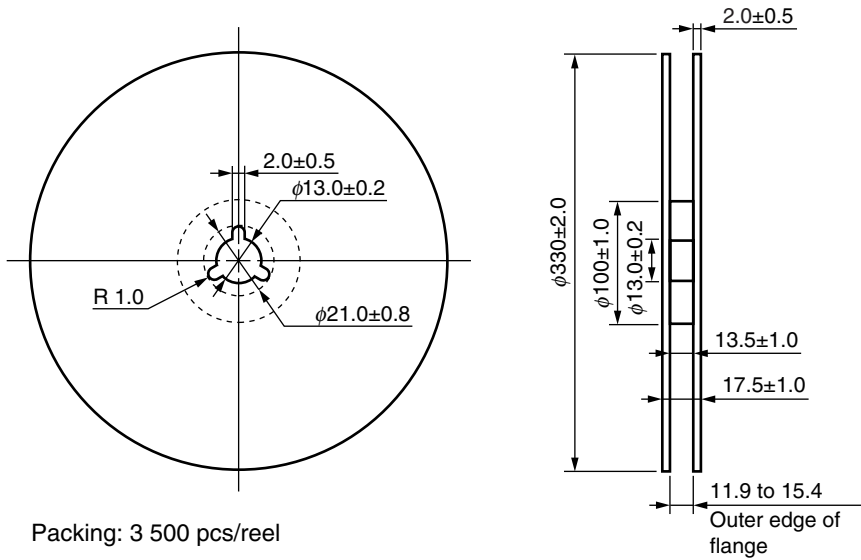
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)

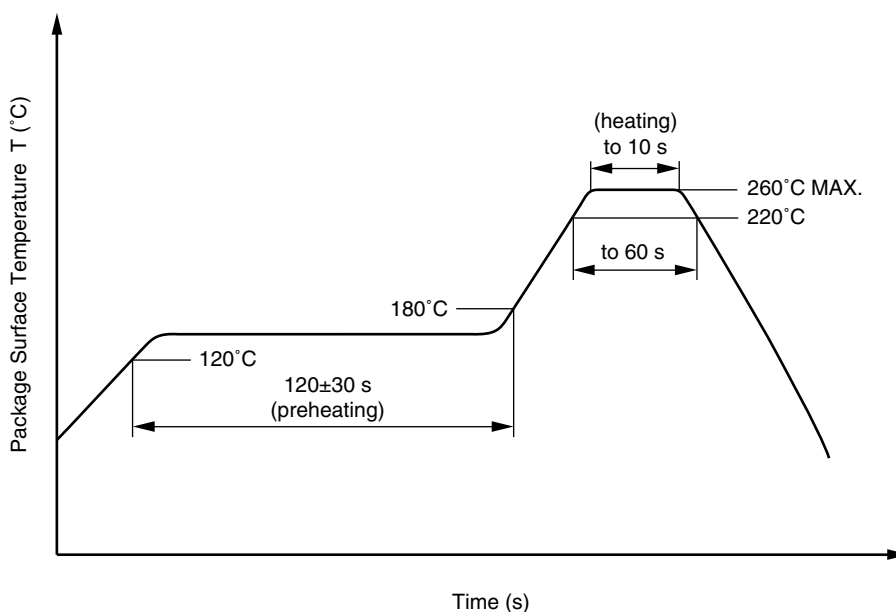


**RECOMMENDED SOLDERING CONDITIONS**

**(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
- <R> • Number of reflows Two
- 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**

- <R>
- To avoid quality degradation, assembling within 1 month after take this device out from covered pack is required.  
(Storage conditions 25°C, 65%RH MAX.)
  - 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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► For further information, please contact

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