

# DATA SHEET

# NEC

Solid State Relay  
OCMOS FET

## PS7142-1C, PS7142L-1C

8-PIN DIP, 400 V BREAK DOWN VOLTAGE  
TRANSFER TYPE  
2-ch Optical Coupled MOS FET

–NEPOC Series–

### DESCRIPTION

The PS7142-1C and PS7142L-1C are transfer type solid state relays containing normally open (N.O.) contact and normally close (N.C.) contact on output side.

They are suitable for analog signal control because of their low offset and high linearity.

The PS7142L-1C has a surface mount type lead.

### FEATURES

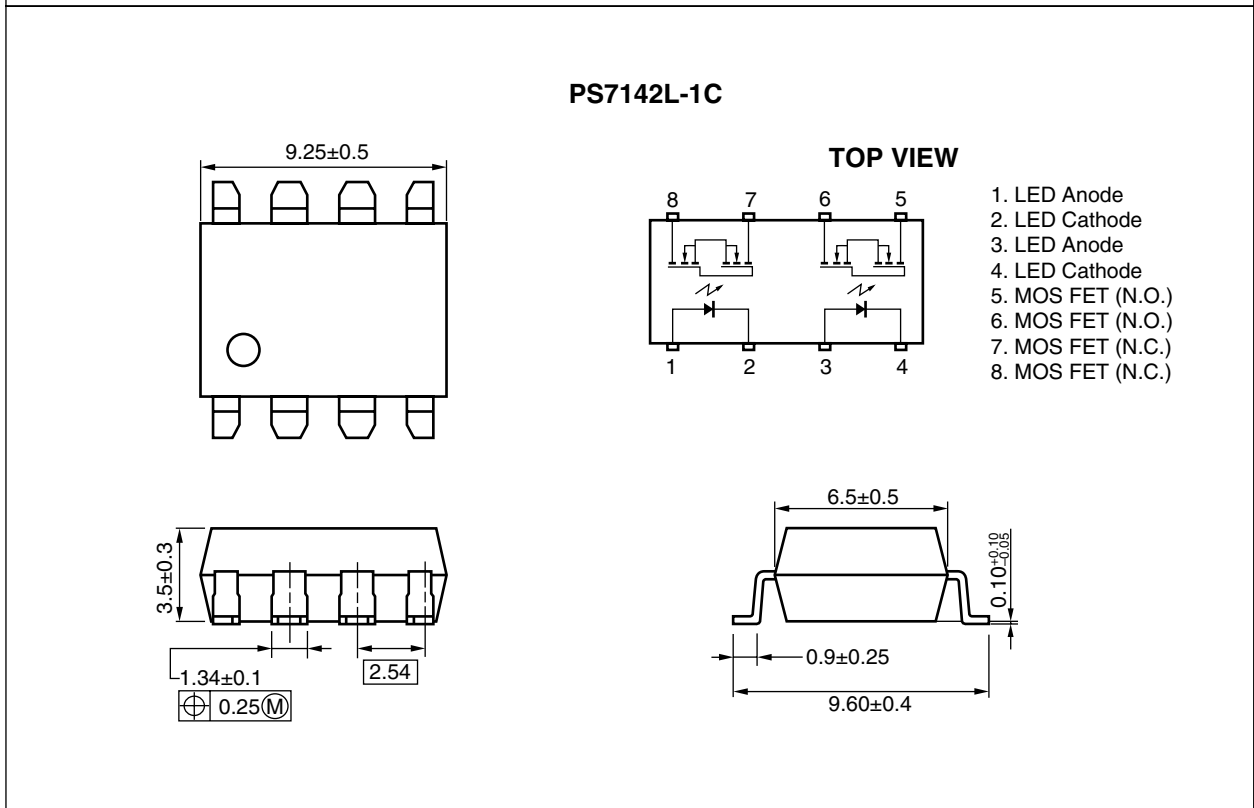
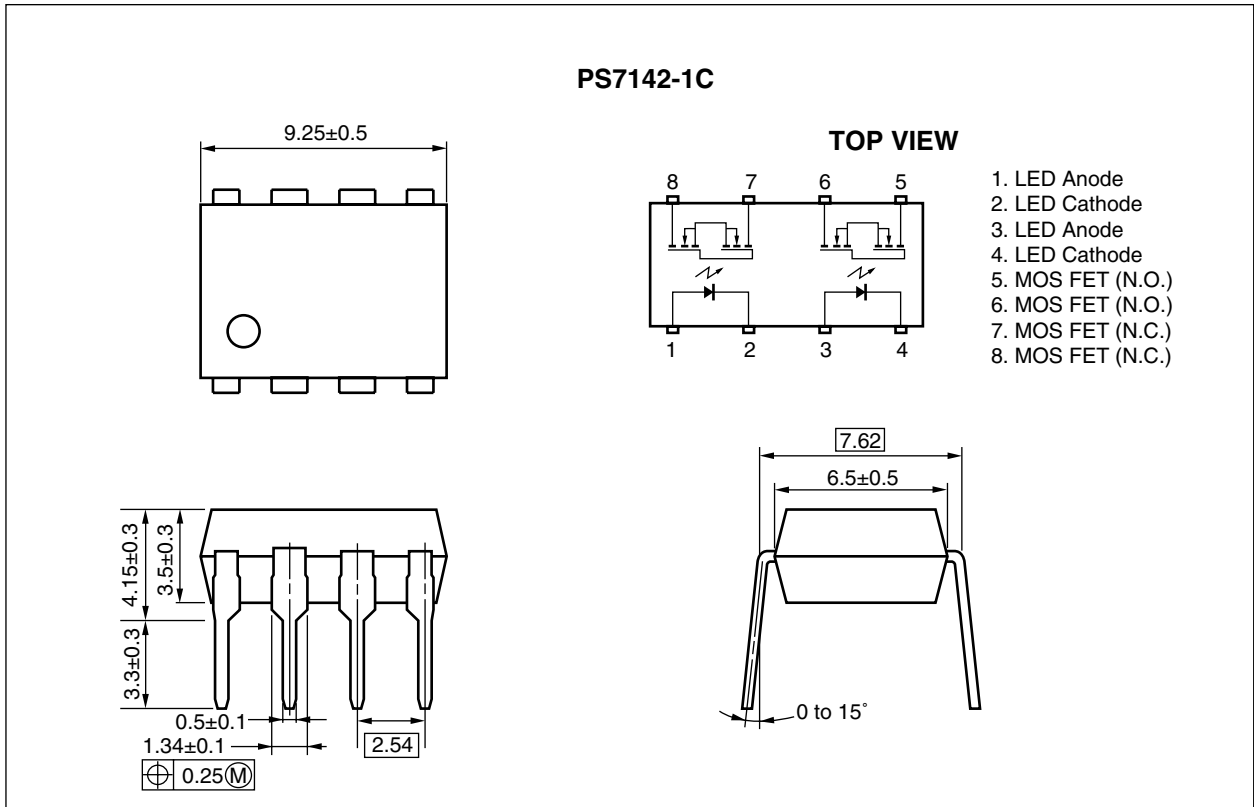
- 2 channel type (1 a + 1 b output)
- Low LED operating current ( $I_f = 2 \text{ mA}$ )
- Designed for AC/DC switching line changer
- Small package (8-pin DIP)
- Low offset voltage
- Ordering number of taping product : PS7142L-1C-E3, E4: 1 000 pcs/reel
- <R> • Pb-Free product
- <R> • Safety standards
  - UL approved: File No. E72422
  - BSI approved: No. 8245/8246
  - CSA approved: No. CA 101391

### APPLICATIONS

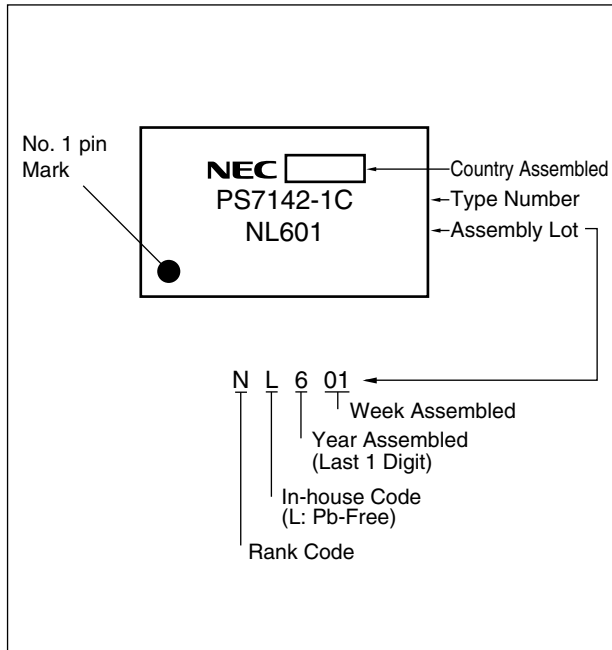
- Exchange equipment
- Measurement equipment
- FA/OA equipment

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PACKAGE DIMENSIONS (in millimeters)



<R> MARKING EXAMPLE



<R> ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number <sup>1</sup>
PS7142-1C	PS7142-1C-A	Pb-Free	Magazine case 50 pcs	Standard products (UL, BSI, CSA approved)	PS7142-1C
PS7142L-1C	PS7142L-1C-A				
PS7142L-1C-E3	PS7142L-1C-E3-A		Embossed Tape 1 000 pcs/reel		
PS7142L-1C-E4	PS7142L-1C-E4-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/ch
	Reverse Voltage	V <sub>R</sub>	5.0	V
	Power Dissipation	P <sub>D</sub>	50	mW/ch
	Peak Forward Current <sup>1</sup>	I <sub>FP</sub>	1	A/ch
MOS FET	Break Down Voltage	V <sub>L</sub>	400	V
	Continuous Load Current	I <sub>L</sub>	200	mA/ch
	Pulse Load Current <sup>2</sup> (AC/DC Connection)	I <sub>LP</sub>	400	mA/ch
	Power Dissipation	P <sub>D</sub>	375	mW/ch
Isolation Voltage <sup>3</sup>		BV	1 500	Vr.m.s.
Total Power Dissipation		P <sub>T</sub>	850	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 1-4 shorted together, 5-8 shorted together.

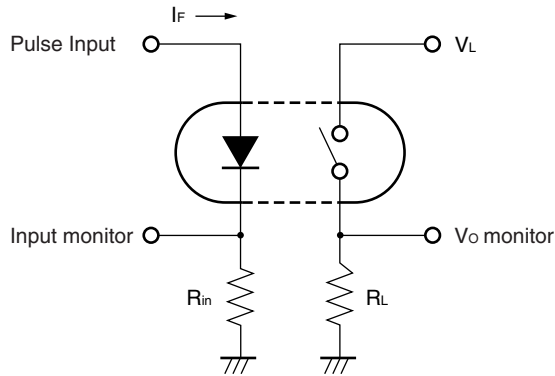
**RECOMMENDED OPERATING CONDITIONS (T<sub>A</sub> = 25°C)**

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

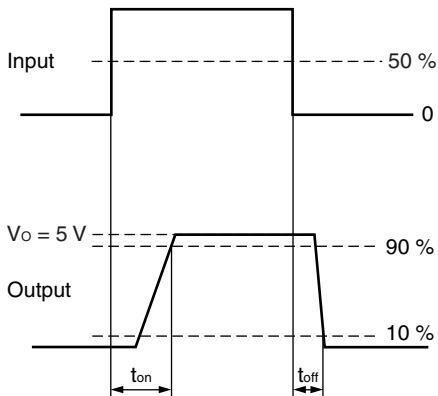
ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

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>	N.O. : I <sub>F</sub> = 0 mA, V <sub>D</sub> = 400 V		0.03	1.0	μA	
			N.C. : I <sub>F</sub> = 10 mA, V <sub>D</sub> = 400 V					
	Output Capacitance	C <sub>out</sub>	N.O. : V <sub>D</sub> = 0 V, f = 1 MHz		140		pF/ch	
			N.C. : V <sub>D</sub> = 0 V, f = 1 MHz, I <sub>F</sub> = 10 mA		430			
Coupled	LED On-state Current	I <sub>Fon</sub>	N.O. : I <sub>L</sub> = 200 mA			2.0	mA	
	LED Off-state Current	I <sub>Foff</sub>	N.C. : I <sub>L</sub> = 200 mA			2.0		
	On-state Resistance	R <sub>on1</sub>	N.O. : I <sub>F</sub> = 10 mA, I <sub>L</sub> = 10 mA		8	12	Ω	
			N.C. : I <sub>F</sub> = 0 mA, I <sub>L</sub> = 10 mA		7	12		
		R <sub>on2</sub>	N.O. : I <sub>F</sub> = 10 mA, I <sub>L</sub> = 200 mA, t ≤ 10 ms		7	10		
			N.C. : I <sub>F</sub> = 0 mA, I <sub>L</sub> = 200 mA, t ≤ 10 ms		7	10		
	Turn-on Time <sup>*1,2</sup>	t <sub>on</sub> (N.O.)	I <sub>F</sub> = 10 mA, V <sub>O</sub> = 5 V, R <sub>L</sub> = 500 Ω, PW ≥ 10 ms		0.3	2.0	ms	
				t <sub>on</sub> (N.C.)		0.03		0.2
		Turn-off Time <sup>*1,2</sup>		t <sub>off</sub> (N.O.)		0.03		0.2
				t <sub>off</sub> (N.C.)		0.6		2.0
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		1.1		pF/ch		

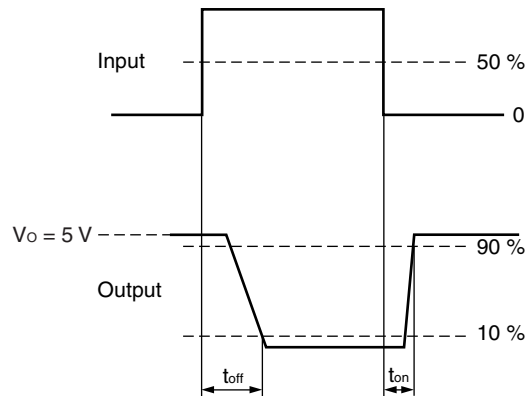
\*1 Test Circuit for Switching Time



N.O. (between pin 5 and 6)



N.C. (between pin 7 and 8)

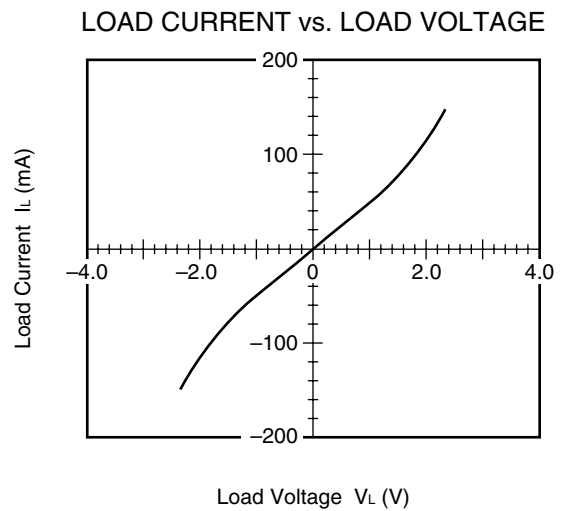
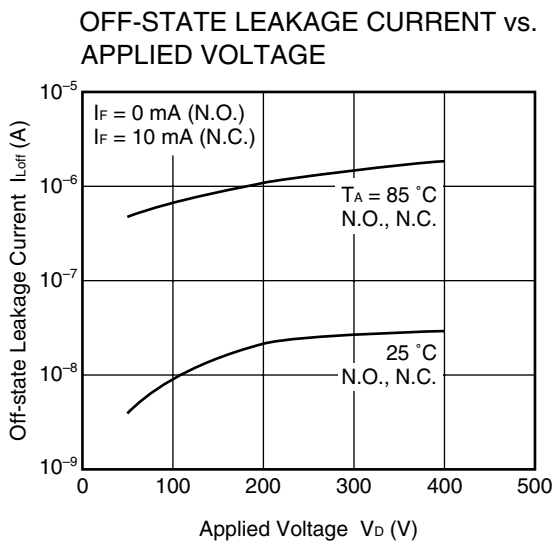
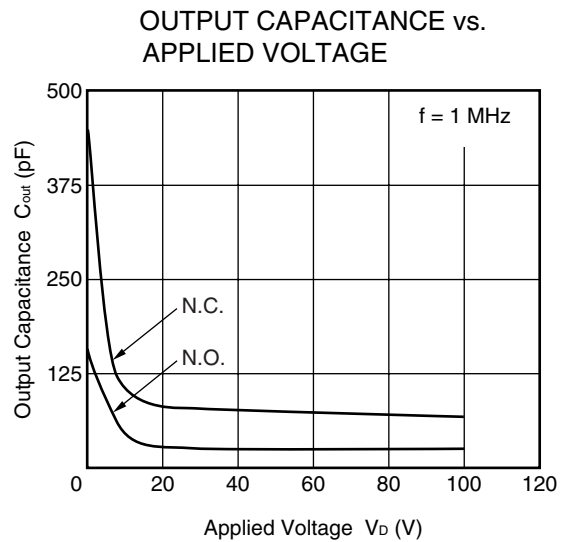
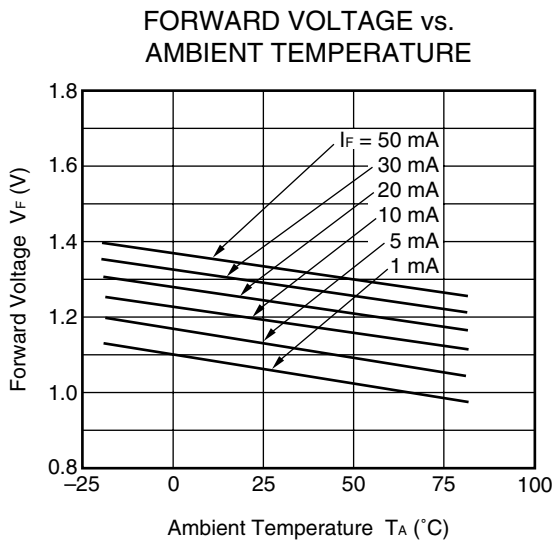
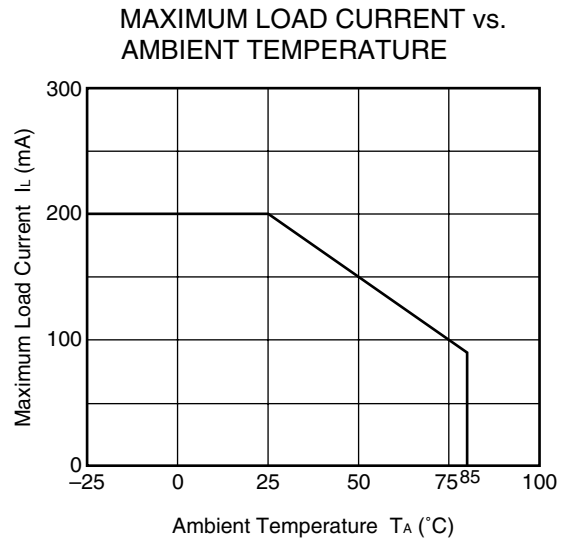
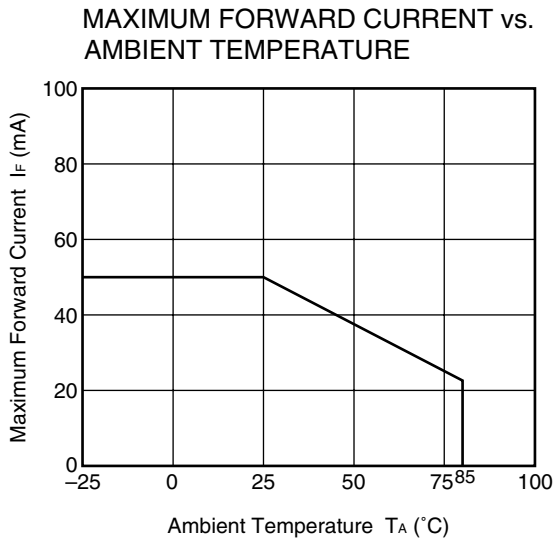


<R>

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

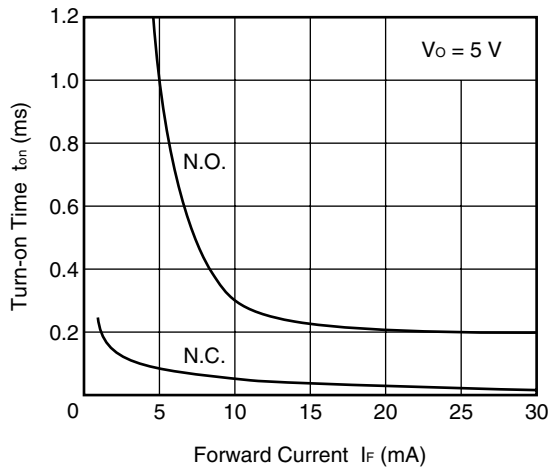
Be aware that when the device operates with an input-pulse width less than 10 ms, the turn-on time and turn-off time will increase.

**TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C, unless otherwise specified)**

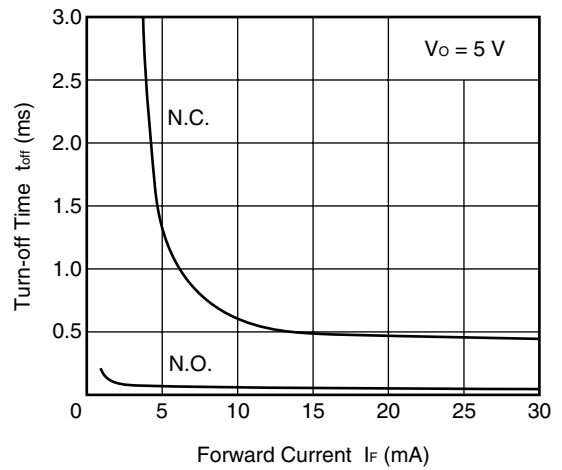


**Remark** The graphs indicate nominal characteristics.

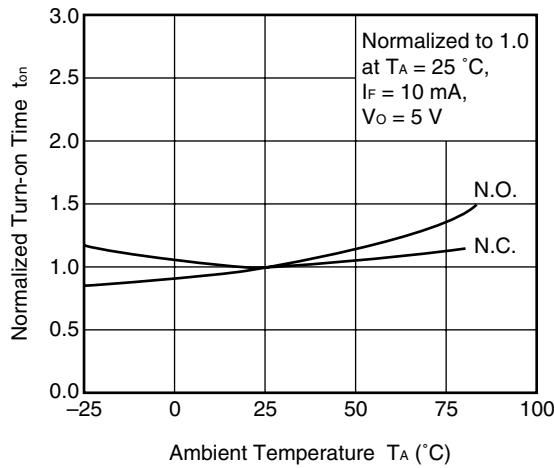
TURN-ON TIME vs. FORWARD CURRENT



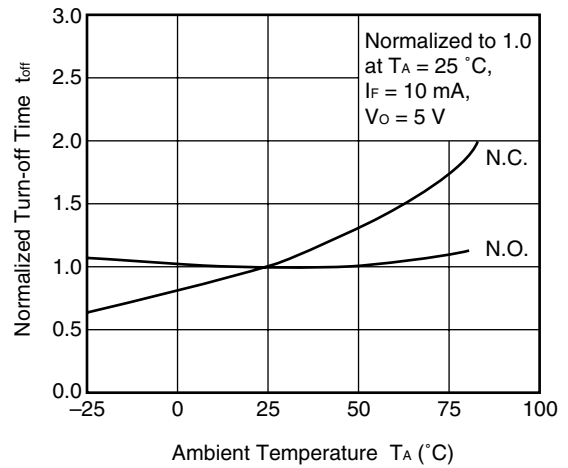
TURN-OFF TIME vs. FORWARD CURRENT



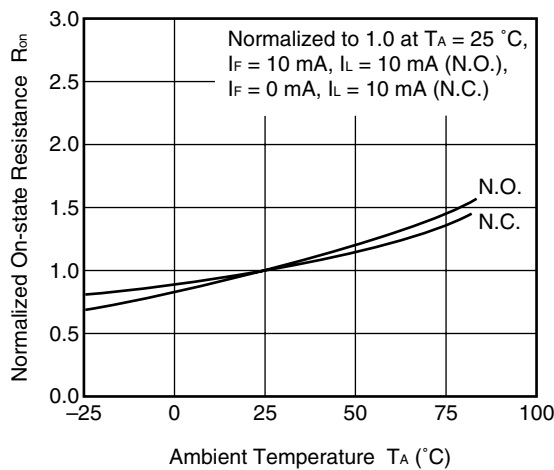
NORMALIZED TURN-ON TIME vs. AMBIENT TEMPERATURE



NORMALIZED TURN-OFF TIME vs. AMBIENT TEMPERATURE

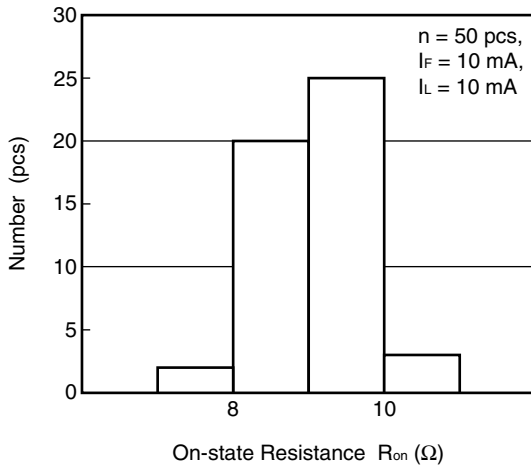


NORMALIZED ON-STATE RESISTANCE vs. AMBIENT TEMPERATURE

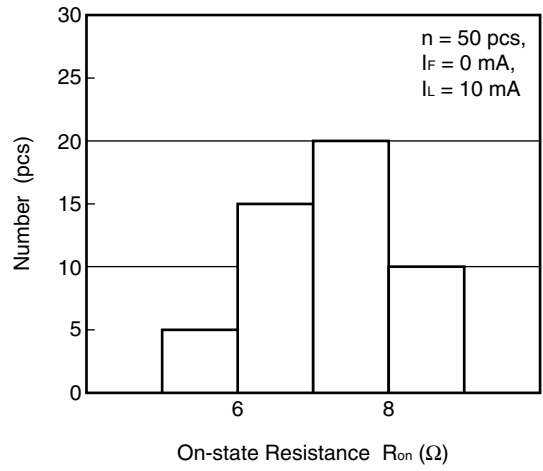


**Remark** The graphs indicate nominal characteristics.

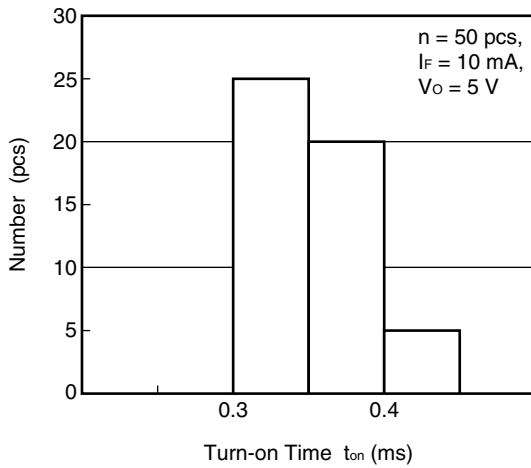
ON-STATE RESISTANCE (N.O.) DISTRIBUTION



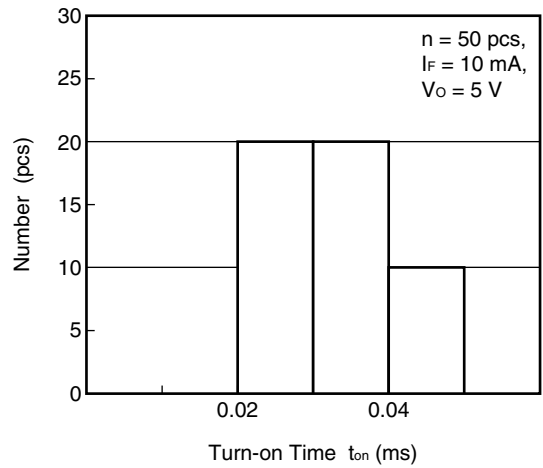
ON-STATE RESISTANCE (N.C.) DISTRIBUTION



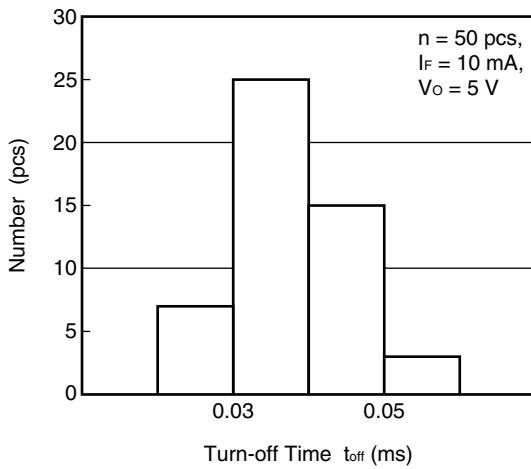
TURN-ON TIME (N.O.) DISTRIBUTION



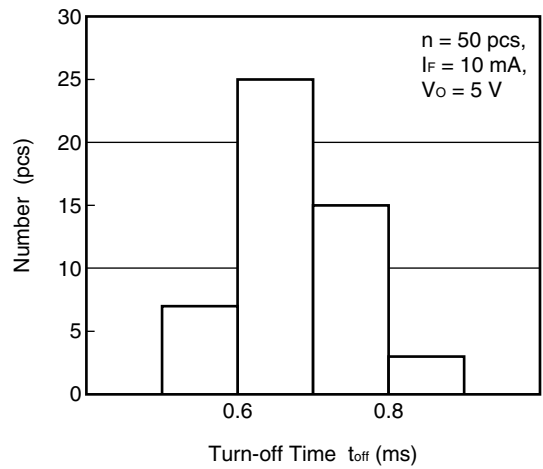
TURN-ON TIME (N.C.) DISTRIBUTION



TURN-OFF TIME (N.O.) DISTRIBUTION



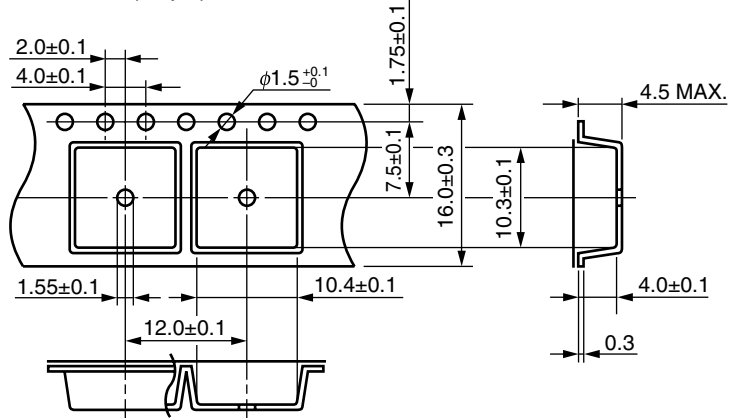
TURN-OFF TIME (N.C.) DISTRIBUTION



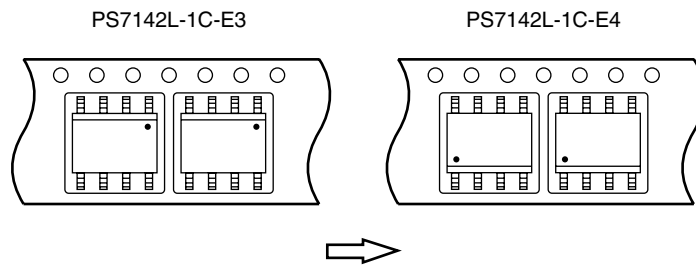
**Remark** The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (in millimeters)

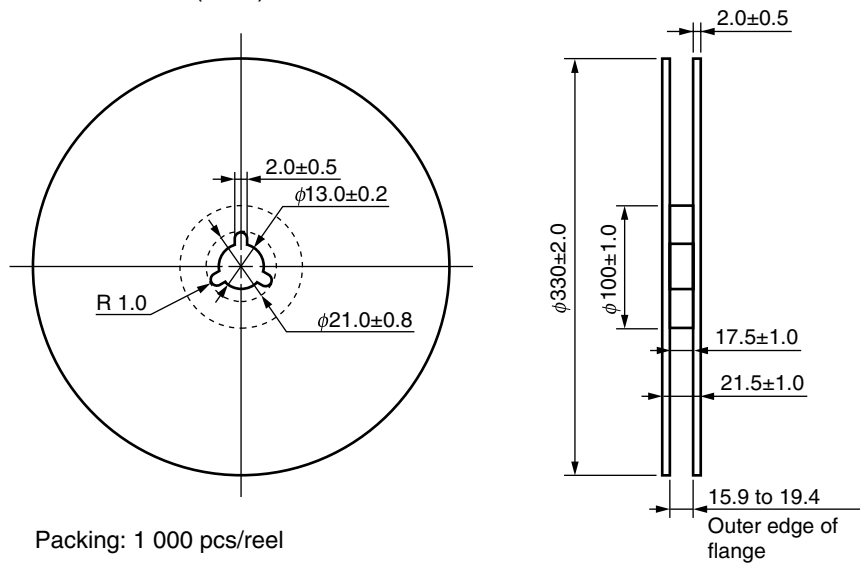
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)

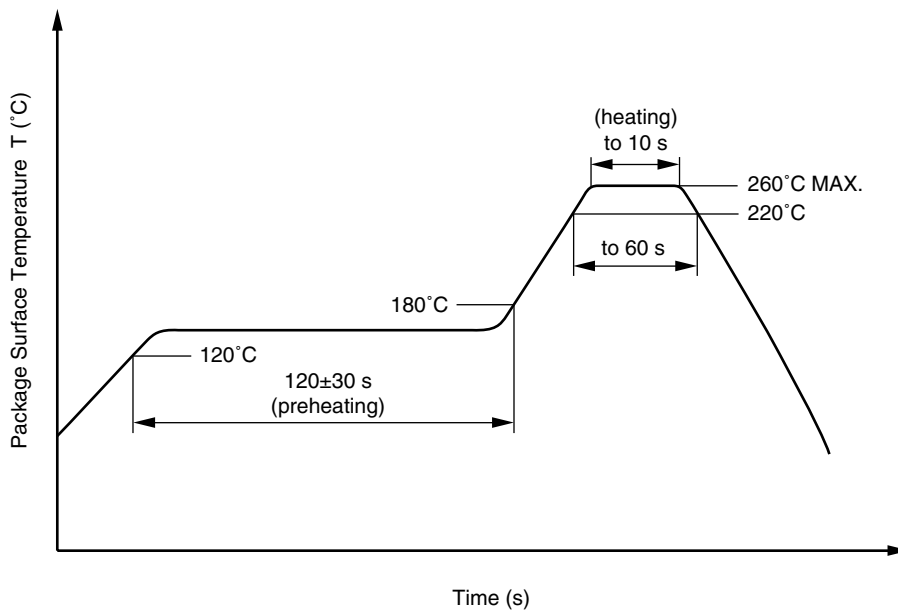


**RECOMMENDED SOLDERING CONDITIONS**

**(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.)

<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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<p><b>Caution</b></p>	<p>GaAs Products</p>	<p>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.</p> <ul style="list-style-type: none"> <li>• 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.               <ol style="list-style-type: none"> <li>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.</li> <li>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.</li> </ol> </li> <li>• Do not burn, destroy, cut, crush, or chemically dissolve the product.</li> <li>• Do not lick the product or in any way allow it to enter the mouth.</li> </ul>
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► **For further information, please contact**

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