DATA SHEET

NEC

Solid State Relay
OCMOS FET

PS7141-1C,PS7141L-1C

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

DESCRIPTION

The PS7141-1C and PS7141L-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.

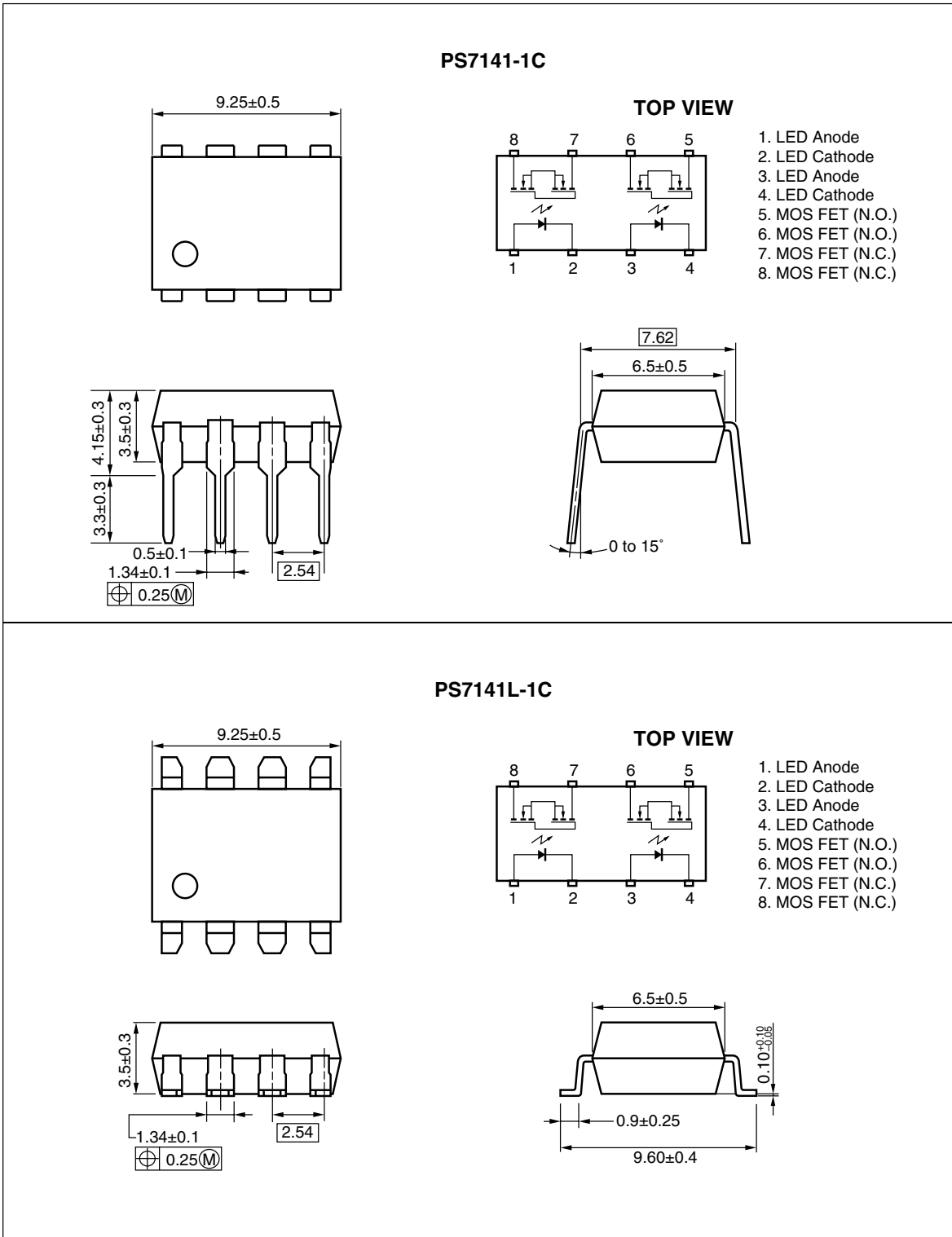The PS7141L-1C has a surface mount type lead.

FEATURES

- 2 channel type (1 a + 1 b output)
- Low LED operating current (I_F = 2 mA)
- Designed for AC/DC switching line changer
- Small package (8-pin DIP)
- Low offset voltage
- Ordering number of taping product : PS7141L-1C-E3, E4: 1 000 pcs/reel

<R>
- Pb-Free product
- Safety standards
  - UL approved: File No. E72422
  - BSI approved: No. 8245/8246
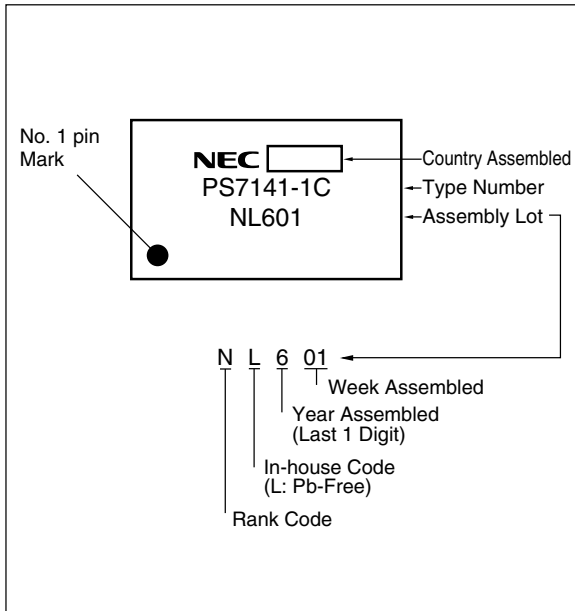 - CSA approved: No. CA 101391

APPLICATIONS

- Exchange equipment
- Measurement equipment
- FA/OA equipment

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The mark <R> shows major revised points. © **NEC Electronics Corporation 1997, 2006**

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 (in millimeters)

PS7141-1C

9.25±0.5

TOP VIEW

8   7   6   5

1   2   3   4

1. LED Anode
2. LED Cathode
3. LED Anode
4. LED Cathode
5. MOS FET (N.O.)
6. MOS FET (N.O.)
7. MOS FET (N.C.)
8. MOS FET (N.C.)

4.15±0.3

3.5±0.3

3.3±0.3

0.5±0.1

1.34±0.1

2.54

⊕ 0.25Ⓜ

7.62

6.5±0.5

0 to 15°

PS7141L-1C

9.25±0.5

TOP VIEW

8   7   6   5

1   2   3   4

1. LED Anode
2. LED Cathode
3. LED Anode
4. LED Cathode
5. MOS FET (N.O.)
6. MOS FET (N.O.)
7. MOS FET (N.C.)
8. MOS FET (N.C.)

3.5±0.3

1.34±0.1

2.54

⊕ 0.25Ⓜ

6.5±0.5

$0.10^{+0.10}_{-0.05}$

0.9±0.25

9.60±0.4

2   Data Sheet   PN10280EJ02V0DS

<R> **MARKING EXAMPLE**

No. 1 pin Mark

NEC [ ] — Country Assembled
PS7141-1C ← Type Number
NL601 ← Assembly Lot

N L 6 01
           Week Assembled
       Year Assembled (Last 1 Digit)
     In-house Code (L: Pb-Free)
   Rank Code

<R>   **ORDERING INFORMATION**

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number[1]
PS7141-1C	PS7141-1C-A	Pb-Free	Magazine case 50 pcs	Standard products (UL, BSI, CSA approved)	PS7141-1C
PS7141L-1C	PS7141L-1C-A				
PS7141L-1C-E3	PS7141L-1C-E3-A		Embossed Tape 1 000 pcs/reel		
PS7141L-1C-E4	PS7141L-1C-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/ch
	Reverse Voltage	V_R	5.0	V
	Power Dissipation	P_D	50	mW/ch
	Peak Forward Current [1]	I_{FP}	1	A/ch
MOS FET	Break Down Voltage	V_L	400	V
	Continuous Load Current	I_L	150	mA/ch
	Pulse Load Current [2] (AC/DC Connection)	I_{LP}	300	mA/ch
	Power Dissipation	P_D	375	mW/ch
Isolation Voltage [3]		BV	1 500	Vr.m.s.
Total Power Dissipation		P_T	850	mW
Operating Ambient Temperature		T_A	−40 to +85	°C
Storage Temperature		T_{stg}	−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_A = 25°C, RH = 60% between input and output
   Pins 1-4 shorted together, 5-8 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	μA
MOS FET	Off-state Leakage Current	I_{Loff}	N.O.: I_F = 0 mA, V_D = 400 V		0.03	1.0	μA
			N.C.: I_F = 10 mA, V_D = 400 V				
	Output Capacitance	C_{out}	N.O.: V_D = 0 V, f = 1 MHz		65		pF/ch
			N.C.: V_D = 0 V, f = 1 MHz, I_F = 10 mA		185		
Coupled	LED On-state Current	I_{Fon}	N.O.: I_L = 150 mA			2.0	mA
	LED Off-state Current	I_{Foff}	N.C.: I_L = 150 mA			2.0	mA
	On-state Resistance	R_{on1}	N.O.: I_F = 10 mA, I_L = 10 mA		20	30	Ω
			N.C.: I_F = 0 mA, I_L = 10 mA		24	30	
		R_{on2}	N.O.: I_F = 10 mA, I_L = 150 mA, t $\leq$ 10 ms		16	25	
			N.C.: I_F = 0 mA, I_L = 150 mA, t $\leq$ 10 ms		16	25	
	Turn-on Time [1, 2]	$t_{on (N.O.)}$	I_F = 10 mA, V_O = 5 V, R_L = 500 Ω, PW $\geq$ 10 ms		0.33	1.0	ms
		$t_{on (N.C.)}$			0.02	0.2	
	Turn-off Time [1, 2]	$t_{off (N.O.)}$			0.03	0.2	
		$t_{off (N.C.)}$			0.20	1.0	
	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		1.1		pF/ch

*1 Test Circuit for Switching Time
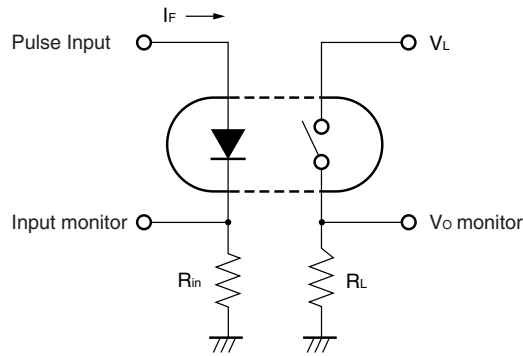
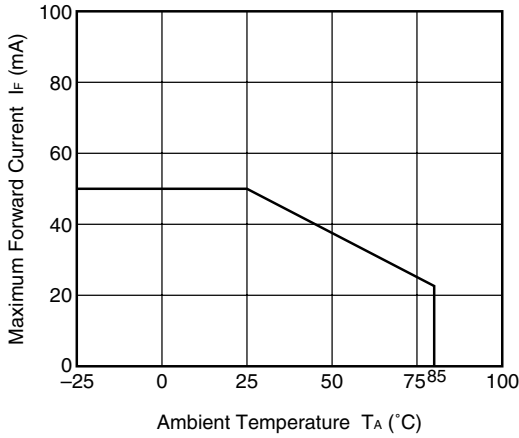N.O. (between pin 5 and 6) N.C. (between pin 7 and 8)
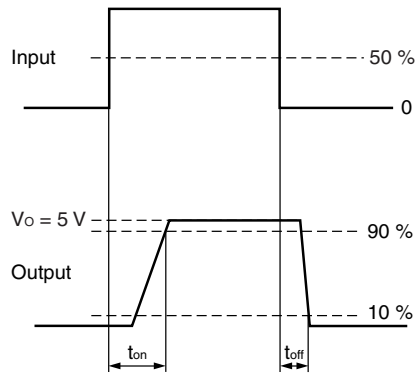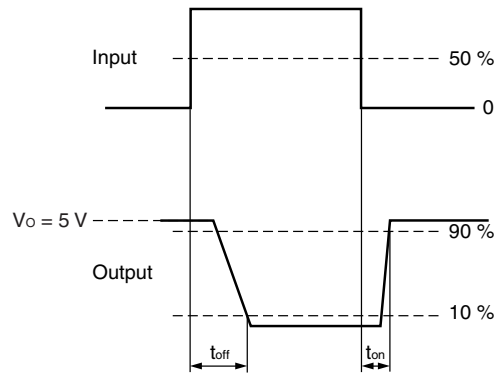
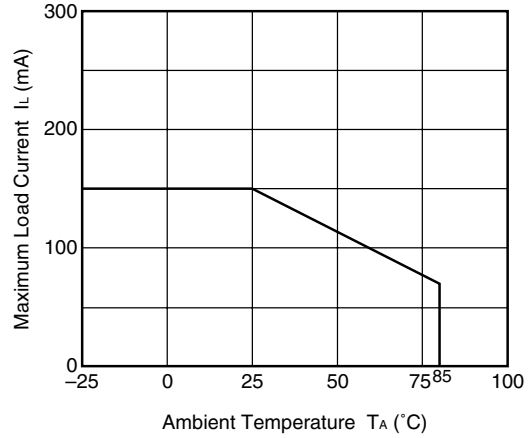\<R> ***2** The turn-on time and turn-off time are specified as input-pulse width ≥ 10 ms.
Be aware that when the device operates with an input-pulse width less than 10 ms, the turn-on time and turn-off time will increase.

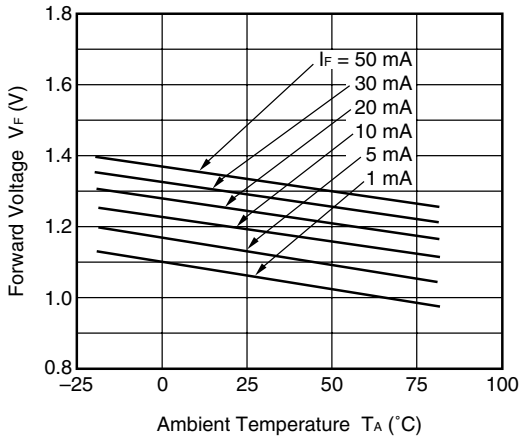**TYPICAL CHARACTERISTICS (T$_A$ = 25°C, unless otherwise specified)**
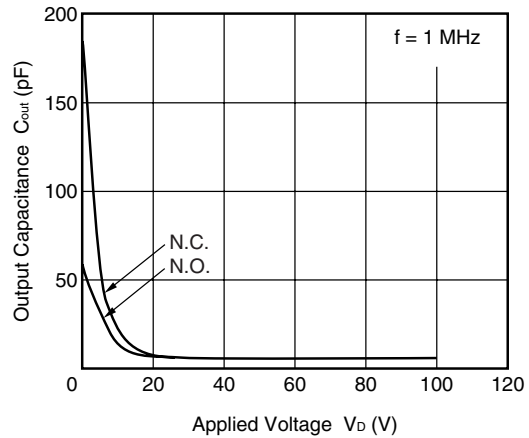
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE

MAXIMUM LOAD CURRENT vs. AMBIENT TEMPERATURE

FORWARD VOLTAGE vs. AMBIENT TEMPERATURE

OUTPUT CAPACITANCE vs. APPLIED VOLTAGE

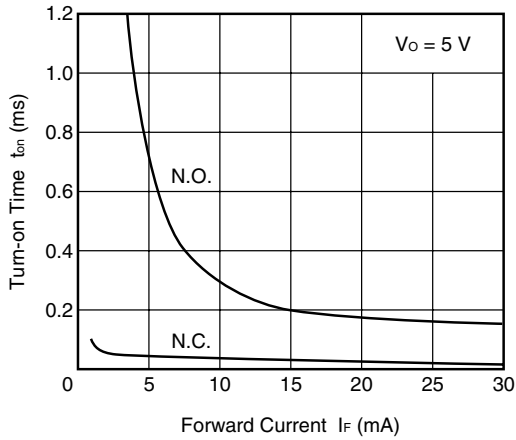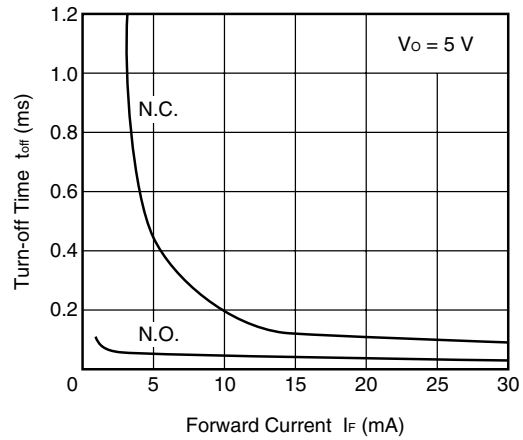### OFF-STATE LEAKAGE CURRENT vs. APPLIED VOLTAGE
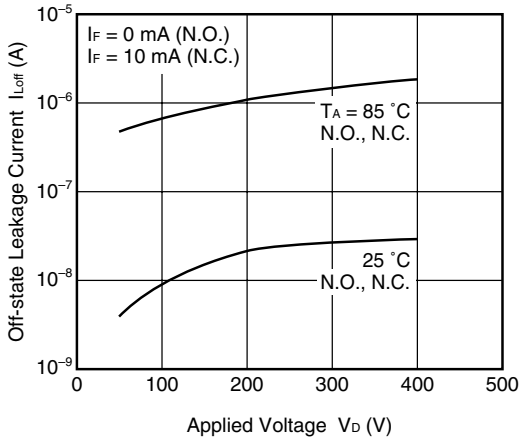
LOAD CURRENT vs. LOAD VOLTAGE
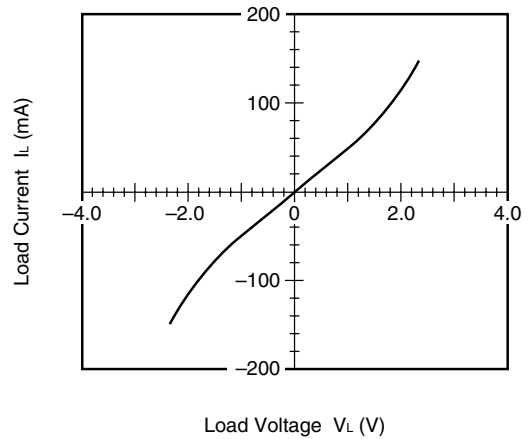
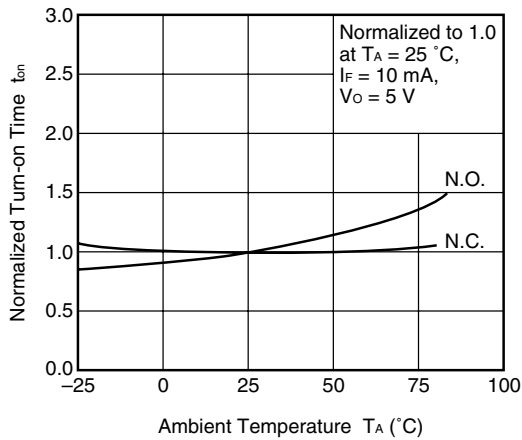**Remark** The graphs indicate nominal characteristics.
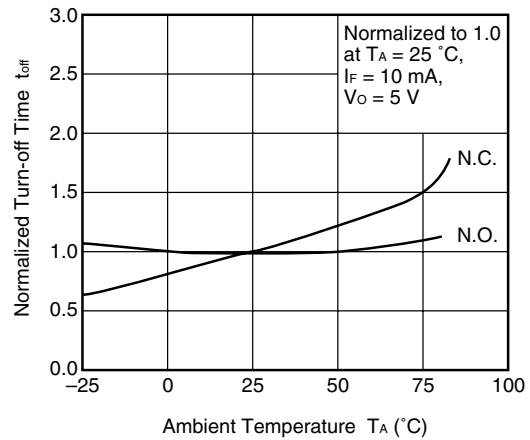
TURN-ON TIME vs. FORWARD CURRENT

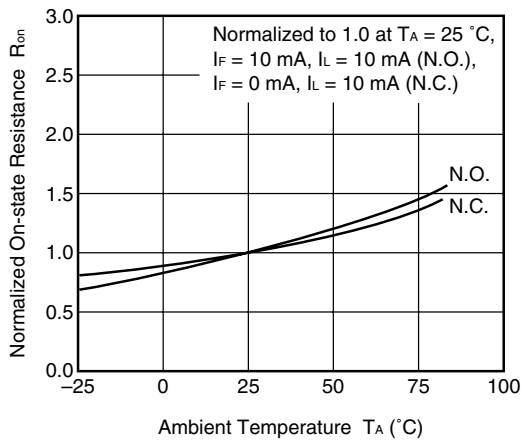## TURN-OFF TIME vs. FORWARD CURRENT

NORMALIZED TURN-ON TIME vs. AMBIENT TEMPERATURE

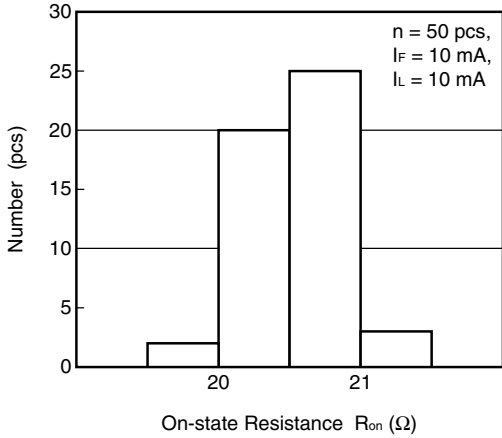## NORMALIZED TURN-OFF TIME vs. AMBIENT TEMPERATURE

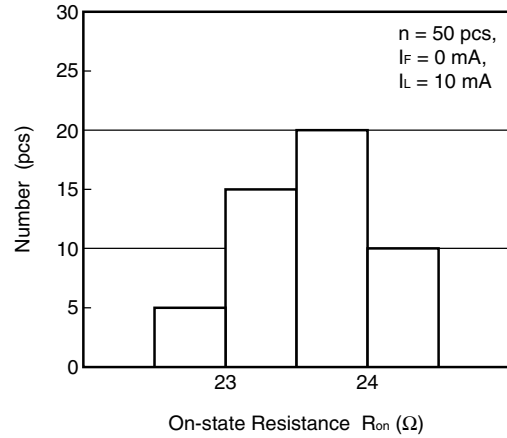## NORMALIZED ON-STATE RESISTANCE vs. AMBIENT TEMPERATURE

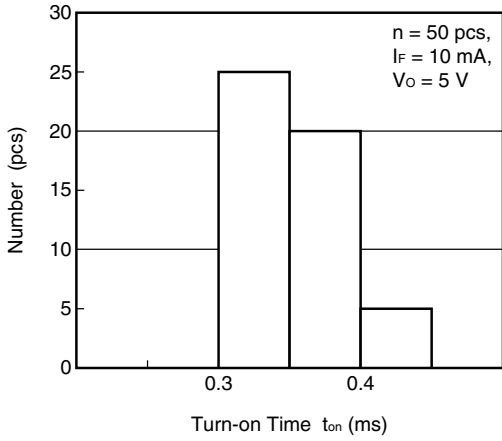**Remark** The graphs indicate nominal characteristics.
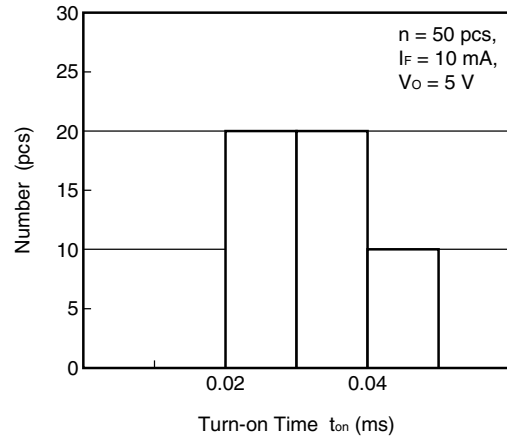
ON-STATE RESISTANCE (N.O.) DISTRIBUTION

n = 50 pcs,
I_F = 10 mA,
I_L = 10 mA

On-state Resistance R_{on} (Ω)

ON-STATE RESISTANCE (N.C.) DISTRIBUTION

n = 50 pcs,
I_F = 0 mA,
I_L = 10 mA

On-state Resistance R_{on} (Ω)

TURN-ON TIME (N.O.) DISTRIBUTION

n = 50 pcs,
I_F = 10 mA,
V_O = 5 V

Turn-on Time t_{on} (ms)

TURN-ON TIME (N.C.) DISTRIBUTION

n = 50 pcs,
I_F = 10 mA,
V_O = 5 V

Turn-on Time t_{on} (ms)

TURN-OFF TIME (N.O.) DISTRIBUTION

n = 50 pcs,
I_F = 10 mA,
V_O = 5 V

Turn-off Time t_{off} (ms)
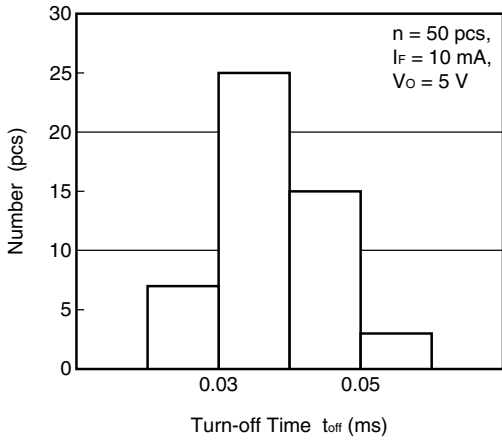
TURN-OFF TIME (N.C.) DISTRIBUTION

n = 50 pcs,
I_F = 10 mA,
V_O = 5 V

Turn-off Time t_{off} (ms)
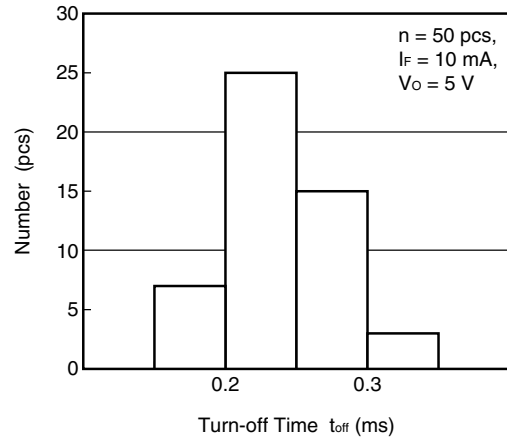
Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (in millimeters)

Outline and Dimensions (Tape)

2.0±0.1
4.0±0.1
$\phi 1.5 ^{+0.1}_{-0}$
1.75±0.1
4.5 MAX.
7.5±0.1
16.0±0.3
10.3±0.1
1.55±0.1
10.4±0.1
4.0±0.1
12.0±0.1
0.3

Tape Direction

PS7141L-1C-E3

PS7141L-1C-E4
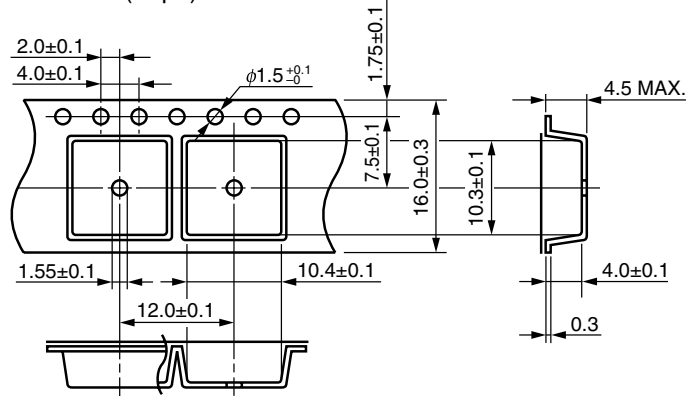
Outline and Dimensions (Reel)

2.0±0.5

2.0±0.5
$\phi 13.0$±0.2
R 1.0
$\phi 21.0$±0.8

$\phi 330$±2.0
$\phi 100$±1.0
17.5±1.0
21.5±1.0
15.9 to 19.4
Outer edge of flange

Packing: 1 000 pcs/reel

Data Sheet PN10280EJ02V0DS
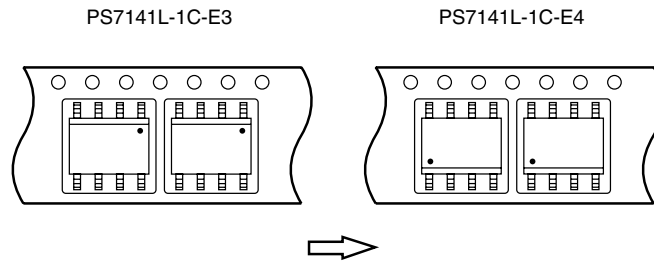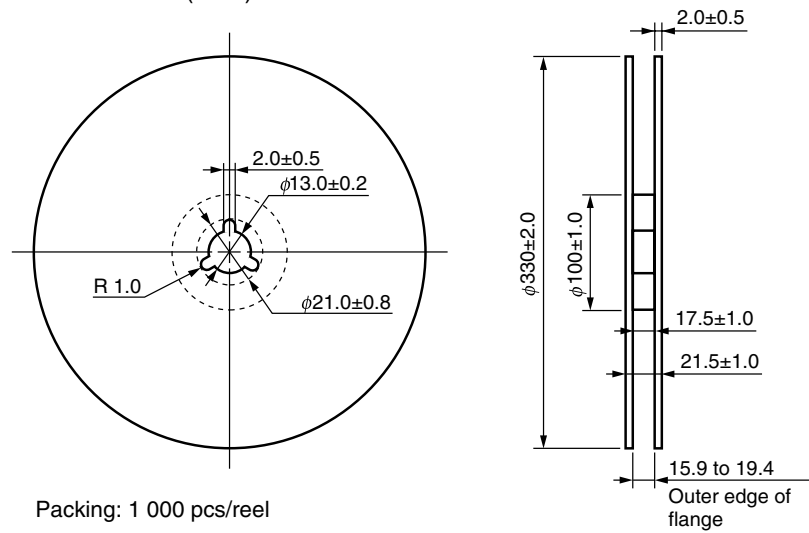
RECOMMENDED SOLDERING CONDITIONS

(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.)
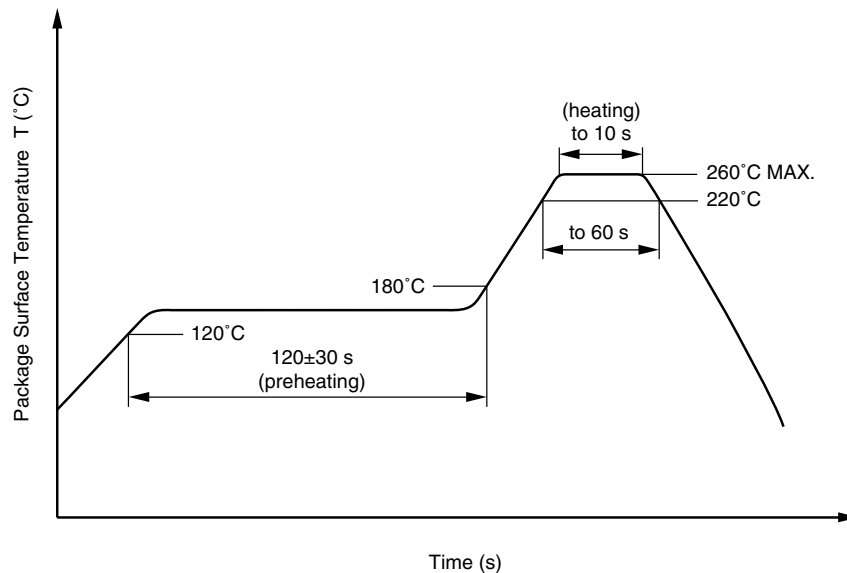
Recommended Temperature Profile of Infrared Reflow

(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).
		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.

▶**For further information, please contact**

NEC Compound Semiconductor Devices Hong Kong Limited
 E-mail: contact@ncsd-hk.necel.com
 Hong Kong Head Office   TEL: +852-3107-7303   FAX: +852-3107-7309
 Taipei Branch Office   TEL: +886-2-8712-0478   FAX: +886-2-2545-3859
 Korea Branch Office   TEL: +82-2-558-2120   FAX: +82-2-558-5209

NEC Electronics (Europe) GmbH   http://www.eu.necel.com/
 TEL: +49-211-6503-0   FAX: +49-211-6503-1327

California Eastern Laboratories, Inc.   http://www.cel.com/
 TEL: +1-408-988-3500   FAX: +1-408-988-0279

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

0604