

**HIGH ISOLATION VOLTAGE, HIGH-SPEED 10 Mbps  
OPEN COLLECTOR OUTPUT TYPE  
8-PIN DIP PHOTOCOUPLER**

–NEPOC™ Series–

**DESCRIPTION**

The PS9601 and PS9601L are optically coupled isolators containing a GaAlAs LED on the input side and a photo diode and a signal processing circuit on the output side on one chip.

The PS9601 is in a plastic DIP (Dual In-line Package) and the PS9601L is lead bending type (Gull-wing) for surface mounting.

**FEATURES**

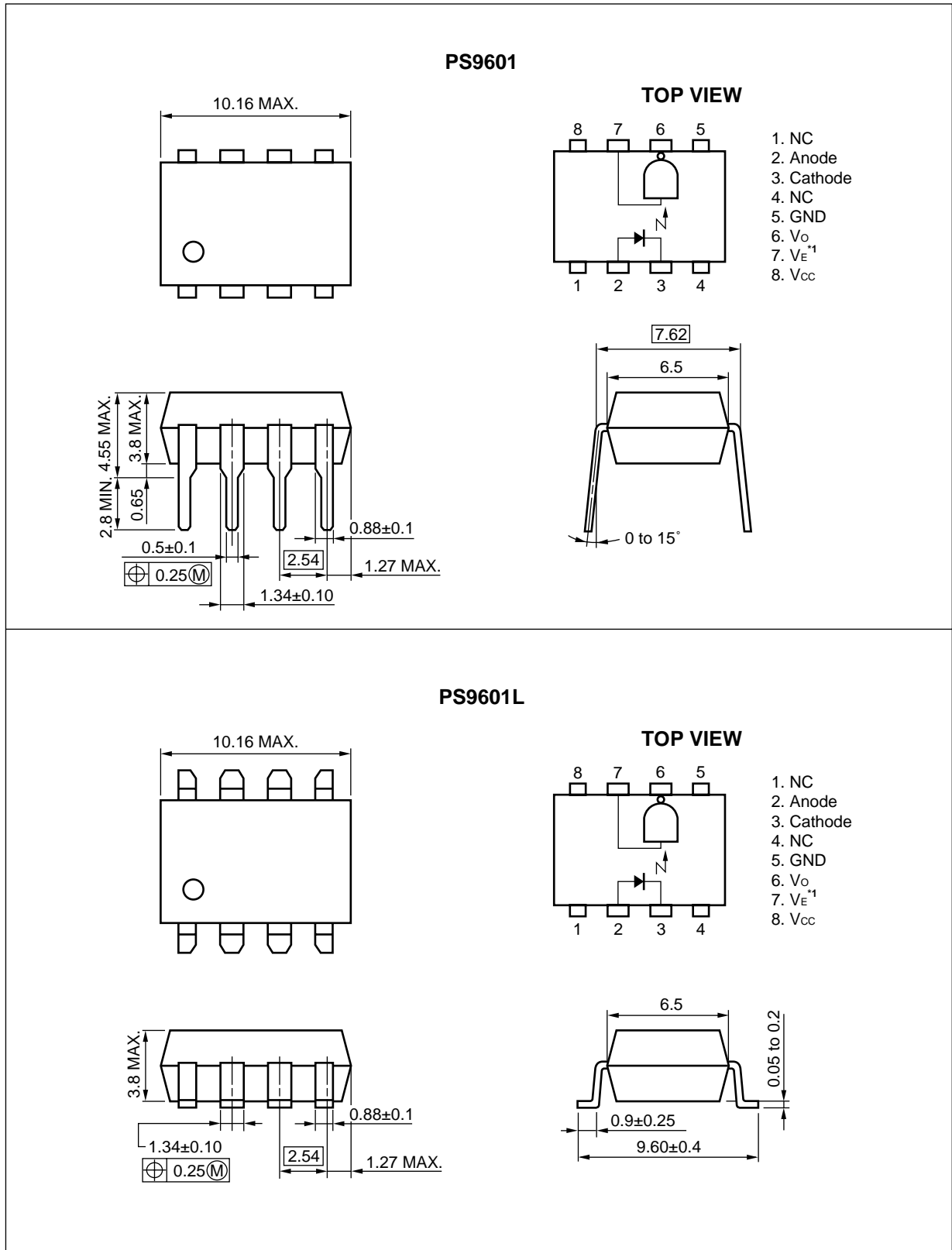
- High isolation voltage (BV = 5 000 Vr.m.s.)
- High-speed response ( $t_{PHL}$ ,  $t_{PLH}$  = 50 ns TYP.)
- Low threshold input current ( $I_{FHL}$  = 2.5 mA TYP.)
- TTL, CMOS compatible with a resistor
- Ordering number of tape product: PS9601L-E3, E4: 1 000 pcs/reel
- ★ Safety standards
  - UL approved: File No. E72422 (S)
  - BSI approved: No. 8389, 8390

**APPLICATIONS**

- Computer and peripheral manufactures
- Electronic musical instruments
- Audio-visual
- Measurement equipment

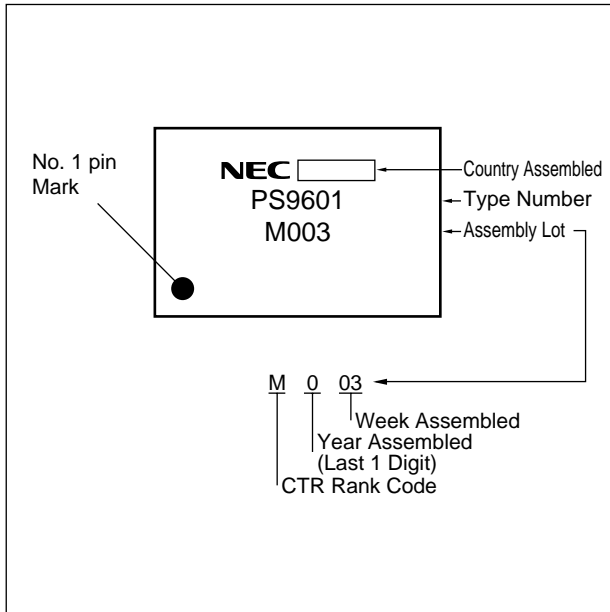
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★ PACKAGE DIMENSIONS (UNIT: mm)



\*1  $V_E$  is pulled-up to

★ MARKING EXAMPLE



★ ORDERING INFORMATION

Part Number	Package	Packing Style	Application Part Number <sup>*1</sup>
PS9601	8-pin DIP	Magazine case 50 pcs	PS9601
PS9601L			PS9601L
PS9601L-E3		Embossed Tape 1 000 pcs/reel	
PS9601L-E4			

\*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	I <sub>F</sub>	30	mA
	Reverse Voltage	V <sub>R</sub>	5	V
	Power Dissipation	P <sub>D</sub>	60	mW
Detector	Supply Voltage	V <sub>CC</sub>	7	V
	Output Voltage	V <sub>O</sub>	7	V
	Output Current	I <sub>O</sub>	50	mA
	Enable Voltage	V <sub>E</sub>	5.5	V
	Power Dissipation	P <sub>C</sub>	85	mW
Isolation Voltage <sup>*1</sup>		BV	5 000	Vr.m.s.
Operating Ambient Temperature		T <sub>A</sub>	-40 to +85	°C
Storage Temperature		T <sub>stg</sub>	-55 to +125	°C

\*1 AC voltage for 1 minute at T<sub>A</sub> = 25 °C, RH = 60 % between input and output.

**RECOMMENDED OPERATING CONDITIONS**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
High Level Input Current	I <sub>FH</sub>	7	10	15	mA
Low Level Input Current	I <sub>FL</sub>	0		250	μA
High Level Enable Voltage	V <sub>EH</sub>	2		V <sub>CC</sub>	V
Low Level Enable Voltage	V <sub>EL</sub>	0		0.8	V
Supply Voltage	V <sub>CC</sub>	4.5	5.0	5.5	V
TTL (loads)	N			8	
Operating Ambient Temperature	T <sub>A</sub>	0	25	70	°C

★

★ TRUTH TABLE

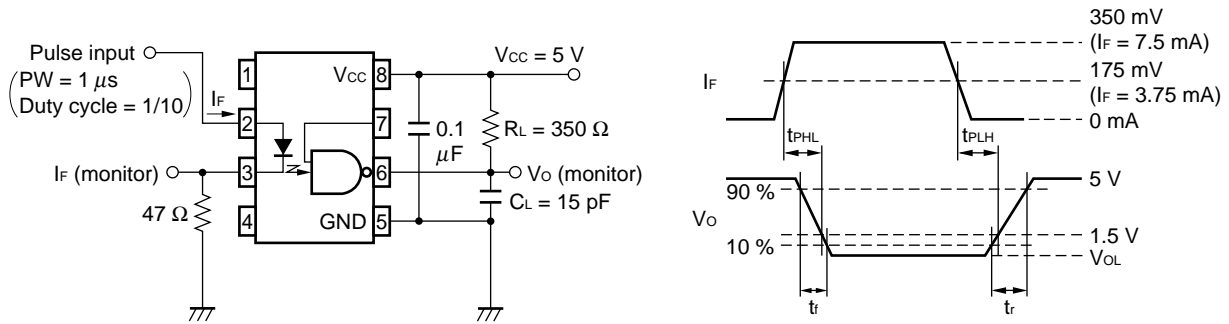
LED	Enable	Output
H	H	L
L	H	H
H	L	H
L	L	H

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = -40 to +85 °C, unless otherwise specified)**

Parameter		Symbol	Conditions	MIN.	TYP. <sup>1</sup>	MAX.	Unit	
Diode	Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 10 mA, T <sub>A</sub> = 25 °C	1.4	1.65	1.9	V	
	Reverse Current	I <sub>R</sub>	V <sub>R</sub> = 5 V, T <sub>A</sub> = 25 °C			10	μA	
	Terminal Capacitance	C <sub>t</sub>	V = 0 V, f = 1 MHz, T <sub>A</sub> = 25 °C		60		pF	
Detector	High Level Output Current	I <sub>OH</sub>	V <sub>CC</sub> = V <sub>O</sub> = 5.5 V, I <sub>F</sub> = 250 μA, V <sub>E</sub> = 2 V		2	250	μA	
	Low Level Output Voltage	V <sub>OL</sub>	V <sub>CC</sub> = 5.5 V, I <sub>F</sub> = 5 mA, V <sub>E</sub> = 2 V, I <sub>O</sub> = 13 mA		0.2	0.6	V	
	High Level Supply Current	I <sub>CCH</sub>	V <sub>CC</sub> = 5.5 V, V <sub>E</sub> = 0.5 V, I <sub>F</sub> = 0 mA	5	7	10	mA	
	Low Level Supply Current	I <sub>CCL</sub>	V <sub>CC</sub> = 5.5 V, V <sub>E</sub> = 2 V, I <sub>F</sub> = 10 mA	10	13	18	mA	
	High Level Enable Current	I <sub>EH</sub>	V <sub>CC</sub> = 5.5 V, V <sub>EH</sub> = 2 V	-0.7	-1	-1.5	mA	
	Low Level Enable Current	I <sub>EL</sub>	V <sub>CC</sub> = 5.5 V, V <sub>EL</sub> = 0.5 V	-1	-1.4	-2	mA	
Coupled	Threshold Input Current (H → L)	I <sub>FHL</sub>	V <sub>CC</sub> = 5 V, V <sub>E</sub> = 2 V, V <sub>O</sub> = 0.8 V, R <sub>L</sub> = 350 Ω	0.5	2.5	5	mA	
	Isolation Resistance	R <sub>I-O</sub>	V <sub>I-O</sub> = 1 kV <sub>DC</sub> , R <sub>H</sub> = 40 to 60 %, T <sub>A</sub> = 25 °C	10 <sup>11</sup>			Ω	
	Isolation Capacitance	C <sub>I-O</sub>	V = 0 V, f = 1 MHz, T <sub>A</sub> = 25 °C		0.6		pF	
	Propagation Delay Time (H → L) <sup>2</sup>	t <sub>PHL</sub>	V <sub>CC</sub> = 5 V, I <sub>F</sub> = 7.5 mA, R <sub>L</sub> = 350 Ω, C <sub>L</sub> = 15 pF, T <sub>A</sub> = 25 °C		50	75	ns	
	Propagation Delay Time (L → H) <sup>2</sup>	t <sub>PLH</sub>			50	75	ns	
	Rise Time <sup>2</sup>	t <sub>r</sub>				20		ns
	Fall Time <sup>2</sup>	t <sub>f</sub>				10		ns
	Enable Propagation Delay Time (H → L) <sup>3</sup>	t <sub>EH</sub>		V <sub>CC</sub> = 5 V, I <sub>F</sub> = 7.5 mA, V <sub>EH</sub> = 3 V, V <sub>EL</sub> = 0.5 V, R <sub>L</sub> = 350 Ω, C <sub>L</sub> = 15 pF, T <sub>A</sub> = 25 °C		10		ns
Enable Propagation Delay Time (L → H) <sup>3</sup>	t <sub>EL</sub>	T <sub>A</sub> = 25 °C		25		ns		

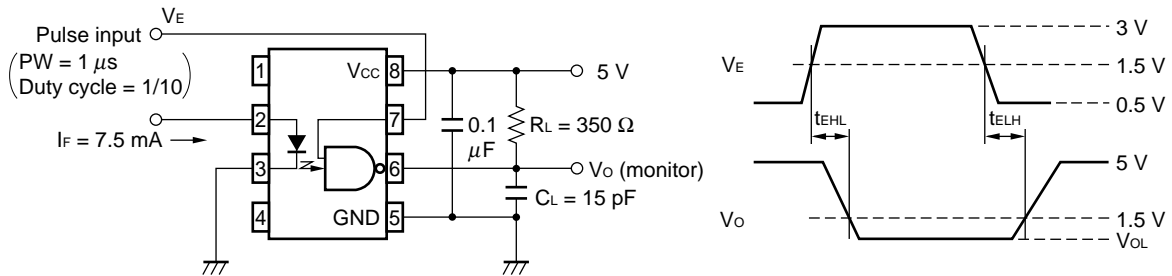
★ \*1 Typical values at  $T_A = 25\text{ }^\circ\text{C}$

\*2 Test circuit for propagation delay time



$C_L$  includes probe and stray wiring capacitance.

\*3 Test circuit for enable propagation delay time



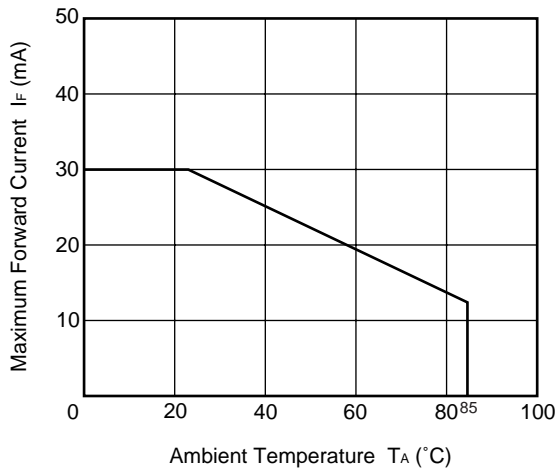
$C_L$  includes probe and stray wiring capacitance.

★ **USAGE CAUTIONS**

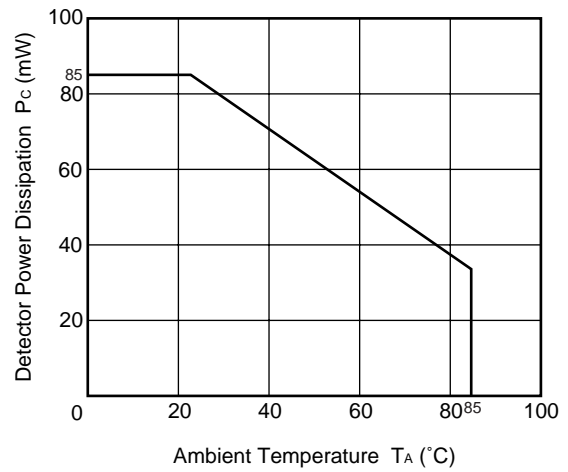
1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. By-pass capacitor of more than 0.1 μF is used between  $V_{CC}$  and GND near device. Also, ensure that the distance between the leads of the photocoupler and capacitor is no more than 10 mm.

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

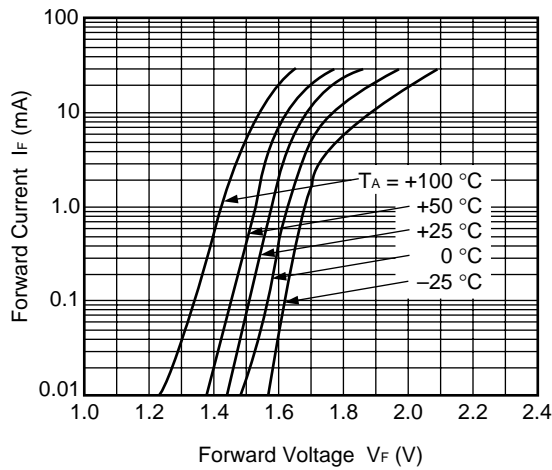
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



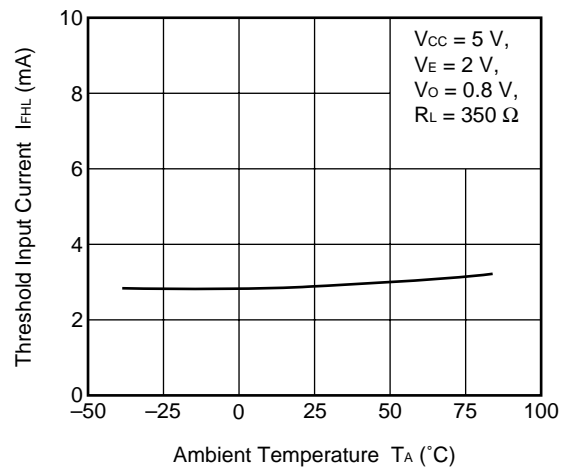
DETECTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



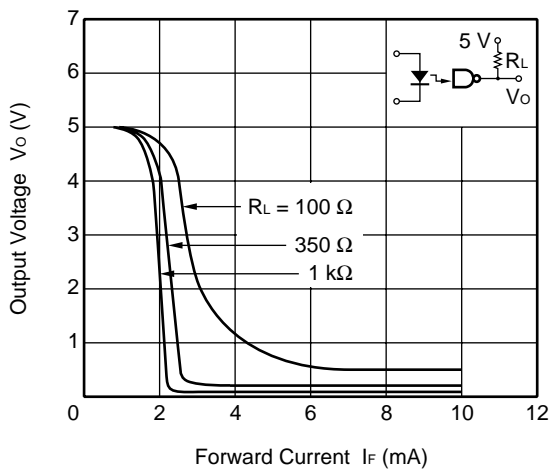
FORWARD CURRENT vs. FORWARD VOLTAGE



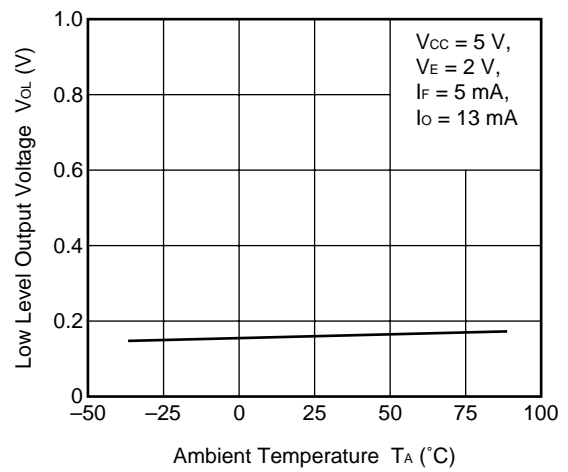
THRESHOLD INPUT CURRENT vs. AMBIENT TEMPERATURE



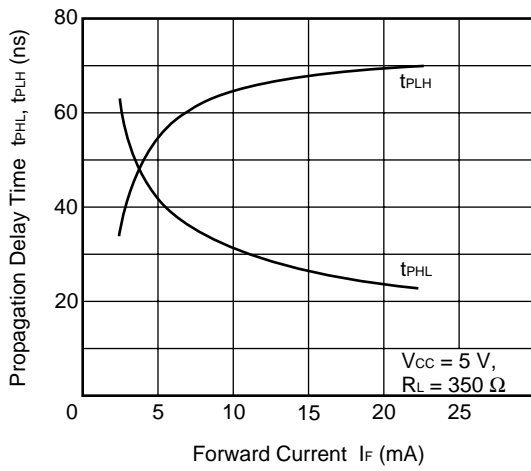
OUTPUT VOLTAGE vs. FORWARD CURRENT



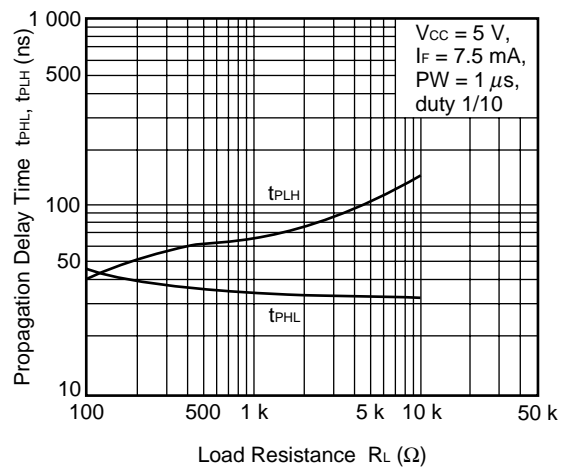
LOW LEVEL OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE



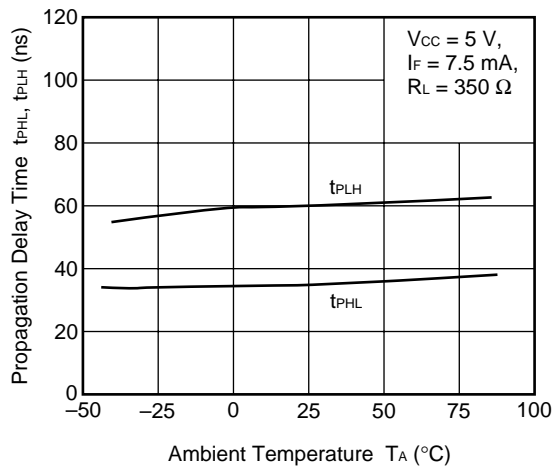
PROPAGATION DELAY TIME vs. FORWARD CURRENT



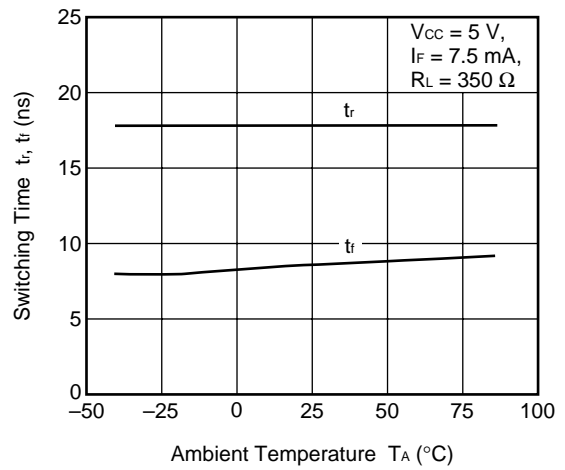
PROPAGATION DELAY TIME vs. LOAD RESISTANCE



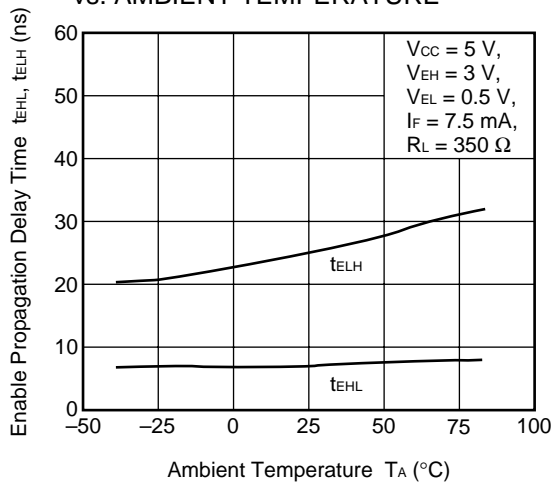
PROPAGATION DELAY TIME vs. AMBIENT TEMPERATURE



SWITCHING TIME vs. AMBIENT TEMPERATURE



ENABLE PROPAGATION DELAY TIME vs. AMBIENT TEMPERATURE

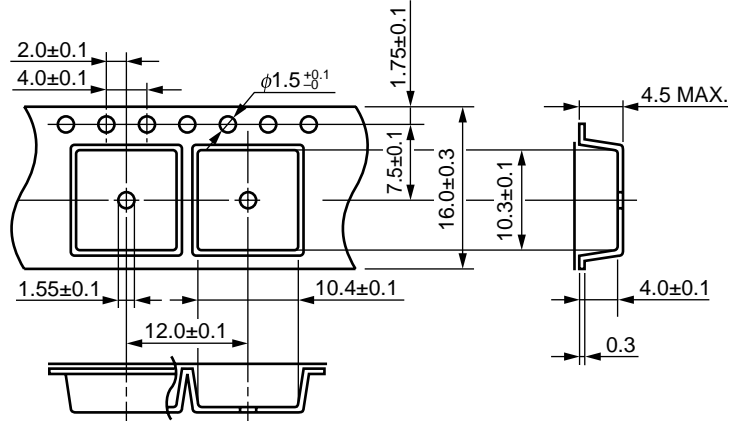


**Remark** The graphs indicate nominal characteristics.

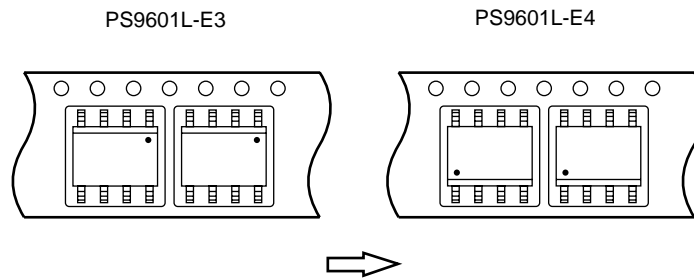


★ TAPING SPECIFICATIONS (UNIT: mm)

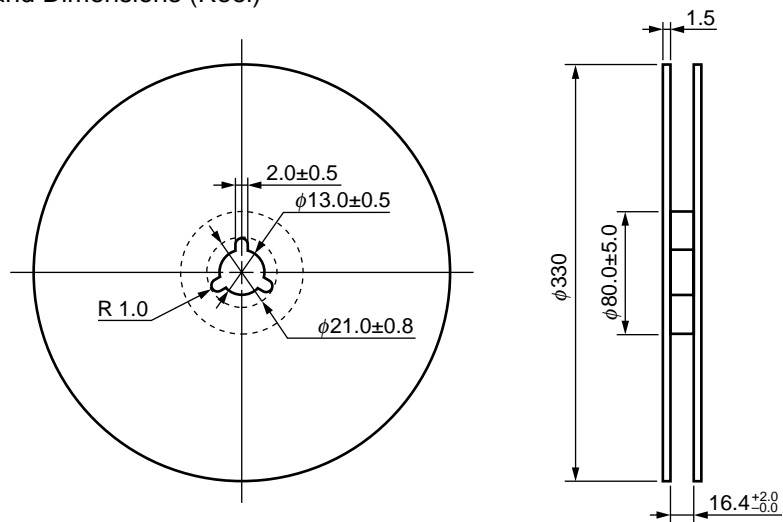
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



Packing: 1 000 pcs/reel

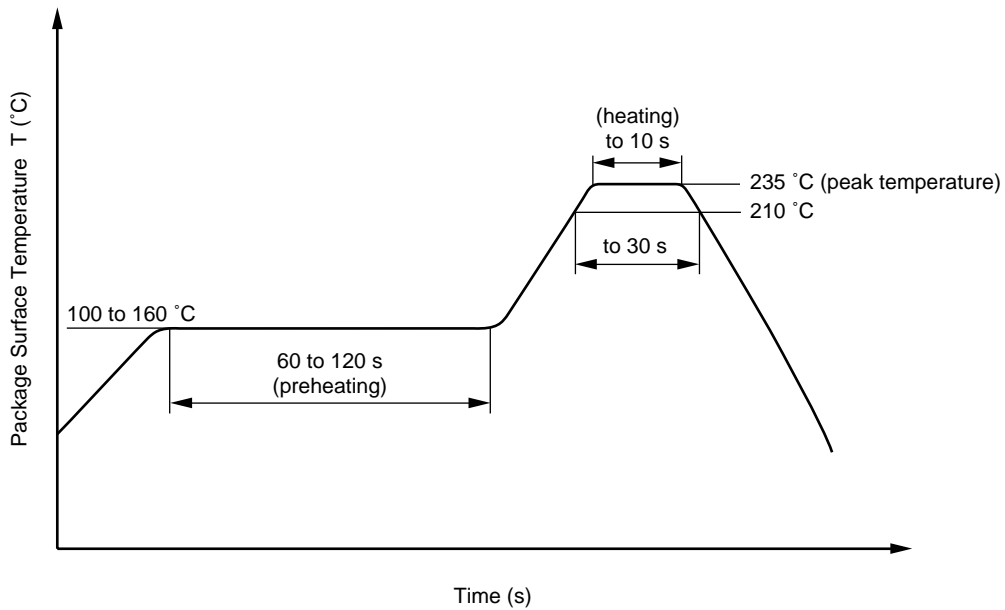
★ NOTES ON HANDLING

**Recommended soldering conditions**

**(1) Infrared reflow soldering**

- Peak reflow temperature 235 °C or below (package surface temperature)
- Time of temperature higher than 210 °C 30 seconds or less
- 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 100 °C or below (package surface temperature)
- Number of times One (Allowed to be dipped in solder including plastic mold portion.)
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt % is recommended.)

**(3) Cautions**

- Fluxes  
Avoid removing the residual flux with freon-based and chlorine-based cleaning solvent.

[MEMO]

**SAFETY INFORMATION ON THIS PRODUCT**

<p><b>Caution</b></p>	<p>GaAs Products</p>	<p>The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested.</p> <ul style="list-style-type: none"> <li>• Do not destroy or burn the product.</li> <li>• Do not cut or cleave off any part of the product.</li> <li>• Do not crush or chemically dissolve the product.</li> <li>• Do not put the product in the mouth.</li> </ul> <p>Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.</p>
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