

HIGH NOISE REDUCTION/HIGH-SPEED 10 Mbps, TOTEM-POLE OUTPUT TYPE
8-PIN DIP PHOTOCOUPLER –NEPOC™ Series–**DESCRIPTION**

The PS9611 and PS9611L are optically coupled high-speed, totem-pole output isolators containing a GaAlAs LED on light emitting diode (input side) and a photodiode and a signal processing circuit on light receiving side (output side) on one chip.

The PS9611 is in a plastic DIP (Dual In-line Package) and the PS9611L is lead bending type (Gull-wing) for surface mounting.

FEATURES

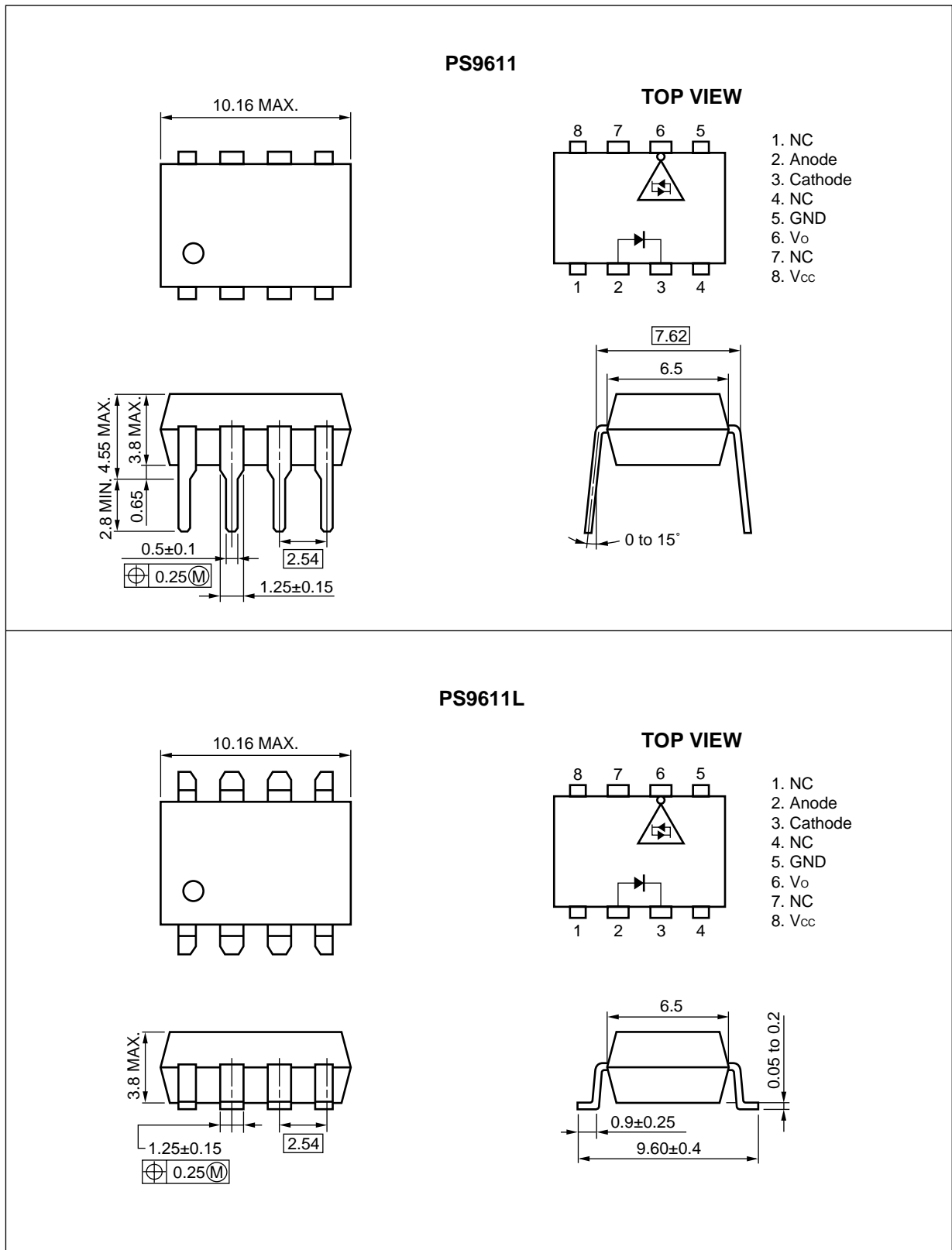
- High common mode transient immunity ($CM_H, CM_L = \pm 10 \text{ kV}/\mu\text{s}$ TYP.)
- High-speed response ($t_{PHL}, t_{PLH} = 30 \text{ ns}$ TYP.)
- Pulse width distortion ($|t_{PHL} - t_{PLH}| = 3 \text{ ns}$ TYP.)
- Totem-pole output (No pull-up resistor required)
- Ordering number of taping product: PS9611L-E3, E4: 1 000 pcs/reel

APPLICATIONS

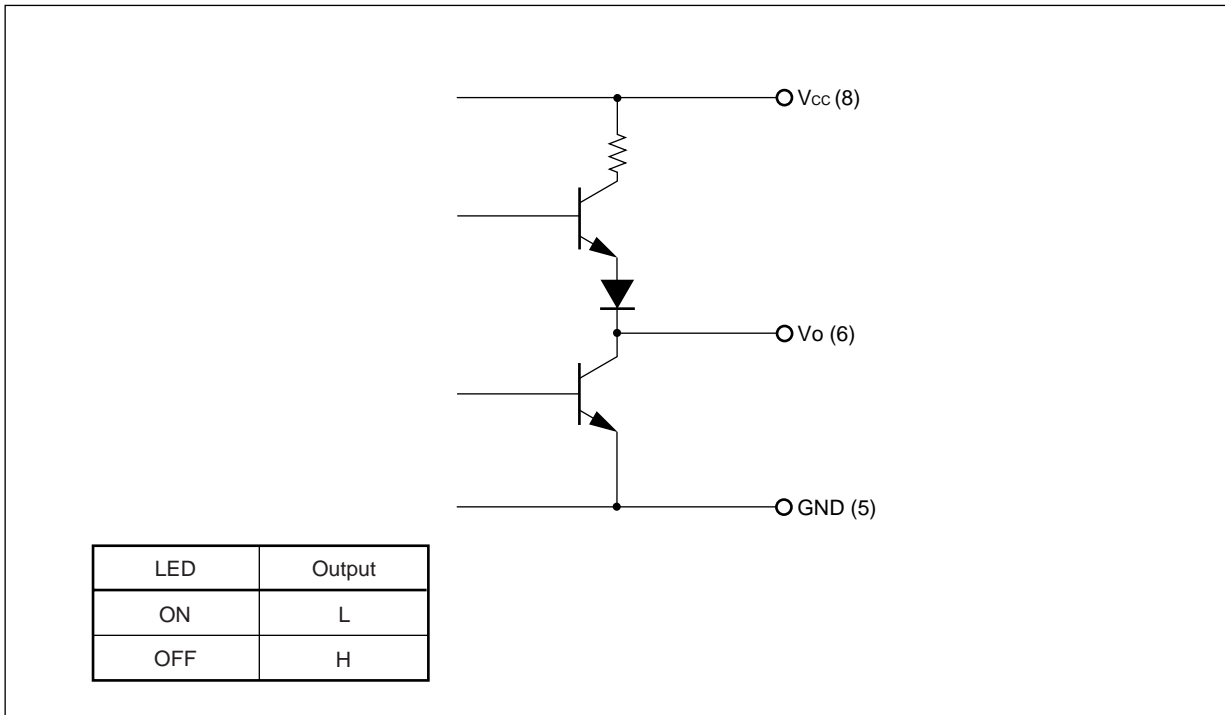
- Computer and peripheral manufactures
- Measurement equipment
- PDP

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

PACKAGE DIMENSIONS (in millimeters)



★ INTERNAL OUT PUT CIRCUIT



ORDERING INFORMATION

Part Number	Package	Packing Style	Application Part Number ^{*1}
PS9611	8-pin DIP	Magazine case 50 pcs	PS9611
PS9611L			PS9611L
PS9611L-E3		Embossed Tape 1 000 pcs/reel	
PS9611L-E4			

*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	I _F	30	mA
	Reverse Voltage	V _R	3.0	V
Detector	Supply Voltage	V _{CC}	7	V
	Output Voltage	V _O	7	V
	High Level Output Current ^{*1}	I _{OH}	-5	mA
	Low Level Output Current ^{*1}	I _{OL}	25	mA
	Power Dissipation ^{*1}	P _C	150	mW
Isolation Voltage ^{*2}		BV	3 750	Vr.m.s.
Operating Ambient Temperature		T _A	-40 to +85	°C
Storage Temperature		T _{stg}	-55 to +125	°C

*1 T_A = -40 to +85 °C

*2 AC voltage for 1 minute at T_A = 25 °C, RH = 60 % between input and output.

RECOMMENDED OPERATING CONDITIONS

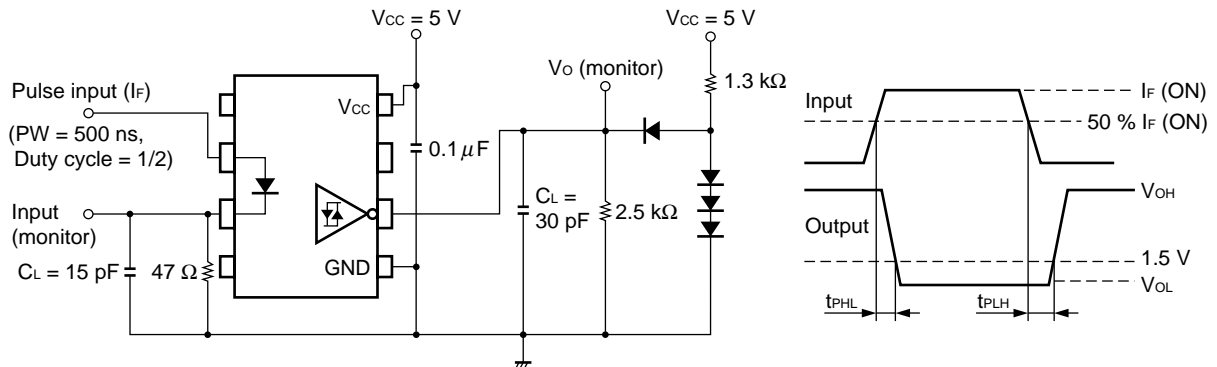
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
★ High Level Input Current	I _{FH}	7.5		12.5	mA
Low Level Input Current	I _{FL}	0		250	μA
Supply Voltage	V _{CC}	4.5	5.0	5.5	V
TTL (loads)	N			5	

ELECTRICAL CHARACTERISTICS (T_A = -40 to +85 °C, unless otherwise specified)

Parameter		Symbol	Conditions	MIN.	TYP. ¹	MAX.	Unit	
Diode	Forward Voltage	V _F	I _F = 10 mA, T _A = 25 °C	1.4	1.65	1.9	V	
	Reverse Current	I _R	V _R = 3 V, T _A = 25 °C			10	μA	
	Terminal Capacitance	C _t	V = 0 V, f = 1 MHz, T _A = 25 °C		30		pF	
Detector	High Level Output Current	I _{OH}	V _{CC} = V _O = 5.5 V, I _F = 250 μA		1	200	μA	
	High Level Output Voltage	V _{OH}	V _{CC} = 4.5 V, I _F = 250 μA, I _{OH} = -2 mA	2.4	3.0		V	
	Low Level Output Voltage	V _{OL}	V _{CC} = 4.5 V, I _F = 7 mA, I _O = 8 mA		0.38	0.6	V	
	High Level Supply Current	I _{CCH}	V _{CC} = 5.5 V, I _F = 0 mA		11	17	mA	
	Low Level Supply Current	I _{CCL}	V _{CC} = 5.5 V, I _F = 10 mA		12	18	mA	
	High Level Output Short Circuit Current	I _{OSH}	V _{CC} = 5.5 V, V _O = GND, I _F = 0 mA, 10 ms or less		-26		mA	
	Low Level Output Short Circuit Current	I _{OSL}	V _{CC} = V _O = 5.5 V, I _F = 8 mA, 10 ms or less		34		mA	
Coupled	Threshold Input Current (H → L)	I _{FHL}	V _{CC} = 5 V	T _A = 25 °C		2.7	5	mA
							6	
	Threshold Input Current (L → H)	I _{FLH}	V _{CC} = 5 V	T _A = 25 °C	0.5			mA
					0.35			
	Isolation Resistance	R _{I-O}	V _{I-O} = 1 kV _{DC} , R _H = 40 to 60 %, T _A = 25 °C	10 ¹¹			Ω	
	Isolation Capacitance	C _{I-O}	V = 0 V, f = 1 MHz, T _A = 25 °C		0.9		pF	
	Propagation Delay Time (H → L) ²	t _{PHL}	V _{CC} = 5 V, I _F = 7.5 mA	T _A = 25 °C	15	30	65	ns
					10		85	
	Propagation Delay Time (L → H) ²	t _{PLH}	V _{CC} = 5 V, I _F = 7.5 mA	T _A = 25 °C	15	30	65	ns
10						85		
Pulse Width Distortion (PWD) ²	t _{PHL} -t _{PLH}	V _{CC} = 5 V, I _F = 7.5 mA		3	35	ns		
Common Mode Transient Immunity at High Level Output ³	CM _H	V _{CC} = 5 V, T _A = 25 °C, I _F = 0 mA, V _{O(MIN.)} = 2 V, V _{CM} = 100 V	1	10		kV/μs		
Common Mode Transient Immunity at Low Level Output ³	CM _L	V _{CC} = 5 V, T _A = 25 °C, I _F = 7.5 mA, V _{O(MAX.)} = 0.8 V, V _{CM} = 100 V	1	10		kV/μs		

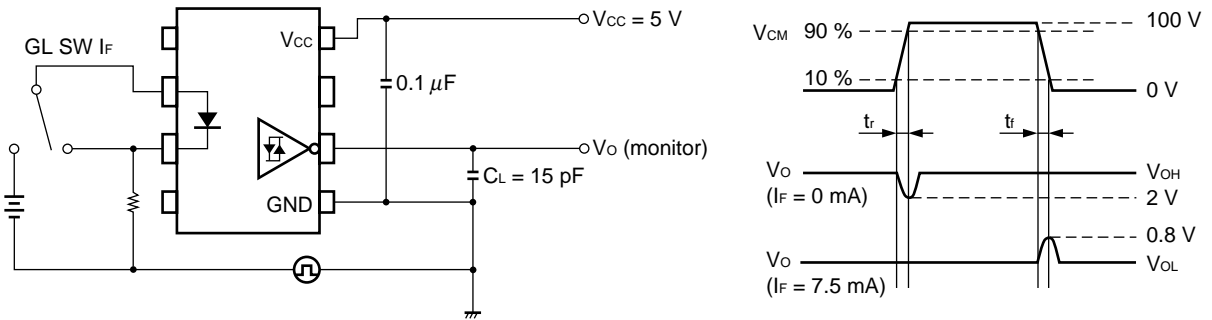
*1 Typical values at $T_A = 25\text{ }^\circ\text{C}$

*2 Test circuit for propagation delay time



C_L is approximately which includes probe and stray wiring capacitance.

*3 Test circuit for common mode transient immunity

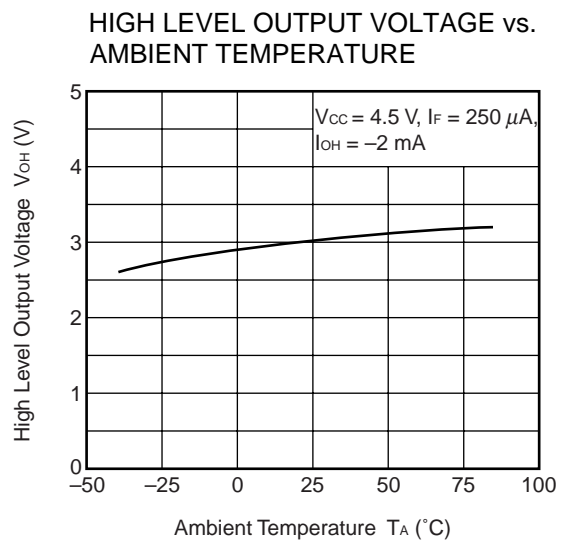
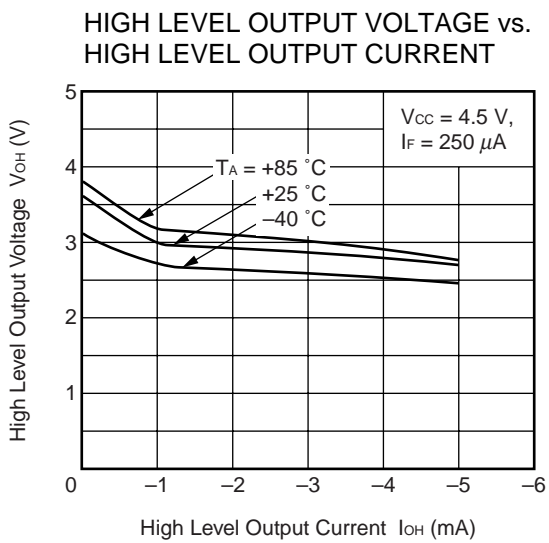
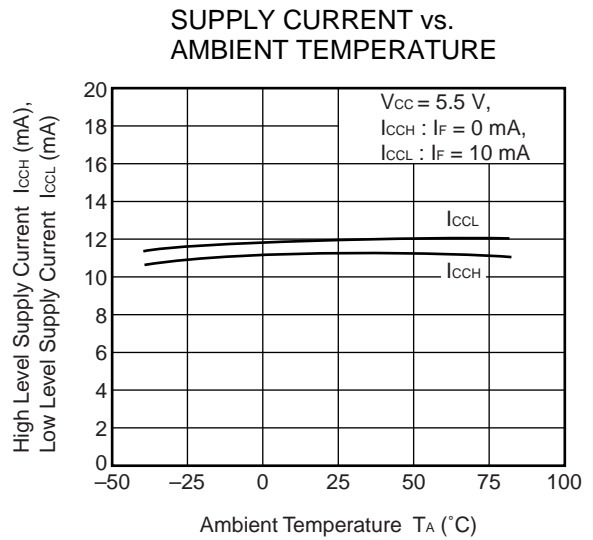
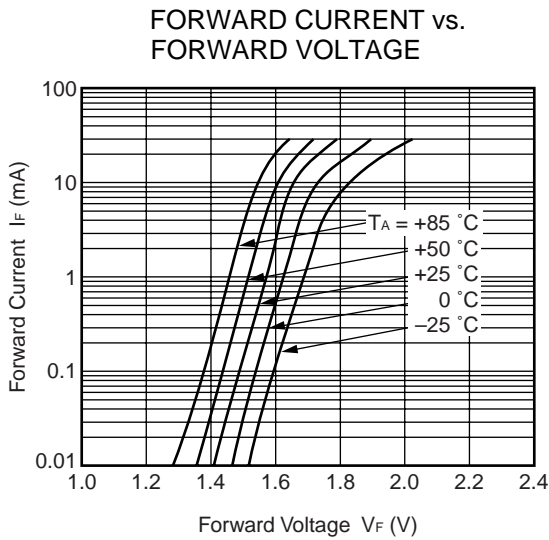
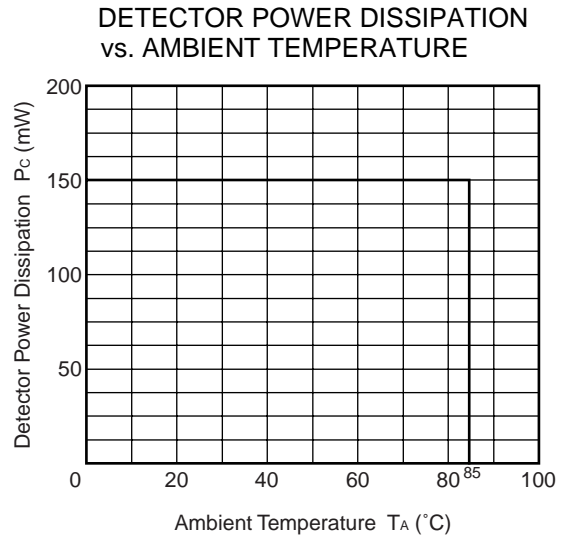
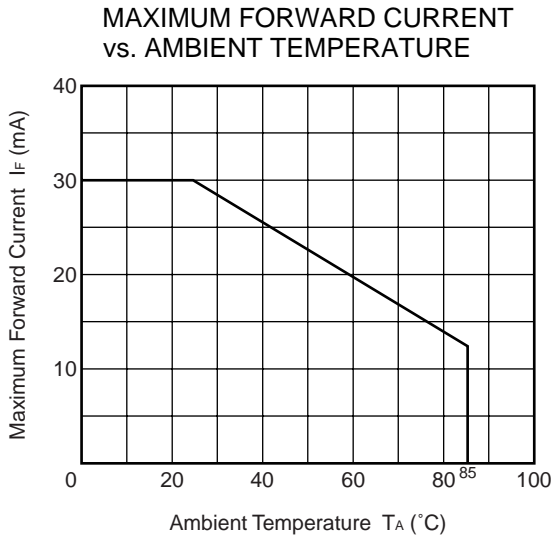


C_L is approximately which includes probe and stray wiring capacitance.

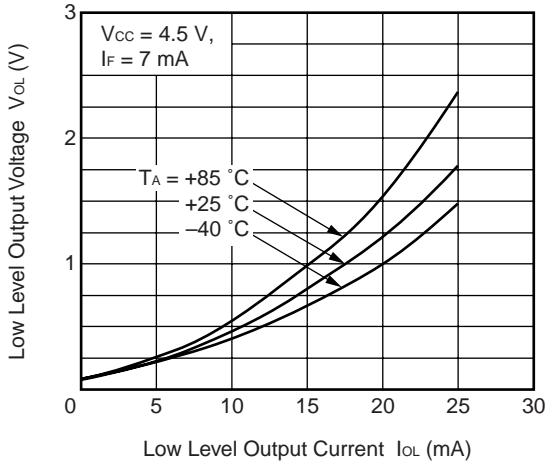
USAGE CAUTIONS

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 $0.1\text{ }\mu\text{F}$ is used between V_{cc} and GND near device.

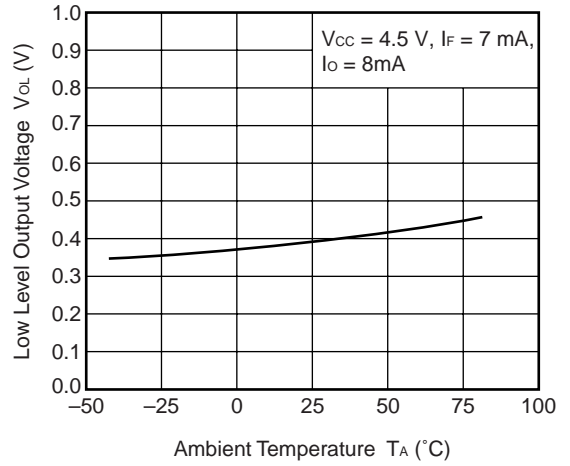
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise specified)



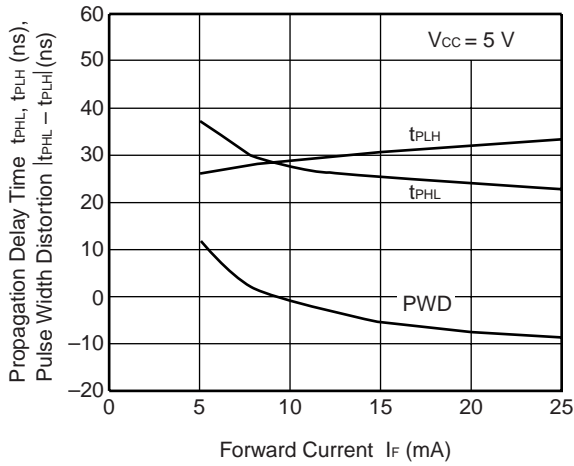
LOW LEVEL OUTPUT VOLTAGE vs. LOW LEVEL OUTPUT CURRENT



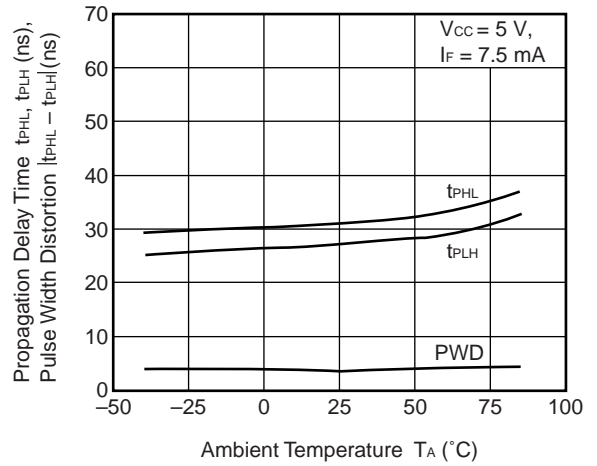
LOW LEVEL OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE



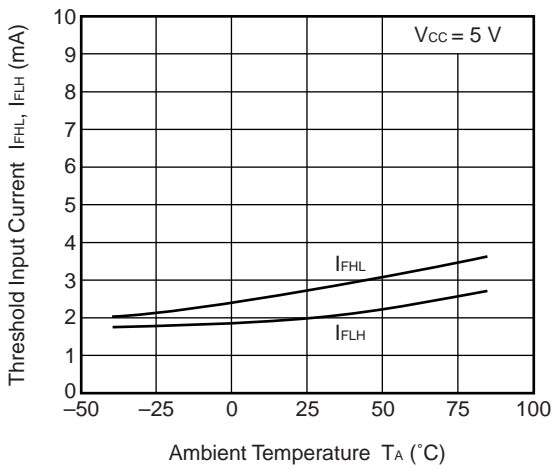
PROPAGATION DELAY TIME, PULSE WIDTH DISTORTION vs. FORWARD CURRENT



PROPAGATION DELAY TIME, PULSE WIDTH DISTORTION vs. AMBIENT TEMPERATURE



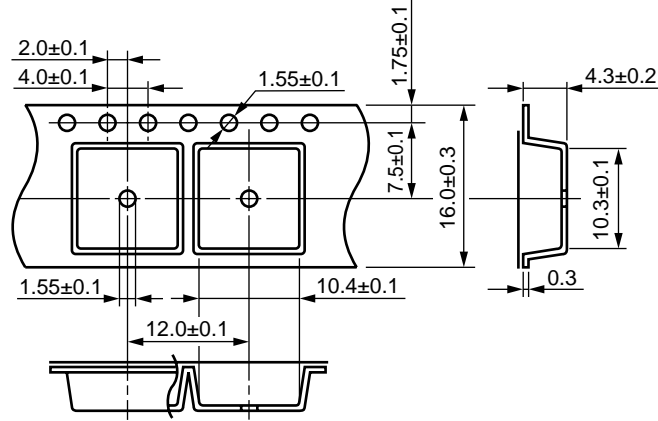
THRESHOLD INPUT CURRENT vs. AMBIENT TEMPERATURE



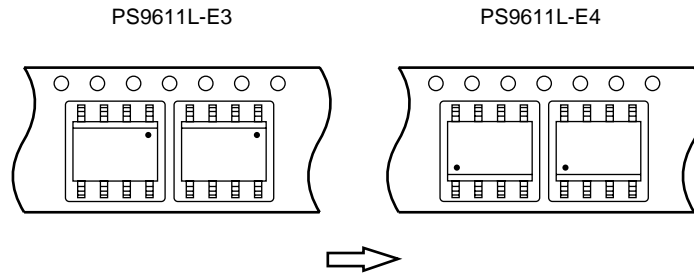
Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (in millimeters)

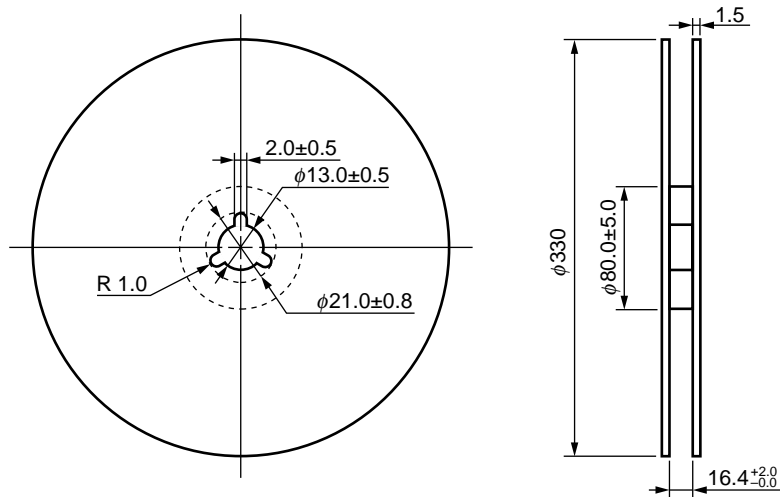
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



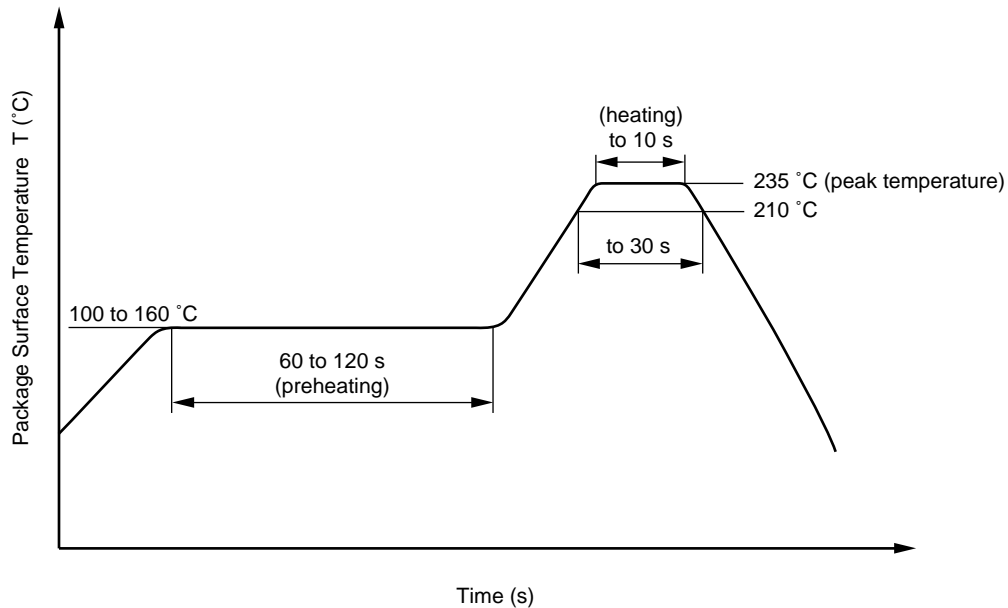
Packing: 1 000 pcs/reel

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) Dip soldering

- Temperature 260 °C or below (molten solder temperature)
- Time 10 seconds or less
- 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]

CAUTION

Within this device there exists GaAs (Gallium Arsenide) material which is a harmful substance if ingested. Please do not under any circumstances break the hermetic seal.

NEPOC is a trademark of NEC Corporation.

- **The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.**
 - No part of this document may be copied or reproduced in any form or by any means without the prior written consent of NEC Corporation. NEC Corporation assumes no responsibility for any errors which may appear in this document.
 - NEC Corporation does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from use of a device described herein or any other liability arising from use of such device. No license, either express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC Corporation or others.
 - Descriptions of circuits, software, and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software, and information in the design of the customer's equipment shall be done under the full responsibility of the customer. NEC Corporation assumes no responsibility for any losses incurred by the customer or third parties arising from the use of these circuits, software, and information.
 - While NEC Corporation has been making continuous effort to enhance the reliability of its semiconductor devices, the possibility of defects cannot be eliminated entirely. To minimize risks of damage or injury to persons or property arising from a defect in an NEC semiconductor device, customers must incorporate sufficient safety measures in its design, such as redundancy, fire-containment, and anti-failure features.
 - NEC devices are classified into the following three quality grades:
"Standard", "Special", and "Specific". The Specific quality grade applies only to devices developed based on a customer designated "quality assurance program" for a specific application. The recommended applications of a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device before using it in a particular application.
 - Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots
 - Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)
 - Specific: Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.
- The quality grade of NEC devices is "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact an NEC sales representative in advance.