



**THE DATASHEET OF  
PS9614L-A**





# NEC's HIGH NOISE REDUCTION HIGH SPEED DIGITAL OUTPUT TYPE 8 PIN DIP OPTOCOUPLER

**PS9614**  
**PS9614L**

## FEATURES

- **HIGH COMMON MODE TRANSIENT IMMUNITY:**  
CMR, CML:  $\pm 20$  kV/ $\mu$ s TYP
- **HIGH SPEED RESPONSE:**  
10 Mbps
- **HIGH ISOLATION VOLTAGE:**  
BV: 3750 Vr.m.s. MIN
- **OPEN COLLECTOR OUTPUT TYPE**
- **TAPE AND REEL AVAILABLE:**  
PS9614L-E3, E4: 1000 Pcs/Reel

## DESCRIPTION

NEC's PS9614 and PS9614L are optically coupled isolators containing a GaAlAs LED on the light emitting diode (input) side and a photodiode and a signal processing circuit on the detector (output) side on one chip. The PS9614 is in a plastic DIP (Dual In-line Package) and the PS9614L is a lead-bending type (Gull-wing) for surface mount.

## APPLICATIONS

- MEASUREMENT EQUIPMENT
- PDP
- FACTORY AUTOMATION NETWORK

## ELECTRICAL CHARACTERISTICS (TA = -40~+85°C unless otherwise specified)

PART NUMBER				PS9614, PS9614L			
	SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX	
Diode	V <sub>F</sub>	Forward Voltage, I <sub>F</sub> = 10 mA, T <sub>A</sub> = 25°C	V	1.65	1.9		
	I <sub>R</sub>	Reverse Current, V <sub>R</sub> = 5 V, T <sub>A</sub> = 25°C	$\mu$ A		10		
	C <sub>t</sub>	Terminal Capacitance, V = 0V, f = 1 MHz, T <sub>A</sub> = 25°C	pF		30		
Detector	I <sub>OH</sub>	High Level Output Current, V <sub>CC</sub> = V <sub>O</sub> = 5.5 V, V <sub>F</sub> = 0.8 V	$\mu$ A		0.03	250	
	V <sub>OL</sub>	Low Level Output Voltage, V <sub>CC</sub> = 5.5 V, I <sub>F</sub> = 5 mA, I <sub>O</sub> = 13 mA	V		0.2	0.6	
	I <sub>CCH</sub>	High Level Supply Current, V <sub>CC</sub> = 5.5 V, I <sub>F</sub> = 0 mA	mA		2.6	8	
	I <sub>CCL</sub>	Low Level Supply Current, V <sub>CC</sub> = 5.5 V, I <sub>F</sub> = 10 mA	mA		7	11	
	I <sub>FHL</sub>	Threshold Input Current, V <sub>CC</sub> = 5 V, V <sub>O</sub> = 0, 0.8 V, R <sub>L</sub> = 350 $\Omega$	%		2.3	5	
Coupled	R <sub>I-O</sub>	Isolation Resistance, V <sub>in-out</sub> = 1k V <sub>Dc</sub> , R <sub>H</sub> = 40 to 60%, T <sub>A</sub> = 25°C	$\Omega$	10 <sup>11</sup>			
	C <sub>I-O</sub>	Isolation Capacitance, V = 0, f = 1 MHz, T <sub>A</sub> = 25°C	pF		0.9		
	t <sub>PHL</sub>	Propagation Delay Time, High $\rightarrow$ Low <sup>1</sup> , V <sub>CC</sub> = 5 V, R <sub>L</sub> = 350 $\Omega$ , I <sub>F</sub> = 7.5 mA	ns			61	75
						T <sub>A</sub> = 25°C	
	t <sub>PLH</sub>	Propagation Delay Time, Low $\rightarrow$ High <sup>1</sup> , V <sub>CC</sub> = 5 V, R <sub>L</sub> = 350 $\Omega$ , I <sub>F</sub> = 7.5 mA	ns			51	75
						T <sub>A</sub> = 25°C	
	t <sub>r</sub>	Rise Time, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 350 $\Omega$ , I <sub>F</sub> = 7.5 mA	ns		20		
	t <sub>f</sub>	Fall Time, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 350 $\Omega$ , I <sub>F</sub> = 7.5 mA	ns		8		
	PWD	Pulse Width Distortion, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 350 $\Omega$ , I <sub>F</sub> = 7.5 mA	ns		10	50	
	t <sub>PSK</sub>	Propagation Skew, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 350 $\Omega$ , I <sub>F</sub> = 7.5 mA	ns			60	
CMH	Common Mode Transient Immunity at High Level Output <sup>2</sup> V <sub>CC</sub> = 5 V, V <sub>CM</sub> = 1 kV, T <sub>A</sub> = 25°C, I <sub>F</sub> = 0 mA, V <sub>O</sub> (MIN) = 2 V, R <sub>L</sub> = 350 $\Omega$	kV/ $\mu$ s	10	20			
CML	Common Mode Transient Immunity at Low Level Output <sup>2</sup> V <sub>CC</sub> = 5 V, V <sub>CM</sub> = 1 kV, T <sub>A</sub> = 25°C, I <sub>F</sub> = 0 mA, V <sub>O</sub> (MIN) = 0.8 V, R <sub>L</sub> = 350 $\Omega$	kV/ $\mu$ s	10	20			

Please see notes on the next page.

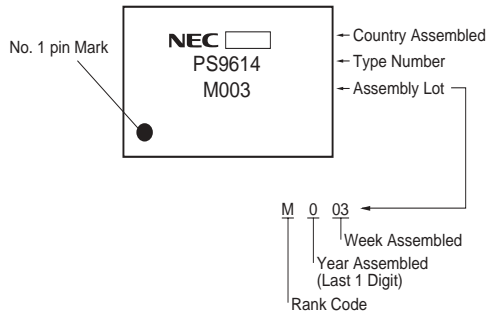
**ABSOLUTE MAXIMUM RATINGS<sup>1</sup>** (T<sub>A</sub> = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
Diode			
I <sub>F</sub>	Forward Current	mA	30
V <sub>R</sub>	Reverse Voltage	V	3
Detector			
V <sub>CC</sub>	Supply Voltage	V	7
V <sub>O</sub>	Output Voltage	V	7
I <sub>O</sub>	Output Current	mA	25
P <sub>C</sub>	Power Dissipation	mW	40
BV	Isolation Voltage <sup>2</sup>	V <sub>r.m.s.</sub>	3750
T <sub>A</sub>	Operating Ambient Temp.	°C	-40 to +85
T <sub>STG</sub>	Storage Temperature	°C	-55 to +125

Notes:

1. Operation in excess of any one of these parameters may result in permanent damage.
2. AC voltage for 1 minute at T<sub>A</sub> = 25 °C, RH = 60 % between input and output.

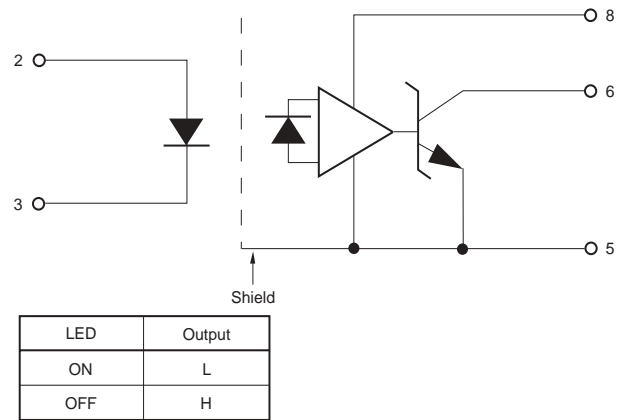
**MARKING**



**RECOMMENDED OPERATING CONDITIONS**

SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V <sub>FL</sub>	Low Level Input Voltage	V	0		0.8
I <sub>FH</sub>	High Level Input Current	mA	6.3	10	12.5
V <sub>CC</sub>	Supply Voltage	V	4.5	5	5.5
N	TTL (loads) (R <sub>L</sub> = 1kΩ)				5
R <sub>L</sub>	Pull-up Resistance	Ω	330		4k
T <sub>A</sub>	Operating Ambient Temperature		-40	+85	

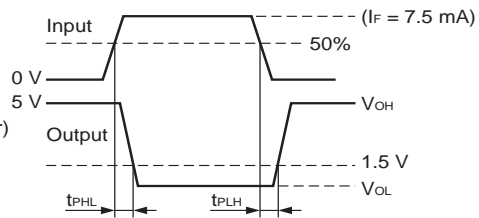
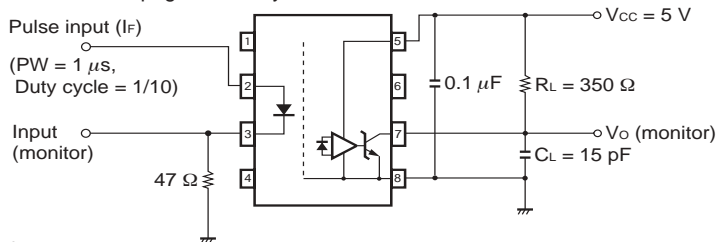
**FUNCTIONAL DIAGRAM**



(Continued from previous page.)

Note:

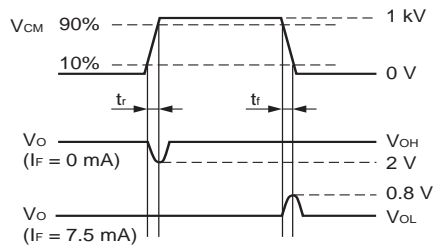
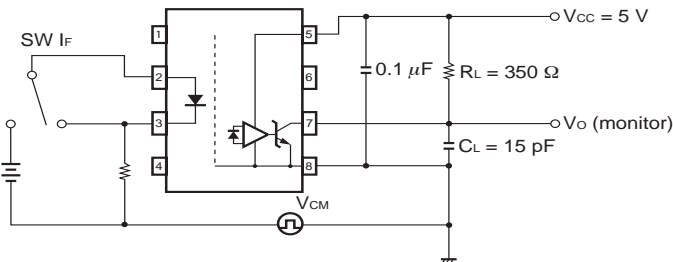
1. Test Circuit for Propagation Delay Time:



\*C<sub>L</sub> is approximately 15 pF which includes probe and stray wiring capacitance.

C<sub>L</sub> includes probe and stray wiring capacitance.

2. Test Circuit for Common Mode Transient Immunity:

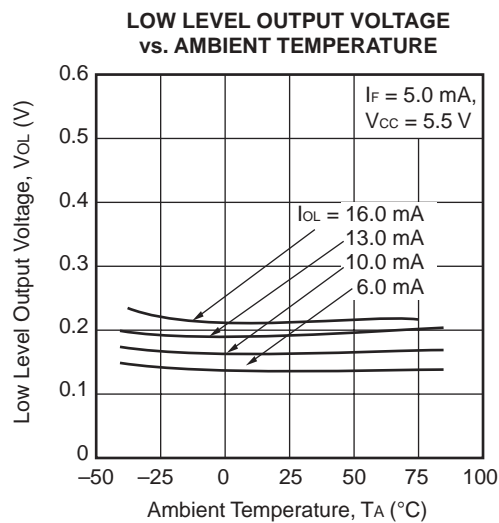
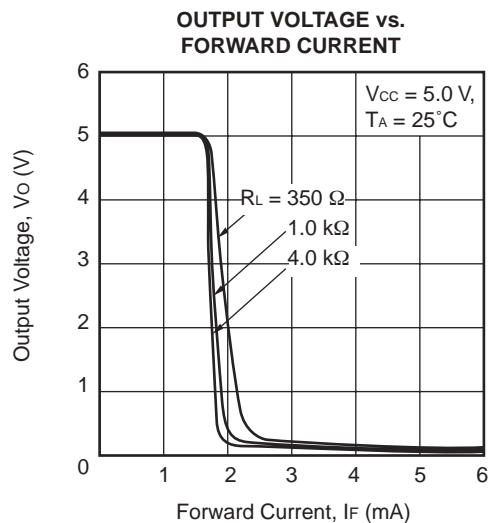
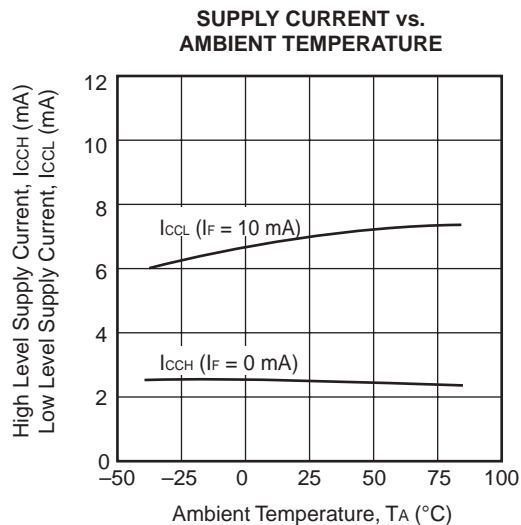
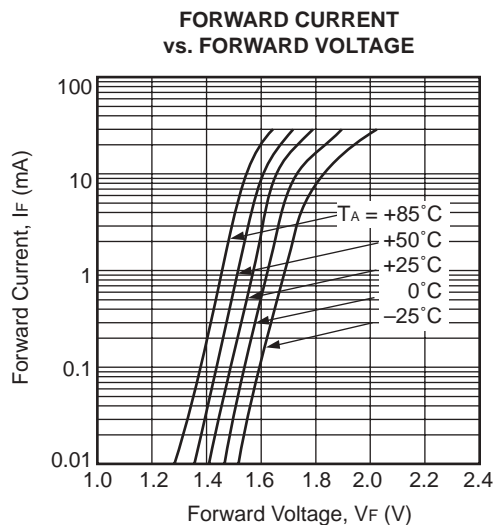
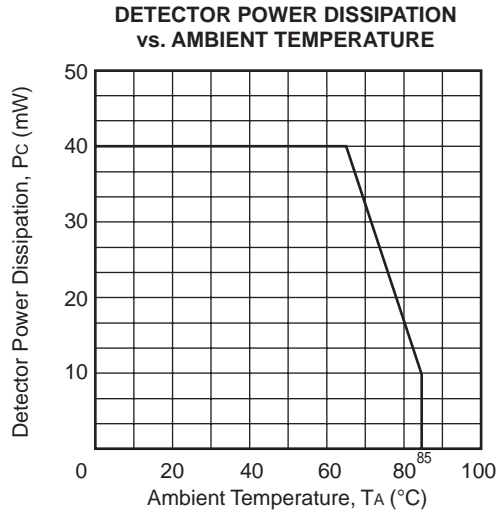
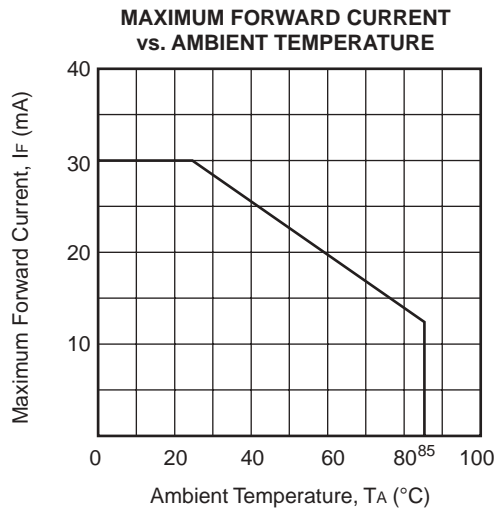


C<sub>L</sub> includes probe and stray wiring capacitance.

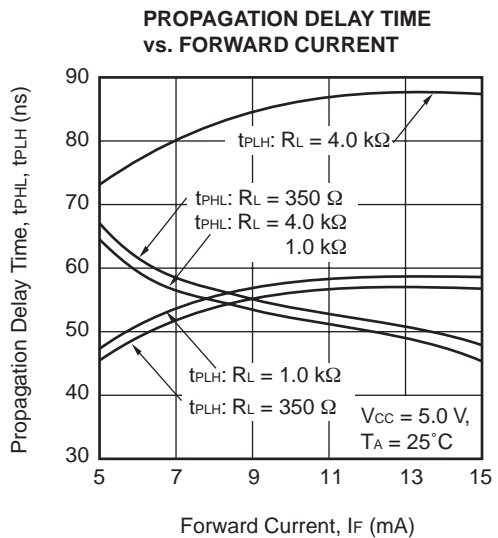
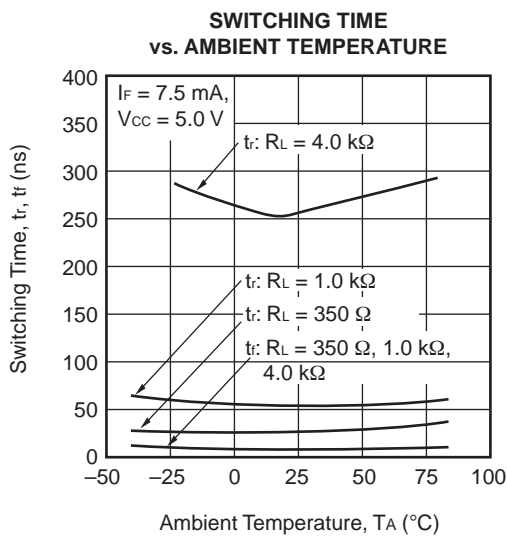
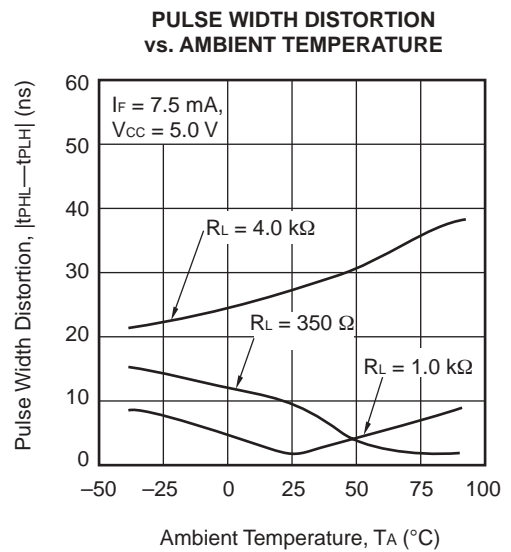
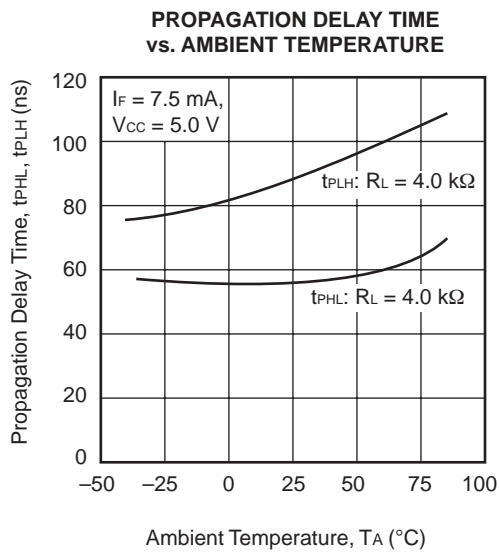
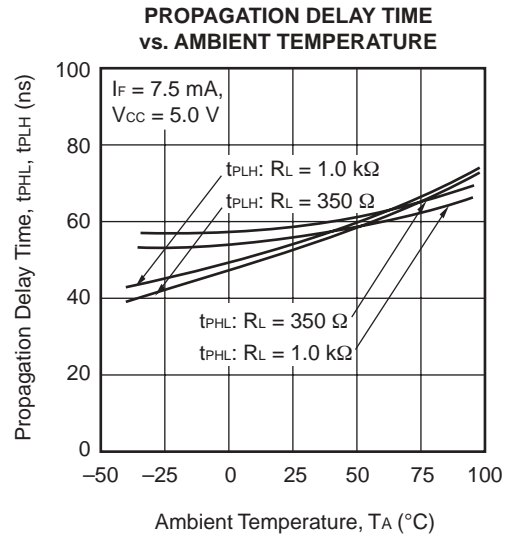
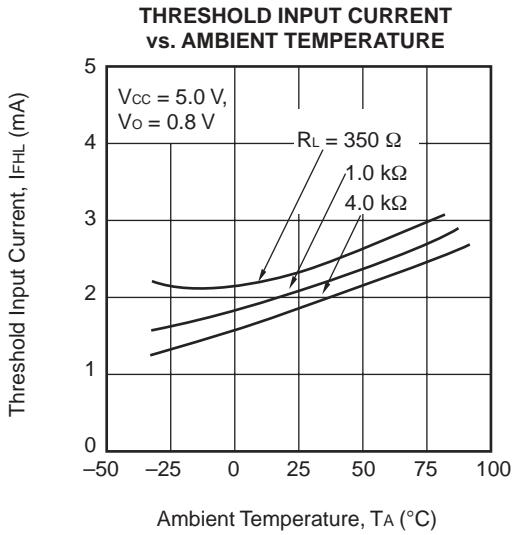
**USAGE CAUTIONS**

1. Protect against static electricity when handling this product.
2. Bypass capacitor greater than 0.1 μF is used between V<sub>CC</sub> and GND near device (lead distance: 10 mm MIN).

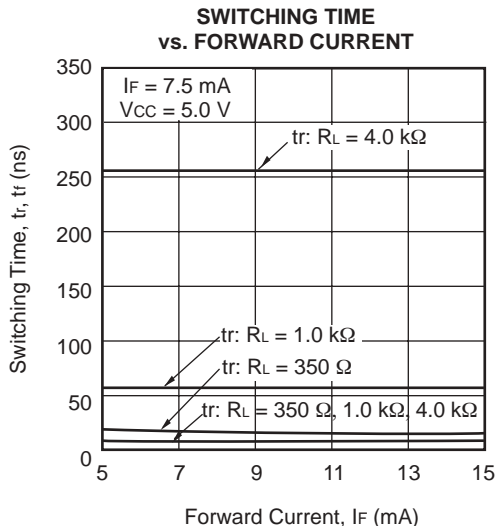
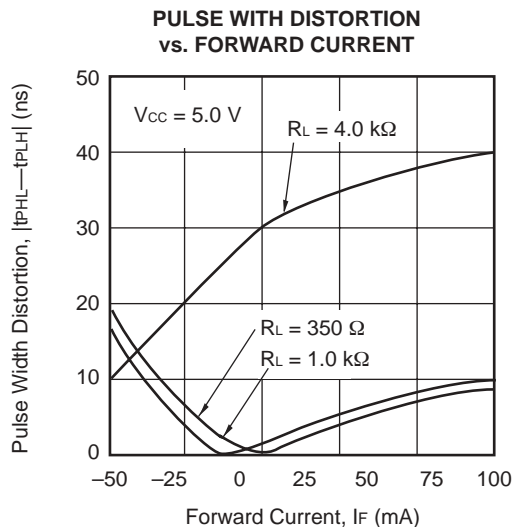
TYPICAL PERFORMANCE CURVES (TA = 25°C)



**TYPICAL PERFORMANCE CURVES** ( $T_A = 25^\circ\text{C}$ )



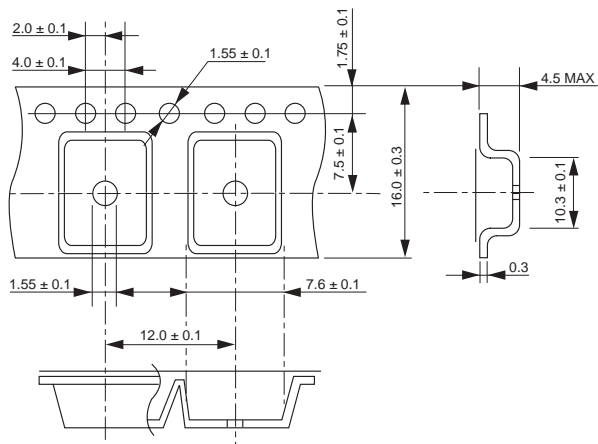
**TYPICAL PERFORMANCE CURVES** ( $T_A = 25^\circ\text{C}$ )



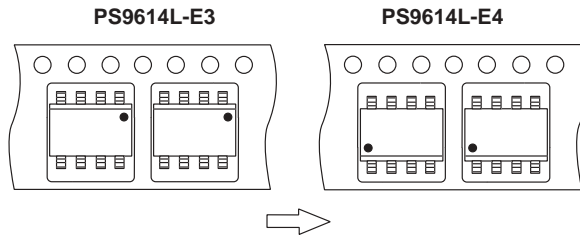
Note: Graphs indicate nominal characteristics.

**TAPING SPECIFICATIONS** (Units in mm)

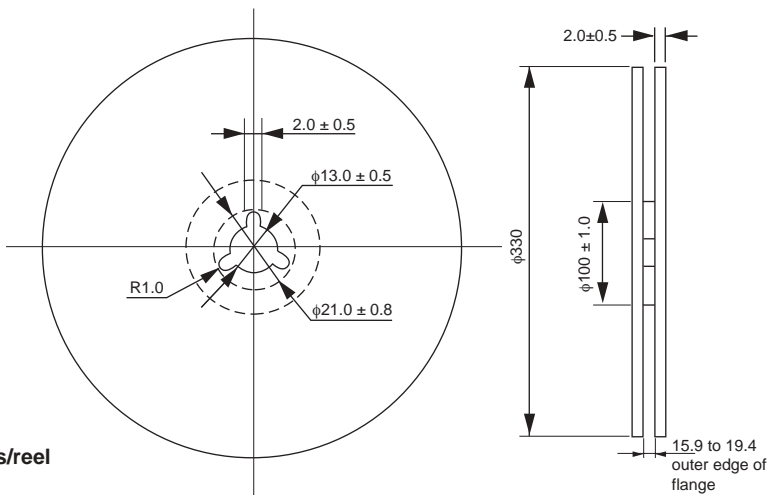
**Tape Outline and Dimensions**



**Tape Direction**



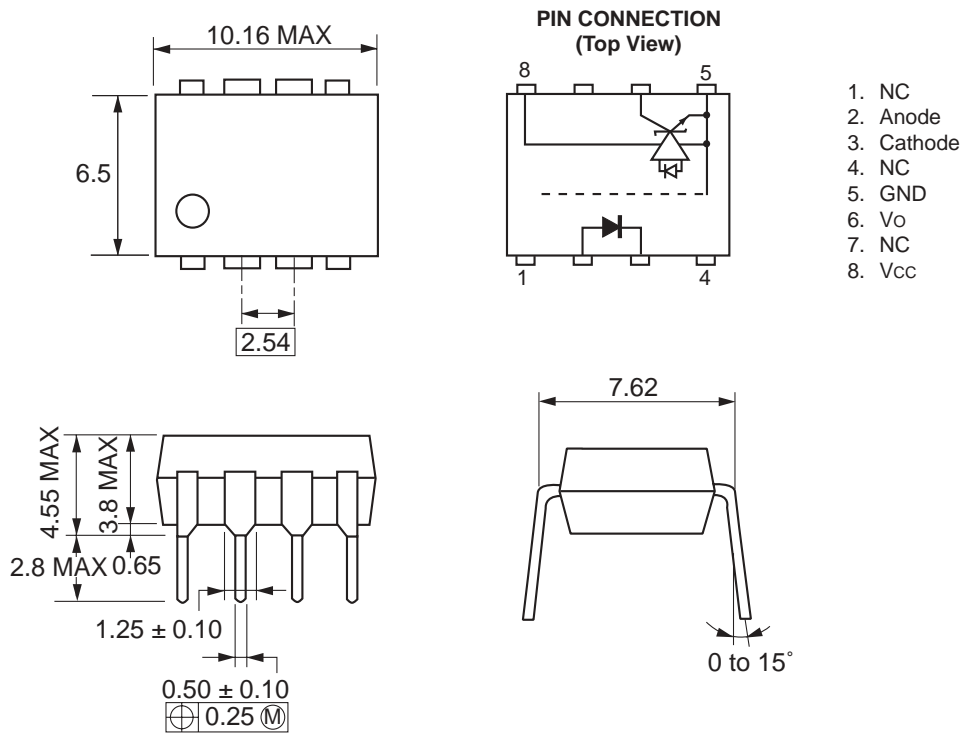
**Reel Outline and Dimensions**



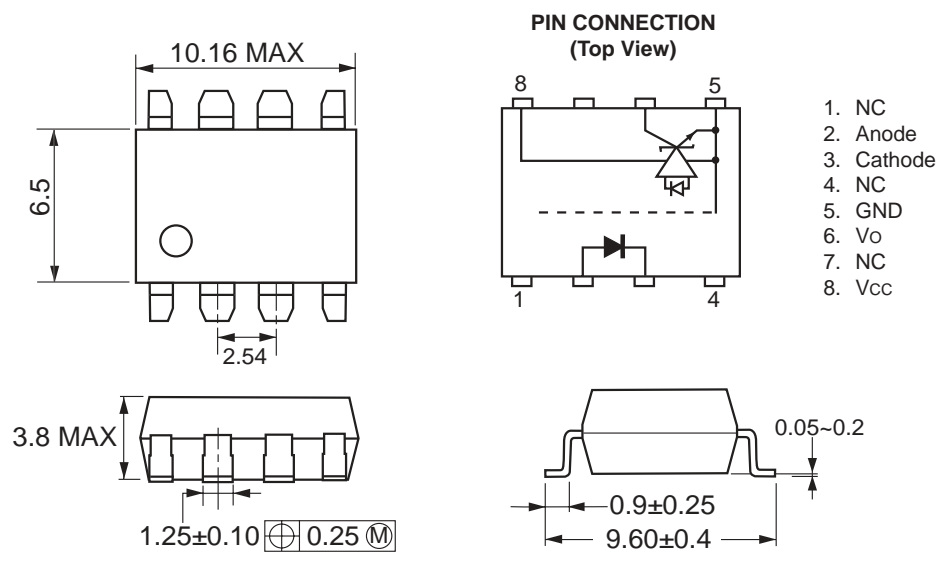
Packing: 1000 pcs/reel

PACKAGE OUTLINE (Units in mm)

PS9614



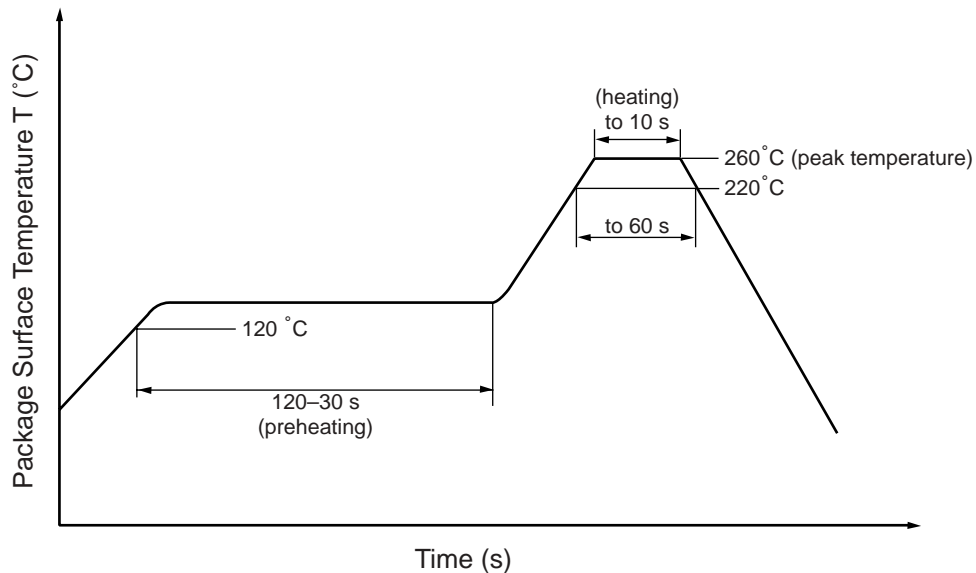
PS9614L



## 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.)



### (2) Wave Soldering

- Temperature 260°C or below
- Time 10 seconds or less
- Preheating conditions 120°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.

#### Life Support Applications

These NEC products are not intended for use in life support devices, appliances, or systems where the malfunction of these products can reasonably be expected to result in personal injury. The customers of CEL using or selling these products for use in such applications do so at their own risk and agree to fully indemnify CEL for all damages resulting from such improper use or sale.

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