



# NEC's HIGH CMR, 10 Mbps OPEN COLLECTOR OUTPUT TYPE 5 PIN SOP OPTOCOUPLER

## PS9714

### FEATURES

- **HIGH COMMON MODE TRANSIENT IMMUNITY:**  
CMH, CML:  $\pm 20$  kV/ $\mu$ s TYP
- **PULSE WIDTH DISTORTION:**  
tPHL - tPLH = 3 ns TYP
- **HIGH SPEED RESPONSE:**  
10 Mbps
- **HIGH ISOLATION VOLTAGE:**  
BV: 2500 Vr.m.s.
- **OPEN COLLECTOR OUTPUT TYPE**
- **SMALL OUTLINE PACKAGE:**  
5 PIN SOP
- **TAPE AND REEL AVAILABLE:**  
PS9714-F3, F4: 3500 Pcs/Reel
- **SAFETY STANDARDS:**  
UL and VDE0884 approved

### DESCRIPTION

NEC's PS9714 is an optically coupled, high speed isolator 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 PS9714 is in a plastic SOP (Small Outline Package) for high density applications.

### APPLICATIONS

- MEASUREMENT EQUIPMENT
- PDP
- FACTORY AUTOMATION NETWORK

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

PART NUMBER		PS9714				
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	1.4	1.65	1.9
	I <sub>R</sub>	Reverse Current, V <sub>R</sub> = 3 V, T <sub>A</sub> = 25°C	$\mu$ A			10
	C <sub>t</sub>	Terminal Capacitance, V = 0 V, 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		0.02	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		0.15	0.6
	I <sub>CCH</sub>	High Level Supply Current, V <sub>CC</sub> = 5.5 V, I <sub>F</sub> = 0 mA	mA		3	8
	I <sub>CCL</sub>	Low Level Supply Current, V <sub>CC</sub> = 5.5 V, I <sub>F</sub> = 10 mA	mA		7.0	11
	I <sub>FHL</sub>	Threshold Input Current, V <sub>CC</sub> = 5 V, V <sub>O</sub> = 0.8 V, R <sub>L</sub> = 350 $\Omega$	%		2.0	5.0
Coupled	R <sub>I-O</sub>	Isolation Resistance, V <sub>in-out</sub> = 1kV <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, I <sub>F</sub> = 7.5 mA, R <sub>L</sub> = 350 $\Omega$ T <sub>A</sub> = 25°C	ns		54	100
	t <sub>PLH</sub>	Propagation Delay Time, Low $\rightarrow$ High <sup>1</sup> , V <sub>CC</sub> = 5 V, I <sub>F</sub> = 7.5 mA, R <sub>L</sub> = 350 $\Omega$ T <sub>A</sub> = 25°C	ns		51	100
	t <sub>r</sub>	Rise Time, V <sub>CC</sub> = 5 V, I <sub>F</sub> = 7.5 mA, R <sub>L</sub> = 350 $\Omega$	ns		20	
	t <sub>f</sub>	Fall Time, V <sub>CC</sub> = 5 V, I <sub>F</sub> = 7.5 mA, R <sub>L</sub> = 350 $\Omega$	ns		10	
	PWD	Pulse Width Distortion, V <sub>CC</sub> = 5 V, I <sub>F</sub> = 7.5 mA, R <sub>L</sub> = 350 $\Omega$	ns		3	50
	t <sub>PSK</sub>	Propagation Skew, V <sub>CC</sub> = 5 V, I <sub>F</sub> = 7.5 mA, R <sub>L</sub> = 350 $\Omega$	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	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> = 7.5 mA, V <sub>O</sub> (MAX) = 0.8 V	kV/ $\mu$ s	10	20	

Please see notes on the next page.

**ABSOLUTE MAXIMUM RATINGS<sup>1</sup>**

(T<sub>A</sub> = 25°C unless otherwise specified)

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 <sup>2</sup>	mW	40
BV	Isolation Voltage <sup>3</sup>	V <sub>r.m.s.</sub>	2500
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. Applies to output pin V<sub>O</sub> and power supply pin V<sub>CC</sub>.
2. AC voltage for 1 minute at T<sub>A</sub> = 25 °C, RH = 60 % between input and output.

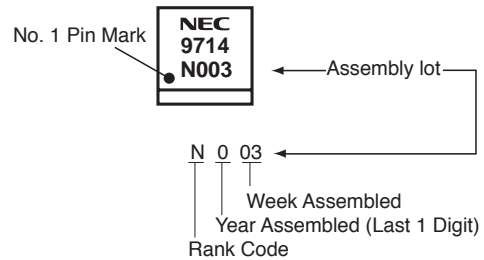
**ORDERING INFORMATION**

Part Number	Packing Style	Safety Standards Approval
PS9714	Magazine Case 100 pcs	UL
PS9714-F3	Embossed Tape 3500 pcs/reel	Approved
PS9714-F4		
PS9714-V	Magazine Case 100 pcs	VDE0884
PS9714-V-F3	Embossed Tape 3500 pcs/reel	Approved
PS9714-V-F4		

**RECOMMENDED OPERATING CONDITIONS**

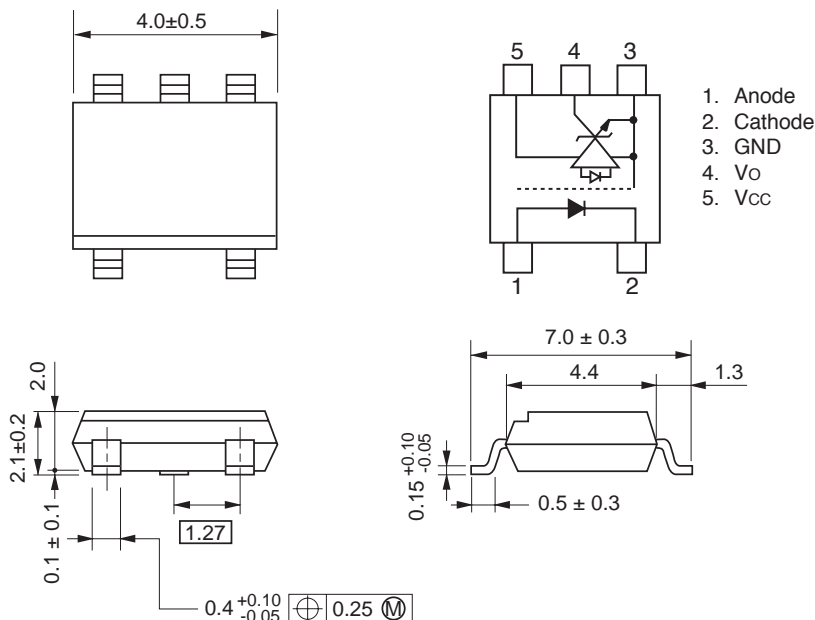
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V <sub>FL</sub>	Low Level Input Voltage	V	0		0.8
I <sub>FH</sub>	High Level Input Current	mA	6.3		12.5
V <sub>CC</sub>	Supply Voltage	V	4.5	5	5.5
N	TTL (loads) (R <sub>L</sub> = 1kΩ)				5
R <sub>L</sub>	Pull-up Resistance	Ω	330		4k

**MARKING**



**PACKAGE OUTLINE** (Units in mm)

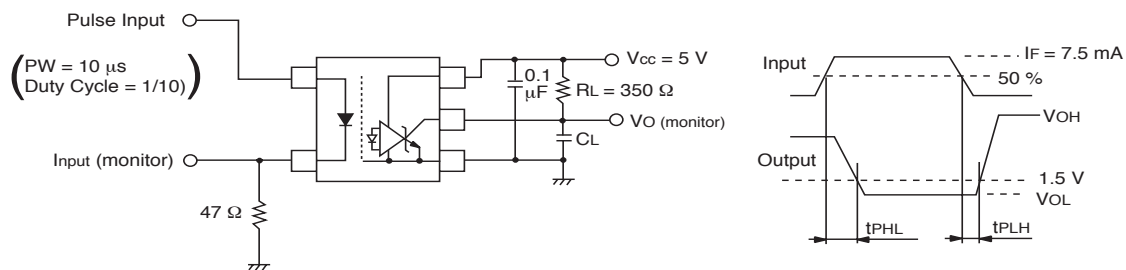
**PIN CONNECTION (Top View)**



(Continued from first page.)

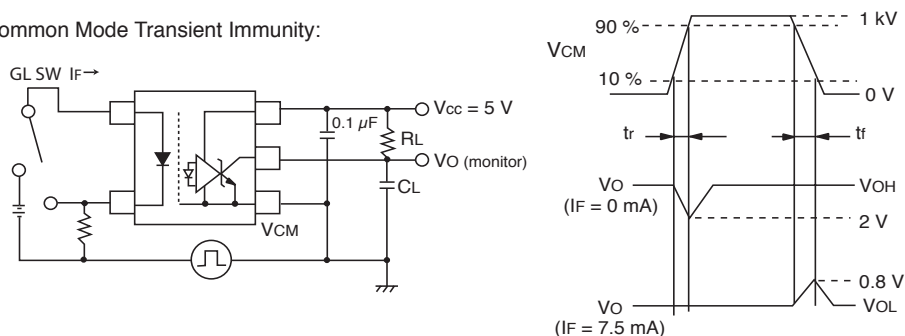
Notes:

1. Typical values at  $T_A = 25^\circ\text{C}$ .
2. Because  $V_{OL}$  of 2 V or more may be output when LED current input and when output supply of  $V_{CC} = 2.6$  V or less, it is important to confirm the characteristics (operation with the power supply on and off) during design, before using this device.
3. Test Circuit for Propagation Delay Time:



\* $CL$  is approximately 15 pF which includes probe and stray wiring capacitance.

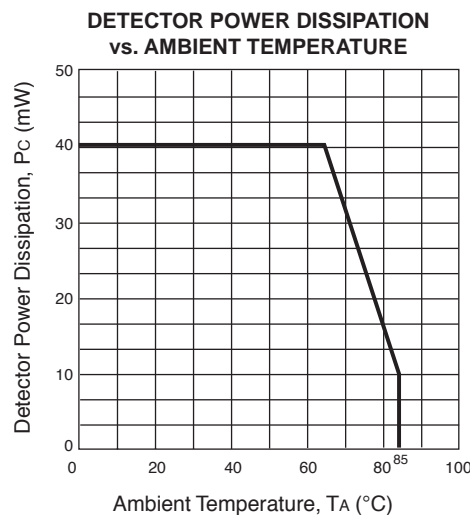
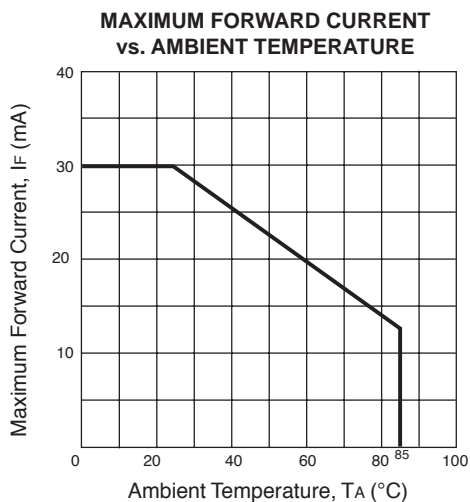
4. Test Circuit for Common Mode Transient Immunity:



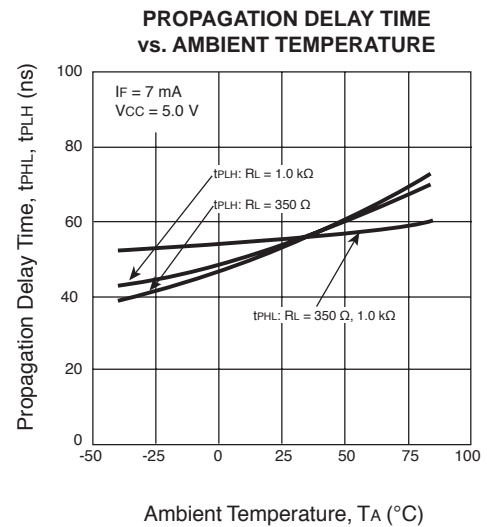
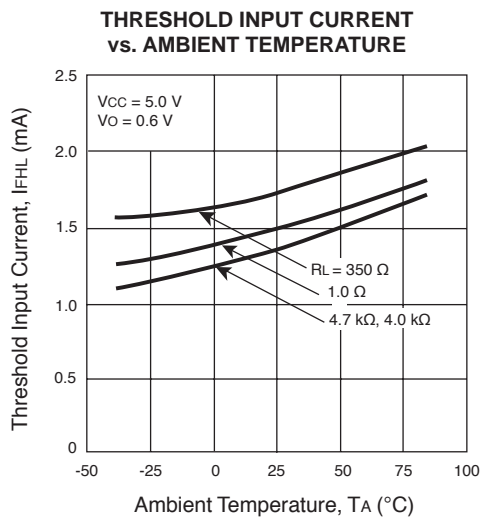
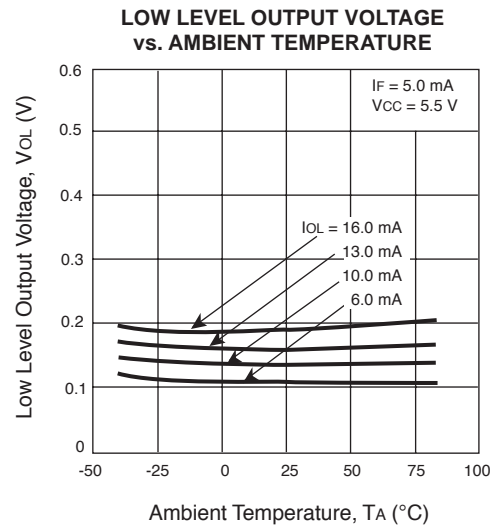
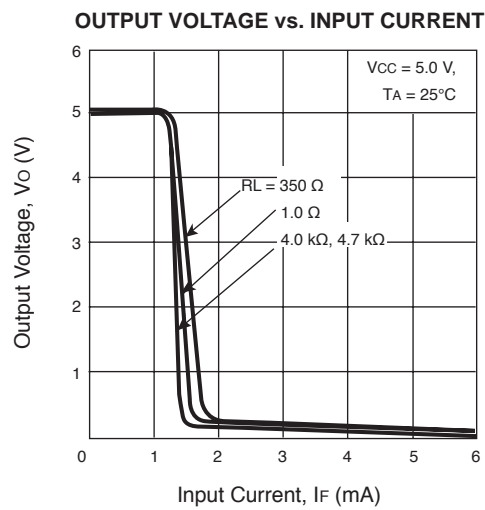
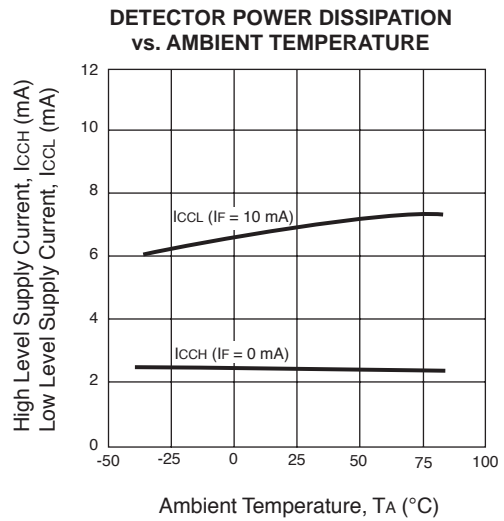
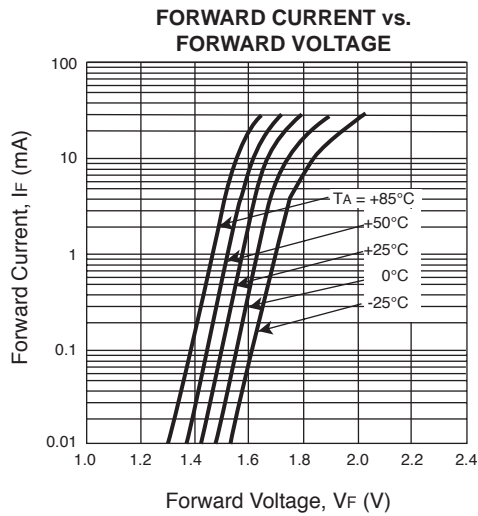
**USAGE CAUTIONS**

1. Protect against static electricity when handling this product.
2. Bypass capacitor greater than 0.1  $\mu\text{F}$  is used between  $V_{CC}$  and GND near device (lead distance: 10 mm MAX).

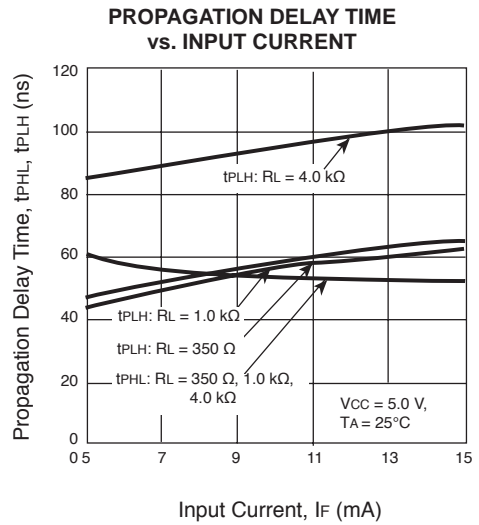
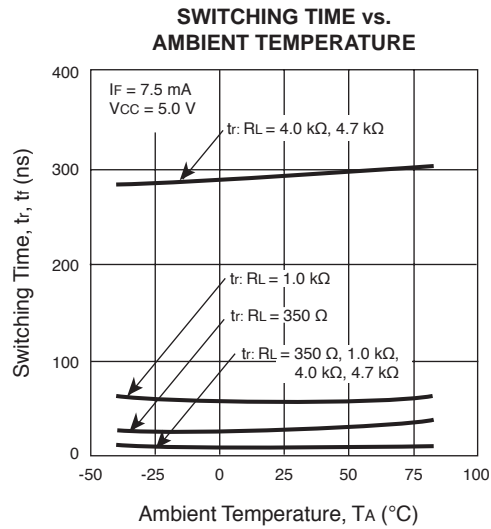
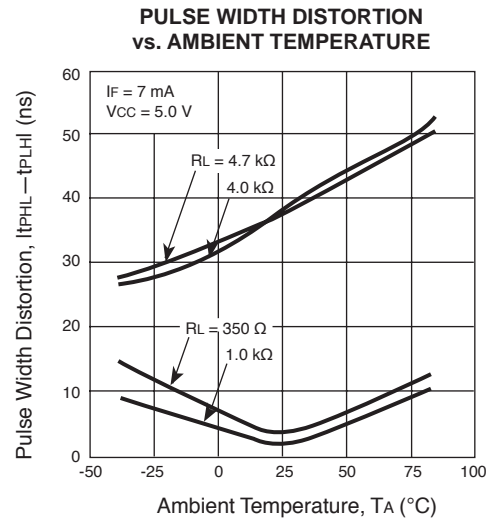
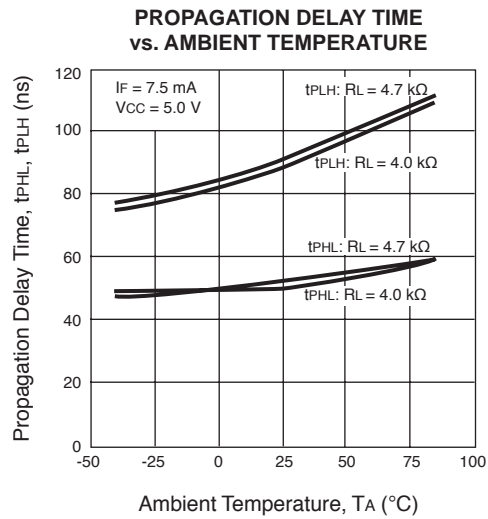
**TYPICAL PERFORMANCE CURVES** ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)



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

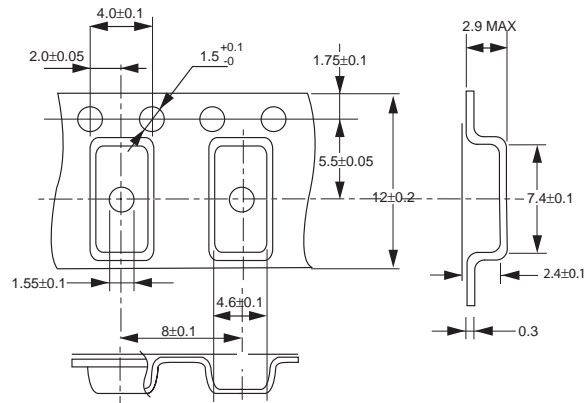


**TYPICAL PERFORMANCE CURVES** ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)

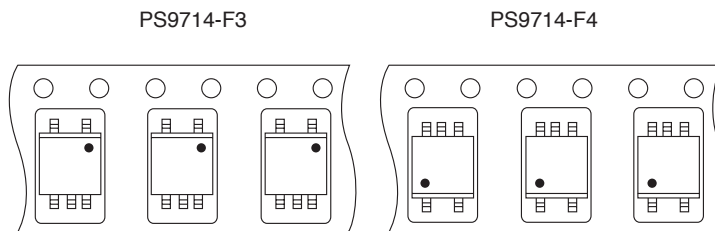


TAPING SPECIFICATIONS

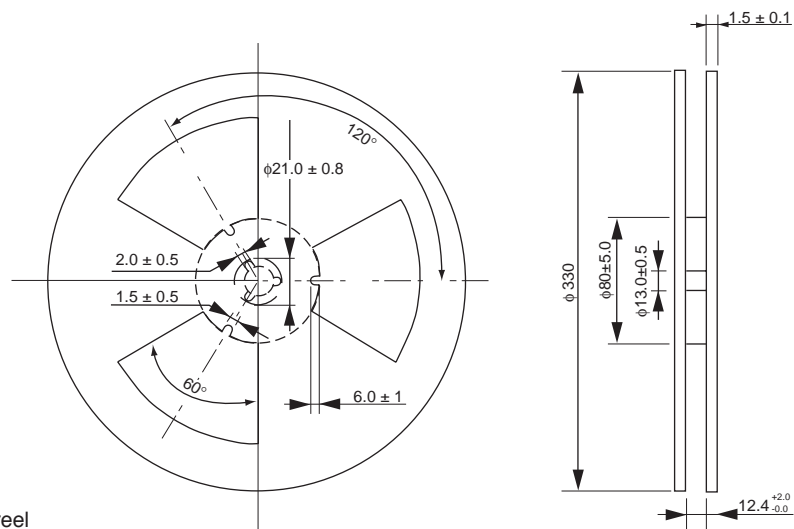
Tape Outline and Dimensions



Tape Direction



Reel Outline and Dimensions

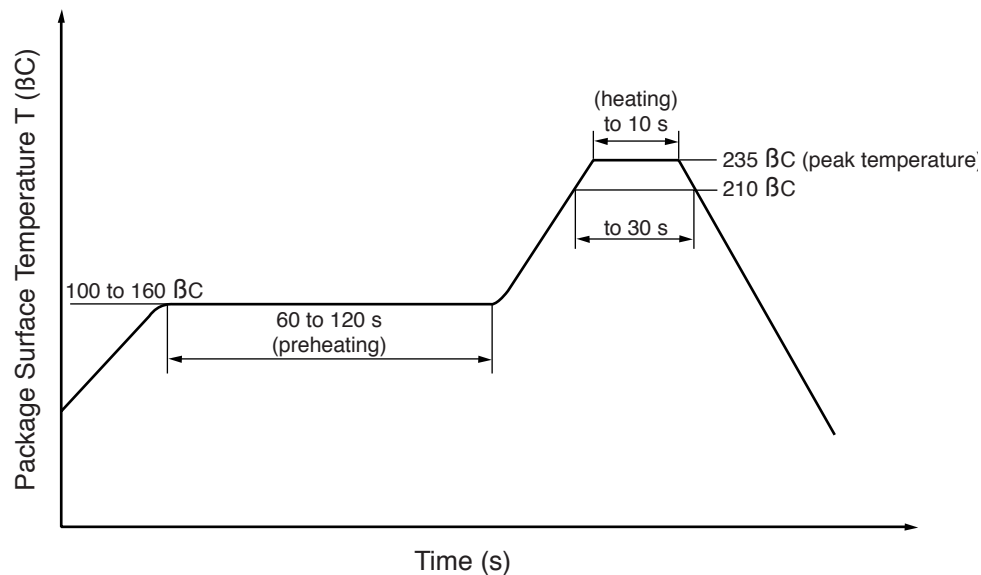


Packing: 3500 pcs/reel

## 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.)



### (2) 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.

**CEL** California Eastern Laboratories, Your source for NEC RF, Microwave, Optoelectronic, and Fiber Optic Semiconductor Devices.

4590 Patrick Henry Drive • Santa Clara, CA 95054-1817 • (408) 988-3500 • FAX (408) 988-0279 • [www.cel.com](http://www.cel.com)

DATA SUBJECT TO CHANGE WITHOUT NOTICE

02/12/2003