



# PHOTOCOUPLER PS2513-1, PS2513L-1

## HIGH-SPEED SWITCHING/HIGH ISOLATION VOLTAGE PHOTOCOUPLER SERIES

–NEPOC Series–

### DESCRIPTION

The PS2513-1 and PS2513L-1 are optically coupled isolators containing a GaAs light emitting diode and an NPN silicon phototransistor.

The PS2513-1 is in a plastic DIP (Dual In-line Package) and the PS2513L-1 is lead bending type (Gull-wing) for surface mount.

### FEATURES

- High isolation voltage ( $BV = 5\,000\text{ V r.m.s.}$ )
- High collector to emitter voltage ( $V_{CE0} = 120\text{ V}$ )
- Guaranteed maximum switching speed ( $t_{off} \leq 60\ \mu\text{s}$  @  $I_F = 5\text{ mA}$ ,  $V_{CC} = 5\text{ V}$ ,  $R_L = 1.9\text{ k}\Omega$ )
- High-speed switching ( $t_{on} = 5\ \mu\text{s}$  TYP. @  $I_F = 5\text{ mA}$ ,  $V_{CC} = 5\text{ V}$ ,  $R_L = 1.9\text{ k}\Omega$ )  
( $t_{off} = 25\ \mu\text{s}$  TYP. @  $I_F = 5\text{ mA}$ ,  $V_{CC} = 5\text{ V}$ ,  $R_L = 1.9\text{ k}\Omega$ )
- Ordering number of tape product: PS2513L-1-E3, E4, F3, F4

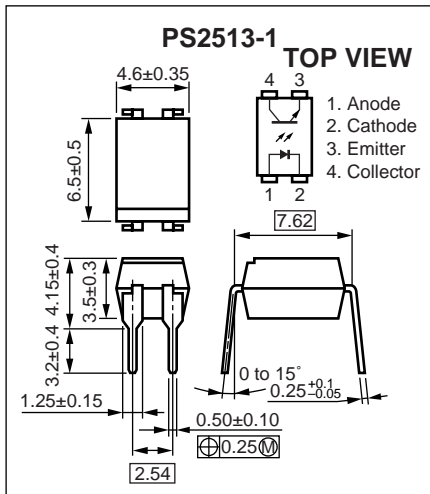
### APPLICATIONS

- Power supply
- Air conditioner
- FA equipment

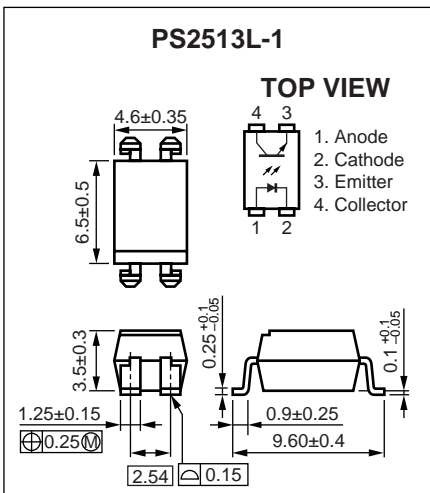
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**PACKAGE DIMENSIONS (UNIT: mm)**

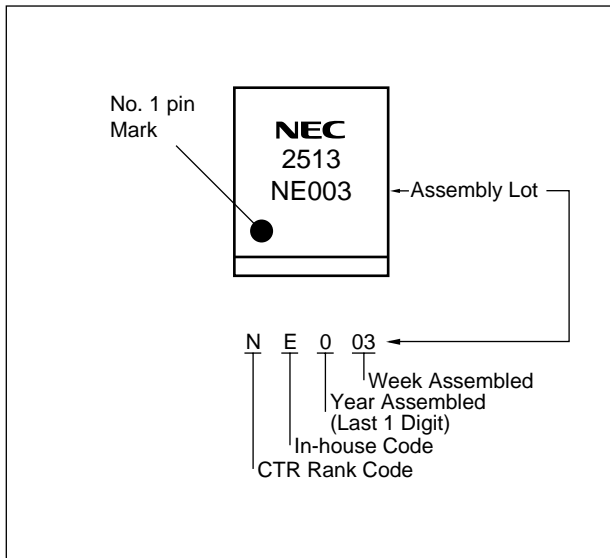
**DIP Type**



**Lead Bending Type**



**MARKING EXAMPLE**



**ORDERING INFORMATION (Solder Contains Lead)**

Part Number	Package	Packing Style	Application Part Number <sup>*1</sup>
PS2513-1	4-pin DIP	Magazine case 100 pcs	PS2513-1
PS2513L-1		Embossed Tape 1 000 pcs/reel	
PS2513L-1-E3			
PS2513L-1-E4			
PS2513L-1-F3		Embossed Tape 2 000 pcs/reel	
PS2513L-1-F4			

\*1 For the application of the Safety Standard, following part number should be used.

**ORDERING INFORMATION (Pb-Free)**

Part Number	Package	Packing Style	Application Part Number <sup>*1</sup>
PS2513-1-A	4-pin DIP	Magazine case 100 pcs	PS2513-1
PS2513L-1-A		Embossed Tape 1 000 pcs/reel	
PS2513L-1-E3-A			
PS2513L-1-E4-A			
PS2513L-1-F3-A		Embossed Tape 2 000 pcs/reel	
PS2513L-1-F4-A			

\*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
			PS2513-1, PS2513L-1	
Diode	Reverse Voltage	V <sub>R</sub>	6	V
	Forward Current (DC)	I <sub>F</sub>	60	mA
	Power Dissipation Derating	ΔP <sub>D</sub> /°C	1.5	mW/°C
	Power Dissipation	P <sub>D</sub>	150	mW
	Peak Forward Current <sup>*1</sup>	I <sub>FP</sub>	1	A
Transistor	Collector to Emitter Voltage	V <sub>CEO</sub>	120	V
	Emitter to Collector Voltage	V <sub>ECO</sub>	6	V
	Collector Current	I <sub>C</sub>	30	mA
	Power Dissipation Derating	ΔP <sub>C</sub> /°C	1.5	mW/°C
	Power Dissipation	P <sub>C</sub>	150	mW
Isolation Voltage <sup>*2</sup>		BV	5 000	Vr.m.s.
Operating Ambient Temperature		T <sub>A</sub>	-55 to +100	°C
Storage Temperature		T <sub>stg</sub>	-55 to +150	°C

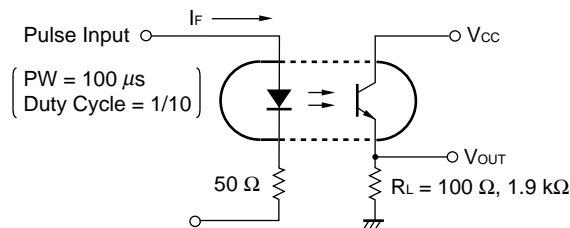
\*1 PW = 100 μs, Duty Cycle = 1%

\*2 AC voltage for 1 minute at T<sub>A</sub> = 25°C, RH = 60% between input and output

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 5 mA		1.1	1.3	V
	Reverse Current	I <sub>R</sub>	V <sub>R</sub> = 5 V			5	μA
	Terminal Capacitance	C <sub>t</sub>	V = 0 V, f = 1.0 MHz		30		pF
Transistor	Collector to Emitter Dark Current	I <sub>CEO</sub>	V <sub>CE</sub> = 120 V, I <sub>F</sub> = 0 mA			100	nA
Coupled	Current Transfer Ratio (I <sub>c</sub> /I <sub>F</sub> )	CTR1	I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 5 V	25	75	100	%
		CTR2	I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 5 V	50	125	200	%
	Collector Saturation Voltage	V <sub>CE(sat)</sub>	I <sub>F</sub> = 10 mA, I <sub>c</sub> = 2 mA			0.3	V
	Isolation Resistance	R <sub>I-O</sub>	V <sub>I-O</sub> = 1.0 kV <sub>DC</sub>	10 <sup>11</sup>			Ω
	Isolation Capacitance	C <sub>I-O</sub>	V = 0 V, f = 1.0 MHz		0.5		pF
	Rise Time* <sup>1</sup>	t <sub>r</sub>	V <sub>CC</sub> = 5 V, I <sub>c</sub> = 2 mA, R <sub>L</sub> = 100 Ω		3		μs
	Fall Time* <sup>1</sup>	t <sub>f</sub>			4		
	Turn-on Time* <sup>1</sup>	t <sub>on</sub>	V <sub>CC</sub> = 5 V, I <sub>F</sub> = 5 mA, R <sub>L</sub> = 1.9 kΩ		5	60	μs
Turn-off Time* <sup>1</sup>	t <sub>off</sub>			25	60		

\*1 Test circuit for switching time

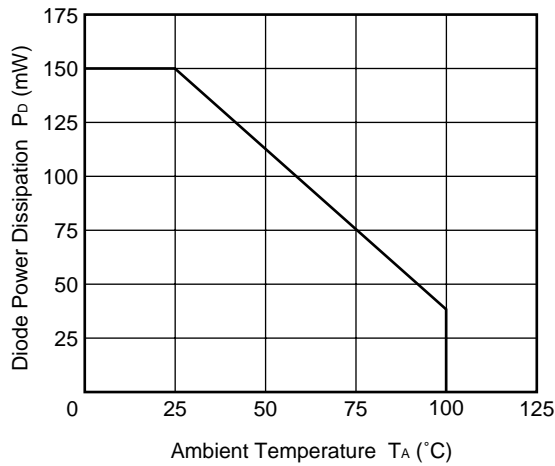


**CAUTIONS REGARDING NOISE**

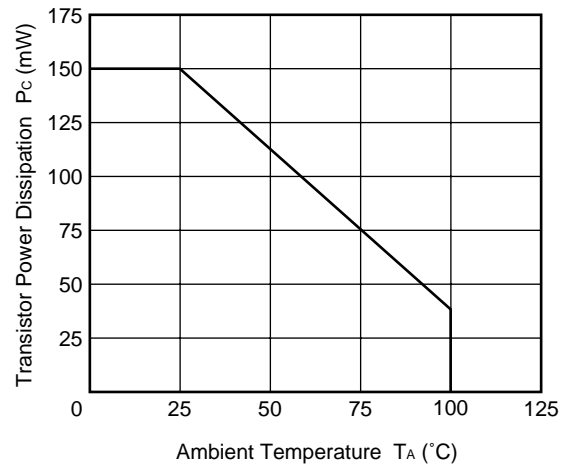
Be aware that when voltage is applied suddenly between the photocoupler's input and output or between corrector-emitters at startup, the output side may enter the on state, even if the voltage is within the absolute maximum ratings.

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

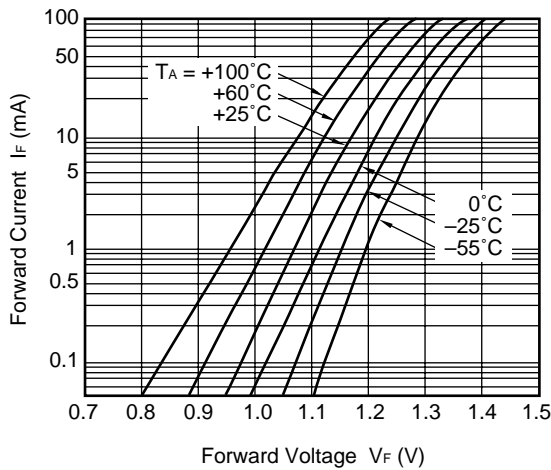
**DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE**



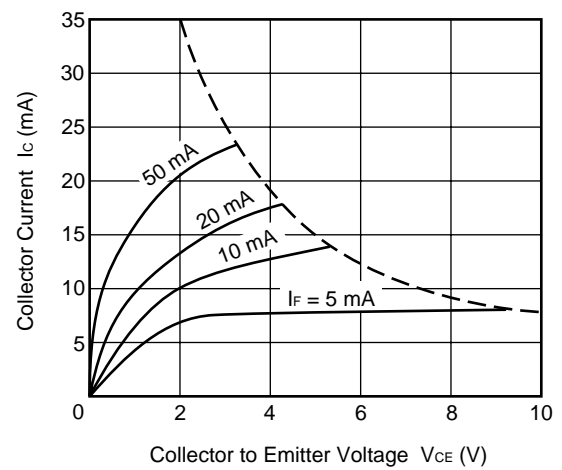
**TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE**



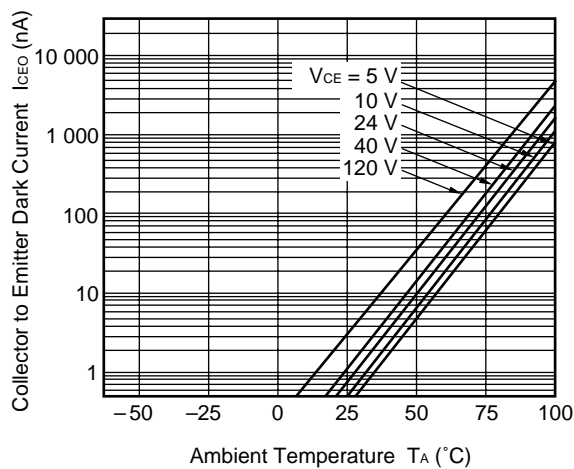
**FORWARD CURRENT vs. FORWARD VOLTAGE**



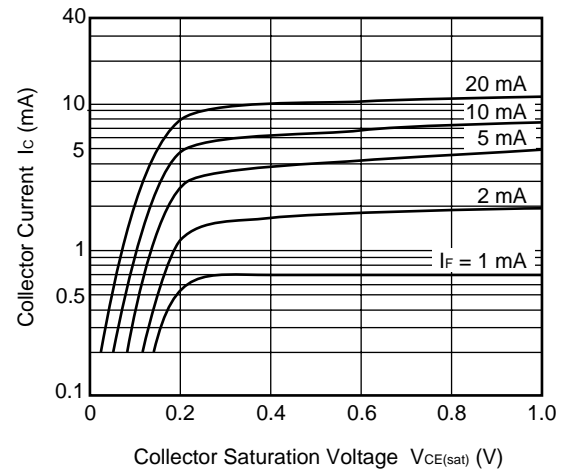
**COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE**



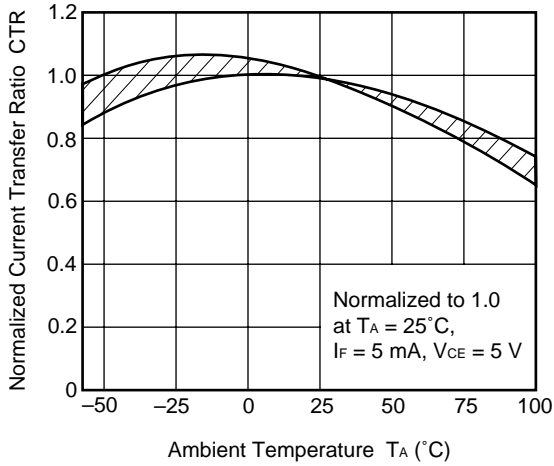
**COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE**



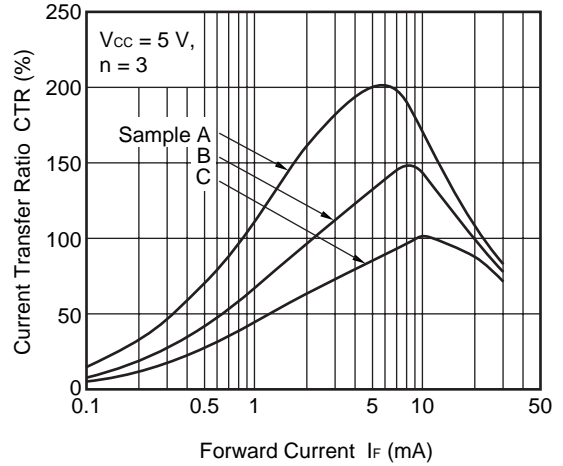
**COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE**



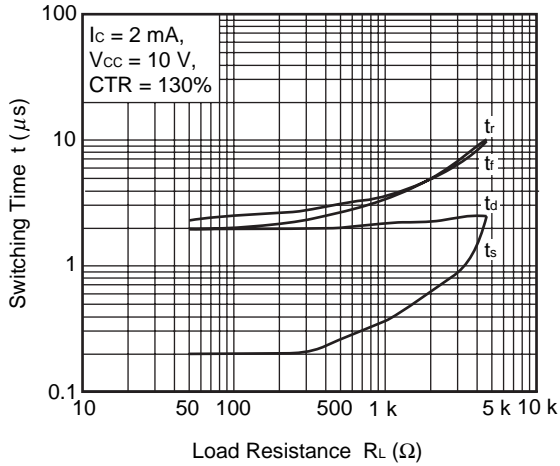
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



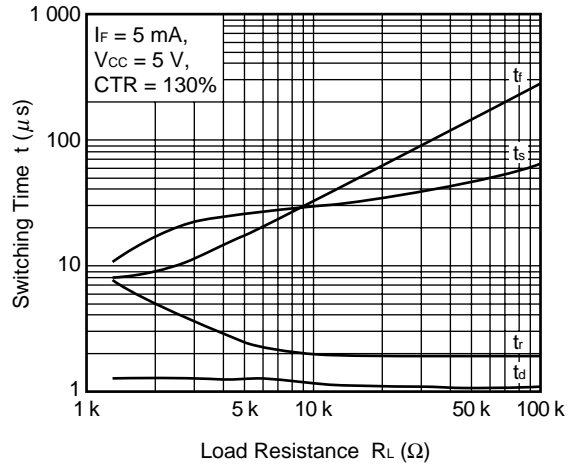
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



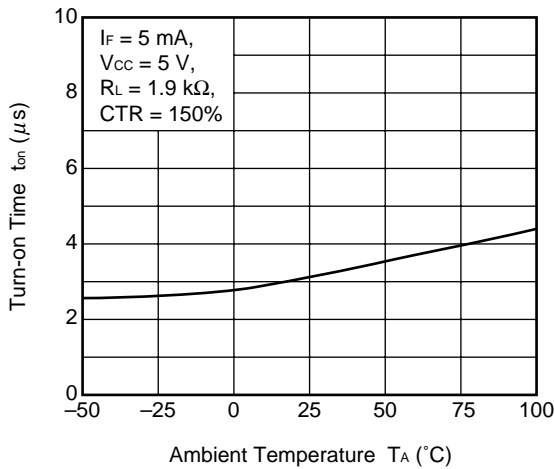
SWITCHING TIME vs. LOAD RESISTANCE



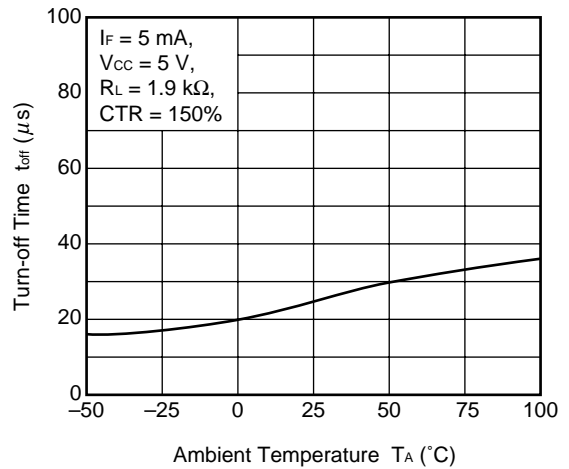
SWITCHING TIME vs. LOAD RESISTANCE

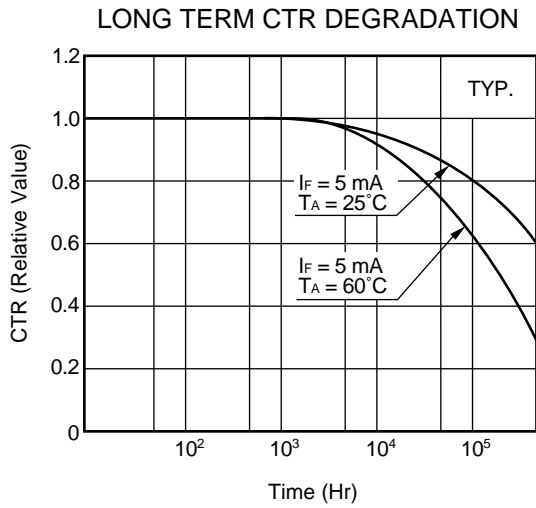


TURN-ON TIME vs. AMBIENT TEMPERATURE



TURN-OFF TIME vs. AMBIENT TEMPERATURE



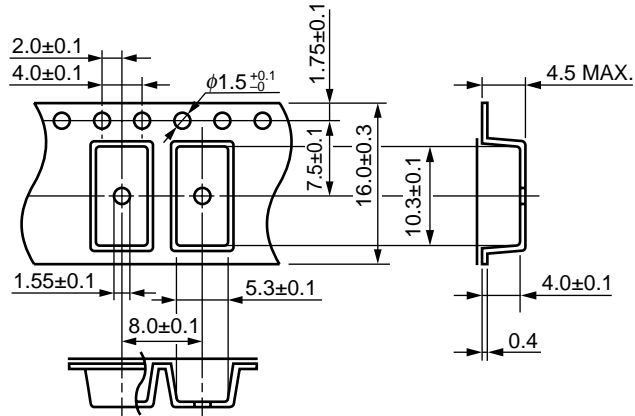


**Remark** The graphs indicate nominal characteristics.

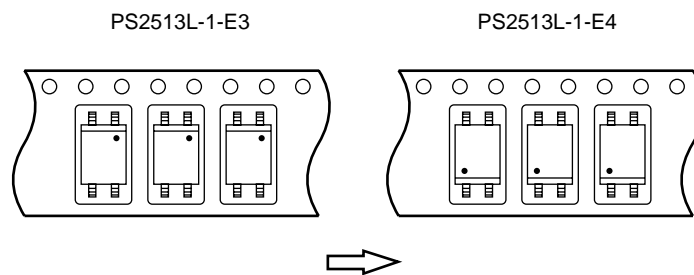


★ TAPING SPECIFICATIONS (UNIT: mm)

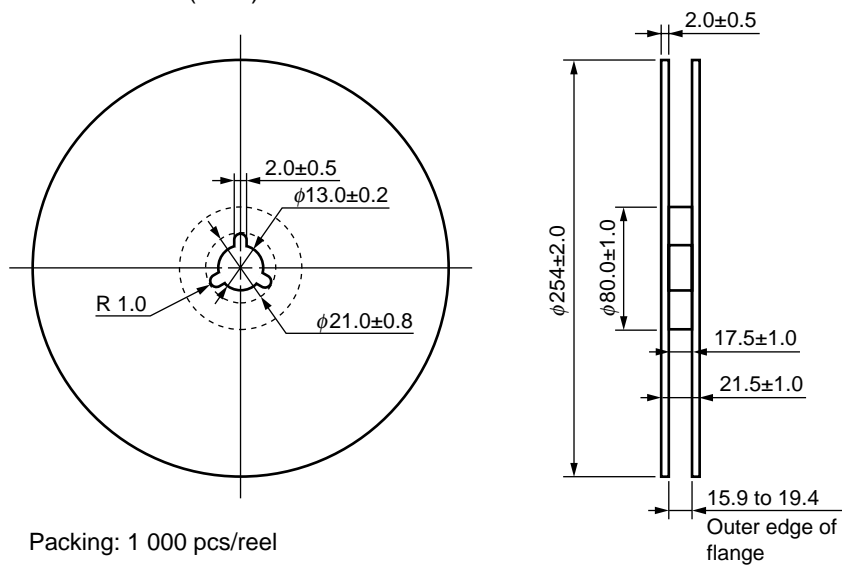
Outline and Dimensions (Tape)



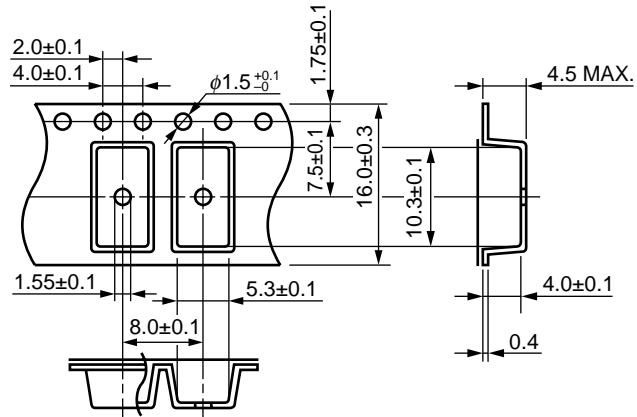
Tape Direction



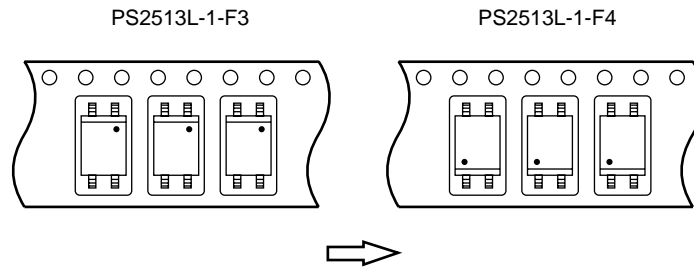
Outline and Dimensions (Reel)



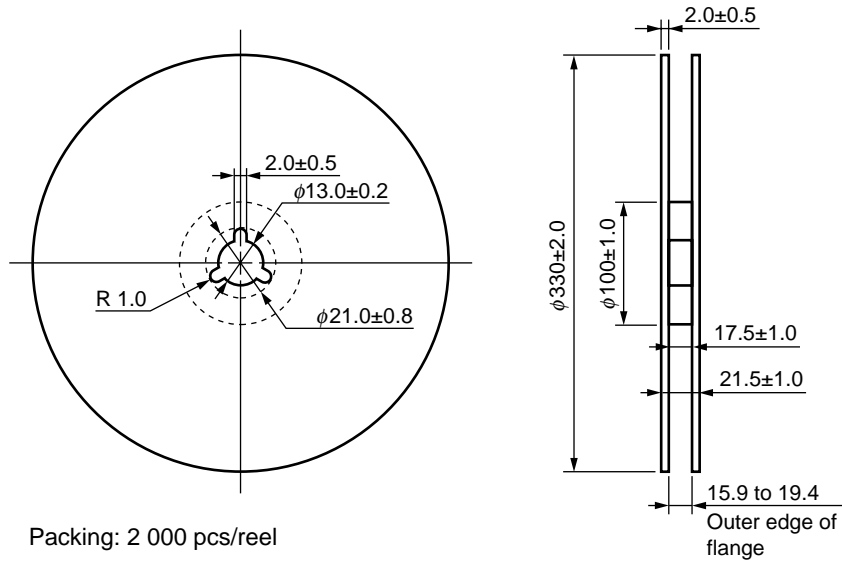
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)

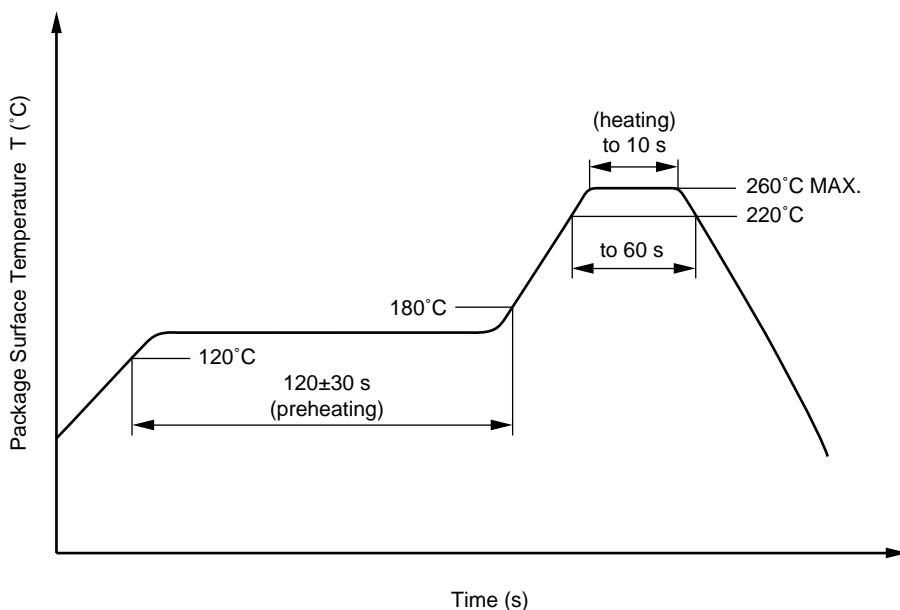


**RECOMMENDED SOLDERING CONDITIONS**

**(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 (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.

**USAGE CAUTIONS**

1. Protect against static electricity when handling.
2. Avoid storage at a high temperature and high humidity.

Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (\*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL’s understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)	Concentration contained in CEL devices	
		-A	-AZ
Lead (Pb)	< 1000 PPM	Not Detected	(*)
Mercury	< 1000 PPM	Not Detected	
Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.

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