CEL

PHOTOCOUPLER

PS2501-1,-2,-4, PS2501L-1,-2,-4

HIGH ISOLATION VOLTAGE SINGLE TRANSISTOR TYPE MULTI PHOTOCOUPLER SERIES

–NEPOC Series–

DESCRIPTION

The PS2501-1, -2, -4 and PS2501L-1, -2, -4 are optically coupled isolators containing a GaAs light emitting diode and an NPN silicon phototransistor.

The PS2501-1, -2, -4 are in a plastic DIP (Dual In-line Package) and the PS2501L-1, -2, -4 are lead bending type (Gull-wing) for surface mount.

FEATURES

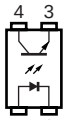
- High isolation voltage (BV = 5 000 Vr.m.s.)
- High collector to emitter voltage (V_{CEO} = 80 V)
- High-speed switching (t_r = 3 μs TYP., t_f = 5 μs TYP.)
- Ordering number of tape product: PS2501L-1-E3, E4, F3, F4, PS2501L-2-E3, E4
- Safety standards
  - UL approved: File No. E72422

APPLICATIONS

- Power supply
- Telephone/FAX.
- FA/OA equipment
- Programmable logic controller

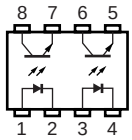
PIN CONNECTION
(Top View)

PS2501-1, PS2501L-1



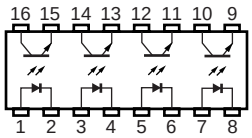
1. Anode
2. Cathode
3. Emitter
4. Collector

PS2501-2, PS2501L-2



1, 3. Anode
2, 4. Cathode
5, 7. Emitter
6, 8. Collector

PS2501-4, PS2501L-4



1, 3, 5, 7. Anode
2, 4, 6, 8. Cathode
9, 11, 13, 15. Emitter
10, 12, 14, 16. Collector

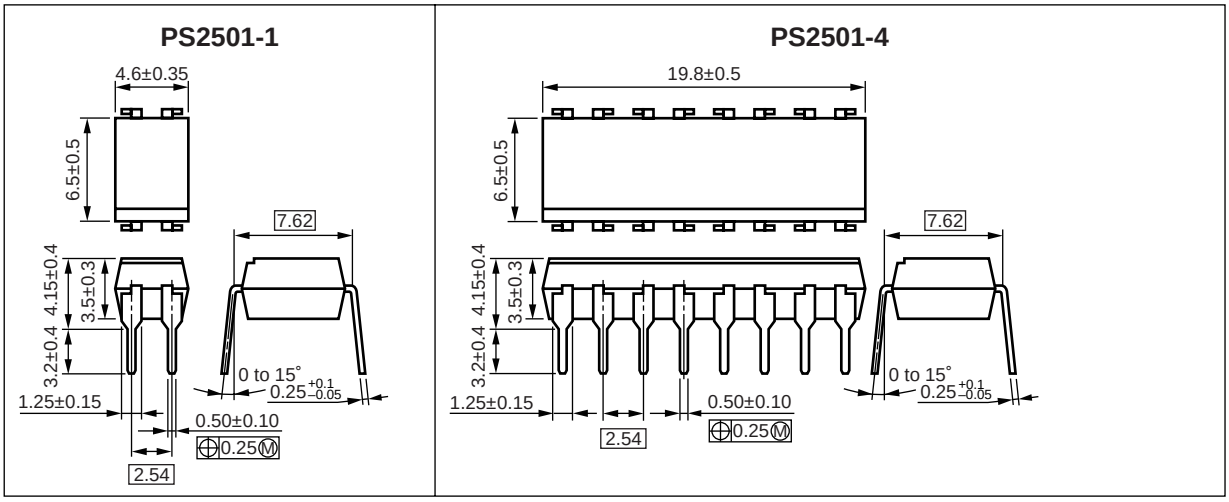
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Document No. PN10225EJ02V0DS (2nd edition)
Date Published April 2005 CP(K)

The mark ★ shows major revised points.

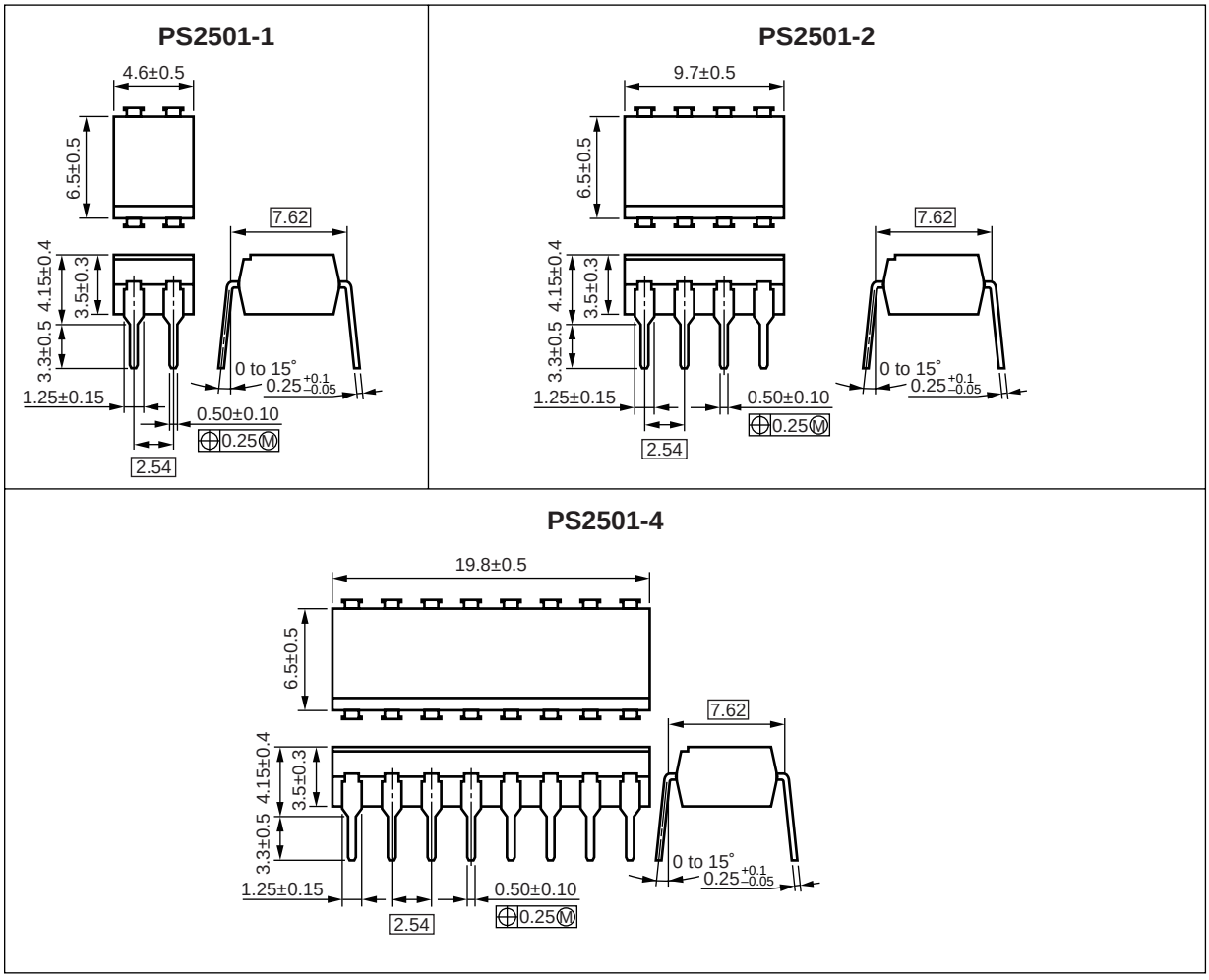
PACKAGE DIMENSIONS (UNIT : mm)

DIP Type (New package)

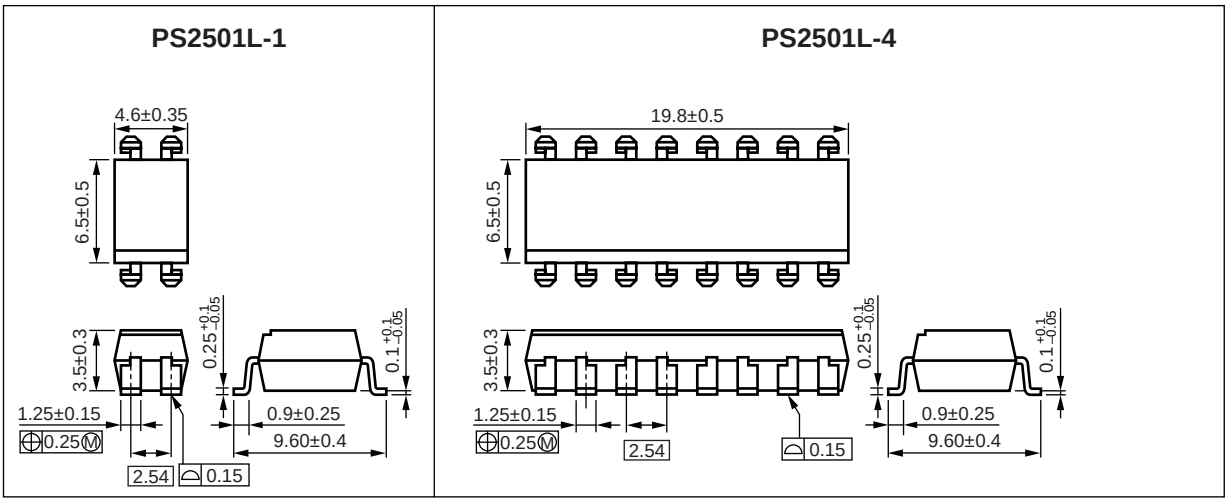


Caution New package 1-ch, 4-ch only

DIP Type

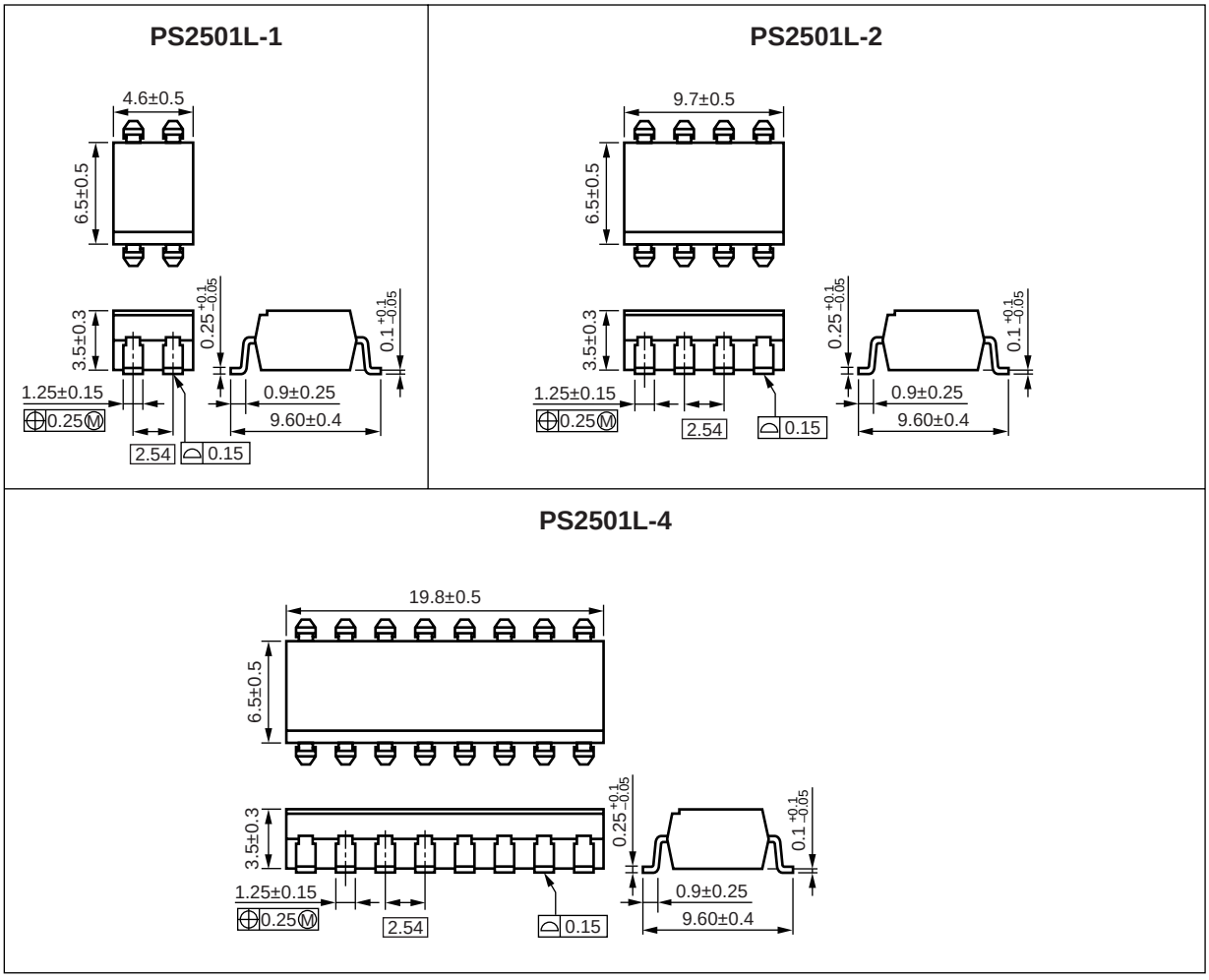


Lead Bending Type (New package)



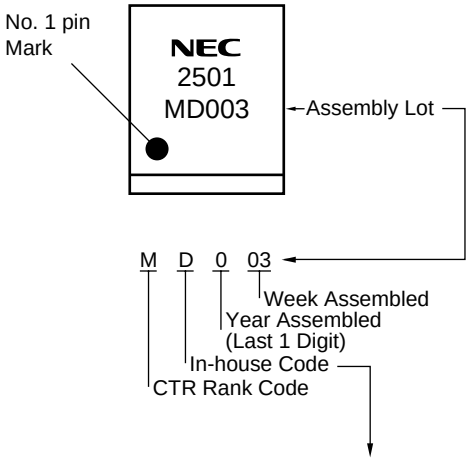
Caution New package 1-ch, 4-ch only

Lead Bending Type



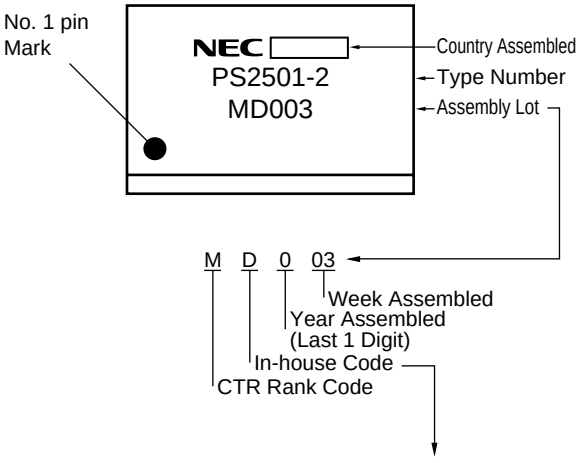
MARKING EXAMPLE

PS2501-1



Package	Made in Japan	Made in Taiwan
Standard PKG	D	F
New PKG	E	H

PS2501-2, -4



Package	Made in Japan	Made in Taiwan
Standard PKG	D	F
New PKG	E*1	

***1** PS2501-4 only

★ ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number *1
PS2501-1	PS2501-1	Solder contains lead	Magazine case 100 pcs	Standard products (UL Approved)	PS2501-1
PS2501L-1	PS2501L-1				
PS2501L-1-E3	PS2501L-1-E3		Embossed Tape 1 000 pcs/reel		
PS2501L-1-E4	PS2501L-1-E4				
PS2501L-1-F3	PS2501L-1-F3		Embossed Tape 2 000 pcs/reel		
PS2501L-1-F4	PS2501L-1-F4				
PS2501-2	PS2501-2		Magazine case 45 pcs		PS2501-2
PS2501L-2	PS2501L-2				
PS2501L-2-E3	PS2501L-2-E3		Embossed Tape 1 000 pcs/reel		
PS2501L-2-E4	PS2501L-2-E4				
PS2501-4	PS2501-4		Magazine case 20 pcs		PS2501-4
PS2501L-4	PS2501L-4				
PS2501-1	PS2501-1-A	Pb-Free	Magazine case 100 pcs		PS2501-1
PS2501L-1	PS2501L-1-A				
PS2501L-1-E3	PS2501L-1-E3-A		Embossed Tape 1 000 pcs/reel		
PS2501L-1-E4	PS2501L-1-E4-A				
PS2501L-1-F3	PS2501L-1-F3-A		Embossed Tape 2 000 pcs/reel		
PS2501L-1-F4	PS2501L-1-F4-A				
PS2501-2	PS2501-2-A		Magazine case 45 pcs		PS2501-2
PS2501L-2	PS2501L-2-A				
PS2501L-2-E3	PS2501L-2-E3-A		Embossed Tape 1 000 pcs/reel		
PS2501L-2-E4	PS2501L-2-E4-A				
PS2501-4	PS2501-4-A		Magazine case 20 pcs		PS2501-4
PS2501L-4	PS2501L-4-A				

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

ABSOLUTE MAXIMUM RATINGS (Unless otherwise specified, T_A = 25°C)

Parameter		Symbol	Ratings		Unit
			PS2501-1, PS2501L-1	PS2501-2,-4 PS2501L-2,-4	
Diode	Reverse Voltage	V_R	6		V
	Forward Current (DC)	I_F	80		mA
	Power Dissipation Derating	ΔP_D/°C	1.5	1.2	mW/°C
	Power Dissipation	P_D	150	120	mW/ch
	Peak Forward Current*1	I_{FP}	1		A
Transistor	Collector to Emitter Voltage	V_{CEO}	80		V
	Emitter to Collector Voltage	V_{ECO}	7		V
	Collector Current	I_C	50		mA/ch
	Power Dissipation Derating	ΔP_C/°C	1.5	1.2	mW/°C
	Power Dissipation	P_C	150	120	mW/ch
Isolation Voltage*2		BV	5 000		Vr.m.s.
Operating Ambient Temperature		T_A	–55 to +100		°C
Storage Temperature		T_{stg}	–55 to +150		°C

***1** PW = 100 μs, Duty Cycle = 1%

***2** AC voltage for 1 minute at T_A = 25°C, RH = 60% between input and output.
Pins 1-2 shorted together, 3-4 shorted together (PS2501-1, PS2501L-1).
Pins 1-4 shorted together, 5-8 shorted together (PS2501-2, PS2501L-2).
Pins 1-8 shorted together, 9-16 shorted together (PS2501-4, PS2501L-4).

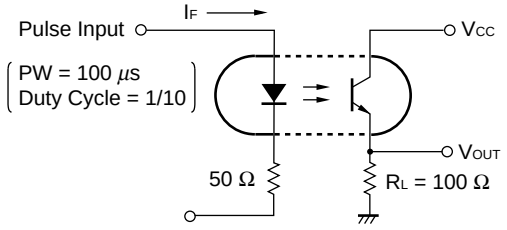
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	V_F	I_F = 10 mA		1.17	1.4	V
	Reverse Current	I_R	V_R = 5 V			5	μA
	Terminal Capacitance	C_t	V = 0 V, f = 1.0 MHz		50		pF
Transistor	Collector to Emitter Dark Current	I_{CEO}	V_{CE} = 80 V, I_F = 0 mA			100	nA
Coupled	Current Transfer Ratio (I_C/I_F)*1	CTR	I_F = 5 mA, V_{CE} = 5 V	80	300	600	%
	Collector Saturation Voltage	$V_{CE(sat)}$	I_F = 10 mA, I_C = 2 mA			0.3	V
	Isolation Resistance	R_{I-O}	V_{I-O} = 1.0 kV_{DC}	10^{11}			Ω
	Isolation Capacitance	C_{I-O}	V = 0 V, f = 1.0 MHz		0.5		pF
	Rise Time*2	t_r	V_{CC} = 10 V, I_C = 2 mA, R_L = 100 Ω		3		μs
	Fall Time*2	t_f			5		

***1** CTR rank (* : only PS2501-1, PS2501L-1)

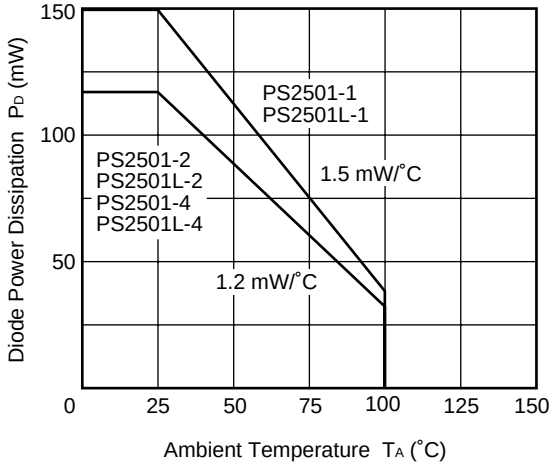
K* : 300 to 600 (%)
L* : 200 to 400 (%)
M* : 80 to 240 (%)
D* : 100 to 300 (%)
H* : 80 to 160 (%)
W* : 130 to 260 (%)
Q* : 100 to 200 (%)
N : 80 to 600 (%)

***2** Test circuit for switching time

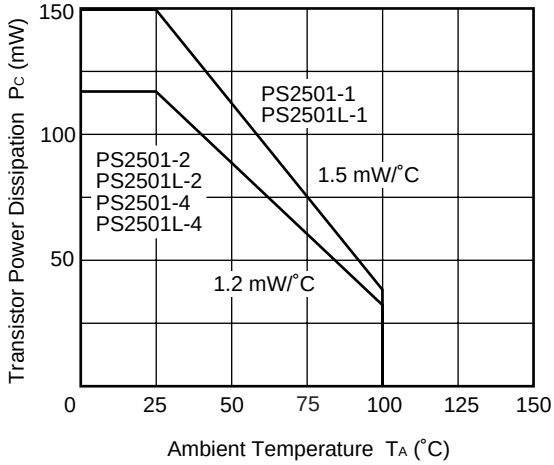


TYPICAL CHARACTERISTICS (Unless otherwise specified, T_A = 25°C)

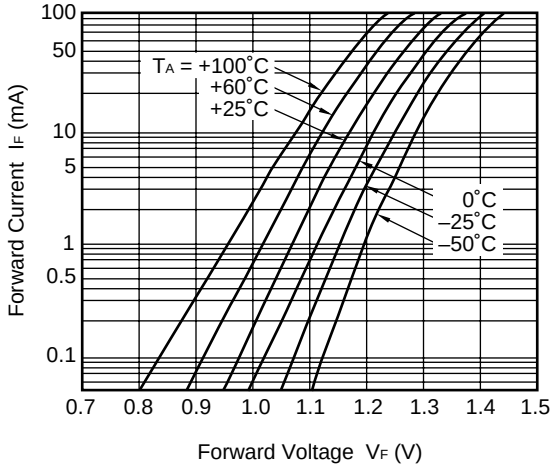
DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE



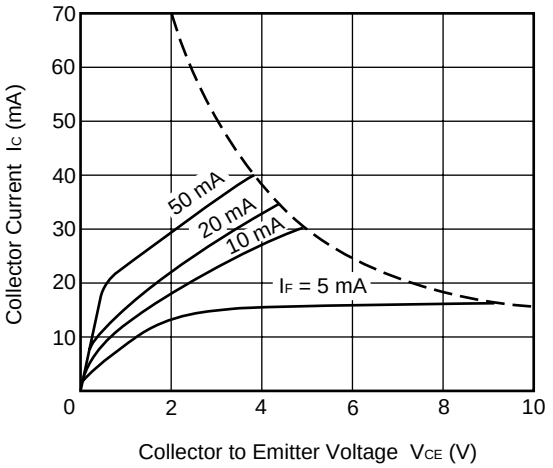
TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



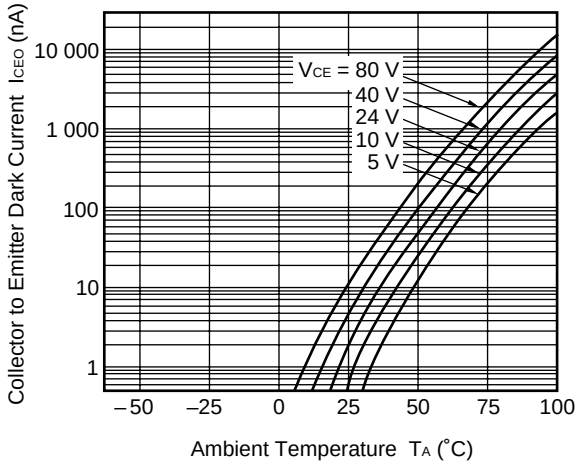
FORWARD CURRENT vs. FORWARD VOLTAGE



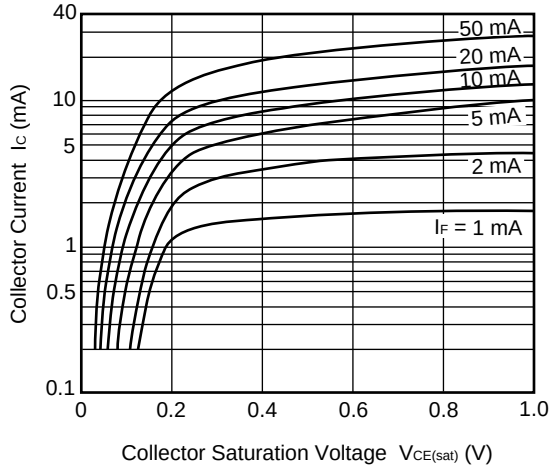
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE

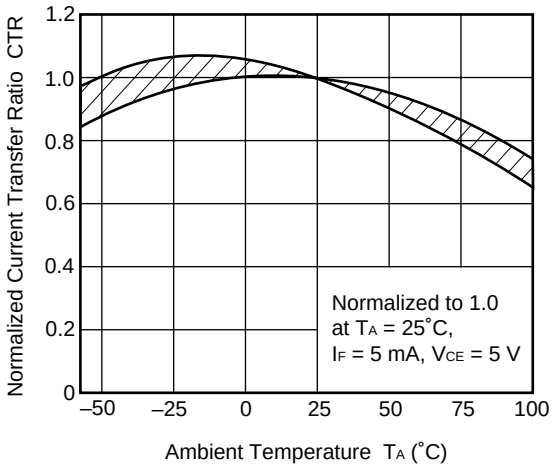


COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE

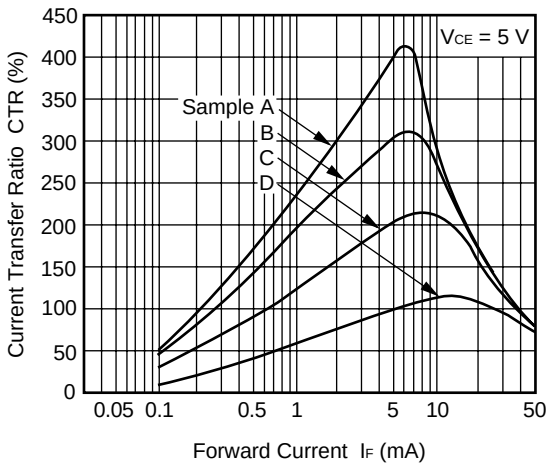


Remark The graphs indicate nominal characteristics.

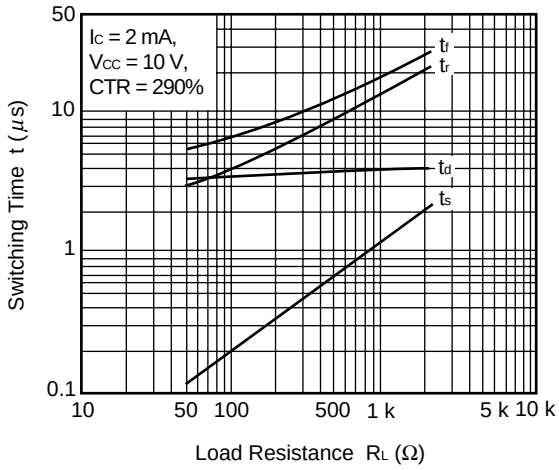
★ NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



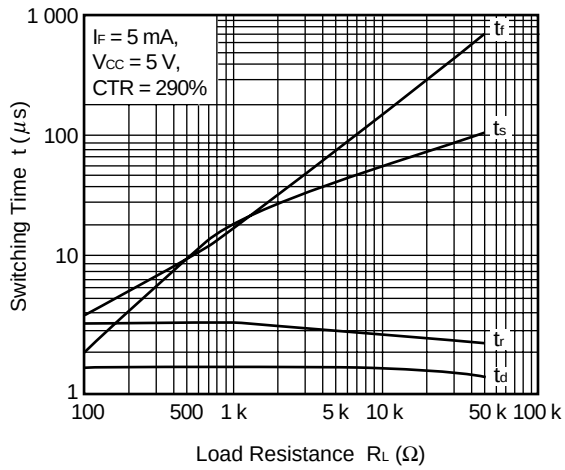
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



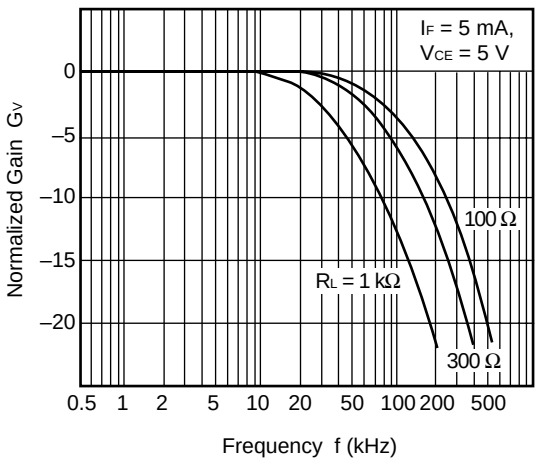
SWITCHING TIME vs. LOAD RESISTANCE



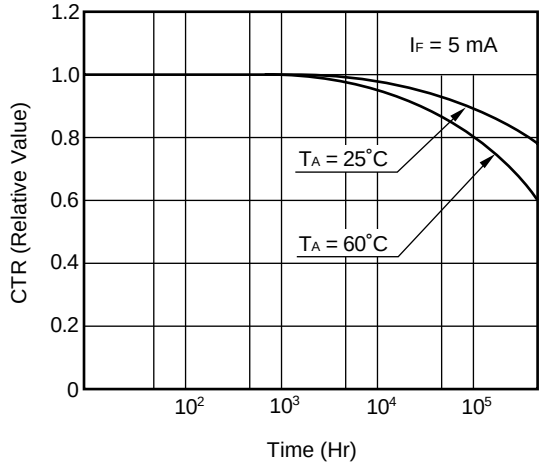
SWITCHING TIME vs. LOAD RESISTANCE



FREQUENCY RESPONSE



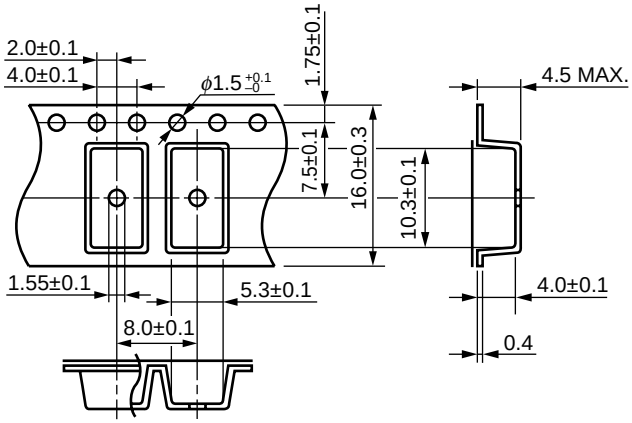
LONG TERM CTR DEGRADATION



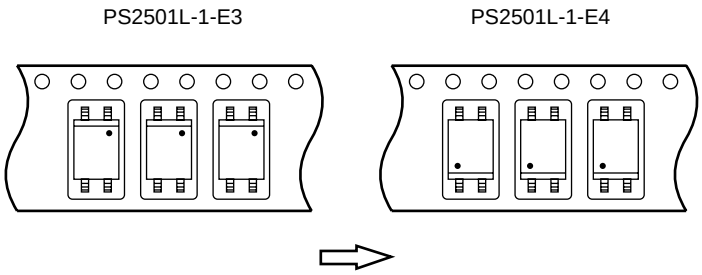
Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (UNIT : mm)

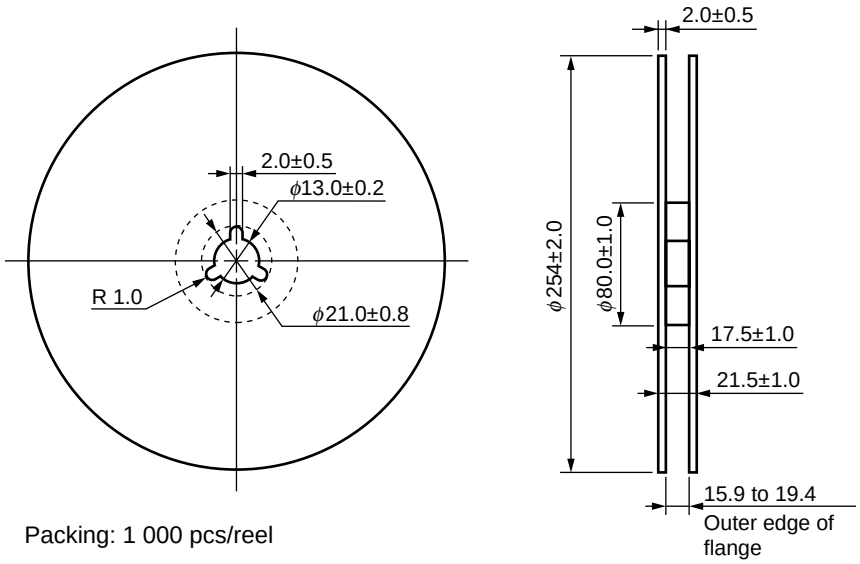
Outline and Dimensions (Tape)



Tape Direction

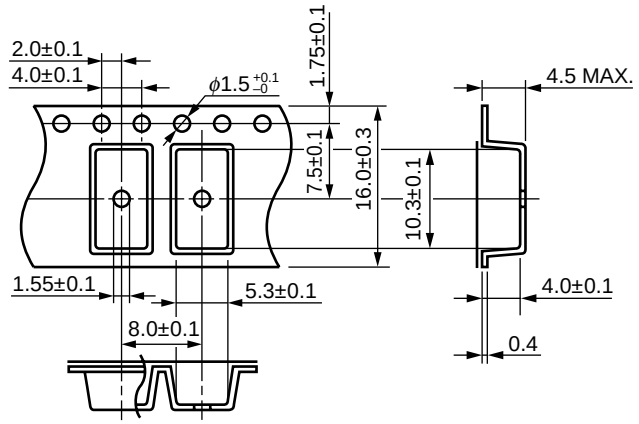


Outline and Dimensions (Reel)

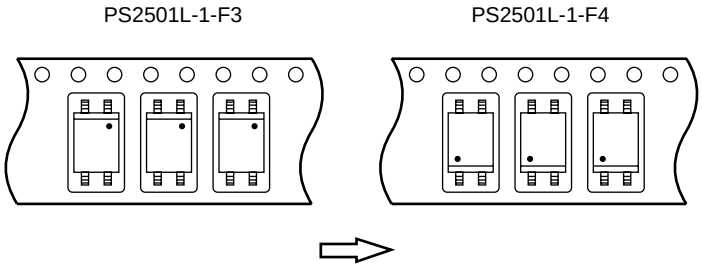


Packing: 1 000 pcs/reel

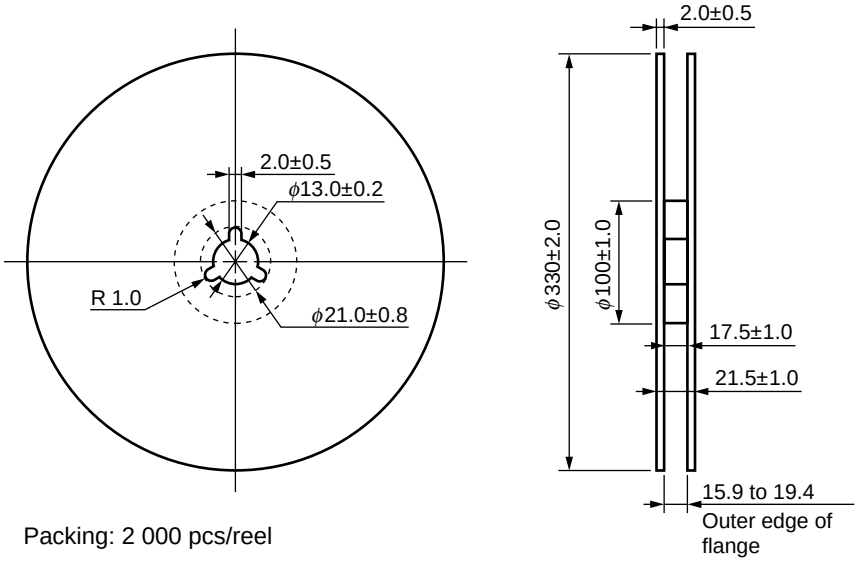
Outline and Dimensions (Tape)



Tape Direction

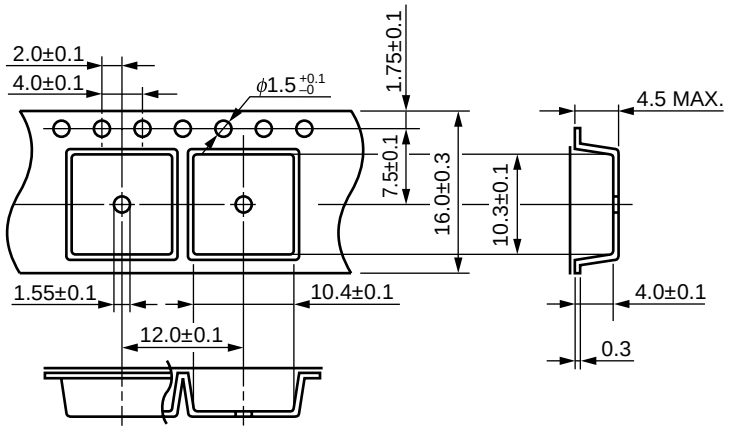


Outline and Dimensions (Reel)

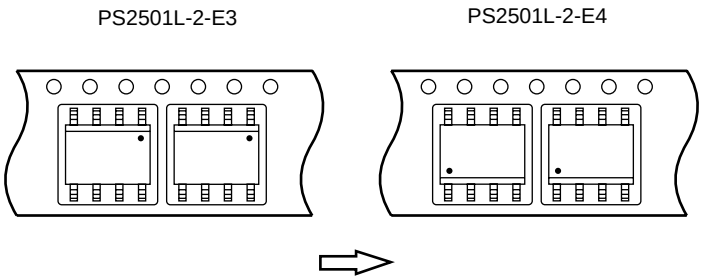


Packing: 2 000 pcs/reel

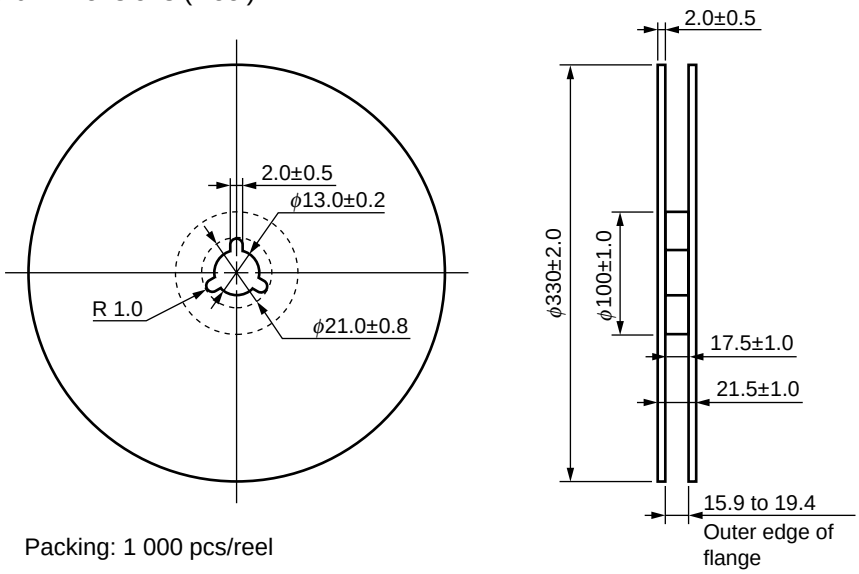
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



Packing: 1 000 pcs/reel

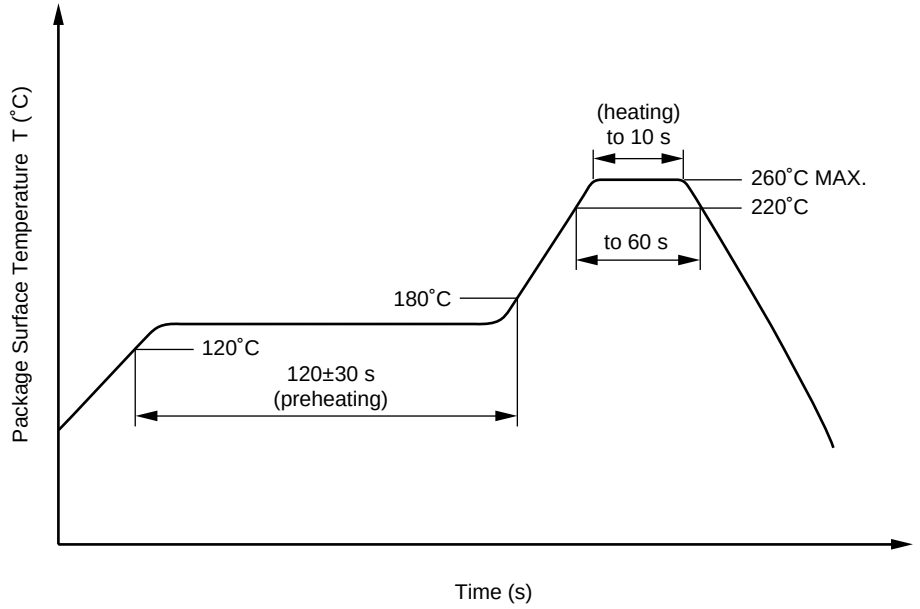
★ NOTES ON HANDLING

1. 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) Soldering by soldering iron

• Peak temperature (lead part temperature)	350°C or below
• Time (each pins)	3 seconds or less
• Flux	Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

(a) Soldering of leads should be made at the point 1.5 to 2.0 mm from the root of the lead.

(b) Please be sure that the temperature of the package would not be heated over 100°C.

(4) Cautions

• Fluxes

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

2. Cautions regarding noise

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

USAGE CAUTIONS

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

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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	
Lead (Pb)	< 1000 PPM	-A	-AZ
		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.

Important Information and Disclaimer: Information provided by CEL on its website or in other communications concerting the substance content of its products represents knowledge and belief as of the date that it is provided. CEL bases its knowledge and belief on information provided by third parties and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. CEL has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. CEL and CEL suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.
In no event shall CEL's liability arising out of such information exceed the total purchase price of the CEL part(s) at issue sold by CEL to customer on an annual basis.
See CEL Terms and Conditions for additional clarification of warranties and liability.