

LOW INPUT CURRENT, HIGH SPEED SWITCHING
MULTI PHOTOCOUPLER SERIES

–NEPOC™ Series–

DESCRIPTION

The PS2503-1, -2, -4 and PS2503L-1, -2, -4 are optically coupled isolators containing a GaAs light emitting diode and an NPN silicon phototransistor.

The PS2503-1, -2, -4 are in a plastic DIP (Dual In-line Package) and the PS2503L-1, -2, -4 are lead bending type (Gull-wing) for surface mount.

FEATURES

- High isolation voltage (BV = 5 000 Vr.m.s.)
- High-speed switching ($t_r = 20 \mu s$ TYP., $t_f = 30 \mu s$ TYP.)
- Ordering number of tape product: PS2503L-1-E3, E4, F3, F4, PS2503L-2-E3, E4
- ★ • Safety standards
 - UL approved: File No. E72422 (S)
 - CSA approved: No. CA 101391

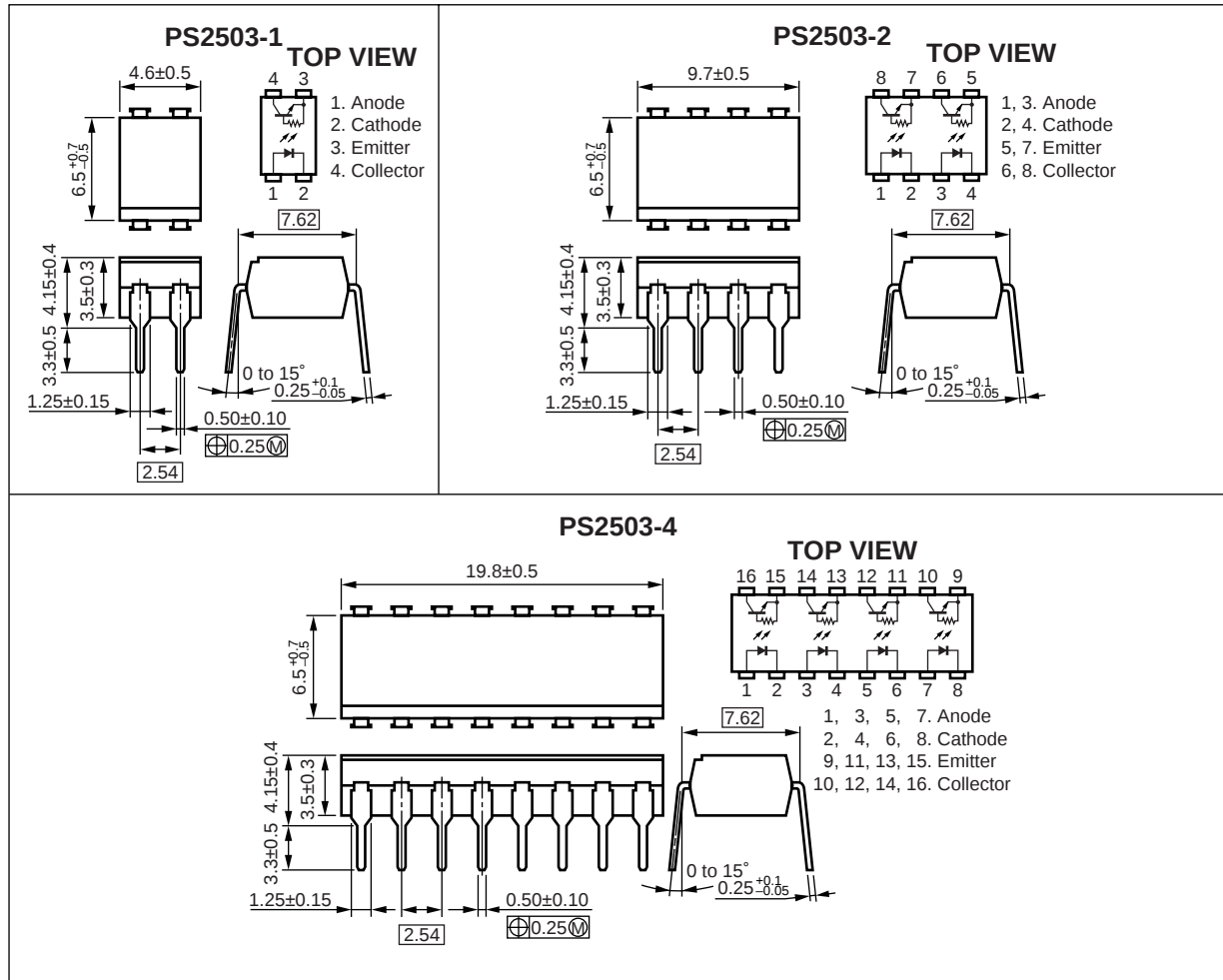
APPLICATIONS

- Measurement equipment
- Programmable logic controller
- Telephone/Telegraph Receiver
- Power supply

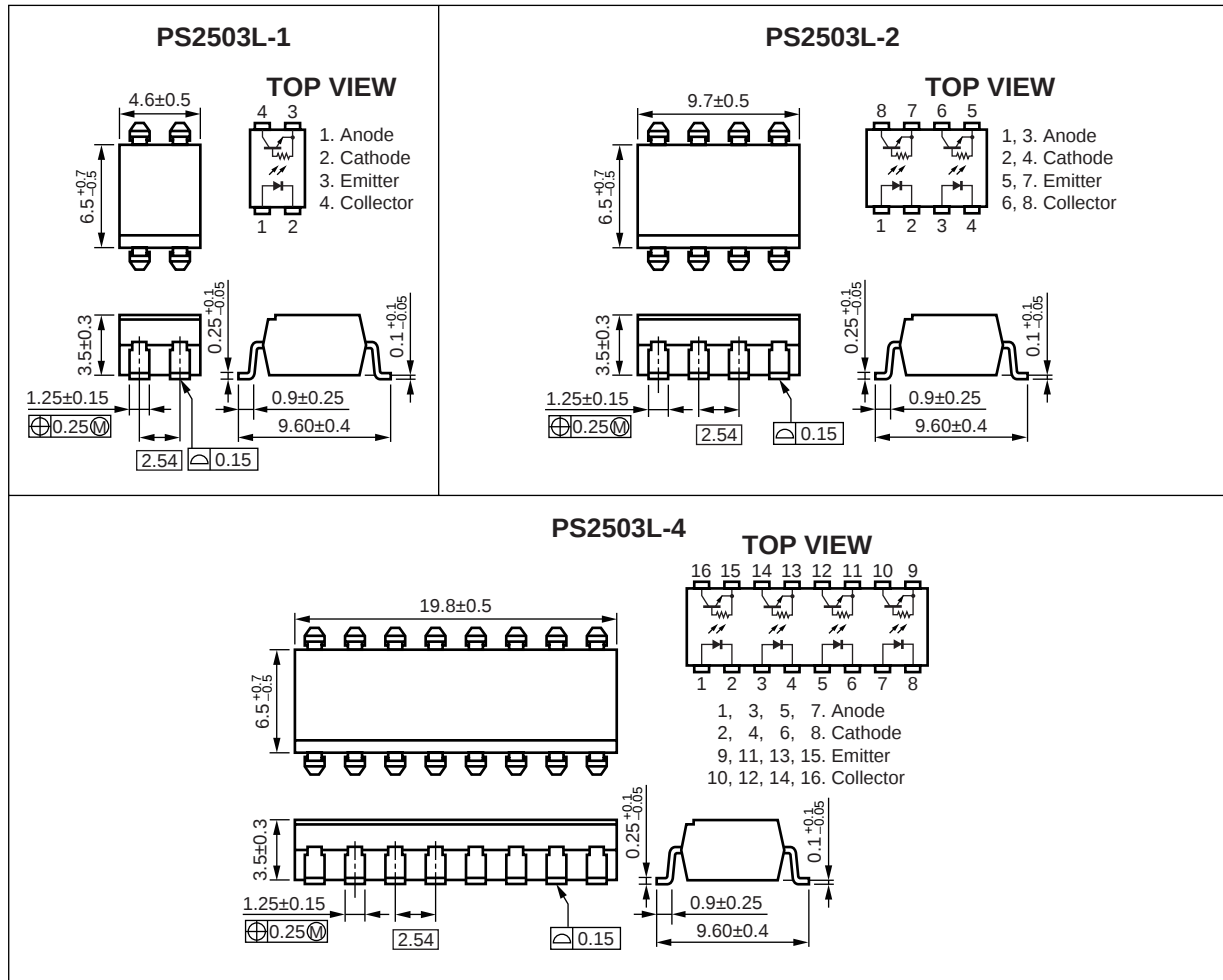
The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

★ PACKAGE DIMENSIONS (UNIT : mm)

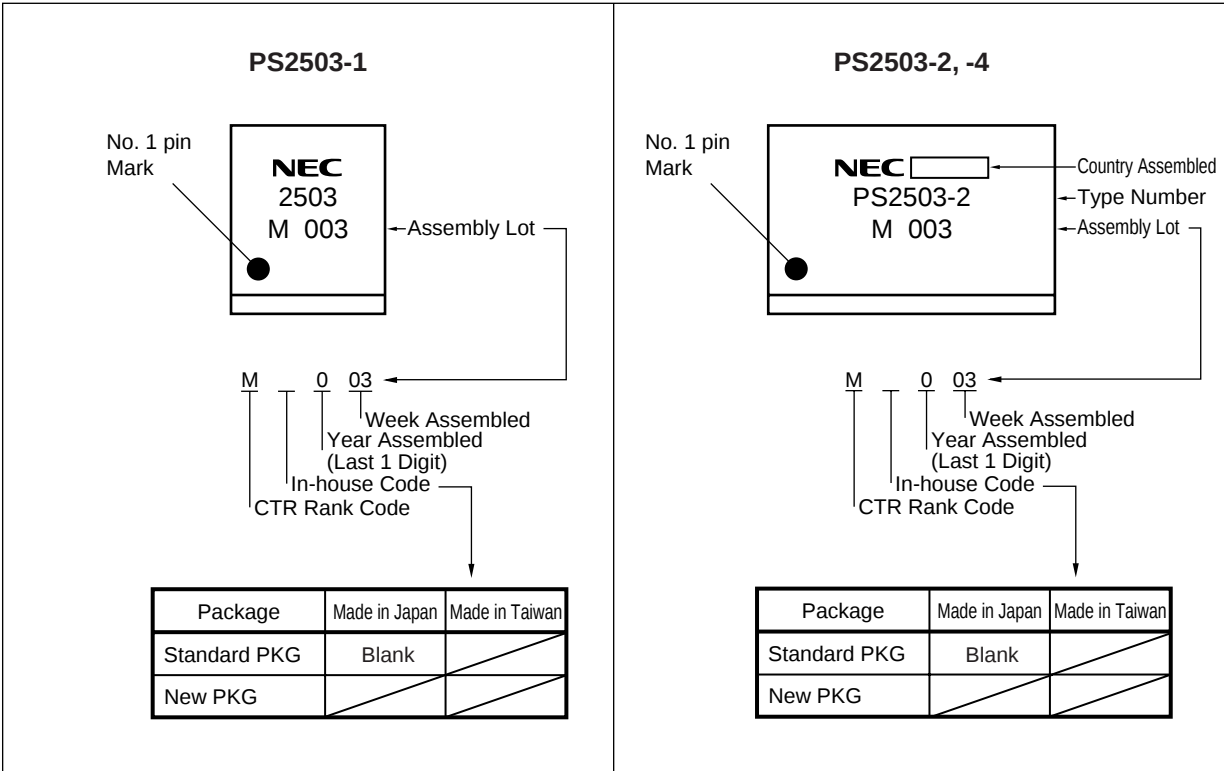
DIP Type



Lead Bending Type



★ MARKING EXAMPLE



★ ORDERING INFORMATION

Part Number	Package	Packing Style	Application Part Number ^{*1}
PS2503-1	4-pin DIP	Magazine case 100 pcs	PS2503-1
PS2503L-1			
PS2503L-1-E3		Embossed Tape 1 000 pcs/reel	
PS2503L-1-E4			
PS2503L-1-F3		Embossed Tape 2 000 pcs/reel	
PS2503L-1-F4			
PS2503-2	8-pin DIP	Magazine case 45 pcs	PS2503-2
PS2503L-2			
PS2503L-2-E3		Embossed Tape 1 000 pcs/reel	
PS2503L-2-E4			
PS2503-4	16-pin DIP	Magazine case 20 pcs	PS2503-4
PS2503L-4			

*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
			PS2503-1, PS2503L-1	PS2503-2,-4 PS2503L-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}	40		V
	Emitter to Collector Voltage	V _{ECO}	0.6		V
	Collector Current	I _C	30		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

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	V _F	I _F = 1 mA		1.1	1.3	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} = 40 V, I _F = 0 mA			100	nA
Coupled	Current Transfer Ratio (I _c /I _F) ^{*1}	CTR	I _F = 1 mA, V _{CE} = 5 V	100	200	400	%
	Collector Saturation Voltage	V _{CE(sat)}	I _F = 1 mA, I _c = 0.2 mA			0.25	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} = 5 V, I _F = 1 mA, R _L = 10 kΩ		20		μs
	Fall Time ^{*2}	t _f			30		

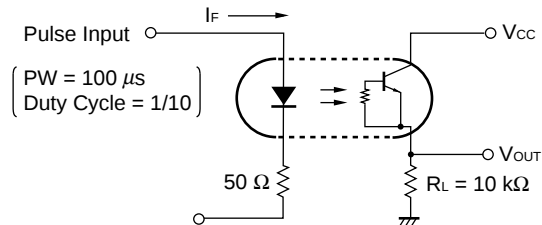
*1 CTR rank (only PS2503-1, PS2503L-1)

K : 200 to 400 (%)

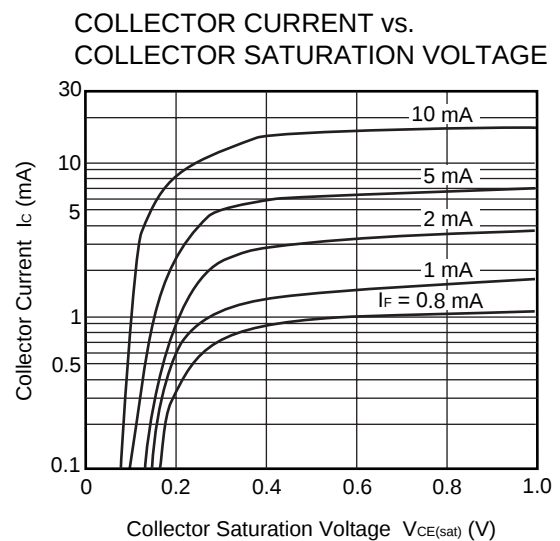
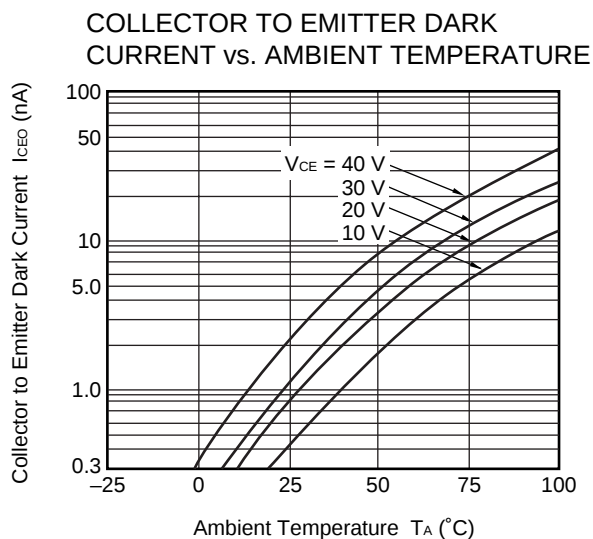
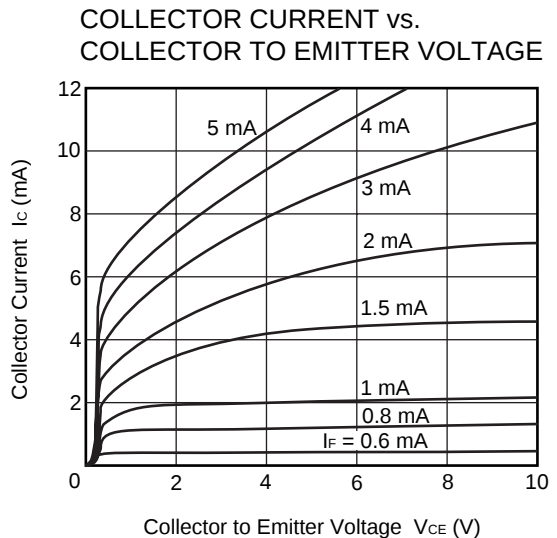
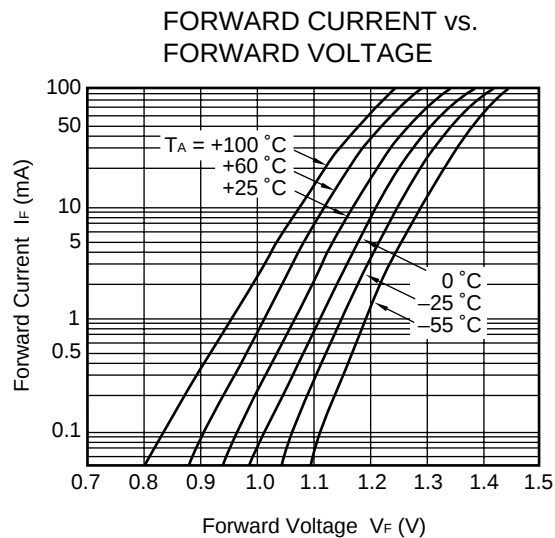
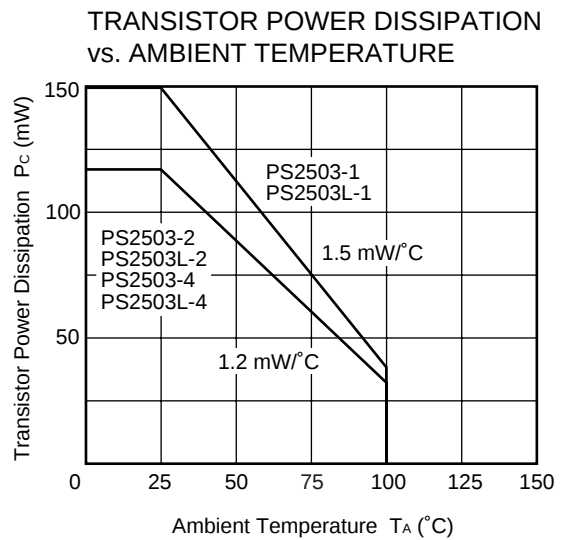
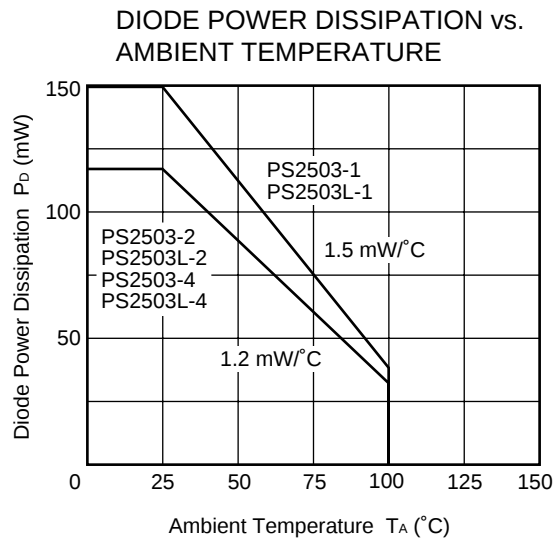
L : 150 to 300 (%)

M : 100 to 200 (%)

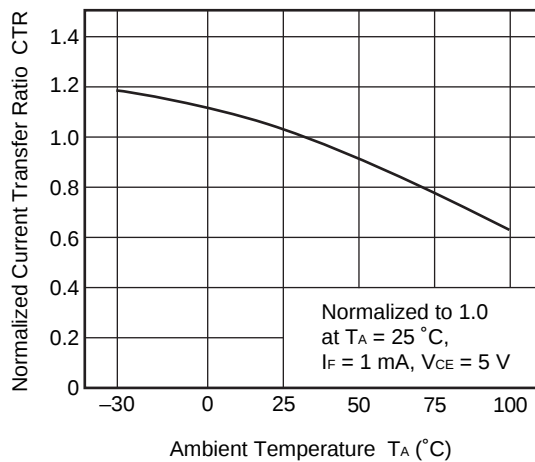
*2 Test circuit for switching time



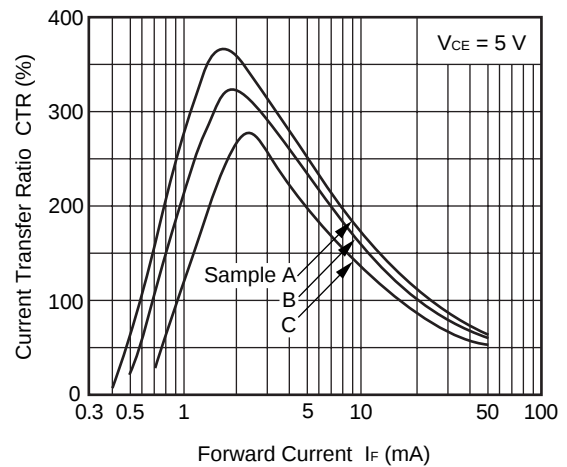
TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise specified)



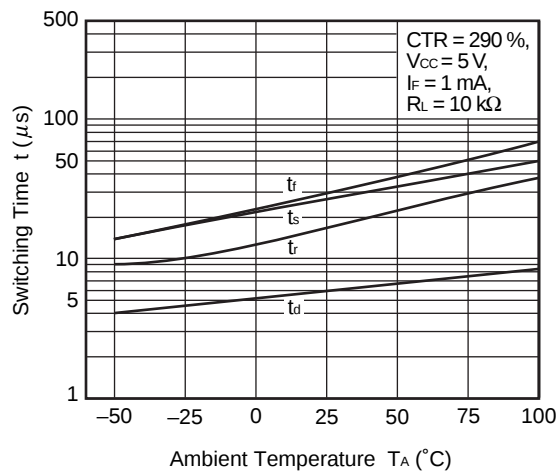
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



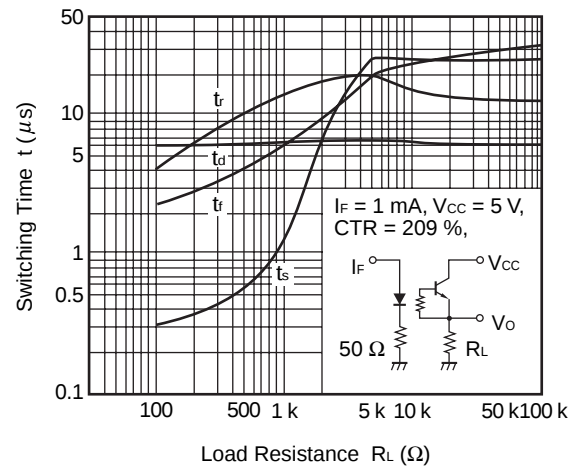
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



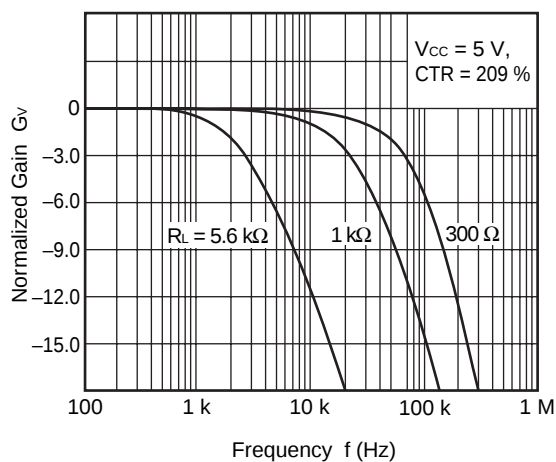
SWITCHING TIME vs. AMBIENT TEMPERATURE



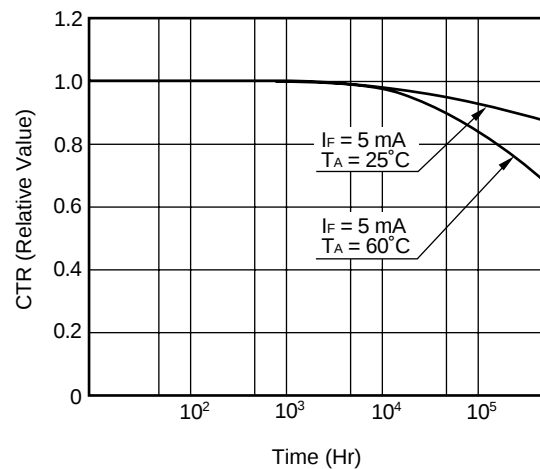
SWITCHING TIME vs. LOAD RESISTANCE



FREQUENCY RESPONSE



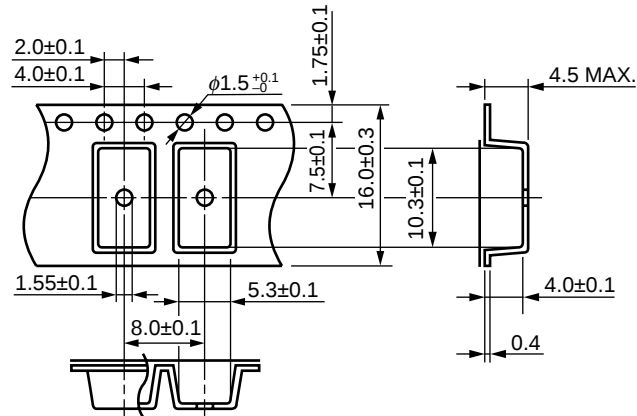
LONG TERM CTR DEGRADATION



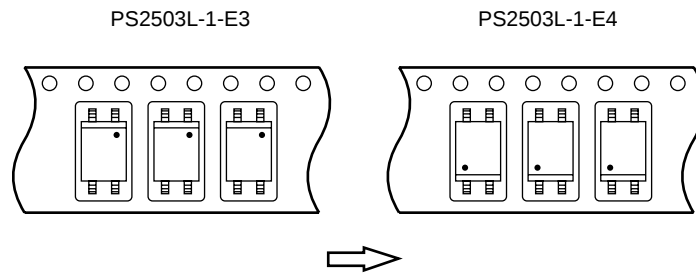
Remark The graphs indicate nominal characteristics.

★ TAPING SPECIFICATIONS (UNIT : mm)

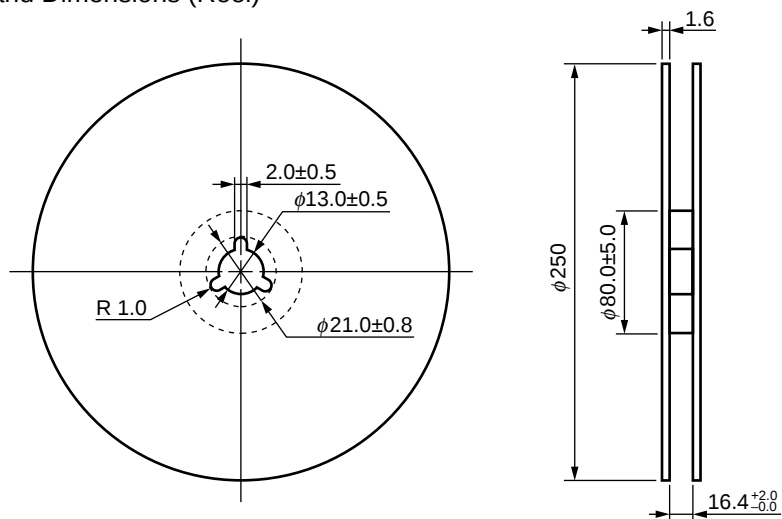
Outline and Dimensions (Tape)



Tape Direction

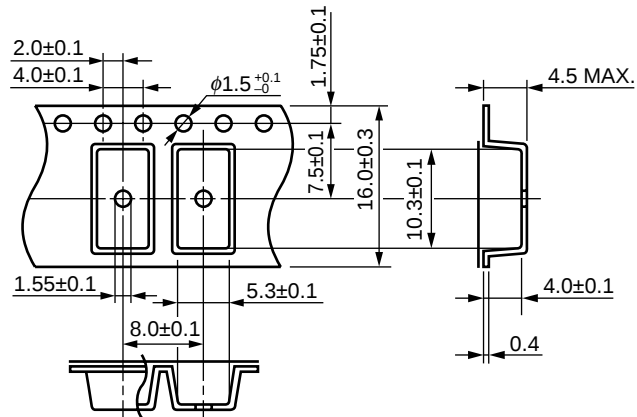


Outline and Dimensions (Reel)

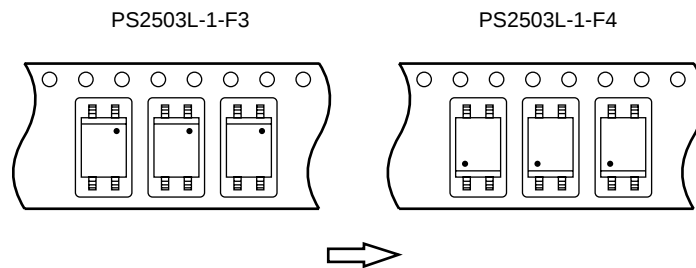


Packing: 1 000 pcs/reel

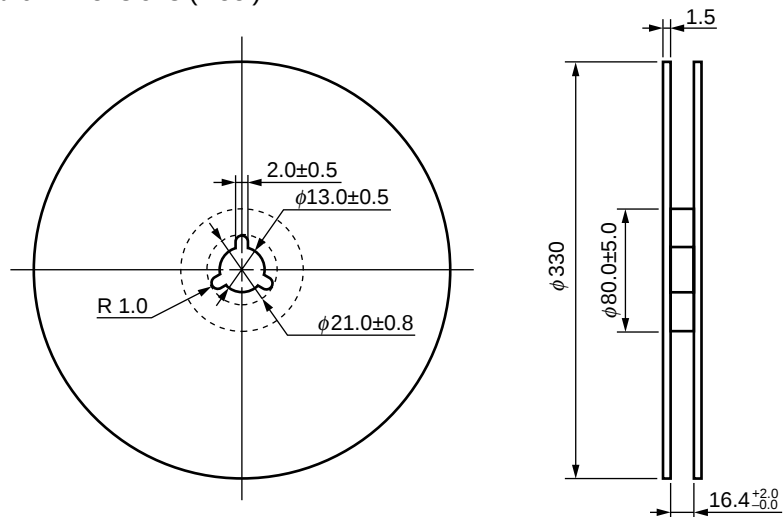
Outline and Dimensions (Tape)



Tape Direction

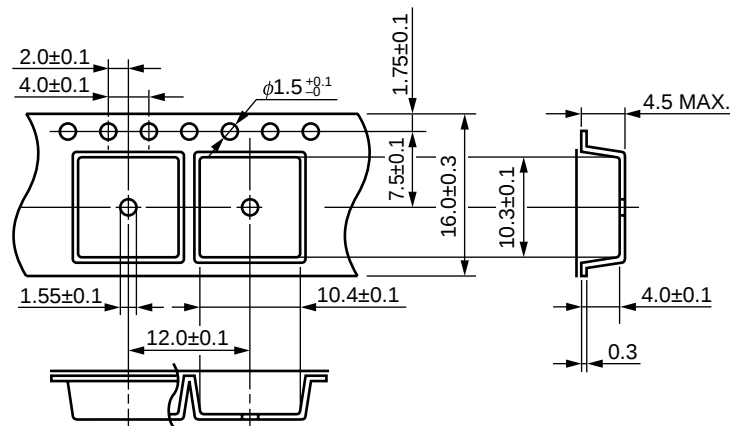


Outline and Dimensions (Reel)

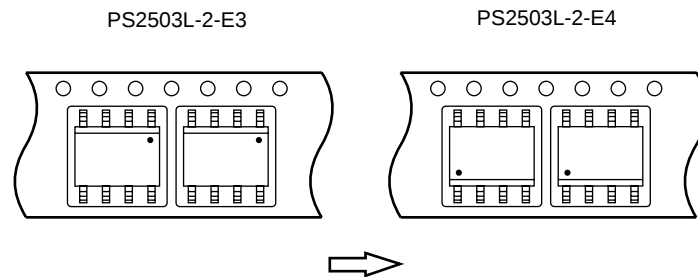


Packing: 2 000 pcs/reel

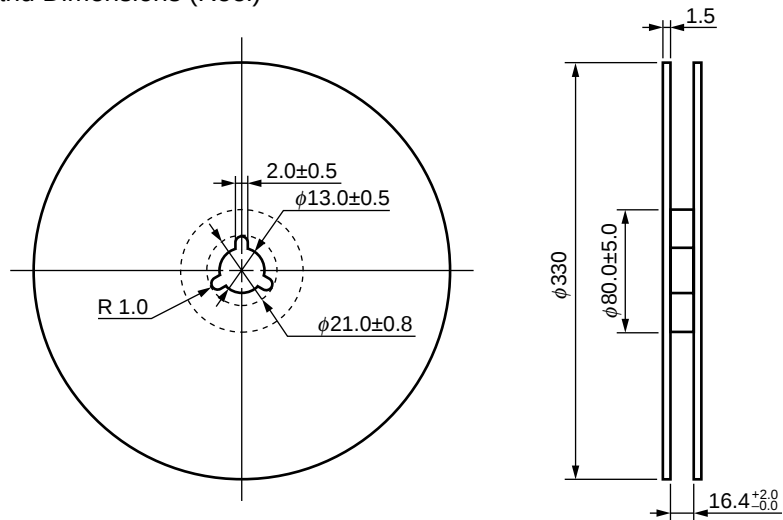
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



Packing: 1 000 pcs/reel

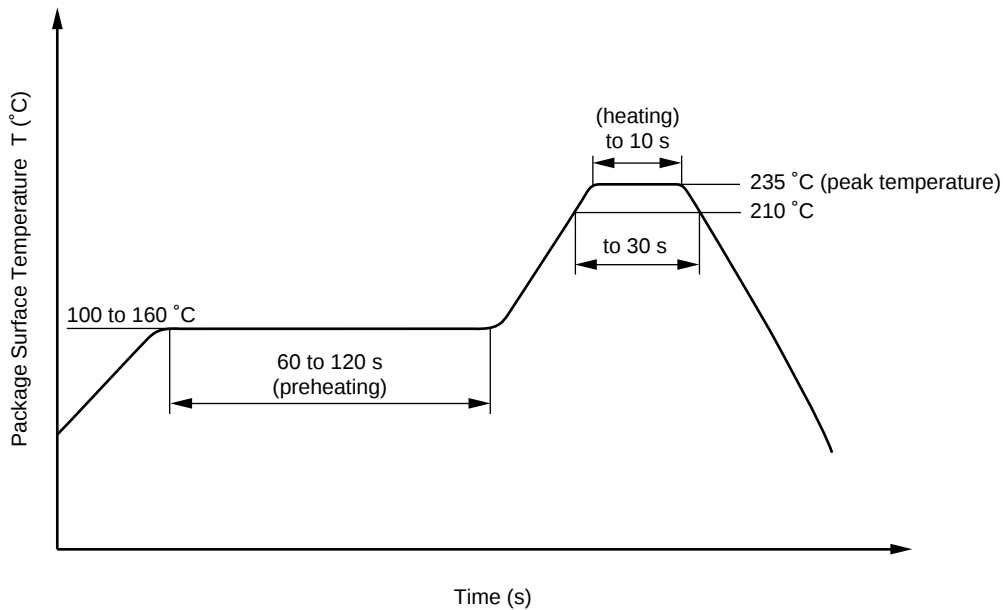
★ NOTES ON HANDLING

1. Recommended soldering conditions

(1) Infrared reflow soldering

- Peak reflow temperature 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.

2. 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.

[MEMO]

[MEMO]

[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 current as of March, 2001. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**
 - No part of this document may be copied or reproduced in any form or by any means without prior written consent of NEC. NEC assumes no responsibility for any errors that may appear in this document.
 - NEC does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC semiconductor products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC 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 customer's equipment shall be done under the full responsibility of customer. NEC assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
 - While NEC endeavours to enhance the quality, reliability and safety of NEC semiconductor products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC semiconductor products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment, and anti-failure features.
 - NEC semiconductor products are classified into the following three quality grades:
 "Standard", "Special" and "Specific". The "Specific" quality grade applies only to semiconductor products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of a semiconductor product depend on its quality grade, as indicated below. Customers must check the quality grade of each semiconductor product 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 and medical equipment for life support, etc.
- The quality grade of NEC semiconductor products is "Standard" unless otherwise expressly specified in NEC's data sheets or data books, etc. If customers wish to use NEC semiconductor products in applications not intended by NEC, they must contact an NEC sales representative in advance to determine NEC's willingness to support a given application.
- (Note)
- (1) "NEC" as used in this statement means NEC Corporation and also includes its majority-owned subsidiaries.
 - (2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).