

DATA SHEET

NEC

PHOTOCOUPLER

PS2502-1,-2,-4,PS2502L-1,-2,-4**HIGH ISOLATION VOLTAGE
DARLINGTON TRANSISTOR TYPE
MULTI PHOTOCOUPLER SERIES**

-NEPOC Series-

DESCRIPTION

The PS2502-1, -2, -4 and PS2502L-1, -2, -4 are optically coupled isolators containing a GaAs light emitting diode and an NPN silicon darlington connected phototransistor.

The PS2502-1, -2, -4 are in a plastic DIP (Dual In-line Package) and the PS2502L-1, -2, -4 are lead bending type (Gull-wing) for surface mount.

FEATURES

- High isolation voltage (BV = 5 000 Vr.m.s.)
- High current transfer ratio (CTR = 2 000 % TYP.)
- High-speed switching ($t_r, t_f = 100 \mu s$ TYP.)
- Ordering number of tape product: PS2502L-1-E3, E4, F3, F4, PS2502L-2-E3, E4
- Safety standards
 - UL approved: File No. E72422 (S)

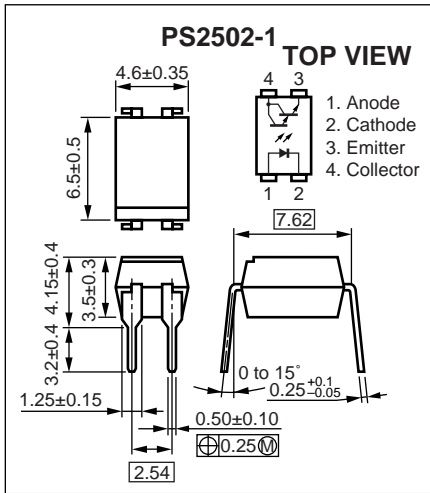
APPLICATIONS

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

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 Compound Semiconductor Devices representative for availability and additional information.

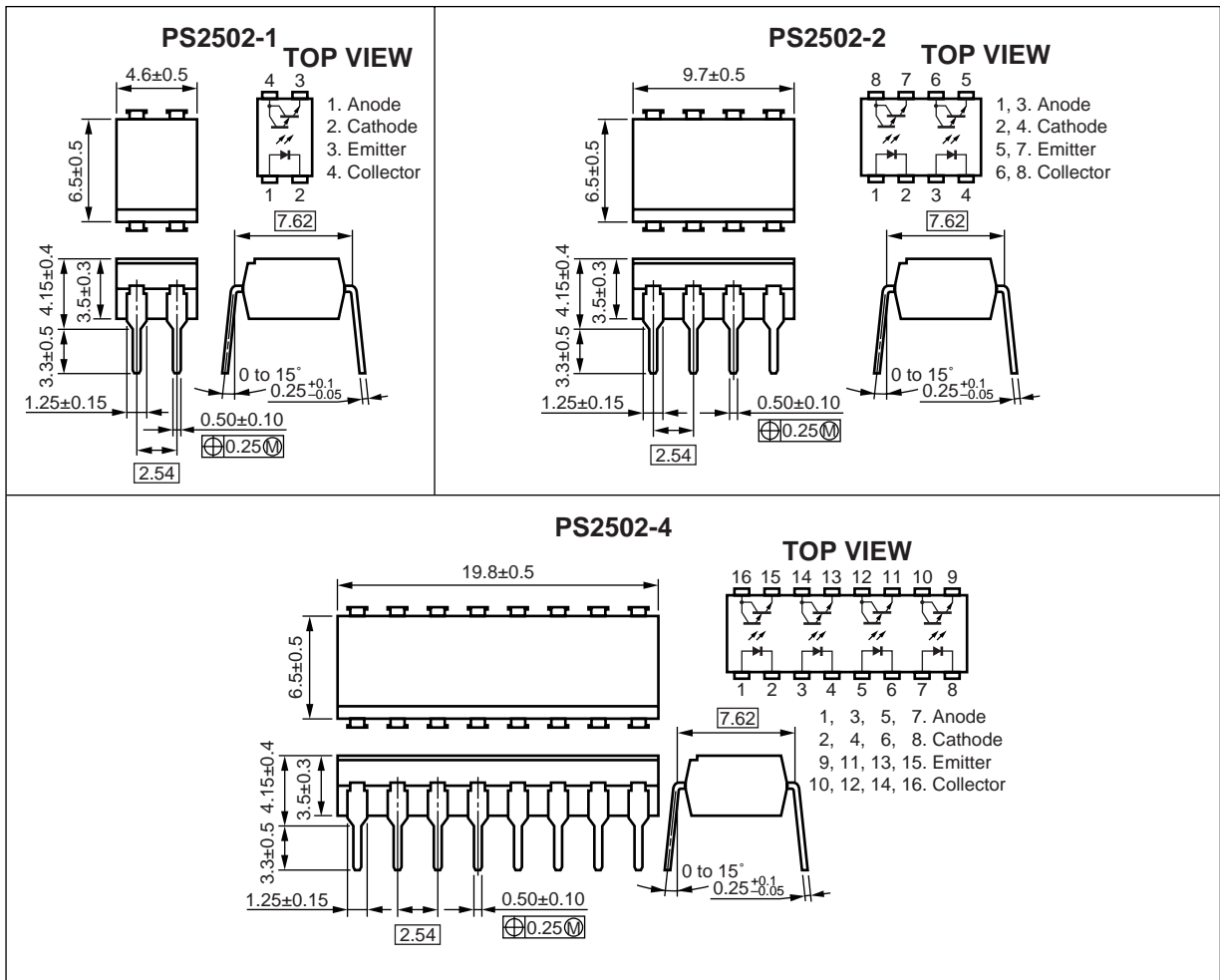
★ PACKAGE DIMENSIONS (UNIT : mm)

DIP Type (New package)

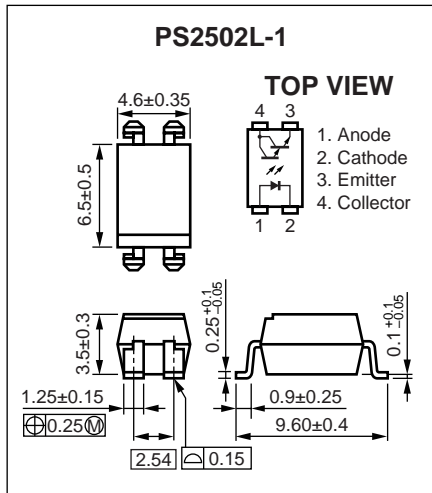


Caution New package 1-ch only

DIP Type

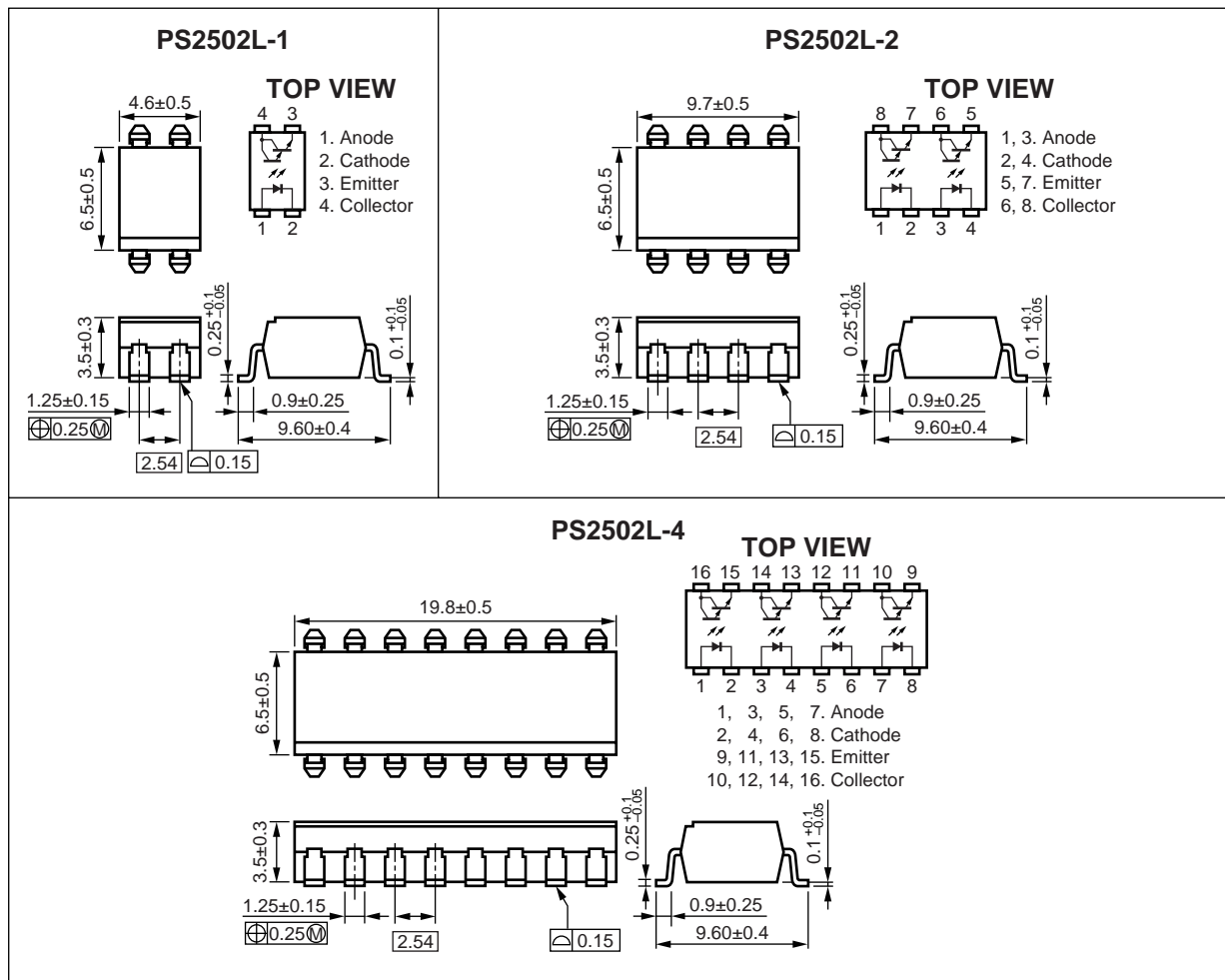


Lead Bending Type (New package)

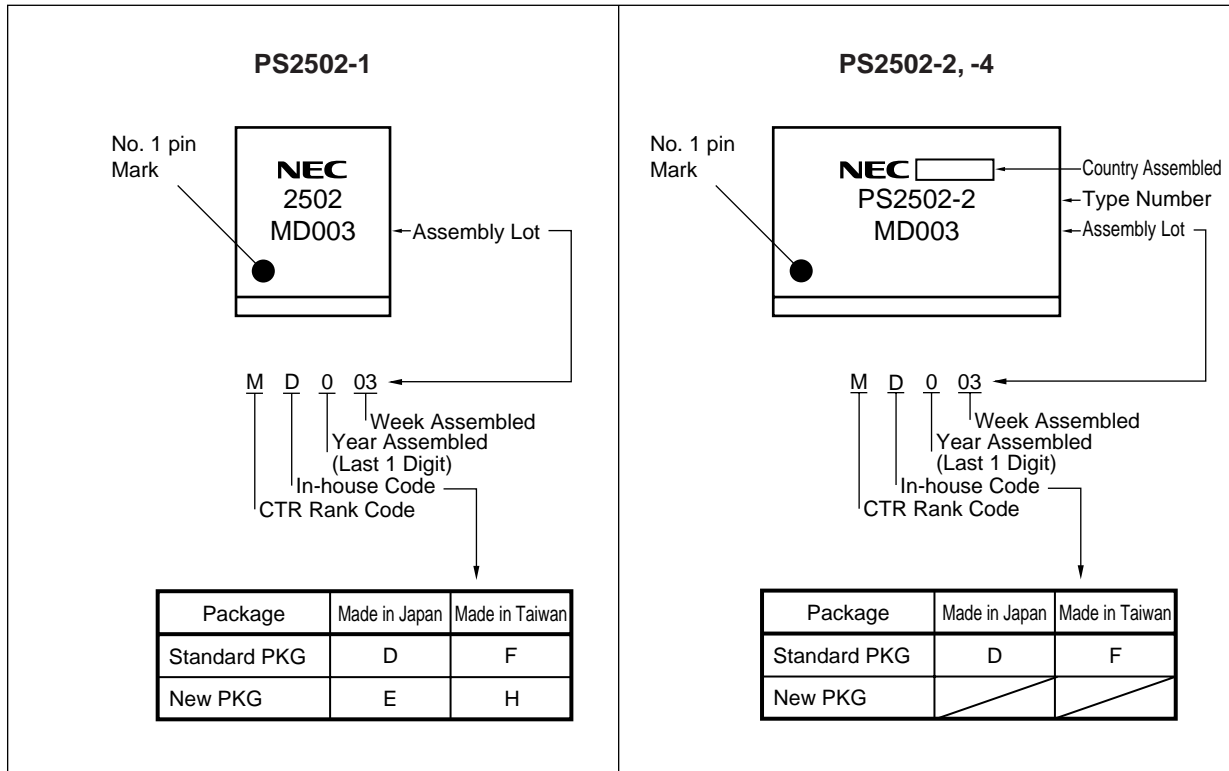


Caution New package 1-ch only

Lead Bending Type



★ MARKING EXAMPLE



ORDERING INFORMATION

Part Number	Package	Packing Style	Application Part Number ^{*1}
PS2502-1	4-pin DIP	Magazine case 100 pcs	PS2502-1
PS2502L-1		Embossed Tape 1 000 pcs/reel	
PS2502L-1-E3			
PS2502L-1-E4			
PS2502L-1-F3			
PS2502L-1-F4		Embossed Tape 2 000 pcs/reel	
PS2502-2	8-pin DIP	Magazine case 45 pcs	PS2502-2
PS2502L-2		Embossed Tape 1 000 pcs/reel	
PS2502L-2-E3			
PS2502L-2-E4			
PS2502-4	16-pin DIP	Magazine case 20 pcs	PS2502-4
PS2502L-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
			PS2502-1, PS2502L-1	PS2502-2,-4 PS2502L-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}	6		V
	Collector Current	I _C	200	160	mA/ch
	Power Dissipation Derating	ΔP _C /°C	2.0	1.6	mW/°C
	Power Dissipation	P _C	200	160	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 = 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} = 40 V, I _F = 0 mA			400	nA
Coupled	Current Transfer Ratio (I _c /I _F) ¹	CTR	I _F = 1 mA, V _{CE} = 2 V	200	2 000		%
	Collector Saturation Voltage	V _{CE(sat)}	I _F = 1 mA, I _c = 2 mA			1.0	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		100		μs
	Fall Time ²	t _f			100		

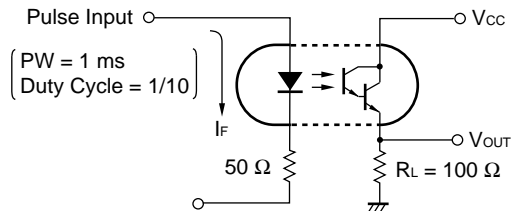
*1 CTR rank (only PS2502-1, PS2502L-1)

K : 2 000 to (%)

L : 700 to 3 400 (%)

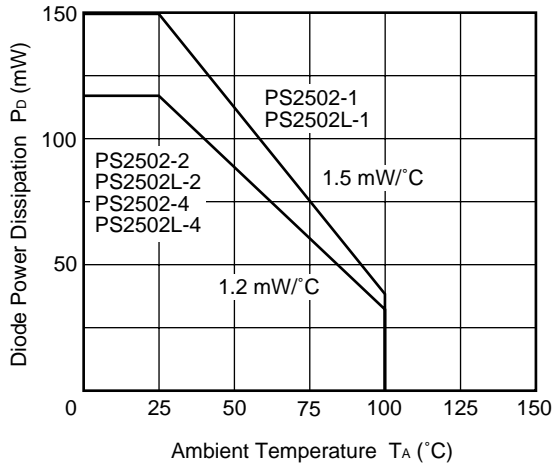
M : 200 to 1 000 (%)

*2 Test circuit for switching time

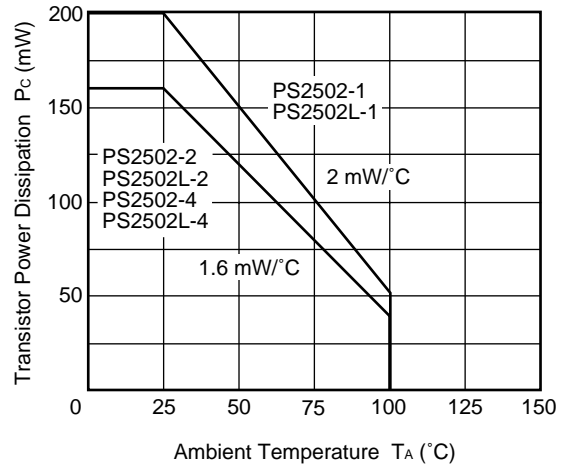


TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise specified)

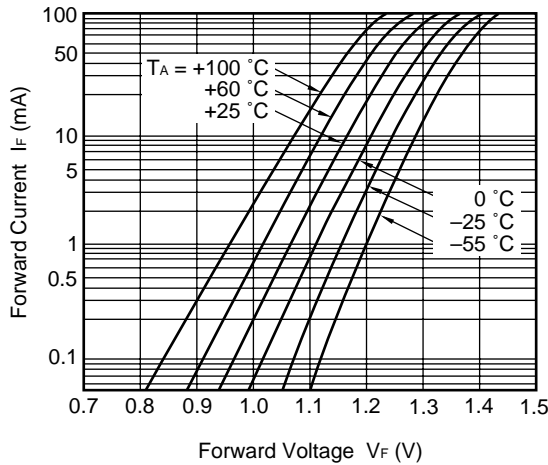
DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE



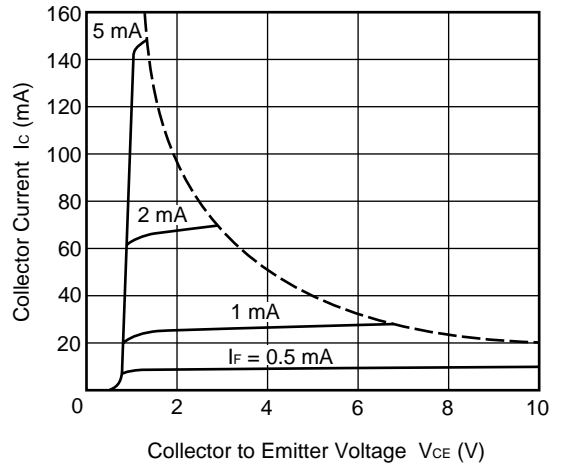
TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



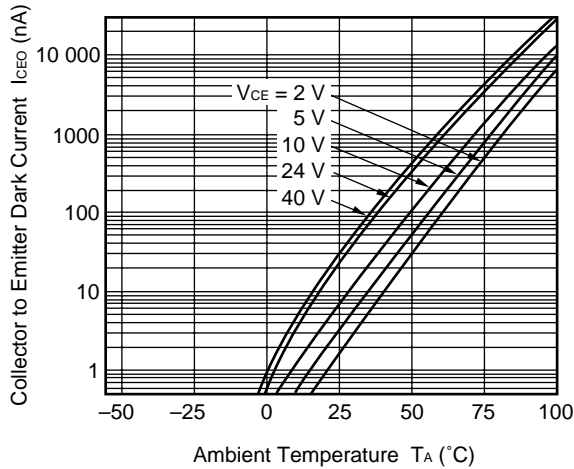
FORWARD CURRENT vs. FORWARD VOLTAGE



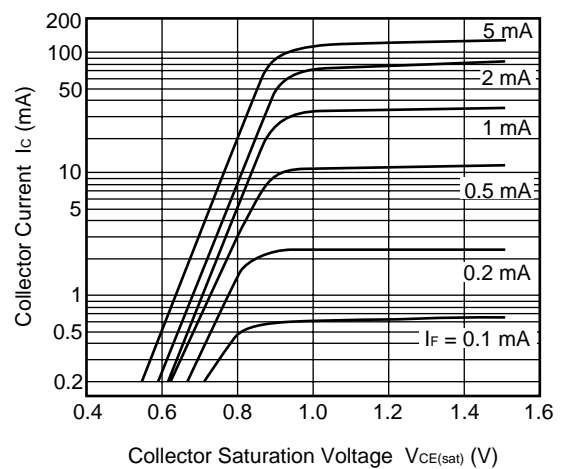
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



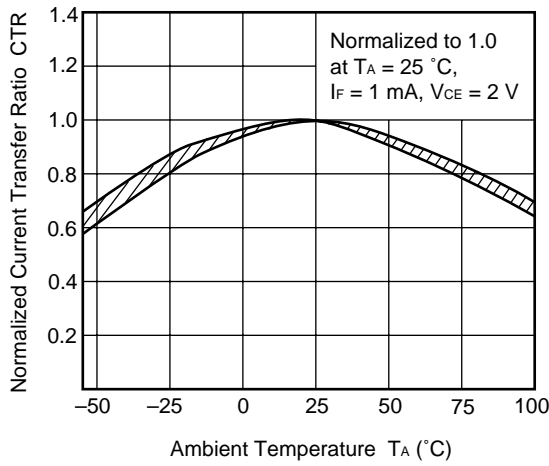
COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE



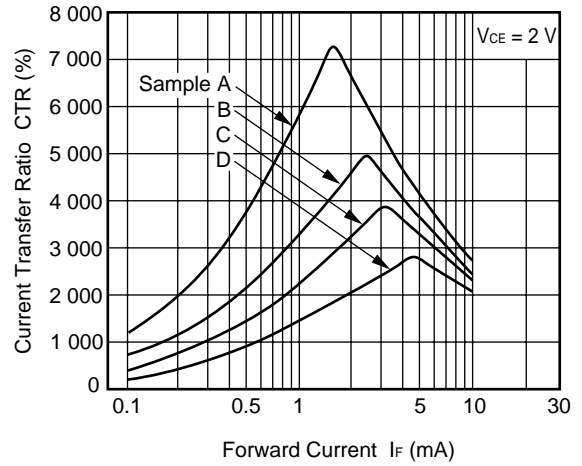
COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE



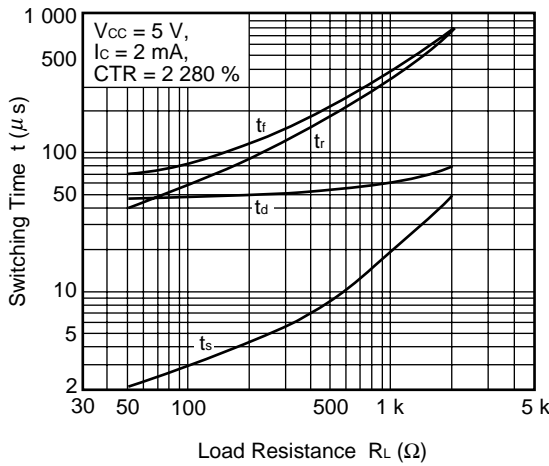
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



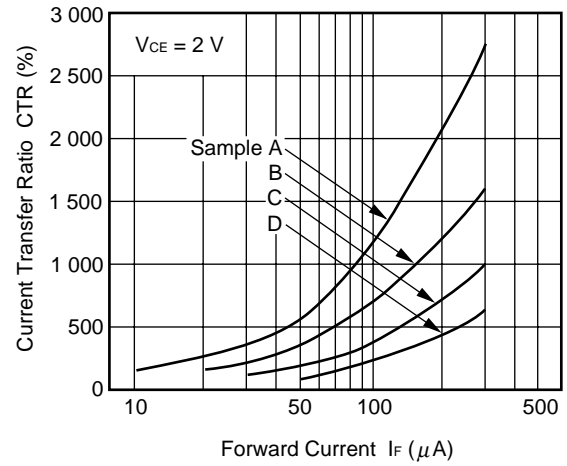
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



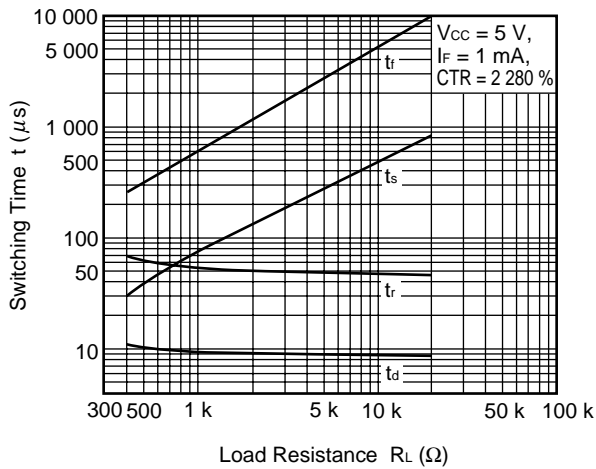
SWITCHING TIME vs. LOAD RESISTANCE



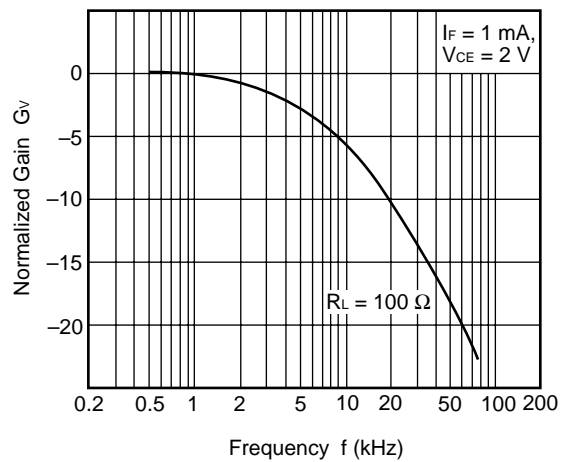
CURRENT TRANSFER RATIO vs. FORWARD CURRENT

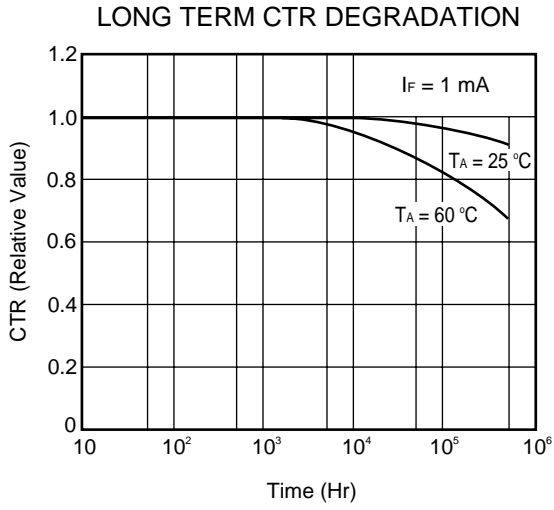


SWITCHING TIME vs. LOAD RESISTANCE



FREQUENCY RESPONSE

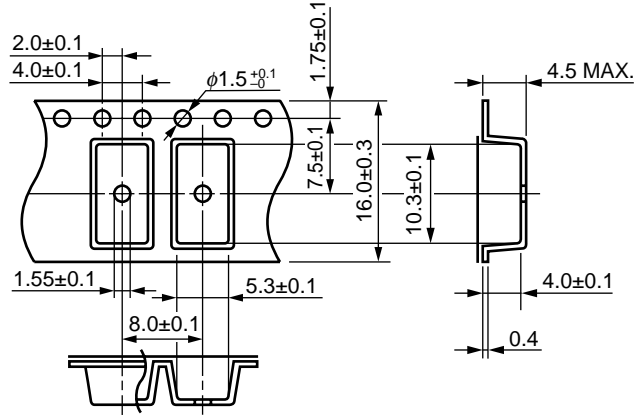




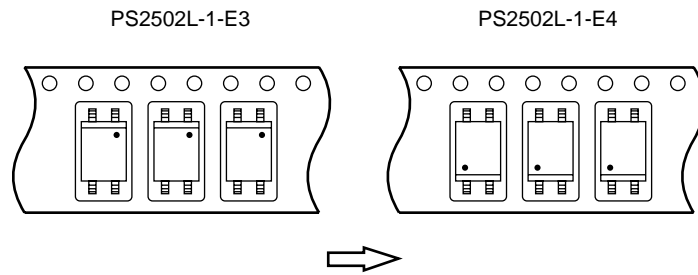
Remark The graphs indicate nominal characteristics.

★ TAPING SPECIFICATIONS (UNIT : mm)

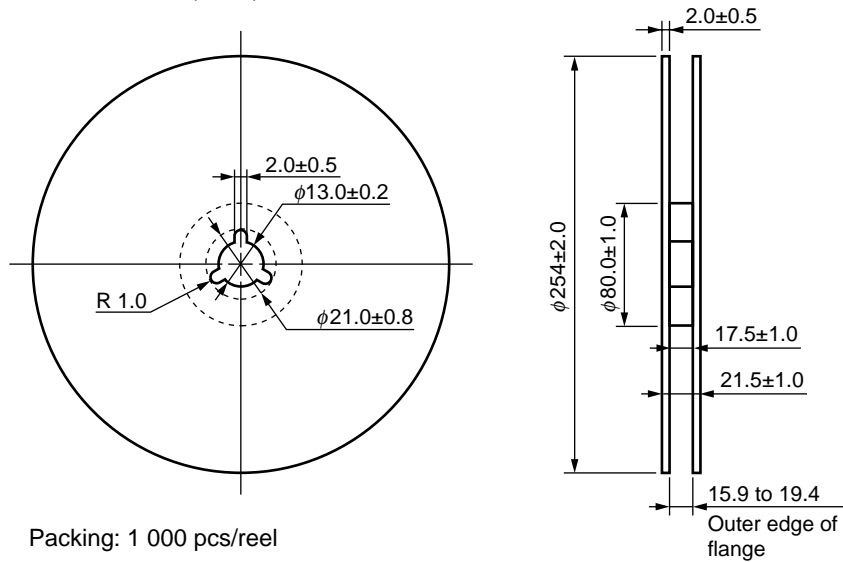
Outline and Dimensions (Tape)



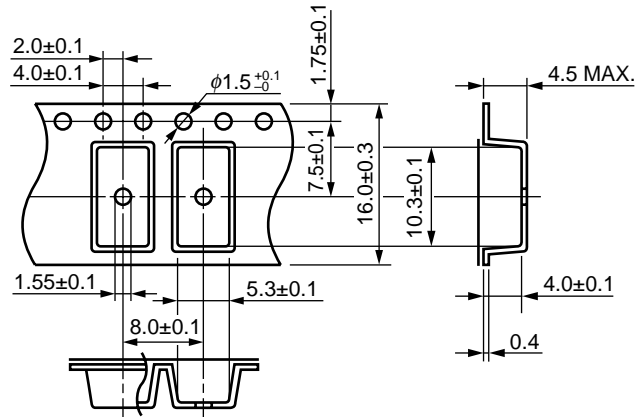
Tape Direction



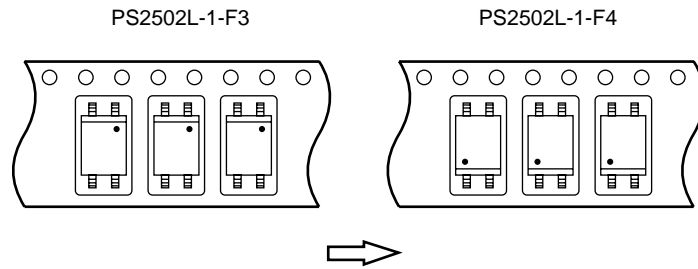
Outline and Dimensions (Reel)



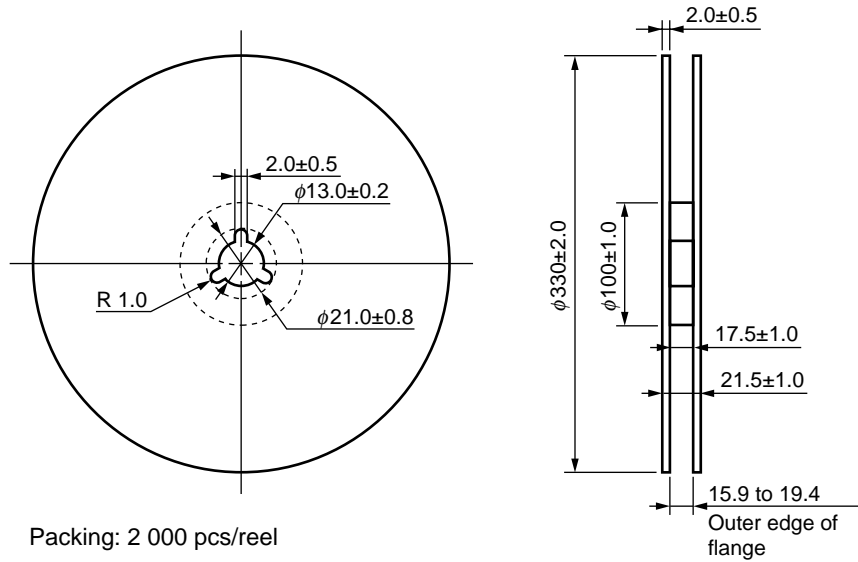
Outline and Dimensions (Tape)



Tape Direction

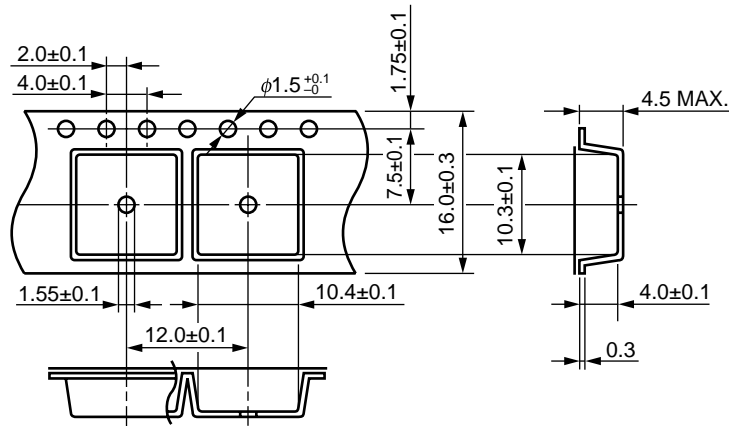


Outline and Dimensions (Reel)

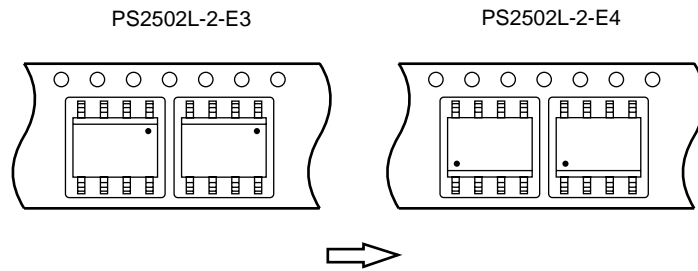


Packing: 2 000 pcs/reel

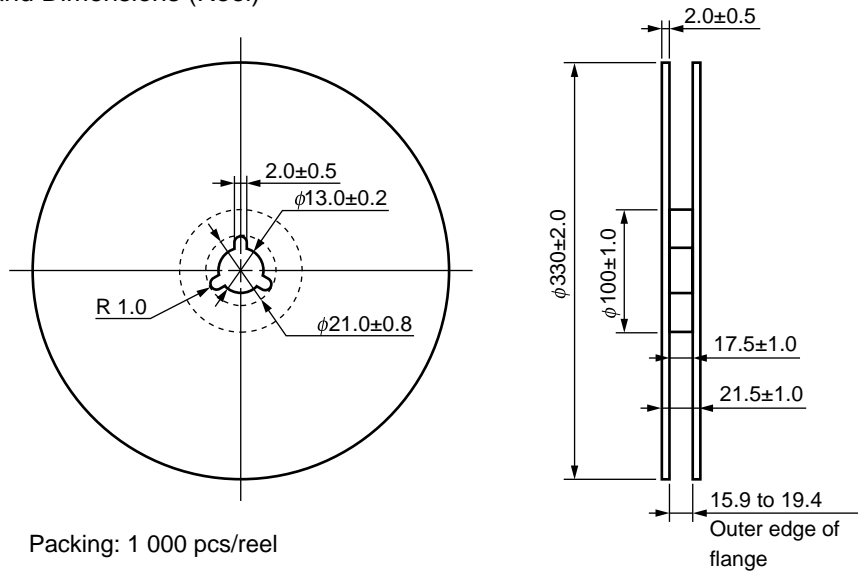
Outline and Dimensions (Tape)



Tape Dimension



Outline and Dimensions (Reel)



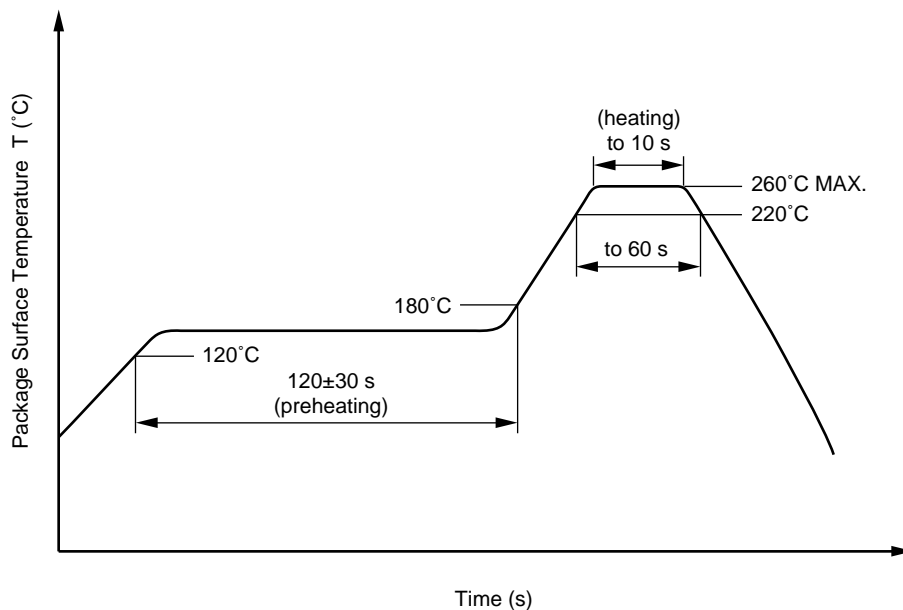
★ NOTES ON HANDLING

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) 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 side 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.

- **The information in this document is current as of February, 2003. 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, NEC Compound Semiconductor Devices, Ltd. 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).

M8E 00.4-0110

SAFETY INFORMATION ON THIS PRODUCT

<p>Caution</p>	<p>GaAs Products</p>	<p>The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested.</p> <ul style="list-style-type: none"> • Do not destroy or burn the product. • Do not cut or cleave off any part of the product. • Do not crush or chemically dissolve the product. • Do not put the product in the mouth. <p>Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.</p>
-----------------------	----------------------	---

► For further information, please contact

NEC Compound Semiconductor Devices, Ltd.

5th Sales Group, Sales Division TEL: +81-44-435-1588 FAX: +81-44-435-1579 E-mail: salesinfo@csd-nec.com

NEC Compound Semiconductor Devices Hong Kong Limited

Hong Kong Head Office TEL: +852-3107-7303 FAX: +852-3107-7309
 Taipei Branch Office TEL: +886-2-8712-0478 FAX: +886-2-2545-3859
 Korea Branch Office TEL: +82-2-558-2120 FAX: +82-2-558-5209

NEC Electronics (Europe) GmbH <http://www.ee.nec.de/>

TEL: +49-211-6503-01 FAX: +49-211-6503-487

California Eastern Laboratories, Inc. <http://www.cel.com/>

TEL: +1-408-988-3500 FAX: +1-408-988-0279