

### PHOTOCOUPLER

# PS2502-1,-4,PS2502L-1,-4

## HIGH ISOLATION VOLTAGE DARLINGTON TRANSISTOR TYPE MULTI PHOTOCOUPLER SERIES

–NEPOC Series–

### DESCRIPTION

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

The PS2502-1, -4 are in a plastic DIP (Dual In-line Package) and the PS2502L-1, -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 (tr, tr = 100 μs TYP.)
- <R> • Ordering number of tape product: PS2502L-1-F3: 2 000 pcs/reel
- Safety standards
  - UL approved: No. E72422

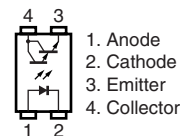
### APPLICATIONS

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

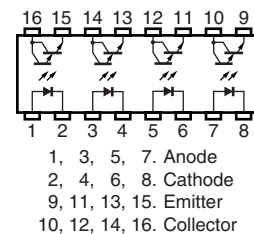
### PIN CONNECTION

(Top View)

#### PS2502-1, PS2502L-1



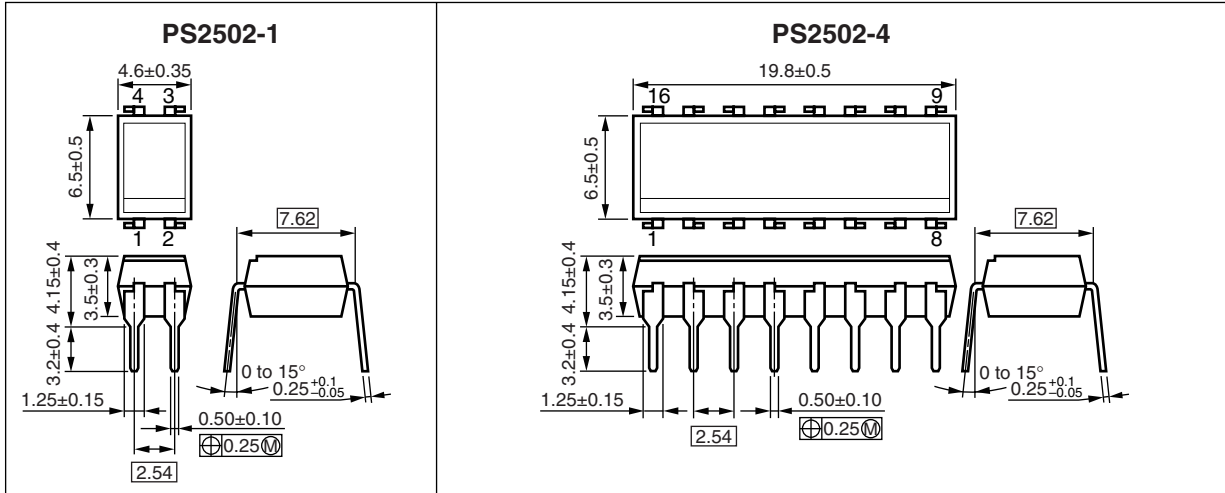
#### PS2502-4, PS2502L-4



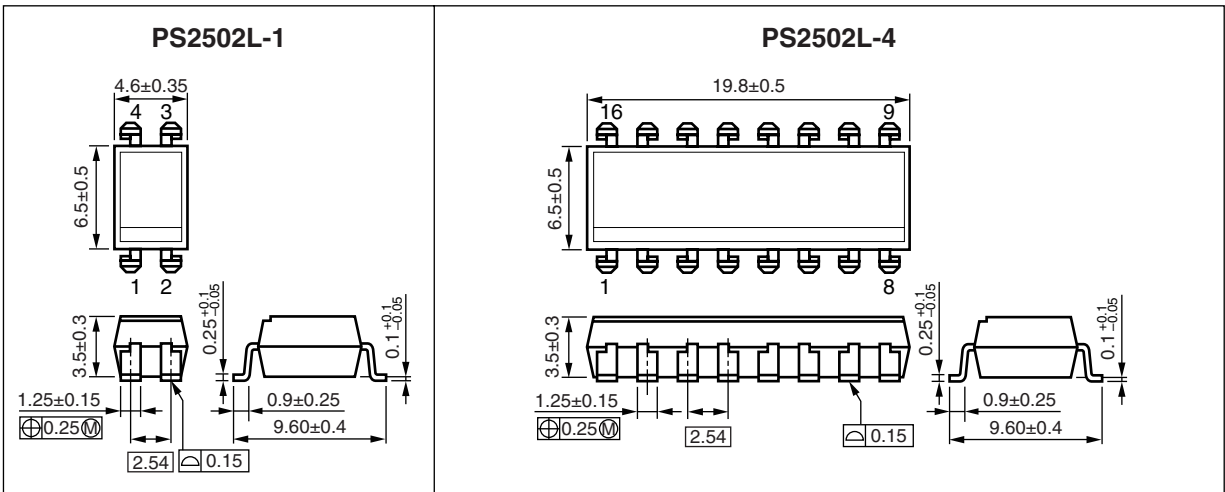
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<R> PACKAGE DIMENSIONS (UNIT : mm)

DIP Type



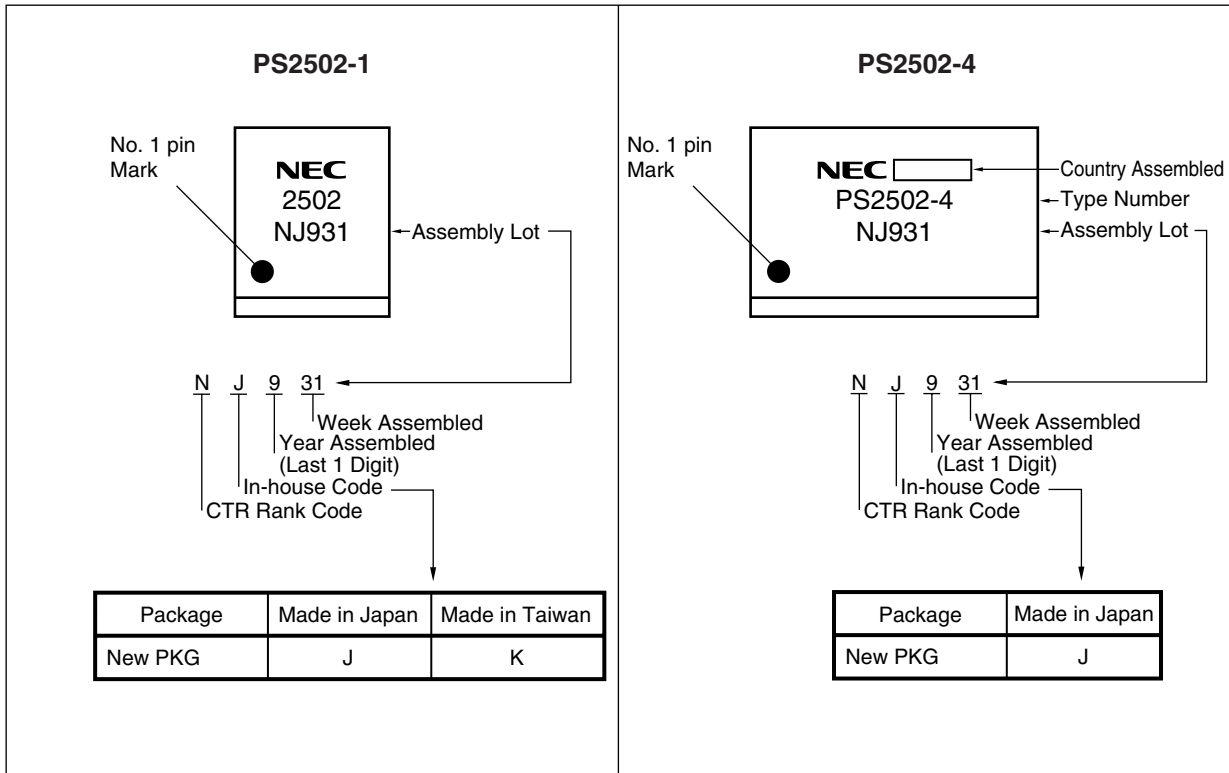
Lead Bending Type



<R> PHOTOCOUPLER CONSTRUCTION

Parameter	Unit (MIN.)
Air Distance	7 mm
Outer Creepage Distance	7 mm
Inner Creepage Distance	3.5 mm
Isolation Distance	0.3 mm

<R> MARKING EXAMPLE



<R> ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number <sup>*1</sup>
PS2502-1	PS2502-1-A	Pb-Free	Magazine case 100 pcs	Standard products (UL Approved)	PS2502-1
PS2502L-1	PS2502L-1-A		Embossed Tape 2 000 pcs/reel		
PS2502L-1-F3	PS2502L-1-F3-A				
PS2502-4	PS2502-4-A		Magazine case 20 pcs		PS2502-4
PS2502L-4	PS2502L-4-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
			PS2502-1, PS2502L-1	PS2502-4, PS2502L-4	
Diode	Reverse Voltage	V <sub>R</sub>	6		V
	Forward Current (DC)	I <sub>F</sub>	80		mA/ch
	Power Dissipation Derating	ΔP <sub>D</sub> /°C	1.5	1.2	mW/°C
	Power Dissipation	P <sub>D</sub>	150	120	mW/ch
	Peak Forward Current <sup>*1</sup>	I <sub>FP</sub>	1		A/ch
Transistor	Collector to Emitter Voltage	V <sub>CEO</sub>	40		V
	Emitter to Collector Voltage	V <sub>ECO</sub>	6		V
	Collector Current	I <sub>C</sub>	200	160	mA/ch
	Power Dissipation Derating	ΔP <sub>C</sub> /°C	2.0	1.6	mW/°C
	Power Dissipation	P <sub>C</sub>	200	160	mW/ch
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.

Pins 1-2 shorted together, 3-4 shorted together (PS2502-1, PS2502L-1).

Pins 1-8 shorted together, 9-16 shorted together (PS2502-4, PS2502L-4).

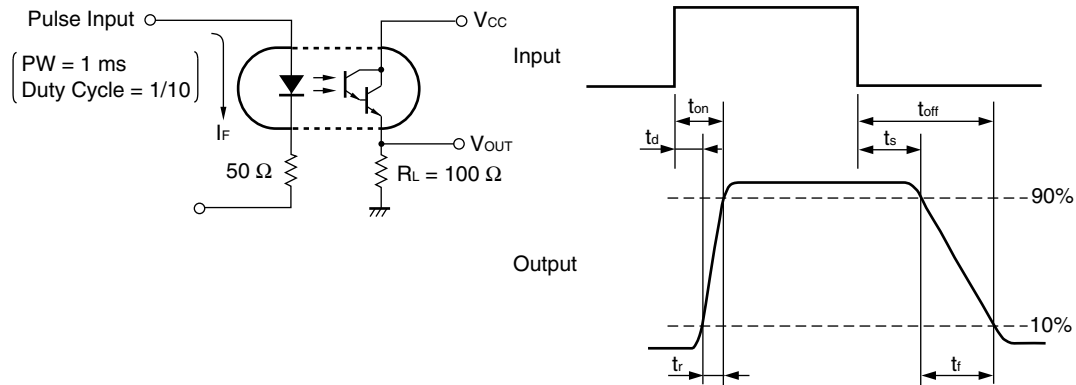
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 10 mA		1.17	1.4	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		50		pF
Transistor	Collector to Emitter Dark Current	I <sub>CEO</sub>	V <sub>CE</sub> = 40 V, I <sub>F</sub> = 0 mA			400	nA
Coupled	Current Transfer Ratio (I <sub>c</sub> /I <sub>F</sub> ) <sup>*1</sup>	CTR	I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 2 V	200	2 000		%
	Collector Saturation Voltage	V <sub>CE(sat)</sub>	I <sub>F</sub> = 1 mA, I <sub>c</sub> = 2 mA			1.0	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>*2</sup>	t <sub>r</sub>	V <sub>CC</sub> = 10 V, I <sub>c</sub> = 2 mA, R <sub>L</sub> = 100 Ω		100		μs
	Fall Time <sup>*2</sup>	t <sub>f</sub>			100		

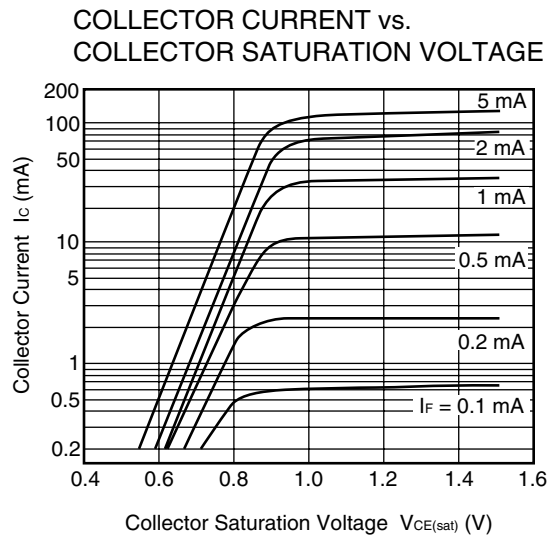
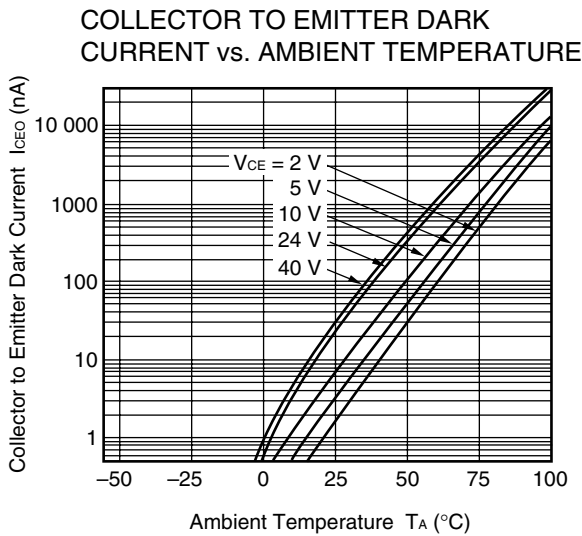
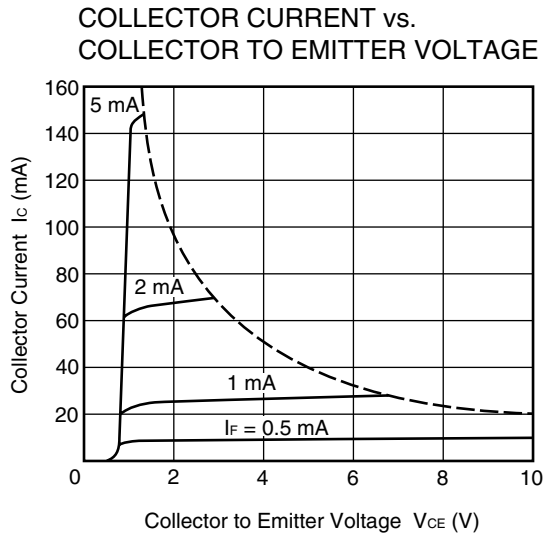
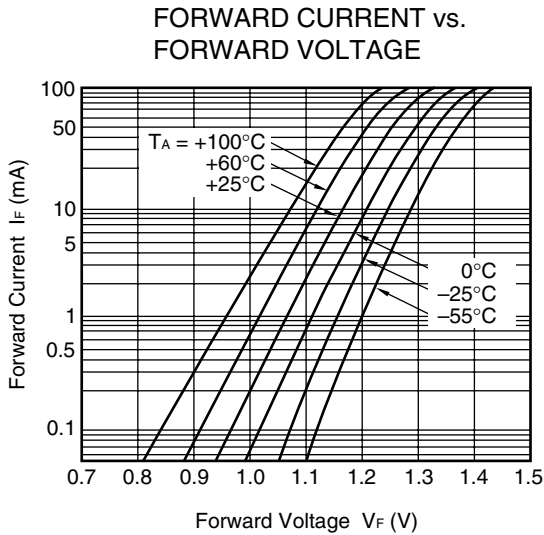
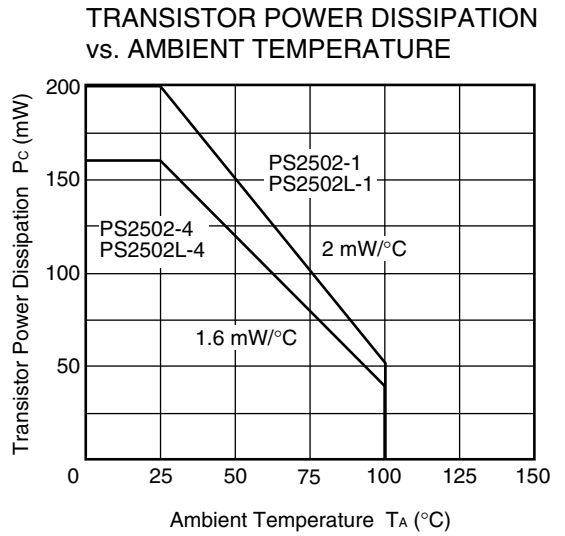
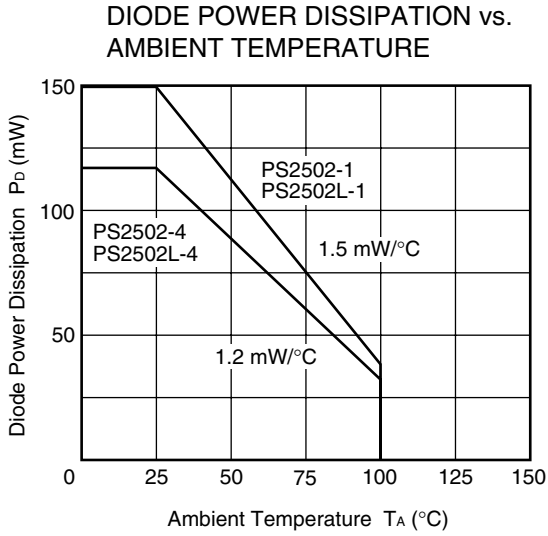
\*1 CTR rank (only PS2502-1, PS2502L-1)

- K : 2 000 to (%)
- L : 700 to 3 400 (%)
- M : 200 to 1 000 (%)

\*2 Test circuit for switching time

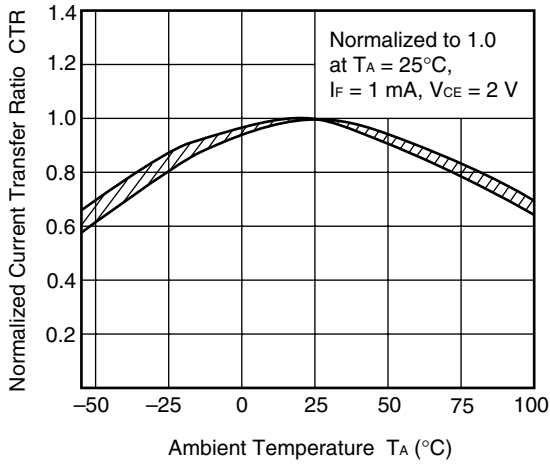


TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)

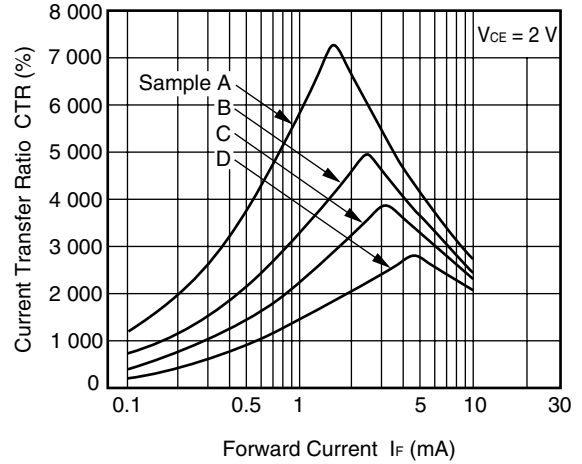


**Remark** The graphs indicate nominal characteristics.

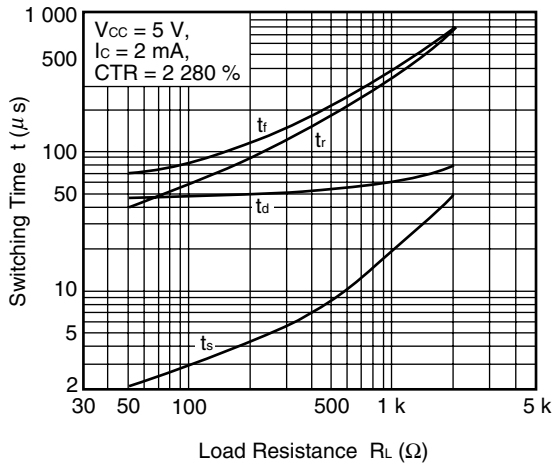
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



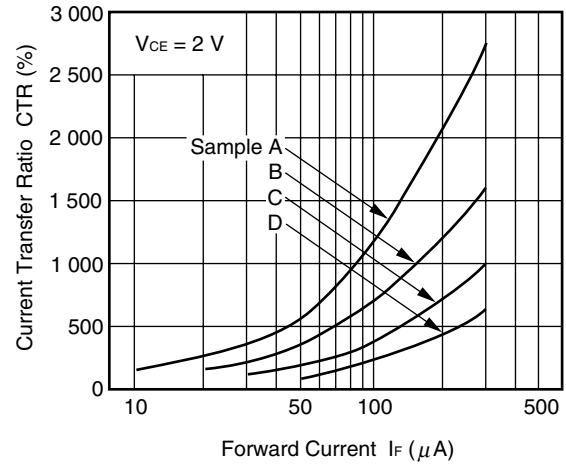
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



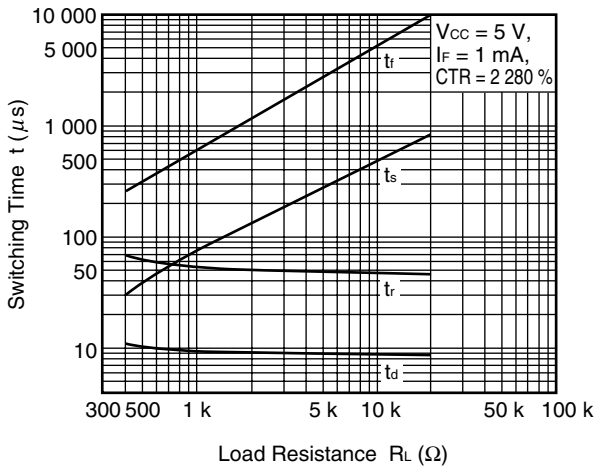
SWITCHING TIME vs. LOAD RESISTANCE



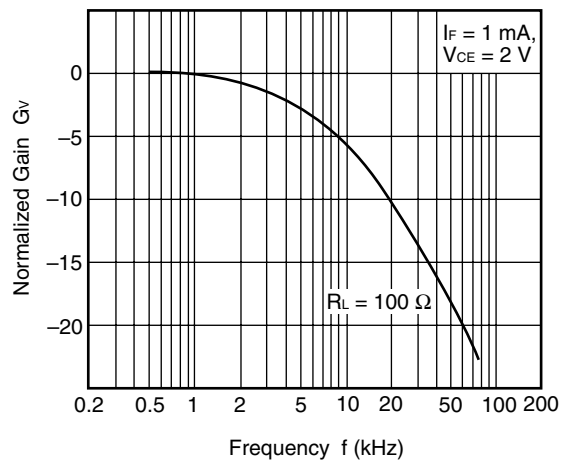
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



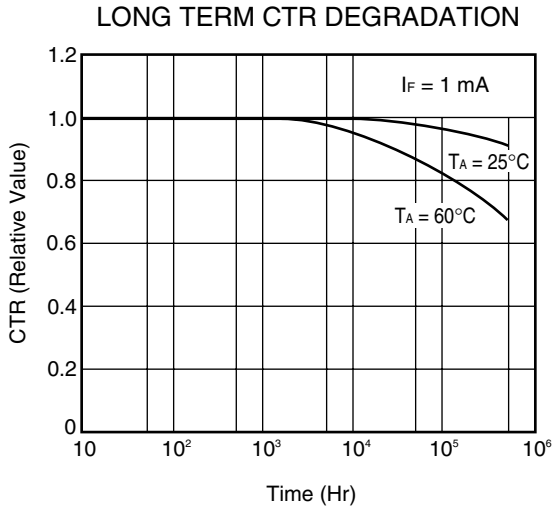
SWITCHING TIME vs. LOAD RESISTANCE



FREQUENCY RESPONSE



Remark The graphs indicate nominal characteristics.

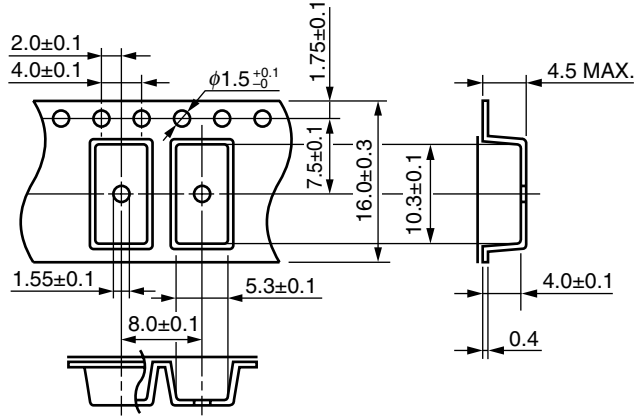


**Remark** The graph indicates nominal characteristics.



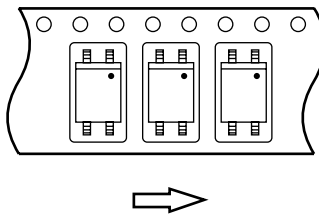
<R> TAPING SPECIFICATIONS (UNIT : mm)

Outline and Dimensions (Tape)

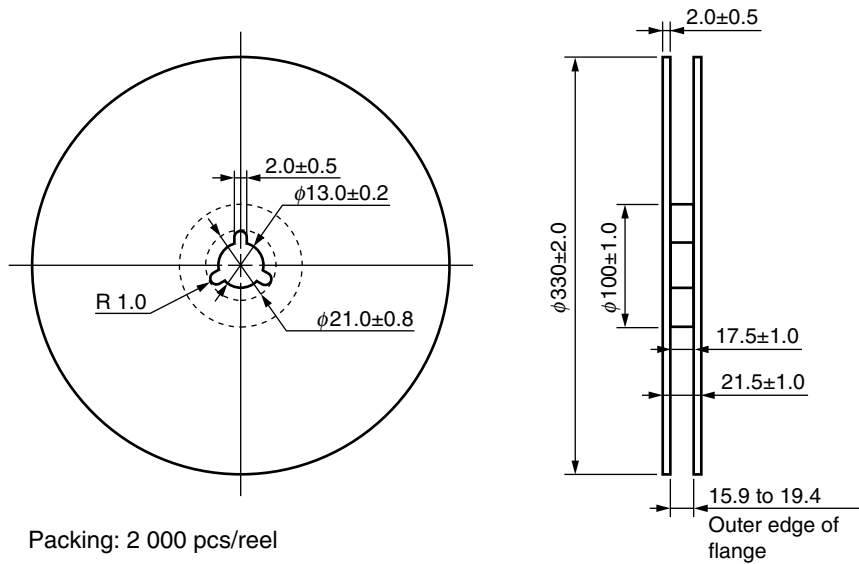


Tape Direction

PS2502L-1-F3



Outline and Dimensions (Reel)



Packing: 2 000 pcs/reel

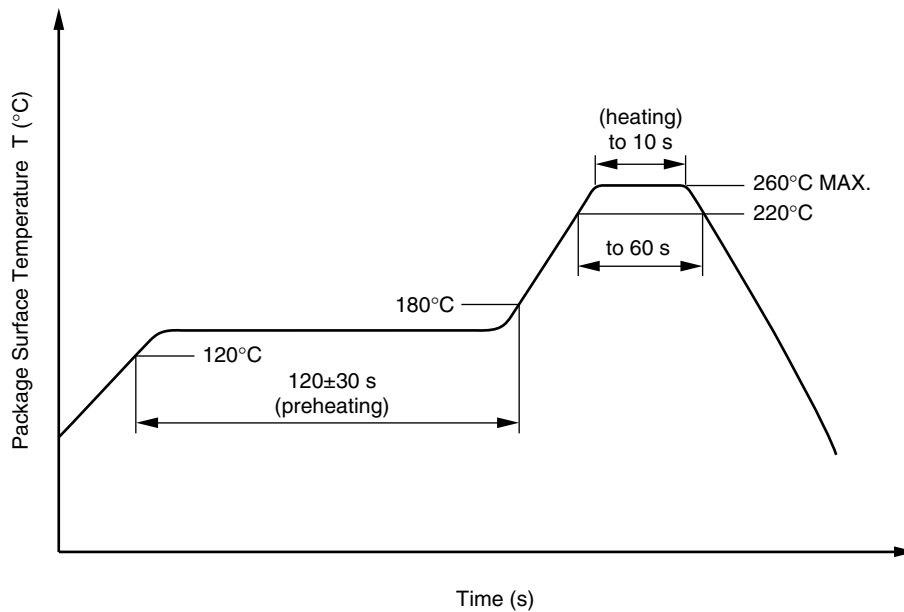
**NOTES ON HANDLING**

**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.

**3. Measurement conditions of current transfer ratios (CTR), which differ according to photocoupler**

Check the setting values before use, since the forward current conditions at CTR measurement differ according to product.

When using products other than at the specified forward current, the characteristics curves may differ from the standard curves due to CTR value variations or the like. Therefore, check the characteristics under the actual operating conditions and thoroughly take variations or the like into consideration before use.

**USAGE CAUTIONS**

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

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M8E0904E

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To our customers,

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Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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