

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

R08DS0203EJ0100

Rev.1.00

HIGH ISOLATION VOLTAGE DARLINGTON TRANSISTOR TYPE

Dec 25, 2020

### 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

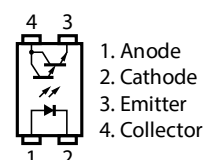
- High isolation voltage ( $BV = 5\,000\text{ Vr.m.s.}$ )
- High current transfer ratio ( $CTR = 2\,000\% \text{ TYP.}$ )
- High-speed switching ( $t_r, t_f = 100\ \mu\text{s TYP.}$ )
- Ordering number of taping product: PS2502L-1-F3 : 2 000 pcs/reel
- Pb-Free product
- Safety standards
  - UL approved: UL1577, Double protection

### APPLICATIONS

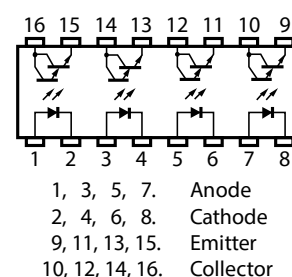
- Power supply
- Telephone/FAX.
- FA/OA equipment
- Programmable logic controller

#### PIN CONNECTION (Top View)

PS2502-1, PS2502L-1

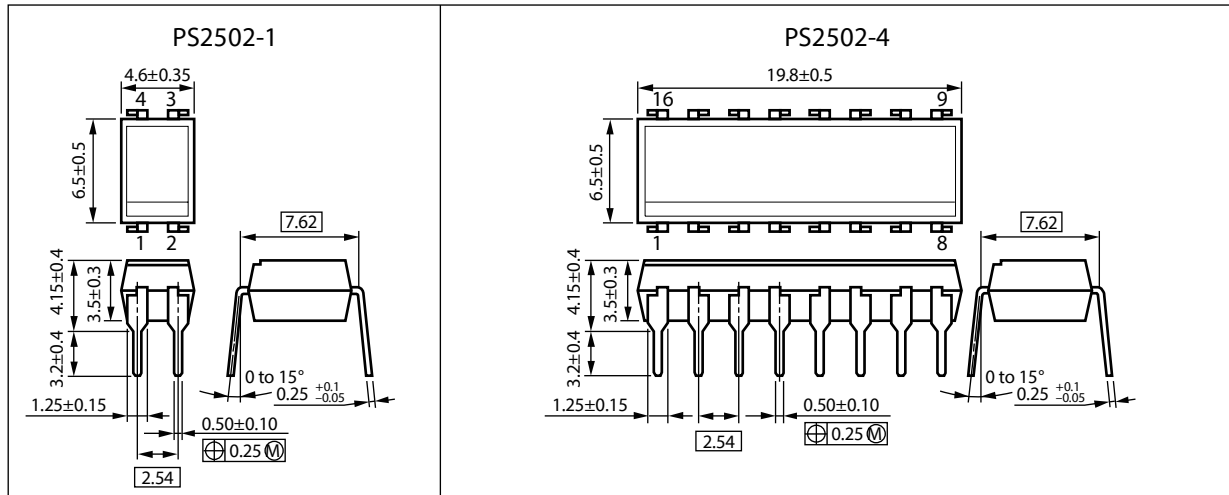


PS2502-4, PS2502L-4

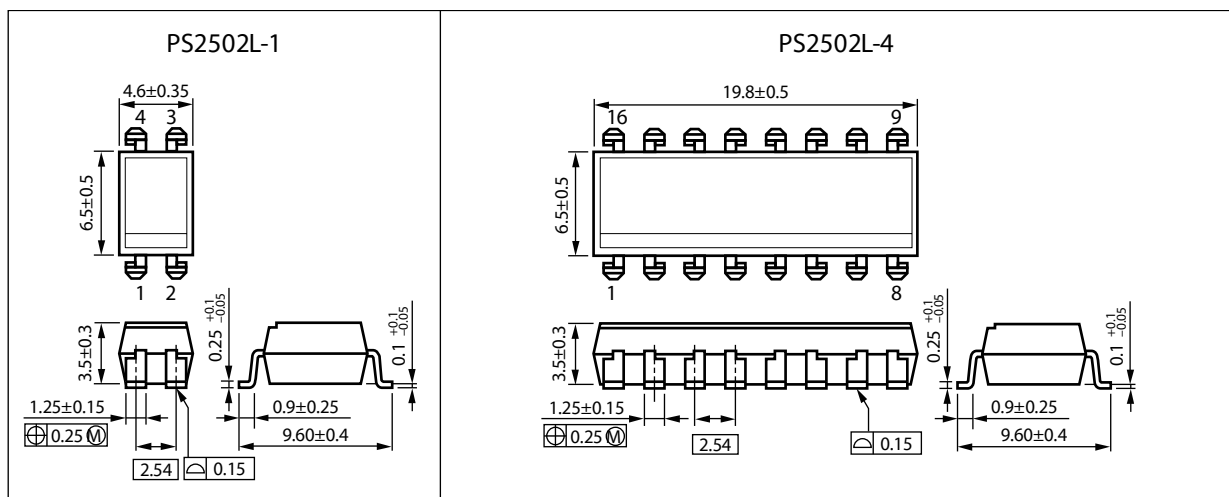


## PACKAGE DIMENSIONS (UNIT: mm)

### DIP Type



### Lead Bending Type For Surface Mount



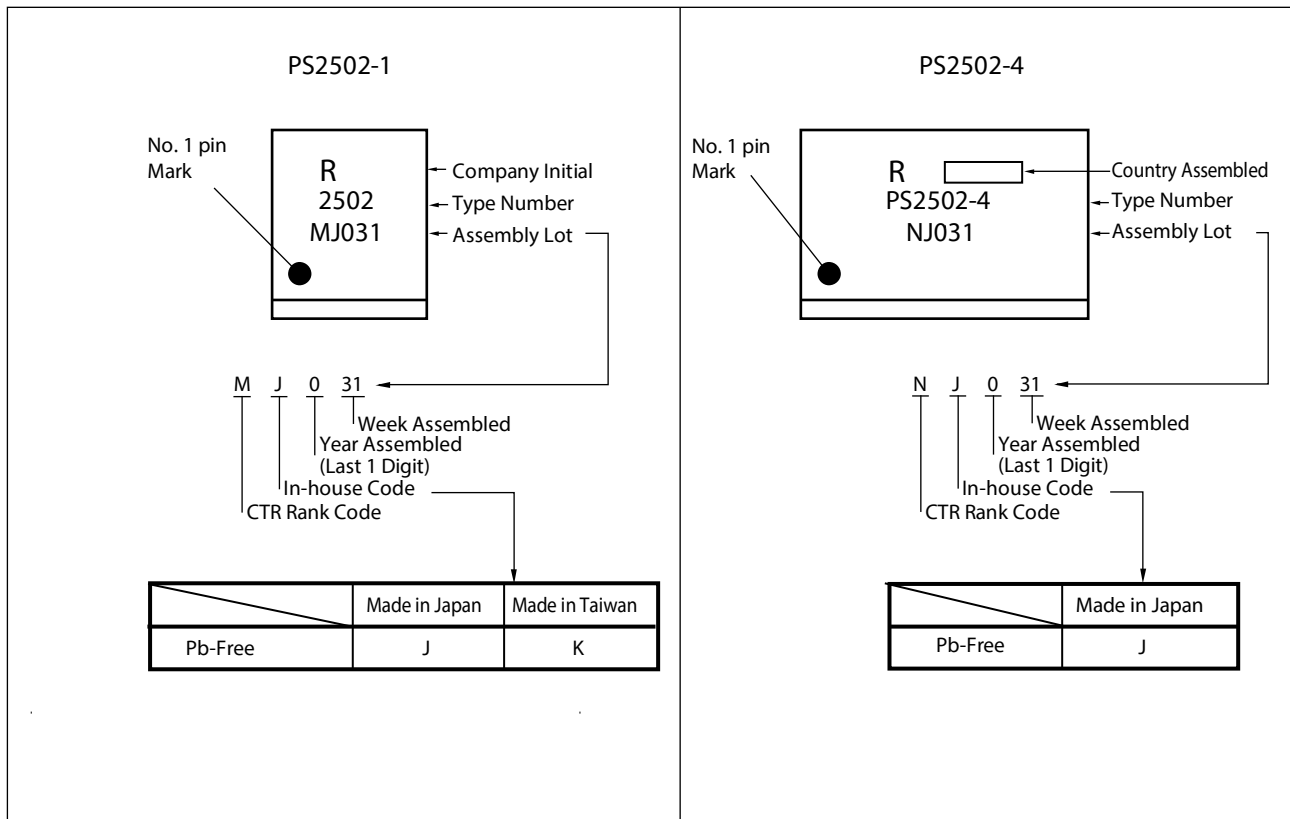
Weight (4-pin DIP) : 0.26 g (typ.)

Weight (16-pin DIP) : 1.02 g (typ.)

## PHOTOCOUPLER CONSTRUCTION

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

## MARKING EXAMPLE



## ORDERING INFORMATION

Part Number	Order Number *1	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number *2
PS2502-1	PS2502-1-A	Pb-Free	Magazine case 100 pcs	Standard products (UL approved)	PS2502-1
PS2502L-1	PS2502L-1-A				PS2502L-1
PS2502L-1-F3	PS2502L-1-F3-A		Embossed Tape 2 000 pcs/reel		PS2502L-1
PS2502-4	PS2502-4-A		Magazine case 20 pcs		PS2502-4
PS2502L-4	PS2502L-4-A				PS2502L-4

Notes: \*1. When specifying CTR rank, please add "/CTR rank" after Order Number.

ex. L rank : PS2502-1-A/L

Notes: \*2. For the application of the Safety Standard, following part number should be used.

**ABSOLUTE MAXIMUM RATINGS ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)**

Parameter		Symbol	Ratings		Unit
			PS2502-1, PS2502L-1	PS2502-4, PS2502L-4	
Diode	Reverse Voltage	$V_R$	6		V
	Forward Current (DC)	$I_F$	80		mA/ch
	Power Dissipation Derating	$\Delta P_D/^{\circ}\text{C}$	1.5	1.2	mW/ $^{\circ}\text{C}$
	Power Dissipation	$P_D$	150	120	mW/ch
	Peak Forward Current *1	$I_{FP}$	1		A/ch
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	$\Delta P_C/^{\circ}\text{C}$	2.0	1.6	mW/ $^{\circ}\text{C}$
	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		$^{\circ}\text{C}$
Storage Temperature		$T_{stg}$	-55 to +150		$^{\circ}\text{C}$

Note: \*1.  $PW = 100\text{ }\mu\text{s}$ , Duty Cycle = 1 %

\*2. AC voltage for 1 minute at  $T_A = 25\text{ }^{\circ}\text{C}$ , 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 ( $T_A = 25\text{ }^{\circ}\text{C}$ )**

	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	$V_F$	$I_F = 10\text{ mA}$		1.17	1.4	V
	Reverse Current	$I_R$	$V_R = 5\text{ V}$			5	$\mu\text{A}$
	Terminal Capacitance	$C_t$	$V = 0\text{ V}$ , $f = 1.0\text{ MHz}$		50		pF
Transistor	Collector to Emitter Dark Current	$I_{CEO}$	$V_{CE} = 40\text{ V}$ , $I_F = 0\text{ mA}$			400	nA
Coupled	Current Transfer Ratio ( $I_C/I_F$ ) <sup>*1</sup>	CTR	$I_F = 1\text{ mA}$ , $V_{CE} = 2\text{ V}$	200	2000		%
	Collector Saturation Voltage	$V_{CE(sat)}$	$I_F = 1\text{ mA}$ , $I_C = 2\text{ mA}$			1.0	V
	Isolation Resistance	$R_{I-O}$	$V_{I-O} = 1.0\text{ kV}_{DC}$	$10^{11}$			$\Omega$
	Isolation Capacitance	$C_{I-O}$	$V = 0\text{ V}$ , $f = 1.0\text{ MHz}$		0.5		pF
	Rise Time <sup>*2</sup>	$t_r$	$V_{CC} = 10\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$		100		$\mu\text{s}$
	Fall Time <sup>*2</sup>	$t_f$			100		

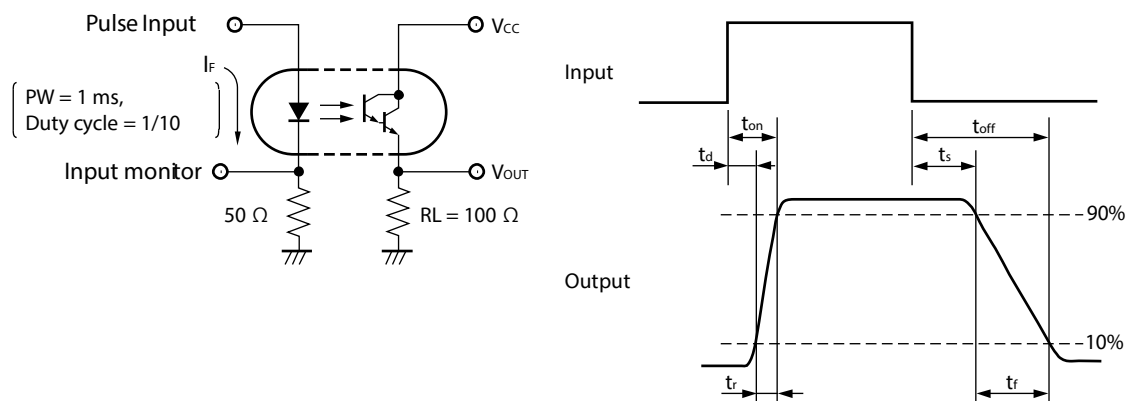
Note : \*1. CTR rank ( \* : only PS2502-1, PS2502L-1)

K\* : 2 000 to (%)

L\* : 700 to 3 400 (%)

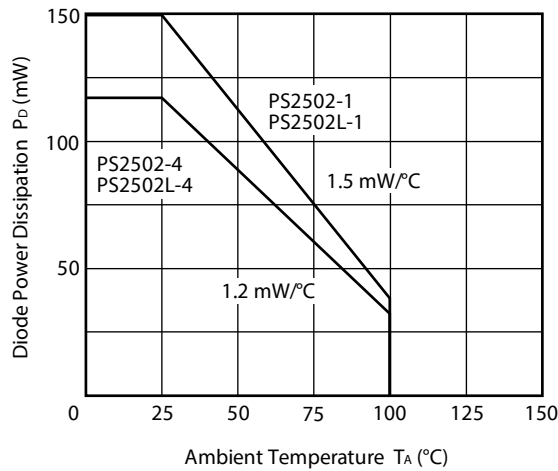
M\* : 200 to 1 000 (%)

\*2. Test Circuit for Switching Time

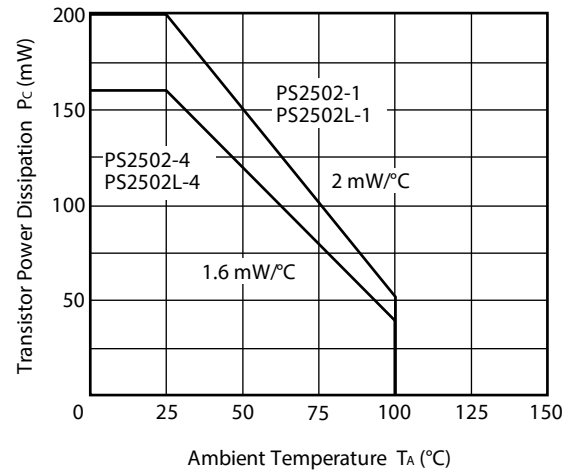


# TYPICAL CHARACTERISTICS ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

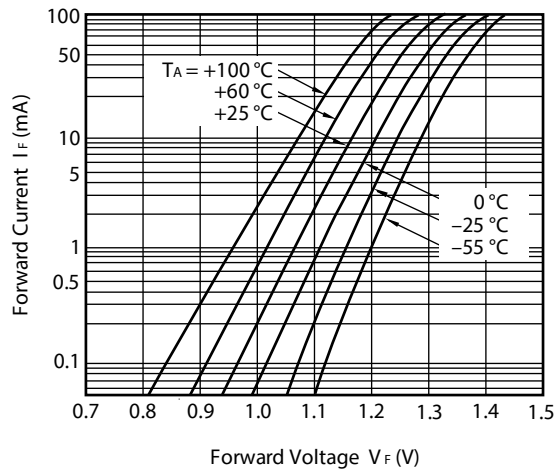
DIODE POWER DISSIPATION vs.  
AMBIENT TEMPERATURE



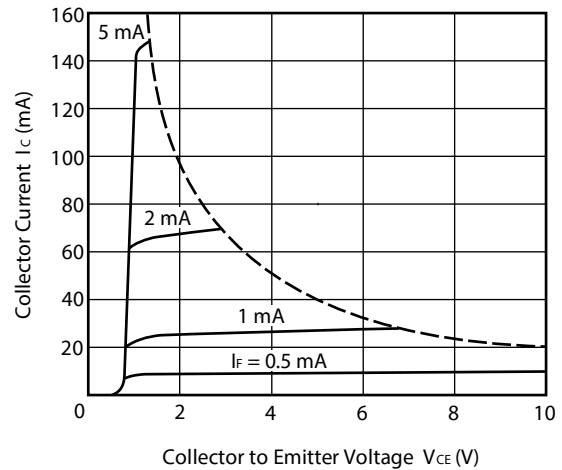
TRANSISTOR POWER DISSIPATION  
vs. AMBIENT TEMPERATURE



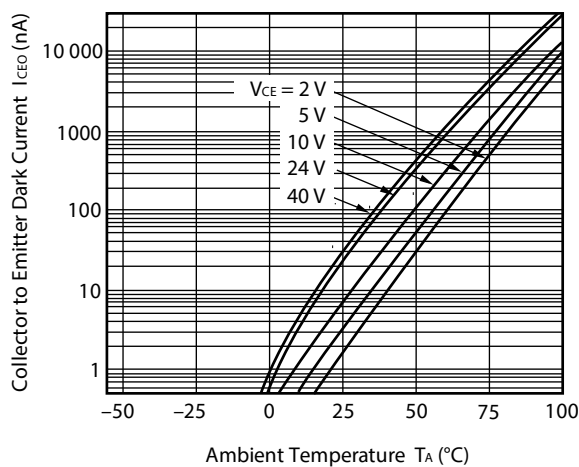
FORWARD CURRENT vs.  
FORWARD VOLTAGE



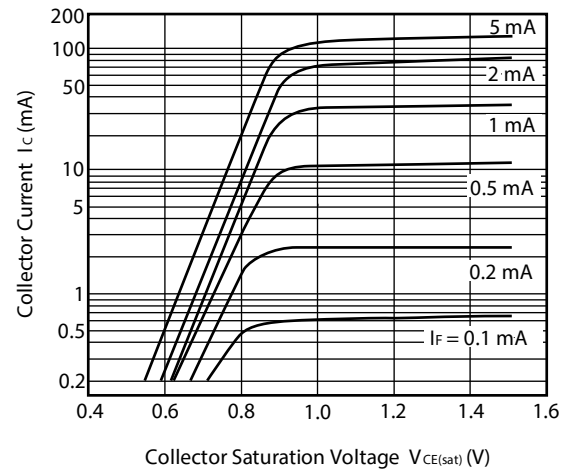
COLLECTOR CURRENT vs.  
COLLECTOR TO EMITTER VOLTAGE



COLLECTOR TO EMITTER DARK  
CURRENT vs. AMBIENT TEMPERATURE

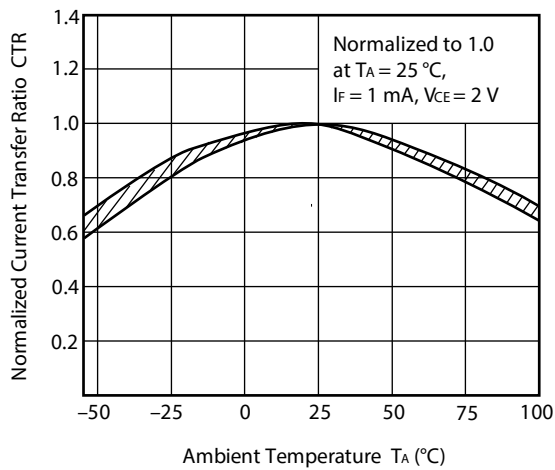


COLLECTOR CURRENT vs.  
COLLECTOR SATURATION VOLTAGE

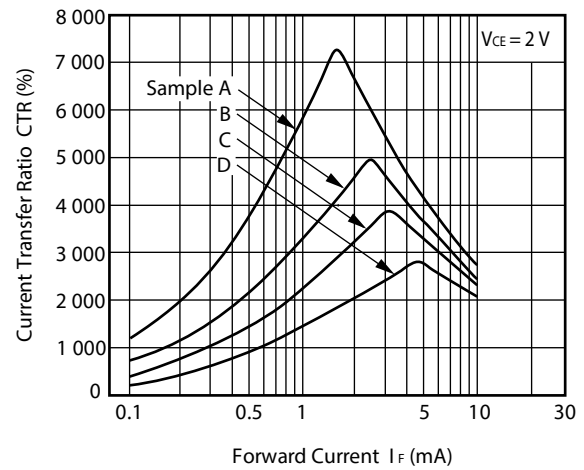


**Remark** The graphs indicate nominal characteristics.

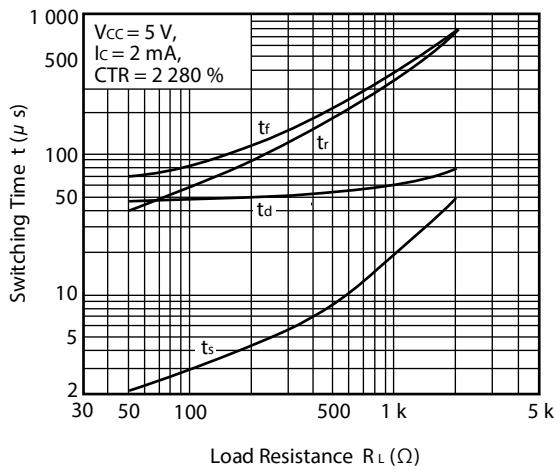
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



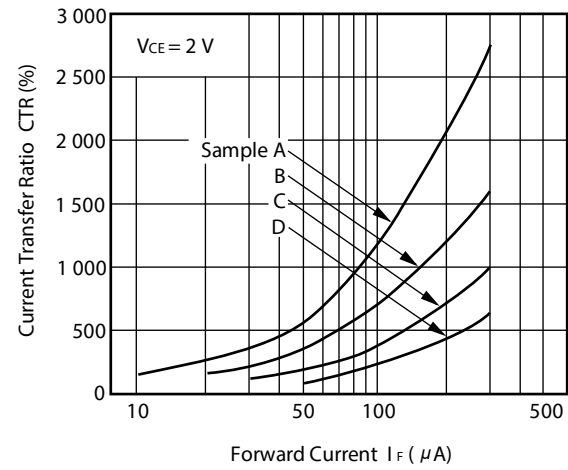
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



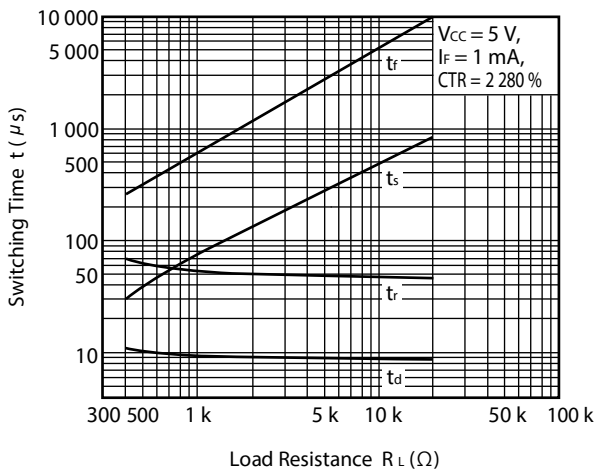
SWITCHING TIME vs. LOAD RESISTANCE



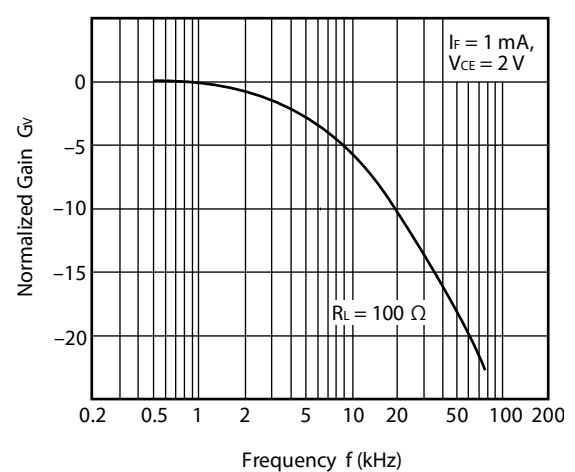
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



SWITCHING TIME vs. LOAD RESISTANCE



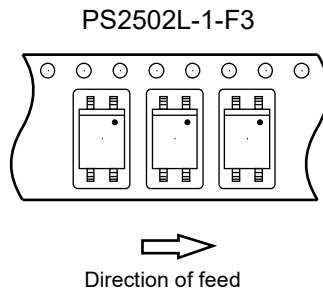
FREQUENCY RESPONSE



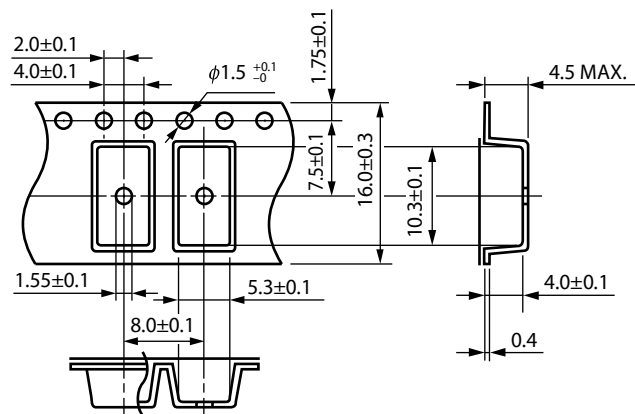
**Remark** The graphs indicate nominal characteristics.

## TAPING SPECIFICATIONS (UNIT: mm)

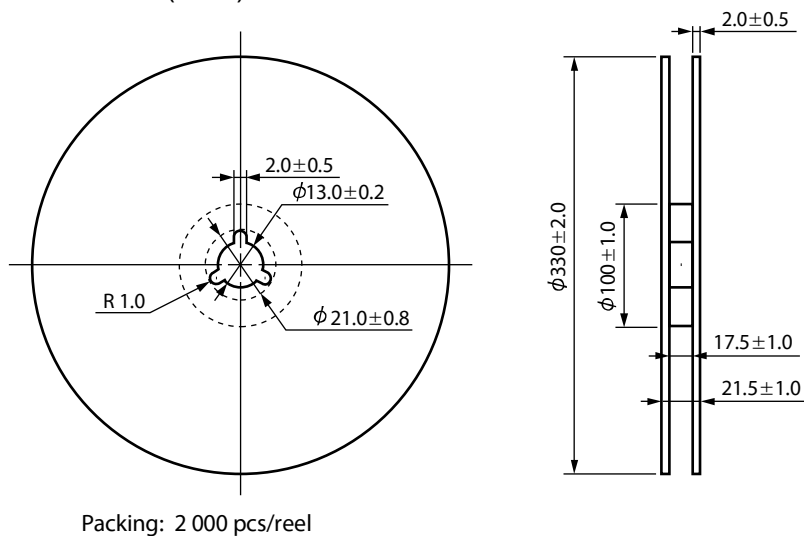
## Taping Direction



## Outline and Dimensions (Tape)

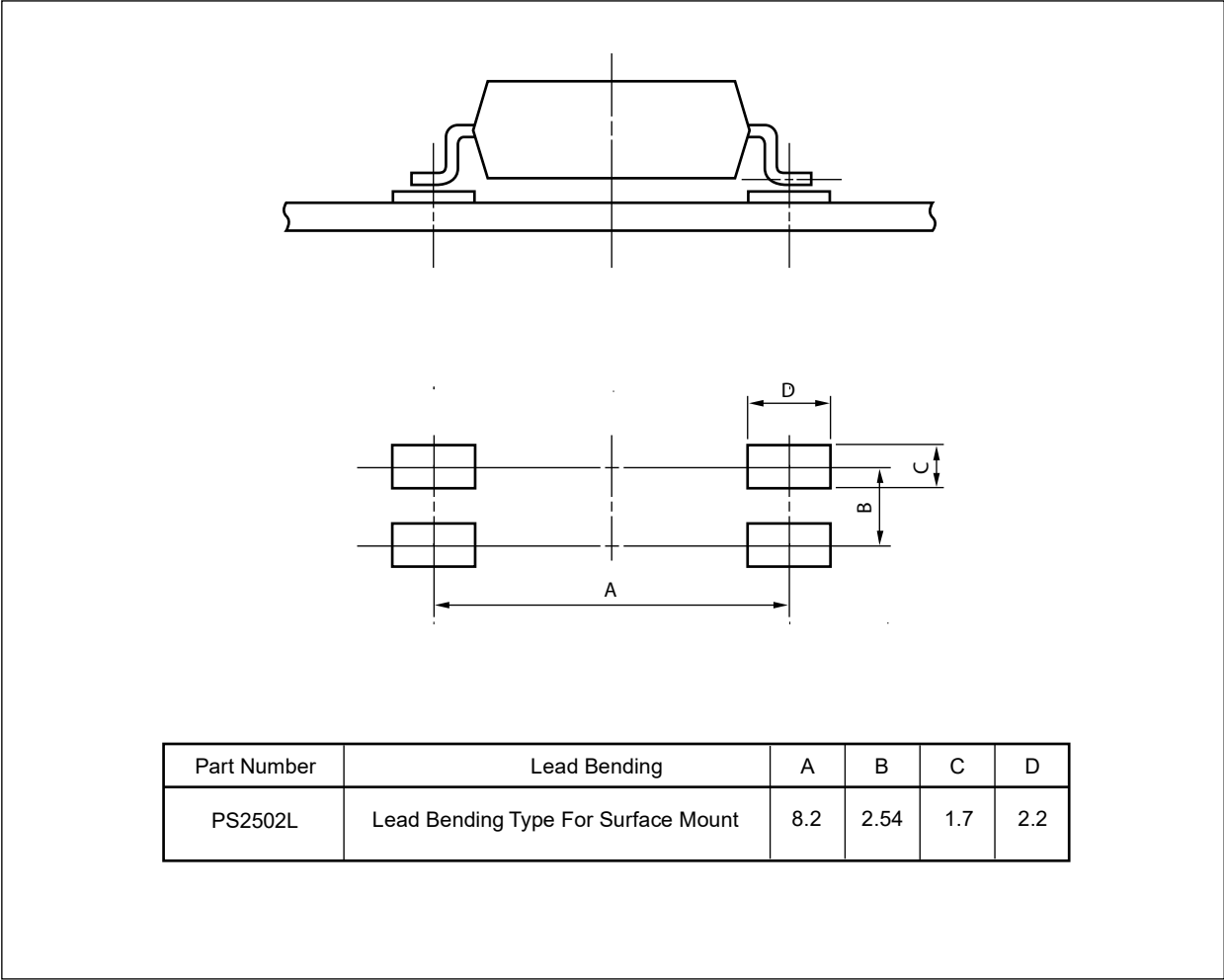


## Outline and Dimensions (Reel)





RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)



**Remark** All dimensions in this figure must be evaluated before use.

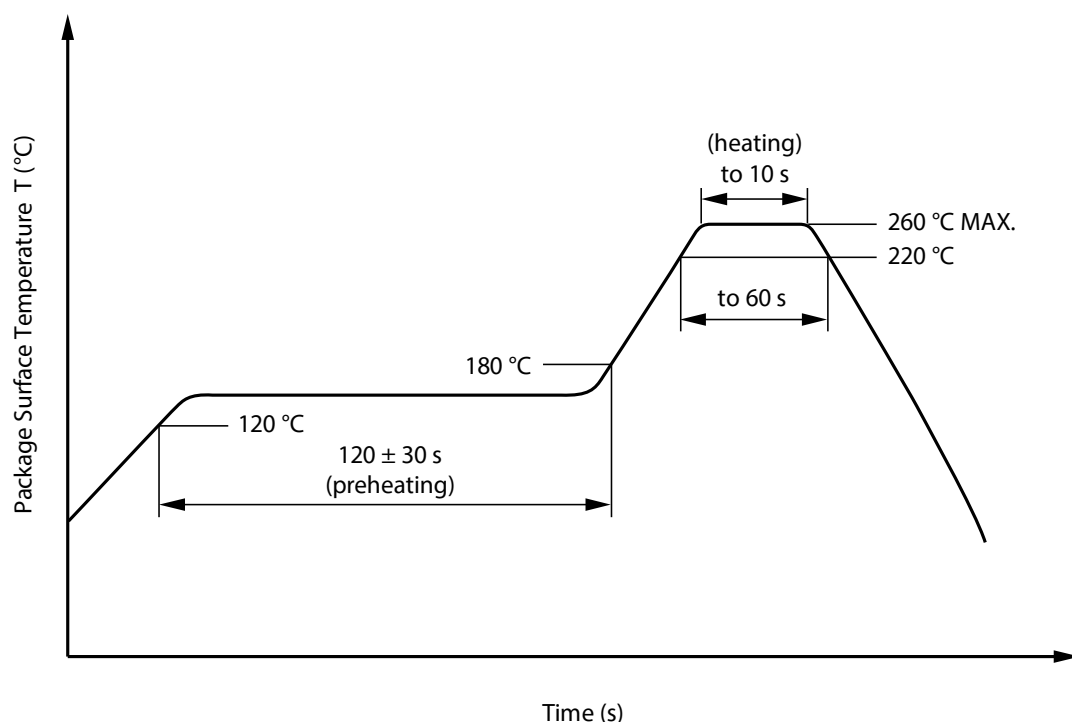
## NOTES ON HANDLING

### 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

- Flux Cleaning  
Avoid cleaning with Freon based or halogen-based (chlorinated etc.) solvents.
- Do not use fixing agents or coatings containing halogen-based substances.

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.
3. Avoid cleaning with Freon based or halogen-based (chlorinated etc.) solvents.
4. Do not use fixing agents or coatings containing halogen-based substances.

**Caution**

GaAs Products

This product uses gallium arsenide (GaAs).

GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points.

- Follow related laws and ordinances when disposing of the product. If there are no applicable laws and/or ordinances, dispose of the product as recommended below.
  1. Commission a disposal company able to (with a license to) collect, transport and dispose of materials that contain arsenic and other such industrial waste materials.
  2. Exclude the product from general industrial waste and household garbage, and ensure that the product is controlled (as industrial waste subject to special control) up until final disposal.
- Do not burn, destroy, cut, crush, or chemically dissolve the product.
- Do not lick the product or in any way allow it to enter the mouth.

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