

# PS2514-1, PS2514L-1

R08DS0012EJ0100

Rev.1.00

Mar 19, 2012

HIGH-SPEED SWITCHING/HIGH ISOLATION VOLTAGE PHOTOCOUPLER SERIES

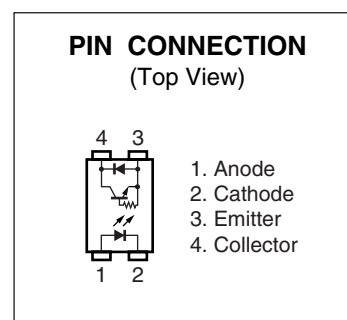
## DESCRIPTION

The PS2514-1 and PS2514L-1 are optically coupled isolators containing a GaAs light emitting diode and an NPN silicon phototransistor, enabling relatively high switching speed with high load resistor of several kΩ.

The PS2514-1 is in a plastic DIP (Dual In-line Package) and the PS2514L-1 is lead bending type (Gull-wing) for surface mount.

## FEATURES

- High isolation voltage (BV = 5 000 Vr.m.s.)
- High collector to emitter voltage ( $V_{CEO} = 40\text{ V}$ )
- Guaranteed maximum switching speed  
( $t_{off} \leq 25\ \mu\text{s}$  @  $I_F = 5\text{ mA}$ ,  $V_{CC} = 5\text{ V}$ ,  $R_L = 5\text{ k}\Omega$ )
- High-speed switching ( $t_{on} = 15\ \mu\text{s}$  TYP. @  $I_F = 5\text{ mA}$ ,  $V_{CC} = 5\text{ V}$ ,  $R_L = 5\text{ k}\Omega$ )  
( $t_{off} = 15\ \mu\text{s}$  TYP. @  $I_F = 5\text{ mA}$ ,  $V_{CC} = 5\text{ V}$ ,  $R_L = 5\text{ k}\Omega$ )
- Embossed tape product: PS2514L-1-F3: 2 000 pcs/reel
- <R> • Pb-Free product
- <R> • Safety standards
  - UL approved: No. E72422
  - CSA approved: No. CA 101391 (CA5A, CAN/CSA-C22.2 60065, 60950)
  - CQC approved: CQC11001056759/CQC11001056758  
CQC11001056865/CQC11001057073
  - DIN EN60747-5-2 (VDE0884 Part2) approved: No. 40008862 (Option)



## APPLICATIONS

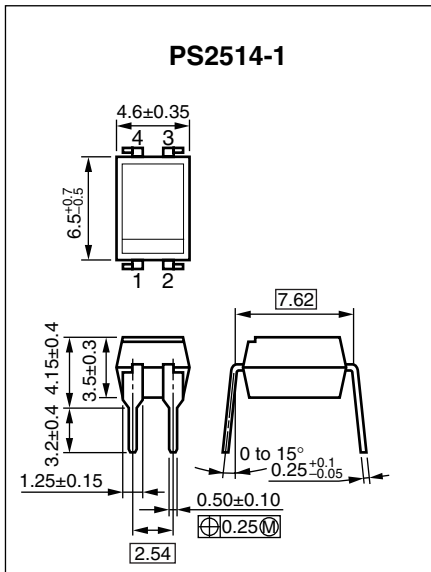
- Power supply
- FA equipment
- Electronic electricity meter

The mark <R> shows major revised points.

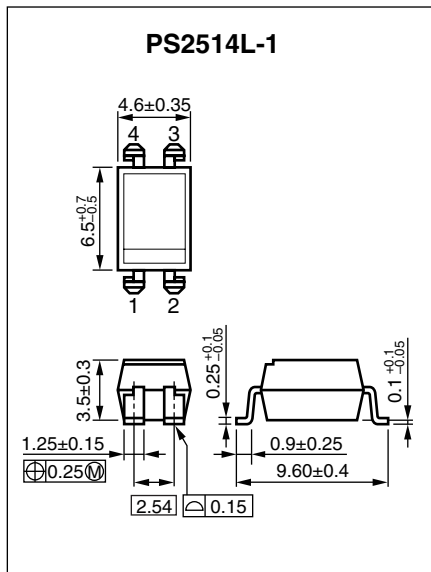
The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

PACKAGE DIMENSIONS (UNIT: mm)

DIP Type



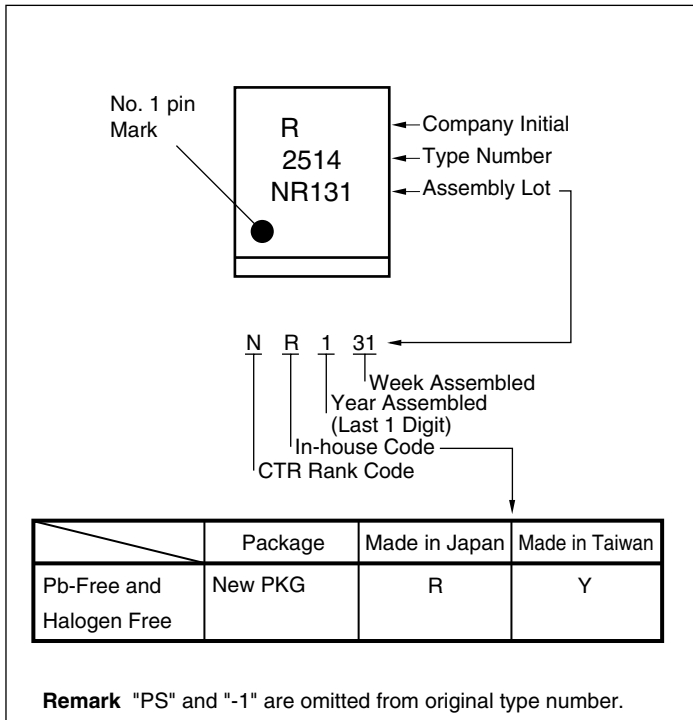
Lead Bending Type



PHOTOCOPLER CONSTRUCTION

Parameter	Unit (MIN.)
Air Distance	7 mm
Outer Creepage Distance	7 mm
Inner Creepage Distance	4 mm
Isolation Thickness	0.3 mm

<R> MARKING EXAMPLE



## &lt;R&gt; ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification etc.	Packing Style	Safety Standard Approval	Application Part Number <sup>1</sup>
PS2514-1	PS2514-1Y-A	Pb-Free and Halogen Free	Magazine case 100 pcs	Standard products (UL, CSA, CQC approved)	PS2514-1
PS2514L-1	PS2514L-1Y-A		Embossed Tape 2 000 pcs/reel		DIN EN60747-5-2 (VDE0884 Part2) approved (Option)
PS2514L-1-F3	PS2514L-1Y-F3-A			Magazine case 100 pcs	
PS2514-1-V	PS2514-1Y-V-A		Embossed Tape 2 000 pcs/reel		DIN EN60747-5-2 (VDE0884 Part2) approved (Option)
PS2514L-1-V	PS2514L-1Y-V-A			Embossed Tape 2 000 pcs/reel	
PS2514L-1-V-F3	PS2514L-1Y-V-F3-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
Diode	Reverse Voltage	V <sub>R</sub>	6	V
	Forward Current (DC)	I <sub>F</sub>	30	mA
	Power Dissipation Derating	ΔP <sub>D</sub> /°C	1.5	mW/°C
	Power Dissipation	P <sub>D</sub>	150	mW
	Peak Forward Current <sup>1</sup>	I <sub>FP</sub>	0.5	A
Transistor	Collector to Emitter Voltage	V <sub>CEO</sub>	40	V
	Emitter to Collector Voltage	V <sub>ECO</sub>	0.6	V
	Collector Current	I <sub>C</sub>	20	mA
	Power Dissipation Derating	ΔP <sub>C</sub> /°C	1.5	mW/°C
	Power Dissipation	P <sub>C</sub>	150	mW
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.

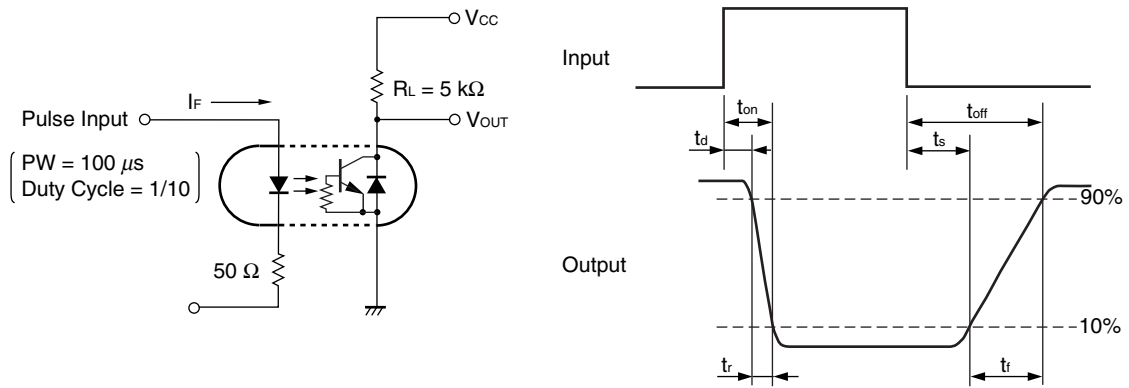
**RECOMMENDED OPERATING CONDITIONS**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Input Current	I <sub>F</sub>	5	6	7	mA

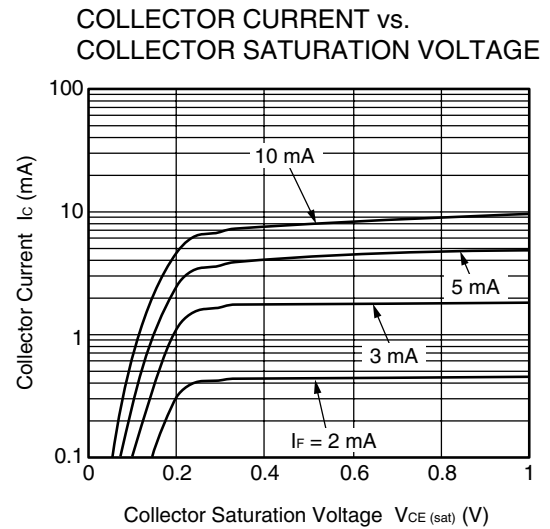
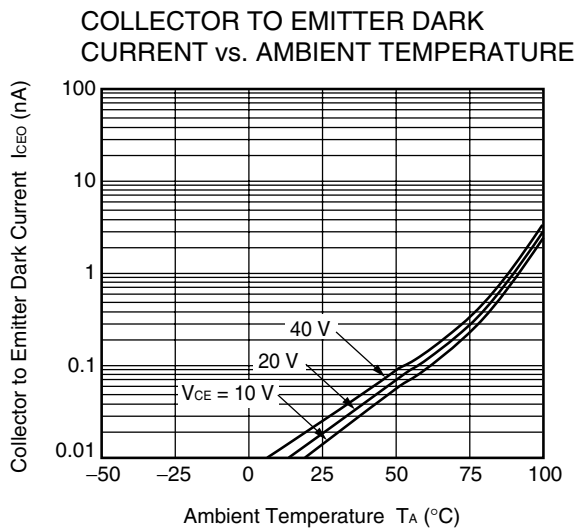
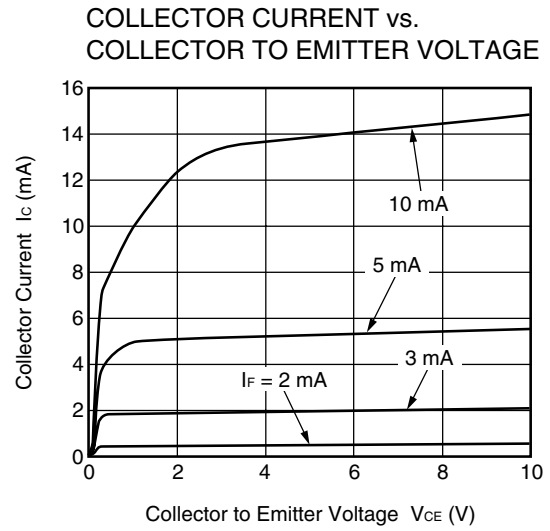
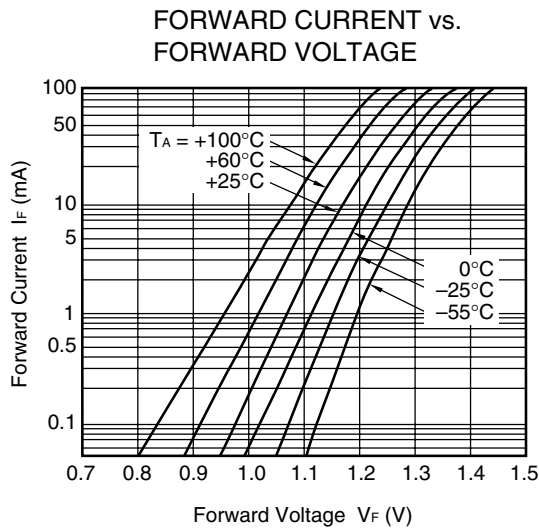
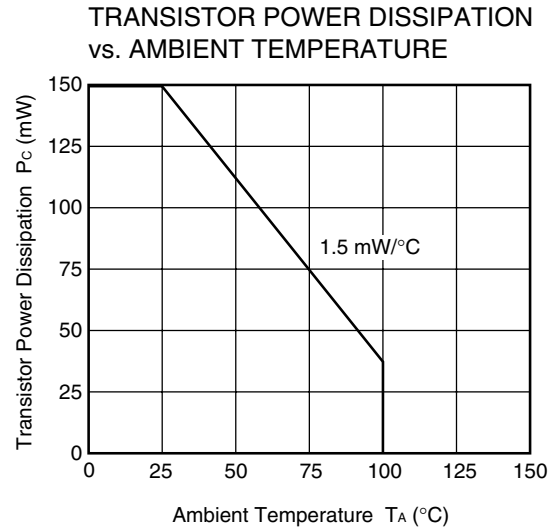
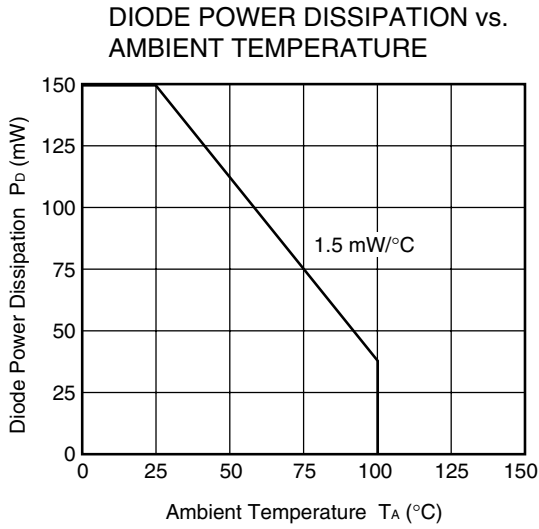
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 5 mA		1.1	1.3	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		10		pF
Transistor	Collector to Emitter Dark Current	I <sub>CEO</sub>	V <sub>CE</sub> = 40 V, I <sub>F</sub> = 0 mA			100	nA
Coupled	Current Transfer Ratio	CTR	I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 5 V	50	125	200	%
	Collector Saturation Voltage	V <sub>CE(sat)</sub>	I <sub>F</sub> = 5 mA, I <sub>C</sub> = 1 mA			0.35	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
	Turn-on Time <sup>*1</sup>	t <sub>on</sub>	V <sub>CC</sub> = 5 V, I <sub>F</sub> = 5 mA, R <sub>L</sub> = 5 kΩ		15	25	μs
Turn-off Time <sup>*1</sup>	t <sub>off</sub>			15	25		

\*1 Test circuit for switching time

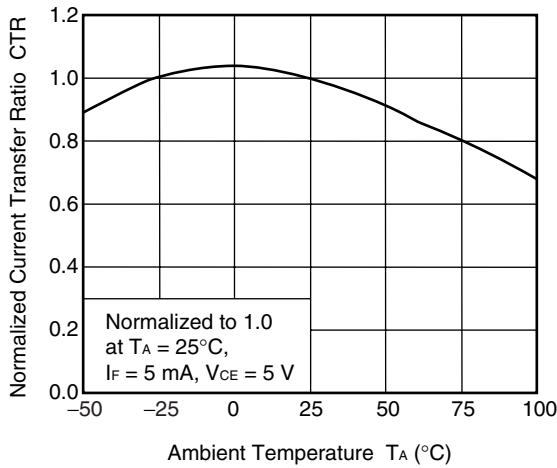


<R> TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C, unless otherwise specified)

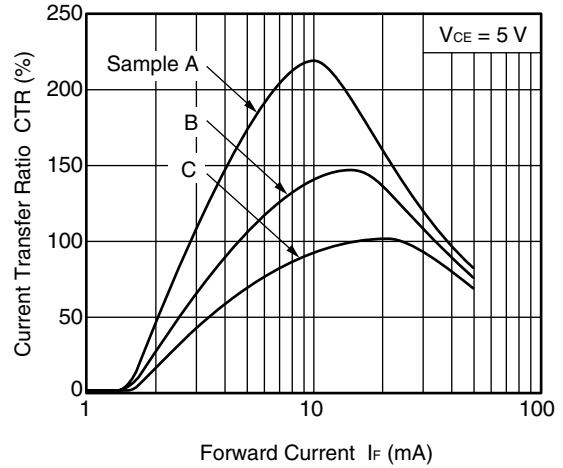


**Remark** The graphs indicate nominal characteristics.

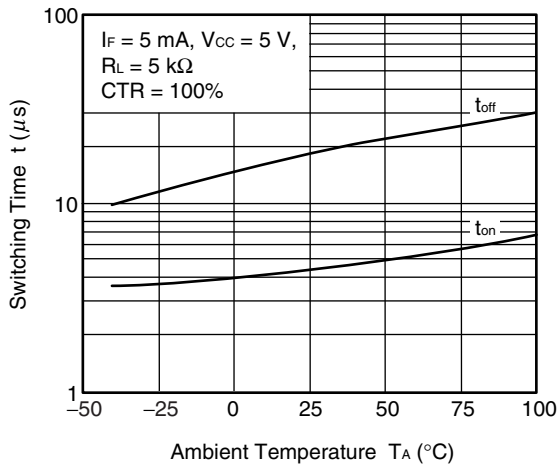
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



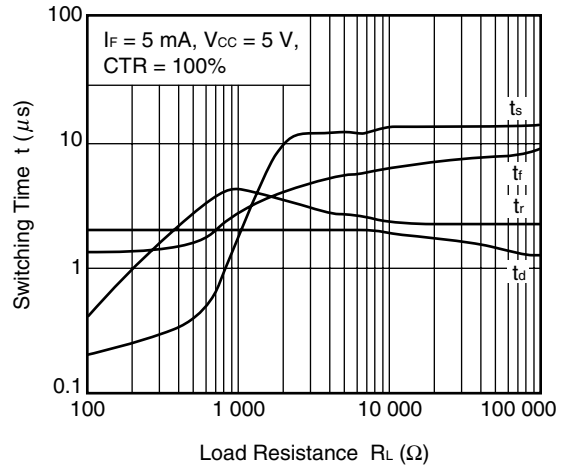
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



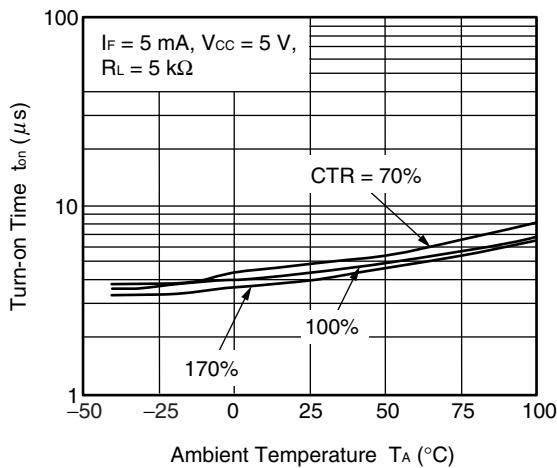
SWITCHING TIME vs. LOAD RESISTANCE



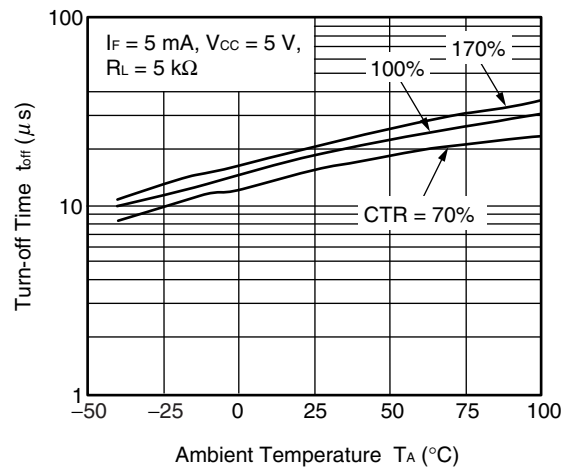
SWITCHING TIME vs. LOAD RESISTANCE



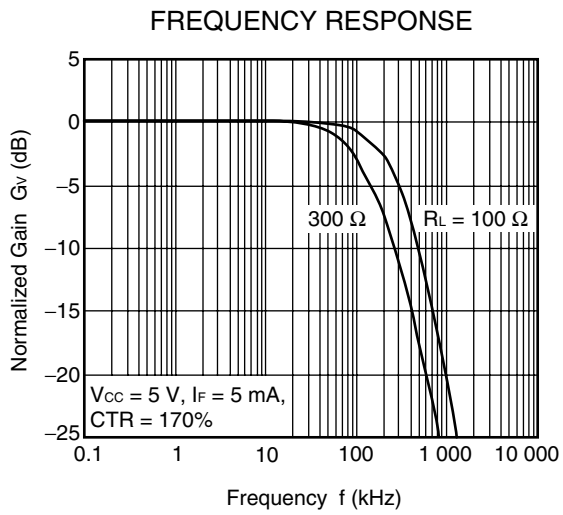
TURN-ON TIME vs. AMBIENT TEMPERATURE



TURN-OFF TIME vs. AMBIENT TEMPERATURE



**Remark** The graphs indicate nominal characteristics.

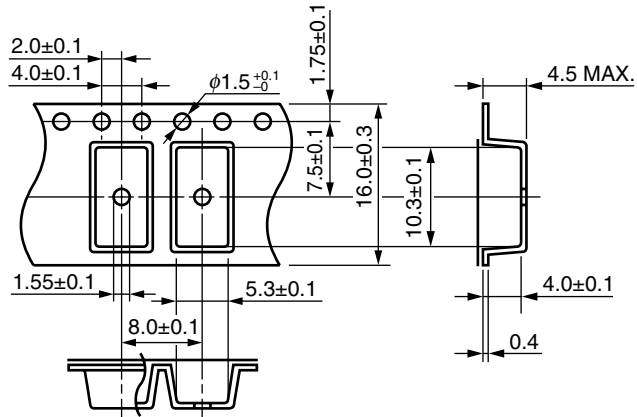


**Remark** The graphs indicate nominal characteristics.

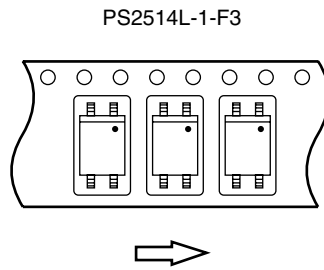


TAPING SPECIFICATIONS (UNIT: mm)

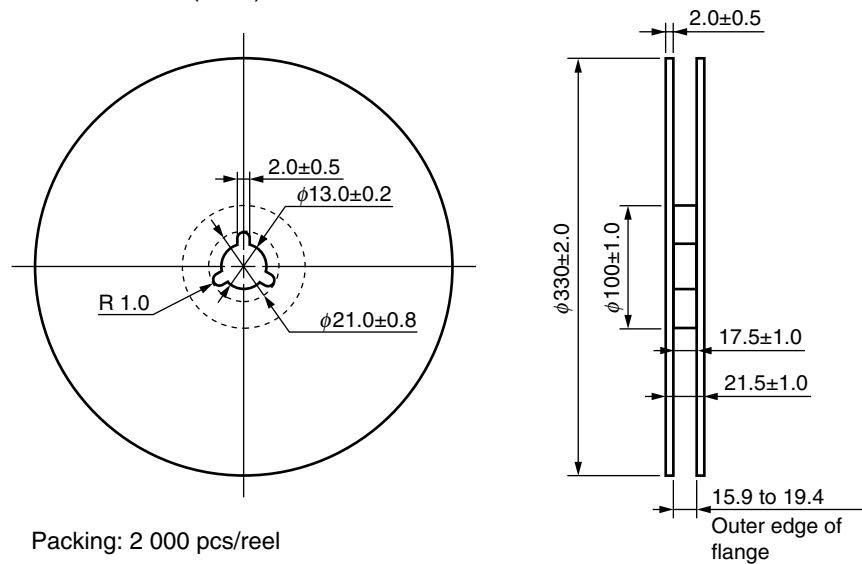
Outline and Dimensions (Tape)



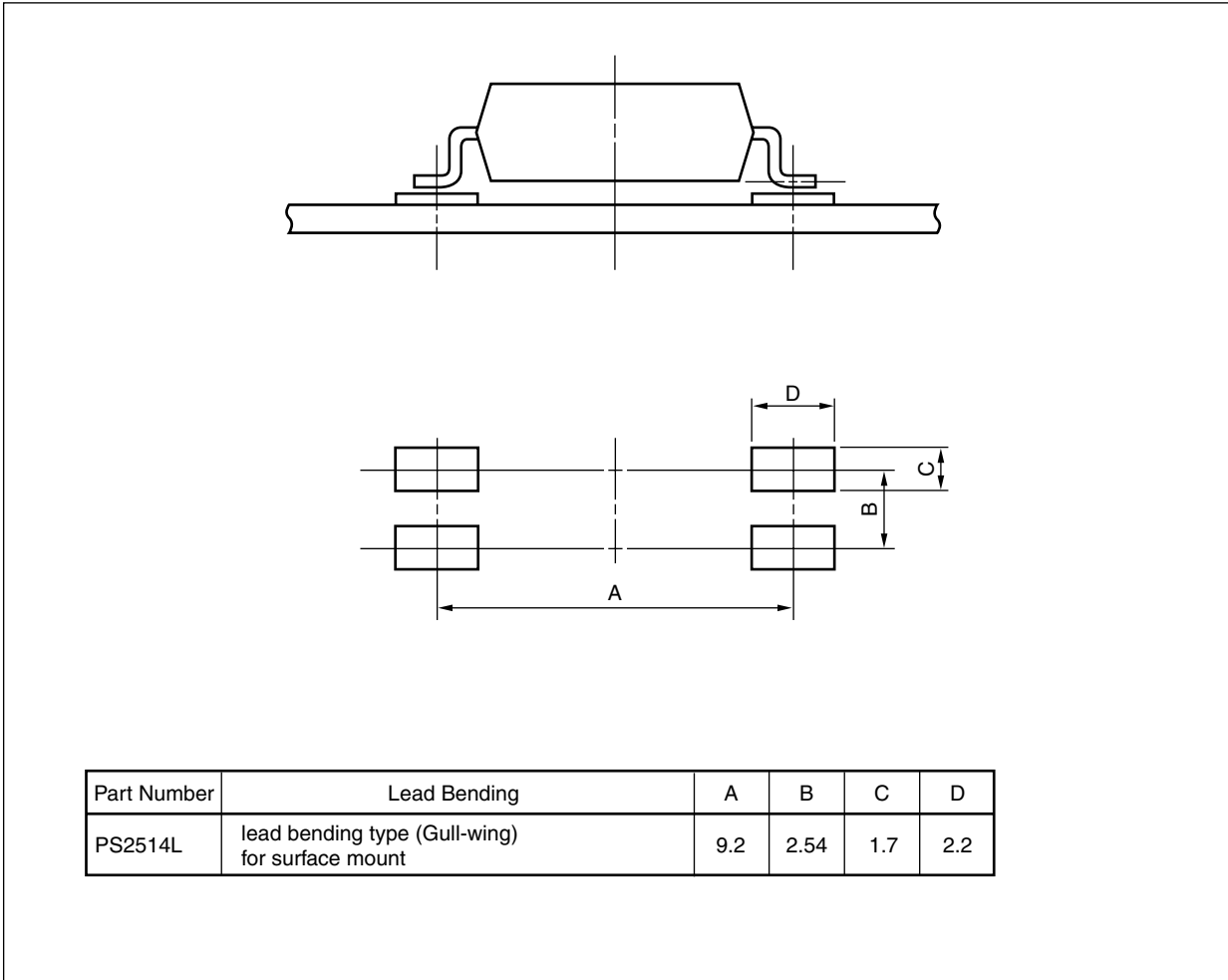
Tape Direction



Outline and Dimensions (Reel)



<R> RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)

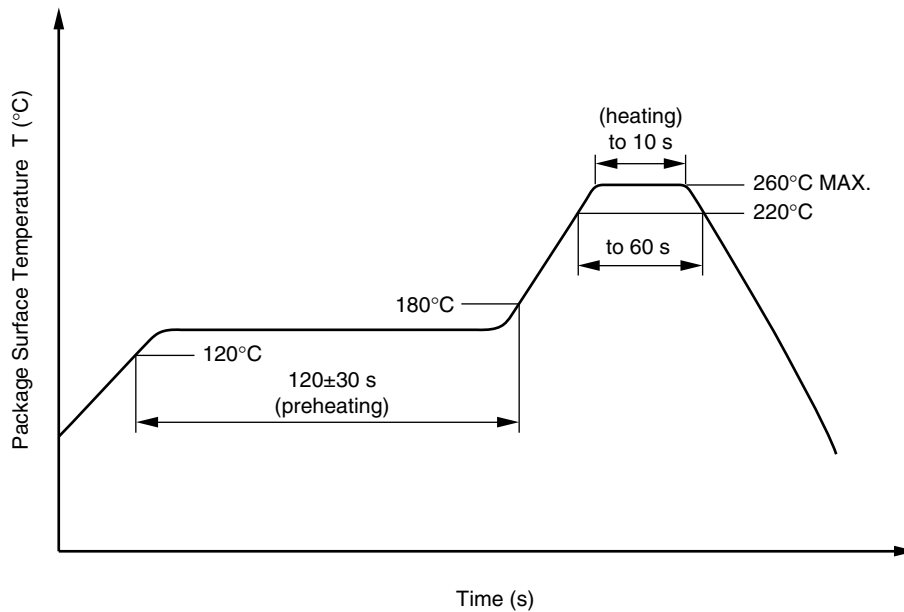


## &lt;R&gt; NOTES ON HANDLING

**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.

**(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 corrector-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.

## &lt;R&gt; SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

Parameter	Symbol	Spec.	Unit
Climatic test class (IEC 60068-1/DIN EN 60068-1)		55/100/21	
Dielectric strength maximum operating isolation voltage	$U_{IORM}$	890	$V_{peak}$
Test voltage (partial discharge test, procedure a for type test and random test) $U_{pr} = 1.5 \times U_{IORM}, P_d < 5 \text{ pC}$	$U_{pr}$	1 335	$V_{peak}$
Test voltage (partial discharge test, procedure b for all devices) $U_{pr} = 1.875 \times U_{IORM}, P_d < 5 \text{ pC}$	$U_{pr}$	1 669	$V_{peak}$
Highest permissible overvoltage	$U_{TR}$	8 000	$V_{peak}$
Degree of pollution (DIN EN 60664-1 VDE0110 Part 1)		2	
Comparative tracking index (IEC 60112/DIN EN 60112 (VDE 0303 Part 11))	CTI	175	
Material group (DIN EN 60664-1 VDE0110 Part 1)		III a	
Storage temperature range	$T_{stg}$	-55 to +150	°C
Operating temperature range	$T_A$	-55 to +100	°C
Isolation resistance, minimum value $V_{IO} = 500 \text{ V dc at } T_A = 25^\circ\text{C}$ $V_{IO} = 500 \text{ V dc at } T_A \text{ MAX. at least } 100^\circ\text{C}$	$R_{is \text{ MIN.}}$ $R_{is \text{ MIN.}}$	$10^{12}$ $10^{11}$	$\Omega$ $\Omega$
Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve)			
Package temperature	$T_{si}$	175	°C
Current (input current $I_F$ , $P_{si} = 0$ )	$I_{si}$	400	mA
Power (output or total power dissipation)	$P_{si}$	700	mW
Isolation resistance $V_{IO} = 500 \text{ V dc at } T_A = T_{si}$	$R_{is \text{ MIN.}}$	$10^9$	$\Omega$

<b>Caution</b>	GaAs Products	<p>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.</p> <ul style="list-style-type: none"><li>• 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.<ol style="list-style-type: none"><li>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.</li><li>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.</li></ol></li><li>• Do not burn, destroy, cut, crush, or chemically dissolve the product.</li><li>• Do not lick the product or in any way allow it to enter the mouth.</li></ul>
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**Revision History****PS2514-1,PS2514L-1 Data Sheet**

<b>Rev.</b>	<b>Date</b>	<b>Description</b>	
		<b>Page</b>	<b>Summary</b>
0.01	May 28, 2010	–	First edition issued
1.00	Mar 19, 2012	Throughout	Preliminary Data Sheet -> Data Sheet
		Throughout	Safety standards approved
		p.1	Addition of Pb-Free product
		p.3	Modification of <b>MARKING EXAMPLE</b>
		p.4	Modification of <b>ORDERING INFORMATION</b>
		pp.6 to 8	Addition of <b>TYPICAL CHARACTERISTICS</b>
		p.10	Modification of <b>RECOMMENDED MOUNT PAD DIMENSIONS</b>
		pp.11 to 12	Addition of <b>NOTES ON HANDLING</b>
p.13	Addition of <b>SPECIFICATION OF VDE MARKS LICENSE DOCUMENT</b>		

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