

# PHOTOCOUPLER

## PS9313L, PS9313L2

**1 Mbps, OPEN COLLECTOR OUTPUT TYPE,  
HIGH CMR, INTELLIGENT POWER MODULE DRIVE  
8 mm CREEPAGE 6-PIN SDIP PHOTOCOUPLER –NEPOC Series–**

### DESCRIPTION

The PS9313L and PS9313L2 are optical coupled isolators containing a GaAlAs LED on the input side and a photo diode and a signal processing circuit on the output side on one chip.

The PS9313L and PS9313L2 are specified high CMR, high CTR and pulse width distortion with operating temperature. It is suitable for IPM drive.

The PS9313L is lead bending type (Gull-wing) for surface mounting.

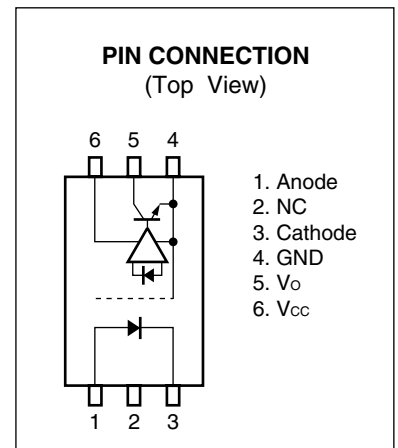
The PS9313L2 is lead bending type for long creepage distance (Gull-wing) for surface mount.

### FEATURES

- High common mode transient immunity ( $CM_H, CM_L = \pm 15 \text{ kV}/\mu\text{s}$  MIN.)
- Half size of 8-pin DIP
- Long creepage distance (8 mm MIN. : PS9313L2)
- High-speed response ( $t_{PHL} = 500 \text{ ns}$  MAX.,  $t_{PLH} = 750 \text{ ns}$  MAX.)
- <R> • Maximum propagation delays ( $t_{PLH} - t_{PHL} = 220 \text{ ns}$  TYP.)
- <R> • Pulse width distortion ( $|t_{PHL} - t_{PLH}| = 220 \text{ ns}$  TYP.)
- High isolation voltage ( $BV = 5\,000 \text{ Vr.m.s.}$ )
- Open collector output
- Pb-Free product

### APPLICATIONS

- IPM Driver
- General purpose inverter



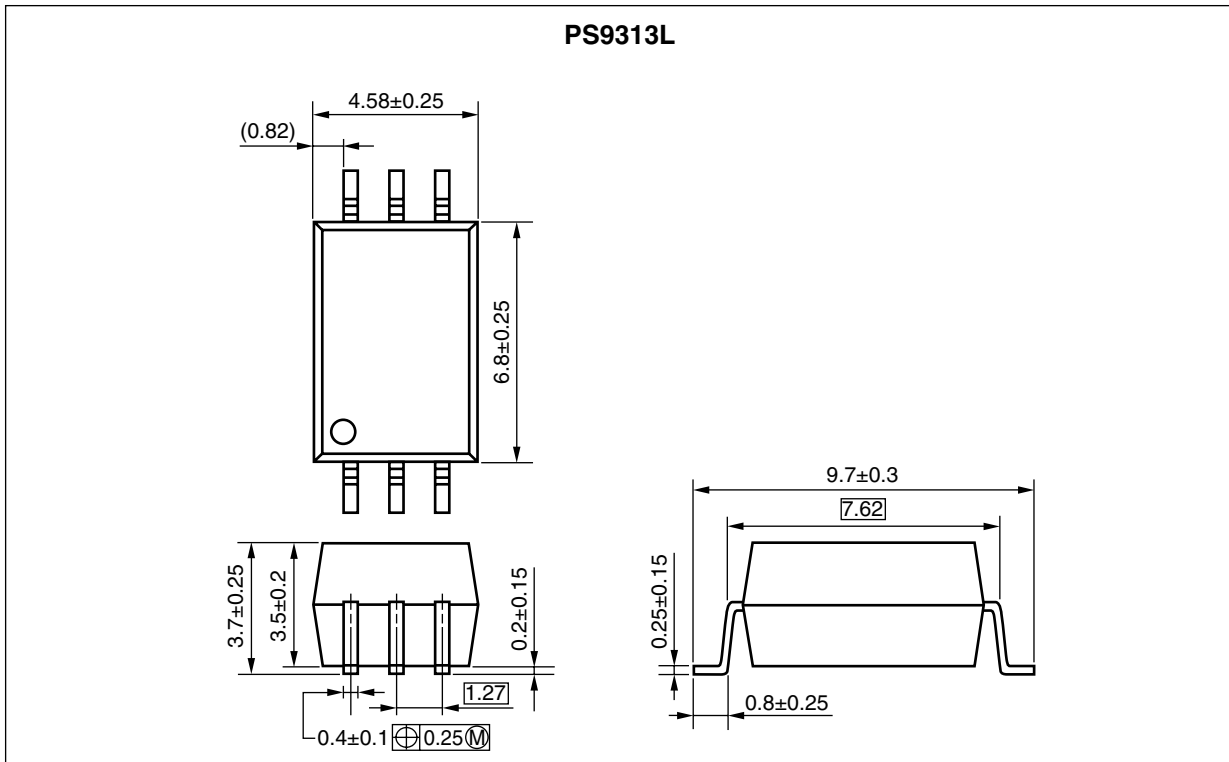
### TRUTH TABLE

LED	Output
ON	L
OFF	H

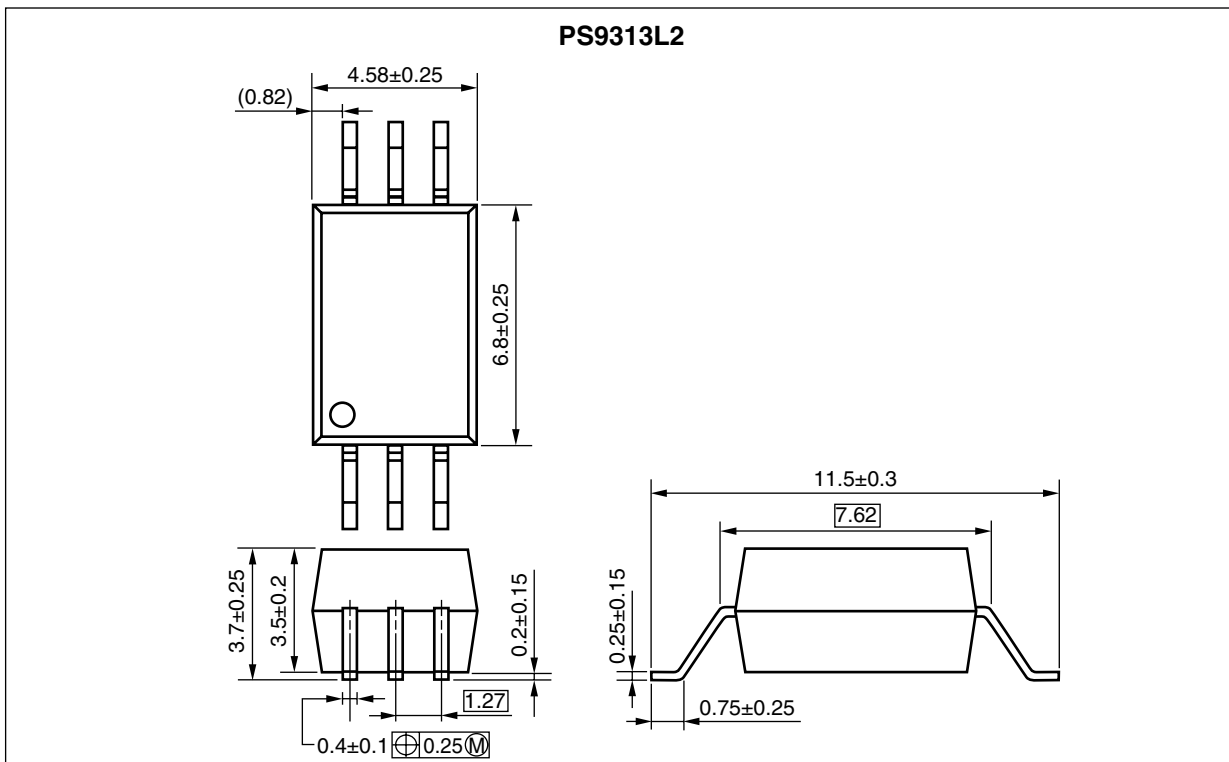
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PACKAGE DIMENSIONS (UNIT: mm)

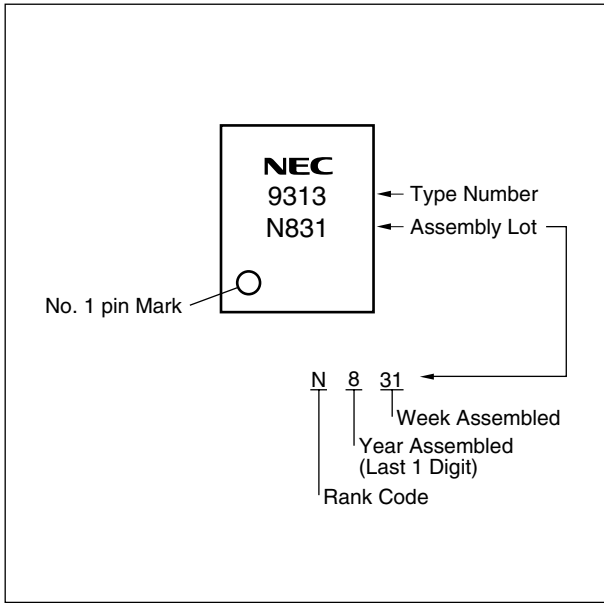
Lead Bending Type (Gull-wing) For Surface Mount



Lead Bending Type For Long Creepage Distance (Gull-wing) For Surface Mount



<R> **MARKING EXAMPLE**



**PHOTOCOUPLER CONSTRUCTION**

Parameter	PS9313L	PS9313L2
Air Distance (MIN.)	7 mm	8 mm
Outer Creepage Distance (MIN.)	7 mm	8 mm
Isolation Distance (MIN.)	0.4 mm	0.4 mm

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C, unless otherwise specified)**

Parameter		Symbol	Ratings	Unit
Diode	Forward Current <sup>1</sup>	I <sub>F</sub>	25	mA
	Reverse Voltage	V <sub>R</sub>	5	V
Detector	Supply Voltage	V <sub>CC</sub>	-0.5 to +35	V
	Output Voltage	V <sub>O</sub>	-0.5 to +35	V
	Output Current	I <sub>O</sub>	15	mA
	Power Dissipation <sup>2</sup>	P <sub>C</sub>	100	mW
Isolation Voltage <sup>3</sup>		BV	5 000	Vr.m.s.
Operating Ambient Temperature		T <sub>A</sub>	-40 to +110	°C
Storage Temperature		T <sub>stg</sub>	-55 to +125	°C

\*1 Reduced to 0.33 mA/°C at T<sub>A</sub> = 70°C or more.

\*2 Reduced to 2.0 mW/°C at T<sub>A</sub> = 75°C or more.

\*3 AC voltage for 1 minute at T<sub>A</sub> = 25°C, RH = 60% between input and output.  
Pins 1-3 shorted together, 4-6 shorted together.

**RECOMMENDED OPERATING CONDITIONS**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V <sub>CC</sub>	4.5	15	30	V
Output Voltage	V <sub>O</sub>	0		30	V
Forward Current (ON)	I <sub>F (ON)</sub>	8		12	mA
Forward Voltage (OFF)	V <sub>F (OFF)</sub>	0		0.8	V

<R> ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = -40 to +110°C, V<sub>CC</sub> = 15 V, unless otherwise specified)

Parameter		Symbol	Conditions	MIN.	TYP.*1	MAX.	Unit
Diode	Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 10 mA, T <sub>A</sub> = 25°C	1.2	1.56	1.9	V
	Reverse Current	I <sub>R</sub>	V <sub>R</sub> = 3 V, T <sub>A</sub> = 25°C			10	μA
	Terminal Capacitance	C <sub>t</sub>	V = 0 V, f = 1 MHz		60		pF
Detector	Low Level Output Voltage	V <sub>OL</sub>	I <sub>F</sub> = 10 mA, I <sub>OL</sub> = 2.4 mA		0.13	0.6	V
	High Level Output Current	I <sub>OH</sub>	V <sub>CC</sub> = 30 V, V <sub>F</sub> = 0.8 V		1.0	50	μA
	High Level Supply Current	I <sub>COH</sub>	V <sub>CC</sub> = 30 V, V <sub>F</sub> = 0.8 V, V <sub>O</sub> = open		0.6	1.3	mA
	Low Level Supply Current	I <sub>COL</sub>	V <sub>CC</sub> = 30 V, I <sub>F</sub> = 10 mA, V <sub>O</sub> = open		0.7	1.3	mA
Coupled	Threshold Input Current (H → L)	I <sub>FHL</sub>	V <sub>O</sub> = 0.8 V, I <sub>O</sub> = 0.75 mA		0.75	5.0	mA
	Current Transfer Ratio (I <sub>C</sub> /I <sub>F</sub> )	CTR	I <sub>F</sub> = 10 mA, V <sub>O</sub> = 0.6 V	44	110		%
	Isolation Resistance	R <sub>I-O</sub>	V <sub>I-O</sub> = 1 kV <sub>DC</sub>	10 <sup>11</sup>			Ω
	Isolation Capacitance	C <sub>I-O</sub>	V = 0 V, f = 1 MHz		0.7		pF
	Propagation Delay Time (H → L)	t <sub>PHL</sub>	I <sub>F</sub> = 10 mA, R <sub>L</sub> = 20 kΩ, C <sub>L</sub> = 100 pF, V <sub>THHL</sub> = 1.5 V, V <sub>THLH</sub> = 2.0 V		240	500	ns
	Propagation Delay Time (L → H)	t <sub>PLH</sub>			460	750	
	Maximum Propagation Delays	t <sub>PLH</sub> -t <sub>PHL</sub>		-200	220	650	
	Pulse Width Distortion (PWD)	t <sub>PHL</sub> -t <sub>PLH</sub>			220	650	
	Common Mode Transient Immunity at High Level Output	CM <sub>H</sub>	T <sub>A</sub> = 25°C, I <sub>F</sub> = 0 mA, V <sub>O</sub> > 3.0 V, V <sub>CM</sub> = 1.5 kV, R <sub>L</sub> = 20 kΩ, C <sub>L</sub> = 100 pF	15			kV/μs
	Common Mode Transient Immunity at Low Level Output	CM <sub>L</sub>	T <sub>A</sub> = 25°C, I <sub>F</sub> = 10 mA, V <sub>O</sub> < 1.0 V, V <sub>CM</sub> = 1.5 kV, R <sub>L</sub> = 20 kΩ, C <sub>L</sub> = 100 pF	15			kV/μs

\*1 Typical values at T<sub>A</sub> = 25°C.

**USAGE CAUTIONS**

1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. By-pass capacitor of 0.1  $\mu$ F is used between Vcc and GND near device. Also, ensure that the distance between the leads of the photocoupler and capacitor is no more than 10 mm.
3. Avoid storage at a high temperature and high humidity.

**NOTES ON HANDLING****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.

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<p><b>Caution</b> GaAs Products</p>	<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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