

### HIGH CMR, 10 Mbps, OPEN COLLECTOR OUTPUT TYPE, 8 mm CREEPAGE 6-PIN SDIP PHOTOCOUPLER –NEPOC Series–

#### DESCRIPTION

The PS9317L and PS9317L2 are optical coupled high-speed, active low type isolators containing a GaAlAs LED on the input side and a photodiode and a signal processing circuit on the output side on one chip.

The PS9317L and PS9317L2 are designed specifically for high common mode transient immunity (CMR) and low pulse width distortion.

The PS9317L is lead bending type (Gull-wing) for surface mounting.

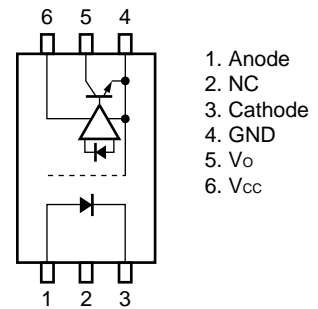
The PS9317L2 is lead bending type for long creepage distance (Gull-wing) for surface mount.

#### FEATURES

- Pulse width distortion ( $|t_{PHL} - t_{PLH}| = 35 \text{ ns MAX.}$ )
- High common mode transient immunity ( $CM_{IL}, CM_{OL} = \pm 15 \text{ kV}/\mu\text{s MIN.}$ )
- Half size of 8-pin DIP
- Long creepage distance (8 mm MIN. : PS9317L2)
- High-speed (10 Mbps)
- High isolation voltage ( $BV = 5\,000 \text{ Vr.m.s.}$ )
- Open collector output
- Pb-Free product
- Safety standards
  - UL approved: File No. E72422
  - CSA approved: No. CA 101391
  - DIN EN60747-5-2 (VDE0884 Part2) approved: No. 40024069 (Option)

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#### PIN CONNECTION (Top View)



#### APPLICATIONS

- Measurement equipment
- PDP
- FA Network

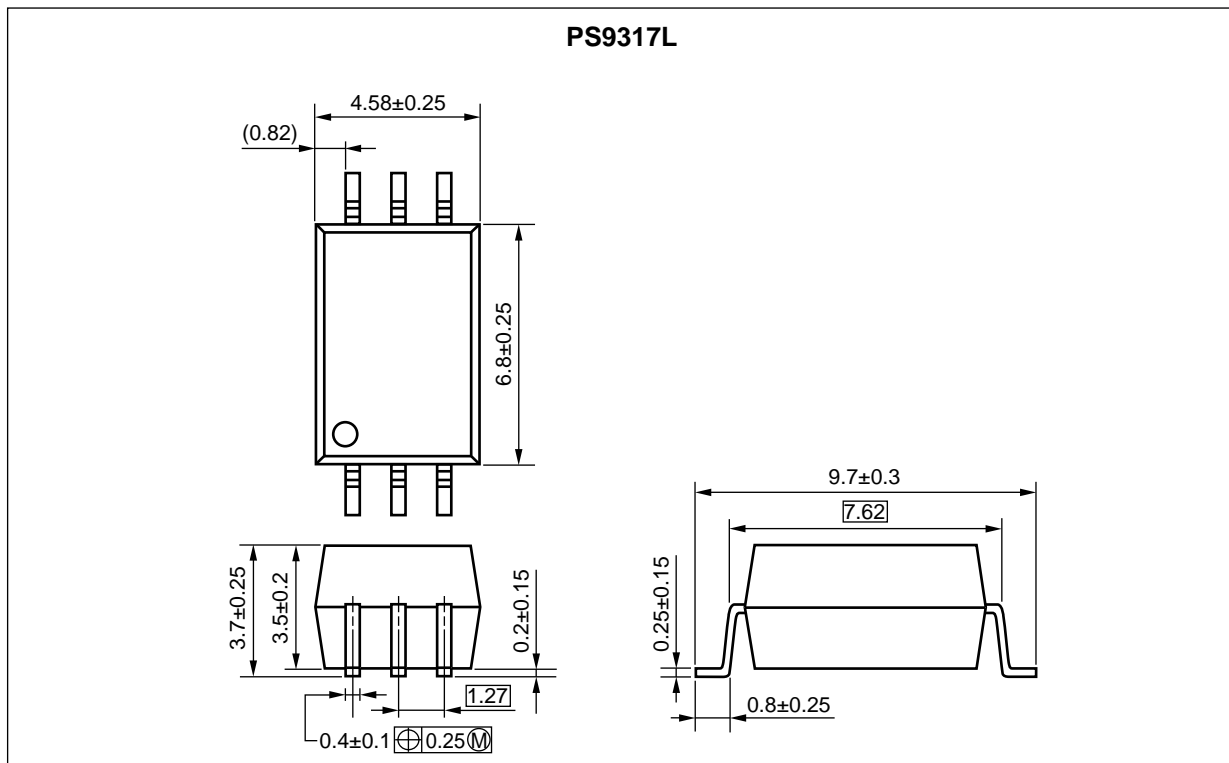
#### TRUTH TABLE

LED	Output
ON	L
OFF	H

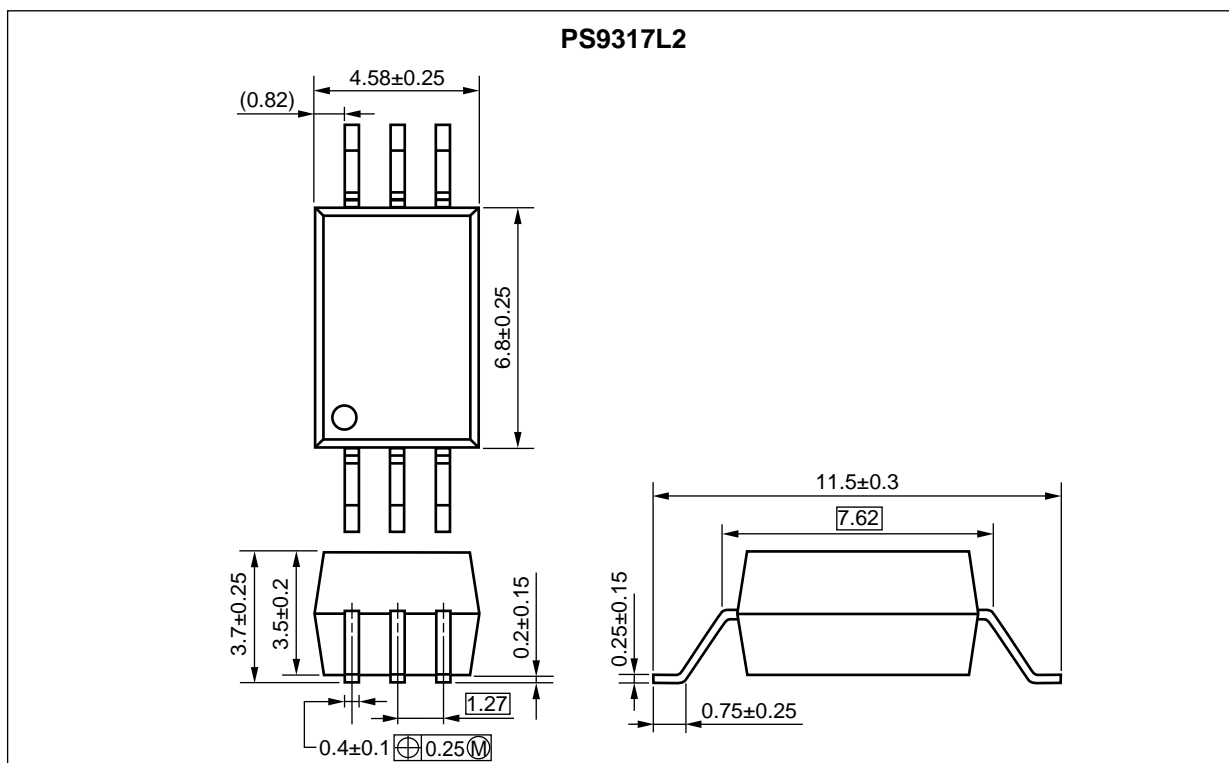
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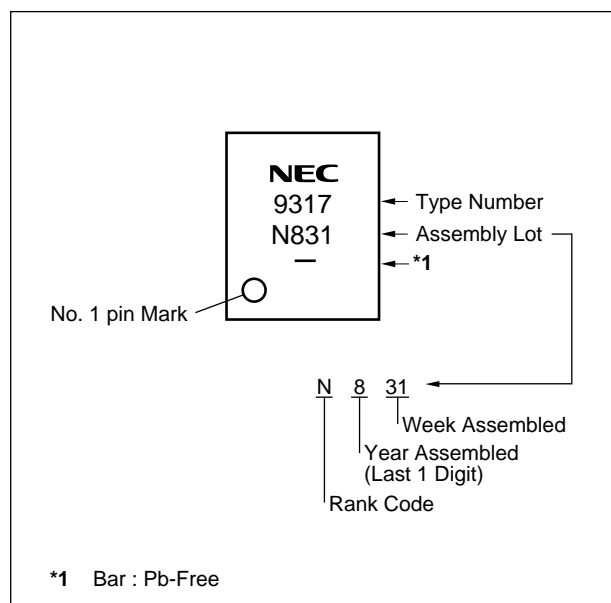
**PACKAGE DIMENSIONS (UNIT: mm)**

**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	PS9317L	PS9317L2
Air Distance (MIN.)	7 mm	8 mm
Outer Creepage Distance (MIN.)	7 mm	8 mm
Isolation Distance (MIN.)	0.4 mm	0.4 mm

**<R> ORDERING INFORMATION**

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number <sup>*1</sup>
PS9317L	PS9317L-AX	Pb-Free (Ni/Pd/Au)	20 pcs (Tape 20 pcs cut)	Standard products (UL, CSA approved)	PS9317L
PS9317L-E3	PS9317L-E3-AX		Embossed Tape 2 000 pcs/reel		
PS9317L2	PS9317L2-AX		20 pcs (Tape 20 pcs cut)	DIN EN60747-5-2 (VDE0884 Part2)	PS9317L2
PS9317L2-E3	PS9317L2-E3-AX		Embossed Tape 2 000 pcs/reel		
PS9317L-V	PS9317L-V-AX		20 pcs (Tape 20 pcs cut)	Approved (Option)	PS9317L
PS9317L-E3-V	PS9317L-E3-V-AX		Embossed Tape 2 000 pcs/reel		
PS9317L2-V	PS9317L2-V-AX		20 pcs (Tape 20 pcs cut)	Approved (Option)	PS9317L2
PS9317L2-E3-V	PS9317L2-E3-V-AX		Embossed Tape 2 000 pcs/reel		

\*1 For the application of the Safety Standard, following part number should be used.

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

Parameter		Symbol	Ratings	Unit
Diode	Forward Current <sup>*1</sup>	$I_F$	30	mA
	Reverse Voltage	$V_R$	5	V
Detector	Supply Voltage	$V_{CC}$	7	V
	Output Voltage	$V_O$	7	V
	Output Current	$I_O$	25	mA
	Power Dissipation <sup>*2</sup>	$P_C$	40	mW
Isolation Voltage <sup>*3</sup>		BV	5 000	Vr.m.s.
Operating Ambient Temperature		$T_A$	-40 to +85	$^\circ\text{C}$
Storage Temperature		$T_{stg}$	-55 to +125	$^\circ\text{C}$

\*1 Reduced to 0.3 mA/ $^\circ\text{C}$  at  $T_A = 25^\circ\text{C}$  or more.

\*2 Applies to output pin  $V_O$  (collector pin). Reduced to 1.5 mW/ $^\circ\text{C}$  at  $T_A = 65^\circ\text{C}$  or more.

\*3 AC voltage for 1 minute at  $T_A = 25^\circ\text{C}$ , RH = 60% between input and output.

Pins 1-3 shorted together, 4-6 shorted together.

**RECOMMENDED OPERATING CONDITIONS**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Low Level Input Voltage	$V_{FL}$	0		0.8	V
High Level Input Current	$I_{FH}$	6		12	mA
Supply Voltage	$V_{CC}$	4.5	5.0	5.5	V
TTL ( $R_L = 1\text{ k}\Omega$ , loads)	N			5	
Pull-up Resistor	$R_L$	330		4 k	$\Omega$

**ELECTRICAL CHARACTERISTICS ( $T_A = -40$  to  $+85^\circ\text{C}$ , unless otherwise specified)**

Parameter		Symbol	Conditions	MIN.	TYP.* <sup>1</sup>	MAX.	Unit
Diode	Forward Voltage	$V_F$	$I_F = 10\text{ mA}$ , $T_A = 25^\circ\text{C}$	1.2	1.56	1.9	V
	Reverse Current	$I_R$	$V_R = 3\text{ V}$ , $T_A = 25^\circ\text{C}$			10	$\mu\text{A}$
	Terminal Capacitance	$C_t$	$V = 0\text{ V}$ , $f = 1\text{ MHz}$ , $T_A = 25^\circ\text{C}$		60		pF
Detector	High Level Output Current	$I_{OH}$	$V_{CC} = V_O = 5.5\text{ V}$ , $V_F = 0.8\text{ V}$		1	100	$\mu\text{A}$
	Low Level Output Voltage* <sup>2</sup>	$V_{OL}$	$V_{CC} = 5.5\text{ V}$ , $I_F = 5\text{ mA}$ , $I_{OL} = 13\text{ mA}$		0.2	0.6	V
	High Level Supply Current	$I_{CCH}$	$V_{CC} = 5.5\text{ V}$ , $I_F = 0\text{ mA}$ , $V_O = \text{open}$		4	7	mA
	Low Level Supply Current	$I_{CCL}$	$V_{CC} = 5.5\text{ V}$ , $I_F = 10\text{ mA}$ , $V_O = \text{open}$		6	10	mA
Coupled	Threshold Input Current (H $\rightarrow$ L)	$I_{FHL}$	$V_{CC} = 5\text{ V}$ , $V_O = 0.8\text{ V}$ , $R_L = 350\ \Omega$		2.5	5	mA
	Isolation Resistance	$R_{I-O}$	$V_{I-O} = 1\text{ kV}_{DC}$ , $R_H = 40$ to $60\%$ , $T_A = 25^\circ\text{C}$	$10^{11}$			$\Omega$
	Isolation Capacitance	$C_{I-O}$	$V = 0\text{ V}$ , $f = 1\text{ MHz}$ , $T_A = 25^\circ\text{C}$		0.7		pF
	Propagation Delay Time (H $\rightarrow$ L)	$t_{PHL}$	$V_{CC} = 5\text{ V}$ , $R_L = 350\ \Omega$ , $C_L = 15\text{ pF}$ , $I_F = 7.5\text{ mA}$ , $V_{THLH} = V_{THLH} = 1.5\text{ V}$	$T_A = 25^\circ\text{C}$	40	75	ns
						100	
	Propagation Delay Time (L $\rightarrow$ H)	$t_{PLH}$		$T_A = 25^\circ\text{C}$	35	75	
						100	
	Rise Time	$t_r$			20		
	Fall Time	$t_f$			5		
	Pulse Width Distortion (PWD)	$ t_{PHL} - t_{PLH} $			5	35	
	Propagation Delay Skew	$t_{PSK}$				40	
	Common Mode Transient Immunity at High Level Output	$CM_H$	$V_{CC} = 5\text{ V}$ , $R_L = 350\ \Omega$ , $T_A = 25^\circ\text{C}$ , $I_F = 0\text{ mA}$ , $V_O > 2\text{ V}$ , $V_{CM} = 1.5\text{ kV}$	15			kV/ $\mu\text{s}$
	Common Mode Transient Immunity at Low Level Output	$CM_L$	$V_{CC} = 5\text{ V}$ , $R_L = 350\ \Omega$ , $T_A = 25^\circ\text{C}$ , $I_F = 7.5\text{ mA}$ , $V_O < 0.8\text{ V}$ , $V_{CM} = 1.5\text{ kV}$	15			kV/ $\mu\text{s}$

\*1 Typical values at  $T_A = 25^\circ\text{C}$ .

\*2 Because  $V_{OL}$  of 2 V or more may be output when LED current input and when output supply of  $V_{CC} = 2.6\text{ V}$  or less, it is important to confirm the characteristics (operation with the power supply on and off) during design, before using this device.

**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.

**<R> SPECIFICATION OF VDE MARKS LICENSE DOCUMENT**

Parameter		Symbol	Speck	Unit
Application classification (DIN EN 60664-1 VDE0110 Part 1) for rated line voltages ≤ 300 Vr.m.s. for rated line voltages ≤ 600 Vr.m.s.			IV III	
Climatic test class (DIN EN 60664-1 VDE0110)			40/85/21	
Dielectric strength maximum operating isolation voltage Test voltage (partial discharge test, procedure a for type test and random test) $U_{pr} = 1.5 \times U_{IORM}$ , $P_d < 5 \text{ pC}$		$U_{IORM}$ $U_{pr}$	1 130 1 695	$V_{peak}$ $V_{peak}$
Test voltage (partial discharge test, procedure b for all devices) $U_{pr} = 1.875 \times U_{IORM}$ , $P_d < 5 \text{ pC}$		$U_{pr}$	2 119	$V_{peak}$
Highest permissible overvoltage		$U_{TR}$	8 000	$V_{peak}$
Degree of pollution (DIN EN 60664-1 VDE0110 Part 1)			2	
Clearance distance	PS9317L		>7.0	mm
	PS9317L2		>8.0	
Creepage distance	PS9317L		>7.0	mm
	PS9317L2		>8.0	
Comparative tracking index (DIN IEC 112/VDE 0303 Part 1)		CTI	175	
Material group (DIN EN 60664-1 VDE0110 Part 1)			III a	
Storage temperature range		$T_{slg}$	−55 to +125	℃
Operating temperature range		$T_A$	−40 to +85	℃
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 $100^\circ\text{C}$		Ris MIN. Ris MIN.	$10^{12}$ $10^{11}$	$\Omega$ $\Omega$
Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve) Package temperature Current (input current $I_F$ , $Psi = 0$ ) Power (output or total power dissipation) Isolation resistance $V_{IO} = 500 \text{ V dc}$ at $T_A = T_{si}$		$T_{si}$ $I_{si}$ $Psi$  Ris MIN.	175 400 700  $10^9$	℃ mA mW  $\Omega$

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**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.