

**1 Mbps OPEN COLLECTOR OUTPUT TYPE**  
**5-PIN SOP (SO-5)**  
**HIGH-SPEED PHOTOCOUPLER**

-NEPOC Series-

**DESCRIPTION**

The PS9122 is an optical coupled high-speed, active low type isolator containing a GaAlAs LED on the input side and a photodiode and a signal processing circuit on the output side on one chip.

The PS9122 is a high-speed digital output type photocoupler designed specifically for low circuit current.

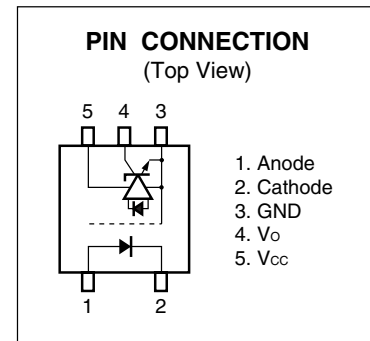
The PS9122 is in 5-pin plastic SOP (Small Outline Package) and is suitable for high density application.

**FEATURES**

- Supply Voltage  
N rank:  $V_{CC} = 3.3\text{ V}$   
L rank:  $V_{CC} = 5\text{ V}$
- Pulse width distortion ( $|t_{PHL} - t_{PLH}| = 200\text{ ns MAX.}$ )
- Small package (SO-5)
- High-speed (1 Mbps)
- High isolation voltage ( $BV = 3\ 750\text{ Vr.m.s.}$ )
- Open collector output
- Ordering number of taping product: PS9122-F3: 2 500 pcs/reel
- Pb-Free product

**APPLICATIONS**

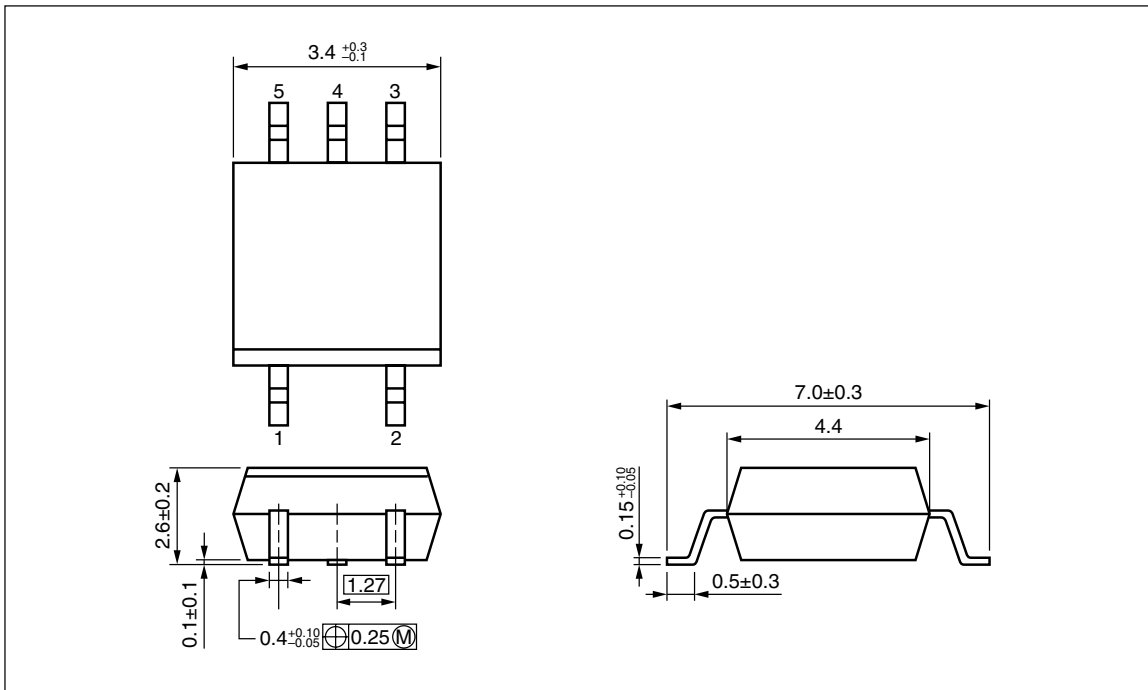
- PoE (Power over Ethernet)
- Measurement equipment
- FA Network

**TRUTH TABLE**

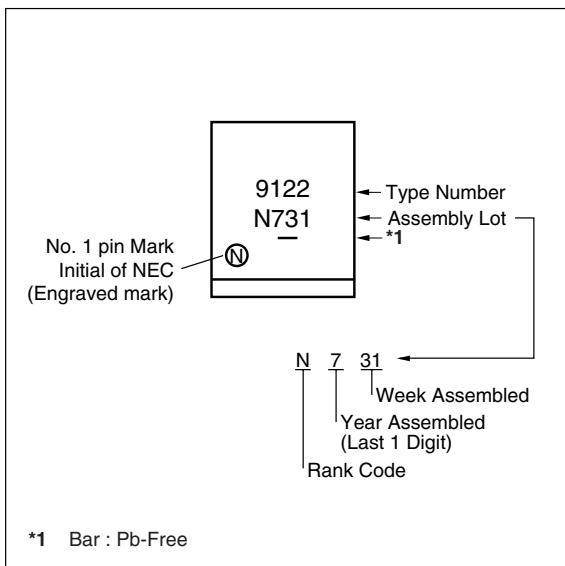
LED	Output
ON	L
OFF	H

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PACKAGE DIMENSIONS (UNIT: mm)



MARKING EXAMPLE



**ORDERING INFORMATION**

Part Number	Order Number	Rank	Solder Plating Specification	Packing Style	
PS9122	PS9122-AX	N <sup>1</sup>	Pb-Free	20 pcs (Tape 20 pcs cut)	
		L <sup>2</sup>			
PS9122-F3	PS9122-F3-AX	N <sup>1</sup>		Pb-Free	Embossed Tape 2 500 pcs/reel
		L <sup>2</sup>			

\*1 N rank: V<sub>CC</sub> = 3.3 V

\*2 L rank: V<sub>CC</sub> = 5 V

**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>	7	V
	Output Voltage	V <sub>O</sub>	7	V
	Output Current	I <sub>O</sub>	10	mA
	Power Dissipation <sup>2</sup>	P <sub>C</sub>	40	mW
Isolation Voltage <sup>3</sup>		BV	3 750	Vr.m.s.
Operating Ambient Temperature		T <sub>A</sub>	-40 to +100	°C
Storage Temperature		T <sub>stg</sub>	-55 to +125	°C

\*1 Reduced to 0.3 mA/°C at T<sub>A</sub> = 25°C or more.

\*2 Applies to output pin V<sub>O</sub> (collector pin). Reduced to 1.5 mW/°C at T<sub>A</sub> = 65°C or more.

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

Pins 1-2 shorted together, 3-5 shorted together.

**RECOMMENDED OPERATING CONDITIONS**

Parameter		Symbol	MIN.	TYP.	MAX.	Unit
Low Level Input Voltage		V <sub>FL</sub>	0		0.8	V
High Level Input Current		I <sub>FH</sub>	6.3	10	12.5	mA
Supply Voltage	N rank	V <sub>CC</sub>	2.7	3.3	3.6	V
	L rank		4.5	5.0	5.5	
TTL (R <sub>L</sub> = 1 kΩ, loads)		N			5	
Pull-up Resistor		R <sub>L</sub>	330		4 k	Ω

**ELECTRICAL CHARACTERISTICS: N rank (T<sub>A</sub> = -40 to +100°C, unless otherwise specified)**

Parameter		Symbol	Conditions	MIN.	TYP.* <sup>1</sup>	MAX.	Unit
Diode	Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 10 mA, T <sub>A</sub> = 25°C		1.6	1.8	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, T <sub>A</sub> = 25°C		30		pF
Detector	High Level Output Current	I <sub>OH</sub>	V <sub>CC</sub> = V <sub>O</sub> = 3.3 V, V <sub>F</sub> = 0.8 V		1	100	μA
	Low Level Output Voltage <sup>2</sup>	V <sub>OL</sub>	V <sub>CC</sub> = 3.3 V, I <sub>F</sub> = 5 mA, I <sub>OL</sub> = 13 mA		0.2	0.6	V
	High Level Supply Current	I <sub>CCH</sub>	V <sub>CC</sub> = 3.3 V, I <sub>F</sub> = 0 mA, V <sub>O</sub> = Open			2	mA
	Low Level Supply Current	I <sub>CCL</sub>	V <sub>CC</sub> = 3.3 V, I <sub>F</sub> = 10 mA, V <sub>O</sub> = Open			3	mA
Coupled	Threshold Input Current (H → L)	I <sub>FHL</sub>	V <sub>CC</sub> = 3.3 V, V <sub>O</sub> = 0.8 V, R <sub>L</sub> = 350 Ω			5	mA
	Isolation Resistance	R <sub>I-O</sub>	V <sub>I-O</sub> = 1 kV <sub>DC</sub> , R <sub>H</sub> = 40 to 60%, T <sub>A</sub> = 25°C	10 <sup>11</sup>			Ω
	Isolation Capacitance	C <sub>I-O</sub>	V = 0 V, f = 1 MHz, T <sub>A</sub> = 25°C		0.6		pF
	Propagation Delay Time (H → L)	t <sub>PHL</sub>	V <sub>CC</sub> = 3.3 V, R <sub>L</sub> = 350 Ω, I <sub>F</sub> = 7.5 mA, V <sub>THL</sub> = V <sub>THLH</sub> = 1.5 V			500	ns
	Propagation Delay Time (L → H)	t <sub>PLH</sub>				700	
	Pulse Width Distortion (PWD)	t <sub>PHL</sub> -t <sub>PLH</sub>	V <sub>CC</sub> = 3.3 V, R <sub>L</sub> = 350 Ω, I <sub>F</sub> = 7.5 mA, V <sub>THL</sub> = V <sub>THLH</sub> = 1.5 V			200	ns

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

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

**ELECTRICAL CHARACTERISTICS: L rank (T<sub>A</sub> = -40 to +100°C, unless otherwise specified)**

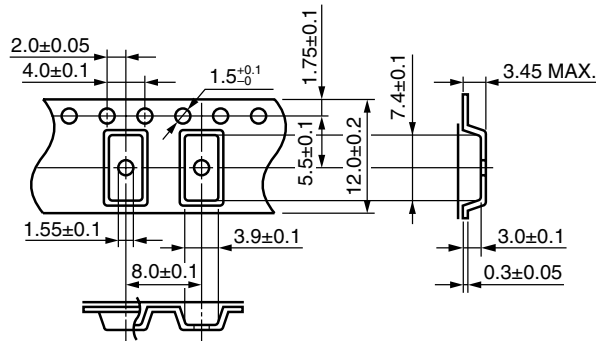
Parameter		Symbol	Conditions	MIN.	TYP.* <sup>1</sup>	MAX.	Unit
Diode	Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 10 mA, T <sub>A</sub> = 25°C		1.6	1.8	V
	Reverse Current	I <sub>R</sub>	V <sub>R</sub> = 3 V, T <sub>A</sub> = 25°C			10	μA
	Terminal Capacitance	C <sub>t</sub>	V = 0 V, f = 1 MHz, T <sub>A</sub> = 25°C		30		pF
Detector	High Level Output Current	I <sub>OH</sub>	V <sub>CC</sub> = V <sub>O</sub> = 5 V, V <sub>F</sub> = 0.8 V		1	100	μA
	Low Level Output Voltage <sup>2</sup>	V <sub>OL</sub>	V <sub>CC</sub> = 5 V, I <sub>F</sub> = 5 mA, I <sub>OL</sub> = 13 mA		0.2	0.6	V
	High Level Supply Current	I <sub>CCH</sub>	V <sub>CC</sub> = 5 V, I <sub>F</sub> = 0 mA, V <sub>O</sub> = Open			2.5	mA
	Low Level Supply Current	I <sub>CCL</sub>	V <sub>CC</sub> = 5 V, I <sub>F</sub> = 10 mA, V <sub>O</sub> = Open			3.5	mA
Coupled	Threshold Input Current (H → L)	I <sub>FHL</sub>	V <sub>CC</sub> = 5 V, V <sub>O</sub> = 0.8 V, R <sub>L</sub> = 350 Ω			5	mA
	Isolation Resistance	R <sub>I-O</sub>	V <sub>I-O</sub> = 1 kV <sub>DC</sub> , R <sub>H</sub> = 40 to 60%, T <sub>A</sub> = 25°C	10 <sup>11</sup>			Ω
	Isolation Capacitance	C <sub>I-O</sub>	V = 0 V, f = 1 MHz, T <sub>A</sub> = 25°C		0.6		pF
	Propagation Delay Time (H → L)	t <sub>PHL</sub>	V <sub>CC</sub> = 5 V, R <sub>L</sub> = 350 Ω, I <sub>F</sub> = 7.5 mA, V <sub>THHL</sub> = V <sub>THLH</sub> = 1.5 V			500	ns
	Propagation Delay Time (L → H)	t <sub>PLH</sub>				700	
	Pulse Width Distortion (PWD)	t <sub>PHL</sub> -t <sub>PLH</sub>	V <sub>CC</sub> = 5 V, R <sub>L</sub> = 350 Ω, I <sub>F</sub> = 7.5 mA, V <sub>THHL</sub> = V <sub>THLH</sub> = 1.5 V			200	ns

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

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

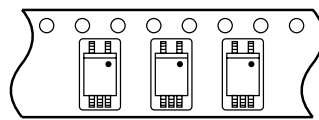
TAPING SPECIFICATIONS (UNIT: mm)

Outline and Dimensions (Tape)

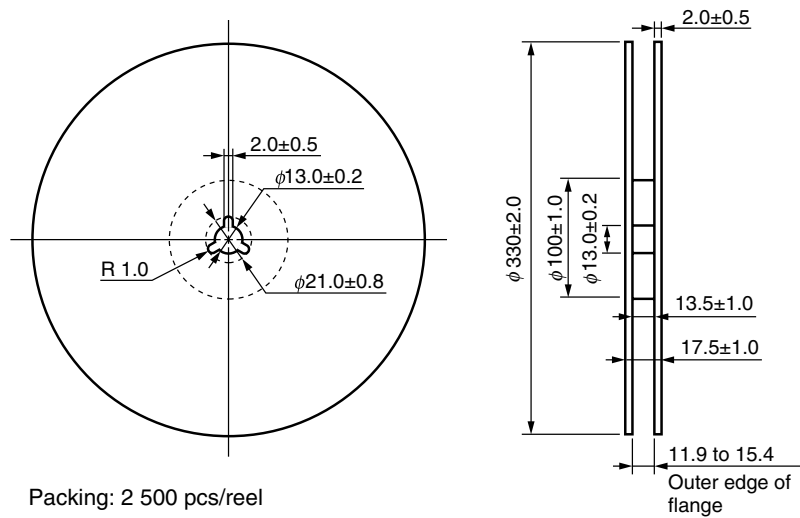


Tape Direction

PS9122-F3



Outline and Dimensions (Reel)



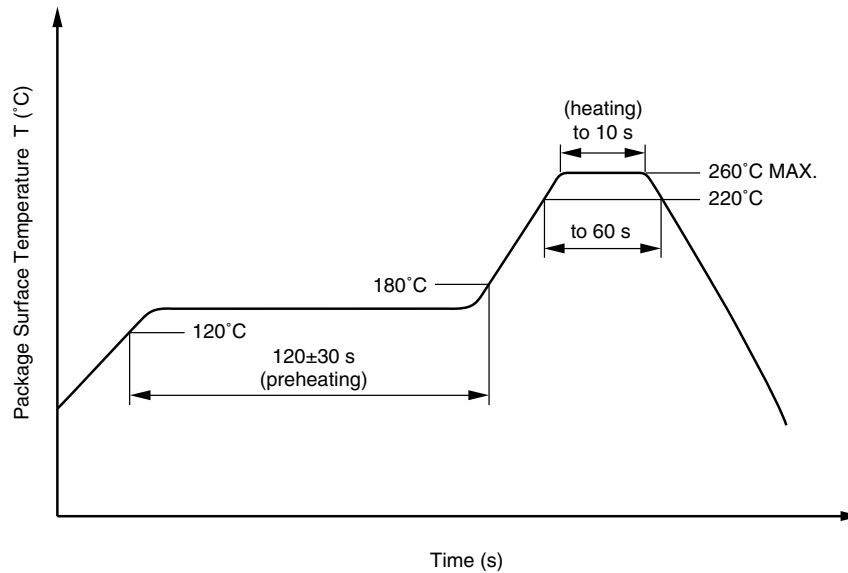
**NOTES ON HANDLING**

**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.

**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.



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M8E 02.11-1

<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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