

To our customers,

Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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PHOTOCOUPLER

PS9317L, PS9317L2

**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.

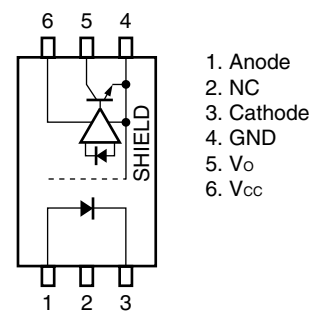
The PS9317L2 is lead bending type for long creepage distance (Gull-wing) for surface mount.

FEATURES

- Pulse width distortion ($|t_{PHL} - t_{PLH}| = 35 \text{ ns MAX.}$)
- High common mode transient immunity ($CMH, CML = \pm 15 \text{ kV}/\mu\text{s MIN.}$)
- 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: No. E72422
 - CSA approved: No. CA 101391 (CA5A, CAN/CSA-C22.2 60065, 60950)
 - DIN EN60747-5-2 (VDE0884 Part2) approved: No. 40024069 (Option)

<R>

PIN CONNECTION
(Top View)



APPLICATIONS

- Measurement equipment
- PDP
- FA Network

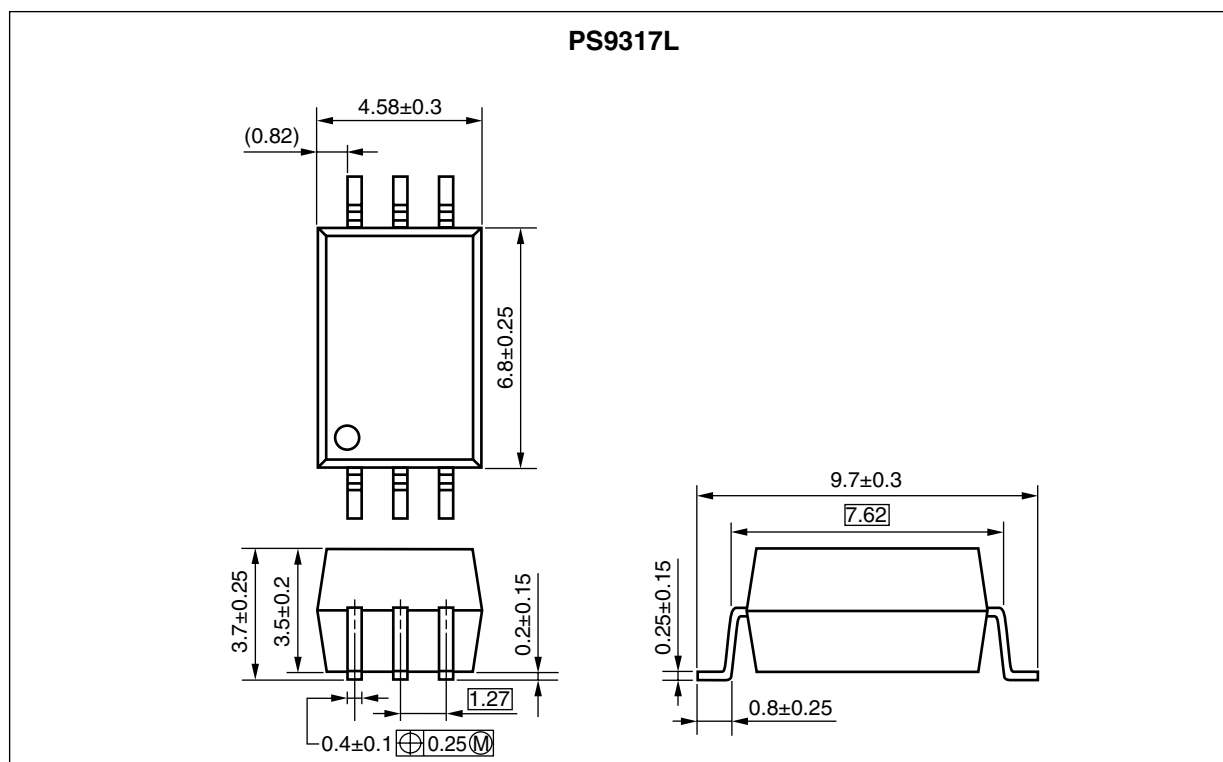
TRUTH TABLE

LED	Output
ON	L
OFF	H

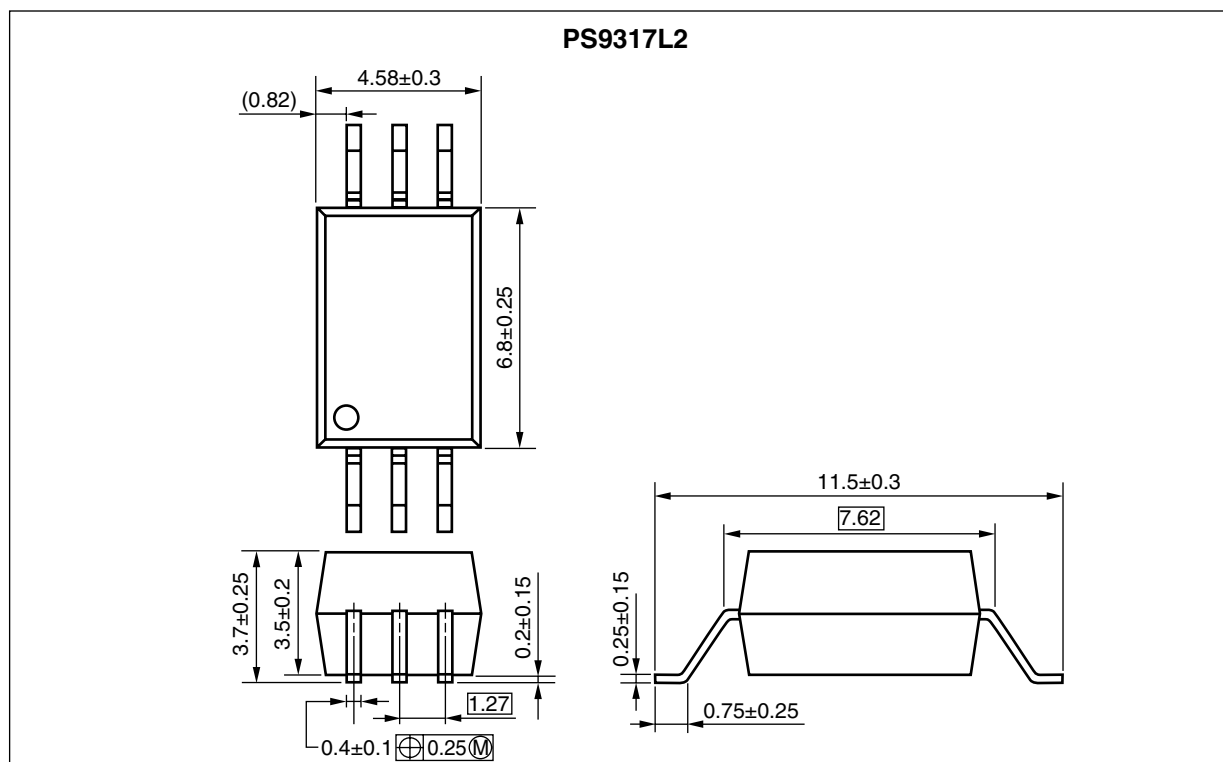
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PACKAGE DIMENSIONS (UNIT: mm)

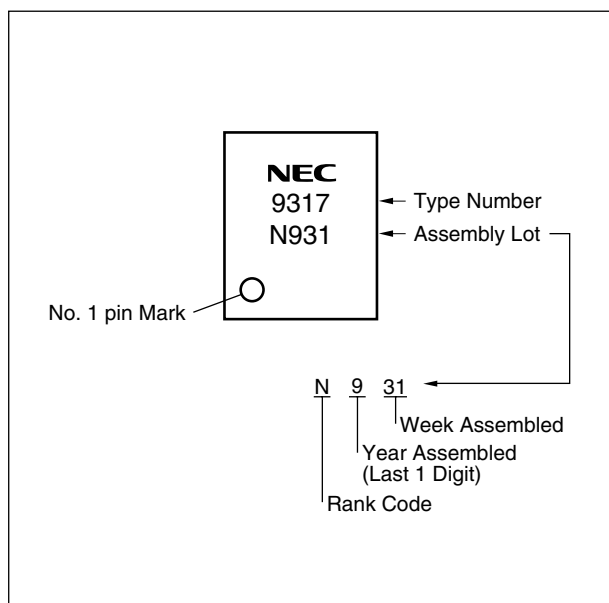
Lead Bending Type (Gull-wing) For Surface Mount



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

ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number ^{*1}
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-V-E3	PS9317L-V-E3-AX		Embossed Tape 2 000 pcs/reel		
PS9317L2-V	PS9317L2-V-AX		20 pcs (Tape 20 pcs cut)	Approved (Option)	PS9317L2
PS9317L2-V-E3	PS9317L2-V-E3-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°C, unless otherwise specified)

Parameter		Symbol	Ratings	Unit
Diode	Forward Current ^{*1}	I _F	20	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 ^{*2}	P _C	40	mW
Isolation Voltage ^{*3}		BV	5 000	Vr.m.s.
Operating Ambient Temperature		T _A	−40 to +85	°C
Storage Temperature		T _{stg}	−55 to +125	°C

*1 Reduced to 0.3 mA/°C at T_A = 65°C or more.

*2 Applies to output pin V_O (collector pin). Reduced to 1.5 mW/°C at T_A = 65°C or more.

*3 AC voltage for 1 minute at T_A = 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
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 kΩ, loads)	N			5	
Pull-up Resistor	R _L	330		4 k	Ω

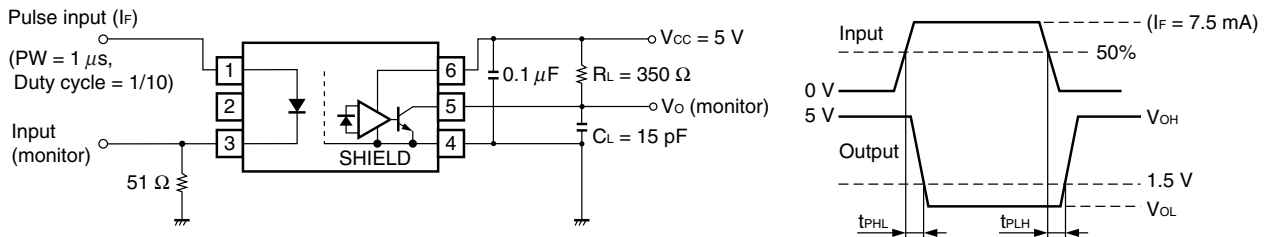
<R> ELECTRICAL CHARACTERISTICS ($T_A = -40$ to $+85^\circ\text{C}$, unless otherwise specified)

Parameter		Symbol	Conditions	MIN.	TYP. ^{*1}	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	μA
	Terminal Capacitance	C_t	$V = 0\text{ V}$, $f = 1\text{ MHz}$, $T_A = 25^\circ\text{C}$		30		pF
Detector	High Level Output Current	I_{OH}	$V_{CC} = V_O = 5.5\text{ V}$, $V_F = 0.8\text{ V}$		1	100	μA
	Low Level Output Voltage ^{*2}	V_{OL}	$V_{CC} = 5.5\text{ V}$, $I_F = 5\text{ mA}$, $I_{OL} = 13\text{ mA}$		0.16	0.6	V
	High Level Supply Current	I_{CCH}	$V_{CC} = 5.5\text{ V}$, $I_F = 0\text{ mA}$, $V_O = \text{open}$		3.5	7	mA
	Low Level Supply Current	I_{CCL}	$V_{CC} = 5.5\text{ V}$, $I_F = 10\text{ mA}$, $V_O = \text{open}$		6.5	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	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}			Ω
	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) ^{*3}	t_{PHL}	$V_{CC} = 5\text{ V}$, $R_L = 350\ \Omega$, $C_L = 15\text{ pF}$, $I_F = 7.5\text{ mA}$, $V_{THL} = V_{THLH} = 1.5\text{ V}$		40	75	ns
	Propagation Delay Time (L \rightarrow H) ^{*3}	t_{PLH}			35	75	
	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 ^{*4}	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/ μs
	Common Mode Transient Immunity at Low Level Output ^{*4}	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/ μs

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

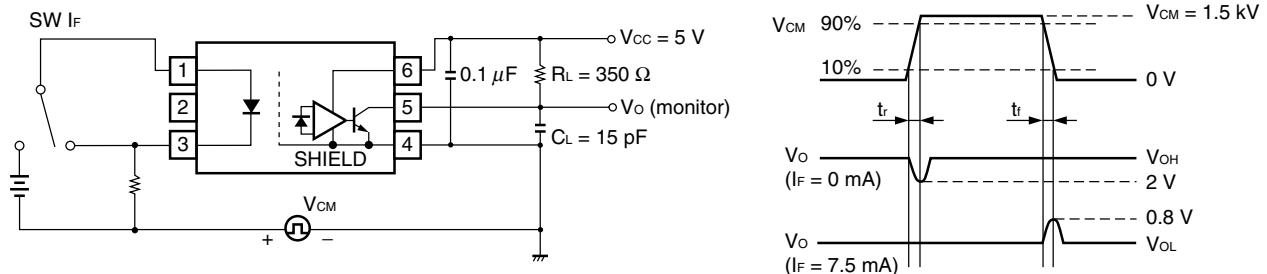
*2 Because V_{OL} of 2 V or more may be output when the LED current is input and when output supply of $V_{CC} = 2.6\text{ V}$ or less, it is important to confirm the characteristics (operation with the power supply on and off) during design, before using this device.

*3 Test circuit for propagation delay time



Remark C_L includes probe and stray wiring capacitance.

*4 Test circuit for common mode transient immunity



Remark C_L includes probe and stray wiring capacitance.

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 more than $0.1\ \mu\text{F}$ is used between V_{CC} and GND near device. Also, ensure that the distance between the leads of the photocoupler and capacitor is no more than 10 mm.
3. Pin 2 (which is an NC^{*1} pin) can either be connected directly to the GND pin on the LED side or left open. Unconnected pins should not be used as a bypass for signals or for any other similar purpose because this may degrade the internal noise environment of the device.

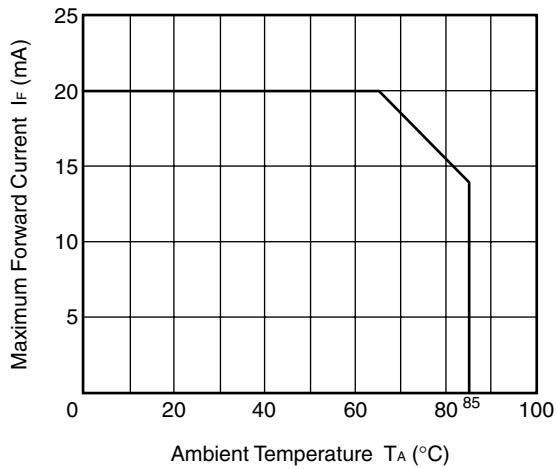
*1 NC: Not connected (No connection)

4. Avoid storage at a high temperature and high humidity.

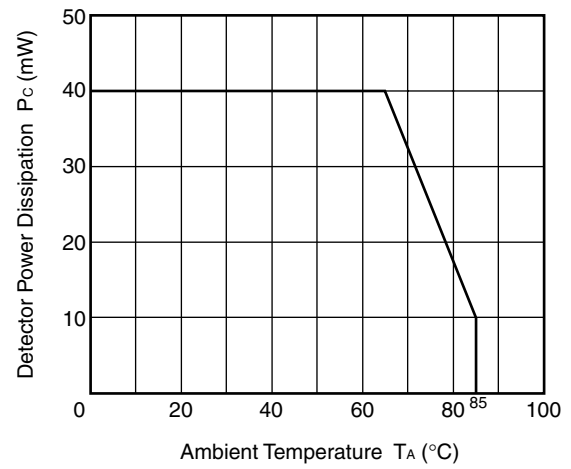
<R>

<R> **TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise specified)**

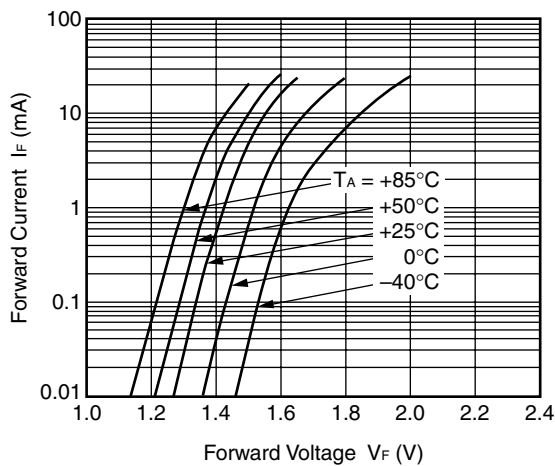
**MAXIMUM FORWARD CURRENT
vs. AMBIENT TEMPERATURE**



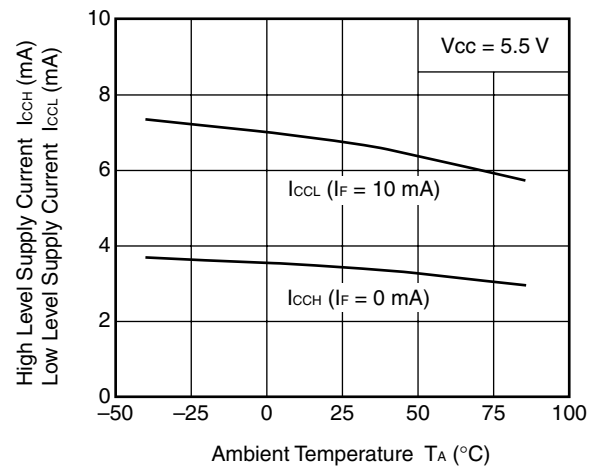
**DETECTOR POWER DISSIPATION
vs. AMBIENT TEMPERATURE**



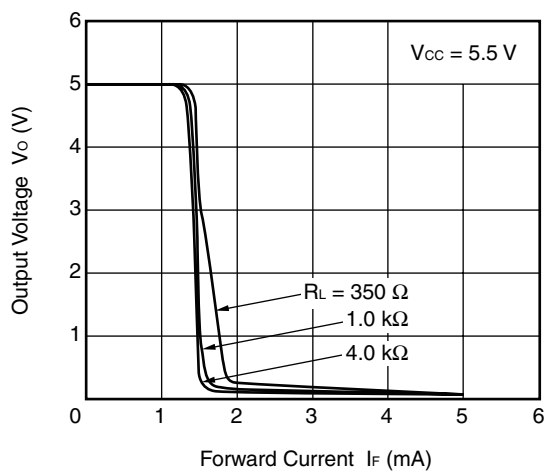
**FORWARD CURRENT vs.
FORWARD VOLTAGE**



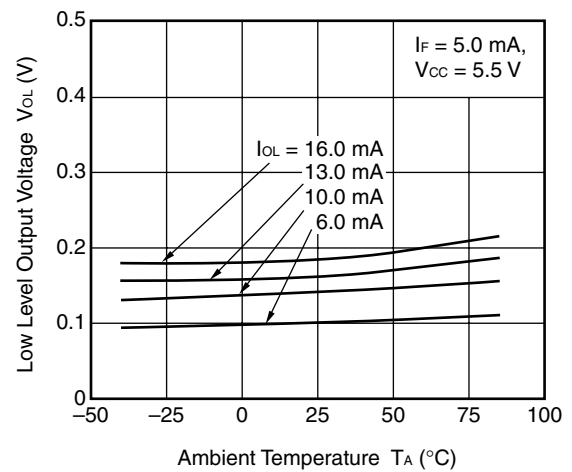
**SUPPLY CURRENT vs.
AMBIENT TEMPERATURE**



**OUTPUT VOLTAGE vs.
FORWARD CURRENT**

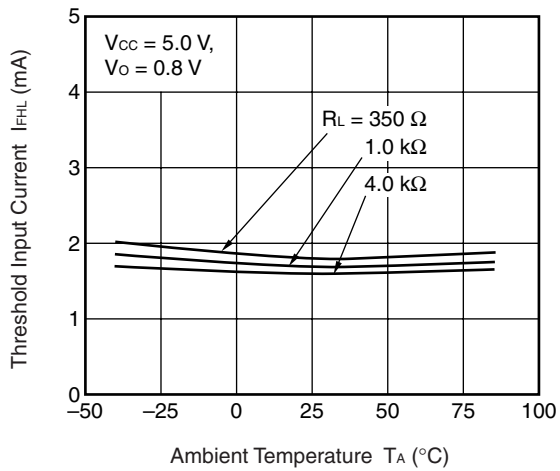


**LOW LEVEL OUTPUT VOLTAGE vs.
AMBIENT TEMPERATURE**

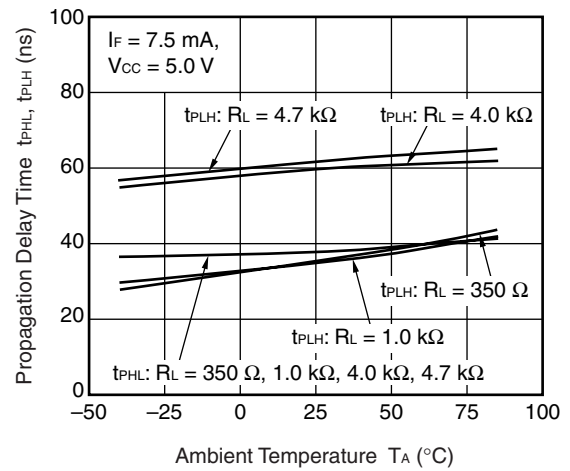


Remark The graphs indicate nominal characteristics.

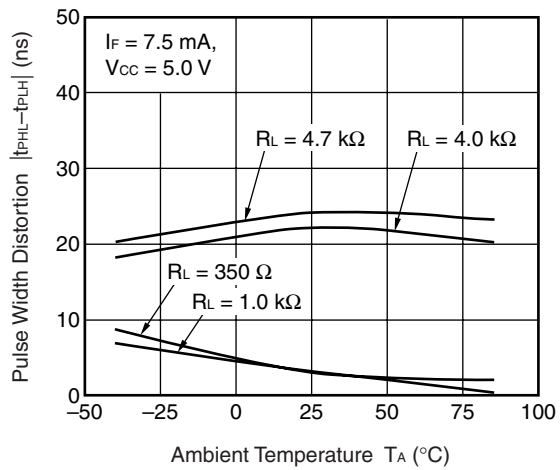
THRESHOLD INPUT CURRENT vs. AMBIENT TEMPERATURE



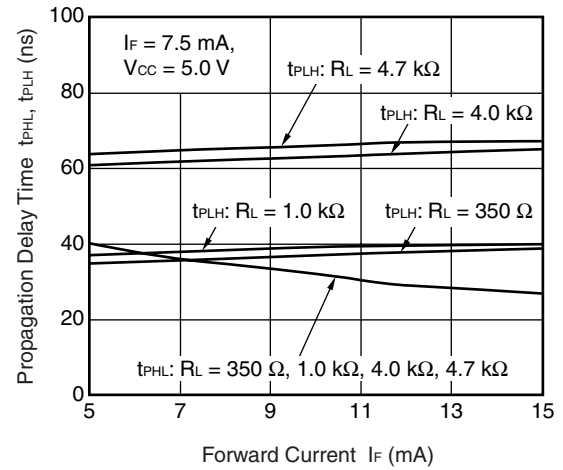
PROPAGATION DELAY TIME vs. AMBIENT TEMPERATURE



PULSE WIDTH DISTORTION vs. AMBIENT TEMPERATURE



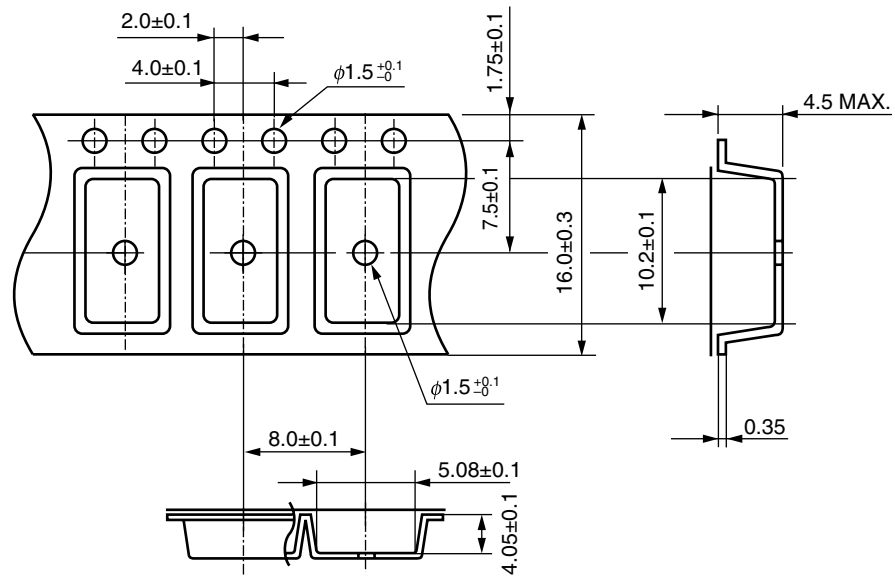
PROPAGATION DELAY TIME vs. FORWARD CURRENT



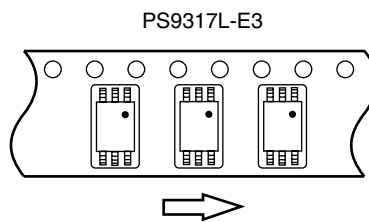
Remark The graphs indicate nominal characteristics.

<R> TAPING SPECIFICATIONS (UNIT: mm)

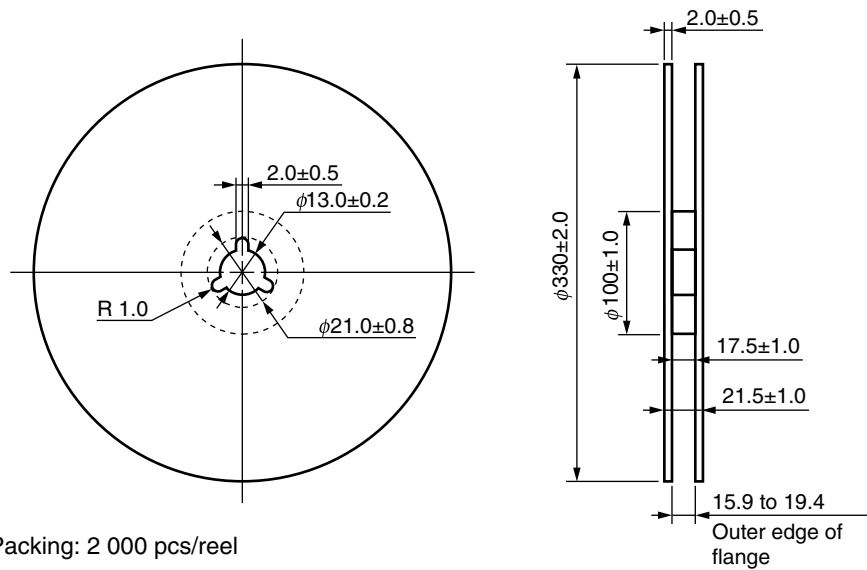
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



Packing: 2 000 pcs/reel

Technical drawing of a circular component with a central hole and a flange. The drawing includes a top view (left) and a side view (right).

Top View Dimensions:

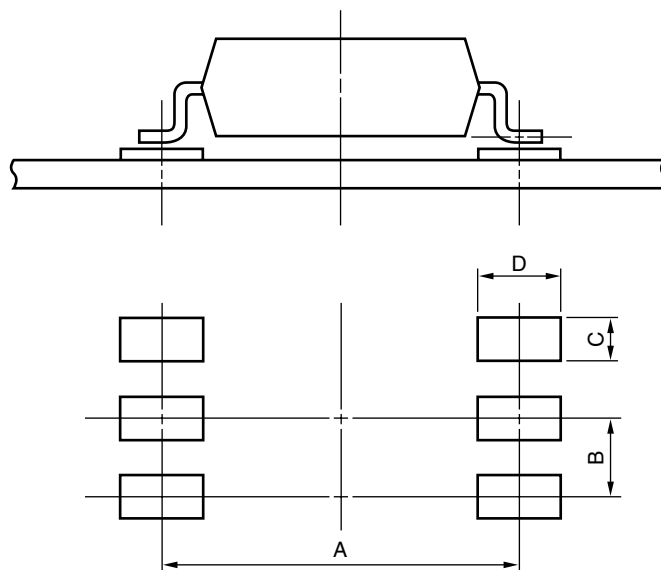
- Outer diameter: $\phi 330 \pm 2.0$
- Distance from center to outer edge of hole: 21.0 ± 0.8
- Distance from center to outer edge of hole (inner): 13.0 ± 0.2
- Radius of hole: $R 1.0$
- Distance from center to outer edge of hole (top): 2.0 ± 0.5

Side View Dimensions:

- Outer diameter: $\phi 330 \pm 2.0$
- Distance from center to outer edge of flange: 25.5 ± 1.0
- Distance from center to outer edge of flange: 29.5 ± 1.0
- Distance from center to outer edge of flange: 23.9 to 27.4
- Outer edge of flange

Packing: 2 000 pcs/reel

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



Part Number	Lead Bending	A	B	C	D
PS9317L	lead bending type (Gull-wing) for surface mount	8.2	1.27	0.8	2.2
PS9317L2	lead bending type (Gull-wing) for long creepage distance (surface mount)	10.2	1.27	0.8	2.2

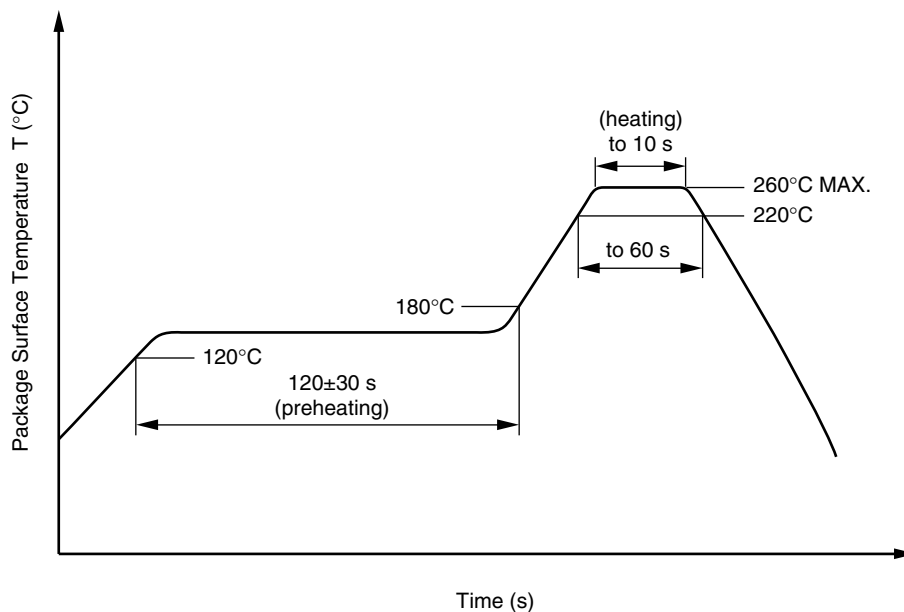
<R> NOTES ON HANDLING

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 side may enter the on state, even if the voltage is within the absolute maximum ratings.

<R> SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

Parameter	Symbol	Spec.	Unit
Climatic test class (IEC 60068-1/DIN EN 60068-1)		40/85/21	
Dielectric strength maximum operating isolation voltage Test voltage (partial discharge test, procedure a for type test and random test) $U_{pr} = 1.5 \times U_{IORM}$, $P_d < 5$ pC	U_{IORM} U_{pr}	1 130 1 695	V_{peak} V_{peak}
Test voltage (partial discharge test, procedure b for all devices) $U_{pr} = 1.875 \times U_{IORM}$, $P_d < 5$ 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	
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 +125	°C
Operating temperature range	T_A	-40 to +85	°C
Isolation resistance, minimum value $V_{IO} = 500$ V dc at $T_A = 25^\circ\text{C}$ $V_{IO} = 500$ V dc at T_A MAX. at least 100°C	R_{is} MIN. R_{is} MIN.	10^{12} 10^{11}	Ω Ω
Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve) Package temperature Current (input current I_F , $\Psi_i = 0$) Power (output or total power dissipation) Isolation resistance $V_{IO} = 500$ V dc at $T_A = T_{si}$	T_{si} I_{si} Ψ_i R_{is} MIN.	175 400 700 10^9	°C mA mW Ω

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- NEC Electronics products are classified into the following three quality grades: "Standard", "Special" and "Specific".

The "Specific" quality grade applies only to NEC Electronics products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of an NEC Electronics product depend on its quality grade, as indicated below. Customers must check the quality grade of each NEC Electronics product before using it in a particular application.

"Standard": Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots.

"Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support).

"Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

The quality grade of NEC Electronics products is "Standard" unless otherwise expressly specified in NEC Electronics data sheets or data books, etc. If customers wish to use NEC Electronics products in applications not intended by NEC Electronics, they must contact an NEC Electronics sales representative in advance to determine NEC Electronics' willingness to support a given application.

(Note)

(1) "NEC Electronics" as used in this statement means NEC Electronics Corporation and also includes its majority-owned subsidiaries.

(2) "NEC Electronics products" means any product developed or manufactured by or for NEC Electronics (as defined above).

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<div data-bbox="177 230 284 275"> Caution </div> <div data-bbox="300 237 446 264"> GaAs Products </div>	<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"> • 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"> 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 i any way allow it to enter the mouth.
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