

To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

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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**HIGH SPEED ANALOG OUTPUT TYPE
8-PIN PHOTOCOUPLER**

–NEPOC Series–

<R> DESCRIPTION

The PS8601 and PS8601L are 8-pin high speed photocouplers containing a GaAlAs LED on input side and a PN photodiode and a high speed amplifier transistor on output side on one chip. The PS8601 is in a plastic DIP (Dual In-line Package). The PS8601L is lead bending type (Gull wing) for surface mount.

The PS8601L1 is lead bending type for long creepage distance.

The PS8601L2 is lead bending type for long creepage distance (Gull-wing) for surface mount.

FEATURES

- High supply voltage ($V_{CC} = 35 \text{ V MAX.}$)
- High speed response ($t_{PHL}, t_{PLH} = 0.8 \mu\text{S MAX.}$)
- High isolation voltage ($BV = 5\,000 \text{ V}_{r.m.s.}$)
- TTL, CMOS compatible with a resistor
- For Infrared reflow soldering
- <R> • Ordering number of tape product : PS8601L-E3, E4: 1 000 pcs/reel
: PS8601L2-E3, E4: 1 000 pcs/reel
- <R> • Safety standards
 - UL approved: File No. E72422
 - BSI approved: No. 8004, 8854
 - DIN EN60747-5-2 (VDE0884 Part2) approved (Option)

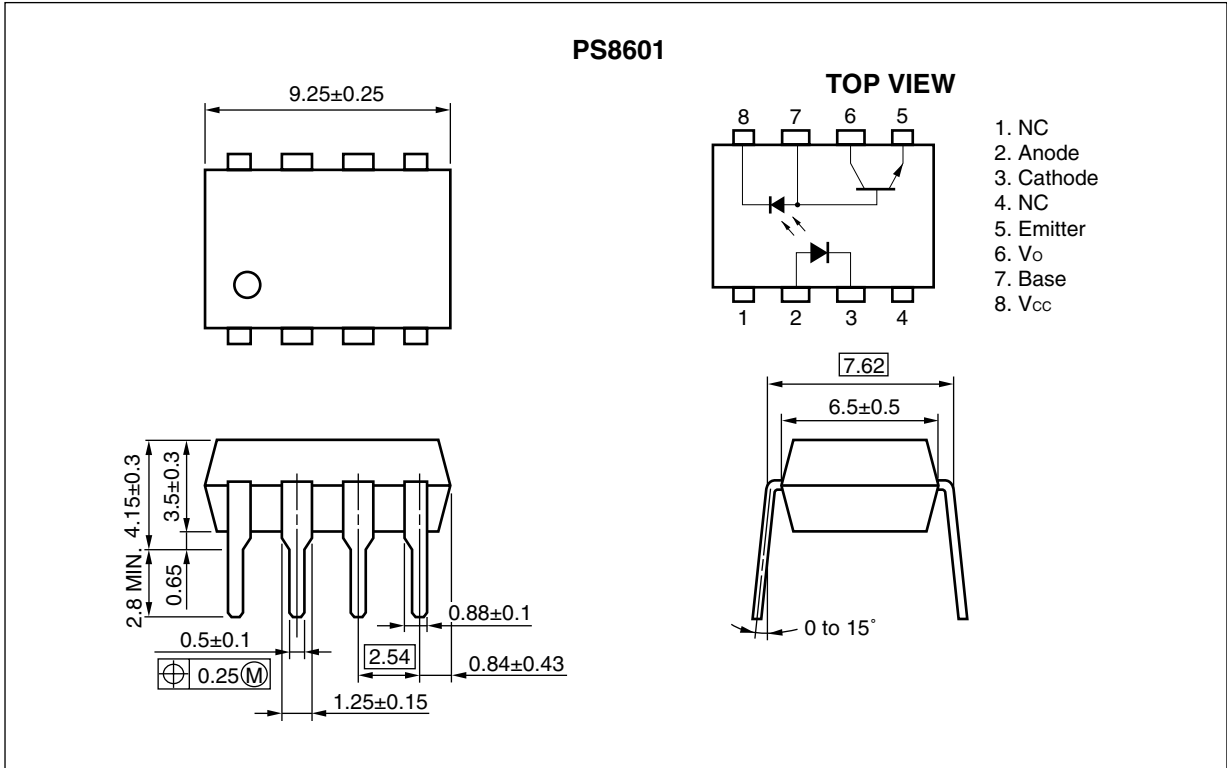
APPLICATIONS

- Interface for measurement or control equipment
- Substitutions for relays and pulse transformers

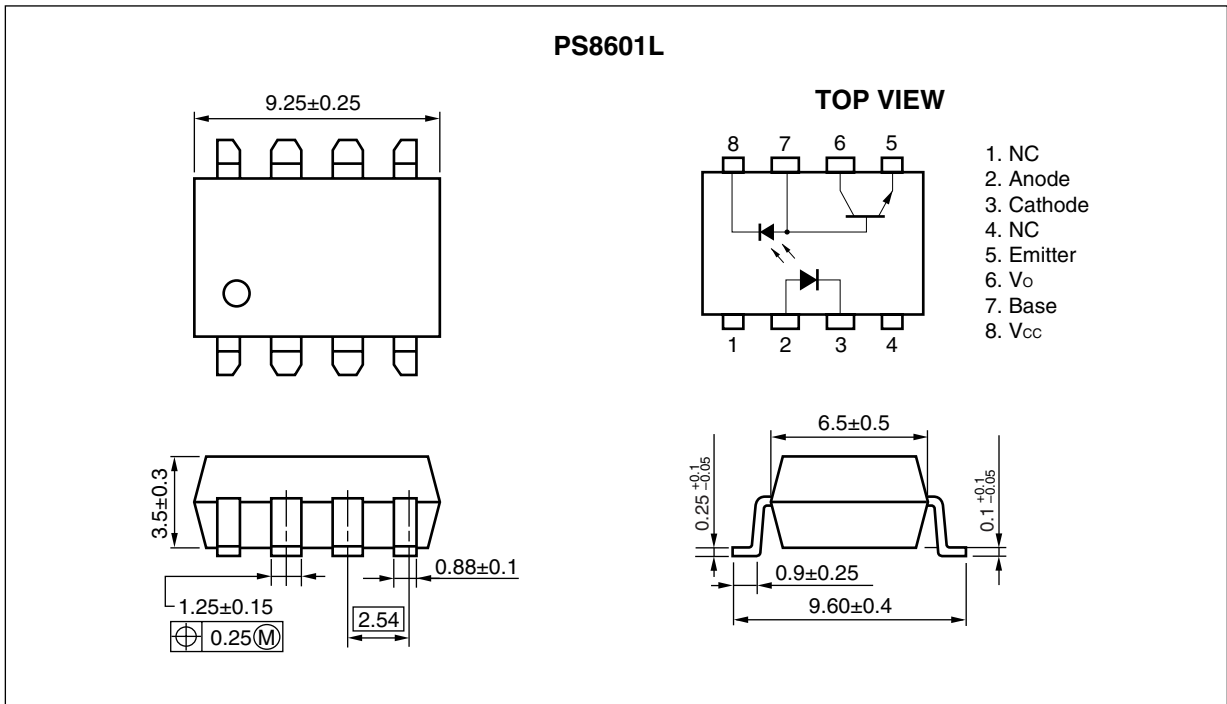
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PACKAGE DIMENSIONS (UNIT: mm)

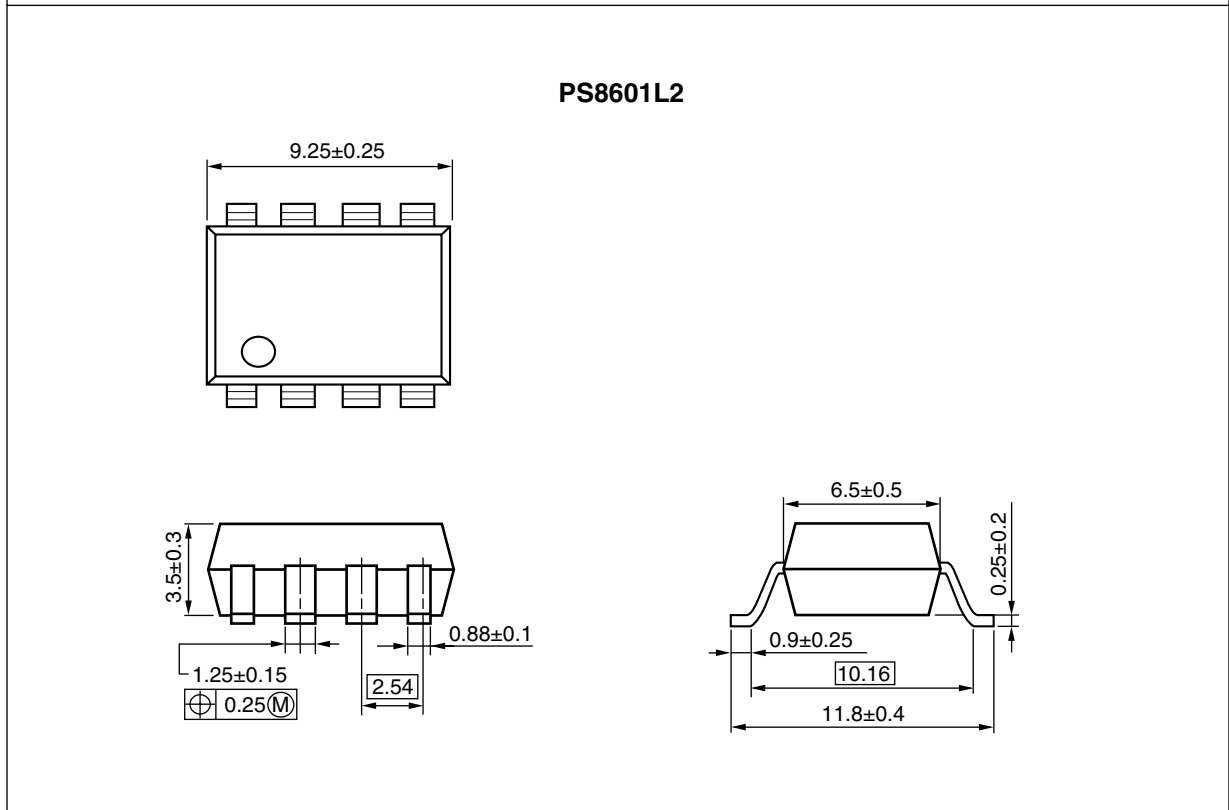
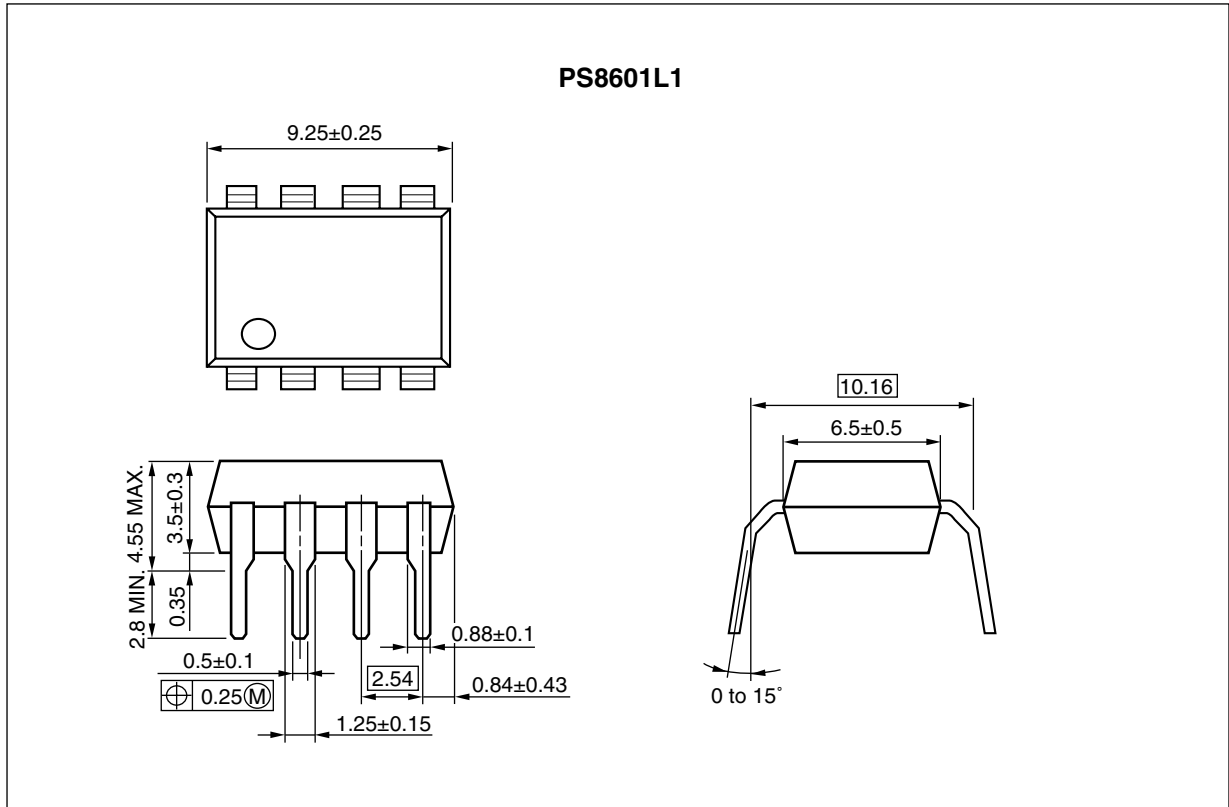
DIP Type



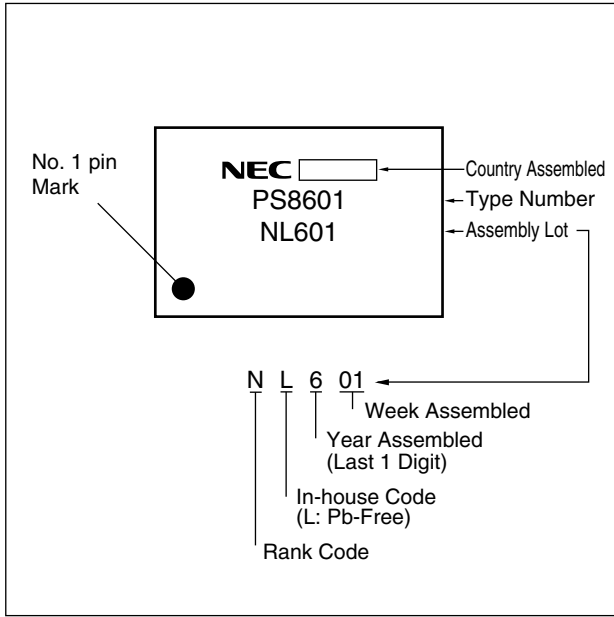
Lead Bending Type



Lead Bending Type For Long Creepage Distance



<R> **MARKING EXAMPLE**



<R> ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number ^{*1}
PS8601	PS8601-A	Pb-Free	Magazine case 50 pcs	Standard products (UL, BSI approved)	PS8601
PS8601L	PS8601L-A				
PS8601L1	PS8601L1-A				
PS8601L2	PS8601L2-A				
PS8601L-E3	PS8601L-E3-A		Embossed Tape 1 000 pcs/reel		
PS8601L-E4	PS8601L-E4-A				
PS8601L2-E3	PS8601L2-E3-A				
PS8601L2-E4	PS8601L2-E4-A				
PS8601-V	PS8601-V-A		Magazine case 50 pcs	DIN EN60747-5-2 (VDE0884 Part2) Approved (Option)	
PS8601L-V	PS8601L-V-A				
PS8601L1-V	PS8601L1-V-A				
PS8601L2-V	PS8601L2-V-A				
PS8601L-V-E3	PS8601L-V-E3-A			Embossed Tape 1 000 pcs/reel	
PS8601L-V-E4	PS8601L-V-E4-A				
PS8601L2-V-E3	PS8601L2-V-E3-A				
PS8601L2-V-E4	PS8601L2-V-E4-A				

*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	
<R>	Diode	Forward Current ^{*1}	I _F	25	mA
		Reverse Voltage	V _R	5	V
		Power Dissipation	P _D	45	mW
<R>	Detector	Supply Voltage	V _{CC}	35	V
		Output Voltage	V _O	35	V
		Output Current	I _O	8	mA
		Power Dissipation ^{*2}	P _C	100	mW
Isolation Voltage ^{*3}		BV	5 000	Vr.m.s.	
Operating Ambient Temperature		T _A	-55 to +100	°C	
Storage Temperature		T _{stg}	-55 to +100	°C	

*1 Reduced to 0.25 mA/°C at T_A = 25°C or more.

*2 Applies to output pin V_O (collector pin). Reduced to 1.0 mW/°C at T_A = 25°C or more.

*3 AC voltage for 1 minute at T_A = 25°C, RH = 60% between input and output.

Pins 1-4 shorted together, 5-8 shorted together.

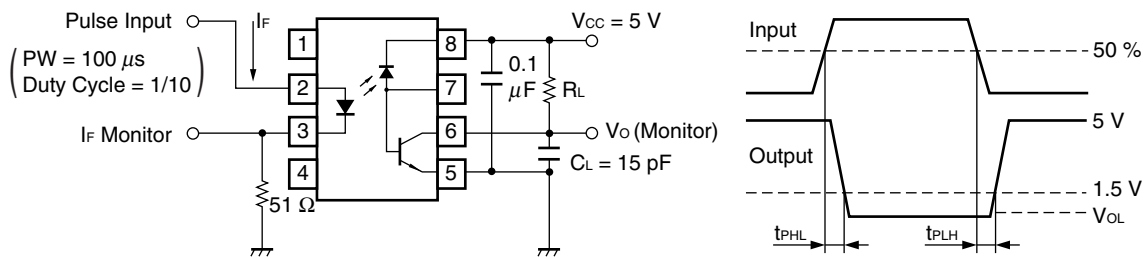
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

<R>

Parameter		Symbol	Conditions	MIN.	TYP. ^{*1}	MAX.	Unit
Diode	Forward Voltage	V _F	I _F = 16 mA		1.7	2.2	V
	Reverse Current	I _R	V _R = 5 V			10	μA
	Forward Voltage Temperature Coefficient	ΔV _F /ΔT	I _F = 16 mA		-1.6		mV/°C
	Terminal Capacitance	C _t	V = 0 V, f = 1 MHz		30		pF
Detector	High Level Output Current	I _{OH} (1)	I _F = 0 mA, V _{CC} = V _O = 5.5 V		3	500	nA
	High Level Output Current	I _{OH} (2)	I _F = 0 mA, V _{CC} = V _O = 35 V			100	μA
	Low Level Output Voltage	V _{OL}	I _F = 16 mA, V _{CC} = 4.5 V, I _O = 1.2 mA		0.1	0.4	V
	Low Level Supply Current	I _{CCL}	I _F = 16 mA, V _O = Open, V _{CC} = 35 V		50		μA
	High Level Supply Current	I _{CCH}	I _F = 0 mA, V _O = Open, V _{CC} = 35 V		0.01	1	μA
	DC Current Gain	h _{FE}	V _O = 5 V, I _O = 3 mA		100		
Coupled	Current Transfer Ratio	CTR	I _F = 16 mA, V _{CC} = 4.5 V, V _O = 0.4 V	15			%
	Isolation Resistance	R _{I-O}	V _{I-O} = 1 kV _{DC}	10 ¹¹			Ω
	Isolation Capacitance	C _{I-O}	V = 0 V, f = 1 MHz		0.7		pF
	Propagation Delay Time (H → L) ^{*2}	t _{PHL}	I _F = 16 mA, V _{CC} = 5 V, R _L = 1.9 kΩ		0.5	0.8	μs
	Propagation Delay Time (L → H) ^{*2}	t _{PLH}	I _F = 16 mA, V _{CC} = 5 V, R _L = 1.9 kΩ		0.3	0.8	μs

*1 Typical values at T_A = 25°C

*2 Test circuit for propagation delay time

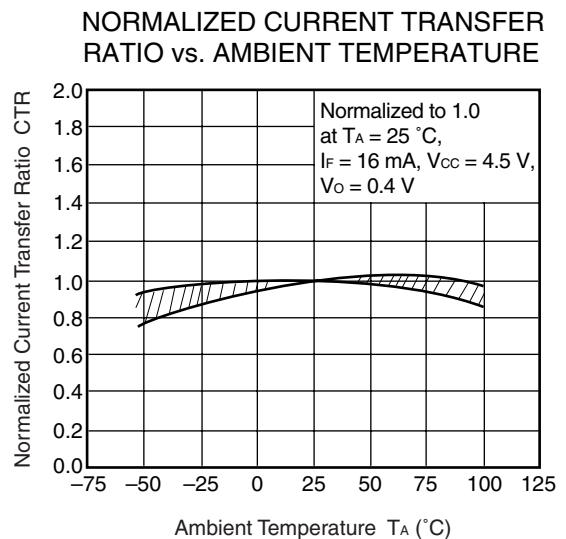
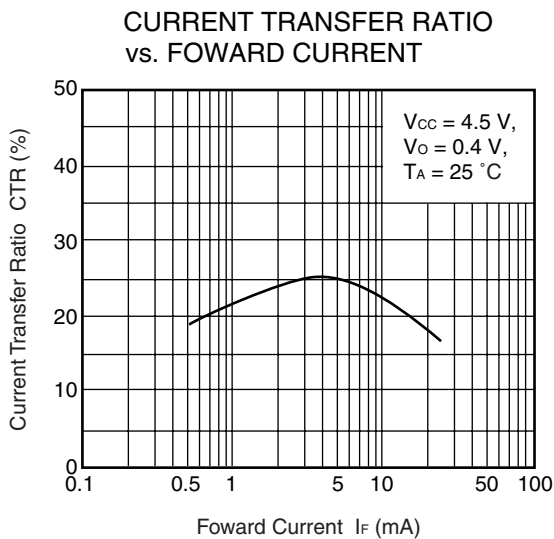
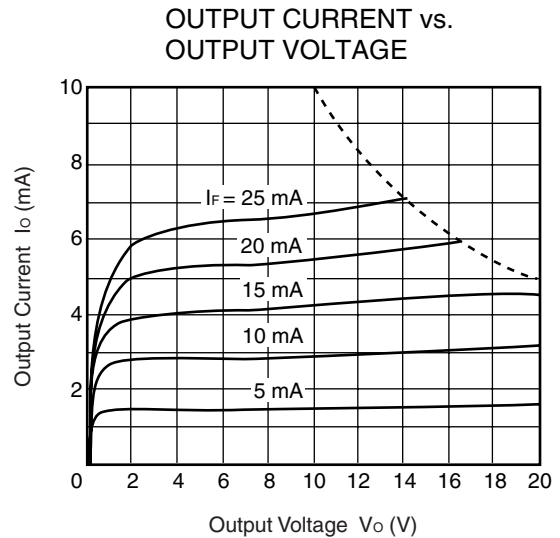
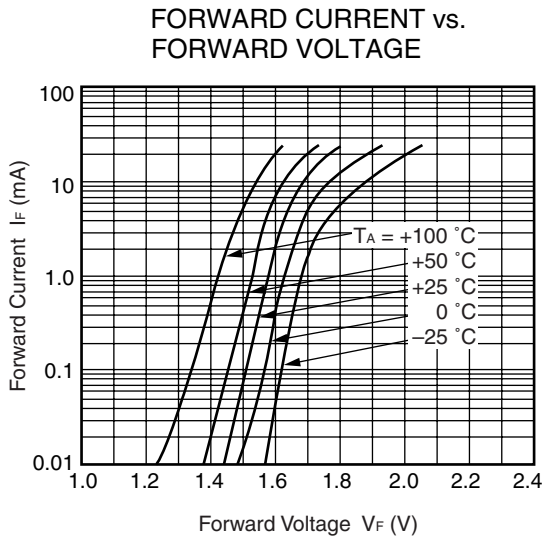
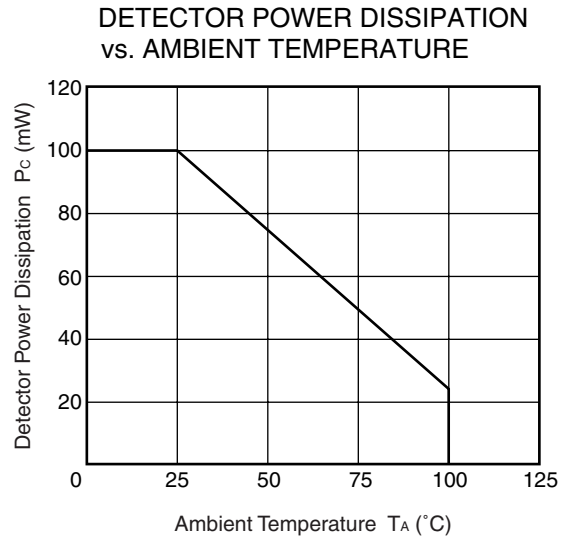
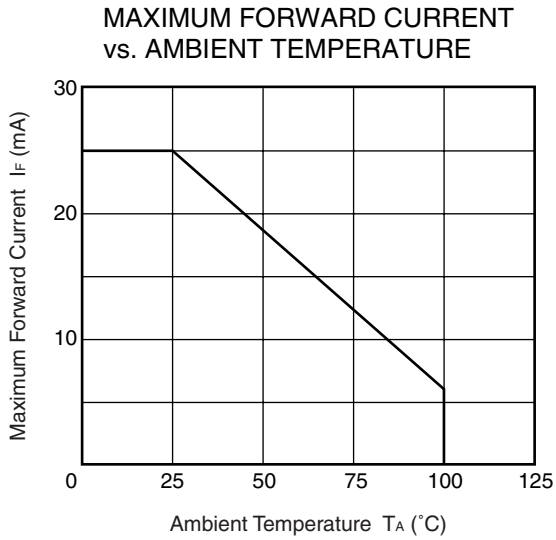


Remark C_L includes probe and stray wiring capacitance.

USAGE CAUTIONS

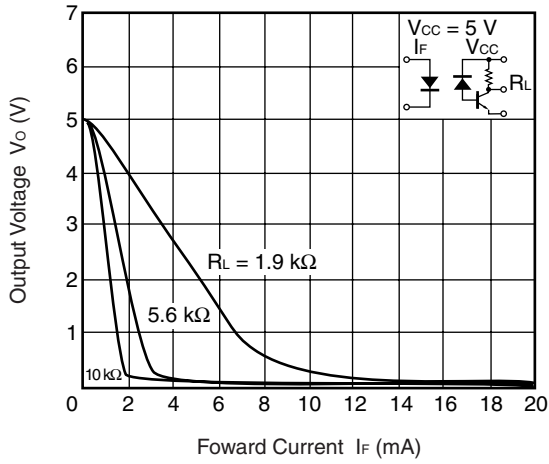
1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. By-pass capacitor of more than 0.1 μF is used between V_{CC} and GND near device. Also, ensure that the distance between the leads of the photocoupler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

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

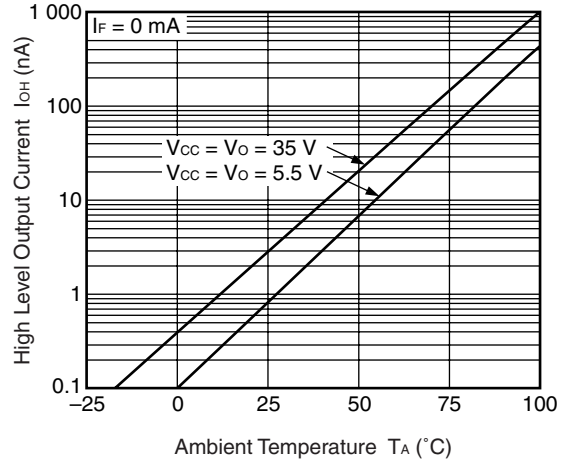


Remark The graphs indicate nominal characteristics.

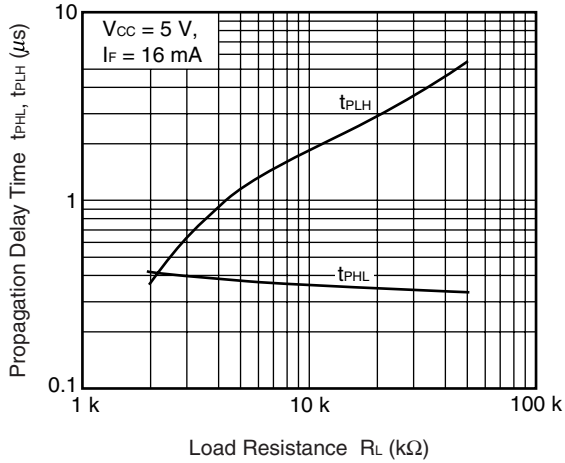
OUTPUT VOLTAGE vs. FOWARD CURRENT



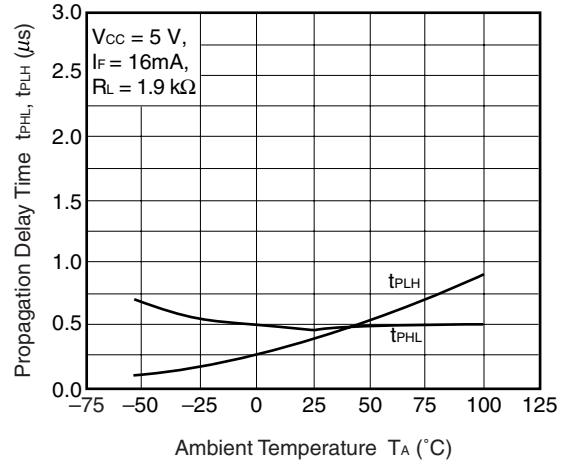
HIGH LEVEL OUTPUT CURRENT vs. AMBIENT TEMPERATURE



PROPAGATION DELAY TIME, vs. LORD RESISTANCE



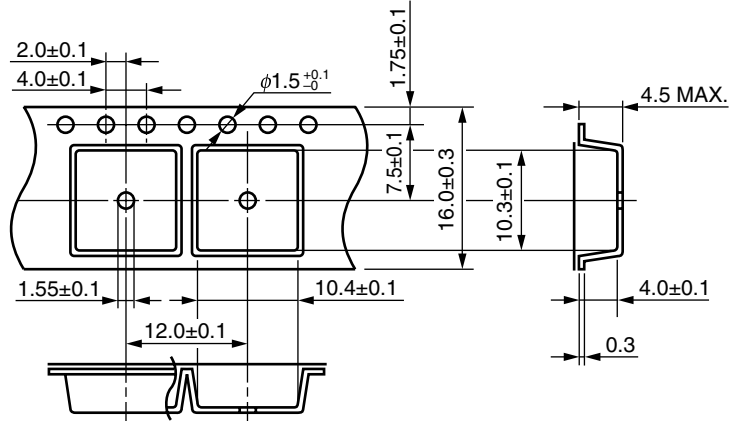
PROPAGATION DELAY TIME, vs. AMBIENT TEMPERATURE



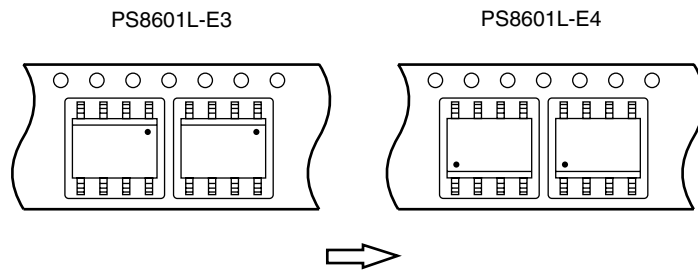
Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (UNIT: mm)

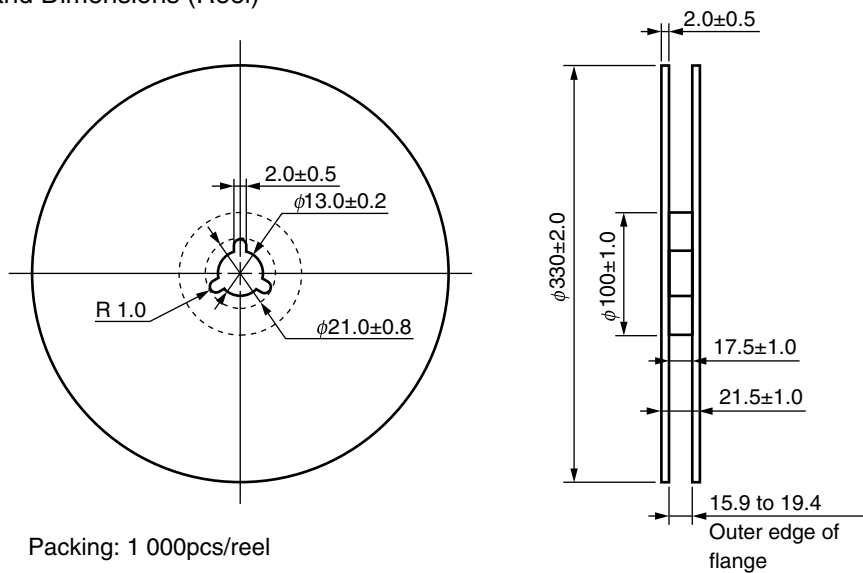
Outline and Dimensions (Tape)



Tape Direction

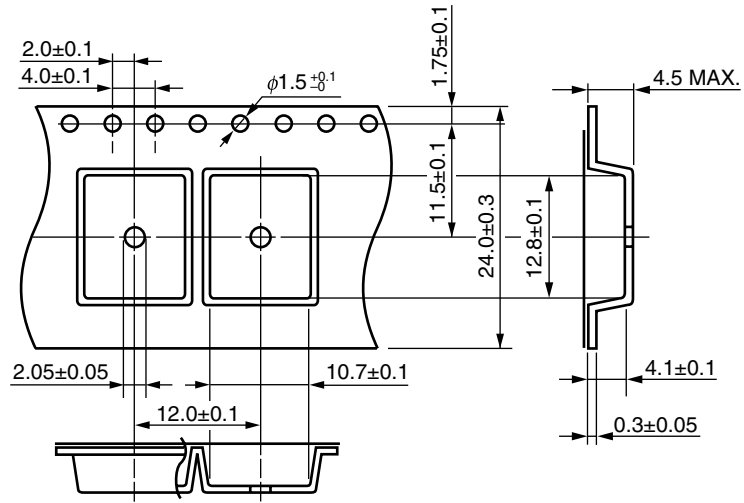


Outline and Dimensions (Reel)

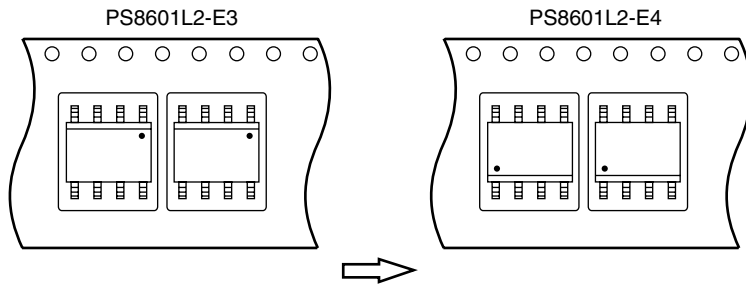


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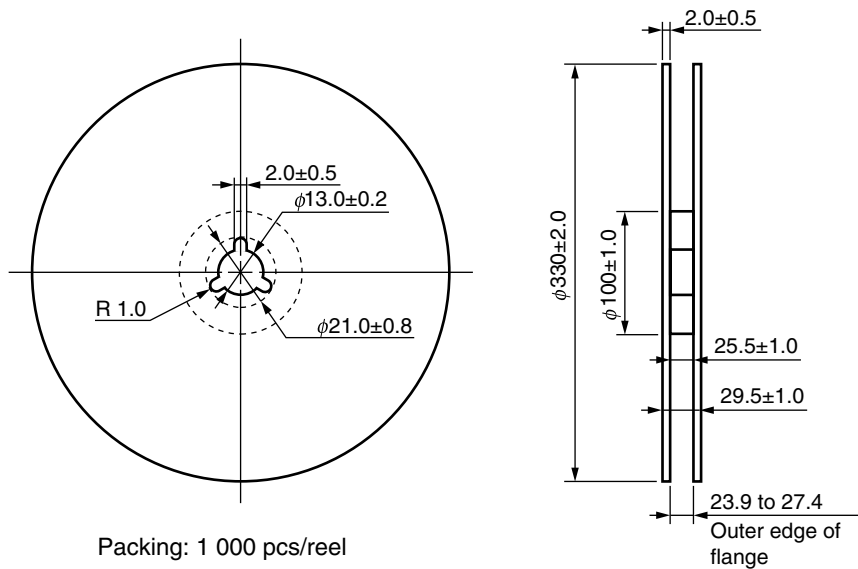
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



Packing: 1 000 pcs/reel

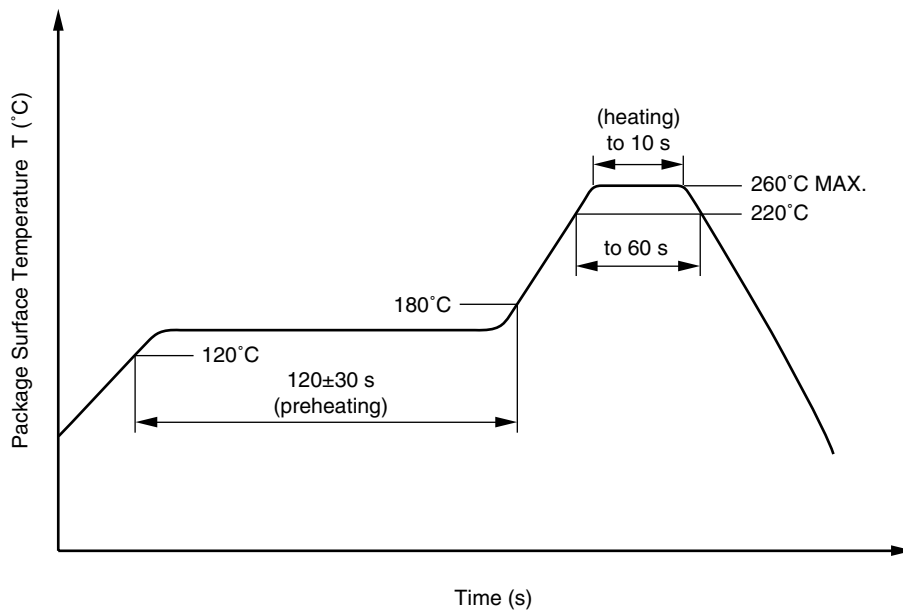
NOTES ON HANDLING

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.)

<R> (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.

SPECIFICATION OF VDE MARKS LICENSE DOCUMENT (VDE0884)

Parameter	Symbol	Speck	Unit
Application classification (DIN VDE 0109) for rated line voltages ≤ 300 V _{r.m.s.} for rated line voltages ≤ 600 V _{r.m.s.}		IV III	
Climatic test class (DIN IEC 68 Teil 1/09.80)		55/100/21	
Dielectric strength maximum operating isolation voltage Test voltage (partial discharge test, procedure a for type test and random test) $U_{pr} = 1.2 \times U_{IORM}, P_d < 5$ pC	U_{IORM} U_{pr}	890 1 068	V_{peak} V_{peak}
Test voltage (partial discharge test, procedure b for all devices test) $U_{pr} = 1.6 \times U_{IORM}, P_d < 5$ pC	U_{pr}	1 424	V_{peak}
Highest permissible overvoltage	U_{TR}	8 000	V_{peak}
Degree of pollution (DIN VDE 0109)		2	
Clearance distance		> 7.0	mm
Creepage distance		> 7.0	mm
Comparative tracking index (DIN IEC 112/VDE 0303 part 1)	CTI	175	
Material group (DIN VDE 0109)		III a	
Storage temperature range	T_{stg}	-55 to +150	°C
Operating temperature range	T_A	-55 to +100	°C
Isolation resistance, minimum value $V_{IO} = 500$ V dc at $T_A = 25$ °C $V_{IO} = 500$ V dc at T_A MAX. at least 100 °C	Ris MIN. Ris 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 $I_F, P_{si} = 0$) Power (output or total power dissipation) Isolation resistance $V_{IO} = 500$ V dc at $T_A = 175$ °C (T_{si})	T_{si} I_{si} P_{si} Ris MIN.	175 400 700 10^9	°C mA mW Ω

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► For further information, please contact

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