DATA SHEET

NEC

PHOTOCOUPLER

PS8601,PS8601L,PS8601L1,PS8601L2

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 V MAX.)
- High speed response (t_{PHL}, t_{PLH} = 0.8 μs MAX.)
- High isolation voltage (BV = 5 000 $V_{r.m.s.}$)
- 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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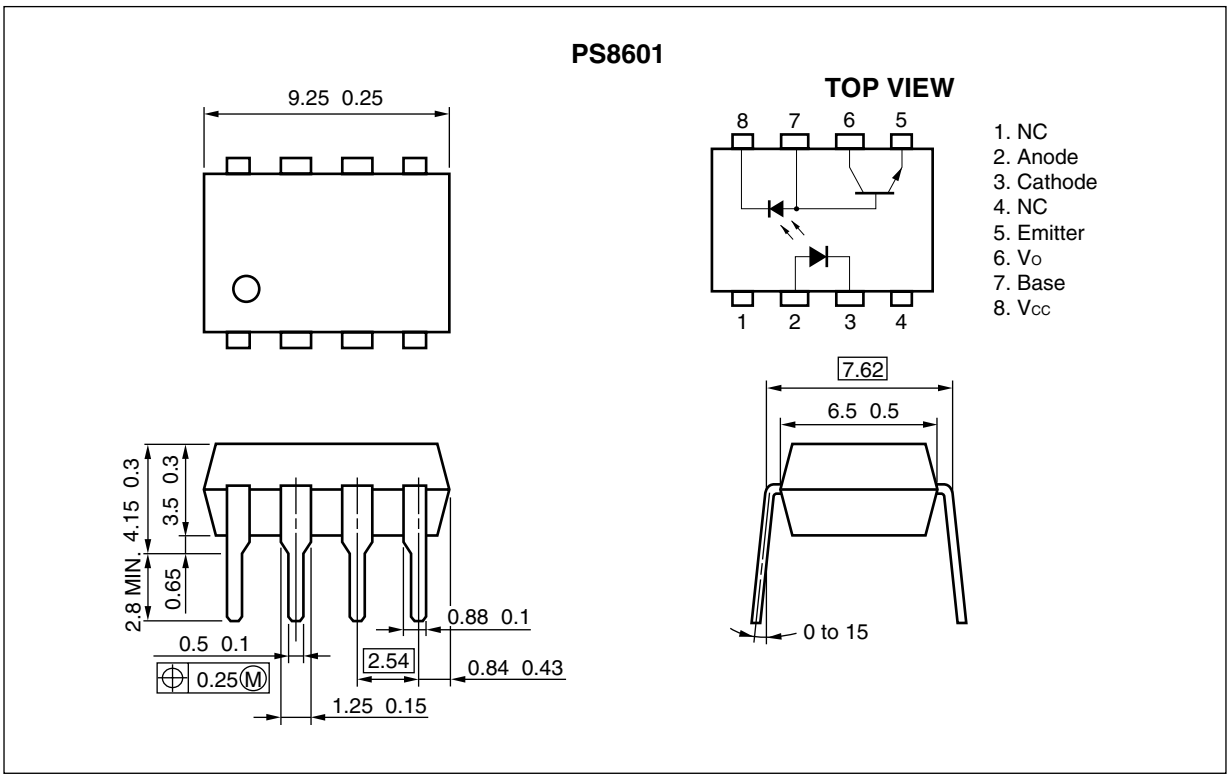
The mark <R> shows major revised points.

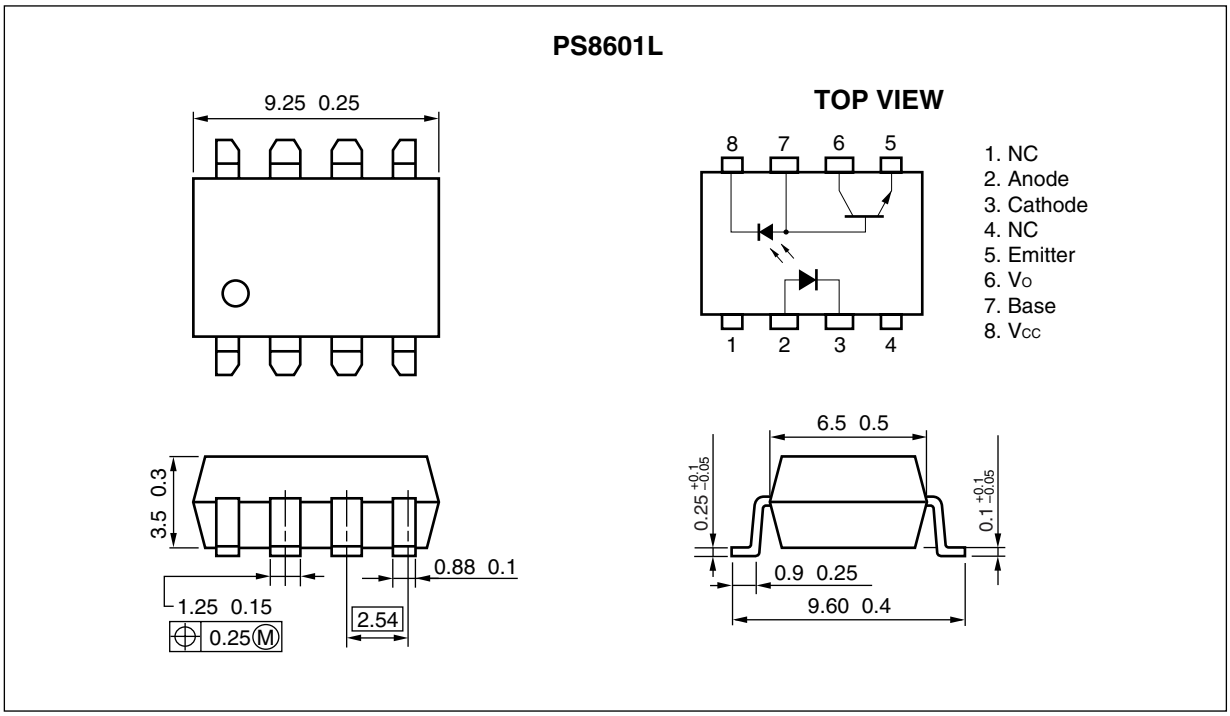
The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

PACKAGE DIMENSIONS (UNIT: mm)

DIP Type

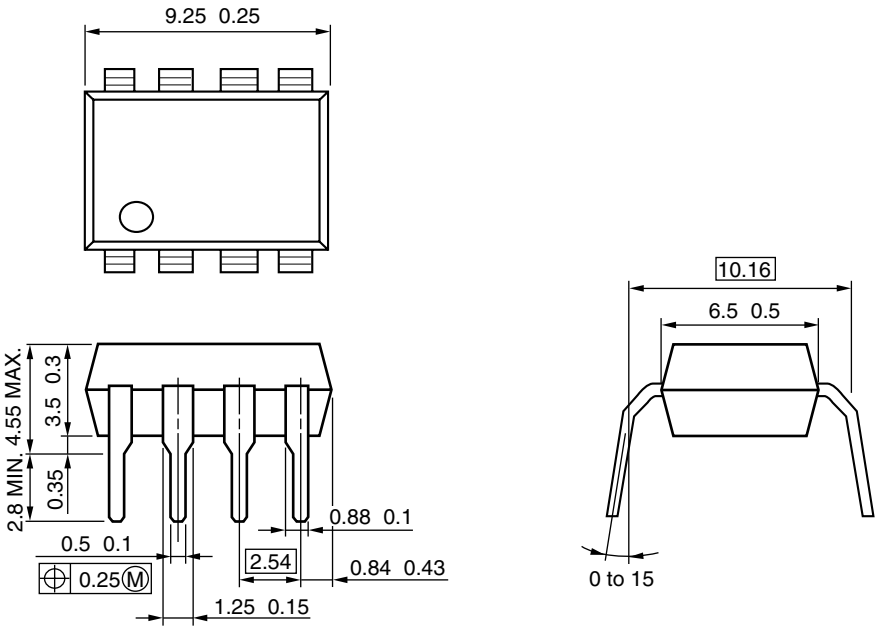


Lead Bending Type

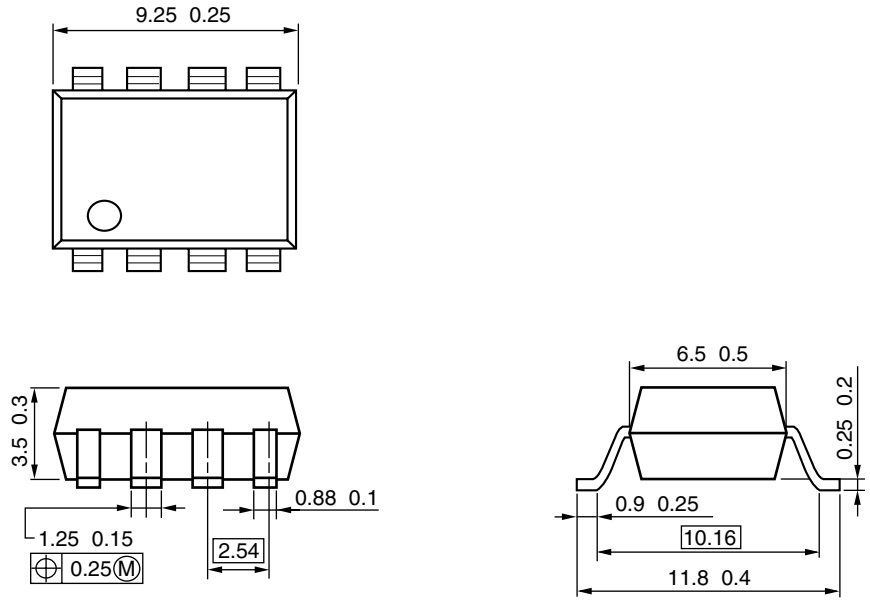


Lead Bending Type For Long Creepage Distance

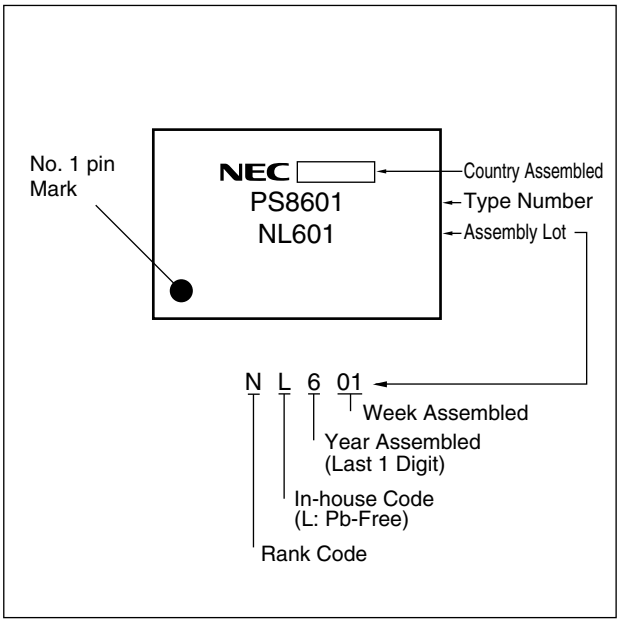
PS8601L1



PS8601L2



<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)

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Parameter		Symbol	Ratings	Unit
Diode	Forward Current*1	I_F	25	mA
	Reverse Voltage	V_R	5	V
	Power Dissipation	P_D	45	mW
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)

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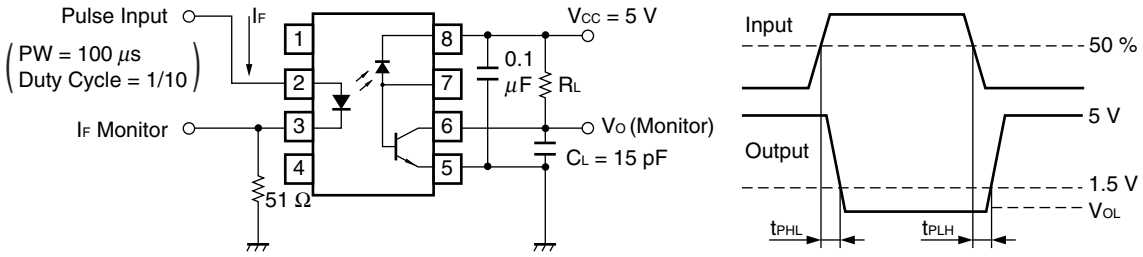
Parameter		Symbol	Conditions	MIN.	TYP.*1	MAX.	Unit
Diode	Forward Voltage	V_F	I_F = 16 mA		1.7	2.2	V
	Reverse Current	I_R	V_R = 5 V			10	μA
	Forward Voltage Temperature Coefficent	$\Delta V_F/\Delta T$	I_F = 16 mA		−1.6		mV/°C
	Terminal Capacitance	C_t	V = 0 V, f = 1 MHz		30		pF
Detector	High Level Output 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



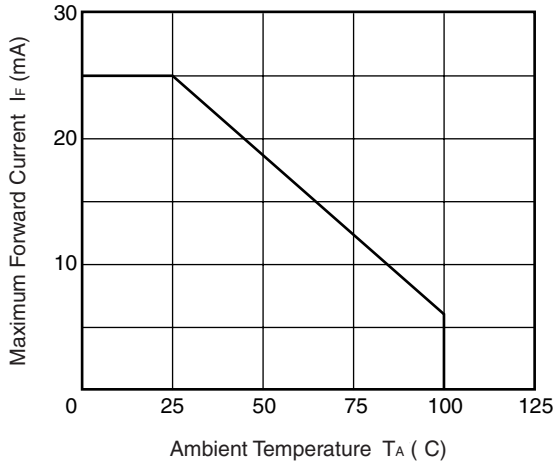
Remark C_L includes probe and stray wiring capacitance.

USAGE CAUTIONS

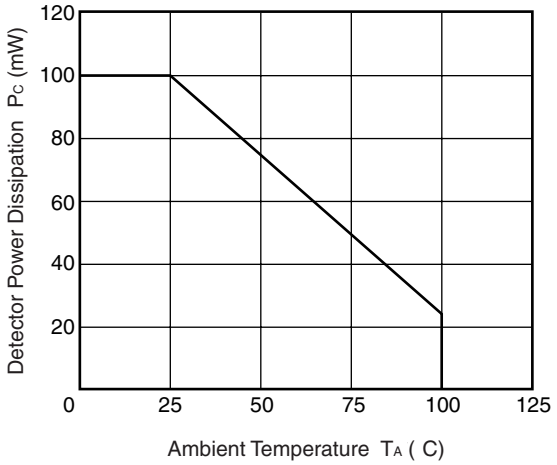
1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. By-pass capacitor of more than 0.1 μF is used between V_{CC} and GND near device. Also, ensure that the distance between the leads of the photocoupler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

TYPICAL CHARACTERISTICS (T_A = 25°C, unless otherwise specified)

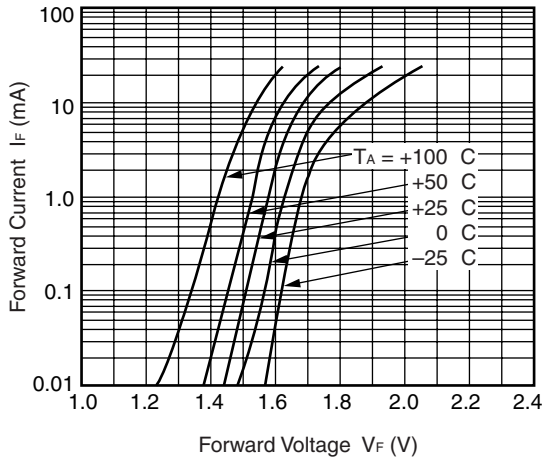
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



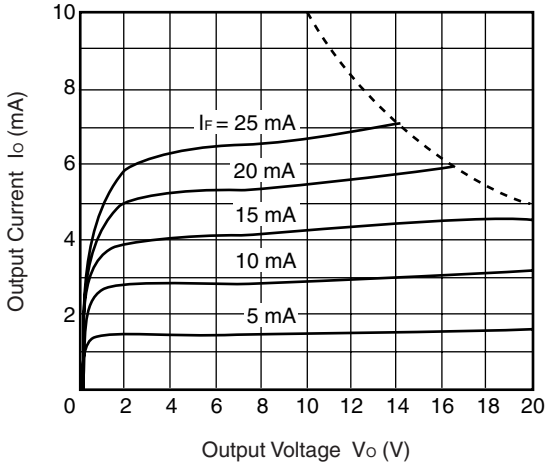
DETECTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



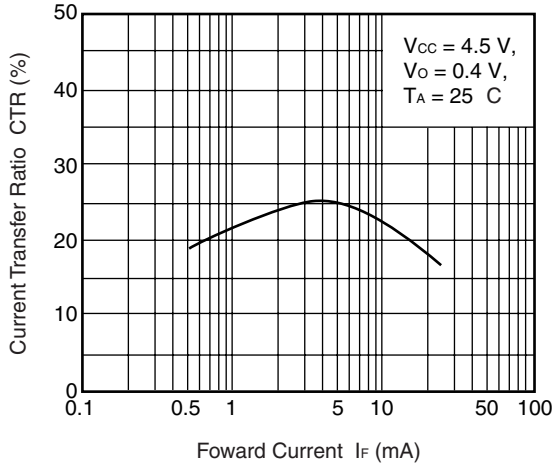
FORWARD CURRENT vs. FORWARD VOLTAGE



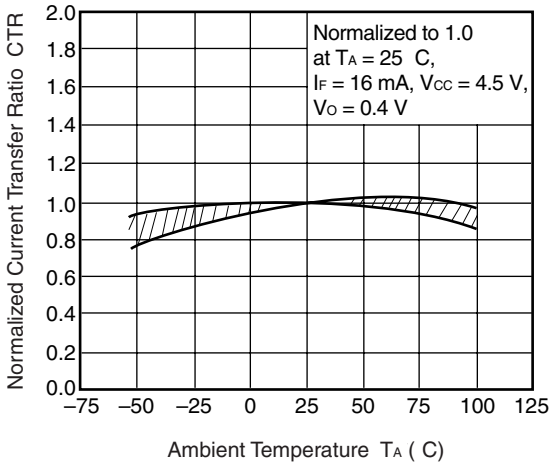
OUTPUT CURRENT vs. OUTPUT VOLTAGE



CURRENT TRANSFER RATIO vs. FOWARD CURRENT

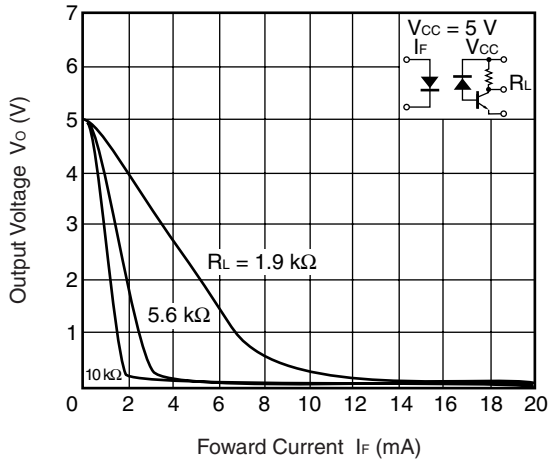


NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE

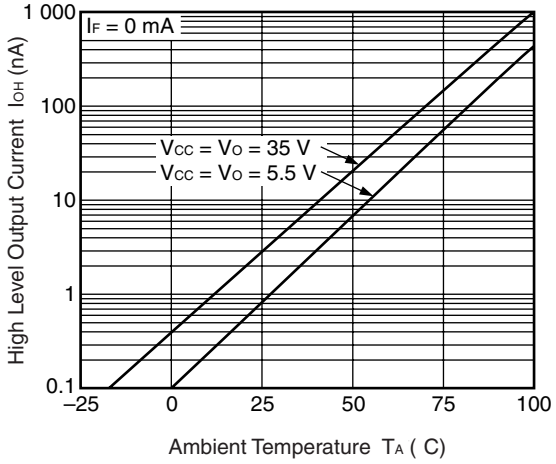


Remark The graphs indicate nominal characteristics.

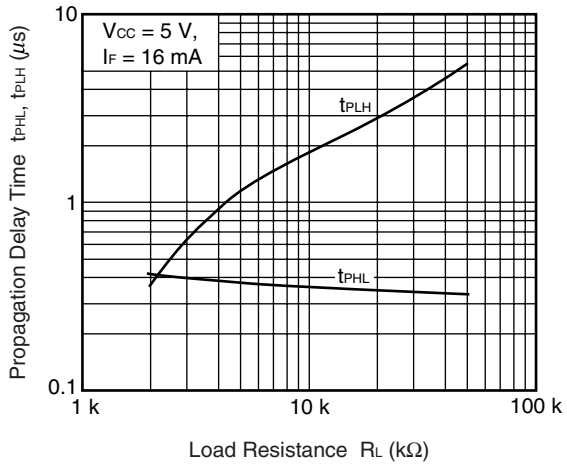
OUTPUT VOLTAGE vs.
FOWARD CURRENT



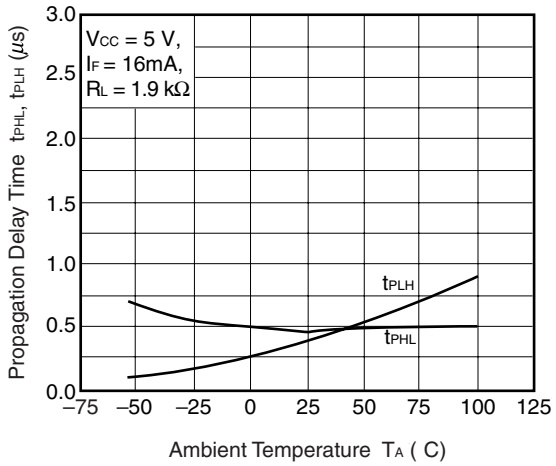
HIGH LEVEL OUTPUT CURRENT
vs. AMBIENT TEMPERATURE



PROPAGATION DELAY TIME,
vs. LORD RESISTANCE



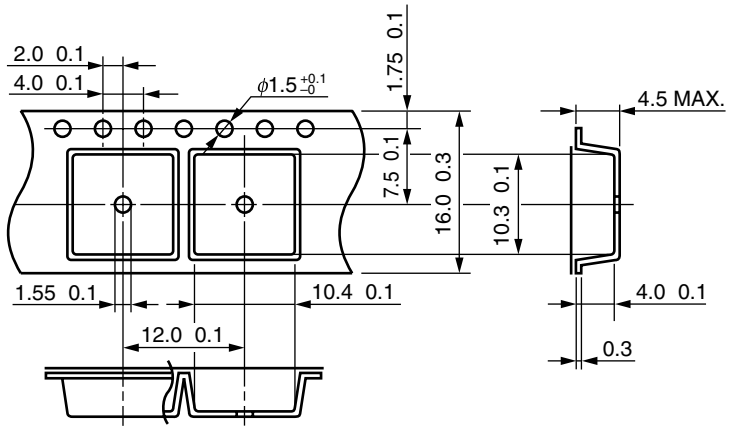
PROPAGATION DELAY TIME,
vs. AMBIENT TEMPERATURE



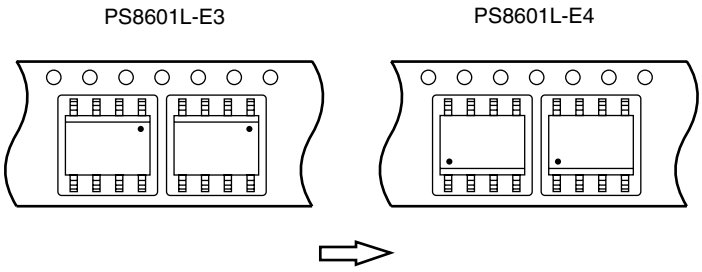
Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (UNIT: mm)

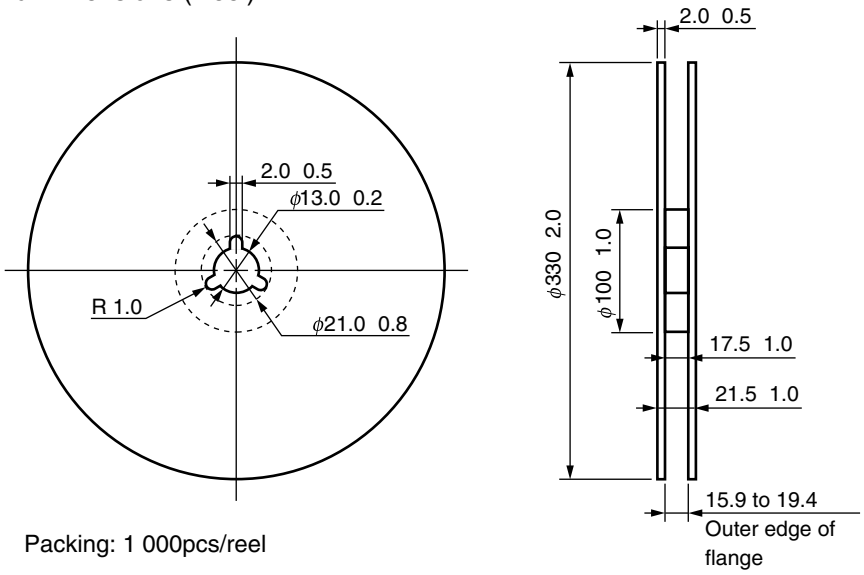
Outline and Dimensions (Tape)



Tape Direction



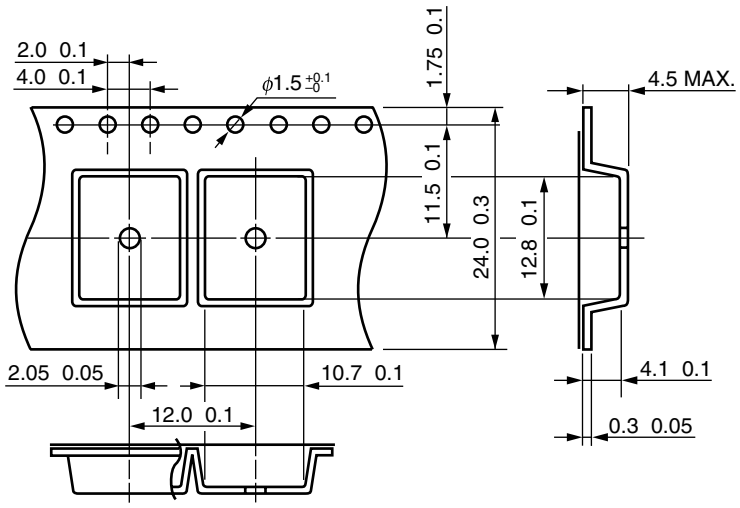
Outline and Dimensions (Reel)



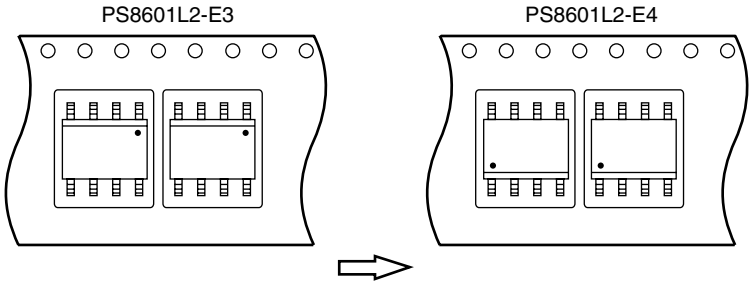
Packing: 1 000pcs/reel

<R>

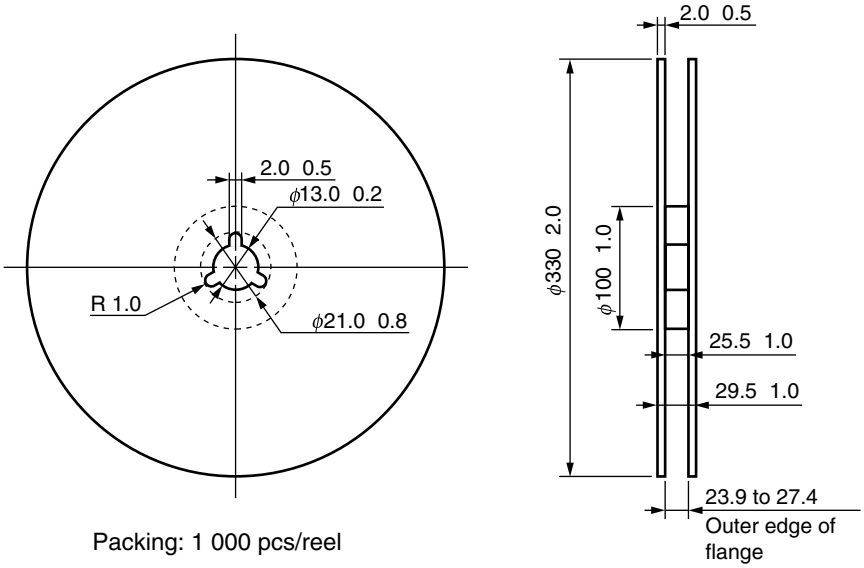
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



Packing: 1 000 pcs/reel

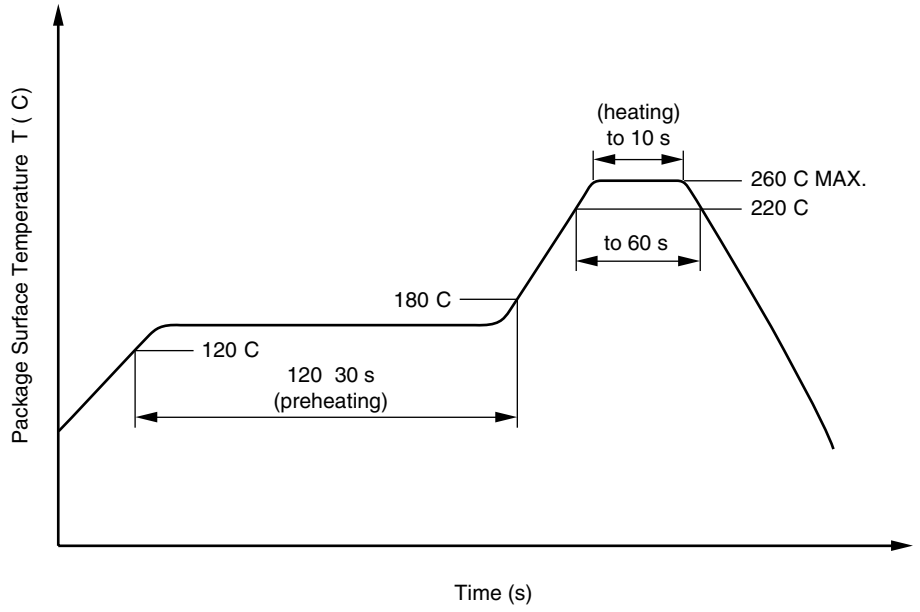
NOTES ON HANDLING

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 × 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 × 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, Psi = 0) Power (output or total power dissipation) Isolation resistance V_{IO} = 500 V dc at T_A = 175 C (Tsi)	 Tsi Isi Psi Ris MIN.	 175 400 700 10^{9}	 C mA mW Ω

- **The information in this document is current as of May, 2006. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC Electronics data sheets or data books, etc., for the most up-to-date specifications of NEC Electronics products. Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.**
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M8E 02. 11-1

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.

▶**For further information, please contact**

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0604