DATA SHEET

NEC

PHOTOCOUPLER

PS8601,PS8601L

HIGH SPEED ANALOG OUTPUT TYPE 8-PIN PHOTOCOUPLER

–NEPOC Series–

DESCRIPTION

The PS8601 and PS8601L are 8-pin high speed photocouplers containing a GaAIAs 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.

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
- Ordering number of tape product: PS8601L-E3, E4: 1 000 pcs/reel
- Safety standards
  - UL approved: File No. E72422 (S)
  - BSI approved: No. 8004
  - VDE0884 approved (Option) No.91877

APPLICATIONS

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

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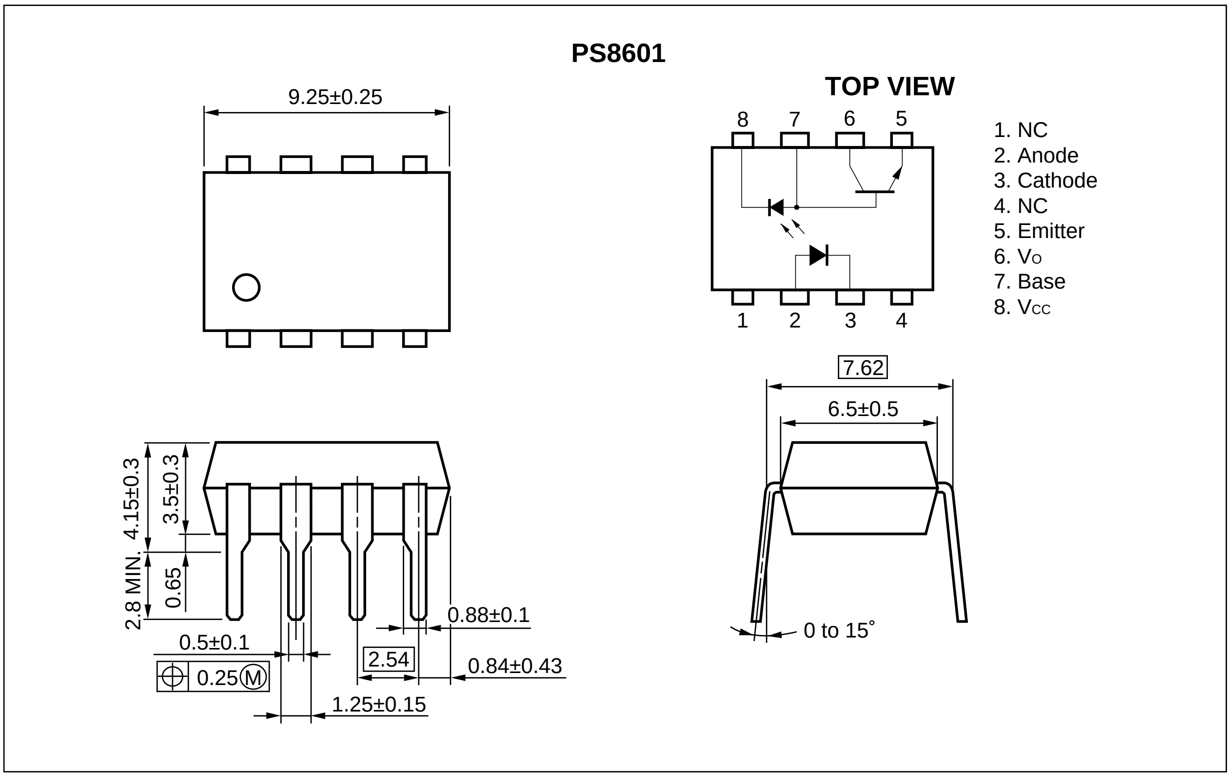
(Previous No. P11650EJ3V1DS00)
Date Published February 2003 CP(K)
Printed in Japan

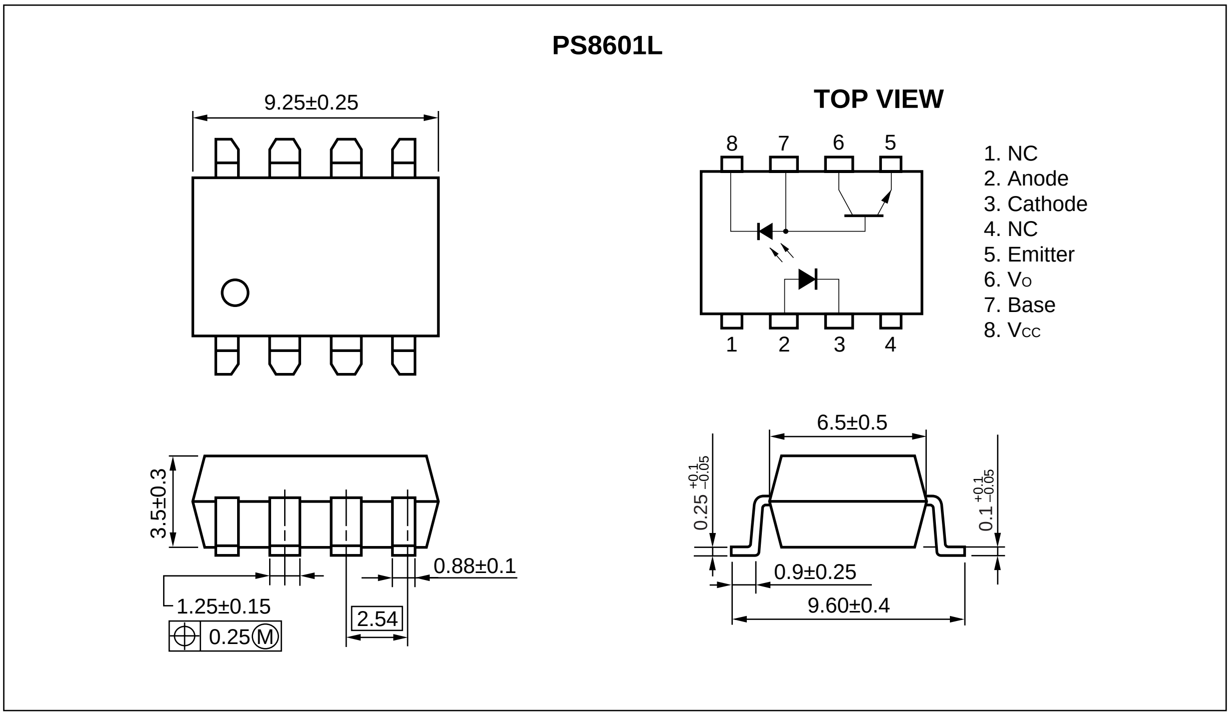
The mark ★ shows major revised points.

★ PACKAGE DIMENSIONS (UNIT: mm)

DIP Type

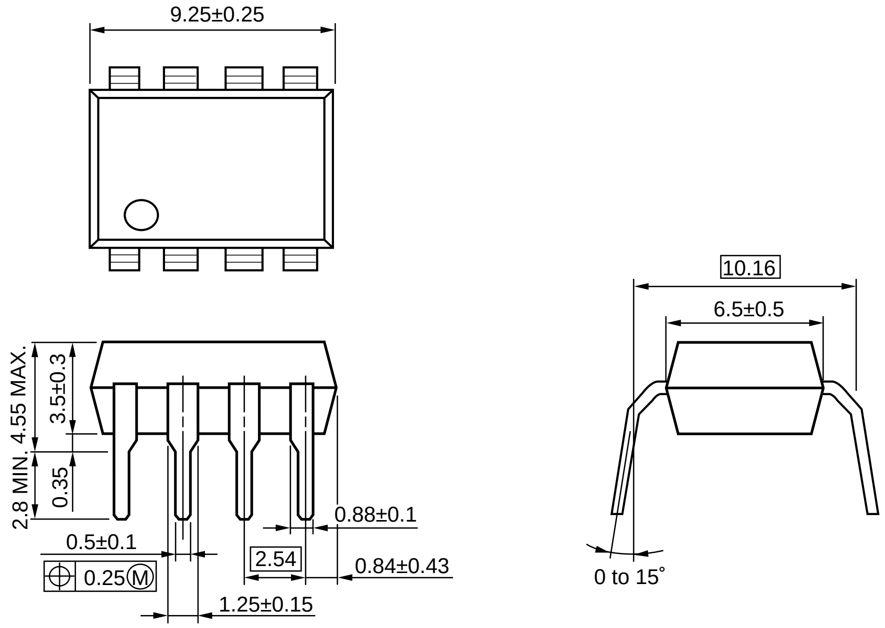


Lead Bending Type

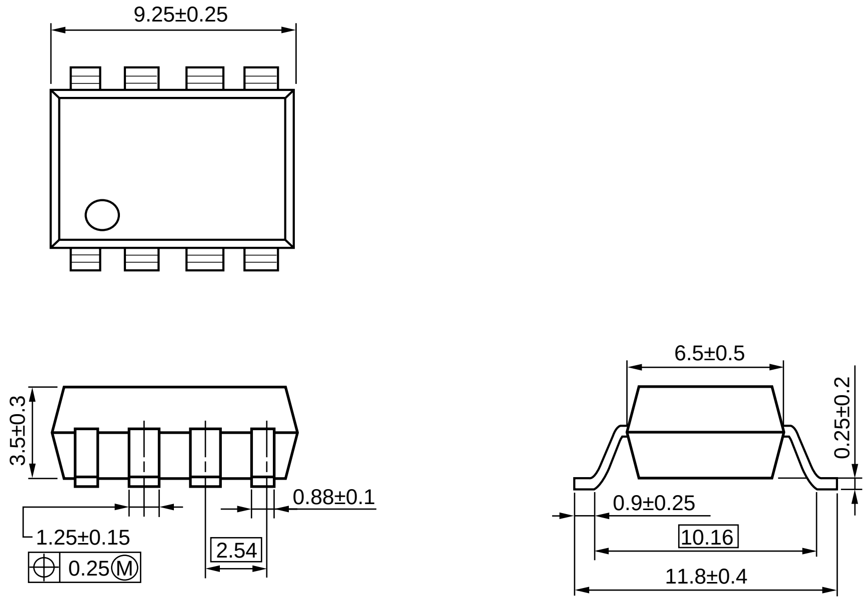


★ Lead Bending Type For Long Creepage Distance

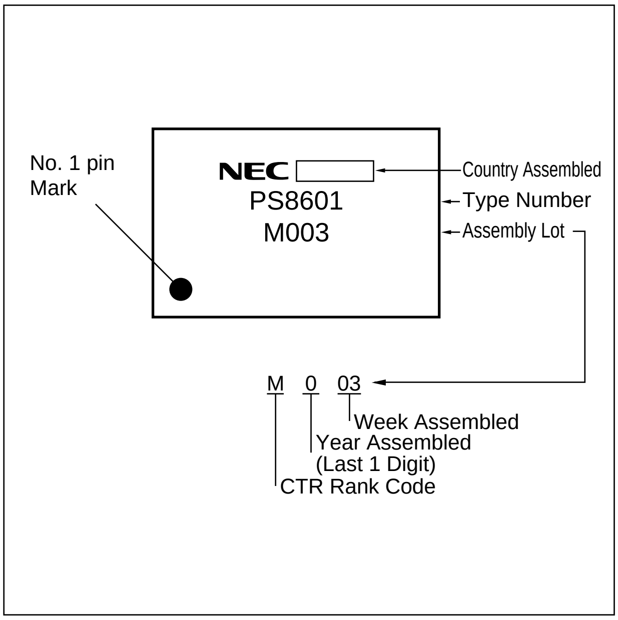
PS8601L1



PS8601L2



MARKING EXAMPLE



ORDERING INFORMATION

Part Number	Package	Packing Style	Application Part Number[*1]
PS8601	8-pin DIP	Magazine case 50 pcs	PS8601
PS8601L			PS8601L
PS8601L1			
PS8601L2			
PS8601L-E3		Embossed Tape 1 000 pcs/reel	
PS8601L-E4			
PS8601-V		Magazine case 50 pcs	PS8601
PS8601L-V			PS8601L
PS8601L1-V			
PS8601L2-V			
PS8601L-V-E3		Embossed Tape 1 000 pcs/reel	
PS8601L-V-E4			

***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	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	P_C	100	mW
Isolation Voltage[*1]		BV	5 000	Vr.m.s.
Operating Ambient Temperature		T_A	–55 to +100	°C
Storage Temperature		T_{stg}	–55 to +100	°C

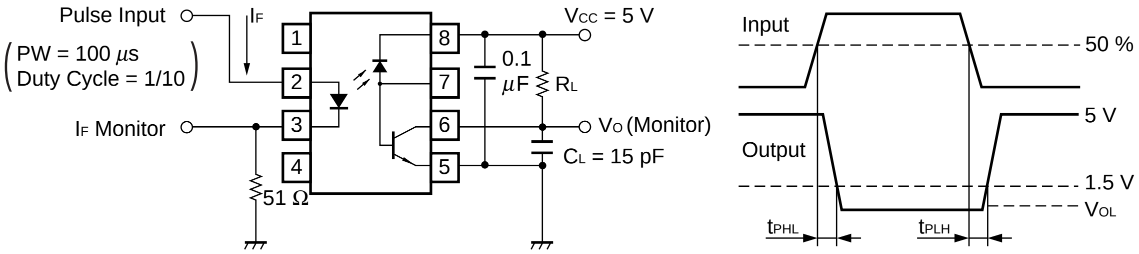
***1** AC voltage for 1 minute at T_A = 25 °C, RH = 60 % between input and output.

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

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		60		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	$R_{I\text{-}O}$	$V_{I\text{-}O}$ = 1 kV_{DC}	10^{11}			Ω
	Isolation Capacitance	$C_{I\text{-}O}$	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



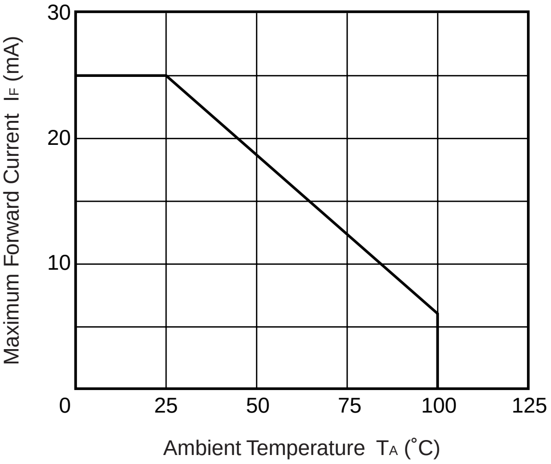
C_L includes probe and stray wiring capacitance

USAGE CAUTIONS

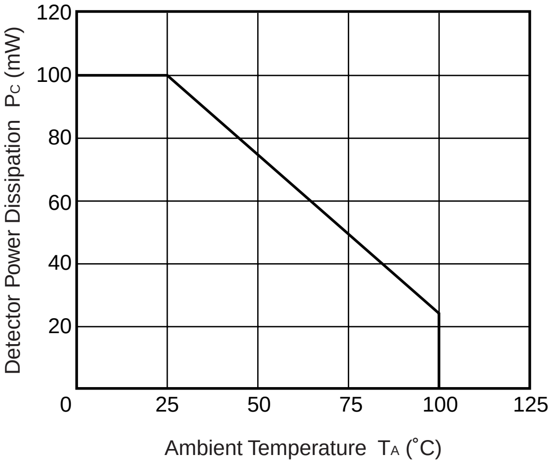
1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. By-pass capacitor of more than 0.1 μF is used between V_{CC} and GND near device. Also, ensure that the distance between the leads of the photocoupler 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)

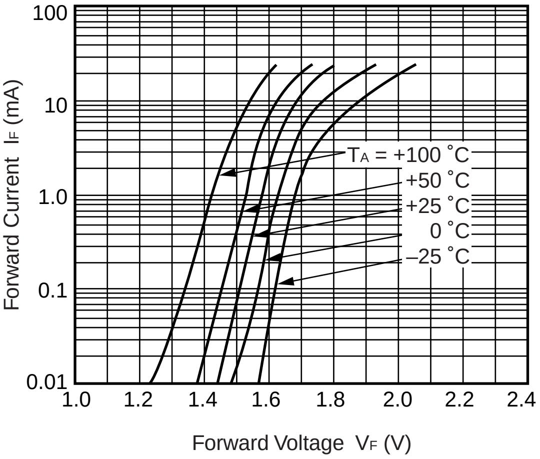
MAXIMUM FORWARD CURRENT
vs. AMBIENT TEMPERATURE



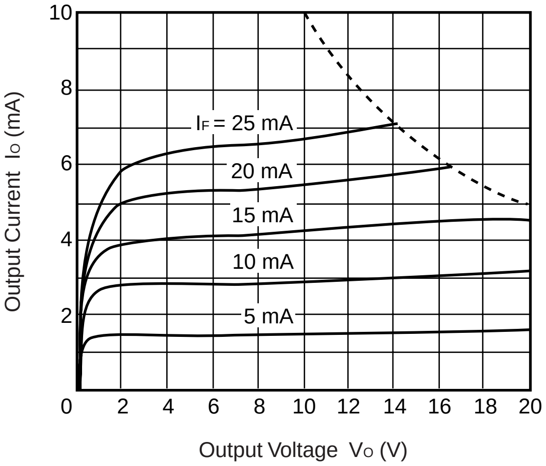
DETECTOR POWER DISSIPATION
vs. AMBIENT TEMPERATURE



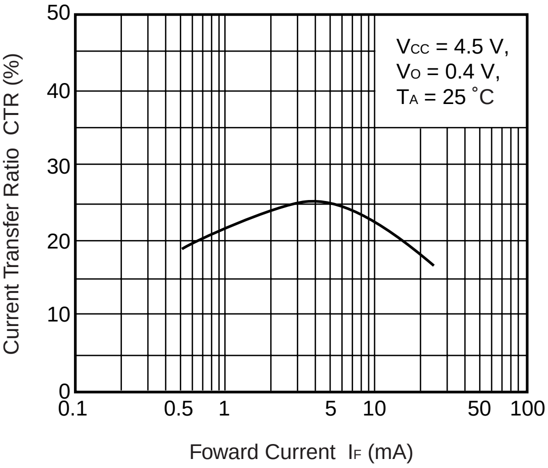
FORWARD CURRENT vs.
FORWARD VOLTAGE



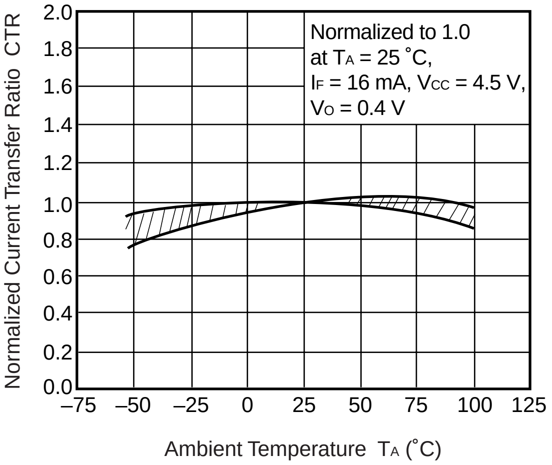
OUTPUT CURRENT vs.
OUTPUT VOLTAGE

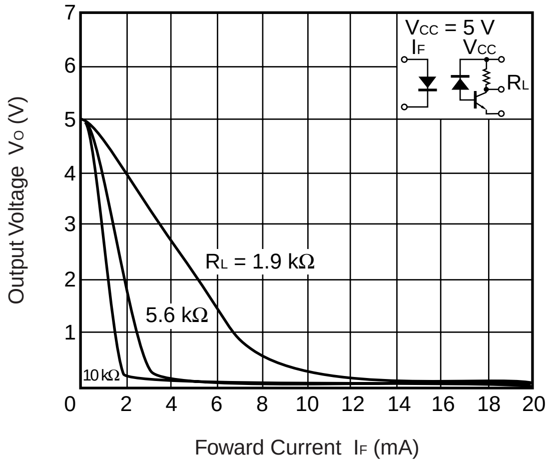


CURRENT TRANSFER RATIO
vs. FOWARD CURRENT

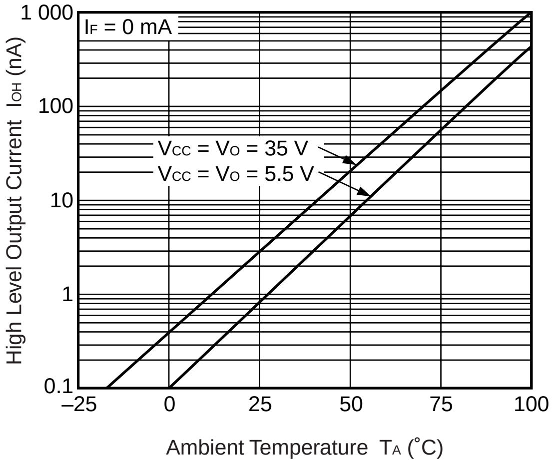


NORMALIZED CURRENT TRANSFER
RATIO vs. AMBIENT TEMPERATURE

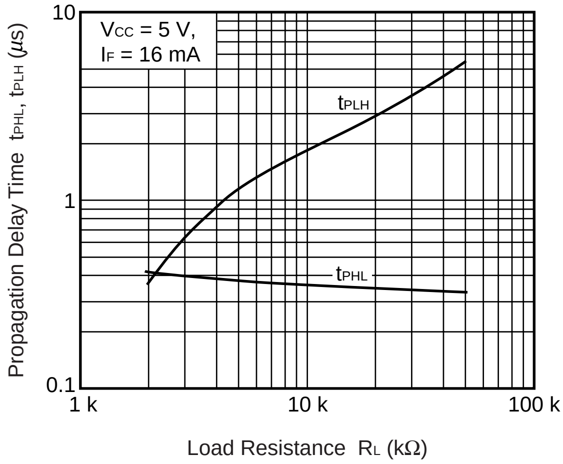




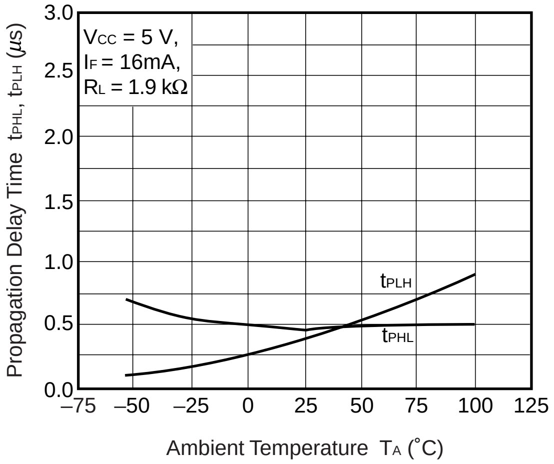
OUTPUT VOLTAGE vs.
FOWARD CURRENT



HIGH LEVEL OUTPUT CURRENT
vs. AMBIENT TEMPERATURE



PROPAGATION DELAY TIME,
vs. LORD RESISTANCE

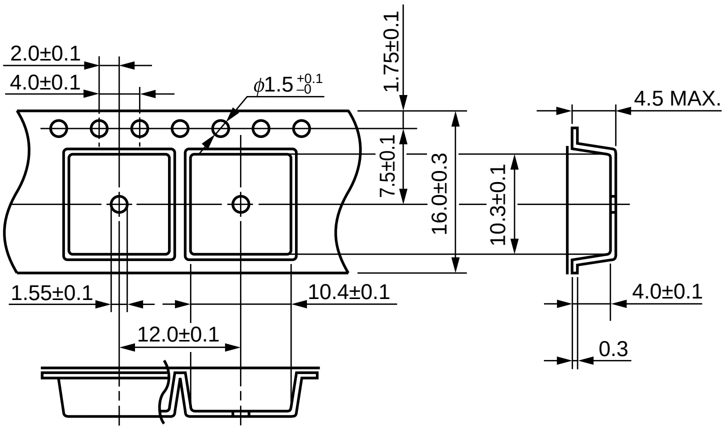


PROPAGATION DELAY TIME,
vs. AMBIENT TEMPERATURE

Remark The graphs indicate nominal characteristics.

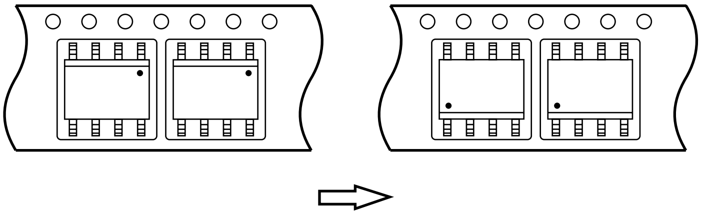
★ TAPING SPECIFICATIONS (UNIT: mm)

Outline and Dimensions (Tape)

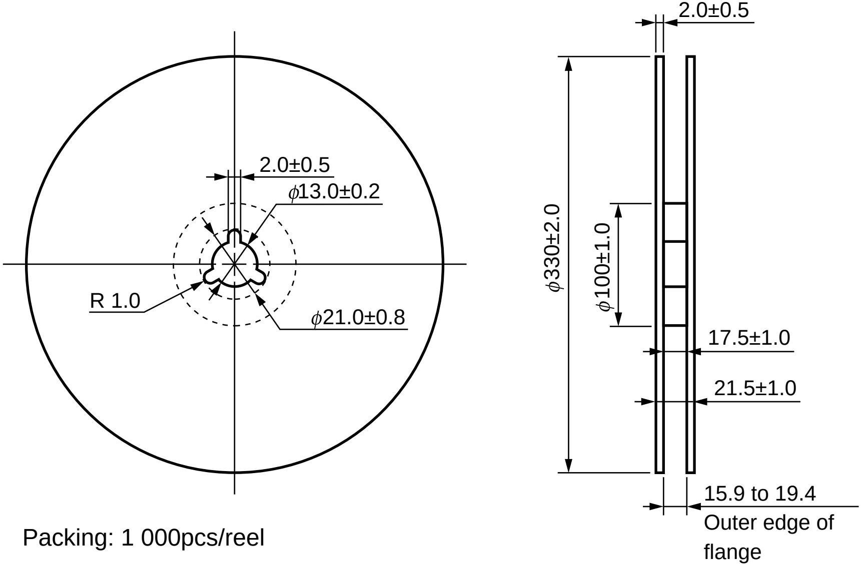


Tape Direction

PS8601L-E3　　　　PS8601L-E4



Outline and Dimensions (Reel)



Packing: 1 000pcs/reel

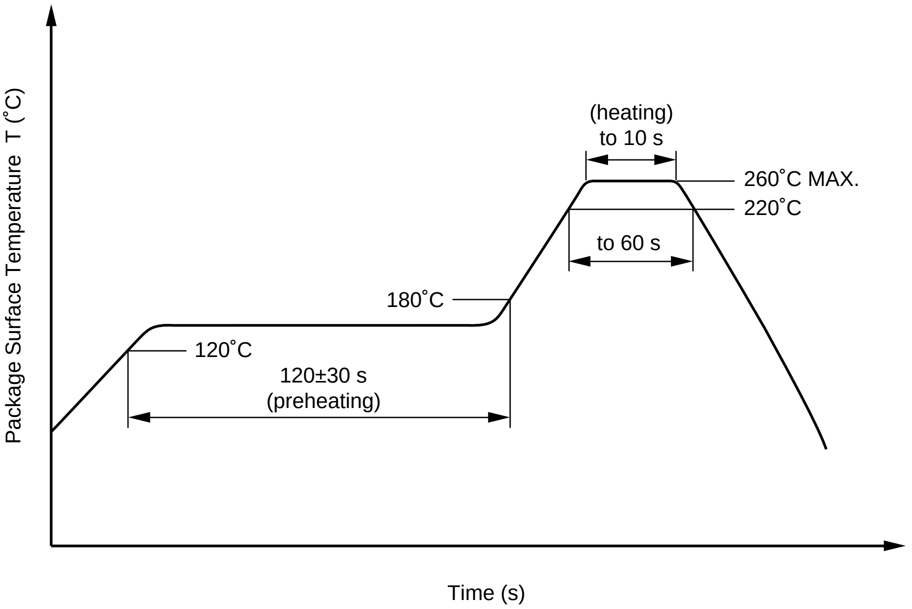
★ NOTES ON HANDLING

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) 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.

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, 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

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M8E 00. 4 - 0110

SAFETY INFORMATION ON THIS PRODUCT

Caution GaAs Products	The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested. • Do not destroy or burn the product. • Do not cut or cleave off any part of the product. • Do not crush or chemically dissolve the product. • Do not put the product in the mouth. Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.

▶**For further information, please contact**

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