CEL

PHOTOCOUPLER
PS9611,PS9611L

HIGH NOISE REDUCTION, HIGH-SPEED 10 Mbps TOTEM POLE OUTPUT TYPE 8-PIN DIP PHOTOCOUPLER

–NEPOC Series–

DESCRIPTION

The PS9611 and PS9611L are optically coupled high-speed, totem pole output 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 PS9611 is in a plastic DIP (Dual In-line Package) and the PS9611L is lead bending type (Gull-wing) for surface mounting.

FEATURES

- High common mode transient immunity (CM_H, CM_L = ±10 kV/μs TYP.)
- High-speed response (t_{PHL} = 30 ns TYP., t_{PLH} = 35 ns TYP.)
- Pulse width distortion ($|t_{PHL} - t_{PLH}|$ = 5 ns TYP.)
- Totem pole output (No pull-up resistor required)
- Ordering number of tape product: PS9611L-E3, E4: 1 000 pcs/reel
- Safety standards
  - UL approved: File No. E72422 (S)
  - VDE0884 approved (Option) : No.91877

APPLICATIONS

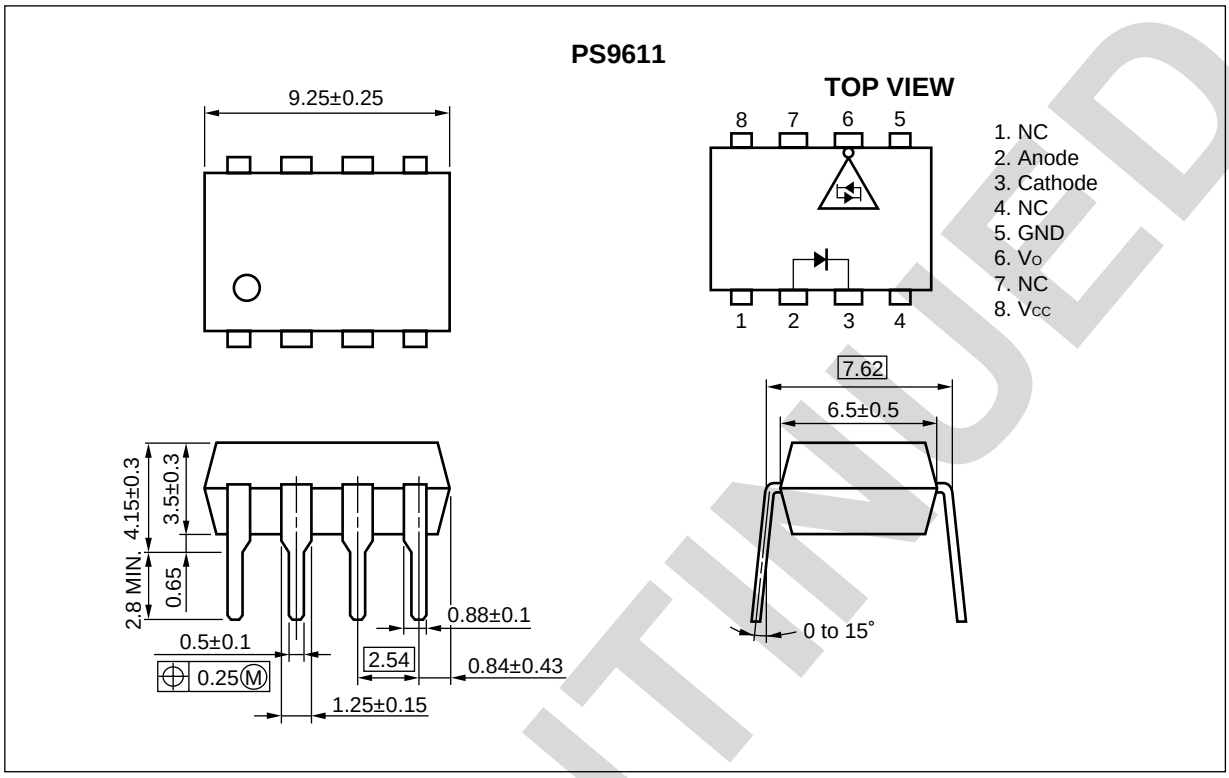
- Computer and peripheral manufactures
- Measurement equipment
- PDP

Document No. PN10072EJ02V0DS (2nd edition)
Date Published February 2003 CP(K)

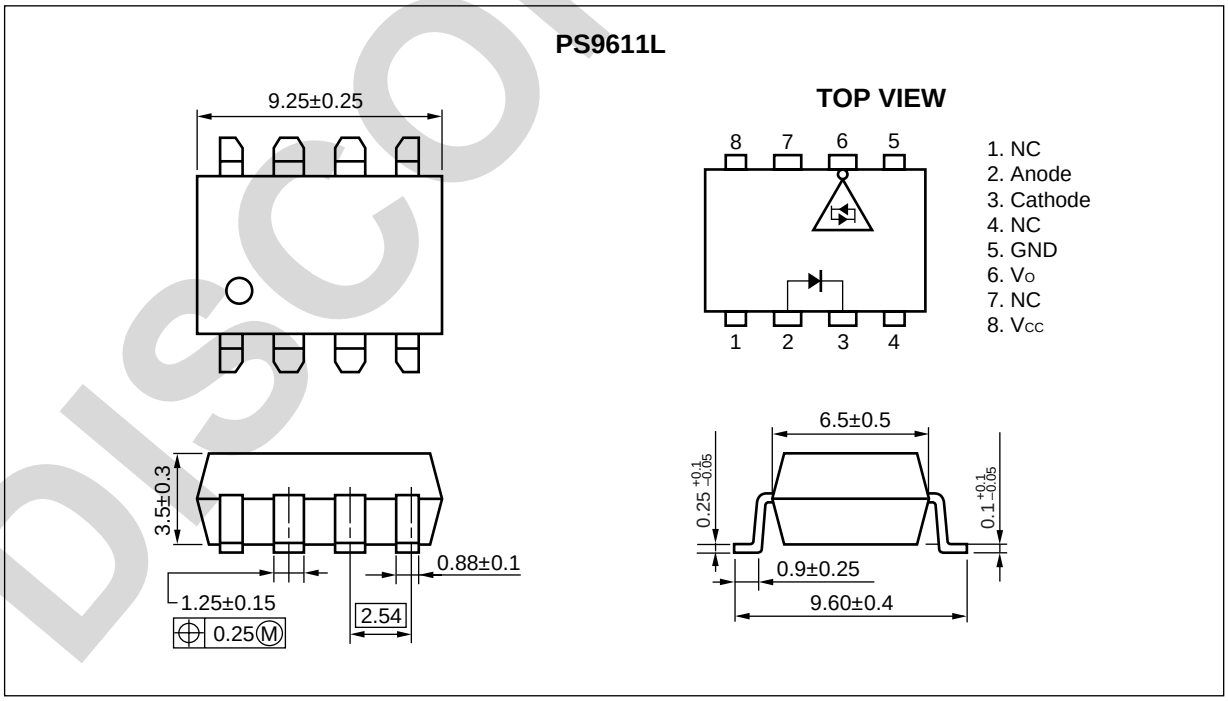
The mark ★ shows major revised points.

★ PACKAGE DIMENSIONS (UNIT: mm)

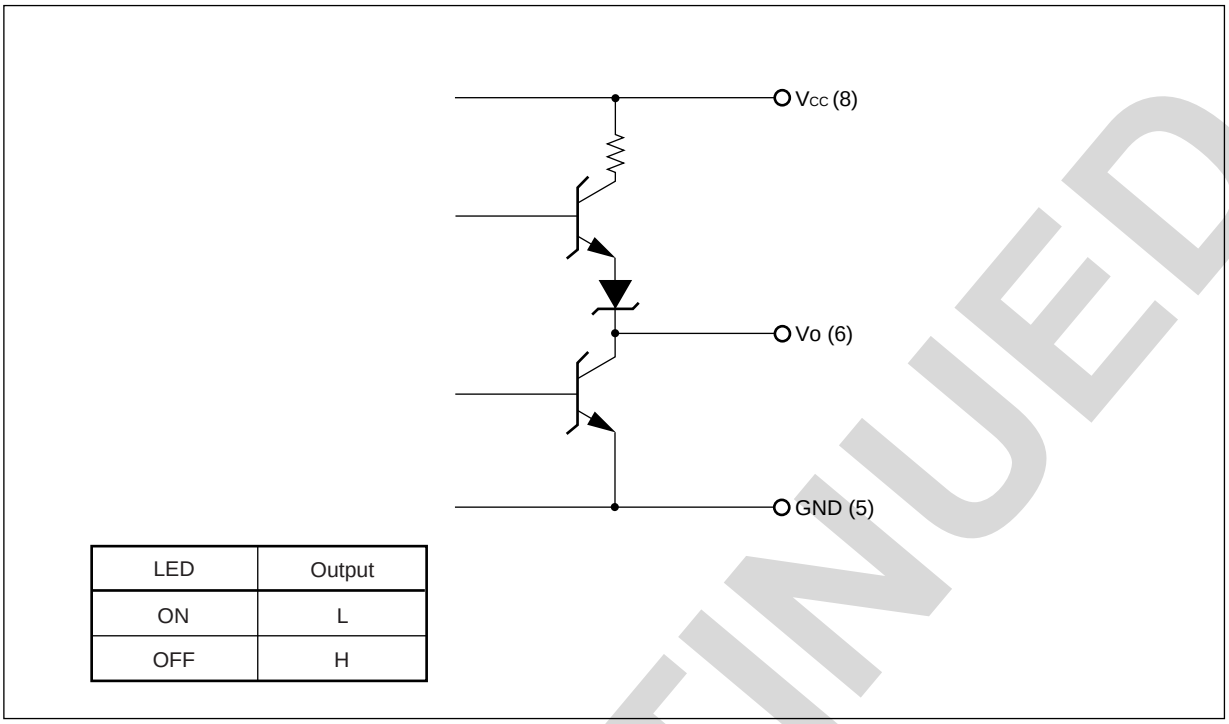
DIP Type



Lead Bending Type

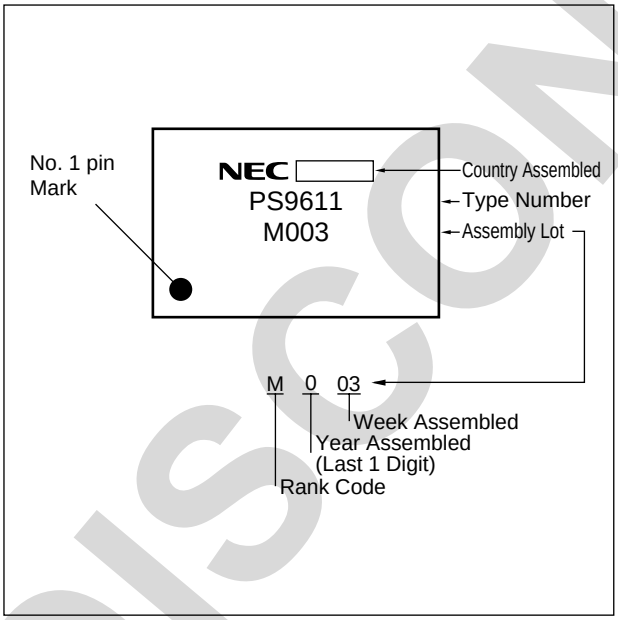


INTERNAL OUTPUT CIRCUIT



LED	Output
ON	L
OFF	H

MARKING EXAMPLE



ORDERING INFORMATION (Solder Contains Lead)

Part Number	Package	Packing Style	Safety Standards Approval	Application Part Number*1
PS9611	8-pin DIP	Magazine case 50 pcs	Approved products other than VDE	PS9611
PS9611L				PS9611L
PS9611L-E3		Embossed Tape 1 000 pcs/reel		
PS9611L-E4				
PS9611-V		Magazine case 50 pcs	VDE0884 approved (Option)	PS9611
PS9611L-V				PS9611L
PS9611L-V-E3		Embossed Tape 1 000 pcs/reel		
PS9611L-V-E4				

***1** For the application of the Safety Standard, following part number should be used.

ORDERING INFORMATION (Pb-Free)

Part Number	Package	Packing Style	Safety Standards Approval	Application Part Number*1
PS9611-A	8-pin DIP	Magazine case 50 pcs	Approved products other than VDE	PS9611
PS9611L-A				PS9611L
PS9611L-E3-A		Embossed Tape 1 000 pcs/reel		
PS9611L-E4-A				
PS9611-V-A		Magazine case 50 pcs	VDE0884 approved (Option)	PS9611
PS9611L-V-A				PS9611L
PS9611L-V-E3-A		Embossed Tape 1 000 pcs/reel		
PS9611L-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
Diode	Forward Current	I_F	30	mA
	Reverse Voltage	V_R	3.0	V
Detector	Supply Voltage	V_{CC}	7	V
	Output Voltage	V_O	7	V
	High Level Output Current*1	I_{OH}	–5	mA
	Low Level Output Current*1	I_{OL}	25	mA
	Power Dissipation*1, 2	P_C	150	mW
Isolation Voltage*3		BV	3 750	Vr.m.s.
Operating Ambient Temperature		T_A	–40 to +85	°C
Storage Temperature		T_{stg}	–55 to +125	°C

***1** T_A = –40 to +85°C

***2** Applies to output pin V_O and power supply pin V_{CC}.

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

RECOMMENDED OPERATING CONDITIONS

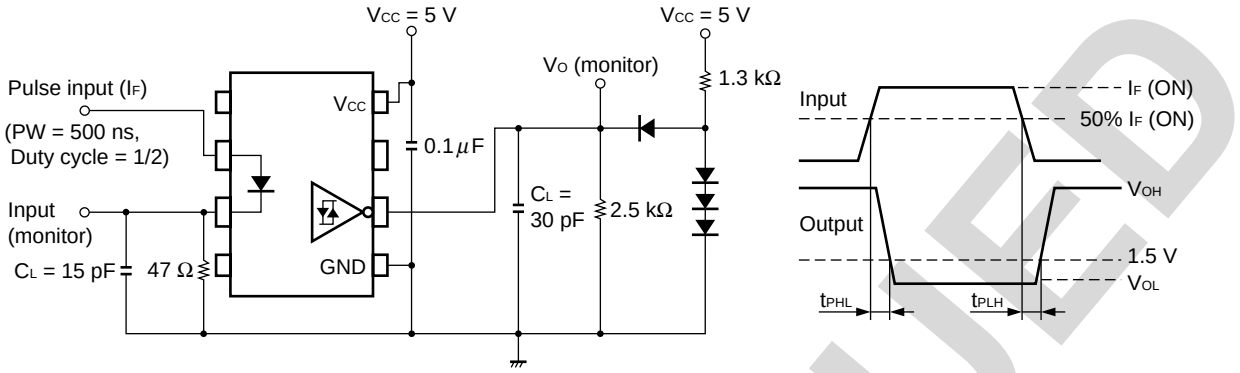
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
High Level Input Current	I_{FH}	7.5		12.5	mA
Low Level Input Current	I_{FL}	0		250	μA
Supply Voltage	V_{CC}	4.5	5.0	5.5	V
TTL (loads)	N			5	

ELECTRICAL CHARACTERISTICS (T_A = –40 to +85°C, unless otherwise specified)

Parameter		Symbol	Conditions	MIN.	TYP.[*1]	MAX.	Unit
Diode	Forward Voltage	V_F	I_F = 10 mA, T_A = 25°C	1.4	1.65	1.9	V
	Reverse Current	I_R	V_R = 3 V, T_A = 25°C			10	μA
	Terminal Capacitance	C_t	V = 0 V, f = 1 MHz, T_A = 25°C		30		pF
Detector	High Level Output Current	I_{OH}	V_{CC} = V_O = 5.5 V, I_F = 250 μA		1	200	μA
	High Level Output Voltage	V_{OH}	V_{CC} = 4.5 V, I_F = 250 μA, I_{OH} = –2 mA	2.4	3.0		V
	Low Level Output Voltage	V_{OL}	V_{CC} = 4.5 V, I_F = 7 mA, I_{OL} = 8 mA		0.38	0.6	V
	High Level Supply Current	I_{CCH}	V_{CC} = 5.5 V, I_F = 0 mA		11	17	mA
	Low Level Supply Current	I_{CCL}	V_{CC} = 5.5 V, I_F = 10 mA		12	18	mA
	High Level Output Short Circuit Current	I_{OSH}	V_{CC} = 5.5 V, V_O = GND, I_F = 0 mA, 10 ms or less		–26		mA
	Low Level Output Short Circuit Current	I_{OSL}	V_{CC} = V_O = 5.5 V, I_F = 8 mA, 10 ms or less		34		mA
Coupled	Threshold Input Current (H → L)	I_{FHL}	V_{CC} = 5 V, T_A = 25°C		2.7	5	mA
			V_{CC} = 5 V			6	
	Threshold Input Current (L → H)	I_{FLH}	V_{CC} = 5 V, T_A = 25°C	0.5			mA
			V_{CC} = 5 V	0.35			
	Isolation Resistance	R_{I-O}	V_{I-O} = 1 kV_{DC}, RH = 40 to 60%, T_A = 25°C	10^{11}			Ω
	Isolation Capacitance	C_{I-O}	V = 0 V, f = 1 MHz, T_A = 25°C		0.9		pF
	Propagation Delay Time (H → L)[*2]	t_{PHL}	T_A = 25°C	15	30	65	ns
			V_{CC} = 5 V, I_F = 7.5 mA	10		85	
	Propagation Delay Time (L → H)[*2]	t_{PLH}	T_A = 25°C	15	35	65	ns
			V_{CC} = 5 V, I_F = 7.5 mA	10		85	
	Pulse Width Distortion (PWD)[*2]	$\lvert t_{PHL}-t_{PLH} \rvert$	V_{CC} = 5 V, I_F = 7.5 mA		5	35	ns
	Common Mode Transient Immunity at High Level Output[*3]	CM_H	V_{CC} = 5 V, T_A = 25°C, I_F = 0 mA, $V_{O\ (MIN.)}$ = 2 V, V_{CM} = 100 V	1	10		kV/μs
	Common Mode Transient Immunity at Low Level Output[*3]	CM_L	V_{CC} = 5 V, T_A = 25°C, I_F = 7.5 mA, $V_{O\ (MAX.)}$ = 0.8 V, V_{CM} = 100 V	1	10		kV/μs

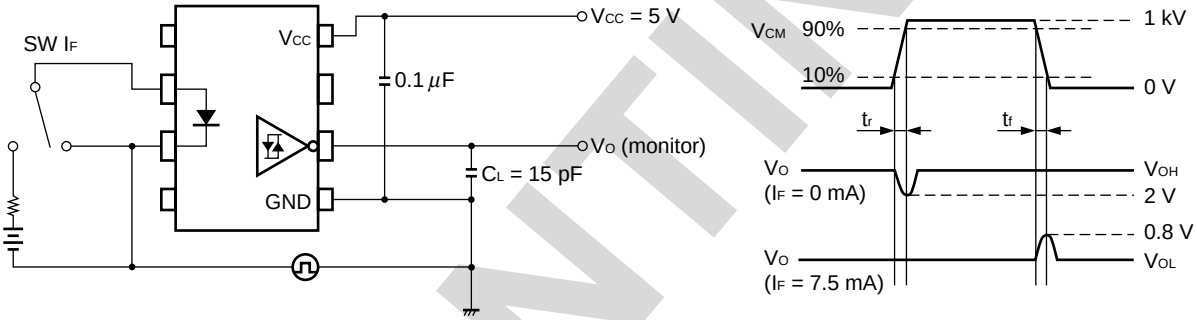
***1** Typical values at T_A = 25°C

***2** Test circuit for propagation delay time



C_L includes probe and stray wiring capacitance.

***3** Test circuit for common mode transient immunity



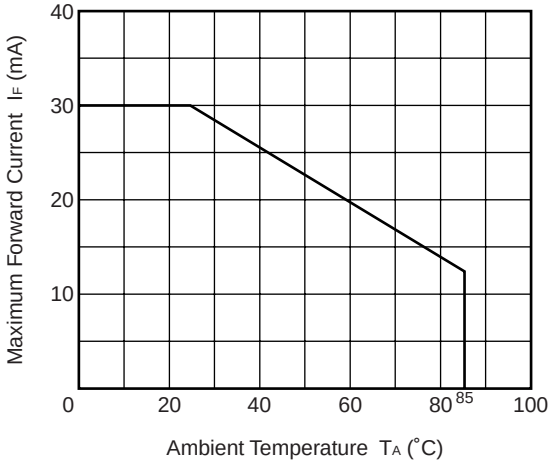
C_L includes probe and stray wiring capacitance.

USAGE CAUTIONS

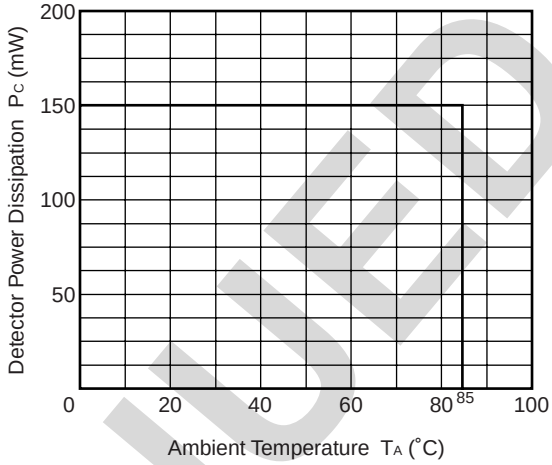
1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. By-pass capacitor of more than 0.1 μF is used between V_{CC} and GND near device. Also, ensure that the distance between the leads of the photocoupler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

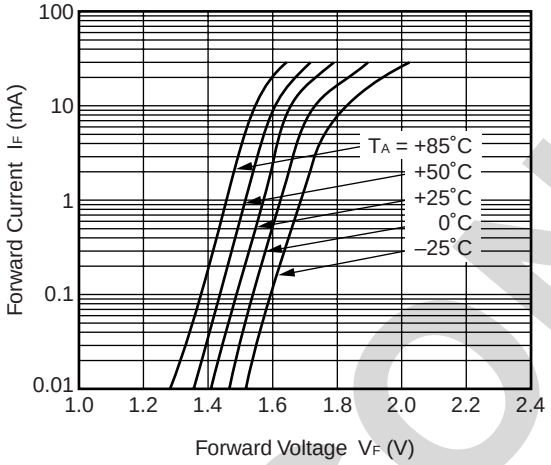
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



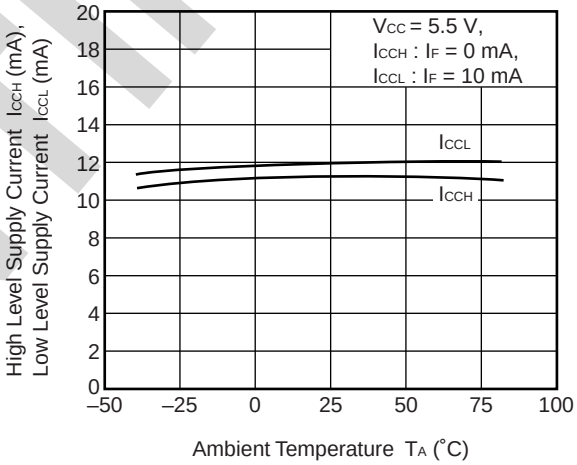
DETECTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



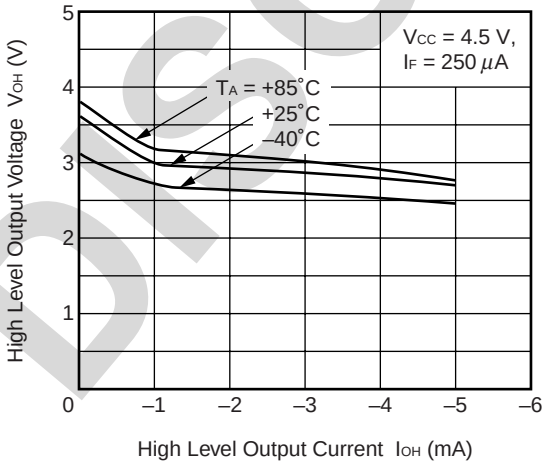
FORWARD CURRENT vs. FORWARD VOLTAGE



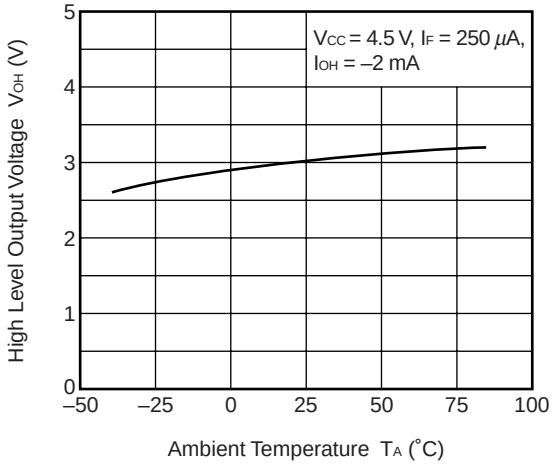
SUPPLY CURRENT vs. AMBIENT TEMPERATURE



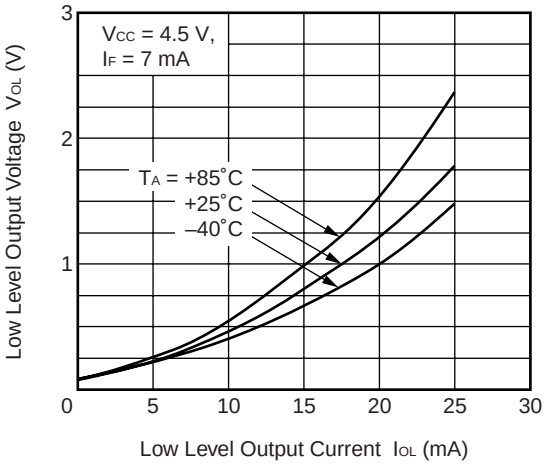
HIGH LEVEL OUTPUT VOLTAGE vs. HIGH LEVEL OUTPUT CURRENT



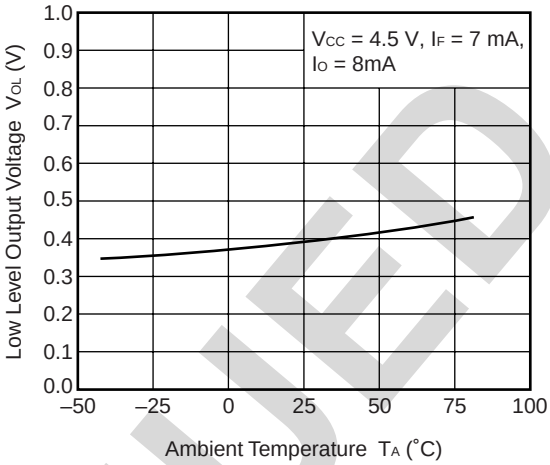
HIGH LEVEL OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE



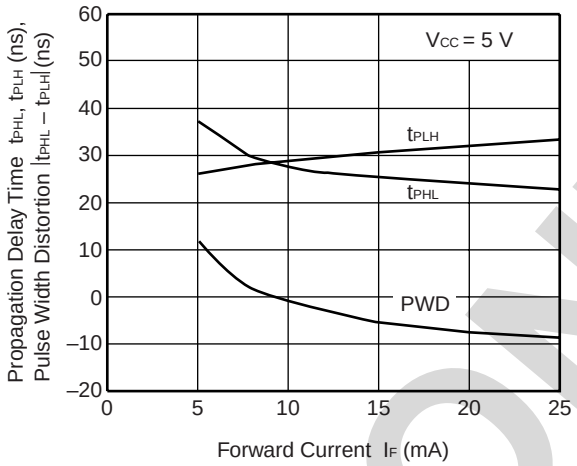
LOW LEVEL OUTPUT VOLTAGE vs.
LOW LEVEL OUTPUT CURRENT



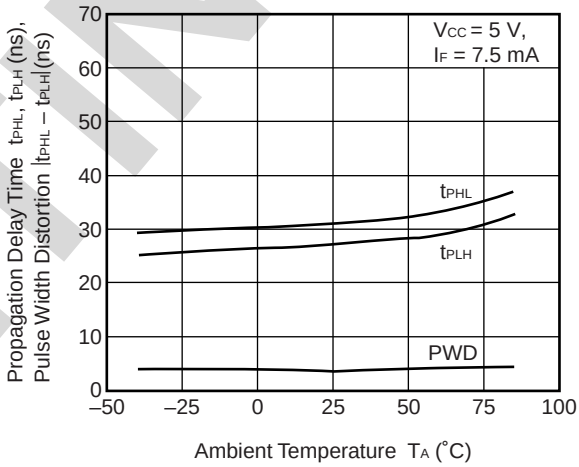
LOW LEVEL OUTPUT VOLTAGE vs.
AMBIENT TEMPERATURE



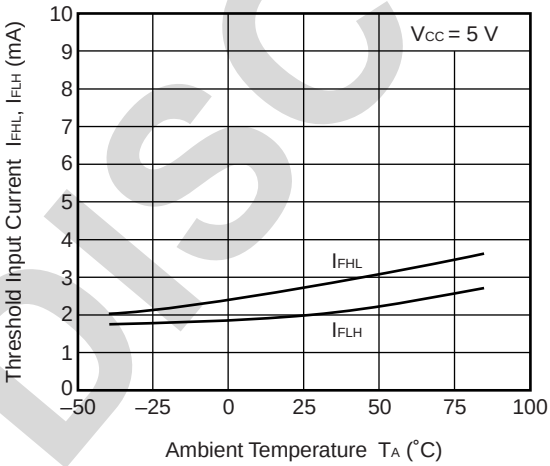
PROPAGATION DELAY TIME,
PULSE WIDTH DISTORTION
vs. FORWARD CURRENT



PROPAGATION DELAY TIME,
PULSE WIDTH DISTORTION
vs. AMBIENT TEMPERATURE



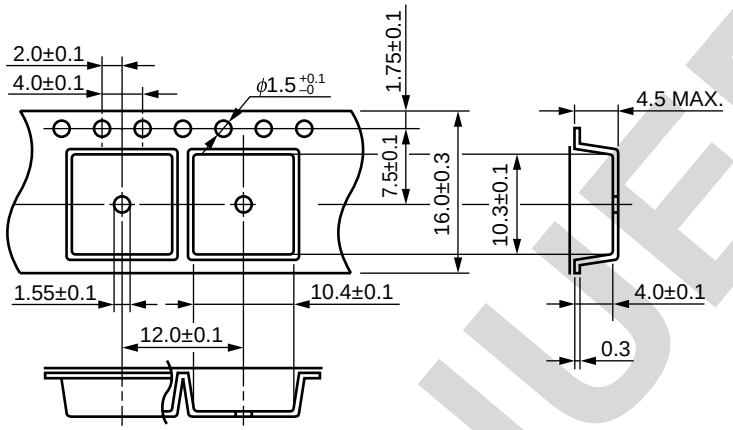
THRESHOLD INPUT CURRENT vs.
AMBIENT TEMPERATURE



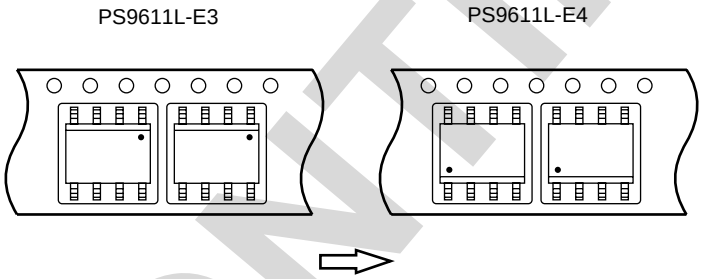
Remark The graphs indicate nominal characteristics.

★ **TAPING SPECIFICATIONS (UNIT: mm)**

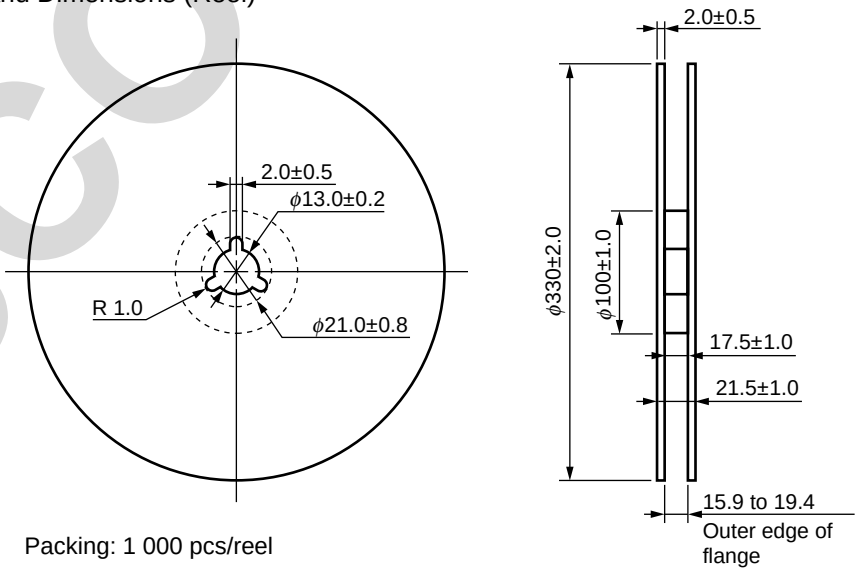
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



Packing: 1 000 pcs/reel

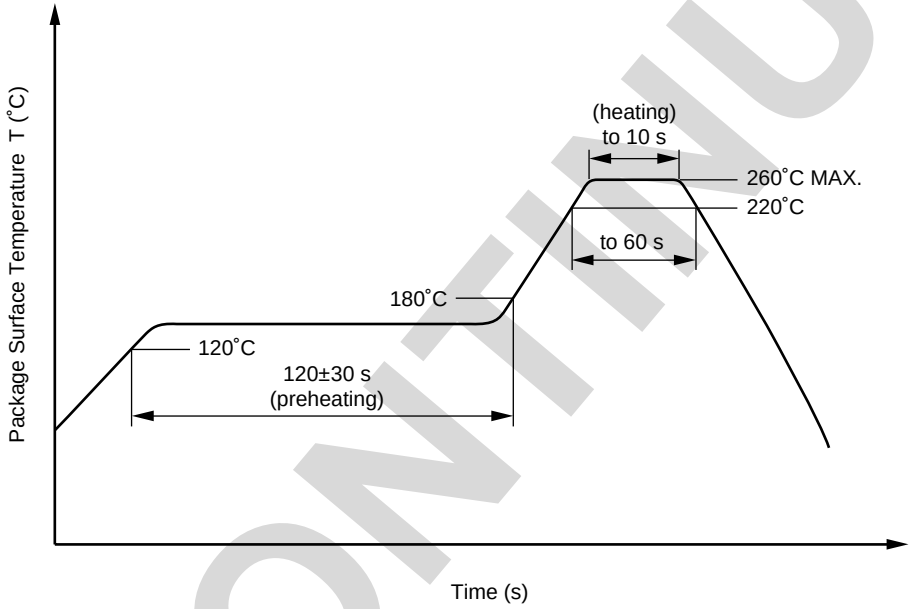
NOTES ON HANDLING

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.)

(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.

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Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL's understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)	Concentration contained in CEL devices	
Lead (Pb)	< 1000 PPM	-A	-AZ
		Not Detected	(*)
Mercury	< 1000 PPM	Not Detected	
Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.