DATA SHEET

NEC

PHOTOCOUPLER

PS8602,PS8602L

HIGH NOISE REDUCTION HIGH SPEED ANALOG OUTPUT TYPE 8 PIN PHOTOCOUPLER

–NEPOC™ Series–

DESCRIPTION

The PS8602 and PS8602L are 8-pin high speed photocouplers containing a GaAIAs LED on input side and a P-N photodiode and a high speed amplifier transistor on output side on one chip. The PS8602 is in a plastic DIP (Dual In-line Package). The PS8601L is lead bending type (Gull wing) for surface mount.

★ FEATURES

- High common mode transient immunity (CM_H, CM_L = ±2 000 kV/μs MIN.)
- 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: PS8602L-E3, E4: 1 000 pcs/reel
- Safety standards
  - UL approved: File No. E72422 (S)
  - BSI approved: No. 8004
  - VDE0884 approved (Option) No.91877

★ APPLICATIONS

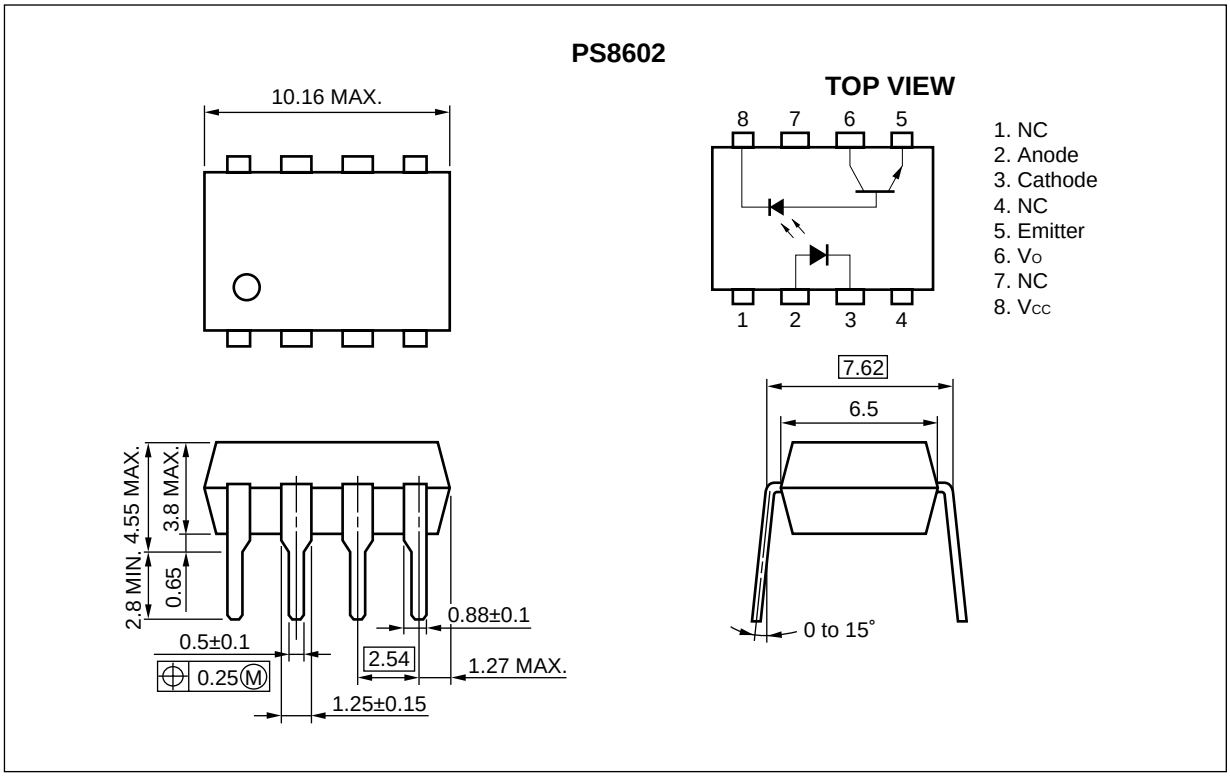
- Interface for measurement or control equipment
- Substitutions for relays and pulse transformers

Document No. P11651EJ3V1DS00 (3rd edition)
Date Published July 2001 NS CP(K)
Printed in Japan

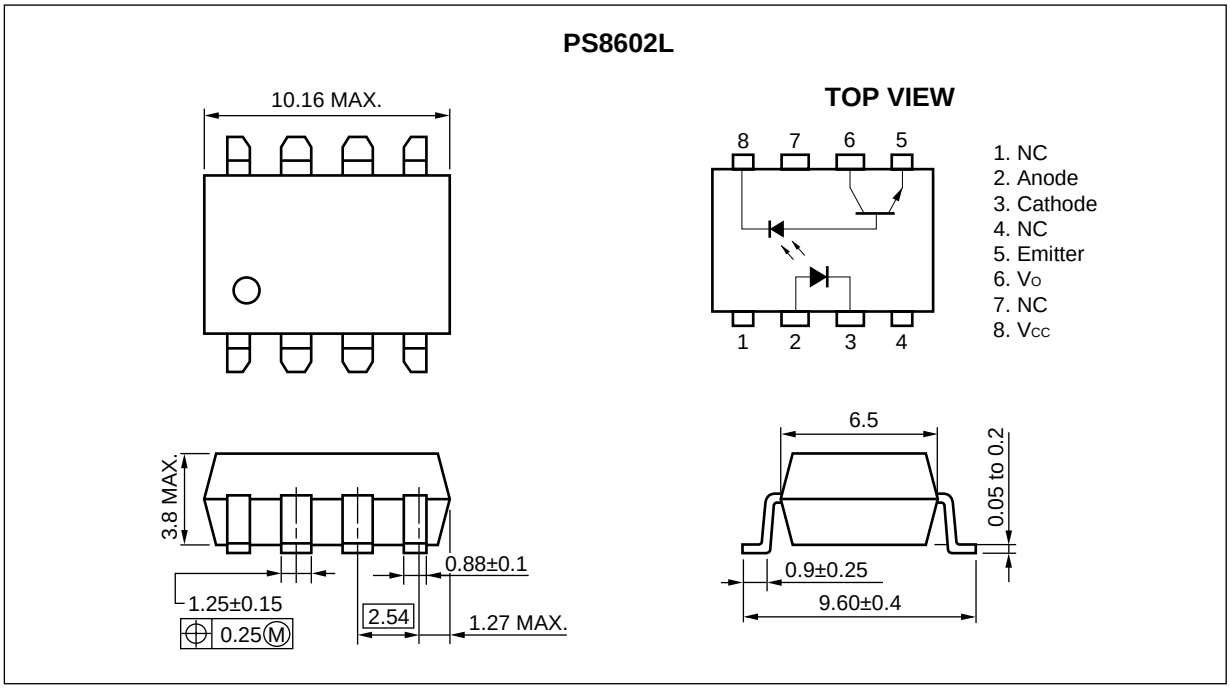
The mark ★ shows major revised points.

★ **PACKAGE DIMENSIONS (UNIT: mm)**

DIP Type

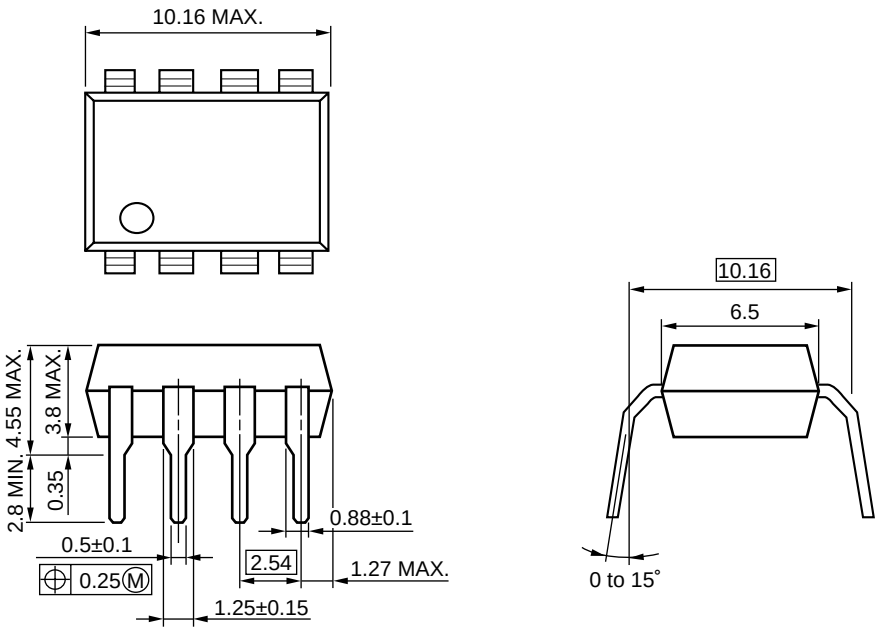


Lead Bending Type

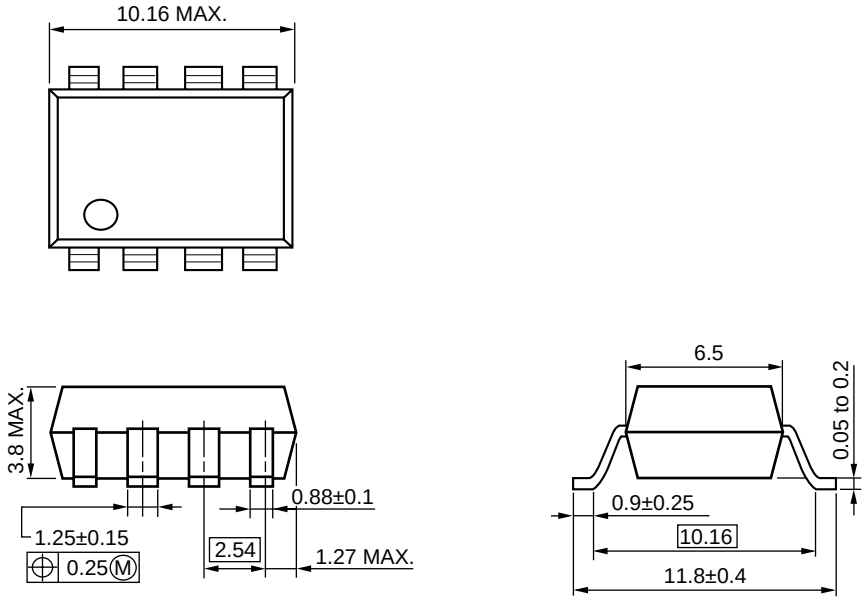


Lead Bending Type For Long Creepage Distance

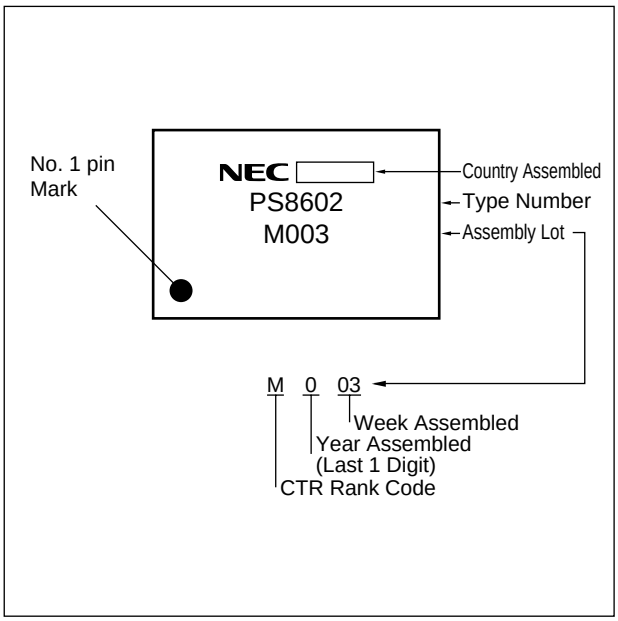
PS8602L1



PS8602L2



★ **MARKING EXAMPLE**



★ ORDERING INFORMATION

Part Number	Package	Packing Style	Application Part Number*1
PS8602	8-pin DIP	Magazine case 50 pcs	PS8602
PS8602L			PS8602L
PS8602L1			
PS8602L2			
PS8602L-E3		Embossed Tape 1 000 pcs/reel	
PS8602L-E4			
PS8602-V		Magazine case 50 pcs	PS8602
PS8602L-V			PS8602L
PS8602L1-V			
PS8602L2-V			
PS8602L-V-E3		Embossed Tape 1 000 pcs/reel	
PS8602L-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 +150	°C

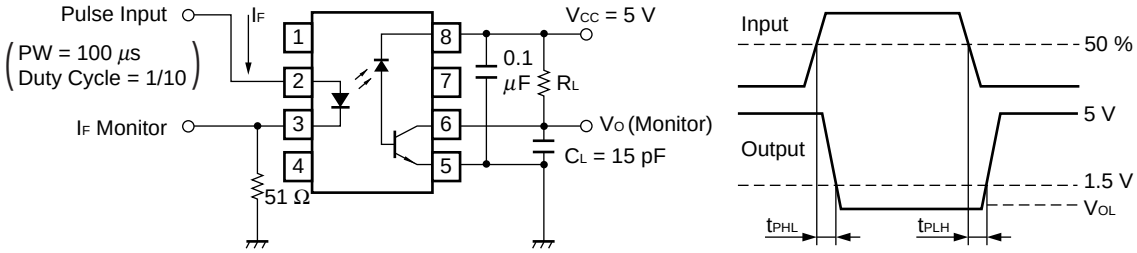
***1** AC voltage for 1 minute at T_A = 25 °C, RH = 60 % between input and output.

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
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
	Common Mode Transient Immunity at High Level Output[*3]	CM_H	I_F = 0 mA, V_{CM} = 400 V R_L = 4.1 kΩ	−2 000			V/μs
	Common Mode Transient Immunity at Low Level Output[*3]	CM_L	I_F = 16 mA, V_{CM} = 400 V R_L = 4.1 kΩ	2 000			V/μs

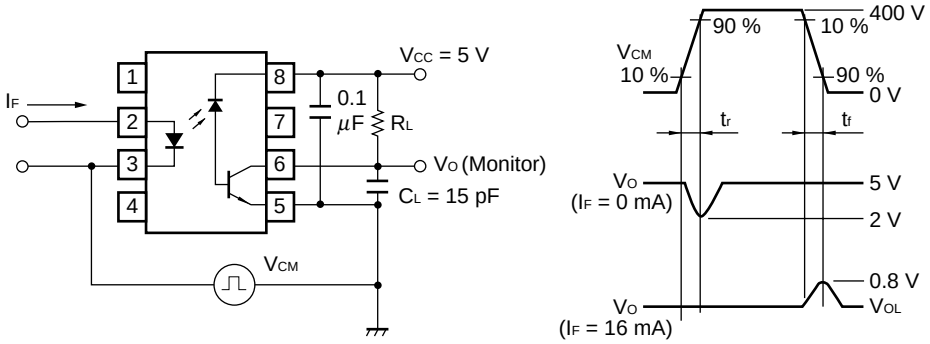
★ ***1*** Typical values at T_A = 25 °C

2 Test circuit for propagation delay time



C_L includes probe and stray wiring capacitance

3 Test circuit for common mode transient immunity



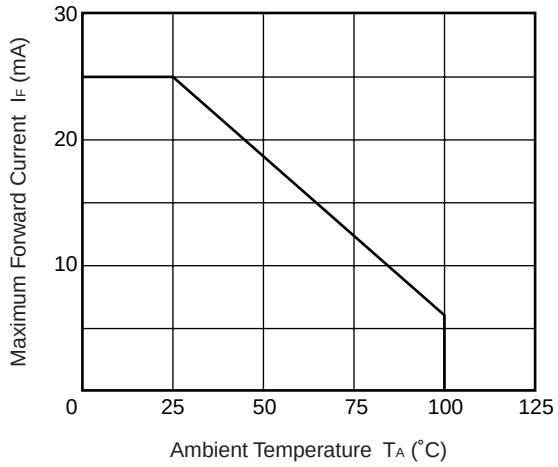
C_L includes probe and stray wiring capacitance

★ USAGE CAUTIONS

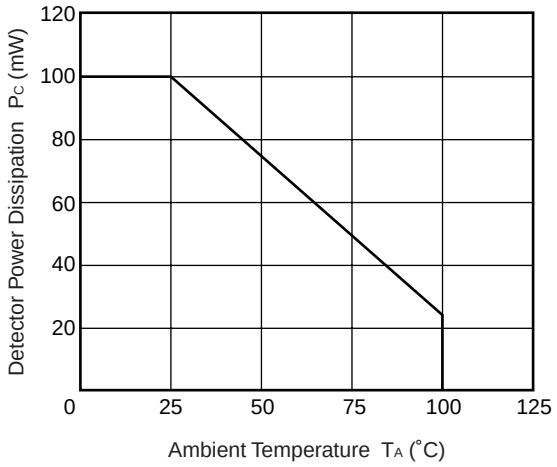
1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. By-pass capacitor of more than 0.1 μF is used between V_{CC} and GND near device. Also, ensure that the distance between the leads of the photocoupler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

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

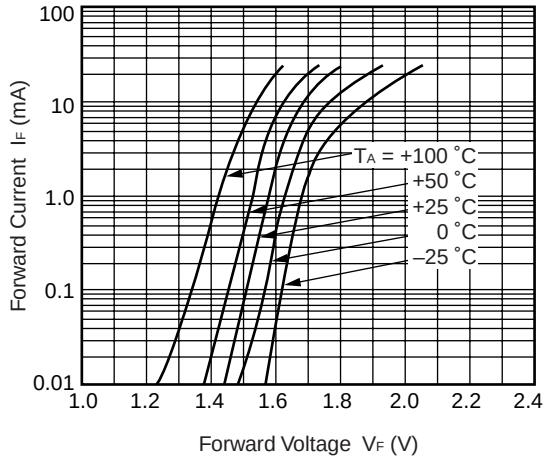
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



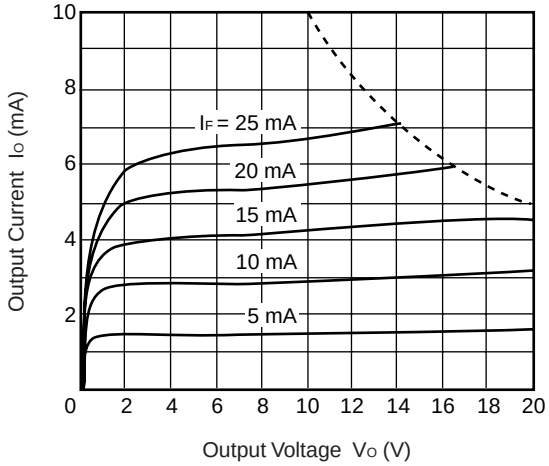
DETECTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



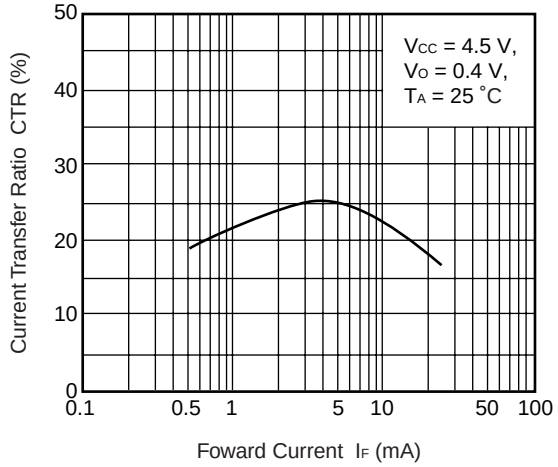
FORWARD CURRENT vs. FORWARD VOLTAGE



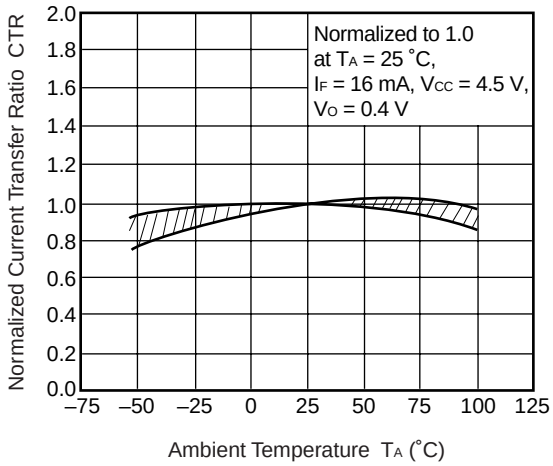
OUTPUT CURRENT vs. OUTPUT VOLTAGE



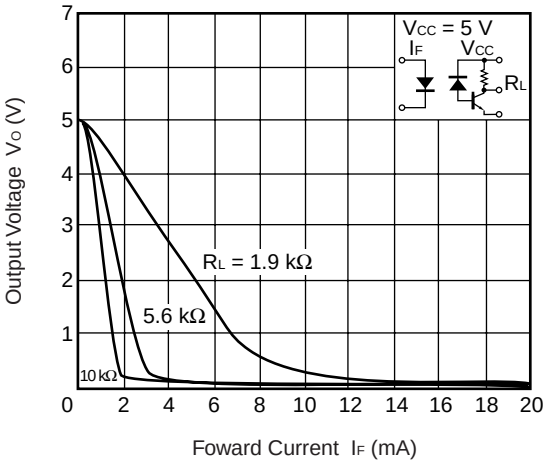
CURRENT TRANSFER RATIO vs. FOWARD CURRENT



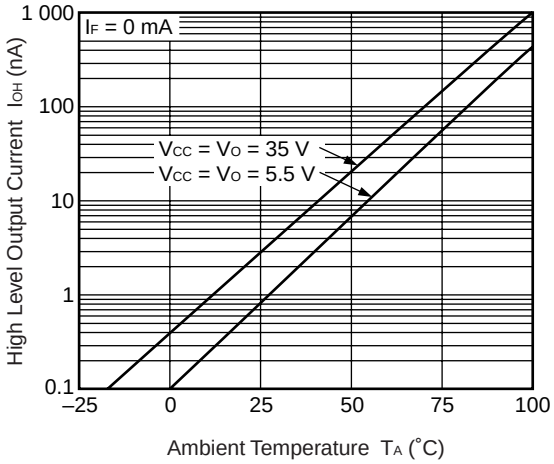
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



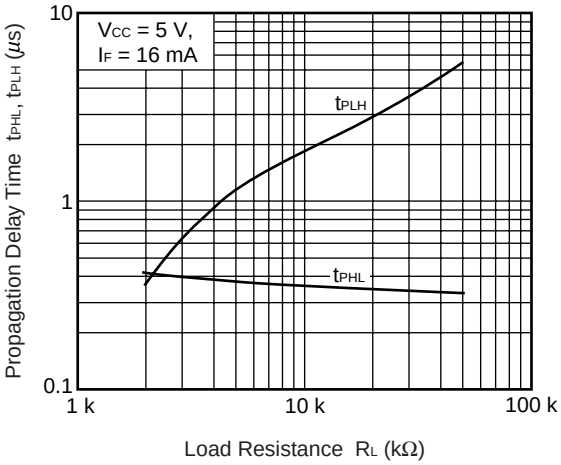
OUTPUT VOLTAGE vs.
FOWARD CURRENT



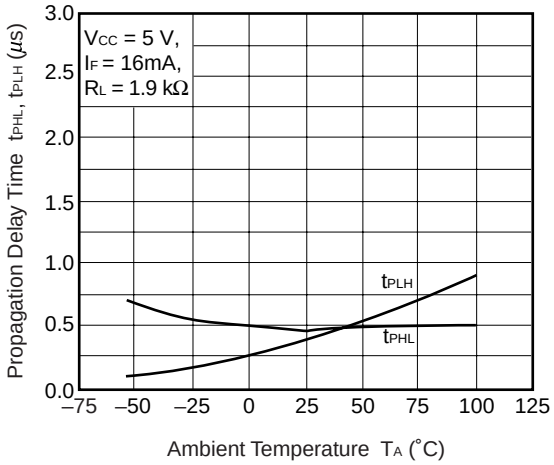
HIGH LEVEL OUTPUT CURRENT
vs. AMBIENT TEMPERATURE



PROPAGATION DELAY TIME,
vs. LORD RESISTANCE



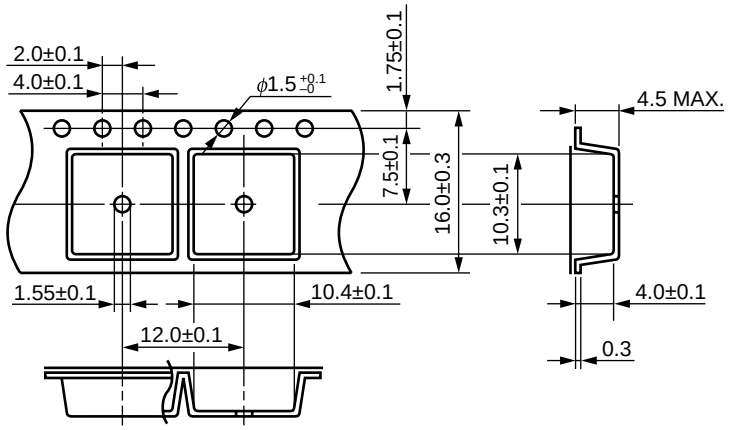
PROPAGATION DELAY TIME,
vs. AMBIENT TEMPERATURE



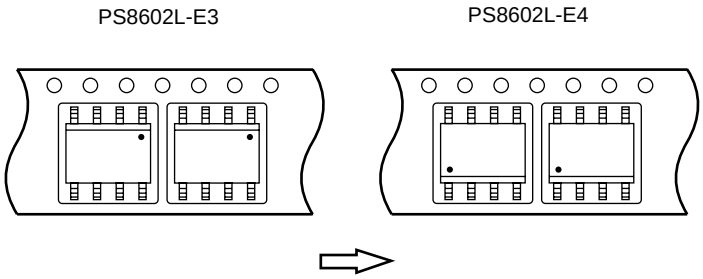
Remark The graphs indicate nominal characteristics.

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

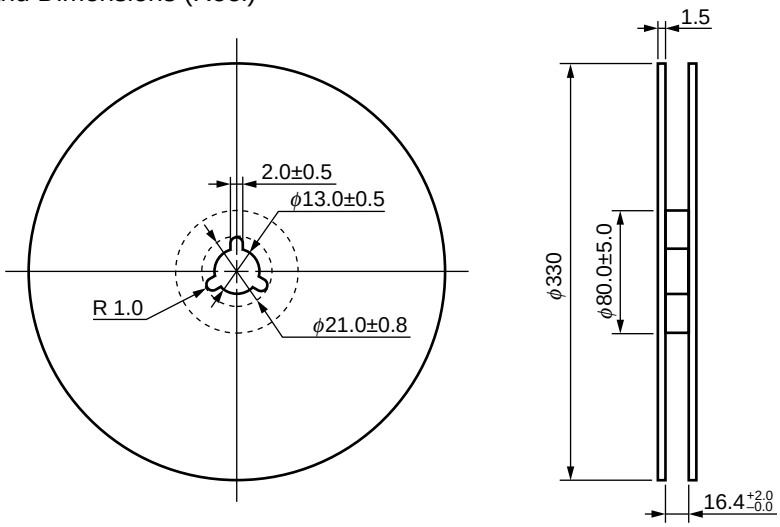
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



Packing: 1 000 pcs/reel

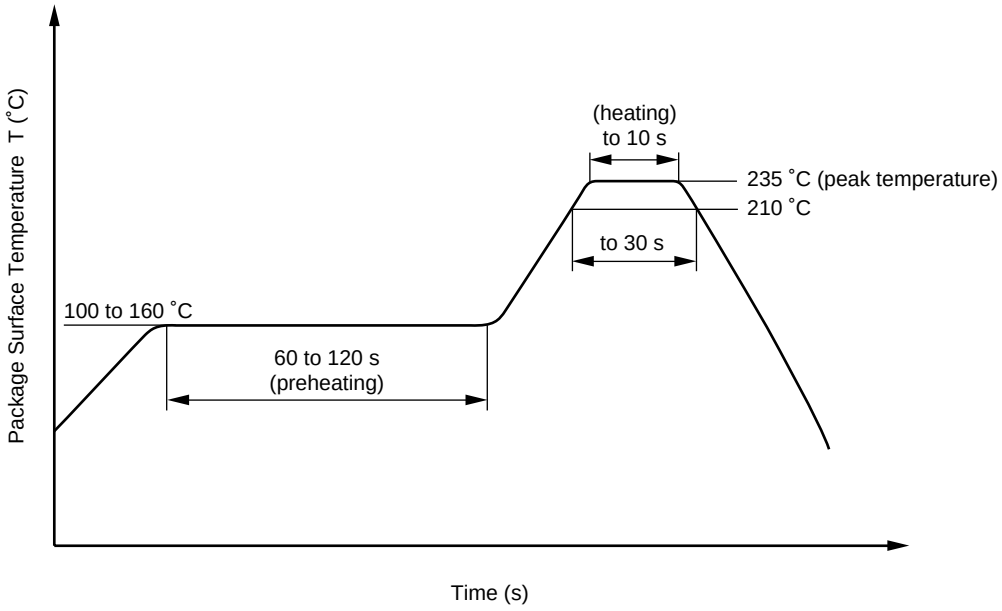
★ NOTES ON HANDLING

1. Recommended soldering conditions

(1) Infrared reflow soldering

- Peak reflow temperature — 235 °C or below (package surface temperature)
- Time of temperature higher than 210 °C — 30 seconds or less
- 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 — 100 °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

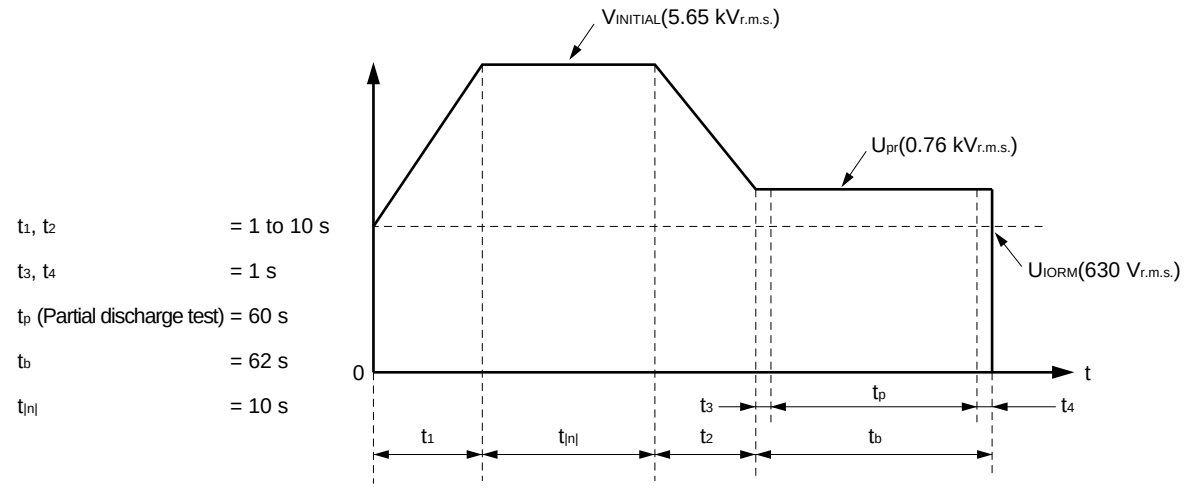
- Fluxes

  Avoid removing the residual flux with freon-based and chlorine-based cleaning solvent.

★ SPECIFICATION OF VDE MARKS LICENSE DOCUMENT (VDE0884)

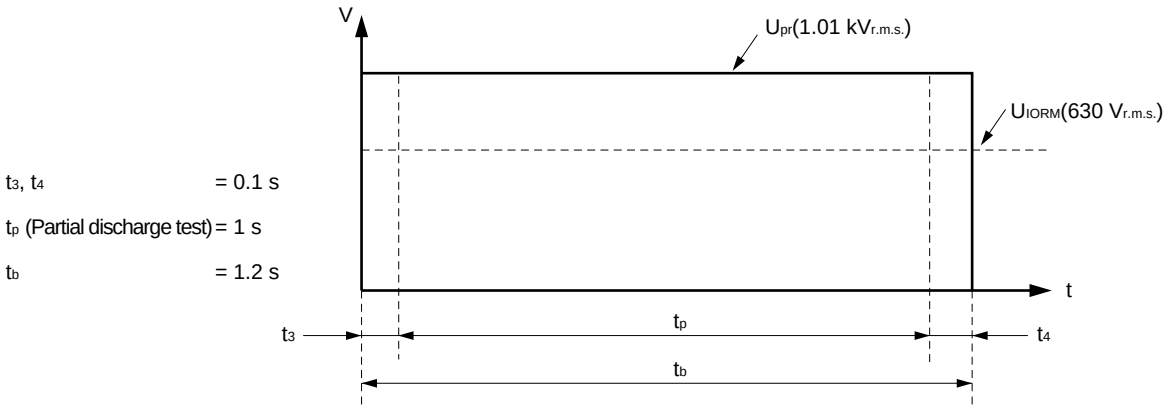
Parameter	Symbol	Speck	Unit
Application classification (DIN VDE 0109) for rated line voltages ≤ 300 $V_{r.m.s.}$ for rated line voltages ≤ 600 $V_{r.m.s.}$		 IV III	
Climatic test class (DIN IEC 68 Teil 1/09.80)		55/100/21	
Dielectric strength maximum operating isolation voltage Test voltage (partial 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 random 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

DIAGRAM 1 According to VDE0884 test voltage waveform: Procedure a, destructive test (for type or random test)



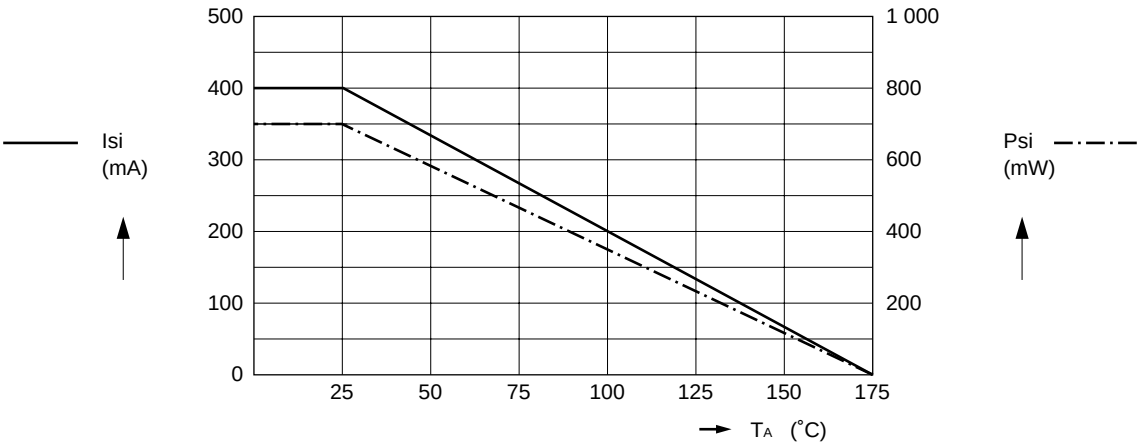
t_1, t_2 = 1 to 10 s
t_3, t_4 = 1 s
t_p (Partial discharge test) = 60 s
t_b = 62 s
$t_{|n|}$ = 10 s

DIAGRAM 2 According to VDE0884 test voltage waveform: Procedure b, nondestructive test (for random test)



t_3, t_4 = 0.1 s
t_p (Partial discharge test) = 1 s
t_b = 1.2 s

DIAGRAM 3 Safety maximum ratings – Ambient temperature (photocoupler malfunction)



[MEMO]

[MEMO]

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.

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M8E 00.4