



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 GaAlAs 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 ($CM_H, CM_L = \pm 2\,000\text{ kV}/\mu\text{s MIN.}$)
- 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
- 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

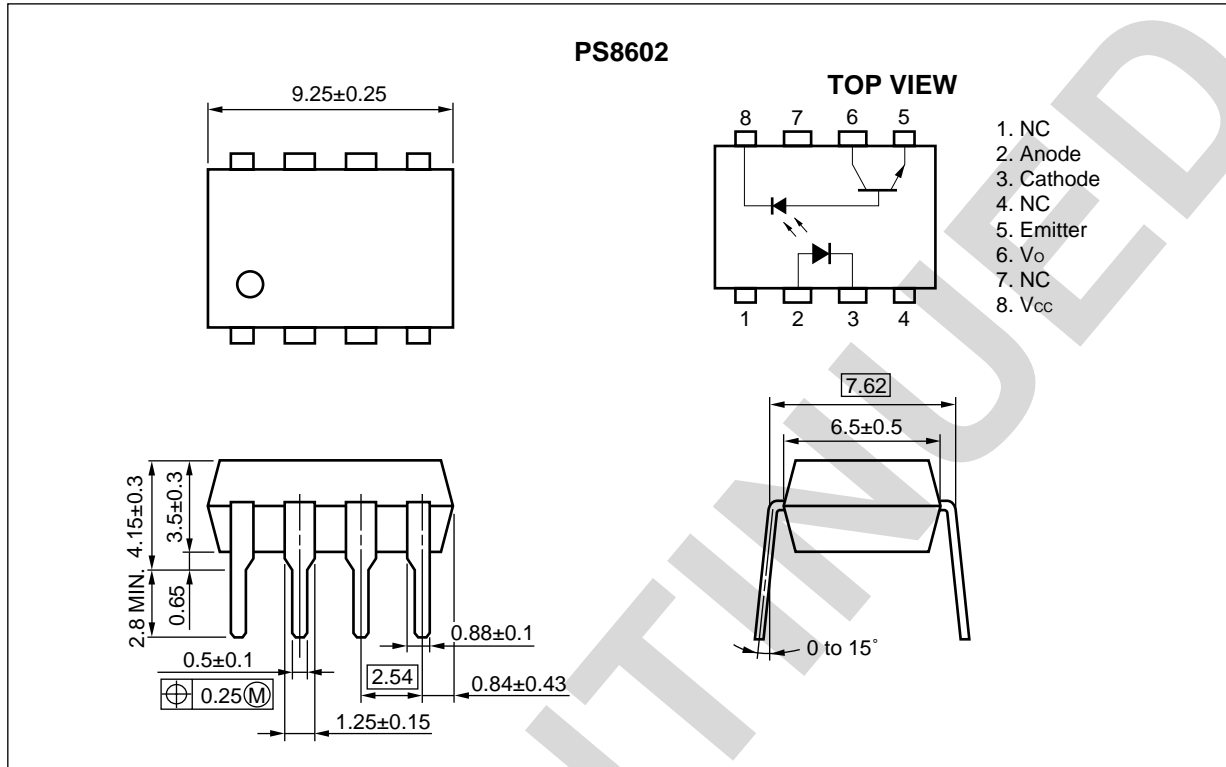
APPLICATIONS

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

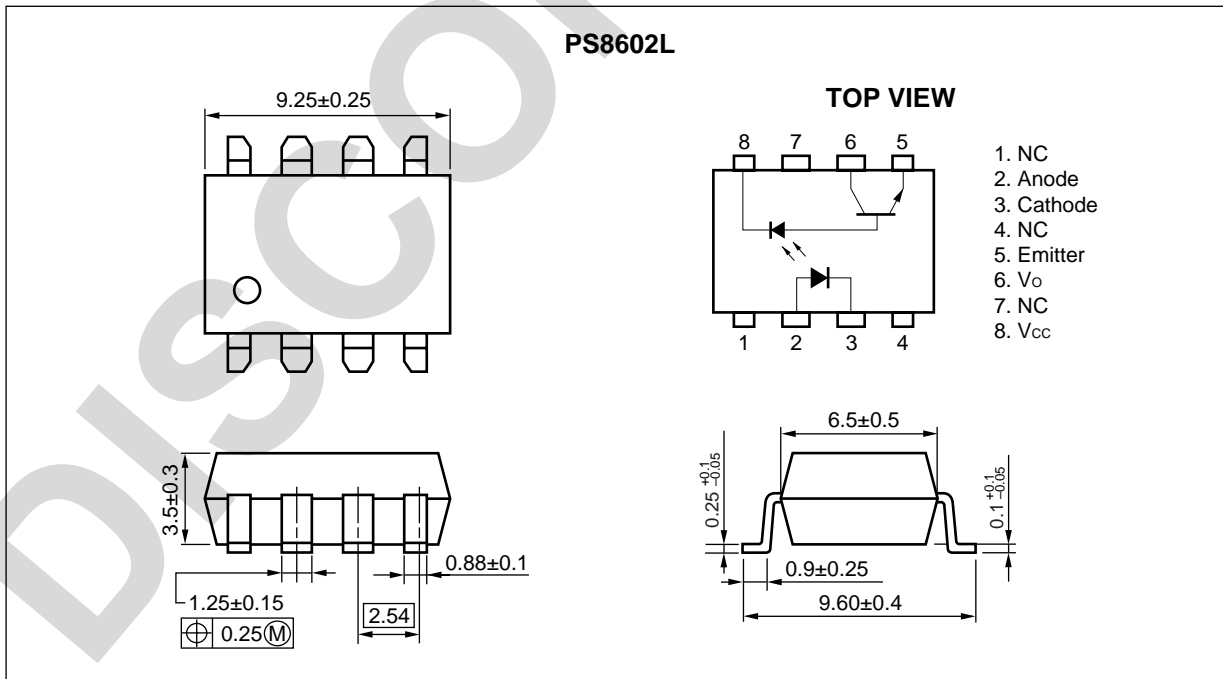
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★ PACKAGE DIMENSIONS (UNIT: mm)

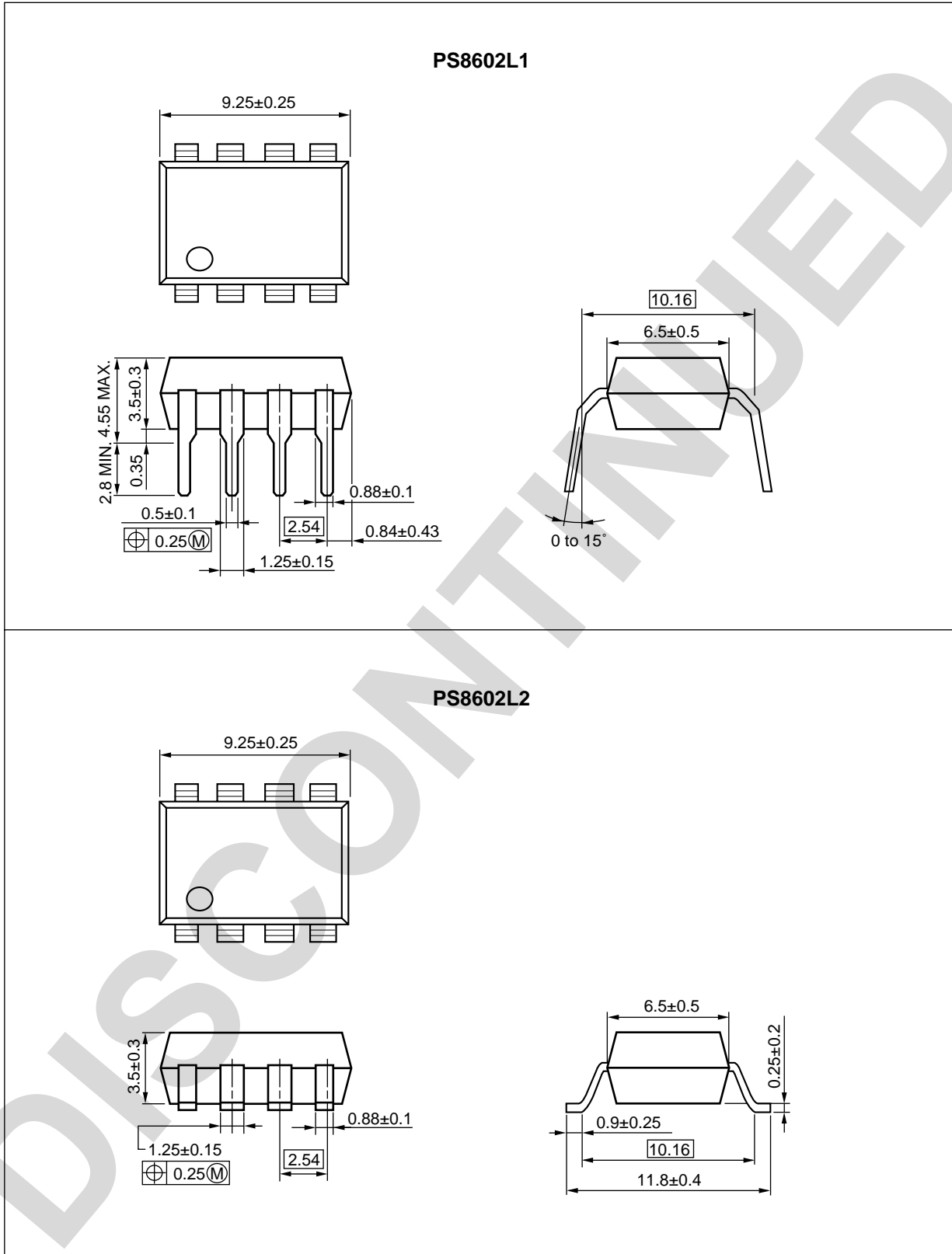
DIP Type



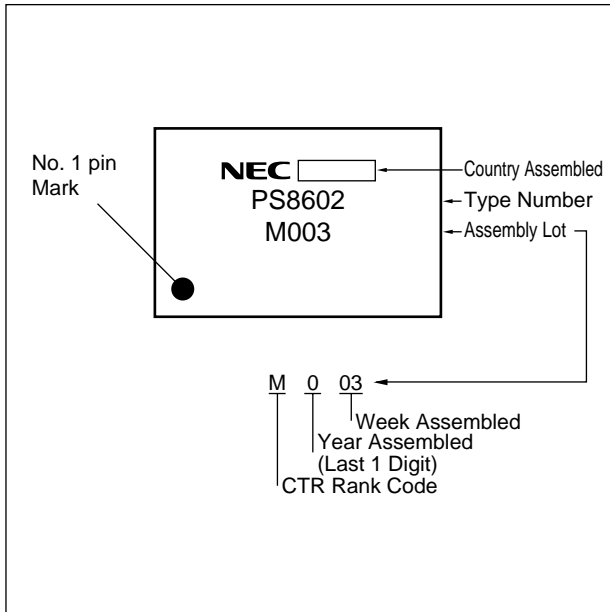
Lead Bending Type



Lead Bending Type For Long Creepage Distance



MARKING EXAMPLE



ORDERING INFORMATION (Solder Contains Lead)

| 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 | | PS8602 |
| PS8602L-E4 | | | | |
| PS8602-V | | | PS8602L | |
| PS8602L-V | | | | |
| PS8602L1-V | | | | |
| PS8602L2-V | | | | |
| PS8602L-V-E3 | | Embossed Tape 1 000 pcs/reel | PS8602L | |
| PS8602L-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 | Application Part Number ^{*1} |
|----------------|-----------|------------------------------|---------------------------------------|
| PS8602-A | 8-pin DIP | Magazine case 50 pcs | PS8602 |
| PS8602L-A | | | PS8602L |
| PS8602L1-A | | | |
| PS8602L2-A | | | |
| PS8602L-E3-A | | Embossed Tape 1 000 pcs/reel | |
| PS8602L-E4-A | | | |
| PS8602-V-A | | Magazine case 50 pcs | PS8602 |
| PS8602L-V-A | | | PS8602L |
| PS8602L1-V-A | | | |
| PS8602L2-V-A | | | |
| PS8602L-V-E3-A | | Embossed Tape 1 000 pcs/reel | |
| PS8602L-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 | 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 |

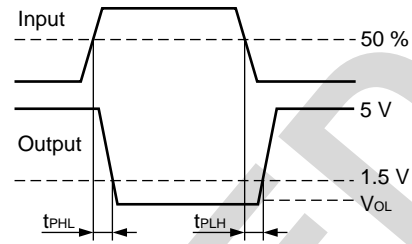
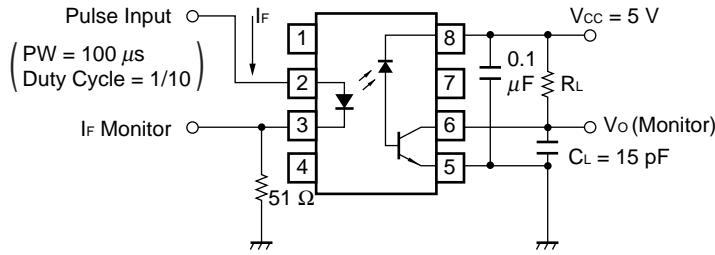
*1 AC voltage for 1 minute at T_A = 25 °C, RH = 60 % between input and output.

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 Coefficient | ΔV _F /ΔT | 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 |

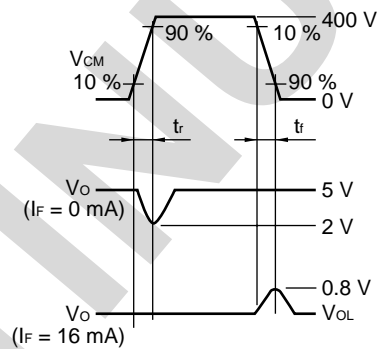
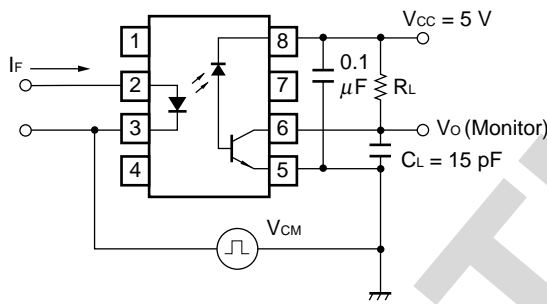
*1 Typical values at $T_A = 25\text{ }^\circ\text{C}$

*2 Test circuit for propagation delay time



C_L includes probe and stray wiring capacitance

*3 Test circuit for common mode transient immunity



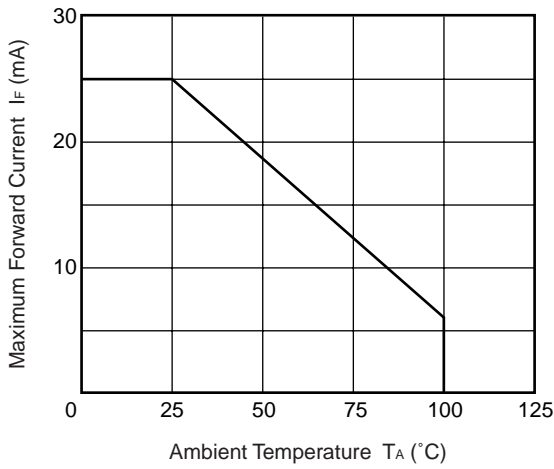
C_L includes probe and stray wiring capacitance

USAGE CAUTIONS

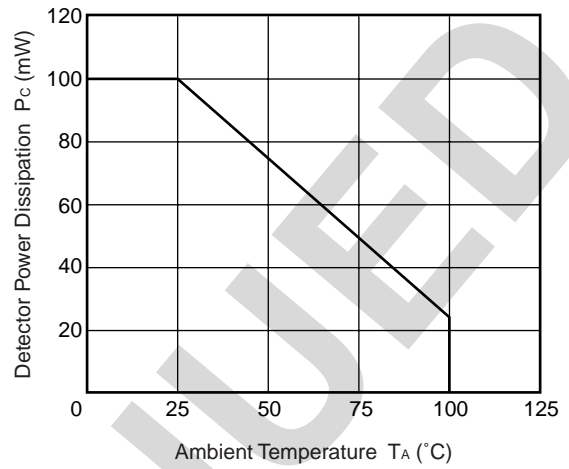
1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. By-pass capacitor of more than $0.1\text{ }\mu\text{F}$ is used between V_{CC} and GND near device. Also, ensure that the distance between the leads of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

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

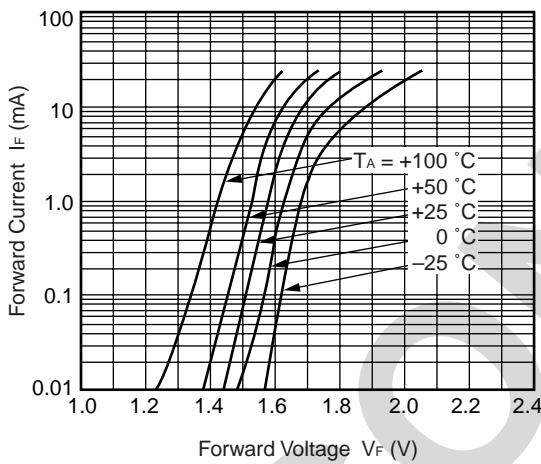
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



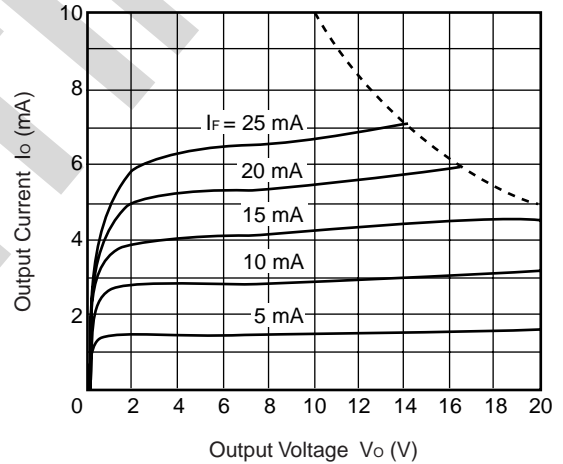
DETECTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



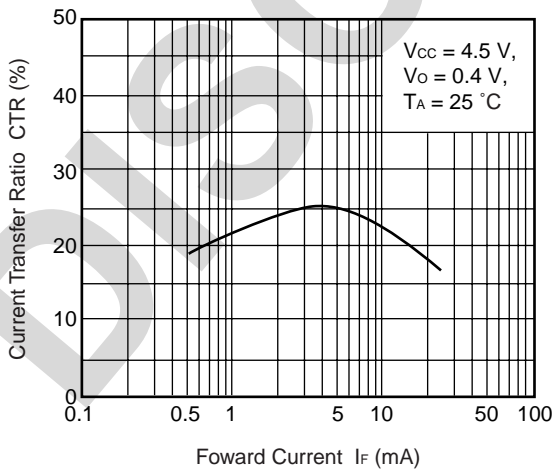
FORWARD CURRENT vs. FORWARD VOLTAGE



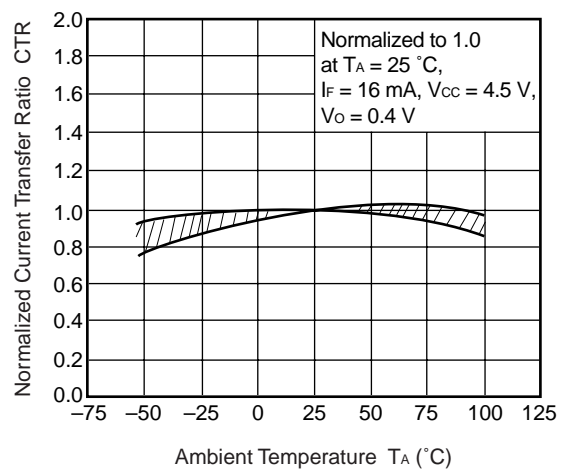
OUTPUT CURRENT vs. OUTPUT VOLTAGE



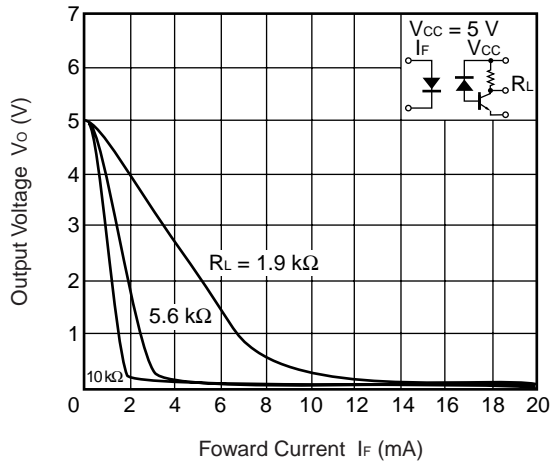
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



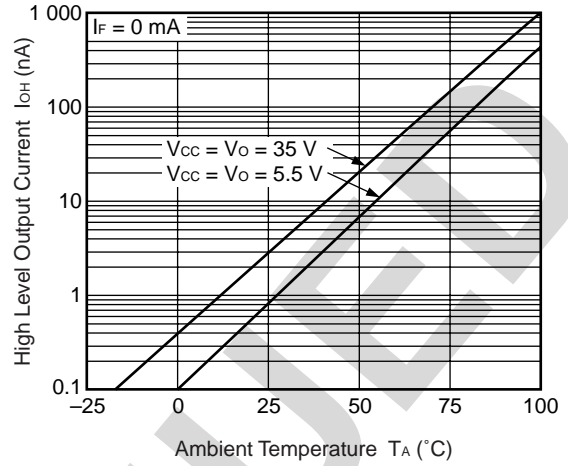
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



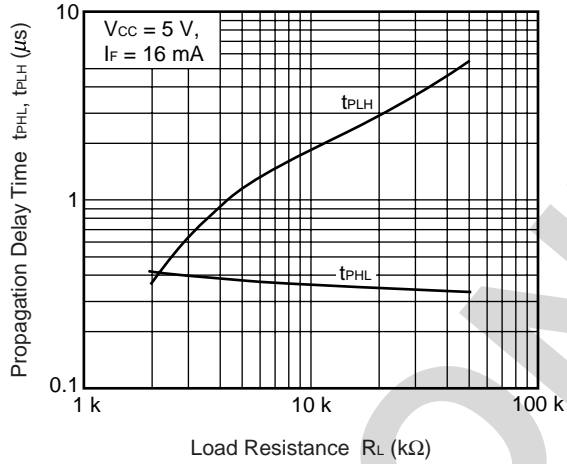
OUTPUT VOLTAGE vs. FOWARD CURRENT



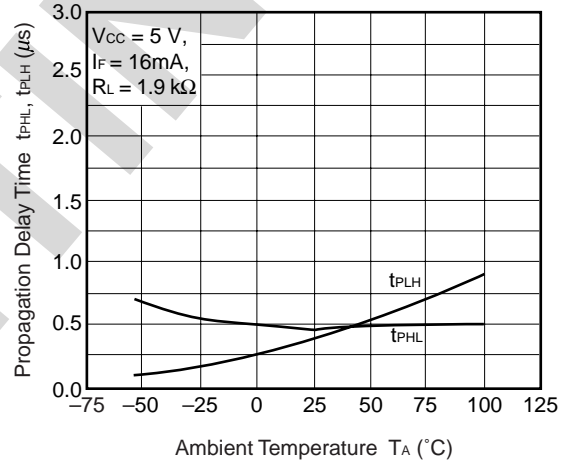
HIGH LEVEL OUTPUT CURRENT vs. AMBIENT TEMPERATURE



PROPAGATION DELAY TIME, vs. LOAD RESISTANCE



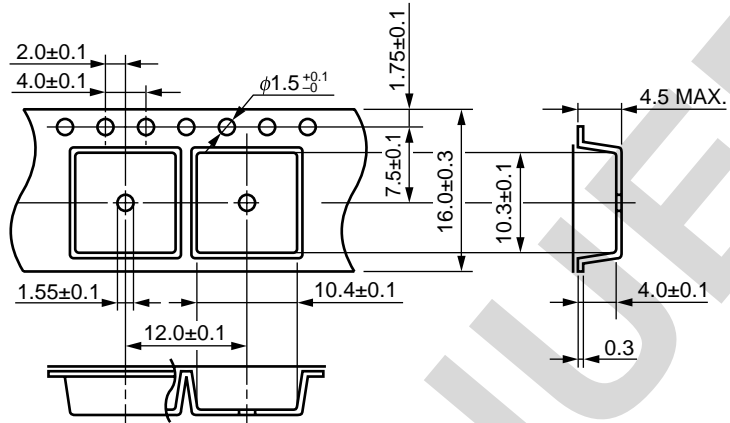
PROPAGATION DELAY TIME, vs. AMBIENT TEMPERATURE



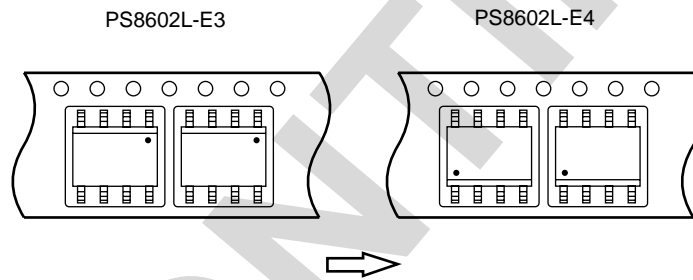
Remark The graphs indicate nominal characteristics.

★ TAPING SPECIFICATIONS (UNIT: mm)

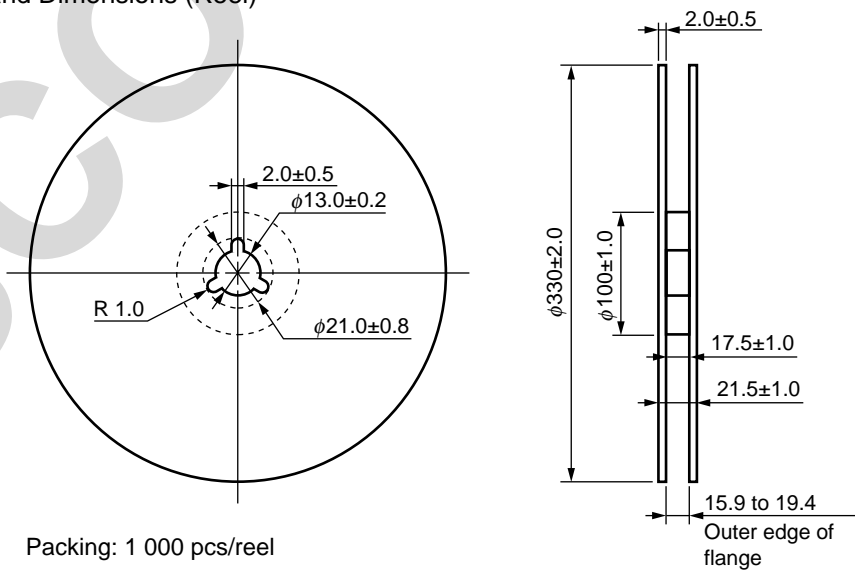
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



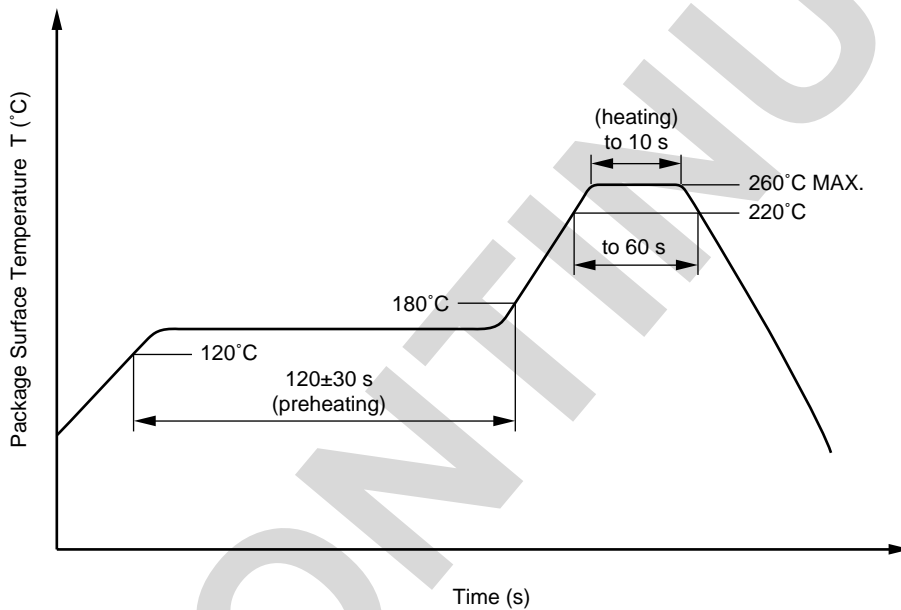
★ NOTES ON HANDLING

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) $U_{pr} = 1.6 \times U_{IORM}$, $P_d < 5$ 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 , $\Psi_i = 0$) Power (output or total power dissipation) Isolation resistance $V_{IO} = 500$ V dc at $T_A = 175$ °C (T_{si}) | T_{si} I_{si} Ψ_{si} Ris MIN. | 175 400 700 10^9 | °C mA mW Ω |

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 | |
|-------------------------------|---|--|-----|
| | | -A | -AZ |
| Lead (Pb) | < 1000 PPM | 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.

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