# PS8902

1 Mbps HIGH CMR ANALOG OUTPUT TYPE, 8-PIN LSDIP PHOTOCOUPLER
FOR CREEPAGE DISTANCE OF 14.5 mm

R08DS0128EJ0100
Rev. 1.00
Aug 24, 2015

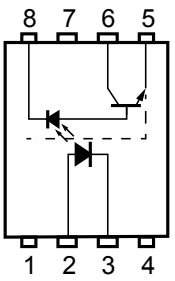
## DESCRIPTION

The PS8902 is an optically coupled isolator containing a GaAlAs LED on the light emitting diode (input side) and a PIN photodiode and a high-speed amplifier transistor on the output side on one chip.

## FEATURES

- Long creepage distance (14.5 mm MIN.)
- 8-pin LSDIP (Long Creepage SDIP) type
- High-speed response (tPHL = 0.8 μs MAX., tPLH = 1.2 μs MAX.)
- High common mode transient immunity ($CM_H$, $CM_L$ = ±15 kV/$\mu$s MIN.)
- Embossed tape product: PS8902-Y-F3: 1 000 pcs/reel
- Pb-Free Product
- Safety standards
  - UL approved: No. E72422
  - CSA approved: No. CA 101391 (CA5A, CAN/CSA-C22.2 60065, 60950)
  - DIN EN 60747-5-5 (VDE 0884-5) approved (Option)

PIN CONNECTION
(Top View)




1. NC
2. Anode
3. Kathode
4. NC
5. GND
6. Vo
7. NC
8. Vcc

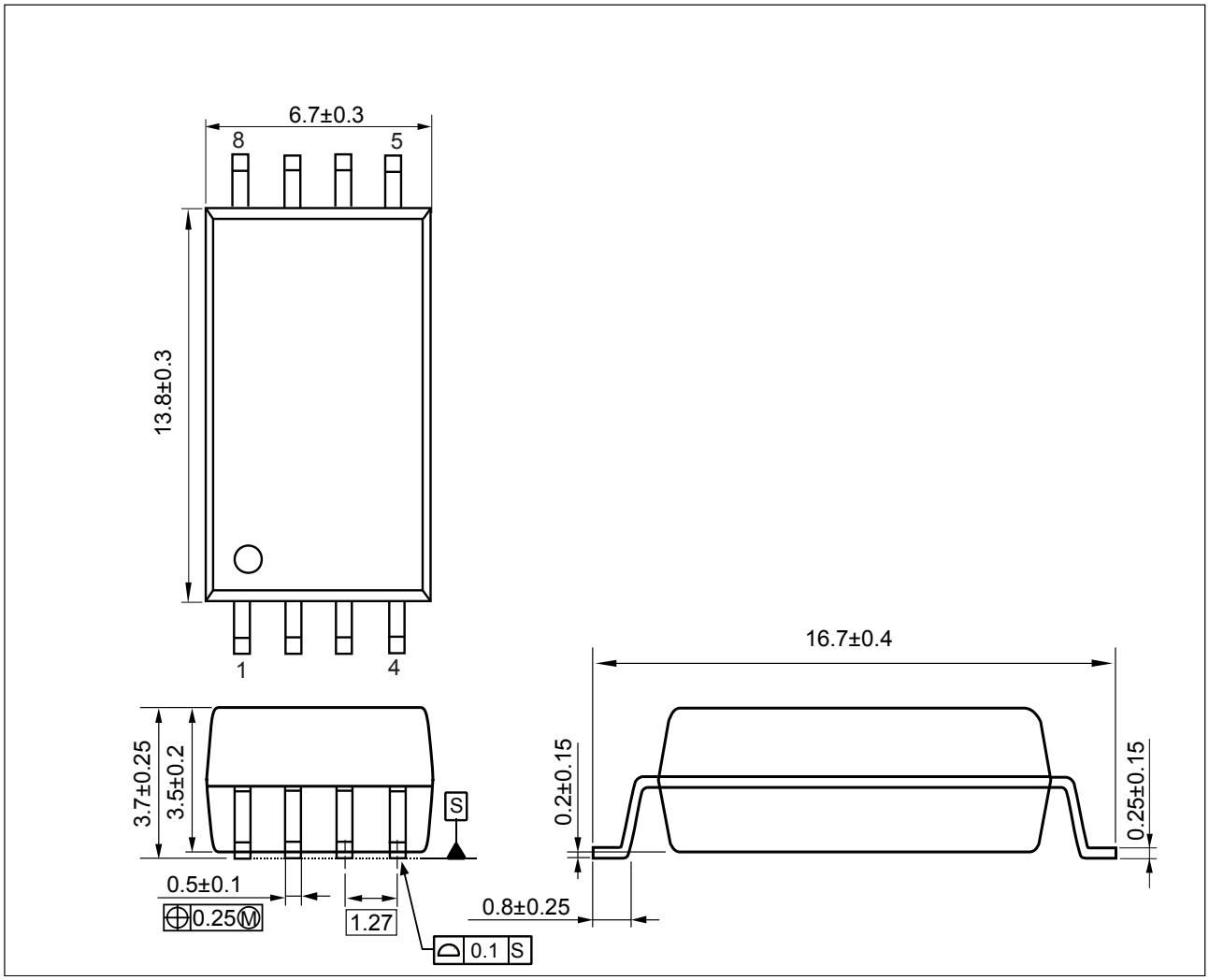
## APPLICATIONS

- Power supply
- Computer and peripheral manufactures
- General purpose inverter
- Substitutions for relays and pulse transformers



Start of mass production
Sep.2015

## PACKAGE DIMENSIONS (UNIT: mm)

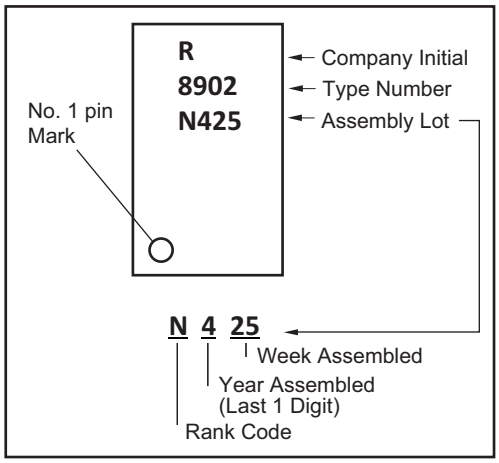



**Weight: 0.642g (typ.)**

## PHOTOCOUPLER CONSTRUCTION

| Parameter | Unit (MIN.) |
|---|---|
| Air Distance | 14.5 mm |
| Outer Creepage Distance | 14.5 mm |
| Isolation Distance | 0.4 mm |

## MARKING EXAMPLE



## ORDERING INFORMATION

| Part Number | Order Number | Solder Plating Specification | Packing Style | Safety Standard Approval | Application Part Number*1 |
|---|---|---|---|---|---|
| PS8902 | PS8902-Y-AX | Pb-Free (Ni/Pd/Au) | 10 pcs (Tape 10 pcs cut) | Standard products (UL,CSA approved) | PS8902 |
| PS8902-F3 | PS8902-Y-F3-AX | | Embossed Tape 1 000 pcs/reel | | |
| PS8902-V | PS8902-Y-V-AX | | 10 pcs (Tape 10 pcs cut) | UL,CSA approved DIN EN60747-5-5 (VDE0884-5): 2011-11 approved (Option) | |
| PS8902-V-F3 | PS8902-Y-V-F3-AX | | Embossed Tape 1 000 pcs/reel | | |

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

## ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C, unless otherwise specified)

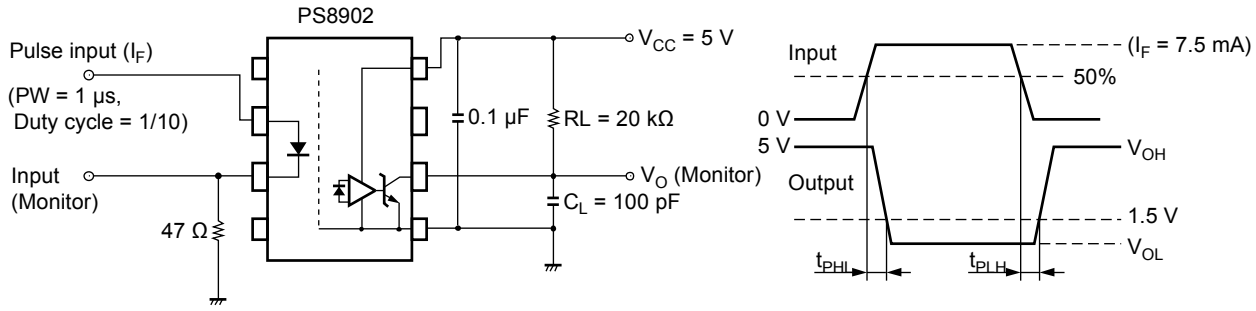
| Parameter | | Symbol | Ratings | Unit |
|---|---|---|---|---|
| Diode | Forward Current | $I_F$ | 25 | mA |
| | Reverse Voltage | $V_R$ | 5.0 | V |
| | Power Dissipation*1 | $P_D$ | 45 | mW |
| Detector | Supply Voltage | $V_{CC}$ | 35 | V |
| | Output Voltage | $V_O$ | 35 | V |
| | Output Current | $I_O$ | 8.0 | mA |
| | Power Dissipation*2 | $P_C$ | 250 | mW |
| Isolation Voltage*3 | | BV | 7500 | Vr.m.s. |
| Operating Ambient Temperature | | $T_A$ | –40 to +110 | °C |
| Storage Temperature | | $T_{stg}$ | –55 to +125 | °C |

**Notes** ***1** Reduced to 0.8 mW/°C at $T_A$ = 85°C or more.
***2** Reduced to5.2 mW/°C at $T_A$ = 85°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)

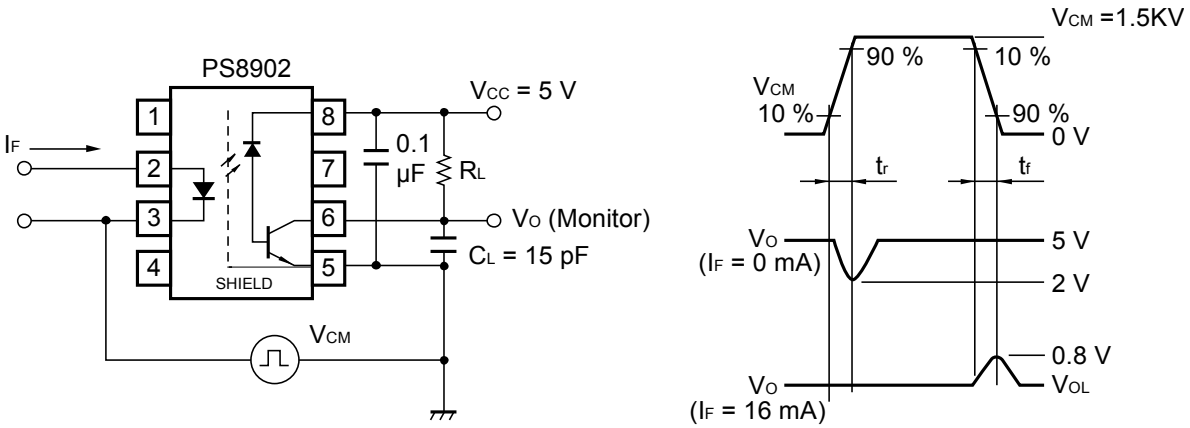
| Parameter | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|---|
| Diode | Forward Voltage | $V_F$ | $I_F$ = 16 mA | 1.35 | 1.65 | 1.85 | V |
| | Reverse Current | $I_R$ | $V_R$ = 3 V | - | - | 10 | μA |
| | Forward Voltage Temperature Coefficient | $\Delta V_F/\Delta T_A$ | $I_F$ = 16 mA | - | -2.2 | - | 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 | - | 0.5 | 500 | nA |
| | High Level Output Current | $I_{OH}$ (2) | $I_F$ = 0 mA, $V_{CC}$ = $V_O$ = 30 V | - | - | 100 | μA |
| | Low Level Output Voltage | $V_{OL}$ | $I_F$ = 16 mA, $V_{CC}$ = 4.5 V, $I_{OL}$ = 1.2 mA | - | 0.1 | 0.4 | V |
| | High Level Supply Current | $I_{CCH}$ | $I_F$ = 0 mA, $V_O$ = open, $V_{CC}$ = 30 V | - | 0.01 | 2 | μA |
| | Low Level Supply Current | $I_{CCL}$ | $I_F$ = 16 mA, $V_O$ = open, $V_{CC}$ = 30 V | - | 50 | - | μA |
| Coupled | Current Transfer Ratio | CTR | $I_F$ = 16 mA, $V_{CC}$ = 4.5 V, $V_O$ = 0.4 V | 15 | - | 35 | % |
| | Input-Output Isolation Resistance | $R_{I-O}$ | $V_{I-O}$ = 1 $kV_{DC}$, RH = 40 to 60% | $10^{11}$ | - | - | Ω |
| | Input-Output Isolation Capacitance | $C_{I-O}$ | V = 0 V, f = 1 MHz | - | 1.0 | - | pF |
| | Propagation Delay Time (H → L)[*1] | $t_{PHL}$ | $I_F$ = 16 mA, $V_{CC}$ = 5 V, $R_L$ = 2.2 kΩ, $C_L$ = 15 pF | - | 0.3 | 0.8 | μs |
| | Propagation Delay Time (L → H)[*1] | $t_{PLH}$ | | - | 0.5 | 1.2 | |
| | Common Mode Transient Immunity at High Level Output[*2] | $C_{MH}$ | $I_F$ = 0 mA, $V_{CC}$ = 5 V, $R_L$ = 4.1 kΩ, $V_{CM}$ = 1.5 kV,Vo>2V | 15 | - | - | kV/μs |
| | Common Mode Transient Immunity at Low Level Output[*2] | $C_{ML}$ | $I_F$ = 16 mA, $V_{CC}$ = 5 V, $R_L$ = 4.1 kΩ, $V_{CM}$ = 1.5 kV, Vo<0.8V | 15 | - | - | |

**Notes** *1 Test circuit for propagation delay time




**Remark** $C_L$ includes probe and stray wiring capacitance.

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



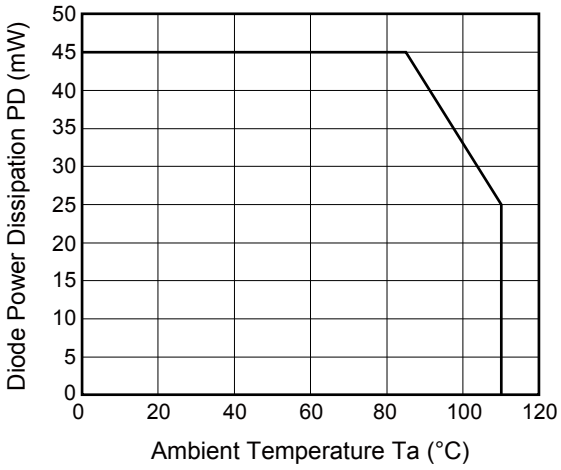

**Remark** $C_L$ includes probe and stray wiring capacitance.

## USAGE CAUTIONS

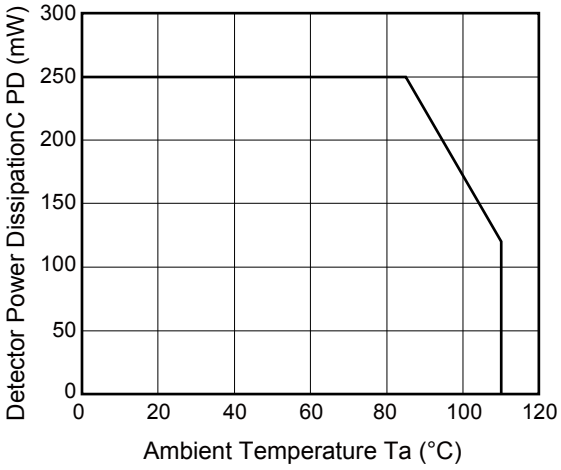
1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. By-pass capacitor of 0.1 $\mu$F is used between $V_{CC}$ and GND near device. Also, ensure that the distance between the leads of the photocoupler and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

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

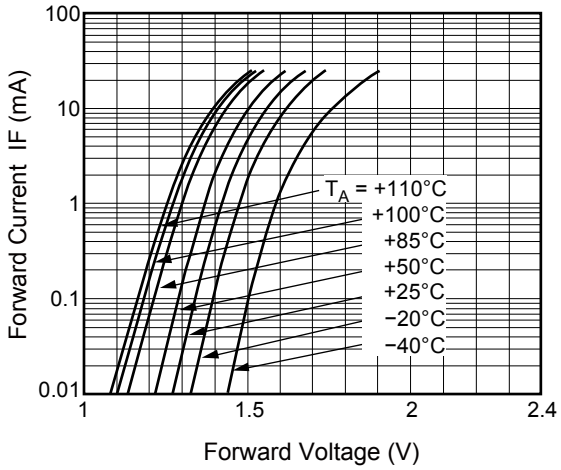
Diode Power Dissipation vs. Ambient Temperature



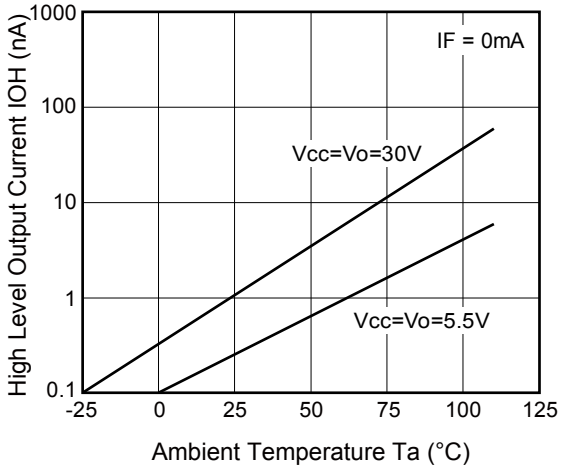

Detector Power Dissipation vs. Ambient Temperature



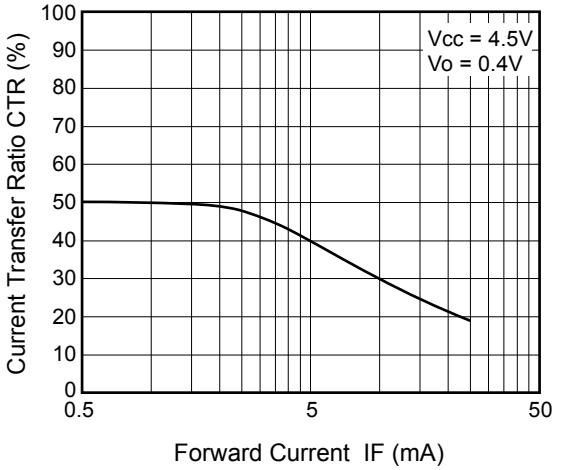

Forward Current vs. Forward Voltage



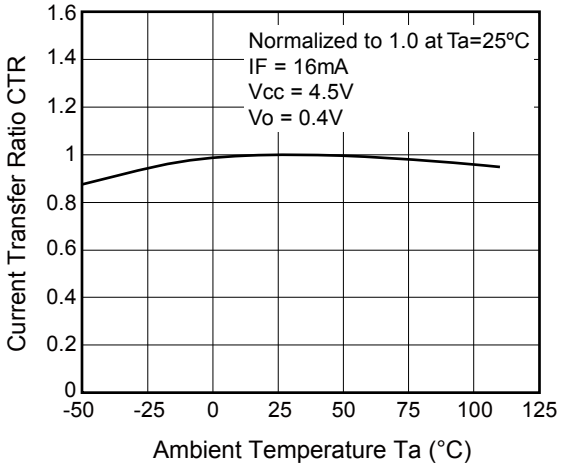

High Level Output Current vs. Ambient Temperature




Current Transfer Ratio vs. Forward Current

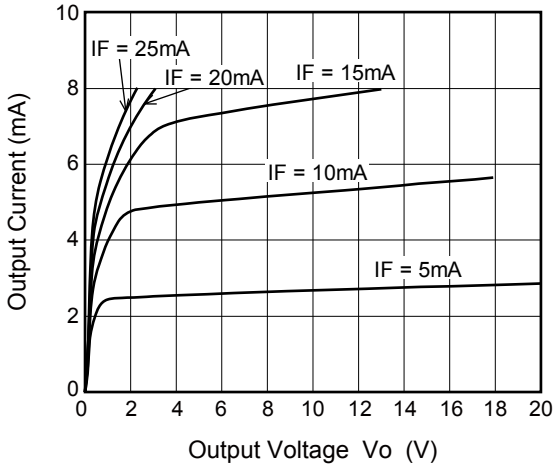



Current Transfer Ratio

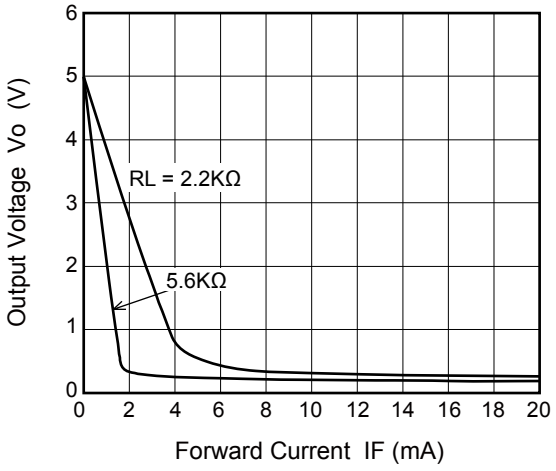


## TYPICAL CHARACTERISTICS ($T_A$ = 25°C, unless otherwise specified)

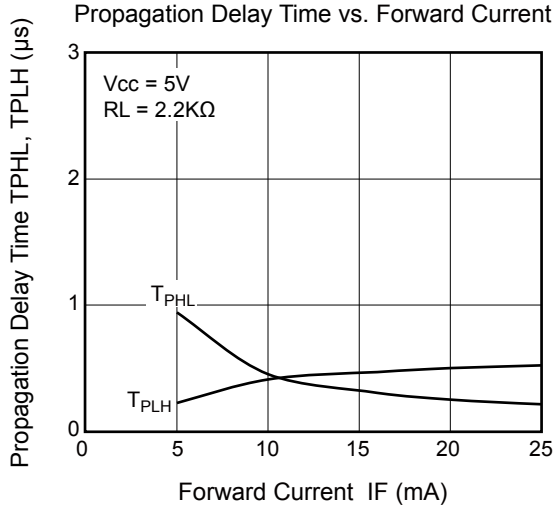
Output Current vs. Output Voltage



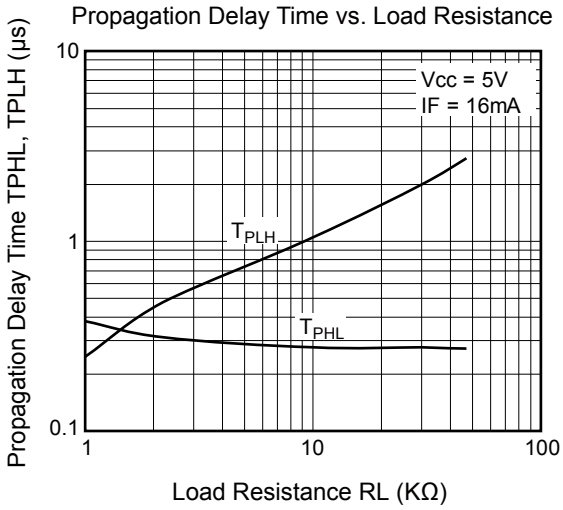

Output Voltage vs. Forward Current



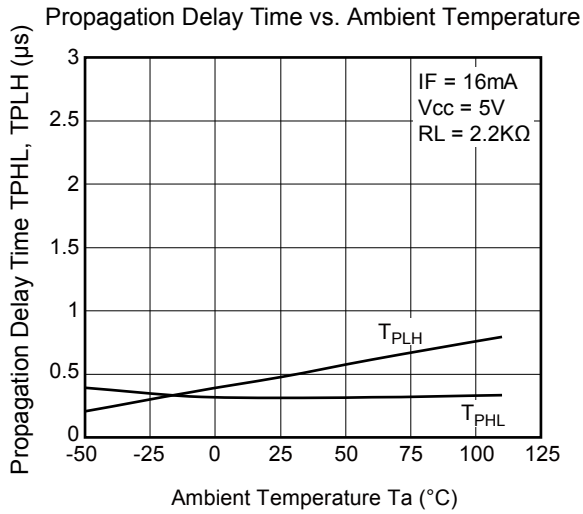

Propagation Delay Time vs. Forward Current




Propagation Delay Time vs. Load Resistance

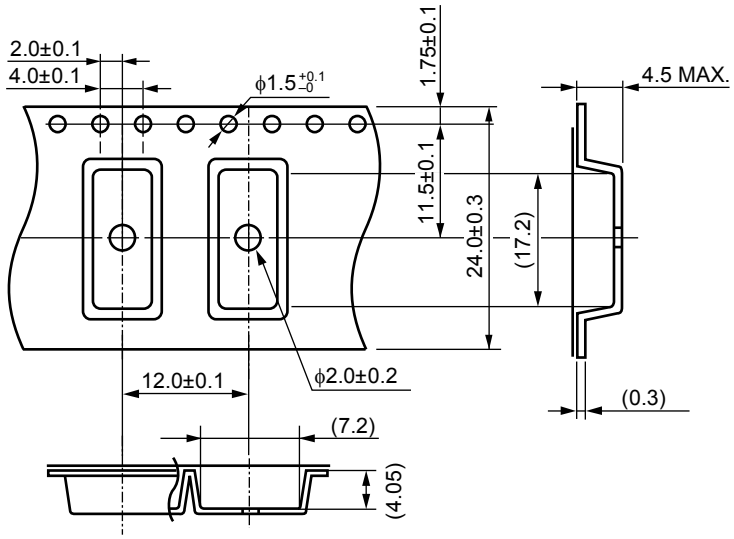



Propagation Delay Time vs. Ambient Temperature



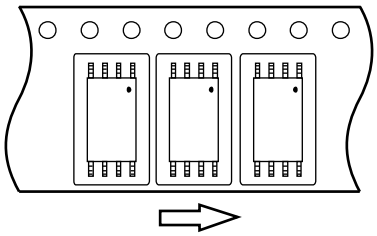
## TAPING SPECIFICATIONS (UNIT: mm)

Outline and Dimensions (Tape)

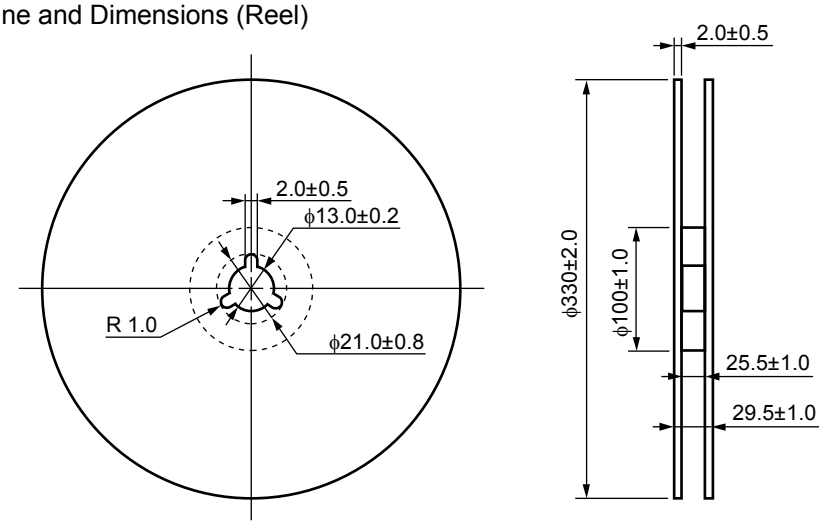



Tape Direction

PS8902-F3

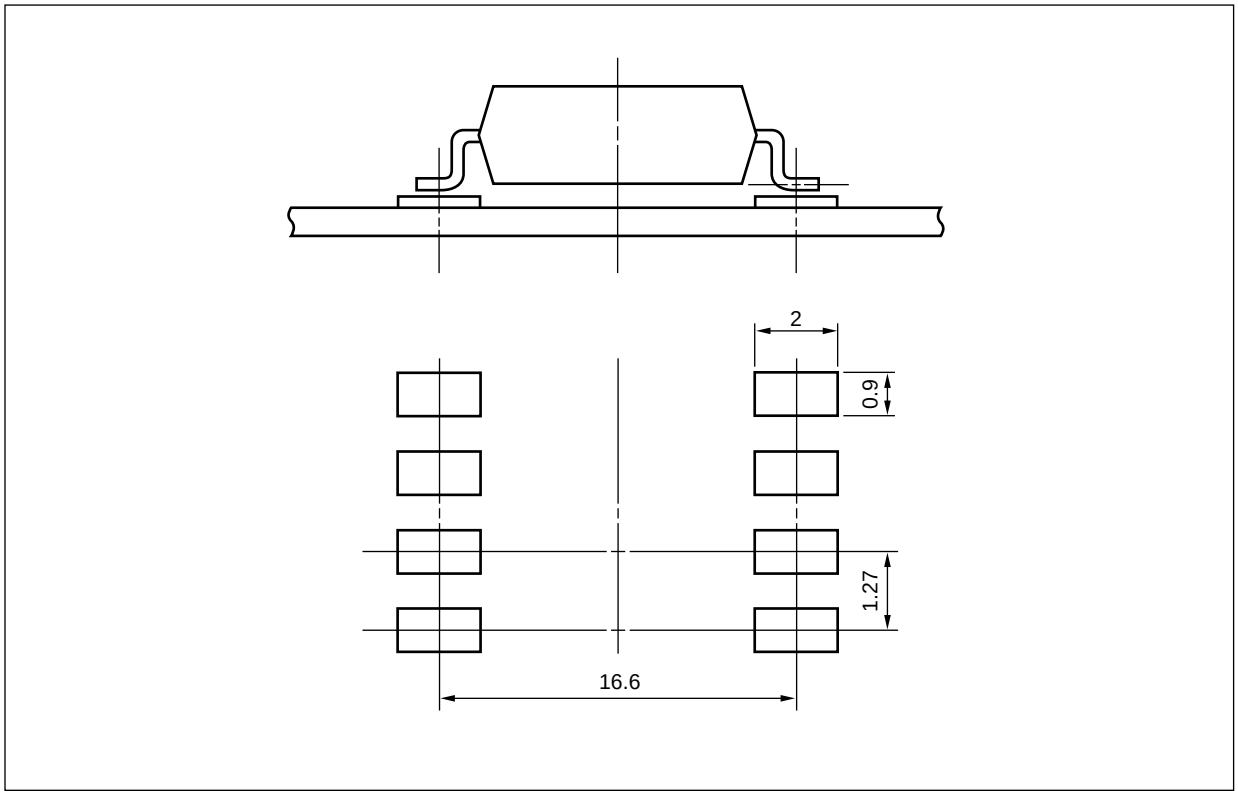


Outline and Dimensions (Reel)




Packing: 1 000 pcs/reel

## RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)



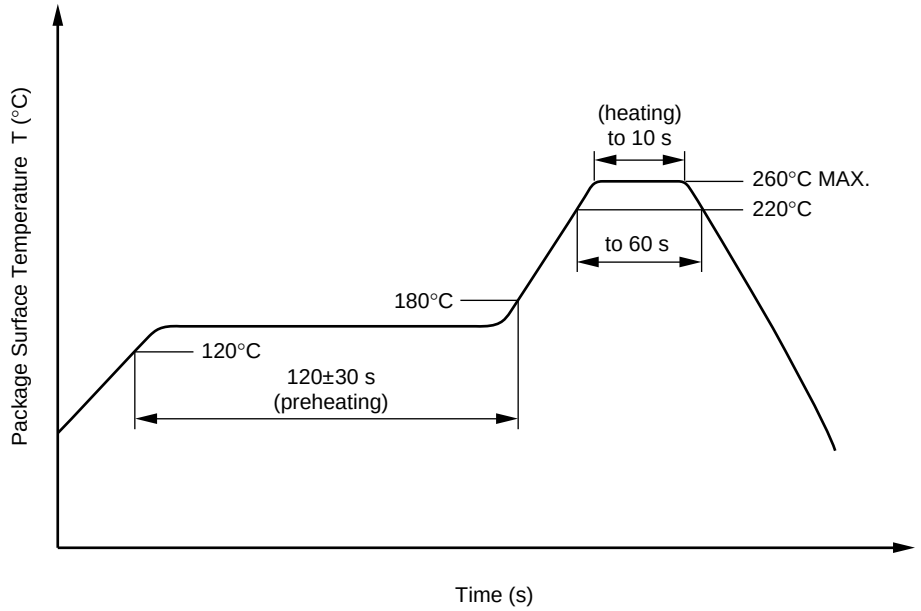
# NOTES ON HANDLING

## 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) 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.

### (4) Cautions

- Fluxes

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

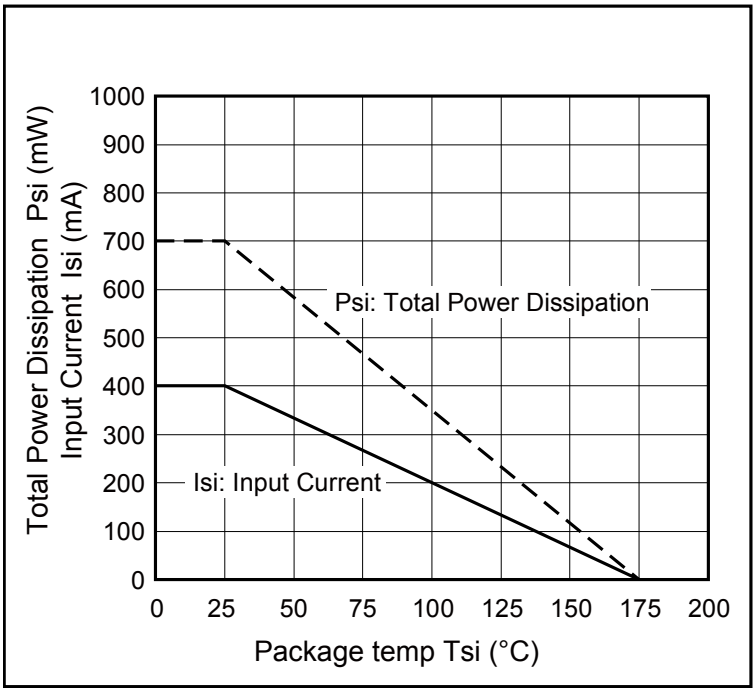
## 2. Cautions regarding noise

Be aware that when voltage is applied suddenly between the photocoupler's input and output at startup, the output transistor may enter the on state, even if the voltage is within the absolute maximum ratings.

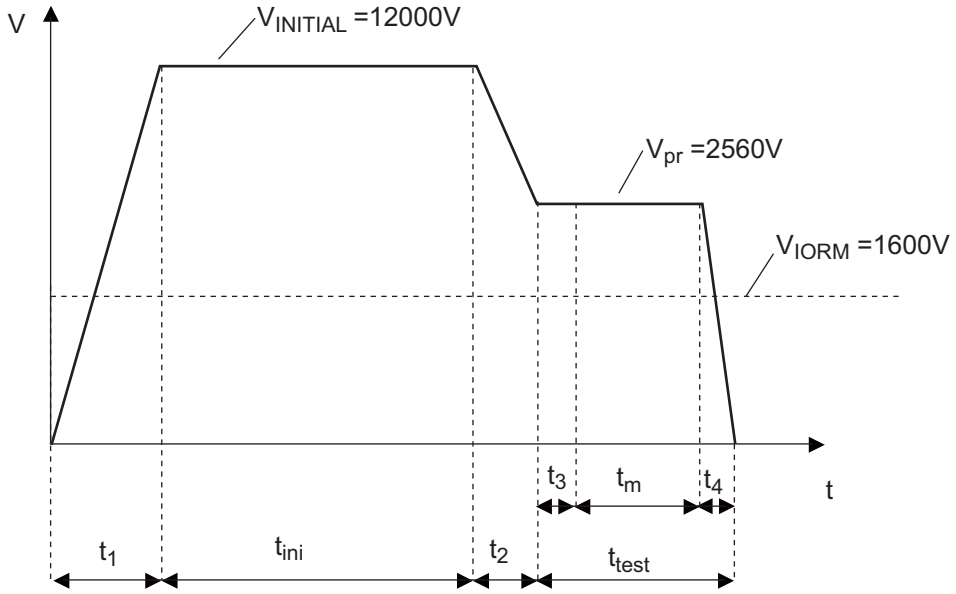
## SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

| Parameter | Symbol | Spec. | Unit |
|---|---|---|---|
| Climatic test class (IEC 60068-1/DIN EN 60068-1) | | 40/110/21 | |
| Dielectric strength<br>maximum operating isolation voltage<br>Test voltage (partial discharge test, procedure a for type test and random test)<br>$U_{pr}$ = 1.6 × $U_{IORM.}$, $P_d$ < 5 pC | <br>$U_{IORM}$<br>$U_{pr}$ | <br>1 600<br>2 560 | <br>$V_{peak}$<br>$V_{peak}$ |
| Test voltage (partial discharge test, procedure b for all devices)<br>$U_{pr}$ = 1.875 × $U_{IORM.}$, $P_d$ < 5 pC | $U_{pr}$ | 3 000 | $V_{peak}$ |
| Highest permissible overvoltage | $U_{TR}$ | 12 000 | $V_{peak}$ |
| Degree of pollution (DIN EN 60664-1 VDE0110 Part 1) | | 2 | |
| Comparative tracking index (IEC 60112/DIN EN 60112 (VDE 0303 Part 11)) | CTI | 175 | |
| Material group (DIN EN 60664-1 VDE0110 Part 1) | | III a | |
| Storage temperature range | $T_{stg}$ | –55 to +125 | °C |
| Operating temperature range | $T_A$ | –40 to +110 | °C |
| Isolation resistance, minimum value<br>$V_{IO}$ = 500 V dc at $T_A$ = 25°C<br>$V_{IO}$ = 500 V dc at $T_A$ MAX. at least 100°C | <br>Ris MIN.<br>Ris MIN. | <br>$10^{12}$<br>$10^{11}$ | <br>Ω<br>Ω |
| Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve)<br>Package temperature<br>Current (input current $I_F$, Psi = 0)<br>Power (output or total power dissipation)<br>Isolation resistance<br>$V_{IO}$ = 500 V dc at $T_A$ = Tsi | <br>Tsi<br>Isi<br>Psi<br><br>Ris MIN. | <br>175<br>400<br>700<br><br>$10^9$ | <br>°C<br>mA<br>mW<br><br>Ω |

### Dependence of maximum safety ratings with package temperature

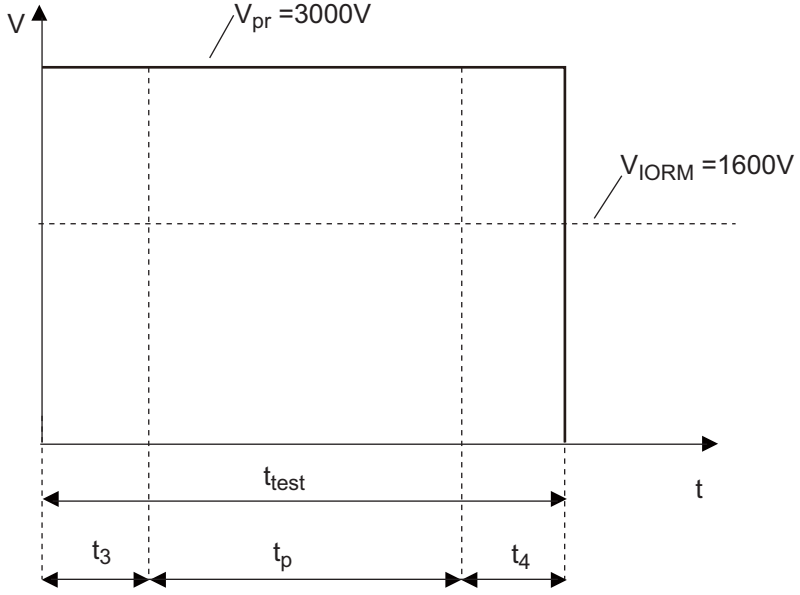


## Method a Destructive Test, Type and Sample Test




$t_1$,$t_2$ = 1 to 10 sec
$t_3$,$t_4$ = 1 sec
$t_{m(PARTIAL\ DISCHARGE)}$= 10 sec
$t_{test}$ = 12 sec
$t_{ini}$ = 60 sec

## Method b Non-destructive Test, 100% Production Test




$t_3$,$t_4$ = 0.1 sec
$t_{m(PARTIAL\ DISCHARGE)}$= 1.0 sec
$t_{test}$ = 1.2 sec

| | |
|---|---|
| **Caution** GaAs Products | This product uses gallium arsenide (GaAs).<br>GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points.<br>• 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.<br>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.<br>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.<br>• Do not burn, destroy, cut, crush, or chemically dissolve the product.<br>• Do not lick the product or in any way allow it to enter the mouth. |

| Revision History | PS8902 Data Sheet |
|---|---|

| Rev. | Date | Description | |
|---|---|---|---|
| | | Page | Summary |
| 1.00 | Aug 24, 2015 | – | First edition issued |
| | | | |

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