

PS8101

1 Mbps, HIGH CMR ANALOG OUTPUT TYPE
5-PIN SOP (SO-5) PHOTOCOUPLER

R08DS0138EJ0100
Rev.1.00
Oct.29.2018

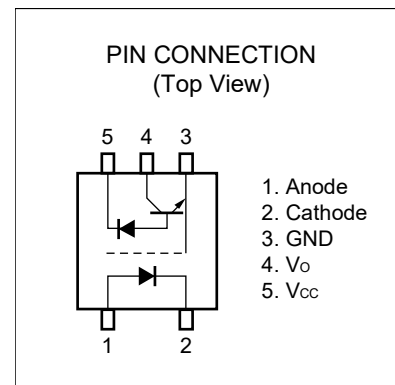
DESCRIPTION

The PS8101 is an optically coupled isolator containing an AlGaAs 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.

This is a plastic SOP (Small Out-line Package) type for high density applications.

FEATURES

- High common mode transient immunity ($CM_H, CM_L = \pm 15 \text{ kV}/\mu\text{s}$ MIN.)
- Small package (SO-5)
- High supply voltage ($V_{CC} = 35 \text{ V}$)
- High isolation voltage ($BV = 3\,750 \text{ Vr.m.s.}$)
- High-speed response ($t_{PHL} = 0.8 \mu\text{s}$ MAX., $t_{PLH} = 1.2 \mu\text{s}$ MAX.)
- Ordering number of taping product: PS8101-F3 : 2 500 pcs/reel
- Pb-Free product
- Safety standards
 - UL approved: UL1577, Single protection
 - CSA approved: CAN/CSA-C22.2 No. 62368-1, Basic insulation
 - VDE approved: DIN EN 60747-5-5 (Option)

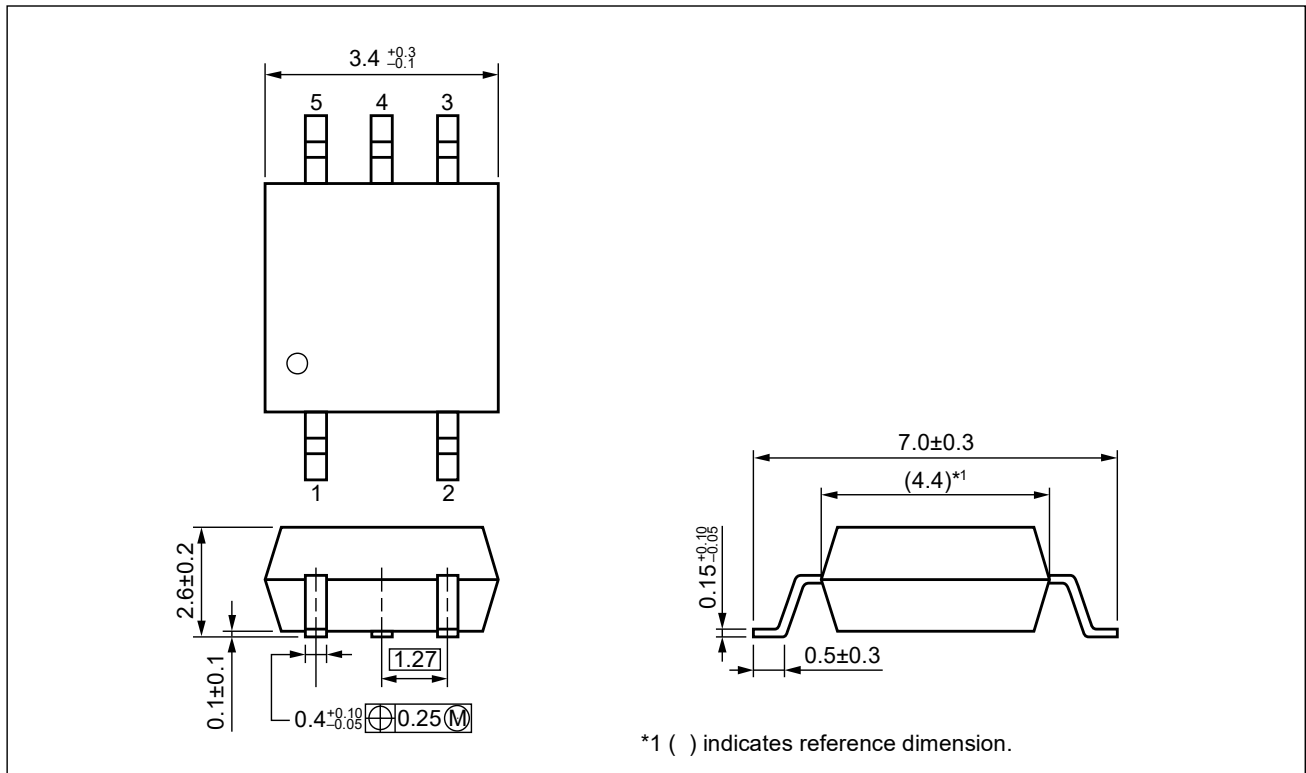


APPLICATIONS

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

Start of mass production
Jul.2007

PACKAGE DIMENSIONS (UNIT: mm)

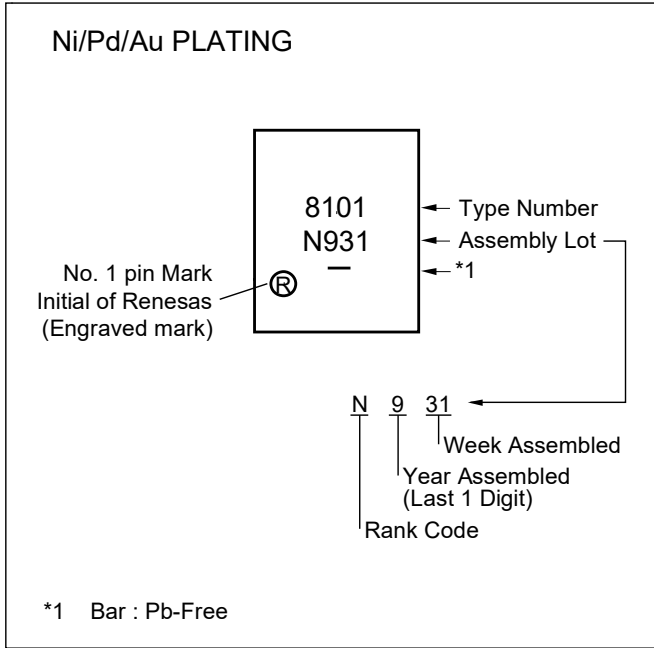


Weight: 0.08g (typ.)

PHOTOCOUPLER CONSTRUCTION

| Parameter | PS8101 |
|---------------------------|--------|
| Air Distance (MIN.) | 4.2 mm |
| Creepage Distance (MIN.) | 4.2 mm |
| Isolation Distance (MIN.) | 0.2 mm |

MARKING EXAMPLE



ORDERING INFORMATION

| Part Number | Order Number | Solder Plating Specification | Packing Style | Safety Standard Approval | Application Part Number ^{*1} |
|-------------|----------------|------------------------------|---------------------------------|--|---------------------------------------|
| PS8101 | PS8101-AX | Pb-Free (Ni/Pd/Au) | 20 pcs (Tape 20 pcs cut) | Standard products (UL, CSA approved) | PS8101 |
| PS8101-F3 | PS8101-F3-AX | | Embossed Tape 2500 pcs/reel | | |
| PS8101-V | PS8101-V-AX | | 20 pcs (Tape 20 pcs cut) | UL, CSA, DIN EN 60747-5-5 approved | |
| PS8101-V-F3 | PS8101-V-F3-AX | | Embossed Tape 2 500 pcs/reel | | |

Notes: *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 | 100 | mW |
| Isolation Voltage ^{*3} | | BV | 3 750 | Vr.m.s. |
| Operating Ambient Temperature | | T _A | -55 to +100 | °C |
| Storage Temperature | | T _{stg} | -55 to +125 | °C |

Notes: *1. Reduced to 0.45 mA/°C at T_A = 25°C or more.

*2. Reduced to 1.00 mW/°C at T_A = 25°C or more.

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

Pins 1-2 shorted together, 3-5 shorted together.

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

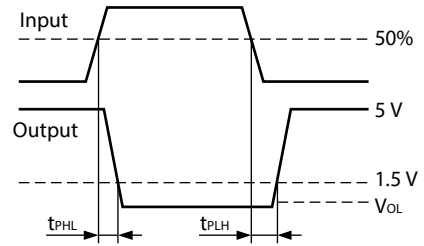
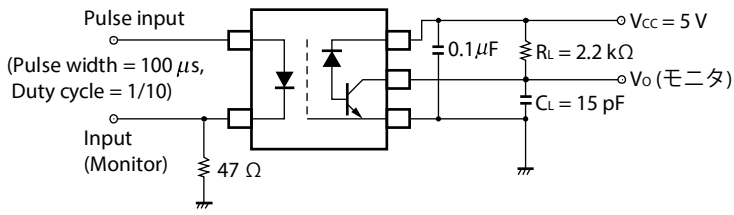
| Parameter | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|-----------|---|----------------------------------|--|------------------|------|------|-------|
| Diode | Forward Voltage | V _F | I _F = 16 mA | | 1.7 | 2.2 | V |
| | Reverse Current | I _R | V _R = 3 V | | | 10 | μA |
| | Forward Voltage Temperature Coefficient | ΔV _F /ΔT _A | I _F = 16 mA | | -2.1 | | 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 | | 3 | 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 _O = 1.2 mA | | 0.1 | 0.4 | V |
| | Low Level Supply Current | I _{CCL} | I _F = 16 mA, V _O = open, V _{CC} = 30 V | | 50 | | μA |
| | High Level Supply Current | I _{CCH} | I _F = 0 mA, V _O = open, V _{CC} = 30 V | | 0.01 | 2 | |
| Coupled | Current Transfer Ratio*1 | CTR | I _F = 16 mA, V _{CC} = 4.5 V, V _O = 0.4 V | 15 | 20 | 35 | % |
| | Isolation Resistance | R _{I-O} | V _{I-O} = 1 kV _{DC} , RH = 40 to 60% | 10 ¹¹ | | | Ω |
| | Isolation Capacitance | C _{I-O} | V = 0 V, f = 1 MHz | | 0.4 | | pF |
| | Propagation Delay Time (H → L)*2 | t _{PHL} | I _F = 16 mA, V _{CC} = 5 V, R _L = 2.2 kΩ, C _L = 15 pF | | 0.5 | 0.8 | μs |
| | Propagation Delay Time (L → H)*2 | t _{PLH} | | | 0.6 | 1.2 | |
| | Common Mode Transient Immunity at High Level Output*3 | CM _H | I _F = 0 mA, V _{CC} = 5 V, R _L = 4.1 kΩ, V _{CM} = 1.5 kV | 15 | | | kV/μs |
| | Common Mode Transient Immunity at Low Level Output*3 | CM _L | I _F = 16 mA, V _{CC} = 5 V, R _L = 4.1 kΩ, V _{CM} = 1.5 kV | -15 | | | |

Notes:*1. CTR rank

K : 20 to 35 (%)

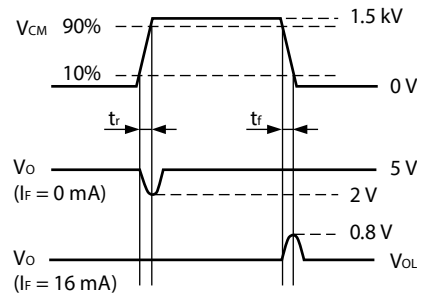
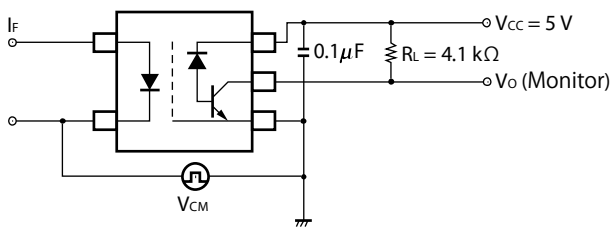
N : 15 to 35 (%)

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



Remark CL includes probe and stray wiring capacitance.

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

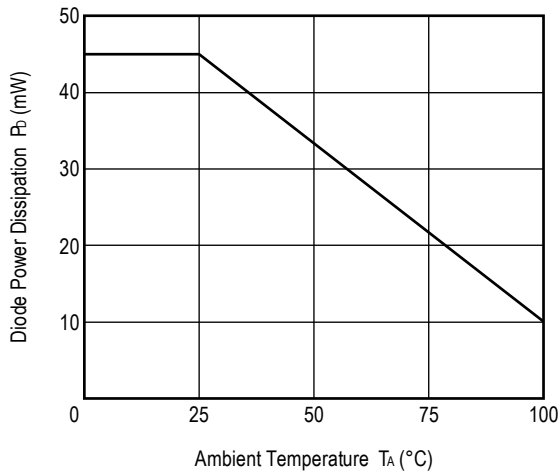


USAGE CAUTIONS

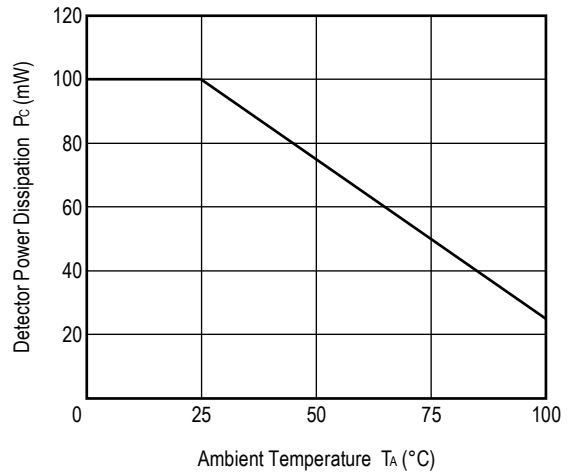
1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. By-pass capacitor of more than 0.1 μF is used between VCC and GND near device. Also, ensure that the distance between the leads of the photocoupler and capacitor is no more than 10 mm.
3. Avoid storage at a high temperature and high humidity.
4. Do not use adhesives or coating materials including halogens to fix this device.

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

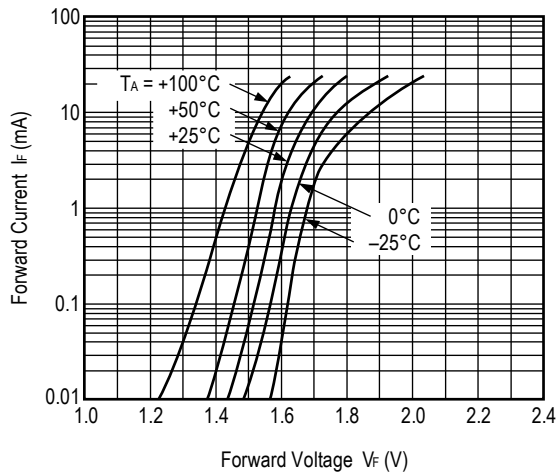
DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE



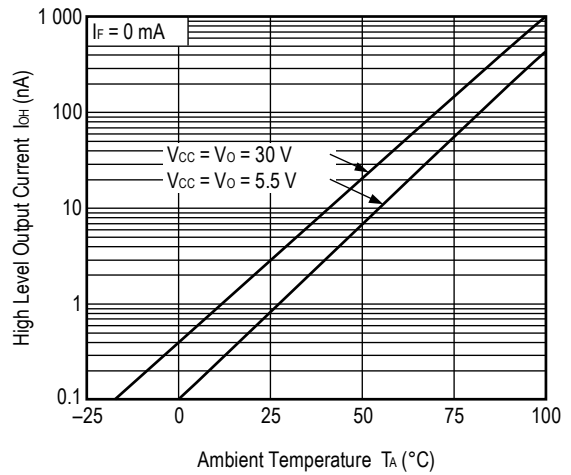
DETECTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



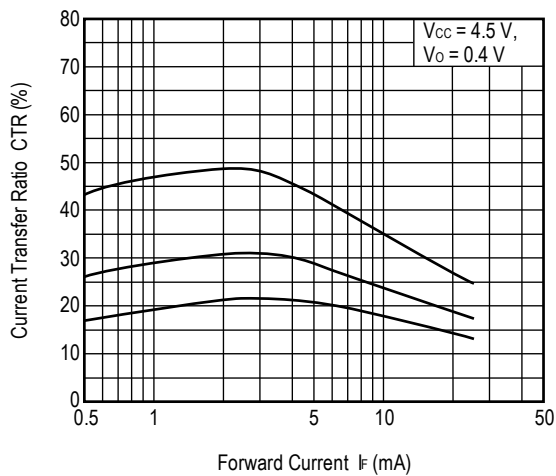
FORWARD CURRENT vs. FORWARD VOLTAGE



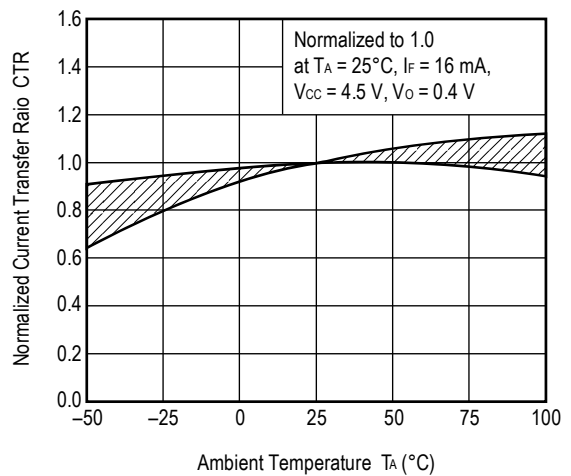
HIGH LEVEL OUTPUT CURRENT vs. AMBIENT TEMPERATURE



CURRENT TRANSFER RATIO vs. FORWARD CURRENT

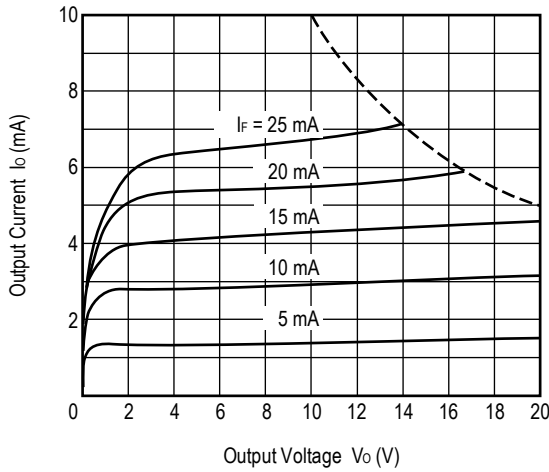


NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE

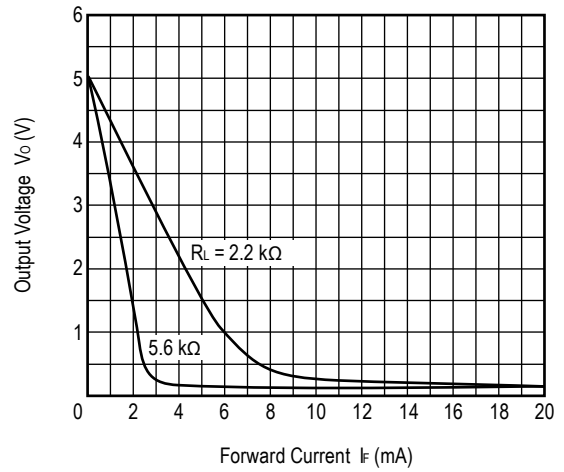


Remark The graphs indicate nominal characteristics.

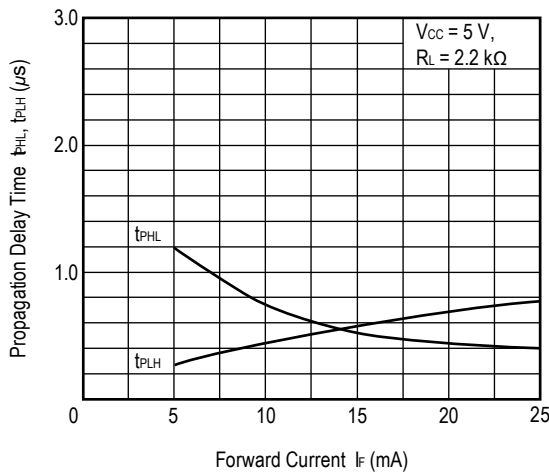
OUTPUT CURRENT vs. OUTPUT VOLTAGE



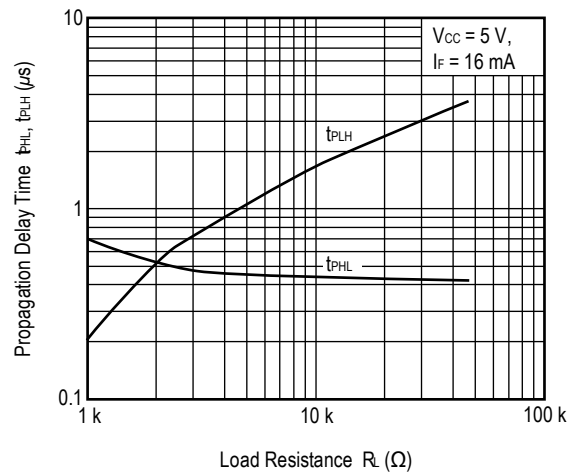
OUTPUT VOLTAGE vs. FORWARD CURRENT



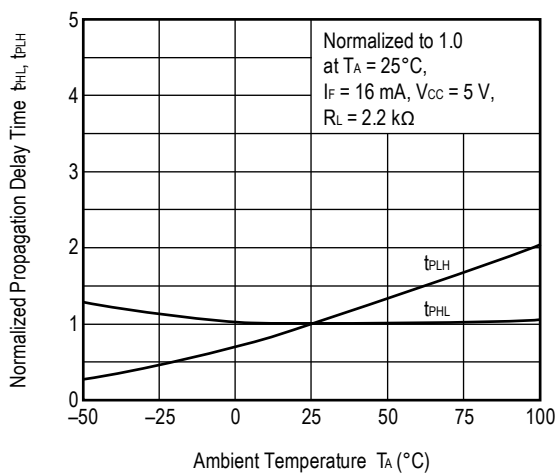
PROPAGATION DELAY TIME vs. FORWARD CURRENT



PROPAGATION DELAY TIME vs. LOAD RESISTANCE



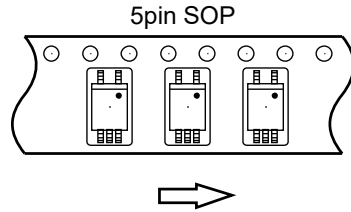
NORMALIZED PROPAGATION DELAY TIME vs. AMBIENT TEMPERATURE



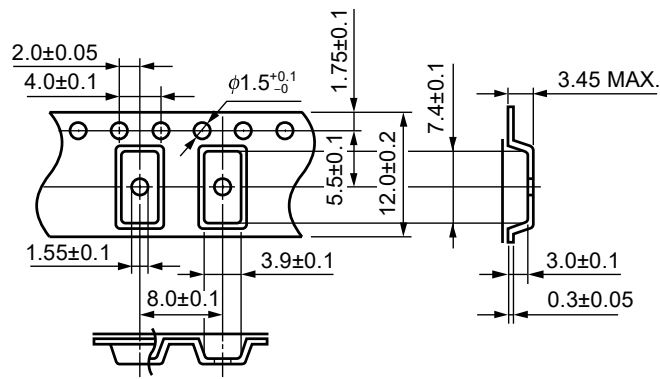
Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (UNIT: mm)

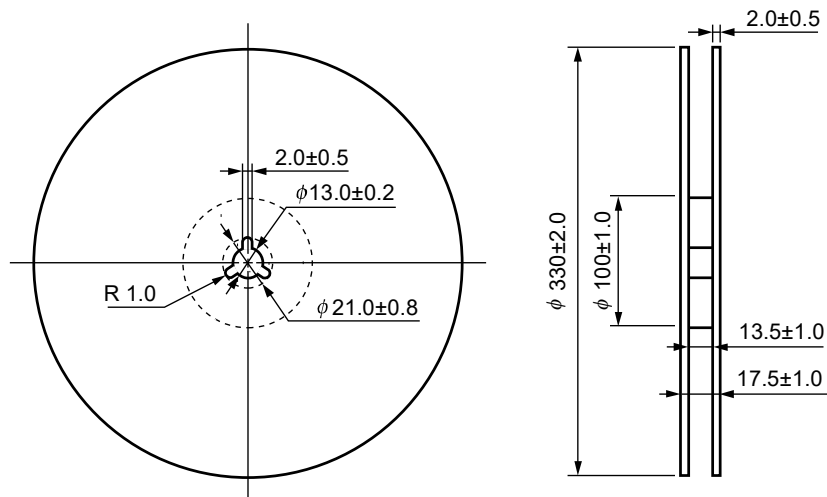
Tape Direction



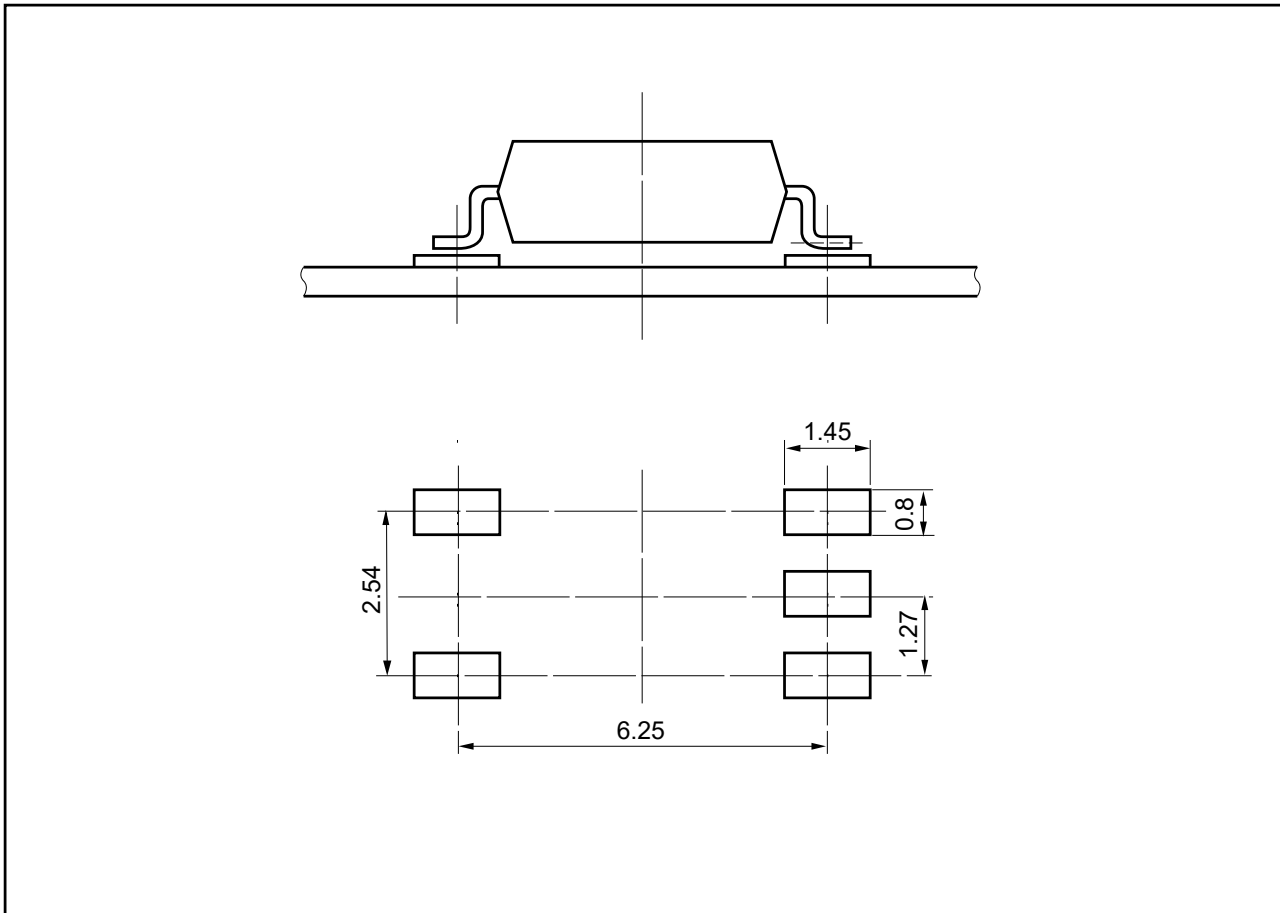
Outline and Dimensions (Tape)



Outline and Dimensions (Reel)



Packing: 2 500 pcs/reel

RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)

【5pin SOP】

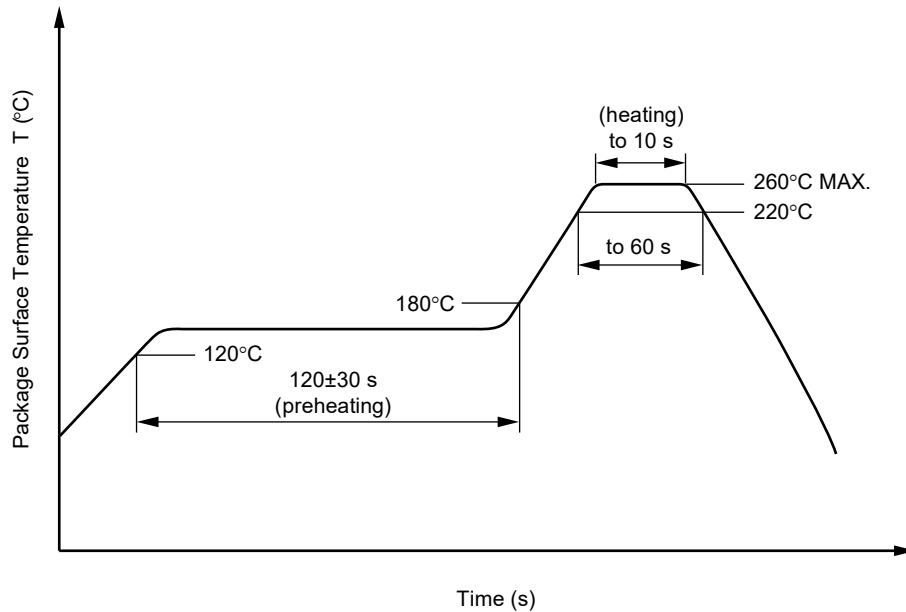
NOTES ON HANDLING

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

(b) Please be sure that the temperature of the package would not be heated over 100°C

(4) Cautions

- Fluxes
Avoid removing the residual flux with freon-based and halogens-based (chlorine-based) cleaning solvent.

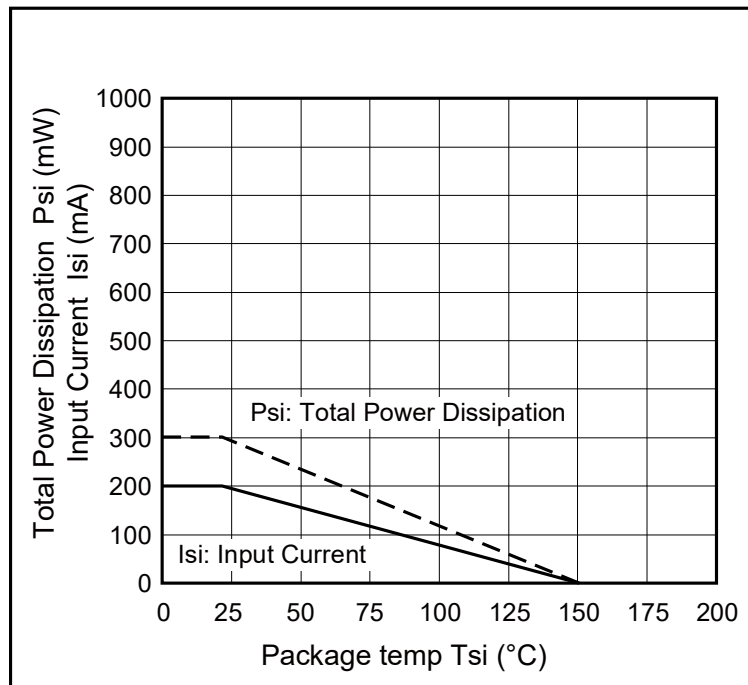
2. Cautions regarding noise

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

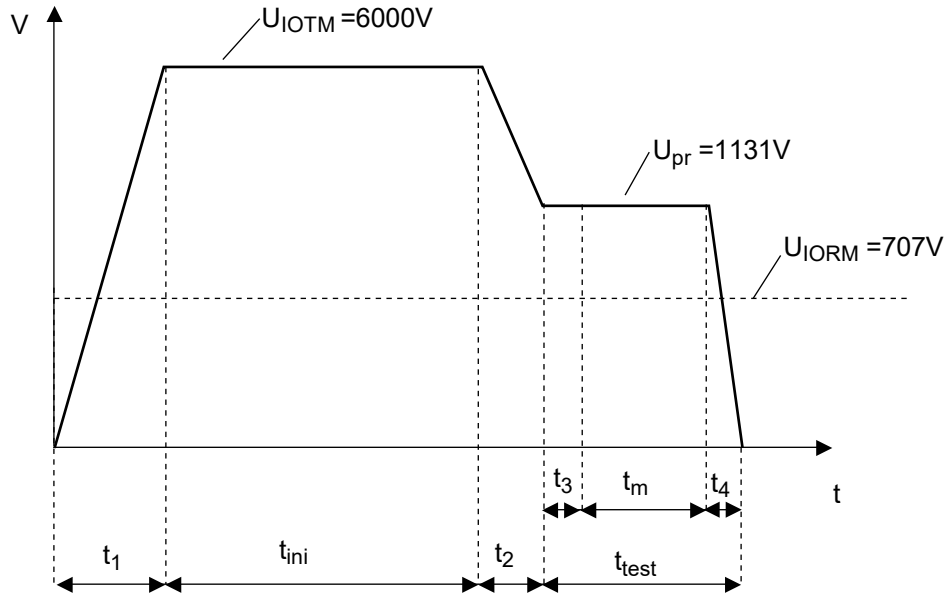
SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

| Parameter | Symbol | Rating | Unit |
|---|----------------------|------------------------|----------------------|
| Climatic test class (IEC 60068-1/DIN EN 60068-1) | | 55/100/21 | |
| Dielectric strength maximum operating isolation voltage | U_{IORM} | 707 | V_{peak} |
| Test voltage (partial discharge test, procedure a for type test and random test) $U_{pr} = 1.6 \times U_{IORM}, P_d < 5 \text{ pC}$ | U_{pr} | 1 131 | V_{peak} |
| Test voltage (partial discharge test, procedure b for all devices) $U_{pr} = 1.875 \times U_{IORM}, P_d < 5 \text{ pC}$ | U_{pr} | 1 326 | V_{peak} |
| Highest permissible overvoltage | U_{IOTM} | 6 000 | V_{peak} |
| Degree of pollution (DIN EN 60664-1 VDE 0110 Part 1) | | 2 | |
| Comparative tracking index (IEC 60112/DIN EN 60112 (VDE 0303 Part 11)) | CTI | 175 | |
| Material group (DIN EN 60664-1 VDE 0110 Part 1) | | III a | |
| Storage temperature range | T_{stg} | -55 to +125 | $^{\circ}\text{C}$ |
| Operating temperature range | T_A | -55 to +100 | $^{\circ}\text{C}$ |
| Isolation resistance, minimum value $V_{IO} = 500 \text{ V dc at } T_A = 25^{\circ}\text{C}$ $V_{IO} = 500 \text{ V dc at } T_A \text{ MAX. at least } 100^{\circ}\text{C}$ | 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 | T_{si} | 150 | $^{\circ}\text{C}$ |
| Current (input current I_f , $P_{si} = 0$) | I_{si} | 200 | mA |
| Power (output or total power dissipation) | P_{si} | 300 | mW |
| Isolation resistance $V_{IO} = 500 \text{ V dc at } T_A = T_{si}$ | Ris MIN. | 10^9 | Ω |

Dependence of maximum safety ratings with package temperature

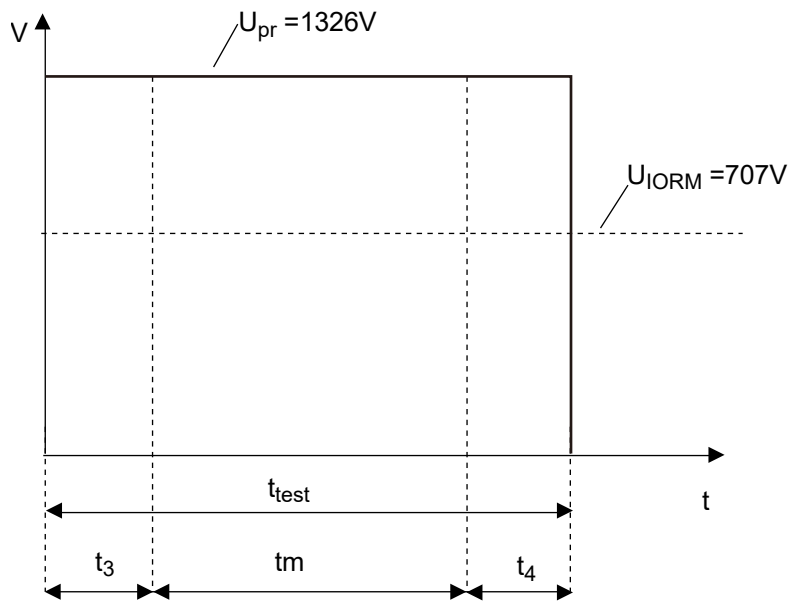


Method a) Destructive Test, Type and Sample Test



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

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



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

| | | |
|----------------|---------------|--|
| Caution | GaAs Products | <p>This product uses gallium arsenide (GaAs). GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points.</p> <ul style="list-style-type: none">• 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.<ol style="list-style-type: none">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.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.• Do not burn, destroy, cut, crush, or chemically dissolve the product.• Do not lick the product or in any way allow it to enter the mouth. |
|----------------|---------------|--|

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