# PS2561A1, PS2561AL-1, PS2561AL1-1, PS2561AL2-1

HIGH ISOLATION VOLTAGE SINGLE TRANSISTOR TYPE

R08DS0210EJ0100
Rev.1.00
Dec 25, 2020

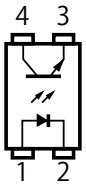
## DESCRIPTION

The PS2561A-1 is an optically coupled isolator containing a GaAs light emitting diode and an NPN silicon phototransistor to realize an excellent cost performance.
The PS2561A-1 is in a plastic DIP (Dual In-line Package) and the PS2561AL-1 is lead bending type (Gull-wing) for surface mount.
The PS2561AL1-1 is wide lead bending type.
The PS2561AL2-1 is wide lead bending type for surface mount.

## FEATURES

- High isolation voltage (BV = 5 000 Vr.m.s.)
- Ordering number of taping product: PS2561AL-1-F3 : 2 000 pcs/reel
  : PS2561AL2-1-F3 : 2 000 pcs/reel
- Pb-Free product
- Safety standards
  - UL approved: UL1577, Double protection
  - CSA approved: CAN/CSA-C22.2 No. 62368-1, Reinforced insulation
  - BSI approved: BS EN 62368-1, Reinforced insulation
  - SEMKO approved: EN 62368-1, IEC 62368-1, Reinforced insulation
  - NEMKO approved: EN 62368-1, Reinforced insulation
  - FIMKO approved: EN 62368-1, Reinforced insulation
  - DEMKO approved: EN 62368-1, Reinforced insulation
  - VDE approved: DIN EN 60747-5-5 (Option)

PIN CONNECTION
(Top View)



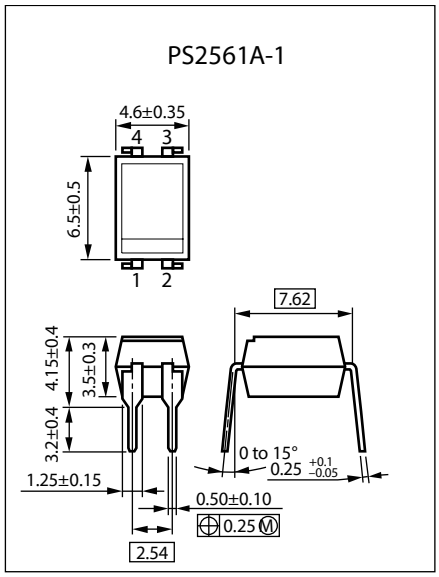

1. Anode
2. Cathode
3. Emitter
4. Collector

## APPLICATIONS

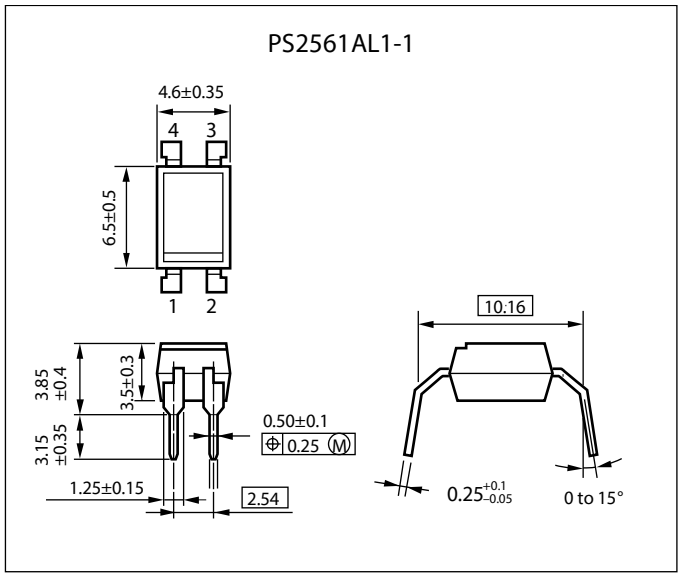
- Power supply
- Telephone/FAX.
- FA/OA equipment
- Programmable logic controllers

# PACKAGE DIMENSIONS (UNIT: mm)

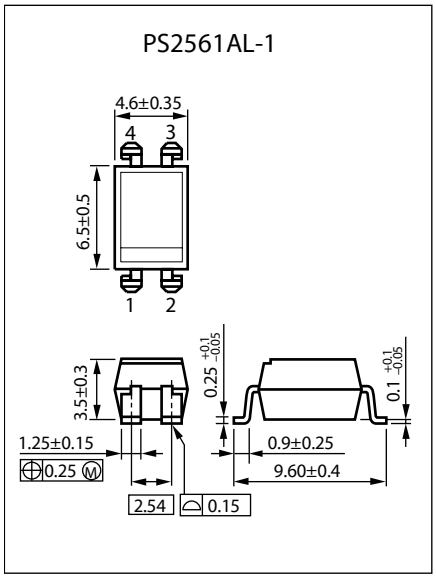
### DIP Type



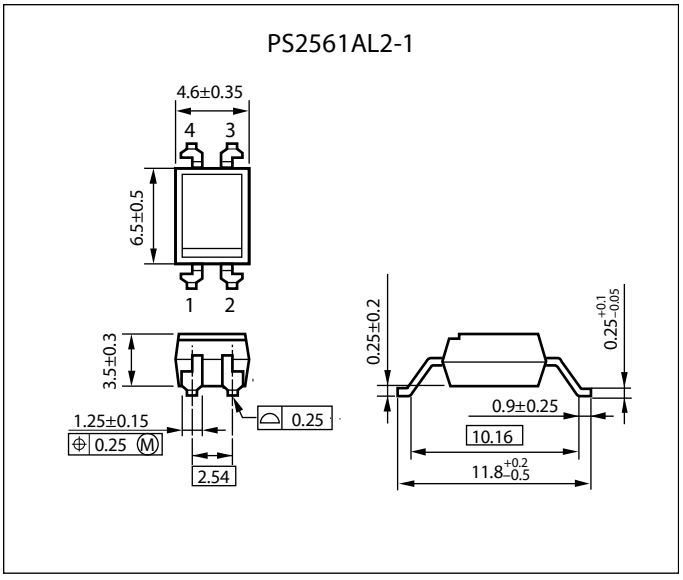

### Wide Lead Bending Type




### Lead Bending Type For Surface Mount




### Wide Lead Bending Type For Surface Mount

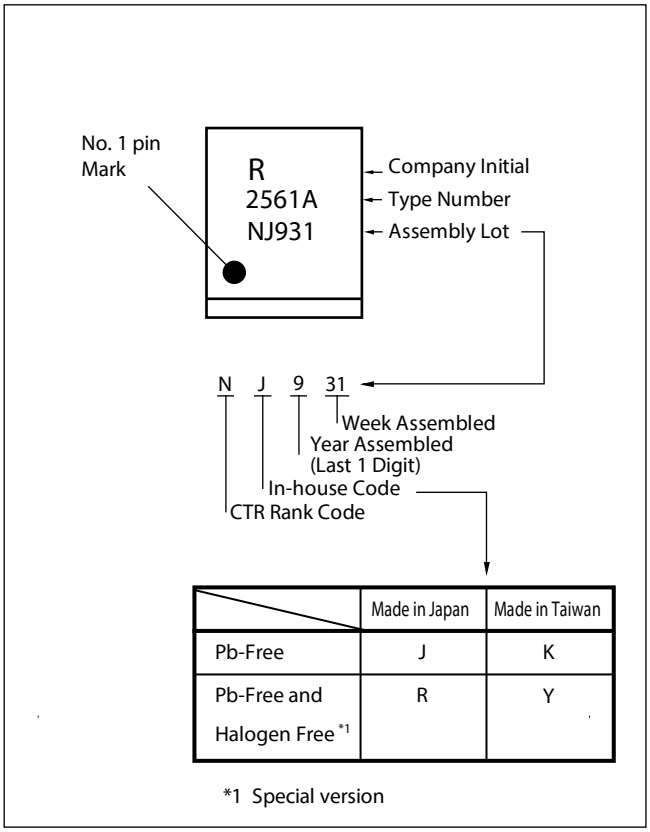



Weight ( 4-pin DIP) : 0.26 g (typ.)

## PHOTOCOUPLER CONSTRUCTION

| Parameter | Unit (mm) |
|---|---|
| Air Distance (MIN.) | 7 |
| Creepage Distance (MIN.) | 7 |
| Isolation Distance (MIN.) | 0.4 |

## MARKING EXAMPLE




| | Made in Japan | Made in Taiwan |
|---|---|---|
| Pb-Free | J | K |
| Pb-Free and Halogen Free *1 | R | Y |

*1 Special version

## ORDERING INFORMATION

| Part Number | Order Number *1 | Solder Plating Specification | Packing Style | Safety Standard Approval | Application Part Number *2 |
|---|---|---|---|---|---|
| PS2561A-1 | PS2561A-1-A | Pb-Free | Magazine case 100 pcs | Standard products (UL, CSA, BSI, NEMKO, SEMKO, DEMKO, FIMKO approved) | PS2561A-1 |
| PS2561AL-1 | PS2561AL-1-A | | | | PS2561AL-1 |
| PS2561AL1-1 | PS2561AL1-1-A | | | | PS2561AL1-1 |
| PS2561AL2-1 | PS2561AL2-1-A | | | | PS2561AL2-1 |
| PS2561AL-1-F3 | PS2561AL-1-F3-A | | Embossed Tape 2 000 pcs/reel | | PS2561AL-1 |
| PS2561AL2-1-F3 | PS2561AL2-1-F3-A | | | | PS2561AL2-1 |
| PS2561A-1-V | PS2561A-1-V-A | | Magazine case 100 pcs | UL, CSA, BSI, SEMKO, NEMKO, FIMKO, DEMKO, DIN EN 60747-5-5 approved | PS2561A-1 |
| PS2561AL-1-V | PS2561AL-1-V-A | | | | PS2561AL-1 |
| PS2561AL1-1-V | PS2561AL1-1-V-A | | | | PS2561AL1-1 |
| PS2561AL2-1-V | PS2561AL2-1-V-A | | | | PS2561AL2-1 |
| PS2561AL-1-V-F3 | PS2561AL-1-V-F3-A | | Embossed Tape 2 000 pcs/reel | | PS2561AL-1 |
| PS2561AL2-1-V-F3 | PS2561AL2-1-V-F3-A | | | | PS2561AL2-1 |
| PS2561A-1 | PS2561A-1Y-A | Special version (Pb-Free and Halogen Free) | Magazine case 100 pcs | Standard products (UL, CSA, BSI, NEMKO, SEMKO, DEMKO, FIMKO approved) | PS2561A-1 |
| PS2561AL-1 | PS2561AL-1Y-A | | | | PS2561AL-1 |
| PS2561AL1-1 | PS2561AL1-1Y-A | | | | PS2561AL1-1 |
| PS2561AL2-1 | PS2561AL2-1Y-A | | | | PS2561AL2-1 |
| PS2561AL-1-F3 | PS2561AL-1Y-F3-A | | Embossed Tape 2 000 pcs/reel | | PS2561AL-1 |
| PS2561AL2-1-F3 | PS2561AL2-1Y-F3-A | | | | PS2561AL2-1 |
| PS2561A-1-V | PS2561A-1Y-V-A | | Magazine case 100 pcs | UL, CSA, BSI, SEMKO, NEMKO, FIMKO, DEMKO, DIN EN 60747-5-5 approved | PS2561A-1 |
| PS2561AL-1-V | PS2561AL-1Y-V-A | | | | PS2561AL-1 |
| PS2561AL1-1-V | PS2561AL1-1Y-V-A | | | | PS2561AL1-1 |
| PS2561AL2-1-V | PS2561AL2-1Y-V-A | | | | PS2561AL2-1 |
| PS2561AL-1-V-F3 | PS2561AL-1Y-V-F3-A | | Embossed Tape 2 000 pcs/reel | | PS2561AL-1 |
| PS2561AL2-1-V-F3 | PS2561AL2-1Y-V-F3-A | | | | PS2561AL2-1 |

Notes: *1. When specifying CTR rank, please add “/CTR rank” after Order Number.

ex. L rank : PS2561A-1-A/L

Notes: *2. 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 | Reverse Voltage | $V_R$ | 6 | V |
| | Forward Current (DC) | $I_F$ | 30 | mA |
| | Power Dissipation Derating | $\Delta P_D$/°C | 1.5 | mW/°C |
| | Power Dissipation | $P_D$ | 150 | mW |
| | Peak Forward Current*1 | $I_{FP}$ | 0.5 | A |
| Transistor | Collector to Emitter Voltage | $V_{CEO}$ | 70 | V |
| | Emitter to Collector Voltage | $V_{ECO}$ | 5 | V |
| | Collector Current | $I_C$ | 30 | mA |
| | Power Dissipation Derating | $\Delta P_C$/°C | 1.5 | mW/°C |
| | Power Dissipation | $P_C$ | 150 | mW |
| Isolation Voltage*2 | | BV | 5 000 | Vr.m.s. |
| Operating Ambient Temperature | | $T_A$ | –55 to +100 | °C |
| Storage Temperature | | $T_{stg}$ | –55 to +150 | °C |

Note: *1. PW = 100 $\mu$s, Duty Cycle = 1 %

*2. AC voltage for 1 minute at $T_A$ = 25 °C, RH = 60 % between input and output.
Pins 1-2 shorted together, 3-4 shorted together.

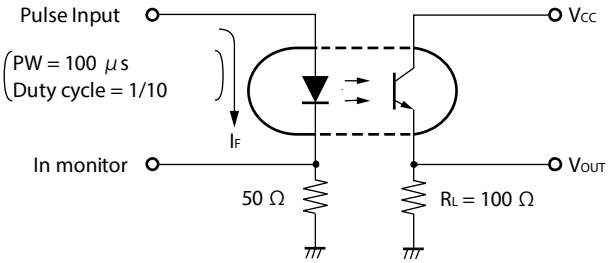
## ELECTRICAL CHARACTERISTICS ($T_A$ = 25 °C)

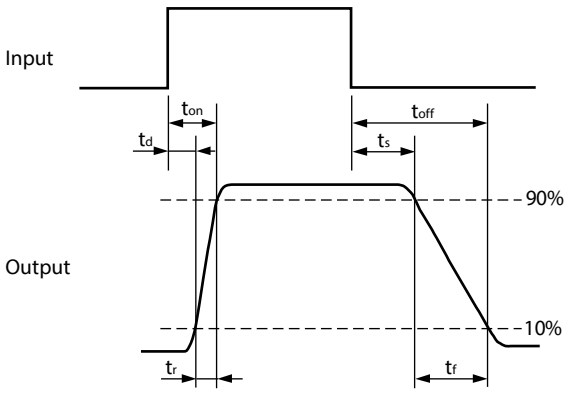
| Parameter | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|---|
| Diode | Forward Voltage | $V_F$ | $I_F$ = 10 mA | | 1.2 | 1.4 | V |
| | Reverse Current | $I_R$ | $V_R$ = 5 V | | | 5 | μA |
| | Terminal Capacitance | $C_t$ | V = 0 V, f = 1.0 MHz | | 10 | | pF |
| Transistor | Collector to Emitter Dark Current | $I_{CEO}$ | $V_{CE}$ = 70 V, $I_F$ = 0 mA | | | 100 | nA |
| Coupled | Current Transfer Ratio ($I_C/I_F$)*1 | CTR | $I_F$ = 5 mA, $V_{CE}$ = 5 V | 50 | | 400 | % |
| | Collector Saturation Voltage | $V_{CE (sat)}$ | $I_F$ = 10 mA, $I_C$ = 2 mA | | 0.13 | 0.3 | V |
| | Isolation Resistance | $R_{I-O}$ | $V_{I-O}$ = 1.0 kV$_{DC}$ | $10^{11}$ | | | Ω |
| | Isolation Capacitance | $C_{I-O}$ | V = 0 V, f = 1.0 MHz | | 0.4 | | pF |
| | Rise Time*2 | $t_r$ | $V_{CC}$ = 10 V, $I_C$ = 2 mA, $R_L$ = 100 Ω | | 3 | | μs |
| | Fall Time*2 | $t_f$ | | | 5 | | |

Note: *1. CTR rank

N : 50 to 400 (%)
H : 80 to 160 (%)
Q : 100 to 200 (%)
W : 130 to 260 (%)
L : 200 to 400 (%)

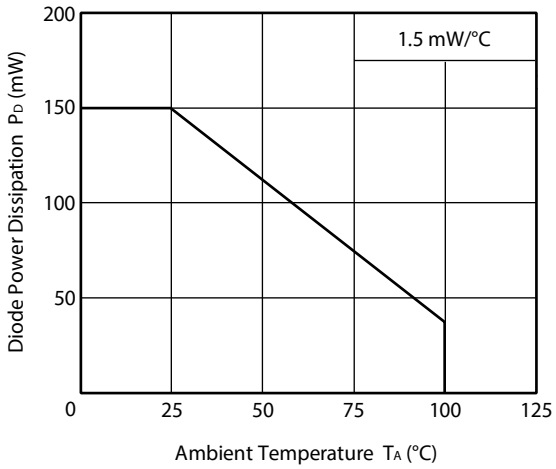
*2. Test Circuit for Switching Time



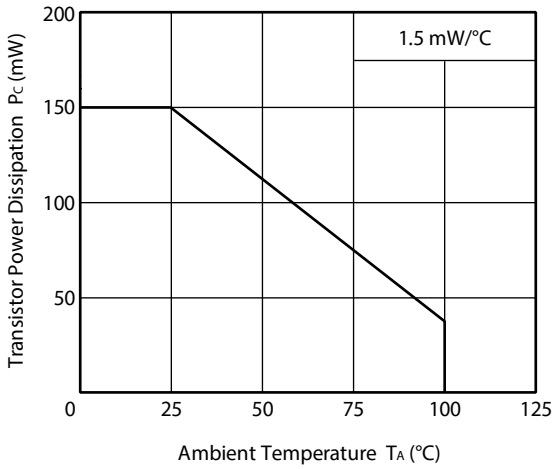



## TYPICAL CHARACTERISTICS ($T_A$ = 25 °C, unless otherwise specified)

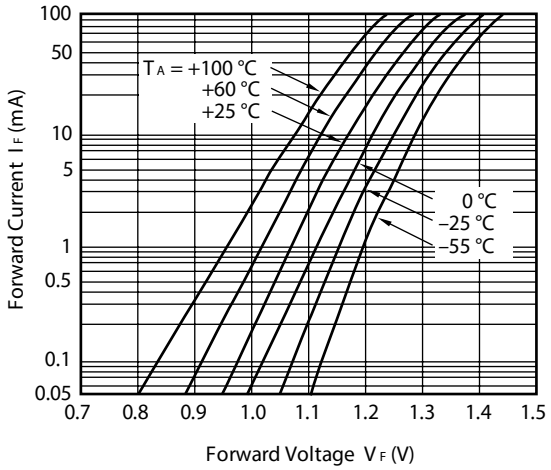
DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE



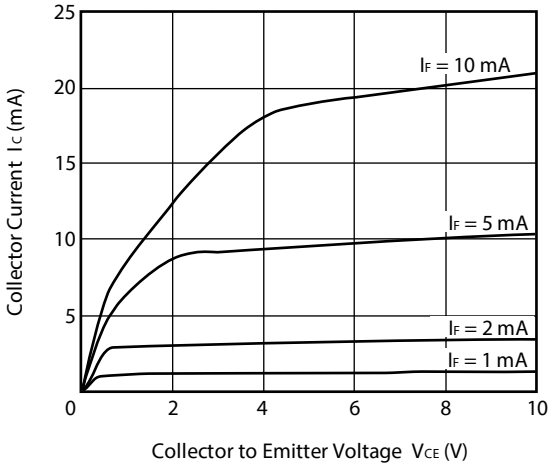

TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



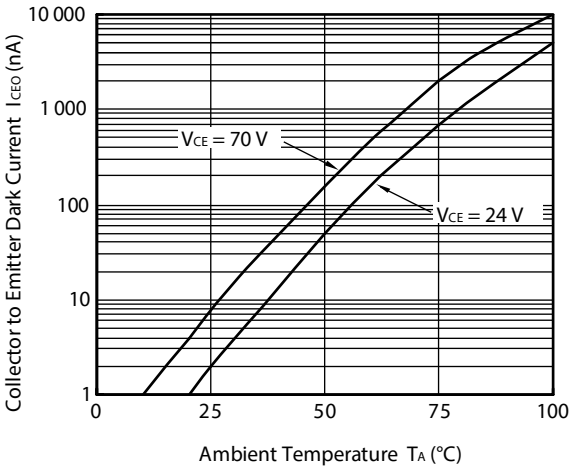

FORWARD CURRENT vs. FORWARD VOLTAGE



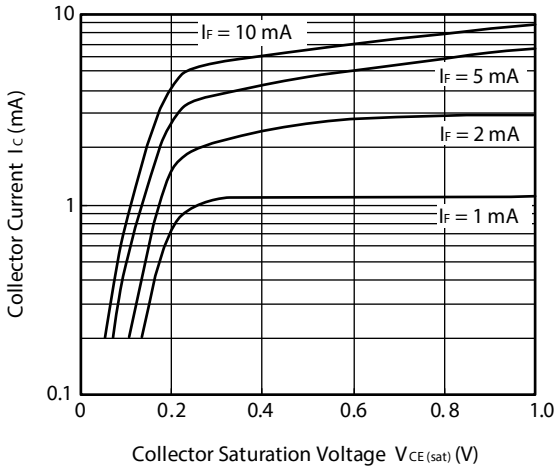

COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE




COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE

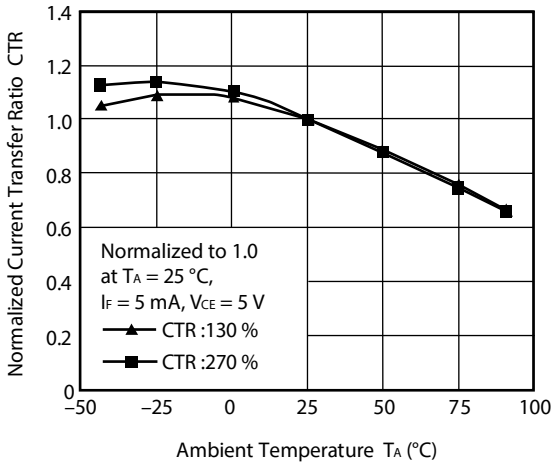



COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE

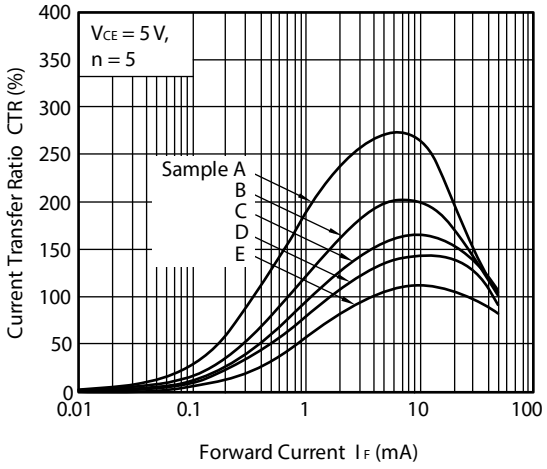



**Remark** The graphs indicate nominal characteristics.

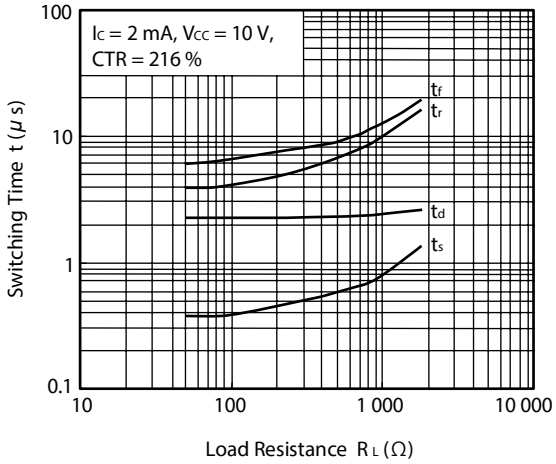
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



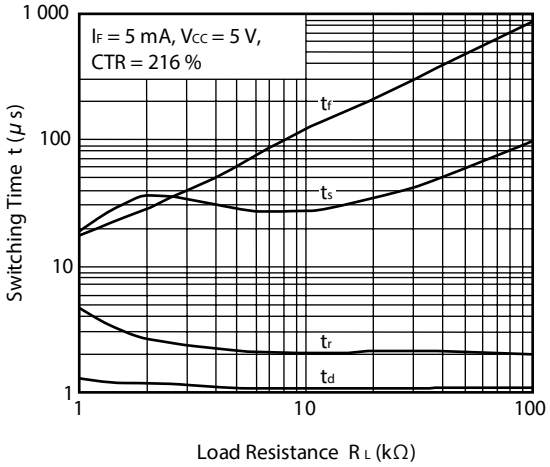

CURRENT TRANSFER RATIO vs. FORWARD CURRENT



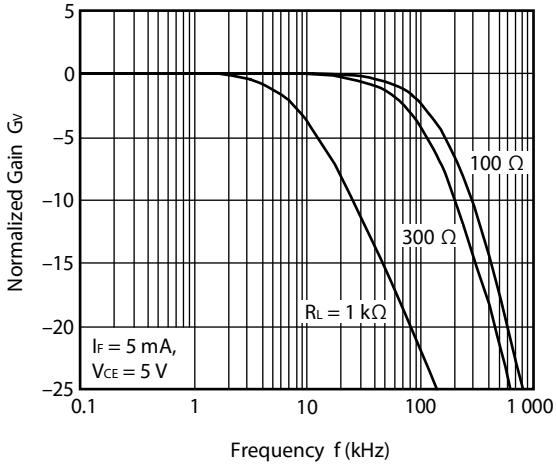

SWITCHING TIME vs. LOAD RESISTANCE




SWITCHING TIME vs. LOAD RESISTANCE




FREQUENCY RESPONSE

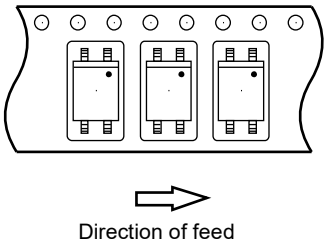



**Remark** The graphs indicate nominal characteristics.

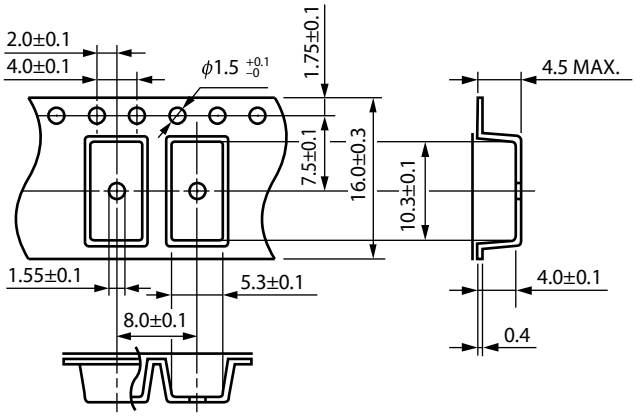
## TAPING SPECIFICATIONS (UNIT: mm)

Taping Direction

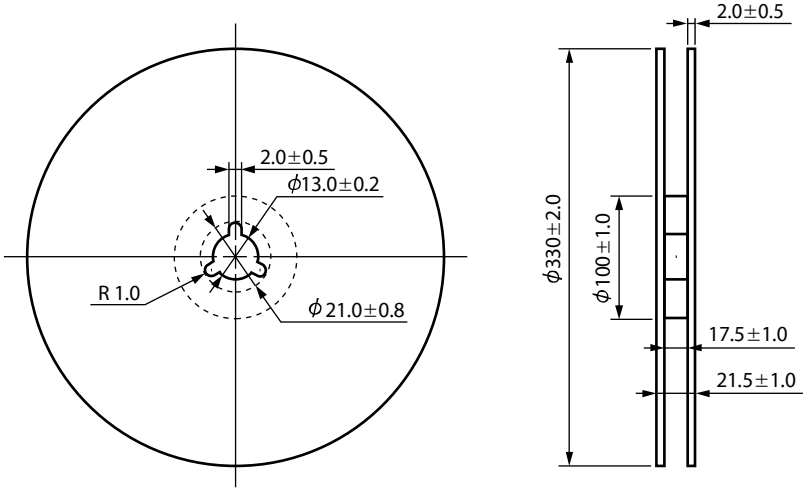
PS2561AL-1-F3




Outline and Dimensions (Tape)




Outline and Dimensions (Reel)

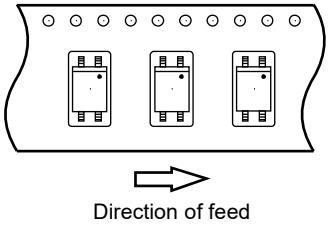



Packing: 2 000 pcs/reel

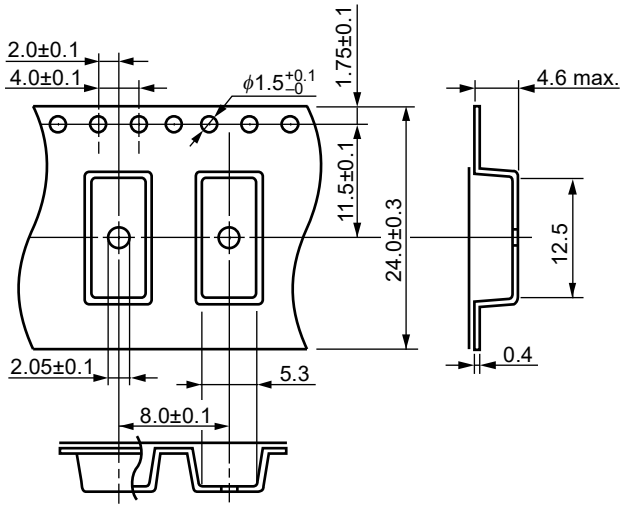
## TAPING SPECIFICATIONS (UNIT: mm)

Taping Direction

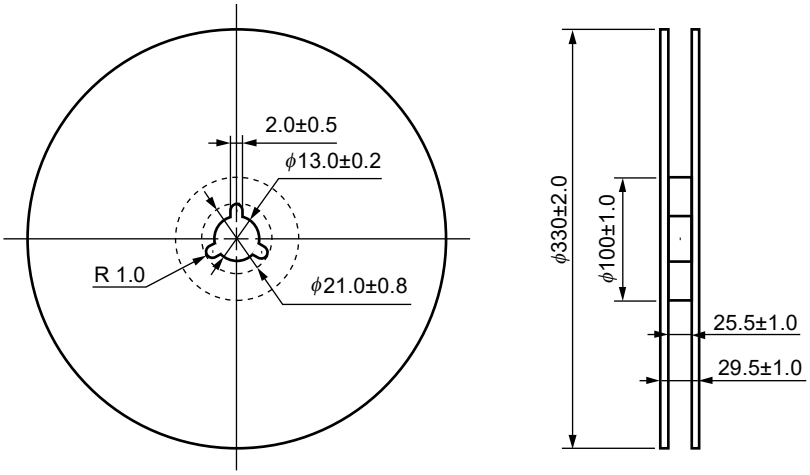
PS2561AL2-F3




Outline and Dimensions (Tape)

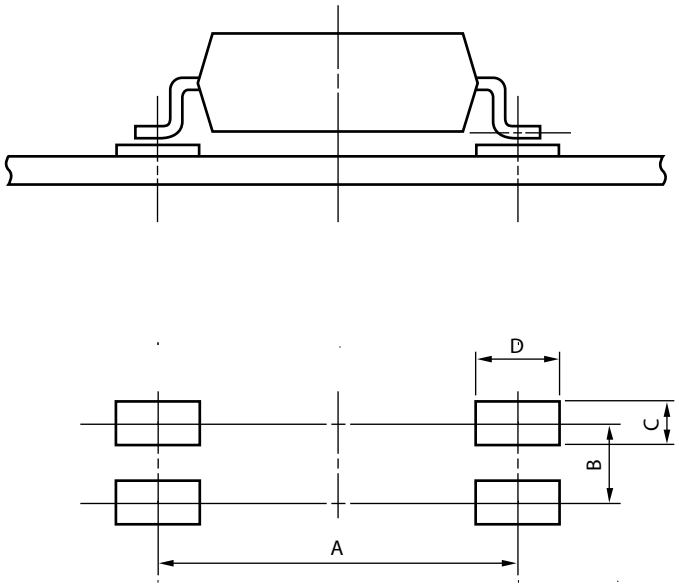



Outline and Dimensions (Reel)




Packing: 2 000 pcs/reel

## RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)




| Part Number | Lead Bending | A | B | C | D |
|---|---|---|---|---|---|
| PS2561A | Lead Bending Type For Surface Mount | 8.2 | 2.54 | 1.7 | 2.2 |
| PS2561AL2 | Wide Lead Bending Type For Surface Mount | 10.2 | 2.54 | 1.7 | 2.2 |

**Remark** All dimensions in this figure must be evaluated before use.

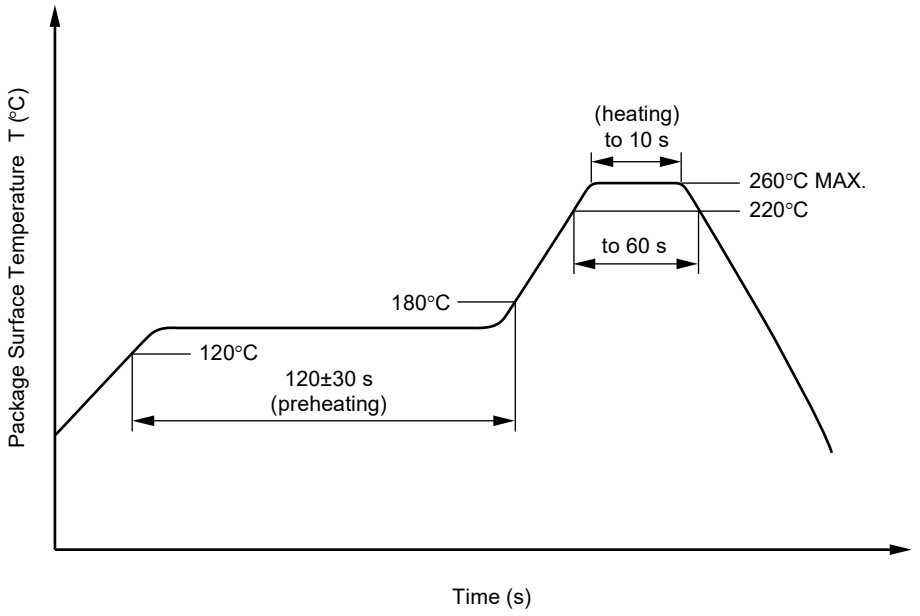
## NOTES ON HANDLING

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

• Flux Cleaning

Avoid cleaning with Freon based or halogen-based (chlorinated etc.) solvents.

• Do not use fixing agents or coatings containing halogen-based substances.

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 transistor may enter the on state, even if the voltage is within the absolute maximum ratings.

3. Measurement conditions of current transfer ratios (CTR), which differ according to photocoupler
   Check the setting values before use, since the forward current conditions at CTR measurement differ according to product.
   When using products other than at the specified forward current, the characteristics curves may differ from the standard curves due to CTR value variations or the like. This tendency may sometimes be obvious, especially below $I_F$ = 1 mA.
   Therefore, check the characteristics under the actual operating conditions and thoroughly take variations or the like into consideration before use.

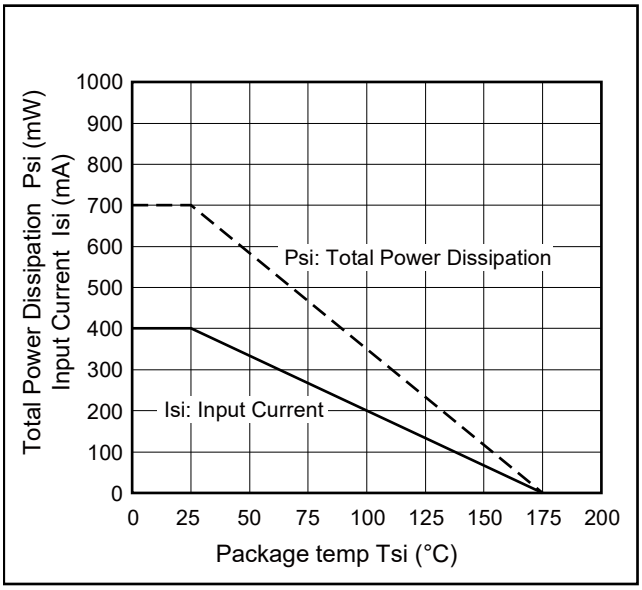
## USAGE CAUTIONS

1. Protect against static electricity when handling.
2. Avoid storage at a high temperature and high humidity.
3. Avoid cleaning with Freon based or halogen-based (chlorinated etc.) solvents.
4. Do not use fixing agents or coatings containing halogen-based substances.

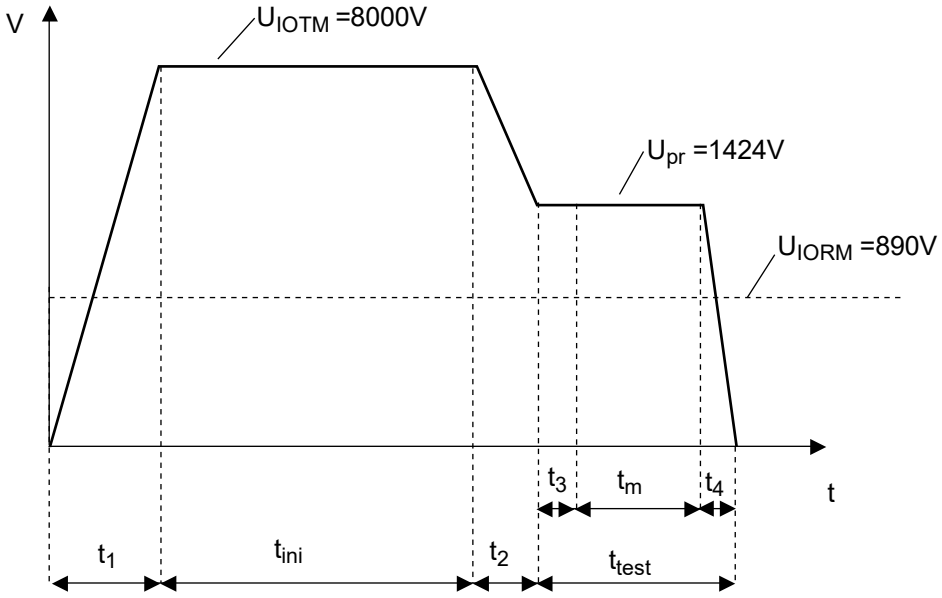
## SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Climatic test class (IEC 60068-1/DIN EN 60068-1) | | 55/100/21 | |
| Dielectric strength<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>890<br>1 424 | <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 | $U_{pr}$ | 1 669 | $V_{peak}$ |
| Highest permissible overvoltage | $U_{IOTM}$ | 8 000 | $V_{peak}$ |
| Degree of pollution (IEC 60664-1/DIN EN 60664-1 (VDE 0110-1) | | 2 | |
| Comparative tracking index (IEC 60112/DIN EN 60112 (VDE 0303-11)) | CTI | 175 | |
| Material group (IEC 60664-1/DIN EN 60664-1 (VDE 0110-1)) | | III a | |
| Storage temperature range | $T_{stg}$ | –55 to +150 | °C |
| Operating temperature range | $T_A$ | –55 to +100 | °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

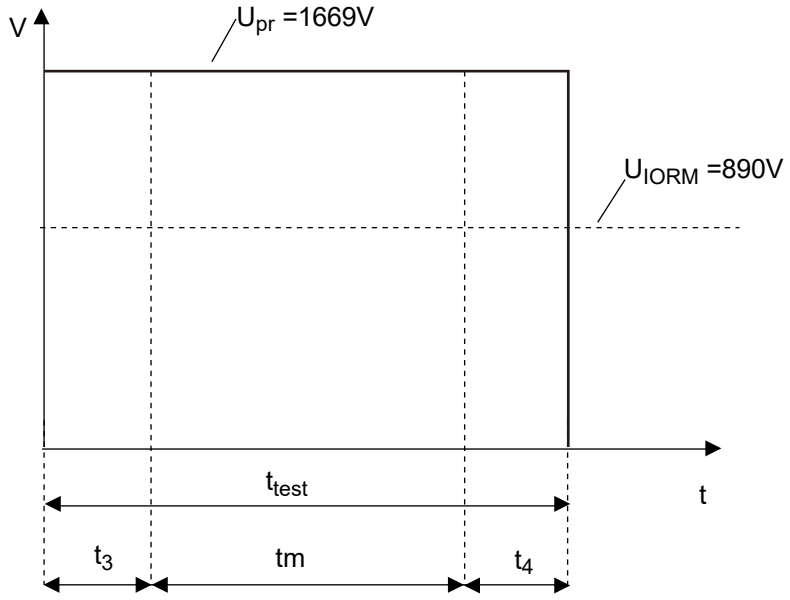


Method a) Destructive Test, Type and Sample Test




$t_1$,$t_2$ = 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

| | |
|---|---|
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