# PS2806-1,PS2806-4

R08DS0176EJ0101
Rev.1.01
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HIGH ISOLATION VOLTAGE AC INPUT, DARLINGTON TRANSISTOR TYPE SSOP PHOTOCOUPLER

## DESCRIPTION

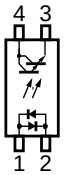
The PS2806-1 and PS2806-4 are optically coupled isolators containing a GaAs light emitting diode and an NPN silicon Darlington-connected phototransistor in a plastic SSOP for high density applications. This package has shield effect to cut off ambient light.

## FEATURES

- High isolation voltage (BV = 2 500 Vr.m.s.)
- Small and thin package (4, 16-pin SSOP, Pin pitch 1.27 mm)
- AC input response
- High current transfer ratio (CTR = 2 000 % TYP. @ IF = ±1 mA, $V_{CE}$ = 2 V)
- Ordering number of tape product: PS2806-1-F3, PS2806-4-F3
- Pb-free product
- Safety standards
  - UL approved: UL1577, Single protection
  - CSA approved: CAN/CSA-C22.2 No. 62368-1, Basic insulation
  - BSI approved: BS EN 62368-1, Basic/Supplementary insulation
  - VDE approved: DIN EN 60747-5-5 (Option)

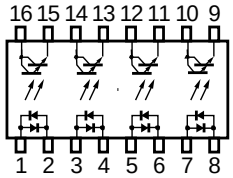
PIN CONNECTION
(Top View)

PS2806-1




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

PS2806-4

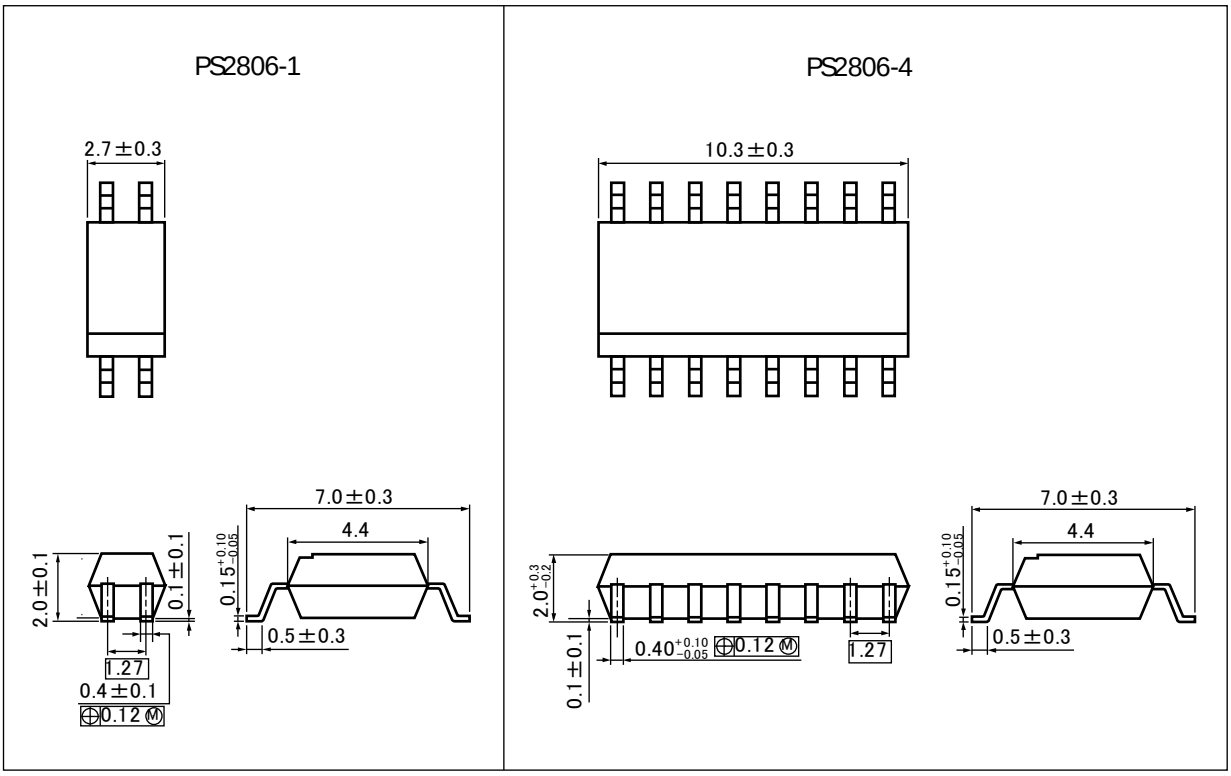



1. 3. 5. 7. Anode, Cathode
2. 4. 6. 8. Cathode, Anode
9. 11. 13. 15. Emitter
10. 12. 14. 16. Collector

## APPLICATIONS

- Programmable logic controllers
- Measuring instruments
- Power supply
- Hybrid IC

## PACKAGE DIMENSIONS (UNIT: mm)




Weight ( 4-pin SSOP) : 0.05 g (TYP.)

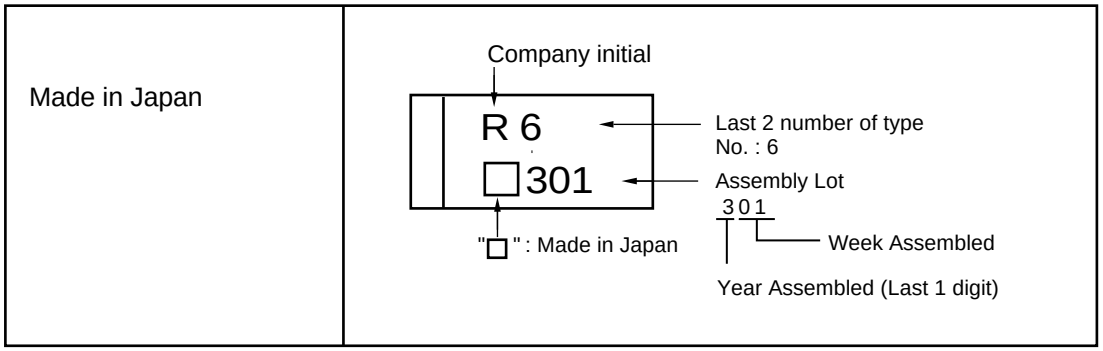
Weight (16-pin SSOP) : 0.2 g (TYP.)

## PHOTOCOUPLER CONSTRUCTION

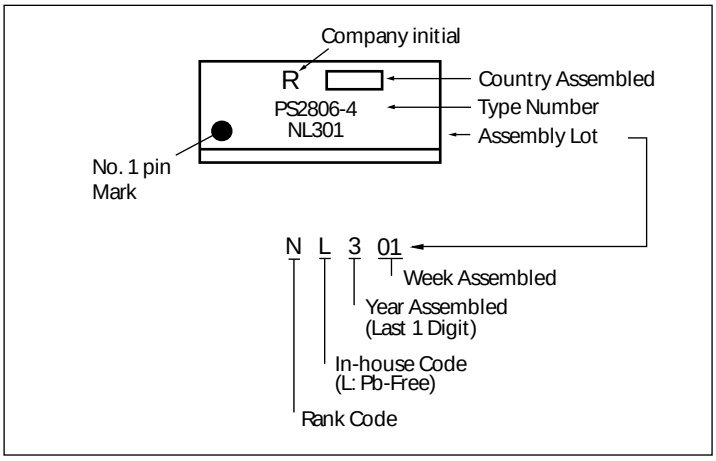
| Parameter | MIN. |
|---|---|
| Air Distance | 4.5 mm |
| Creepage Distance | 4.5 mm |
| Isolation Thickness | 0.1 mm |

## MARKING EXAMPLE

### PS2806-1




### PS2806-4



## ORDERING INFORMATION

| Part Number | Order Number | Solder Plating Specification | Packing Style | Safety Standard Approval | Application Part Number*1 |
|---|---|---|---|---|---|
| PS2806-1 | PS2806-1-A | Pb-Free | Embossed Tape 50 pcs | Standard Products (UL, BSI, CSA Approved) | PS2806-1 |
| PS2806-1-F3 | PS2806-1-F3-A | | Embossed Tape 3 500 pcs/reel | | |
| PS2806-4 | PS2806-4-A | | Embossed Tape 10 pcs | | PS2806-4 |
| PS2806-4-F3 | PS2806-4-F3-A | | Embossed Tape 2 500 pcs/reel | | |
| PS2806-1-V | PS2806-1-V-A | | Embossed Tape 50 pcs | UL, BSI, CSA, DIN EN 60747-5-5 Approved | PS2806-1 |
| PS2806-1-V-F3 | PS2806-1-V-F3-A | | Embossed Tape 3 500 pcs/reel | | |
| PS2806-4-V | PS2806-4-V-A | | Embossed Tape 10 pcs | | PS2806-4 |
| PS2806-4-V-F3 | PS2806-4-V-F3-A | | Embossed Tape 2 500 pcs/reel | | |

Notes: *1. For the application of the safety standard, the following part number should be used.

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

| Parameter | | Symbol | Ratings | | Unit |
|---|---|---|---|---|---|
| | | | PS2806-1 | PS2806-4 | |
| Diode | Forward Current (DC) | $I_F$ | ±50 | | mA/ch |
| | Power Dissipation Derating | $\Delta P_D$/°C | 0.6 | 0.8 | mW/°C |
| | Power Dissipation | $P_D$ | 60 | 80 | mW/ch |
| | Peak Forward Current *1 | $I_{FP}$ | ±1 | | A/ch |
| Transistor | Collector to Emitter Voltage | $V_{CEO}$ | 40 | | V |
| | Emitter to Collector Voltage | $V_{ECO}$ | 6 | | V |
| | Collector Current | $I_C$ | 90 | 100 | mA/ch |
| | Power Dissipation Derating | $\Delta P_C$/°C | 1.2 | | mW/°C |
| | Power Dissipation | $P_C$ | 120 | | mW/ch |
| Isolation Voltage *2 | | BV | 2 500 | | Vr.m.s. |
| Operating Ambient Temperature | | $T_A$ | −55 to +100 | | °C |
| Storage Temperature | | $T_{stg}$ | −55 to +150 | | °C |

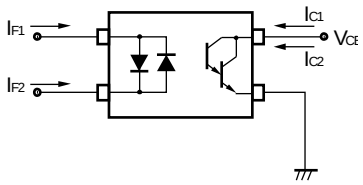
Notes: *1. PW = 100 µs, Duty Cycle = 1 %

*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 (PS2806-1).
Pins 1-8 shorted together, 9-16 shorted together (PS2806-4).

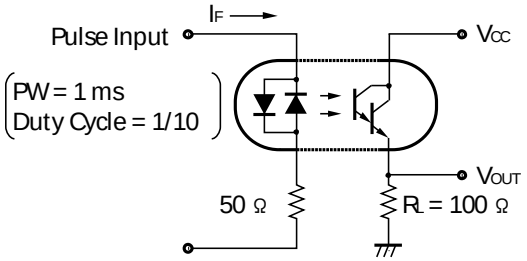
## ELECTRICAL CHARACTERISTICS ($T_A$ = 25 °C)

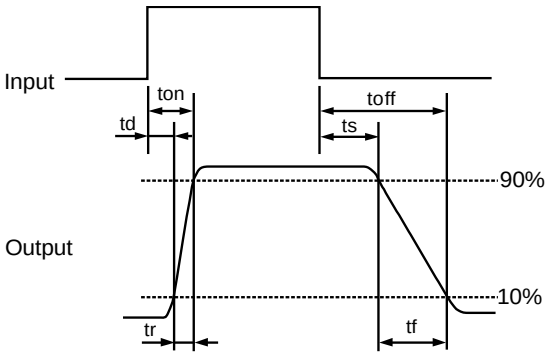
| Parameter | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|---|
| Diode | Forward Voltage | $V_F$ | $I_F$ = ±5 mA | | 1.1 | 1.4 | V |
| | Terminal Capacitance | $C_t$ | V = 0 V, f = 1.0 MHz | | 30 | | pF |
| Transistor | Collector to Emitter Dark Current | $I_{CEO}$ | $V_{CE}$ = 40 V, $I_F$ = 0 mA | | | 400 | nA |
| Coupled | Current Transfer Ratio ($I_C/I_F$) | CTR | $I_F$ = ±1 mA, $V_{CE}$ = 2 V | 200 | 2 000 | | % |
| | CTR Ratio *1 | CTR1/ CTR2 | $I_F$ = 1 mA, $V_{CE}$ = 2 V | 0.3 | 1.0 | 3.0 | |
| | Collector Saturation Voltage | $V_{CE(sat)}$ | $I_F$ = ±1 mA, $I_C$ = 2 mA | | | 1.0 | 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 | $t_r$ | $V_{CC}$ = 5 V, $I_C$ = 2 mA, $R_L$ = 100 Ω | | 200 | | µs |
| | Fall Time *2 | $t_f$ | | | 200 | | |

Notes: *1. CTR1 = $I_{C1}/I_{F1}$, CTR2 = $I_{C2}/I_{F2}$



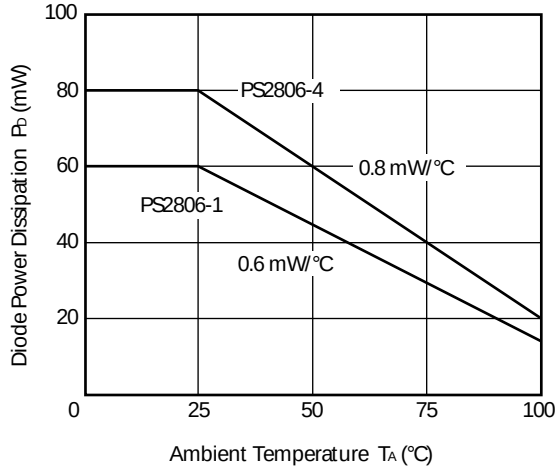

*2. Test circuit for switching time



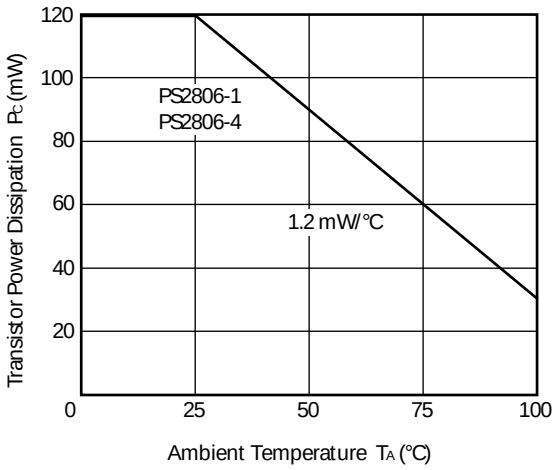



## TYPICAL CHARACTERISTICS ($T_A$ = 25 °C, unless otherwise specified)

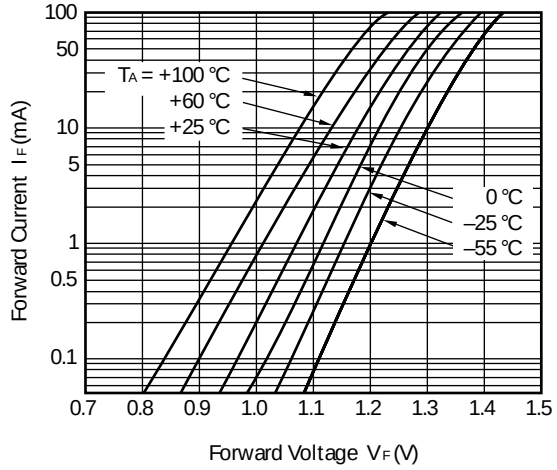
DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE



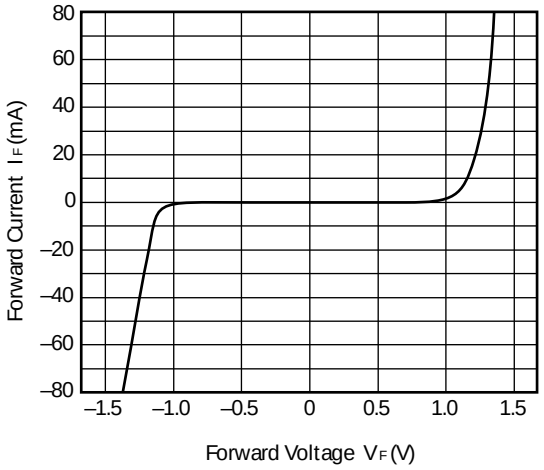

TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



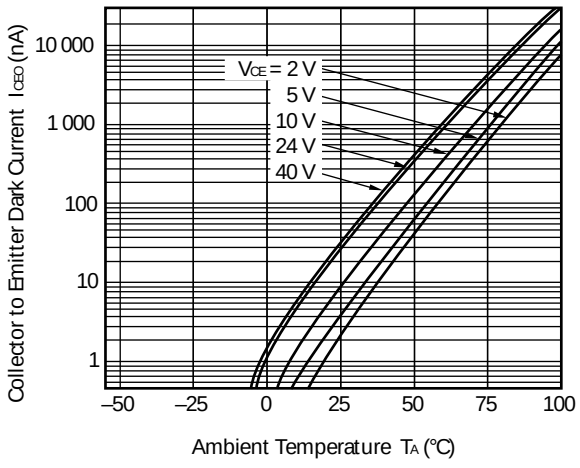

FORWARD CURRENT vs. FORWARD VOLTAGE



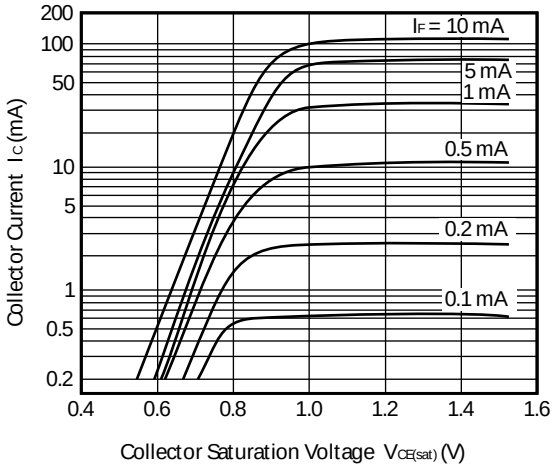

FORWARD CURRENT vs. FORWARD VOLTAGE




COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE

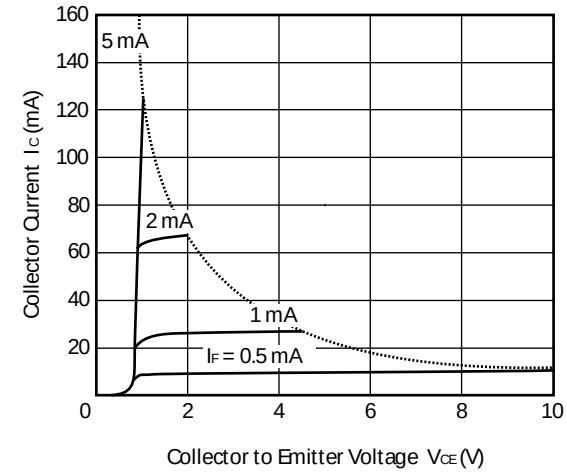



COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE

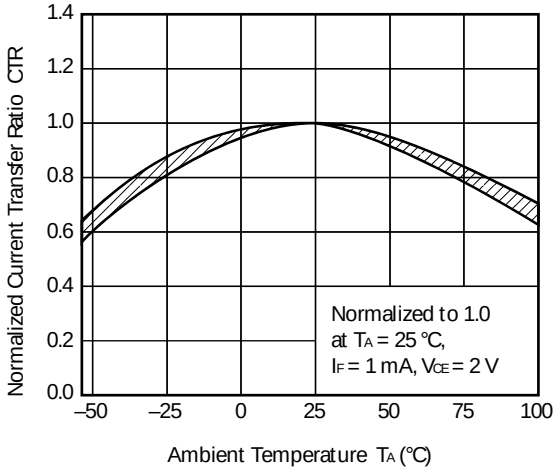



**Remark** The graphs indicate nominal characteristics.

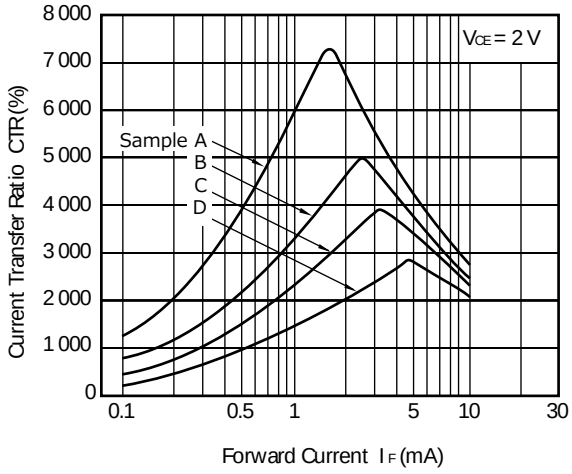
COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



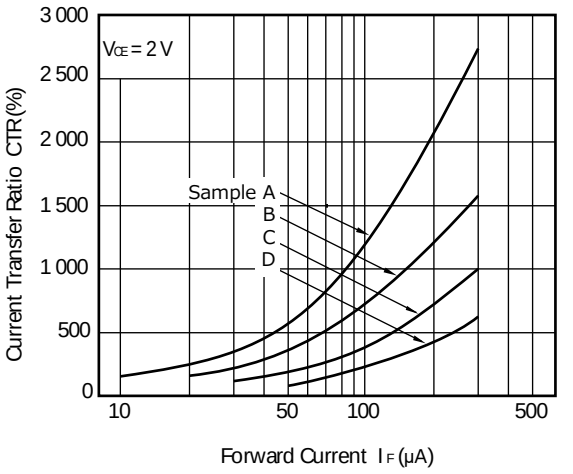

NORMALIZED CURRENT TRANSFER
RATIO vs. AMBIENT TEMPERATURE



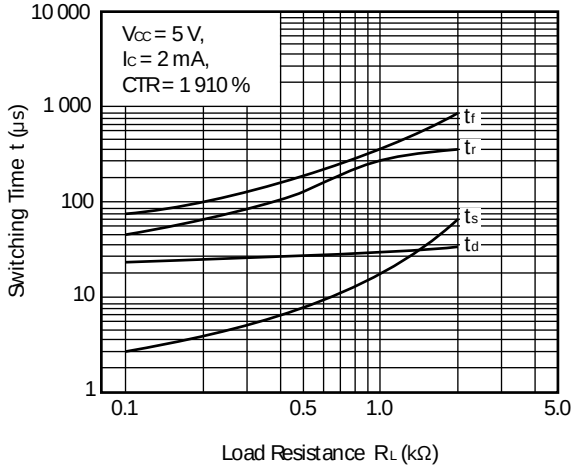

CURRENT TRANSFER RATIO vs.
FORWARD CURRENT



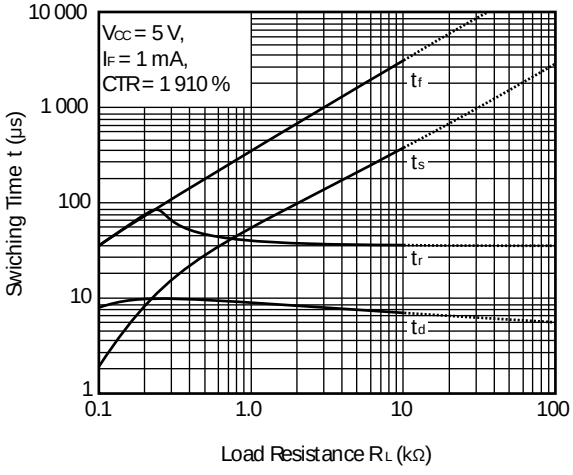

CURRENT TRANSFER RATIO vs.
FORWARD CURRENT




SWITCHING TIME vs.
LOAD RESISTANCE




SWITCHING TIME vs.
LOAD RESISTANCE

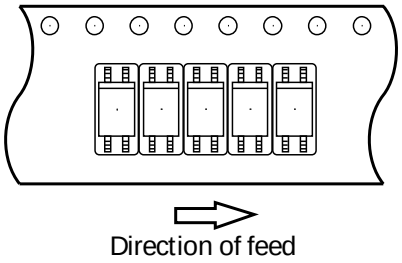



**Remark** The graphs indicate nominal characteristics.

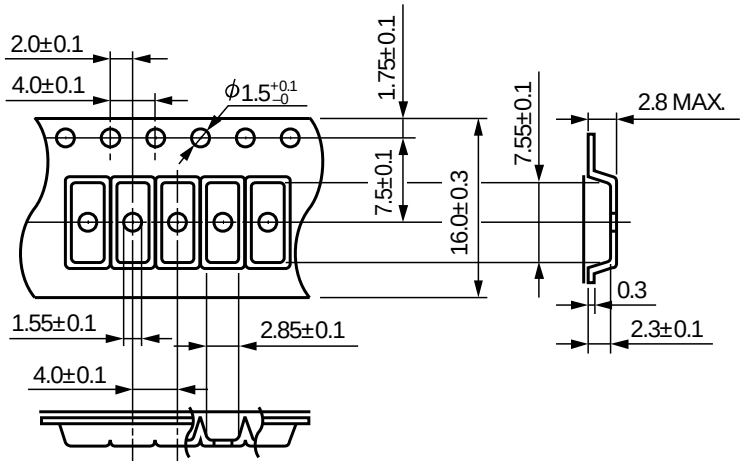
## TAPING SPECIFICATIONS (UNIT: mm)

Tape Direction

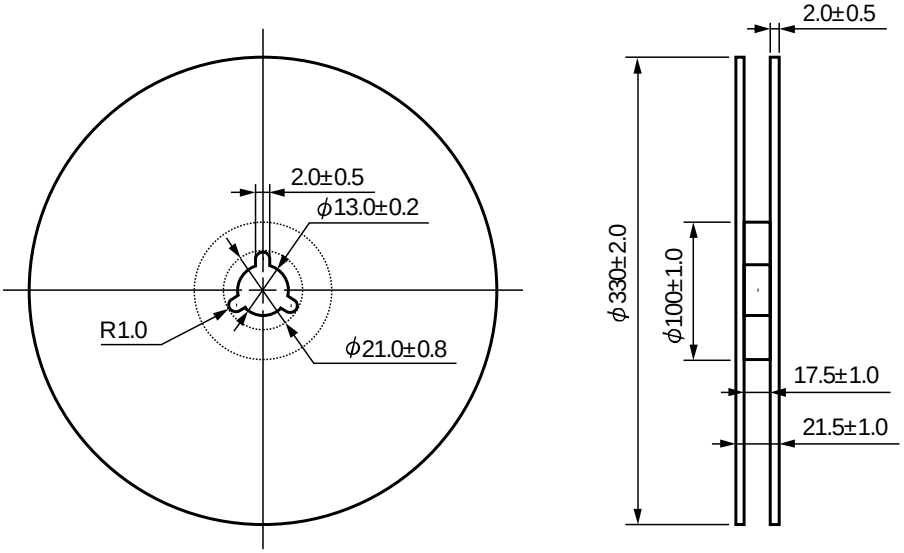
PS2806-1-F3




Outline and Dimensions (Tape)



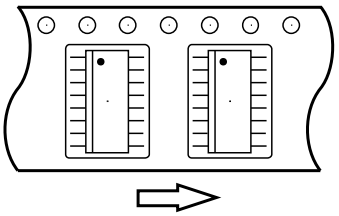

Outline and Dimensions (Reel)



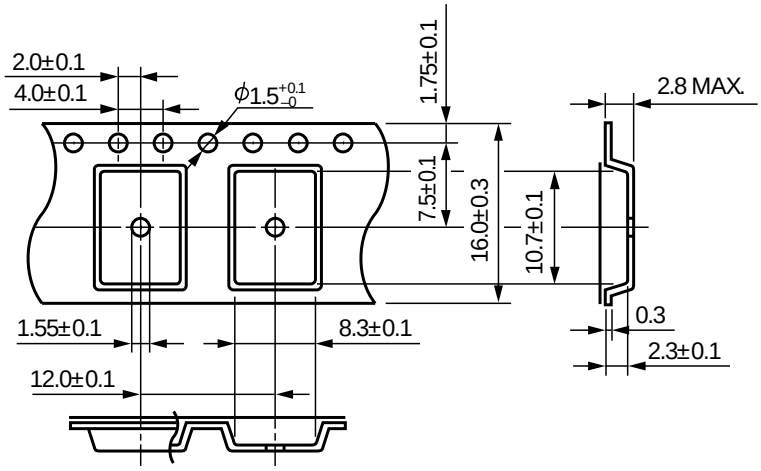

Packing: 3 500 pcs/reel

Tape Direction

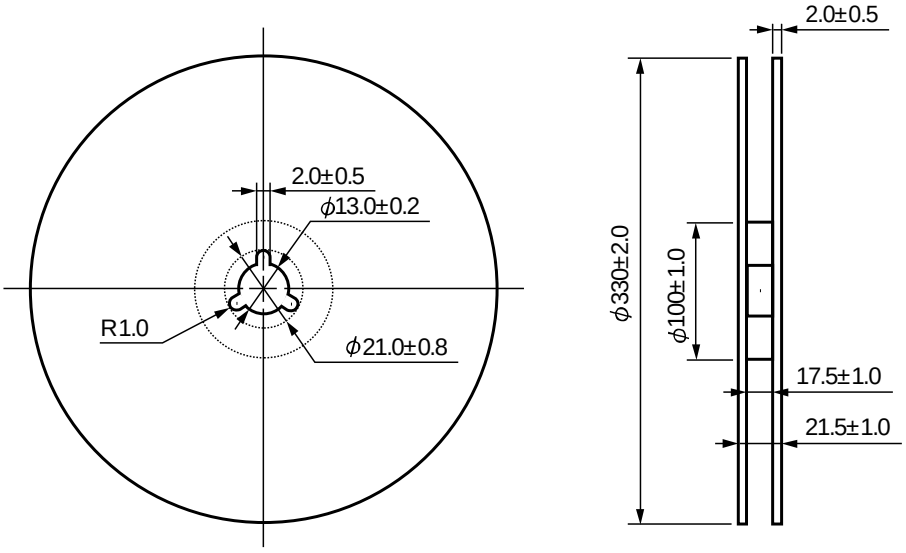
PS2806-4-F3




Outline and Dimensions (Tape)

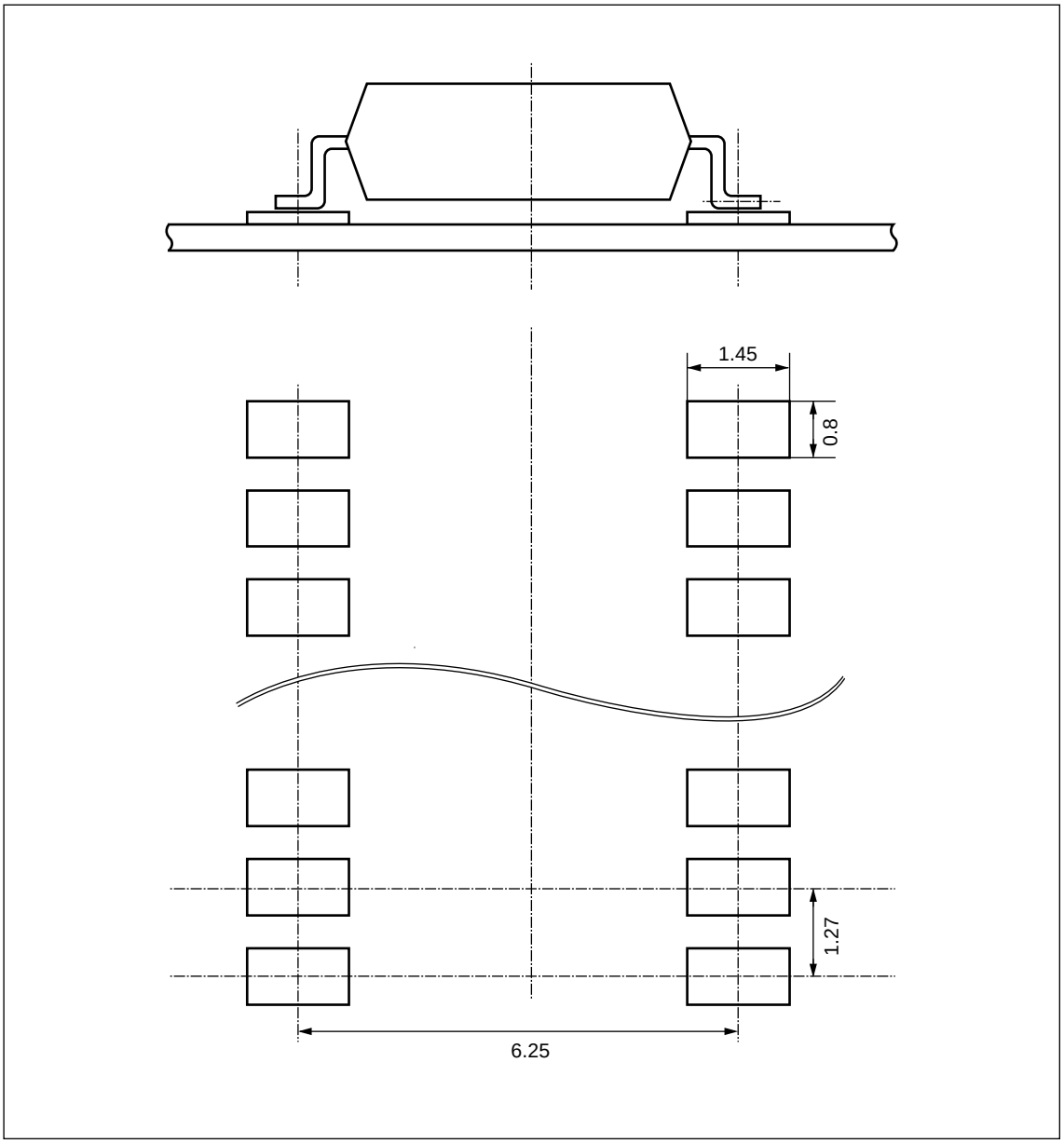



Outline and Dimensions (Reel)




Packing: 2 500 pcs/reel

## RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)




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

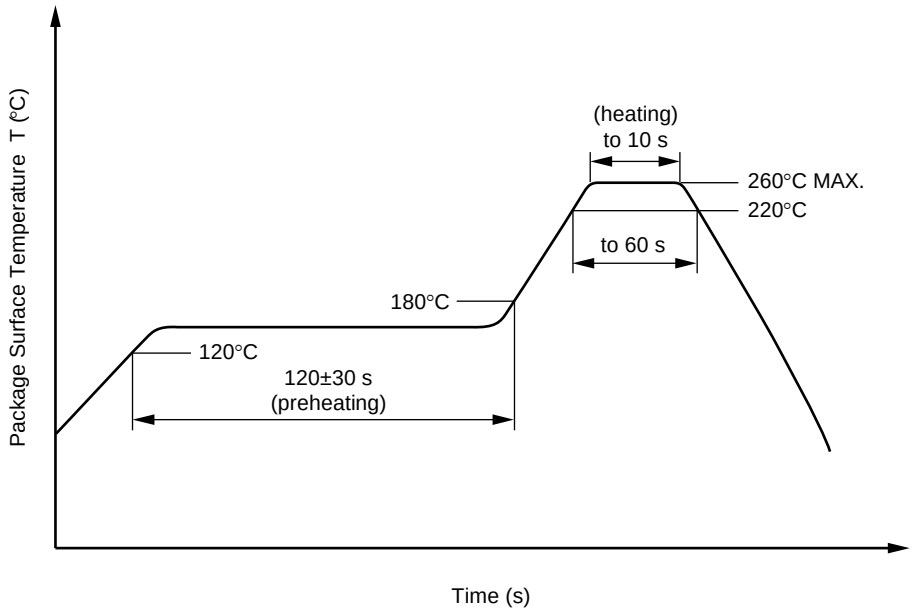
## NOTES ON HANDLING

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

(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.

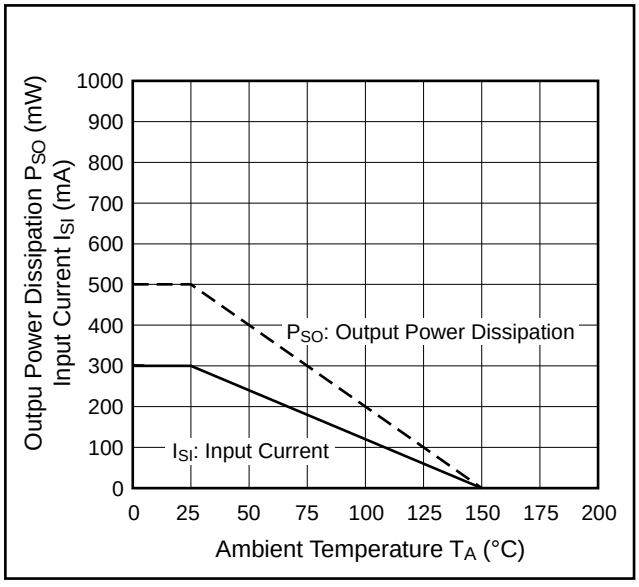
## USAGE CAUTIONS

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.

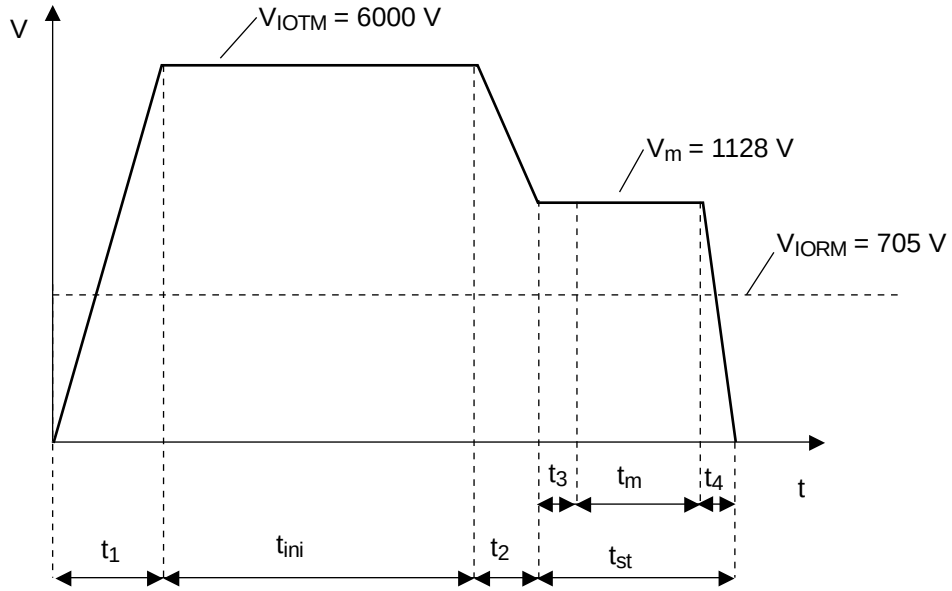
## SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

| 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>$V_m = 1.6 \times V_{IORM.}$, $q_{pd} < 5$ pC | <br>$V_{IORM}$<br>$V_m$ | <br>705<br>1 128 | <br>$V_{peak}$<br>$V_{peak}$ |
| Test voltage (partial discharge test, procedure b for all devices)<br>$V_m = 1.875 \times V_{IORM.}$, $q_{pd} < 5$ pC | $V_m$ | 1 322 | $V_{peak}$ |
| Highest permissible overvoltage | $V_{IOTM}$ | 6 000 | $V_{peak}$ |
| 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～+150 | °C |
| Operating temperature range | $T_A$ | −55～+100 | °C |
| Isolation resistance, minimum value<br>$V_{I-O}$ = 500 V dc, $T_A$ = 25 °C<br>$V_{I-O}$ = 500 V dc, $T_A$ = maximum temperature of rating, at least 100 °C | <br>$R_{I-O}$ MIN.<br>$R_{I-O}$ 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>Maximum ambient temperature<br>Maximum input current<br>Maximum output power dissipation<br>Isolation resistance, minimum value at $V_{I-O}$ = 500 V dc, $T_A = T_S$ | <br>$T_S$<br>$I_{SI}$<br>$P_{SO}$<br>$R_{I-O}$ MIN. | <br>150<br>300<br>500<br>$10^9$ | <br>°C<br>mA<br>mW<br>Ω |

## Dependence of maximum safety ratings with package temperature

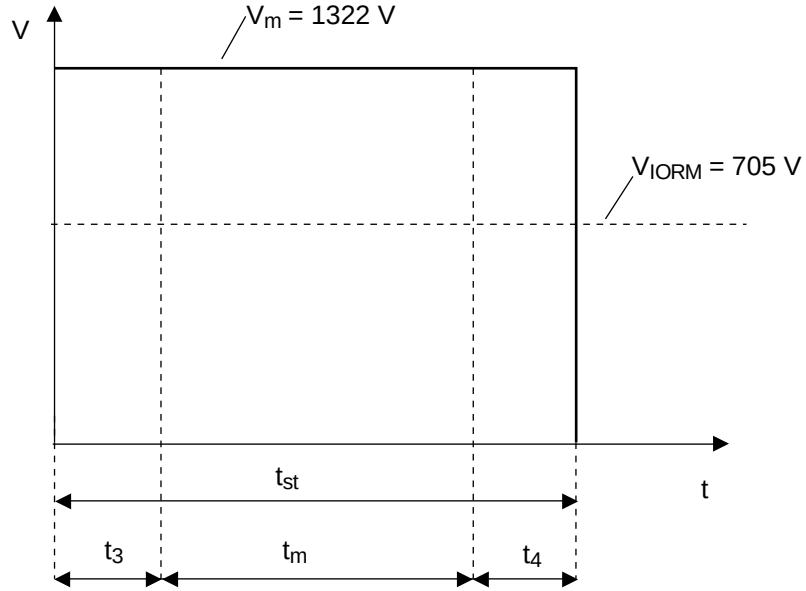


## Method a) Destructive Test, Type and Sample Test




$t_1$, $t_2$ = 1 to 10 sec
$t_3$, $t_4$ = 1 sec
$t_m$ = 10 sec
$t_{st}$ = 12 sec
$t_{ini}$ = 60 sec

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




$t_3$, $t_4$ = 0.1 sec
$t_m$ = 1.0 sec
$t_{st}$ = 1.2 sec

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