

# PS2805-1, PS2805-4

R08DS0095EJ0401

Rev.4.01

HIGH ISOLATION VOLTAGE AC INPUT RESPONSE TYPE SSOP PHOTOCOUPLER

July 26, 2019

## DESCRIPTION

The PS2805-1 and PS2805-4 are optically coupled isolators containing GaAs light emitting diodes and an NPN silicon phototransistor in a plastic SSOP for high density applications.

This package has shield effect to cut off ambient light.

## FEATURES

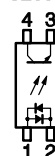
- High isolation voltage ( $BV = 2\,500\text{ V r.m.s.}$ )
- Small and thin package (4,16-pin SSOP, Pin pitch 1.27 mm)
- High collector to emitter voltage ( $V_{CEO} = 80\text{ V}$ )
- AC input response
- High-speed switching ( $t_r = 3\text{ }\mu\text{s TYP.}$ ,  $t_f = 5\text{ }\mu\text{s TYP.}$ )
- Ordering number of tape product: PS2805-1-F3, PS2805-4-F3
- Pb-Free product
- Safety standards
  - UL approved: UL1577, Single protection
  - CSA approved: CAN/CSA-C22.2 No. 62368-1, Basic/Supplementary insulation
  - BSI approved: BS EN 62368-1, Basic/Supplementary insulation
  - VDE approved: DIN EN 60747-5-5 (Option)

## APPLICATIONS

- Programmable logic controllers
- Measuring instruments
- Hybrid IC

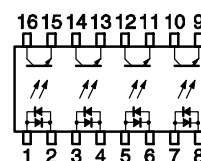
### PIN CONNECTION (Top View)

#### PS2805-1



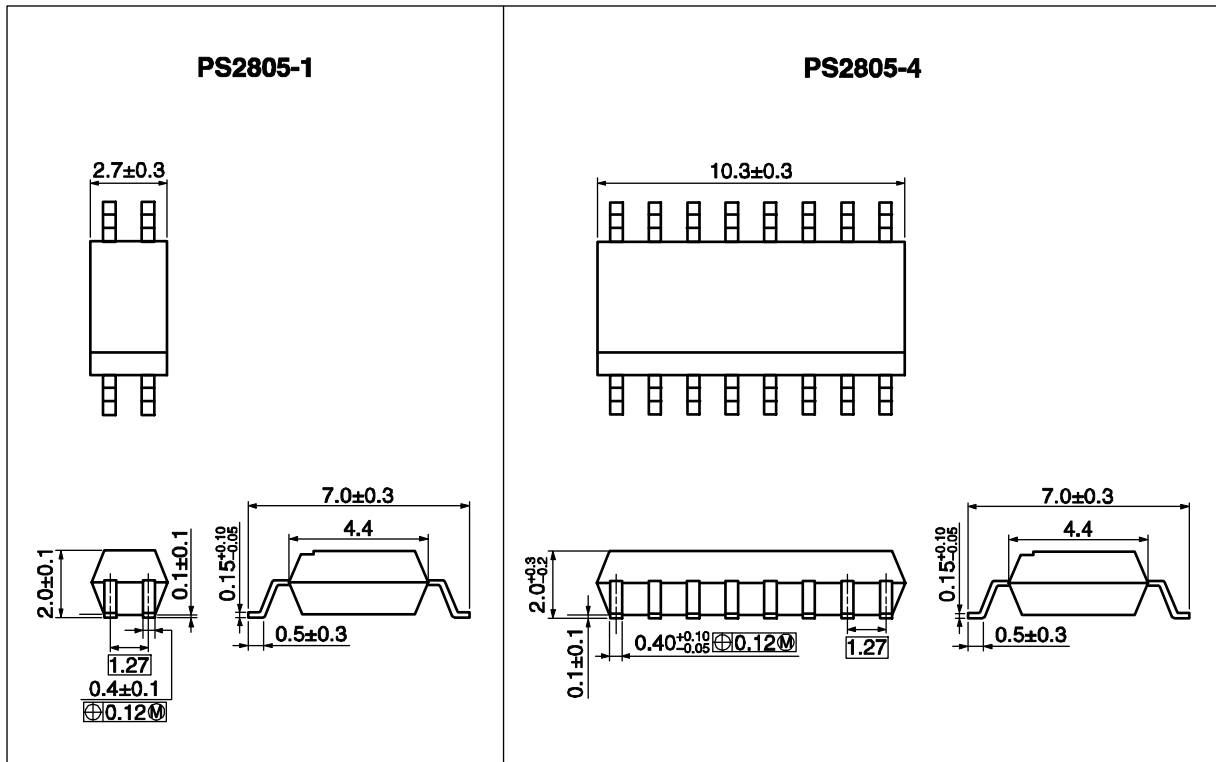
1. Anode, Cathode
2. Cathode, Anode
3. Emitter
4. Collector

#### PS2805-4



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

## PACKAGE DIMENSIONS (UNIT: mm)



## PHOTOCOUPLER CONSTRUCTION

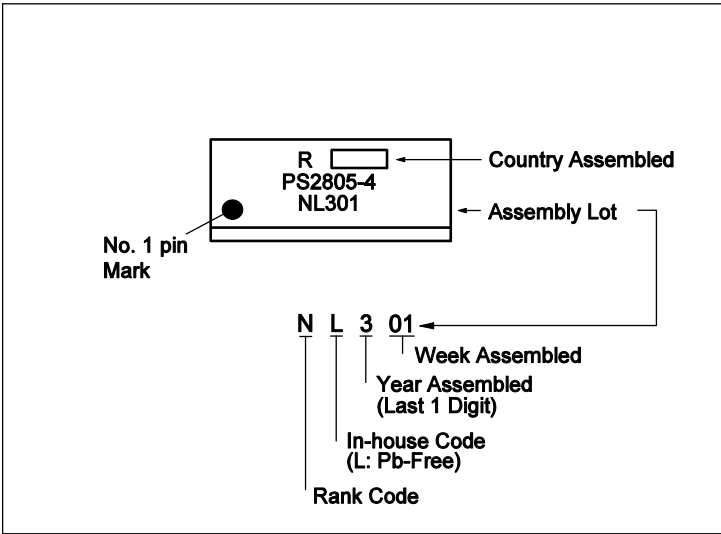
| Parameter          | Unit (MIN.) |
|--------------------|-------------|
| Air Distance       | 4.5 mm      |
| Creepage Distance  | 4.5 mm      |
| Isolation Distance | 0.1 mm      |

MARKING EXAMPLE

PS2805-1

|                |                                                                                                                                                                                                                                    |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Made in Taiwan | <div><div>Company initial</div><div><div>R5</div><div>301</div></div><div><div>Last 1 number of type<br/>No. : 5</div><div>Assembly Lot<br/>301</div><div>Week Assembled</div><div>Year Assembled (Last 1 digit)</div></div></div> |
| Made in Japan  | <div><div><div>R5</div><div><div>□</div>301</div></div><div>"□" (Square)<br/>:Made in Japan</div></div>                                                                                                                            |

PS2805-4



## ORDERING INFORMATION

| Part Number   | Order Number    | Solder Plating Specification | Packing Style                | Safety Standard Approval                      | Application Part Number <sup>*1</sup> |
|---------------|-----------------|------------------------------|------------------------------|-----------------------------------------------|---------------------------------------|
| PS2805-1      | PS2805-1-A      | Pb-Free                      | 50 pcs (Tape 50 pcs cut)     | Standard products<br>(UL, BSI, CSA approved)  | PS2805-1                              |
| PS2805-1-F3   | PS2805-1-F3-A   |                              | Embossed Tape 3 500 pcs/reel |                                               |                                       |
| PS2805-4      | PS2805-4-A      |                              | 10 pcs (Tape 10 pcs cut)     |                                               | PS2805-4                              |
| PS2805-4-F3   | PS2805-4-F3-A   |                              | Embossed Tape 2 500 pcs/reel |                                               |                                       |
| PS2805-1-V    | PS2805-1-V-A    |                              | 50 pcs (Tape 50 pcs cut)     | UL, BSI, CSA,<br>DIN EN 60747-5-5<br>approved | PS2805-1                              |
| PS2805-1-V-F3 | PS2805-1-V-F3-A |                              | Embossed Tape 3 500 pcs/reel |                                               |                                       |
| PS2805-4-V    | PS2805-4-V-A    |                              | 10 pcs (Tape 10 pcs cut)     |                                               | PS2805-4                              |
| PS2805-4-V-F3 | PS2805-4-V-F3-A |                              | Embossed Tape 2 500 pcs/reel |                                               |                                       |

Note: <sup>\*1</sup>. For the application of the Safety Standard, following part number should be used.

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)

| Parameter                       |                                    | Symbol                      | Ratings     |          | Unit                 |
|---------------------------------|------------------------------------|-----------------------------|-------------|----------|----------------------|
|                                 |                                    |                             | PS2805-1    | PS2805-4 |                      |
| Diode                           | Forward Current (DC)               | $I_F$                       | $\pm 50$    |          | mA/ch                |
|                                 | Power Dissipation Derating         | $\Delta P_D/^\circ\text{C}$ | 0.6         | 0.8      | mW/ $^\circ\text{C}$ |
|                                 | Power Dissipation                  | $P_D$                       | 60          | 80       | mW/ch                |
|                                 | Peak Forward Current <sup>*1</sup> | $I_{FP}$                    | $\pm 1$     |          | A/ch                 |
| Transistor                      | Collector to Emitter Voltage       | $V_{CEO}$                   | 80          |          | V                    |
|                                 | Emitter to Collector Voltage       | $V_{ECO}$                   | 6           |          | V                    |
|                                 | Collector Current                  | $I_C$                       | 50          |          | mA/ch                |
|                                 | Power Dissipation Derating         | $\Delta P_D/^\circ\text{C}$ | 1.2         |          | mW/ $^\circ\text{C}$ |
|                                 | Power Dissipation                  | $P_C$                       | 120         |          | mW/ch                |
| Isolation Voltage <sup>*2</sup> |                                    | BV                          | 2 500       |          | Vr.m.s.              |
| Operating Ambient Temperature   |                                    | $T_A$                       | -55 to +100 |          | $^\circ\text{C}$     |
| Storage Temperature             |                                    | $T_{stg}$                   | -55 to +150 |          | $^\circ\text{C}$     |

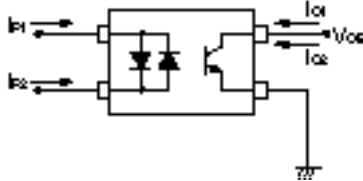
Notes: <sup>\*1</sup>.  $PW = 100 \mu\text{s}$ , Duty Cycle = 1%

<sup>\*2</sup>. AC voltage for 1 minute at  $T_A = 25^\circ\text{C}$ , RH = 60% between input and output.  
Pins 1-2 shorted together, 3-4 shorted together (PS2805-1).  
Pins 1-8 shorted together, 9-16 shorted together (PS2805-4).

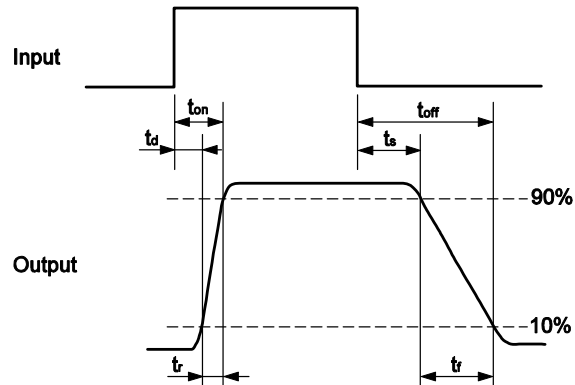
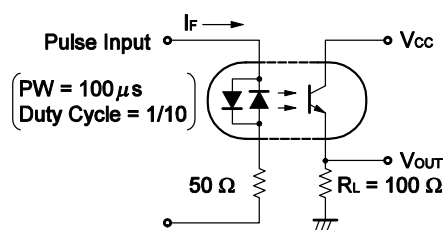
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

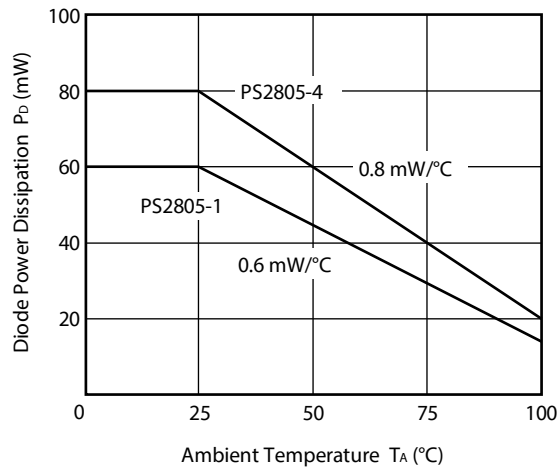
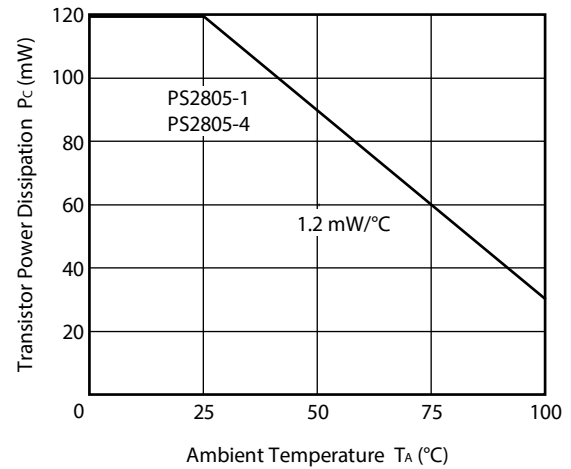
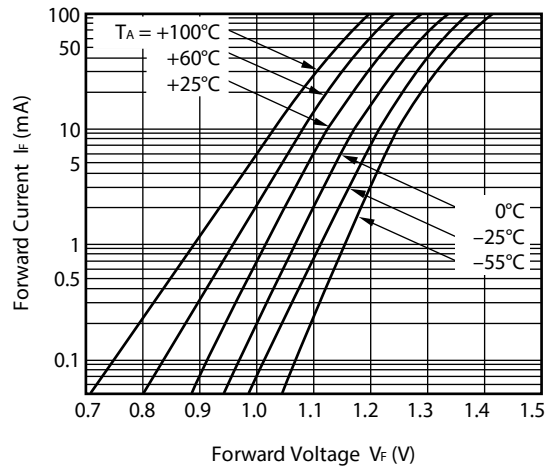
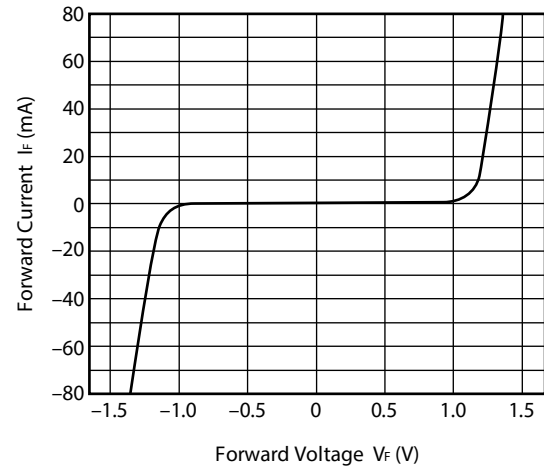
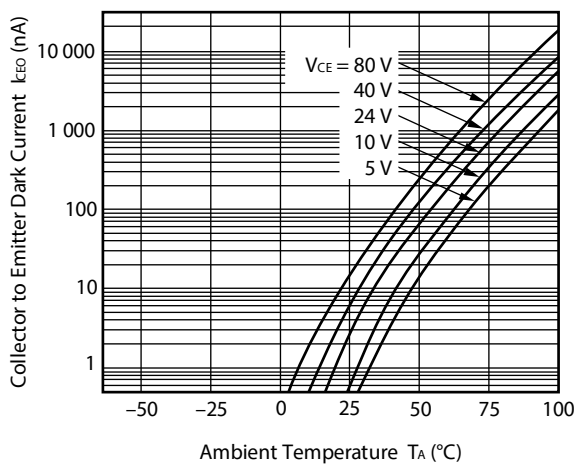
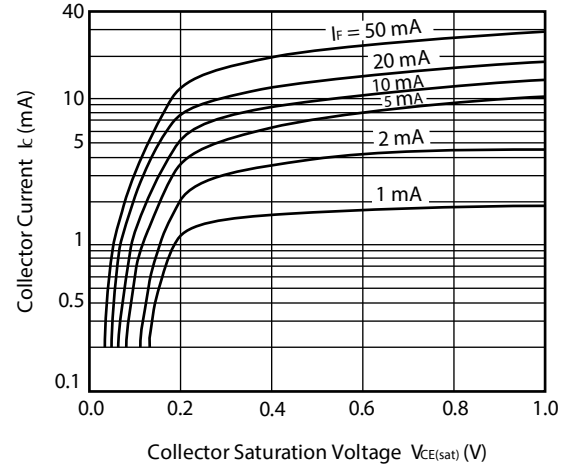
|            | Parameter                                                              | Symbol               | Conditions                                                           | MIN.             | TYP. | MAX. | Unit |
|------------|------------------------------------------------------------------------|----------------------|----------------------------------------------------------------------|------------------|------|------|------|
| Diode      | Forward Voltage                                                        | V <sub>F</sub>       | I <sub>F</sub> = ±5 mA                                               |                  | 1.1  | 1.4  | V    |
|            | Terminal Capacitance                                                   | C <sub>t</sub>       | V = 0 V, f = 1.0 MHz                                                 |                  | 30   |      | pF   |
| Transistor | Collector to Emitter Dark Current                                      | I <sub>CEO</sub>     | V <sub>CE</sub> = 80 V, I <sub>F</sub> = 0 mA                        |                  |      | 100  | nA   |
| Coupled    | Current Transfer Ratio (I <sub>C</sub> /I <sub>F</sub> ) <sup>*1</sup> | CTR                  | I <sub>F</sub> = ±5 mA, V <sub>CE</sub> = 5 V                        | 80               |      | 600  | %    |
|            | CTR Ratio <sup>*1</sup>                                                | CTR1/<br>CTR2        | I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 5 V                         | 0.3              | 1.0  | 3.0  |      |
|            | Collector Saturation Voltage                                           | V <sub>CE(sat)</sub> | I <sub>F</sub> = ±10 mA, I <sub>C</sub> = 2 mA                       |                  |      | 0.3  | V    |
|            | Isolation Resistance                                                   | R <sub>I-O</sub>     | V <sub>I-O</sub> = 1.0 kV <sub>DC</sub>                              | 10 <sup>11</sup> |      |      | Ω    |
|            | Isolation Capacitance                                                  | C <sub>I-O</sub>     | V = 0 V, f = 1.0 MHz                                                 |                  | 0.4  |      | pF   |
|            | Rise Time <sup>*2</sup>                                                | t <sub>r</sub>       | V <sub>CC</sub> = 5 V, I <sub>C</sub> = 2 mA, R <sub>L</sub> = 100 Ω |                  | 3    |      | μs   |
|            | Fall Time <sup>*2</sup>                                                | t <sub>f</sub>       |                                                                      |                  | 5    |      |      |
|            | Turn-on Time <sup>*2</sup>                                             | t <sub>on</sub>      |                                                                      |                  | 6    |      |      |
|            | Turn-off Time <sup>*2</sup>                                            | t <sub>off</sub>     |                                                                      |                  | 5    |      |      |

Notes: \*1. CTR1 = I<sub>C1</sub>/I<sub>F1</sub>, CTR2 = I<sub>C2</sub>/I<sub>F2</sub>

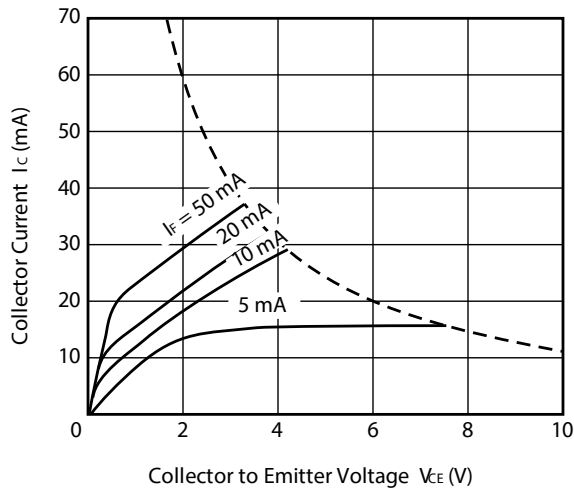
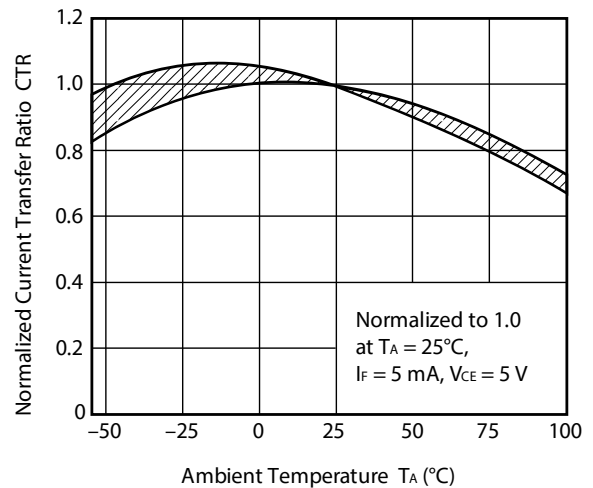
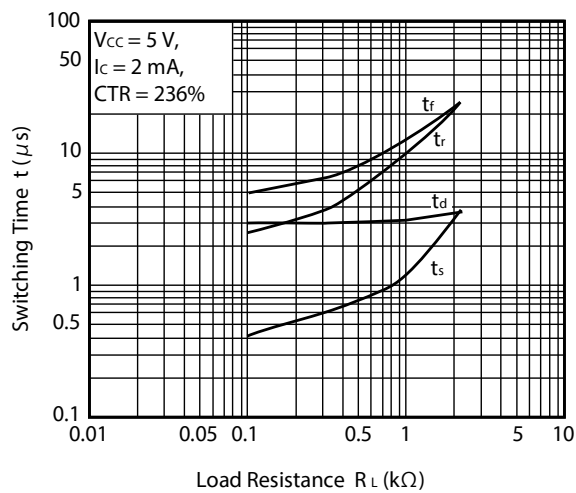
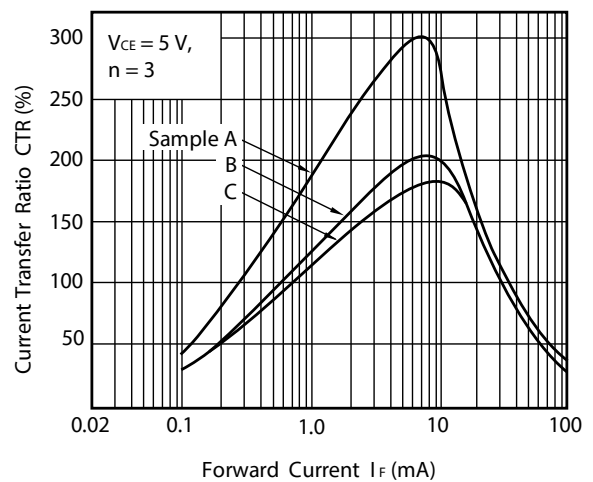
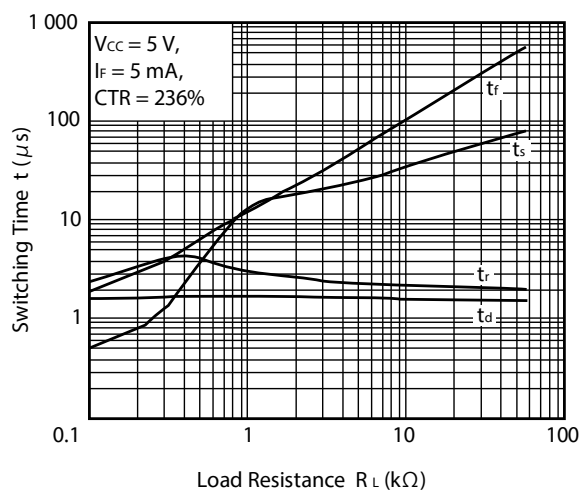


\*2. Test circuit for switching time

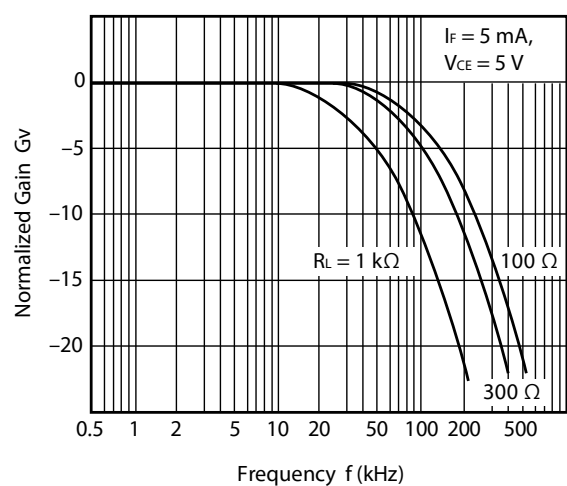


TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)DIODE POWER DISSIPATION vs.  
AMBIENT TEMPERATURETRANSISTOR POWER DISSIPATION  
vs. AMBIENT TEMPERATUREFORWARD CURRENT vs.  
FORWARD VOLTAGEFORWARD CURRENT vs.  
FORWARD VOLTAGECOLLECTOR TO EMITTER DARK  
CURRENT vs. AMBIENT TEMPERATURECOLLECTOR CURRENT vs.  
COLLECTOR SATURATION VOLTAGE

**Remark** The graphs indicate nominal characteristics.

COLLECTOR CURRENT vs.  
COLLECTOR TO EMITTER VOLTAGENORMALIZED CURRENT TRANSFER  
RATIO vs. AMBIENT TEMPERATURESWITCHING TIME vs.  
LOAD RESISTANCECURRENT TRANSFER RATIO vs.  
FORWARD CURRENTSWITCHING TIME vs.  
LOAD RESISTANCE

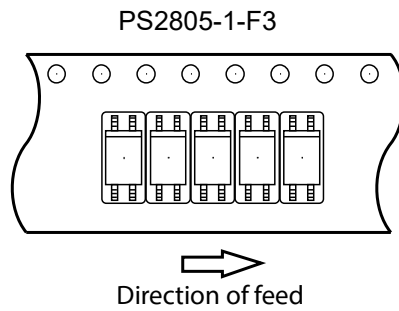
FREQUENCY RESPONSE



**Remark** The graphs indicate nominal characteristics.

## TAPING SPECIFICATIONS (UNIT: mm)

## Tape Direction



## Outline and Dimensions (Tape)

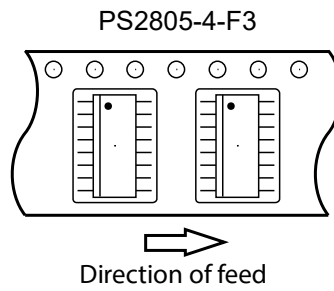


## Outline and Dimensions (Reel)



Packing: 3 500 pcs/reel

# Tape Direction



## Outline and Dimensions (Tape)

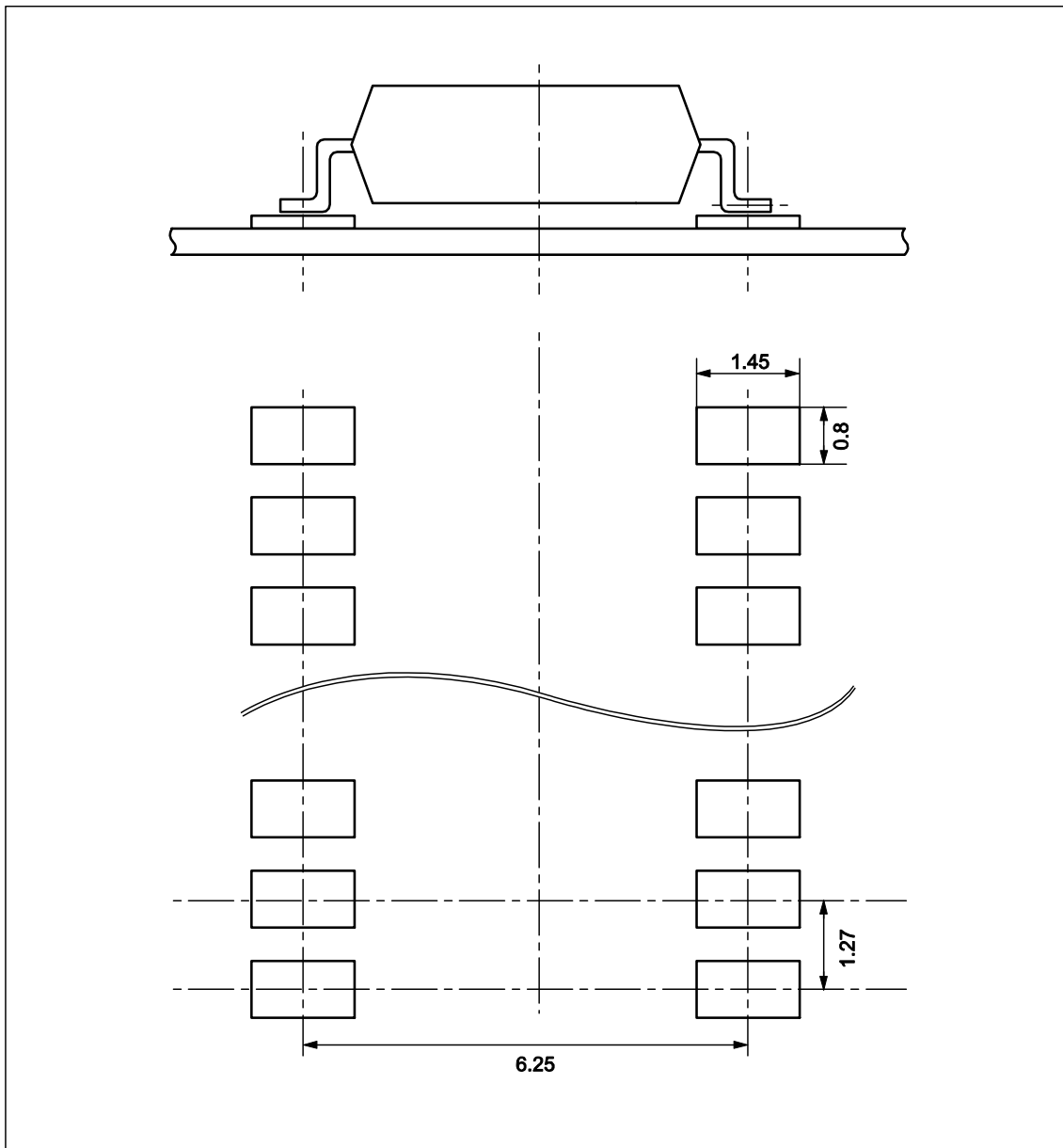


## Outline and Dimensions (Reel)



Packing: 2 500 pcs/reel

## RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)



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

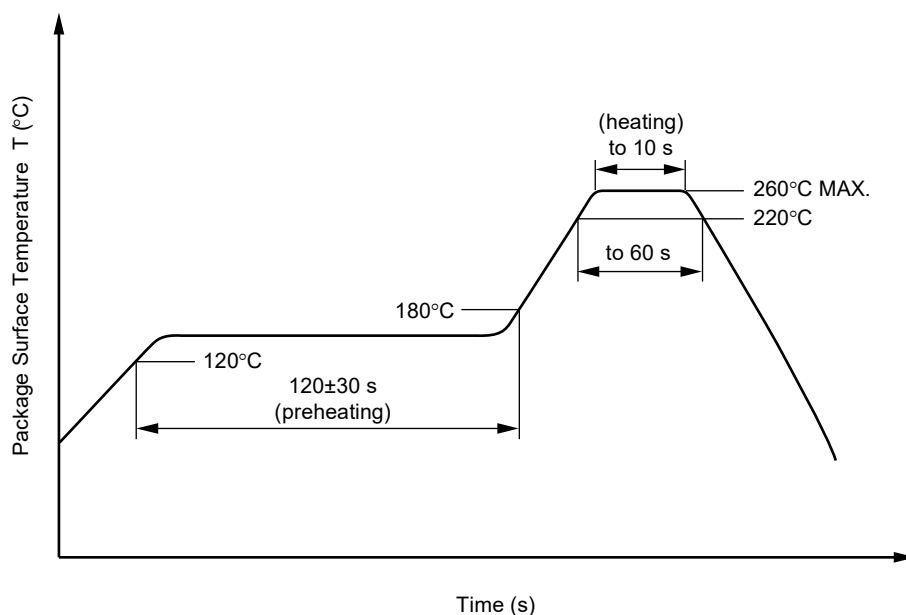
## NOTES ON HANDLING

### 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<br>(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<br>(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  $I_F = 1 \text{ mA}$ .

Therefore, check the characteristics under the actual operating conditions and thoroughly take variations or the like into consideration before use.

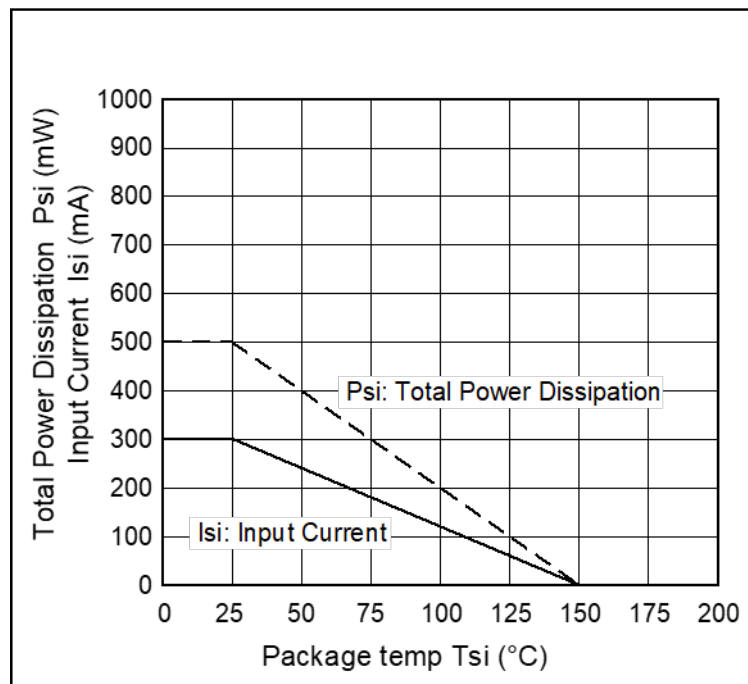
## **USAGE CAUTIONS**

1. Protect against static electricity when handling.
2. Avoid storage at a high temperature and high humidity.

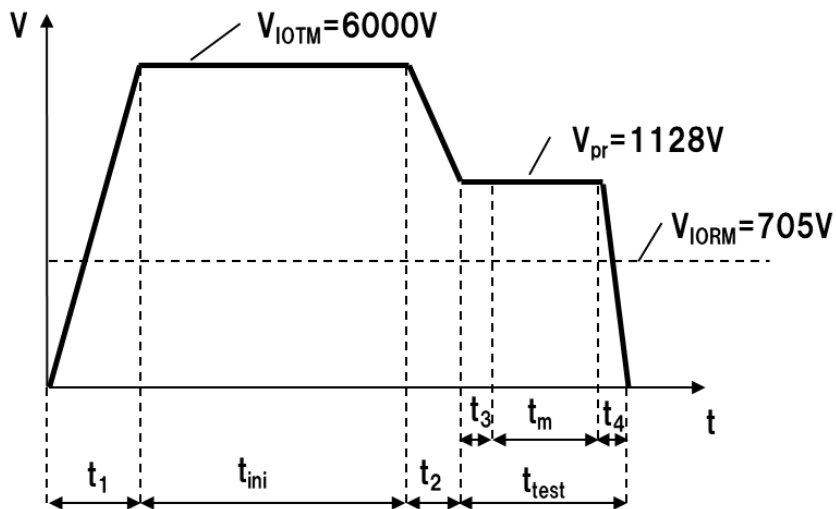
## SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

| Parameter                                                                                 | Symbol     | Rating      | Unit       |
|-------------------------------------------------------------------------------------------|------------|-------------|------------|
| Climatic test class (IEC 60068-1/DIN EN 60068-1)                                          |            | 55/100/21   |            |
| Dielectric strength                                                                       |            |             |            |
| maximum operating isolation voltage                                                       | $U_{IORM}$ | 705         | $V_{peak}$ |
| Test voltage (partial discharge test, procedure a for type test and random test)          | $U_{pr}$   | 1 128       | $V_{peak}$ |
| $U_{pr} = 1.6 \times U_{IORM}$ , $P_d < 5 \text{ pC}$                                     |            |             |            |
| Test voltage (partial discharge test, procedure b for all devices)                        | $U_{pr}$   | 1 322       | $V_{peak}$ |
| $U_{pr} = 1.875 \times U_{IORM}$ , $P_d < 5 \text{ pC}$                                   |            |             |            |
| Highest permissible overvoltage                                                           | $U_{TR}$   | 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 to +150 | °C         |
| Operating temperature range                                                               | $T_A$      | -55 to +100 | °C         |
| Isolation resistance, minimum value                                                       |            |             |            |
| $V_{IO} = 500 \text{ V dc}$ at $T_A = 25^\circ\text{C}$                                   | Ris MIN.   | $10^{12}$   | $\Omega$   |
| $V_{IO} = 500 \text{ V dc}$ at $T_A \text{ MAX.}$ at least $100^\circ\text{C}$            | Ris MIN.   | $10^{11}$   | $\Omega$   |
| Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve) |            |             |            |
| Package temperature                                                                       | $T_{si}$   | 150         | °C         |
| Current (input current $I_F$ , $\Psi_i = 0$ )                                             | $I_{si}$   | 300         | mA         |
| Power (output or total power dissipation)                                                 | $\Psi_i$   | 500         | mW         |
| Isolation resistance                                                                      |            |             |            |
| $V_{IO} = 500 \text{ V dc}$ at $T_A = T_{si}$                                             | Ris MIN.   | $10^9$      | $\Omega$   |

## Dependence of maximum safety ratings with package temperature



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



$t_1, t_2 = 1$  to  $10$  sec

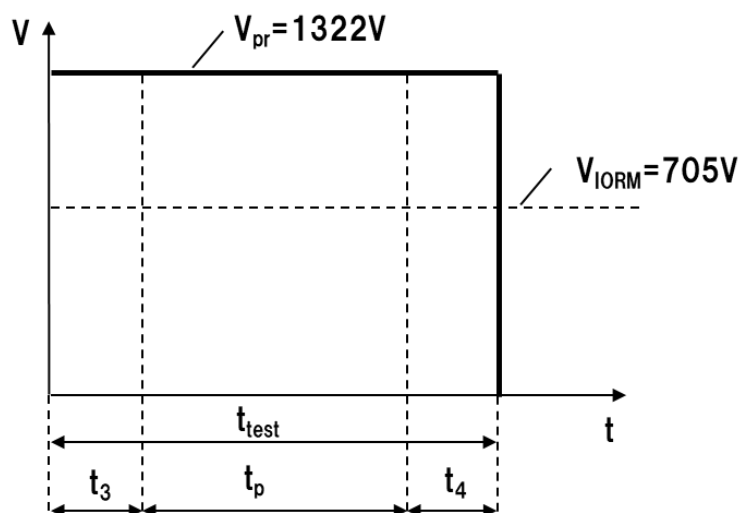
$t_3, t_4 = 1$  sec

$t_m$  (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

$t_p$  (PARTIAL DISCHARGE) =  $1.0$  sec

$t_{test} = 1.2$  sec

|                |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Caution</b> | GaAs Products | <p>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.</p> <ul style="list-style-type: none"><li>• 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.</li></ul> <ol style="list-style-type: none"><li>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.</li><li>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.</li></ol> <ul style="list-style-type: none"><li>• Do not burn, destroy, cut, crush, or chemically dissolve the product.</li><li>• Do not lick the product or in any way allow it to enter the mouth.</li></ul> |
|----------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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