

# PS2805C-1, PS2805C-4

## Data Sheet

HIGH ISOLATION VOLTAGE AC INPUT RESPONSE TYPE  
 SSOP PHOTOCOUPLER

R08DS0074EJ0300  
 Rev.3.00  
 Jan 9, 2013

### DESCRIPTION

The PS2805C-1 and PS2805C-4 are optically coupled isolators containing a GaAs light emitting diode and an NPN silicon phototransistor in a plastic SSOP for high density applications to realize an excellent cost performance.

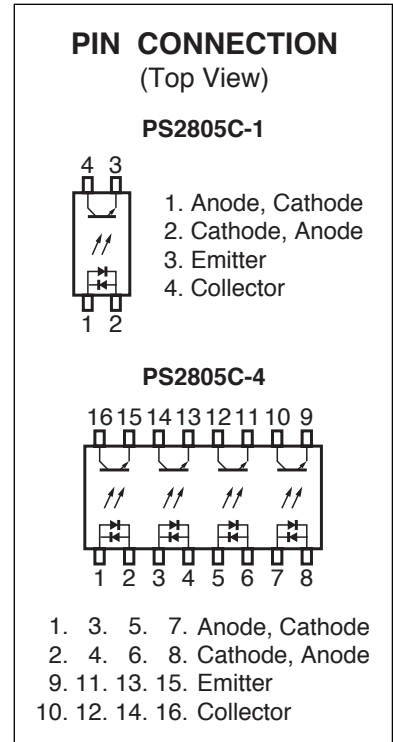
This package has shield effect to cut off ambient light.

### FEATURES

- High isolation voltage (BV = 2 500 Vr.m.s.)
- Small and thin package (4, 16-pin SSOP, Pin pitch 1.27 mm)
- High collector to emitter voltage (V<sub>CEO</sub> : 80 V)
- AC input response
- <R> • Ordering number of tape product: PS2805C-1-F3, PS2805C-4-F3
- Pb-Free product
- <R> • Safety standards
  - UL approved: No. E72422
  - CSA approved: No. CA 101391 (CA5A, CAN/CSA-C22.2 60065, 60950)
  - BSI approved (BS EN 60065, BS EN 60950) (PS2805C-1 only)
  - DIN EN 60747-5-5 (VDE 0884-5) approved (Option)

### APPLICATIONS

- Programmable logic controllers
- OA equipment
- Measuring instruments
- Hybrid IC

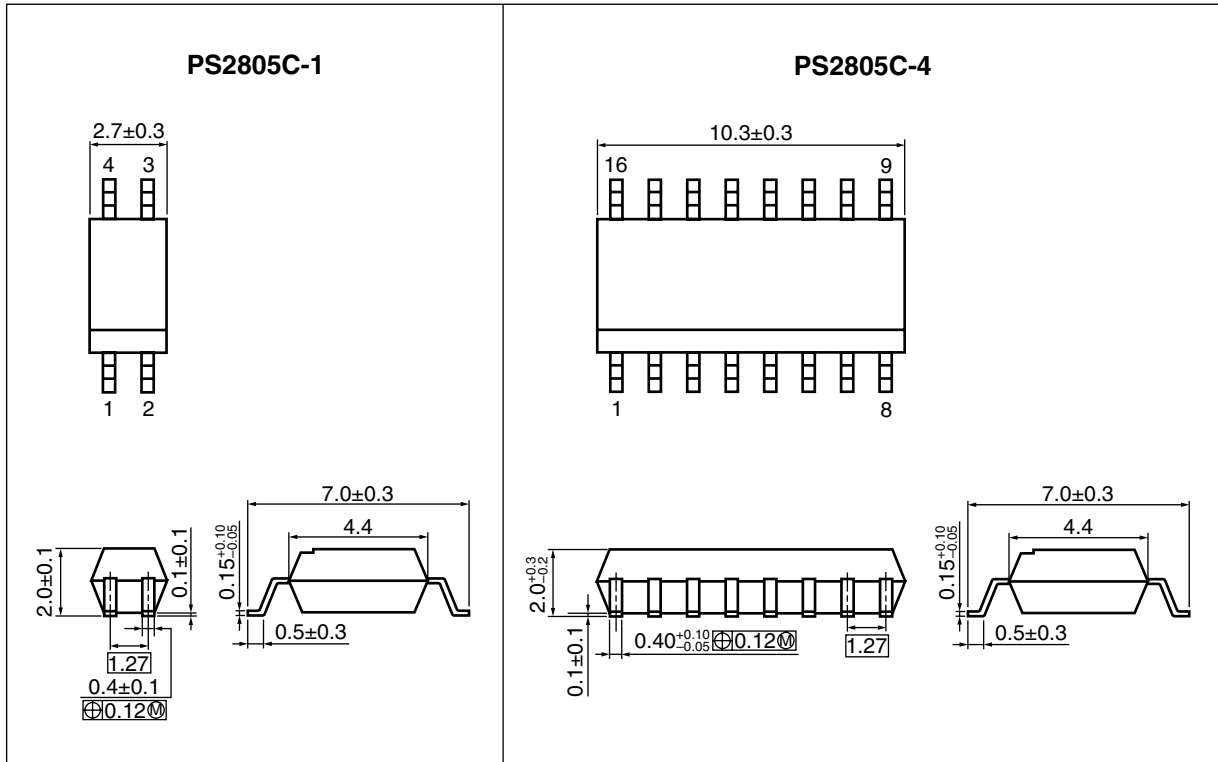


The mark <R> shows major revised points.

The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

**PS2805C-1, PS2805C-4**

**PACKAGE DIMENSIONS (UNIT: mm)**



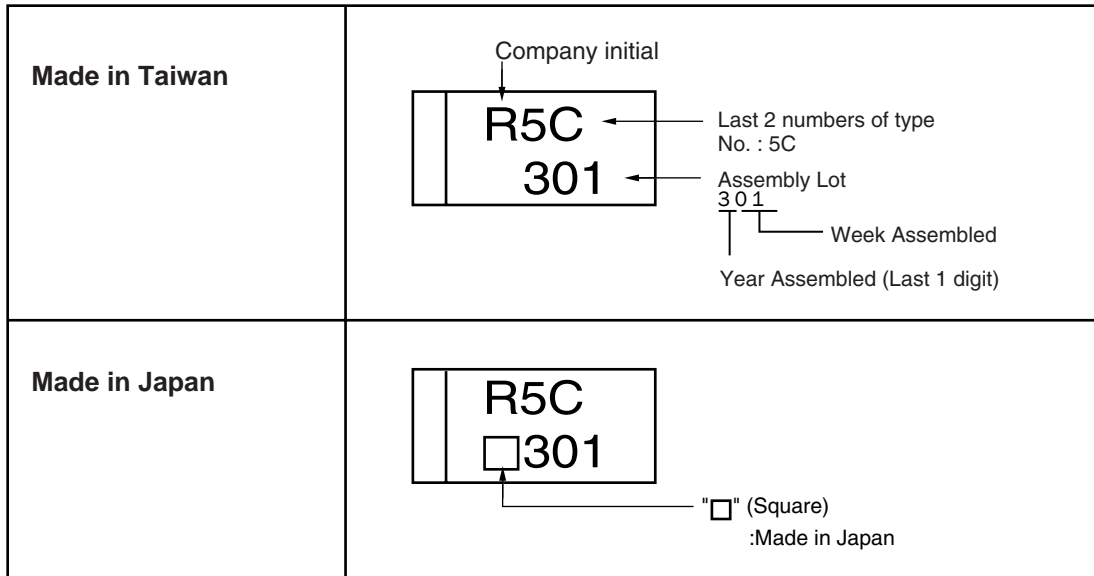
**<R> PHOTOCOUPLER CONSTRUCTION**

| Parameter               | Unit (MIN.) |
|-------------------------|-------------|
| Air Distance            | 4.5 mm      |
| Outer Creepage Distance | 4.5 mm      |
| Inner Creepage Distance | 2.5 mm      |
| Isolation Distance      | 0.1 mm      |

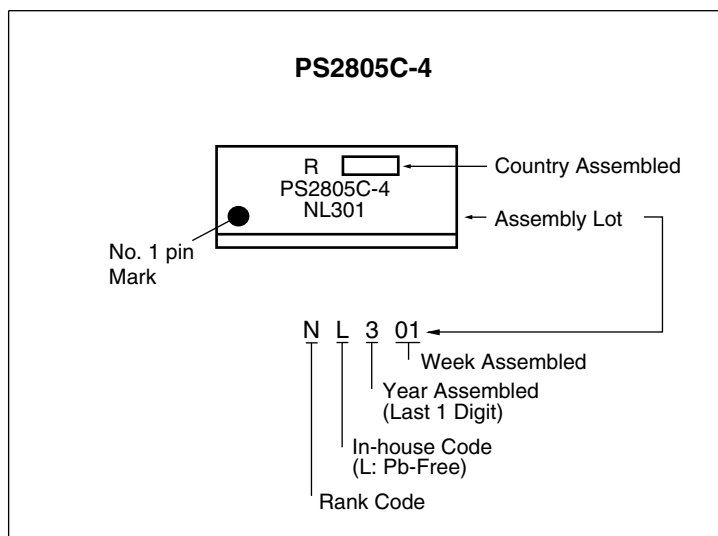
**PS2805C-1, PS2805C-4**

<R> **MARKING EXAMPLE**

**PS2805C-1**



**PS2805C-4**



## &lt;R&gt; ORDERING INFORMATION

| Part Number    | Order Number     | Solder Plating Specification | Packing Style                   | Safety Standards Approval                            | Application Part Number <sup>*1</sup> |
|----------------|------------------|------------------------------|---------------------------------|--|---------------------------------------|
| PS2805C-1-F3   | PS2805C-1-F3-A   | Pb-Free                      | Embossed Tape 3<br>500 pcs/reel | Standard products<br>(UL, CSA, BSI approved)         | PS2805C-1                             |
| PS2805C-4-F3   | PS2805C-4-F3-A   |                              | Embossed Tape 2<br>500 pcs/reel |  | PS2805C-4                             |
| PS2805C-1-V-F3 | PS2805C-1-V-F3-A |                              | Embossed Tape 3<br>500 pcs/reel | DIN EN 60747-5-5<br>(VDE0884-5)<br>Approved (Option) | PS2805C-1                             |
| PS2805C-4-V-F3 | PS2805C-4-V-F3-A |                              | Embossed Tape 2<br>500 pcs/reel |  | PS2805C-4                             |

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

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C, unless otherwise specified)**

| Parameter                       |                                    | Symbol              | Ratings     |           | Unit    |
|---------------------------------|------------------------------------|---------------------|-------------|-----------|---------|
|                                 |                                    |                     | PS2805C-1   | PS2805C-4 |         |
| Diode                           | Forward Current (DC)               | I <sub>F</sub>      | ±30         |           | mA/ch   |
|                                 | Power Dissipation Derating         | ΔP <sub>D</sub> /°C | 0.6         | 0.8       | mW/°C   |
|                                 | Power Dissipation                  | P <sub>D</sub>      | 60          | 80        | mW/ch   |
|                                 | Peak Forward Current <sup>*1</sup> | I <sub>FP</sub>     | ±0.5        |           | A/ch    |
| Transistor                      | Collector to Emitter Voltage       | V <sub>CEO</sub>    | 80          |           | V       |
|                                 | Emitter to Collector Voltage       | V <sub>ECO</sub>    | 5           |           | V       |
|                                 | Collector Current                  | I <sub>C</sub>      | 30          |           | mA/ch   |
|                                 | Power Dissipation Derating         | ΔP <sub>D</sub> /°C | 1.2         |           | mW/°C   |
|                                 | Power Dissipation                  | P <sub>C</sub>      | 120         |           | mW/ch   |
| Isolation Voltage <sup>*2</sup> |                                    | BV                  | 2 500       |           | Vr.m.s. |
| Operating Ambient Temperature   |                                    | T <sub>A</sub>      | -55 to +100 |           | °C      |
| Storage Temperature             |                                    | T <sub>stg</sub>    | -55 to +150 |           | °C      |

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

- \*2. AC voltage for 1 minute at T<sub>A</sub> = 25°C, RH = 60% between input and output.  
Pins 1-2 shorted together, 3-4 shorted together (PS2805C-1).  
Pins 1-8 shorted together, 9-16 shorted together (PS2805C-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   |                  | 1.2  | 1.4  | V    |
|                             | Terminal Capacitance   | C <sub>t</sub>       | V = 0 V, f = 1.0 MHz   |                  | 20   |      | 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                        | 50               |      | 400  | %    |
|                             | Collector Saturation Voltage   | V <sub>CE(sat)</sub> | I <sub>F</sub> = ±10 mA, I <sub>C</sub> = 2 mA                       |                  | 0.13 | 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 |                  | 5    |      | μs   |
|                             | Fall Time <sup>*2</sup>  | t <sub>f</sub>       |  |                  | 7    |      |      |
|                             | Turn-on Time <sup>*2</sup>   | t <sub>on</sub>      |  |                  | 10   |      |      |
| Turn-off Time <sup>*2</sup> | t <sub>off</sub>   |                      |  | 7                |      |      |      |

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Notes: \*1. CTR rank

PS2805C-1

N : 50 to 400 (%)

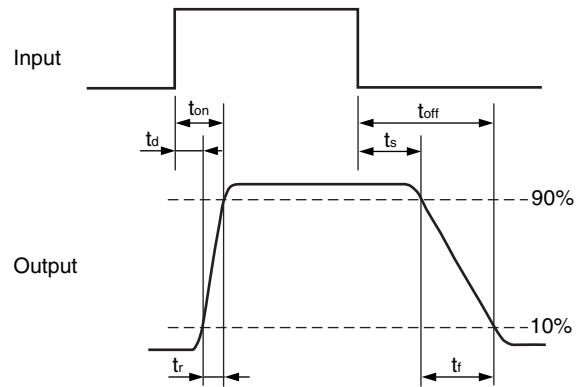
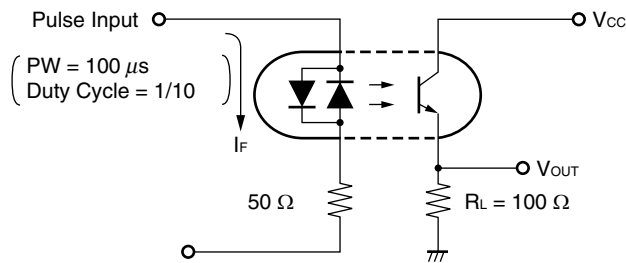
M : 100 to 400 (%)

PS2805C-4

N : 50 to 400 (%)

M : 100 to 400 (%)

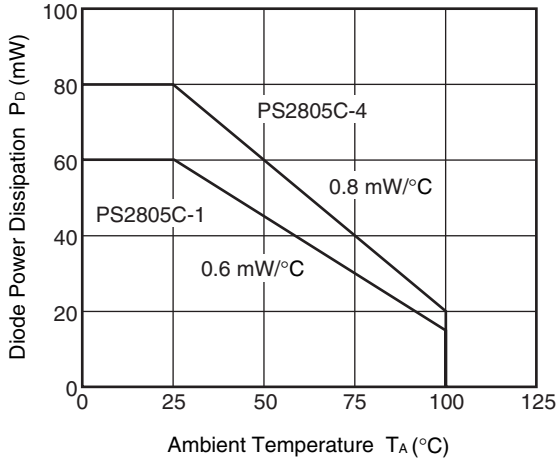
\*2. Test circuit for switching time



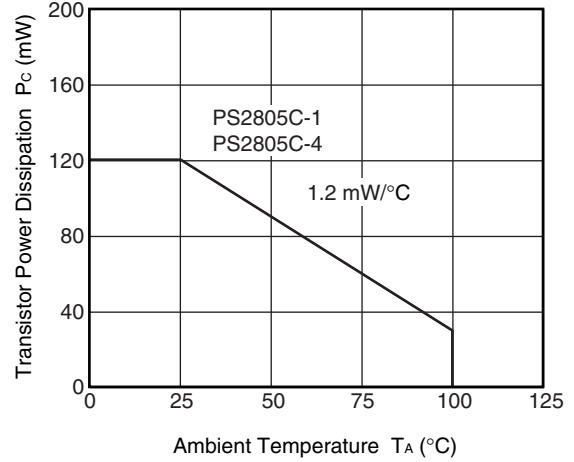
**PS2805C-1, PS2805C-4**

**<R> TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C, unless otherwise specified)**

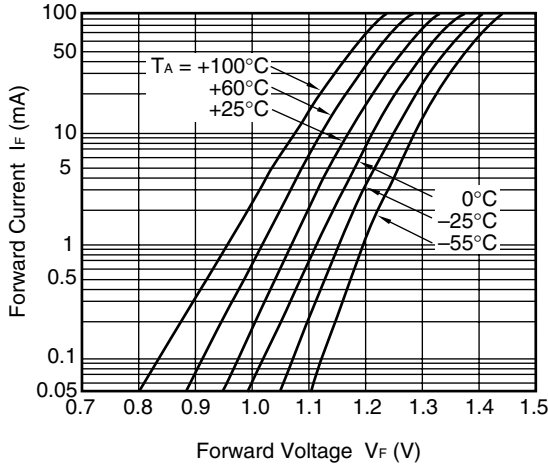
**DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE**



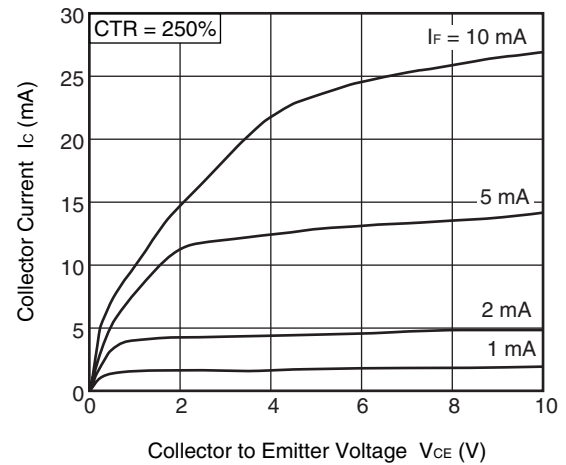
**TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE**



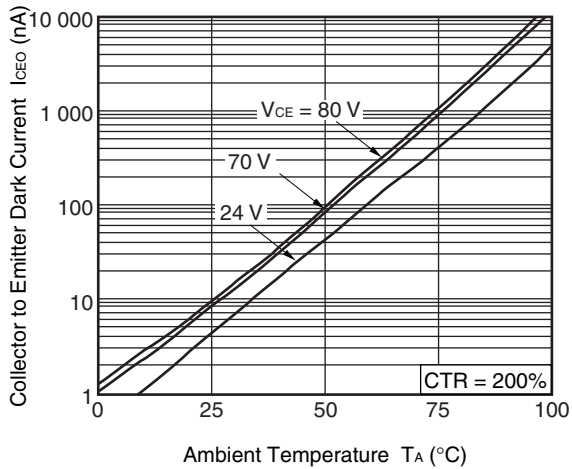
**FORWARD CURRENT vs. FORWARD VOLTAGE**



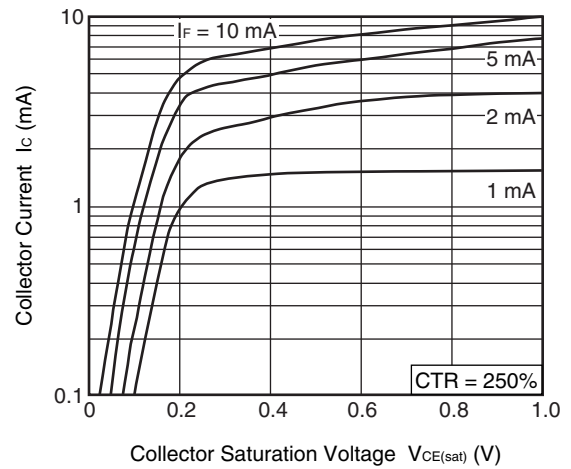
**COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE**



**COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE**

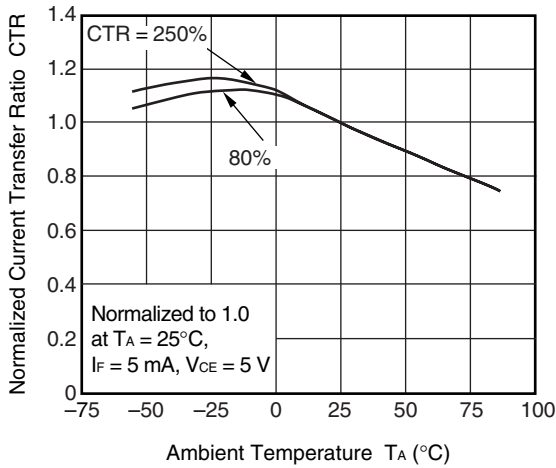


**COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE**

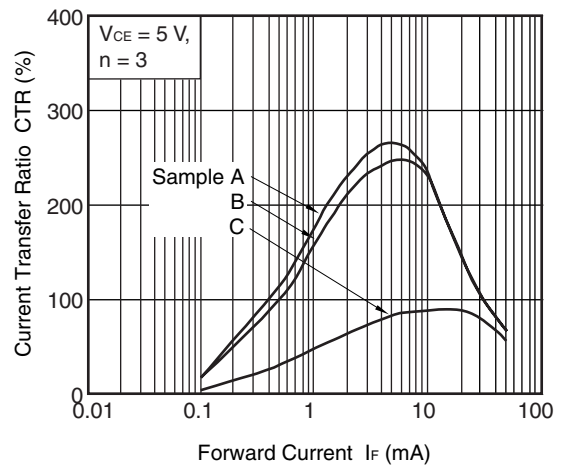


**Remark** The graphs indicate nominal characteristics.

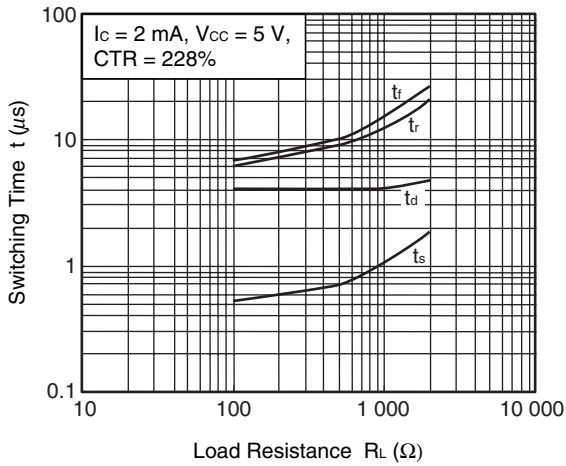
**NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE**



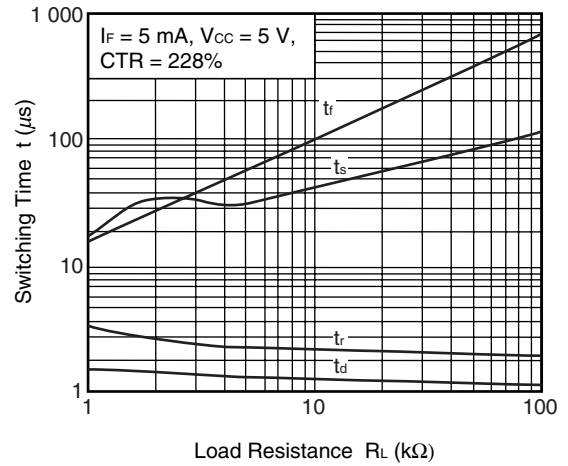
**CURRENT TRANSFER RATIO vs. FORWARD CURRENT**



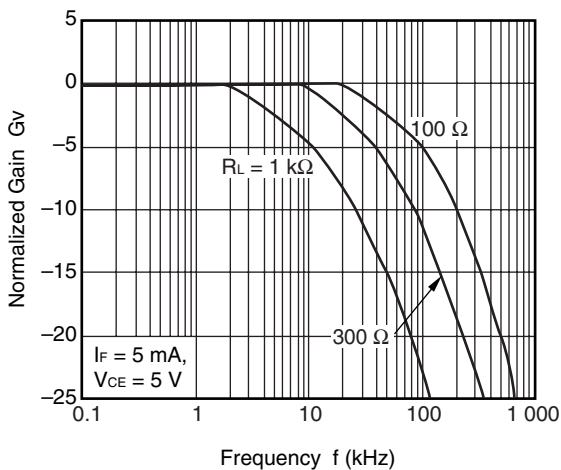
**SWITCHING TIME vs. LOAD RESISTANCE**



**SWITCHING TIME vs. LOAD RESISTANCE**



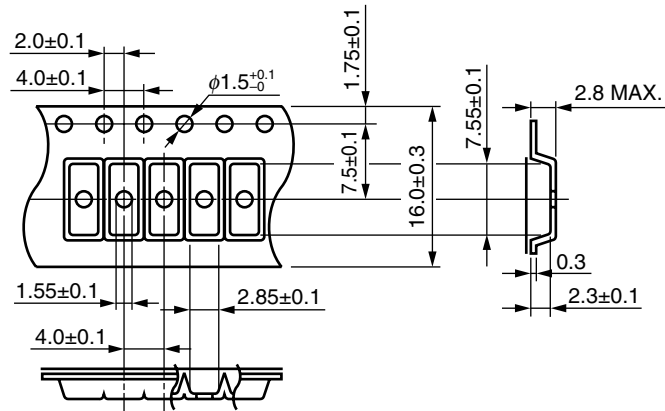
**FREQUENCY RESPONSE**



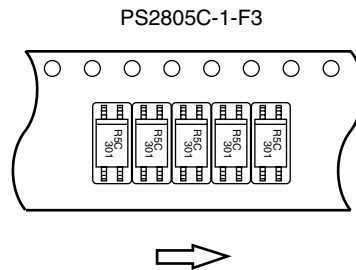
**Remark** The graphs indicate nominal characteristics.

<R> **TAPING SPECIFICATIONS (UNIT: mm)**

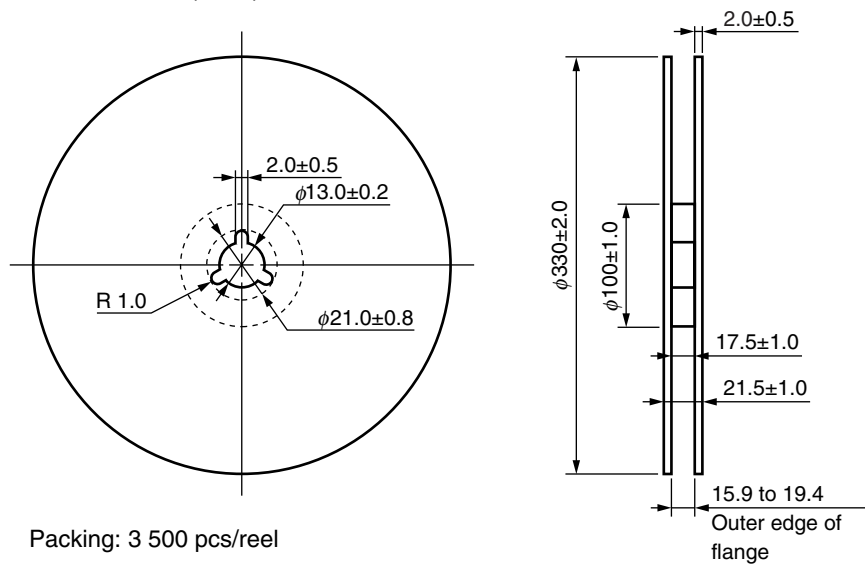
Outline and Dimensions (Tape)



Tape Direction

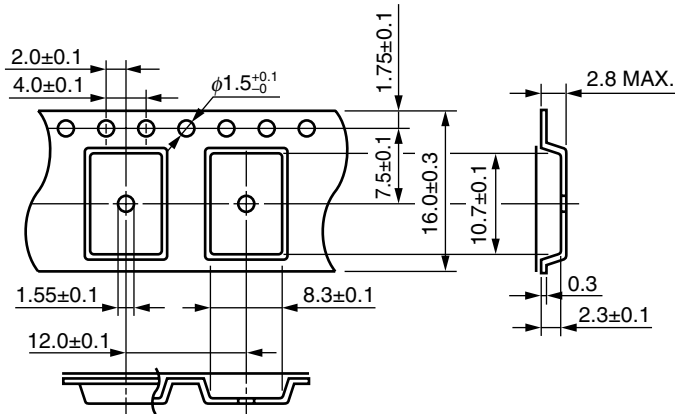


Outline and Dimensions (Reel)

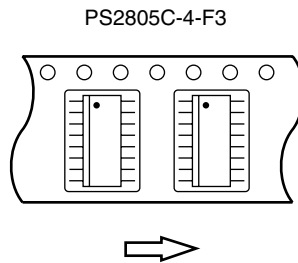




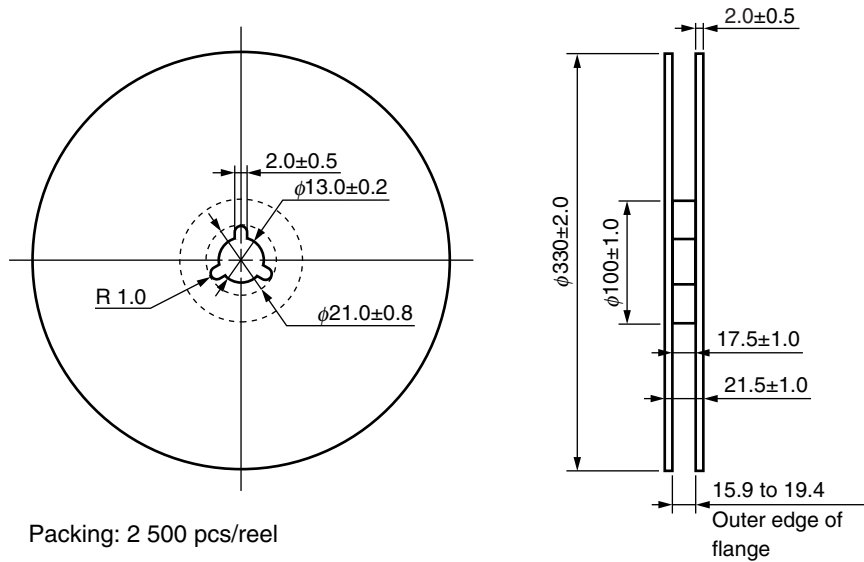
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



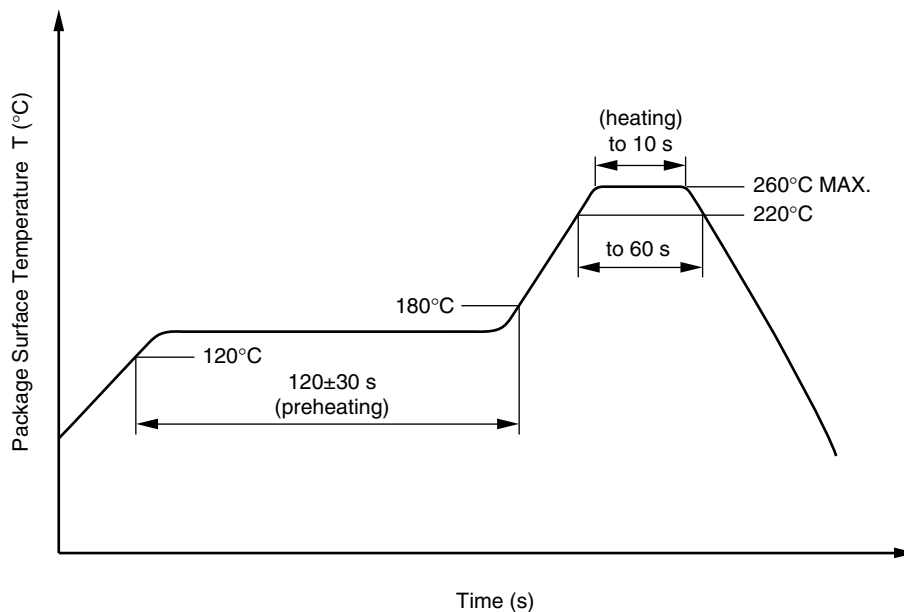
<R> **NOTES ON HANDLING**

## 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

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## (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 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     | Spec.       | Unit               |
|-----|---|------------|-------------|--------------------|
|     | Climatic test class (IEC 60068-1/DIN EN 60068-1)  |            | 55/100/21   |                    |
|     | Dielectric strength   |            |             |                    |
|     | maximum operating isolation voltage   | $U_{IORM}$ | 705         | $V_{peak}$         |
| <R> | Test voltage (partial discharge test, procedure a for type test and random test)          | $U_{pr}$   | 1 128       | $V_{peak}$         |
| <R> | $U_{pr} = 1.6 \times U_{IORM}$ , $P_d < 5 \text{ pC}$                                     |            |             |                    |
|     | 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 (DIN EN 60664-1 VDE0110 Part 1)                                       |            | 2           |                    |
| <R> | 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 +150 | $^{\circ}\text{C}$ |
|     | Operating temperature range   | $T_A$      | -55 to +100 | $^{\circ}\text{C}$ |
|     | Isolation resistance, minimum value   |            |             |                    |
|     | $V_{IO} = 500 \text{ V dc}$ at $T_A = 25^{\circ}\text{C}$                                 | 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         | $^{\circ}\text{C}$ |
|     | 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.   | $10^9$      | $\Omega$           |

**Revision History**
**PS2805C-1, PS2805C-4 Data Sheet**

| Rev. | Date         | Description |  |
|------|--------------|-------------|--|
|      |              | Page        | Summary  |
| 1.00 | May 30, 2006 | –           | This data sheet was released as PN10611EJ01V0DS  |
| 3.00 | Jan 9, 2013  | Throughout  | Renesas format is applied to this data sheet.  |
|      |              | p.1         | The ordering number and safety standards are revised.  |
|      |              | p.2         | PHOTOCOUPLER CONSTRUCTION is added as each distance of this device.  |
|      |              | p.3         | The explanation in MARKING EXAMPLE is revised.   |
|      |              | p.4         | ORDERING INFORMATION is modified with the revision of the safety standards.  |
|      |              | p.5         | Turn-on Time ( $t_{on}$ ) and Turn-off Time ( $t_{off}$ ) are added to the table in ELECTRICAL CHARACTERISTICS.  |
|      |              | p.6         | The graph of DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE and TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE are revised  |
|      |              | p.7         | The graph of LONG TERM CTR DEGRADATION is deleted.   |
|      |              | p.8         | PS2805C-1-F4 is deleted form Tape Direction image in TAPING SPECIFICATIONS.  |
|      |              | p.9         | PS2805C-4-F4 is deleted form Tape Direction image in TAPING SPECIFICATIONS.  |
|      |              | p.10        | The note about temperature condition of the recommended soldering conditions is deleted.   |
|      |              | p.12        | The values in SPECIFICATION OF VDE MARKS LICENSE DOCUMENT are changed as follows.<br>-- Test voltage is changed from the factor, 1.5, and the value, 1058, to 1.6 and 1128, respectively.<br>-- Clearance distance is moved to PHOTOCOUPLER CONSTRUCTION with changing 5.0 (min.) to 4.5 (min.). |

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