

# PS2703-1

## Data Sheet

R08DS0098EJ0300

HIGH ISOLATION VOLTAGE, HIGH COLLECTOR TO EMITTER  
 VOLTAGE TYPE SOP MULTI PHOTOCOUPLER SERIES

Rev.3.00  
 Jan 29, 2013

### DESCRIPTION

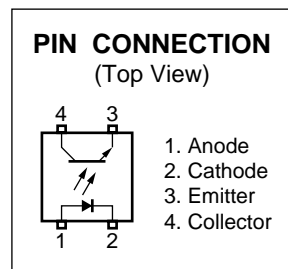
The PS2703-1 is an optically coupled isolator containing a GaAs light emitting diode and an NPN silicon phototransistor.

This is mounted in a plastic SOP (Small Outline Package) for high density applications.

This package has shield effect to cut off ambient light.

### FEATURES

- High isolation voltage ( $BV = 3\,750\text{ V}_{r.m.s.}$ )
- High collector to emitter voltage ( $V_{CE0} = 120\text{ V}$ )
- SOP (Small Outline Package) type
- Each isolated channel per package
- High-speed switching ( $t_r, t_f = 10\ \mu\text{s TYP.}$ )
- <R> • Taping product number: PS2703-1-F3
- <R> • Safety standards
  - UL approved: No. E72422
  - BSI approved (BS EN 60065, BS EN 60950)
  - CSA approved: No. CA 101391(CA5A, CAN/CSA-C22.2 60065, 60950)
  - DIN EN 60747-5-5 (VDE 0884-5) approved (Option)



### APPLICATIONS

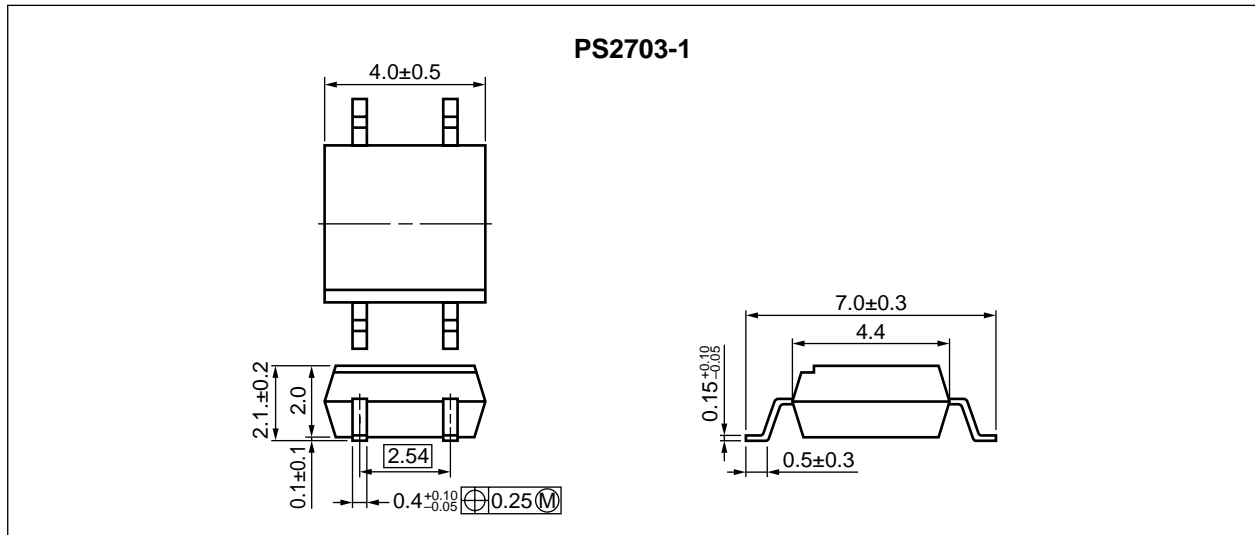
- Hybrid IC
- Telephone/FAX
- FA/OA equipment
- Programmable logic controllers
- Power supply

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.

## PS2703-1

### PACKAGE DIMENSIONS (UNIT: mm)

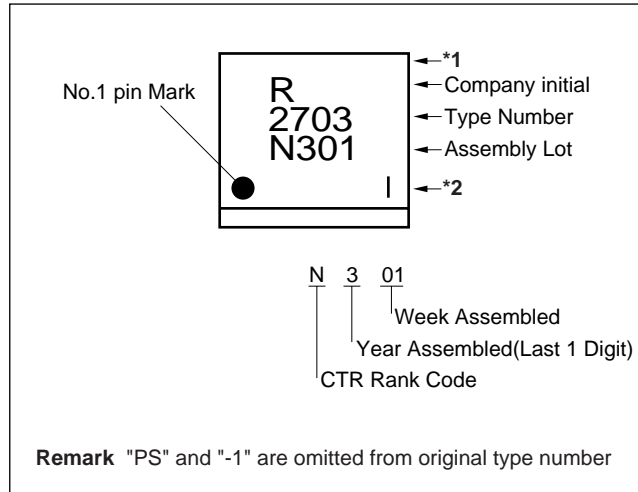


### <R> PHOTOCOUPLER CONSTRUCTION

| Parameter               | Unit (MIN.) |
|-------------------------|-------------|
| Air Distance            | 5 mm        |
| Outer Creepage Distance | 5 mm        |
| Inner Creepage Distance | 2.5 mm      |
| Isolation Thickness     | 0.3 mm      |

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<R> **MARKING EXAMPLE**



Note: Bar indication contents of \*1 and \*2

|   |  |
|---|--|
| <p><b>Made in Taiwan</b></p> <p>( *1: No indication<br/>*2: No indication )</p>       |  |
| <p><b>Made in Japan</b></p> <p>( *1: No indication<br/>*2: "   " (Vertical bar) )</p> | <p>"   " (Vertical bar)<br/>:Made in Japan</p> |

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### <R> ORDERING INFORMATION

| Part Number   | Order Number    | Solder Plating Specification | Packing Style                | Safety Standard Approval                        | Application Part Number <sup>*1</sup> |
|---------------|-----------------|------------------------------|------------------------------|---|---------------------------------------|
| PS2703-1-F3   | PS2703-1-F3-A   | Pb-Free                      | Embossed Tape 3 500 pcs/reel | Standard products (UL, BSI, CSA approved)       | PS2703-1                              |
| PS2703-1-V-F3 | PS2703-1-V-F3-A |                              | Embossed Tape 3 500 pcs/reel | DIN EN 60747-5-5 (VDE 0884-5) Approved (Option) |                                       |

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                 |
|---------------------------------|------------------------------------|-----------------------------|-------------|----------------------|
| Diode                           | Forward Current (DC)               | $I_F$                       | 50          | mA                   |
|                                 | Reverse Voltage                    | $V_R$                       | 6           | V                    |
|                                 | Power Dissipation Derating         | $\Delta P_D/^\circ\text{C}$ | 0.8         | mW/ $^\circ\text{C}$ |
|                                 | Power Dissipation                  | $P_D$                       | 80          | mW                   |
|                                 | Peak Forward Current <sup>*1</sup> | $I_{FP}$                    | 1           | A                    |
| Transistor                      | Collector to Emitter Voltage       | $V_{CEO}$                   | 120         | V                    |
|                                 | Emitter to Collector Voltage       | $V_{ECO}$                   | 6           | V                    |
|                                 | Collector Current                  | $I_C$                       | 30          | mA                   |
|                                 | Power Dissipation Derating         | $\Delta P_D/^\circ\text{C}$ | 1.5         | mW/ $^\circ\text{C}$ |
|                                 | Power Dissipation                  | $P_C$                       | 150         | mW                   |
| Isolation Voltage <sup>*2</sup> |                                    | BV                          | 3 750       | 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.

**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    |
|                             | Reverse Current  | I <sub>R</sub>       | V <sub>R</sub> = 5 V  |                  |      | 5    | μA   |
|                             | Terminal Capacitance   | C <sub>t</sub>       | V = 0 V, f = 1 MHz  |                  | 30   |      | pF   |
| Transistor                  | Collector to Emitter Dark Current                                      | I <sub>CEO</sub>     | I <sub>F</sub> = 0 mA, V <sub>CE</sub> = 120 V                      |                  |      | 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               | 150  | 400  | %    |
|                             |  |                      | I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 5 V                        | 10               | 80   |      |      |
|                             | 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 kV <sub>DC</sub>                               | 10 <sup>11</sup> |      |      | Ω    |
|                             | Isolation Capacitance  | C <sub>I-O</sub>     | V = 0 V, f = 1 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> = 1 kΩ |                  | 10   |      | μs   |
|                             | Fall Time <sup>*2</sup>  | t <sub>f</sub>       |   |                  | 10   |      |      |
|                             | Turn-on Time <sup>*2</sup>   | t <sub>on</sub>      |   |                  | 13   |      |      |
| Turn-off Time <sup>*2</sup> | t <sub>off</sub>   |                      |   | 11               |      |      |      |

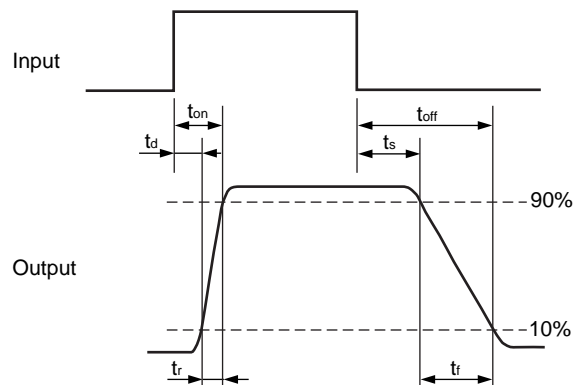
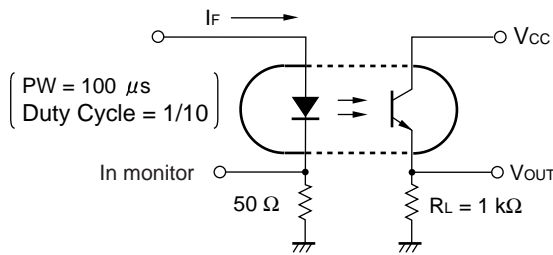
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Notes: \*1. CTR rank

| CTR rank | CTR (%)       | Conditions                                   |
|----------|---------------|--|
| K        | 200 to 400    | I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 5 V |
|          | 80 and larger | I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 5 V |
| L        | 100 to 300    | I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 5 V |
|          | 25 and larger | I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 5 V |
| M        | 50 to 150     | I <sub>F</sub> = 5 mA, V <sub>CE</sub> = 5 V |
|          | 10 and larger | I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 5 V |

\*2. Test circuit for switching time

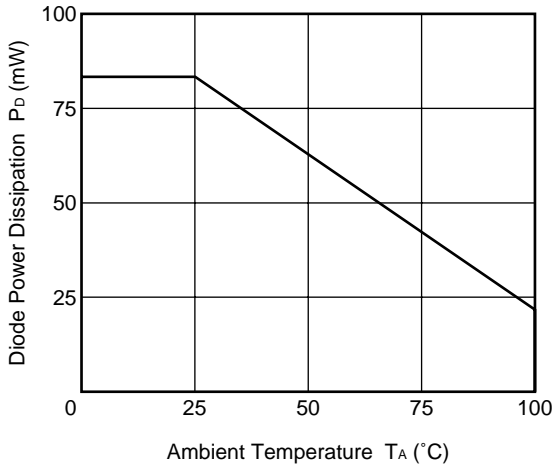
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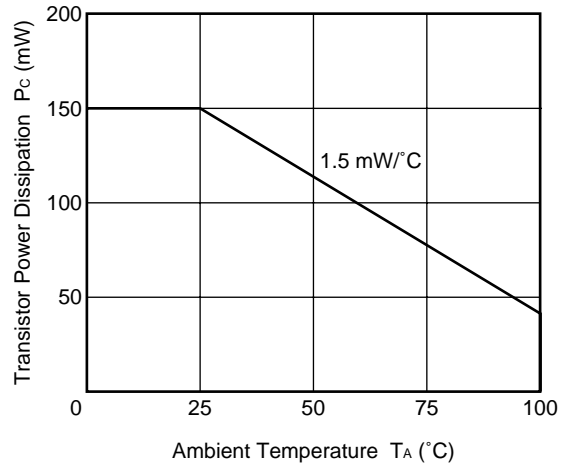
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**<R> TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C, unless otherwise specified)**

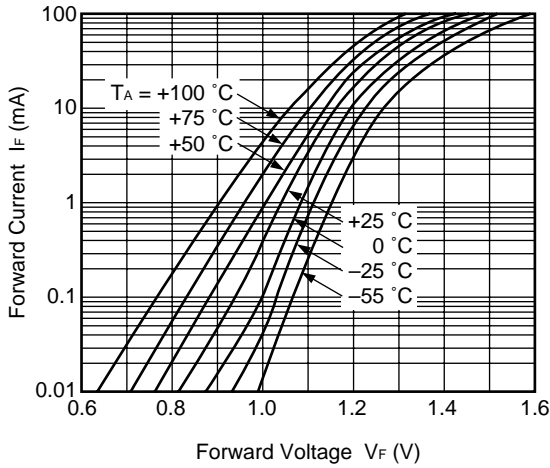
**DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE**



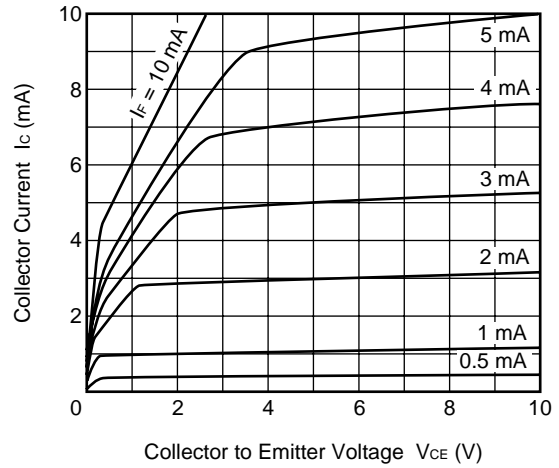
**TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE**



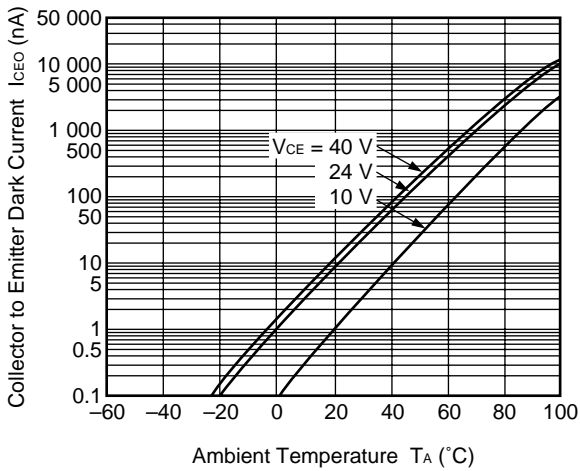
**FORWARD CURRENT vs. FORWARD VOLTAGE**



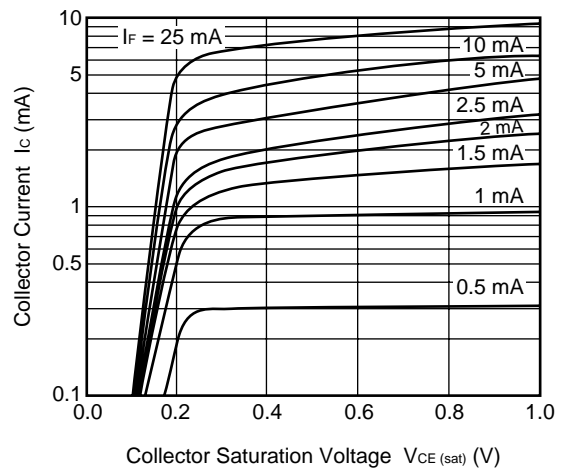
**COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE**



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

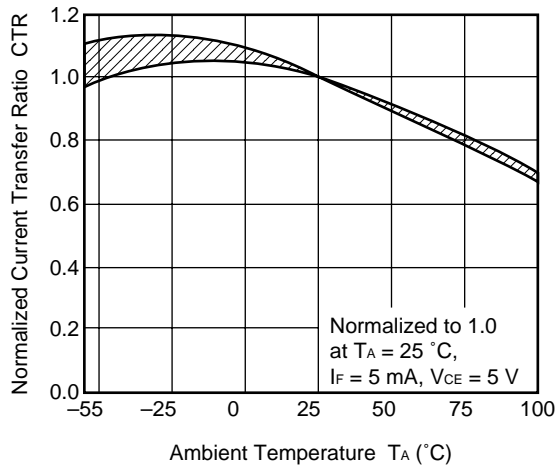


**COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE**

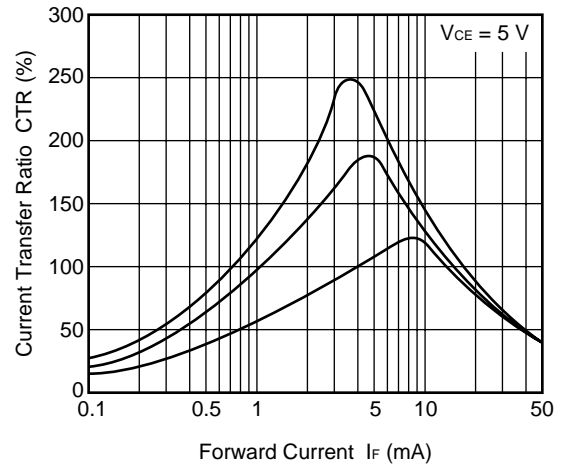


**Remark** The graphs indicate nominal characteristics.

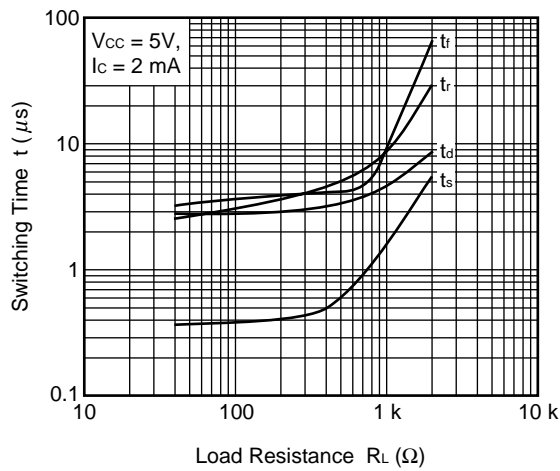
**NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE**



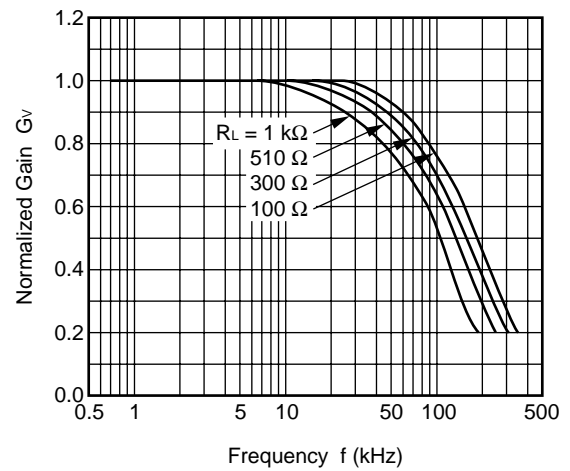
**CURRENT TRANSFER RATIO vs. FORWARD CURRENT**



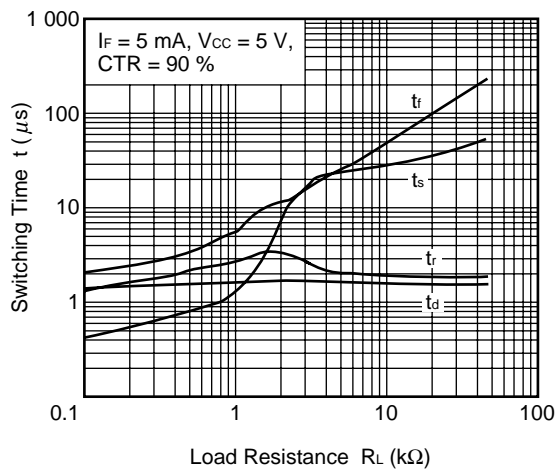
**SWITCHING TIME vs. LOAD RESISTANCE**



**FREQUENCY RESPONSE**



**SWITCHING TIME vs. LOAD RESISTANCE**

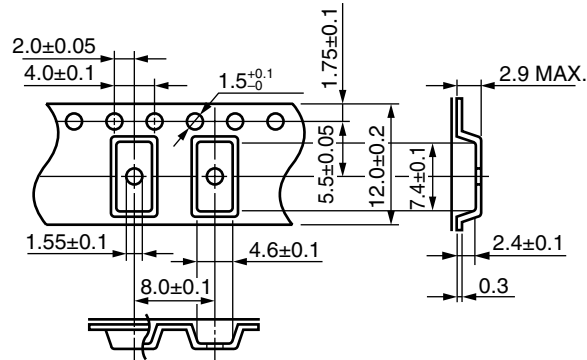


**Remark** The graphs indicate nominal characteristics.

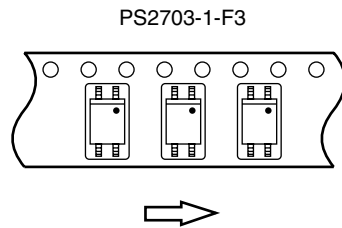
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**<R> TAPING SPECIFICATIONS (UNIT: mm)**

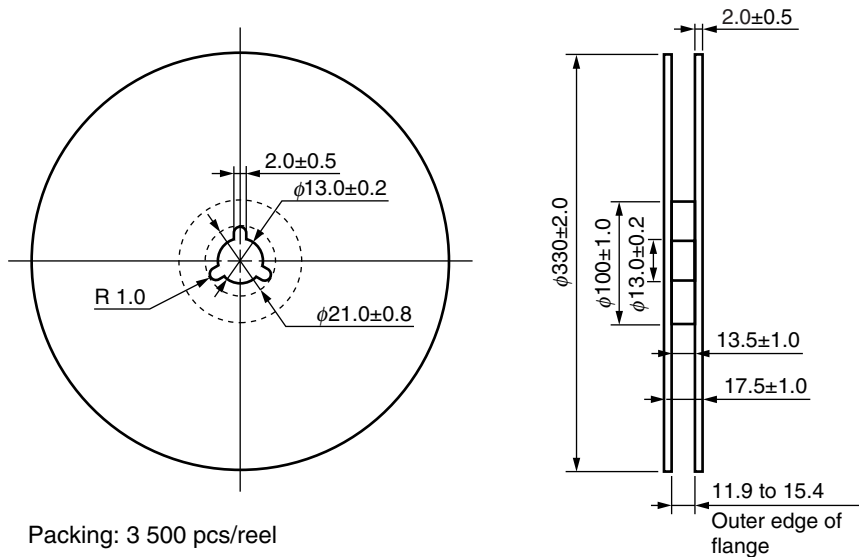
Outline and Dimensions (Tape)



Tape Direction

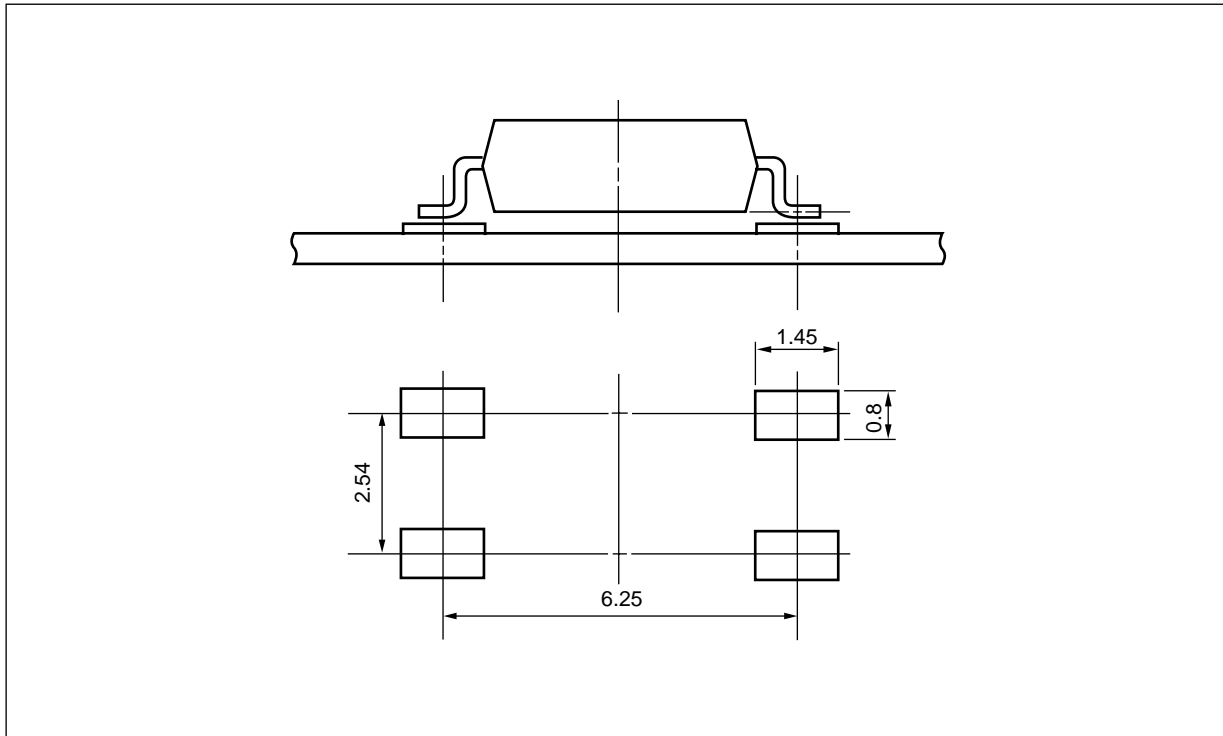


Outline and Dimensions (Reel)



Packing: 3 500 pcs/reel



**PS2703-1****<R> RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)**

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

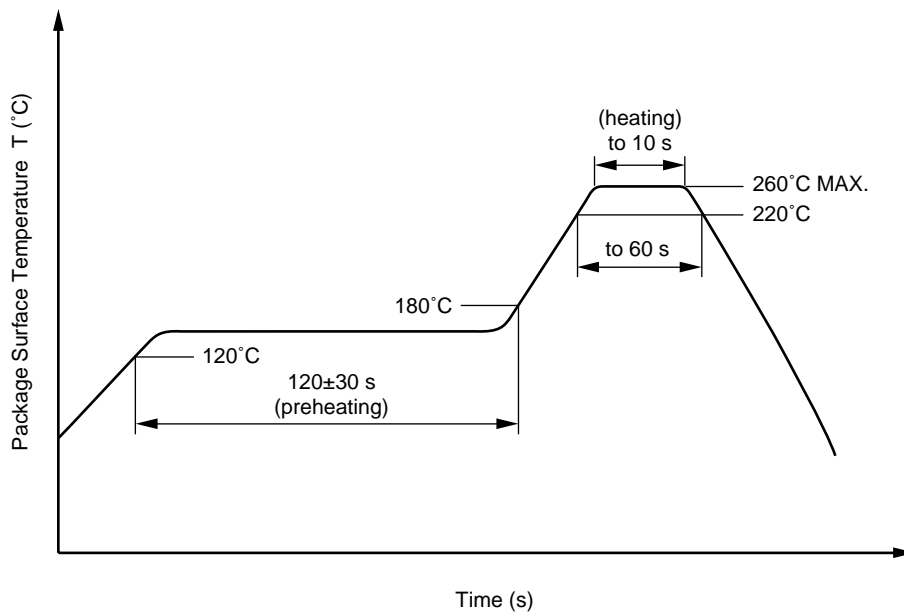
**NOTES ON HANDLING**

## 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

&lt;R&gt;

## (4) Cautions

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

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**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. 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.

**<R> 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<br>maximum operating isolation voltage<br>Test voltage (partial discharge test, procedure a for type test and random test)<br>$U_{pr} = 1.6 \times U_{IORM}, P_d < 5 \text{ pC}$   | $U_{IORM}$<br>$U_{pr}$                       | 707<br>1131                 | $V_{peak}$<br>$V_{peak}$   |
| Test voltage (partial discharge test, procedure b for all devices)<br>$U_{pr} = 1.875 \times U_{IORM}, P_d < 5 \text{ pC}$   | $U_{pr}$                                     | 1 325                       | $V_{peak}$                 |
| Highest permissible overvoltage  | $U_{TR}$                                     | 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 1))  | CTI  | 175                         |                            |
| Material group (DIN EN 60664-1 VDE 0110 Part 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>$V_{IO} = 500 \text{ V dc at } T_A = 25^\circ\text{C}$<br>$V_{IO} = 500 \text{ V dc at } T_A \text{ MAX. at least } 100^\circ\text{C}$  | Ris MIN.<br>Ris MIN.                         | $10^{12}$<br>$10^{11}$      | $\Omega$<br>$\Omega$       |
| Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve)<br>Package temperature<br>Current (input current $I_F$ , $P_{si} = 0$ )<br>Power (output or total power dissipation)<br>Isolation resistance<br>$V_{IO} = 500 \text{ V dc at } T_A = T_{si}$ | $T_{si}$<br>$I_{si}$<br>$P_{si}$<br>Ris MIN. | 150<br>300<br>500<br>$10^9$ | °C<br>mA<br>mW<br>$\Omega$ |

|                |               |  |
|----------------|---------------|--|
| <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.<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></li><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> |
|----------------|---------------|--|

## Revision History

## PS2703-1 Data Sheet

| Rev. | Date         | Description |  |
|------|--------------|-------------|--|
|      |              | Page        | Summary  |
| 1.00 | Mar 31, 2003 | –           | This data sheet was released as PN10242EJ01V0DS  |
| 3.00 | Jan 29, 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.  |
|      |              | p.3         | The explanation in MARKING EXAMPLE is revised.<br>One of the captions in MARKING EXAMPLE is revised from Trade Mark to Company initial.  |
|      |              | 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.5         | The timing chart is added in the note 2.   |
|      |              | p.7         | The graph of LONG TERM CTR DEGRADATION is deleted from those in TYPICAL CHARACTERISTICS.   |
|      |              | p.8         | PS2703-1-F4 is deleted from Tape Direction image in TAPING SPECIFICATIONS.   |
|      |              | p.9         | RECOMMENDED MOUNT PAD DIMENSIONS is added.   |
|      |              | p.10        | The note about temperature condition of the recommended soldering conditions is deleted.   |
|      |              | p.12        | The format of SPECIFICATION OF VDE MARKS LICENSE DOCUMENT is revised.<br>The value of maximum operating isolation voltage is changed to 707.<br>The value of test voltage (partial discharge test, procedure a for type test and random test) is changed to 1130.<br>The value of test voltage (partial discharge test, procedure b for all devices) is changed to 1325.<br>The value of Current (input current $I_F$ , $\Psi_i = 0$ ) is changed to 300.<br>The value of Power (output or total power dissipation) is changed to 500. |

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