

PS2702-1

R08DS0099EJ0300

Rev.3.00

Jan 29, 2013

HIGH ISOLATION VOLTAGE DARLINGTON TRANSISTOR
SOP MULTI PHOTOCOUPLER SERIES

DESCRIPTION

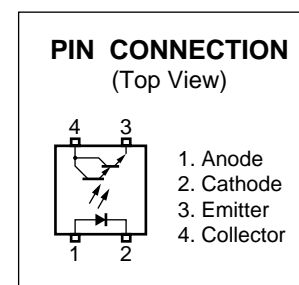
The PS2702-1 is an optically coupled isolator containing a GaAs light emitting diode and an NPN silicon darlington-connected phototransistor.

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

This package has shield effect to cut off ambient light.

FEATURES

- High current transfer ratio (CTR = 2 000% TYP.)
- High isolation voltage (BV = 3 750 Vr.m.s.)
- Small and thin (SOP) package
- High-speed switching ($t_r = 70 \mu s$ TYP., $t_f = 60 \mu s$ TYP.)
- <R> • Ordering number of taping product: PS2702-1-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)



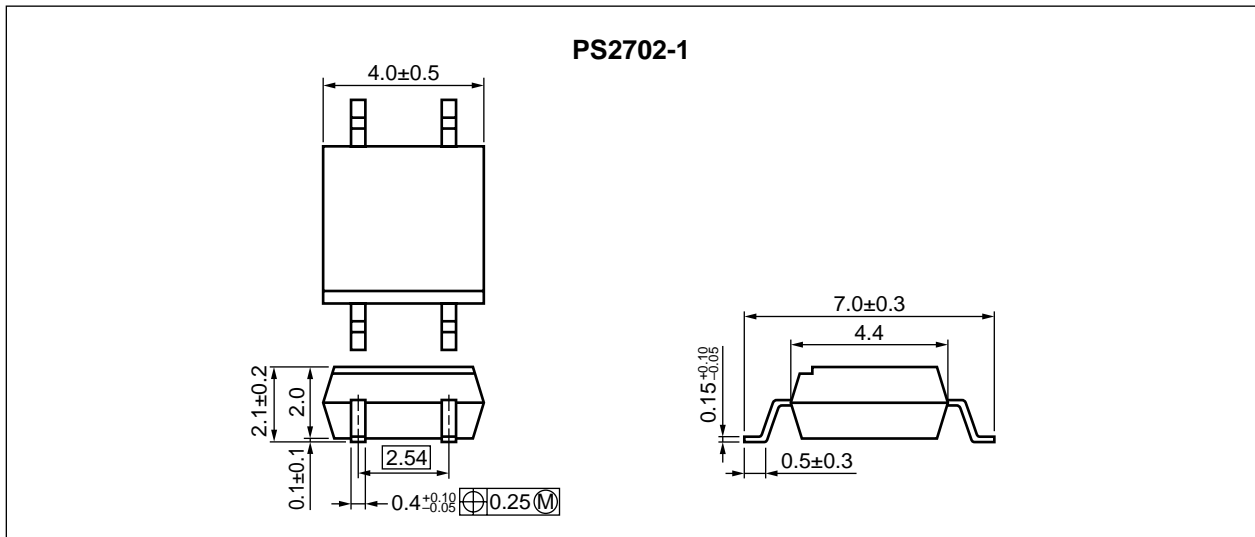
APPLICATIONS

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

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.

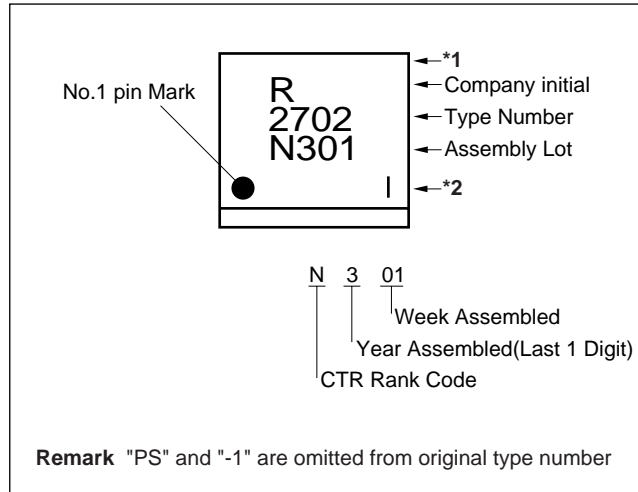
PACKAGE DIMENSIONS (UNIT: mm)



<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 |

<R> MARKING EXAMPLE



Note: Bar indication contents of *1 and *2

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

<R> ORDERING INFORMATION

| Part Number | Order Number | Solder Plating Specification | Packing Style | Safety Standard Approval | Application Part Number ^{*1} |
|---------------|-----------------|------------------------------|------------------------------|---|---------------------------------------|
| PS2702-1-F3 | PS2702-1-F3-A | Pb-Free | Embossed Tape 3 500 pcs/reel | Standard products (UL, BSI, CSA approved) | PS2702-1 |
| PS2702-1-V-F3 | PS2702-1-V-F3-A | | Embossed Tape 3 500 pcs/reel | DIN EN 60747-5-5 (VDE 0884-5) Approved (Option) | |

Note: ^{*1}. 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 | Forward Current (DC) | I _F | 50 | mA |
| | Reverse Voltage | V _R | 6.0 | V |
| | Power Dissipation Derating | ΔP _D /°C | 0.8 | mW/°C |
| | Power Dissipation | P _D | 80 | mW |
| | Peak Forward Current ^{*1} | I _{FP} | 1 | A |
| Transistor | Collector to Emitter Voltage | V _{CEO} | 40 | V |
| | Emitter to Collector Voltage | V _{ECO} | 6 | V |
| | Collector Current | I _C | 200 | mA |
| | Power Dissipation Derating | ΔP _D /°C | 1.5 | mW/°C |
| | Power Dissipation | P _C | 150 | mW |
| Isolation Voltage ^{*2} | | BV | 3 750 | 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.

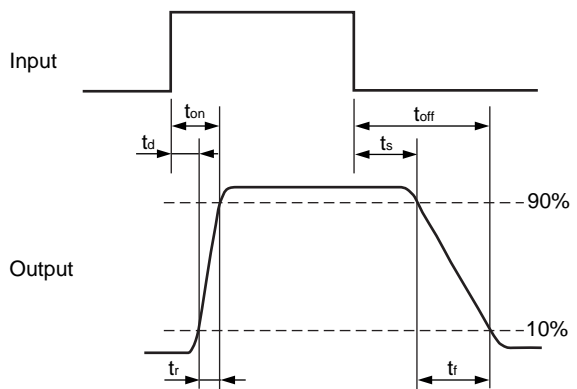
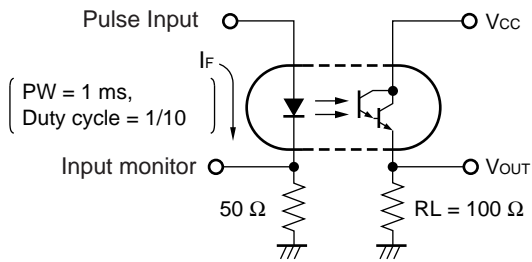
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

| | Parameter | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|-----------------------------|--|----------------------|--|------------------|-------|------|------|
| Diode | Forward Voltage | V _F | I _F = 5 mA | | 1.1 | 1.4 | V |
| | Reverse Current | I _R | V _R = 5 V | | | 5 | μA |
| | Terminal Capacitance | C _t | V = 0 V, f = 1 MHz | | 30 | | pF |
| Transistor | Collector to Emitter Dark Current | I _{CEO} | I _F = 0 mA, V _{CE} = 40 V | | | 400 | nA |
| Coupled | Current Transfer Ratio (I _C /I _F) ^{*1} | CTR | I _F = 1 mA, V _{CE} = 2 V | 200 | 2 000 | | % |
| | 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 kV _{DC} | 10 ¹¹ | | | Ω |
| | Isolation Capacitance | C _{I-O} | V = 0 V, f = 1 MHz | | 0.4 | | pF |
| | Rise Time ^{*2} | t _r | V _{CC} = 5 V, I _C = 2 mA, R _L = 100 Ω | | 70 | | μs |
| | Fall Time ^{*2} | t _f | | | 60 | | |
| | Turn-on Time ^{*2} | t _{on} | | | 90 | | |
| Turn-off Time ^{*2} | t _{off} | | | 60 | | | |

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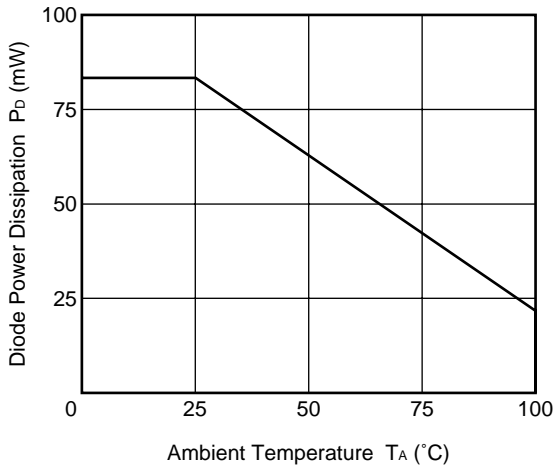
- Notes: *1. CTR rank
 K: 2 000 and larger (%)
 L: 700 to 3 400 (%)
 M: 200 to 1 000 (%)
 *2. Test circuit for switching time

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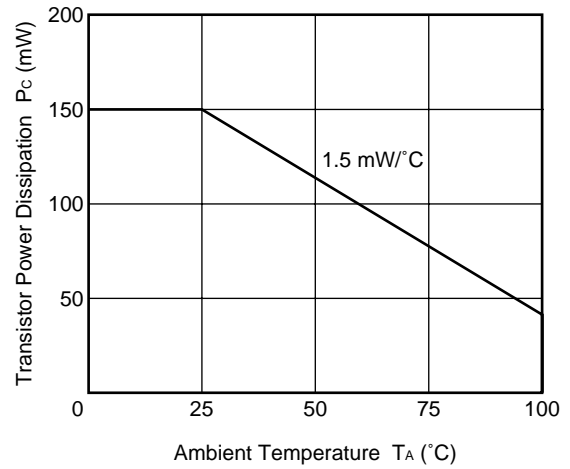


<R> TYPICAL CHARACTERISTICS (T_A = 25°C, unless otherwise specified)

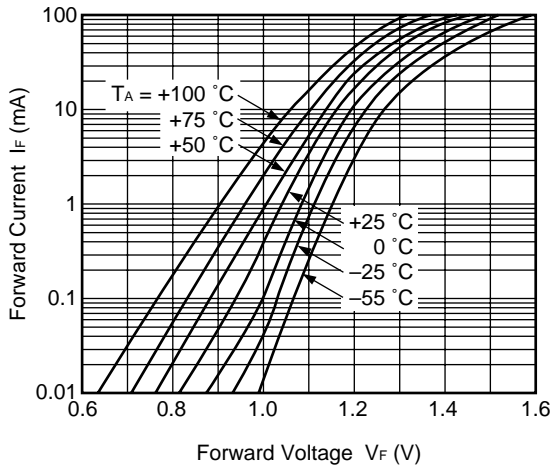
DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE



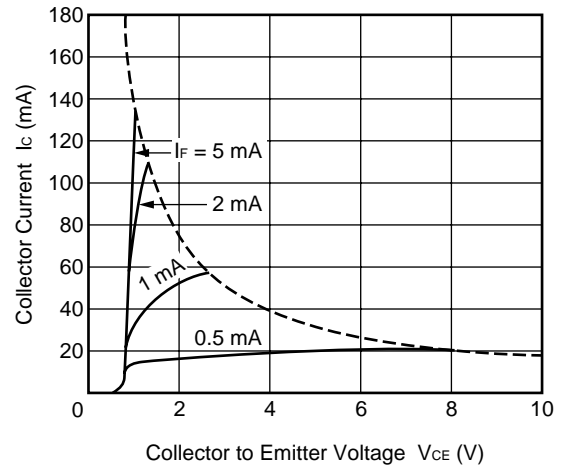
TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



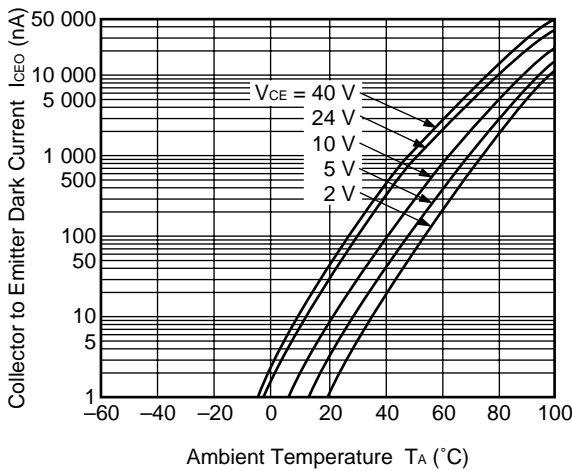
FORWARD CURRENT vs. FORWARD VOLTAGE



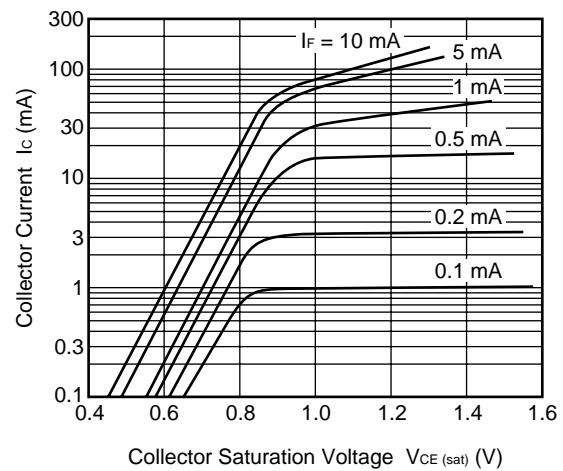
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE

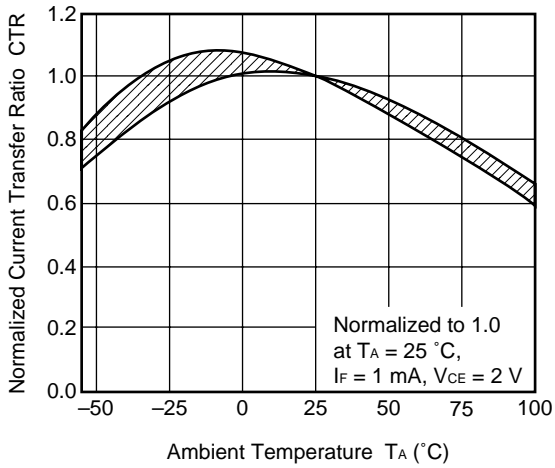


COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE

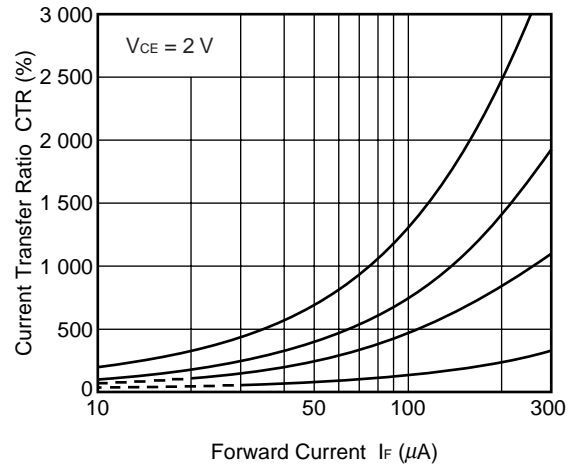


Remark The graphs indicate nominal characteristics.

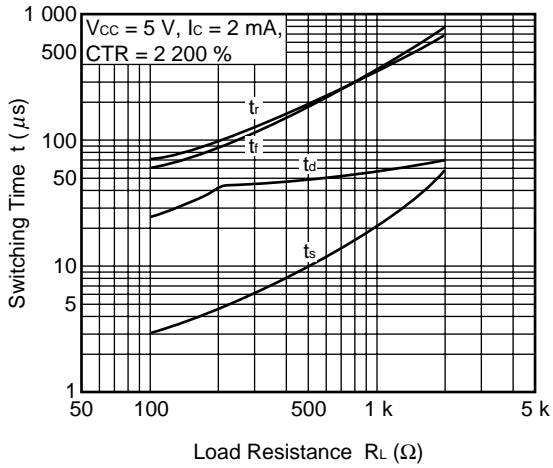
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



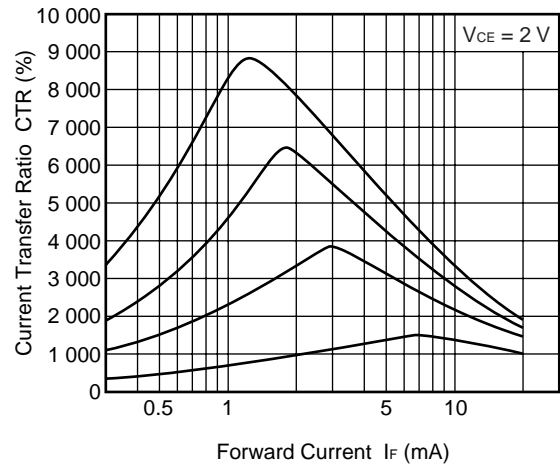
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



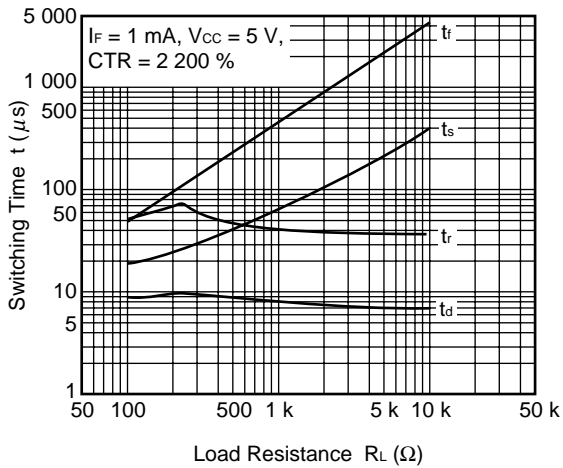
SWITCHING TIME vs. LOAD RESISTANCE



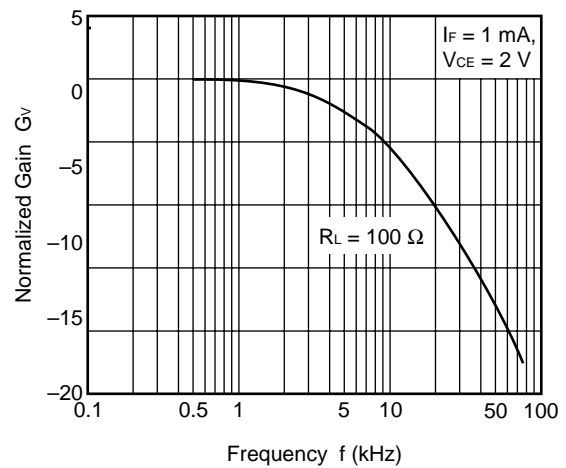
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



SWITCHING TIME vs. LOAD RESISTANCE



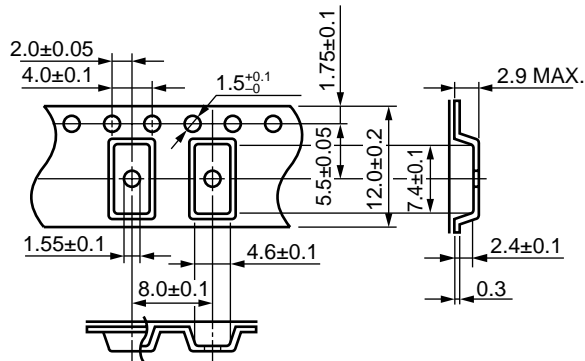
FREQUENCY RESPONSE



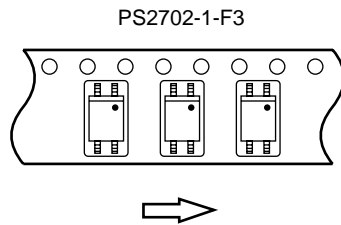
Remark The graphs indicate nominal characteristics.

<R> TAPING SPECIFICATIONS (UNIT: mm)

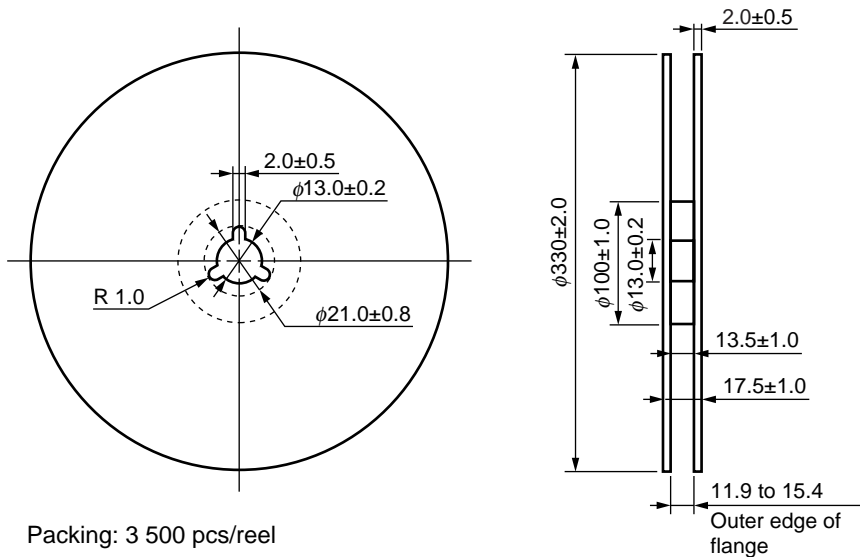
Outline and Dimensions (Tape)



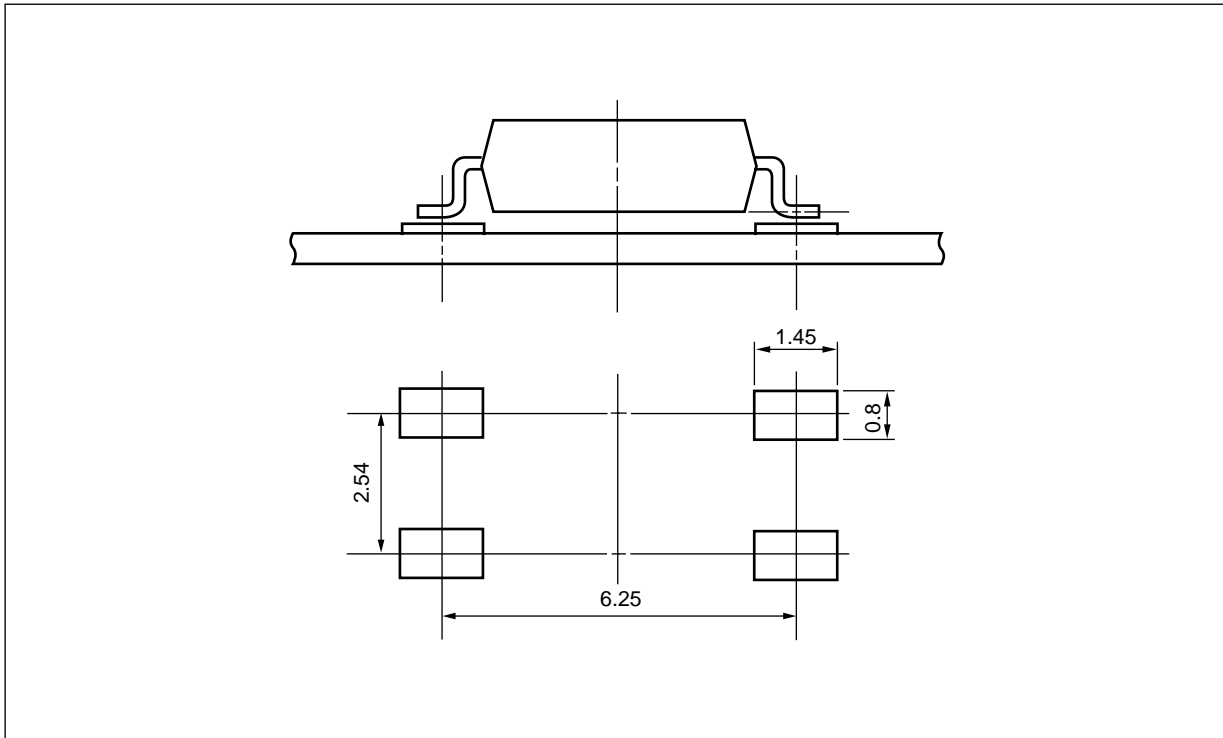
Tape Direction



Outline and Dimensions (Reel)



<R> RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)



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

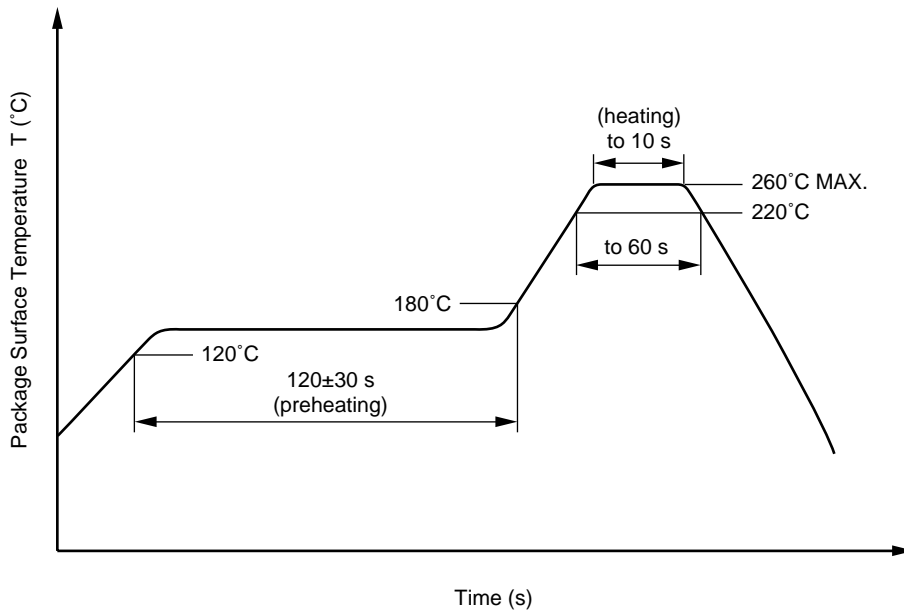
NOTES ON HANDLING

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.)

<R> (a) Soldering of leads should be made at the point 1.5 to 2.0 mm from the root of the lead

(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. 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 maximum operating isolation voltage Test voltage (partial discharge test, procedure a for type test and random test) $U_{pr} = 1.6 \times U_{IORM}, P_d < 5 \text{ pC}$ | U_{IORM} U_{pr} | 707 1 131 | V_{peak} V_{peak} |
| Test voltage (partial discharge test, procedure b for all devices) $U_{pr} = 1.875 \times U_{IORM}, P_d < 5 \text{ pC}$ | 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 $V_{IO} = 500 \text{ V dc at } T_A = 25^\circ\text{C}$ $V_{IO} = 500 \text{ V dc at } T_A \text{ MAX. at least } 100^\circ\text{C}$ | Ris MIN. Ris MIN. | 10^{12} 10^{11} | Ω Ω |
| Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve) Package temperature Current (input current I_F , $P_{si} = 0$) Power (output or total power dissipation) Isolation resistance $V_{IO} = 500 \text{ V dc at } T_A = T_{si}$ | T_{si} I_{si} P_{si} Ris MIN. | 150 300 500 10^9 | °C mA mW Ω |

| | | |
|----------------|---------------|--|
| Caution | GaAs Products | <p>This product uses gallium arsenide (GaAs). 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">• 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">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.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.• Do not burn, destroy, cut, crush, or chemically dissolve the product.• Do not lick the product or in any way allow it to enter the mouth. |
|----------------|---------------|--|

Revision History

PS2702-1 Data Sheet

| Rev. | Date | Description | |
|------|--------------|-------------|--|
| | | Page | Summary |
| 1.00 | Mar 31, 2003 | – | This data sheet was released as PN10241EJ01V0DS |
| 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. 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.6 | The graph of LONG TERM CTR DEGRADATION is deleted from those in TYPICAL CHARACTERISTICS. |
| | | p.8 | PS2702-1-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. The value of maximum operating isolation voltage is changed to 707. The value of test voltage (partial discharge test, procedure a for type test and random test) is changed to 1130. The value of test voltage (partial discharge test, procedure b for all devices) is changed to 1325. The value of Current (input current I_F , $\Psi_i = 0$) is changed to 300. The value of Power (output or total power dissipation) is changed to 500. |

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