

PS2911-1

R08DS0110EJ0400

Rev.4.00

HIGH CTR, 4-PIN ULTRA SMALL PACKAGE FLAT-LEAD PHOTOCOUPLER

Jan 21, 2016

DESCRIPTION

The PS2911-1 is an optically coupled isolator containing a GaAs light emitting diode and an NPN silicon phototransistor in one package for high density mounting applications.

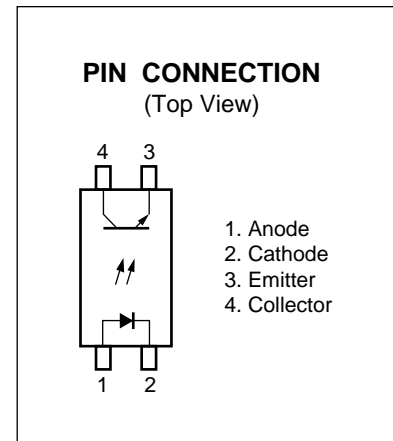
An ultra small flat-lead package has been provided which realizes a reduction in mounting area of about 30% compared with the PS28xx series.

FEATURES

- Ultra small flat-lead package (4.6 (L) × 2.5 (W) × 2.1 (H) mm)
- High current transfer ratio (CTR = 200% TYP. @ $I_F = 1 \text{ mA}$, $V_{CE} = 5 \text{ V}$)
- High isolation voltage (BV = 2 500 Vr.m.s.)
- Ordering number of taping product: PS2911-1-F3: 3 500 pcs/reel
- <R> • Safety standards
 - UL approved: UL1577, Single protection
 - BSI approved: BS EN 62368-1, Supplementary insulation
 - VDE approved: DIN EN 60747-5-5 (Option)

APPLICATIONS

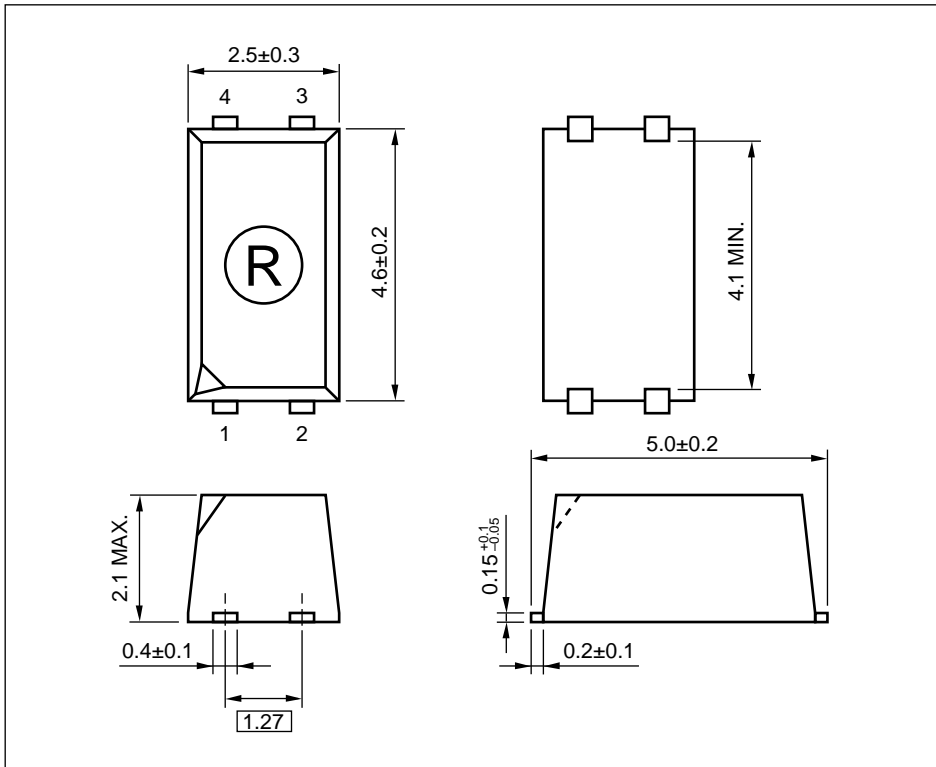
- DC/DC converter
- Modem/PC card



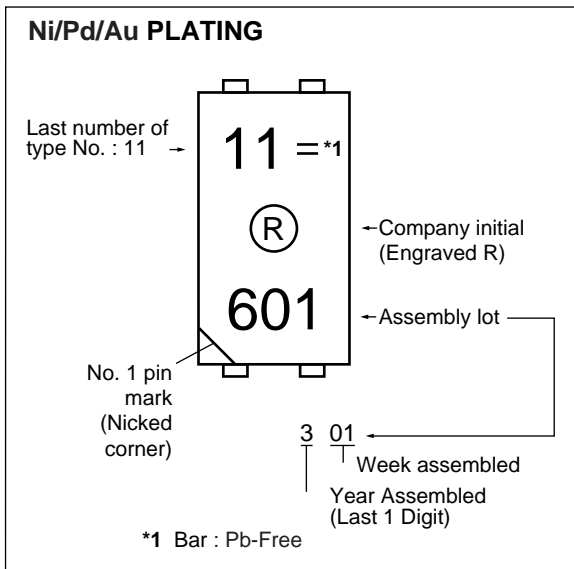
The mark <R> shows major revised points.

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)



MARKING EXAMPLE



PHOTOCOUPLER CONSTRUCTION

| Parameter | MIN. |
|--------------------|--------|
| Air Distance | 4 mm |
| Creepage Distance | 4 mm |
| Isolation Distance | 0.4 mm |

<R> ORDERING INFORMATION

| Part Number | Order Number | Solder Plating Specification | Packing Style | Safety Standard Approval | Application Part Number ^{*1} |
|---------------|------------------|------------------------------|------------------------------|---|---------------------------------------|
| PS2911-1 | PS2911-1-AX | Pb-Free (Ni/Pd/Au) | 50 pcs (Tape 50 pcs cut) | Standard products (UL, BSI approved) | PS2911-1 |
| PS2911-1-F3 | PS2911-1-F3-AX | | Embossed Tape 3 500 pcs/reel | | |
| PS2911-1-V | PS2911-1-V-AX | | 50 pcs (Tape 50 pcs cut) | UL, BSI approved DIN EN 60747-5-5 | |
| PS2911-1-V-F3 | PS2911-1-V-F3-AX | | Embossed Tape 3 500 pcs/reel | (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 | I _F | 50 | mA |
| | Forward Current Derating | $\Delta I_F / ^\circ\text{C}$ | 0.5 | mA/ ^o C |
| | Peak Forward Current ^{*1} | I _{FP} | 0.5 | A |
| | Power Dissipation | P _D | 60 | mW |
| | Reverse Voltage | V _R | 6 | V |
| Detector | Collector to Emitter Voltage | V _{CEO} | 40 | V |
| | Emitter to Collector Voltage | V _{ECO} | 5 | V |
| | Collector Current | I _C | 40 | mA |
| | Power Dissipation Derating | $\Delta P_C / ^\circ\text{C}$ | 1.2 | mW/ ^o C |
| | Power Dissipation | P _C | 120 | mW |
| Isolation Voltage ^{*2} | | BV | 2 500 | Vr.m.s. |
| Total Power Dissipation | | P _T | 160 | mW |
| 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 = 1 mA | 0.9 | 1.1 | 1.3 | V |
| | Reverse Current | I _R | V _R = 5 V | | | 5 | μA |
| | Terminal Capacitance | C _t | V = 0 V, f = 1 MHz | | 15 | | pF |
| Transistor | Collector to Emitter Dark Current | I _{CEO} | I _F = 0 mA, V _{CE} = 40 V | | | 100 | nA |
| Coupled | Current Transfer Ratio (I _C /I _F) *1 | CTR | I _F = 1 mA, V _{CE} = 5 V | 100 | 200 | 400 | % |
| | Collector Saturation Voltage | V _{CE(SAT)} | I _F = 1 mA, I _C = 0.2 mA | | 0.13 | 0.3 | 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 | | 5 | | μs |
| | Fall Time *2 | t _f | | | 10 | | |
| | Turn-on Time *2 | t _{on} | V _{CC} = 5 V, I _F = 1 mA, R _L = 5 kΩ | | 40 | | μs |
| | Storage Time *2 | t _s | | | 10 | | |
| Turn-off Time *2 | t _{off} | | | 120 | | | |

Notes: *1. CTR rank

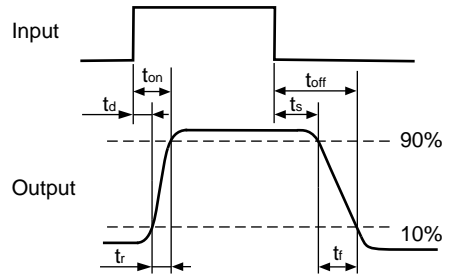
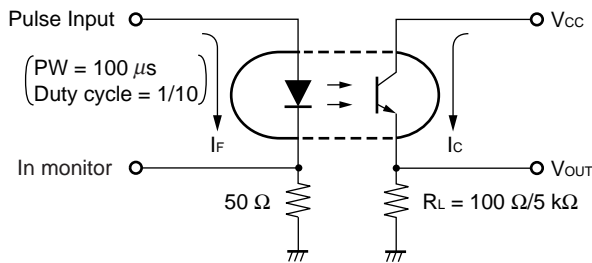
N : 100 to 400 (%)

K : 200 to 400 (%)

L : 150 to 300 (%)

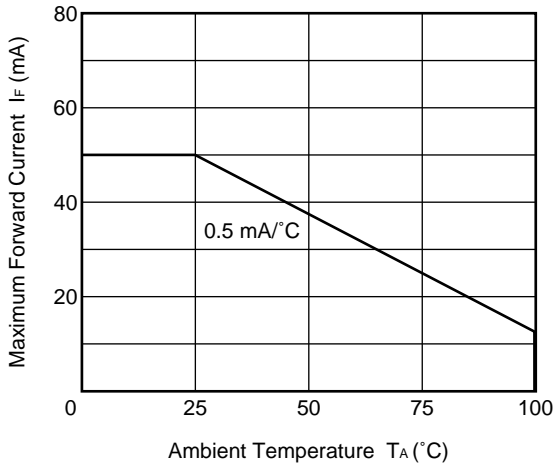
M : 100 to 200 (%)

*2. Test circuit for switching time

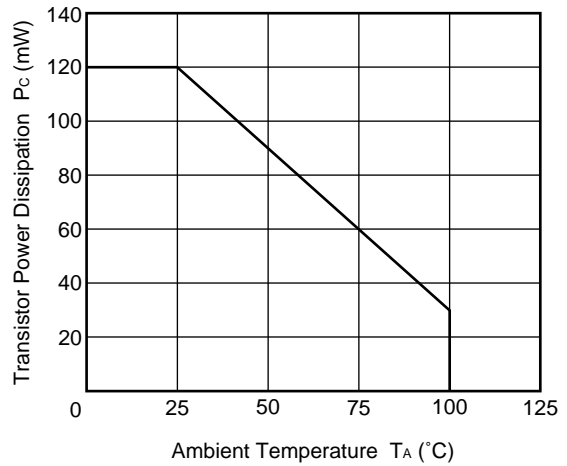


TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise specified)

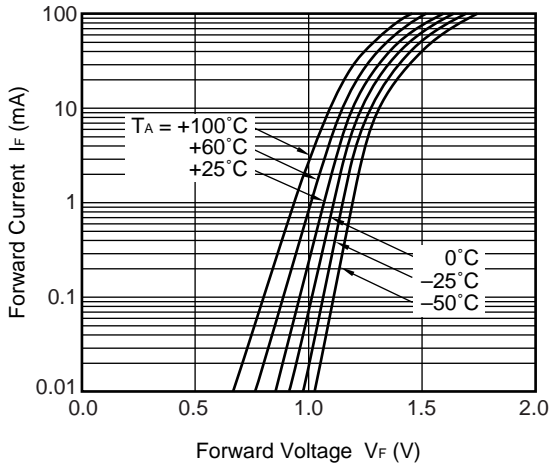
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



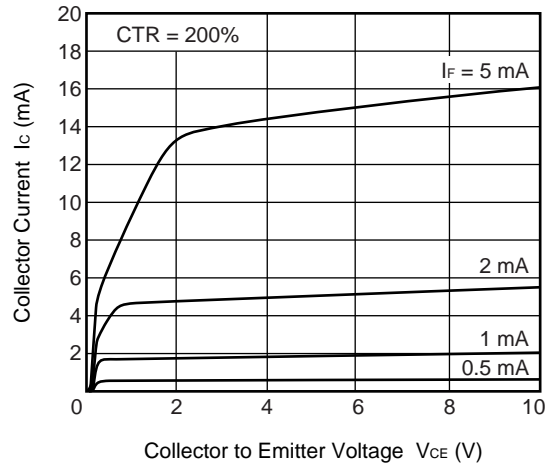
TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



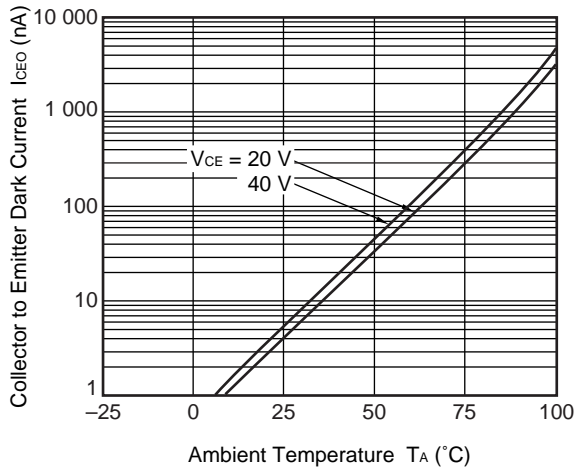
FORWARD CURRENT vs. FORWARD VOLTAGE



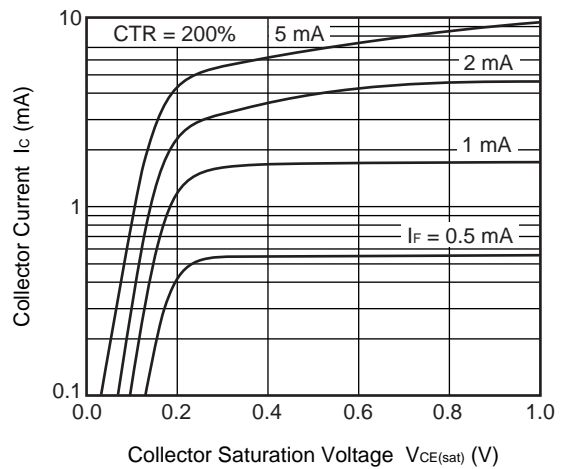
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE

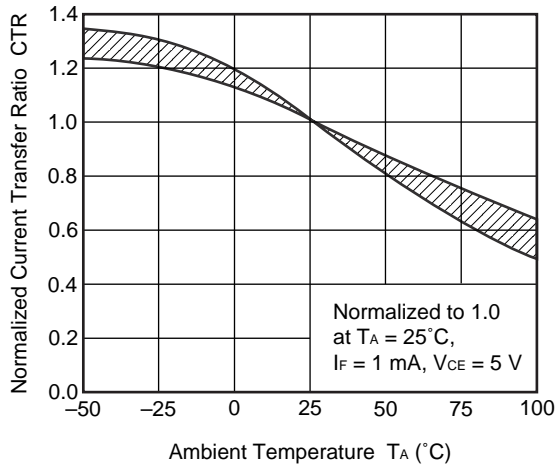


COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE

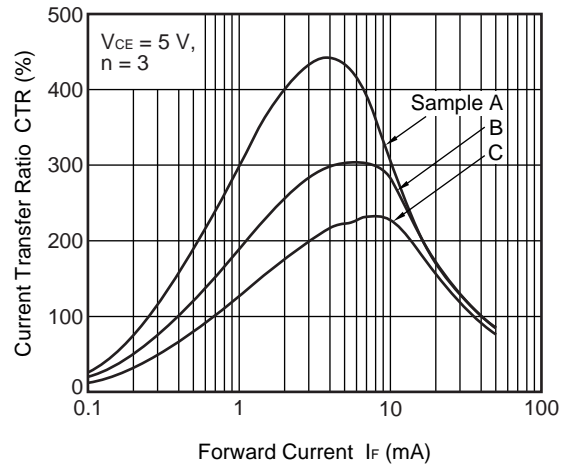


Remark The graphs indicate nominal characteristics.

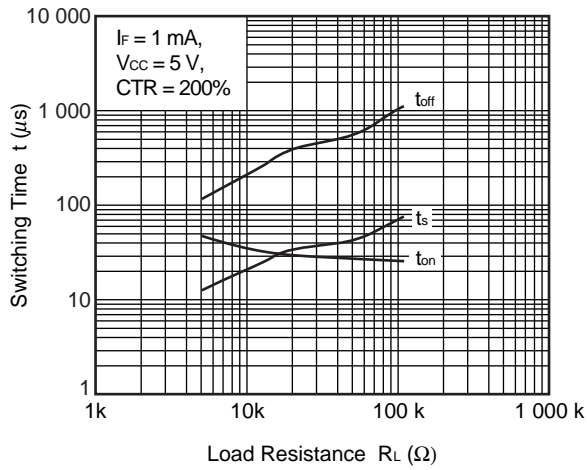
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



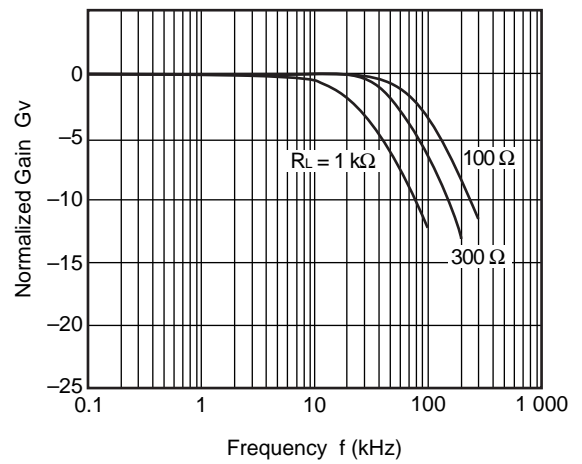
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



SWITCHING TIME vs. LOAD RESISTANCE



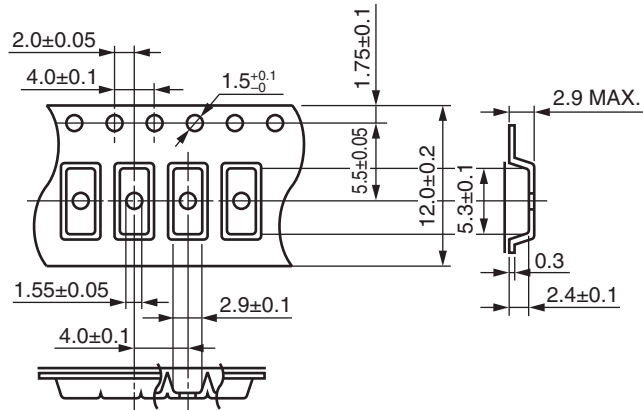
FREQUENCY RESPONSE



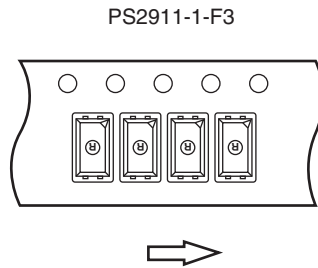
Remark The graphs indicate nominal characteristics.

<R> TAPING SPECIFICATIONS (UNIT: mm)

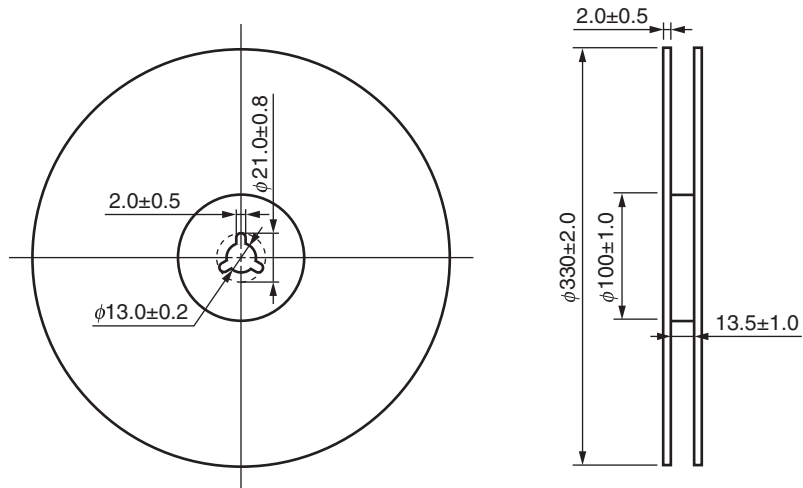
Outline and Dimensions (Tape)



Tape Direction

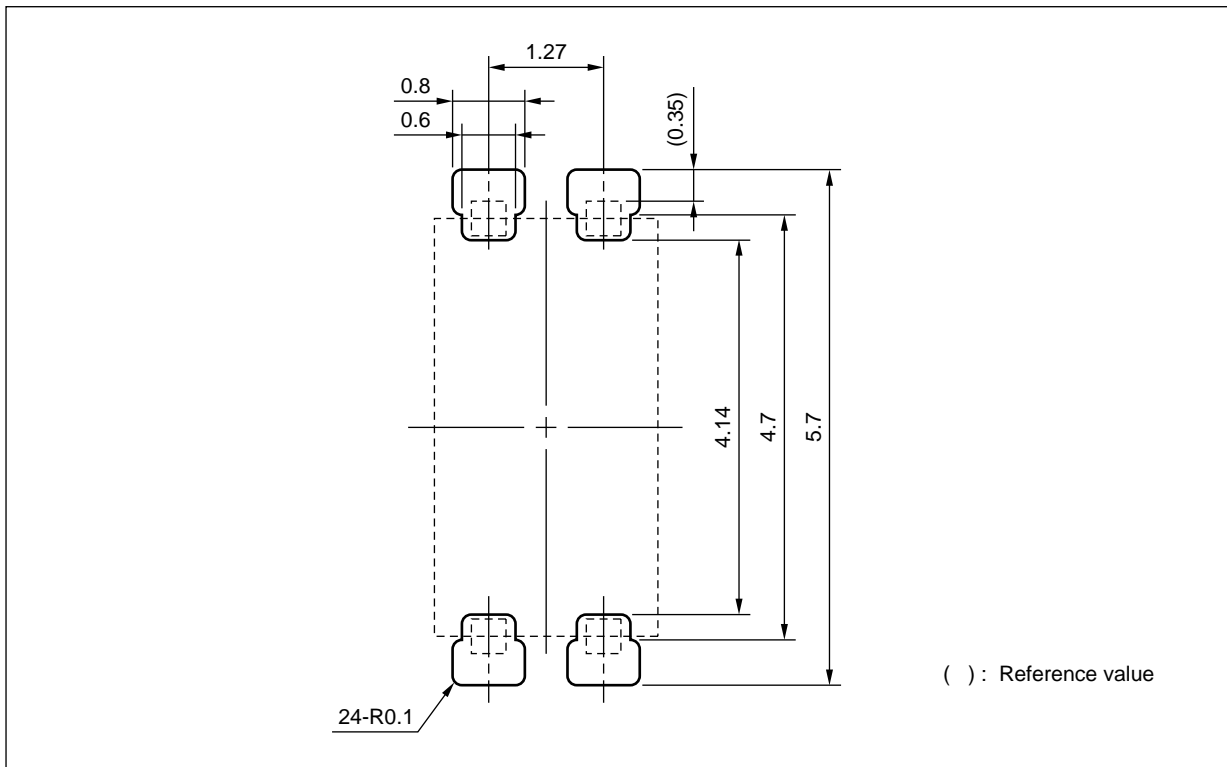


Outline and Dimensions (Reel)



Packing: 3 500 pcs/reel

RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)



Remark This drawing is considered to meet air and outer creepage distance 4.0 mm minimum. All dimensions in this figure must be evaluated before use.

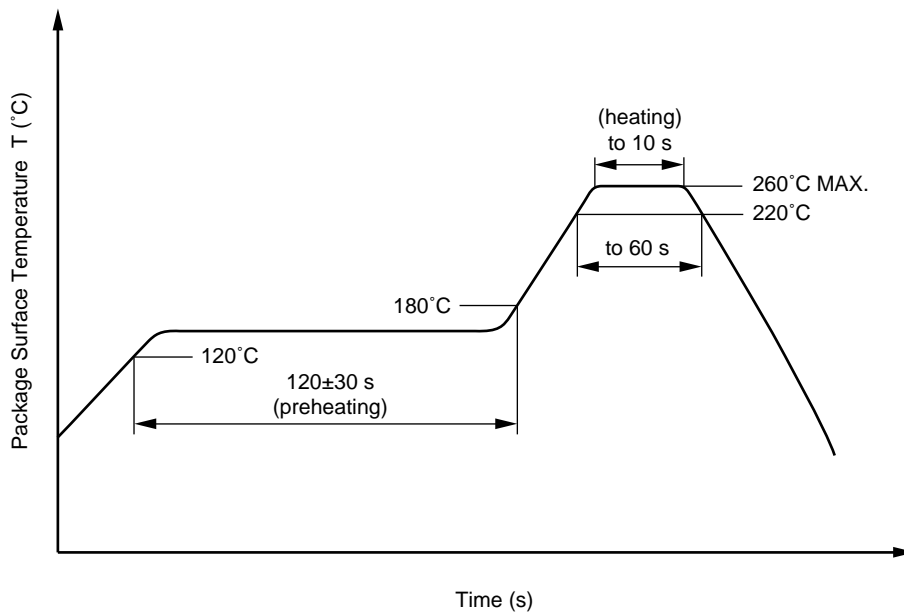
NOTES ON HANDLING

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 or less
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% or less 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% or less is recommended.)

(3) Soldering by Soldering Iron

- Peak Temperature (lead part temperature) 350°C or below
- Time (each pin) 3 seconds or less
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% or less 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

- 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.

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} | 570 912 | 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} | 1 068 | V_{peak} |
| Highest permissible overvoltage | U_{TR} | 4 000 | V_{peak} |
| Degree of pollution (DIN EN 60664-1 VDE0110 Part 1) | | 2 | |
| 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 | °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**PS2911-1 Data Sheet**

| Rev. | Date | Description | |
|-------------|---|--------------------|---|
| | | Page | Summary |
| 2.00 | May 25, 2006 | – | First edition issued |
| 3.00 | May 24, 2013 | Throughout | Renesas format is applied to this data sheet. |
| | | p.1 | Modification of FEATURES |
| | | p.2 | Modification of PACKAGE DIMENSIONS |
| | | | Modification of MARKING EXAMPLE |
| | | p.3 | Modification of ORDERING INFORMATION |
| | | p.4 | Modification of ELECTRICAL CHARACTERISTICS |
| | | p.7 | Modification of TAPING SPECIFICATIONS |
| | | p.9 | Modification of NOTES ON HANDLING |
| p.11 | Addition of SPECIFICATION OF VDE MARKS LICENSE DOCUMENT | | |
| 4.00 | Jan 21, 2016 | p.1 | Update of FEATURES - Safety standards |
| | | p.3 | Modification of ORDERING INFORMATION |
| | | p.7 | Modification of TAPING SPECIFICATIONS |

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California Eastern Laboratories, Inc.

4590 Patrick Henry Drive, Santa Clara, California 95054-1817, U.S.A.
Tel: +1-408-919-2500, Fax: +1-408-988-0279

Renesas Electronics Europe Limited

Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-585-100, Fax: +44-1628-585-900

Renesas Electronics Europe GmbH

Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.

Room 1709, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100191, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.

Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, P. R. China 200333
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited

Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022

Renesas Electronics Taiwan Co., Ltd.

13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.

80 Bendemeer Road, Unit #06-02, Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.

Unit 1207, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics India Pvt. Ltd.

No.777C, 100 Feet Road, HAL II Stage, Indiranagar, Bangalore, India
Tel: +91-80-67208700, Fax: +91-80-67208777

Renesas Electronics Korea Co., Ltd.

12F., 234 Teheran-ro, Gangnam-Gu, Seoul, 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141