PS2915-1

R08DS0112EJ0100
Rev.1.00
Nov 01, 2013

HIGH CTR, AC INPUT RESPONSE TYPE 4-PIN ULTRA SMALL FLAT-LEAD PHOTOCOUPLER

DESCRIPTION

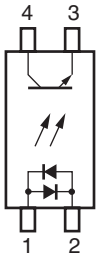
The PS2915-1 is an optically coupled isolator containing GaAs light emitting diodes and an NPN silicon phototransistor in one package for high density mounting applications.

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 mA, V_{CE} = 5 V)
- High isolation voltage (BV = 2 500 Vr.m.s.)
- Ordering number of taping product: PS2915-1-F3, 3 500 pcs/reel
- <R> Safety standards
  - UL approved: No. E72422
  - BSI approved (BS EN 60065, BS EN 60950)
  - DIN EN 60747-5-5 (VDE 0884-5) approved (Option)

PIN CONNECTION
(TOP VIEW)



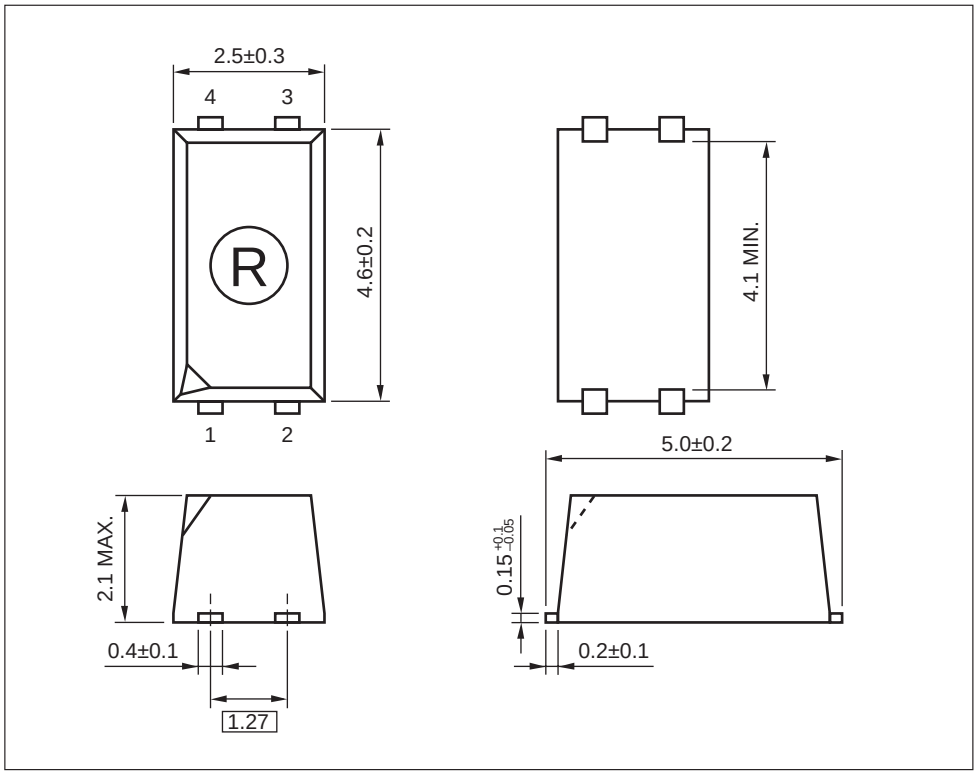
1. Anode, Cathode
2. Cathode, Anode
3. Emitter
4. Collector

APPLICATIONS

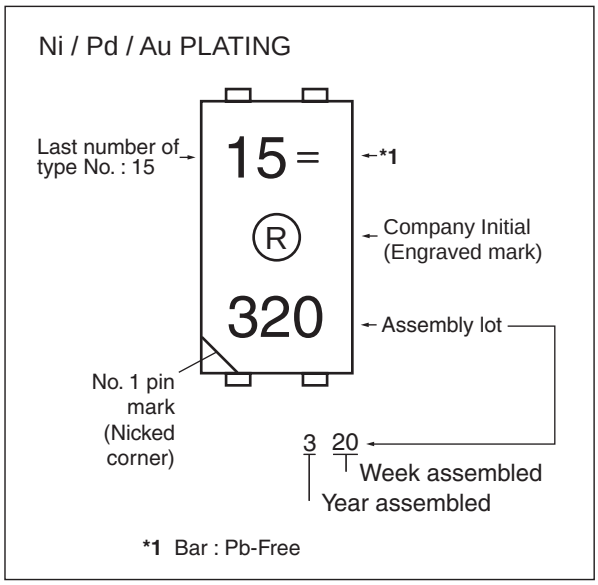
- DC/DC converter
- Modem/PC card

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.

<R> PACKAGE DIMENSIONS (UNIT: mm)



<R> 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
PS2915-1	PS2915-1-AX	Pb-Free (Ni/Pd/Au)	50 pcs (Tape 50 pcs cut)	Standard products (UL, BSI approved)	PS2915-1
PS2915-1-F3	PS2915-1-F3-AX		Embossed Tape 3 500 pcs/reel		
PS2915-1-V	PS2915-1-V-AX		50 pcs (Tape 50 pcs cut)	DIN EN60747-5-5 (VDE 0884-5) Approved(Option)	
PS2915-1-V-F3	PS2915-1-V-F3-AX		Embossed Tape 3 500 pcs/reel		

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	ΔI_F/°C	0.5	mA/°C
	Peak Forward Current*1	I_{FP}	±0.5	A
	Power Dissipation	P_D	60	mW
Transistor	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	ΔP_C/°C	1.2	mW/°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%

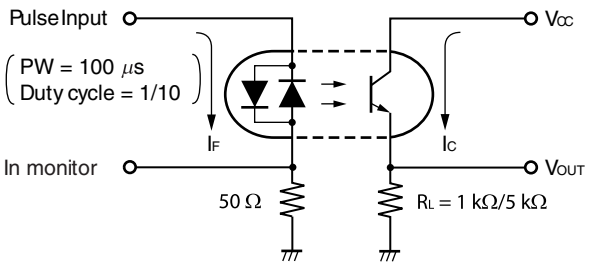
*2. AC voltage for 1 minute at T_A = 25°C, RH = 60% between input and output
Pins 1-2 shorted together, 3-4 shorted together.

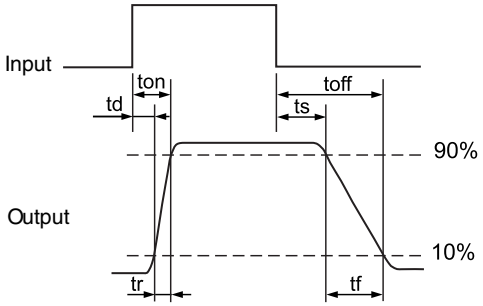
<R> ELECTRICAL CHARACTERISTICS (T_A = 25°C)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	V_F	I_F = ±1 mA	0.9	1.1	1.3	V
	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			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 kVDC	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 = 1 kΩ		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		μs
	Turn-off Time*2	t_{off}			120		μs

Notes: *1 CTR rank
N : 100 to 400 (%)

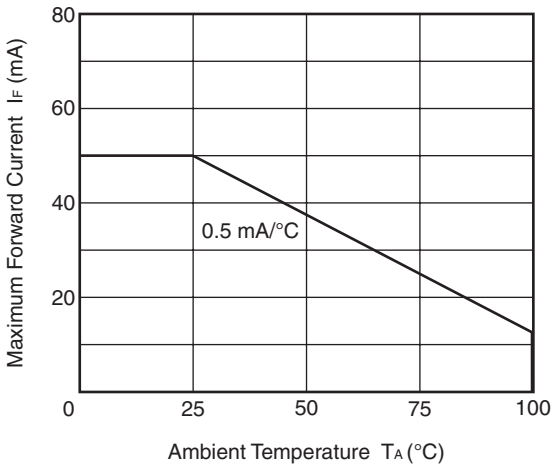
<R> *2 Test circuit for switching time



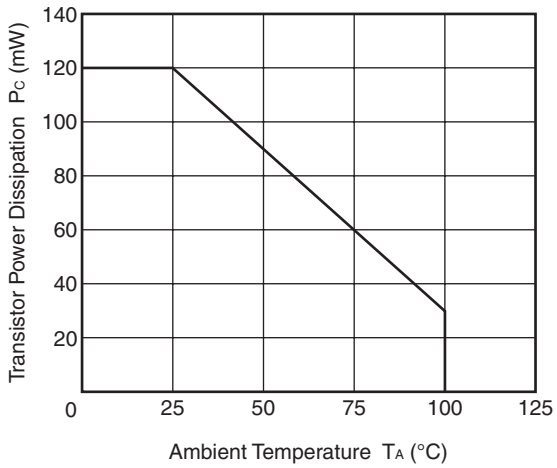


TYPICAL CHARACTERISTICS (T_A = 25°C, unless otherwise specified)

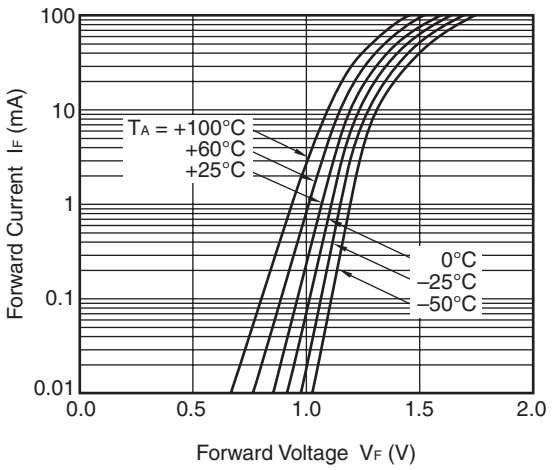
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



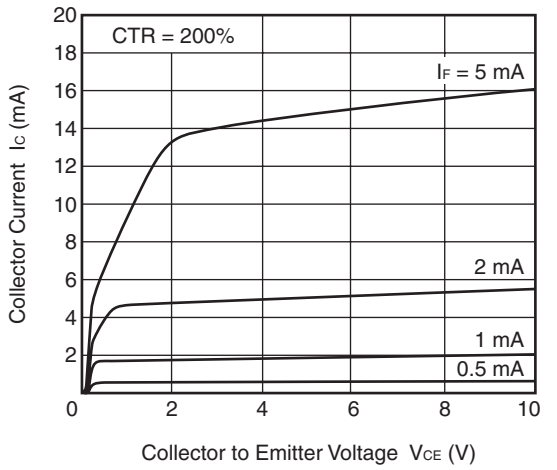
TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



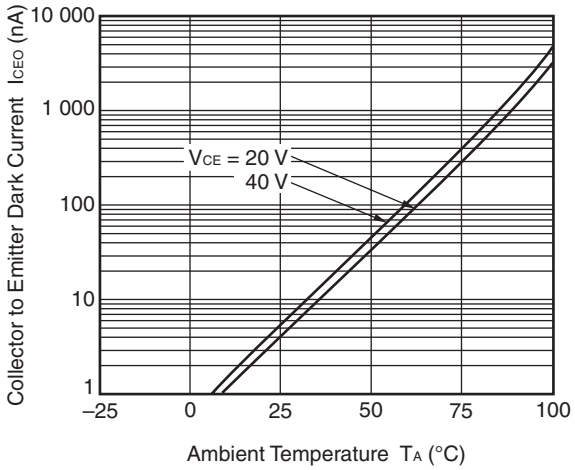
FORWARD CURRENT vs. FORWARD VOLTAGE



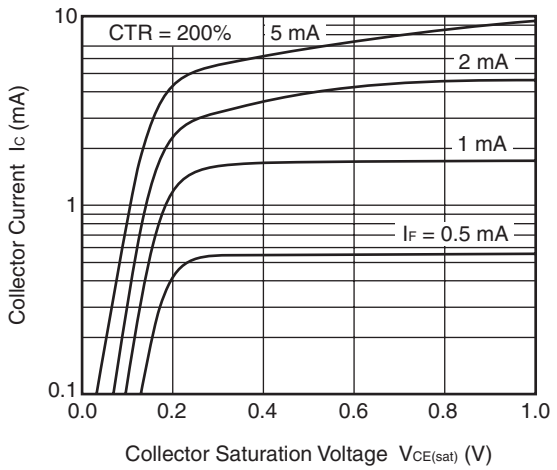
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE



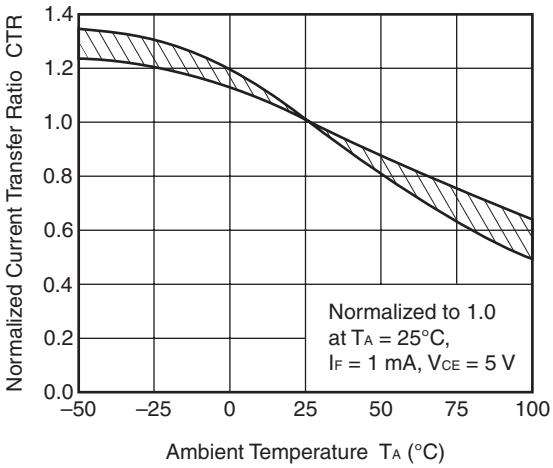
COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE



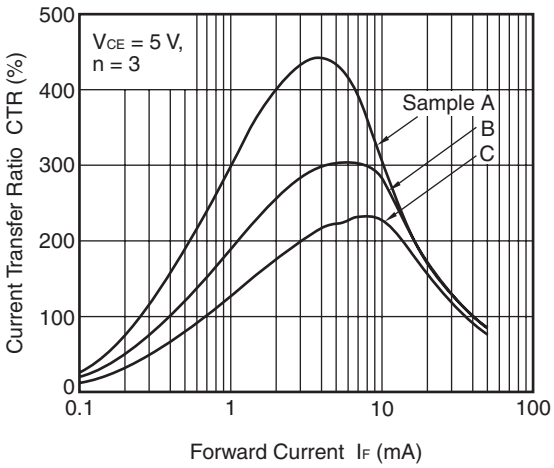
Remark The graphs indicate nominal characteristics.

<R>

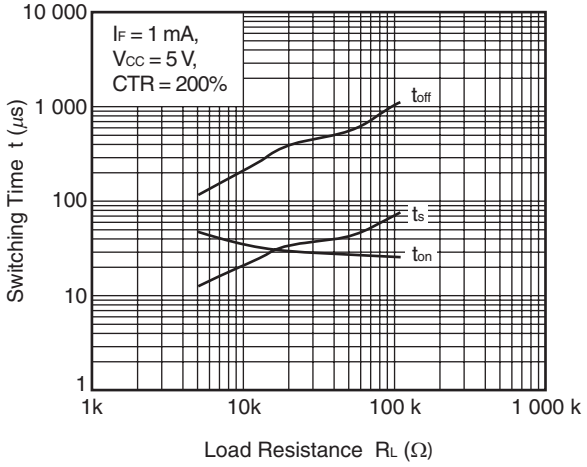
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



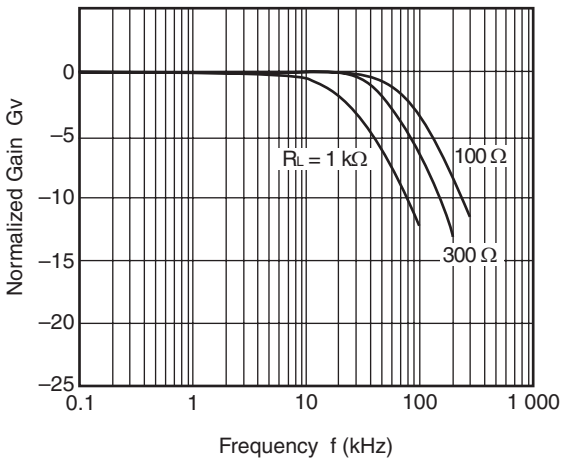
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



SWITCHING TIME vs. LOAD RESISTANCE



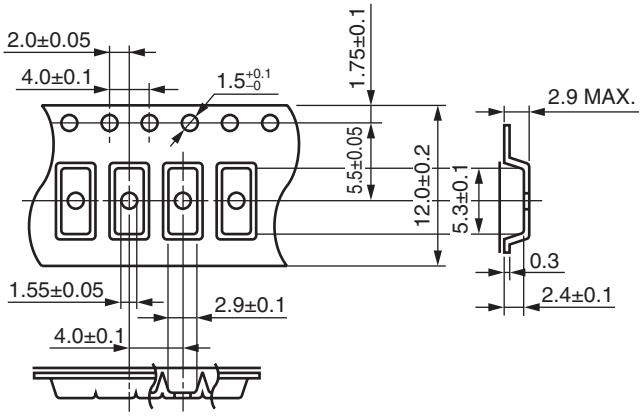
FREQUENCY RESPONSE



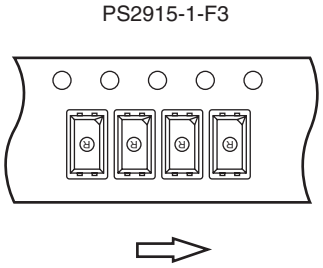
Remark The graphs indicate nominal characteristics.

<R> TAPING SPECIFICATIONS (UNIT: mm)

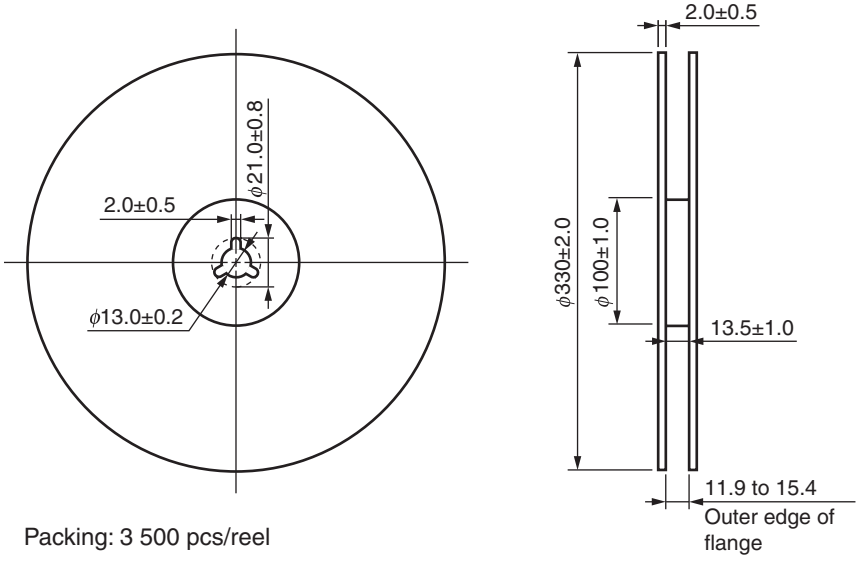
Outline and Dimensions (Tape)



Tape Direction

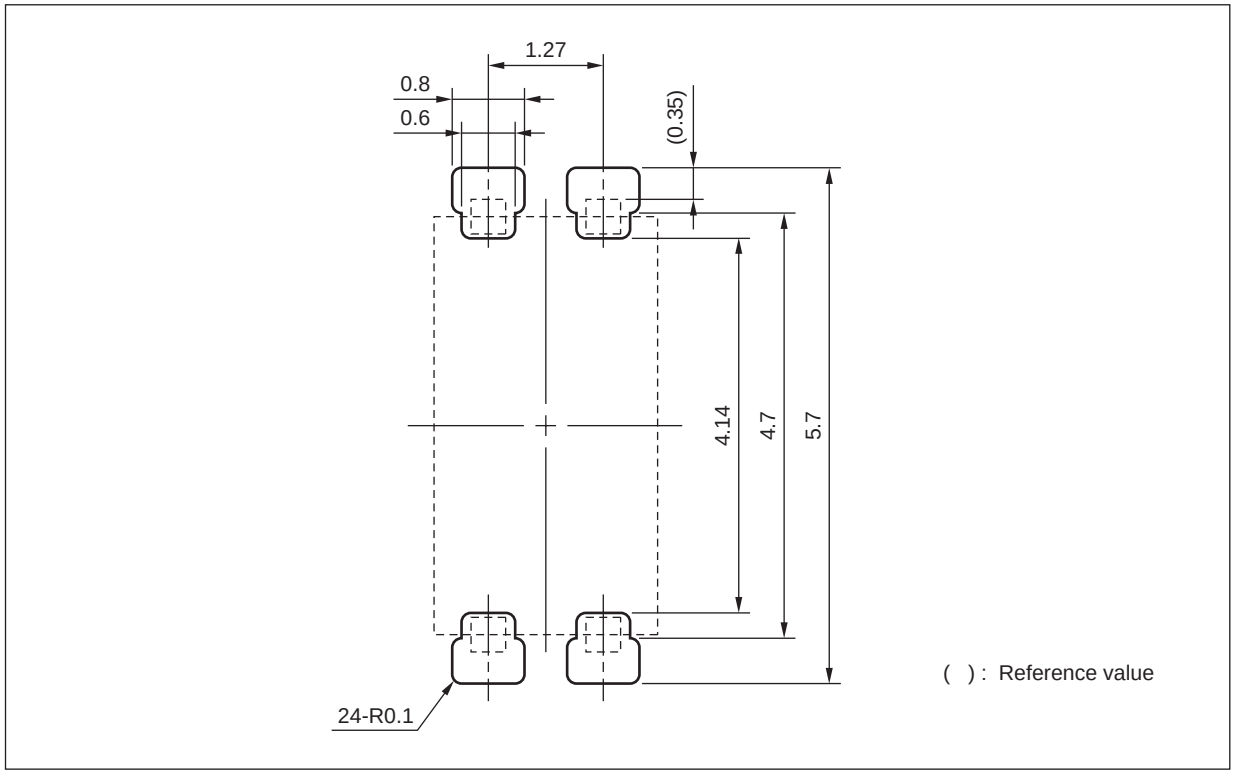


Outline and Dimensions (Reel)



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.

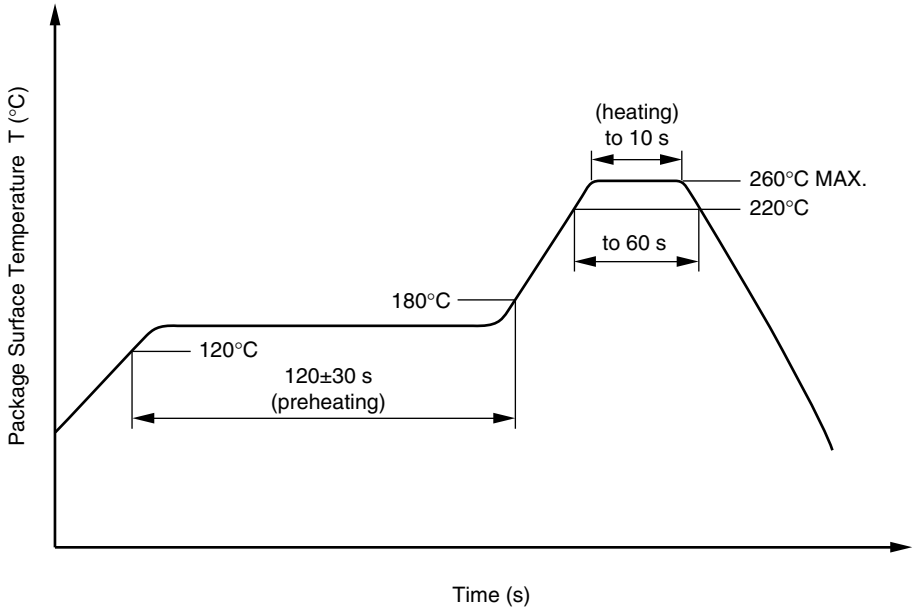
NOTES ON HANDLING

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
• 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.)

<R> (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.)

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 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 × $U_{IORM.}$, P_d < 5 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 × $U_{IORM.}$, P_d < 5 pC	U_{pr}	1068	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 V dc at T_A = 25°C V_{IO} = 500 V dc at T_A MAX. at least 100°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, Psi = 0) Power (output or total power dissipation) Isolation resistance V_{IO} = 500 V dc at T_A = Tsi	 Tsi Isi Psi Ris MIN.	 150 300 500 10^9	 °C mA mW Ω

Caution GaAs Products	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. • 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. 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	PS2915-1 Data Sheet

Rev.	Date	Description	
		Page	Summary
2.00	May 25, 2006	–	First edition issued
1.00	Nov 01, 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.6	Modification of TYPICAL CHARACTERISTICS
		p.7	Modification of TAPING SPECIFICATIONS
		p.9	Modification of NOTES ON HANDLING
		p.11	Addition of SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
2. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
3. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
4. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from such alteration, modification, copy or otherwise misappropriation of Renesas Electronics product.
5. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The recommended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.
   "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots etc.
   "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; and safety equipment etc.
   Renesas Electronics products are neither intended nor authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems, surgical implantations etc.), or may cause serious property damages (nuclear reactor control systems, military equipment etc.). You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application for which it is not intended. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for which the product is not intended by Renesas Electronics.
6. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
7. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or systems manufactured by you.
8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
9. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You should not use Renesas Electronics products or technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. When exporting the Renesas Electronics products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations.
10. It is the responsibility of the buyer or distributor of Renesas Electronics products, who distributes, disposes of, or otherwise places the product with a third party, to notify such third party in advance of the contents and conditions set forth in this document, Renesas Electronics assumes no responsibility for any losses incurred by you or third parties as a result of unauthorized use of Renesas Electronics products.
11. This document may not be reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

RENESAS

SALES OFFICES Renesas Electronics Corporation http://www.renesas.com

Refer to "http://www.renesas.com/" for the latest and detailed information.

California Eastern Laboratories, Inc.
4590 Patrick Henry Drive, Santa Clara, California 95054, 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: +44-1628-651-700, Fax: +44-1628-651-804

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-65030, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd., Pudong District, Shanghai 200120, China
Tel: +86-21-5877-1818, Fax: +86-21-6887-7858 / -7898

Renesas Electronics Hong Kong Limited
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2886-9318, Fax: +852 2886-9022/9044

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei, 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 906, 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 Korea Co., Ltd.
11F., Samik Lavied' or Bldg., 720-2 Yeoksam-Dong, Kangnam-Ku, Seoul 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

[Colophon 2.2]