PS2701-1

HIGH ISOLATION VOLTAGE SOP MULTI PHOTOCOUPLER

R08DS0094EJ0400
Rev.4.00
Jan 23, 2013

DESCRIPTION

The PS2701-1 is an optically coupled isolator containing a GaAs light emitting diode and an NPN silicon phototransistor.

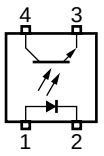
This package is SOP (Small Outline Package) type and has shield effect to cut off ambient light.

It is designed for high density mounting applications.

FEATURES

- High isolation voltage (BV = 3 750 Vr.m.s.)
- SOP (Small Outline Package) type
- High-speed switching (t_r = 3 μs TYP., t_f = 5 μs TYP.)
- <R> Ordering number of taping product: PS2701-1-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)
  - SEMKO, NEMKO, DEMKO, FIMKO approved (EN 60065, EN 60950)
  - DIN EN 60747-5-5 (VDE 0884-5) approved (Option)

PIN CONNECTION
(Top View)



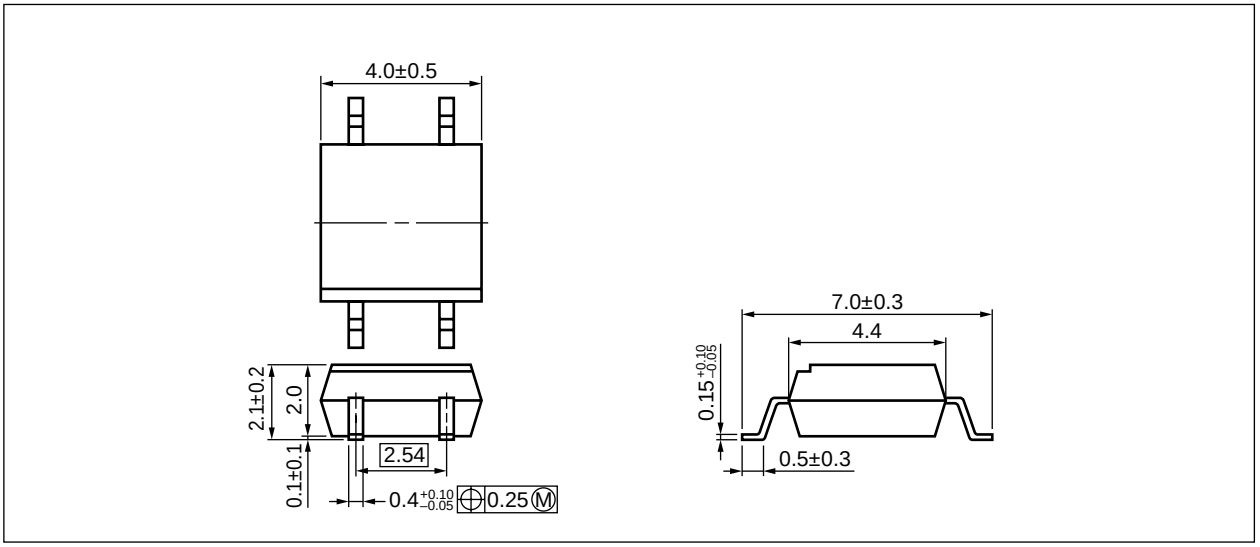
1. Anode
2. Cathode
3. Emitter
4. Collector

APPLICATIONS

- Hybrid IC
- Measuring instruments
- Power supply
- 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.

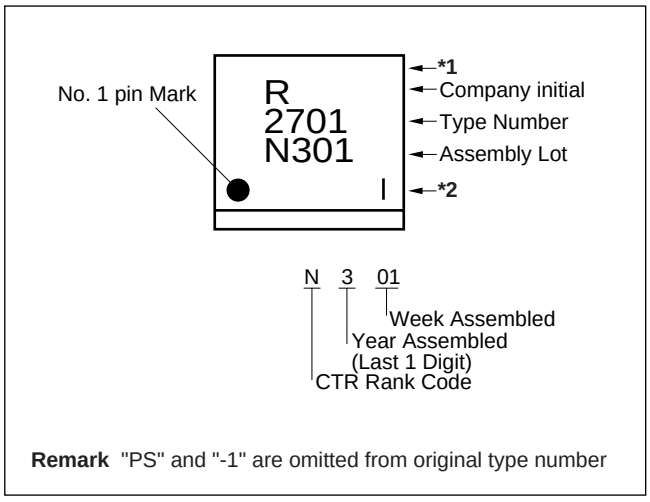
PACKAGE DIMENSIONS (UNIT: mm)



<R> PHOTOCOUPLER CONSTRUCTION

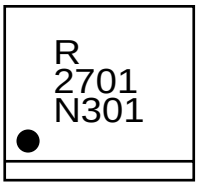
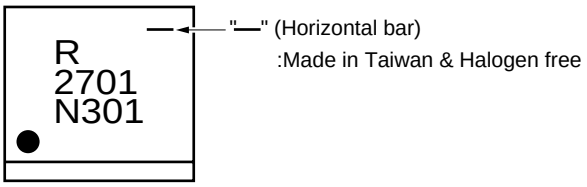
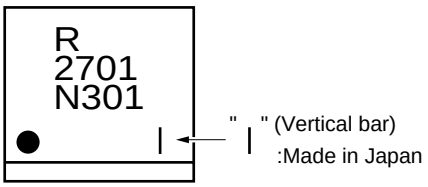
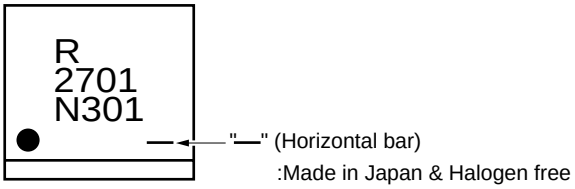
Parameter	Unit (MIN.)
Air Distance	5 mm
Outer Creepage Distance	5 mm
Inner Creepage Distance	2.5 mm
Isolation Distance	0.3 mm

<R> MARKING EXAMPLE



Remark "PS" and "-1" are omitted from original type number

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

Made in Taiwan (*1: No indication *2: No indication)	
Made in Taiwan **Halogen free** (*1: "— " (Horizontal bar) *2: No indication)	
Made in Japan (*1: No indication *2: " | " (Vertical bar))	
Made in Japan **Halogen free** (*1: No indication *2: "— " (Horizontal bar))	

<R> ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number*1
PS2701-1-F3	PS2701-1-F3-A	Pb-Free	Embossed Tape 3 500 pcs/reel	Standard products (UL, BSI, CSA, SEMKO, NEMKO, DEMKO, FIMKO approved)	PS2701-1
PS2701-1-V-F3	PS2701-1-V-F3-A		Embossed Tape 3 500 pcs/reel	DIN EN 60747-5-5 (VDE 0884-5) Approved (Option)	
PS2701-1-F3	PS2701-1Y-F3-A	Special version (Pb-Free and Halogen Free)	Embossed Tape 3 500 pcs/reel	Standard products (UL, BSI, CSA, SEMKO, NEMKO, DEMKO, FIMKO approved)	PS2701-1
PS2701-1-V-F3	PS2701-1Y-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	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	80	mA
	Power Dissipation Derating	ΔP_C/°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

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

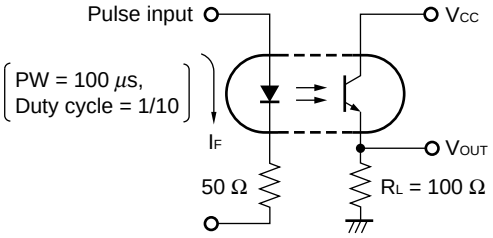
*2. AC voltage for 1 minute at T_A = 25°C, RH = 60% between input and output.
Pins 1-2 shorted together, 3-4 shorted together.

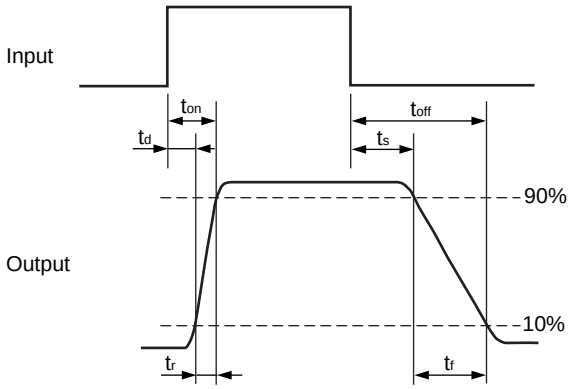
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

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			100	nA
Coupled	Current Transfer Ratio (I_C/I_F)*1	CTR	I_F = 5 mA, V_{CE} = 5 V	50	100	300	%
	Collector Saturation Voltage	$V_{CE (sat)}$	I_F = 10 mA, I_C = 2 mA			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		3		μs
	Fall Time*2	t_f			5		
<R>	Turn-on Time*2	t_{on}			5		
<R>	Turn-off Time*2	t_{off}			4		

Note: *1. CTR rank
P: 150 to 300 (%)
L: 100 to 300 (%)
M: 50 to 150 (%)

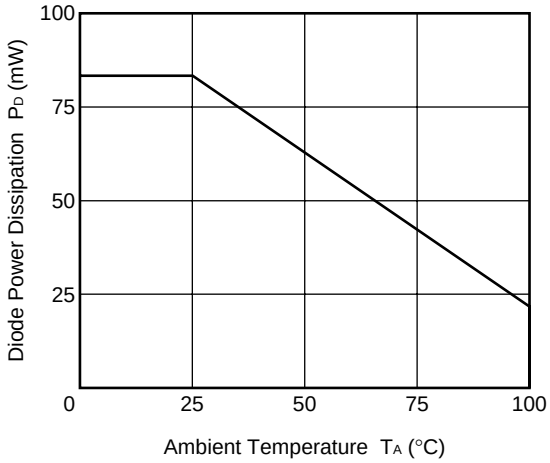
*2. Test Circuit for Switching Time



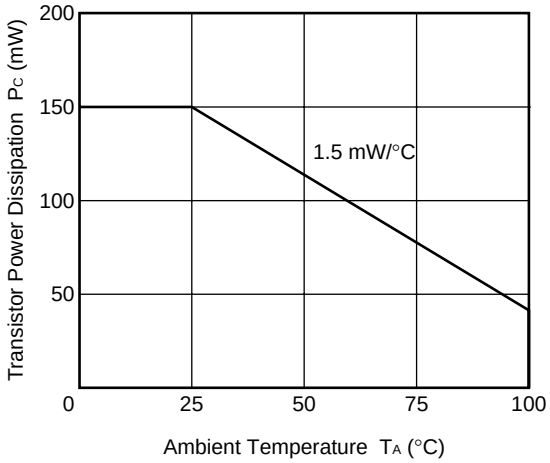


TYPICAL CHARACTERISTICS (T_A = 25°C, unless otherwise specified)

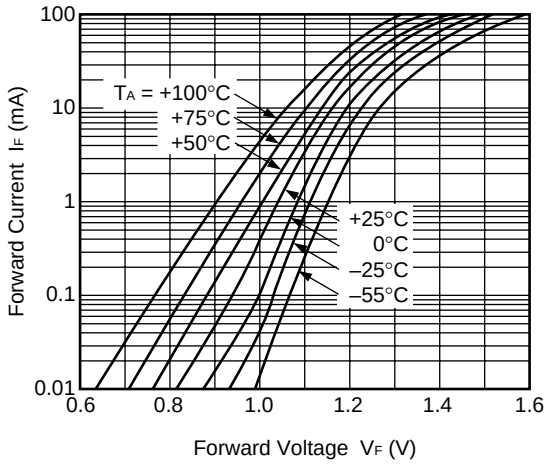
DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE



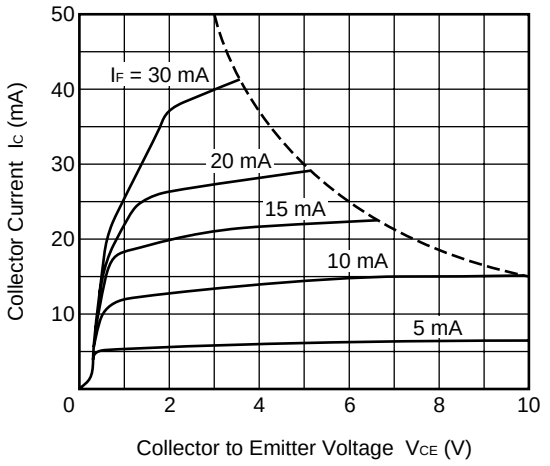
TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



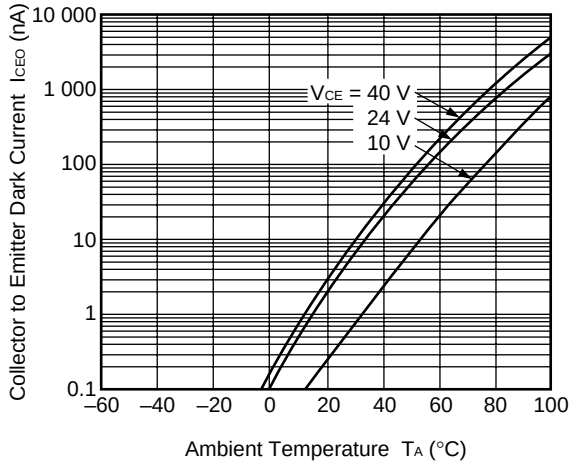
FORWARD CURRENT vs. FORWARD VOLTAGE



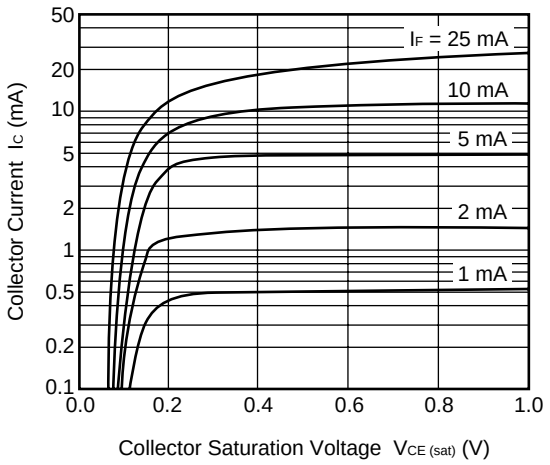
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE

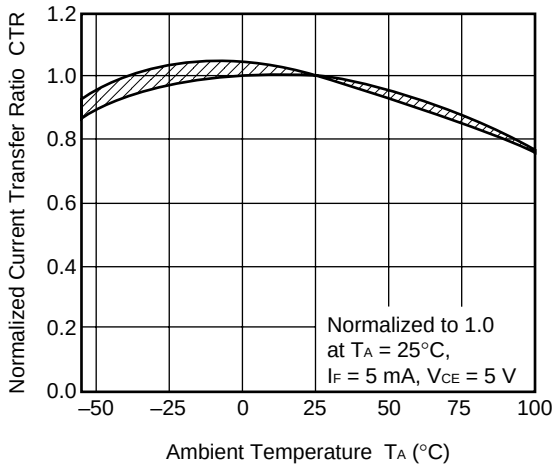


COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE

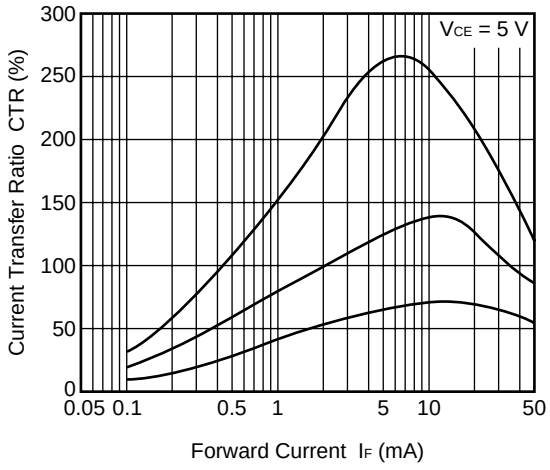


Remark The graphs indicate nominal characteristics.

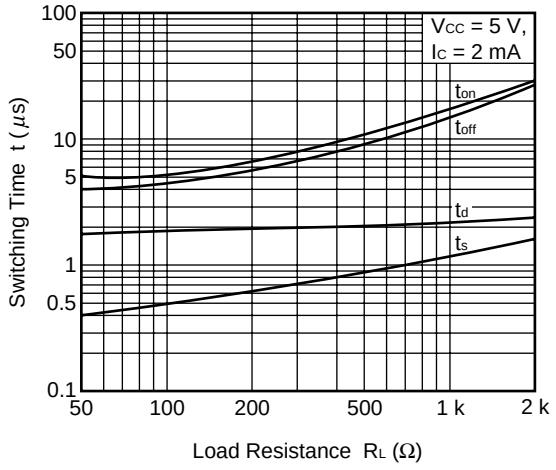
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



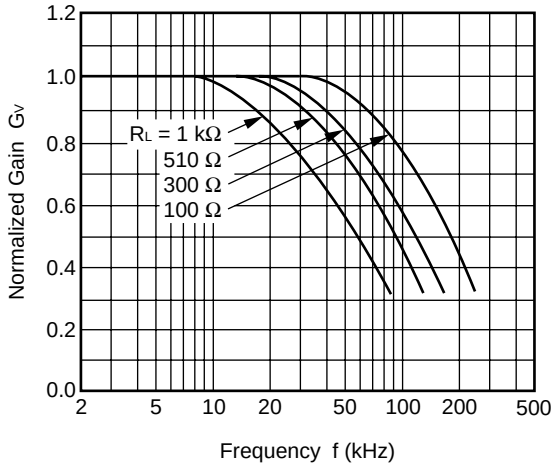
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



SWITCHING TIME vs. LOAD RESISTANCE

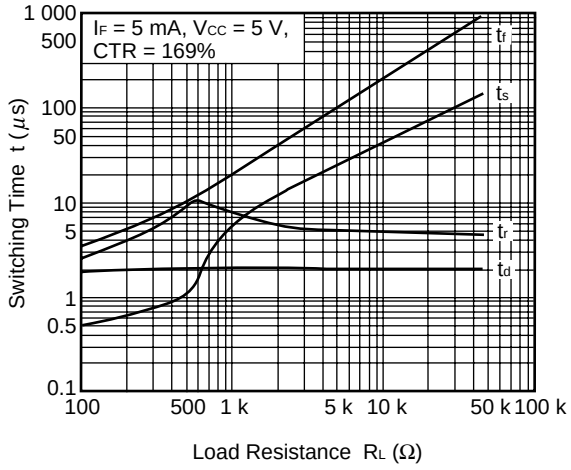


FREQUENCY RESPONSE



SWITCHING TIME vs. LOAD RESISTANCE

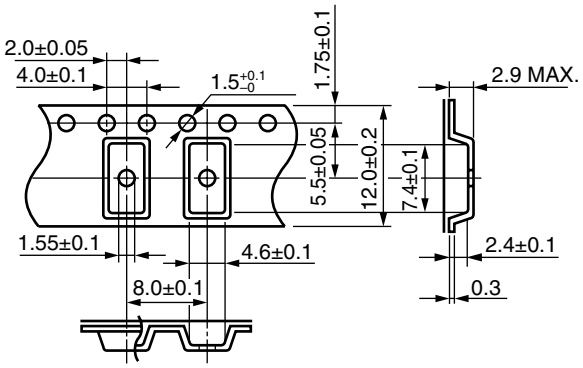
<R>



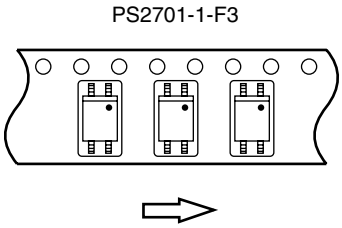
Remark The graphs indicate nominal characteristics.

<R> TAPING SPECIFICATIONS (UNIT: mm)

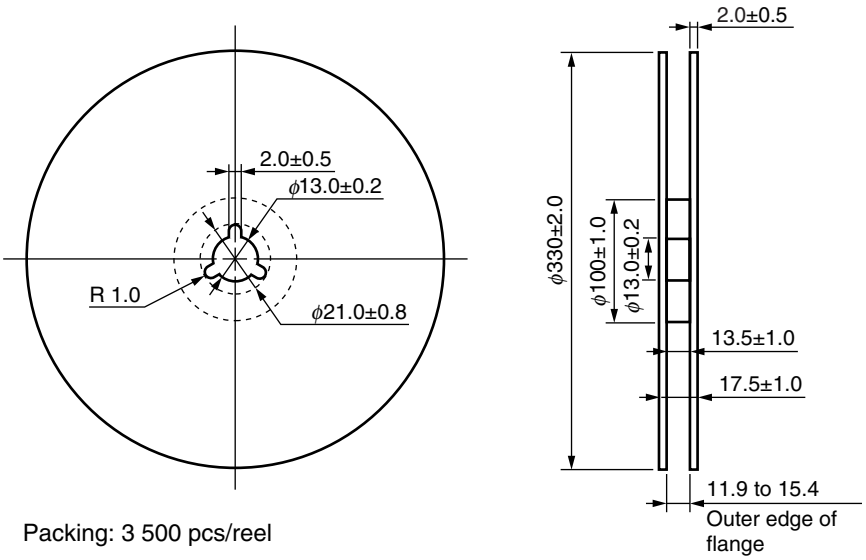
Outline and Dimensions (Tape)



Tape Direction

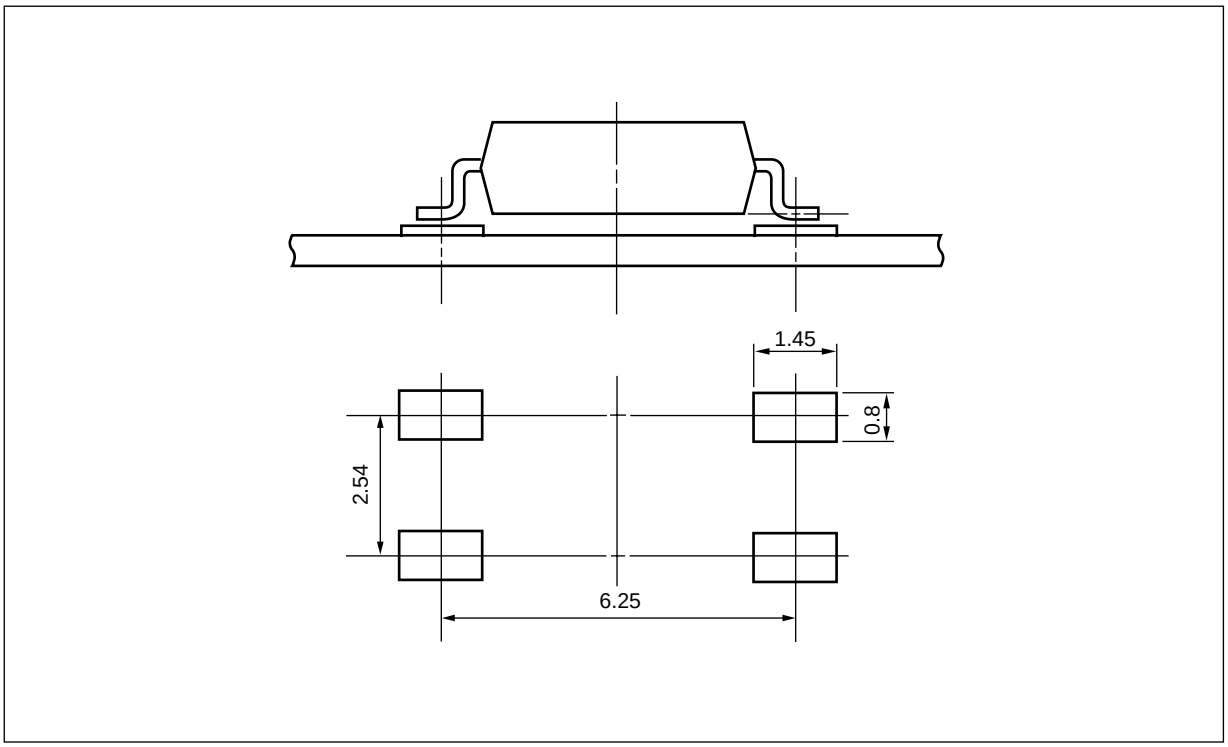


Outline and Dimensions (Reel)



Packing: 3 500 pcs/reel

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



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

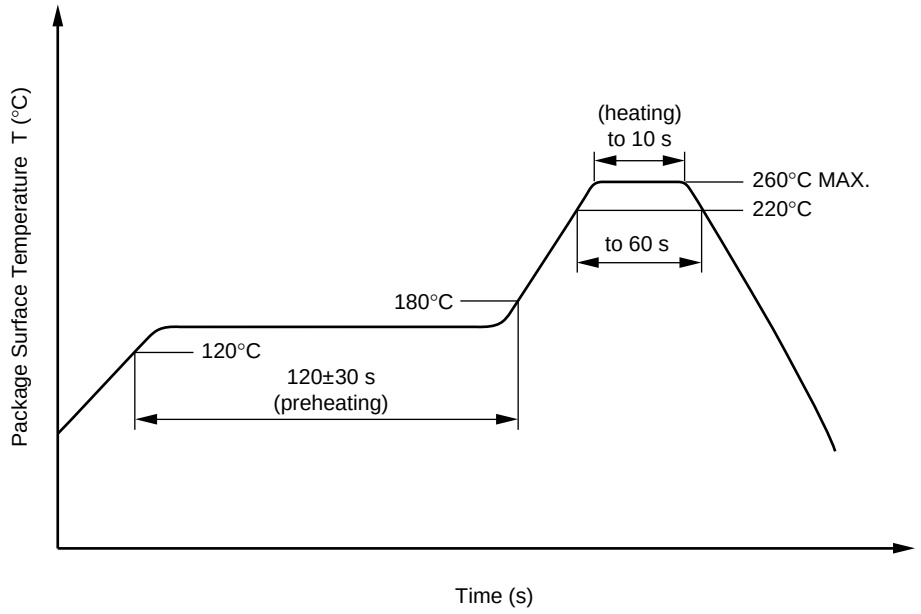
NOTES ON HANDLING

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

<R>

(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 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
<R>	Climatic test class (IEC 60068-1/DIN EN 60068-1)		55/100/21	
	Dielectric strength maximum operating isolation voltage	U_{IORM}	707	V_{peak}
<R>	Test voltage (partial discharge test, procedure a for type test and random test)	U_{pr}	1 131	V_{peak}
<R>	$U_{pr} = 1.6 \times U_{IORM}$, $P_d < 5$ pC			
	Test voltage (partial discharge test, procedure b for all devices) $U_{pr} = 1.875 \times U_{IORM}$, $P_d < 5$ pC	U_{pr}	1 325	V_{peak}
	Highest permissible overvoltage	U_{TR}	6 000	V_{peak}
<R>	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
<R>	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	PS2701-1 Data Sheet

Rev.	Date	Description	
		Page	Summary
1.00	Mar 31, 2003	–	This data sheet was released as PN10240EJ01V0DS
4.00	Jan 23, 2013	Throughout	Renesas format is applied to this data sheet.
		p.1	PS2701-1-F4 is deleted form Ordering number of taping product.
		p.1	The safety standards are revised.
		p.2	PHOTOCOUPLER CONSTRUCTION is added.
		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.8	PS2701-1-F4 is deleted form 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 values of “Climatic test class (IEC 60068-1/DIN EN 60068-1)” is changed from “55/110/21” to “55/100/21”.
			The values of Upr is changed from 1060 to 1131 and the factor of U_{IORM} is changed from 1.5 to 1.6.
			“Clearance distance” and “Creepage distance” are deleted form table.
			The values of “Operating temperature range” is changed from “–55 to +110” to “–55 to +100”.

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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]