

PS2801-1, PS2801-4

R08DS0096EJ0500

Rev.5.00

HIGH ISOLATION VOLTAGE SSOP PHOTOCOUPLER

Jan 23, 2013

DESCRIPTION

The PS2801-1 and PS2801-4 are optically coupled isolators containing a GaAs light emitting diode and an NPN silicon phototransistor in a plastic SSOP for high density applications.

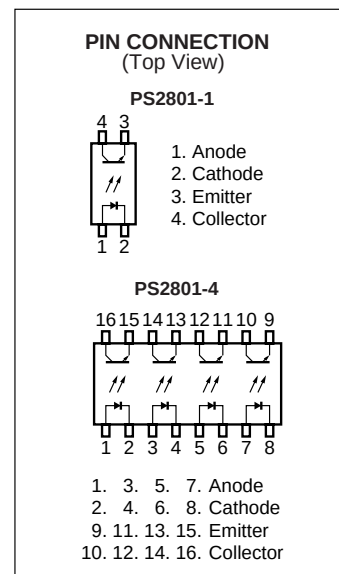
This package has shield effect to cut off ambient light.

FEATURES

- High isolation voltage ($BV = 2\,500\text{ V}_{r.m.s.}$)
- Small and thin package (4,16-pin SSOP, Pin pitch 1.27 mm)
- High collector to emitter voltage ($V_{CEO} = 80\text{ V}$)
- High-speed switching ($t_r = 3\text{ }\mu\text{s TYP.}$, $t_f = 5\text{ }\mu\text{s TYP.}$)
- <R> • Ordering number of tape product: PS2801-1-F3, PS2801-4-F3
- Pb-Free product
- <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

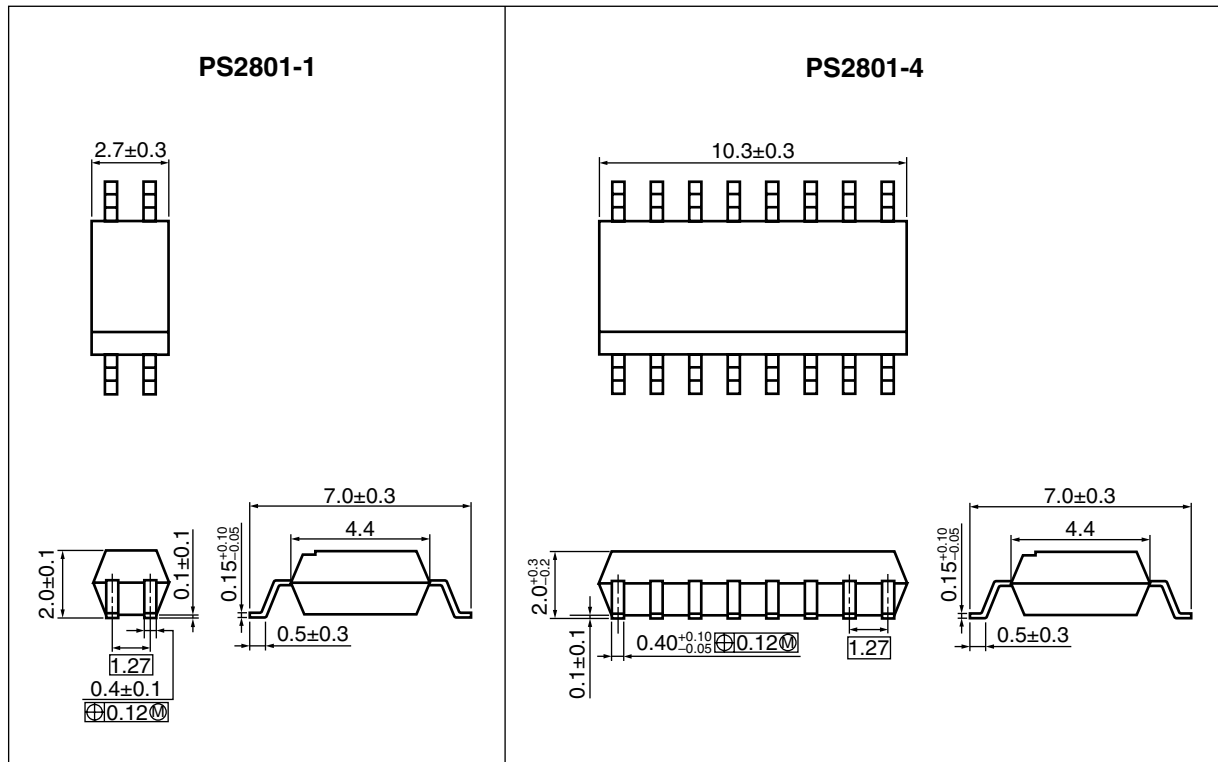
- Programmable logic controllers
- Measuring instruments
- Power supply
- Hybrid IC



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

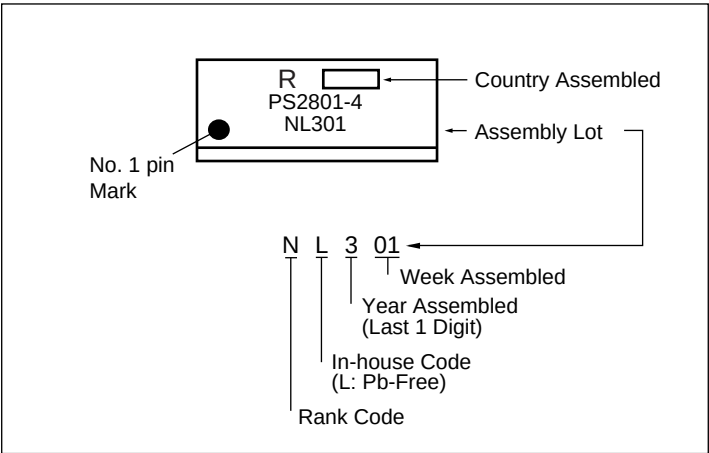
Parameter	Unit (MIN.)
Air Distance	4.5 mm
Outer Creepage Distance	4.5 mm
Inner Creepage Distance	2.5 mm
Isolation Thickness	0.1 mm

<R> MARKING EXAMPLE

PS2801-1

Made in Taiwan	Company initial R1 301 Last 1 numbers of type No. : 1 Assembly Lot 301 Week Assembled Year Assembled (Last 1 digit)
Made in Taiwan Halogen free	R1 301 " " (Vertical bar) :Made in Taiwan & Halogen free
Made in Japan	R1 □301 "□" (Square) :Made in Japan
Made in Japan Halogen free	R1 —301 "—" (Horizontal bar) :Made in Japan & Halogen free

PS2801-4



<R> ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number ^{*1}
PS2801-1-F3	PS2801-1-F3-A	Pb-Free	Embossed Tape 3 500 pcs/reel	Standard products (UL, BSI, CSA approved)	PS2801-1
PS2801-1-V-F3	PS2801-1-V-F3-A		Embossed Tape 3 500 pcs/reel	DIN EN 60747-5-5 (VDE 0884-5) Approved (Option)	
PS2801-4-F3	PS2801-4-F3-A		Embossed Tape 2 500 pcs/reel	Standard products (UL, BSI, CSA approved)	PS2801-4
PS2801-4-V-F3	PS2801-4-V-F3-A		Embossed Tape 2 500 pcs/reel	DIN EN 60747-5-5 (VDE 0884-5) Approved (Option)	
PS2801-1-F3	PS2801-1Y-F3-A	Special version (Pb-Free and Halogen Free)	Embossed Tape 3 500 pcs/reel	Standard products (UL, BSI, CSA approved)	PS2801-1
PS2801-1-V-F3	PS2801-1Y-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 ($T_A = 25^\circ\text{C}$, unless otherwise specified)

Parameter		Symbol	Ratings		Unit
			PS2801-1	PS2801-4	
Diode	Forward Current (DC)	I_F	50		mA/ch
	Reverse Voltage	V_R	6		V
	Power Dissipation Derating	$\Delta P_D/^\circ\text{C}$	0.6	0.8	mW/°C
	Power Dissipation	P_D	60	80	mW/ch
	Peak Forward Current ^{*1}	I_{FP}	1		A/ch
Transistor	Collector to Emitter Voltage	V_{CEO}	80		V
	Emitter to Collector Voltage	V_{ECO}	6		V
	Collector Current	I_C	50		mA/ch
	Power Dissipation Derating	$\Delta P_D/^\circ\text{C}$	1.2		mW/°C
	Power Dissipation	P_C	120		mW/ch
Isolation Voltage ^{*2}		BV	2 500		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 $T_A = 25^\circ\text{C}$, RH = 60% between input and output.

Pins 1-2 shorted together, 3-4 shorted together (PS2801-1).

Pins 1-8 shorted together, 9-16 shorted together (PS2801-4).

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	V_F	$I_F = 5\text{ mA}$		1.1	1.4	V
	Reverse Current	I_R	$V_R = 5\text{ V}$			5	μA
	Terminal Capacitance	C_t	$V = 0\text{ V}, f = 1.0\text{ MHz}$		15		pF
Transistor	Collector to Emitter Dark Current	I_{CEO}	$V_{CE} = 80\text{ V}, I_F = 0\text{ mA}$			100	nA
Coupled	Current Transfer Ratio (I_C/I_F) ^{*1}	CTR	$I_F = 5\text{ mA}, V_{CE} = 5\text{ V}$	80		600	%
	Collector Saturation Voltage	$V_{CE(sat)}$	$I_F = 10\text{ mA}, I_C = 2\text{ mA}$			0.3	V
	Isolation Resistance	R_{I-O}	$V_{I-O} = 1.0\text{ kV}_{DC}$	10^{11}			Ω
	Isolation Capacitance	C_{I-O}	$V = 0\text{ V}, f = 1.0\text{ MHz}$		0.4		pF
	Rise Time ^{*2}	t_r	$V_{CC} = 5\text{ V}, I_C = 2\text{ mA}, R_L = 100\ \Omega$		3		μs
	Fall Time ^{*2}	t_f			5		
	Turn-on Time ^{*2}	t_{on}			6		
	Turn-off Time ^{*2}	t_{off}			5		

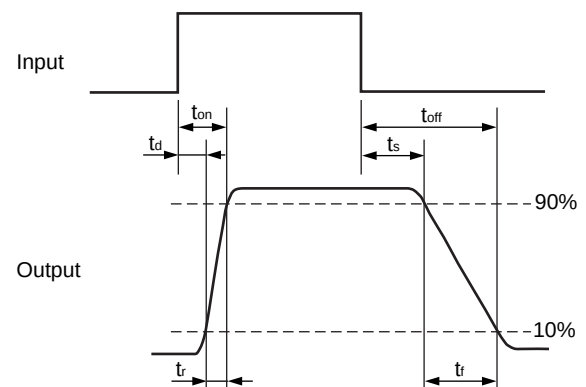
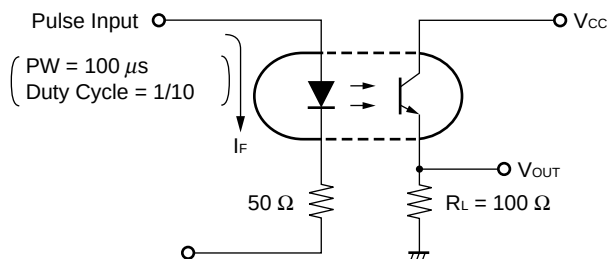
Notes: ^{*1} 1. CTR rank (PS2801-1 only)

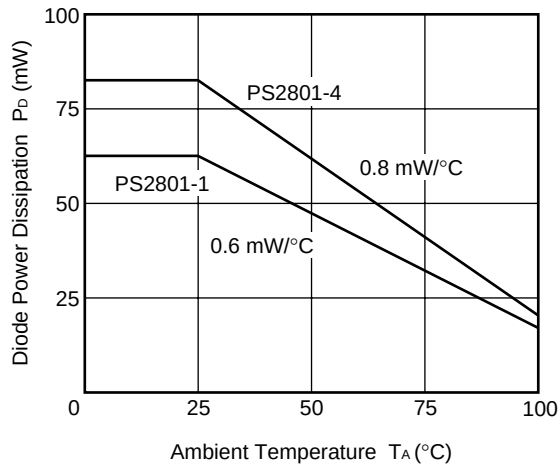
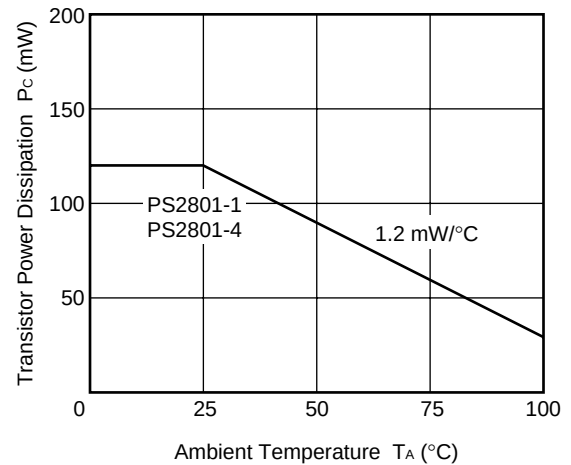
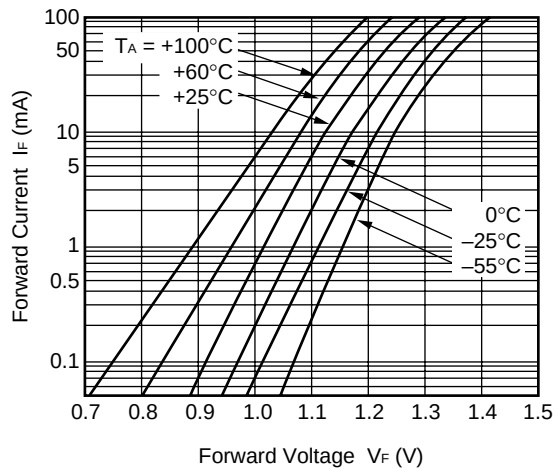
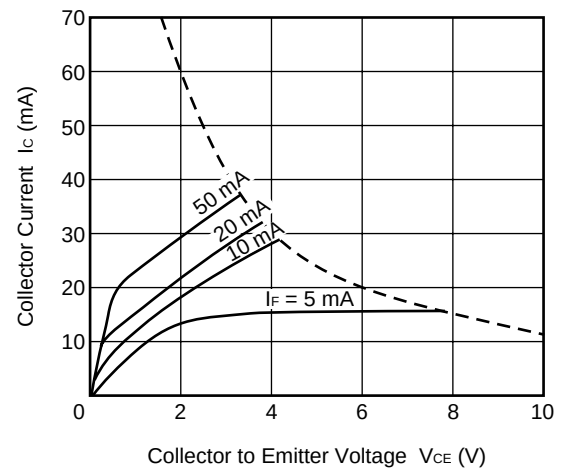
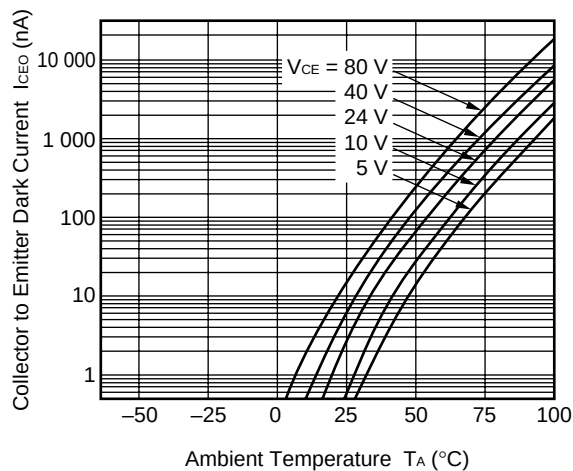
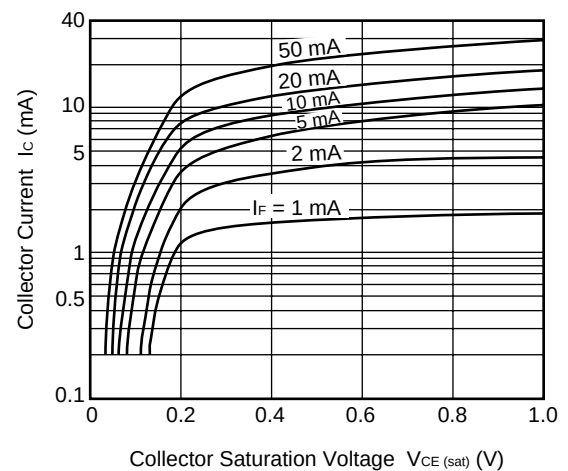
K : 300 to 600 (%)

P : 150 to 300 (%)

L : 100 to 300 (%)

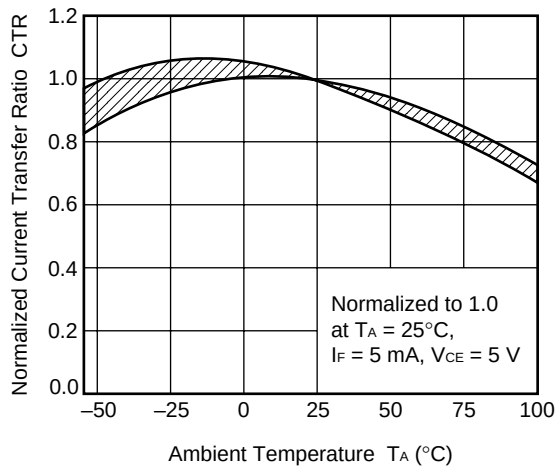
N : 80 to 600 (%)

^{*2} 2. Test circuit for switching time

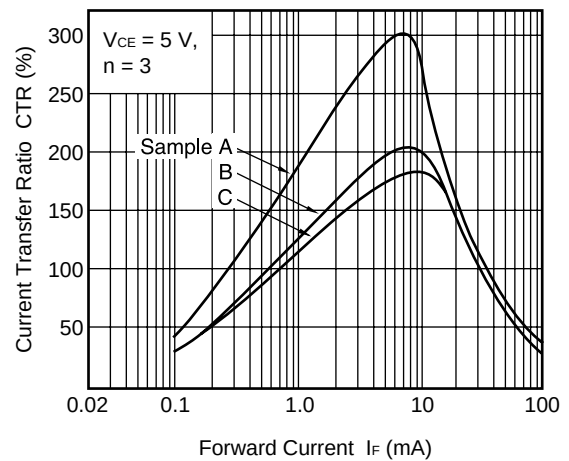
<R> **TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise specified)****DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE****TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE****FORWARD CURRENT vs. FORWARD VOLTAGE****COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE****COLLECTOR TO EMITTER DARK CURRENT vs. AMBIENT TEMPERATURE****COLLECTOR CURRENT vs. COLLECTOR SATURATION VOLTAGE**

Remark The graphs indicate nominal characteristics.

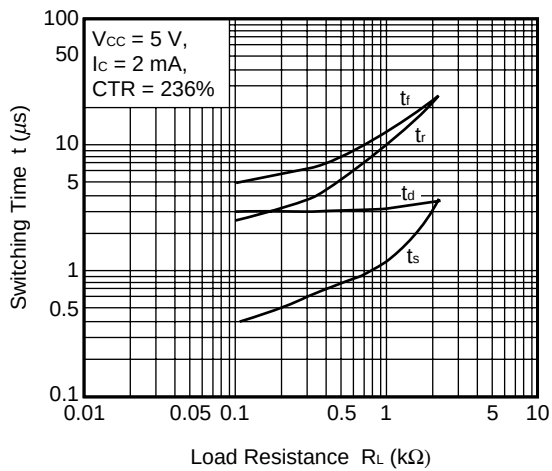
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



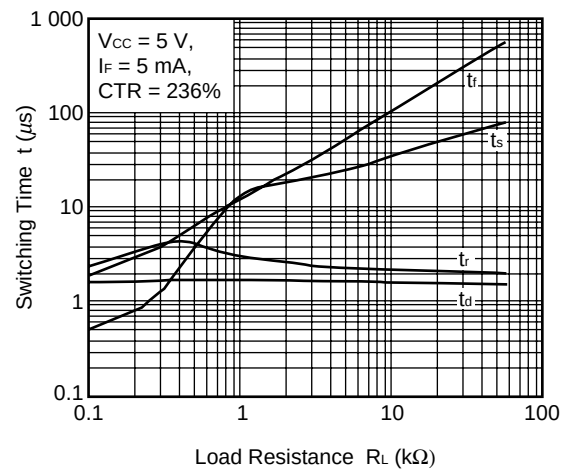
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



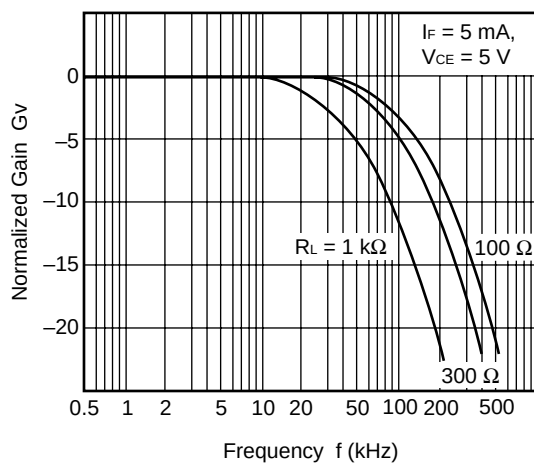
SWITCHING TIME vs. LOAD RESISTANCE



SWITCHING TIME vs. LOAD RESISTANCE



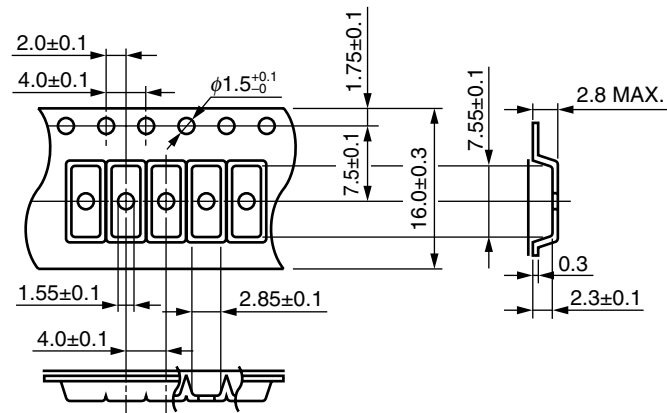
FREQUENCY RESPONSE



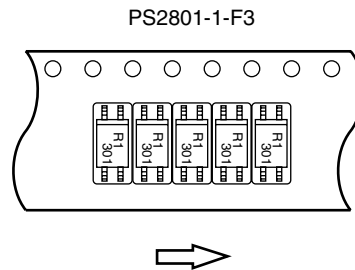
Remark The graphs indicate nominal characteristics.

<R> TAPING SPECIFICATIONS (UNIT: mm)

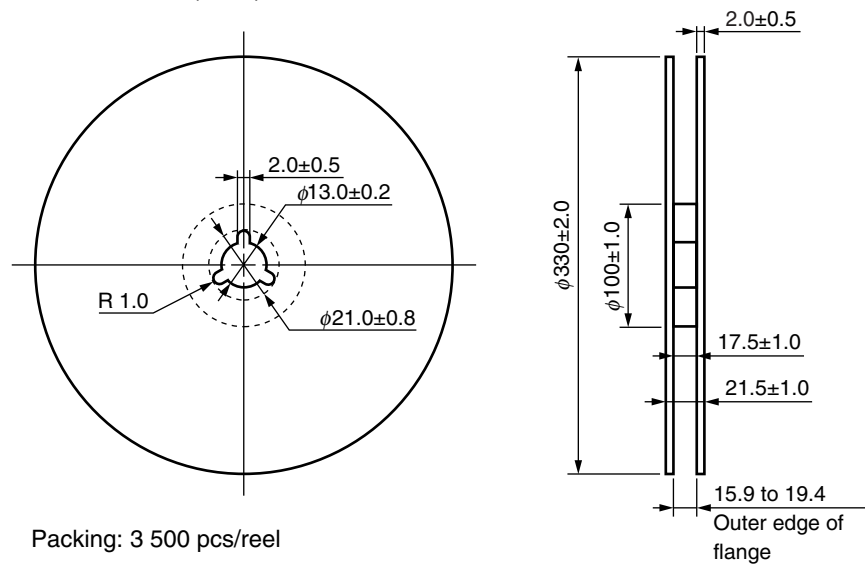
Outline and Dimensions (Tape)



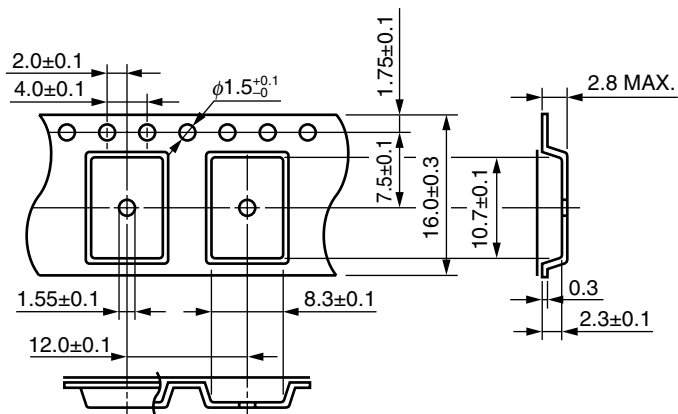
Tape Direction



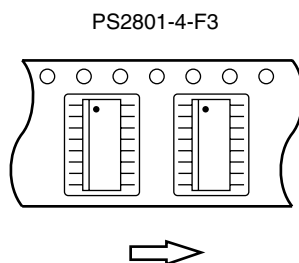
Outline and Dimensions (Reel)



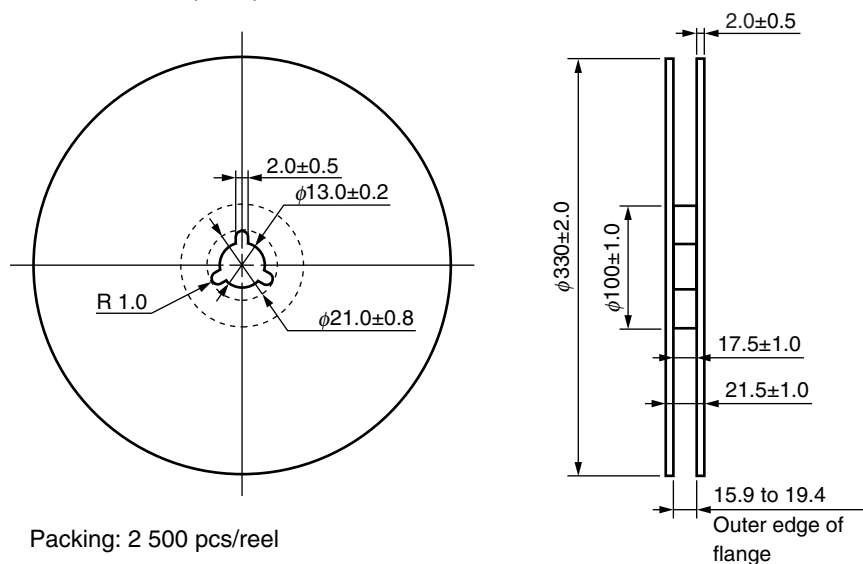
Outline and Dimensions (Tape)



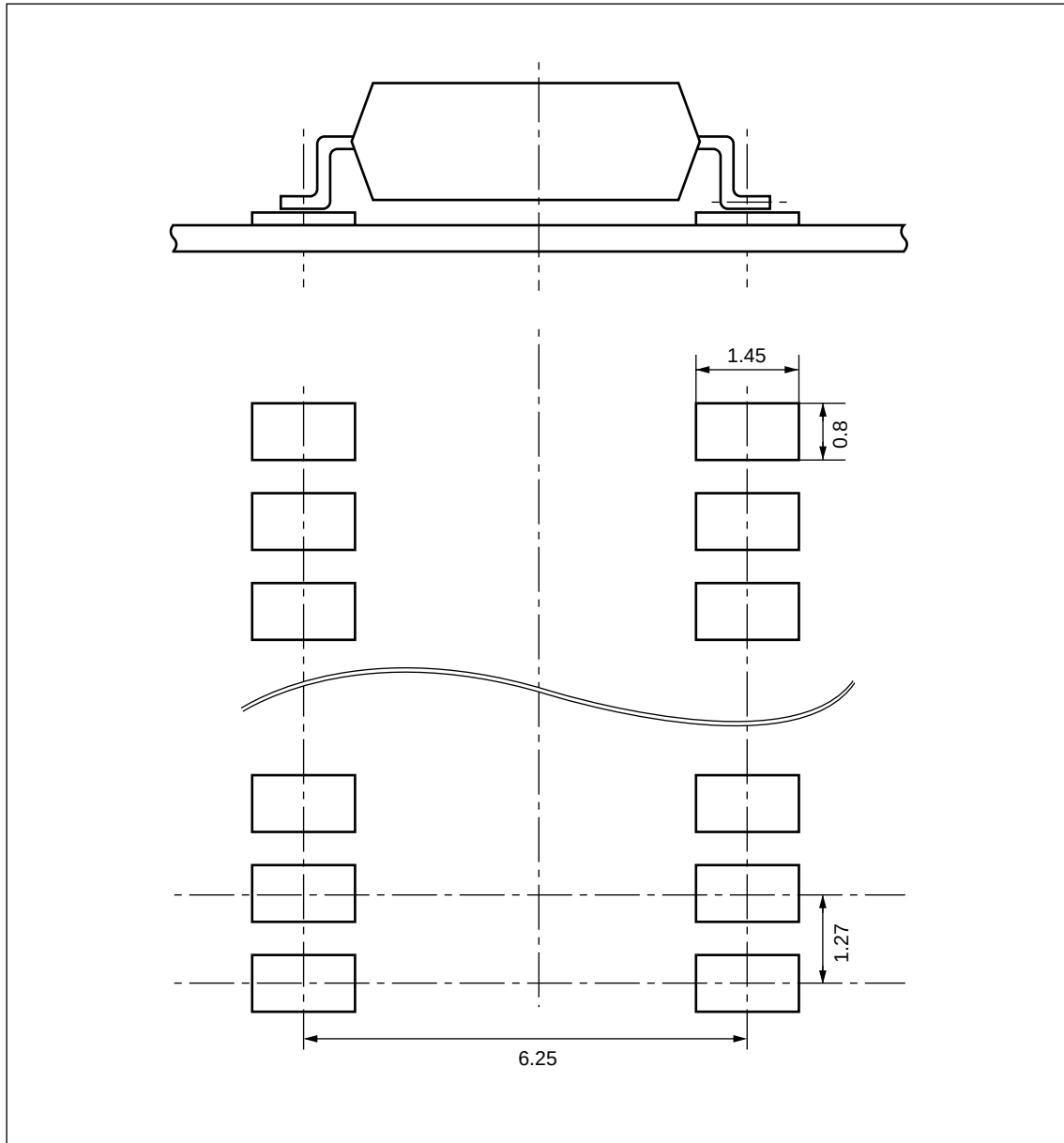
Tape Direction



Outline and Dimensions (Reel)



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



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

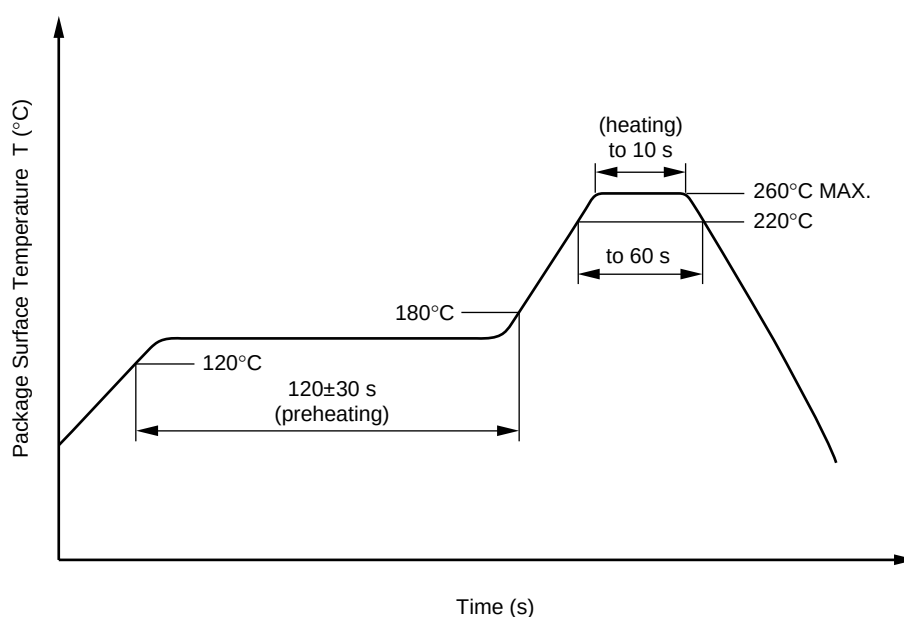
NOTES ON HANDLING

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.) |

(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 $I_F = 1 \text{ mA}$.

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.

<R>

<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}	705 1 128	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}	1 322	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 11))	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	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.
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Revision History	PS2801-1, PS2801-4 Data Sheet
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Rev.	Date	Description	
		Page	Summary
1.00	Mar 31, 2003	–	This data sheet was released as PN10251EJ01V0DS
5.00	Jan 17, 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.
		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.6	The graph of LONG TERM CTR DEGRADATION is deleted from those in TYPICAL CHARACTERISTICS.
		p.7	PS2801-1-F4 is deleted from Tape Direction image in TAPING SPECIFICATIONS.
		p.8	PS2801-4-F4 is deleted from Tape Direction image in TAPING SPECIFICATIONS.
		p.10	RECOMMENDED MOUNT PAD DIMENSIONS is added.
		p.11	The note about temperature condition of the recommended soldering conditions is deleted.
		p.12	PROGRAMMABLE LOGIC CONTROLLERS EXMAPLE is deleted.
		p.13	SPECIFICATION OF VDE MARKS LICENSE DOCUMENT is changed to the same as PS2801C.

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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

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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