

PS2701-1

R08DS0094EJ0400

Rev.4.00

HIGH ISOLATION VOLTAGE SOP MULTI PHOTOCOUPLER

Jan 23, 2013

DESCRIPTION

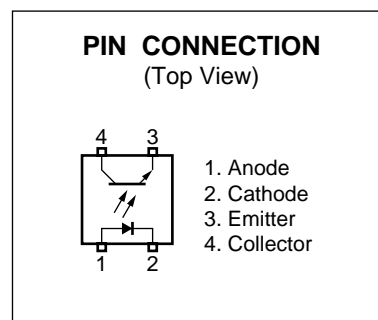
The PS2701-1 is an optically coupled isolator containing a GaAs light emitting diode and an NPN silicon phototransistor.

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 ($BV = 3\,750\text{ V}_{r.m.s.}$)
- SOP (Small Outline Package) type
- High-speed switching ($t_r = 3\,\mu s$ TYP., $t_f = 5\,\mu s$ 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)

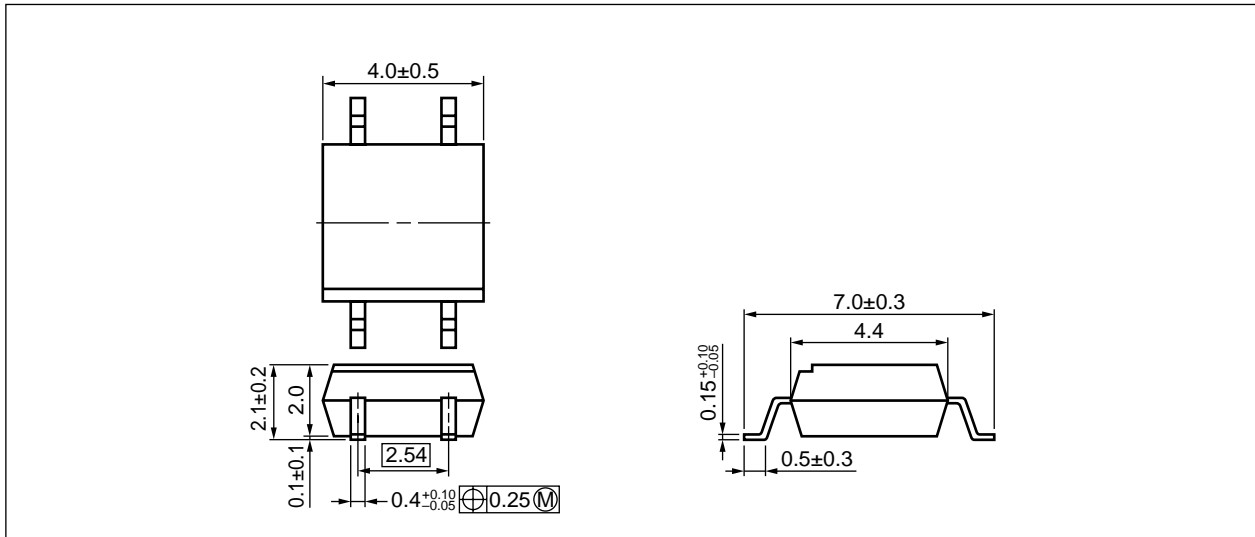


APPLICATIONS

- 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)

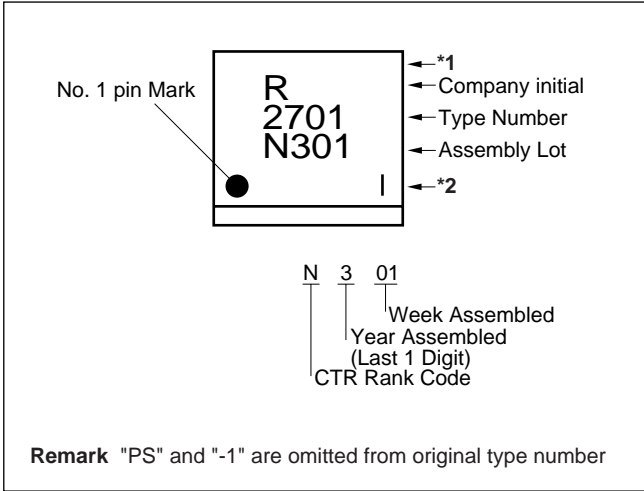
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PHOTOCOUPLER CONSTRUCTION

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



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

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

	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	$V = 0\text{ V}, f = 1\text{ MHz}$		30		pF
Transistor	Collector to Emitter Dark Current	I_{CEO}	$I_F = 0\text{ mA}, V_{CE} = 40\text{ V}$			100	nA
Coupled	Current Transfer Ratio (I_C/I_F) ^{*1}	CTR	$I_F = 5\text{ mA}, V_{CE} = 5\text{ V}$	50	100	300	%
	Collector Saturation Voltage	$V_{CE(sat)}$	$I_F = 10\text{ mA}, I_C = 2\text{ mA}$			0.3	V
	Isolation Resistance	R_{I-O}	$V_{I-O} = 1\text{ kV}_{DC}$	10^{11}			Ω
	Isolation Capacitance	C_{I-O}	$V = 0\text{ V}, f = 1\text{ MHz}$		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}			5		
	Turn-off Time ^{*2}	t_{off}			4		

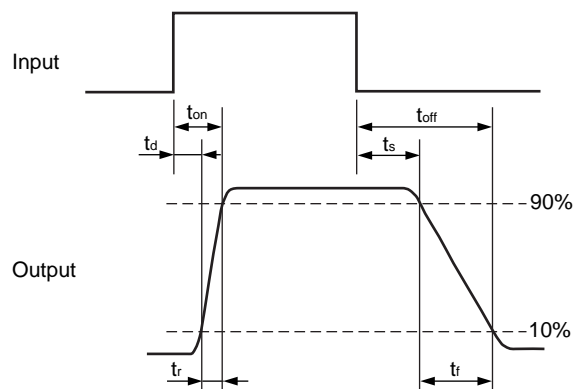
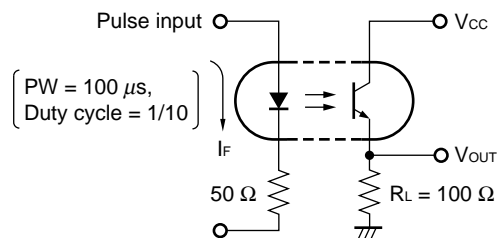
Note: *1. CTR rank

P: 150 to 300 (%)

L: 100 to 300 (%)

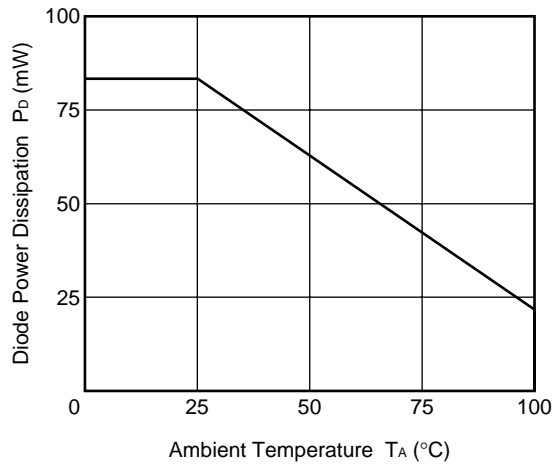
M: 50 to 150 (%)

*2. Test Circuit for Switching Time

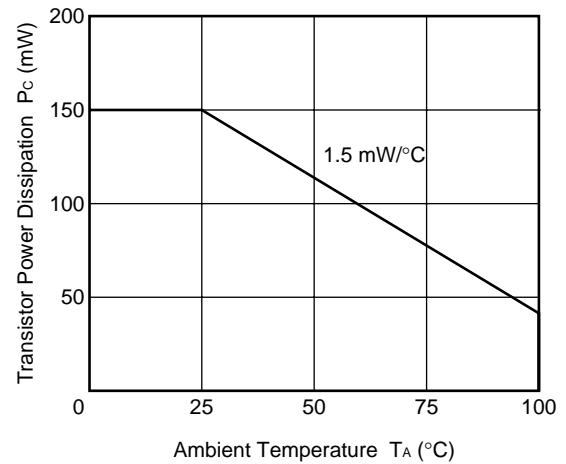


TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise specified)

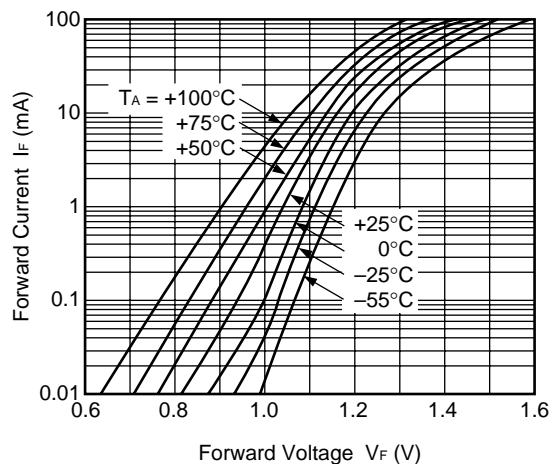
DIODE POWER DISSIPATION vs.
AMBIENT TEMPERATURE



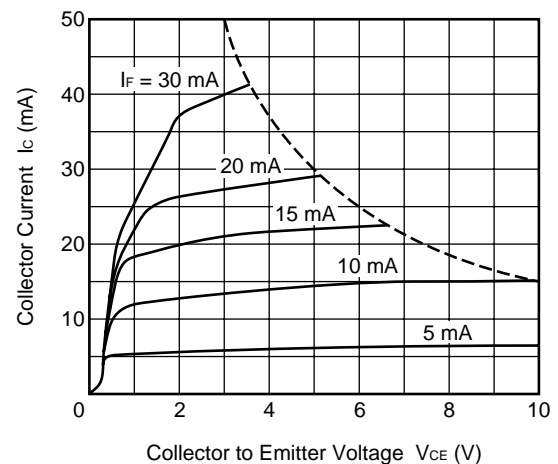
TRANSISTOR POWER DISSIPATION vs.
AMBIENT TEMPERATURE



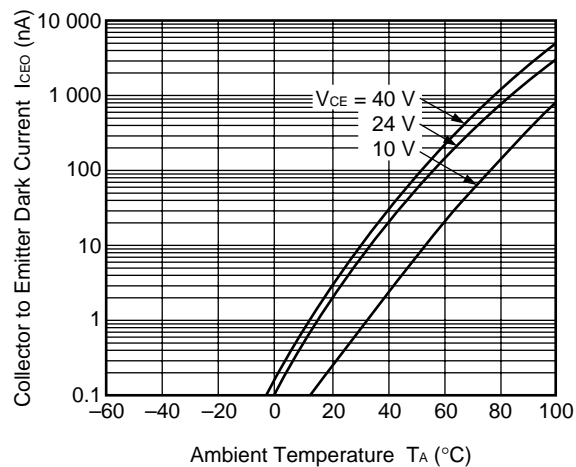
FORWARD CURRENT vs.
FORWARD VOLTAGE



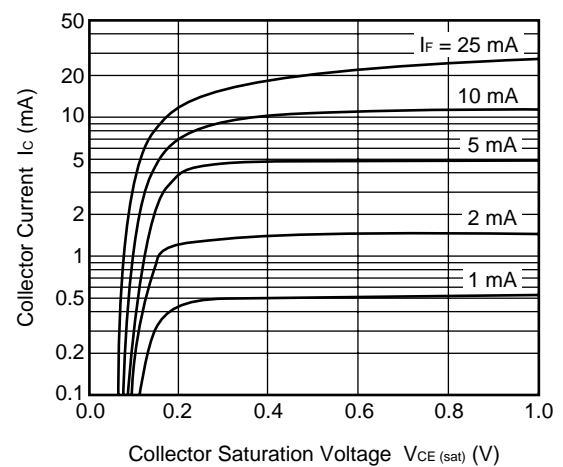
COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



COLLECTOR TO EMITTER DARK
CURRENT vs. AMBIENT TEMPERATURE

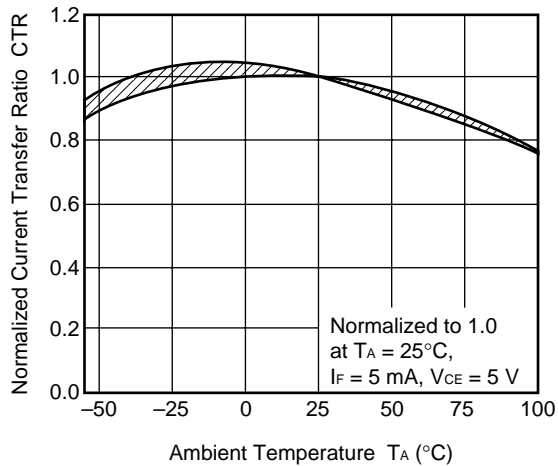


COLLECTOR CURRENT vs.
COLLECTOR SATURATION VOLTAGE

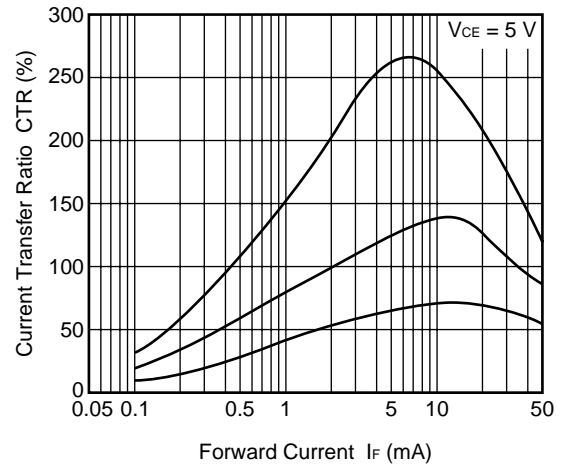


Remark The graphs indicate nominal characteristics.

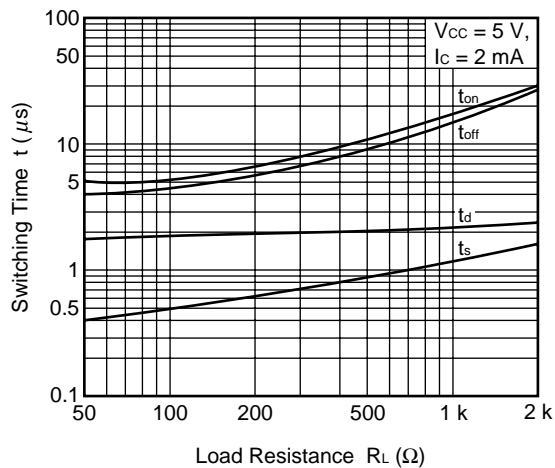
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



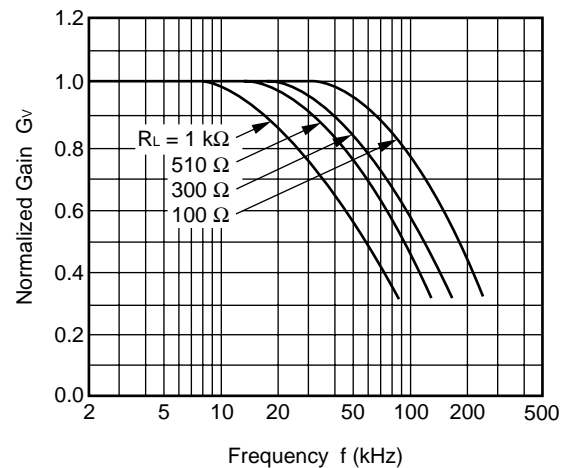
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



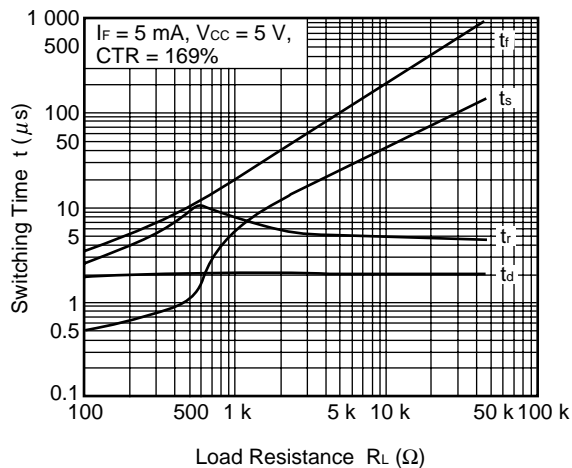
SWITCHING TIME vs. LOAD RESISTANCE



FREQUENCY RESPONSE



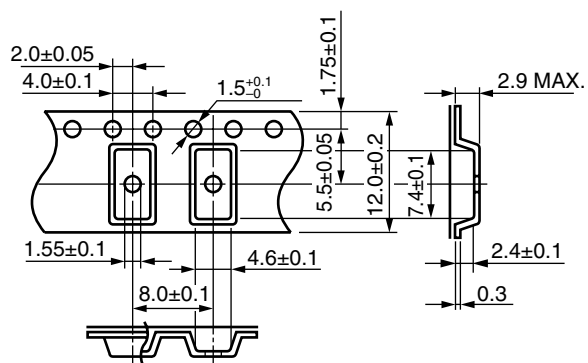
SWITCHING TIME vs. LOAD RESISTANCE



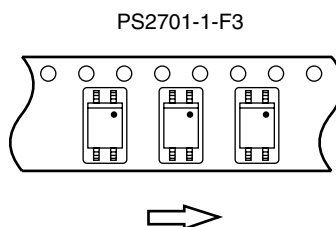
Remark The graphs indicate nominal characteristics.

<R> TAPING SPECIFICATIONS (UNIT: mm)

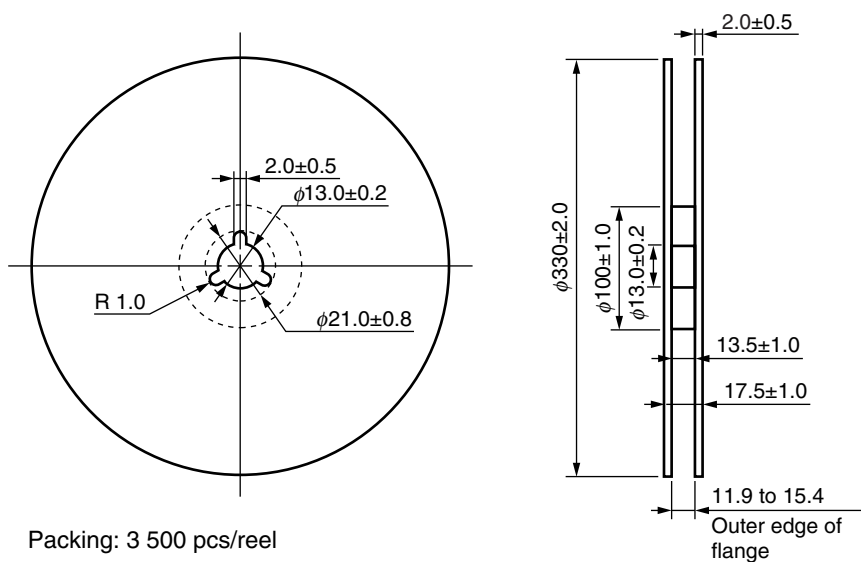
Outline and Dimensions (Tape)



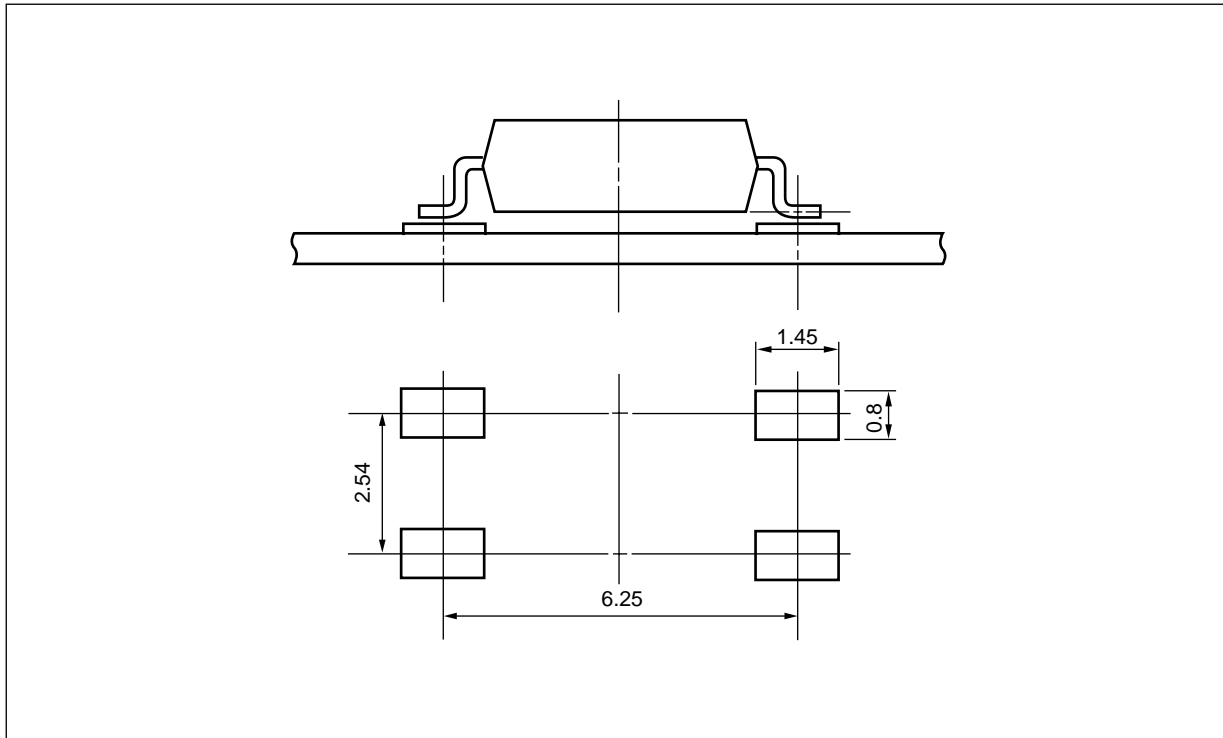
Tape Direction



Outline and Dimensions (Reel)



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



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

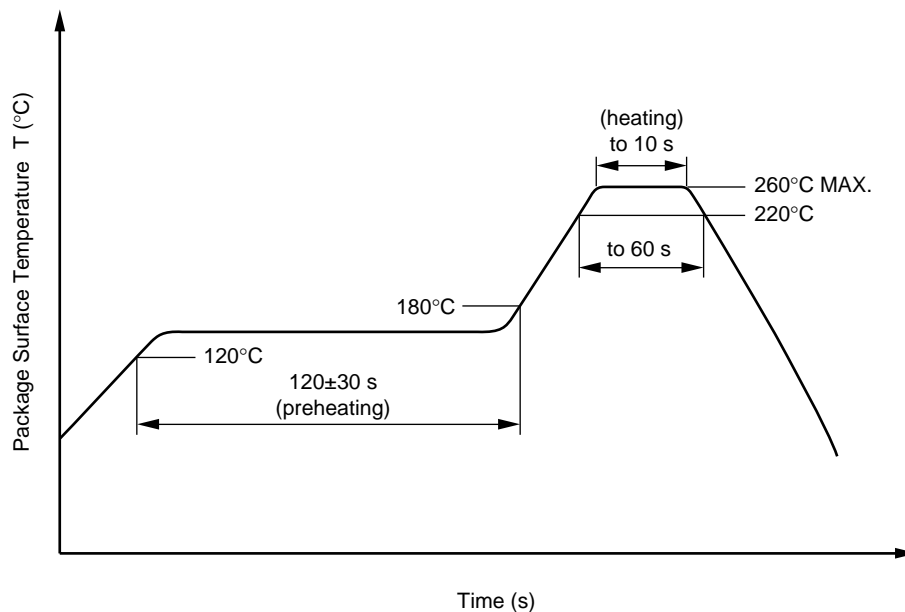
NOTES ON HANDLING

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.) |

(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.

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>	$U_{pr} = 1.6 \times U_{IORM}$, $P_d < 5 \text{ pC}$			
	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}
<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 $V_{IO} = 500 \text{ V dc at } T_A = 25^\circ\text{C}$ $V_{IO} = 500 \text{ V dc at } T_A \text{ MAX. at least } 100^\circ\text{C}$	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	T_{si}	150	°C
	Current (input current I_F , $P_{si} = 0$)	I_{si}	300	mA
	Power (output or total power dissipation)	P_{si}	500	mW
	Isolation resistance $V_{IO} = 500 \text{ V dc at } T_A = T_{si}$	Ris MIN.	10^9	Ω

Caution	<p>GaAs Products</p>	<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.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	PS2701-1 Data Sheet
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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 U_{pr} 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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