PHOTOCOUPLER
PS8101

1 Mbps HIGH CMR ANALOG OUTPUT TYPE 5-PIN SOP (SO-5) PHOTOCOUPLER

–NEPOC Series–

DESCRIPTION

The PS8101 is an optically coupled isolator containing a GaAlAs LED on the light emitting diode (input side) and a PIN photodiode and a high-speed amplifier transistor on the output side on one chip.

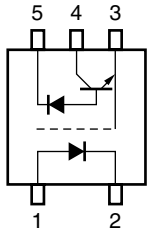
This is a plastic SOP (Small Out-line Package) type for high density applications.

FEATURES

<R> • High common mode transient immunity (C_{MH}, C_{ML} = ±15 kV/μs MIN.)
- Small package (SO-5)
- High supply voltage (V_{CC} = 35 V)
- High isolation voltage (BV = 3 750 Vr.m.s.)
- High-speed response (t_{PHL} = 0.8 μs MAX., t_{PLH} = 1.2 μs MAX.)
- Ordering number of taping product: PS8101-F3, F4: 2 500 pcs/reel
- Pb-Free product
- Safety standards
  - UL approved: File No. E72422

<R> • CSA approved: No. CA 101391 (CA5A, CAN/CSA-C22.2 60065, 60950)
- DIN EN60747-5-2 (VDE0884 Part2) approved: No. 40008902 (Option)

PIN CONNECTION
(Top View)



1. Anode
2. Cathode
3. GND
4. V_O
5. V_{CC}

APPLICATIONS

- Computer and peripheral manufactures
- General purpose inverter
- Substitutions for relays and pulse transformers
- Power supply

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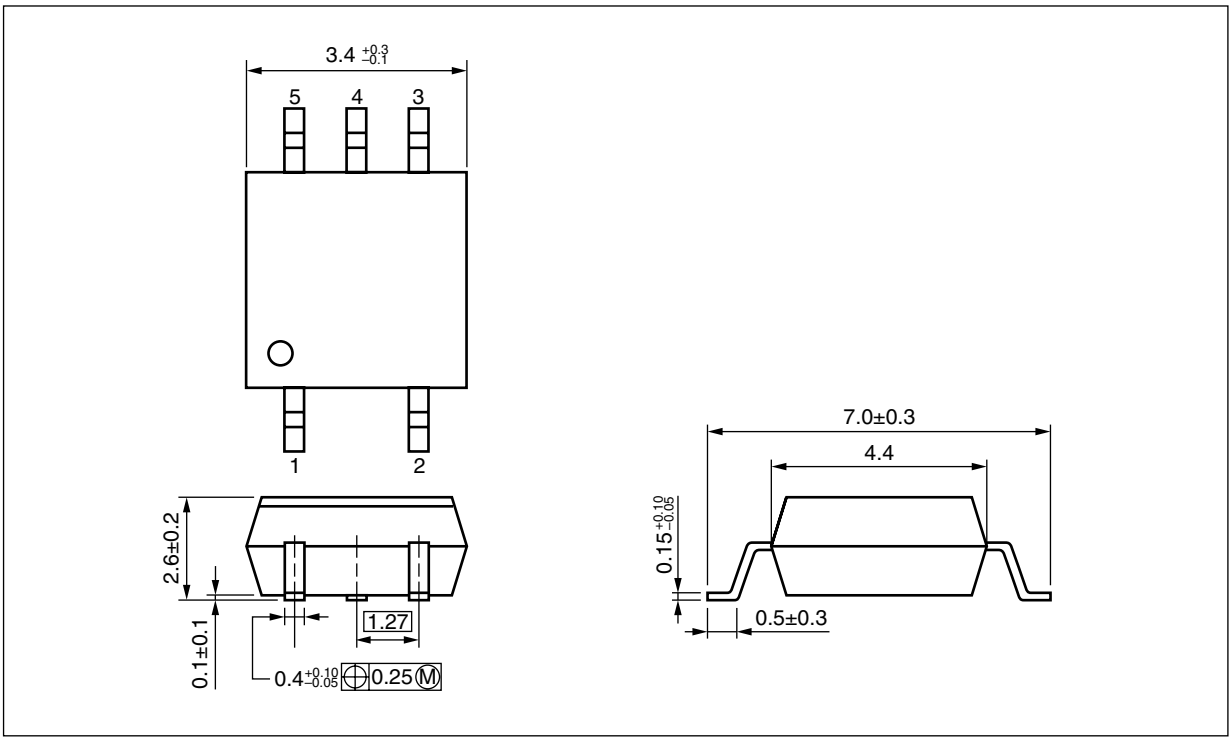
The mark <R> shows major revised points.

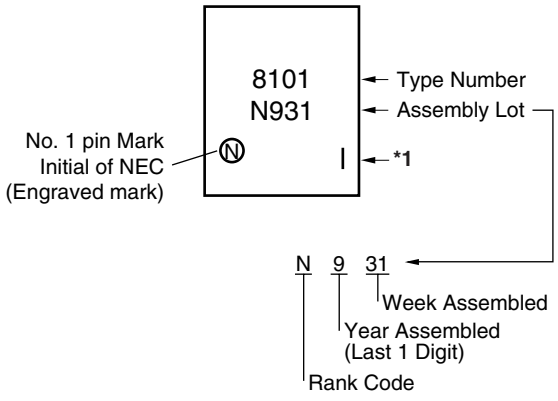
The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

<R> **PACKAGE DIMENSIONS (UNIT: mm)**



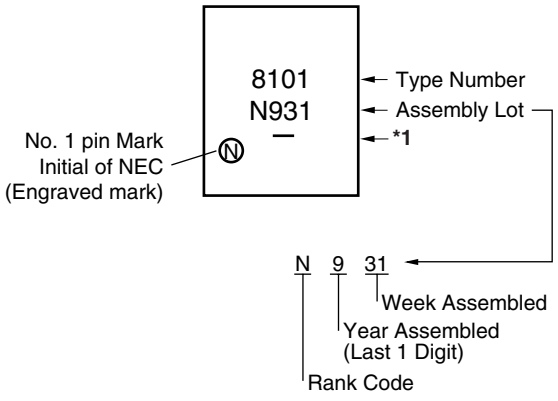
<R> **MARKING EXAMPLE**

SnBi PLATING



***1** Bar : Pb-Free

Ni/Pd/Au PLATING



***1** Bar : Pb-Free

<R> **PHOTOCOUPLER CONSTRUCTION**

Parameter	PS8101
Air Distance (MIN.)	4.2 mm
Outer Creepage Distance (MIN.)	4.2 mm
Isolation Distance (MIN.)	0.2 mm

<R> **ORDERING INFORMATION**

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number*1
PS8101	PS8101-A	Pb-Free (SnBi)	20 pcs (Tape 20 pcs cut)	Standard products (UL, CSA approved)	PS8101
PS8101-F3	PS8101-F3-A		Embossed Tape 2 500 pcs/reel		
PS8101-F4	PS8101-F4-A				
PS8101-V	PS8101-V-A		20 pcs (Tape 20 pcs cut)	DIN EN60747-5-2 (VDE0884 Part2) Approved (Option)	
PS8101-V-F3	PS8101-V-F3-A		Embossed Tape 2 500 pcs/reel		
PS8101-V-F4	PS8101-V-F4-A				
PS8101	PS8101-AX	Pb-Free (Ni/Pd/Au)	20 pcs (Tape 20 pcs cut)	Standard products (UL, CSA approved)	
PS8101-F3	PS8101-F3-AX		Embossed Tape 2 500 pcs/reel		
PS8101-F4	PS8101-F4-AX				
PS8101-V	PS8101-V-AX		20 pcs (Tape 20 pcs cut)	DIN EN60747-5-2 (VDE0884 Part2) Approved (Option)	
PS8101-V-F3	PS8101-V-F3-AX		Embossed Tape 2 500 pcs/reel		
PS8101-V-F4	PS8101-V-F4-AX				

***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	25	mA
	Reverse Voltage	V_R	5.0	V
	Power Dissipation*1	P_D	45	mW
Detector	Supply Voltage	V_{CC}	35	V
	Output Voltage	V_O	35	V
	Output Current	I_O	8.0	mA
	Power Dissipation*2	P_C	100	mW
Isolation Voltage*3		BV	3 750	Vr.m.s.
Operating Ambient Temperature		T_A	–55 to +100	°C
Storage Temperature		T_{stg}	–55 to +125	°C

***1** Reduced to 0.45 mW/°C at T_A = 25°C or more.

***2** Reduced to 1.00 mW/°C at T_A = 25°C or more.

***3** AC voltage for 1 minute at T_A = 25°C, RH = 60% between input and output.
Pins 1-2 shorted together, 3-5 shorted together.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

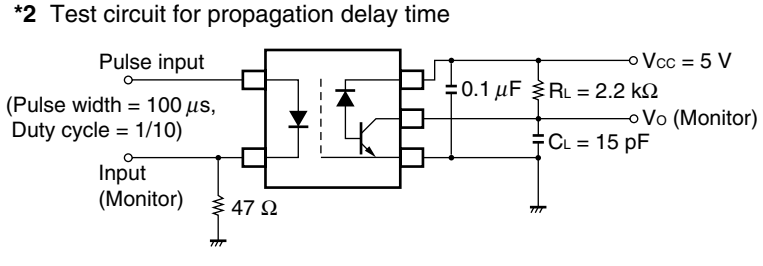
	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	V_F	I_F = 16 mA		1.7	2.2	V
	Reverse Current	I_R	V_R = 3 V			10	μA
	Forward Voltage Temperature Coefficient	$\Delta V_F/\Delta T_A$	I_F = 16 mA		−2.1		mV/°C
	Terminal Capacitance	C_t	V = 0 V, f = 1 MHz		30		pF
Detector	High Level Output Current	I_{OH} (1)	I_F = 0 mA, V_{CC} = V_O = 5.5 V		3	500	nA
	High Level Output Current	I_{OH} (2)	I_F = 0 mA, V_{CC} = V_O = 30 V			100	μA
	Low Level Output Voltage	V_{OL}	I_F = 16 mA, V_{CC} = 4.5 V, I_O = 1.2 mA		0.1	0.4	V
	Low Level Supply Current	I_{CCL}	I_F = 16 mA, V_O = open, V_{CC} = 30 V		50		μA
	High Level Supply Current	I_{CCH}	I_F = 0 mA, V_O = open, V_{CC} = 30 V		0.01	2	
Coupled	Current Transfer Ratio[*1]	CTR	I_F = 16 mA, V_{CC} = 4.5 V, V_O = 0.4 V	15	20	35	%
	Isolation Resistance	R_{I-O}	V_{I-O} = 1 kV_{DC}, RH = 40 to 60%	10^{11}			Ω
	Isolation Capacitance	C_{I-O}	V = 0 V, f = 1 MHz		0.4		pF
	Propagation Delay Time (H → L)[*2]	t_{PHL}	I_F = 16 mA, V_{CC} = 5 V, R_L = 2.2 kΩ, C_L = 15 pF		0.5	0.8	μs
	Propagation Delay Time (L → H)[*2]	t_{PLH}			0.6	1.2	
<R>	Common Mode Transient Immunity at High Level Output[*3]	C_{MH}	I_F = 0 mA, V_{CC} = 5 V, R_L = 4.1 kΩ, V_{CM} = 1.5 kV	15			kV/μs
<R>	Common Mode Transient Immunity at Low Level Output[*3]	C_{ML}	I_F = 16 mA, V_{CC} = 5 V, R_L = 4.1 kΩ, V_{CM} = 1.5 kV	−15			

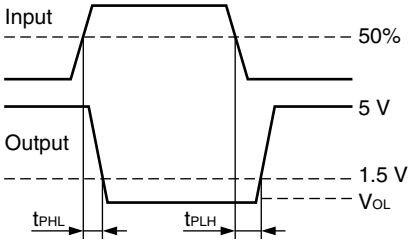
***1** CTR rank

K : 20 to 35 (%)

N : 15 to 35 (%)

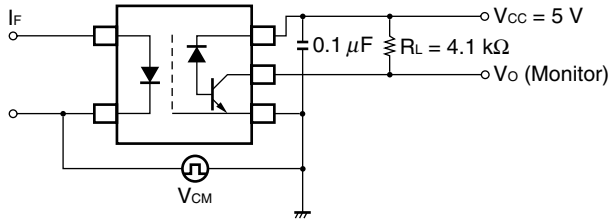
***2** Test circuit for propagation delay time

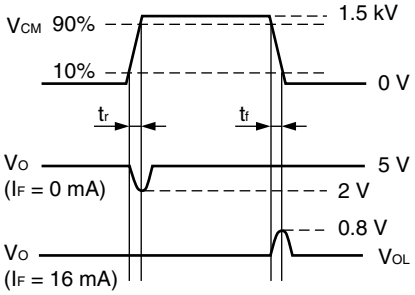




C_L is approximately 15 pF which includes probe and stray wiring capacitance.

***3** Test circuit for common mode transient immunity



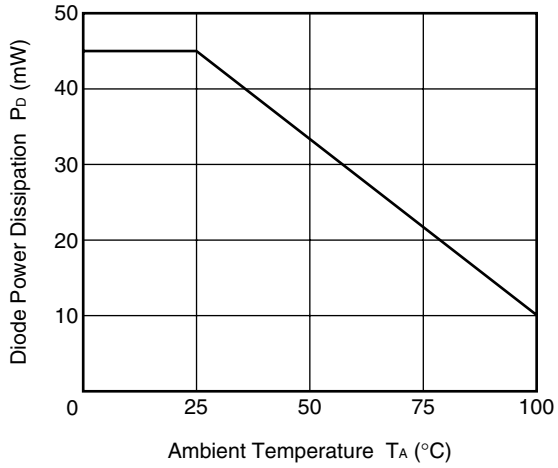


USAGE CAUTIONS

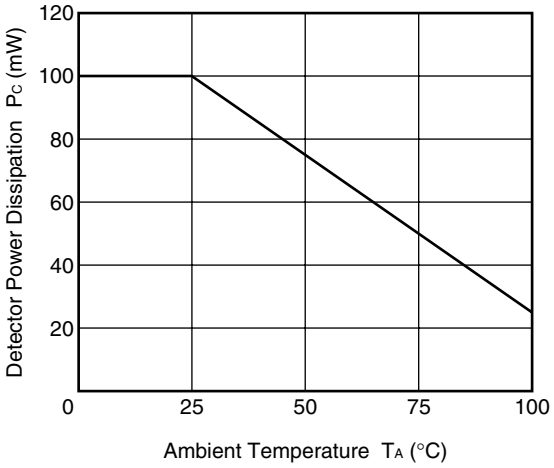
1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. By-pass capacitor of 0.1 μF is used between V_{CC} and GND near device. Also, ensure that the distance between the leads of the photocoupler and capacitor is no more than 10 mm.
3. Avoid storage at a high temperature and high humidity.

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

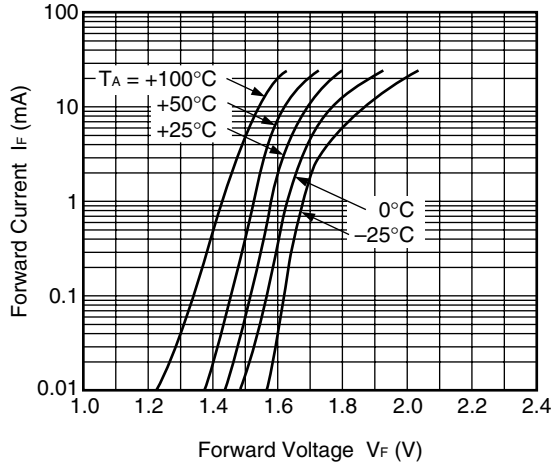
DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE



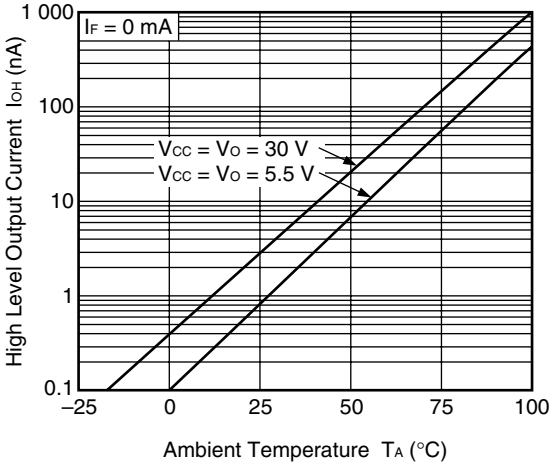
DETECTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



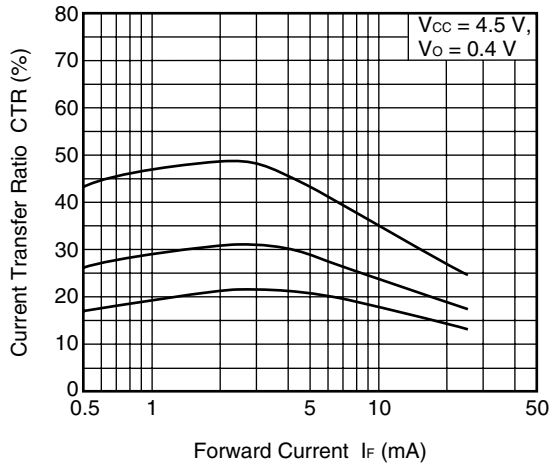
FORWARD CURRENT vs. FORWARD VOLTAGE



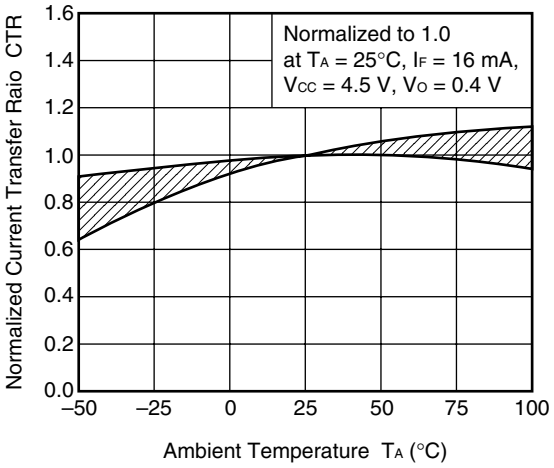
HIGH LEVEL OUTPUT CURRENT vs. AMBIENT TEMPERATURE



CURRENT TRANSFER RATIO vs. FORWARD CURRENT

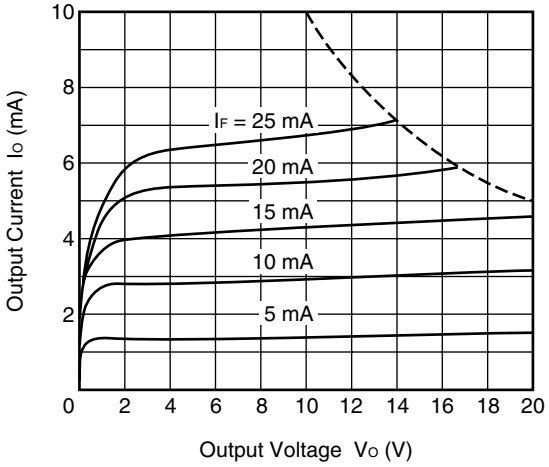


NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE

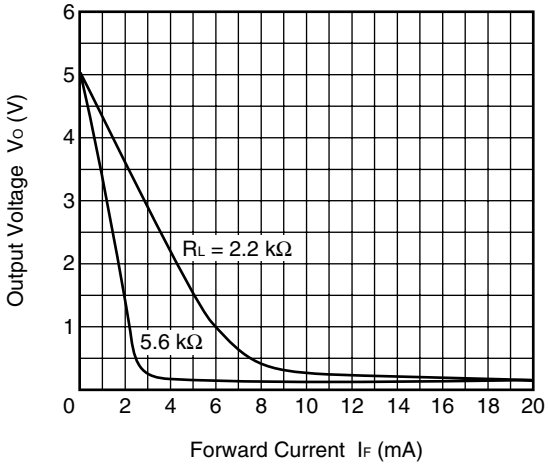


Remark The graphs indicate nominal characteristics.

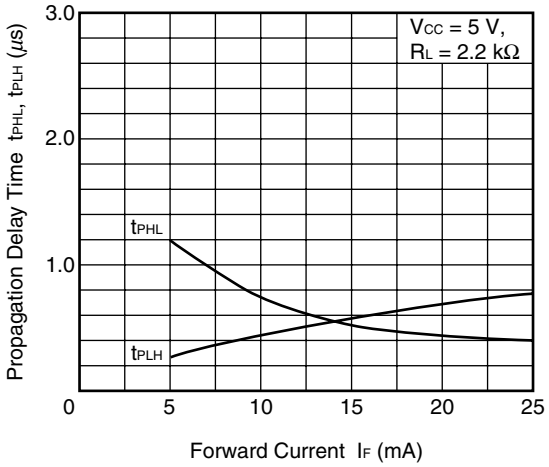
OUTPUT CURRENT vs.
OUTPUT VOLTAGE



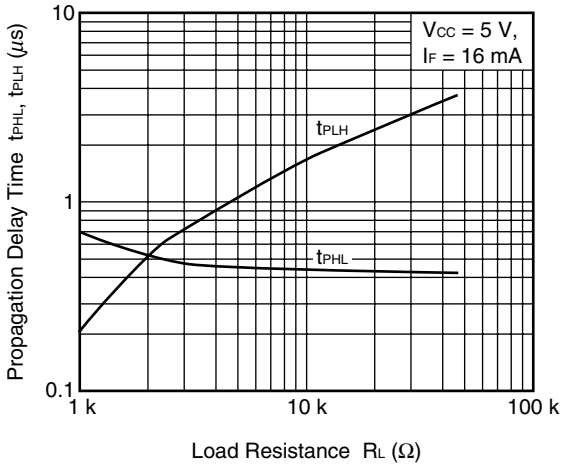
OUTPUT VOLTAGE vs.
FORWARD CURRENT



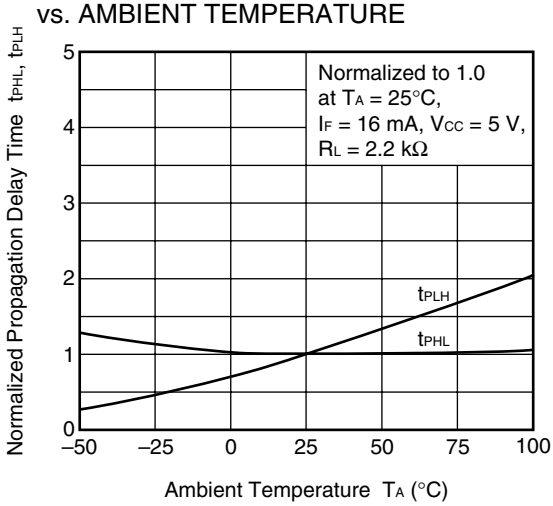
PROPAGATION DELAY TIME vs.
FORWARD CURRENT



PROPAGATION DELAY TIME vs.
LOAD RESISTANCE



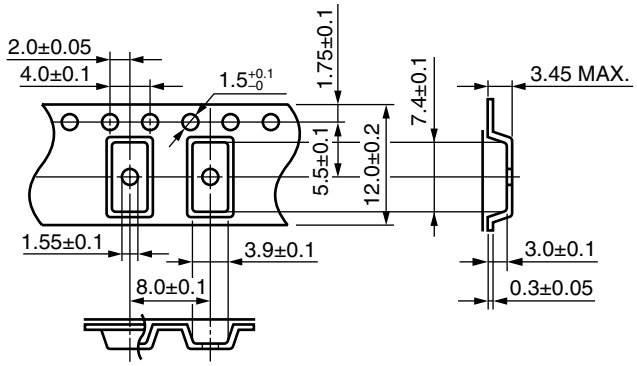
NORMALIZED PROPAGATION DELAY TIME
vs. AMBIENT TEMPERATURE



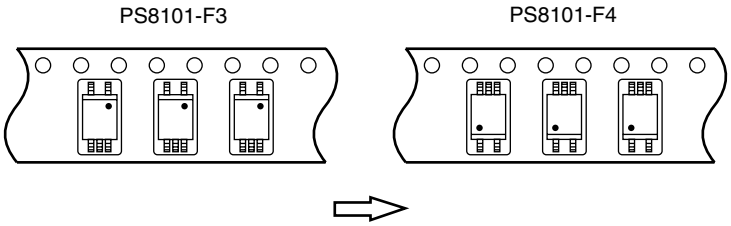
Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (UNIT: mm)

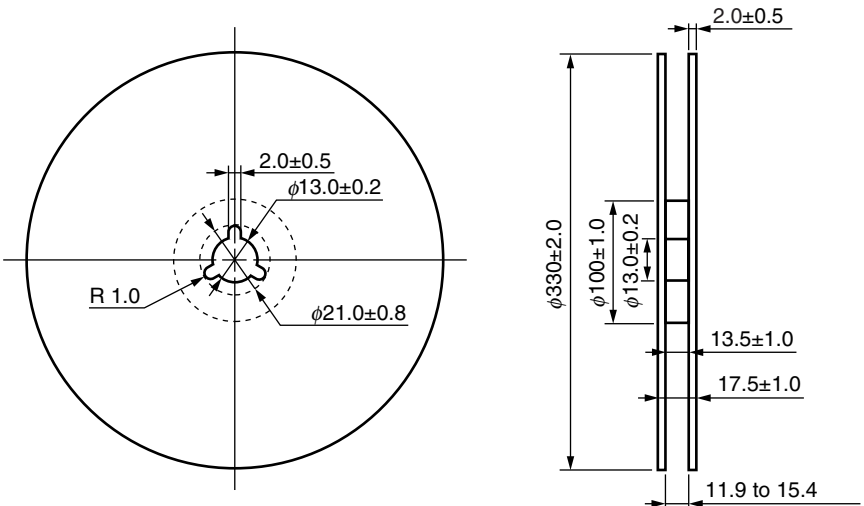
Outline and Dimensions (Tape)



Taping Direction

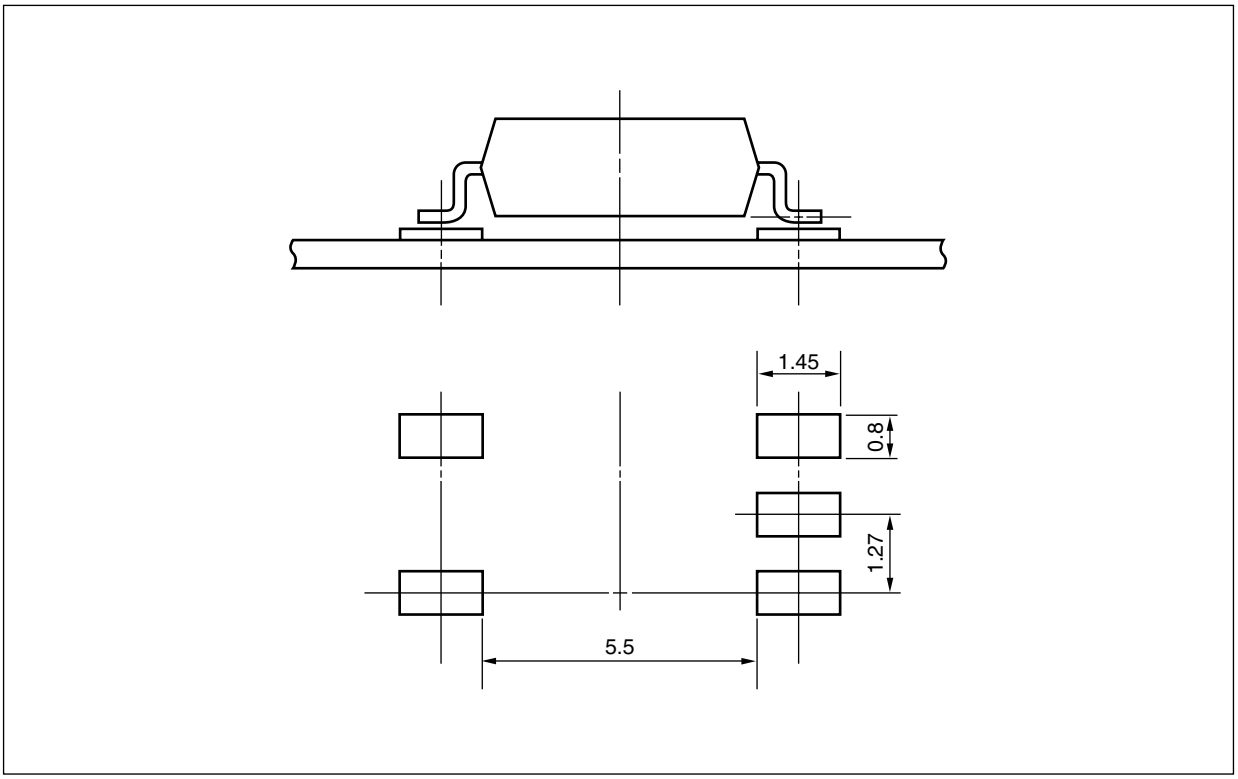


Outline and Dimensions (Reel)



Packing: 2 500 pcs/reel

RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)



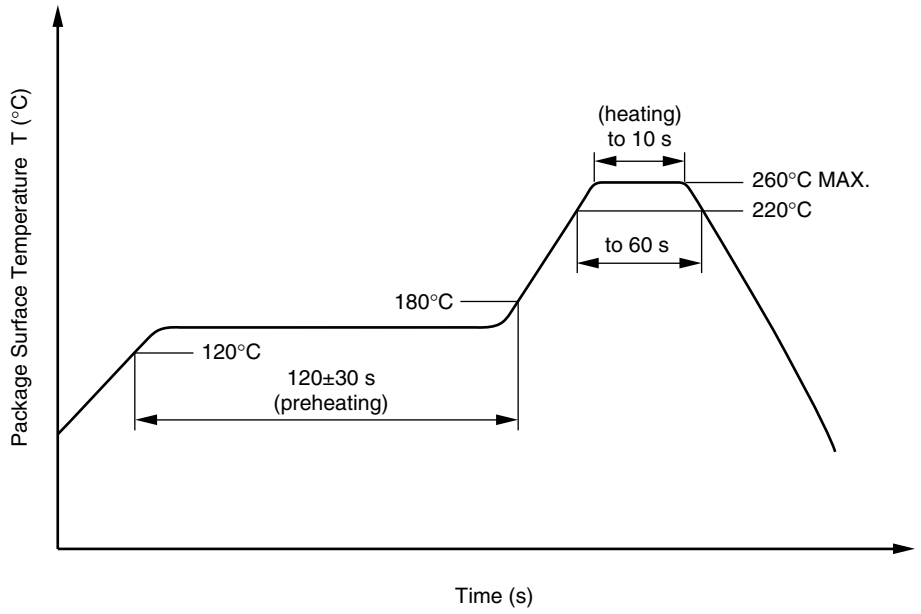
NOTES ON HANDLING

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

(b) Please be sure that the temperature of the package would not be heated over 100°C

(4) Cautions

• Fluxes

Avoid removing the residual flux with freon-based and chlorine-based cleaning solvent.

<R> **2. Cautions regarding noise**

Be aware that when voltage is applied suddenly between the photocoupler's input and output or between V_{CC} and GND at startup, the output transistor may enter the on state, even if the voltage is within the absolute maximum ratings.

<R> SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

Parameter	Symbol	Speck	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) $U_{pr} = 1.5 \times U_{IORM}$, $P_d < 5$ pC	 U_{IORM} U_{pr}	 707 1 061	 V_{peak} V_{peak}
Test voltage (partial discharge test, procedure b for all devices) $U_{pr} = 1.875 \times U_{IORM}$, $P_d < 5$ pC	U_{pr}	1 326	V_{peak}
Highest permissible overvoltage	U_{TR}	6 000	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 +125	°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.	 150 200 300 10^{9}	 °C mA mW Ω

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M8E0904E

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.

To our customers,

Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

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