THE DATASHEET OF

PS8821-2-A

CEL

PHOTOCOUPLER
PS8821-1,-2

1 Mbps ANALOG OUTPUT TYPE 8-PIN SSOP (SO-8) HIGH-SPEED PHOTOCOUPLER

–NEPOC Series–

DESCRIPTION

The PS8821-1, -2 are optically coupled isolators 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.

The PS8821-2 is suitable for high density applications.

FEATURES

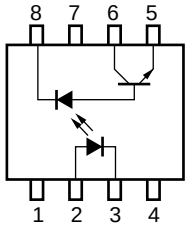
- 40% reduction of mounting area (5-pin SOP × 2)
- Low power consumption (V_{CC} = 3.3 V)
- High isolation voltage (BV = 2 500 Vr.m.s.)
- High-speed response (t_{PHL} = 0.6 μs MAX., t_{PLH} = 0.9 μs MAX.)
- Ordering number of tape product: PS8821-1-F3, F4: 1 500 pcs/reel
  : PS8821-2-F3, F4: 1 500 pcs/reel
- Pb-Free product
- Safety standards
  - UL approved: File No. E72422
  - DIN EN60747-5-2 (VDE0884 Part2) approved (Option)

APPLICATIONS

- Power over Ethernet
- Computer and peripheral manufactures
- Substitutions for relays and pulse transformers
- Power supply

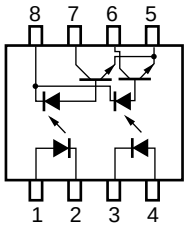
PIN CONNECTION
(Top View)

PS8821-1



1. NC
2. Anode
3. Cathode
4. NC
5. GND
6. V_O
7. NC
8. V_{CC}

PS8821-2



1. Anode1
2. Cathode1
3. Cathode2
4. Anode2
5. GND
6. V_O2
7. V_O1
8. V_{CC}

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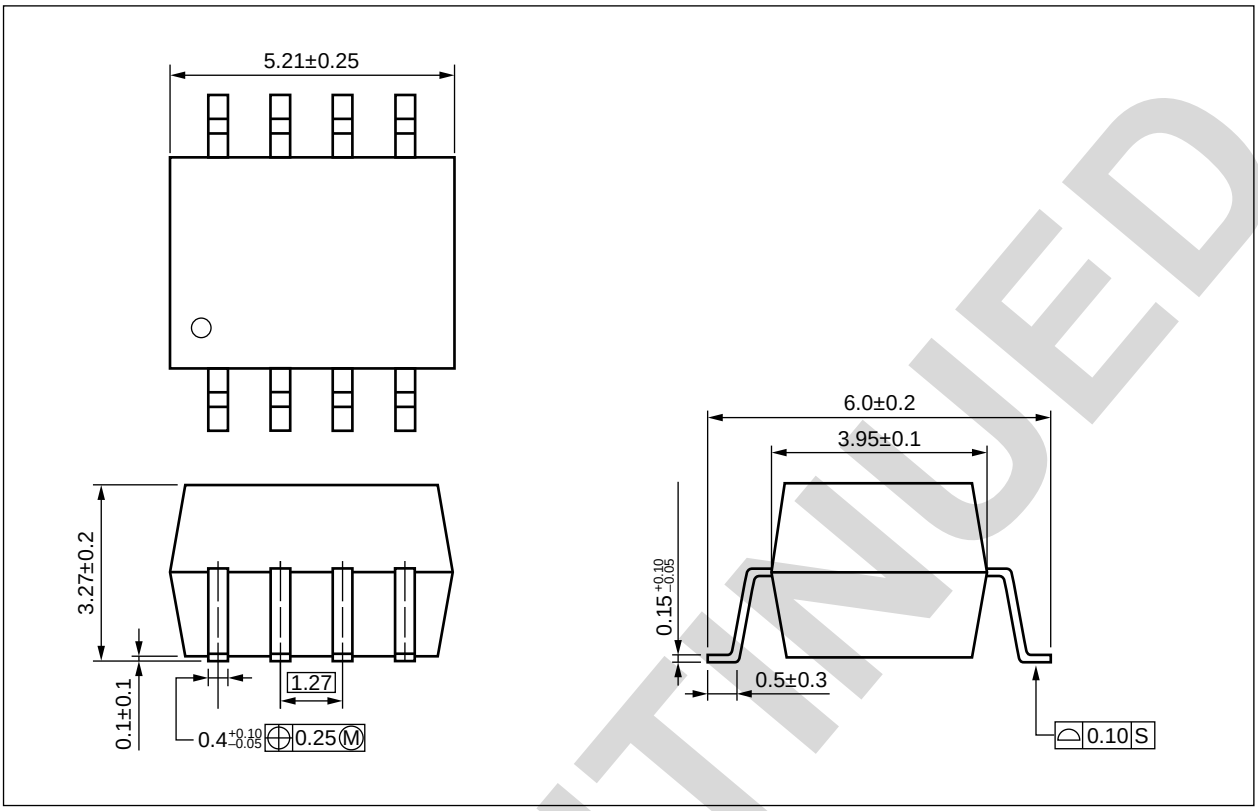
Date Published August 2008 NS

The mark <R> shows major revised points.

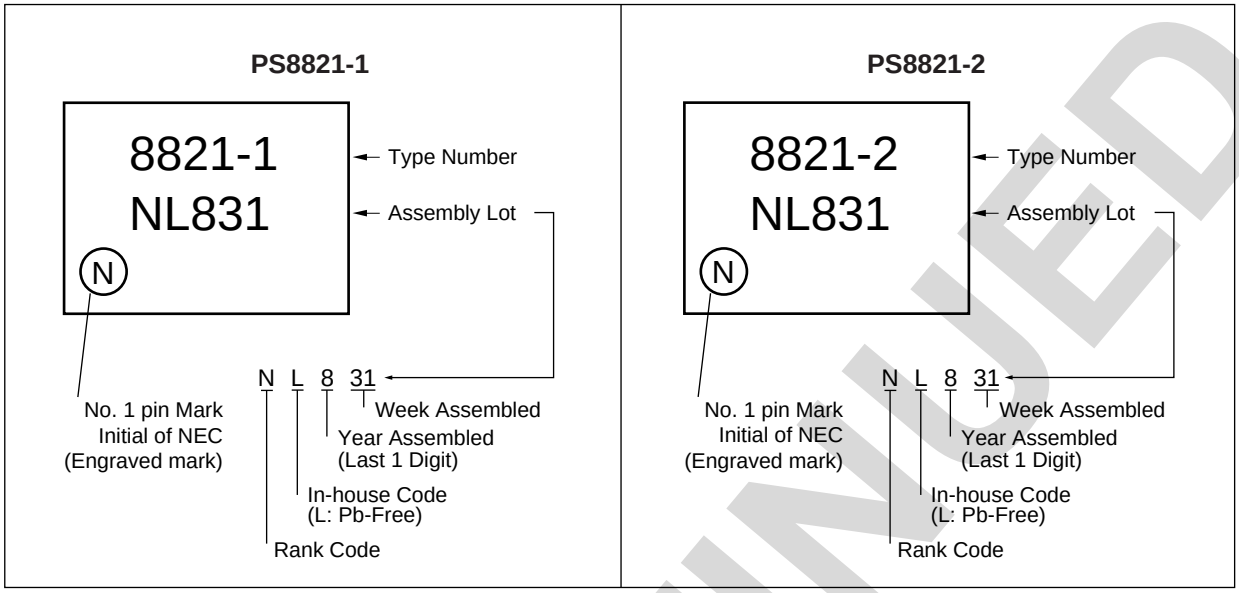
The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

PACKAGE DIMENSIONS (UNIT: mm)

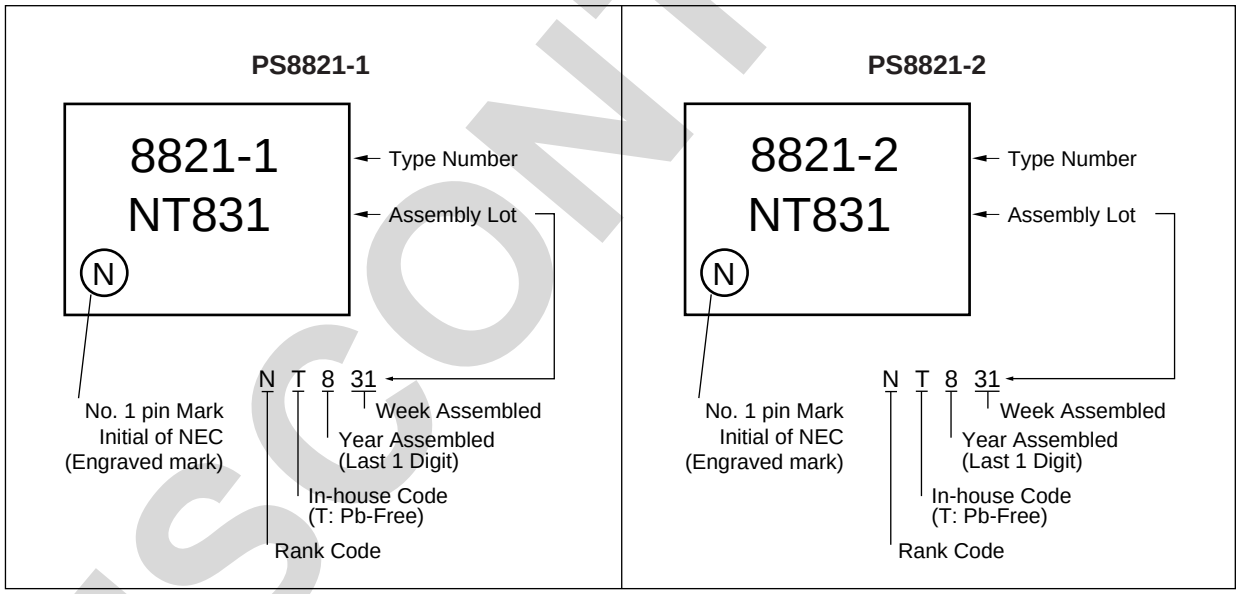


<R> **MARKING EXAMPLE**

SnBi PLATING



Ni/Pd/Au PLATING



<R> **ORDERING INFORMATION**

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number*1
PS8821-1	PS8821-1-A	Pb-Free (SnBi)	20 pcs (Tape 20 pcs cut)	Standard products (UL approved)	PS8821-1
PS8821-1-F3	PS8821-1-F3-A		Embossed Tape 1 500 pcs/reel		
PS8821-1-F4	PS8821-1-F4-A				
PS8821-2	PS8821-2-A		20 pcs (Tape 20 pcs cut)		PS8821-2
PS8821-2-F3	PS8821-2-F3-A		Embossed Tape 1 500 pcs/reel		
PS8821-2-F4	PS8821-2-F4-A				
PS8821-1-V	PS8821-1-V-A		20 pcs (Tape 20 pcs cut)	DIN EN60747-5-2 (VDE0884 Part2) Approved (Option)	PS8821-1
PS8821-1-V-F3	PS8821-1-V-F3-A		Embossed Tape 1 500 pcs/reel		
PS8821-1-V-F4	PS8821-1-V-F4-A				
PS8821-2-V	PS8821-2-V-A		20 pcs (Tape 20 pcs cut)		PS8821-2
PS8821-2-V-F3	PS8821-2-V-F3-A		Embossed Tape 1 500 pcs/reel		
PS8821-2-V-F4	PS8821-2-V-F4-A				
PS8821-1	PS8821-1-AX	Pb-Free (Ni/Pd/Au)	20 pcs (Tape 20 pcs cut)	Standard products (UL approved)	PS8821-1
PS8821-1-F3	PS8821-1-F3-AX		Embossed Tape 1 500 pcs/reel		
PS8821-1-F4	PS8821-1-F4-AX				
PS8821-2	PS8821-2-AX		20 pcs (Tape 20 pcs cut)		PS8821-2
PS8821-2-F3	PS8821-2-F3-AX		Embossed Tape 1 500 pcs/reel		
PS8821-2-F4	PS8821-2-F4-AX				
PS8821-1-V	PS8821-1-V-AX		20 pcs (Tape 20 pcs cut)	DIN EN60747-5-2 (VDE0884 Part2) Approved (Option)	PS8821-1
PS8821-1-V-F3	PS8821-1-V-F3-AX		Embossed Tape 1 500 pcs/reel		
PS8821-1-V-F4	PS8821-1-V-F4-AX				
PS8821-2-V	PS8821-2-V-AX		20 pcs (Tape 20 pcs cut)		PS8821-2
PS8821-2-V-F3	PS8821-2-V-F3-AX		Embossed Tape 1 500 pcs/reel		
PS8821-2-V-F4	PS8821-2-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/ch
	Reverse Voltage	V_R	5.0	V/ch
	Power Dissipation*1	P_D	45	mW/ch
Detector	Supply Voltage	V_{CC}	7	V
	Output Voltage	V_O	7	V/ch
	Output Current	I_O	8.0	mA/ch
	Power Dissipation*2	P_C	100	mW/ch
Isolation Voltage*3		BV	2 500	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 mA/°C at T_A = 25°C or more.

***2** Reduced to 1.00 mA/°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 1-4 shorted together, 5-8 shorted together.

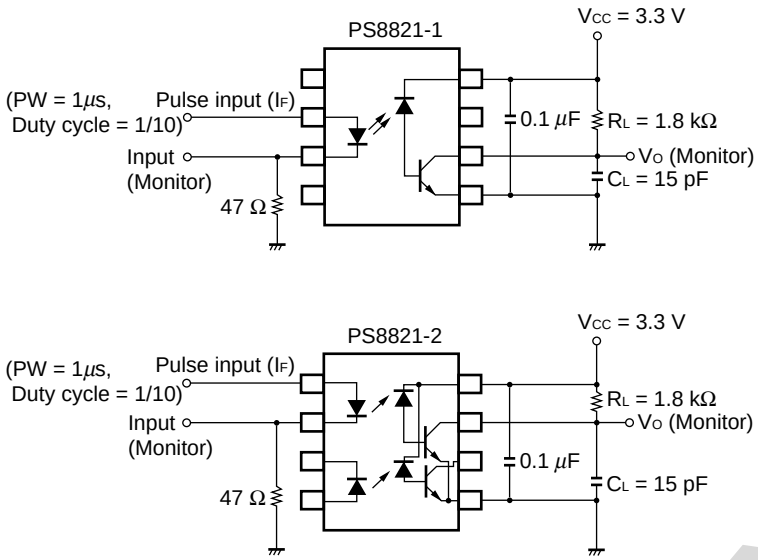
RECOMMENDED OPERATING CONDITIONS

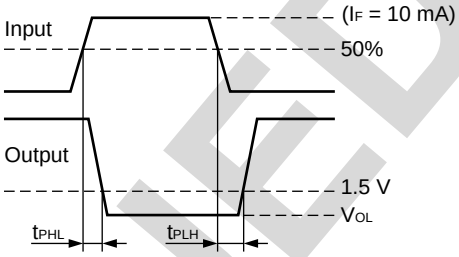
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V_{CC}	3.0	3.3	3.6	V
Forward Current (ON)	$I_{F (ON)}$	16		20	mA
Input Voltage (OFF)	$V_{F (OFF)}$	0		0.8	V

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

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}	I_F = 0 mA, V_{CC} = V_O = 3.3 V		0.01	1	μA
	Low Level Output Voltage	V_{OL}	I_F = 16 mA, V_{CC} = 3.3 V, I_{OL} = 1.2 mA		0.1	0.4	V
	High Level Supply Current (PS8821-1)	I_{CCH}	I_F = 0 mA, V_O = open, V_{CC} = 3.3 V		0.1	10	μA
	High Level Supply Current (PS8821-2)				0.2	20	
	Low Level Supply Current (PS8821-1)	I_{CCL}	I_F = 16 mA, V_O = open, V_{CC} = 3.3 V		100		
	Low Level Supply Current (PS8821-2)				200		
Coupled	Current Transfer Ratio	CTR	I_F = 16 mA, V_{CC} = 3.3 V, V_O = 0.4 V	20	40		%
	Input-Output Isolation Resistance	R_{I-O}	V_{I-O} = 1 kV_{DC}, RH = 40 to 60%	10^{11}			Ω
	Insulation Resistance (Input-Input), (PS8821-2)	R_{I-I}	V_{I-I} = 5 V_{DC}, RH = 40 to 60%	10^{7}			
	Input-Output Isolation Capacitance	C_{I-O}	V = 0 V, f = 1 MHz		0.6		pF
	Insulation Capacitance (Input-Input), (PS8821-2)	C_{I-I}			0.3		
	Propagation Delay Time (H → L)[*1]	t_{PHL}	I_F = 10 mA, V_{CC} = 3.3 V, R_L = 1.8 kΩ, C_L = 15 pF, V_{THHL} = V_{THLH} = 1.5 V, T_A = 0 to 100°C		0.3	0.6	μs
	Propagation Delay Time (L → H)[*1]	t_{PLH}			0.5	0.9	
	Common Mode Transient Immunity at High Level Output[*2]	C_{MH}	I_F = 0 mA, V_{CC} = 3.3 V, R_L = 4.1 kΩ, V_{CM} = 1 kV		1		kV/μs
	Common Mode Transient Immunity at Low Level Output[*2]	C_{ML}	I_F = 10 mA, V_{CC} = 3.3 V, R_L = 4.1 kΩ, V_{CM} = 1 kV		−1		

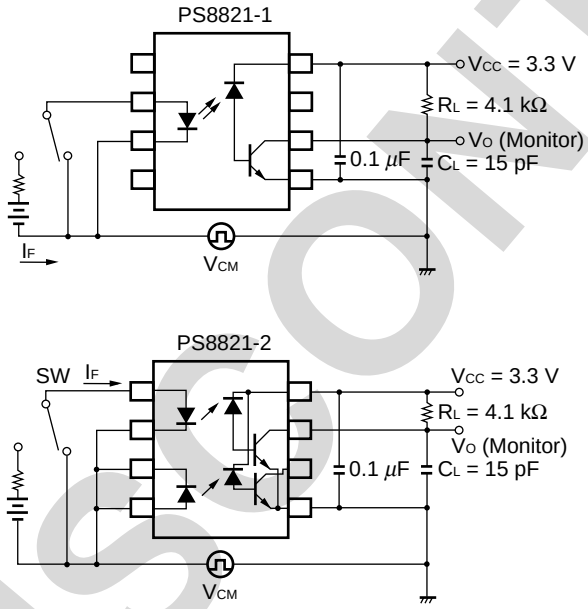
***1** Test circuit for propagation delay time

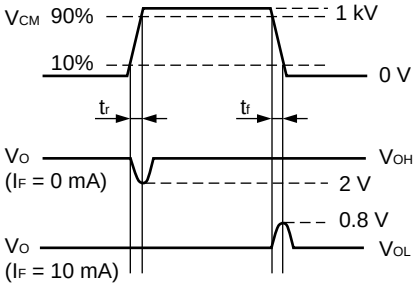




Remark C_L is approximately 15 pF which includes probe and stray wiring capacitance.

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



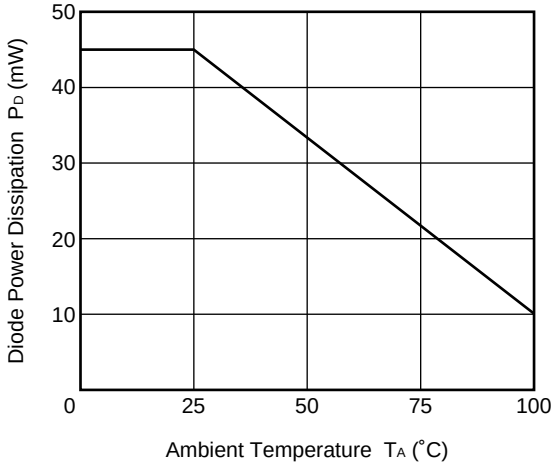


USAGE CAUTIONS

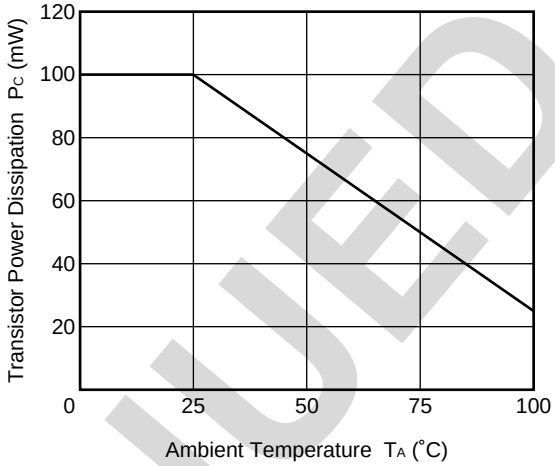
1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. By-pass capacitor of 0.1 μF is used between V_{CC} and GND near device. Also, ensure that the distance between the leads of the photocoupler and capacitor 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)

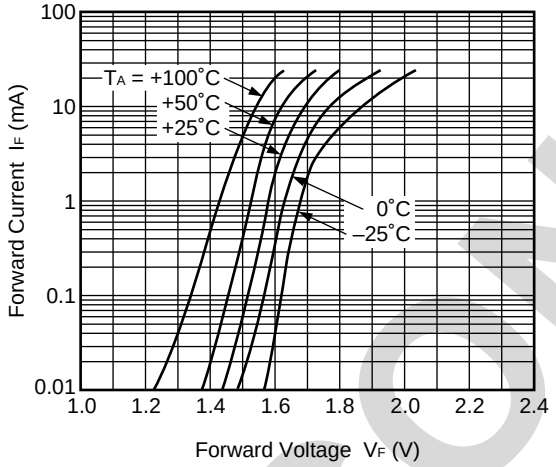
DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE



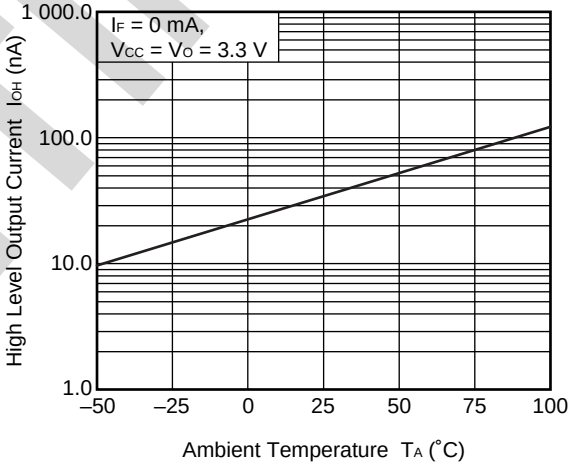
TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



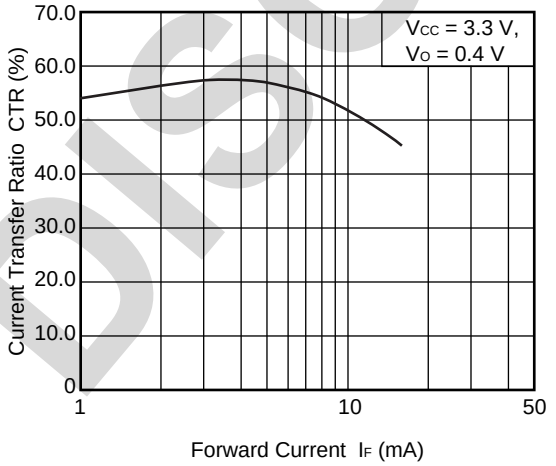
FORWARD CURRENT vs. FORWARD VOLTAGE



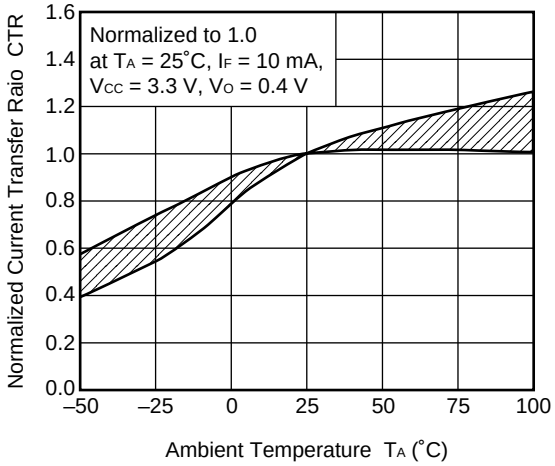
HIGH LEVEL OUTPUT CURRENT vs. AMBIENT TEMPERATURE



CURRENT TRANSFER RATIO vs. FORWARD CURRENT

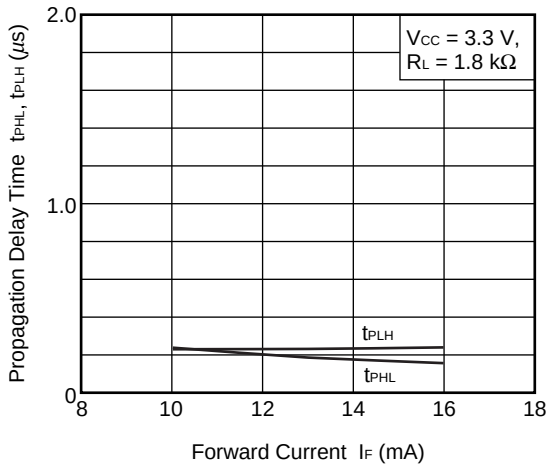


NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE

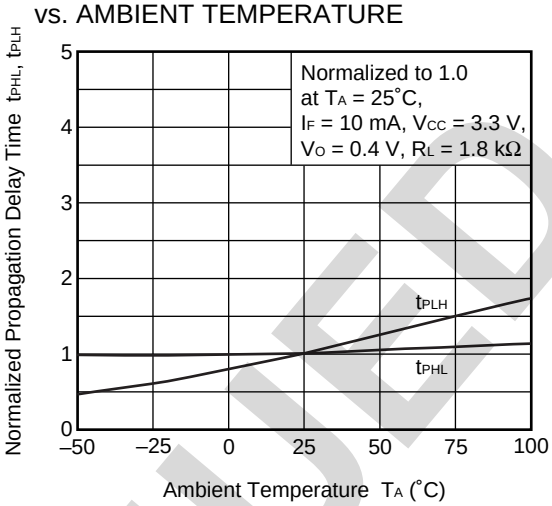


Remark The graphs indicate nominal characteristics.

PROPAGATION DELAY TIME vs. FORWARD CURRENT



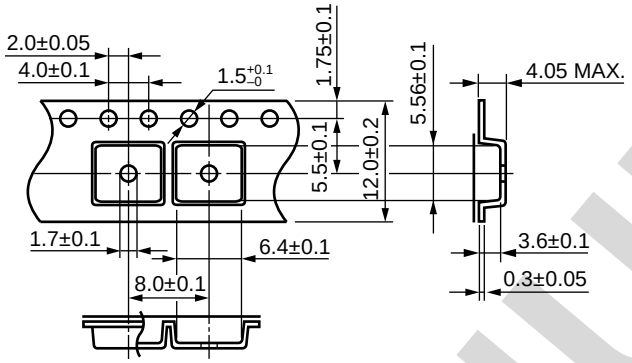
NORMALIZED PROPAGATION DELAY TIME vs. AMBIENT TEMPERATURE



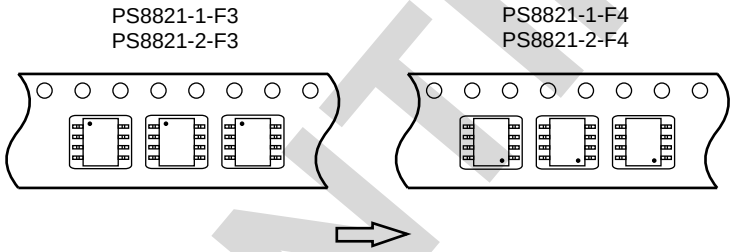
Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (UNIT: mm)

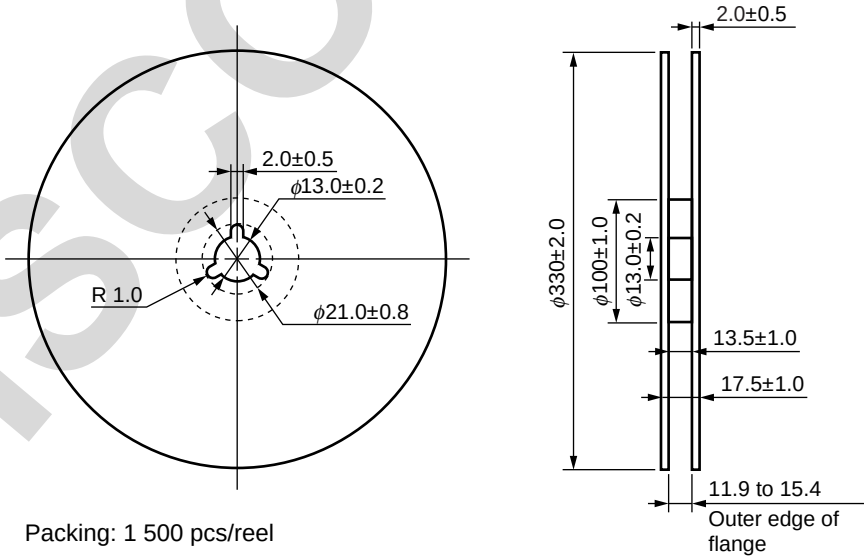
Outline and Dimensions (Tape)



Taping Direction

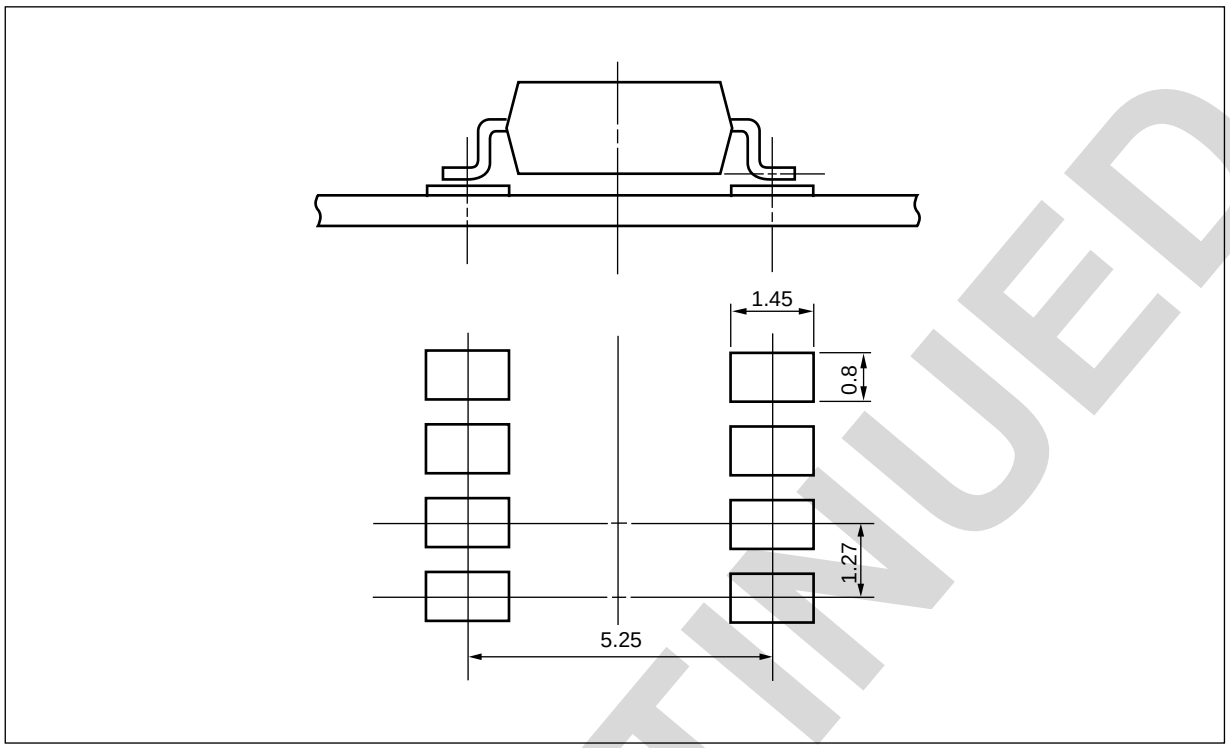


Outline and Dimensions (Reel)



Packing: 1 500 pcs/reel

RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)



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

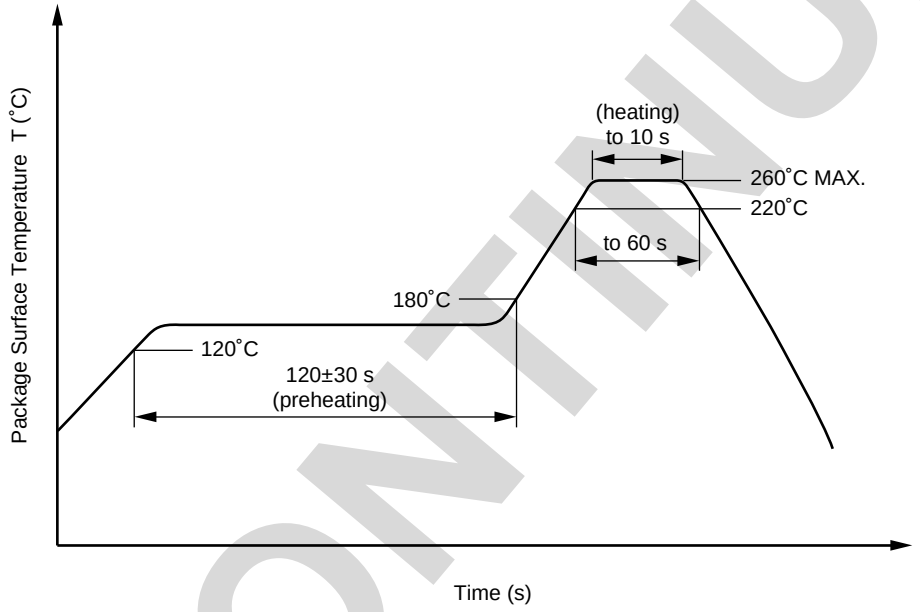
NOTES ON HANDLING

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.

(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.

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.

<R> **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	Speck	Unit
Application classification (DIN EN 60664-1 VDE0110 Part 1) for rated line voltages ≤ 300 Vr.m.s. for rated line voltages ≤ 600 Vr.m.s.		 IV III	
Climatic test class (DIN EN 60664-1 VDE0110)		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}	 566 849	 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}	1 061	V_{peak}
Highest permissible overvoltage	U_{TR}	4 000	V_{peak}
Degree of pollution (DIN EN 60664-1 VDE0110 Part 1)		2	
Clearance distance		>4.0	mm
Creepage distance		>4.0	mm
Comparative tracking index (DIN IEC 112/VDE 0303 Part 1)	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.	 150 150 600 10^9	 °C mA mW Ω

- **The information in this document is current as of August, 2008. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC Electronics data sheets or data books, etc., for the most up-to-date specifications of NEC Electronics products. Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.**
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- NEC Electronics products are classified into the following three quality grades: "Standard", "Special" and "Specific".
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  "Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support).
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(1) "NEC Electronics" as used in this statement means NEC Electronics Corporation and also includes its majority-owned subsidiaries.
(2) "NEC Electronics products" means any product developed or manufactured by or for NEC Electronics (as defined above).

M8E 02. 11-1

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.

Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

- View PS8821-2-A on WIN SOURCE
- CEL Information

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- Obsolete Management
- Cost Control Management
- Shortage Management
- Alternative Solution
- Excess Inventory Management