

1 Mbps HIGH CMR ANALOG OUTPUT TYPE

8-PIN SSOP (SO-8)

HIGH-SPEED PHOTOCOUPLER

—NEPOC Series—

DESCRIPTION

The PS8802-1, -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.

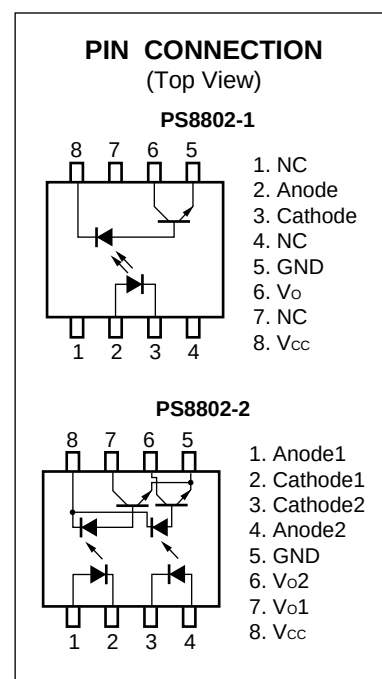
The PS8802-1, -2 are designed specifically for high common mode transient immunity (CMR), the PS8802-2 is suitable for high density applications.

FEATURES

- 40% reduction of mounting area (5-pin SOP × 2)
- High common mode transient immunity (C_{MH} , $C_{ML} = \pm 15 \text{ kV}/\mu\text{s MIN.}$)
- High supply voltage ($V_{CC} = 35 \text{ V}$)
- High isolation voltage ($BV = 2\,500 \text{ Vr.m.s.}$)
- High-speed response ($t_{PHL} = 0.8 \mu\text{s MAX.}$, $t_{PLH} = 1.2 \mu\text{s MAX.}$)
- Ordering number of tape product: PS8802-1-F3, F4: 1 500 pcs/reel
: PS8802-2-F3, F4: 1 500 pcs/reel
- Pb-Free product
- Safety standards
 - UL approved: File No. E72422
 - DIN EN60747-5-2 (VDE0884 Part2) approved (option)

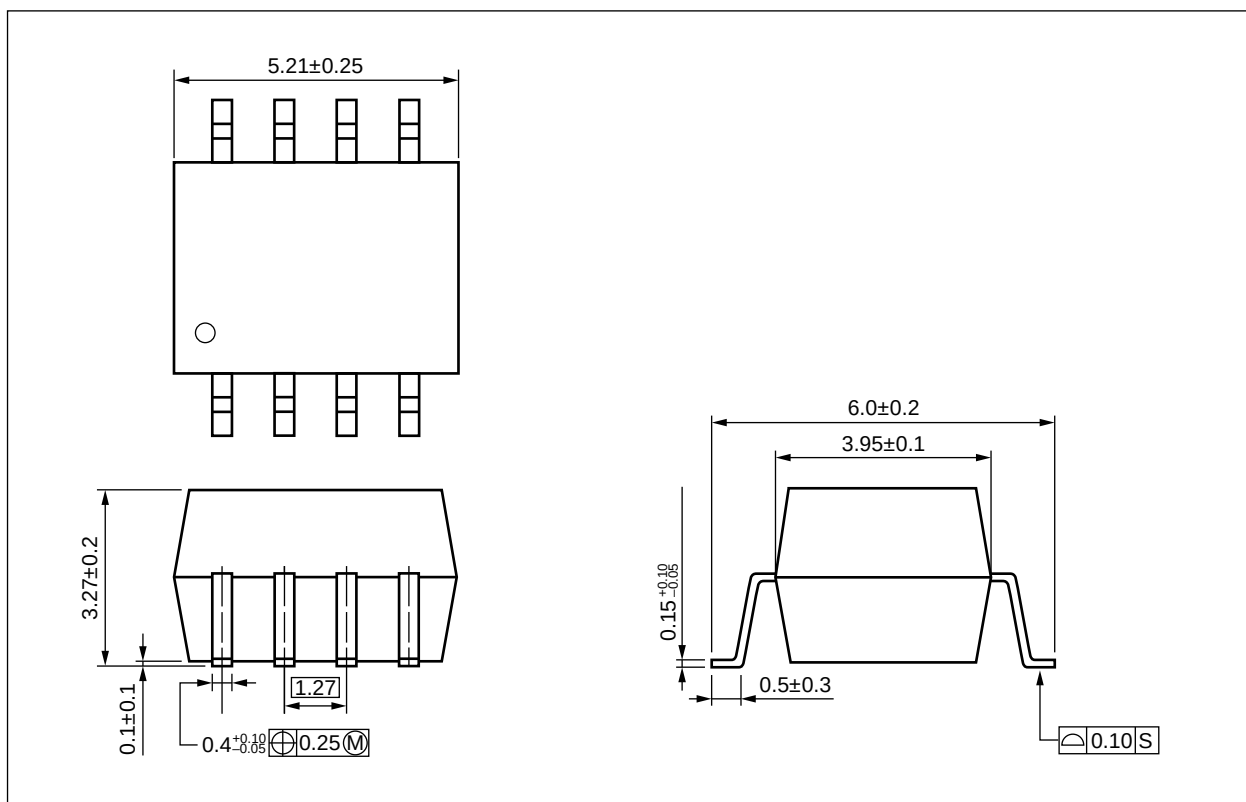
APPLICATIONS

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



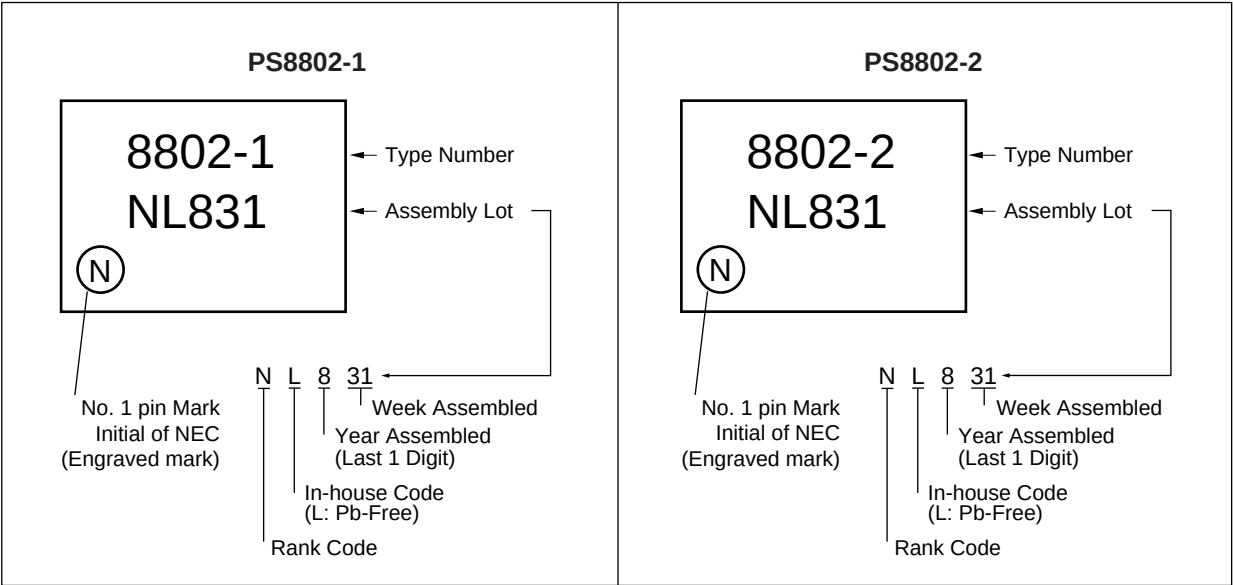
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PACKAGE DIMENSIONS (UNIT: mm)

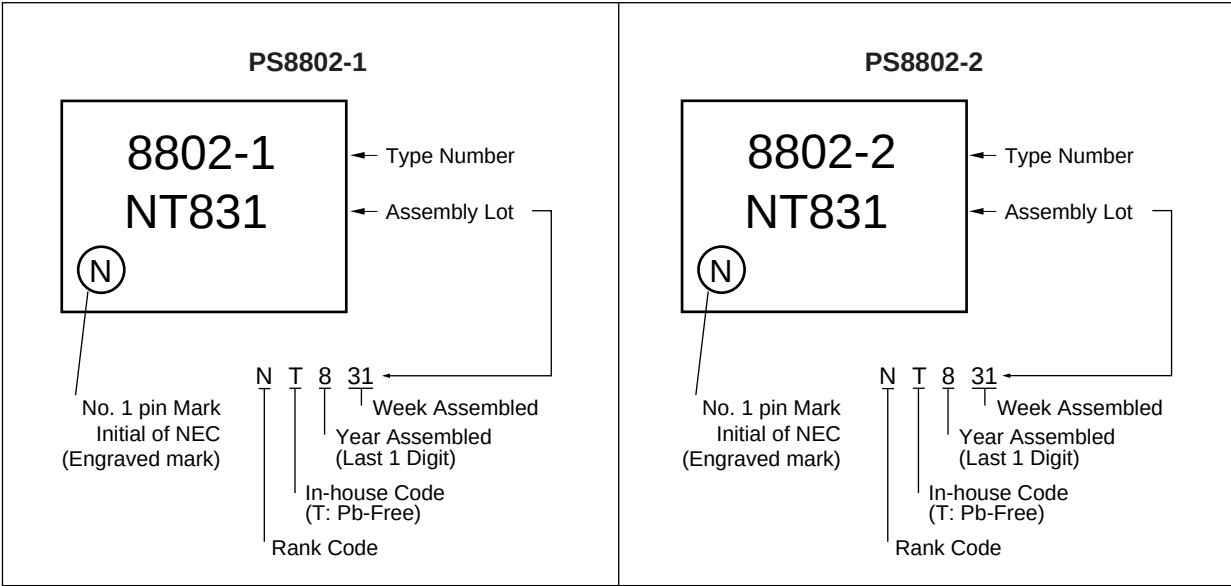


<R> **MARKING EXAMPLE**

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}
PS8802-1	PS8802-1-A	Pb-Free (SnBi)	20 pcs (Tape 20 pcs cut)	Standard products (UL approved)	PS8802-1
PS8802-1-F3	PS8802-1-F3-A		Embossed Tape 1 500 pcs/reel		
PS8802-1-F4	PS8802-1-F4-A				
PS8802-2	PS8802-2-A		20 pcs (Tape 20 pcs cut)		PS8802-2
PS8802-2-F3	PS8802-2-F3-A		Embossed Tape 1 500 pcs/reel		
PS8802-2-F4	PS8802-2-F4-A				
PS8802-1-V	PS8802-1-V-A		20 pcs (Tape 20 pcs cut)	DIN EN60747-5-2 (VDE0884 Part2) Approved (Option)	PS8802-1
PS8802-1-V-F3	PS8802-1-V-F3-A		Embossed Tape 1 500 pcs/reel		
PS8802-1-V-F4	PS8802-1-V-F4-A				
PS8802-2-V	PS8802-2-V-A		20 pcs (Tape 20 pcs cut)		PS8802-2
PS8802-2-V-F3	PS8802-2-V-F3-A		Embossed Tape 1 500 pcs/reel		
PS8802-2-V-F4	PS8802-2-V-F4-A				
PS8802-1	PS8802-1-AX	Pb-Free (Ni/Pd/Au)	20 pcs (Tape 20 pcs cut)	Standard products (UL approved)	PS8802-1
PS8802-1-F3	PS8802-1-F3-AX		Embossed Tape 1 500 pcs/reel		
PS8802-1-F4	PS8802-1-F4-AX				
PS8802-2	PS8802-2-AX		20 pcs (Tape 20 pcs cut)		PS8802-2
PS8802-2-F3	PS8802-2-F3-AX		Embossed Tape 1 500 pcs/reel		
PS8802-2-F4	PS8802-2-F4-AX				
PS8802-1-V	PS8802-1-V-AX		20 pcs (Tape 20 pcs cut)	DIN EN60747-5-2 (VDE0884 Part2) Approved (Option)	PS8802-1
PS8802-1-V-F3	PS8802-1-V-F3-AX		Embossed Tape 1 500 pcs/reel		
PS8802-1-V-F4	PS8802-1-V-F4-AX				
PS8802-2-V	PS8802-2-V-AX		20 pcs (Tape 20 pcs cut)		PS8802-2
PS8802-2-V-F3	PS8802-2-V-F3-AX		Embossed Tape 1 500 pcs/reel		
PS8802-2-V-F4	PS8802-2-V-F4-AX				

***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
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}	35	V
	Output Voltage	V_O	35	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	$^\circ\text{C}$
Storage Temperature		T_{stg}	-55 to +125	$^\circ\text{C}$

***1** Reduced to 0.45 mW/ $^\circ\text{C}$ at $T_A = 25^\circ\text{C}$ or more.

***2** Reduced to 1.00 mW/ $^\circ\text{C}$ at $T_A = 25^\circ\text{C}$ or more.

***3** AC voltage for 1 minute at $T_A = 25^\circ\text{C}$, RH = 60% between input and output.
Pins 1-4 shorted together, 5-8 shorted together.

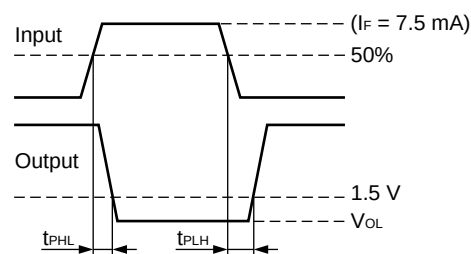
ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	V_F	$I_F = 16\text{ mA}$		1.7	2.2	V
	Reverse Current	I_R	$V_R = 3\text{ V}$			10	μA
	Forward Voltage Temperature Coefficient	$\Delta V_F / \Delta T_A$	$I_F = 16\text{ mA}$		-2.1		mV/ $^\circ\text{C}$
	Terminal Capacitance	C_i	$V = 0\text{ V}, f = 1\text{ MHz}$		30		pF
Detector	High Level Output Current	$I_{OH} (1)$	$I_F = 0\text{ mA}, V_{CC} = V_O = 5.5\text{ V}$		10	500	nA
	High Level Output Current	$I_{OH} (2)$	$I_F = 0\text{ mA}, V_{CC} = V_O = 30\text{ V}$			100	μA
	Low Level Output Voltage	V_{OL}	$I_F = 16\text{ mA}, V_{CC} = 4.5\text{ V}, I_{OL} = 1.2\text{ mA}$		0.1	0.4	V
	High Level Supply Current (PS8802-1)	I_{CCH}	$I_F = 0\text{ mA}, V_O = \text{open}, V_{CC} = 30\text{ V}$		0.1	2	μA
	High Level Supply Current (PS8802-2)				0.2	4	
	Low Level Supply Current (PS8802-1)	I_{CCL}	$I_F = 16\text{ mA}, V_O = \text{open}, V_{CC} = 30\text{ V}$		100		
	Low Level Supply Current (PS8802-2)				200		
Coupled	Current Transfer Ratio	CTR	$I_F = 16\text{ mA}, V_{CC} = 4.5\text{ V}, V_O = 0.4\text{ V}$	15	25	45	%
	Input-Output Isolation Resistance	R_{I-O}	$V_{I-O} = 1\text{ kV}_{DC}, RH = 40\text{ to }60\%$	10^{11}			Ω
	Insulation Resistance (Input-Input), (PS8802-2)	R_{I-I}	$V_{I-I} = 1\text{ kV}_{DC}, RH = 40\text{ to }60\%$	10^{10}			
	Input-Output Isolation Capacitance	C_{I-O}	$V = 0\text{ V}, f = 1\text{ MHz}$		0.6		pF
	Insulation Capacitance (Input-Input), (PS8802-2)	C_{I-I}			0.3		
	Propagation Delay Time ($H \rightarrow L$) ¹	t_{PHL}	$I_F = 16\text{ mA}, V_{CC} = 5\text{ V}, R_L = 2.2\text{ k}\Omega, C_L = 15\text{ pF}$		0.3	0.8	μs
	Propagation Delay Time ($L \rightarrow H$) ¹	t_{PLH}			0.6	1.2	
	Common Mode Transient Immunity at High Level Output ²	C_{MH}	$I_F = 0\text{ mA}, V_{CC} = 5\text{ V}, R_L = 4.1\text{ k}\Omega, V_{CM} = 1.5\text{ kV}$	15			kV/ μs
	Common Mode Transient Immunity at Low Level Output ²	C_{ML}	$I_F = 16\text{ mA}, V_{CC} = 5\text{ V}, R_L = 4.1\text{ k}\Omega, V_{CM} = 1.5\text{ kV}$	-15			

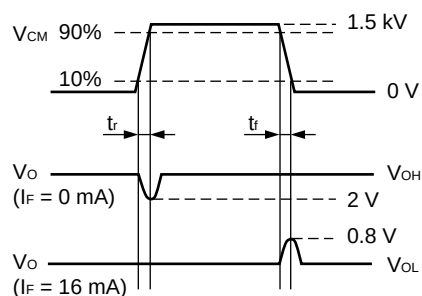
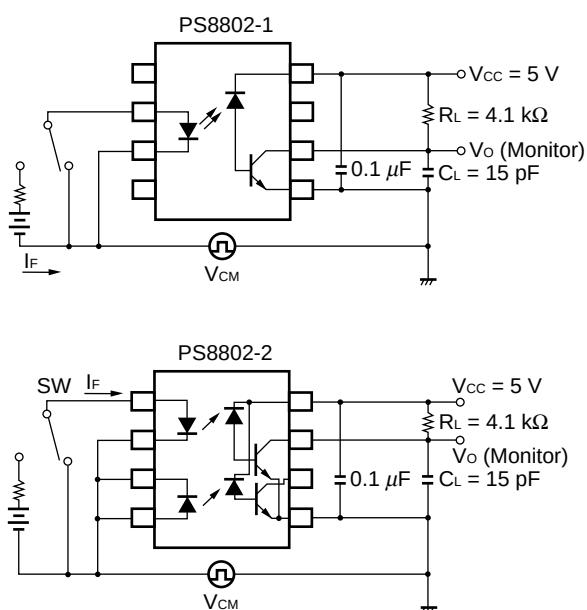
The figure shows two circuit diagrams for the PS8802-1 and PS8802-2 comparators. Both comparators are configured with a 5V supply ($V_{CC} = 5V$), a load resistor ($R_L = 2.2k\Omega$), a feedback capacitor ($C_L = 15pF$), and a 47 Ω resistor at the input. The input signal is a pulse with a width of $PW = 1\mu s$ and a duty cycle of $1/10$. The output is monitored at V_O (Monitor).

PS8802-1: This comparator has a single input stage. The input signal is applied to the inverting input (I_F). The non-inverting input is connected to ground through a 47 Ω resistor. The output is connected to the load resistor and the feedback capacitor.

PS8802-2: This comparator has a differential input stage. The input signal is applied to the inverting input (I_F). The non-inverting input is connected to ground through a 47 Ω resistor. The output is connected to the load resistor and the feedback capacitor.



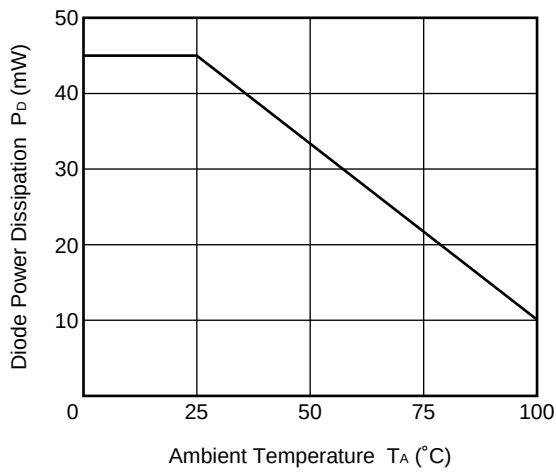
*2 Test circuit for common mode transient immunity



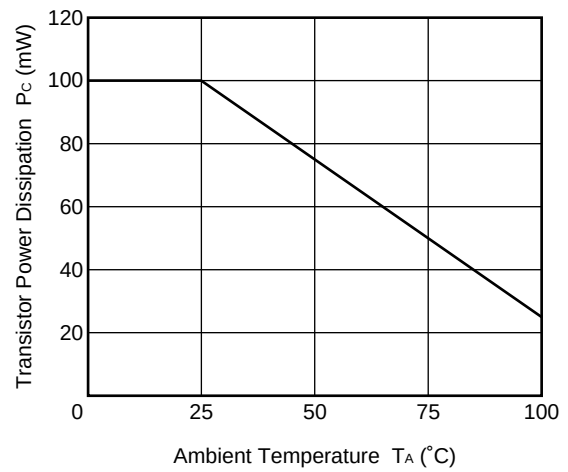
1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. By-pass capacitor of 0.1 μ F is used between V_{CC} and GND near device. Also, ensure that the distance between the leads of the photocoupler and capacitor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

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

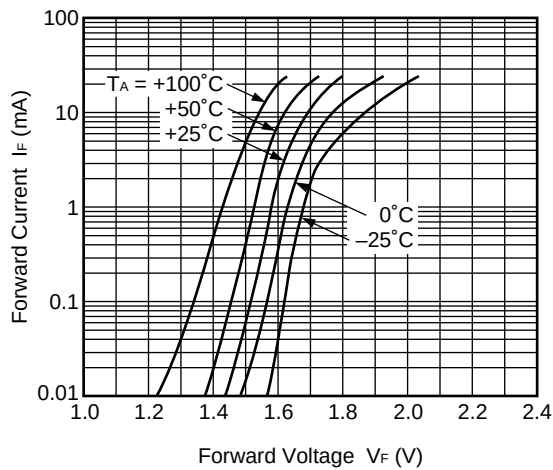
DIODE POWER DISSIPATION vs. AMBIENT TEMPERATURE



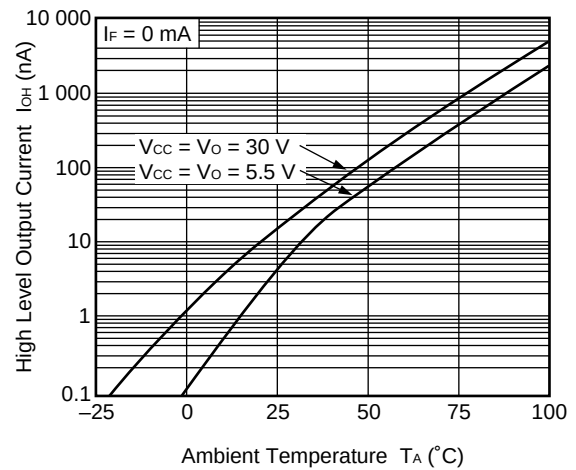
TRANSISTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



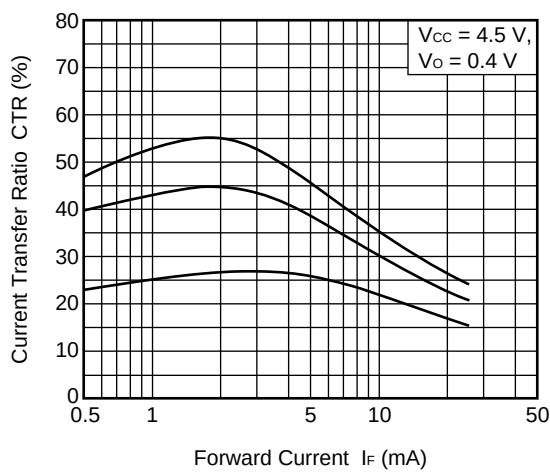
FORWARD CURRENT vs. FORWARD VOLTAGE



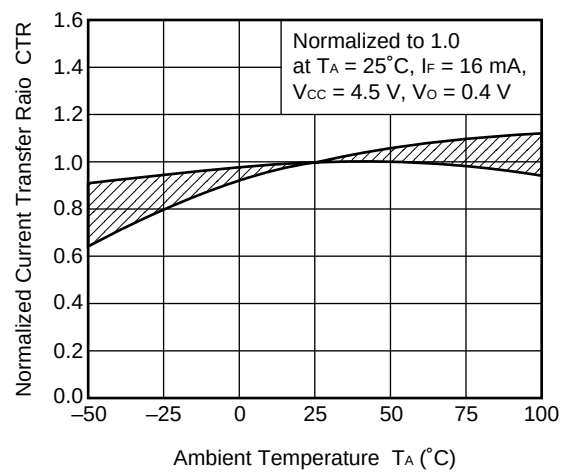
HIGH LEVEL OUTPUT CURRENT vs. AMBIENT TEMPERATURE



CURRENT TRANSFER RATIO vs. FORWARD CURRENT

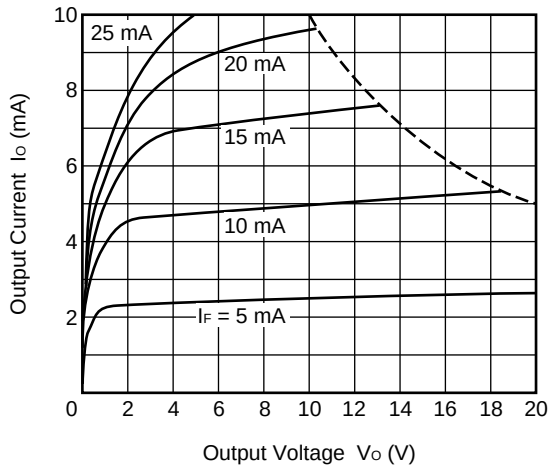


NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE

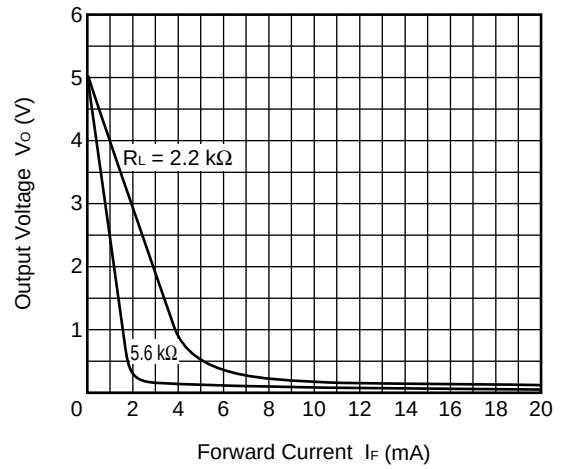


Remark The graphs indicate nominal characteristics.

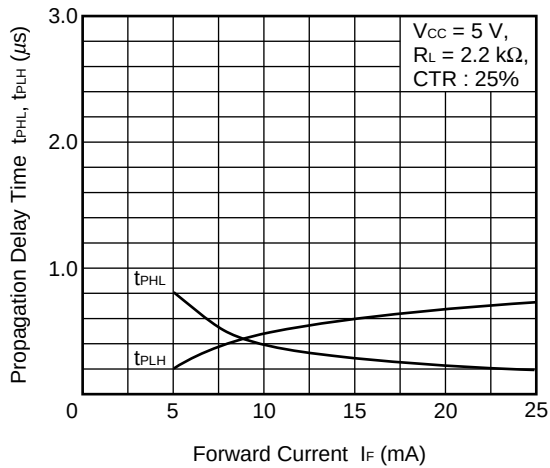
OUTPUT CURRENT vs.
OUTPUT VOLTAGE



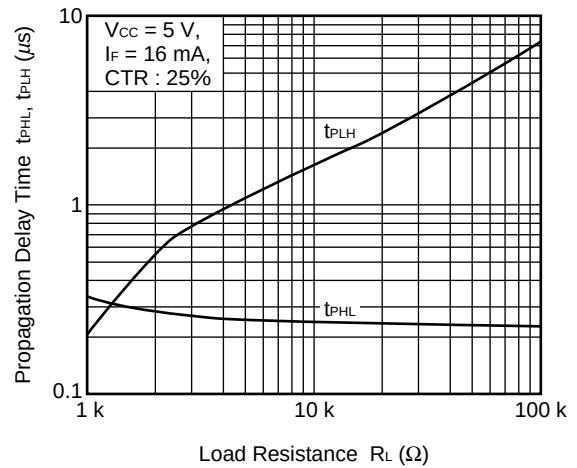
OUTPUT VOLTAGE vs.
FORWARD CURRENT



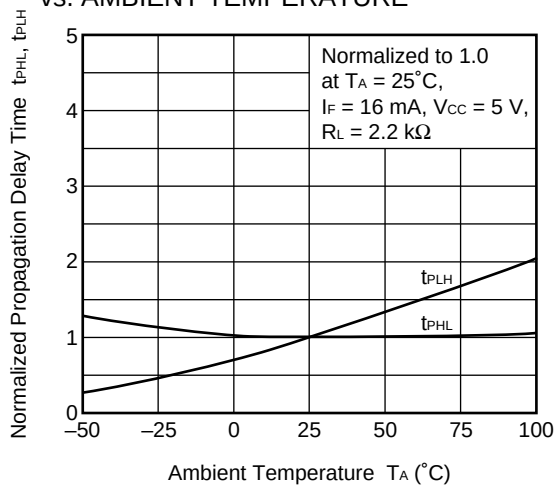
PROPAGATION DELAY TIME vs.
FORWARD CURRENT



PROPAGATION DELAY TIME vs.
LOAD RESISTANCE

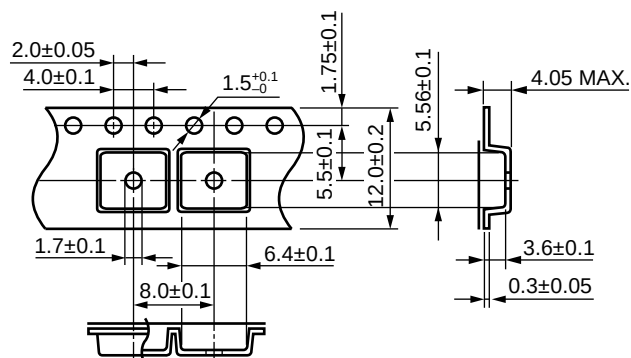


NORMALIZED PROPAGATION DELAY TIME
vs. AMBIENT TEMPERATURE

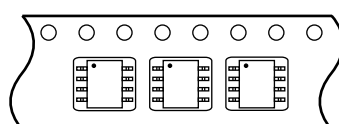


Remark The graphs indicate nominal characteristics.

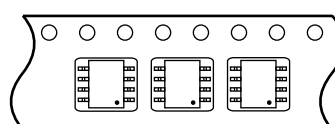
Outline and Dimensions (Tape)



PS8802-1-F3
PS8802-2-F3



PS8802-1-F4
PS8802-2-F4

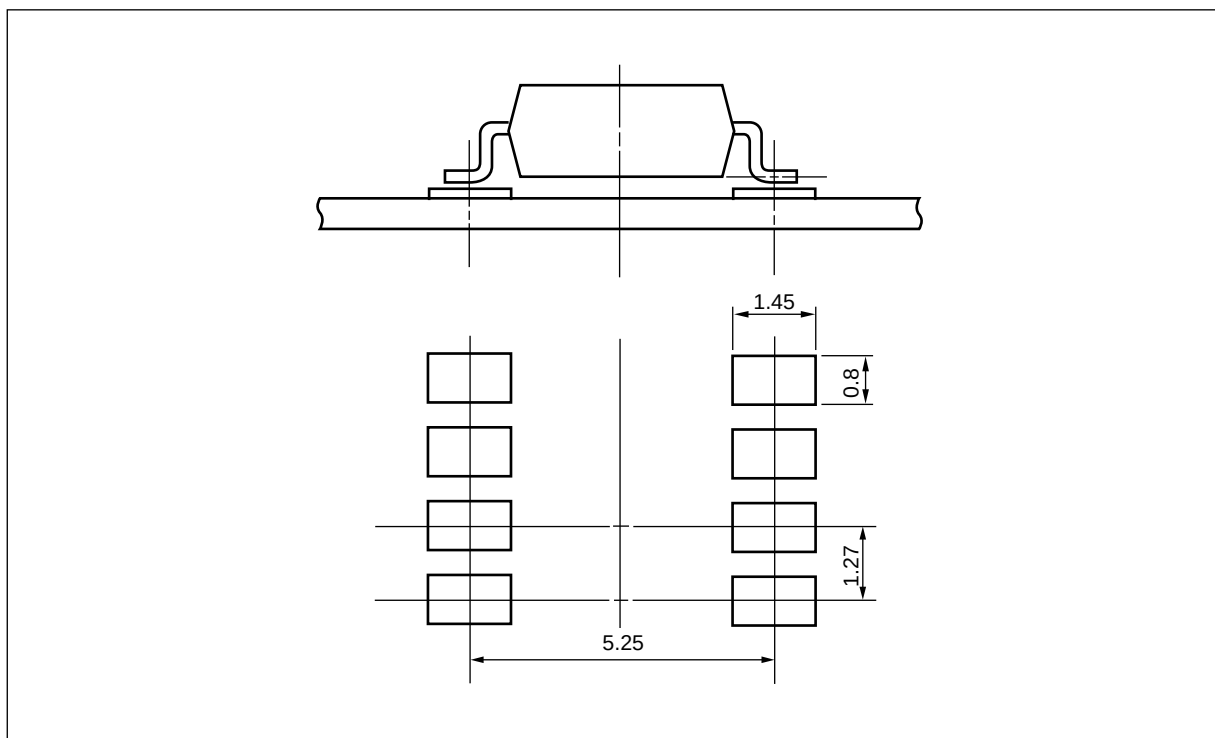


Technical drawing of a circular part. The drawing shows a large outer circle, a smaller dashed circle, and a central feature with a radius of R 1.0. Dimension lines indicate a width of 2.0 ± 0.5 , a diameter of $\phi 13.0 \pm 0.2$, and a diameter of $\phi 21.0 \pm 0.8$.

Technical drawing of a vertical pipe section showing dimensions for a flange. The drawing includes a central vertical line with horizontal lines indicating various diameters and distances. Dimensions are given in millimeters with tolerances.

- Top horizontal dimension: 2.0 ± 0.5
- Left vertical dimension (total length): $\phi 330 \pm 2.0$
- Left vertical dimension (upper section): $\phi 100 \pm 1.0$
- Left vertical dimension (lower section): $\phi 13.0 \pm 0.2$
- Right vertical dimension (upper section): 13.5 ± 1.0
- Right vertical dimension (lower section): 17.5 ± 1.0
- Bottom horizontal dimension: 11.9 to 15.4
- Text below bottom dimension: Outer edge of flange

RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)



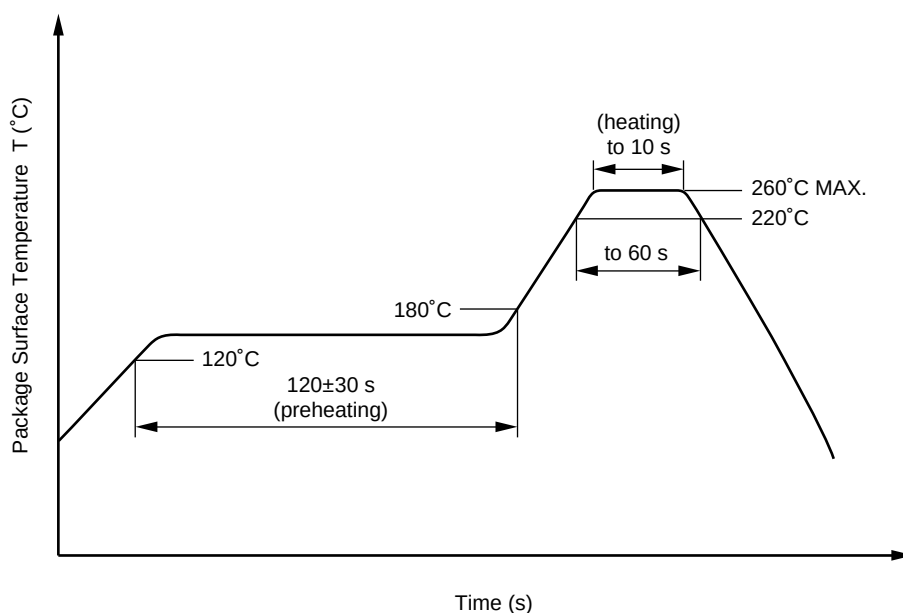
NOTES ON HANDLING

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.

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.

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 $T_A = 25^\circ\text{C}$ $V_{IO} = 500$ 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 , $P_{si} = 0$) Power (output or total power dissipation) Isolation resistance $V_{IO} = 500$ V dc at $T_A = T_{si}$	T_{si} I_{si} P_{si} 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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(Note)

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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.