

## HIGH CMR, 10 Mbps OPEN COLLECTOR OUTPUT TYPE

### 8-PIN SSOP (SO-8)

### HIGH-SPEED PHOTOCOUPLER

-NEPOC Series-

**DESCRIPTION**

The PS9817A-1 and PS9817A-2 are active-low type high-speed photocouplers that use a GaAlAs light-emitting diode on the input side and a photodetector IC that includes a photodiode and a signal processor on the same chip on the output side.

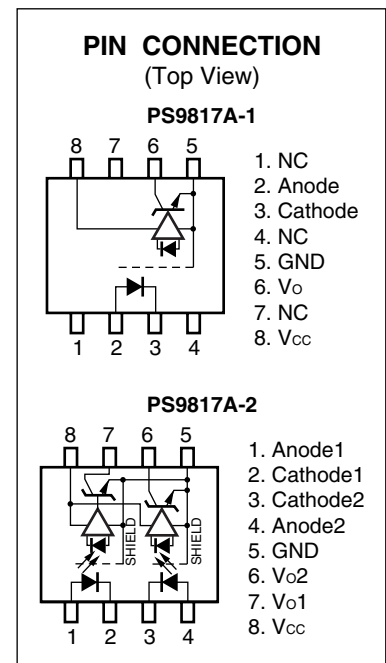
The PS9817A-1 and PS9817A-2 are designed specifically for high common mode transient immunity (CMR) and low pulse width distortion. The PS9817A-2 is suitable for high density applications.

**FEATURES**

- Pulse width distortion ( $|t_{PHL}-t_{PLH}| = 35 \text{ ns MAX.}$ )
- High common mode transient immunity ( $CM_H, CM_L = \pm 15 \text{ kV}/\mu\text{s MIN.}$ )
- 40% reduction of mounting area (5-pin SOP  $\times 2$ )
- High-speed (10 Mbps)
- High isolation voltage ( $BV = 2\,500 \text{ Vr.m.s.}$ )
- Open collector output
- Ordering number of tape product : PS9817A-1-F3: 1 500 pcs/reel  
: PS9817A-2-F3: 1 500 pcs/reel
- Pb-Free product

**APPLICATIONS**

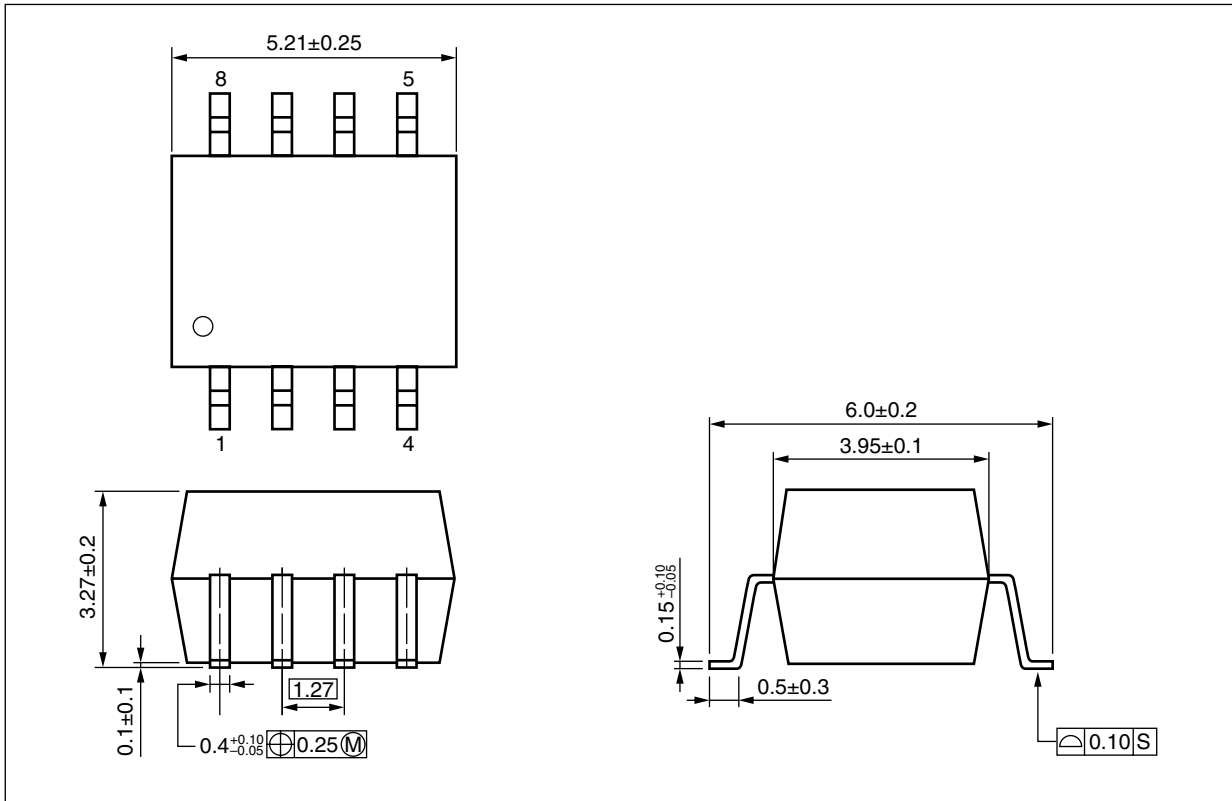
- Measurement equipment
- PDP
- FA Network

**TRUTH TABLE**

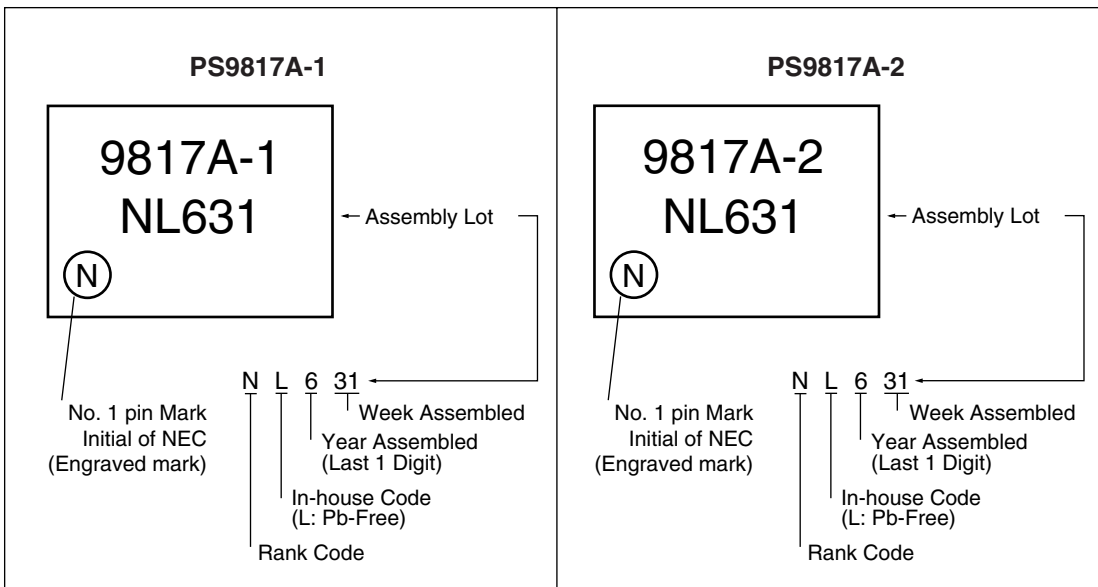
LED	Output
ON	L
OFF	H

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PACKAGE DIMENSIONS (UNIT: mm)



MARKING EXAMPLE



**ORDERING INFORMATION**

Part Number	Order Number	Solder plating specification	Packing Style	Safety Standards Approval	Application Part Number <sup>*1</sup>
PS9817A-1	PS9817A-1-A	Pb-Free	20 pcs (Tape 20 pcs cut)	Standard products (UL approved)	PS9817A-1
PS9817A-1-F3	PS9817A-1-F3-A		Embossed Tape 1 500 pcs/reel		
PS9817A-2	PS9817A-2-A		20 pcs (Tape 20 pcs cut)		PS9817A-2
PS9817A-2-F3	PS9817A-2-F3-A		Embossed Tape 1 500 pcs/reel		
PS9817A-1-V	PS9817A-1-V-A		20 pcs (Tape 20 pcs cut)	DIN EN60747-5-2	PS9817A-1
PS9817A-1-V-F3	PS9817A-1-V-F3-A		Embossed Tape 1 500 pcs/reel	(VDE0884 Part2)	
PS9817A-2-V	PS9817A-2-V-A		20 pcs (Tape 20 pcs cut)	approved	PS9817A-2
PS9817A-2-V-F3	PS9817A-2-V-F3-A		Embossed Tape 1 500 pcs/reel	(Option)	

\*1 For the application of the Safety Standard, following part number should be used.

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C, unless otherwise specified)**

Parameter		Symbol	Ratings		Unit
			PS9817A-1	PS9817A-2	
Diode	Forward Current	I <sub>F</sub>	20 <sup>*1</sup>	15 <sup>*2</sup>	mA/ch
	Reverse Voltage	V <sub>R</sub>	5		V/ch
Detector	Supply Voltage	V <sub>CC</sub>	7		V
	Output Voltage	V <sub>O</sub>	7		V/ch
	Output Current	I <sub>O</sub>	25		mA/ch
	Power Dissipation <sup>*3</sup>	P <sub>C</sub>	40		mW/ch
Isolation Voltage <sup>*4</sup>		BV	2 500		V <sub>r.m.s.</sub>
Operating Ambient Temperature		T <sub>A</sub>	-40 to +85		°C
Storage Temperature		T <sub>stg</sub>	-55 to +125		°C

\*1 Reduced to 0.3 mA/°C at T<sub>A</sub> = 60°C or more.

\*2 Reduced to 0.1 mA/°C at T<sub>A</sub> = 60°C or more.

\*3 Applies to output pin V<sub>O</sub> (collector pin). Reduced to 1.5 mW/°C at T<sub>A</sub> = 65°C or more.

\*4 AC voltage for 1 minute at T<sub>A</sub> = 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
Low Level Input Voltage	V <sub>FL</sub>	0		0.8	V
High Level Input Current	I <sub>FH</sub>	6.3	10	12.5	mA
Supply Voltage	V <sub>CC</sub>	4.5		5.5	V
Pull-up Resistance	R <sub>L</sub>	330		4 k	Ω
TLL (R <sub>L</sub> = 1.0 kΩ, loads)	N			5	

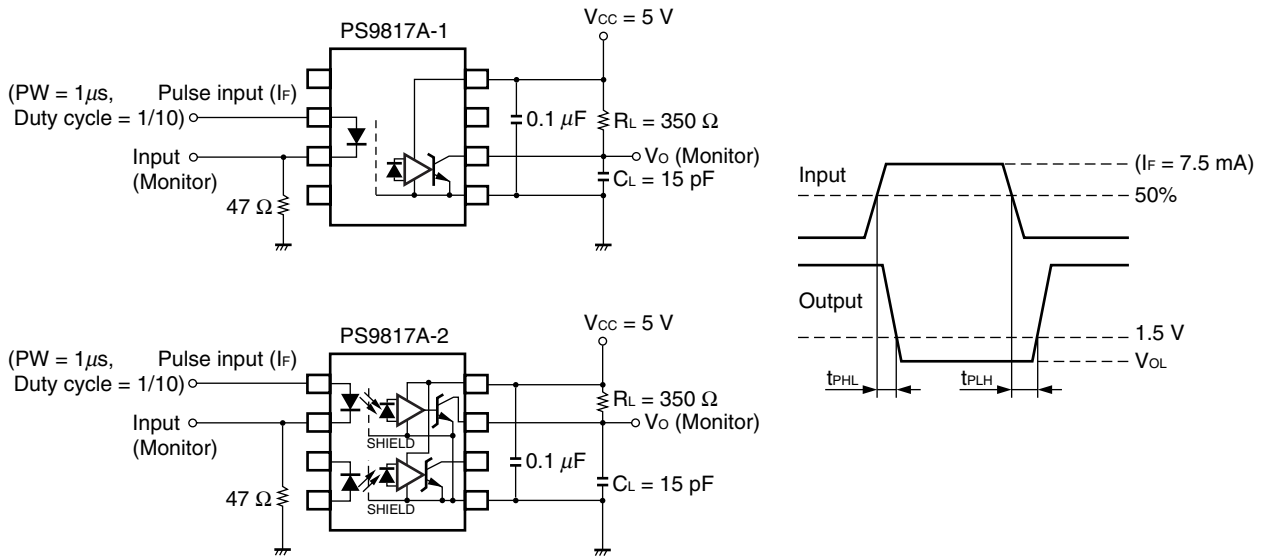
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = -40 to +85°C, unless otherwise specified)**

Parameter		Symbol	Conditions	MIN.	TYP. *1	MAX.	Unit	
Diode	Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 10 mA, T <sub>A</sub> = 25°C	1.4	1.65	1.8	V	
	Reverse Current	I <sub>R</sub>	V <sub>R</sub> = 3.0 V, T <sub>A</sub> = 25°C			10	μA	
	Terminal Capacitance	C <sub>i</sub>	V <sub>F</sub> = 0 V, f = 1 MHz, T <sub>A</sub> = 25°C		30		pF	
Detector	High Level Output Current	I <sub>OH</sub>	V <sub>CC</sub> = V <sub>O</sub> = 5.5 V, V <sub>F</sub> = 0.8 V		1	100	μA	
	Low Level Output Voltage *2	V <sub>OL</sub>	V <sub>CC</sub> = 5.5 V, I <sub>F</sub> = 5.0 mA, I <sub>OL</sub> = 13 mA		0.2	0.6	V	
	High Level Supply Current (PS9817A-1)	I <sub>CCH</sub>	V <sub>CC</sub> = 5.5 V, I <sub>F</sub> = 0 mA, V <sub>O</sub> = open		4	7	mA	
	High Level Supply Current (PS9817A-2)				8	14		
	Low Level Supply Current (PS9817A-1)	I <sub>CCL</sub>	V <sub>CC</sub> = 5.5 V, I <sub>F</sub> = 10 mA, V <sub>O</sub> = open		6	10		
	Low Level Supply Current (PS9817A-2)				12	20		
Coupled	Threshold Input Current (H → L)	I <sub>FHL</sub>	V <sub>CC</sub> = 5.0 V, V <sub>O</sub> = 0.8 V, R <sub>L</sub> = 350 Ω		2	5	mA	
	Isolation Resistance	R <sub>I-O</sub>	V <sub>I-O</sub> = 1 kV <sub>DC</sub> , R <sub>H</sub> = 40 to 60%, T <sub>A</sub> = 25°C	10 <sup>11</sup>			Ω	
	Insulation Resistance (Input-Input), (PS9817A-2)	R <sub>I-I</sub>	V <sub>I-I</sub> = 1 kV <sub>DC</sub> , R <sub>H</sub> = 40 to 60%, T <sub>A</sub> = 25°C	10 <sup>10</sup>			Ω	
	Isolation Capacitance	C <sub>I-O</sub>	V = 0 V, f = 1 MHz, T <sub>A</sub> = 25°C		0.6		pF	
	Insulation Capacitance (Input-Input), (PS9817A-2)	C <sub>I-I</sub>	V = 0 V, f = 1 MHz, T <sub>A</sub> = 25°C		0.3		pF	
	Propagation Delay Time (H → L) *3	t <sub>PHL</sub>	V <sub>CC</sub> = 5.0 V, R <sub>L</sub> = 350 Ω, I <sub>F</sub> = 7.5 mA	T <sub>A</sub> = 25°C		40	75	ns
							100	
	Propagation Delay Time (L → H) *3	t <sub>PLH</sub>		T <sub>A</sub> = 25°C		45	75	
							100	
	Rise Time	t <sub>r</sub>				20		
	Fall Time	t <sub>f</sub>				5		
	Pulse Width Distortion (PWD) *3	t <sub>PHL</sub> - t <sub>PLH</sub>				5	35	
	Propagation Delay Skew	t <sub>PSK</sub>					40	
Common Mode Transient Immunity at High Level Output *4	CM <sub>H</sub>	V <sub>CC</sub> = 5.0 V, R <sub>L</sub> = 350 Ω, T <sub>A</sub> = 25°C, I <sub>F</sub> = 0 mA, V <sub>O</sub> > 2 V, V <sub>CM</sub> = 1 kV		15	20		kV/μs	
Common Mode Transient Immunity at Low Level Output *4	CM <sub>L</sub>	V <sub>CC</sub> = 5.0 V, R <sub>L</sub> = 350 Ω, T <sub>A</sub> = 25°C, I <sub>F</sub> = 7.5 mA, V <sub>O</sub> < 0.8 V, V <sub>CM</sub> = 1 kV		15	20			

\*1 Typical values at T<sub>A</sub> = 25°C

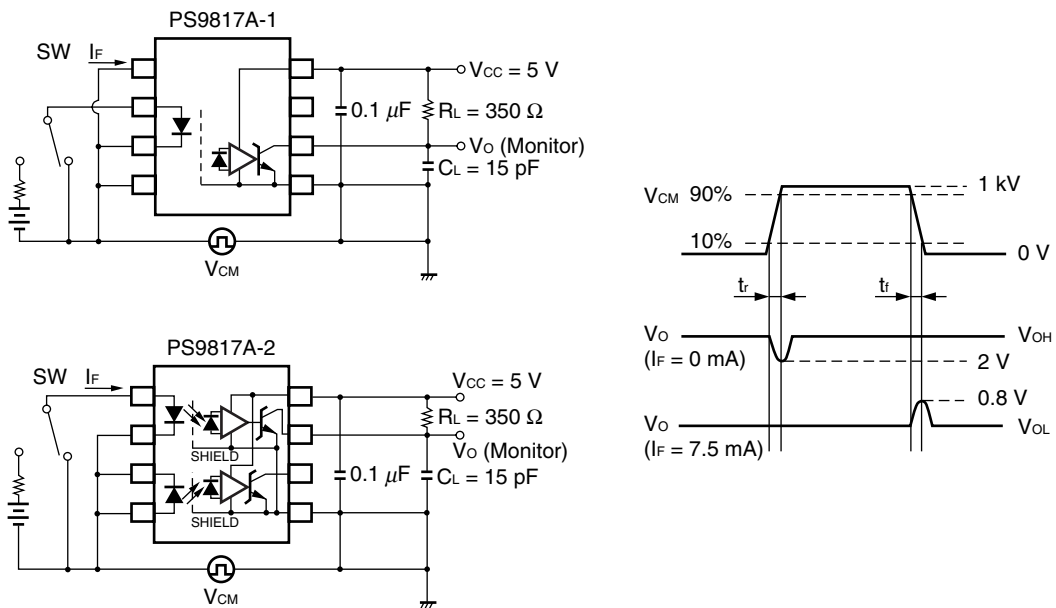
\*2 Because V<sub>OL</sub> of 2 V or more may be output when LED current input and when output supply of V<sub>CC</sub> = 2.6 V or less, it is important to confirm the characteristics (operation with the power supply on and off) during design, before using this device.

**\*3 Test circuit for propagation delay time**



**Remark**  $C_L$  includes probe and stray wiring capacitance.

**\*4 Test circuit for common mode transient immunity**

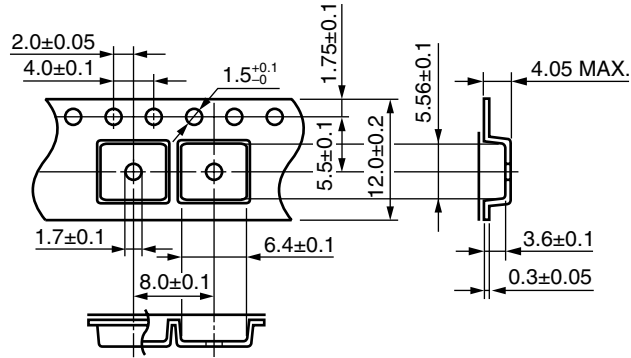


**USAGE CAUTIONS**

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  $0.1\ \mu\text{F}$  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  $10\text{ mm}$ .
3. Avoid storage at a high temperature and high humidity.

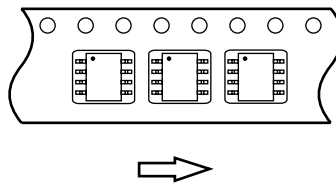
TAPING SPECIFICATIONS (UNIT: mm)

Outline and Dimensions (Tape)

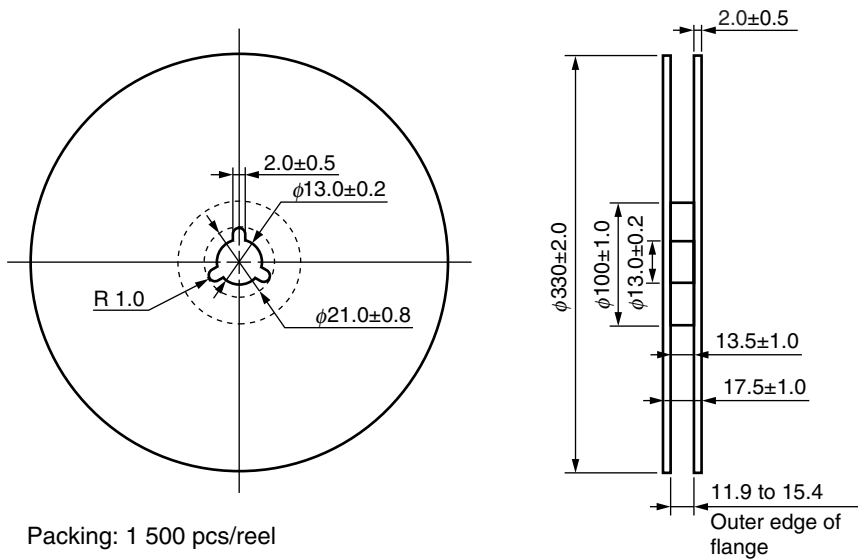


Taping Direction

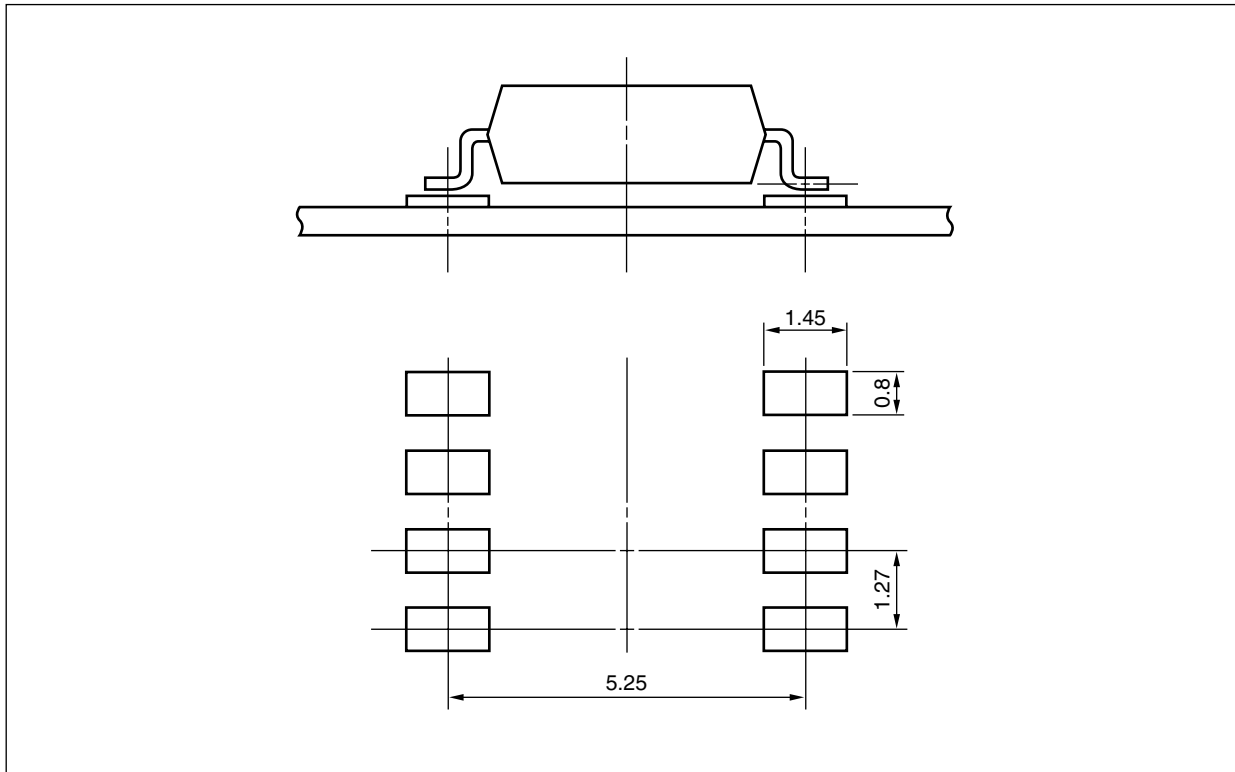
PS9817A-1-F3  
PS9817A-2-F3



Outline and Dimensions (Reel)



RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)



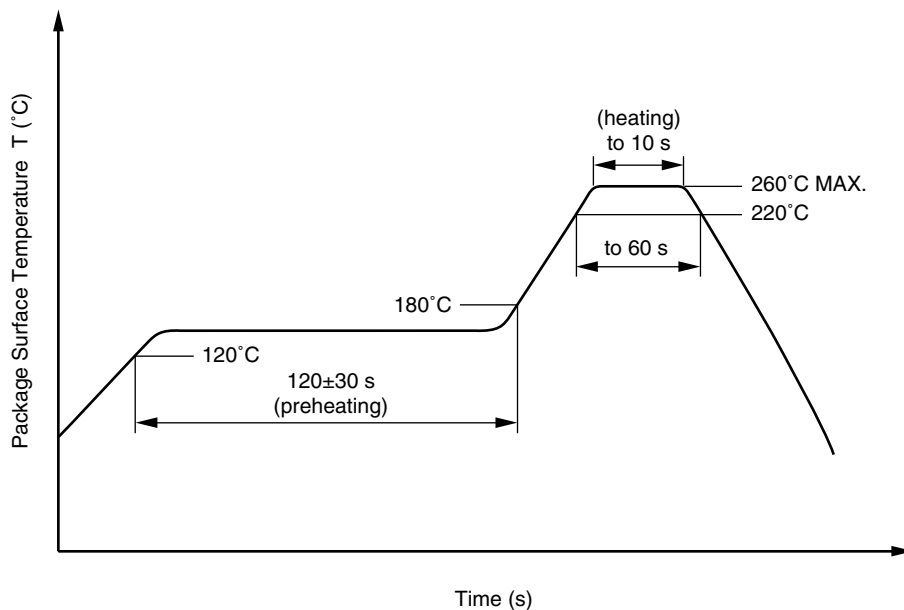
**NOTES ON HANDLING**

**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.

**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.

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