

PHOTOCOUPLER PS9701

HIGH SPEED DIGITAL OUTPUT TYPE 5-PIN SOP PHOTOCOUPLER

-NEPOC[™] Series-

DESCRIPTION

The PS9701 is an optically coupled isolator containing a GaAlAs LED on light emitting side (input side) and a photodiode and a signal processing circuit on light receiving side (output side) on one chip.

This is SOP (Small Outline Package) type for high-density applications.

FEATURES

- High isolation voltage (BV = 2 500 Vr.m.s.)
- Small and thin package (5-pin SOP)
- ★ High-speed response (tPHL = 36 ns TYP., tPLH = 60 ns TYP.)
 - Low threshold input current (IFHL = 2.5 mA TYP.)
- ★ Open-collector type
 - Ordering number of taping product: PS9701-1-E3, E4, F3, F4
 - UL approved: File No. E72422 (S)
 - VDE0884 approved (Option)

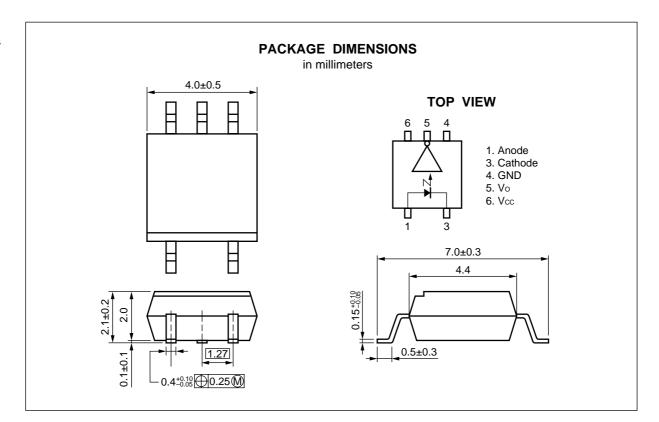
APPLICATIONS

- Computer and peripheral manufactures
- · Measurement equipment
- Audio-Visual

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Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.







★ ORDERING INFORMATION

Part Number	Package	Packing Style	Safety Standards Approval	Application Part Number*1
PS9701	5-pin SOP	Magazine case 100 pcs	UL approved	PS9701
PS9701-E3		Embossed Tape 900 pcs/reel		
PS9701-E4				
PS9701-F3		Embossed Tape 3 500 pcs/reel		
PS9701-F4				
PS9701-V		Magazine case 100 pcs	VDE0884 approved	
PS9701-V-E3		Embossed Tape 900 pcs/reel		
PS9701-V-E4				
PS9701-V-F3		Embossed Tape 3 500 pcs/reel		
PS9701-V-F4				

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

ABSOLUTE MAXIMUM RATINGS (TA = 25 °C, unless otherwise specified)

Parameter		Symbol	Ratings	Unit
Diode	Forward Current	lF	30	mA
	Reverse Voltage	VR	5	٧
Detector	Supply Voltage	Vcc	7	V
	Output Voltage	Vo	7	V
	Output Current	lo	50	mA
	Power Dissipation	Pc	85	mW
Isolation Voltage [™]		BV	2 500	Vr.m.s.
Operating Ambient Temperature		TA	-40 to +85	°C
Storage Temperature		T _{stg}	-55 to +125	°C

^{*1} AC voltage for 1 minute at $T_A = 25$ °C, RH = 60 % between input and output

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Low Level Input Current	lfL	0		250	μΑ
High Level Input Current	lғн	5	7.5	15	mA
Supply Voltage	Vcc	4.5	5.0	5.5	٧
Operating Ambient Temperature	TA	0	25	70	°C

Remark By-pass capacitor of more than 0.1 μ F is used between Vcc and GND near the device.

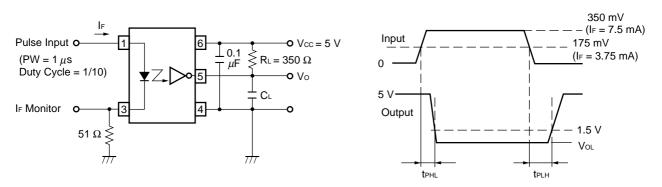
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ELECTRICAL CHARACTERISTICS (TA = 0 to +70 °C, unless otherwise specified)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	VF	I _F = 10 mA, T _A = 25 °C	1.4	1.65	1.9	V
	Reverse Current	IR	V _R = 5 V, T _A = 25 °C			10	μΑ
	Terminal Capacitance	Ct	V = 0 V, f = 1 MHz, T _A = 25 °C		60		pF
Detector	High Level Output Current	Іон	$Vcc = Vo = 5.5 \text{ V}, \text{ IF} = 250 \ \mu\text{A}$		2	250	μΑ
	Low Level Output Voltage	Vol	Vcc = 5.5 V, I _F = 7.5 mA, I _O = 13 mA		0.3	0.6	٧
	High Level Supply Current	Іссн	Vcc = 5.5 V, I _F = 0 mA	4	6	8	mA
	Low Level Supply Current	Iccl	Vcc = 5.5 V, I _F = 10 mA	9	12	15	mA
Coupled	Threshold Input Current	IFHL	T _A = 25 °C	0.5	2.5	5.0	mA
	$(H \rightarrow L)$		$V_{CC} = 5 \text{ V}, V_{O} = 0.8 \text{ V}, R_{L} = 350 \Omega$			7	
	Isolation Resistance	Rı-o	$V_{I-O} = 1 \text{ kVpc}, \text{ RH} = 40 \text{ to } 60 \text{ \%},$ $T_A = 25 ^{\circ}\text{C}$	1011			Ω
	Isolation Capacitance	C _{I-O}	V = 0 V, f = 1 MHz, T _A = 25 °C		0.6		pF
	Propagation Delay Time $(H \rightarrow L)^{-1}$	t PHL	$\label{eq:Vcc} \begin{array}{l} \mbox{Vcc} = 5 \mbox{ V, I}_F = 7.5 \mbox{ mA, RL} = 350 \ \Omega, \\ \mbox{CL} = 15 \mbox{ pF, T}_A = 25 \mbox{ °C} \end{array}$		36	75	ns
	Propagation Delay Time $(L \rightarrow H)^{-1}$	t PLH			60	75	
	Rise Time	tr			20		
Ì	Fall Time	tf			10		

*1 Test circuit for propagation delay time

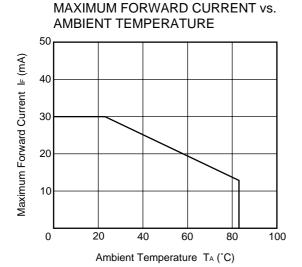


Remark C_L is approximately 15 pF, which includes probe and stray wiring capacitance.

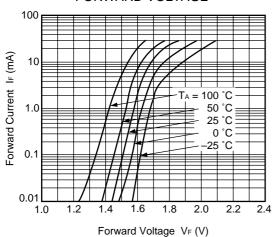
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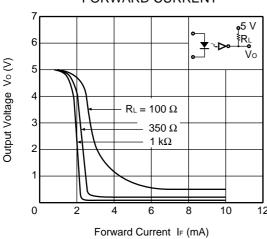
TYPICAL CHARACTERISTICS (TA = 25 °C, unless otherwise specified)



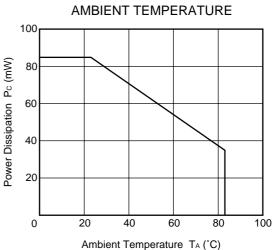
FORWARD CURRENT vs. FORWARD VOLTAGE



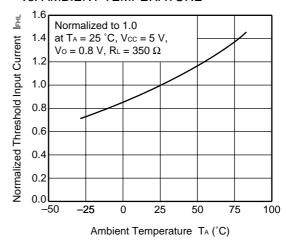
OUTPUT VOLTAGE vs. FORWARD CURRENT



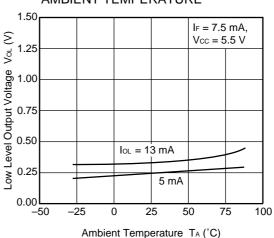
POWER DISSIPATION vs.



NORMALIZED THRESHOLD INPUT CURRENT vs. AMBIENT TEMPERATURE

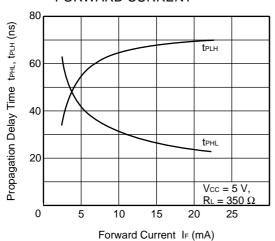


LOW LEVEL OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE

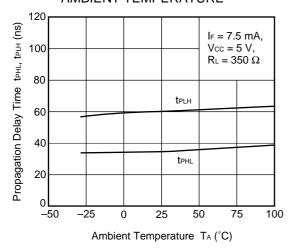




PROPAGATION DELAY TIME vs. FORWARD CURRENT

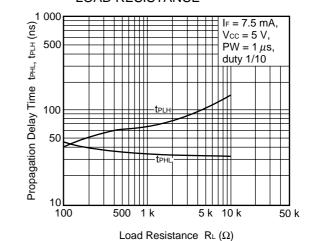


PROPAGATION DELAY TIME vs. AMBIENT TEMPERATURE

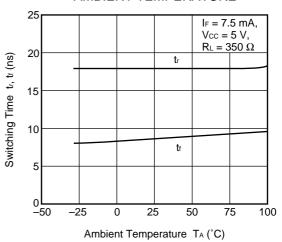


Remark The graphs indicate nominal characteristics.

PROPAGATION DELAY TIME vs. LOAD RESISTANCE

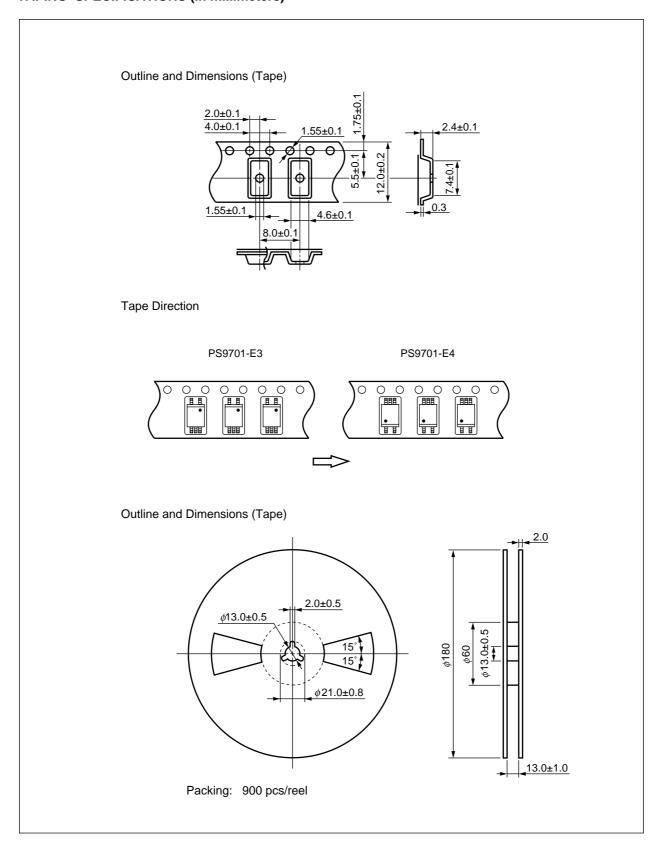


SWITCHING TIME vs. AMBIENT TEMPERATURE

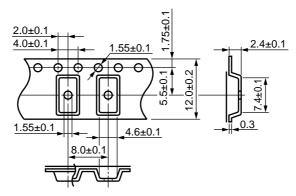




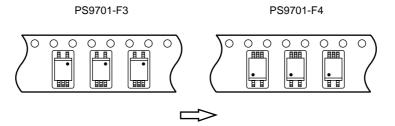
★ TAPING SPECIFICATIONS (in millimeters)



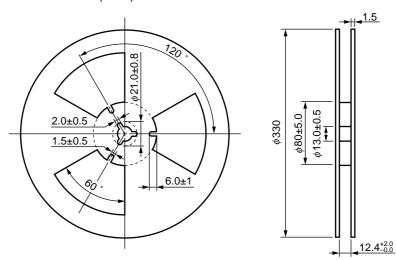
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



Packing: 3 500 pcs/reel



RECOMMENDED SOLDERING CONDITIONS

(1) Infrared reflow soldering

235 °C (package surface temperature) • Peak reflow temperature

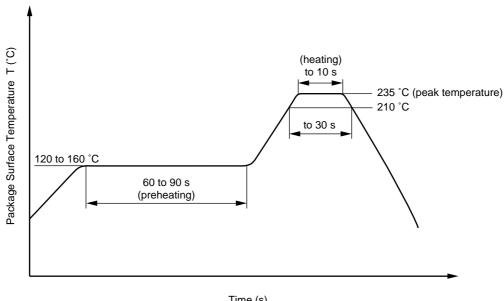
 \bullet Time of temperature higher than 210 $^{\circ}\text{C}$ 30 seconds or less

· 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



Time (s)

(2) Dip soldering

 Temperature 260 °C or below (molten solder temperature)

• Time 10 seconds or less

• Number of times One

• Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of

0.2 Wt % is recommended.)

(3) Cautions

Fluxes

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

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SPECIFICATION OF VDE MARKS LICENSE DOCUMENT (VDE0884)

Parameter	Symbol	Speck	Unit
Application classification (DIN VDE 0109)			
for rated line voltages ≤ 300 Vr.m.s.		IV	
for rated line voltages ≤ 600 Vr.m.s.		III	
Climatic test class (DIN IEC 68 Teil 1/09.80)		40/085/21	
Dielectric strength maximum operating isolation voltage.			
Test voltage (partial discharge test procedure a for type test and random test)	UIORM	710	V_{peak}
U _{pr} = 1.2 x U _{IORM} , P _d < 5 pC	U_pr	850	V_{peak}
Test voltage (partial discharge test procedure b for random test) $U_{pr} = 1.6 \times U_{IORM}, P_d < 5 pC$	Upr	1 140	V_{peak}
Highest permissible overvoltage	Utr	4 000	V _{peak}
Degree of pollution (DIN VDE 0109)		2	
Clearance distance		> 5	mm
Creepage distance		> 5	mm
Comparative tracking index (DIN IEC 112/VDE 0303 part 1)	СТІ	175	
Material group (DIN VDE 0109)		III a	
Storage temperature range	T _{stg}	-55 to +125	°C
Operating temperature range	TA	-40 to +85	°C
Isolation resistance, minimum value			
$V_{IO} = 500 \text{ V dc at T}_A = 25 ^{\circ}\text{C}$	Ris MIN.	10 ¹²	Ω
V _{IO} = 500 V dc at T _A MAX. at least 100 °C	Ris MIN.	10 ¹¹	Ω
Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve)			
Package temperature	Tsi	150	°C
Current (input current I _F , Psi = 0)	Isi	200	mA
Power (output or total power dissipation)	Psi	300	mW
Isolation resistance			
V _{IO} = 500 V dc at T _A = 175 °C (Tsi)	Ris MIN.	10°	Ω

[MEMO]

CAUTION

Within this device there exists GaAs (Gallium Arsenide) material which is a harmful substance if ingested. Please do not under any circumstances break the hermetic seal.

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