

DATA SHEET

NEC

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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 ($t_{PHL} = 36$ ns TYP., $t_{PLH} = 60$ ns TYP.)
- Low threshold input current ($I_{FHL} = 2.5$ 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)

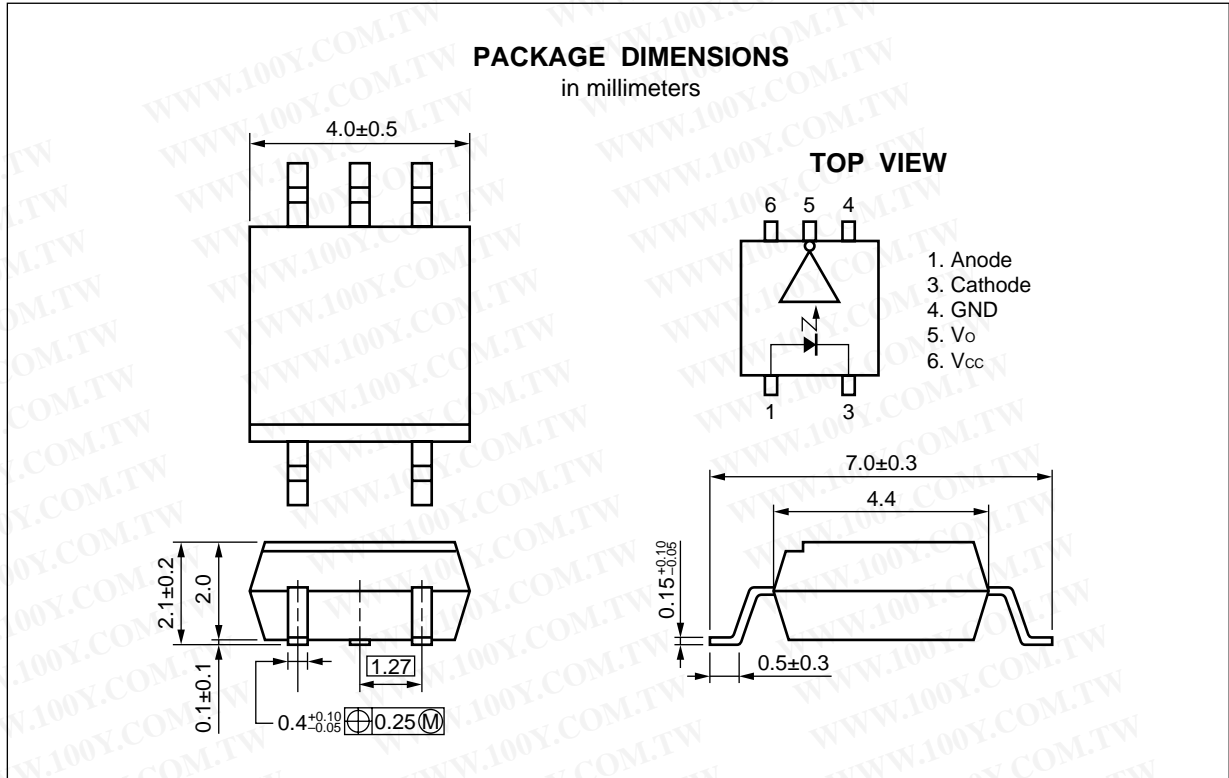
APPLICATIONS

- 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.

★

PACKAGE DIMENSIONS
in millimeters



★ 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	VDE0884 approved	
PS9701-F4				
PS9701-V		Magazine case 100 pcs		
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 (T_A = 25 °C, unless otherwise specified)

Parameter		Symbol	Ratings	Unit
Diode	Forward Current	I _F	30	mA
	Reverse Voltage	V _R	5	V
Detector	Supply Voltage	V _{CC}	7	V
	Output Voltage	V _O	7	V
	Output Current	I _O	50	mA
	Power Dissipation	P _C	85	mW
Isolation Voltage ^{*1}		BV	2 500	Vr.m.s.
Operating Ambient Temperature		T _A	-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

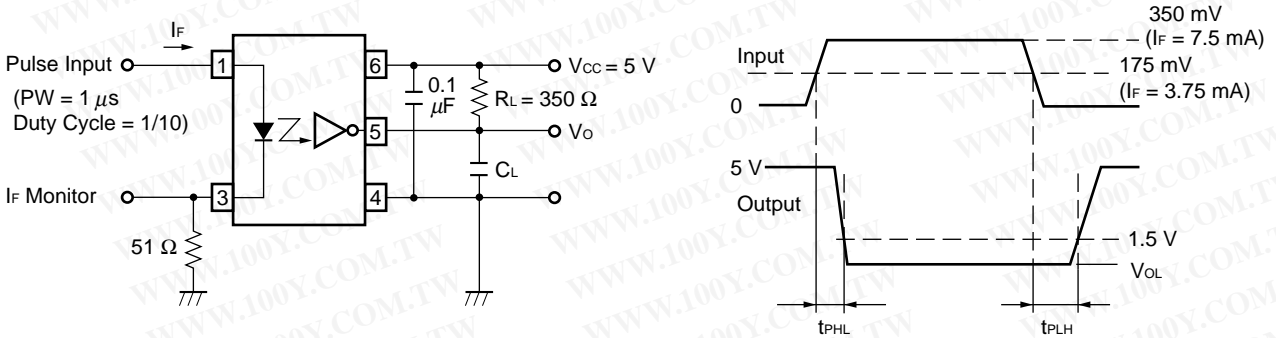
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Low Level Input Current	I _{FL}	0		250	μA
High Level Input Current	I _{FH}	5	7.5	15	mA
Supply Voltage	V _{CC}	4.5	5.0	5.5	V
Operating Ambient Temperature	T _A	0	25	70	°C

Remark By-pass capacitor of more than 0.1 μF is used between V_{CC} and GND near the device.

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

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	V _F	I _F = 10 mA, T _A = 25 °C	1.4	1.65	1.9	V
	Reverse Current	I _R	V _R = 5 V, T _A = 25 °C			10	μA
	Terminal Capacitance	C _t	V = 0 V, f = 1 MHz, T _A = 25 °C		60		pF
Detector	High Level Output Current	I _{OH}	V _{CC} = V _O = 5.5 V, I _F = 250 μA		2	250	μA
	Low Level Output Voltage	V _{OL}	V _{CC} = 5.5 V, I _F = 7.5 mA, I _O = 13 mA		0.3	0.6	V
	High Level Supply Current	I _{CCH}	V _{CC} = 5.5 V, I _F = 0 mA	4	6	8	mA
	Low Level Supply Current	I _{CCL}	V _{CC} = 5.5 V, I _F = 10 mA	9	12	15	mA
Coupled	Threshold Input Current (H → L)	I _{FHL}	T _A = 25 °C	0.5	2.5	5.0	mA
			V _{CC} = 5 V, V _O = 0.8 V, R _L = 350 Ω			7	
	Isolation Resistance	R _{I-O}	V _{I-O} = 1 kV _{DC} , R _H = 40 to 60 %, T _A = 25 °C	10 ¹¹			Ω
	Isolation Capacitance	C _{I-O}	V = 0 V, f = 1 MHz, T _A = 25 °C		0.6		pF
	Propagation Delay Time (H → L) ^{*1}	t _{PHL}	V _{CC} = 5 V, I _F = 7.5 mA, R _L = 350 Ω, C _L = 15 pF, T _A = 25 °C		36	75	ns
	Propagation Delay Time (L → H) ^{*1}	t _{PLH}			60	75	
	Rise Time	t _r				20	
Fall Time	t _f				10		

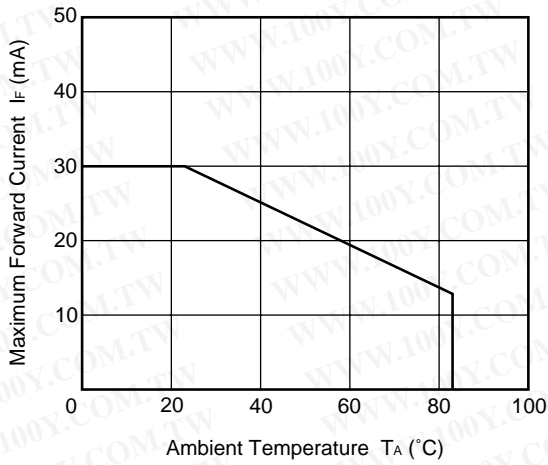
*1 Test circuit for propagation delay time



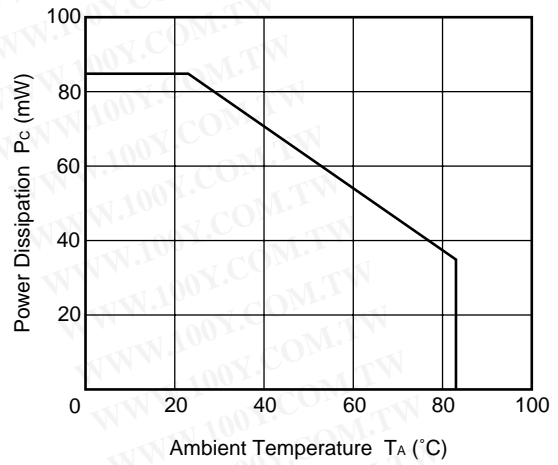
Remark C_L is approximately 15 pF, which includes probe and stray wiring capacitance.

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

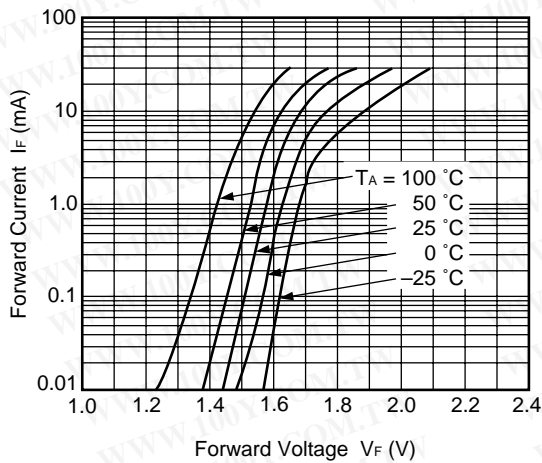
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



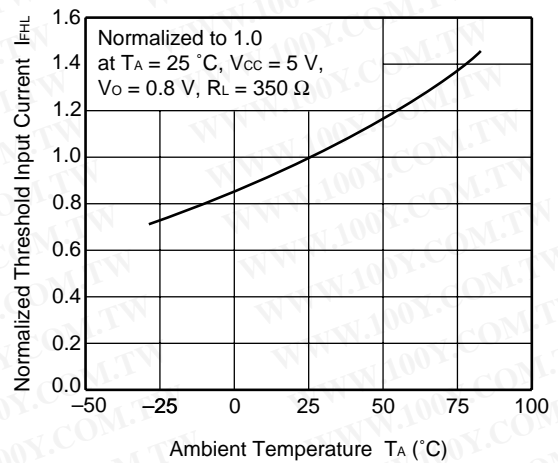
POWER DISSIPATION vs. AMBIENT TEMPERATURE



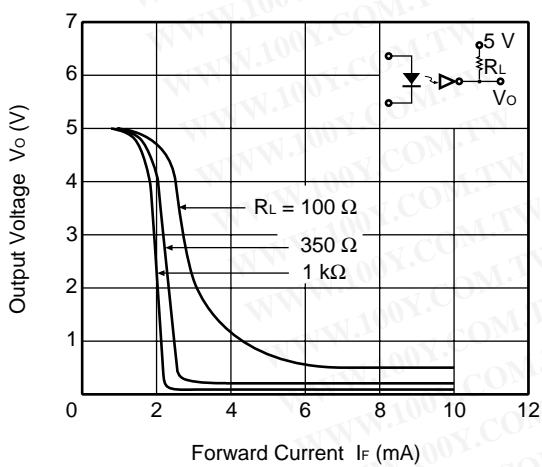
FORWARD CURRENT vs. FORWARD VOLTAGE



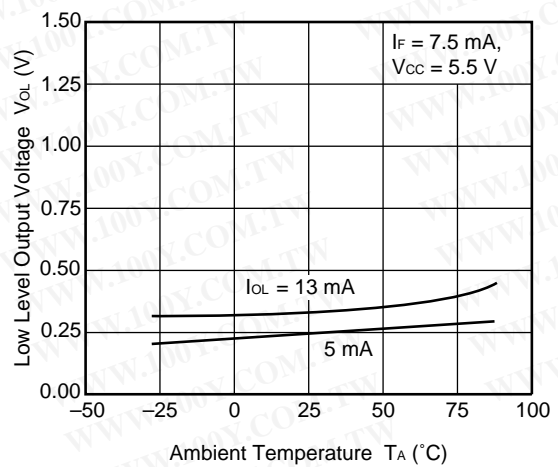
NORMALIZED THRESHOLD INPUT CURRENT vs. AMBIENT TEMPERATURE



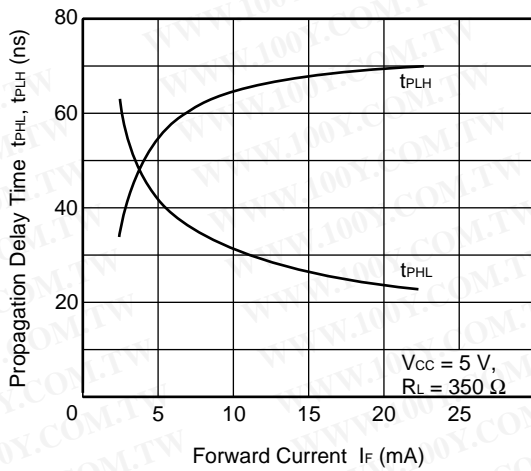
OUTPUT VOLTAGE vs. FORWARD CURRENT



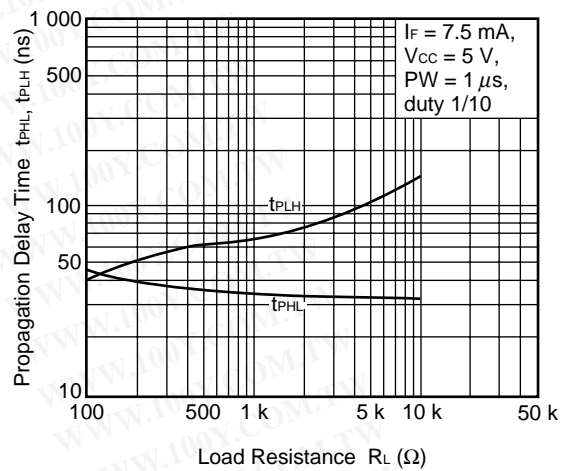
LOW LEVEL OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE



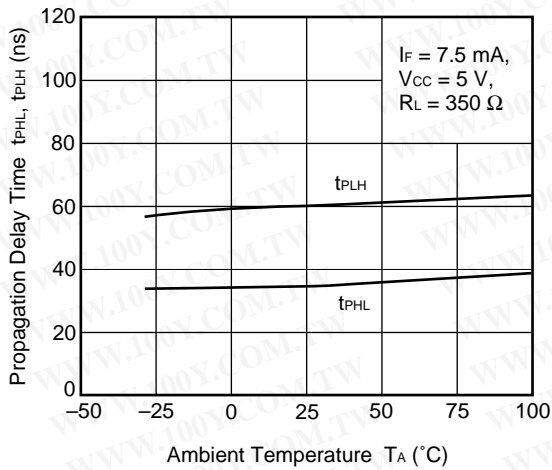
PROPAGATION DELAY TIME vs. FORWARD CURRENT



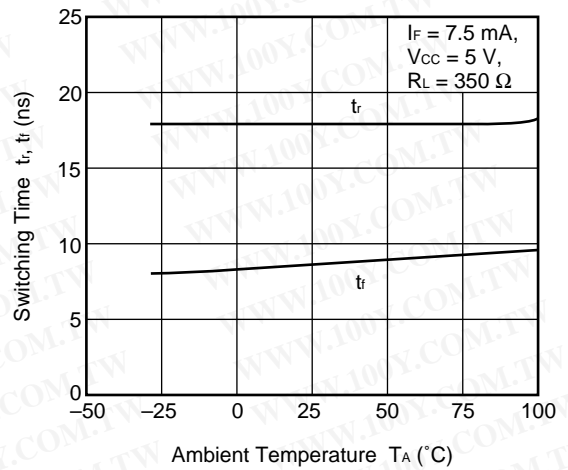
PROPAGATION DELAY TIME vs. LOAD RESISTANCE



PROPAGATION DELAY TIME vs. AMBIENT TEMPERATURE

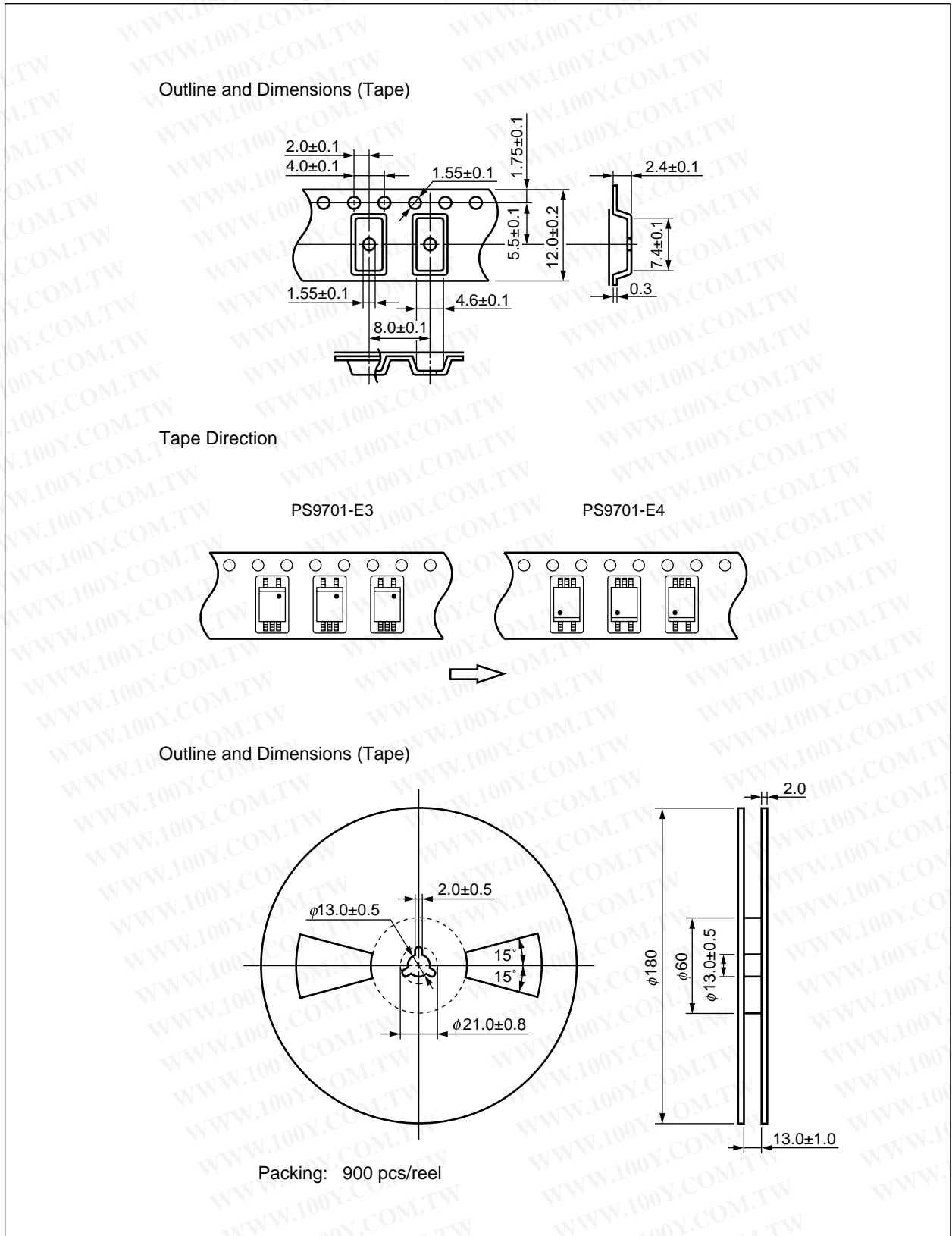


SWITCHING TIME vs. AMBIENT TEMPERATURE

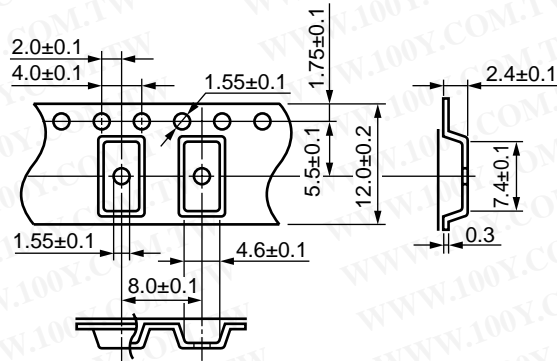


Remark The graphs indicate nominal characteristics.

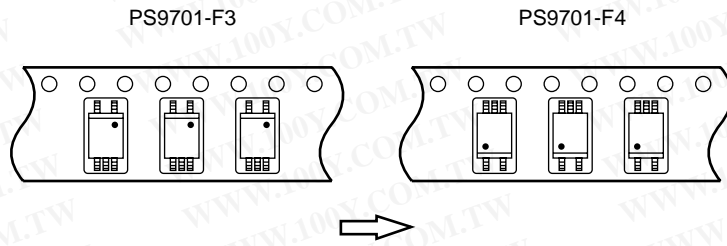
★ TAPING SPECIFICATIONS (in millimeters)



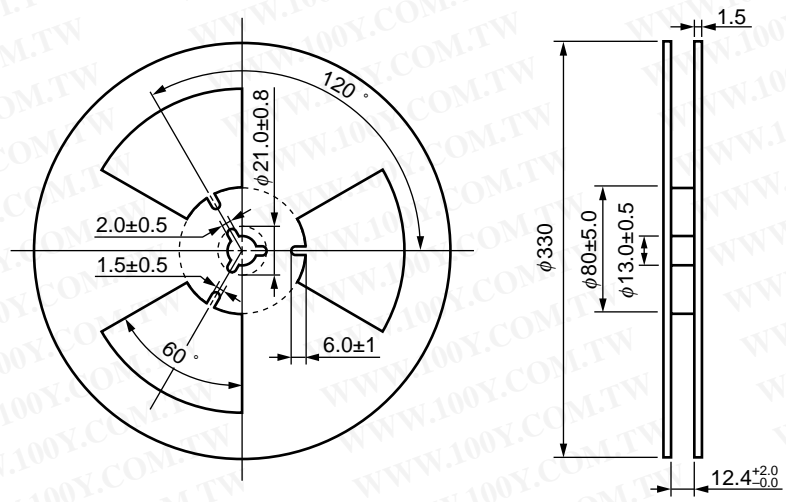
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



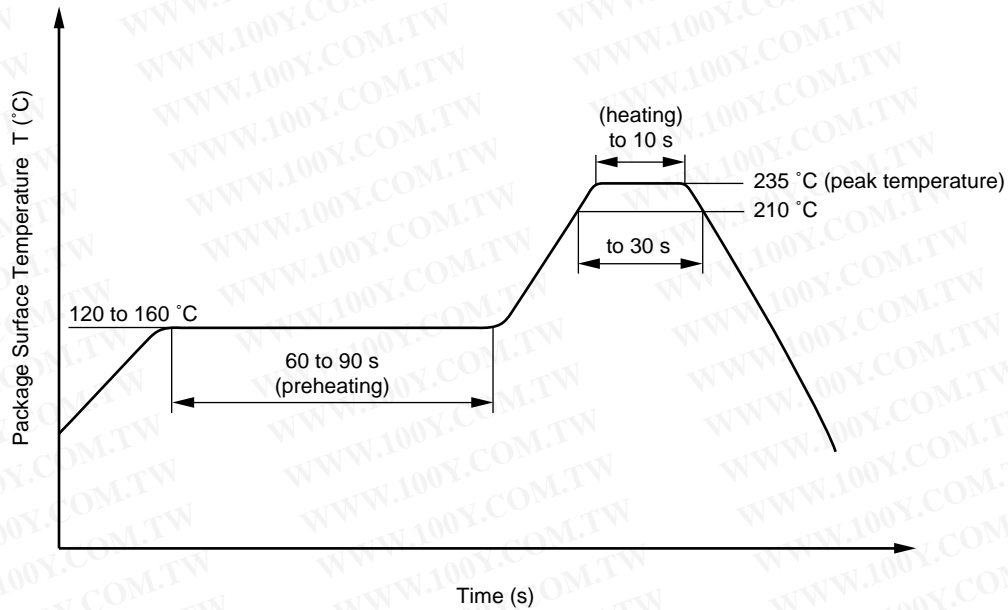
Packing: 3 500 pcs/reel

★ **RECOMMENDED SOLDERING CONDITIONS**

(1) Infrared reflow soldering

- Peak reflow temperature 235 °C (package surface temperature)
- Time of temperature higher than 210 °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



(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.

SPECIFICATION OF VDE MARKS LICENSE DOCUMENT (VDE0884)

Parameter	Symbol	Speck	Unit
Application classification (DIN VDE 0109) for rated line voltages ≤ 300 Vr.m.s. for rated line voltages ≤ 600 Vr.m.s.		IV 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) $U_{pr} = 1.2 \times U_{IORM}, P_d < 5 \text{ pC}$	U_{IORM} U_{pr}	710 850	V_{peak} V_{peak}
Test voltage (partial discharge test procedure b for random test) $U_{pr} = 1.6 \times U_{IORM}, P_d < 5 \text{ pC}$	U_{pr}	1 140	V_{peak}
Highest permissible overvoltage	U_{TR}	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)	CTI	175	
Material group (DIN VDE 0109)		III a	
Storage temperature range	T_{stg}	-55 to +125	°C
Operating temperature range	T_A	-40 to +85	°C
Isolation resistance, minimum value $V_{IO} = 500 \text{ V dc at } T_A = 25 \text{ °C}$ $V_{IO} = 500 \text{ V dc at } T_A \text{ MAX. at least } 100 \text{ °C}$	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 $V_{IO} = 500 \text{ V dc at } T_A = 175 \text{ °C (Tsi)}$	T_{si} I_{si} P_{si} Ris MIN.	150 200 300 10^9	°C mA mW 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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 - 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)
 - Specific: Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.
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