

**HIGH SPEED DIGITAL OUTPUT TYPE**  
**5-PIN SOP PHOTOCOUPLER**

–NEPOC Series–

**DESCRIPTION**

The PS9701 is an optically coupled isolator containing a GaAlAs LED on the input side and a photodiode and a signal processing circuit on the output side on one chip.

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

**FEATURES**

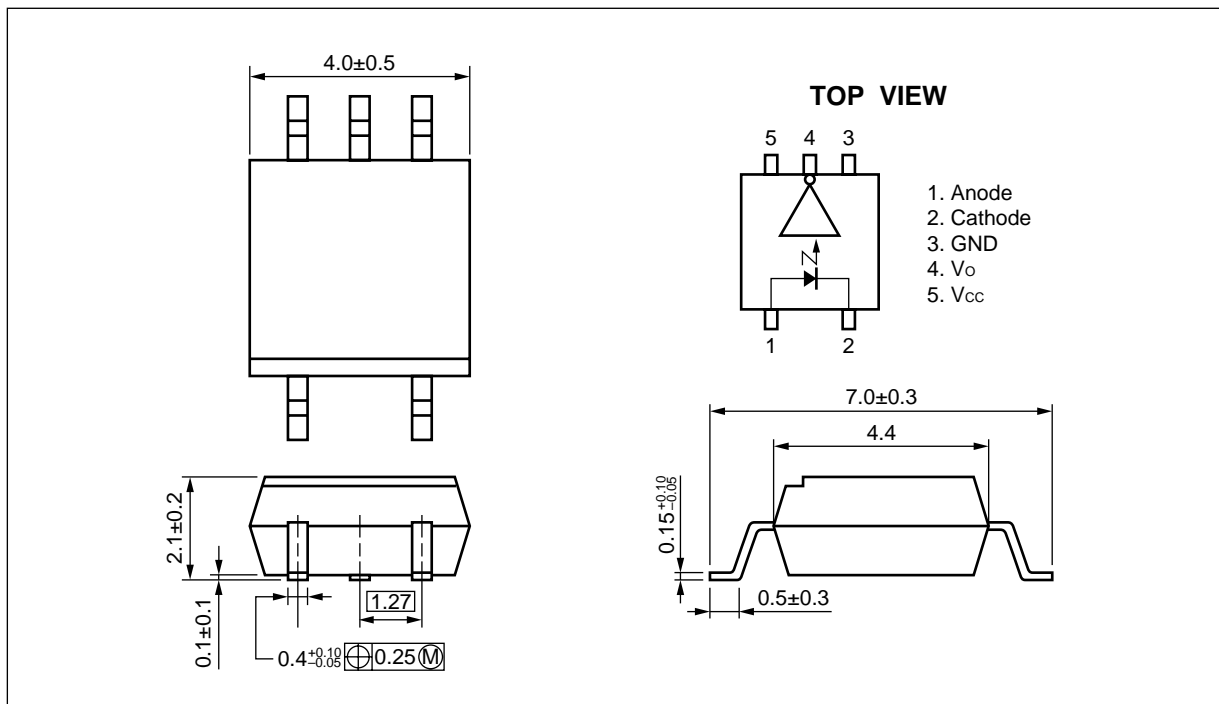
- High isolation voltage ( $BV = 2\,500\text{ V r.m.s.}$ )
- Small and thin package (5-pin SOP)
- High-speed response ( $t_{PHL} = 36\text{ ns TYP.}$ ,  $t_{PLH} = 60\text{ ns TYP.}$ )
- Low threshold input current ( $I_{FHL} = 2.5\text{ mA TYP.}$ )
- Open collector type
- ★ • Ordering number of taping product: PS9701-F3, F4: 3 500 pcs/reel
- Safety standards
  - UL approved: File No. E72422 (S)
- ★ • BSI approved (BS415, BS7002) : No. 8387
  - VDE0884 approved (Option)

**APPLICATIONS**

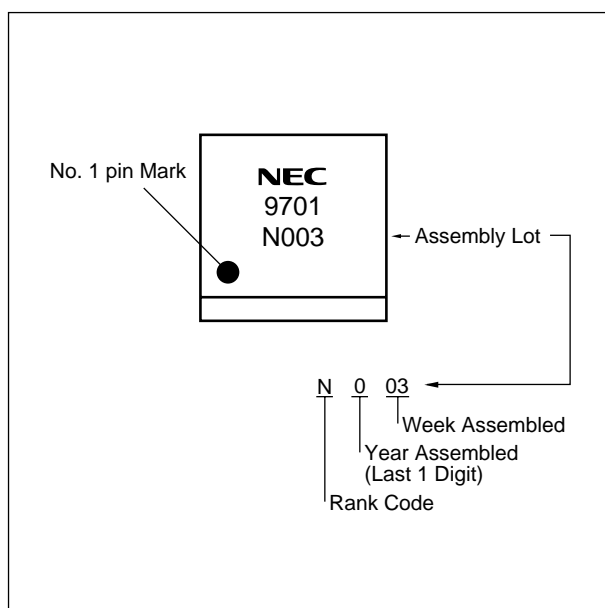
- Computer and peripheral manufactures
- Measurement equipment
- Audio-Visual

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★ PACKAGE DIMENSIONS (UNIT: mm)



★ MARKING EXAMPLE



★ ORDERING INFORMATION

Part Number		Package	Packing Style	Application Part Number <sup>*1</sup>
Standard Products	VDE0884 Approved Products (Option)			
PS9701	PS9701-V	5-pin SOP	Magazine case 100 pcs	PS9701
PS9701-F3	PS9701-V-F3		Embossed tape 3 500 pcs/reel	
PS9701-F4	PS9701-V-F4			

\*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
Diode	Forward Current	I <sub>F</sub>	30	mA
	Reverse Voltage	V <sub>R</sub>	5	V
Detector	Supply Voltage	V <sub>CC</sub>	7	V
	Output Voltage	V <sub>O</sub>	7	V
	Output Current	I <sub>O</sub>	50	mA
	Power Dissipation	P <sub>C</sub>	85	mW
Isolation Voltage <sup>*1</sup>		BV	2 500	Vr.m.s.
Operating Ambient Temperature		T <sub>A</sub>	−40 to +85	°C
Storage Temperature		T <sub>stg</sub>	−55 to +125	°C

\*1 AC voltage for 1 minute at T<sub>A</sub> = 25°C, RH = 60% between input and output

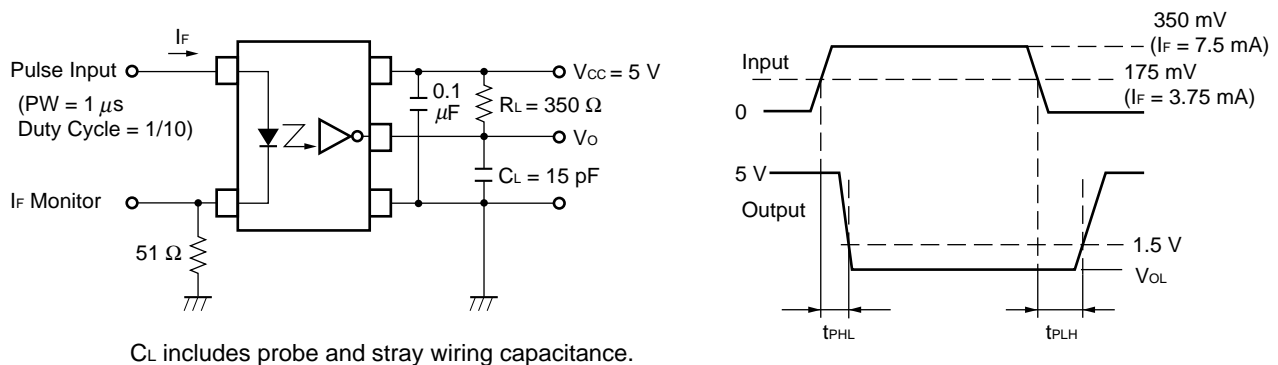
**RECOMMENDED OPERATING CONDITIONS**

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

**ELECTRICAL CHARACTERISTICS ( $T_A = 0$  to  $+70^\circ\text{C}$ , unless otherwise specified)**

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	$V_F$	$I_F = 10\text{ mA}$ , $T_A = 25^\circ\text{C}$	1.4	1.65	1.9	V
	Reverse Current	$I_R$	$V_R = 5\text{ V}$ , $T_A = 25^\circ\text{C}$			10	$\mu\text{A}$
	Terminal Capacitance	$C_t$	$V = 0\text{ V}$ , $f = 1\text{ MHz}$ , $T_A = 25^\circ\text{C}$		60		pF
Detector	High Level Output Current	$I_{OH}$	$V_{CC} = V_O = 5.5\text{ V}$ , $I_F = 250\text{ }\mu\text{A}$		2	250	$\mu\text{A}$
	Low Level Output Voltage	$V_{OL}$	$V_{CC} = 5.5\text{ V}$ , $I_F = 7.5\text{ mA}$ , $I_{OL} = 13\text{ mA}$		0.3	0.6	V
	High Level Supply Current	$I_{CCH}$	$V_{CC} = 5.5\text{ V}$ , $I_F = 0\text{ mA}$	4	6	8	mA
	Low Level Supply Current	$I_{CCL}$	$V_{CC} = 5.5\text{ V}$ , $I_F = 10\text{ mA}$	9	12	15	mA
Coupled	Threshold Input Current ( $H \rightarrow L$ )	$I_{FHL}$	$T_A = 25^\circ\text{C}$	0.5	2.5	5.0	mA
			$V_{CC} = 5\text{ V}$ , $V_O = 0.8\text{ V}$ , $R_L = 350\text{ }\Omega$			7	
	Isolation Resistance	$R_{I-O}$	$V_{I-O} = 1\text{ kV}_{DC}$ , $R_H = 40$ to $60\%$ , $T_A = 25^\circ\text{C}$	$10^{11}$			$\Omega$
	Isolation Capacitance	$C_{I-O}$	$V = 0\text{ V}$ , $f = 1\text{ MHz}$ , $T_A = 25^\circ\text{C}$		0.6		pF
	Propagation Delay Time ( $H \rightarrow L$ ) <sup>*1</sup>	$t_{PHL}$	$V_{CC} = 5\text{ V}$ , $I_F = 7.5\text{ mA}$ , $R_L = 350\text{ }\Omega$ , $C_L = 15\text{ pF}$ , $T_A = 25^\circ\text{C}$		36	75	ns
	Propagation Delay Time ( $L \rightarrow H$ ) <sup>*1</sup>	$t_{PLH}$			60	75	
	Rise Time	$t_r$			20		
	Fall Time	$t_f$			10		

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



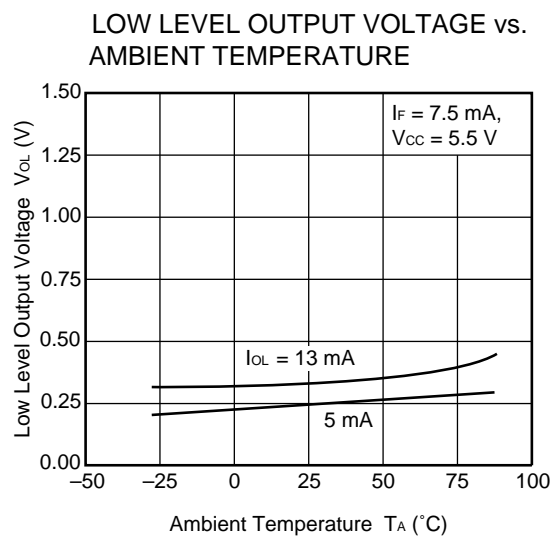
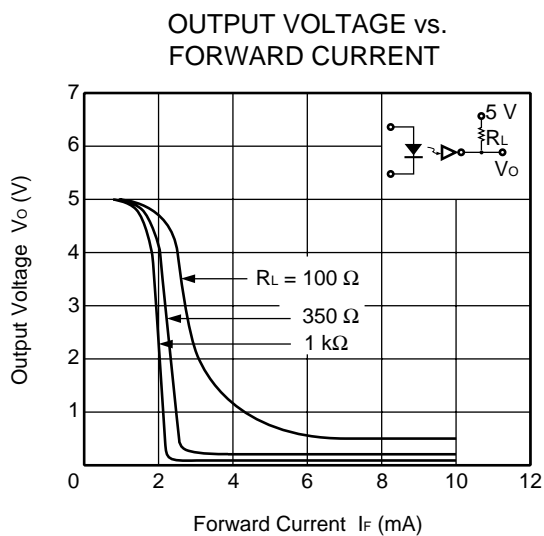
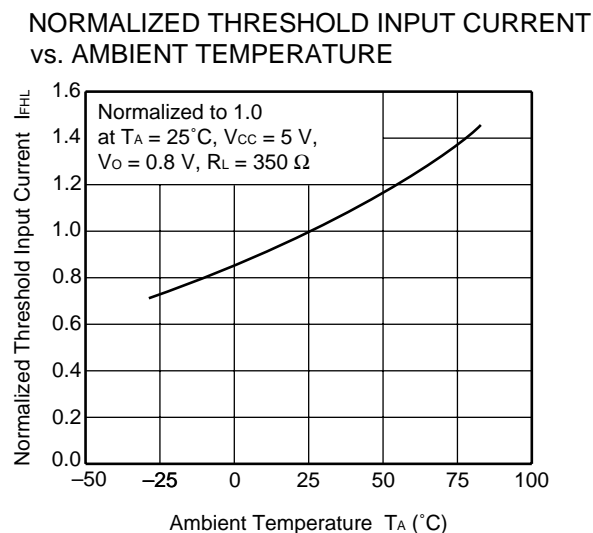
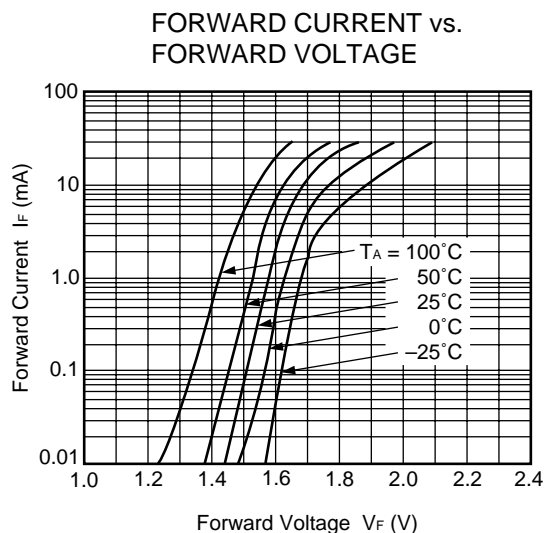
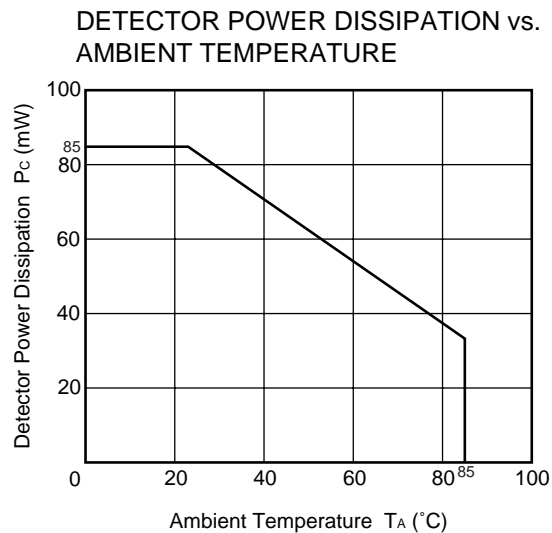
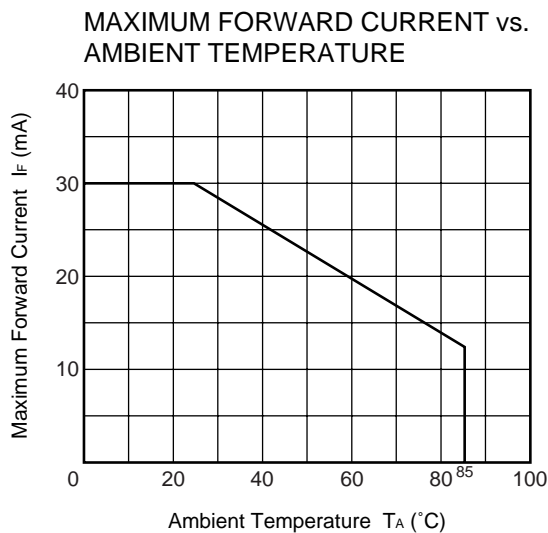
**CAUTIONS REGARDING NOISE**

Be aware that when voltage is applied suddenly between the photocoupler's input and output at startup, the output side may enter the on state, even if the voltage is within the absolute maximum ratings.

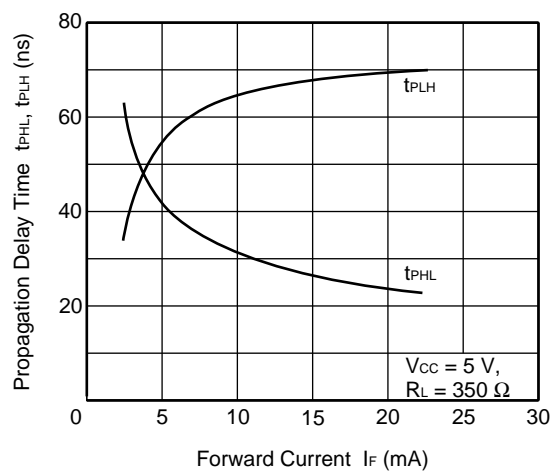
**USAGE CAUTIONS**

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 more than  $0.1\text{ }\mu\text{F}$  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  $10\text{ mm}$ .

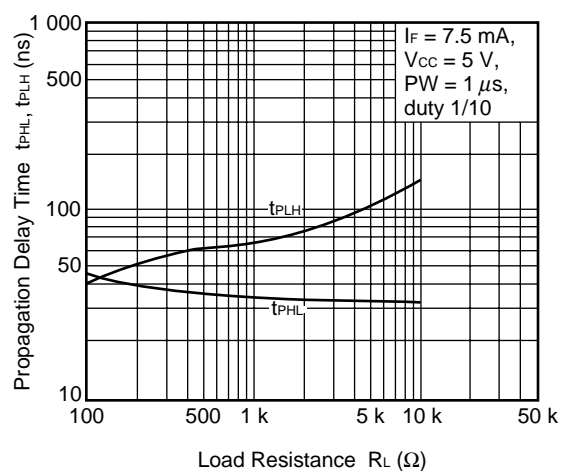
**TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)**



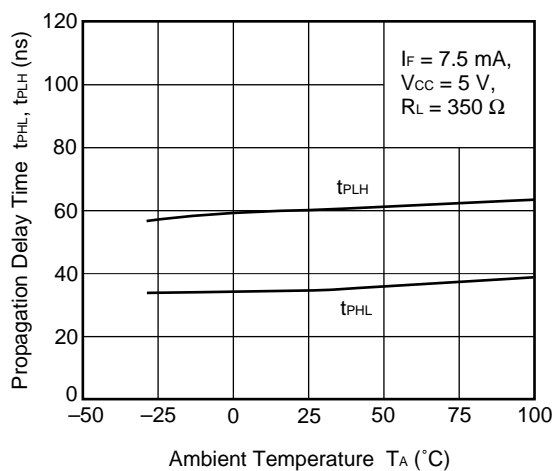
PROPAGATION DELAY TIME vs.  
FORWARD CURRENT



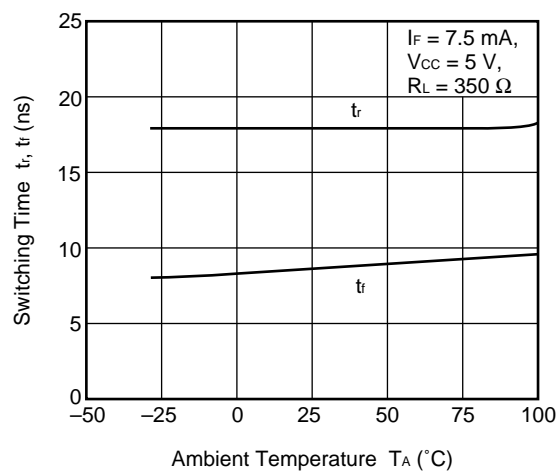
PROPAGATION DELAY TIME vs.  
LOAD RESISTANCE



PROPAGATION DELAY TIME vs.  
AMBIENT TEMPERATURE



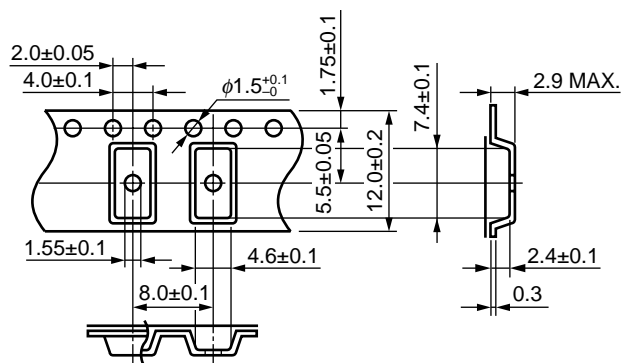
SWITCHING TIME vs.  
AMBIENT TEMPERATURE



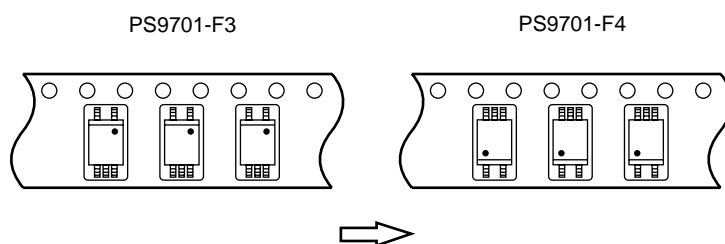
**Remark** The graphs indicate nominal characteristics.

★ TAPING SPECIFICATIONS (UNIT: mm)

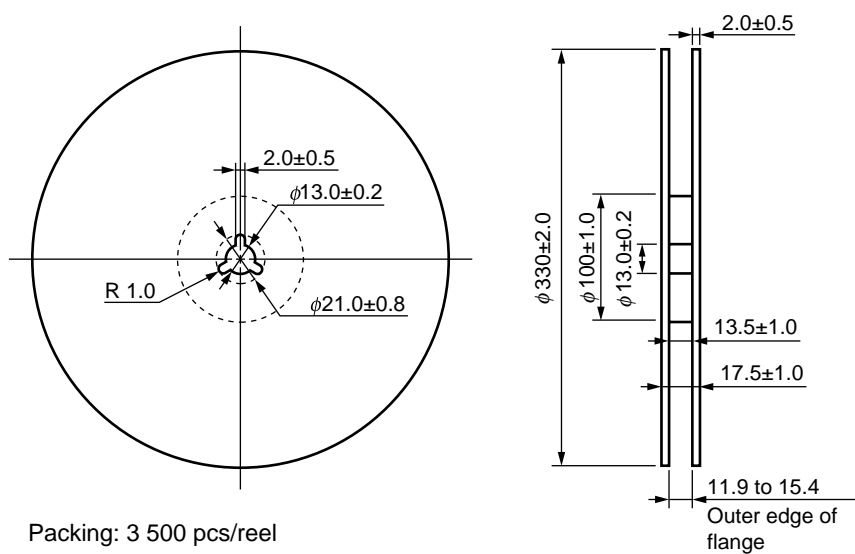
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)

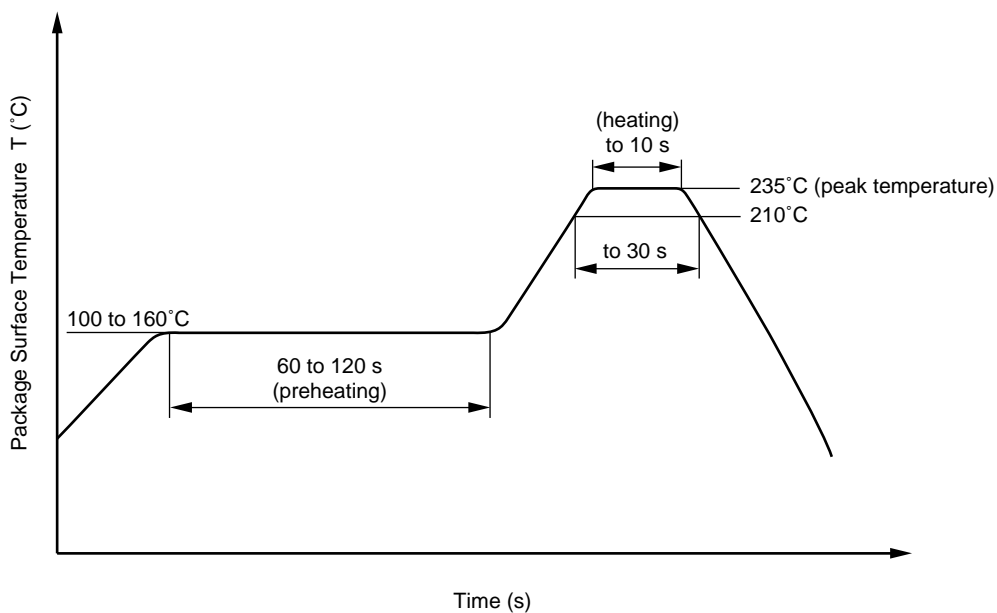


★ **RECOMMENDED SOLDERING CONDITIONS**

**(1) Infrared reflow soldering**

- |   |  |
|---|--|
| • Peak reflow temperature               | 235°C or below (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) Cautions**

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



**SPECIFICATION OF VDE MARKS LICENSE DOCUMENT (VDE0884)**

Parameter	Symbol	Spec	Unit
Application classification (DIN VDE 0109) for rated line voltages $\leq 300$ Vr.m.s. for rated line voltages $\leq 600$ 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) $U_{pr} = 1.2 \times U_{IORM}$ , $P_d < 5$ pC	$U_{IORM}$ $U_{pr}$	710 850	$V_{peak}$ $V_{peak}$
Test voltage (partial discharge test procedure b for random test) $U_{pr} = 1.6 \times U_{IORM}$ , $P_d < 5$ 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 $V_{IO} = 500$ V dc at $T_A = 25^\circ\text{C}$ $V_{IO} = 500$ V dc at $T_A$ MAX. at least $100^\circ\text{C}$	Ris MIN. Ris MIN.	$10^{12}$ $10^{11}$	$\Omega$ $\Omega$
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 $T_A = 175^\circ\text{C}$ ( $T_{si}$ )	$T_{si}$ $I_{si}$ $P_{si}$  Ris MIN.	150 200 300  $10^9$	°C mA mW  $\Omega$

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M8E 00.4-0110

**SAFETY INFORMATION ON THIS PRODUCT**

<div data-bbox="188 277 280 304" data-label="Section-Header"> <p><b>Caution</b></p> </div> <div data-bbox="300 277 448 300" data-label="Text"> <p>GaAs Products</p> </div>	<p>The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested.</p> <ul style="list-style-type: none"> <li>• Do not destroy or burn the product.</li> <li>• Do not cut or cleave off any part of the product.</li> <li>• Do not crush or chemically dissolve the product.</li> <li>• Do not put the product in the mouth.</li> </ul> <p>Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.</p>
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► **Business issue**

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► **Technical issue**

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