NEC

PHOTOCOUPLER
PS9713

1 Mbps, OPEN COLLECTOR OUTPUT, FOR GATE DRIVE INTERFACE HIGH CMR, INTELLIGENT POWER MODULE 5-PIN SOP PHOTOCOUPLER

–NEPOC Series–

DESCRIPTION

The PS9713 is an optically coupled isolator containing a GaAlAs LED on the input side and a photo diode and a signal processing circuit on the output side on one chip.

FEATURES

- High instantaneous common mode rejection voltage (CM_H, CM_L = ±15 kV/μs MIN.)
- Small and thin package (5-pin SOP)
- High-speed response (t_{PHL} = 500 ns MAX., t_{PLH} = 750 ns MAX.)
- Maximum propagation delays ($t_{PLH} - t_{PHL}$ = 270 ns TYP.)
- Pulse width distortion ($|t_{PHL} - t_{PLH}|$ = 270 ns TYP.)
- Ordering number of taping product: PS9713-F3, F4: 3 500 pcs/reel
- Safety standards
  - UL approved: File No. E72422 (S)
  - VDE0884 approved (Option)

APPLICATIONS

- IPM Driver
- General purpose inverter

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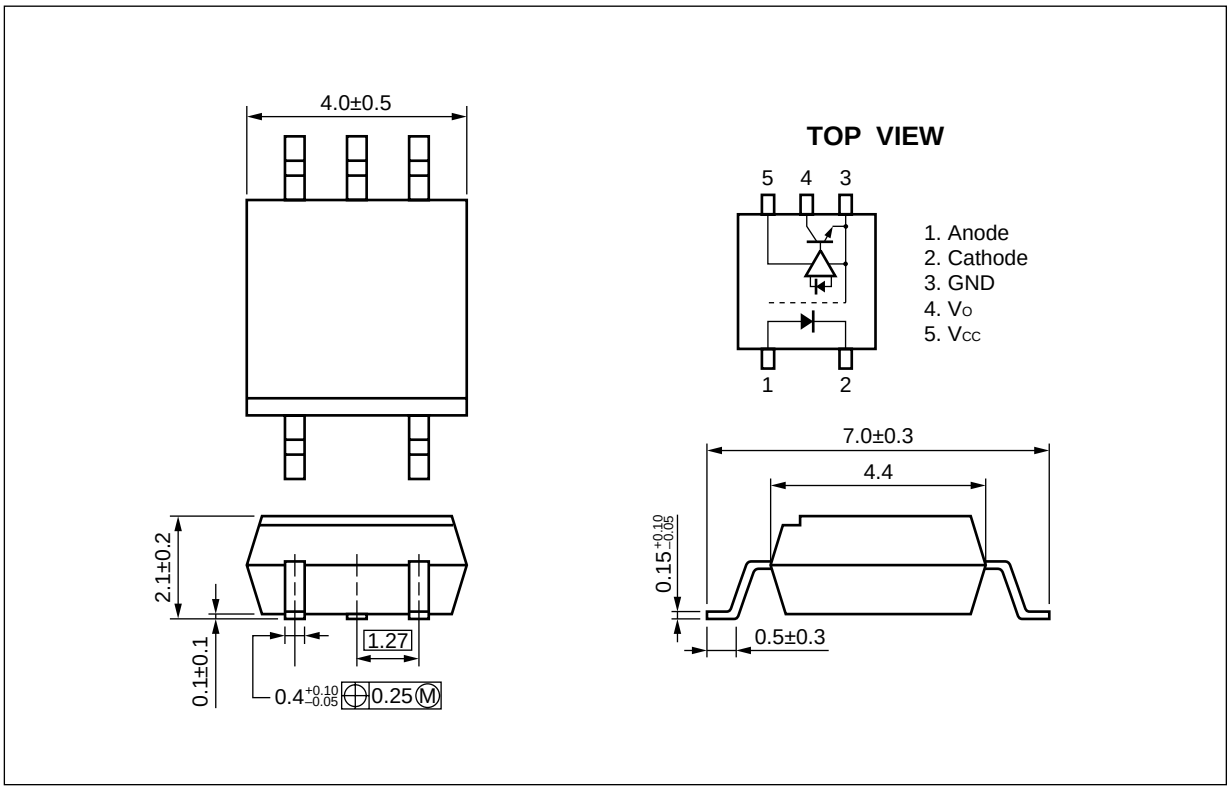
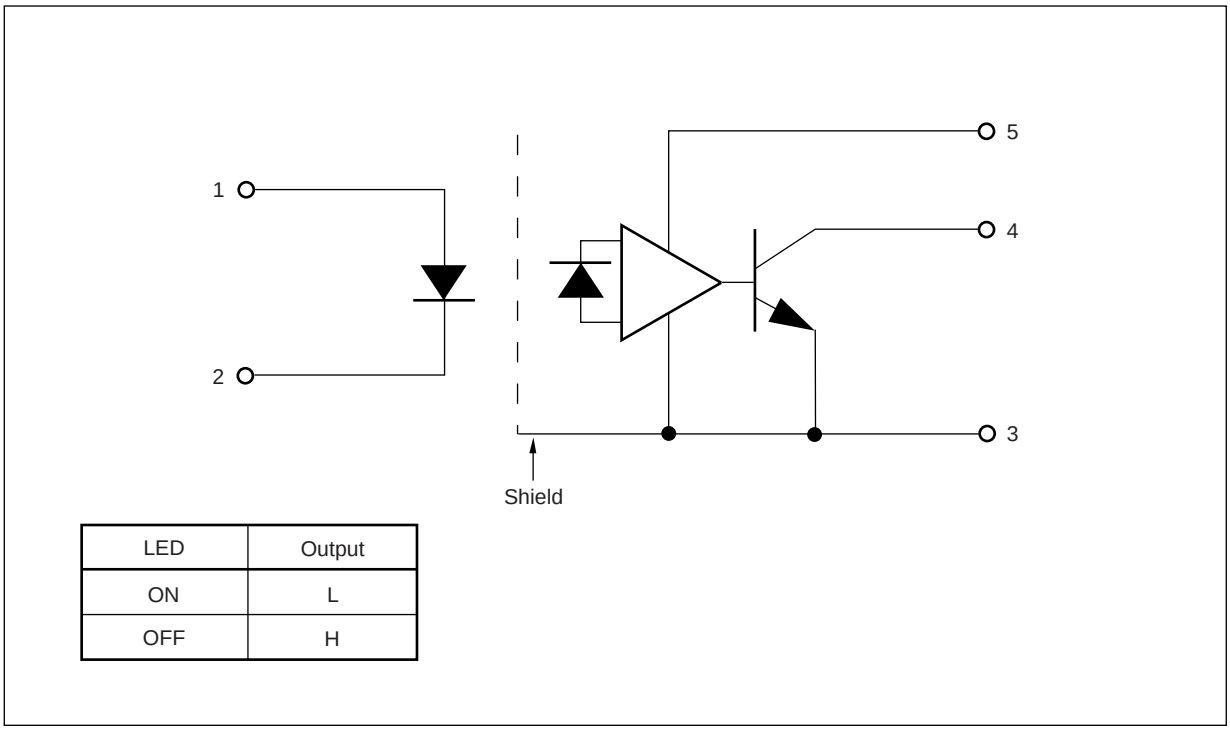
(Previous No. P13982EJ2V0DS00)
Date Published April 2002 CP(K)
Printed in Japan

The mark ★ shows major revised points.

★ **PACKAGE DIMENSIONS (UNIT: mm)**

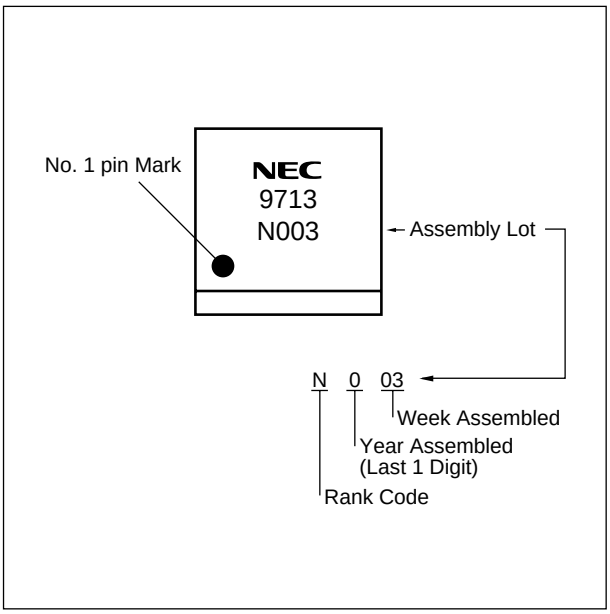


★ **FUNCTIONAL DIAGRAM**



LED	Output
ON	L
OFF	H

★ **MARKING EXAMPLE**



★ ORDERING INFORMATION

Part Number		Package	Packing Style	Application Part Number*1
Standard Products	VDE0884 Approved Products (Option)			
PS9713	PS9713-V	5-pin SOP	Magazine case 100 pcs	PS9713
PS9713-F3	PS9713-V-F3		Embossed tape 3 500 pcs/reel	
PS9713-F4	PS9713-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	25	mA
	Reverse Voltage	V_R	5	V
Detector	Supply Voltage	V_{CC}	–0.5 to +35	V
	Output Voltage	V_O	–0.5 to +35	V
	Output Current	I_O	15	mA
	Power Dissipation	P_C	100	mW
Isolation Voltage*1		BV	2 500	Vr.m.s.
Operating Ambient Temperature		T_A	–40 to +100	°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

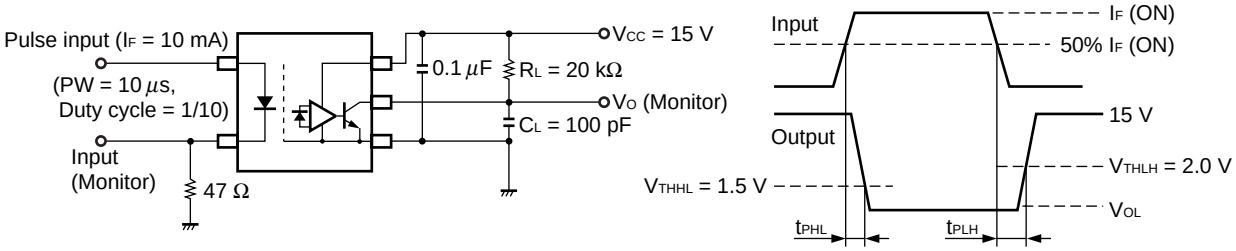
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
High Level Input Current	I_{FH}	10		20	mA
Output Voltage	V_O	0		30	V
Supply Voltage	V_{CC}	4.5		30	V
LED Off Voltage	V_F	0		0.8	V

ELECTRICAL CHARACTERISTICS (T_A = –40 to +100°C, V_{CC} = 15 V, unless otherwise specified)

	Parameter		Symbol	Conditions	MIN.	TYP.[*1]	MAX.	Unit
	Diode	Forward Voltage	V_F	I_F = 10 mA	1.3	1.65	2.1	V
		Reverse Current	I_R	V_R = 3 V			200	μA
		Terminal Capacitance	C_t	V = 0 V, f = 1 MHz, T_A = 25°C		30		pF
★	Detector	Low Level Output Voltage	V_{OL}	I_F = 10 mA, V_{CC} = 5 V, I_{OL} = 2.4 mA		0.13	0.6	V
★		High Level Output Current	I_{OH}	V_{CC} = 30 V, V_F = 0.8 V		0.01	50	μA
		High Level Supply Current	I_{CCH}	V_{CC} = 30 V, V_F = 0.8 V, V_O = open		0.6	1.3	mA
		Low Level Supply Current	I_{CCL}	V_{CC} = 30 V, I_F = 10 mA, V_O = open		0.6	1.3	mA
	Coupled	Threshold Input Current (H → L)	I_{FHL}	V_O = 0.8 V, I_O = 0.75 mA		1.5	5.0	mA
		Current Transfer Ratio (I_C/I_F)	CTR	I_F = 10 mA, V_O = 0.6 V	44	110		%
		Isolation Resistance	R_{I-O}	V_{I-O} = 1 kV_{DC}, RH = 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)[*2]	t_{PHL}	I_F = 10mA, R_L = 20 kΩ, C_L = 100 pF, V_{THHL} = 1.5 V, V_{THLH} = 2.0 V		250	500	ns
		Propagation Delay Time (L → H)[*2]	t_{PLH}			520	750	
		Maximum Propagation Delays	t_{PLH}–t_{PHL}		–200	270	650	
		Pulse Width Distortion (PWD)[*2]	$\lvert t_{PHL}-t_{PLH} \rvert$			270	650	
★		Common Mode Transient Immunity at High Level Output[*3]	CM_H	T_A = 25°C, I_F = 0 mA, V_O > 3.0 V, V_{CM} = 1.5 kV, R_L = 20 kΩ, C_L = 100 pF	15			kV/μs
★		Common Mode Transient Immunity at Low Level Output[*3]	CM_L	T_A = 25°C, I_F = 10 mA, V_O < 1.0 V, V_{CM} = 1.5 kV, R_L = 20 kΩ, C_L = 100 pF	15			kV/μs

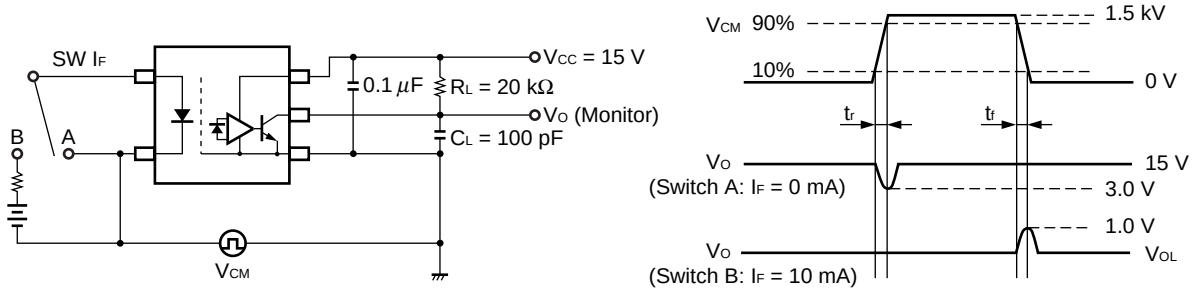
***1** Typical values at T_A = 25°C.

***2** Test circuit for propagation delay time



C_L includes probe and stray wiring capacitance.

★ ***3** Test circuit for common mode transient immunity



C_L includes probe and stray wiring capacitance.

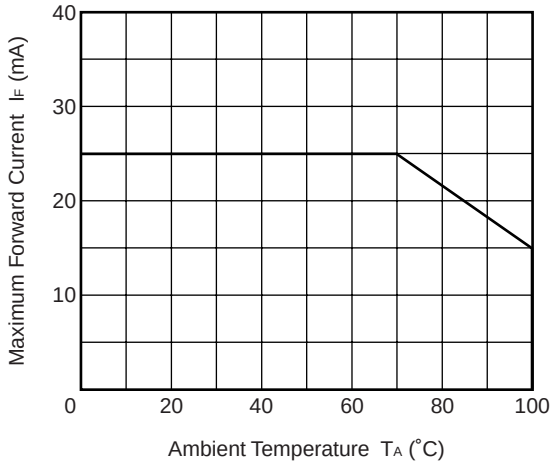
USAGE CAUTIONS

★ **1.** This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.

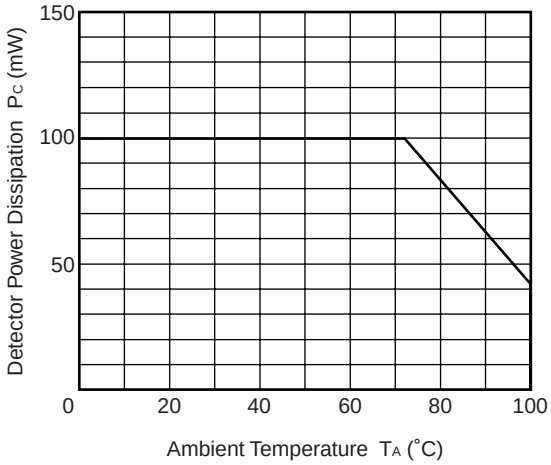
2. By-pass capacitor of more than 0.1 μF is used between V_{CC} and GND near device. Also, ensure that the distance between the leads of the photocoupler and capacitor is no more than 10 mm.

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

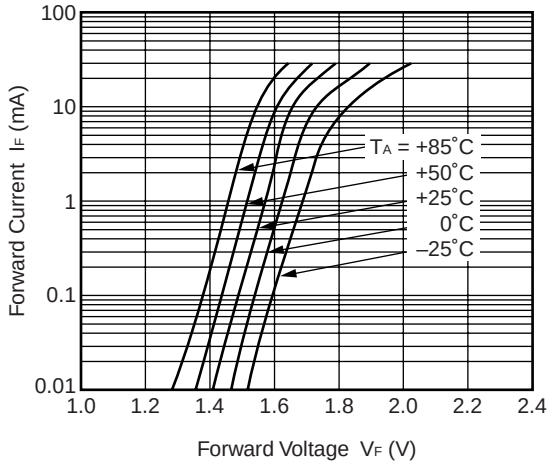
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



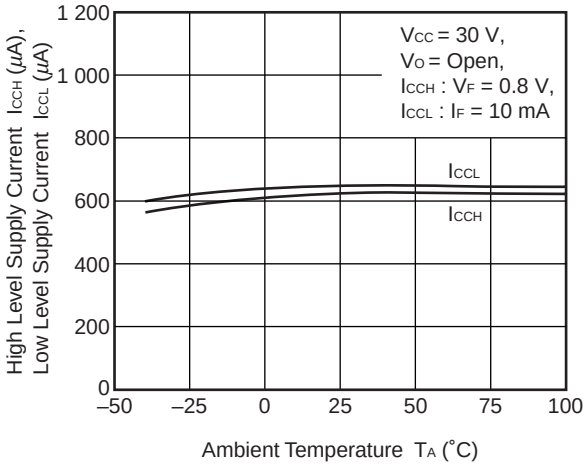
DETECTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



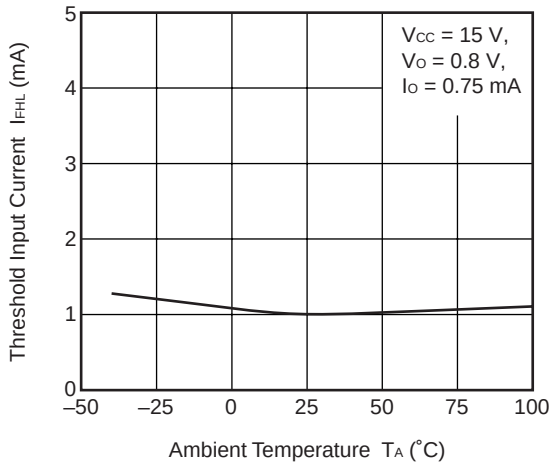
FORWARD CURRENT vs. FORWARD VOLTAGE



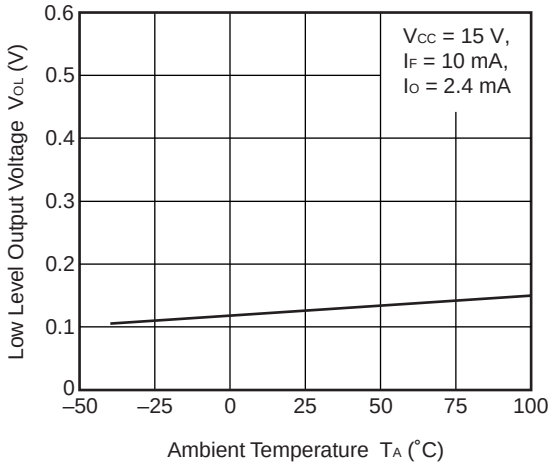
SUPPLY CURRENT vs. AMBIENT TEMPERATURE



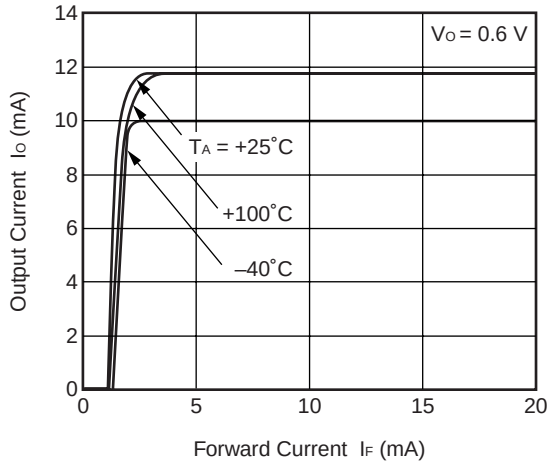
THRESHOLD INPUT CURRENT vs. AMBIENT TEMPERATURE



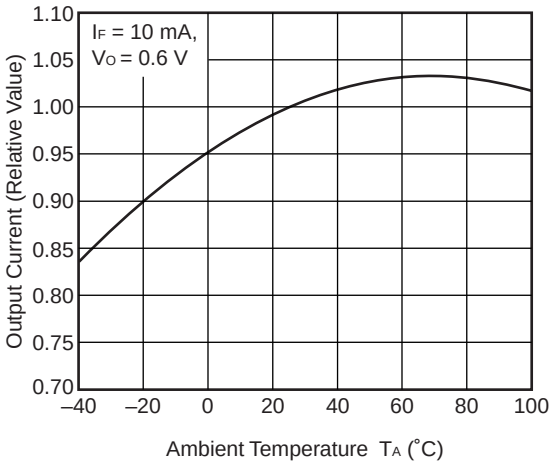
LOW LEVEL OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE



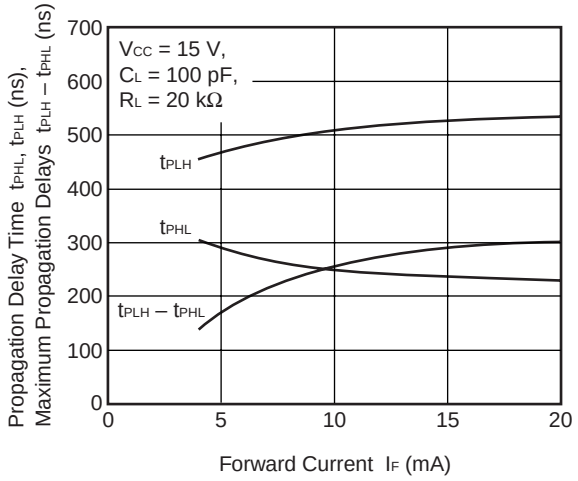
OUTPUT CURRENT vs. FORWARD CURRENT



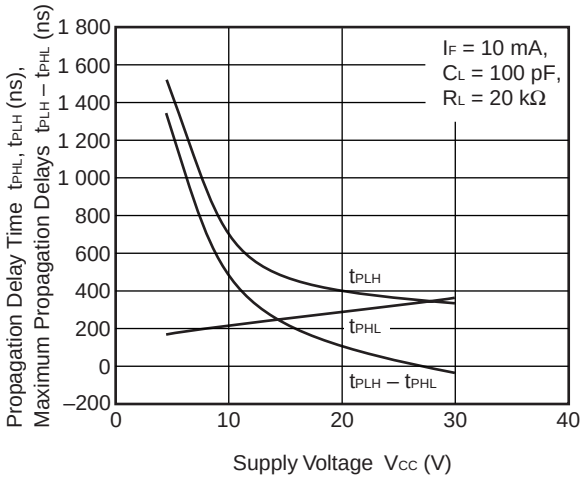
OUTPUT CURRENT vs. AMBIENT TEMPERATURE



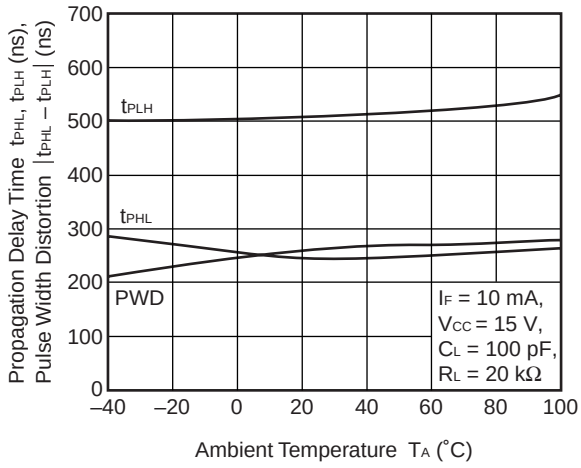
PROPAGATION DELAY TIME, MAXIMUM PROPAGATION DELAYS vs. FORWARD CURRENT



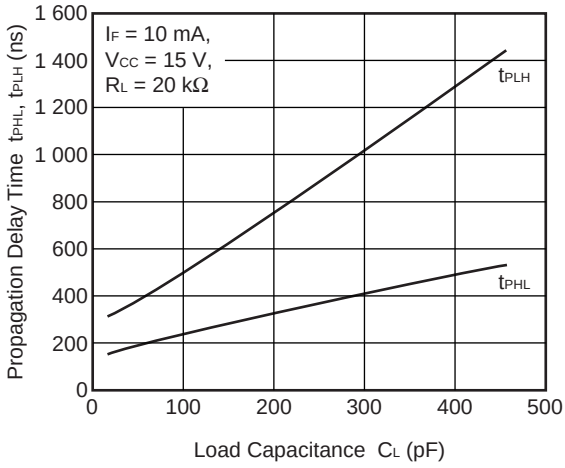
PROPAGATION DELAY TIME, MAXIMUM PROPAGATION DELAYS vs. SUPPLY VOLTAGE



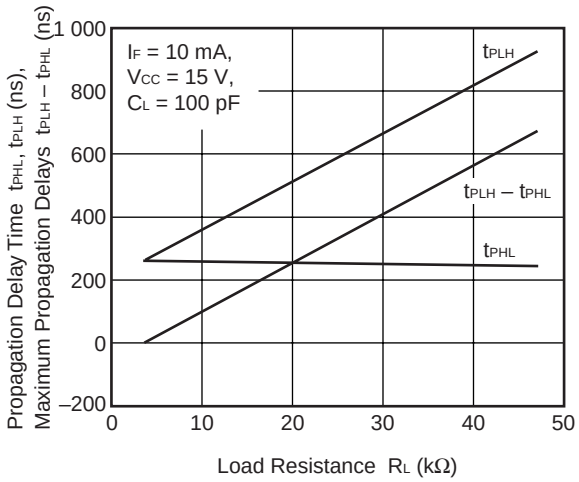
PROPAGATION DELAY TIME, PULSE WIDTH DISTORTION vs. AMBIENT TEMPERATURE



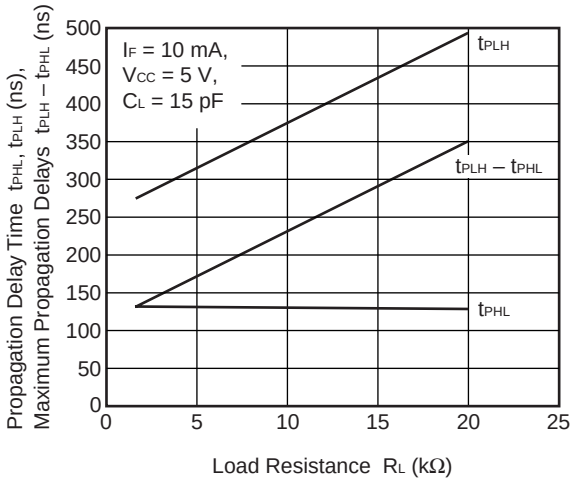
PROPAGATION DELAY TIME vs. LOAD CAPACITANCE



PROPAGATION DELAY TIME, MAXIMUM PROPAGATION DELAYS vs. LOAD RESISTANCE



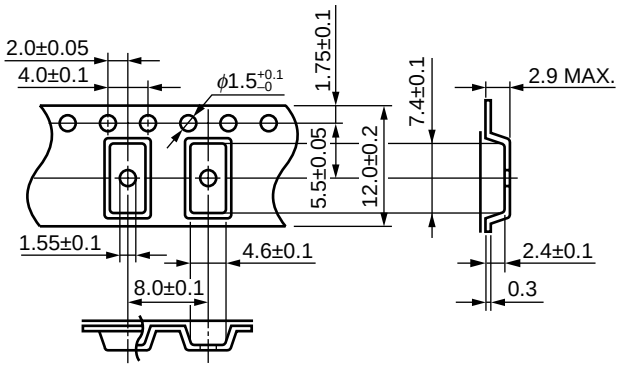
PROPAGATION DELAY TIME, MAXIMUM PROPAGATION DELAYS vs. LOAD RESISTANCE



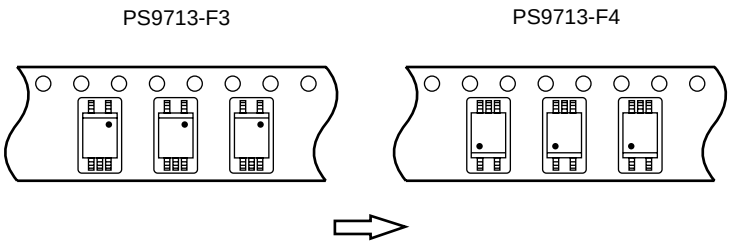
Remark The graphs indicate nominal characteristics.

★ **TAPING SPECIFICATIONS (UNIT: mm)**

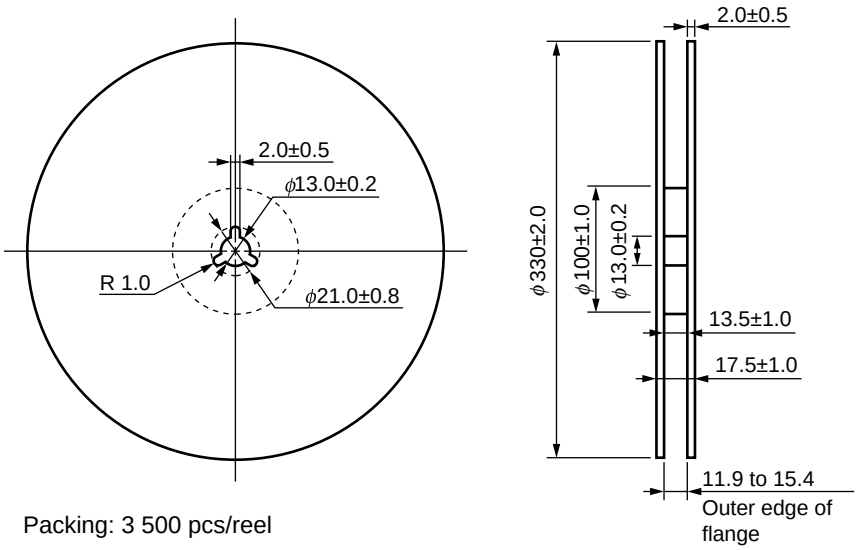
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



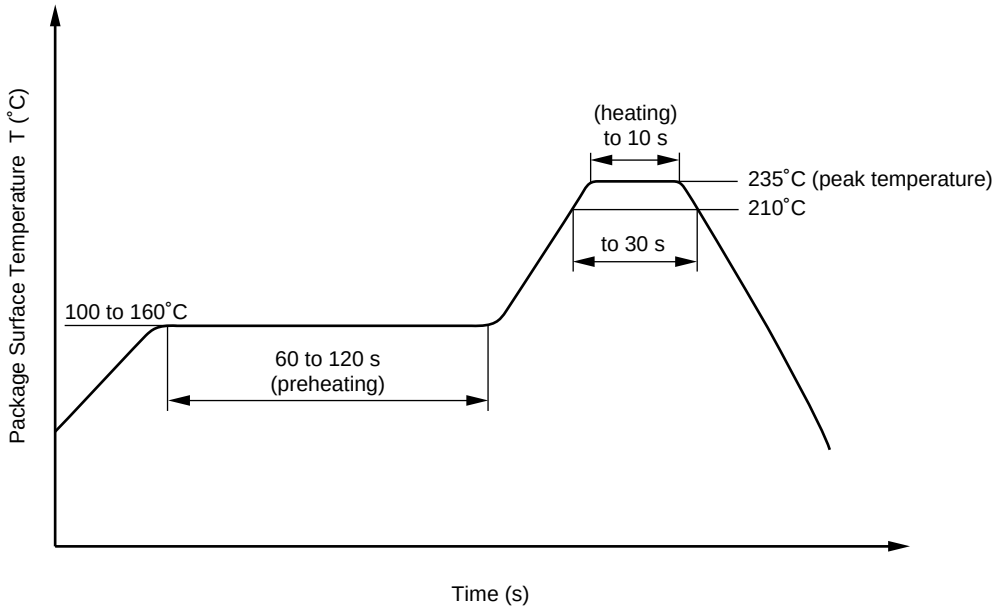
Packing: 3 500 pcs/reel

★ RECOMMENDED SOLDERING CONDITIONS

(1) Infrared reflow soldering

• Peak reflow temperature	235°C 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.

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M8E 00.4-0110

SAFETY INFORMATION ON THIS PRODUCT

Caution GaAs Products	The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested. • Do not destroy or burn the product. • Do not cut or cleave off any part of the product. • Do not crush or chemically dissolve the product. • Do not put the product in the mouth. Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.

▶**Business issue**

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▶**Technical issue**

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