NEC

PHOTOCOUPLER
PS9713

1 Mbps, OPEN COLLECTOR OUTPUT, FOR GATE DRIVE INTERFACE 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 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
- UL approved: File No. E72422 (S)
- VDE0884 approved (Option)

APPLICATIONS

- IPM Driver
- General purpose inverter

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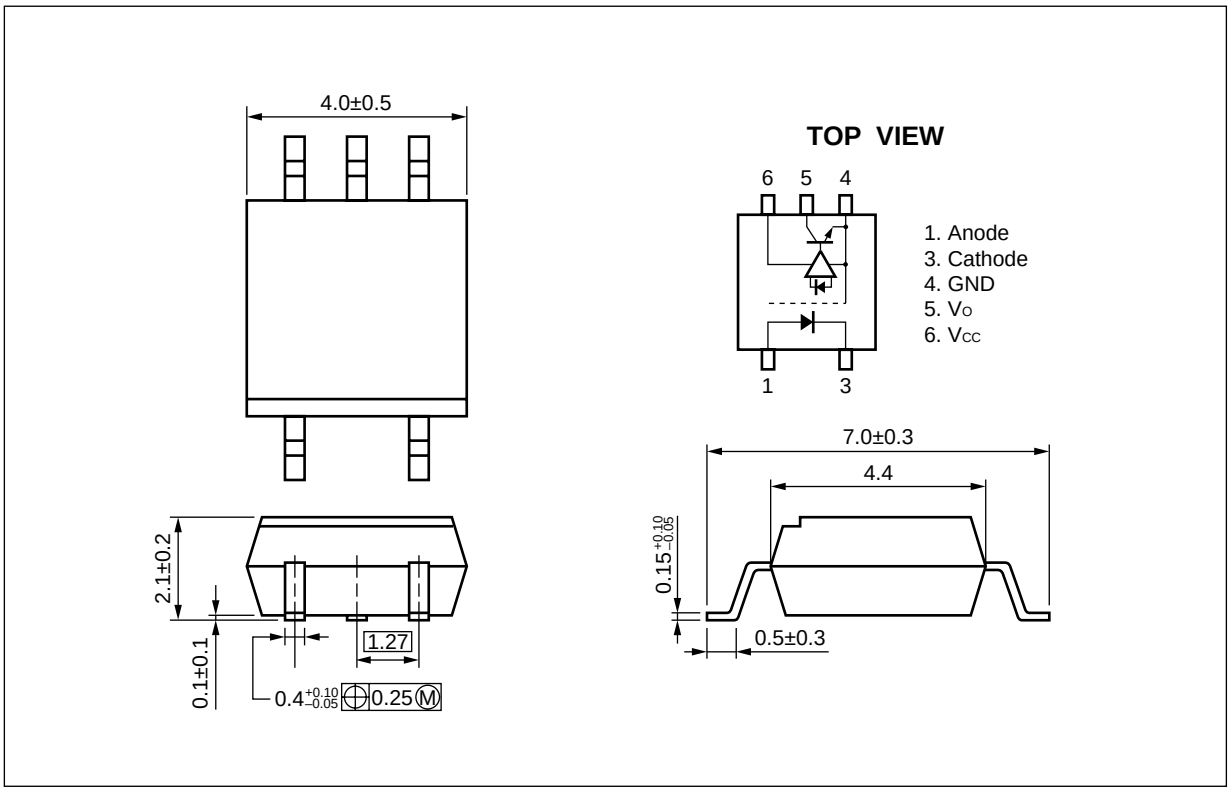
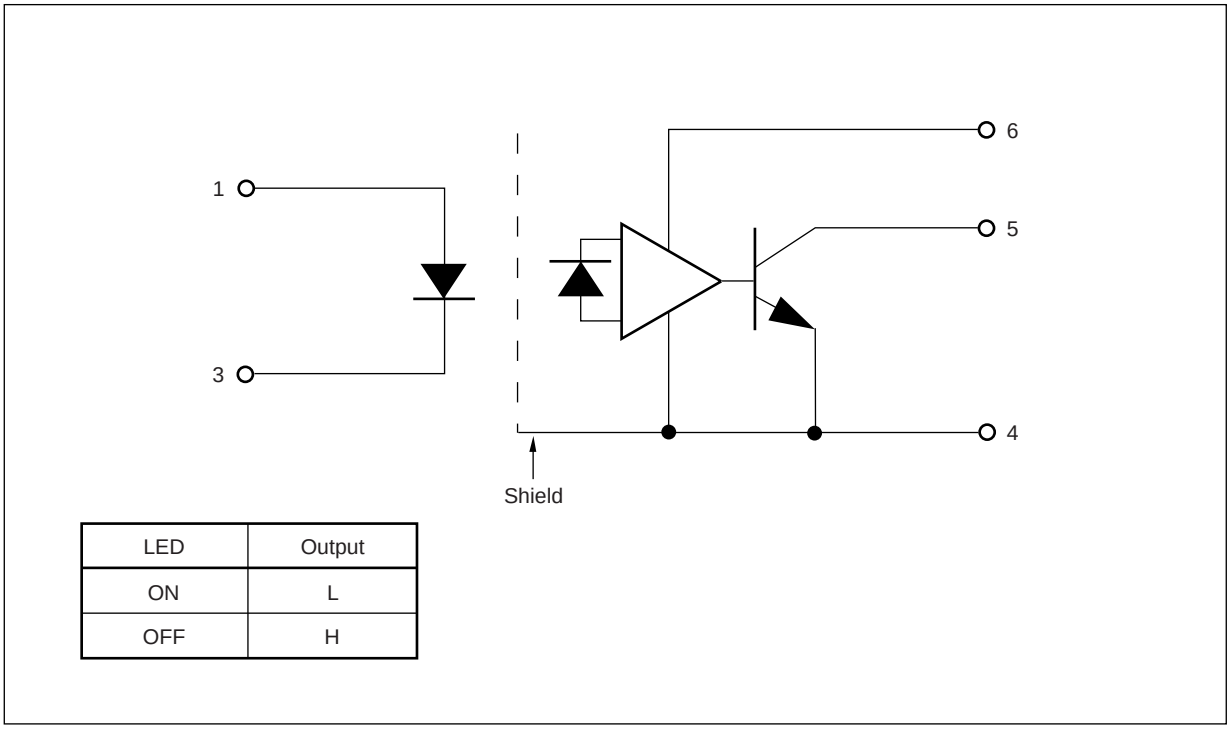
PACKAGE DIMENSIONS (in millimeters)



FUNCTIONAL DIAGRAM



LED	Output
ON	L
OFF	H

ORDERING INFORMATION

Part Number	Package	Packing Style	Safety Standards Approval	Application Part Number*1
PS9713	5-pin SOP	Magazine case 100 pcs	UL approved	PS9713
PS9713-F3		Embossed Tape 3 500 pcs/reel		
PS9713-F4				
PS9713-V		Magazine case 100 pcs	VDE0884 approved	
PS9713-V-F3		Embossed Tape 3 500 pcs/reel		
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	3.0	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

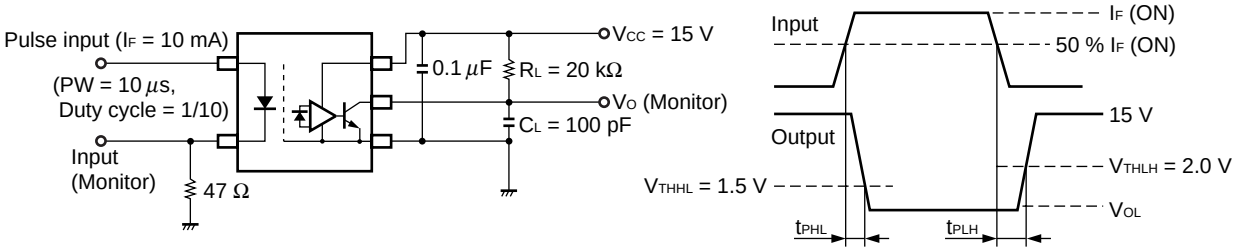
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
High Level Input Current	I_{FH}	10		20	mA
Output Voltage	V_O	0		30	V
Supply Voltage	V_{CC}	4.5		30	V
LED Off Voltage	V_F	0		0.8	V

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_O = 2.4 mA		0.13	0.6	V
	High Level Output Current	I_{OH}	V_{CC} = 30 V, V_F = 0.8 V		1.0	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]	$\|t_{PHL}–t_{PLH}\|$			270	650	
	Instantaneous Common Mode Rejection Voltage (Output: High) [*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
	Instantaneous Common Mode Rejection Voltage (Output: Low) [*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

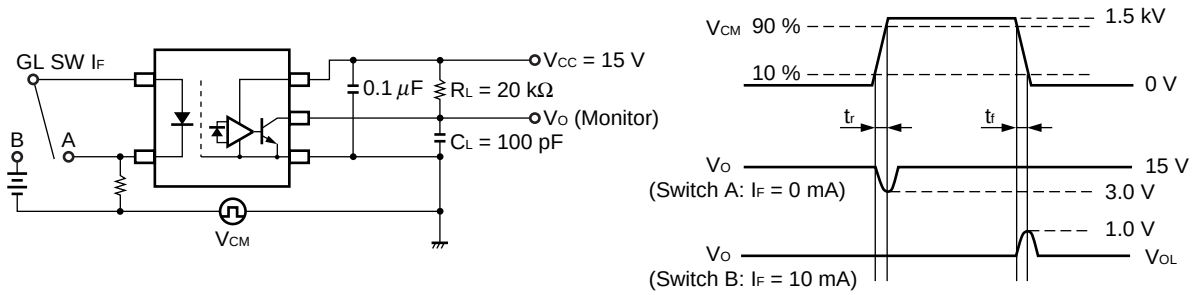
***1** Typical values at T_A = 25 °C.

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



C_L is approximately which includes probe and stray wiring capacitance.

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



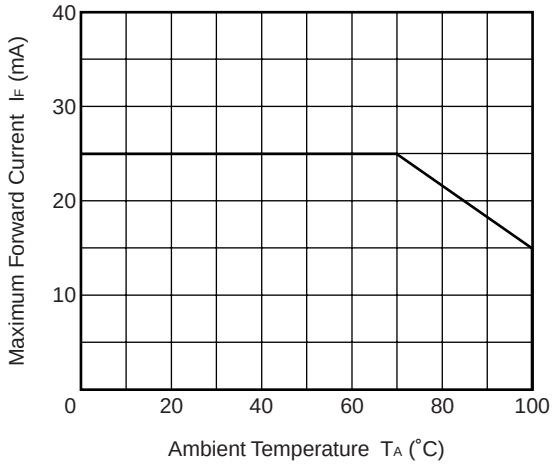
C_L is approximately which includes probe and stray wiring capacitance.

USAGE CAUTION

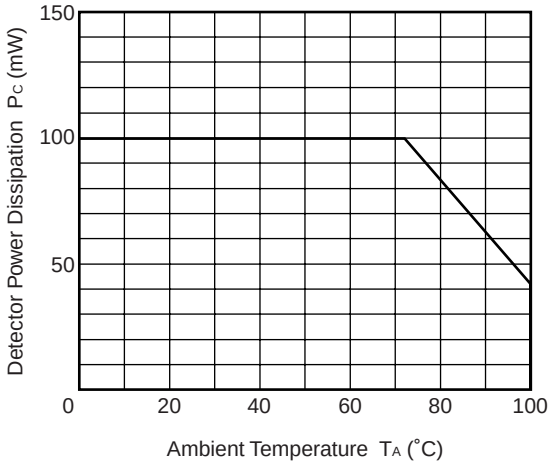
By-pass capacitor of more than 0.1 μF is used between V_{CC} and GND near device. Also, ensure that the distance between the leads of the photocoupler and capacitor is no more than 10 mm.

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

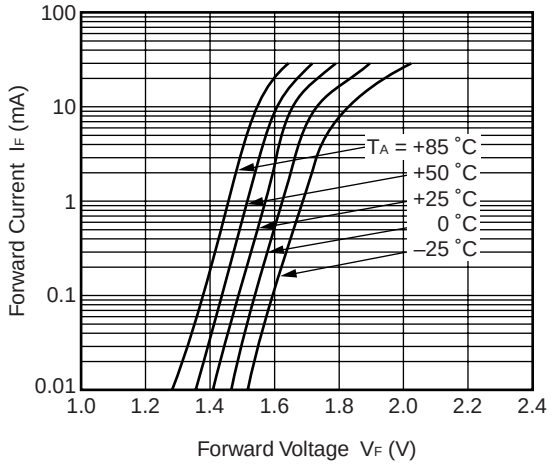
MAXIMUM FORWARD CURRENT vs. AMBIENT TEMPERATURE



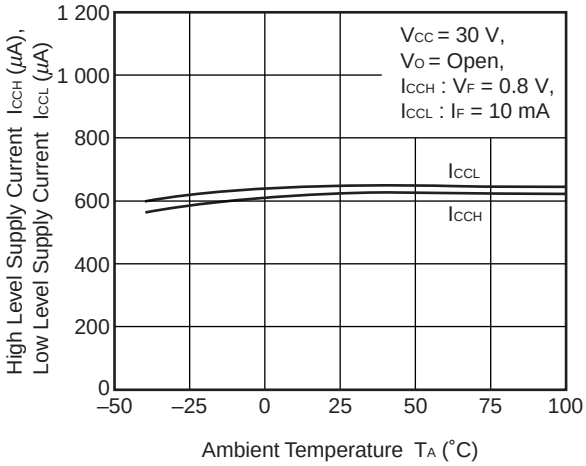
DETECTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



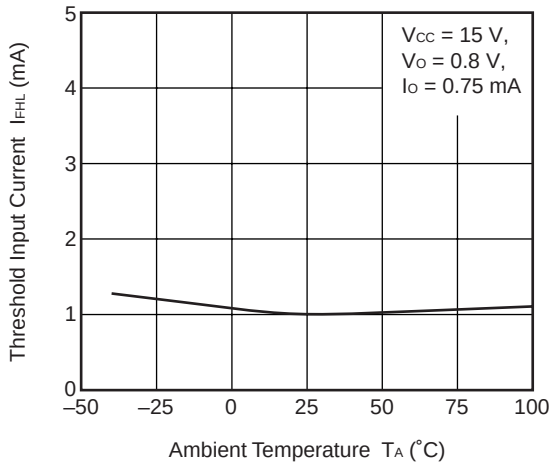
FORWARD CURRENT vs. FORWARD VOLTAGE



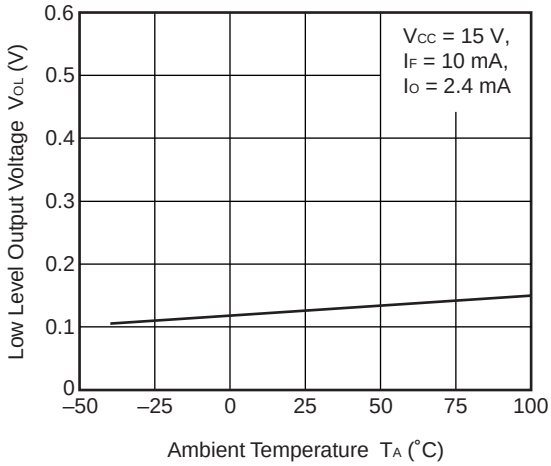
SUPPLY CURRENT vs. AMBIENT TEMPERATURE



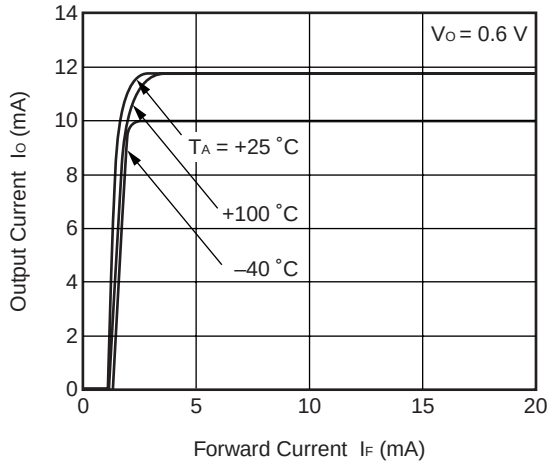
THRESHOLD INPUT CURRENT vs. AMBIENT TEMPERATURE



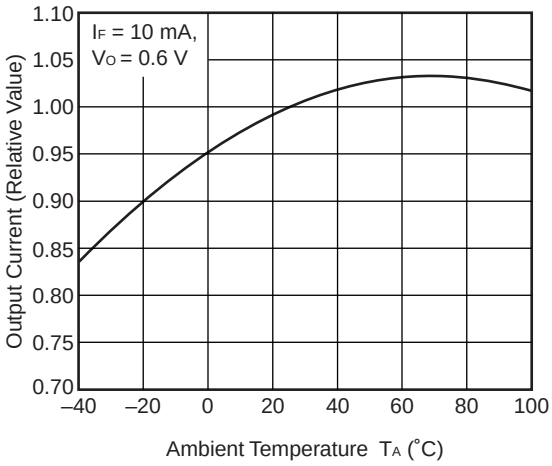
LOW LEVEL OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE



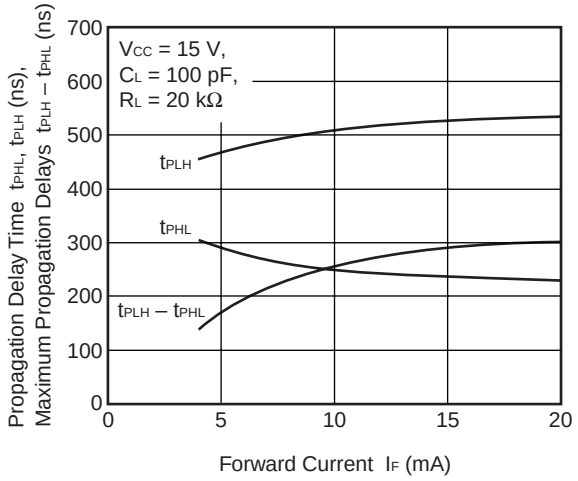
OUTPUT CURRENT vs. FORWARD CURRENT



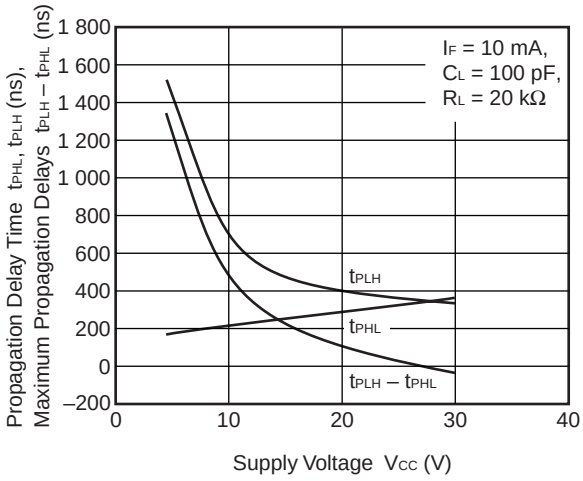
OUTPUT CURRENT vs. AMBIENT TEMPERATURE



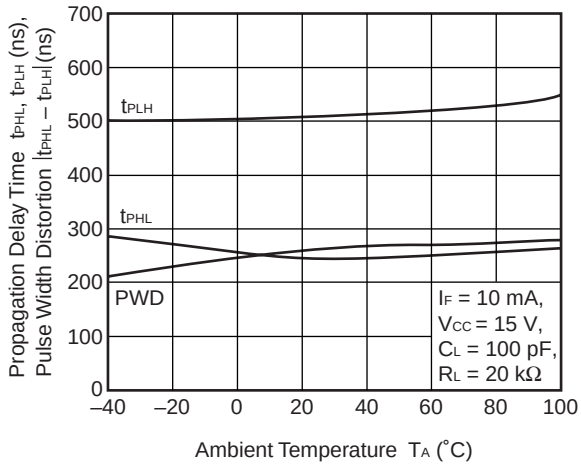
PROPAGATION DELAY TIME, MAXIMUM PROPAGATION DELAYS vs. FORWARD CURRENT



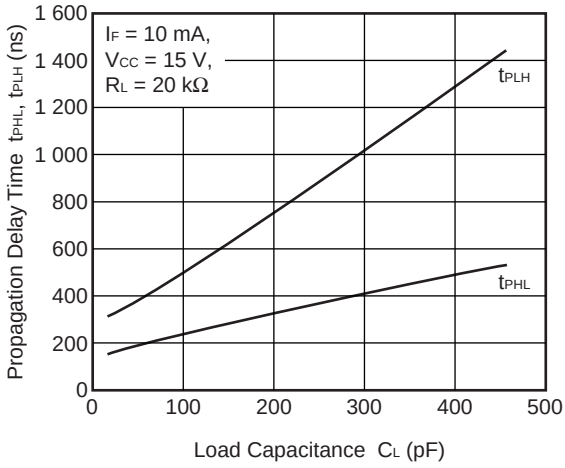
PROPAGATION DELAY TIME, MAXIMUM PROPAGATION DELAYS vs. SUPPLY VOLTAGE



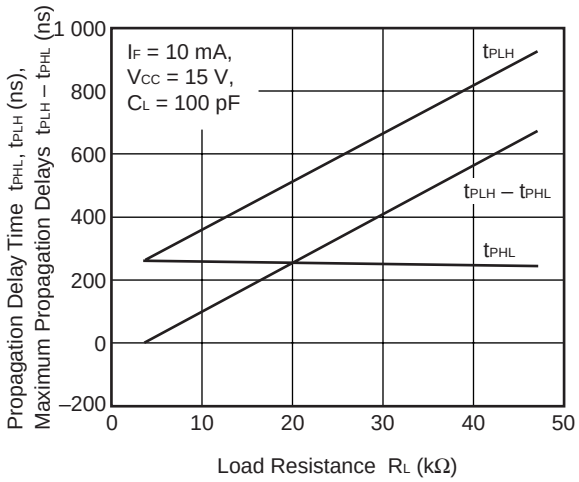
PROPAGATION DELAY TIME, PULSE WIDTH DISTORTION vs. AMBIENT TEMPERATURE



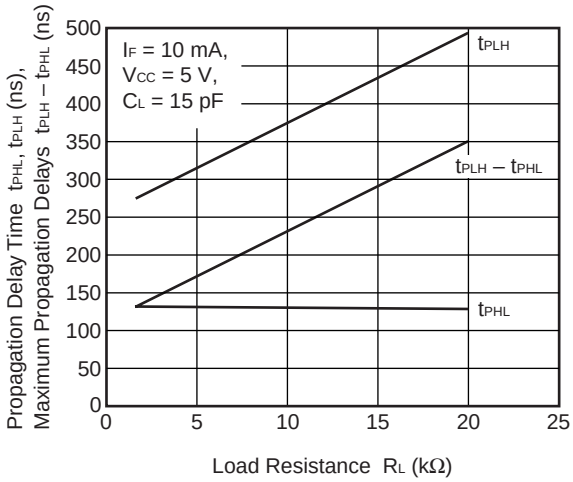
PROPAGATION DELAY TIME vs. LOAD CAPACITANCE



PROPAGATION DELAY TIME, MAXIMUM PROPAGATION DELAYS vs. LOAD RESISTANCE



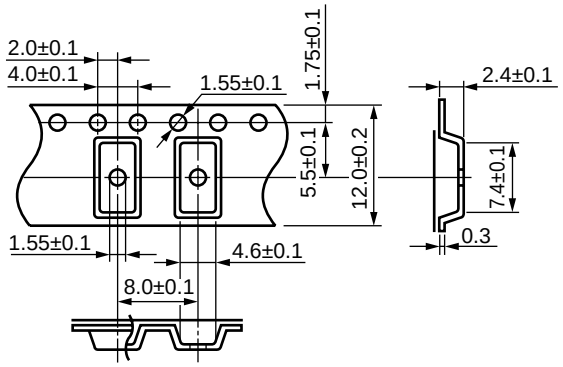
PROPAGATION DELAY TIME, MAXIMUM PROPAGATION DELAYS vs. LOAD RESISTANCE



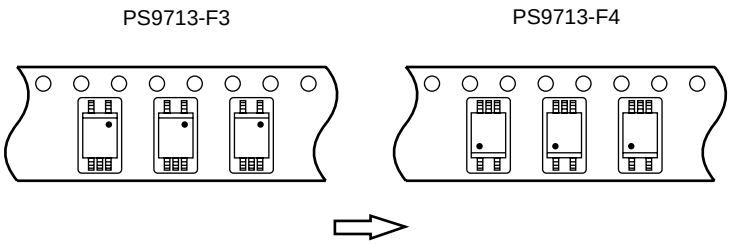
Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (in millimeters)

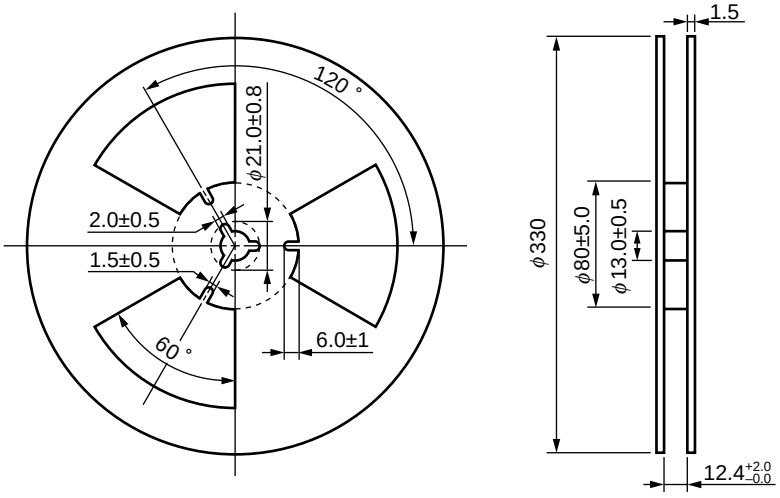
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



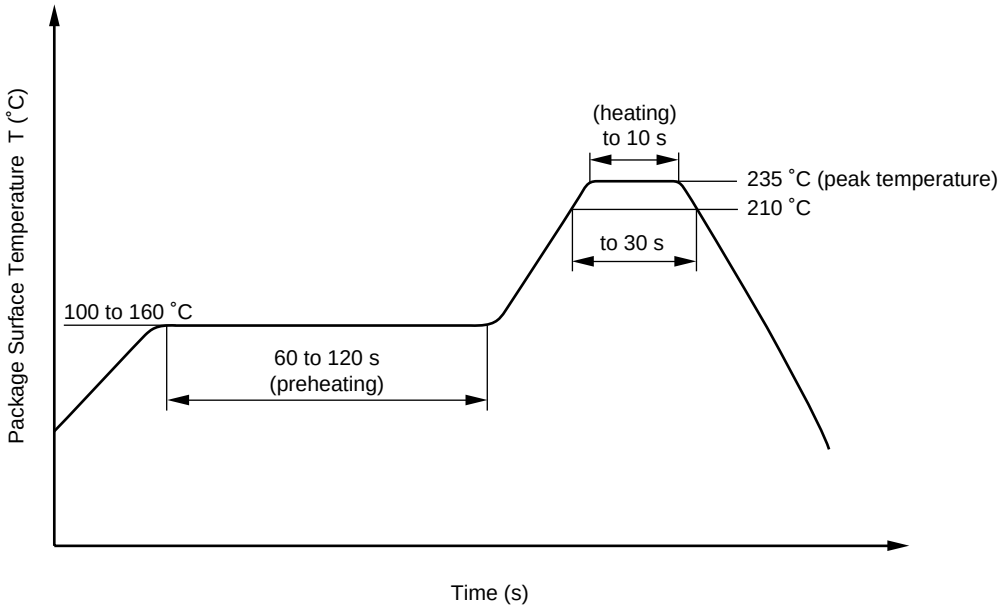
Packing: 3 500 pcs/reel

RECOMMENDED SOLDERING CONDITIONS

(1) Infrared reflow soldering

- Peak reflow temperature — 235 °C 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) Dip soldering

- Temperature — 260 °C or below (molten solder temperature)
- Time — 10 seconds or less
- 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) Cautions

- Fluxes

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

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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