

**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

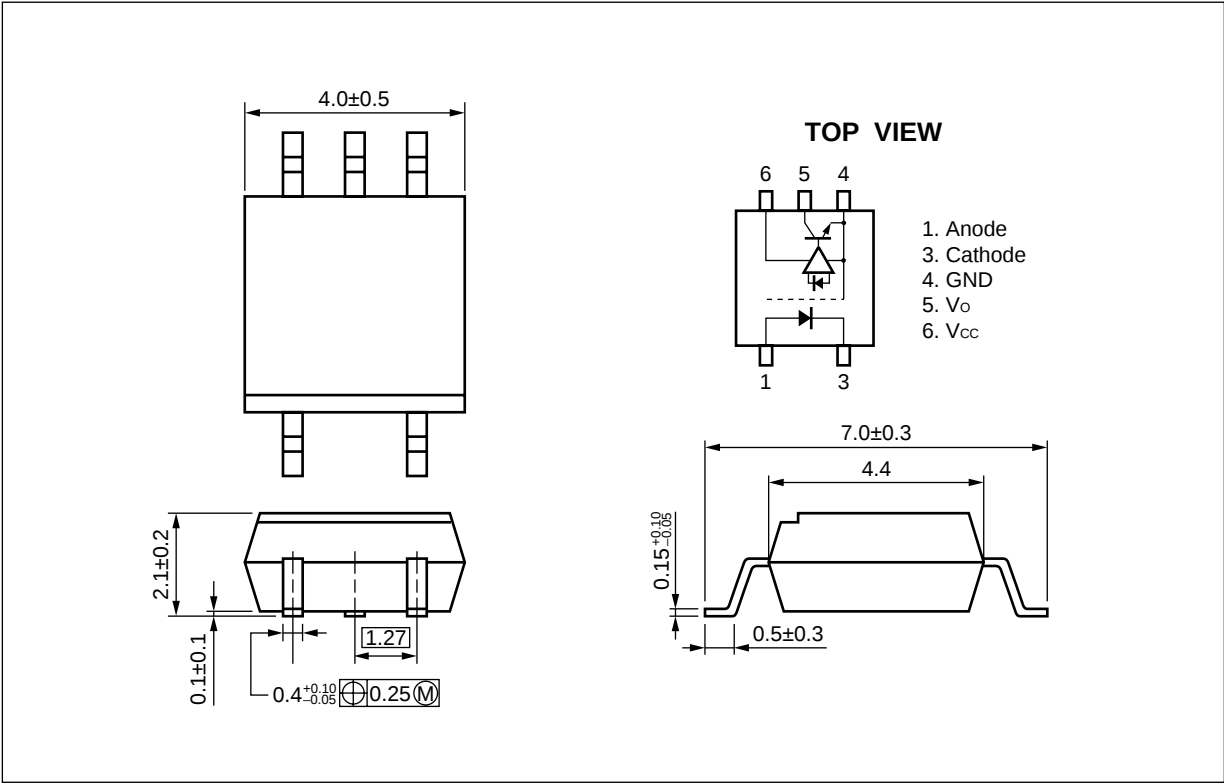
- High instantaneous common mode rejection voltage (CM_H , $CM_L = \pm 15 \text{ kV}/\mu\text{s MIN.}$)
- Small package (5-pin SOP)
- High-speed response ($t_{PHL} = 500 \text{ ns MAX.}$, $t_{PLH} = 750 \text{ ns MAX.}$)
- Maximum propagation delays ($t_{PLH} - t_{PHL} = 270 \text{ ns TYP.}$)
- Pulse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

APPLICATIONS

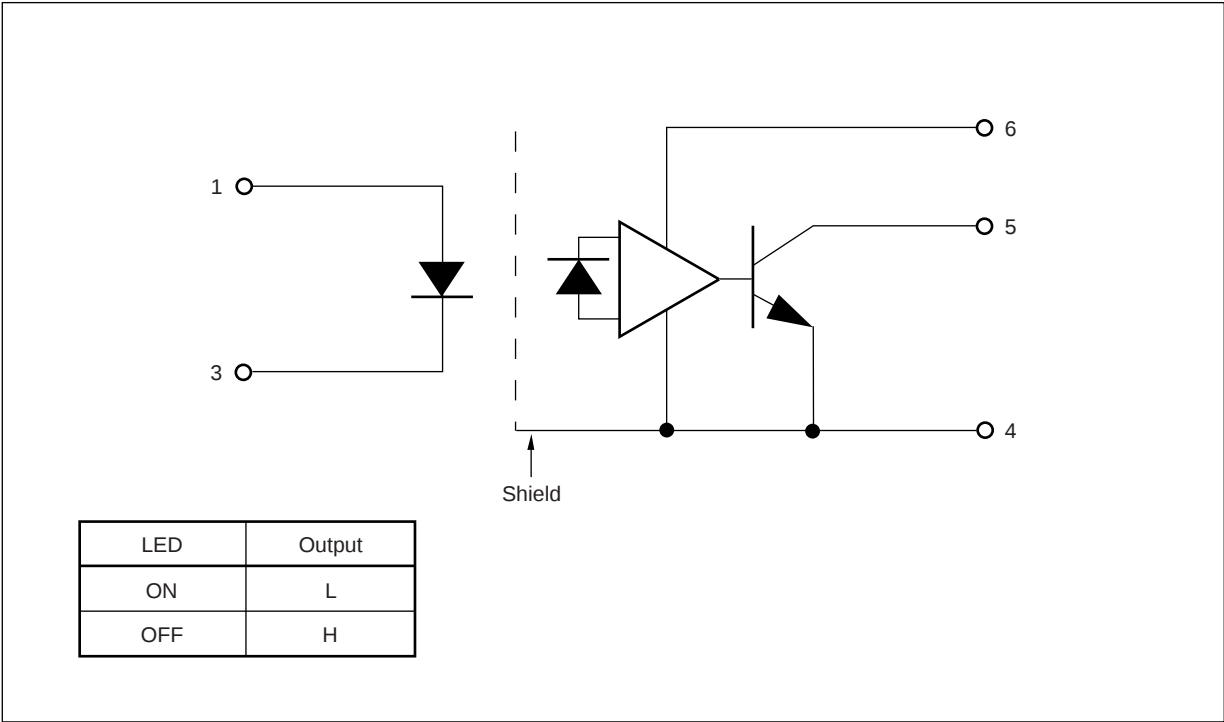
- IPM Driver
- General purpose inverter

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

PACKAGE DIMENSIONS (in millimeters)



FUNCTIONAL DIAGRAM



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

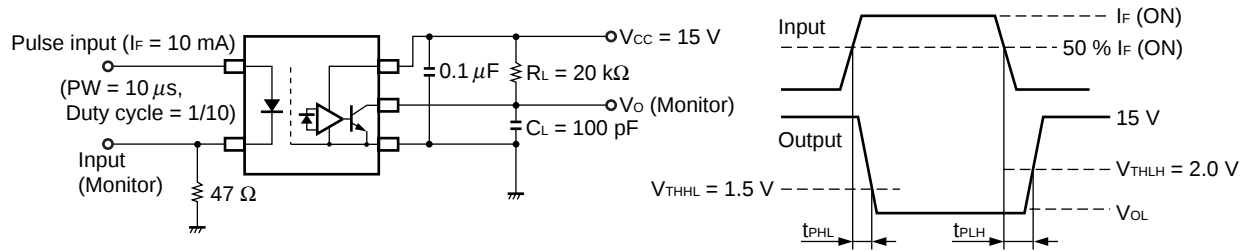
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
High Level Input Current	I _{FH}	10		20	mA
Output Voltage	V _O	0		30	V
Supply Voltage	V _{CC}	4.5		30	V
LED Off Voltage	V _F	0		0.8	V

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	μ A
	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	μ A
	High Level Supply Current	I_{CCH}	$V_{CC} = 30$ V, $V_F = 0.8$ V, $V_O = \text{open}$		0.6	1.3	mA
	Low Level Supply Current	I_{CCL}	$V_{CC} = 30$ V, $I_F = 10$ mA, $V_O = \text{open}$		0.6	1.3	mA
Coupled	Threshold Input Current ($H \rightarrow L$)	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 ($H \rightarrow L$) ^{*2}	t_{PHL}	$I_F = 10$ mA, $R_L = 20$ k Ω , $C_L = 100$ pF, $V_{THHL} = 1.5$ V, $V_{THLH} = 2.0$ V		250	500	ns
	Propagation Delay Time ($L \rightarrow H$) ^{*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, $R_L = 20$ k Ω , $C_L = 100$ pF	15			kV/ μ s
	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, $R_L = 20$ k Ω , $C_L = 100$ pF	15			kV/ μ s

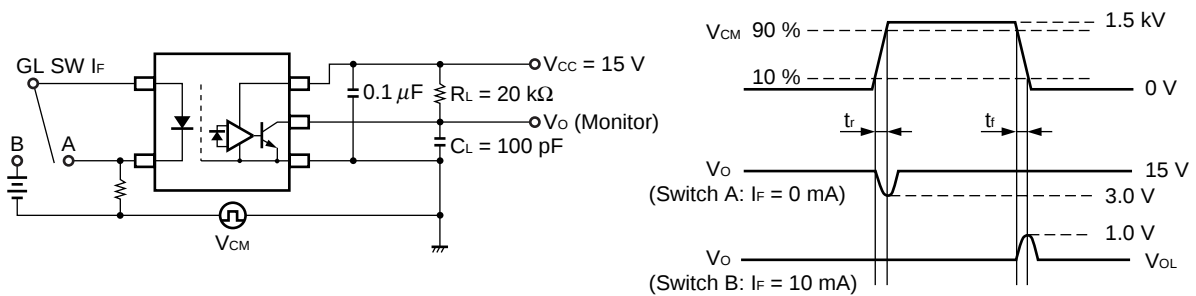
*1 Typical values at $T_A = 25\text{ }^{\circ}\text{C}$.

*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

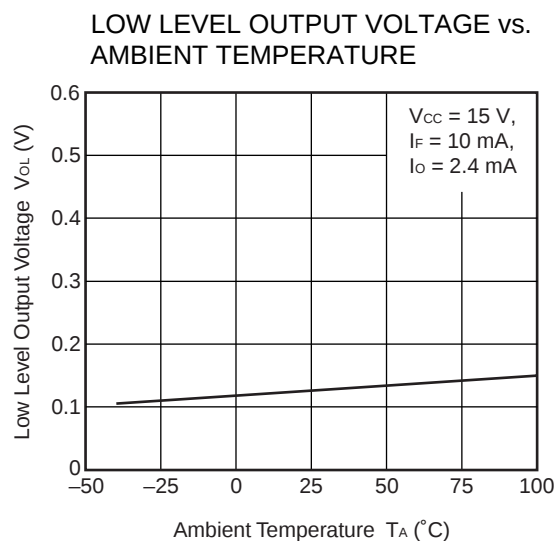
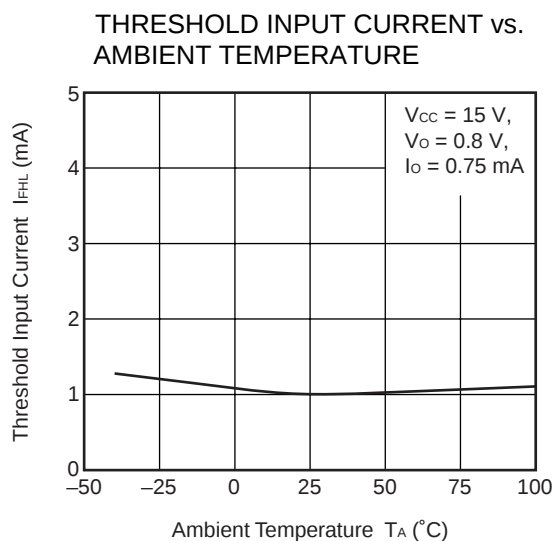
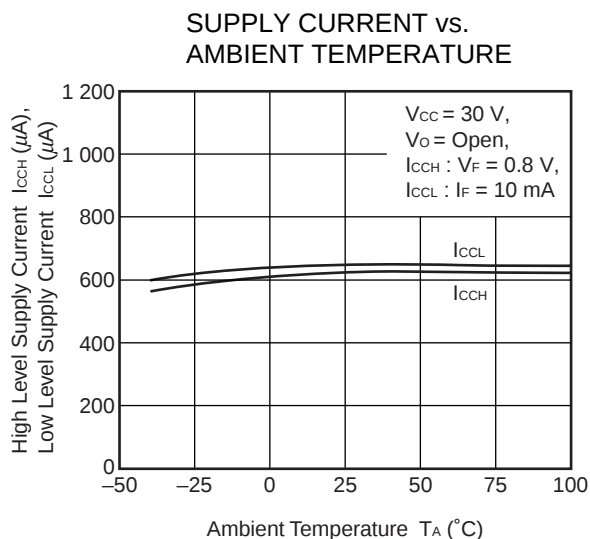
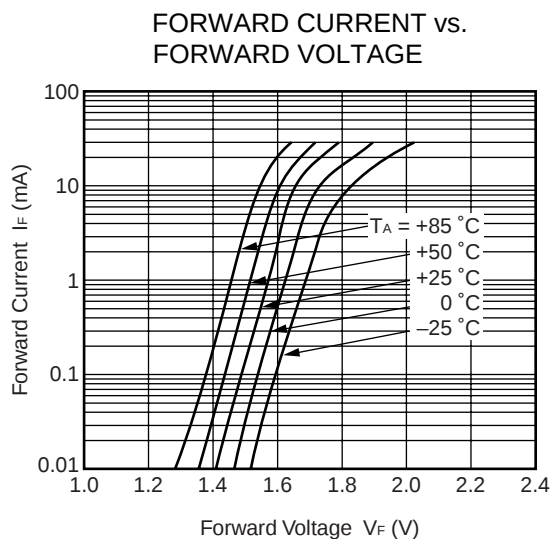
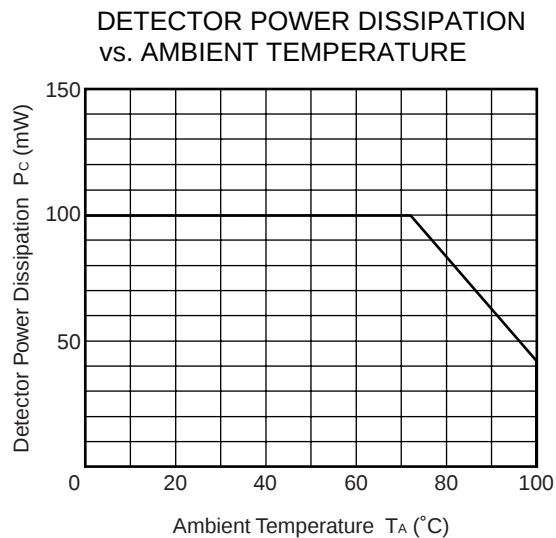
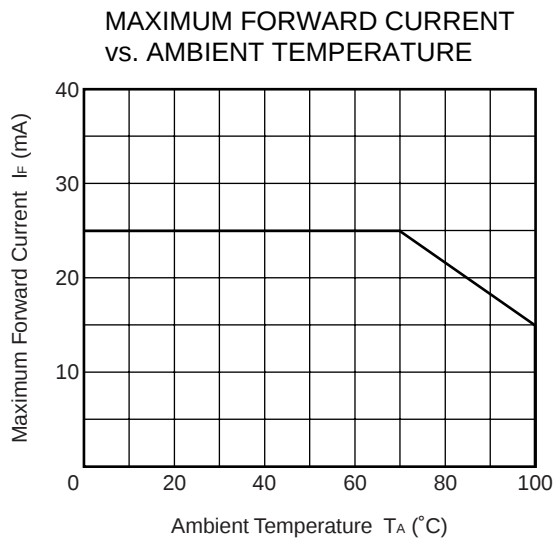


C_L is approximately which includes probe and stray wiring capacitance.

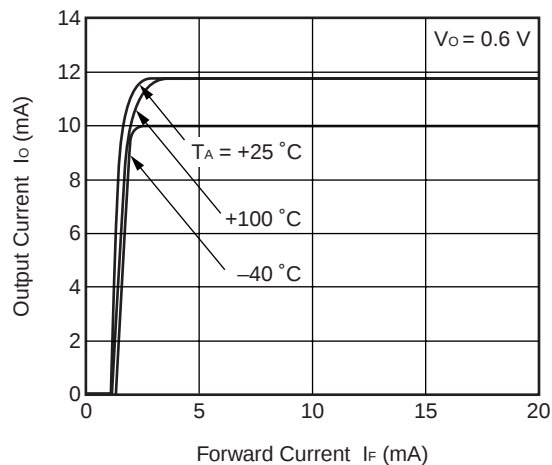
USAGE CAUTION

By-pass capacitor of more than $0.1\text{ }\mu\text{F}$ 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 mm .

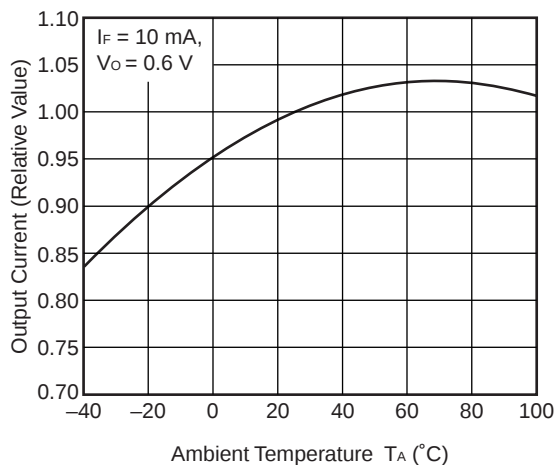
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)



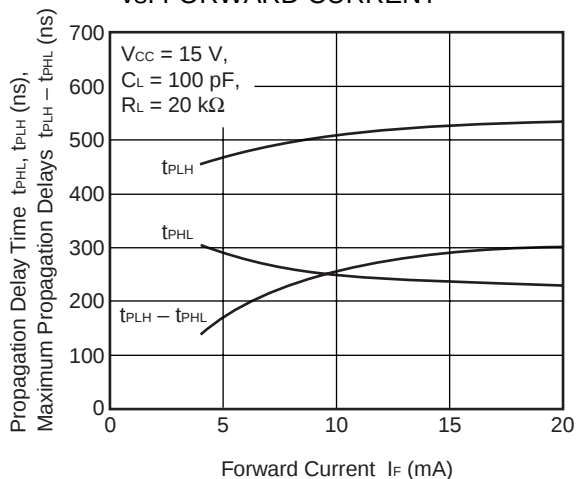
OUTPUT CURRENT vs. FORWARD CURRENT



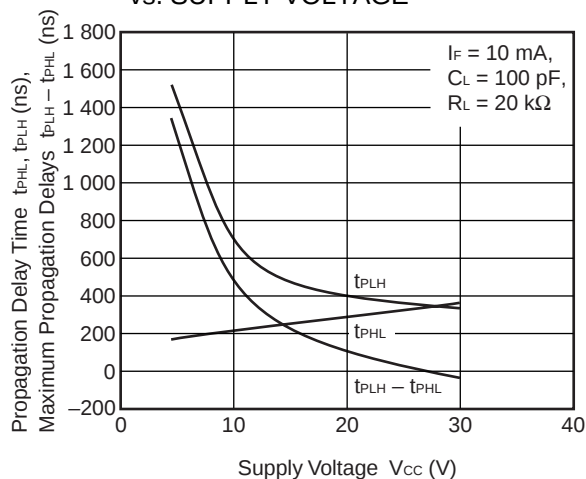
OUTPUT CURRENT vs. AMBIENT TEMPERATURE



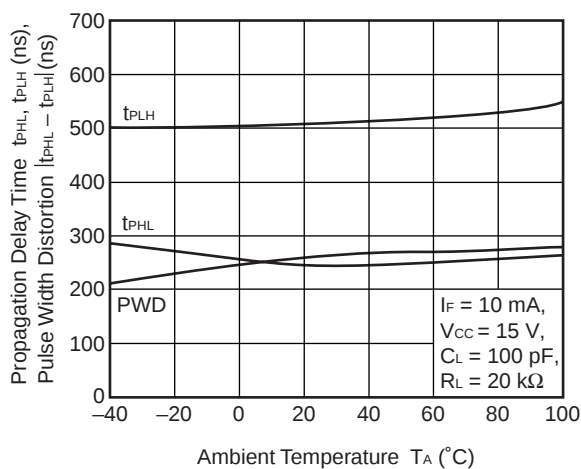
PROPAGATION DELAY TIME, MAXIMUM PROPAGATION DELAYS vs. FORWARD CURRENT



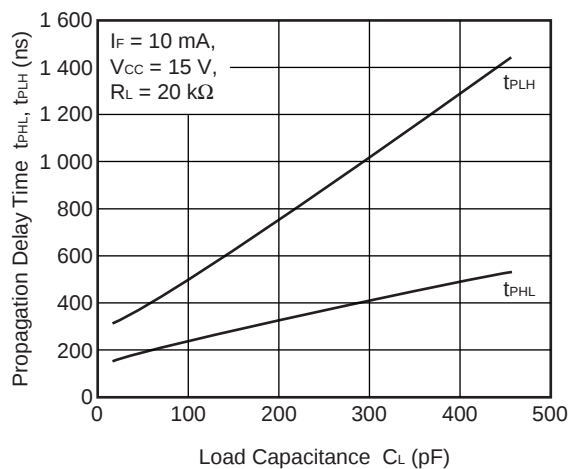
PROPAGATION DELAY TIME, MAXIMUM PROPAGATION DELAYS vs. SUPPLY VOLTAGE

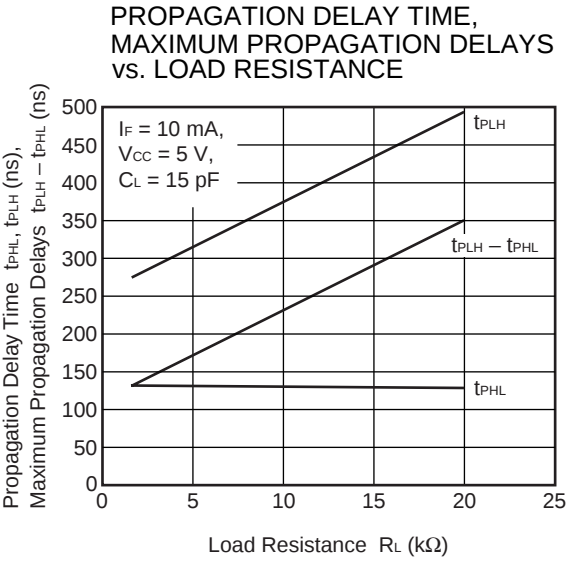
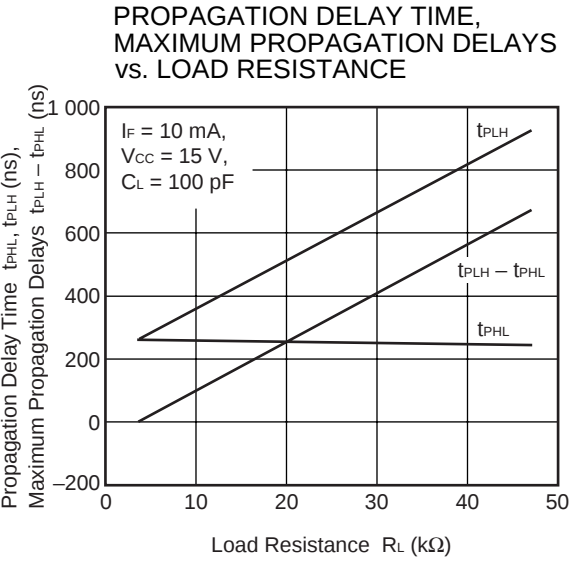


PROPAGATION DELAY TIME, PULSE WIDTH DISTORTION vs. AMBIENT TEMPERATURE



PROPAGATION DELAY TIME vs. LOAD CAPACITANCE

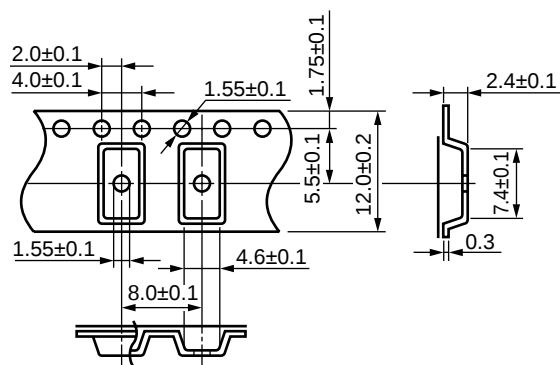




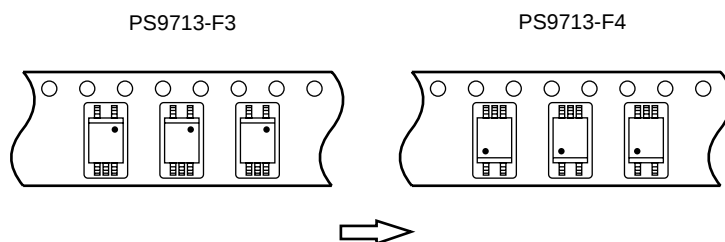
Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (in millimeters)

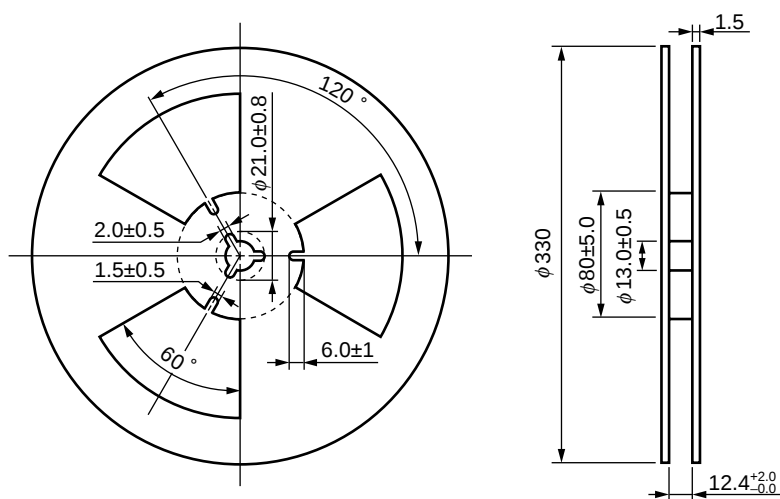
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



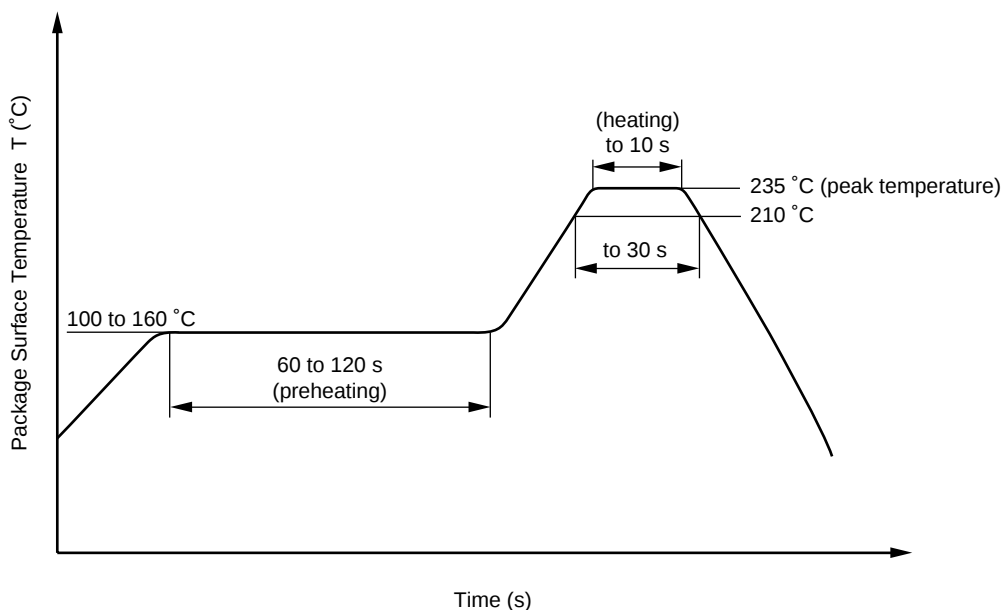
Packing: 3 500 pcs/reel

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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M8E 00.4