

PHOTOCOUPLER PS9613,PS9613L

1 Mbps, OPEN COLLECTOR OUTPUT, FOR GATE DRIVE INTERFACE INTELLIGENT POWER MODULE -NEPOC[™] Series-8-PIN DIP PHOTOCOUPLER

DESCRIPTION

The PS9613 and PS9613L are optically coupled isolators containing a GaAlAs LED on the input side and a photo diode and a signal processing circuit on the output side on one chip.

The PS9613 is in a plastic DIP (Dual In-line Package) and the PS9613L is lead bending type (Gull-wing) for surface mounting.

FEATURES

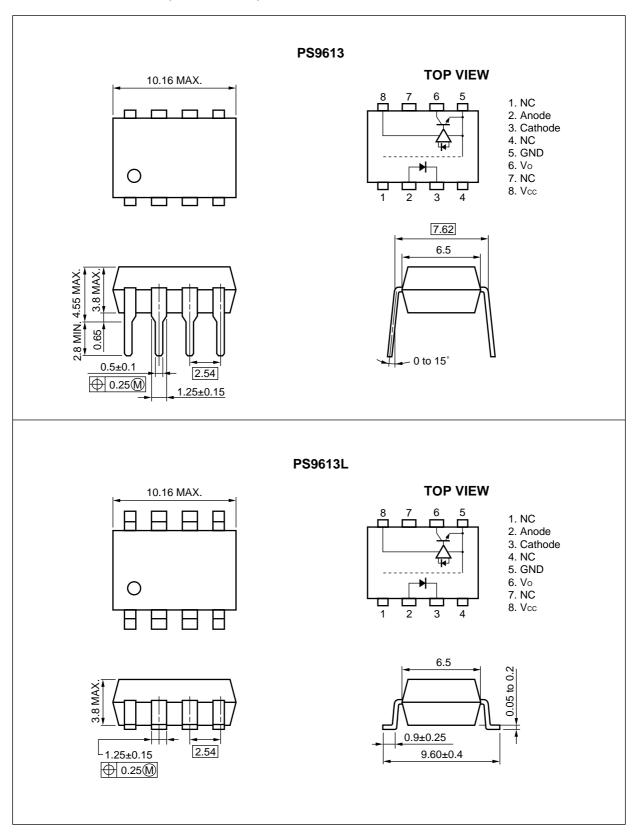
- High instantaneous common mode rejection voltage (CMH, CML = ± 15 kV/ μ s MIN.)
- High-speed response (tphl = 500 ns MAX., tplh = 750 ns MAX.)
- Maximum propagation delays (tplh tphl = 270 ns TYP.)
- Pulse width distortion ($| t_{PHL} t_{PLH} | = 270 \text{ ns TYP.}$)
- Ordering number of taping product: PS9613L-E3, E4: 1 000 pcs/reel
- UL approved: File No. E72422 (S)
- VDE0884 approved (Option)

APPLICATIONS

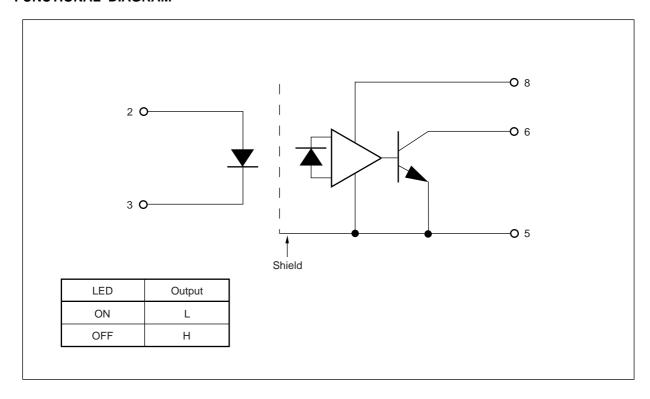
- IPM Driver
- General purpose inverter

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PACKAGE DIMENSIONS (in millimeters)



FUNCTIONAL DIAGRAM



ORDERING INFORMATION

Part Number	Package	Packing Style	Safety Standards Approval	Application Part Number*1
PS9613	8-pin DIP	Magazine case 50 pcs	UL approved	PS9613
PS9613L				PS9613L
PS9613L-E3		Embossed Tape 1 000 pcs/reel		
PS9613L-E4				
PS9613-V		Magazine case 50 pcs	VDE0884 approved	PS9613
PS9613L-V				PS9613L
PS9613L-V-E3		Embossed Tape 1 000 pcs/reel		
PS9613L-V-E4				

^{*1} For the application of the Safety Standard, following part number should be used.

ABSOLUTE MAXIMUM RATINGS (TA = 25 °C, unless otherwise specified)

Parameter		Symbol	Ratings	Unit
Diode	Forward Current	lF	25	mA
	Reverse Voltage	VR	3.0	V
Detector	Supply Voltage	Vcc	-0.5 to +35	V
	Output Voltage	Vo	-0.5 to +35	V
	Output Current	lo	15	mA
	Power Dissipation	Pc	100	mW
Isolation Voltage ^{*1}		BV	5 000	Vr.m.s.
Operating Ambient Temperature		TA	-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
Forward Current	lF	10		20	mA
Output Voltage	Vo	0		30	V
Supply Voltage	Vcc	4.5		30	V
LED Off Voltage	VF	0		0.8	V

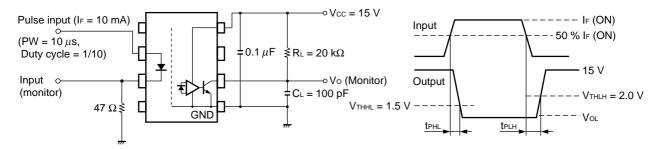


ELECTRICAL CHARACTERISTICS (TA = -40 to +100 °C, Vcc = 15 V, unless otherwise specified)

Parameter		Symbol	Conditions	MIN.	TYP.*1	MAX.	Unit
Diode	Forward Voltage	VF	I _F = 10 mA	1.3	1.65	2.1	V
	Reverse Current	IR	V _R = 3 V			200	μΑ
	Terminal Capacitance	Ct	V = 0 V, f = 1 MHz, T _A = 25 °C		30		pF
Detector	Low Level Output Voltage	Vol	IF = 10 mA, Vcc = 5 V, Io = 2.4 mA		0.13	0.6	V
	High Level Output Current	Іон	Vcc = 30 V, V _F = 0.8 V		1.0	50	μΑ
	High Level Supply Current	Іссн	Vcc = 30 V, V _F = 0.8 V, V _O = open		0.6	1.3	mA
	Low Level Supply Current	Iccl	Vcc = 30 V, IF = 10 mA, Vo = open		0.6	1.3	mA
Coupled	Threshold Input Current $(H \rightarrow L)$	IFHL	Vo = 0.8 V, Io = 0.75 mA		1.5	5.0	mA
	Current Transfer Ratio (Ic/IF)	CTR	IF = 10 mA, Vo = 0.6 V	44	110		%
	Isolation Resistance	R _{I-O}	$V_{I-O} = 1 \text{ kV}_{DC}, \text{ RH} = 40 \text{ to } 60 \text{ \%},$ $T_A = 25 ^{\circ}\text{C}$	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	$I_F = 10 mA, \; R_L = 20 \; k\Omega, \; C_L = 100 \; pF,$ $V_{THHL} = 1.5 \; V, \; V_{THLH} = 2.0 \; V$		250	500	ns
	Propagation Delay Time $(L \rightarrow H)^{-2}$	t PLH			520	750	
	Maximum Propagation Delays	tрш-tрнц		-200	270	650	
	Pulse Width Distortion (PWD) ²	tрнц—tрцн			270	650	
	Instantaneous Common Mode Rejection Voltage (Output: High) '3	СМн	$T_{\text{A}} = 25~^{\circ}\text{C}, \text{ I}_{\text{F}} = 0~\text{mA}, \text{ Vo} > 3.0~\text{V}, \\ \text{V}_{\text{CM}} = 1.5~\text{kV}, \text{ R}_{\text{L}} = 20~\text{k}\Omega, \\ \text{C}_{\text{L}} = 100~\text{pF}$	15			kV/μs
	Instantaneous Common Mode Rejection Voltage (Output: Low) ⁻³	CM∟	$T_{A}=25~^{\circ}C,~I_{F}=10~mA,~V_{O}<1.0~V,$ $V_{CM}=1.5~kV,~R_{L}=20~k\Omega,$ $C_{L}=100~pF$	15			kV/μs

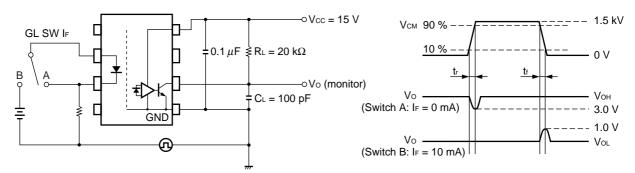
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- *1 Typical values at T_A = 25 °C.
- *2 Test circuit for propagation delay time



C∟ is approximately which includes probe and stray wiring capacitance.

*3 Test circuit for common mode transient immunity



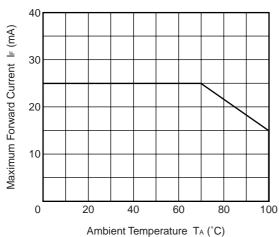
 C_{L} is approximately which includes probe and stray wiring capacitance.

USAGE CAUTION

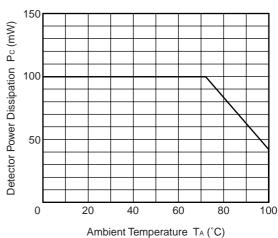
By-pass capacitor of more than 0.1 μ F is used between Vcc and GND near device. Also, ensure that the distance between the leads of the photocoupler and capacitor is no more than 10 mm.

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

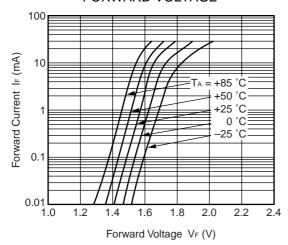




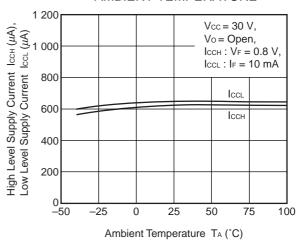
DETECTOR POWER DISSIPATION vs. AMBIENT TEMPERATURE



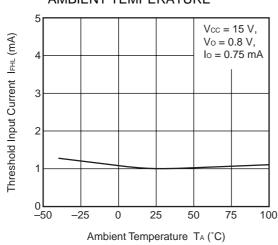
FORWARD CURRENT vs. FORWARD VOLTAGE



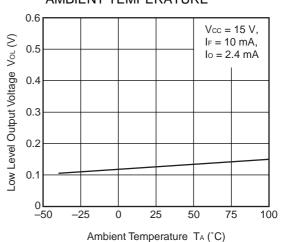
SUPPLY CURRENT vs.
AMBIENT TEMPERATURE



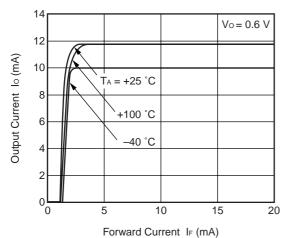
THRESHOLD INPUT CURRENT vs. AMBIENT TEMPERATURE



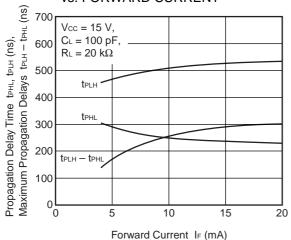
LOW LEVEL OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE



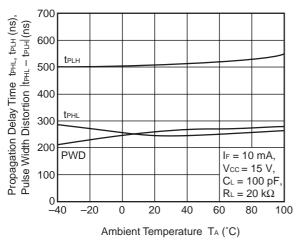
OUTPUT CURRENT vs. FORWARD CURRENT



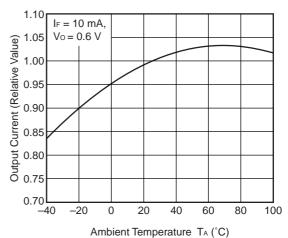
PROPAGATION DELAY TIME, MAXIMUM PROPAGATION DELAYS vs. FORWARD CURRENT



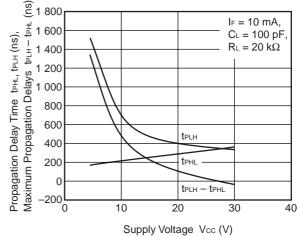
PROPAGATION DELAY TIME, PULSE WIDTH DISTORTION vs. AMBIENT TEMPERATURE



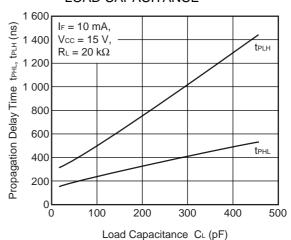
OUTPUT CURRENT vs. AMBIENT TEMPERATURE



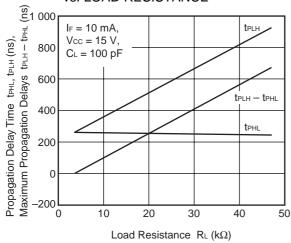
PROPAGATION DELAY TIME, MAXIMUM PROPAGATION DELAYS vs. SUPPLY VOLTAGE



PROPAGATION DELAY TIME vs. LOAD CAPACITANCE

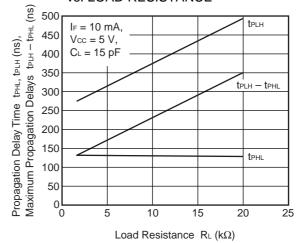


PROPAGATION DELAY TIME, MAXIMUM PROPAGATION DELAYS vs. LOAD RESISTANCE

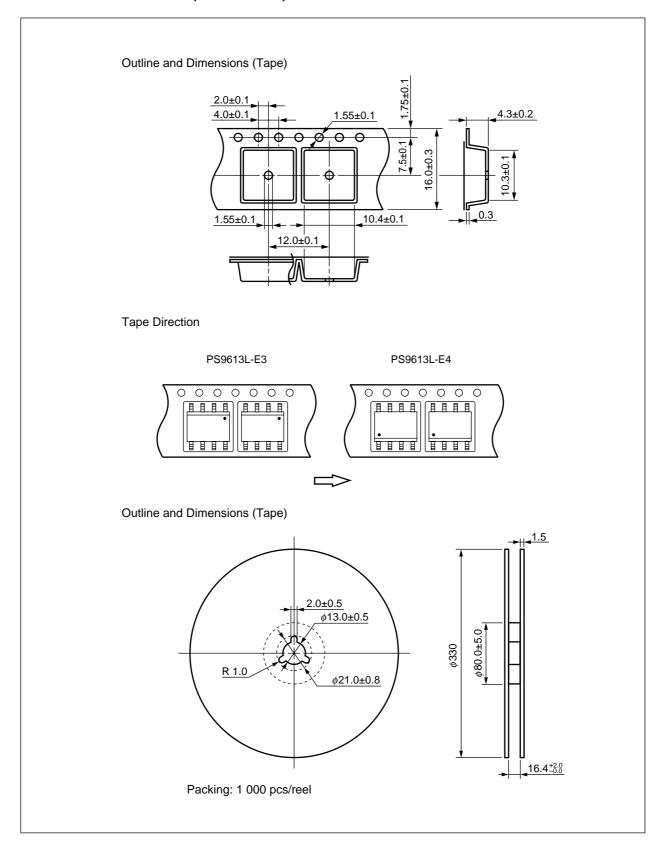


Remark The graphs indicate nominal characteristics.

PROPAGATION DELAY TIME, MAXIMUM PROPAGATION DELAYS vs. LOAD RESISTANCE



TAPING SPECIFICATIONS (in millimeters)





RECOMMENDED SOLDERING CONDITIONS

(1) Infrared reflow soldering

• Peak reflow temperature 235 °C or below (package surface temperature)

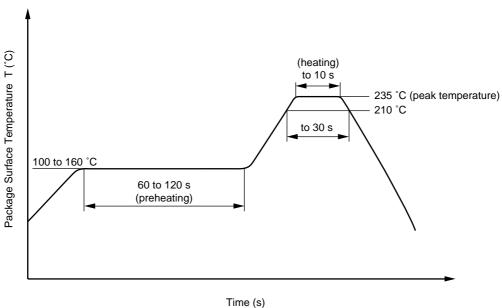
• Time of temperature higher than 210 °C 30 seconds or less

· 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

260 °C or below (molten solder temperature) 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.

[MEMO]

[MEMO]

[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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