PS9306L,PS9306L2

–NEPOC Series–

0.6 A OUTPUT CURRENT, HIGH CMR, IGBT GATE DRIVE, 6-PIN SDIP PHOTOCOUPLER

R08DS0017EJ0001
Rev.0.01
Aug 20, 2010

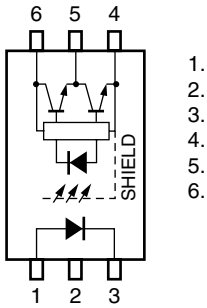
DESCRIPTION

The PS9306L and PS9306L2 are optical coupled isolators containing a GaAlAs LED on the input side and a photo diode, a signal processing circuit and a power output transistor on the output side on one chip.
The PS9306L and PS9306L2 are in 6-pin plastic SDIP (Shrink Dual In-line Package). The PS9306L2 has 8 mm creepage distance. The mount area of 6-pin plastic SDIP is half size of 8-pin DIP.
The PS9306L and PS9306L2 are designed specifically for high common mode transient immunity (CMR) and high switching speed. It is suitable for driving IGBTs and MOS FETs.
The PS9306L is lead bending type (Gull-wing) for surface mounting.
The PS9306L2 is lead bending type for long creepage distance (Gull-wing) for surface mount.

FEATURES

- Long creepage distance (8 mm MIN.: PS9306L2)
- Half size of 8-pin DIP
- Peak output current (0.6 A MAX., 0.4 A MIN.)
- High speed switching (t_{PLH}, t_{PHL} = 0.4 μs MAX.)
- High common mode transient immunity (CM_H, CM_L = ±25 kV/μs MIN.)
- Embossed tape product : PS9306L-E3 : 2 000 pcs/reel
  : PS9306L2-E3: 2 000 pcs/reel
- Pb-Free product

PIN CONNECTION
(Top View)



1. Anode
2. NC
3. Cathode
4. V_{EE}
5. V_O
6. V_{CC}

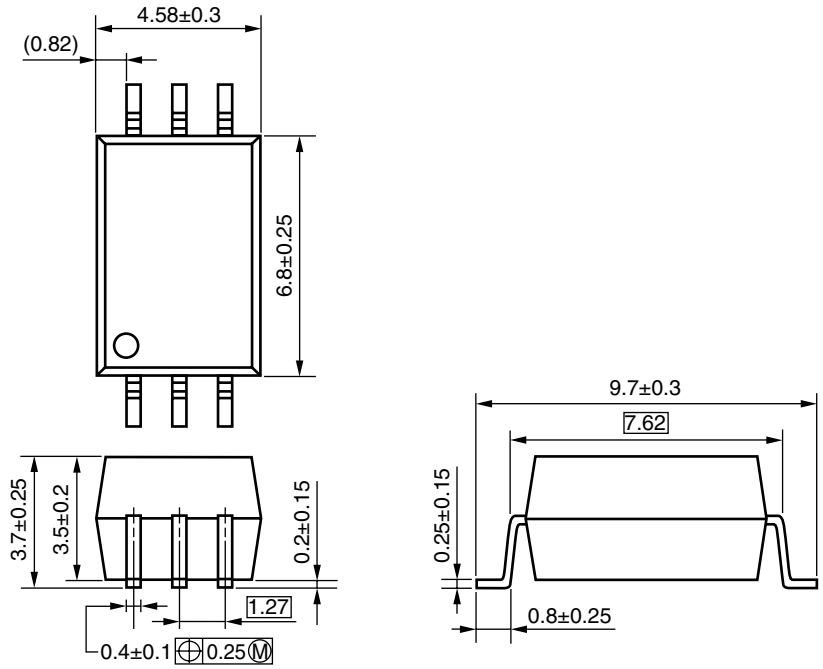
APPLICATIONS

- IGBT, Power MOS FET Gate Driver
- Industrial inverter
- IH (Induction Heating)

PACKAGE DIMENSIONS (UNIT: mm)

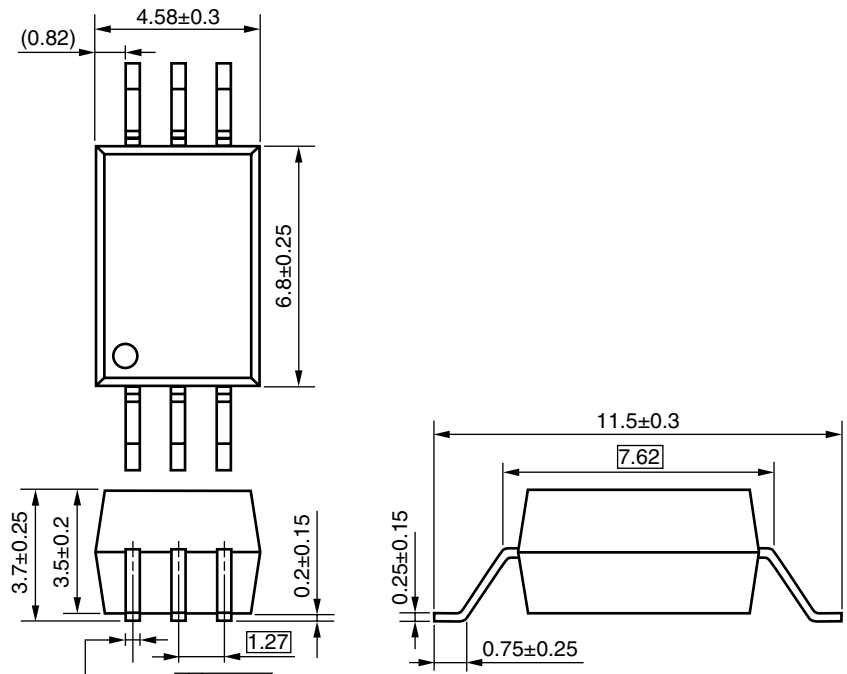
Lead Bending Type (Gull-wing) For Surface Mount

PS9306L



Lead Bending Type (Gull-wing) For Long Creepage Distance (Surface Mount)

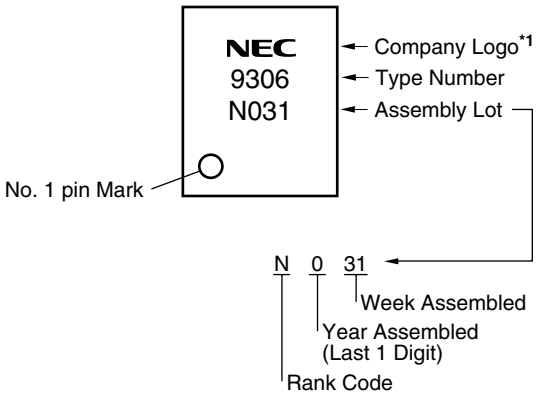
PS9306L2



PHOTOCOUPLER CONSTRUCTION

Parameter	PS9306L	PS9306L2
Air Distance (MIN.)	7 mm	8 mm
Outer Creepage Distance (MIN.)	7 mm	8 mm
Isolation Distance (MIN.)	0.4 mm	0.4 mm

MARKING EXAMPLE



Note: *1 NEC Company logo is planned to be changed to "R" indicator after October 2010.

ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number*1
PS9306L	PS9306L-AX	Pb-Free (Ni/Pd/Au)	20 pcs (Tape 20 pcs cut)	Standard products (UL and CSA awaiting approval)	PS9306L
PS9306L-E3	PS9306L-E3-AX		Embossed Tape 2 000 pcs/reel		
PS9306L2	PS9306L2-AX		20 pcs (Tape 20 pcs cut)		PS9306L2
PS9306L2-E3	PS9306L2-E3-AX		Embossed Tape 2 000 pcs/reel		
PS9306L-V	PS9306L-V-AX		20 pcs (Tape 20 pcs cut)	DIN EN60747-5-2 (VDE0884 Part2) awaiting approval (Option)	PS9306L
PS9306L-V-E3	PS9306L-V-E3-AX		Embossed Tape 2 000 pcs/reel		
PS9306L2-V	PS9306L2-V-AX		20 pcs (Tape 20 pcs cut)		PS9306L2
PS9306L2-V-E3	PS9306L2-V-E3-AX		Embossed Tape 2 000 pcs/reel		

Note: *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
	Peak Transient Forward Current (Pulse Width < 1 μs)	$I_{F\ (TRAN)}$	1.0	A
	Reverse Voltage	V_R	5	V
	Power Dissipation *1	P_D	45	mW
Detector	High Level Peak Output Current *2	$I_{OH\ (PEAK)}$	0.6	A
	Low Level Peak Output Current *2	$I_{OL\ (PEAK)}$	0.6	A
	Supply Voltage	(V_{CC}–V_{EE})	0 to 35	V
	Output Voltage	V_O	0 to V_{CC}	V
	Power Dissipation *3	P_C	250	mW
Isolation Voltage *4		BV	5 000	Vr.m.s.
Operating Frequency *5		f	50	kHz
Operating Ambient Temperature		T_A	–40 to +110	°C
Storage Temperature		T_{stg}	–55 to +125	°C

Notes: *1. Reduced to 1.2 mW/°C at T_A = 85°C or more.

*2. Maximum pulse width = 10 μs, Maximum duty cycle = 0.2%

*3. Reduced to 4.5 mW/°C at T_A = 65°C or more.

*4. AC voltage for 1 minute at T_A = 25°C, RH = 60% between input and output. Pins 1-3 shorted together, 4-6 shorted together.

*5. $I_{OH\ (PEAK)} \leq 0.4$ A (≤ 2.0 μs), $I_{OL\ (PEAK)} \leq 0.4$ A (≤ 2.0 μs)

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	(V_{CC}–V_{EE})	10		30	V
Forward Current (ON)	$I_{F\ (ON)}$	8		12	mA
Forward Voltage (OFF)	$V_{F\ (OFF)}$	–2		0.8	V
Operating Ambient Temperature	T_A	–40		110	°C

ELECTRICAL CHARACTERISTICS (T_A = –40 to +110°C, V_{CC} = 10 to 30 V, $I_{F\ (ON)}$ = 8 to 12 mA, $V_{F\ (OFF)}$ = –2 to 0.8 V, V_{EE} = GND, unless otherwise specified)

Parameter		Symbol	Conditions	MIN.	TYP.*1	MAX.	Unit
Diode	Forward Voltage	V_F	I_F = 10 mA, T_A = 25°C	1.2	1.56	1.8	V
	Reverse Current	I_R	V_R = 3 V, T_A = 25°C			10	μA
	Input Capacitance	C_{IN}	f = 1 MHz, V_F = 0 V, T_A = 25°C		30		pF
Detector	High Level Output Current	I_{OH}	V_O = (V_{CC}–4 V) *2	0.2			A
			V_O = (V_{CC}–10 V) *3	0.4	0.5		
	Low Level Output Current	I_{OL}	V_O = (V_{EE}+2.5 V) *2	0.2	0.4		A
			V_O = (V_{EE}+10 V) *3	0.4	0.5		
	High Level Output Voltage	V_{OH}	I_O = –100 mA *4	V_{CC}–4.0	V_{CC}–1.8		V
	Low Level Output Voltage	V_{OL}	I_O = 100 mA		0.4	1.0	V
	High Level Supply Current	I_{CCH}	I_O = 0 mA		0.7	3.0	mA
	Low Level Supply Current	I_{CCL}	I_O = 0 mA		1.2	3.0	mA
Coupled	Threshold Input Current (L → H)	I_{FLH}	I_O = 0 mA, V_O > 5 V			7.0	mA
	Threshold Input Voltage (H → L)	V_{FHL}	I_O = 0 mA, V_O < 5 V	0.8			V
	Isolation Capacitance	C_{I-O}	V_F = 0 V, f = 1 MHz, T_A = 25°C		0.7		pF

Notes: *1. Typical values at T_A = 25°C, V_{CC}–V_{EE} = 30 V.
*2. Maximum pulse width = 50 μs, Maximum duty cycle = 0.5%.
*3. Maximum pulse width = 10 μs, Maximum duty cycle = 0.2%.
*4. V_{OH} is measured with the DC load current in this testing.

SWITCHING CHARACTERISTICS (T_A = –40 to +110°C, V_{CC} = 10 to 30 V, $I_{F\ (ON)}$ = 8 to 12 mA, $V_{F\ (OFF)}$ = –2 to 0.8 V, V_{EE} = GND, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.*1	MAX.	Unit
Propagation Delay Time (L → H)	t_{PLH}	R_g = 47 Ω, C_g = 3 nF,	0.05	0.18	0.4	μs
Propagation Delay Time (H → L)	t_{PHL}	f = 10 kHz,	0.05	0.18	0.4	μs
Pulse Width Distortion (PWD)	$\|t_{PHL}–t_{PLH}\|$	Duty Cycle = 50%*2,			0.25	μs
Propagation Delay Time (Difference Between Any Two Products)	$t_{PHL}–t_{PLH}$	I_F = 10 mA, V_{CC} = 30 V	–0.3		0.3	μs
Rise Time	t_r			50		ns
Fall Time	t_f			50		ns
Common Mode Transient Immunity at High Level Output	$\|CM_H\|$	T_A = 25°C, I_F = 10 mA, V_{CC} = 30 V, V_{CM} = 1.5 kV, $V_{O\ (MIN.)}$ = 26 V	25			kV/μs
Common Mode Transient Immunity at Low Level Output	$\|CM_L\|$	T_A = 25°C, I_F = 0 mA, V_{CC} = 30 V, V_{CM} = 1.5 kV, $V_{O\ (MAX.)}$ = 1 V	25			kV/μs

Notes: *1. Typical values at T_A = 25°C, $V_{CC}–V_{EE}$ = 30 V.

*2. This load condition is equivalent to the IGBT load at 1 200 V/25 A.

TEST CIRCUIT

Fig. 1 I_{OH} Test Circuit

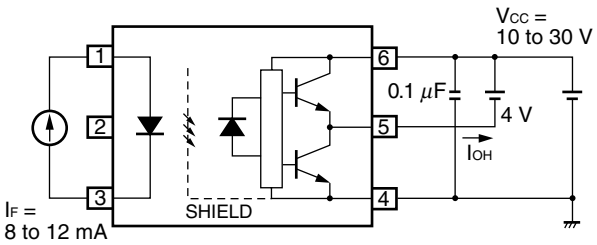


Fig. 2 I_{OL} Test Circuit

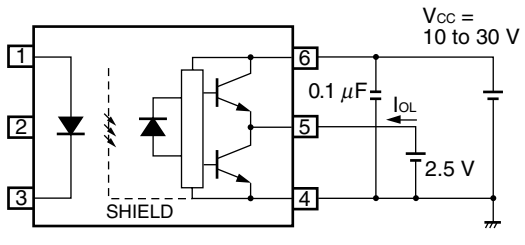


Fig. 3 V_{OH} Test Circuit

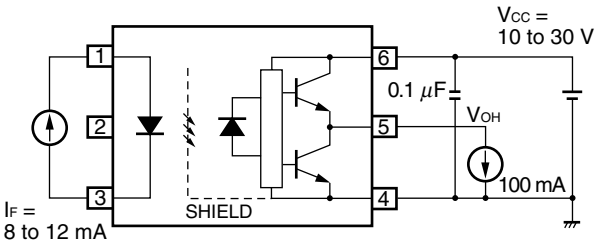


Fig. 4 V_{OL} Test Circuit

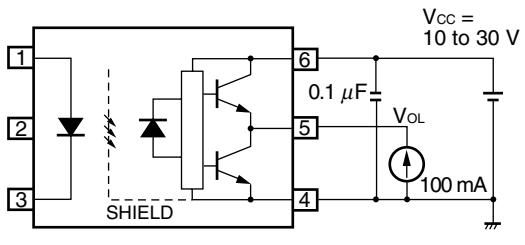


Fig. 5 I_{FLH} Test Circuit

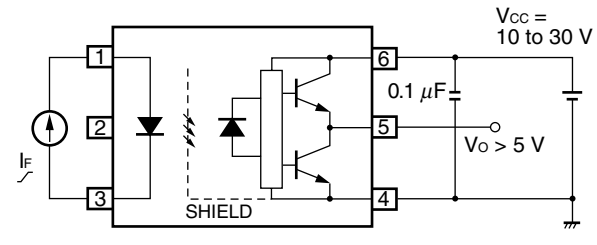


Fig. 6 t_{PLH}, t_{PHL}, t_r, t_f Test Circuit and Wave Forms

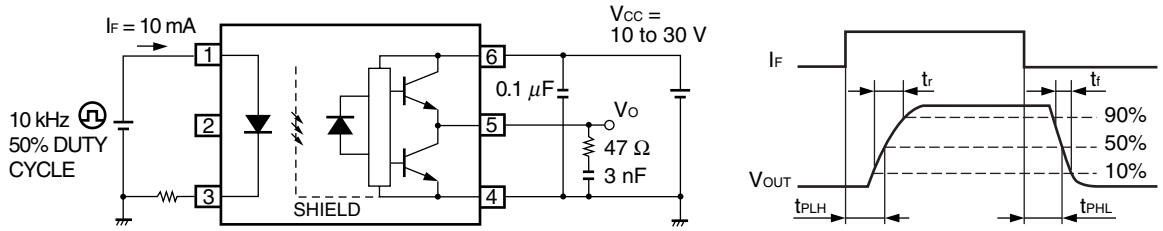
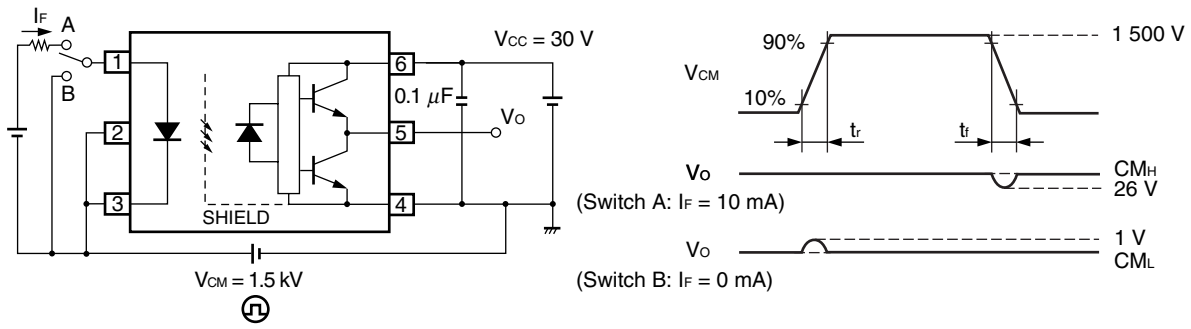


Fig. 7 CMR Test Circuit and Wave Forms



Remarks 1. Common Mode Transient Immunity at High Level Output is the maximum value of dV_{CM}/dt at which the output remains High Level (e.g. $V_O > 26$ V).

2. Common Mode Transient Immunity at Low Level Output is the maximum value of dV_{CM}/dt at which the output remains Low Level (e.g. $V_O < 1.0$ V).

3. Connect pin 2 to the LED common.

NOTES ON HANDLING

CAUTIONS REGARDING NOISE

Be aware that when voltage is applied suddenly between the photocoupler's input and output at startup, the output transistor 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. Board designing

(1) 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.

(2) In older to avoid malfunctions and characteristics degradation, IGBT collector or emitter traces should not be closed to the LED input.

(3) Pin 2 (which is an NC[*1] pin) can either be connected directly to the GND pin on the LED side or left open. Unconnected pins should not be used as a bypass for signals or for any other similar purpose because this may degrade the internal noise environment of the device.

Note: *1. NC: Non-Connection (No Connection).

3. Make sure the rise/fall time of the forward current is 0.5 μs or less.

4. In order to avoid malfunctions, make sure the rise/fall slope of the supply voltage is 3 V/μs or less.

5. Avoid storage at a high temperature and high humidity.

Caution GaAs Products	This product uses gallium arsenide (GaAs). GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points. • Follow related laws and ordinances when disposing of the product. If there are no applicable laws and/or ordinances, dispose of the product as recommended below. 1. Commission a disposal company able to (with a license to) collect, transport and dispose of materials that contain arsenic and other such industrial waste materials. 2. Exclude the product from general industrial waste and household garbage, and ensure that the product is controlled (as industrial waste subject to special control) up until final disposal. • Do not burn, destroy, cut, crush, or chemically dissolve the product. • Do not lick the product or in any way allow it to enter the mouth.

Revision History	PS9306L,PS9306L2 Preliminary Data Sheet

Rev.	Date	Description	
		Page	Summary
0.01	Aug 20, 2010	–	First edition issued

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