

HIGH CMR, 1 Mbps TOTEM POLE OUTPUT TYPE
6-PIN SDIP PHOTOCOUPLER

-NEPOC Series-

DESCRIPTION

The PS9303L and PS9303L2 are optical coupled high-speed, totem pole output isolators containing a GaAlAs LED on the input side and a photodiode and a signal processing circuit on the output side on one chip.

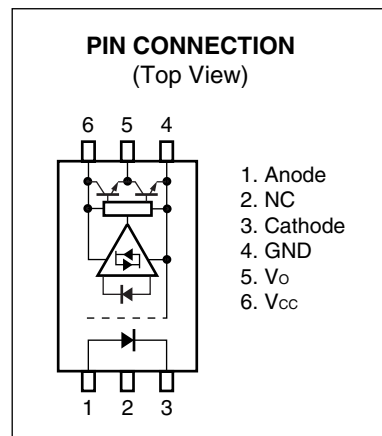
The PS9303L and PS9303L2 are specified high CMR and pulse width distortion with operating temperature. It is suitable for IPM drive.

The PS9303L is lead bending type (Gull-wing) for surface mounting.

The PS9303L2 is lead bending type for long creepage distance (Gull-wing) for surface mount.

FEATURES

- High common mode transient immunity ($CM_H, CM_L = \pm 15 \text{ kV}/\mu\text{s MIN.}$)
- Half size of 8-pin DIP
- <R> • Pulse width distortion ($|t_{PLH} - t_{PHL}| = 350 \text{ ns MAX.}$)
- High-speed (1 Mbps)
- High isolation voltage ($BV = 5\,000 \text{ Vr.m.s.}$)
- Totem pole output (Active High Output Type)
- Pb-Free product
- Safety standards
 - UL approved: No. E72422
 - CSA approved: No. CA 101391
 - DIN EN60747-5-2 (VDE0884 Part2) approved: No. 40024069 (Option)



APPLICATIONS

- IPM Driver
- General purpose inverter

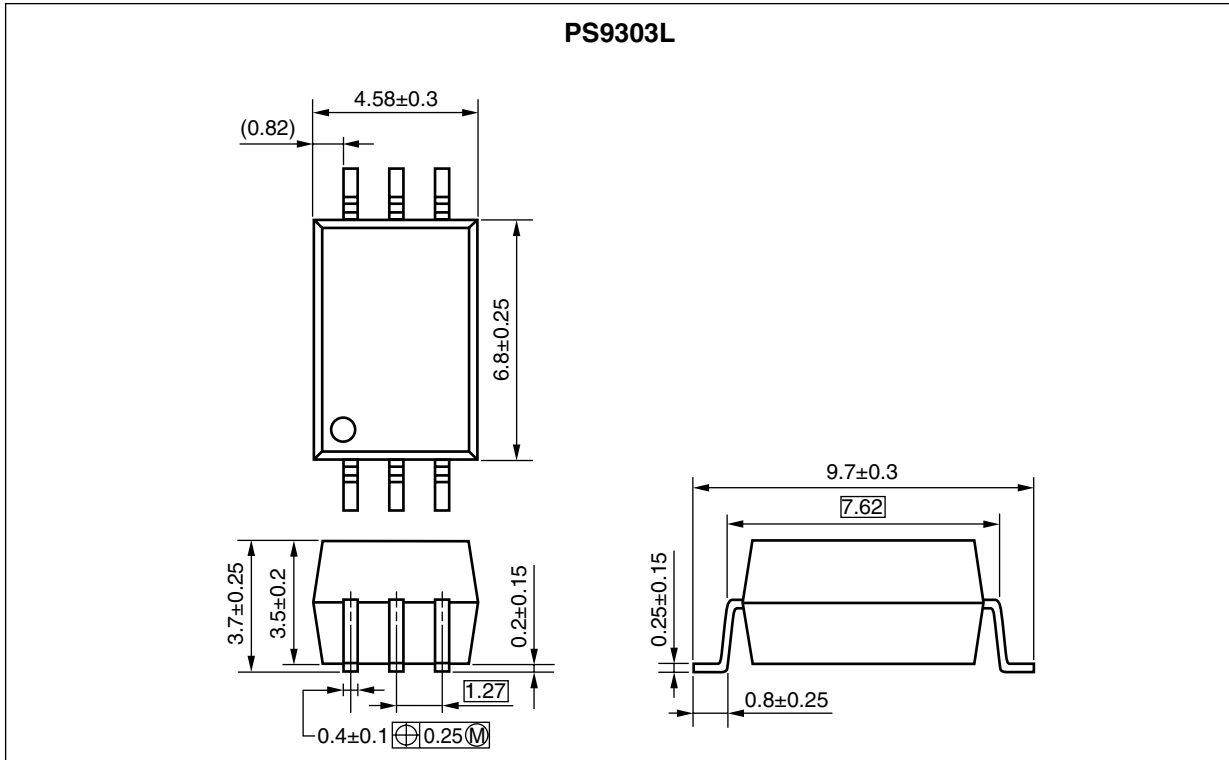
TRUTH TABLE

LED	Output
ON	H
OFF	L

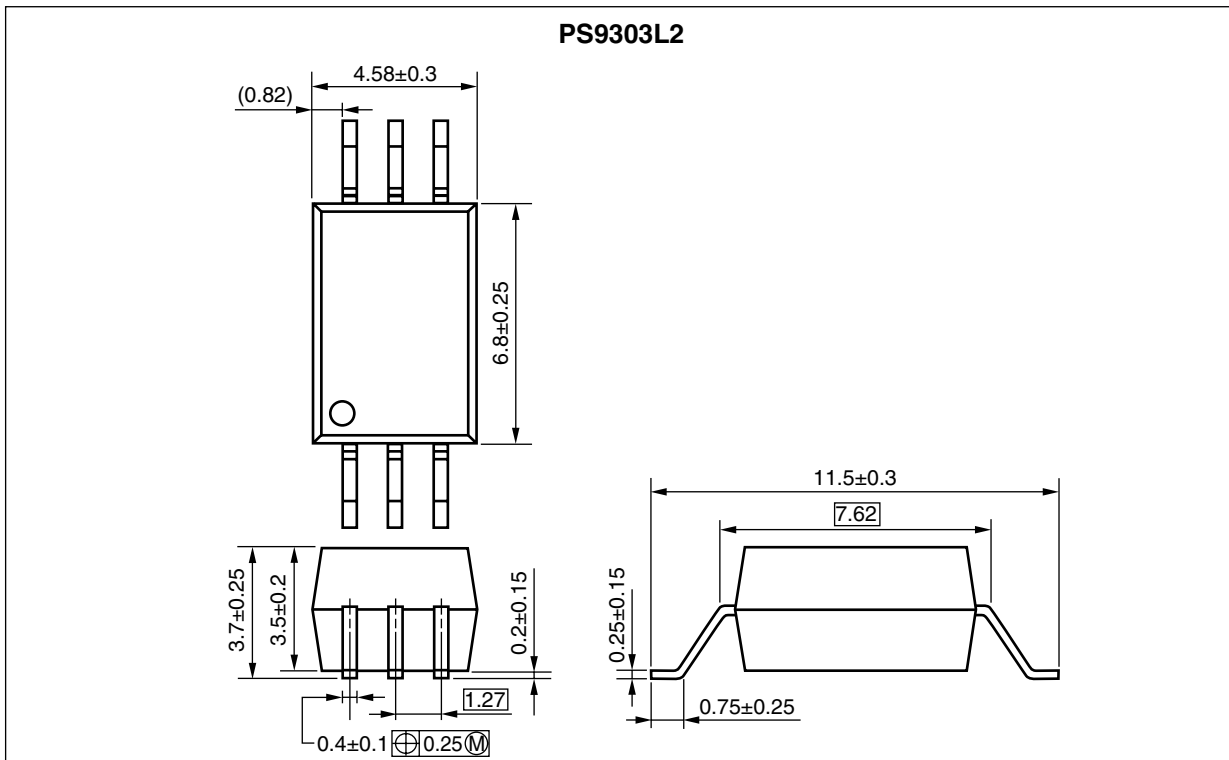
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<R> PACKAGE DIMENSIONS (UNIT: mm)

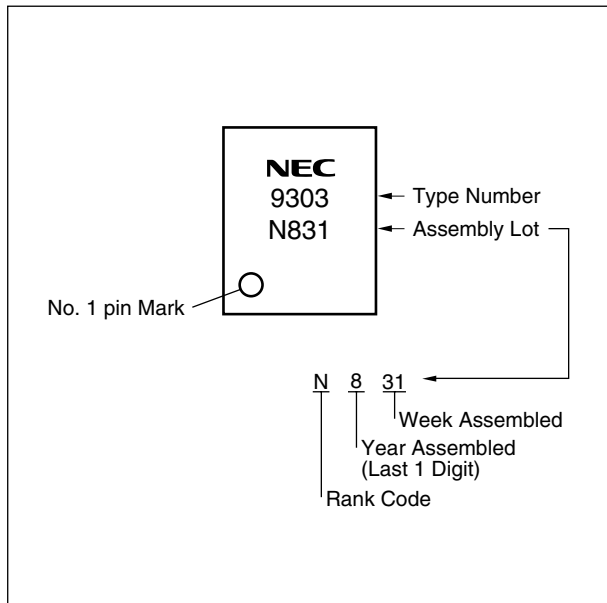
Lead Bending Type (Gull-wing) For Surface Mount



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



<R> MARKING EXAMPLE



PHOTOCOUPLER CONSTRUCTION

Parameter	PS9303L	PS9303L2
Air Distance (MIN.)	7 mm	8 mm
Outer Creepage Distance (MIN.)	7 mm	8 mm
Isolation Distance (MIN.)	0.4 mm	0.4 mm

<R> ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number ^{*1}
PS9303L	PS9303L-AX	Pb-Free (Ni/Pd/Au)	20 pcs (Tape 20 pcs cut)	Standard products (UL, CSA approved)	PS9303L
PS9303L-E3	PS9303L-E3-AX		Embossed Tape 2 000 pcs/reel		
PS9303L2	PS9303L2-AX		20 pcs (Tape 20 pcs cut)		PS9303L2
PS9303L2-E3	PS9303L2-E3-AX		Embossed Tape 2 000 pcs/reel		
PS9303L-V	PS9303L-V-AX		20 pcs (Tape 20 pcs cut)	DIN EN60747-5-2 (VDE0884 Part2)	PS9303L
PS9303L-V-E3	PS9303L-V-E3-AX		Embossed Tape 2 000 pcs/reel		
PS9303L2-V	PS9303L2-V-AX		20 pcs (Tape 20 pcs cut)	Approved (Option)	PS9303L2
PS9303L2-V-E3	PS9303L2-V-E3-AX		Embossed Tape 2 000 pcs/reel		

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

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

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Parameter		Symbol	Ratings	Unit
Diode	Forward Current ¹	I _F	20	mA
	Reverse Voltage	V _R	5	V
Detector	Supply Voltage	V _{CC}	-0.5 to +25	V
	Output Voltage	V _O	-0.5 to +25	V
	Output Current	I _O	25	mA
	Power Dissipation ²	P _C	210	mW
Isolation Voltage ³		BV	5 000	Vr.m.s.
Operating Ambient Temperature		T _A	-40 to +100	°C
Storage Temperature		T _{stg}	-55 to +125	°C

*1 Reduced to 0.33 mA/°C at T_A = 70°C or more.

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*2 Reduced to 4.0 mW/°C at T_A = 70°C or more.

*3 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.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V _{CC}	4.5	15	20	V
Output Voltage	V _O	0		20	V
Input Current (ON)	I _{F (ON)}	6		10	mA
Input Voltage (OFF)	V _{F (OFF)}	0		0.8	V

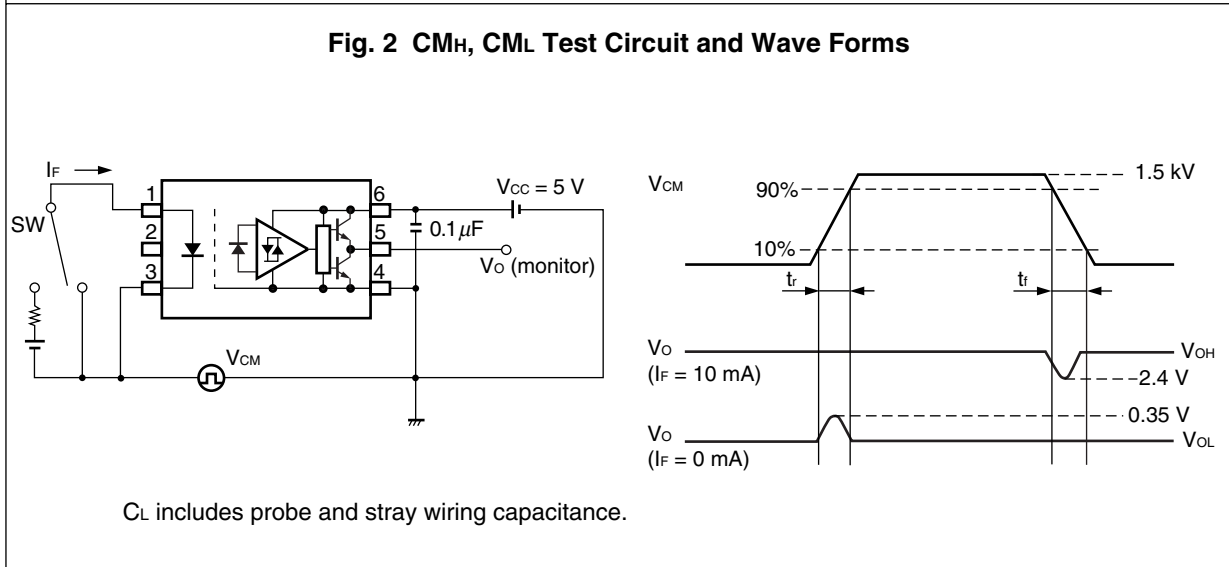
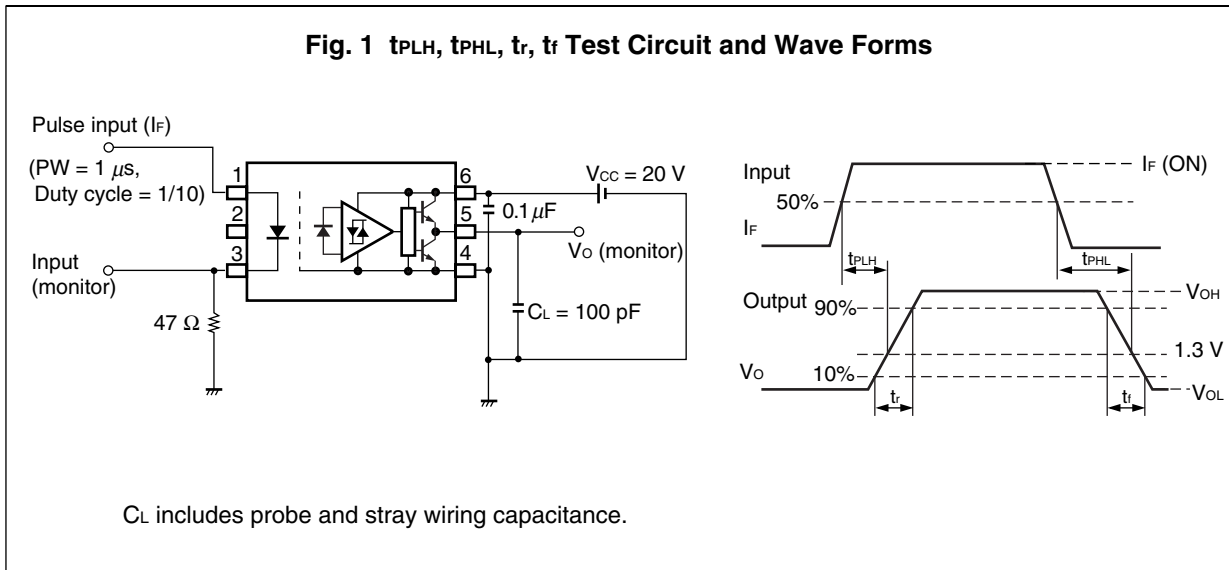
<R> ELECTRICAL CHARACTERISTICS (T_A = -40 to +100°C, V_{CC} = 4.5 to 20 V, unless otherwise specified)

Parameter		Symbol	Conditions	MIN.	TYP.*1	MAX.	Unit
Diode	Forward Voltage	V _F	I _F = 10 mA, T _A = 25°C	1.2	1.6	1.9	V
	Reverse Current	I _R	V _R = 3 V, T _A = 25°C			10	μA
	Terminal Capacitance	C _t	V = 0 V, f = 1 MHz, T _A = 25°C		30		pF
Detector	High Level Output Voltage	V _{OH}	V _{CC} = 5 V, I _o = -3.5 mA, I _F = 10 mA	2.4	3.5		V
			V _{CC} = 20 V, I _o = -3.5 mA, I _F = 10 mA	17.4	18.1		
	Low Level Output Voltage ²	V _{OL}	I _o = 3.5 mA, V _F = 0 V		0.1	0.35	V
	High Level Supply Current	I _{CCH}	V _{CC} = 5 V, I _F = 10 mA		1.6	2.7	mA
			V _{CC} = 20 V, I _F = 10 mA		1.8	3	
	Low Level Supply Current	I _{CCL}	V _{CC} = 5 V, V _F = 0 V		2.7	3.7	mA
			V _{CC} = 20 V, V _F = 0 V		2.9	4	
	High Level Output Short Circuit Current	I _{OSH}	V _{CC} = 20 V, V _o = GND, I _F = 10 mA	-7	-40		mA
Low Level Output Short Circuit Current	I _{OSL}	V _{CC} = V _o = 20 V, V _F = 0 V	7	40		mA	
Coupled	Threshold Input Current	I _{FLH}	V _{CC} = 5 V, V _o > 2.4 V, I _o = -3.5 mA		2.4	5	mA
	Isolation Resistance	R _{I-O}	V _{I-O} = 500 V _{DC} , RH = 60%, T _A = 25°C	10 ¹²			Ω
	Isolation Capacitance	C _{I-O}	V = 0 V, f = 1 MHz, T _A = 25°C		0.6		pF
	Propagation Delay Time (H → L)	t _{PHL}	V _{CC} = 20 V, C _L = 100 pF, I _F = 10 → 0 mA, V _{THHL} = 1.3 V	50	185	550	ns
	Propagation Delay Time (L → H)	t _{PLH}	V _{CC} = 20 V, C _L = 100 pF, I _F = 0 → 10 mA, V _{THLH} = 1.3 V	50	240	500	ns
	Pulse Width Distortion (PWD)	t _{PLH} -t _{PHL}	V _{CC} = 20 V, C _L = 100 pF, I _F = 10 ↔ 0 mA		55	350	ns
	Rise Time (10-90%)	t _r	V _{CC} = 20 V, C _L = 100 pF, I _F = 0 → 10 mA		120		ns
	Fall Time (90-10%)	t _f	V _{CC} = 20 V, C _L = 100 pF, I _F = 10 → 0 mA		90		ns
	Common Mode Transient Immunity at High Level Output	CM _H	V _{CC} = 5 V, T _A = 25°C, I _F = 10 mA, V _{CM} = 1.5 kV, V _{O(MIN)} = 2.4 V	15			kV/μs
	Common Mode Transient Immunity at Low Level Output	CM _L	V _{CC} = 5 V, T _A = 25°C, I _F = 0 mA, V _{CM} = 1.5 kV, V _{O(MAX)} = 0.35 V	15			kV/μs

*1 Typical values at T_A = 25°C

<R> *2 Because V_o of 2.4 V may be output when the LED current is not input and when output supply of V_{CC} = 4.5 V or less, it is important to confirm the characteristics (operation with the power supply on and off) during design, before using this device.

TEST CIRCUIT



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

NOTES ON HANDLING**Cautions regarding noise**

Be aware that when voltage is applied suddenly between the photocoupler's input and output or between collector-emitters at startup, the output transistor may enter the on state, even if the voltage is within the absolute maximum ratings.

SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

Parameter	Symbol	Spec.	Unit
Application classification (DIN EN 60664-1 VDE0110 Part 1) for rated line voltages ≤ 300 Vr.m.s. for rated line voltages ≤ 600 Vr.m.s.		IV III	
Climatic test class (DIN EN 60664-1 VDE0110)		40/100/21	
Dielectric strength maximum operating isolation voltage Test voltage (partial discharge test, procedure a for type test and random test) $U_{pr} = 1.5 \times U_{IORM}, P_d < 5 \text{ pC}$	U_{IORM} U_{pr}	1 130 1 695	V_{peak} V_{peak}
Test voltage (partial discharge test, procedure b for all devices) $U_{pr} = 1.875 \times U_{IORM}, P_d < 5 \text{ pC}$	U_{pr}	2 119	V_{peak}
Highest permissible overvoltage	U_{TR}	8 000	V_{peak}
Degree of pollution (DIN EN 60664-1 VDE0110 Part 1)		2	
Clearance distance	PS9303L	>7.0	mm
	PS9303L2	>8.0	
Creepage distance	PS9303L	>7.0	mm
	PS9303L2	>8.0	
Comparative tracking index (DIN IEC 112/VDE 0303 Part 1)	CTI	175	
Material group (DIN EN 60664-1 VDE0110 Part 1)		III a	
Storage temperature range	T_{stg}	-55 to +125	°C
Operating temperature range	T_A	-40 to +100	°C
Isolation resistance, minimum value $V_{IO} = 500 \text{ V dc at } T_A = 25^\circ\text{C}$ $V_{IO} = 500 \text{ V dc at } T_A \text{ MAX. at least } 100^\circ\text{C}$	Ris MIN.	10^{12}	Ω
	Ris MIN.	10^{11}	Ω
Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve)			
Package temperature	T_{si}	175	°C
Current (input current I_F , $\Psi_i = 0$)	I_{si}	400	mA
Power (output or total power dissipation)	Ψ_{si}	700	mW
Isolation resistance $V_{IO} = 500 \text{ V dc at } T_A = T_{si}$	Ris MIN.	10^9	Ω

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M8E 02.11-1

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