PRELIMINARY DATA SHEET

CEL

PHOTOCOUPLER

PS9551L4

HIGH CMR, DIGITAL OUTPUT TYPE OPTICAL COUPLED ISOLATION AMPLIFIER (SIGMA-DELTA MODULATOR)

–NEPOC Series–

DESCRIPTION

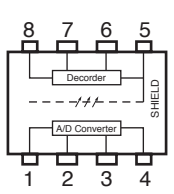
The PS9551L4 is an optical coupled isolation amplifier that uses an IC provided with a high-accuracy A/D conversion function (sigma-delta modulation method) and a GaAlAs light-emitting diode with high-speed response and high luminance efficiency on the input side. On the output side IC provided with an encoding function.

The PS9551L4 is designed specifically for high common mode transient immunity (CMR) and high linearity (non-linearity). The PS9551L4 is suitable for current sensing in motor drives.

FEATURES

- Non-linearity (INL = 30 LSB MAX.)
- High common mode transient immunity (CMR = 10 kV/μs MIN.)
- High isolation voltage (BV = 5 000 Vr.m.s.)
- Package: 8-pin DIP lead bending type (Gull-wing) for long creepage distance for surface mount (L4)
- Ordering number of tape product: PS9551L4-E3: 1 000 pcs/reel
- Pb-Free product
- Safety standards
  - UL approved: File No. E72422
  - CSA approved: No. CA 101391
  - BSI approved: No. 8937, 8938
  - SEMKO approved: No. 611507
  - NEMKO approved: No. P06207243
  - DEMKO approved: No. 313935
  - FIMKO approved: No. FI 22827
  - DIN EN60747-5-2 (VDE0884 Part2) approved (Option)

PIN CONNECTION
(Top View)



1. $V_{DD}1$
2. V_{IN+}
3. V_{IN-}
4. GND1
5. GND2
6. MDAT
7. MCLK
8. $V_{DD}2$

APPLICATIONS

- AC Servo, inverter
- Measurement equipment

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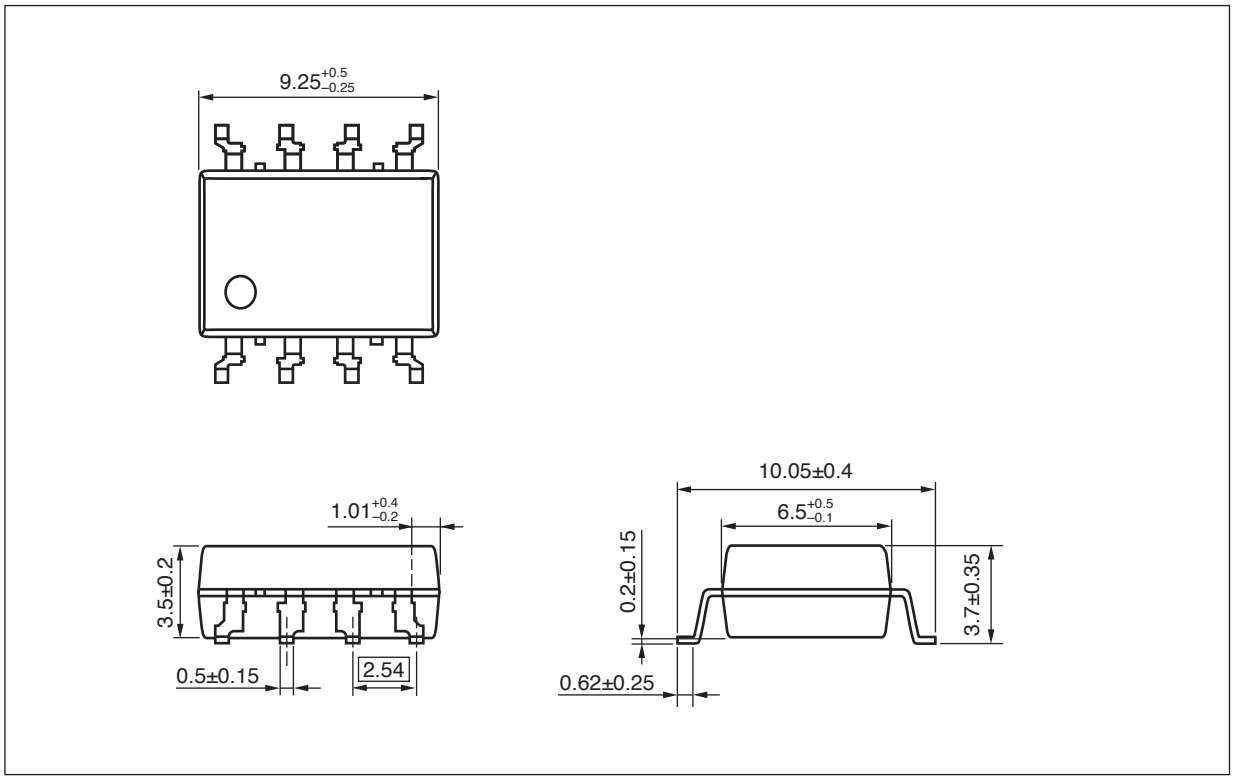
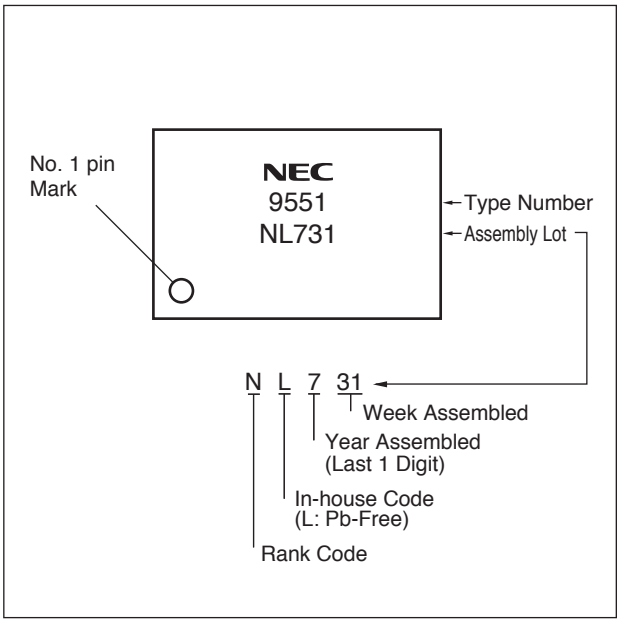
PACKAGE DIMENSIONS (UNIT: mm)

Lead Bending Type (Gull-wing) For Long Creepage Distance For Surface Mount (L4)



MARKING EXAMPLE



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

Parameter	Symbol	MIN.	MAX.	Unit
Operating Ambient Temperature	T_A	−40	85	°C
Storage Temperature	T_{stg}	−55	125	°C
Supply Voltage	$V_{DD}1$, $V_{DD}2$	0	5.5	V
Input Voltage	V_{IN+}, V_{IN-}	−2	$V_{DD}1$+0.5	V
2 Seconds Transient Input Voltage	V_{IN+}, V_{IN-}	−6	$V_{DD}1$+0.5	V
Output Voltage	MCLK, MDAT	−0.5	$V_{DD}2$+0.5	V

RECOMMENDED OPERATING CONDITIONS (T_A = 25°C, unless otherwise specified)

Parameter	Symbol	MIN.	MAX.	Unit
Operating Ambient Temperature	T_A	−40	85	°C
Supply Voltage	$V_{DD}1$, $V_{DD}2$	4.5	5.5	V
Input Voltage (Accurate and Linear)	V_{IN+}, V_{IN-}	−200	200	mV

ELECTRICAL CHARACTERISTICS (DC Characteristics)
(TYP.: T_A = 25°C, V_{IN+} = V_{IN-} = 0 V, $V_{DD}1$ = $V_{DD}2$ = 5 V,
MIN., MAX.: T_A = –40 to +85°C, V_{IN+} = V_{IN-} = –200 to 200 mV, $V_{DD}1$ = $V_{DD}2$ = 4.5 to 5.5 V, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input Supply Current	$I_{DD}1$	V_{IN+} = 350 mV		14.5	18	mA
Output Supply Current	$I_{DD}2$	V_{IN+} = –350 mV		10	15	
Input Bias Current	I_{IN+}			–0.8		μA
Low Level Output Voltage	V_{OL}	I_{OUT} = 1.6 mA		0.1	0.6	V
High Level Output Voltage	V_{OH}	I_{OUT} = –100 μA	3.9	4.9		V
Output Short-circuit Current	$\lvert I_{OSC} \rvert$	V_{OUT} = $V_{DD}2$ or V_{OUT} = GND2		30		mA
Equivalent Input Resistance	R_{IN}			300		kΩ
Output Clock Frequency	f_{CLK}		8.2	10	13.2	MHz
Data Hold Time*1	t_{HDDAT}		15			ns
Input DC Common-Mode Rejection Ratio*2	$CMRR_{IN}$			60		dB

***1** The data hold time is that MDAT will stay stable following the rising edge of MCLK.

***2** $CMRR_{IN}$ is defined as the ratio of the differential signal gain (apply the differential signal between V_{IN+} and V_{IN-}) to the isolation-mode gain (connect both input pins to GND1 and apply the signal between (PS9551L4's) input and output) at 60 Hz. This value is indicated in dB.

ELECTRICAL CHARACTERISTICS (Tested with filter IC (specified by NEC Electronics))
(TYP.: T_A = 25°C, V_{IN+} = V_{IN-} = 0 V, $V_{DD}1$ = $V_{DD}2$ = 5 V,
MIN., MAX.: T_A = –40 to +85°C, V_{IN+} = V_{IN-} = –200 to 200 mV, $V_{DD}1$ = $V_{DD}2$ = 4.5 to 5.5 V, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Integral Non-linearity *1	INL	–200 mV ≤ V_{IN+} ≤ 200 mV		12	30	LSB
				0.04	0.14	%
Input Offset Voltage	V_{OS}	V_{IN+} = 0 V	–3	0	3	mV
Input Offset Voltage Drift vs. Temperature	$\lvert dV_{OS}/dT_A \rvert$	V_{IN+} = 0 V, T_A = −40 to +85°C		2	10	μV/°C
Input Offset Voltage Drift vs. $V_{DD}1$	$\lvert dV_{OS}/dV_{DD}1 \rvert$	V_{IN+} = 0 V		0.12		mV/V
Internal Reference Voltage	$\lvert V_{REF} \rvert$			320		mV
Absolute Internal Reference Voltage Tolerance	–		–4		4	%
Internal Reference Voltage Drift vs. Temperature	$\lvert dV_{REF}/dT_A \rvert$	T_A = −40 to +85°C		60		ppm/°C
Common Mode Transient Immunity *2	CMR	V_{CM} = 1 kV, T_A = 25°C	10	15		kV/μs

***1** Integral Non-linearity: Half of peak-to-peak output voltage deviation from best fit gain line.

***2** CMR is tested by applying steep rise/fall time (50 ns) voltage step between PS9551L4's input and output.

PACKAGE CHARACTERISTICS

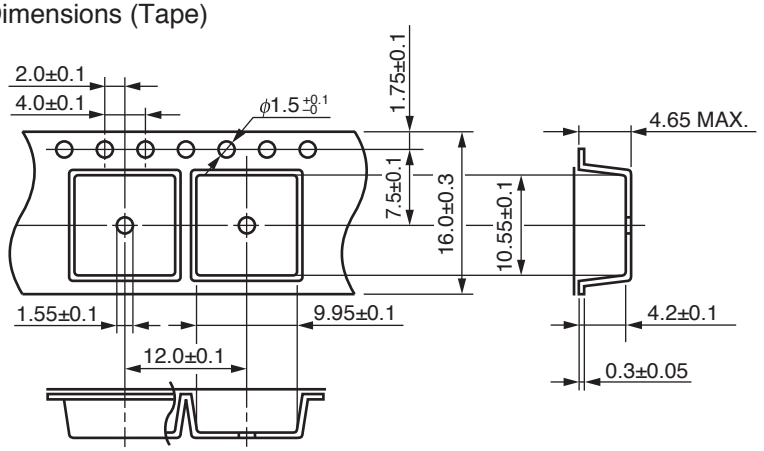
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Isolation Voltage	BV	RH = 60%, t = 1 min., T_A = 25°C	5 000			Vr.m.s.
Isolation Resistance	R_{I-O}	V_{I-O} = 500 V_{DC}		$> 10^9$		Ω
Isolation Capacitance	C_{I-O}	f = 1 MHz		1.2		pF

USAGE CAUTIONS

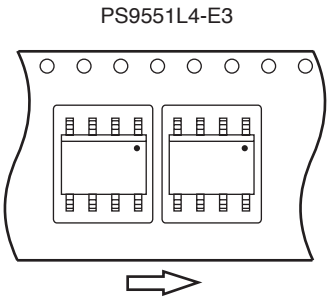
1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. Board designing
   (1) By-pass capacitor of more than 0.1 μF is used between V_{DD} and GND near device. Also, ensure that the distance between the leads of the photocoupler and capacitor is no more than 10 mm.
   (2) Make sure the distance between input terminal (V_{IN+} and V_{IN-}) of PS9551L4 and the devices (or components) to be connected is as close as possible.
   (3) Make sure the distance between output terminal (V_{OUT+} and V_{OUT-}) of PS9551L4 and the devices (or components) to be connected is as close as possible.
3. Avoid storage at a high temperature and high humidity.

TAPING SPECIFICATIONS (UNIT: mm)

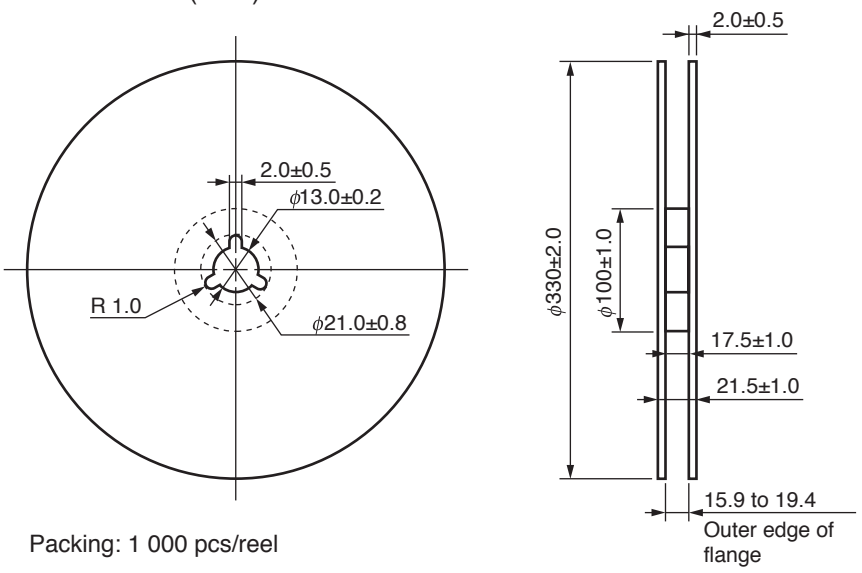
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



Packing: 1 000 pcs/reel

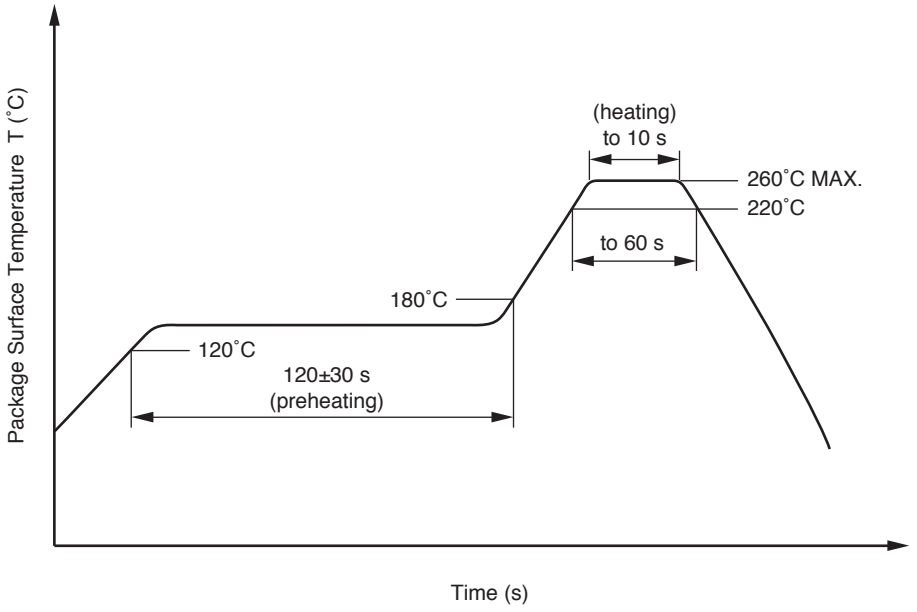
NOTES ON HANDLING

1. Recommended soldering conditions

(1) Infrared reflow soldering

• Peak reflow temperature	260°C or below (package surface temperature)
• Time of peak reflow temperature	10 seconds or less
• Time of temperature higher than 220°C	60 seconds or less
• Time to preheat temperature from 120 to 180°C	120±30 s
• 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) Wave soldering

• Temperature	260°C or below (molten solder temperature)
• Time	10 seconds or less
• Preheating conditions	120°C or below (package surface temperature)
• 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) Soldering by soldering iron

• Peak temperature (lead part temperature)	350°C or below
• Time (each pins)	3 seconds or less
• Flux	Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

(a) Soldering of leads should be made at the point 1.5 to 2.0 mm from the root of the lead.

(b) Please be sure that the temperature of the package would not be heated over 100°C.

(4) Cautions

• Fluxes

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

2. Cautions regarding noise

Be aware that a malfunction may occur if voltage is applied suddenly between the photocoupler's input and output, even if the voltage is within the absolute maximum ratings.

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M8E 02. 11-1

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