PRELIMINARY DATA SHEET

CEL

PHOTOCOUPLER

PS8551L4

HIGH CMR, ANALOG OUTPUT TYPE OPTICAL COUPLED ISOLATION AMPLIFIER –NEPOC Series–

DESCRIPTION

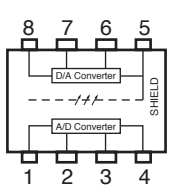
The PS8551L4 is an optical coupled isolation amplifier that uses an IC provided with a high-accuracy A/D conversion function (sigma-delta modulation method) and a GaAlAs light-emitting diode with high-speed response and high luminance efficiency on the input side. On the output side IC provided with a high-accuracy D/A conversion function.

The PS8551L4 is designed specifically for high common mode transient immunity (CMR) and high linearity (non-linearity). The PS8551L4 is suitable for current sensing in motor drives.

FEATURES

- Non-linearity (NL200 = 0.35% MAX.)
- High common mode transient immunity (CMR = 10 kV/μs MIN.)
- High isolation voltage (BV = 5 000 Vr.m.s.)
- Gain tolerance (ΔG = ±3%)
  Gain: 8 V/V
- Package: 8-pin DIP lead bending type (Gull-wing) for long creepage distance
  for surface mount (L4)
- Ordering number of tape product : PS8551L4-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. V_{OUT-}
7. V_{OUT+}
8. $V_{DD}2$

APPLICATIONS

- AC Servo, inverter
- Measurement equipment

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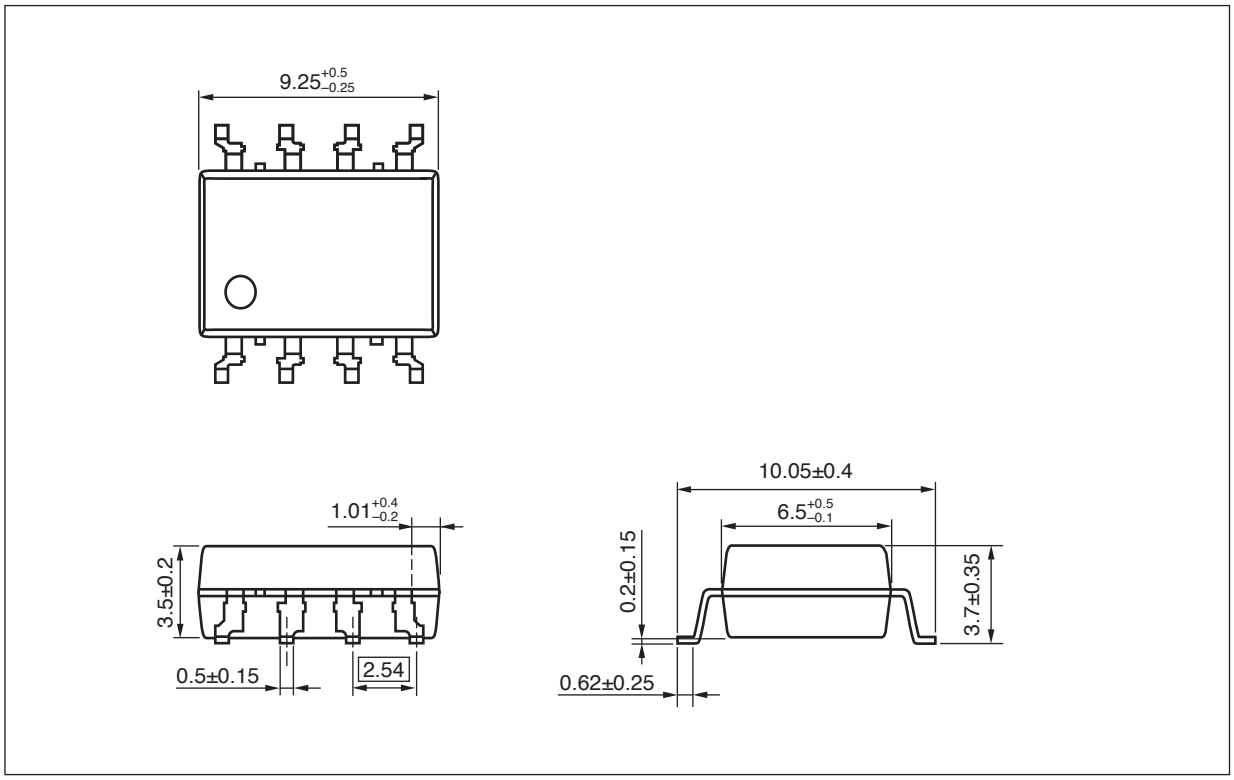
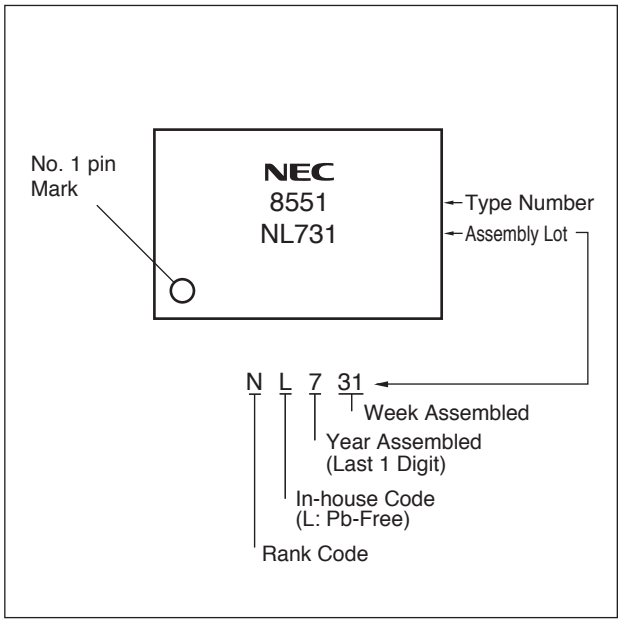
Date Published September 2007 NS

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	100	°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	V_{OUT+}, V_{OUT-}	−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 Offset Voltage	V_{os}	T_A = 25°C	–2	0.3	2	mV
			–3		3	
Input Offset Voltage Drift vs. Temperature	$\lvert dV_{os}/dT_A \rvert$	T_A = –40 to +85°C		3	10	μV/°C
Gain	G	–200 mV ≤ V_{IN+} ≤ 200 mV	7.76	8	8.24	V/V
V_{OUT} Gain Drift vs. Temperature	$\lvert dG/dT_A \rvert$	T_A = –40 to +85°C		0.00084		V/V°C
V_{OUT} Non-linearity (200 mV) *1	NL200	–200 mV ≤ V_{IN+} ≤ 200 mV		0.038	0.35	%
V_{OUT} Non-linearity (200 mV) Drift vs. Temperature	$\lvert dNL200/dT_A \rvert$	T_A = –40 to +85°C		0.0002		%/°C
V_{OUT} Non-linearity (100 mV) *1	NL100	–100 mV ≤ V_{IN+} ≤ 100 mV		0.026	0.2	%
Maximum Input Voltage before V_{OUT} Clipping	$\lvert V_{IN+} \rvert$ MAX.			308		mV
Input Supply Current	$I_{DD}1$	V_{IN+} = 400 mV		14.5	18	mA
Output Supply Current	$I_{DD}2$	V_{IN+} = –400 mV		10	16	mA
Input Bias Current	I_{IN+}	V_{IN+} = 0V		–0.5	5	μA
Input Bias Current Drift vs. Temperature	$\lvert dI_{IN+}/dT_A \rvert$	T_A = –40 to +85°C		0.45		nA/°C
Low Level Saturated Output Voltage	V_{OL}	V_{IN+} = –400 mV		1.29		V
High Level Saturated Output Voltage	V_{OH}	V_{IN+} = 400 mV		3.8		V
Output Voltage (V_{IN+} = V_{IN-} = 0 V)	V_{OCM}	V_{IN+} = V_{IN-} = 0 V	2.2	2.55	2.8	V
Output Short-circuit Current	$\lvert I_{OSC} \rvert$			18.6		mA
Equivalent Input Resistance	R_{IN}			300		kΩ
V_{OUT} Output Resistance	R_{OUT}			15		Ω
Input DC Common-Mode Rejection Ratio *2	$CMRR_{IN}$			46		dB

***1** Non-linearity : [Half of peak-to-peak output voltage deviation from best fit gain line] ÷ [Full-scale differential output voltage] (%).

***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 PS8551L4's input and output) at 60 Hz. This value is indicated in dB.

ELECTRICAL CHARACTERISTICS (AC 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
V_{OUT} Bandwidth (–3 dB)	f_C	V_{IN+} = 200 mV_{p-p}, sine wave	50	100		kHz
V_{OUT} Noise	N_{OUT}	V_{IN+} = 0 V		31.5		mVr.m.s.
V_{IN} to V_{OUT} Signal Delay (50 to 10%)	t_{PD10}	V_{IN+} = 0 to 150 mV step		2.03	3.3	μs
V_{IN} to V_{OUT} Signal Delay (50 to 50%)	t_{PD50}			3.47	5.6	
V_{IN} to V_{OUT} Signal Delay (50 to 90%)	t_{PD90}			4.99	9.9	
V_{OUT} Rise Time/Fall Time (10 to 90%)	t_r/t_f	V_{IN+} = 0 to 150 mV step		2.96	6.6	μs
Common Mode Transient Immunity*1	CMR	V_{CM} = 1 kV, T_A = 25°C	10	15		kV/μs
Power Supply Noise Rejection*2	PSR	f = 1 MHz		170		mVr.m.s.

***1** CMR is tested by applying steep rise/fall time (50 ns) voltage step between PS8551L4's input and output. The voltage step is amplified until the differential output voltage (V_{OUT+} – V_{OUT-}) reaches more than 200 mV (> 1 μs) deviation from the average output voltage.

***2** This is the value of the transient voltage at the differential output when 1 V_{p-p}, 1 MHz, and 40 ns rise/fall time square wave is applied to both $V_{DD}1$ and $V_{DD}2$.

PACKAGE CHARACTERISTICS

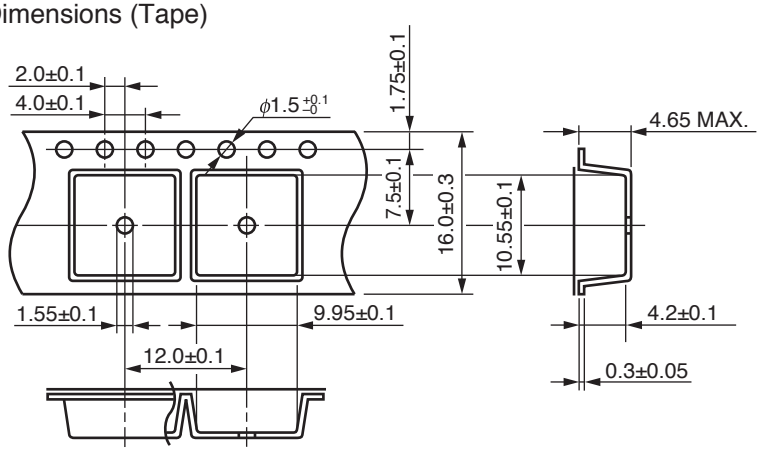
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Isolation Voltage	BV	RH = 60%, t = 1 min., T_A = 25°C	5 000			Vr.m.s.
Isolation Resistance	R_{I-O}	V_{I-O} = 500 V_{DC}		> 10^9		Ω
Isolation Capacitance	C_{I-O}	f = 1 MHz		1.2		pF

USAGE CAUTIONS

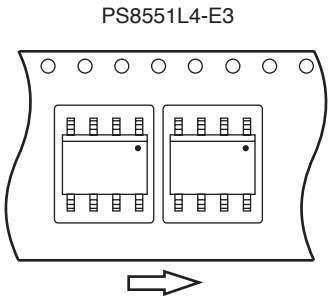
1. This product is weak for static electricity by designed with high-speed integrated circuit so protect against static electricity when handling.
2. Board designing
   (1) By-pass capacitor of more than 0.1 μF is used between V_{DD} and GND near device. Also, ensure that the distance between the leads 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 PS8551L4 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 PS8551L4 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)

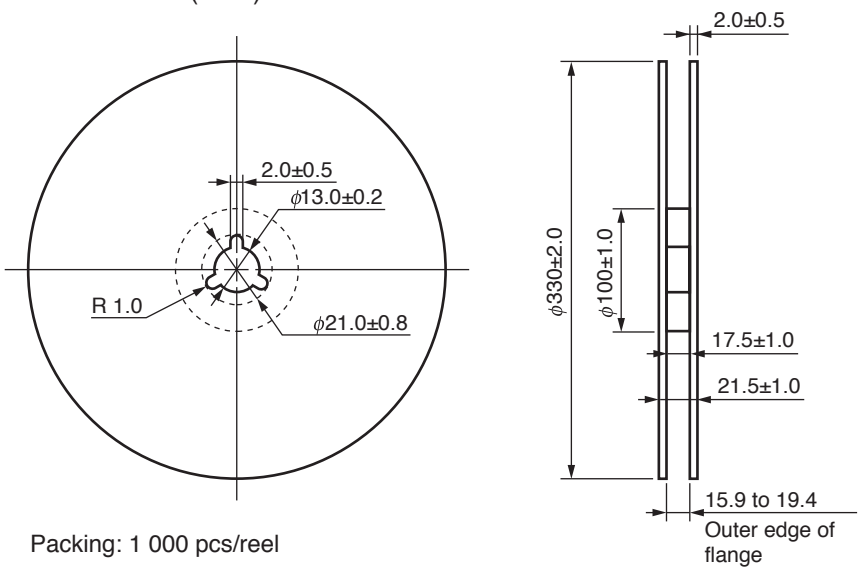
Outline and Dimensions (Tape)



Tape Direction



Outline and Dimensions (Reel)



Packing: 1 000 pcs/reel

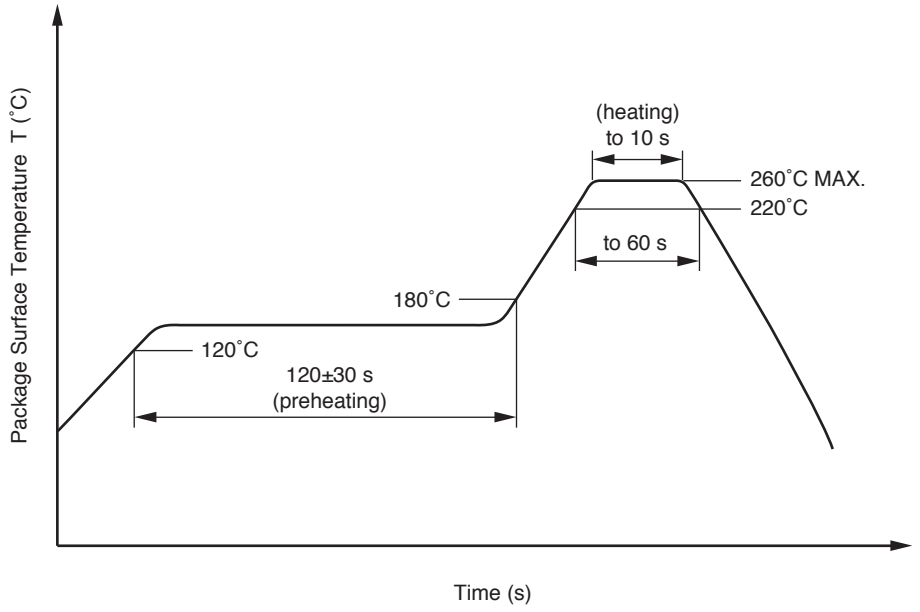
NOTES ON HANDLING

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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