

## Opt-Pass Sensor

### ■ GENERAL DESCRIPTION

The NJL9101R is the high-precision optical position sensor, which is combine with a super luminosity RED LED and Si light-sensitive element into small package. Three sine waves with high precision phase difference will output by using the dedicated striped mirror (NJL9600 series). By arithmetic processing of the sensor output signal, the position detection with high precision and high resolution can be performed.

The characteristics by optical scheme are not affected from the magnetic field of magnet that built into the motor etc

The Opt-Pass (NJL9101R,NJL9600 series) sensor has been designed strongly against the distance variation between the sensor and the special striped mirror. Also the Opt-pass has been designed against the tilt variation.

### ■ FEATURES

- Output voltage : 90mVp-p typ. (0°, 90°, 180°) @IF=5mA, VCE=3.3V,RL=2KΩ,d=0.7mm,NJL9601MD
- Miniature, thin package : 2.3mm × 2.0mm × 0.6mm
- Low operating dark current : 0.5μA max.
- Pb free solder re-flowing permitted : 255°C, 2times
- Built-in function of visible light cut-off filter

### ■ APPLICATIONS

- Detecting the location of AF Lens unit for DSC,DVC
- Detecting the location of Zoom Lens unit for DSC,DVC
- Positioning for high precision

### ■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
<b>Emitter</b>			
Forward Current (Continuous)	IF	15	mA
Reverse Voltage (Continuous)	VR	6	V
Power Dissipation	PD	45	mW
<b>Detector</b>			
Collector-Emitter Voltage	VCEO	16	V
Emitter-Collector Voltage	VECO	6	V
Collector Current	IC	10	mA
Collector Power Dissipation	PC	25	mW
<b>Coupled</b>			
Total Power Dissipation	Ptot	60	mW
Operating Temperature	Topr	-30 to +70	°C
Storage Temperature	Tstg	-30 to +85	°C
Reflow Soldering Temperature	Tsol	255	°C

### ■ RECOMMENDED OPERATING CONDITION

PARAMETER	SYMBOL	RATINGS	UNIT
Forward Current	IF	5	mA
Collector-Emitter Voltage	VCEO	+2.0 to +3.3	V
Power Dissipation	Gap	0.7	mm

NOTICE: This product is under development. The content of data sheet is subject to change prior notice.

## ELECTRO-OPTICAL CHARACTERISTICS (Ta=25°C)

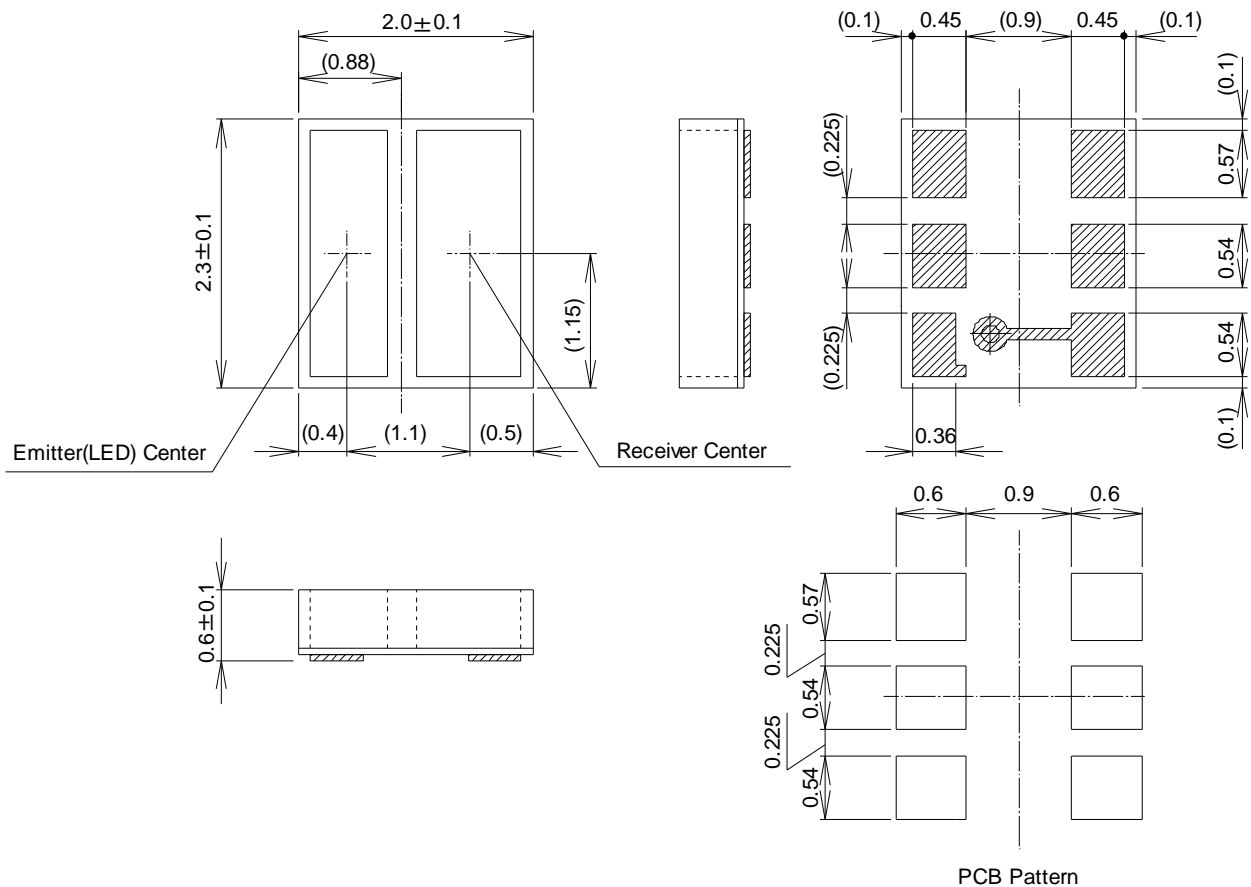
PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
<b>Emitter</b>						
Forward Voltage	V <sub>F</sub>	I <sub>F</sub> =5mA	1.1	1.4	1.7	V
Reverse Current	I <sub>R</sub>	V <sub>R</sub> =6V	—	—	1	μA
<b>Detector</b>						
Dark Current	I <sub>CEO</sub>	V <sub>CE</sub> =5V	—	—	0.5	μA
Collector-Emitter Voltage	V <sub>CEO</sub>	I <sub>C</sub> =100μA	16	—	—	V
<b>Coupled</b>						
Output Current 1 *1	I <sub>O1</sub>	I <sub>F</sub> =5mA, V <sub>CE</sub> =3.3V, d=0.7mm(Al Mirror)*1	TBD	(400)	TBD	μA
Output Current 2 *1	I <sub>O2</sub>	I <sub>F</sub> =5mA, V <sub>CE</sub> =3.3V, d=0.7mm(Al Mirror)*1	TBD	(400)	TBD	μA
Output Current 3 *1	I <sub>O3</sub>	I <sub>F</sub> =5mA, V <sub>CE</sub> =3.3V, d=0.7mm(Al Mirror)*1	TBD	(400)	TBD	μA
Operating Dark Current 1	I <sub>CEOD1</sub>	I <sub>F</sub> =5mA, V <sub>CE</sub> =3.3V	—	—	(0.5)	μA
Operating Dark Current 2	I <sub>CEOD2</sub>	I <sub>F</sub> =5mA, V <sub>CE</sub> =3.3V	—	—	(0.5)	μA
Operating Dark Current 3	I <sub>CEOD3</sub>	I <sub>F</sub> =5mA, V <sub>CE</sub> =3.3V	—	—	(0.5)	μA
Output Voltage 1 *2	V <sub>O1</sub>	I <sub>F</sub> =5mA, V <sub>CE</sub> =3.3V, R <sub>L</sub> =2KΩ, d=0.7mm*2	—	90	—	mVp-p
Output Voltage 2 *2	V <sub>O2</sub>	I <sub>F</sub> =5mA, V <sub>CE</sub> =3.3V, R <sub>L</sub> =2KΩ, d=0.7mm*2	—	90	—	mVp-p
Output Voltage 3 *2	V <sub>O3</sub>	I <sub>F</sub> =5mA, V <sub>CE</sub> =3.3V, R <sub>L</sub> =2KΩ, d=0.7mm*2	—	90	—	mVp-p
Phase Difference2	Vo2p	Phase Difference to Output Voltage1	—	90	—	deg
Phase Difference3	Vo3p	Phase Difference to Output Voltage2	—	180	—	deg
Cut -off Frequency	f <sub>c</sub>	V <sub>CE</sub> =3.3V, R <sub>L</sub> =2KΩ, -3dB	—	20	—	kHz

\*1 Output Current is the value obtained that is used the reflective board of Aluminum Evaporation

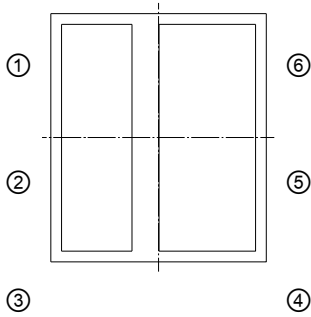
\*2 Output Voltage is the value obtained that is used the dedicated striped mirror (NJL9601MD).

## OUTLINE (typ.)

Unit : mm

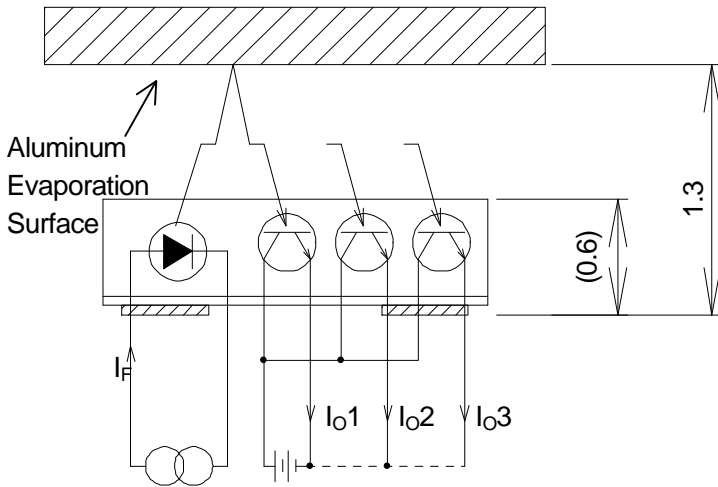


■ PIN LAYOUT

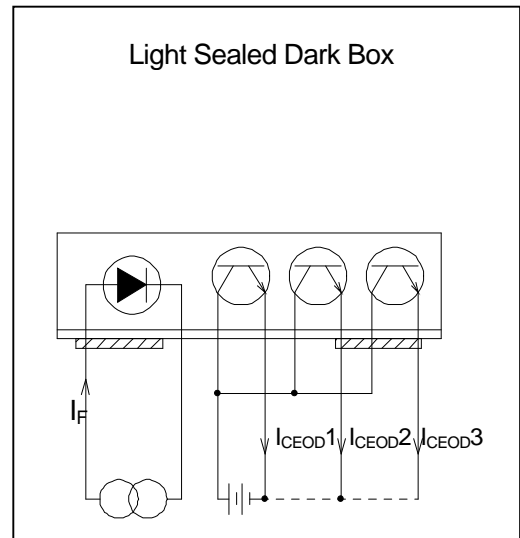


- ① Cathode (LED)
- ② Anode (LED)
- ③ Emitter1 (Out1)
- ④ Emitter2 (Out2)
- ⑤ Collector (Common Out1,2,3)
- ⑥ Emitter3 (Out3)

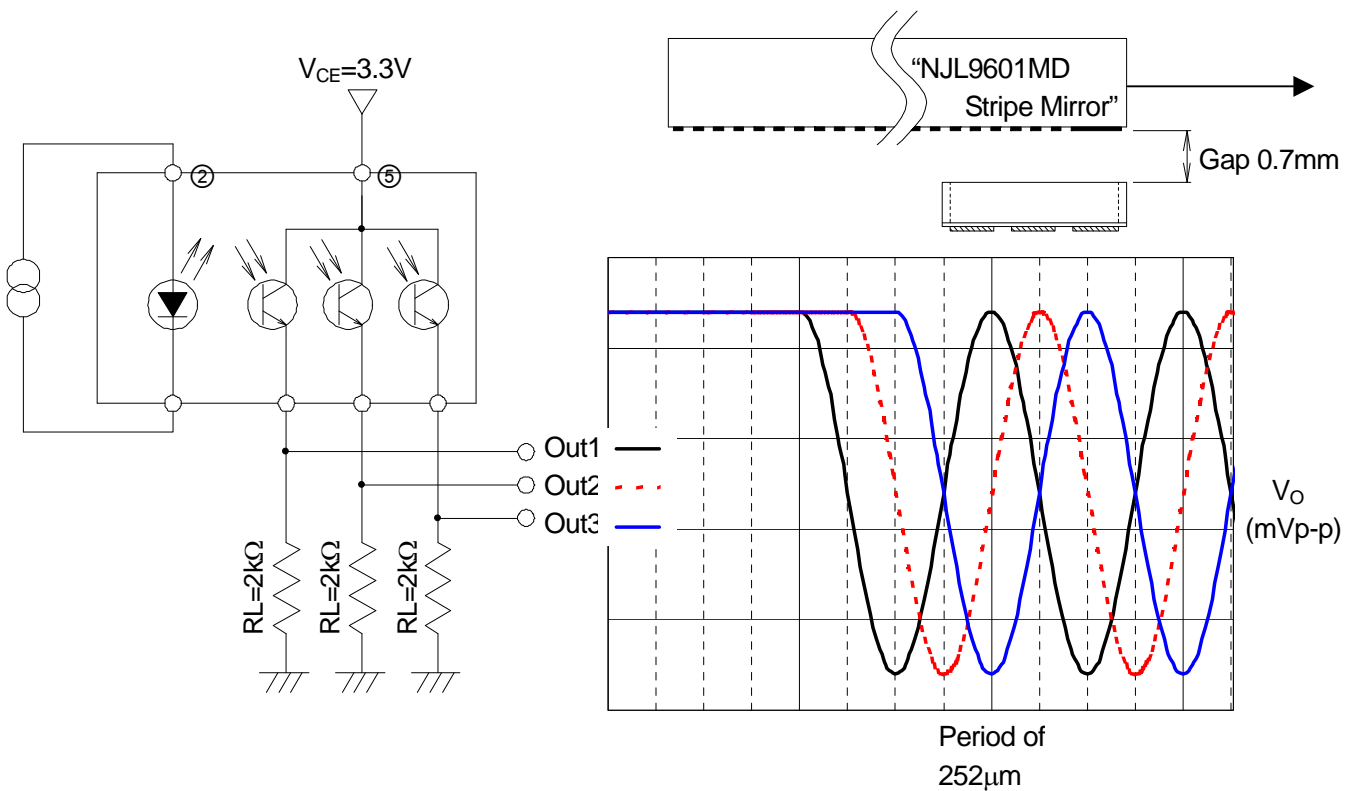
■ OUTPUT CURRENT TEST CONDITION



■ DARK CURRENT TEST CONDITION

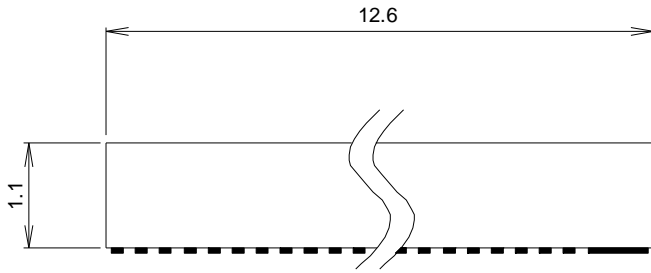


■ OUTPUT VOLTAGE TEST CONDITION

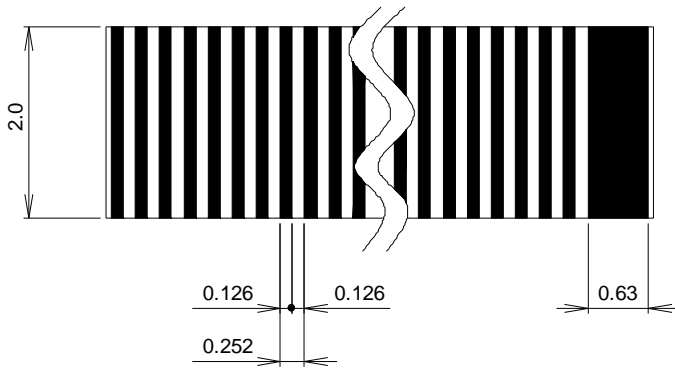


## ■ NJL9101R STRIPED MIRROR OUTLINE (typ.)

Unit : mm



- Outline Tolerance ±0.05mm
- Dimension for Pattern of  
Original position detection 0.63mm±0.002mm
- Dimension for Reflective Pattern 0.126mm±0.002mm
- Dimension for Non-Reflective Pattern 0.126mm±0.002mm
- Pattern Pitch 0.252mm
- Recommend detection distance 10mm



## ■ MOUNTING METHOD

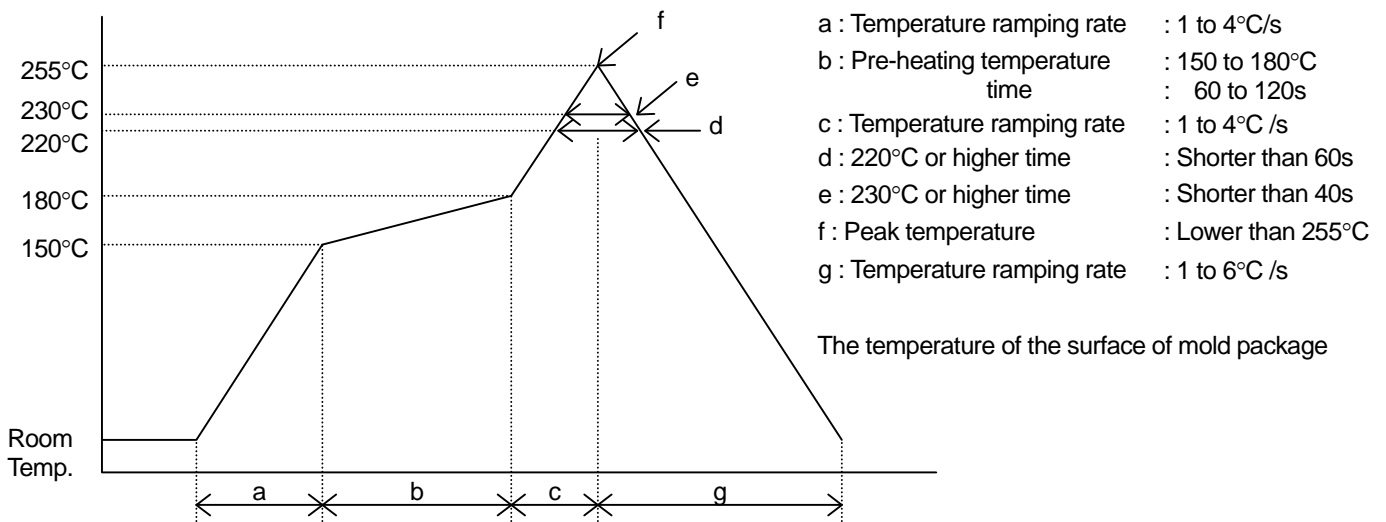
### NOTE

Mounting was evaluated with the following profiles in our company, so there was no problem.  
However, confirm mounting by the condition of your company beforehand.

Mounting: Twice soldering is allowed.

## ■ INFRARED REFLOW SOLDERING METHOD

Recommended reflow soldering procedure



(NOTE1) Using reflow furnace with short wave infrared radiation heater such as halogen lamp

Regarding temperature profile, please refer to those for reflow furnace.

In this case the resin surface temperature may become higher than lead terminals due to endothermic ally of black colored mold resin. Therefore, please avoid from direct exposure to mold resin.

(NOTE2) Other method

Such other methods of soldering as dipping the device into melted solder and vapor phase method (VPS) are not appropriate because the body of device will be heated rapidly. Therefore, these are not recommended to apply.

(NOTE3) The resin gets softened right after soldering, so, the following care has to be taken

Not to contact the lens surface to anything.

Not to dip the device into water or any solvents.

## ■ FLOE SOLDERING METHOD

Flow soldering is not possible.

## ■ IRON SOLDERING METHOD

Iron soldering is not possible.

## ■ CLEANING

Avoid washing the device after soldering by reflow method.

## ■ IC STORAGE CONDITIONS AND ITS DURATION

(1) Temperature and humidity ranges

Pack Sealing	Temperature:	5 to 40 [°C]
	Humidity:	40 to 80 [%]
Pack Opening	Temperature:	5 to 30 [°C]
	Humidity:	40 to 70 [%]

After opening the bag, solder products within 48h.

Avoid a dry environment below 40% because the products are easily damageable by the electrical discharge.

Store the products in the place where it does not create dew with the products due to a sudden change in temperature.

(2) When baking, place the reel vertically to avoid load to the side.

(3) Do not store the devices in corrosive-gas atmosphere.

(4) Do not store the devices in a dusty place.

(5) Do not expose the devices to direct rays of the sun.

(6) Do not allow external forces or loads to be applied to IC's.

(7) BE careful because affixed label on the reel might be peeled off when baking.

## ■ BAKING

In case of keeping expect above condition be sure to apply baking. (Heat-resistant tape)

Baking method: Ta=60°C, 48 to 72h, Three times baking is allowed

Ta=100°C, 2 to 6h, Three times baking is allowed

## ■ STORAGE DURATION

Within a year after delivering this device.

For the products stored longer than a year, confirm their terminals and solderability before they are used.

## ■ APPLICATION NOTES

(1) Attention in handling

Treat not to touch the lens surface.

Avoid dust and any other foreign materials on the lens surface such as point, bonding material, etc.

Never to apply reverse voltage (VEC) of more than 6V on the photo transistor when measuring the characteristics or adjusting the system. If applied, it causes to lower the sensitivity.

When mounting, special care has to be taken on the mounting position and tilting of the device because it is very important to place the device to the optimum position to the object.

### [CAUTION]

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