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# LA0151CS

Monolithic Linear IC

## Ambient Light Sensor, Linear Current Output, with 2-Stage Gain Switching, Ultra-small Package

### Overview

The LA0151CS is a photo IC for ultra-small ambient light sensor. It enables to be mounted on a very small limited space such as on the mobile phones which is becoming small and thinner and on other mobile applications.

### Functions

- Linear current output
- Low gain mode function [low gain : -35dB]

### Specifications

#### Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC}$		6	V
Operating temperature	$T_{opr}$		-30 to +85	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-40 to +100	$^\circ\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

#### Recommended operating conditions and operating voltage range at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Recommended supply voltage	$V_{CC}$		2.2	3.3	5.5	V
SW pin low voltage	$V_l$	Normal gain mode	0		0.4	V
SW pin high voltage	$V_h$	Low gain mode	2.1			V

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## Electrical and optical characteristics at $T_a = 25^\circ\text{C}$ , $V_{CC} = 3.3\text{V}$

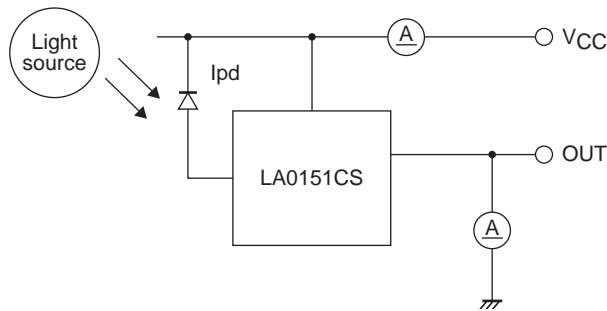
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current dissipation (1) *1, *3	$I_{CC}$	$E_v = 1000 \text{ lx}$ , $R_L = 5\text{k}\Omega$ , N mode	90	150	210	$\mu\text{A}$
Current dissipation (2) *1, *3	$I_{CC}$	$E_v = 1000 \text{ lx}$ , $R_L = 5\text{k}\Omega$ , L mode	42	70	98	$\mu\text{A}$
Output current (1) *1, *3	$I_{O1}$	$E_v = 100 \text{ lx}$ , N mode	6	8	10	$\mu\text{A}$
Output current (2) *1, *3	$I_{O2}$	$E_v = 1000 \text{ lx}$ , N mode	60	80	100	$\mu\text{A}$
Output current (3) *1, *3	$I_{O3}$	$E_v = 100 \text{ lx}$ , L mode	0.12	0.16	0.2	$\mu\text{A}$
Output current (4) *1, *3	$I_{O4}$	$E_v = 1000 \text{ lx}$ , L mode	1.2	1.6	2.0	$\mu\text{A}$
Dark current	$I_{leak}$	$E_v = 0 \text{ lx}$ , N mode, L mode			0.1	$\mu\text{A}$
Temperature coefficient *2	$I_{tc}$	$E_v = 100 \text{ lx}$ , N mode, L mode, $T_a = -20 \text{ to } 60^\circ\text{C}$		0.34		$\% / ^\circ\text{C}$
Rise time (1) *4	$T_{r1}$	$E_v = 1000 \text{ lx}$ , $R_L = 5\text{k}\Omega$ , N mode		15	40	$\mu\text{s}$
Rise time (2) *4	$T_{r2}$	$E_v = 1000 \text{ lx}$ , $R_L = 500\text{k}\Omega$ , L mode		20	50	$\mu\text{s}$
Fall time (1) *4	$T_{f1}$	$E_v = 1000 \text{ lx}$ , $R_L = 5\text{k}\Omega$ , N mode		150	500	$\mu\text{s}$
Fall time (2) *4	$T_{f2}$	$E_v = 1000 \text{ lx}$ , $R_L = 500\text{k}\Omega$ , L mode		150	500	$\mu\text{s}$
Peak sensitivity wave length *2	$\lambda_p$			550		nm
Saturation output voltage *5	$V_O$	$E_v = 1000 \text{ lx}$ , $R_L = 150\text{k}\Omega$ , N mode	3.0	3.2		V

N mode and L mode stand for the normal gain mode and the low gain mode, respectively.

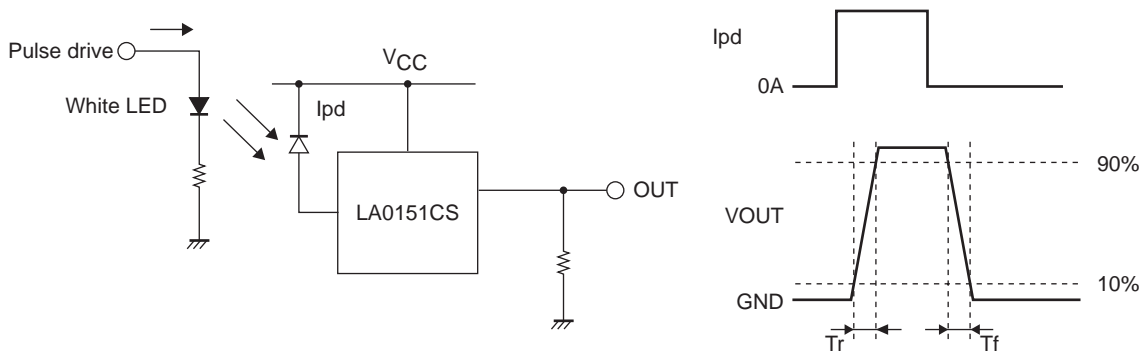
\*1. Measured with the standard light source A. White LED is used instead in the mass production line.

\*2. Design guaranteed item

\*3. Test circuit for measuring current dissipation and output current



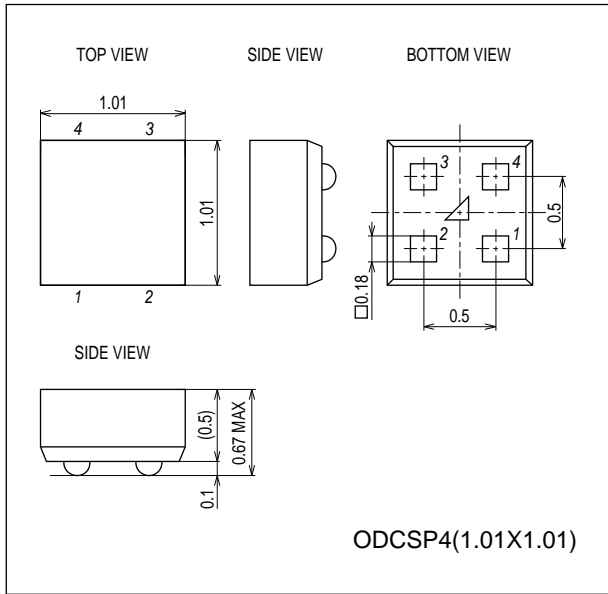
\*4. Measuring method of rise time ( $T_r$ ) and fall time ( $T_f$ )



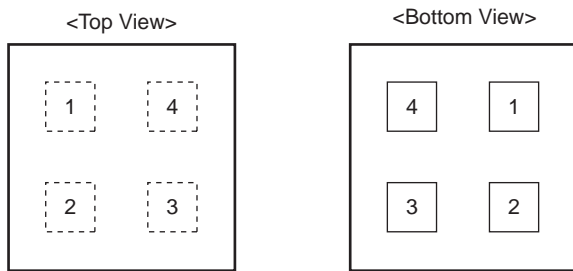
\*5. Reference value : min = 2.6V and typ = 2.8V when  $V_{CC} = 2.9\text{V}$

**Package Dimensions**

unit : mm (typ)  
3350A



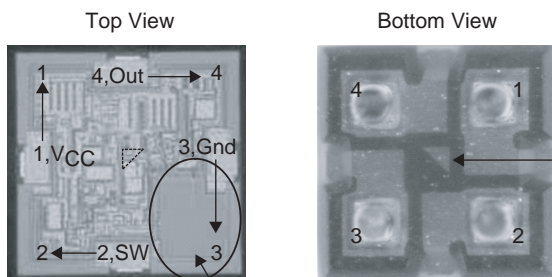
**Pad layout**



Pin No.	Pin Name	Function
1	VCC	Power supply
2	SW	Switch
3	GND	Ground
4	OUT	Output

Ball pitch : 0.5mm, Ball size : 0.18mm<sup>□</sup>

**Pad layout (Photos)**



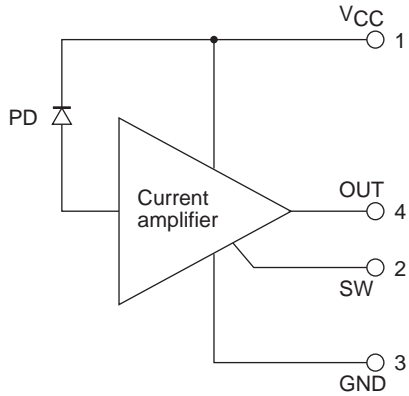
Pin 1 mark  
It is located at the center of the bottom of the package.

Photo diode. Only this part looks dark on the product.

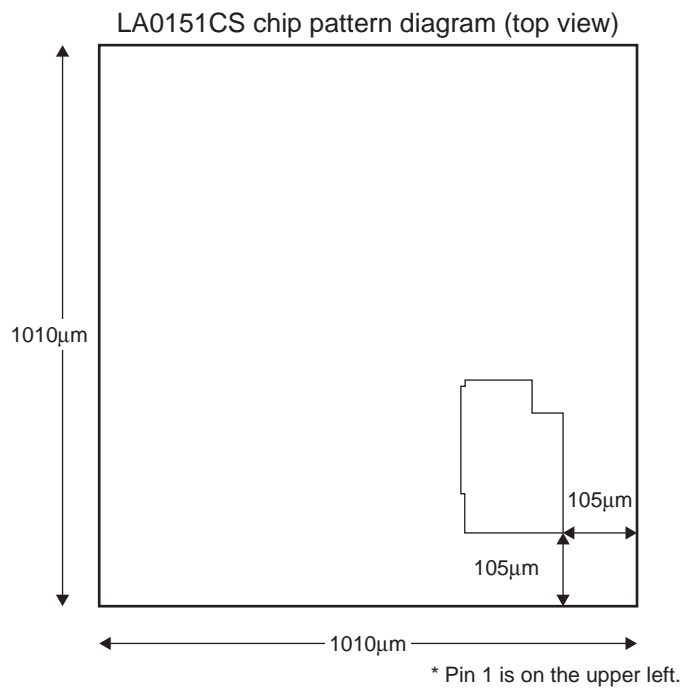
\* The photo diode is located in pin 3. Be careful not to mistake the pin 1 mark for the photo diode.

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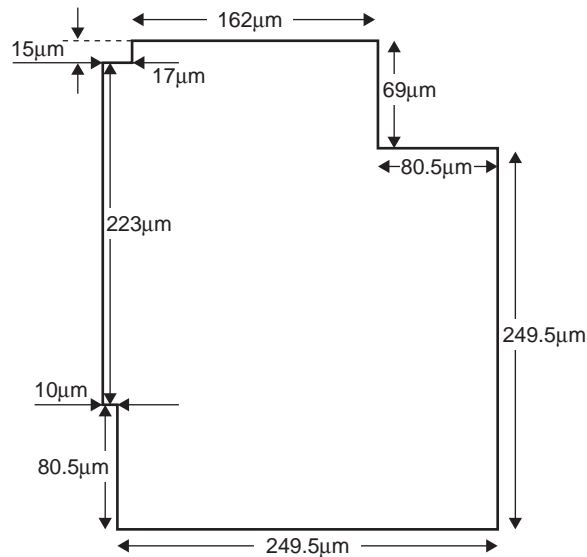
## Internal block diagram



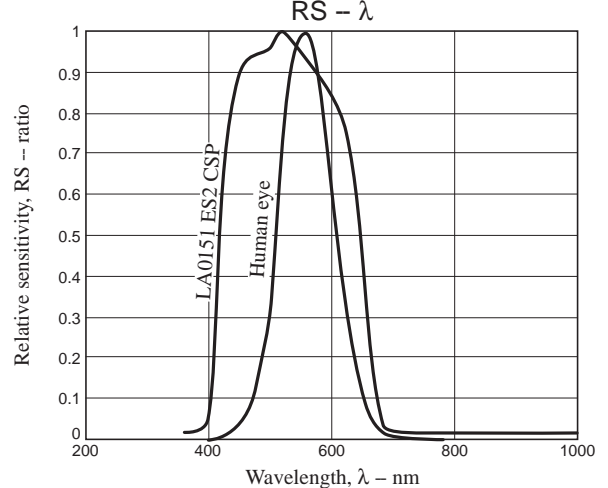
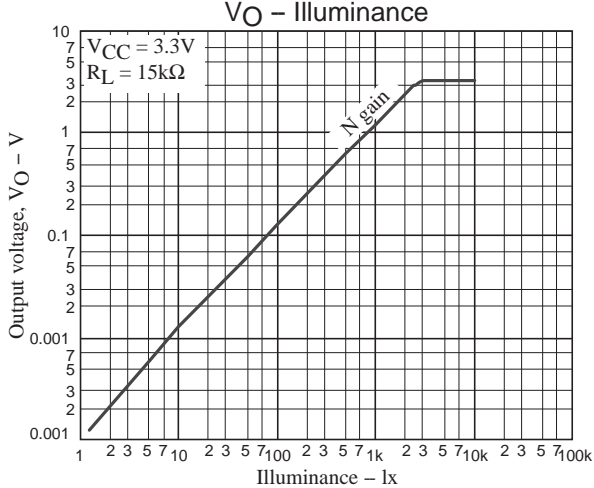
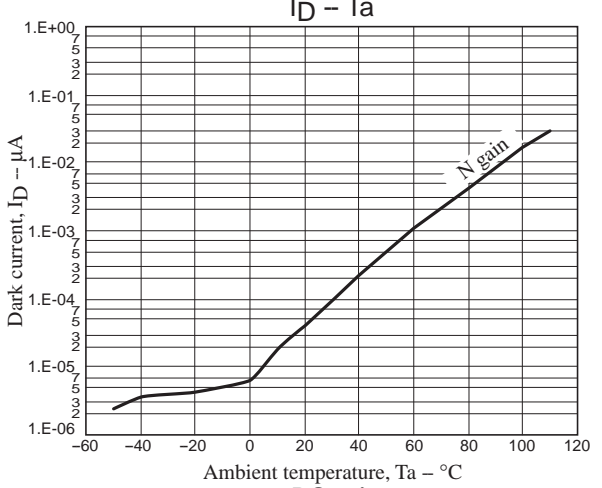
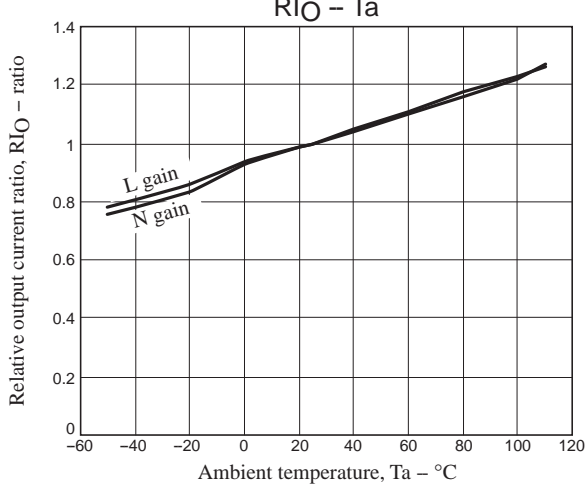
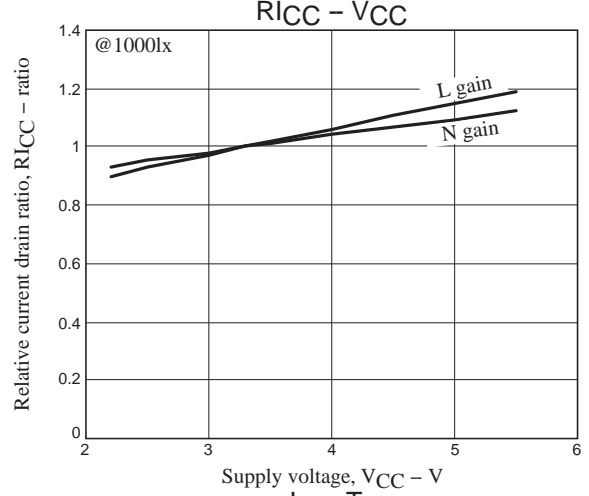
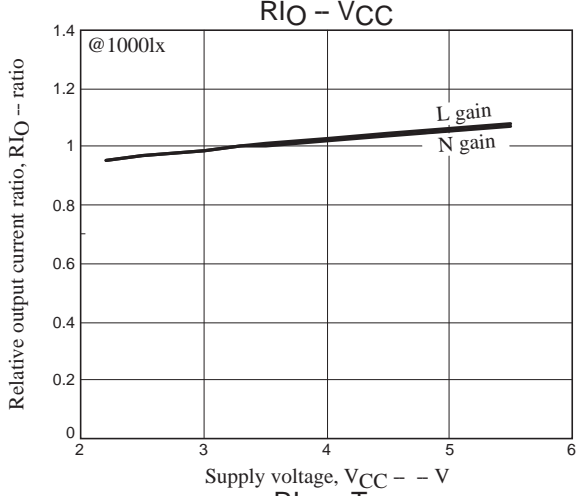
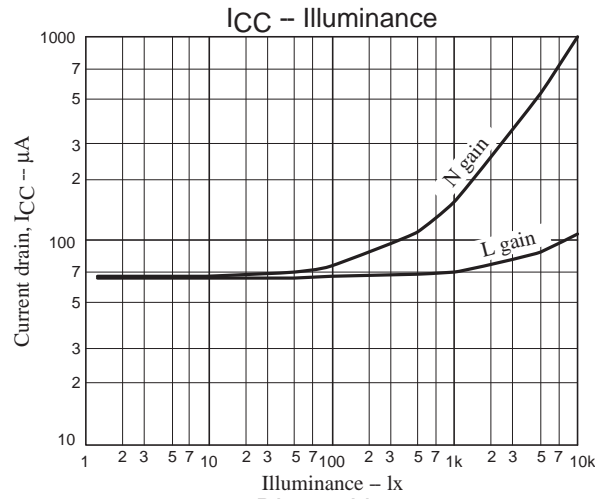
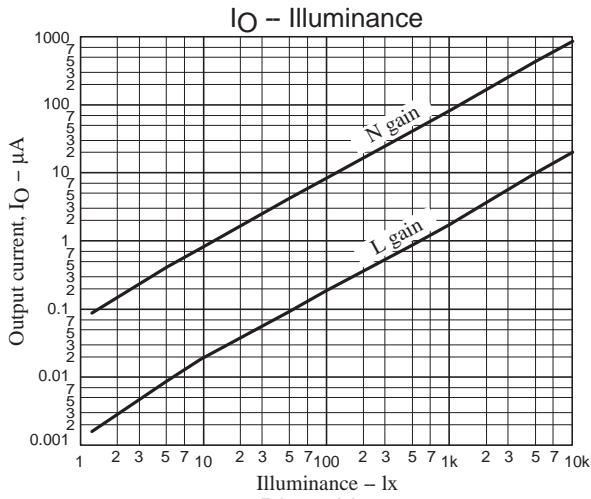
## Chip pattern and photo-receiving pattern diagrams



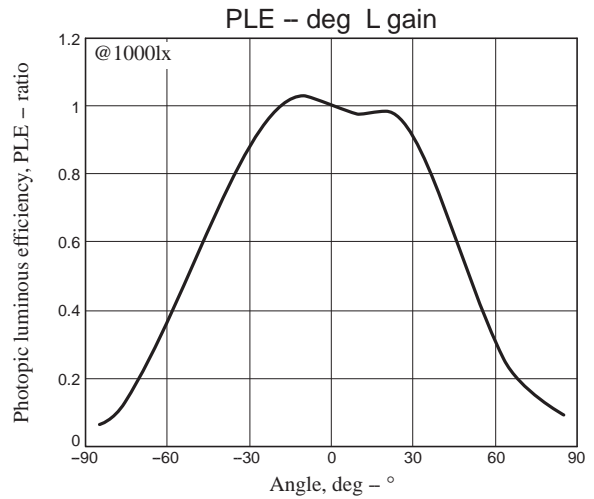
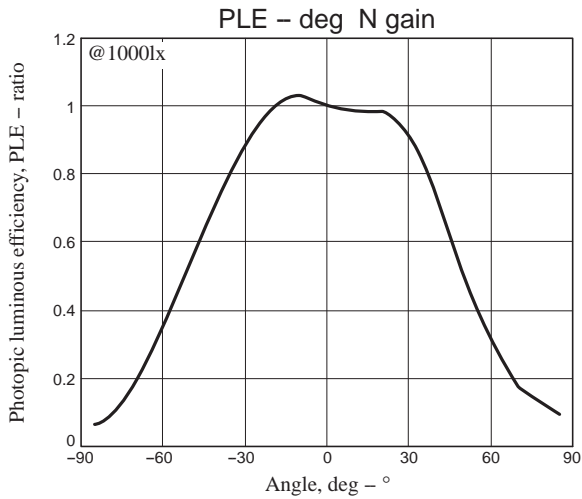
LA0151CS photo-receiving pattern enlarged diagram (effective area)



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