

Ambient Light Sensor, Linear Current Output, with 2-Stage Gain Switching

LA0151CS

Overview

The LA0151CS is a photo IC for ultra-small package 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.

Features

- Linear Current Output
- Low Gain Mode Function [Low Gain: -35 dB]

Typical Applications

- Mobile Phones and Tablets
- Digital Still Cameras
- Security Camera

SPECIFICATION

ABSOLUTE MAXIMUM RATINGS (at $T_a = 25^\circ\text{C}$)

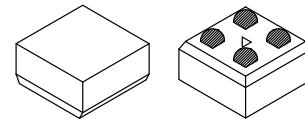
Parameter	Symbol	Conditions	Rating	Unit
Maximum Supply Voltage	V_{CC}		6	V
Operating Temperature	T_{OPR}		-30 to +85	$^\circ\text{C}$
Storage Temperature	T_{STG}		-40 to +100	$^\circ\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

RECOMMENDED OPERATING CONDITIONS AND OPERATING VOLTAGE RANGE (at $T_a = 25^\circ\text{C}$)

Parameter	Symbol	Conditions	Rating			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

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.



ODCSP4 1.01x1.01
CASE 570AC

ORDERING INFORMATION

Ordering Code	Package	Shipping [†]
LA0151CS-TLM-E	ODCSP4 (Pb-Free / Halogen Free)	5000 / Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

ELECTRICAL 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) (Note 2, 4)	I_{CC}	$E_v = 1000\text{ lx}$, $R_L = 5\text{ k}\Omega$, N mode	90	150	210	μA
Current Dissipation (2) (Note 2, 4)	I_{CC}	$E_v = 1000\text{ lx}$, $R_L = 5\text{ k}\Omega$, L mode	42	70	98	μA
Output Current (1) (Note 2, 4)	I_{O1}	$E_v = 100\text{ lx}$, N mode	6	8	10	μA
Output Current (2) (Note 2, 4)	I_{O2}	$E_v = 1000\text{ lx}$, N mode	60	80	100	μA
Output Current (3) (Note 2, 4)	I_{O3}	$E_v = 100\text{ lx}$, L mode	0.12	0.16	0.2	μA
Output Current (4) (Note 2, 4)	I_{O4}	$E_v = 1000\text{ lx}$, L mode	1.2	1.6	2.0	μA
Dark Current	I_{leak}	$E_v = 0\text{ lx}$, N mode, L mode	—	—	0.1	μA
Temperature Coefficient (Note 3)	I_{tc}	$E_v = 100\text{ lx}$, N mode, L mode, $T_a = -20$ to 60°C	—	0.34	—	$^\circ\text{C}$
Rise Time (1) (Note 5)	T_{r1}	$E_v = 1000\text{ lx}$, $R_L = 5\text{ k}\Omega$, N mode	—	15	40	μs
Rise Time (2) (Note 5)	T_{r2}	$E_v = 1000\text{ lx}$, $R_L = 500\text{ k}\Omega$, L mode	—	20	50	μs
Fall Time (1) (Note 5)	T_{f1}	$E_v = 1000\text{ lx}$, $R_L = 5\text{ k}\Omega$, N mode	—	150	500	μs
Fall Time (2) (Note 5)	T_{f2}	$E_v = 1000\text{ lx}$, $R_L = 500\text{ k}\Omega$, L mode	—	150	500	μs
Peak Sensitivity Wave Length (Note 3)	λ_p		—	550	—	nm
Saturation Output Voltage (Note 6)	V_O	$E_v = 1000\text{ lx}$, $R_L = 150\text{ k}\Omega$, N mode	3.0	3.2	—	V

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1. N mode and L mode stand for the normal gain mode and the low gain mode, respectively.
2. Measured with the standard light source A. White LED is used instead in the mass production line.
3. Design guaranteed item
4. Test circuit for measuring current dissipation and output current

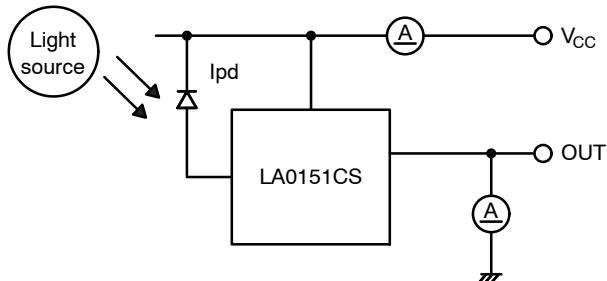


Figure 1.

5. Measuring method of rise time (Tr) and fall time (Tf)

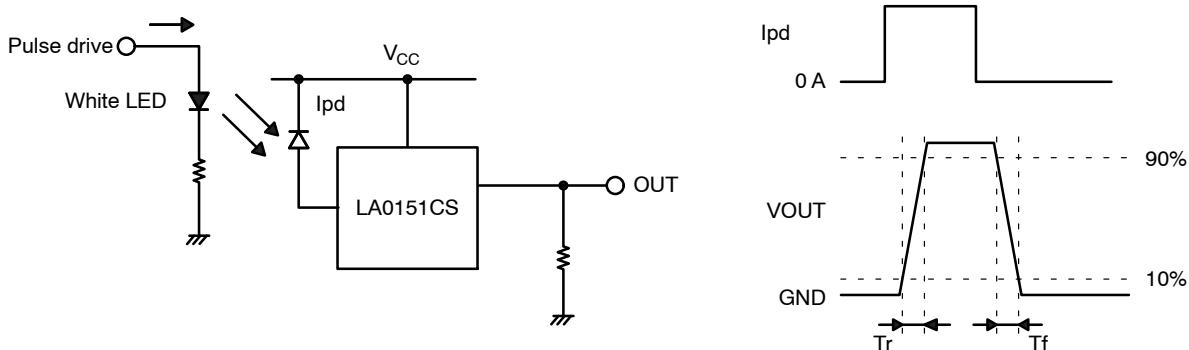
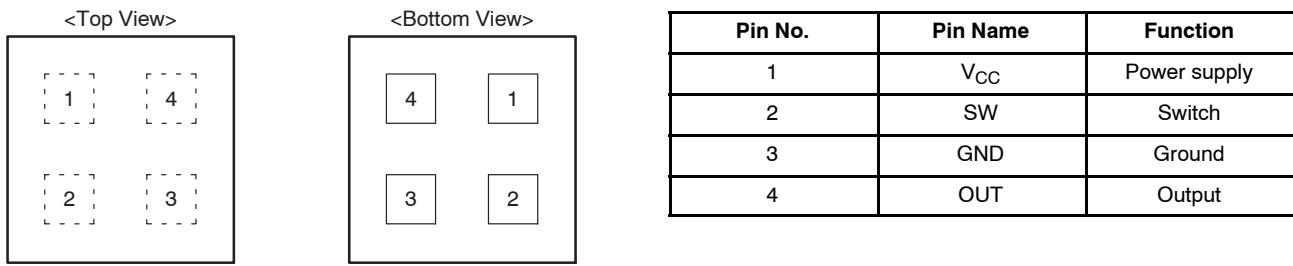


Figure 2.

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

LA0151CS

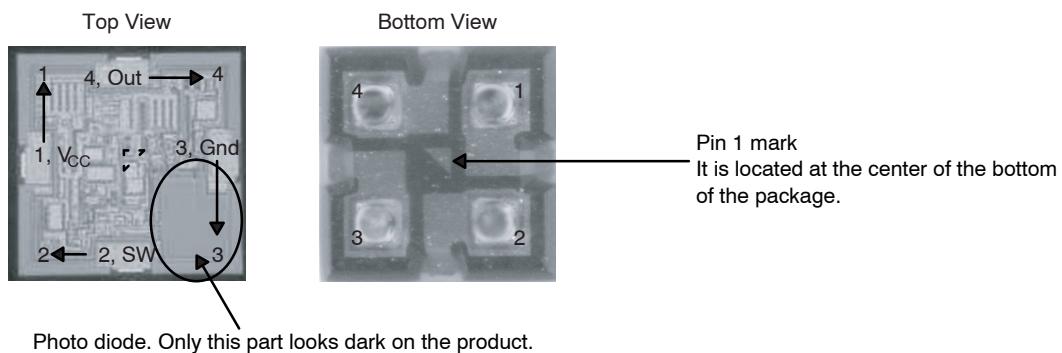
PAD LAYOUT



Ball pitch: 0.5 mm, Ball size: 0.18 mm

Figure 3. Pad Layout

PAD LAYOUT (Photos)



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

Figure 4. Pad Layout (Photos)

INTERNAL BLOCK DIAGRAM

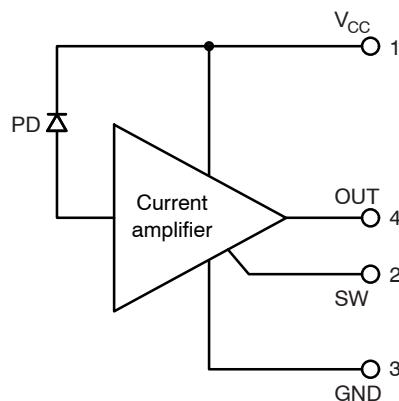
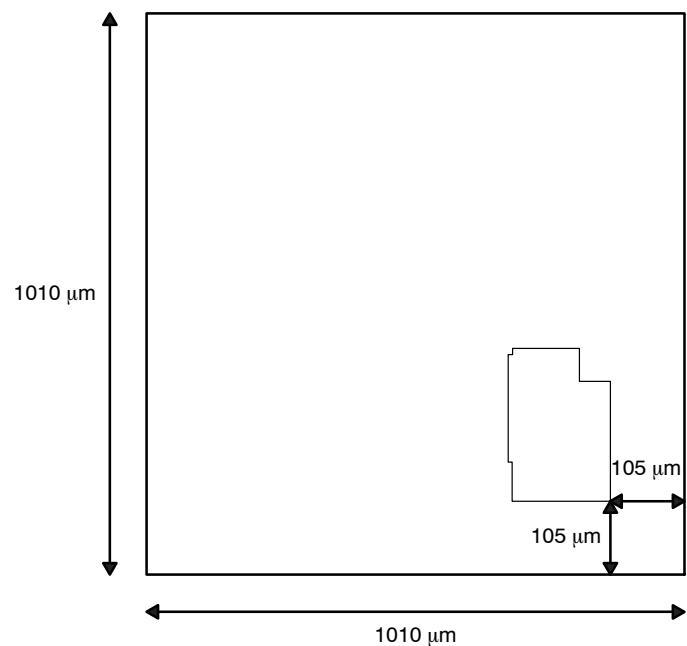


Figure 5. Internal Block Diagram

CHIP PATTERN AND PHOTO-RECEIVING PATTERN DIAGRAMS



*Pin 1 is on the upper left.

Figure 6. LA0151CS Chip Pattern Diagram (Top View)

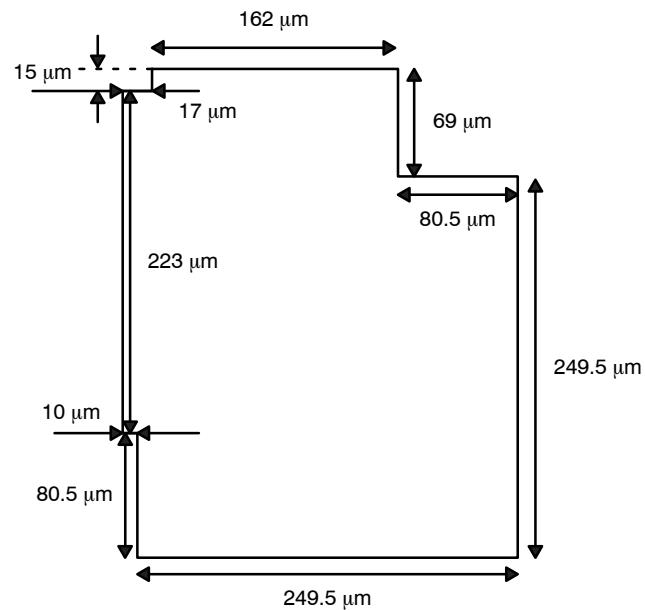


Figure 7. LA0151CS Photo-receiving Pattern Enlarged Diagram (Effective Area)

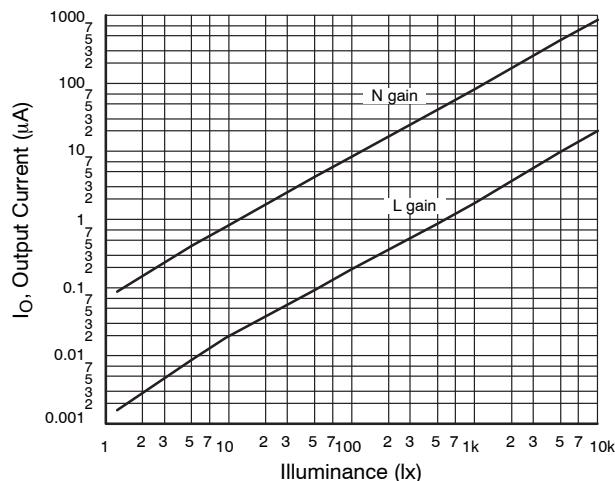


Figure 8. I_O – Illuminance

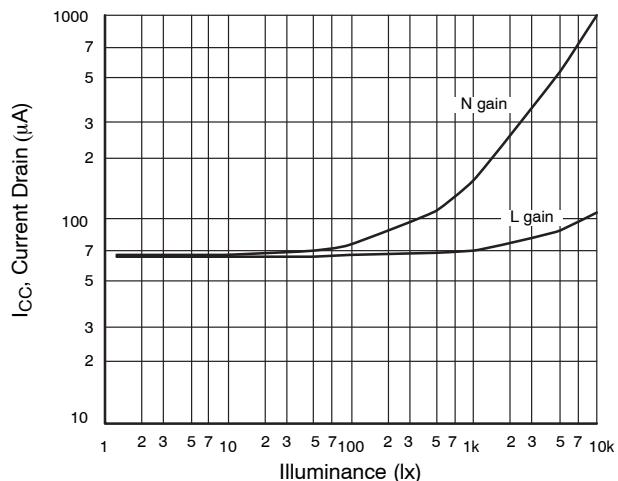


Figure 9. I_{CC} – Illuminance

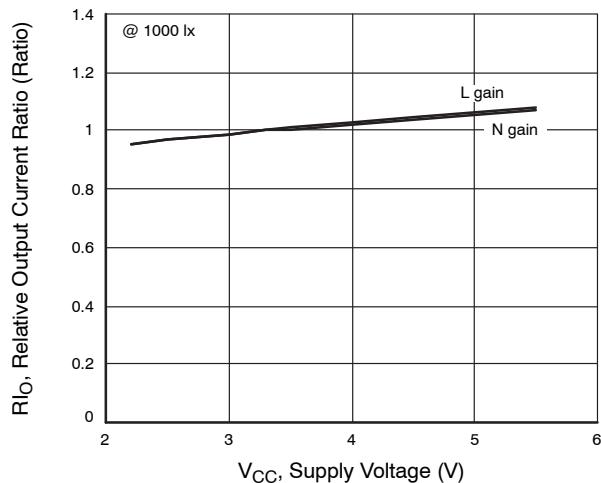


Figure 10. R_{IO} – V_{CC}

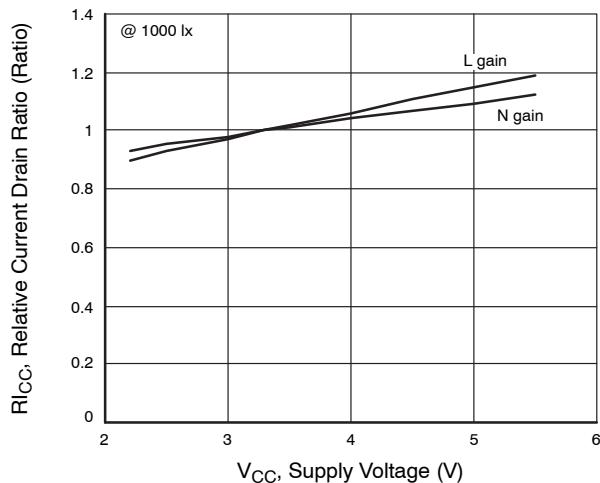


Figure 11. R_{CC} – V_{CC}

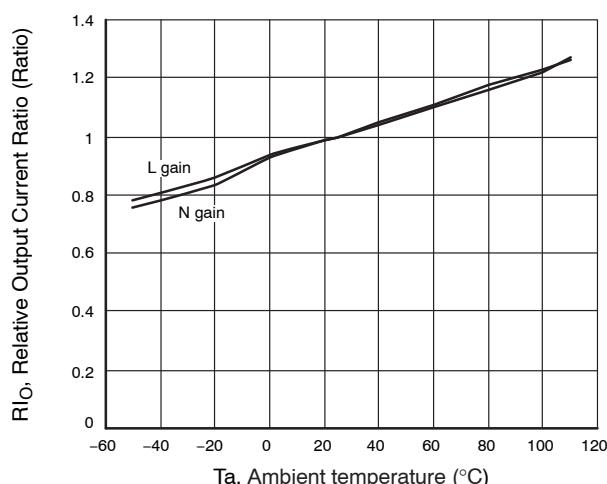


Figure 12. R_{IO} – T_a

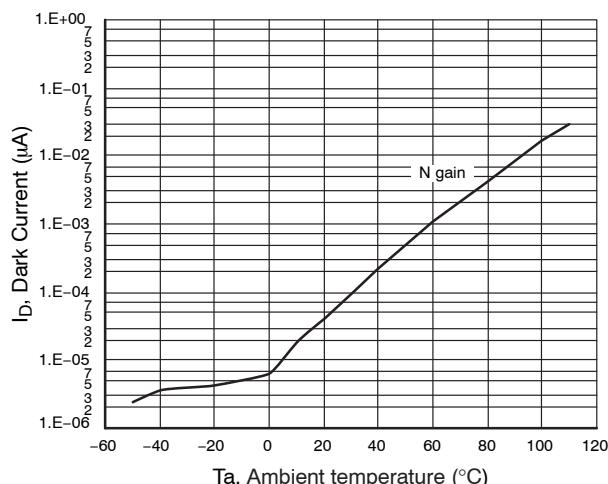


Figure 13. I_D – T_a

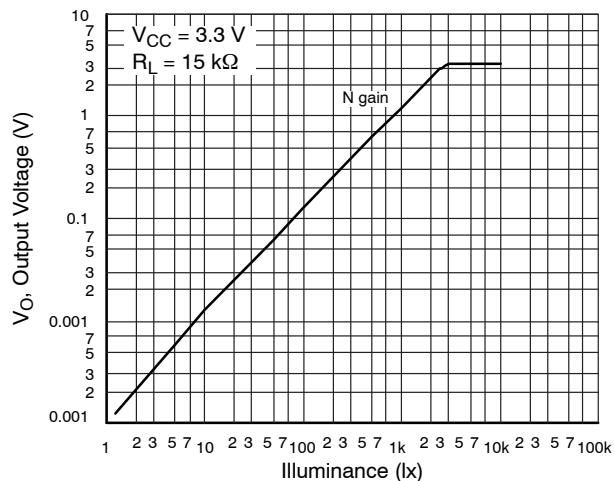


Figure 14. V_O – Illuminance

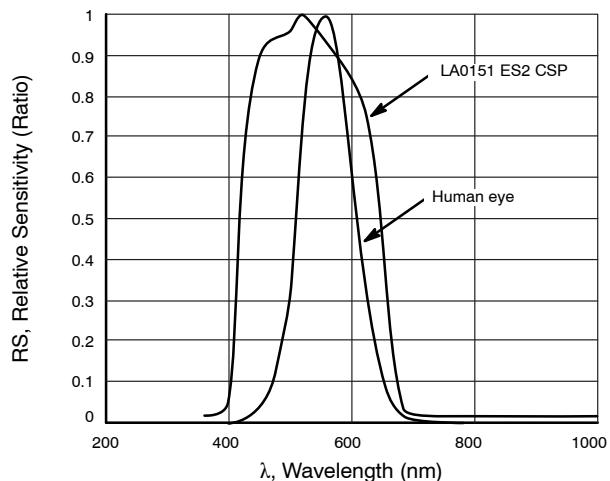


Figure 15. RS – λ

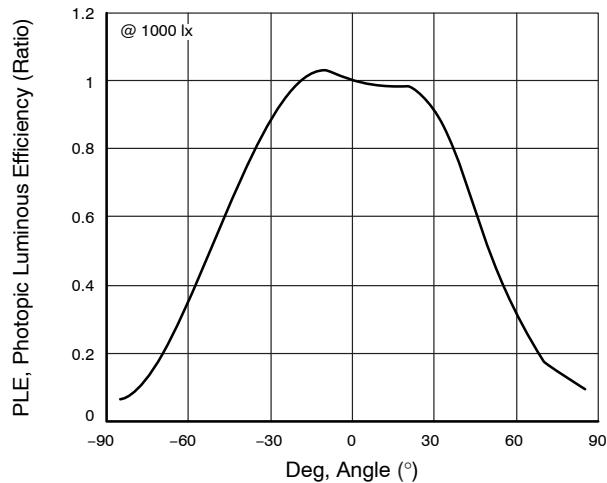


Figure 16. PLE – Deg N Gain

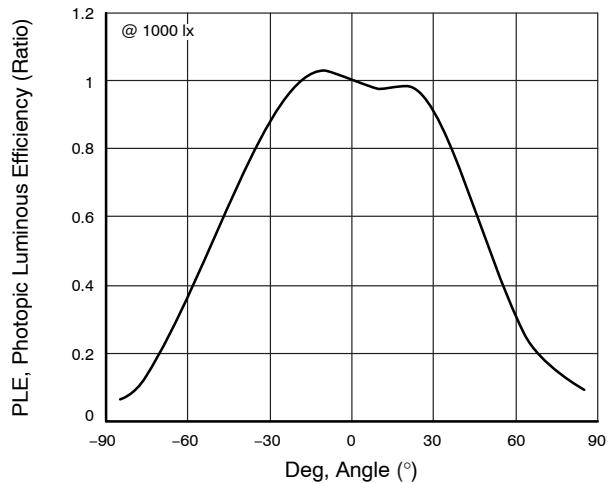
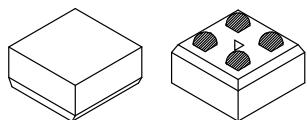


Figure 17. PLE – Deg L Gain

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

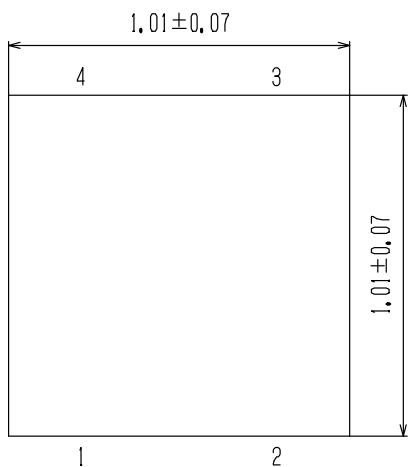
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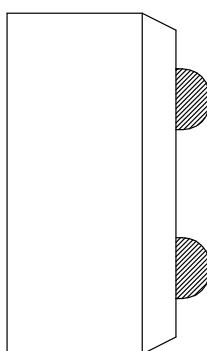
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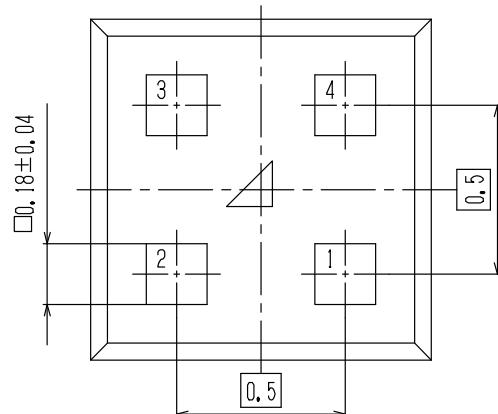
TOP VIEW



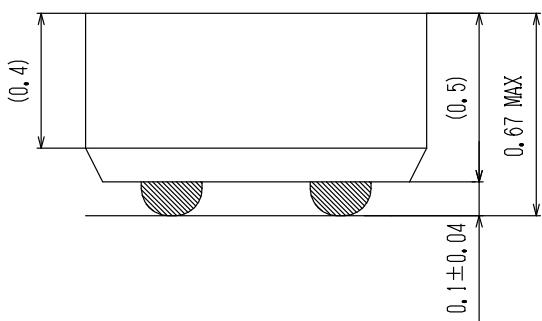
SIDE VIEW



BOTTOM VIEW



SIDE VIEW



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