



Optical Sensor  
Product Data Sheet  
LTR-568ALS-01

Spec No. :DS86-2018-0018  
Effective Date: 12/13/2018  
Revision: -

**LITE-ON DCC**

**RELEASE**

BNS-OD-FC001/A4

## OPTICAL SENSOR LTR-568ALS-01

### Description

The LTR-568ALS-01 is an integrated low voltage I2C ambient light sensor (ALS), and proximity sensor (PS), with built-in emitter in a single miniature chipled lead-free surface mount package.

The ALS provides a linear response over a wide dynamic range, which is well suited to applications under very low or bright ambient brightness. Besides, with built-in proximity sensor, this sensor offers the feature to detect object at a user configurable distance.

The sensor has a programmable interrupt with hysteresis to response to events and that removes the need to poll the sensor for a reading which improves system efficiency. This CMOS design and factory-set one time trimming capability ensure minimal sensor-to-sensor variations for ease of manufacturability to the end customers.

### Application

- Control brightness of display panel
- Object detection in mobile, computing, and consumer devices.

### Features

- I<sup>2</sup>C interface (Standard mode @100kHz or Fast mode @400kHz)
- Ambient Light and Proximity Sensing in one ultra-small ChipLED package
- Very low power consumption with sleep mode capability
- Operating voltage ranges: 1.8V to 3.6V
- Operating temperature ranges: -40 to +85 °C
- Built-in temperature compensation circuit
- Programmable interrupt function for ALS and PS with upper and lower thresholds
- RoHS and Halogen free compliant

#### ALS Features

- 16 bits effective resolution
- Wide dynamic range with linear response
- Close to human eye spectral response
- Automatic rejection for 50Hz/60Hz lighting flicker

#### PS Features

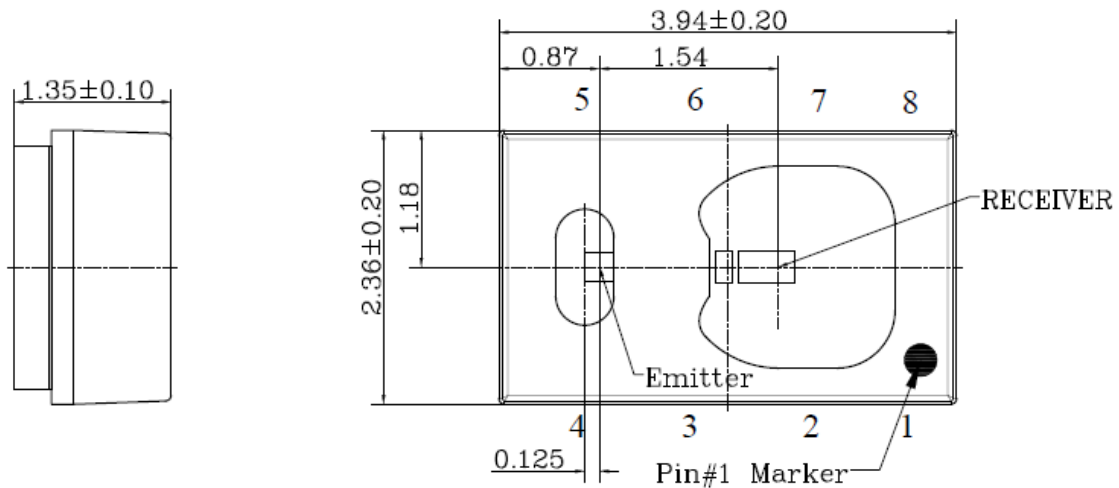
- Built-in LED driver
- High ambient light suppression
- 16-bit effective resolution
- Cancellation of crosstalk
- Programmable LED drive setting
- Ambient IR saturation indicator

### Ordering Information

| Part Number   | Packaging Type | Package               | Quantity |
|---------------|----------------|-----------------------|----------|
| LTR-568ALS-01 | Tape and Reel  | 8-pin chipled package | 8000pcs  |

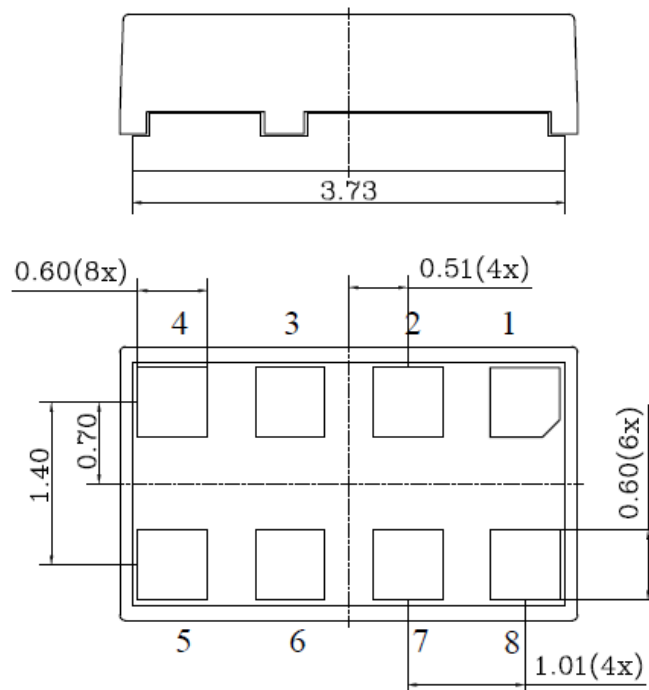
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### 1. Outline Dimensions and Pins Configuration



#### Pin-Out Assignment:

- |         |         |
|---------|---------|
| 1. SDA  | 5. LEDA |
| 2. INT  | 6. GND  |
| 3. LDR  | 7. SCL  |
| 4. LEDK | 8. VDD  |

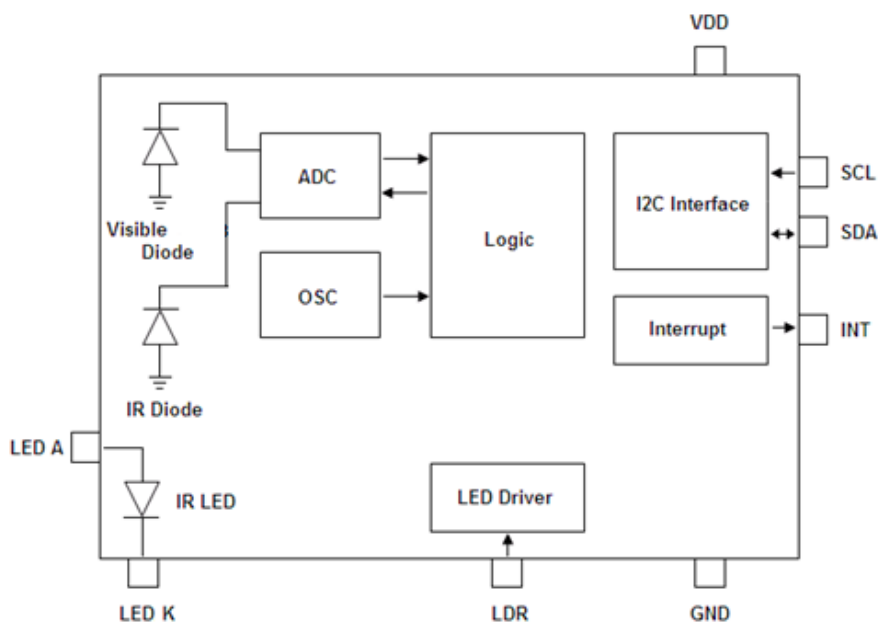


Note: All dimension in millimeter

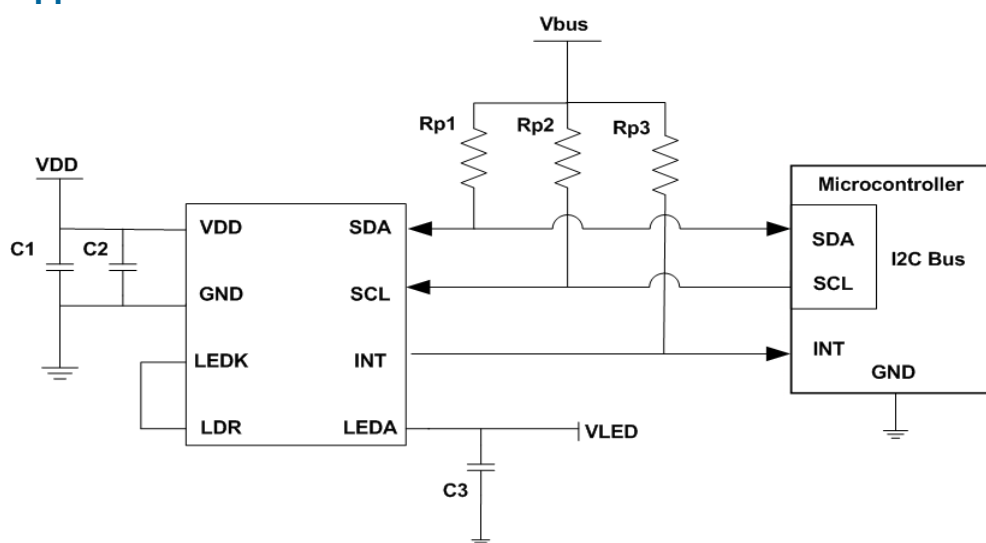
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### 2. Functional Block Diagram

The LTR-568ALS-01 contains 2 integrated photodiodes (1 for proximity diode, 1 diodes for ambient diode) for respective photocurrent measurement. The photodiode currents are converted to digital values by ADCs. The sensor also included a LED driver, as well as some peripheral circuits such as an internal oscillator, a current course, voltage reference, and internal fuses to store trimming information.



### 3. Application Circuit



Note: It is a requirement to separate the VDD and VLED

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I/O Pins Configuration Table

| Pin | I/O Type | Symbol | Description                            |
|-----|----------|--------|----------------------------------------|
| 1   | I/O      | SDA    | I <sup>2</sup> C serial data           |
| 2   | O        | INT    | Interrupt pin                          |
| 3   | O        | LDR    | LED driver. To connect to LED Cathode. |
| 4   |          | LDK    | LED Cathode. To connect to LED driver  |
| 5   |          | LEDA   | LED Anode. To connect to VLED          |
| 6   |          | GND    | GND                                    |
| 7   | I        | SCL    | I <sup>2</sup> C serial clock          |
| 8   |          | VDD    | Supply Voltage                         |

Recommended Application Circuit Components

| Component         | Recommended Value                      |
|-------------------|----------------------------------------|
| Rp1, Rp2, Rp3 [1] | 1 k $\Omega$ to 10 k $\Omega$          |
| C1, C3            | 1 $\mu$ F $\pm$ 20%, X7R / X5R Ceramic |
| C2,C4             | 0.1 $\mu$ F                            |

- [1] Selection of pull-up resistors value is dependent on bus capacitance values. For more details, please refer to I<sup>2</sup>C Specifications:  
[http://www.nxp.com/documents/user\\_manual/UM10204.pdf](http://www.nxp.com/documents/user_manual/UM10204.pdf)

## 4. Ratings and Specifications

Absolute Maximum Ratings at Ta = 25°C

| Parameter                                                            | Symbol           | Min. | Max  | Unit |
|----------------------------------------------------------------------|------------------|------|------|------|
| Supply Voltage                                                       | VDD              |      | 4.5  | V    |
| Digital Voltage Range                                                | SCL, SDA, INT    | -0.5 | 4.5  | V    |
| Max Voltage Range                                                    | LDR              | -0.5 | 4.5  | V    |
| Storage Temperature                                                  | T <sub>stg</sub> | -40  | 100  | °C   |
| Electrostatic Discharge Protection<br>(Human Body Model JESD22-A114) | V <sub>HBM</sub> |      | 2000 | V    |

Note: Exceeding these ratings could cause damage to the sensor. All voltages are with respect to ground. Currents are positive into, negative out of the specified terminal.

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### Recommended Operating Conditions

| Description                 | Symbol               | Min. | Typ. | Max. | Unit |
|-----------------------------|----------------------|------|------|------|------|
| Supply Voltage              | VDD                  | 1.8  |      | 3.6  | V    |
| LED Supply Voltage          | V <sub>LED</sub>     | 2.5  |      | 4.35 | V    |
| Interface signal input high | V <sub>I2Chigh</sub> | 1.5  |      | VDD  | V    |
| Interface signal input low  | V <sub>I2Clow</sub>  | 0    |      | 0.4  | V    |
| Operating Temperature       | T <sub>ope</sub>     | -40  |      | 85   | °C   |

### Electrical & Optical Specifications

All specifications are at VDD = 1.8V, T<sub>ope</sub> = 25°C, unless otherwise noted.

| Parameter                 | Min. | Typ. | Max. | Unit | Condition                                                  |
|---------------------------|------|------|------|------|------------------------------------------------------------|
| Supply Current            |      | 220  | 265  | uA   | Both ALS and PS Active mode.<br>Default setting            |
| ALS Active Supply Current |      | 220  | 265  | uA   | Full load                                                  |
| PS Active Supply Current  |      | 110  | 140  | uA   | Max. MRR with 16pulse<br>100%duty                          |
| Standby Current           |      |      | 5    | uA   | Shutdown Mode                                              |
| Wakeup Time from Standby  |      | 5    | 10   | ms   | From Standby to Active mode<br>where measurement can start |

### Characteristics Ambient Light Sensor

| Parameter                    | Min. | Typ. | Max. | Unit  | Condition                              |
|------------------------------|------|------|------|-------|----------------------------------------|
| ALS Resolution               |      |      | 16   | Bit   | Programmable for 13, 14, 15,<br>16 Bit |
| ALS Lux accuracy             |      | 10%  |      | %     | Across different light sources         |
| Dark Level Count             |      |      | 5    | Count | 0 Lux, 16-bit resolution,<br>gainx128  |
| Integration time             | 50   |      | 400  | ms    | With 50/60Hz Rejection                 |
| 50/60 Hz flicker noise error | -5   |      | +5   | %     |                                        |

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### Characteristics Proximity Sensor

| Parameter                    | Min. | Typ. | Max. | Unit   | Condition                        |
|------------------------------|------|------|------|--------|----------------------------------|
| PS Resolution                |      |      | 16   | Bit    |                                  |
| Sensitivity Range            |      | 940  |      | nm     |                                  |
| Detection Distance           |      |      | 12   | cm     | 32us, 7 pulse, 190mA             |
| LED Pulse Current            |      |      | 240  | mA     | Configurable                     |
| LED Pulse width              |      |      | 32   | us     | Configurable for 4,8,16,32 us    |
| LED Duty Cycle               |      |      | 100  | %      |                                  |
| Number of LED Pulses         | 1    |      | 32   | Pulses | Programmable from 1 to 32 pulses |
| Ambient light suppression ** |      |      | 100  | klux   | Direct sunlight                  |

\*\* Above 50klux, internal fail-safe feature will force PS count to zero to prevent false trigger.

### Typical Device Parameter

(VDD = 2.8V, Ta=25°C, Default power-up settings, unless otherwise noted)

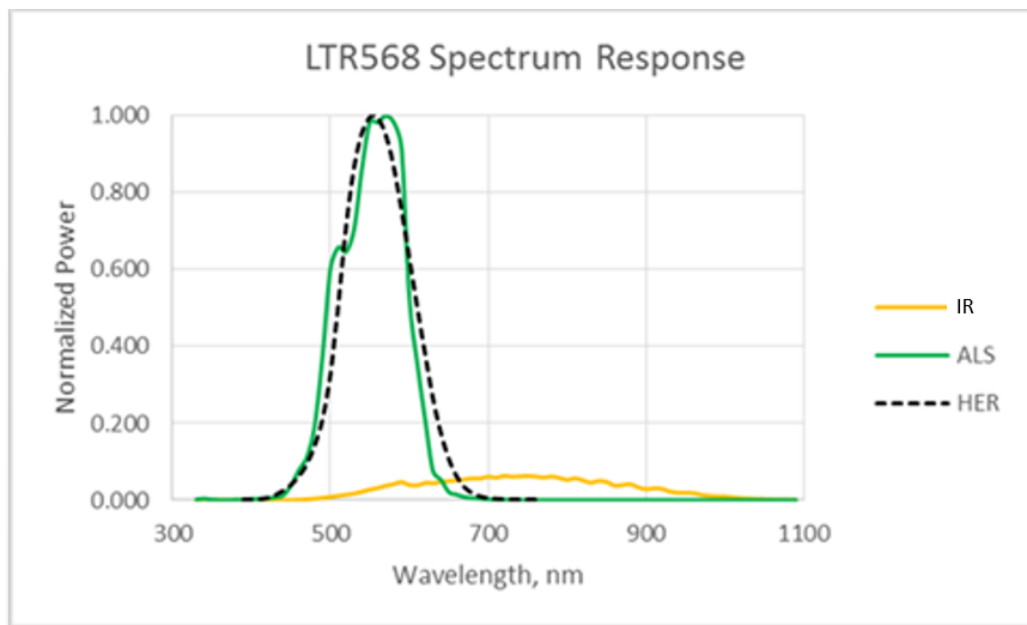


Figure 4.1 : ALS Spectral response



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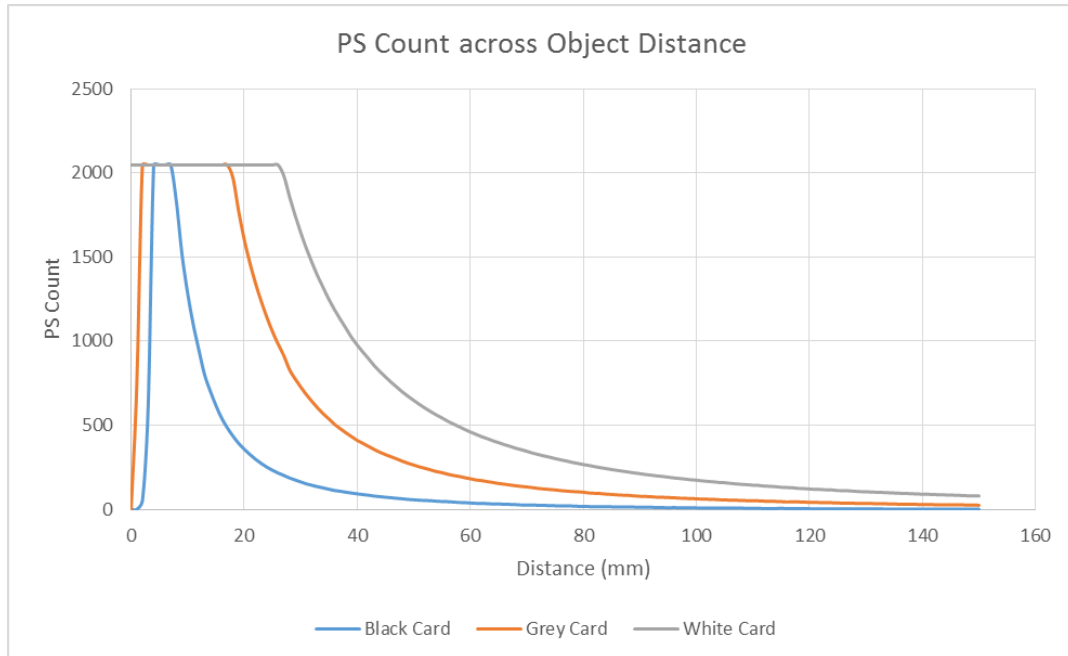


Figure 4.2: PS performance across distance VDD 3V, 190mA, 16pulses, with others in default settings.

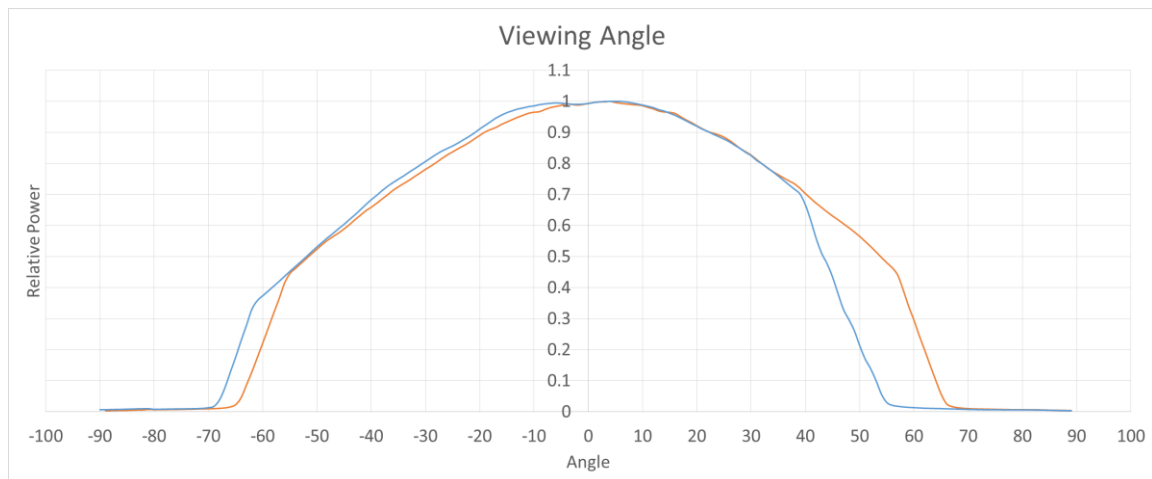


Figure 4.3: ALS viewing angle performance

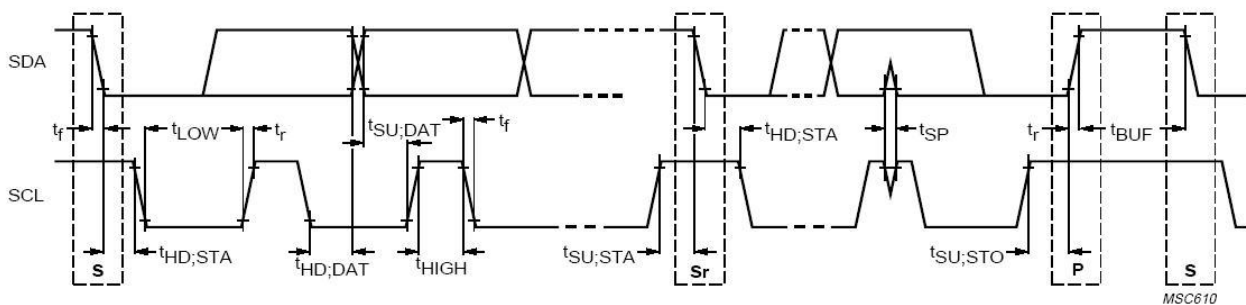


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### AC Electrical Characteristics

All specifications are at VBus = 1.7V, T<sub>ope</sub> = 25°C, unless otherwise noted.

| Parameter                                                                                   | Symbol       | Standard mode |      | Fast mode |      | Unit |
|---------------------------------------------------------------------------------------------|--------------|---------------|------|-----------|------|------|
|                                                                                             |              | Min.          | Max. | Min.      | Max. |      |
| SCL clock frequency                                                                         | $f_{SCL}$    | 100           |      | 400       |      | kHz  |
| Bus free time between a STOP and START condition                                            | $t_{BUF}$    | 4.7           | -    | 1.3       | -    | us   |
| Hold time (repeated) START condition. After this period, the first clock pulse is generated | $t_{HD;STA}$ | 4.0           | -    | 0.6       | -    | us   |
| LOW period of the SCL clock                                                                 | $t_{LOW}$    | 4.7           | -    | 1.3       | -    | us   |
| HIGH period of the SCL clock                                                                | $t_{HIGH}$   | 4.0           | -    | 0.6       | -    | us   |
| Set-up time for a repeated START condition                                                  | $t_{SU;STA}$ | 4.7           | -    | 0.6       | -    | us   |
| Set-up time for STOP condition                                                              | $t_{SU;STO}$ | 4.0           | -    | 0.6       | -    | us   |
| Rise time of both SDA and SCL signals                                                       | $t_r$        | -             | 1000 | -         | 300  | ns   |
| Fall time of both SDA and SCL signals                                                       | $t_f$        | -             | 300  | -         | 300  | ns   |
| Data hold time                                                                              | $t_{HD;DAT}$ | 0             | -    | 0         | -    | us   |
| Data setup time                                                                             | $t_{SU;DAT}$ | 250           | -    | 100       | -    | ns   |



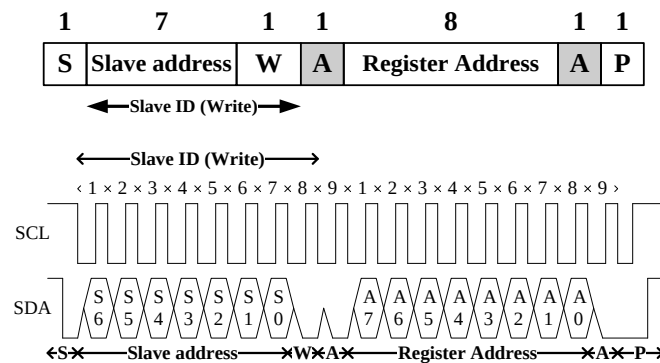
**Definition of timing for I<sup>2</sup>C bus**

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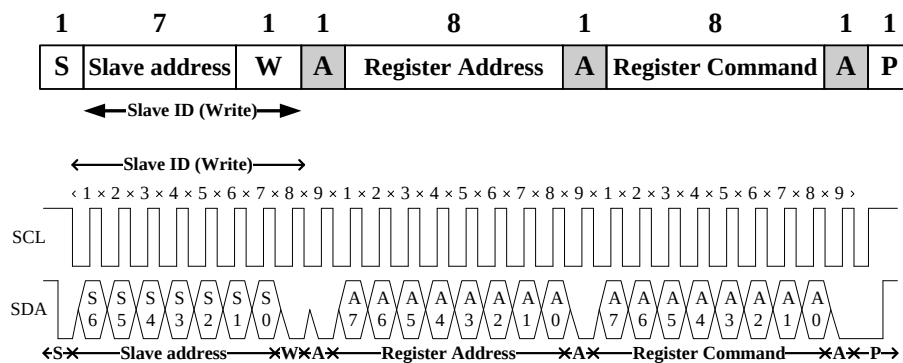
## 5. Principles of Operation

### I<sup>2</sup>C Protocols

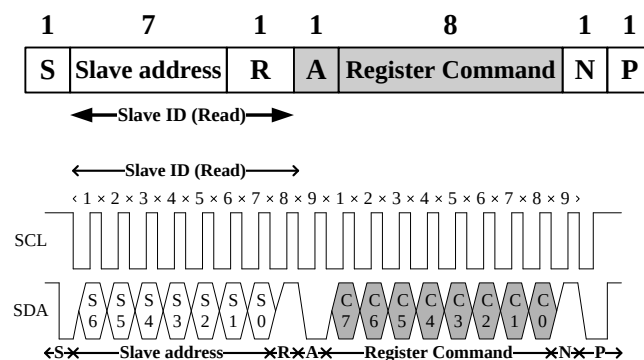
#### • I<sup>2</sup>C Write Protocol (type 1):



#### • I<sup>2</sup>C Write Protocol (type 2):

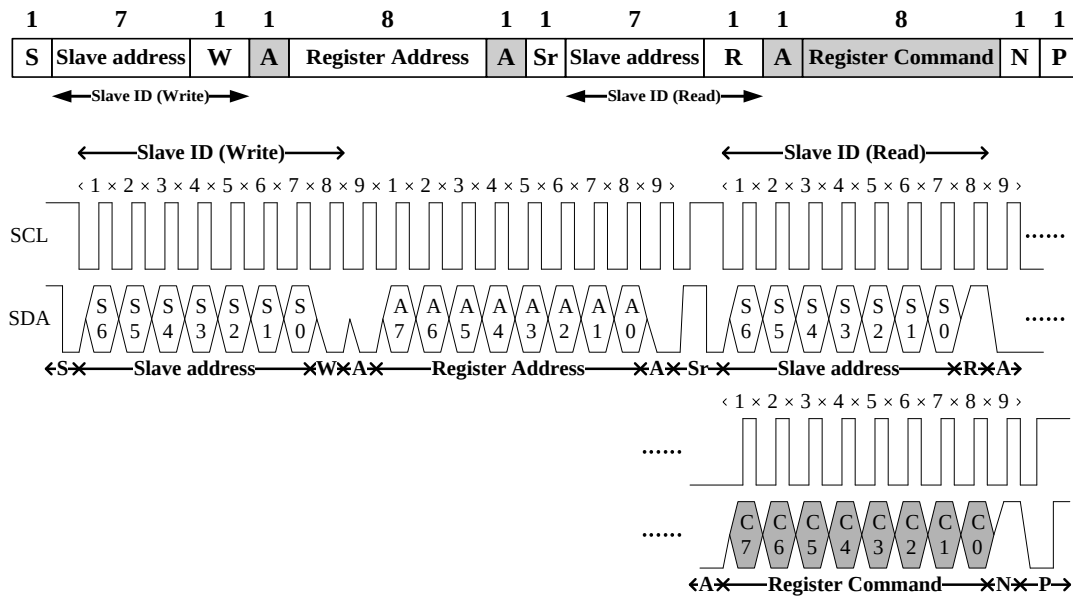


#### • I<sup>2</sup>C Read Protocol:



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### • I<sup>2</sup>C Read (Combined format) Protocol:



**A** Acknowledge (0 for an ACK)

**S** Start condition

**P** Stop condition

**W** Write (0 for writing)

 Slave-to-master

**N** Non-Acknowledge(1 for an NACK)

**Sr** Repeated Start condition

**R** Read (1 for read)

 Master-to-Slave

### I<sup>2</sup>C Slave Address

The 7 bits slave address for this sensor is 0x23H. A read/write bit should be appended to the slave address by the master device to properly communicate with the sensor.

| I <sup>2</sup> C Slave Address |         |      |      |      |      |      |      |         |         |
|--------------------------------|---------|------|------|------|------|------|------|---------|---------|
| Command Type                   | (0x23H) |      |      |      |      |      |      | (0x23H) | (0x23H) |
|                                | Bit7    | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0    |         |
| Write                          | 0       | 1    | 0    | 0    | 0    | 1    | 1    | 0       | 0x46H   |
| Read                           | 0       | 1    | 0    | 0    | 0    | 1    | 1    | 1       | 0x47H   |

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### 6. Register Set

| Address | R / W | Register Name     | Description                                              | Reset Value |
|---------|-------|-------------------|----------------------------------------------------------|-------------|
| 0x7E    | RW    | ALS_AVE_LIMIT     | ALS digital averaging limit                              | 0x01        |
| 0x7F    | RW    | ALS_AVE_FAC       | ALS digital averaging factor                             | 0x07        |
| 0x80    | RW    | ALS_CONTR         | ALS operation mode control                               | 0x20        |
| 0x81    | RW    | PS_CONTR          | PS operation mode control/SW Reset                       | 0x10        |
| 0x82    | RW    | PS_LED            | PS LED setting                                           | 0x7A        |
| 0x83    | RW    | PS_N_PULSES       | PS number of pulses                                      | 0x00        |
| 0x84    | RW    | PS_MEAS_RATE      | PS measurement rate in active mode                       | 0x04        |
| 0x85    | RW    | ALS_INT_TIME      | ALS integration time and measurement rate in active mode | 0x06        |
| 0x86    | R     | PART_ID           | Part Number ID and revision IDs                          | 0x1C        |
| 0x87    | R     | MANUFAC_ID        | Manufacturer ID                                          | 0x05        |
| 0x88    | R     | ALS_STATUS        | ALS Status                                               | 0x00        |
| 0x89    | R     | IR_DATA_LSB       | ALS/RGB measurement IR data, LSB                         | 0x00        |
| 0x8A    | R     | IR_DATA_MSB       | ALS/RGB measurement IR data, MSB                         | 0x00        |
| 0x8B    | R     | GREEN_DATA_LSB    | ALS/RGB measurement GREEN data, LSB                      | 0x00        |
| 0x8C    | R     | GREEN_DATA_MSB    | ALS/RGB measurement GREEN data, MSB                      | 0x00        |
| 0x91    | R     | PS_STATUS         | PS Status                                                | 0x08        |
| 0x92    | R     | PS_DATA           | PS measurement data, LSB                                 | 0x00        |
| 0x93    | R     | PS_DATA           | PS measurement data, MSB                                 | 0x00        |
| 0x94    | R     | PS_SAR            | PS SAR value                                             | 0x00        |
| 0x95    | R     | ALS_SAR           | ALS SAR value                                            | 0x00        |
| 0x98    | RW    | INTERRUPT         | Interrupt settings                                       | 0x08        |
| 0x99    | RW    | INTERRUPT_PERSIST | PS and ALS interrupt persist setting                     | 0x00        |
| 0x9A    | RW    | PS_THRES_HIGH_LSB | PS interrupt upper threshold, LSB                        | 0xFF        |
| 0x9B    | RW    | PS_THRES_HIGH_MSB | PS interrupt upper threshold, MSB                        | 0xFF        |
| 0x9C    | RW    | PS_THRES_LOW_LSB  | PS interrupt lower threshold, LSB                        | 0x00        |
| 0x9D    | RW    | PS_THRES_LOW_MSB  | PS interrupt lower threshold, MSB                        | 0x00        |
| 0x9E    | RW    | PXTALK_LSB        | Xtalk correction on PS CH0 PD, LSB                       | 0x00        |
| 0x9F    | RW    | PXTALK_MSB        | Xtalk correction on PS CH0 PD, MSB                       | 0x00        |

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|      |    |               |                                    |      |
|------|----|---------------|------------------------------------|------|
| 0xB6 | RW | PS_VREHL      | External PS VREHL value, affect PS | 0x08 |
| 0xB7 | RW | PS_SAR_ENABLE | PS external SAR setting            | 0x40 |

### ALS\_AVE\_LIMIT Register (0x7E) (Read/Write)

The ALS\_AVE\_LIMIT register controls ALS digital averaging delta limit ( new data – old data).

| 0x7E | ALS_AVE_LIMIT (default = 0x00) |       |       |       |       |       |               |       |
|------|--------------------------------|-------|-------|-------|-------|-------|---------------|-------|
|      | Bit 7                          | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1         | Bit 0 |
|      | Reserved                       |       |       |       |       |       | ALS_AVE_LIMIT |       |

| Field         | Bits | Default | Description |              |
|---------------|------|---------|-------------|--------------|
| Reserved      | 7:2  | 000000  |             |              |
| ALS_AVE_LIMIT | 1:0  | 01      | 00          | 511          |
|               |      |         | 01          | 255(default) |
|               |      |         | 1x          | 127          |

### ALS\_AVE\_FAC Register (0x7F) (Read/Write)

The ALS\_AVE\_FAC register controls ALS digital averaging factor value.

| 0x7F | ALS_AVE_FAC (default = 0x07) |       |       |       |       |       |       |       |
|------|------------------------------|-------|-------|-------|-------|-------|-------|-------|
|      | Bit 7                        | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|      | ALS_AVE_FAC                  |       |       |       |       |       |       |       |

| Field       | Bits | Default | Description |              |
|-------------|------|---------|-------------|--------------|
| ALS_AVE_FAC | 7:0  | 00      | 00000000    | No averaging |
|             |      |         | 00000001    | Factor =1    |
|             |      |         | 00000010    | Factor = 2   |
|             |      |         | .           | .            |
|             |      |         | .           | .            |

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|  |  |  |          |                     |
|--|--|--|----------|---------------------|
|  |  |  | 00000111 | Factor =7 (default) |
|  |  |  | .        | .                   |
|  |  |  | .        | .                   |
|  |  |  | .        | .                   |
|  |  |  | 11111111 | Factor = 255        |

### ALS\_CONTR Register (0x80) (Read/Write)

The ALS\_CONTR register controls the ALS operation modes for the sensor. The ALS sensor can be set to either standby mode or active mode. At either of these modes, the I2C circuitry is always active. The default mode after power up is standby mode. During standby mode, there is no ALS measurement performed but I2C communication is allowed to enable read/write to all the registers.

| 0x80 | ALS_CONTR (default = 0x20) |       |              |                 |       |       |                    |                 |
|------|----------------------------|-------|--------------|-----------------|-------|-------|--------------------|-----------------|
|      | Bit 7                      | Bit 6 | Bit 5        | Bit 4           | Bit 3 | Bit 2 | Bit 1              | Bit 0           |
|      | <b>ALS resolution</b>      |       | <b>IR_EN</b> | <b>ALS_Gain</b> |       |       | <b>ALS_SAR_ENB</b> | <b>ALS Mode</b> |

| Field       | Bits | Default | Description |                              |
|-------------|------|---------|-------------|------------------------------|
| ALS_DR      | 7:6  | 00      | 00          | 16Bits Integration (default) |
|             |      |         | 01          | 15Bits Integration           |
|             |      |         | 10          | 14Bits Integration           |
|             |      |         | 11          | 13Bits Integration           |
| IR_EN       | 5    | 1       | 0           | Disable                      |
|             |      |         | 1           | Enable (default)             |
| ALS_GAIN    | 4:2  | 000     | 000         | Gain 1X (default) *          |
|             |      |         | 001         | Gain 4X                      |
|             |      |         | 010         | Gain 16X                     |
|             |      |         | 011         | Gain 64X                     |
|             |      |         | 100         | Gain 128X                    |
|             |      |         | 101         | Gain 512X                    |
| ALS SAR_ENB | 1    | 0       | 0           | Enable (default)             |

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|          |   |   |   |                                |
|----------|---|---|---|--------------------------------|
|          |   |   | 1 | Disable                        |
| ALS MODE | 0 | 0 | 0 | Stand-by mode <b>(default)</b> |
|          |   |   | 1 | Active mode                    |

\* When ALS\_SAR\_ENB=0 and under Gain=1, the ALS DATA may not complete. Firmware need to read the SAR value and reconstruct the actual ALS DATA.

### PS\_CONTR Register (0x81) (Read/Write)

The PS\_CONTR register controls the PS operation modes and software reset for sensor. The PS sensor can be set to either standby mode or active mode. At either of these modes, the I2C circuitry is always active. The default mode after power up is standby mode. During standby mode, there is no ALS measurement performed but I2C communication is allowed to enable read/write to all the registers.

| 0x81 | PS_CONTR (default = 0x10) |       |               |          |       |                |         |          |
|------|---------------------------|-------|---------------|----------|-------|----------------|---------|----------|
|      | Bit 7                     | Bit 6 | Bit 5         | Bit 4    | Bit 3 | Bit 2          | Bit 1   | Bit 0    |
|      | Reserved                  |       | PS_16BITS_ENB | Reserved | PS_OS | FTN/NTF enable | PS Mode | SW Reset |

| Field        | Bits | Default | Description                                                                                          |                                                   |
|--------------|------|---------|------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| Reserved     | 7:6  | 00      | Must write as 00                                                                                     |                                                   |
| PS_16BITS_EN | 5    | 0       | 0                                                                                                    | Output 11 bits <b>(default)</b>                   |
|              |      |         | 1                                                                                                    | Output 16 bits                                    |
| Reserved     | 4    | 1       | Must write as 1                                                                                      |                                                   |
| PS_OS        | 3    | 0       | PS Offset/Xtalk Cancellation. When enabled, PS DATA will be subtracted with PS OFFSET register data. |                                                   |
|              |      |         | 0                                                                                                    | Disabled <b>(default)</b>                         |
|              |      |         | 1                                                                                                    | Enabled                                           |
| FTN/FTN EN   | 2    | 0       | 0                                                                                                    | Disable FTN/NTF Status reporting <b>(default)</b> |
|              |      |         | 1                                                                                                    | Enable FTN/NTF Status reporting                   |
| PSMODE       | 1    | 0       | 1                                                                                                    | Active Mode                                       |
|              |      |         | 0                                                                                                    | Stand-by mode <b>(default)</b>                    |

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|        |   |   |                                                                   |                                                                  |
|--------|---|---|-------------------------------------------------------------------|------------------------------------------------------------------|
| SW_RST | 0 | 0 | Reset registers to default values, with sensor into standby mode. |                                                                  |
|        |   |   | 0                                                                 | No action <b>(default)</b>                                       |
|        |   |   | 1                                                                 | Reset Registers to default values (including calibration values) |

### PS\_LED Register (0x82) (Read/Write)

The PS\_LED register controls the LED pulse width and LED peak current.

| 0x82 | PS_LED (default = 0x7A) |                 |       |                  |       |             |       |       |
|------|-------------------------|-----------------|-------|------------------|-------|-------------|-------|-------|
|      | Bit 7                   | Bit 6           | Bit 5 | Bit 4            | Bit 3 | Bit 2       | Bit 1 | Bit 0 |
|      | Reserved                | PLED pulse duty |       | PLED Pulse Width |       | LED current |       |       |

| Field            | Bits | Default | Description  |                         |
|------------------|------|---------|--------------|-------------------------|
| Reserved         | 7    | 0       | Must write 0 |                         |
| PLED Pulse Duty  | 6:5  | 11      | 00           | 12.5%                   |
|                  |      |         | 01           | 25%                     |
|                  |      |         | 10           | 50%                     |
|                  |      |         | 11           | 100% <b>(default)</b>   |
| PLED Pulse Width | 4:3  | 11      | 00           | 4us                     |
|                  |      |         | 01           | 8us                     |
|                  |      |         | 10           | 16us                    |
|                  |      |         | 11           | 32us <b>(default)</b>   |
| LED current      | 2:0  | 010     | 000          | 0 mA                    |
|                  |      |         | 001          | 50 mA                   |
|                  |      |         | 010          | 100 mA <b>(default)</b> |
|                  |      |         | 011          | 120 mA                  |
|                  |      |         | 100          | 140 mA                  |
|                  |      |         | 101          | 170 mA                  |
|                  |      |         | 110          | 190 mA                  |
|                  |      |         | 111          | 240 mA                  |



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### PS\_N\_Pulses Register (0x83) (Read/Write)

The PS\_N\_Pulses register controls the number of PS set of Sequence and LED pulses to be emitted.

| 0x83 | PS_N_Pulses (default = 0x00) |       |          |                 |       |       |       |       |
|------|------------------------------|-------|----------|-----------------|-------|-------|-------|-------|
|      | Bit 7                        | Bit 6 | Bit 5    | Bit 4           | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|      | PS averaging factor          |       | Reserved | LED Pulse Count |       |       |       |       |

| Field                   | Bits | Default | Description |                                                                                               |
|-------------------------|------|---------|-------------|-----------------------------------------------------------------------------------------------|
| PS averaging factor     | 7:6  | 00      | 00          | No average <b>(default)</b>                                                                   |
|                         |      |         | 01          | 2n averaging                                                                                  |
|                         |      |         | 10          | 4n averaging                                                                                  |
|                         |      |         | 11          | 8n averaging                                                                                  |
| Reserved                | 5    | 0       |             | Must write 0.                                                                                 |
| PS number of LED pulses | 4:0  | 00000   |             | Specifies PS LED number of pulses. If PS number of pulse set to 0, the pulse count will be 1. |

### PS\_MEAS\_RATE Register (0x84) (Read/Write)

The ALS\_PS\_MEAS\_RATE register controls the timing of the periodic measurements of the ALS and PS in active mode. Measurement Repeat Rate is the interval between DATA registers update.

| 0x84 | ALS_PS_MEAS_RATE (default = 0x04) |       |       |       |       |                            |       |       |
|------|-----------------------------------|-------|-------|-------|-------|----------------------------|-------|-------|
|      | Bit 7                             | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2                      | Bit 1 | Bit 0 |
|      | Reserved                          |       |       |       |       | PS Measurement Repeat Rate |       |       |

| Field    | Bits | Default | Description         |
|----------|------|---------|---------------------|
| Reserved | 7:3  | 00000   | Must write as 00000 |

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|                     |  |     |     |     |                        |
|---------------------|--|-----|-----|-----|------------------------|
| PS Measurement Rate |  | 2:0 | 100 | 000 | 6.125ms                |
|                     |  |     |     | 001 | 12.5ms                 |
|                     |  |     |     | 010 | 25ms                   |
|                     |  |     |     | 011 | 50ms                   |
|                     |  |     |     | 100 | 100ms <b>(default)</b> |
|                     |  |     |     | 101 | 200ms                  |
|                     |  |     |     | 110 | 400ms                  |
|                     |  |     |     | 111 | 800ms                  |

### ALS\_INT\_TIME Register (0x85) (Read/Write)

The ALS\_MEAS\_RATE register controls the integration time and timing of the periodic measurement of the ALS in active mode.

| 0x85 | ALS_INT_TIME (default = 0x06) |       |       |       |                      |       |                      |       |
|------|-------------------------------|-------|-------|-------|----------------------|-------|----------------------|-------|
|      | Bit 7                         | Bit 6 | Bit 5 | Bit 4 | Bit 3                | Bit 2 | Bit 1                | Bit 0 |
|      | Reserved                      |       |       |       | ALS Integration Time |       | ALS Measurement Rate |       |

| Field                | Bits | Default | Description     |                          |
|----------------------|------|---------|-----------------|--------------------------|
| Reserved             | 7:4  | 000     | Must write 1010 |                          |
| ALS Integration Time | 3:2  | 01      | 00              | 50msec                   |
|                      |      |         | 01              | 100msec <b>(default)</b> |
|                      |      |         | 10              | 200msec                  |
|                      |      |         | 11              | 400msec                  |
| ALS measurement rate | 1:0  | 10      | 00              | 100msec                  |
|                      |      |         | 01              | 200msec                  |
|                      |      |         | 10              | 400msec <b>(default)</b> |
|                      |      |         | 11              | 800msec                  |

### PART\_ID Register (0x86) (Read Only)

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The PART\_ID register defines the part number and revision identification of the sensor.

| 0x86 | PART_ID (default = 0x1C) |       |       |       |       |       |             |       |
|------|--------------------------|-------|-------|-------|-------|-------|-------------|-------|
|      | Bit 7                    | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1       | Bit 0 |
|      | Part Number ID           |       |       |       |       |       | Revision ID |       |

### MANUFAC\_ID Register (0x87) (Read Only)

The MANUFAC\_ID register defines the manufacturer identification of the sensor.

| 0x87 | MANUFAC_ID (default = 0x05) |       |       |       |       |       |       |       |
|------|-----------------------------|-------|-------|-------|-------|-------|-------|-------|
|      | Bit 7                       | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|      | Manufacturer ID             |       |       |       |       |       |       |       |

### ALS\_STATUS Register (0x88) (Read Only)

The ALS\_PS\_STATUS register stores information about interrupt status as well as ALS data status. New data means data has not been read before. Everytime measurement is done and data is written to the data register, data status bit should be set to logic 1. Everytime the data register is read, data status bit should be set to logic 0.

Interrupt status declares if ALS and PS criteria are met (ALS or PS measured data is outside of preset threshold window set with upper and lower threshold)

| 0x88 | ALS_STATUS (default = 0x00) |       |          |       |       |         |          |                 |
|------|-----------------------------|-------|----------|-------|-------|---------|----------|-----------------|
|      | Bit 7                       | Bit 6 | Bit 5    | Bit 4 | Bit 3 | Bit 2   | Bit 1    | Bit 0           |
|      | Reserved                    | Valid | ALS_Gain |       |       | ALS_SAR | Reserved | ALS Data Status |

| Field               | Bits | Default | Description |                                    |
|---------------------|------|---------|-------------|------------------------------------|
| Reserved            | 7    | 0       | 0           | Must write 0                       |
| ALS Data Valid      | 6    | 0       | 0           | ALS Data is Valid <b>(default)</b> |
|                     |      |         | 1           | ALS Data is Invalid                |
| ALS Data Gain Range | 5:3  | 0       | 000         | Gain 1X <b>(default)</b>           |

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|                           |   |   |            |                                         |
|---------------------------|---|---|------------|-----------------------------------------|
|                           |   |   | 001        | Gain 4X                                 |
|                           |   |   | 010        | Gain 16X                                |
|                           |   |   | 011        | Gain 64X                                |
|                           |   |   | 100        | Gain 128X                               |
|                           |   |   | 101        | Gain 512x                               |
| ALS SAR (DR)<br>Extension | 2 | 0 | 0          | No Extension (SAR code = 0)             |
|                           |   |   | 1          | With Extension (SAR code != 0)          |
| Reserved                  | 1 | 0 | Don't care |                                         |
| ALS data status           | 0 | 0 | 0          | OLD data (data already read), (default) |
|                           |   |   | 1          | NEW data (first time data is read)      |

### IR\_DATA Register (0x89,0x8A) (Read Only)

ALS measurement results are stored in ALS\_DATA registers.

| Field   | Bits | Default | Description                                        |
|---------|------|---------|----------------------------------------------------|
| IR_ LSB | 0x89 | 0       | IR low byte data, bit 0 is LSB of the 16-bit data  |
| IR_ MSB | 0x8A | 0       | IR high byte data, bit 7 is MSB of the 16-bit data |

### ALS\_DATA Register (0x8B,0x8C) (Read Only)

ALS measurement results are stored in ALS\_DATA registers.

| Field    | Bits | Default | Description                                         |
|----------|------|---------|-----------------------------------------------------|
| ALS_ LSB | 0x8B | 0       | ALS low byte data, bit 0 is LSB of the 16-bit data  |
| ALS_ MSB | 0x8C | 0       | ALS high byte data, bit 7 is MSB of the 16-bit data |

### PS\_Status Register (0x91) (Read Only)

| 0x91 | PS_Status (default = 0x91) |       |       |       |       |       |       |       |
|------|----------------------------|-------|-------|-------|-------|-------|-------|-------|
|      | Bit 7                      | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

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|  |          |     |     |          |                    |                     |                |
|--|----------|-----|-----|----------|--------------------|---------------------|----------------|
|  | Reserved | FTN | NTF | Reserved | Ambient Saturation | PS Interrupt Status | PS Data Status |
|--|----------|-----|-----|----------|--------------------|---------------------|----------------|

| Field               | Bits | Default | Description                                       |
|---------------------|------|---------|---------------------------------------------------|
| Reserved            | 7:6  | 00      | Reserved                                          |
| FTN                 | 5    | 0       | 0 No far to near object detected <b>(default)</b> |
|                     |      |         | 1 Far to near object detected                     |
| NTF                 | 4    | 0       | 0 No near to far object detected <b>(default)</b> |
|                     |      |         | 1 Near to far object detected                     |
| Reserved            | 3    | 1       | Reserved                                          |
| Ambient Saturation  | 2    | 0       | 0 No ambient saturation                           |
|                     |      |         | 1 Ambient saturation happens                      |
| PS interrupt status | 1    | 0       | 0 interrupt signal INACTIVE (default)             |
|                     |      |         | 1 interrupt signal ACTIVE                         |
| PS data status      | 0    | 0       | 0 OLD data (data already read), (default)         |
|                     |      |         | 1 NEW data (first time data is read)              |

### PS\_DATA Register (0x92 ~ 0x93) (Read Only)

PS measurement results are stored in PS\_DATA registers.

| Field       | Bits | Default | Description             |
|-------------|------|---------|-------------------------|
| PS_Data LSB | 0x92 | 0       | PS measurement data LSB |
| PS_Data MSB | 0x93 | 0       | PS measurement data MSB |

### SAR\_DATA Register (0x94 ~ 0x95) (Read Only)

ALS\_SAR value and PS\_SAR value are stored in SAR\_DATA register.

| Field  | Bits | Default | Description         |
|--------|------|---------|---------------------|
| PS_SAR | 0x94 | 0000    | 4 bits PS SAR value |

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|         |      |      |                      |
|---------|------|------|----------------------|
| ALS_SAR | 0x95 | 0000 | 4 bits ALS SAR value |
|---------|------|------|----------------------|

### INTERRUPT Register (0x98) (Read/Write)

INTERRUPT register controls the operation of the interrupt pin and functions. The ALS\_PS\_STATUS register is updated even if interrupt pin is INACTIVE / high-impedance state.

| 0x98 | INTERRUPT (default = 0x08) |       |       |       |       |                    |          |                |
|------|----------------------------|-------|-------|-------|-------|--------------------|----------|----------------|
|      | Bit 7                      | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2              | Bit 1    | Bit 0          |
|      | Reserved                   |       |       |       |       | Interrupt Polarity | Reserved | Interrupt Mode |

| Field              | Bits | Default | Description |                                                             |
|--------------------|------|---------|-------------|-------------------------------------------------------------|
| Reserved           | 7:3  | 00001   |             | Must write as 00001                                         |
| Interrupt Polarity | 2    | 0       | 0           | INT pin is considered active when it is a logic 0 (default) |
|                    |      |         | 1           | INT pin is considered active when it is a logic 1           |
| Reserved           | 1    | 0       |             | Must write as 0                                             |
| Interrupt mode     | 0    | 0       | 0           | Interrupt pin is INACTIVE / high impedance state (default)  |
|                    |      |         | 1           | Only PS measurement can trigger interrupt                   |

### INTERRUPT PERSIST Register (0x99) (Read/Write)

INTERRUPT PERSIST register sets the N number of times the measurement is out of the threshold range settings before asserting the INTERRUPT pin.

| 0x98 | INTERRUPT PERSIST (default = 0x00) |       |       |       |          |       |       |       |
|------|------------------------------------|-------|-------|-------|----------|-------|-------|-------|
|      | Bit 7                              | Bit 6 | Bit 5 | Bit 4 | Bit 3    | Bit 2 | Bit 1 | Bit 0 |
|      | PS_PERSIST                         |       |       |       | Reserved |       |       |       |

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| Field      | Bits | Default | Description |                                                  |
|------------|------|---------|-------------|--------------------------------------------------|
| PS_PERSIST | 7:4  | 0       | 0           | Every ALS value out of threshold range (default) |
|            |      |         | 1           | 1 consecutive PS values out of threshold range   |
|            |      |         | .....       | .....                                            |
|            |      |         | 1111        | 15 consecutive PS values out of threshold range  |
| Reserved   | 3:0  | 0       |             | Must write as 0000                               |

### PS\_THRESHOLD Registers (0x9A -0x9D) (Read/Write)

PS\_THRESHOLD registers are used to set the upper and lower limit of the absolute interrupt threshold value.

Interrupt functions compare the value in the PS\_THRESHOLD registers to measured data value in PS\_DATA registers.

The data format for PS\_THRESHOLD must be the same as that of PS\_DATA registers.

For both high and low threshold, LSB must be written first followed by MSB to ensure whole 16 bits are taken effective simultaneously.

| Field        | Bits | Default  | Description |                                         |
|--------------|------|----------|-------------|-----------------------------------------|
| PTH_HIGH LSB | 0x9A | 11111111 | --          | PS upper interrupt threshold value, LSB |
| PTH_HIGH MSB | 0x9B | 11111111 | --          | PS upper interrupt threshold value, MSB |
| PTH_LOW LSB  | 0x9C | 00000000 | --          | PS lower interrupt threshold value, LSB |
| PTH_LOW MSB  | 0x9D | 00000000 | --          | PS lower interrupt threshold value, MSB |

### PS\_OFFSET Register (0x9E -0x9F) (Read/Write)

PS OFFSET registers let user define PS crosstalk of the device. All PS data will be subtracted by this **OFFSET** registers.

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| Field         | Bits | Default | Description          |
|---------------|------|---------|----------------------|
| PS OFFSET LSB | 0x9E | 0       | PS <b>OFFSET</b> LSB |
| PS OFFSET MSB | 0x9F | 0       | PS <b>OFFSET</b> MSB |

### PS\_VREHL Register (0xB6) (Read/Write)

This register control the device fail-safe feature under bright sunlight. Value has direct relation to sunlight brightness level. Recommendation is 0x06 which is equivalent to 50kLUX of sunlight.

| Field    | Bits | Default   | Description             |
|----------|------|-----------|-------------------------|
| Reserved | 7:0  | 0000 1000 | Must write as 0000 0110 |

### External PS SAR Register (0xB7) (Read/Write)

| Field    | Bits | Default   | Description             |
|----------|------|-----------|-------------------------|
| Reserved | 7:0  | 0000 0000 | Must write as 0001 0000 |

## 7. Application Information

### 7.1 ALS Lux Conversion formula

#### 7.1.1 Lux formula for all Gains

Lux\_Calc is the calculated lux reading based on the output ADC from ALS DATA regardless of light sources.

$$Lux = \frac{ALS\_count}{(GAIN \times INT)} \times W_{FAC}$$

Where :



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1. For device under tinted window with coated-ink of flat transmission rate at 400-600nm wavelength, window factor is to compensate light loss due to the lower transmission rate from the coated-ink.
  - a. WFAC = 1 for NO window / clear window glass.
  - b. WFAC >1 device under tinted window glass. Calibrate under white LED.

2. The Gain factors & Integration time factors:

| ALS Gain | GAIN |
|----------|------|
| X1       | 1    |
| X4       | 4    |
| X16      | 16   |
| X64      | 64   |
| X128     | 128  |
| X512     | 512  |

| Integration Time (ms) | INT |
|-----------------------|-----|
| 50                    | 0.5 |
| 100                   | 1   |
| 200                   | 2   |
| 400                   | 4   |

### 7.1.2 Lux formula Gainx1 SAR extension

LTR-568ALS-01 has dynamic extension feature just for Gainx1 by using conversion formula using SAR value read from register <0x95>.

$$\text{DATA} = \text{ALS} + \frac{2^{16}}{\text{SAR\_GAIN} * \text{INT\_TIME} * \text{SAR\_CODE}}$$

SAR\_GAIN = 8

SAR\_CODE = <0x95>

## 7.2 Operating Mode

### Stand-by Mode

The device is by default in stand-by mode after power-up. No measurement activity done in

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either ALS or PS. I2C communication is allowed to be able to read/write to the registers. The device can be reset from MCU by setting appropriate register control (SW reset). Start-up sequence is exactly the same as that when power-on reset is triggered.

### Active Mode

The ALS and PS can simultaneously be in active mode (see Fig 1). Measurement data is expected to be available within a known fixed time (refer to measurement time parameter from ALS and PS specification).

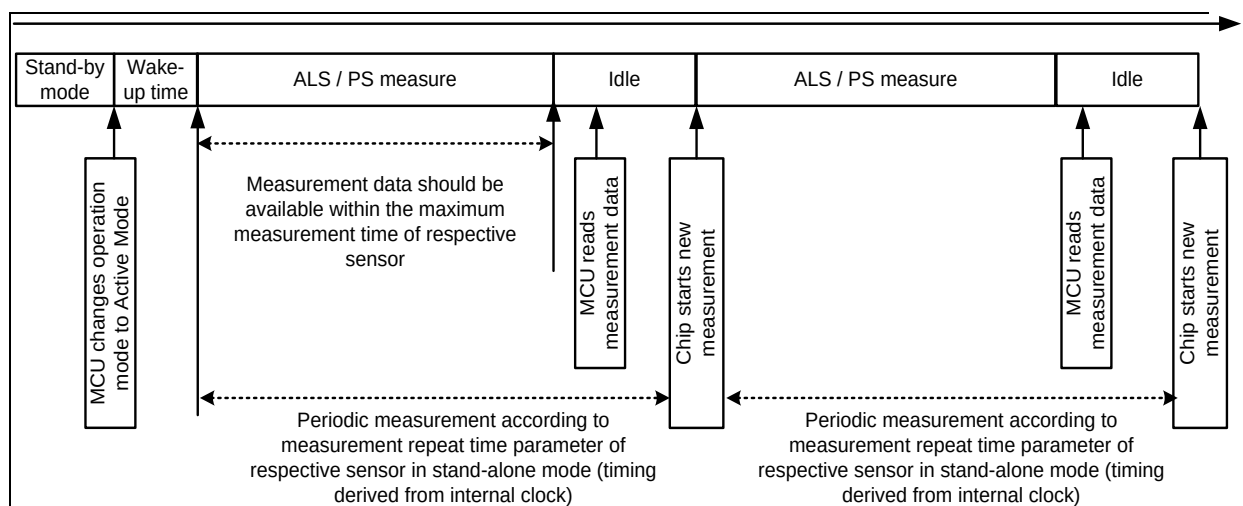


Figure 7.2.1 : ALS and PS measurement sequence

### 7.3 Interrupt Features

The interrupt function is active if ALS new data is updated OR if PS measurements are outside of the upper and lower absolute threshold levels set in the appropriate threshold register. Only newly measured data is compared to the threshold levels set such that old data will not cause triggering of the INT pin if in case the threshold levels are changed in between measurements.

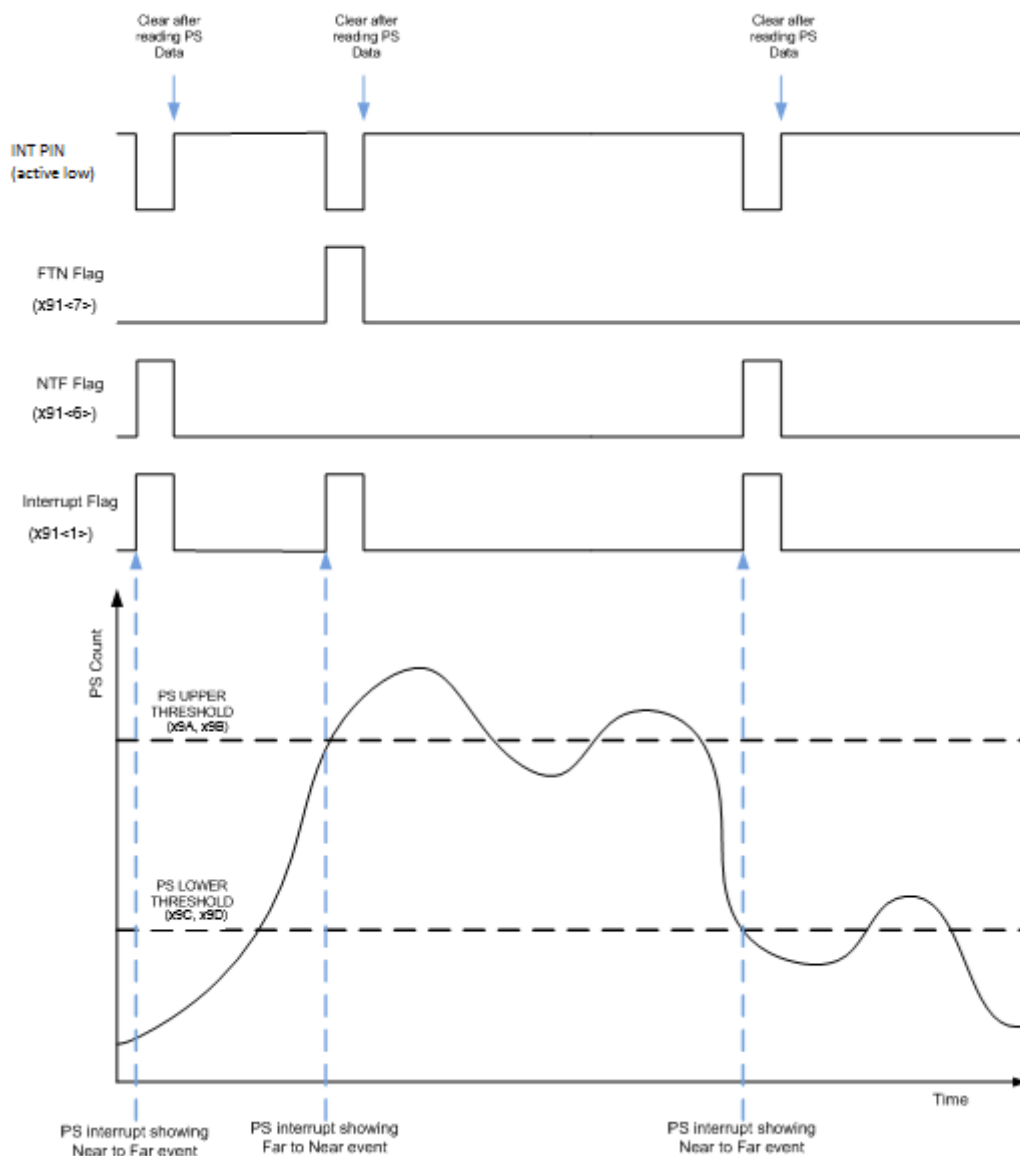
The status of interrupt can be monitored directly through the interrupt (INT) pin or by checking contents of the interrupt register. Interrupt pin can either be enable or disabled. Possible to invert interrupt output of LOW or HIGH state.

Interrupt pin IO requirements are exactly the same as those of the I2C bus pins SDA and SCL.

There are two user selectable type of interrupts, which are window interrupt type & logic interrupt type. Refer to

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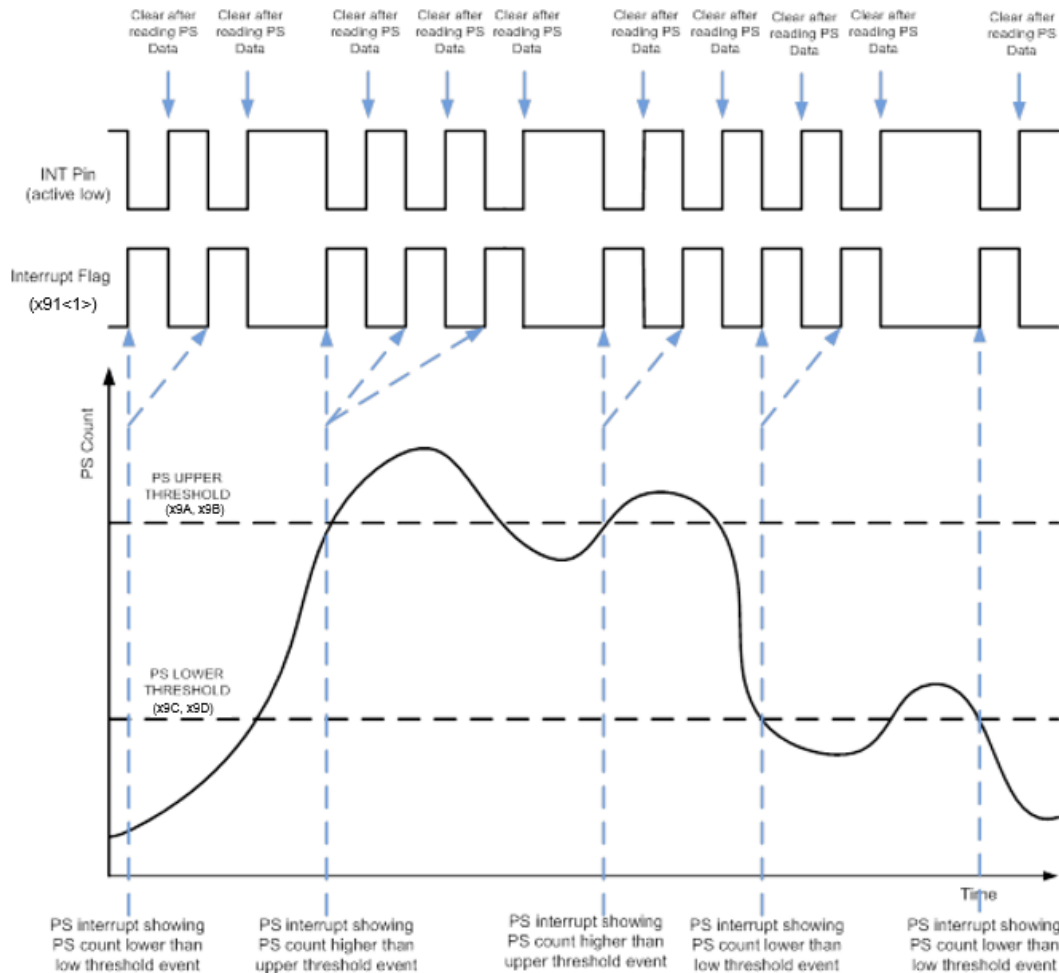
Figure 7.3.1 and 7.3.2 for illustration.



**Figure 7.3.1 : Interrupt illustration on logic type (with NTF/FTN reporting)**

(Logic Mode: activated by control register PS\_CONTR (0x81<2>) and INTERRUPT (0x91<1>))

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**Figure 7.3.2 : Interrupt illustration on window type (by default, without NTF/FTN reporting)**

### 7.4 PS Dynamic Sunlight Saturation (DSS) Detection

The proximity sensor ADC circuit is configured as a coarse “ambient light sensor” briefly before each actual proximity measurement to determine the IR ambient light level. The resolution is about 8KLux/count of direct sunlight. The measured coarse ADC value is reflected in register `0x94<3:0>` (PS\_Sunlight). Register `0xB6<3:0>` (PS\_Sunlight\_Threshold) is used to set the threshold to trigger a Sunlight Saturation condition. If the value of PS\_Sunlight register is above the PS\_Sunlight\_Threshold register, the proximity ADC measurement data reported is masked to zero.

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A proximity Sunlight Saturation status flag 0x91<2> will return a value of 1 if the above condition is met to validate the zero proximity count is due to saturation.

Alternatively, the proximity Sunlight Saturation status flag is also mirrored in 0x93<7>. This register is part of the proximity data registers (0x93 + 0x92).

This method is used to ensure the proximity operation does not become unstable and cause a false detection due to interference caused by very high IR ambient (i.e. under strong sunlight).

The recommended value of 0xB6 = 0x06, which correspond to at least about 50Klux of direct sunlight before Sunlight Saturation is met.

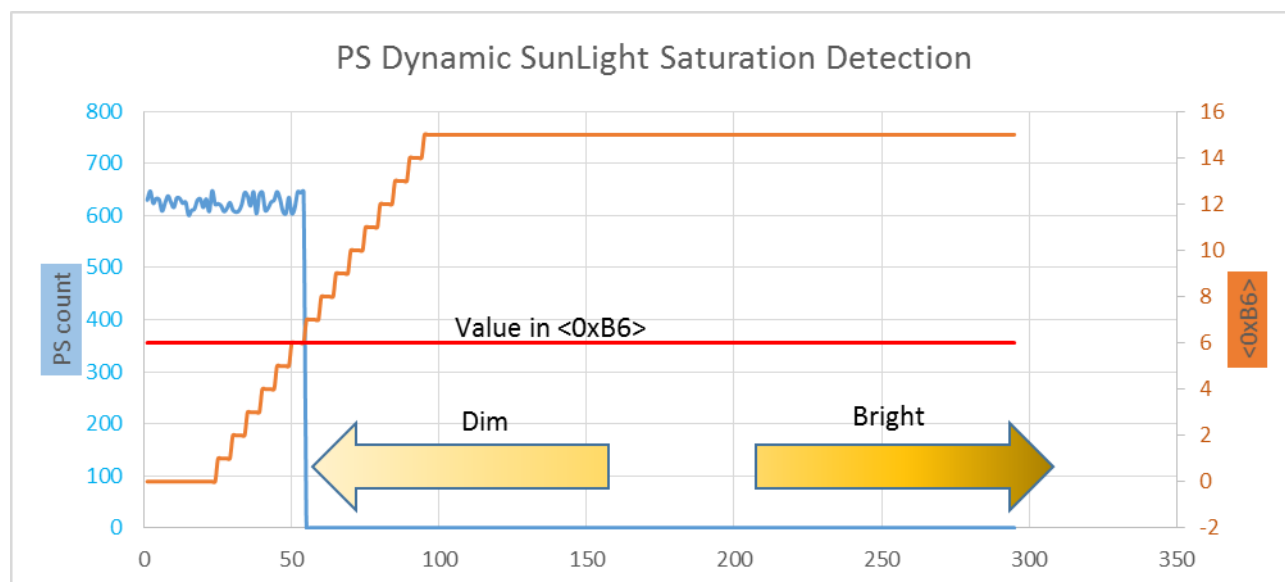
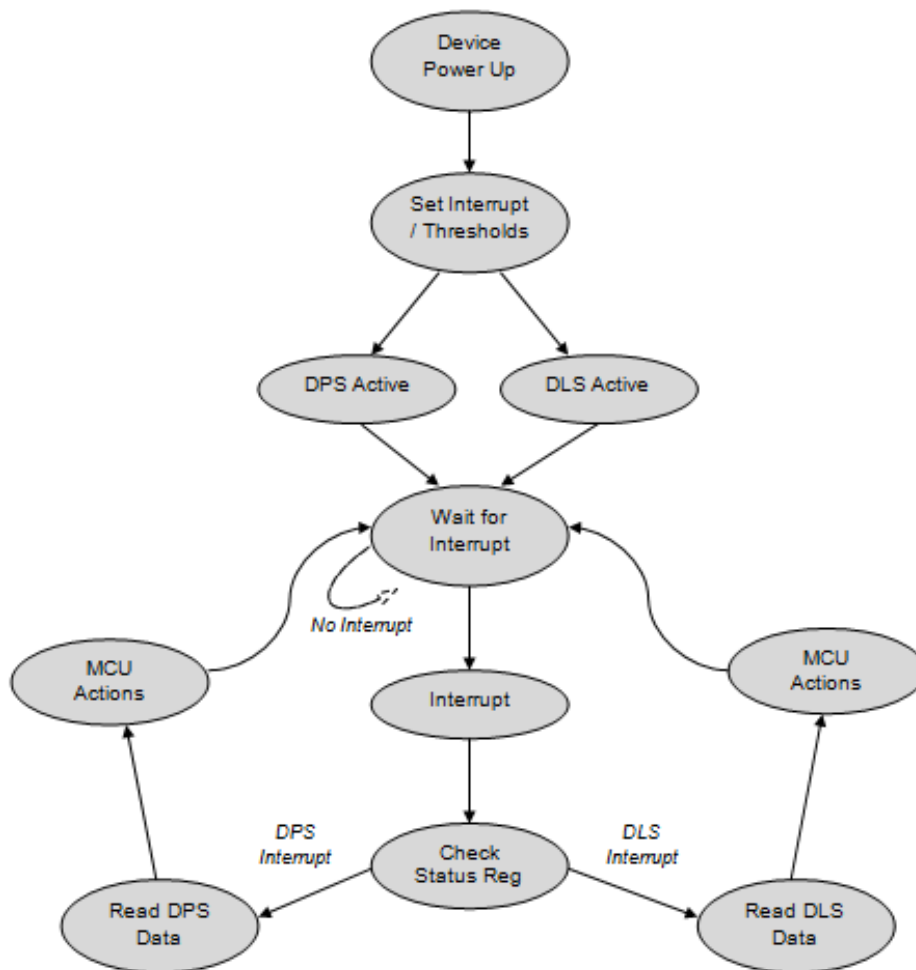


Figure 7.3.3 : DSS feature illustration under sunlight

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Flow diagram below illustrates the operation flow, and involving the use of Thresholds and interrupt.



## 8. Pseudo Codes Examples

### PS LED Registers

// The PS LED Registers define the LED duty, pulse modulation frequency and peak current.

// Default setting is 0x7A (Pulse width 32us, 100mA).

Slave\_Addr = 0x23

// Slave address of LTR-568ALS-01 device

**// Set LED Pulse width 4us (with default peak current 100mA)**

Register\_Addr = 0x82

// PS\_LED register



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```
// For Meas rate = 100ms, Command = 0x04
// For Meas rate = 200ms, Command = 0x05
// For Meas rate = 400ms, Command = 0x06
// For Meas rate = 800ms, Command = 0x07
```

```
WriteByte(Slave_Addr, Register_Addr, Command)
```

### ALS Integration Time

```
// The ALS_INT_TIME register controls the ALS integration time and ALS measurement rate.
// Default setting of the register is 0x06
```

```
Slave_Addr = 0x23 // Slave address of LTR-568ALS-01 device
```

#### // Set ALS integration time 50msec (with default ALS measurement rate 400ms)

```
Register_Addr = 0x85 // ALS_INT_TIME register
Command = 0x02 // Integration time = 50msec
// For Integration time = 100msec, Command = 0x06
// For Integration time = 200msec, Command = 0x0A
// For Integration time = 400msec, Command = 0x0E
```

#### // Set ALS measurement rate 100msec (with default ALS integration time 100ms)

```
Register_Addr = 0x85 // ALS_INT_TIME register
Command = 0x04 // measurement rate = 100msec
// measurement rate = 200msec, Command = 0x05
// measurement rate = 400msec, Command = 0x06
// measurement rate = 800msec, Command = 0x07
```

```
WriteByte(Slave_Addr, Register_Addr, Command)
```

### Interrupt Register

```
// The Interrupt register controls the operation of the interrupt pins and function.
// The default value for this register is 0x08
// The bit7 must be 1.
```

```
Slave_Addr = 0x23 // Slave address of LTR-568ALS-01 device
```

#### // Set INT pin is considered active when it is a logic 1 ( with Interrupt pin is INACTIVE / high impedance state)

```
Register_Addr = 0x98 // INT pin is considered active when it is a logic 1
Command = 0x8C // INT pin is considered active when it is a logic 1=Command 0x8C
// INT pin is considered active when it is a logic 0=Command 0x88
```

#### // Set Only PS measurement can trigger interrupt ( with INT pin is considered active when it is a logic 0)

```
Register_Addr = 0x98 // Only PS measurement can trigger interrupt
Command = 0x89 // Only PS measurement can trigger interrupt =Command 0x89
// Interrupt pin is INACTIVE / high impedance state =Command 0x88
```

```
WriteByte(Slave_Addr, Register_Addr, Command)
```

### Interrupt Persist Register

```
// The Interrupt persist register controls the N number of times the measurement is out of the threshold range settings before asserting the INTERRUPT pin
```



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// The default value for this register is 0x00

Slave\_Addr = 0x23

// Slave address of LTR-568ALS-01 device

### // Set 1 consecutive PS values out of threshold range

Register\_Addr = 0x99

// 1 consecutive PS values out of threshold range

Command = 0x10

// Every PS value out of threshold range =Command 0x00

// 1 consecutive PS values out of threshold range =Command 0x10

// 2 consecutive PS values out of threshold range =Command 0x20

// ....

// 15 consecutive PS values out of threshold range =Command 0xF0

WriteByte(Slave\_Addr, Register\_Addr, Command)

### PS Threshold Registers

// The PS\_THRES\_UP and PS\_THRES\_LOW registers determines the upper and lower limit of the interrupt threshold value.

// Following example illustrates the setting of the PS threshold window of decimal values of 200 (lower threshold) and // 1000 (upper threshold).

Slave\_Addr = 0x23

// Slave address of LTR-568ALS-01 device

### // Upper Threshold Setting (decimal 1000)

PS\_THRES\_UP\_0 = 0xA8

// PS Upper Threshold Low Byte Register address

PS\_THRES\_UP\_1 = 0xA9

// PS Upper Threshold High Byte Register address

Data1 = 1000 >> 8

// To convert decimal 1000 into two eight bytes register values

Data0 = 1000 & 0xFF

WriteByte(Slave\_Addr, PS\_Upp\_Threshold\_Reg\_0, Data0)

WriteByte(Slave\_Addr, PS\_Upp\_Threshold\_Reg\_1, Data1)

### // Lower Threshold Setting (decimal 200)

PS\_THRES\_LOW\_0 = 0xAA

// PS Lower Threshold Low Byte Register address

PS\_THRES\_LOW\_1 = 0xAB

// PS Lower Threshold High Byte Register address

Data1 = 200 >> 8

// To convert decimal 200 into two eight bytes register values

Data0 = 200 & 0xFF

WriteByte(Slave\_Addr, PS\_Low\_Threshold\_Reg\_0, Data0)

WriteByte(Slave\_Addr, PS\_Low\_Threshold\_Reg\_1, Data1)

### PS OFFSET Registers

// PS OFFSET registers let user define PS crosstalk of the device. All PS data will be subtracted by this OFFSET registers.

// Following example illustrates the setting of the PS OFFSET of decimal values of 200

Slave\_Addr = 0x23

// Slave address of LTR-568ALS-01 device

### // PS OFFSET Setting (decimal 200)

PS\_OFFSET\_0 = 0x9E

// PS\_OFFSET Low Byte Register address

PS\_OFFSET\_1 = 0x9F

// PS\_OFFSET High Byte Register address

Data1 = 200 >> 8

// To convert decimal 200 into two eight bytes register values

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```
Data0 = 200 & 0xFF
WriteByte(Slave_Addr, PS_OFFSET_0, Data0)
WriteByte(Slave_Addr, PS_OFFSET_1, Data1)
```

### PS VREHL Register

// This register need to be written 0x05. Default value is 0x08

```
Slave_Addr = 0x23 // Slave address of LTR-568ALS-01 device
Command = 0x05
```

```
WriteByte(Slave_Addr, PS_VREHL, Command)
```

### Control Registers

// The Control Registers define the operating modes and gain settings of the ALS and PS of LTR-568ALS-01.  
 // It is recommended that Control Register for ALS (0x80) and PS (0x81) to be set at the end of the sequence.  
 // This is to ensure all register settings are the same for all started measurement.  
 // Default settings are 0x20 for ALS register and 0x10 for PS register (both in Standby mode after power up).

```
Slave_Addr = 0x23 // Slave address of LTR-568ALS-01 device
```

#### // Enable ALS

```
Register_Addr = 0x80 // ALS_CONTR register
Command = 0x21 // For Dynamic Range x1
// For Dynamic Range x4 , Command = 0x25
// For Dynamic Range x16 , Command = 0x29
// For Dynamic Range x64 , Command = 0x2D
// For Dynamic Range x128 , Command = 0x31
// For Dynamic Range x512, Command = 0x35
```

```
WriteByte(Slave_Addr, Register_Addr, Command)
```

#### // Enable PS

```
Register_Addr = 0x81 // PS_CONTR register
Command = 0x12 // For PS active
```

#### // Enable PS OFFSET

```
Register_Addr = 0x81 // PS_CONTR register
Command = 0x1A // For PS active & enable PS OFFSET
```

#### // Enable FTN/NTF

```
Register_Addr = 0x81 // PS_CONTR register
Command = 0x1E // For PS active & enable FTN/NTF
```

```
WriteByte(Slave_Addr, Register_Addr, Command)
```

### Data Registers (Read Only)

// The ALS and PS Data Registers contain the ADC output data.  
 // These registers should be read as a group, with the lower address being read first.

```
Slave_Addr = 0x23 // Slave address of LTR-568ALS-01 device
```

## OPTICAL SENSOR LTR-568ALS-01

### // Read ALS\_DATA

```
Register_Addr = 0x8B // ALS ADC low byte address
ReadByte(Slave_Addr, Register_Addr, Data0)
Register_Addr = 0x8C // ALS ADC high byte address
ReadByte(Slave_Addr, Register_Addr, Data1)

ALS_ADC_Data = (Data1 << 8) | Data0 // Combining lower and upper bytes to give 16-bit ALS ADC data
                                         (Direct conversion to illuminance in lux).

Slave_Addr = 0x23 // Slave address of LTR-568ALS-01 device
```

### // Read PS\_DATA

```
Register_Addr = 0x92 // PS_DATA low byte address
ReadByte(Slave_Addr, Register_Addr, Data0)
Register_Addr = 0x93 // PS_DATA high byte address
ReadByte(Slave_Addr, Register_Addr, Data1)

PS_ADC_Data = ((Data1 << 8) | Data0) // Combining lower and upper bytes to give 16-bit PS data
```

### ALS Status Register (Read Only)

// The ALS\_STATUS Register contains the information on Interrupt, ALS data gain, validity and status.

```
Slave_Addr = 0x23 // Slave address of LTR-568ALS-01 device

Register_Addr = 0x88 // ALS_STATUS register address
ReadByte(Slave_Addr, Register_Addr, Data)

ALS valid = Data & 0x40 // ALS data valid = 0x80 → ALS data is invalid
                        // ALS data valid = 0x00 → ALS data is valid

ALS Gain Range= Data & 0x38 // Gain Range = 0x00 → Gain x1
                          // Gain Range = 0x08 → Gain x4
                          // Gain Range = 0x10 → Gain x16
                          // Gain Range = 0x18 → Gain x64
                          // Gain Range = 0x20 → Gain x128
                          // Gain Range = 0x28 → Gain x512

ALS Data_Status = Data & 0x01 // NewData_Status = 0x00 → OLD data
                             // NewData_Status = 0x01 → NEW data
```

### PS Status Register (Read Only)

// The PS\_STATUS Register contains the information on Interrupt, NTF/FTN information, ambient saturation and PS status.

```
Slave_Addr = 0x23 // Slave address of LTR-568ALS-01 device

Register_Addr = 0x91 // PS_STATUS register address
ReadByte(Slave_Addr, Register_Addr, Data)

FTN = Data & 0x20 // FTN = 0x20 → FTN detected
```

### OPTICAL SENSOR LTR-568ALS-01

NTF = Data & 0x10

// FTN = 0x00 → No FTN detected  
// NTF = 0x10 → NTF detected  
// NTF = 0x00 → No NTF detected

Ambient Saturation = Data & 0x04

// Ambient Saturation = 0x04 → Ambient Saturation happens  
// Ambient Saturation = 0x00 → No ambient Saturation

PS\_Interrupt\_Status = Data & 0x02

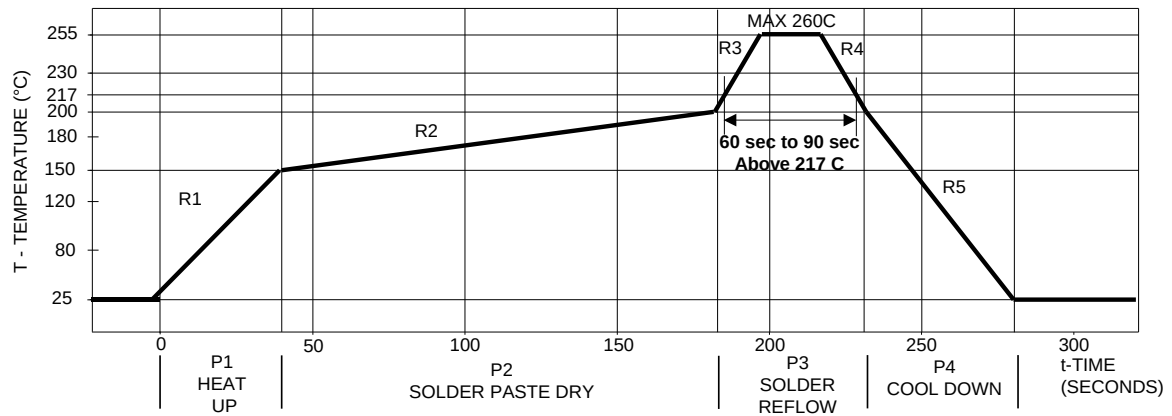
// Interrupt\_Status = 0x02 → PS interrupt is triggered  
// Interrupt\_Status = 0x00 → PS interrupt is not triggered

PS\_Data\_Status = Data & 0x01

// NewData\_Status = 0x00 → OLD data  
// NewData\_Status = 0x01 → NEW data

## OPTICAL SENSOR LTR-568ALS-01

### 9. Recommended Leadfree Reflow Profile



It is recommended to perform reflow soldering no more than twice.

**OPTICAL SENSOR  
LTR-568ALS-01****10. Moisture Proof Packaging**

All LTR-568ALS-01 are shipped in moisture proof package. Once opened, moisture absorption begins. This part is compliant to JEDEC J-STD-033A Level 3.

**10.1 Shelf Life**

Device has the shelf life of 12 months if stored in an unopened moisture proof package. It is recommended to store in following condition.

- Shelf Life : 12 months
- Ambient Temperature : <40°C
- Relative Humidity: <90%

**10.2 Floor Life**

After removal from the moisture barrier bag, the parts should be stored at the recommended storage conditions and soldered within seven days.

- Floor Life : 168 hours
- Ambient Temperature : <30°C
- Relative Humidity: <60%

**10.3 Rebaking information**

When the moisture barrier bag is opened and the parts are exposed to the recommended storage conditions for more than seven days, the parts must be baked before reflow to prevent damage to the parts.

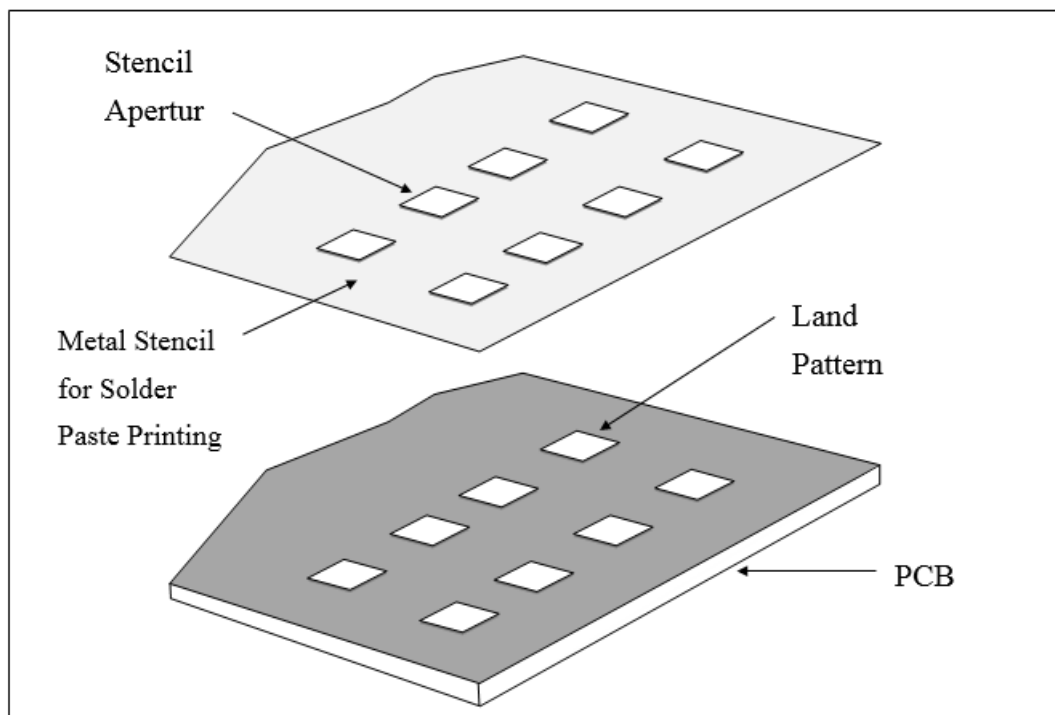
**Baking Conditions**

| Package  | Temperature | Time     |
|----------|-------------|----------|
| In Reels | 60°C        | 48 hours |
| In Bulk  | 100°C       | 4 hours  |

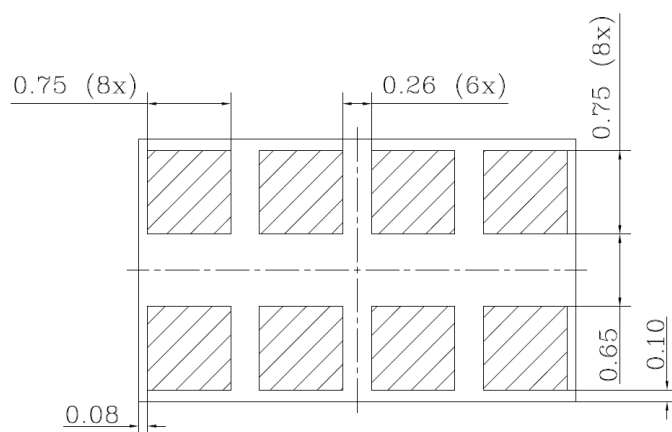
Baking should only be done once.

## OPTICAL SENSOR LTR-568ALS-01

### 11. Recommended Land Pattern and Metal Stencil Aperture



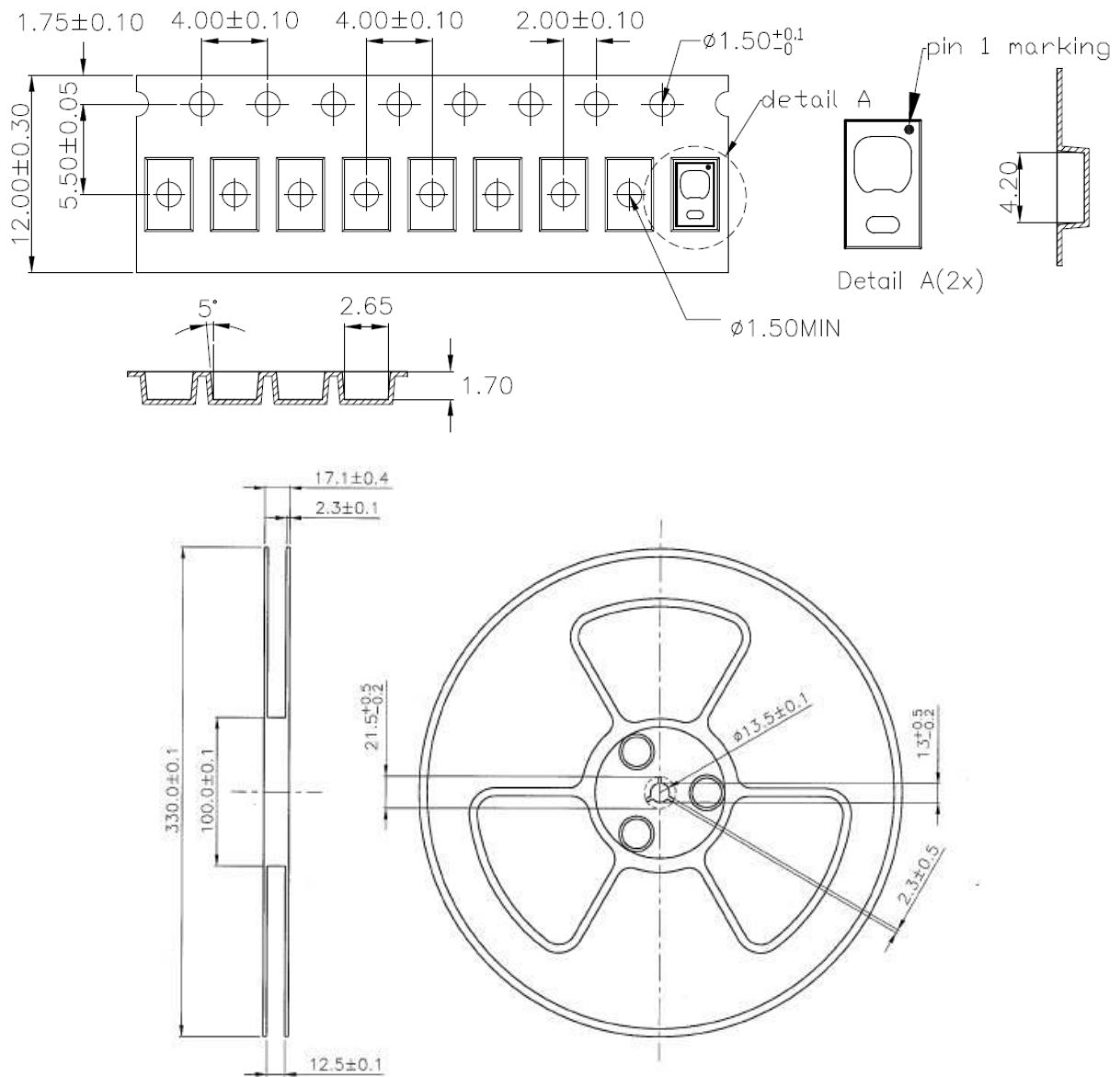
#### Recommended Land Pattern



Note: All dimensions are in millimeters

# OPTICAL SENSOR LTR-568ALS-01

## 12.Package Dimension for Tape and Reel



Notes:

1. All dimensions are in millimeters
2. Empty component pockets sealed with top cover tape
3. 13 inch reel - 8000 pieces per reel
4. In accordance with ANSI/EIA 481-1-A-1994 specifications



**OPTICAL SENSOR  
LTR-568ALS-01**

| Version | Update                     | Page     | Date     |
|---------|----------------------------|----------|----------|
| 1.0     | Final datasheet as created | Total 40 | 06/06/18 |