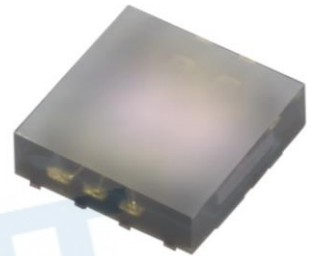


RGBW Color Sensor with I²C Interface EACLSST2020A1

Features

- I²C interface (Fast Speed Mode at 400kHz/s)
- Supply Voltage Range from 2.4V to 3.6V
- I²C BUS Voltage Range from 1.7V to 3.6V
- Operating Temperature Range from -40°C to +65°C
- Support parallel output for (R, G, B, W, IR)
- Up to 16-bit Digital Output (0~65535)
- Programmable Dynamic Range Ratio (x1, x4, x8, x32, x96)
- High resolution (0.002 Lux/count)
- Maximum detection lux (204,679 Lux)
- Programmable integration time
- 50Hz/60Hz flicker noise and IR rejection
- Individual programmable low and high threshold for interrupt function
- The product itself will remain within RoHS compliant version
- Compliance with EU REACH
- Compliance Halogen Free(Br < 900ppm, Cl < 900ppm, Br+Cl < 1500ppm)



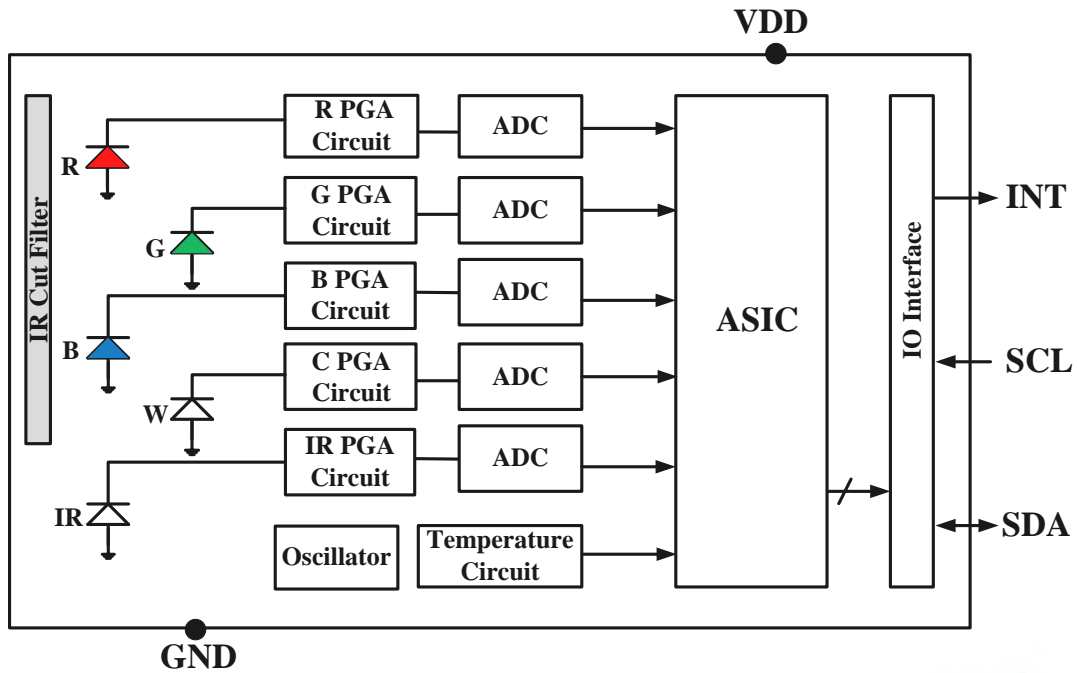
Description

The EACLSST2020A1 is a low power, high sensitivity, Color light sensor with an I²C interface. This color sensor senses red, green, blue, white (RGBW) and infrared light and converts them to digital values. The RGBW sensor is designed to reject IR in light sources allowing the device to operate in environments from sunlight to dark rooms. The integrating ADC rejects 50Hz and 60Hz flicker caused by artificial light sources. A selectable range allows the user to optimize sensitivity suitable for the illuminance and color temperature of ambient light for adjusting LCD backlight of TV, mobile phone and tablet PC. The EACLSST2020A1 supports hardware and software user programmable interrupt thresholds.

Applications

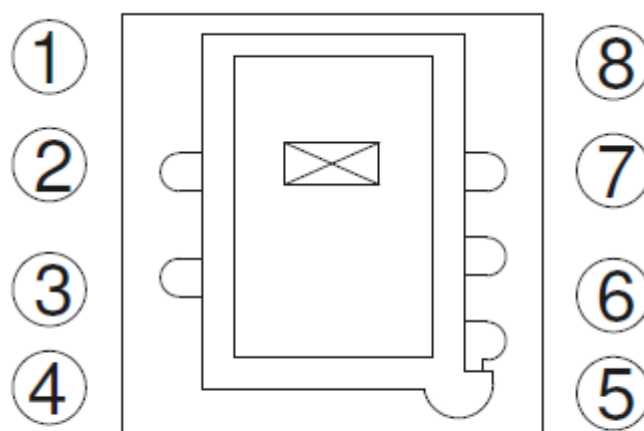
- Detection of ambient for controlling the backlight of TFT LCD display.
- Automatic residential and commercial lighting management.
- Automatic contrast enhancement for electronic signboard.
- Mobile phone, Smart phone, PDA, Tablet PC.

Block Diagram



EVERLIGHT

I/O Pins Configuration



Top view

Pad Description

| Pin | I/O Type | Pin Name | Description |
|-----|----------|----------|------------------------------------|
| 1 | NC | NC | No connection |
| 2 | PWR | VDD | Power supply |
| 3 | GND | GND | Ground |
| 4 | NC | NC | No connection |
| 5 | I | SCL | I ² C serial clock line |
| 6 | I/O | SDA | I ² C serial data line |
| 7 | O | INT | Interrupt pin |
| 8 | NC | NC | No connection |

Direction denotation:

| I/O Type | Dir. | I/O Type | Dir. |
|----------|--------|----------|----------------|
| O | Output | GND | Ground |
| I | Input | I/O | Input / Output |
| PWR | Power | NC | Not Connect |

Absolute Maximum Ratings

| Parameter | Symbol | Rating | Unit |
|----------------------------------|------------------|-------------|------|
| Supply Voltage | V _{DD} | 4.5 | V |
| I ² C Bus Pin Voltage | SCL, SDA, INT | -0.2 to 4.5 | V |
| Operating Temperature | T _{ope} | -40 to +65 | °C |
| Storage Temperature | T _{stg} | -40 to +100 | °C |
| ESD Rating | Human Body Model | 2 | KV |

Note:

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

Recommended Operating Conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Condition |
|---|--|------------------------|------|-----------------|------|------------------------------------|
| Supply Voltage (Note 1) | V _{DD} | 2.4 | - | 3.6 | V | - |
| I ² C Bus Pin Voltage | V _{Bus} | 1.62 | 1.8 | V _{DD} | V | V _{Bus} ≤ V _{DD} |
| Operating Temperature | T _{ope} | -40 | - | +65 | °C | - |
| I ² C Bus Input High Voltage (Note2) | V _{IH_SCL} , V _{IH_SDA} | V _{Bus} × 0.7 | - | - | V | - |
| I ² C Bus Input Low Voltage ^{Note2} | V _{IL_SCL} , V _{IL_SDA} | - | - | 0.5 | V | - |

Notes:

- The power supply need to make sure the V_{DD} slew rate at least 1.0V/ms. EACLSST2020A1 has a power on reset function. When V_{DD} drops below 2V at room temp, the IC will be reset automatically. After power back up at the required slew rate, the I²C registers need to be set again to the required values.
- The specs are defined under V_{DD}=3.3V, T_a=25°C

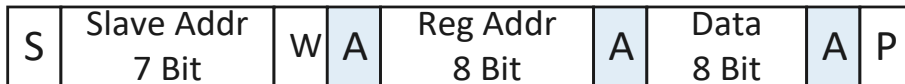
Electro-Optical Characteristics (V_{DD}=3.3V, T_a = 25°C)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Condition |
|---------------------------------|---------------------|-------|------|-------|----------|--|
| Supply Current | I _{DD} | - | 210 | - | μA | E _V = 0 lx (Note 1) |
| | I _{PD} | - | 2.5 | - | μA | Sleep mode E _V = 0 lx I ² C inactive |
| A/DC resolution | - | 10 | - | 16 | bit | - |
| ADC integration time | T _{INT} | 2.067 | - | 2116 | ms | INT_TIME x CLSCONV |
| Sensing Area | DIOD_SELT | 1 | - | 2 | - | - |
| Full ADC counts value | - | 1023 | - | 65535 | counts | - |
| Dark ADC Count | RCH | 0 | 1 | 3 | counts | E _V = 0 lx (Note 2) |
| | GCH | | | | | |
| | BCH | | | | | |
| | WCH | | | | | |
| Irradiance response | RCH | - | 1500 | - | counts | λ _P =632 nm LED (Note 3,5) |
| | GCH | - | 3300 | - | counts | λ _P =518 nm LED (Note 3,6) |
| | BCH | - | 2100 | - | counts | λ _P =468 nm LED (Note 3,7) |
| CLS detection resolution | - | - | - | 0.002 | lx/count | White LED 6500K (Note 2) |
| CLS maximum detection intensity | - | - | - | 204K | Lux | White LED 6500K (Note 4) |
| Peak sensitivity wavelength | λ _{PRed} | - | 610 | - | - | - |
| | λ _{PGreen} | - | 550 | - | nm | - |
| | λ _{PBlue} | - | 470 | - | - | - |

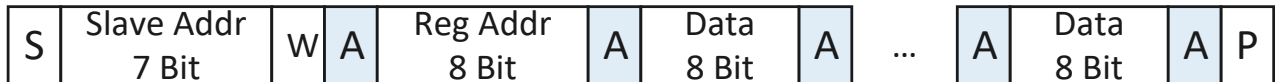
Note :

1. The testing condition: EN_CLS=1, DIOD_SELT=2, PGA_CLS=x4, INT_TIME=64 T, CLSCONV=1 INT_TIME
2. The testing condition: EN_CLS=1, DIOD_SELT=2, PGA_CLS=x96, INT_TIME=64 T, CLSCONV=16 INT_TIME
3. The testing condition: EN_CLS=1, DIOD_SELT=2, PGA_CLS=x96, INT_TIME=16 T, CLSCONV=6 INT_TIME
4. The testing condition: EN_CLS=1, DIOD_SELT=1, PGA_CLS=x1, INT_TIME=1 T, CLSCONV=1 INT_TIME
5. Red LED is used as optical source. (I_e = 20 μW/cm²)
6. Green LED is used as optical source. (I_e = 20 μW/cm²)
7. Blue LED is used as optical source. (I_e = 20 μW/cm²)

I2C Write Format



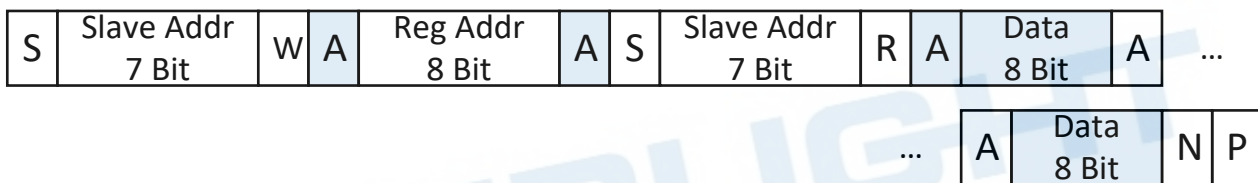
I2C Block Write Format



I2C Read Format



I2C Block Read Format



| | | | | |
|--------------------------|-----------------|--------------------------|---|-------------------------------------|
| <input type="checkbox"/> | Master to Slave | <input type="checkbox"/> | S | Start Condition, 1 Bit |
| <input type="checkbox"/> | Slave to Master | <input type="checkbox"/> | P | Stop Condition, 1 Bit |
| <input type="checkbox"/> | | <input type="checkbox"/> | W | Write, Set 0 for write, 1 Bit |
| <input type="checkbox"/> | | <input type="checkbox"/> | R | Read, Set 1 for read, 1 Bit |
| <input type="checkbox"/> | | <input type="checkbox"/> | A | Acknowledge(ACK), Set 0, 1 Bit |
| <input type="checkbox"/> | | <input type="checkbox"/> | N | Non acknowledge(NACK), Set 1, 1 Bit |

I2C Slave Address and R/W bit

This address is seven bits long followed by an eighth bit which is a data direction bit (R/W). A '0' indicates a transmission (WRITE), a '1' indicates a request for data (READ). The slave address of this device is 0x38.

Register Set

The EACLSST2020A1 is operated over the I²C bus with registers that contain configuration, status, and result information. All registers are 8 bits long.

| Address | Name | Type | Default value | Description |
|---------|--------------|------|---------------|--|
| 0x00 | SYSM_CTRL | RW | 0x00 | CLS operation mode control, waiting mode control, SW reset |
| 0x01 | INT_CTRL | RW | 0x03 | Interrupt pin control, interrupt persist control |
| 0x02 | INT_FLAG | RW | 0x00 | Interrupt flag, error flag, power on reset(POR) flag |
| 0x03 | WAIT_TIME | RW | 0x00 | Waiting time setting |
| 0x04 | CLS_GAIN | RW | 0x00 | CLS analog gain setting |
| 0x05 | CLS_TIME | RW | 0x00 | CLS integrated time setting |
| 0x0B | PERSISTENCE | RW | 0x11 | CLS persistence setting |
| 0x0C | CLS_THRES_LL | RW | 0x00 | CLS lower interrupt threshold - LSB |
| 0x0D | CLS_THRES_LH | RW | 0x00 | CLS lower interrupt threshold - MSB |
| 0x0E | CLS_THRES_HL | RW | 0xFF | CLS higher interrupt threshold - LSB |
| 0x0F | CLS_THRES_HH | RW | 0xFF | CLS higher interrupt threshold - MSB |
| 0x16 | INT_SOURCE | RW | 0x08 | CLS interrupt source |
| 0x17 | ERROR_FLAG | RW | 0x00 | Error flag |
| 0x1C | RCH_DATA_L | R | 0x00 | RCH output data - LSB |
| 0x1D | RCH_DATA_H | R | 0x00 | RCH output data - MSB |
| 0x1E | GCH_DATA_L | R | 0x00 | GCH output data - LSB |
| 0x1F | GCH_DATA_H | R | 0x00 | GCH output data - MSB |
| 0x20 | BCH_DATA_L | R | 0x00 | BCH output data - LSB |
| 0x21 | BCH_DATA_H | R | 0x00 | BCH output data - MSB |
| 0x22 | WCH_DATA_L | R | 0x00 | WCH output data - LSB |
| 0x23 | WCH_DATA_H | R | 0x00 | WCH output data - MSB |
| 0x24 | IRCH_DATA_L | R | 0x00 | IRCH output data - LSB |
| 0x25 | IRCH_DATA_H | R | 0x00 | IRCH output data - MSB |
| 0xBC | PROD_ID_L | R | 0x12 | Product ID - LSB |
| 0xBD | PROD_ID_H | R | 0x07 | Product ID - MSB |

SYSM_CTRL

| 0x00 | SYSM_CTRL, System Control (Default = 0x00) | | | | | | | |
|------|--|---------|---|---|---|---|-------|--------|
| BIT | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| R/W | SWRST | EN_WAIT | 0 | 0 | 0 | 0 | EN_IR | EN_CLS |

SWRST : Software reset. Reset all register to default value.

0: (Default)

1: Reset will be triggered.

EN_WAIT : Waiting time will be inserted between two measurements.

0: Disable waiting function. (Default)

1: Enable waiting function.

EN_IR : Enables IR function.

0: Disable IR function. (Default)

1: Enable IR function.

EN_CLS : Enables CLS function.

0: Disable CLS function. (Default)

1: Enable CLS function.

INT_CTRL

| 0x01 | Interrupt Pin Control (Default = 0x01) | | | | | | | |
|------|--|---|---|----------|---|---|---|---------|
| BIT | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| R/W | 0 | 0 | 0 | CLS_SYNC | 0 | 0 | 0 | EN_CINT |

CLS_SYNC : Measurement is pended when CLS interrupt is triggered. Until clear the interrupt then start the next measurement.

0: Disable pending CLS function. (Default)

1: Enable pending CLS function.

EN_CINT : The CLS interrupt (INT_CLS) flag can trigger the INT pin to low.

0: Disable **INT_CLS** effect INT pin.

1: Enable **INT_CLS** effect INT pin. (Default)

INT_FLAG

| 0x02 | INT_FLAG, System Control (Default = 0x00) | | | | | | | |
|------|---|-----------|---|---|---|---|---|---------|
| BIT | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| R/W | INT_POR | DATA_FLAG | 0 | 0 | 0 | 0 | 0 | INT_CLS |

INT_POR : Power-On-Reset Interrupt flag trigger the INT pin when the flag sets to one. Write zero to clear the flag.

0: Clear the flag

1: This bit will be set to one when it satisfy one of the following conditions:

- Power On
- VDD < 2.0V
- SWRST

DATA_FLAG : It shows if any data is invalid after completion of each conversion cycle. This bit is read-only.

0: data valid.

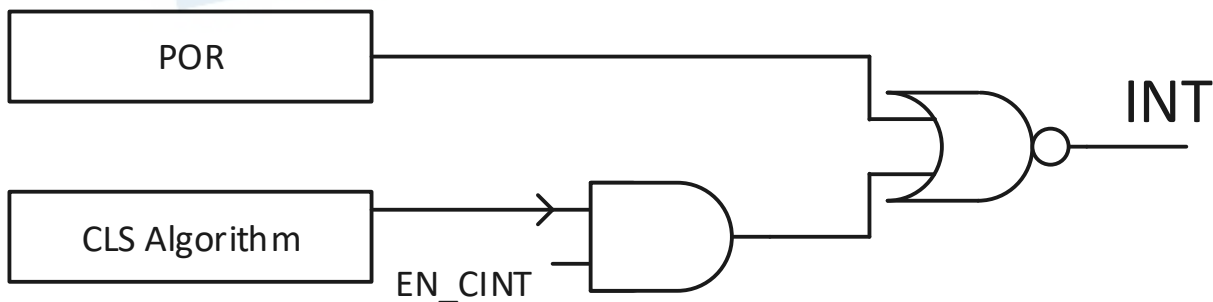
1: data invalid.

INT_CLS : CLS Interrupt flag. It correlation with sensor data and CLS high/low threshold. Write zero to clear the flag.

0: CLS Interrupt not trigger or be cleared.

1: CLS interrupt triggered

Interrupt Behavior:



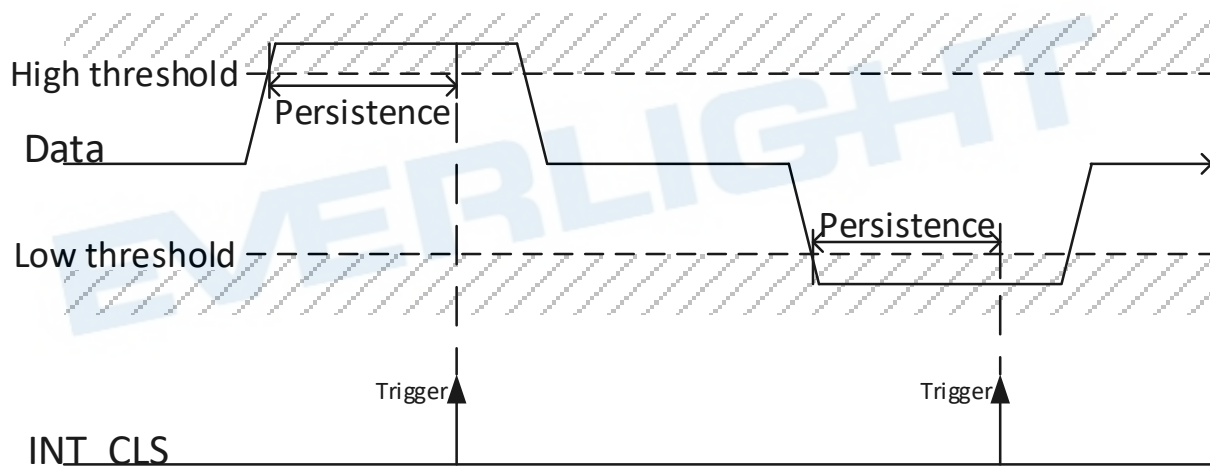
CLS Interrupt Algorithm

Correlative register:

- The CLS Interrupt (**INT_CLS**, register 0x02, bit0).
- The CLS Persistence (**PRS_CLS**, register 0x0B, bit0 to bit3),
- The CLS Data (**W channel data**, register 0x22 to 0x23),
- The CLS Low Threshold (**CLS_THRES_L**, register 0x0C to 0x0D),
- The CLS High Threshold (**CLS_THRES_H**, register 0x0E to 0x0F).

INT_CLS triggered condition:

- Rule of active interrupt: **DATA > CLS_THRES_H** or **DATA < CLS_THRES_L**.
- If the **DATA** meets the rule, the **interrupt** count increases one.
If the **DATA** fails in the rule, the interrupt count will be clear.
- When the **interrupt** count equal to **PRS_CLS setting**, **INT_CLS** will be triggered and reset the interrupt counter.
- If **PRS_CLS** is set to zero, **threshold** will be ignored and **DATA** will meet the active interrupt rule forcibly.



WAIT_TIME

| 0x03 | WAIT_TIME, waiting time (Default = 0x00) | | | | | | | |
|------|--|---|---|---|---|---|---|---|
| BIT | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| R/W | WTIME | | | | | | | |

WTIME : This register controls the time unit of waiting state which is inserted between two measurements.

It is 10 ms per time unit.

0x00: 1 time unit.

0x01: 2 time units

.....

0xFF: 256 time units

CLS_GAIN

| 0x04 | CLS_GAIN, CLS analog gain (Default = 0x81) | | | | | | | |
|------|--|---|---|---------|---|---|---|---|
| BIT | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| R/W | DIOD_SE LT | 0 | 0 | PGA_CLS | | | | |

DIOD SELT : CLS sensor area select.

0: x1

1: x2 (default)

PGA_CLS : CLS sensing gain.

0x01: x1 (default)

0x02: x4

0x04: x8

0x08: x32

0x10: x96

CLS_TIME

| 0x05 | CLS_TIME, CLS integrated time (Default = 0x03) | | | | | | | |
|------|--|---|---|---|---|---|----------|---|
| BIT | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| R/W | CLSCONV | | | | 0 | 0 | INT_TIME | |

CLSCONV: This register controls the conversion time of AD converter at CLS mode (T_{CLS}), and the resolution of output data.

0x0: The maximum count of **output data** is 1023, $T_{CLS} = 1 \text{ INT_TIME}$ (default)

0x1: The maximum count of **output data** is 2047, $T_{CLS} = 2 \text{ INT_TIME}$

.....

0xf: The maximum count of **output data** is 16384, $T_{CLS} = 16 \text{ INT_TIME}$

INT_TIME: This register controls the integrated time.

0x0: 1 INT_TIME (T) = 2.0667 ms.

0x1: 4 INT_TIME (4T) = 8.2668 ms.

0x2: 16 INT_TIME (16T) = 33.0672 ms.

0x3: 64 INT_TIME (64T) = 132.2688 ms.

The conversion time of CLS function (T_{CLS}) is decided by **CLSCONV** and **INT_TIME**.

$T_{CLS} = 3.827 + [\text{INT_TIME} \times (\text{CLSCONV} + 1)]$ (ms)

EX :

Setting INT_TIME = 0x01 (4T UNIT) and CLSCONV = 0x01

The maximum count of **output data** is minimum of

$[1024 \times [\text{INT_TIME} \times (\text{CLSCONV} + 1)] - 1, 65535]$

$= [1024 \times [4 \times (1+1)] - 1, 65535]$.

PERSISTENCE

| 0x0B | PERSISTENCE, CLS persistence setting (Default = 0x00) | | | | | | | |
|------|---|---|---|---|---------|---|---|---|
| BIT | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| R/W | 0 | 0 | 0 | 0 | PRS_CLS | | | |

PRS_CLS: This register sets the number of similar consecutive CLS interrupt events before the interrupt pin is triggered.

0x0: interrupt always on independent from CLS values, don't use.

0x1: if one single CLS value fulfills the interrupt condition an interrupt will be triggered

.....

0xf: 15 consecutive CLS values must fulfill the interrupt condition to trigger an interrupt

CLS_THRES_L

| 0x0C 0x0D | CLS_THRES_L, CLS low interrupt threshold (Default = 0x0000) | | | | | | | |
|--------------|---|---|---|---|---|---|---|---|
| BIT | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| R/W | CLS_THRE_LL | | | | | | | |
| R/W | CLS_THRE_LH | | | | | | | |

This register sets the lower threshold value of CLS interrupt. The interrupt algorithm compares the selected CLS data and CLS threshold value.

CLS_THRE_LL : CLS lower interrupt threshold value, LSB. (Reg. 0x0C)

CLS_THRE_LH : CLS lower interrupt threshold value, MSB. (Reg. 0x0D)

CLS_THRES_H

| 0x0E 0x0F | CLS_THRES_H, CLS high interrupt threshold (Default = 0xFFFF) | | | | | | | |
|--------------|--|---|---|---|---|---|---|---|
| BIT | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| R/W | CLS_THRE_HL | | | | | | | |
| R/W | CLS_THRE_HH | | | | | | | |

This register sets the high threshold value of CLS interrupt. The interrupt algorithm compares the selected CLS data and CLS threshold value.

CLS_THRE_HL : CLS high interrupt threshold value, LSB. (Reg. 0x0E)

CLS_THRE_HH : CLS high interrupt threshold value, MSB. (Reg. 0x0F)

INT_SOURCE

| 0x16 | INT_SOURCE, CLS interrupt source (Default = 0x08) | | | | | | | | |
|------|---|---|---|---------|---|---|---|---|--|
| BIT | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| R/W | 0 | 0 | 0 | INT_SRC | | | | | |

INT_SRC : This register sets to select the CLS data for the CLS Interrupt algorithm.

0x01: Select RCH_DATA.

0x02: Select GCH_DATA.

0x04: Select BCH_DATA.

0x08: Select WCH_DATA. (default)

0x10: Select IRCH_DATA.

ERROR_FLAG

| 0x17 | ERROR_FLAG, Error flag status | | | | | | | |
|------|-------------------------------|---|---|----------|---------|---------|---------|---------|
| BIT | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| R/W | 0 | 0 | 0 | ERR_IRCH | ERR_WCH | ERR_BCH | ERR_GCH | ERR_RCH |

This register indicates the CLS data status. If the CLS data is outside of measurable range, the corresponding error flag (ERR_RCH, ERR_GCH, ERR_BCH, ERR_WCH, and ERR_IRCH) will set to one. That also means the data is invalid.

RCH_DATA

| 0x1C 0x1D | RCH_DATA, R channel output data. | | | | | | | |
|--------------|----------------------------------|---|---|---|---|---|---|---|
| BIT | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| R/W | RCH_DATA_L | | | | | | | |
| R/W | RCH_DATA_H | | | | | | | |

The R channel conversion result is written into RCH_DATA when CLS conversion is done.

For insuring the data in the register comes the same measurement, the high byte data will be latched when the low byte data has being accessed until the high byte data has been read.

GCH_DATA

| 0x1E 0x1F | GCH_DATA, G channel output data. | | | | | | | |
|--------------|----------------------------------|---|---|---|---|---|---|---|
| BIT | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| R/W | GCH_DATA_L | | | | | | | |
| R/W | GCH_DATA_H | | | | | | | |

The G channel sensor result is written into GCH_DATA when CLS conversion is done.

For insuring the data in the register comes the same measurement, the high byte data will be latched when the low byte data has being accessed until the high byte data has been read.

BCH_DATA

| | | | | | | | | |
|----------------------------|---|---|---|---|---|---|---|---|
| 0x20 0x21 | BCH_DATA, B channel output data. | | | | | | | |
| BIT | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| R/W | BCH_DATA_L | | | | | | | |
| R/W | BCH_DATA_H | | | | | | | |

The B channel sensor result is written into BCH_DATA when CLS conversion is done.

For insuring the data in the register comes the same measurement, the high byte data will be latched when the low byte data has being accessed until the high byte data has been read.

WCH_DATA

| | | | | | | | | |
|----------------------------|---|---|---|---|---|---|---|---|
| 0x22 0x23 | WCH_DATA, W channel output data. | | | | | | | |
| BIT | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| R/W | WCH_DATA_L | | | | | | | |
| R/W | WCH_DATA_H | | | | | | | |

The W channel sensor result is written into WCH_DATA when CLS conversion is done.

For insuring the data in the register comes the same measurement, the high byte data will be latched when the low byte data has being accessed until the high byte data has been read.

IRCH_DATA

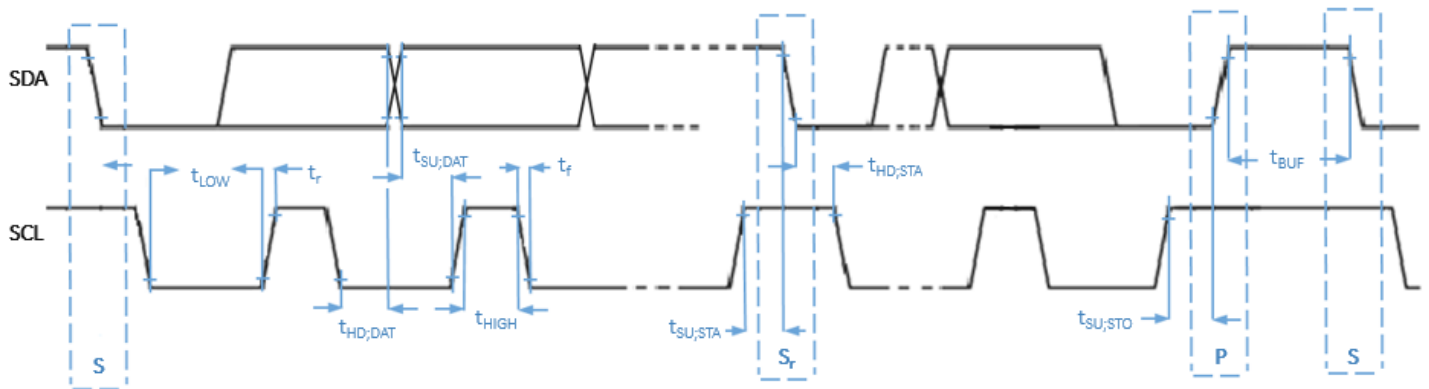
| | | | | | | | | |
|----------------------------|---|---|---|---|---|---|---|---|
| 0x24 0x25 | IRCH_DATA, IR channel output data. | | | | | | | |
| BIT | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| R/W | IRCH_DATA_L | | | | | | | |
| R/W | IRCH_DATA_H | | | | | | | |

The IR channel sensor result is written into IRCH_DATA when CLS conversion is done.

For insuring the data in the register comes the same measurement, the high byte data will be latched when the low byte data has being accessed until the high byte data has been read.

I²C Interface Timing Characteristics

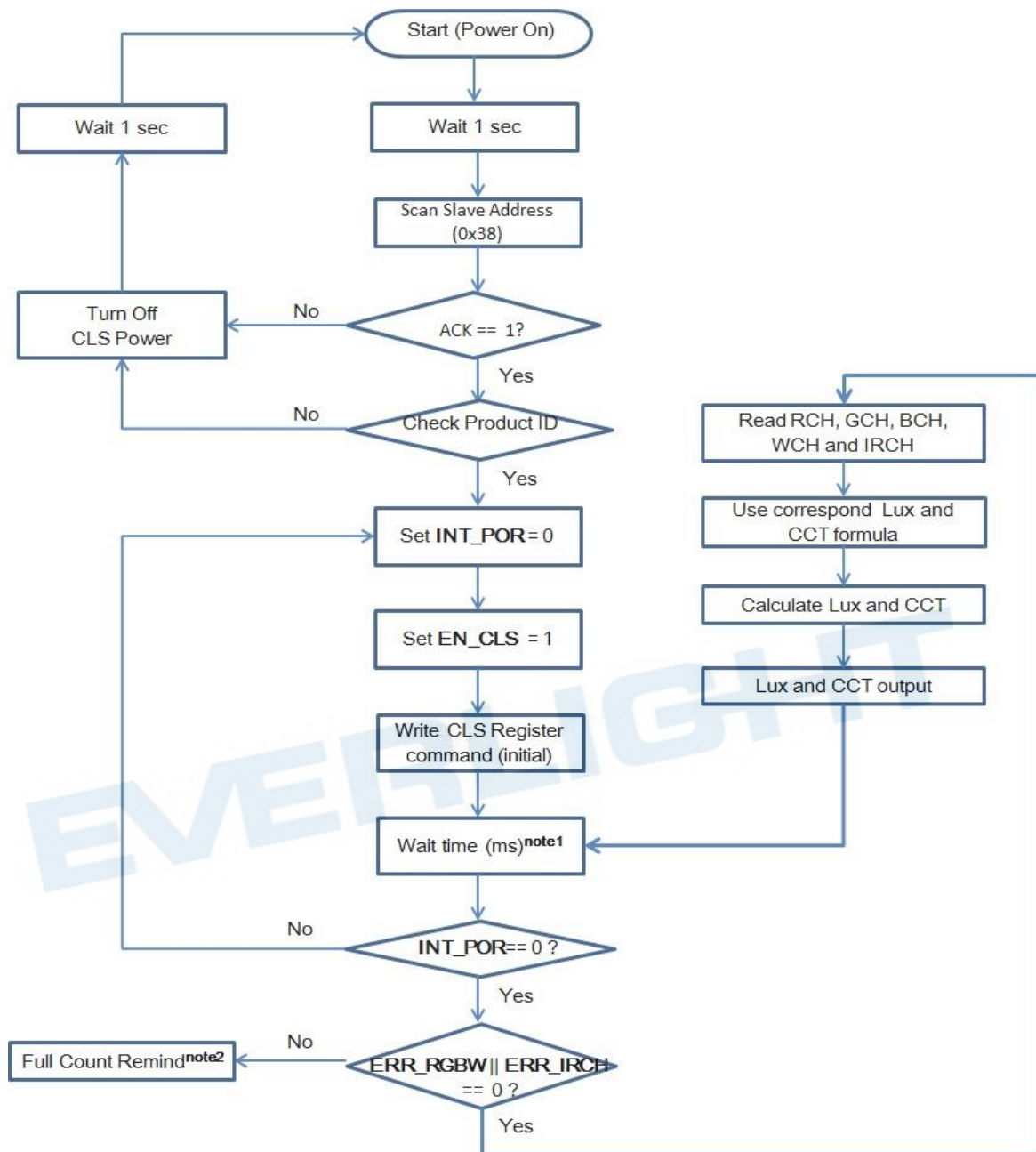
This section will describe the protocol of the I²C bus. For more details and timing diagrams please refer to the I²C specification.



| Parameter (*) | Symbol | I ² C Standard Mode | | I ² C Fast Mode | | Unit |
|--|---------------------|--------------------------------|------|----------------------------|------|------|
| | | Min. | Max. | Min. | Max. | |
| SCL clock frequency | f _{SCL} | 0 | 100 | 0 | 400 | kHz |
| Hold time (repeated) START condition | t _{HD;STA} | 4 | -- | 0.6 | -- | μs |
| Set-up time (repeated) START condition | t _{SU;STA} | 4.7 | -- | 0.6 | -- | μs |
| LOW period of the SCL clock | t _{LOW} | 4.7 | -- | 1.3 | -- | μs |
| HIGH period of the SCL clock | t _{HIGH} | 4 | -- | 0.6 | -- | μs |
| Data hold time | t _{HD;DAT} | 0 | 3.45 | 0 | 0.9 | μs |
| Data set-up time | t _{SU;DAT} | 250 | -- | 100 | -- | ns |
| Rise time of both SDA and SCL signals | t _(r) | -- | 1000 | 20 | 300 | ns |
| Fall time of both SDA and SCL signals | t _(f) | -- | 300 | -- | 300 | ns |
| Set-up time for STOP condition | t _{SU;STO} | 4 | -- | 0.6 | -- | μs |
| Bus free time between STOP condition and START condition | t _{BUF} | 4.7 | -- | 1.3 | -- | μs |

(*) All specifications are at V_{Bus} = 3.3V, T_{ope}=25°C, unless otherwise noted. Specified by design and characterization; not production tested.

Basic Operation Flow Chart



Notes:

1. The wait time need to be longer than WAIT_TIME + CLS_TIME (ms).
2. ERR_RCH || ERR_GCH || ERR_BCH || ERR_WCH || ERR_IRCH ==1 means CLS data is outside of measurable range.

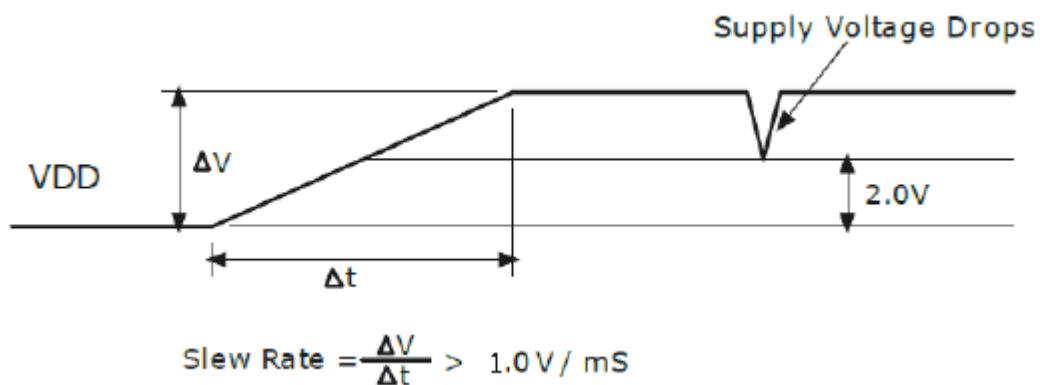
Next steps can be decided by costumer, such as:

- Ignore the reminder and continue reading RCH、GCH、BCH、WCH & IRCH.
- Send an error message to MCU and wait for next command.
- Other error handling actions.

Supply Voltage Drops

Upon power-up, a slew rate of VDD greater than 1.0 V/ms must be ensured.

The supply voltage shall NOT drop below 2.0V after power up. If the voltage dropped below 2V after power up, the supply voltage must be turned off for at least one second before powering up the device again.



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Note:

I²C Bus Clear

In the unlikely event where the clock (SCL) is stuck LOW, the preferential procedure is to reset the bus using the HW reset signal if your I2C devices have HW reset inputs. If the I2C devices do not have HW reset inputs, cycle power to the devices to activate the mandatory Internal Power-On Reset (POR) circuit.

If the data line (SDA) is stuck LOW, the master should send nine clock pulses. The device that held the bus LOW should release it within those nine clock cycles.

I²C General Call Software Reset

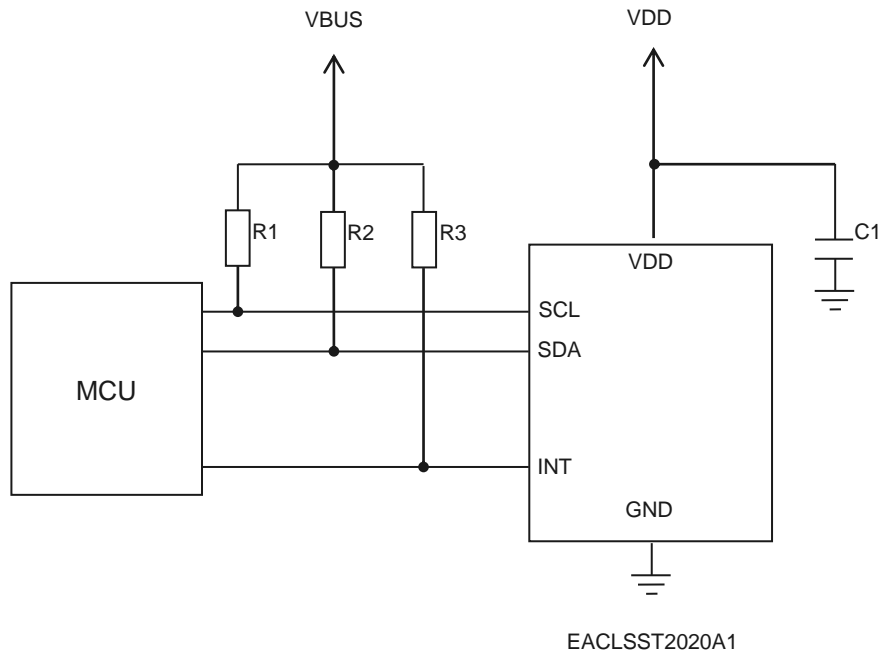
Following a General Call, (0000 0000), sending 0000 0110 (06h) as the second byte causes software reset.

This feature is optional and not all devices will respond to this command. On receiving this 2-byte sequence, all devices designed to respond to the general call address will reset and take in the programmable part of their address.

Precautions have to be taken to ensure that a device is not pulling down the SDA or SCL line after applying the supply voltage, since these low levels would block the bus.

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Typical Application Circuit



The capacitor C1 is required for sensor power supply. The capacitor should be placed as close as possible to the VDD pin. The high frequency AC noises can be shunted to the ground by the capacitors. The transient current caused by digital circuit switching also can be handled by the capacitors. A typical value of 0.1 μ F can be used. The capacitor must be a ceramic capacitor. When choosing the capacitor temperature effects and capacitance change over voltage must be considered.

The pull-up resistors (R1, R2) are required for I²C communication. At fast speed mode (400kHz/s) and VBUS = 3V, the resistor values must not be lower than 1k Ω . Higher values can be used, but might cause too slow rise/fall times in case of high parasitic capacitances of the I2C bus. The pull-up resistor (R3) is also required for the interrupt, a typical value between 10k Ω and 100k Ω can be used.

Electrical and Optical Characteristics (T_a=25°C)

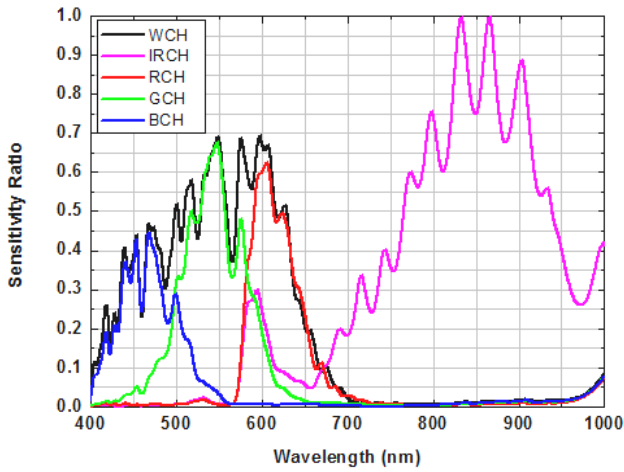


Fig.1 Spectral vs. Wavelength

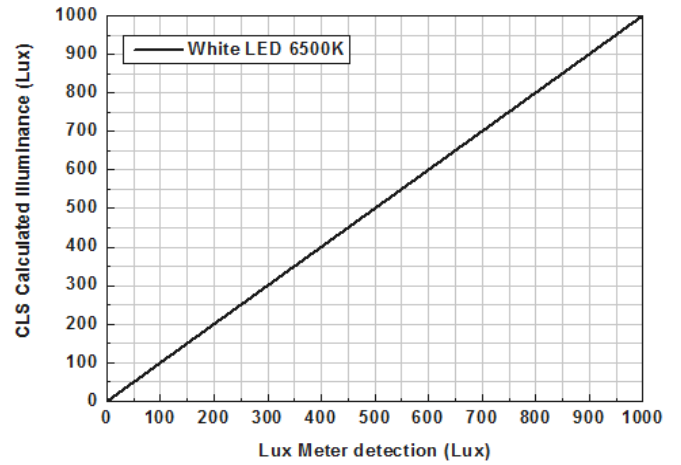


Fig.2 CLS sensor Lux vs. Meter Lux (White LED)

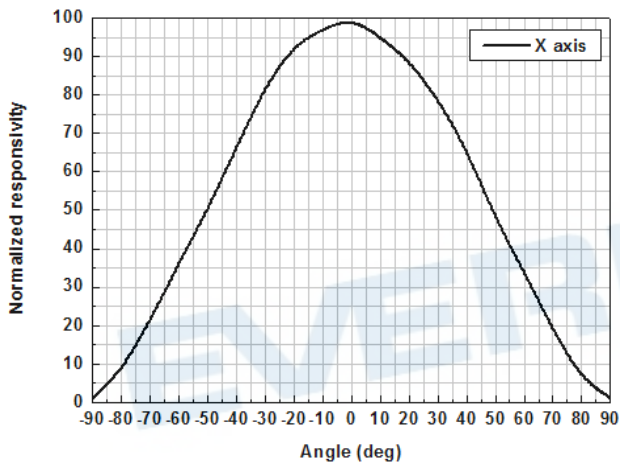


Fig.3 CLS angular sensitivity for X axis

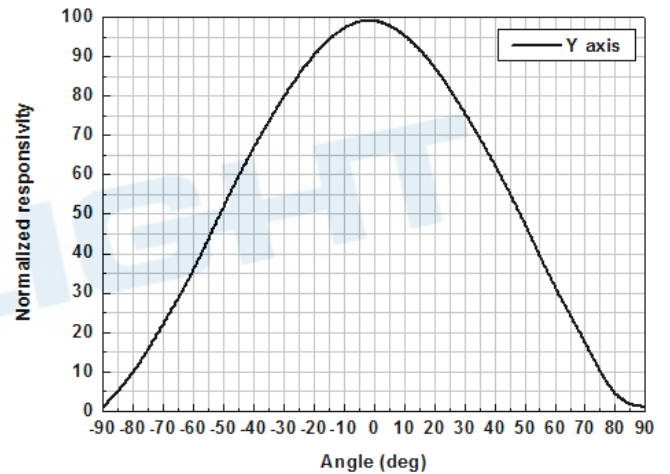


Fig.4 CLS angular sensitivity for Y axis

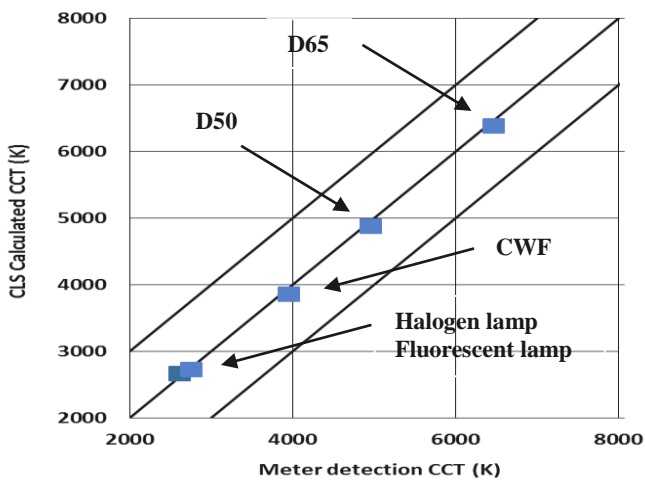
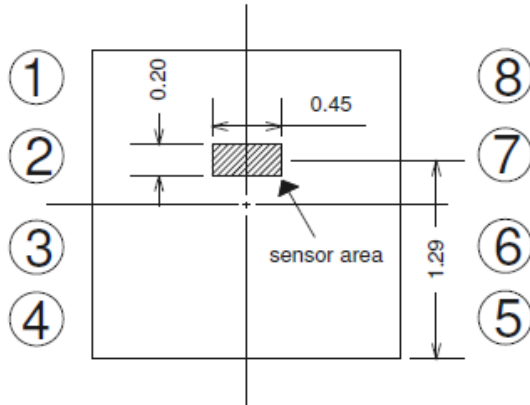


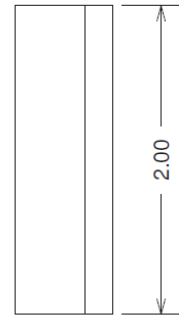
Fig.5 CLS sensor CCT vs. Meter CCT

Package Dimensions and recommended solder pad layout

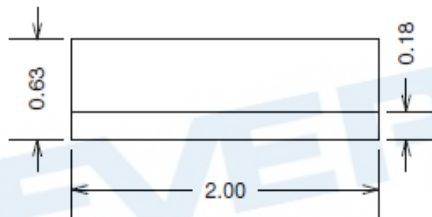
Top view



Side View

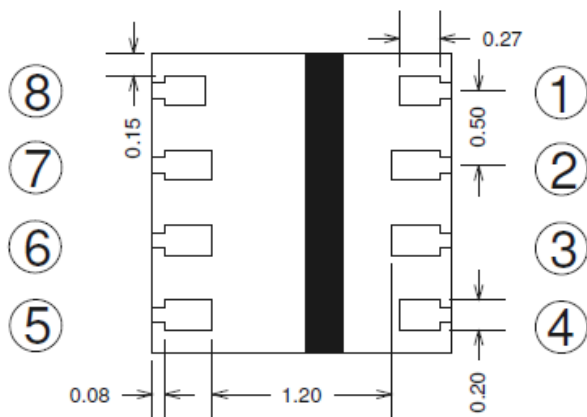


Side View

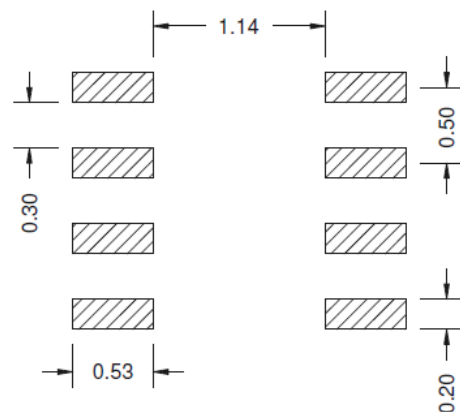


| Pad Number | Pad Name |
|------------|----------|
| 1 | NC |
| 2 | VDD |
| 3 | GND |
| 4 | NC |
| 5 | SCL |
| 6 | SDA |
| 7 | INT |
| 8 | NC |

Bottom View



Recommend Soldering Pad



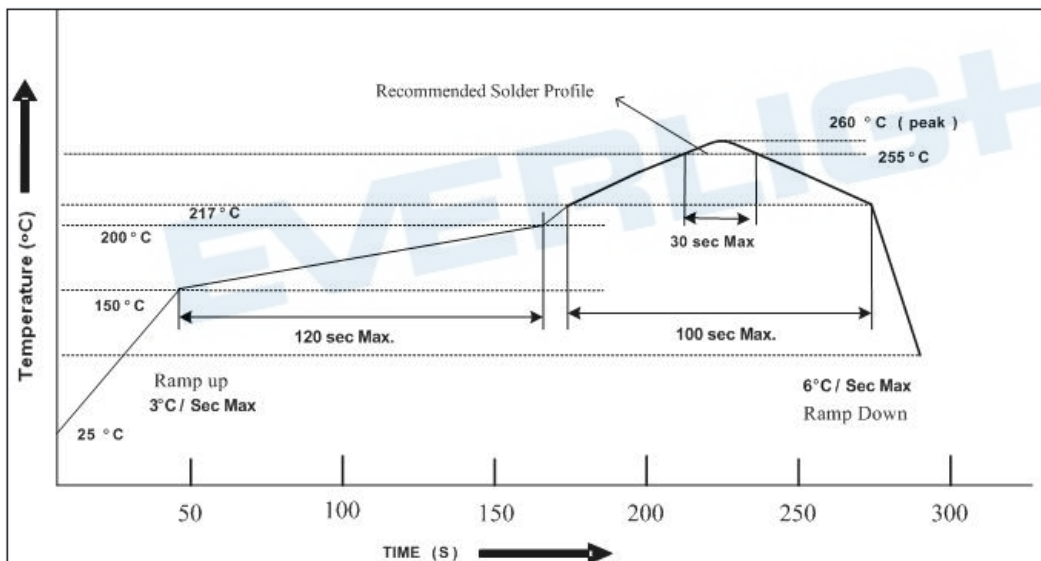
Unit: mm

Tolerances: ± 0.1mm

Recommended method of storage

1. Do not open moisture proof bag before devices are ready to use.
2. Shelf life in sealed bag from the bag seal date: 18 months at 10°C~30°C and < 90% RH.
3. After opening the package, the devices must be stored at 10°C~30°C and ≤ 60%RH, and used within 168 hours (floor life).
4. If the moisture absorbent material (desiccant material) has faded or unopened bag has exceeded the shelf life or devices (out of bag) have exceeded the floor life, baking treatment is required.
5. If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure or recommend the following conditions:
 - 192 hours at 40°C +5/-0°C and < 5 % RH (reeled/tubed/loose units) or
 - 96 hours at 60°C ± 5°C and < 5 % RH (reeled/tubed/loose units) or
 - 24 hours at 125°C ± 5°C, not suitable for reel or tubes.

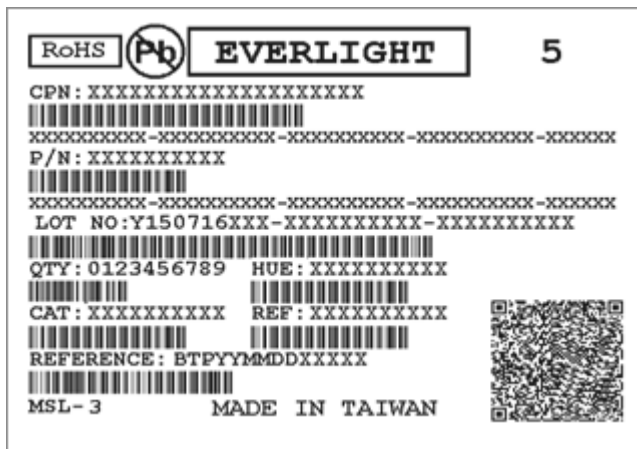
Recommended Solder Profile



Notice:

1. Reflow soldering should not be done more than two times.
2. When soldering, do not put stress on the devices during heating.
3. After soldering, do not warp the circuit board.
4. Reference: IPC/JEDEC J-STD-020D

Label Explanation

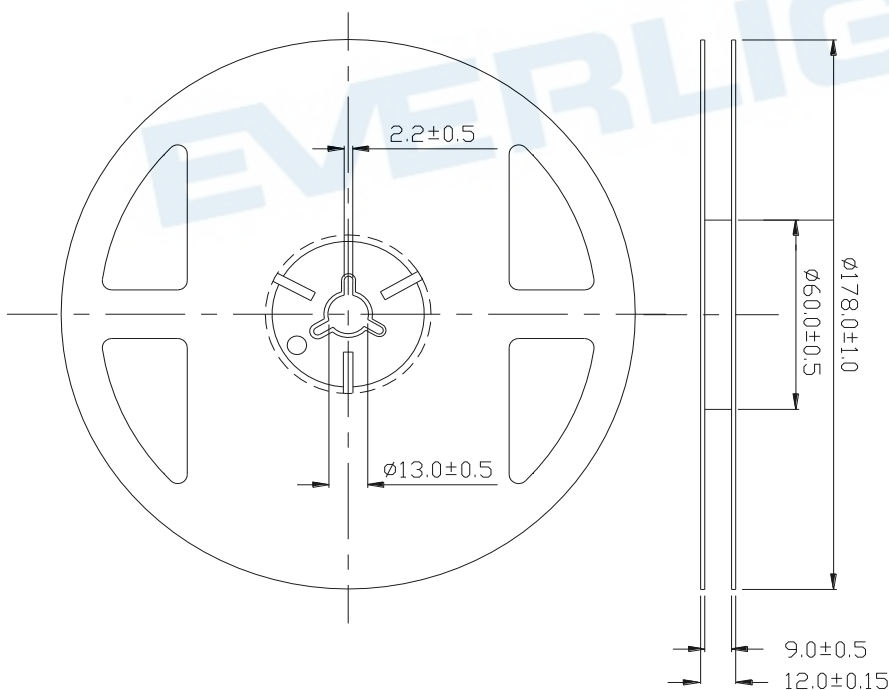


- CPN: Customer's Product Number
- P/N: Product Number
- QTY: Packing Quantity
- CAT: Luminous Intensity Rank
- HUE: Dom. Wavelength Rank
- REF: Forward Voltage Rank
- LOT No: Lot Number
- MADE IN TAIWAN: Production Place

Packing Quantity Specification

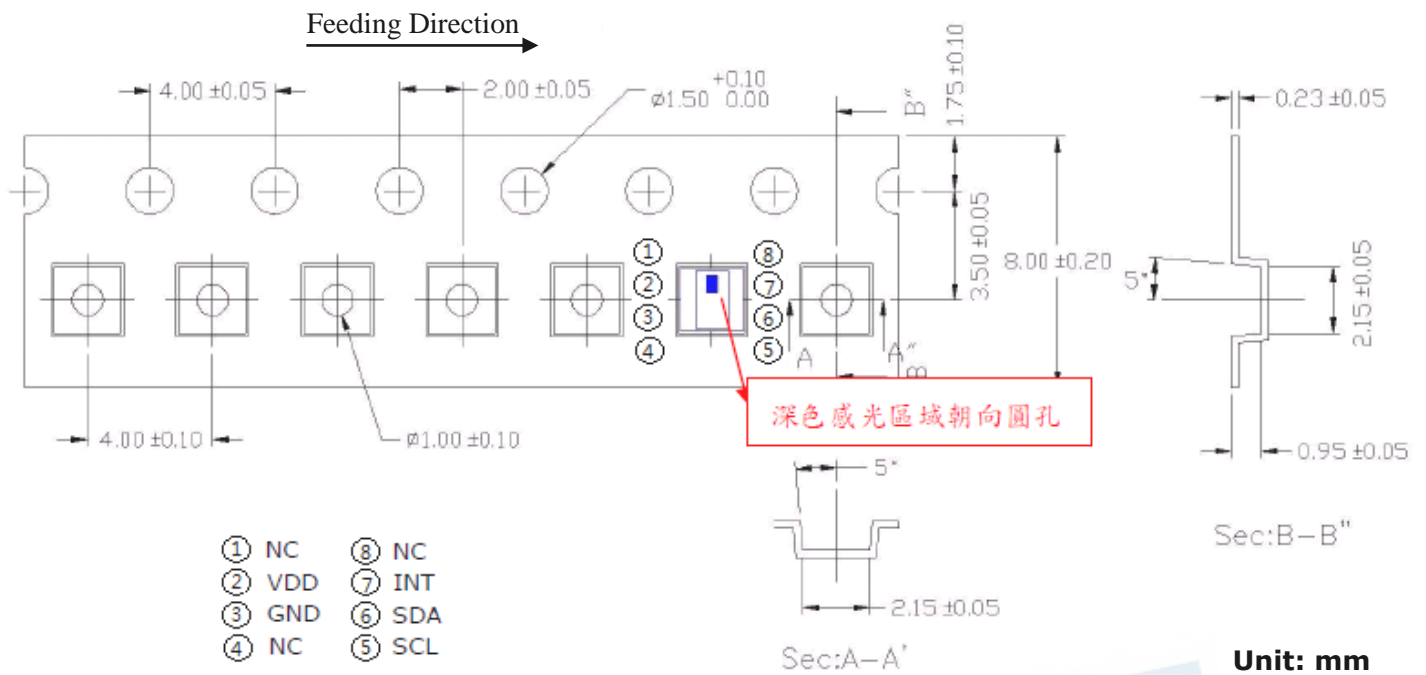
2000 PCS/ 1 Reel

Reel Dimensions

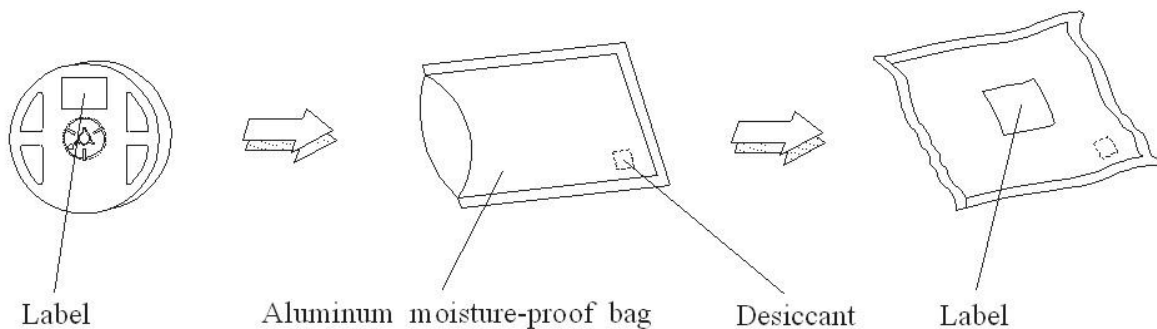


Unit: mm

Tape Dimensions



Moisture Resistant Packing Process



DISCLAIMER

1. EVERLIGHT reserves the right(s) on the adjustment of product material for the specification.
2. The product meets EVERLIGHT published specification for a period of twelve (12) months from date of shipment.
3. The graphs shown in this datasheet are representing typical data only and do not show guaranteed values.
4. When using this product, please observe the absolute maximum ratings and the instructions for using outlined in these specification sheets. EVERLIGHT assumes no responsibility for any damage resulting from the use of the product which does not comply with the absolute maximum ratings and the instructions included in these specification sheets.
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