

# FLD00042

## I<sup>2</sup>C Digital Ambient Light Sensor

### Features

- Built-in temperature compensation circuit
- Operating temperature: -30°C to 70°C
- Supply voltage range: 2.4V to 3.6V
- I<sup>2</sup>C serial port communication: Fast 400kHz
- Light sensing
  - Full dynamic range: 0.01 Lux to 64,000 Lux
  - High resolution range: 0.01 Lux to 320 Lux
  - 16-bit effective resolution
  - 50Hz/60Hz rejection
  - Immunity to IR and UV light
- Size: 2.65mm(L) x 2.00mm(W) x 0.70mm(H)
- Halogen free

### Applications

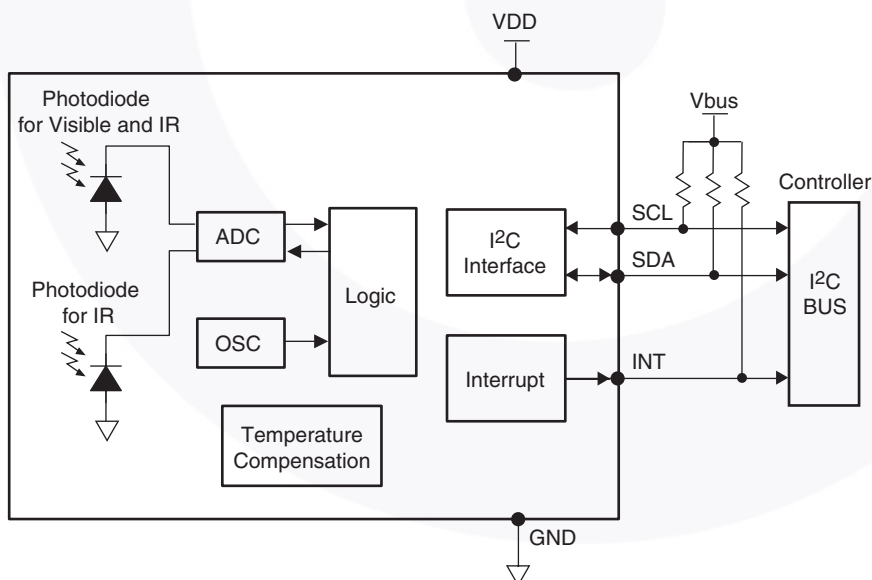
- Display backlight control for smart phones
- Laptops, desktops, monitors
- LCD TV

### Description

The FLD00042 is a digital-output light sensor with a two-wire, I<sup>2</sup>C serial interface. It combines two photodiodes with signal processing on a single CMOS integrated circuit to provide a linear response over an effective 16-bit dynamic range from virtually 0 Lux to 64,000 Lux.

The FLD00042 includes an interrupt mode that signals to the controller readings exceeding a maximum threshold.

### Block Diagram



### Pinout

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

(Top View)

## Pin Definitions

| Pin | Symbol | I/O Type | Description                                                             |
|-----|--------|----------|-------------------------------------------------------------------------|
| 1   | VDD    |          | Power Supply Voltage.                                                   |
| 2   | GND    |          | Ground.                                                                 |
| 3   | NC     |          | Not Connected.                                                          |
| 4   | NC     |          | Not Connected.                                                          |
| 5   | NC     |          | Not Connected.                                                          |
| 6   | INT    | O        | Level Interrupt. This pin is an open drain output.                      |
| 7   | SCL    | I        | I <sup>2</sup> C Serial Clock. This pin is an open drain input.         |
| 8   | SDA    | I/O      | I <sup>2</sup> C Serial Data. This pin is an open drain input / output. |

## Absolute Maximum Ratings (T<sub>A</sub> = 25°C)

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

| Symbol           | Parameter              | Min. | Max. | Unit |
|------------------|------------------------|------|------|------|
| V <sub>DD</sub>  | Supply Voltage         | -0.5 | 3.8  | V    |
| V <sub>O</sub>   | Digital Output Voltage | -0.5 | 3.8  | V    |
| I <sub>O</sub>   | Digital Output Current | -1   | +20  | mA   |
| T <sub>STG</sub> | Storage Temperature    | -40  | +85  | °C   |
| T <sub>OPR</sub> | Operating Temperature  | -30  | +70  | °C   |

## Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the data sheet specifications. Fairchild does not recommend exceeding them or designing to absolute maximum ratings.

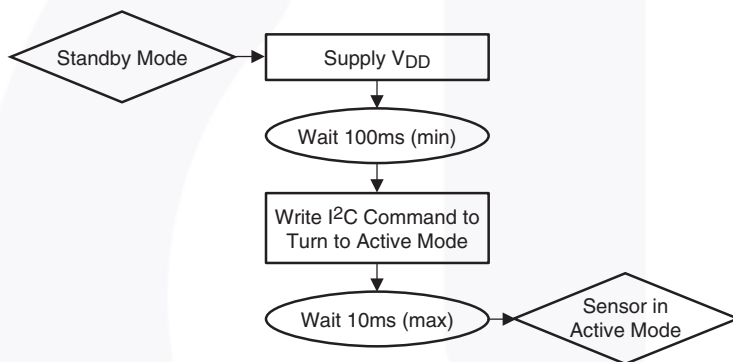
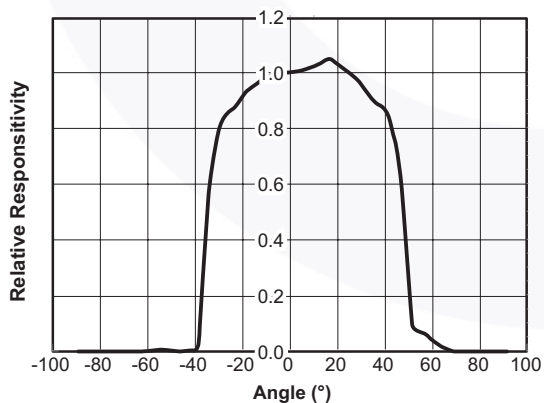
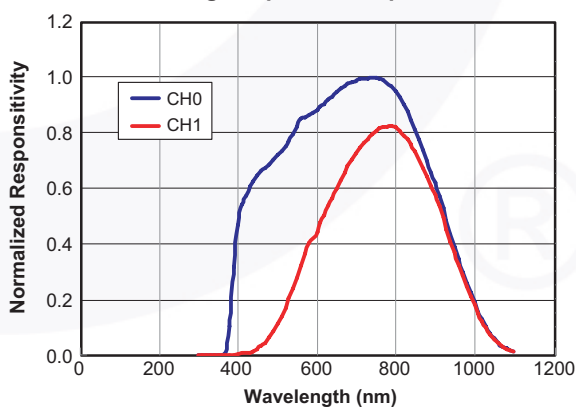
| Symbol           | Parameter                                 | Min. | Max. | Unit |
|------------------|-------------------------------------------|------|------|------|
| V <sub>DD</sub>  | Supply Voltage                            | 2.4  | 3.6  | V    |
| V <sub>BUS</sub> | Bus Supply Voltage                        | 1.7  | 3.6  | V    |
| V <sub>IH</sub>  | I <sup>2</sup> C Bus Input High (SCL/SDA) | 1.2  |      | V    |
| V <sub>IL</sub>  | I <sup>2</sup> C Bus Input Low (SCL/SDA)  |      | 0.6  | V    |

**Electrical/Optical Characteristics** ( $T_A = 25^\circ\text{C}$  and  $V_{DD} = 3.0\text{V}$ )

| Symbol              | Parameter                | Test Condition           | Min. | Typ.  | Max.  | Unit     |
|---------------------|--------------------------|--------------------------|------|-------|-------|----------|
| I <sub>dd1</sub>    | Active Supply Current    | Active Mode              |      | 200   | 300   | μA       |
| I <sub>dd2</sub>    | Standby Current          | Standby / Sleep Mode     |      |       | 5     | μA       |
| T <sub>ini</sub>    | Initial Startup Time     | Note 1                   | 100  |       |       | ms       |
| T <sub>wakeup</sub> | Wakeup Time from Standby | Note 1                   |      |       | 10    | ms       |
| <b>LIGHT SENSOR</b> |                          |                          |      |       |       |          |
| Data FS             | Full Scale ADC Count     |                          |      |       | 65535 | Count    |
| Data 0              | Dark ADC Count           | Ev = 0 lux (Ch0 and Ch1) | 0    |       | 6     | Count    |
| Data 1              | Output Ch0               | Ev = 200 Lx, Gain = 1    |      | 95    |       | Count    |
| Data 2              | Output Ch1               |                          |      | 40    |       | Count    |
| Res 1               | Resolution Range 1       | (0.01 to 320 Lx)         |      | 0.005 |       | Lx/Count |
| Res 2               | Resolution Range 2       | (2 to 64k Lx)            |      | 1     |       | Lx/Count |

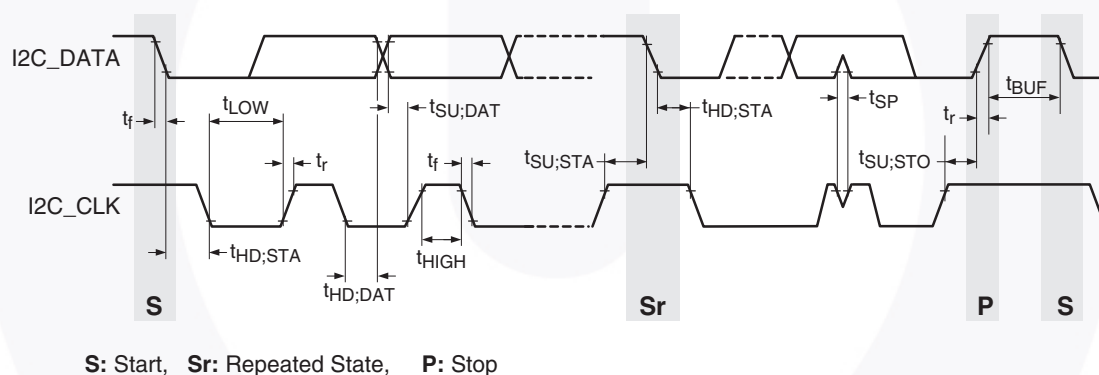
**Note:**

- Startup Sequence

**Typical Performance Characteristics****Fig. 1 Normalized Reception Pattern for the ALS Detector****Fig. 2 Spectral Response**

**I<sup>2</sup>C Timing Specifications** ( $V_{BUS} = 1.8V$ ,  $T_{OPR} = 25^{\circ}C$ )

| Symbol       | Parameter                                                                                      | Min. | Max. | Units   |
|--------------|------------------------------------------------------------------------------------------------|------|------|---------|
| $f_{SCL}$    | SCL Clock Frequency                                                                            | 1    | 400  | kHz     |
| $t_{BUF}$    | Bus Free Time Between a STOP and START Condition                                               | 1.3  |      | $\mu s$ |
| $t_{HD:STA}$ | Hold Time (Repeated) START Condition.<br>After this period, the first clock pulse is generated | 0.6  |      | $\mu s$ |
| $t_{LOW}$    | LOW Period of the SCL Clock                                                                    | 1.3  |      | $\mu s$ |
| $t_{HIGH}$   | HIGH Period of the SCL Clock                                                                   | 0.6  |      | $\mu s$ |
| $t_{SU:STA}$ | Set-up Time for a Repeated START Condition                                                     | 0.6  |      | $\mu s$ |
| $t_{SU:STO}$ | Set-up Time for STOP Condition                                                                 | 0.6  |      | $\mu s$ |
| $t_r$        | Rise Time of Both SDA and SCL Signals                                                          | 30   | 300  | ns      |
| $t_f$        | Fall Time of Both SDA and SCL Signals                                                          | 30   | 300  | ns      |
| $t_{HD:DAT}$ | Data Hold Time                                                                                 | 0.3  | 0.9  | $\mu s$ |
| $t_{SU:DAT}$ | Data Setup Time                                                                                | 100  |      | ns      |
| $t_{SP}$     | Pulse Width of Spikes Which Must be Suppressed by the Input Filter                             | 0    | 50   | ns      |

**Figure 3. I<sup>2</sup>C Timing Diagram**

## I<sup>2</sup>C Interface – Read and Write Transactions

- Figure 4 through Figure 7 outline the sequences for data read and write.
- All addresses and data are MSB first.

### Bit Definitions

|                          |                            |                          |                                |
|--------------------------|----------------------------|--------------------------|--------------------------------|
| <b>A</b>                 | Acknowledge (0 for an ACK) | <b>N</b>                 | Non-Acknowledge (1 for a NACK) |
| <b>S</b>                 | Start Condition            | <b>Sr</b>                | Repeated Start Condition       |
| <b>P</b>                 | Stop Condition             | <b>R</b>                 | Read (1 for Read)              |
| <b>W</b>                 | Write (0 for Writing)      | <input type="checkbox"/> | Master-to-Slave                |
| <input type="checkbox"/> | Slave-to-Master            |                          |                                |

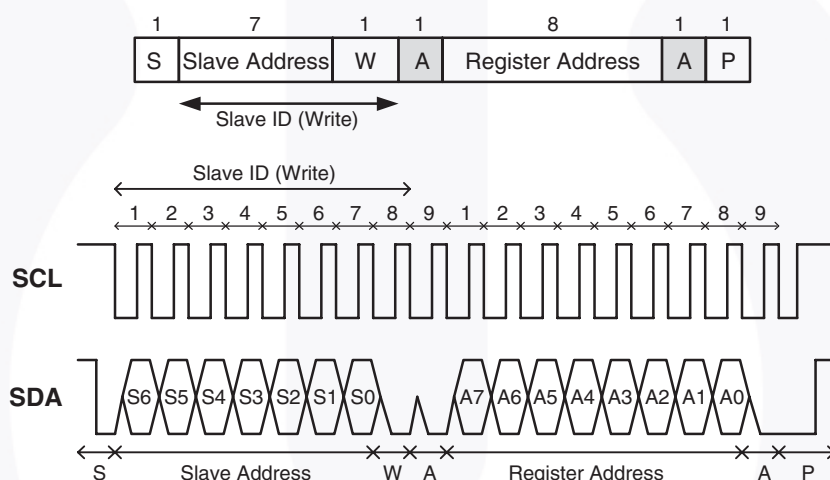


Figure 4. I<sup>2</sup>C Write Protocol (Type 1)

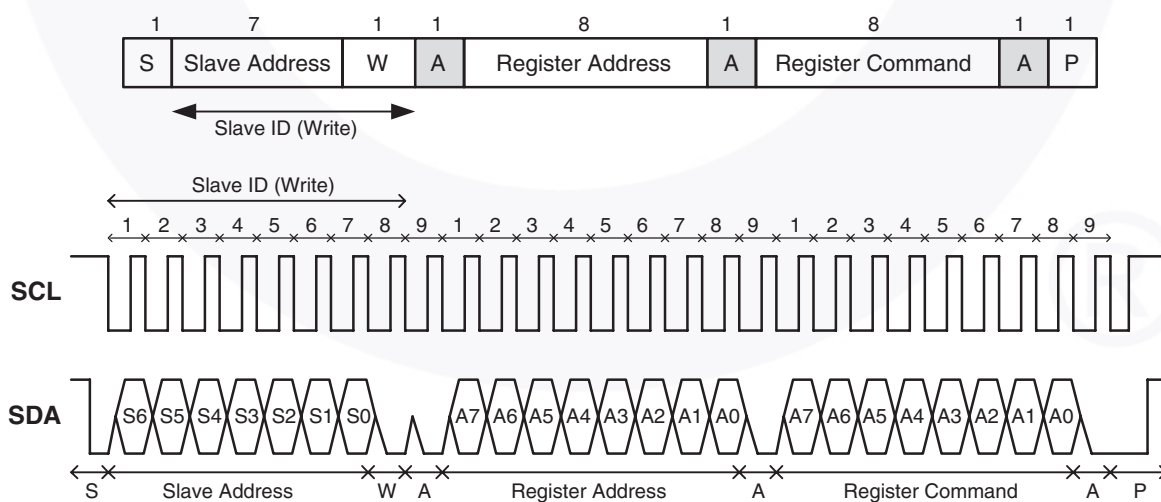


Figure 5. I<sup>2</sup>C Write Protocol (Type 2)

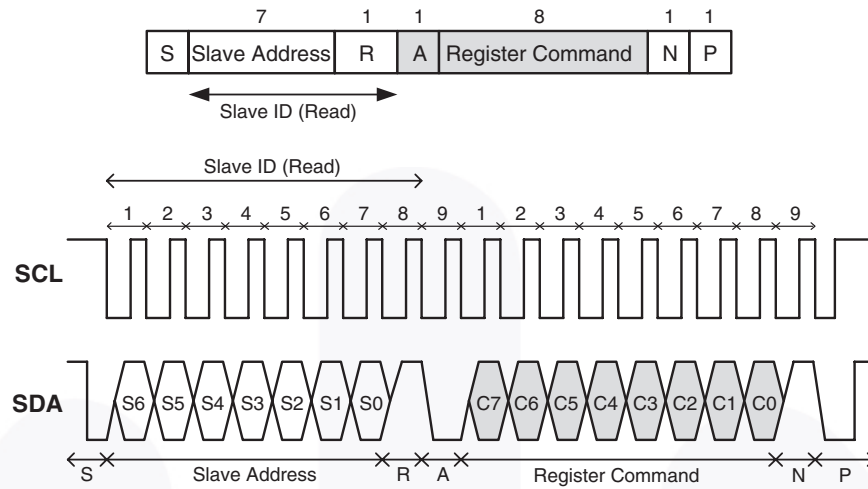


Figure 6. I<sup>2</sup>C Read Protocol

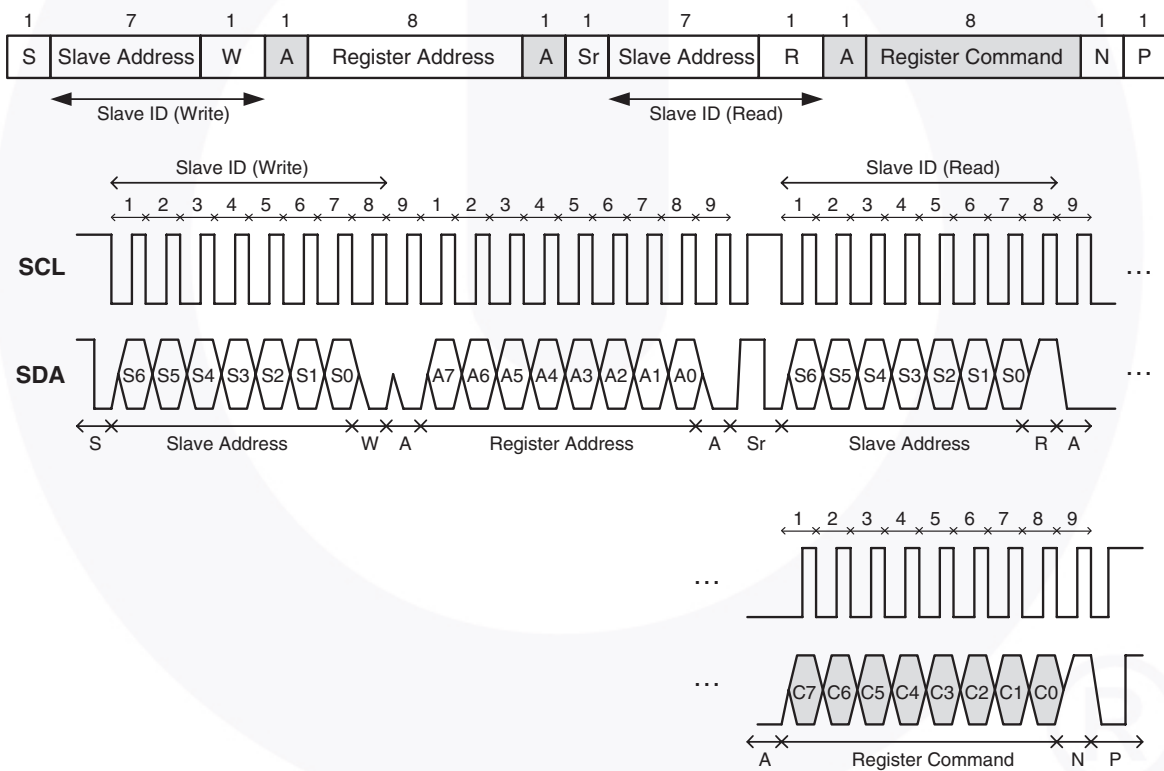


Figure 7. I<sup>2</sup>C Read (Combined Format) Protocol

## 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) |       |       |       |       |       |       | W/R   | Value |
|                                | Bit 7   | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |       |
| Write                          | 0       | 1     | 0     | 0     | 0     | 1     | 1     | 0     | 0x46H |
| Read                           | 0       | 1     | 0     | 0     | 0     | 1     | 1     | 1     | 0x47H |

## Register Descriptions

| Addr | R/W | Register Name     | Description                               | Reset Value |
|------|-----|-------------------|-------------------------------------------|-------------|
| 0x80 | R/W | ALS_CONTR         | ALS operation mode control SW reset       | 0x00        |
| 0x81 | R/W | RESERVED          | Reserved register                         | 0x00        |
| 0x82 | R/W | RESERVED          | Reserved register                         | 0x6B        |
| 0x83 | R/W | RESERVED          | Reserved register                         | 0x7F        |
| 0x84 | R/W | RESERVED          | Reserved register                         | 0x02        |
| 0x85 | R/W | ALS_MEAS_RATE     | ALS measurement rate in active mode       | 0x03        |
| 0x86 | R   | PART_ID           | Part Number ID and Revision ID            | 0x80        |
| 0x87 | R   | MANUFAC_ID        | Manufacturer ID                           | 0x05        |
| 0x88 | R   | ALS_DATA_CH1_0    | ALS measurement CH1 data, lower byte      | 0x00        |
| 0x89 | R   | ALS_DATA_CH1_1    | ALS measurement CH1 data, upper byte      | 0x00        |
| 0x8A | R   | ALS_DATA_CH0_0    | ALS measurement CH0 data, lower byte      | 0x00        |
| 0x8B | R   | ALS_DATA_CH0_1    | ALS measurement CH0 data, upper byte      | 0x00        |
| 0x8C | R   | ALS_STATUS        | ALS new data status                       | 0x00        |
| 0x8D | R   | RESERVED          | Reserved register                         | 0x00        |
| 0x8E | R   | RESERVED          | Reserved register                         | 0x00        |
| 0x8F | R/W | INTERRUPT         | Interrupt settings                        | 0x08        |
| 0x90 | R/W | RESERVED          | Reserved register                         | 0xFF        |
| 0x91 | R/W | RESERVED          | Reserved register                         | 0x07        |
| 0x92 | R/W | RESERVED          | Reserved register                         | 0x00        |
| 0x93 | R/W | RESERVED          | Reserved register                         | 0x00        |
| 0x97 | R/W | ALS_THRES_UP_0    | ALS interrupt upper threshold, lower byte | 0xFF        |
| 0x98 | R/W | ALS_THRES_UP_1    | ALS interrupt upper threshold, upper byte | 0xFF        |
| 0x99 | R/W | ALS_THRES_LOW_0   | ALS interrupt lower threshold, lower byte | 0x00        |
| 0x9A | R/W | ALS_THRES_LOW_1   | ALS interrupt lower threshold, upper byte | 0x00        |
| 0x9E | R/W | INTERRUPT PERSIST | ALS Interrupt persist setting             | 0x00        |

### Notes:

- When reading ALS data registers, read sequence should always be from lower address to higher address (e.g., for ALS data, Ch1 data should be read first followed by Ch0 data. Read sequence should be 0x88, 0x89, 0x8A, 0x8B. When 0x8B is read, all four ALS data registers will be populated with new set of data).
- When setting of INTERRUPT register (addr 0x8F) is necessary, it should be done before the device is in Active mode.
- Reserved registers should not be written with any value other than its default value.

## Register Bit Definitions

### ALS\_CONTR Register (0x80)

The ALS\_CONTR register controls the ALS operation modes and software (SW) reset for the sensor. The ALS sensor can be set to either standby mode or active mode. At either of these modes, the I<sup>2</sup>C circuitry is always active. The default mode after power up is standby mode. During standby mode, there is no ALS measurement performed but I<sup>2</sup>C communication is allowed to enable read/write to all the registers.

| ALS_CONTR (default = 0x00) |    |    |    |          |          |          |    |
|----------------------------|----|----|----|----------|----------|----------|----|
| B7                         | B6 | B5 | B4 | B3       | B2       | B1       | B0 |
| Reserved                   |    |    |    | ALS Gain | SW Reset | ALS Mode |    |

| Field    | Bits | Description                                                                                                |
|----------|------|------------------------------------------------------------------------------------------------------------|
| Reserved | 7:4  | Must write as 0                                                                                            |
| ALS Gain | 3    | 0: Dynamic Range 2 (2 lux to 64k lux) (default)<br>1: Dynamic Range 1 (0.01 lux to 320 lux)                |
| SW Reset | 2    | 0: Software reset is NOT started (default)<br>1: Software reset is started, default value after reset is 0 |
| ALS Mode | 1:0  | 00 / 01: Standby Mode (default)<br>10 / 11: Active Mode                                                    |

### ALS\_MEAS\_RATE Register (0x85)

The ALS\_MEAS\_RATE register controls the integration time and timing of the periodic measurement of the ALS in active mode. ALS Measurement Repeat Rate is the interval between ALS\_DATA registers update. ALS Integration Time is the measurement time for each ALS cycle.

ALS Measurement Repeat Rate must be set to be equal or larger than the ALS Integration Time. If ALS Measurement Repeat Rate is set to be smaller than ALS Integration Time, it will be automatically reset to be equal to ALS Integration Time by the IC internally.

| ALS_MEAS_RATE (default = 0x03) |    |    |                      |    |                             |    |    |
|--------------------------------|----|----|----------------------|----|-----------------------------|----|----|
| B7                             | B6 | B5 | B4                   | B3 | B2                          | B1 | B0 |
| Reserved                       |    |    | ALS Integration Time |    | ALS Measurement Repeat Rate |    |    |

| Field                       | Bits | Description                                                                                                                                                                                                                 |
|-----------------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reserved                    | 7:5  | Must write as 0                                                                                                                                                                                                             |
| ALS Integration Time        | 4:3  | 00: 100ms (default)<br>01: 50ms (can only be used in Dynamic Range 2, effective resolution is 15-bit @ 2 lux / count)<br>10: 200ms (can only be used in Dynamic Range 1)<br>11: 400ms (can only be used in Dynamic Range 1) |
| ALS Measurement Repeat Rate | 2:0  | 000: 50ms<br>001: 100ms<br>010: 200ms<br>011: 500ms (default)<br>100: 1000ms<br>101 / 110 / 111: 2000ms                                                                                                                     |

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

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

| PART_ID (default = 0x80) |    |    |    |             |    |    |    |
|--------------------------|----|----|----|-------------|----|----|----|
| B7                       | B6 | B5 | B4 | B3          | B2 | B1 | B0 |
| Part Number ID           |    |    |    | Revision ID |    |    |    |

| Field          | Bits | Description |
|----------------|------|-------------|
| Part Number ID | 7:4  | 0x08H       |
| Revision ID    | 3:0  | 0x00H       |

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

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

| MANUFAC_ID (default = 0x05) |    |    |    |    |    |    |    |
|-----------------------------|----|----|----|----|----|----|----|
| B7                          | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| Manufacturer ID             |    |    |    |    |    |    |    |

| Field           | Bits | Description |
|-----------------|------|-------------|
| Manufacturer ID | 7:0  | 0x05H       |

**ALS\_DATA\_CH1 Register (0x88/0x89) (Read Only)**

The ALS\_DATA registers should be read as a group, with the lower address read back first (i.e., read 0x88 first, then read 0x89). These two registers should also be read before reading channel-0 data (from registers 0x8A, 0x8B).

When the I<sup>2</sup>C read operation starts, all four ALS data registers are locked until the I<sup>2</sup>C read operation of register 0x8B is completed. This will ensure that the data in the registers is from the same measurement even if an additional integration cycle ends during the read operation. New measurement data is stored into temporary registers and the ALS\_DATA registers are updated as soon as there is no on-going I<sup>2</sup>C read operation.

The ALS ADC channel-1 data is expressed as a 16-bit data spread over two registers. The ALS\_DATA\_CH1\_0 and ALS\_DATA\_CH1\_1 registers provide the lower and upper byte respectively.

**0x88**

| ALS_DATA_CH1_0 (default = 0x00) |    |    |    |    |    |    |    |
|---------------------------------|----|----|----|----|----|----|----|
| B7                              | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| ALS Data Ch1 Low                |    |    |    |    |    |    |    |

**0x89**

| ALS_DATA_CH1_1 (default = 0x00) |    |    |    |    |    |    |    |
|---------------------------------|----|----|----|----|----|----|----|
| B7                              | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| ALS Data Ch1 High               |    |    |    |    |    |    |    |

| Field             | Addr | Bits | Description                       |
|-------------------|------|------|-----------------------------------|
| ALS Data Ch1 Low  | 0x88 | 7:0  | ALS ADC channel 1 lower byte data |
| ALS Data Ch1 High | 0x89 | 7:0  | ALS ADC channel 1 upper byte data |

**ALS\_DATA\_CH0 Register (0x8A/0x8B) (Read Only)**

These two registers should be read after reading channel-1 data (from registers 0x88, 0x89). Lower address register should be read first (i.e read 0x8A first, then read 0x8B). See ALS\_DATA\_CH1 register information above.

The ALS ADC channel-0 data is expressed as a 16-bit data spread over two registers. The ALS\_DATA\_CH0\_0 and ALS\_DATA\_CH0\_1 registers provide the lower and upper byte respectively.

**0x8A**

| ALS_DATA_CH0_0 (default = 0x00) |    |    |    |    |    |    |    |
|---------------------------------|----|----|----|----|----|----|----|
| B7                              | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| ALS Data Ch0 Low                |    |    |    |    |    |    |    |

**0x8B**

| ALS_DATA_CH0_1 (default = 0x00) |    |    |    |    |    |    |    |
|---------------------------------|----|----|----|----|----|----|----|
| B7                              | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| ALS Data Ch0 High               |    |    |    |    |    |    |    |

| Field             | Addr | Bits | Description                       |
|-------------------|------|------|-----------------------------------|
| ALS Data Ch0 Low  | 0x8A | 7:0  | ALS ADC channel 0 lower byte data |
| ALS Data Ch0 High | 0x8B | 7:0  | ALS ADC channel 0 upper byte data |

**ALS\_STATUS Register (0x8C) (Read Only)**

The ALS\_STATUS register stores the information about interrupt status and ALS data status. New data means data has not been read yet. When the measurement is completed and data is written to the data register, the data status bit will be set to logic 1. When the data register is read, the data status bit will be set to logic 0.

Interrupt status determines if the ALS interrupt criteria are met. It will check if the ALS measurement data is outside of the range defined by the upper and lower threshold limits.

| ALS_STATUS (default = 0x00) |    |    |          |                      |                 |          |          |
|-----------------------------|----|----|----------|----------------------|-----------------|----------|----------|
| B7                          | B6 | B5 | B4       | B3                   | B2              | B1       | B0       |
| Reserved                    |    |    | ALS Gain | ALS Interrupt Status | ALS Data Status | Reserved | Reserved |

| Field                | Bits | Description                                                                                                                     |
|----------------------|------|---------------------------------------------------------------------------------------------------------------------------------|
| Reserved             | 7:5  | Do not care                                                                                                                     |
| ALS Gain             | 4    | 0: ALS measurement data is in dynamic range 2 (2 to 64k lux)<br>1: ALS measurement data is in dynamic range 1 (0.01 to 320 lux) |
| ALS Interrupt Status | 3    | 0: ALS interrupt is clear or not yet triggered<br>1: ALS interrupt is triggered                                                 |
| ALS Data Status      | 2    | 0: ALS measurement data is old data (Data has been read)<br>1: ALS measurement data is new data (Data has not been read)        |
| Reserved             | 1:0  | Do not care                                                                                                                     |

**INTERRUPT Register (0x8F)**

The INTERRUPT register controls the operation of the interrupt pin and functions. When the Interrupt Mode is set to 00, the INT output pin 2 is inactive / disabled and will not trigger any interrupt. However at this condition, the ALS\_STATUS register will still be updated.

Note that when this register is to be set with values other than its default values, it should be set before device is in Active mode.

| INTERRUPT (default = 0x08) |    |    |    |    |                    |                |    |
|----------------------------|----|----|----|----|--------------------|----------------|----|
| B7                         | B6 | B5 | B4 | B3 | B2                 | B1             | B0 |
| Reserved                   |    |    |    |    | Interrupt Polarity | Interrupt Mode |    |

| Field              | Bits | Description                                                                                                                                    |
|--------------------|------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Reserved           | 7:4  | Must write as 0                                                                                                                                |
| Reserved           | 3    | Do not care                                                                                                                                    |
| Interrupt Polarity | 2    | 0: INT output pin 2 is considered active when it is a logic 0 (default)<br>1: INT output pin 2 is considered active when it is a logic 1       |
| Interrupt Mode     | 1:0  | 00: INT output pin 2 is inactive / high impedance state (default)<br>01: Reserved<br>10: ALS measurement can trigger interrupt<br>11: Reserved |

**ALS\_THRES Register (0x97 / 0x98 / 0x99 / 0x9A)**

The ALS\_THRES\_UP and ALS\_THRES\_LOW registers determines the upper and lower limit of the interrupt threshold value respectively. These two values form a range and the interrupt function compares if the measurement value in ALS\_DATA registers is inside or outside the range. The interrupt function is active if the measurement data is outside the range defined by the upper and lower limits. The data format for ALS\_THRES must be the same as ALS\_DATA registers.

**0x97**

| ALS_THRES_UP_0 (default = 0xFF) |    |    |    |    |    |    |    |
|---------------------------------|----|----|----|----|----|----|----|
| B7                              | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| ALS Upper Threshold Low         |    |    |    |    |    |    |    |

**0x98**

| ALS_THRES_UP_1 (default = 0xFF) |    |    |    |    |    |    |    |
|---------------------------------|----|----|----|----|----|----|----|
| B7                              | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| ALS Upper Threshold High        |    |    |    |    |    |    |    |

**0x99**

| ALS_THRES_LOW_0 (default = 0x00) |    |    |    |    |    |    |    |
|----------------------------------|----|----|----|----|----|----|----|
| B7                               | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| ALS Lower Threshold Low          |    |    |    |    |    |    |    |

**0x9A**

| ALS_THRES_LOW_1 (default = 0x00) |    |    |    |    |    |    |    |
|----------------------------------|----|----|----|----|----|----|----|
| B7                               | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| ALS Lower Threshold High         |    |    |    |    |    |    |    |

| Field                    | Addr | Bits | Description                    |
|--------------------------|------|------|--------------------------------|
| ALS Upper Threshold Low  | 0x97 | 7:0  | ALS upper threshold lower byte |
| ALS Upper Threshold High | 0x98 | 7:0  | ALS upper threshold upper byte |
| ALS Lower Threshold Low  | 0x99 | 7:0  | ALS lower threshold lower byte |
| ALS Lower Threshold High | 0x9A | 7:0  | ALS lower threshold upper byte |

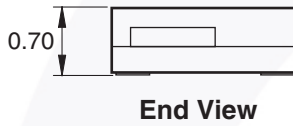
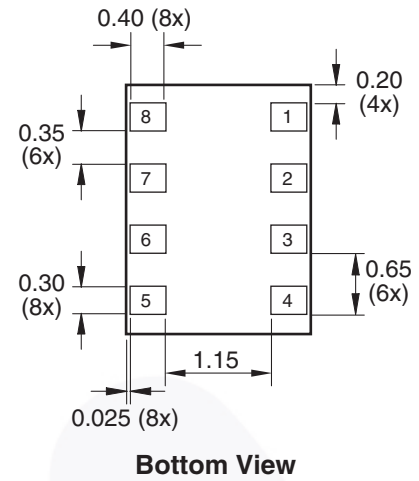
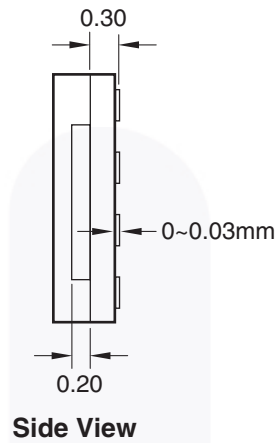
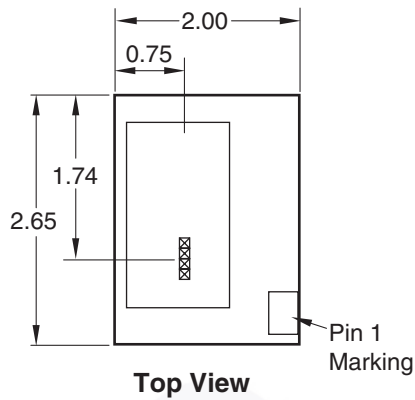
**INTERRUPT PERSIST Register (0x9E)**

The INTERRUPT PERSIST register controls the N number of times the measurement data is outside the range defined by the upper and lower threshold limits before asserting the INT output pin 2.

| INTERRUPT PERSIST (default = 0x00) |    |    |    |             |    |    |    |
|------------------------------------|----|----|----|-------------|----|----|----|
| B7                                 | B6 | B5 | B4 | B3          | B2 | B1 | B0 |
| Reserved                           |    |    |    | ALS Persist |    |    |    |

| Field       | Bits | Description                                                                                                                                                                                                                                                             |
|-------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reserved    | 7:4  | Must write as 0                                                                                                                                                                                                                                                         |
| ALS Persist | 3:0  | 0000: Every ALS measurement data will generate an interrupt (default)<br>0001: 1 consecutive ALS measurement data outside the range<br>0010: 2 consecutive ALS measurement data outside the range<br>...<br>1111: 15 consecutive ALS measurement data outside the range |

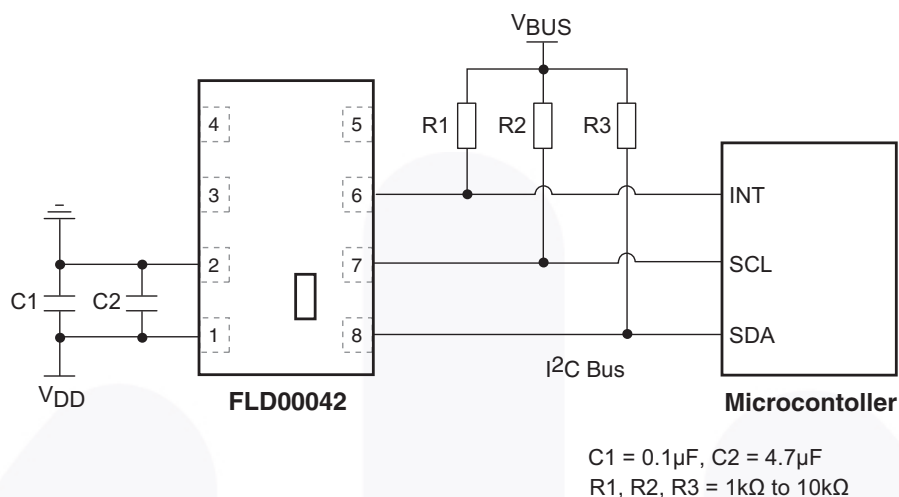
## Package Dimensions



### Note:

1. All units in mm.
2. Tolerances:  $\pm 0.2\text{mm}$

## Typical Application Circuit



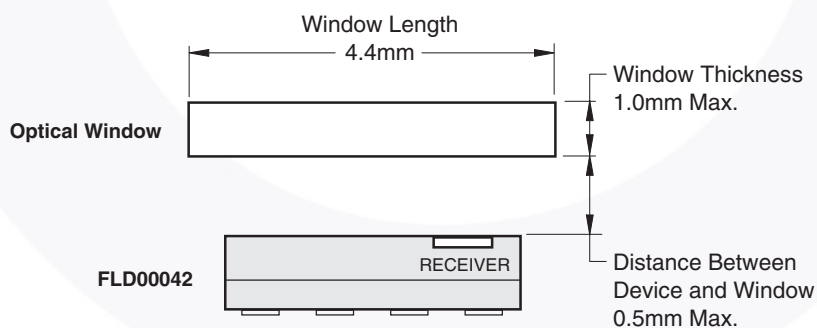
## Optical Design Recommendations

The performance of the device in the application depends on its characteristics as well as the way the device is mounted on the end system.

The critical aspect of the end system mechanical design is the optimization of the optical path between the device and the space around, which is governed by:

- The size of the glass or plastic window so that light is not blocked by the adjacent opaque surfaces.
- The thickness of the window.
- The transmittance of the window material.
- The distance from the device to the window.

The dimensional recommendations are shown in the diagram below.

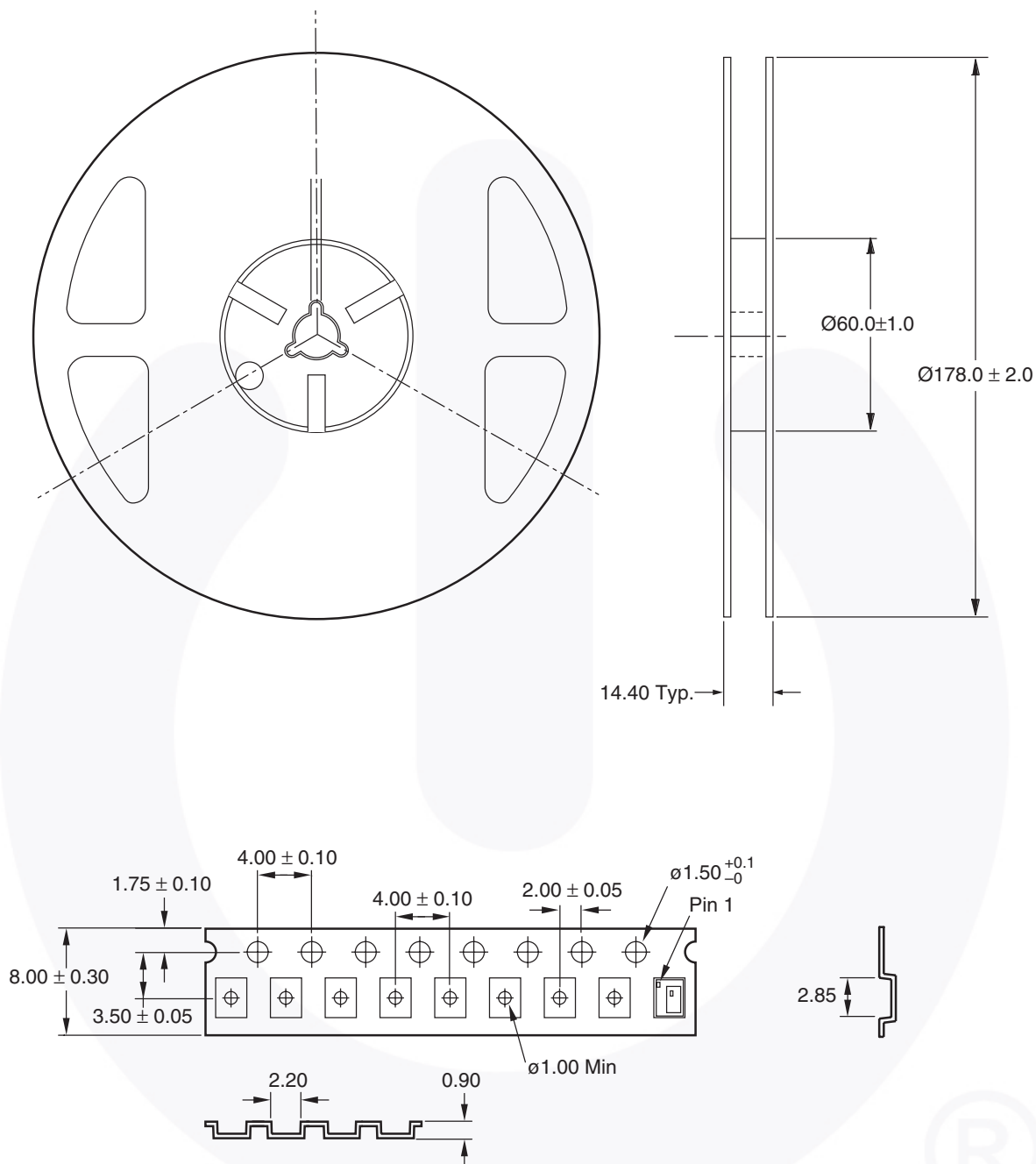


NOTE: Not to scale

**Side View of Recommended Mounting**

Regarding the transmittance, the window material should be selected based on its transmittance in the visible spectrum and the infrared spectrum (400nm to 900nm).

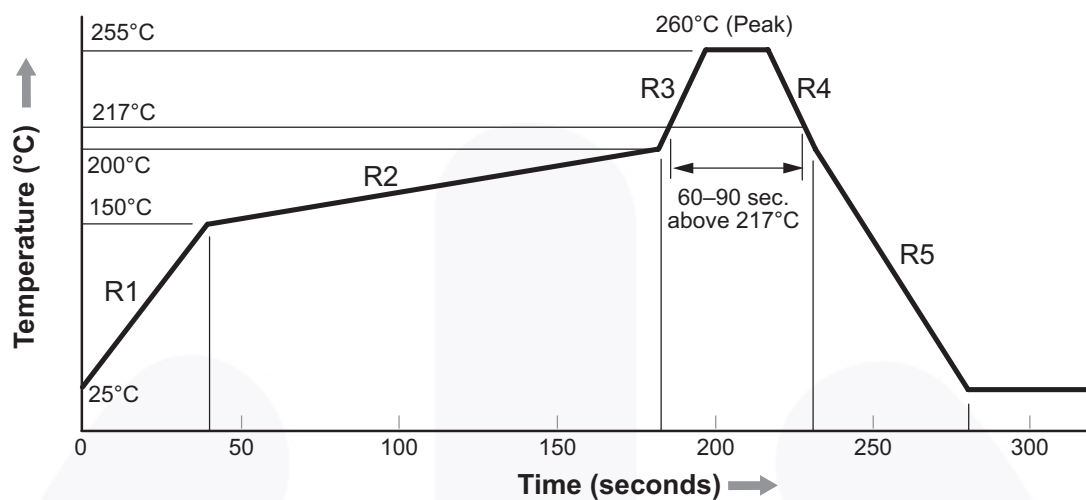
## Tape and Reel Dimensions



### Note:

1. All units in mm.
2. Empty component pockets sealed with top cover tape
3. 7 inch reel: 2,500 pieces per reel
4. In accordance with ANSI/EIA 481-1-A-1994 specifications

## Reflow Profile



### Notes:

1. Reflow soldering should not be done more than twice.
2. When soldering, do not put stress on the devices during heating.
3. After soldering, do not warp the circuit board.

| Symbol                                      | Process Zone     | $\Delta$ Temp  | Maximum $\Delta$ Temp/ $\Delta$ Time or Duration |
|---------------------------------------------|------------------|----------------|--------------------------------------------------|
| R1                                          | Heat Up          | 25°C to 150°C  | 3°C/s                                            |
| R2                                          | Solder Paste Dry | 150°C to 200°C | 100s to 180s                                     |
| R3                                          | Solder Reflow    | 200°C to 260°C | 3°C/s                                            |
| R4                                          |                  | 260°C to 200°C | -6°C/s                                           |
| R5                                          | Cool Down        | 200°C to 25°C  | -6°C/s                                           |
| Time Maintained Above Liquidus Point, 217°C |                  | >217°C         | 60 to 90 seconds                                 |
| Peak Temperature                            |                  | 260°C          |                                                  |
| Time Within 5°C of Actual Peak Temperature  |                  | >255°C         | 20 seconds                                       |
| Time 25°C to Peak Temperature               |                  | 25°C to 260°C  | 8 minutes                                        |



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| ESBC™                                                                             | MicroPak™                                      | STEALTH™                                                                          |  |
|  | MicroPak2™                                     | SuperFET®                                                                         | UHC®                                                                                |
| Fairchild®                                                                        | MillerDrive™                                   | SuperSOT™-3                                                                       | Ultra FRFET™                                                                        |
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