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LITE-ON DCC

RELEASE

BNS-OD-FC001/A4

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Description

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The LTR-308ALS-01 is an integrated low voltage I2C ambient light sensor (ALS) in a single 2x2mm 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.

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 in mobile, computing, and consumer devices.

Features

- I²C interface (Standard mode @100kHz or Fast mode @400kHz)
- Ambient Light in ultra-small chipled package
- Very low power consumption with sleep mode capability
- Operating voltage ranges: 1.7V to 3.6V
- Operating temperature ranges: -40 to +85 °C
- Built-in temperature compensation circuit
- Programmable interrupt function for ALS with upper and lower thresholds
- RoHS and Halogen free compliant
- ALS Features
 - > 16 to 20 bits effective resolution
 - Wide dynamic range (0.01 to 157K lux) with linear response
 - > Close to human eye spectral response
 - Automatic rejection for 50Hz/60Hz lighting flicker

Ordering Information

Part Number	Packaging Type	Package	Quantity
LTR-308ALS-01	Tape and Reel	6-pin chipled package	3500





Detector area

1. Outline Dimensions





All dimensions in mm
 Tolerances is +/-0.1mm unless specify

I/O Pins Configuration Table

	Pin I/O Type	Symbol	Description
1		VDD	Power Supply Voltage
2		NC	No connection to this pin
3		GND	Ground
4	I	SCL*	I ² C serial clock. This pin is an open drain input.
5	0	INT*	Level Interrupt Pin. This pin is an open drain output.
6	I/O	SDA*	l²C serial data. This pin is an open drain input / output.

* Note: For noisy environment, add 10pF capacitor from signal to GND for additional noise filtering.



2. Functional Block Diagram

LTR-308ALS-01 contains photodiode for respective photocurrent measurement. The photodiode currents are converted to digital values by ADCs. The sensor also includes some peripheral circuits such as an internal oscillator, a current course, voltage reference, and internal fuses to store trimming information.







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3. Rating and Specification

3.1. Absolute Maximum Rating at Ta=25℃

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	VDD		4.0	V
Digital Voltage Range	SCL, SDA, INT	-0.5	4.0	V
Storage Temperature	T _{stg}	-40	100	°C
Electrostatic Discharge Protection (Human Body Model JESD22-A114)	V _{HBM}		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.

3.2. Recommended Operating Conditions

Description	Symbol	Min.	Тур.	Max.	Unit
Supply Voltage	VDD	1.7		3.6	V
Interface signal input high	V _{I2Chigh}	1.5		VDD	V
Interface signal input low	V _{I2Clow}	0		0.4	V
Operating Temperature	T _{ope}	-40		85	°C

3.3. Electrical Specifications (VDD = 1.8V, Ta=25℃, unless otherwise noted)

Parameter	Min.	Тур.	Max.	Unit	Condition
Active Supply Current		110		uA	Max. duty cycle, Vdd=1.8V, Gain 3x
Standby Current		1		uA	Shutdown Mode
Wakeup Time from Standby		5	10	ms	From Standby to Active mode where measurement can start
Reset Time (Delay time needed after SW reset)	1			ms	Delay time until the next command

3.4. Characteristics Ambient Light

Parameter	Min.	Тур.	Max.	Unit	Condition
ALS Resolution	16		20	Bit	Programmable for 16, 17, 18, 19, 20 Bit
ALS Lux accuracy	-10		10	%	White LED, 5000K, Ta = 25°
Dark Level Count		0	5	Count	0 Lux, 18-bit resolution
Integration time	25		400	ms	With 50/60Hz Rejection
Timing accuracy	20		+20	%	
50/60 Hz flicker noise error	-5		+5	%	

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3.5. Typical Device Parameter

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





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3.6 AC Electrical Characteristics

Parameter	Symbol	Stan mo	dard de	Fast		
		Min.	Max.	Min.	Max.	Unit
SCL clock frequency	f_{scl}	10	00	40	00	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 I²C bus





4. Principle of Operation

I²C Protocols

• I²C Write Protocol (type 1):



· I²C Write Protocol (type 2):



• I²C Read Protocol:



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Wait 100 ms (min) - initial startup time



Wait 10 ms (max) - wakeup time from standby

Sensor is Active and starts measurement

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I2C Slave Address

The device has a 7-bit slave address of 0x53. A read/write bit should be appended to the slave address by the master device to properly communicate with the device.

	I ² C Slave Address (Default)									
Command	Command (0x53)									
Туре	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	value	
Write	1	0	1	0	0	1	1	0	0xA6H	
Read	1	0	1	0	0	1	1	1	0xA7H	

5. Register Set

Addr	R/W	Register Name	Description	Reset Value
0x00	RW	MAIN_CTRL	ALS operation mode control, SW reset	0x00
0x01~0x03	R	Reserved		
0x04	R/W	ALS_MEAS_RATE	ALS measurement rate and resolution in Active Mode	0x22
0x05	R/W	ALS_GAIN	ALS analog Gain	0x01
0x06	R	PART_ID	Part number ID and revision ID	0xB1
0x07	R	MAIN_STATUS	Power-On status, Interrupt status, Data status	0x20
0x08~0x0C	R	Reserved		
0x0D	R	ALS_DATA_0	ALS ADC measurement data, LSB	0x00
0x0E	R	ALS_DATA_1	ALS ADC measurement data	0x00
0x0F	R	ALS_DATA_2	ALS ADC measurement data, MSB	0x00
0x10~0x18	R	Reserved		0x00
0x19	R/W	INT_CFG	Interrupt configuration	0x10
0x1A	R/W	INT_PST	Interrupt persist setting	0x00
0x1B~0x20	R	Reserved		
0x21	R/W	ALS_THRES_UP_0	ALS interrupt upper threshold, LSB	0xFF
0x22	R/W	ALS_THRES_UP_1	ALS interrupt upper threshold, intervening bits	0xFF
0x23	R/W	ALS_THRES_UP_2	ALS interrupt upper threshold, MSB	0x0F
0x24	R/W	ALS_THRES_LOW_0	ALS interrupt lower threshold, LSB	0x00
0x25	R/W	ALS_THRES_LOW_1	ALS interrupt lower threshold, intervening bits	0x00
0x26	R/W	ALS_THRES_LOW_2	ALS interrupt lower threshold, MSB	0x00









MAIN_CTRL Register (0x00) (Read/Write)

This register controls the operation modes of ALS, which can be set to either standby or active mode. When writing to this register, it will cause a stop to any ongoing measurements and start new measurement.

0x00		MAIN_CTRL (default = 0x00)							
	B7	B6	B5	B4	B3	B2	B1	В0	
	Reserved			Softwar e Reset	Reserved		ALS Enable	Reserved	

Field	Bits	Default	Description		
Reserved	7:5	000		Must write 000	
SW Reset	4	0	0	Software reset is NOT triggered (default)	
SWIKeset	+	0	1	Software reset is triggered	
Reserved	2:3	00		Must Write 00	
			0	ALS standby(default)	
ALS Enable	le 1 0	1	ALS active		
Reserved	0	0		Must write 0	





ALS_MEAS_RATE Register (0x04) (Read/Write)

This register controls ALS measurement resolution, Gain setting and measurement rate. When the measurement rate is programmed to be faster than possible for the programmed ADC measurement, the rate will be lowered than programmed (maximum speed).

0x04		ALS _MEAS_RATE (default = 0x22)								
	B7	B6	В5	B4	B3	B2	B1	В0		
	Reserved	ALS/C F	Resolution/E	Bit Width	Reserve d	ALS M	easuremen	t Rate		

Field	Bits	Default	Description	
Reserved	7	0	Must write 0	
			000	20 Bit, Conversion time = 400ms
			001	19 Bit, Conversion time = 200ms
ALS Resolution	6.4	010	010	18 Bit, Conversion time = 100ms(default)
ALS Resolution	6:4	010	011	17 Bit, Conversion time = 50ms
			100	16 Bit, Conversion time = 25ms
			101/110/111	Reserved
Reserved	3	0		
			000	25ms
ALS			001	50ms
Measurement	2:0	010	010	100ms (default)
Rate	2.0	010	011	500ms
Nate			101	1000ms
			110/111	2000ms

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ALS_ GAIN Register (0x05) (Read/Write)

This register controls ALS measurement Gain Range.

0x05		ALS_GAIN (default = 0x01)							
	B7	B7 B6 B5 B4 B3 B2 B1 B0							
			Reserved	AL	S Gain Ran	ge			

Field	Bits	Default	Descripti	on
Reserved	7:3	00000	00000 Must write 00000	
			000	Gain Range: 1
			001	Gain Range: 3 (default)
ALS Gain Range	2:0	001	010	Gain Range: 6
			011	Gain Range: 9
			100	Gain Range: 18

PART_ID Register (0x06) (Read Only)

This register defines the part number and revision identification of the sensor.

0x06		PART_ID (default = 0xB1)							
	B7	B6	В5	B4	B3	B2	B1	В0	
		Part Nu	mber ID			Revis	ion ID		

Field	Bits	Default	Description
Part Number ID	7:4	1011	Part Number ID
Revision ID	3:0	0001	Revision ID

Part No. : LTR-308ALS-01 BNS-OD-FC002/A4

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MAIN_STATUS Register (0x07) (Read Only)

This register stores the information about the ALS interrupts and data status. The interrupt status in Bit 4 determines if the ALS interrupt criteria are met in Normal Interrupt Mode. It triggers when the ALS data is above the upper or below the lower threshold for a specified number of consecutive measurements in respective interrupt persist settings. For details interrupt behavior, refer to Section 10.

0x07		MAIN_STATUS (default = 0x20)								
	B7	B6	В5	B4	B3	B2	B1	В0		
	Reserved		Power ON Status	ALS Interrup t Status	ALS Data Status		Reserved			

Field	Bits	Default	Descriptio	n
Reserved	7:6	00	00	Must write 00
Power On Status	5	0	0	Power on event and All interrupt threshold settings in the registers have been rest to power on default states (either due to part turned on or power supply voltage glitch). Flag is cleared after read.
ALS			0	Interrupt is NOT triggered (default)
Interrupt Status	4	0	1	Interrupt is triggered and will be cleared after read
			0	ALS data is old data (Data has been read)
ALS Data Status	ALS Data 3 0 Status 3	1	ALS data is new data (Data has not been read and will be cleared after read)	
Reserved	2:0	000	000	Must write 000



ALS_DATA Register (0x0D / 0x0E / 0x0F) (Read Only)

The ALS Channel digital output data are expressed as a 16 to 20 bit unsigned integer data. When I2C read operation is active and points to any of the register address between 0x07 and 0x18, all 3 registers will be locked until the I2C read operation has been completed or the specified address range is left. This is to ensure that the data in the registers is from the same measurement even if an additional measurement cycle ends during the read operation. New measurement data is stored into temporary registers and the ALS_DATA registers will be updated as soon as there is no on-going I2C read operation to the address range 0x07 to 0x18.

0x0D		ALS_DATA _0 (default = 0x00)							
	B7	B6	В5	B4	B3	B2	B1	В0	
		ALS DATA, Low							

0x0E		ALS DATA_1 (default = 0x00)							
	B7	В6	В5	B4	B3	B2	B1	B0	
	ALS DATA, Middle								

0x0F		ALS_DATA_ 2 (default = 0x00)								
	B7	В6	B5	B4	B3	B2	B1	B0		
		Rese	erved			ALS DA	TA, High			

Field	Address	Bits	Default	Description
ALS Data, Low	0x0D	7:0	00000000	ALS Data lower byte data
ALS Data, Middle	0x0E	7:0	00000000	ALS Data Middle byte data
			0000	Reserved
ALS Data, High	0x0F	3:0	0000	ALS Data Higher byte data





INT_CFG Register (0x19) (Read/Write)

This register controls the operation of the interrupt pin and functions. ALS has independent interrupt signal and ALS interrupt is active low.

ALS interrupt is enabled by Bit 2. Under Normal Interrupt Mode, the edge-triggered interrupt signal output will be maintains at active level until MAIN_STATUS register is read.

0x19		INT_CFG (default = 0x10)							
	B7	B6	B5	B4	B3	B2	B1	В0	
	Reserved		ALS INT	ALS INT SELECT		ALS INT PIN ENABLE	Res	erved	

Field	Bits	Default	Description	
Reserved	7:6	00	00	Must write 00
ALS Interrupt	4:5	01	00	Reserved
Select	4.5	01	01	ALS Channel(Default)
Reserved	3	0	0	Must be 0
ALS Interrupt	2	0	0	ALS interrupt disabled (default)
Pin Enable	2	0	1	ALS interrupt enabled
Reserved	1:0	00	00	Must write 00





INT_PST Register (0x1A) (Read/Write)

This 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 interrupt.

0x1A		INT_PST (default = 0x00)								
	B7	B7 B6 B5 B4 B3 B2 B1 B0								
		ALS P	Persist			Rese	erved			

Field	Bits	Default		Description
			0000	Every ALS value out of threshold range asserts an interrupt (default)
ALS Persist	7:4	0000	0001	2 consecutive ALS values out of threshold range assert an interrupt
1 Orolot				
			1111	16 consecutive ALS values out of threshold range assert an interrupt
Reserved	3:0	0000	Must write 0000	

ALS_THRES Register (0x21 / 0x22 / 0x23 / 0x24 / 0x25 / 0x26) (Read/Write)

The ALS_THRES_UP (up to 20-bits) and ALS_THRES_LOW (up to 20-bits) registers determines the upper and lower limit of the interrupt threshold value respectively. Interrupt will be triggered if measurement data in ALS_DATA is exceeding the upper and lower limits.

0x21		ALS_THRES_UP_0 (default = 0xFF)								
	B7	B7 B6 B5 B4 B3 B2 B1 B0								
		ALS Upper Threshold, Low								

0x22		ALS_THRES_UP_1 (default = 0xFF)								
	B7	B7 B6 B5 B4 B3 B2 B1 B0								
		ALS Upper Threshold, Mid								





0x23		ALS_THRES_UP_2 (default = 0x0F)								
	B7	B7 B6 B5 B4 B3 B2 B1 B0								
		Rese	erved		A	LS Upper TI	nreshold, H	ligh		

0x24		ALS_THRES_LOW_0 (default = 0x00)								
	B7	B7 B6 B5 B4 B3 B2 B1 B0								
	ALS Lower Threshold, Low									

0x25		ALS_THRES_LOW_1 (default = 0x00)								
	B7	B7 B6 B5 B4 B3 B2 B1 B0								
		ALS Lower Threshold, Mid								

0x26		ALS_THRES_LOW_2 (default = 0x00)								
	B7	B7 B6 B5 B4 B3 B2 B1 B0								
		Rese	erved		A	LS Lower TI	nreshold, H	ligh		

Field	Address	Bits	Default	Description
ALS Upper Threshold, Low	0x21	7:0	11111111	ALS upper interrupt threshold, Low byte
ALS Upper Threshold, Mid	0x22	7:0	11111111	ALS upper interrupt threshold, Mid byte
ALS Upper	0	7:4	0000	Reserved
Threshold, High	0x23	3:0	1111	ALS upper interrupt threshold, High byte
ALS Lower Threshold, Low	0x24	7:0	0000000	ALS lower interrupt threshold, Low byte
ALS Lower Threshold, Mid	0x25	7:0	00000000	ALS lower interrupt threshold, Mid byte
ALS Lower	000	7:4	0000	Reserved
Threshold, High	0x26	3:0	0000	ALS lower interrupt threshold, High byte





6. Application Circuit



* Note: For noisy environment, add 10pF capacitor from signal to GND for additional noise filtering.

Component	Recommended Value
Rp1, Rp2, Rp3 [1]	1 k Ω to 10 k Ω
C1	0.1uF
C2	4.7uF

Recommended Application Circuit Components

Notes:

[1] Selection of pull-up resistors value is dependent on bus capacitance values. For more details, please refer to I2C Specifications: <u>http://www.nxp.com/documents/user_manual/UM10204.pdf</u>







7. Application Information

7.1 Lux Formula

Lux_Calc is the calculated lux reading and ALS DATA is the digital representation (output ADC) of ambient light level stored in the registers (Address: 0x0D-0x0F) regardless of light sources.

For no window (Clear window)

$$Lux_{Calc} = \frac{0.6 \times ALS_{DATA}}{(GAIN \times INT)}$$

For device under window (eg: Tinted window)

Window Factor is needed when device under Window glass with coated tinted ink. This is to compensate the light loss due to the lower transmission rate of the window glass.

$$Lux_{Calc} = \frac{0.6 \times ALS_{DATA}}{(GAIN \times INT)} \times Window Factor$$

Where:

ALS Gain	GAIN	Resolution (bit) / Integration Time (ms)	INT
X1	1	16-bit, 25ms	0.25
Х3	3	17-bit, 50ms	0.5
X6	6	18-bit, 100ms	1
X9	9	19-bit, 200ms	2
X18	18	20-bit, 400ms	4

Note :

1. For low lux detection (0.01 lux to 10 000 lux, under bare die condition), it is recommended to use highest Gain (Gain x18) and highest resolution bit (20 bit).

2. For default setting Gain 3x, 18-bits, 100ms integration time, detectable lux 0.2 to 52K lux





7.2 Device Operation (State Machine and Interrupt Features)

State Machine

Below diagram is the main state machine of LTR-308ALS.



During the ALS Operation, ALS measurements can be activated by setting the ALS_Enable bit to 1. As soon as the ALS sensors become activated through an I2C command, the internal support blocks are powered on. Once the voltages and currents are settled (typically after 5ms), the state machine checks for trigger events from a measurement scheduler to start ALS conversions according to the selected measurement repeat rates. Once ALS_Enable is changed back to 0, a running conversion on the respective channel will be completed and the relevant ADCs and support blocks will move to power-down state.

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Interrupt Features

This device generates independent ALS interrupt signal that can be multiplexed and output to the INT output pin. The interrupt conditions are always evaluated after completion of a new conversion of the ALS channels. ALS interrupts is active low at the INT pin.

ALS Interrupt

The ALS interrupt is enabled by Bit 2 (ALS INT Pin Enabled) of INT_CFG register (0x19). The source is selected by Bit 4 and 5 (ALS INT Select) of INT_CFG register.

The INT is set when the data of the selected interrupt source is above the upper or below the lower threshold for a specified number of consecutive measurements set in ALS Persist in INT_PST register (0x1A).

The Interrupt signal is also stored in MAIN_STATUS register (0x07) as flag bit in Bit 4 (ALS INT Status). This status flag bit is cleared by reading the MAIN_STATUS register. A cleared flag will also clear the interrupt signal on the INT pin.

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8. Pseudo Codes Examples

Slave address

Slave_Addr = 0xA6

MAIN_CTRL Register

// This defines the operating modes of the ALS
// Default settings is 0x00 (ALS standby)

Register_Addr = 0x00Command = 0x02

WriteByte(Slave_Addr, Register_Addr, Command);

ALS_MEAS_RATE Register

// This controls the ALS measurement resolution and measurement rate.// Default setting of the register is 0x22 (Resolution = 18 Bit, Measurement rate of 100ms)

Register_Addr = 0x04Command = 0x41 // ALS_MEAS_RATE register // Resolution = 16 bit, Meas Rate =50ms // Command =0x25, Resolution = 18 bit, Meas Rate =1000ms // Command =0x02, Resolution = 20 bit, Meas Rate =100ms

WriteByte(Slave_Addr, Register_Addr, Command)

ALS_GAIN Register

// This controls the ALS Gain Range.
// Default setting of the register is 0x01 (Gain Range = 3)

Register_Addr = 0x05Command = 0x00 // ALS_GAIN register // Gain = 1 // Command =0x04, Gain = 18

// MAIN_CTRL register

// ALS in Active Mode
// Command = 0x02, ALS in Active Mode,

WriteByte(Slave_Addr, Register_Addr, Command)

MAIN_STATUS Register (Read Only)

// This Register contains the information on Interrupt, ALS data status.

Register_Addr = 0x07 Data = ReadByte(Slave_Addr, Register_Addr)	// MAIN_STATUS register address
Power_ON_Status = Data & 0x20	// If 0x20 Part went through power-up event // If 0x00 Normal
ALS_Interrupt_Status = Data & 0x10	// If 0x10 Interrupt triggered
	<pre>// If 0x00 Interrupt condition not fulfilled</pre>
ALS_Data_Status = Data & 0x08	<pre>// If 0x08 ALS data is new</pre>



Data Sheet

CLEAR_DATA and ALS_DATA Registers (Read Only)

// The register 0x0A contains CLEAR_ADC 0 lower byte data.

- // The register 0x0B contains CLEAR_ADC 1 upper byte data.
- // The register 0x0C contains CLEAR_ADC 2 (top) upper byte data.
- // The register 0x0D contains ALS_ADC 0 lower byte data.
- // The register 0x0E contains ALS_ADC 1 upper byte data. // The register 0x0F contains ALS_ADC 2 (top) upper byte data.

// These registers should be read as a group with block read function.

Register_Addr = 0x0A// Started with Register CLEAR_DATA_0 Bytes_Count = 6// Read 3 bytes for each CLEAR_DATA and ALS_DATA DataArray=BlockReadByte(Slave_Addr, Register_Addr, Bytes_Count) DataArray [0] = CLEAR_DATA_0 DataArray [1] = CLEAR_DATA_1 DataArray [2] = CLEAR_DATA_2 DataArray [3] = ALS_DATA_0 DataArray [4] = ALS_DATA_1 DataArray [5] = ALS_DATA_2

CLEAR_DATA = (CLEAR_DATA_2*256*256) + (CLEAR_DATA_1*256) + CLEAR_DATA_0 ALS_DATA = (ALS_DATA_2*256*256) + (ALS_DATA_1*256) + ALS_DATA_0 // Combine each 3 arrays to get CLEAR_DATA and ALS_DATA

INT_CFG Register

//This register controls the operation of the interrupt pins and options to trigger interrupt for ALS. //The default value for this INT CFG register is 0x10 (Interrupts inactive for both ALS)

Register_Addr = 0x19 // INT_CFG Register address Command = 0x14// Interrupt CH = ALS, ALS Interrupt Enable, Normal Trigger Mode

WriteByte(Slave_Addr, Register_Addr, Command)

INTERRUPT_PERSIST Register

// This register sets the ALS persist level. // The default setting is 0x00. Interrupt at every ALS reading outside set thresholds.

Register_Addr = 0x1A// INT_PST register // Interrupt for every ALS value outside threshold Command = 0x00// Command =0x10, Subsequent 2 ALS outside threshold range

WriteByte(Slave_Addr, Register_Addr, Command)

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ALS_THRES Registers

//The register 0x21 contains ALS Interrupt upper threshold lower byte data (ALS_THRES_UP_0) //The register 0x22 contains ALS Interrupt upper threshold 1 upper byte data (ALS_THRES_UP_1) //The register 0x23 contains ALS Interrupt upper threshold 2 upper byte data (ALS_THRES_UP_2)

//The register 0x24 contains ALS Interrupt lower threshold lower byte data (ALS_THRES_LOW_0)
//The register 0x25 contains ALS Interrupt lower threshold 1 upper byte data (ALS_THRES_LOW_1)
//The register 0x26 contains ALS Interrupt lower threshold 2 upper byte data (ALS_THRES_LOW_2)

// To set ALS Upper threshold for Interrupt Upper_Threshold_Value=1000 Data2 = Upper_Threshold_Value >> 16 Data1 = Upper_Threshold_Value >> 8 Data0 = Upper_Threshold_Value & 0xFF

Register_Addr = 0x21 WriteByte(Slave_Addr, Register_Addr, Data0) Register_Addr = 0x22 WriteByte(Slave_Addr, Register_Addr, Data1) Register_Addr = 0x23 WriteByte(Slave_Addr, Register_Addr, Data2)

// To set ALS Lower threshold for Interrupt Lower_Threshold_Value=100 Data2 = Lower_Threshold_Value >> 16 Data1 = Lower_Threshold_Value >> 8 Data0 = Lower_Threshold_Value & 0xFF

Register_Addr = 0x24 WriteByte(Slave_Addr, Register_Addr, Data0) Register_Addr = 0x25 WriteByte(Slave_Addr, Register_Addr, Data1) Register_Addr = 0x26 WriteByte(Slave_Addr, Register_Addr, Data2) // Example 1000 // Shift right to extract the 2 upper byte // Shift right to extract the 1 upper byte // Mask to extract lower byte.

// ALS_THRES_UP_0 Register address

// ALS_THRES_UP_1 Register address

// ALS_THRES_UP_2 Register address

// Example 100

- // Shift right to extract the 2 upper byte
- // Shift right to extract the 1 upper byte // Mask to extract lower byte.

// ALS_THRES_LOW_0 Register address

// ALS_THRES_LOW_1 Register address

// ALS_THRES_LOW_2 Register address

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9. Recommended Leadfree Reflow Profile



Process Zone	ΔΤ	Maximum ∆T/∆time or Duration
Heat Up	25°C to 150°C	3°C/s
Solder Paste Dry	150°C to 200°C	120s max
Solder Reflow	200°C to 245°C 245°C to 217°C	3°C/s -6°C/s
Cool Down	217°C to 100°C	-6°C/s
Time maintained above liquidus point , 217°C	> 217°C	100s max
Peak Temperature	245°C	±5°C
Time within 5°C of actual Peak Temperature	> 240°C	10 ~ 20s
Time 25°C to Peak Temperature	25°C to 245°C	8mins max

Notes:

The reflow profile shown in Figure can be a typical range for the customer peak reflow temperature (Tp) of 235°C ~ 250°C to be used.

The peak reflow temperature (Tp) has to be lower than maximum peak reflow temperature (Tp) 260°C shown in Figure. The reflow profile and peak temperature should conform to the solder paste manufacturer recommendation.

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

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10. Moisture Proof Packaging

All LTR-308ALS-01 are shipped in moisture proof package. Once opened, moisture absorption begins. This part is compliant to JEDEC J-STD-033A Level 3.

Time from Unsealing to Soldering

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

Recommended Storage Conditions

Storage Temperature	10°C to 30°C
Relative Humidity	Below 60% RH

Baking Conditions

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

Baking should only be done once.







11. Recommended Land Pattern



Recommended Land Pattern for LTR-308ALS-01



Note: All dimensions are in millimeters

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12. Metal Stencil Aperture

It is recommended that the metal stencil used for solder paste printing has a thickness (t) of 0.11mm (0.004 inches / 4 mils) or 0.127mm (0.005 inches / 5 mils).

The stencil aperture opening is recommended to be 0.3mm x 0.65mm which has the same dimension as the land pattern. This is to ensure adequate printed solder paste volume and yet no shorting.



Note: 1. All dimensions are in millimeters







13. Tape and Reel Dimensions





Notes:

- 1. All dimensions are in millimeters (inches)
- 2. Empty component pockets sealed with top cover tape
- 3. 7 inch reel 3500 pieces per reel
- 4. In accordance with ANSI/EIA 481-1-A-1994 specifications



OPTICAL SENSOR LTR-308ALS-01

Revision Table:

Version	Update	Page	Date
1.0	Final Datasheet as created	Total 29	22-Mar-16
1.1	Update Part ID from 0xB2 to 0xB1	10	29-Mar-16
1.2	Add flowchart for startup sequence	6	18-May-16
1.3	Updated packaging dimension	2	3-Jun-16
1.4	Added graph of supply current vs temperature	5	19-Jun-17
1.5	Added reset time	4	20-Feb-19
1.6	Update I2C spec	5	02-Jan-20
1.7	Update pseudo code	22,23,24	25-May-21
1.8	Add-on time accuracy & Integration time	5	8-Sep-22
1.9	Update Reflow profile	Page 25	06-May2024
2.0	Update 2D drawing	Page 2	01-Jul-2024
2.1	Updated package qty	Page1 & 29	05/09/2024

