Model WF-M63B-UWM1 Datasheet

IEEE 802.11 2x2 WIFI 5 Wireless LAN and Bluetooth 5.1 Integrated light sensor, IR, LED, Touch switch Multifunctional Combo Module

[SoC MT7663BUN]

for 802.11a/b/g/n/ac + Bluetooth 5.1

Version： 0.5

<Specification may be changed without prior notice>

Sichuan AI-Link Technology Co., Ltd

Below Space Intentionally Left Blank for Customer Confirmation or Comments

Typed Name	Signature	Date

Please sign and return this page and the front page to our company by email or fax, or by courier to the following address:

Address: Anzhou Industrial Park, Mianyang, Sichuan, P.R.C

Company: Sichuan AI-Link Technology Co., Ltd.

Module Name		**WF-M63B-UWM1**	
	Designed by	Reviewed by	Approved by
Signature	WANG, Xin	HUANG, Wei	DING, SHUANGPENG
Date	10/28/2023	10/28/2023	10/28/2023

Model WF-M63B-UWM1

- **Compatible WLAN Standards**

  IEEE Std. 802.11 a/b/g/n/ac

  Bluetooth V2.1/3.0/4.2/5.1

- **SoC**

  MT7663BUN

- **Product Size**

  35mm×45mm×10.4mm

- **Product Weight**

  6.2g

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Features

WLAN

- IEEE 802.11 a/b/g/n/ac compliant
- Support 20/40 bandwidth in 2.4GHz and 20/40/80M bandwidth in 5GHz band
- Dual bands 2T2R mode
- data rate up to 867Mbps
- Support MU-MIMO RX
- Support STBC, LDPC, TX Beamformer, and RX Beamformer
- Greenfield, mixed-mode, legacy modes support
- IEEE 802.11 d/e/h/i/j/k/r/v/w support
- Security support for WFA WPA/WPA2/WPA3 personal, WPS2.0
- QoS support of WFA WMM,WMM PS

Bluetooth

- Bluetooth v5.1 with BLE (BT low energy)
- Supports BT/BLE dual mode
- Supports BT/Wi-Fi coexistence
- Supports SCO and eSCO link with re-transmission
- Supports wide-band speech

- Supports mSBC and SBC including mono and stereo
- Supports Packet Loss Concealment (PLC) function for better voice quality
- Supports secure connection with AES128 and ECC256
- Channel quality driven data rate adaptation
- Channel assessment and WB RSSI for AFH

Others

- Support light sensor function
- Support IR function
- Support LED，Touch switch

Revision Record

Revision	Date	Description	Edited by
V0.1	05/20/2023	Premier Release	HUANG, Wei
V0.2	07/14/2023	Add pictures	HUANG, Wei
V0.3	10/17/2023	Picture changes	WANG, Xin
V0.4	10/19/2023	Add CE and change IR	WANG, Xin
V0.5	10/28/2023	Modified timing	HUANG, Wei
** Private Preview Only*			

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1 General Description

1.1 System Overview

Model WF-M63B-UWM1 is a highly integrated WIFI module by AI-Link, based on the MediaTek SoC MT7663BUN, featuring a 2x2 a/b/g/n/ac dual-band Wi-Fi, and a Bluetooth v5.1 subsystems.

The finely tuned hardware architecture and baseband algorithms provide superlative RF performance, as well as low power consumption. Intelligent MAC design powers a highly efficient offload engine; the hardware supports standard features of higher level of security, performance, and conforms most international regulations, offering the great performance at any time, in any circumstance.

1.2 System Properties

Dimension	Typically, 35mm x 45mm x 10.4mm
Chipset	MT7663BUN
Operating Frequency	2.4GHz:2.400~2.497 GHz 5 GHz：5.150~5.925GHz
Antenna	3 PCB Antenna
Operating Voltage	5V±10%
PCB Information	4-layers design (1.2 +/-0.15mm)
Peripheral Interface	WIFI&BT@USB
Rate	11b: 1, 2, 5.5 and 11Mbps 11a/g: 6, 9, 12, 18, 24, 36, 48 and 54 Mbps 11n: MCS0~15, up to 300Mbps

	11ac: MCS0~9, Nss=2, BW=80MHz up to 866.7Mbps
Operating Temperature	-10℃ to +70℃
Storage Temperature	-40℃ to +85℃
ESD Protection	HBM：2000V

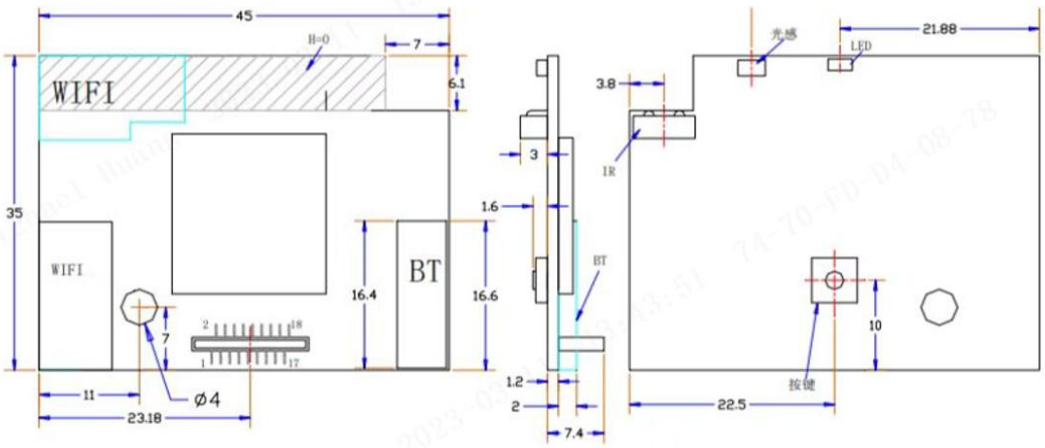
1.3 Diagram

The AI-Link’s WF-M63B-UWM1 module Complies with IEEE standards 802.11a/b/g/n/ac; it also supports 2x2 Multi-User Multiple-Input Multiple-Output (known as MU-MIMO) and could reach up to data rate of 867 Mbps. Meanwhile, it is also a module of Bluetooth v5.1 and Wi-Fi Dual-band.

2 Mechanical Dimensions

2.1 Mechanical Outline Drawing

- Typical Dimension (W x L x T): 35.0mmx 45.0mm x 10.4mm
- General tolerance: ±0.2mm
- PCB Thickness: 1.2mm (+/-0.15mm)



Top View *SIDE View* *BOT VIEW*

2.2 Pin definitions

Pin	Define	Description
1	SCL	SCL (light sensor)
2	SDA	SDA (light sensor)
3	Key	Key (input low)
4	LED	LED indicator(White)
5	STBC_IR	IR_OUT((36KHz))
6	3V3_STB	Standby 3.3V
7	GND	GND
8	GND	GND
9	BT_IRQn	BT WAKE HOST
10	WIFI_IRQn	WIFI WAKE HOST
11	RESET	RESET 7663BU SOC
12	GND	GND
13	GND	GND
14	USB_DP	USB D+
15	USB_DM	USB D-
16	5V	Power supply, 3.3V@1.5A
17	5V	Power supply, 3.3V@1.5A
18	5V	Power supply, 3.3V@1.5A

2.3 roduct Photos

TOP View *BOT View*

2.4 Label Information

- Top Label

- CE，H=5mm
- WIFI MAC information DM code
- Part number：WF-M63B-UWM1
- SRRC ID：2023AP16843
- Company information

3 RF Characteristics

3.1 Wi-Fi Subsystem

Items	Contents	
WLAN Standard	IEEE 802.11a/b/g/n/ac	
Frequency Range	2.412 GHz~2.462 GHz (2.4 GHz)	
	5.150 GHz~5.850 GHz (5 GHz)	
Channels	CH1 to CH13 @ 2.4G	
	CH36 to CH165 @ 5G	
Modulation Mode	802.11b: DBPSK, DQPSK ,CCK	
	802.11 a/g/n: BPSK, QPSK, 16QAM, 64QAM	
	802.11 ac: BPSK, QPSK, 16QAM, 64QAM,256QAM	
	11ax: BPSK, QPSK, 16QAM, 64QAM,256QAM,1024QAM	
Output Power Min& EVM	Power Value	EVM
	802.11b /11Mbps: 15dBm±2	≤ -10dB
	802.11g /54Mbps: 15dBm±2	≤ -25dB
	802.11a /54Mbps: 15dBm±2	≤ -25dB
	802.11n HT20 /MCS7: @2.4G 14dBm±2	≤ -28dB
	802.11n HT20 /MCS7: @5G 14dBm±2	≤ -28dB
	802.11n HT40 /MCS7: @2.4G 14dBm±2	≤ -28dB
	802.11n HT40 /MCS7: @5G 14dBm±2	≤ -28dB
	802.11ac VHT20 /MCS8: @5G 13dBm±2	≤ -32dB
	802.11ac VHT40 /MCS9: @5G 13dBm±2	≤ -32dB

Items	Contents	
	802.11ac VHT80 /MCS9: @5G 13dBm±2	≤ -32dB
Receiver Sensitivity @2.4G PER≤ 10% @5G PER≤ 10%	Rate Type	Max
	802.11b /11Mbps @2.4G PER≤8%	-83dBm
	802.11g /54Mbps @2.4G	-71dBm
	802.11a /54Mbps @5G	-71dBm
	802.11n HT20 /MCS7 @2.4G	-68dBm
	802.11n HT20 /MCS7 @5G	-68dBm
	802.11n HT40 /MCS7 @2.4G	-66dBm
	802.11n HT40 /MCS7 @5G	-66dBm
	802.11ac VHT20 /MCS8 @5G	-64dBm
	802.11ac VHT40 /MCS9 @5G	-58dBm
	802.11ac VHT80 /MCS9 @5G	-55dBm

3.2 Bluetooth Subsystem

Items	Contents
Host Interface	USB
TX Characteristics	
Channel	BR、EDR:CH0 toCH78

	LE:CH0 to CH39			
Modulation	GFSK、π/4-DQPSK 、8PSK			
TX Power	Rate Type	Min(dBm)	Typ(dBm)	Max(dBm)
	1DH5	7	10	13
	2DH5	7	10	13
	3DH5	7	10	13
	1LE	7	10	13
	2LE	7	10	13
RX Characteristics				
RX	Rate Type	Min(dBm)	Typ(dBm)	Max(dBm)
	1DH5 (BER<0.1%)		-90	-70
	2DH5 (BER<0.01%)		-86	-70
	3DH5 (BER<0.01%)		-80	-70
	1LE (PER<30.8%)		-90	-70
	2LE (PER<30.8%)		-90	-70

** Note: [1] Typical RF Output Power are tested at room temp.25℃*

4 Interface

4.1USB Interface

The module supports the USB (USB v2.0 specification) device port, Use USB as the host interface for Bluetooth.

5 Electrical Current Consumption

5.1 WLAN Current Consumption

Description	Value	Unit
Power Consumption （WIFI TX 5G TX NSS=2 HT20 MCS0)	813@3.3V	mA
Power Consumption（WIFI RX 5G RX NSS=2 VHT80 MCS9)	165@3.3V	mA

**Note:*

[1] Results are measured provided VDD33 is 3.3V. TX power is measured at the antenna port. The temperature is 25oC.

[2] The duty cycle for TX/RX measurement is 100%.

[3] The chip variation is +/- 25%.

5.2 Bluetooth Current Consumption

Description	Value	Unit
Power Consumption（BT TX)	82@3.3V	mA
Power Consumption（BT RX)	29@3.3V	mA

**Note:*

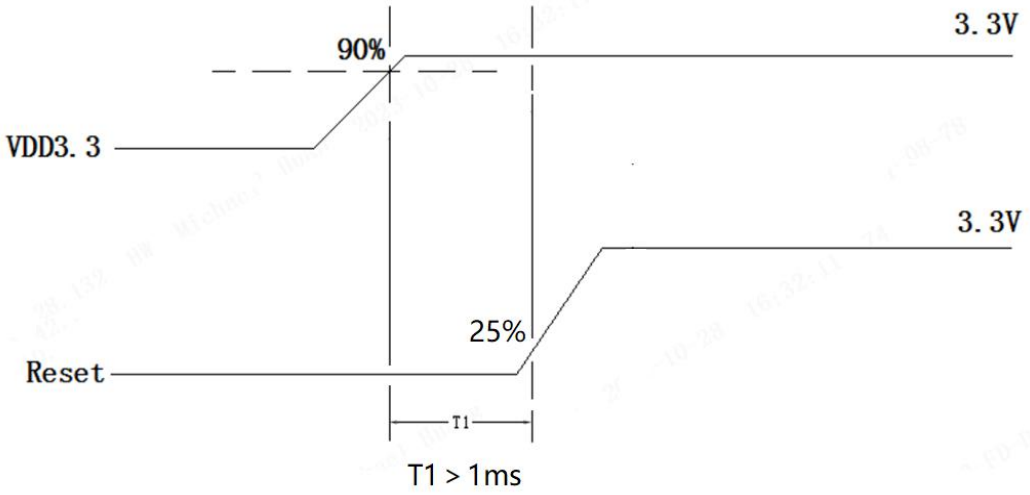
[1] Results are measured provided VDD33 is 3.3V. TX power is measured at the antenna port. The temperature is 25oC.

[2] The duty cycle for TX/RX measurement is 100%.

[3] The chip variation is +/- 25%

6 Sequence

6.1 Power On

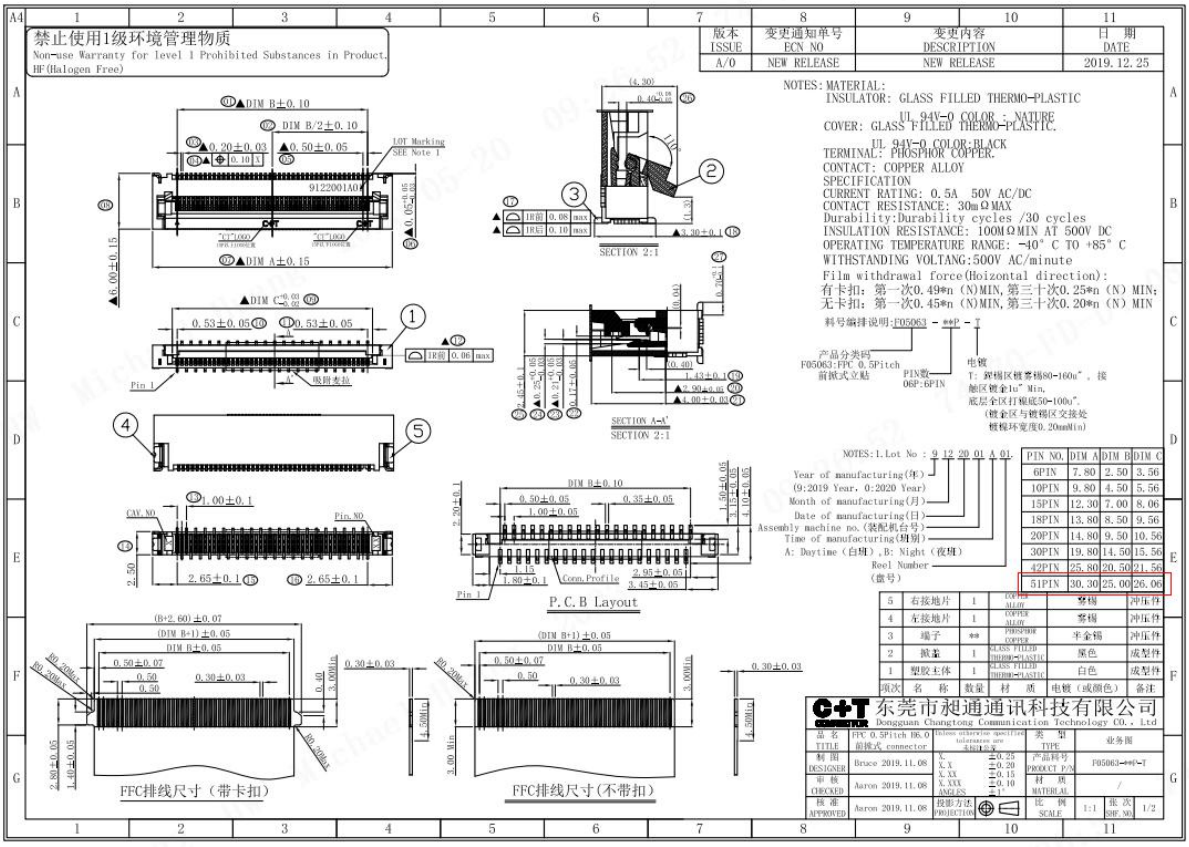


6.2 Reset

7 DC characteristics

Symbol	Parameter	Conditions	MIN	TYP	MAX	Unit
VIL	Input low voltage	Input voltage	-0.3	-	0.825	V
VIH	Input High voltage	Input voltage	2.0625	-	3.6	V
VOL	Output low voltage	Input voltage |IOL|=1~64mA	-0.3	-	0.4	V
VOH	Output High voltage	Output voltage |IOH|=2~96mA	2.9	-	3.6	V

8 Connector(18PIN)



PIN NO.	DIM A	DIM B	DIM C
6PIN	7.80	2.50	3.56
10PIN	9.80	4.50	5.56
15PIN	12.30	7.00	8.06
18PIN	13.80	8.50	9.56
20PIN	14.80	9.50	10.56
30PIN	19.80	14.50	15.56
42PIN	25.80	20.50	21.56
51PIN	30.30	25.00	26.06

9 IR (TSOP95436TR)

IR Receiver Modules for Remote Control Systems

20953

FEATURES

- Improved dark sensitivity
- Improved immunity against optical noise
- Very low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.0 V to 3.6 V
- Insensitive to supply voltage ripple and noise
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
e3
RoHS COMPLIANT
HALOGEN FREE
GREEN (5-2008)

DESIGN SUPPORT TOOLS

click logo to get started

3D Models Available

MECHANICAL DATA

1, 4 = GND, 2 = V_S, 3 = OUT

ORDERING CODE

Taping:

TSOP95...TT - top view taped

TSOP95...TR - side view taped

DESCRIPTION

The TSOP95... series devices are the latest generation miniaturized IR receiver modules for infrared remote control systems. These series provide improvements in sensitivity to remote control signals in dark ambient as well as in sensitivity in the presence of optical disturbances e.g. from CFLs.

The devices contain a PIN diode and a preamplifier assembled on a lead frame. The epoxy package contains an IR filter. The demodulated output signal can be directly connected to a microprocessor for decoding.

The TSOP952.. and TSOP954.., series devices are designed to receive long burst codes (10 or more carrier cycles per burst). The third digit designates the AGC level (AGC2 or AGC4) and the last two digits designate the band-pass frequency (see table below). The higher the AGC, the better noise is suppressed, but the lower the code compatibility. AGC2 provides basic noise suppression and AGC4 provides enhanced noise suppression. Generally, we advise to select the highest AGC that satisfactorily receives the desired remote code.

These components have not been qualified to automotive specifications.

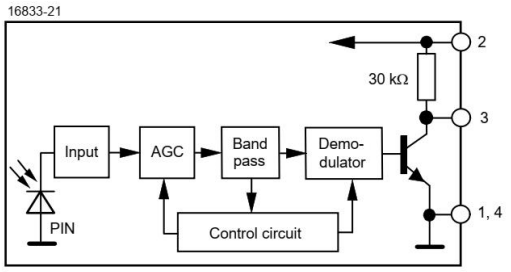
PARTS TABLE

AGC		BASIC NOISE SUPPRESSION (AGC2)	ENHANCED NOISE SUPPRESSION (AGC4)
Carrier frequency	30 kHz	TSOP95230	TSOP95430
	33 kHz	TSOP95233	TSOP95433
	36 kHz	TSOP95236	TSOP95436 (2)(7)
	38 kHz	TSOP95238	TSOP95438 (10)
	40 kHz	TSOP95240 (12)	TSOP95440
	56 kHz	TSOP95256 (1)	TSOP95456 (8)(9)
Package		Heimdall	
Pinning		1, 4 = GND, 2 = V_S, 3 = OUT	
Dimensions (mm)		6.8 W x 3.0 H x 3.2 D	
Mounting		SMD	
Application		Remote control	
Best choice for		(1) Cisco (2) MCIR (3) Mitsubishi (4) NEC (5) Panasonic (6) RC-5 (7) RC-6 (8) RCA (9) r-step (10) Sejin 4PPM (11) Sharp (12) Sony	

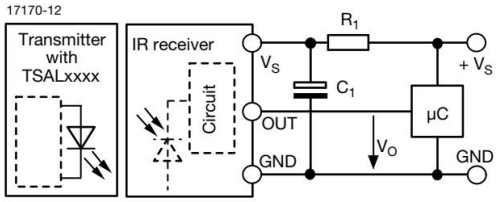
Notes

- 30 kHz and 33 kHz only available on written request
- See datasheet for TSOP956.. for preferred devices for (3)(4)(5)(6)(11)

BLOCK DIAGRAM



APPLICATION CIRCUIT



R_1 and C_1 recommended to reduce supply ripple for $V_S < 2.2$ V

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Supply voltage		V_S	-0.3 to +3.6	V
Supply current		I_S	3	mA
Output voltage		V_O	-0.3 to (V_S + 0.3)	V
Output current		I_O	5	mA
Junction temperature		T_j	100	°C
Storage temperature range		T_{stg}	-25 to +85	°C
Operating temperature range		T_{amb}	-25 to +85	°C
Power consumption	$T_{amb} \leq 85$ °C	P_{tot}	10	mW

Note

- Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect the device reliability

ELECTRICAL AND OPTICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Supply current	E_v = 0, V_S = 3.3 V	I_{SD}	0.25	0.37	0.45	mA
	E_v = 40 klx, sunlight	I_{SH}	-	0.50	-	mA
Supply voltage		V_S	2.0	-	3.6	V
Transmission distance	E_v = 0, test signal see Fig. 1, IR diode TSAL6200, I_F = 50 mA	d	-	25	-	m
Output voltage low	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m², test signal see Fig. 1	V_{OSL}	-	-	100	mV
Minimum irradiance	Test signal: NEC code	$E_{e\ min.}$	-	0.11	0.25	mW/m²
Maximum irradiance	$t_{pi} - 4/f_0 < t_{po} < t_{pi} + 4/f_0$, test signal see Fig. 1	$E_{e\ max.}$	30	-	-	W/m²
Directivity	Angle of half transmission distance	$\varphi_{1/2}$	-	± 50	-	°

TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

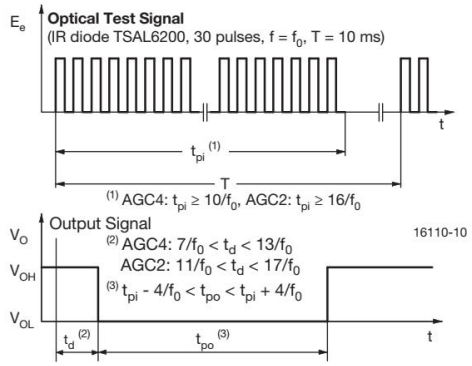


Fig. 1 - Output Delay and Pulse-Width

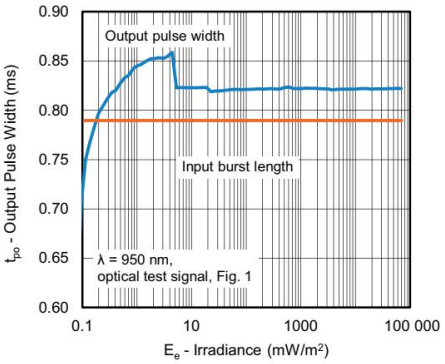


Fig. 2 - Pulse-Width vs. Irradiance in Dark Ambient

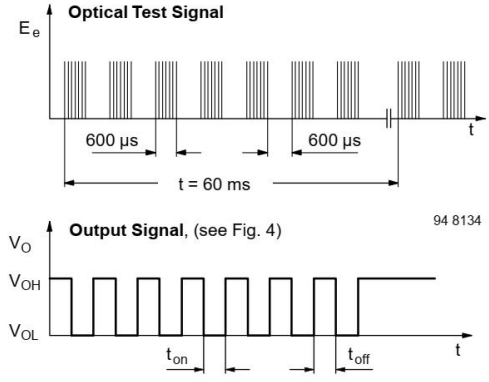


Fig. 3 - Test Signal

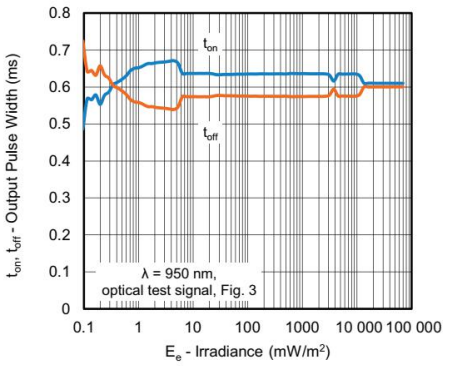


Fig. 4 - Pulse-Width vs. Irradiance in Dark Ambient

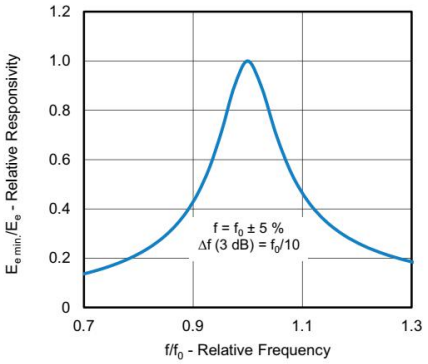


Fig. 5 - Frequency Dependence of Responsivity

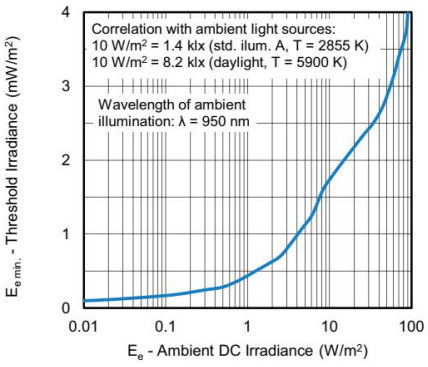


Fig. 6 - Sensitivity in Bright Ambient

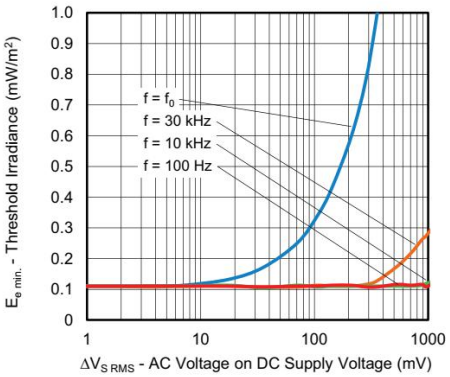


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

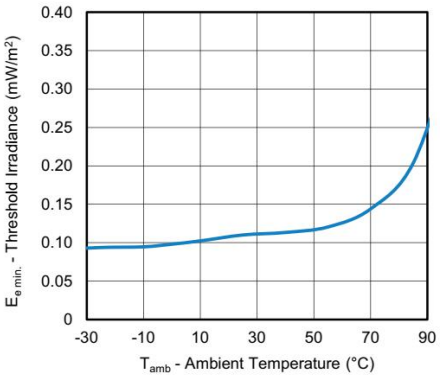


Fig. 9 - Sensitivity vs. Ambient Temperature

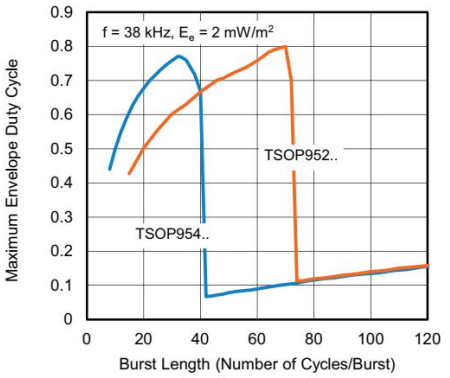


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

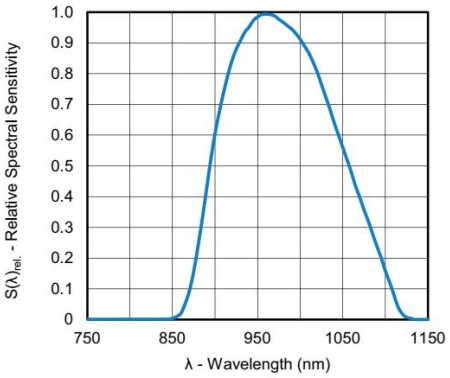


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

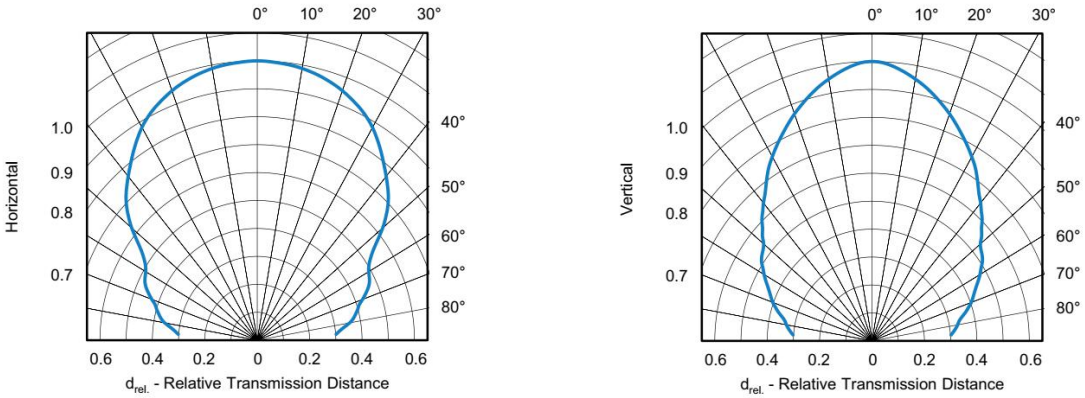


Fig. 11 - Horizontal and Vertical Directivity

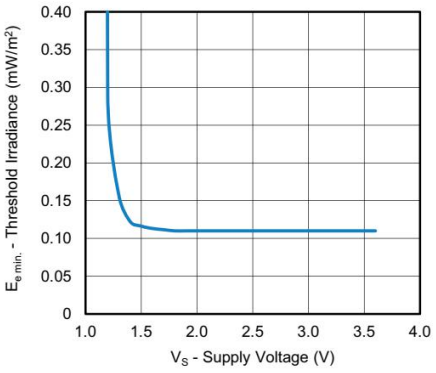


Fig. 12 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

This series is designed to suppress spurious output pulses due to noise or disturbance signals. The devices can distinguish data signals from noise due to differences in frequency, burst length, and envelope duty cycle. The data signal should be close to the device's band-pass center frequency (e.g. 38 kHz) and fulfill the conditions in the table below.

When a data signal is applied to the product in the presence of a disturbance, the sensitivity of the receiver is automatically reduced by the AGC to insure that no spurious pulses are present at the receiver's output. Some examples which are suppressed are:

- DC light (e.g. from tungsten bulbs sunlight)
- Continuous signals at any frequency
- Strongly or weakly modulated patterns from fluorescent lamps with electronic ballasts (see Fig. 13 or Fig. 14)

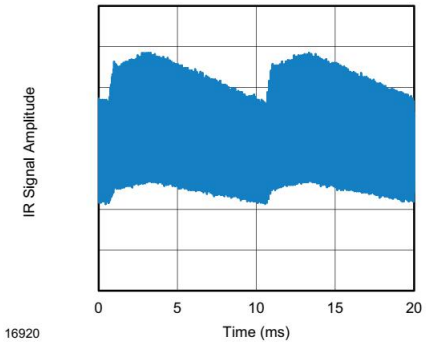


Fig. 13 - IR Emission from Fluorescent Lamp With Low Modulation

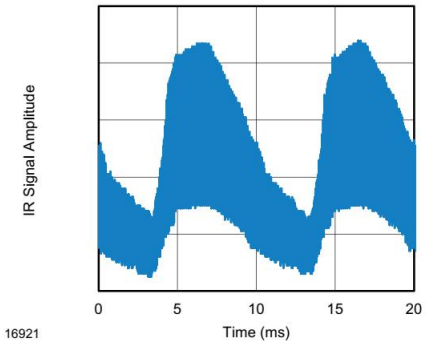


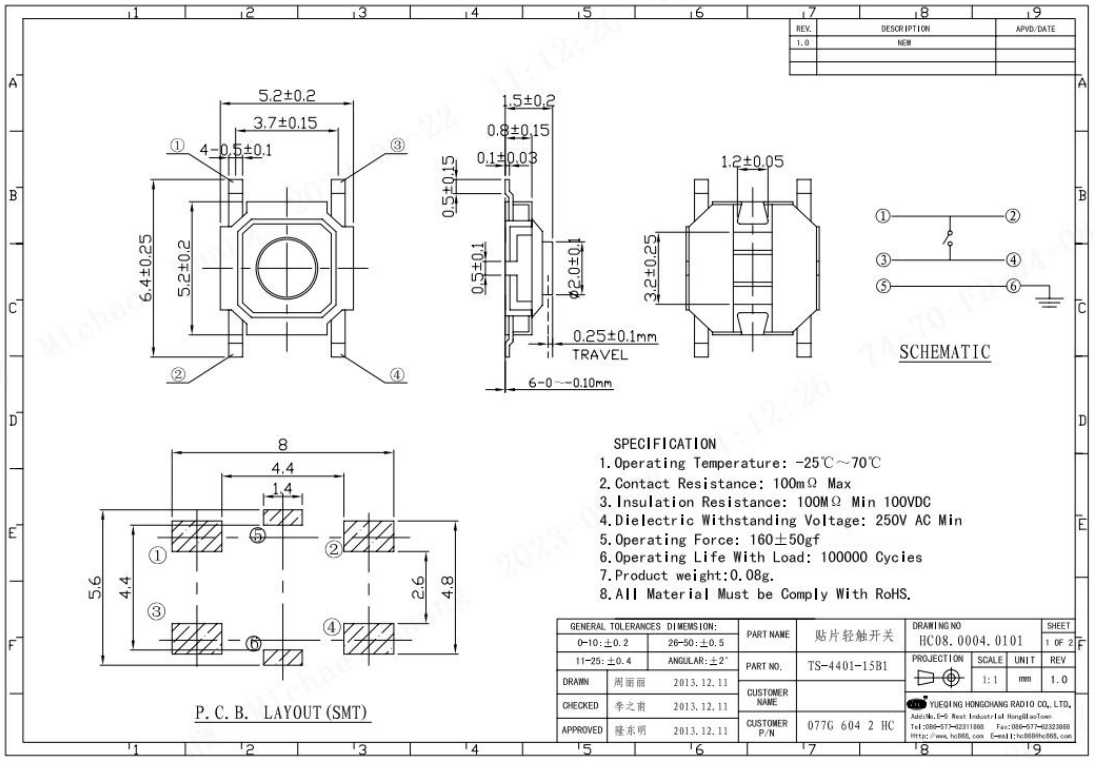
Fig. 14 - IR Emission from Fluorescent Lamp With High Modulation

	TSOP952..	TSOP954..
Minimum burst length	16 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	16 to 70 cycles ≥ 16 cycles	10 to 40 cycles ≥ 12 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 6 x burst length	40 cycles > 10 x burst length
Maximum number of continuous short bursts/second	1000	1800
RC-5 code	Yes	Yes
RC-6 code	Yes	Preferred
NEC code	Yes	Yes
r-step code 56 kHz	No	Preferred
Sony code	Preferred	No
RCA 56 kHz code	Yes	Preferred
Mitsubishi code 38 kHz	Yes	Yes
Suppression of interference from fluorescent lamps	Fig. 13	Fig. 13 and Fig. 14

Note

- For data formats with short bursts please see the datasheet for TSOP953.., TSOP955..

10 KEY(TS-4401-15B1)



11 LED(GPSS008WC1-D)

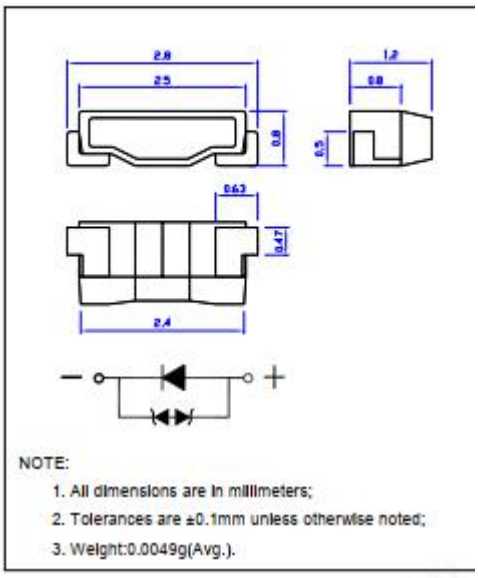
●Features:

1. Chip material: InGaN
2. Emitted color: white
3. Resin Color: yellow diffuse
4. Low power consumption.
5. High efficiency.
6. Compatible with infrared and vapor phase reflow solder process.
7. Low current requirement.
8. Tape/3000pcs.
9. This product don't contained restriction substance, compliance RoHS standard.

● Applications:

1. TV set
2. Monitor
3. Mobile telephone
4. Computer
5. Circuit board
6. BackLight

●Package dimensions:



NOTE:

1. All dimensions are in millimeters;
2. Tolerances are ±0.1mm unless otherwise noted;
3. Weight:0.0049g(Avg.).

● Absolute maximum ratings(Ta=25℃)

Parameter	Symbol	Rating	Unit
Power Dissipation	Pd	110	mW
Forward Current	I_F	30	mA
Peak Forward Current*1	I_{FP}	100	mA
Reverse Voltage	V_R	5	V
Operating Temperature	Topr	-40~+85	℃
Storage Temperature	Tstg	-40~+90	℃
Solder Ability Temperature	T_{SOA}	245±3 The area of covering solder exceed 95%(pad)	℃
Solder Endurance Heat Temperature	Tsol	260 (for 10s)	℃
Hand Solder Endurance HeatTemperature		350 (for 3s)	℃

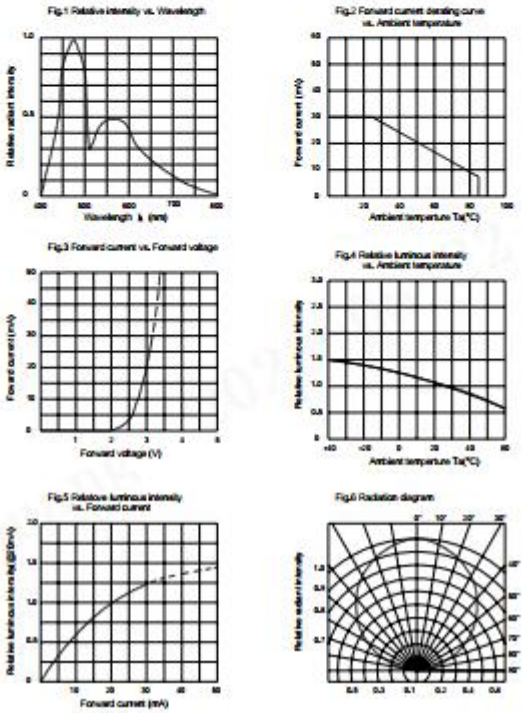
*1Condition for I_{FP} is pulse of 1/10 duty and 0.1msec width

● **Electrical and optical characteristics(Ta=25℃)**

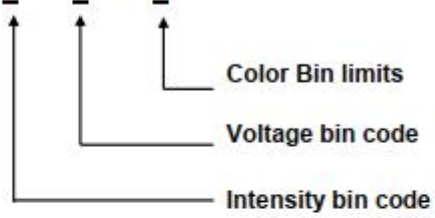
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V_F	I_F=20mA	2.95	3.10	3.55	V
		I_F=5mA	2.70	2.85	3.30	
Luminous Intensity	Iv	I_F=20mA	990.0	-	1500.0	mcd
		I_F=5mA	200.0	300.0	500.0	
Reverse Current	I_R	V_R=5V	-	-	10	μA
CIE.Chromatic Coordinates	X	I_F=5mA/ 20mA	W1+W2+W3+W4+W5+W6+W7+W8			
	Y	I_F=5mA/ 20mA				
Viewing Angle	2θ1/2	I_F=5mA/ 20mA	-	110	-	deg

* Tolerance of luminous intensity is ±10%
* Tolerance of forward voltage is ±0.1V
* Tolerance of dominant wave length is ±1nm

● **Typical electro-optical characteristics curves**



● Bin : X X - X



● **Bin Limits**

1. Intensity bin limits (At I_F= 5mA)

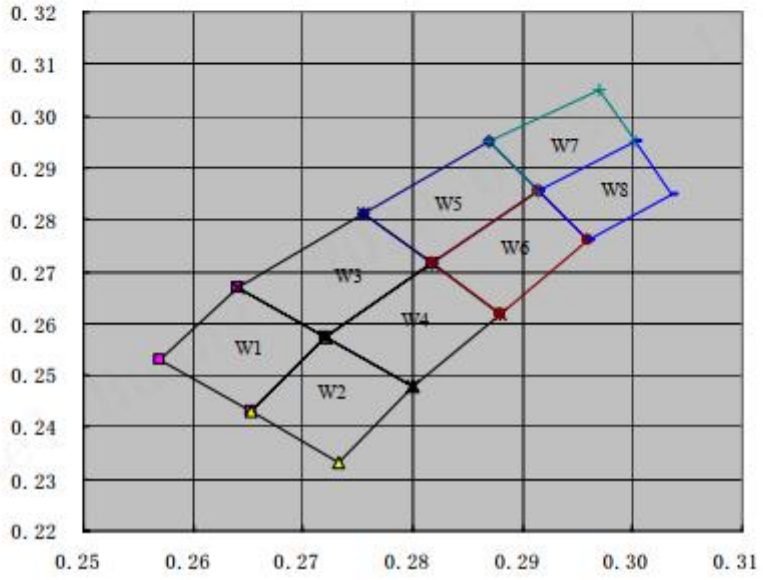
Bin Code	Min. (mcd)	Max. (mcd)
P1	200	250
P2	250	320
Q1	320	400
Q2	400	500

2. Voltage Bin limits (At I_F= 5mA)

Bin Code	Min. (V)	Max. (V)
G1	2.70	2.80
G2	2.80	2.90
H1	2.90	3.00
H2	3.00	3.10
J1	3.10	3.20
J2	3.20	3.30

3. Color Bin limits (At I_F= 5mA)

Color Ranks		CIE			
W1	X	0.2640	0.2569	0.2652	0.2720
	Y	0.2670	0.2528	0.2429	0.2575
W2	X	0.2720	0.2652	0.2733	0.2800
	Y	0.2575	0.2429	0.2333	0.2480
W3	X	0.2720	0.2640	0.2755	0.2818
	Y	0.2575	0.2670	0.2810	0.2715
W4	X	0.2800	0.2720	0.2818	0.2879
	Y	0.2480	0.2575	0.2715	0.2619
W5	X	0.2818	0.2755	0.2870	0.2915
	Y	0.2715	0.2810	0.2950	0.2855
W6	X	0.2879	0.2818	0.2915	0.2960
	Y	0.2619	0.2715	0.2855	0.2760
W7	X	0.2915	0.2870	0.2970	0.3003
	Y	0.2855	0.2950	0.3050	0.2950
W8	X	0.2960	0.2915	0.3003	0.3035
	Y	0.2760	0.2855	0.2950	0.2850



12 Light sensor(JSA-1136)

Ambient Light Sensor
JSA-1136

1. Feature

- Works under all light sources including sunlight
- Programmable interrupt scheme minimizes microcontroller utilization
- Ambient Light Sensing
  - simple output code directly proportional to lux
  - 50Hz/60Hz flicker noise and IR rejection
  - light sensor close to human eye response
  - selectable 128/256/512/1024/2048 lux range
- Intelligent and Flexible Interrupts
  - adjustable interrupt persistency
    1/4/8/16 consecutive triggers required before interrupt
- Ultra Low Power
  - 100μA DC typical supply current
  - less than 0.1μA supply current when powered down
- Easy to Use
  - set registers; wait for interrupt
  - I^2C (SMBus Compatible) interface
  - temperature compensated
- Wide Operating Voltage Range
  - 1.7V to 3.6V supply for I2C interface
  - 2.3V to 3.6V sensor power supply
  - I^2C address selection
- Side view type

2. General Description

The JSA-1136 is a high performance, high resolution, wide range ambient light sensor with stable measurement output and SMBus compatible I2C Interface. For ambient light conversion, a built-in ADC converts the ambient light in 100ms per sample and rejects 50Hz/60Hz flicker noise caused by artificial light sources. The JSA-1136 uses both a hardware pin and a software bit to indicate an interrupt event has occurred. An ambient light triggered interrupt is defined as a measurement which is outside a set window. The user may require that ambient light interrupt occurs at once, up to 16 times in a row before activating the interrupt pin. The low power JSA-1136 is designed for minimal microcontroller utilization, and to operate from 2.3V to 3.6V over the -40°C to +85°C ambient temperature range.

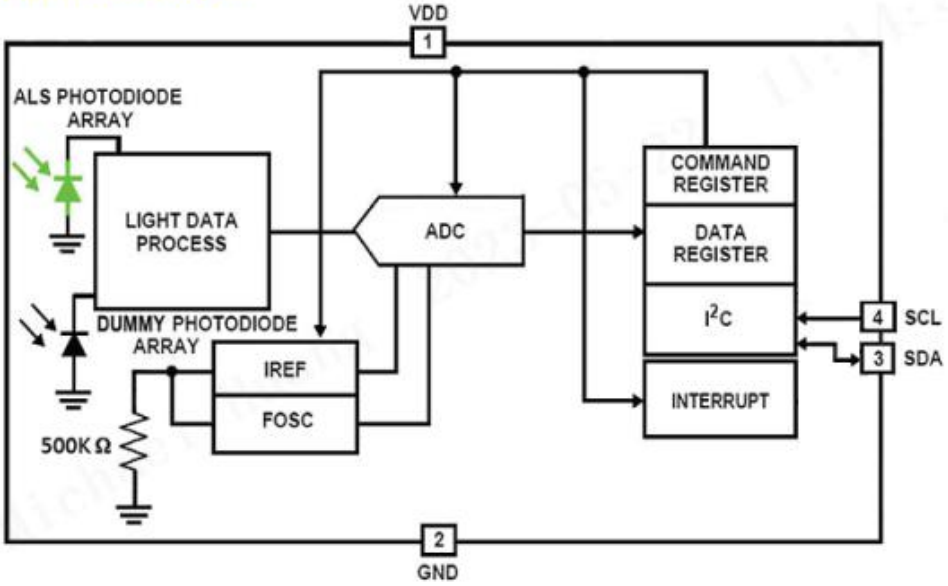
3. Applications

- Display and keypad dimming adjustment and proximity sensing for:
  - Mobile Devices: smart phone, PDA, GPS
  - Computing Devices: laptop PC, notebook
  - Consumer Devices: LCD-TV, digital picture frame, digital camera
- Industrial and medical light and proximity sensing

4. Pin Description

Pin No	Pin Name	Description
1	VDD	Positive supply: 2.3V to 3.6V
2	GND	Ground
3	SDA	The I^2C bus lines can be pulled from 1.7V to above V_{DD}, 3.6V max SDA: Serial Data
4	SCL	SCL: Serial Clock

5. Function Block Diagram



8. I^2C Electrical Specifications (VDD = 3.0V, TA = +25°C)

Parameter	Description	Condition	Min	Typ	Max	Unit
V_{I2C}	Supply voltage range for I^2C interface		1.7		3.6	V
f_{I2C}	I^2C clock rate				750	KHz
V_{IL}	SCL and SDA input low voltage				0.55	V
V_{IH}	SCL and SDA input high Voltage		1.25			V
Vhys	Hysteresis of Schmitt trigger input		0.55VDD			V
V_{OL}	Low-level output voltage (open-drain) at 4Ma sink current				0.4	V
I_i	Input leakage for each SDA, SCL		-10		10	uA
t_{SP}	Pulse width of spikes that must be suppressed by the input filter				50	nS
t_{AA}	SCL falling edge to DA output data valid				0.9	uS
Ci	Capacitance for each SDA and SCL pin				10	pF
$t_{HD:STA}$	Hold time (repeated) START condition		0.6			uS
t_{LOW}	Low period of the SCL clock		1.3			uS
t_{HIGH}	High period of the SCL clock		0.6			uS
$t_{SU:STA}$	Set-up time for a repeated START condition		0.6			uS
$t_{HD:DAT}$	Data hold time		30			nS
$t_{SU:DAT}$	Data set-up time		100			nS
t_R	Rise time of both SDA and SCL	Rpull-up = 10KΩ, Cb = 10pF		95		nS
t_F	Fall time of SDA and SCL	Rpull-up = 10KΩ, Cb = 10pF		25		nS
$t_{SU:STO}$	Set-up time for STOP condition		0.6			uS
t_{BUF}	Bus free time between a STOP and START condition		1.3			nS
C_b	Capacitive load for each bus line				0.4	nF
$R_{pull-up}$	SDA and SCL system bus pull-up resistor	Maximum is determined by t_R and t_F		10		KΩ
$t_{VD:DAT}$	Data valid time				0.9	uS
$t_{VD:ACK}$	Data valid to acknowledge time				0.9	uS
V_{nL}	Noise margin at the LOW level		0.1VDD			V
V_{nH}	Noise margin at the HIGH level		0.2VDD			V

Note: The I^2C bus protocol was developed by Philips (now NXP). For a complete description of the I^2C protocol, please review the NXP

6. Absolute Maximum Ratings (T_a=25°C)

Parameter	Rating	Unit
VDD Supply Voltage	4.0	V
I^2C Bus Pin Voltage (SCL, SDA)	-0.5 to 4.0	V
I^2C Bus Pin Current (SCL, SDA)	less than10	mA
ESD Human Body Mode	3	KV
ESD Machine Mode	300	V
CAUTION: Do not operate at or near the maximum ratings listed for extended periods of time. Exposure to such conditions may adversely impact product reliability and result in failures not covered by warranty.		

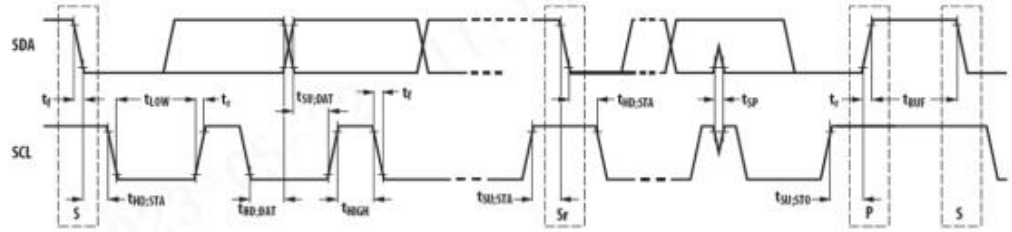
IMPORTANT NOTE: All parameters having Min/Max specifications are guaranteed. Typical values are for information purposes only. Unless otherwise noted, all tests are at the specified temperature and are pulsed tests, therefore : $T_J = T_C = T_A$

7. Electrical Characteristics (VDD = 3.0V, TA = +25°C)

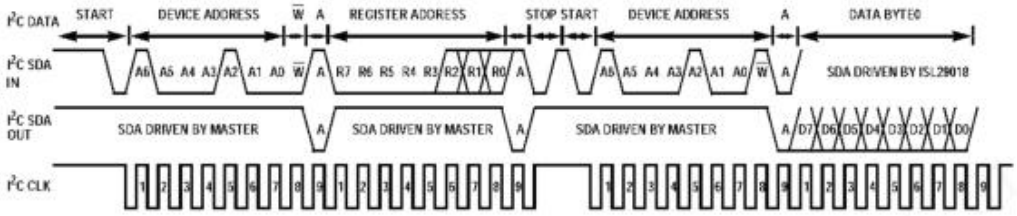
Parameter	Descriptions	Condition	Min	Typ	Max	Unit
V_{DD}	Power supply range		2.3	3	3.6	V
SR_V_{DD}	Power-up slew rate	VDD Rising Edge between 0.4V and 2.3V	0.5			V/ms
I_{DD_OFF}	Supply current when ALS is disabled	ALS_EN = 0		0.1	0.8	uA
I_{DD_ALS}	Supply Current for ALS	ALS_EN = 1		110		uA
t_{INTGR_ALS}	12-bit ALS conversion time		88	100	112	mS
$COUNT_{ALS\_DK}$	ALS measurement when there is no light	Ev = 0 Lux, Range 4		1	5	Counts
$COUNT_{ALS\_FS}$	Full scale of ALS output			4095		Counts
$RATIO_{ALS}$	Count ratio of incandescent to fluorescent light source		90	100	110	%
$COUNT_{ALS\_0}$	ALS count in Range 0 (low resolution)	Ev = 100 Lux , Fluorescent Lamp		201		Counts
$COUNT_{ALS\_1}$	ALS count in Range 1	Ev = 100 Lux, Fluorescent Lamp		402		Counts
$COUNT_{ALS\_2}$	ALS count in Range 2	Ev = 100 Lux, Fluorescent Lamp		805		Counts
$COUNT_{ALS\_3}$	ALS count in Range 3	Ev = 100 Lux, Fluorescent Lamp		1610		Counts
$COUNT_{ALS\_4}$	ALS count in Range 4 (high resolution)	Ev = 100 Lux, Fluorescent Lamp		3220		Counts
I_{SDA}	SDA current sinking capability	VOL = 0.4V	3	5		mA

NOTE: *All parameters having Min/Max specifications are guaranteed. Typical values are for information purposes only. Unless otherwise noted, all tests are at the specified temperature and are pulsed tests, therefore: $T_J = T_C = T_A$*

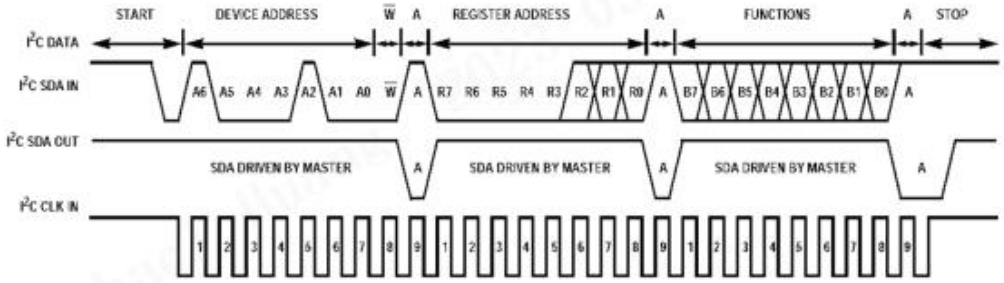
9. I²C Timing Diagram



9.1 I²C Read Timing Diagram (8-bit Register Data)



9.2 I²C Write Timing Diagram (8-bit Control Data)



10. Register Map

There are 3 registers accessible via I2C. Registers 0x1 define the operation mode of the device. Registers 0x6 and 0x7 store the results of ALS ADC conversions.

10.1 Registers and Register Bits

REG ADDR	REG NAME	BIT								DEFAULT
		7	6	5	4	3	2	1	0	
0x01	CONFIGURE	Write(0)	ALS_RANGE[2..0]			Write(0)	Write(0)	ALS_EN	Write(0)	0x00
0x06	ALS_DT1	ALS_DATA[7:0]								0x00
0x07	ALS_DT2	*(Unused)*				ALS_DATA[11:8]				0x00

10.2 Register 0x01 (CONFIGURE) - ALS configuration

Bit #	Access	Default	Name	Function / Operation
7	RW	0x00	Reserved	Unused register bit- write 0
6:4	RW	0x00	ALS_RANGE[2:0]	For bits 6:4= (see the following) 000: ALS is in 2034 lux range (0.497 lux / count) 001: ALS is in 1017 lux range (0.248lux / count) 010: ALS is in 508 lux range (0.124 lux / count) 011: ALS is in 254lux range (0.062 lux / count) 100~ 111: ALS is in 127 lux range (0.031 lux / count)
3:2	RW	0x00	Reserved	Unused register bit- write 0
1	RW	0x00	ALS_EN (ALS Enable)	When = 0, ALS sensing is disabled When= 1, continuous ALS sensing is enabled with new data ready every 100ms

10.3Register 0x06 (ALS_DT1) – ALS Measurement (Lower 8 bits)

Bit #	Access	Default	Name	Function / Operation
7:0	RO	0x00	ALS_DATA	Lower 8 bits (of 12 bits) from result of ALS sensor conversion

10.4 Register 0x07 (ALS_DT2) - ALS Measurement (Upper 4 bits)

Bit #	Access	Default	Name	Function / Operation
7:4	RO	0x00	*(Unused)*	Unused bits
3:0	RO	0x00	ALS_DATA	Upper 4 bits (of 12 bits) from result of ALS sensor conversion

11. Principles of Operation

11.1 I²C Interface

The JSA-1136's I²C slave address is 0x45. Figures 2 and 3 detail the protocol of writing or reading the register data inside the SY3061-S1

A : Acknowledge (0)
NA : Not Acknowledged (1)
P : Stop Condition
R : Read (1)
W : Write (0)
S : Start Condition
Sr : Repeat Start
... : Continuation of Protocol
□ : Mater to Slave
▒ : Slave to Mater

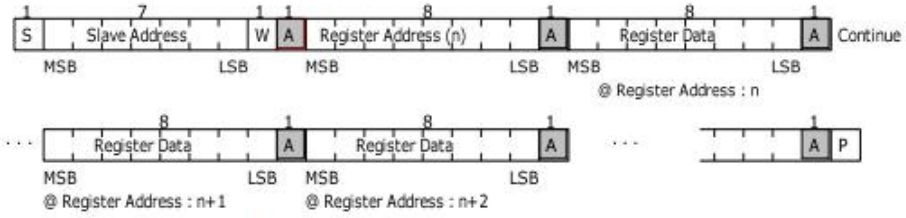


Figure 2. I²C Write-Register-Data Protocol

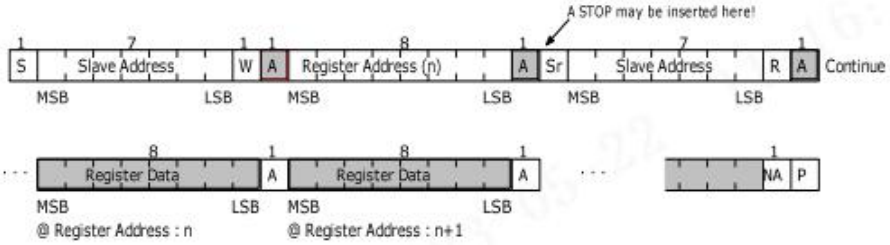
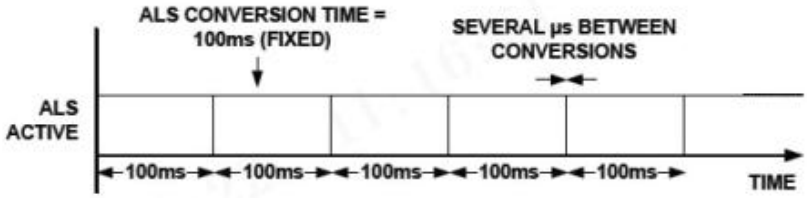


Figure 3. I²C Read-Register-Data Protocol

11.2 Photodiodes and ADCs

The JSA-1136 contains a photodiode which converts ambient light into photocurrent. The photodiode is constructed to mimic the human eye's wavelength response curve to visible light. The photocurrent is digitized by a 12-bit ADC in 100ms per sample. These 12 bits can be accessed by reading from I²C registers 0x6 and 0x07 when the ADC conversion is completed. The ALS converter is a current integrating 12-bit ADC which is best for converting small signals in the presence of periodic AC noise. Integrating over 100ms highly rejects both 50Hz and 60Hz light flicker. The ALS runs continuously with new data available every 100ms as shown below.



11.3 Ambient Light Sensing

The JSA-1136 is set for ambient light sensing when Register bit "ALR_EN =

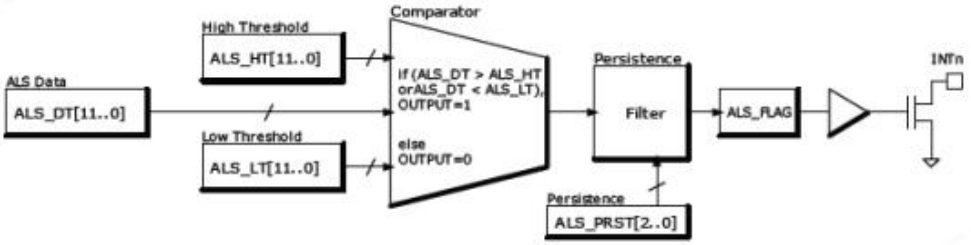


Figure 5. Interrupt Scheme

11.4 VDD Power-up and Power Supply

Upon power-up, please ensure a VDD slew rate of 0.5V/ms or greater. After power-up, or if the user's power supply temporarily deviates from our specification (2.3V to 3.6V), we recommends the user write 0x00 to three Registers: 0x0D, 0x0E, and 0x01 (in that order), wait ~1ms or more and then rewrite all registers to the desired values. If the user prefers a hardware reset method instead of writing to test registers: set VDD = 0V for 1 second or more, power back up at the required slew rate, and write registers to the desired values.

11.5 Power-Down

To put the JSA-1136 into a power-down state, the user can set ALS_EN bit to 0 in Register 0x01. Or more simply, set all of Register 0x01 to 0x00.

11.6 Calculating Lux

The JSA-1136's ADC output codes are directly proportional to lux when in ALS mode (see ALS ALS_MODE bit).

$$Ecalc = \alpha RANGE \times OUTADC$$

In the above equation, *Ecalc* is the calculated lux reading and *OUT* represents the ADC code. The constant α to plug in is determined by the range bits ALS_RANGE (bits 2: 0 of register 0x0B) and is independent of the light source type. Table 9 shows five different scale factors: from 0.5 lux/count to 0.03125 lux/count.

ALS Sensitivity at Different Ranges

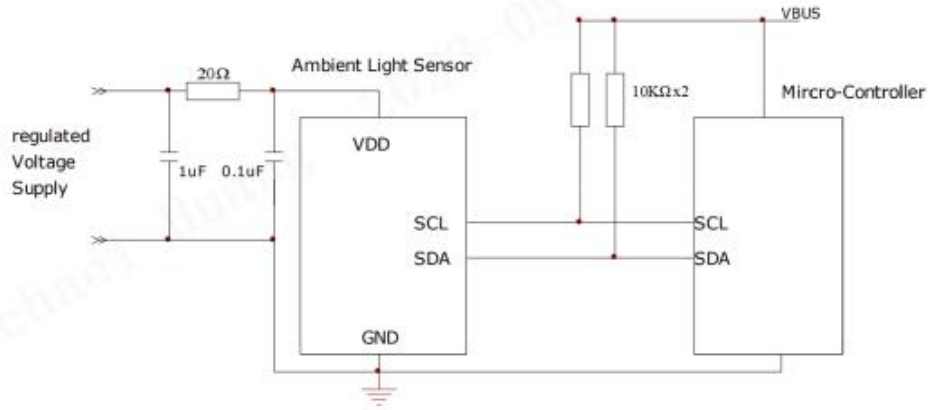
ALS_RANGE	Resolution (lux /Count)	Luminance (lux)
0	0.497	ALS_DT x 0.500
1	0.248	ALS_DT x 0.250
2	0.124	ALS_DT x 0.125
3	0.062	ALS_DT x 0.063
4~7	0.031	ALS_DT x 0.031

11.7 Noise Rejection

Charge balancing ADC's have excellent noise-rejection characteristics for periodic noise sources whose frequency is an integer multiple of the conversion rate. For instance, a 60Hz AC unwanted signal's sum from 0ms to k*16.66ms (k = 1,2...ki) is zero. Similarly, setting the device's integration time to be an integer multiple of the periodic noise signal greatly improves the light sensor output signal in the presence of noise. Since wall sockets may output at 60Hz or 50Hz, our integration time is 100ms: the lowest common integer number of cycles for both frequencies.

11.8 Typical Circuit

A typical application for the JSA-1136 is shown in Figure 6. The JSA-1136's I^2C address is internally hardwired as 0b1000101(0x45). The device can be tied onto a system's I^2C bus together with other I^2C compliant devices. The JSA-1136 is relatively insensitive to layout. Like other I^2C devices, it is intended to provide excellent performance even in significantly noisy environments. There are only a few considerations which will ensure best performance. Route the supply and I^2C traces as far as possible from all sources of noise. A 0.1μF and 1μF power supply decoupling capacitors need to be placed close to the device.

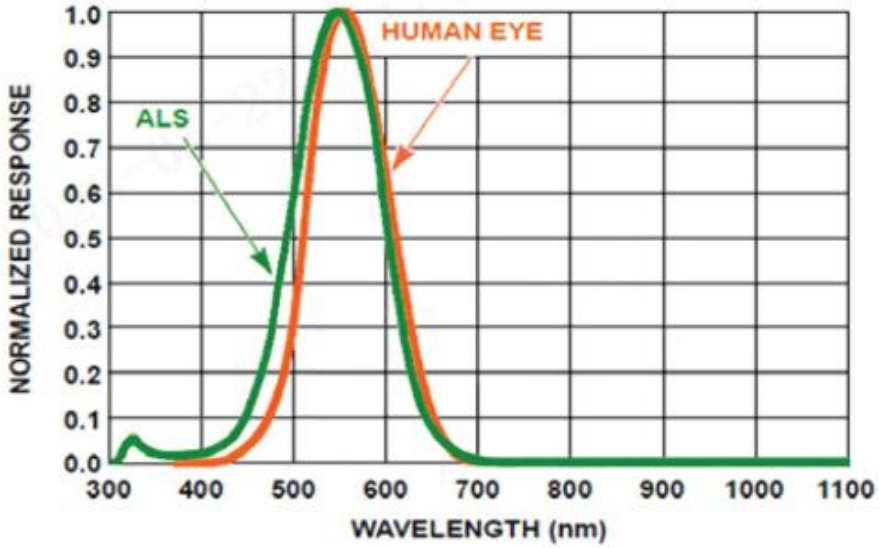


11.9 Layout Considerations

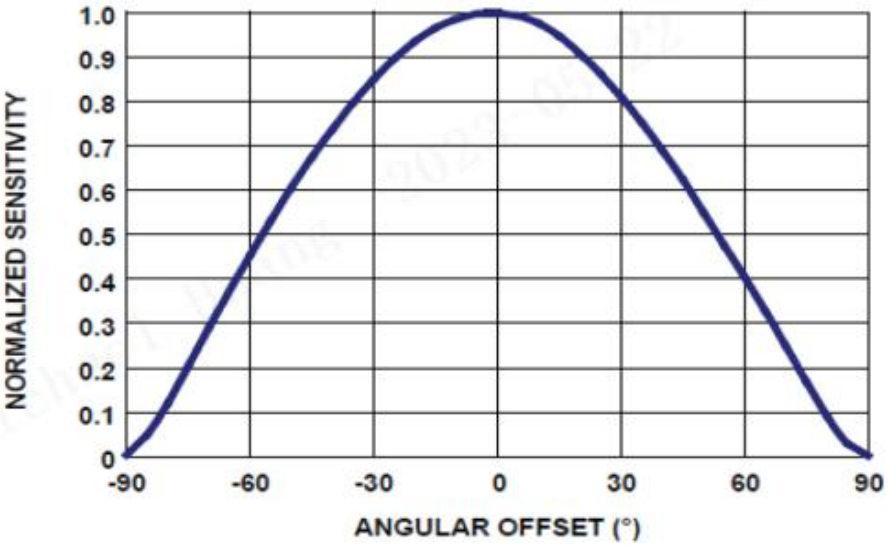
The JSA-1136 is relatively insensitive to layout. Like other I2C devices, it is intended to provide excellent performance even in significantly noisy environments. There are only a few considerations that will ensure best performance. Route the supply and I2C traces as far as possible from all sources of noise. A 0.1μF and 1μF power supply decoupling capacitors need to be placed close to the device.

12. Typical Characteristics

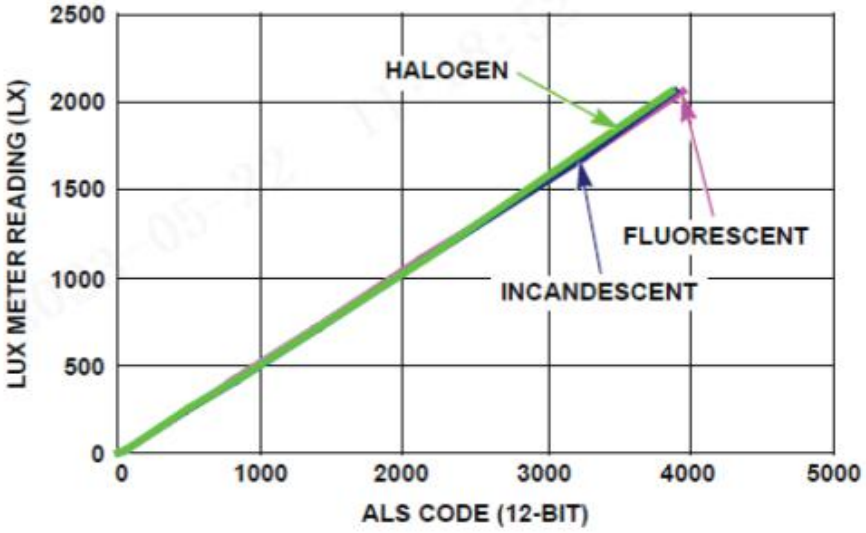
12.1 Spectral Response



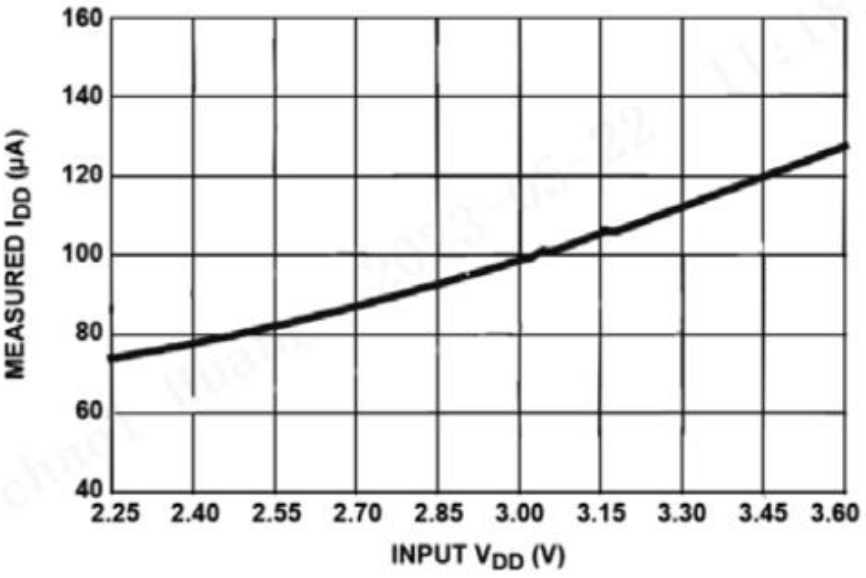
12.2 Angular Sensitivity



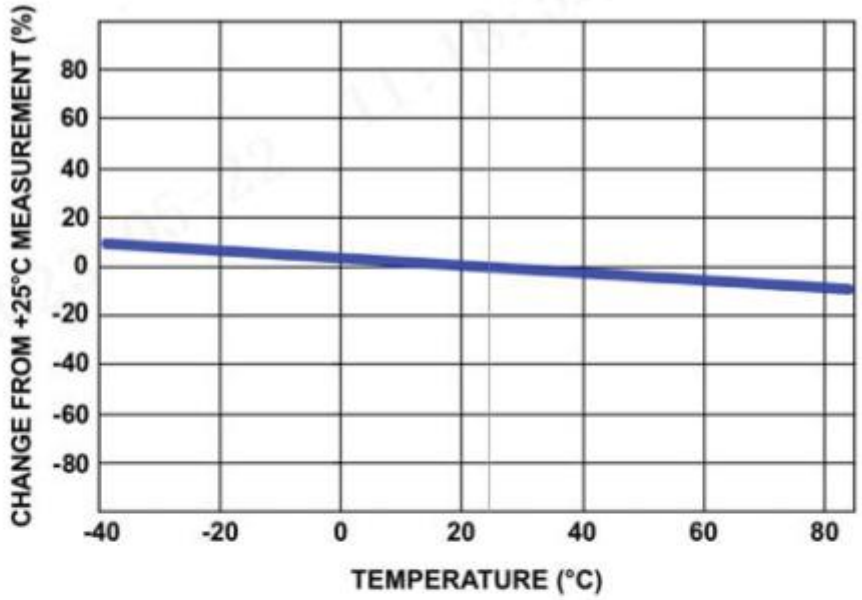
12.3 Linearity over 3 Light Sources



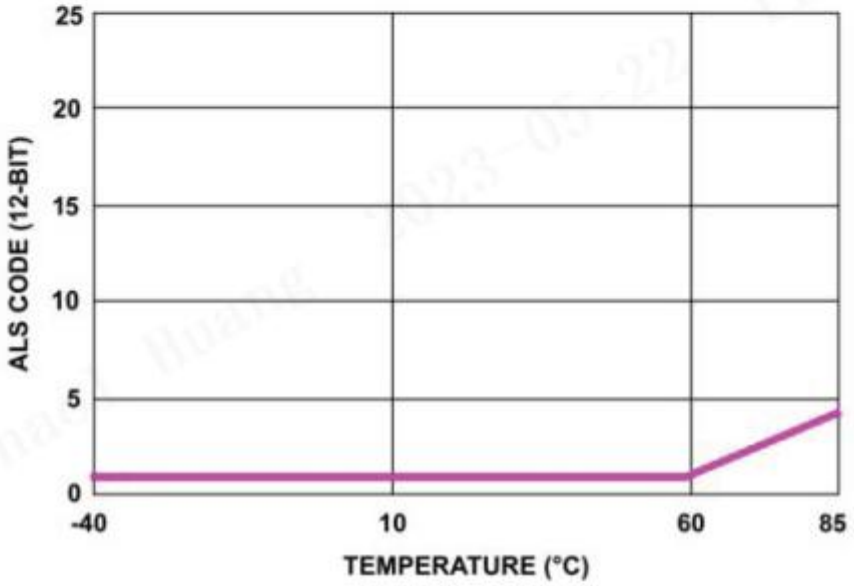
12.5 VDD vs. IDD for Various Operation Modes



12.7 Stability of ALS Output over Temperature at 300 lux



12.8 Stability of ALS Output over Temperature at 0 Lux (ALS_RANGE =000)



13 Package, Storage & Disposal

13.1 Package

13.2 Storage

All electronic components must be stored in a clean, well-ventilated place free of corrosive gas. Unless otherwise specified, the temperature and humidity of the storage place must meet below requirements:

- Temperature：-40~85℃;
- Humidity：20%~75%;
- Humidity sensitivity grade： MSL 3
- Container Requirement: products shall be placed in a container well-functioning as an electrostatic shielding.

13.3 Disposal

The waste disposal of this product and the package should comply with the applicable local/regional /state/ international regulations.

14 Appendix

Key Components List

NO.	Name	Model	Specification	Manufacturer
1	IC	MT7663BUN		MediaTek
2	PCB	JUI7.820.1423 series	4L 1.2mm	KX IQE Sunlord RJX
3	Crystal	3225 40M	3225 40M	Hosonic ECEC TKD JWT

4	IR	TSOP95436TR		Vishay
5	light sensor	JSA-1136		JT
6	key	TS-4401-15B1		HC

15 Certification Information:

FCC Radiation Exposure Statement

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the

instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio/TV technician for help

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions (1)this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Radiation Exposure Statement

The modular can be installed or integrated in mobile or fix devices only. This modular be installed in any portable device, for example, USB dongle like transmitters is forbidden. This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be collocated or operating in conjunction with antenna or transmitter. If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display label referring to the enclosed module. This exterior label can use wording such as the following:” Contains Transmitter Module FCC ID: 2AOKI-WFM63BUWM1, when the module is installed inside another device, the user manual of this device must contain below warning statements;1. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions :(1) This device may not cause harmful interference.(2) This device must accept any interference received, including interference that may undesired operation.2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. The devices must be installed and used in strict accordance with the manufacturer’s instructions as described in the user documentation that comes with the product. This device is intended only for OEM integrators under the followingconditions:1) The antenna must be installed such that 20 cm is maintained between the antenna and user.2) The transmitter module may not be co-located with any other transmitter or antenna. Module Antenna Type: ANT, 1dBi gain

16 The requirement for KDB 996369 D03

1.1 List of applicable FCC rules

FCC Part 15.247, FCC Part 15.407.

1.2 Summarize the specific operational use conditions

EUT use PCB antenna.

1.3 Limited module procedures

The module is a single module, so this requirement is not applicable to the Product.

1.4. Trace antenna desig

Not support

1.5 RF exposure considerations

The host device can be used as mobile device.

1.6 Antennas

2.4G: PCB antenna : 2.47dBi max（On Board）

5G: PCB antenna : 6.11dBi max（On Board）

1.7 Label and compliance information

If this certified module is installed inside the host device, then the outside of the host must be labeled with “Contains FCC ID: 2AOKI-WFM63BUWM1.

1.8 Information on test modes and additional testing requirements

The host manufacturer can use the software of MT7663 QA to make the WIF transmit continuously.

1.9. Additional testing, Part 15 Subpart B disclaimer

The module only complies with the FCC Part 15.247 and 15.407. If the module is installed in the host device, the host manufacturer is responsible for the compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. For example, if the host manufacturer markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the host manufacturer shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.