洲光源
CHAULIGHT

产品规格书
SPECIFICATION

客户名称：_____
Customer Name

产品类型：数字近端传感器
Product Name

产品型号：ZAPM-R4024C-14DV-Z1
Part No.

☐技术参考 Technical Reference		☐样品 Sample		☐量产供货 Mass Product
客户审核（加盖公章） Client approval（Stamp）		洲光源审核 Chaulight approval		
核准 Approval	确认 Checked	核准 Approval	确认 Checked	制作 Edited
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ZAPM-R4024C-14DV-Z1

数字近端传感器
Digital Proximity Sensor

ZAPM-R4024C-14DV-Z1 设备将执行色温、环境光传感（ALS）和接近检测传感。内部状态机提供了将设备置于接近和 ALS 测量之间的低功率状态的能力，提供了非常低的平均功耗。

The ZAPM-R4024C-14DV-Z1 device will perform color temperature, ambient light sensing (ALS) and proximity detection sensing.An internal state machine provides the ability to put the device into a low power state between proximity and ALS measurements providing very low average power consumption.

PRODUCT SUMMARY				
工作电压范围[V] Operating Voltage Range [V]	连接数 No. Of Connection	I2C 总线电压范围[V] I2C BUS Voltage Range [V]	LED 脉冲电流[mA] LED PULSE Current [mA]	输出分辨率[bit] Output Resolution [bit]
2.5 to 5	5	1.8 to 5	5 to 125	16

特性 Feature

•环境光（ALS）及红外传感器.

• ALS, Ambient Light and IR Sensor.

•色温和环境光传感.

•Color Temperature and Ambient Light Sensing.

-紫外线/红外屏蔽滤波器、16 位分辨率.

- UV/IR blocking filters、16 Bit resolution.

-可编程的增益和集成时间.

- Programmable Gain & Integration Time.

-可控的调整时间、高灵敏度.

- Ideal for Operation Behind Dark Glass、Very High Sensitivity.

•小尺寸的全接近传感器.

• Full proximity sensor feature in tiny package size.

-4.0mm x 2.4mm x 1.35mm .

- 4.0mm x 2.4mm x 1.35mm .

-16 位分辨率的 A/D 转换.

- 16 bit ADC.

-集成 940nm 210mW Vcsel.

- Integrated 940nm 210mW Vcsel.

•接近检测.

•Proximity Detection.

-可编程偏移控制寄存器可编程.

- Programmable Offset Control Register Programmable.

-可编程模拟增益和集成时间.

- Programmable Analog Gain and IntegrationTime.

-外部红外指示灯的当前水槽驱动器.

- Current Sink Driver for External IR LED.

•可编程式接近度检测和中断.

•Programmable Proximity Detection and Interrupt.

-可编程 ADC，LED 驱动程序参数.

- Programmable ADC, LED driver parameters.

-可编程中断生成条件.

- Programmable Interrupt generation conditions.

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•SUBI2C 接口兼容性
• I2C Interface Compatible
-最多为 400kHz（I2C 快速模式）.
- Up to 400kHz (I2C Fast Mode).
-OTP 可选设备地址：0x39,0x3D(7bit).
- OTP selectable device addr. : 0x39, 0x3D (7bit).
-I2C H 级范围：1.8V 至 5V.
- I2C H-level range: 1.8V to 5V.

•功率管理.
•Power Management.
-电源电压范围：2.5V 至 5V.
- Supply voltage range: 2.5V to 5V
-低功率 1uA 睡眠状态.
- Low Power 1uA Sleep State.
-70uA 的待机状态与可编程的待机时间.
- 70uA Wait State with Programmable Wait Time.

应用 Application

--环境光感应，色温感应，手机触摸屏禁用，机械开关更换，自动扬声器启用，自动菜单弹出.

--Ambient Light Sensing、Color Temperature Sensing、Cell Phone Touch Screen Disable、Mechanical Switch Replacement、Automatic Speakerphone Enable、Automatic Menu Popup.

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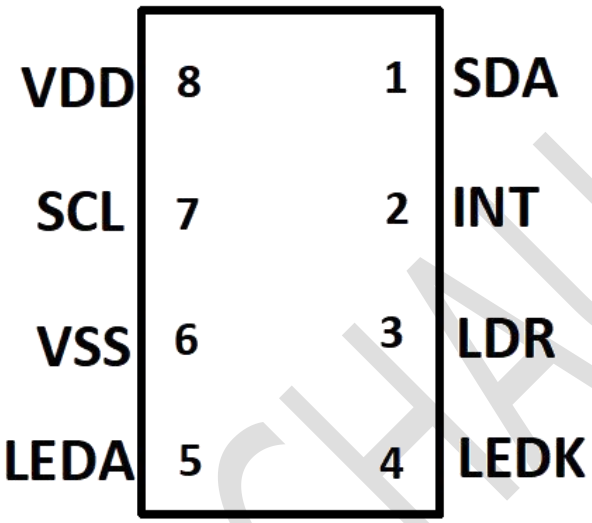
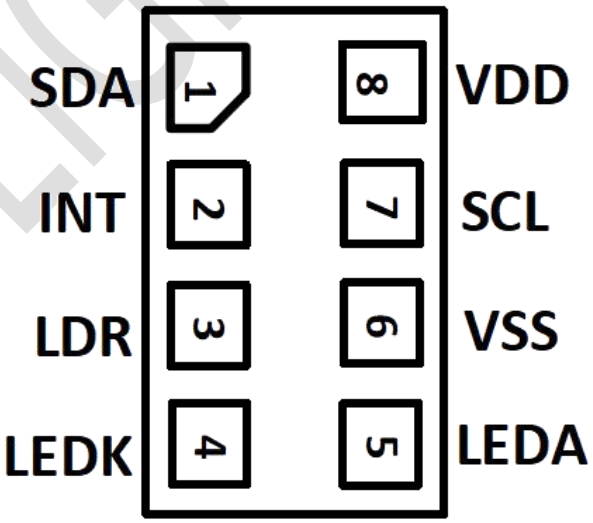
管脚配置和功能 Pin Configuration and Functions

#.	PIN.	I/O/P/G	DESCRIPTION
1	SDA	I/O	I2C 串行数据输入/输出端子 I2C serial data input/output terminal .
2	INT	O	中断-打开阈值（低电平） Interrupt – open drain (active low).
3	LDR	O	接近式红外 LED 控制的电流汇驱动器 Proximity IR LED controlled current sink driver.
4	LEDK	O	阴极 Cathode.
5	LEDA	I	阳极 Anode
6	VSS	G	接地端 Supply Ground.
7	SCL	I	I2C 串行时钟输入终端 I2C serial clock input terminal.
8	VDD	P	电源电压 Supply voltage.



[Top View]



[Bottom View]

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产品规格 Product Specifications.

1、绝对最大额定参数 Absolute Maximum Ratings.

SYMBOL	PARAMETER	MIN	MAX	Unit
VDD	供电电源 Power Supply Voltage.	-0.5	6	V
Vin	输入电压 Input Voltage.	-0.5	VDD	V
Vout	输出电压 Output Voltage.	-0.5	VDD	V
Tj	结区温度 Junction Temperature.	-40	85	℃

*超出“绝对最大额定参数”所列的应力可能会对设备造成永久性损坏。此仅为应力等级，并不暗示设备在这些或任何其他条件下的功能操作，超出了在“推荐操作条件”下指示的功能操作。长时间暴露于绝对最大额定条件下可能会影响设备的可靠性。

*Stresses beyond those listed under“absolute maximum ratings”may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute- maximum-rated conditions for extended periods may affect device reliability.

注：所有电压值均与 VSS 有关。

Note : All voltage values are with respect to VSS.

2、ESD 等级 ESD Ratings.

SYMBOL	PARAMETER	VALUE	Unit
VESD	人体形态 Human-Body Model (HBM).	+/- 2000	V
	机器形态 Machine Model (MM).	+/- 200	V

3、建议使用条件 Recommended Operating Conditions.

SYMBOL	PARAMETER	MIN	TYP	MAX	Unit
VDD	供电电源 Power Supply Voltage.	2.5	3.0	3.6	V
Vin	输入电压 Input Voltage.	0	--	VDD	V
Vout	输出电压 Output Voltage.	0	--	VDD	V
TA	运行温度 Operating ambient temperature.	-20	--	70	℃

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4、电气特性(VDD=3V，Ta=25℃) Electrical Characteristics (VDD = 3V, Ta = 25℃).

SYMBOL	PARAMETER	MIN	TYP	MAX	Unit
电源电压 Supply Current.	运行-LDR 脉冲关闭 Active – LDR pulses off.	--	250	300	uA
	等待状态 Wait State (@ADDR high).	--	100	120	
	睡眠状态 Sleep State (@ADDR low).	--	1	10	
	PWIDTH =17.4us, PPULSE=1, PDRIVE=5mA, PTIME=185us, WTIME=4.07ms	--	75	--	
最大输出电流 Max. Supply Current	PWIDTH =4.4ms, PPULSE=255 PDRIVE=5mA	2.647			mA
SDA 输出低电平 SDA output Low voltage.	3mA 反向电流 3mA sink current.	0	--	0.4	V
	6mA 反向电流 6mA sink current.	0	--	0.6	
低电平输出电压 Low Level Input Voltage.	--	--	--	VDD*0.3	V
高电平输出电压 High Level Input Voltage.	--	VDD*0.7	--	--	V

5、数据传输的时间要求 Data Transmission Timing Requirements.

PARAMETER	Symbol	CONDITIONS	MIN	MAX	Unit
输出低电平(SDA) Output Low Level (SDA)	V_{OL}	IOL=4mA.	--	0.5	V
SCLK 工作频率 SCLK Operating Frequency	f_{SCLK}	--	--	400	KHz
停止和启动条件 Stop and Start Condition	t_{BUF}	--	1.3	--	us
重复启动后的保持时间 Hold Time After Repeated Start Conditions	$t_{HD;STA}$	--	0.6	--	us
SCLK 时钟低周期 SCLK Clock Low Period	t_{LOW}	--	1.3	--	us
SCLK 时钟低周期 SCLK Clock High Period.	t_{HIGH}	--	0.6	--	us
重复启动条件设置时间 Repeated Start Condition Setup Time.	$t_{SU;STA}$	--	0.6	--	us
计数保持时间 Data Hold Time.	$t_{HD;DAT}$	--	0	0.9	us
计数设置时间 Data Setup Time.	$t_{SU;DAT}$	--	100	--	ns
时钟/计数下降时间 Clock/Data Fall Time.	t_F	--	--	300	ns
时钟/计数上升时间 Clock/Data Rise Time.	t_R	--	--	300	ns
停止条件设置时间 Stop Condition Setup Time.	$t_{SU;STO}$	--	0.6	--	ns

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6、ALS+IR 特性 ALS+IR Characteristics (VDD = 3V, Ta = 25℃, PEN = 1)

PARAMETER		CONDITIONS	MIN	TYP	MAX	Unit
ADC 峰值波长强度 Peak_Sensitivity Wavelength of ADC	R	--	--	620	--	nm
	G	--	--	550	--	
	B	--	--	490	--	
	C	--	--	580	--	
	IR	--	--	850	--	
ADC 计数器值 Counter Value of ADC	R	Integration Time 0.83ms @ 1300Lux 3000K (In wafer)	--	TBD	--	counts
	G		--	TBD	--	counts
	B		--	TBD	--	counts
	C		--	TBD	--	counts
	IR		--	TBD	--	counts
暗计数值 Dark Count Value	Dark Integration Time 25ms@ Dark (In wafer)		0	1	3	counts
ADC 计数范围 ADC count Range	--		--	--	65535	counts
偏移比例 Gain scaling	GAIN_ALS = 0(Low)		--	1.0	--	x
	GAIN_ALS = 1 (Med)		--	1.8	--	
	GAIN_ALS = 2 (High)		--	3.1	--	
	GAIN_ALS = 3 (Max)		--	6.9	--	

7、接近特性 Proximity Characteristics (VDD = 3V, Ta = 25℃, PEN = 1)

PARAMETER	CONDITIONS		MIN	TYP	MAX	Unit
Prox.全计算值 Prox. Full count value			--	--	65535	counts
LED 驱动电流 LED drive current	PDH = 0	PDRIVE = 0	--	215	--	mA
		PDRIVE = 1	--	182	--	
		PDRIVE = 2	--	145	--	
		PDRIVE = 3	--	100	--	
	PDH = 1	PDRIVE = 0	--	25	--	mA
		PDRIVE = 1	--	20	--	
		PDRIVE = 2	--	15	--	
		PDRIVE = 3	--	10	--	
偏移比例 Gain scaling	GAIN_ALS = 0(Low)		--	1.0	--	x
	GAIN_ALS = 1 (Med)		--	1.8	--	
	GAIN_ALS = 2 (High)		--	3.1	--	

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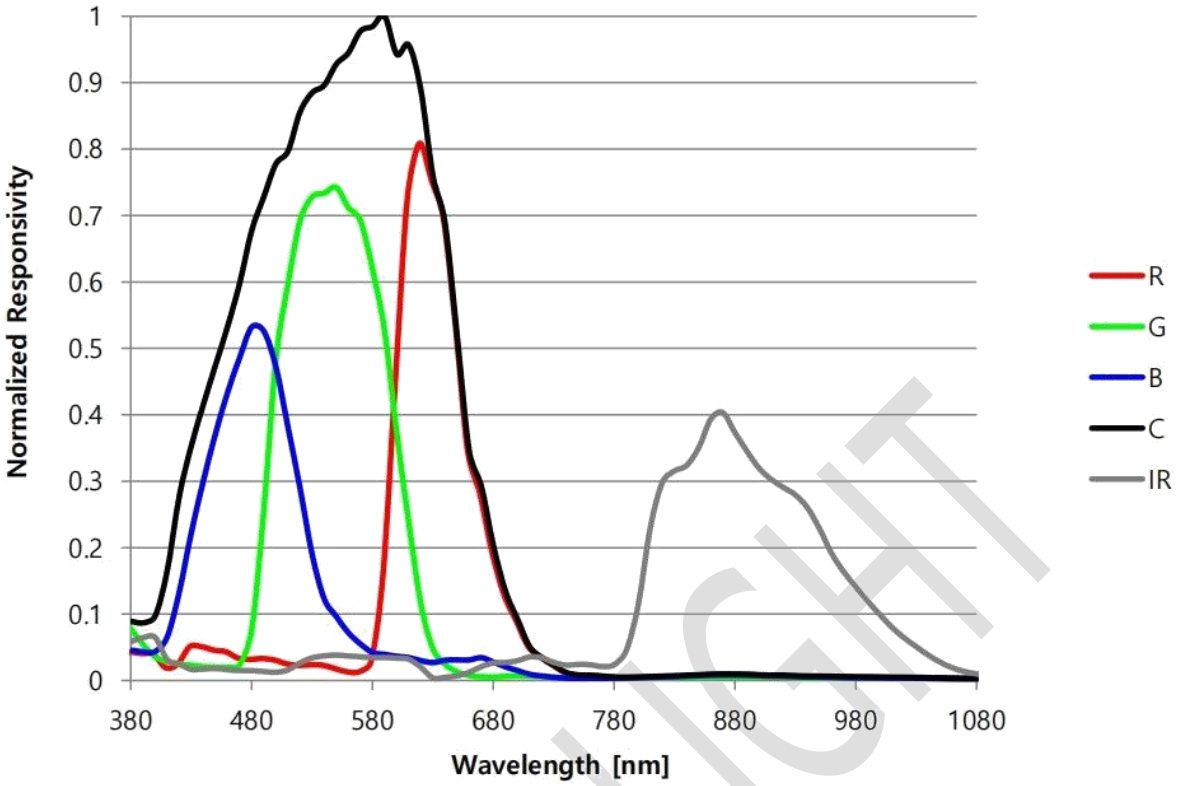
8、典型特性曲线 Typical Performance Characteristics .



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详细说明 Detailed Description.

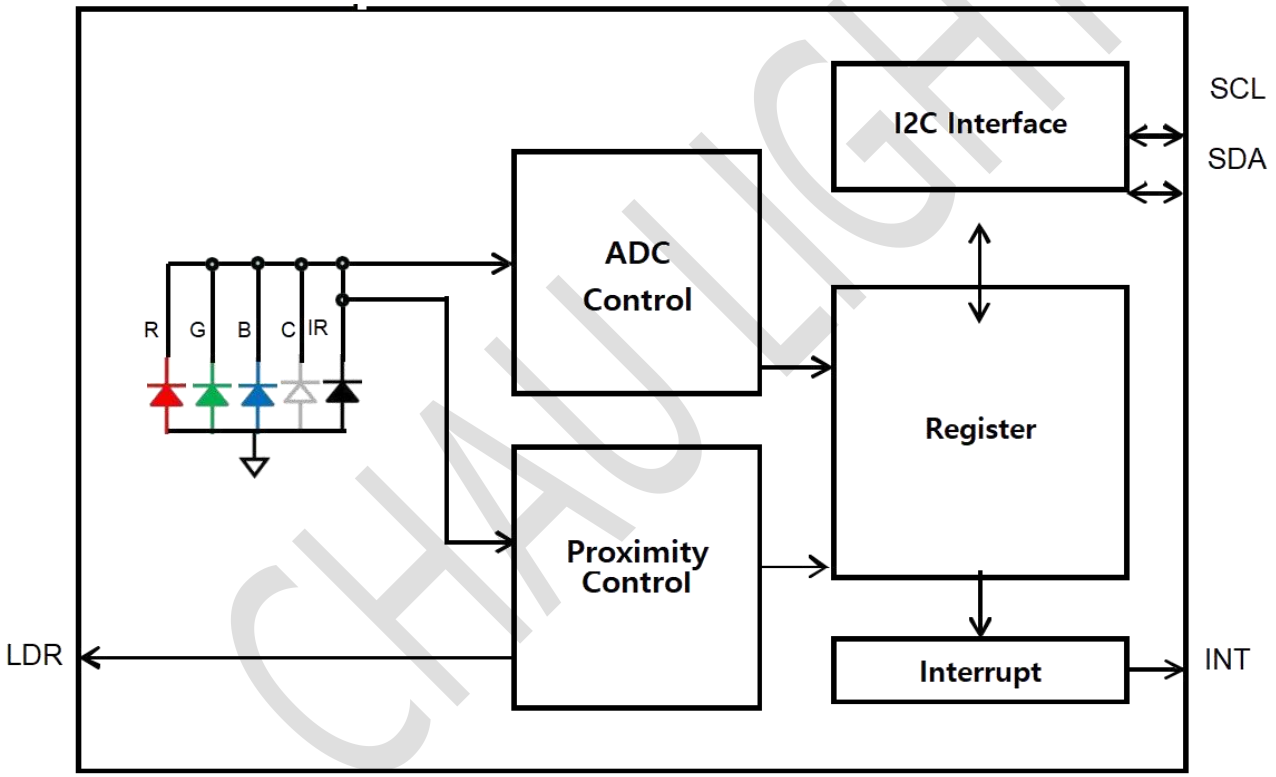
1、概述 Overview.

ZAPM-R4024C-14DV-Z1 集合 ALS 和光电二极管，集成放大器、ADC、存储器、时钟、缓冲器、比较器、状态机和 I2C 接口。它还集成了红外 LED 作为一个光源。集成 ADC 同时将放大的光电二极管电流转换为提供高达 16 位分辨率的数字值。

The ZAPM-R4024C-14DV-Z1 provides on-chip ALS and photo diode, integrating amplifier, ADC, accumulator, clock, buffer, comparator, a state machine and an I2C interface. Also It has integrated IRLED as a light source. Integrating ADC simultaneously convert the amplified photo diode currents into a digital value providing up to 16 bits of resolution.

I2C 接口，支持高达 400kbits/s 的数据速率，该集成电路的数字接口在 1.8V 到 3.3V 之间运行，这些特性使得 ZAPM-R4024C-14DV-Z1 能够编程在各种应用中使用。

The device connects to a video processor or image sensor through a standby I2C interface which supports up to 400-kbits/s data rate. The digital interface supports IO levels from 1.8V to 3.3V.



<功能图示>
<Functional Block Diagram>

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2、特征描述 Feature Description.

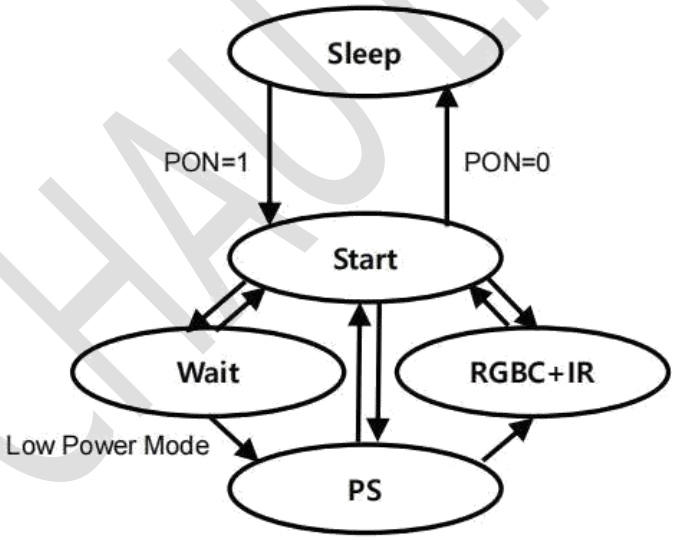
2.1、系统状态机 System State machine.

ZAPM-R4024C-14DV-Z1 设备提供环境光、红色、绿、蓝、清晰、红外和近距离检测传感。内部状态机负责管理设备的操作。控制颜色、ALS、PS 功能和断电模式。通过控制可变低功率待机周期来管理平均功耗。中断功能通过消除了轮询传感器的需要，从而提高了系统的效率。两个中断源（清除，PS)可以激活打开的漏极输出引脚。每个中断源都是独立启用的。当连续数量的样本读数超过上或下阈值时，就会出现 ALS 和 PS 中断。

The ZAPM-R4024C-14DV-Z1 device provides ambient light, Red, Green, Blue, Clear, IR and Proximity detection sensing. The internal state machine manages the operation of the device. It controls the Color, ALS, PS functionality and power down modes.Average power consumption is managed via control of variable endurance low power wait cycles. The interrupt feature improves system efficiency by eliminating the need to poll the sensor. Two interrupt sources (Clear, PS) can activate the open drain output pin. Each interrupt source is enabled independently. ALS and PS interrupts appear when upper or lower thresholds are exceeded for a consecutive number of sample readings.

ZAPM-R4024C-14DV-Z1 的先进数字彩色光传感器部分包含一个用于颜色测量的分段圆形光电二极管阵列。这种结构提供了稳定的颜色传感，独立于光的入射角度。四个集成的模数转换器（ADCS）同时集成了来自光电二极管的光能。

The advanced digital color light sensor portion of the ZAPM-R4024C-14DV-Z1 contains a segmented circular photo diode array used for color measurements. This architecture provides stable color sensing independent of the incident angle of light. Four integrating analog-to-digital converters (ADCS) integrate light energy from photo diodes simultaneously.



<状态图>
<State Diagram>

设备的通信是通过一个快速（高达 400 kHz）的双线 I² C 串行总线来完成的，便于连接到一个微控制器或嵌入式控制器。在彩色光下操作时只需 250 μ A，断电时只需 1uA。

Communication with the device is accomplished through a fast(u p to 400 kHz) two wire I² C serial bus for easy connection to a micro controller or embedded controller. The device typically draws only 250 μ A in color operation and 1uA during power down.

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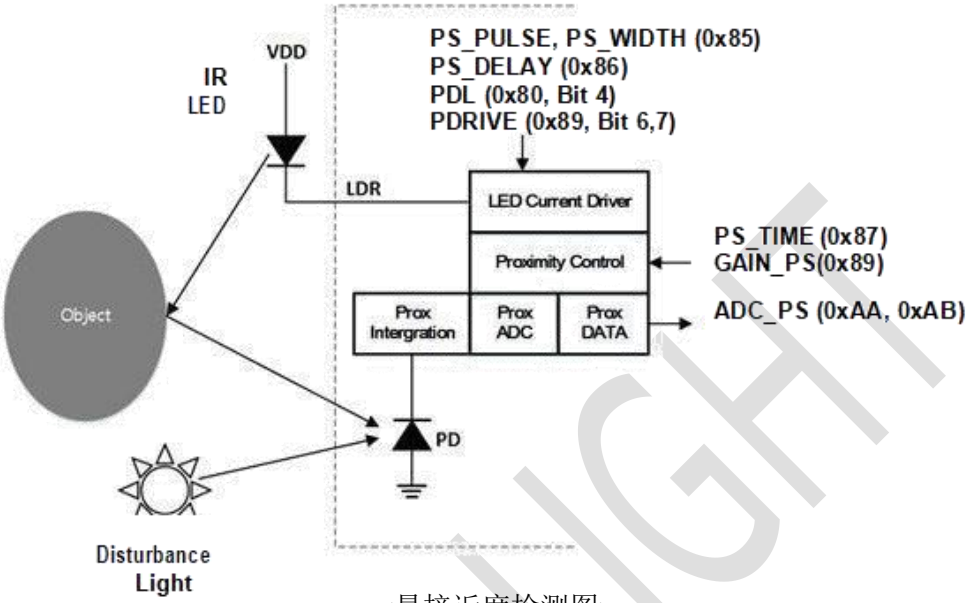
2.2、接近检测 Proximity Detection.

接近检测是通过测量光能量来完成的，通常是从物体上反射的红外 LED 光源来确定其距离。接近光源由集成的接近 LED 电流驱动器驱动，如图所示。

Proximity detection is accomplished by measuring the amount of light energy, generally from an IRLED, reflected off an object to determine its distance. The proximity light source is driven by the integrated proximity LED current driver as shown in Figure .



<最接近度检测图>

<Proximity Detection Diagram>

集成的 LED 电流驱动器是一个被调节的电流接收器，它不需要外部电流感测电阻器来进行电流控制。LED 电流驱动程序允许用户使用 PDRIVE 寄存器和 PDL 位配置寄存器的组合来设置 LED 驱动器电流从 5mA 到 125mA。集成的电流驱动器和 LED 分别提供外部引脚、LDR、LDR_LED。要使用内部光源，引脚需要相互连接。或者为了驱动超过 125mA 的外部光源或为了减少芯片上的接地反弹，LDR 引脚可用于驱动外部光源的 P 型晶体管。

The integrated LED current driver is a regulated current sink which doesn't need external current sensing resistor for current control. The LED current driver allows user to set the LED drive current from 5mA to 125mA using a combination of PDRIVE register and PDL bit of CONFIG register. The integrated current driver and the LED provides external pins, LDR, LDR_LED respectively. To use internal light source, the pins need to be connected to each other. Or to drive an external light source with more than 125 mA or to minimize on-chip ground bounce, LDR pin can be used to drive an external p-type transistor which drives external light source.

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2.2、中断 Interrupt.

中断特性通过消除轮询传感器以确定接近值是否在用户定义的范围之外的必要性，简化和提高了系统效率。虽然中断功能始终启用，并且其状态在状态寄存器（0x81）中可用，但可以使用“启用寄存器”（0x81）中的“中断手动清除启用(IMCEN)”字段启用中断状态的输出。一旦 IMCEN 字段设置为 1，就需要通过 I2C 控制 INT 引脚的中断参数和信号活动。

The interrupt feature simplifies and improves system efficiency by eliminating the necessity for polling the sensor to find out whether proximity values are in the outside of user-defined range. While the interrupt function is always enabled and its status is available in the Status register (0x81), the output of the interrupt state can be enabled using the Interrupt Manual Clear Enable (IMCEN) field in the Enable register (0x81). Once IMCEN field is set to 1, interrupt parameters and signal activity of INT pin are need to be controlled via I2C.

两个 16 位中断阈值寄存器允许用户设置在接近红外 LED 范围以下和以上的限制。当接近数据(PDATA)小于接近中断低阈值(PILTx)或大于接近中断高阈值(PIHTx)时，可以产生中断。

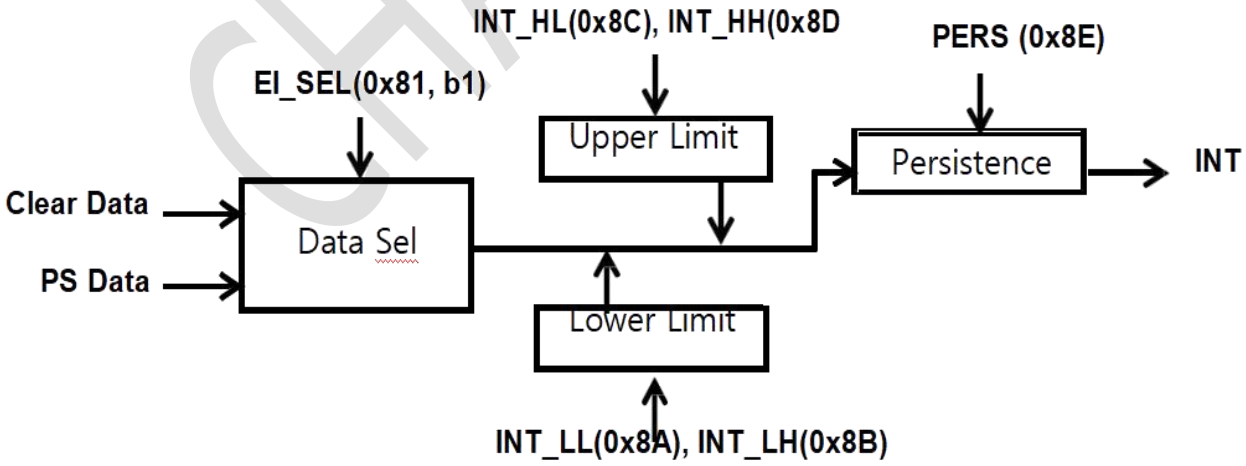
Two 16-bit interrupt threshold registers allow the user to set limits below and above a desired IRLED proximity range. An interrupt can be generated when the proximity data (PDATA) is less than the proximity interrupt low threshold (PILTx) or is greater than the proximity interrupt high threshold (PIHTx).

设备还提供了一个中断持久性功能。持久性过滤器允许用户指定连续超出范围的接近发生的次数作为中断生成条件。持久性过滤器寄存器（0x8E）允许用户设置接近持久性过滤器(PPERS)值。有关持久性过滤器值的详细信息，请参见持久性过滤器寄存器。

The device also provides an interrupt persistence feature. The persistence filter allows the user to specify the number of consecutive out-of-range proximity occurrences as an interrupt generation condition. The persistence filter register (0x8E) allows the user to set the proximity persistence filter (PPERS) values. See the persistence filter register for details on the persistence filter values.

一旦中断生成并发出，中断必须在已为下一次中断执行了服务例程。只需阅读中断清除寄存器执行此中断清除操作。

Once an interrupt is generated and issued, the interrupt has to be cleared after the service routine has been executed for next interrupt generation. Simply reading the Interrupt clear register performs this interrupt clear operation.



< 可编程中断>
<Programmable Interrupt>

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编程 Programming.

1、I2C 协议 I2C Protoco.

ZAPM-R4024C-14DV-Z1 的接口和控制是通过 I2C 串行兼容接口（标准或快速模式）到一组寄存器完成的，这些寄存器提供对设备控制功能和输出数据的访问，设备支持使用 7 位寻址协议 7 ‘b0111001 的单个从属地址。

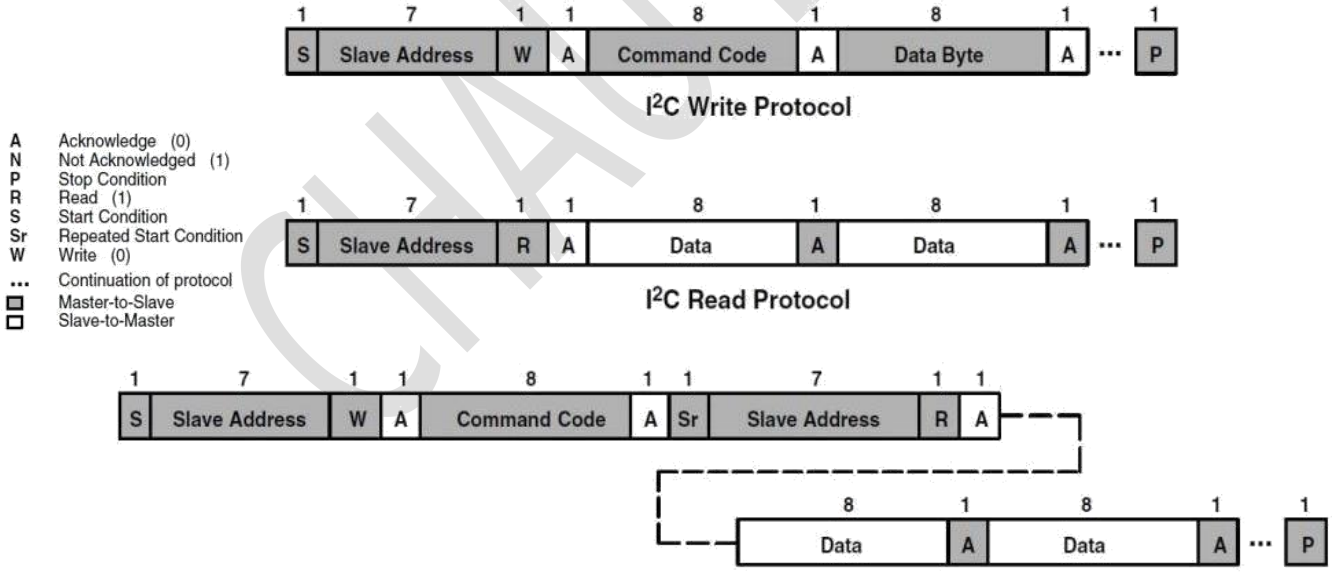
Interface and control of the ZAPM-R4024C-14DV-Z1 is accomplished through an I2C serial compatible interface (standard or fast mode) to a set of registers that provide access to device control functions and output data. The device supports a single slave address of 7’ b0111001 using 7-bit addressing protocol. (Contact factory for other addressing options.)

I2C 标准提供了三种类型的总线服务：读、写和一个组合协议（如下图），在写入操作中，写入的第一个字节是一个命令字节，后面是数据。在组合协议中，写入的第一个字节是命令字节，然后读取一系列字节。如果发出了读取命令，则先前命令中的寄存器地址将用于数据访问。

The I2C standard provides for three types of bus transaction: read, write, and a combined protocol (Figure 4). During a write operation, the first byte written is a command byte followed by data. In a combined protocol, the first byte written is the command byte followed by reading a series of bytes. If a read command is issued, the register address from the previous command will be used for data access. For a complete description of I2C protocols, please review the I2C Specification at: http://www.semiconductors.philips.com.

有关 I2C 协议的完整描述，请查看 I2C 规范。

For a complete description of I2C protocols, please review the I2C Specification at: http://www.semiconductors.philips.com.



< I2C协议>
< I2C Protocols>

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寄存器图 Register Maps.

ADDR	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	DEF
0x80	SAI	INT_TP	PITG	PDL	EN_W	EN_PS	EN_ALS	PON	0x00
0x81			INT_PSH	INT_PSL	INT_V	EI_SEL	EI_PS	EI_VALID	0x00
0x82	50HZ	TIME_BASE			WLONG	TIME_DELAY			0xFF
0x83	TIME_WAIT								0x00
0x84	TIME_ALS								0x00
0x85	PS_PULSE				PS_WIDTH				0x00
0x86	PS_DELAY								0x00
0x87	PS_TIME								0x00
0x88	PS_OFFSET								0x00
0x89	PDRIVE		GAIN_IR		GAIN_PS		GAIN_ALS		0x00
0x8A	INT_LL								0x00
0x8B	INT_LH								0x00
0x8C	INT_HL								0xFF
0x8D	INT_HH								0xFF
0x8E					PERS				0x02
0x98	DEV_ID				REV_ID				0xA0
0xA0	ADC_R[7:0]								0x00
0xA1	ADC_R[15:8]								0x00
0xA2	ADC_G[7:0]								0x00
0xA3	ADC_G[15:8]								0x00
0xA4	ADC_B[7:0]								0x00
0xA5	ADC_B[15:8]								0x00
0xA6	ADC_C[7:0]								0x00
0xA7	ADC_C[15:8]								0x00
0xA8	ADC_IR[7:0]								0x00
0xA9	ADC_IR[15:8]								0x00
0xAA	ADC_PS[7:0]								0x00
0xAB	ADC_PS[15:8]								0x00

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启用寄存器 Enable Register

ADDR	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	DEF
0x80	SAI	INT_TP	PITG	PDL	EN_W	EN_PS	EN_ALS	PON	0x00

FIELD	BITS	DESCRIPTION
SAI	7	中断后睡眠 当断言时，如果产生一个中断，设备将在 ALS 周期结束时关机. Sleep After Interrupt. When asserted, the device will power down at the end of a ALS cycle if an interrupt is generated.
INT_TP	6	中断类型 指定中断保留类型 0: 如果超出阈值 1，将中断；只有当它超出阈值时才会发生 Interrupt Type. Specify the interrupt retention type. 0: it will be interrupted if it goes out of the threshold, 1; it will occur only when it goes out of the threshold.
PITG	5	PS 集成控制 此位激活集成可到达 2 倍位 PS Integration control. This bit activates the Integration Cap to Double size
PDL	4	LDR PIN 0 的 LED 电流控制：大电流 1: 小电流（大电流/ 10) LED Current Control of LDR PIN 0: Large current1: Small current (Large current / 10)
EN_W	3	等待计时器启用 Wait Timer Enable.
EN_PS	2	接近控制器启用 Proximity controller Enable.
EN_ALS	1	ALS 控制器启用 ALS controller Enable.
PON	0	“通电” 这个位激活内部振荡器，允许定时器和 ADC 通道工作，写一个 1 会激活振荡器。写一个 0 会禁用振荡器。在 I²C 接口的读写过程中，这个位被暂时覆盖，振荡器被启用，独立于 PON 的状态 Power ON. This bit activates the internal oscillator to permit the timers and ADC channels to operate. Writing a 1 activates the oscillator. Writing a 0 disables the oscillator. During reads and writes over the I² C interface, this bit is temporarily overridden and the oscillator is enabled, independent of the state of PON.

中断控制寄存器 Interrupt control Register

ADDR	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	DEF
0x81			INT_PSH	INT_PSL	INT_V	EI_SEL	EI_PS	EI_VALI	0x00

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FIELD	BITS	DESCRIPTION
INT_PSH	5	1 表示当 PS ADC 高于阈值时发生的中断。当读取地址 0x81 时，已清除为 0 1 for interrupts that occur when the PS ADC is above the threshold. Cleared to 0 when reading address 0x81.
INT_PSL	4	1 用于当 PS ADC 低于阈值时发生的中断。当读取地址 0x81 时，已清除为 0 1 for interrupts that occur when the PS ADC is below the threshold. Cleared to 0 when reading address 0x81.
INT_V	3	ALS 有效 表示 ALS 通道已完成了一个集成周期 ALS Valid. Indicates that the ALS channels have completed an integration cycle.
EI_SEL	2	中断数据：选择 0：PS 数据，1：清除数据 Interrupt Data Select0: PS Data, 1: Clear Data.
EI_PS	1	PS 中断启用 当断言允许生成 PS 中断时 PS interrupt Enable. When asserted permits PS interrupts to be generated.
EI_VALID	0	ALS 有效中断启用 当断言允许 ALS 生成有效的中断时 ALS valid interrupt Enable. When asserted permits ALS valid interrupts to be generated.

sistence Filter Register (0x8E)

中断持久性过滤器设置在生成中断之前超出范围的连续接近循环的数量。超出范围由接近中断阈值寄存器（0x8A 到 0x8D）确定.

The interrupt persistence filter sets the number of consecutive proximity cycles that are out- of-range before an interrupt is generated. Out-of-range is determined by the proximity interrupt threshold registers (0x8A through 0x8D).

ADDR	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	DEF
0x8E					PERS				0x02

FIELD	BITS	DESCRIPTION
INT_PSH	5	控制对主机处理器的中断速率 Controls rate of interrupt to the host processor 0x1：1 的接近值超出范围 0x1 : 1 proximity value out of range 0x2：2 连续接近值超出范围 0x2 : 2 consecutive proximity values out of range 0x3：3 连续接近值超出范围 0x3 : 3 consecutive proximity values out of range 0x4：5 连续接近值超出范围 0x4 : 5 consecutive proximity values out of range 0x5：10 连续接近值超出范围 0x5 : 10 consecutive proximity values out of range ... 0xF：60 个连续接近值超出范围 0xF : 60 consecutive proximity value out of range

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时间控制寄存器 Time control Register

ADDR	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	DEF
0x82	50HZ	TIME_BASE			WLONG	TIME_DELAY			0xFF
0x83	TIME_WAIT								0x00
0x84	TIME_ALS								0x00
0x85	PS_PULSE				PS_WIDTH				0x00
0x86	PS_DELAY								0x00
0x87	PS_TIME								0x00
0x88	PS_OFFSET								0x00

FIELD	BITS	DESCRIPTION
50HZ	0x82 Bit 7	设置参考时间以降低功率噪声 0 :0.83ms (60Hz / 20) 1 :1ms (50Hz / 20) Set reference time to reduce power noise 0 : 0.83ms (60Hz / 20) 1 : 1ms (50Hz / 20)
TIME_BASE	0x82 Bit 6:4	设置等待计时器或 ALS ADC 的基本时间 基本时间=参考时间 x（TIME_BASE+1） Set the base time of Wait Timer or ALS ADC. Base Time = Reference Time x (TIME_BASE+1)
WLONG	0x82 Bit 3	长时间待机，当断言时，等待周期将比 TIME_WAIT 寄存器中编程的周期增加 12×。 Wait Long. When asserted, the wait cycles are increased by a factor 12× from that programmed in the TIME_WAIT register.
TIME_DELAY	0x82 Bit 2:0	设置延迟时间，等待初始化 ALS 传感器和 ADC 延迟时间=基准时间 x（TIME_DELAY+5） Set the delay time to wait to initialize the ALS sensor and ADC. Delay Time = Base Time x (TIME_DELAY+5)
TIME_WAIT	0x83	设置等待计时器的时间 等待时间=基本时间 x（TIME_WAIT+1） Set the time of Wait Timer. Wait Time = Base Time x (TIME_WAIT+1)
TIME_ALS	0x84	设置 ALS 传感器的测量时间 测量时间=基本时间 x（TIME_ALS+1） Set the measurement time of the ALS sensor. Measure Time = Base Time x (TIME_ALS+1)
PS_PULSE	0x85 Bit 7:4	设置 LED 脉冲数 = PS_PULSE + 1 Set Number of LED Pulse. Number of Pluses = PS_PULSE + 1
PS_WIDTH	0x85 Bit 3:0	设置 LED 脉冲的宽度 脉冲时间=（（PS_WIDTH+1）x 12 x 1.45）x 2 us Set width of LED pulse.Pulse Time = ((PS_WIDTH+1) x 12 x 1.45) x 2 us
PS_DELAY	0x86	设置 LED 脉冲驱动前的延迟时间 延迟时间=（PS_DELAY+1）x 1.45us Set the delay time before LED pulse drive. Delay Time = (PS_DELAY+1) x 1.45us
PS_TIME	0x87	设置 PS 的释放时间 PS 排放时间=（PS_TIME +1）x 128 x 1.45 us Set the PS Discharge Time.PS Discharge time = (PS_TIME +1) x 128 x 1.45 us
PS_OFFSET	0x88	设置 PS 偏移量（数字） PS 偏移数据= PS_OFFSET x2（2 的补充） Set the PS Offset (digital)PS Offset data = PS_OFFSET x 2 (2’s compliment)

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增益和中断阈值寄存器 Gain and Interrupt Threshold Register

ADDR	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	DEF
0x89	PDRIVE		GAIN_IR		GAIN_PS		GAIN_ALS		0x00
0x8A	INT_LL								0x00
0x8B	INT_LH								0x00
0x8C	INT_HL								0xFF
0x8D	INT_HH								0xFF

FIELD	BITS	DESCRIPTION
PDRIVE	0x89 Bit 7:6	LED 电平 LED Current Level. PDL 是 0：0：215 mA，1：182 mA，2：145 mA，3：100 mA PDL is 0 : 0: 215mA, 1: 182mA, 2: 145mA, 3: 100mA PDL 是 1：0：25 mA 1：20 mA，2：15 mA，3：10 mA PDL is 1 : 0: 25mA 1: 20mA, 2: 15mA, 3: 10mA
GAIN_IR	0x89 Bit 5:4	IR 增益 0：x1、1：x0.5、2：x0.25、3：x0.125 IR Gain 0: x1, 1: x0.5, 2: x0.25, 3: x0.125
GAIN_PS	0x89 Bit 3:2	PS 增益 0：低，1：中，2：高 PS Gain 0: Low, 1: Medium, 2: High
GAIN_ALS	0x89 Bit 1:0	ALS 增益 0: 低，1：中，2：高，3：最大值 ALS Gain 0: Low, 1: Medium, 2: High, 3: Max
INT_LL	0x8A	接近中断低阈值低字节 Proximity interrupt low threshold low byte
INT_LH	0x8B	接近中断低阈值高字节 Proximity interrupt low threshold high byte
INT_HL	0x8C	接近中断高阈值低字节 Proximity interrupt high threshold low byte
INT_HH	0x8D	接近中断高阈值高字节 Proximity interrupt high threshold high byte

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ADC 数据 ADC Data

ADDR	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	DEF
0x98	DEV_ID				REV_ID				0xA0
0xA0	ADC_R[7:0]								0x00
0xA1	ADC_R[15:8]								0x00
0xA2	ADC_G[7:0]								0x00
0xA3	ADC_G[15:8]								0x00
0xA4	ADC_B[7:0]								0x00
0xA5	ADC_B[15:8]								0x00
0xA6	ADC_C[7:0]								0x00
0xA7	ADC_C[15:8]								0x00
0xA8	ADC_IR[7:0]								0x00
0xA9	ADC_IR[15:8]								0x00

FIELD	DESCRIPTION
DEV_ID	Device ID (0xA)
REV_ID	Revision ID (0x0)
ADC_R	RED data
ADC_G	GREEN data
ADC_B	BLUE data
ADC_C	Clear data
ADC_IR	IR data

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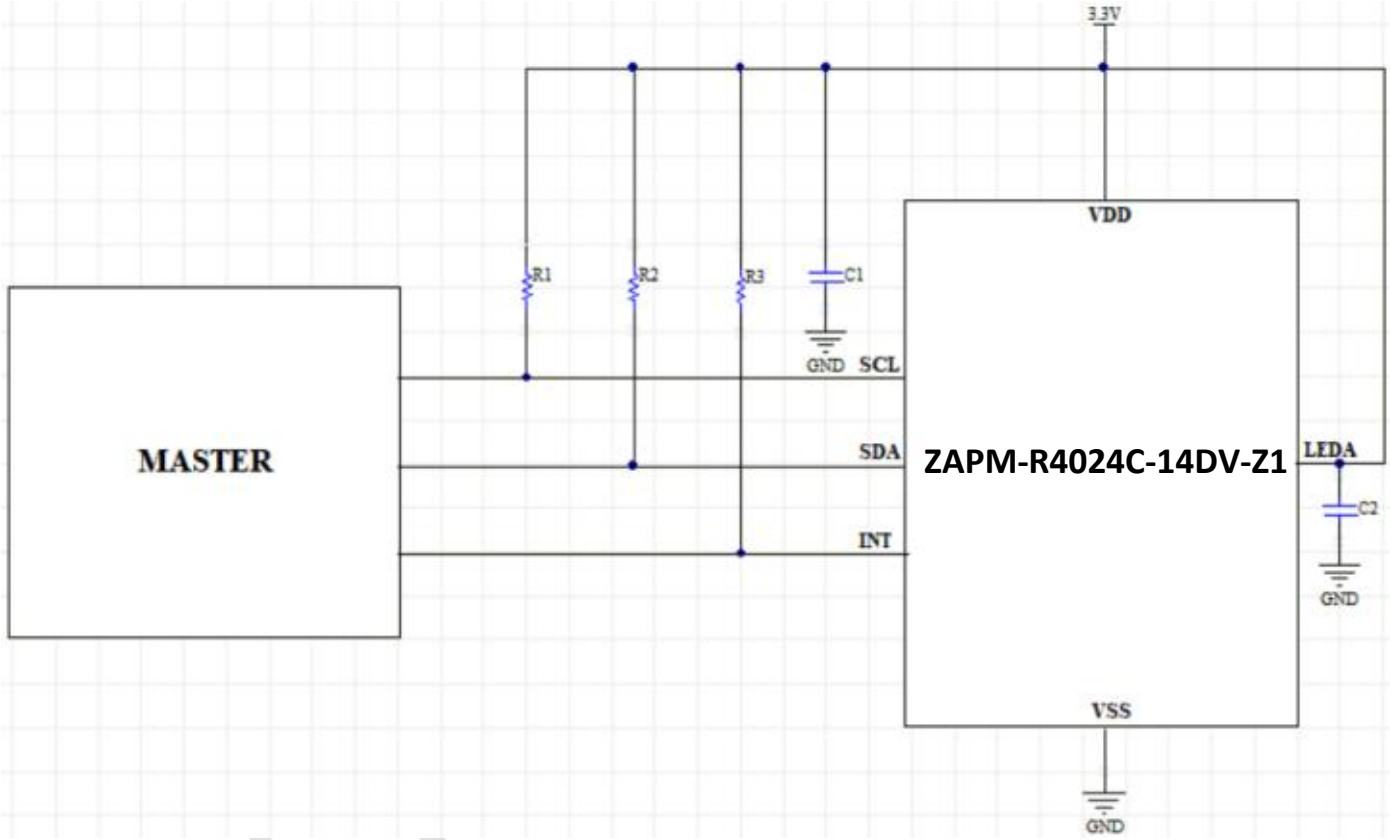
应用 Application

1、典型应用 Typical Application

在近距离传感系统中，红外 LED 可以由超过 200 mA 快速切换电流的 ZAPM-R4024C-14DV-Z1 脉冲，因此，必须记住一些设计考虑，以获得最佳性能。关键是减少在 LED 脉冲期间耦合回设备的电源噪声。

In a proximity sensing system, the IR LED can be pulsed by the SMAPS331DL-FRBS with more than 200 mA of rapidly switching current, therefore, a few design considerations must be kept in mind to get the best performance. The key goal is to reduce the power supply noise coupled back into the device during the LED pulse.



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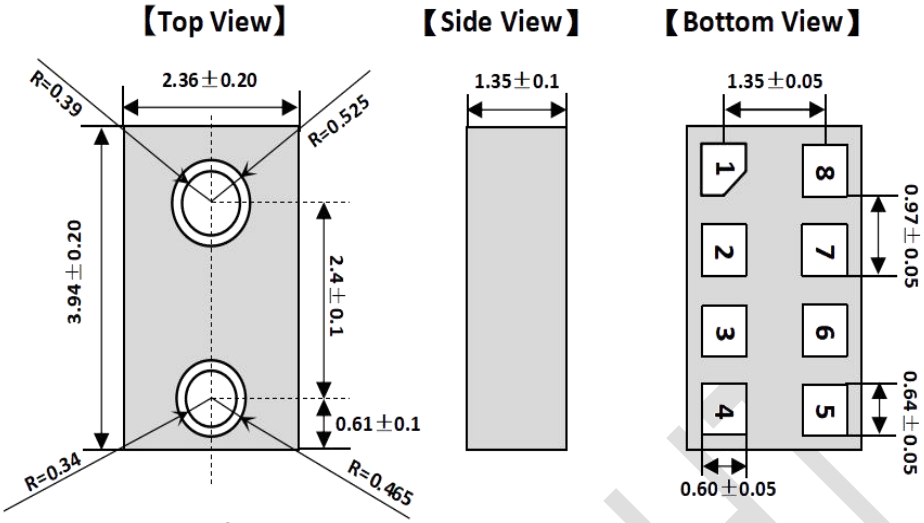
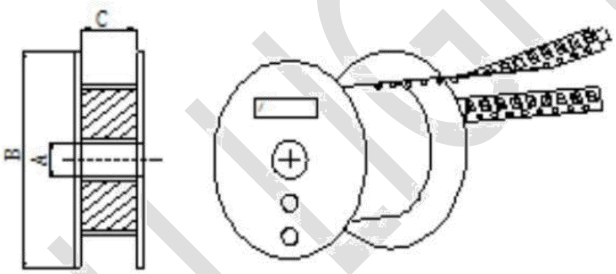
封装尺寸 Package Dimension



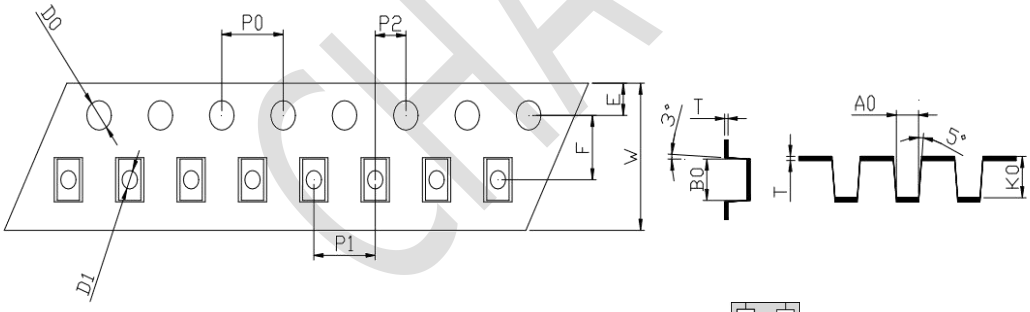
包装规格 Packing Specification

--卷轴包装尺寸 Package Dimensions

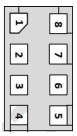


--载带编带的尺寸 Carrier Tape Dimensions

进料方向 Progressive Direction



1 脚缺口位置朝载带孔



W	12.00±0.05
T	0.25±0.02
A0	2.65±0.10
B0	4.20±0.10
K0	1.58±0.10
D0	1.60±0.10
D1	1.60±0.10
E	1.75±0.10
F	5.50±0.10
P0	4.00±0.10
P1	4.00±0.10
P2	2.00±0.10
10P0	40.00±0.20

--装载数量 Loaded Quantity

2000 个/盘 2000pcs/reel

--备注 Note

所有的尺寸公差最少是正负 0.1 毫米 The tolerances unless mentioned is ±0.1mm

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注意事项 Note

--过流保护 Over-current-proof

1、客户必须应用电阻进行保护，否则会造成轻微电压偏移大电流变化（烧毁将发生）。Customer must apply resistors for protection, otherwise slight voltage shift will cause big current change (Burn out will happen).

--储存 Storage

1、产品准备使用前不要打开防潮袋。Do not open moisture proof bag before the products are ready to use.

2、在打开包装之前，二极管应保持在 10℃~30℃和 90%RH 或以下。Before opening the package, the LED should be kept at 10℃~30℃ and 90%RH or less.

3、二极管建议在一年内使用。The LED suggested be used within one year.

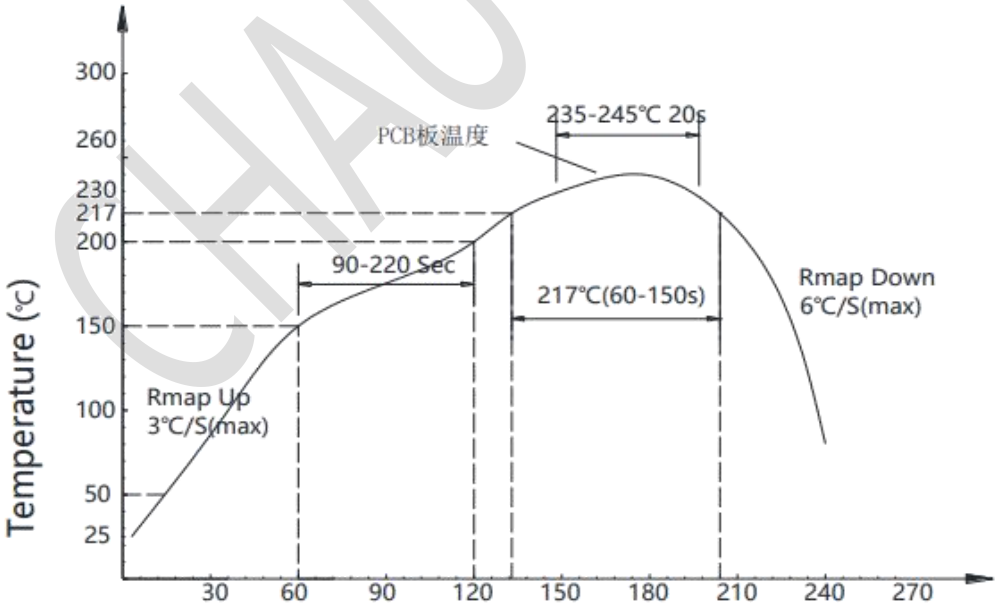
4、 打开包装后，设备必须存储在 10°C~30°C 和 60%RH，并在 168 小时内使用（地板寿命）。如果未使用的二极管仍然存在，它应储存在防潮包装中。After opening the package, the devices must be stored at 10°C~30°C and 60%RH, and used within 168 hours (floor life). If unused LED remain, it should be stored in moisture proof packages.

5、如果吸湿材料（干燥剂材料）已褪色或未打开的袋子已超过保质期或设备（袋外）已超过地板寿命，需要烘焙处理。If the moisture absorbent material (desiccant material) has faded or unopened bag has exceeded the shelf life or devices (out of bag) have exceeded the floor life, baking treatment is required.

6 、如果需要烘焙，请参阅 IPC/JEDECJ-STD-033 进行烘焙程序或建议以下条件：在 60° C±5° C 和 5%RH<96 小时（筛/管/套单位）If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure or recommend the following conditions: 96 hours at 60°C ± 5°C and < 5 % RH (reeled/tubed/loose units)

--焊接条件 Soldering Condition

1、回流焊温度曲线推荐（无铅）：Recommended for return welding temperature curve (lead-free)



2、回流焊不应做两次以上。Reflow soldering should not be done more than two times.

3、焊接时，不要在加热过程中对 LED 施加压力。 When soldering, do not put stress on the LEDs during heating.

4、焊接后，不要使电路板翘曲。After soldering, do not warp the circuit board.

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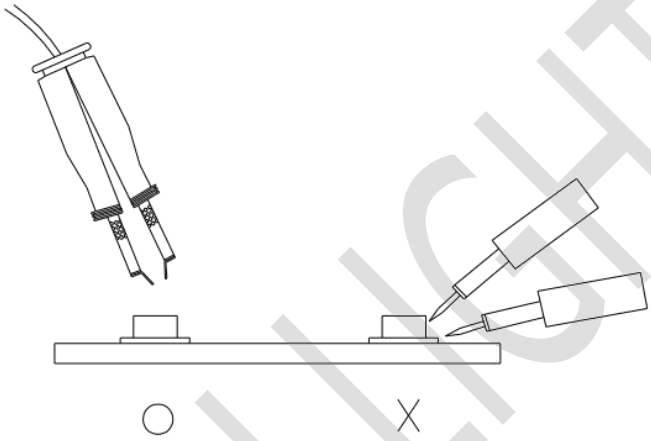
--烙铁条件 Soldering Iron

每个端子都要去烙铁尖端温度低于 350℃为 3 秒内一次少于烙铁容量 25W。 离开两秒钟然后更多的间隔，并做焊接每个终端。手工焊料通常在开始的时候容易损坏产品。Each terminal is to go to the tip of soldering iron temperature less than 350℃ for 3 seconds within once in less than the soldering iron capacity 25W. Leave two seconds and more intervals, and do soldering of each terminal. Be careful because the damage of the product is often started at the time of the hand solder.

--手工补数 Repairing

修理不应在 LED 焊接后进行。 当修理是不可避免的是，应该使用双头烙铁（如下图所示）。 应该是事先确认 LED 的特性是否会或不会损坏通过修理。Repair should not be done after the LEDs have been soldered. When repairing is unavoidable, a double-head soldering iron should be used (as below figure). It should be confirmed beforehand whether the characteristics of the LEDs will or will not be damaged by repairing.



--其他 Other

1、以上规格可更改，恕不另行通知。 洲光源将为上述规格的材料变更保留权力 Above specification may be changed without notice. CHAU LIGHT will reserve authority on material change for above specification.

2、当使用此产品时，请观察这些规格表中概述的绝对最大额定值和使用说明。洲光源不承担任何损坏结果的责任从不符合绝对最大额定值的产品的使用和这些规格表中包含的说明 When using this product, please observe the absolute maximum ratings and the instruction for using outlined in these specification sheets. CHAU LIGHT assumes no responsibility for any damage resulting from use of the product which does not comply with the absolute maximum ratings and the instructions included in these specification sheets.

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更改记录表 Engineering Change Notice-Record

版本 Edition	更改日期 Date	主要更改内容 Main Content	拟 制 Prepared	确 认 Checked
A/0	2021-10-25	新版本发布 New Edition	谢育国	郝三强

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