



洲光源
CHAULIGHT

产品规格书 SPECIFICATION

客户名称: _____

Customer Name

产品类型: 彩色光传感器

Product Name

产品型号: ZCS-2016C-08D-Z4

Part No.

<input type="checkbox"/> 技术参考 Technical Reference		<input type="checkbox"/> 样品 Sample		<input type="checkbox"/> 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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<input type="checkbox"/> 接收 Qualified			<input type="checkbox"/> 不接收 Disqualified		日期 Date: 2021/09/27

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广东洲光源红外半导体有限公司
Guangdong Chaulight Infrared Semiconductor Co.,Ltd.

ZCS-2016C-08D-Z4 设备可进行色温测量、亮度传感。内部状态机提供了将设备置于色温测量之间的低功率状态的能力，非常低的平均功耗。

ZCS-2016C-08D-Z4 device will perform color temperature measurement, brightness sensing. An internal state machine provides the ability to put the device into a low power state between color temperature measurement providing very low average power consumption.

特性 Feature

- 色温及环境光传感.
 - Color Temperature and Ambient Light Sensing.
 - 低功耗运行.
 - Low Power Management .
 - 16 位分辨率.
 - 16 Bit resolution.
 - 可编程的增益和集成时间.
 - Programmable Gain & Integration Time.
 - I2C 快速模式接口兼容.
 - I2C Fast Mode Interface Compatible .
 - 红外阻塞滤波器.
 - IR blocking filters.
- 运行功率.
- Power Management.
 - 低功耗 1uA--睡眠状态.
 - Low Power 1uA Sleep State.
- SUBI2C 接口兼容性
- I2C Interface Compatible
 - 最多为 400kHz (I2C 快速模式) .
 - Up to 400kHz (I2C Fast Mode).
 - 设备地址: 7' b1000_011 (R, ADDR float) 7' b1000_010 (R, ADDR 低) .
 - Device address : 7' b1000_011 (R/W, ADDR float) 7' b1000_010 (R/W, ADDR low).

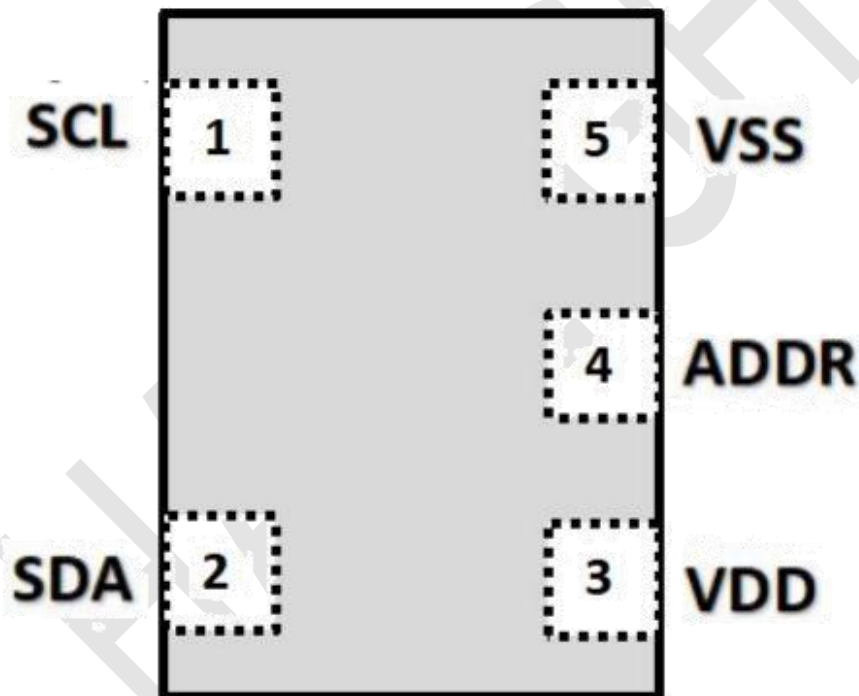
应用 Application

--亮度传感器、彩色温度传感器、 小笔记本、 穿戴设备、工业及医疗应用

Brightness Sensing、Color Temperature Sensing、Notebook、Handheld device、Industrial and medical application.

管脚配置和功能 Pin Configuration and Functions

#.	PIN.	I/O/P/G	DESCRIPTION
1	SCL	I	I2C 串行时钟输入终端 I2C serial clock input terminal.
2	SDA	I/O	I2C 串行数据输入/输出终端 I2C serial data input/output terminal.
3	VDD	P	电源电压 Supply voltage.
4	ADDR	O	I2C 设备地址输入端子 (内部上拉) -高或浮动: 7' b1000_011-低: 7' b1000_010. I2C device address input terminal (internal pull-up) - High or Floating : 7' b1000_011 - Low :7' b1000_010.
5	VSS	G	接地端 Supply Ground.



【Top View】

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	3.6	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	80	°C

*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).	+/- 800	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.	2.6	3.3	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.	-30	--	70	°C

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 Active.	--	300	350	uA
	睡眠 Sleep (@ADDR high).	--	1	10	
	睡眠 Sleep (@ADDR low).	--	16	25	
SDA 输出低电平 SDA output Low voltage.	3mA 反向电流 13mA sink current.	0	--	0.4	V
	6mA 反向电流 6mA sink current.	--	--	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	CONDITIONS	MIN	MAX	Unit
输出低电平(SDA) Output Low Level (SDA)	IOL=4mA.	--	0.5	V
SCL 工作频率 SCL Operating Frequency	--	--	400	KHz
停止和启动条件 Stop and Start Condition	--	1.3	--	us
重复启动后的保持时间 Hold Time After Repeated Start Conditions	--	0.6	--	us
SCL 时钟低周期 SCL Clock Low Period	--	1.3	--	us
SCL 时钟高周期 SCL Clock High Period.	--	0.6	--	us
重复启动条件设置时间 Repeated Start Condition Setup Time.	--	0.6	--	us
计数保持时间 Data Hold Time.	--	0	0.9	us
计数设置时间 Data Setup Time.	--	100	--	ns
时钟/计数下降时间 Clock/Data Fall Time.	--	--	300	ns
时钟/计数上升时间 Clock/Data Rise Time.	--	--	300	ns
停止条件设置时间 Stop Condition Setup Time.	--	0.6	--	ns

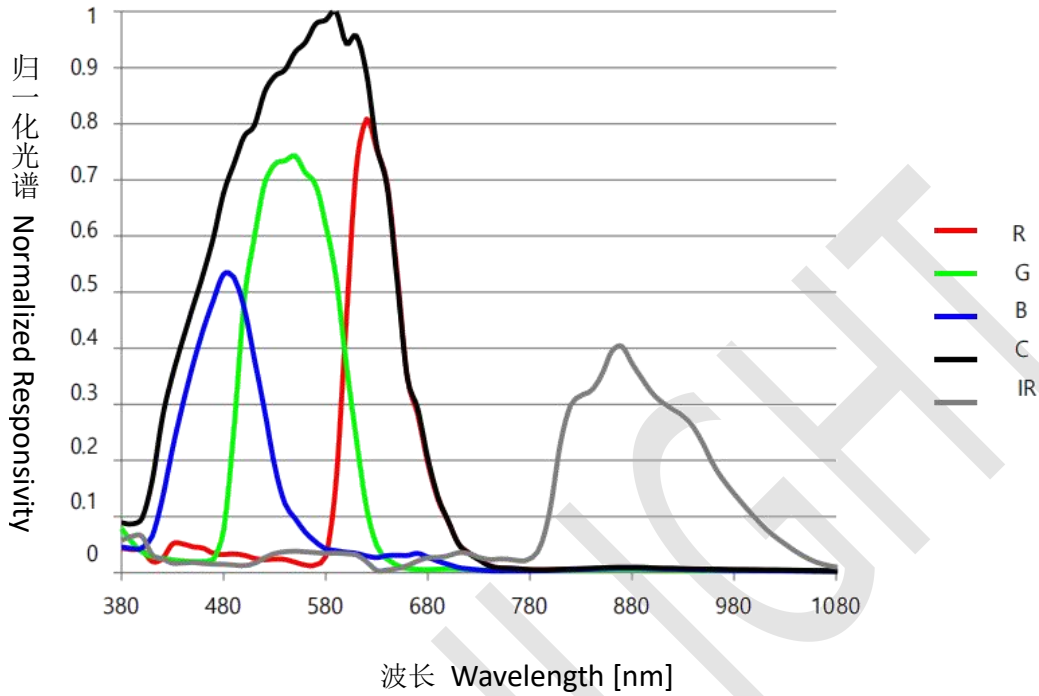
6、光学特性(VDD=3V, Ta=25℃) Optical Characteristics (VDD = 3V, Ta = 25℃).

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	Unit
ADC 峰值波长灵敏度 Peak_Sensitivity Wavelength of ADC.	R	--	--	630	--	nm
	G	--	--	550	--	nm
	B	--	--	480	--	nm
	C	--	--	590	--	nm
	IR	--	--	870	--	nm
ADC 的计数值 Counter Value of ADC.	R	5700K WLED, 1000Lux, 集成时间 10ms, 再次=1.	--	3730	--	counts
	G		--	8635	--	counts
	B		--	7545	--	counts
	C	5700K WLED, 1000Lux, Integration Time 10ms,	--	15830	--	counts
	IR	AGAIN=1.	--	50	--	counts
暗计数值 Dark Count Value.	黑暗, 集成时间 100ms, 再次=1 Dark, Integration Time 100ms, AGAIN=1.	0	1	3	counts	
ADC 计数范围 ADC count Range.	--	0	--	65.535	counts	
增益缩放 Gain scaling.	AGAIN = 0 AGAIN = 1 AGAIN = 2 AGAIN = 3	-- -- -- --	1 1.5 2 2.5	-- -- -- --	x	

7、典型性能特征 Typical Performance Characteristics.

归一化相应曲线

Normalized Spectral Response

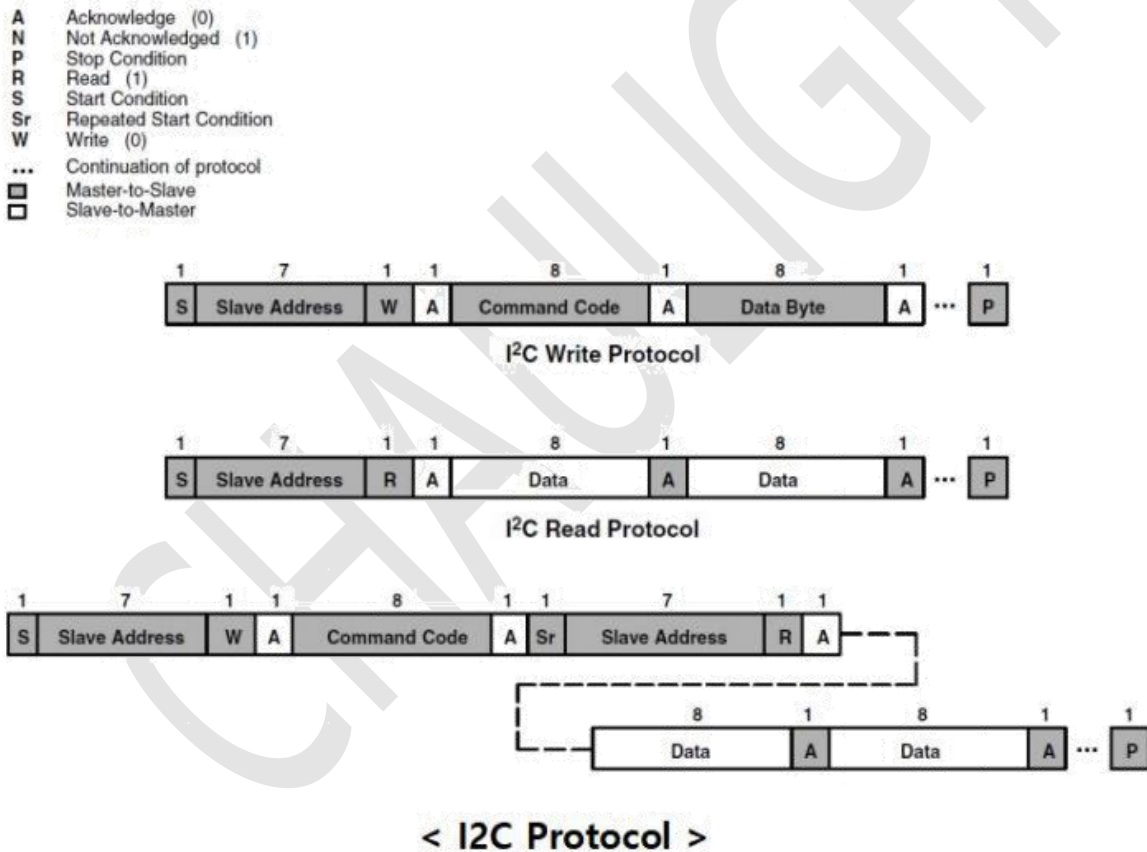


详细说明书 Detailed Description.

1、I2C Protocol

ZCS-2016C-08D-Z4 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。该设备支持使用 7 位寻址协议在 b1000_011 和 b1000_010 之间选择一个可选择的 I2C 地址。I2C 标准提供了三种类型的总线事务：读、写和组合协议。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。

Interface and control of the ZCS-2016C-08D-Z4 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 select able I2C address between b1000_011 and b1000_010 using 7-bit addressing protocol. The I2C standard provides for three types of bus transaction: read, write, and a combined protocol. 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.



寄存器图 Register Maps.

ADDR	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	DEF
0x80	RESERVED			DARK_EN	RESERVED	W_EN	RGB_EN	PON	0x00
0x81	IRGAIN		IRGAIN AGAIN		W_TIME	RGB_TIME			0x00
0x82	DEVICE ID								0x24
0x83	REVISION ID								0x00
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

1、启用注册 Enable Register.

ADDR	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	DEF
0x80	RESERVED			DARK_EN	RESERVED	W_EN	RGB_EN	PON	0x00

FIELD	BITS	DESCRIPTION
DARK_EN	4	暗偏移应用取消 Dark Offset cancellation Enable.
W_EN	2	等待状态启用 Wait State Enable.
RGB_EN	1	RGB, 清除和红外控制器启用 RGB, Clear and IR controller Enable.
PON	0	<p>电源打开 Power ON.</p> <p>该位激活内部模拟电路, 以允许计时器和 ADC 通道工作。写入一个 1 将激活模拟电路。写入 0 将禁用模拟电路。在对 I²C 接口的读写期间, 这个位被暂时覆盖, 模拟电路被启用, 独立于 PON 的状态。</p> <p>This bit activates the internal analog circuit to permit the timers and ADC channels to operate. Writing a 1 activates analog circuit. Writing a 0 disables analog circuit. During reads and writes over the I²C interface, this bit is temporarily overridden and analog circuit is enabled, independent of the state of PON.</p>

2、增益和时间控制注册 Gain & Time control Register.

ADDR	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	DEF
0x81	IRGAIN		AGAIN		W_TIME	RGB_TIME			0x00

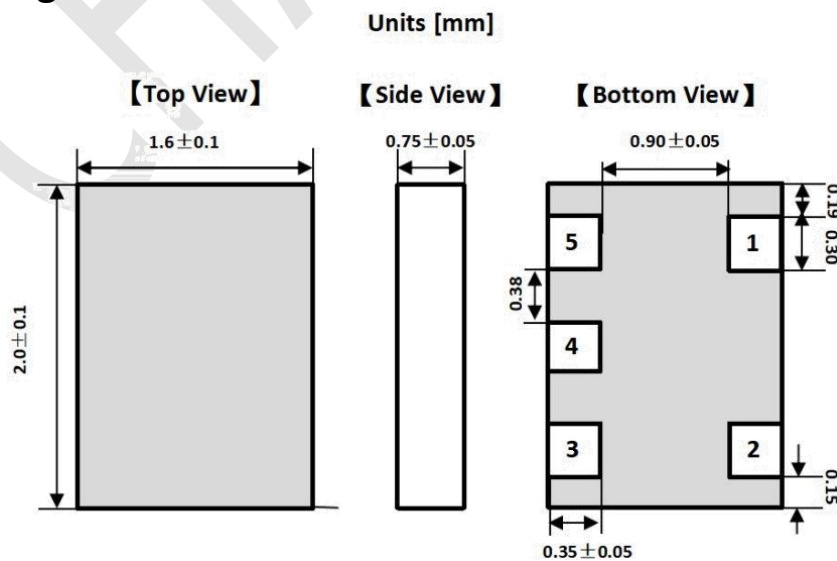
FIELD	BITS	DESCRIPTION
IRGAIN	[7:6]	IR Gain 0 : 1x, 1: 0.5x, 2: 0.25x, 3:
AGAIN	[5:4]	Analog Gain 0 : 1x, 1: 1.5x, 2: 2x, 3: 2.5x
W_TIME	3	WAIT Time 0 : 10ms, 1: 100ms
RGB_TIME	[2:0]	Optical Integration Time 0: 10ms, 1: 20ms, 2: 40ms, 3: 80ms 4: 100ms, 5: 200ms, 6: 400ms, 7: 800ms

3、ADC 数据 ADC Data

ADDR	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	DEF	
0x82									DEVICE ID	0x24
0x83									REVISION ID	0x00
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

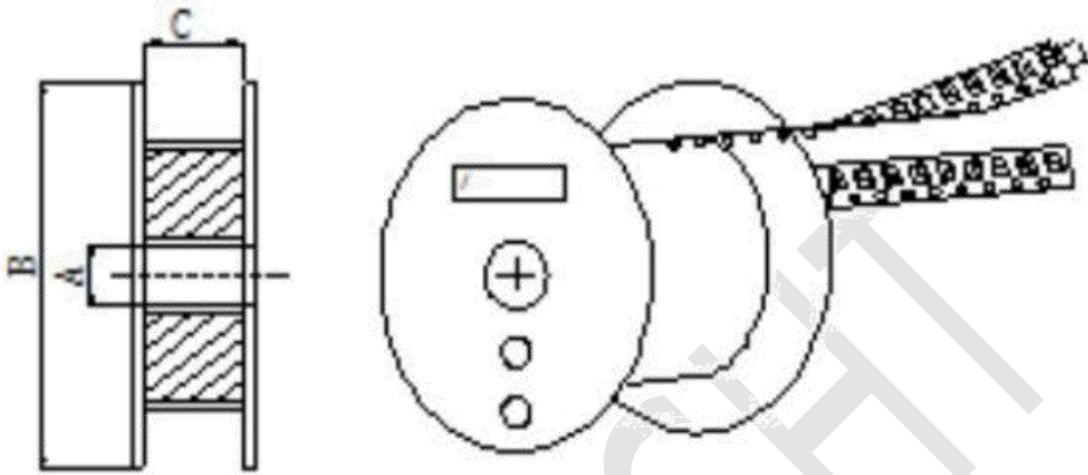
FIELD	DESCRIPTION
DEV_ID	Device ID (0x24)
REV_ID	Revision ID (0x0)
ADC_R	RED data
ADC_G	GREEN data
ADC_B	BLUE data
ADC_C	Clear data
ADC_IR	IR data

封装尺寸 Package Dimension



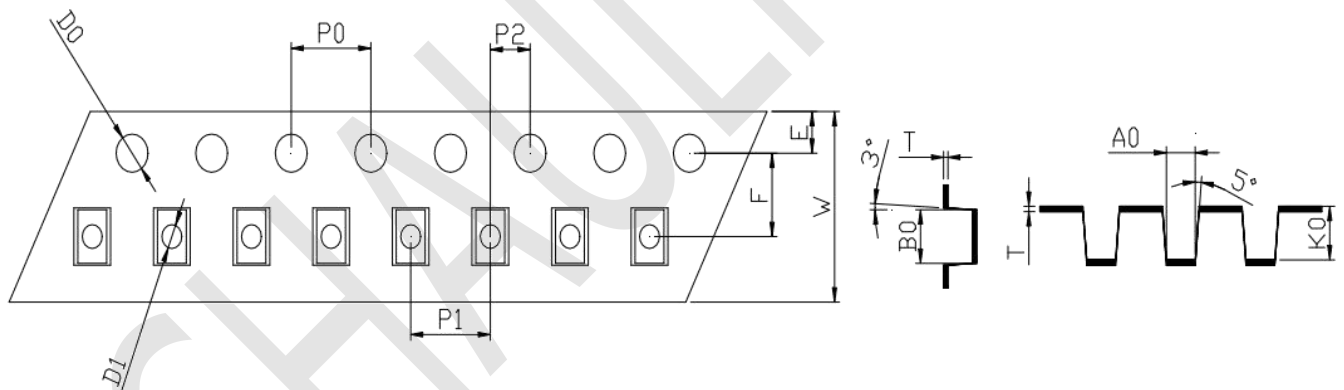
包装规格 Packing Specification

--卷轴包装尺寸 Package Dimensions



--载带编带的尺寸 Carrier Tape Dimensions

进料方向 Progressive Direction



--装载数量 Loaded Quantity

4000 个/盘 4000pcs/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 $\pm 0.1\text{mm}$

注意事项 Note

--过流保护 Over-current-proof

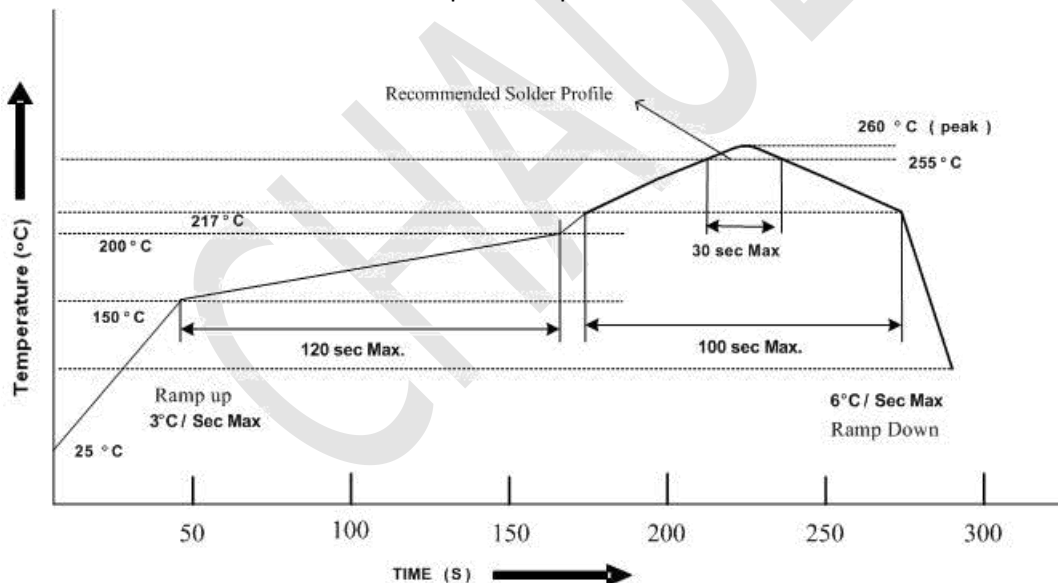
1、客户必须应用电阻进行保护，否则会造成轻微电压偏移大电流变化（烧毁将发生）。Customer must apply resistors for protection, otherwise slight voltage shift will cause big current change (Burn out will happen).

--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°C~30°C 和 90%RH 或以下。Before opening the package, the LED should be kept at 10°C~30°C 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、铅焊料温度剖面 Lead solder temperature profile



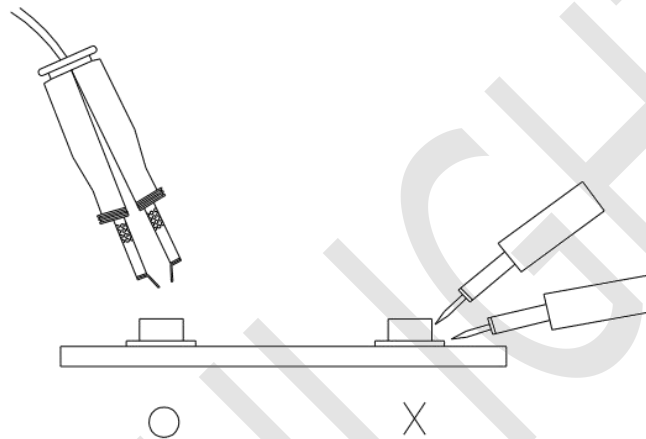
- 2、回流焊不应做两次以上。Reflow soldering should not be done more than two times.
- 3、焊接时，不要在加热过程中对 LED 施加压力。When soldering, do not put stress on the LEDs during heating.
- 4、焊接后，不要使电路板翘曲。After soldering, do not warp the circuit board.

--烙铁条件 Soldering Iron

每个端子都要去烙铁尖端温度低于 320°C 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 320°C 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

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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	2021-09-27	新版本发布 New Edition	谢育国	郝三强
A/1	2022-05-31	修正版 Revised Edition	谢育国	郝三强