NULLLAB 空想实验室
NULLLAB

模块使用说明书

SPECIFICATION

客户名称：_____

Customer Name

产品类型：彩色光传感器

Product Name

产品型号：NLCS11

Part No.

地址(Add)：深圳市宝安区福海街道新和社区富桥三区二期厂房A13号301

No. 301, A13, Fuqiao Third District, Xinhe Community,Fuhai Street, Baoan District,Shenzhen

NLCS11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。

NLCS11device 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.

-低功率运行.

- 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.

-低功率 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.

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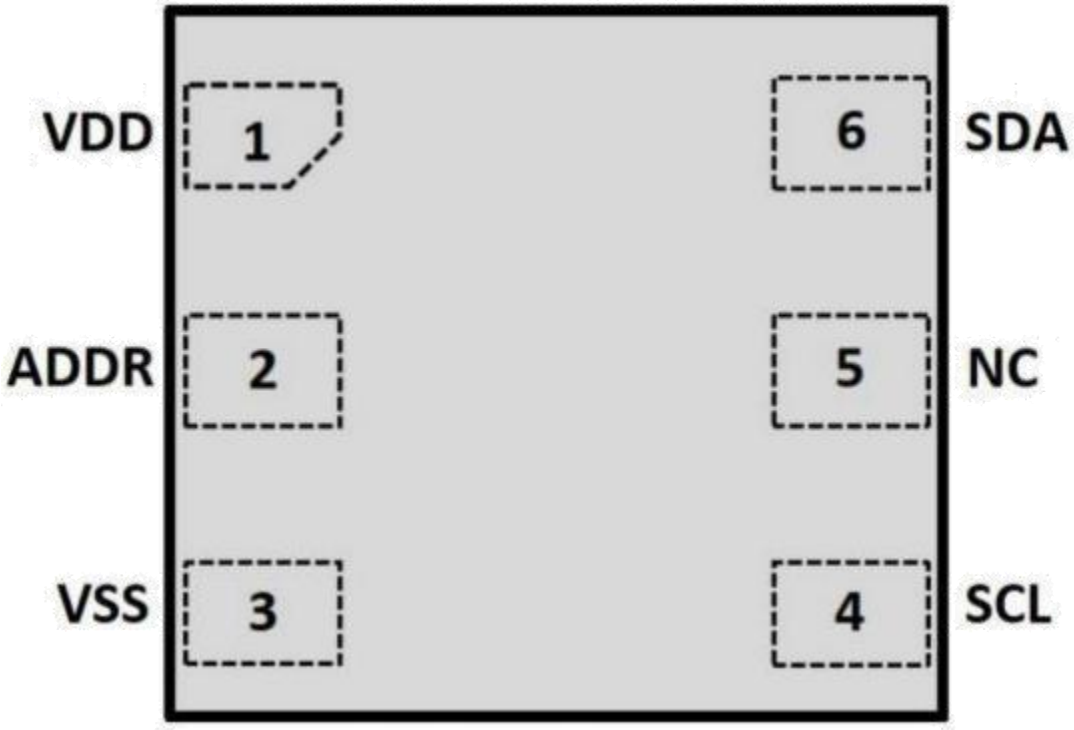
管脚配置和功能 Pin Configuration and Functions

#.	PIN.	I/O/P/G	DESCRIPTION
1	VDD	P	电源电压 Supply voltage.
2	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.
3	VSS	G	接地端 Supply Ground.
4	SCL	I	I2C 串行时钟输入终端 I2C serial clock input terminal.
5	NC		此引脚无连接 No connection to this pin
6	SDA	I/O	I2C 串行数据输入/输出终端 I2C serial data input/output terminal.



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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	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	℃

*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).	+/- 8000	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	℃

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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 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 I3mA 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 时钟低周期 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

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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. 5700K WLED, 1000Lux, Integration Time 10ms, AGAIN=1.	--	3730	--	counts
	G		--	8635	--	counts
	B		--	7545	--	counts
	C		--	15830	--	counts
	IR		--	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

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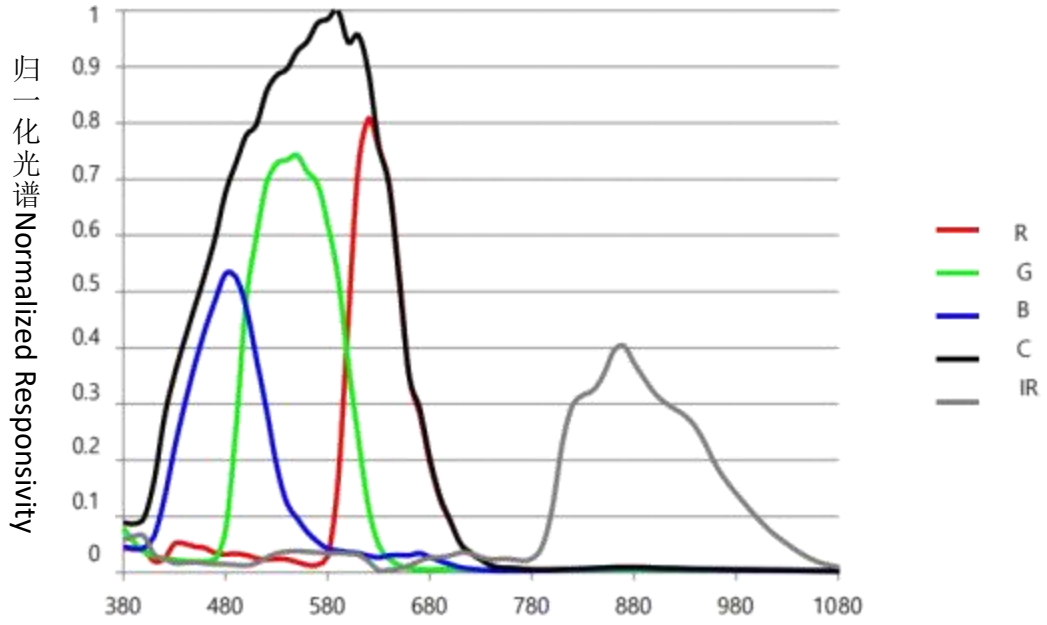
7、典型性能特征 Typical Performance Characteristics.

归一化相应曲线

Normalized Spectral Response



波长 Wavelength [nm]

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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	电源打开 Power ON. 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。 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 I² C interface, this bit is temporarily overridden and analog circuit is enabled, independent of the state of PON.

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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

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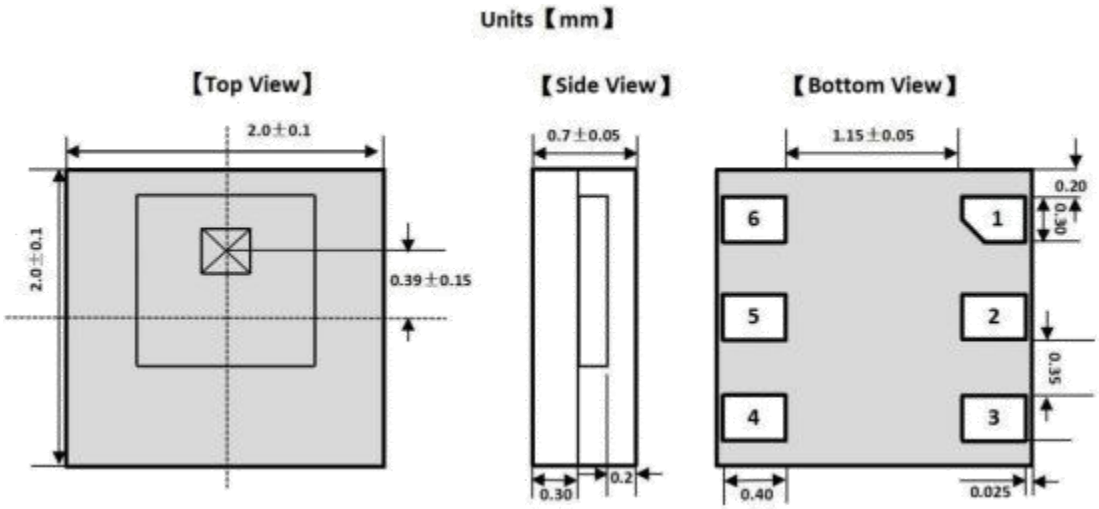
3、ADC 数据 ADC Data

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



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