

佛山市国星 RGB 器件事业部

FOSHAN NATIONSTAR RGB DIVISION

产品规格书
SPECIFICATION

顾客名称 Customer		产品名称 Product	TOP LED
顾客型号 Customer Type		产品型号 Type	TBA-T2020M-J1I16
顾客部品号 Customer No.		版本号 Version NO	A 版



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制 定 DRAW	审 核 CHECK	批 准 APPROVE	确 认 CONFIRM
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TBA-T2020M-J1I16**TOP Full-color LED****技术数据表 Technical Data Sheet**

本产品属于表面贴装全彩器件, 拥有全白料、双通道传输、传输数据 8/16bit 等特点, 是户内显示、灯条装饰等领域的理想选择。

These products are full-color SMD components, which are white material, two-channel transmission, and 8-bit or 16-bit transmit data. They are designed for indoor display and decoration applications.

**特性:****Features:**

- 管芯材料:

红色 Red	绿色 Green	蓝色 Blue
AlGaInP	InGaN	InGaN

Material:
- 封装材料: 环氧树脂
Encapsulation: Epoxy Resin
- 焊接方法: 无铅回流焊
Soldering methods: Pb-Free reflow soldering
- 符合欧盟公布的 ROHS 指令要求
Complied With ROHS Directive

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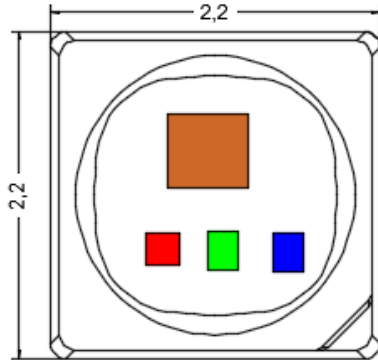
*产品规格如因工艺改进而有所改变, 恕不另行通知。

* The specifications of the product may be modified for improvement without notice.

1.外形尺寸

Outline Dimension

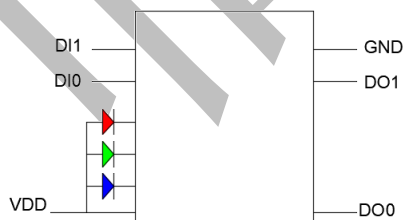
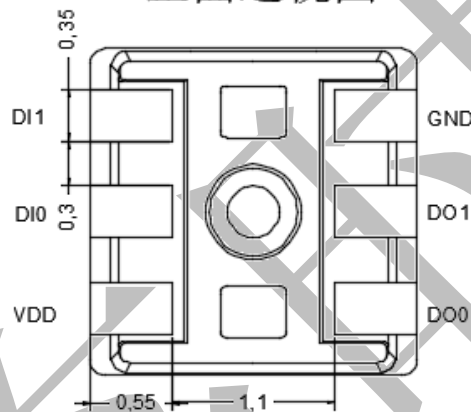
正面图



侧视图



正面透视图



极性 Polarity

Note:

A : 缺口标志

A : Nick Mark

单位: mm;

All dimensions in mm.

公差: X.X ± 0.1 mm

X.XX ± 0.05 mm

Tolerances: X.X ± 0.1 mm

X.XX ± 0.05 mm

2. 产品特性参数

Product characteristic parameters

引脚名称	引脚序号	I/O	功能说明
GND	1	--	芯片供电负极端口
DO1	2	O	数据输出端口 1
DO0	3	O	数据输出端口 0
DI1	4	I	数据输入端口 1
DI0	5	I	数据输入端口 0
VDD	6	--	芯片供电正极端口

符号 symbol	项目 Item	单位 Units	发光颜色 Device	最小值 Min	典型值 Typ	最大值 Max	测试条件 Test Conditions
VF	正向电压 Forward Voltage	V	Red	1.6	2.1	2.4	IF=8mA
			Green	2.5	2.8	3.5	IF=5mA
			Blue	2.5	2.8	3.5	IF=3mA
$\Delta\lambda_{1/2}$	发光角度 Viewing Angle	°	/	/	110	/	/
Iv	发光强度 Luminous Intensity	mcd	Red	110	147	194	IF=8mA
			Green	200	267	350	IF=5mA
			Blue	27	36	47	IF=3mA
λ_D	主波长 Dominate Wavelength	nm	Red	615	623	630	IF=8mA
			Green	515	525	540	IF=5mA
			Blue	462	472	478	IF=3mA

3. IC 功能特点

Functional features of IC

1. 极限参数

Parameter	Symbol	Range	Unit
电源电压	VCC	3.3~12	V
功率	PD	<300	mW
最大输出电流	IOUT	40	mA
工作温度	TOPR	-40~85	°C
焊接温度	TM	270 (8S)	°C
储存温度	TSTO	-40~85	°C
ESD (HBM)	VESD	4k	V

2. 电气参数

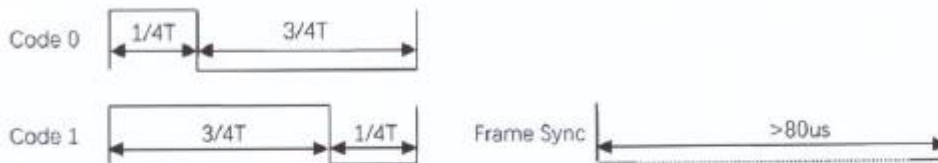
Parameter	Symbol	Min	Typ	Max	Unit	Note
工作电压	VCC	3.3	5	12	V	
工作电流	ICC			0.8	mA	1.6MHZ 数据输入
静态功耗	ICCS			0.7	mA	无数据输入
数据传输速率	FTRAN	400K		1.6M	Hz	自适应
高电平 Input	VIH	0.7VCC			V	
低电平 Input	VIL			0.3VCC	V	
高电平 Output	VOH			VCC-0.3	V	
低电平 Output	VOL			GND+0.1	V	
R/G/B 输出电流	ILED	5		15	mA	R/G 为 9~15mA, B 为 5~9mA
R/G/B 电流偏差	IDIF	1		3	%	同电流下
DIE to DIE R/G/B 偏差	IDDIF	1		3	%	同电流下

4. 时序特性

temporal characteristic

通讯协议简介

占空比码是一种串行数据传输, 目前主流传输码率为 800Kbps. AB1002A 采用的是专利授权的增强型自适应码率占空比码协议, 支持 400Kbps 至 1.6Mbps 的任意数据传输码率, 芯片传输的数据频率取决于控制器发送的数据频率. 芯片接收 24/48 比特数据, R/G/B 分别为 8/16 比特数据. Code 0 和 Code 1 以 $T/2$ 为判定点, 高电平大于 $T/2$ 为 Code 1. 高电平小于 $T/2$ 为 Code 0. 建议值如下. 帧同步讯号为低电平 Idle $>80\mu s$.



测试方案

发送 1Mbps 的数据, 占空比为 1:3, 即是 1 码时高电平 750ns, 低电平 250ns; 0 码时高电平 250ns, 低电平 750ns; 帧间停顿 80us, 连续发送 4 帧, 每帧 144bit。

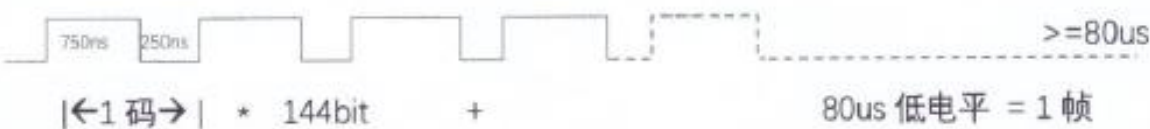
1. 上电时间 100ms, 电压 5V, DI0 发送 144bit 全 0 数据, 连续 4 帧率, DI1 接 GND, 检测 RGB 灯不亮, 且 DO0 和 DO1 有数据输出。



2. DI0 发送 144bit 全 1 数据, 连续 4 帧率, DI1 浮空, 检测 RGB 灯全亮。



3. DI1 发送 144bit 全 1 数据, 连续 4 帧率, DI0 浮空, 检测 RGB 灯全亮, 分光。



5. 焊接指导 (1)

Guideline for Soldering (1)

1. 使用烙铁人手焊接

Hand Soldering

- 使用手工焊接, 建议使用小于25瓦的电烙铁, 烙铁温度必须控制在315℃以下, 焊接时间需控制在3秒钟之内, 且每个电极只能焊接一次。

If manual soldering is used, the use of a soldering iron of less than 25W is recommended. The temperature of the iron must be kept below 315℃, with soldering time within 3 seconds and each electrode can be only soldered at one time.

- 手工焊接时电烙铁不可触及SMD LED表面。

The epoxy resin of the SMD LED should not contact the tip of the soldering iron.

- 焊接期间, 不可以对器件施加机械压力。

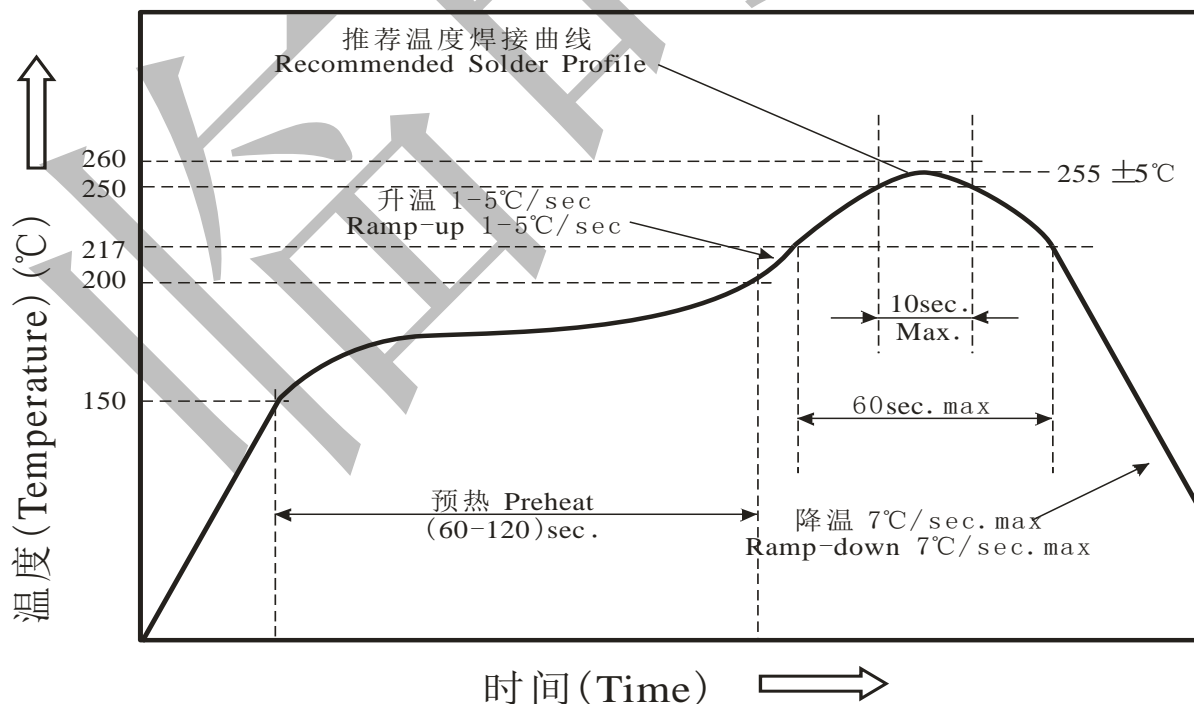
No mechanical stress should be exerted on the resin portion by the tip of the soldering iron.

- 器件外部温度在 40℃ 以下时, 才可以对其进行处理。避免高温时操作对 LED 造成损伤。

Handling of the SMD LED should be done when the temperature of environment is below 40℃, in case of LED failures caused by thermal-mechanical stress in condition of high temperature .

2. 回流焊接: 推荐使用以下无铅回流焊接温度图进行。

Reflow Soldering: Use the conditions shown in the under Figure of Pb-Free Reflow Soldering.



5. 焊接指导 (2)

Guideline for Soldering (2)

- 回流焊接最多只能进行一次。

Reflow soldering should not be done more than one time.

- 在回流焊接升温过程中, 请不要对 LED 施加任何压力。

Stress on the LEDs should be avoided during heating in the reflow soldering process.

- 在焊接完成后, 待产品温度下降到室温之后, 再进行其他处理。

After soldering, do not deal with the product before its temperature drop down to room temperature.

3. 清洗:

Cleaning

- 在焊接后推荐使用酒精 (无水乙醇) 进行清洗, 在温度不高于 30°C 的条件下持续 3 分钟, 不高于 50°C 的条件下持续 30 秒。使用其他类似溶剂清洗前, 请先确认使用的溶剂不会对 LED 的封装和环氧树脂部分造成损伤。

It is recommended that alcohol (Anhydrous ethanol) be used as a solvent for cleaning after soldering. Cleaning is to go under 30°C for 3 minutes or 50°C for 30 seconds. When using other solvents, it should be confirmed beforehand whether the solvents will dissolve the package and the resin or not.

- 超声波清洗也是有效的方法, 一般最大功率不应超过 300W, 否则可能对 LED 造成损伤。请根据具体的情况预先测试清洗条件是否会对 LED 造成损伤。

Ultrasonic cleaning is also an effective way for cleaning. The influence of Ultrasonic cleaning on LED depends on factors such as ultrasonic power. Generally, the ultrasonic power should not be higher than 300W, otherwise it will cause LED damage. Before cleaning, a pre-test should be done to confirm if any damage to LEDs will occur.

*** 注意:** 此一般指导原则并不适用于所有 PCB 设计和焊接设备的配置。具体工艺受到诸多因素的影响, 请根据特定的 PCB 设计和焊接设备来确定焊接方案。

*** Note:** This general guideline may not apply to all PCB designs and configurations of all soldering equipment. The technique in practice is influenced by many factors, it should be specialized base on the PCB designs and configurations of the soldering equipment.

6.使用注意事项(1)

Precautions (1)

1. 贮存:

Storage

- 本产品使用密封防潮抗静电袋包装, 并附有干燥剂, 湿度卡。
Moisture proof, anti-electrostatic package and moisture absorbent material are used, to keep moisture to a minimum. Humidity indicator card inside to test if the products are moisted.
- 贮存环境为: 开封前, 产品贮存在温度 $<30^{\circ}\text{C}$, 湿度 $<60\%\text{RH}$ 环境中, 当贮存时间超过 2 个月时, 须重新烘烤使用。
Storage environment: Before opening the package, the product should be kept at 30°C or less and humidity less than 60% RH, When the storage time more than 2 months, need to be used to bake.
- 开封前, 需检查包装袋有无漏气现象, 若已漏气, 请重新烘烤使用。
Before using, please check whether there is any air leakage or not, If the bag has leaked air, Please bake the product with below condition.
- 开封后, 请在温度 $<30^{\circ}\text{C}$, 湿度 $<60\%\text{RH}$ 环境下使用, 并于 2h 内完成贴片, 如果超过使用时间, 须将产品重新烘烤使用。
Before soldering ,the product must be stored under the condition of $<30^{\circ}\text{C}$ and $<60\%\text{RH}$. Under these conditions the SMD LEDs must be used (subject to reflow oven) within 2 hours.
- 烘烤条件: $(80\pm 5)^{\circ}\text{C} \times 24\text{h}$.
Baking conditions: $(80\pm 5)^{\circ}\text{C} \times 24\text{h}$.

2. 静电:

Static Electricity

- 静电和电涌会导致产品特性发生改变, 例如正向电压降低等, 如果情况严重甚至会损毁产品。所以在使用时必须采取有效的防静电措施。
Static electricity or surge voltage damages the LEDs. Damaged LEDs will show some unusual characteristics such as the forward voltage becomes lower, or the LEDs can not be lighted up. In view of the above, we should do some anti-static precautions when using the SMD LEDs.

6.使用注意事项(2)

Precautions (2)

- 所有相关的设备和机器都应该正确接地，同时必须采取其他防止静电和电涌的措施。

All devices, equipments and machineries must be properly grounded, at the same time we should take measures to prevent anti-static and voltage surge.

- 使用防静电手环，防静电垫子，防静电工作服、工作鞋、手套，防静电容器，都是有效的防止静电和电涌的措施。

It is also recommended that anti-electrostatic wrist bands, pads, uniforms, gloves or containers can be used when dealing with the LEDs.

3. 设计建议:

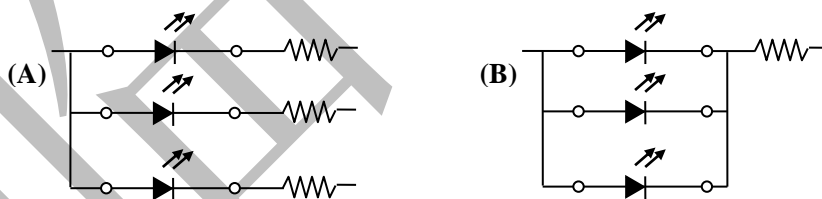
Design Consideration

- 设计电路时，通过 LED 的电流不能超过规定的最大值，同时，还需使用保护电阻，否则，微小的电压变化将会引起较大的电流变化，可能导致产品损毁。

In designing a circuit, the current through each LED must not exceed the absolute maximum rating specified for each LED. In the meanwhile, resistors for protection should be applied, otherwise slight voltage shift will cause big current change which will probably lead to damage.

- 建议使用以下（A）电路，该电路能够很好的调节通过每个 LED 的电流；不推荐使用（B）电路，该电路在持续的电压驱动下，LED 的正向电压（ V_F ）发生变化，电流会随之而发生变化，可能使某些 LED 承受高于规定的电流值。

It is recommended to use Circuit A which regulates the current flowing through each LED rather than Circuit B. When driving LEDs with a constant voltage in Circuit B, the current through the LEDs may vary due to the variation in Forward Voltage (V_F) of the LEDs. In the worst case, some LED may be subjected to stress in the excess of the Absolute Maximum Rating.



- LED 的特性容易因为自身的发热和环境的温度的改变而发生改变。温度的升高会降低 LED 的发光效率、影响发光颜色等，所以在设计时应充分考虑散热的问题。
- Thermal Design is paramount importance because heat generation may result in the Characteristics decline,
- such as brightness decrease, Color change and so on. Please consider the heat dissipation when making the system design.

6.使用注意事项(3)

Precautions (3)

4. 反压保护

Reverse voltage protection

- 通常 LED 的反向漏电流都很小, 不会影响正常使用。如果 LED 长期遭受超过其所能承受的反向电压冲击时, LED 会被损伤, 例如, 反向漏电流会迅速变大等。这样会引起显示屏零灰度下串光的发生。在设计中, 要注意控制反向电压, 建议加在 LED 上的反向电压值不超过 10V。

In general, the reverse current of LED is very small, which won't affect the normal use of components. But when it is often suffered the reverse voltage which exceeds the limit of the component then it will be damaged. Such as the reverse current increase rapidly. And it will cause the string light when the screen is black. So please pay attention to controlling the reverse voltage which less than 10V is recommended.

5. 温度保护:

The safe temperature for LEDs working

- LED 在高温条件下, 衰减会加速, 本身应力也会增大, 若长期处于高温环境下, 极容易出现失效。对于高密度排列使用的情况, 建议在使用过程中灯面温度不超过 55℃, 灯脚温度不超过 75℃。

The high temperature will make the LEDs' Luminous Intensity decreased radically, if LEDs are used in hot environment for a long time, they will be disabled easily. When LEDs are used in a high density array, we suggest that the LEDs' surface temperature should be lower than 55℃ and the legs' temperature should be lower than 75℃.

6. 其他事项:

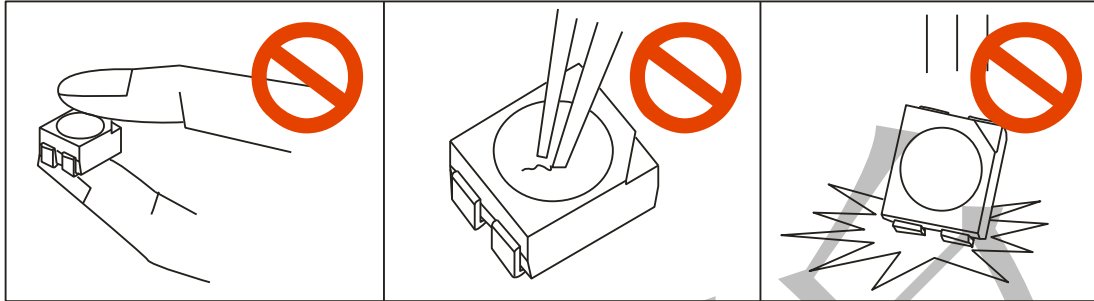
Others

- 直接用手拿取产品不但会污染封装树脂表面, 也可能由于静电等因素导致产品性能的改变。过度的压力也可能直接影响封装内部的管芯和金线, 因此请勿对产品施加过度压力, 特别当产品处于高温状态下, 例如在回流焊接过程中。

When handling the product, touching the encapsulation with bare hands will not only contaminate its surface, but also have an effect on its optical characteristics. Excessive force to the encapsulation might result in catastrophic failure of the LEDs due to die breakage or wire deformation. For this reason, please do not put excessive stress on LEDs, especially when the LEDs are heated such as during Reflow Soldering.

6.使用注意事项(4)

Precautions (4)



- LED 的环氧树脂封装部分相当脆弱, 请勿用坚硬、尖锐的物体刮、擦封装树脂部分。在用镊子夹取的时候也应当小心注意。

The epoxy resin of encapsulation is fragile, so please avoid scratch or friction over the epoxy resin surface.

While handling the product with tweezers, do not hold by the epoxy resin, be careful.

- LED 注意事项及防潮防护措施请参考我司《全彩 SMD LED 防潮使用指南》。

LED Precautions against moisture please refer to 《RGB SMD LED Moisture-proof User Guide》.