APA-102-65536-5050 SPECIFICATION

Intelligent external control (two-wire high-gray transmission) SMD-type surface mount LED

Model No.:   APA-102-65536-5050

Description: 5.5x5.0x1.6mm 0.2W Intelligent External Controlled Double Wire High Gray Transfer Surface Mount Type SMD LED

ELECTROSTATIC SENSITIVE DEVICES

RoHS

1. Product description:

APA-102-65536-5050 is a two-wire transmission three-channel (RGB) drive control circuit and light-emitting circuit in one of the intelligent external control LED light source. The products include signal decoding module, data buffer, built-in constant current circuit and RC oscillator. The integrated current gain control module, CMOS process, low voltage, low power consumption; when REXT suspended When empty, the three-channel constant current driver default output 18mA, but also through the REXT external resistor to adjust the required current, each output channel can output 16-bit (65536 Level) gray-scale adjustable linear current; the use of two-wire output, DATA data and synchronization of the CLK signal, so that the output of the chip synchronous output; refresh rate Up to 4KHz, showing more delicate smooth, power-on default is not lit. 。

2. The main application areas:

● LED full color LED light string, LED full color module, LED Symphony light and soft light strip, LED guardrail tube, LED appearance / scene lighting

● LED point light source, LED pixel screen, LED profiled screen, all kinds of electronic products, electrical equipment Marquee 。

3. Feature Description:

● Top SMD internal integrated high-quality serial cascade constant current IC; 5V power application; default power does not light；

● Control circuit and chip integrated in the SMD 5050 components, constitute a complete external control pixel, color temperature uniformity and high uniformity 。

● Two-wire synchronous control, built-in two-way transmission 。

● RGB three-color output control, 64Bit (65,536 grade) color settings; each data has 1bit start code +15 Bit (32) brightness adjustment (red, green,

Blue three ports of the 5bits, respectively, corresponding to S4 ~ S0); 48bits grayscale data (red, green and blue of

the 16bits)。

● Three-way constant current drive, built-in high-precision and high stability oscillator, current error <± 5%。

●The maximum serial input data frequency 30MHZ, refresh rate up to 4KHz, cascade up to 1024 points。

● External REXT resistor adjusts current (OUTR / G / B is approx. 18mA when REXT is floating and 60mA maximum with REXT external resistor).

4.机械尺寸:
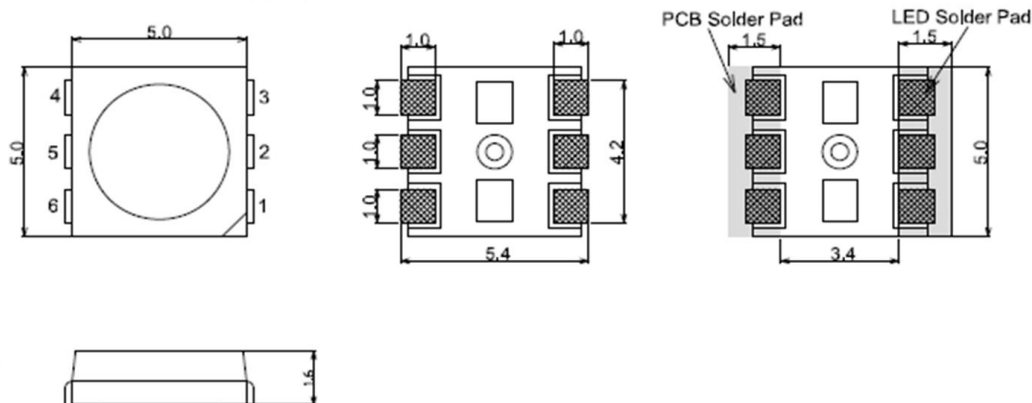
Remarks: 1. The above units are in millimeters. 2. The dimensional tolerances are ± 0.1 mm unless otherwise noted.5.

Pin diagram and function
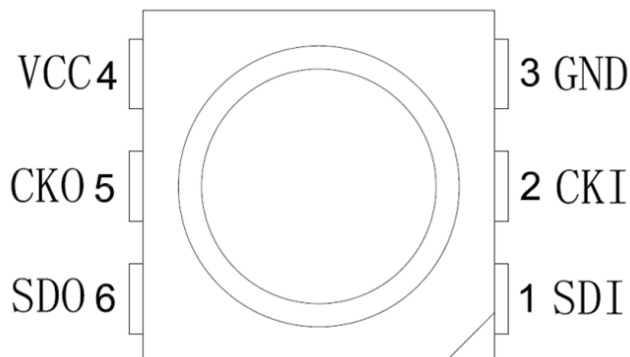
NO.	symbol	NAME	Functional description
1	SDI	data input	Cascade data input
2	CKI	Clock input	Serial clock signal input
3	GND	Ground or power supply negative terminal	Negative power supply
4	VCC	Positive power supply	Positive power supply
5	CKO	Clock output	Serial clock signal output
6	SDO	Data output	Serial data output

6. General description of product naming　　APA-102-65536-5050

| APA-102: RGB chips+ IC | 65536: GRAY | 5050: CASE SIZE |
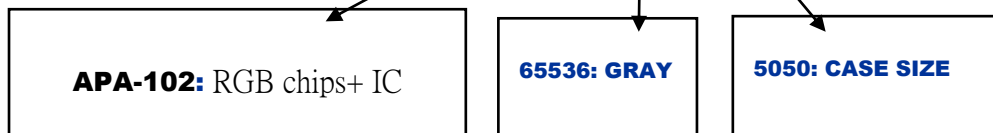
7. ELECTRICAL PARAMETERS（Limit parameter，Ta=25℃,VSS=0V）：

| PARAMETERS	symbol	RANGE	UNIT
Voltage and voltage	V_{DD}	+0.5～+5.5	V
Logic input voltage	V_I	-0.3～VDD+5.5	V
Operating temperature	Topt	-40~+85	℃
Storage temperature	Tstg	-4~+100	℃
Power dissipation	PD	550	mW
ESDPressure resistance	V_{ESD}	>2K	V

8. ELECTRICAL PARAMETERS（If no special instructions，TA=-20～+70℃，VDD=4.5～5.5V,VSS=0V）：

PARAMETERS	symbol	MIN	typical	MAX	UNIT	Test Conditions
Chip internal power supply voltage	V_{DD}	---	5.2	5.3	V	---
R / G / B port withstanding voltage	$V_{DS,MAX}$	---	---	30	V	---
DOUTDrive capability	ID_{OH}	---	50	---	mA	DOUT ground, maximum drive current
	ID_{OL}	---	-50	---	mA	DOUT is connected, the maximum sink current
Signal input rollover threshold	V_{IH}	3.0	---	3.0	V	VDD=5.0V
	V_{IL}	---	---	1.6	V	
OUTR/G/BPort drive current	I_{out}	---	18	---	mA	V_{DS} =2V,REXT Floating
PWMfrequency	F_{PWM}	---	4.0	---	KHZ	---

Static power consumption	I$_{DD}$	---	3.6	---	mA	---
OUTR/G/BPort current change	%VS.V$_{DS}$	---	0.5	---	%	V$_{DS}$=1~5V, I$_{OUT}$=18mA
	%VS.VDD	---	2.5	---	%	VDD=4~6V, I$_{OUT}$=18mA
	%VS . Temp.	---	5.0	---	%	I$_{OUT}$=18mA,Temp=-40~+85℃

9. Switching characteristics（VCC=5V±5%,Ta=25℃）:

PARAMETERS	symbol	MIN	typical	MAX	UNIT	Test Conditions
LED Scanning frequency	F$_{OUT}$	---	4.15	---	KHZ	Duty cycle 50% gain adjustment 10001
DCLKO Conversion time	Tr1	---	6.8	---	ns	DCLKO Port load capacitance 30pF
	T$_{f1}$	---	5.5	---	ns	
DOUT Conversion time	T$_{r2}$	---	60	---	ns	Duty cycle 50% gain adjustment 10001
	T$_{f2}$	---	50	---	ns	
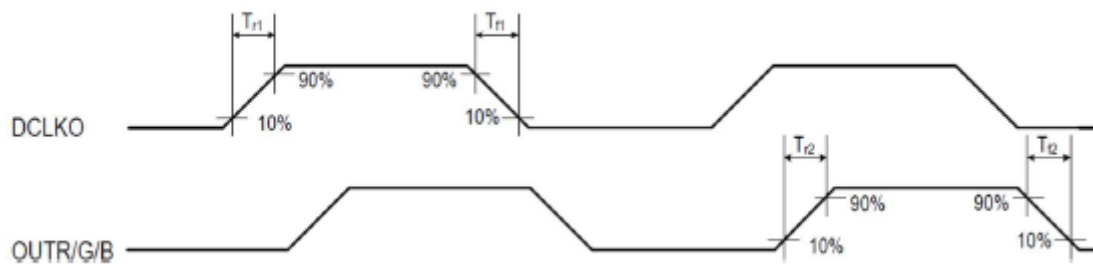
10. Data communication protocol：

（**1**）**16bits** Grayscale data format input：
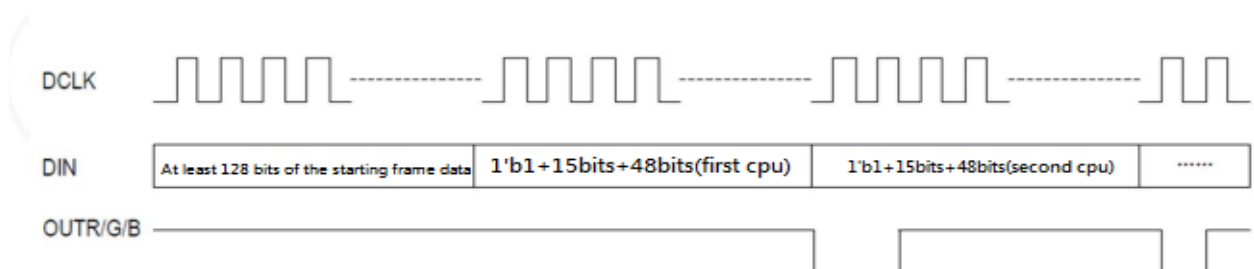
(A) Move at least 128bits "0" as the start frame, then move to the data frame, the first frame and the data frame are high first, DCLK rising edge

Sampling data:

(B) Each gray-scale data is controlled by 1bit start code + 15bits current gain adjustment value (5bits for each port of red, green and blue) +

48bits gray scale data Green and blue lights of the 16bits);

(C) a first data frame corresponding to a distance from the most recent LED driver chip;

(D) after the completion of the gray-scale data transmission, the need for additional chips corresponding to the number of additional pulses

DCLK (512 cascade chip, the need to send an additional 512

DCLK), DIN remains high, the new data that is effective;

（**2**）Grayscale data format for each chip：
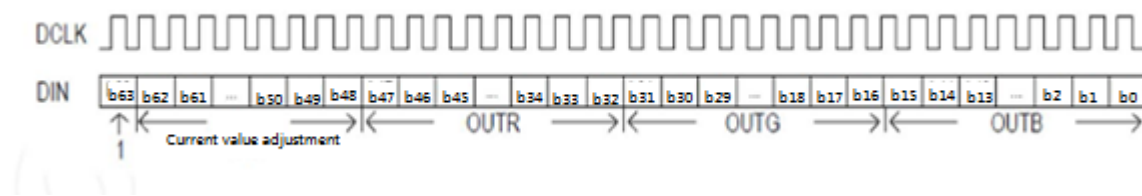
（**3**）Current gain adjustment parameter：
Current gain function Data transmission format：

Red, green and blue lights a total of 15bits current gain adjustment bit, corresponding to 5bits (S4 ~ S0), the system sends the order is the first

red light 5bits, and then

Is the green light of the 5bits, the last blue light 5bits, starting high S4, the last low S0.

Current gain parameter transmission format		
RED（**R**)	GREEN(**G**)	BULE（**B**)
S4 , S3 , S2 , S1 , S0	**S4 , S3 , S2 , S1 , S0**	**S4 , S3 , S2 , S1 , S0**

Specific current setting table：

Current regulation level	Current gain adjustment bit					Corresponding to the current value（**mA**)
	S4	S3	S2	S1	S0	
1	0	0	0	0	0	1.68
2	0	0	0	0	1	2.24
3	0	0	0	1	0	2.80

4	0	0	0	1	1	3.36
5	0	0	1	0	0	3.92
6	0	0	1	0	1	4.48
7	0	0	1	1	0	5.04
8	0	0	1	1	1	5.60
9	0	1	0	0	0	6.16
10	0	1	0	0	1	6.72
11	0	1	0	1	0	7.28
12	0	1	0	1	1	7.84
13	0	1	1	0	0	8.40
14	0	1	1	0	1	8.96
15	0	1	1	1	0	9.52
16	0	1	1	1	1	10.08
17	1	0	0	0	0	10.64
18	1	0	0	0	1	11.20
19	1	0	0	1	0	11.76
20	1	0	0	1	1	12.32
21	1	0	1	0	0	12.88
22	1	0	1	0	1	13.44
23	1	0	1	1	0	14.00
24	1	0	1	1	1	14.56

25	1	1	0	0	0	15.12
26	1	1	0	0	1	15.68
27	1	1	0	1	0	16.24
28	1	1	0	1	1	16.80
29	1	1	1	0	0	17.36
30	1	1	1	0	1	17.92
31	1	1	1	1	0	18.48
32	1	1	1	1	1	19.04

10. Typical Application Circuit：
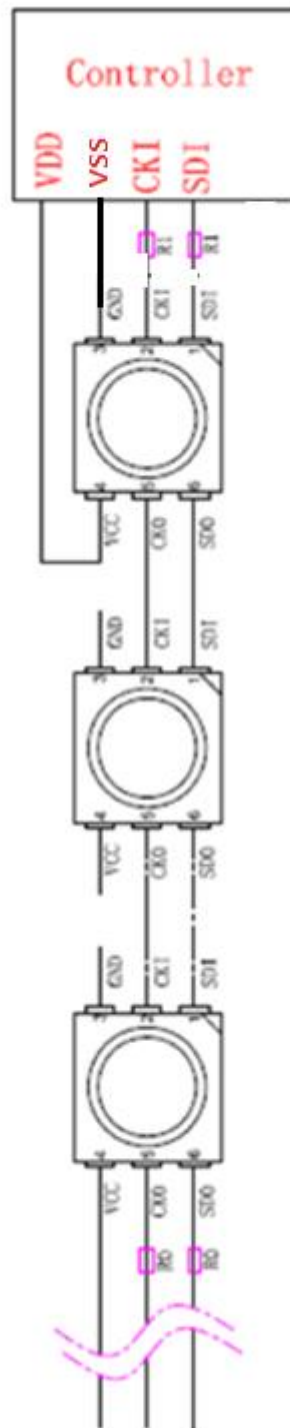
In the actual application circuit, in order to prevent the product in the test when the hot plug generated by the moment of high-voltage damage IC internal signal input and output pins, the signal input

And the output terminal series protection resistor. In addition, in order to make more stable operation between the IC chip, the decoupling capacitor between the lamp beads is essential;

Application 1: For the soft light or hard light, light bead transmission distance between the short, the proposed signal and clock line input and output of the series connection protection resistor, that R1 = R0 about 50 ohms;

Application 2: For modules or general-shaped products, the transmission distance between the lamp beads is long, because the wire and the transmission distance is different, the signal and the clock line at both ends of the series of security

Protect the resistance will be slightly different; the actual use of the set;

Precautions for Use of Surface Mount LED

1. Features

Through this information, to achieve the Oscar Optoelectronics customers a clear understanding of the purpose of the use of LED.

2. Description

LEDs are also used in the same way as other electronic components. For a better use of Optics LED products, please refer to the following LED protection precautions.

3. Precautions

3.1. Dust and cleaning

LED surface is silicone encapsulation, silicone for LED optical system and anti-aging properties are very good protection.However, the silicone resin is soft,

Easy to stick dust, therefore, to keep the operating environment clean.Of course, the LED surface has a certain limit of dust, it will not affect the brightness, but we should avoid

Free of dust on the LED surface. Open the bag on the priority use, installed LED components should be stored in a clean container medium.

In the LED surface needs cleaning, if the use of trichlorethylene or acetone solution will appear to dissolve the LED surface and so on.

Do not use a solution with a soluble solution to clean the LED, you can use a solution of this isopropyl, before using any cleaning solution should confirm whether there will be dissolved LED effect.

Please do not use the ultrasonic method of cleaning the LED, if the product must use ultrasound, it is necessary to evaluate the impact of LED some parameters, such as ultrasonic power, baking

Of the time and assembly conditions, etc., must be commissioned before cleaning to confirm whether it will affect the LED.

3.2. Moisture-proof packaging

TOP SMD LED is a humidity-sensitive component, the LED packaging in the aluminum bag is to avoid the LED in the transport and storage of moisture absorption, in the bag placed dry

Agent to absorb moisture. If the LED absorbs the water vapor, then in the LED over reflow, the water vapor will evaporate and expand, it is possible that the colloid and stent detachment and damage

LED optical system. For this reason, moisture-proof packaging is to avoid moisture inside the bag. This product moisture level LEVEL6.

Table 1: Definition of moisture-proof rating (MSL) for IPC / JEDEC J-STD-020

Moisture level	Shop life after unpacking	
	TIME	condition
LEVEL1	Unlimited	**≦30℃/85 % RH**
LEVEL2	1YEAR	**≦30℃/60 % RH**
LEVEL2a	4WEEKS	**≦30℃/60 % RH**
LEVEL3	168HOURS	**≦30℃/60 % RH**
LEVEL4	72HOURS	**≦30℃/60 % RH**
LEVEL5	48HOURS	**≦30℃/60 % RH**
LEVEL5a	24HOURS	**≦30℃/60 % RH**
LEVEL6	Get out of the box	**≦30℃/60 % RH**

3.3. Storage

In order to avoid LED moisture, should be in bulk or pasted with the LED stored in a drying oven or desiccant with the container, in addition, the following environment can also be stored for a short time:

A. Temperature: 5 ℃ ~ 30 ℃ b. Humidity: less than 60%

When using the LED, the aluminum foil electrostatic bag should be opened soon after welding, for the remaining LED should be re-sealed packaging. Open the aluminum bag after the LED, should be completed within 1 hour reflow soldering.

If you need to bake, please refer to the following baking temperature: 70 ℃ ± 5 ℃ in the oven baking no less than 24 hours

3.4. Reflow soldering

By Eugene built using the following parameters listed in the test proof, surface mount LED meet JEDEC J-STD-020C standard. As a general guideline, Jin Jian Electronics recommends that the customer follow the recommended soldering

temperature profile for the solder paste manufacturer.

Please note that this general guideline may not apply to all PCB designs and reflow soldering equipment

configurations。
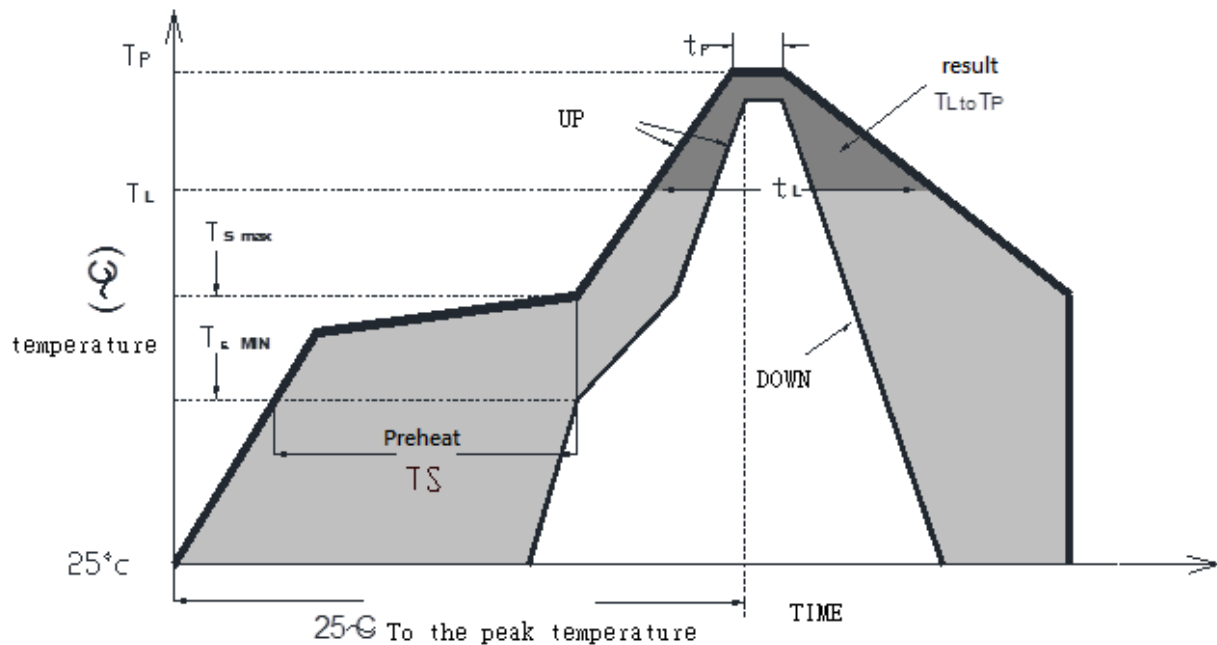
Temperature curve characteristics	Lead - containing solder	Lead-free solder
The average heating rate (Ts max to Tp)	Up to 3 ° C / sec	Up to 3 ° C / sec
Preheat: minimum temperature (Ts min)	100℃	150℃
Preheat: Maximum temperature (Ts max)	150℃	200℃
Preheat: Time (ts min to ts max)	60-120 SEC.	60-180 SEC.
Time to maintain high temperature: temperature (TL)	183 ℃	217 ℃
Time to maintain high temperature: Time (t L)	60-150 SEC.	60-150 SEC.
Peak / classification temperature (T P)	215 ℃	250 ℃
In the actual peak temperature (tp) of 5 ° C	<10 SEC.	<10 SEC.

Cooling rate	Up to 6 ° C / sec	Up to 6 ° C / sec
25 ℃ rose to peak temperature required time	Up to 6 minutes	Up to 6 minutes

Note: All temperatures refer to the temperature measured on the upper surface of the package body.

3.5. Heat generation

For LED products, thermal design is very important in the system design, please consider the heat generated by the LED, PCB board thermal resistance, LED placement density and related components, as well as the input power will increase the temperature.

Therefore, to avoid excessive heat generation, ensure that the LEDs are operated within the maximum specifications required in the product specifications. When setting the drive current of the LED, the highest ambient temperature should be taken into account.

3.6. Anti-static and Surge:

Static electricity and surges can damage LEDs

. To protect the LED, no matter what time and occasion, as long as the exposure to the LED, they should wear with anti-static strap, anti-static feet with anti-static gloves

All devices and equipment must be grounded

It is recommended that each product be tested for electrical performance prior to shipment inspection in order to pick out any defective product due to static electricity

In circuit design, consideration should be given to eliminating the possibility of a surge hazard to the LED.

3.7. Others

We will not be responsible for any problems beyond the specifications.

LED can issue a strong enough to hurt the light to the eye, pay attention to prevention, not too long with the naked eye look at the LED light.

Before extensive use, talk to us about more detailed specifications.

LED product shapes and specifications are subject to change, please do not timely notice.