WS2812D-F5-15MA-C1

Intelligent external control integrated LED light source

Main Features

- IC control circuit and LED point light source share one power supply。
- *The control circuit and RGB chip are integrated in a 5mm diameter round head four-pin in-line packaged lamp bead, forming a complete external control pixel point。*
- *Built-in signal shaping circuit, any pixel receives the signal after waveform shaping and then outputs it to ensure that the line waveform distortion will not accumulate。*
- *Built-in power-on reset and power-down reset circuit。*
- *The three primary colors of each pixel can realize 256-level brightness display and complete the full true color display of 16777216 colors。*
- *Scanning frequency 2kHz/s。*
- *Serial cascading interface, which can receive and decode data through one signal line.*
- *When the transmission distance of any two-point transmission does not exceed 2 meters, there is no need to add any circuit.*
- *When the refresh rate is 30 frames/second, the number of cascades is not less than 2048 points.*
- *The data transmission speed can reach 800Kbps.*
- *The color of the light is highly consistent, and the cost performance is high.*

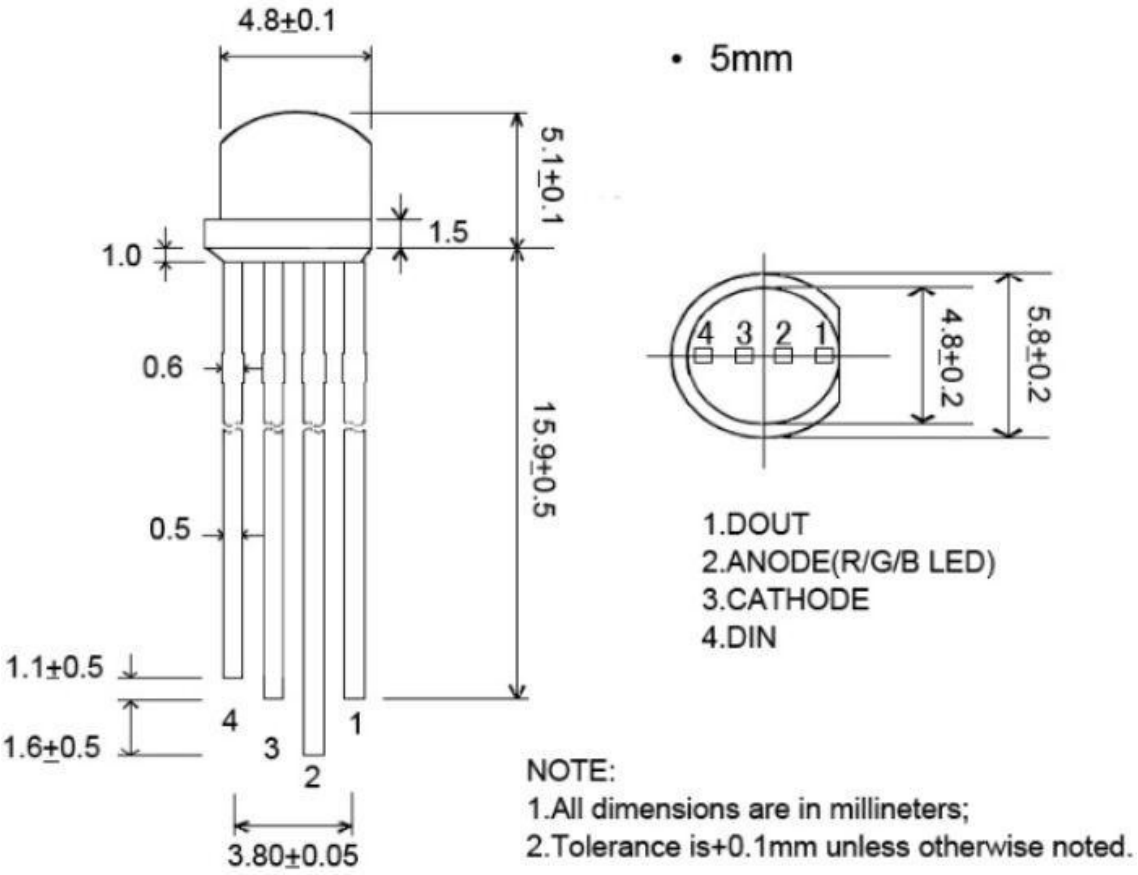
Main application areas

● LED full-color light-emitting character light string, LED full-color module, LED full-color flexible light strip and hard light strip, LED guardrail tube.
● LED point light source, LED pixel screen, LED special-shaped screen, various electronic products, electrical equipment marquee.

Product Description

- WS2812D-F5-15MA-C1 is an intelligent externally controlled LED light source that integrates control circuit and lighting circuit. Its appearance is the same as an F5 LED lamp bead, and each element is a pixel. The interior of the pixel includes an intelligent digital interface data latch signal shaping and amplifying drive circuit, as well as a high-precision internal oscillator and constant current control part, which effectively ensures that the color of the pixel light is highly consistent.
- The data protocol adopts the single-line return-to-zero code communication method. After the pixel is powered on and reset, the DIN terminal accepts the data transmitted from the controller. The 24bit data sent first is extracted by the first pixel and sent to the interior of the pixel. The remaining data is shaped and amplified by the internal shaping processing circuit and then forwarded and output to the next cascaded pixel through the DO port. After the transmission of one pixel, the signal is reduced by 24 bits. The pixel adopts automatic shaping and forwarding technology, so that the cascade number of the pixel is not limited by the signal transmission, but only limited by the signal transmission speed requirement.
- LED has the advantages of low voltage drive, environmental protection and energy saving, high brightness, large scattering angle, good consistency, ultra-low power, ultra-long life and so on. By integrating the control circuit on the LED, the circuit becomes simpler, the volume is smaller, and the installation is easier.

Mechanical dimension and pin diagram (unit mm)



Pin Function

Pin	Symbol	Name	Function
1	Dout	*Data Output*	*Control data signal output*
2	VDD	*Power Supply*	*Power supply pins*
3	GND	*Ground*	*Signal ground and power ground*
4	Din	*Data Input*	*Control data signal input*

Maximum rating (unless otherwise specified, TA=25℃, VSS=0V)

Parameter	Symbol	Scope	Unit
voltage	V_{DD}	+3.7~+5.3	V
Logic input voltage	V_I	VDD-0.5～VDD+0.5	V
Operating temperature	Topt	-25～+80	℃
Storage temperature	Tstg	-55~+150	℃

Electrical parameters (if no special instructions, TA=-20～+70℃, VDD=4.5～5.5V, VSS=0V)

Parameter	Symbol	Min	Typical	Max	Unit	Test Cond.
Low Level Output Current	I_{dout}	14.5	15	15.5	mA	Vo=0.4V, Dout
Input Current	I_I	——	——	±1	μA	V_I=V_{DD}/V_{SS}
High Level Input	V_{IH}	0.7V_{DD}	——	——	V	D_{IN}, SET
Low Level Input	V_{IL}	——	——	0.3 V_{DD}	V	D_{IN}, SET
Hysteresis Voltage	V_H	——	0.35	——	V	D_{IN}, SET

Switching characteristics (unless otherwise specified, TA=-20～+70℃, VDD=4.5～5.5V, VSS=0V)

Parameter	Symbol	Min	Typical	Max	Unit	Test Cond.
Oscillation Freq	*Fosc*	——	800	——	KHz	——
Transmission Delay	t_{PLZ}	——	——	300	ns	CL=15pF, DIN→DOUT, RL=10KΩ
Fall Time	t_{THZ}	——	——	120	μs	CL=300pF, OUTR/OUTG/OUTB
Input Capacitance	C_I	——	——	15	pF	——

Lamp bead light-emitting chip parameters

RED COLOR:

Parameter	Symbol	Min	Typ.	Max	Unit	Test Condition
Forward voltage	V_F	1.8	2.0	2.2	V	IF=20 mA
Luminous intensity	Iv	2500	3000	3500	mcd	IF=20 mA
Peak emission wavelength	λp	620	622.5	625	nm	❖
Half intensity angle	2 θ½	❖	❖	❖	deg	❖

GREEN COLOR:

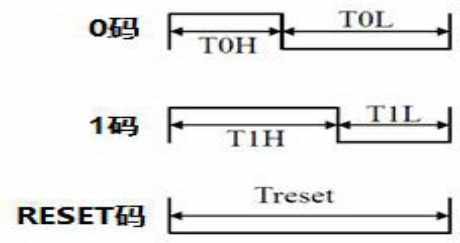
Parameter	Symbol	Min	Typ.	Max	Unit	Test Condition
Forward voltage	V_F	3.0	3.2	3.4	V	IF=20 mA
Luminous intensity	Iv	3500	4000	4500	mcd	IF=20 mA
Peak emission wavelength	λp	520	522.5	525	nm	❖
Half intensity angle	2 θ½	❖	❖	❖	deg	❖

BLUE COLOR:

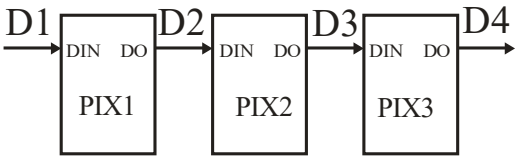
Parameter	Symbol	Min	Typ.	Max	Unit	Test Condition
Forward voltage	V_F	3.0	3.2	3.4	V	IF=20 mA
Luminous intensity	Iv	2000	2500	3000	mcd	IF=20 mA
Peak emission wavelength	λp	465	467.5	470	nm	❖
Half intensity angle	2 θ½	❖	❖	❖	deg	❖

Timing Waveform

Input Pattern:



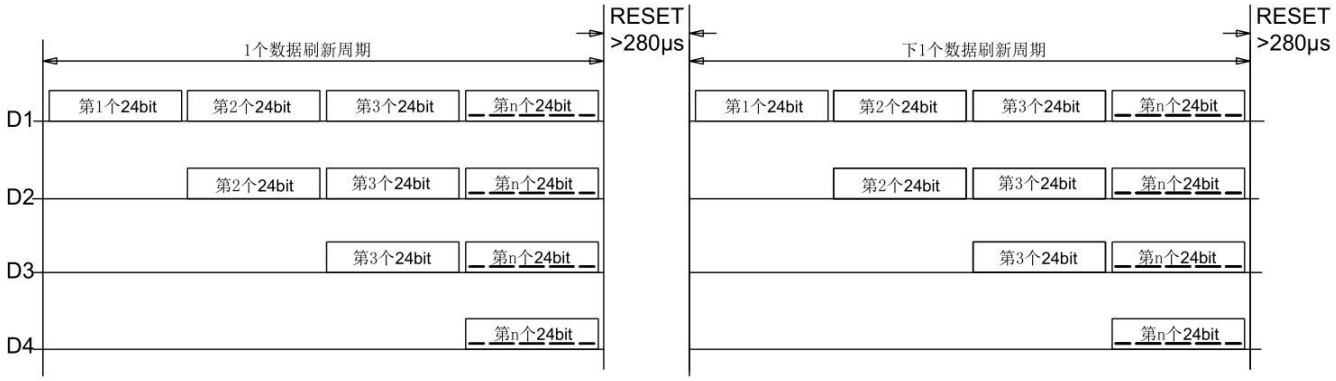
Connection Method:



Data Transfer Time (TH+TL=1.25us±150ns):

T0H	0 *code, high time*	220ns~380ns
T1H	1 *code, high time*	750ns~1us
T0L	0 *code, low time*	750ns~1us
T1L	1 *code, low time*	220ns~380ns
RES	*Low time*	280us *above*

Data Transfer Method



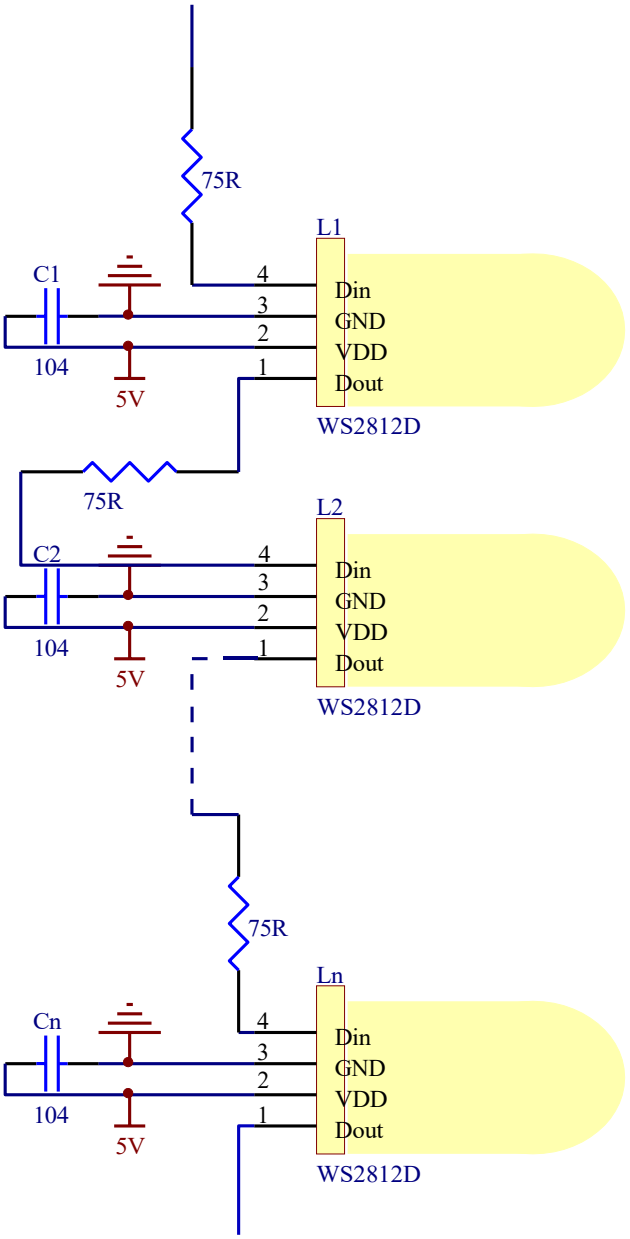
Note: D1 is the data sent by the MCU, D2, D3, D4 are the data automatically shaped and forwarded by the cascade circuit.

24bit data structure

R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0

Note: High-order bits are sent first, and data is sent in the order of RGB.

Typical Application Circuit



File Change Log

版本号	状态	修改内容概要	修订日期	修订人	批准人
V1.0	N	*新建*	20170523	*沈金国*	*尹华平*
V1.1	M	*最大额定值、数据传输方法*	20171009	*沈金国*	*尹华平*

*注：初始版本号*V1.0；*每次修订批准后，版本号顺序加*"0.1"；

*状态包括：*N--*新建*，A--*增加*，M--*修改*，D--*删除*。*