



Features and Benefits

- The IC control circuit and the LED point light source share one power supply.
- Control circuit and RGB chips are integrated in a 2.45*4.8*4.5mm Square-headed 4pin **DIP LED**, form a complete addressable pixel.
- Built-in signal shaping circuit, After any pixel receives the signal, it undergoes waveform shaping before being output, ensuring that the waveform distortion of the line does not accumulate.
- Built-in electric reset circuit and power lost reset circuit.
- OUT R/G/B output gray level: 256 gray scale, complete 16777216 full color display effect.
- Port Refresh frequency is of 2KHz.
- Serial cascade interface, data receiving and decoding depend on just one signal line.
- When the refresh rate is 30fps, cascade number are not less than 1024 pixels.
- Send data at speeds of 800Kbps.
- The color of the light is highly consistent, cost-effective.
- **Static power consumption is below 1μA; 3.3 V power supply is supported.**

Applications

- LED full-color illuminated letter light strings, LED full-color modules, LED full-color soft light strips and hard light strips, LED guardrail tubes.
- LED point light sources, LED pixel screens, LED irregular-shaped screens, various electronic products, electrical equipment running lights.

General description

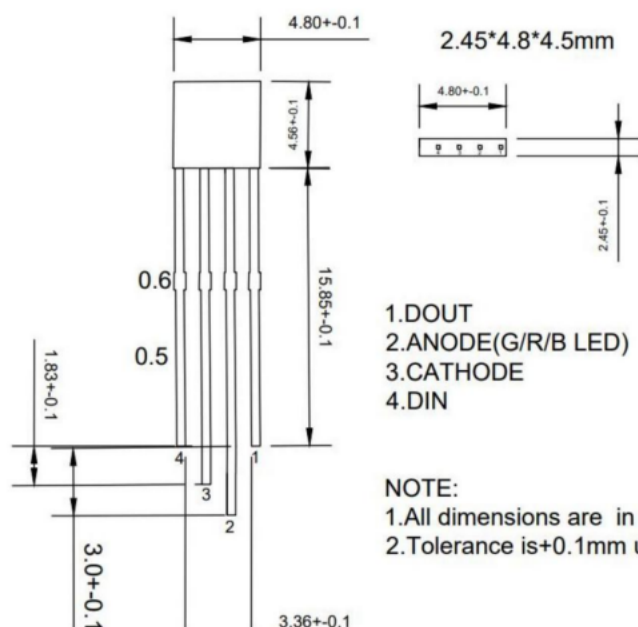
WS2812D-255-V6 is a intelligent control LED light source that the control circuit and RGB chip are integrated in a package of **255 DIP** components. It internal include intelligent digital port data latch and signal reshaping amplification drive circuit. Also include a precision internal oscillator and a voltage programmable constant current control part, effectively ensuring the pixel point light color height consistent.

The data transfer protocol use Single-wire RZ protocol. After the pixel power-on reset, the DIN port receive data from controller, the first pixel collect initial 24bit data then sent to the internal data latch, the other data which reshaping by the internal signal reshaping amplification circuit sent to the next cascade pixel through the DO port. After transmission for each pixel, the signal to reduce 24bit. pixel adopt auto reshaping transmit technology, making the pixel cascade number is not limited the signal transmission, only depend on the speed of signal transmission.

Refresh Frequency updates to 2KHz, Low Frame Frequency and No Flicker appear in HD Video Camera, it improve excellent display effect.

RESET time > 280μs, it won't cause wrong reset while interruption, supports the lower frequency and inexpensive MCU. LED with low driving voltage, environmental protection and energy saving, high brightness, scattering angle is large, good consistency, low power, long life and other advantages. The control chip integrated in LED above becoming more simple circuit, small volume, convenient installation.

Mechanical Dimensions and PIN configurations(unit:mm)



PIN Function

NO.	Symbol	PIN	Function description
1	1	DOUT	DATA OUTPUT
2	2	VDD	POWER SUPPLY
3	3	GND	GROUND
4	4	DIN	DATA IN

Absolute Maximum Ratings (T_A=25°C, V_{SS}=0V)

Parameter	Symbol	Ratings	Unit
Power supply voltage	V _{DD}	+3.3~+5.3	V
Logical Input Voltage	V _I	-0.3V~V _{DD} +0.7V	V
Working temperature	T _{opt}	-25~+80	°C
Storage temperature(bulk material)	T _{stg}	-55~+150	°C

Electrical Characteristics ($T_A=25^{\circ}\text{C}$, $V_{DD}=5\text{V}$, $V_{SS}=0\text{V}$)

Parameter	Symbol	Min	Tpy	Max	Unit	Conditions
Quiescent current	I_o	—	—	1	μA	No signal transmission, RGB Channel is turned off
Low voltage output current	I_{dout}	11	12	14	mA	DC=5V, DIN (FFH)
Input current	I_I	—	—	± 1	μA	$V_I=V_{DD}/V_{SS}$
High Voltage Input	V_{IH}	0.55VDD	—	—	V	DIN, SET
Low Voltage Input	V_{IL}	—	—	0.3 VDD	V	DIN, SET
Hysteresis voltage	V_H	—	0.35	—	V	DIN, SET

Switching Characteristics ($T_A=25^{\circ}\text{C}$, $V_{DD}=5\text{V}$, $V_{SS}=0\text{V}$)

Parameter	Symbol	Min	Tpy	Max	Unit	Condition
Oscillation frequency	F_{osc}	—	800	—	KHz	—
Transmission delay time	t_{PLZ}	—	—	300	ns	CL=15pF,DIN→DOUT,RL=10K Ω
Fall time	t_{THZ}	—	—	120	μs	CL=300pF,OUTR/OUTG/OUTB
Data transmission rate	F_{MAX}	600	—	—	Kbps	Duty cycle 50%
Input capacity	C_I	—	—	15	pF	—

LED RGB Chip parameters

Red:

Parameter	Symbol	Min.	Typ	Max	Unit	Test condition
Forward voltage	V_F	1.8	2.0	2.2	V	IF=20mA
Luminous intensity	I_v	100	120	150	mcd	IF=20mA
Peak wavelength	λ_p	620	622.5	625	nm	—
Irritation angle	2 81/2	—	—	—	deg	—

Green:

Parameter	Symbol	Min.	Typ	Max	Unit	Test condition
Forward voltage	V_F	3.0	3.2	3.4	V	IF=20mA
Luminous intensity	I_v	400	450	600	mcd	IF=20mA
Peak wavelength	λ_p	520	522.5	525	nm	—
Irritation angle	2 81/2	—	—	—	deg	—

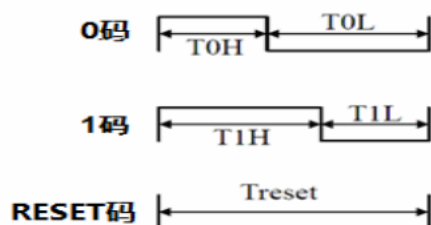
Blue:

Parameter	Symbol	Min.	Typ	Max	Unit	Test condition
Forward voltage	V_F	3.0	3.2	3.4	V	$I_F=20\text{mA}$
Luminous intensity	I_v	80	90	100	mcd	$I_F=20\text{mA}$
Peak wavelength	λ_p	465	467.5	470	nm	—
Irradiation angle	$2\theta_{1/2}$	—	—	—	deg	—

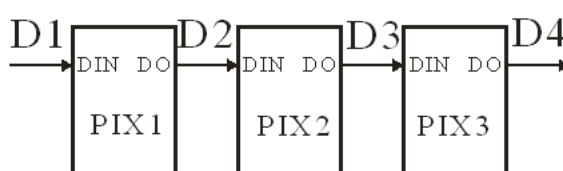
Data Transfer Time

T0H	0 code, high voltage time	220ns~380ns
T1H	1 code, high voltage time	580ns~1μs
T0L	0 code, low voltage time	580ns~1μs
T1L	1 code, low voltage time	580ns~1μs
RES	Frame unit, low voltage time	>280μs
T _{DATA}	Data cycle	≥1.25us

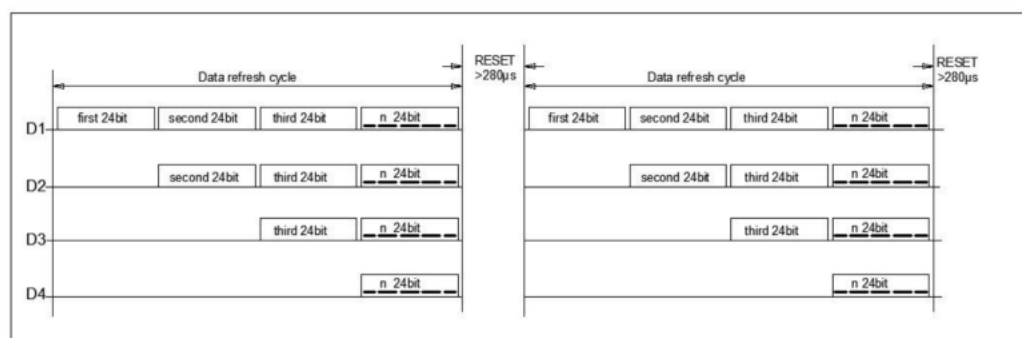
Sequence Chart



Cascade Method



Data Transmission Method



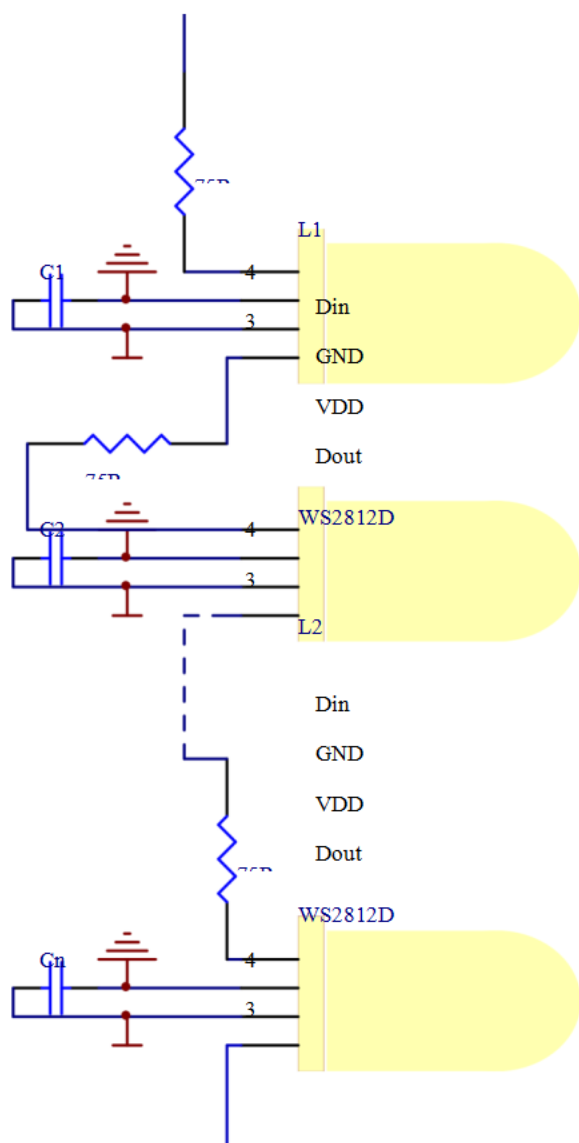
Note: The data of D1 is send by MCU, and D2, D3, D4 through pixel internal reshaping amplification to transmit.

Composition of 24bit Data

G7	G6	G5	G4	G3	G2	G1	G0	R7	R6	R5	R4	R3	R2	R1	R0	B7	B6	B5	B4	B3	B2	B1	B0
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Note: Data transmit in order of RGB, high bit data at first.

Typical Application Circuit:



C1 is the filter capacitor of the LED's VDD pin, C1= 100NF.

Modify Record

Version №	Status Bar	Modify Content Summary	Date	Reviser	Approved
V1.0	N	New	20260708	Chen YongZhao	Yin HuaPing
V1.1	M	Update the logo; Add the description of "signal transmission rate"	20260716	Chen YongZhao	Yin HuaPing

Remarks: Initial version: V1.0; Version number plus "0.1" after each revision;

Status bar: N--New, A--Add, M--Modify, D--Delete.

1. Version number plus "0.1" if for add & modify parameters, eg. V1.0→ V1.1
2. Major revision or many parameters modified, version number plus "1.0", eg. V1.0→ V2.0
3. No version number is attached to Part Number