

Main Features

- The **OUTR, G, B** ports withstand a voltage of 20V, while the **DIN** port withstands 9.5 V.
- The chip includes a built-in voltage regulator; for power supplies below 24V, simply connect a resistor in series to the VDD pin—no external regulator is required.
- Gray scale adjustment circuit (with 256 adjustable gray levels).
- The device features a built-in signal shaping circuit that processes signals into optimized waveforms before output, preventing cumulative waveform distortion along the transmission path.
- It features built-in power-on reset and power-off reset circuits.
- The PWM control unit supports 256-level adjustment with a scanning frequency of 4 kHz.
- A serial interface cascaded interface that enables data reception and decoding via a single signal line.
- The transmission distance between any two points does not exceed 5 meters without requiring additional circuits.
- When the refresh rate is 30 frames per second, the number of cascades can be at least 1024 points.
- Data transmission speed can reach up to 800 Kbps.

Main Applications

- LED full-color pixel string and LED full-color modules.
- LED full-color flexible LED strips, Rigid LED strips, and LED guardrail tubes.
- LED point light sources, LED pixel displays, and LED custom-shaped displays.
- Various electronic products, electrical equipment, running lights.
- Other various LED lighting products.

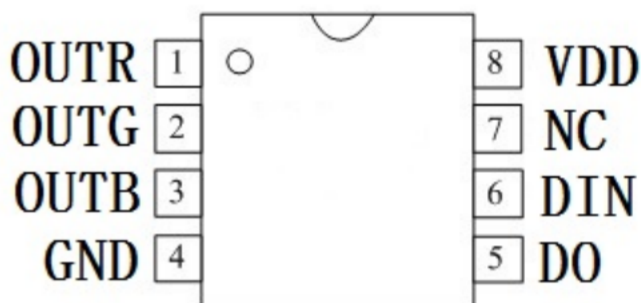
Product Overview

The **WS2811C** is 3 output channels special for LED driver circuit. Its internal includes intelligent digital port data latch and signal reshaping amplification drive circuit. Also include a precision internal oscillator and a **20V** voltage programmable constant current output drive. In the purpose of reduce power supply ripple, the 3 output channels designed to delay turn-on function.

IC use single single wire RZ protocol. After the chip power-on reset, the DIN port receive data from controller, the first IC 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 IC through the DO port. After transmission for each chip, the signal to reduce **24bit**. IC adopt auto reshaping transmit technology, making the chip cascade number is not limited the signal transmission, only depend on the speed of signal transmission.

The data latch of IC depend on the received **24bit** data produce different duty ratio signal at OUTR, OUTG, OUTB port. All chip synchronous send the received data to each segment when the DIN port input a reset signal. It will receive new data again After the reset signal finished. Before a new reset signal received, the control signal of OUTR ,OUTG, OUTB port unchanged. IC sent PWM data that received justly to OUTR, OUTG, OUTB port, after receive a low voltage reset signal the time retain over **280μs**.

PIN configuration



PIN function

NO.	Symbol	PIN	Function description
1	OUTR	LED Driver Output	Output of RED PWM control
2	OUTG	LED Driver Output	Output of GREEN PWM control
3	OUTB	LED Driver Output	Output of BLUE PWM control
4	GND	Ground	Data & Power Grounding
5	DO	DO	Data Output
6	DIN	Data Input	Control data input
7	NC	NC	NC
8	VDD	Power Voltage	IC power supply

Absolute Maximum Ratings(TA = 25°C, VSS = 0 V)

Parameter	Symbol	Ratings	Unit
Logical Power Supply Voltage	VDD	+3.5~+5.8	V
R/G/B Channel Output Port Withstand Voltage	VOUT	20	V
Logical Input Voltage	VI	VDD-0.7 ~ VDD+0.7V	V
Operation Temperature	Topt	-40~+80	°C
Storage Temperature Range	Tstg	-40~+85	°C

Electrical parameters (TA = 25°C, VDD = 4.5–5.5 V, VSS = 0 V)

Parameter	Symbol	Min	Tpy	Max	Unit	Conditions
Quiescent current	I _o	—	0.6	—	mA	DC=5V
R、G、B Low-level output current	I _{OL}	30	35	40	mA	
Low-level output current	I _{dout}	10	—	—	mA	V _o =0.4V, D _{OUT}
Input Current	I _I	—	—	±1	μA	V _I =V _{DD} /V _{SS}
High-level input	V _{IH}	0.7V _{DD}	—	—	V	D _{IN}
Low-level input	V _{IL}	—	—	0.3 V _{DD}	V	D _{IN}
Lagging voltage	V _H	—	0.35	—	V	D _{IN}

Switching characteristics (TA = 25°C, VDD = 4.5–5.5 V, VSS = 0 V)

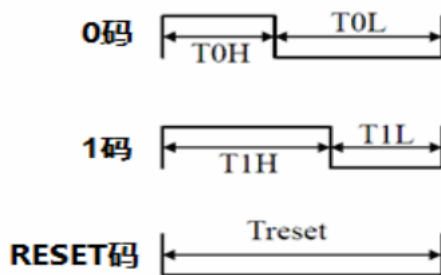
Parameter	Symbol	Min	Tpy	Max	Unit	Condition
Oscillation frequency	F _{osc}	—	800	—	KHz	—
Transmission delay time	t _{PLZ}	—	—	300	ns	CL=15pF, DIN→DOUT, RL=10KΩ
Fall time	t _{THZ}	—	—	120	μs	CL=300pF, OUTR/OUTG/OUTB
Data transmission rate	F _{MAX}	600	—	—	Kbps	Occupancy Ratio 50%
Input capacity	C _I	—	—	15	pF	—

Data Transmission Time

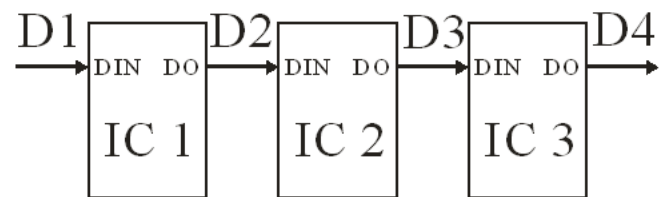
T0H	0 code, high level duration	220ns~380ns
T1H	1 code, high level duration	580ns~1us
T0L	0 code, low-level duration	580ns~1us
T1L	1 code, low-level duration	580ns~1us
RES	Frame unit, low-level duration	>280 μ s
T _{DATA}	Data Cycle	T1H+T1L、T0H+T0L $\cong$ 1.25us

Time Series Waveform Chart

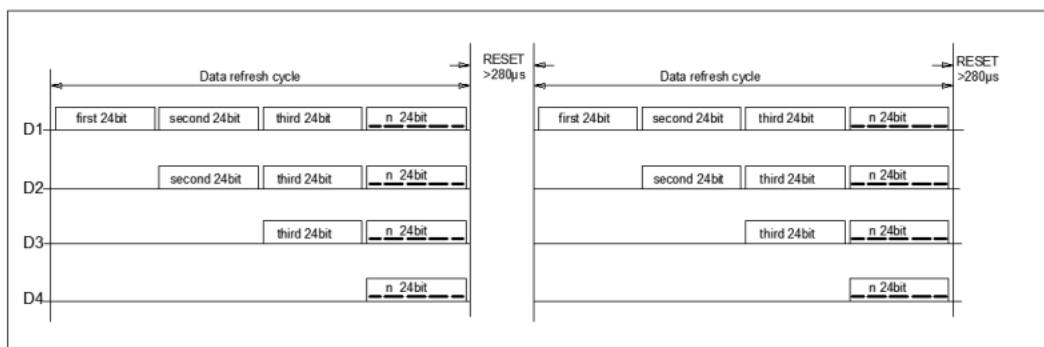
Sequence Chart



Cascade Method



Data Transmission Method



Note: D1 represents data transmitted by the MCU, while D2, D3, and D4 denote data automatically shaped and forwarded by the cascaded circuit.

24-bit 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
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Note: Data transmit in order of RGB, high bit data at first.



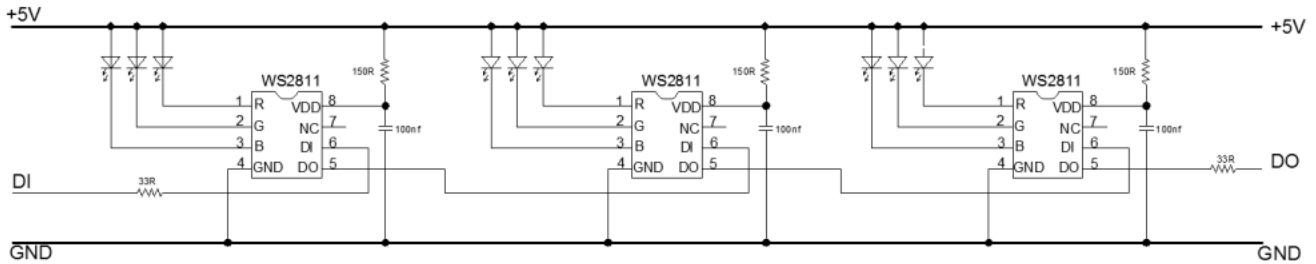
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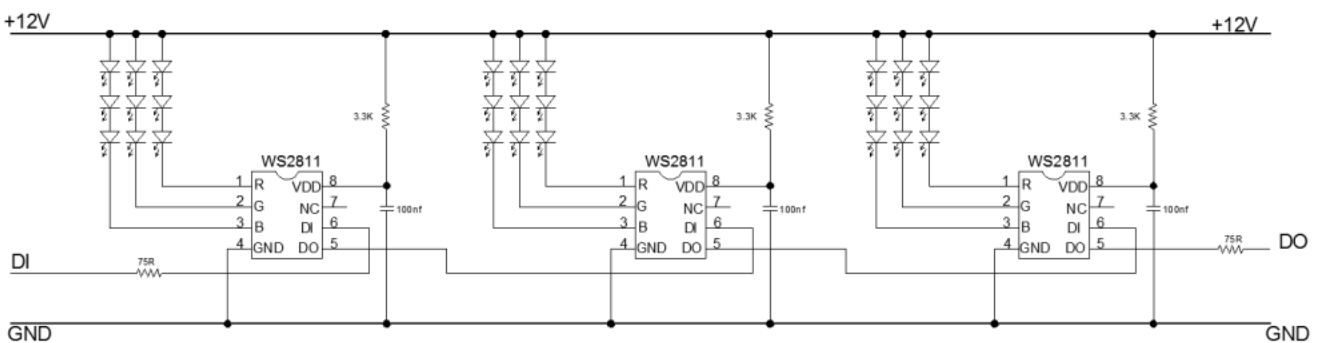
Single wire, 256 grayscale, 3 Channels
Constant Current LED Drive IC

Typical Application Circuit

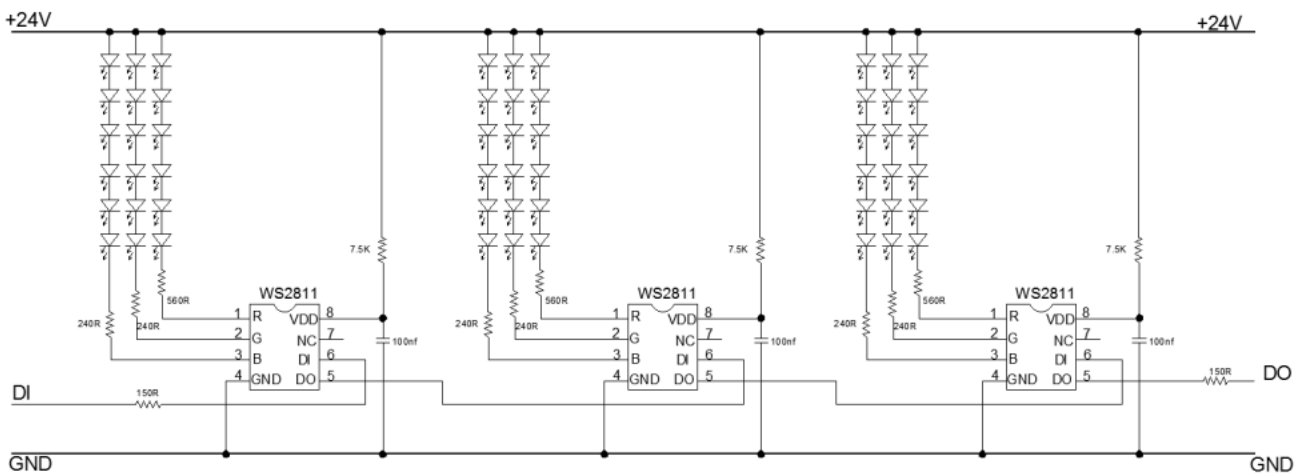
1. .Supply voltage=5V, 1 LED for each channel



2. Supply voltage=12V, 3 LED for each channel



3. Supply voltage=24V, 6 LED for each channel





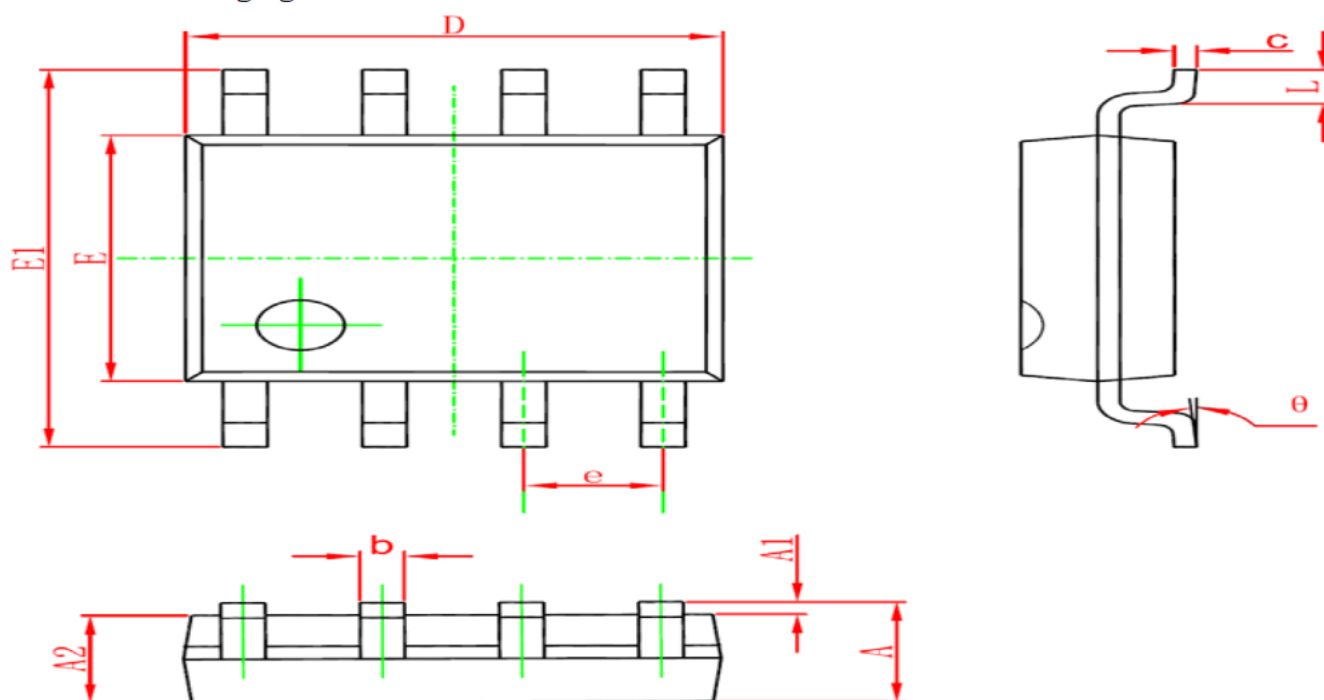
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WS2811C

Single wire, 256 grayscale, 3 Channels
Constant Current LED Drive IC

Package information

● SOP8 Packaging



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270		0.050	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

Modify Records

Version №	Status Bar	Modify Content Summary	Date	Reviser	Approved
V1.0	N	New-built	20170524	Shen Jingguo	Yin Huaping
V1.1	M	Correction of detailed parameters	20190524	Shen Jingguo	Yin Huaping
V1.2	M	Timing adjustment	20231214	Hu Jin	Yin Huaping
V1.3	A	Add a description of static current; Standardize the logic power supply voltage and output current	20250409	Chen YongZhao	Yin Huaping
V1.4	M	Update Logo,Standardize the voltage of the logic power supply	20260714	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.