



WS2811

Single-wire 256-level grayscale three-channel constant current LED driver IC

Main features •

OUTR, G, B and DOUT ports withstand voltage 20V, DIN port withstand voltage 9.5V. • The chip has a built-in voltage regulator tube, and the power supply terminal below 24V only needs to connect a series resistor to the VDD pin, and no external voltage regulator tube is required. • Chip built-in resistors, DIN and DOUT ports have overvoltage protection, short circuit 24V instantly will not burn out. • Gray scale adjustment circuit (256 levels of gray scale adjustable). • Built-in signal shaping circuit, after any IC receives a signal, it will be output after wave shaping to ensure that line wave distortion will not accumulate. • Built-in power-on reset and power-off reset circuits. • The PWM control terminal can realize 256 levels of adjustment, and the scanning frequency is 4KHz. • Serial interface cascade interface, which can complete data reception and decoding through one signal line. • The transmission distance between any two points does not exceed 4 meters without adding any circuits. • When the refresh rate is 30 frames per second, the cascade number is not less than 1024 points. • Data sending speed can reach 800Kbps.

Main application fields • LED

full-color luminous character light strings, LED full-color modules. • LED full-color flexible light bar hard light bar, LED guardrail tube. • LED point light source, LED pixel screen, LED special-shaped screen. • A variety of electronic products, electrical equipment marquee. • Various other LED lighting products.

product description

WS2811 is a special circuit for three-channel LED drive control. The chip contains an intelligent digital interface data latch signal shaping and amplifying drive circuit, as well as a high-precision internal oscillator and a 20V high-voltage programmable constant current output driver. At the same time, in order to reduce the power ripple, the OUTR, G, and B channels have a delay conduction function, which can reduce the circuit ripple when the frame is refreshed.

The chip adopts the single-wire return-to-zero code communication method. After the chip is powered on and reset, the DIN terminal receives the data transmitted from the controller. The 24bit data sent first is extracted by the first chip and sent to the data latch inside the chip. After being reshaped and amplified by the internal shaping processing circuit, the remaining data is forwarded and output to the next cascaded chip through the DO port. Every time a chip is transmitted, the signal is reduced by 24 bits. The chip adopts automatic shaping and forwarding technology, so that the cascade number of the chip is not limited by signal transmission, but only limited by the signal transmission speed requirements.

The data latch inside the chip generates different duty cycle control signals at the OUTR, OUTG, and OUTB control terminals according to the received 24bit data. When waiting for the DIN terminal to input the RESET signal, all chips will send the received data to each segment synchronously, and the chip will re-receive the data after the signal ends, and after receiving the first 24bit data, forward the data port through the DO port, before the chip receives the RESET code, OUTR, OUTG, The original output of the OUTB pin remains unchanged. After receiving the low-level RESET code of more than 280 μ s, the chip outputs the 24bit PWM data pulse width just received to the OUTR, OUTG, and OUTB pins.

Available in SOP8, MSOP8, FSOP8 packages.

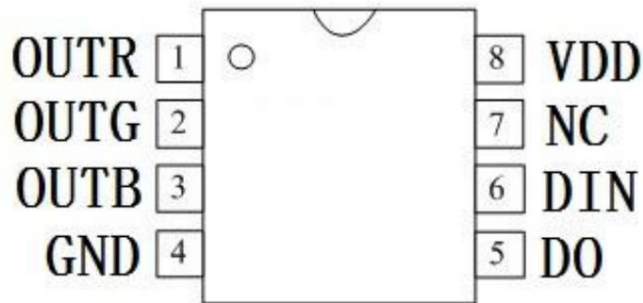


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Terminal Arrangement



Lead function

serial number	symbol	Pin name	Functional description
1	OTHER	LED driver output	RED (red) PWM control output
2	OUTG	LED driver output	GREEN (green) PWM control output
3	OUTB	LED driver output	BLUE (blue) PWM control output
4	GND	land	Signal Ground and Power Ground
5	DO	data output	show data cascade output
6	FROM	data input	show data entry
7	NC	Empty pin	Empty pin
8	VDD	logic power	IC power supply

Maximum rating (TA=25°C, VSS=0V)

parameter	symbol	scope	unit
Logic supply voltage	VDD	+3.5~+5.7	V
R, G, B output port withstand voltage	VOUT	20	V
Logic input voltage	VI	VDD-0.7~VDD+0.7V	V
Operating temperature	T _{op}	-40~+85	°C
Storage temperature	T _{stg}	-40~+105	°C



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

parameter	Symbol	Minimum	Typical	Maximum	Unit	Test Conditions
Quiescent Current	This	—	0.3	—	mA	DC=5V
RyGyB Low level output current	IOL	15.5	16.5	17.5	mA	DC=5V, DINyFFHy
Single RGB current difference Dif		0	—	0.8	mA	DC=5V, DIN
Low level output current Iout		10	—	—	mA	Vo=0.4V, DOUT
Signal input current	II	—	—	—	μA	VI=VDD/VSS
High level input	HIV	0.55VDD	—	—	IN	FROM
low level input	WILL	—	0.3 VDD	—	IN	FROM
hysteresis voltage	VH	—	0.35	—	IN	FROM

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

parameter	Symbol	Minimum	Typical	Maximum	Unit	Test Conditions
Oscillation frequency	Dark	—	800	—	KHz	—
Transmission delay time tPLZ		—	300	—	ns	CL=15pF, DINyDOUT, RL=10Ky
fall time	tTHZ	—	120	—	μs	CL=300pF, OUTR/OUTG/OUTB
Data transfer rate FMAX		600	—	—	Kbps	duty cycle 50%
input capacitance	CI	—	15	—	pF	—

data transfer time

T0H	0 yards, high time	220ns~380ns
T1H	1 yard, high time	580ns~1us
T0L	0 yards, low time	580ns~1us
T1L	1 yard, low time	580ns~1us
RES	Frame unit, low level time	280 μs or more



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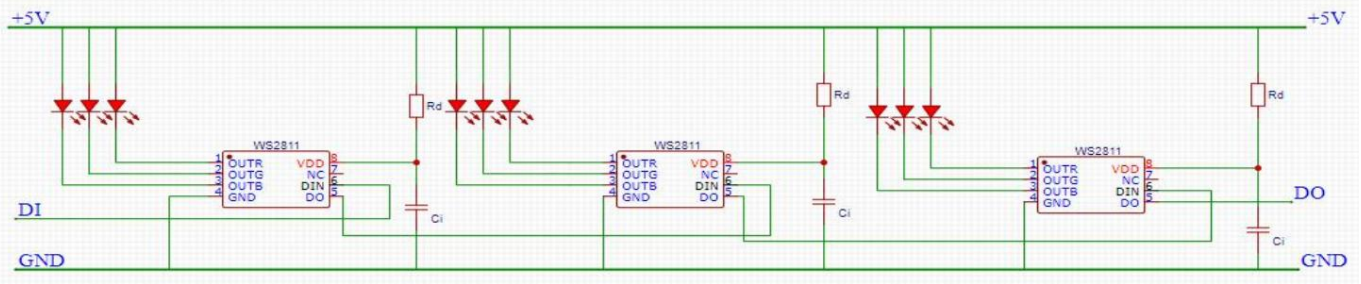
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Typical Application Circuit

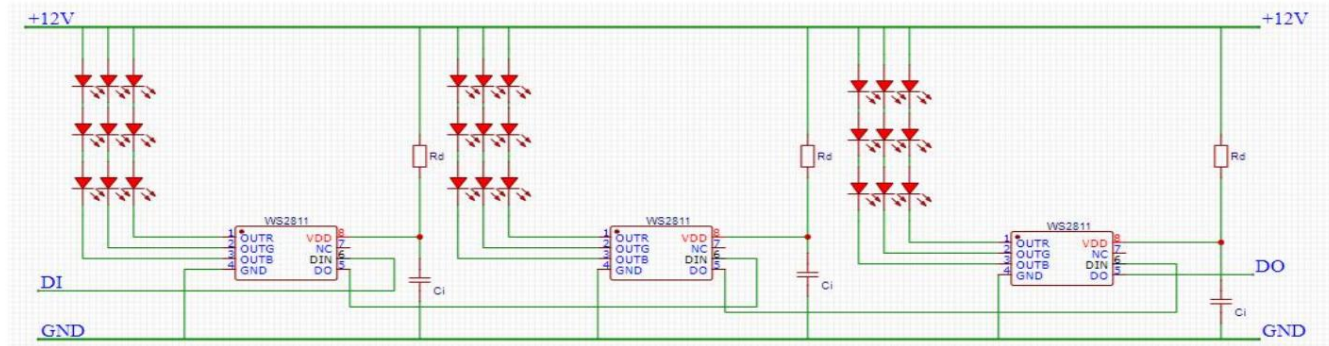
1. Reference circuit for **5V** power supply application (each channel has **1 LED**): The

recommended value of **R_d** is 150R, and the recommended value of **C_i** is 1uF.



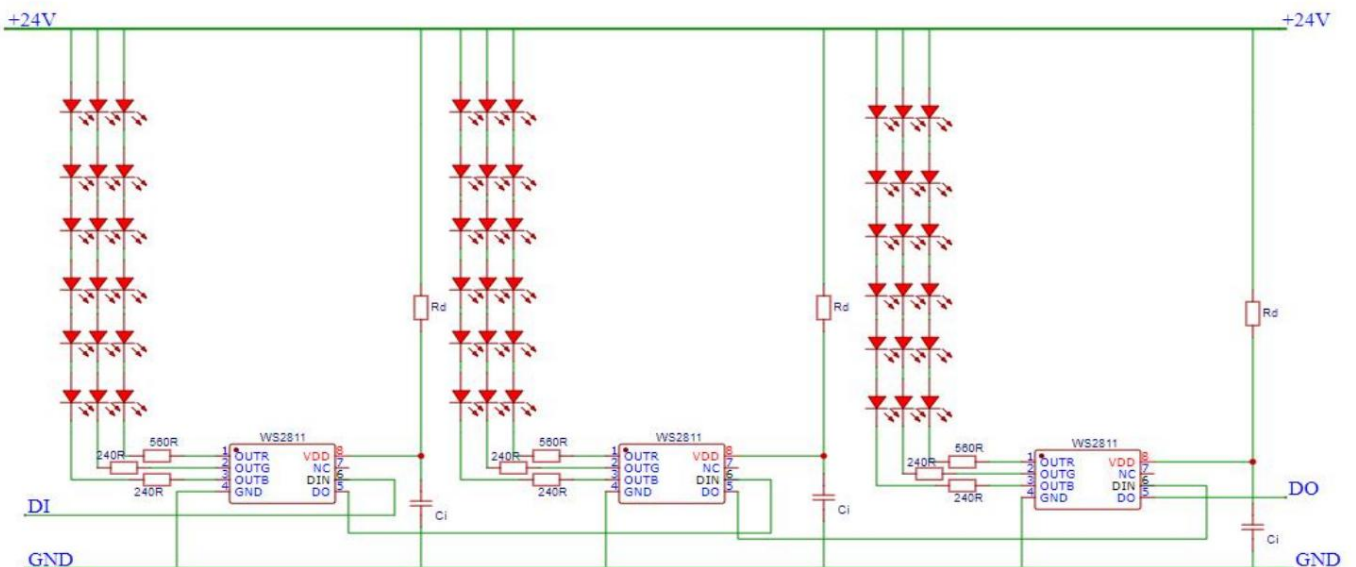
2. Reference circuit for **12V** power supply application (each channel has **3 LEDs**): The

recommended value of **R_d** is 4.7k, and the recommended value of **C_i** is 1uF.



3. Reference circuit for **24V** power supply application (each channel has **6 LEDs**):

The recommended value for **R_d** is 10k, and the recommended value for **C_i** is 1uF.





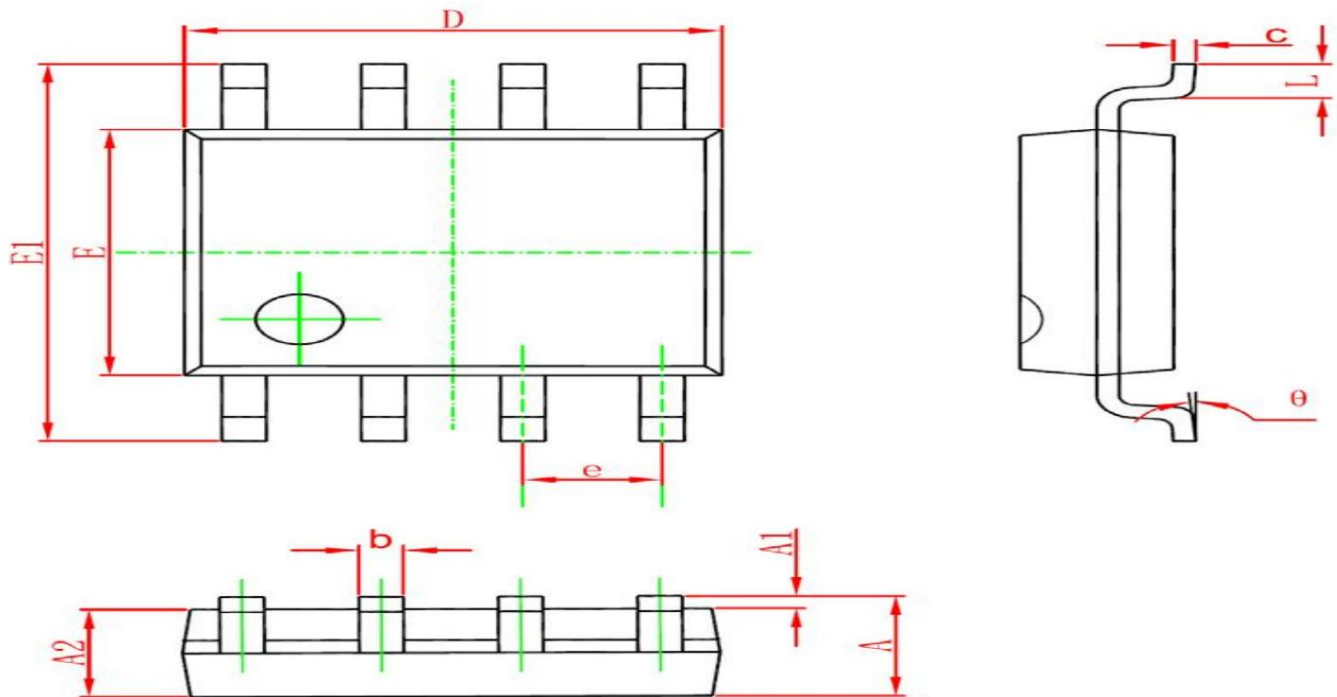
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Package Diagram and Parameters

• SOP8 package



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
Δ	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
π s	1.270		0.050	
L	0.400	1.270	0.016	0.050
i	0°	8th	0°	8th

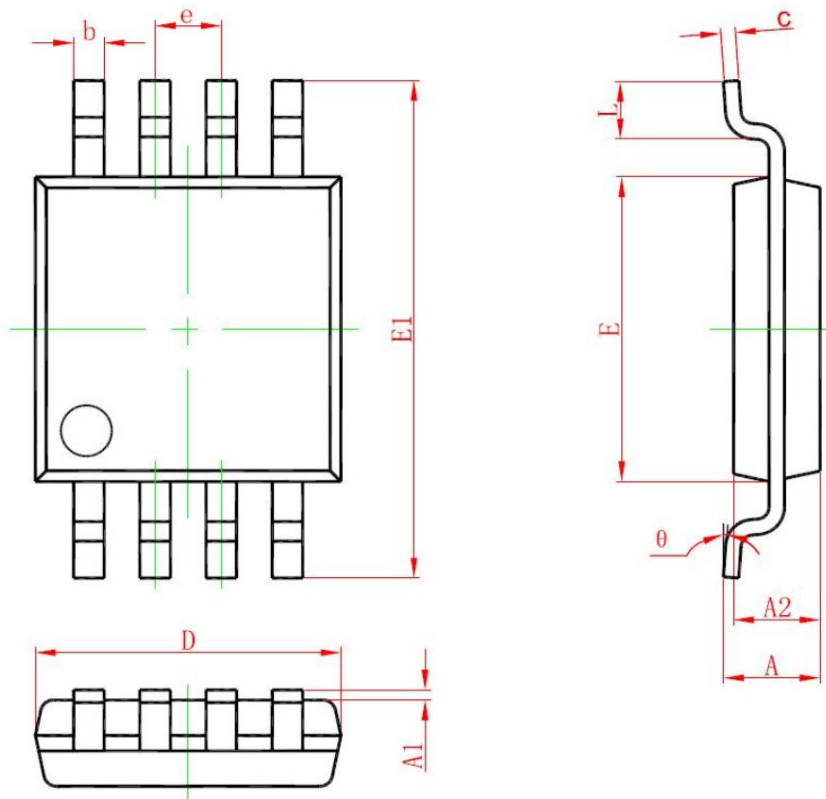


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MSOP8 package



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
e	0.650(BSC)		0.026(BSC)	
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
L	0.400	0.800	0.016	0.031
theta	0°	6°	0°	6°

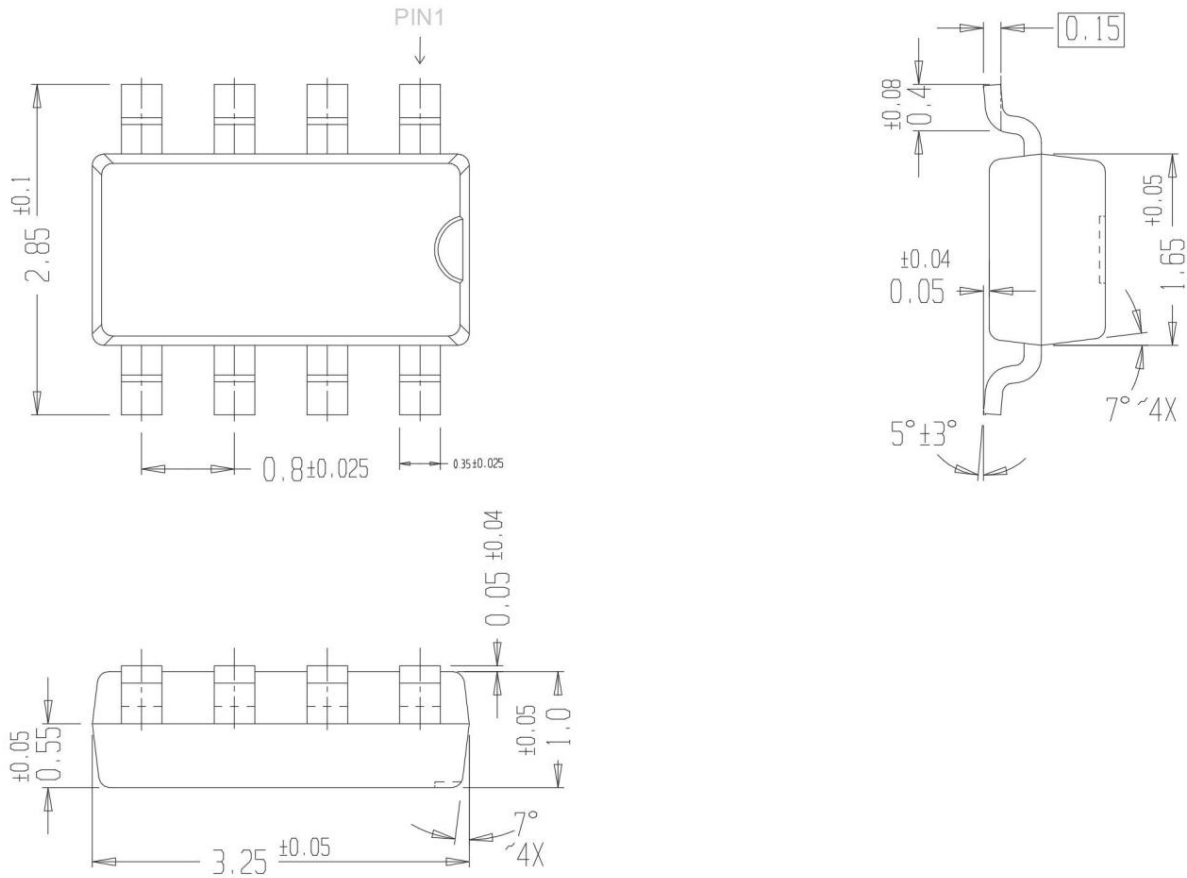


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• FSOP8 package



File Change Record Version

Number	Status	Summary of revisions	Revised Date	Revised By	Approver
V1.0	N	new build	20170524	Shen Jinguo	Yin Huaping
V1.1	M	maximum rating	20171014	Shen Jinguo	Yin Huaping
V1.2	M	Switching characteristics	20171108	Shen Jinguo	Yin Huaping
V1.3	M	Maximum ratings, data transmission time, main features, product overview	2018-2-7	Shen Jinguo	Yin Huaping
V1.4	M	T1L time modification, standard logic input voltage	2018-9-10	Shen Jinguo	Yin Huaping
V1.5	M	Modify the typical application circuit diagram (supplement 24V application circuit)	2018-9-20	Shen Jinguo	Yin Huaping
V1.6	M	RGB port 12V full withstand voltage test, add Dif test	2021-12-31	Yu Xinghui	Yin Huaping
v2.0	M	Driver IC upgrade	2022-10-10	Yu Xinghui	Yin Huaping
v2.1	M	Add FSOP8 package	2022-11-11	Yu Xinghui	Yin Huaping