

# WS2814A

## Signal line 256 Gray level 4-channel Constant current LED driver IC

### Feature

- OUTR, G, B, W port withstand voltage 20V, DIN port withstand voltage 9V.
- Built-in voltage-regulator, only a resistor needed to add to VDD PIN when under 24V power supply.
- Built-in signal reshaping circuit, to ensure waveform distortion do not accumulate after wave reshaping to the next driver.
- Built-in electrify reset circuit and power-down reset circuit.
- 256 Gray-scale adjustable and scan frequency is **2KHz**.
- Cascading port transmission signal by single line.
- Any two point the distance less than 2 meters transmission signal without any additional circuit.
- Good color consistency and cost effective.
- When the refresh rate is 30fps, the cascade number is at least 1024 pixels.
- Send data at speed of 800Kbps.

### Applications

- LED full color decorative lighting, such as LED string, LED strip, LED module etc.
- Indoor/outdoor LED video or irregular screen, LED pixel lights and other kinds of LED lighting products.

### General description

WS2814A is a 4-channel LED control driver chip. 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.

WS2814A adopts single NZR communication mode. After the chip power-on reset, the DIN port receive data from controller, the first IC collect initial 32bit 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 32bit. 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.

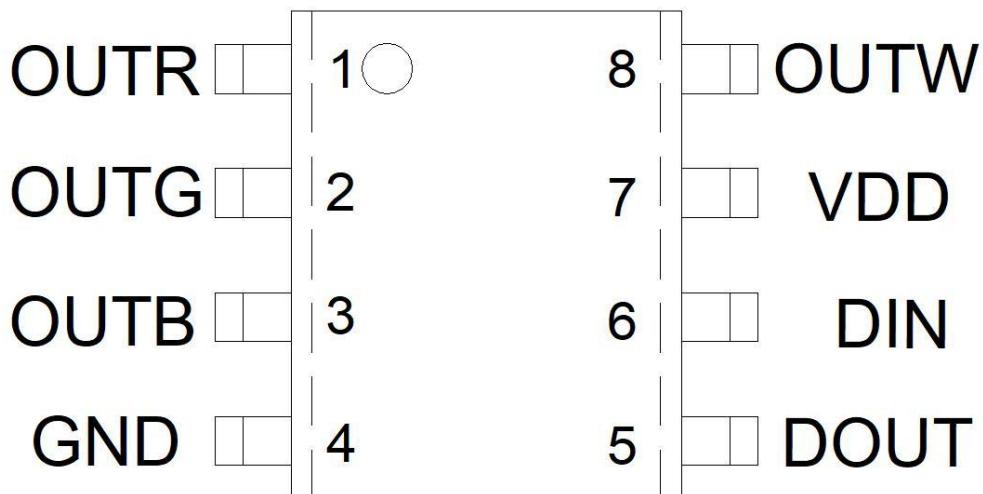
The data latch of IC depend on the received 24bit data produce different duty ratio signal at OUTR, OUTG, OUTB port. All chip synchronous send the received data to each segment when the DIN port input a reset signal. It will receive new data again After the reset signal finished. Before a new reset signal 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**.

There are SOP8 and FSOP8 packages available.

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## 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	DOUT	Data Output	Control data output
6	DIN	Data Input	Control data input
7	VDD	Logical power supply	IC power supply
8	OUTW	LED Driver Output	Output of WHITE PWM control

## Absolute Maximum Ratings (TA=25°C, V<sub>SS</sub>=0V)

Parameter	Symbol	Ratings	Unit
Power Supply Voltage	V <sub>DD</sub>	+3.7~+5.3	V
R/G/B/W Channel Output Port Withstand Voltage	V <sub>out</sub>	20	V
Logical Input Voltage	V <sub>I</sub>	VDD-0.7~VDD+0.7V	V
Operation Temperature	T <sub>opt</sub>	-40~+85	°C
Storage Temperature Range	T <sub>stg</sub>	-40~+105	°C
Electrostatic immunity	ESD	4	KV

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Electrical Characteristics (TA=25°C, VDD=4.5~5.5V, V<sub>SS</sub>=0V)

Parameter	Symbol	Min	Tpy	Max	Unit	Conditions
R/G/B Low level output current	I <sub>OL</sub>	15.5	16.5	17.5	mA	
Low level output current	I <sub>dout</sub>	10	—	—	mA	V <sub>O</sub> =0.4V, D <sub>OUT</sub>
Input current	I <sub>I</sub>	—	—	±1	μA	V <sub>I</sub> =V <sub>DD</sub> /V <sub>SS</sub>
High level input	V <sub>IH</sub>	0.7V <sub>DD</sub>	—	—	V	D <sub>IN</sub>
Low level input	V <sub>IL</sub>	—	—	0.3 V <sub>DD</sub>	V	D <sub>IN</sub>
Hysteresis voltage	V <sub>H</sub>	—	0.35	—	V	D <sub>IN</sub>

Switching characteristics (TA=25°C, VDD=4.5~5.5V, V<sub>SS</sub>=0V)

Parameter	Symbol	Min	Tpy	Max	Unit	Condition
Transmission delay time	T <sub>PLZ</sub>	—	—	300	ns	CL=15pF, DIN→DOUT, RL=10KΩ
Fall time	T <sub>THZ</sub>	—	—	120	μs	CL=300pF, OUTR/OUTG/OUTB/OUTW
Data transmission rate	F <sub>MAX</sub>	600	—	—	Kbps	Duty ratio 50%
Input capacity	C <sub>I</sub>	—	—	15	pF	—

### Data Transfer Time

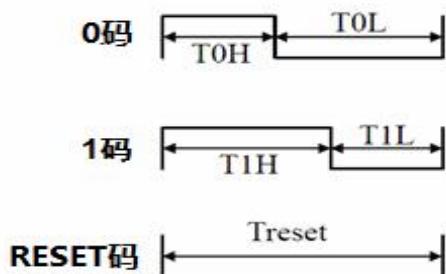
T0H	0 code, high voltage time	220ns~380ns
T1H	1 code, high voltage time	580ns~1us
T0L	0 code, low voltage time	580ns~1us
T1L	1 code, low voltage time	580ns~1us
RES	Frame unit, low voltage time	>280μs
T <sub>DATA</sub>	Data cycle	≥1.25μs

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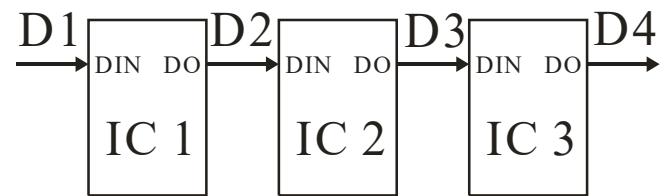
## Signal line 256 Gray level 4-channel Constant current LED driver IC

### Timing waveform diagram

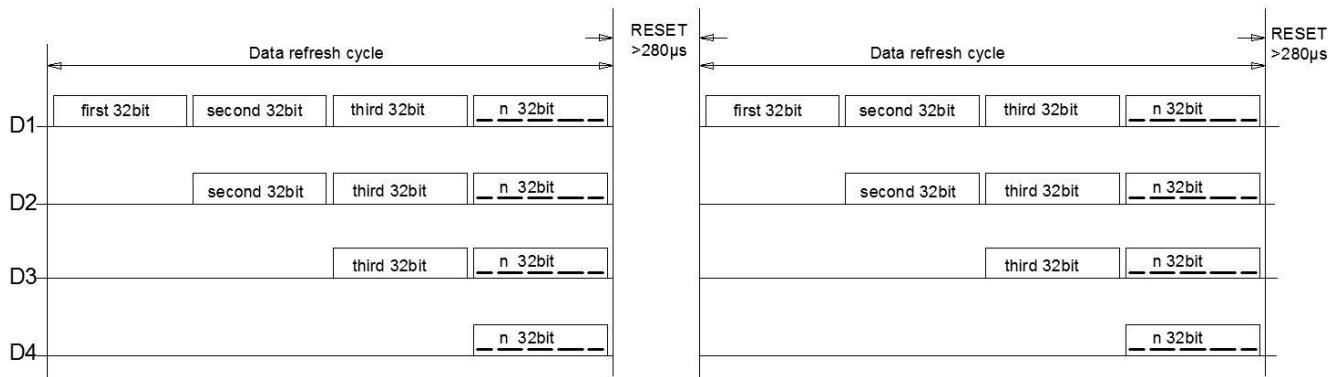
#### Sequence Chart



#### Cascade Method



### Data Transmission Method



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

### Composition of 24bit Data

W	W	W	W	W	W	W	W	R	R	R	R	R	R	R	R	G	G	G	G	G	G	B	B	B	B	B	B				
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

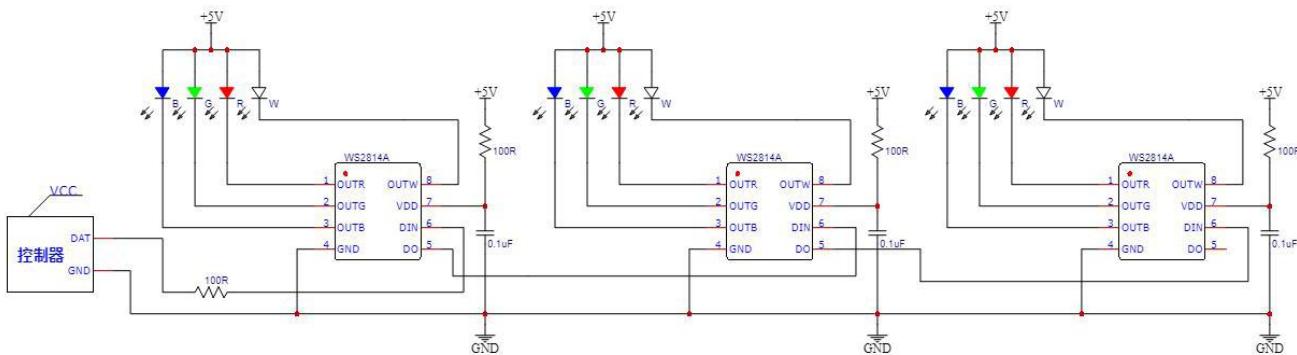
Note: Data transmit in order of WRGB, high bit data at first.

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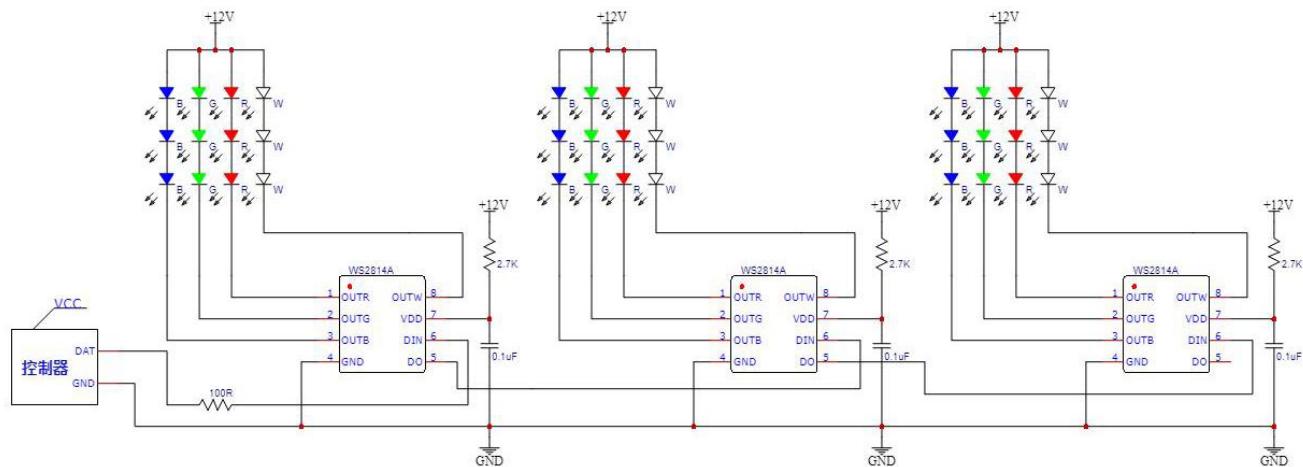
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### Typical Application Circuit

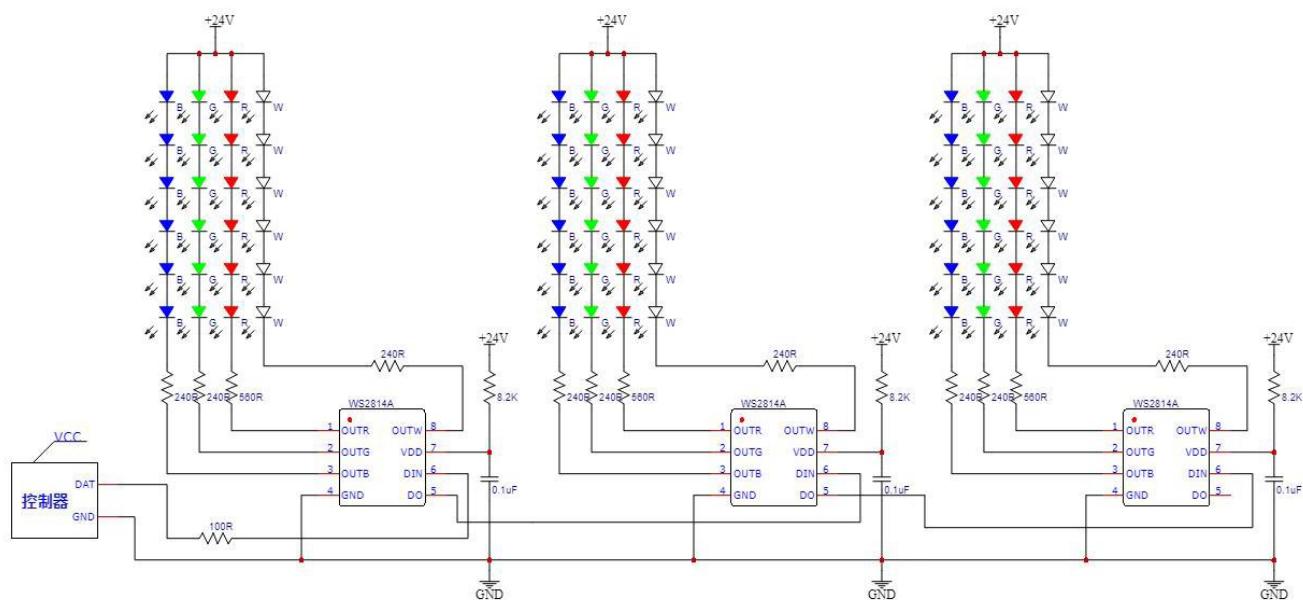
#### 1. Supply voltage=5V (Each channel drives 1 LED)



#### 2. Supply voltage=12V (Each channel drives 3 LEDs)



#### 3. Supply voltage=24V (Each channel drives 6 LEDs)

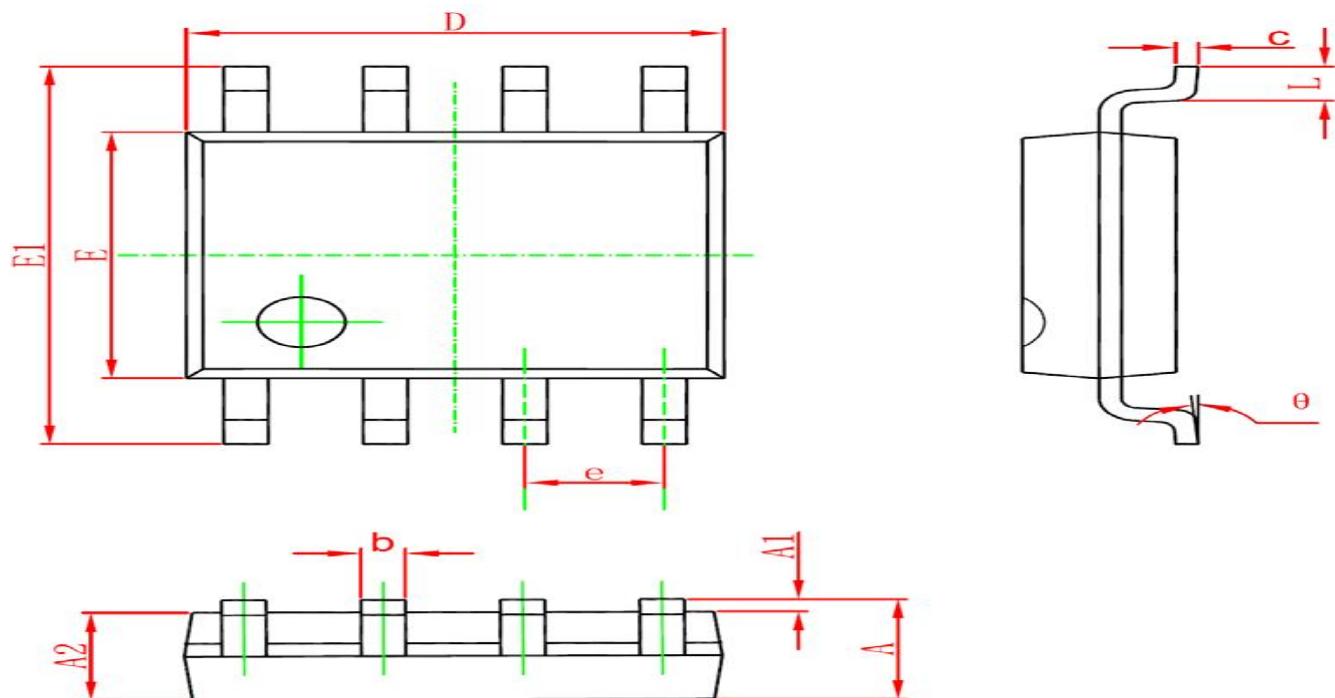


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### Package information

- SOP8 Package

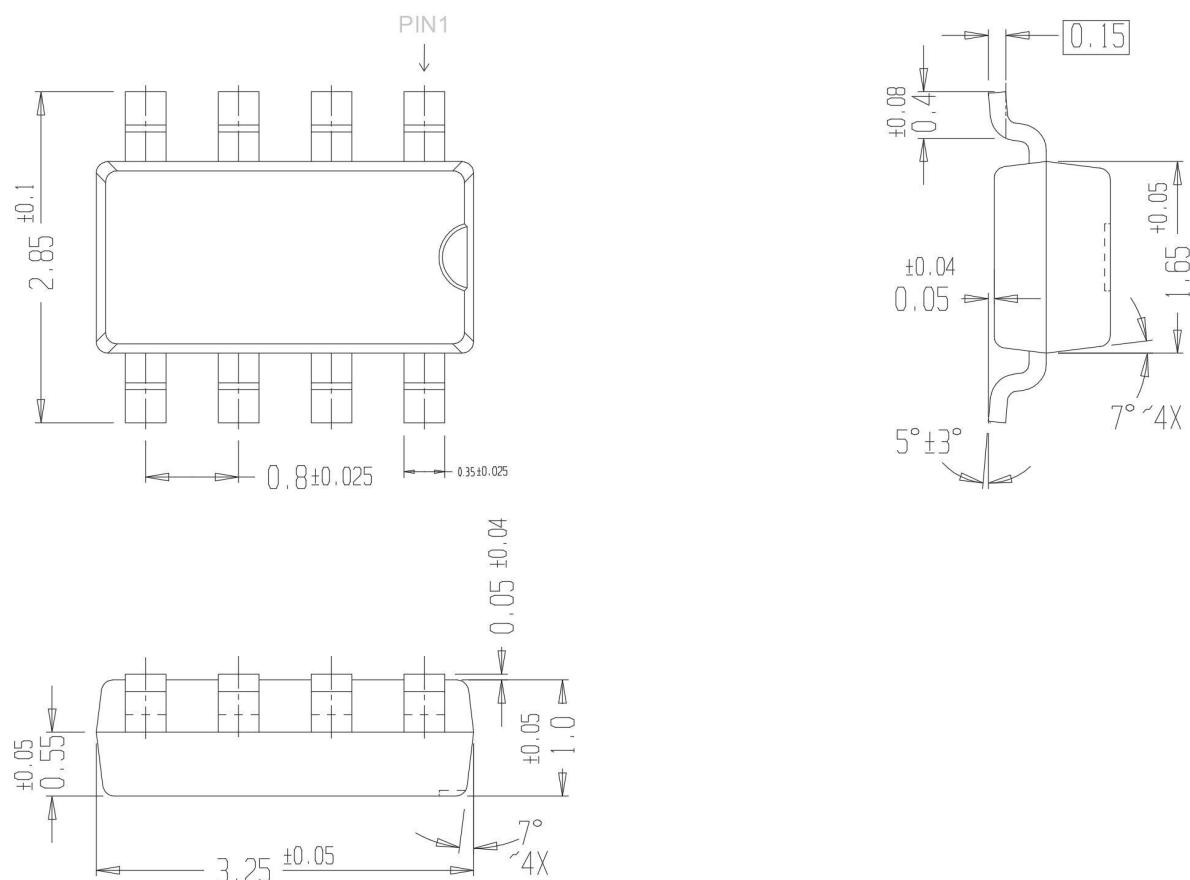


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270		0.050	
L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

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- FSOP8 Package



### Modify Records

Version №	Status Bar	Modify Content Summary	Date	Reviser	Approved
V1.0	N	New	20190410	Dong Le	Shen JinGuo
V1.1	M	Detailed parameters updated	20210118	Dong Le	Shen JinGuo
V1.2	M	Application circuits updated	20211125	Xie YanFan	Yu XingHui
V1.3	M	Added ESD	20220712	Hu Jin	Yu XingHui
V1.4	M	Added FSOP8 package	20230328	Hu Jin	Yu XingHui

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

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