



WS2814A

Single wire, 256 grayscale, 4 Channels Constant Current LED Drive IC

Main Features

- The **OUTR, G, B, W** ports withstand a voltage of **40V**, while the **DIN, DOUT** port withstands **24V**.
- The chip includes a built-in voltage regulator; for power supplies below **36V**, simply connect a resistor in series to the **VDD** pin—no external regulator is required.
- The device features a built-in signal shaping circuit that processes signals into optimized wave-forms 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 2 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 point light sources, LED pixel displays, and LED custom-shaped displays.

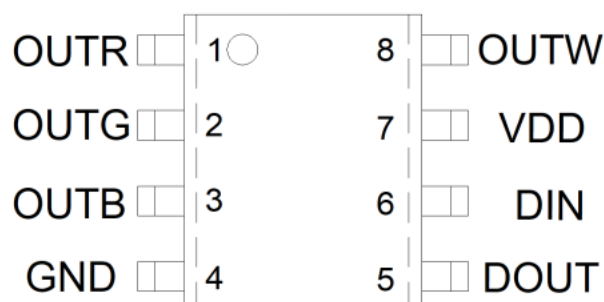
Product Overview

WS2814A is a 4-channel dedicated circuit for LED driver control. The chip internally incorporates an intelligent digital interface data latch signal shaping and amplification driver circuit, a high-precision internal oscillator, a **40V** high-voltage programmable constant current output driver, and a high-precision constant current control module, effectively ensuring the high consistency of the color of the pixel light on the driver circuit.

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 **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 will 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 inside the chip generates different duty cycle control signals at the **OUTR, OUTG, OUTB, OUTW** control terminals based on the received **32-bit** data. When a **RESET** signal is input at the **DIN** terminal, all chips synchronously send the received data to each segment. After the signal ends, the chips will receive the data again. After receiving the initial **32-bit** data, the data port is forwarded through the **DO** port. Before the chip receives the **RESET** code, the original output of the **OUTR, OUTG, OUTB, OUTW** pins remains unchanged. When a low-level **RESET** code above **280μs** is received, The chip outputs the **32-bit** PWM data pulse width just received to the **OUTR, OUTG, OUTB, OUTW** pins.

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	Data Output
6	DIN	Data input	Control data input
7	VDD	Power Voltage	IC power supply
8	OUTW	LED Driver Output	Output of WHITE PWM control

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

Parameter	Symbol	Ratings	Unit
Logical power supply voltage	VDD	+3.7~+5.8	V
Logical Input Voltage	VI	VDD-0.7 ~ VDD+0.7	V
The R, G, B, and W output ports have voltage withstand capability.	Vout	40	V
Working temperature	Topt	-40 ~ +85	°C
Storage temperature	Tstg	-40~+150	°C
Electrostatic Resistance	ESD	≥2.5	KV

Electrical parameters ($T_A=25^{\circ}\text{C}$, $V_{DD}=4.5\sim 5.5\text{V}$, $V_{SS}=0\text{V}$)

Parameter	Symbol	Min	Tpy	Max	Unit	Conditions
Quiescent current	I_o	—	0.6	—	mA	DC=5V
R, G, B, W low-level output current	I_{OL}	13.5	15.5	17.5	mA	
Low-level output current	I_{dout}	10	—	—	mA	$V_o=0.4\text{V}$, 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 ($T_A = 25^{\circ}\text{C}$, $V_{SS} = 0\text{ V}$)

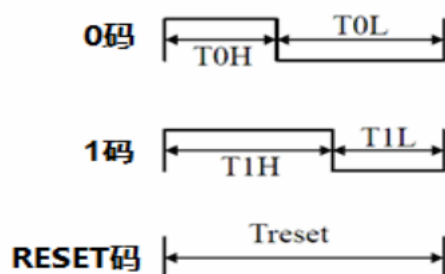
Parameter	Symbol	Min	Tpy	Max	Unit	Condition
Oscillation frequency	F_{osc}	—	800	—	KHz	—
Transmission delay time	t_{PLZ}	—	—	300	ns	$CL=15\text{pF}$, $D_{IN}\rightarrow D_{OUT}$, $R_L=10\text{K}\Omega$
Fall time	t_{THZ}	—	—	120	μs	$CL=300\text{pF}$, $OUTR/OUTG/OUTB$
Data transmission rate	F_{MAX}	600	—	—	Kbps	Occupancy Ratio 50%
Input capacity	C_I	—	—	15	pF	—

Data Transmission Time

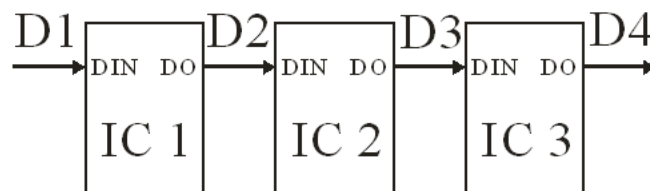
T_{0H}	0 code, high level duration	220ns~380ns
T_{1H}	1 code, high level duration	580ns~1 μs
T_{0L}	0 code, low-level duration	580ns~1 μs
T_{1L}	1 code, low-level duration	580ns~1 μs
RES	Frame unit, low-level duration	>350 μs
T_{DATA}	Data Cycle	$\geq 1.25\mu\text{s}$

Time Series Waveform Chart

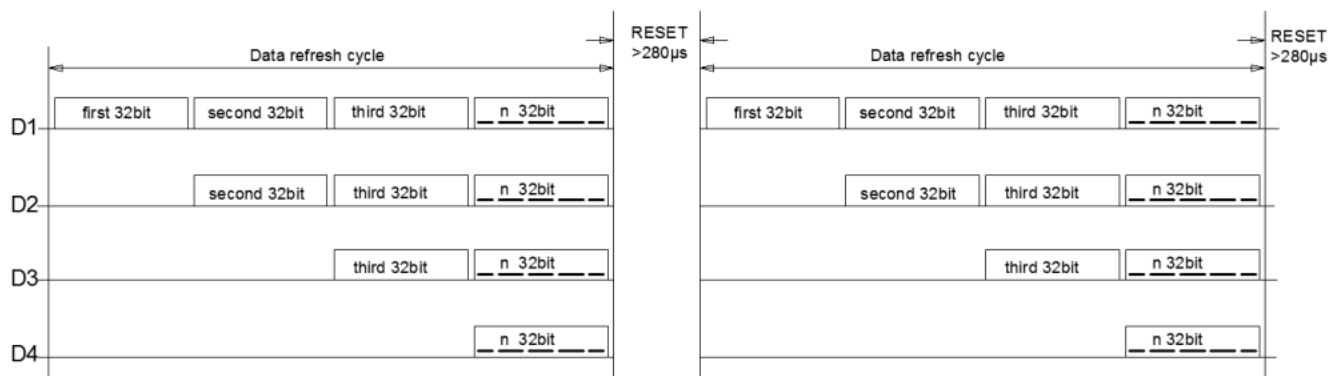
Sequence Chart



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.

32bit Data Structure

W7	W6	W5	W4	W3	W2	W1	W0	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 WRGB, high bit data at first.



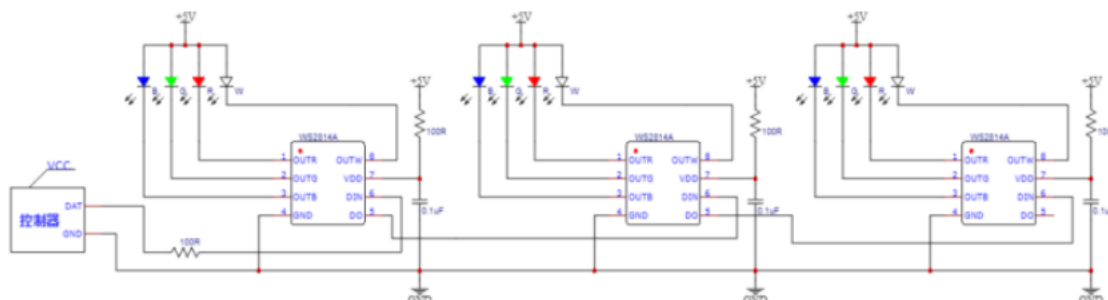
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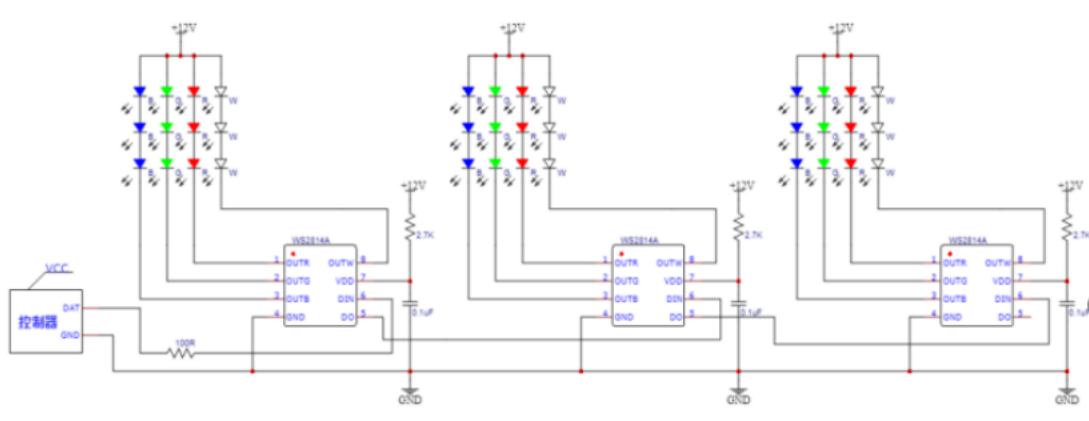
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Typical Application Circuit

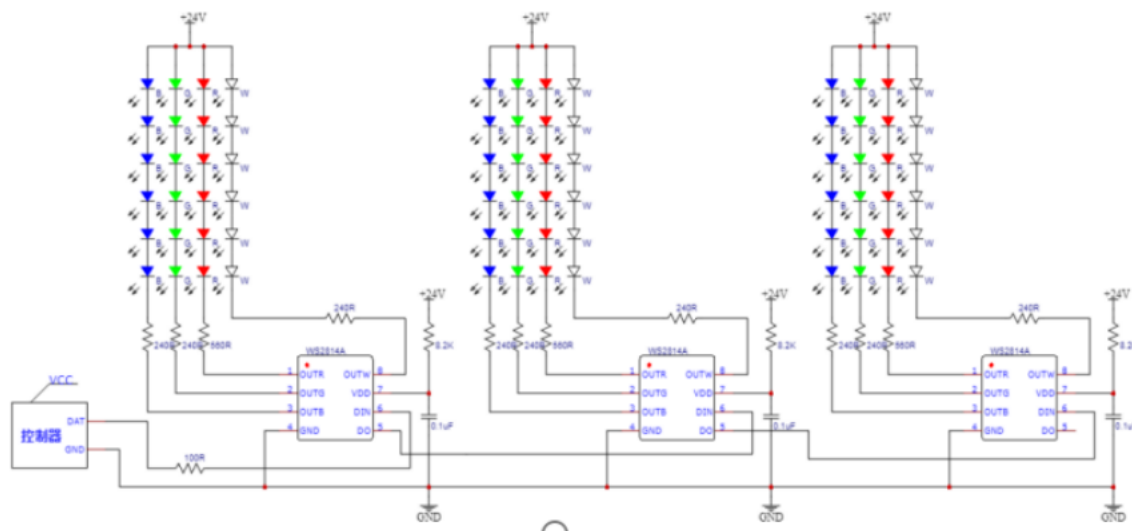
1. Supply voltage=5V, 1 LED for each channel



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



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



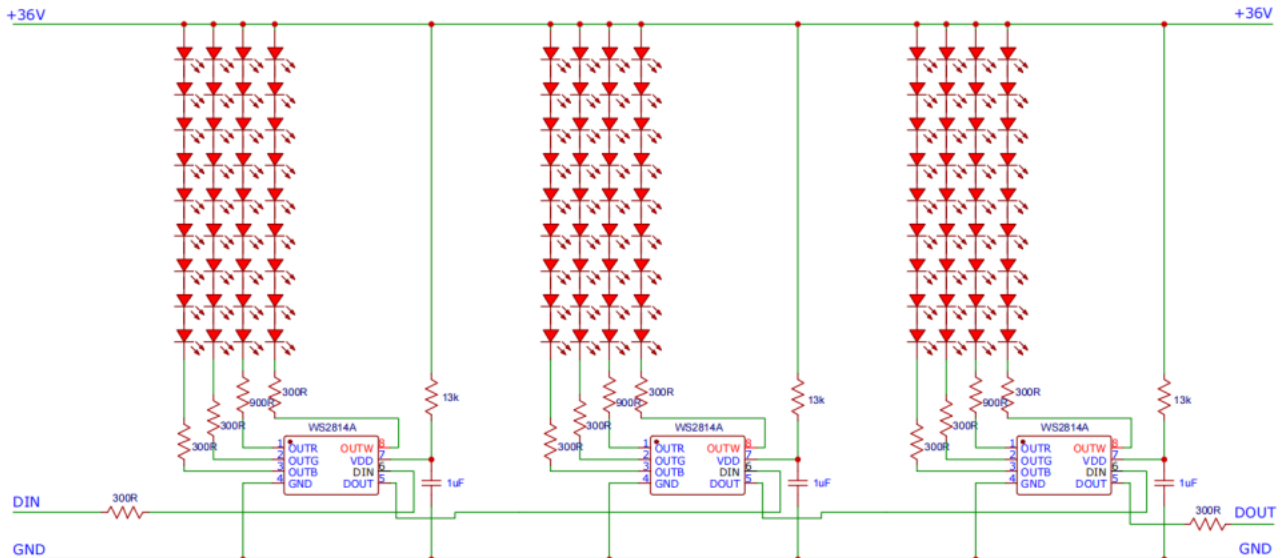


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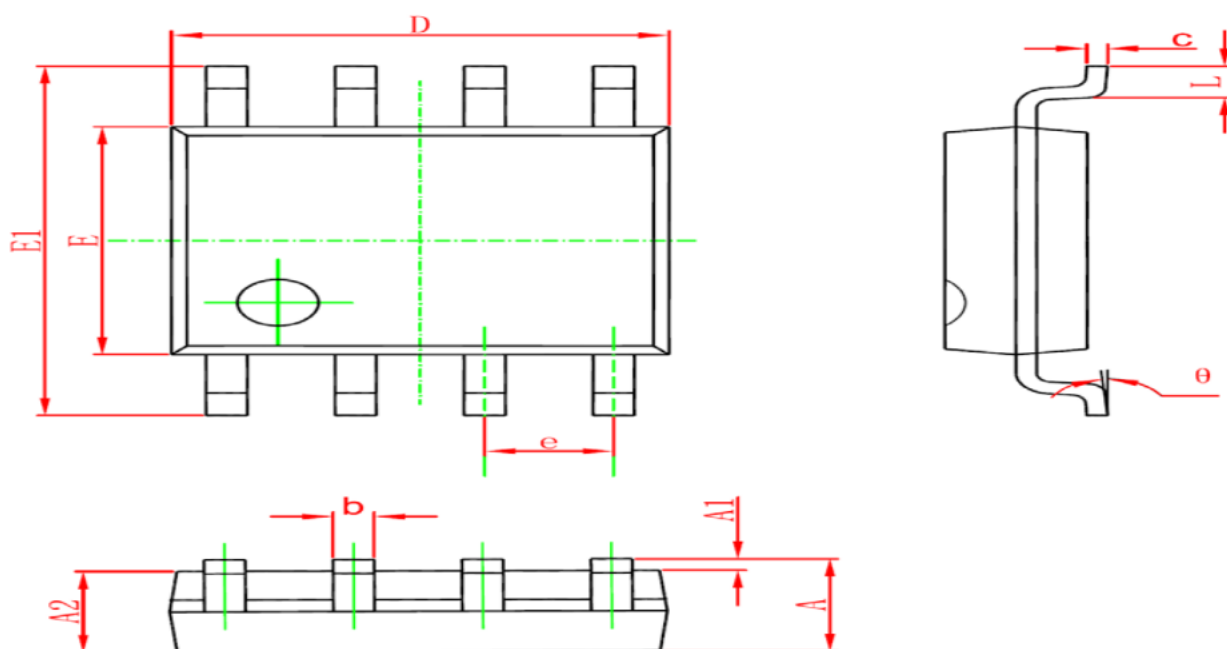
4. Supply voltage=36V, 9 LED for each channel



- Under 36V application conditions, it is recommended that 300-ohm resistors be connected in series with DI and DO to prevent damage caused by hot plugging and unplugging or momentary short circuits to the power supply.

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	20190410	Dong Le	Shen JinGuo
V1.1	M	Correction of detailed parameters	20210118	Dong Le	Shen JinGuo
V1.2	M	Modify the typical application circuit	20211125	Xie YanFan	Yu XingHui
V1.3	M	Add ESD	20220712	Hu Jin	Yu XingHui
V1.4	A	Add FSOP8 Package	2023/3/28	Hu Jin	Yu XingHui
V1.5	M	FSOP8 package specifications are separated and become independent	20230422	Hu Jin	Yu XingHui
V1.6	M	Timing description	20240108	Hu Jin	Yin HuPing
V1.7	M	Standard output current; Add a description of static current	20250806	Chen YongZhao	Hu Jin
V2.0	M	Driver IC upgrade	20260320	Chen YongZhao	Hu Jin
V2.1	M	Update logo; Add ESD,Format adjustment	20260714	Chen YongZhao	Hu Jin

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

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