WS2814B

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

Main Features

- The **OUTR, G, B, W** ports withstand a voltage of **20V**, while the **DIN**、**DOUT** port withstands **9V**.
- 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.
- 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.
- Single-wire Self-By pass function.

Main Applications

- LED full-color pixel string and LED full-color modules.
- LED point light sources, LED pixel displays, and LED custom-shaped displays.

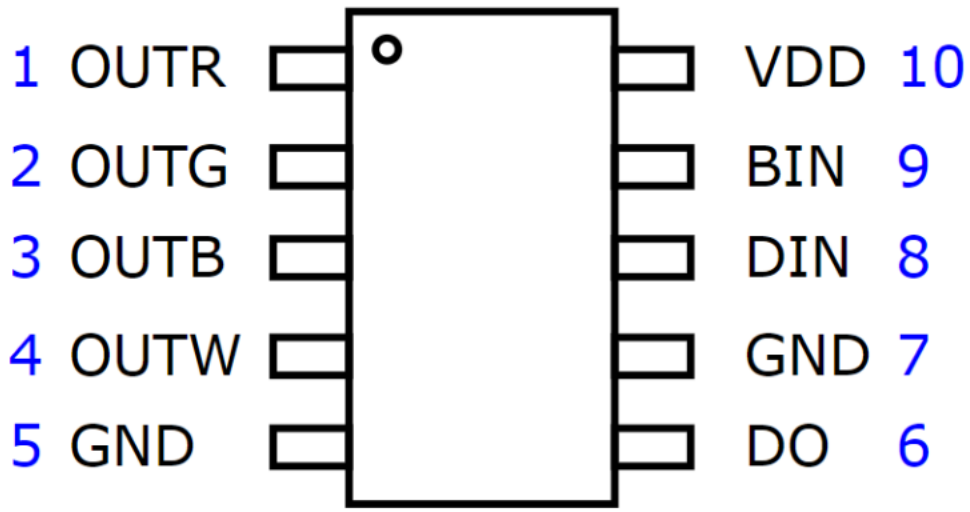
Product Overview

The **WS2814B** is 4 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. It effectively ensures that the color of the light at the pixel points on the drive circuit is highly consistent.

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	OUTW	LED Driver Output	Output of WHITE PWM control
5	GND	Ground	Data & Power Grounding
6	DOUT	DO	Data Output
7	GND	Ground	Data & Power Grounding
8	DIN	Data Input	Control data input
9	BIN	Backup signal input	Backup signal input
10	VDD	Logic Power Voltage	IC power supply

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,W output ports withstand voltage	Vout	20	V
Working temperature	Topt	-40 ~ +85	℃
Storage temperature	Tstg	-40~+150	℃

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

Parameter	Symbol	Min	Tpy	Max	Unit	Conditions
Quiescent current	Io	——	0.4	——	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	Vo=0.4V，D_{OUT}
Input current	I_I	——	——	±1	μA	V_I=V_{DD}/V_{SS}
High-level input	V_{IH}	0.55V_{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 ~ 5.5V,VSS = 0 V)

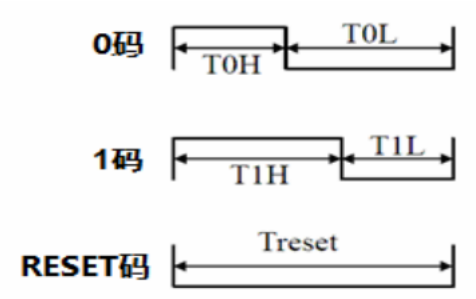
Parameter	Symbol	Min	Tpy	Max	Unit	Condition
Transmission delay time	tPLZ	——	——	300	ns	CL=15pF, DIN→DOUT, RL=10KΩ
Fall time	tTHZ	——	——	120	μs	CL=300pF, OUTR/OUTG/OUTB
Data transmission rate	*FMAX*	600	——	——	Kbps	Occupancy Ratio 50%
Input capacity	CI	——	——	15	pF	——

Data Transmission Time

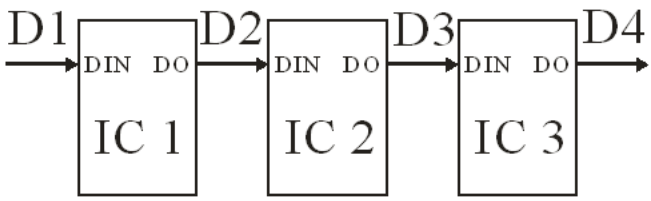
T0H	0 code, high level duration	220ns~380ns
T1H	1 code, high level duration	580ns~1us
T0L	0 code, low-level duration	580ns~1us
T1L	1 code, low-level duration	580ns~1us
RES	Frame unit, low-level duration	>280 μs
T_{DATA}	Data Cycle	≥1.25us

Time Series Waveform Chart

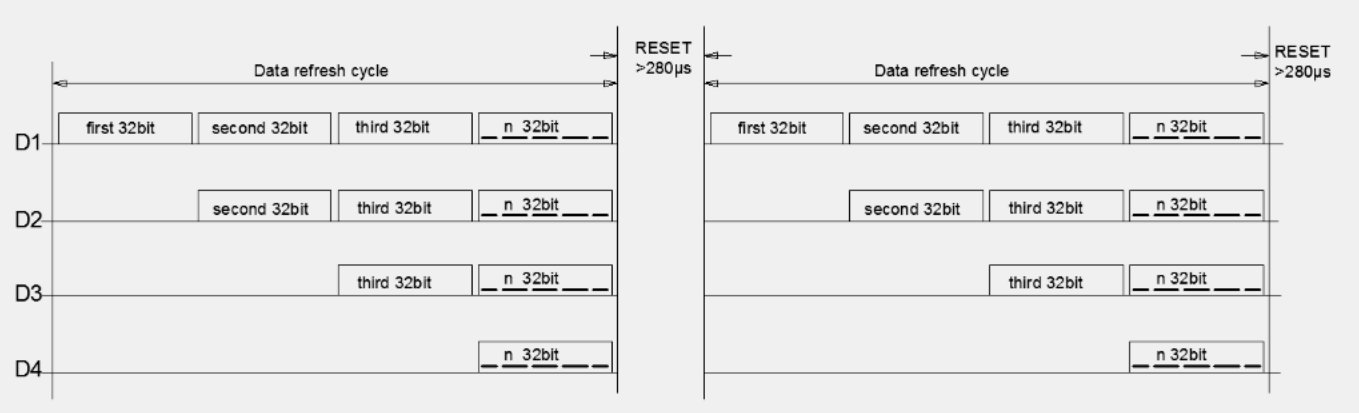
Sequence Chart



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.

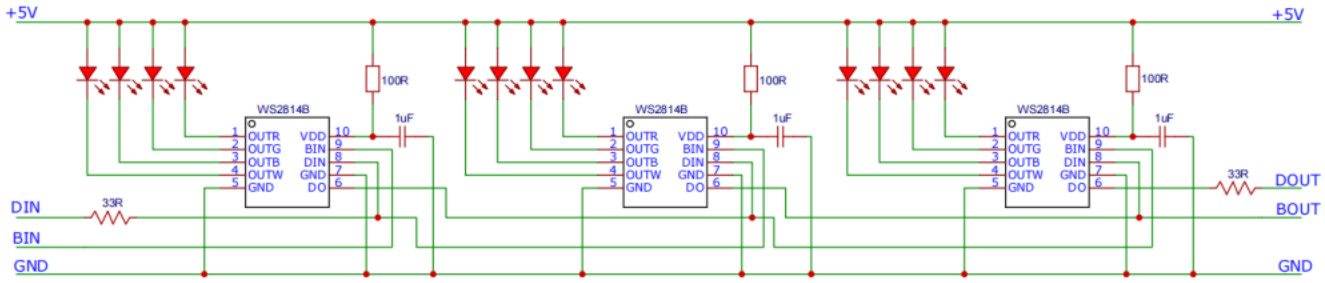
32bit Data Structure

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

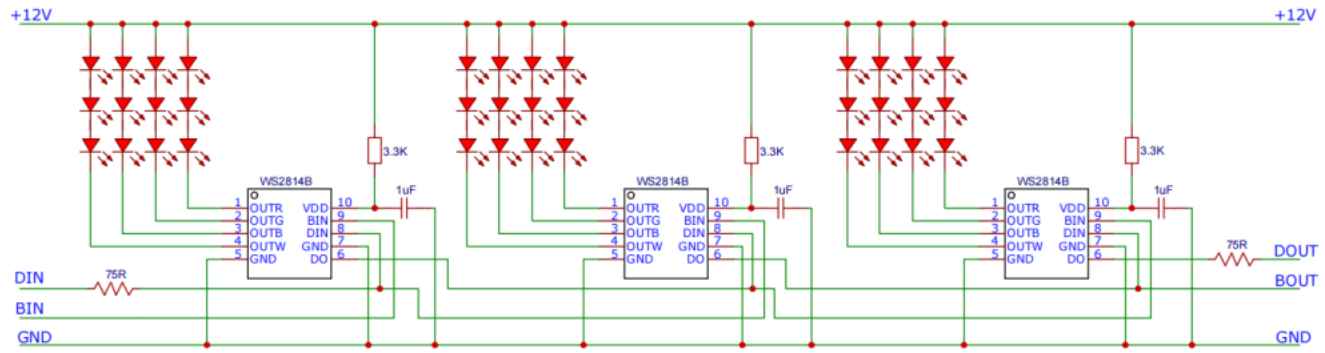
Note: Data transmit in order of WRGB, high bit data at first.

Typical Application Circuit

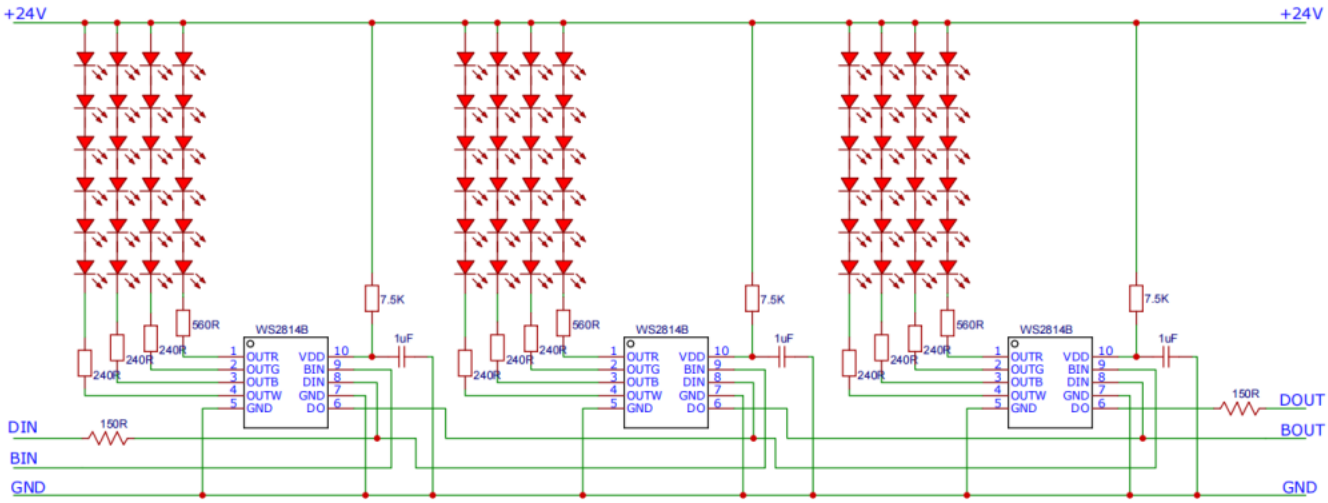
1. Supply voltage=5V, 1 LED for each channel



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



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



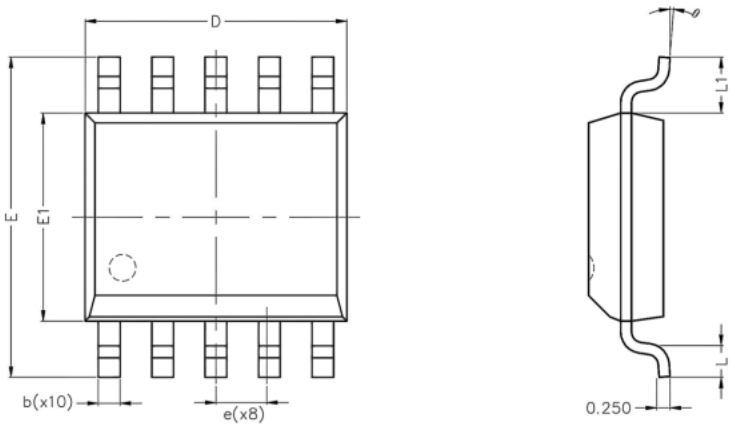
Remark:

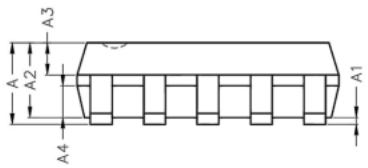
1.DIN is the main input signal and BIN is the backup input signal. Under normal circumstances, the IC extracts signals from the DIN. When one IC among them is damaged, the latter IC extracts the signal from the BIN without affecting the signal transmission of the subsequent ics.

2. For the finished product application, the BIN pin of the first IC can't be left floating. It is recommended to connect it to GND.

Package information

- **SOP10 package**





	SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS	A	–	–	1.75
STAND OFF	A1	0.05	0.125	0.20
MOLD TOTAL THICKNESS	A2	1.30	1.40	1.60
TOP MOLD THICKNESS	A3	0.55	0.60	0.65
BOTTOM MOLD THICKNESS	A4	0.547	0.597	0.647
LEAD WIDTH	b	0.31	–	0.53
MOLD LENGTH	D	4.80	4.90	5.00
MOLD WIDTH	E1	3.80	3.90	4.00
LEAD SPAN	E	5.80	6.00	6.20
LEAD PITCH	e	1.00 BSC		
LEAD LENGTH	L1	0.95	1.05	1.15
LEAD SOLE LENGTH	L	0.40	0.60	0.80
LEAD FORM ANGLE	θ	0°	–	8°

Modify Records

Version №	Status Bar	Modify Content Summary	Date	Reviser	Approved
V1.0	N	New	20230718	Hu Jin	Shen JinGuo
V1.1	M	Correct the current range; Add the description of the application circuit	20250701	Chen YongZhao	Shen JinGuo
V1.2	M	Maximum rated value; Static current High-level input	20250806	Chen YongZhao	Shen JinGuo
V1.3	M	Update Logo	20260714	Chen YongZhao	Shen JinGuo

Remarks: Initial version: V1.0； Version number plus "0.1" after each revision;
Status bar: N--New, A--Add, M--Modify, D--Delete.