WS2818B

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

Main Features

- The **OUTR, G, B** 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.
- It features built-in power-on reset and power-off reset circuits.
- 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.
- 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.
- Single-wire Self-Bypass function,Even if a single chip is damaged, it does not affect the overall display effect.
- The transmission distance between any two points does not exceed 5 meters without requiring additional circuits.
- The color of light is highly consistent and the cost performance is high.
- 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.
- DOUT short-circuiting 24V will not burn out the IC within 5 minutes.

Main Applications

- LED full-color pixel string,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.

Product Overview

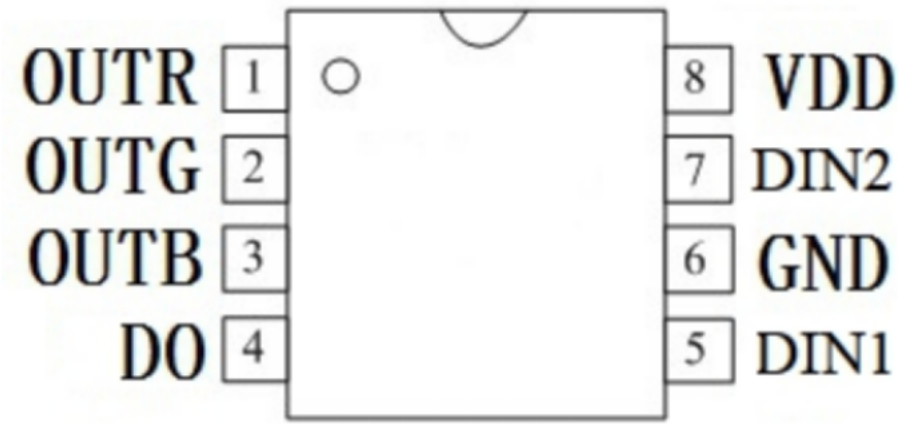
The **WS2818B** is **3** output channels special for LED driver circuit. Its internal includes intelligent digital port data latch and signal reshaping amplification drive circuit. Also include a precision internal oscillator and a **20V** voltage programmable constant current output drive.It effectively 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 **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 will 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 inside the chip generates different duty cycle control signals at the OUTR, OUTG, and OUTB control terminals based on the received **24-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 **24-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, and OUTB pins remains unchanged. When a low-level RESET code above **280μs** is received, The chip outputs the 24-bit PWM data pulse width just received to the OUTR, OUTG, and OUTB pins.

We offer SOP8、SOT23-8 package.

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	DO	DO	Data Output
5	DIN1	Data1 Input	Control data1 input
6	GND	Ground	Data & Power Grounding
7	DIN2	Data1 Input	Control data2 input
8	VDD	Power Voltage	IC power supply

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

Parameter	Symbol	Ratings	Unit
Logical Power Supply Voltage	V_{DD}	+3.5~+5.8	V
Logical Input Voltage	V_I	-0.7～VDD+0.7	V
R/G/B Channel Output Port Withstand Voltage	Vout	20	V
Operation Temperature	Topt	-25～+85	℃
Storage Temperature Range	Tstg	-40~+150	℃

Electrical parameters (T_A=-20～+70℃，V_{DD}=4.5～5.5V，V_{SS}=0V)

Parameter	Symbol	Min	Tpy	Max	Unit	Conditions
Quiescent current	Io	——	0.35	——	mA	DC=5V
R、G、B Low-level output current	I_{OL}	14.5	16.0	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}	0.5V_{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=-20～+70℃，V_{DD}=4.5～5.5V，V_{SS}=0V)

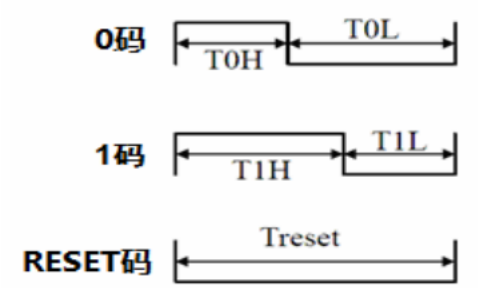
Parameter	Symbol	Min	Tpy	Max	Unit	Condition
Transmission delay time	t_{PLZ}	——	——	300	ns	CL=15pF, DIN→DOUT, RL=10KΩ
Fall time	t_{THZ}	——	——	120	μs	CL=300pF, OUTR/OUTG/OUTB
Data transmission rate	F_{MAX}	600	——	——	Kbps	Occupancy Ratio 50%
Input capacity	C_I	——	——	15	pF	——

Data Transmission Time

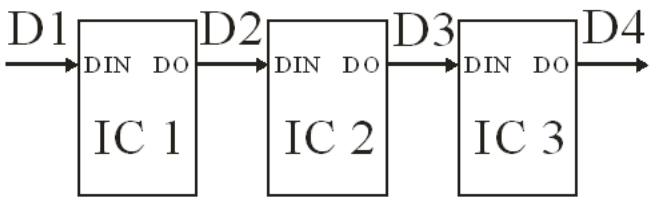
T0H	0 code, high level duration	220ns~380ns
T1H	1 code, high level duration	580ns~1us
T0L	0 code, low-level duration	580ns~1us
T1L	1 code, low-level duration	580ns~1us
RES	Frame unit, low-level duration	>280 μs
T_{DATA}	Data cycle	T_{DATA}

Timing Waveform Chart

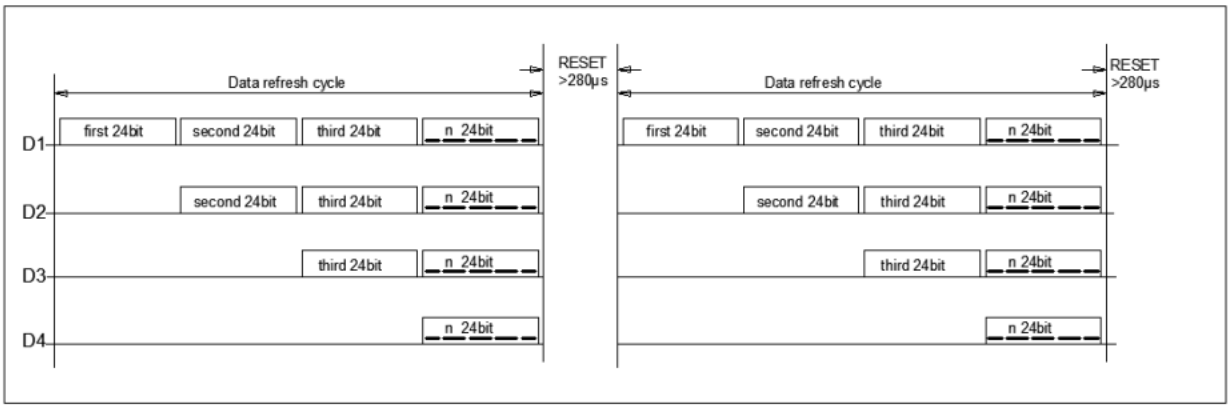
Sequence Chart



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

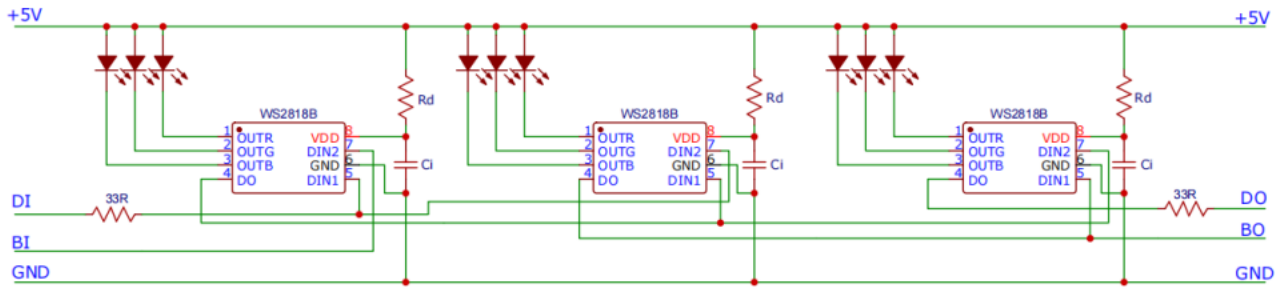
R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0

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

Typical Application Circuit

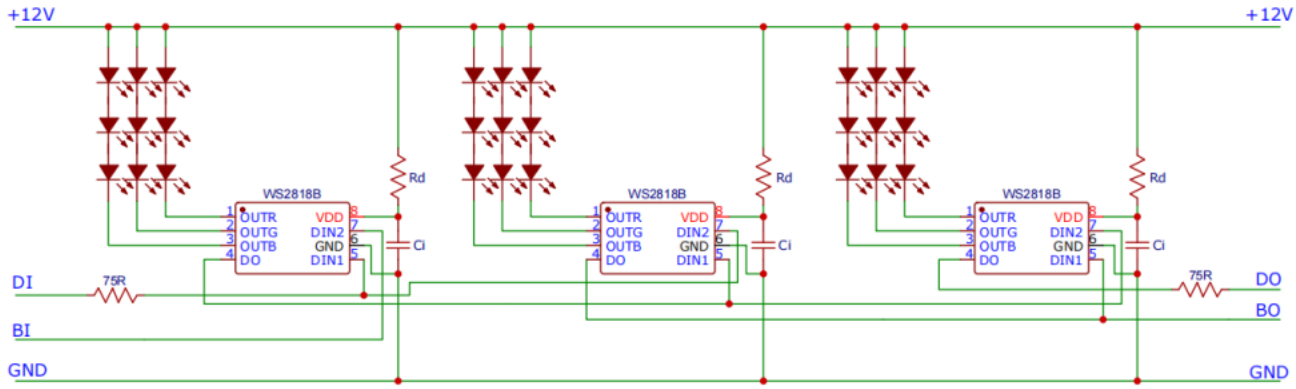
1. Supply voltage=5V, 1 LED for each channel

The recommended value for Rd is 150 R, and the recommended value for Ci is 1 μF.



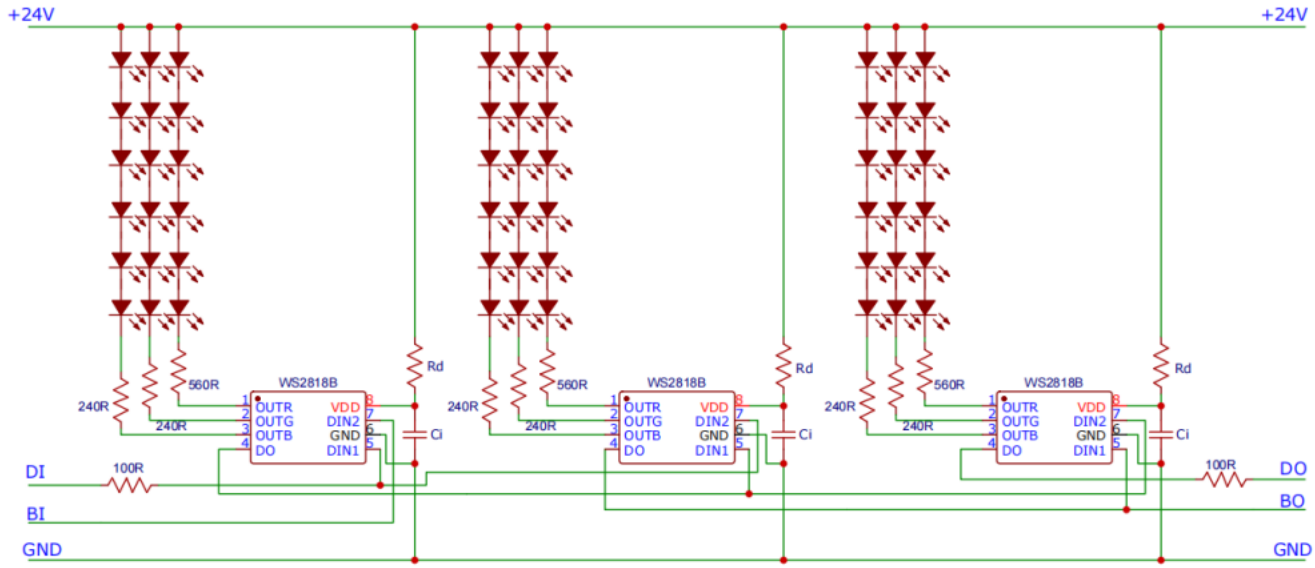
2. Supply voltage=12V, 3 LED for each channel

The recommended values are 3.3 k for Rd and 1 μF for Ci.



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

The recommended value for Rd is 7.5 k, and the recommended value for Ci is 1 μF.



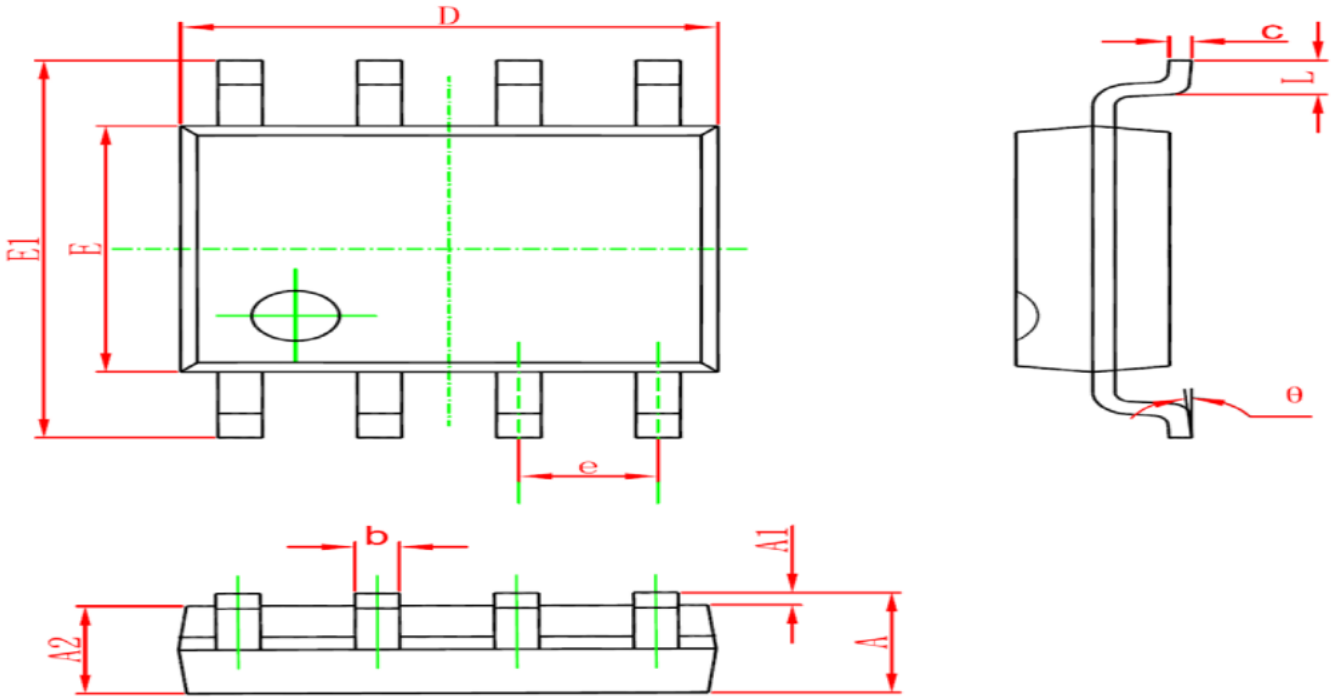
Remark:

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.

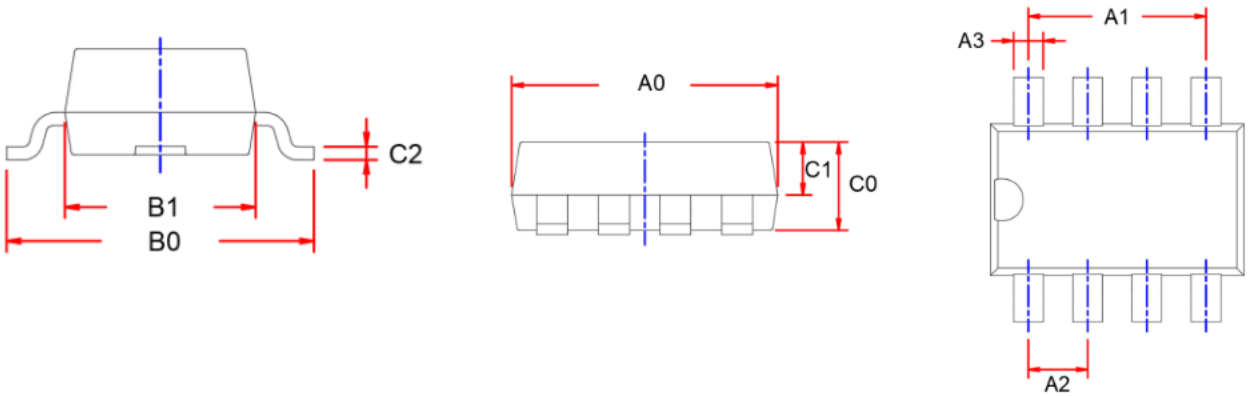
Package information

- **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°

- **SOT23-8 Package**



Dimension Position	Position Name	Typical size(mm)
A0	Total length	3.25
A1	Total PIN distance	2.40
A2	Single PIN distance	0.80
A3	PIN Width	0.35
B0	Total Width	2.85
B1	Colloid width	1.65
C0	Colloid height	1.00
C1	Bonding wire height	0.55
C2	PIN thickness	0.15

Modify Records

Version №	Status Bar	Modify Content Summary	Date	Reviser	Approved
V1.0	N	New	20170523	Shen JinGuo	Yin Huaping
V1.1	M	Maximum rated value	20171010	Shen JinGuo	Yin Huaping
V1.2	M	Modify the logic input voltage range, modify the T1L time, and modify the electrical parameter description	2018-2-7	Shen JinGuo	Yin Huaping
V1.3	M	Modify the RGB port withstand voltage and add a 24V application	2019-9-6	Shen JinGuo	Yin Huaping
V1.4	M	Modify description	20210401	Shen JinGuo	Yin HuaPing
V1.5	M	Remove the CPC8 package and add the FSOP8 package	20221027	Yu XingHui	Yin HuaPing
V2.0	M	Optimize the internal chip	20230923	Hu Jin	Yin HuaPing
V2.1	A	Add application circuits; Add a description of static current; Update the output current	20250418	Chen YongZhao	Yin Huaping
V2.2	M	Optimize the application circuit	20250822	Chen YongZhao	Yin Huaping
V2.3	M	Update Logo	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.