

Feature

- OUTR, G, B, W1, W2 port withstand voltage 20V, DIN&DOUT port withstand voltage 24V.
- Built-in voltage-regulator tube, only a resistance needed to add to IC VDD feet when under 24V power supply.
- With built-in resistors, DIN and DOUT ports are over-voltage protected, and a short connection of 24V will not burn out.
- 256 Gray-scale adjustable and 4 KHz scanning frequency.
- 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.
- Cascading port transmission signal by single line.
- Any two point the distance less than five meters' transmission signal without any increase circuit.
- 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.
- Other consumer electronics.
- Other Various LED Lighting Products.

General description

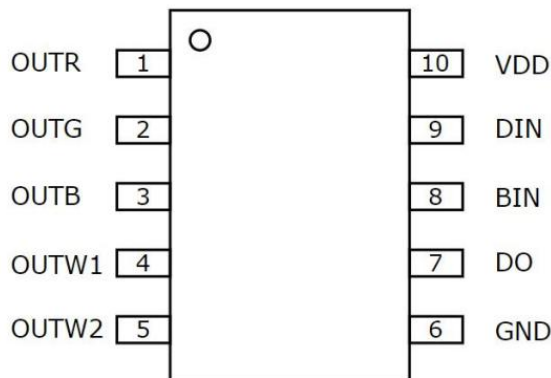
WS2805 is 5 output channels specially for LED driver circuit. Its internal includes intelligent digital port data latch and signal reshaping amplification drive circuit. Also include a precision internal oscillator and a 20V voltage programmable constant current output drive. Also to reduce power ripple, the OUTR, G, B, W1, and W2 channels have delayed on function to reduce the circuit ripple during frame refresh.

IC use single NZR communication mode. After the chip power-on reset, the DIN1 port receive data from controller, the first IC collect initial 40bit 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 40bit. 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 40bit data produce different duty ratio signal at OUTR, G,B,W1,W2 ports. All chip synchronous send the received data to each segment when the DIN1 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,G,B,W1,W2 port unchanged. IC sent PWM data that received justly to OUTR,G,B,W1,W2 ports, after receive a low voltage reset signal the time retain over **280μs**.

SOP10 package is available.

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	OUTW1	LED Driver Output	Output of WHITE1 PWM control
5	OUTW2	LED Driver Output	Output of WHITE2 PWM control
6	GND	Ground	Data & Power Grounding
7	DOUT	Data Output	Display data cascade output
8	BIN	Backup data input	Backup data input
9	DIN	Data Input	Display data input
10	VDD	Logic Power Supply	IC power supply

Absolute Maximum Ratings (T_A=25°C, V_{SS}=0V)

Parameter	Symbol	Ratings	Unit
Power Supply Voltage	V _{DD}	+3.5~+5.7	V
R/G/B/W1/W2 Channel Output Port Withstand Voltage	V _{OUT}	20	V
Logical Input Voltage	V _I	V _{DD} -0.7 ~ V _{DD} +0.7	V
Operation Temperature	T _{opt}	-40 ~ +85	°C
Storage Temperature Range	T _{stg}	-40~105	°C

Single line 256 Gray level 5-channel Constant current LED driver IC

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

Parameter	Symbol	Min	Tpy	Max	Unit	Conditions
Quiescent current	I_o	—	0.6	—	mA	DC=5V
R/G/B/W Low voltage output current	I_{OL}	14.5	16	17.5	mA	DC=5V, DIN (FFH)
Low voltage output current	I_{dout}	10	—	—	mA	$V_o = 0.4\text{V}$, D_{OUT}
Input current	I_I	—	—	± 1	μA	$V_I = V_{DD}/V_{SS}$
Input voltage level	V_{IH}	$0.7V_{DD}$	—	—	V	D_{IN}
	V_{IL}	—	—	$0.3 V_{DD}$	V	D_{IN}
Hysteresis voltage	V_H	—	0.35	—	V	D_{IN}

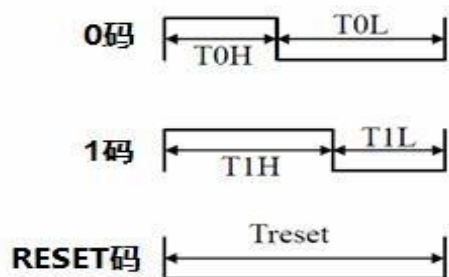
Switching characteristics ($T_A = -20 \sim +70^{\circ}\text{C}$, $V_{DD} = 4.5 \sim 5.5\text{V}$, $V_{SS} = 0\text{V}$, unless otherwise specified)

Parameter	Symbol	Min	Tpy	Max	Unit	Condition
Oscillation frequency	F_{OSC}	—	800	—	KHz	—
Transmission delay time	T_{PLZ}	—	—	300	ns	$CL = 15\text{pF}$, $DIN \rightarrow DOUT$, $RL = 10\text{K}\Omega$
Fall time	T_{THZ}	—	—	120	μs	$CL = 300\text{pF}$, $OUTR/OUTG/OUTB$
Data transmission rate	F_{MAX}	600	—	—	Kbps	Duty ratio 50%
Input capacity	C_I	—	—	15	pF	—

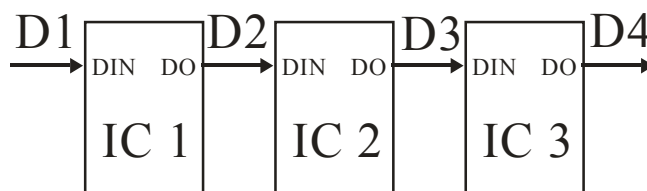
Data Transfer Time

T0H	0 code, high voltage time	220ns~380ns
T1H	1 code, high voltage time	580ns~1 μs
T0L	0 code, low voltage time	580ns~1 μs
T1L	1 code, low voltage time	580ns~1 μs
RES	Frame unit, low voltage time	>280 μs
T _{DATA}	Data cycle (TH+TL)	$\geq 1.25\mu\text{s}$

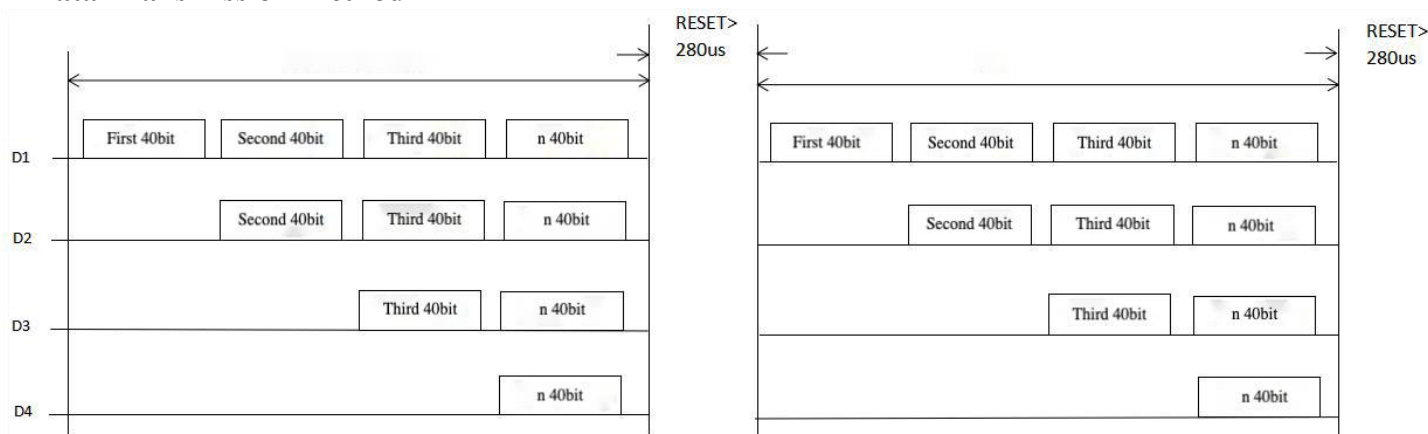
Timing Waveform Diagram Sequence Chart



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 40bit Data

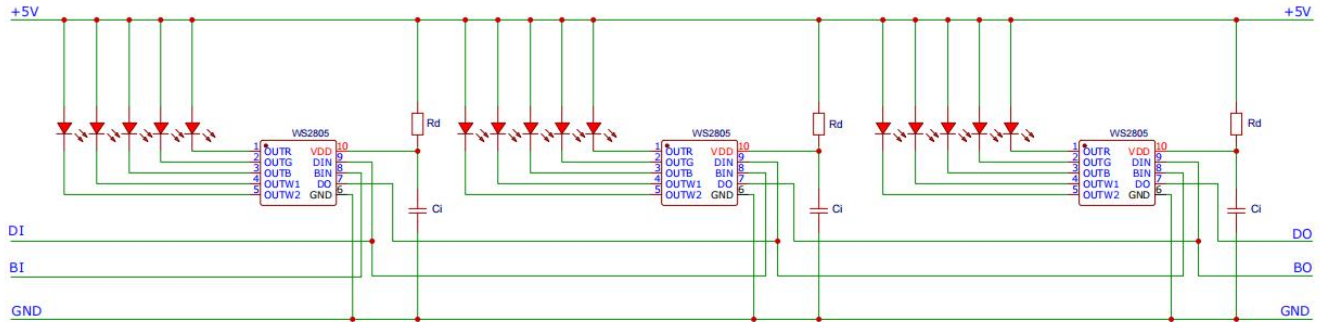
R7	R6	R5	R4	R3	R2	R2	R0	G7	G6	G5	G4	G3	G2	G1	G0	
.....	B7	B6	B5	B4	B3	B2	B1	B0	W17	W16	W15	W14	W13	W12	W11	W10
.....	W27	W26	W25	W24	W23	W22	W21	W20									

Note: Data transmit in order of RGBW₁W₂, high bit data at first.

Recommended Application Circuit

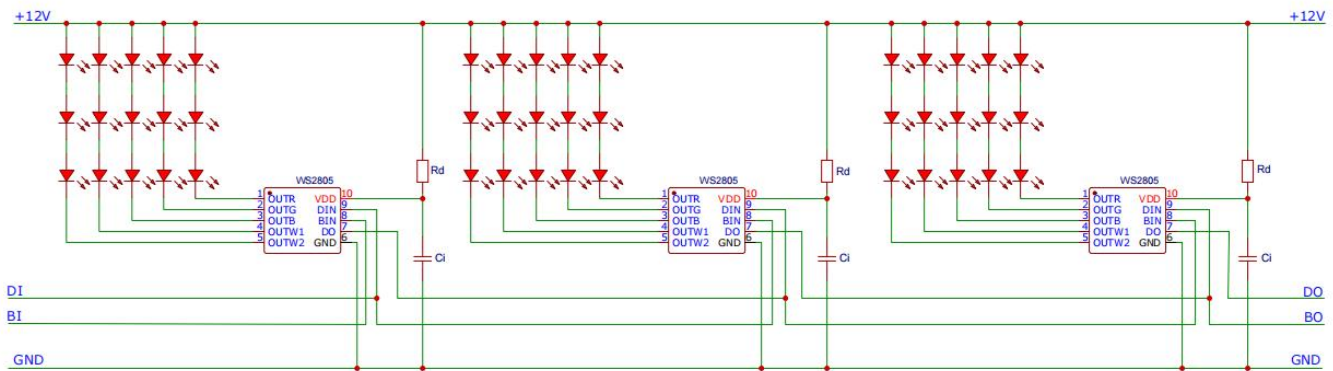
1. Supply voltage=5V (1 LED for each channel)

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



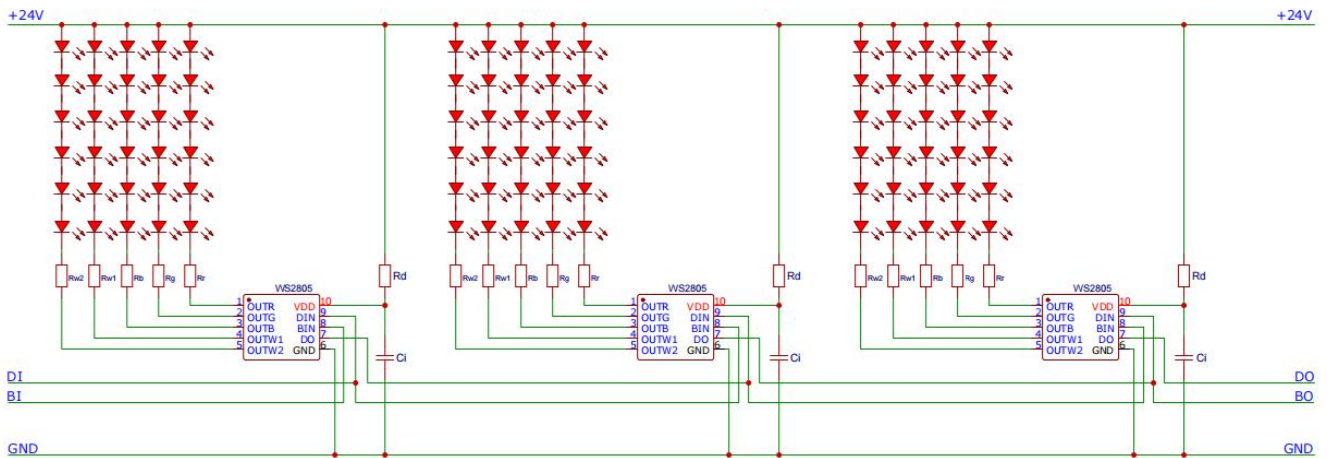
2. Supply voltage=12V (3 LED for each channel)

The recommended value of R_d is 4.7K, the recommended value of C_i is 1uF.



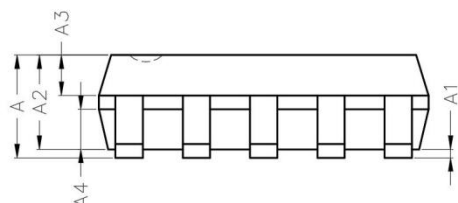
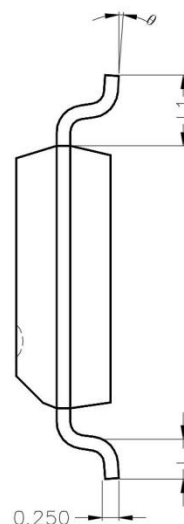
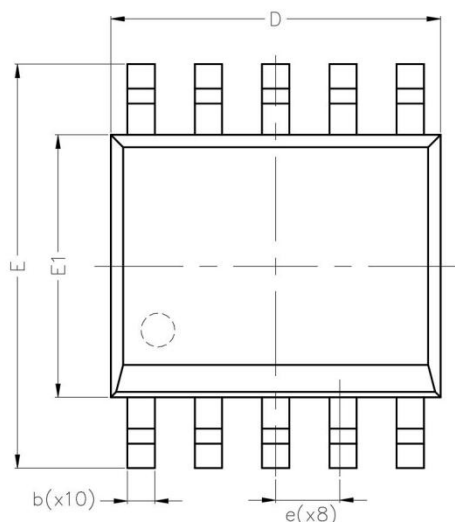
3. Supply voltage=24V (6 LED for each channel)

The recommended value of R_d is 10K, the recommended value of C_i is 1uF.



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	20230719	Hu Jin	Yin HuaPing
V1.1	M	Current adjustment	20231013	Hu Jin	Yin HuaPing
V1.2	M	Detailed parameters modified	20240305	Chen YongZhao	Yin HuaPing
V.3	A	Add recommended application circuit	20240904	OuYang Yu	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.