

Main Features

- OUTR、G、B、W1、W2 ports compression 35V. DOUT、DIN port withstand voltage 24V
- Built-in voltage-regulator tube, only a resistor needed in series to VDD, no need external regulator.
- Built-in resistors, DIN&DOUT have over voltage protection. Instantaneous short-circuiting to 24V won't cause damage.
- Gray-scale adjustment circuit (65,536 levels gray-scale adjustable).
- Built-in signal shaping circuit. After receiving signal, any IC will shape the waveform before outputting it, ensuring that waveform distortion does not accumulate along the circuit.
- Built-in power-on reset and power-off reset circuits.
- The PWM control terminal can achieve 65,536 levels adjustment, The scanning frequency is 4KHz.
- Serial interface and cascading interface, capable of receiving and decoding data through a single signal line.
- Any two pixel's distance less than 4 Meters' transmission signal without any increase circuit.
- When the refresh rate is 30fps, the cascading number is no less than 400 pixels.
- The data transmission speed can reach 800Kbps.

Main Applications

- Full-color LED decorative lighting, such as LED strings, LED strips, LED modules, etc.
- Indoor/outdoor LED video or irregular screens.
- LED consumer electronic products.
- Various LED lighting products.

General description

WS2915 is a dedicated circuit for five-channel LED drive control. The chip contains intelligent digital interface, data latch, signal shaping, and amplification, as well as an internal oscillator and a 20V high-voltage programmable constant current output driver. To reduce power supply ripple, OUTR, G, B, W1, W2 channels have a delayed turn-on function. During frame refreshing, it can reduce circuit ripple.

IC use single NZR communication mode. After the chip power-on reset, the DIN port receive data from controller, the first IC collect initial **80 bits** 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. With each chip transmission, the signal reduces by **80bits**. 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 IC generates different duty cycle control signals at the OUTR, OUTG, OUTB, OUTW1, OUTW2 control terminals based on the received **80-bit** data. When the DIN terminal receives the RESET signal, all chips synchronously send the received data to each segment. IC will receive the data after the signal ends and forward the data through the DO port. Before receiving the RESET code, the OUTR, OUTG, OUTB, OUTW1, OUTW2 pins of the chip maintain the original output. When receiving a **RESET** code more than **280μs**, the chip will output the **80-bit** PWM data pulse width to the OUTR, OUTG, OUTB, OUTW1, OUTW2 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	OUTW1	LED Driver Output	Output of WHITE W1 PWM control
5	OUTW2	LED Driver Output	Output of WHITE W2 PWM control
6	GND	Ground	Data & Power Grounding
7	DO	DO	Data Output
8	SET	Set Pin	NC = 5 channels Grounding: 4 channels, when W1 and W2 are connected in parallel, it can reach 120mA
9	DIN	Data Input	Control data input
10	VDD	Power Voltage	IC power supply

Single line 65536 Gray level 5 channel Constant current LED driver IC

Absolute Maximum Ratings ($T_A=25^{\circ}\text{C}$, $V_{SS}=0\text{V}$)

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}	$V_{SS}-0.7\sim 35$	V
DIN Logical Input Voltage	V_I	$V_{SS}-0.7\sim 24$	V
DOUT Logical Input Voltage	V_O	$V_{SS}-0.7\sim 24$	V
Working Temperature	T_{opt}	-40~+85	$^{\circ}\text{C}$
Storage Temperature Range	T_{stg}	-40~+105	$^{\circ}\text{C}$

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
Static current	I_O	—	0.3	—	mA	DC=5V
R、G、B Low voltage output current	I_{OL}	—	30	—	mA	DC=5V, DIN(FFH)
W1、W2 Parallel connection low voltage output current	I_{OL}	—	60	—	mA	DC=5V, DIN(FFH)
Single RGBW current difference	Dif	—	—	1.2	mA	DC=5V, DIN
Low voltage output current	I_{dout}	10	—	—	mA	$V_O=0.4\text{V}$, D_{OUT}
Input current	I_I	—	—	± 1	μA	$V_I=V_{DD}/V_{SS}$
High voltage input	V_{IH}	$0.55V_{DD}$	—	—	V	D_{IN}
Low voltage input	V_{IL}	—	—	$0.3 V_{DD}$	V	D_{IN}
Hysteresis voltage	V_H	—	0.35	—	V	D_{IN}

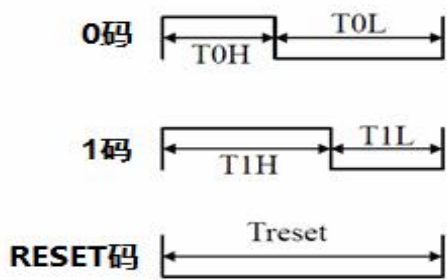
Switching characteristics ($T_A=25^{\circ}\text{C}$, $V_{DD}=4.5\sim 5.5\text{V}$, $V_{SS}=0\text{V}$)

Parameter	Symbol	Min	Tpy	Max	Unit	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	Pulse width ratio: 50%
Input capacity	C_I	—	—	15	pF	—

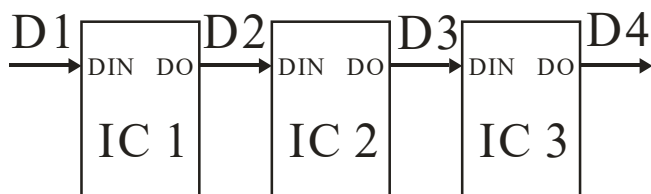
Data Transfer Time

T0H	0 code, high voltage time	220ns~380ns
T1H	1 code, high voltage time	580ns~1us
T0L	0 code, low voltage time	580ns~1us
T1L	1 code, low voltage time	580ns~1us
RES	Frame unit, low voltage time	>280μs
T0H+T0L, T1H+T1L ≥ 1.25μs		

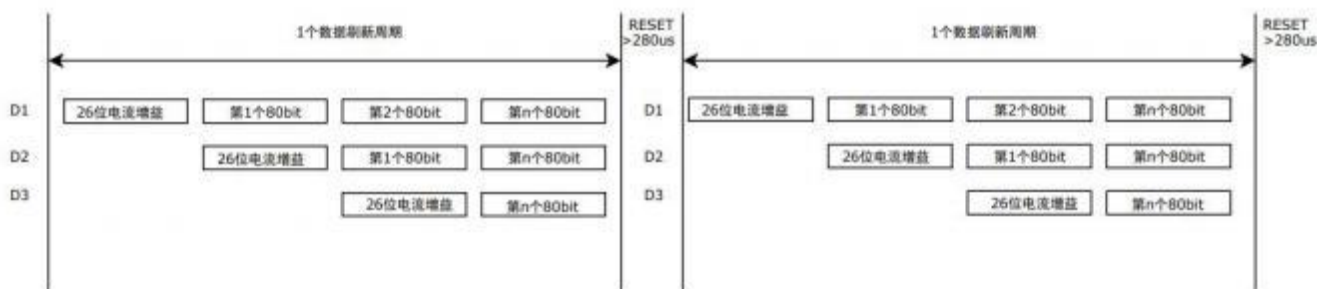
Sequence Chart



Cascade Method



Data Transmission Method



Note: D1 represents the data sent by the MCU end, while D2, D3, D4 are the data automatically processed and forwarded by the cascaded circuit.

26-bit current gain data structure

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

IR	IR	IR	IR	IR	IG	IG	IG	IG	IG	IB	IB	IB	IB	IB	IW1	IW1	IW1	IW1	IW1	
4	3	2	1	0	4	3	2	1	0	4	3	2	1	0	4	3	2	1	0	
....	Connected	IW2	IW2	IW2	IW2	IW2	check digit													
		4	3	2	1	0														

Note: To verify the numbers, please send "1".

Composition of 80bit data

R15	R14	R13	R12	R11	R10	R9	R8	R7	R6	R5	R4	R3	R2	R1	R0	...Connected...
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...Connected...	G15	G14	G13	G12	G11	G10	G9	G8	G7	G6	G5	G4	G3	G2	G1	G0	...Connected...
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...Connected...	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0	...Connected...
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IW1	IW1	IW1	IW1	IW1	IW1	IW1	IW1	IW1	IW1	IW1	IW1	IW1	IW1	IW1	IW1	...Connected...
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	

IW2	IW2	IW2	IW2	IW2	IW2	IW2	IW2	IW2	IW2	IW2	IW2	IW2	IW2	IW2	IW2
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

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

Typical Application Circuit

1. Power supply voltage $VCC = 5V$ (each channel with 1 LED):

The recommended values for RV and CV are 150R and 0.1uF respectively.

WS2915 is compatible with the earlier 5V WS2805 application circuit and can operate normally at 100R.

2. Power supply voltage $VCC = 12V$ (each channel with 3 LEDs):

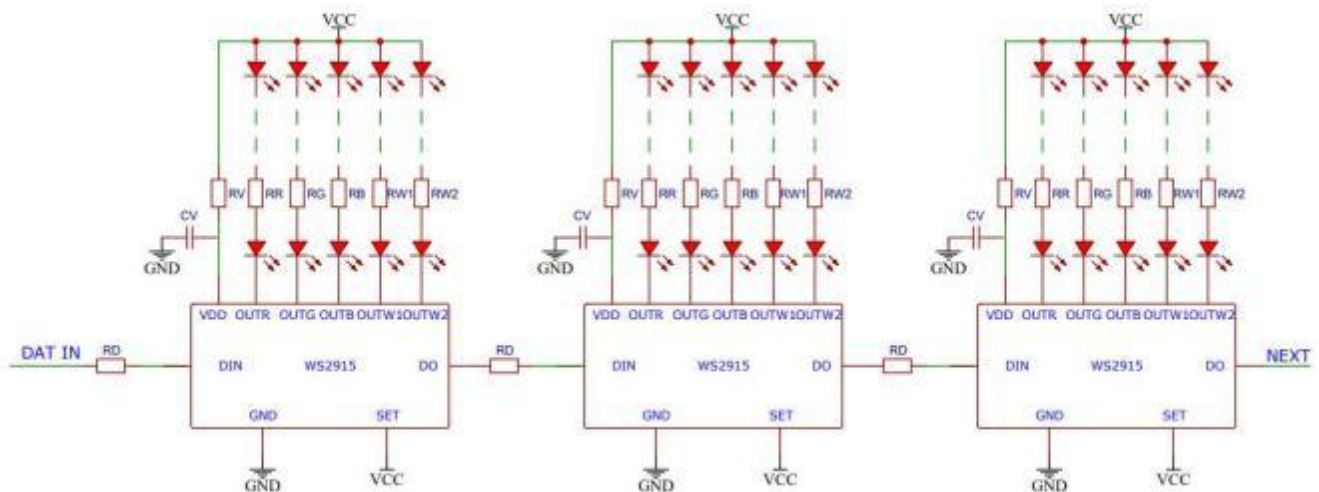
The recommended values for RV and CV are 4.7k and 0.1uF respectively.

WS2915 is compatible with the earlier 12V WS2805 application circuit and can operate normally at 2.7k.

3. Power supply voltage $VCC = 24V$ (each channel with 6 LEDs):

The recommended values for RV and CV are 10k and 0.1uF respectively. WS2915 is compatible with the earlier 24V WS2805 application circuit and can operate normally at 7.5k.

WS2915 Application Circuit



Note: The W1W2 two channels can be short-circuited for use. After short-circuiting, the current will be 120mA. The currents of the other un-short-circuited channels will remain unchanged.

Package information

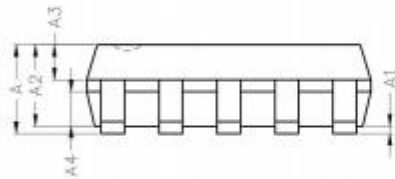
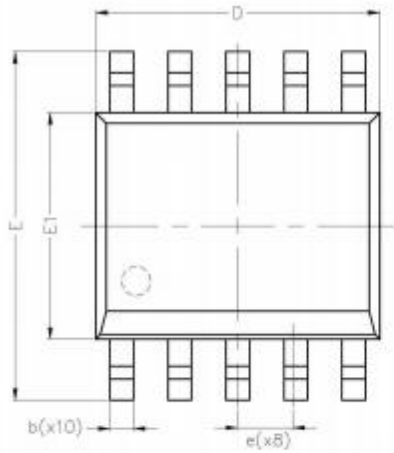
- SOP10 Package



Worldsemi

WS2915

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	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
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WS2915

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V1.0	N	New	20240801	He WenBin	Yin HuaPing
V1.1	M	Revise parameters	20241212	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.