



WS2814F

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.

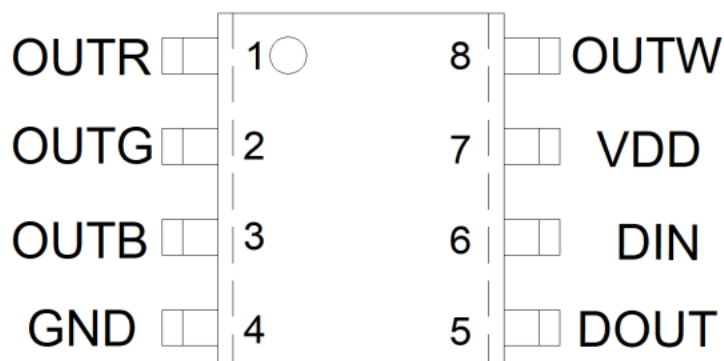
Product Overview

The **WS2814F** 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 40V 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 **32-bit** 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 **32-bit**. 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	DO	Data Output
6	DIN	Data Input	Control data input
7	VDD	Backup signal input	Backup signal input
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,W output ports withstand voltage	Vout	40	V
Working temperature	Topt	-40~+85	°C
Storage temperature	Tstg	-40~+150	°C
Electrostatic Resistance	ESD	≥2.5	KV

Electrical parameters (TA = 25°C, VDD=4.5 ~ 5.5V, VSS = 0 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 =0.4V, 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 (TA = 25°C, VDD=4.5 ~ 5.5V, VSS = 0 V)

Parameter	Symbol	Min	Tpy	Max	Unit	Condition
Oscillation frequency	F _{osc}	—	800	—	KHz	—
Transmission delay time	t _{PLZ}	—	—	300	ns	CL=15pF, DIN→DOUT, RL=10KΩ
Fall time	t _{THZ}	—	—	120	μs	CL=300pF, OUTR/OUTG/OUTB/OUTW
Data transmission rate	F _{MAX}	600	—	—	Kbps	占空比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	≥ 1.25us



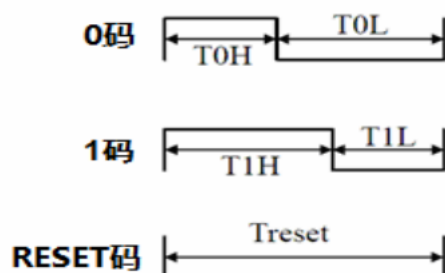
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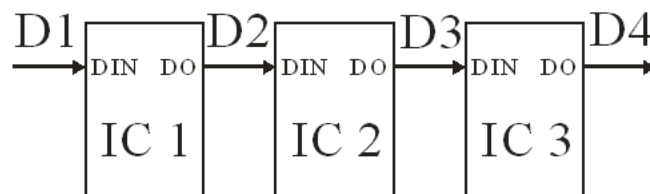
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Timing Waveform Chart

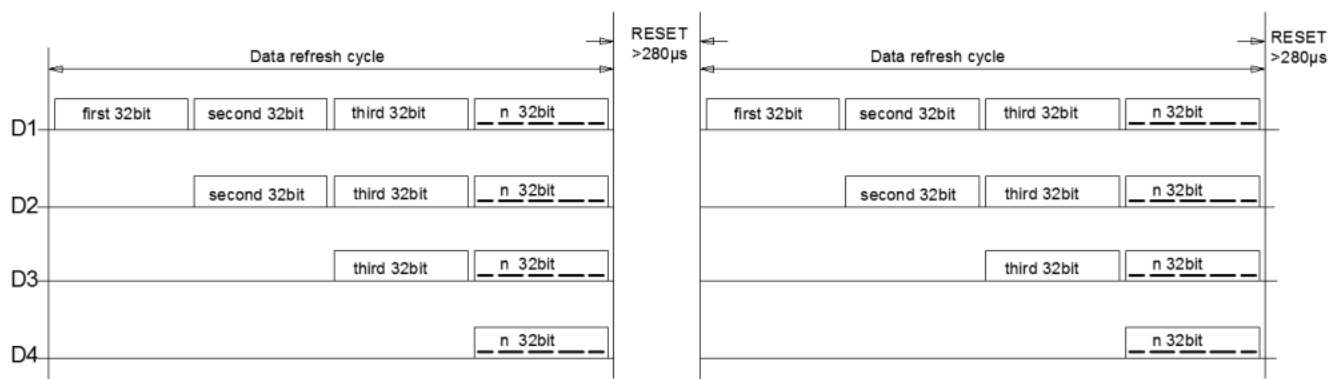
Sequence Chart



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.

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.



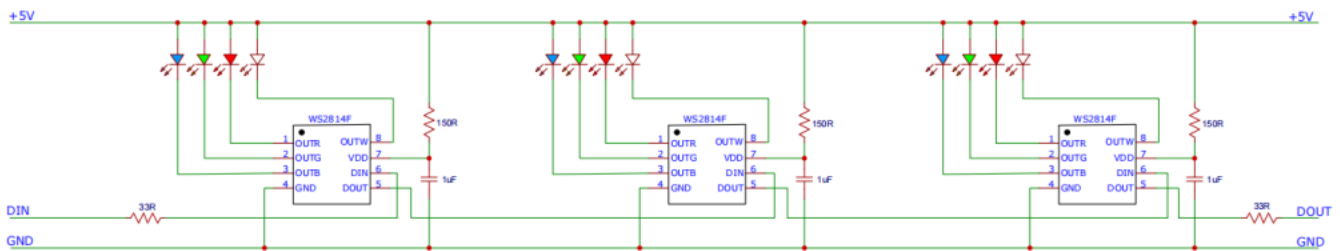
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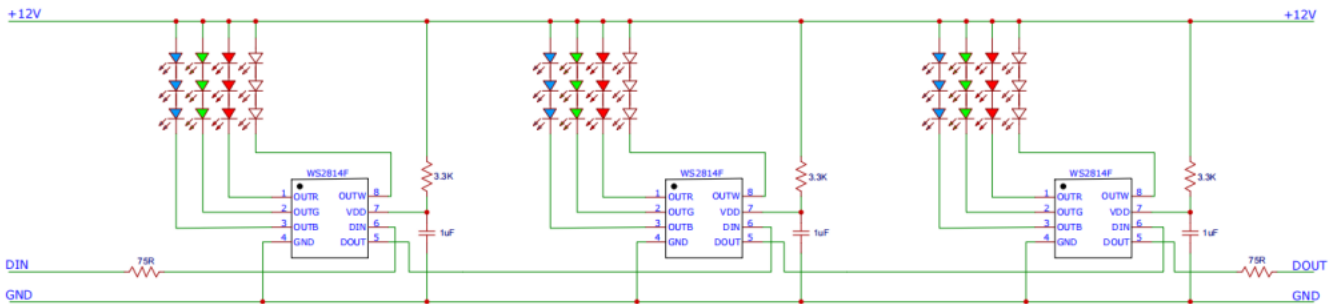
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Typical Application Circuit

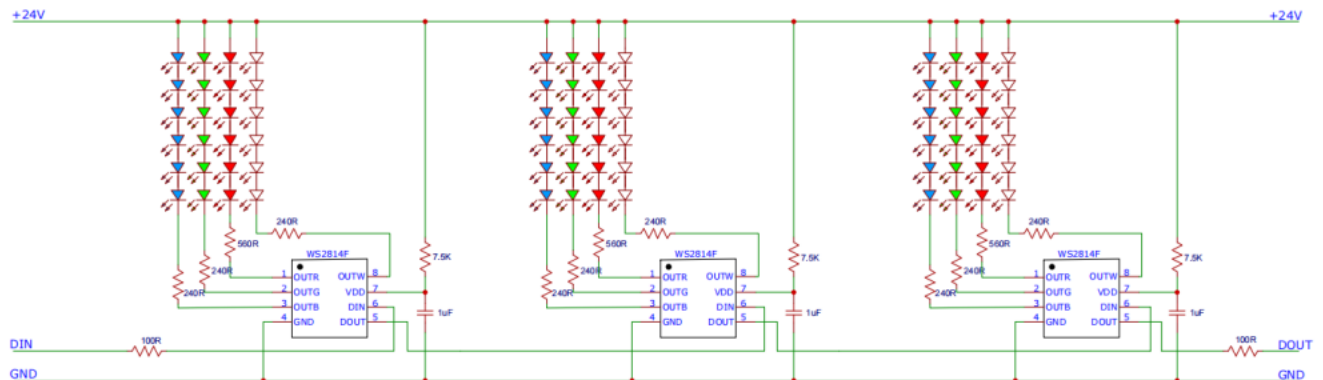
1. Supply voltage=5V, 1 LED for each channel



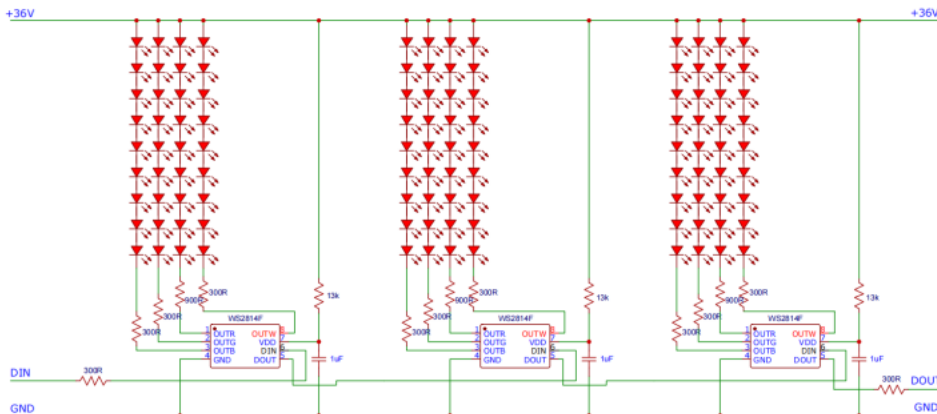
2. Supply voltage=12V, 3 LED for each channel



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



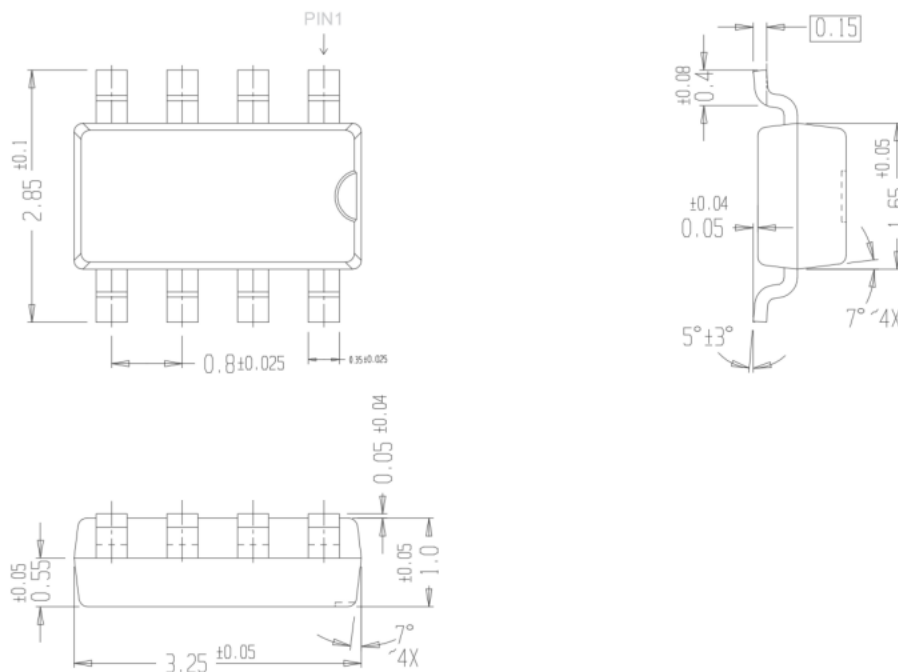
4. Supply voltage=36V, 9 LED for each channel



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

- SOT23-8 package



Modify Records

Version №	Status Bar	Modify Content Summary	Date	Reviser	Approved
V1.0	N	New	20221027	Hu Jin	Shen JinGuo
V1.1	M	Modify PIN configuration	20230328	Hu Jin	Shen JinGuo
V1.2	M	Update the port current description	20240624	He WenBin	Chen YongZhao
V1.3	M	Correction of detailed parameters	20250806	Chen YongZhao	Shen JinGuo
V2.0	M	LED Driver IC upgrade	20260320	Chen YongZhao	Shen JinGuo
V2.1	M	Update LOGO,Format adjustment	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.