# WS2811

## Signal line 256 Gray level 3 channel Constant current LED driver IC

### Feature

- Output port compression 20V.
- Built-in voltage-regulator tube, only a resistance needed to add to IC VDD feet when under 24V power supply.
- 256 Gray-scale adjustable and scan frequency is more than **2KHz**.
- 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 5 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.
- LED consumer electronics.

### General description

The WS2811 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 12V voltage programmable constant current output drive. In the purpose of reduce power supply ripple, the 3 output channels designed to delay turn-on function.

IC use single NZR communication mode. 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 to 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 of IC depend on the received 24bit data produce different duty ratio signal at OUTR, OUTG, OUTB port. All chip synchronous send the received data to each segment when the DIN 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 ,OUTG, OUTB port unchanged. IC sent PWM data that received justly to OUTR, OUTG, OUTB port, after receive a low voltage reset signal the time retain over **280μs**.

We offer TWO package SOP8 and MSOP8.

## PIN configuration
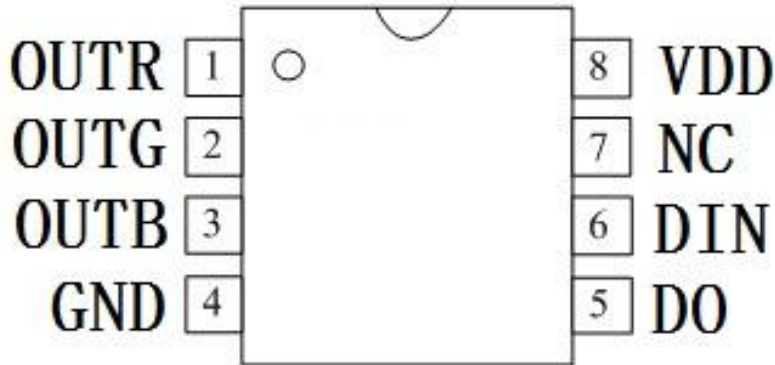


## PIN function

| 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 | DO | DO | Data Output |
| 6 | DIN | Data Input | Control data input |
| 7 | NC | NC | NC |
| 8 | VDD | Power Voltage | IC power supply |

## Absolute Maximum Ratings ($T_A$=25℃, $V_{SS}$=0V, unless otherwise noted.)

| Parameter | Symbol | Ratings | Unit |
|---|---|---|---|
| Power Supply Voltage | $V_{DD}$ | +3.5~+5.5 | V |
| R/G/B Channel Output Port Withstand Voltage | Vout | 20 | V |
| Logical Input Voltage | $V_I$ | VDD-0.7～VDD+0.7 | V |
| Operation Temperature | Topt | -25～+85 | ℃ |
| Storage Temperature Range | Tstg | -40~150 | ℃ |

Note: If the voltage on the pins exceeds the maximum ratings may cause permanent damage to the device.

**Electrical Characteristics (**$T_A$=-20～+70°C, $V_{DD}$=4.5～5.5V, $V_{SS}$=0V, unless otherwise specified**)**

| Parameter | Symbol | Min | Tpy | Max | Unit | Conditions |
|---|---|---|---|---|---|---|
| R/G/B Low voltage output current | $I_{OL}$ | 15.5 | 16.5 | 17.5 | mA | |
| Low voltage output current | $I_{dout}$ | 10 | —— | —— | mA | Vo=0.4V，$D_{OUT}$ |
| Input current | $I_I$ | —— | —— | ±1 | μA | $V_I$=$V_{DD}$/$V_{SS}$ |
| Input voltage level | $V_{IH}$ | 0.7$V_{DD}$ | —— | —— | V | $D_{IN}$，SET |
| | $V_{IL}$ | —— | —— | 0.3 $V_{DD}$ | V | $D_{IN}$，SET |
| Hysteresis voltage | $V_H$ | —— | 0.35 | —— | V | $D_{IN}$，SET |

**Switching characteristics (**$T_A$=-20～+70°C, $V_{DD}$=4.5～5.5V, $V_{SS}$=0V, unless otherwise specified**)**

| Parameter | Symbol | Min | Tpy | Max | Unit | Condition |
|---|---|---|---|---|---|---|
| Oscillation frequency | *Fosc* | —— | 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 |
| Data transmission rate | *$F_{MAX}$* | 600 | —— | —— | Kbps | Duty ratio 50% |
| Input capacity | $C_I$ | —— | —— | 15 | pF | —— |

**Data Transfer Time**

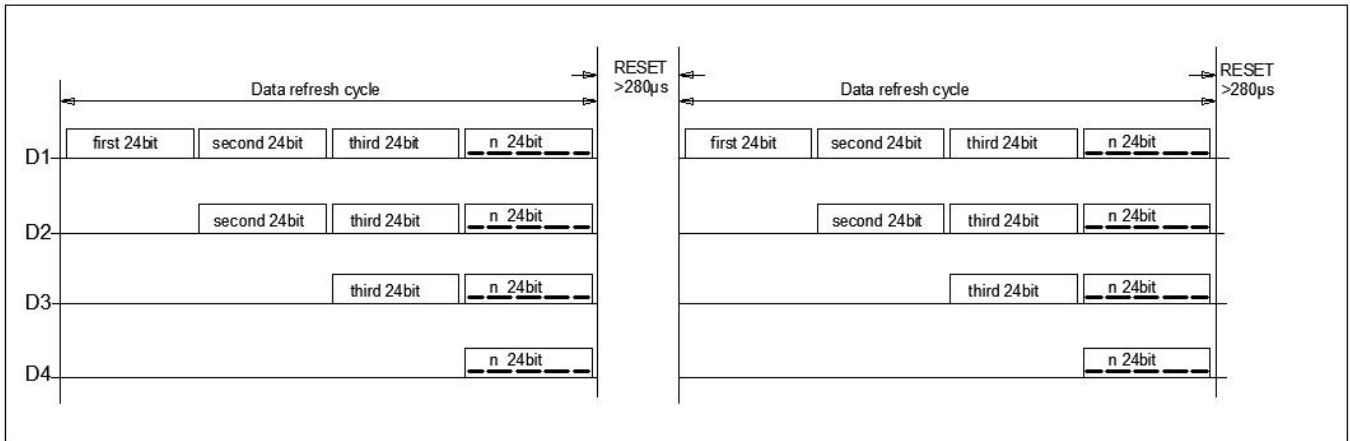| | | |
|---|---|---|
| T0H | 0 code, high voltage time | 220ns~380ns |
| T1H | 1 code, high voltage time | 580ns~1us |
| T0L | 0 code, low voltage time | 580ns~1us |
| T1L | 1 code, low voltage time | 580ns~1us |
| RES | Frame unit, low voltage time | >280μs |

## Sequence Chart
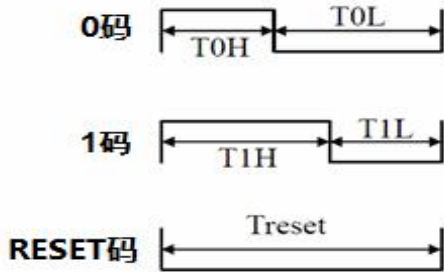


## Cascade Method
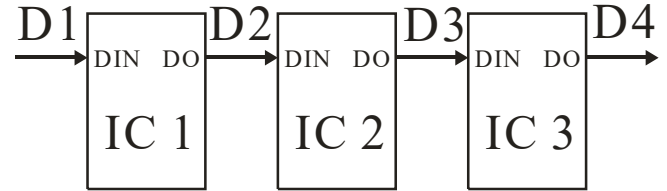


## Data Transmission Method



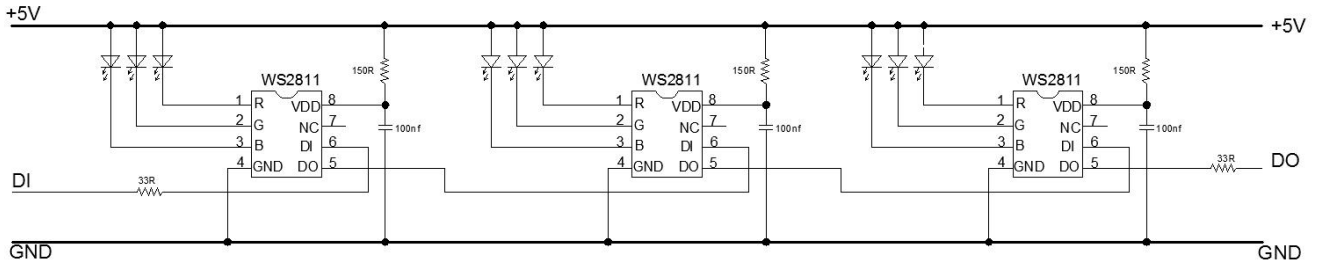Note: The data of D1 is send by MCU,and D2, D3, D4 through IC internal reshaping amplification to transmit.

## Composition of 24bit Data

| 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.

# WS2811
## Signal line 256 Gray level 3 channel
## Constant current LED driver IC
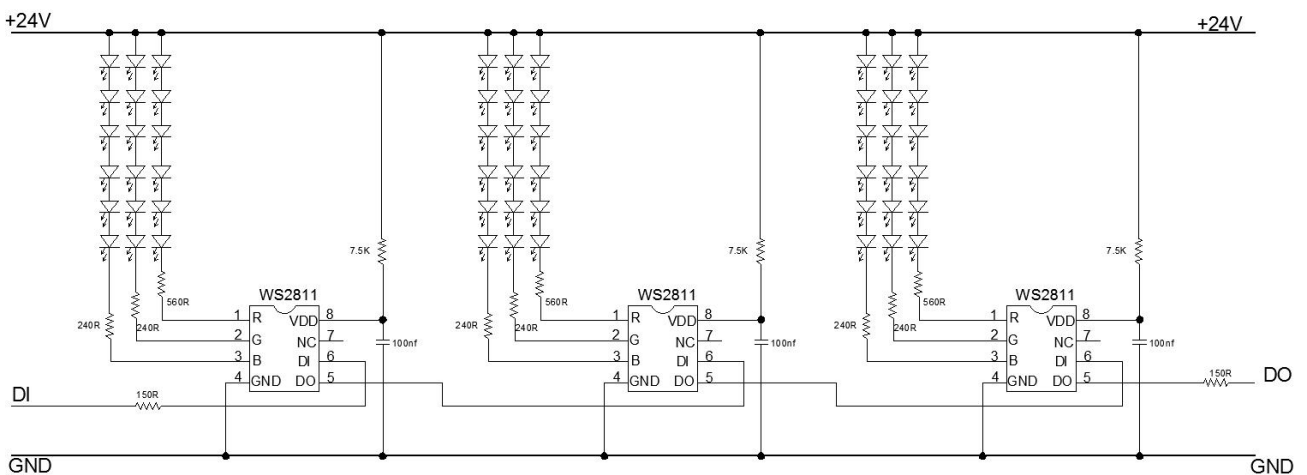
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## Typical Application Circuit

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

2. **Supply voltage=12V, 3 LED for each channel**
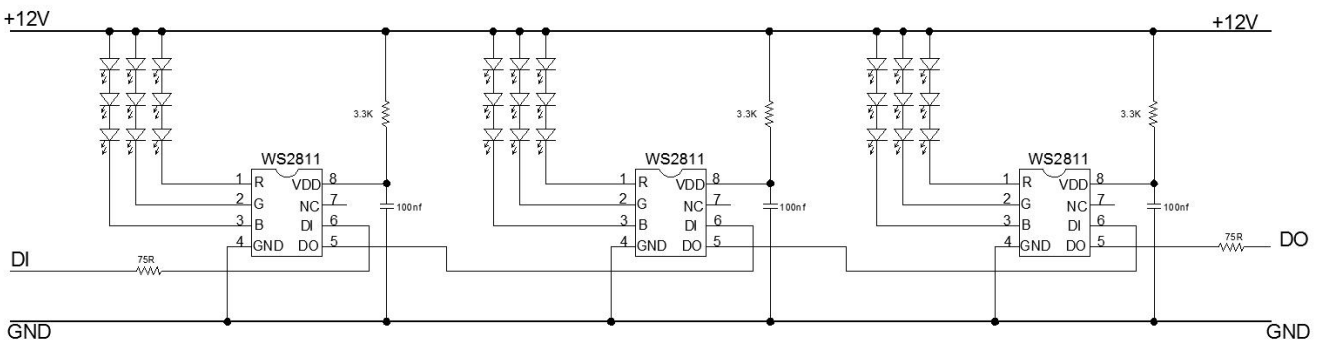
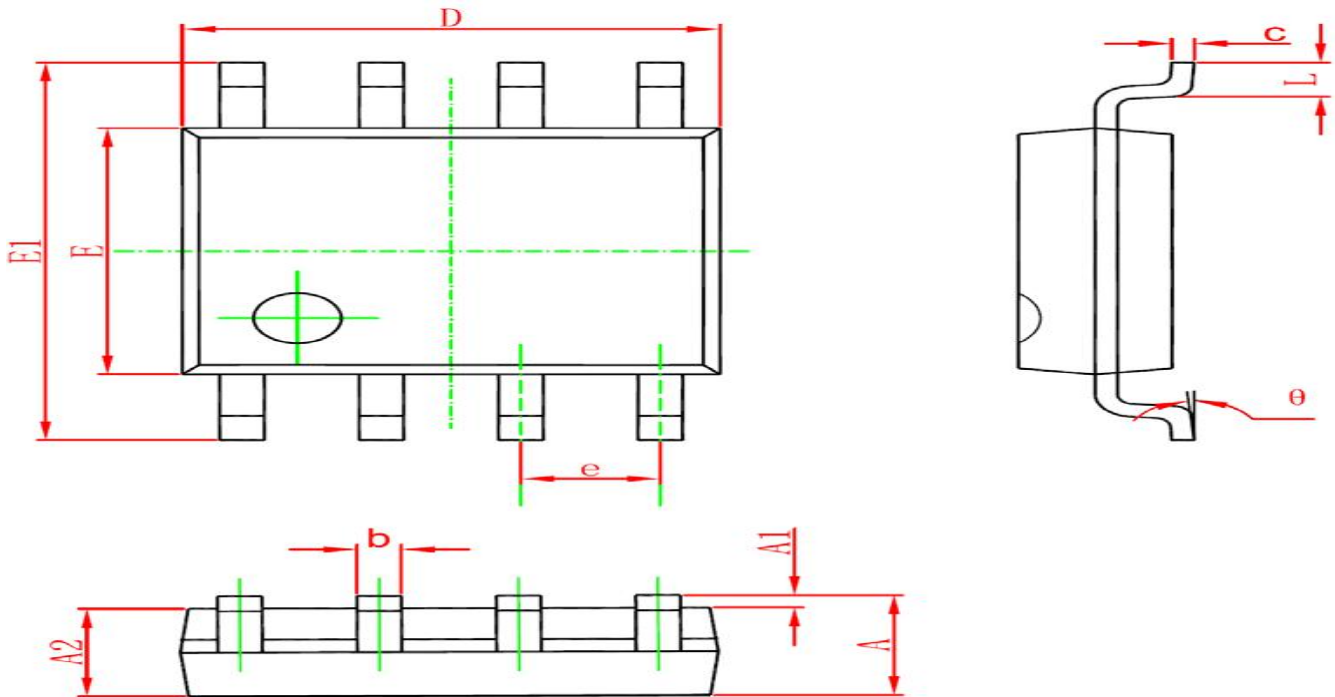3. **Supply voltage=24V, 6 LED for each channel**

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## Package information

- **SOP8 Package**



| 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 | 0º | 8º | 0º | 8º |

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● **MSOP8 Package**
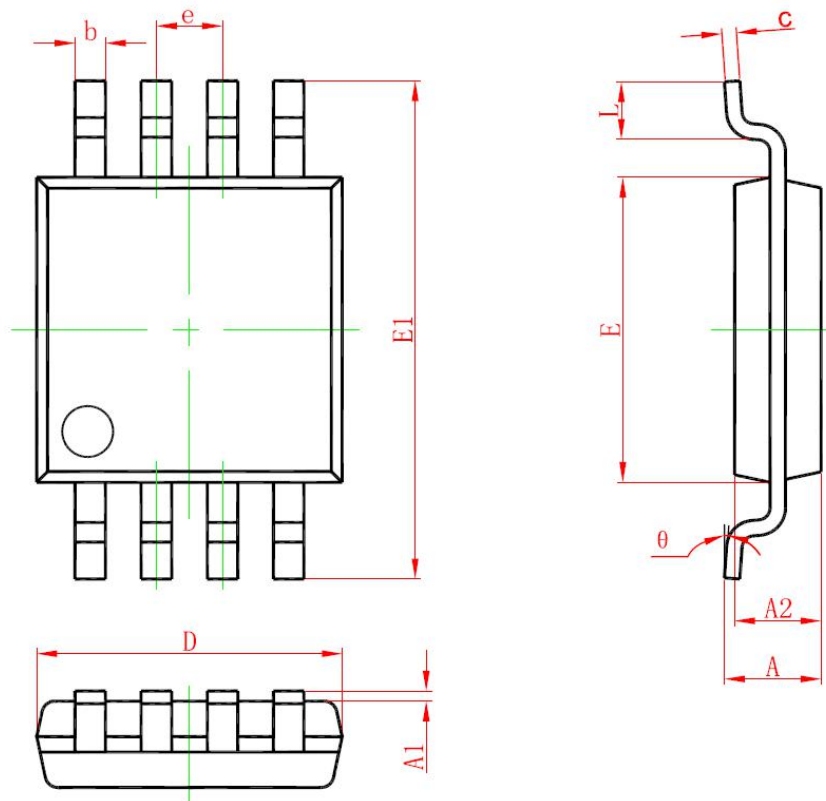


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|------|------|------|------|
| | Min | Max | Min | Max |
| A | 0.820 | 1.100 | 0.032 | 0.043 |
| A1 | 0.020 | 0.150 | 0.001 | 0.006 |
| A2 | 0.750 | 0.950 | 0.030 | 0.037 |
| b | 0.250 | 0.380 | 0.010 | 0.015 |
| c | 0.090 | 0.230 | 0.004 | 0.009 |
| D | 2.900 | 3.100 | 0.114 | 0.122 |
| e | 0.650(BSC) | | 0.026(BSC) | |
| E | 2.900 | 3.100 | 0.114 | 0.122 |
| E1 | 4.750 | 5.050 | 0.187 | 0.199 |
| L | 0.400 | 0.800 | 0.016 | 0.031 |
| θ | 0° | 6° | 0° | 6° |

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## Modify Records

| Version № | Status Bar | Modify Content Summary | Date | Reviser | Approved |
|---|---|---|---|---|---|
| V1.0 | N | New | 20170523 | Shen JinGuo | Yin HuaPing |
| V1.1 | M | Absolute Maximum Ratings | 20171009 | Shen JinGuo | Yin HuaPing |
| V1.2 | M | Switching characteristics | 20171108 | Shen JinGuo | Yin HuaPing |
| V1.3 | M | Maximum ratings, Data transfer time, Main feature, General description | 20182207 | Shen JinGuo | Yin HuaPing |
| V1.4 | M | Logical Input Voltage, T1L timing | 20180910 | Shen JinGuo | Yin HuaPing |
| V1.5 | M | Typical Application Circuit | 20190920 | Shen JinGuo | 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.

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