



WORLDSEMI CO., LIMITED

DIGITAL LED WS2812 Series Upgrade Instructions

The leading global original manufacturer of DIGITAL LED

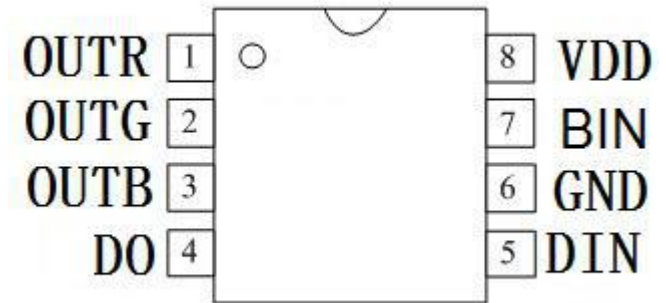
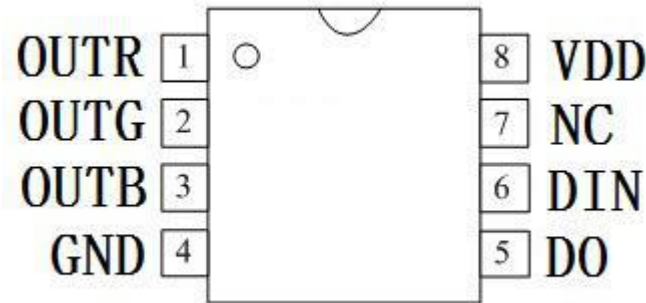
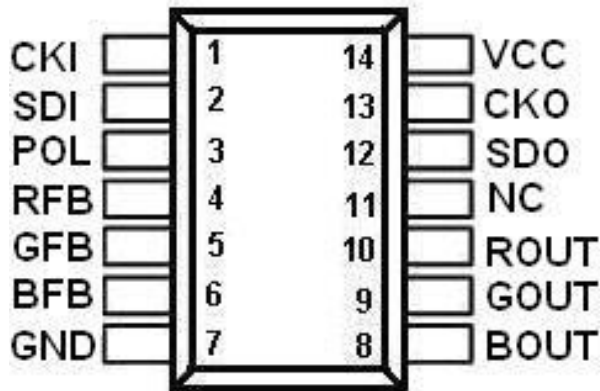


Product Overview - LED Driver IC

3-channel dual-line IC
WS2801 -SOP14

3-channel dual-line IC
WS2811 -SOP8

3-channel dual-line IC
WS2818-SOP8

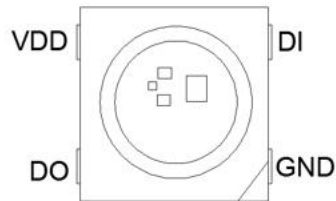


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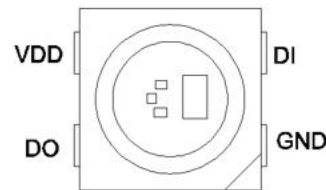


Product Overview - Digital addressable LED ~ WS2812 Series

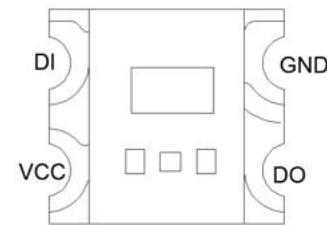
5050 size



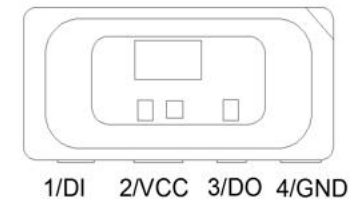
3535 size



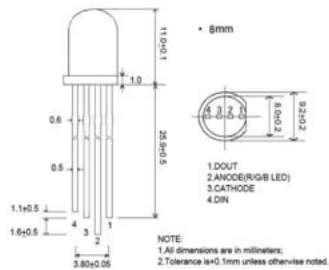
2020 size



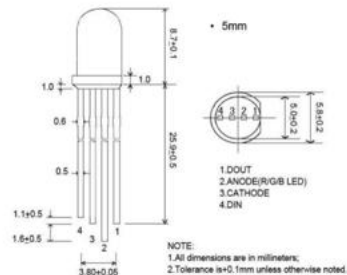
4020 size



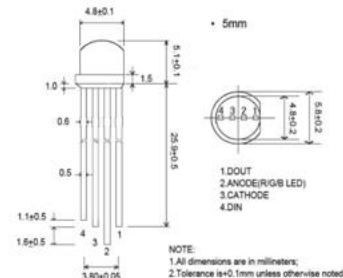
DIP- $\Phi 8$ size



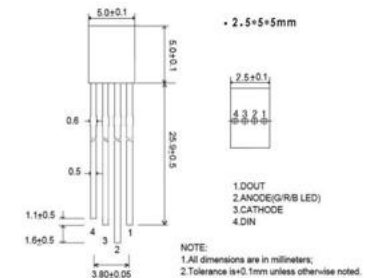
DIP- $\Phi 5$ size



DIP- $\Phi 5$ Straw-hat size



DIP- F255 size

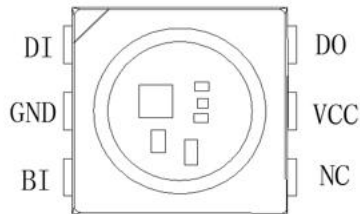


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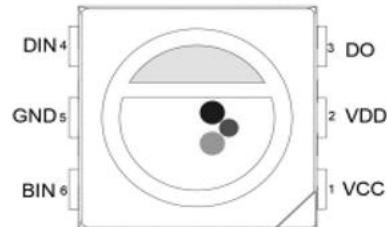


Product Overview - Digital addressable LED ~ WS2813 breakpoint Series

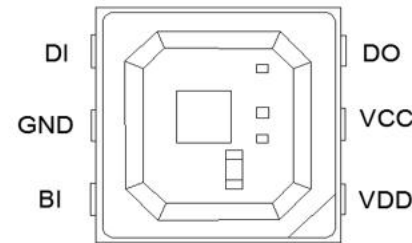
5050 size



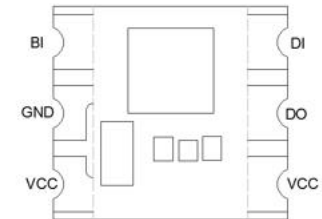
5050 RGBW size



3535 size

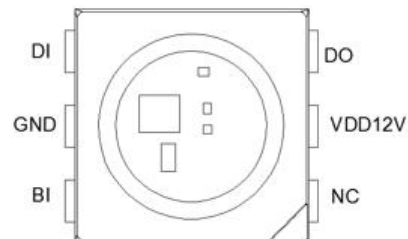


2020 size



Product Overview - Digital addressable LED ~ WS2815 breakpoint SeriesDC12V

5050 size





WS2812 Series Upgrading Key Points

01

IC Internal Integrated Filter Capacitor.
Highly Integrated/NO external components required.

02

Reverse-connection protection
The IC will not be burnt out if VCC and GND reverse connected.

03

VCC/DIN/DOUT PIN instantaneously suppresses 12V voltage.
Increased the PIN withstand voltage

04

Ensure color consistency even under 3.5V working voltage
Driver IC's Low-Dropout performance improved.

05

Greatly improved the consistency of the LED's color and brightness LED
The accuracy of the IC output current: 5%

06

Signal recognition range reduced to less than 2.8V
Compatible with 3.3V ARM & 3.0V Bluetooth Chips

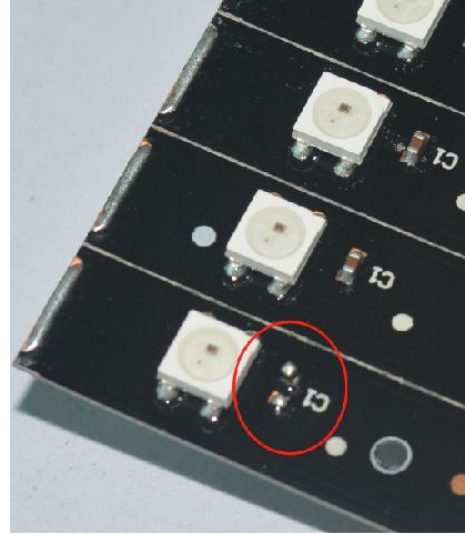
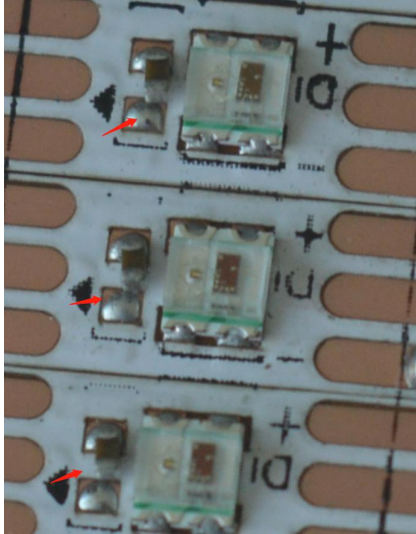
07

Improved EMC/EMI performance
Reducing Noise of Power Supply and Output Signal

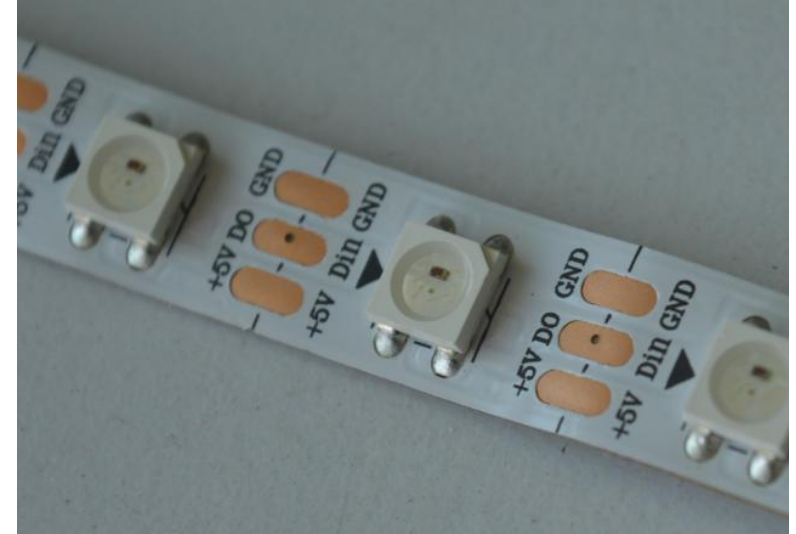
08

All upgraded LEDs' defective rate $< 1\text{‰}$

01 Advantage: NO external components required



VS



Cost Reduction

Succient & beatiful appearance

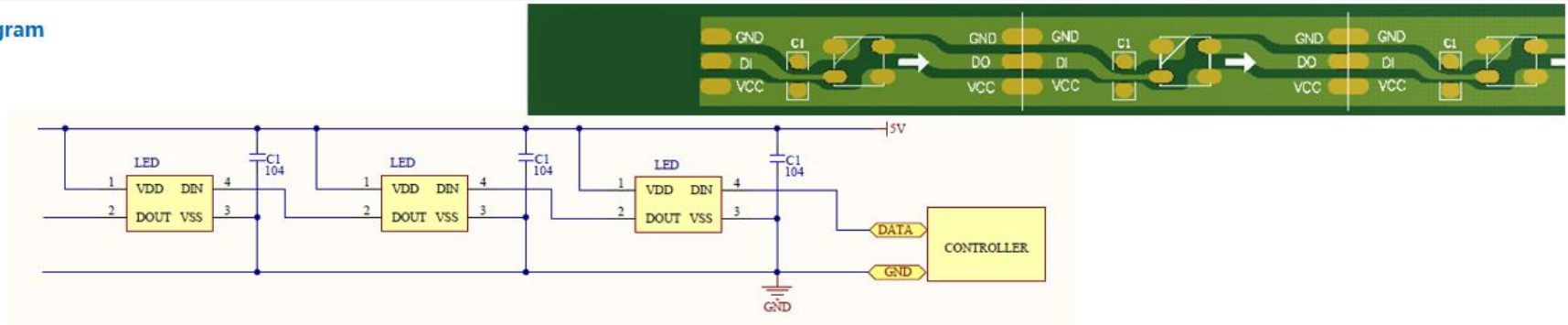
NO faulty welded

Simplify PCB layout & space-saving

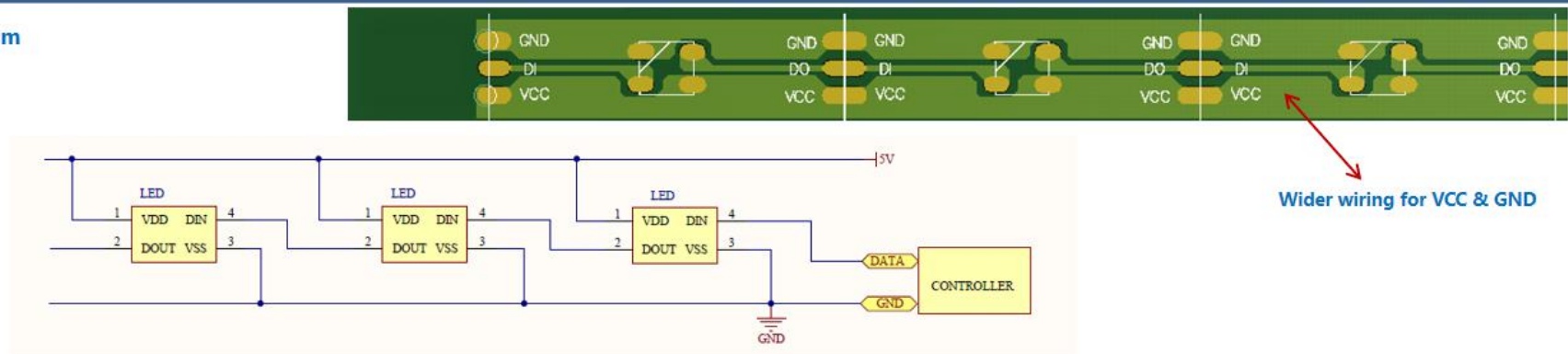


PCB Comparison Diagram

Pre-upgrade Program



Upgraded Program

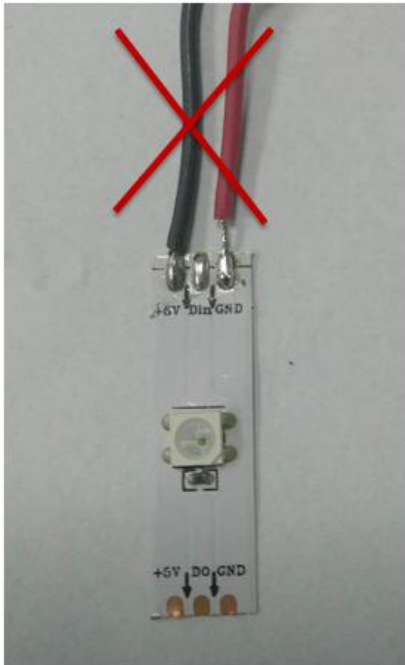


02 Advantage: Reverse-connection Protection

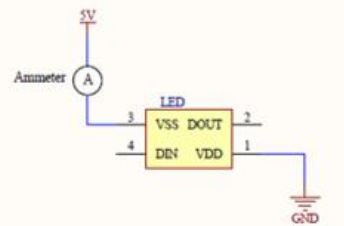


Graphical Representation

Actual measurement & verification



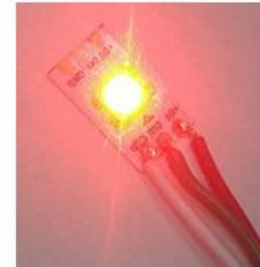
Reverse-connection Graphic



5V reverse-connection test: The LED won't be damaged if reverse current of 13mA

No protection

LED damaged if reverse- connected

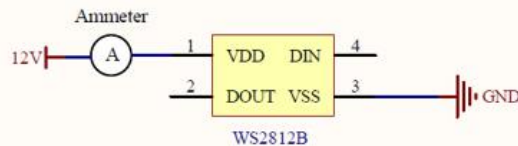


Verification

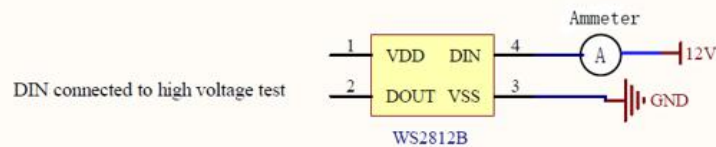
LED working well

03 Advantage: VCC/DIN/DOUT PIN instantaneously suppresses 12V voltage

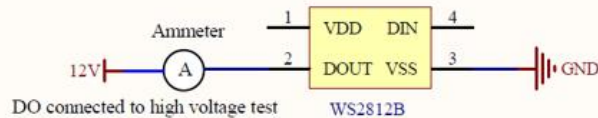
VDD connected to high voltage test



VDD connected to 12V, the static current of IC tested by multimeter is 17 mA, but it won't damage the LED



DIN connected to 12V, the static current of IC tested by multimeter is 60 mA, but it won't damage the LED



DO connected to 12V, the static current of IC tested by multimeter is 60 mA, but it won't damage the LED



Verification: LED working well



04 Advantage: Compatible with 3.3V ARM; 3.0V Bluetooth chip

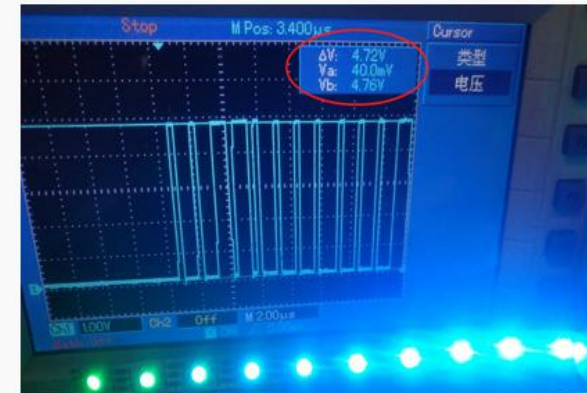
NO electrical level conversion circuit required

3.0V Bluetooth Controller

(Actual test and verification)



The original ones that only support with 5V needed to raise the signal voltage to support ARM and Bluetooth chips.



Actual test and verification

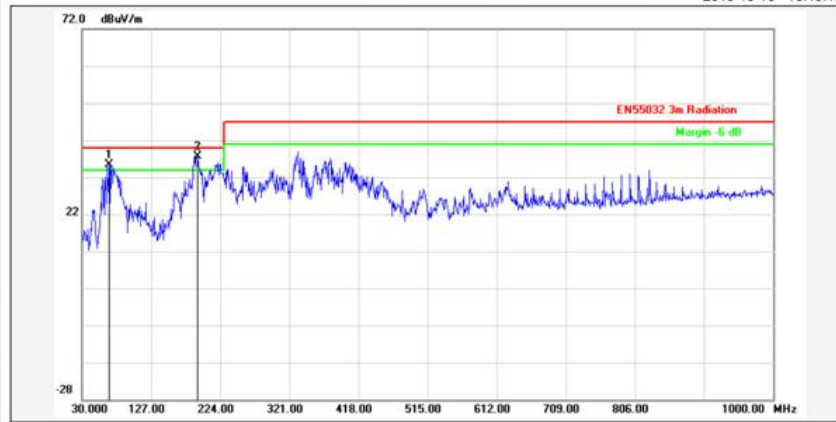
3.3V ARM Controller

(Actual test and verification)



05 Advantage: EMC/EMI test getting perceptibly better

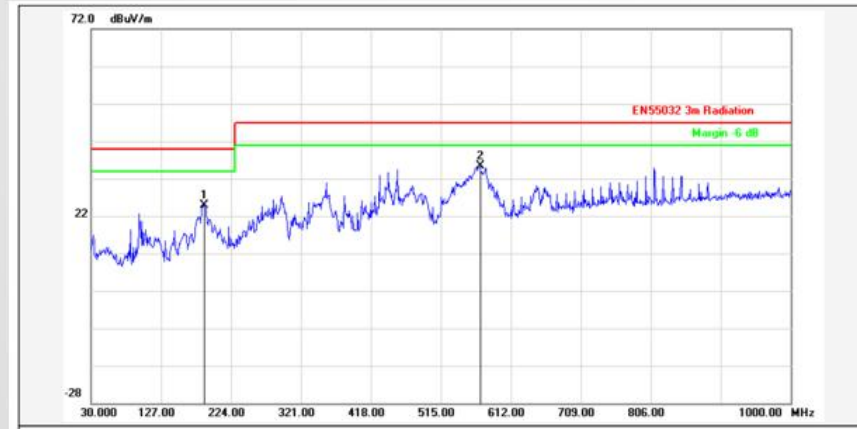
Pre-upgrade: EMC/EMI Spectrum of the over-unit



The highest point slightly exceeds the national standard average, and there is still a certain margin from the highest value.

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	67.8300	11.35	24.01	35.36	40.00	-4.64	peak			P	
2	191.9900	12.83	24.83	37.66	40.00	-2.34	peak			P	

Upgraded: EMC/EMI Spectrum of the over-unit



The highest point has a certain margin from the national standard average, and it reaches the EMC/EMI specifications.

No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	187.1400	12.41	12.54	24.95	40.00	-15.05	peak			P	
2	569.3200	22.30	13.12	35.42	47.00	-11.58	peak			P	

Remarks: Two test validation uses the same over-unit machine (a desktop Bluetooth machine with lights), only replacing the LED

06 Advantages: Significant Improvement in Differential Voltage Performance



Light intensity tester

5V-3.5V powered, LED keeps constant current,
NO visual differential brightness



Actual test & verification

5V White LED Brightness:
2069mcd



Actual test & verification

4V White LED Brightness:
2059mcd



Actual test & verification

3.5V White LED Brightness:
1936mcd



The Upgraded Version Number



WS2812B-V5
WS2812E-V3
5050 Packaging



WS2812B-MINI-V3
3535 Packaging



The following P/N are imported into the upgraded IC without a separate version

※Import into the upgraded IC after all inventory used up※

WS2812B-4020
WS2812C-4020
4020 Packaging

WS2812C-2020
2020 Packaging

WS2812S
WS2812A
WS2812C
5050 Packaging