a module solution provider

WG6031-00 WLAN Module

Realtek RTL8189EM IEEE 802.11b/g/n

1T/1R Solution with SDIO/SPI Interface

Datasheet

Draft 0.2

Prepared By	Reviewed By	Approved By

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1. HISTORY CHANGE

Revision	Date	Description
Draft 0.1	2017-06-05	Initial Document creation.
Draft 0.2	2017-10-06	1. Updated SDIO information. 2. Corrected RF Performance. 3. Updated Module Size tolerance. 4. Added Module Package Marking and Regulatory Information.

2. GENERAL DESCRIPTION

The WG6031-00 is a 802.11b/g/n 1T1R Wireless LAN SiP (system in package) module with SDIO/SPI interface. The WG6031-00 provides a complete solution for a high throughput performance integrated wireless LAN device.

2.1. Features

- Dimension 13mm(L) x 13mm(W) x 2.35mm(H).
- LGA-20 pin package.
- CMOS MAC, Baseband PHY, and RF in a single chip for 802.11b/g/n compatible WLAN.
- Complete 802.11n solution for 2.4GHz band.
- 72.2Mbps receive PHY rate and 72.2Mbps transmit PHY rate using 20MHz bandwidth.
- 150Mbps receive PHY rate and 150Mbps transmit PHY rate using 40MHz bandwidth.
- Compatible with 802.11n specification.
- Backward compatible with 802.11b/g device while operating in 802.11n mode.
- Operating temperature: 0°C to 70°C

3. MODULE BLOCK DIAGRAM

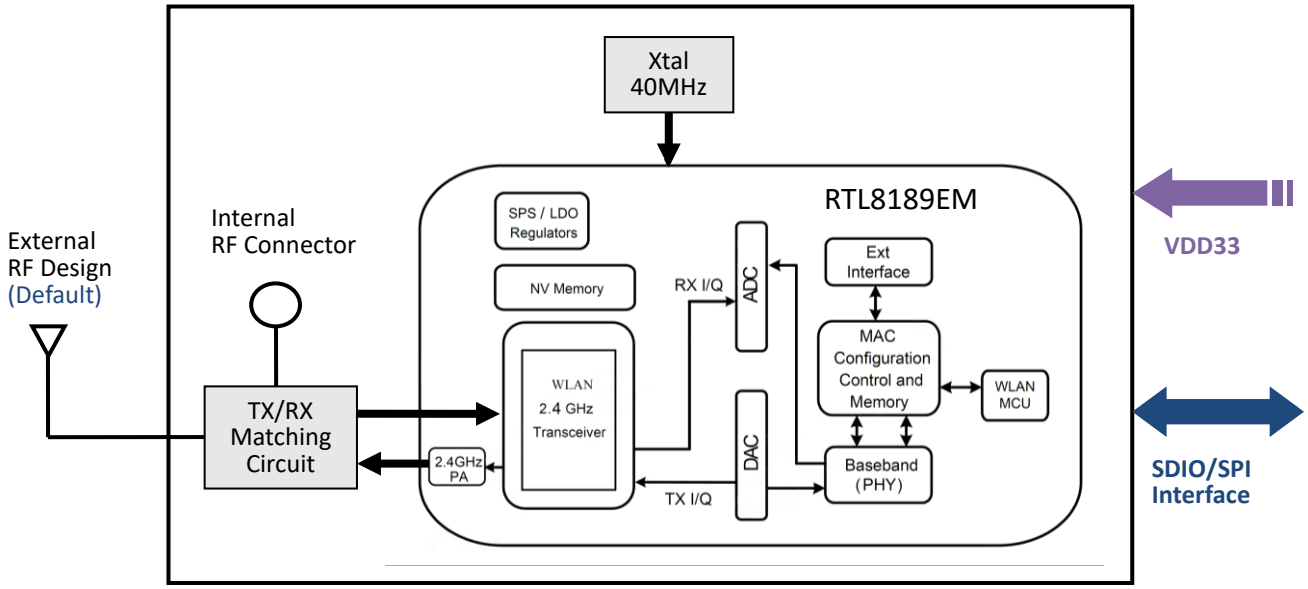


Figure 3-1. WG6031-00 Block Diagram

4. MODULE OUTLINE

4.1. Signal Layout (Top View)

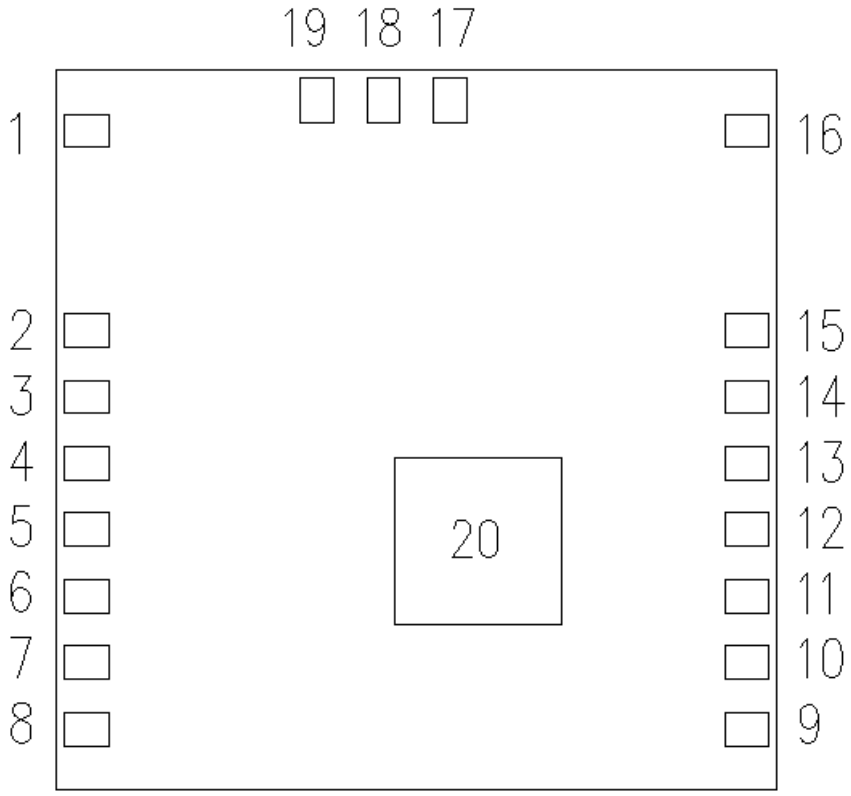


Figure 4-1 Device pins (Top View)

4.2. Pin Description

Pin	Signal Name	Type	Description
1	GND	Power	Ground
2	GND	Power	Ground
3	GND	Power	Ground
4	NC (1)	I/O	SPI not Connection / SDIO D3
5	SPI_IRQ	O	SPI Interrupt Output / SDIO D2
6	SPI_SS	I	SPI Slave Select / SDIO D1
7	SPI_MISO	O	SPI Master in Slave out / SDIO D0
8	SPI_MOSI	I	SPI Master out Slave in / SDIO Command Input
9	SPI_CLK	I	SPI Clock Input / SDIO Clock Input
10	RESET	I	Hardware Reset
11	WAKE	I/O	General Purpose Input / Output Pin
12	GND	Power	Ground
13	VDD	Power	Power supply input. Typical 3.3V.
14	VDD	Power	Power supply input. Typical 3.3V.
15	GND	Power	Ground.
16	GND	Power	Ground.
17	GND	Power	Ground.
18	RF_OUT	RF	WLAN 2.4GHz External RF port.
19	GND	Power	Ground.
20	PGND	Power	Ground. Module Thermal PAD.

(1) SPI interface: this pin is no used. / SDIO interface: this pin is defined SDIO_D3.

5. MODULE SPECIFICATION

5.1. General Module Requirements and Operation

5.1.1. Temperature Limit Ratings

Parameter	Min	Max	Units
Storage Temperature	-40	+125	℃
Ambient Operating	0	+70	℃

5.1.2. DC Power Supply Characteristics

Parameter	Condition	Min	Typical	Max	Units
VDD	DC supply Voltage	3.0	3.3	3.6	V

5.1.3. Digital IO DC Characteristics

Parameter	Condition	Min	Normal	Max	Units
V_{IH}	Input high voltage	2.0	3.3	3.6	V
V_{IL}	Input low voltage	-	0	0.9	V
V_{OH}	Output high voltage	2.97	-	3.3	V
V_{OL}	Output low voltage	0	-	0.33	V

5.2. WLAN RF Performance

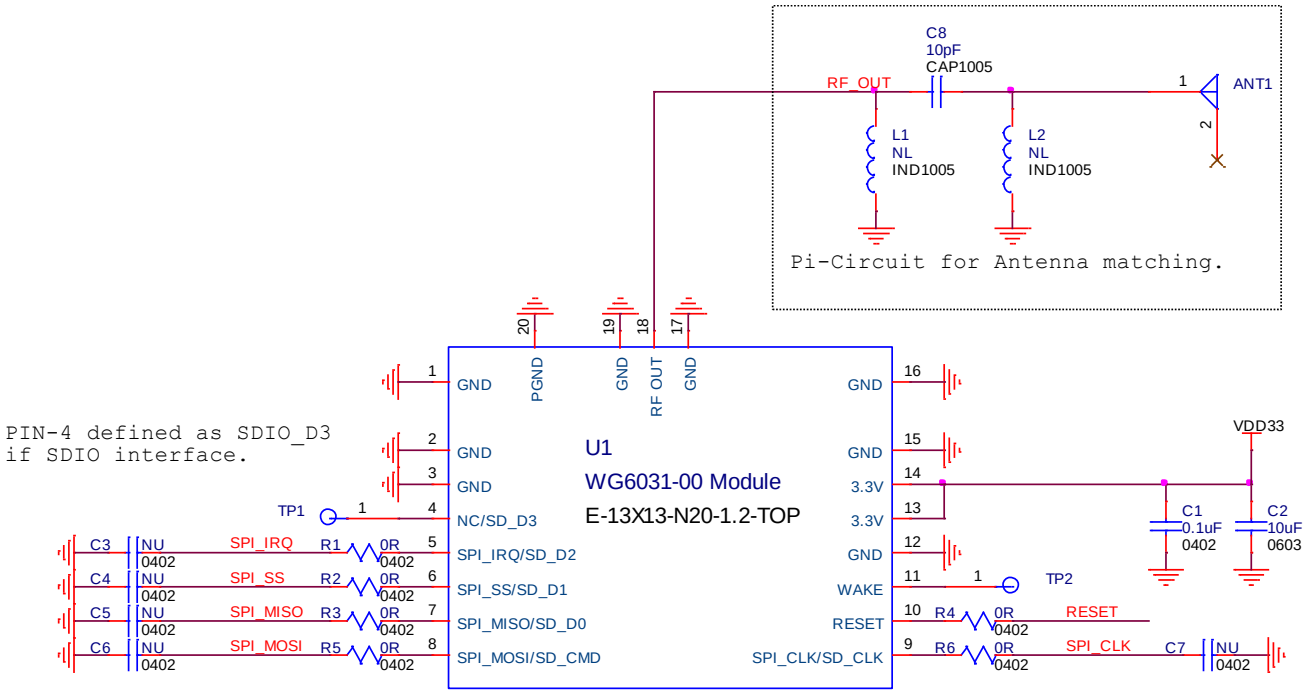
5.2.1. WLAN 2.4-GHz Receiver Characteristics

Parameter		Condition	Min	Typ	Max	Units
Operation frequency range			2412		2484	MHz
Sensitivity	At < 8% PER limit	1 Mbps DSSS		-95		dBm
		11 Mbps CCK		-86		
	At < 10% PER At < 10% PER limit	6 Mbps OFDM		-91		
		54 Mbps OFDM		-74		
		MCS0 MM		-90		
		MCS7 MM		-71		
		MCS0 MM 40MHz		-87		
		MCS7 MM 40MHz		-68		

5.2.2. WLAN 2.4-GHz Transmitter Power

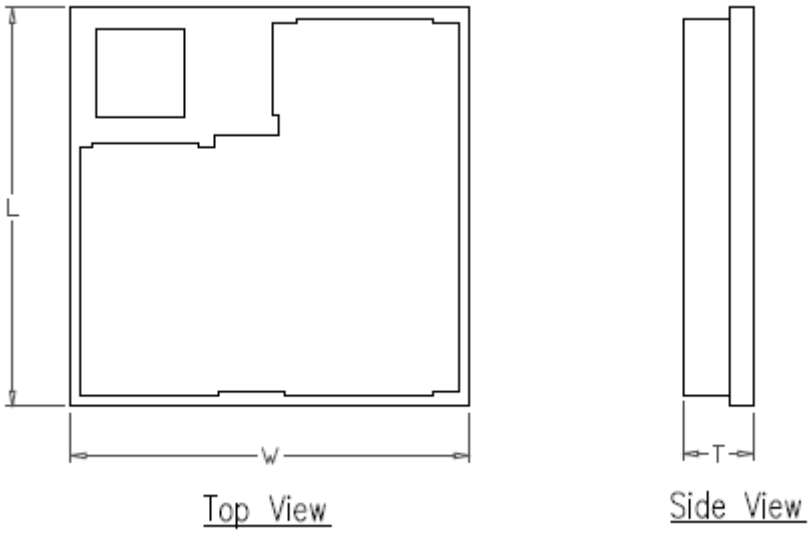
Parameter	Condition	Min	Typ	Max	
Output Power	11 Mbps CCK		17	–	dBm
	54 Mbps OFDM		15	–	
	MCS7 MM		14	–	
	MCS7 MM 40MHz		14	–	
Frequency Accuracy		-20		+20	ppm

6. REFERENCE SCHEMATICS



7. PACKAGE INFORMATION

7.1. Module mechanical outline



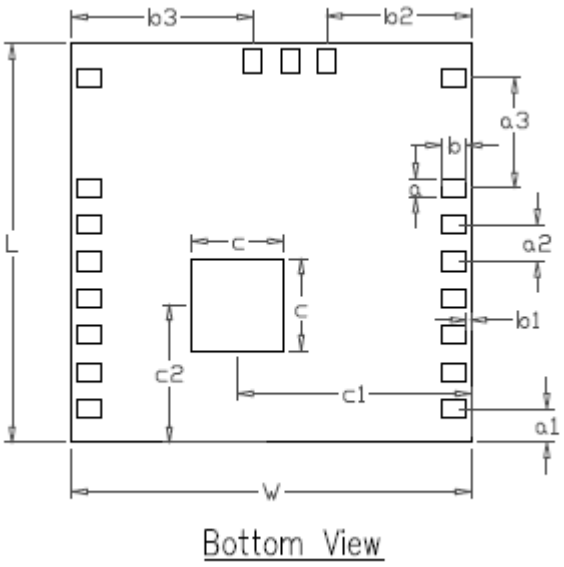


Figure 6-1 Module Pad Dimensions

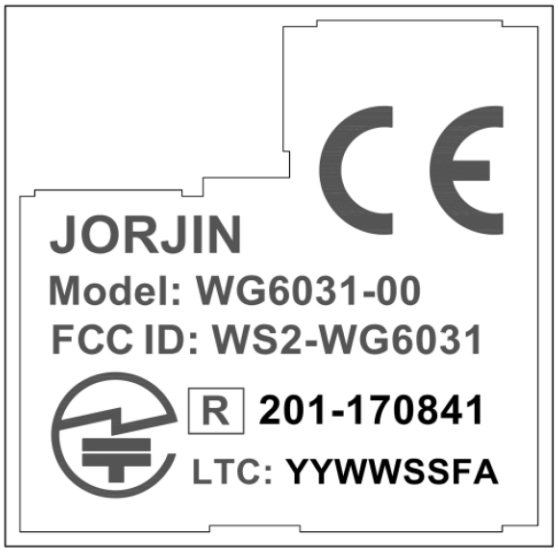
Marking	Min	Nom	Max	Marking	Min	Nom	Max
L (Body size)	12.85	13.00	13.15	b	0.75	0.80	0.85
W (Body size)	12.85	13.00	13.15	b1	0.10	0.15	0.20
T (Thickness)	2.15	2.35	2.55	b2	4.65	4.70	4.75
a	0.55	0.60	0.65	b3	5.85	5.90	5.95
a1	1.05	1.10	1.15	c	2.95	3.00	3.05
a2	1.15	1.20	1.25	c1	7.55	7.60	7.65
a3	3.55	3.60	3.65	c2	4.45	4.50	4.55

Table 7-1. Dimensions for Module Mechanical Outline

7.2. Ordering Information

Part number:	WG6031-00A

7.3. Module Marking



LTC : Date Code , **YYWWSSFA**

YY = Digit of the year, ex: 2017=17

WW = Week (01~52)

SS = Serial number from 01 ~99 match to manufacture's lot number.

F = Reserve for internal use.

A = Module version.

7.4. Certification Information

- **FCC :** WS2-WG6031, FCC grant ID
- **TELEC :** R **201-170841**, TELEC grant ID and compliance mark
- **CE :** CE compliance mark

8. SMT AND BAKING RECOMMENDATION

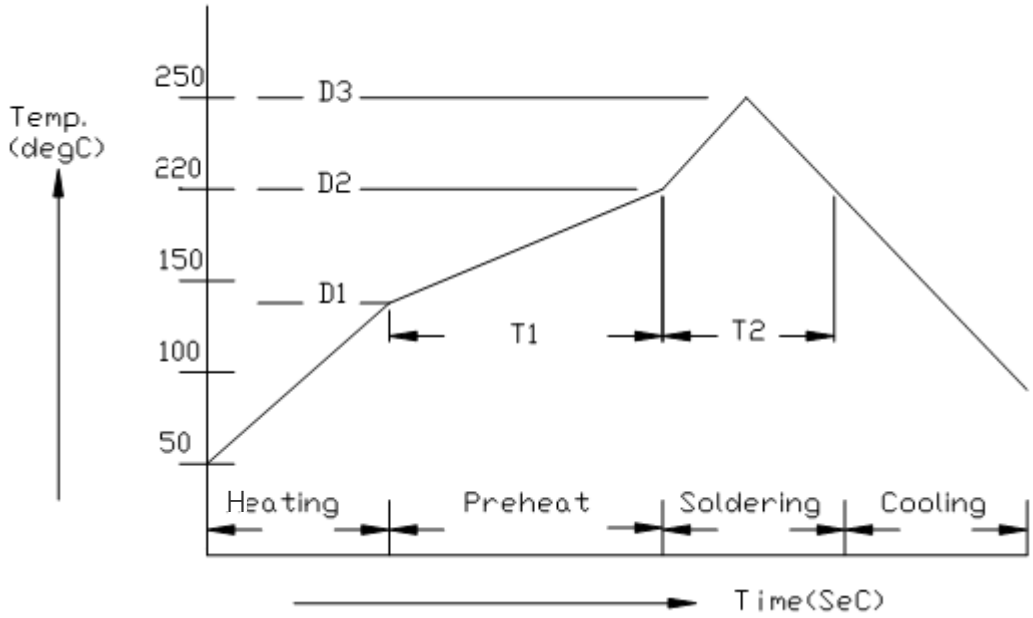
8.1. Baking Recommendation

- **Baking condition：**
  - Follow MSL Level 4 to do baking process.
  - After bag is opened, devices that will be subjected to reflow solder or other high temperature process must be
    a) Mounted within 72 hours of factory conditions <30°C/60% RH, or
    b) Stored at <10% RH.
  - Devices require bake, before mounting, if Humidity Indicator Card reads >10%

  If baking is required, Devices may be baked for 8 hrs at 125 °C.

8.2. SMT Recommendation

- **Recommended Reflow profile：**



No.	Item	Temperature (°C)	Time (sec)
1	Pre-heat	D1: 140 ~ D2: 200	T1: 80 ~ 120
2	Soldering	D2: = 220	T2: 60 ± 10
3	Peak-Temp.	D3: 250 °C max	

Note: (1) Reflow soldering is recommended two times maximum.

(1) Add Nitrogen while Reflow process： SMT solder ability will be better.

- **Stencil thickness**： 0.1~ 0.15 mm (Recommended)
- **Soldering paste (without Pb)**： Recommended SENJU N705-GRN3360-K2-V can get better soldering effects.

9. REGULATORY INFORMATION

This section outlines the regulatory information for the following countries:

- United States
- Europe
- Japan

9.1. United States

Federal Communications Commission Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

FCC RF Radiation Exposure Statement:

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment and it also complies with Part 15 of the FCC RF Rules.

This device is intended only for OEM integrators under the following conditions:

(1) The antenna must be installed such that 20cm is maintained between the antenna and users, and

(2) The transmitter module may not be co-located with any other transmitter or antenna,

(3) For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4Gband by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change.

As long as 3 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Important Note:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling:

The final end product must be labelled in a visible area with the following:

“Contains FCC ID: WS2-WG6031”.

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user’s manual of the end product which integrates this module.