



a module solution provider

**WG1300-00** WLAN Module  
TI CC3000 IEEE 802.11b/g solution

Datasheet

Revision 0.4

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## 1. OVERVIEW

WG1300-00, a WiFi SiP (system in package) module, is the most demanded design for portable devices below.

- Home entertainment control
- Thermostats, appliances, HVAC controller, remote displays
- Home Network aggregators
- Remote appliance diagnostics/support
- Remote storage devices
- Cameras and video surveillance
- Toys
- Gaming
- Cable replacement for Medical and Personal Healthcare

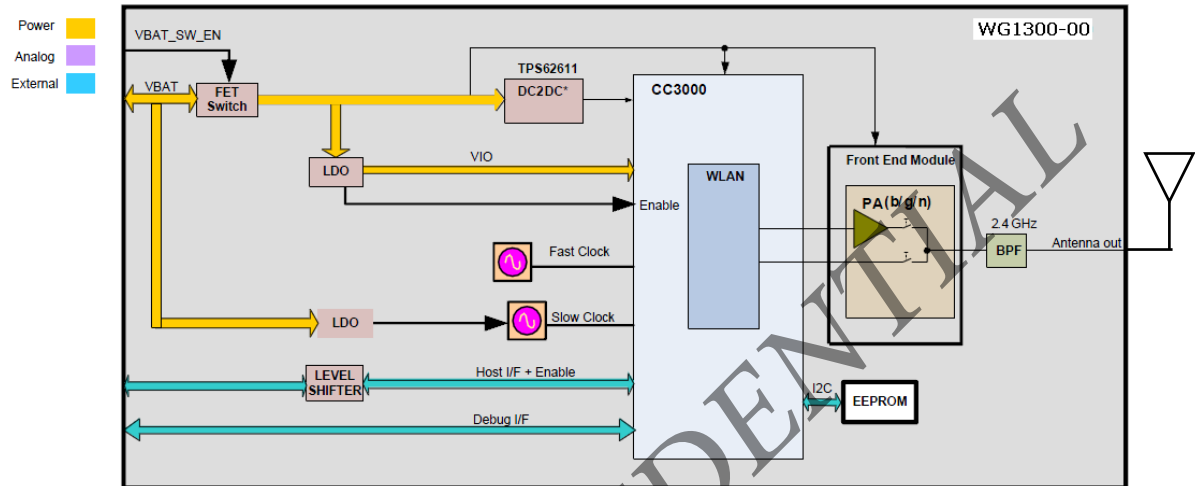
with TI CC3000 IEEE 802.11b/g solution to provide the best WiFi performance power saving technologies from TI.

### 1.1. General Features

- WLAN radio on a SiP module
- LGA46 pin package
- Dimension 16.3mm(L) x 13.5mm(W) x 2mm(H)
- Based on TI CC3000 65-nm CMOS technology packaged in WSP for module.
- Wireless LAN optimized for easy use with microcontroller applications (IEEE802.11b/g)
- Embedded wireless security subsystem
- Embedded network stack
- SPI external host I/F
- BSD socket-compliant API for application layer implemented on external host
- Connection profile management
- Preferred connection
- Fast reconnect to AP
- EEPROM Read/Write from Host

## 2. FUNCTIONAL FEATURES

### 2.1. Module Block Diagram



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## 2.2. Block Functional Feature

### 2.2.1. WLAN Features

- WLAN MAC Baseband Processor and RF transceiver which is IEEE802.11b/g compliant
- Accepts 26MHz reference clock Input
- IEEE Std 802.11d,i PICS compliant
- Supports serial debug interface
- Supports Serial Peripheral Interface (SPI) Host Interface
- **Medium-Access Controller (MAC)**
  - Embedded ARM™ Central Processing Unit (CPU)
  - Hardware-Based Encryption/Decryption Using 64-, 128-Bit WEP, TKIP or AES Keys
  - Supports requirements for Wireless Fidelity (Wi-Fi) Protected Access (WPA and WPA2.0) and IEEE Std 802.11i [Includes Hardware-Accelerated Advanced-Encryption Standard (AES)]
- **Baseband Processor**
- **2.4GHz Radio**
  - Digital Radio Processor (DRP) implementation
  - Internal LNA
  - Supports : IEEE Std 802.11b, 802.11g, 802.11b/g

### 3. MODULE SPECIFICATION

#### 3.1. Absolute Maximum Ratings

Over operating free-air temperature range

Characteristics		Value	Unit
Supply Voltage Range	VBAT	-0.5 to 5.5	V
Input Voltage to Analog Pins		-0.5 to 2.1	V
Input Voltage to all Other Pins		-0.5 to (VDD5 + 0.5V)	V
Operating Ambient Temperature Range		-40 to +85	°C
Storage Temperature Range		-55 to +125	°C

#### 3.2. Recommended Operating Conditions

The WG1300-00 requires two supplies: VBAT

Power Supply	Voltage		
	Min.	Typ.	Max.
VBAT	2.3V	3.3V	4.8V

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### 3.3. WLAN RF Characteristic

#### 3.3.1. 2.4-GHz Receiver

CHARACTERISTICS	CONDITION	SYMBOL	MIN	TYP	MAX	UNIT
Operation frequency range			2412		2484	MHz
Sensitivity	1 Mbps DSSS		-96	-92	-	dBm
	2 Mbps DSSS		-93	-89	-	
	5.5 Mbps CCK		-90	-86	-	
	11 Mbps CCK		-86	-82	-	
	6 Mbps OFDM		-90	-86	-	
	9 Mbps OFDM		-89	-85	-	
	12 Mbps OFDM		-87	-83	-	
	18 Mbps OFDM		-85	-81	-	
	24 Mbps OFDM		-83	-79	-	
	36 Mbps OFDM		-79	-75	-	
	48 Mbps OFDM		-74	-70	-	
54 Mbps OFDM		-73	-69	-		

#### 3.3.2. 2.4-GHz Transmitter

CHARACTERISTICS	CONDITION	Max EVM	MIN	TYP	MAX	UNIT
11b Output Power	11M CCK	35%	16	18	--	dBm
	5.5M CCK	35%	16	18	--	
	2M DSSS	35%	16	18	--	
	1M DSSS	35%	16	18	--	
11g Output Power	54M OFDM	-25	11.5	13.5	--	dBm
	48M OFDM	-25	11.5	13.5	--	
	36M OFDM	-19	13.5	15.5	--	
	24M OFDM	-19	13.5	15.5	--	
	18M OFDM	-13	15	17	--	



	12M OFDM	-13	15	17	--	
	9M OFDM	-8	15	17	--	
	6M OFDM	-8	15	17	--	

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## 4. POWER CONSUMPTION

### 4.1. Device Shutdown Current Consumption

Mode Description	Power Supply	Typ	Max	Unit
Shut-down mode (1)	Total VBAT at 3.3V	0.5	5	uA

(1) Internal power FET switch is controlled by the host GPIO.

### 4.2. Device Active Current Consumption

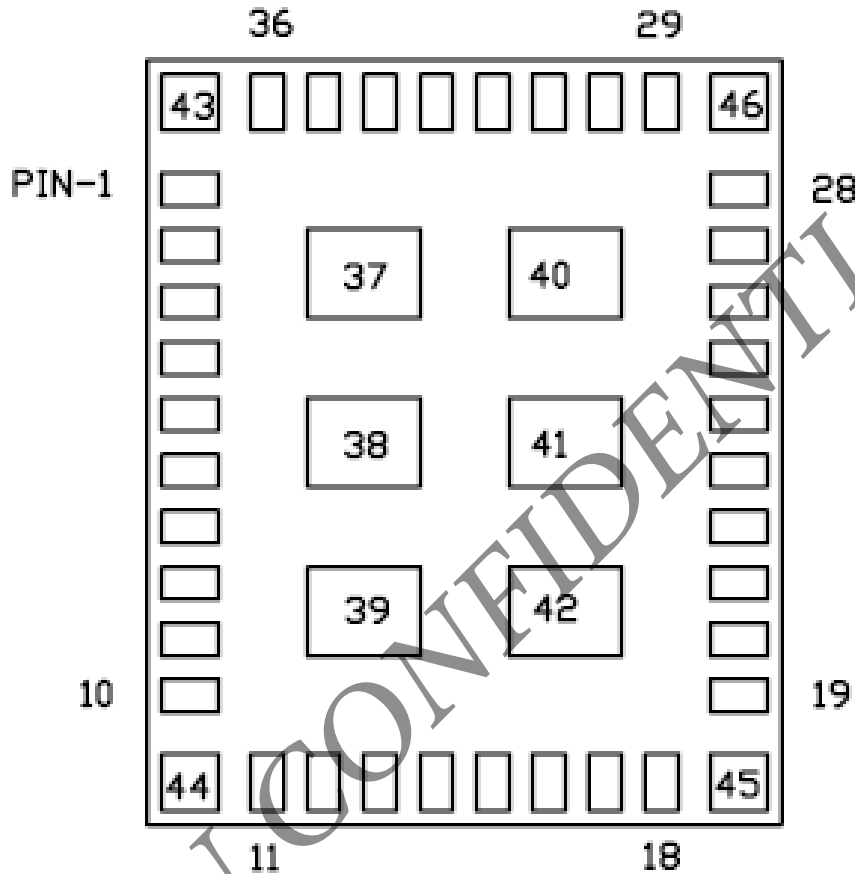
Mode Description	Power Supply	IEEE802.11b 11Mbps (2)	IEEE802.11g 54Mbps (3)	Unit
Stand by	Total VBAT at 3.3V	11.4		mA
Sleep		5.5		mA
Listen		74		mA
Transmit Data 2048Bytes / Delay 0.04ms		266	198	mA
Receive Data		106	106	mA

(2) Output Power of 11Mbps at 17dBm.

(3) Output Power of 54Mbps at 13.5dBm.

## 5. MODULE OUTLINE

### 5.1. Signal Layout (Top View)



## 5.2. Pin Description

Pin #	Signal Name	Type	Description
1	GND	GND	Ground
2	NS_UARTD	I/O	Networking subsystem UART Debug line
3	FUNC4	I/O	GPIO
4	WL_UART_DBG	I	WL_UART_DBG
5	WL_EN2	O	WL_EN2
6	WL_RS232_TX	I	WL_RS232_TX
7	WL_EN1	O	WL_EN1
8	WL_RS232_RX	O	WL_RS232_RX
9	GND	GND	Ground
10	GND	GND	Ground
11	GND	GND	Ground
12	SPI_CS	O	SPI_CS
13	SPI_DOUT	I	SPI_DOUT
14	SPI_IRQ	O	SPI_IRQ
15	SPI_DIN	I	SPI_DIN
16	GND	GND	Ground
17	SPI_CLK	O	SPI_CLK
18	GND	GND	Ground
19	VBAT_IN	Power	VBAT_IN
20	GND	GND	Ground
21	EXT_32K	CLK	EXT_32K
22	GND	GND	Ground
23	VIO_HOST	Power	VIO_HOST
24	VIO_SOC	Power	VIO_SOC
25	GND	GND	Ground
26	VBAT_SW_EN	I	VBAT_SW_EN
27	SDA_EEPROM	I/O	SDA_EEPROM
28	SDA_CC3000	I/O	SDA_CC3000
29	SCL_EEPROM	I/O	SCL_EEPROM
30	SCL_CC3000	I/O	SCL_CC3000

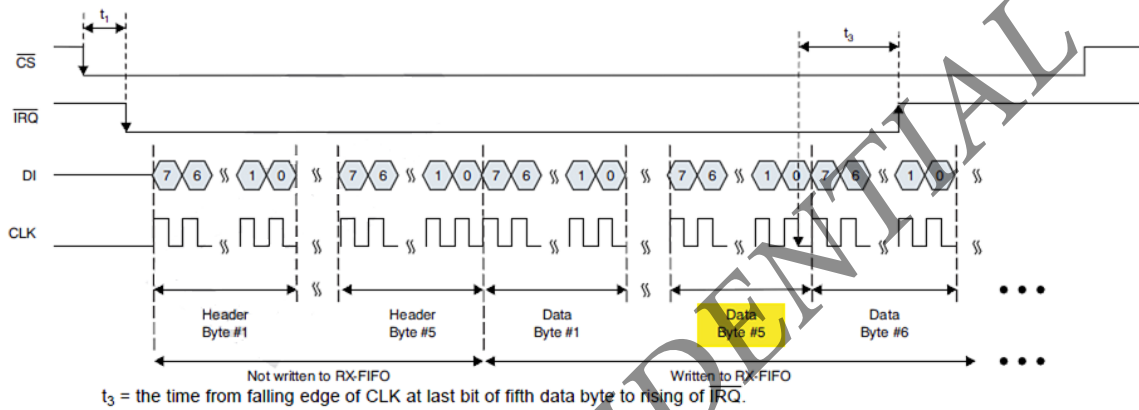
31	GND	GND	Ground
32	GND	GND	Ground
33	GND	GND	Ground
34	GND	GND	Ground
35	RF_ANT	RF	RF_ANT
36	GND	GND	Ground
37	GND	GND	Ground
38	GND	GND	Ground
39	GND	GND	Ground
40	GND	GND	Ground
41	GND	GND	Ground
42	GND	GND	Ground
43	GND	GND	Ground
44	GND	GND	Ground
45	GND	GND	Ground
46	GND	GND	Ground

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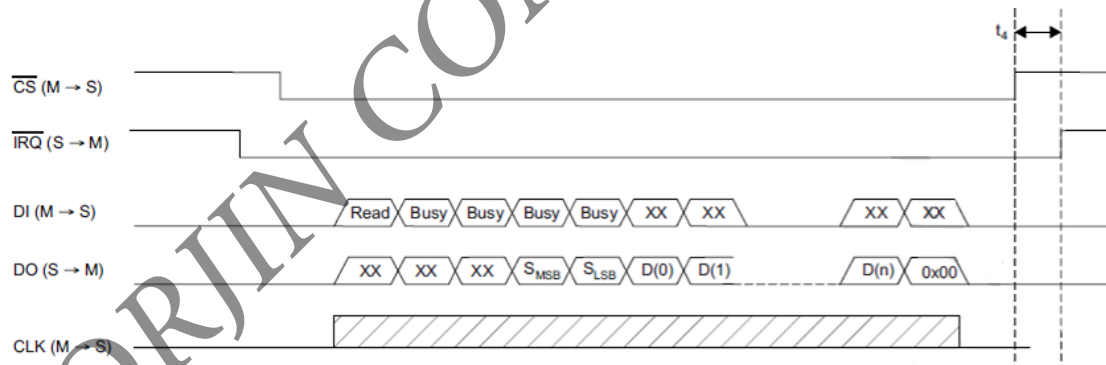
## 6. INTERFACE CHARACTERISTICS

### 6.1. WLAN SPI timing specifications

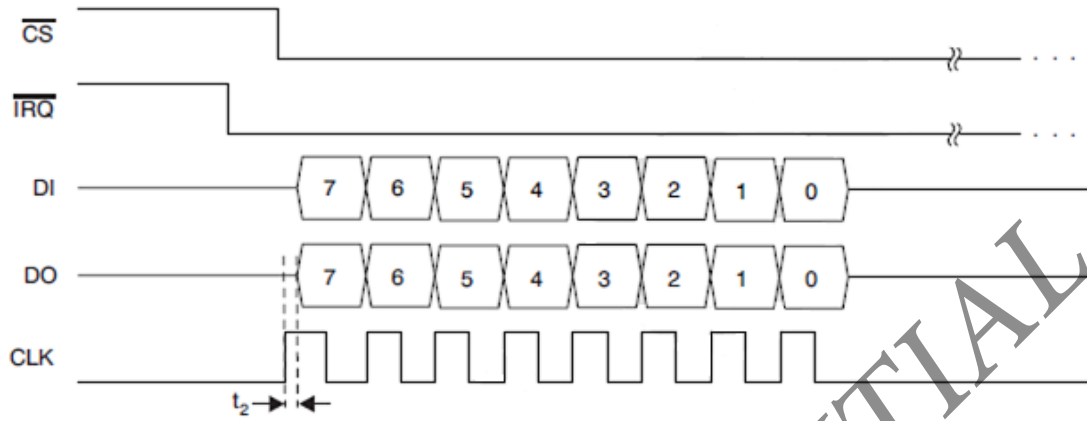
SPI Write Timing



SPI Read transaction



SPI Read Header: First Byte Timing



SPI Read/Write Timing

Time	MIN	TYE	MAX	UNIT
t1	83		375	ns
t2	2.9		9.52	ns
t3	666		2125	ns
t4	83		375	ns

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## 7. DEBUG INTERFACE

The debug interface helps customers to evaluate the HW/SW features for their application. It also helps to debug during the development and manufacturing stage. The WG1300-00 module support RS232 signals and UART signals for debug purpose. Connect RS232 and UART signals to the test points for future debug support.

### 7.1. UART Debug Lines

A unidirectional UART lines are provided for debugging WLAN subsystem and network subsystem functions. This is a TX-only debug interface that delivers diagnostic messages.

The table below describes the dedicated debug pins of WG1300-00

Signal names	WG1300-00 Pin#	Function
WL_UART_DBG	4	Logger for WLAN FW debug
NS_UARTD	2	Networking subsystem UART Debug line

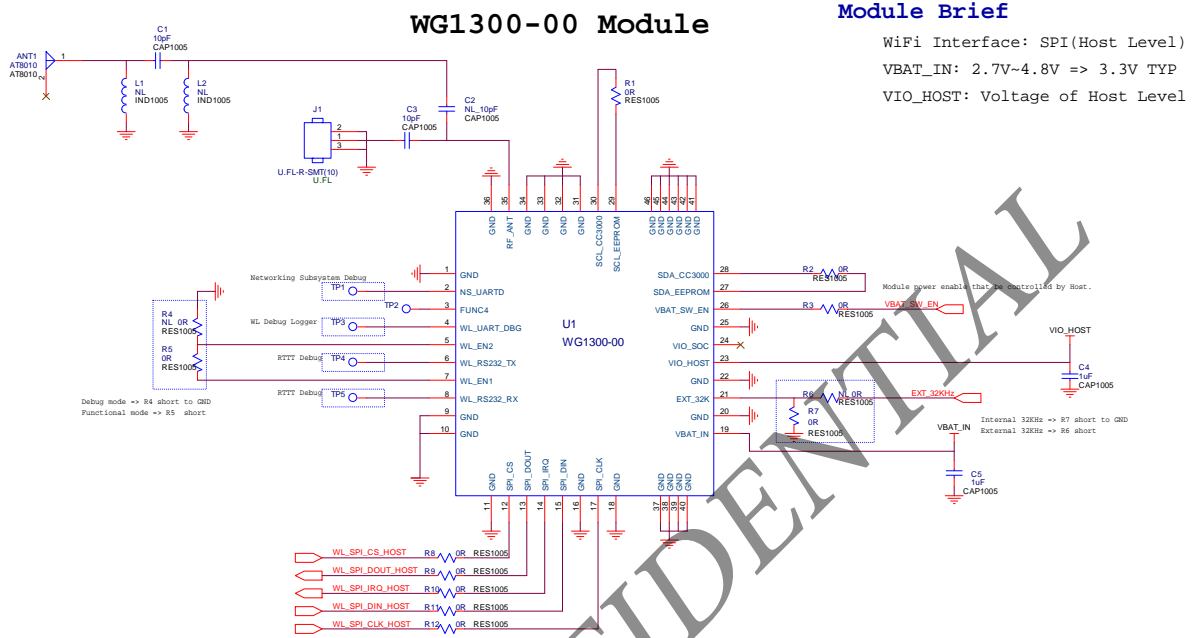
### 7.2. RS232 Debug Lines

During production testing the pins below are used for RTTT Wireless LAN SW utility.

Signal names	Function
WL_RS232_TX	RTTT Test Utility for WLAN RF Debug
WL_RS232_RX	



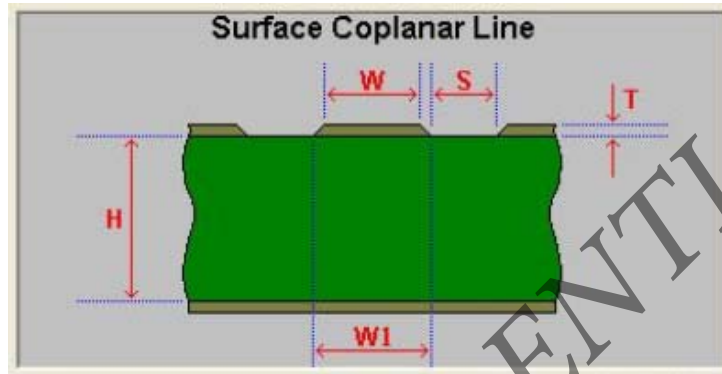
## 8. REFERENCE SCHEMATIC



## 9. LAYOUT RECOMMENDATION

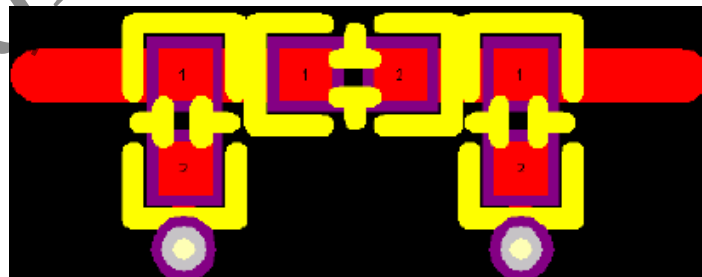
- **RF Trace & Antenna**

- 50 ohm trace impedance match on the trace to the antenna.
- Recommended 50ohm trace design for PCB layout



Height Between L1 and L2 ( <b>H</b> ):	12.0 mil
Trace ( <b>W</b> ):	14.3 mil
( <b>W1</b> ):	14.3 mil
Thickness ( <b>T</b> ):	2.1 mil
Separation ( <b>S</b> ):	10.0 mil
Dielectric ( <b>Er</b> ):	4.3

- Move all the high-speed traces and components far away from the antenna.
- Check ANT vendor for the layout guideline and clearance.
- Matching circuit layout should be as following figure.



- **Power Trace**

- Power trace for VBAT should be 40mil wide. 1.8V trace

should be 18mil wide.

- **Ground**

- Having a complete Ground and more GND vias under module in layer1 for system stable and thermal dissipation as following figure.
- Have a complete Ground pour in layer 2 for thermal dissipation.
- Increase the GND pour in the 1st layer, move all the traces from the 1st layer to the inner layers if possible.
- Move GND vias close to the pad.

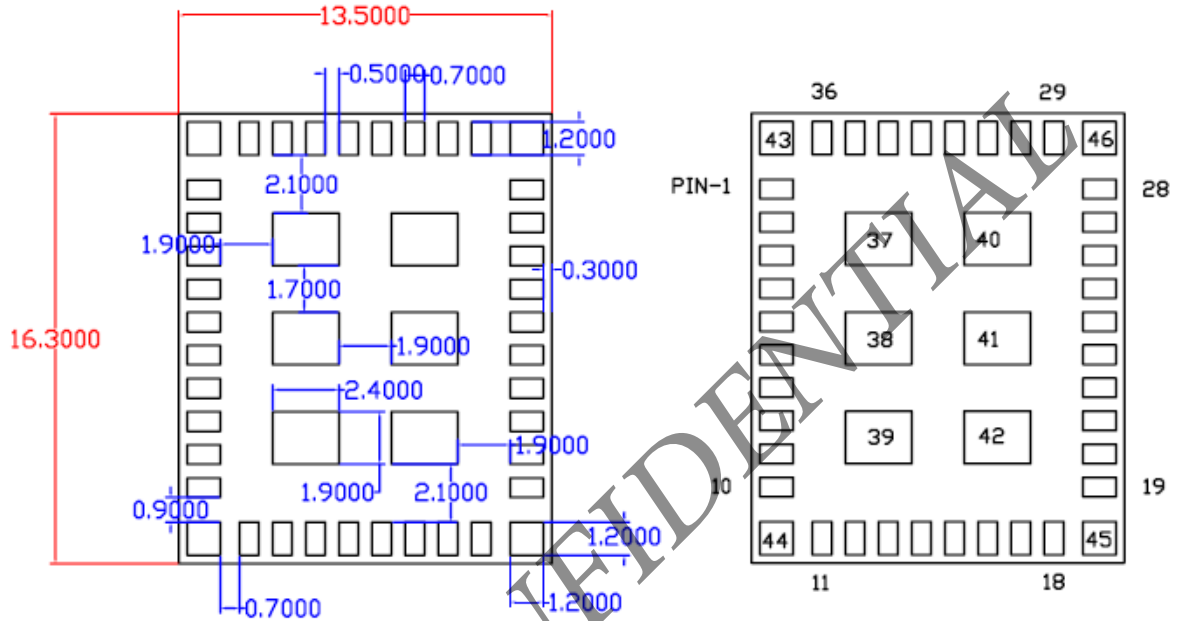
- **Slow Clock**

- The slow clock trace should not be routed above or below digital signals on other layers.

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## 10. Package Information

### 10.1. Module Footprint



TOP VIEW

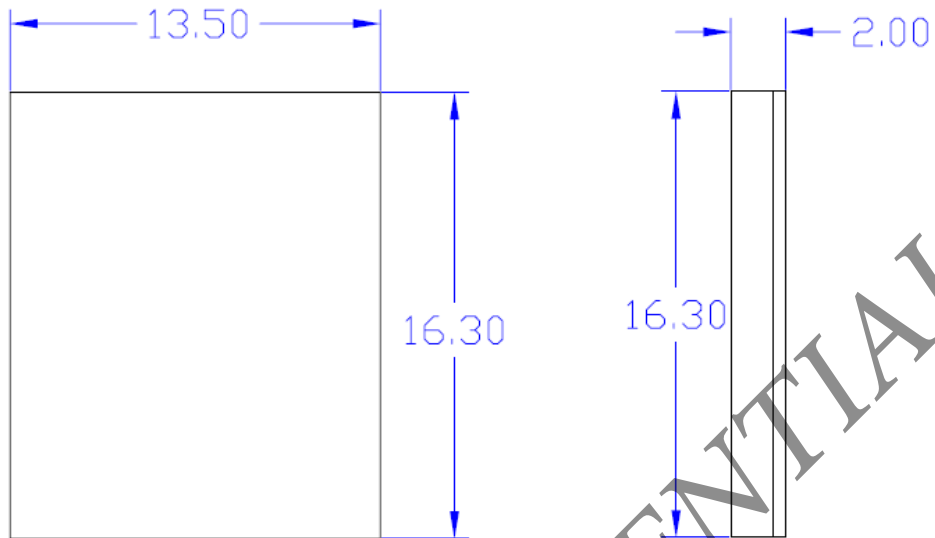
WG1300-00

Module Size: 16.3x13.5mm

PAD Size: 1.2x0.7mm

Patch: 0.5mm

## 10.2. Module Mechanical Outline



TOP VIEW

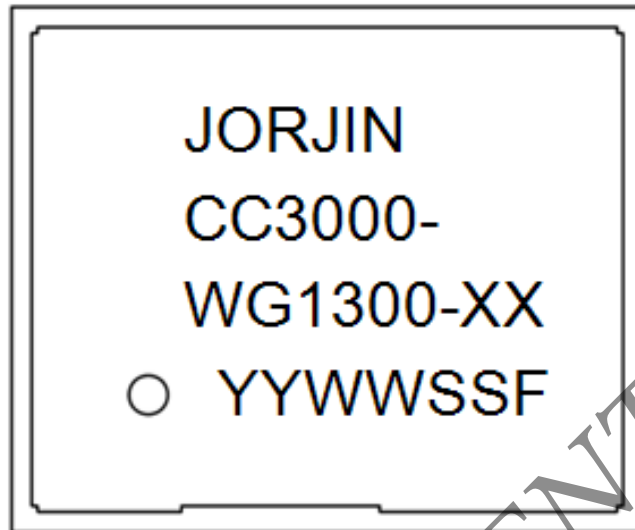
SIDE VIEW

WG1300-00  
Module Size: 16.3x13.5x2.0mm

## 10.3. Ordering Information

Part number:	WG1300-00
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#### 10.4. Package Marking



Date Code: YYWWSSF

YY = Digit of the year, ex: 2010=10

WW = Week (01~53)

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

F = Reserve for internal use

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## 11. SMT AND BAKING RECOMMENDATION

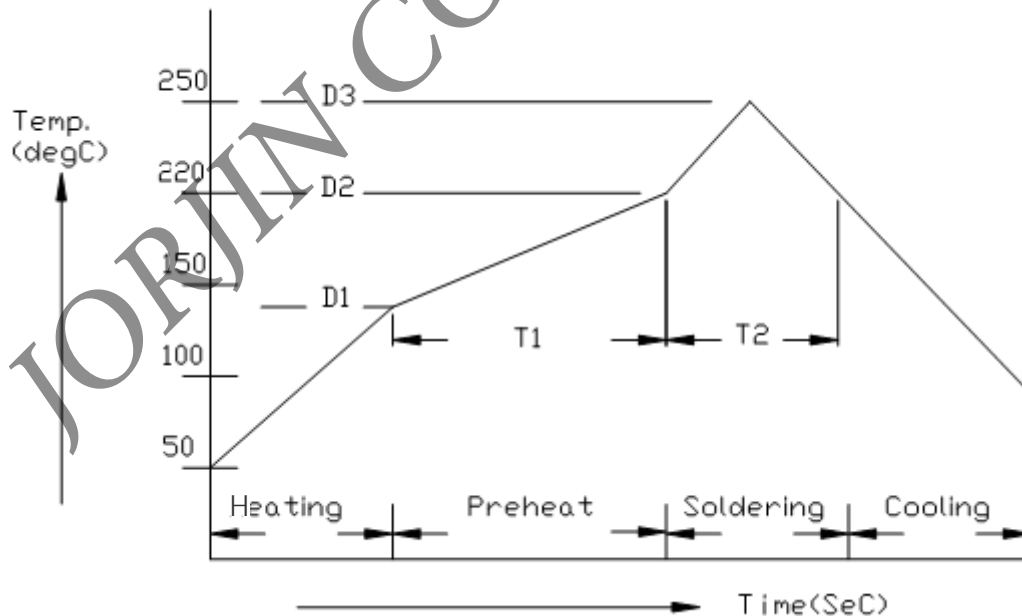
### 11.1. Baking Recommendation

- 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  $< 30^{\circ}\text{C}/60\% \text{ RH}$ ,  
or
    - b) Stored at  $< 10\% \text{ RH}$ .
  - Devices require bake, before mounting, if Humidity Indicator Card reads  $> 10\%$

**If baking is required, Devices may be baked for 8 hrs at  $125^{\circ}\text{C}$ .**

### 11.2. 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.  
 (2) 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.

## 12. HISTORY CHANGE

Revision	Date	Description
R 0.1	2012/1/4	Release 0.1
R 0.2	2012/2/20	Add Module footprint at Section 10.1
R 0.3	2012/4/17	Update Package Marking
R 0.4	2012/5/7	Update power consumption