Data Sheet

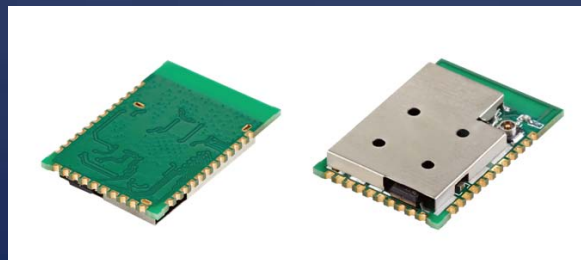GlobalTop Technology Inc.

Wqm-u2618
Low Power
Wi-Fi Module
Data Sheet

Revision: V. 0.0

Version History

Title:	**GlobalTop Wqm-u2618 Datasheet**			
Subtitle:	**Wi-Fi Module**			
Doc Type:	**Datasheet**			
Revision	**Date**	**Editor**	**Description**	
V00	2015-03-02	Allen Chang	First release	

Table of Contents

1. Functional Description

1.1 Overview

Wqm-u2618 with a built-in printed antenna is an intelligent Internet of Everything platform with low power wireless connectivity. This complete networking platform enables customers to add full-featured Wi-Fi to a wide variety of products with minimal development effort and cost. It supports a network stack along with SSL security, enabling full-featured internet connectivity and reliable information exchange in a small, low-cost system.

The Wqm-u2618 module contains a Qualcomm® Atheros QCA4004 chip. The QCA4004 is a single chip system on a chip (SoC) 1x1 802.11 b/g/n device optimized for low-power embedded applications with single-stream capability for both Tx and Rx. It has an integrated network processor with a large set of TCP/IP with IPv4/IPv6-based services. The Wqm-u2618 provides UART based host and SPI slave interfaces for connecting to local system controllers.

Application

- Home automation

- Household appliances

- Smart plug

- Lighting

- Metering

1.2 Features

- Embedded IEEE 802.11b/g/n drivers, supplicant, and TCP/IP stack

- Support IPv4 / IPv6 network stack

- Provide integrated power management, control functions and extremely low power

  operation for maxim battery life

- Security support for WPA, WPA2, WEP, TKIP

- Rich interfaces include: UART, SPI, I2C, GPIOs, and USB

- Flexible pin design for both SMT or internal wiring

1.3 System Block Diagram
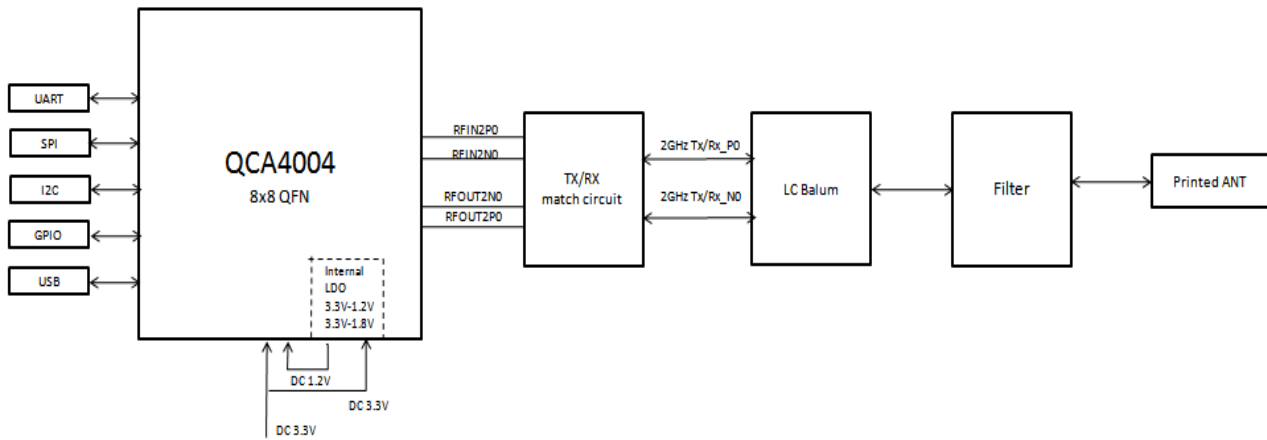
Figure 1-3 System block diagram

2. Specifications

2.1 Mechanical Dimension
Dimension: (Unit: mm, Tolerance: +/- 0.2mm)
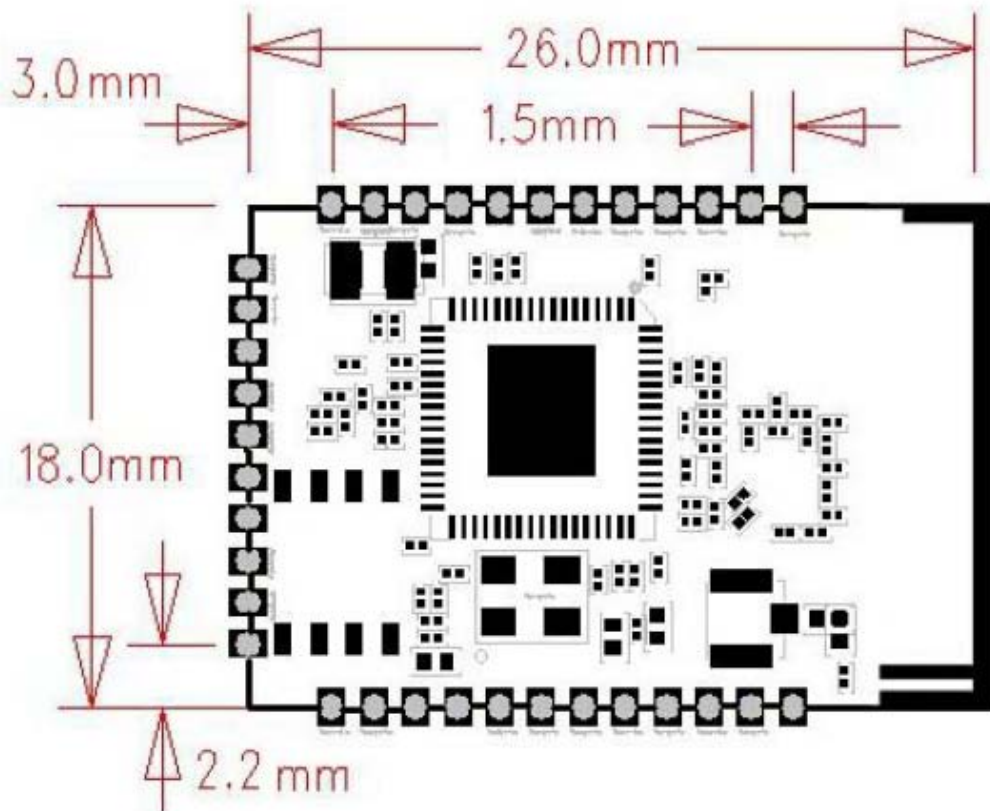
2.2 Pin Configuration
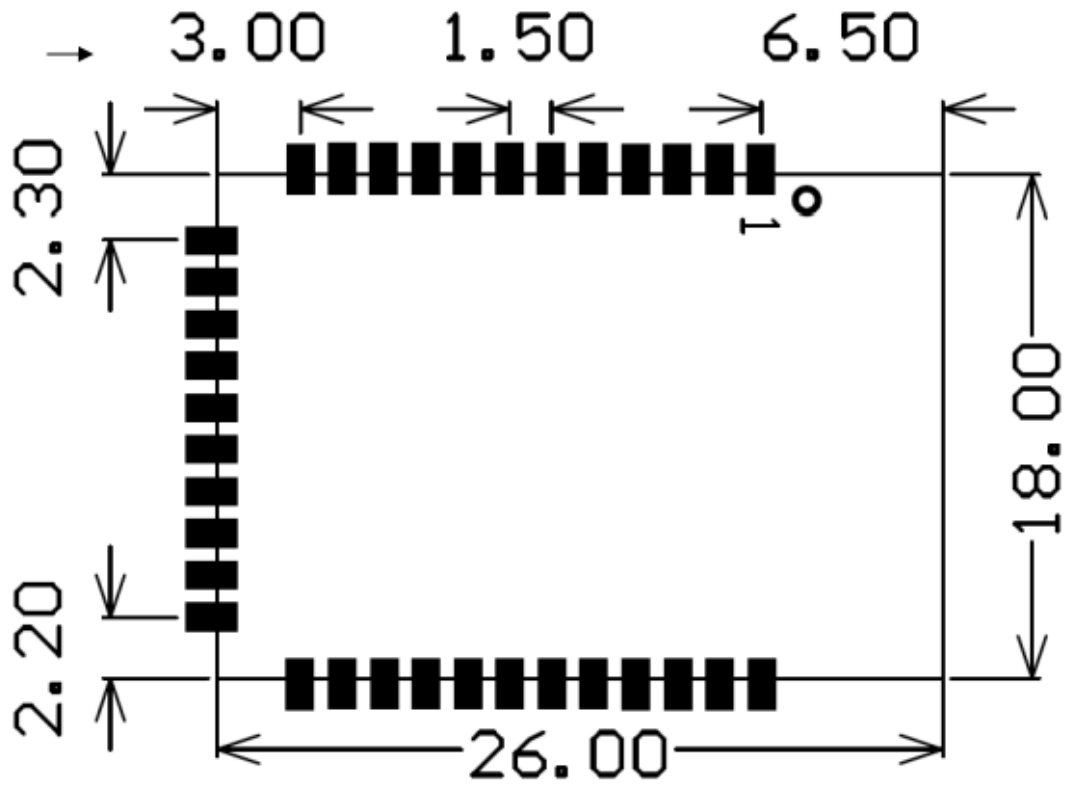
Dimension Label	Dimension(mm)
A	3
B	1.5
C	1.5
D	18
E	26
Module Height	2.5

2.3 Pin Assignment

Signal Name	Pin	Description
USB_DP	14	USB device / manufacturing test and configuration interface
USB_DN	15	
CHIP_PWD#	18	Power down control signal; setting this pin low forces the module in to its lowest power state
WAKEUP	19	
GPIO	2	GPIO with multiplexed functions
I2C	3	
UART1_TXD	4	
UART1_RXD	5	
UART0_CTS	6	
UART0_RXD/I2C_DATA	7	
SPI_CLK	8	
UART0_RTS	9	
UART0_TXD	10	
SPI_INT	11	
SPI_MISO	12	
SPI_MOSI	13	
HM0	16	
SPI_CS/HM1	17	
GPIO	20	
GPIO16	21	
GND	1	Ground
	22	
	26	
	34	
VDD33	25	3.3V supply for whole module
NC	23	Leave for future
	24	
	27	
	28	
	29	
	30	
	31	
	32	
	33	

2.4 Specification

	Description
Wi-Fi Solution	QCA4004
Memory	4Mbit Flash
Standard	IEEE 802.11 b/g/n standards compliant
Wireless LAN	1T1R Mode
Antenna	Printed antenna for Receiver & Transmitter; (U. FL of Hirose is optional)
Internet protocols	IPv4 / IPv6, TCP / UDP, ARP / NDP, DHCPv4, ICMPv6
Security protocols	WPA, WPA2, WEP, TKIP
Wireless Specification	Standard supported: IEEE 802.11 b/g/n Frequency: 2.412 to 2.484 GHz (subject to local regulations) Channels: up to 13 channels
I/O Interface	UART x2, SPI x1, I2C x1, GPIO
Host Interface	UART, SPI SPI slave: allows simplified connection to local host MCU. UART interface: Support AT style command set
Host Data Rate	UART: 115200bps, 8, n, 1 SPI: up to 12 Mbps
Connector	SMD-Pad connector-34 pads
Transmit Power(EIRP)	IEEE802.11b 11Mbps: +18dBm IEEE802.11g 54Mbps: +14 dBm IEEE802.11n 135Mbps: +13 dBm

Receiver Sensitivity	IEEE802.11b 11Mbps: -86dBm IEEE802.11g 54Mbps: -68 dBm IEEE802.11n 135Mbps: -64 dBm
Power consumption	Transmit: 250mA @ 16dBm Receive: 75mA (typical) Power down mode: 11 uA Standby mode (sleep): 2~4mA
Dimension	26 x 18 x 2.5mm
Weight	2.05g
Operating voltage	3.3V +/- 10%
Operating temperature	-10^{0}C ~ +65^{0}C
Operating humidity	20-70%
Certifications	CE, FCC, ROHS compliant
Warranty	One Year

3. Features

3.1 Power Management

The Wqm-u2618 provides integrated power management and control functions and extremely low power operation for maximum battery life across all operational states.

- **Transmit: 250 mA @16dBm;**
- **Receive: 75 mA (typical)**
- **Power down mode: 11uA**
- **Standby mode(Sleep): 2~4mA**

Sleep state minimizes power consumption while network services are not required, yet the system needs to remain available for use within a short time.

State	Typical Current Consumption for Wqm-u2618 module
CHIP_PWD	11uA (including SPI flash)
SLEEP	2~4mA

3.2 WiFi Link Feature

- IEEE 802.11b/g/n, single stream 1x1
- Single-band 2.4 GHz
- Integrated PA, LNA, with support for external PA and external LNA
- Green Tx power saving mode
- Low power listen mode
- Two-layer PCB design
- Link rates up to 150 Mbps

4. Electrical Specifications

4.1 Absolute Maximum Ratings

Table 4-1 summarizes the absolute maximum ratings and Table 4-2 lists the recommended operating conditions for the Wqm-u2618. Absolute maximum ratings are those values beyond which damage to the device can occur.

Functional operation under these conditions, or at any other condition beyond those indicated in the operational sections of this document, is not recommended.

NOTE Maximum rating for signals follows the supply domain of the signals.

Table 4-1 absolute maximum ratings

symbol	Description	Max rating	unit
VDD33	VDD supply for whole module	−0.3 to 4.0	V
VIH MIN	Minimum Digital I/O Input Voltage for 1.8 V or 3.3 V I/O Supply	−0.3	V
3.3 V I/O VIH MAX	Maximum Digital I/O Input Voltage for 3.3 V I/O Supply	Vdd +0.3	V
RFin	Maximum RF input (reference to 50-Ω input)	+10	dbm
Tstore	Storage Temperature	−45 to 135	°C
Tj	Junction Temperature	125	°C
ESD	Electrostatic Discharge Tolerance	HBM - 2000 CDM - 500	V

4.2 Recommended Operating Conditions

These conditions apply to all DC characteristics unless otherwise specified:

Tamb= 25^{0}C, Vdd33=3.3V

Table 4-2 Recommended Operating Conditions

Symbol	Parameter	Min	Typ	Max	unit
VDD33	VDD supply for whole module	3.14	3.3	3.46	V
Tcase	Case temperature	0	-	85	°C
PsiJT	Thermal Parameter2	-	3	-	°C/W

4.3 General DC electrical specifications

These conditions apply to all DC characteristics unless otherwise specified:

Tamb= 25^{0}C, Vdd33=3.3V

Table 4-3 DC Electrical Characteristics for Digital I/Os

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{IH}	High level voltage		1.8		3.6	V
V_{IL}	Low level voltage		-0.3		0.3	V
V_{OH}	High level O voltage		2.2		3.3	V
V_{OL}	Low level O voltage		0		0.4	V
I_{IL}	Low level I current				0.1	uA
I_{OH}	High level O current for GPIO0 to GPIO13				8	mA
	High level O current for GPIO18 to GPIO25				20	
I_{IH}	High level I current				0.1	uA
I_{OL}	High level O current for GPIO0 to GPIO13				20	mA
	High level O current for GPIO18 to GPIO25				20	
C_{IN}	I capacitance for GPIO0 to GPIO13			5		pF
	I capacitance for GPIO18 to GPIO25			3		

5. Timing Specification

5.1 External 26 / 40 MHz Reference Input Clock Timing

Figure 5-1 External 26/40 MHz Reference Input
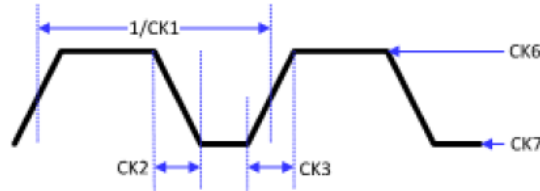
Table 5-1 External 26/40 MHz Reference Input Clock Timing

Symbol	Description	Min	Typ	Max	Unit
CK2	Fall time			0.1 x period	ns
CK3	Rise time			0.1 x period	ns
CK4	Duty cycle(high-to-low ratio)	40		60	%
CK5	Frequency stability	-20		20	ppm
CK6	Input high voltage	0.75		1.26	V
CK7	Input low voltage	-0.55		0.3	V

5.2 SPI Slave Interface Timing

Figure5-2 SPI Slave Timing
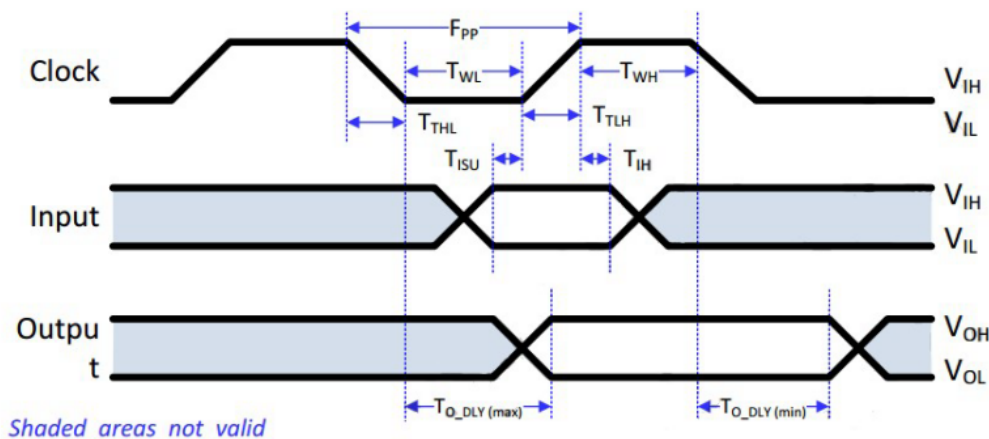
Table 5-2 SPI Slave Timing Constraints

Parameter	Description	Min	Max	Unit
f_{PP}	Clock frequency	0	48	MHz
t_{WL}	Clock low time	8.3	-	ns
t_{WH}	Clock high time	8.33	-	ns
t_{TLH}	Clock rise time	-	2	ns
t_{THL}	Clock fall time	-	2	ns
t_{ISU}	Input setup time	5	-	ns
t_{IH}	Input hold time	5	-	ns
t_{O_DLY}	Output delay	0	5	ns

5.3 SPI Master Interface Timing
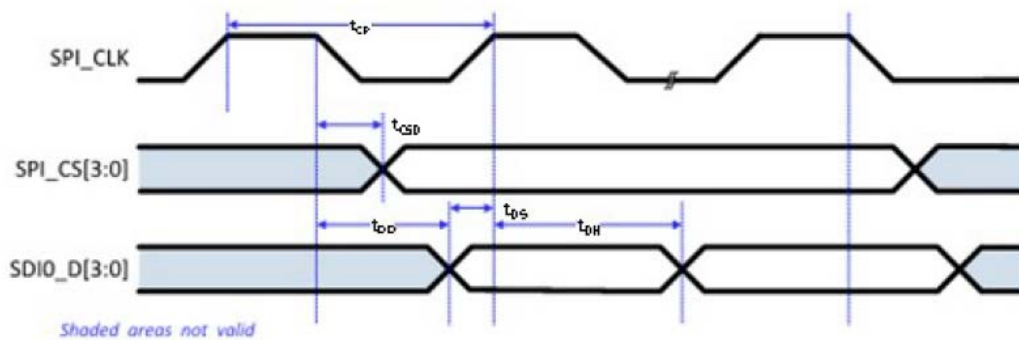
Figure 5-3 SPI Master Timing

Table 5-3 SPI Master Timing Constraints

Parameter	Description	Min	Max	Unit
t_{CP}	Clock period	30.7	1000	ns
t_{CSD}	Chip select valid delay	-5.5	5	ns
t_{DD}	Date valid delay	-5.5	5	ns
t_{DS}	Data setup	3	-	ns
t_{DH}	Data hold	0	-	ns

6. Interface Description

6.1 Bootstrap signals

Signal Name	Direction while CHIP_PWD# Is low	Description	
HM [1：0]	I	Bootstrap for host interface selection. Note: The pull-up or pull-down resistor is populated on the module. The system level should take care not to conflict with pull selection on the module.	
		Pull to 00	Enter USB/manufacturing test and configuration mode
		Pull to 01	Enter No External Host Required mode
		Pull to 10	Enter SPI Host mode
		Pull to 11	Enter SDIO Host mode

6.2 SPI slave signals

Signal Name	Direction	Description
SPI_CLK	I	Clock line from master, maximum rate 48 MHz
SPI_CS	I	Chip select, active low
SPI_MISO	O	Serial data to master
SPI_MOSI	I	Serial data from master

6.3 SPI master signals

These signals enable the QCA4004 to boot from an external SPI flash device. The QCA4004 supports single / quad mode SPI flash read / write.

Signal Name	Direction	Description
SPIM_CLK	O	SPI serial interface clock
SPIM_CS	O	SPI chip select
SPIM_MISO	IO	Data transmission from the QCA4004 to an external device
SPIM_MOSI	IO	Data transmission from an external device to the QCA4004

6.4 I²C signals

Signal Name	Direction	Description
I2C-CLK	IO	I²C clock
I2C-DATA	IO	I²C data

6.5 UART signals

Signal Name	Direction	Description
UART0_CTS	I	UART clear to send signal
UART0_RTS	O	UART ready to send signal
UART0_RXD	I	UART receive data
UART0_TXD	O	UART transmit data
UART1_RXD	I	UART receive data
UART1_TXD	O	UART transmit data

7.6 GPIO Signals

Signal Name	Direction	Description
GPIO0	I/O	
GPIO2	I/O	
GPIO7	I/O	
GPIO8	I/O	General purpose input/output.
GPIO9	I/O	The QCA4004 supports SDIO,SPI,I²C,I²S,UART,and JTAG interfaces.It is possible to configure the QCA4004 to support these interfaces by tying certain inputs externally during boot up.
GPIO11	I/O	
GPIO13	I/O	
GPIO16	I/O	
GPIO19	I/O	
GPIO21	I/O	

7. RF Parameters

7.1 Transmitter Characteristics for 2.4GHz Operation

Table 8-1 summarizes the transmitter characteristics for the Wqm-u2618

Table 8-1 transmitter characteristics

Symbol	Rate/Mbps	IEEE Citation	Output power/dbm
802.11b	11	18.4.7.2	18±3
802.11g	6	17.3.9.1	18±3
	54	17.3.9.1	14±3
802.11n	6.5	20.3.21.3	18±3
	135	20.3.21.3	13±3

7.2 Receiver Characteristics for 2.4GHz Operation

Table 7-2 summarizes the receiver characteristics for the Wqm-u2618. Notice that transmitter and especially receiver characteristics must be test under test guider.

Table 8-2 receiver characteristics

| Symbol	Rate/Mbps	IEEE limited/dbm	Typical Sensitivity/dbm
802.11 b	11	-76	-82
802.11g	6	-82	-85
	54	-65	-68
802.11n	6.5	-82	-85
	135	-61	-64

8. Manufacture information

8.1 Handling

The Wqm-u2618 modules contain a highly sensitive electronic circuitry. Handling without proper ESD protection may destroy or damage the module permanently.

8.2 Soldering Recommendations

The Wqm-u2618 modules can be SMT on the board following the temperature curve graph:
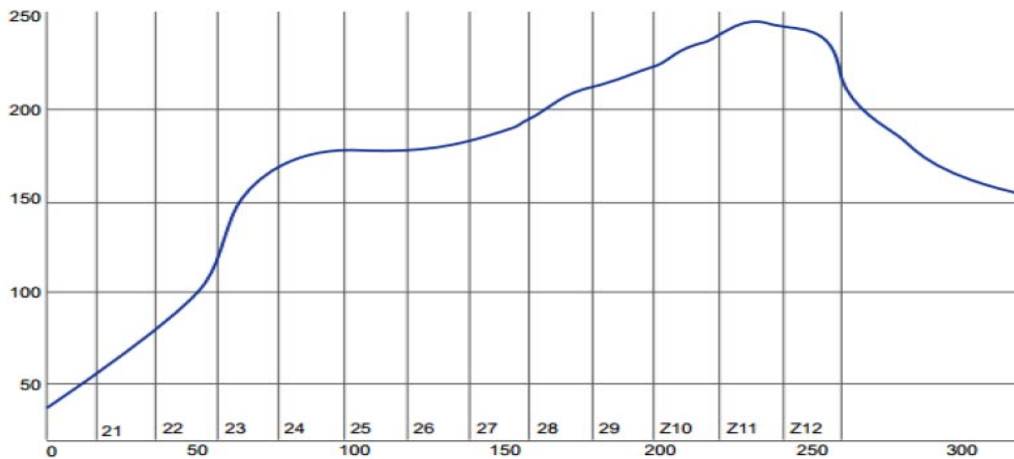
8.3 Rework

The module can be unsoldered from the host board if the Moisture Sensitivity Level (MSL) requirements are met as described in this datasheet. Never attempt a rework on the module itself, e.g. replacing individual components. Such actions will terminate warranty coverage.

9. Packing and Handling

Wi-Fi modules, like any other SMD devices, are sensitive to moisture, electrostatic discharge, and temperature. By following the standards outlined in this document for GlobalTop module storage and handling, the chances of them being damaged during production set-up can be reduced. This section will walk you through the basics on how GlobalTop packages its modules to ensure they arrive at their destination without any damages and deterioration to performance quality. It includes cautionary notes for prior to the surface mount process.

⚠️ **Please read the sections II to V carefully to avoid damages permanent damages due to moisture intake**

⚠️ **Wi-Fi modules contain highly sensitive electronic circuits and are electronic sensitive devices and improper handling without ESD protections may lead to permanent damages to the modules. Please read section VI for more details.**

9.1 Moisture Sensitivity

GlobalTop Wi-Fi modules are moisture sensitive, and must be pre-baked before going through the solder reflow process. It is important to know that:

GlobalTop Wi-Fi modules must complete solder reflow process in 72 hours after pre-baking.

This maximum time is otherwise known as "Floor Life"

If the waiting time has exceeded 72 hours, it is possible for the module to suffer damages during the solder reflow process such as cracks and delamination of the SMD pads due to excess moisture pressure.

9.2 Packing

GlobalTop Wi-Fi modules are packed in such a way to ensure the product arrives to SMD factory floor without any damages.

Wi-Fi modules are placed individually on to the packaging tray. The trays will then be stacked and packaged together.

Included are:

1. Two packs of desiccant for moisture absorption

2. One moisture level color coded card for relative humidity percentage.

Each package is then placed inside an antistatic bag (or PE bag) that prevents the modules from being damaged by electrostatic discharge.

Figure 1: One pack of Wi-Fi modules

Each bag is then carefully placed inside two levels of cardboard carton boxes for maximum protection.

Figure 2: Box protection

The moisture color coded card provides an insight to the relative humidity (RH). When the WI-FI modules are taken out, it should be around or lower than 30% RH level.

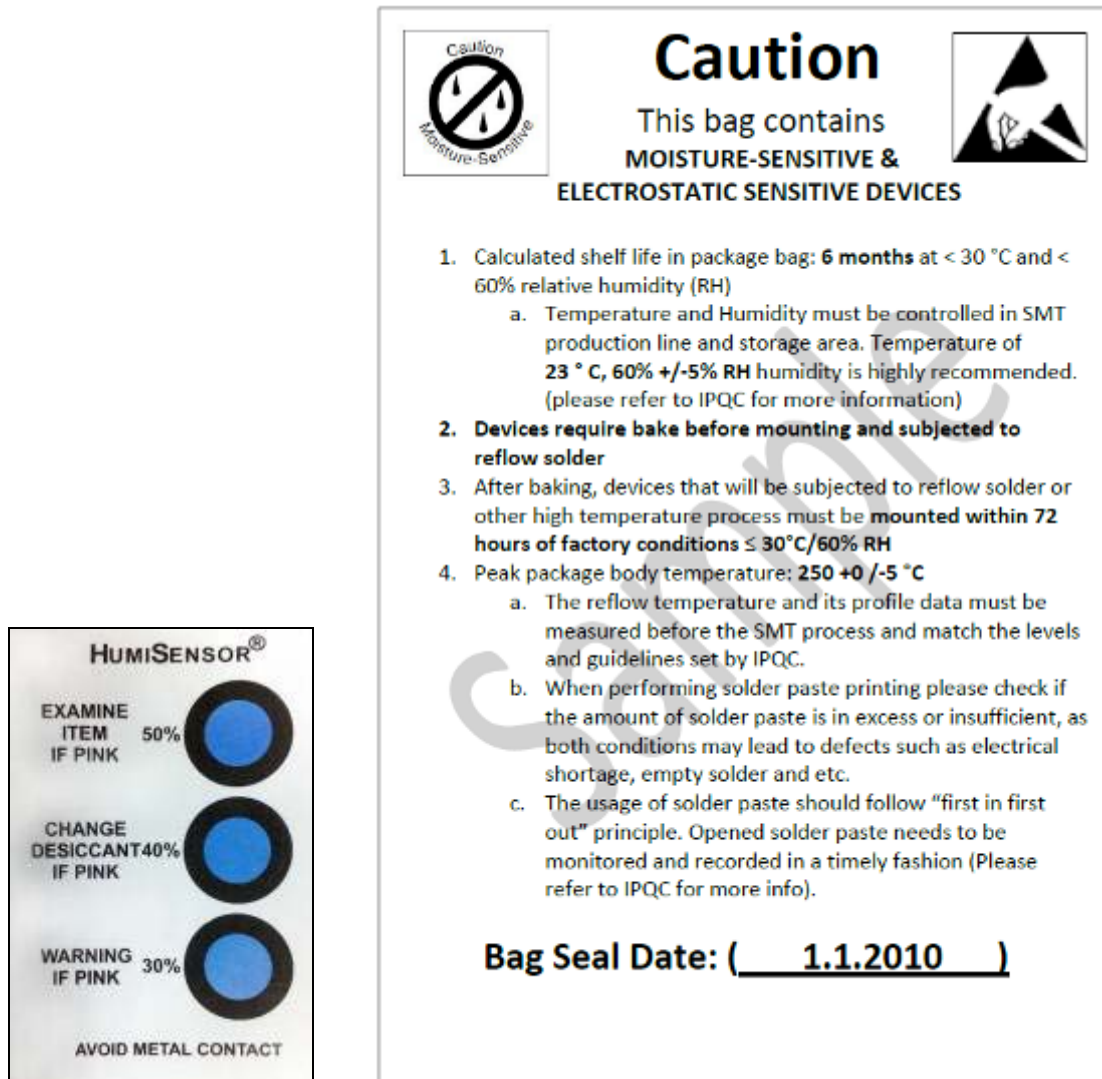Outside each electrostatic bag is a caution label for moisture sensitive device.

Caution
This bag contains
MOISTURE-SENSITIVE &
ELECTROSTATIC SENSITIVE DEVICES

1. Calculated shelf life in package bag: **6 months** at < 30 °C and < 60% relative humidity (RH)
   a. Temperature and Humidity must be controlled in SMT production line and storage area. Temperature of **23 ° C, 60% +/-5% RH** humidity is highly recommended. (please refer to IPQC for more information)
2. **Devices require bake before mounting and subjected to reflow solder**
3. After baking, devices that will be subjected to reflow solder or other high temperature process must be **mounted within 72 hours of factory conditions ≤ 30°C/60% RH**
4. Peak package body temperature: **250 +0 /-5 °C**
   a. The reflow temperature and its profile data must be measured before the SMT process and match the levels and guidelines set by IPQC.
   b. When performing solder paste printing please check if the amount of solder paste is in excess or insufficient, as both conditions may lead to defects such as electrical shortage, empty solder and etc.
   c. The usage of solder paste should follow "first in first out" principle. Opened solder paste needs to be monitored and recorded in a timely fashion (Please refer to IPQC for more info).

Bag Seal Date: (_____1.1.2010_____)

Figure 3: Example of moisture color coded card and caution label

9.3 Storage and Floor Life Guideline

Since GlobalTop modules must undergo solder-reflow process in 72 hours after it has gone through pre-baking procedure, therefore if it is not used by then, it is recommended to store the WI-FI modules in dry places such as dry cabinet.

The approximate shelf life for GlobalTop WI-FI modules packages is 6 months from the bag seal date, when store in a non-condensing storage environment (<30°C/60% RH)

⚠️ **It is important to note that it is a required process for GlobalTop Wi-Fi modules to undergo pre-baking procedures, regardless of the storage condition.**

9.4 Drying

When WI-FI modules exposed to high temperature of solder reflow, the moisture vapor pressure inside the WI-FI modules increase greatly. In order to prevent internal delaminating, cracking of the device or the "popcorn" phenomenon, it is **necessary** to undergo pre-baking procedure prior to any high temperature or solder reflow process.

The recommended baking time for GlobalTop WI-FI module is as follows:

✓ **60°C for 8 to 12 hours**

Once baked, the module's floor life will be "reset", and has additional 72 hours in normal factory condition to undergo solder reflow process.

⚠️ **Please limit the number of times the Wi-Fi modules undergoes baking processes as repeated baking process has an effect of reducing the wetting effectiveness of the SMD pad contacts. This applies to all SMT devices.**

⚠️ **Oxidation Risk: Baking SMD packages may cause oxidation and/or intermetallic growth of the terminations, which if excessive can result in solderability problems during board assembly. The temperature and time for baking SMD packages are therefore limited by solderability considerations. The cumulative bake time at a temperature greater than 90°C and up to 125°C shall not exceed 96 hours. Bake temperatures higher than 125°C are now allowed.**

9.5 ESD Handling

Please carefully follow the following precautions to prevent severe damage to Wi-Fi modules.

GlobalTop Wi-Fi modules are sensitive to electrostatic discharges, and thus are Electrostatic Sensitive Devices (ESD). Careful handling of the Wi-Fi modules and in particular to its patch antenna (if included) and RF_IN pin, must follow the standard ESD safety practices:

- ✓ Unless there is a galvanic coupling between the local GND and the PCB GND, then the first point of contact when handling the PCB shall always be between the local GND and PCB GND.

- ✓ Before working with RF_IN pin, please make sure the GND is connected

- ✓ When working with RF_IN pin, do not contact any charges capacitors or materials that can easily develop or store charges such as patch antenna, coax cable, soldering iron.

- ✓ Please do not touch the mounted patch antenna to prevent electrostatic discharge from the RF input

- ✓ When soldering RF_IN pin, please make sure to use an ESD safe soldering iron (tip).

10. Contact Information

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