WT11

Preliminary Data Sheet

Version 1.4

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bluegiga
TECHNOLOGIES

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Contents:

VERSION HISTORY

Version:	Date:	Author:	Comments:
1.0	11.5.2005	*MS*	*Preliminary version*
1.1	14.9.2005	*PR*	*Dimension update*
1.2	30.1.2006	*MS*	*Images, dimensions and interfaces updated.*
1.3	6.2.2006	*MS*	*Foot print fixed*
1.4	2.3.2006	*PR*	*Figure 6 added*

1. DEVICE FEATURES OVERVIEW

- Fully Qualified Bluetooth system v2.0 + EDR, CE and FCC
- Class 1, range up to 300 meters
- Integrated chip antenna or UFL connector
- Industrial temperature range from -40^{o}C to +85^{o}C
- Enhanced Data Rate (EDR) compliant with v2.0.E.2 of specification for both 2Mbps and 3Mbps modulation modes
- RoHS Compliant
- Full Speed Bluetooth Operation with Full Piconet
- Scatternet Support
- USB version 2.0 compatible
- UART with bypass mode
- Support for 802.11 Coexistence
- 8Mbits of Flash Memory

2. GENERAL DESCRIPTION

2.1 Physical Outlook

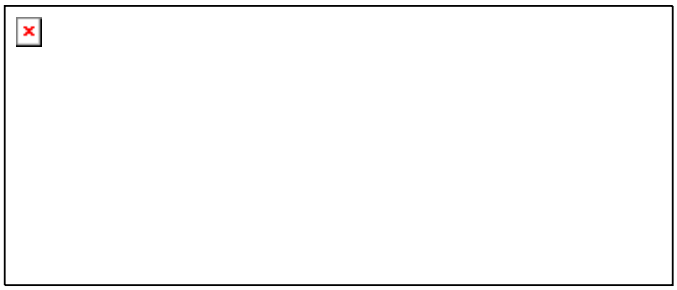

Figure 1: Physical outlook of WT11-A

Figure 2: Physical outlook of WT11-E

2.2 Block Diagram and Descriptions

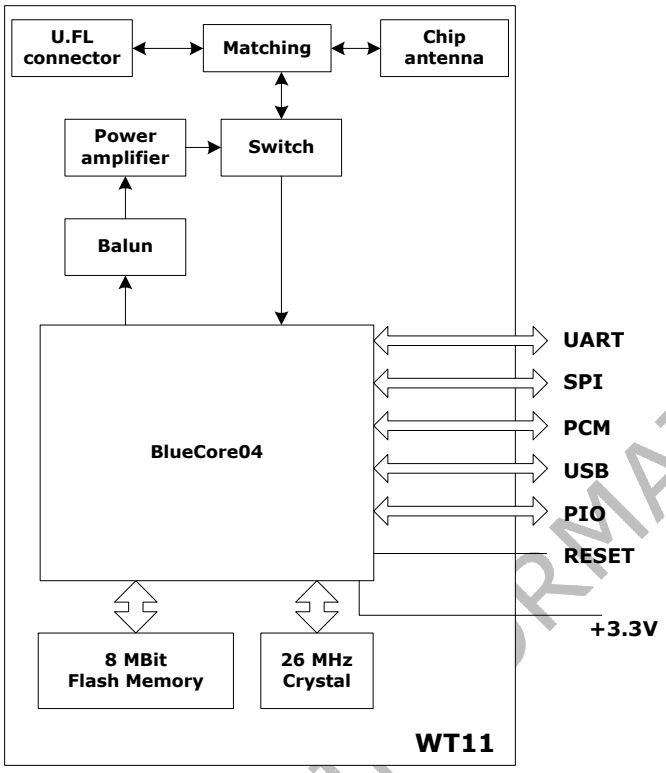

Figure 3: Block Diagram of WT11

2.2.1 BlueCore04

BlueCore4 is a single chip Bluetooth solution which implements the Bluetooth radio transceiver and also an on chip microcontroller. BlueCore4 implements Bluetooth® 2.0+EDR (Enhanced Data Rate) and it can deliver data rates up to 3 Mbps.

The microcontroller (MCU) on BlueCore04 acts as interrupt controller and event timer run the Bluetooth software stack and control the radio and host interfaces. A 16-bit reduced instruction set computer (RISC) microcontroller is used for low power consumption and efficient use of memory.

BlueCore04 has 48Kbytes of on-chip RAM is provided to support the RISC MCU and is shared between the ring buffers used to hold voice/data for each active connection and the general purpose memory required by the Bluetooth stack.

2.2.2 Crystal

The crystal oscillates at 26MHz.

2.2.3 Flash

Flash memory is used for storing the Bluetooth protocol stack and Virtual Machine applications. It can also to the optional external RAM for memory intensive applications.

2.2.4 Balun

Balun changes the balanced input/output signal of the module to unbalanced signal of the monopole antenna.

2.2.5 Power amplifier

Power amplifier is used to increase the output power to a level required by class 1 specification.

2.2.6 Switch

Switch is used to separate transmission and receiver modes.

2.2.7 Matching

Antenna matching components match the antenna to 50 Ohms and also selects between chip antenna and UFL connector.

2.2.8 Antenna

The antenna is ACX AT3216 chip antenna.

2.2.9 U.FL

This is a standard U.FL male connector for external antenna possibility.

2.2.10 USB

This is a full speed Universal Serial Bus (USB) interface for communicating with other compatible digital devices. WT11 acts as a USB peripheral, responding to requests from a Master host controller such as a PC.

2.2.11 Synchronous Serial Interface

This is a synchronous serial port interface (SPI) for interfacing with other digital devices. The SPI port can be used for system debugging. It can also be used for programming the Flash memory.

2.2.12 UART

This is a standard Universal Asynchronous Receiver Transmitter (UART) interface for communicating with other serial devices.

2.2.13 Audio PCM Interface

The audio pulse code modulation (PCM) Interface supports continuous transmission and reception of PCM encoded audio data over Bluetooth.

2.2.14 Programmable I/O

WT11 has a total of 6 digital programmable I/O terminals. These are controlled by firmware running on the device.

2.2.15 Reset

This can be used to reset WT11.

2.2.16 802.11 Coexistence Interface

Dedicated hardware is provided to implement a variety of coexistence schemes. Channel skipping AFH (Adaptive Frequency Hopping), priority signaling, channel signaling and host passing of channel instructions are all supported. The features are configured in firmware. Since the details of some methods are proprietary (e.g. Intel WCS) please contact Bluegiga Technologies for details.

2.3 Applications

WT11 Bluetooth module is designed for:

- Hand held terminals
- Industrial devices
- Point-of-Sale systems
- PCs
- Personal Digital Assistants (PDAs)
- Computer Accessories
- Access Points
- Automotive Diagnostics Units

2.4 Product names and codes

iWRAP firmware:

- WT11 with internal chip antenna, iWRAP firmware: WT11-A-AI
- WT11 with UFL connector, iWRAP firmware: WT11-E-AI

HCI firmware:

- WT11 with internal chip antenna, HCI firmware: WT11-A-HCI
- WT11 with UFL connector, HCI firmware: WT11-E-HCI

Notes:

HCI firmware is delivered with USB as host interface!

Custom firmware:

- WT11 with internal chip antenna, custom firmware: WT11-A-C
- WT11 with UFL connector, custom firmware: WT11-E-C

Notes:

Custom firmware requires properly filled custom firmware document or custom firmware ID.

General Specifications

Item	Specification
Supply voltage	3.3 V ± 0.1 V regulated voltage. (Noise < 10 mV_{P-P})
Supply current	Maximum current in TX mode: 170.0mA Maximum current in RX mode: 170.0mA
Frequency range	2400 MHz … 2483.5 MHz (ISM-Band)
Guard band	2 MHz < F < 3.5 MHz (Europe, Japan, USA)
Carrier frequency	2402 MHz … 2480 MHz, F = 2402 + k MHz, k = 0 … 78
Modulation method	GFSK (1 Mbps), π/4 DQPSK (2Mbps) and 8DQPSK (3Mbps)
Hopping	1600 hops/s, 1 MHz channel space
Maximum data rate	**GFSK:** Asynchronous, 723.2 kbps / 57.6 kbps Synchronous: 433.9 kbps / 433.9 kbps **π/4 DQPSK:** Asynchronous, 1448.5 kbps / 115.2 kbps Synchronous: 869.7 kbps / 869.7 kbps **8DQPSK:** Asynchronous, 2178.1 kbps / 177.2 kbps Synchronous: 1306.9 kbps / 1306.9 kbps
Receiving signal range	-82 to -20 dBm (Typical)
Receiver IF frequency	1.5 MHz (Center frequency)
Transmission power	Minimum: -11 …-9 dBm Maximum +16 … +20 dBm

RF input impedance	50 Ω
Baseband crystal OSC	26 MHz
Output interfaces	6 GPIO, PCM, SPI, UART, USB
Operation temperature	-40ºC … +85ºC
Storage temperature	-40ºC … +105ºC
Compliance	Bluetooth specification, version 2.0 + EDR
USB specification	USB specification, version 1.2

Table 1: General specifications

3. ELECTRICAL CHARASTERISTICS

Rating	Min	Max
Storage temperature	-40°C	+150°C
Supply Voltage: VDD	3.2V	3.4V

Table 2: Absolute Maximum Ratings

Operating conditions	Min	Max
Operating Temperature Range:	-40°C	+85°C
Supply Voltage: VDD	3.2V	3.4V

Table 3: Recommended Operating Conditions

Digital terminals	Min	Typ	Max	Unit
Input voltage				
V_{IL} input logic level low (VDD=3.3V)	-0.4		+0.8	V
V_{IH} input logic level high	0.7VDD		VDD+0.1	V
Output voltage				
V_{OL} output logic level low (VDD=3.3V) (I_o = 3.0mA)			0.2	V
V_{OL} output logic level high (VDD=3.3V) (I_o = -3.0mA)	VDD-0.2			V

Table 4: Input/Output Terminal Characteristics

4. WT11 PIN DESCRIPTION

The PIN description of WT11 is shown in the table below.

No.	Pin name	I/O	Description
1	GND	GND	Ground
2	3V3	VDD	Power supply connection
3	PIO2	I/O	Programmable I/O lines
4	PIO3	I/O	Programmable I/O lines
5	NRTS	O	UART RTS (internal pull-up, active low)
6	RXD	I	UART RX (internal pull down)
7	PCMO	O	Synchronous 8 kbps data out (internal Pull down)
8	USB_D+	A	USB data plus (Internal 22 ohm serial resistor)
9	USB_D-	A	USB data minus (Internal 22 ohm serial resistor)
10	NCTS	I	UART CTS (internal pull down, active low)
11	PCMI	I	Synchronous 8 kbps data in (internal pull-down)
12	PCMC	I/O	Synchronous data clock (internal pull-down)
13	PCMS	I/O	Synchronous data strobe (internal pull-down)
14	GND	GND	Ground
15	GND	GND	Ground
16	3V3	VDD	Power supply connection
17	RES	I	Reset input (active high)

18	PIO6	I/O	Programmable I/O lines
19	PIO7	I/O	Programmable I/O lines
20	PIO4	I/O	Programmable I/O lines
21	NCSB	I	Chip selection for SPI (internal pull up, active low)
22	SCLK	I/O	SPI Clock (internal pull down)
23	MISO	O	SPI data output (pull down)
24	MOSI	I	SPI data input (pull down)
25	PIO5	I/O	Programmable I/O lines
26	TXD	O	UART TX (internal pull up)
27	NC	-	NC, not used in WT11 module.
28	GND	GND	Ground

Table 5: WT11 PIN configuration

Notes: Voltage level of input (I), output (O) and input/output (I/O) pins is 3.3V.

5. FOOT PRINT

Figure 4: WT11 foot print and dimension

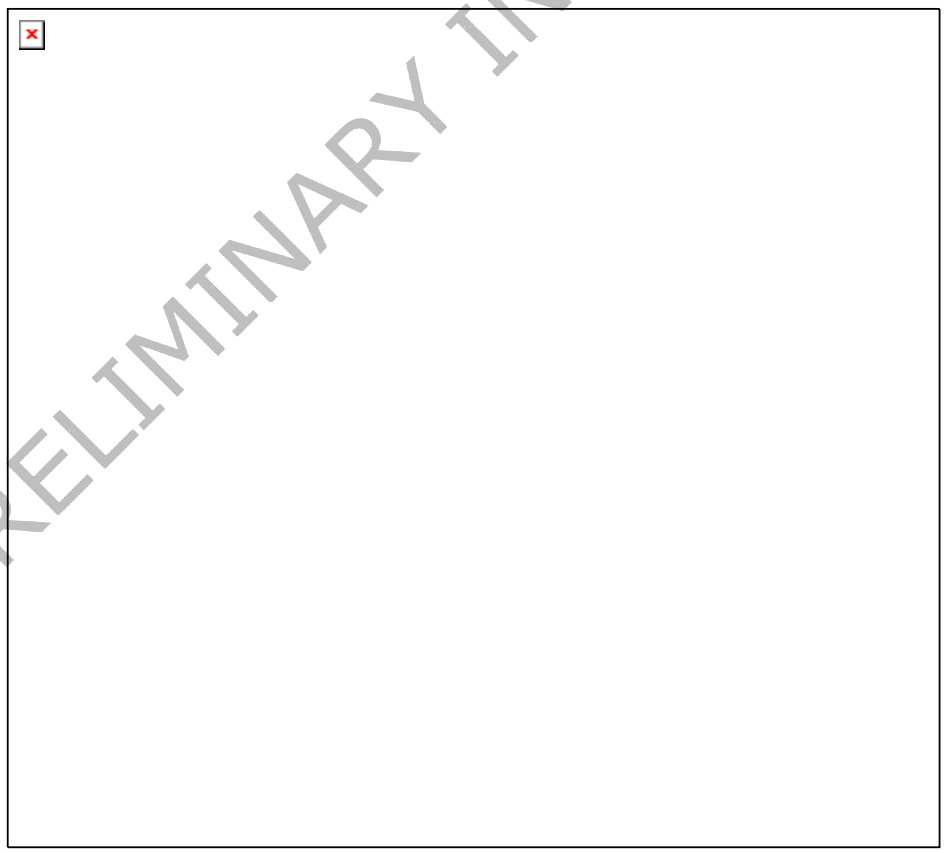

Figure 5: WT11 pad dimensions

6. ANTENNA KEEP OUT AREA

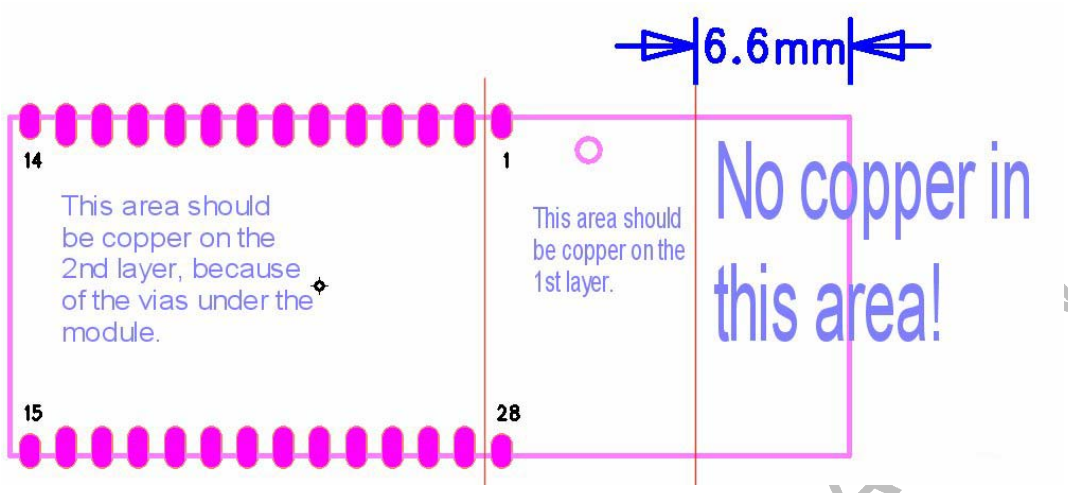

Figure 6: PCB design around ACX antenna

Figure four above illustrates how PCB design around the antenna of WT11 should be made. The most important thing is that there is no copper (ground plane or traces) underneath or in the close proximity of the ACX antenna.

It's also very important to have grounding vias all the way in the border between ground plane and free space, as illustrated with black and gray dots in figure 4. This prevents the RF signal for reflecting back to the PCB and signal lines over there.

For more information, please refer to the WT11 design guide and design references.

7. WT11-A PHYSICAL DIMENSIONS

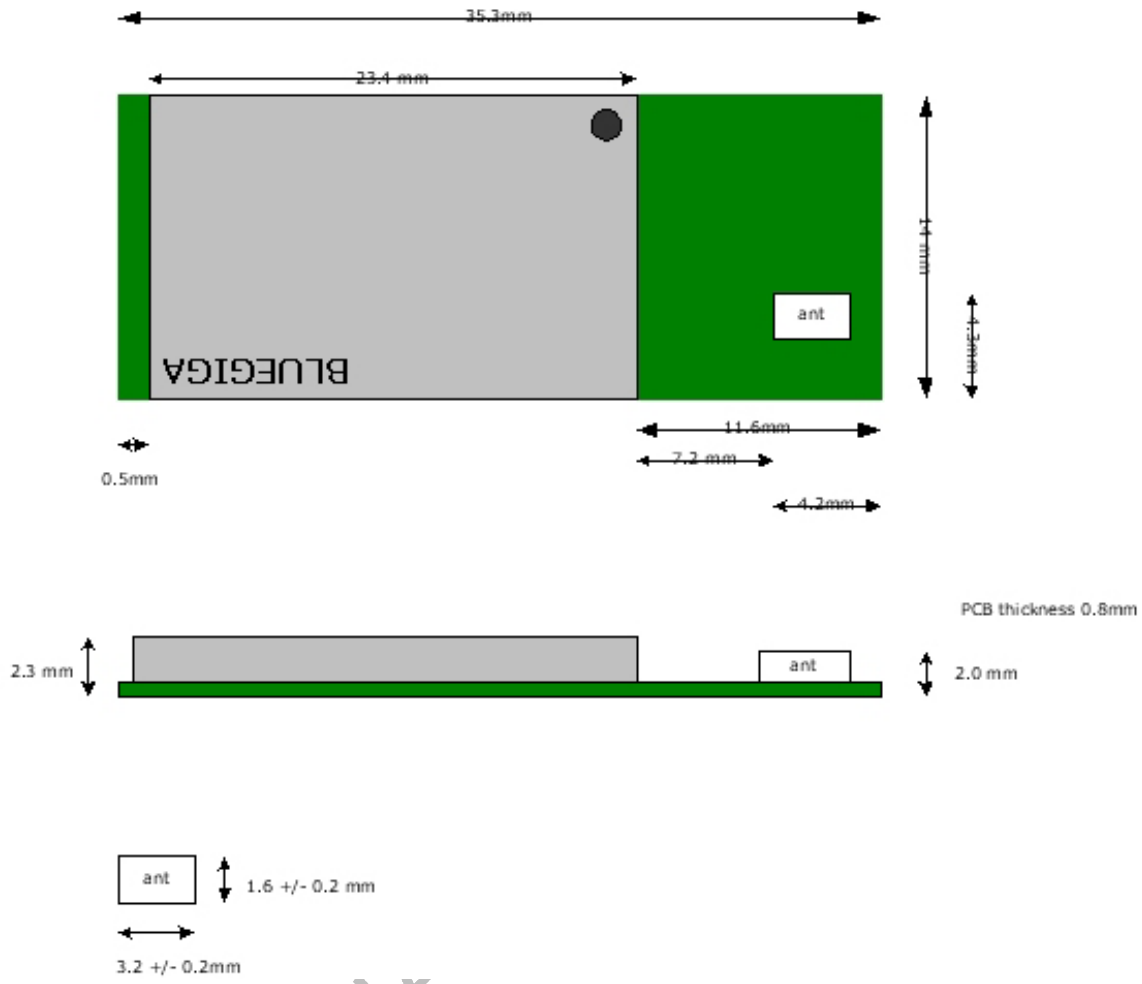

Figure 7: WT11-A Dimensions

7.1 UART Interface

WT11 Universal Asynchronous Receiver Transmitter (UART) interface provides a simple mechanism for communicating with other serial devices using the RS232 standard[1].

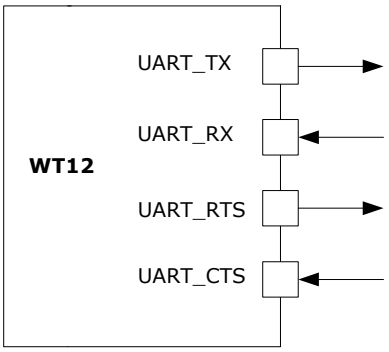

Figure 8: WT11 UART interface

Four signals are used to implement the UART function, as shown in Figure 11.12. When WT11 is connected to another digital device, UART_RX and UART_TX transfer data between the two devices. The remaining two signals, UART_CTS and UART_RTS, can be used to implement RS232 hardware flow control where both are active low indicators. All UART connections are implemented using CMOS technology and have signaling levels of 0V and VDD_PADS.

Figure 9: WRAP THOR VM Stack

In figure above, the iWRAP software solution is described. In this version of the stack firmware shown no host processor is required to run the Bluetooth protocol stack. All software layers, including application software, run on the internal RISC processor in a protected user software execution environment known as a Virtual Machine (VM).

The host processor interfaces to iWRAP software via one or more of the physical interfaces which are also shown in the figure above. The most common interfacing is done via UART interface using the ASCII commands supported by the iWRAP software. With these ASCII commands the user can access Bluetooth functionality without paying any attention to the complexity which lies in the Bluetooth protocol stack.

The user may write applications code to run on the host processor to control iWRAP software with ASCII commands and to develop Bluetooth powered applications.

Notes:

More details of iWRAP software and it's features can be found from *iWRAP User Guide* which can be downloaded from www.bluegiga.com.

Federal Communications Commission (FCC) Statement

15.21

You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

15.105(b)

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 or more 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.

Operation is subject to the following two conditions:

1) this device may not cause interference and

2) this device must accept any interference, including interference that may cause undesired operation of the device.

FCC RF Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Note: The end product shall has the words "Contains Transmitter Module FCC ID: QOQWT11"

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