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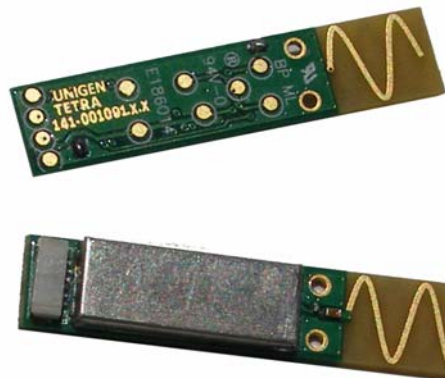
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Unigen Corp. Wireless Module Products

TETRA Dual Mode Bluetooth Radio Module
UGWT1BL2FLA233A

Issue Date: 01-Dec-11
Revision: 0.1a

Revision History

Rev. No.	History	Issue Date	Remarks
0.1	Draft	Dec. 11, 2011	Advanced information; Author: Allen B. Cabreros
0.1a	-	Jan. 23, 2012	FCC Compliance/Warning statement added

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PRODUCT INTRODUCTION

The Tetra module supports Bluetooth v4.0 for the Low Energy operation and Bluetooth v3.0 + High Speed[*] for communication with existing Bluetooth devices. Tetra operates on the High Speed (+HS) bandwidth via a XSR six pin JST connector. The interface is the USB HCI protocol. Tetra utilizes a serial EEPROM for retaining the Bluetooth Address, Country Code of operation, and previously paired Bluetooth devices. It stores the Bluetooth address and link key information on the module.

The slim design of Tetra features on-board, double helix, printed, antenna which addresses many antenna placement issues. The module is designed to be placed in areas that are small and slim offering optimum antenna placement. Also, instead of using RF cable assemblies and/or external antenna, the module can be placed using a low cost 6 wire cable assembly which is used to connect the module to the motherboard and host.

FEATURES AND BENEFITS

- Dual Mode Bluetooth, V3.0+HS, V4.0, BLE
- Programmable EEPROM
- Full Speed USB 2.0 Protocol Interface
- Double Helix Printed PCB Antenna
- +9dBm Transmit Power; -90dBm Receive Sensitivity
- Dimensions: 30mm x 6.5mm x 2.25mm
- 6 pin XSR JST Low Profile Connector
- LED Driver
- Deep Sleep Mode of 40µA With Fast Wake-up
- Range up to 35 meters

[*] Bluetooth High Speed is dependent on the Bluetooth Stack on the Host.

Applications

- Laptops
- Netbooks
- Tablets
- Automotive Dash & Infotainment
- Televisions
- Set Top Box
- IP-TV/DVRs
- Health, Fitness, Exercise Equipment
- Smart Energy/Grid
- Smart Appliances
- Vending
- Point of Sales
- Kiosks
- Smart Bar Code Scanner/Readers
- Security

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PRODUCT DESCRIPTION

TETRA Module

The Tetra module is a complete Bluetooth controller subsystem that includes the Bluetooth radio transceiver, Baseband, Link Controller and exposed HCI layer using USB. The Tetra module operates in the 2.4GHz ISM (Industrial, Scientific and Medical) band. The Tetra module utilizes a CSR BlueCore® CSR8510™ chipset solution. The CSR BlueCore® CSR8510™ is a single-chip radio and baseband IC for Bluetooth 2.4GHz system. With the on-chip CSR Bluetooth Controller, the module contains the lower Bluetooth software protocol stack that is fully compliant Bluetooth with the v3.0+HS and v4.0 specification versions. The module dimensions measures 30mm x 6.5mm x 2.25mm. Power, Ground and USB communications are through a low profile, 6 pin, XSR JST connector.

CSR Bluetooth Controller IC

BlueCore® CSR8510™ is a product from CSR's Connectivity Centre. It is a single-chip radio and baseband IC for Bluetooth 2.4GHz systems including EDR to 3Mbps. Dedicated signal and baseband processing is included for full Bluetooth operation. The CSR BlueCore® CSR8510™ support the Bluetooth stack up to the HCI layer and the radio. The radio and baseband also supports High Speed and the Bluetooth v4.0 radio.

Functional Block Diagram

TETRA BLUETOOTH MODULE

ANT

CSR BlueCore® CSR8510™

RAM

2.4GHz Radio

Baseband DSP

I/O

MCU

FILTER

LED DRV

USB

3V

XSR JST CON1

XTAL

EEPROM
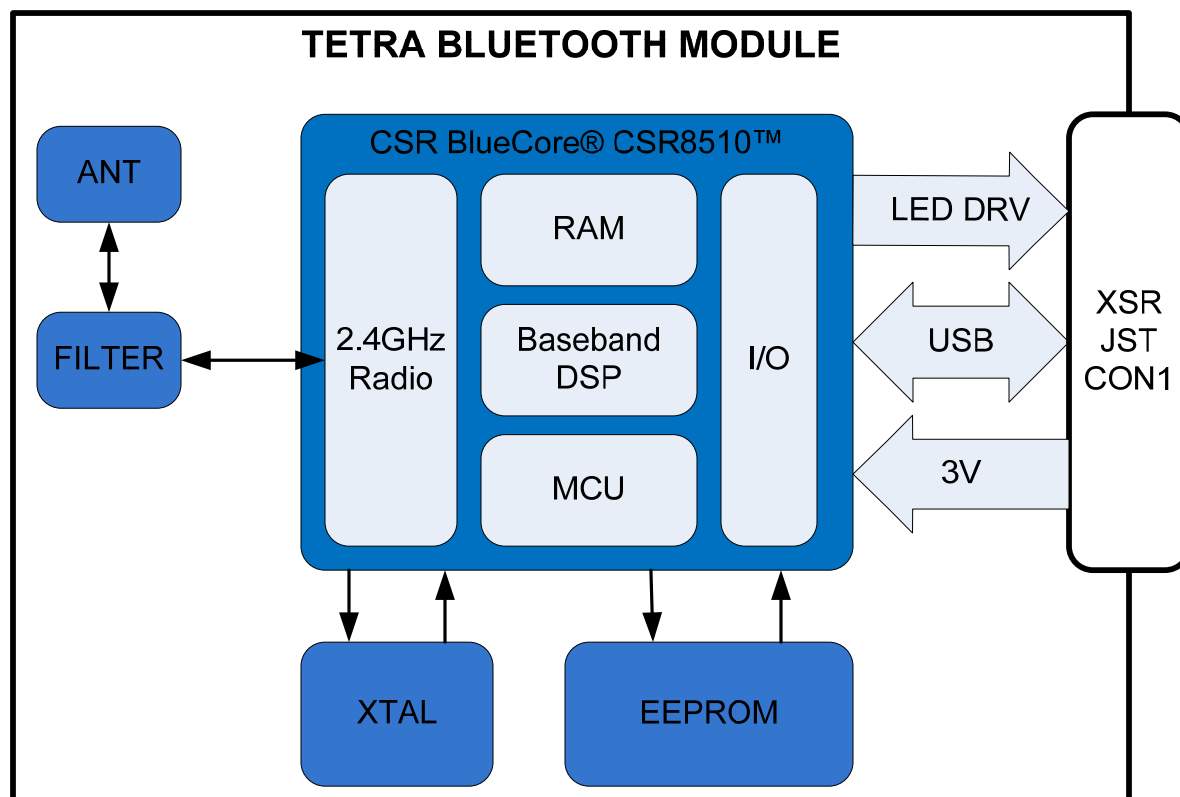
Figure 1: TETRA Module Block Diagram

TETRA Bluetooth Radio Module

CONNECTOR PIN ASSIGNMENT

PIN	Description
1	3.3V
2	GND
3	USB_P
4	USB_N
5	LED_DRV
6	NC
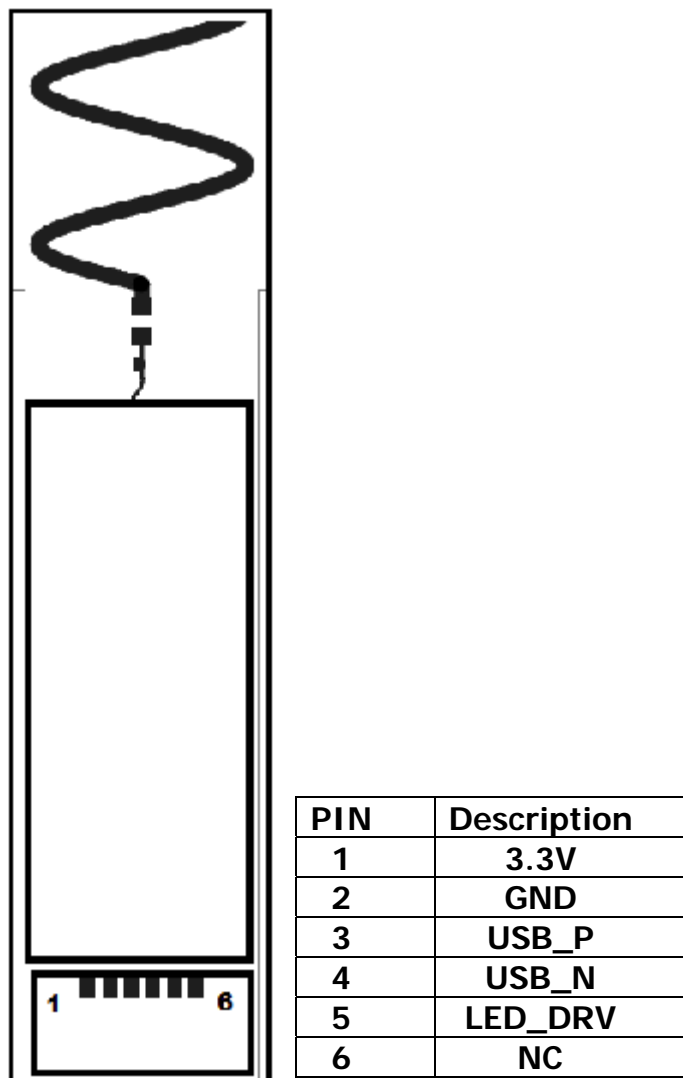
Figure 2: TETRA Pin Location and Descriptions

PIN FUNCTIONS

Table 1: TETRA Pin Functions

Pin	Signal Name	Type	Description
1	3.3V	PWR	Module power supply
2	Ground	GND	Module Ground
3	USB_P	I/O	USB+ Data Line
4	USB_N	I/O	USB- Data Line
5	LED_DRV	I/O	LED Drive Pin
6	NC	-	Not Connected

ABSOLUTE MAXIMUM RATINGS

Table 2: Absolute Maximum Ratings

Definition	Min	Max	Unit
3.3 Supply Voltage	2.3	4.8	V
Storage Temperature	-40	+85	°C

These are stress ratings only. Exposure to stresses beyond these maximum ratings may cause permanent damage to, or affect the reliability of this module. Avoid using the module outside the recommended operating conditions defined below. This module is ESD sensitive and should be handled and/or used in accordance with proper ESD mitigation.

RECOMMENDED OPERATING CONDITIONS

Table 3: Recommended Operating Conditions

Description	Value			
	Min	Typ	Max	Unit
Supply Voltage	2.4	3.3	4.9	Vdc
Operating Temp. Range	0	25	85	°C
Ground Voltage	-0.4	0	+0.4	Vdc

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RF CHARACTERISTICS

Table 4: RF Characteristics

Parameter	Specifications	Units
RF output power	**+ 9**	dBm
Receiver sensitivity	**- 90**	dBm

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TETRA Bluetooth Radio Module

AGENCY CERTIFICATIONS (PRE-SCAN)

TBD

FCC REGULATORY COMPLIANCE STATEMENT

FCC warning statements:

- This device complies with Part 15 of the FCC Rules.

    Operation is subject to the following two conditions:

    - *This device may not cause harmful interference, and*
    - *This device must accept any interference received, including interference that may cause undesired operation.*

- 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.

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

- When integrated into a host equipment the host equipment should clearly display a label stating "this product contains FCC ID: R8KUGWT1BL1"

- The final Host product using this module will be subject to verification to FCC CFR 47 Part 15B

BLUETOOTH COMPLIANCE

TBD

TETRA Bluetooth Radio Module

FUNCTIONAL OVERVIEW

TETRA Hardware Functional Description

The TETRA is a complete Radio Transceiver Module operating in the license free ISM (Industrial Scientific and Medical) 2.4GHz band. The TETRA module is equipped with a crystal oscillator and BALUN, Filter and a printed double helix antenna. TETRA incorporates CSR's BlueCore® CSR8510™ chipset that is fully compliant to the Bluetooth v2.1+EDR, v3.0+HS and v4.0 specifications.

The full speed USB interface, power, and ground lines are connected via a XSR JST, low profile connector. The USB interface communicates with an external host running the upper Bluetooth stack defined by the Host Controller Interface (HCI) layer in the Bluetooth specifications. The USB interface is used to send HCI commands and events to and from the external host to TETRA module.

Asynchronous and Synchronous Bluetooth data is sent between the module and external host via the USB interface as well. Asynchronous data is sent and received over an Asynchronous packet switched RF link defined by the Bluetooth specification as "Asynchronous ConnectionLess" (ACL). Synchronous data such as audio data uses "Synchronous Connection Oriented" (SCO) circuit switched RF links defined by the Bluetooth specification. ACL data links can retransmit lost or corrupted data continuously due to the packet switched connection. SCO data can provide fast reliable continuous synchronous data over the circuit-switched RF link. SCO over the USB is supported.

BLUETOOTH SOFTWARE STACK

The TETRA module is supplied with Bluetooth v4.0 specification qualified HCI stack firmware and also supplied with enhanced application software for PC environments.

The figure below shows an example implementation. An internal processor runs the Bluetooth stack up to the HCI. The host processor must provide all upper layers including the application.
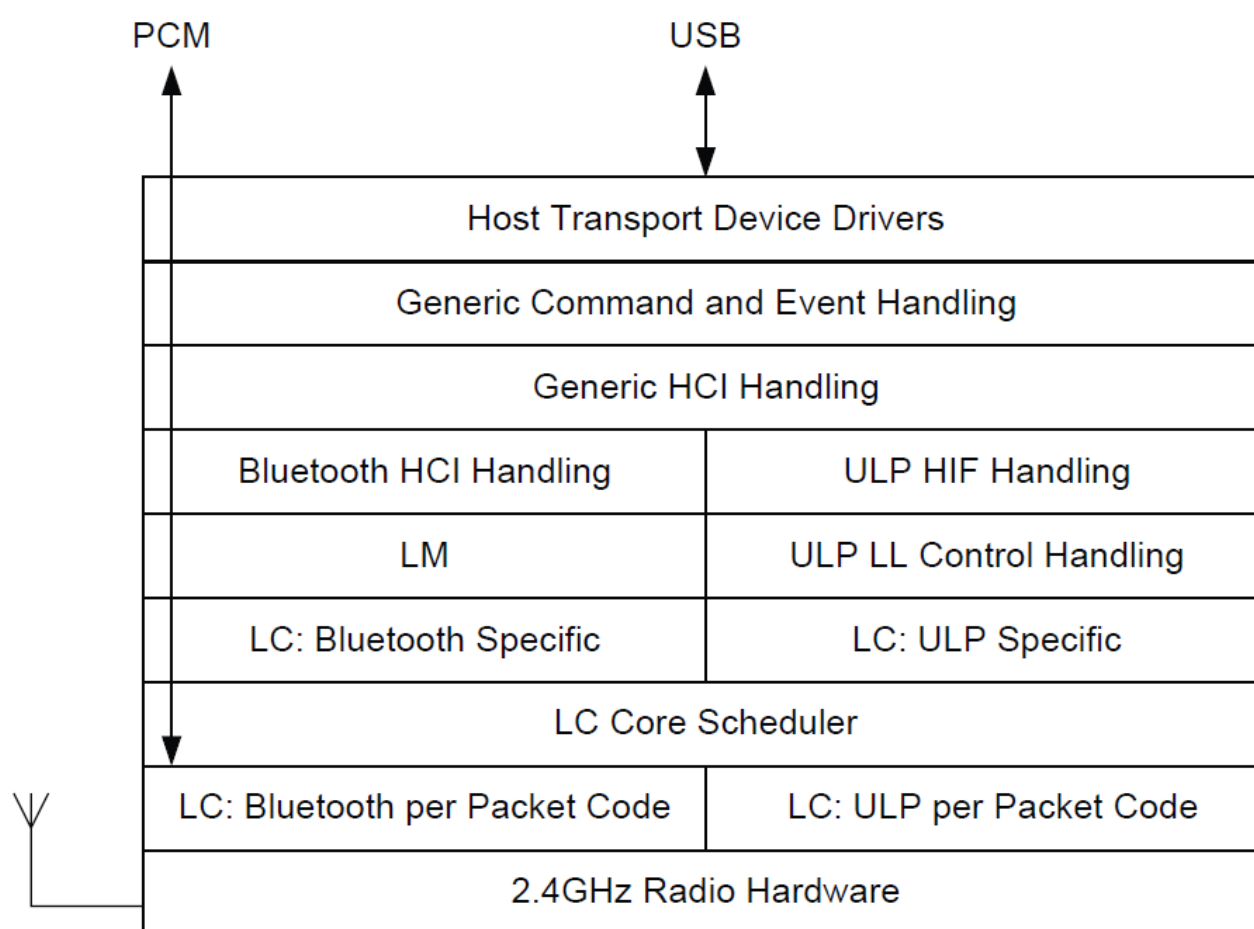

Figure 3: TETRA Bluetooth HCI Stack

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Key Features of the HCI Stack

The Tetra module supports the following Bluetooth v2.1 + EDR, v3.0, V4.0 functionality:

- Secure simple pairing
- Sniff subrating
- Encryption pause resume
- Packet boundary flags
- Encryption
- Extended inquiry response
- Enhanced Power Control
- Enhanced USB HCI Transports
- HCI Read Encryption Key Size command
- Unicast Connectionless Data
- Adaptive frequency hopping (AFH), including classifier
- Faster connection - enhanced inquiry scan (immediate FHS response)
- LMP improvements
- Parameter ranges
- Adaptive Frequency Hopping (AFH) as Master and Automatic Channel Classification
- Fast Connect - Interlaced Inquiry and Page Scan plus RSSI during Inquiry
- Extended SCO (eSCO), eV3 +CRC, eV4, eV5
- SCO handle
- Synchronization

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The TETRA module also contains extra application software designed for PC environments:

- LED control:
  - o Support for a configurable LED drive indicating Bluetooth radio operation
  - o Configurable LED flash patterns for each radio state
- Hardware RF kill:
  - o Typically for Flight Mode applications, this disables RF activity depending on a PIO state
- Software RF kill:
  - o Typically for Flight Mode applications, this disables RF activity using HCI commands from the USB host
  - o State is optionally maintained through reboot

USB INTERFACE

The TETRA module has a full-speed (12Mbps) USB interface for communicating with other compatible digital devices. The USB interface on TETRA acts as a USB peripheral responding to requests from a master host controller. TETRA supports the Universal Serial Bus Specification, Revision v2.0 (USB v2.0 Specification) available from http://www.usb.org.

POWER CONSUMPTION

Table 5: Operating Power Consumption Figures

Operation Mode	Connection Type	Average	Unit
Page scan, time interval 1.28s	-	TBD	mA
Inquiry and page scan, time interval 1.28s	-	TBD	mA
ACL no traffic	Master	TBD	mA
ACL with file transfer	Master	TBD	mA
ACL 40ms sniff	Master	TBD	mA
ACL 1.28s sniff	Master	TBD	mA
eSCO EV5	Master	TBD	mA
eSCO EV3	Master	TBD	mA
eSCO EV3 - hands-free - setting S1	Master	TBD	mA
SCO HV1	Master	TBD	mA
SCO HV3	Master	TBD	mA
SCO HV3 30ms sniff	Master	TBD	mA
ACL no traffic	Slave	TBD	mA
ACL with file transfer	Slave	TBD	mA
ACL 40ms sniff	Slave	TBD	mA
ACL 1.28s sniff	Slave	TBD	mA
eSCO EV5	Slave	TBD	mA
eSCO EV3	Slave	TBD	mA
eSCO EV3 - hands-free - setting S1	Slave	TBD	mA
SCO HV1	Slave	TBD	mA
SCO HV3	Slave	TBD	mA
SCO HV3 30ms sniff	Slave		mA
Standby host connection (Deep-Sleep)	-		µA
Reset (active low)	-		µA

Note Conditions: 20°C, +VBT = 3.15V, +VBT = 3.15V, UART BAUD rate = 115.2kbps.

Table 6: Peak Current

Typical Peak Current @ 20°C	
Device Activity/State	**Current (mA)**
Peak current during cold boot	TBD
Peak TX current Master	TBD
Peak RX current Master	TBD
Peak TX current Slave	TBD
Peak RX current Slave	TBD
Conditions	
RF output power	TBD

MECHANICAL DRAWINGS
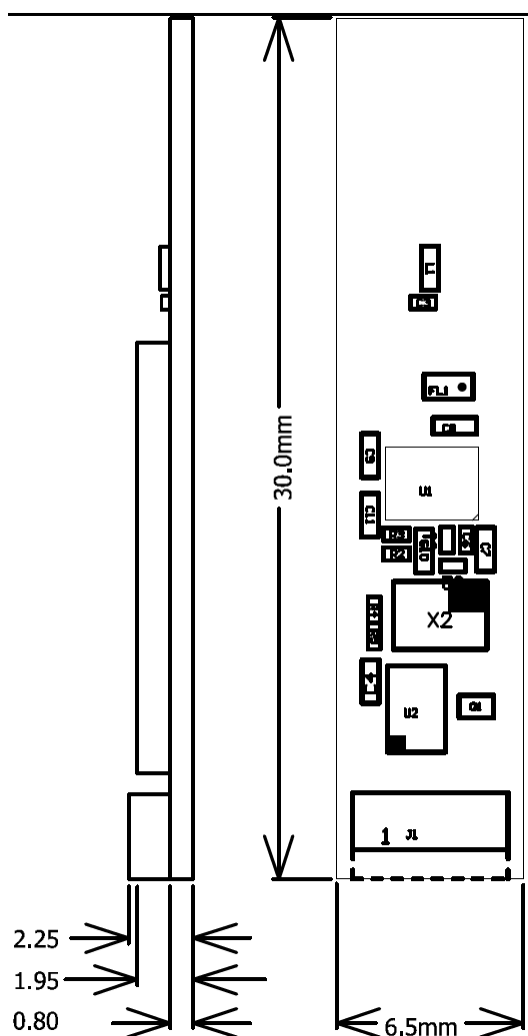
Figure 4: TETRA Mechanical Drawing

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