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Solutions for a Real Time World

UNIGEN CORP. WIRELESS MODULE PRODUCTS

PART NUMBER FAMILY:
JUNO-M WIRELESSUSB™ RADIO MODULES

UGWM1US & UGWM2US SERIES
SHORT RANGE MODULES

Issue Date: 18 October 2004

Revision: 1.00

Revision History

Rev. No.	History	Issue Date	Remarks
0.9	Final Draft	24 September 2004	Update Reference Documents, Functional Description
1.0	Final Release	18 October 2004	Final Release, adds Physical Dimensions

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support@unigen.com
http://www.unigen.com

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45388 Warm Springs Blvd. Fremont, CA 94539
TEL: (510) 668.2088 FAX: (510) 661.2788
Customer Comment Line: (800) 826.0808

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REFERENCE DOCUMENTATION:

The Unigen JUNO-M (UGWM1US) WirelessUSB™ module adaptation of the Cypress Semiconductor CYWUSB6934 LS 2.4GHz DSSS Radio SOC is represented in this document. The detail provided is information for using JUNO-M in a digital electronic device and is only a "companion" document to Cypress Semiconductors' CYWUSB6934 documentation for the above noted part.

The CYWUSB6934 LS 2.4GHz DSSS Radio SOC 10-meter information and technical details (ex. register settings, timing, application interfaces, clocking and power management, etc.) may be obtained from the Cypress Semiconductor web site or contacting Cypress's authorized sales representatives.

The following is a list of required documents and locations known at the time of publication that accompany this datasheet.

- The CYWUSB6934 LS 2.4GHz DSSS Radio SOC Datasheet – CUWUSB6934.pdf
  http://www.cypress.com/cfuploads/img/products/cywusb6934.pdf

INTRODUCTION:

Unigen JUNO-M WirelessUSB™ 10 and 50 meter range module represent the convergence of emerging wireless connectivity solutions and the USB "Plug-N-Play" ease of operation. WirelessUSB, as created by Cypress Semiconductor, is a low-cost, 2.4GHz communication protocol designed for use in commercial, industrial, consumer, and computer product applications needing highly reliable data connectivity.

JUNO-M module combine Cypress Semiconductor's wireless and USB expertise with Unigen's module design, manufacturing, and testing proficiency to create production ready, pre-certified modules that are easily integrated into existing, and new product designs.

JUNO-M module offer immediate, drop-in design solutions and use the native Operating System HID drivers to seamlessly enumerate and operate mouse, keyboard, and gaming devices, or other devices using the HID specification for communication with the host systems.

FEATURES:

- **CYWUSB6934 LS 2.4GHz DSSS Radio SOC**
- **Operates in the 2.4 to 2.483GHz, unlicensed frequency range (ISM – Industrial, Scientific and Medical)**
- **-95dBm receive sensitivity**
- **Range options of 10 and 50 meters**
- **Data Rate of 62.5kbits/sec**
- **SPI interface**
  (up to 2MHz data rate)
- **Operating Voltage Requirement**
  2.7 – 3.6Vdc
- **Multiple connection interfaces available**
- **Small PCBA Design:**
  UGWM1US
  0.9375" x 0.656" x 0.375" (23.81mm x 16.67mm x 9.53mm)
- **Complete Radio Module**
  Antenna Option – Integrated Tuned Trace Antenna
- **Agency Pre-Certification**
  FCC/EU/ETSI/Industry Canada
  Module certified to FCC/EU compliance specifications limiting your agency compliance time and cost.
- **Agency Pre-Certification**
  Tested to comply with Analog and Digital immunity standards from around the world

DESCRIPTION:

JUNO-M WirelessUSB™ Modules are tightly integrated, low-cost, high-reliability 2.4GHz TX/RX communications modules for use with Human Interface Device (HID) class compliant products.

The JUNO-M 10-meter modules use the Cypress Semiconductor CYWUSB6934 LS 2.4GHz DSSS Radio SOC device. The JUNO-MM 50-meter modules use the Cypress Semiconductor CYWUSB6935 LR 2.4GHz DSSS Radio SOC device.

JUNO-M modules are a complete radio solution requiring only integration into an existing, or new device.

JUNO-M modules are 100% tested for functional operation and are pre-screened for FCC Part 15 compliance. The modules are supplied with an integrated antenna. For applications where the integrated antenna is unsuitable, models are available that support using an external coaxial antenna. Unigen offers 2dBi gain antennae for customers requiring an external antenna.

JUNO-M modules are intended for use in computer and consumer product/device applications and use the OS native HID class drivers to enable compliant devices. In most applications, *no additional host drivers are required*. The modules are suitable for use in embedded and/or industrial applications as well.

The JUNO-M is less than 1/2"sq and is available with a keyed shrouded header mounting directly to the matching receptacle on the PCB. The modules are available bare-board for application off board within the device.

FUNCTIONAL BLOCK DIAGRAMS:

Simplified Block Diagram JUNO-M
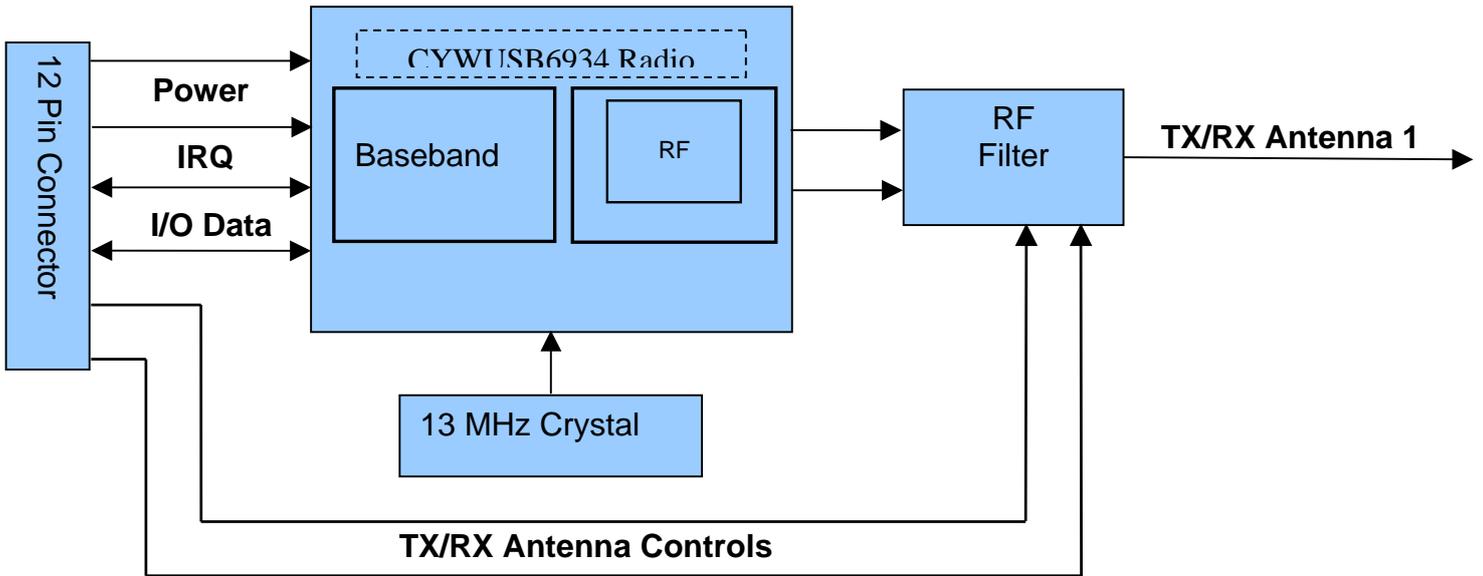
Simplified Block Diagram CYWUSB6934 Radio Chip

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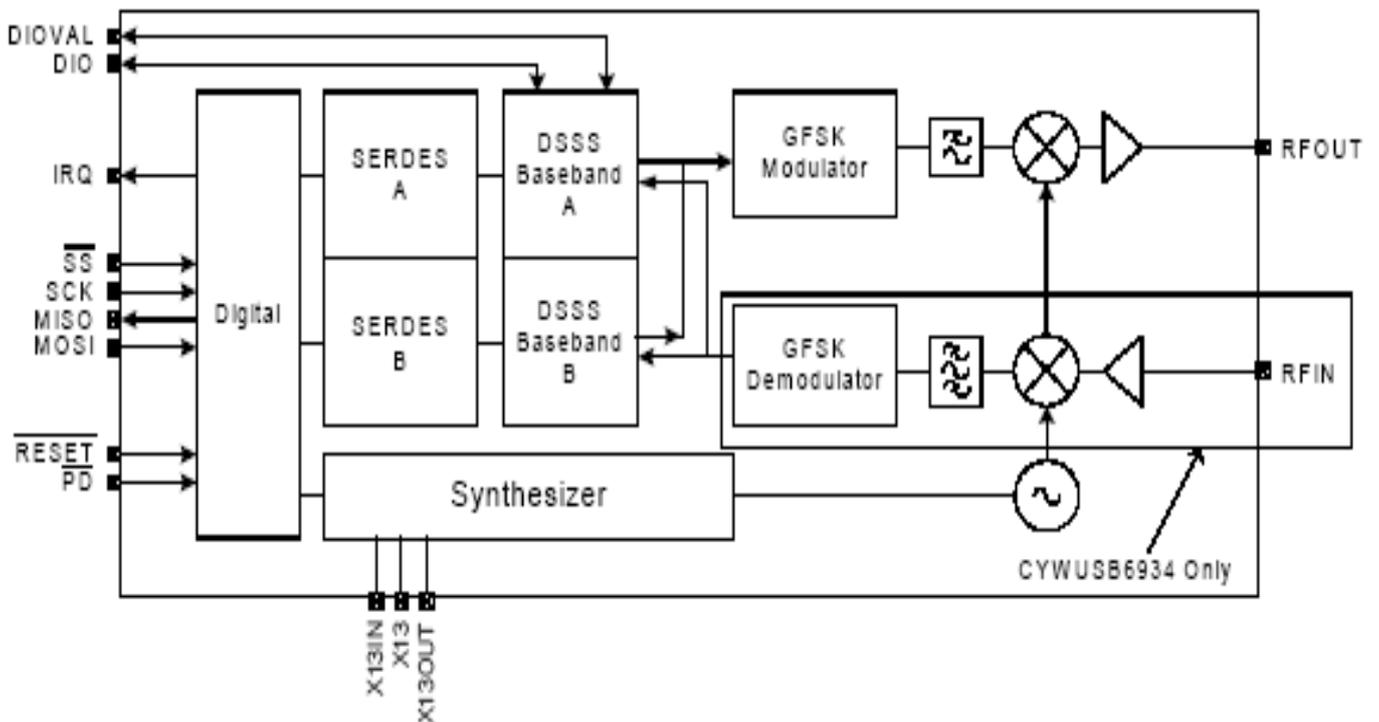
ABSOLUTE MAXIMUM RATINGS:

Symbol	Definition	Min.	Max.	Unit
V_{CC}	Supply Voltage – Radio SOC	-0.3	3.9	V_{DC}
T_{OC}	Commercial Operating Temperature Range	-20	70	°C
T_S	Storage Temperature Range	-40	125	°C
V_{LI}	V_{DC} to Logic Inputs	-0.3	V_{CC} + 0.3	V_{DC}
V O/Hi-Z	V_{DC} to Outputs in Hi-Z state	-0.3	V_{CC} + 0.3	V_{DC}
SDVD	Static Discharge Voltage Digital		>4000	V_{DC}
SDVR	Static Discharge Voltage RF		>4000	V_{DC}

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:

Symbol	Description	Value			
		Min.	Typ.*	Max.	Unit
V_{CC}	Supply Voltage	2.7	3.0	3.6	V_{DC}
T_{OC}	Commercial Operating Temperature Range	-20	25	70	°C
GND	Ground Voltage		0		V_{DC}

DC Electrical Characteristics:

Symbol	Description	Condition(s)	Min.	Typ.*	Max.	Unit
V_{CC}	Supply Voltages		2.7	3.0	3.6	V_{DC}
V_{OH1}	Voltage Output High 1	At $I_{OH} = -100.0\mu A$	V_{CC}-0.1	V_{CC}		V_{DC}
V_{OH2}	Voltage Output High 2	At $I_{OH} = -2.0$ mA	2.4	3.0		V_{DC}
V_{OL}	Voltage Output Low	At $I_{OL} = 2.0$ mA		0.0	0.4	V_{DC}
V_{IH}	Voltage Input High		2.0		V_{CC}	V_{DC}
V_{IL}	Voltage Input Low		-0.3		0.8	V_{DC}
I_{IL}	Input Leakage Current	0 < VIN < VCC	-1	0.30	+1	µA
I_{SLEEP}	Power-down current consumption	PD = Low		0.26	10	µA
TX AVG $I_{CC}1$	Mean transmitter current consumption [1]	no handshake		6.0		mA
TX AVG $I_{CC}2$	Mean transmitter current consumption [2]	w/handshake		10.0		mA
RX I_{CC} (Peak)	Current consumption during receive			60.0		mA
TX I_{CC} (Peak)	Current consumption during transmit			71.4		mA
MTBF		Calculated			>87,600	Hours

Table 1 – Electrical Characteristics

*= Measured with 3.0V_{CC} at 25ºC

[1]= Mean Icc when transmitting a 5-byte packet (3 data bytes + 2 bytes of protocol) every 10ms using the Wireless USB LS 1-way protocol.

[2]= Mean Icc when transmitting a 5-byte packet (3 data bytes + 2 bytes of protocol) every 10ms using the Wireless USB LS 2-way protocol.

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Radio Parameters:

Parameter Description	Condition	Min.	Typ.	Max	Unit
RF Frequency Range		2.400		2.483	GHz
Radio Receiver (T = 25ºC, Vcc = 3.3V, fosc = 13.000MHz, X13OUT off, 64 chips/bit, Threshold Low = 8, Threshold High = 56, BER ≤10⁻³					
Sensitivity			-90		dBm
Maximum Received Signal		-20	-10		dBm
RSSI Value for PWR$_{in}$ >-40dBm			28-31		
RSSI Value for PWR$_{in}$ <-95dBm			0-10		
Interference Performance					
Co-channel Interference rejection Carrier-to-Interference (C/I)	C = −60 dBm		11		dB
Adjacent (1 MHz) channel selectivity C/I 1 MHz	C = −60 dBm		3		dB
Adjacent (2 MHz) channel selectivity C/I 2 MHz	C = −60 dBm		-30		dB
Adjacent (> 3 MHz) channel selectivity C/I > 3 MHz	C = −67 dBm		-40		dB
Image[22] Frequency Interference, C/I Image	C = −67 dBm		-20		dB
Adjacent (1 MHz) interference to in-band image frequency, C/I image ±1 MHz	C = −67 dBm		-25		dB
Out-of-band Blocking Interference Signal Frequency					
30MHz – 2399MHz except (FO/N & FO/N± 1MHz)	C = −67 dBm		-30		dBm
2498MHz – 12.75GHz, except (FO*N & FO*N±1MHz)	C = −67 dBm		-20		dBm
Intermodulation	C = −67 dBm, Δf = 5, 10MHz		-39		dBm
Spurious Emission					
30MHz – 1GHz				-57	dBm
1GHz – 12.75GHz (except 4.8GHz – 5.0GHz)				-47	dBm
4.8GHz – 5.0GHz				-37	dBm
Radio Transmitter (T = 25ºC, Vcc = 3.3V, fosc = 13.000MHz)					
Maximum RF Transmit Power	PA = 7		0		dBm
RF Power Control Range			30		dB
RF Power Range Control Step Size	Seven steps, monotonic		4.3		dB
Frequency Deviation	PN Code Pattern 10101010		270		kHz
Frequency Deviation	PN Code Pattern 11110000		320		kHz
Zero Crossing Error			±125		ns
Occupied Bandwidth	100-kHz resolution bandwidth, -6dBc	500			kHz
Initial Frequency Offset			±75		kHz
In-Band Spurious					
Second Channel Power (±=2MHz)				-30	dBm
≥ Third Channel Power (≥3 MHz)				-40	dBm
Non-Harmonically Related Spurs					
30MHz – 12.75GHz				-57	dBm
Harmonic Spurs					
Second Harmonic				-20	dBm
Third Harmonic				-30	dBm
Fourth and Greater Harmonics				-47	dBm

Table 3 – Radio Characteristics

PIN ASSIGNMENTS:

Function	UGWM1US UGWB2US	I/O	Description
GND	1	I	Module Ground
Vcc	2	O/Hi-Z	Module Input Power
IRQ	3	I	Interrupt Request
RSTn	4	O	Module Reset
MOSI	5	-	SPI Data Output to MCU
SSn	6	I	SPI Enable
SCK	7	I	SPI Input Clock
MISO	8	O/Hi-Z	SPI Data Input from MCU
GND	9	I	Module Ground
PDn	10	I	Power Down
N/C	11	-	No Connect
N/C	12	-	No Connect

Table 4 – Pin Assignments

PIN FUNCTIONS:

MOSI: SPI Input from MCU
Receives commands/data from the device microcontroller.

MISO: SPI Output to MCU
Transmits requests/data to the device microcontroller.

SSn: SPI Slave Select Enable Input
SPI enable

IRQ: Interrupt Request
The Interrupt Request Pin Select bits are used to determine the drive method of the IRQ pin

GND: Module Ground

RSTn: Module Reset
Active LOW reset switch

SCK: SPI Input Clock

PDn: Power Down
Driving signal LOW will put the module in SUSPEND MODE (X13OUT = 0 when PDn is LOW)

Vcc: Module Input Power
Vcc range 2.7 to 3.6Vdc

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TEL: (510) 668.2088 FAX: (510) 661.2788
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AGENCY CERTIFICATIONS (PRE-SCAN):

Agency	Test Performed	Type	Limit	Result	Margin
EU	Radiated Spurious Emissions	30-12.75MHz Transmit Mode	EN 300 328	PASS	-4.6dB @ 4804MHz
		30-12.75MHz Transmit Mode	EN 300 328	PASS	-4.9 @ 177.01MHz
FCC 15.247	Radiated Emissions	30 25,000 Spurious Emissions	FCC Part 15.209/15.247 (c)	PASS	Results on File
		6dB Bandwidth	15.247(a)	PASS	960kHz
		99% Bandwidth	IC RSS-210	PASS	1.175MHz
		Output Power	15.247(b)	PASS	7.2dBm
		Power Spectral Density (PSD)	15.247(d)	PASS	3.06dBm
		Bandedge	FCC Part 15.209 /15.247(c)	PASS	Results on File
		Out of band	15.247(c)	PASS	Results on File
EU	Radio Performance Test	Output Power, Power spectral density at normal conditions	EN 300 328-1	PASS	Results on File
		Frequency Range at normal conditions	EN 300 328-1	PASS	Results on File
		Output Power over extreme conditions	EN 300 328-1	TBT	
		Frequency Range over extreme conditions	EN 300 328-1	TBT	
		Conducted spurious emissions, 30MHz - 12750MHz, transmit mode	EN 300 328-1	PASS	Results on File
		Conducted spurious emissions, 30MHz - 12750MHz, receive/stand-by mode	EN 300 328-1	PASS	Results on File
	Radiated Spurious Emissions	30 - 12,750 MHz -Spurious Emissions Transmit Mode	EN 300 328 V1.2.1	PASS	Results on File
		30 - 12,750 MHz -Spurious Emissions Receive Mode	EN 300 328 V1.2.1	PASS	Results on File

Table 5 – Regulatory Agency Certifications

Regulatory Compliance Statement:

The module has been pre-scanned against the relevant requirements of standards: EN 300 328, EN 301 489-17, FCC part 15 and Industry Canada RSS-210. The module is certified by the regulatory authorities in the USA and Canada and complies with the applicable essential requirements of the Radio & Telecommunication Terminal Equipment (R&TTE) directive in the EU. The module can thus be incorporated into products sold worldwide with little or no additional testing of the module itself. ***The end product must meet the appropriate technical requirements that apply to that product type but re-certification of the radio module is not required in the USA and Canada.***

In the EU, the integrator is responsible for evaluating their product type per the essential performance requirements of the R&TTE directive (except those associated with the module), declaring compliance and then notifying the member states prior to marketing the product (because the module uses a frequency band that is not harmonized in the EU). It is the responsibility of the module integrator to obtain the necessary approvals to sell products incorporating this module in other countries outside of North America and the EU. The report of measurements performed on the module in compliance with the FCC rules and EN standards can be used in these submittals (as the requirements in many other markets around the world are based in part or in whole on the standards prevalent in North America and the EU).

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MECHANICAL CHARACTERISTICS:

Item	Description	Specification
1	PCB Material	FR-4
2	PCB Layers	2
3	Connector Type	Straight thru-hole or header, right angle thru-hole or header, bare Please see Table 4 for pin assignments
4	PCB Number	1
5	Flammability Rating	UL94 V-0
6	UGWM1US Dimensions	0.975" x 0.656" x 0.375" (24.765mm x 16.67mm x 9.525mm) ±.01%
8	Antenna Cable Connector	GSC Ultra-Miniature Coaxial (Optional and not covered in FCC Grant)
9	User Serviceable Parts	None

Table 6 – Mechanical Description

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MECHANICAL DRAWINGS & PHYSICAL DIMENSIONS:
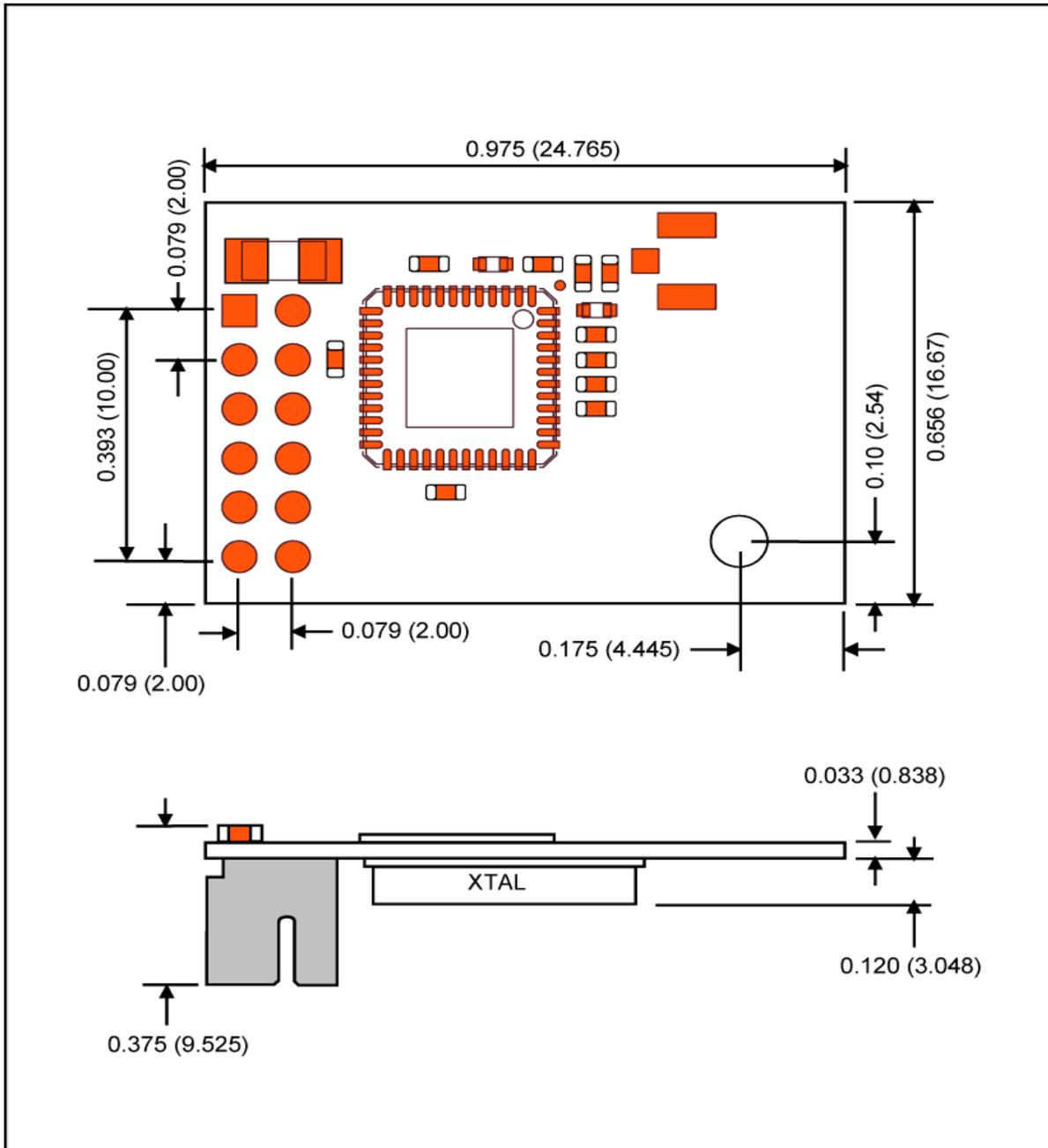
Figure 1 – Juno-M Dimensions (Top View)

Figure 2 – Juno-M Dimensions (Bottom View)

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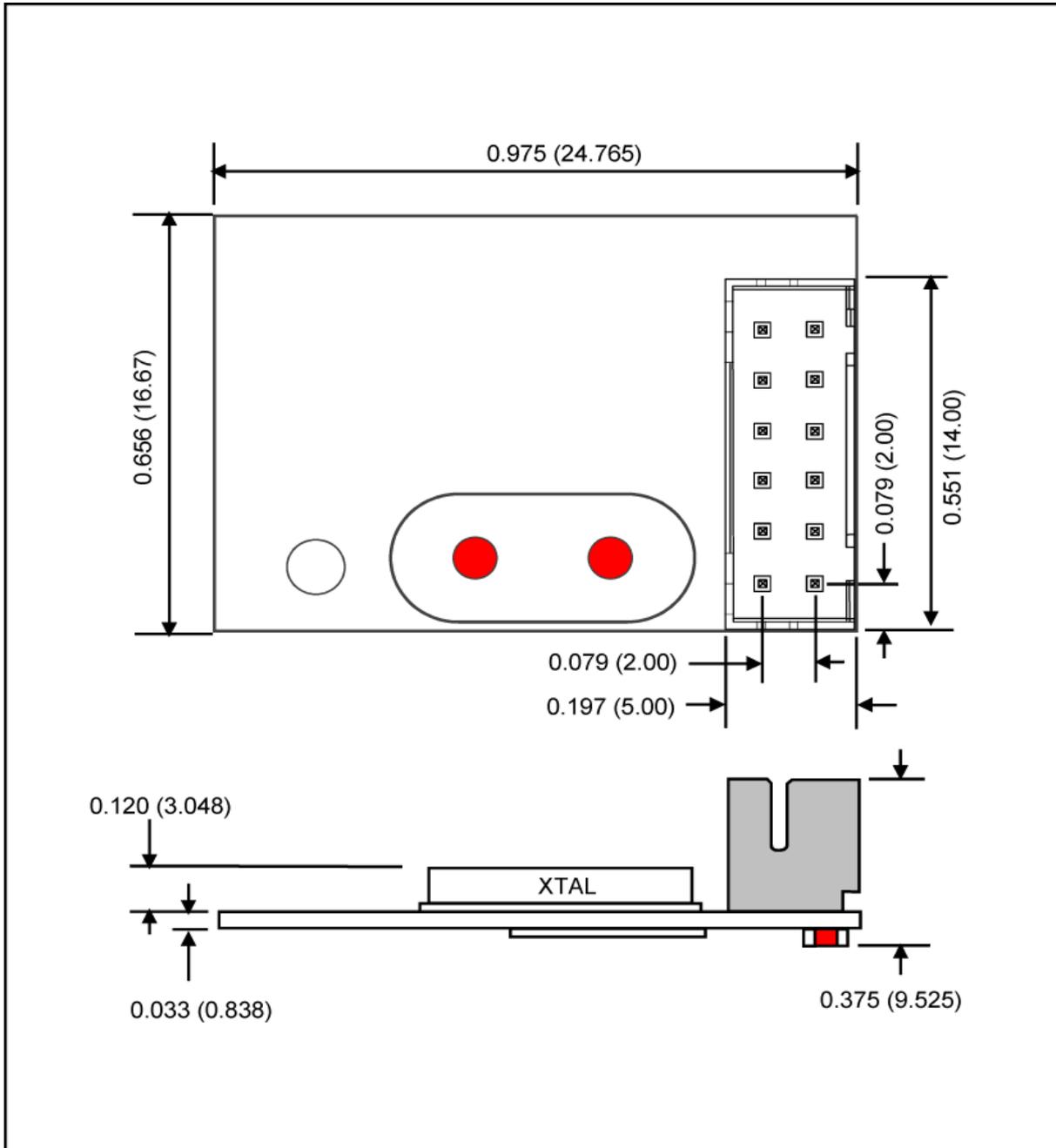
ORDERING INFORMATION:*

Typical Applications

UNIGEN PRODUCT GROUP – WIRELESS -	FORM FACTOR	WIRELESSUSB TECH	CONNECTION	CONNECTOR TYPE	VOLTAGE	ANTENNA
UGW	M	1US (10M)	HN BB	MIRRORED 2X6 HEADER BARE – NO CONNECTOR	**33**=3.3VDC	**BLANK**=MINI COAXIAL **A**=INTEG. CHIP

*Module based on the Cypress Semiconductor CYWUSB6934-48 WirelessUSB™ LS 2.4GHz DSSS Radio SoC device.

Antennae

Unigen Product Group – Antennae –	Technology	Form Factor (Appearance)	Frequency / Gain	Coaxial Cable Type	Cable Length	Connector Type	Special Require ments
UGA	**D**= Dipole Antenna Module	**L1**= 3.5" desktop **A0**= 4" Swivel Whip	**B1**= 2.4GHz, 2.0dBi	**M1**= 1.13mm HF	**050**= 50mm **100**= 100mm **150**= 150mm **200**= 200mm **250**= 250mm **300**= 300mm	**M**= Mini Coax	**None**= Default **F**= EMI core and PVC
		C1= 7.75" Swivel Whip	**B2**= 2.4GHz, 5.0dBi				

Contact your Unigen Sales Representative for additional information or visit the Nexus™ Wireless Products section of our web site (www.unigen.com).

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CONTACT INFORMATION:

CORPORATE HEADQUARTERS

Unigen Corporation
45388 Warm Springs Boulevard
Fremont, CA 94539

Telephone:	1.510.688.2088
Fax:	1.510.661.2788
Email:	Support@unigen.com
Web:	www.unigen.com
Customer Comment:	1.800.826.0808