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**UNIGEN CORP. WIRELESS MODULE PRODUCTS****PART NUMBER FAMILY:  
JUNO-B/L WIRELESSUSB™ RADIO MODULES****UGWB AND UGWL SERIES  
SHORT AND MEDIUM RANGE MODULES**

Issue Date: 18 October 2004

Revision: 1.02

**Revision History**

Rev. No.	History	Issue Date	Remarks
0.9	Final Draft	24 June 2004	Update Reference Documents, Functional Description
1.0	Final Release	26 July 2004	Final Release, adds Medium Range Modules
1.01	Minor Iteration	24 August 2004	Update to Electrical Characteristics
1.02	Minor Iteration	18 Oct. 2004	Update to P/N guide on Pin-out (page 10)

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**REFERENCE DOCUMENTATION:**

The Unigen JUNO-B (UGWB1US) and JUNO-L (UGWL1US) WirelessUSB™ module adaptation of the Cypress Semiconductor CYWUSB6934 LS 2.4GHz DSSS Radio SOC and the Unigen JUNO-B (UGWB2US) and JUNO-L (UGWL2US) WirelessUSB™ module adaptation of the Cypress Semiconductor CYWUSB6935 LR 2.4GHz DSSS Radio SOC is represented in this document. The detail provided is information for using JUNO-B/L in a digital electronic device and is only a "companion" document to Cypress Semiconductors' 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>

The CYWUSB6935 LR 2.4GHz DSSS Radio SOC 50-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 CYWUSB6935 LR 2.4GHz DSSS Radio SOC Datasheet – CUWUSB6935.pdf  
<http://www.cypress.com/cfuploads/img/products/cywusb6935.pdf>

Additional documentation for the Cypress Semiconductor CYWUSB6934 LS 2.4GHz DSSS Radio SOC device and the Unigen JUNO-B/L WirelessUSB™ modules may be obtained by contacting agents or representatives of the respective companies.

**INTRODUCTION:**

Unigen JUNO-B/L WirelessUSB™ 10 and 50-meter range modules 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-B/L modules 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-B/L modules 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.

Both JUNO 10-meter and 50-meter modules use the same PCB given their form factors and may be interchanged with no other changes required in the end-device.

**FEATURES:**

- **CYWUSB6934 LS 2.4GHz DSSS Radio SOC**
- **CYWUSB6935 LR 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:**  
**UGWB#US**  
0.95" (24.13mm) by 1.00" (25.40mm)  
**UGWL#US**  
0.90" (22.86mm) by 1.10" (27.94mm)
- **Complete Radio Module**  
Antenna Option – Integrated Chip or Coaxial connector (PN. – UGADL1B1M1 or UGADA0B1M1) for external mount.
- **Agency Pre-Certification (Pending)**  
**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-B/L 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-B/L 10-meter modules use the Cypress Semiconductor CYWUSB6934 LS 2.4GHz DSSS Radio SOC device. The JUNO-B/L 50-meter modules use the Cypress Semiconductor CYWUSB6935 LR 2.4GHz DSSS Radio SOC device.

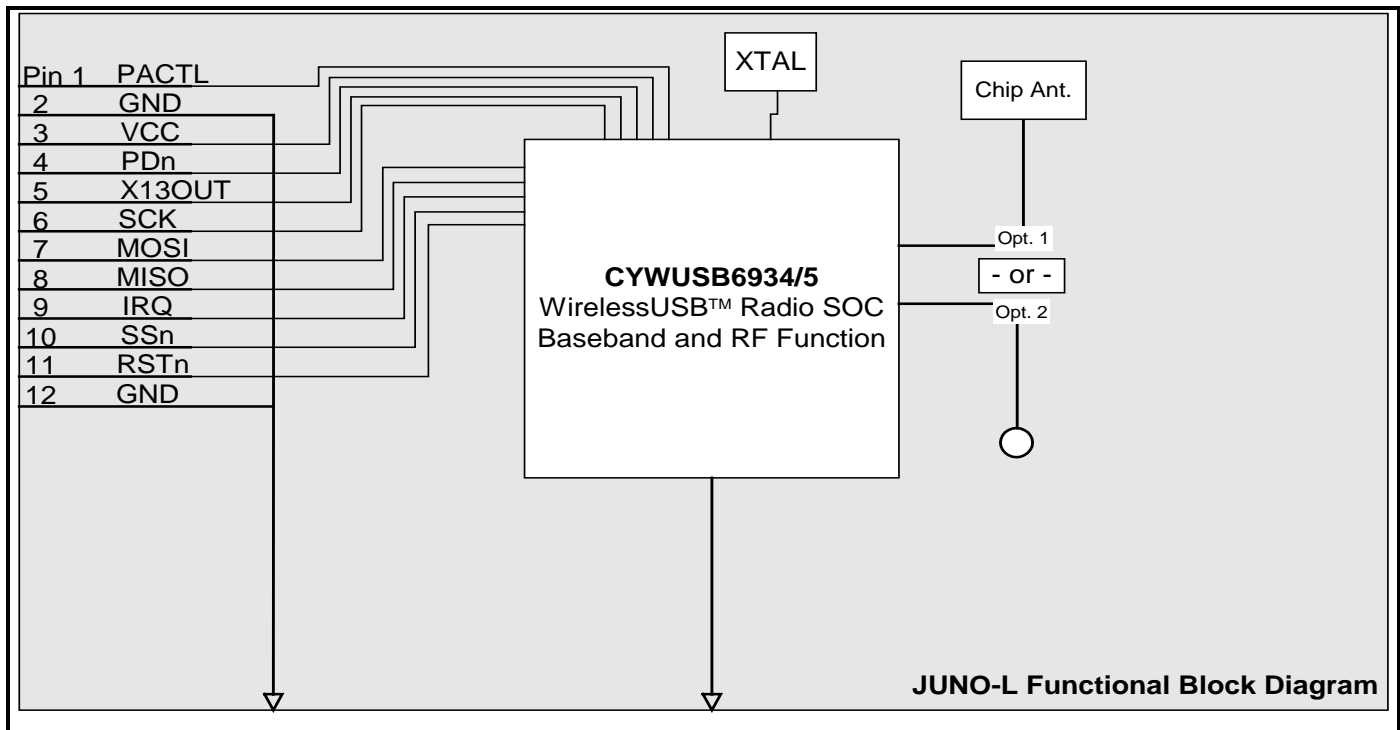
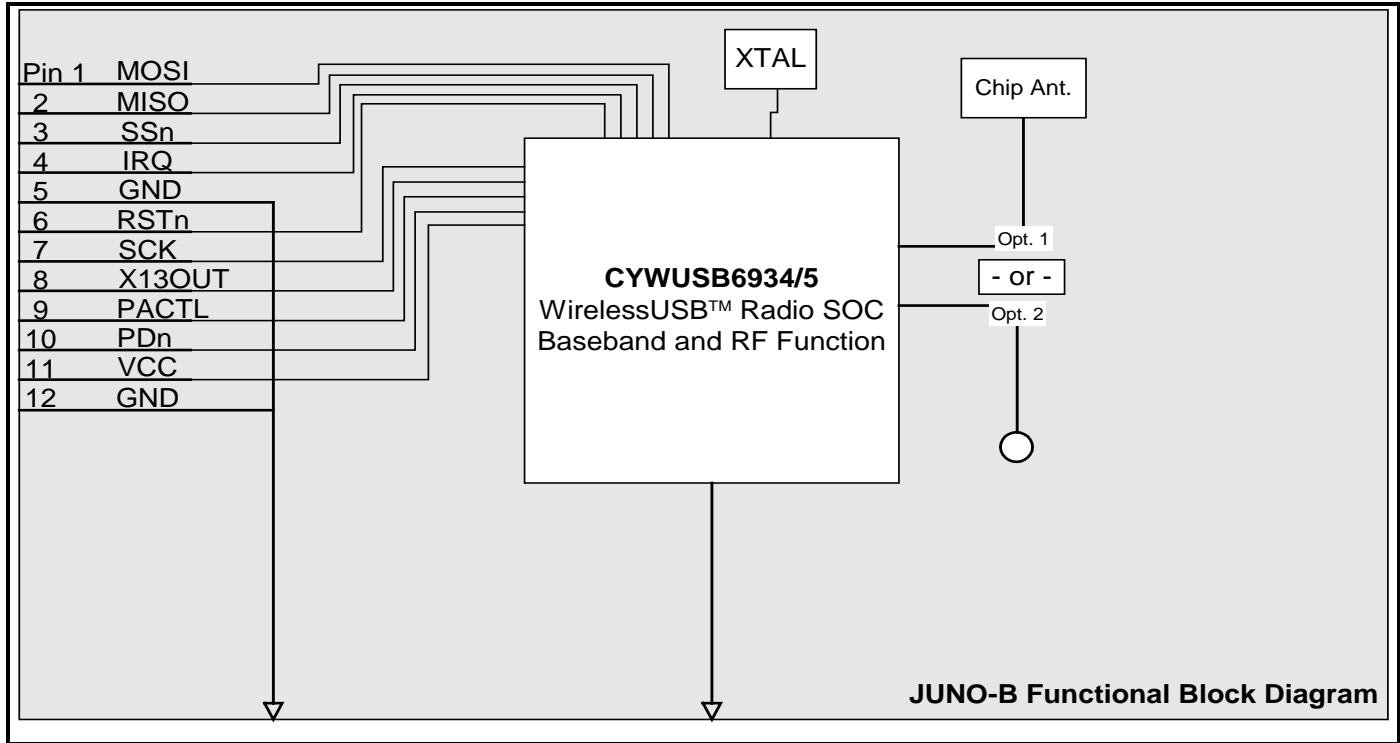
JUNO-B/L modules are a complete radio solution requiring only integration into an existing, or new device.

JUNO-B/L modules are 100% tested for functional operation and are pre-screened for FCC Part 15 compliance. The modules are supplied with an integrated chip-antenna. For applications where the chip 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-B/L 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-B/L are less than 1"sq and are available for horizontal or vertical mounting directly to the device PCB. The modules are available bare-board for application off board within the device.

## FUNCTIONAL BLOCK DIAGRAMS:



## ABSOLUTE MAXIMUM RATINGS:

Symbol	Definition	Min.	Max.	Unit
VCC	Supply Voltage – Radio SOC	-0.3	3.9	VDC
TOC	Commercial Operating Temperature Range	-20	70	°C
TS	Storage Temperature Range	-40	125	°C
VLI	VDC to Logic Inputs	-0.3	VCC + 0.3	VDC
V O/Hi-Z	VDC to Outputs in Hi-Z state	-0.3	VCC + 0.3	VDC
SDVD	Static Discharge Voltage Digital		>4000	VDC
SDVR	Static Discharge Voltage RF		>4000	VDC

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
VCC	Supply Voltage	2.7	3.0	3.6	VDC
TOC	Commercial Operating Temperature Range	-20	25	70	°C
GND	Ground Voltage		0		VDC



## DC ELECTRICAL CHARACTERISTICS:

Symbol	Description	Condition(s)	Value			
			Min.	Typ.*	Max.	Unit
VCC	Supply Voltages		2.7	3.0	3.6	VDC
VOH1	Voltage Output High 1	At IOH = -100.0µA	VCC-0.1	VCC		VDC
VOH2	Voltage Output High 2	At IOH = -2.0 mA	2.4	3.0		VDC
VOL	Voltage Output Low	At IOL = 2.0 mA		0.0	0.4	VDC
VIH	Voltage Input High		2.0		VCC	VDC
VIL	Voltage Input Low		-0.3		0.8	VDC
IIL	Input Leakage Current	0 < VIN < VCC	-1	0.30	+1	µA
ISLEEP	Power-down current consumption	PD = Low		0.26	10	µA
TX AVG Icc1	Mean transmitter current consumption <sup>1</sup>	no handshake		6.0		mA
TX AVG Icc2	Mean transmitter current consumption <sup>2</sup>	w/handshake		10.0		mA
RX Icc (Peak)	Current consumption during receive			60.0		mA
TX Icc (Peak)	Current consumption during transmit			71.4		mA
MTBF		Calculated			>87,600	Hours

**Table 1 – Electrical Characteristics**

\* = Measured with 3.0Vcc at 25°C

<sup>1</sup>= 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.

<sup>2</sup>= 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.

## ANTENNA:

JUNO-B/L modules with the optional coaxial antenna connector require the addition of an antenna for radio operation. Unigen tested the noted antennae with the JUNO-B/L modules and offers these to our customers. Customers may use antennae other than these listed, however these antennae have been pre-screened with the modules for digital and RF emissions.

Customers may obtain antennae (part numbers UGADL1B1M1 or UGADA0B1M1) with the following properties:

Item	Property
Coaxial Cable Type	4.13mm high freq.
Cable Length	11.81" (300mm) – other lengths available
Connector	Mini Coaxial
Frequency Range	2.4000~2.4835GHz
Impedance	50Ω (Typ.)
VSWR	2.0 max. over full range of operation
Return Loss	-10dB max.
Gain	2.0dBi - calculated
Maximum Power	1W
Electrical Wave	½ λ Dipole

**Table 2 – Antenna Characteristics**

## RADIO PARAMETERS:

Parameter Description	Condition	Min.	Typ.	Max	Unit
RF Frequency Range		2.400		2.483	GHz
<b>Radio Receiver</b> (T = 25°C, V <sub>CC</sub> = 3.3V, f <sub>osc</sub> = 13.000MHz, X13OUT off, 64 chips/bit, Threshold Low = 8, Threshold High = 56, BER ≤ 10 <sup>-3</sup> )					
Sensitivity			-90		dBm
Maximum Received Signal		-20	-10		dBm
RSSI Value for PWR <sub>in</sub> > -40dBm			28-31		
RSSI Value for PWR <sub>in</sub> < -95dBm			0-10		
<b>Interference Performance</b>					
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
<b>Out-of-band Blocking Interference Signal Frequency</b>					
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
<b>Spurious Emission</b>					
30MHz – 1GHz				-57	dBm
1GHz – 12.75GHz (except 4.8GHz – 5.0GHz)				-47	dBm
4.8GHz – 5.0GHz				-37	dBm
<b>Radio Transmitter</b> (T = 25°C, V <sub>CC</sub> = 3.3V, f <sub>osc</sub> = 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
<b>In-Band Spurious</b>					
Second Channel Power (±2MHz)				-30	dBm
≥ Third Channel Power (≥3 MHz)				-40	dBm
<b>Non-Harmonically Related Spurs</b>					
30MHz – 12.75GHz				-57	dBm
<b>Harmonic Spurs</b>					
Second Harmonic				-20	dBm
Third Harmonic				-30	dBm
Fourth and Greater Harmonics				-47	dBm

Table 3 – Radio Characteristics

## PIN ASSIGNMENTS:

Function	UGWB1US UGWB2US	UGWL1US UGWL2US	I/O	Description
MOSI	1	7	I	SPI Data Input from MCU
MISO	2	8	O/Hi-Z	SPI Data Output to MCU
SSn	3	10	I	SPI Slave Select Enable
IRQ	4	9	O	Interrupt Request
GND	5	2	-	Module Ground
RSTn	6	11	I	Module Reset
SCK	7	6	I	SPI Input Clock
X13OUT	8	5	O/Hi-Z	Output Clock
PACTL	9	1	I	PA Control
PDn	10	4	I	Power Down
Vcc	11	3	-	Module Input Power
GND	12	12	-	Module Ground

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  
Ground to equal 0Vdc
- RSTn:** Module Reset  
Active LOW reset switch
- SCK:** SPI Input Clock
- X13OUT:** System Clock  
On-board XTL clock output of 13MHz
- PACTL:** Power Amplifier Control  
Enables/disables external power amplification circuitry, where available

- 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

## 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).

## 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 ("L" model only) Please see Table 4 for pin assignments
4	PCB Number	1
5	Flammability Rating	UL94 V-0
6	UGWB#US Dimensions	1.00" x 0.95" x 0.222" (25.40mm x 24.13mm x 5.64mm)
7	UGWL#US Dimensions	1.10" x 0.90" x 0.222" (27.94mm x 22.86mm x 5.64mm)
8	Antenna Cable Connector	GSC Ultra-Miniature Coaxial
9	User Serviceable Parts	None

**Table 6 – Mechanical Description**

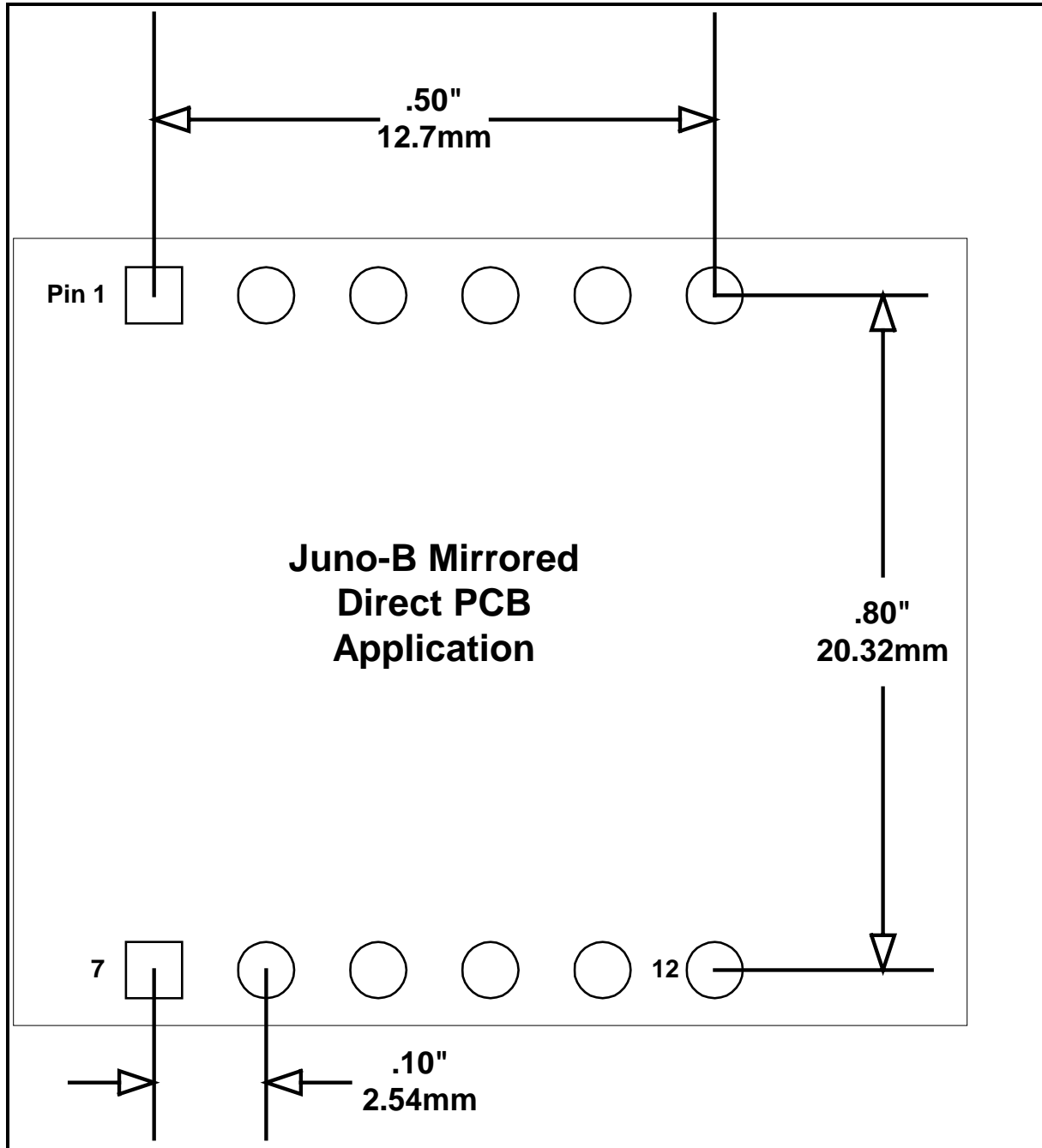
**MECHANICAL DRAWINGS:**

Figure 1 – Juno-B Mirrored Land Pattern

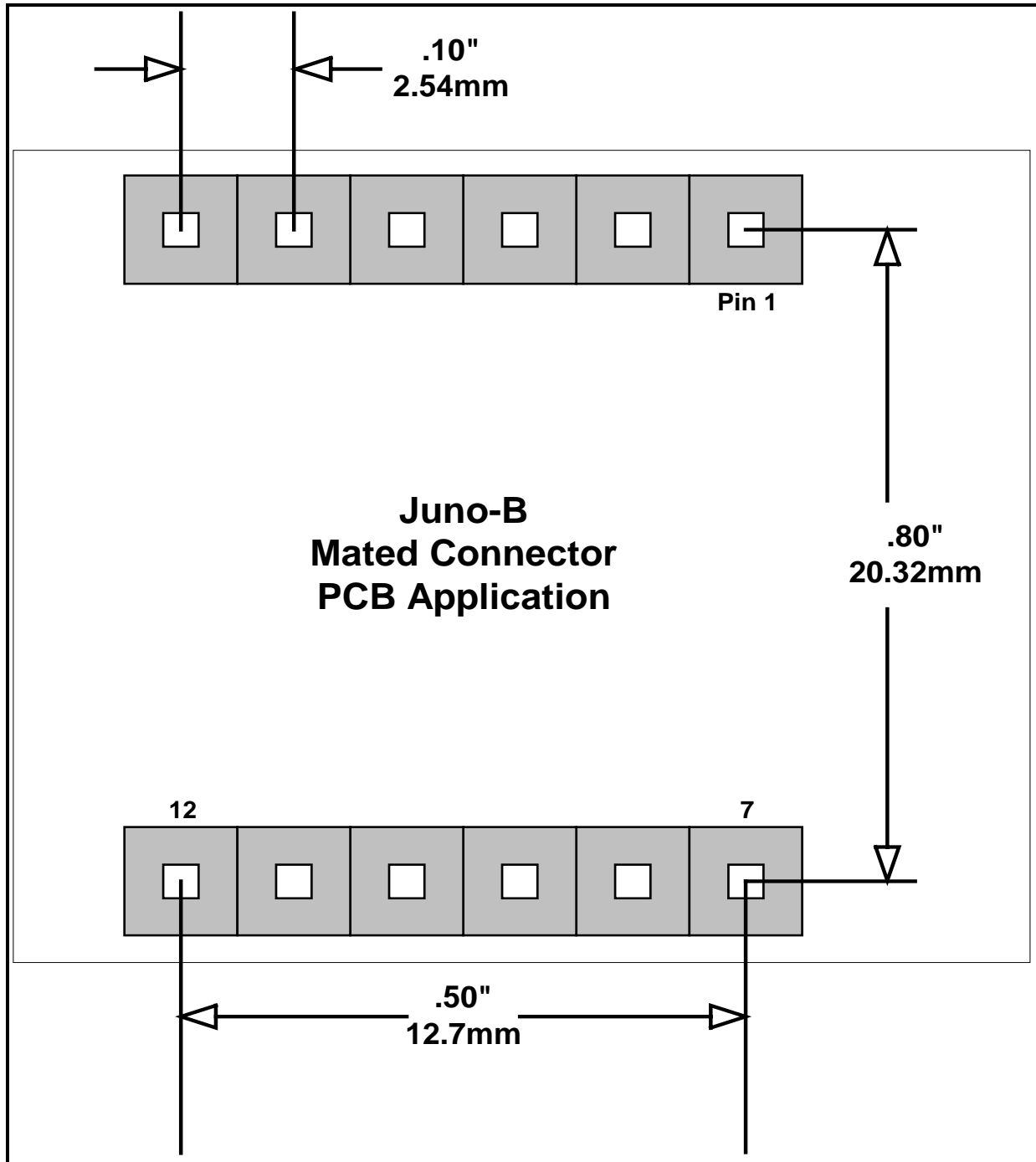


Figure 2 – Juno-B Land Pattern



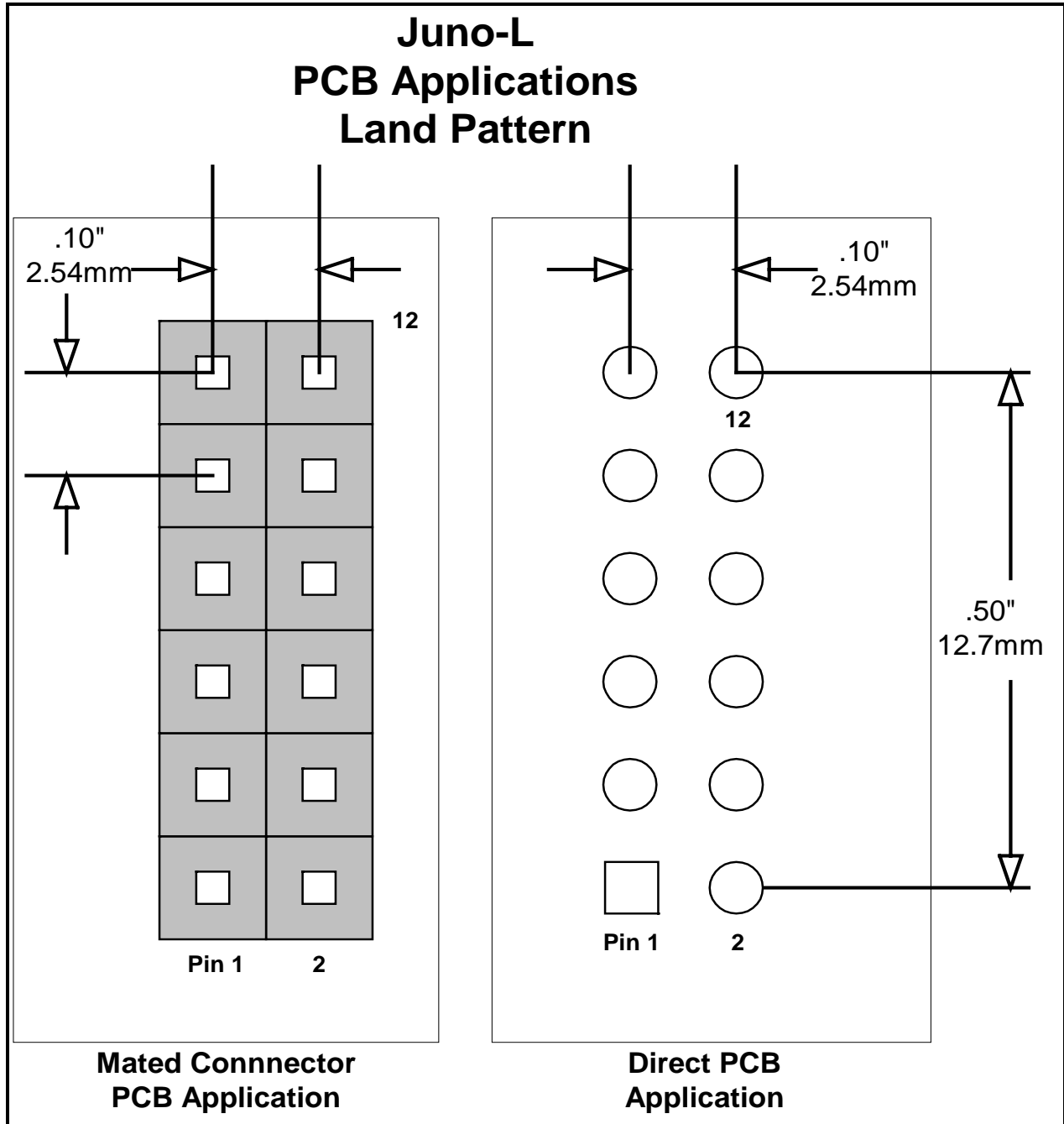


Figure 3 – Juno-L Land Pattern

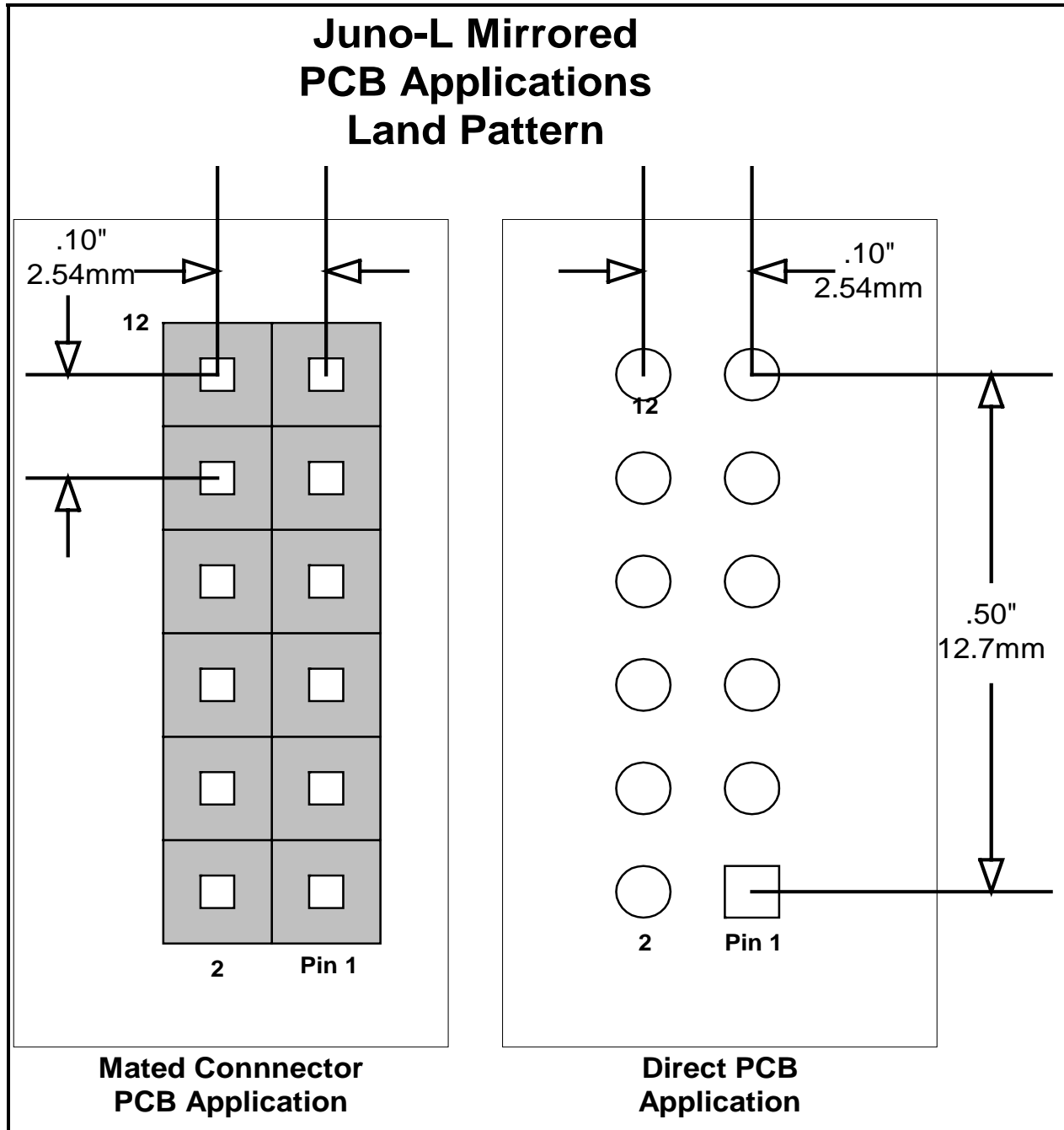


Figure 4 – Juno-L Mirrored Land Pattern

## PHYSICAL DIMENSIONS:

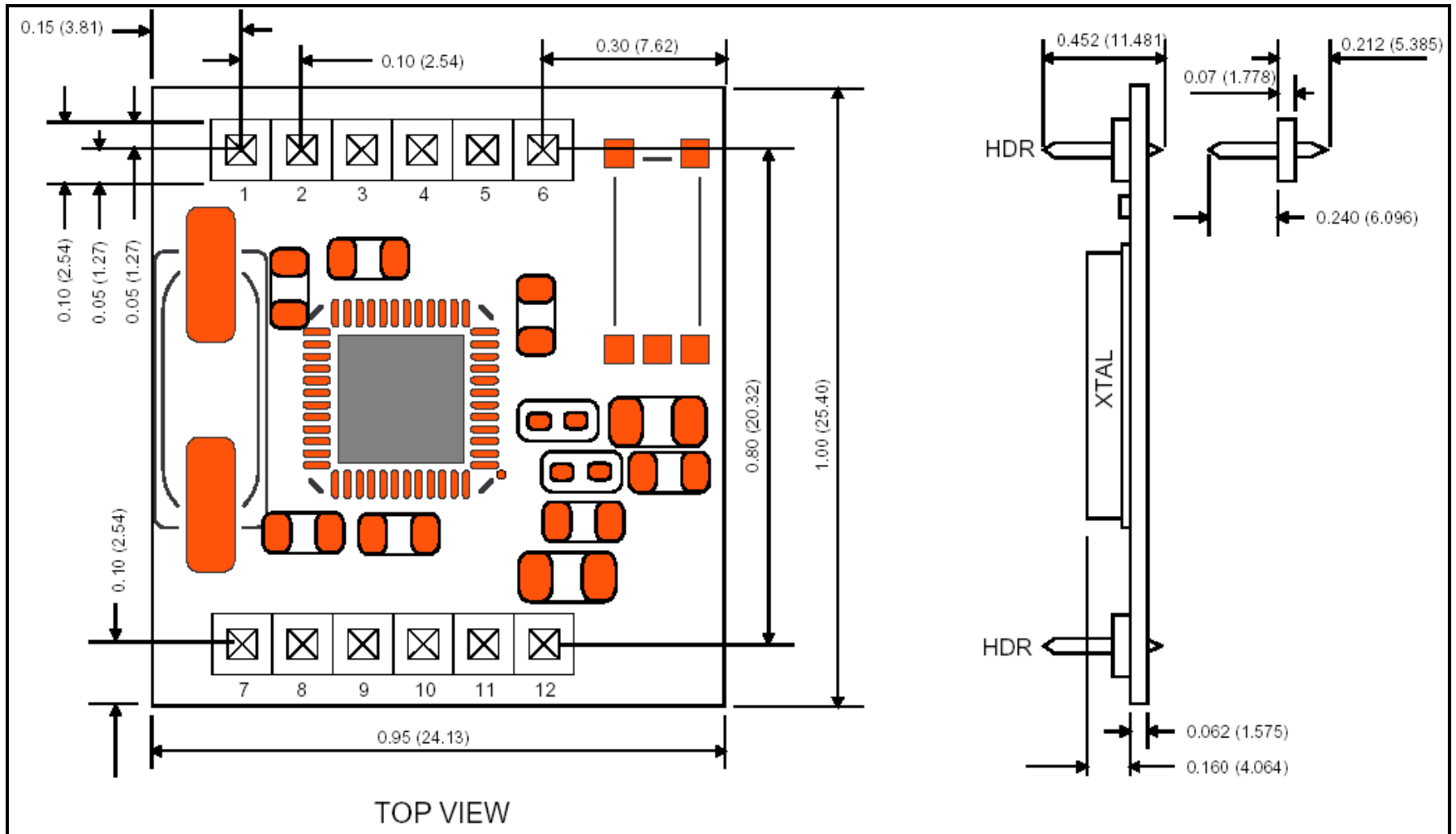
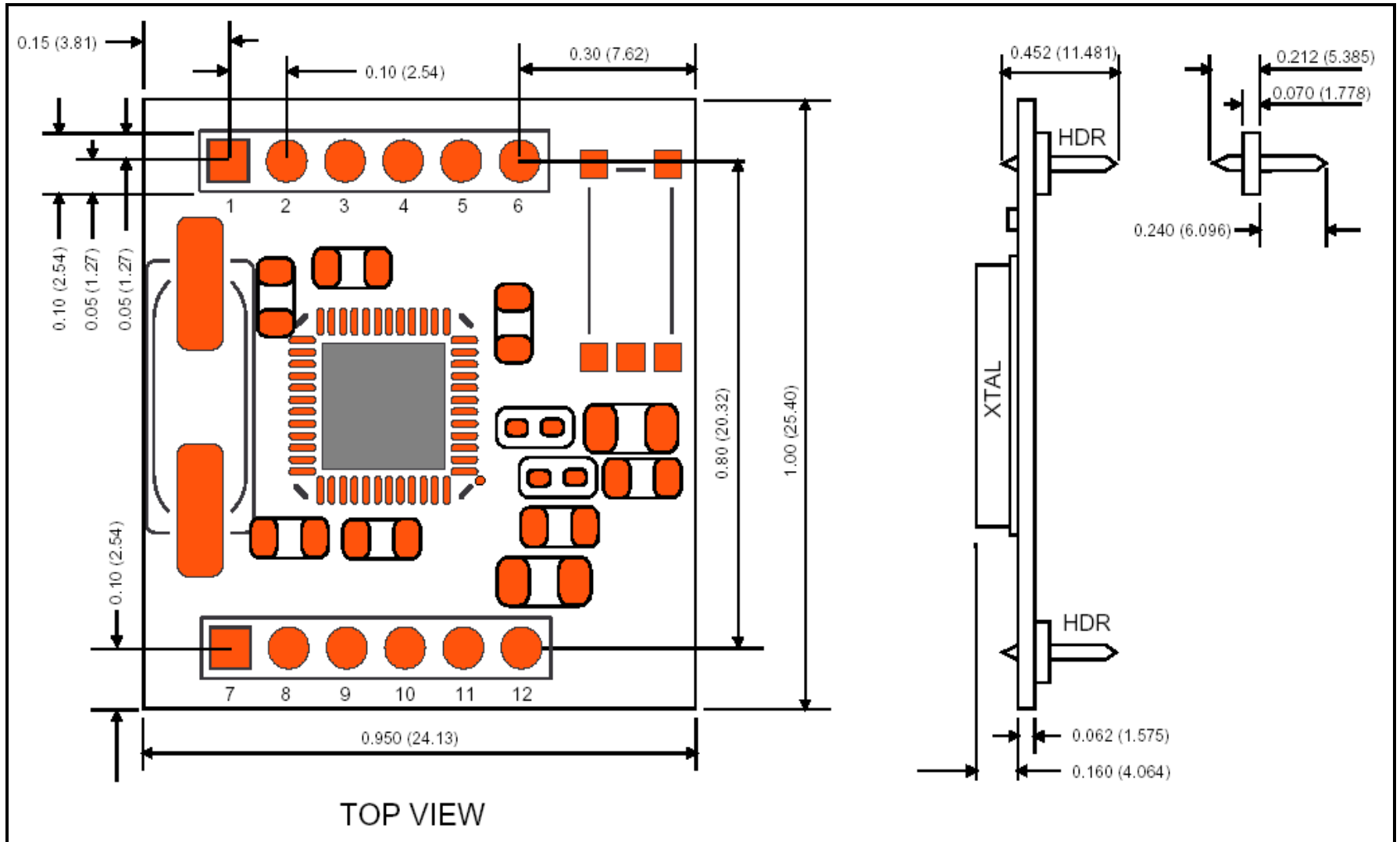


Figure 5 – Juno-B Dimensions



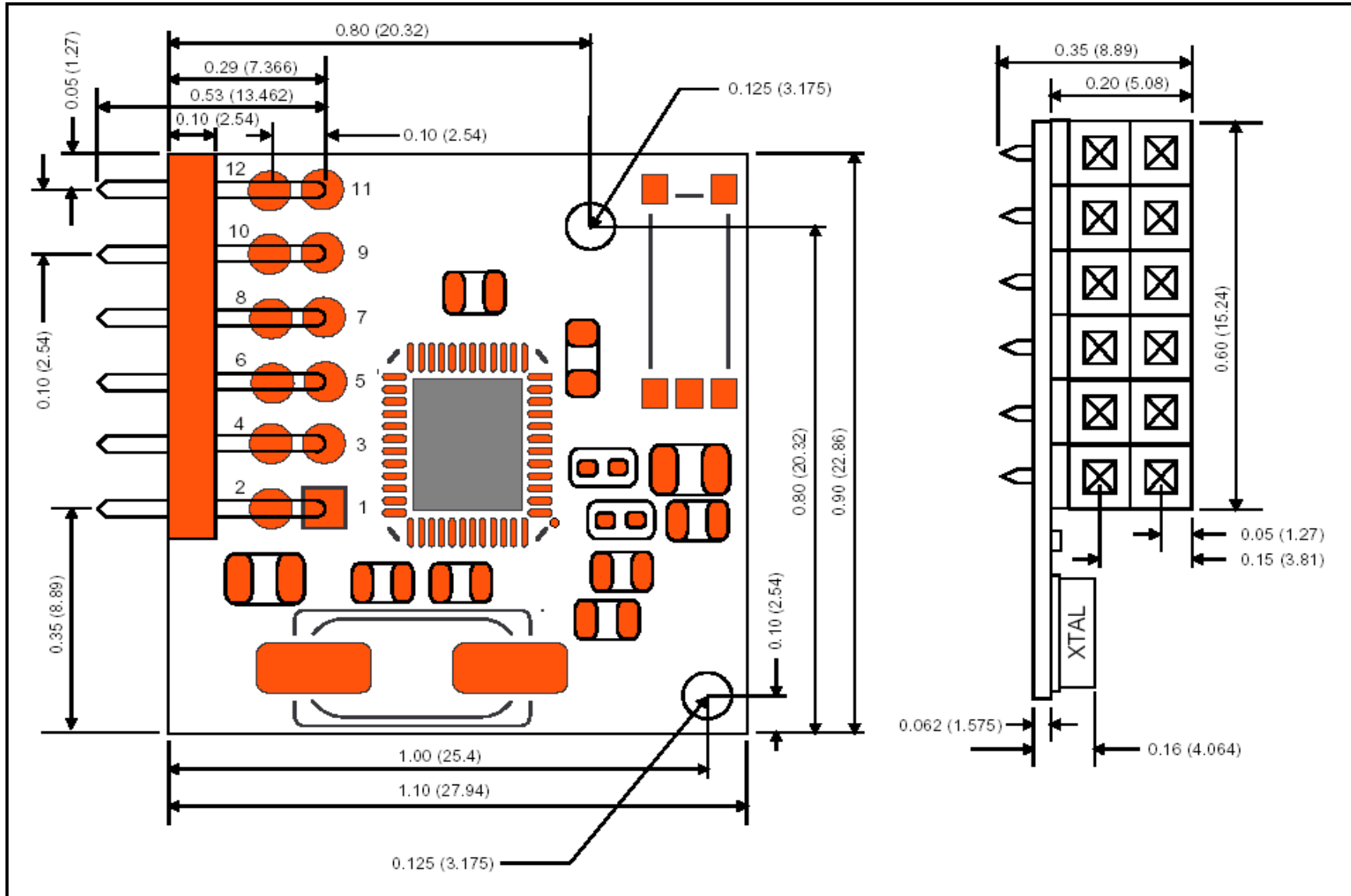


Figure 7 – Juno-L Dimensions

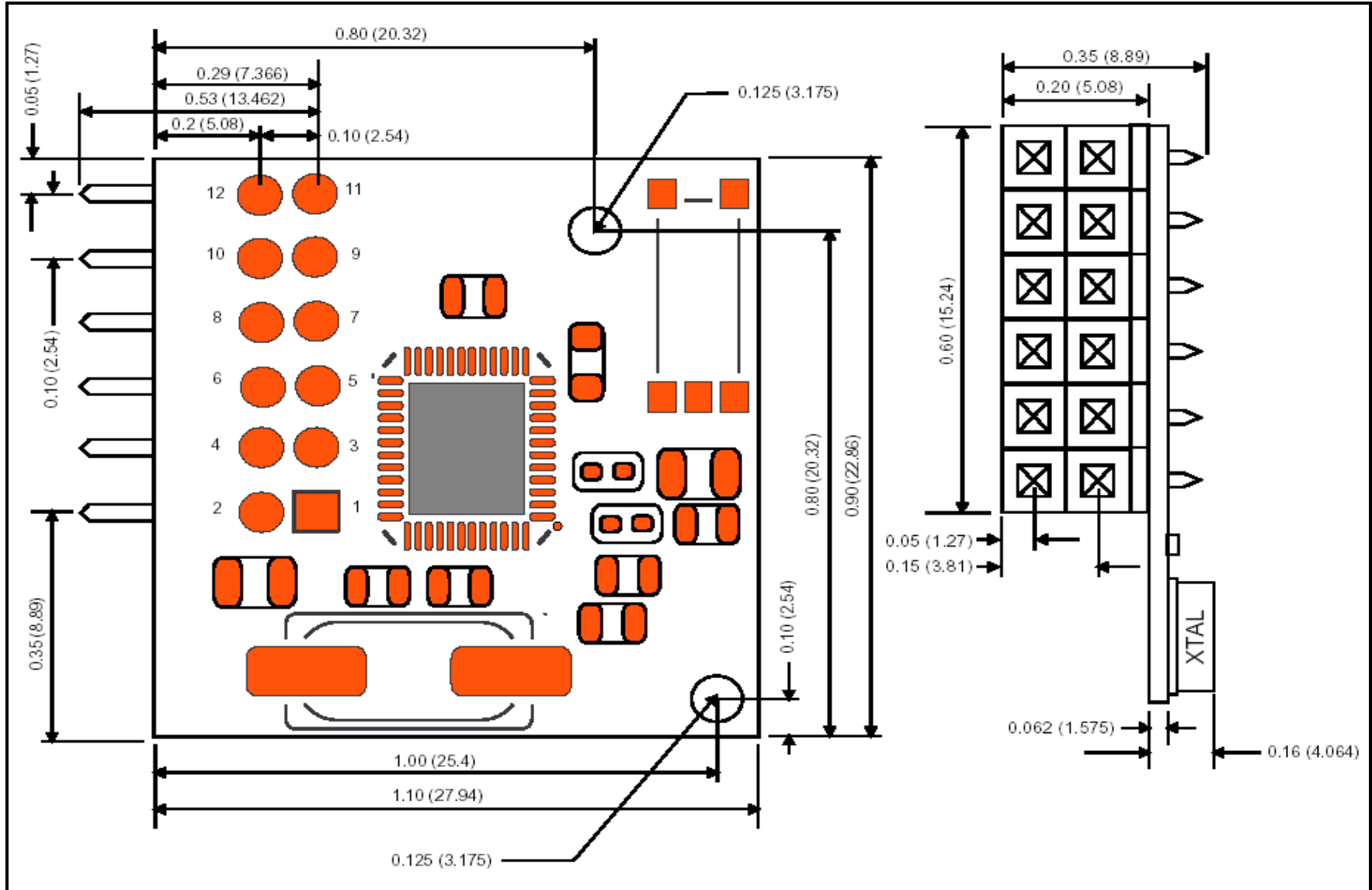


Figure 8 – Juno-L Mirrored Dimensions



# WirelessUSB™ - UGWB/L

Solutions for a Real Time World

Data Sheet

## ORDERING INFORMATION: \*

### Typical Applications

Unigen Product Group - Wireless -	Form Factor	WirelessUSB Tech	Connection	Connector Type	Voltage	Antenna
UGW	B	1US (10m) 2US (50m)	HA HM	1x6 Header x 2 Mirrored 1x6 Header x 2	33=3.3Vdc	Blank=Mini Coaxial A=Integ. Chip
	L		HB HN BB	2x6 Header Mirrored 2x6 Header Bare - No Connector		

\*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 Requirements
UGA	D= Dipole Antenna Module	L1= 3.5" desktop	B1= 2.4GHz, 2.0dBi	M1= 1.13mm HF	050= 50mm	M= Mini Coax	None= Default  F= EMI core and PVC
		A0= 4" Swivel Whip			100= 100mm		
		C1= 7.75" Swivel Whip	B2= 2.4GHz, 5.0dBi		150= 150mm		
					200= 200mm		
					250= 250mm		
					300= 300mm		

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



Solutions for a Real Time World

# WirelessUSB™ - UGWB/L

Data Sheet

## CONTACT INFORMATION:

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