

**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.

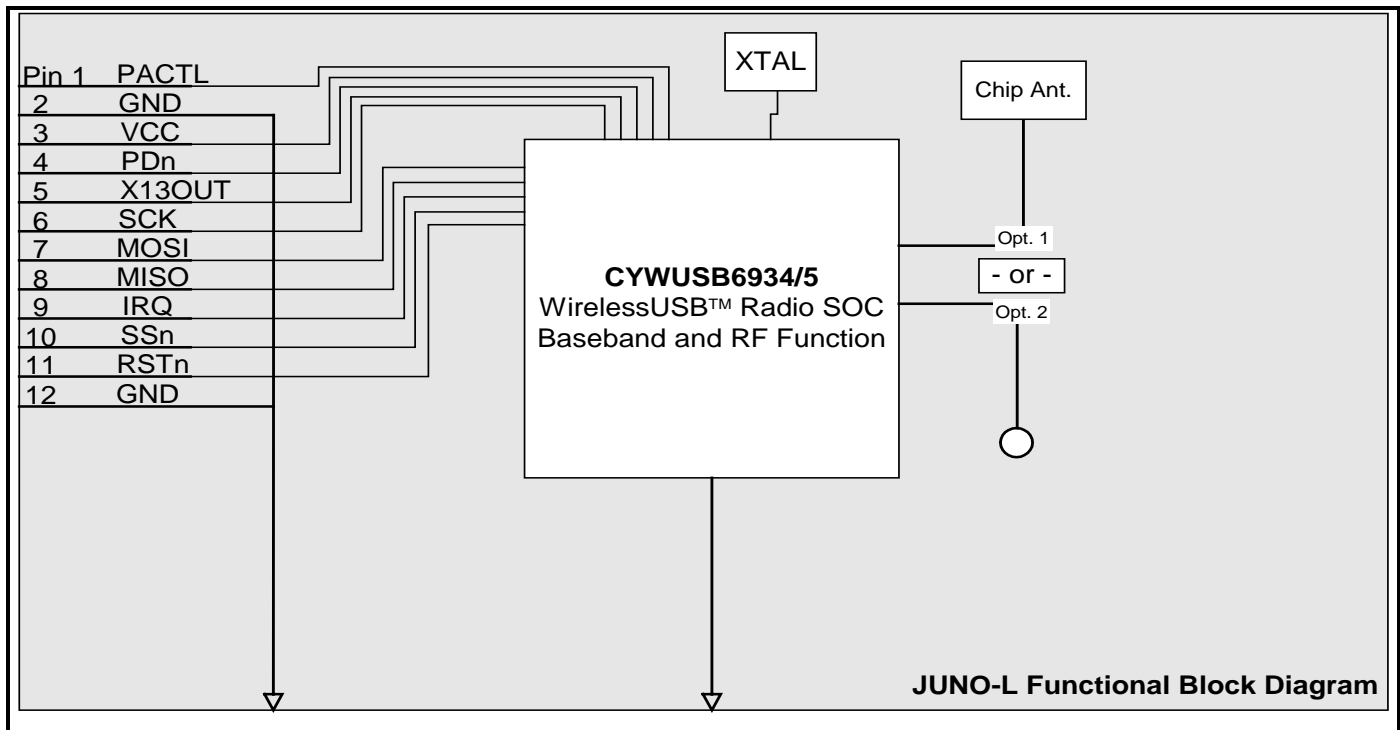
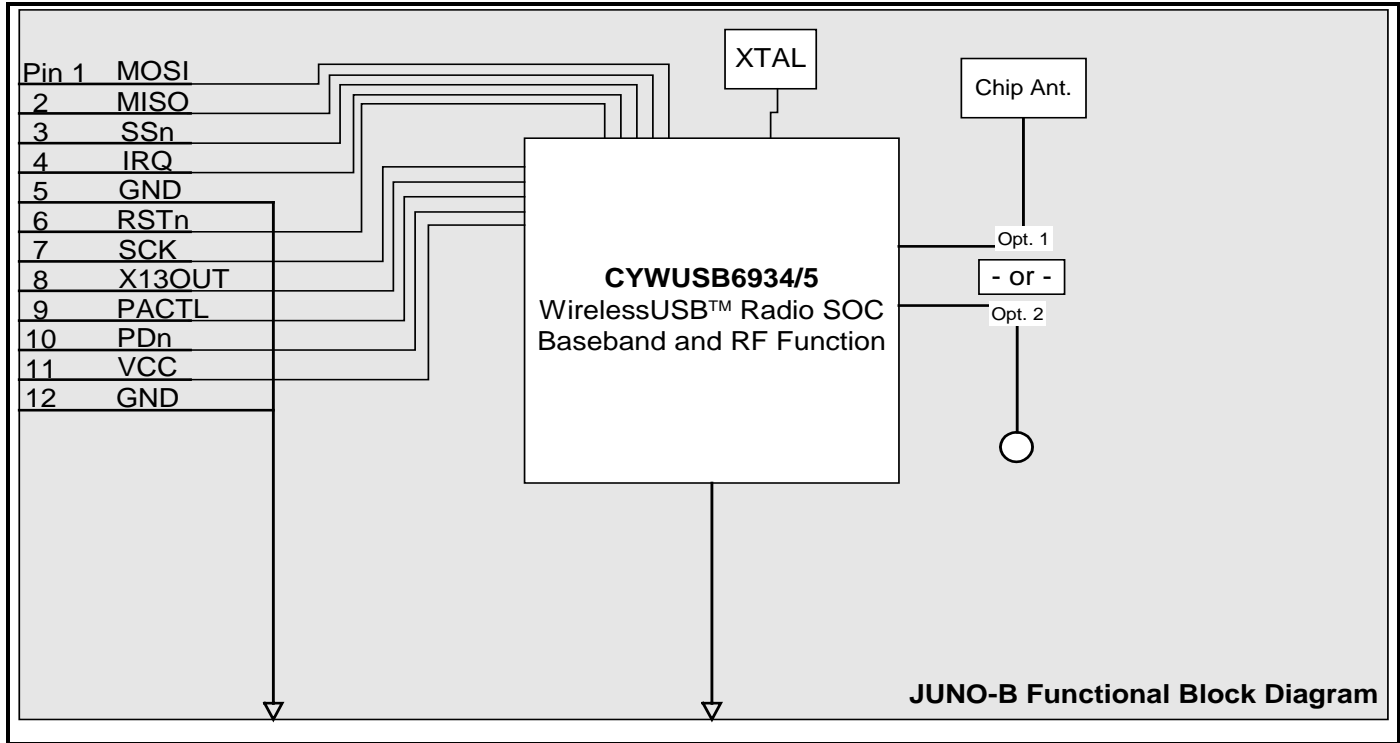
JUNO-B/L modules are a complete radio solution requiring only integration into an existing, or new device.

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<br>UGWB2US | UGWL1US<br>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<br>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:

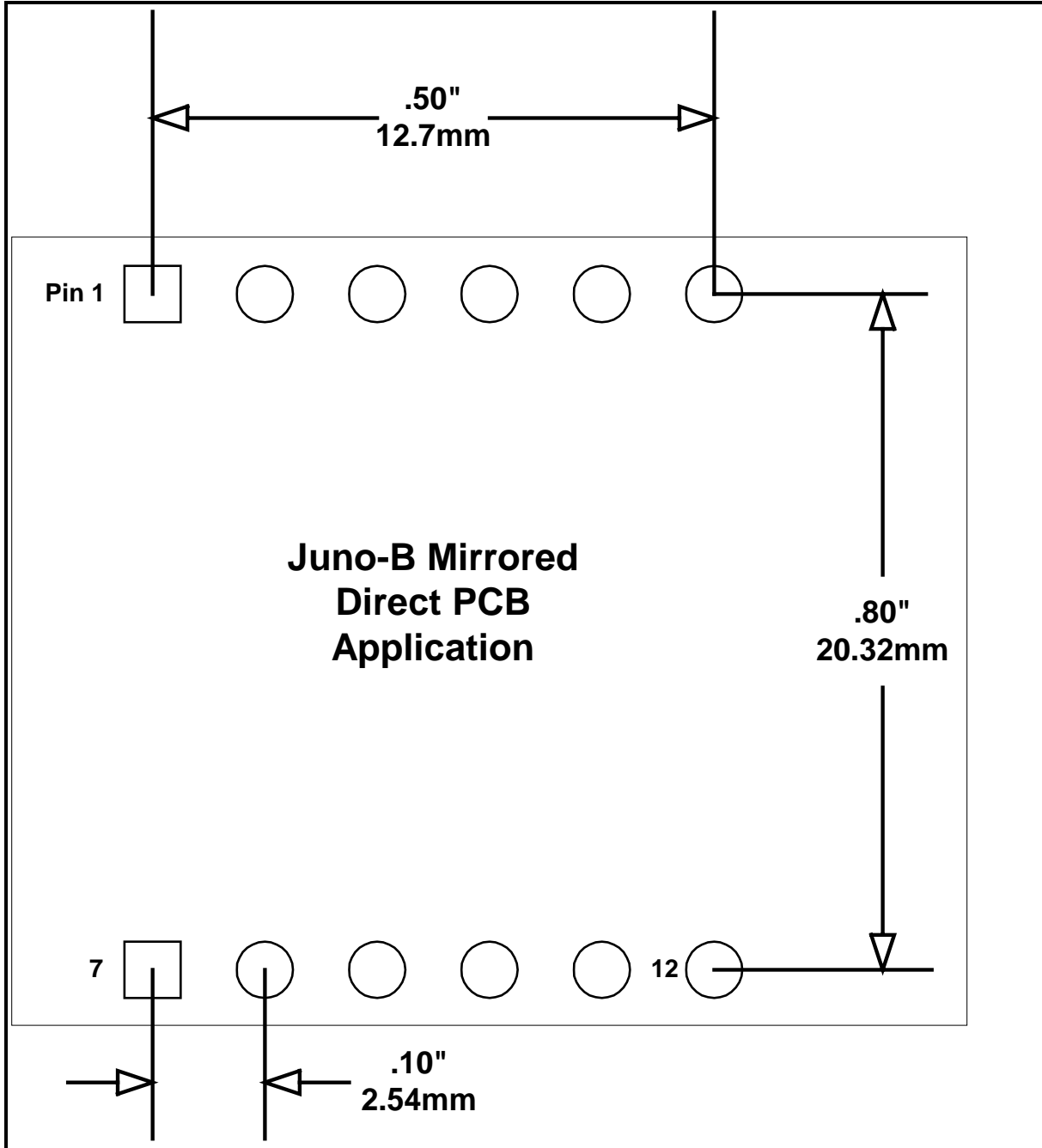


Figure 1 – Juno-B Mirrored Land Pattern

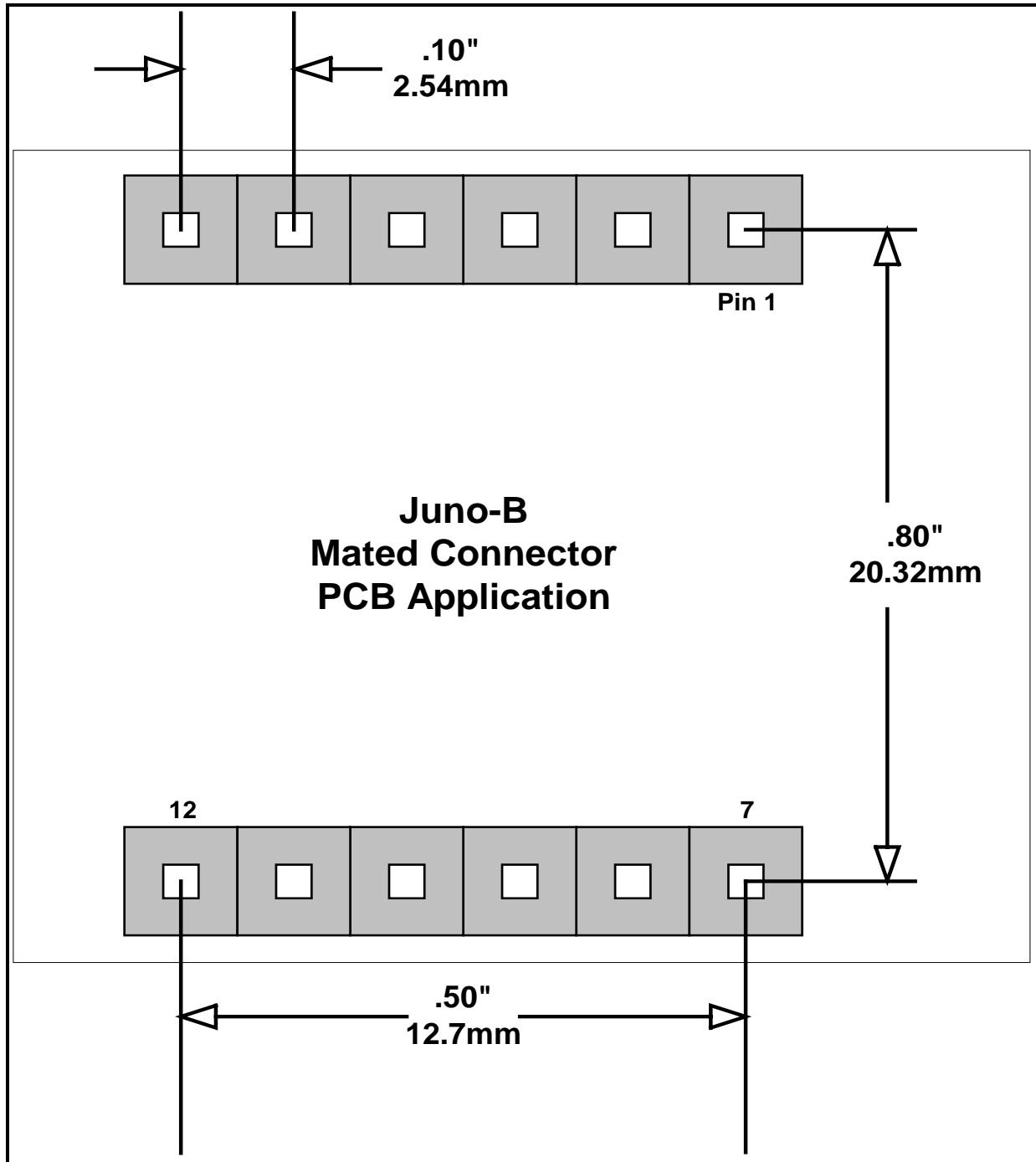


Figure 2 – Juno-B Land Pattern

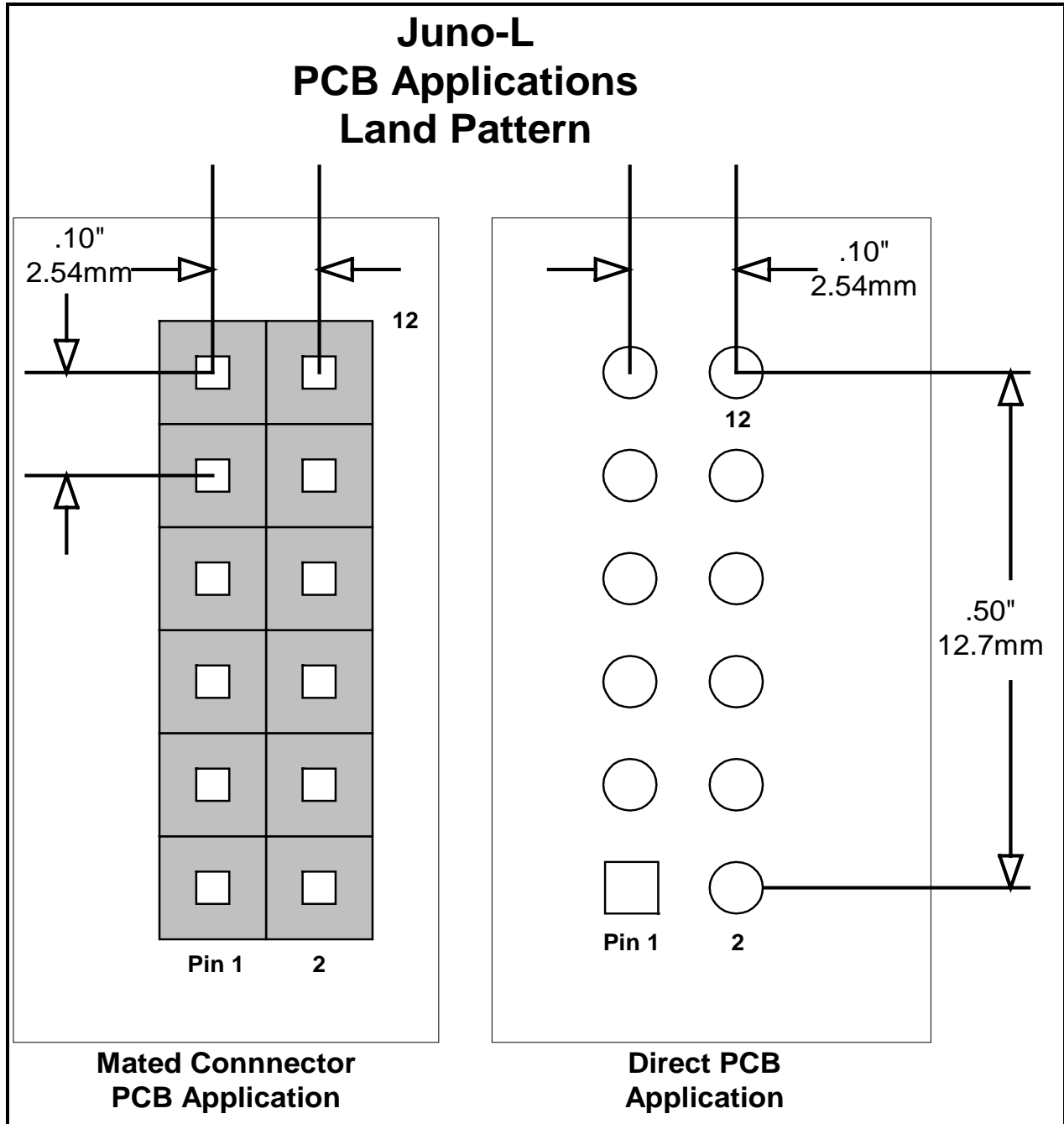


Figure 3 – Juno-L Land Pattern



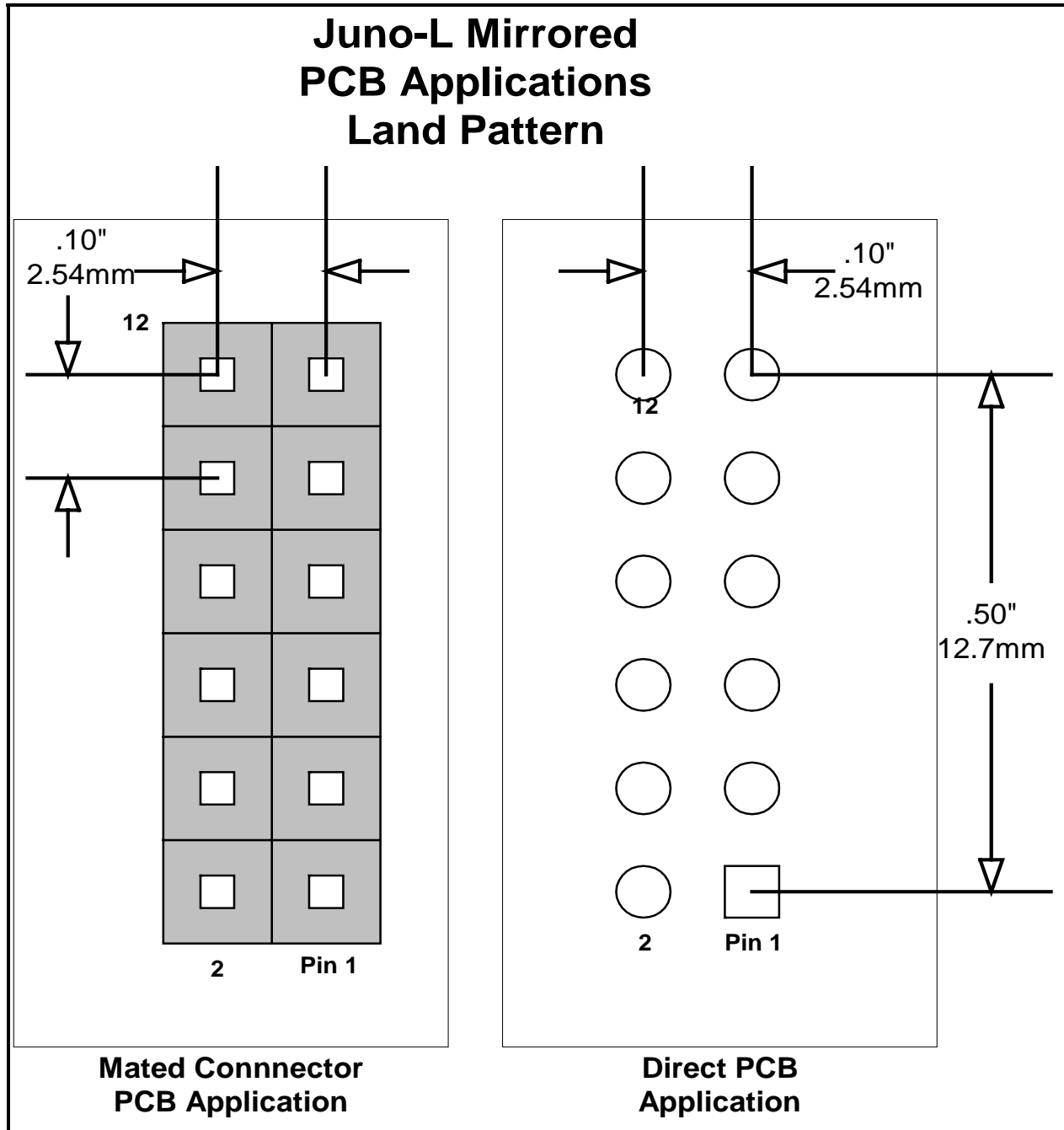


Figure 4 – Juno-L Mirrored Land Pattern

## PHYSICAL DIMENSIONS:

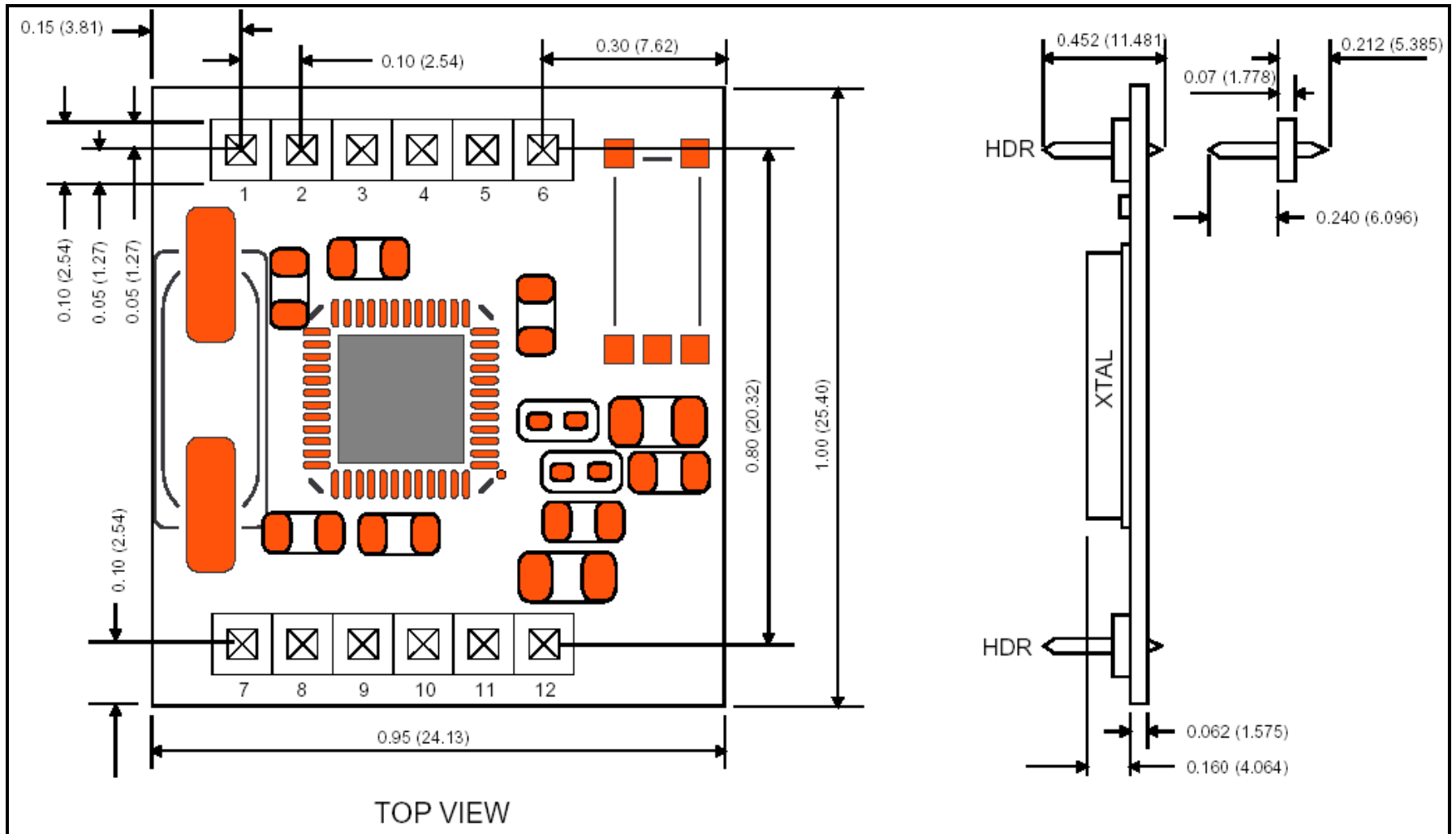
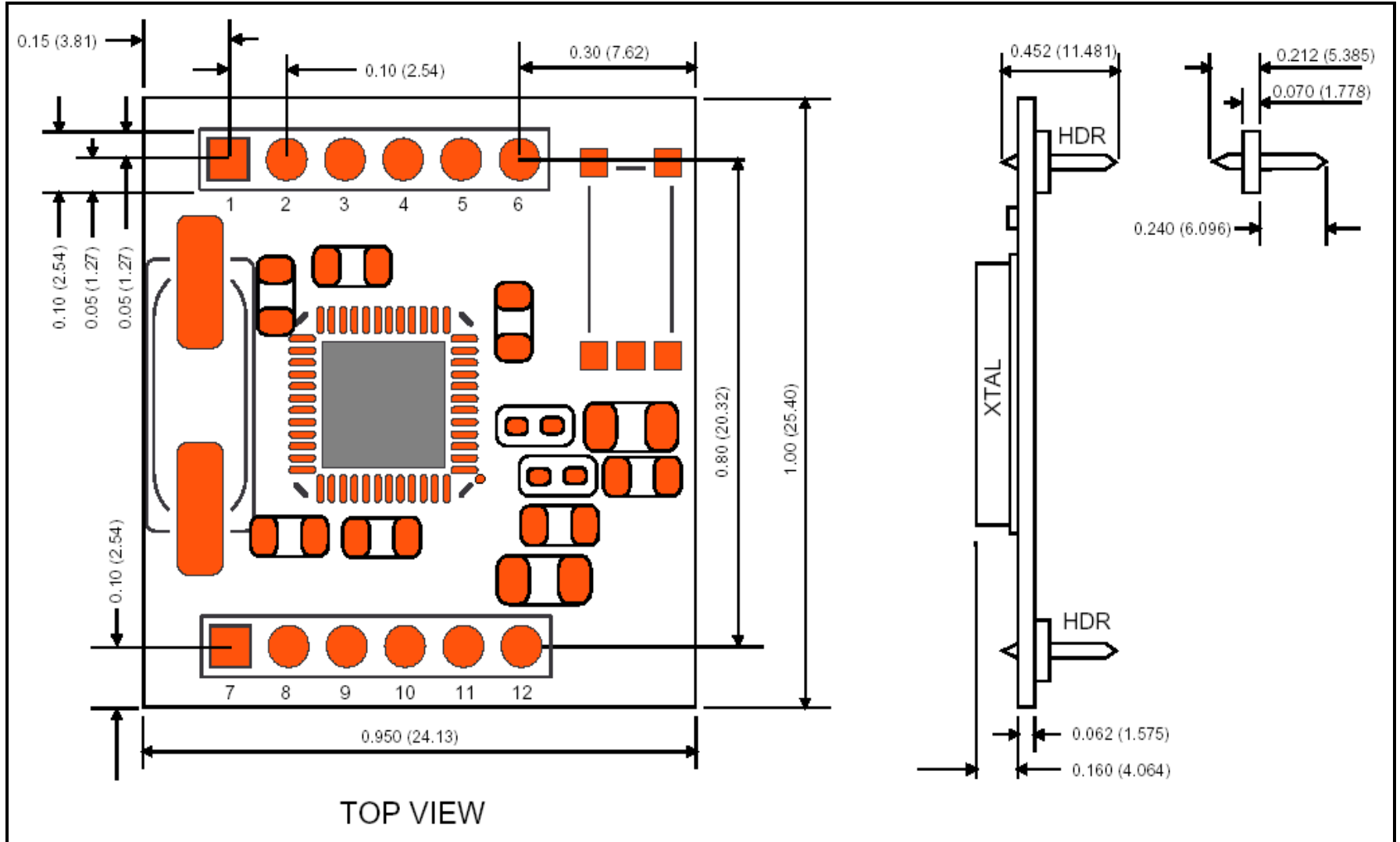


Figure 5 – Juno-B Dimensions



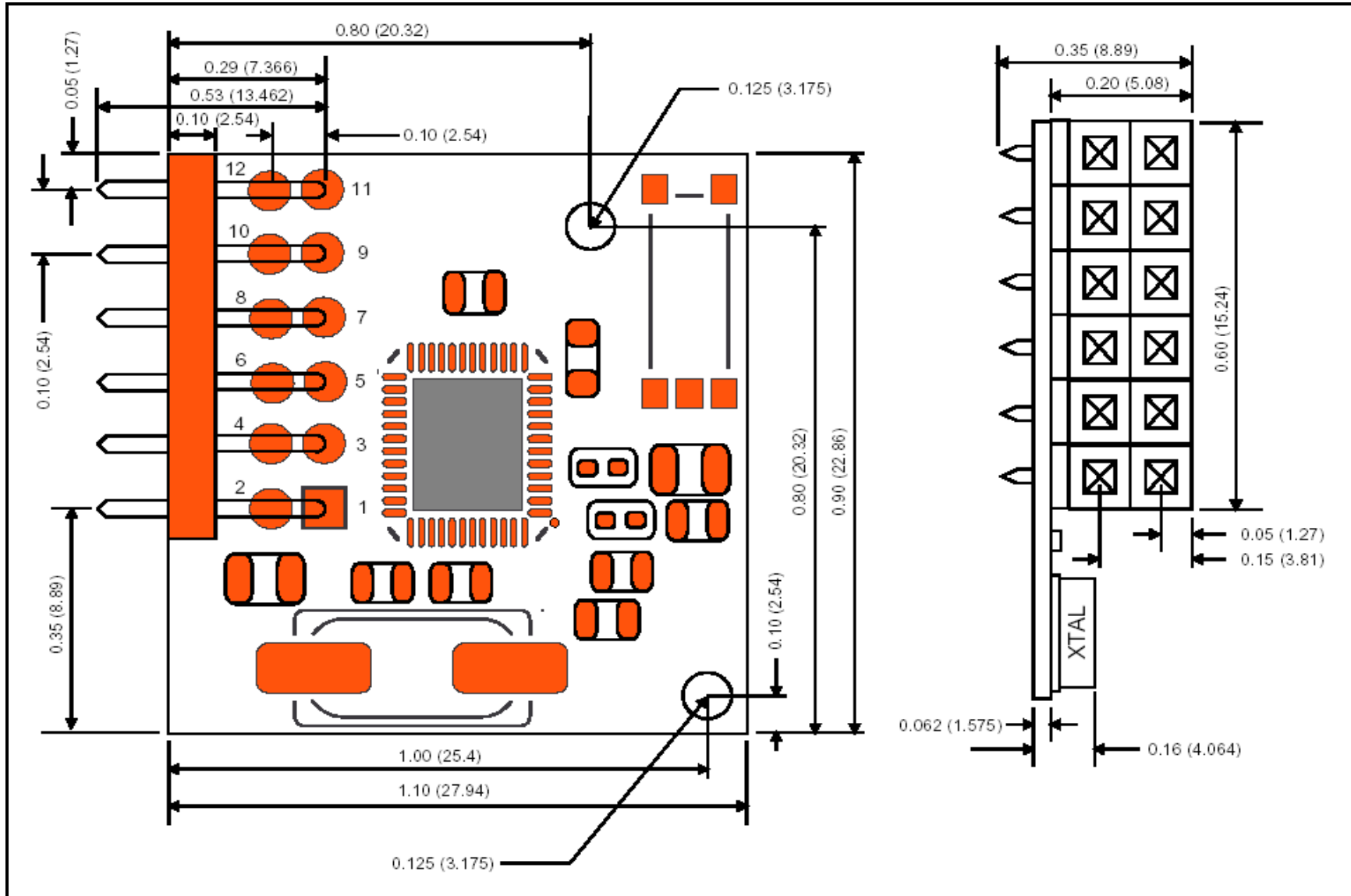


Figure 7 – Juno-L Dimensions

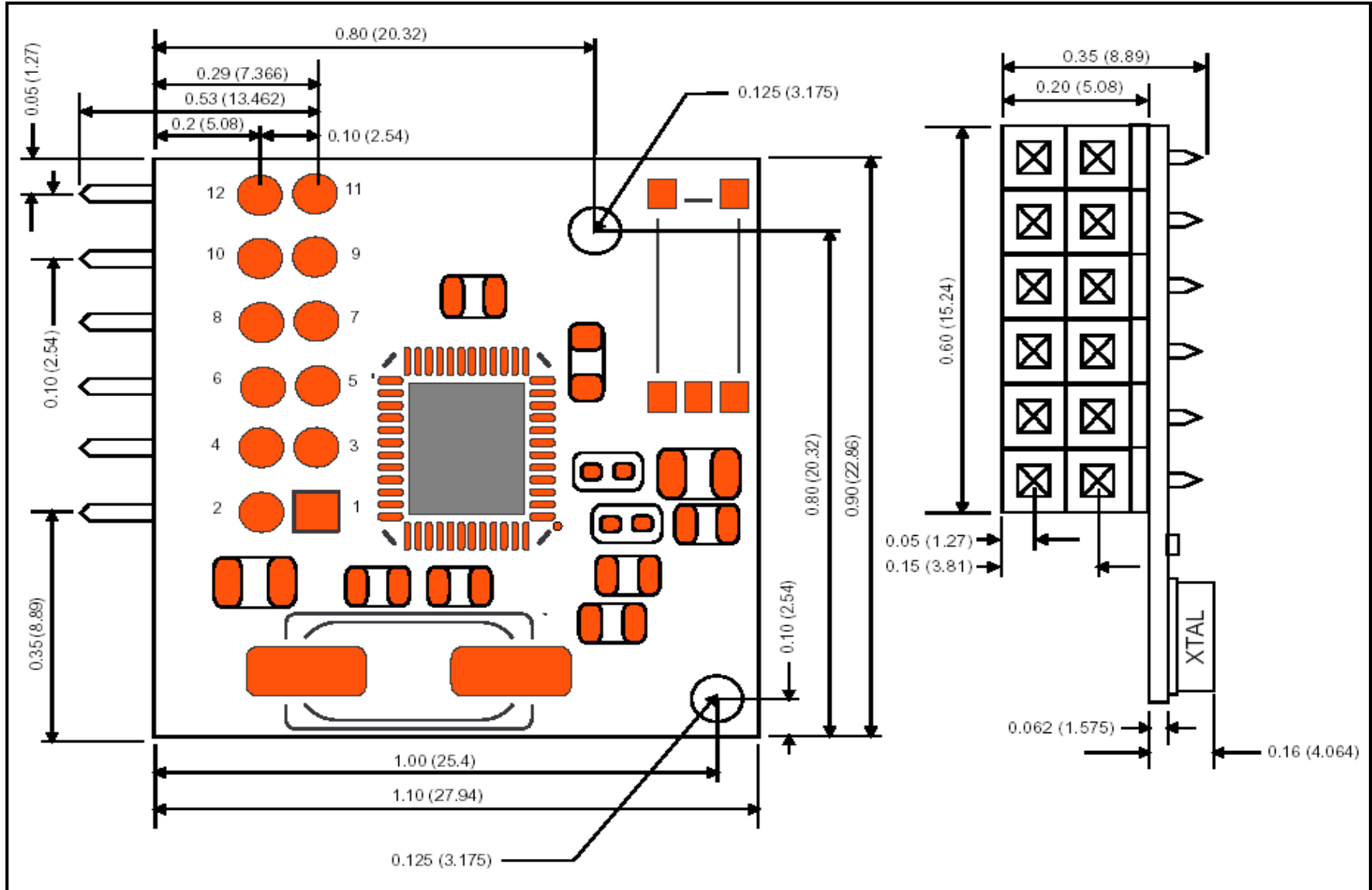


Figure 8 – Juno-L Mirrored Dimensions



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## ORDERING INFORMATION: \*

### Typical Applications

| Unigen Product Group - Wireless - | Form Factor | WirelessUSB Tech       | Connection     | Connector Type   | Voltage   | Antenna                             |
|-----------------------------------|-------------|------------------------|----------------|--|-----------|-------------------------------------|
| UGW                               | B           | 1US (10m)<br>2US (50m) | HA<br>HM       | 1x6 Header x 2<br>Mirrored 1x6 Header x 2                | 33=3.3Vdc | Blank=Mini Coaxial<br>A=Integ. Chip |
|                                   | L           |                        | HB<br>HN<br>BB | 2x6 Header<br>Mirrored 2x6 Header<br>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=<br>Dipole<br>Antenna<br>Module | L1=<br>3.5" desktop      | B1=<br>2.4GHz, 2.0dBi | M1=<br>1.13mm HF   | 050=<br>50mm  | M=<br>Mini Coax | None=<br>Default<br><br>F=<br>EMI core and<br>PVC |
|                                   |                                   | A0=<br>4" Swivel Whip    |                       |                    | 100=<br>100mm |                 |   |
|                                   |                                   | C1=<br>7.75" Swivel Whip | B2=<br>2.4GHz, 5.0dBi |                    | 150=<br>150mm |                 |   |
|                                   |                                   |                          |                       |                    | 200=<br>200mm |                 |   |
|                                   |                                   |                          |                       |                    | 250=<br>250mm |                 |   |
|                                   |                                   |                          |                       |                    | 300=<br>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)).



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