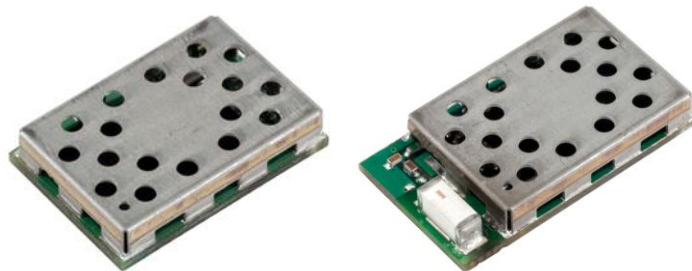




## BTM410/411 DATA MODULE

Datasheet

Version 6.4



global solutions: local support™

Embedded Wireless Solutions Support Center: <http://ews-support.lairdtech.com>

Americas: +1-800-492-2320

Europe: +44-1628-858-940

Asia: +852-2923-0610

[www.lairdtech.com/bluetooth](http://www.lairdtech.com/bluetooth)

## REVISION HISTORY

| Revision | Date            | Description  | Approved By   |
|----------|-----------------|--|---------------|
| 1.0      | 1 March 2012    | Initial Release  | Jonathan kaye |
| 2.0      | 12 March 2012   | General updates and compliant with firmware v16.1.3.0  | Jonathan kaye |
| 3.0      | 13 April 2012   | Reformatting and general edits   | Jonathan kaye |
| 4.0      | 15 August 2012  | Reformatting. Addition of Table 2-6. Reference to Table 2-6 in Table 2-1. Update to Sniff Mode section (everything following Figure 5). Cross References. Updated ATI Commands table. Added links to Low Power and Absolute Current Ratings application notes. | Jonathan kaye |
| 5.0      | 21 March 2013   | Updated mechanical drawings, updated FCC statements, general formatting edits.   | Jonathan kaye |
| 6.0      | 16 January 2014 | Separated document into two documents: Hardware Integration Guide and User Guide   | Jonathan kaye |
| 6.1      | 06 Feb 2014     | Added the Bluetooth SIG Qualification section.   | Jonathan kaye |
| 6.2      | 07 August 2014  | Updated shipping tray image and added module package dimension image.  | Jonathan kaye |
| 6.3      | 3 Sept. 2014    | Updated EU Declaration of Conformity   | Jonathan kaye |
| 6.4      | 20 Nov 2016     | Updated to Datasheet from Hardware Integration Guide   | Sue White     |

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## 1 OVERVIEW AND KEY FEATURES

The BTM410 and BTM411 Bluetooth® modules from Laird are designed to meet the needs of developers who wish to add robust, short range Bluetooth data connectivity to their products. These modules are based on the market leading Cambridge Silicon Radio BC04 chipset, providing exceptionally low power consumption with outstanding range. They support the Bluetooth® version 2.1 specification, providing the important advantage of Secure Simple Pairing (SSP), which improves security and ease of use for end customers.

With physical sizes as small as 12.5 mm x 18.0 mm and best of class, low-power operation, these modules are the ideal choice for applications where designers need both performance and minimum size. For maximum flexibility in systems integration, the modules are designed to support a separate power supply for I/O.

To aid product development and integration, Laird has integrated a complete Bluetooth protocol stack within the modules, including support for the Bluetooth Serial Port Profile. The modules are fully qualified as Bluetooth End Products, allowing designers to integrate them within their own products with no further Bluetooth Qualification. They can then list and promote products on the Bluetooth website free of charge.

A comprehensive AT command interface is included, which simplifies firmware integration. Combined with a low cost developer's kit, choosing Laird Bluetooth modules guarantees the fastest route to market.

### Features and Benefits



- Bluetooth® v2.1+EDR
- Adaptive Frequency Hopping to handle interference from other wireless devices
- Secure Simple Pairing (SSP) support
- External or internal antenna options
- Comprehensive AT interface for simple programming
- Bluetooth® End Product Qualified
- Compact size
- Class 2 output – 4 dBm
- Low power operation
- UART interface
- PCM and SCO for external codec
- GPIO lines under AT control
- Wi-Fi co-existence

### Applications

- Embedded devices
- Phone accessories
- Security devices
- Medical and wellness devices
- Automotive applications
- Bluetooth advertising
- ePOS

## 2 SPECIFICATIONS

### 2.1 Detailed Specifications

Table 2-1: Detailed specifications

| Categories                     | Feature                   | Implementation   |
|--------------------------------|---------------------------|--|
| Wireless Specification         | Bluetooth®                | Version 2.1+EDR  |
|                                | Transmit Class            | Class 2  |
|                                | Frequency                 | 2.402 – 2.480 GHz  |
|                                | Channels                  | 79 channels Frequency Hopping<br>Adaptive Frequency Hopping                    |
|                                | Max. Transmit Power       | +4 dBm at antenna pad – BTM410<br>+4 dBm from integrated antenna –<br>BTM411   |
|                                | Min. Transmit Power       | -27 dBm at antenna pad – BTM410<br>-27 dBm from integrated antenna –<br>BTM411 |
|                                | Receive Sensitivity       | -84 dBm  |
|                                | Range                     | 30 m   |
|                                | Data Transfer Rate        | Up to 300 kbps   |
|                                | Antenna Modes             | External Antenna   |
| Integrated Antenna<br>(option) |                           | +0 dBi multilayer ceramic – BTM411   |
| UART Interface                 | Serial Interface          | RS-232 bi-directional for commands and<br>data 16550 compatible                |
|                                | Baud Rate                 | Configurable from 1,200 to 921,600 bps<br>Non-standard baud rates supported    |
|                                | Bits                      | 8  |
|                                | Parity                    | Odd, even, none  |
|                                | Stop bits                 | 1 or 2   |
|                                | Default Serial parameters | 9600,n,8,1   |
|                                | Levels                    | Set by VDD_USB input   |
|                                | Modem Control             | DTR, DSR, DCD, RI, RTS, CTS  |
| General Purpose<br>Interface   | I/O                       | 8 general purpose I/O pins   |
| Audio                          | Support                   | 1 PCM channel @ 64 kbps  |
|                                | SCO Channels              | Support SCO and eSCO   |

| Categories                 | Feature                   | Implementation  |
|----------------------------|---------------------------|---|
|                            | PCM Interface             | Configurable as master or slave<br>8 bit A-law<br>8 bit $\mu$ -law<br>13 bit linear<br>PCM Clock available when in slave mode |
| Protocols And Firmware     | Bluetooth Stack           | Version 2.1 compliant. Fully integrated.  |
|                            | Profiles                  | GAP (Generic Access Profile)<br>SDP (Service Discovery Profile)<br>SPP (Serial Port Profile)                                  |
|                            | Firmware Upgrade          | Available over UART   |
|                            | Connection Modes          | Point to point (cable replacement)  |
| Command Interface          | AT Instructions set       | Comprehensive control of connection and module operation S Registers for non-volatile storage of parameters                   |
| Current Consumption        | Data Transfer             | Typically 32 mA<br><b>Note:</b> For an Absolute Current Ratings summary, see <a href="#">Table 2-6</a> .                      |
|                            | Low Power Sniff Mode      | Less than 2.5mA   |
| Supply Voltage             | Supply                    | 3.0 V – 3.3 V DC  |
|                            | I/O                       | 1.7 V – 3.3 V DC (independent of Supply)  |
|                            | USB & UART                | 1.7 V – 3.6 V DC (independent of Supply)  |
| Coexistence/ Compatibility | WLAN (802.11)             | 2-wire and 3-wire hardware coexistence schemes supported  |
| Connections                | Interface                 | Surface Mount Pads  |
|                            | External Antenna (BTM410) | Pad for 50 Ohm antenna  |
| Physical                   | Dimensions                | 12.5 mm x 18.0 mm x 3.4 mm BTM410<br>12.5 mm x 22.0 mm x 3.4 mm BTM411  |
|                            | Weight                    | 3 grams   |
| Environmental              | Operating Temperature     | -40° C to +85° C  |
|                            | Storage Temperature       | -40° C to +85° C  |
| Approvals                  | Bluetooth                 | Qualified as an Bluetooth End product   |
|                            | FCC                       | Limited Modular Approval (BTM410)<br>Full Modular Approval (BTM411)   |
|                            | CE & R&TTE                | Meets CE and R&TTE requirements   |
| Miscellaneous              | Lead free                 | Lead-free and RoHS compliant  |
|                            | Warranty                  | 1-Year Warranty   |
| Development Tools          | Development Kit           | Development board and software tools<br>DVK-BTM410 Dev Kit with BTM410 module<br>DVK-BTM411 Dev Kit with BTM411 module        |

## 2.2 Pin Definitions

Table 2-2: Pin definitions

| Pin # | Signal            | Description                         | Voltage Specification |
|-------|-------------------|-------------------------------------|-----------------------|
| 1     | Unused            |                                     |                       |
| 2     | GND               |                                     |                       |
| 3     | UART_CTS          | Clear to Send I/P                   | VUSB                  |
| 4     | UART_RXD          | Receive data I/P                    | VUSB                  |
| 5     | UART_RTS          | Request to Send O/P                 | VUSB                  |
| 6     | UART_TXD          | Transmit data O/P                   | VUSB                  |
| 7     | GND               |                                     |                       |
| 8     | SPI_CSB           | SPI bus chip select I/P             | VIO                   |
| 9     | SPI_MISO          | SPI bus serial O/P                  | VIO                   |
| 10    | SPI_MOSI          | SPI bus serial I/P                  | VIO                   |
| 11    | SPI_CLK           | SPI bus clock I/P                   | VIO                   |
| 12    | VDD_USB           | USB & UART supply voltage           |                       |
| 13    | VDD_IO            | I/O supply voltage                  |                       |
| 14    | VDD_IN            | Main supply voltage                 |                       |
| 15    | GND               |                                     |                       |
| 16    | PCM_IN            | PCM data I/P                        | VIO                   |
| 17    | PCM_SYNC          | PCM sync I/P                        | VIO                   |
| 18    | PCM_CLK           | PCM clock I/P                       | VIO                   |
| 19    | PCM_OUT           | PCM data O/P                        | VIO                   |
| 20    | RESET             | Module reset I/P                    | See note 2            |
| 21    | GPIO4             | I/O for host - BT_Active / BT_State | VIO                   |
| 22    | GPIO2 / UART_DCD  | I/O for host                        | VIO                   |
| 23    | GND               |                                     |                       |
| 24    | Unused            |                                     |                       |
| 25    | Unused            |                                     | See note 3            |
| 26    | Unused            |                                     | See note 3            |
| 27    | Unused            |                                     | See note 3            |
| 28    | GND (BTM410 only) |                                     | See note 3            |
| 29    | ANT (BTM410 only) | Antenna connection (50 ohm matched) | See note 3            |
| 30    | GND (BTM410 only) |                                     | See note 3            |
| 31    | Unused            |                                     | See note 3            |
| 32    | Unused            |                                     | See note 3            |
| 33    | Unused            |                                     | See note 3            |
| 34    | Unused            |                                     | See note 3            |
| 35    | Unused            |                                     | See note 3            |
| 36    | Unused            |                                     | See note 3            |
| 37    | Unused            |                                     | See note 3            |
| 38    | Unused            |                                     |                       |

| Pin # | Signal           | Description                     | Voltage Specification |
|-------|------------------|---------------------------------|-----------------------|
| 39    | Unused           |                                 |                       |
| 40    | Unused           |                                 |                       |
| 41    | GND              |                                 |                       |
| 42    | GPIO1 / UART_RI  | I/O for host                    | VIO                   |
| 43    | GPIO7 / UART_DTR | I/O for host                    | VIO                   |
| 44    | GPIO8 / UART_DSR | I/O for host                    | VIO                   |
| 45    | GND              |                                 |                       |
| 46    | D-               | Not used for AT module variants | VUSB                  |
| 47    | D+               | Not used for AT module variants | VUSB                  |
| 48    | GPIO6            | I/O for host - RF_Active        | VIO                   |
| 49    | GPIO5            | I/O for host - WLAN_Active      | VIO                   |
| 50    | GPIO3            | I/O for host - BT_Priority      | VIO                   |

1. Unused pins may have internal connections and must not be connected.
2. Reset input is active low. Input is pulled up to VDD\_IN via 22k. Minimum reset pulse width is 5 ms.
3. Pins 8 – 11 (SPI related) are only for Laird internal production purposes.
4. Pins 25-37 should be left not connected on modules with integrated antenna.

## 2.3 Operating Parameters

Table 2-3: Operating parameters

| Operating Condition                      | Min | Max |
|--|-----|-----|
| VDD_USB (USB compatibility not required) | 1.7 | 3.6 |
| VDD_USB (USB compatibility required)     | 3.1 | 3.6 |
| VDD_IO                                   | 1.7 | 3.3 |
| VDD_IN                                   | 3.0 | 3.3 |

## 2.4 Voltage Specifications

Table 2-4: Voltage specifications (VUSB)

|  | Min           | Typ | Max  |
|--|---------------|-----|------|
| <b>Input Voltage Levels</b>                          |               |     |      |
| Vih  | 0.7VDD_USB    |     |      |
| Vil 2.7<VDD_USB<3.0                                  | -0.4          |     | +0.8 |
| 1.7<VDD_USB<1.9                                      | -0.4          |     | -0.4 |
| <b>Output Voltage Levels (1.7&lt;VDD_USB&lt;1.9)</b> |               |     |      |
| Voh (Iout = -4mA)                                    | VDD_USB – 0.4 |     |      |
| Vol (Iout = 4mA)                                     |               |     | 0.4  |
| <b>Output Voltage Levels (2.7&lt;VDD_USB&lt;3.0)</b> |               |     |      |
| Voh (Iout = -4mA)                                    | VDD_USB – 0.2 |     |      |
| Vol (Iout = 4mA)                                     |               |     | 0.2  |

**Note:** VDD\_USB must be connected to power the USB and UART interfaces.



**Table 2-5: Voltage specifications (VIO)**

|   | Min           | Typ | Max  |
|---|---------------|-----|------|
| <b>Input Voltage Levels</b>                             |               |     |      |
| Vih   | 0.7VDD_IO     |     |      |
| Vil 2.7<VDD_USB<3.0                                     | -0.4          |     | +0.8 |
| 1.7<VDD_USB<1.9   | -0.4          |     | -0.4 |
| <b>Output Voltage Levels (1.7 &lt; VDD_IO &lt; 1.9)</b> |               |     |      |
| Voh (Iout = -4 mA)                                      | VDD_USB – 0.4 |     |      |
| Vol (Iout = 4 mA)                                       |               |     | 0.4  |
| <b>Output Voltage Levels (2.7 &lt; VDD_IO &lt; 3.0)</b> |               |     |      |
| Voh (Iout = -4 mA)                                      | VDD_USB – 0.2 |     |      |
| Vol (Iout = 4 mA)                                       |               |     | 0.2  |

**Table 2-6: Absolute Current Rating Summary**

|                                       |                         |         |   |
|---------------------------------------|-------------------------|---------|---|
| Power up / reset                      | I_avg_reset             | 20.7 mA |   |
|                                       | t_reset_current_dur.    | 3.0 s   |   |
| Idle <sup>(2)</sup>                   | I_avg @ 9600 baud       | 2.60 mA | 5 second average, no data at UART <sup>(2)</sup>      |
|                                       | I_avg @ 38400 baud      | 2.75 mA |   |
|                                       | I_avg @ 115200 baud     | 2.95 mA |   |
|                                       | I_avg @ 460800 baud     | 4.37 mA |   |
| Connectable and Discoverable          | I_avg_cycle             | 23.1 mA | AT+BTP / ATS512=4, 9600 Baud, average over 1 interval |
| Inquiry                               | I_avg_inquiry           | 42.1 mA |   |
| Initiate pairing                      | I_avg_pair_ini          | 28.8 mA |   |
| Accept pairing                        | I_avg_pair_acc          | 42.0 mA |   |
| Initiate a connection (SPP)           | I_avg_connect_ini       | 39.8 mA |   |
| Accept a connection (SPP)             | I_avg_connect_ini       | 37.2 mA |   |
| Connected as master, no data exchange | I_avg_conn_master_idle  | 13.3 mA | Active mode   |
|                                       | I_avg_master_sniff_idle | 13.6 mA | Sniff interval=50 ms                                  |
|                                       | I_avg_master_ssr_idle   | 9.9 mA  | SSR, interval=300 ms                                  |
| Connected as slave, no data exchange  | I_avg_conn_slave_idle   | 29.0 mA | Active mode   |
|                                       | I_avg_slave_sniff_idle  | 12.7 mA | Sniff interval=50 ms                                  |
|                                       | I_avg_slave_ssr_idle    | 9.9 mA  | SSR, interval=300 ms                                  |

1. All current peaks measured were less than 86 mA.
2. Even when no data transmits, higher baud rates cause a higher standby current.
3. For additional information on Absolute Current Rating, see *Application Note – BTM41x Absolute Current Ratings* located at [www.lairdtech.com/wireless](http://www.lairdtech.com/wireless).

## 3 FCC REGULATORY STATEMENTS

### 3.1 BTM410 FCC and Industry Canada Statements

#### The Final Equipment user manual must show the following statements:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

To comply with the FCC RF exposure compliance requirements, this device and its antenna must not be co-located or operating to conjunction with any other antenna or transmitter.

#### 3.1.1 Considerations for OEM Integration

This module has a limited modular approval. Approval with any other antenna configuration or layout other than that approved will necessitate additional radiated emission testing to be performed.

To inherit the modular approval, the antennas for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

This module was approved with the following antenna:

RF Solutions: ANT-24G-WHJ-SMA 0dBi

Operation of this module with any other antenna will require additional testing to be performed.

Co-location with other radio transmitting devices operating concurrently in the same band will require additional testing and certification.

Designers should note the distinction that the FCC makes regarding portable and mobile devices. Mobile devices are defined as products that are not used closer than 20cm to the human body, whereas portable devices can be used closer than 20cm to the body. A device may be used in portable exposure conditions with no restrictions on host platforms when the averaged output power is less than the low power threshold for an uncontrolled environment  $\leq 60/f(\text{GHz})$  i.e. 25mW for a 2.4Ghz device. The Maximum Power Exposure for the BTM410 has been evaluated and found to comply with the low power threshold for an uncontrolled environment.

Refer to FCC document KDB 447498 for more information on RF exposure procedures and equipment authorization policies for mobile and portable devices.

#### 3.1.2 FCC Labelling Requirement

If the FCC ID is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: PI4410B" or "Contains FCC ID: PI4410B." Any similar wording that expresses the same meaning may be used.

## 3.2 BTM411 FCC and Industry Canada Statements

### The user manual must show the following statements:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

To comply with the FCC RF exposure compliance requirements, this device and its antenna must not be co-located or operating to conjunction with any other antenna or transmitter.

### 3.2.1 Considerations for OEM Integration

To inherit the modular approval, the antennas for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

Co-location with other radio transmitting devices operating concurrently in the same band will require additional testing and certification.

Designers should note the distinction that the FCC makes regarding portable and mobile devices. Mobile devices are defined as products that are not used closer than 20cm to the human body, whereas portable devices can be used closer than 20cm to the body. A device may be used in portable exposure conditions with no restrictions on host platforms when the averaged output power is less than the low power threshold for an uncontrolled environment  $\leq 60/f$  (GHz) i.e. 25 mW for a 2.4 GHz device. The Maximum power Exposure for the BTM411 has been evaluated and found to comply with the low power threshold for an uncontrolled environment.

Refer to FCC document KDB 447498 for more information on RF exposure procedures and equipment authorization policies for mobile and portable devices.

### 3.2.2 FCC Labelling Requirement

If the FCC ID is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: PI4411B" or "Contains FCC ID: PI4411B." Any similar wording that expresses the same meaning may be used.

## 4 EU DECLARATION OF CONFORMITY – BTM410 / BTM411

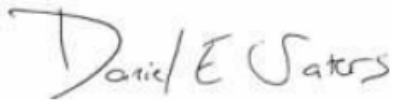
|                               |  |
|-------------------------------|--|
| <b>Manufacturer:</b>          | Laird  |
| <b>Product:</b>               | BTM410 / BTM411 / BTM420 / BTM421 /<br>BTM430 / BTM431 / BTM441 / BTM443 /<br>BTM461 |
| <b>EU Directive:</b>          | RTTE 1995/5/EC   |
| <b>Conformity Assessment:</b> | Annex IV   |

### 4.1 Reference Standards used for Presumption of Conformity

| Article Number | Requirement   | Reference standard(s)  |
|----------------|---|--|
| 3.1a           | Health and Safety   | EN 60950-1:2005 (2 <sup>nd</sup> Ed); +Am1:2009 +Am2:2013<br>EN<br>60950-1:2006+A11+a1:2010+A12:2011+A2:2013   |
| 3.1a           | RF Exposure   | EN 62479:2010  |
| 3.1b           | Protection requirements with respect to electromagnetic compatibility | EN 301 489-1 V1.9.2 (2011-09)<br>EN 301 489-17 V2.2.1 (2012-09)<br>Emissions:<br>EN55022:2010 /AC:2011 (ClassB)<br>Immunity:<br>EN61000-4-2:2009<br>EN61000-4-3:2006 /A1:2008 /A2:2010 |
| 3.2            | Means of the efficient use of the radio frequency spectrum            | EN 300 328 V1.8.1 (2012-06)  |

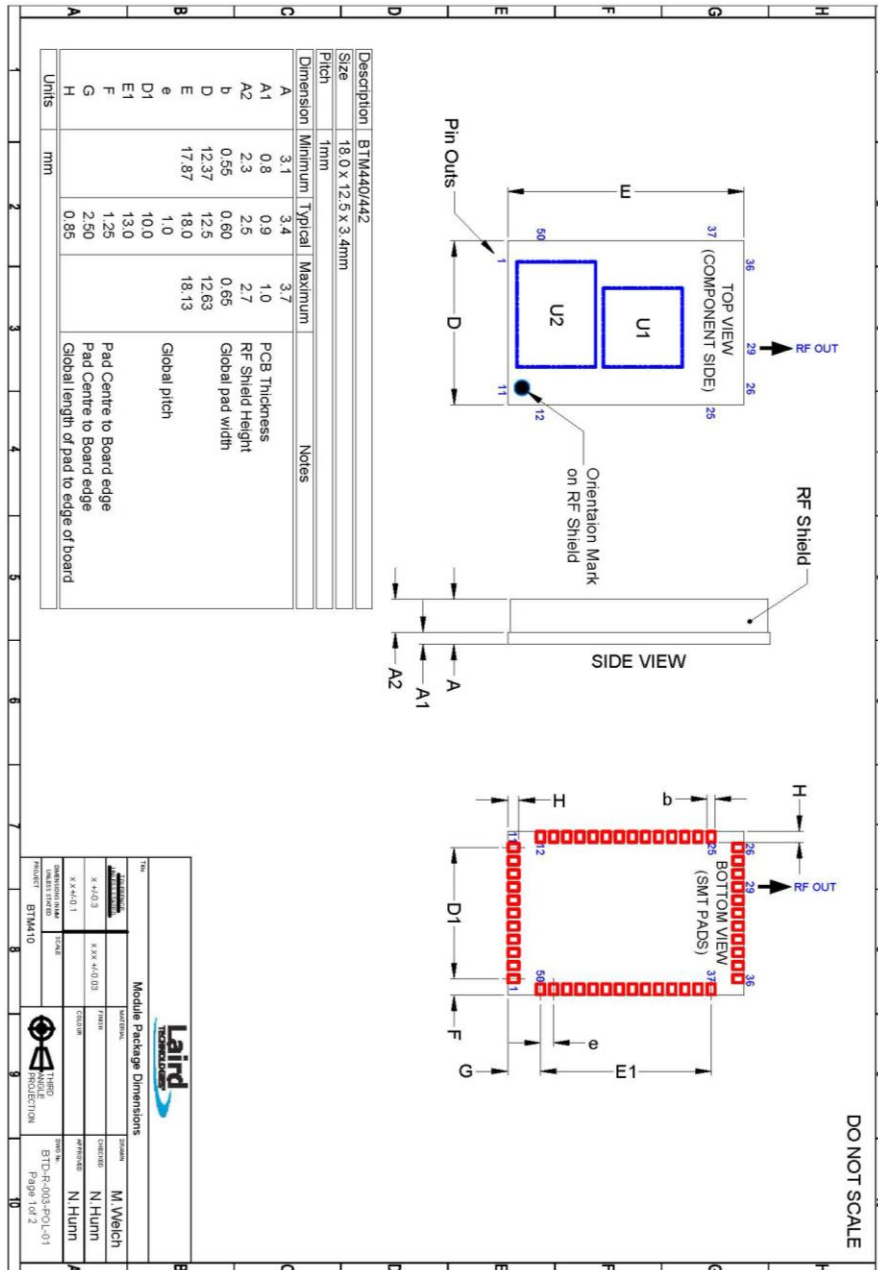
### 4.2 Declaration:

We, Laird, declare under our sole responsibility that the essential radio test suites have been carried out and that the above product to which this declaration relates is in conformity with all the applicable essential requirements of Article 3 of the EU Directive 1995/5/EC, when used for its intended purpose.

|                                   |  |
|-----------------------------------|--|
| <b>Place of Issue:</b>            | Laird<br>11160 Thompson Ave.<br>Lenexa, KS 66219                                     |
| <b>Date of Issue:</b>             | October 2009   |
| <b>Name of Authorized Person:</b> | Daniel Waters / Certifications Specialist  |
| <b>Signature:</b>                 |  |

## 5 MECHANICAL DRAWINGS

### 5.1 BTM410 Mechanical Details

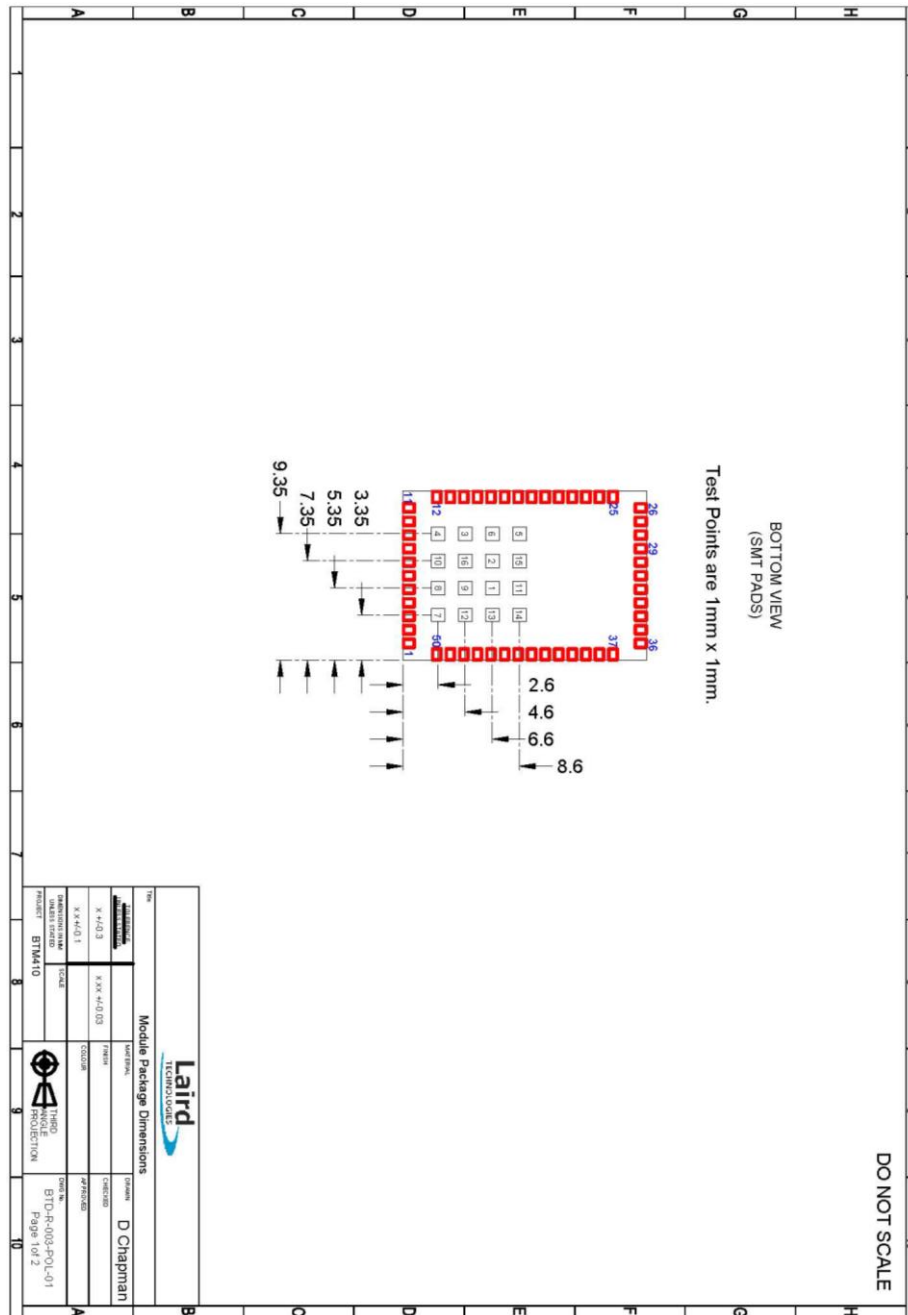


**Note:** An area of 1.5 mm around the module should be reserved as a keep-out area.

Development Kit Schematics can be accessed here: [Development Kit Schematics – BTM410 / BTM411](#)



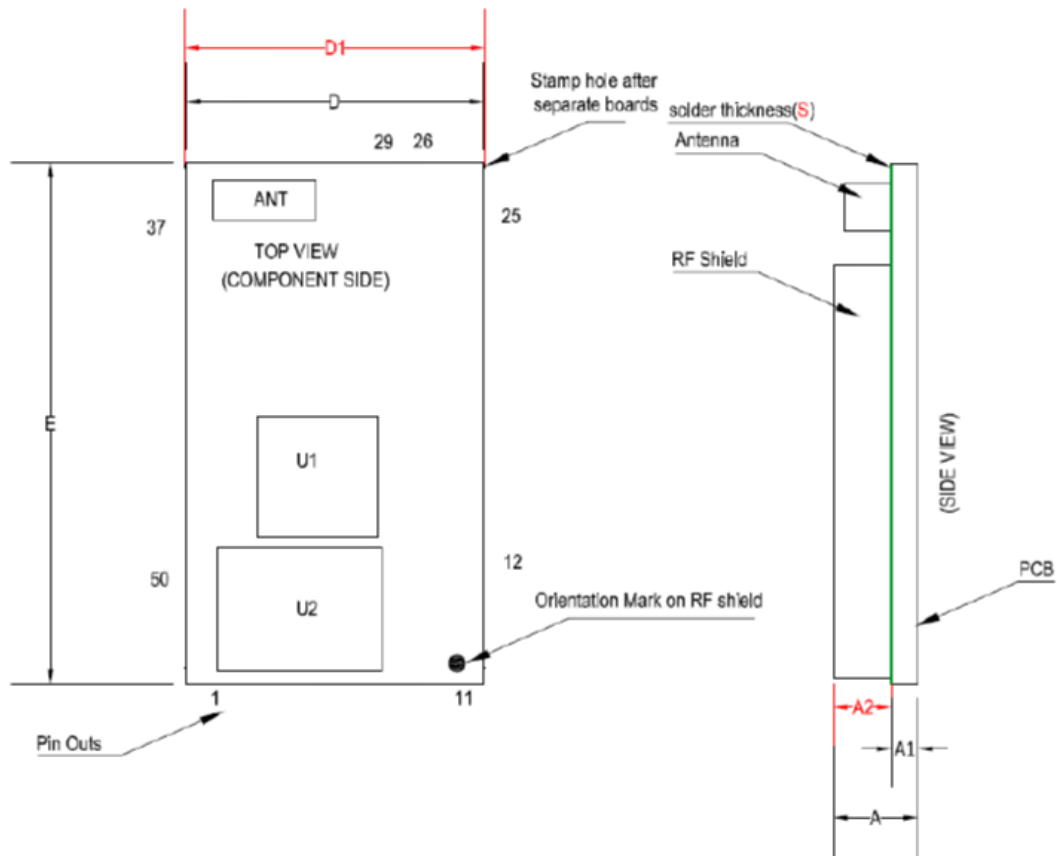
### 5.3 BTM410 Mechanical Details



**WARNING:** Test point dimensions are for reference only. *DO NOT* make electrical connections to these test points, this will void the warranty. Laird does not recommend routing on the top layer underneath the module.

Development Kit Schematics can be accessed here: [Development Kit Schematics – BTM410 / BTM411](#)

### 5.4 BTM411 Mechanical Details



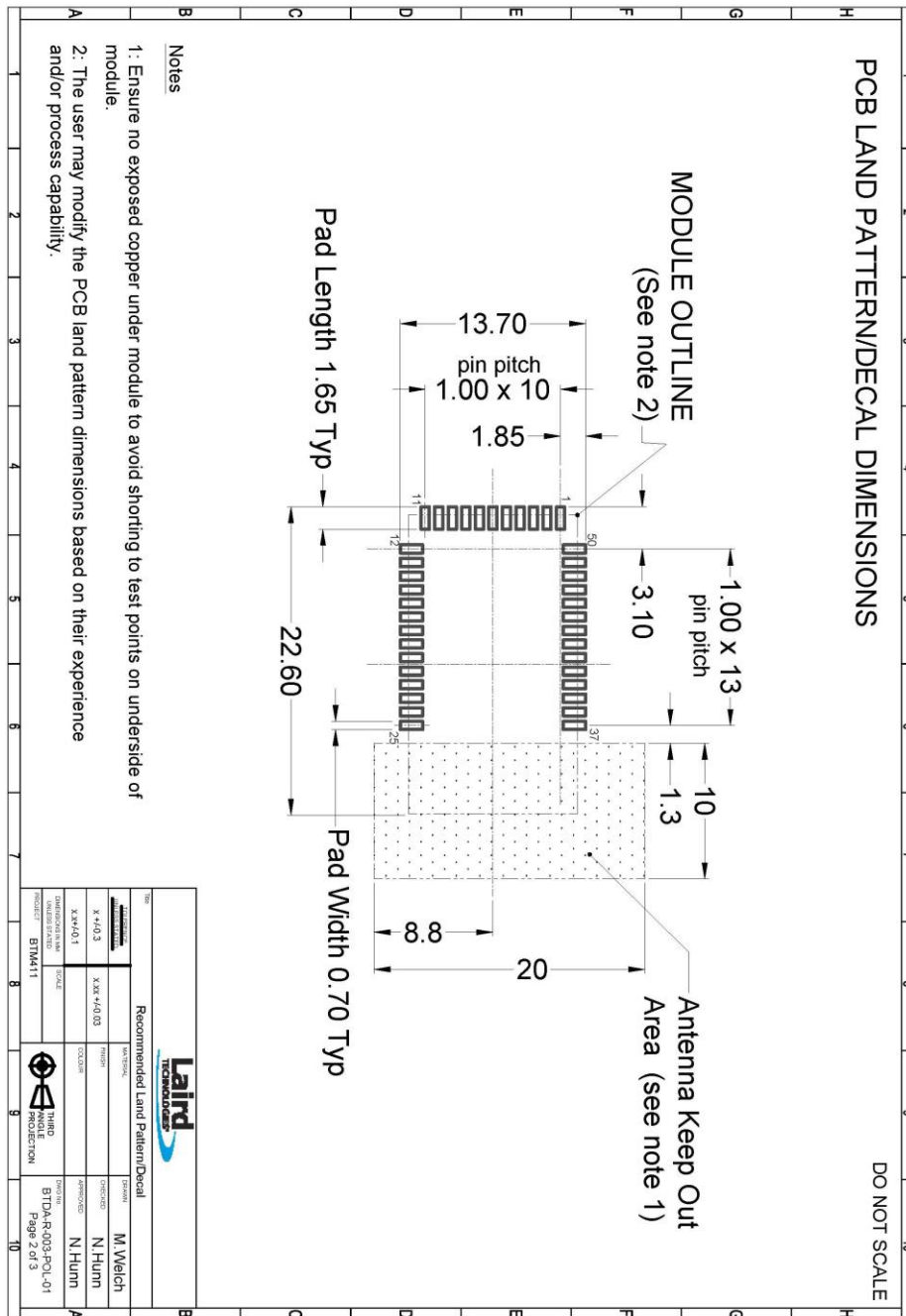
| Description | BTM4X1             |          |         |   |
|-------------|--------------------|----------|---------|---|
| Size        | 22.0x12.5x3.0495mm |          |         |   |
| Pitch       | 1mm                |          |         |   |
| Dimension   | Minimum            | Typical  | Maximum | Notes   |
| A           | 2.822mm            | 3.0495mm | 3.277mm | 1)A is consist of A1 and A2                               |
| A1          | 0.8mm              | 0.9mm    | 1.0mm   | 2)A2 include solder and shield                            |
| A2          | 2.022mm            | 2.1495mm | 2.277mm | 3)D1 measured on stamp hole location after depanelization |
| D           | 12.37mm            | 12.5mm   | 12.63mm |   |
| D1          | 12.37mm            | 12.5mm   | 13.03mm |   |
| E           | 21.87mm            | 22.0mm   | 22.13mm |   |

**Note:** An area of 1.5 mm around the module should be reserved as a keep-out area.

Development Kit Schematics can be accessed here: [Development Kit Schematics – BTM410 / BTM411](#)



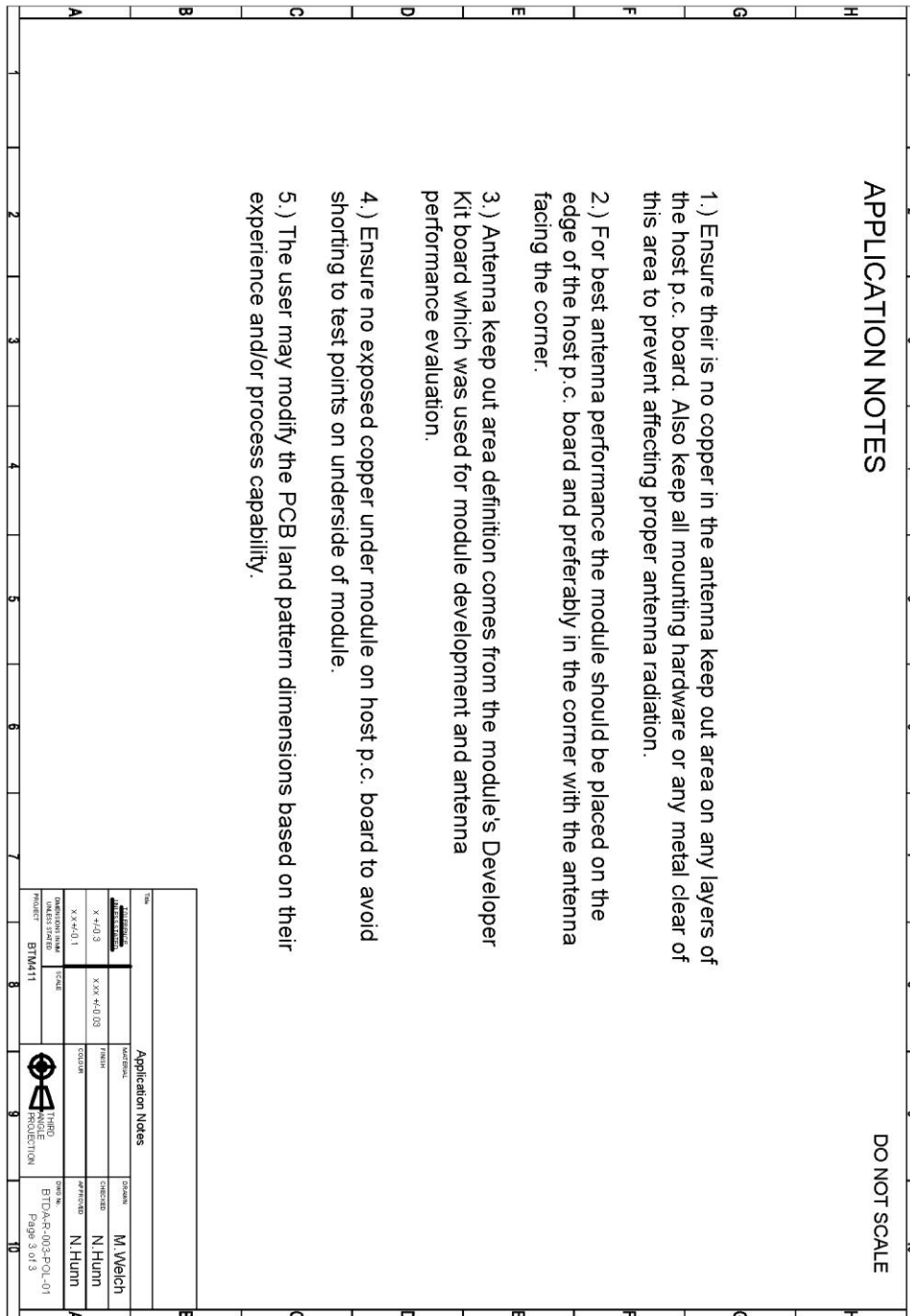
### 5.5 BTM411 Mechanical Details



**Note:** An area of 1.5 mm around the module should be reserved as a keep-out area.

Development Kit Schematics can be accessed here: [Development Kit Schematics – BTM410 / BTM411](#)

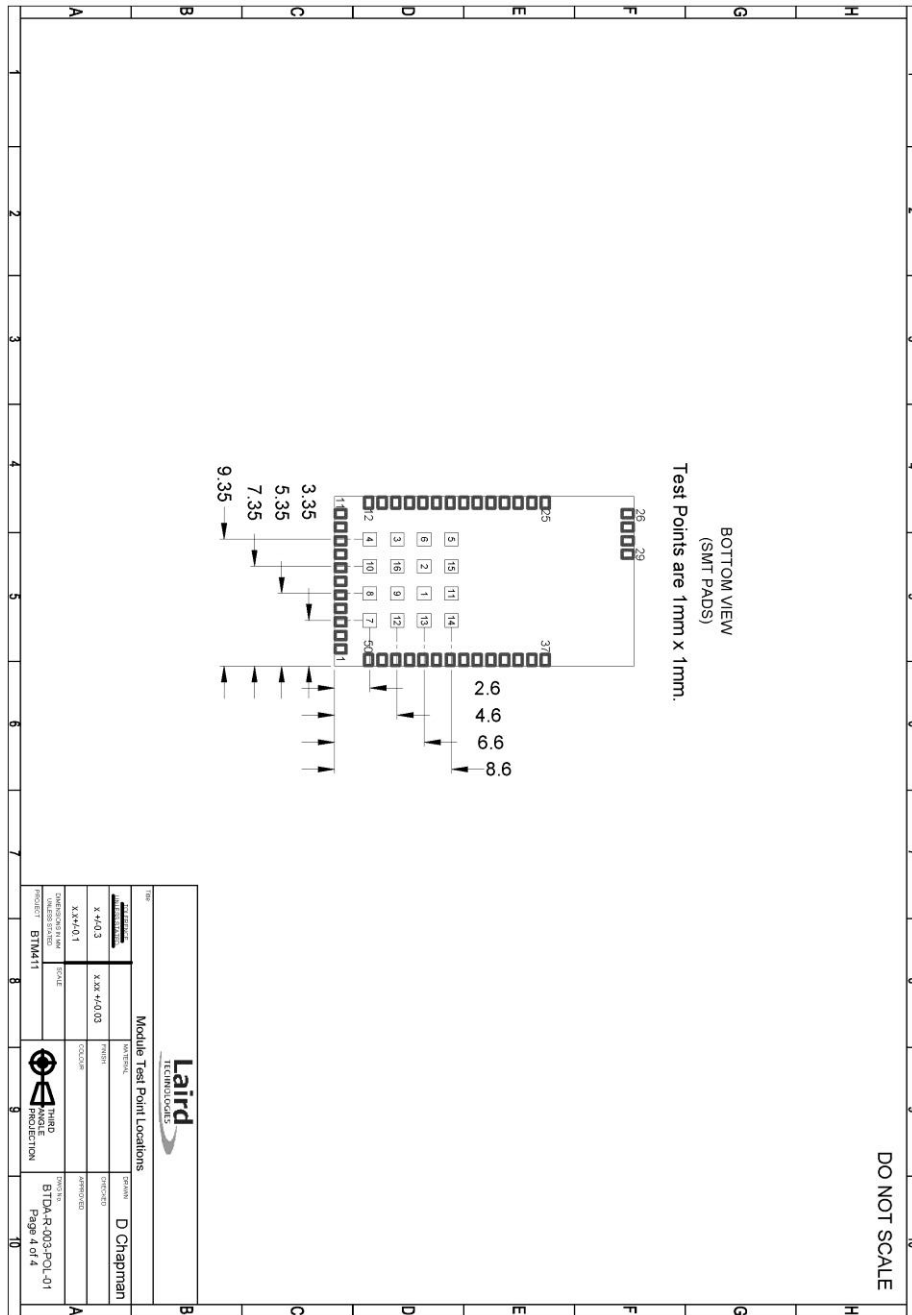
### 5.6 BTM411 Mechanical Details



**Note:** An area of 1.5 mm around the module should be reserved as a keep-out area.

Development Kit Schematics can be accessed here: [Development Kit Schematics – BTM410 / BTM411](#)

### 5.7 BTM411 Mechanical Details



**WARNING:** Test point dimensions are for reference only. *DO NOT* make electrical connections to these test points, this will void the warranty. Laird does not recommend routing on the top layer underneath the module.

Development Kit Schematics can be accessed here: [Development Kit Schematics – BTM410 / BTM411](#)

## 6 APPLICATION NOTE FOR SURFACE MOUNT MODULES

### 6.1 Introduction

Laird's surface mount modules are designed to conform to all major manufacturing guidelines. This section is intended to provide additional guidance beyond the information that is presented elsewhere. This section is considered a living document and will be updated as new information presents.

The modules are designed to meet the needs of several commercial and industrial applications. The modules are designed to be easily manufactured and conform to current automated manufacturing processes.

### 6.2 Shipping

Modules are shipped in ESD (Electrostatic Discharge) safe trays that can be loaded into most manufacturers pick and place machines. Layouts of the trays are provided in Figure 6-1.

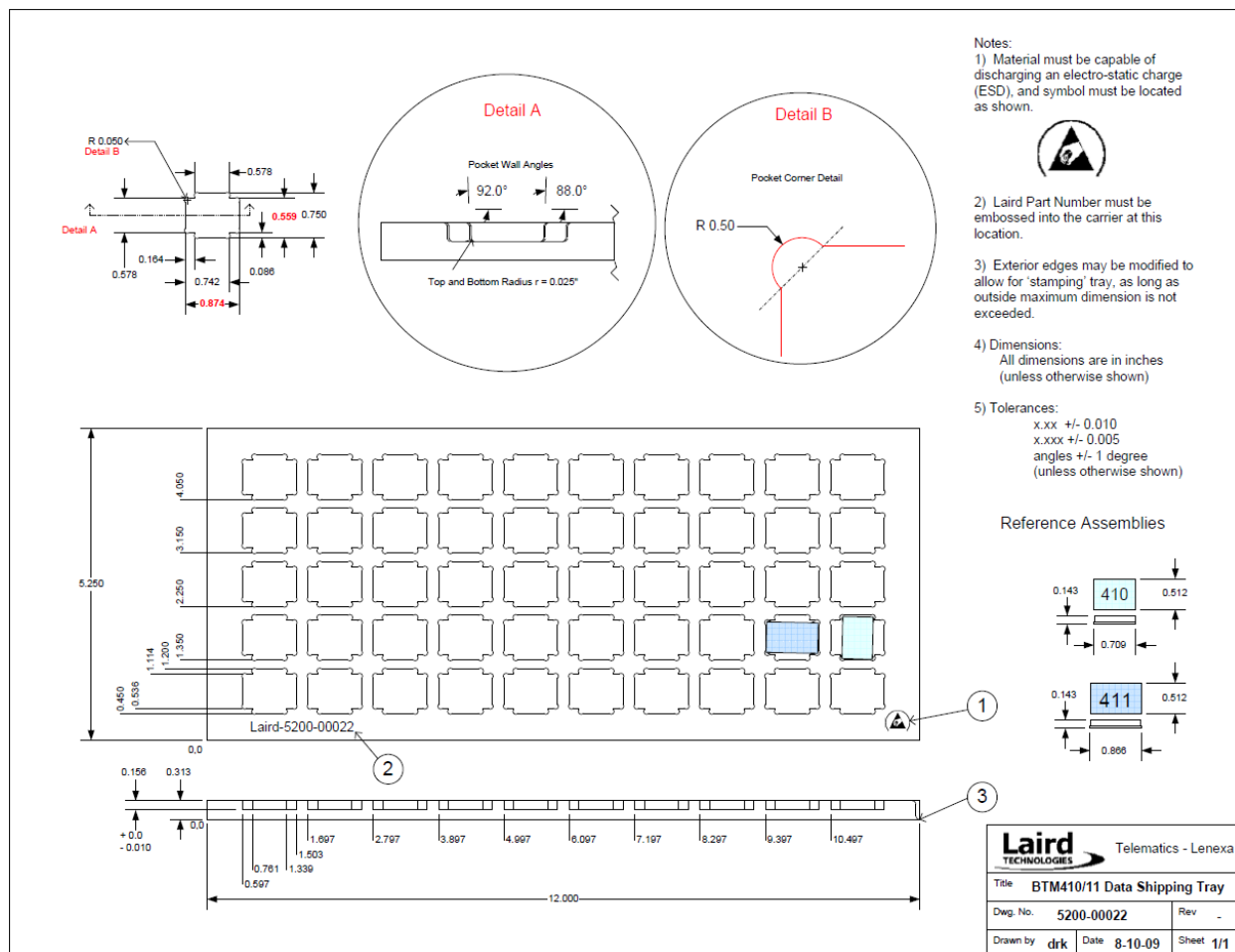


Figure 6-1: BTM410 and BTM411 Shipping Tray Details

### 6.3 Reflow Parameters

Laird's surface mount modules are designed to be easily manufactured, including reflow soldering to a PCB. Ultimately it is the responsibility of the customer to choose the appropriate solder paste and to ensure oven temperatures during reflow meet the requirements of the solder paste. Laird Technologies' surface mount modules conform to J-STD-020D1 standards for reflow temperatures.

**IMPORTANT: During reflow, modules should not be above 260°C and not for more than 30 seconds.**

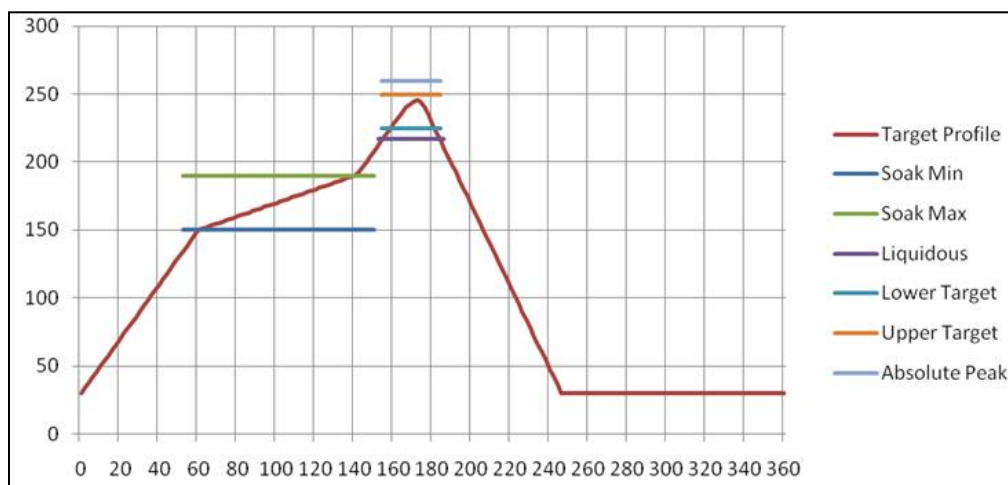


Figure 6-2: Recommended Reflow Temperature

Temperatures should not exceed the minimums or maximums presented in Table 6-1.

Table 6-1: Recommended Maximum and minimum temperatures

| Specification                    | Value  | Unit     |
|----------------------------------|--------|----------|
| Temperature Inc./Dec. Rate (max) | 3      | °C / Sec |
| Temperature Decrease rate (goal) | 2-3    | °C / Sec |
| Soak Temp Increase rate (goal)   | .5 - 1 | °C / Sec |
| Flux Soak Period (Min)           | 60     | Sec      |
| Flux Soak Period (Max)           | 90     | Sec      |
| Flux Soak Temp (Min)             | 150    | °C       |
| Flux Soak Temp (max)             | 190    | °C       |
| Time Above Liquidous (max)       | 60     | Sec      |
| Time Above Liquidous (min)       | 20     | Sec      |

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| Specification                      | Value | Unit |
|------------------------------------|-------|------|
| Time In Target Reflow Range (goal) | 30    | Sec  |
| Time At Absolute Peak (max)        | 30    | Sec  |
| Liquidous Temperature (SAC305)     | 217   | °C   |
| Lower Target Reflow Temperature    | 225   | °C   |
| Upper Target Reflow Temperature    | 250   | °C   |
| Absolute Peak Temperature          | 260   | °C   |

## 7 ORDERING INFORMATION

### 7.1 Product Part Numbers

| Part Number  | Description  |
|--------------|--|
| BTM410       | Bluetooth AT Data Module (external antenna)            |
| BTM411       | Bluetooth AT Data Module (with integrated antenna)     |
| DVK – BTM410 | Development board with BTM410 module soldered in place |
| DVK – BTM411 | Development board with BTM411 module soldered in place |

### 7.2 General Comments

Please check with Laird Technologies for the latest information before commencing a design. If in doubt, ask. Refer to the schematic BTMD-R-001.pdf for the Development Kit on the following two pages for examples of typical pin connections. A PDF of the schematic can be downloaded from [www.lairdtech.com/wireless](http://www.lairdtech.com/wireless).

## 8 BLUETOOTH SIG QUALIFICATION

The BTM410 and BTM411 modules are listed on the Bluetooth SIG website as qualified End Products.

| Design Name       | Owner                 | Declaration ID | Link to listing on the SIG website  |
|-------------------|-----------------------|----------------|---|
| BTM410,<br>BTM411 | Laird<br>Technologies | B016071        | <a href="https://www.bluetooth.org/tpg/QLI_viewQDL.cfm?qid=16071">https://www.bluetooth.org/tpg/QLI_viewQDL.cfm?qid=16071</a> |

It is a mandatory requirement of the Bluetooth Special Interest Group (SIG) that every product implementing Bluetooth technology has a Declaration ID. Every Bluetooth design is required to

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go through the qualification process, even when referencing a Bluetooth Design that already has its own Declaration ID. The Qualification Process requires each company to registered as a member of the Bluetooth SIG – [www.bluetooth.org](http://www.bluetooth.org)

The following link provides a link to the Bluetooth Registration page:

<https://www.bluetooth.org/login/register/>

For each Bluetooth Design it is necessary to purchase a Declaration ID. This can be done before starting the new qualification, either through invoicing or credit card payment. The fees for the Declaration ID will depend on your membership status, please refer to the following webpage:

<https://www.bluetooth.org/en-us/test-qualification/qualification-overview/fees>

For a detailed procedure of how to obtain a new Declaration ID for your design, please refer to the following SIG document:

[https://www.bluetooth.org/DocMan/handlers/DownloadDoc.ashx?doc\\_id=283698&vId=317486](https://www.bluetooth.org/DocMan/handlers/DownloadDoc.ashx?doc_id=283698&vId=317486)

To start the listing, go to: [https://www.bluetooth.org/tpg/QLI\\_SDoc.cfm](https://www.bluetooth.org/tpg/QLI_SDoc.cfm)

In step 1, select the option, **Reference a Qualified Design** and enter 16071 in the End Product table entry. You can then select your pre-paid Declaration ID from the drop down menu or go to the Purchase Declaration ID page, (please note that unless the Declaration ID is pre-paid or purchased with a credit card, it will not be possible to proceed until the SIG invoice is paid.

Once all the relevant sections of step 1 are finished, complete steps 2, 3, and 4 as described in the help document. Your new Design will be listed on the SIG website and you can print your Certificate and DoC.

For further information please refer to the following training material:

<https://www.bluetooth.org/en-us/test-qualification/qualification-overview/listing-process-updates>

## 8.1 Additional Assistance

Please contact your local sales representative or our support team for further assistance:

Laird Technologies Connectivity Products Business Unit

Support Centre: <http://ews-support.lairdtech.com>

Email: [wireless.support@lairdtech.com](mailto:wireless.support@lairdtech.com)

Phone: Americas: +1-800-492-2320 Option 2

Europe: +44-1628-858-940

Hong Kong: +852 2923 0610

Web: <http://www.lairdtech.com/bluetooth>

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## 9 RELATED DOCUMENTS AND FILES

The following additional BTM410/411 technical documents are also available from the Laird BTM41x Series product page under the Documentation tab:

- Product Brief
- User Guide - Version 6.0
- Firmware Release Notes - Version 16.1.3.0
- BTM411 Development Kit Quick Start Guide SPP - Version 2
- Development Kit Schematics
- Quick Start Guide





Laird Technologies is the world leader in the design and manufacture of customized, performance-critical products for wireless and other advanced electronics applications. Laird Technologies partners with its customers to find solutions for applications in various industries such as:

- Network Equipment
- Telecommunications
- Data Communications
- Automotive Electronics
- Computers
- Aerospace
- Military
- Medical Equipment
- Consumer Electronics

Laird Technologies offers its customers unique product solutions, dedication to research and development, as well as a seamless network of manufacturing and customer support facilities across the globe.

CONN-HIG-BTM410-411

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