# CB-OLP425 CB-OLS425 CB-OLS426 ELECTRICAL MECHANICAL DATA SHEET

**Document Revision**
Document number: 10551321
Release: Jun 18, 2013 14:56
Document version: 6

# 1 Abstract

This document describes the hardware characteristics of the connectBlue **O**EM Bluetooth **L**ow Energy **P**latform cB-OLP425, **O**EM Bluetooth **L**ow Energy **S**erial Port Adapter cB-OLS425 and cB-OLS426 products.

The cB-OLP425 product is a platform module for building Bluetooth Low Energy applications. One Application is the cB-OLS425 Serial Port Adapter. The cB-OLS426 is a cB-OLS425 module mounted on a carrier board which is physical compatible with the connectBlue Classic Bluetooth Serial Port Adapters e.g. cB-OBS411.

The cB-OLP425 is based on the CC2540 Bluetooth Low Energy SoC from Texas Instruments. The platform has options for on-board peripherals typical for Bluetooth Low Energy applications like an accurate temperature sensors and an accelerometer.

# 2 Table of Content

# 3 Related Documents

## 3.1 Serial Port Adapter Related Documents

Documents related to the cB-OLS425/426 Serial Port Adapter products:

1. **Bluetooth Low Energy Serial Port Adapter - Getting Started:** Briefly describes how to use the connectBlue Bluetooth Low Energy Serial Port Adapter modules.
2. **Bluetooth Serial Port Adapter AT Commands:** Describes all AT commands, default values for AT commands, and possible constraints for different Serial Port Adapter modules.
3. **cB-OBS411 Electrical Mechanical Data Sheet:** Describes the electrical and mechanical interface, operating status, antennas solutions, Bluetooth and regulatory information as well as some usage and connection guidelines for the Classic Bluetooth Serial Port Adapter cB-OBS411.
4. **cB-OBS421 Electrical Mechanical Data Sheet:** Describes the electrical and mechanical interface, operating status, antennas solutions, Bluetooth and regulatory information as well as some usage and connection guidelines for the Classic Bluetooth Serial Port Adapter cB-OBS421.

## 3.2 Platform Related Documents

Documents related to the cB-OLP425 Platform product:

5. The **cB-OLP425 Development Kit Getting started** documentation contains important information about the electrical and mechanical characteristics of the cB-OLP425 hardware.
6. Texas Instruments **CC2540 Bluetooth Low Energy Developers Guide**, SWRU271B.
7. Texas Instruments **CC2540 Datasheet**, SWRS084D.
8. connectBlue CC Debugger Adapter Board - User Guide.
9. Texas Instruments **CC253x/40/41 User's Guide**, SWRU191C.
10. Texas Instruments **Measuring Bluetooth Low Energy Power Consumption**, AN092.

# 4 Introduction

The hardware is the same for the cB-OLP425 Bluetooth Low Energy Platform and the Serial Port Adapter cB-OLS425 except that the optional sensors and battery holder is not used and therefore not included in the cB-OLS425 Serial Port Adapter.

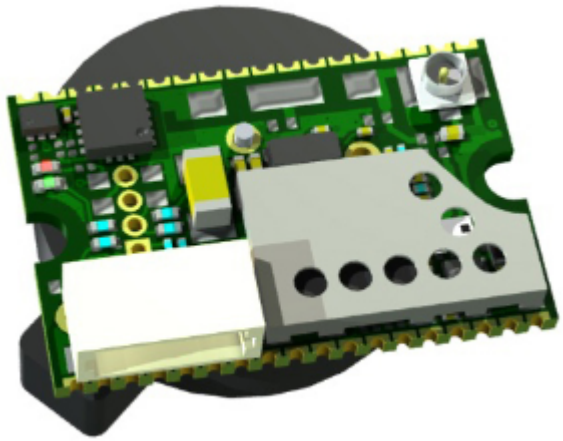


**Figure 1: cB-OLP425x-26 Bluetooth Low Energy Platform with external antenna**.

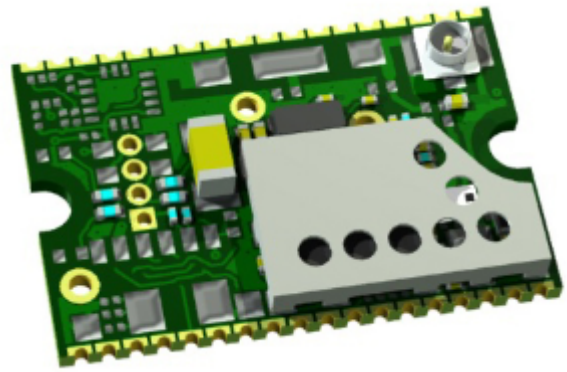


**Figure 2: cB-OLS425x-04 Bluetooth Low Energy Serial Port Adapter with external antenna**.

The cB-OLS426 is a cB-OLS425 module mounted on a carrier board which is physical compatible with the connectBlue Classic Bluetooth Serial Port Adapters e.g. cB-OBS411 [3] and cB-OBS421 [4]. Figure 3 and figure 4 illustrates the physical compatibility.

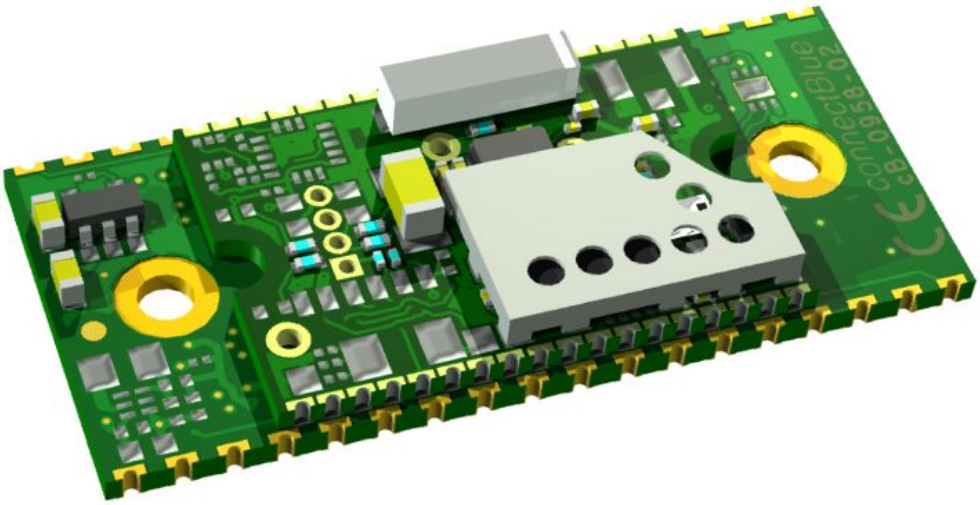


**Figure 3: cB-OLS426i-04 Bluetooth Low Energy Serial Port Adapter with internal antenna**.

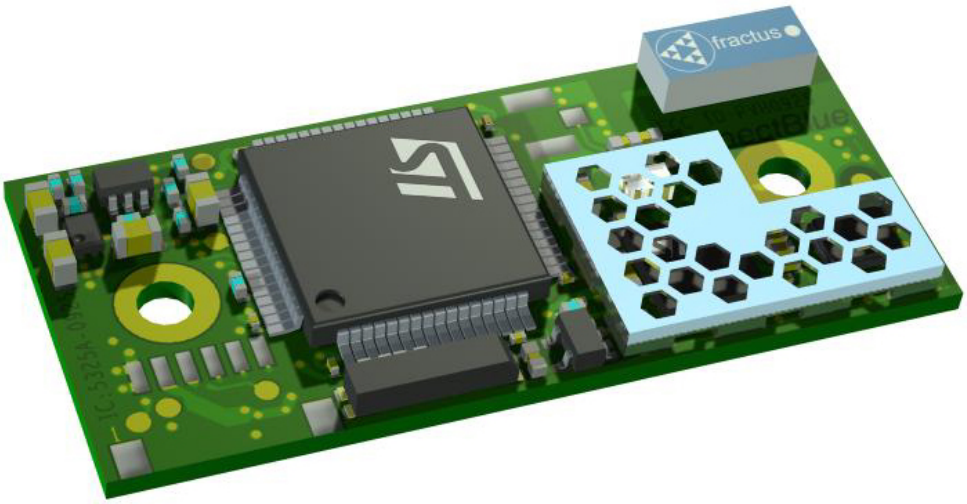



**Figure 4: cB-OBS411i-04 Bluetooth Serial Port Adapter with internal antenna**.

The connectBlue cB-OLP425 is a Bluetooth low energy platform module with a unique set of features and functionality that provides customers with a complete turnkey solution. The cB-OLP425 can either be delivered with digital and analog GPIOs or complete with battery holder, temperature sensor, 3-axis motion sensor/accelerometer, see cB-OLP425 Platform variants. There are also 4x1 through holes to solder wires or through hole components. Using the IAR Embedded Workbench, the customer embeds their own software and application in the cB-OLP425 module. Such possible software includes Bluetooth low energy profiles/services/attributes and customer application such as machine/device access and asset management, data conversion, data acquisition, logic etc.

The low energy consumption is achieved by the Bluetooth Low Energy protocol with very rapid and short radio activity and long sleep times in between. During the radio activity and data processing phases the unit is consuming almost the same amount of energy as a Classic Bluetooth application and e.g. a Bluetooth low energy device used for continuous data transfer would not have a lower power consumption than a comparable Bluetooth device transmitting the same amount of data. It would likely use more power, since the protocol is optimized for small bursts. It is important to understand the current consumption. It is important to understand the concept if low energy is important and we recommend the developer/user to read the Calculating Energy Consumption section.

The Bluetooth Low Energy Serial Port Adapters are similar to the connectBlue Bluetooth Classic Serial Port Adapters but with the Bluetooth Low Energy technology (much lower standby power consumption and faster response times but lower throughput). The cB-OLS426 module can in many cases replace the Bluetooth Classic modules in existing applications without redesigns if the Bluetooth Low Energy features would gain the performance of the system. The cB-OLS425/426 is not equipped with any sensors or LEDs.

The hardware of the cB-OLP425/cB-OLS425 products is referred as cB-0950 and the module is Type Approved with the type name cB-0950. The electrical differences between the cB-OLS426 and cB-OLS426 is only the LDO regulator mounted on the carrier board and can also refer to the cB-0950 Type Approval.

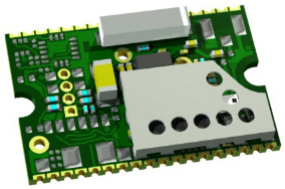
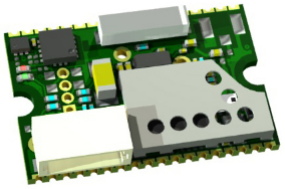
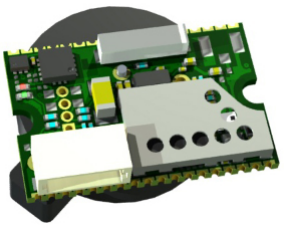
The modules are available in different configuration (see Product Variants) with Internal antennas or a U.FL. connector for connecting an External antenna.

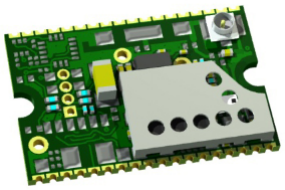
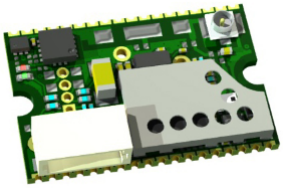
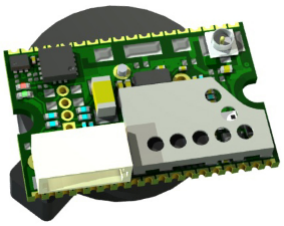
## 4.1 Product Variants

The modules are available in two antenna options (integrated antenna, or U.FL. connector for external antenna) and in other mounting option variants described below.

### 4.1.1 cB-OLP425 Platform Variants

**Table 1: cB-OLP425 Platform variants**

| Product Name | Regulatory ID<br><br>FCC ID<br>IC ID | Bluetooth Type | Description | |
|---|---|---|---|---|
| cB-OLP425i-04 | cB-0950<br>PVH0950<br>5325A-0950 | Bluetooth Low Energy Output power: 2 dBm EIRP* Sensitivity: -91 dBm EIRP* | OEM Low Energy Platform 425 with internal antenna. No battery holder, no sensors, no JST connector, no LEDs. |  |
| cB-OLP425i-16*** | cB-0950<br>PVH0950<br>5325A-0950 | Bluetooth Low Energy Output power: 2 dBm EIRP* Sensitivity: -91 dBm EIRP* | OEM Low Energy Platform 425 with internal antenna, JST connector, LEDs, Temperature Sensor and Accelerometer. |  |
| cB-OLP425i-26*** | cB-0950<br>PVH0950<br>5325A-0950 | Bluetooth Low Energy Output power: 2 dBm EIRP* Sensitivity: -91 dBm EIRP* | OEM Low Energy Platform 425 with internal antenna, JST connector, LEDs, Temperature Sensor, Accelerometer and CR1632 battery holder. |  |

| | | | | |
|---|---|---|---|---|
| cB-OLP425x-04 | cB-0950<br>PVH0950<br>5325A-0950 | Bluetooth Low Energy<br>Output power: 2 to 5 dBm EIRP**<br>Sensitivity: -91 to -94 dBm EIRP** | OEM Low Energy Platform 425 with external antenna. No battery holder, no sensors, no JST connector, no LEDs. |  |
| cB-OLP425x-16*** | cB-0950<br>PVH0950<br>5325A-0950 | Bluetooth Low Energy<br>Output power: 2 to 5 dBm EIRP**<br>Sensitivity: -91 to -94 dBm EIRP** | OEM Low Energy Platform 425 with external antenna, JST connector, LEDs, Temperature Sensor and Accelerometer. |  |
| cB-OLP425x-26*** | cB-0950<br>PVH0950<br>5325A-0950 | Bluetooth Low Energy<br>Output power: 2 to 5 dBm EIRP**<br>Sensitivity: -91 to -94 dBm EIRP** | OEM Low Energy Platform 425 with external antenna, JST connector, LEDs, Temperature Sensor, Accelerometer and CR1632 battery holder. |  |

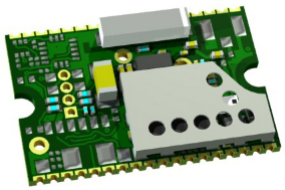
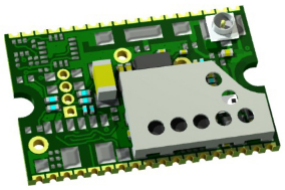
* EIRP is including antenna gain.
** EIRP is including antenna gain and cable loss and thus depends on the antenna selection.
*** The JST connector is specified down to -25 ºC. See Environmental for more information.

Please contact connectBlue for discussion about higher quantity customer specific mounting options on the platform products. Components that are available for optional mountings are:

- CR1632 coin cell battery holder
- 3-axis motion sensor / accelerometers
- Temperature sensor
- Pushbutton
- JST connector
- 2x LEDs
- Internal antenna or u.fl. connector for external antenna
- Through hole mounted analog or digital discrete sensors (4x1 through holes at 1.27 mm pitch)
- PCB wings/flaps with holes for mounting of the module (module size including wings 16x36 mm)
- Voltage regulator for 3.0-6.0 VDC power supply

### 4.1.2 cB-OLS425 Serial Port Adapters Variants

**Table 2: cB-OLS425 Serial Port Adapters variants**

| Product Name | Regulatory ID<br><br>FCC ID<br>IC ID | Bluetooth Type | Description | |
|---|---|---|---|---|
| cB-OLS425i-04 | cB-0950<br>PVH0950<br>5325A-0950 | Bluetooth Low Energy<br>Output power: 2 dBm EIRP*<br>Sensitivity: -91 dBm EIRP* | Bluetooth Low Energy Serial Port Adapter 425 with internal antenna, solder pads.<br><br>No battery holder, no sensors, no JST connector, no LEDs. |  |
| cB-OLS425x-04 | cB-0950<br>PVH0950<br>5325A-0950 | Bluetooth Low Energy<br>Output power: 2 to 5 dBm EIRP**<br>Sensitivity: -91 to -94 dBm EIRP** | Bluetooth Low Energy Serial Port Adapter 425 with external antenna, solder pads.<br><br>No battery holder, no sensors, no JST connector, no LEDs. |  |

* EIRP is including antenna gain.
** EIRP is including antenna gain and cable loss and thus depends on the antenna selection.

### 4.1.3 cB-OLS426 Serial Port Adapters Variants

**Table 3: cB-OLS426 Serial Port Adapters variants**

| Product Name | Regulatory ID<br><br>FCC ID<br>IC ID | Bluetooth Type | Description | |
|---|---|---|---|---|
| cB-OLS426i-04 | cB-0950<br>PVH0950<br>5325A-0950 | Bluetooth Low Energy<br><br>Output power: 2 dBm EIRP*<br>Sensitivity: -91 dBm EIRP* | Bluetooth Low Energy Serial Port Adapter 426 with internal antenna, solder pads.<br><br>No battery holder, no sensors, no JST connector, no LEDs. |  |
| cB-OLS426x-04 | cB-0950<br>PVH0950<br>5325A-0950 | Bluetooth Low Energy<br>Output power: 2 to 5 dBm EIRP**<br>Sensitivity: -91 to -94 dBm EIRP** | Bluetooth Low Energy Serial Port Adapter 426 with external antenna, solder pads.<br><br>No battery holder, no sensors, no JST connector, no LEDs. |  |

* EIRP is including antenna gain.
** EIRP is including antenna gain and cable loss and thus depends on the antenna selection.

## 4.2 Block Diagram

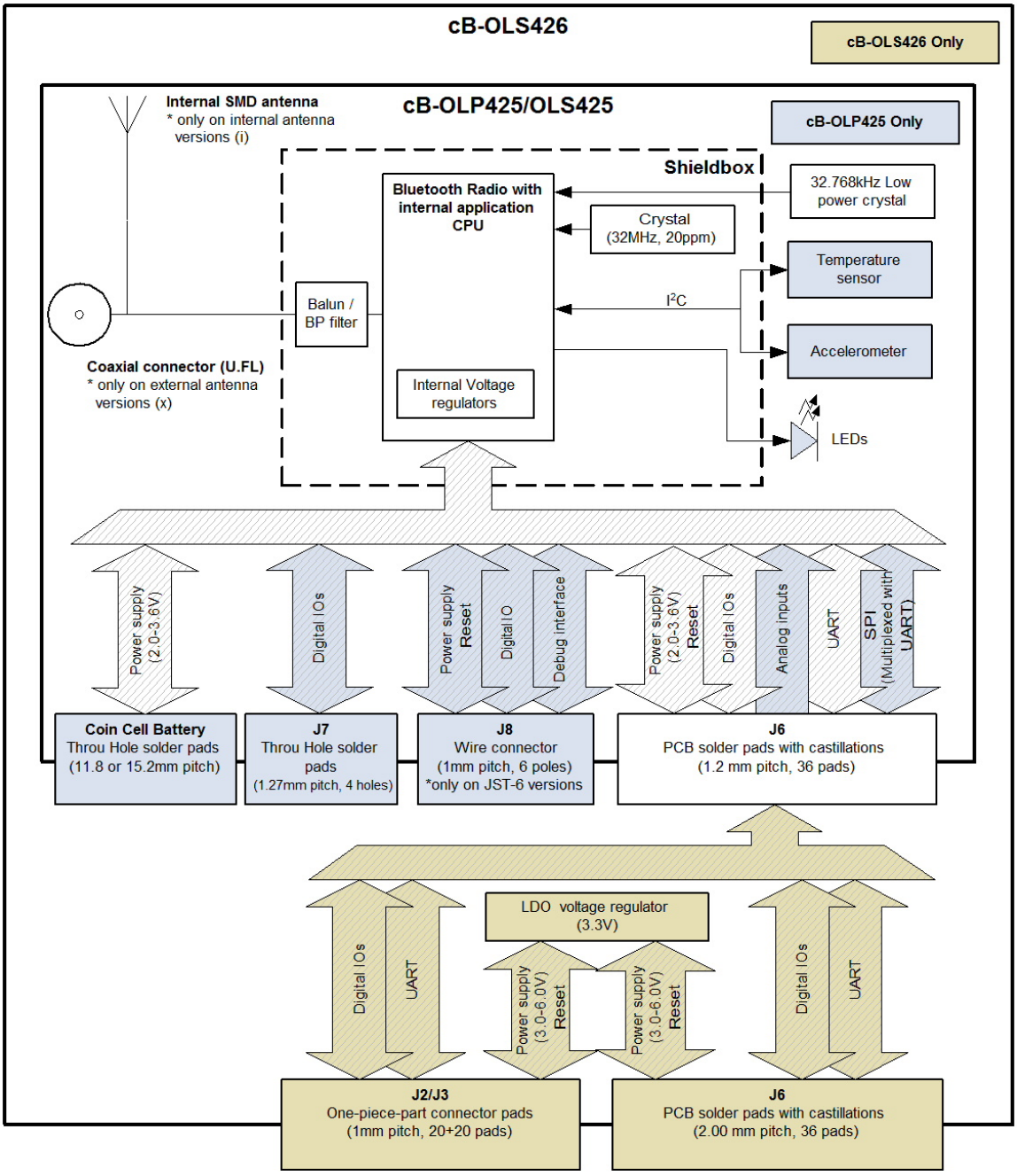



**Figure 5: Block diagram of cB-OLP425/OLS425 and cB-OLS426. Notice that the Serial port Adapters (cB-OLS425/426) does not include all functions as the platform (cB-OLP425). The cB-OLS426 is a cB-OLS425 mounted on a carrier board with an LDO regulator.**

## 4.3 cB-OLP425 Bluetooth Stack and Application Platform Software

The platform module cB-OLP425 is a hardware platform based on the Texas Instruments CC2540 [7] system-on-chip (256 kB flash memory and 8 kB SRAM).

The TI chip runs both application and the Bluetooth low energy protocol stack. The *TI Bluetooth low energy software stack and tools* includes object code with the latest BLE protocol stack supporting multiple connections, sample projects and applications covering an extensive set of profiles with source code. Please note that this package is not provided by connectBlue.

The cB-OLP425 sample code package includes sample projects for accessing the LEDs, temperature sensor and accelerometers.

All embedded software is developed using *IAR Embedded Workbench for 8051*.

**NOTE**

Software/firmware support is not included by connectBlue. To sign a support agreement for software support or to discuss a full implementation project please contact us.

**TIP**

On request the cB-OLP425 can be programmed with a customer specific firmware in the production line at connectBlue. This shall only be considered for quantities exceeding 5k a year. The production test sequence is divided into two steps. In the first step the functionality of the hardware is verified. In the second step the device is programmed with the customer specific firmware. No test are done after the device has been programmed with the customer specific firmware.

If this is of interest please contact your sales representative or contact support@connectblue.com.

# 5 Electrical Interface and Connectors

## 5.1 Electrical Interface and Connectors on the cB-OLP425 Platform

### 5.1.1 cB-OLP425 Connector Interfaces

This section describes the signals available on the cB-OLP425 platform. There are three ways to connect to the cB-OLP425 platform:

- Via the PCB solder pads on the edge of the PCB, J6 (see Figure 6). See Section "Using the J6 PCB solder pads" for more information.
- Via the JST connector, J8 (see Figure 7).
  The JST connector is a 6 poles wire connector. The pitch is 1mm. The manufacturer of the mounted connector is JST and the part number is SM06B-SRSS-TB. The SM06B-SRSS-TB connector is mated with the wire connector SHR-06V-S from JST. Other connector options are also available from JST.

  **JST Connector**

  The JST connector does NOT contains a UART interface in contrast with many other connectBlue Serial Port Adapters OEM modules. The JST connector is a debug, firmware upgrade and IO interface on the cB-OLP425 modules. See the connectBlue CC Debugger Adapter Board - User Guide [8] and cB-OLP425 Development Kit Getting started [5] documentation for more info about the debug interface and how to use it.

  Notice that the TI CC Debugger Adapter Cable (cB-ACC-71) included in the Development kit can NOT directly be connected to the cB-OLP425 if the module at the same time has voltage supplied from another source e.g. a battery. A voltage supply collision will occur which could damage the electronics/battery because the CC Debugger also includes a voltage supply pin which is connected to the voltage supply pin on the J8 JST connector via the adapter cable. It is strongly recommended to use the CC Debugger Adapter Board instead of the cB-ACC-71 cable.

- Via the 4x1 through holes row J7 (see Figure 7) for solder wires or through holes components to the board (1.27mm pitch).

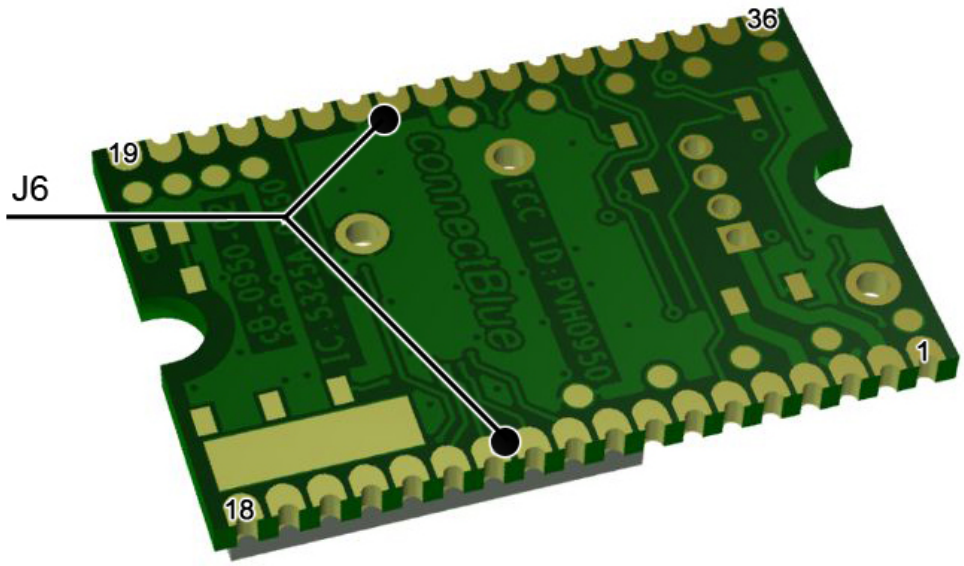



**Figure 6: The solder pads J6 are available on the long edges of the bottom side of the PCB.**

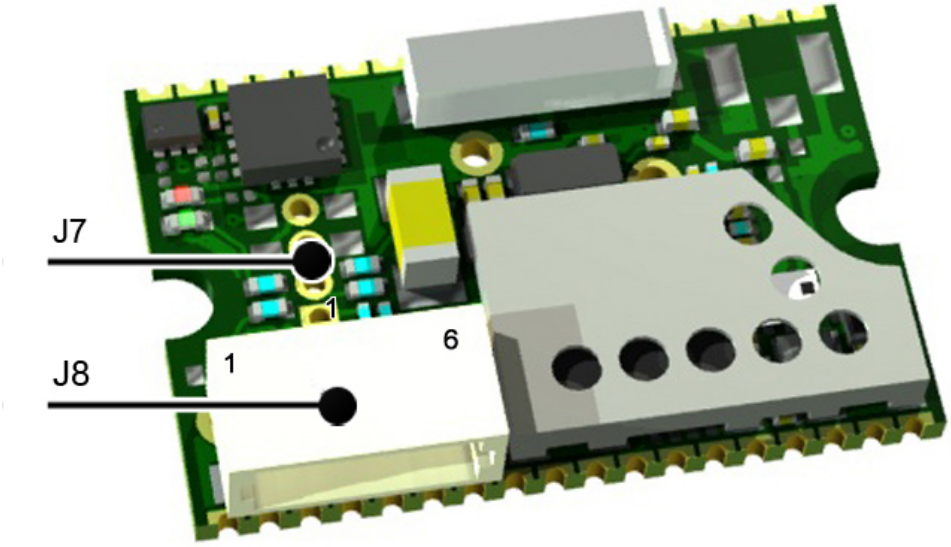



**Figure 7: 4x1 through holes row J7 and the JST connector J8 mounted on the component side of the PCB.**

### 5.1.2 cB-OLP425 Pin Numbering

See Figure 6 and 7 above.

### 5.1.3 cB-OLP425 Pin Description

**Table 4: cB-OLP425 pin descriptions.**

| J6 Pin No | J7 Pin No | J8 Pin No | CC2540 Signal name | Description |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 1 | - | 5 | Reset_N | Hardware reset |
| 2 | 1 | - | P1_0 | Digital IO.<br><br>IO capable of deliver 20 mA.<br><br>⚠ The I/O port pins P1_0 and P1_1 do not have pullup/pulldown capability. See [9] for more info. |
| 3, 25 | 4 | 1 | GND | Ground |
| 4, 27 | - | 2 | Vin | 2.0-3.6 VDC Power supply. |
| 14-17, 19-22, 30 | - | - | - | Reserved, do not connect. |
| 6 | - | - | P1_2 | Digital IO. |
| 7 | - | - | P1_7 | Digital IO.<br><br>⚠ Internally connected to the Red LED if the LED is mounted, see LEDs section for more info. |
| 8 | - | - | P1_4 | Digital IO.<br><br>⚠ Internally connected to the Green LED if the LED is mounted, see LEDs section for more info. |
| 9 | - | - | P1_1 | Digital IO.<br><br>IO capable of deliver 20 mA.<br><br>⚠ The I/O port pins P1_0 and P1_1 do not have pullup/pulldown capability. See [9] for more info.<br><br>. |
| 10 | - | - | P0_4 | Digital IO or UART-CTS<br><br>UART-CTS:<br>Clear To Send hardware flow control. Active low.<br>CC2540-UART0 configured as alternative 1, see [9] Section 7.6 "Peripheral I/O" and Chapter 7 "USART" for more info.<br><br>Multiplexed/connected with SPI-CS. |

| | | | | |
|---|---|---|---|---|
| 11 | - | - | P0_3 | Digital IO or UART-TxD<br><br>UART-TxD:<br>Transmit Data. "0" : Low, "1" : High<br>CC2540-UART0 configured as alternative 1, see [9] Section 7.6 "Peripheral I/O" and Chapter 7 "USART" for more info.<br><br>Multiplexed/connected with SPI-MOSI. |
| 12 | - | - | P0_5 | Digital IO or UART-RTS<br><br>UART-RTS:<br>Request To Send hardware flow control. Active low<br>CC2540-UART0 configured as alternative 1, see [9] Section 7.6 "Peripheral I/O" and Chapter 7 "USART" for more info.<br><br>Multiplexed/connected with SPI-CLK. |
| 13 | - | - | P0_2 | Digital IO or UART-RxD<br><br>UART-RxD:<br>Receive Data. "0" : Low, "1" : High<br>CC2540-UART0 configured as alternative 1, see [9] Section 7.6 "Peripheral I/O" and Chapter 7 "USART" for more info.<br><br>Multiplexed/connected with SPI-MiSO. |
| 5 | - | 4 | P2_1 | CC2540 Debug Data (DD) and Digital IO.<br><br>Debug interface for debugging and downloading firmware, see [5] and [8] more more info.<br><br>⚠ Not recommended to use as IO pin if other IO pins are available because of the debugging functionality. |
| 18 | - | 3 | P2_2 | CC2540 Debug Clock (DC) and Digital IO.<br><br>Debug interface for debugging and downloading firmware, see [5] and [8] more more info.<br><br>⚠ Not recommended to use as IO pin if other IO pins are available because of the debugging functionality. |
| 23 | - | - | P2_0 | Digital IO. |
| 24 | - | - | P0_2 | Digital IO or SPI-MISO.<br><br>SPI-MISO:<br>SPI Master Input Slave Output.<br>CC2540-SPI0 configured as alternative 1, see [9] Section 7.6 "Peripheral I/O" and Chapter 7 "USART" for more info.<br><br>Multiplexed/connected with UART-RxD. |

| | | | | |
|---|---|---|---|---|
| 26 | - | - | P0_5 | Digital IO or SPI-CLK.<br><br>SPI-CLK:<br>SPI clock.<br>CC2540-SPI0 configured as alternative 1, see [9] Section 7.6 "Peripheral I/O" and Chapter 7 "USART" for more info.<br><br>Multiplexed/connected with UART-RTS. |
| 28 | - | - | P0_3 | Digital IO or SPI-MOSI.<br><br>SPI-MOSI:<br>SPI Master Output Slave Input.<br>CC2540-SPI0 configured as alternative 1, see [9] Section 7.6 "Peripheral I/O" and Chapter 7 "USART" for more info.<br><br>Multiplexed/connected with UART-TxD. |
| 29 | - | - | P0_4 | Digital IO or SPI-SS.<br><br>SPI-SS:<br>SPI Slave Select.<br>CC2540-SPI0 configured as alternative 1, see [9] Section 7.6 "Peripheral I/O" and Chapter 7 "USART" for more info.<br><br>Multiplexed/connected with UART-CTS. |
| 31 | 2 | 6 | P0_0 | Digital IO or Analog input. |
| 32 | 3 | - | P0_1 | Digital IO or Analog input. |
| 33 | - | - | P0_6 | Digital IO or Analog input. |
| 34 | - | - | P0_7 | Digital IO or Analog input.<br><br>⚠ The signal are internally connected to the Temperature Sensor Alert pin if it is mounted. See Temperature Sensor section for more info. |
| 35 | - | - | P1_5 | Digital IO and SW-platform implemented I²C-SCL (I²C clock).<br><br>⚠ The I²C bus are connected to the internal sensors if they are mounted, see Peripherals section for more info. |
| 36 | - | - | P1_6 | Digital IO and SW-platform implemented I²C-SDA (I²C data).<br><br>⚠ The I²C bus are connected to the internal sensors if they are mounted, see Peripherals section for more info. |

### 5.1.4 Peripherals

The OEM Low Energy Platform can be customized to suit an end application e.g. with the on board 3 axis motion sensor, a temperature sensor and two LEDs. There are also 4x1 through holes (1.27mm pitch) available to solder wires or through holes components to the board (see cB-OLS425 Pin Numbering for more info). Software APIs controlling the peripherals are available in the platform, see the cB-OLP425 Development Kit Getting started [5] documentation for more info.

#### 5.1.4.1 Temperature Sensor

A Texas Instrument high accurate TMP112 temperature sensor is available on board on the platform version. The communication is via I²C with the device address 0x49. The communication interface is an software implemented I²C:

**Table 5: cB-OLP425 temperature sensor signals.**

| Signal | CC2540 port | Description |
|---|---|---|
| SDA | P1-6 | Serial Data |
| SCL | P1-5 | Clock |
| Alert | P0-7 | Interrupt signal (optional) |

#### 5.1.4.2 Accelerometer

A ST Microelectronics LIS3DH 2/4/8/16 g accelerometer is available on board. The communication is via I²C with the device address 0x19. The communication interface is an software implemented I²C:

**Table 6: cB-OLP425 accelerometer signals.**

| Signal | CC2540 port | Description |
|---|---|---|
| SDA | P1-6 | Serial Data |
| SCL | P1-5 | Clock |
| Interrupt1 | P1-3 | Interrupt signal (optional) |

#### 5.1.4.3 LEDs

One green and one red LED are available on board: Notice that the signals controlling the LEDs are the same RED and Green signals available on the connector interface (see cB-OLP425 Pin Description).

**Table 7: cB-OLP425 LED signals.**

| LED | CC2540 port | Description |
|---|---|---|
| Green | P1-4 | Active low green signal |
| Red | P1-7 | Active low red signal |

## 5.2 Electrical Interface and Connectors on the cB-OLS425 Serial Port Adapter

### 5.2.1 cB-OLS425 Connector Interfaces

The serial interface of the cB-OLS425 product is only available via the PCB solder pads on the edge of the PCB, J6 (see Figure 8).

See Section Using the J6 PCB solder pads for more information.

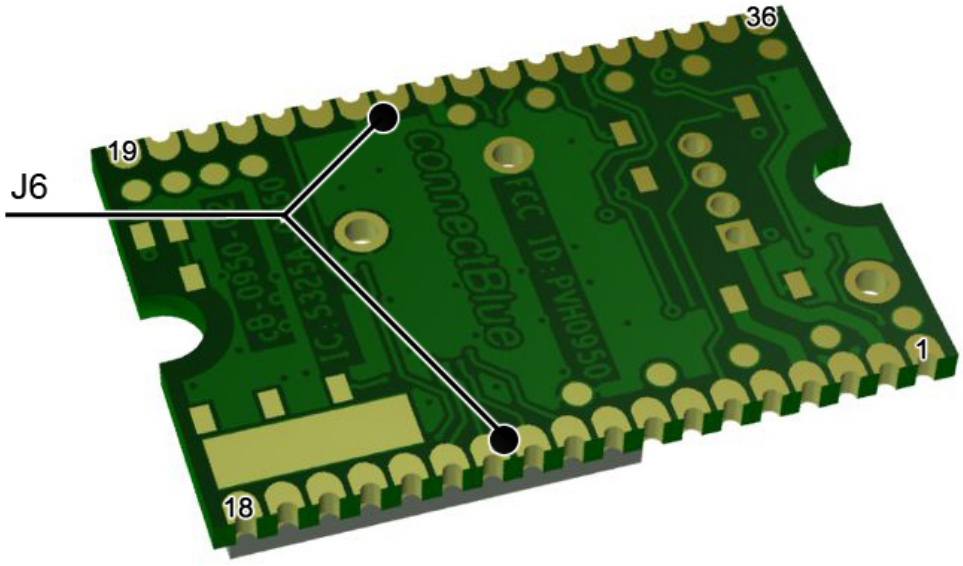



**Figure 8: The solder pads J6 are available on the long edges of the bottom side of the PCB.**

### 5.2.2 cB-OLS425 Pin Numbering

See Figure 8 above.

### 5.2.3 cB-OLS425 Pin Description

**Table 8: cB-OLS425 pin descriptions.**

| J6 Pin No | Signal Name | Type | IO No | Description |
|---|---|---|---|---|
| 1 | $\overline{\text{RESET}}$ | In | - | Hardware reset |
| 3, 25 | GND | | - | Ground |
| 4, 27 | Vin | In | - | 2.0-3.6 VDC Power supply. |

| | | | | |
|---|---|---|---|---|
| 2, 14-17, 19-24, 26, 28-30 | - | - | - | Reserved, do not connect. |
| 6 | Switch-0 | In | 1 | Used for the "Connect on external signal" function, see the Serial Port Adapter AT command Specification for more information on the Function switch. Active low.<br><br>A secondary function is that the module will restore all factory settings if both the Switch-1 and Switch-0 signals are low during start up.<br><br>See the Serial Port Adapter AT command Specification for more information on the Restoring Default Configuration functionality. |
| 7 | RED | Out | 2 | RED:Logic Red LED Signal (see the Operating Status section). Active low.<br><br>Mode: **Not used on cB-OLS425.** This pin is also used to select Logic level mode (instead of RS232) for connectBlue products with internal RS232 driver. To be compatible with these products check the datasheet for these products about this signal. |
| 8 | GREEN/Switch-1 | In/Out | 3 | This signal is multiplexed:<br>GREEN:Logic Green LED Signal (see the Operating Status secti on). Not valid until 500-1000 ms after startup. Active low.<br><br>Switch-1: If the level on this pin is pulled-down** the unit goes back to default serial settings. The Switch-1 input is only active during the first 500-1000 ms after startup. The module will restore all factory settings if both the Switch-1 and Switch-0 signals are low during start up.<br><br>See [2] for more information on the Restoring Default Configuration functionality. |
| 9 | BLUE | Out | 4 | Logic Blue LED Signal (see the Operating Status section). Active low.<br>Note:Signal will flicker at data transmission. |
| 10 | UART-CTS | In | 5 | UART Clear To Send.<br>Hardware flow control. Active low |
| 11 | UART-TxD | Out | 6 | UART Transmit Data.<br>"0" : Low, "1" : High |
| 12 | UART-RTS | Out | 7 | UART Request To Send.<br>Hardware flow control. Active low |
| 13 | UART-RxD | In | 8 | UART Receive Data.<br>"0" : Low, "1" : High |

| | | | | |
|---|---|---|---|---|
| 5 | UART-DTR | Out | 0 | UART Data Terminal Ready.<br>Active low. |
| 18 | UART-DSR | In | 9 | Data Set Ready.<br>Active low. |
| 23 | - | - | 10 | IO signal |
| 31 | ADC-IN0 | In | 15 | Analog input. |
| 32 | ADC-IN1 | In | 16 | Analog input. |
| 33 | ADC-IN2 | In | 17 | Analog input. |
| 34 | ADC-IN3 | In | 18 | Analog input. |
| 35 | SerialSelect-1 | Out | 19 | SerialSelect-1: Control signal for external serial transceivers.<br>See [3] for more information. |
| 36 | SerialSelect-0 | Out | 20 | SerialSelect-0: Control signal for external serial transceivers.<br>See [3] for more information. |

## 5.3 Electrical Interface and Connectors on the cB-OLS426 Serial Port Adapter

### 5.3.1 cB-OLS426 Connector Interfaces

There are two ways to connect to the cB-OLS426 Serial Port Adapter:

- Via the PCB solder pads on the edge of the PCB, J6 (see Figure 9). See section Using the J6 PCB solder pads for more information.
- Via the 2x20-pin 1mm pitch board-to-board (one piece part) connectors, J2 through J3. The J2 to J3 connectors on the cB-OLS426 exist on the module only as a mating PCB-layout pattern (see Figure 9). See section Using the J2/J3 Board-to-Board Connectors for more information.

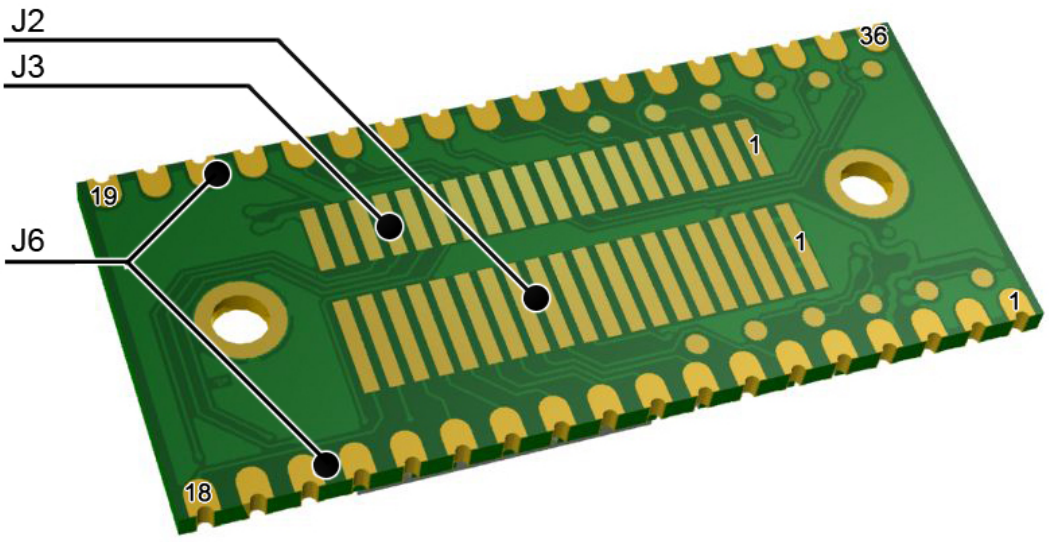



**Figure 9: The solder pads J6 are available on the long edges of the bottom side of the PCB. The board-to-board connector pads J2-J3 are located between the mounting holes.**

### 5.3.2 cB-OLS426 Pin Numbering

See Figure 9 above.

### 5.3.3 cB-OLS426 Pin Description

**Table 9: cB-OLS426 pin descriptions.**

| J2 Pin No | J3 Pin No | J6 Pin No | Signal Name | Type | IO No | Description |
|---|---|---|---|---|---|---|
| - | 19 | 1 | $\overline{\text{RESET}}$ | In | - | Hardware reset |
| 1, 2 | 8, 12 | 3, 25 | GND | - | - | Ground |
| 3, 4 | - | 4 | Vin | In | - | 3.0-6.0 VDC Power supply. |
| 5-10 | 5-7, 11, 13, 15-18, 20 | 2, 14-17, 19-22, 24, 26-30 | - | - | - | Reserved, do not connect. |
| 12 | - | 6 | Switch-0 | In | 1 | Used for the "Connect on external signal" function, see the Serial Port Adapter AT command Specification for more information on the Function switch. Active low.<br><br>A secondary function is that the module will restore all factory settings if both the Switch-1 and Switch-0 signals are low during start up.<br><br>See the Serial Port Adapter AT command Specification for more information on the Restoring Default Configuration functionality. |
| 11 | - | 7 | RED | Out | 2 | RED:Logic Red LED Signal (see the Operating Status section). Active low.<br><br>Mode: **Not used on cB-OLS426.** This pin is also used to select Logic level mode (instead of RS232) for connectBlue products with internal RS232 driver. To be compatible with these products check the datasheet for these products about this signal. |

| | | | | | | |
|---|---|---|---|---|---|---|
| 13 | - | 8 | GREEN/Switch-1 | In/Out | 3 | This signal is multiplexed:<br>GREEN:Logic Green LED Signal (see the Operating Status section). Not valid until 500-1000 ms after startup. Active low.<br><br>Switch-1: If the level on this pin is pulled-down** the unit goes back to default serial settings. The Switch-1 input is only active during the first 500-1000 ms after startup. The module will restore all factory settings if both the Switch-1 and Switch-0 signals are low during start up.<br><br>See [2] for more information on the Restoring Default Configuration functionality. |
| 14 | - | 9 | BLUE | Out | 4 | Logic Blue LED Signal (see the Operating Status section). Active low.<br>Note:Signal will flicker at data transmission. |
| 15 | - | 10 | UART-CTS | In | 5 | UART Clear To Send.<br>Hardware flow control. Active low |
| 16 | - | 11 | UART-TxD | Out | 6 | UART Transmit Data.<br>"0" : Low, "1" : High |
| 17 | - | 12 | UART-RTS | Out | 7 | UART Request To Send.<br>Hardware flow control. Active low |
| 18 | - | 13 | UART-RxD | In | 8 | UART Receive Data.<br>"0" : Low, "1" : High |
| 19 | - | 5 | UART-DTR | Out | 0 | UART Data Terminal Ready.<br>Active low. |
| 20 | - | 18 | UART-DSR | In | 9 | Data Set Ready.<br>Active low. |
| - | 10 | 35 | SerialSelect-1 | Out | 19 | SerialSelect-1: Control signal for external serial transceivers.<br>See [3] for more information. |
| - | 9 | 36 | SerialSelect-0 | Out | 20 | SerialSelect-0: Control signal for external serial transceivers.<br>See [3] for more information. |
| - | 14 | 23 | - | - | 10 | IO signal |
| - | 1 | 31 | ADC-IN0 | In | 15 | Analog input. |
| - | 2 | 32 | ADC-IN1 | In | 16 | Analog input. |
| - | 3 | 33 | ADC-IN2 | In | 17 | Analog input. |
| - | 4 | 34 | ADC-IN3 | In | 18 | Analog input. |

# 6 Characteristics

## 6.1 Power Supply cB-OLP425 and cB-OLS425

> **NOTE**
>
> Read the Guidelines for Efficient and Safe Use before using the modules.

**Table 10: Power supply cB-OLP425 and cB-OLS425.**

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| Vin | Power supply | Min | 2.0 | VDC |
| | | Max | 3.6 | VDC |

## 6.2 Power Supply cB-OLS426

> **NOTE**
>
> Read the Guidelines for Efficient and Safe Use before using the modules

The cB-OLS426 has an 3.3V LDO regulator to be compatible with other connectBlue modules. The voltage drop is <20mV.

**Table 11: Power supply cB-OLS426.**

| Symbol | Parameter | | Value | Power supply to radio module Typ | Unit |
|---|---|---|---|---|---|
| Vin | Power supply | Min | 3.0 | 3.0 | VDC |
| | | Typ | 3.3 | 3.3 | VDC |
| | | Max | 6.0 | 3.3 | VDC |

## 6.3 Current Consumption for cB-OLP425

The current consumption is very dependent of the customer implementation and because of this is specific current consumption data for cB-OLP425 not included in this documentation. The cB-OLP425 with a cB-OLS425 firmware would have the same current consumption as a cB-OLS425. Current consumption can be measure by measuring the voltage drop over an 10ohm resistor (I = $V_{drop}$/10ohm). The current peaks/activities is best visualized with an oscilloscope. Very low currents (uA) like the sleep currents can usually not be

measured with an ordinary oscilloscope. Very low stable currents can instead be measure with an accurate multimeter. See Calculating Energy Consumption and [10] for more info about current measurements.

## 6.4 Current Consumption for cB-OLS425 and cB-OLS426

Current consumption for cB-OLS425 and cB-OLS426. The cB-OLS426 has higher consumption because the internal LDO regulator. See Calculating Energy Consumption and [10] for more info about current measurements.

> ⚠ The modules has an 100uF capacitance which makes the peaks lower compared to the actual radio current consumption peaks. The average measurements are also lower but the durations are longer and the energy consumption is preserved compared to the actual radio energy consumption.

**Table 12: Current consumption.**

| Mode | State | Calculations / conditions | Symbol | Type | OLS425 (Typ) | OLS426 (Typ) | Unit |
|---|---|---|---|---|---|---|---|
| Stop mode | Offline (DSR not active) | $R_{Source}$ = 10 ohm | $I_{Stop\_mode\_avg}$ | Avg | 0.4 | 6.7 | uA |
| Stop mode | Offline (DSR not active)<br>Advertising period 1000ms | $I_{Stop\text{-}mode\_avg} = I_{Stop\text{-}mode\_sleeping\_avg} + I_{Adv\_stop\_avg} * t_{Adv} / t_{Adv\_period}$<br>Average Duration = $t_{Adv}$ = 7.2 ms<br>$t_{Adv\_period}$ = 1000 ms<br>$R_{Source}$ = 10 ohm | $I_{Stop\text{-}mode\_avg}$ | Avg | 52 | 53 | uA |
| | | | $I_{Stop\text{-}mode\_sleeping\_avg}$ | Avg | 1.2 | 7.5 | uA |
| | | | $I_{Adv\_stop\_avg}$ | Avg | 7.0 | 7.3 | mA |
| | | | $I_{Adv\_stop\_peak}$ | Peak | 15 | 15 | mA |
| Online | Online<br>(DSR active) | No radio activity (e.g. between advertising).<br>$R_{Source}$ = 10 ohm | $I_{Online\_idle\_avg}$ | Avg | 8.0 | 8.3 | mA |
| Connected | Online (DSR active) | | $I_{Connected\_online\_avg}$ | Avg | 8.2 | 8.5 | mA |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | $I_{Connected\_online\_peak}$ | Peak | 18 | 18 | mA |

## 6.5 Input/Output Signals

**Table 13: Input/output signals. Vin = 3.0V.**

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_{IN}$ Low | Logic LOW level input voltage | Min | -0.3 | V |
| | | Max | 0.5 | V |
| $V_{IN}$ High | Logic HIGH level input voltage | Min | 2.5 | V |
| | | Max | 3.3 | V |
| $V_{OUT}$ Low | Logic LOW level output voltage | Max | 0.5 | V |
| $V_{OUT}$ High | Logic HIGH level output voltage | Min | 2.4 | V |
| $I_{IO\_20mA}$ | Sink and source current pin J6-2 and J6-9 | Max | 20 | mA |
| | Voltage drop @ $I_{IO\_20mA}$= 20mA | Typ | 0.3 | V |
| $I_{IO\_4mA}$ | Sink and source current all other IO pins | Max | 4 | mA |
| | Voltage drop @ $I_{IO\_4mA}$= 4mA | Typ | 0.5 | V |
| $R_{IN\_PULL-UP}$ | Input signals (including $\overline{RESET}$ ) internal pull-up | Typ | 20 | kohm |
| $t_{Reset}$ | Reset pulse length | Min | 1 | us |
| $V_{ADC}$ | ADC Analog input pins | Min | 0 | V |
| | | Max | Vin | V |
| | ADC number of bits | Min | 7 | bits |
| | | Max | 12 | bits |

See [7] for more information.

## 6.6 Environmental

The temperature characteristic is not valid if a battery is mounted on the module. The temperature limits need to be adjusted according to the battery characteristics.

**Table 14: Temperatures characteristics**

| Parameter | | Model | Value | Unit |
|---|---|---|---|---|
| Storage temperature | Min | Without JST connector | -40 | °C |
| | | With JST connector | -25 | °C |
| | Max | Without JST connector | +125 | °C |
| | | With JST connector | +85 | °C |
| Operating temperature | Min | Without JST connector | -40 | °C |
| | | With JST connector | -25 | °C |
| | Max | All | +85 | °C |

## 6.7 Hardware Reset

A hardware $\overline{\text{RESET}}$ input is available on the connectors (see Electrical Interface and Connectors). An external reset source must be open drain collector. The $\overline{\text{RESET}}$ pin is internally pulled-up with 50kohm.

# 7 Calculating Energy Consumption

The OLP425, cB-OLS425/426 is always a peripheral device and the energy consumption is usually a very important factor and it is important to understand how the Bluetooth Low Energy protocol works to optimize each specific application for low current consumption.

Typical Bluetooth Low Energy application is sensors supplied with power from a 3.0V lithium coin cell battery like a CR2032. The coin cell battery has a relative high internal resistance (10-100ohm) and is not capable of delivering high currents. A 100uF capacitor is mounted to offload the power source. During high current periods the capacitor will act as the primary power source, while during low current periods the battery will be the primary power source and recharge the capacitor, see Figure 10. The slope of the curves is dependent on the internal resistance of the battery and most measurements has 10ohm power source resistance.

Current consumption can be measure by measuring the voltage drop over a 10ohm resistor ($I = V_{drop}/10ohm$). The current peaks/activities are best visualized with an oscilloscope. Very low currents (uA) like the sleep currents can usually not be measured with an ordinary oscilloscope. Very low stable currents can instead be measure with an accurate multimeter. See [10] for more info about current measurements.

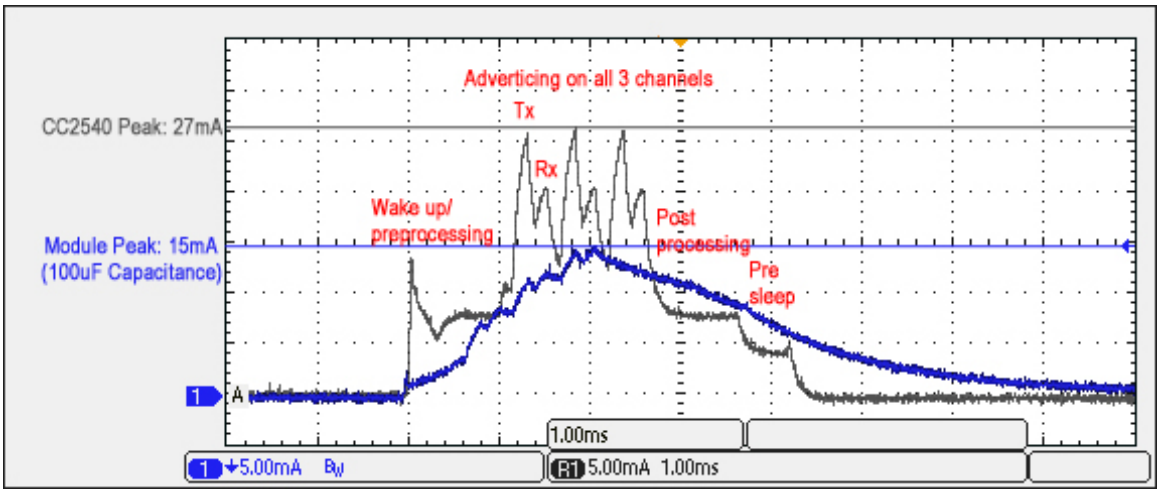



**Figure 10: cB-OLS425 current consumption during advertising. The grey curve is moment radio consumption and the blue is smoothed-out because of the 100uF capacitance to offload the battery. An 10ohm resistance is used as internal power source resistance in the measurements. The energy consumption (mAh) is the integration (area under the curves) of the curves.**

# 8 cB-OLS425/426 Serial Port Adapter Operating Status

The module can be in different modes (see [1] for more information about the modes) and the RED, GREEN and BLUE signals can be used to detect or indicate the status. The LED signals are active LOW.

**Table 15: Signal states in different module modes**

| Serial Port Adapter Mode | Status | RGB LED Color | GREEN GPIO | BLUE GPIO | RED GPIO |
|---|---|---|---|---|---|
| Low power mode | SLEEPING[2] [3] | Off | HIGH[2] | HIGH[3] | HIGH |
| Data mode | IDLE | Green | LOW | HIGH | HIGH |
| AT mode | IDLE | Orange | LOW | HIGH | LOW |
| Data mode, AT mode | CONNECTED [1] | Blue | HIGH | LOW | HIGH |

[1] On data activity the BLUE GPIO blinks and will be HIGH (50-100ms).
[2] The GREEN GPIO will be LOW (active) when Advertising (4-6ms).
[3] The BLUE GPIO will be LOW (active) when the module responds to connection events.

# 9 Antennas

This chapter gives an overview of the different antenna options. All antennas options are the same for cB-OLP425, cB-OLS425 and cB-OLS426.

There are 2 different antenna options available:

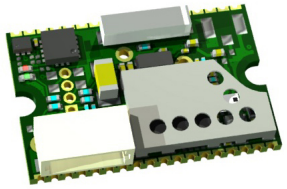
- Internal surface mounted (SMD) antenna.
- An U.FL. connector for external antennas. Different types of external antennas are available.

The sections below lists the antennas that are included in the radio type approvals of the module. For each antenna the "Approvals" field defines in which test reports the antenna is included. Definitions of the "Approvals" field are:

- **FCC** - The antenna is included in the FCC test reports, and thus approved for use in countries that accept the FCC radio approvals, primarily US.
- **IC** - The antenna is included in the IC (Industrie Canada) test reports, and thus approved for use in countries that accept the IC radio approvals, primarily Canada.
- **R&TTE** - The antenna is included in the R&TTE test reports, and thus approved for use in countries that accept the R&TTE radio approvals, primarily the European countries.

In general, antennas with SMD antenna, Reverse Polarity SMA connector or U.FL connector are included in FCC, IC and R&TTE radio tests. Antennas with SMA connector are in general included in R&TTE radio tests but not FCC or IC due to FCC/IC regulations.

## 9.1 Surface Mounted Antennas (Internal)

| **Part Number** | **cB-OLP425i, cB-OLS425i and cB-OLS426i** | |
|---|---|---|
| Antenna name | ANCG12G44SAA162 |  |
| Manufacture | muRata | |
| Gain | 0 dBi | |
| Antenna size (LxWxH) | 8.0 x 2.0 x 2.0 mm | |
| Comment | The antenna gain is very dependent of the mounting of the module.<br>See section Antenna Issues for mounting the module considering the antenna. | |
| Approval | FCC, IC and R&TTE | |

## 9.2 External Antennas

The external antennas are connected to the board through a U.FL connector. Some of the antennas are connected directly to the U.FL connector of the board and some are connected using an SMA or reversed polarity SMA connector through a short U.FL to SMA or reversed polarity SMA adapter cable.

Antennas with a part number in the form "cB-ACC-XX" are available for orders via the connectBlue distribution network. For information about other antennas please contact connectBlue.

### 9.2.1 Antenna Accessories

| **Part Number** | **cB-ACC-18 / cB-ACC-48** | |
|---|---|---|
| Name | U.FL to SMA adapter cable |  |
| Connector | U.FL and SMA jack (outer thread and pin receptacle) | |
| Cable length | 120 mm | |
| Cable loss | Less than 0.5dB | |
| Comment | The SMA connector may be mounted in a panel. | |
| Approval | R&TTE | |

| **Part Number** | **cB-ACC-38** | |
|---|---|---|
| Name | U.FL to reverse polarity SMA adapter cable |  |
| Connector | U.FL and reverse polarity SMA jack (outer thread and pin) | |
| Cable length | 120 mm | |
| Cable loss | Less than 0.5dB | |
| Comment | The reverse polarity SMA connector may be mounted in a panel. | |
| Approval | FCC, IC and R&TTE | |

### 9.2.2 Recommended Antennas

| **Part Number** | **cB-ACC-61** | |
|---|---|---|
| Name | Ex-IT 2400 RP-SMA 28-001 |  |
| Manufacture | ProAnt | |
| Polarization | Vertical | |
| Gain | +3.0 dBi | |
| Size | Ø 12.0 x 28.0 mm | |
| Connector | Reverse Polarity SMA plug (inner thread and pin receptacle) | |
| Comment | To be mounted on the U.FL to Reverse Polarity SMA adapter cable (cB-ACC-38).<br>An SMA version antenna is also available but not recommended to use (Ex-IT 2400 SMA 28-001). | |
| Approval | FCC, IC and R&TTE | |

| **Part Number** | **cB-ACC-63** | |
|---|---|---|
| Name | Ex-IT 2400 MHF 28 |  |
| Manufacture | ProAnt | |
| Polarization | Vertical | |
| Gain | +2.0 dBi | |
| Size | Ø 12.0 x 28.0 mm | |
| Cable length | 100 mm | |
| Connector | U.FL. connector | |

| | | |
|---|---|---|
| Comment | To be mounted on the U.FL connector on the PCB. | |
| Approval | FCC, IC and R&TTE | |

| Part Number | cB-ACC-64 | |
|---|---|---|
| Name | Ex-IT 2400 RP-SMA 70-002 |  |
| Manufacture | ProAnt | |
| Polarization | Vertical | |
| Gain | +3.0 dBi | |
| Size | Ø 10 x 83 mm | |
| Connector | Reverse Polarity SMA plug (inner thread and pin receptacle) | |
| Comment | To be mounted on the U.FL to Reverse Polarity SMA adapter cable (cB-ACC-38).<br>An SMA version antenna is also available but not recommended to use (Ex-IT 2400 SMA 70-002). | |
| Approval | FCC, IC and R&TTE | |

| Part Number | cB-ACC-60 | |
|---|---|---|
| Name | Ex-IT 2400 MHF 70-001 |  |
| Manufacture | ProAnt | |
| Polarization | Vertical | |

| | | |
|---|---|---|
| Gain | +3.0 dBi | |
| Size | Ø 9.4 x 70.5 mm | |
| Cable length | 100 mm | |
| Connector | U.FL. connector | |
| Comment | To be mounted on the U.FL connector on the PCB. | |
| Approval | FCC, IC and R&TTE | |

| Part Number | cB-ACC-57 | |
|---|---|---|
| Name | InSide-2400 |  |
| Manufacture | ProAnt | |
| Gain | +3.0 dBi | |
| Size | 27 x 12 mm (triangular) | |
| Cable length | 100 mm | |
| Connector | U.FL. connector | |
| Comment | To be mounted on the U.FL connector on the PCB. | |
| Approval | FCC, IC and R&TTE | |

| Part Number | cB-ACC-66 | |
|---|---|---|
| Name | FlatWhip-2400 |  |
| Manufacture | ProAnt | |
| Gain | +3.0 dBi | |
| Size | Ø 50.0 x 30.0 mm | |
| Connector | SMA plug (inner thread and pin) | |
| Comment | To be mounted on the U.FL to SMA adapter cable. | |
| Approval | R&TTE | |

| Part Number | cB-ACC-67 | |
|---|---|---|
| Name | Outside-2400 |  |
| Manufacture | ProAnt | |
| Gain | +3.0 dBi | |
| Size | 36.0 x 18.0 x 16.0 mm | |
| Cable length | 70 mm | |
| Connector | U.FL. connector | |
| Comment | To be mounted on the U.FL connector on the PCB. | |
| Approval | FCC, IC and R&TTE | |

### 9.2.3 Alternative Antennas

The alternative antennas are available for backward compatibility but not recommended for new designs.

| **Part Number** | **cB-ACC-16 / cB-ACC-36** | |
|---|---|---|
| Name | WCR2400-SMA / WCR2400-SMRP |  |
| Manufacture | Laird Technologies | |
| Polarization | Vertical | |
| Gain | +2.0 dBi | |
| Size | 100 mm (Straight) | |
| Connector | cB-ACC-16: SMA plug (inner thread and pin)<br><br>cB-ACC-36: Reverse Polarity SMA plug (inner thread and pin receptacle) | |
| Comment | cB-ACC-16 is to be used together with the U.FL to SMA adapter cable (cB-ACC-18 or cB-ACC-48).<br>cB-ACC-36 is to be used together with the U.FL to Reverse Polarity SMA adapter cable (cB-ACC-38). | |
| Approval | cB-ACC-36: FCC, IC and R&TTE<br>cB-ACC-16: R&TTE | |

| **Part Number** | **cB-ACC-27 / cB-ACC-29** | |
|---|---|---|
| Name | WCR-2400-IP04 / WCR-2400-IP10 |  |
| Manufacture | Laird Technologies | |
| Polarization | Vertical | |
| Gain | +2.0 dBi | |

| | | |
|---|---|---|
| Size | 108 mm (Straight) | |
| Cable length | cB-ACC-27: 100 mm<br>cB-ACC-29: 250 mm | |
| Connector | U.FL. connector | |
| Comment | To be mounted on the U.FL connector on the PCB. | |
| Approval | FCC, IC and R&TTE | |

| Part Number | cB-ACC-23 | |
|---|---|---|
| Name | PSTG0-2400HS |  |
| Manufacture | Mobile Mark Communications Antennas | |
| Polarization | Vertical | |
| Gain | 0 dBi | |
| Size | Ø 9.5 x 26 mm | |
| Connector | SMA plug (inner thread and pin) | |
| Comment | To be used together with the U.FL to SMA adapter cable (cB-ACC-18 or cB-ACC-48).<br>An alternative Reverse Polarity SMA version antenna is available (PSTG0-2400HRS). | |
| Approval | R&TTE | |

| Part Number | cB-ACC-28 | |
|---|---|---|
| Name | NanoBlue-IP04 |  |
| Manufacture | Laird Technologies | |
| Polarization | Linear | |
| Gain | +2.0 dBi | |
| Size | 47.8 x 12.7 x 0.9 mm | |
| Cable length | 100 mm | |
| Connector | U.FL. connector | |

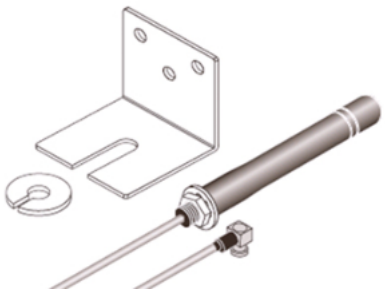
| | | |
|---|---|---|
| Comment | To be mounted on the U.FL connector on the PCB. | |
| Approval | FCC, IC and R&TTE | |

| Part Number | cB-ACC-17 / cB-ACC-37 | |
|---|---|---|
| Name | Reel planTec Bluetooth m70 |  |
| Manufacture | REEL | |
| Gain | +1.0 dBi | |
| Size | Ø 75 x 20 mm | |
| Mounting | M16 x 13.6 mm | |
| Connector | cB-ACC-17: SMA plug (inner thread and pin)<br>cB-ACC-37: Reverse Polarity SMA plug (inner thread and pin receptacle) | |
| Cable length | 300 cm. Other cable lengths are available on request. | |
| Comment | cB-ACC-17 is to be used together with the U.FL to SMA adapter cable (cB-ACC-18 or cB-ACC-48).<br>cB-ACC-37 is to be used together with the U.FL to Reverse Polarity SMA adapter cable (cB-ACC-38). | |
| Approval | cB-ACC-37: FCC, IC and R&TTE.<br>cB-ACC-17: R&TTE. | |

| Part Number | cB-ACC-21 | |
|---|---|---|
| Name | R380.500.127 |  |
| Manufacture | Pulse | |
| Polarization | Vertical | |

| | | |
|---|---|---|
| Gain | +2.0 dBi | |
| Size | Ø 14.3 x 61.4 mm | |
| Connector | SMA plug (inner thread and pin) | |
| Comment | To be mounted on the U.FL to SMA adapter cable (cB-ACC-18 or cB-ACC-48).<br>A Reverse Polarity SMA version is also available (R380.500.125). | |
| Approval | R&TTE | |

| **Part Number** | **—** | |
|---|---|---|
| Name | R380.500.139 |  |
| Manufacture | Pulse | |
| Polarization | Vertical | |
| Gain | +2.0 dBi | |
| Size | Ø 14.3 x 61.1 mm | |
| Connector | Reverse Polarity SMA plug (inner thread and pin receptacle) | |
| Comment | The difference compared to the R380.500.125 antenna is that the R380.500.139 antenna has a seal ring.<br>To be mounted on the U.FL to Reverse Polarity SMA adapter cable (cB-ACC-38).<br>An SMA version antenna is also available (R380.500.124). | |
| Approval | FCC, IC and R&TTE | |

| **Part Number** | **—** | |
|---|---|---|
| Name | IHF-242 |  |
| Manufacture | Joymax | |
| Polarization | Vertical | |
| Gain | +2.0 dBi | |
| Size | Ø 9.2 x 82.5 mm | |

| | | |
|---|---|---|
| Cable length | 150 cm | |
| Connector | MCX male connector | |
| Comment | To be mounted on a MCX to U.FL adapter cable. | |
| Approval | FCC, IC and R&TTE | |

# 10 Mechanics

## 10.1 cB-OLP425 and cB-OLS425 Mechanics

### 10.1.1 Module Dimensions

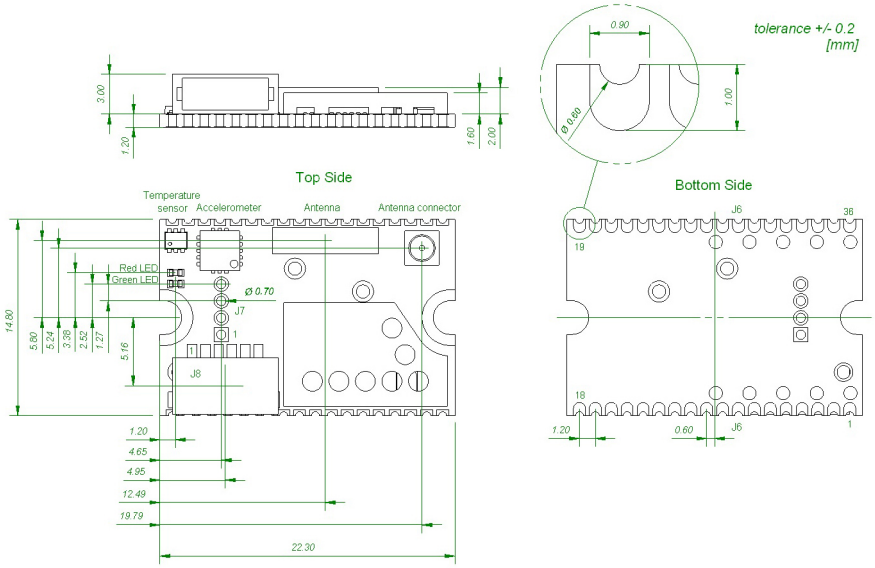



**Figure 11: cB-OLP425 and cB-OLS425 module dimensions.**

Weight: 1.5 g

### 10.1.2 Battery Holder and Mounting Wings Dimensions (optionals)

**Optional battery holder**

The optional battery holder is mounted on modules cB-OLP425i-26 and cB-OLP425x-26 (mounting wings not mounted).

**Optional mounting wings**

The optional mounting wings are available only for higher quantity request. Please contact us with project details for further discussion.

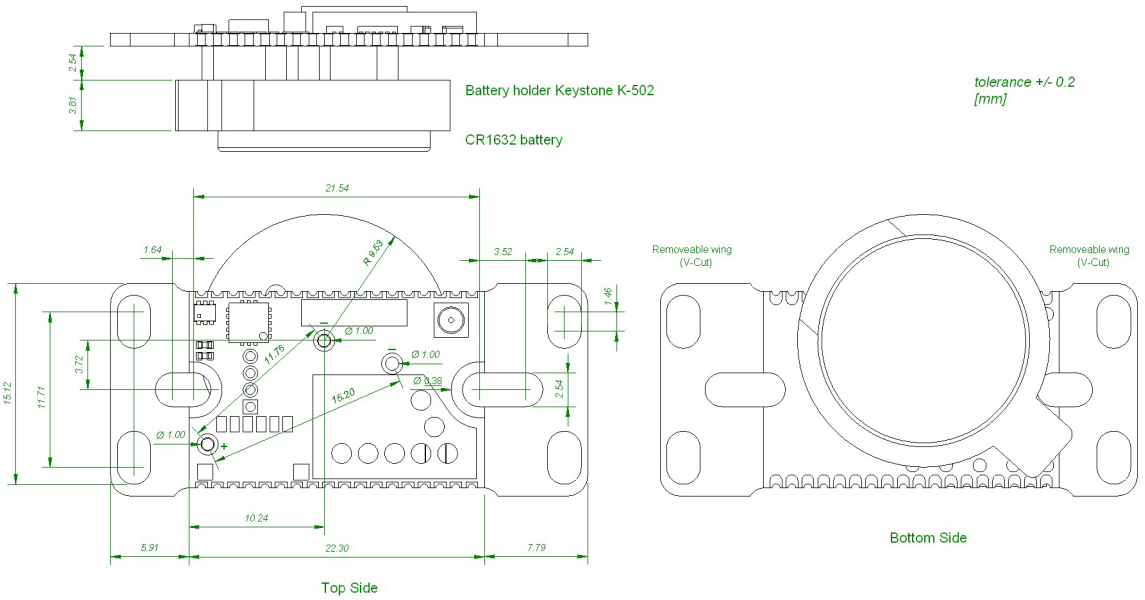



**Figure 12: cB-OLP425 dimensions with mounting wings (optional, on request only) and CR1632 battery holder.**

Weight: 2 g

### 10.1.3 Using the J6 PCB Solder Pads

#### 10.1.3.1 Host Board

The host PCB footprint should not contain any traces or vias under the module except the pads interfacing the J6 pads to avoid contact with traces/vias on the module. The host pads which are soldered to the J6 pads should have the same size as the module and can be extended some mm outside the module for manual soldering or inspection purpose. No other pads than the J6 should be soldered to the host PCB.

#### 10.1.3.2 cB-OLP425 and cB-OLS425 Mounting Process

We strongly recommend the cB-OLP425 and cB-OLS425 modules not being soldered more than one time after shipping from connectBlue and that the modules are mounted just before the host product is being soldered the last time. Although, connectBlue devices will withstand up to two reflows to an absolute maximum temperature of 250°C.

- The PCB in our modules is made of FR4-type with Chemical Gold Pads.
- The modules are produced in a lead-free process with a lead-free soldering paste.
- It is recommended that the customers make their own electrical, climate, stress and vibration tests on the final assembled product to secure that the manufacturing process hasn't damaged or affected the Bluetooth module in any way.
- The modules are normally delivered without labels on each module when packaged on tape-and-reel or tray since the labels do not withstand soldering. However, if they are delivered with labels on each module, the labels should be removed before the module is processed since the labels do not withstand the heat of soldering.
- The device recommended maximum re-flow temperature is 245°C for 10 sec.
- The device absolute maximum re-flow temperature is 250°C for 3 sec.

## 10.2 cB-OLS426 Mechanics

### 10.2.1 Module Dimensions

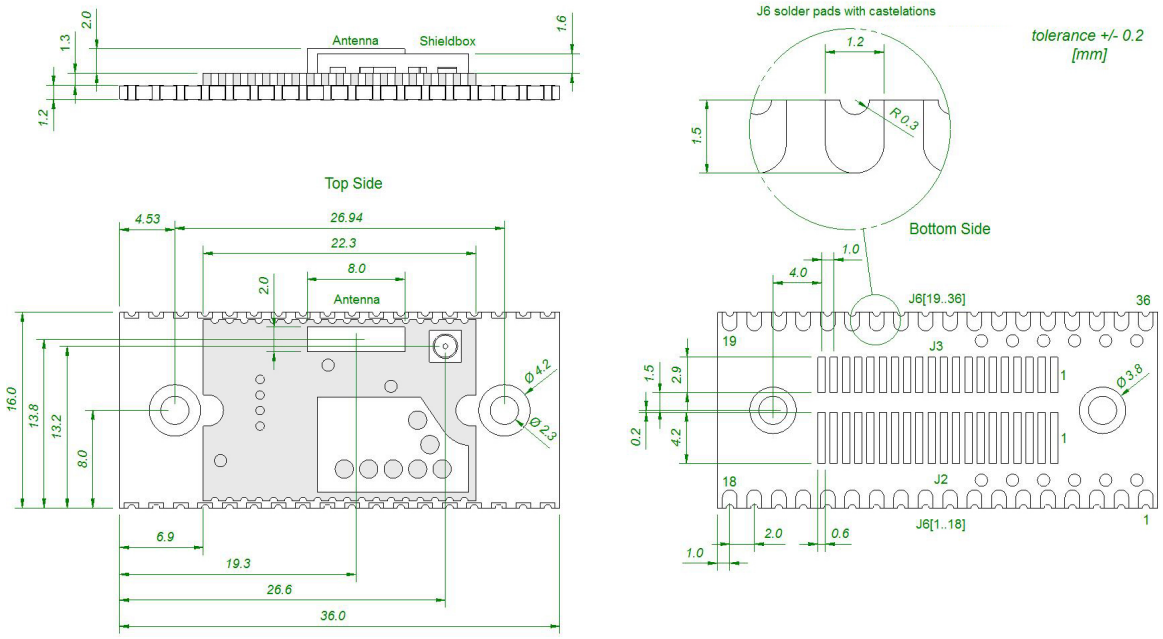



**Figure 13: cB-OLS426 dimensions.**

Weight: 3 g

### 10.2.2 cB-OLS426 Mounting Holes

There are 2 x 2.3mm mounting holes on the cB-OLS426 module. The reasons for the 2.3mm holes are that the threaded M2 holes on the single and double row connectors are not aligned. The outer tangents of the 2.3mm holes align the module if the single row connectors are used and the inner if double row connectors are used (see Figure 14).

**Figure 14: The 2.3mm mounting holes [mm].**

### 10.2.3 Using the J2/J3 Board-to-Board Connectors

The board-to-board connector should be a 1mm pitch one-piece part connector. The recommended manufacture is Samtec.

The Electrical Interface and Connectors section contains more information about the connector and the electrical interface.

#### 10.2.3.1 Single Row Connectors

The single row connector SEI-120-02 can be used but is not recommended for new designs.

#### 10.2.3.2 Double Row Connectors

This connector has a height of 3.0mm and this has to be considered if components are to be mounted on the motherboard under the OEM Serial Port Adapter board. There are alignment pins on the bottom side of the connector.
The connector is available with M2 threaded inserts that fit the mounting holes on the board (see section Mounting Holes). If you want to have a tighter and more secure mounting you may use longer screws and secure it using a nut on the backside of the motherboard.

**Table 16: Double row connectors from Samtec.**

| Samtec order number | Quote number | Equivalent part | Package | Remark |
|---|---|---|---|---|
| REF-120018-01 | 55392 | FSI-120-03-G-D-M-AB | Tube | With M2 threaded inserts and align pin on bottom side only |
| REF-120018-02 | 55392 | FSI-120-03-G-D-M-AB-K-TR | Tape-n-Reel | With M2 threaded inserts and align pin on bottom side only |

When ordering connectors from Samtec or an official Samtec distributor, please use the REF order number and refer to the connectBlue global quote number for best price. For technical questions regarding the Samtec connectors please contact connectBlue or Samtec at (Scandinavia@samtec.com).

See Figure 15 for more information about the connector and necessary measurements on the motherboard.

**Figure 15: Host PCB layout [mm] for double row connector.**

### 10.2.4 Using the J6 PCB Solder Pads

#### 10.2.4.1 Host Board

The host PCB footprint should not contain any traces or vias under the module except the pads interfacing the J6 pads to avoid contact with traces/vias on the module. The host pads which are soldered to the J6 pads should have the same size as the module and can be extended some mm outside the module for manual soldering or inspection purpose. No other pads than the J6 should be soldered to the host PCB.

#### 10.2.4.2 cB-OLS426 Mounting Process

The cB-OLS426 is only guaranteed to withstand one reflow time after shipping from connectBlue and it is recommended that the modules are mounted just before the host product is being soldered the last time.

- The PCB in our modules is made of FR4-type with Chemical Gold Pads.
- The modules are produced in a lead-free process with a lead-free soldering paste.
- It is recommended that the customers make their own electrical, climate, stress and vibration tests on the final assembled product to secure that the manufacturing process hasn't damaged or affected the Bluetooth module in any way.
- The modules are normally delivered without labels on each module when packaged on tape-and-reel or tray since the labels do not withstand soldering. However, if they are delivered with labels on each module, the labels should be removed before the module is processed since the labels do not withstand the heat of soldering.
- The device recommended maximum re-flow temperature is 245°C for 10 sec.
- The device absolute maximum re-flow temperature is 250°C for 3 sec.

## 10.3 Antenna Issues

The unit cannot be mounted arbitrary, because of the radio communication. The unit with an internal surface mounted antenna cannot be mounted in a metal enclosure. No metal casing or plastics using metal flakes should be used, avoid also metallic based paint or lacquer. Keep a minimum clearance of 5 mm between the antenna and the casing. Keep minimum 10 mm free space from metal around the antenna including under and above. If a metal enclosure is required, one of the external antenna options has to be used. See Surface Mounted Antenna (Internal) for more information on the antenna options available.

# 11 Bluetooth Information

## 11.1 General Information

In the tables below you can find information about Bluetooth properties. The conducted output power of the cB-OLP425, cB-OLS425 and cB-OLS426 devices is 2 dBm (1.6mW).

**Table 17: Bluetooth information cB-OLP425, cB-OLS425 and cB-OLS426.**

| Parameter | Data |
|---|---|
| Bluetooth Low Energy radio | Texas Instrument CC2540F256 |
| RF output power<br>(conducted - excluding antenna gain) | 2 dBm |
| Receive sensitive level | -91 dBm |
| Output frequency | 2.402 - 2.480 GHz, ISM band. |
| Bluetooth standard | 4.0 (single mode / Bluetooth Smart) |

## 11.2 Bluetooth Qualification Information

All products based on the PCB cB-0950 (cB-OLP425, cB-OLS425 and cB-OLS426) have been qualified according to the Bluetooth specification 4.0 (single mode / Bluetooth Smart).

**Table 18: Bluetooth Qualification information**

| Module | Bluetooth specification | QDID for Controller Subsystem | QDID for Host Subsystem | QDID for Profile Subsystem |
|---|---|---|---|---|
| cB-OLP425 | 4.0 (single mode / Bluetooth Smart) | B019409 | B017183 | B019095 |
| cB-OLS425 | 4.0 (single mode / Bluetooth Smart) | B019409 | B017183 | B019095 |
| cB-OLS426 | 4.0 (single mode / Bluetooth Smart) | B019409 | B017183 | B019095 |

To do an end product listing (EPL) the controller subsystem *cB-OLH425* (QDID B019409) shall be combined

with the host subsystem *TI CC254x EM Host* (QDID B017183) and the profile subsystem *TI CC254x BLE* (QDID B019095). The Controller Subsystem implements the lower layers of the Bluetooth stack, the Host Subsystem implements the upper layers of the Bluetooth stack in, and the Profile Subsystem implements the profiles and services.

The Bluetooth SIG's "Go To Market Toolkit" guides you through four key steps for success when going to market with a Bluetooth enabled product: https://www.bluetooth.org/en-us/bluetooth-brand/go-to-market-toolkit

When creating end products based on the cB-OLH425 the following applies:

- The end product does not have to be re-tested or re-qualified.
- A free of charge Bluetooth End Product Listing (EPL) **must** be completed at the Bluetooth SIG website www.bluetooth.org. This applies for all products implementing Bluetooth technology. The EPL requires no testing (online listing only) and is good marketing since the product is published at the Bluetooth web site www.bluetooth.com. A free of charge "Adopter Bluetooth SIG membership" is required.
- Create the EPL based on the connectBlue *cB-OLH425* (QD ID: B019409) combined with the host subsystem *TI CC254x EM Host* (QDID B017183) and the profile subsystem *TI CC254x BLE* (QDID B019095). A guide describing each step in the end product listing process is available in the connectBlue Bluetooth Qualification Guide.
- The Bluetooth Trademark may be placed on the end product. This requires a free of charge Adopter Bluetooth SIG membership. For more information see www.bluetooth.org
- The Bluetooth Trademark may be used in material related to the end product. This requires a free of charge Adopter Bluetooth SIG membership. For more information see www.bluetooth.org.

For more information please contact connectBlue.

# 12 Regulatory Information

## 12.1 Declaration of Conformity

CE 0678 ⓘ

We, **connectBlue AB**, of **Norra Vallgatan 64 3V**
**SE-211 22 Malmö, Sweden**

declare under our sole responsibility that our products:

cB-OLP425 and cB-OLS425 (cB-0950)

to which this declaration relates, conforms to the following product specifications:

**R&TTE Directive 1999/5/EC:**

Effective use of frequency spectrum:
EN 300 328 V1.7.1 (2006-10)

EMC:
EN 301 489-1 V1.9.2 (2011-09)
EN 301 489-17 V2.1.1 (2009-05)
EN 61000-6-2 (2005)

Health and safety:
EN 50371:2002
EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011
IEC 60950-1:2005 + A1:2009

**Medical Electrical Equipment**

IEC 60601-1-2 (2007)

2013-03-21 Malmö, Sweden


*CTO of connectBlue AB*

## 12.2 Safety Compliance

In order to fulfill the safety standard EN 60950-1 the unit must be supplied by a limited power source.

## 12.3 FCC and IC Compliance

See the Product Variants section for information about the different product variants.

### 12.3.1 Compliance for cB-0950

#### 12.3.1.1 FCC Statement for cB-0950

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.

**NOTE**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected

Consult the dealer or an experienced radio/TV technician for help.

#### 12.3.1.2 Antenna

Our module type cB-0950 is for OEM integrations only. The end-user product will be professionally installed in such a manner that only the authorized antennas are used.

#### 12.3.1.3 Caution

Any changes or modifications NOT explicitly APPROVED by connectBlue AB could cause the module to cease to comply with FCC rules part 15, and thus void the user's authority to operate the equipment.

#### 12.3.1.4 IC Compliance

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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de

licence. L'exploitation est autorisée aux deux conditions suivantes:

(1) l'appareil ne doit pas produire de brouillage, et
(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This device has been designed to operate with an antenna having a maximum gain of 3.5 dBi.
Having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms.
To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication.

The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website www.hc-sc.gc.ca/rpb

#### 12.3.1.5 Labeling Requirements for End Product

For an end product using the product cB-0950 there must be a label containing, at least, the following information:

> This device contains
> FCC ID: PVH0950
> IC: 5325A-0950

The label must be affixed on an exterior surface of the end product such that it will be visible upon inspection in compliance with the modular approval guidelines developed by the FCC.

In accordance with 47 CFR § 15.19 the end product shall bear the following statement in a conspicuous location on the device:

"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."

When the device is so small or for such use that it is not practicable to place the statement above on it, the information shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC ID label must be displayed on the device.

In case, where the final product will be installed in locations where the end-user is not able to see the FCC ID and/or this statement, the FCC ID and the statement shall also be included in the end-product manual.

## 12.4 UL Listing Information

If a customer intends to UL list a product including any of the Bluetooth modules based on the PCB cB-0950 this information is useful:

The printed circuit board if produced according to the following specification:

- UL recognized ZPMV2 min. 105 °C flame class V-0 or better.

## 12.5 Compliance with RoHS Directive


All products based on the PCB cB-0950 are produced according to the RoHS (Restriction of the use of certain Hazardous substances in electrical and electronic equipment) directive and complies with the directive.

# 13 Guidelines for Efficient and Safe Use

## 13.1 General

Read this information before using your module.

For any exceptions when using your Bluetooth module, due to national requirements or limitations, please visit www.bluetooth.org.

**WARNING**

Changes or modifications to the product not expressly approved by connectBlue AB will void the user's authority to operate the equipment.

## 13.2 Product Care

- Do not expose your product to liquid or moisture.
- Do not expose you product to extreme hot or cold temperature (see section Environmental for further information).
- Do not expose your product to lit candles, cigarettes, cigars, open flames, etc.
- Do not drop, throw or try to bend your product since rough treatment could damage your product.
- Do not attempt to disassemble your product. Doing so will void warranty. The product does not contain consumer serviceable or replaceable components. Service should only be performed by connectBlue AB.
- Do not paint your product as the paint could prevent normal use.
- If you will not be using your product for a while, store it in a place that is dry, free from damp, dust and extreme heat and cold.
- The clearance and creepage distances required by the end product must be withheld when the module is installed.
- The cooling of the end product shall not negatively be influenced by the installation of the module when the module is installed.

## 13.3 Radio Frequency Exposure

The module contains a small radio transmitter and receiver. During communication with other Bluetooth products the module receives and transmits radio frequency (RF) electromagnetic fields (microwaves) in the frequency range 2400 to 2500 MHz. The output power of the radio transmitter is very low.

When using the module, you will be exposed to some of the transmitted RF energy. This exposure is well below the prescribed limits in all national and international RF safety standards and regulations.

## 13.4 Electronic Equipment

Most modern electronic equipment, for example, in hospitals and cars, is shielded from RF energy. However, certain electronic equipment is not. Therefore:

**NOTE**

This equipment emits RF energy in the ISM (Industrial, Scientific, Medical) band. Please insure that all medical devices used in proximity to this device meet appropriate susceptibility specifications for this type of RF energy.

## 13.5 Potentially Explosive Atmospheres

Turn off your electronic device before entering an area with potentially explosive atmosphere. It is rare, but your electronic device could generate sparks. Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death.

Areas with a potentially explosive atmosphere are often, but not always, clearly marked. They include fuelling areas, such as petrol station, below deck on boats, fuel or chemical transfer or storage facilities, and areas where the air contains chemicals or particles, such as grain, dust, or metal powders.

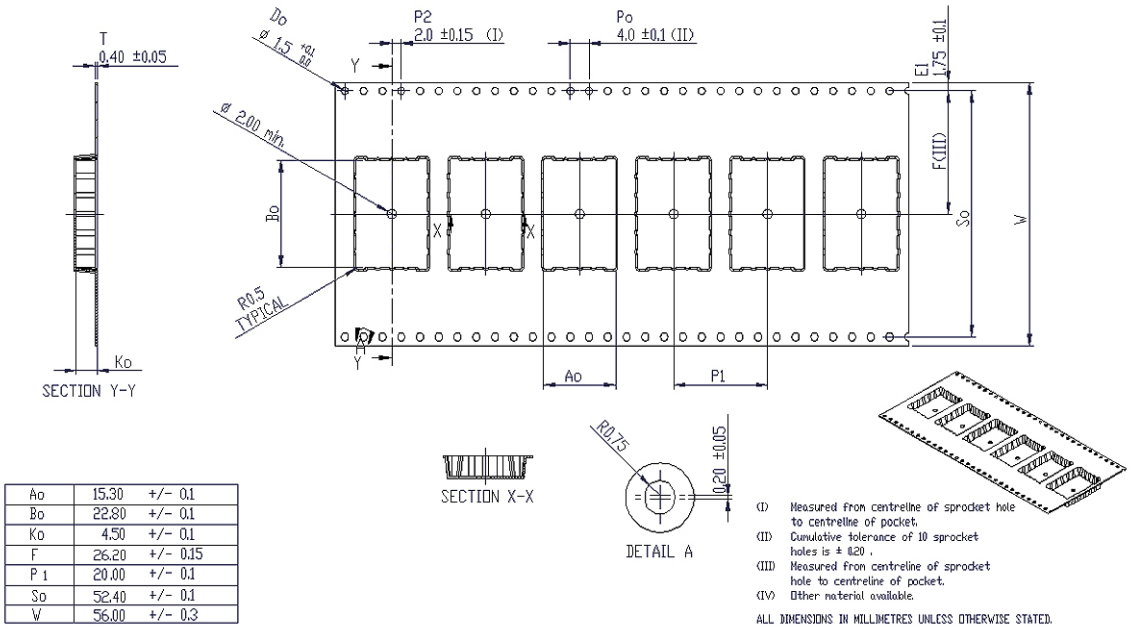
## 13.6 Power Supply

The OEM module must be supplied by a limited power source according to EN 60950-1.

- Connect your power supply only to designated power-sources as marked on the product.
- Make sure all cords and cable are positioned so that they will not be stepped on, tripped over or otherwise subject to damage or stress.
- To reduce risk of electric shock, unplug the unit from any power source before attempting to clean it.

# 14 Package Information

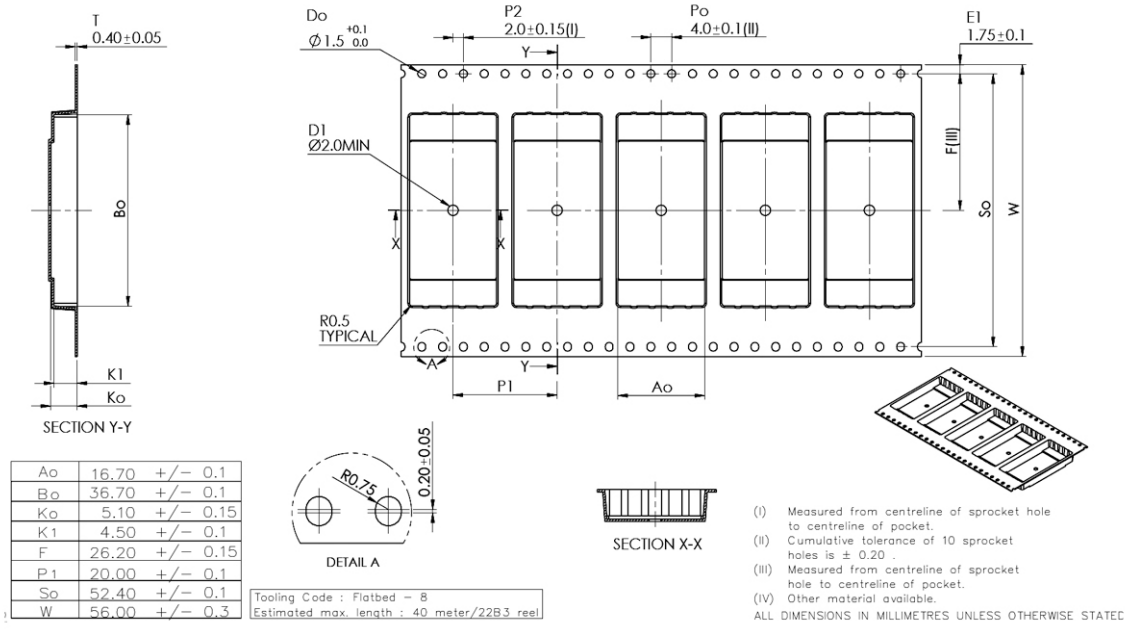
## 14.1 cB-OLP425 and cB-OLS425 Tape Dimensions




| | | |
|---|---|---|
| Ao | 15.30 | +/- 0.1 |
| Bo | 22.80 | +/- 0.1 |
| Ko | 4.50 | +/- 0.1 |
| F | 26.20 | +/- 0.15 |
| P 1 | 20.00 | +/- 0.1 |
| So | 52.40 | +/- 0.1 |
| W | 56.00 | +/- 0.3 |

**Figure 16: cB-OLP425 and cB-OLS425 tape dimensions**.

## 14.2 cB-OLS426 Tape Dimensions

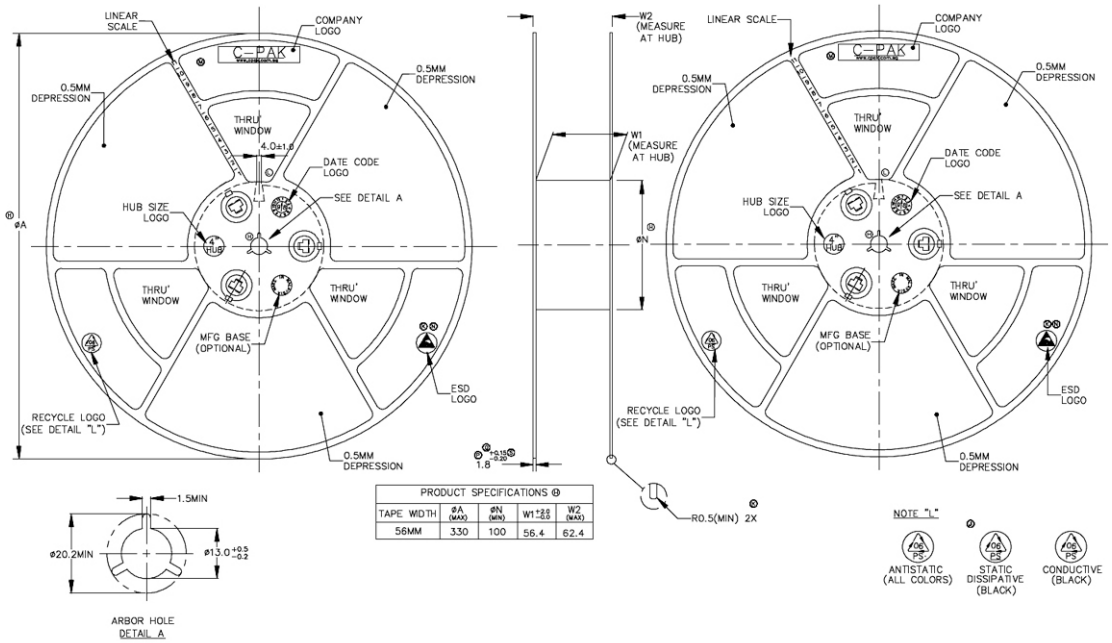



| | | |
|---|---|---|
| Ao | 16.70 | +/- 0.1 |
| Bo | 36.70 | +/- 0.1 |
| Ko | 5.10 | +/- 0.15 |
| K1 | 4.50 | +/- 0.1 |
| F | 26.20 | +/- 0.15 |
| P1 | 20.00 | +/- 0.1 |
| So | 52.40 | +/- 0.1 |
| W | 56.00 | +/- 0.3 |

**Figure 17: cB-OLS426 tape dimensions**.

## 14.3 Reel Dimensions

The same reel is used for cB-OLP425, cB-OLS425 and cB-OLS426 tapes.




| PRODUCT SPECIFICATIONS | | | | |
|---|---|---|---|---|
| TAPE WIDTH | ØA (MAX) | ØN (MIN) | W1 | W2 (MAX) |
| 56MM | 330 | 100 | 56.4 | 62.4 |

**Figure 18: Tape reel dimensions.**