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# Datasheet

## BT860 Development Kit

Applicable to the following Laird part numbers:

- *DVK-BT860-SA – Integrated antenna version*
- *DVK-BT860-ST – Trace pin for external antenna version*

*Version 1.0*

## REVISION HISTORY

| Version | Date | Notes | Contributor(s) | | Approver |
|---|---|---|---|---|---|
| 1.0 | 12 Jan 2018 | Initial version | Raymond Au<br>Raj Khatri | Jacky Kuo<br>Shewan Yitayew | Jonathan Kaye |
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# 1 OVERVIEW

Laird's Development Kit (DVK-BT860-Sx) provides a platform for rapid prototyping of BT860 series modules. The development board provides simple, easy to use access to the various hardware interfaces and configuration options for the module. The DVK is the perfect platform to provide for early development testing of the BT860 module series features and functionality, prior to designing the module onto a host PCB.

This manual is for the development PCB which is DVK-BT860 1.0 on PCB.

# 2 INTRODUCTION

The Laird DVK-BT860 is designed to support the rapid development of applications and evaluation for the specific Laird Bluetooth module part number BT860-Sx. In-depth documentation for thismodule series is available from the BT860 series product page: https://www.lairdtech.com/products/bt860-uart-ble-module

## 2.1. Package Contents

Each DVK-BT860 contains the following items:

| | |
|---|---|
| **Development Motherboard** | The motherboard has the appropriate BT860 module already soldered down onto it and all available hardware interfaces are exposed. |
| **USB Cable – USB A type male to Micro-USB type** | The USB cable can be used to power, control, and configure the BT860. |
| **Stand-off** | Screw nuts (4); Stand-off (4) |
| **Pin Header Fly Leads** | Leads for easy prototyping into host board (6) |
| **Insert card** | Provides links to additional information including BT860 User Manual, Utilities, Schematics, and Quick Start Guides. |
| **External antenna** | Only supplied with DVK-BT860-ST.<br>Antenna supplied is Laird part # 0600-00040. |

## 2.2. DVK-BT860 – Main Development Board

The development board allows the BT860 module to be easily connected to a PC. The development board provides USB to UART converter linking to USB connector and the BT860 UART HCI interface. Any Windows PC (Windows 7 or later) auto-installs the necessary drivers and if your PC can not locate the drivers, you can download them from http://www.ftdichip.com/Products/FT232R.htm.



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# 3 Getting to Know the Development Board

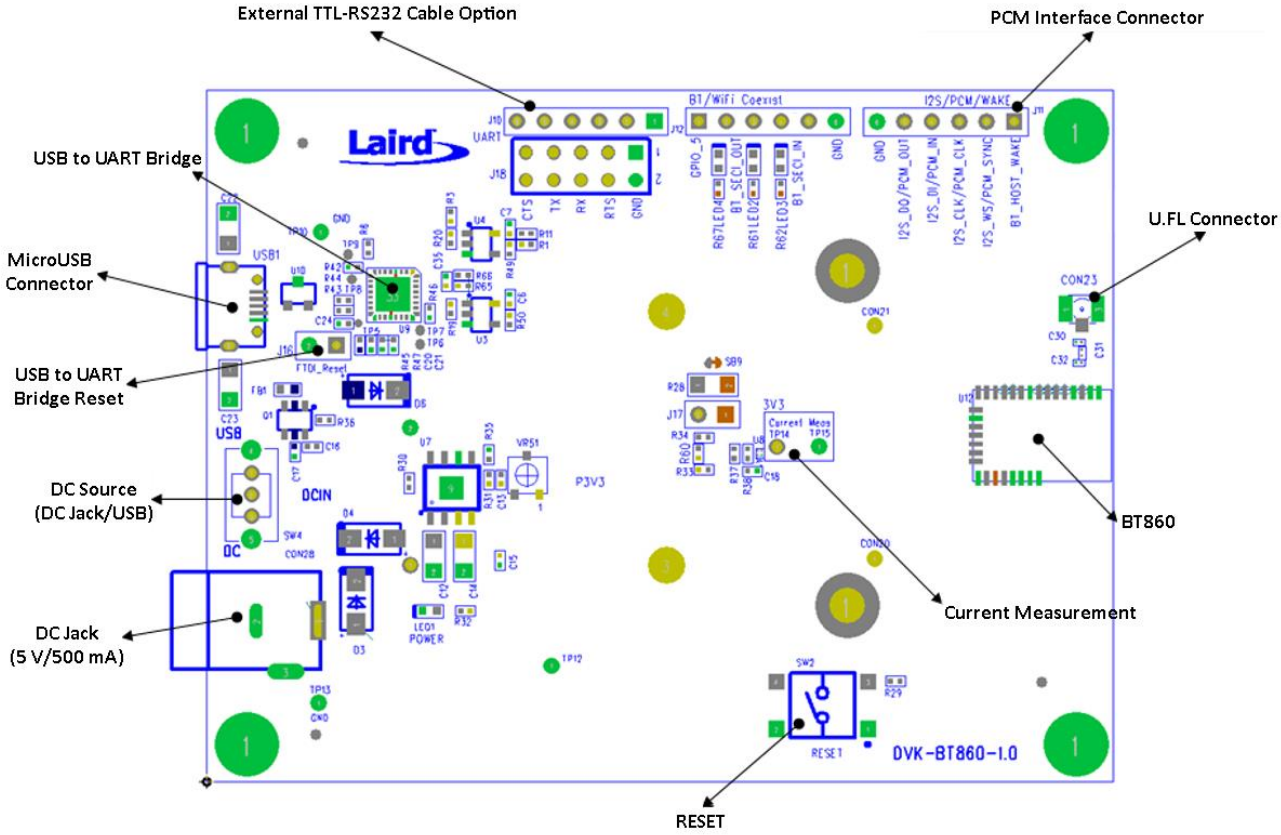


***Figure 1: Main DVK-BT860 board***

# 4 Power Supply

***Table 1: Input voltage***

| | Minimum | Typical | Maximum |
|---|---|---|---|
| **Input Voltage** | 4.5V | 5V | 5.5V |

Power supply options for powering development board from:

- USB
- External DC supply

The DVK-BT860-Sx includes a USB cable to provide power to the development board. This should be plugged into a PC USB port, a USB hub, or a mains adaptor with a USB output. If a hub is used, it should be a powered USB hub to ensure that sufficient current is available at the port. The BT860-Sx module can be driven by the available current at a USB port.

The low noise LDO (U7) on the DVK-BT860-Sx provides the 3.3V out to support the whole board's operating voltage.



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# 5 INTERFACE SPECIFICATION

## 5.1. GPIOs (PIN HEADER – J11 and J12)

There are four GPIO signals (GPIO[1; 5; 6; 7]) presented on pin header J11 and J12 individual. These can be used for an LED indicator or Cypress GCI (Global Coexistence Interface) or BT_HOST_WAKEUP. The following are the default settings by firmware on the BT860-Sx (Table 2).

***Table 2: J11 and J12 pin headers***

| GPIO Number | Function |
|---|---|
| GPIO_1 | BT_HOST_WAKEUP |
| GPIO_5 | LED indications |
| GPIO_6 | Cypress GCI; BT_SECI_IN (same as WLAN_Activity) |
| GPIO_7 | Cypress GCI; BT_SECI_OUT (same as BT_Activity) |

**Note 1:** All GPIOs functions are configured by firmware and any changes from the defaults would require a new firmware load.

The pin descriptions of J11 and J12 are shown in Table 3 and Table 4. Pin-1 is marked with a square pad.

***Table 3: J11 pin descriptions***

| J11 | Description | Direction |
|---|---|---|
| Pin-1 | GPIO[1] | O |

***Table 4: J12 pin descriptions***

| J12 | Description | Direction |
|---|---|---|
| Pin-1 | GPIO[5] | O |
| Pin-3 | GPIO[7] | O |
| Pin-4 | GPIO[6] | I |

There are four LED indicators on the DVK-BT860-Sx asshown in Table 5.

***Table 5: LEDs description and functions***

| LEDs | Description | Function | |
|---|---|---|---|
| **LED1** | Connected to the BT_SECI_I | Cypress GCI indication | |
| **LED2** | Connected to the BT_SECI_OUT | Cypress GCI indication | |
| **LED3** | Connected to the output of the U4 (LDO) | 3.3V power supply rail indication | |
| **LED4** | Connected to GPIO_5 | For BT860-Sx status indications including inquiry, connected, and data traffic. | |
| | | **BR/EDR Modes** | ▪ When in inquiry mode, the LED flashes with one-second periods.<br>▪ When the BT connection is created, the LED is in a solid light state<br>▪ When the BT has data traffic, the LED flashes with 250 ms periods |
| | | **LE Mode** | ▪ When in inquiry mode, the LED is flashing with 1 second periods.<br>▪ When the BT connection is created, the LED is in a solid light<br>▪ When the BT has data traffic, the LED is flashing with 250 ms periods |



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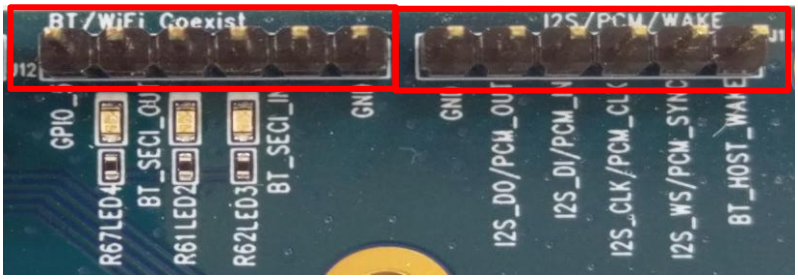


***Figure 2: Pin headers - J11 and J12***

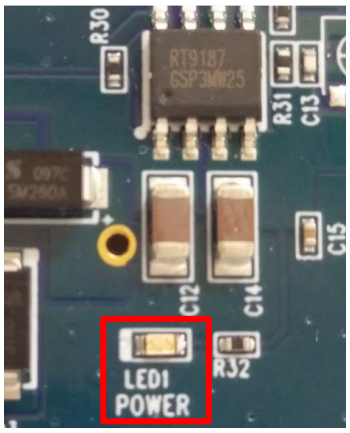


***Figure 3: LED1***

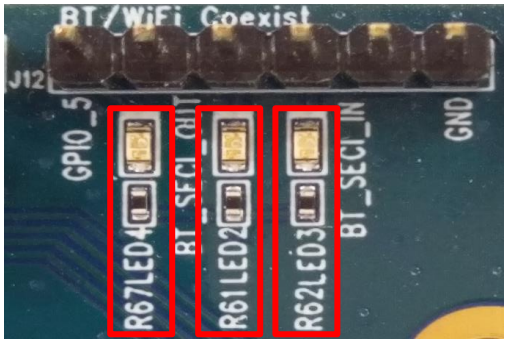


***Figure 4: LED2, LED3, LED4***

PLEASE NOTE – The LED4 status configuration is controlled by firmware, any changes from the above default, please contact Laird.

## 5.2. PCM/I²S Interface (Pin Header – J11)

The DVK-BT860-Sx has a four-wire digital audio port capable of operating in PCM or I²S mode; it is a dedicated audio interface and cannot be used as general purpose GPIOs.

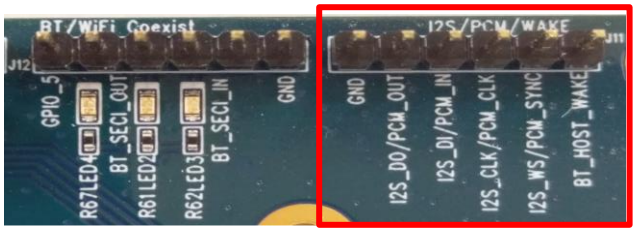


***Figure 5: Pin header J11***



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The pin descriptions of J11 in PCM/I²S are shown in 6.

***Table 6: J11 descriptions for PCM/I²S interface***

| J11 | Description (PCM/I²S/SPI) | Direction |
|---|---|---|
| Pin-2 | PCM_SYNC/I²S_WS | I/O |
| Pin-3 | PCM_CLK/I²S_CLK | I/O |
| Pin-4 | PCM_IN/I²S_DI | Input |
| Pin-5 | PCM_OUT/I²S_OUT | Output |
| Pin-6 | GND | |

## 5.3. 4-Wire UART Serial Interface

The DVK-BT860-Sx provides access to the TTL level HCI interface of the BT860-Sx module through pin header J10 (Figure 6) or through USB (via U9 FTDI USB-UART convertor chip). The default configuration is USB.

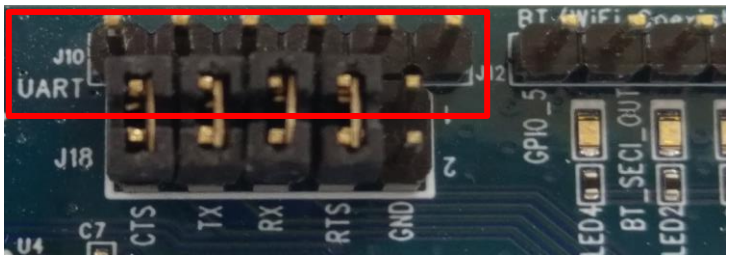


***Figure 6: Pin header J10***

**Note:** When you use the J10 to access the BT860-Sx module, you must remove all of the J18 jumpers.

The pins of header J10 are detailed in Table 6.

***Table 6: J10 descriptions***

| J10 | Description (UART) | Direction |
|---|---|---|
| Pin 1 | GND | |
| Pin 2 | Module_RTS | Output |
| Pin 3 | NA | |
| Pin 4 | Module_RX | Input |
| Pin 5 | Module_TX | Output |
| Pin 6 | Module_CTS | Input |

**Note:** For a 3-wire interface, you can leave RTS/CTS floating.
You can use just TX, RX and GND pin to access the module.



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### 5.3.1. UART Interface Driven by USB

| | |
|---|---|
| **USB Connector** | The development kit provides a USB Type micro-USB connector (USB1) which allows connection to any USB host device. The connector optionally supplies power to the DVK-BT860-Sx when SW4 is set to the USB position. The USB signals are connected to a USB to serial convertor device (FT232R) (Figure 7). |
| **USB – UART** | The development kit is fitted with a (U9) FTDI FT232R USB to UART converter which provides USB-to-Virtual COM port on any Windows PC (Win 7 or later). Upon connection, Windows auto-installs the required drivers. For more details and driver downloads, visit http://www.ftdichip.com/Products/FT232R.htm. |
| **UART Interface driven by USB FTDI chip** | **UART interface driven by USB FTDI chip.** In normal operation, the BT860-SxHCI interface is driven by the FTDI FT232R USB to UART converter. |

**Note:** Before using the 4-wire UART through J10, place the jumper on J16 to disable the function of FT232R.

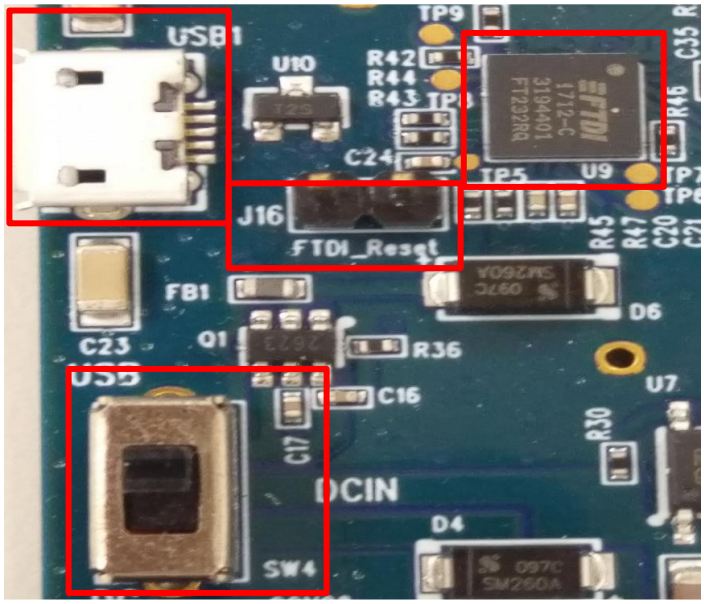


***Figure 7: Micro-USB Connector (USB1), FT232R (U9), SW4, and J16***

## 5.4. Push Button

SW2 (push button TACT switch) provides a reset signal to reset the BT860-Sx module (**Error! Reference source not found.**).

| Push Button | Label on DVK-BT860 PCB | Description |
|---|---|---|
| SW2 | Reset | Reset the BT860-Sx module |

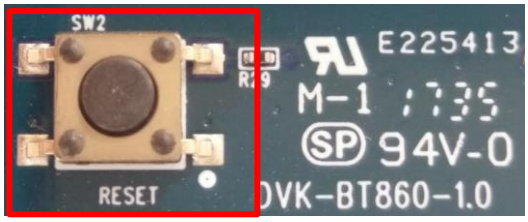


***Figure 8: SW2***



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# 6 Other Features

## 6.1. Current Consumption Measurement

A removable jumper (J17) is provided to break the power supply line directly to the module (if SB9 is cut), allowing you to measure current consumption. For normal operation, J17 must be fitted. Figure 9 shows the locations of SB9 and J17.

**Note:** This measures the current consumption of the BT860-Sx series module ONLY.

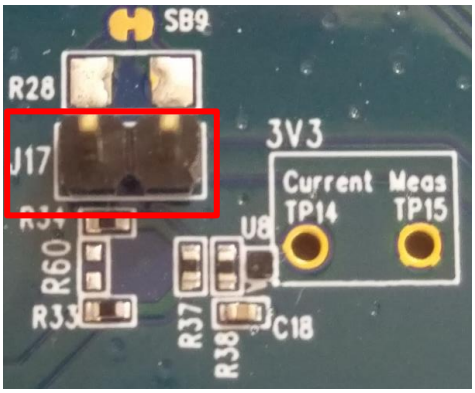


***Figure 9: Current measurement circuit***

To prepare the board for current measurement, **cut the shorting of the solder bridge SB9.** After this modification, there are two primary ways to measure the current consumption:

- **Using Ammeter –** Connect an ampere meter between the two pins of connector J17. This directly monitors the current.
- **Using Oscilloscope (Note below) –** Mount a resistor on the footprint R28. The resistor should not be larger than 10 Ohm. Connect an oscilloscope or similar with two probes on the pin on the J17 connector and measure the voltage drop. The voltage drop is proportional with current consumption. If a 1 Ohm resistor is chosen, 1 mV equals 1 mA.

There is also a third way to measure current:

- **Using Current Shunt Monitor –** The current drawn by the BT860-Sx module can be monitored using the Current Shunt Monitor (CSM), INA216 (U8). The gain of INA216 is 200 V/V for lowest possible drop voltage.

  **Note:** The Current Shunt Monitor method allows the dynamic current consumption waveforms on oscilloscope as the BT860-Sx radio operates. This can provide insight into power optimization.

Current consumed by the BT860-Sx series module is measured as a voltage (that is proportional to the current) using the CSM by connecting measuring voltmeter or oscilloscope to TP14 Connect measuring voltmeter or oscilloscope GND to TP15.

**I(mA) = Vmeas_TP14(mV) /51**

**CAUTION:** To avoid permanently damaging the current shunt monitor IC U8, do not short the TP14 output to GND.



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# 7 Additional Documentation

Laird offers a variety of documentation and ancillary information to support our customers through the initial evaluation process and ultimately into mass production. Additional documentation can be found at the BT860 product page under the documentation tab. It includes:

- BT860 – Class 1 BT4.2 Dual Mode HCI module – Product brief
- BT860 Datasheet - Hardware Integration Guide
- BT860 Using the BT860 with the BlueZ Linux BCCMD tool

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