

## General Description

The MAX32600 evaluation kit (EV kit) provides a convenient platform for evaluating the capabilities of the MAX32600 wellness measurement microcontroller. The EV kit also provides a complete functional system, ideal for developing and debugging applications.

The evaluation board includes a MAX32600 circuit, multiple power options, headers for access to the processor's I/O port pins and analog front-end devices, an 8-digit LCD display, USB interface, UART interface, low-power Bluetooth transceiver, and other general-purpose IO devices.

## Features and Benefits

- Easily Load and Debug Code Using the Included JTAG Adapter
- Selectable Power Sources Including USB, Coin Cell, Two AAA Batteries, or a Bench Power Supply
- Headers for Accessing MAX32600 I/O Pins and Analog Front-End (AFE) Input and Output Signals
- On-Board 8-Digit Alphanumeric LCD Glass

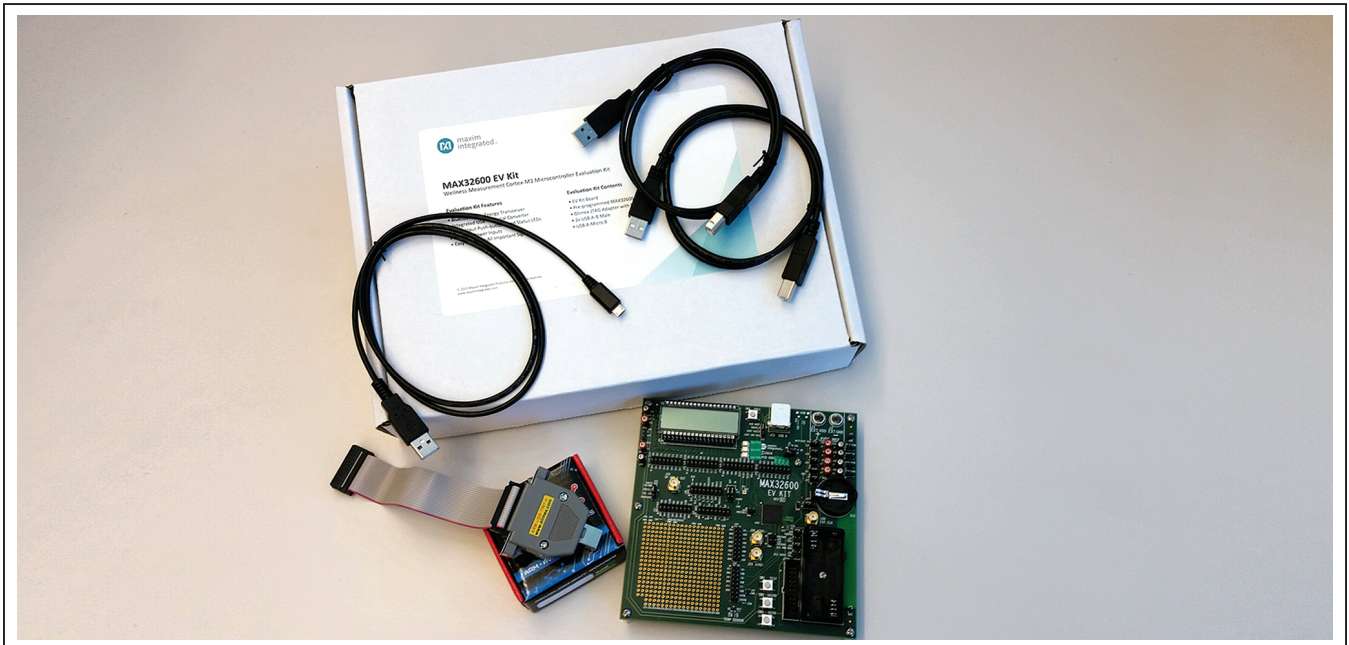
- MAX32600 Internal Real-Time Clock (RTC) with On-Board Supercap Keep-Alive Power
- On-Board Bluetooth 4.0 BLE Transceiver
- General-Purpose Pushbutton Switch, Indicator LEDs, and Beeper (All Connected to GPIOs) for User I/O
- Prototyping Matrix (0.1in Grid) with Integrated Power Rails for Customer Circuitry
- Proven PCB Layout
- Fully Assembled and Tested

## EV Kit Contents

- EV Kit Board Containing a MAX32600 with Preprogrammed Demo
- Olimex ARM®-USB-TINY-H JTAG Adapter with JTAG Ribbon Cable
- USB Standard A-to-Standard-B Cable (for Connecting the Olimex JTAG Adapter to a PC)
- USB Standard-A-to-Standard-B Cable
- USB Standard-A-to-Micro-B adapter Cable
- Quick Start Guide

Ordering Information appears at end of data sheet.

## EV Kit Contents



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## Quick Start

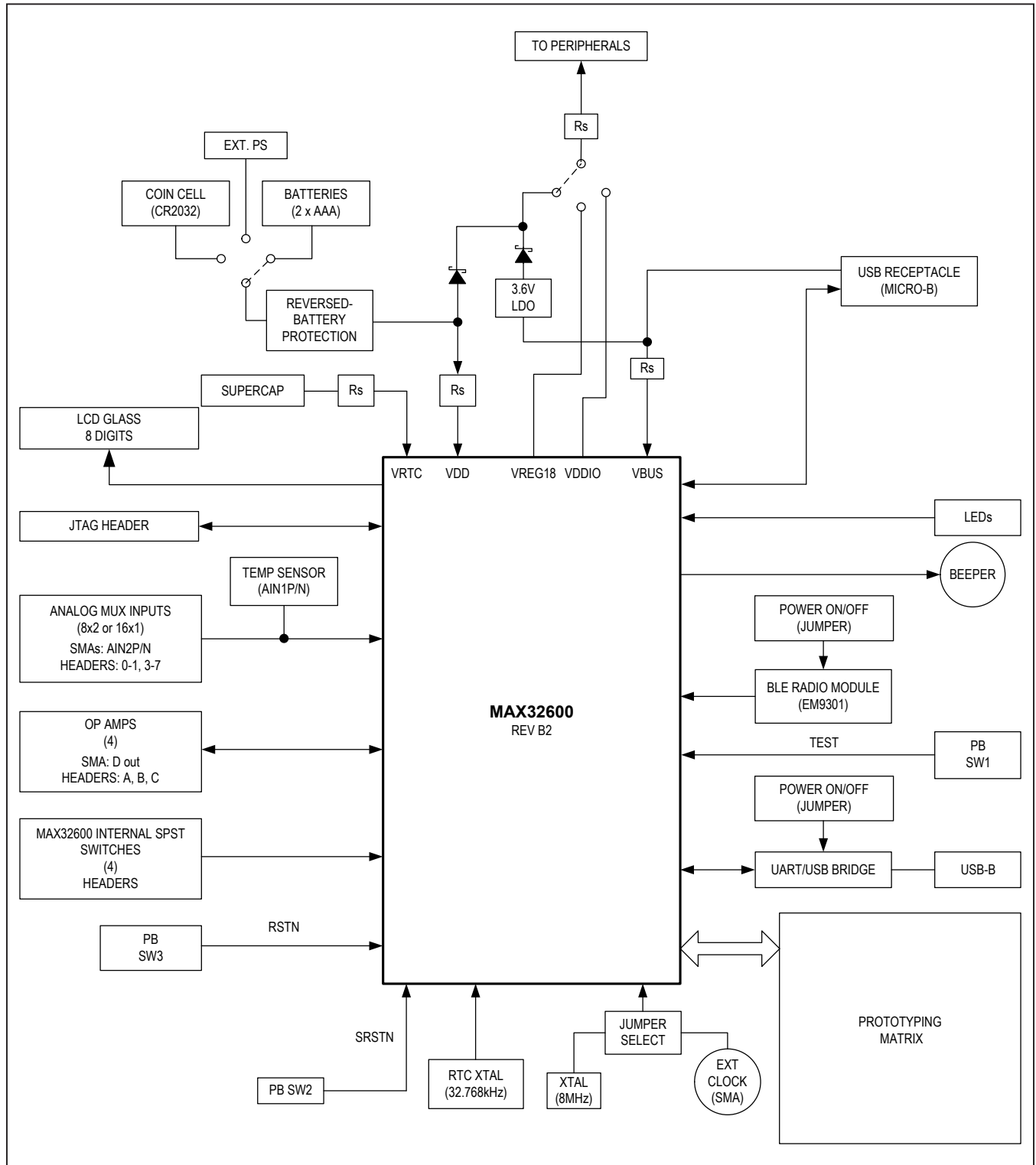
### Getting Started

The EV kit is fully assembled and tested. Follow the steps below to verify board operation:

- 1) While observing safe ESD practices, carefully remove the EV kit board from its packaging. Quickly inspect the board to make sure that no damage occurred during shipment.
- 2) Jumpers/shunts were preinstalled prior to testing and packaging. By default, they select the USB interface as the source of power for the EV kit board. The default jumper settings and all the jumper descriptions are described in the [Detailed Description](#) section.
- 3) The MAX32600 was preprogrammed with a Hello World demo program. To power up the board and run the demo, simply connect the Micro-USB cable to the Micro-USB jack found on the bottom side of the EV kit PCB. The jack is labeled **CN1**. To get +5V power, the other end of the Micro-USB cable can either be connected to a computer or to a USB wall charger. No data is sent over the USB in this demo.
- 4) Once power is applied, the Hello World demo begins, and the three LEDs (D4–D6) start flashing in an alternating fashion.
- 5) To change the LED flashing sequence, press the switch labeled TEST (SW1).
- 6) The demo also displays scrolling text on the LCD.
- 7) If the LEDs do not flash, verify that the USB port is supplying +5V.
- 8) Do not connect any additional USB cables or the Olimex JTAG adapter until after the tool chain/drivers are installed.

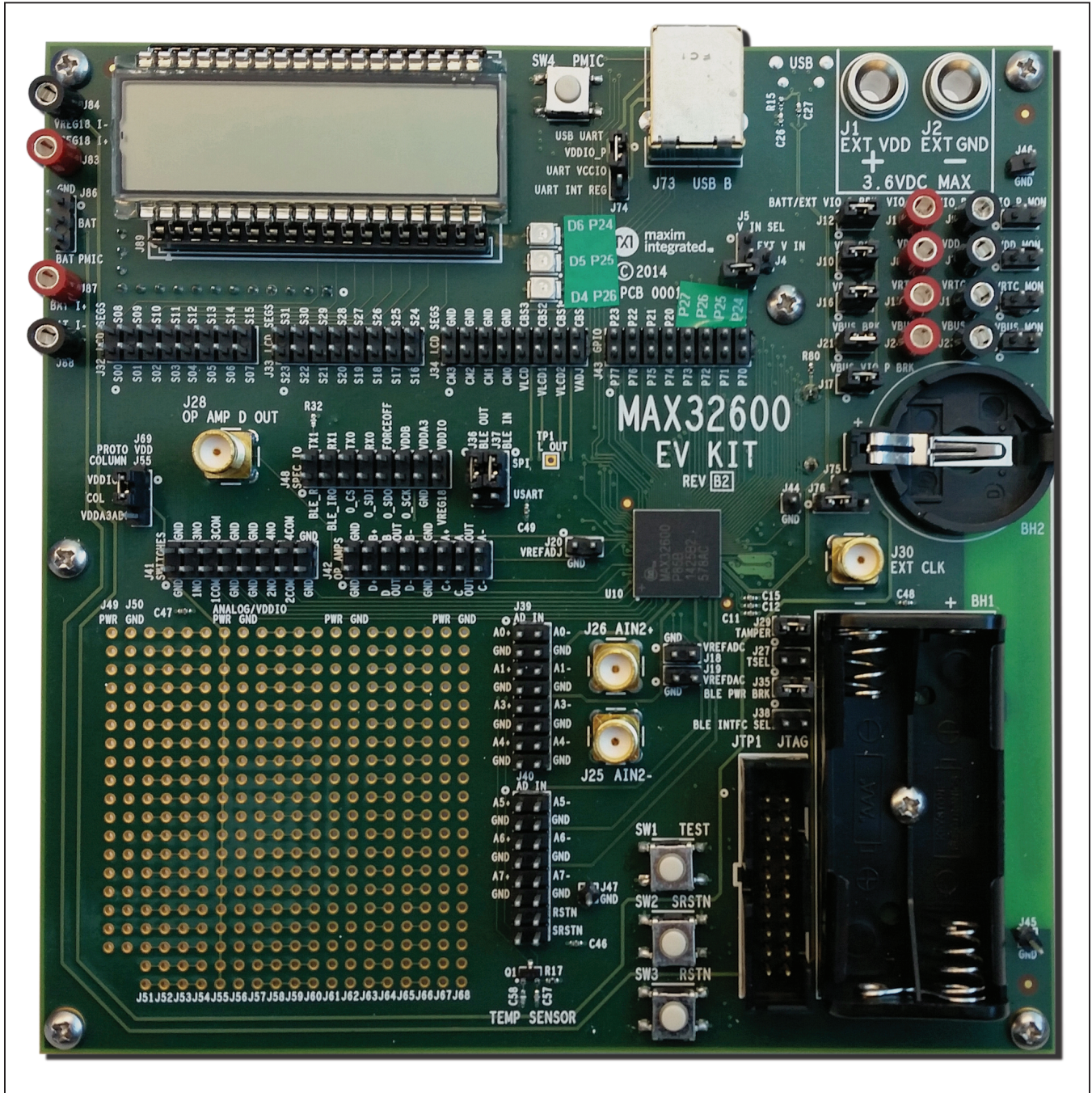
If the demo runs as expected, the next step is to download and run the installer, as described in the Quick Start Guide. The installer is a small application that allows the user to select which components they want to download and install, including tools, drivers, and documentation. A description of each component and the required hard-drive size is available by clicking on the respective component.

Block Diagram





MAX32600 EV Kit Board





## Detailed Description

This section describes each major function or component of the MAX32600 EV kit. This EV kit is general-purpose in nature and provides many user-selectable options.

### Board Power

The EV kit can be powered a few different ways.

The default jumper settings select the USB interface as the source of power for the EV kit board. To power up the board, simply connect the included Micro-USB cable to the Micro-USB jack (labeled CN1) found on the bottom side of the EV kit PCB. To get +5V power, the other end of the Micro-USB cable can either be connected to a computer or a USB wall charger. No data is sent over the USB, by default.

When 5V is available through the USB CN1 connector, the MAX32600 (IC) is automatically powered from this 5V input. When the IC senses 5V on its VBUS pin, internal power management automatically switches to utilize the VBUS input, with no power drawn from the VDD supply by the IC. Note that the U2 regulator output is set to 3.6V. This allows both the IC and on-board peripherals to be powered by the USB supply when present, and when the USB is not connected, closing jumper J12 allows the board peripherals to be powered from the same supply that powers VDD. When the USB is connected, the 3.6V output supply overrides the VDD source for the purposes of powering VDDIO\_P, since current will be forced through Schottky diode D3 and no current drawn through D1; otherwise, the IC's main power-supply input (VDD) can be supplied by on-board batteries or an external bench power supply. For the battery, the user can select either a lithium coin cell (Panasonic CR2032 or equivalent) or two AAA batteries. When using the bench supply, carefully observe the VDD limits (3.6V max). These power options are selectable with the combination of headers J5 and J4. Pin J5-2 is jumpered to one of the surrounding three pins to select the desired input. The VDD input rail is protected against accidental polarity reversals by a resettable fuse (F1) and Schottky diode (D2).

Jumpers J75/J76 provide several other options for powering the on-board peripheral devices, such as the Bluetooth transceiver, LEDs, pushbutton input switches, and piezo buzzer. These options are the currently selected VDD source supply (on-board batteries/bench supply, overridden by the 3.6V regulator output when the USB is connected), the IC's VDDIO output or VREG18 output. Note that VDDIO and VREG18 have load limits; refer to the MAX32600 IC data sheet for more details.

In cases where power is not supplied through the MAX32600 VDD or VBUS pins, the internal RTC and battery-backed states of the IC are maintained by drawing power from the 0.22mF supercap on VRTC. Application firmware on the IC must first ensure that the supercap has been charged by setting the appropriate control registers; refer to the User's Guide for more details.

### Current Monitoring

The VDD, VBUS, and VRTC power rails into the IC each have small series resistors to enable monitoring of current flow by measuring the associated voltage drop. The VDD and VBUS rails have 1.0Ω resistors, which provide 1mV/mA (or 1μV/μA) sensitivity. The VRTC rail has a 100Ω resistor to provide higher sensitivity (100μV/μA). Each resistor has two standard 2mm (.080in) tip jacks for access.

The VDDIO\_P rail that powers all peripherals on the board, as detailed above, also has a 1.0Ω series resistor to use for similar current measurements.

### Pushbuttons

Pushbutton switch SW1 can be used to generate an input for test purposes on port pin P0.7; SW1 is normally open and therefore provides a logic 0 when depressed. Firmware defines the action taken on this switch closure.

Use pushbutton SW2 to manually reset the IC (system-reset source); SW2 is normally open and asserts SRSTN (system reset) when depressed.

Pushbutton SW3 provides a global POR reset function for the IC by asserting the RSTN input.

### USB

The IC features an integrated USB 2.0 full-speed interface (12Mbps). This interface is accessible through the USB Micro-B receptacle, CN1.

### USB-to-UART Bridge

A USB-to-UART bridge chip (FTDI FT230X) is available on the EV kit. This bridge eliminates the requirement for a physical RS-232 COM port. Instead, MAX32600 UART access is through the USB standard-B connector, J73. Default parameters are 57600 baud, 8 bits, no parity, one stop bit, and no flow control.

The FT230X provides adjustable UART I/O levels based on its VCCIO input. Connecting VCCIO to VDDIO\_P (using J74/J75) will enable the FT230X I/O levels to track the IC's I/O levels. Maintaining this compatibility is important because of the wide operating range of the IC.

### LEDs

Three low-power (2mA typ) LEDs with series current-limiting resistors are included. LEDs D4 (green), D5 (red) and D6 (yellow) connect to the MAX32600 GPIO pins P1.6, P1.5 and P1.4, respectively. An LED illuminates when the appropriate GPIO pin is driven low.

### Beeper

A piezoelectric beeper connects to port P1.7. The beeper is activated when the P1.7 output is a square-wave signal. Maximum volume is obtained at the beeper resonant frequency, which is between 4kHz and 4.5kHz. Long-term DC bias should not be applied to the beeper, thus the default P1.7 output should be held at logic 1 (or open-circuit) when the beeper is not driven. For increased volume, drive the beeper differentially by installing R46 and uninstalling R45 and C28. P1.4 must then provide the complement of the P1.7 output.

### Bluetooth Low-Energy (BLE) Controller

A low-power Bluetooth controller (EM9301) is included on the EV kit board. The EM9301 controller is Bluetooth Specification V4.0 compliant. Communication with the IC is selectable through either an SPI or UART interface using jumpers J36 and J37. An in-board PCB antenna provides a convenient RF interface. A folded dipole formed by PCB etch is approximately 200Ω and connects directly to the EM9301 RF stage. Refer to the EM Microelectronic EM9301 data sheet for additional details.

### HF Crystal/Oscillator

The IC operates from an external 24MHz, 12MHz, or 8MHz crystal. The EV kit board has an 8MHz crystal (Y2) installed. Optionally, an external precision clock source can be selected by installing R27 and depopulating R28. J30 is the SMA connector for input of the external high-frequency clock if the crystal is not used.

### SMA Connectors

SMA connectors are included on several AFE interfaces for more robust connectivity to test equipment, if desired. J26 and J25 provide access to the analog mux inputs, AIN2+ and AIN2-/AIN10+, respectively. The configuration of these two pins is programmable. They can be combined as a single differential input, or seen as independent single-ended inputs.

J28 provides access to the OPAMP-D output, so the output of any of the four D-to-A converters can be examined.

### Temperature Sensor

Transistor Q1 is configured as a forward-biased diode with a series resistor, R17. If desired, this circuit can be designed into a constant-current configuration using other MAX32600 AFE devices. See Maxim Application Note 4296: *Measuring Temperature with the MAX1358 Data Acquisition System* for an explanation of a similar example configuration using the MAX1358.

### JTAG Connector

The ARM standard 20-pin connector is provided by shrouded header JTP1. Various debugger modules are available for this interface. The Olimex ARM-USB-TINY-H debugger is included with the EV kit.

### LCD Glass

The IC provides an integrated LCD controller for driving up to 160 segments. A standard 8-digit, reflective LCD glass is included on the EV kit board. Each digit is comprised of a 14-segment character, plus a decimal point and apostrophe for a total segment count of  $8 \times 16 = 128$ .

### Prototyping Area

An area for adding customer-specific circuitry is provided. This matrix is on 0.1in spacing and is usable for solder or wire-wrap construction. Power and ground rails run through the matrix. The pads are interconnected, as shown in [Figure 1](#). In addition, one of the power rails can switch between VDDIO\_P and VDDA3ADC. Refer to the MAX32600 IC data sheet for VDDA3ADC current-sourcing characteristics.



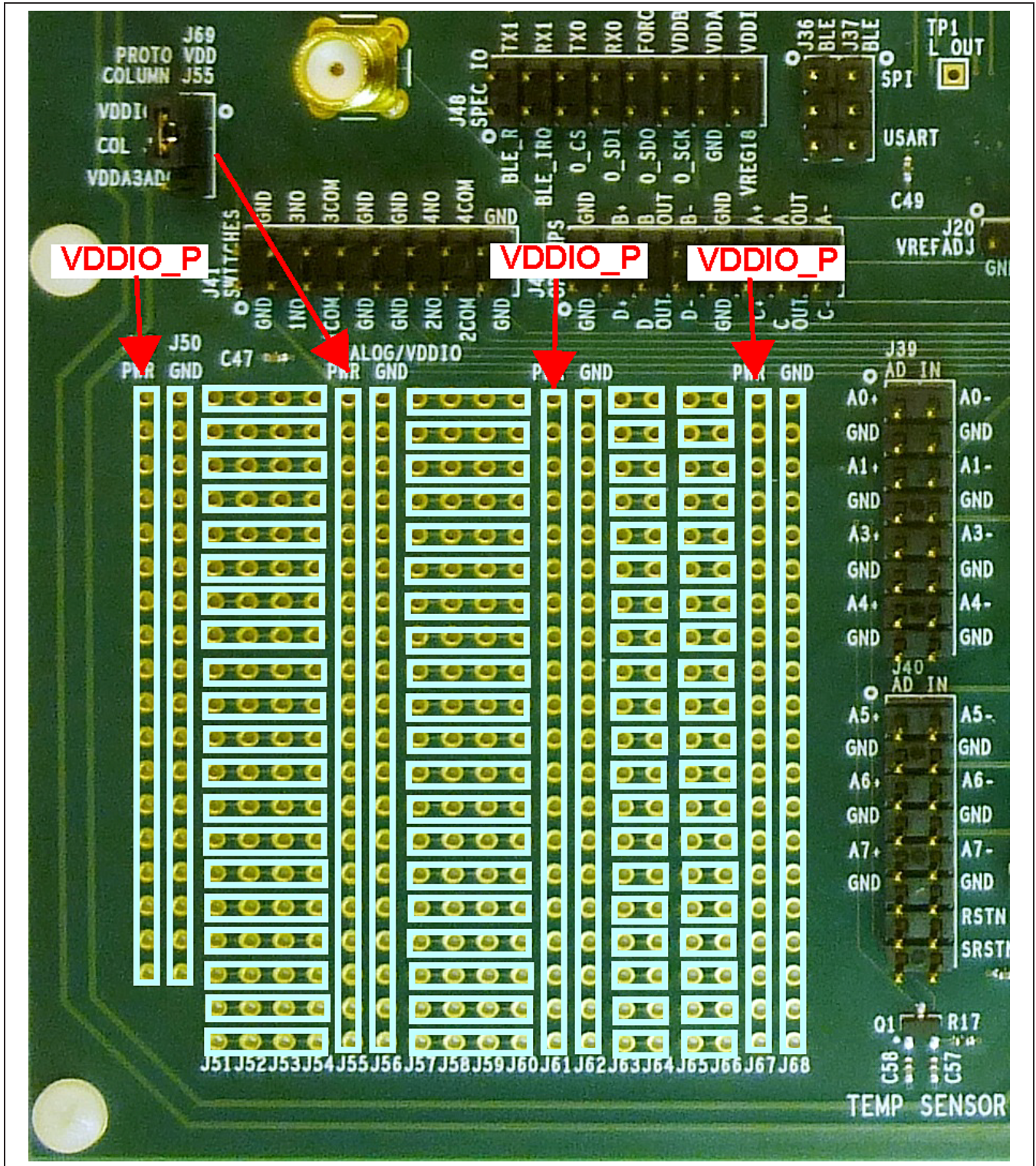


Figure 1. MAX32600 EV Kit Prototype Area



## Jumper Descriptions

[Table 1](#) details the functions of the configurable jumper headers on the EV kit board. The headers are standard 0.1in spacing and .025in posts. Settings in the table marked with an asterisk (\*) indicate the default settings.

**Table 1. EV Kit Jumper Functions and Default Settings**

JUMPER	SETTING	EFFECT OF SETTING
J4, J5 (V IN SEL)	Open*	Board is powered by the USB (CN1).
	J5-2 to J4-1 Closed	Selects the external lab supply as power option for the board. The external supply must be connected through the J1(+) and J2(-) banana jacks. <b>Note:</b> Carefully observe polarity and the 3.6V $V_{DD}$ maximum.
	J5-2 to J5-1 Closed	Selects the coin-cell battery as power option for the board. A 3V lithium coin cell (CR2032 or equivalent) must be installed in BH2. The (+) side of the battery is UP.
	J5-2 to J5-3 Closed	Selects the AAA batteries as power option for the board. Two AAA cells (nominal 1.5V each) must be installed in BH1. Observe polarities as marked in the holder.
J10 (VDD BRK)	Open	Connection broken between the MAX32600 VDD power input and Batteries/Ext PS.
	Closed*	Connection enabled between MAX32600 VDD power input and Batteries/Ext PS.
J12 (BATT/EXT VDDIO_P BRK)	Open	Connection broken between VDDIO_P (board peripherals power) and Batteries/Ext PS.
	Closed*	Connection enabled between VDDIO_P (board peripherals power) and Batteries/Ext PS.
J16 (VRTC BRK)	Open	Connection broken between MAX32600 VRTC and supercap.
	Closed*	Connection enabled between MAX32600 VRTC and supercap.
J17 (VBUS VDDIO_P BRK)	Open	Connection broken between the 3.6V LDO and VDDIO_P.
	Closed*	Connection enabled between the 3.6V LDO and VDDIO_P.
J21 (VBUS BRK)	Open	Connection broken between the USB connector VBUS (5V nominal) and the MAX32600 VBUS power input.
	Closed*	Connection enabled between the USB connector VBUS (5V nominal) and the MAX32600 VBUS power input.
J27 (TSEL)	Open*	MAX32600 TSEL input is logic 1. The MAX32600 JTAG input is connected to the ARM JTAG port.
	Closed	MAX32600 TSEL input is logic 0. The MAX32600 JTAG input is connected to the MAX32600 test access port (TAP) controller. <b>Note:</b> This setting is intended for Maxim-Internal testing only and cannot be used for application development.
J29 (TAMPER)	Open	The MAX32600 TamperO-to-TamperI connection is broken. If the dynamic tamper sensor function is enabled on the MAX32600, breaking this connection will trigger a tamper response.
	Closed*	The MAX32600 TamperO-to-TamperI connection is made. This connection should be left closed, unless you are testing the dynamic tamper sensor function.

**Table 1. EV Kit Jumper Functions and Default Settings (continued)**

JUMPER	SETTING	EFFECT OF SETTING
J35 (BLE PWR BRK)	Open	Connection broken between VDDIO_P and the EM9301 BLE controller. The controller is disabled.
	Closed*	Connection enabled between VDDIO_P and the EM9301 BLE controller.
J36 (BLE OUT)	Open	No communication/control between the MAX32600 and the BLE controller.
	2-1*	SPI bus communication between MAX32600 (SDI) and the BLE (MISO output) is connected.
	2-3	UART communication between MAX32600 (RX1) and the BLE (TX) is enabled.
J37 (BLE IN)	Open	No communication/control between the MAX32600 and the BLE controller.
	2-1*	SPI bus communication between MAX32600 (SDO) and the BLE (MOSI input) is enabled.
	2-3	UART communication between MAX32600 (TX1) and the BLE (RX) is enabled.
J38 (BLE INTFC SEL)	Open*	SEL input to the BLE controller is set to logic 1. This enables the EM9301 SPI interface.
	Closed	SEL input to the BLE controller is set to logic 0. This enables the EM9301 UART interface.
J69 (PR VDD SEL)	Open	No power applied to Proto Matrix J55 power rail.
	2-1*	VDDIO_P power connected to Proto Matrix J55 power rail.
	2-3	VDDA3ADC power connected to Proto Matrix J55 power rail. Current constraints exist. Consult Maxim engineering before using this option.
J74 (USB-UART IO LEVEL)	Open	USB-UART Bridge IOs are unpowered.
	2-1*	USB-UART Bridge IO levels track VDDIO_P.
	2-3	USB-UART Bridge IO levels are fixed at 3.3V.
J75, J76 (VDDIO_P SELECT)	Open	Board peripherals are unpowered.
	J76-2 to J76-1 Closed *	VDDIO output from MAX32600 powers peripherals.
	J76-2 to J76-3 Closed	VREG18 output from MAX32600 powers peripherals.
	J76-2 to J75-1 Closed	Batteries, external PS, or LDO power the peripherals. If a USB host is connected to the micro-B connector (CN1), the 3.6V LDO output overrides the battery voltages through the D1/D3 Schottky diodes.

\*Default position.

### Additional Resources

- Additional Resources
- MAX32600 EV Kit Quick Start
- MAX32600 EV Kit Data Sheet (this document)
- MAX32600 EV Kit Schematic\*
- MAX32600 IC Data Sheet\*
- MAX32600 User's Guide\*
- ARM Cortex® Toolchain User's Guide – README\*
- MAX32600 CMSIS Libraries – Firmware User's Guide\*
- Example projects and app notes describing them\*

\*A lot of valuable information resides in the **MAX32600 Resources** component of the Installer. Once this component is installed, the information can then be found in the Windows Start Menu under Maxim Integrated, as shown in [Figure 2](#).

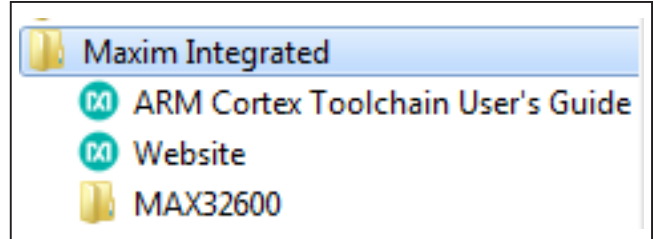


Figure 2. Screenshot of Installed Files and Folders

### Technical Support

For technical support, visit <http://support.maximintegrated.com>.

### Component List

Refer to files “MAX32600 B2 DS BOM.xlsx” and “MAX32600 Schematics.pdf” attached to this PDF for component information.



### Ordering Information

PART	TYPE
MAX32600-KIT#	EV Kit

#Denotes RoHS compliant.

## Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	11/14	Initial release	—

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at [www.maximintegrated.com](http://www.maximintegrated.com).

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