MAX30001G Evaluation Kit

General Description

The MAX30001G evaluation kit (EV kit) provides a single platform to evaluate the functionality and features of the MAX30001G with Biopotential (ECG and R-to-R) and Bioimpedance (BioZ) optimized for Galvanic Skin Response (GSR) measurement capabilities. The EV kit includes a MAX30001G evaluation kit (EV kit) and a MAX32630FTHR Cortex-M4F microcontroller for wearables. The MAX32630FTHR provides power to the MAX30001G EV kit and contains the firmware necessary to use the EV kit GUI program. The EV kit ships with jumpers installed and supply voltages set to typical operating values. Optional connections exist which can be shunted to make use of different functionalities.

This EV kit is not a medical device.

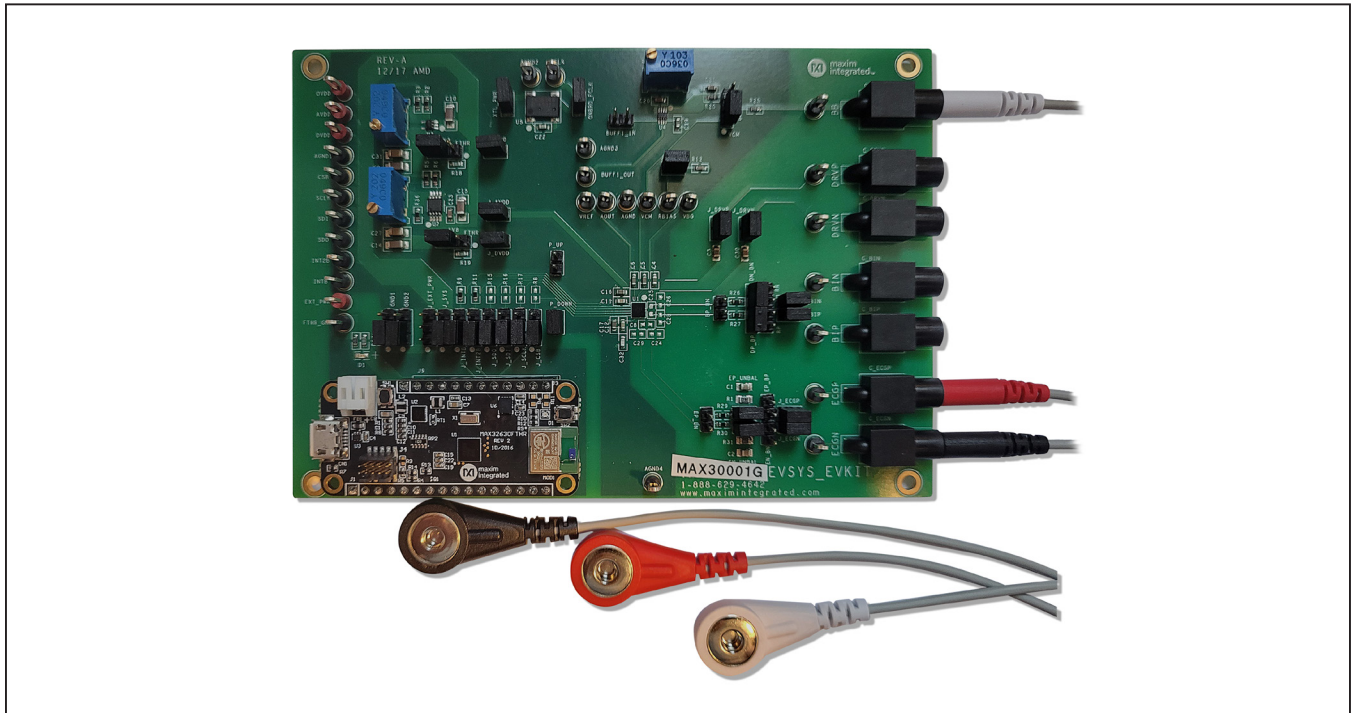*Ordering Information* **appears at end of data sheet.**

Features

- Convenient Platform to Evaluate the MAX30001G
- Many Easy-to-Reach Test Points
- Measure Individual Supply Currents
- Touchproof Cable Connectors
- Windows® 7/8/10 Compatible GUI software
- Fully Assembled and Tested
- Facilitates IEC 60601-2-47 Compliance Testing
- Ultra-Low-Power Design

EV kit Contents

- MAX30001G EV kit
- MAX32630FTHR
- USB A to micro-USB cable
- Three (3) ECG cables

MAX30001G EV Kit Board Photo

Windows is a registered trademark and registered service mark of Microsoft Corporation.

MAX30001G EV kit Files

FILE	DECRIPTION
MAX30001G EVKit.exe	PC GUI Program

Quick Start

Required Equipment

Note: In the following sections, software-related items are identified by bold text. Text in **bold** refers to items directly from the install of EV kit software. Text which is **bold and underlined** refers to items from the Windows operating system.

- MAX30001G EV kit
- MAX32630FTHR
- Micro-USB cable
- Windows PC with USB port

Procedure

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

1) Confirm that the MAX32630FTHR is firmly seated in connectors J8 and J7 in the proper orientation.

2) Set the EV kit hardware on a nonconductive surface to ensure that nothing on the PCB shorts together.

3) Connect the EV kit hardware to a PC with the provided USB cable. Attach the micro-USB end to the MAX32630FTHR board and the type A end to the host PC. Once connected, LED D1 on the MAX32630FTHR will blink red, and LED D1 on the EV kit board will be green.

4) Windows should automatically begin installing the necessary device driver. The USB interface of the EV kit hardware is configured as a COM device and therefore does not require a unique/custom device driver. Once the driver installation is complete, a Windows message appears near the System Icon menu, indicating that the hardware is ready to use. Do not attempt to run the GUI before this message. If you do, then you must close the application and restart it once the driver installation is complete. On some versions of Windows, administrator privileges may be required to install the USB device.

5) Once the device drivers have been installed, download the latest EV kit software (MAX30001G EVKitSoftware-Install.ZIP) and extract it to a temporary folder.

6) Open the extracted ZIP folder and double-click the .EXE file to run the installer. If a message box stating "The publisher could not be verified. Are you sure you want to run this software?" appears, select the **Yes** option.

7) When the installer GUI appears, click **Next**. Select the installation paths and if a shortcut should be created on the desktop. When prompted, press **Install**. Once complete, click **Close**.

8) Double-click the shortcut to start the GUI. Alternatively, go to Start | All Programs. Look for the MAX30001G EVKitSoftware folder and click on the MAX30001G EVKitSoftware.EXE file inside the folder.

9) After the initial splash screen, when the GUI appears, the text in the right field of the status strip at the bottom of the GUI window should display **Hardware Connected** and the COM port associated with the EV kit.

Detailed Description of Software

Software Startup

If the EV kit is connected when the software is opened, the software first initializes the hardware to communicate. The software then reads the device registers and updates all the associated control fields displayed on the GUI. The status strip at the bottom of the GUI displays the MAX32630FTHR firmware version, the GUI version, and the hardware's associated COM port.

If the EV kit is not connected on startup, the **Connection Issue** dialog box shown in Figure 1 appears after the GUI splash screen. Clicking **OK** opens the **Connection** window of the GUI. Use the **Scan Ports** button to identify all COM ports in use by the PC and select the port associated with the EV kit hardware in the **COM Port** drop down menu. This window, shown in Figure 2, may appear if connecting to the EV kit for the first time even if the hardware is connected before starting the GUI.

Once the correct COM port is selected, press **Connect** at the bottom center of the GUI to enter the main window. The program reads all device registers and updates the control fields of the GUI.
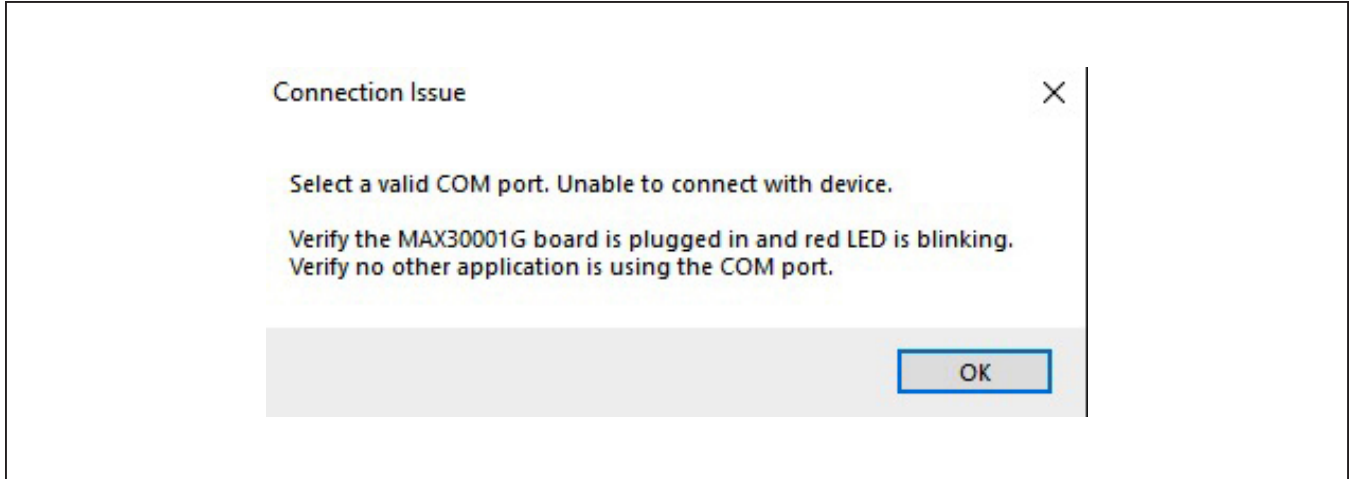
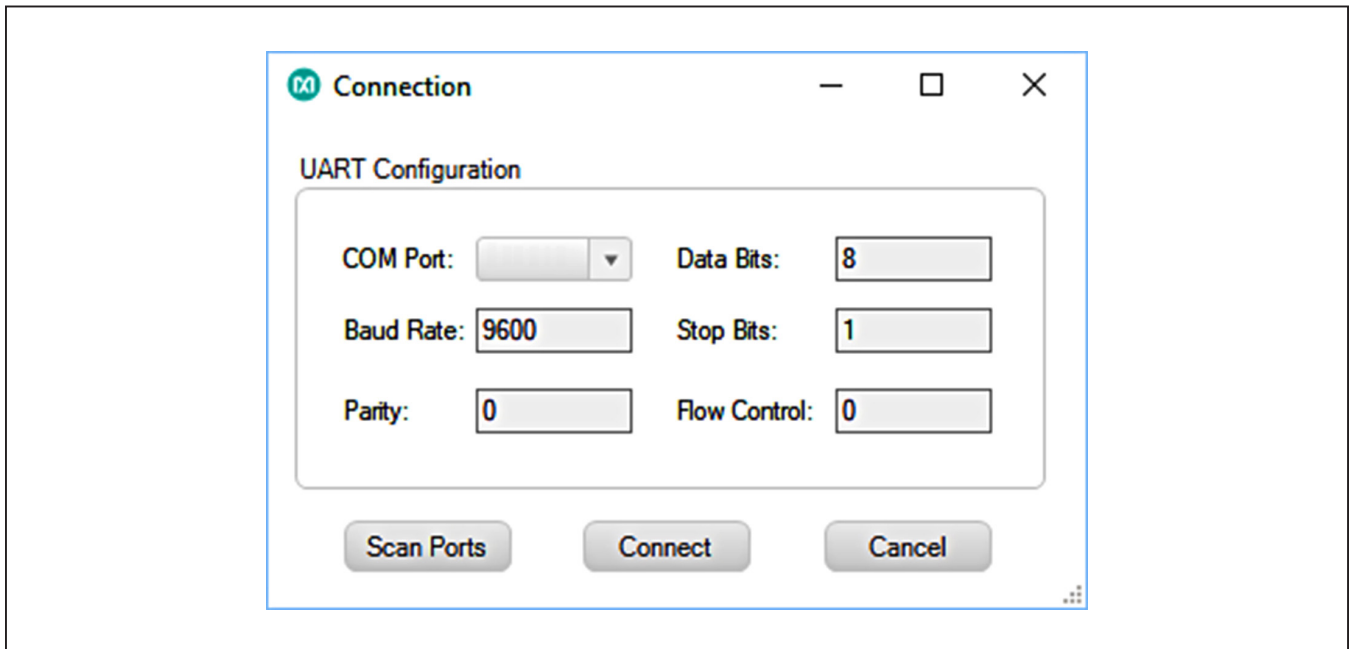*Figure 1. The Connection Issue Dialog Box Appears If The GUI Does Not Detect the EV Kit.*

Figure 2. The Connection Screen Allows The User to Select Which COM Port Contains the EV Kit.

ToolStrip Menu Bar

The ToolStrip menu bar (Figure 3) is located at the top of the GUI window. This bar comprises the **File**, **Device**, **Options**, **Logging**, and **Help** menus whose functions are detailed in the following sections.

File Menu

The **File** menu contains the option to exit out of the GUI program.

Device Menu

The **Device** menu provides the ability to connect or disconnect an EV kit to the GUI. If a board is disconnected while the GUI is open the GUI will display **Hardware Not Connected** in the lower right corner. If the device is then plugged back in, the user will be able to navigate to the **Device** menu and select **Connect**. If successful, the bottom right corner of the GUI will read **Device Connected** and display the COM port to which the hardware is connected.

Options Menu

The **Options** menu provides several settings to access more features offered by the GUI. **Show MAX30001G Register Names** changes all the control field names to correspond with their register names in the data sheet. **BioZ Milliohm Scale** configures the scaling on the BioZ plot to be shown in milliohms rather than ohms for a zoomed in the display of the BioZ measurement. **Plots Maximum Time** allows the user to select how many seconds of data they want to be shown on the plot at one time. The selected time will still show 10 divisions and each division will be 1/10 of the maximum time. By default, the maximum time is 10 seconds.

Load Register Settings allows the user to quickly set up the GUI based on previous, saved register settings. The **Save Register Settings** item is used to save the current register settings to be loaded again at a later time. The **Show Advanced Tab** setting will add an extra tab in the GUI called **Advanced**. The advanced tab is described in depth in the **Tab Control** section of this document.

Logging Menu

The **Logging** menu provides a way to export accurate, exact data that is being measured by the device. The four log options are **ECG File Log**, **R-To-R File Log**, **Pace File Log**, and **BioZ File Blog**. Selecting any log option opens a prompt asking for a name for the comma-separated-value (CSV) log file, as well as the location to save the generated file. Figure 4 shows the GUI when creating a log file. Data logging begins when **Start Monitor** is pressed on the **Plots** tab and ends when **Stop Monitor** is pushed. The GUI disables logging after one monitoring session and a new file must be generated through the **Logging** menu to log the next dataset.

Help Menu

The **Help** menu contains information that can be helpful in aiding with any problems which may arise in the use of the GUI. **Online Documentation** takes the user to the Maxim Integrated website associated with the MAX30001G where all documents that are associated with the part are located. The **About** option displays the GUI splash screen which tells the user which GUI version is being used.

Tab Control

The main interface structure of the GUI consists of a tab control, where each tab contains controls relevant to various blocks of the device. Changing these interactive controls triggers a write operation to the MAX30001G to update the register contents. Likewise, these controls are refreshed when reading from the device.

Tabs responsible for configuring measurements contain block diagrams of their respective channel. To configure a measurement channel, select the desired values from the drop down list items in and below the diagram. Switches in the block diagrams open and close according to the device configuration.
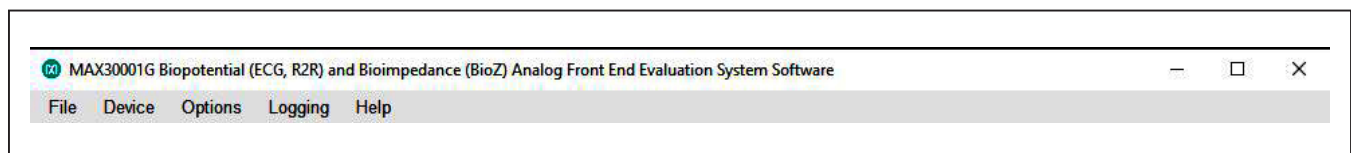

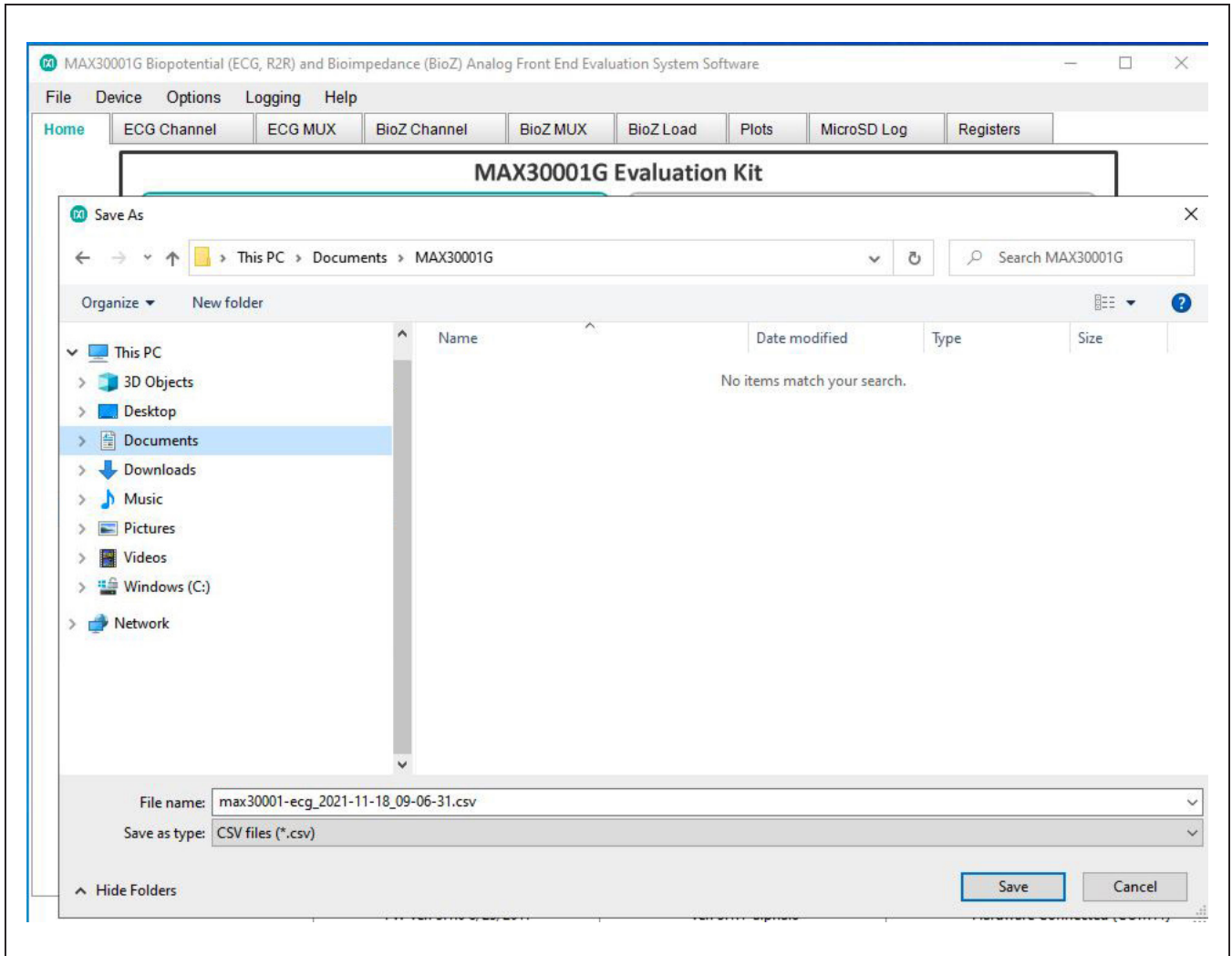*Figure 3. The ToolStrip Menu Items.*

Figure 4. Saving a Log File.

Home Tab

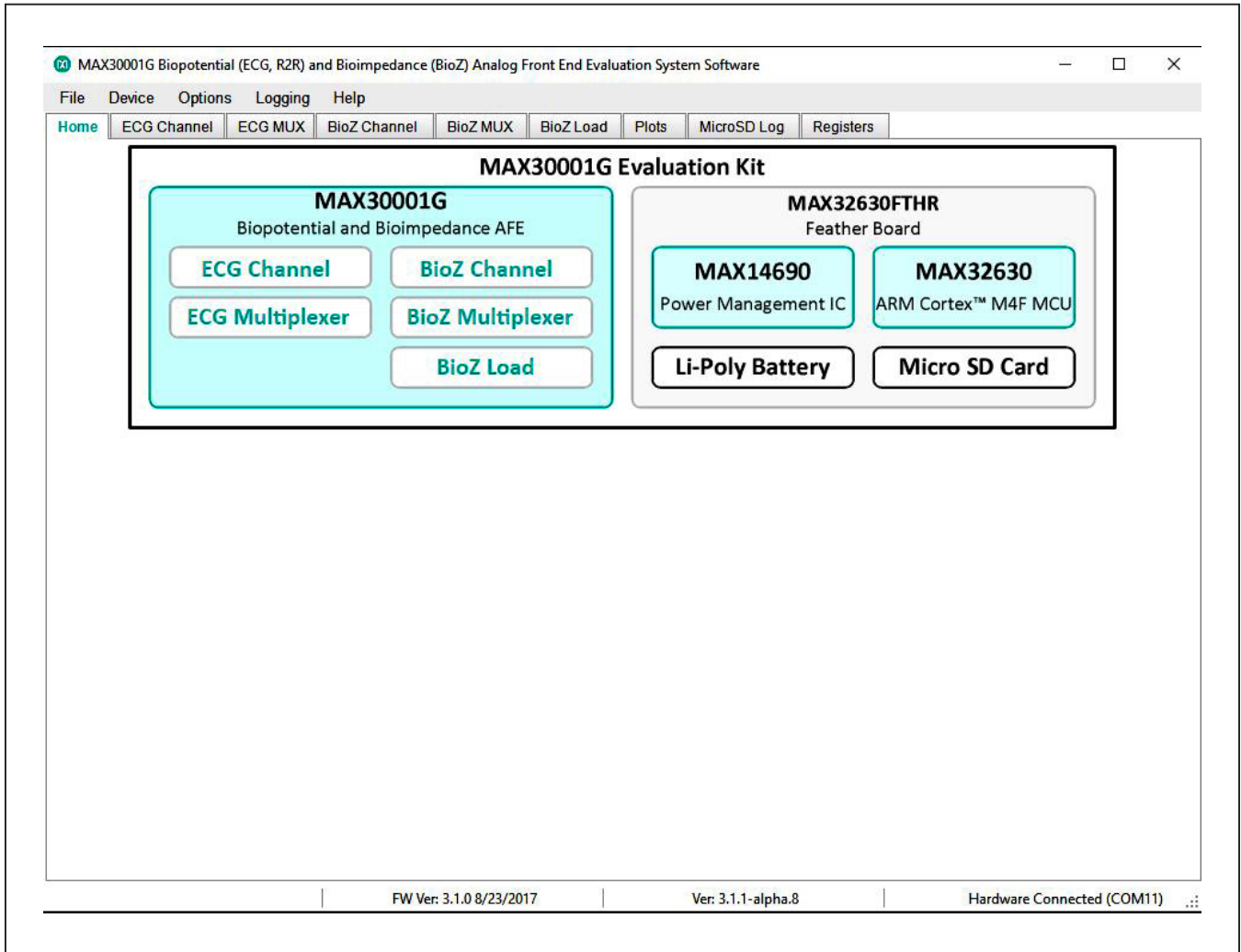The **Home** tab (Figure 5) provides an overview of the MAX30001G EV kit's features.

Figure 5. MAX30001G EV Kit GUI Home Tab

ECG Channel Tab

The **ECG Channel** tab ([Figure 6](#)) contains all settings which dictate the signal processing behavior of the ECG measurement channel. Controls for the ECG input channel, such as Fast Recovery settings, gain for the programmable amplifier, and the ADC sampling rate, are found in the **ECG Channel** block diagram. The **R-to-R** box configures R-to-R detection using the ECG input data.

A detailed description of all ECG channel configuration settings and R-to-R functionality can be found in the MAX30001G data sheet.

Figure 6. MAX30001G EV Kit ECG Channel Tab.

ECG MUX Tab

The **ECG MUX** tab (Figure 7) configures the internal ECG switches that precede the ECG amplifiers and filters. Internal calibration and verification functions of the IC are also accessible from this tab. To measure external ECG signals, the **ECGP Switch** and **ECGN Switch** in the **Switches** block must be set to **Connected**. **The switches should be set to Isolated if Calibration Test Voltage** is used. It is also recommended to have **Resistive Lead Bias Enable** set to **ECG Bias**, **Resistive Bias Value** set to **100MΩ**, **Positive Input Bias Enable** and **Negative Input Bias Enable** set to **Connected**. **DC Lead-Off Check**, **ULP Lead-On Check**, and **Calibration Test Voltage** functionalities are detailed further in depth in the MAX30001G data sheet.
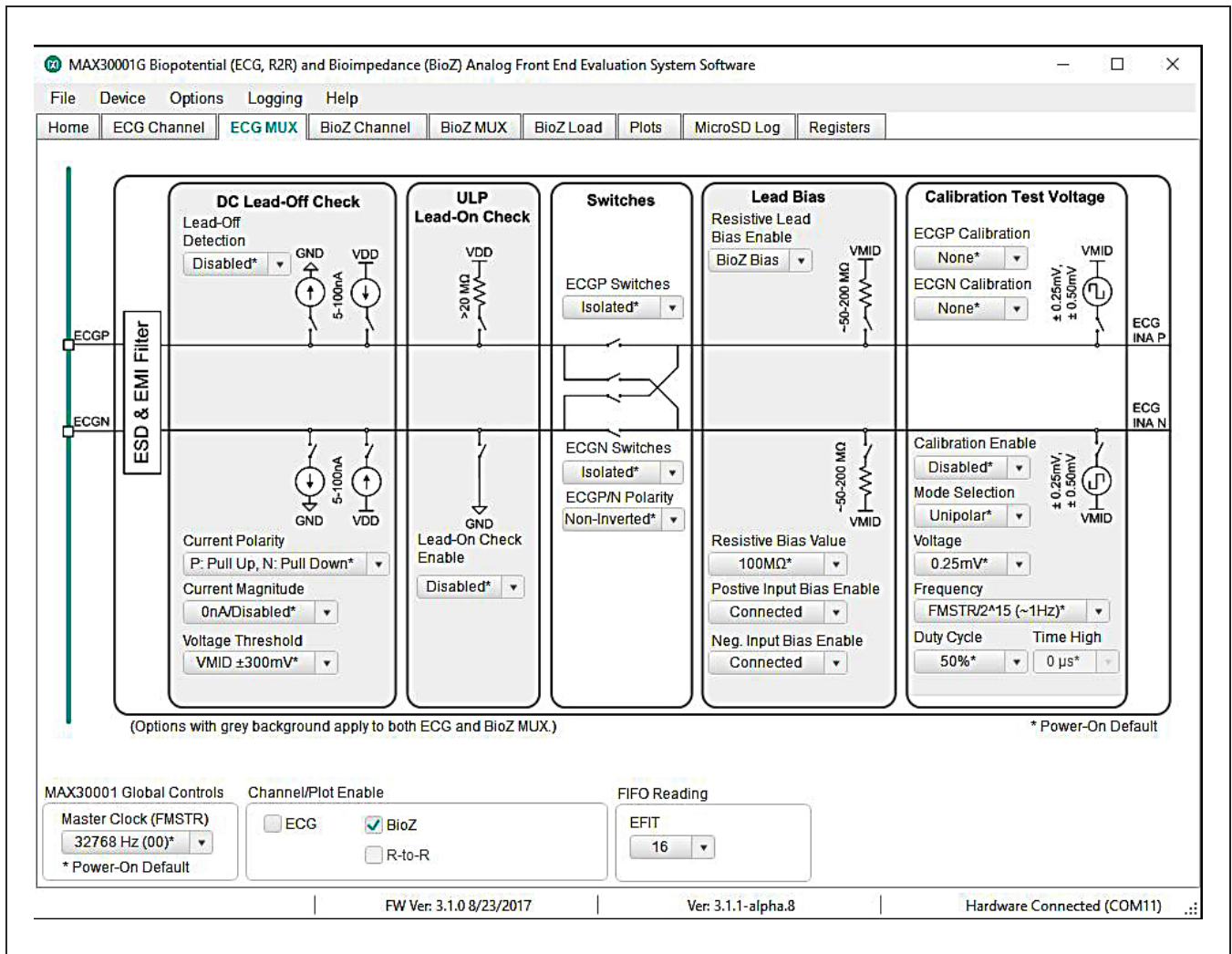

Figure 7. MAX30001G EV Kit ECG MUX Tab

BioZ Channel Tab

The **BioZ Channel** tab (Figure 8) hosts the settings that control the BioZ components following the BioZ Input MUX. As in the **ECG Channel** tab, controls on this tab configure the filters and amplifiers of the device's BioZ channel.

A detailed description of all BioZ channel configuration settings can be found in the MAX30001G data sheet.
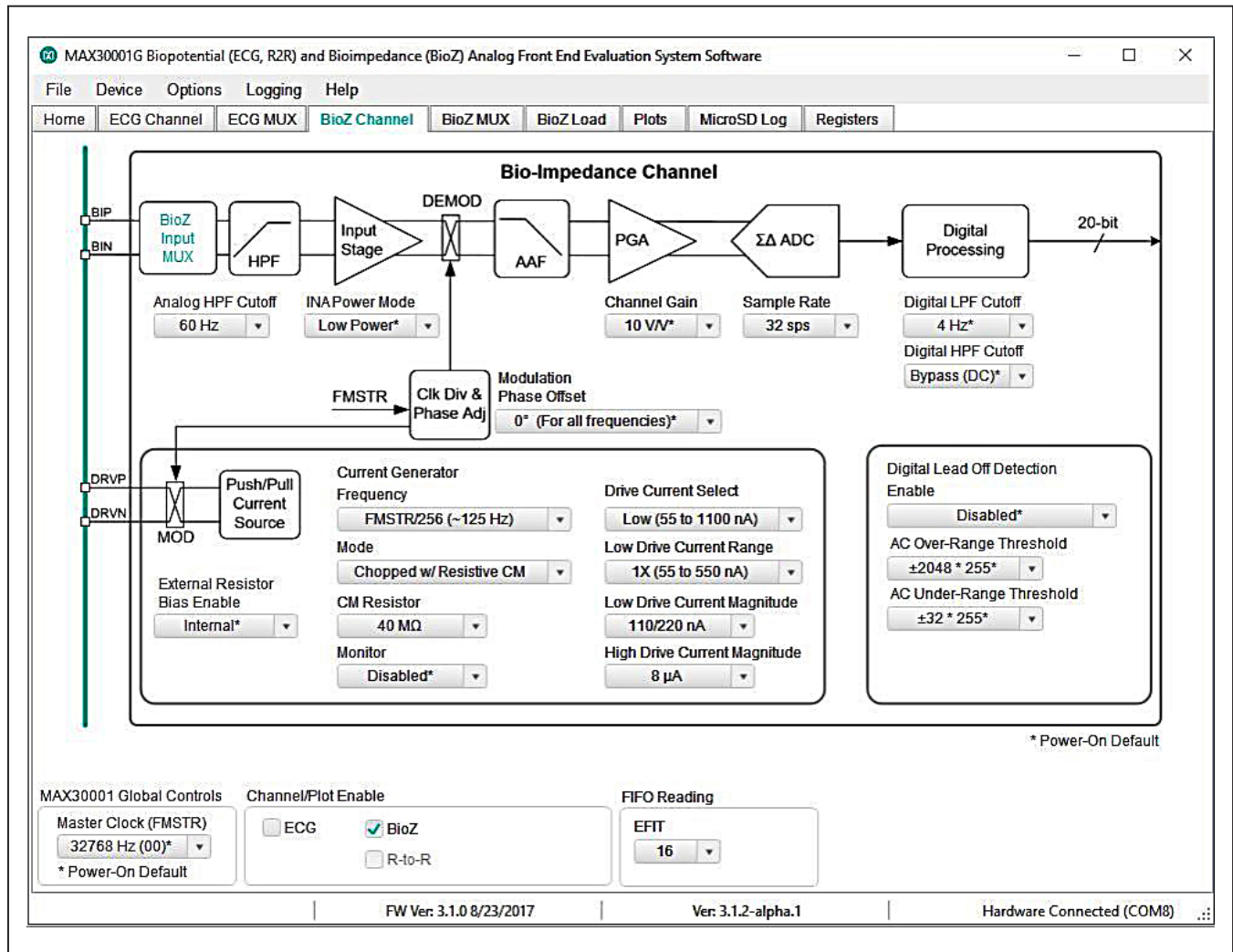

Figure 8. MAX30001G EV Kit BioZ Channel Tab.

BioZ MUX Tab

The **BioZ MUX** tab ([Figure 9](#)) configures the internal BioZ switches that precede the BioZ signal path. Internal calibration and verification functions of the IC are also accessible from this tab. In order to use the BioZ channel, the **BIP Switch** and **BIN Switch** in the **Switches** block must be set to **Connected**. **The switches should be set to Isolated if** using the internal self-test features. As part of the BioZ self-test, a resistive load is available on the DRVP and DRVN pins. Clicking on **Selectable Resistive Load** will bring the GUI to the **BioZ Load** tab. Refer to the full MAX30001G data sheet for detailed descriptions of the BioZ MUX configurations.
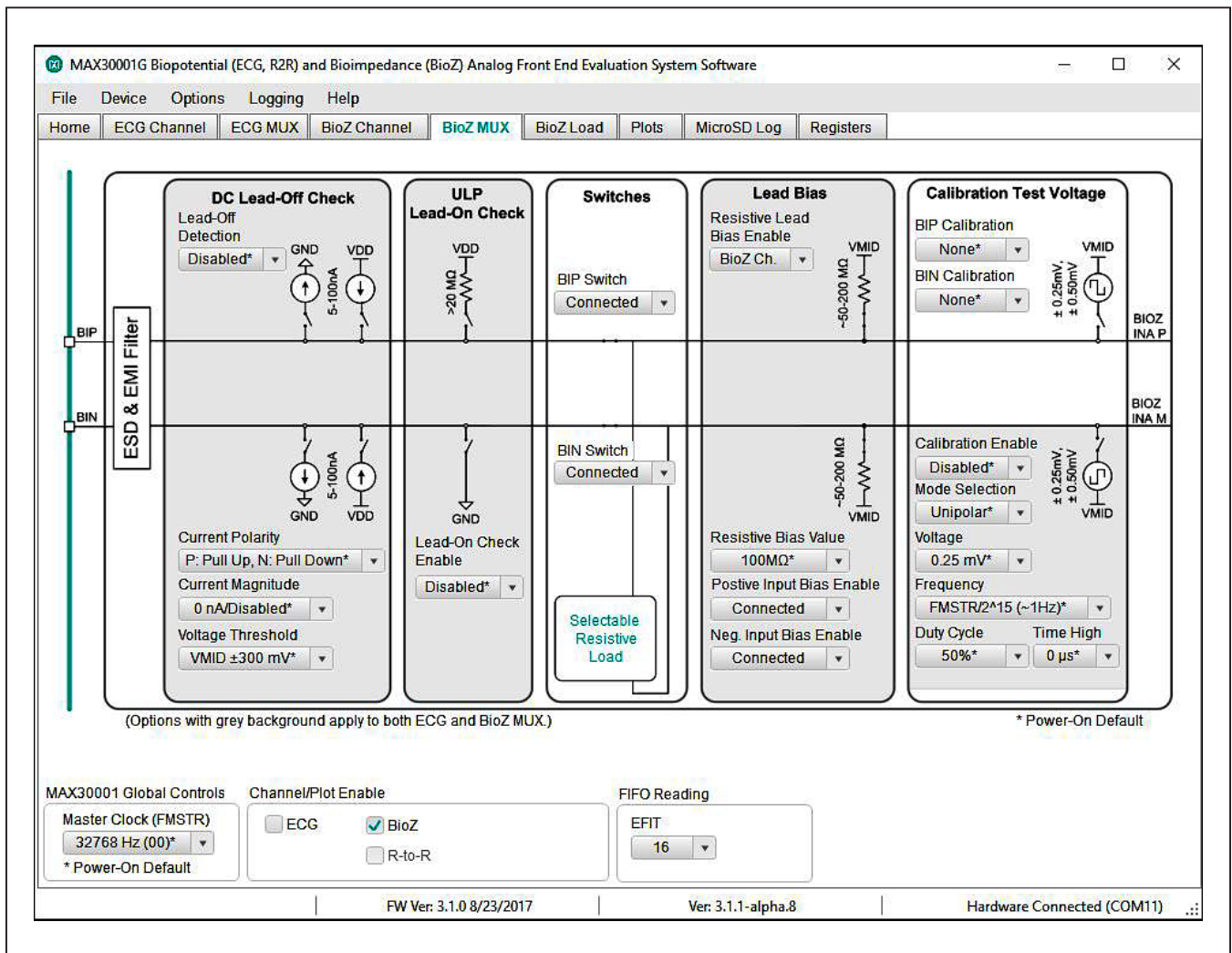

Figure 9. MAX30001G EV Kit BioZ MUX Tab.

BioZ Load

The **BioZ Load** tab (Figure 10) configures the resistive load used for the self-test of the BioZ channel. The nominal resistance and modulation frequency are set by the **Nominal Resistance** and **Frequency** controls in the **Modulated Resistance Built-In-Self-Test (RMOD BIST)** block. **RMOD BIST Enable** configures the BioZ channel to connect or detach the resistive load.

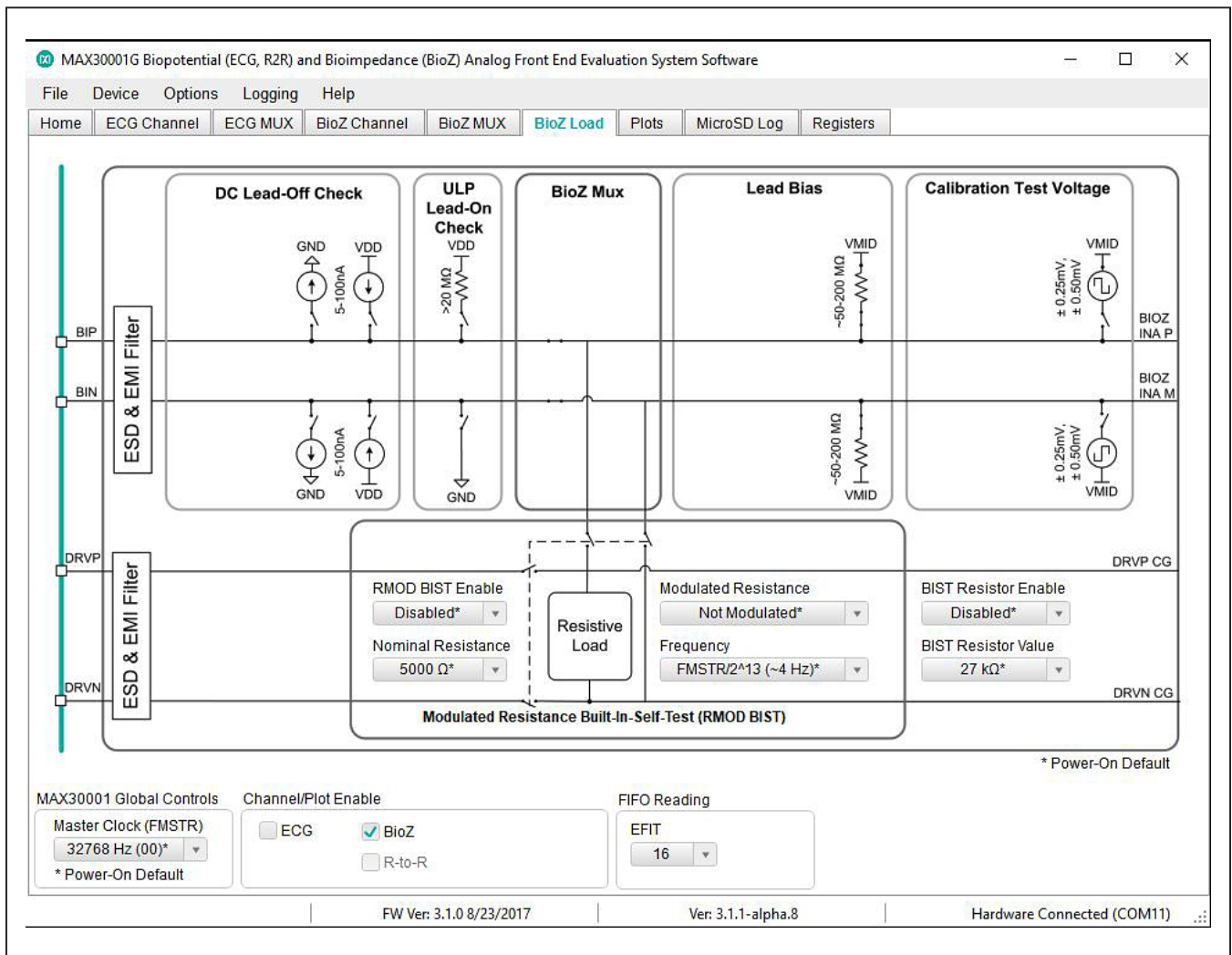Refer to the full MAX30001G data sheet for a description of the modulated resistive load.

Figure 10. MAX30001G EV Kit BioZ Load Tab.

Plots Tab

The **Plots** tab (Figure 11) enables real time monitoring of ECG and BioZ waveforms. By default, both ECG and BioZ plots are visible. Toggling the controls in **Channel/Plot Enable** changes which of the two plots is displayed. If **ECG** is enabled and **BioZ** is disabled, the plot area will be occupied entirely by the ECG waveform. Likewise, if **BioZ** is enabled instead of **ECG**, the BioZ plot is maximized. When both measurement channels are enabled, the plotting space contains both ECG and BioZ data.
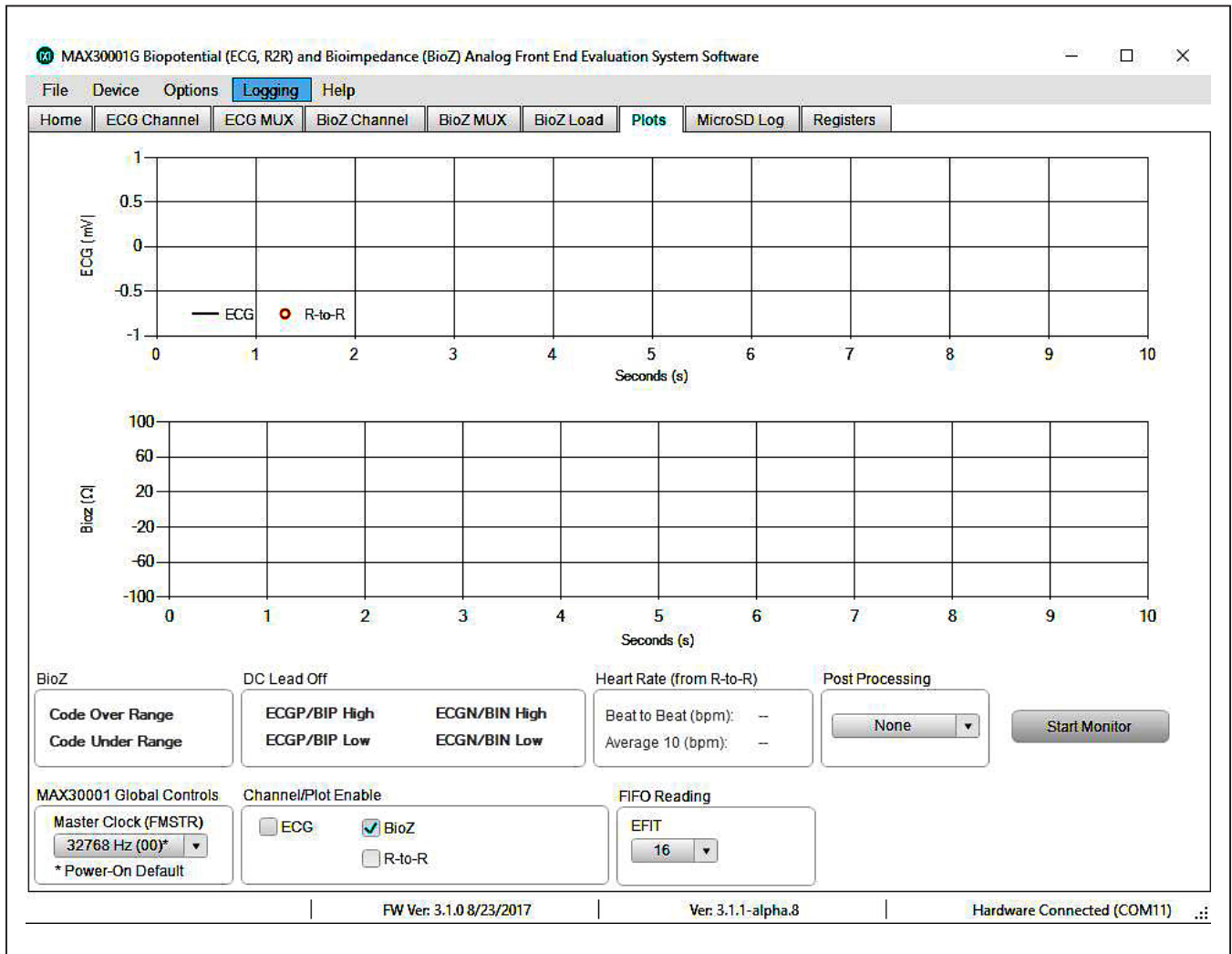

Figure 11.MAX30001G EV Kit Plots Tab.

R-to-R data is shown in the ECG plot. R-to-R peak detection is indicated by a red circle at the peaks of the R waves. Heart rate information gathered from R-to-R detection can be found in the **Heart Rate (from R-to-R)** box below the plotting area. Figure 12 illustrates an ECG waveform with R-to-R detection enabled. The ECG sample rate is 128sps.
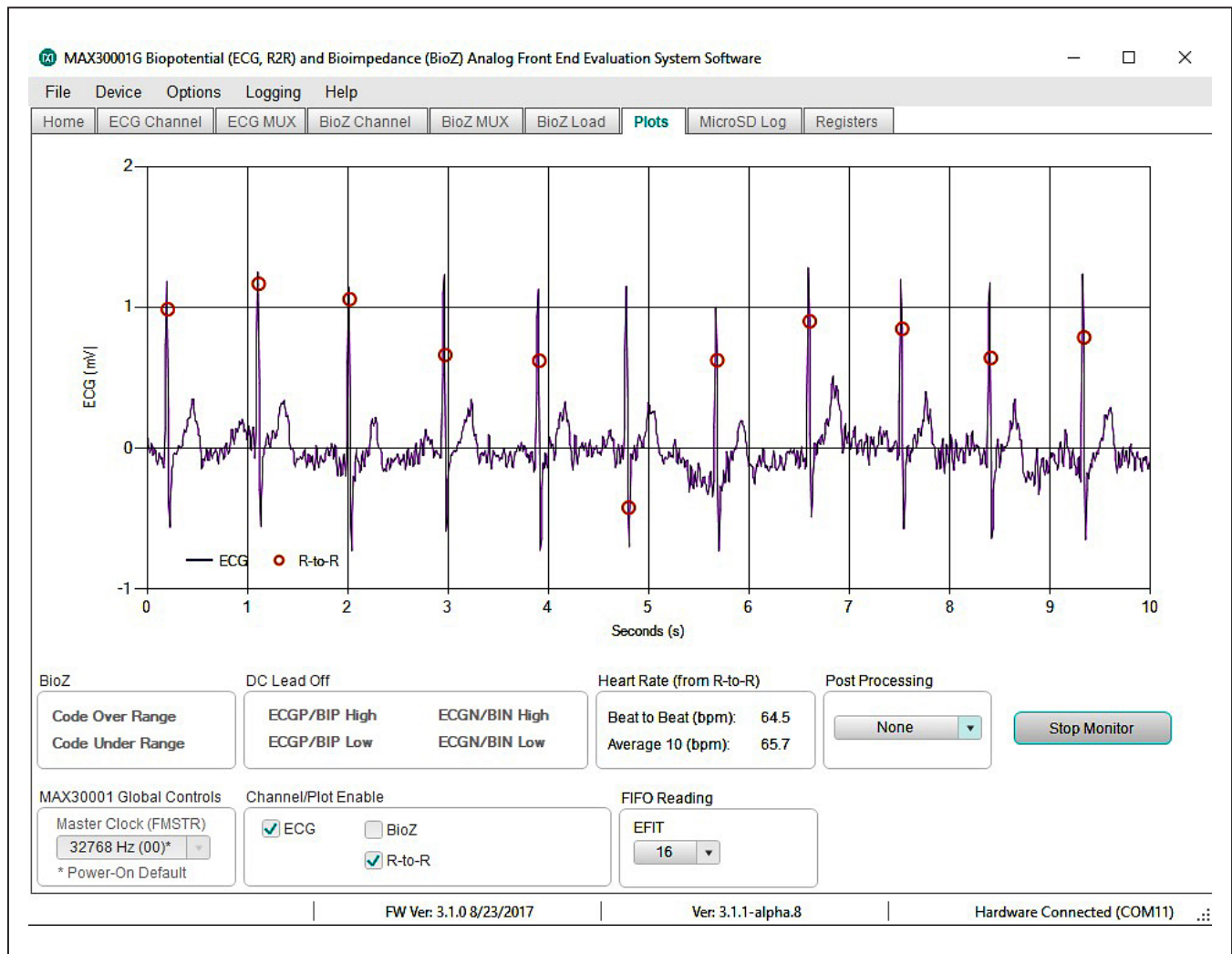

Figure 12. An ECG Waveform with R-to-R and Pace Detection Enabled.

MicroSD Log Tab

The MAX30001G EV kit can use the SD card read/write functionality of the MAX32630FTHR to store and recall log data to and from a microSD card. This allows data to be collected with the USB cable connected or with the USB disconnected from the PC host and powering the EV kit with a battery. To use an SD card, insert the card into connector CN2 on the underside of the MAX32630FTHR board before starting the GUI.

SD card logging is configured in the **MicroSD Log** tab (Figure 13). The GUI can save, load, and clear stored register configuration settings with the **Read**, **Write**, and **Erase** buttons, respectively. Pressing **Advanced** displays the current register contents to be written to an SD card setting file when **Write** is pressed. After confirming the register configurations, select the type of data to save in the **ECG Channel Log Enable** box and press **Write** to load the measurement parameters to the SD card. Press SW2 on the MAX32630FTHR board to start logging and press it a second time to stop logging.

When the EV kit is reconnected to the GUI after logging data, data from the SD card can be saved to the host PC. Press **Save to File** to open a file dialogue and select the location and file name of the logged data. Data is stored in a CSV format.
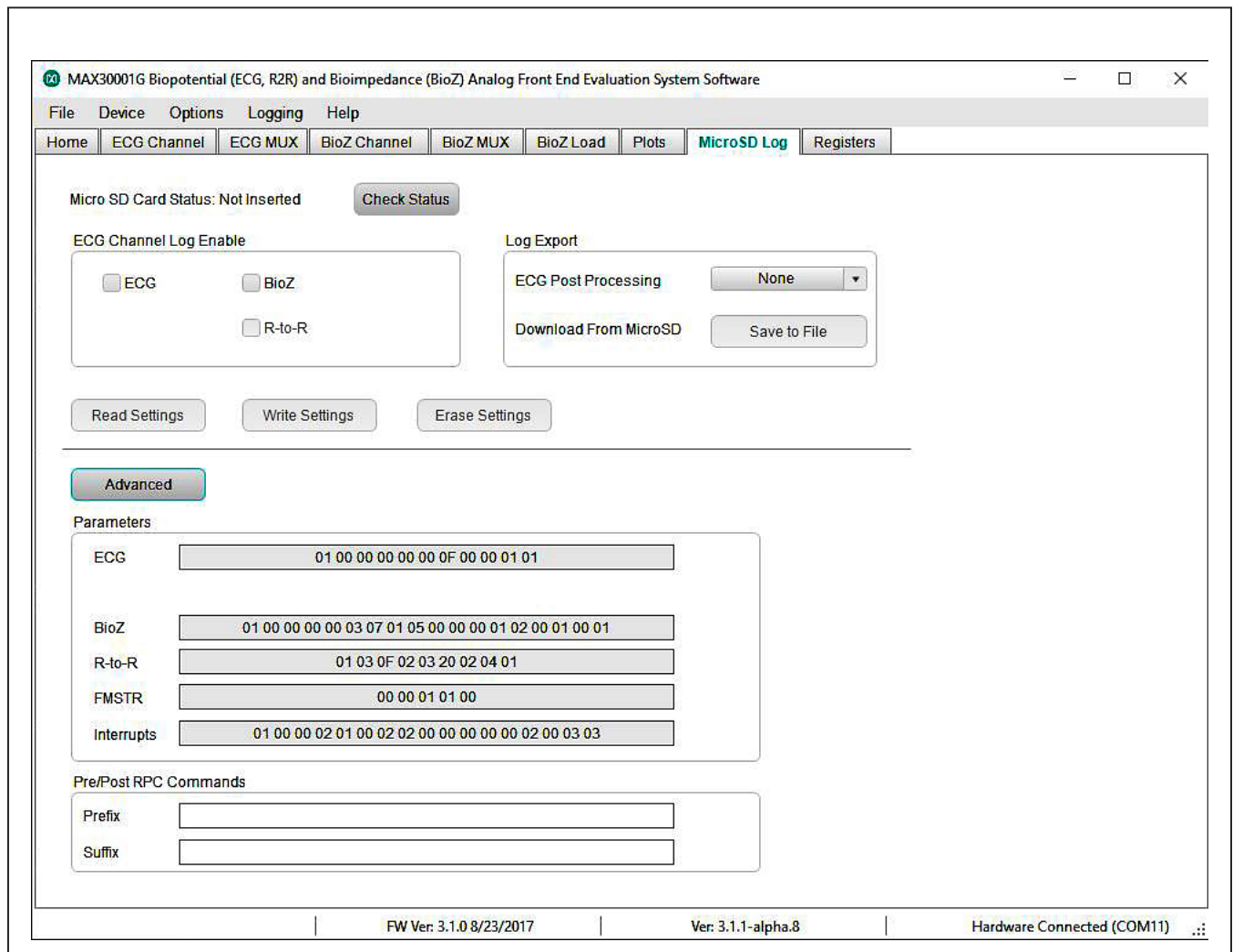

Figure 13. MicroSD Log Tab with Advanced Toggled On.

Registers Tab

The Registers tab (Figure 14) provides more direct access to the internal registers of the MAX30001G. From this tab, it is possible to read the contents of individual registers and to manually enter the desired bit settings for a write operation. For the register address selected in the table on the left, the contents are displayed at the bottom of the tab and visualized as bold and non-bold bit names. When a bit is bold, its value is 1. Otherwise, the bit is 0. Full descriptions of each bit are available in the **Bit Description** field for quick reference. Pressing **Read** reads the selected register, highlighted in teal, while pressing **Read All** reads all registers and updates their values in the **Registers** tab. To write to a register, set the desired bit values by clicking on the bit names to make bold or non-bold and then press **Write**. Alternatively, double click the **Value (Hex)** cell of a selected row to manually enter a value and press the "Enter" key to write the value to the device register.

Figure 14. Registers Tab.

Advanced Tab

The **Advanced** tab (*Figure 15*) is accessible through the **Options** ToolStrip menu. The tab provides manual communication with the MAX30001G to bypass the GUI controls entirely. Enter the register address, as a hexadecimal value, in the **Address** field. Read data from a register by pressing the **ReadReg** button and the data will populate the **Read Data** field. To write data, enter the hexadecimal value in the **Write Data** field and press the **WriteReg** button. **Command Line** displays the formatted command sent by the GUI to the EV kit.
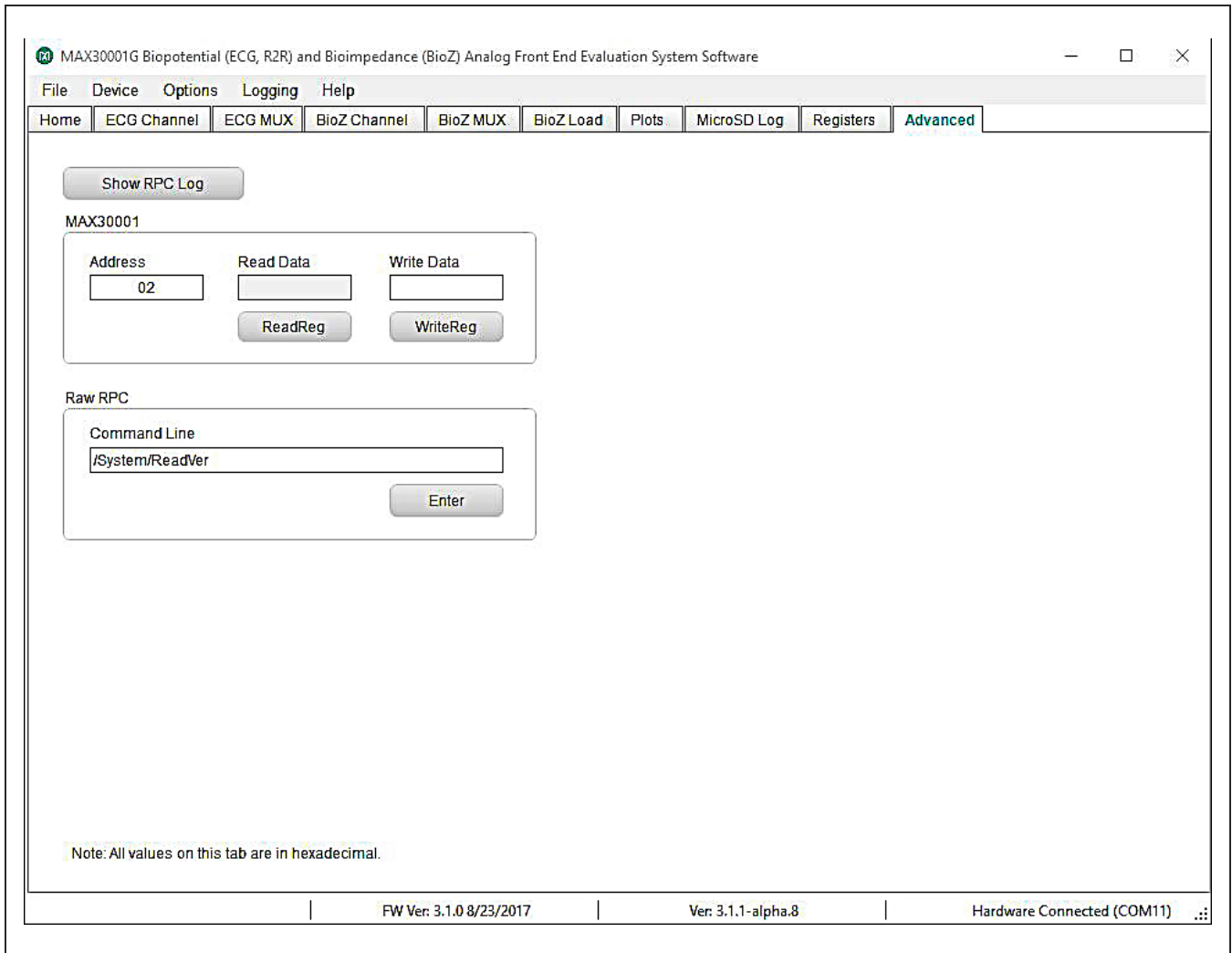

Figure 15. Advanced Tab.

Detailed Description of Hardware

The MAX30001G EV kit provides a single platform to evaluate the functionality and features of the MAX30001G with Biopotential (ECG and R-to-R) and Bioimpedance (BioZ) measurement capabilities. The board contains jumpers, optional resistors, and capacitors to test the MAX30001G under several conditions. A list of all jumpers and their respective functions is available in Table 1. An onboard 32.768kHz crystal oscillator (U5) supplies FCLK to the IC, but external frequency generation is supported.

The EV kit utilizes the MAX32630FTHR Cortex-M4F Microcontroller for Wearables for interfacing with the GUI and optionally providing power to the MAX30001G. The MAX32630FTHR operates either from a host PC or

directly from a Li+ battery. If an SD card is present in the MAX32630FTHR, register settings and measurement configurations can be saved through the GUI. When the EV kit operates without a host PC, pressing SW2 on the MAX32630FTHR initiates the measurement and saves log files to the SD card. Logging is stopped by pressing SW2 a second time.

See Figure 16 for a simplified schematic of the EV kit biopotential circuitry.

Note: Ball C2 on the MAX30001G is called **N.C.** and should **not be connected** to anything. This PCB does route this signal to the testpoint labeled AOUT. **Do not connect** anything to this testpoint.

Table 1. Description Of Jumpers

JUMPER	SHUNT POSITION	DESCRIPTION
J_ECGN	1-2*	Connects ECGN on the IC to C_ECGN on the EV kit.
J_ECGP	1-2*	Connects ECGP on the IC to C_ECGP on the EV kit.
EN_BN	1-2	Connects ECGN to BIN.
EP_BP	1-2	Connects ECGP to BIP.
EN_UNBAL	1-2*	Bypasses the ECG electrode unbalance on ECGN.
EP_UNBAL	1-2*	Bypasses the ECG electrode unbalance on ECGP.
EP_EN	1-2	Short ECGP to ECGN.
J_BIN	1-2*	Connects BIN on the IC to C_BIN on the EV kit.
J_BIP	1-2*	Connects BIN on the IC to C_BIN on the EV kit.
RN	1-2	Connects one end of R28 to BIN.
RP	1-2	Connects one end of R28 to BIP.
DN_BN	1-2*	Connects DRVN to BIN.
DP_BP	1-2*	Connects DRVP to BIP.
BP_BN	1-2	Short BIP to BIN.
J_DRVN	1-2*	Connects DRVN on the IC to C_DRVN on the EV kit.
J_DRVP	1-2*	Connects DRVP on the IC to C_DRVP on the EV kit.
BB_SEL	1-2*	Use VCM as the body bias.
	2-3	Use an adjustable voltage from 0V to OVDD as the body bias. Adjust voltage with R7.
J_RBIAS	1-2*	Connect an external 324kΩ resistor to RBIAS.
BUFF1_IN	1-2	Input to second buffer of U4.

Table 1. Description Of Jumpers (continued)

JUMPER	SHUNT POSITION	DESCRIPTION
1V8	1-2	Supply 1.8V to J_AVDD and J_DVDD from the MAX32630FTHR.
	2-3*	Supply an adjustable voltage to J_AVDD and J_DVDD from an LDO (U2).
3V3	1-2	Supply 3.3V to J_OVDD and OVDDX from the MAX32630FTHR.
	2-3*	Supply an adjustable voltage to J_OVDD and OVDDX from an LDO (U3).
J_AVDD	1-2*	Connect AVDD to pin 2 of jumper 1V8.
J_DVDD	1-2*	Connect DVDD to pin 2 of Jumper 1V8.
J_OVDD	1-2*	Connect OVDD to pin 2 of jumper 3V3.
XTL_PWR	1-2*	Power the onboard crystal from OVDDX.
ONBRD_FCLK	1-2*	Connect the onboard crystal to FCLK.
GND1	1-2**	Connect GND of the MAX32630FTHR to AGND1.
GND2	1-2**	Connect GND of the MAX32630FTHR to AGND2.
J_EXT_PWR	1-2	Connect an external supply to the 5V rail.
	2-3	Do not use.
J_SYS	1-2**	Connect SYS on the MAX32630FTHR to the 5V rail.
J_INTB	1-2**	Connect INTB to the MAX32630FTHR.
J_INT2B	1-2**	Connect INT2B to the MAX32630FTHR.
J_SDO	1-2**	Connect SDO to MISO of the MAX32630FTHR.
J_SDI	1-2**	Connect SDI to MOSI of the MAX32630FTHR.
J_SCLK	1-2**	Connect SCLK to SCLK of the MAX32630FTHR.
J_CSB	1-2**	Connect CSB to the MAX32630FTHR.
P_UP	1-2	Connect R8-11 to OVDDX.
P_DWN	1-2*	Connect R15-17 to GND.

Default shunt position
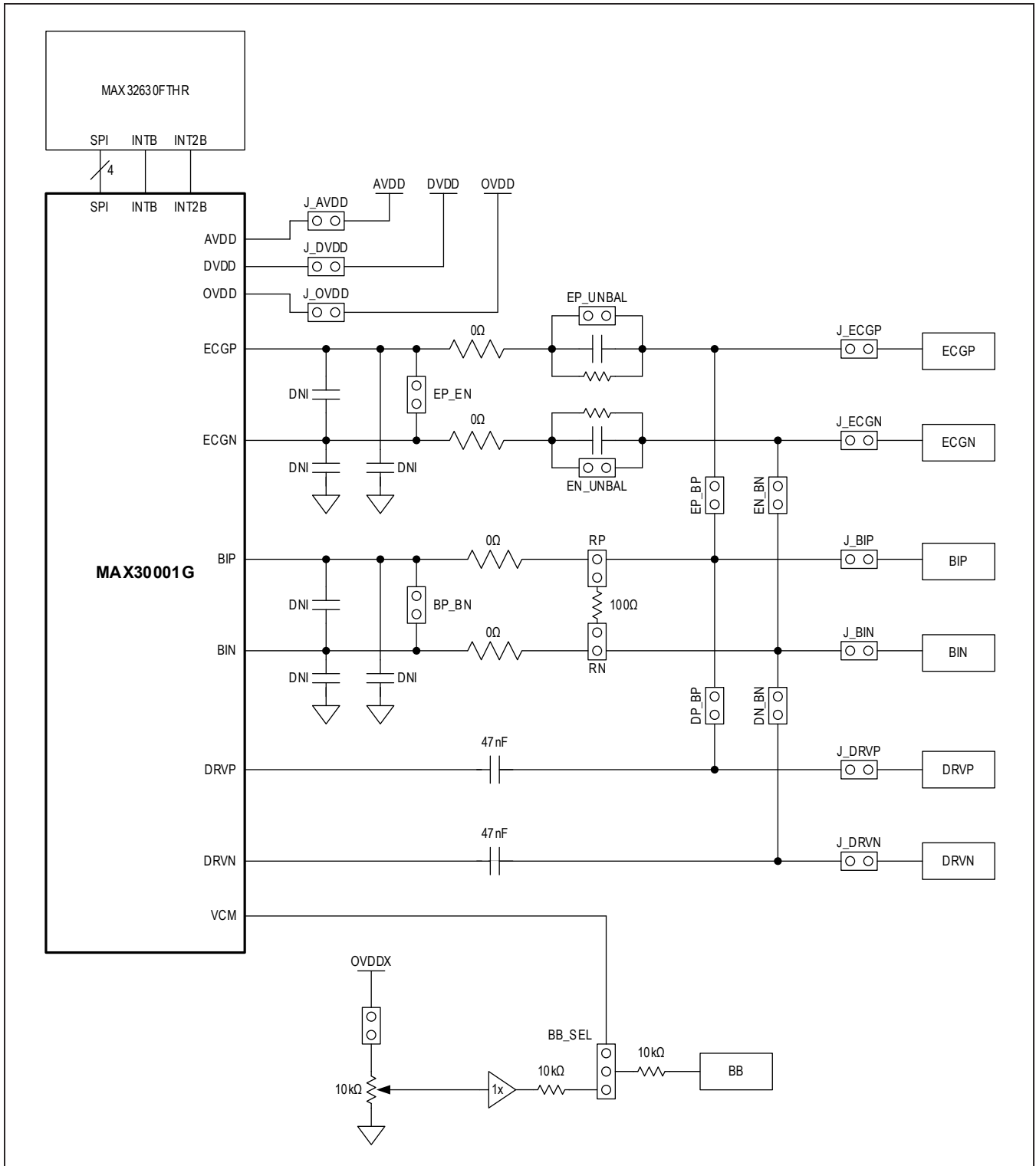*Default shunt position, do not use alternate position*

Figure 16. Simplified Schematic.

Powering the EV Kit

The MAX30001G EV kit can be powered from an external supply or directly from the MAX32630FTHR. To use an external supply, install a shunt on jumper J_EXT_PWR in the 1-2 position. This connects the EXT_PWR test point to the board's 5V rail. Set the power supply's output to +5V, disable the output, connect the positive lead to EXT_PWR and the negative to AGND1, then enable the supply. To power the EV kit with the MAX32630FTHR, install a shunt on jumper J_SYS in the 1-2 position to connect the SYS node to the 5V rail. SYS regulates the USB voltage or directly connects to the battery if present.

The MAX30001G IC receives power from OVDD, AVDD, and DVDD. These pins receive power either through the MAX32630FTHR, externally through test points, or through adjustable LDOs U2 and U3. To supply the IC from the MAX32630FTHR's 1.8V and 3.3V rails, place a shunt in the 1-2 position on the 1V8 and 3V3 jumpers. To use the onboard LDOs, place the shunts in the 2-3 position. Two potentiometers are available to set the U2 and U3 voltages: R4 and R10.

To operate the EV kit without a connection to a host PC or power supply, insert a microSD card into the MAX32630FTHR. After saving a test configuration, disconnect the board from the host PC and connect a Li+ battery to the MAX32630FTHR. Refer to the MAX32630FTHR documentation for details on connecting a Li+ battery. Press SW2 to trigger the measurements saved to the SD card. The J_SYS shunt must be in the 1-2 position for this configuration.

Configuring the Board for Measurement

The MAX30001G EV kit offers several potential connection and component configurations to enable a variety of tests. Both the ECG channel and BioZ channel allow for user-defined line resistance with resistors R26 and R27 for BioZ, and R29 and R30 for ECG. By default, these resistors are populated with 0Ω shunts but can be changed to suit the application. The board also allows for the instal-

lation of external low-pass filtering capacitors on the ECG and BioZ lines. Capacitors C8 and C25 can create an external common mode filter for the ECG and BioZ lines, respectively. C24, C29, C26, and C28 filter ECGP, ECGN, BIP, and BIN. The cutoff frequency of the filters is set by the value of these capacitors and the input resistors R26, R27, R29, and R30. The board also allows the ECGN and ECGP or BIN and BIP inputs to be shorted with jumpers EP_EN and BP_BN, respectively.

Refer to the MAX30001G EV kit schematic and MAX30001G EV kit PCB layout sections for component connections and placements.

ECG Measurement

The EV kit ships configured to measure ECG with balanced electrodes, R-to-R, and BioZ signals. The jumper configurations required for these measurements are shown in Figure 17. Connected jumpers are distinguished with solid black nodes in the jumper box. To use the electrode connectors on the EV kit, ensure the required shunts are installed.

By default, the EV kit leaves the ECG channel balanced. By removing the shunts on EN_UNBAL And EP_UNBAL, the ECGN and ECGP lines each include a 51kΩ resistor and 47nF capacitor in parallel.

BioZ Measurement

Additionally, the EV kit includes a 100Ω resistor to verify the BioZ configuration. Attach shunts on RP and RN to connect the resistor to the BioZ inputs and shunts on DP_BP and DN_BN to route the drive signal to the BioZ channel. Figure 18 illustrates these connections.

Refer to the MAX30001G data sheet for details on configuring a BioZ measurement. Note that the default setting of the current generator is FMSTR/64 (about 500Hz) and the BioZ channel has an internal high-pass filter with a default 500Hz cutoff frequency. In order to correctly measure the 100Ω resistor, bypass or lower the filter cutoff frequency or increase the current generator frequency.
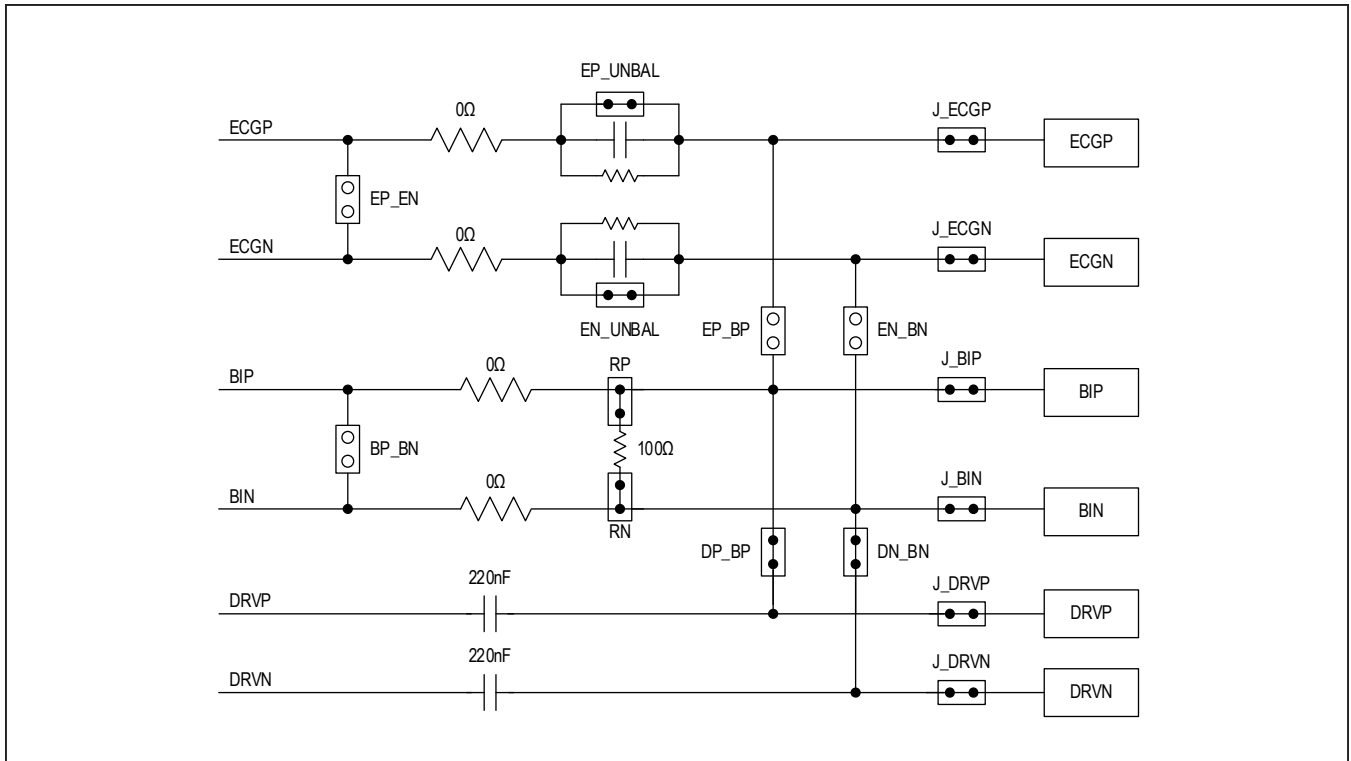
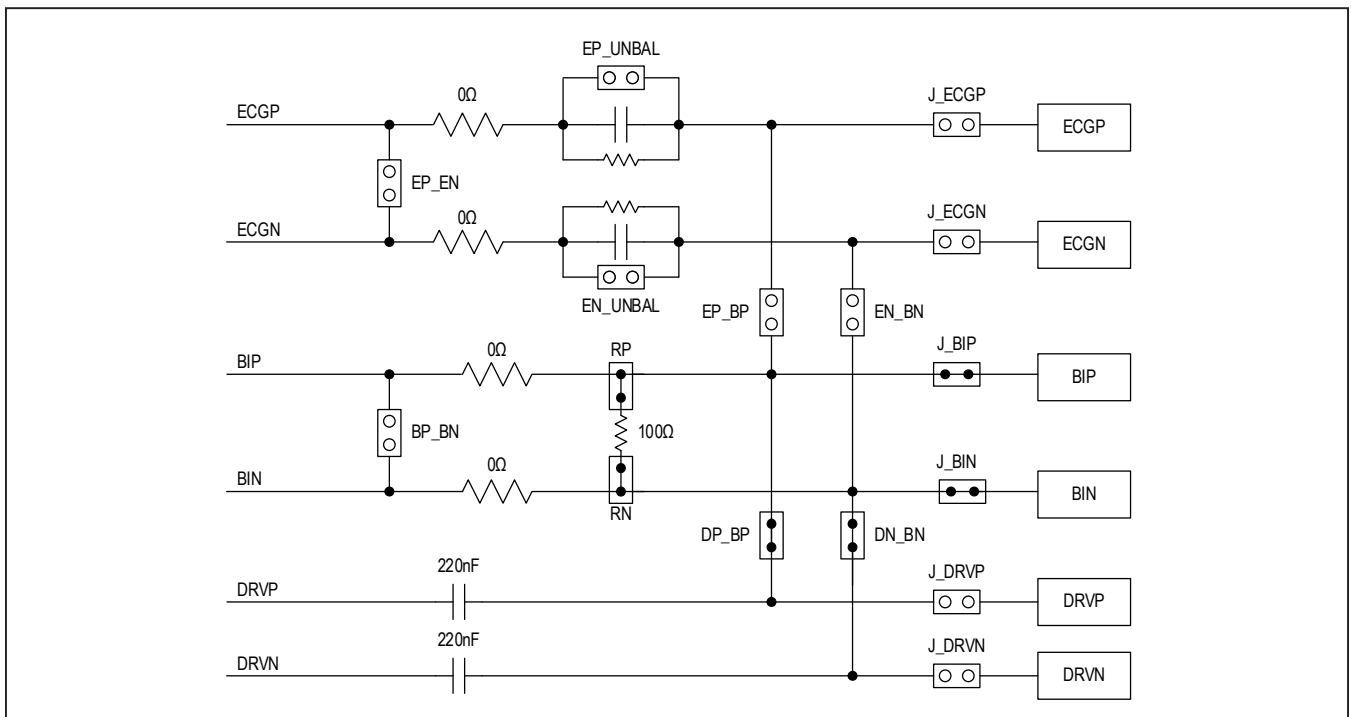Figure 17. Default Measurement Channel Jumper Configurations

Figure 18. BioZ Measurement with 100Ω Test Impedance.

Galvanic Skin Response Measurement

When using the BioZ channel for GSR measurements, two dry electrodes should be used to focus the measurement on the skin's contact impedance. A lower current generator frequency, such as 125Hz, 250Hz, or 500Hz should be selected. Ensure that the BioZ receiver's analog high pass filter cutoff frequency is set below this stimulus frequency. At these lower frequencies, a 220nF DC blocking capacitor should be used between both DRVP and DRVN and their respective electrode. GSR impedance measurements are typically as high as 1MΩ but maybe as high as 10MΩ under low-moisture conditions. Choose lower current generator amplitudes so that the differential voltage at the BioZ input channel does not exceed the maximum AC input differential range of ±90 mV. Figure 19 illustrates the setup for GSR measurements.
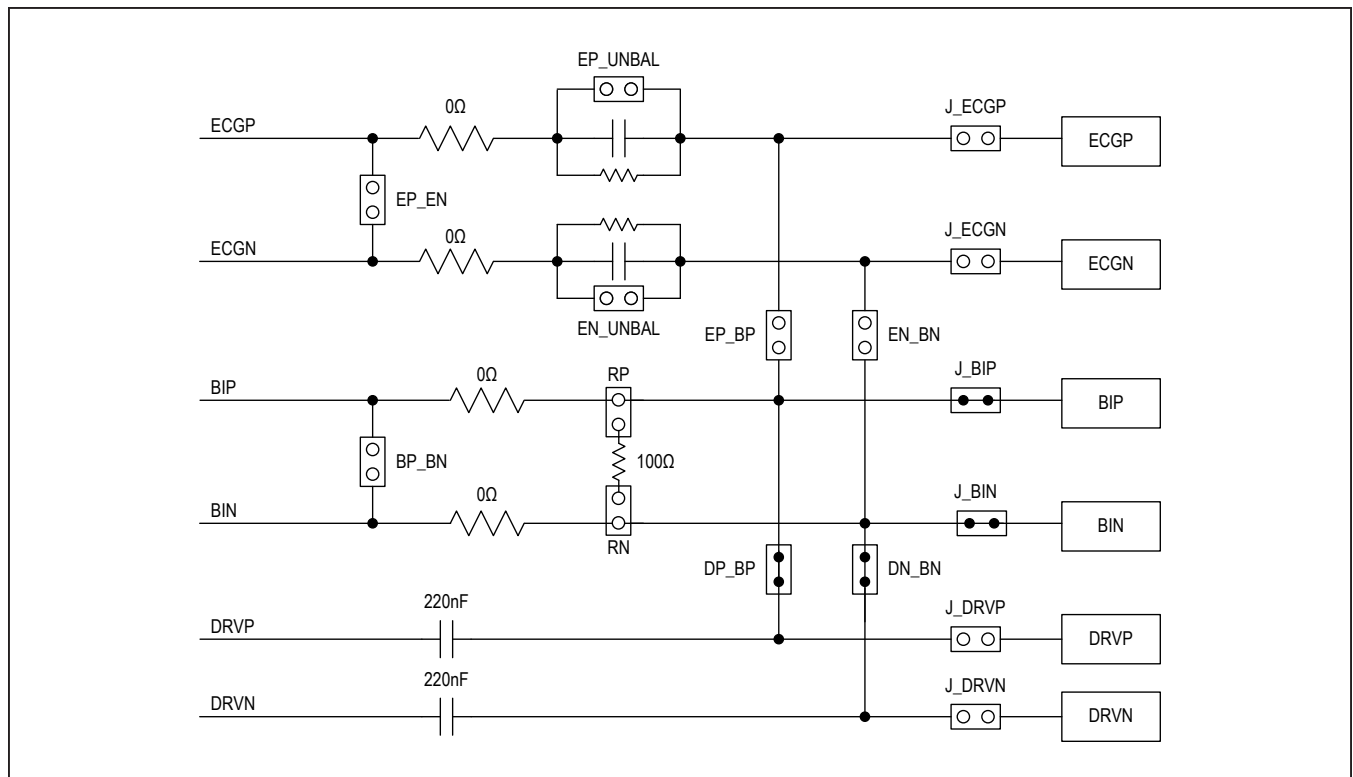

Figure 19. Configuring the EV Kit to measure GSR.

Component Suppliers

SUPPLIER	WEBSITE
Bourns	www.bourns.com
Epson	www.epson.com
Kemet	www.kemet.com
Keystone	www.keyelco.com
Lite-On Electronics	us.liteon.com
Maxim Integrated	www.maximintegrated.com
Murata	www.murata.com
Panasonic	www.panasonic.com
Plastics One	www.plasticsone.com
Sullins Connector Solutions	www.sullinscorp.com
Susuma	www.susuma-usa.com
Taiyo Yuden	www.t-yuden.com
TDK	www.global.tdk.com
TE Connectivity	www.te.com
Vishay Dale	www.vishay.com

Note: *Indicate that you are using the MAX30001G EV kit when contacting these component suppliers.*
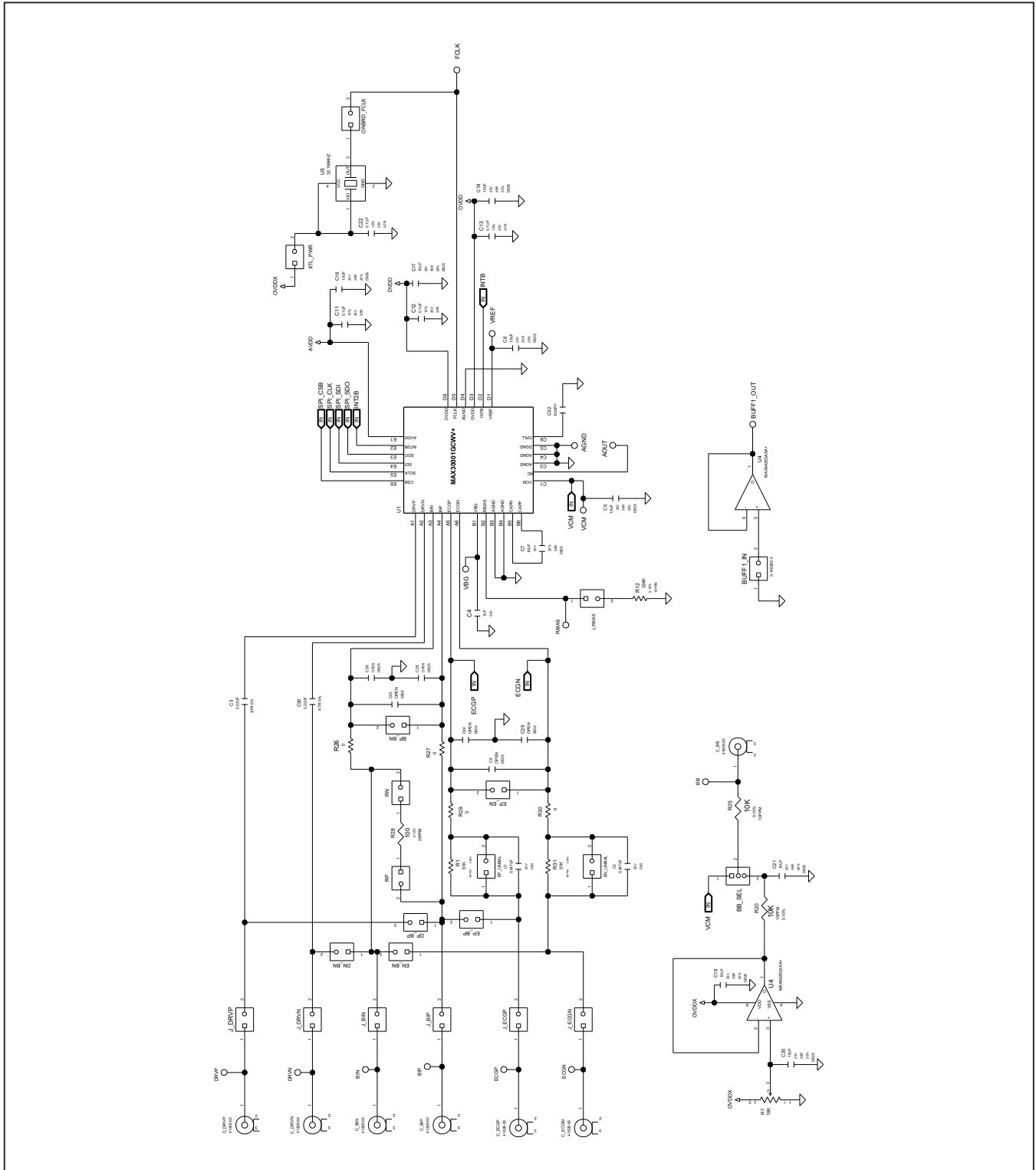
Ordering Information

PART	TYPE
MAX30001GEVKIT#	EV kit

MAX30001G_EVSYS_EVKIT Bill of Materials

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	1V8, 3V3, BB_SEL, GND1, GND2, J_CSB, J_EXT_PWR, J_INT2B, J_INTB, J_SCLK, J_SDI, J_SDO, J_SYS	—	13	PCC03SAAN	SULLINS	PCC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 3PINS; -65 DEGC TO +125 DEGC
2	AGND, AGND1-AGND4, AOUT, BB, BIN, BIP, BUFF1_OUT, CSB, DRVN, DRVP, ECGN, ECGP, FCLK, FTHR_GND, INT2B, INTB, RBIAS, SCLK, SDI, SDO, VBG, VCM, VREF	—	26	5011	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
3	AVDD, DVDD, EXT_PWR, OVDD	—	4	5010	KEYSTONE	N/A	TESTPOINT WITH 1.80MM HOLE DIA, RED, MULTIPURPOSE;
4	BP_BN, BUFF1_IN, DN_BN, DP_BP, EN_BN, EN_UNBAL, EP_BP, EP_EN, EP_UNBAL, J_AVDD, J_BIN, J_BIP, J_DRVN, J_DRVP, J_DVDD, J_ECGN, J_ECGP, J_OVDD, J_RBIAS, ONBRD_FCLK, P_DOWN, P_UP, RN, RP, XTL_PWR	—	25	5-146280-2	TE CONNECTIVITY	5-146280-2	CONNECTOR; MALE; THROUGH HOLE; HEADER ASSEMBLY; MOD II; BREAKWAY; SINGLE ROW; HIGH TEMPERATURE; VERTICAL W/ 0.025 SQ POST; 0.100 C; STRAIGHT; 2PINS
5	C1, C2	—	2	C0805C473J3GACTU	KEMET	0.047UF	CAP; SMT (0805); 0.047UF; 5%; 25V; C0G; CERAMIC
6	C3, C30	—	2	C0805C224J3RAC	KEMET	0.22UF	CAP; SMT (0805); 0.22UF; 5%; 25V; X7R; CERAMIC
7	C4	—	1	UMK107AB7105KA; CC0603KRX7R9BB105	TAIYO YUDEN;YAGEO	1UF	CAP; SMT (0603); 1UF; 10%; 50V; X7R; CERAMIC
8	C5-C7, C16-C21, C23	—	10	GRM188R61E106MA73	MURATA	10UF	CAPACITOR; SMT (0603); CERAMIC; 10UF; 25V; TOL=20%; TG=-55 DEGC TO +85 DEGC; TC=X5R; GRM SERIES; MURATA;
9	C9, C10, C14, C15	—	4	C3216X7R1H335M160AC	TDK	3.3UF	CAP; SMT (1206); 3.3UF; 20%; 50V; X7R; CERAMIC;
10	C11-C13, C22	—	4	C1608X7R1E104K080AA	TDK	0.1UF	CAPACITOR; SMT (0603); CERAMIC; 0.1UF; 25V; TOL=10%; MODEL=C SERIES; TG=-55 DEGC TO +125 DEGC; TC=X7R;
11	C27, C31	—	2	KRM31KR72A225KH01	MURATA	2.2UF	CAP; SMT (1206); 2.2UF; 10%; 100V; X7R; CERAMIC
12	C32	—	1	C0603C102J5GAC; 06035A102JAT2A	KEMET;AVX	1000PF	CAP; SMT (0603); 1000PF; 5%; 50V; C0G; CERAMIC;
13	C_BB, C_BIN, C_BIP, C_DRVN, C_DRVP, C_ECGN, C_ECGP	—	7	41828-50	PLASTICS ONE	41828-50	CONNECTOR; FEMALE; THROUGH HOLE; JACK; PCB; 1.5MM; TOUCHPROOF WAVE SOLDER VERSION WITH STAMPING; RIGHT ANGLE; 3PINS
14	D1	—	1	LTST-C194KGKT	LITE-ON ELECTRONICS INC	LTST-C194KGKT	DIODE; LED; SMD CHIP LED; WATER CLEAR LENS; AlInGaP GREEN; GREEN; SMT (0603); VF=2.1V; IF=0.02A
15	J8	—	1	PPPC161LFBN-RC	SULLINS ELECTRONICS CORP.	PPPC161LFBN-RC	CONNECTOR; FEMALE; THROUGH HOLE; LFB SERIES; 2.54MM CONTACT CENTER; STRAIGHT; 16PINS
16	J9	—	1	PPPC121LFBN-RC	SULLINS ELECTRONICS CORP	PPPC121LFBN-RC	CONNECTOR; FEMALE; THROUGH HOLE; HEADER FEMALE; STRAIGHT; 12PINS

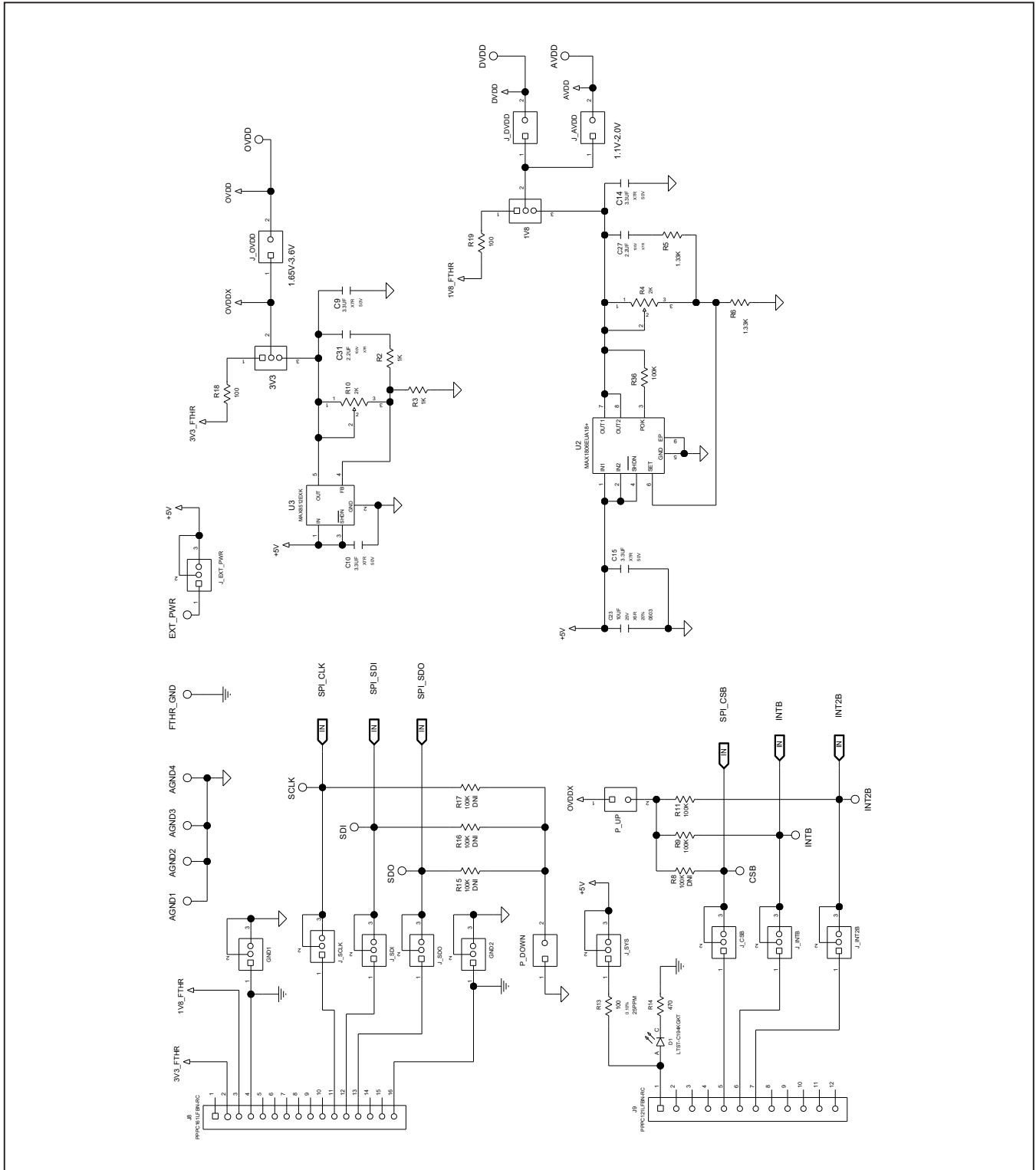## MAX30001G_EVSYS_EVKIT Bill of Materials (continued)

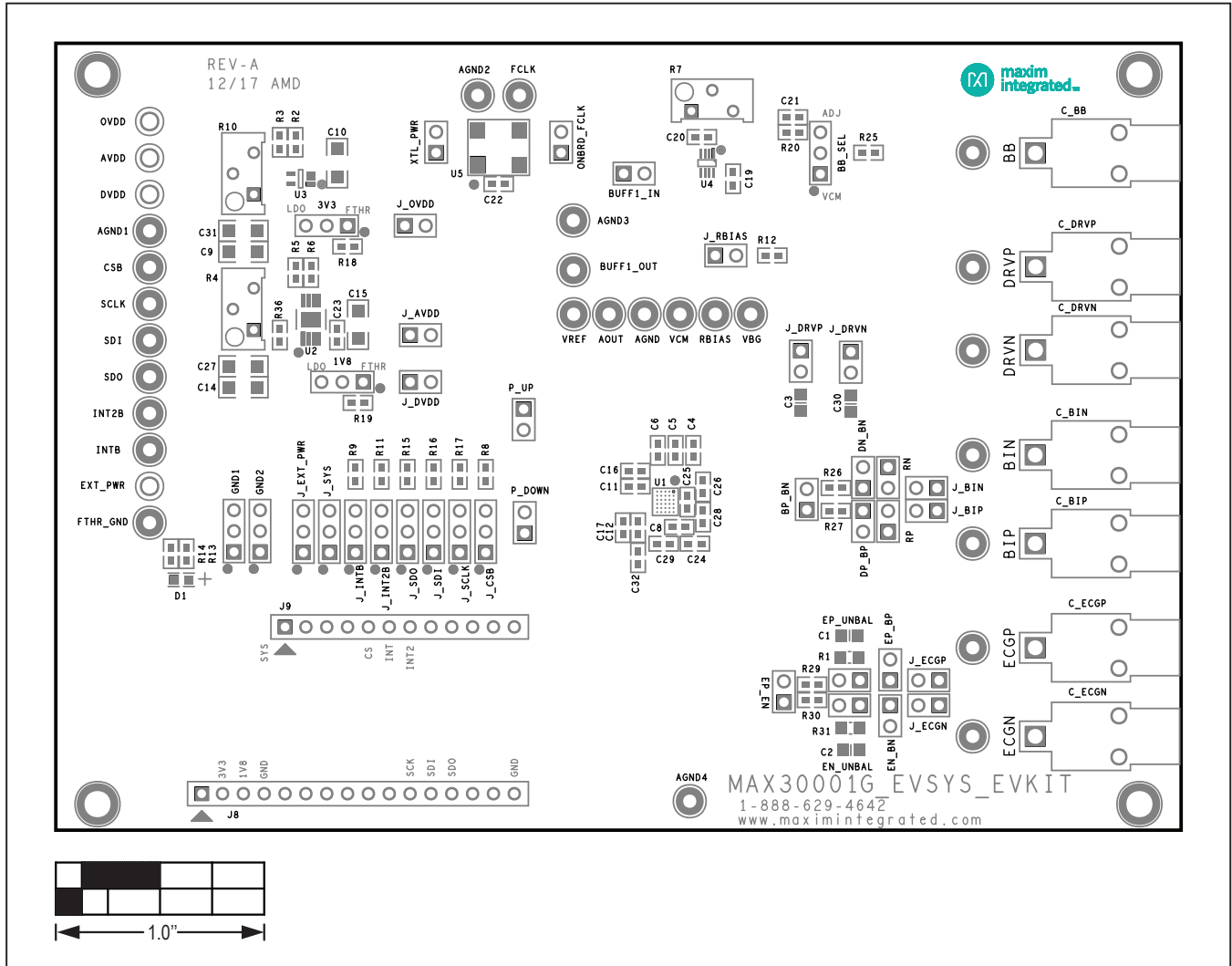| ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
17	R1, R31	—	2	ERA-6ARW513	PANASONIC	51K	RES; SMT (0805); 51K; 0.05%; +/-10PPM/DEGC; 0.1250W
18	R2, R3	—	2	CRCW06031K00FK; ERJ-3EKF1001; CR0603AFX-1001ELF	VISHAY; PANASONIC; BOURNS	1K	RES; SMT (0603); 1K; 1%; +/-100PPM/DEGC; 0.1000W
19	R4, R10	—	2	3296Y-202LF	BOURNS	2K	RESISTOR; THROUGH HOLE-RADIAL LEAD; 3296Y SERIES; 2K OHM; 10%; 100PPM; 0.5W
20	R5, R6	—	2	CRCW06031K33FK	VISHAY DALE	1.33K	RES; SMT (0603); 1.33K; 1%; +/-100PPM/DEGC; 0.1000W
21	R7	—	1	3296Y-1-103LF	BOURNS	10K	RESISTOR; THROUGH-HOLE; 10K OHM; 10%; 100PPM; 0.5W; MOLDER CERAMIC OVER METAL FILM
22	R9, R11, R36	—	3	CRCW0603100KFK; RC0603FR-07100KL; RC0603FR-13100KL; ERJ-3EKF1003; AC0603FR-07100KL	VISHAY DALE; YAGEO;YAGEO; PANASONIC	100K	RES; SMT (0603); 100K; 1%; +/-100PPM/DEGC; 0.1000W
23	R12	—	1	RN73C1J324KB; 4-1879135-8	TE CONNECTIVITY; TE CONNECTIVITY	324K	RES; SMT (0603); 324K; 0.10%; +/-10PPM/DEGC; 0.0630W
24	R13, R18, R19, R28	—	4	RG1608P-101-B; ERA-3YEB101; ERA-3AEB101	SUSUMU CO LTD.; PANASONIC; PANASONIC	100	RES; SMT (0603); 100; 0.10%; +/-25PPM/DEGC; 0.1000W
25	R14	—	1	RG1608P-471-B	SUSUMU CO LTD.	470	RES; SMT (0603); 470; 0.10%; +/-25PPM/DEGC; 0.1000W
26	R20, R25	—	2	ERA-3ARB103	PANASONIC	10K	RES; SMT (0603); 10K; 0.10%; +/-10PPM/DEGC; 0.1000W
27	R26, R27, R29, R30	—	4	CRCW06030000ZS; MCR03EZPJ000; ERJ-3GEY0R00; CR0603AJ/-000ELF	VISHAY; ROHM SEMICONDUCTOR; PANASONIC;BOURNS	0	RES; SMT (0603); 0; JUMPER; JUMPER; 0.1000W
28	U1	—	1	MAX30001GCWV+	MAXIM	MAX30001GCWV+	IC; AFEC; ULTRA-LOW-POWER; SINGLE-CHANNEL INTEGRATED BIOPOTENTIAL (ECG AND R-TO- R) AND BIOIMPEDANCE (BIOZ) AFE ; WLP30
29	U2	—	1	MAX1806EUA18+	MAXIM	MAX1806EUA18+	IC; VREG; LOW-VOLTAGE LINEAR REGULATOR; UMAX8-EP
30	U3	—	1	MAX8512EXK+	MAXIM	MAX8512EXK	IC, VREG, Ultra-Low-Noise, High PSRR, Adjustable Vout, SC70-5
31	U4	—	1	MAX44263AXA+	MAXIM	MAX44263AXA+	IC; OPAMP; 1.8V; 15MHZ LOW-OFFSET; LOW-POWER; RAIL-TO-RAIL I/O DUAL OPERATIONAL AMPLIFIER; SC70-8;
32	U5	—	1	SG-3030-JF-32.768000KHZ-B	EPSON	32.768KHZ	CRYSTAL; SMT; 32.768KHZ
33	PCB	—	1	MAX30001EVSYS	MAXIM	PCB	PCB:MAX30001EVSYS
34	R8, R15-R17	DNP	0	CRCW0603100KFK; RC0603FR-07100KL; RC0603FR-13100KL; ERJ-3EKF1003; AC0603FR-07100KL	VISHAY DALE; YAGEO;YAGEO; PANASONIC	100K	RES; SMT (0603); 100K; 1%; +/-100PPM/DEGC; 0.1000W
35	C8, C24-C26, C28, C29	DNP	0	N/A	N/A	OPEN	PACKAGE OUTLINE 0603 NON-POLAR CAPACITOR
TOTAL			134				

MAX30001G_EVSYS_EV Kit Schematic Diagrams

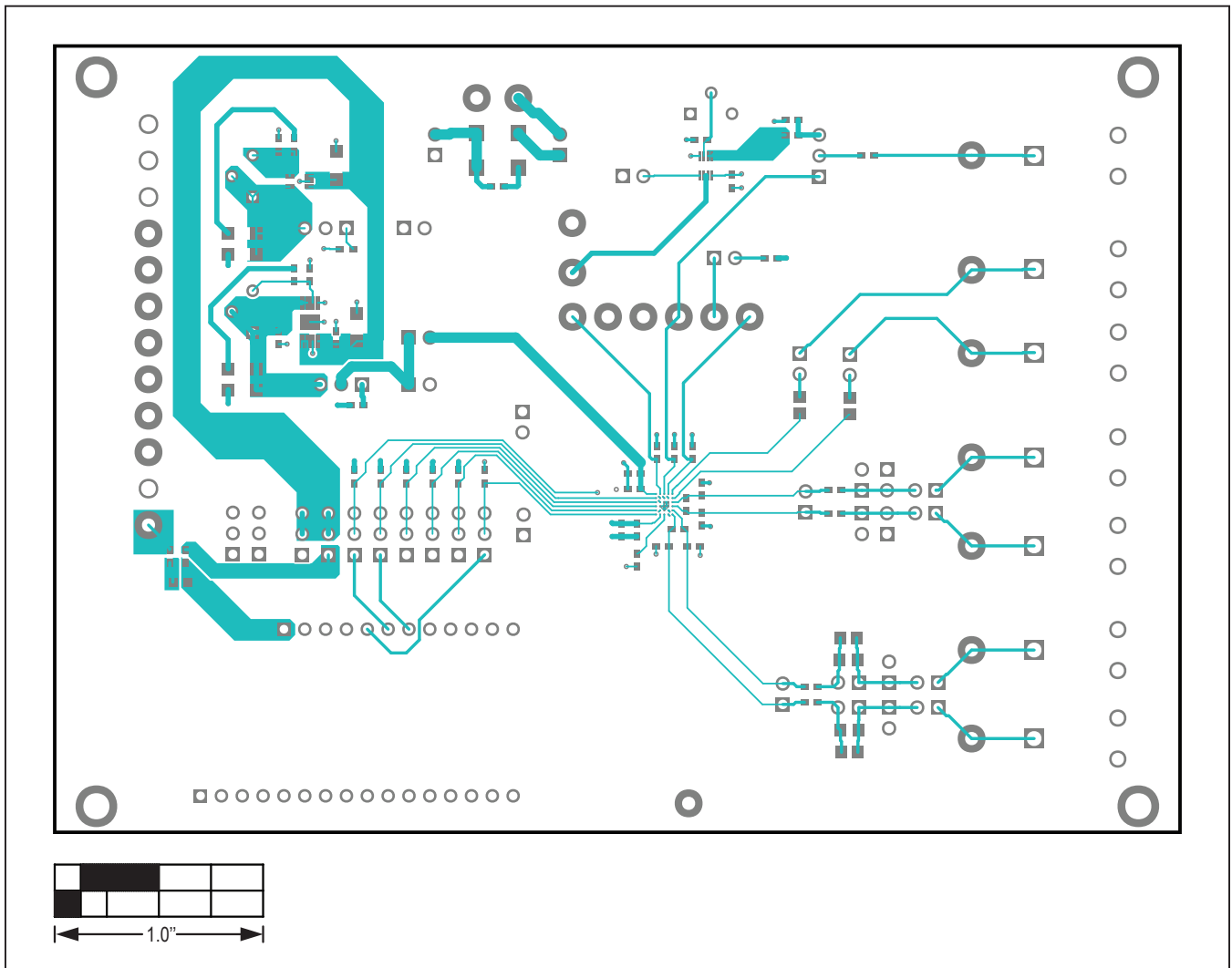## MAX30001G_EVSYS_EV Kit Schematic Diagrams (continued)

MAX30001G_EVSYS_EVKIT PCB Layout Diagrams
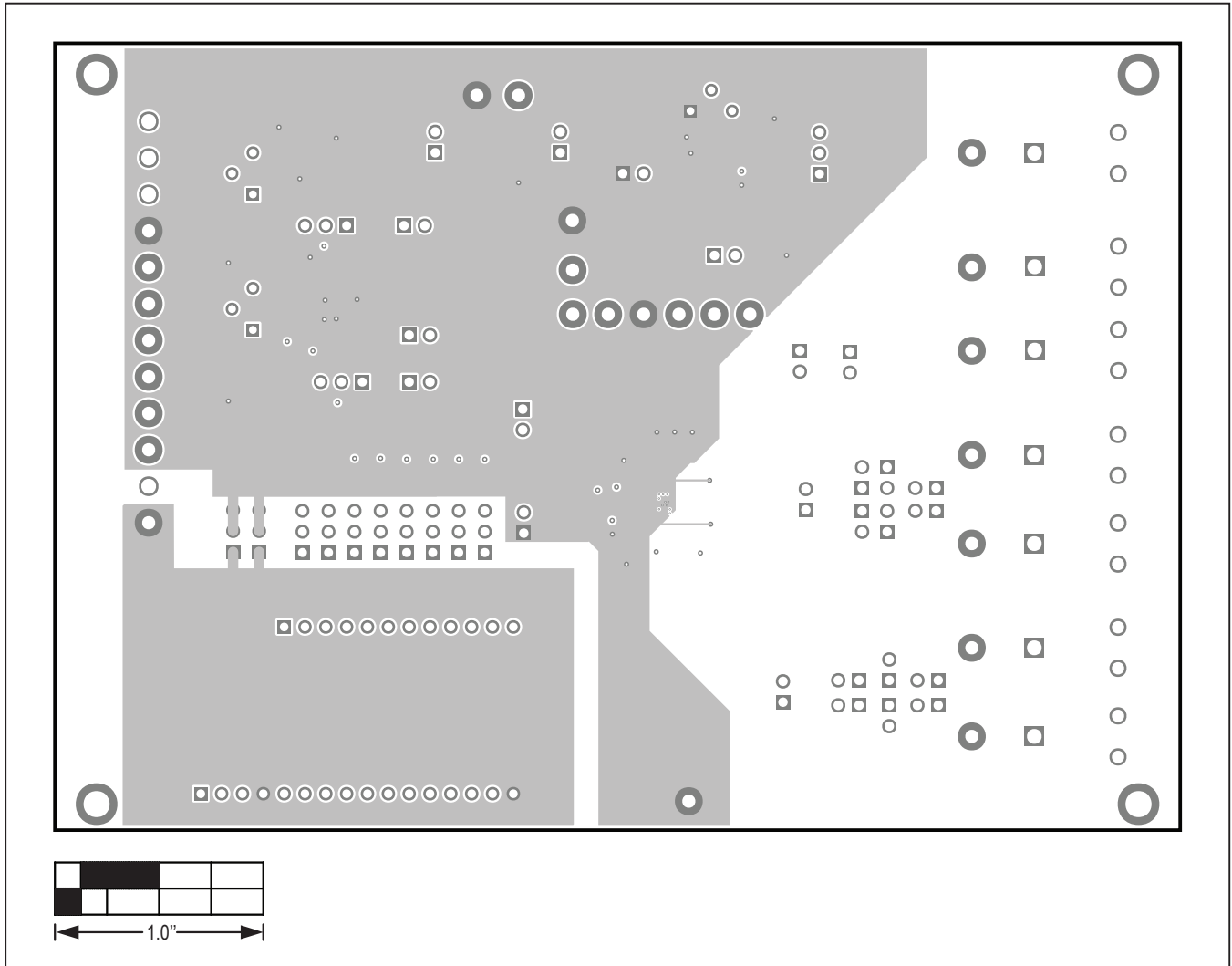

MAX30001G_EVSYS_EVKIT—Top Silkscreen

MAX30001G_EVSYS_EVKIT PCB Layout Diagrams (continued)
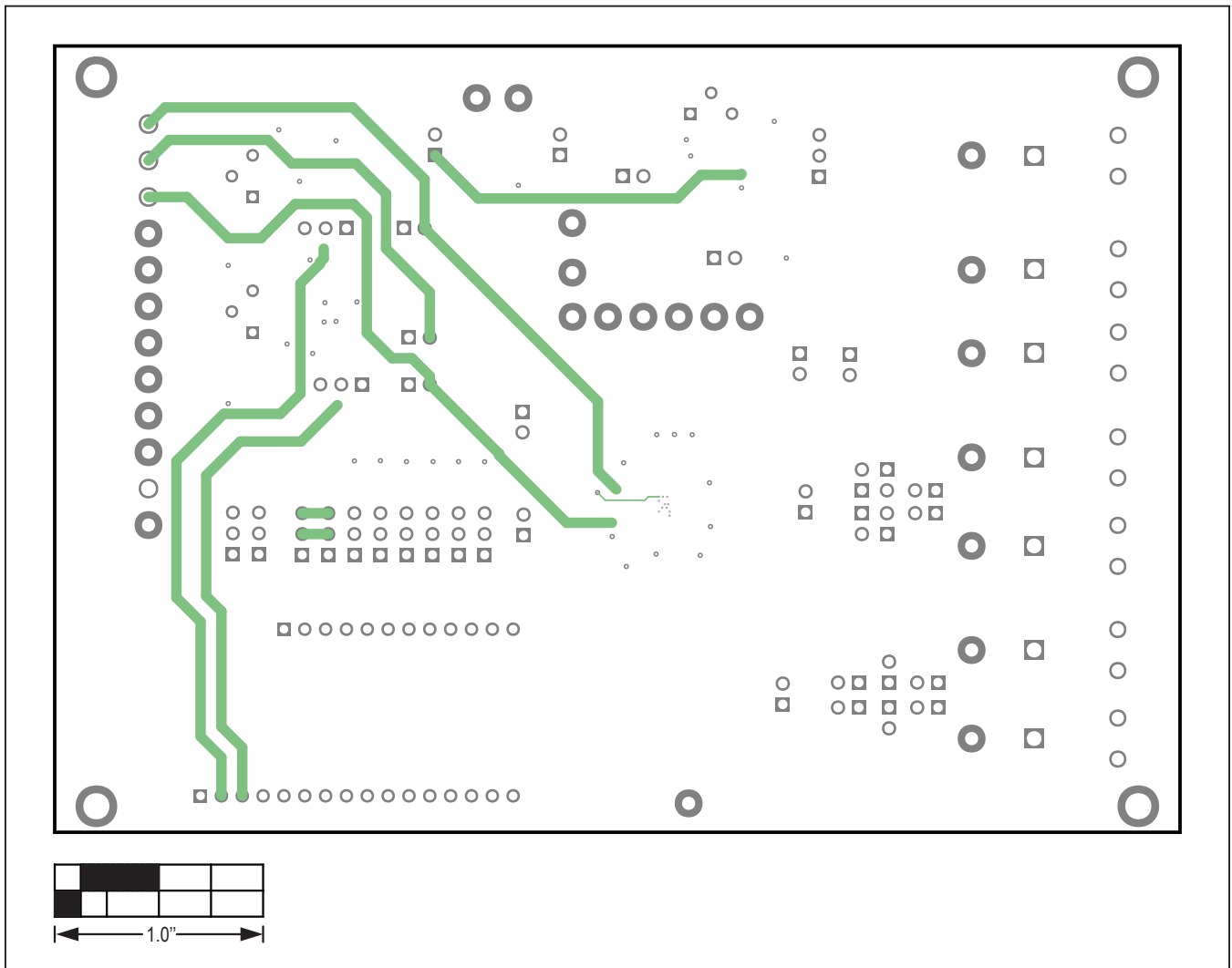

MAX30001G_EVSYS_EVKIT—Top View
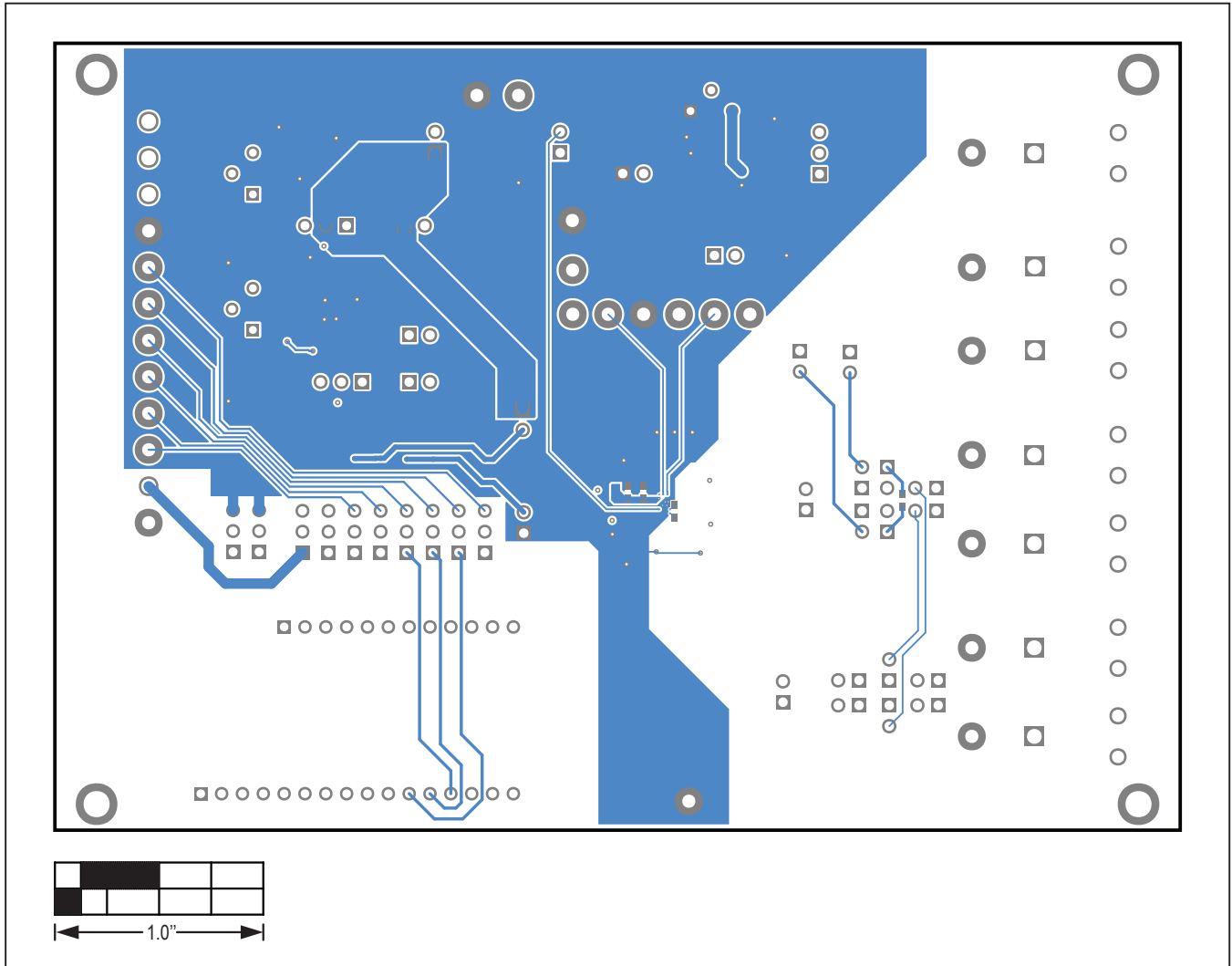
MAX30001G_EVSYS_EVKIT PCB Layout Diagrams (continued)

MAX30001G_EVSYS_EVKIT—Layer 2
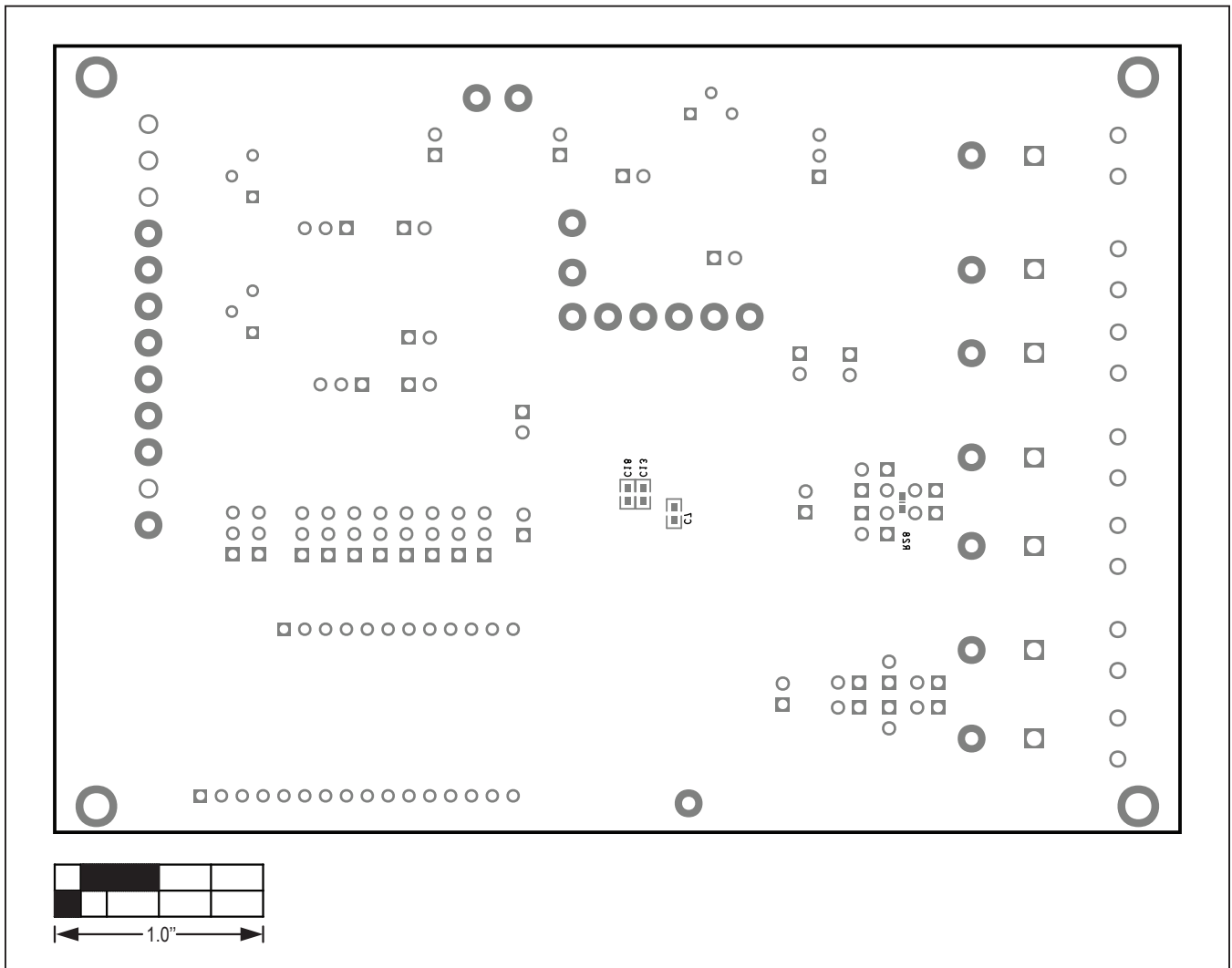
MAX30001G_EVSYS_EVKIT PCB Layout Diagrams (continued)

MAX30001G_EVSYS_EVKIT—Layer 3

MAX30001G_EVSYS_EVKIT PCB Layout Diagrams (continued)

MAX30001G_EVSYS_EVKIT—Bottom View

MAX30001G_EVSYS_EVKIT PCB Layout Diagrams (continued)

MAX30001G_EVSYS_EVKIT—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	11/21	Initial Release	—