MAX86916 Evaluation System

Evaluates: MAX86916

General Description

The MAX86916 evaluation system (EV system) allows for the quick evaluation of the MAX86916 optical module for applications at various sites on the body, particularly the finger. The MAX86916 has four LEDs (blue, green, red, and IR) and one photodiode. The MAX86916 supports a standard I²C interface.

Features

- Quick Evaluation of the MAX86916 IC
- Extensive Control Over Device Registers
- Data Logging and Real-Time Monitoring Capabilities
- Fully Assembled and Tested
- Windows® 7, 8, and 10-Compatible Software

MAX86916 EV System Files

FILE	DESCRIPTION
Insert Final File Name here.exe	PC GUI Program

Quick Start

Required Equipment

- MAX86916_EVKIT_A Board
- MAX32630FTHR
  - Micro-USB Cable
  - USB to FTDI Cable
- Windows PC with Two USB Ports

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

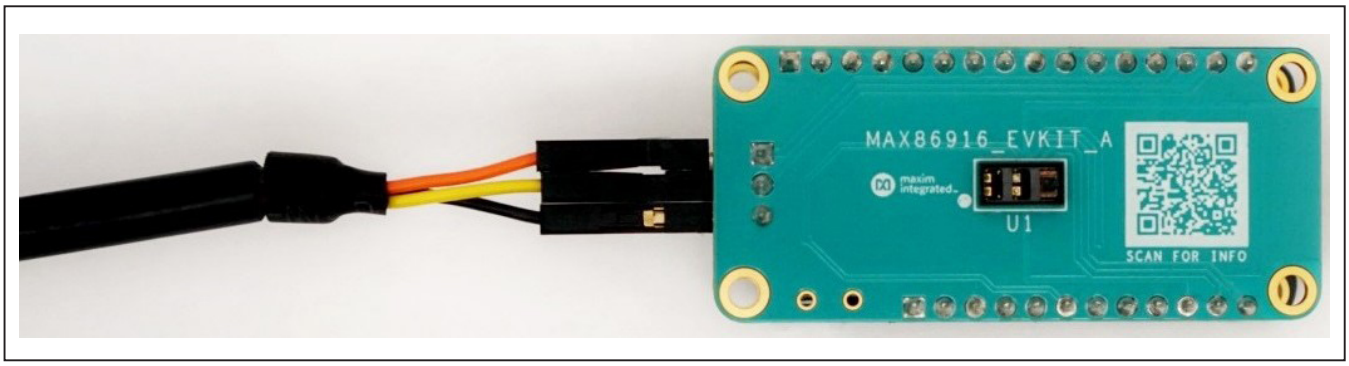
Procedures

Note: Software-related items are identified by bold text. Text in **bold** refers to items directly from the EV system software installer. Text which is **bold and underlined** refers to items from the Windows operating system.

The EV system is tested and ships in two pieces, MAX86916_EVKIT_A and MAX32630FTHR. Perform the following steps to verify board operation:

1) Plug the MAX32630FTHR into the MAX86916_EVKIT_A board.
2) Set the EV system hardware on a nonconductive surface to ensure nothing on the PCBs short together.
3) Connect the EV system hardware to a PC with the provided USB cable. Attach the micro-USB end to the MAX32630FTHR and the other end to the PC. LED D1 on the MAX32630FTHR begins blinking light blue.
4) Connect the FTDI cable to the three headers on the MAX86916_EVKIT_A board. With the MAX86916_EVKIT_A board sensor side up, the order of the FTDI from left to right is orange, yellow, and black. See the MAX86916 EV System Board.
5) Windows automatically begins installing the necessary device driver. Once the driver installation is complete, a Windows message appears near the system icon menu, indicating the hardware is ready to use. Do not attempt to run the GUI prior to this message. Running the GUI prior to receiving this message necessitates closing the application and restarting it once the driver installation is complete. On some versions of Windows, administrator privileges might be required to install the USB device.

MAX86916 EV System Board



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maxim integrated™

6) Once the device drivers have been installed, download the EV system software from MAX86916 EV system Design Resources tab and extract it to a temporary folder.
7) 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.
8) When the installer GUI appears, click **Next**. Select the installation paths and whether to create a shortcut on the desktop. When prompted, click **Install**. Once complete, click **Close**.
9) If a shortcut was created, double-click on the shortcut to start the GUI. Alternatively, go to **Start | All Programs**, look for the MAX86916EVKitTool folder, and click on the MAX86916EVKitTool.EXE file.
10) When the GUI appears, the text in the status bar in the lower right corner displays **Connected**. If the GUI displays **Not Connected**, ensure the flex PCB is properly connected and power cycle the MAX86916 EV system.

Detailed Description of Software

Software Startup

When the DeviceStudio GUI is opened, no devices are connected. Select **Serial over USB/Bluetooth** as the Scan Mode and click the **Scan** button, as shown in Figure 1.

After a device has been found, the **Device Info** and the GUI refresh to indicate a device has been found, as shown in Figure 2.

Click **Launch Tool** to continue using the EV system software.

ToolStrip Menu Bar

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

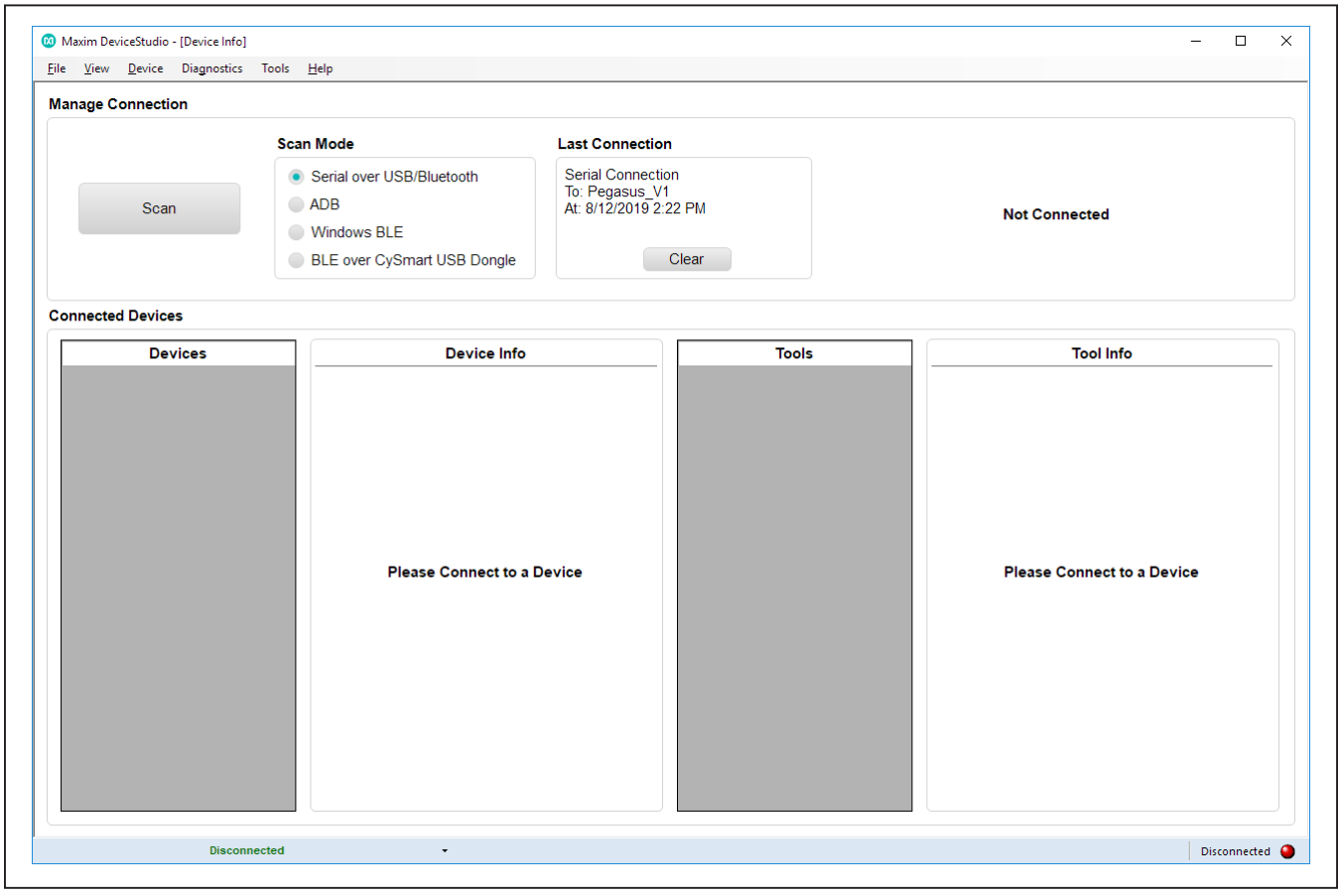


Figure 1. DeviceStudio GUI with Device Disconnected

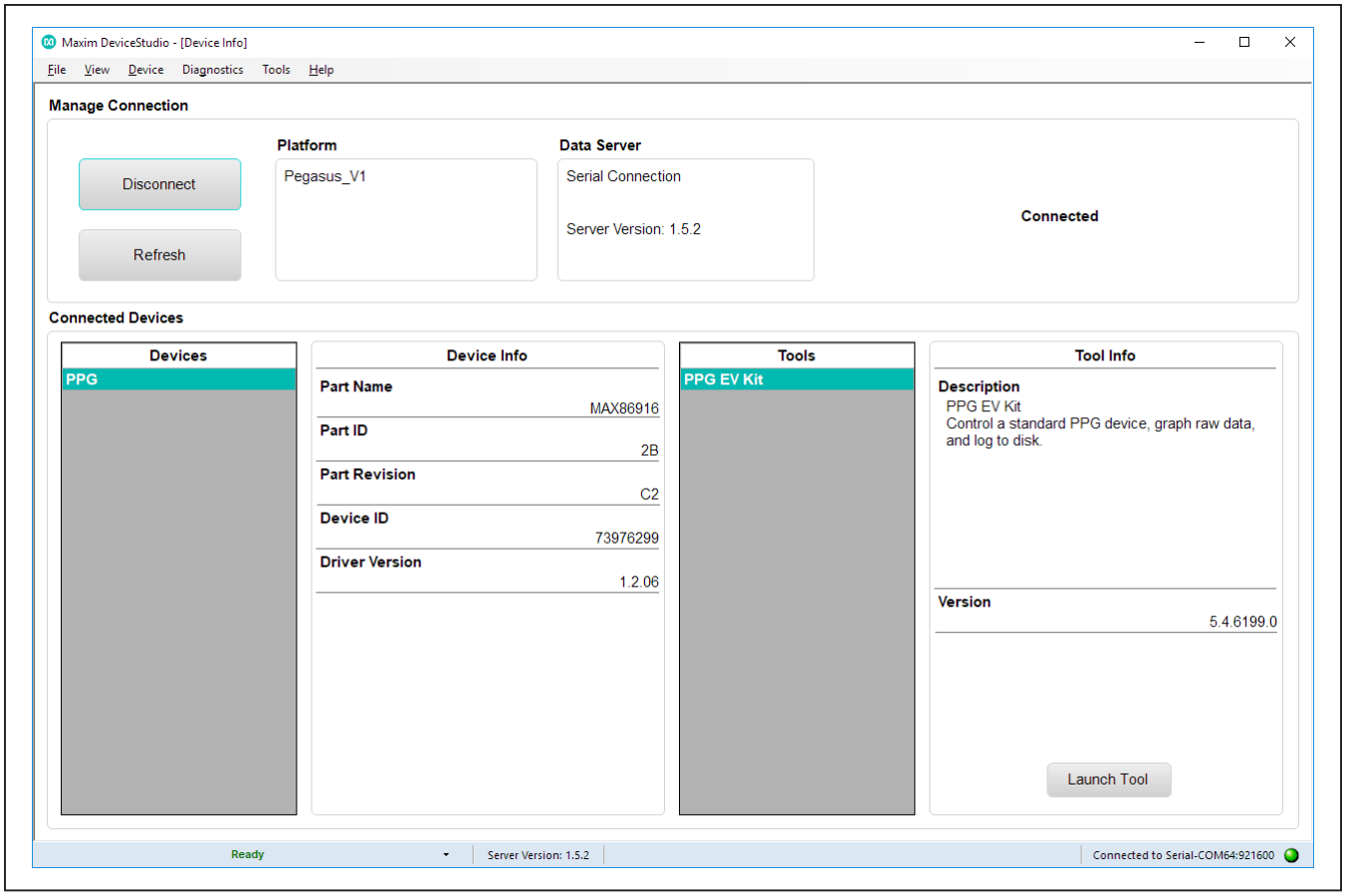


Figure 2. DeviceStudio Device Connected

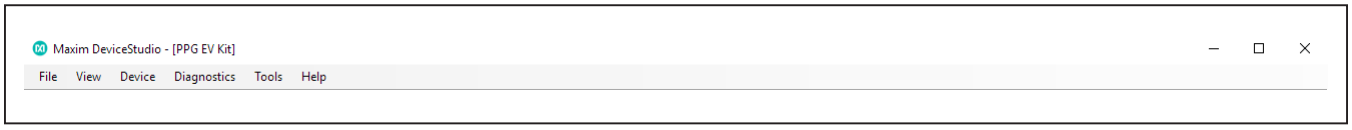


Figure 3. ToolStrip Menu Bar

File Menu

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

View Menu

The **View** menu has the options to view the device info from the GUI introduction screen and to view the **Register Map**. In the register map, the user has the option to read and set individual registers. The register map also provides an explanation of every bit in each register. Double-clicking on a bit toggles its state, and pressing the **Set Reg** button writes the selected settings.

Device Menu

The **Device** menu has the option to connect or disconnect an EV system to the GUI. If a board is disconnected while the GUI is open, the GUI displays **Hardware Not Connected** in the lower right corner. If the device is then plugged back in, the user can navigate to the **Device** menu and select **Connect**. If successful, the lower right corner of the GUI reads **Connected**.

Diagnostics Menu

The **Diagnostics** menu has the option to look at the log file for the DeviceStudio. This can be used for debugging purposes.

Help Menu

The **Help** menu contains information to aid with any problems that might arise when using the GUI. The About option displays the GUI splash screen which tells the user the GUI version being used.

MAX86916 GUI

The main interface structure of the GUI consists of a tab control, where each tab contains controls to change various PPG settings as shown in Figure 4. Changing these interactive controls triggers a write operation to the MAX86916 to update the register contents. Likewise, these controls are refreshed when reading from the device.

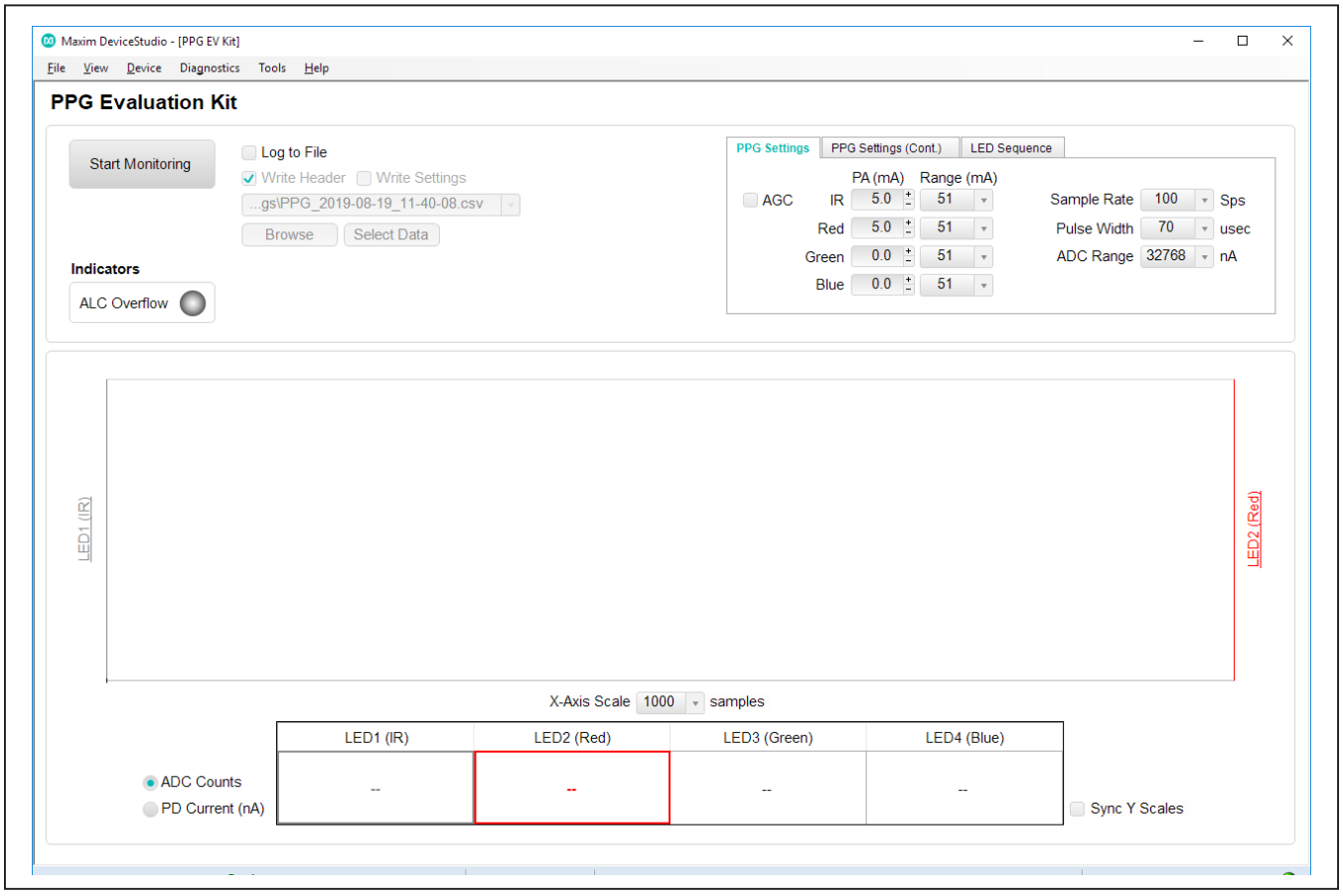


Figure 4. Main GUI Screen

Figure 5 shows an example of viewing data streaming in the GUI. The GUI allows for any LED output to be put on either the left or right Y-axis. Clicking once on an LED shows the output on the left axis, clicking a second time shows the output on the right axis, and clicking a third time stops showing the output. This feature is useful to help align LED outputs on top of each other in the GUI.

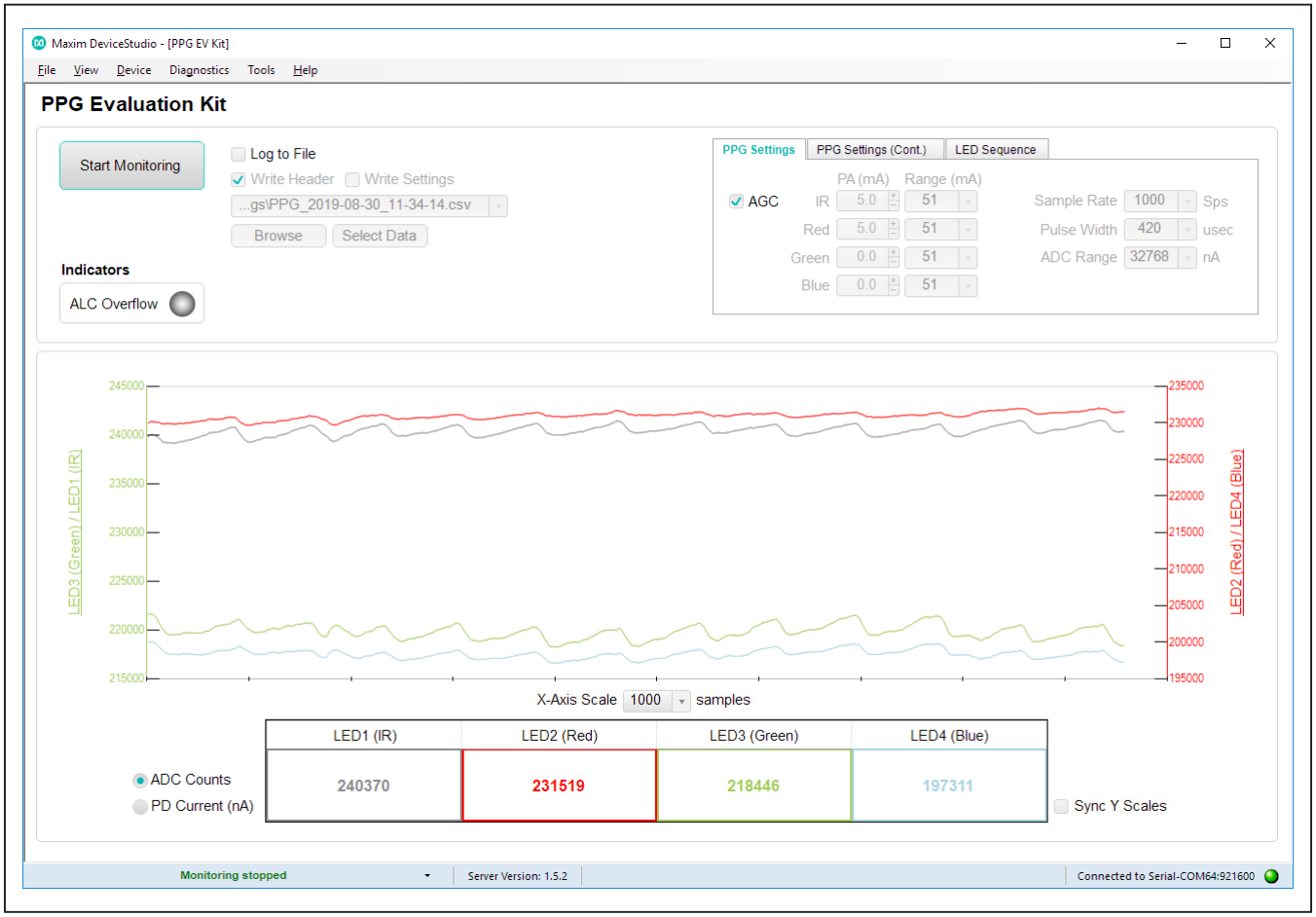


Figure 5. GUI Showing Data Streaming

PPG Settings Tab

The **PPG Settings** tab (Figure 6) displays the general settings associated with PPG. The tab provides the option to enable automatic gain control (AGC), a fully configurable LED drive current, selectable sample rates, pulse widths, and ADC ranges.

PPG Settings (Cont.) Tab

The **PPG Settings (Cont.)** tab (Figure 7) in the GUI gives the option to disable ambient light cancellation, enable and increase the amount of crosstalk cancellation, and change how the FIFO behaves.

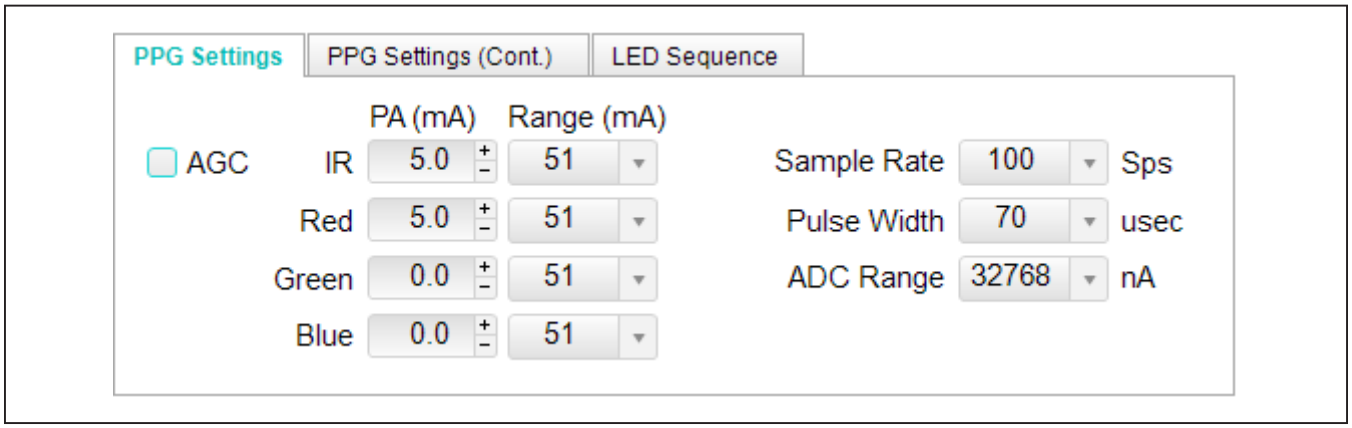


Figure 6. PPG Settings Tab

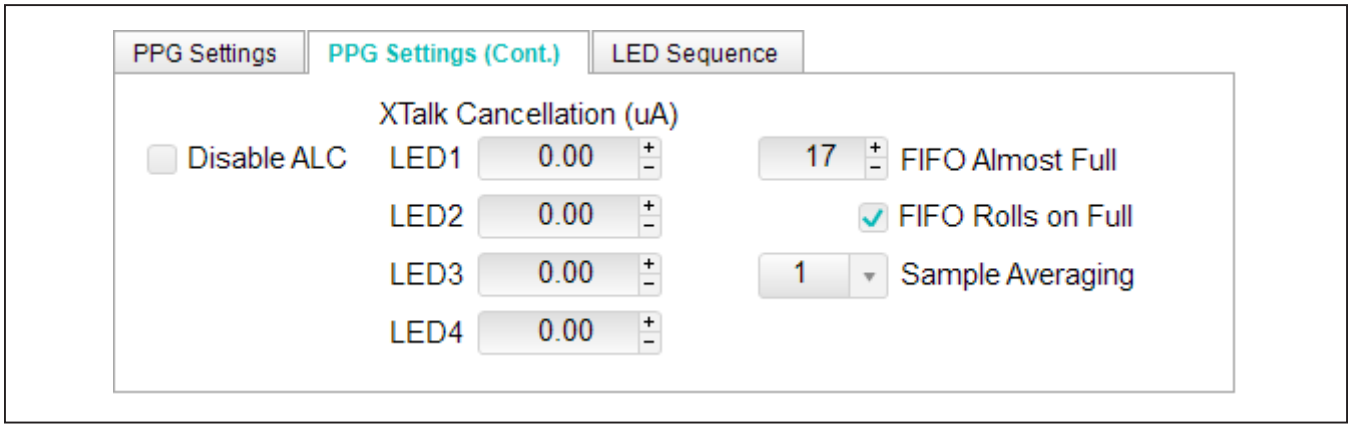


Figure 7. PPG Settings (Cont.) Tab

LED Sequence Tab

The **LED Sequence** tab (Figure 8) controls the data format in the FIFO and the sequence of the LED exposures.

Logging Settings

The MAX86916 GUI provides the ability to log raw optical data to a comma separated value (CSV) file. To log data, check the **Log to File** box (Figure 9), choose whether to write a header and the current PPG settings to the log file, and then click the **Browse** button to select where to save the log file (Figure 10). The GUI allows the user to select which values to be logged to the file.

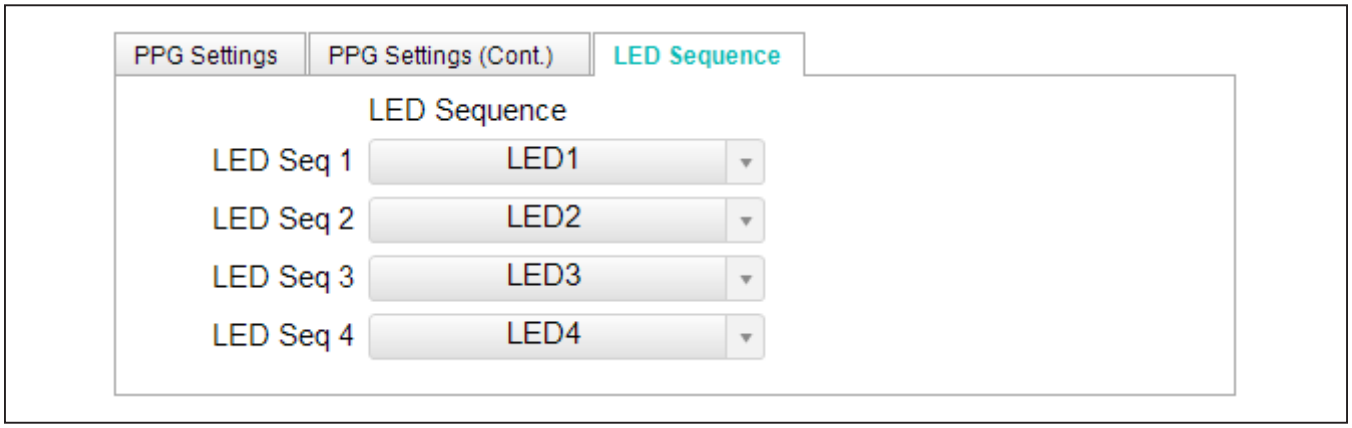


Figure 8. LED Sequence Tab

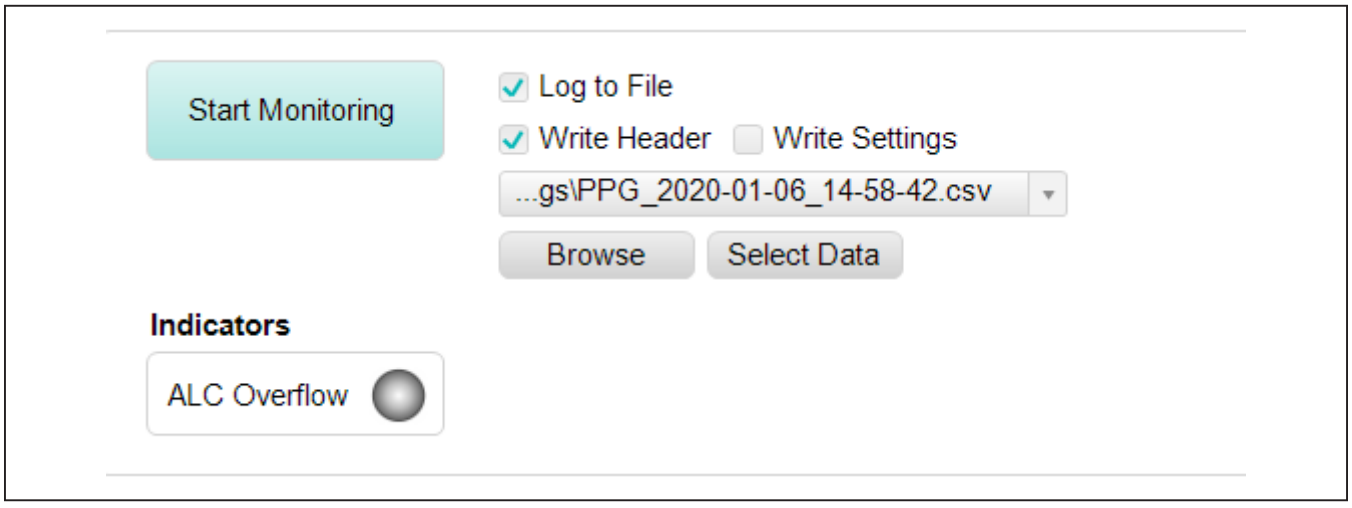


Figure 9. Check the Box to Enable Logging

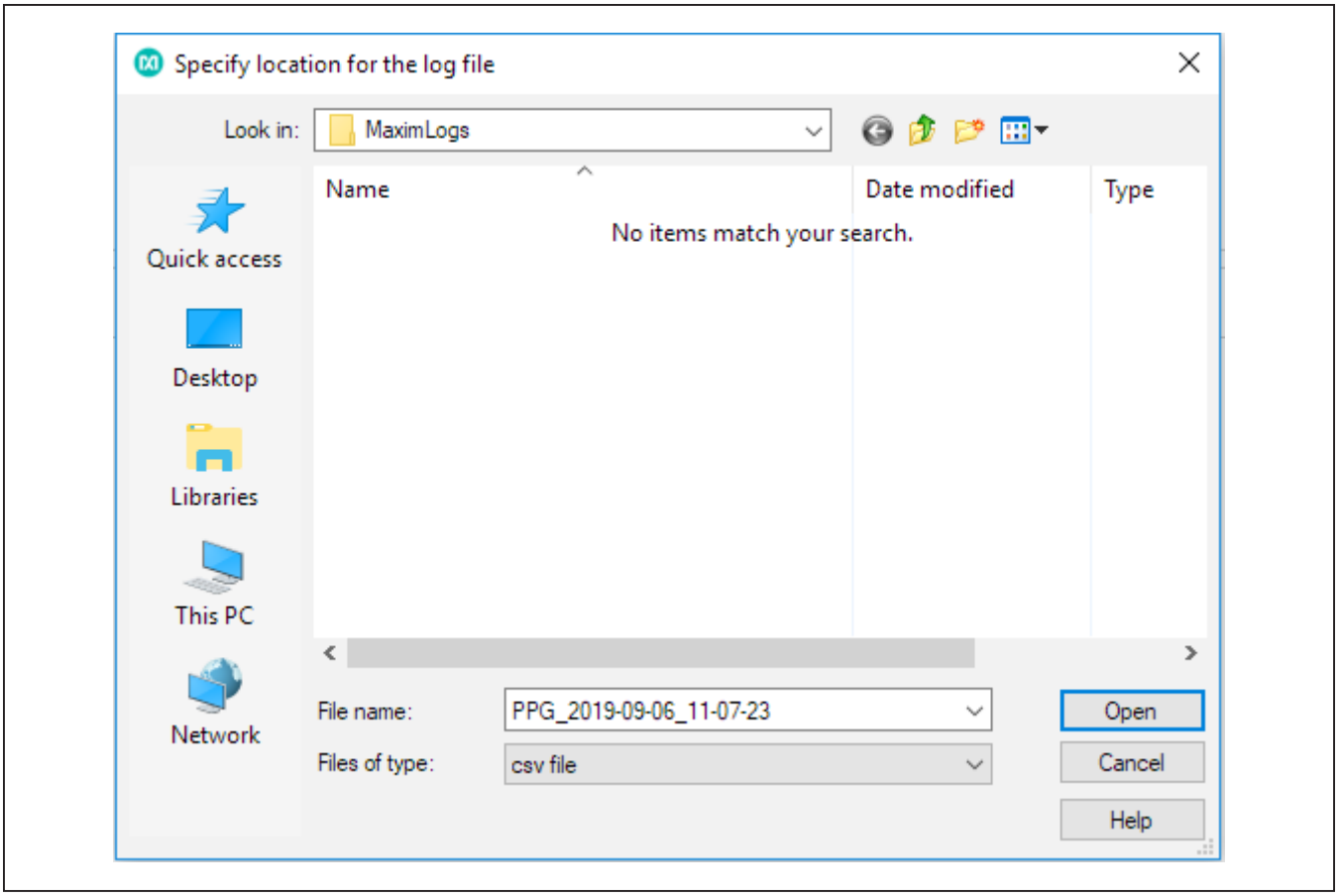


Figure 10. Choose Location to Save the Log File

Detailed Description of Hardware

The MAX86916 EV system provides a single platform to evaluate the functionality and features of the MAX86916. The MAX86916 is an optical module containing 4 LEDs (IR, red, green, and blue) and one photodiode. The EV system comes with all jumpers installed, and a description of the jumpers can be found in Table 1. The EV system utilizes the MAX32630FTHR Cortex-M4F microcontroller for wearables to interface with the GUI and provide power to the MAX86916. The MAX32630FTHR operates from a host PC through a USB to Micro-USB cable and a USB to FTDI cable.

Table 1. Description of Jumpers

JUMPER	DESCRIPTION
JU1	Connect VLED to +5V
JU2	Connect VDD to +1.8V

Component Suppliers

SUPPLIER	WEBSITE
Keystone	www.keyelco.com
Kycon	www.kycon.com
Maxim Integrated	www.maximintegrated.com
Molex	www.molex.com
Murata	www.murata.com
Panasonic	www.industrial.panasonic.com
Samtec	www.samtec.com
Samsung Electro-Mechanics	www.samsungsem.com/global/index.jsp
Sullins	www.sullinscorp.com
TDK Corporation	www.tdk.com
TE Connectivity	www.te.com
Wurth Electronics	www.we-online.com

Note: *When contacting these component suppliers, indicate that the MAX86916 is being used.*

Component List

SUPPLIER	DESCRIPTION
MAX86916_EVKIT_A	MAX86916 Sensor Board
MAX32630FTHR	Microcontroller Board
Micro-USB to USB Cable	Cable to connect Micro-controller Board to PC
USB to FTDI Cable	Cable to provide data streaming from sensor to PC

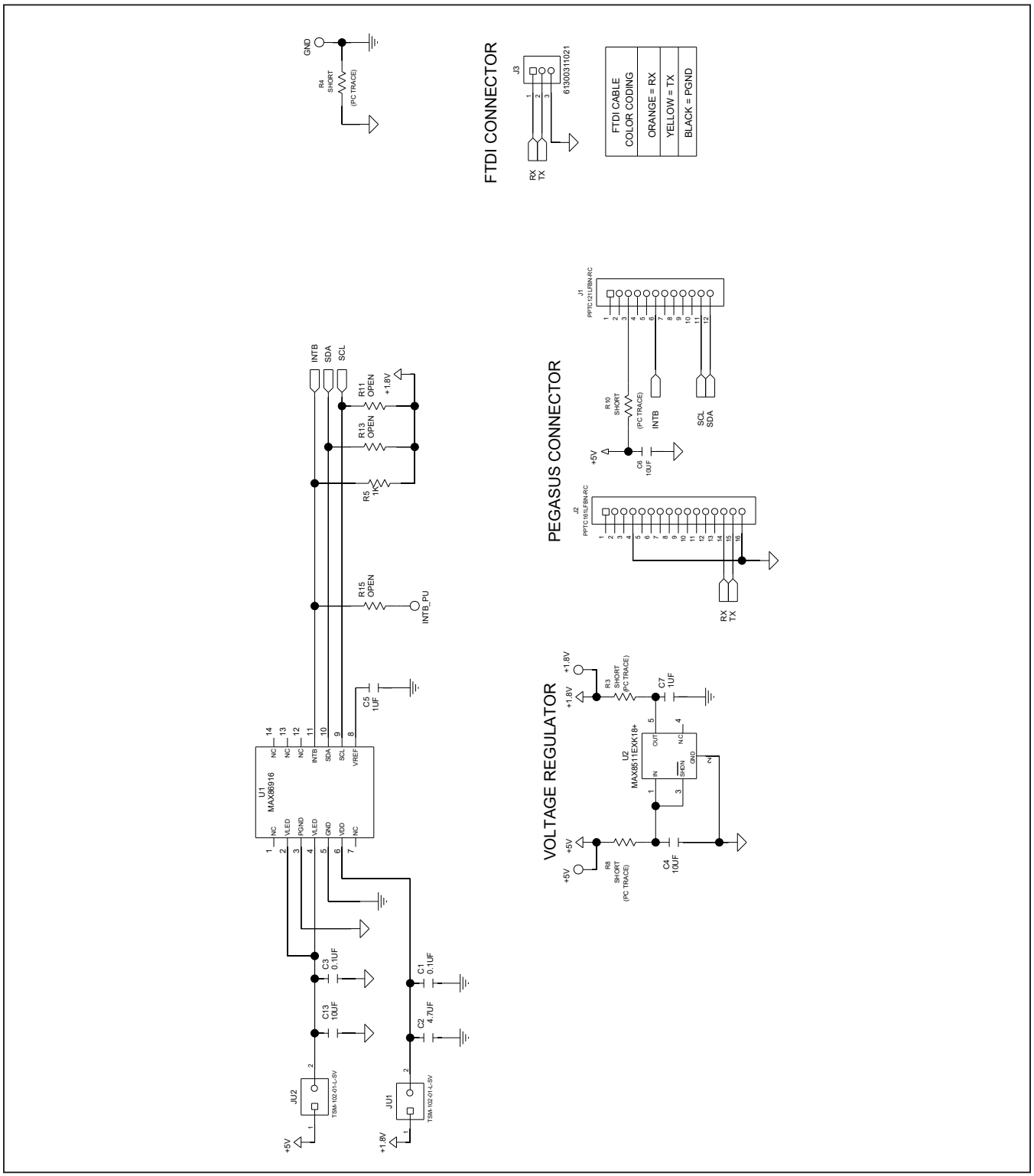
Ordering Information

PART	TYPE
MAX86916EVSYS#	EV System

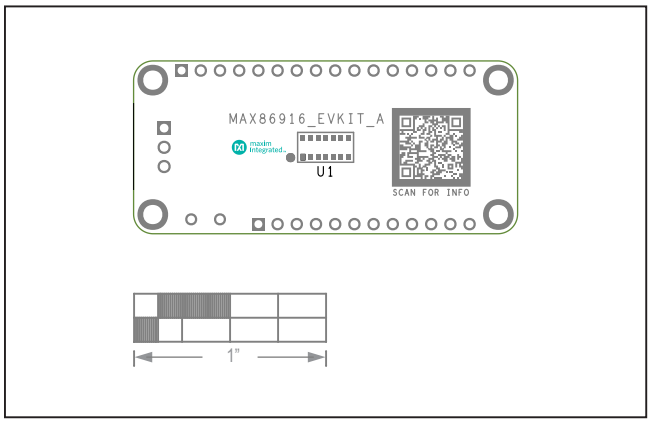
MAX86916 EV System Bill of Materials (BOM)

ITEM	QTY	REF DES	Var Status	MAXINV	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	2	C1, C3	Pref	20-000U1-04A	CGA2B3X7R1H104K050BB;C1005X7R1H104K050BB;GRM155R71H104KE14;GCM155R71H104KE02;C1005X7R1H104K050BE;UMK105B7104KV-FR;CGA2B3X7R1H104K050BE	TDK;TDK;MURATA;MURATA;TDK;TAIYO YUDEN;TDK	0.1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1UF; 50V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R
2	1	C2	Pref	20-004U7-33B	CL05A475MO5NUN	SAMSUNG ELECTRO-MECHANICS	4.7UF	CAP; SMT (0402); 4.7UF; 20%; 16V; X5R; CERAMIC CHIP
3	2	C4, C6	Pref	20-0010U-A29	GRM188R61C106MA73	MURATA	10UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 10UF; 16V; TOL=20%; MODEL=GRM SERIES; TG=-55 DEGC TO +85 DEGC; TC=X5R
4	2	C5, C7	Pref	20-0001U-CA28	EMK105BJ105KV	TAIYO YUDEN	1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 1UF; 16V; TOL=10%; TG=-55 DEGC TO +85 DEGC; TC=X5R ;NOTE:PURCHASE DIRECT FROM THE MANUFACTURER
5	1	C13	Pref	20-0010U-BA12	GRM155R61A106ME44;GRM155R61A106ME11;0402ZD106MAT2A;CL05A106MP5NUNC	MURATA;MURATA;AVX;SAMSUNG	10UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 10UF; 10V; TOL=20%; TG=-55 DEGC TO +85 DEGC; TC=X5R
6	1	INTB_PU	Pref	02-TPMINI5004-00	5004	KEYSTONE	N/A	TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; YELLOW; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH; RECOMMENDED FOR BOARD THICKNESS=0.062IN; NOT FOR COLD TEST
7	1	J1	Pref	01-PPTC121LFBN12P-19	PPTC121LFBN-RC	SULLINS ELECTRONICS CORP	PPTC121LFBN-RC	CONNECTOR; FEMALE; THROUGH HOLE; 2.54MM CONTACT CENTER; FEMALE HEADER; STRAIGHT; 12PINS
8	1	J2	Pref	01-PPTC161LFBN16P-19	PPTC161LFBN-RC	SULLINS ELECTRONICS CORP	PPTC161LFBN-RC	CONNECTOR; FEMALE; THROUGH HOLE; 2.54MM CONTACT CENTER; FEMALE HEADER; STRAIGHT; 16PINS
9	1	J3	Pref	01-613003110213P-19	61300311021	WURTH ELECTRONICS INC	61300311021	CONNECTOR; MALE; THROUGH HOLE; 2.54MM THT ANGLED PIN HEADER; RIGHT ANGLE; 3PINS
10	2	JU1, JU2	Pref	01-TSM10201LSV2P-17	TSM-102-01-L-SV	SAMTEC	TSM-102-01-L-SV	CONNECTOR; MALE; SMT; SINGLE ROW; STRAIGHT THROUGH; 2PINS
11	1	R5	Pref	80-0001K-18	ERJ-2RKF1001	PANASONIC	1K	RESISTOR; 0402; 1K OHM; 1%; 100PPM; 0.10W; THICK FILM
12	2	SU1, SU2	Pref	02-JMPFS1100B-00	S1100-B;SX1100-B;STC02SYAN	KYCON;KYCON;SULLINS ELECTRONICS CORP.	SX1100-B	TEST POINT; JUMPER; STR; TOTAL LENGTH=0.24IN; BLACK; INSULATION=PBT;PHOSPHOR BRONZE CONTACT=GOLD PLATED
13	1	TP3	Pref	02-TPMINI5000-00	5000	KEYSTONE	N/A	TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; RED; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH; RECOMMENDED FOR BOARD THICKNESS=0.062IN; NOT FOR COLD TEST
14	1	U1	Pref	00-SAMPLE-02	MAX86916	MAXIM	MAX86916	EVKIT PART - IC; MAX86916; OLGA14; PACKAGE DRAWING NUMBER: 21-100325; LAND PATTERN NUMBER: 90-100122; PACKAGE CODE: F143H7MK+1
15	1	U2	Pref	10-MAX8511EXK18-X	MAX8511EXK18+	MAXIM	MAX8511EXK18+	IC; VREG; ULTRA-LOW-NOISE; HIGH PSRR; LOW=DROPOUT; LINEAR REGULATOR; SC70-5
16	1	PCB	-	EPCB86916	MAX86916	MAXIM	PCB	PCB:MAX86916
17	1	KIT1	Pref	35-8932630KFT-00	89-32630#KFT	MAXIM	89-32630#KFT	MODULE; BOARD ASSEMBLY; THROUGH HOLE; MAX32630FTHR# LAMINATED PLASTIC WITH COPPER CLAD
19	1	Pref	01-PBC12SAAN12P-21	PBC12SAAN	SULLINS ELECTRONICS CORP.	PBC12SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 12PINS; -65 DEGC TO +125 DEGC	
20	1	Pref	01-PBC16SAAN16P-21	PBC16SAAN	SULLINS ELECTRONICS CORP.	PBC16SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 16PINS; -65 DEGC TO +125 DEGC	
TOTAL	24							
DO NOT PURCHASE(DNP)								
ITEM	QTY	REF DES	Var Status	MAXINV	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	3	R3, R8, R10	DNP	N/A	N/A	N/A	SHORT	PACKAGE OUTLINE 0603 RESISTOR - EVKIT
2	1	R4	DNP	N/A	N/A	N/A	SHORT	PACKAGE OUTLINE 0402 RESISTOR - EVKIT
3	3	R11, R13, R15	DNP	N/A	N/A	N/A	OPEN	PACKAGE OUTLINE 0402 RESISTOR - EVKIT
TOTAL	7							
PACKOUT (These are purchased parts but not assembled on PCB and will be shipped with PCB)								
ITEM	QTY	REF DES	Var Status	MAXINV	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	1	PACKOUT_BOX	Pref	88-00711-SML	88-00711-SML	N/A	N/A	BOX;SMALL BROWN 9 3/16X7X1 1/4 - PACKOUT
2	1	PACKOUT_BOX	Pref	87-02162-00	87-02162-00	N/A	N/A	ESD BAG;BAG;STATIC SHIELD ZIP 4inX6in;W/ESD LOGO - PACKOUT
3	1	PACKOUT_BOX	Pref	85-MAXKIT-PNK	85-MAXKIT-PNK	N/A	N/A	PINK FOAM;FOAM;ANTI-STATIC PE 12inX12inX5MM - PACKOUT
4	1	PACKOUT_BOX	Pref	EVINSERT	EVINSERT	N/A	N/A	WEB INSTRUCTIONS FOR MAXIM DATA SHEET
5	1	PACKOUT_BOX	Pref	85-84003-006	85-84003-006	N/A	N/A	LABEL(EV KIT BOX) - PACKOUT
6	4	PACKOUT	Pref	08-EKSO44003803-01	NYLON_STANDOFF_4-40_3/8	MAXIM	3/8IN	KIT; ASSY-STANDOFF 3/8IN; 1PC. STANDOFF/FEM/HEX/4-40IN/(3/8IN)/NYLON; 1PC. SCREW/SLOT/PAN/4-40IN/(3/
7	4	1.8V, AGND, INTB, TP3	Pref	02-TPCOMP5006-00	5006	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.35IN; BOARD HOLE=0.063IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH; RECOMMENDED FOR BOARD THICKNESS=0.062IN; NOT FOR COLD TEST
9	2	MISC1	Pref	01-302501003-10	3025010-03	QUALTEK	N/A	CONNECTOR; MALE; USB-A_MINI-B; USB 4P(A)/M - USB MINI 5P(B)/M; STRAIGHT; 36IN
TOTAL	15							

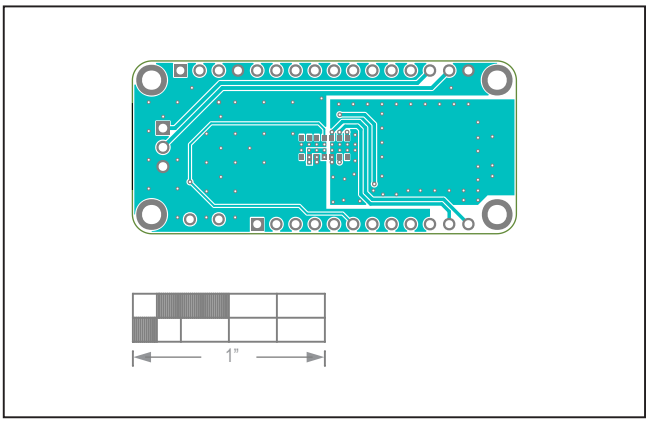
MAX86916 EV System Schematics



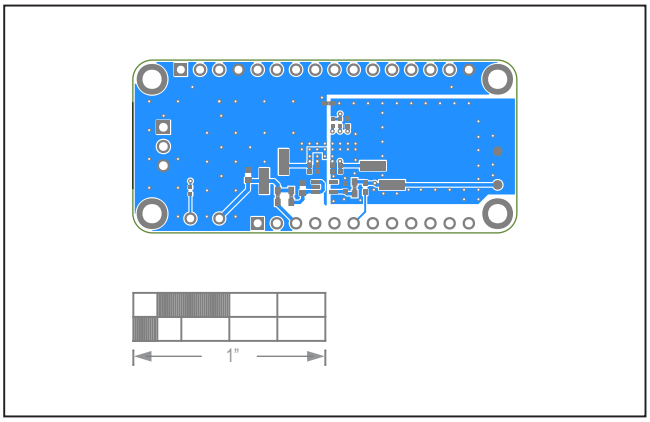
MAX86916 EV System PCB Layout



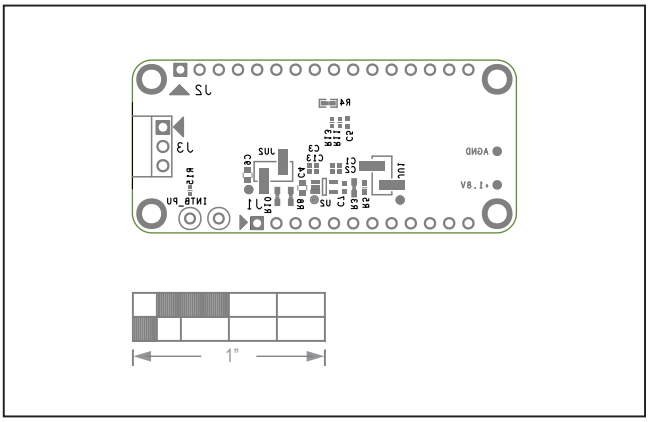
MAX86916 EV System—Top Silkscreen



MAX86916 EV System—Top Layer



MAX86916 EV System—Bottom Layer



MAX86916 EV System—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	2/20	Initial release	—

For pricing, delivery, and ordering information, please visit Maxim Integrated's online storefront at https://www.maximintegrated.com/en/storefront/storefront.html.

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