CY3290-CYAT8168X PSoC™ Automotive Multitouch Evaluation Kit guide

About this document

Scope and purpose

This document describes the CY3290-CYAT8168X Evaluation Kit. The document includes sections on software installation, kit bring-up, hardware configuration, and software usage basics. Appended are the schematics, layouts, and bill of materials.

Intended audience

This document is intended for anyone using the CY3290-CYAT8168X Evaluation Kit.

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Safety precautions

Note: Please note the following warnings regarding the hazards associated with development system

Table 1 Safety precautions

	**Warning:** *The DC link potential of this board is up to 1000 VDC. When measuring voltage waveforms by oscilloscope, high voltage differential probes must be used. Failure to do so may result in personal injury or death.*
	**Warning**: *The evaluation or reference board contains DC bus capacitors which take time to discharge after removal of the main supply. Before working on the drive system, wait five minutes for capacitors to discharge to safe voltage levels. Failure to do so may result in personal injury or death. Darkened display LEDs are not an indication that capacitors have discharged to safe voltage levels.*
	**Warning:** *The evaluation or reference board is connected to the grid input during testing. Hence, high-voltage differential probes must be used when measuring voltage waveforms by oscilloscope. Failure to do so may result in personal injury or death. Darkened display LEDs are not an indication that capacitors have discharged to safe voltage levels.*
	**Warning:** *Remove or disconnect power from the drive before you disconnect or reconnect wires, or perform maintenance work. Wait five minutes after removing power to discharge the bus capacitors. Do not attempt to service the drive until the bus capacitors have discharged to zero. Failure to do so may result in personal injury or death.*
	**Caution:** *The heat sink and device surfaces of the evaluation or reference board may become hot during testing. Hence, necessary precautions are required while handling the board. Failure to comply may cause injury.*
	**Caution:** *Only personnel familiar with the drive, power electronics and associated machinery should plan, install, commission and subsequently service the system. Failure to comply may result in personal injury and/or equipment damage.*
	**Caution:** *The evaluation or reference board contains parts and assemblies sensitive to electrostatic discharge (ESD). Electrostatic control precautions are required when installing, testing, servicing or repairing the assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with electrostatic control procedures, refer to the applicable ESD protection handbooks and guidelines.*
	**Caution:** *A drive that is incorrectly applied or installed can lead to component damage or reduction in product lifetime. Wiring or application errors such as undersizing the motor, supplying an incorrect or inadequate AC supply, or excessive ambient temperatures may result in system malfunction.*
	**Caution:** *The evaluation or reference board is shipped with packing materials that need to be removed prior to installation. Failure to remove all packing materials that are unnecessary for system installation may result in overheating or abnormal operating conditions.*

1 Introduction

The CY3290-CYAT8168X PSoC™ Automotive Multitouch Evaluation Kit (EVK) is a touchscreen evaluation platform based on CYAT8168X, Infineon's capacitive multi-touch all-point touchscreen technology. The CYAT8168X family of PSoC™ Automotive Multitouch touchscreen controllers is optimized for performance and supports advanced features such as superior electromagnetic immunity performance as per automotive standards, thick glove (≤ 5 mm thick), water rejection, and CAPSENSE™.

1.1 Kit contents

Each kit contains:

- EVK assembly
- CYAT8168X sensor board
- Isolation bridge board
- 10.1-inch touchscreen sensor
- USB 2.0 certified cable
- Quick start guide

1.2 Getting started

To learn the solution quickly and apply it to the design, see **"Kit operation"** on page 16.

1.3 Installation

1.3.1 Install EVK software

Install the EVK software from the design support section of the **CY3290-CYAT8168X — PSoC™ Automotive Multitouch Evaluation Kit**. This installs the Touch Tuning Host Emulator (TTHE), PSoC™ Programmer, and the TTHE project for the EVK.

It is recommended to use the latest TTHE and project, both of which can be found in the design support section of the **CY3290-CYAT8168X — PSoC™ Automotive Multitouch Evaluation Kit**.

The TTHE software is a design tool that runs on the PC and communicates with the CYAT8168X device over I2C or SPI using the Touch Tuning Bridge (TTBridge). It can show finger touches, finger gestures, large objects, line drawings, and also record statistical data of raw counts, baselines, and diff count values for sensors, along with many other functions.

The PSoC™ Programmer software allows Single Wire Debug (SWD) programming of the touch controller.

1.3.2 Connect EVK to PC

1. Ensure that the PWR SEL switch on the CYAT8168X EVK case is set to "PC".
2. Connect the CYAT8168X EVK assembly to the PC using the USB cable.
3. Wait for the kit driver enumeration to complete (the power LED (Red) on the sensor board illuminates).

1.3.3 Start TTHE

Launch the TTHE by the Windows Start button and search for “Host Emulator”.

See the TTHE user guide and **“Evaluating the EVK with TTHE”** on page 16 for detailed information on running the TTHE application.

1.4 Documentation conventions

Table 2 Document conventions

Convention	Usage
`Courier New`	Displays file locations, user-entered text, and source code: `C:\...cd\icc\`
Italics	Displays file names and reference documentation: Read about the *sourcefile.hex* file in the *PSoC™ Designer User Guide*.
[**Bracketed, Bold**]	Displays keyboard commands in procedures: [**Enter**] or [**Ctrl**] [**C**]
File > Open	Represents menu paths: **File > Open > New Project**
Bold	Displays commands, menu paths, and icon names in procedures: Click the **File** menu, and then click **Open**.
Times New Roman	Displays an equation: $2 + 2 = 4$
Text in gray boxes	Describes cautions or unique functionality of the product.

1.5 Acronyms

Table 3 Acronyms used in this document

Acronym	Definition
DUT	Device Under Test
ESD	Electrostatic Discharge
FPC	Flexible Printed Circuit
I/O	Input/Output
I2C	Inter-Integrated Circuit
ITO	Indium Tin Oxide
MH3	Manhattan-3 pattern
MTK	Manufacturing Test Kit
MISO	Master In Slave Out (SPI)
MOSI	Master Out Slave In (SPI)
PCB	Printed Circuit Board
SCL	Serial Clock (I2C)
SDA	Serial Data (I2C)
SPI	Serial Peripheral Interface
SS	Slave Select (SPI)
SCLK	Serial clock (SPI)
SWD	Serial Wire Debug
SWDIO	Serial Wire Debug Input/Output
SWDCLK	Serial Wire Debug Clock
TRM	Technical Reference Manual
TTBridge	Touch Tuning Bridge
TTHE	Touch Tuning Host Emulator
XRES	External Reset. Active low

2 Hardware

2.1 CYAT8168X EVK assembly

The CYAT8168X EVK consists of a CYAT8168X sensor board, isolation bridge for communication with power isolation, and a 10.1-inch touchscreen sensor enclosed in a plastic case.

Figure 1 shows the front view of the assembly and **Figure 2** shows the back view.

Figure 1 CYAT8168X EVK assembly (front view)

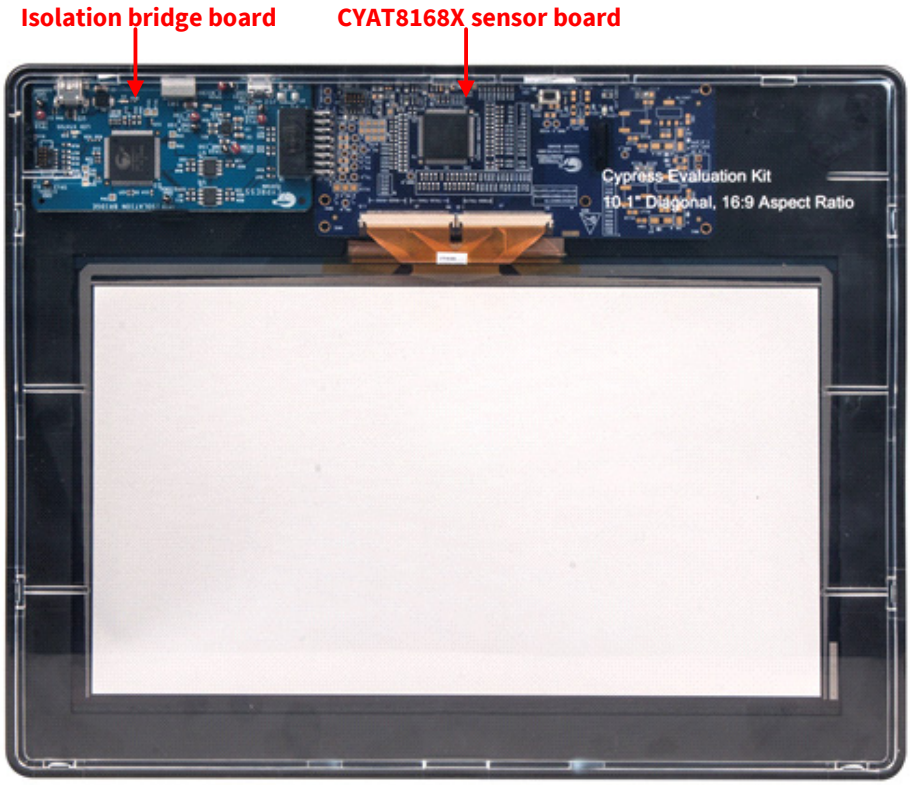

Figure 2 CYAT8168X EVK assembly (back view)

2.2 Power settings

The power source for the EVK is selected using the slide switch at the bottom (see **Figure 3**). The slide switch is attached to the isolation bridge internal to the kit. In most cases, the PC is the power source and the switch should be pushed towards the PC port. Power is supplied by the same USB cable used for communication when the PC port is selected. Power may also be supplied by an external charger (not included with the kit) connected to the Charger port. See **"Isolation bridge"** on page 14 for additional details on power selection.

Switching between power sources may interrupt the kit operation if it is currently running in the TTHE. If the kit becomes unresponsive to touches following a switch between power sources, perform the following steps:

1. Click **Disconnect** .
2. Click **Connect** .
3. Click **Run** .

Figure 3 Power selection slide switch

2.3 Panel overview

The CYAT8168X EVK comes with an ITO panel, which has the following features:

- 10.1-inch diagonal length
- 16:9 aspect ratio
- 0.7-mm cover lens thickness
- 0.55-mm sensor lens thickness
- 50-Ω/sq ITO sheet resistance
- Designed with Infineon's MH3 pattern
- 23 rows and 42 columns

The panel is connected to the CYAT8168X sensor board using a flex connector. The other side of the flex is attached to two 50-pin connectors on the CYAT8168X sensor board. The flex connector is shown in **Figure 4** and details of the two 50-pin connectors are listed in **Table 4**.

Hardware design files of the 50-pin connectors are available at the following location:

C:\Program Files (x86)\Cypress\CY3290-CYAT8168X AUTOMOTIVE EVK\<version>\Hardware\CYAT8168X Sensor Board

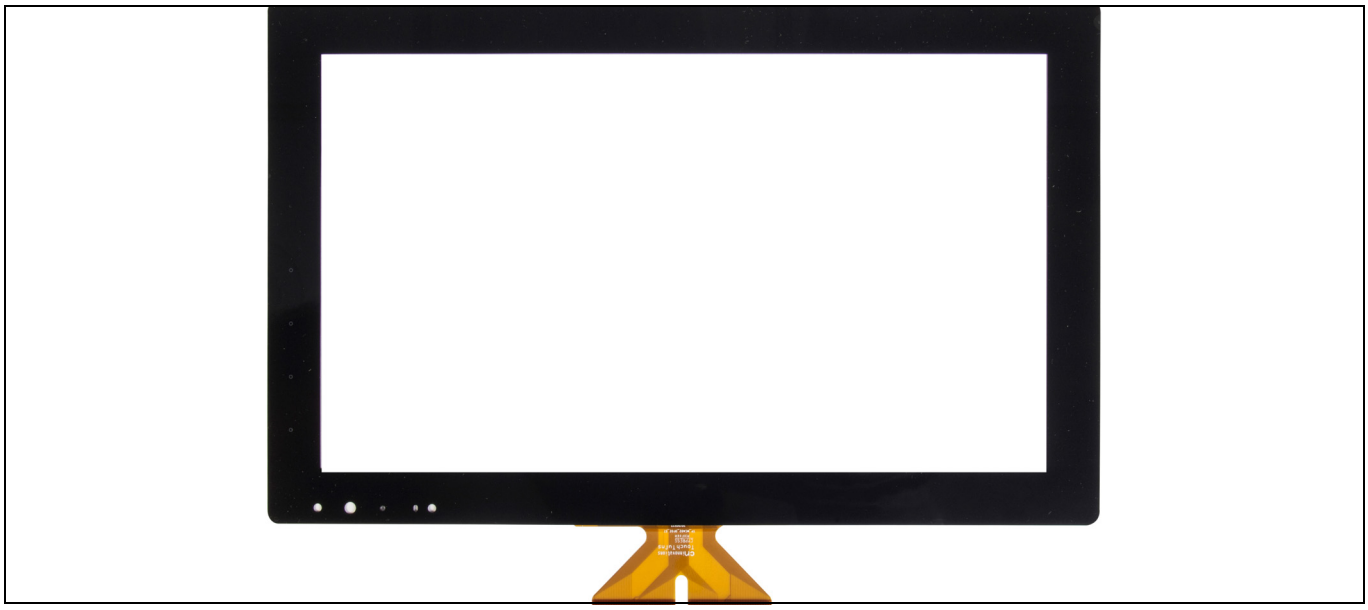

Figure 4 10.1-inch touch sensor

Table 4 50-pin connector details

Connector pin number	Connector J1		Connector J2	
	Sensor	CYAT8168X 100-pin	Sensor	CYAT8168X 100-pin
1	TX17	XY40	NC	NA
2	TX16	XY39	RX00	XY00
3	TX15	XY38	RX01	XY01
4	TX14	XY37	RX02	XY02
5	TX13	XY36	RX03	XY03
6	TX12	XY35	RX04	XY04
7	TX11	XY34	RX05	XY05
8	TX10	XY33	RX06	XY06

Table 4 50-pin connector details (continued)

Connector pin number	Connector J1		Connector J2	
	Sensor	CYAT8168X 100-pin	Sensor	CYAT8168X 100-pin
9	TX09	XY32	RX07	XY07
10	TX08	XY31	RX08	XY08
11	TX07	XY30	RX09	XY09
12	TX06	XY29	RX10	XY10
13	TX05	XY28	RX11	XY11
14	TX04	XY27	RX12	XY12
15	TX03	XY26	RX13	XY13
16	TX02	XY25	RX14	XY14
17	TX01	XY24	RX15	XY15
18	TX00	XY23	RX16	XY16
19	NC	NA	RX17	XY17
20	NC	NA	RX18	XY18
21	NC	NA	RX19	XY19
22	GND_S	VSS	RX20	XY20
23	GND_S	VSS	RX21	XY21
24	GND_S	VSS	RX22	XY22
25	GND_S	VSS	GND_S	VSS
26	GND_S	VSS	GND_S	VSS
27	RX22	XY22	TX41	XY64
28	RX21	XY21	TX40	XY63
29	RX20	XY20	TX39	XY62
30	RX19	XY19	TX38	XY61
31	RX18	XY18	TX37	XY60
32	RX17	XY17	TX36	XY59
33	RX16	XY16	TX35	XY58
34	RX15	XY15	TX34	XY57
35	RX14	XY14	TX33	XY56
36	RX13	XY13	TX32	XY55
37	RX12	XY12	TX31	XY54
38	RX11	XY11	TX30	XY53
39	RX10	XY10	TX29	XY52
40	RX09	XY09	TX28	XY51
41	RX08	XY08	TX27	XY50
42	RX07	XY07	TX26	XY49
43	RX06	XY06	TX25	XY48
44	RX05	XY05	TX24	XY47
45	RX04	XY04	TX23	XY46

Table 4 50-pin connector details (continued)

Connector pin number	Connector J1		Connector J2	
	Sensor	CYAT8168X 100-pin	Sensor	CYAT8168X 100-pin
46	RX03	XY03	TX22	XY45
47	RX02	XY02	TX21	XY44
48	RX01	XY01	TX20	XY43
49	RX00	XY00	TX19	XY42
50	NC		TX18	XY41

*Note: Sensors Y0 and X0 are located in the top left corner of the panel shown in **Figure 5**.*

Figure 5 Panel with sensor location marked

2.4 CYAT8168X sensor board

The sensor board contains the CYAT8168X device. The CYAT8168X EVK uses an 100-pin TQFP part (CYAT81688-100AS77). The sensor board for the EVK is shown in **Figure 6**.

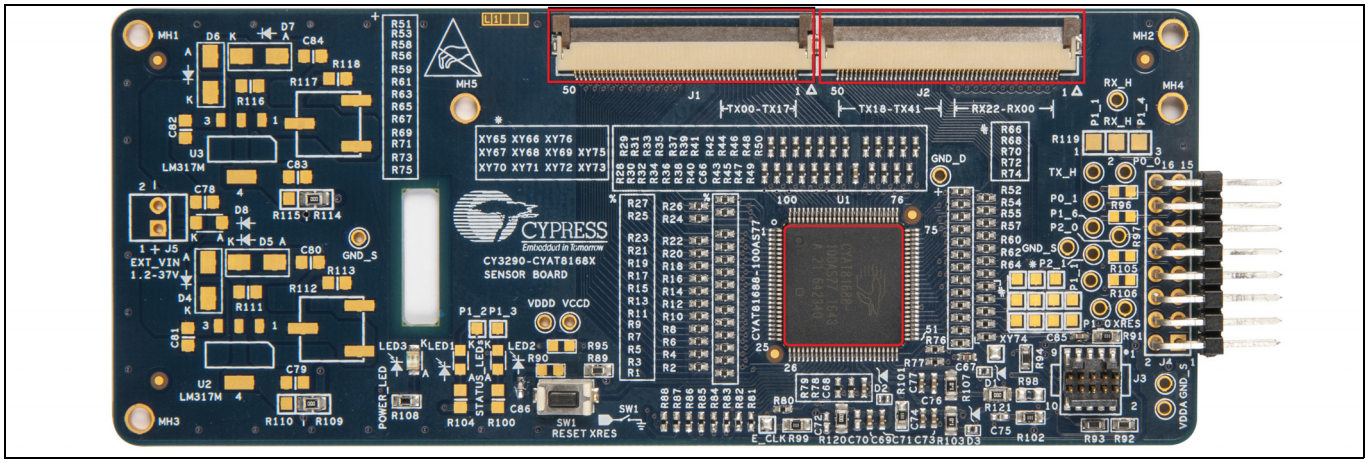

Figure 6 CYAT8168X EVK sensor board

Connectors J1 and J2 attach to the flex connector on the 10.1-inch glass sensor. The 16-pin header (J4) connects to the isolation bridge.

Multiple test points are included on the CYAT8168X sensor board to provide access to signals on the CYAT8168X device, as shown in **Table 5**.

Table 5 CYAT8168X sensor board test points

Test point in schematics	Silkscreen	CYAT8168X signal	Notes
TP1	P0_0	I2C_SCL/SPI_SCLK	I2C clock. Pull-up resistors provided by bridge.
TP2	P0_1	I2C_SDA/SPI_MOSI	I2C data. Pull-up resistors provided by bridge.
TP3	P2_0	SWDIO	Serial wire debug data used for SWD programming.
TP4	P2_1	SWDCLK	Serial wire debug clock used for SWD programming.
TP5	XRES	nXRES	External active LOW reset.
TP6	P1_0	COMM_INT / SPI_MISO	If I2C, optional INT pin; if SPI, MISO pin.
TP7	P1_1	COMM_INT / SPI_SS	If I2C, optional INT pin; if SPI, SS pin.
TP8	P1_6	COMM_INT	Default INT pin.
TP9	TX_H	N/A	TX-Host (TTBridge allows for secondary COM port, not used by this EVK).
TP10	GND_S	N/A	System ground not directly connected to CYAT8168X.
TP11	RX_H	N/A or COMM_INT / SPI_SS or ERROR	R119 placement options: No stuff (default): RX-Host. Short pins 1-2: P1_1 (COMM INT / SPI SS). Short pins 2-3: P1_4 (ERROR).
TP12	VCCD	VCCD	Digital core power supply input/output.
TP13	VDDA	VDDA	5 V supplied from Isolation bridge.
TP14	GND_S	N/A	System ground not directly connected to CYAT8168X.

Note: These test points are not loaded. Users can use the test pads to measure the signals.

Table 5 CYAT8168X sensor board test points (continued)

Test point in schematics	Silkscreen	CYAT8168X signal	Notes
TP15	VDDD	VDDD	3.3 V supplied from Isolation bridge.
TP16	GND_S	N/A	System ground not directly connected to CYAT8168X.
TP17	GND_D	VSS	Sensor board device ground.
Note:	*These test points are not loaded. Users can use the test pads to measure the signals.*		

The schematic for the sensor board is shown in the Appendix section, **"CYAT8168X sensor board"** on page 29.

Hardware design files of the sensor board are available at the following location:

C:\Program Files (x86)\Cypress\CY3290-CYAT8168X AUTOMOTIVE EVK\<version>\Hardware\CYAT8168X Sensor Board

2.5 Isolation bridge

The isolation bridge is an innovative accessory that provides PC or device bridging and power isolation in a single device. The isolation bridge is shown in **Figure 7**.

When the PC port is selected with SW1, both the device under evaluation i.e., the CYAT81688-100AS77 and the isolation bridge run on PC power through J7. When the Charger port is selected with SW1, the DUT is powered from the micro-USB connector (J12), commonly used on mobile device chargers. A simple harness can be constructed to provide battery power through the same interface. A block diagram of the power switching on the isolation bridge is shown in **Figure 8**.

Caution: *Note that the isolation bridge cannot be used to program the CYAT8168X device. The bootloader function of the TTHE must be used to upgrade firmware on the CYAT8168X sensor board. Brute (excessive) force on USB connectors J7 and J12 would snap-off the connector. Please handle delicately during cable insertion and removal.*

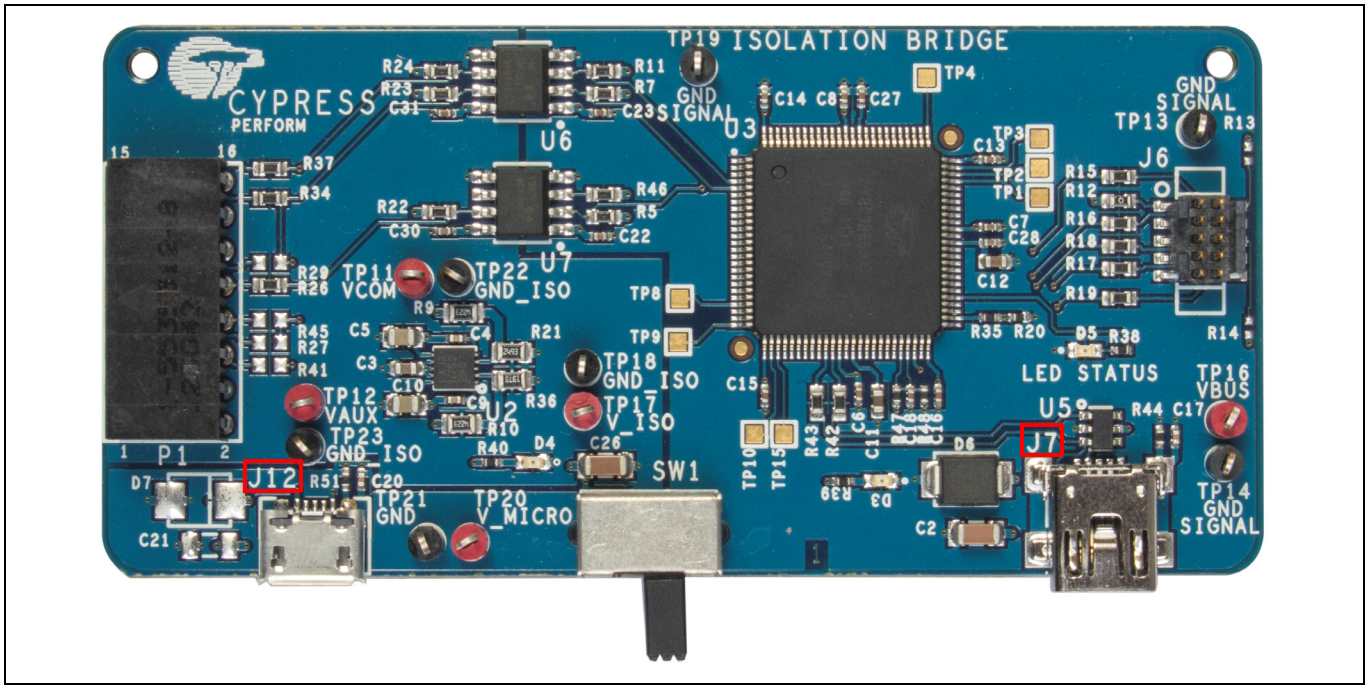

Figure 7 Isolation bridge

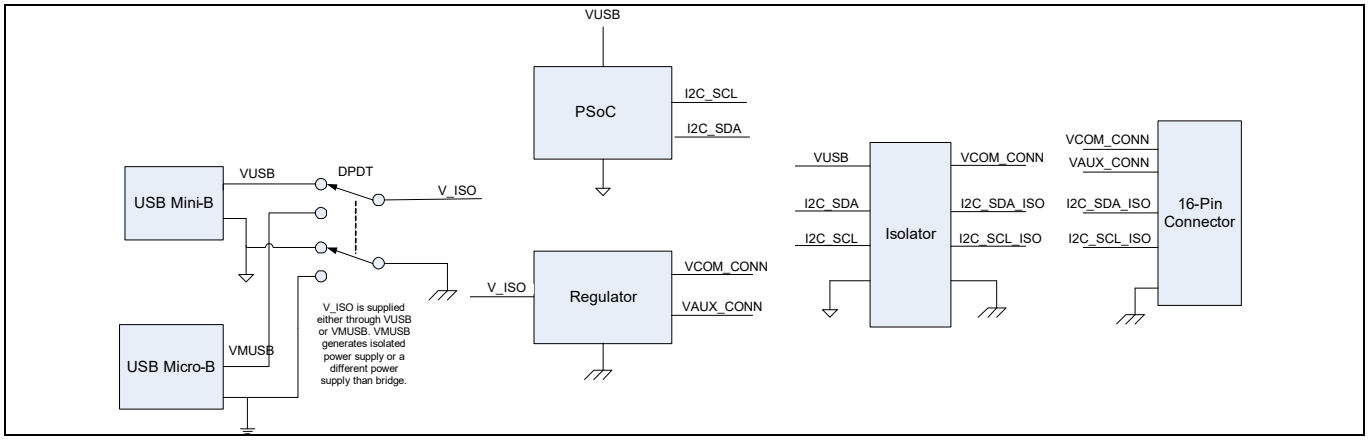

Figure 8 Power switching block diagram

The isolation bridge provides a 3.3-V digital supply (VDDD) and a 5-V analog supply (VDDA) to the CYAT8168X sensor board.

LEDs are provided on the isolation bridge to indicate power status. LED D3 indicates that the isolation bridge is powered. LED D4 indicates when power is applied to the CYAT8168X EVK sensor board.

10-pin SWD Programming header J6 is provided to update the firmware on the isolation bridge by using a MiniProg3 programmer (not included with the kit). Note that the sensor board firmware cannot be upgraded through J6, instead, the sensor board firmware is upgraded by using the TTHE bootloader function as described in **"Bootloading the EVK"** on page 22. In this kit, the isolation bridge is preprogrammed and it is not required to manually update the firmware.

If the Touch Tuning Bridge FW Upgrade window pops up, verify if the Touch Tuning Bridge version is 1.35 or later. If not, then click **Yes** to update the firmware. Click **Close** when complete. Click **No** if the version is already 1.35 or later.

The schematic for the isolation board is shown in the **"Isolation bridge board"** on page 28.

Hardware design files of the isolation bridge board are available at the following location:

C:\Program Files (x86)\Cypress\CY3290-CYAT8168X AUTOMOTIVE EVK\<version>\Hardware\Isolation Bridge Board

2.6 Supply current measurements

The CYAT8168X device offers three modes of operation: normal, low-power mode, and deep-sleep mode. To measure the supply current to the device, the sensor board must be modified. Resistors R120 and R121 on the sensor board provide a series path to VDDD and VDDA respectively. These resistors can be removed and replaced with an ammeter to measure the supply current on the device. Note that specifications for the supply current in various modes of operation are provided in the device datasheet.

3 Kit operation

This chapter explains the steps to evaluate the CYAT8168X EVK with TTHE and also to bootload the EVK. You must complete the installation procedure explained in **"Installation"** on page 5 before proceeding.

The TTHE software has multiple features and capabilities, such as collecting statistics on sensor data, changing operating modes, or viewing touch events. Details on the various features are available in the TTHE menu bar under **Help** > **Contents**.

3.1 Evaluating the EVK with TTHE

1. Launch the TTHE by the Windows Start button and search for "Host Emulator".
2. Connect the CYAT8168X EVK to your computer through a USB cable connected to the **PC** port on the kit.
3. Ensure that the 'SW1' switch is positioned towards the **PC** connector as shown in **Figure 3**.
4. Click on **Open Project** and navigate to the following directory on your computer and select *TSG6_XL_GC6_CYAT81688-100AS77_EVK.config*:

C:\Program Files (x86)\Cypress\CY3290-CYAT8168X AUTOMOTIVE EVK\<version>\TTHE Config File\TSG6_XL_GC6_CYAT81688-100AS77_EVK

*Note: The project TSG6_XL_GC6_CYAT81688-100AS77_EVK in the install directory is read-only. User is requested to create a local copy by selecting the "Save Project As" option from the **File** menu.*

This starts the project and the screen will have the Touch Display window. You can add other windows (Configurable Parameters [Flash/EEPROM] and Touch Display Settings) to know the parameter values set in the project.

- To add the Configurable Parameters [Flash/EEPROM] window, go to **View** > **Tool Windows** > **Configurable Parameters [Flash/EEPROM]**
- To add Touch Display Settings window, go to **View** > **Tool Windows** > **Touch Display Settings**

You can place these windows at left, right, top, or bottom positions of the screen by dragging the windows with a left click of the mouse. **Figure 9** shows windows positioned on both sides of the screen (highlighted) and a window with two tabs at the bottom.

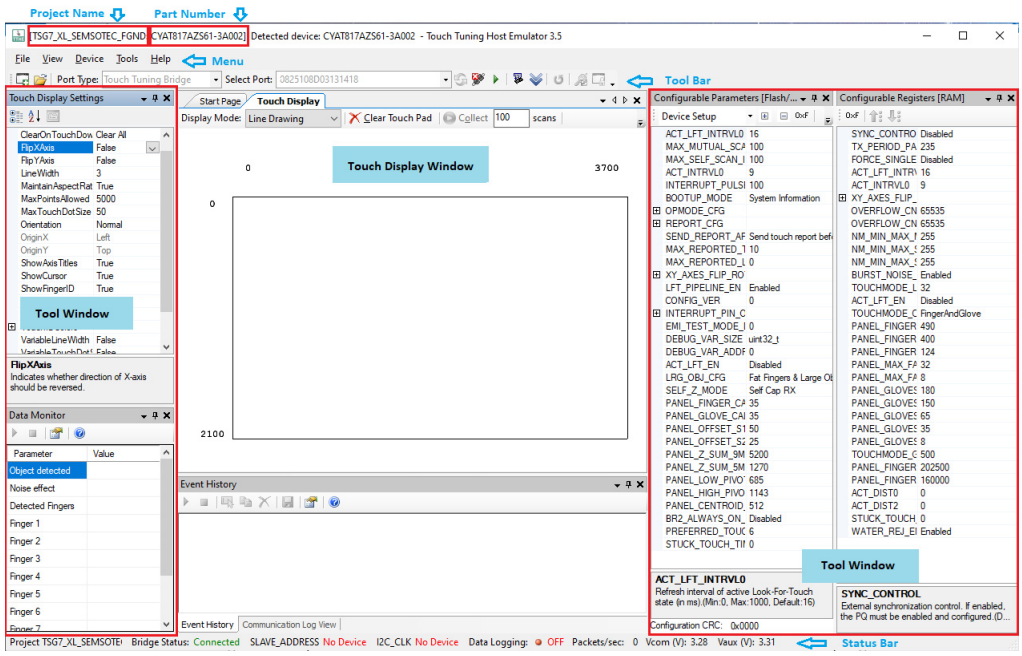

Figure 9 Starting CYAT8168X EVK project in TTHE

5. Click on the **Connect** icon to power the EVK board.
6. This icon should change to after power is applied. The **Bridge Status** in the status bar in the bottom of the TTHE window should now show **"Connected"**. The Vcom and Vaux display around 5 V. These values show the voltage on the PC side of the bridge, not the DUT side. The PC side cannot measure the DUT side voltage.
7. If you are using the TTHE for the first time, click on **Tools** > **Options** in the menu bar. This opens a new **Options** window, which looks similar to the following image.

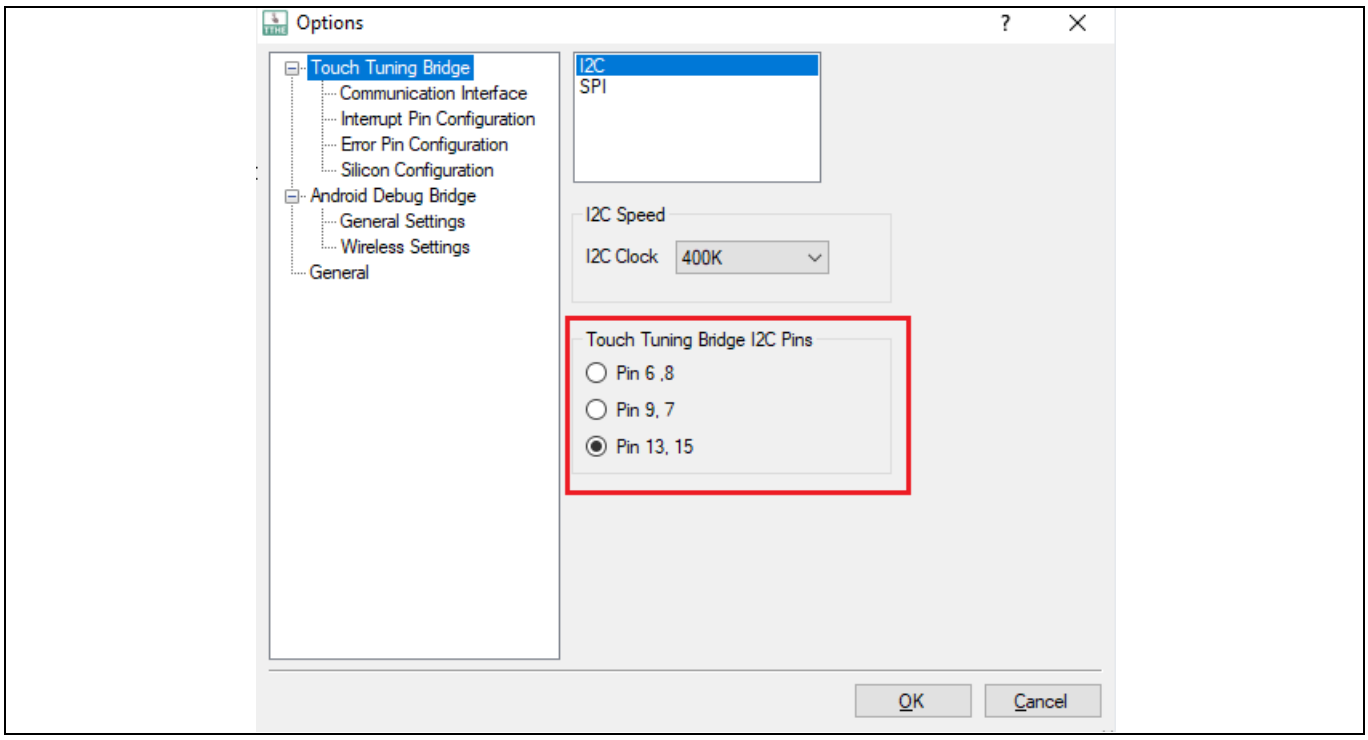

Figure 10 Options window in TTHE

8. Select the **Communication Interface** tab on the left. Select **I2C**, as shown in **Figure 10**, and make sure that the I2C Clock is selected to **400K** and the I2C pins are set to the option **Pin 6, 8**. Click **OK**. This step ensures that the I2C pins on the isolation bridge are routed correctly to the I2C pins on the CYAT8168X EVK.

Note: These settings control the output of the isolation bridge, not the connection between the isolation bridge MCU and 16-pin connector. The connection between the isolation bridge chip and the 16-pin connector is set with zero-ohm resistors.

9. Click the **Run** icon. The TTHE starts reading the contents of the flash. Its progress is displayed in a pop-up window. Click the **Close** button when complete.

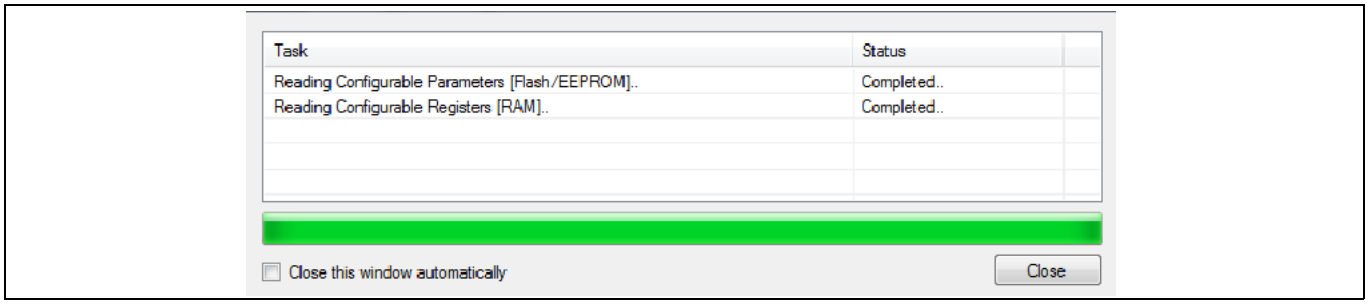

Figure 11 Status bar progress

10. New window may open before the progress bar displays the message reading of flash contents are complete. TTHE compares the values in its Configurable parameters window with the corresponding values in flash. If there is a mismatch, it asks if you want to continue with the values stored in the flash or want to update the flash with the values that are stored in its configurable parameters window.
    The window in **Figure 12** does not appear if the values stored in the device's flash are the same as the values in the TTHE configurable registers window. The Sync All From Project procedure will work only if the FW version is same. For a different FW version, user must Bootload to resolve the difference.

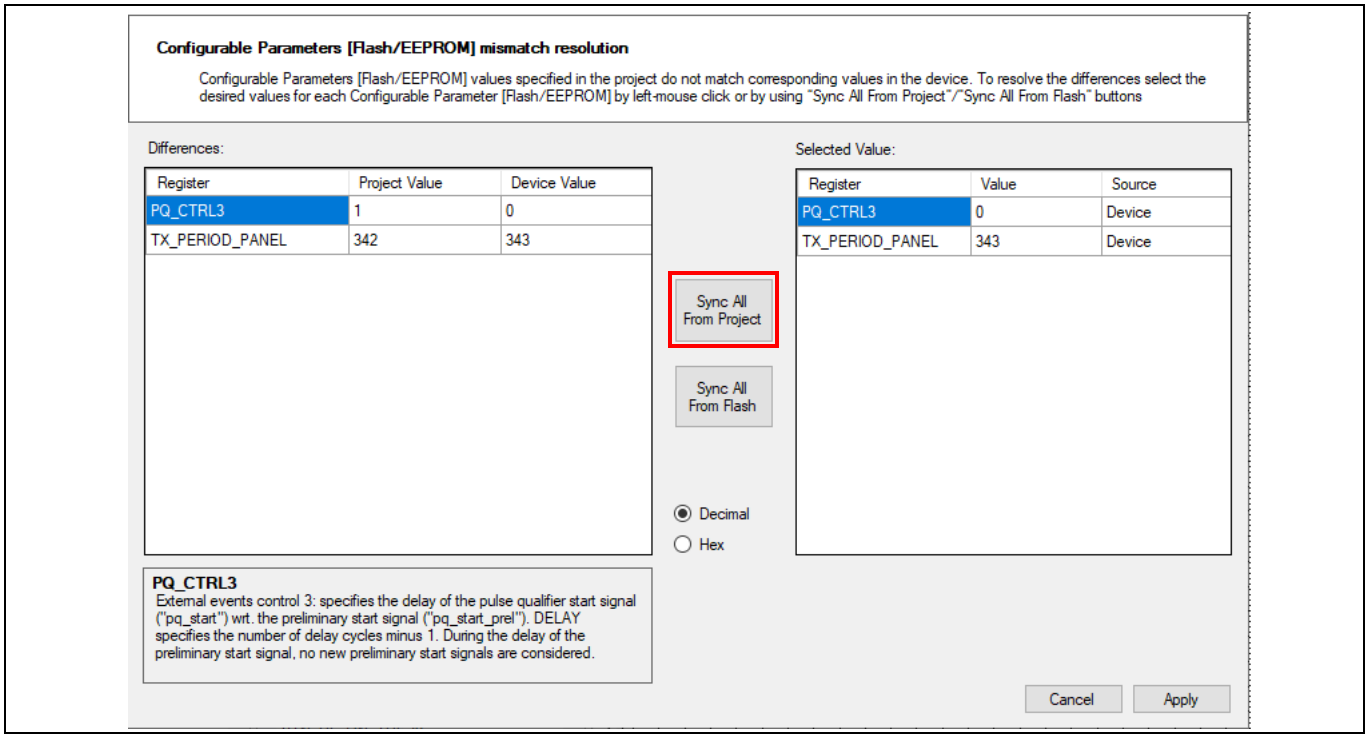

Figure 12 Sync All From Project window

11. If the pop-up window shown in **Figure 12** appears, click on **Sync All From Project**; then, click **Apply**. This ensures that the firmware on the flash is in accordance with the TTHE's TSG6_XL_GC6_CYAT81688-100AS77_EVK project. When you click **Apply**, TTHE starts writing the contents to the flash and its progress is shown in the pop-up window. Click the **Close** button when complete.
12. The steps to set up the TTHE to communicate with the CYAT8168X EVK are now complete. Place a finger on the panel and see it move on the screen, as shown in **Figure 13**. Note that there are five fingers placed on the panel. It reports up to ten fingers.

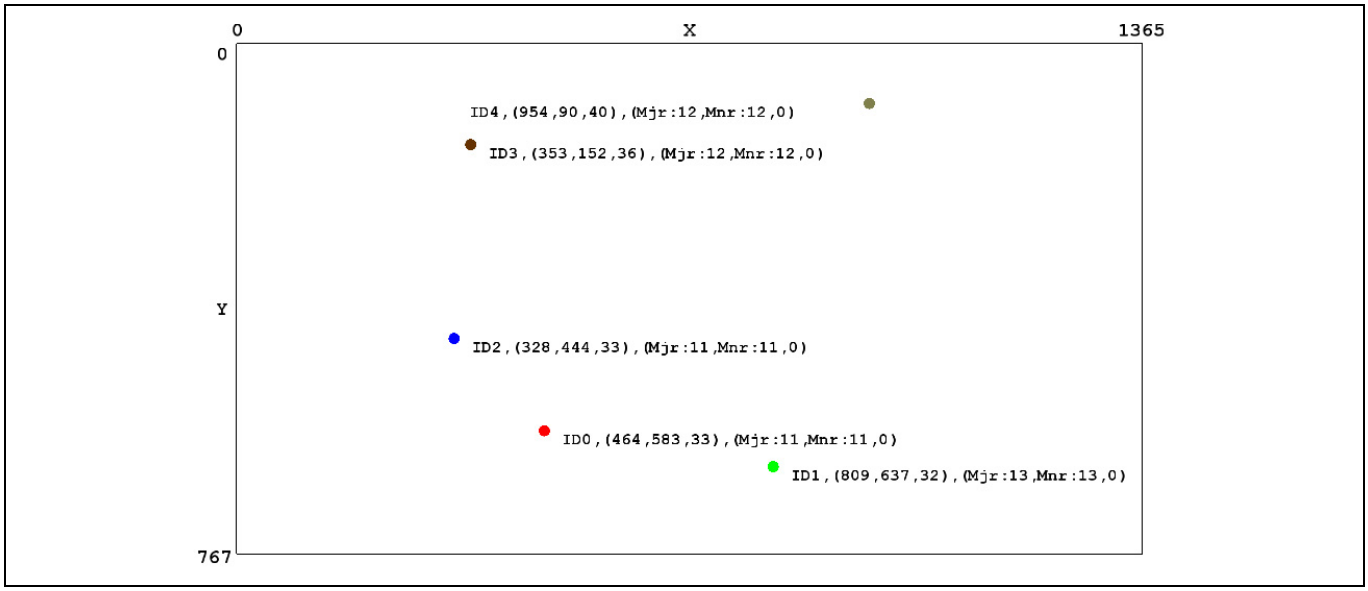

Figure 13 TTHE showing fingers placed on panel

13. CYAT8168X includes support for finger touch with and without gloves. This is handled by the signal threshold tuning parameters, which are configurable in TTHE. TTHE will report touches as shown in **Figure 13** for fingers (filled circle), whereas gloves are represented by a hatch-filled circle. Each finger placed on the panel is represented with a different color on the TTHE. Next to each finger, the finger ID, X-coordinate, Y-coordinate, the Z value (pressure of the touch reported), and Finger Orientation (Major, Minor, and Angle) are displayed in TTHE.
14. To enable Line-Drawing mode, select **Line Drawing** from the drop-down menu shown in **Figure 14**.

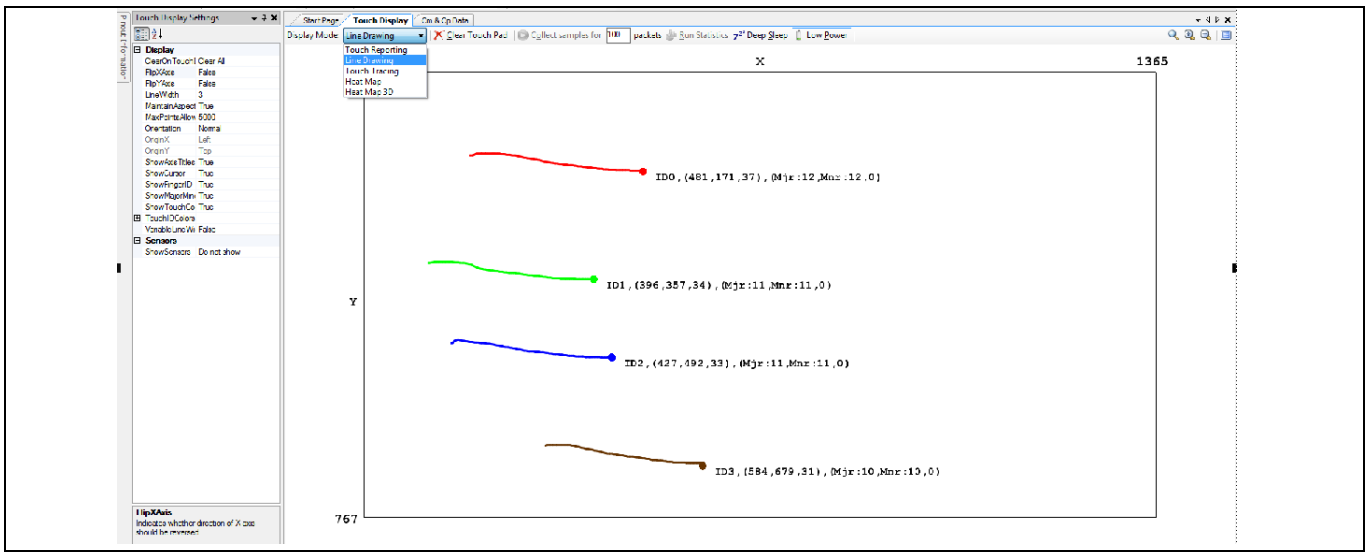

Figure 14 Line drawing mode

15. To view actual sensor data, select **Heat Map** in the drop-down menu. In the Touch Display Settings window, under the **Data** tab, select **Data Type** value to **DiffCounts**. Your window should look similar to **Figure 15**.

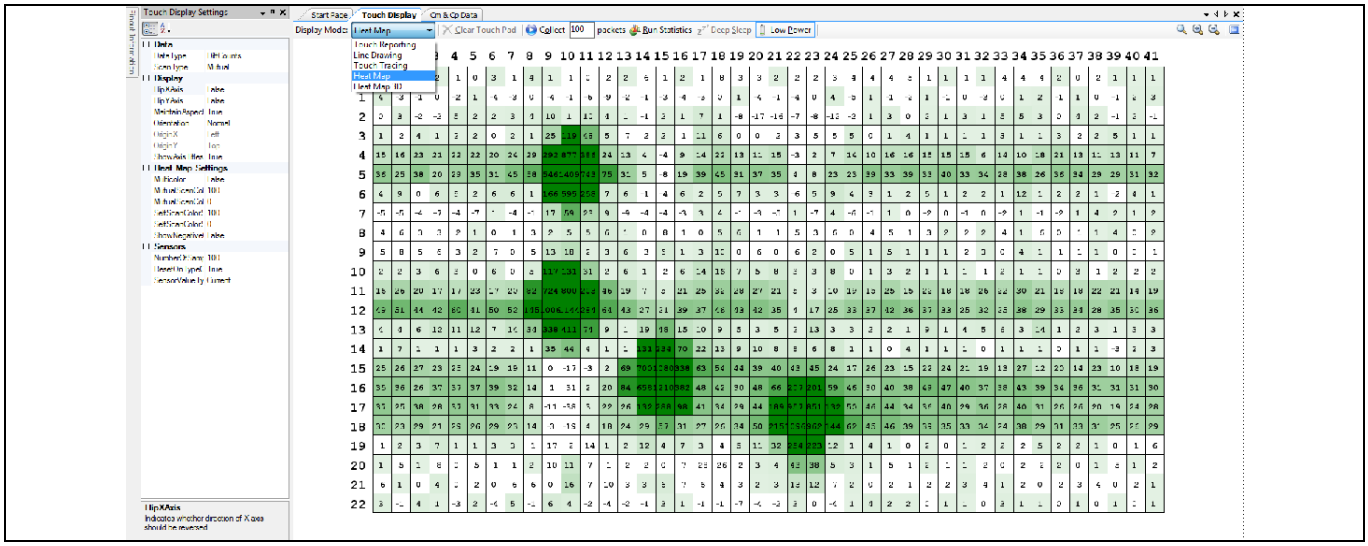

Figure 15 Heat map mode

16. Select **Touch Reporting** in the Display Mode drop down menu as shown in **Figure 16**.

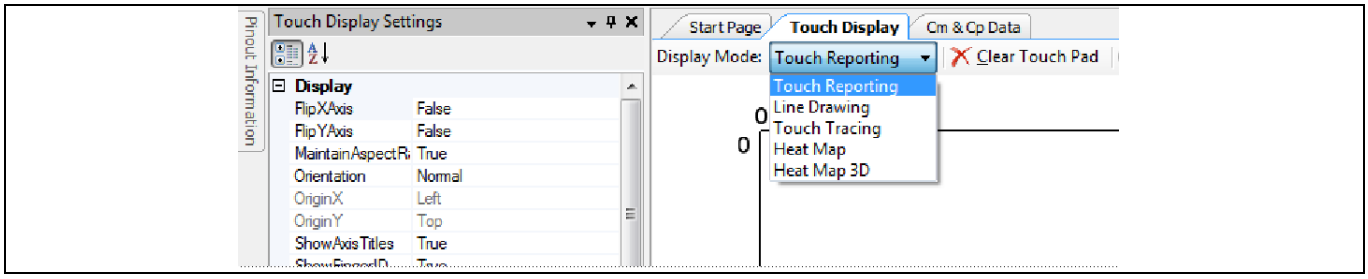

Figure 16 Display Mode - Touch Reporting Selection

17. To view Glove Touch performance, select **View** > **Tool Windows** > **Data Monitor**. Position the Data Monitor panel in the left lower panel as shown in **Figure 17**.
18. Click the green start button in Data Monitor toolbar.
19. Select **View** > **Tool Windows** > **Event History**. Position the Event History panel at the bottom, as shown in **Figure 17**.
20. Click the green start button in Event History toolbar.
21. Now place a Gloved finger (≤ 5 mm) on the panel and see it move on the screen and Glove Touch is reported in Data Monitor and Event History panels.

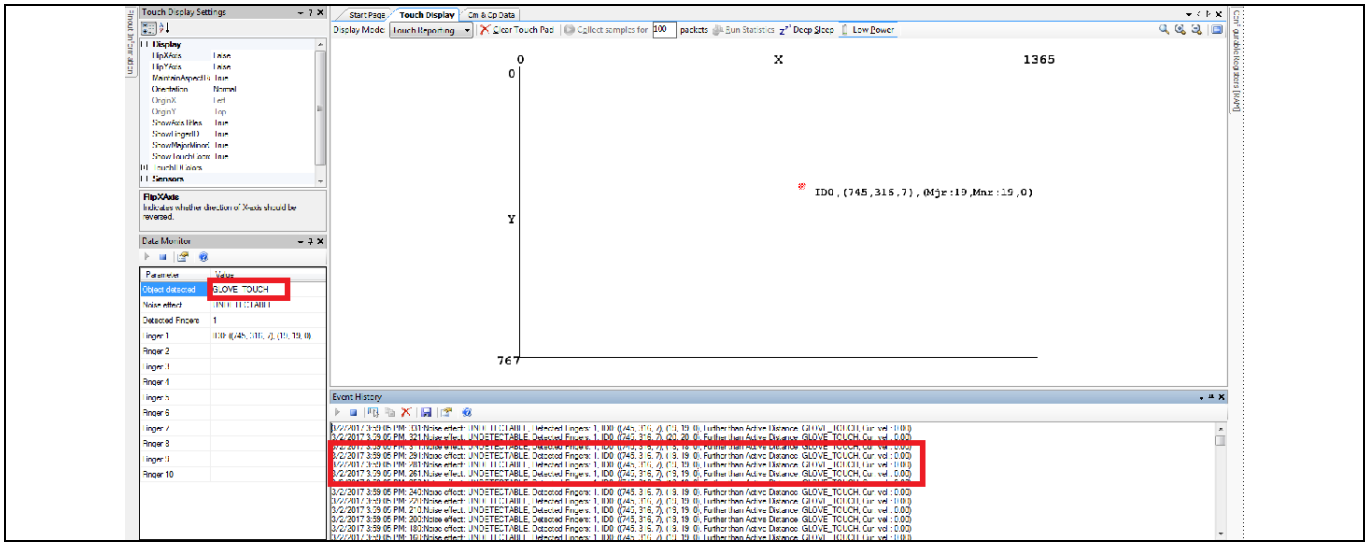

Figure 17 Glove touch report in data monitor and event history panels

22. Select **View** > **Tool Windows** > **Configurable Parameters[Flash/EEPROM]**, and then select **Gesture** from the drop-down.
23. Go to **GESTURE_ENABLED** and select **Enabled Standard**. Click **Apply** arrow as shown in **Figure 18**. The Gestures are now enabled.
24. To view gestures performed, select **View** > **Tool Windows** > **Data Monitor**. Position the Data Monitor panel in the left lower panel as shown in **Figure 18**.
25. Click the green start button in Data Monitor toolbar.
26. Select **View** > **Tool Windows** > **Event History**. Position the Event History panel at the bottom, as shown in **Figure 18**.
27. Click the green start button in Event History toolbar.
28. Now place a finger on the panel and see it move on the screen and gestures are reported in Data Monitor and Event History panels.

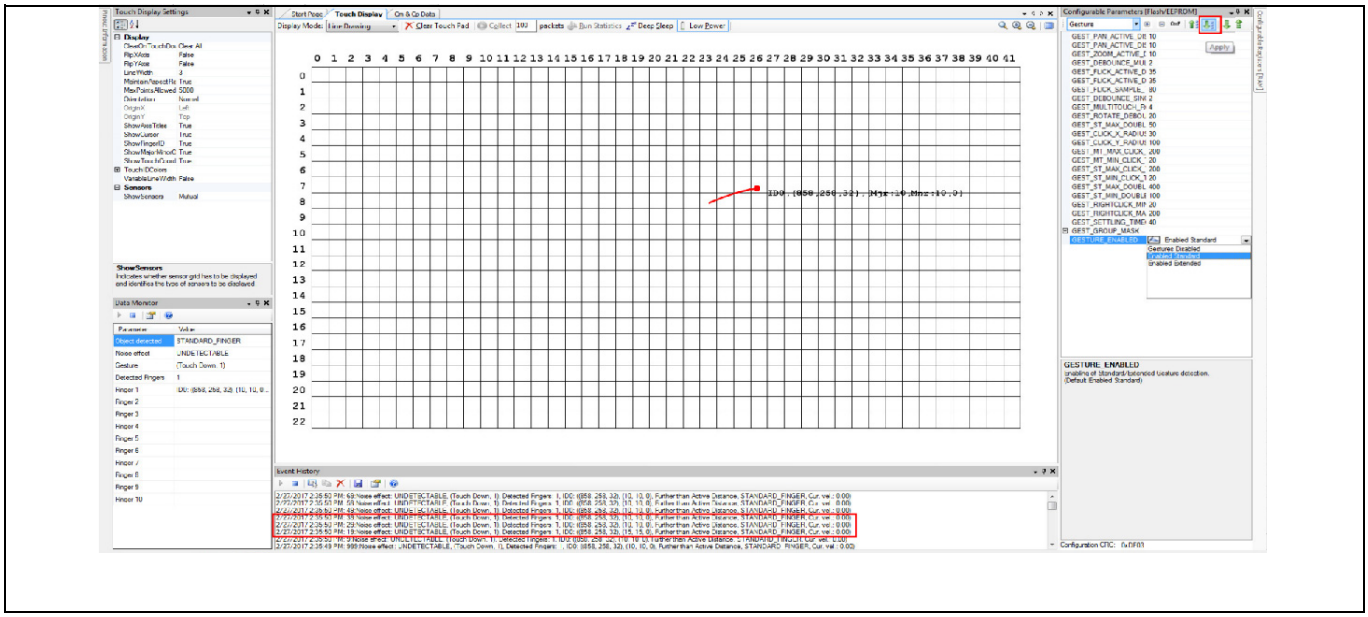

Figure 18 Gesture report in data monitor and event history panels

29. Removing the touch and retouching the panel will override the previous data.
30. Close TTHE after evaluation.

3.2 Bootloading the EVK

The CYAT8168X EVK is pre-programmed and it is not necessary to manually program the device. To update the firmware on the CYAT8168X EVK, follow the instructions provided in this section.

1. Make sure you have completed steps 1 through 8 described in **"Evaluating the EVK with TTHE"** on page 16.
2. Click the **Bootloader** icon and the firmware is updated within seconds. Click **Close** on completion.

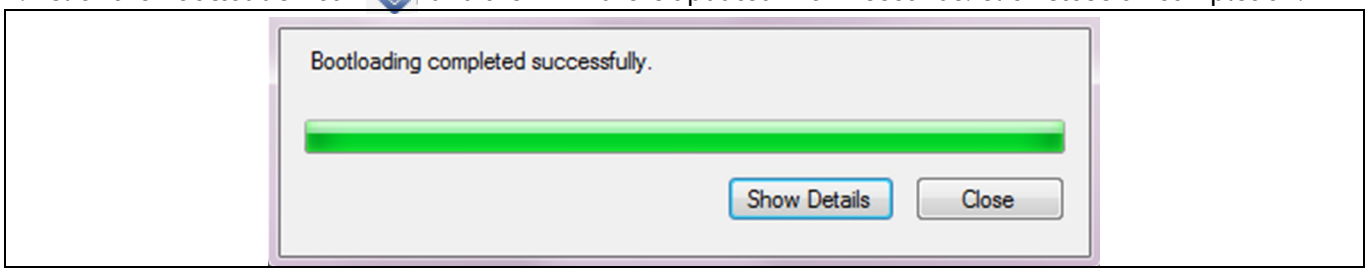

Figure 19 Message of successful bootloading

3. The device is automatically reset and the configuration registers and parameters are read. Close the window if it is not set to close automatically.
4. Go to the TTHE menu bar and click on **Device** > **Calibrate IDAC**. The IDAC will be calibrated for the new firmware. Click **Close** when complete. The steps to update the firmware and bootload the CYAT8168X EVK are now complete.

3.3 Configuring parameters in TTHE

Using TTHE, you can change parameters that affect the panel performance. These parameters are stored in the firmware but can be overwritten through the TTHE. This section shows you how to change the finger threshold (FT).

1. Follow steps 1 through 9 provided in **"Evaluating the EVK with TTHE"** on page 16.
2. If the Configurable Parameters window is not visible (see **Figure 20**), go to the TTHE menu bar and click on **View** > **Tool Windows** > **Configurable Parameters [Flash/EEPROM]**. The Flash Configurable Parameters window opens.

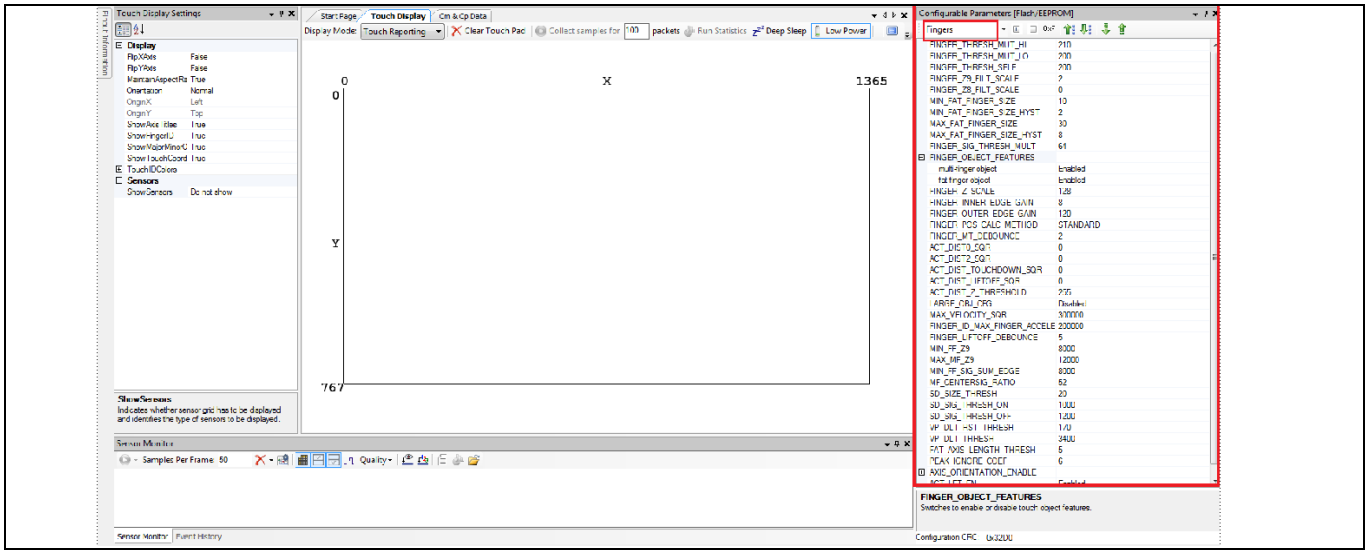

Figure 20 Configurable parameters window

3. Using the drop-down menu located at the top left, select the **Fingers** option to view the list of parameters under Fingers.

4. Search the **FINGER_THRESH_MUT_HI** parameter and change its value. Click the **Apply** button to write the value to the device's flash (see **Figure 5**). A window pop-up appears indicating the configurable parameters are being written to the device.

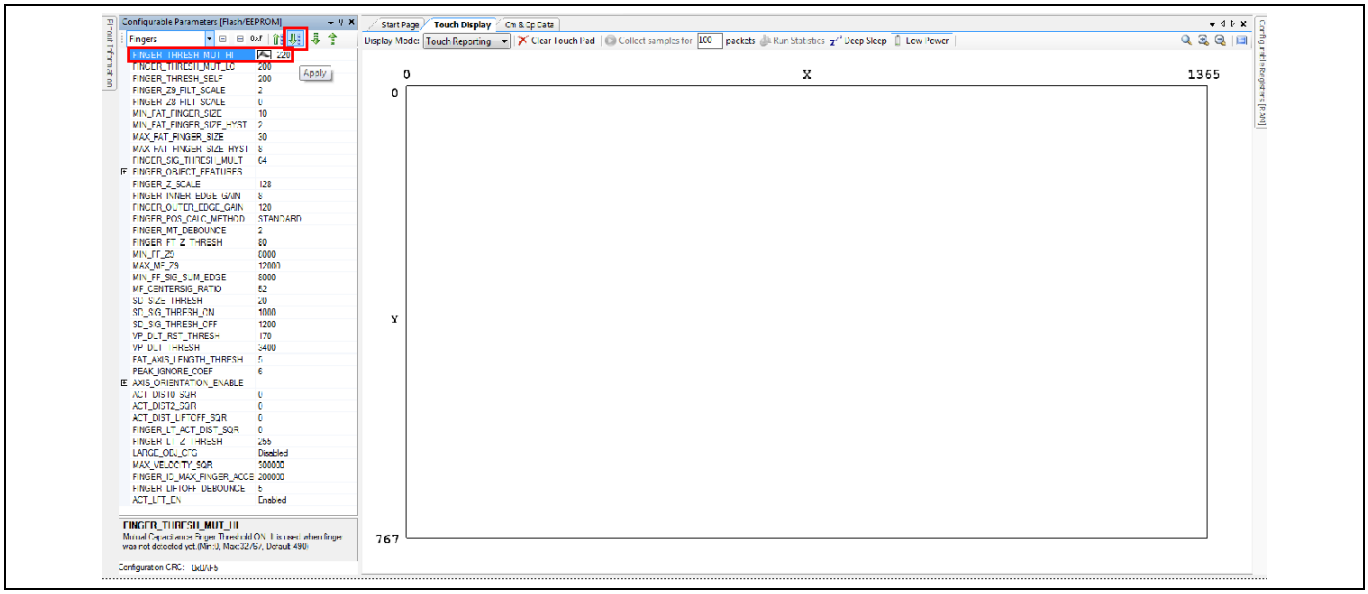

Figure 21 Finger threshold parameter and apply button

5. Click **Close** when complete.
6. The blue flag next to the FT parameter indicates that the value has been updated in flash, but is not saved to the TTHE project. Go to **File** > **Save Project** to update the parameter in the TTHE project.

Similarly, you can modify other parameters using the TTHE. For details on all of the available configurable parameters, refer to CYAT81X PSoC™ Automotive Multitouch Touchscreen Controller technical reference manual (TRM)[1)].

1) Infineon reference documents are available under NDA through your local Infineon sales representative. You can also direct your requests to **automotive@infineon.com**.

4 Miscellaneous topics

4.1 Panel tuning

The CYAT8168X family of touchscreen controller devices measure small changes in capacitance on a sensor panel. Achieving optimal touch detection for a specific application requires that the touch sensing device's parameters should be tuned for the target system. See the CYAT81X Technical Reference Manual (TRM), for more information on how to tune touchscreen controllers for a sensor panel.

4.2 TTHE capabilities

The TTHE software has multiple features and capabilities, such as collecting statistics on sensor data, changing operating modes, or viewing touch events. Details on the various features are available in the TTHE menu bar under **Help** > **Contents**.

4.3 Supply voltage reported in TTHE

The TTHE shows the Vcom and Vaux supply voltages at the bottom of the window. These voltages are not the same as VDDD and VDDA on the CYAT8168X sensor board. There is no indication of VDDD and VDDA in TTHE.

4.4 I2C pins are not physical pins 6 and 8

The I^2C pins on the CYAT8168X sensor board are pins 13 and 15 on the 16-pin Isolation Bridge connector. The TTHE software requires that these pins are set to 6 and 8. The path to the correct pins on the 16-pin connector is made by zero-ohm resistors on the isolation bridge. It is not necessary to manually modify the isolation bridge.

4.5 Programming blank devices

The CYAT8168X sensor board can be programmed without a bootloader. To do this, you must program it using a **CY3295-TTBridge board** (not included in this kit).

4.6 How to open the plastic case

To open the plastic case, separate it on one of the bottom corners. The bottom of the case is the side opposite to the power switch (see **Figure 22**). Separate the clear plastic from the black plastic with your thumbs.

Figure 22 Bottom corner of the case to open plastic case

5 Design files

5.1 Schematics

5.1.1 CYAT8168X sensor board

Hardware design files of the sensor board are available at the following location:

C:\Program Files (x86)\Cypress\CY3290-CYAT8168X AUTOMOTIVE EVK\<version>\Hardware\CYAT8168X Sensor Board

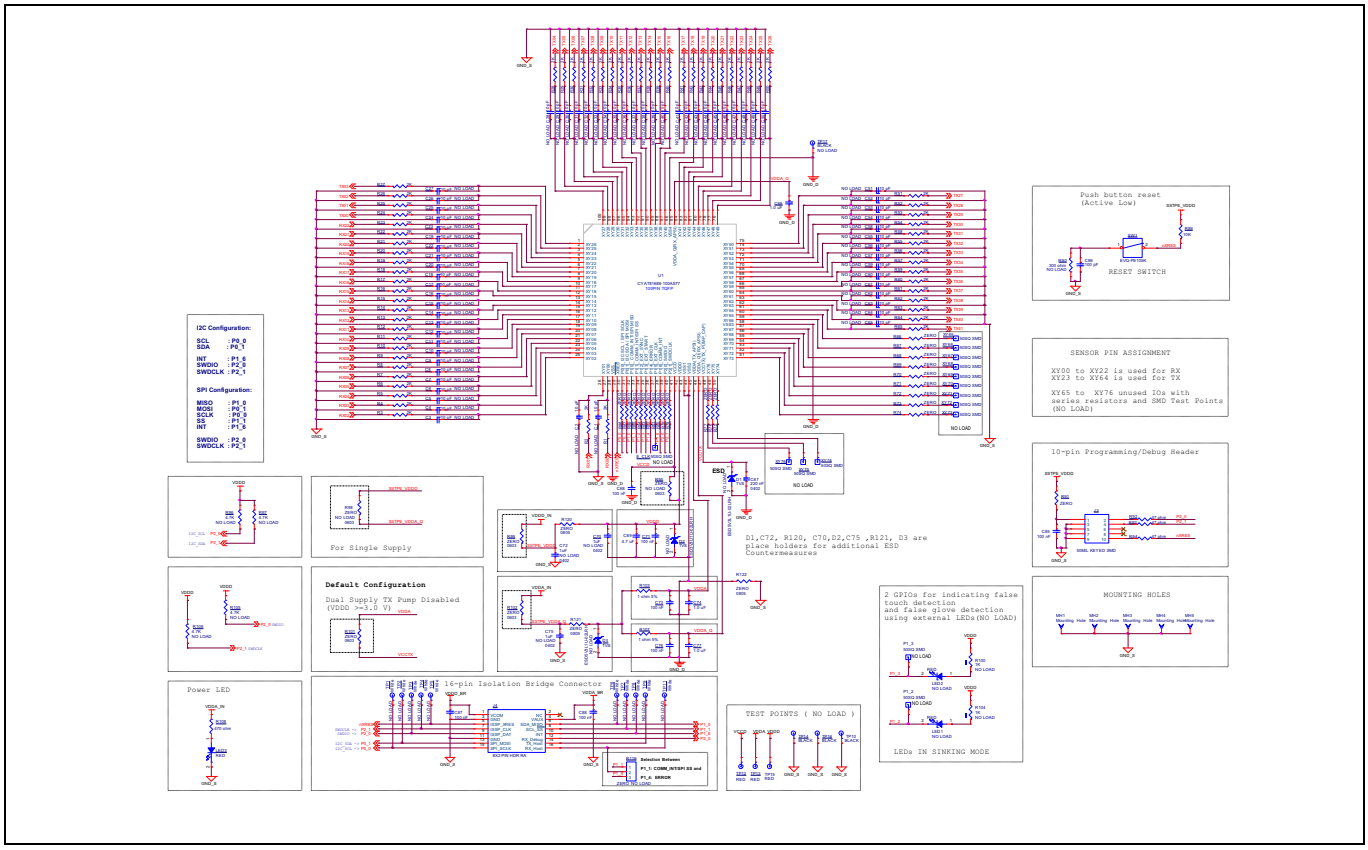

Figure 23 CYAT81688-100AS77 device

Design files

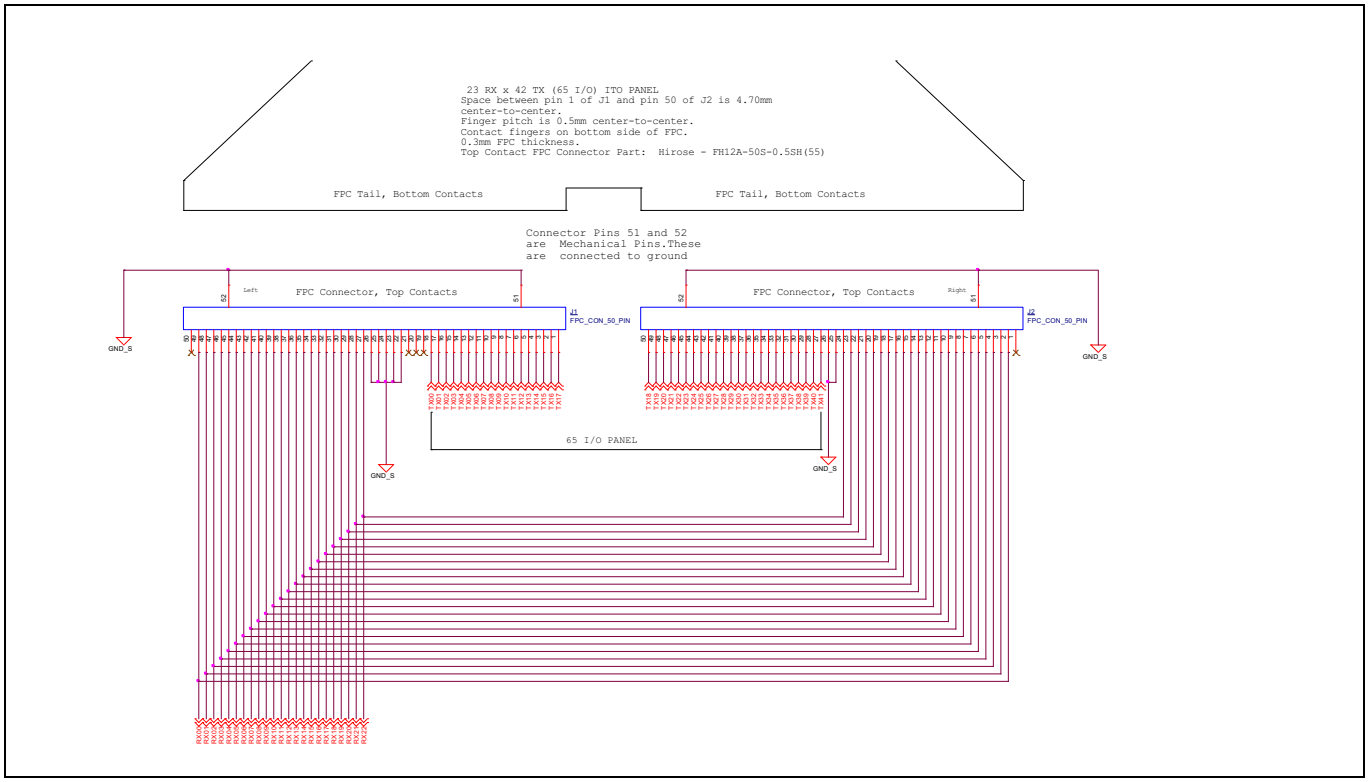

Figure 24 ITO interface connectors

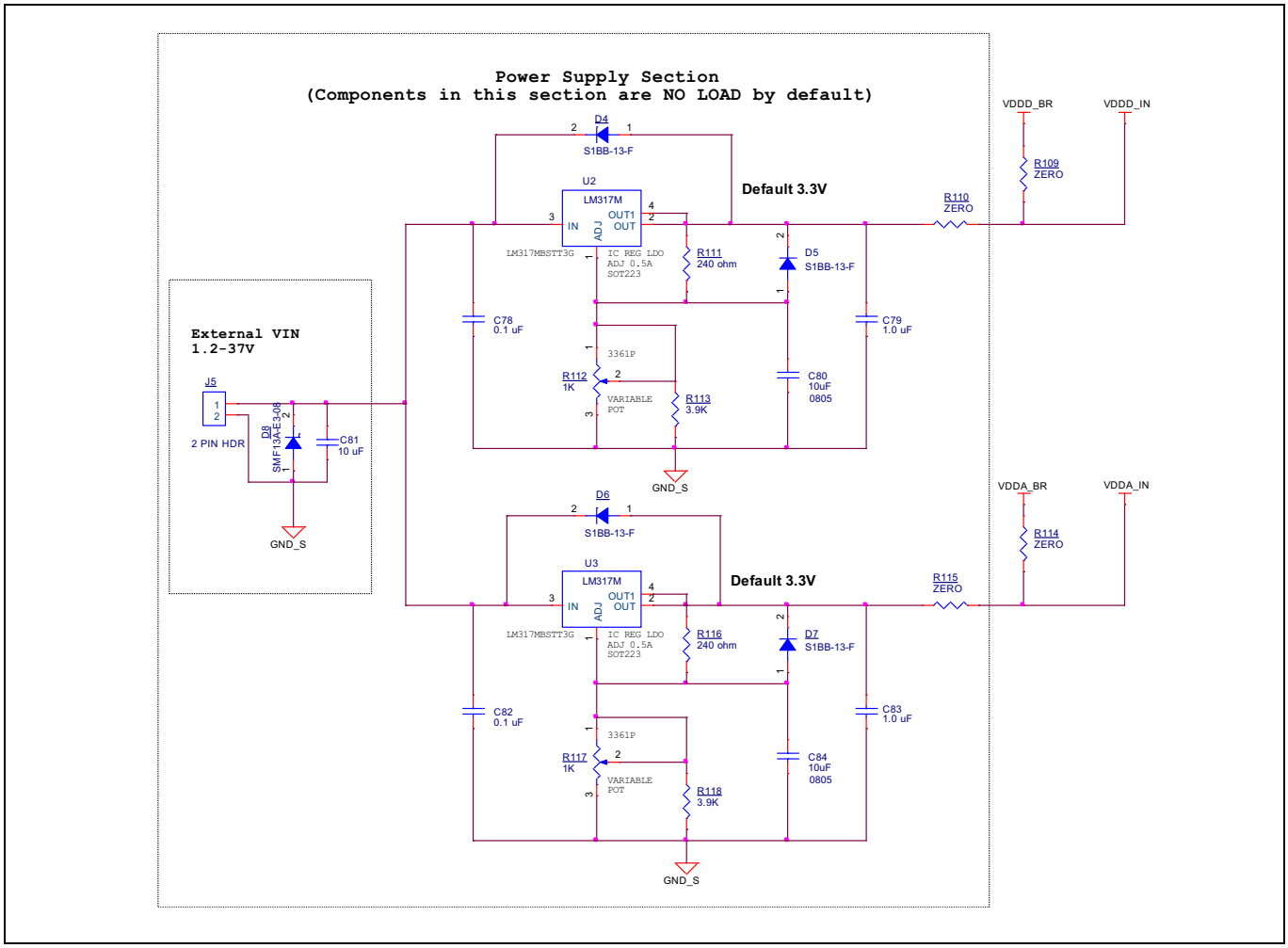

Figure 25 Power supply - LDOs

5.1.2 Isolation bridge board

Hardware design files of the isolation bridge board are available at the following location:

C:\Program Files (x86)\Cypress\CY3290-CYAT8168X AUTOMOTIVE EVK\<version>\Hardware\Isolation Bridge Board

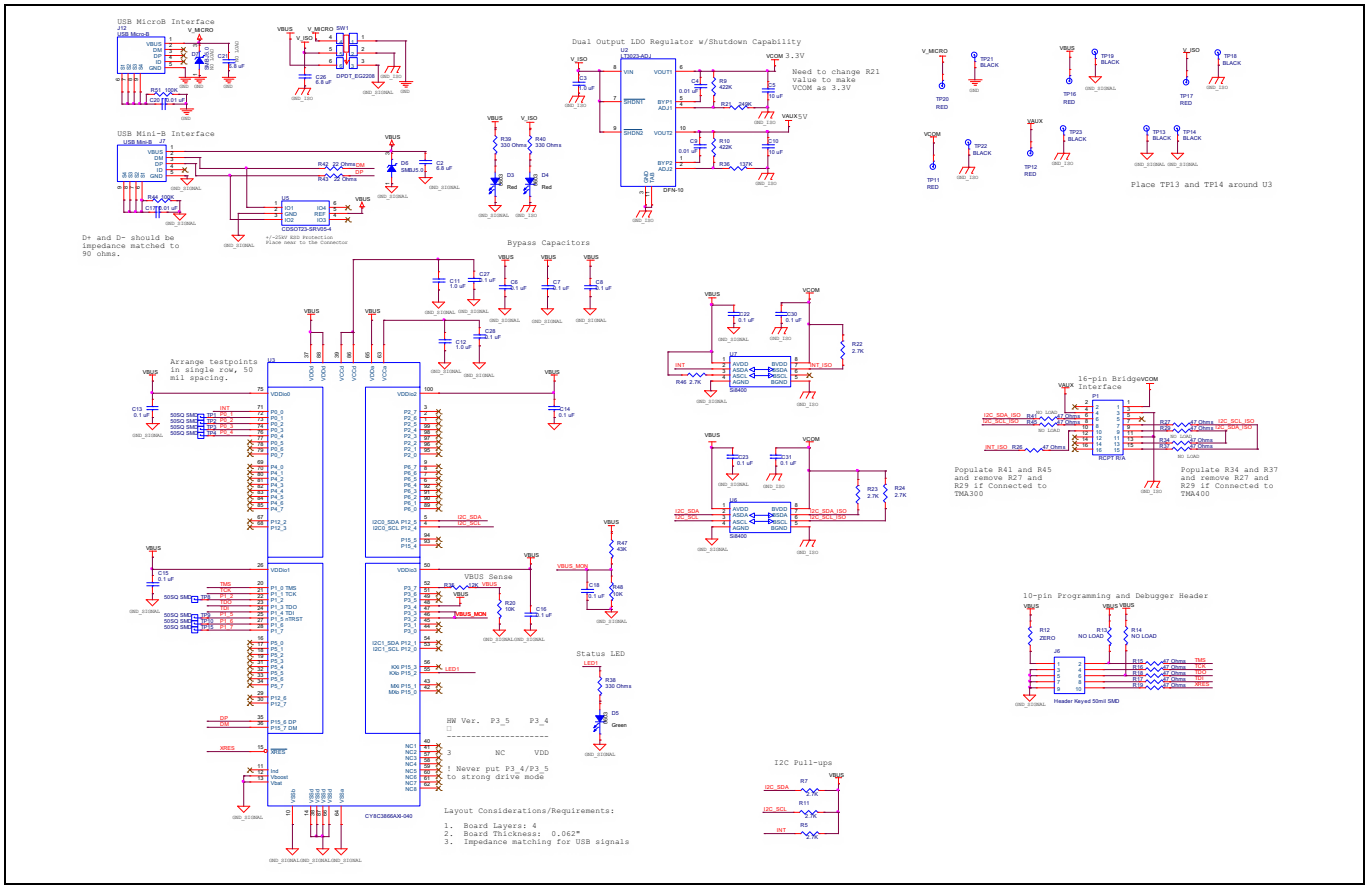

Figure 26 Isolation bridge board

5.2 Gerber files

5.2.1 CYAT8168X sensor board

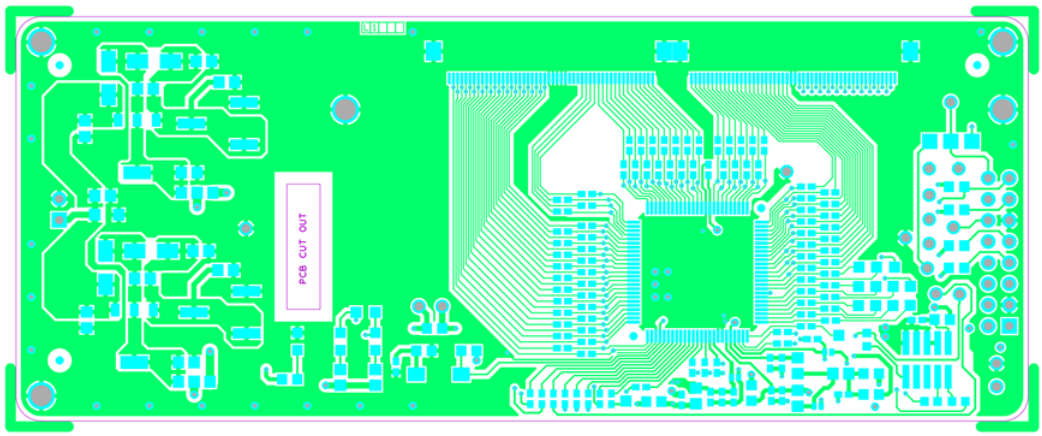

Figure 27 Primary side

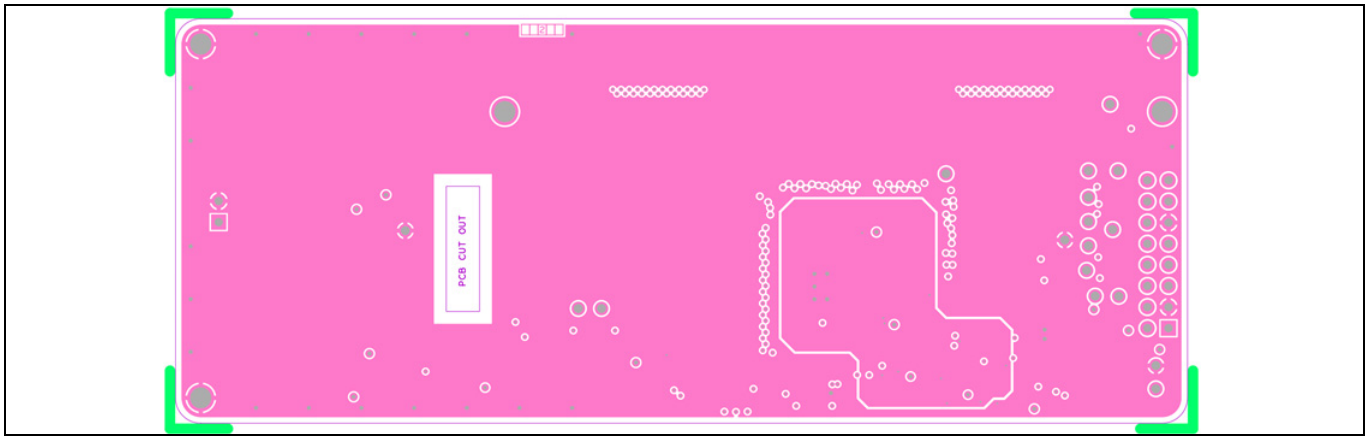

Figure 28 Ground layer

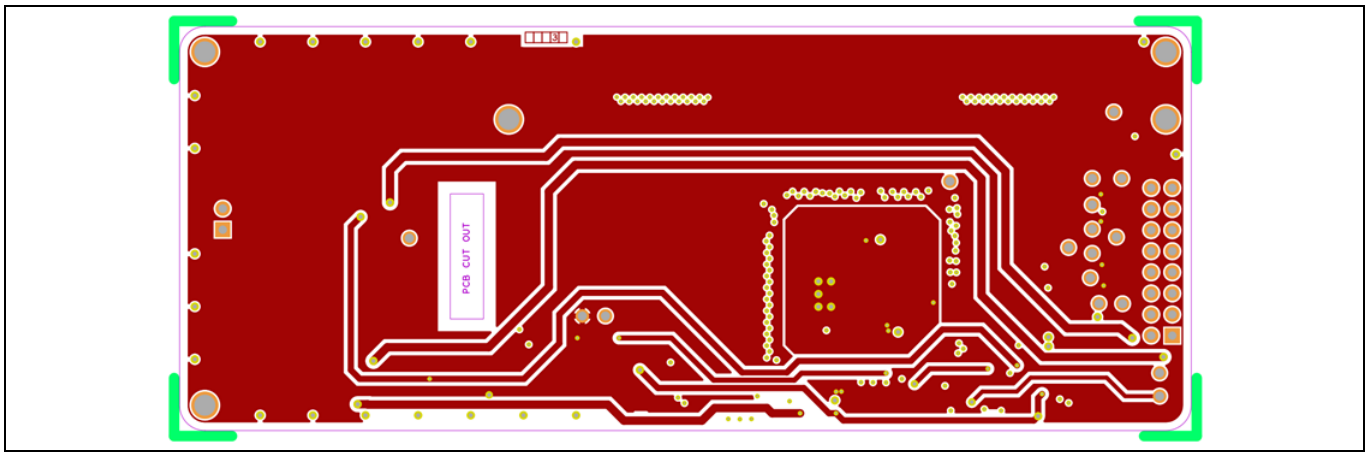

Figure 29 Power layer

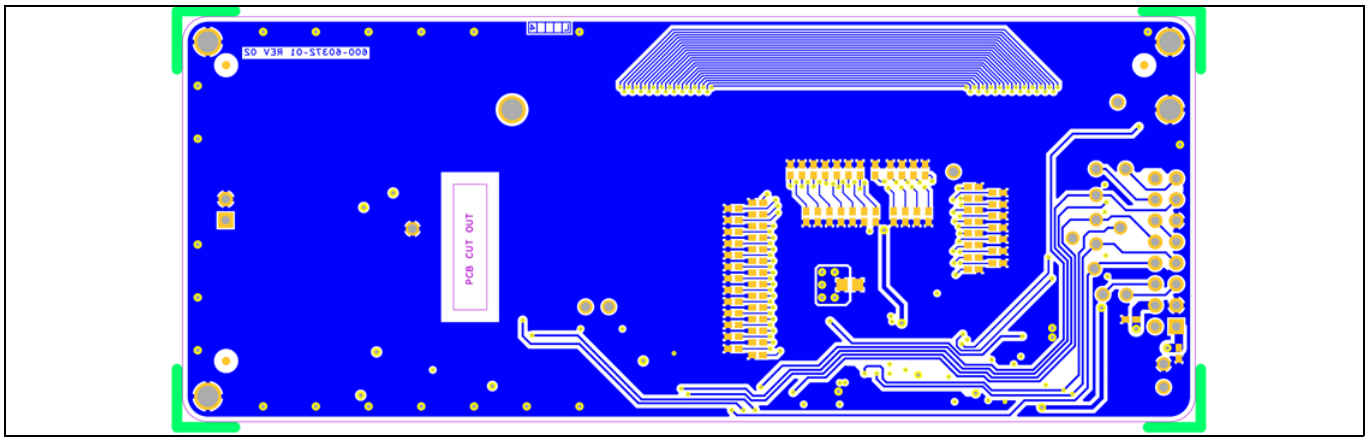

Figure 30 Secondary side

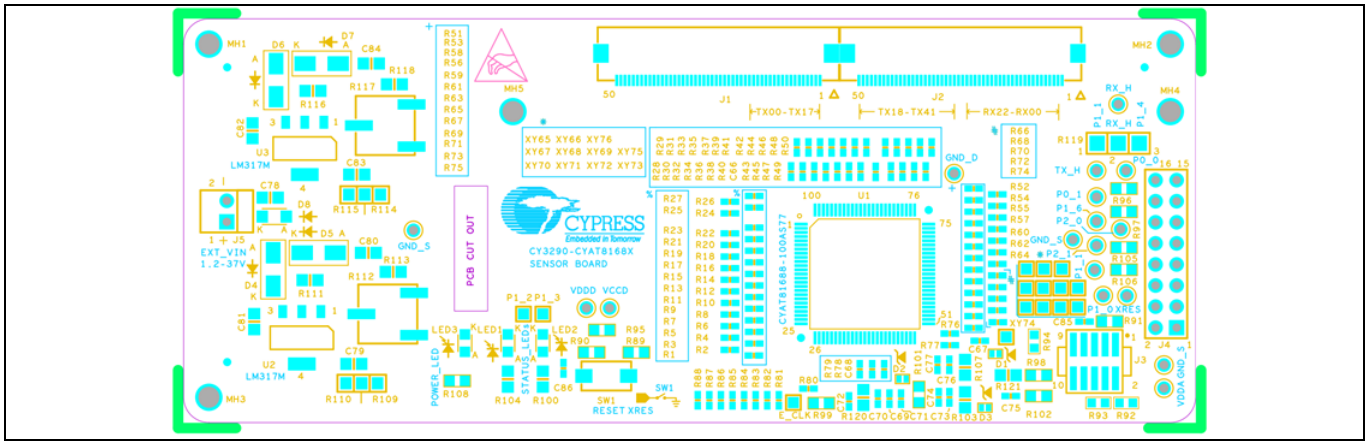

Figure 31 Primary silkscreen

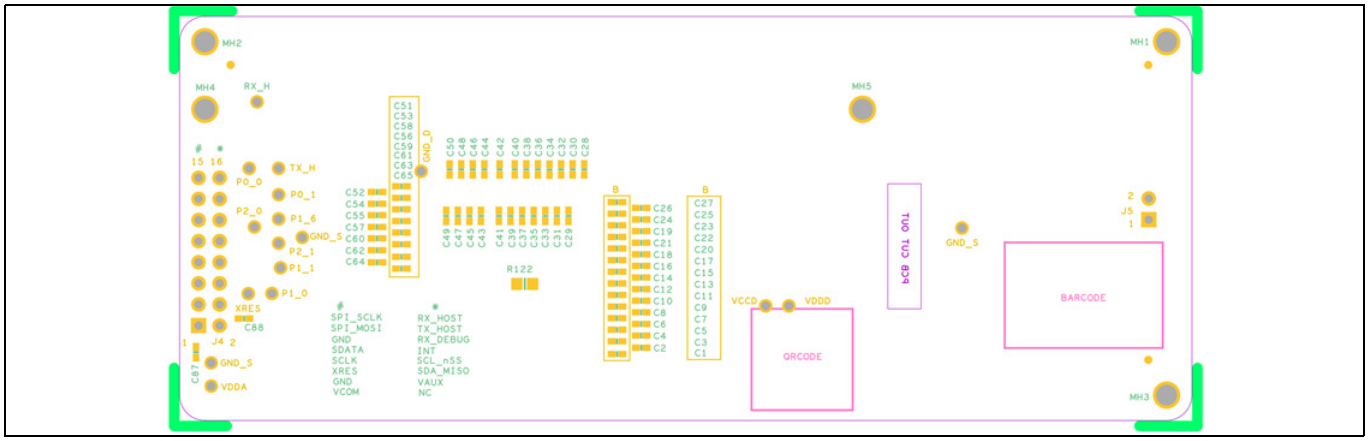

Figure 32 Secondary silkscreen

5.2.2 Isolation bridge board

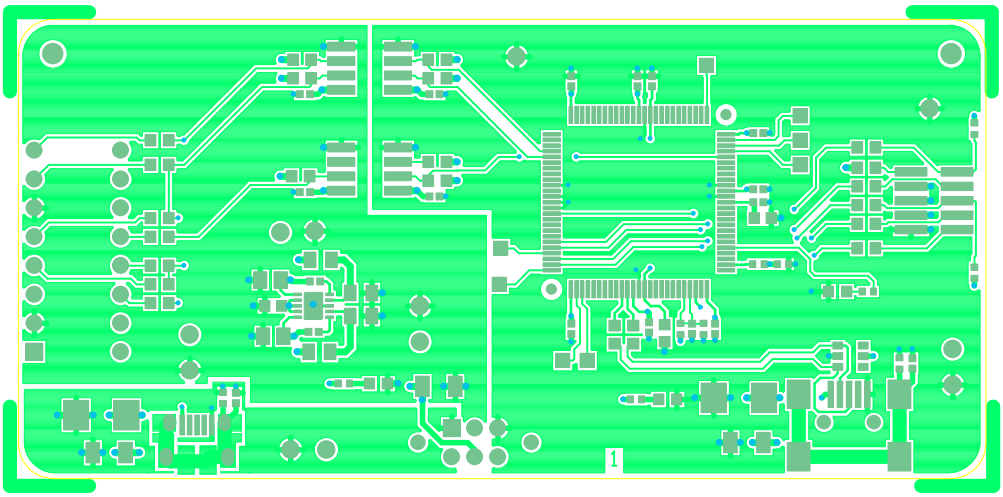

Figure 33 Primary side

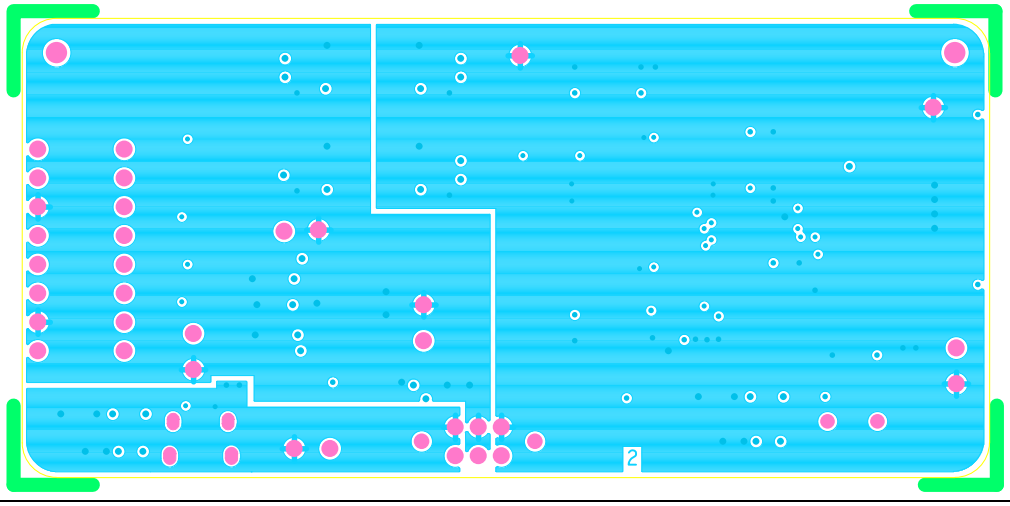

Figure 34 Ground layer

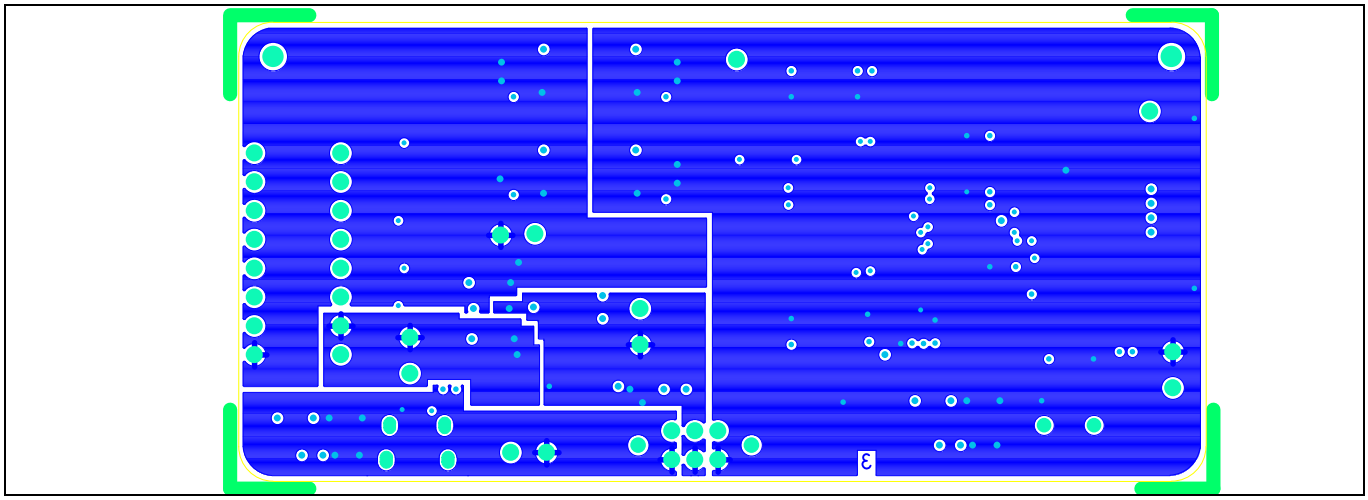

Figure 35 Power plane

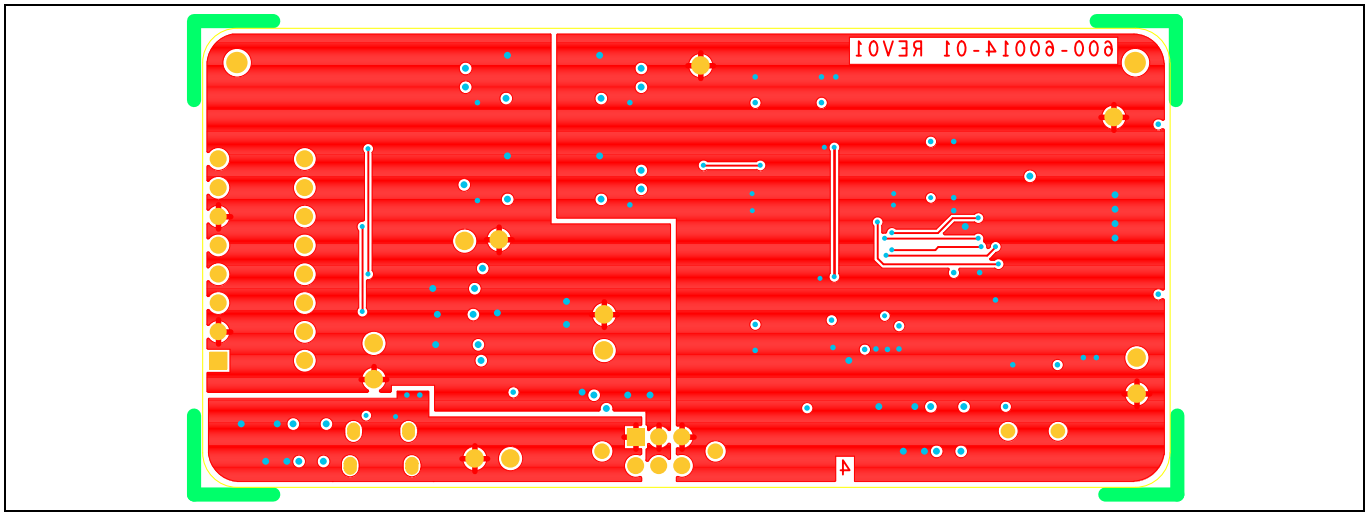

Figure 36 Secondary side

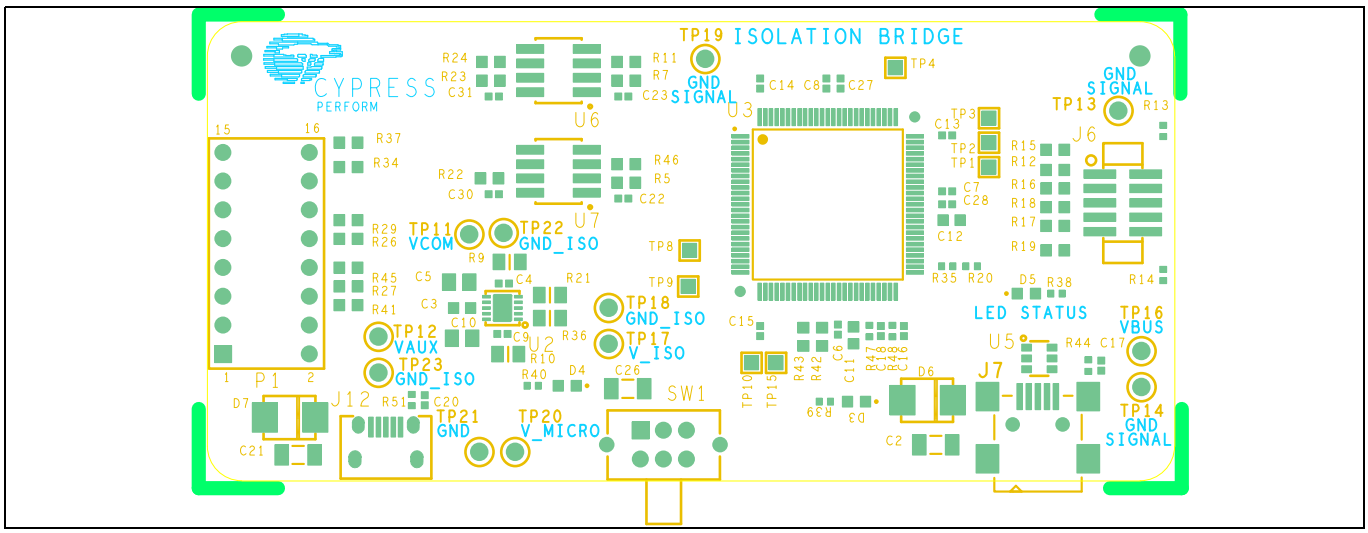

Figure 37 Primary silkscreen

5.3 Bill of materials

5.3.1 CYAT8168X sensor board

Item	Qty.	Reference	Description	Manufacturer	Manufacturer part number
1	1	600--60372-01 REV02	PCB, 122 mm x 48.54 mm, HI Tg, ENIG finish, 4 layer	Infineon Technologies	600--60372-01 REV02
2	3	C66, C74, C77	CAP CER 1UF 10V 10% X5R 0402	Taiyo Yuden	LMK105BJ105KVHF
3	1	C67	CAP CER 0.22UF 16V 10% X7R 0402	TDK Corporation	CGA2B2X7R1C224K050BA
4	7	C68, C71, C73, C76, C85, C87, C88	CAP CER 0.1UF 16V 10% X7R 0402	TDK Corporation	CGA2B1X7R1C104K050BC
5	1	C69	CAP CER 4.7UF 6.3V 20% X5R 0402	Murata Electronics North America	GRT155R60J475ME13D
6	1	C86	CAP CER 100PF 50V C0G 0402	TDK Corporation	CGA2B2C0G1H101J050BA
7	2	J1, J2	CONN FFC TOP 50POS 0.50MM R/A	Hirose Electric Co Ltd	FH12A-50S-0.5SH(55)
8	1	J3	CONN, HDR, KEYED, 2x5, 0.050", Gold, SMD 10 Positions Header, Shrouded Connector 0.050" (1.27mm) Surface Mount Gold	Samtec	FTSH-105-01-L-DV-K
9	1	J4	CONN HEADER 16POS.100 R/A TIN, Through Hole, Right Angle	Molex/Waldom Electronics Corp	90122-0128
10	1	LED3	LED RED CLEAR 0805 SMD	Lite-On Inc.	LTST-C170KRKT

Design files

Item	Qty.	Reference	Description	Manufacturer	Manufacturer part number
11	65	R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22, R23, R24, R25, R26, R27, R28, R29, R30, R31, R32, R33, R34, R35, R36, R37, R38, R39, R40, R41, R42, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R56, R57, R58, R59, R60, R61, R62, R63, R64, R65	RES SMD 2K OHM 1% 1/10W 0402	Panasonic Electronic Components	ERJ-2RKF2001X
12	23	R66, R67, R68, R69, R70, R71, R72, R73, R74, R75, R76, R77, R78, R79, R80, R81, R82, R83, R84, R85, R86, R87, R88	RES SMD 0.0 OHM JUMPER 1/10W 0402	Panasonic Electronic Components	ERJ-2GE0R00X
13	1	R89	RES SMD 10K OHM 1% 1/10W 0603	Panasonic Electronic Components	ERJ-3EKF1002V
14	4	R91, R99, R101, R102	RES SMD 0.0 OHM JUMPER 1/10W 0603	Panasonic Electronic Components	ERJ-3GEY0R00V
15	3	R92, R93, R94	RES SMD 47 OHM 1% 1/10W 0603	Panasonic Electronic Components	ERJ-3EKF47R0V
16	2	R103, R107	RES SMD 1 OHM 5% 1/8W 0805	Panasonic Electronic Components	ERJ-6GEYJ1R0V
17	1	R108	RES SMD 470 OHM 1% 1/10W 0603	Panasonic Electronic Components	ERJ-3EKF4700V
18	5	R109, R114, R120, R121, R122	RES SMD 0.0 OHM JUMPER 1/8W 0805	Panasonic Electronic Components	ERJ-6GEY0R00V
19	1	SW1	SWITCH TACTILE SPST-NO 0.05A 12V, Surface Mount	Panasonic Electronic Components	EVQ-PE105K
20	1	U1	PSoC™ Automotive Multitouch All-Points	Infineon Technologies	CYAT81688-100AS77
No Load					

Design files

Item	Qty.	Reference	Description	Manufacturer	Manufacturer part number
21	65	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C34, C35, C36, C37, C38, C39, C40, C41, C42, C43, C44, C45, C46, C47, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C59, C60, C61, C62, C63, C64, C65	CAP CER 10PF 50V ±0.5pF C0G 0402	TDK Corporation	CGA2B2C0G1H100D050BA
22	3	C70, C72, C75	CAP CER 1UF 10V 10% X5R 0402	Taiyo Yuden	LMK105BJ105KVHF
23	2	C78, C82	CAP CER 0.1UF 50V 10% X7R 0805	TDK Corporation	CGA4J2X7R1H104K125AA
24	2	C79, C83	CAP CER 1UF 16V 10% X5R 0805	TDK Corporation	CGA4J2X5R1C105K125AA
25	3	C80, C81, C84	CAP CER 10UF 16V 10% X5R 0805	TDK Corporation	CGA4J1X5R1C106K125AC
26	15	P1_2, P1_3, XY65, XY66, XY67, XY68, XY69, XY70, XY71, XY72, XY73, XY74, XY75, XY76, E_CLK	CONN, TEST POINT, 50SQ, SMD	NA	NA
27	2	D1, D3	TVS DIODE 5.3VWM 10VC TSLP2-17	Infineon Technologies	ESD5V3L1U-02LRH E6327
28	1	D2	TVS DIODE 3.3VWM 28VC TSLP2-7	Infineon Technologies	ESD3V3U1U-02LRH E6327
29	4	D4, D5, D6, D7	DIODE GEN PURP 100V 1A SMB	Diodes Incorporated	S1BB-13-F
30	1	D8	TVS DIODE 13VWM 21.5VC	Vishay Semiconductor	SMF13A-E3-08
31	1	J5	CONN HEADER 2POS .100 R/A TIN Through Hole, Right	Molex, LLC	22053021
32	2	LED1, LED2	LED RED CLEAR 0805 SMD	Lite-On Inc.	LTST-C170KRKT
33	5	MH1, MH2, MH3, MH4, MH5	Mounting Hole	NA	NA
34	1	R90	RES SMD 300 OHM 1%	Panasonic Electronic Components	ERJ-3EKF3000V

Design files

Item	Qty.	Reference	Description	Manufacturer	Manufacturer part number
35	2	R95, R98	RES SMD 0.0 OHM	Panasonic Electronic Components	ERJ-3GEY0R00V
36	4	R96, R97, R105, R106	RES SMD 4.7K OHM 1%	Panasonic Electronic Components	ERJ-3EKF4701V
37	2	R100, R104	RES SMD 1K OHM 1%	Panasonic Electronic Components	ERJ-6ENF1001V
38	2	R110, R115	RES SMD 0.0 OHM	Panasonic Electronic Components	ERJ-6GEY0R00V
39	2	R111, R116	RES SMD 240 OHM 1%	Panasonic Electronic Components	ERJ-6ENF2400V
40	2	R112, R117	TRIMMER 1K OHM	Bourns Inc	3361P-1-102GLF
41	2	R113, R118	RES SMD 3.9K OHM 1%	Panasonic Electronic Components	ERJ-6ENF3901V
42	1	R119	RES SMD 0.0 OHM	Panasonic Electronic Components	ERJ-3GEY0R00V
43	10	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP11	TEST POINT PC MINI .040"D WHITE	Keystone Electronics	5002
44	3	TP12, TP13, TP15	TEST POINT PC MINI .040"D RED	Keystone Electronics	5000
45	4	TP10, TP14, TP16, TP17	TEST POINT PC MINI .040"D BLACK	Keystone Electronics	5001
46	2	U2, U3	IC REG LDO ADJ 0.5A	ON Semiconductor	LM317MBSTT3G

5.3.2 Isolation bridge board

Item	Qty.	Reference	Description	Manufacturer	Manufacturer part number	Digikey part number
1	1	600-60014-01_REV02	PCB	Infineon Technologies	600-60014-01_REV02	N/A
2	2	C2, C26	CAP, CER, 6.8 µF, 16 V, 10%, X7R, 1206, SMD	Kemet	C1206C685K4RACTU	399-4955-1-ND
3	3	C3, C11, C12	CAP, CER, 1.0 µF, 16 V, 10%, X5R, 0603, SMD	Murata	GRM188R71C105KA12D	490-3900-1-ND
4	4	C4, C9, C17, C20	CAP, CER, 0.01 µF, 16 V, 10%, X7R, 0402, SMD	Murata	GRM155R71C103KA01D	490-1313-1-ND
5	2	C5,C10	CAP, CER, 10 µF, 16 V, 5%, X5R, 0805, SMD	Murata	GRM21BR61C106KE15L	490-3886-1-ND
6	14	C6, C7, C8, C13, C14, C15, C16, C18, C22, C23, C27, C28, C30, C31	CAP, CER, 0.1 µF, 16 V, 10%, X7R, 0402, SMD	Murata	GRM155R71C104KA88D	490-3261-1-ND
7	2	D3, D4	LED, Red, 0603, SMD	Lite-On Trading USA, Inc.	LTST-C190CKT	160-1181-1-ND
8	1	D5	LED, Green, 0603, SMD	Lite-On Trading USA, Inc.	LTST-C190GKT	160-1183-1-ND
9	1	D6	DIODE, ZENER, 5V, 600W, SMBJ5.0, DO-214AA, SMD	Bourns, Inc.	SMBJ5.0CA	SMBJ5.0CABCT-ND
10	1	J6	CONN, HDR, KEYED, 2x5, 0.050", Gold, SMD	Samtec	FTSH-105-01-L-DV-K	
11	1	J7	CONN, JACK, USB Mini-B, 0.8 mm, Gold (30), SMD	Tyco Electronics	1734035-2	A31727CT-ND
12	1	J12	CONN RCPT STD MICRO USB TYPE B	FCI	10103594-0001LF	609-4050-1-ND
13	1	P1	CONN, RCPT, 2x8, RA, 0.100", GOLD, TH	Tyco Electronics	1-5535512-8	A97410-ND
14	7	R5, R7, R11, R22, R23, R24, R46	RES, 2.7K, 1/10 W, 1%, 0603, SMD	Panasonic - ECG	ERJ-3EKF2701V	P2.70KHCT-ND
15	2	R9, R10	Vishay Thick Film Resistors - SMD 1/8watt 422Kohms 1%	Vishay	71-CRCW0805422KFKEA	541-422KCTR-ND
16	1	R12	RES ZERO OHM 1/16W 5% 0603 SMD	Panasonic - ECG	ERJ-3GEY0R00V	P0.0GCT-ND
17	8	R15, R16, R17, R18, R19, R26, R34, R37	RES, 47 Ohms, 1/10 W, 5%, 0603, SMD	Panasonic - ECG	ERJ-3GEYJ470V	P47GCT-ND

Design files

Item	Qty.	Reference	Description	Manufacturer	Manufacturer part number	Digikey part number
18	2	R20, R48	RES, 10K, 1/16 W, 1%, 0402, SMD	Yageo	RC0402FR-0710KL	311-10.0KLRCT-ND
19	1	R21	Vishay Thick Film Resistors - SMD 1/8watt 249Kohms 1%	Vishay	71-CRCW0805-249K-E3	541-249KCTR-ND
20	1	R35	RES, 12K, 1/16 W, 5%, 0402, SMD	Panasonic - ECG	ERJ-2GEJ123X	P12KJCT-ND
21	1	R36	Vishay Thick Film Resistors - SMD 1/8watt 137Kohms 1%	Vishay	71-CRCW0805137KFKEA	541-137KCTR-ND
22	3	R38, R39, R40	RES, 330 Ohms, 1/16 W, 5%, 0402, SMD	Yageo	RC0402JR-07330RL	311-330JRCT-ND
23	2	R42, R43	RES 22.0 OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF22R0V	P22.0HCT-ND
24	2	R44, R51	RES, 100K, 1/16 W, 5%, 0402, SMD	Panasonic - ECG	ERJ-2GEJ104X	P100KJCT-ND
25	1	R47	RES, 43K, 1/10 W, 1%, 0402, SMD	Panasonic - ECG	ERJ-2RKF4302X	P43.0KLCT-ND
26	1	SW1	SWITCH SLIDE DPDT RT ANG L=6MM	E-Switch	EG2208A	EG1942-ND
27	5	TP11, TP12, TP16, TP17, TP20	CONN, TEST POINT, RED, TH	Keystone Electronics	5000	5000K-ND
28	7	TP13, TP14, TP18, TP19, TP21, TP22, TP23	CONN, TEST POINT, BLACK, TH	Keystone Electronics	5001	5001K-ND
29	1	U2	REG, Linear, DUAL, ADJ, 100 mA, LT3023, DFN-10, SMD	Linear Technology	LT3023EDD#PBF	LT3023EDD#PBF-ND
30	1	U3	IC, PSoC3, LCD, USB, CAN, CY8C3866AXI-040, TQFP-100, SMD	Infineon Technologies	CY8C3866AXI-040	
31	2	U6, U7	IC,I2C ISOLATOR 10M 4CH 2.5K 16SOIC	Silicon Laboratories Inc	SI8400AB-B-IS	
32	1	U5	Bourns TVS Diodes - Transient Volt SOT-23 5V 4DIODE	Bourns, Inc.	CDSOT23-SRV05-4	
No load						
1	1	D7	DIODE, ZENER, 5V, 600W, SMBJ5.0, DO-214AA, SMD	Bourns, Inc.	SMBJ5.0CA	SMBJ5.0CABCT-ND

Design files

Item	Qty.	Reference	Description	Manufacturer	Manufacturer part number	Digikey part number
2	1	C21	CAP, CER, 6.8 uF, 16 V, 10%, X7R, 1206, SMD	Kemet	C1206C685K4RACTU	399-4955-1-ND
3	4	R27, R29, R41, R45	RES, 47 Ohms, 1/10 W, 5%, 0603, SMD	Panasonic - ECG	ERJ-3GEYJ470V	P47GCT-ND
4	8	TP1, TP2, TP3, TP4, TP8, TP9, TP10, TP15	CONN, TEST POINT, 50SQ, SMD			
5	2	R13, R14	RES, NO LOAD, 0402 SMD			

Revision history

Document version	Date of release	Description of changes
**	2017-05-24	New kit guide.
*A	2022-06-20	Updated Document Title to read as “CY3290-CYAT8168X PSoC™ Automotive Multitouch Evaluation Kit Guide”. Rebranding to “PSoC™ Automotive Multitouch”. Replaced “TrueTouch” with “PSoC™ Automotive Multitouch” in all instances across the document. Replaced “TrueTouch Host Emulator” with “Touch Tuning Host Emulator” in all instances across the document. Removed “3.3” mentioned after “TTHE” in all instances across the document. Replaced “TrueTouch Bridge” with “Touch Tuning Bridge” in all instances across the document. Updated **“Kit operation”** on page 16: Updated **“Evaluating the EVK with TTHE”** on page 16: Updated description. Removed figure “Touch Tuning Host Emulator 3.3”. Completing Sunset Review.
*B	2023-06-01	Migrated to IFX template
*C	2024-04-02	Updated **“Installation”** on page 5. Updated **“Evaluating the EVK with TTHE”** on page 16. Removed “USB stick with kit installer” from **“Kit contents”** on page 5.

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