TS14

EMBER® EM359X BREAKOUT BOARD TECHNICAL SPECIFICATION

Silicon Labs' Ember EM359x Breakout Board contains the hardware peripherals for the development and deployment of a low-data-rate, low-power ZigBee application on the EM359x series System-on-Chips (SoCs). The SoC is part of the six-layer (FR4-based) module that connects to the EM359x Breakout Board through the board-to-board connectors. The EM359x Breakout Board hardware stimuli include a temperature sensor, two buttons, a piezo buzzer, two LEDs, and a 2" x 2" through-hole prototyping area. In addition, the EM359x Breakout Board contains a USB-to-dual-UART transceiver with USB connector for access to EM359x SC1 and SC3 UART interfaces, Data Emulation Interface (DEI), Packet Trace Port programming interface, and regulated power planes. The EM359x Breakout Board also includes an Embedded Trace Module (ETM) interface for EM359x via third-party debuggers.

You can obtain the EM359x Breakout Board voltage supply from one of five sources: Ember Debug Adapter (ISA3) (through the Packet Trace Port), two external VDC supply sources (3 V direct or 4-20 V regulated to 3.3 V), two USB ports (EM359x from module and USB-to-dual-UART), or AAA battery pack. The various voltage supplies offer a degree of flexibility when testing different network topologies.

This document provides the technical specification for the EM359x Breakout Board. It describes the board-level interfaces as well as the key performance parameters. In addition, it provides the necessary information for developers to validate their application designs using the EM359x Breakout Board.

New in This Revision

Initial release for support of EM359x.

Contents

1 Breakout Board Features

Figure 1 shows the top view of the EM359x Breakout Board.

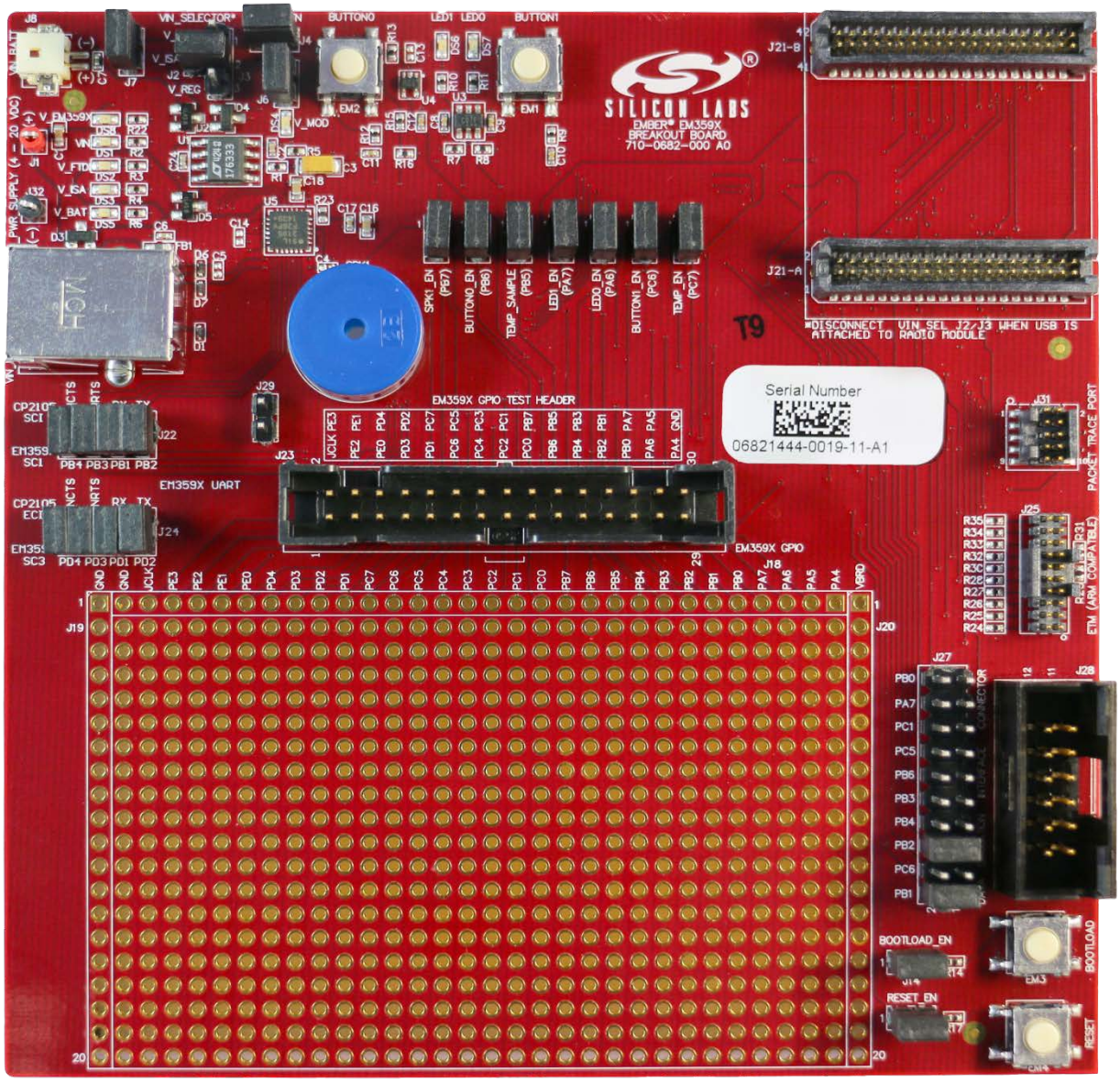


Figure 1. EM359x Breakout Board Top View

The EM359x Breakout Board offers:

- Configurable hardware support for application development

  Temperature sensor (connects to EM359x GPIO)
  Two buttons (connect to EM359x GPIO)
  Piezo buzzer (connect to EM359x GPIO)
  Two LEDs (connect to EM359x GPIO)

- USB to dual-UART transceiver with USB connector (Type B)

- Control Interface for the EM359x Radio Communications Module (RCM)

  RCM RESET button
  Voltage Supply connection (VBRD)
- 3.2" x 2", 0.1" pitch prototyping area
- 30-pin, 0.1" pitch, dual-row logic-analyzer shrouded connector
- 10-pin, 0.05" pitch, dual-row Packet Trace Port connector
- 20-pin, 0.05" pitch, dual-row ARM-compatible Embedded Trace Module (ETM) connector (interfaces with third-party debuggers)
- 12-pin, 0.1” pitch, dual-row, data emulation interface (DEI) with configuration header
- Two 40-pin, 0.05” pitch, dual-row board-to-board connectors for the EM359x radio module interface
- Selection pins for DC power source selection (either external DC power supply, USB from breakout board, USB from radio module, Debug Adapter (ISA3), or AAA battery pack). LEDs indicate which power supply has been selected.
- 2-pin module VDC pin for connection of an ammeter for module current measurements
- 2-pin jumpers for each of the HW application peripherals, buzzer, buttons, piezo, temperature sensor, and LEDs
- 2-pin jumpers for connection to the EM359x UARTs (SC1 and SC3). The selection jumpers route signals (RXD, TXD, nRTS, and nCTS) to a USB-to-dual-UART transceiver, or allow access to the TTL levels.

Table 1 lists the dc electrical characteristics of the EM359x Breakout Board.

Table 1. DC electrical characteristics

Parameter	Min	Typ	Max	Unit
VDD supply				
External DC Supply (J1 / J32)	4		20	V
USB Host	4.5	5		V
Debug Adapter (ISA3)	3.1	3.3V	3.5	V
Battery	2.1		3.6	
External DC supply (J3.2)	3.1	3.3	3.5	V
Current draw (peripherals)				
Piezo buzzer			10	mA
Buttons (enabled)			6	mA
Temperature sensor (enabled)			5	mA
Current draw (miscellaneous)				
USB transceiver (for SC1 and SC3 UART)			18.5	mA
LDO distribution			10	mA
Operating temperature	0		55	C

2 Components

Figure 2 illustrates the components on layer 1 (top side).

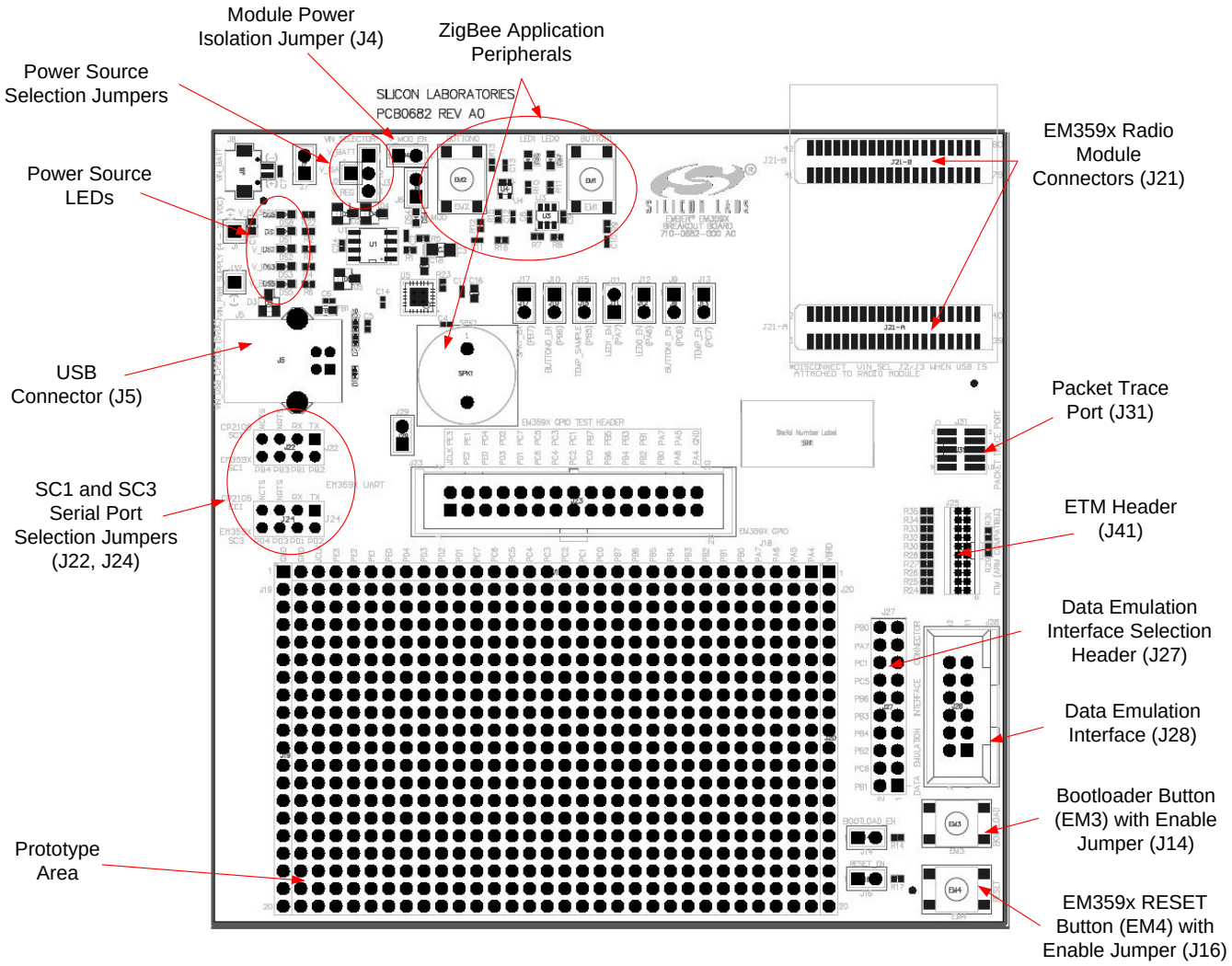


Figure 2. Assembly Print for Layer 1

2.1 Power Supply and Distribution

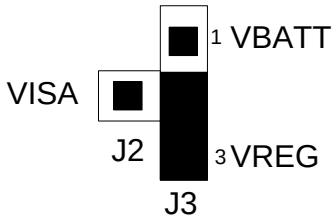
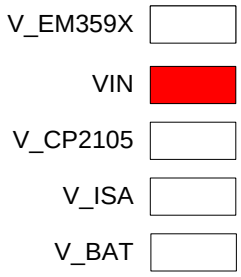
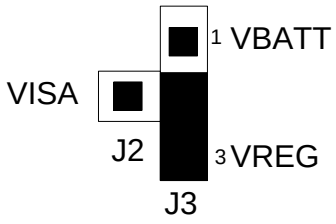
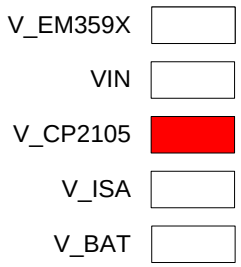
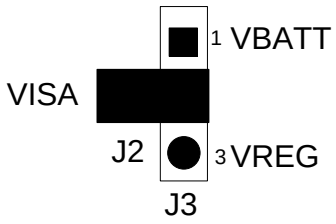
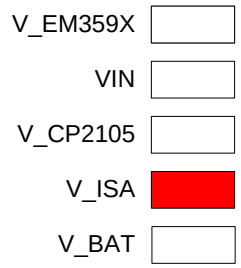
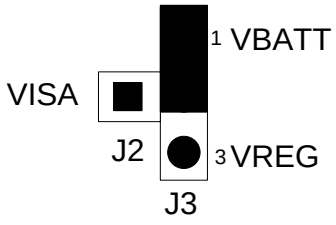
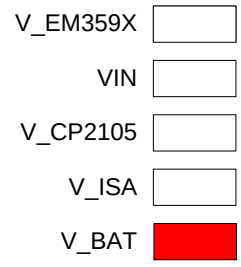
The EM359x Breakout Board can be powered from one of five sources:

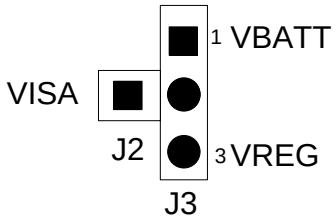
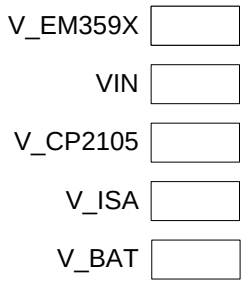
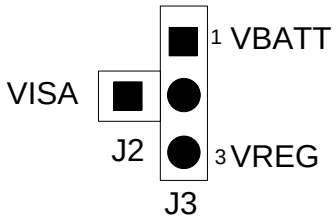
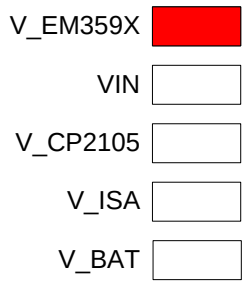
- 4 V to 20 V External DC Power supply (Positive connected J1 and Ground connected to J32)
- Battery pack connector (J8)
- USB Host (J5, via Wall wart or PC connection)
- Debug Adapter (ISA3) (through Packet Trace Port, J31)
- 2.1 to 3.6 V External DC Power supply (Positive connected to J3.2 and Ground connected to J32)

The EM359x Breakout Board contains power source selection jumpers (J2 and J3) which allows only one dc source to power the board. This eliminates the possibility of overcurrent resulting from power supply contention. Table 2 illustrates the connection scheme and LED indication for each power source.

Note: If powering the EM359x Breakout Board via the EM359x USB micro interface is desired, remove jumpers from J2/J3 and solder the EM359x radio board ST1 pins together, which will connect the EM359x Radio Board USB Regulator Output to the EM359x Module Power Net. Please consult TS13 *EM359x Radio Board Tech Spec* for more details on this configuration.

Table 2: Power Supply Connections

Power Source	Selection Scheme (J2 and J3)	LED Indicator
High Voltage External supply (4 V to 20 V) *Connect VDD to J1 and GND to J32.*		
USB Host *Connect USB cable to J5.*		
Debug Adapter (ISA3) *Connect ISA3 to J31.*		
Battery pack *Connect AAA battery pack (supplied by Silicon Labs).*		

Low Voltage External DC supply (3.1 to 3.5) *Connect directly to J3.2 with Ground connected to J32.*		
EM3598 Radio Board USB Micro Connector *Connect USB Micro cable to EM3598 Radio Board.*		

2.1.1 External DC Power Supply (J1 and J32 or J3.2 and J32)

The EM359x Breakout Board allows two easy to use connections to an external power supply.

- The first connection (Low Voltage) allows for a 3.1 to 3.5 V DC external supply to be connected to J3.2 (positive) and J32 (Ground). The power supply should be able to source up to 250 mA at the set voltage. When using a power supply in this mode, there should be no jumpers on J2 or J3 as shown in Table 2.
- The second connection (High Voltage) allows for a 4 V to 20 V dc external supply to be connected to J1 (positive) and J32 (Ground). The power supply should be able to source up to 300 mA at the set voltage. When using a power supply in this mode, there should be a jumper connecting J3.3 and J3.2 as shown in Table 2.

2.1.2 Battery Connector (J8)

The 2-pin, keyed battery connector (Hirose, P/N: DF13-2P-1.25H(50)) allows for connection to a dc power supply or battery pack. The EM359x Breakout Board is shipped with a 2-AAA battery pack with appropriate mating connector for easy attachment. Batteries are sold separately. When using a battery pack, a jumper must be connected between J3.1 and J3.2 as shown in Table 2.

2.1.3 Packet Trace Port (J8)

The EM359x Breakout Board can also be powered from a Debug Adapter (ISA3). To enable this power supply, simply connect the Debug Adapter (ISA3) to the Packet Trace Port (J8) and connect the power selection jumper between J2 and J3.2 as shown in Table 2. In addition, the Debug Adapter (ISA3) selection toggle switch must be put in the INT position. The Debug Adapter (ISA3) provides a target voltage of 3.3 V and sources as much as 250 mA. See document TS7, *Ember Debug Adapter (ISA3) Technical Specification,* for more details on the Debug Adapter (ISA3).

Note: If the Debug Adapter (ISA3) is connected directly to the Packet Trace Port on the Module, the jumper at J4 must be connected as well as the jumper across J2 and J3.2.

2.1.4 USB Host (J5)

The EM359x Breakout Board can also be powered by a USB Host (PC or Silicon Labs-supplied USB power supply). To operate in this mode, a USB Host must be connected to J5 and the power selection jumper must be connected between J3.2 and J3.3 as shown in Table 2.

2.2 Deep Sleep Testing of the Ember Module

To allow for accurate deep sleep current measurements, the EM359x Breakout Board isolates the module VDD power supply from the regulated power domain on the EM359x Breakout Board. The only connection point between the module power supply and the EM359x Breakout Board supply is through the VMOD_EN header (J4).

By isolating the module power supply in this manner, an ammeter can be placed across J4 to monitor the current sourced to the module. To perform accurate deep sleep measurements, configure the EM359x Breakout Board as follows:

- Remove J4 and place ammeter across this jumper.
- Remove J6 so the V_MOD LED DS4 is not driven. If supplying voltage by J8 battery connector, also remove J7 so the V_BATT LED DS5 is not driven.
- Issue "shutdown" in nodetest.
- Once command is issued and node is asleep, remove J22 and J24 UART jumpers.
- Make sure the Packet Trace Port cable and DEI cable are both detached from the EM359x Breakout Board.

This connection scheme offers the highest degree of power supply flexibility. Wake the EM359x from deep sleep by pressing either Button 0 or Button 1.

Note: The use of virtual UART port 4900 is not recommended when interfacing to nodetest for deep sleep testing, because this does not allow for proper configuration of the EM359x for deep sleep measurements. Therefore, use either pass-through UART port 4901 or USB to interface to the nodetest application.

2.3 ZigBee Application Peripherals

As previously mentioned, the EM359x Breakout Board offers six peripherals to assist in ZigBee application development including the following:

- Temperature sensor
- Two (2) “normally open” buttons
- 4 kHz piezo buzzer
- Two (2) LEDs

Each peripheral connects to an EM359x GPIO through a two-pin peripheral header. Because each peripheral header on the EM359x Breakout Board ships with a jumper in place, the peripherals default to “HW Enabled.” If application development does not require the peripheral, simply remove the jumper.

Note: Each peripheral consumes power. Be sure to factor this into the current consumption equations when testing the module in deep sleep mode or if using the battery pack to power the EM359x Breakout Board.

2.3.1 Temperature Sensor (U4)

The temperature sensor is an off-the-shelf component from National Semiconductor (MFG P/N: LM20BIM7). The temperature sensor requires an enable signal to be asserted (active high) prior to generating an analog voltage proportional to the ambient temperature of the EM359x Breakout Board. Therefore, two EM359x GPIO signals, PC7 and PB5, are routed to pin 2 of peripheral headers J13 and J15, respectively.

- PC7 enables the temperature sensor when asserted (active high), when a jumper is installed at J13.
- PB5 contains the analog temperature information from the sensor, when it is enabled and a jumper is installed at J15.

Due to the EM359x ADC voltage reference at 1.2 V, the temperature sensor output is scaled to between 0 and 1.2 V through a resistive voltage divider. If you want to connect a temperature sensor from a different manufacturer, scale the output in a similar manner.

The EM359x Breakout Board is shipped with a jumper installed at J13 and J15. If the jumpers are removed, a different compatible device can be attached to pin 2 of both J13 and J15.

For more information on the temperature sensor, refer to its data sheet (http://www.ti.com/product/LM20).

2.3.2 Buttons (EM1, EM2)

Two programmable, normally-open buttons are provided for software debugging and application development. When either button is pressed, the connected net is driven low. A single-pole RC filter minimizes the effects of switching noise.

These buttons map to the backchannel button commands as follows:

- EM2: controlled by the `button 0` command
- EM1: controlled by the `button 1` command

For information about the `button` command, see document UG110, *EM35xx Development Kit User Guide*.

Two EM359x GPIO signals, PB6 and PC6, are routed from the EM359x Module to pin 2 of peripheral headers J9 and J10, respectively. In the default configuration of the EM359x Breakout Board, jumpers are positioned across J9 and J10 to enable buttons EM1 and EM2, respectively. If the jumpers are removed, different compatible devices can be attached to pin 2 of breakout headers J9 and J10 instead of the buttons.

2.3.3 Application Buttons (EM1, EM2)

Two programmable, normally-open buttons are provided for software debugging and application development. When either button is pressed, the connected net is driven low. A single-pole RC filter minimizes the effects of switching noise.

These buttons map to the backchannel button commands as follows:

- EM2: controlled by the `button 0` command
- EM1: controlled by the `button 1` command

For information about the `button` command, see document UG110, *EM35xx Development Kit User Guide*.

Two EM359x GPIO signals, PB6 and PC6, are routed from the EM359x Module to pin 2 of peripheral headers J9 and J10, respectively. In the default configuration of the EM359x Breakout Board, jumpers are positioned across J9 and J10 to enable buttons EM1 and EM2, respectively. If the jumpers are removed, different compatible devices can be attached to pin 2 of breakout headers J9 and J10 instead of the buttons.

2.3.4 Bootloader Button (EM3)

A normally-open button is provided for bootloader purposes. When this button is pressed, the connected net is driven low. A single-pole RC filter minimizes the effects of switching noise. This button maps to the backchannel command `bootload`. This command engages the bootloader on a reset event. For information about the `bootload` command, see document UG110, *EM35xx Development Kit User Guide*.

EM359x GPIO signal PA5 (nBOOTMODE) is routed from the EM359x Module to pin 2 of peripheral header J14. In the default configuration of the EM359x Breakout Board, a jumper is positioned across J14 to enable button EM3. If the jumpers are removed, different compatible devices can be attached to pin 2 of breakout header J14 instead of the button.

2.3.5 Reset Button (EM4)

A normally-open button is provided for hardware reset purposes. When the button is pressed, the connected net is driven low. A single-pole RC filter minimizes the effects of switching noise. EM359x signal nRESET is routed from the EM359x Module to pin 2 of peripheral header J16. In the default configuration of the EM359x Breakout Board, a jumper is positioned across J16 to enable buttons EM4. If the jumper is removed, different compatible devices can be attached to pin 2 of breakout header J14 instead of the button.

2.3.6 Buzzer (SPK1)

A programmable buzzer is provided for software debugging and application development. An EM359x GPIO signal, PB7, is routed to pin 2 of peripheral header J17. In the default configuration of the EM359x Breakout Board, a jumper is positioned across J17 to enable use of the buzzer. The buzzer installed on the EM359x Breakout Board is from CUI (MFG P/N: CEP-1160). For more information on the buzzer, refer to its data sheet (http://www.cui.com/Product/Resource/PDFRedirect/110/CEP-1160.pdf).

2.3.7 LEDs (DS6 and DS7)

The EM359x Breakout Board contains two LEDs for software debugging and application development. Each LED is buffered (non-inverting) to allow for connection to any EM359x GPIO. Two EM359x GPIO, PA6 and PA7, are routed to pin 2 of header J12 and J11 respectively. To turn on DS7 (RED) from the EM359x RCM, install a jumper at J12, configure PA6 as an output and drive it low. To turn on DS6 (GREEN) from the EM359x RCM, install a jumper at J11, configure PA7 as an output and drive it low.

2.4 Serial Communication for EM359x SC1 UART

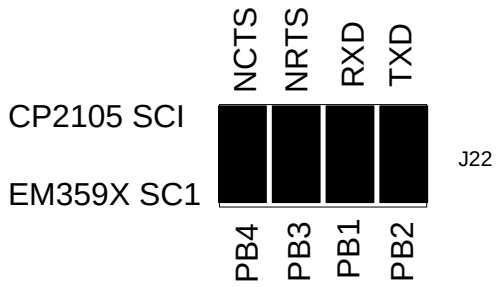
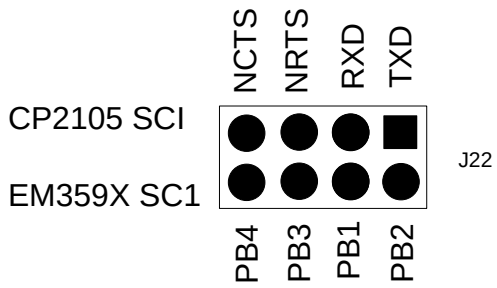
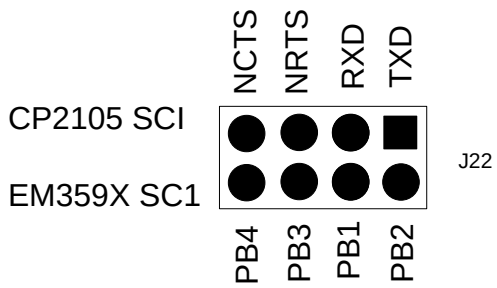
To enhance the software development experience, access to the EM359x SC1 UART is available directly from the EM359x Breakout Board or by telnetting into port 4901 of an ISA3 connected to an Ethernet network. On the EM359x Breakout Board, it is available as USB and TTL-compliant signal levels.

To minimize current consumption and allow for the different configuration options, the EM359x Breakout Board individually routes the EM359x SC1 UART signals TXD (EM359x PB2), RXD (EM359x PB1), nRTS (EM359x PB3), and nCTS (EM359x PB4) to the even-numbered pins of header J22. TTL-level access to these UART signals is available at the odd-numbered pins of this header. To route the UART signals to the USB transceiver, connect the jumpers between the odd-numbered and even-numbered pins on J22. To access the EM359x UART SC1 with an ISA3, remove the jumpers on J22 and place them on the DEI jumper connector (J27) as summarized below and shown in Figure 3.

- TXD: J27.1 to J27.2
- RXD: J27.5 to J27.6
- nRTS: J27.7 to J27.8
- nCTS: J27.9 to J27.10

Each jumper configuration is shown in Table 3.

Table 3: SC1 Serial Communication Selection Jumpers

UART Path	Selection Scheme (J22)
EM359x SC1 to USB	
EM359x SC1 to TTL	
EM359x SC1 over Debug Adapter (ISA3) *Connect DEI cable to J28.*	

Note: To connect to the EM359x SC1 UART over USB, CP2105 USB to UART Bridge Virtual COM Port (VCP) drivers are required. These can be found at http://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx.

Note: To connect to the EM359x SC1 UART over a Debug Adapter (ISA3), the Debug Adapter (ISA3) must be connected to an Ethernet connection. It can be accessed by selecting “Serial 1” within the Console view of the Ember Desktop or by telnetting to Port 4901.

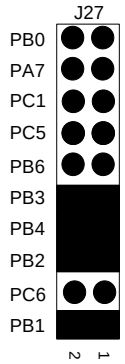


Figure 3. Jumper Settings Required for EM359x SC1 UART Access by Debug Adapter

2.5 Serial Communication for EM359x SC3 UART

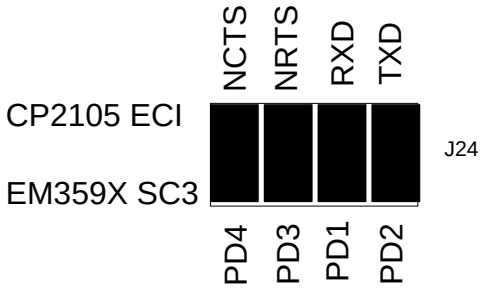
Access to the EM359x SC3 UART is available directly from the EM359x Breakout Board. On the EM359x Breakout Board, it is available as USB and TTL-compliant signal levels.

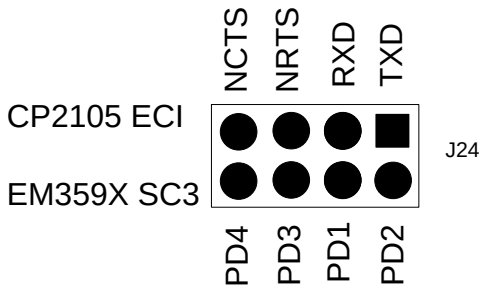
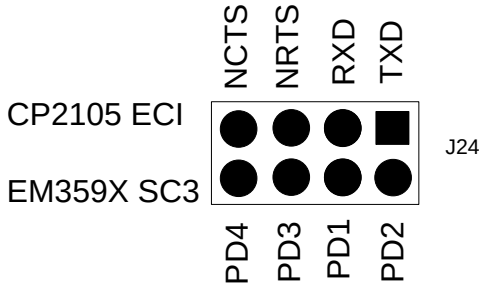
To minimize current consumption and allow for the different configuration options, the EM359x Breakout Board individually routes the EM359x SC3 UART signals TXD (EM359x PD2), RXD (EM359x PD1), nRTS (EM359x PD3), and nCTS (EM359x PD4) to the even-numbered pins of header J24. TTL-level access to these UART signals is available at the odd-numbered pins of this header. To route the UART signals to the USB transceiver, connect the jumpers between the odd-numbered and even-numbered pins on J24. To access the EM359x UART SC3 with an ISA3, remove the jumpers on J24 and connect jumper wires (not included) from J24 to the DEI jumper connector (J27) as summarized below and shown in Figure 3.

- TXD: J24.4 to J27.2
- RXD: J24.2 to J27.6
- nRTS: J24.8 to J27.8
- nCTS: J24.6 to J27.10

Each jumper configuration is shown in Table 4.

Table 4: SC3 Serial Communication Selection Jumpers

UART Path	Selection Scheme (J24)
EM359x SC3 to USB	

EM359x SC3 to TTL	
EM359x SC3 over Debug Adapter (ISA3) *Connect DEI cable to J28. See Figure 4 for special jumper wire connections.*	

Note: To connect to the EM359x SC3 UART over USB, CP2105 USB to UART Bridge Virtual COM Port (VCP) drivers are required. These can be found at http://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx.

Note: To connect to the EM359x SC3 UART over a Debug Adapter (ISA3), the Debug Adapter (ISA3) must be connected to an Ethernet connection. It can be accessed by selecting "Serial 1" within the Console view of the Ember Desktop or by telnetting to Port 4901.

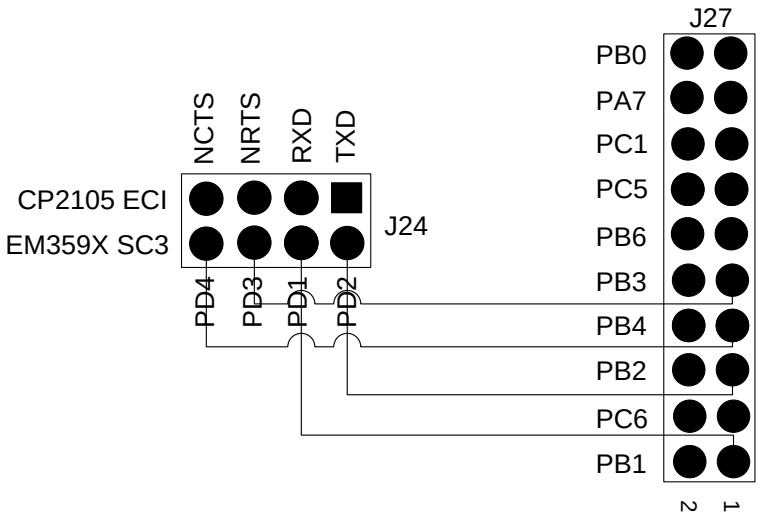


Figure 4. Jumper Wire Settings Required for EM359x SC3 UART Access by Debug Adapter

2.6 Data Emulation Interface (J28)

The 12-pin, dual-row, data emulation interface contains 10 EM359x GPIO signals, as well as voltage (VBRD) and ground (GND) connections. When connected to the Debug Adapter (ISA3), the connector provides additional debug features to software developers.

One feature involves the port 4901 UART connection via Debug Adapter (ISA3). To enable the UART connection to the EM359x SC1 UART signals, install four jumpers on J27 as shown in Figure 3. If SC3 UART is desired over this interface, refer to Figure 3 for special connections (jumper wires not included).

Another feature involves manipulation of BUTTON0 and BUTTON1 GPIO signals. To enable GPIO manipulation of BUTTON0 and BUTTON1, install jumpers on J27 at PB6 and PC6, respectively.

2.7 EM359x USB Interface

Access to the EM359x USB com port is available directly via the USB connector of the EM3598 Radio Board. To access EM359x USB, plug in a USB micro cable from the PC to the USB micro connector on the EM3598 Radio Board. This is a self-powered USB configuration, as the power is sourced from the EM359x Breakout Board. The firmware application must be built for using USB (nodetest-usb, for example).

For additional information on EM359x USB, refer to AN740, *Using the Ember ® EM358x/EM359x USB*.

2.8 EM359x Module Interface Connector (J21)

Two double-row, 0.05” pitch, 40-pin connectors make up the EM359x module interface to the EM359x Breakout Board. The board-to-board connector scheme allows access to all EM359x GPIO as well as nRESET and the JCLK signals. The connector is illustrated in Figure 5, while the dimensions are listed in Figure 6.

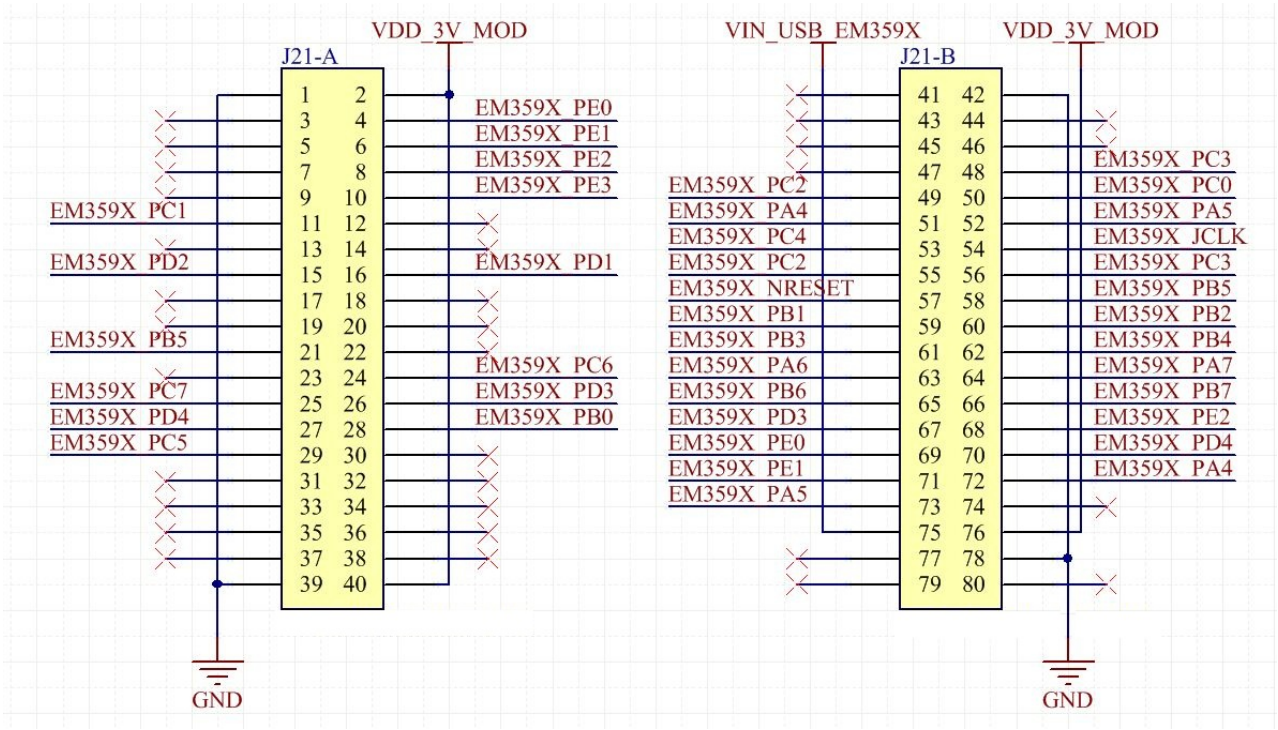


Figure 5. Board-to-Board Connector for the EM359x Module

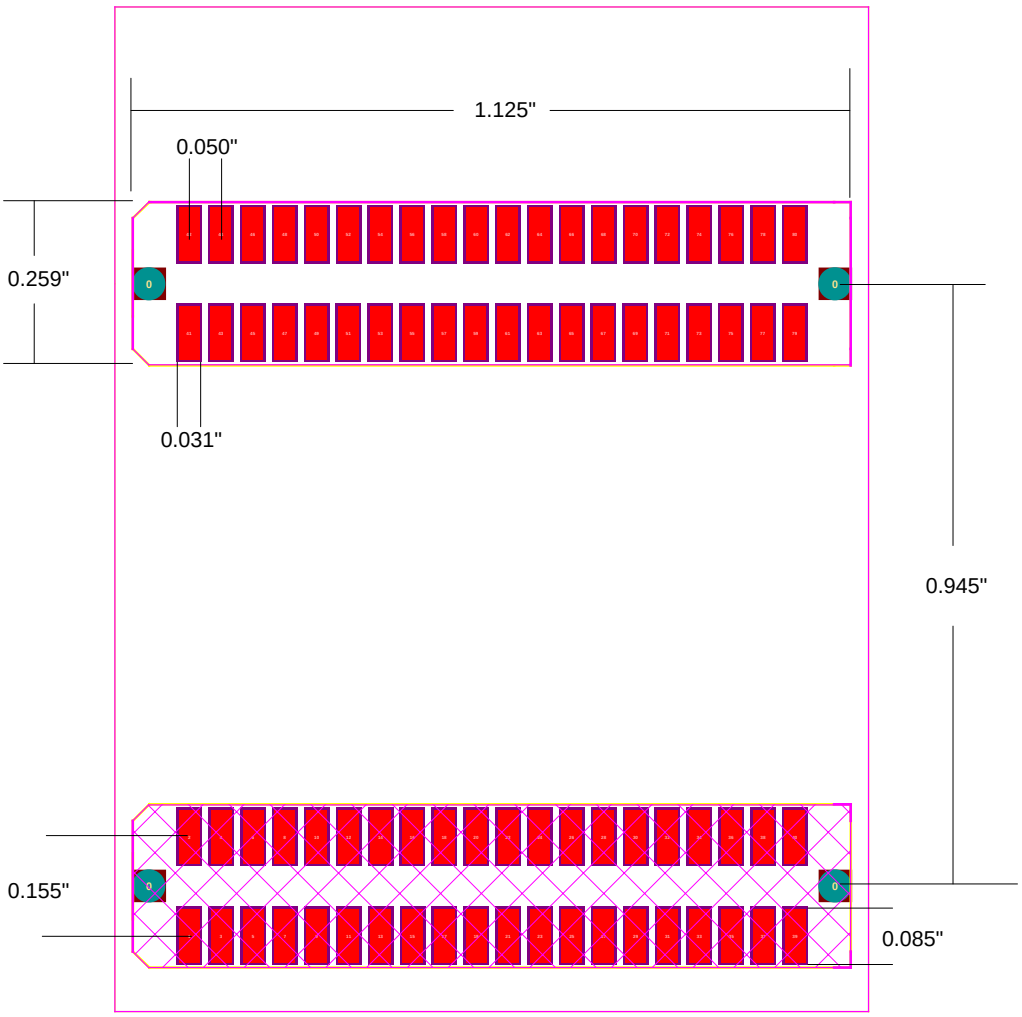


Figure 6. Board-to-Board Connector Dimensions for the EM359x Module

Table 5 describes the pinout and signal names at both J21. The EM359x GPIOs are exposed on the EM359x Breakout Board at the 30-pin, dual row, 0.1" pitch GPIO connector (J23) for application development. For more information on the alternate functions of the GPIO connector, refer to the *EM359x Data Sheet*.

Table 5. Pinout and Signal Names of the Interface Connector

Pin #	Signal name	Direction[1]	Connector	Description
1	GND	Power	J21A	Ground Connection
2	VDD	Power	J21A	2.1 to 3.6 V Module Power Domain
3	N/C	N/A	J21A	Not connected
4	PE0	I/O	J21A	EM359x GPIO (selected via PC1)
5	N/C	N/A	J21A	Not connected
6	PE1	I/O	J21A	EM359x GPIO (selected via PC1)
7	N/C	N/A	J21A	Not connected
8	PE2	I/O	J21A	EM359x GPIO (selected via PC1)
9	N/C	N/A	J21A	Not connected

10	PE3	I/O	J21A	EM359x GPIO (selected via PC1)
11	PC1	I/O	J21A	EM359x GPIO (FLASH_ENABLE)
12	N/C	N/A	J21A	Not connected
13	N/C	N/A	J21A	Not connected
14	N/C	N/A	J21A	Not connected
15	PD2	I/O	J21A	EM359x GPIO
16	PD1	I/O	J21A	EM359x GPIO
17	N/C	N/A	J21A	Not connected
18	N/C	N/A	J21A	Not connected
19	N/C	N/A	J21A	Not connected
20	N/C	N/A	J21A	Not connected
21	PB5	I/O	J21A	EM359x GPIO
22	N/C	N/A	J21A	Not connected
23	N/C	N/A	J21A	Not connected
24	PC6	I/O	J21A	EM359x GPIO
25	PC7	I/O	J21A	EM359x GPIO
26	PD3	I/O	J21A	EM359x GPIO
27	PD4	I/O	J21A	EM359x GPIO
28	PB0	I/O	J21A	EM359x GPIO
29	PC5	O	J21A	EM359x GPIO, alternate function TX_ACTIVE
30	N/C	N/A	J21A	Not connected
31	N/C	N/A	J21A	Not connected
32	N/C	N/A	J21A	Not connected
33	N/C	N/A	J21A	Not connected
34	N/C	N/A	J21A	Not connected
35	N/C	N/A	J21A	Not connected
36	N/C	N/A	J21A	Not connected
37	N/C	N/A	J21A	Not connected
38	N/C	N/A	J21A	Not connected
39	GND	Power	J21A	Ground connection
40	VDD	Power	J21A	2.1 to 3.6 V Module Power Domain
41	N/C	N/A	J21B	Not connected
42	GND	Power	J21B	Ground connection
43	N/C	N/A	J21B	Not connected
44	N/C	N/A	J21B	Not connected
45	N/C	N/A	J21B	Not connected
46	N/C	N/A	J21B	Not connected
47	N/C	N/A	J21B	Not connected
48	PC3	I/O	J21B	EM359x GPIO
49	PC2	I/O	J21B	EM359x GPIO
50	PC0	I/O	J21B	EM359x GPIO
51	PA4	I/O	J21B	EM359x GPIO
52	PA5	I/O	J21B	EM359x GPIO (nBOOTMODE)

53	PC4	I/O	J21B	EM359x GPIO
54	JCLK	Input	J21B	JTAG interface, serial clock
55	PC2	I/O	J21B	EM359x GPIO
56	PC3	I/O	J21B	EM359x GPIO
57	nRESET	I/O	J21B	Active low chip reset (internal pull-up on EM359x)
58	PB5	I/O	J21B	EM359x GPIO
59	PB1	I/O	J21B	EM359x GPIO
60	PB2	I/O	J21B	EM359x GPIO
61	PB3	I/O	J21B	EM359x GPIO
62	PB4	I/O	J21B	EM359x GPIO
63	PA6	I/O	J21B	EM359x GPIO
64	PA7	I/O	J21B	EM359x GPIO
65	PB6	I/O	J21B	EM359x GPIO
66	PB7	I/O	J21B	EM359x GPIO
67	PD3	I/O	J21B	EM359x GPIO
68	PE2	I/O	J21B	EM359x GPIO
69	PE0	I/O	J21B	EM359x GPIO
70	PD4	I/O	J21B	EM359x GPIO
71	PE1	I/O	J21B	EM359x GPIO
72	PA4	I/O	J21B	EM359x GPIO
73	PA5	I/O	J21B	EM359x GPIO
74	N/C	N/A	J21B	Not connected
75	VUSB	Power	J21B	5 V Module USB Bus Power Domain
76	VDD	Power	J21B	2.1 to 3.6 V Module Power Domain
77	NC	N/A	J21B	Not connected
78	GND	Power	J21B	Ground connection
79	NC	N/A	J21B	Not connected
80	NC	N/A	J21B	Not connected

[1] with respect to the RCM

2.9 Prototyping Area

The 3.2" x 2" (0.1” pitch) prototyping area on the EM359x Breakout Board offers software developers an extra degree of flexibility. As shown in Figure 4, it allows access to VBRD, GND, and each of the 32 EM359x GPIOs (excluding PA0-PA3, which is dedicated to EM359x SC2 USB on the EM359x radio board). Therefore, you can solder any sensor or input device to the prototyping area and connect it to the EM359x GPIO for development and debugging.

As shown in Figure 7, the leftmost column is connected to GND and the rightmost column to VBRD. The top row is connected to the EM359x GPIOs. Included in the top row are additional GND and JCLK connections. The remainder of the array is available for application development.

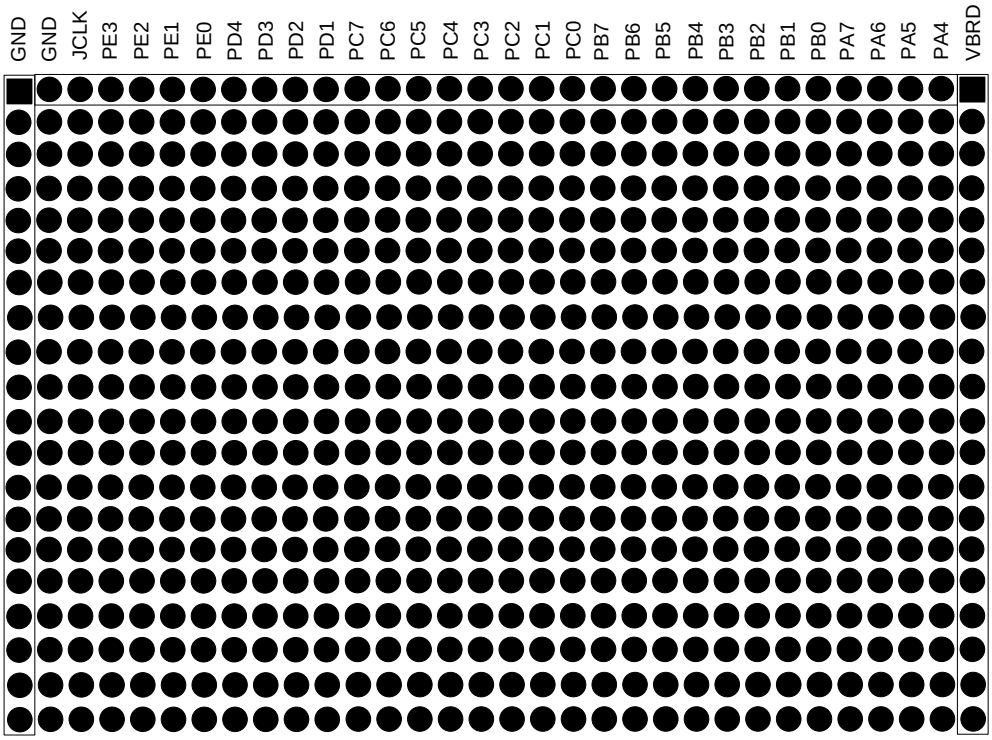


Figure 7. EM359x Breakout Board Prototyping Area

3 EM359x Breakout Board Schematic

The EM359x Breakout Board schematic is included at the end of this document.

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