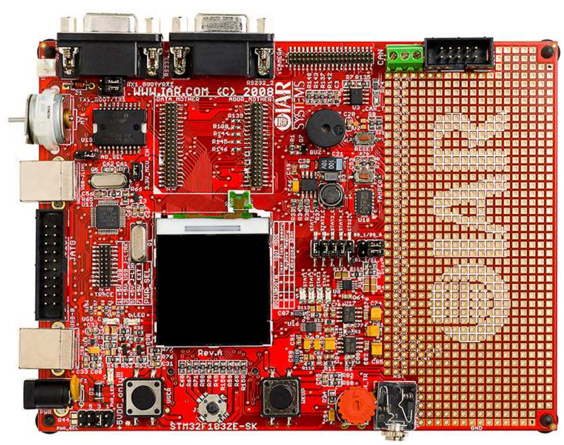
Getting Started Guide

IAR KickStart Kit™ for STMicroelectronics' STM32F103ZE

This guide briefly describes how to get started using IAR Embedded Workbench® with IAR J-Link OB (on board) debug interface to run an example application on the STM32F103ZE-SK target system.

For more detailed information, see the ***IAR Embedded Workbench® IDE User Guide,*** which also contains the C-SPY hardware debugger documentation. This document is reached from the Help menu in the IAR Embedded Workbench IDE.

Features of the STM32F103ZE-SK evaluation board



- STM32F103ZE device
- Stepper motor
- 3-axis accelerometer
- Temperature sensor
- Buzzer
- SD/MMC card slot
- I2S routed to speaker codec
- DAC one channel routed to pin
- USB 2.0 full speed connector
- ADC (routed to potentiometer)
- I2C (routed to UEXT connector)
- SPI1 (routed to UEXT)
- 2 USART DB9 connectors
- CAN routed to a three-pin terminal block
- JTAG/SWD interface connector (standard 20-pin)
- ETM v3 Trace connector (as defined by ARM)
- J-Link OB (your J-Link for ARM is mounted on the evaluation board)
- Status LED
- Power supply LED
- Reset button
- External power connector, through J-Link and USB (jumper selectable)
- Potentiometer (AN-TR)
- Color LCD
- 4 User LEDs
- One user button to simulate external events
- One wake-up button
- Joystick
- Prototype area
- Jumper for measuring power consumption from the controller
- RoHS-compliant

Install IAR Embedded Workbench for ARM

1 Insert the IAR KickStart Kit installation CD. The CD contains all the software you need to get your project up and running. The installation program starts automatically.

2 First choose which board you are working with, and then move on to the **CHOOSE SOFTWARE** page.

3 Select the IAR Embedded Workbench for ARM installation of your choice. We recommend the KickStart edition which has no time limit.

Figure 1 - Install software

4 Follow the installation directions given on the installation CD. You will have to register your product to get your license number and key. These will be delivered to you via e-mail within a few minutes. After this you will be able to install the software. Note that it can take several minutes for the installation files to unpack.

We recommend that you use the default directories on your installation.

Setting up the evaluation board

Before you start IAR Embedded Workbench, IAR J-Link OB (on board) for ARM (hereafter called IAR J-Link) must be installed.

1 Set the following jumpers

Jumper(s)	Description
PWR_SEL	Pin 3-4 closed - power from J-Link OB
JTAG_SEL	Open, J-Link OB is used

Table 1 - Jumper settings

2 Connect your computer and the IAR J-Link through the USB connector **USB-JLINK**, located on the top left side beside the stepper motor.

3 The Power LED on the evaluation board should now be lit.

4 If this is the first time that you are using J-Link, Windows will start the Install wizard. Choose **Install from a specific location**.

5 When asked to locate the USB drivers, click the browse button and navigate to the `\Program Files\IAR Systems\Embedded Workbench x.x Kickstart\arm\drivers\JLink\` directory.

6 Click **Finish**. IAR J-Link is now installed.

Running example applications

When you have installed and set up all the software and hardware, it is time to try out one of the example applications provided with the IAR Embedded Workbench KickStart edition for ARM.

To take full advantage of the example application, you should have some working knowledge of IAR Embedded Workbench IDE. For a quick introduction, see the tutorials in the *ARM IAR Embedded Workbench® IDE User Guide*, available as an online PDF from the IAR Embedded Workbench IDE Help menu.

The example described here is `Buzzer` which will let you control the buzzer to make a sound by pressing the button.

1 From the **Start** menu, start the IAR Embedded Workbench IDE by choosing **All Programs> IAR Systems> IAR Embedded Workbench for ARM x.xx Kickstart >IAR Embedded Workbench.** You will get straight into the **IAR Information Center for ARM**.

2 Click **EXAMPLE PROJECTS**.

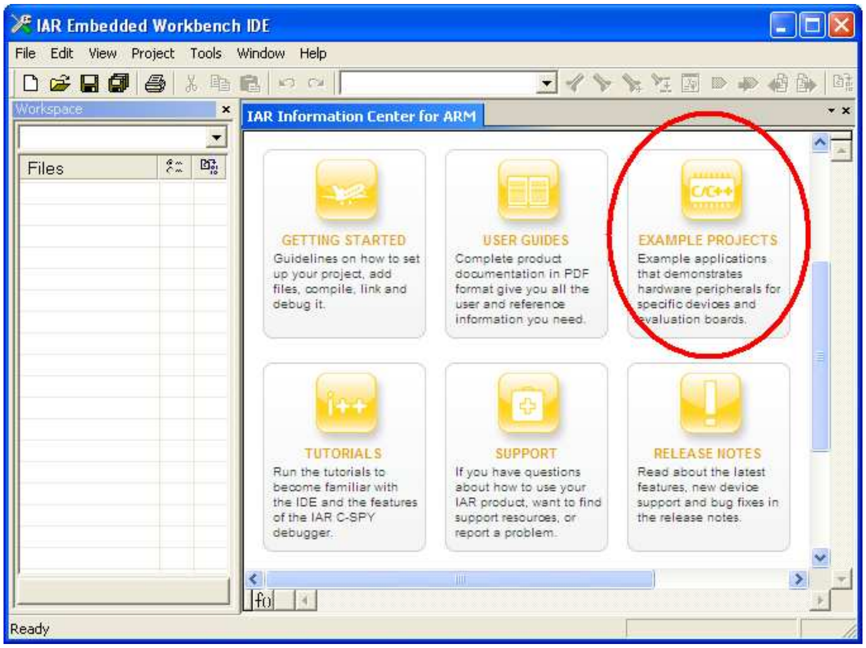


Figure 2 - IAR Information Center for ARM

3 Select in order **ST**, **STM32F10xx** and finally your board **IAR-STM32F103ZE-SK**.

4 Select the **Buzzer** example.

5 Choose a destination folder to save a copy of this project for testing, so that the original project will not be updated for any changes you made during testing.

6 Read the `Example description` in the Editor window or the `readme.txt` file included in the project.

7 Choose **Project>Make** or click the **Make** button on the toolbar. The project should compile with no errors (you can ignore the warnings).

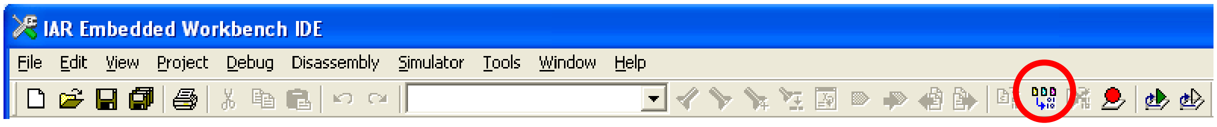


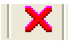
Figure 3 - The Make button

8 Choose **Project>Download and Debug** or click the **Download and Debug** button  on the toolbar to downloaded your program to the development board.

9 The file `main.c` is now open in the editor window and the program is stopped at the start. Click **Debug>Go** or click the **Go** button  on the toolbar to start the application.

10 The LCD is showing an IAR Systems logo. Press the **TAMPER** button; you will hear that the buzzer makes a sound.

11 To stop C-SPY, click the **Break** button  on the debug bar.

12 To exit C-SPY, click the **Stop Debugging** button  on the toolbar.

In order to try other example projects included click **Help>Information Center** to bring up the **IAR Information Center** again. Remember to read the project descriptions in each project.

Short comments of the example applications included

In all example applications, there is an `Example descriptions` or a `readme.txt` that gives more detailed instructions. Given below are some extra hints.

Mass Storage and **USB Mouse:** A separate USB cable is needed to connect your PC and USB-B port.

Stepper Motor Demo: +5v external power might be needed (Pin 7 and 8 should be closed on PWR_SEL).

Virtual COM: After you press the **Go** button, a separate USB cable is needed to connect your PC and **USB-B** port. You will also be asked to install the Virtual COM driver from

`\Program Files\IAR Systems\Embedded Workbench x.x Kickstart\arm\examples \ST\STM32F10x\IAR-STM32F103ZE-SK\VirtualCom\VirCOM_Driver_XP`.

After this you should be able to find **IAR Virtual COM port** under **Device Manager>Ports (COM& LPT).**

Test Demo: The code size of this example exceeds the 32K limit. Please download and test on the 30-day evaluation edition (**http://www.iar.com/downloads**).

Running IAR PowerPac BSP

When IAR Embedded Workbench is installed, it will also automatically install an IAR PowerPac evaluation edition along with it.

1 From the IAR Embedded Workbench IDE, choose **Project>Add Existing Project** and navigate to your local copy of the BSP directory, select **Start_STM32_HD.ewp** and click **Open**.

2 Rebuild and run the application (repeat step 7-10 as above), the application will start two periodic tasks that blink the LEDs (make sure that the jumpers on **STAT1_E** and **STAT2_E** are closed).

To try other example applications included in the `Application/Excluded` group. Use drag and drop to move the RTOS start application `OS_Start_LEDBlink.c` from the folder `Application` into the folder `Application\Excluded`. Then move the example application of choice from the folder `Excluded` into the folder `Application`, rebuild and run.

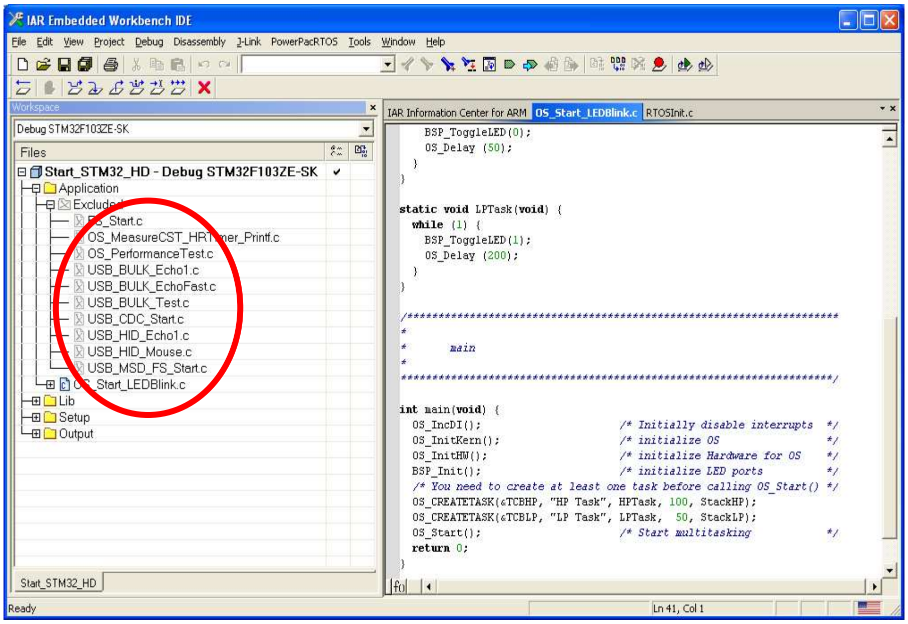


Figure 4 - Try other examples by exchanging the active file

Hints and troubleshooting

Change debug interface between JTAG and SWD

On the STM32 Cortex-M3 device, you can choose between two different debug interfaces – the standard JTAG interface or the SWD (serial wire debug) interface. When you have started IAR Embedded Workbench for ARM, you can change the debug interface used through the project options:

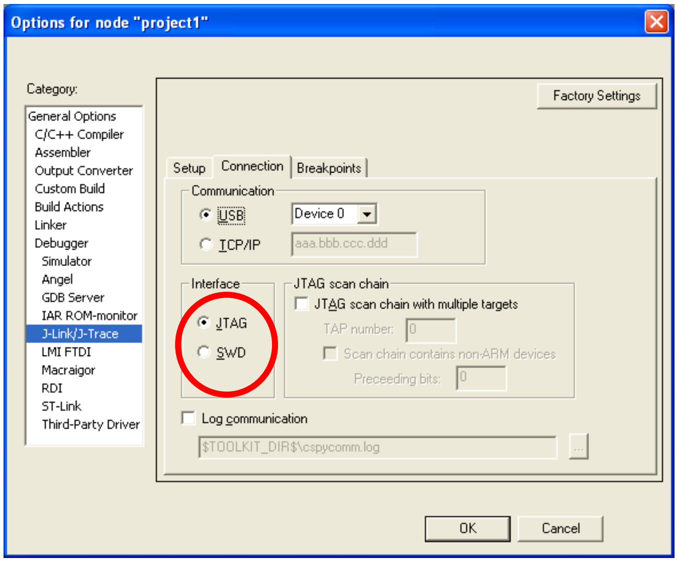


Figure 5 - Choose JTAG or SWD debugger interface

Jumper descriptions

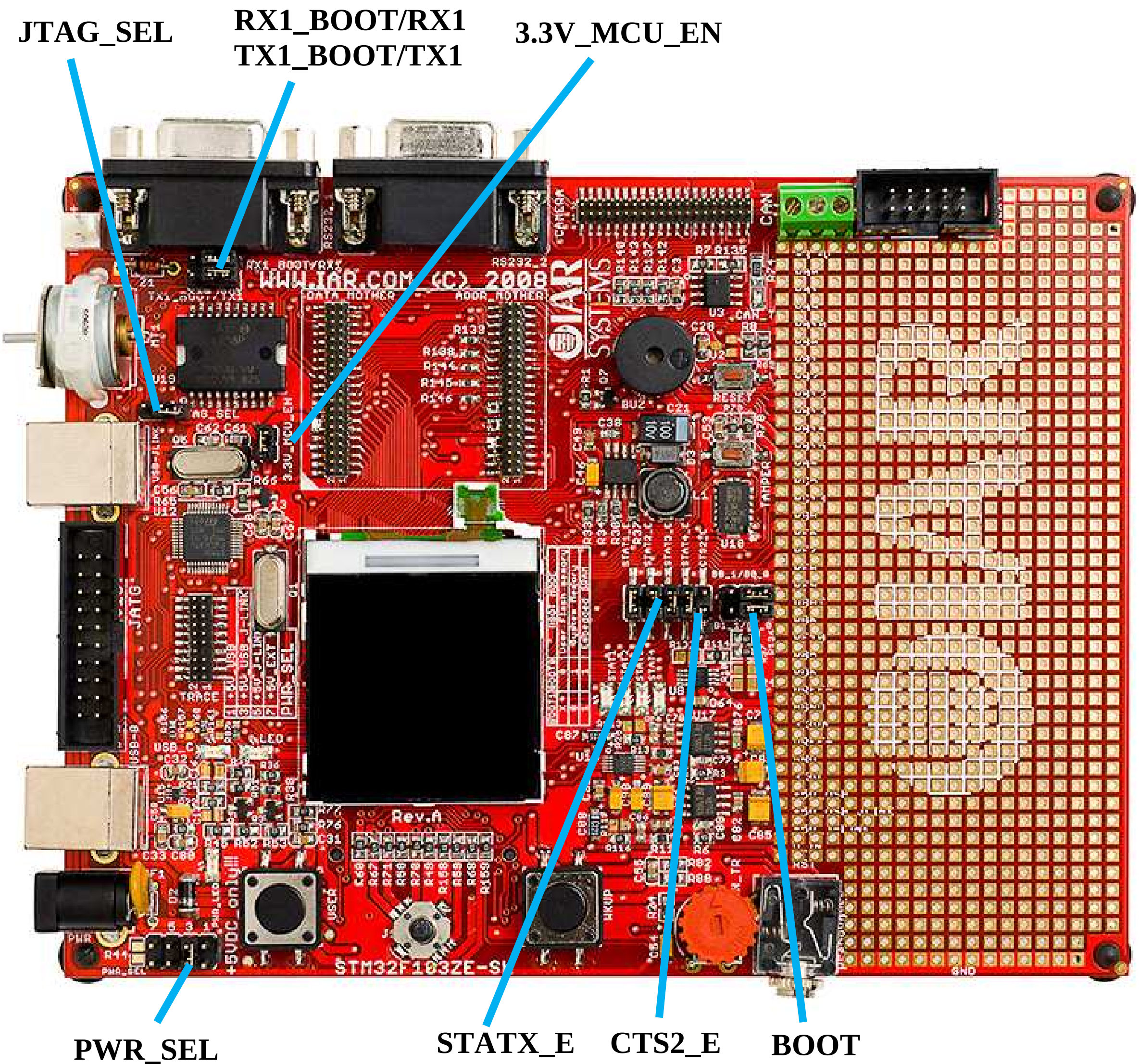


Figure 6 – evaluation board jumpers

<table>
<tr><th>Jumper</th><th>Description</th></tr>
<tr><td>PWR_SEL pin 1-2
PWR_SEL pin 3-4
PWR_SEL pin 5-6
PWR_SEL pin 7-8</td><td>Power from USB +5VDC
Power from USB J-Link-OB +5VDC (default)
Power from the J-Link probe through the JTAG connector +5VDC
Power from external source +5VDC</td></tr>
<tr><td>B0_1/B0_0
Boot select 0
B1_1/B0_1
Boot select 1</td><td><table>
<tr><th>B0</th><th>B1</th><th>Description</th></tr>
<tr><td>0</td><td>X</td><td>Embedded flash (default)</td></tr>
<tr><td>1</td><td>0</td><td>System memory</td></tr>
<tr><td>1</td><td>1</td><td>Embedded SRAM</td></tr>
</table></td></tr>
<tr><td>STAT1_E</td><td>Connect status LED1 (PF6) (default closed)</td></tr>
<tr><td>STAT2_E</td><td>Connect status LED1 (PF7) (default closed)</td></tr>
<tr><td>STAT3_E</td><td>Connect status LED1 (PF8) (default closed)</td></tr>
<tr><td>STAT4_E</td><td>Connect status LED1 (PF9) (default closed)</td></tr>
<tr><td>CTS2_E</td><td>Connect UART2 RS232 CTS signal (default open)</td></tr>
<tr><td>3.3V_MCU_EN</td><td>Connect 3.3V supply to STM32F for current consumption measurement (default closed)</td></tr>
<tr><td>JTAG_SEL</td><td>Disconnect J-Link on board (default open)</td></tr>
<tr><td>RX1_BOOT/RX1</td><td>RX1_BOOT connects RS232_1 to PA10
RX1 connects RS232_1 to PB7 (default)</td></tr>
<tr><td>TX1_BOOT/TX1</td><td>TX1_BOOT connects RS232_1 to PA9
TX1 connects RS232_1 to PB 6 (default)</td></tr>
</table>

Table 2 - Jumper settings

Note: Square pads indicate pin 1.

Board layout

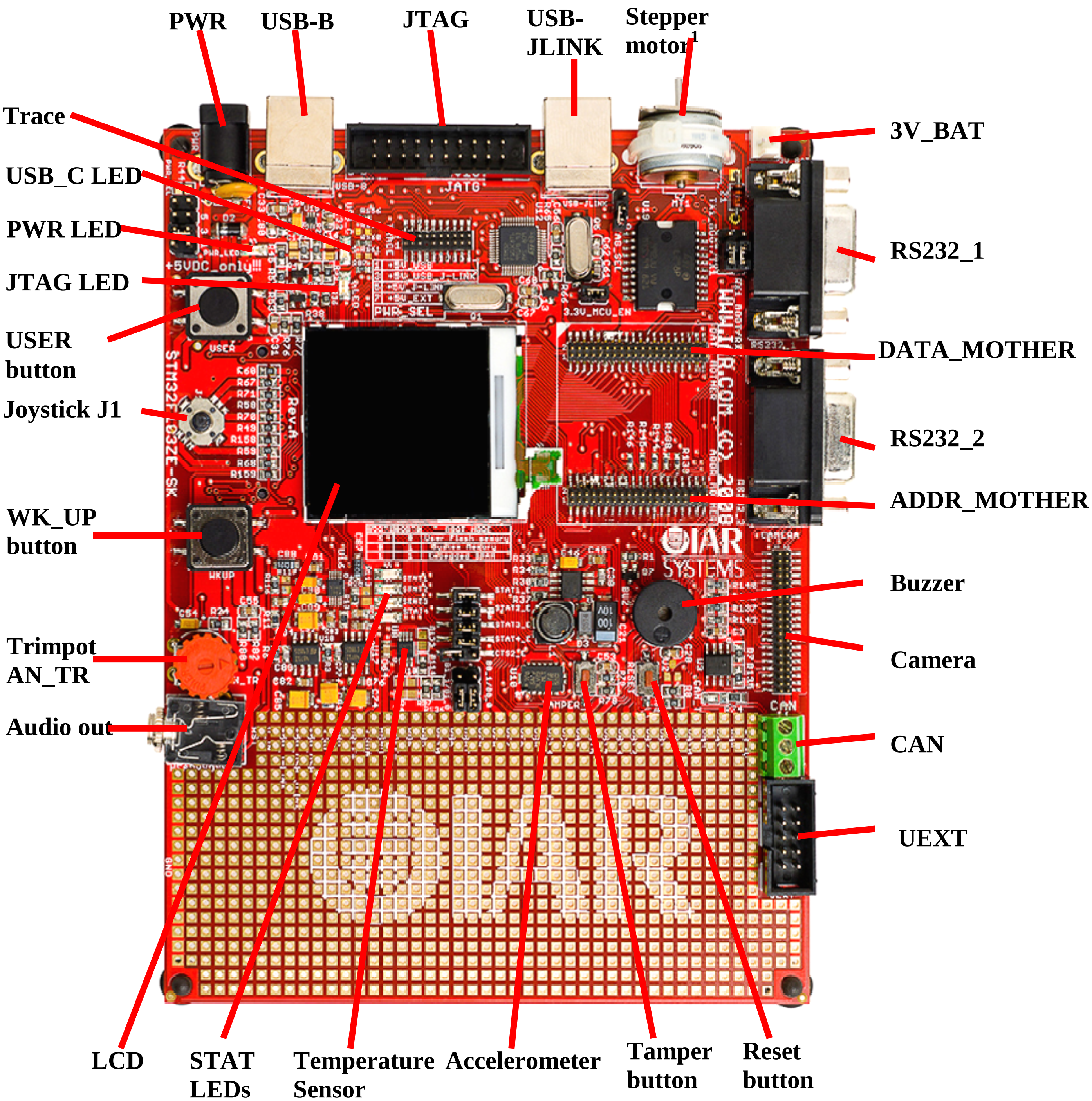


Figure 7 – evaluation board connectors

[1]The stepper motor needs 700 mA. Supply the board with external power when using it.

Input/output

The **USER** button is connected to the STM32F103ZE pin 93 (PG8).

The **WKUP** button is connected to the STM32F103ZE pin 34 (PA0/WKUP/USART2_CTS/ADC123_IN0/TIM5_CH1/TIM2_CH1_ETR/TIM8_ETR).

The **TAMPER** button is connected to the STM32F103ZE pin 7 (PC13/TAMPER-RTC).

The **RESET** button is connected to the STM32F103ZE pin 25 (NRST).

The joystick **J1**'s right is connected to the STM32F103ZE pin 92 (PG7/FSMC_INT3).

The joystick **J1**'s left is connected to the STM32F103ZE pin 127 (PG12/FSMC_NE4).

The joystick **J1**'s down is connected to the STM32F103ZE pin 128 (PG13/FSMC_A24).

The joystick **J1**'s up is connected to the STM32F103ZE pin 129 (PG14/FSMC_A25).

The joystick **J1**'s center button is connected to the STM32F103ZE pin 132 (PG15).

A power-on **PWR** LED shows that the board is powered on.

The **STAT 1** LED is connected to the STM32F103ZE pin 18 (PF6/ADC3_IN4/FSMC_N/ORD).

The **STAT 2** LED is connected to the STM32F103ZE pin 19 (PF7/ADC3_IN5/FSMC_N/REG).

The **STAT 3** LED is connected to the STM32F103ZE pin 20 (PF8/ADC3_IN6/FSMC_N/OWR).

The **STAT 4** LED is connected to the STM32F103ZE pin 21 (PF9/ADC3_IN7/FSMC_CD).

The LED by the name **LED** indicates the JTAG status.

The **USB_C** LED indicates that information is sent over USB.

A trimpot **AN_TR** is connected to the STM32F103ZE pin 44 (PC4/ADC12_IN14).

A color LCD display with a resolution of 132x132 pixels.

Prototyping area

The prototyping area permits adding of new components.

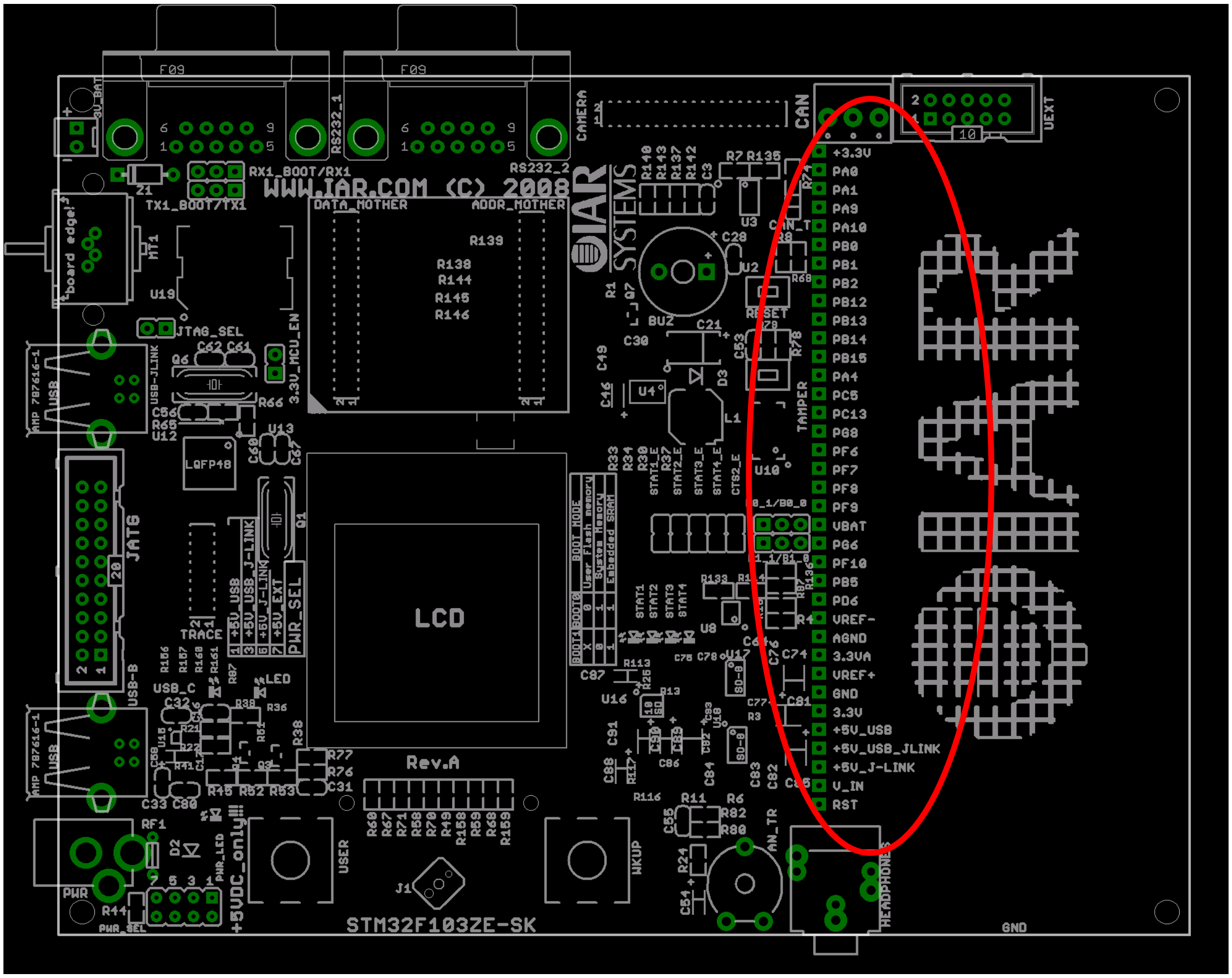


Figure 8 - Pins connected to the prototyping area

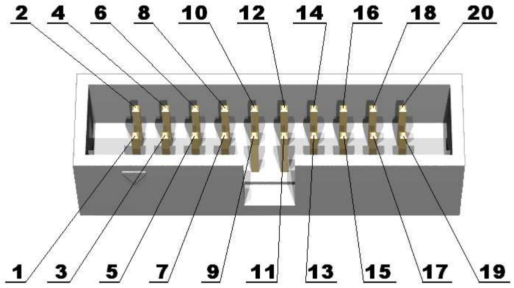
Clock circuit

The oscillator **Q1** at 8 MHz is connected to the STM32F103ZE OSC_IN pin and the OSC_OUT pin.

The oscillator **Q2** at 32.768 kHz is connected to the STM32F103ZE PC14/OSC32_IN pin and the PC15/OSC32_OUT pin.

External connectors description

JTAG



Pin #	Signal name	Pin #	Signal name
1	+3.3V	2	+3.3V
3	TRST	4	GND
5	TDI	6	GND
7	TMS	8	GND
9	TCK	10	GND
11	RTCK	12	GND
13	TDO	14	GND
15	RST	16	GND
17	GND	18	GND
19	+5V_JLINK	20	GND

TDI Input **Test Data In**. This is the serial data input for the shift register.

TDO Output **Test Data Out**. This is the serial data output for the shift register. Data is shifted out of the device on the negative edge of the TCK signal.

TMS Input **Test Mode Select**. The TMS pin selects the next state in the TAP state machine.

TCK Input **Test Clock**. This allows shifting of the data in, on the TMS and TDI pins. It is a positive edge triggered clock with the TMS and TCK signals that define the internal state of the device.

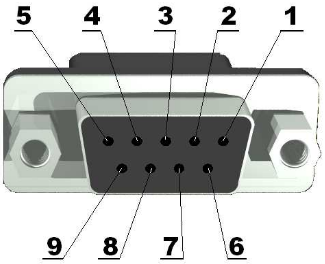
TRST Input **Test Reset**. This signal resets the JTAG controller.

RTCK Output **Return Clock**. This is a synchronization signal which the JTAG connector uses to acknowledge that it is ready to receive/transmit.

JTAG is used for programming and debugging the MCU.

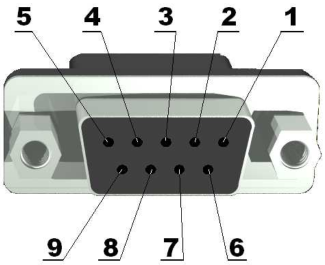
RS232_1

Pin #	Signal name
1	NC
2	TIM1_CH2/TX1 or USART1_TX
3	TIM1_CH3/RX1 or USART1_RX
4	NC
5	GND
6	NC
7	NC
8	NC
9	NC



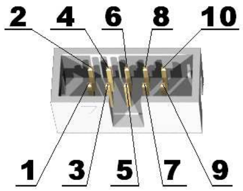
RS232_2

Pin #	Signal name
1	NC
2	USART2_TX
3	USART2_RX
4	NC
5	GND
6	NC
7	CTS
8	RTS
9	NC

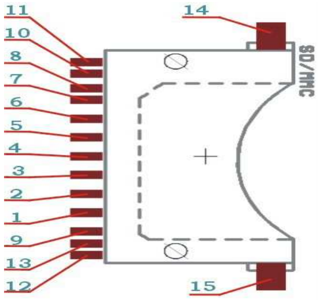


UEXT

Pin #	Signal name	Pin #	Signal name
1	VCC	2	GND
3	USART1_TX	4	USART1_RX
5	I2C2_SCL	6	I2C2_SDA
7	SPI1_MISO	8	SPI1_MOSI
9	SPI1_SCK	10	CS_UEXT



SD/MMC card slot



Pin #	Signal name	Pin #	Signal name
1	SD_D3	2	SD_CMD
3	GND (VSS1)	4	VDD
5	SD_CLK	6	GND (VSS2)
7	SD_D0	8	SD_D1
9	SD_D2	10	WP_E
11	NC	12	NC
13	CP_E	14	3.3V
15	3.3V		

SD_D0-3 I/O **Memory Card Interface Data 0-4**. These are the data lines for the SD/MMC connector. They could be both input and output for the MCU depending on the data flow direction.

SD_CMD Output **Memory Card Interface Command**. This is a command sent form the processor to the memory card and as such it is output from the processor.

SD_CLK Output **Memory Card Interface Clock**. This signal is output from the MCU and synchronizes the data transfer between the memory card and the MCU.

WP_E Input **Write Protect**. This signal is input for the MCU.

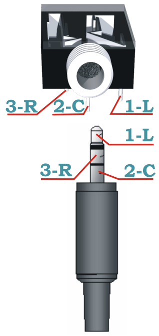
CP_E Input **Card Present**. This signal is input for the MCU.

CAN

Pin #	Signal name
1	CANH
2	CANL
3	GND

Audio Out

Pin #	Signal name
1	LEFT
2	GBUF
3	RIGHT



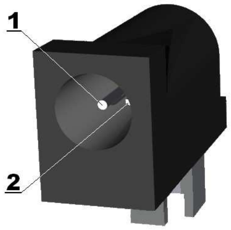
LEFT Output **Left channel output**.

GBUF Output **Virtual ground for audio output**.

RIGHT Output **Right channel output**.

PWD

Pin #	Signal name
1	Power input
2	GND



The power input should be +5 VDC, 500 mA (700 mA when the stepper motor is used).

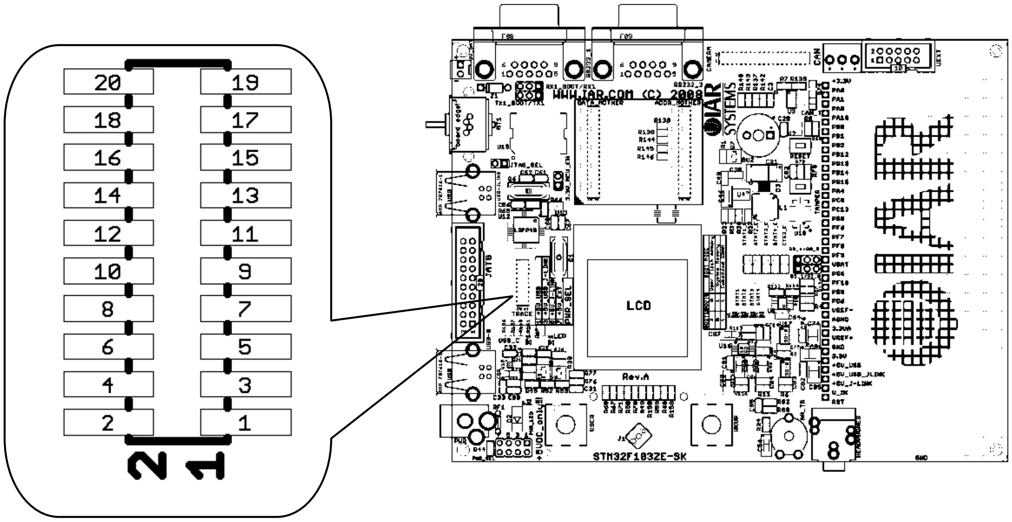
VBAT

Pin #	Signal name
1	+
2	-

The RTC (real-time clock) and backup registers can be powered by VBAT.

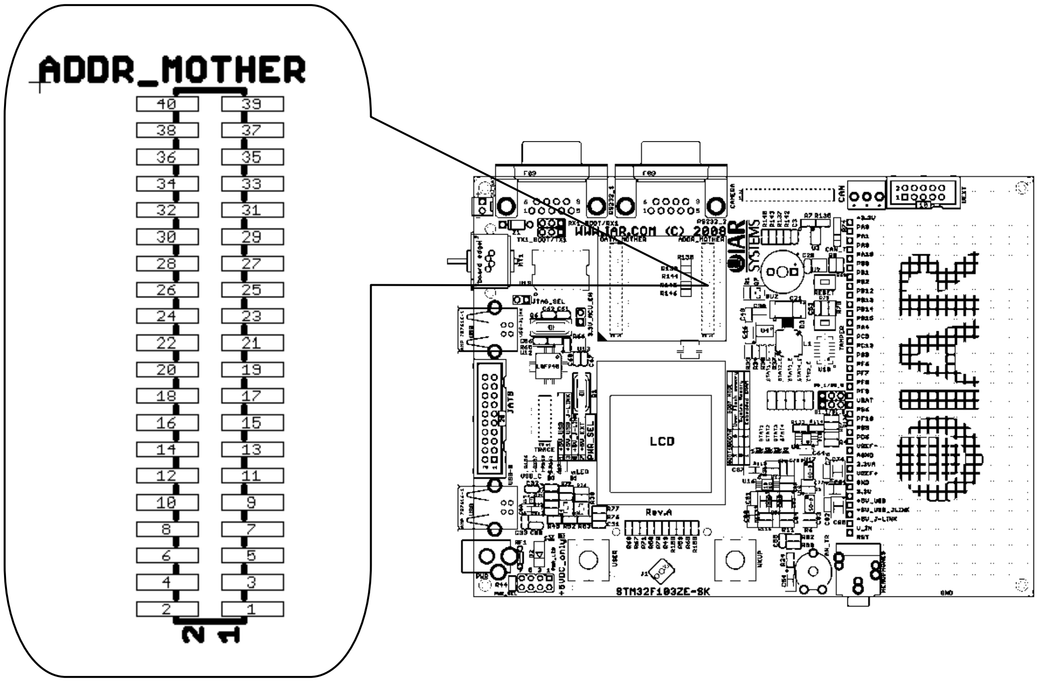
The voltage should be 1.8 to 3.6 V.

Trace



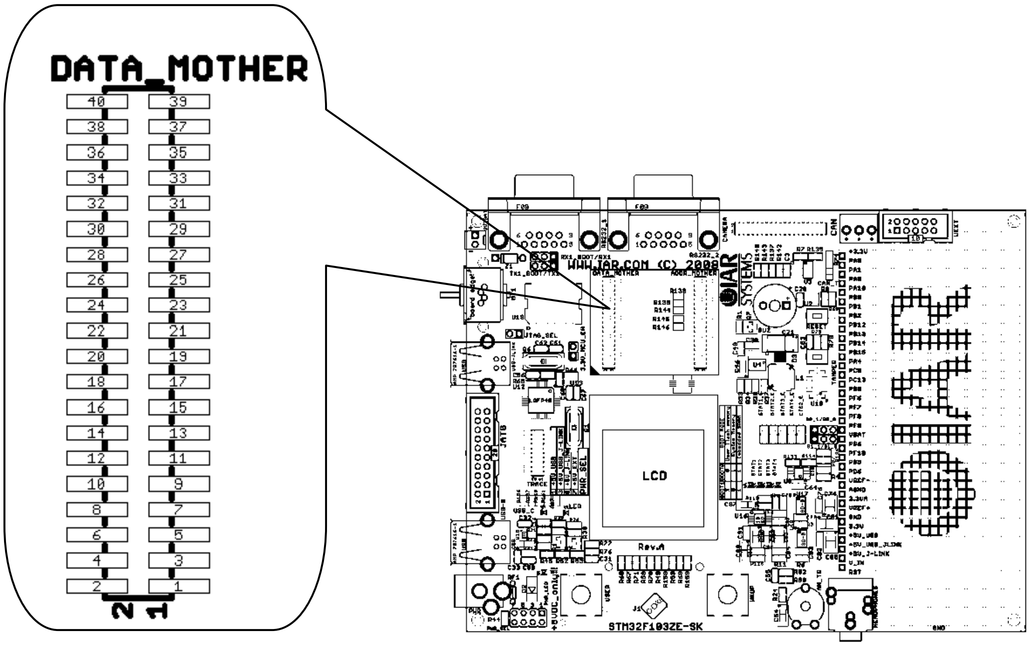
Pin #	Signal	Description	Pin #	Signal	Description
1	VCC	3.3V	2	TMS	
3	GND		4	TCK	
5	GND		6	TDO	
7	NC		8	TDI	
9	GND		10	RST	
11	GND		12	A23	
13	GND		14	A19/TDO	Depends on R156/R157
15	GND		16	A20/TRST	Depends on R160/R161
17	GND		18	A21	
19	GND		20	A22	

ADDR_MOTHER



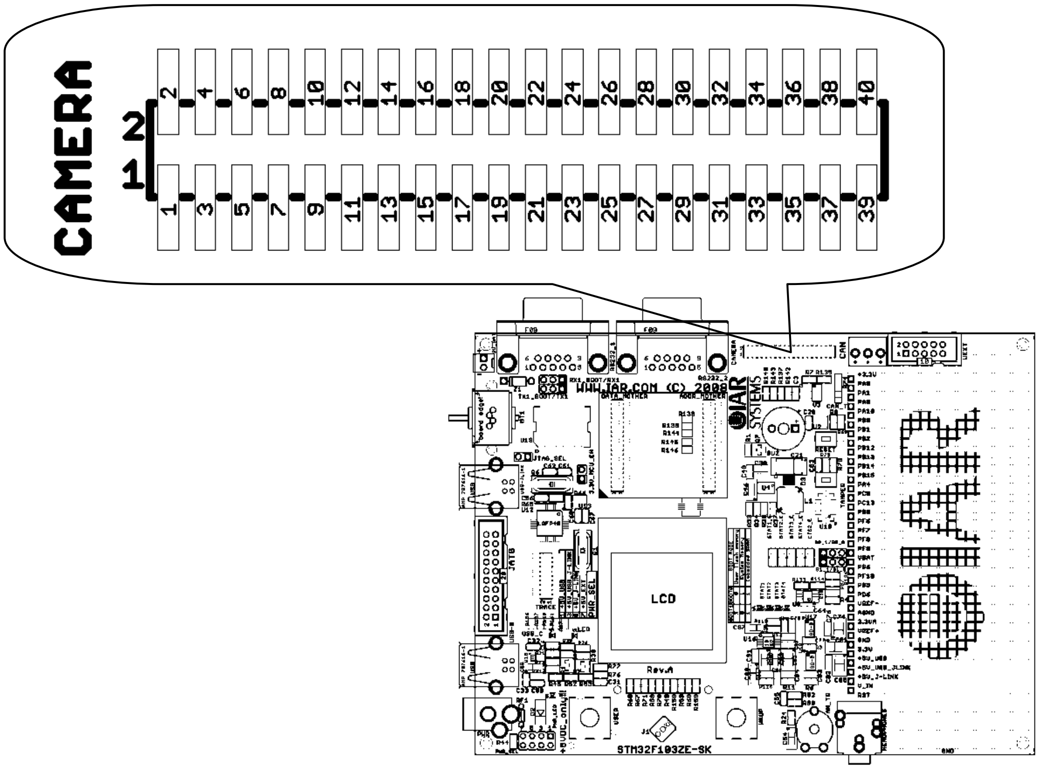
Pin #	Signal	Description	Pin #	Signal	Description
1	A0		2	VCC	
3	A1		4	VCC	
5	A2		6	VCC	
7	A3		8	VCC	
9	A4		10	VCC	
11	A5		12	GND	
13	A6		14	GND	
15	A7		16	GND	
17	A8		18	GND	
19	A9		20	DOWN	
21	A10		22	DISC	
23	A11		24	NE3	
25	A12		26	NE2	
27	A13		28	NE1	
29	A14		30	LEFT	
31	A15		32	RIGHT	
33	NC		34	A23	
35	NC		36	A22	
37	NC		38	A21	
39	A19		40	A20	

DATA_MOTHER



Pin #	Signal	Description	Pin #	Signal	Description
1	D0		2	VCC	
3	D1		4	VCC	
5	D2		6	VCC	
7	D3		8	VCC	
9	D4		10	VCC	
11	D5		12	GND	
13	D6		14	GND	
15	D7		16	GND	
17	D8		18	GND	
19	D9		20	GND	
21	D10		22	CP	
23	D11		24	CNTRL	
25	D12		26	CPLD_INT	
27	D13		28	NC	
29	D14		30	NC	
31	D15		32	NC	
33	/OE		34	STAT2	
35	NC		36	STAT1	
37	/BHE		38	UP	
39	/BLE		40	TEMP_ALERT	

CAMERA



Pin #	Signal	Description	Pin #	Signal	Description
1	D0		2	GND	
3	D1		4	GND	
5	D2		6	GND	
7	D3		8	GND	
9	D4		10	GND	
11	D5		12	GND	
13	D6		14	GND	
15	D7		16	GND	
17	A0		18	GND	
19	A1		20	GND	
21	A2		22	GND	
23	/OE		24	GND	
25	/WE		26	GND	
27	NE2		28	VCC	
29	NC		30	VCC	
31	CPLD_RST		32	VCC	
33	CPLD_INT		34	VCC	
35	I2C2_SCL		36	VCC	
37	I2C2_SDA		38	VCC	
39	MCO		40	VCC	

Troubleshooting
If you are unable to find the cause of a problem, try resetting the evaluation board by using the reset button on the board. Then restart the C-SPY Debugger in the IAR Embedded Workbench IDE. You can also try disconnecting and reconnecting the power to the evaluation board, pressing the reset button and then restarting C-SPY.

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