Evaluation board with STM32F479NI MCU

Introduction

The STM32479I-EVAL evaluation board is a complete demonstration and development platform for STMicroelectronics ARM[®] Cortex[®] -M4 core-based STM32F479NIH6 microcontroller. It features three I^{2}C, six SPIs with two multiplexed full-duplex I^{2}S interfaces, SDMMC, four USARTs and four UARTs, two CANs, three 12-bit ADCs, two 12-bit DACs, one SAI, 8 to 14-bit digital camera module interface, internal 320+4 Kbytes of SRAM and 2 Mbytes of Flash memory, USB HS OTG and USB FS OTG, Ethernet MAC, FMC interface, MIPI DSI interface, Quad-SPI interface, Cryptographic acceleration, JTAG and ETM debugging support. This evaluation board can be used as a reference design for user application development but it cannot be considered as a final application.

The full range of hardware features on the board helps the user to evaluate all peripherals (USB OTG HS, USB OTG FS, Ethernet, motor control, CAN, microSD Card, USART, Audio DAC and ADC, digital microphone, IrDA, RF-EEPROM, SRAM, NOR Flash, SDRAM, Quad-SPI Flash, 4" TFT LCD with MIPI DSI interface and capacitive touch panel and others) and to develop his own applications. Extension headers make it possible to easily connect a daughterboard for specific application.

The integrated ST-LINK/V2-1 provides an embedded in-circuit debugger and programmer for the STM32 MCU.

Figure 1. STM32479I-EVAL evaluation board

1. Picture not contractual.

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1 Features

- STM32F479NIH6 microcontroller with 2 Mbytes of Flash memory and 320+4 Kbytes of RAM in TFBGA package
- Six 5 V power supply options:
    - Power jack
    - ST-LINK/V2-1 USB connector
    - User USB HS connector
    - User USB FS1 connector
    - User USB FS2 connector
    - Daughterboard
- SAI Audio DAC
- Stereo audio jack which supports headset with microphone
- Stereo digital microphone
- Audio jack connector used to connect external speakers
- 2-Gbyte (or more) SDMMC interface microSD card
- RF-EEPROM on I^{2}C compatible serial interface
- RS232 communication
- IrDA transceiver
- JTAG/SWD and ETM trace debug support
- Embedded ST-LINK/V2-1
- IEEE-802.3-2002 compliant Ethernet connector
- Camera module
- 8Mx32 bit SDRAM, 1Mx16 bit SRAM and 8Mx16 bit NOR Flash
- 512-Mbit Quad-SPI NOR Flash
- 4 inch 480x800 pixel TFT color LCD with MIPI DSI interface and capacitive touch panel
- Joystick with 4-direction control and selector
- Reset, WakeUp/Tamper or key button
- 4 color user LEDs
- Extension connectors and memory connectors for daughterboard or wrapping board
- USB OTG HS and FS with Micro-AB connectors
- RTC with backup battery.
- CAN2.0A/B compliant connection.
- Potentiometer
- Motor control connector

2 Demonstration software

Demonstration software is preloaded in the STM32F479NIH6 Flash memory for easy demonstration of the device peripherals in stand-alone mode. For more information and to download the latest version available, refer to the STM32479I-EVAL demonstration software available on *www.st.com*.

3 Ordering information

To order the STM32479I-EVAL evaluation board, based on the STM32F479NI MCU, use the order code STM32479I-EVAL.

4 Delivery recommendations

Some verifications are needed before using the board for the first time to make sure that nothing was damaged during shipment and that no components are unplugged or lost. When the board is extracted from its plastic bag, check that no component remains in the bag.

The main components to verify are:

1. The 25 MHz crystal (X1) and 25 MHz crystal (X4) which may have been removed by a shock from their sockets.
2. The microSD card which may have been ejected from the connector CN17 (right side of the board).
3. The dual-interface EEPROM board (ANT7-M24LR-A) which may have been unplugged from the connector CN2 (top left corner of the board).

Caution: There is an explosion risk if the battery is replaced by an incorrect one. Make sure to dispose of used batteries according to the instructions.

5 Hardware Layout and configuration

STM32479I-EVALevaluation board is designed around theSTM32F479NIH6 (216-pin TFBGA package). The hardware block diagram *Figure 2: Hardware Block Diagram* illustrates the connection between STM32F479NIH6 and peripherals (SDRAM, SRAM, NOR Flash, QSPI Flash, Camera module, Color LCD, USB OTG connectors, motor control connector, USART, IrDA, Ethernet, Audio, CAN, RF-EEPROM, microSD card and embedded ST-LINK) and *Figure 3: STM32479I-EVAL evaluation board layout* will help to locate these features on the actual evaluation board.

Figure 2. Hardware Block Diagram
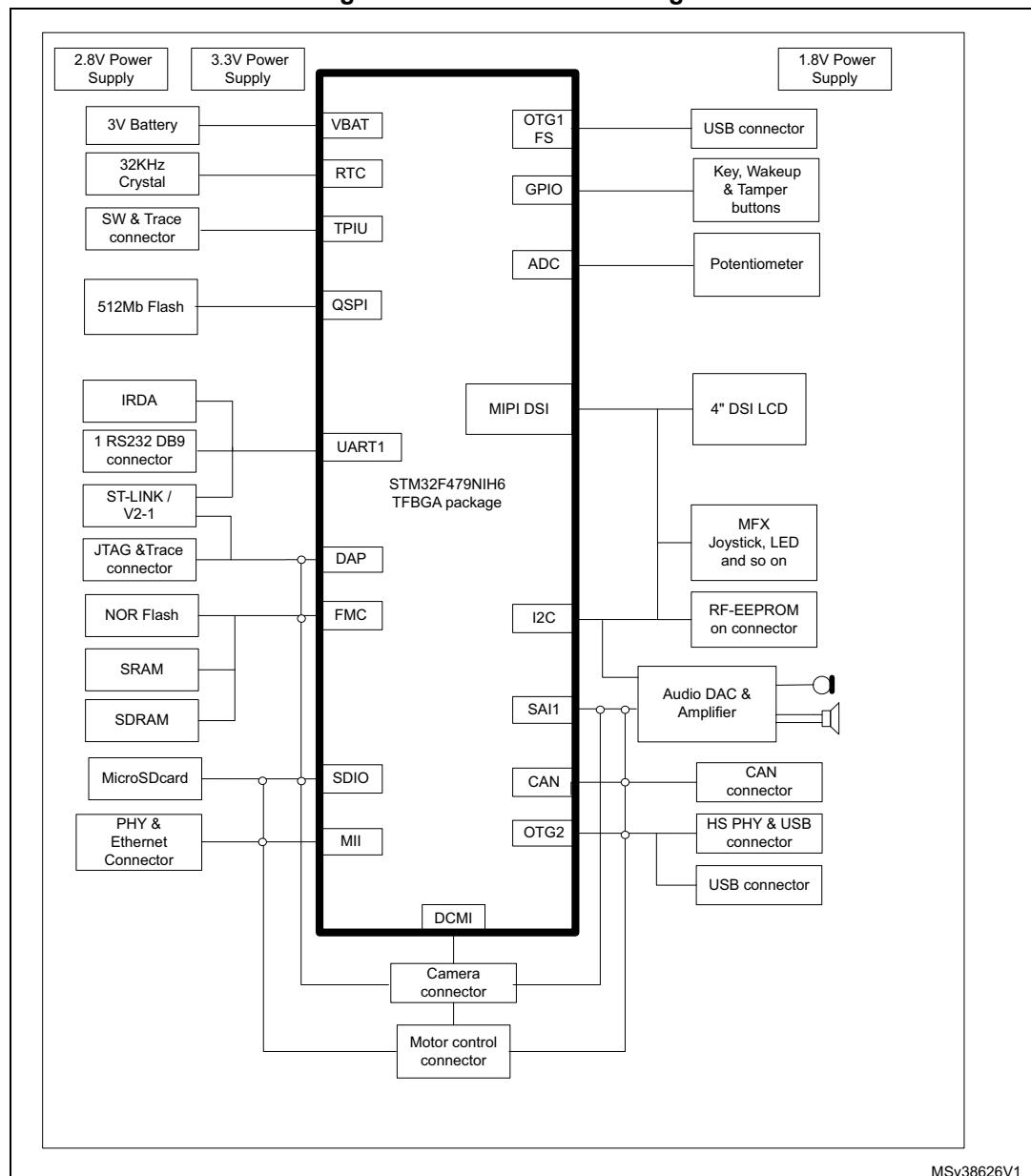
1. The circles show the I/O shared with motor control.

Figure 3. STM32479I-EVAL evaluation board layout
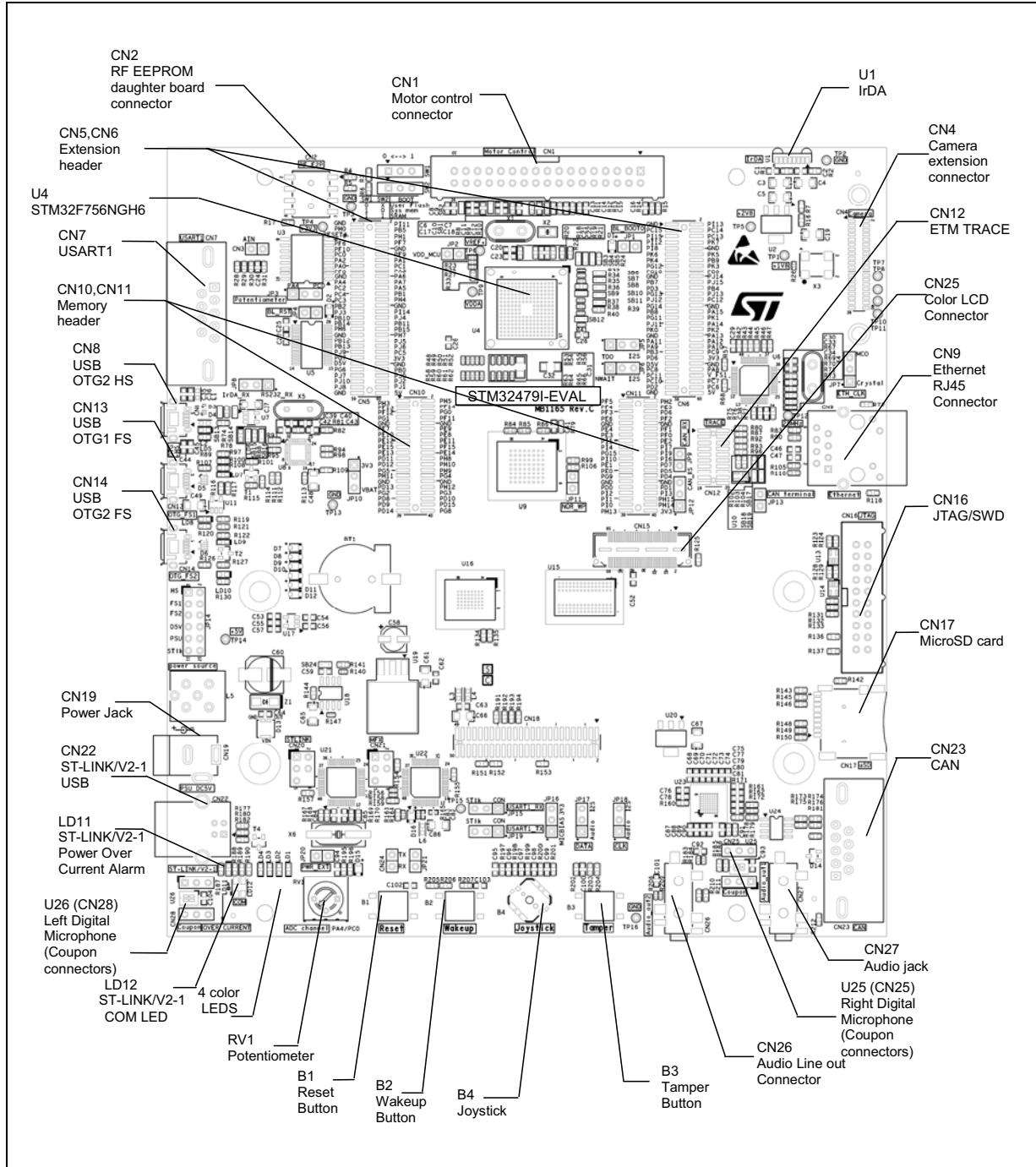
5.1 Embedded ST-LINK/V2-1

The ST-LINK/V2-1 programming and debugging tool is integrated on the STM32479I-EVAL evaluation board. Compared to ST-LINK/V2 the changes are listed below.

The new features supported on ST-LINK/V2-1 are:

- USB software re-enumeration
- Virtual com port interface on USB
- Mass storage interface on USB
- USB power management request for more than 100mA power on USB

This feature is no more supported on ST-LINK/V2-1:

- SWIM interface

For all general information concerning debugging and programming features common between V2 and V2-1 refer to ST-LINK/V2 User Manual UM1075.

Note 1:   *It is possible to power the board via CN22 (Embedded ST-LINK/V2-1 USB connector) even if an external tools is connected to CN12 (ETM Trace connector) or CN16 (External JTAG and SWD connector).*

Note 2:   *ETM can only work at 50MHz clock by default because ETM signals are shared with other peripherals. If a best performance of ETM is required (84 MHz/98 MHz), R32, R34, R35, R37, R38, R238, SB4, SB5, SB7, SB9, SB17, SB19 must be removed, to reduce the stub on ETM signals. In this way SAI, Ethernet and Camera are not functional and NOR flash and the address of the SRAM are limited on A18.*

Note 3:   *ETM Trace function would be abnormal as SAI_SDB share same pins with TRACE_D0, and TRACE_D0 would be forced high by SAI_SDB, so it is necessary to set (SAI_SDB) ADCDAT1 pin of audio codec WM8994ECS/R (U23) to be tri-state by software when using ETM Trace.*

5.1.1 Drivers

The ST-LINK/V2-1 requires a dedicated USB driver, which can be found on *www.st.com* for Windows XP, 7 and 8.
In case the STM32479I-EVAL evaluation board is connected to the PC before the driver is installed, some STM32479I-EVAL interfaces may be declared as "Unknown" in the PC device manager. In this case the user must install the driver files, and update the driver of the connected device from the device manager.

Note: *Prefer using the "USB Composite Device" handle for a full recovery.*

Figure 4. Updating the list of drivers in device manager
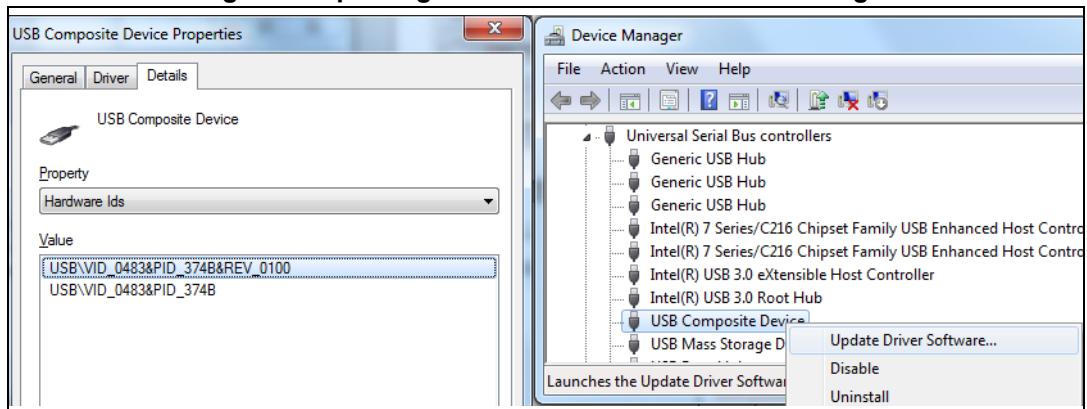
1. Prefer using the "USB Composite Device" handle for a full recovery.

5.1.2 ST-LINK/V2-1 firmware upgrade

The ST-LINK/V2-1 embeds a firmware upgrade mechanism for in-situ upgrade through the USB port. As the firmware may evolve during the life time of the ST-LINK/V2-1 product (for example new functionality, bug fixes, support for new microcontroller families), it is recommended to visit *www.st.com* before starting to use the STM32479I-EVAL board and periodically, in order to stay up-to-date with the latest firmware version.

5.2 Power Supply

STM32479I-EVAL evaluation board is designed to be powered by 5V DC power supply and is protected by PolyZen from wrong power plug-in event. It's possible to configure the evaluation board to use any of following six sources for the power supply.

- 5V DC power adapter connected to CN19, the Power Jack on the board (Power Supply Unit on silk screen of JP14(PSU)).

- 5V DC power with 300mA limitation from CN22, the USB type B connector of ST-LINK/V2-1 (USB 5V power source on silkscreen of JP14(STlk)). If the USB enumeration succeeds (as explained below), the ST-LINK U5V power is enabled, by asserting the PWR_EN pin. This pin is connected to a power switch (ST890), which powers the board. This power switch features also a current limitation to protect the PC in case of short-circuit on board. If over current (more than 600mA) happens on board, the LED LD11 is lit.

- 5V DC power with 500mA limitation from CN8, the USB OTG2 HS Micro-AB connector (USB 5V power source on silkscreen of JP14 (HS)).

- 5V DC power with 500mA limitation from CN13, the USB OTG1 FS Micro-AB connector (USB 5V power source on silkscreen of JP14 (FS1)).

- 5V DC power with 500mA limitation from CN14, the USB OTG2 FS Micro-AB connector (USB 5V power source on silkscreen of JP14 (FS2)).

- 5V DC power from CN5 and CN6, the extension connectors for daughterboard (daughterboard power source on silkscreen of JP14 (D5V)).

STM32479I-EVAL evaluation board can be powered from ST-LINK USB connector CN22 (U5V), but only ST-LINK circuit has the power before USB enumeration, because host PC only provides 100mA to the board at that time. During the USB enumeration, STM32479I-EVAL board asks for the 300mA power to the host PC. If the host is able to provide the

required power, the enumeration succeeds, the power transistor U18 (ST890) is switched ON, the red LED LD10 is turned ON, thus STM32479I-EVAL board is powered and can consume maximum 300mA current, but not more. If the host is not able to provide the requested current, the enumeration fails. Therefore the ST890 (U18) remains OFF so consequently 3.3 V domain of the board and MCU will not be powered. As a consequence the red LED LD10 remains turned OFF. In this case it is mandatory to use an external power supply as extra power supply.

E5V (from PSU) or D5V can be used as external power supply in case current consumption of STM32479I-EVAL board exceeds the allowed current on USB. In this condition it is still possible to use USB for communication for programming or debugging only, but it is mandatory to power the board first using E5V or D5V, then connecting the USB cable to the PC. Proceeding this way ensures that the enumeration succeeds thanks to the external power source.

The following power sequence procedure must be respected:

1. Connect jumper JP14 for PSU or D5V side
2. Check that JP20 is removed
3. Connect the external power source to PSU or D5V (daughterboard mounted)
4. Check red LED LD10 is turned ON
5. Connect the PC to USB connector CN22

If this order is not respected, the board may be powered by V_{BUS} first then E5V or D5V, and the following risks may be encountered:

1. If more than 300mA current is needed by the board, the PC may be damaged or current can be limited by the PC. As a consequence the board is not powered correctly.

2. 300mA will be requested at enumeration (since JP20 must be OFF), so there is risk that request is rejected and enumeration does not succeed if PC can't provide such current. Consequently the board is not powered (LED LD10 remains OFF).

Note: *In case the board is powered by an USB charger, there is no USB enumeration, so the led LD10 remains set to OFF permanently and the board is not powered. Only in this specific case the jumper JP20 needs to be set to ON, to allow the board to be powered anyway.*

The power supply is configured by setting the related jumpers **JP2, JP10 and JP14** as described in *Table 1: Power related jumpers*.

Table 1. Power related jumpers

Jumper	Description
JP2	JP2 is used to measure STM32 current consumption manually by multimeter. Default setting: Fitted
JP10	V_{bat} is connected to +3.3V when JP10 is set as shown to the right: (Default setting) 1 2 3 V_{bat} is connected to battery when JP10 is set as shown to the right: 1 2 3
JP14	JP14 is used to select one of the six possible power supply resources. For power supply from USB connector of ST-LINK/V2-1 (CN22) to STM32479I-EVAL only, JP14 is set as shown to the right: (Default Setting) HS FS1 FS2 D5V PSU STlk For **power supply jack** (CN19) to the STM32479I-EVAL only, JP14 is set as shown to the right: HS FS1 FS2 D5V PSU STlk For power supply from the **daughterboard connectors** (CN5 and CN6) to STM32479I-EVAL only, JP14 is set as shown to the right: HS FS1 FS2 D5V PSU STlk For power supply from USB OTG2 FS (CN14) to STM32479I-EVAL only, JP14 is set as shown to the right: HS FS1 FS2 D5V PSU STlk
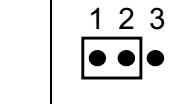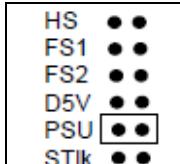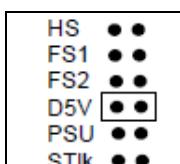
Table 1. Power related jumpers (continued)

Jumper	Description
JP14	For power supply from USB OTG1 FS (CN13) to STM32479I-EVAL only, JP14 is set as shown to the right: HS FS1 FS2 D5V PSU STlk
	For power supply from USB OTG2 HS (CN8) to STM32479I-EVAL only, JP14 is set as shown to the right: HS FS1 FS2 D5V PSU STlk
	For power supply from **power supply jack** (CN19) to both STM32479I-EVAL and daughterboard connected on CN5 and CN6, JP14 is set as shown to the right (**daughterboard must not have its own power supply connected**) HS FS1 FS2 D5V PSU STlk
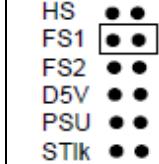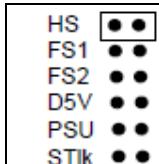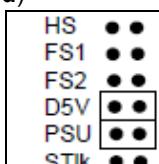
The LED LD10 is lit when the STM32479I-EVAL evaluation board is powered by the 5V correctly.

Caution: In order to avoid the impact of USB PHY and Ethernet PHY and get precise results of current consumption on JP2, the following cautions need to be taken into account:

- configure Ethernet PHY into Power Down Mode by setting low level of MFX (MFX_GPIO13)
- configure USB HS PHY into Low Power Mode (Register Address = 04, bit 6 in USB PHY)

5.3 Clock source

Five clock sources are available on STM32479I-EVAL evaluation board for STM32F479NIH6 and RTC embedded:

- X1, 25MHz Crystal with socket for STM32F479NIH6 Microcontroller, it can be removed when internal RC clock is used.
- X2, 32KHz Crystal for embedded RTC
- X3, 24MHz Oscillator for camera module
- X4, 25MHz Crystal with socket for Ethernet PHY
- X5, 24MHz Crystal for USB OTG2 HS PHY

Table 2. 25MHz Crystal X1 related solder bridges

Jumper	Description
SB37	PH0 is connected to 25MHz crystal when SB37 is open. (Default setting)
	PH0 is connected to extension connector CN5 when SB37 is closed. In such case R20 must be removed to avoid disturbance due to the 25MHz quartz
SB38	PH1 is connected to 25MHz crystal when SB38 is open. (Default setting)
	PH1 is connected to extension connector CN5 when SB38 is closed. In such case C23 and X1 must be removed to avoid disturbance due to the 25MHz quartz

Table 3. 32KHz Crystal X2 related solder bridges

Solder Bridge	Description
SB35	PC14 is connected to 32KHz crystal when SB35 is open. (Default setting)
	PC14 is connected to extension connector CN6 when SB35 is closed. In such case R19 must be removed to avoid disturbance due to the 32Khz quartz
SB36	PC15 is connected to 32KHz crystal when SB36 is open. (Default setting)
	PC15 is connected to extension connector CN6 when SB36 is closed. In such case R18 must be removed to avoid disturbance due to the 32Khz quartz

Note: *For Ethernet clock and JP7 configuration refer to Section 5.13: Ethernet.*

5.4 Reset source

The reset signal of STM32479I-EVAL evaluation board is low active and the reset sources include:

- Reset button B1
- Debugging Tools from JTAG/SWD connector CN16 and ETM trace connector CN12
- Daughterboard from CN5
- Embedded ST-LINK/V2-1
- RS232 connector CN7 for ISP

Note: *The jumper JP4 must be closed to let pin 8 of RS232 connector CN7 (CTS signal) to handle the RESET signal.*

5.5 Boot option

STM32479I-EVAL evaluation board can boot from:

- Embedded User Flash
- System memory with boot loader for ISP
- Embedded SRAM for debugging

The boot option is configured by setting switch SW1 (BOOT0) and SW2 (BOOT1). The BOOT0 can be configured also via RS232 connector CN7.

Table 4. Boot related switch

Switch configuration		Boot from
SW1	**SW2**	-
0<->1 ■● □ SW1	X	STM32479I-EVAL boot from **User Flash** when SW1 is set as shown to the left. (Default setting)
0<->1 □●□ SW1	0<->1 ■● □ SW2	STM32479I-EVAL boot from **System Memory** when SW1 and SW2 are set as shown to the left.
0<->1 □●■ SW1	0<->1 □●□ SW2	STM32479I-EVAL boot from **Embedded SRAM** when SW1 and SW2 are set as shown to the left.
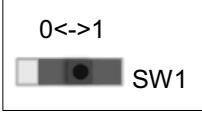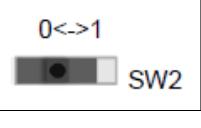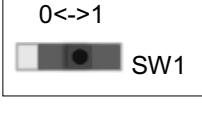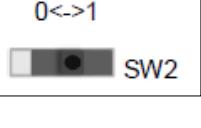
Table 5. Boot0 related jumpers

Jumper	Description
JP1	The Bootloader_BOOT0 is managed by pin 6 of connector CN7 (RS232 DSR signal) when JP1 is closed. This configuration is used to boot from Embedded SRAM or System Memory, depending on SW2. Default Setting: Not fitted

5.6 Audio

An audio codec WM8994ECS/R with 4 DACs and 2 ADCs inside is connected to SAI interface of STM32F479NIH6 to support TDM feature on SAI port. This feature is able to implement audio recording on digital and analog microphones, audio playback of different audio stream on headphone and lineout at the same time.

It communicates with STM32F479NIH6 via I2C1 bus which is shared with LCD, camera module, RF-EEPROM and MFX (Multi-Function eXpander).

The analog microphone on the headset is connected to ADC of WM8994ECS/R through audio jack CN27. External speakers can be connected to WM8994ECS/R via audio jack CN26.

Two digital microphones (MEMS microphone) MP34DT01TR are on STM32479I-EVAL evaluation board. They are able to be connected to either audio codec or I^{2}S port of STM32F479NIH6, by setting jumpers shown in *Table 6: Audio related jumpers*. The coupon connectors CN25 and CN28 can be used to support MEMS microphone evaluation board STEVAL-MKI129V1 after removing SB25 and SB26.

Table 6. Audio related jumpers

Jumper	Description
JP17	Data signal on digital microphones is connected to audio codec when JP17 is set as shown to the right (Default setting)
	Data signal on digital microphones is connected to I^{2}S port of STM32F479NIH6 when JP17 is set as shown to the right (Also need to set JP6 according to this table):
JP18	Clock signal on digital microphones is connected to audio codec when JP18 is set as shown to the right (Default setting)
	Clock signal on digital microphones is connected to timer output (PC7) of STM32F479NIH6 used to divide by two I^{2}S clock when JP18 is set as shown to the right (it is also needed to set JP5 according to this table)
JP5	PB3 is as TDO/SWO signal when JP5 is set as shown to the right (Default setting):
	PB3 (I^{2}S Clock) is connected to Timer input PC6 used as microphone clock divider when JP5 is set as shown to the right (it is also needed to set JP18 according to this table):
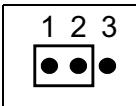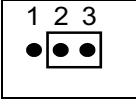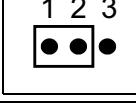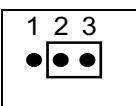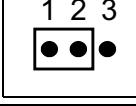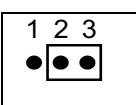
Table 6. Audio related jumpers (continued)

Jumper	Description
JP6	PD6 is as FMC_NWAIT signal when JP6 is set as shown to the right (Default setting): 1 2 3 PD6 is connected to digital microphone as I^{2}S data signal when JP6 is set as shown to the right (Also need to set JP17 together according to this table): 1 2 3
JP16	Digital microphone power source is connected to +3.3V power when JP16 is set as shown to the right (Default setting): 1 2 3 Digital microphone power source is connected to MICBIAS1 from WM8994ECS/R when JP16 is set as shown to the right: 1 2 3
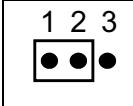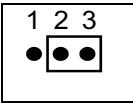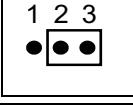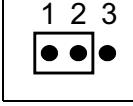
Note: I^{2}C *address of WM8994ECS/R is 0b0011010.*

5.7   USB OTG1 FS

STM32479I-EVAL evaluation board supports USB OTG1 full speed communication via a USB Micro-AB connector (CN13) and USB power switch (U11) connected to V_{BUS}. The evaluation board can be powered by this USB connection at 5V DC with 500mA current limitation.

A green LED LD7 will be lit in one of these cases:

- Power switch (U11) is ON and STM32479I-EVAL works as an USB host
- V_{BUS} is powered by another USB host when STM32479I-EVAL evaluation board works as an USB device

Red LED LD8 will be lit when over-current occurs (I_{VBUS} > 500 mA).

Note: *JP9 must be removed when using USB OTG FS as mentioned in Table 9: CAN related jumpers.*

5.8 USB OTG2 HS and FS

STM32479I-EVAL evaluation board supports USB OTG2:

- High speed communication via a USB Micro-AB connector (CN8), USB High speed PHY (U8) for high speed function.
- Full speed communication via another USB Micro-AB connector (CN14).

The evaluation board can be powered by these USB connectors (CN8 or CN14) at 5V DC with 500mA current limitation.

As several OTG2 FS signals are shared with OTG2 HS ULPI bus, so some settings are needed, when using OTG2 FS (CN14) shown in *Table 7: USB OTG2 function configuration*.

Table 7. USB OTG2 function configuration

Function	ON	OFF
OTG2 HS-CN8 (Default)	R109, SB13, SB16, SB74	R255, SB14, SB15, SB70
OTG2 FS-CN14	R255, SB14, SB15, SB70	R109, SB13, SB16, SB74

A USB power switch (U7) is also connected on V_{BUS} and provides power to either:

- CN8 (with SB13 and SB16 closed and SB14 and SB15 open)
- CN14 (with SB14 and SB15 closed and SB13 and SB16 open)

Green LED LD5 (for CN8) or LD9 (for CN14) will be lit when either:

- Power switch (U7) is ON and STM32479I-EVAL works as an USB host
- V_{BUS} is powered by another USB host when STM32479I-EVAL works as an USB device

Red LED LD6 will be lit when over-current occurs (I_{VBUS} > 500 mA).

5.9 RS232 and IrDA

RS232 and IrDA communication is supported by D-type 9-pins RS232 connector CN7, and IrDA transceiver U1, which is connected to USART1 of STM32F479NIH6 on STM32479I-EVAL evaluation board. The signals Bootloader_RESET and Bootloader_BOOT0 are added on RS232 connector CN7 for ISP support.

USART1 of STM32F479NIH6 is shared with RS232/IrDA and ST-LINK/V2-1 controller. Its communication can be changed by setting JP15 and JP19.

Table 8. USART1 related jumpers

Jumper	Description
JP15	USART1_RX is connected to RS232/IrDA when JP15 is set as shown to the right (Default setting): 1 2 3 • • • • USART1_RX is connected to ST-LINK/V2-1 controller's USART_TX when JP15 is set as shown to the right: 1 2 3 • • • •
JP19	USART1_TX is connected to RS232/IrDA when JP19 is set as shown to the right (Default setting): 1 2 3 • • • • USART1_TX is connected to ST-LINK/V2-1 controller's USART_RX when JP19 is set as shown to the right: 1 2 3 • • • •
JP8	USART1_RX is connected to RS232 transceiver and RS232 communication is enabled when JP15 is set to pin1-2 and JP8 is set as shown to the right (Default setting): 1 2 3 • • • • USART1_RX is connected to IrDA transceiver and IrDA communication is enabled when JP15 is set to pin1-2 and JP8 is set as shown to the right: 1 2 3 • • • •
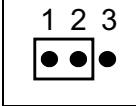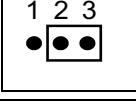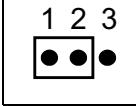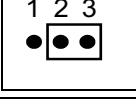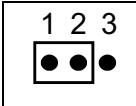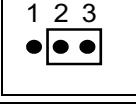
5.10 MicroSD card

The 2-Gbyte (or more) microSD card connected to SDMMC port of STM32F479NIH6 is available on the board. MicroSD card detection is managed by MFX GPIO15.

5.11 RF-EEPROM

RF-EEPROM daughterboard ANT7-M24LR-A is mounted on CN2 to STM32F479NIH6 via I2C1 bus. The RF-EEPROM can be accessed by the microcontroller via the I2C1 bus or by radio frequency (RF) using a 13.56 MHz reader (for example, CR95HF).

I^2C address of RF-EEPROM is 0b1010000.

5.12 CAN

STM32479I-EVAL evaluation board supports one channel of CAN2.0A/B compliant CAN bus communication based on 3.3V CAN transceiver.

High-speed mode, standby mode and slope control mode are available and can be selected by setting JP12.

Table 9. CAN related jumpers

Jumper	Description
JP12	CAN transceiver is working in standby mode when JP12 is set as shown to the right: 1 2 3
	CAN transceiver is working in high-speed mode when JP12 is set as shown to the right: (default setting) 1 2 3
	CAN transceiver is working in slope control mode when JP12 is open.
JP13	CAN terminal resistor is enabled when JP13 is fitted. Default setting: Not fitted
JP9	PA11 is connected with CAN RX signal when JP9 is fitted. Default setting: Not fitted
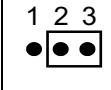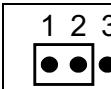
5.13 Ethernet

STM32479I-EVAL evaluation board supports 10M/100M Ethernet communication with a PHY DP83848CVV (U6) and integrated RJ45 connector (CN9). Ethernet PHY is connected to STM32F479NIH6 via MII (Media Independent Interface) interface. 25 MHz clock can be generated by PHY or provided by MCO from STM32F479NIH6 by setting jumper JP7 shown in *Table 10: Ethernet related jumpers*.

Table 10. Ethernet related jumpers

Jumper	Description
JP7	25MHz clock is provided by external crystal X4 when JP7 is set as shown to the right: (Default setting) 1 2 3
	25MHz clock for MII is provided by MCO at PA8 when JP7 is set as shown to the right: 1 2 3
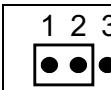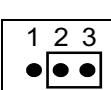
Table 11. Ethernet related solder bridges

Solder bridges	Description
SB48	MII CRS on DP83848CVV is connected to PA0 when SB48 is closed and SB44, SB46 are open Default setting: Open
SB63	MII COL on DP83848CVV is connected to PH3 when SB63 is closed and unmount R243 Default setting: Open
SB12	MII_RX_ER on DP83848CVV is connected to PI10 when SB12 is closed and unmount R244 Default setting: Open

5.14 Memories

8M x 32bit SDRAM is connected to the bank 1 of the SDRAM of FMC interface of STM32F479NIH6.

1Mx16bit SRAM is connected to the bank1 of the NOR/PSRAM2 of FMC interface and both 8bit and 16bit access are allowed by BLN0 and BLN1 connected to BLE and BHE of SRAM respectively.

128Mbit NOR Flash is connected to the bank1 of the NOR/PSRAM1 of FMC interface. The 16bit operation mode is selected by pull-up resistor connected to BYTE pin of NOR Flash. The write protection can be enabled or disabled depending on setting of jumper JP11.

Table 12. NOR Flash related jumpers

Jumper	Description
JP11	Write protection is enabled when JP11 is fitted while write protection is disabled when JP11 is not fitted. Default Setting: Not fitted
JP6	Description of JP6 is in *Section 5.6: Audio*

All signals for memory are also connected on memory connectors CN10 and CN11 for memory daughterboards.

Some limitations happen when using other peripherals:

- FMC addressing limitation depending on the number of ETM data signals used (A18 max for 4 bit ETM to A21 max for 1 bit ETM).
- FMC addresses limited to A18 when SAI is used.
- FMC addresses limited to A20 when Camera is used.
- FMC addresses limited to A22 when Ethernet is used.

In such cases, serial resistors R37 (A19), R35 (A20), R32 (A21) and R34 (A22) should be removed. Thus memory addresses A19 to A22 are not connected to FMC and they are pulled down on the board.

By default, all these serial resistors are soldered on the board. If A18 is required, it is necessary to set (SAI_SDB) ADCDAT1 pin of audio codec WM8994ECS/R (U23) to be tri-state by software. If A21 or A22 are required, the camera daughterboard (MB1183) must be removed from the main boards (MB1165).

5.15 Quad-SPI NOR Flash

512-Mbit Quad-SPI NOR Flash is connected to Quad-SPI interface of STM32F479NIH6 on STM32479I-EVAL evaluation board.

5.16 Analog input

The two-pin header CN3 and 10K ohm potentiometer RV1 are connected to PA4 of STM32F479NIH6 as analog input. A low pass filter can be implemented by replacing R30 and C24 with the right value of resistor and capacitor, as requested by end user's application.

In order to use PA4 as DAC_OUT1 port, analog input can be changed to PC0 by setting jumper JP3 shown in *Table 13: Analog input related jumpers*.

PA4 is shared between analog input and PAR_HSYNC signal for camera, so when PA4 is used as analog input, SB47 needs to be opened or the camera daughterboard (MB1183) can be removed. PA5 used as ULPI_CLK (60MHz) may induce noise on PA4 so, in such case, it is better to switch off ULPI_CLK by software.

When PC0 is used as analog input, to reduce long stub and to reach a better result, it is better to remove SB34.

Table 13. Analog input related jumpers

Jumper	Description
JP3	Analog input is connected to PA4 when JP3 is set as shown to the right: (Default setting)
	Analog input is connected to PC0 when SB34 is removed and JP3 is set as shown to the right:
	Camera can work correctly when JP3 is set as shown to the right:
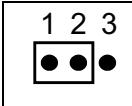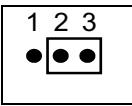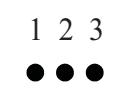
5.17 Camera module

A connector CN4 for DCMI signals is on STM32479I-EVAL evaluation board and camera module daughterboard MB1183.

DCMI signals are duplicated with other peripherals (SAI, I^{2}S, NOR Flash, microSD card, ETM, MEMS Microphone, potentiometer/PA4). These peripherals may not function correctly if camera module is being used.

Note: *JP3 should be left open when using camera, otherwise camera may not function correctly. Refer to Table 13: Analog input related jumpers for details.*

5.18 Display and input devices

4 inch 800x480 TFT color LCD with capacitive touch panel is connected to MIPI DSI interface of STM32F479NIH6.

4 general purpose color LEDs (LD 1, 2, 3, 4) are available as display.

The 4-direction joystick (B4) with selection, Wakeup (B2) and Tamper/key button (B3) are available as input devices.

Table 14. LCD modules connector (CN15)

Pin No.	Description	Pin connection	Pin No.	Description	Pin connection
1	GND	-	2	-	-
3	DSI_CK_P	-	4	TOUCH_INT	MFX GPIO14
5	DSI_CK_N	-	6	-	-
7	GND	-	8	-	-
9	DSI_D0_P	-	10	-	-
11	DSI_D0_N	-	12	-	-
13	GND	-	14	-	-
15	DSI_D1_P	-	16	-	-
17	DSI_D1_N	-	18	-	-
19	GND	-	20	-	-
21	BLVDD (5V)	-	22	-	-
23	BLVDD (5V)	-	24	-	-
25	-	-	26	-	-
27	BLGND	-	28	-	-
29	BLGND	-	30	-	-
31	-	-	32	-	-
33	-	-	34	-	-
35	-	-	36	3.3V	-
37	-	-	38	-	-
39	-	-	40	I2C1_SDA	PB9

Table 14. LCD modules connector (CN15) (continued)

Pin No.	Description	Pin connection	Pin No.	Description	Pin connection
41	-	-	42	-	-
43	-	-	44	I2C1_SCL	PB8
45	-	-	46	-	-
47	-	-	48	-	-
49	DSI_TE	PJ2	50	-	-
51	-	-	52	-	-
53	BL_CTRL	PA8	54	-	-
55	-	-	56	-	-
57	DSI_RESET	PK7	58	-	-
59	-	-	60	-	-

5.19 Motor control

STM32479I-EVAL evaluation board supports both asynchronous and synchronous three-phase brushless motor control via a 34 pins connector CN1, which provides all required control and feedback signals to and from motor power-driving board.

Available signals on this connector includes emergency stop, motor speed, 3-phase motor current, bus voltage, heatsink temperature coming from the motor driving board and 6 channels of PWM control signal going to the motor driving circuit.

Some settings are needed for motor control application to disconnect peripherals which share I/Os with motor control connector and connect these I/Os to motor control connector:

- Open SB31, SB39, SB40, SB44, SB45, SB48, SB53, SB54, SB55, SB62, SB65, SB67, SB71, SB73, SB77, SB80, SB81, remove R233, R242, no jumper on JP5 (Pin2-3), no jumper on JP9, no jumper on JP18 (Pin2-3), CN4 and CN13 unconnected.
- Close SB33, SB41, SB42, SB43, SB46, SB49, SB52, SB58, SB59, SB60, SB61, SB64, SB66, SB68, SB69, SB75, SB78, SB82. Mount R15 with 0 ohm resistor.

PA4 and P45 can be used by motor control application to output analog signals using DAC function, in such case remove camera daughterboard from CN4, open JP3 and remove R113.

Figure 6 and *Figure 7* show that all solder bridges and resistors to be removed are marked in red, while solder bridges to be closed are marked in green.

Figure 5. STM32479I-EVAL evaluation board motor control PCB reworks (bottom side)
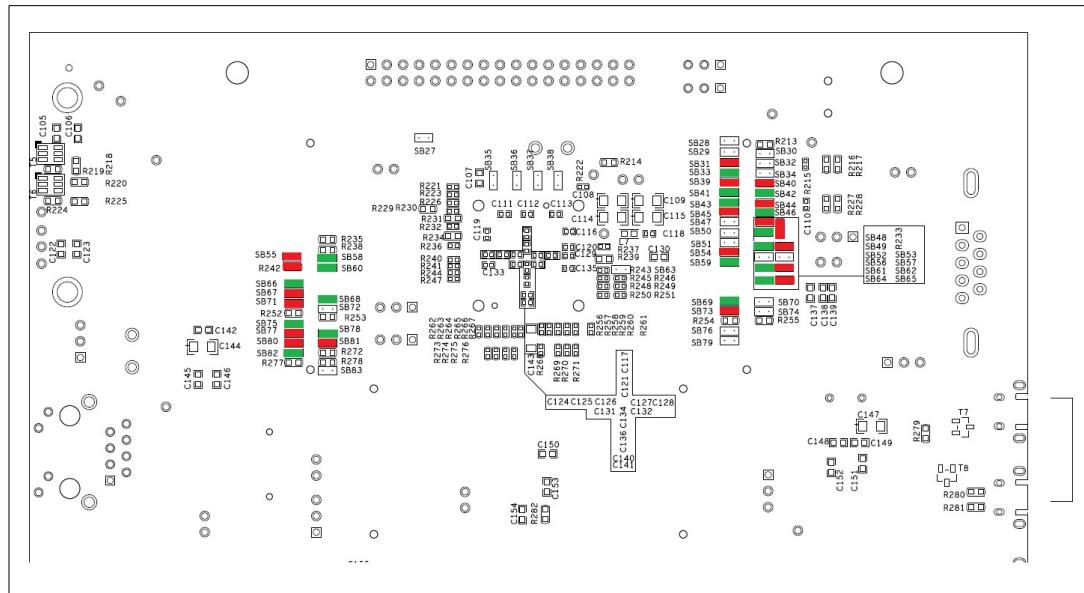
Figure 6. STM32479I-EVAL evaluation board motor control PCB reworks (top side)
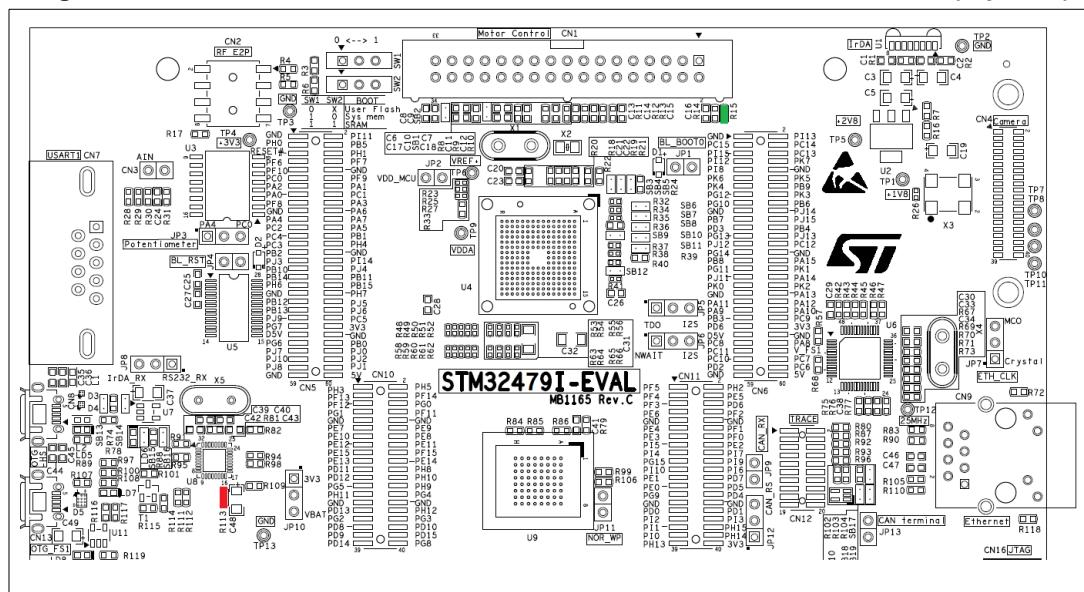
Table 15. Motor control related solder bridges

Solder bridges	Description
SB1	The motor current sampling operation is enabled when SB1 is closed (PA12 connected to PA8). The IO pins PA12 and PA8 are disconnected and can be used by daughterboard when SB1 is not fitted. Default setting: Open
SB2	SB2 should be left open when encoder signal is from pin31 of motor control connector while it needs to be closed when Encoder B (CN1 pin 31) is used as analog input to use filtering capacitor C17. Default setting: Open

5.20 MFX (Multi-Function eXpander)

MFX circuit on STM32479I-EVAL evaluation board acts as IO-expander. The communication interface between MFX and STM32F479NIH6 is I2C1 bus.

The signals connected to MFX are listed in *Table 16: MFX signals* :

Table 16. MFX signals

Pin number of MFX	Pin name of MFX	MFX function	Function of STM32479I-EVAL	Direction (For MFX)	Terminal device
15	PA5	MFX_GPIO5	Audio_INT	Input	Codec
16	PA6	MFX_GPIO6	OTG_FS1_OverCurrent	Input	USB_FS1
17	PA7	MFX_GPIO7	OTG_FS1_PowerSwitchOn	Output	USB_FS1
18	PB0	MFX_GPIO0	JOY_SEL	Input	Joystick
19	PB1	MFX_GPIO1	JOY_DOWN	Input	Joystick
20	PB2	MFX_GPIO2	JOY_LEFT	Input	Joystick
26	PB13	MFX_GPIO13	MII_INT	Input	Ethernet PHY
27	PB14	MFX_GPIO14	TOUCH_INT	Input	LCD
28	PB15	MFX_GPIO15	MicroSDcard Detect	Input	MicroSD
29	PA8	MFX_GPIO8	OTG_FS2_OverCurrent	Input	USB_FS2
30	PA9	MFX_GPIO9	OTG_FS2_PowerSwitchOn	Output	USB_FS2
31	PA10	MFX_GPIO10	XSDN	Output	Camera
32	PA11	MFX_GPIO11	RSTI	Output	Camera
33	PA12	MFX_GPIO12	Camera_PLUG	Input	Camera

Table 16. MFX signals (continued)

Pin number of MFX	Pin name of MFX	MFX function	Function of STM32479I-EVAL	Direction (For MFX)	Terminal device
39	PB3	MFX_GPIO3	JOY_RIGHT	Input	Joystick
40	PB4	MFX_GPIO4	JOY_UP	Input	Joystick

6 Connectors

6.1 Motor control connector CN1

Figure 7. Motor control connector CN1 (top view)
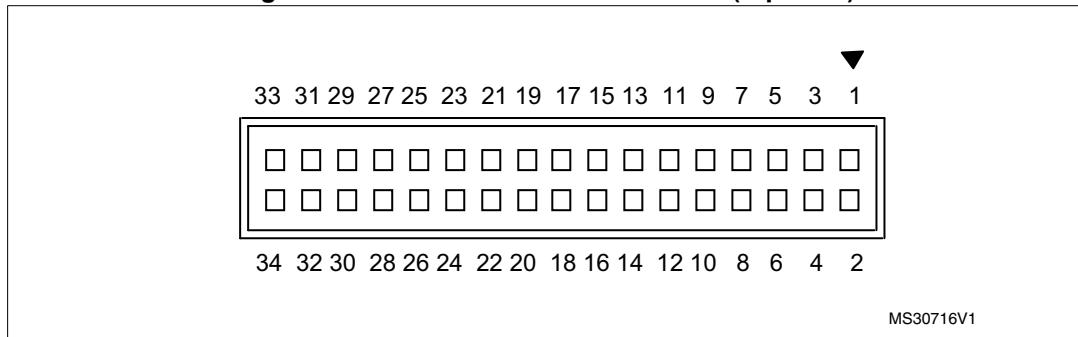
Table 17. Motor control connector CN1

Description	Pin of STM32F479NIH6	Pin number of CN1	Pin number of CN1	Pin of STM32F479NIH6	Description
Emergency STOP	PA6	1	2	-	GND
MC_UH	PC6	3	4	-	GND
MC_UL	PA7	5	6	-	GND
MC_VH	PC7	7	8	-	GND
MC_VL	PB14	9	10	-	GND
MC_WH	PC8	11	12	-	GND
MC_WL	PB15	13	14	PC4	BUS VOLTAGE
CURRENT A	PC1	15	16	-	GND
CURRENT B	PC2	17	18	-	GND
CURRENT C	PC3	19	20	-	GND
NTC BYPASS RELAY	PG11	21	22	-	GND
DISSIPATIVE BRAKE PWM	PH6	23	24	-	GND
+5V power	-	25	26	PC5	heatsink temperature
PFC SYNC	PA12 and PA8 See *Table 15: Motor control related solder bridges* for details	27	28	-	3.3V power
PFC PWM	PA11	29	30	-	GND

Table 17. Motor control connector CN1 (continued)

Description	Pin of STM32F479NIH6	Pin number of CN1	Pin number of CN1	Pin of STM32F479NIH6	Description
Encoder A	PA0	31	32	-	GND
Encoder B	PA1	33	34	PA2	Encoder Index

6.2 RF-EEPROM daughterboard connector CN2

Figure 8. RF-EEPROM daughterboard connector CN2 (front view)
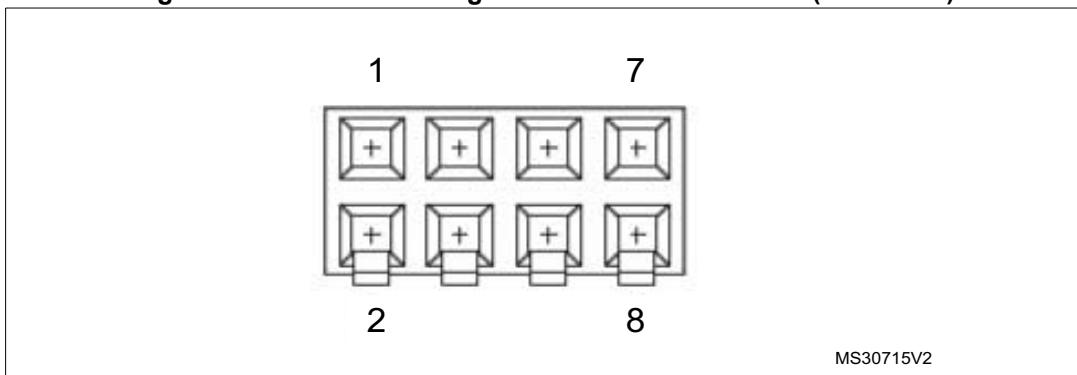
Table 18. RF-EEPROM daughterboard connector CN2

Pin number	Description	Pin number	Description
1	I2C1_SDA (PB9)	5	+3V3
2	NC	6	NC
3	I2C1_SCL (PB8)	7	GND
4	RESET(PC10)	8	NC

6.3 Analog input connector CN3

Figure 9. Analog input-output connector CN3 (top view)
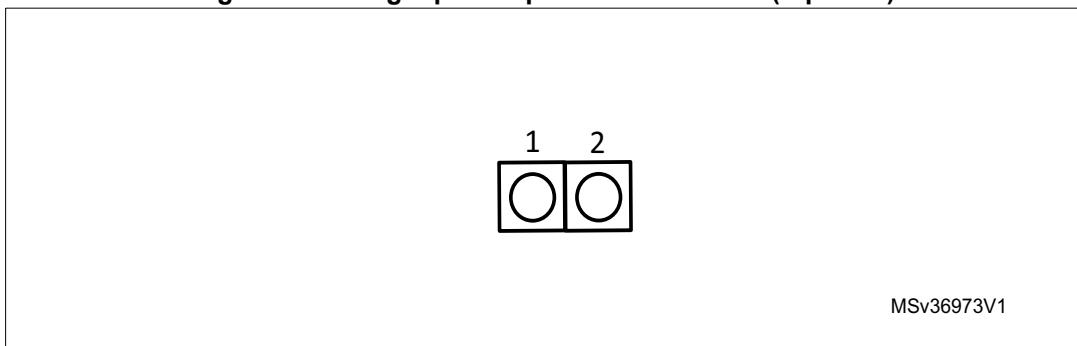
Table 19. Analog input-output connector CN3

Pin number	Description	Pin number	Description
1	analog input-output (PA4 or PC0) See *Table 13: Analog input related jumpers* for details	2	GND

6.4 Camera module connector CN4

Figure 10. Camera module connector CN4 (top view)
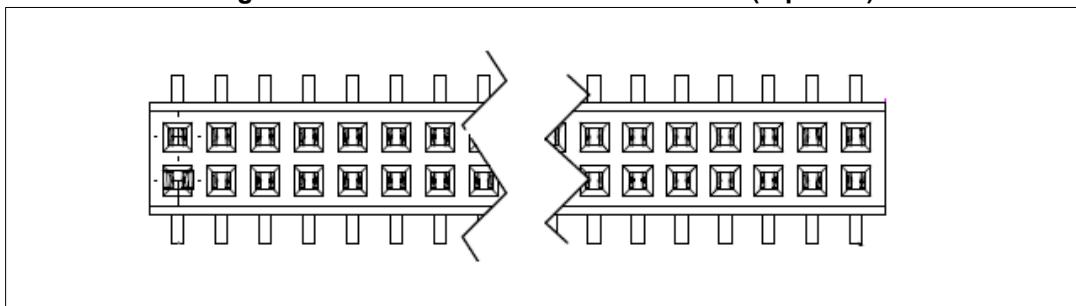
Table 20. Camera module connector CN4

Pin number	Description	Pin number	Description
1	+1.8V	21	GND
2	+1.8V	22	GND
3	GND	23	D0 (PC6)
4	GND	24	D1 (PC7)
5	D10 (PD6)	25	D2 (PC8)
6	D11 (PD2)	26	D3 (PC9)
7	GND	27	D4 (PC11)
8	GND	28	D5 (PD3)
9	D8 (PC10)	29	D6 (PE5)
10	D9 (PC12)	30	D7 (PE6)
11	GND	31	HSYNC (PA4)
12	GND	32	VSYNC (PB7)
13	I2C1_SCL (PB8)	33	PCLK (PA6)
14	I2C1_SDA (PB9)	34	Test point 8
15	Camera_PLUG (MFX GPIO12)	35	Test point 11
16	GND	36	Test point 10
17	RST IN (MFX GPIO11)	37	GND
18	Test point 7	38	GND

Table 20. Camera module connector CN4 (continued)

Pin number	Description	Pin number	Description
19	XSDN (MFX GPIO10)	39	+2.8V
20	Camera clock	40	+2.8V

6.5 Daughterboard extension connectors CN5 and CN6

Two 60-pin male headers CN5 and CN6 can be used to connect daughterboards or standard wrapping boards to STM32479I-EVAL evaluation board. All GPIOs are available on CN5 and CN6 and memory connectors CN10 and CN11.

The space between these two connectors is defined as a standard which allows developing common daughterboards for several ST evaluation boards. The standard width between CN5 pin1 and CN6 pin1 is 2700mils (68.58mm).

Each pin on CN5 and CN6 can be used by a daughterboard after disconnecting it from the corresponding function block on STM32479I-EVAL evaluation board. Refer to *Table 21: Daughterboard extension connector CN5* and *Table 22: Daughterboard extension connector CN6* for details.

Table 21. Daughterboard extension connector CN5

Pin	Description	Alternative function	How to disconnect function block on STM32479I-EVAL board
1	GND	-	-
3	PH0	OSC_IN	remove R20, close SB37
5	RESET#	-	-
7	PF6	QSPI_BK1_IO3	remove R227
9	PF10	QSPI_CLK	-
11	PC0	ULPI_STP/Potentiometer	open SB34, leave JP3 open
13	PA2	MII_MDIO/MC_EnIndex	open SB40, SB42
15	PA0	WAKEUP/ MII_CRS/MC_ENA	open SB44, SB46, SB48
17	PF8	QSPI_BK1_IO0	remove R228
19	GND	-	-
21	PA4	PAR_HSYNC/Potentiometer	disconnect CN4, leave JP3
23	PC2	MII_TXD2/MC_CurrentB	open SB49, remove R233
25	PC4	MII_RXD0/ MC_BUSVOLTAGE	open SB52, SB53
27	PC3	MII_TX_CLK/ MC_CurrentC	open SB54, SB59
29	PB2	BOOT1	remove R6
31	PJ3	-	-
33	PB10	ULPI_D3	remove R94

Table 21. Daughterboard extension connector CN5 (continued)

Pin	Description	Alternative function	How to disconnect function block on STM32479I-EVAL board
35	PB14	USB_FS2_DM/MC_VL	open SB64, SB65
37	PH6	MII_RXD2/MC_DissipativeBrake	open SB55, SB58
39	GND	-	-
41	PB12	ULPI_D5/ USB_FS2_ID/MII_TXD0	open SB70, SB74, remove R254
43	PB13	ULPI_D6/ USB_FS2_VBUS	remove R109, R255
45	-	-	-
47	PG7	SAI1_MCLK_A	-
49	D5V	-	-
51	PG6	-	-
53	-	-	-
55	-	-	-
57	-	-	-
59	GND	-	-
2	PI11	ULPI_DIR	open SB32
4	PB5	ULPI_D7	open SB29
6	PH1	OSC_OUT	remove C23, X1, close SB38
8	PF7	QSPI_BK1_IO2	remove R217
10	GND	-	-
12	PF9	QSPI_BK1_IO1	remove R216
14	PA1	MII_RX_CLK/MC_ENB	open SB33, SB39
16	PC1	MII_MDC/MC_CurrentA	open SB31, SB41
18	PA3	ULPI_D0	remove R82
20	PA6	MC_EmergencySTOP/ PAR_PCLK	remove R15, disconnect CN4
22	PA7	MII_RX_DV/MC_UL	open SB43, SB45
24	PA5	ULPI_CK	remove R113
26	PB1	ULPI_D2	open SB50
28	PH4	ULPI_NXT	open SB56
30	GND	-	-
32	PI14	-	-
34	PJ4	-	-
36	PB11	ULPI_D4	remove R98
38	PB15	USB_FS2_DP/MC_WL	open SB61, SB62

Table 21. Daughterboard extension connector CN5 (continued)

Pin	Description	Alternative function	How to disconnect function block on STM32479I-EVAL board
40	PH7	MII_RXD3	remove R42
42	PJ5	-	-
44	-	-	-
46	PC5	MII_RXD1/MC_HEATSINK	open SB69, SB73
48	+3V3	-	-
50	GND	-	-
52	PB0	ULPI_D1	open SB79
54	PJ0	-	-
56	PJ2	DSI_TE	disconnect CN15
58	PJ1	-	-
60	+5V	-	-

Table 22. Daughterboard extension connector CN6

Pin	Description	Alternative Function	How to disconnect function block on STM32479I-EVAL board
1	GND	-	-
3	PC15	OSC32_OUT	remove R18, close SB36
5	PI15	-	-
7	PI12	-	-
9	PI8	EXPANDER_INT	remove R290
11	PK6	LED4	remove R191
13	PK4	LED2	remove R193
15	PG12	-	-
17	PG10	-	-
19	GND	-	-
21	PB7	PAR_ VSYNC	disconnect CN4
23	PD3	PAR_D5	disconnect CN4
25	PG13	MII_TXD0	remove R36
27	PJ12	-	-
29	PG14	MII_TXD1	remove R235
31	PB8	I2C1_SCL	remove R179, R287, disconnect CN2, CN4
33	PG11	MII_TX_EN/MC_NTC	open SB60, remove R242
35	-	-	-
37	-	-	-

Table 22. Daughterboard extension connector CN6 (continued)

Pin	Description	Alternative Function	How to disconnect function block on STM32479I-EVAL board
39	GND	-	-
41	PA11	CAN1_RX/USB_FS1_DM /MC_PFCpwm	open SB68, remove R281, leave JP9 open, disconnect CN13
43	PA9	RS232_IRDA_TX/USB_FS1_ VBUS	open SB72, remove R253
45	PB3	JTDO- SWO/I2S3_CK	keep JP5 on open
47	PD6	NWAIT/I2S3_SD/PAR_D10	leave JP6 open, disconnect CN4
49	D5V	-	-
51	PC8	SDCARD_D0/MC_WH/PAR_ D2	open SB78, SB81, disconnect CN4
53	PC11	SDCARD_D3/PAR_D4	remove R272, disconnect CN4
55	PC10	SDCARD_D2/EXT_RESET/P AR_D8	remove R278, disconnect CN2, CN4
57	PD2	SDCARD_CMD/PAR_D11	open SB83, disconnect CN4
59	GND	-	-
2	PI13	-	-
4	PC14	OSC32_IN	remove R19, close SB35
6	PC13	TAMPER_KEY	remove R203
8	PK7	DSI_RESET	remove R125, disconnect CN15
10	GND	-	-
12	PK5	LED3	remove R192
14	PB9	I2C1_SDA	remove R172, R288, disconnect CN2, CN4
16	PK3	LED1	remove R194
18	PB6	QSPI_BK1_NCS	remove R215
20	PJ14	-	-
22	PJ15	-	-
24	PB4	JTRST	remove R103
26	PJ13	-	-
28	PC12	SDCARD_CK/ PAR_D9	disconnect CN4, CN17
30	GND	-	-
32	PA15	JTDI	remove R93
34	-	-	-
36	PA14	JTCK-SWCLK	remove R87
38	-	-	-
40	PA13	JTMS-SWDIO	remove R80

Table 22. Daughterboard extension connector CN6 (continued)

Pin	Description	Alternative Function	How to disconnect function block on STM32479I-EVAL board
42	PA12	CAN1_TX/USB_FS1_DP/MC_PFCsync2	open SB66, SB67, SB71
44	PA10	RS232_IRDA_RX/USB_FS1_ID	remove R107, leave JP15 open
46	PC9	SDCARD_D1/PAR_D3	remove R252, disconnect CN4
48	+3.3V	-	-
50	GND	-	-
52	PA8	LCD_BL_CTRL/MII_MCO/MC_PFCsync1	open SB75, SB77, SB80
54	VBUS_FS1	-	-
56	PC7	MC_VH/PAR_D1/MIC_CK	disconnect CN1, CN4, leave JP18 open
58	PC6	MC_UH/PAR_D0/I2S3_CK	open SB82, disconnect CN4, leave JP5 open
60	+5V	-	-

6.6 RS232 connector CN7

Figure 11. RS232 connector CN7 (front view)
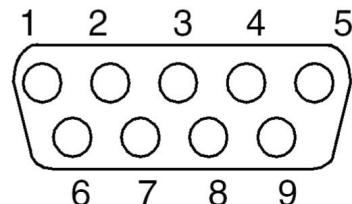
MS30720V1

Table 23. RS232 connector CN7 with ISP support

Pin number	Description	Pin number	Description
1	NC	6	Bootloader_BOOT0
2	RS232_RX (PA10)	7	NC
3	RS232_TX (PA9)	8	Bootloader_RESET
4	NC	9	NC
5	GND	-	-

6.7 USB OTG2 HS micro-AB connector CN8

Figure 12. USB OTG HS Micro-AB connector CN8 (front view)
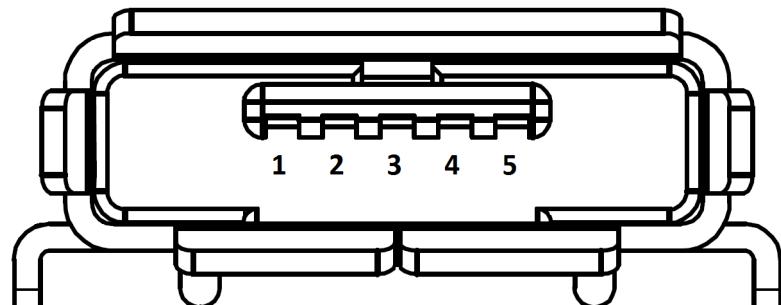
Table 24. USB OTG HS Micro-AB connector CN8

Pin number	Description	Pin number	Description
1	V_{BUS}	4	ID
2	D-	5	GND
3	D+	-	-

6.8 Ethernet RJ45 connector CN9

Figure 13. Ethernet RJ45 connector CN9 (front view)
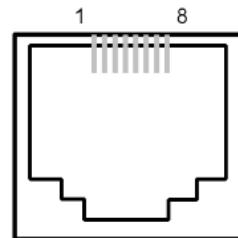
Table 25. RJ45 connector CN9

Pin number	Description	Pin number	Description
1	TxData+	2	TxData-
3	RxData+	4	Shield
5	Shield	6	RxData-
7	Shield	8	Shield

6.9 Memory connectors CN10 and CN11

Two 40-pin male headers CN10 and CN11 are used to connect with memory daughterboard. FMC memory signals, which are not available on CN5 and CN6, are available on these two connectors CN10 and CN11.

The space between these two connectors is defined as a standard which allows to develop common daughterboards for several ST evaluation boards. The standard width between CN10 pin1 and CN11 pin1 is 1914mils (48.62mm). About details on assignment of the signals refer to *Table 26: Memory connector CN10* and *Table 27: Memory connector CN11* .

Table 26. Memory connector CN10

Pin	Description	Alternative Function	How to disconnect function block on STM32479I-EVAL board
1	PH3	SDNE0/MII_COL	Open SB63
3	PF13	A7	-
5	PF12	A6	-
7	PG1	A11	-
9	GND	-	-
11	PE7	D4	-
13	PE10	D7	-
15	PE12	D9	-
17	PE15	D12	-
19	PE13	D10	-
21	PD11	A16	-
23	PD12	A17	-
25	PG5	A15/BA1	-
27	PH11	D19	-
29	GND	-	-
31	PD13	A18	-
33	PG2	A12	-
35	PD8	D13	-
37	PD9	D14	-
39	PD14	D0	-
2	PH5	SDNWE	-
4	PF14	A8	-
6	PG0	A10	-
8	PF11	SDNRAS	-
10	GND	-	-
12	PE9	D6	-
14	PE8	D5	-

Table 26. Memory connector CN10 (continued)

Pin	Description	Alternative Function	How to disconnect function block on STM32479I-EVAL board
16	PE11	D8	-
18	PF15	A9	-
20	PE14	D11	-
22	PH8	D16	-
24	PH10	D18	-
26	PH9	D17	-
28	PG4	A14/BA0	-
30	GND	-	-
32	PH12	D20	-
34	PG3	A13	-
36	PD10	D15	-
38	PD15	D1	-
40	PG8	SDCLK/ MII_PPS_OUT	-

Table 27. Memory connector CN11

Pin	Description	Alternative Function	How to disconnect function block on STM32479I-EVAL board
1	PF5	A5	-
3	PF4	A4	-
5	PF3	A3	-
7	PE6	A22/SAI1_SD_A/TRACED3/ PAR_D7	open SB17, SB18, SB19
9	GND	-	-
11	PE4	A20/SAI1_FS_A/TRACED1	open SB6, SB7
13	PE3	A19/SAI1_SD_B/TRACED0	open SB9, SB10
15	PI5	NBL3	-
17	PI4	NBL2	-
19	PG15	SDNCAS	-
21	PI10	D31/MII_RX_ER	open SB12
23	PE1	NBL1	-
25	PE0	NBL0	-
27	PG9	NE2	-
29	GND	-	-
31	PD0	D2	-

Table 27. Memory connector CN11 (continued)

Pin	Description	Alternative Function	How to disconnect function block on STM32479I-EVAL board
33	PI2	D26	-
35	PI1	D25	-
37	PI0	D24	-
39	PH13	D21	-
2	PH2	SDCKE0	-
4	PE5	A21/SAI1_SCK_A/TRACED2 /PAR_D6	open SB3, SB4, SB5
6	PD6	NWAIT /I2S3_SD/PAR_D10	set JP6 on pin1-2, disconnect CN4
8	PF2	A2	-
10	GND	-	-
12	PF1	A1	-
14	PF0	A0	-
16	PE2	A23/TRACECLK/ MII_TXD3	open SB11, remove R238
18	PI7	D29	-
20	PI9	D30	-
22	PI6	D28	-
24	PD7	NE1	-
26	PD5	NWE	-
28	PD4	NOE	-
30	GND	-	-
32	PD1	D3	-
34	PI3	D27	-
36	PH15	D23	-
38	PH14	D22	-
40	+3.3V	-	-

6.10 ETM trace debugging connector CN12

Figure 14. ETM trace debugging connector CN12 (top view)
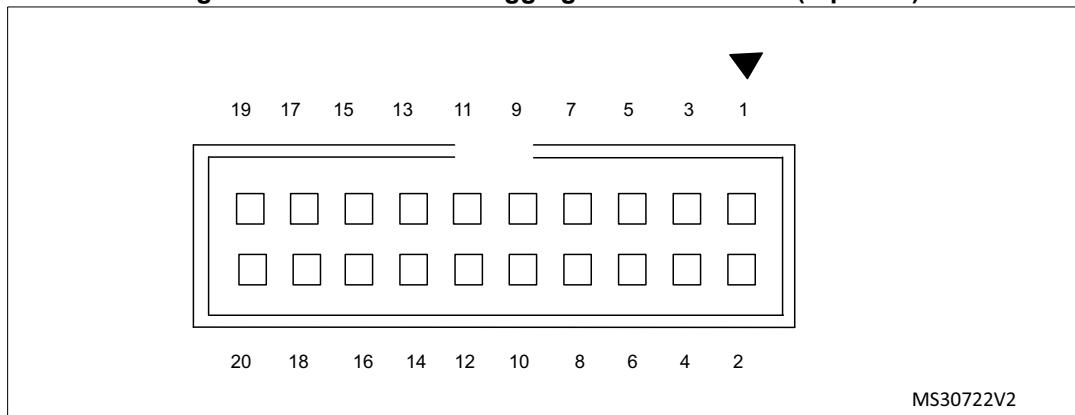
Table 28. ETM trace debugging connector CN12

Pin number	Description	Pin number	Description
1	+3.3V	2	TMS/PA13
3	GND	4	TCK/PA14
5	GND	6	TDO/PB3
7	KEY	8	TDI/PA15
9	GND	10	RESET#
11	GND	12	TraceCLK/PE2
13	GND	14	TraceD0/PE3 or SWO/PB3
15	GND	16	TraceD1/PE4 or nTRST/PB4
17	GND	18	TraceD2/PE5
19	GND	20	TraceD3/PE6

6.11 USB OTG1 FS Micro-AB connector CN13

Figure 15. USB OTG FS1 Micro-AB connector CN13 (front view)
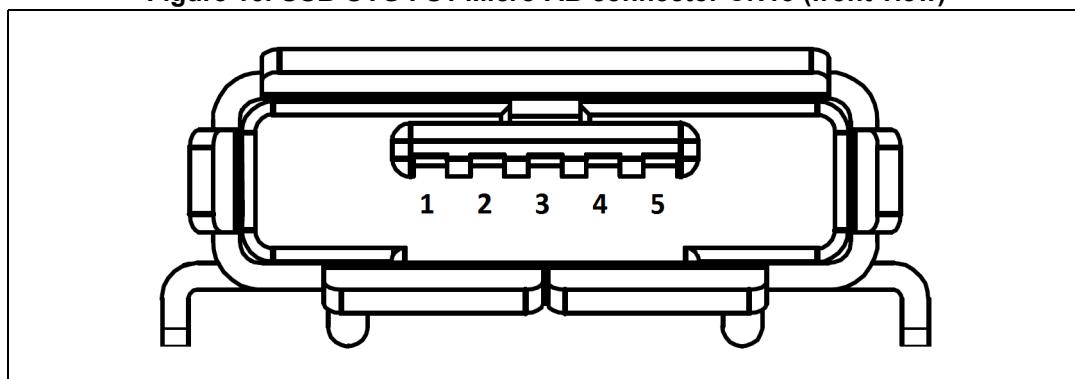
Table 29. USB OTG1 FS Micro-AB connector CN13

Pin number	Description	Pin number	Description
1	V_{BUS} (PA9)	4	ID (PA10)
2	D- (PA11)	5	GND
3	D+ (PA12)	-	-

6.12 USB OTG2 FS Micro-AB connector CN14

Figure 16. USB OTG FS1 Micro-AB connector CN13 (front view)
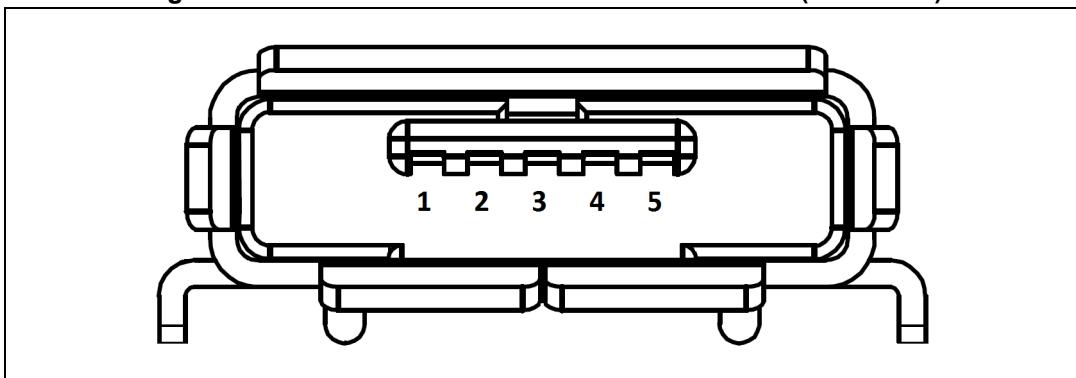
Table 30. USB OTG2 FS Micro-AB connector CN14

Pin number	Description	Pin number	Description
1	V_{BUS} (PB13)	4	ID (PB12)
2	D- (PB14)	5	GND
3	D+ (PB15)	-	-

6.13 TFT LCD connector CN15

A TFT color LCD with MIPI DSI interface board is mounted on CN15. Refer to *Section 5.18: Display and input devices* for details.

6.14 JTAG/SWD connector CN16

Figure 17. JTAG/SWD debugging connector CN15 (top view)
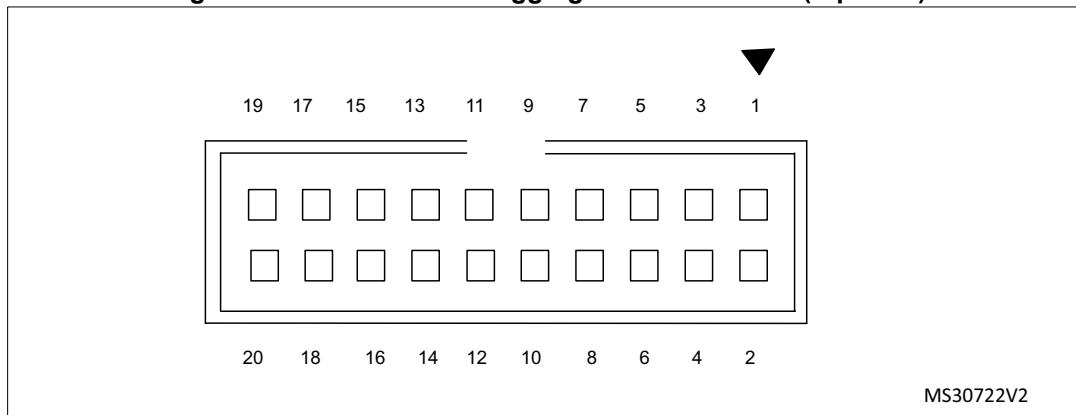
Table 31. JTAG/SWD debugging connector CN16

Pin number	Description	Pin number	Description
1	+3.3V	2	+3.3V
3	PB4	4	GND
5	PA15	6	GND
7	PA13	8	GND
9	PA14	10	GND
11	RTCK	12	GND
13	PB3	14	GND
15	RESET#	16	GND
17	DBGRQ	18	GND
19	DBGACK	20	GND

6.15 MicroSD connector CN17

Figure 18. MicroSD connector CN17 (top view)
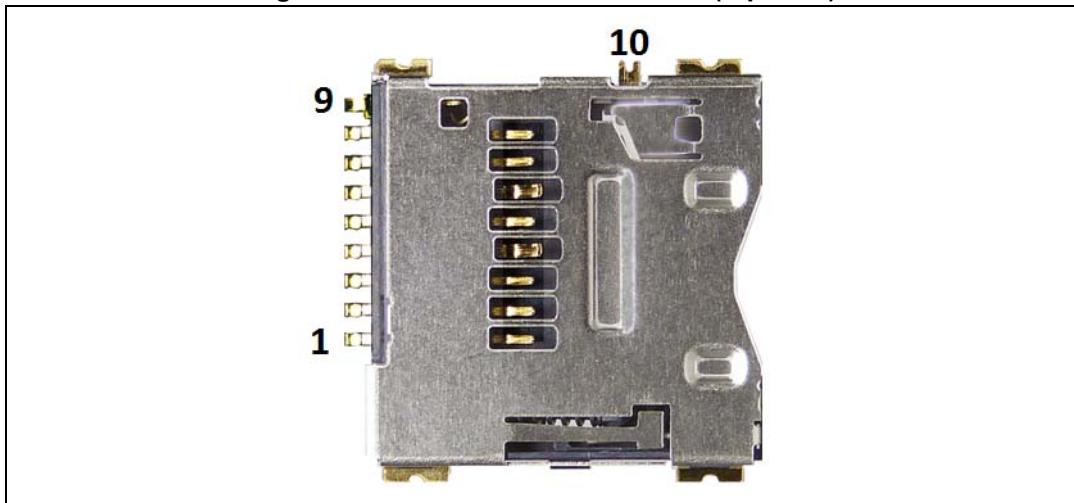
Table 32. MicroSD connector CN17

Pin number	Description	Pin number	Description
1	SDIO_D2 (PC10)	6	Vss/GND
2	SDIO_D3 (PC11)	7	SDIO_D0 (PC8)
3	SDIO_CMD (PD2)	8	SDIO_D1 (PC9)
4	+3.3V	9	GND
5	SDIO_CLK (PC12)	10	MicroSD card_detect (MFX GPIO15)

6.16 Power connector CN19

STM32479I-EVAL evaluation board can be powered from a DC 5V power supply via the external power supply jack (CN19) shown in *Figure 19: Power supply connector CN19 (front view)* .

Figure 19. Power supply connector CN19 (front view)
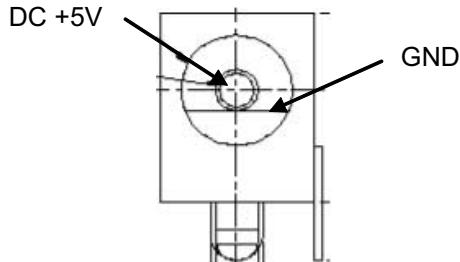
6.17 ST-LINK/V2-1 programming connector CN20

The connector CN20 is used only for embedded ST-LINK/V2-1 programming during board manufacturing. It is not populated by default and not intended for end user.

6.18 MFX programming connector CN21

The connector CN21 is used only for MFX (Multi-Function eXpander) programming during board manufacturing. It is not populated by default and not intended for end user.

6.19 ST-LINK/V2-1 USB type B connector CN22

The USB connector CN22 is used to connect embedded ST-LINK/V2-1 to PC for debugging of board.

Figure 20. USB type B connector CN22 (front view)
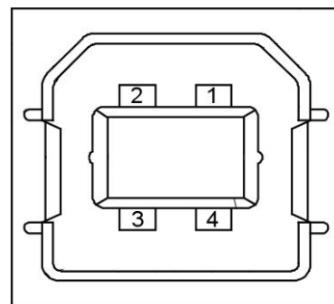
Table 33. USB type B connector CN22

Pin number	Description	Pin number	Description
1	V_{BUS} (power)	4	GND

Table 33. USB type B connector CN22 (continued)

Pin number	Description	Pin number	Description
2	DM	5,6	Shield
3	DP	-	-

6.20 CAN D-type 9-pins male connector CN23

Figure 21. RS232 connector CN23 (front view)
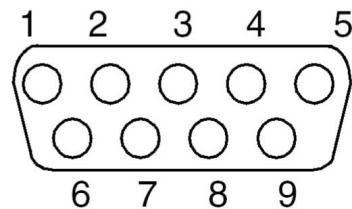
MS30720V1

Table 34. CAN D-type 9-pins male connector CN23

Pin number	Description	Pin number	Description
1,4,8,9	NC	7	CANH
2	CANL	3,5,6	GND

6.21 MEMS microphone coupon connectors CN25 and CN28

Figure 22. MEMS microphone coupon connectors CN25 and CN28 (top view)
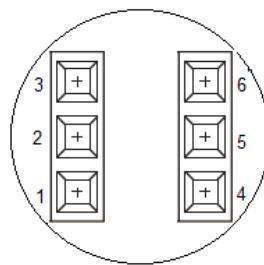
Table 35. MEMS microphone coupon connectors CN25 and CN28

Pin number	Description	Pin number	Description
1	DATA	4	VDD
2	GND	5	L/R
3	CLK	6	NC

6.22 Audio jack (Speaker) CN26

A 3.5 mm stereo audio jack CN26 for speaker out is available on STM32479I-EVAL evaluation board to support external speaker.

6.23 Audio jack CN27

A 3.5 mm stereo audio jack CN27 is available on STM32479I-EVAL evaluation board to support headset (headphone and microphone integrated).

7 Schematics

Figure 23. STM32F479I-EVAL evaluation board
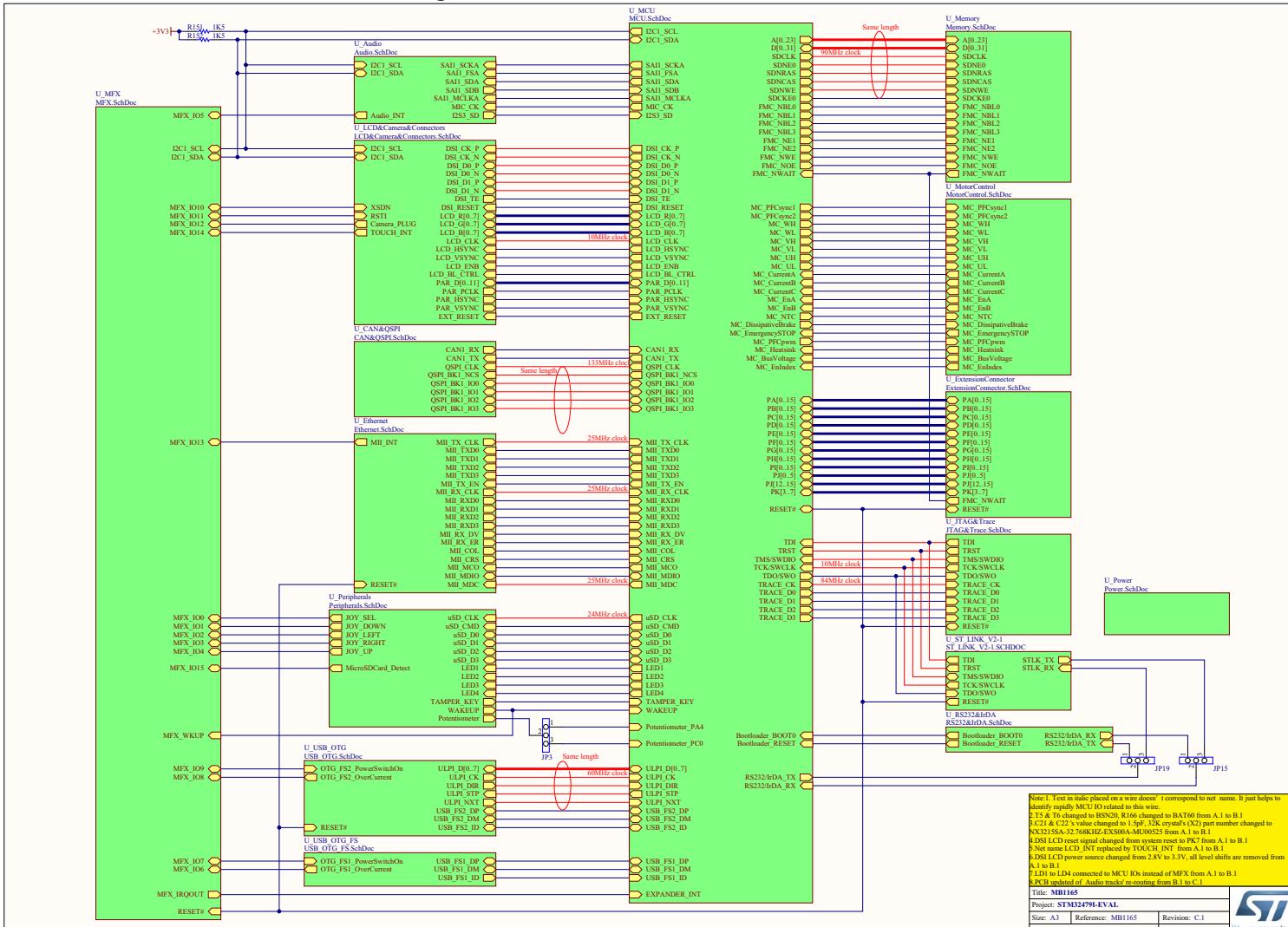
Figure 24. MCU

Figure 25. Power

Figure 26. SRAM, FLASH and SDRAM
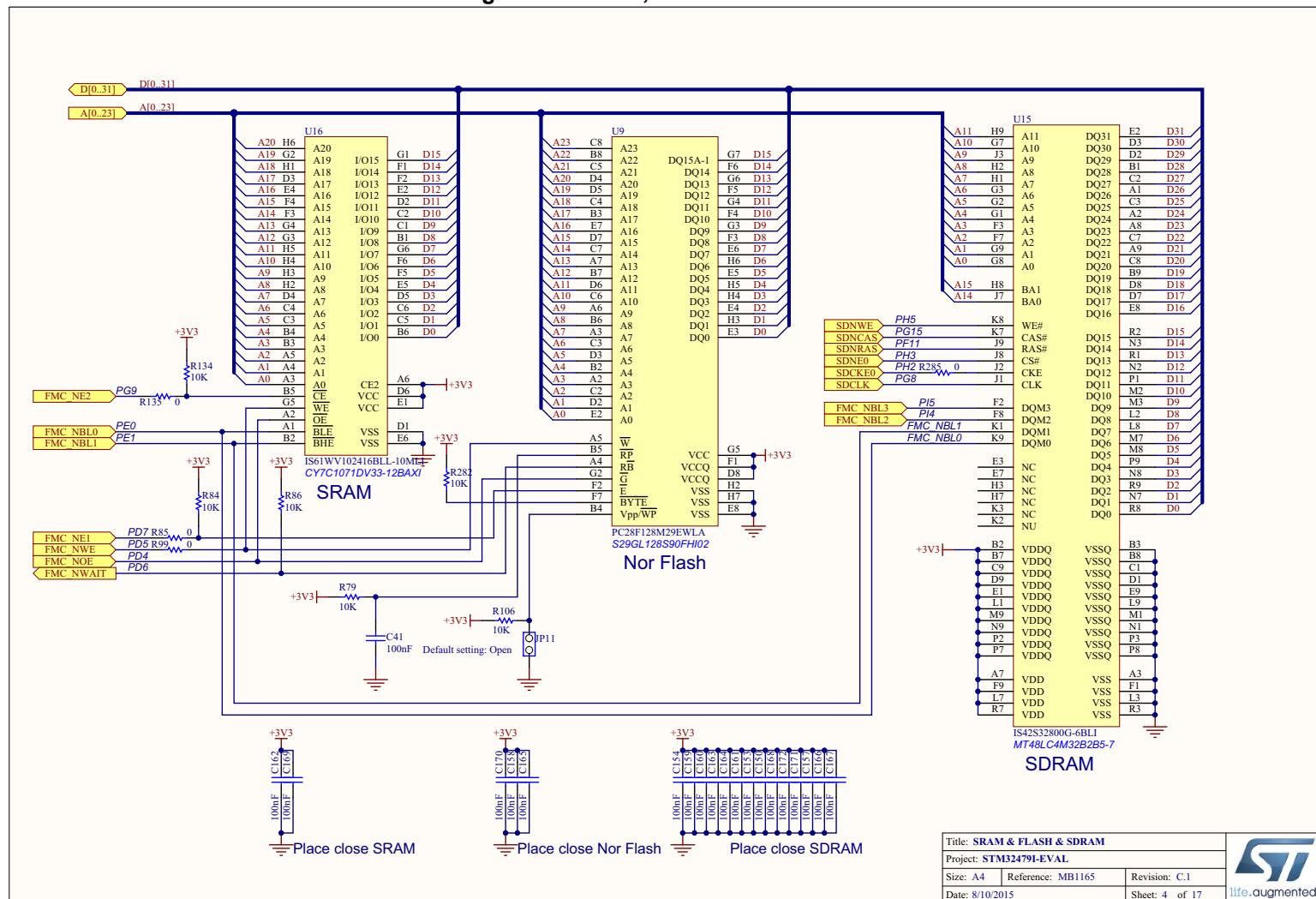
Figure 27. Audio
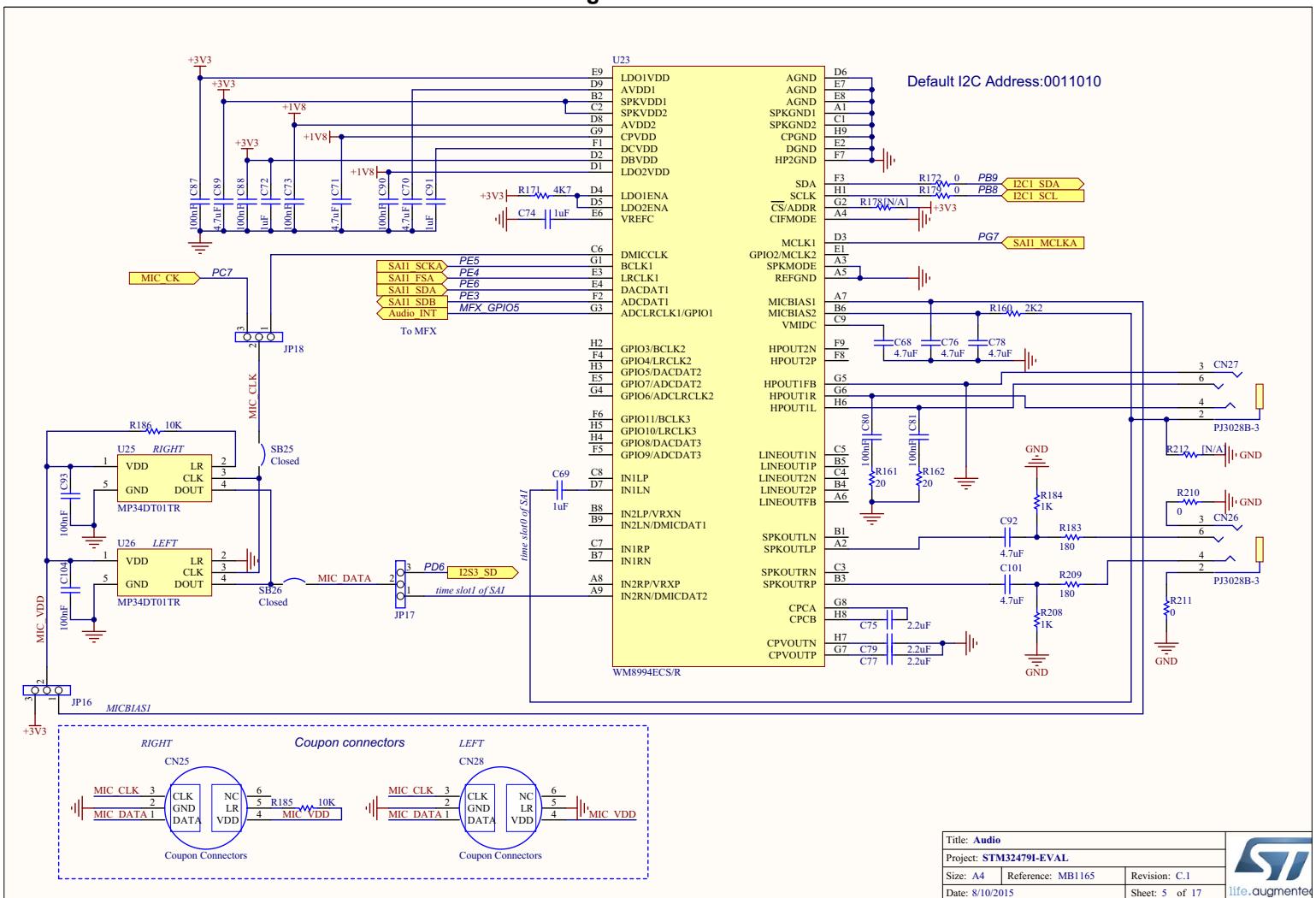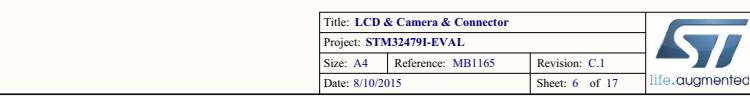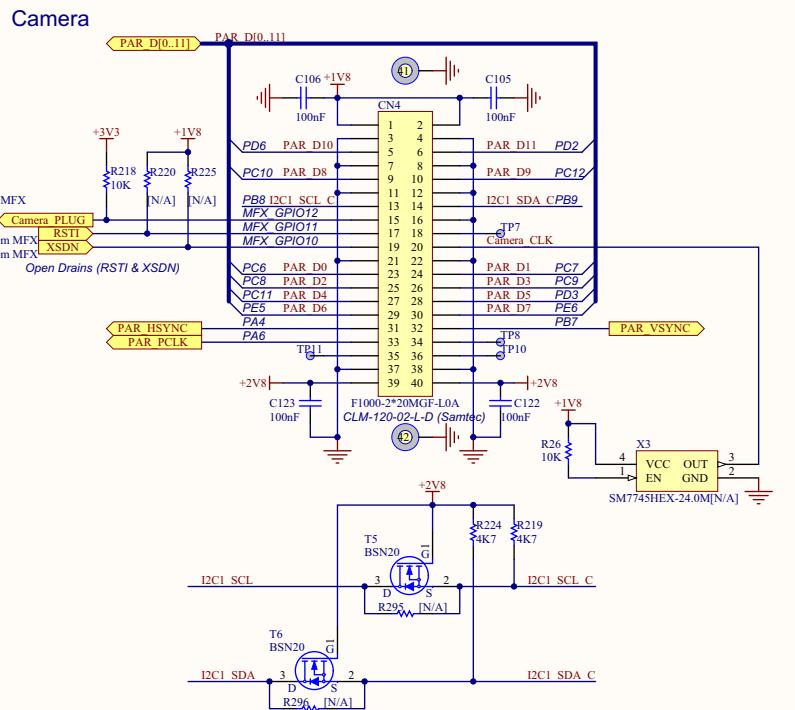
Figure 28. LCD, camera and connectors

DSI LCD

CN15
QSH-030-01-F-D-A

DSI CK P
DSI CK N
DSI D0 P
DSI D0 N
DSI D1 P
DSI D1 N

TOUCH INT *MFX_GPIO14*   To MFX   TOUCH_INT

+5V L8 BEAD(FCM1608KF-601T03)
C155 10uF
C156 100nF
L9 BEAD(FCM1608KF-601T03)

I2C1 SDA PB9   +3V3 C52 100nF
I2C1 SCL PB8

DSI TE PJ2
LCD BL CTRL PA8 LCD_BL_CTRL
DSI RESET PK7
+3V3 R125 10K

RGB LCD

CN18
P127B-2*25MGF-079-1A
FTSH-125-01-F-DV-K (Samtec)

PG13 LCD R0   LCD G0 PB1
PJ0   LCD R1   LCD G1 PB0
PJ1   LCD R2   LCD G2 PI15
PJ2   LCD R3   LCD G3 PG10
PJ3   LCD R4   LCD G4 PJ13
PJ4   LCD R5   LCD G5 PH4
PJ5   LCD R6   LCD G6 PI11
PG6   LCD R7   LCD G7 PB5

LCD R[0..7]   LCD_G[0..7]

PJ12 LCD B0   R153 0   PK7 LCD ENB
PG12 LCD B1
PJ14 LCD B2   PI12 LCD HSYNC
PJ15 LCD B3   PI13 LCD VSYNC
PK3   LCD B4
PK4   LCD B5   PI14 LCD CLK
PK5   LCD B6
PK6   LCD B7   RESET#
LCD B[0..7]   I2C1 SDA PB9 I2C1 SDA
TOUCH INT   I2C1 SCL PB8 I2C1 SCL

LCD BL CTRL
+5V L4 BEAD(FCM1608KF-601T03) +3V3
C66 10uF
C63 100nF
L3 BEAD(FCM1608KF-601T03)

H4 H1 H3 H2

Camera

PAR_D[0..11]   PAR_D[0..11]

C106 +1V8   C105
100nF   100nF

CN4
F1000-2*20MGF-L0A
CLM-120-02-L-D (Samtec)

+3V3 +1V8
R218 10K R220 [N/A] R225 [N/A]

PD6   PAR_D10   PAR_D11 PD2
PC10 PAR_D8   PAR_D9   PC12
PB8 I2C1_SCL_C   I2C1_SDA_C PB9
To MFX Camera_PLUG
RST1   MFX_GPIO12
From MFX MFX_GPIO11
From MFX XSDN MFX_GPIO10   Camera_CLK TP7
PC6   PAR_D0   PAR_D1   PC7
PC8   PAR_D2   PAR_D3   PC9
PC11 PAR_D4   PAR_D5   PD3
PE5   PAR_D6   PAR_D7   PE6
Open Drains (RSTI & XSDN)
PA4   PAR_HSYNC   PAR_VSYNC PB7
PA6   PAR_PCLK
TP11   TP8 TP10

+2V8 C123 100nF   C122 100nF +1V8
R26 10K
X3
VCC OUT
EN   GND
SM7745HEX-24.0M[N/A]

+2V8
R224 4K7 R219 4K7
T5 BSN20 G
I2C1 SCL D S I2C1_SCL_C
R295 [N/A]

T6 BSN20 G
I2C1 SDA D S I2C1_SDA_C
R296 [N/A]

EXT/RF E2P Connector

CN2
F206A-2*04MGF-A
SSM-104-L-DH (Samtec)

I2C1 SDA R4 0 PB9
I2C1 SCL R5 0 PB8   R17 0 PC10 EXT_RESET
+3V3

Title:	**LCD & Camera & Connector**	
Project:	**STM324791-EVAL**	
Size: A4	Reference: MB1165	Revision: C.1
Date: 8/10/2015		Sheet: 6 of 17

life.augmented

Figure 29. Ethernet

Figure 30. USB OTG HS

Figure 31. USB OTG FS

Figure 32. RS232 and IrDA

Figure 33. CAN and QSPI

CAN

+3V3
C183
100nF

R173
10K

R181
0

+3V3

Default setting: 1<->2
JP12

CN23
DB9-male CAN connector

CAN1_TX — PA12

U24
1 D   RS 8
2 GND   CANH 7
3 VCC   CANL 6
4 R   Vref 5

SN65HVD230

CAN1_RX — PA11

Default setting: Open

JP13

R175
120

D14

ESDCAN24-2BLY
Optional

R174
[N/A]

R176
0

+3V3

Quad SPI Flash

QSPI_BK1_IO3 — PF6   R227 33

U3
1 HOLD#/DQ3   CLK 16   PF10 — QSPI_CLK
2 VCC   DQ0 15   R228 33 PF8 — QSPI_BK1_IO0
3 NC   NC 14
4 NC   NC 13
5 NC   NC 12
6 NC   NC 11
7 CS#   Vss 10
8 DQ1   W#/Vpp/DQ2 9   R217 33 PF7 — QSPI_BK1_IO2

MT25QL512ABA8ESF-0SIT

+3V3
C110
100nF

+3V3
R215
10K

QSPI_BK1_NCS — PB6

QSPI_BK1_IO1 — PF9   R216 33

Title:	**CAN & QSPI**		
Project:	**STM324791-EVAL**		
Size: A4	Reference: MB1165	Revision: C.1	
Date: 8/10/2015		Sheet: 11 of 17	

Figure 34. Peripherals
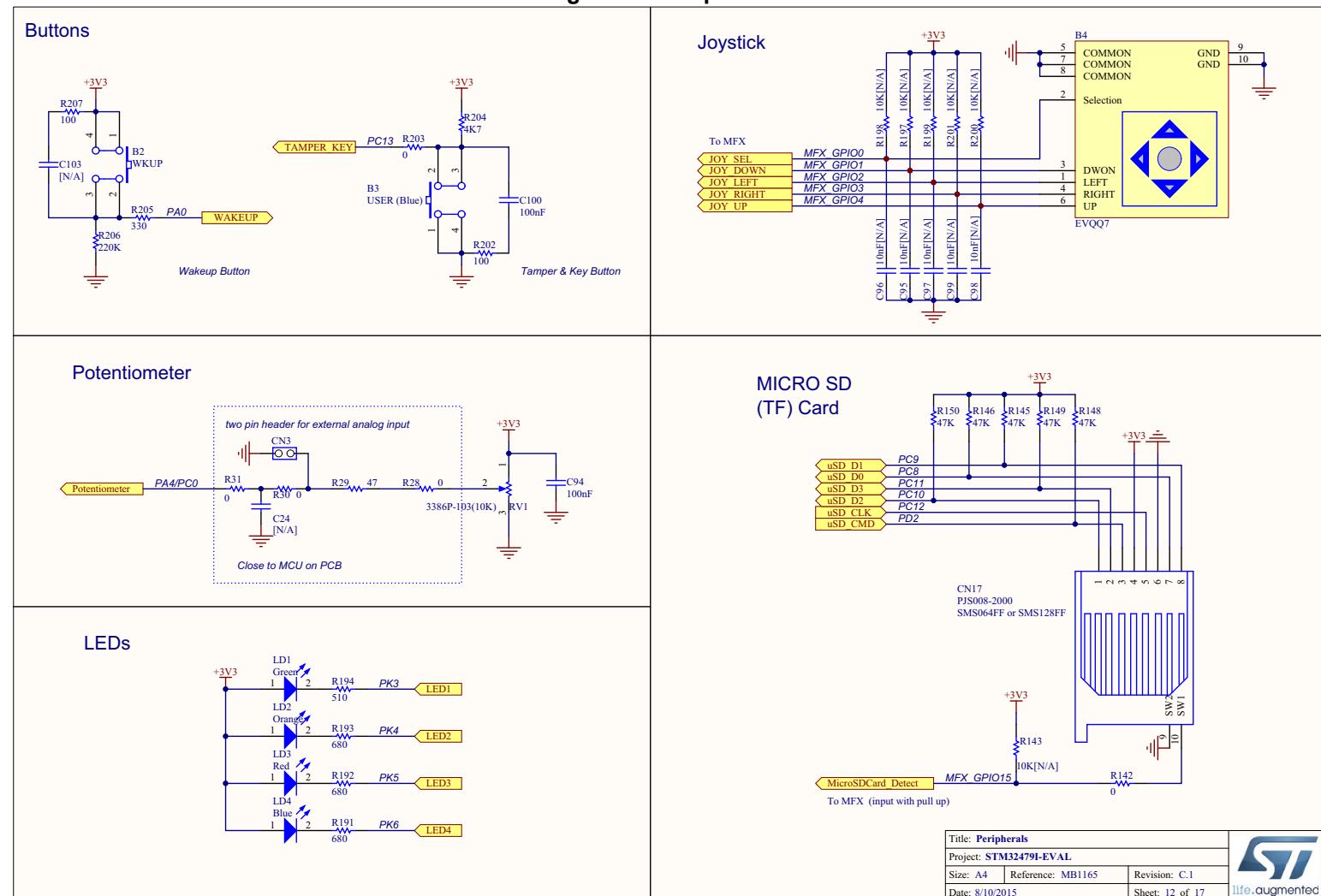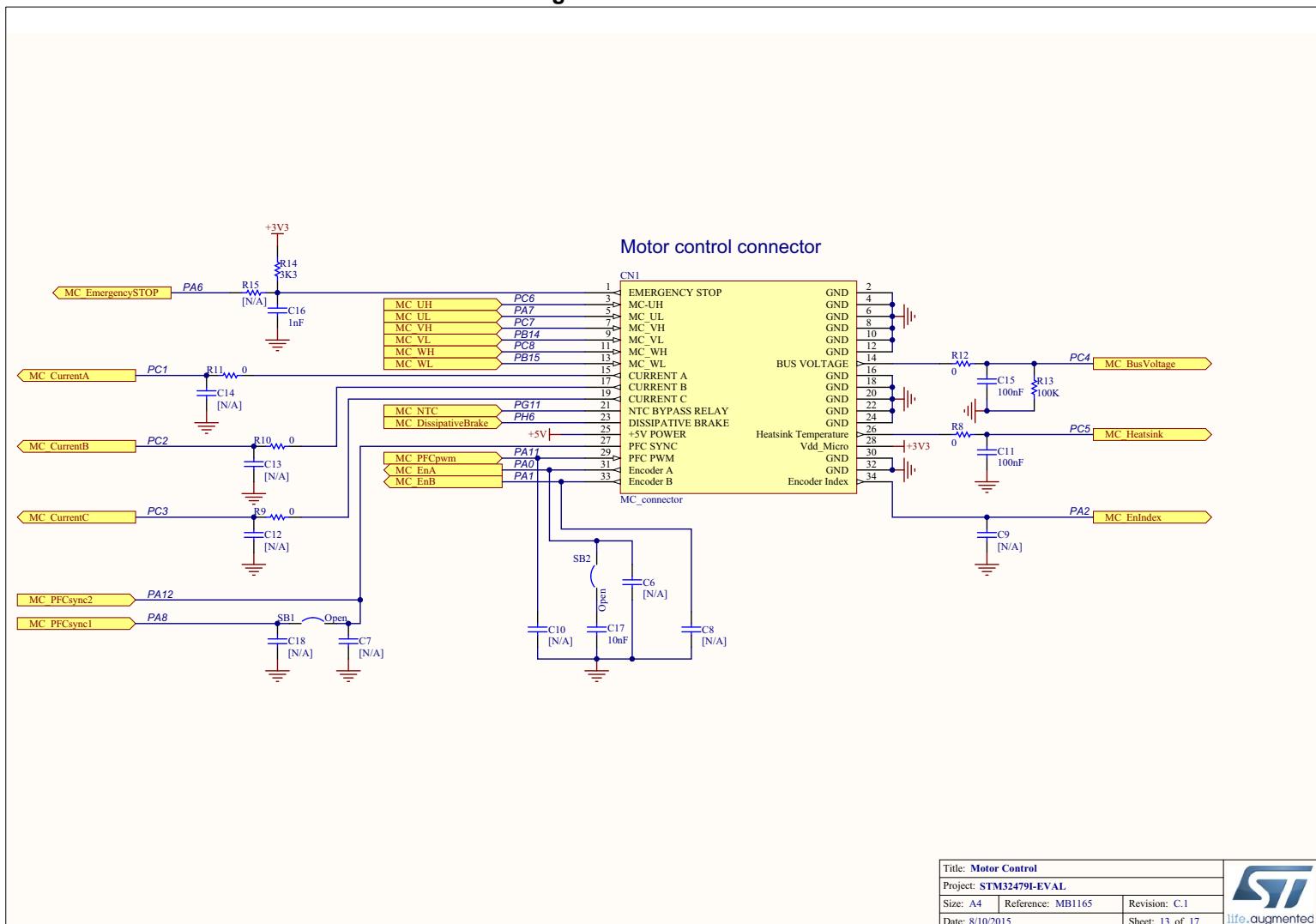
Buttons

Joystick

Potentiometer

MICRO SD
(TF) Card

LEDs

Title: **Peripherals**		
Project: **STM32479I-EVAL**		
Size: A4	Reference: MB1165	Revision: C.1
Date: 8/10/2015		Sheet: 12 of 17

Figure 35. Motor control

Schematics

UM1935
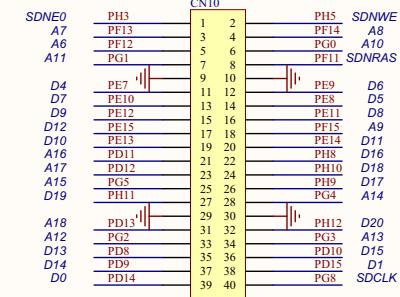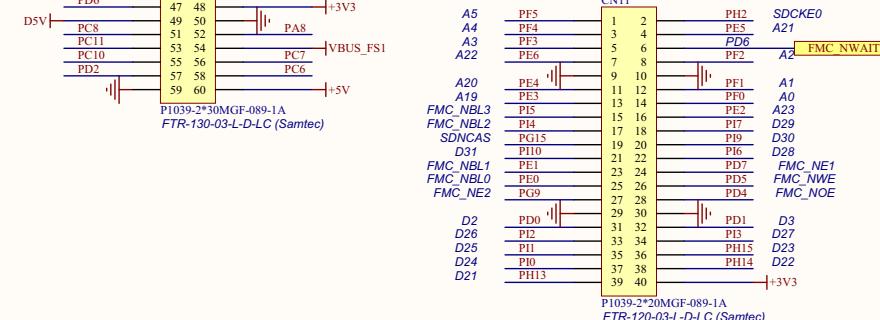
Figure 36. Extension connectors

Figure 37. ST-LINK/V2-1

Figure 38. MFX

MFX
Multi Function eXpander

Default I2C Address:1000010

Title: **MFX**
Project: **STM32479I-EVAL**
Size: A4   Reference: MB1165   Revision: C.1
Date: 8/10/2015   Sheet: 16 of 17

Figure 39. JTAG and trace

Figure 40. 4 inch DSI LCD board
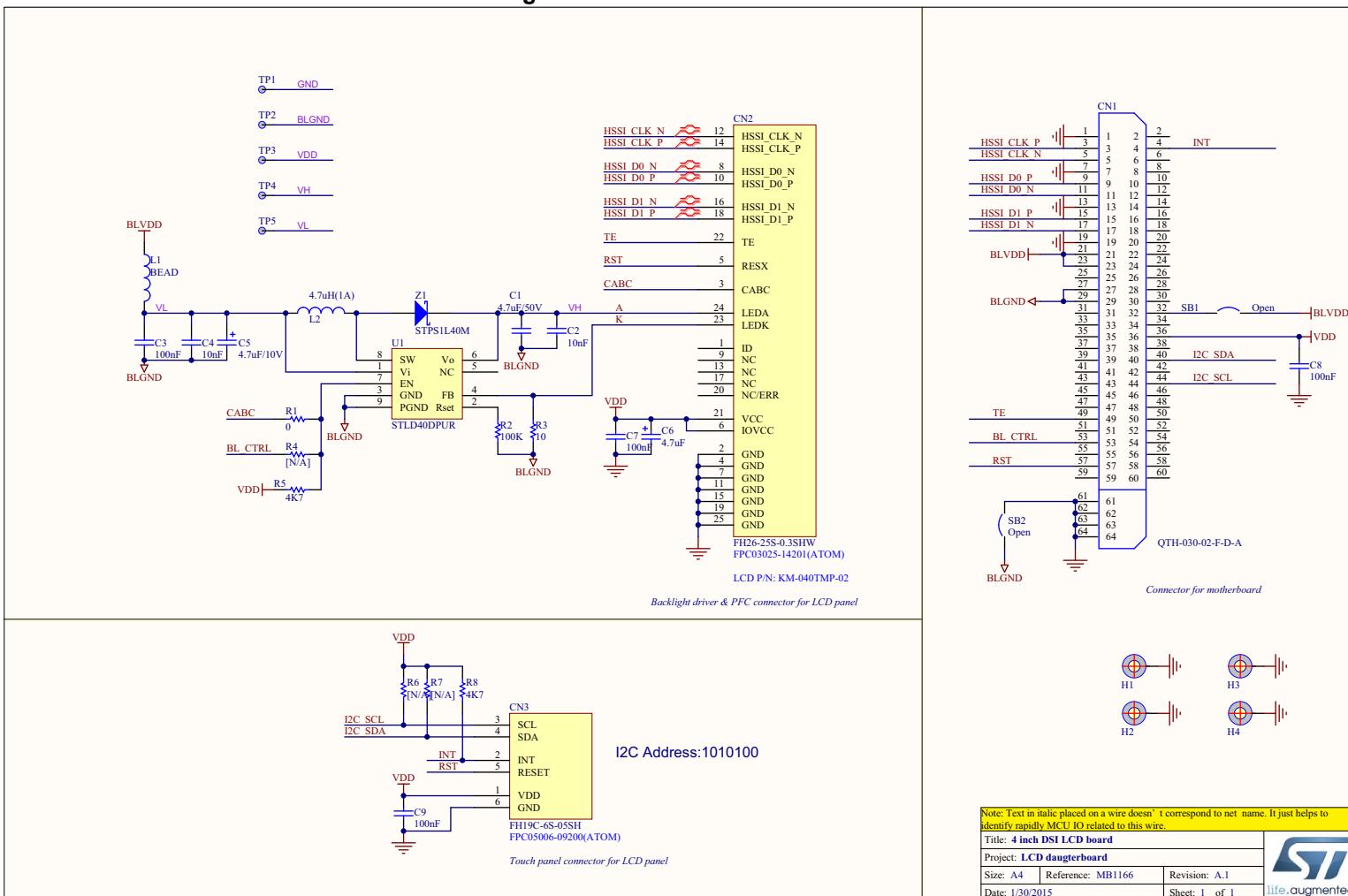
Figure 41. Camera module
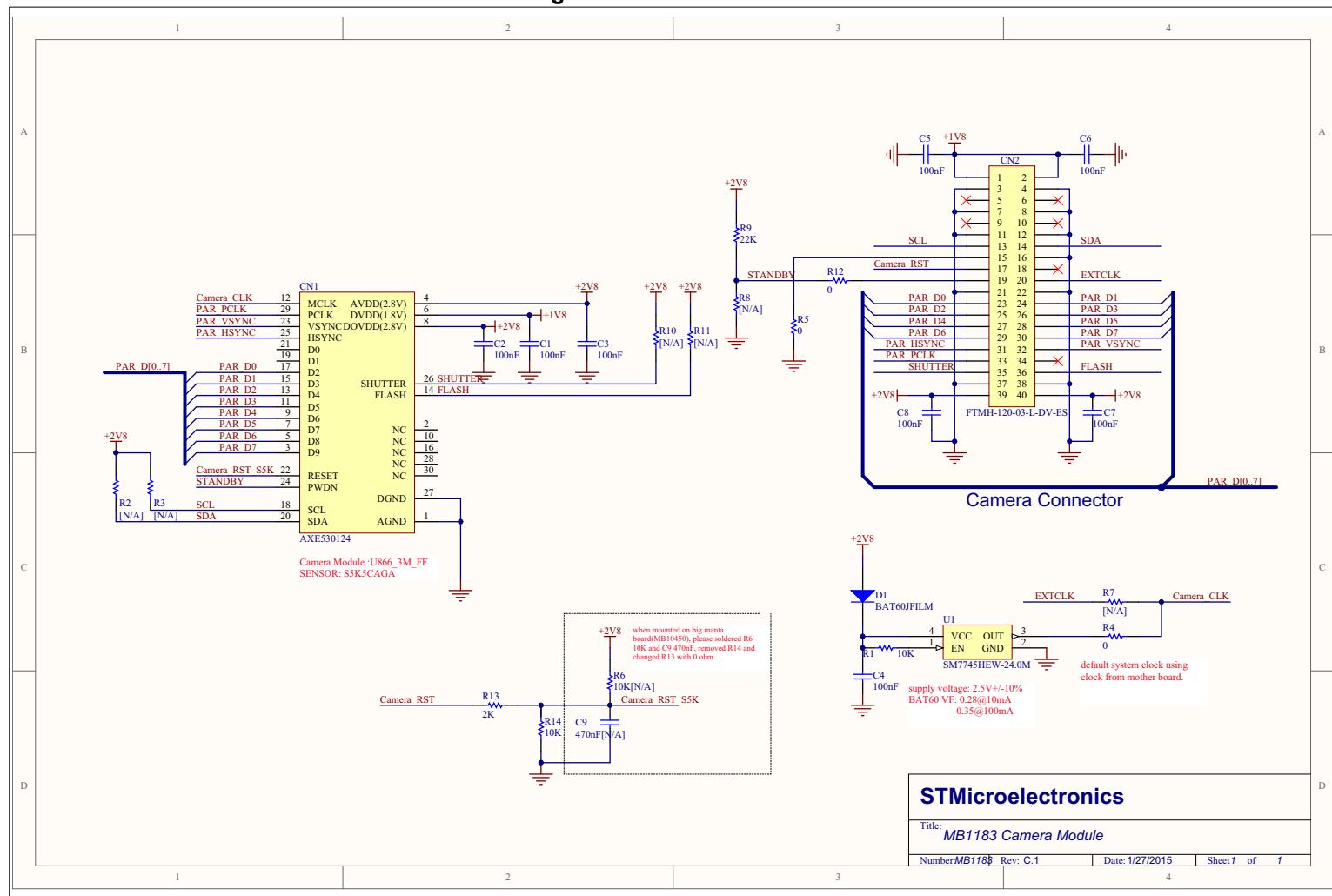
Appendix A   STM32479I-EVAL I/O assignment

Table 36. STM32479I-EVAL I/O assignment

Pin No.	Pin Name	STM32479I-EVAL standard	Motor control variant	Camera variant
A1	PE4	A20 || TRACED1 || SAI1_FS_A	-	-
A2	PE3	A19 || TRACED0 || SAI1_SD_B	-	-
A3	PE2	A23 || TRACECLK || MII_/TXD3	-	-
A4	PG14	MII_/TXD1	-	-
A5	PE1	NBL1	-	-
A6	PE0	NBL0	-	-
A7	PB8	Audio and EXPANDER and ACP and RF_I2C1_SCL	-	-
A8	PB5	ULPI_D7	-	-
A9	PB4	NJTRST	-	-
A10	PB3	JTDO/TRACESWO || MICROPHONE2_I2S3_SCK/3_CK	-	-
A11	PD7	NE1	-	-
A12	PC12	SDCARD_CK || SPI3_MOSI/3_SD	-	D9
A13	PA15	JTDI	-	-
A14	PA14	JTCK-SWCLK	-	-
A15	PA13	JTMS-SWDIO	-	-
B1	PE5	A21 || TRACED2 || SAI1_SCK_A	-	D6
B2	PE6	A22 || TRACED3 || SAI1_SD_A	-	D7
B3	PG13	MII_/TXD0	-	-
B4	PB9	Audio and EXPANDER and ACP and RF_I2C1_SDA	-	-
B5	PB7	-	-	VSYNC
B6	PB6	QSPI_BK1_NCS	-	-
B7	PG15	SDNCAS	-	-
B8	PG11	MII_/TX_EN	NTC_BYPASS_IO	-
B9	PJ13	-	-	-
B10	PJ12	-	-	-

Table 36. STM32479I-EVAL I/O assignment (continued)

Pin No.	Pin Name	STM32479I-EVAL standard	Motor control variant	Camera variant
B11	PD6	NWAIT || MICROPHONE2_I2S3_MOSI /3_SD	-	D10
B12	PD0	D2	-	
B13	PC11	SDCARD_D3 || SPI3_MISO	-	D4
B14	PC10	SDCARD_D2 || SPI3_SCK/3_CK	-	D8
B15	PA12	CAN1_TX || USB_FS1_DP	PFC_SYNC2_TIM1_ETR	-
C1	VBAT	VBAT	-	-
C2	PI8- ANTI TAMP2	EXPANDER_INT	-	-
C3	PI4	NBL2	-	-
C4	PK7	DSI_RESET	-	-
C5	PK6	LED4	-	-
C6	PK5	LED3	-	-
C7	PG12	-	-	-
C8	PG10	-	-	-
C9	PJ14	-	-	-
C10	PD5	NWE	-	-
C11	PD3		-	D5
C12	PD1	D3	-	-
C13	PI3	D27	-	-
C14	PI2	D26	-	-
C15	PA11	CAN1_RX || USB_FS1_DM	PFC_PWM_TIM1_CH4	-
D1	PC13- ANTI_TAMP	KEY_RTC_TAMP1/RTC_TS/ RTC_OUT	-	-
D2	PF0	A0	-	-
D3	PI5	NBL3	-	-
D4	PI7	D29	-	-
D5	PI10	D31 || MII_/RX_ER	-	-
D6	PI6	D28	-	-
D7	PK4	LED2	-	-
D8	PK3	LED1	-	-
D9	PG9	NE2	-	-
D10	PJ15	-	-	-
D11	PD4	NOE	-	-

Table 36. STM32479I-EVAL I/O assignment (continued)

Pin No.	Pin Name	STM32479I-EVAL standard	Motor control variant	Camera variant
D12	PD2	SDCARD_CMD	-	D11
D13	PH15	D23	-	-
D14	PI1	D25	-	-
D15	PA10	RS232‖IRDA_USART1_RX ‖ USB_FS1_ID	-	-
E1	PC14-OSC32_IN	OSC32_IN	-	-
E2	PF1	A1	-	-
E3	PI12	-	-	-
E4	PI9	D30	-	-
E5	PDR_ON	-	-	-
E6	BOOT0	BOOT0	-	-
E7	VDD_3	-	-	-
E8	VDD_11	-	-	-
E9	VDD_10	-	-	-
E10	VDD_15	-	-	-
E11	VCAP2	-	-	-
E12	PH13	D21	-	-
E13	PH14	D22	-	-
E14	PI0	D24	-	-
E15	PA9	RS232‖IRDA_USART1_TX‖ USB_FS1_VBUS	-	-
F1	PC15-OSC32_OUT	OSC32_OUT	-	-
F2	VSS_13_18	-	-	-
F3	PI11	ULPI_DIR	-	-
F4	VDD_13	-	-	-
F5	VDD_17	-	-	-
F6	VSS_3	-	-	-
F7	VSS_11	-	-	-
F8	VSS_10	-	-	-
F9	VSS_15	-	-	-
F10	VSS 2	-	-	-
F11	VDD_2	-	-	-
F12	DSI_D1_P	LCD_DSI_D1P	-	-

Table 36. STM32479I-EVAL I/O assignment (continued)

Pin No.	Pin Name	STM32479I-EVAL standard	Motor control variant	Camera variant
F13	DSI_D1_N	LCD_DSI_D1N	-	
F14	PC9	SDCARD_D1	-	D3
F15	PA8	Backlight_PWM_TIM1_CH1	PFC_SYNC1_TIM1_CH1	-
G1	PH0 - OSC_IN	OSC_IN	-	-
G2	PF2	A2	-	-
G3	PI13	-	-	-
G4	PI15	-	-	-
G5	VDD_18	-	-	-
G6	VSS_17	-	-	-
G10	VSS_9	-	-	-
G11	VDD_USB33	-	-	-
G12	DSI_VSS	LCD_DSI_VSSDSI	-	-
G13	DSI_VDD12	LCD_DSI_VDD12DSI	-	-
G14	PC8	SDCARD_D0	WH_TIM8_CH3	D2
G15	PC7	MIC_CK_OUT_TIM8_CH2	VH_TIM8_CH2	D1
H1	PH1 - OSC_OUT	OSC_OUT	-	-
H2	PF3	A3	-	-
H3	PI14	-	-	-
H4	PH4	ULPI_NXT	-	-
H5	VDD_5	-	-	-
H6	VSS_5	-	-	-
H10	VSS_20	-	-	-
H11	VDD_VREGD SI	LCD_DSI_VDDDSI	-	-
H12	DSI_CK_P	LCD_DSI_CKP	-	-
H13	DSI_CK_N	LCD_DSI_CKN	-	-
H14	PG8	SDCLK || MII_PPS_OUT	-	-
H15	PC6	MIC_CK_IN_TIM8_CH1	UH_TIM8_CH1	D0
J1	NRST	NRST	-	-
J2	PF4	A4	-	-
J3	PH5	SDNWE	-	-
J4	PH3	SDNE0 || MII_/COL	-	-
J5	VDD_12	-	-	-

Table 36. STM32479I-EVAL I/O assignment (continued)

Pin No.	Pin Name	STM32479I-EVAL standard	Motor control variant	Camera variant
J6	VSS_12	-	-	-
J10	VSS_8	-	-	-
J11	VDD_8	-	-	-
J12	DSI_D0_P	LCD_DSI_D0P	-	-
J13	DSI_D0_N	LCD_DSI_D0N	-	-
J14	PG7	SAI1_MCLK_A	-	-
J15	PG6	-	-	-
K1	PF7	QSPI_BK1_IO2	-	-
K2	PF6	QSPI_BK1_IO3	-	-
K3	PF5	A5	-	-
K4	PH2	SDCKE0	-	-
K5	VDD_4	-	-	-
K6	VSS_4	-	-	-
K7	VSS_6	-	-	-
K8	VSS_7	-	-	-
K9	VSS_1	-	-	-
K10	VSS_14	-	-	-
K11	VDD_14	-	-	-
K12	DSI_VCAP	LCD_DSI_VCAPDSI	-	-
K13	PD15	D1	-	-
K14	PB13	ULPI_D6 || USB_FS2_VBUS	-	-
K15	PD10	D15	-	-
L1	PF10	QSPI_CLK	-	-
L2	PF9	QSPI_BK1_IO1	-	-
L3	PF8	QSPI_BK1_IO0	-	-
L4	PC3	MII_/TX_CLK	CURRENT_C_ADC3_123_IN13	
L5	BYPASS_REG	-	-	-
L6	VSS_19	-	-	-
L7	VDD_19	-	-	-
L8	VDD_6	-	-	-
L9	VDD_7	-	-	-
L10	VDD_1	-	-	-
L11	VCAP1	-	-	-

Table 36. STM32479I-EVAL I/O assignment (continued)

Pin No.	Pin Name	STM32479I-EVAL standard	Motor control variant	Camera variant
L12	PD14	D0	-	-
L13	PB12	MII_/TXD0/TXD0 || ULPI_D5 || USB_FS2_ID	-	-
L14	PD9	D14	-	-
L15	PD8	D13	-	-
M1	VSSA	-	-	-
M2	PC0	ULPI_STP	POT_ADC123_IN10	-
M3	PC1	MII_MDC	CURRENT_A_ADC1_123_IN 11	-
M4	PC2	MII_/TXD2	CURRENT_B_ADC2_123_IN 12	-
M5	PB2	BOOT1	-	-
M6	PF12	A6	-	-
M7	PG1	A11	-	-
M8	PF15	A9	-	-
M9	PJ4	-	-	-
M10	PD12	A17	-	-
M11	PD13	A18	-	-
M12	PG3	A13	-	-
M13	PG2	A12	-	-
M14	PJ5	-	-	-
M15	PH12	D20	-	-
N1	VREF-	-	-	-
N2	PA1	MII_/RX_CLK/REF_CLK	ENCODER_B_TIM5_CH2	-
N3	PA0-WKUP	KEY_WKUP || MII_/CRS	ENCODER_A_TIM5_CH1	-
N4	PA4	POT_ADC12_IN4	DAC_OUT1	HSYNC
N5	PC4	MII_/RXD0	BUSVOLTAGE_ADC12_IN14	-
N6	PF13	A7	-	-
N7	PG0	A10	-	-
N8	PJ3	-	-	-
N9	PE8	D5	-	-
N10	PD11	A16	-	-
N11	PG5	A15 || BA1	-	-
N12	PG4	A14 || BA0	-	-
N13	PH7	MII_/RXD3	-	-

Table 36. STM32479I-EVAL I/O assignment (continued)

Pin No.	Pin Name	STM32479I-EVAL standard	Motor control variant	Camera variant
N14	PH9	D17	-	-
N15	PH11	D19	-	-
P1	VREF+		-	-
P2	PA2	MII_MDIO	INDEX_TIM5_CH3	-
P3	PA6	-	STOP_TIM8_BKIN	PIXCLK
P4	PA5	ULPI_CK	DAC_OUT2	-
P5	PC5	MII_/RXD1	HEATSINK_ADC12_IN15	-
P6	PF14	A8	-	-
P7	PJ2	LCD_DSI_TE	-	-
P8	PF11	SDNRAS	-	-
P9	PE9	D6	-	-
P10	PE11	D8	-	-
P11	PE14	D11	-	-
P12	PB10	ULPI_D3	-	-
P13	PH6	MII_/RXD2	DISSIPATIVE_BRAKE_TIM12_CH1	-
P14	PH8	D16	-	-
P15	PH10	D18	-	-
R1	VDDA	-	-	-
R2	PA3	ULPI_D0	-	-
R3	PA7	MII_/RX_DV/CRS_DV	UL_TIM8_CH1N	
R4	PB1	ULPI_D2	-	-
R5	PB0	ULPI_D1	-	-
R6	PJ0	-	-	-
R7	PJ1	-	-	-
R8	PE7	D4	-	-
R9	PE10	D7	-	-
R10	PE12	D9	-	-
R11	PE15	D12	-	-
R12	PE13	D10	-	-
R13	PB11	ULPI_D4	-	-
R14	PB14	USB_FS2_DM	VL_TIM8_CH2N	-
R15	PB15	USB_FS2_DP	WL_TIM8_CH3N	-

Appendix B Mechanical dimensions

Figure 42. Mechanical dimensions
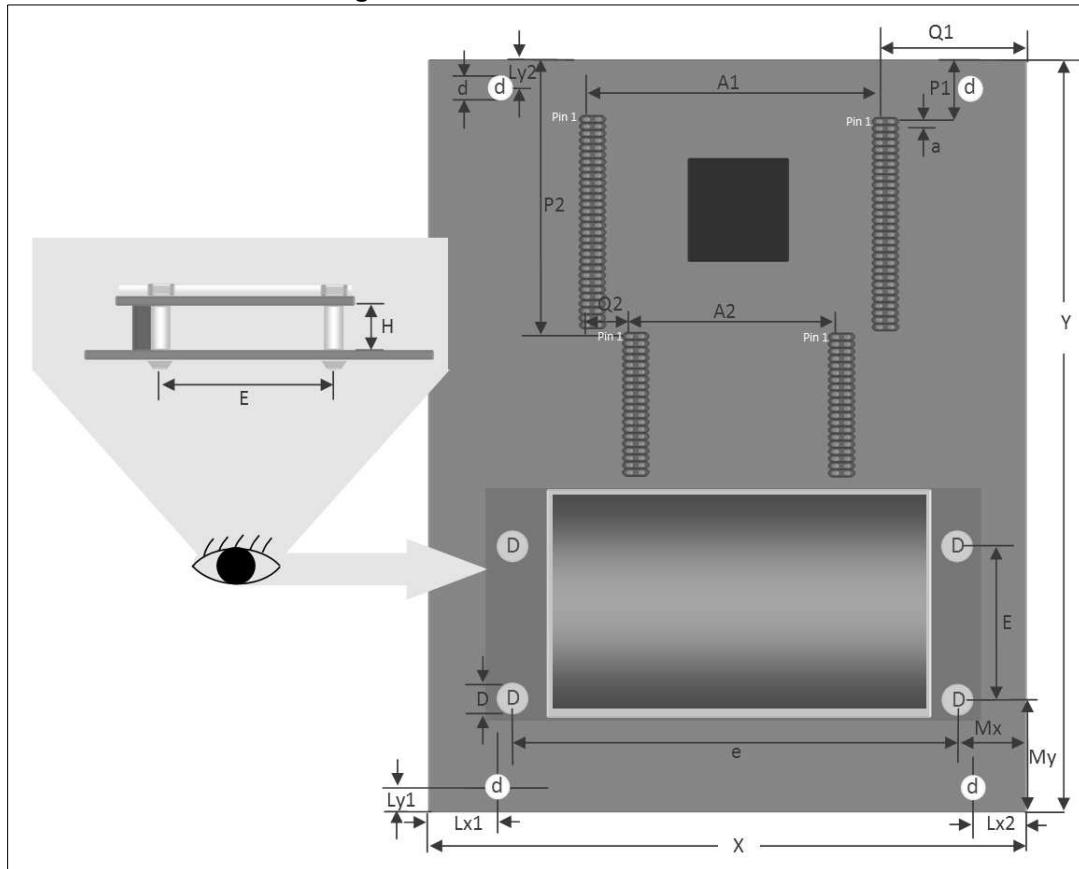
Table 37. Mechanical dimensions

Symbol	Size (mm)	Symbol	Size (mm)	Symbol	Size (mm)
A1	68.58	H	8	P1	16.94
A2	48.62	Lx1	21.36	P2	55.37
a	1.27	Lx2	32.64	Q1	46.77
D	4.5	Ly1	5	Q2	9.98
d	3.5	Ly2	6.4	X	157
E	37.7	Mx	20.1	Y	172.72
e	116.5	My	37.8	-	-

Appendix C Compliance Statement

C.1 Federal Communications Commission (FCC) and Industry Canada (IC) Compliance Statements

C.1.1 FCC Compliance Statement

Part 15.19

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Part 15.105

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Part 15.21

Any changes or modifications to this equipment not expressly approved by STMicroelectronics may cause harmful interference and void the user's authority to operate this equipment.

C.2 IC Compliance Statement

C.2.1 Compliance Statement

Industry Canada ICES-003 Compliance Label: *CAN ICES-3 (A)/NMB-3(A)*

C.2.2 Déclaration de conformité

Étiquette de conformité à la NMB-003 d'Industrie Canada: *CAN ICES-3 (A)/NMB-3(A)*

8 Revision History

Table 38. Document Revision History

Date	Version	Revision Details
24-Sep-2015	1	Initial version.
14-Mar-2016	2	Added *Section Appendix C: Compliance Statement*.

IMPORTANT NOTICE – PLEASE READ CAREFULLY