

MIMXRT1060/1064 Evaluation Kit Board Hardware User's Guide



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Chapter 1 Introduction

This document describes MIMXRT1060/1064 Evaluation Kit (EVK) based on the i.MX RT1060/1064 processor from NXP Semiconductor. The document includes system setup, debugging, and provides detailed information on the overall design and usage of the EVK board from a hardware system.

1.1 Board overview

This EVK board is a platform designed to showcase the commonly used features of the i.MX RT1060/1064 Processor in a small, low-cost package. The MIMXRT1060/1064 EVK board is an entry level development board that familiarizes the developer to the processor before investing on resources for specific designs.

The features of the MIMXRT1060/1064 EVK board are listed in [Board features](#).

The features of the MIMXRT1060/1064 EVK board are listed in [Table 1](#).

Table 1. Board features

Processor	NXP Processor	MIMXRT1062DVL6A MIMXRT1064DVL6A
DRAM Memory	SDRAM 256 Mbit, 166 MHz	IS42S16160J-6BLI
DCDC	MPS	MP2144GJ
LDO	UNION	UM1550S-18 UM1750S-00
Mass Storage	TF Card Slot	
	64 Mbit Quad SPI flash	
	512 Mbit Hyper flash	
Display Interface	LCD connector	
Ethernet	10/100 Mbit/s Ethernet connector. PHY chip: KSZ8081RNB	
USB	USB 2.0 OTG connector	
	USB 2.0 host connector	
Audio Connector	3.5 mm audio stereo headphone jack	
	Board-mounted microphone	
	Left and right speaker out connectors	
	S/PDIF interface (unpopulated)	
Power Connector	5 V DC-jack	
Debug Connector	JTAG 20-pin connector (SWD by default)	
	OpenSDA with DAP-Link	
Sensor	FXOS8700CQ: 6-Axis Ecompass (3-Axis Mag, 3-Axis Accel) (Some boards are unpopulated)	

Table continues on the next page...

Table 1. Board features (continued)

Camera	CMOS sensor interface
CAN	CAN bus connector
User Interface Button	ON/OFF, POR Reset, Reset, USER button
LED Indicator	Power Status, Reset, OpenSDA, USER LED
Expansion Port	Arduino interface
PCB	3.937 inch x 5.9055 inch (10 cm x 15 cm), 4-layer board

1.2 MIMXRT1060/1064 EVK contents

The MIMXRT1060/1064 EVK contains the following items:

- MIMXRT1060/1064 EVK board
- USB cable (Micro B)
- Camera

1.3 MIMXRT1060/1064 EVK board revision history

EVK: Mass Product

Chapter 2 Specifications

This section provides detailed information about the electrical design and practical considerations of the EVK board.

The document describes each block shown in [Block diagram](#).

The document describes each block shown in [Figure 1](#).

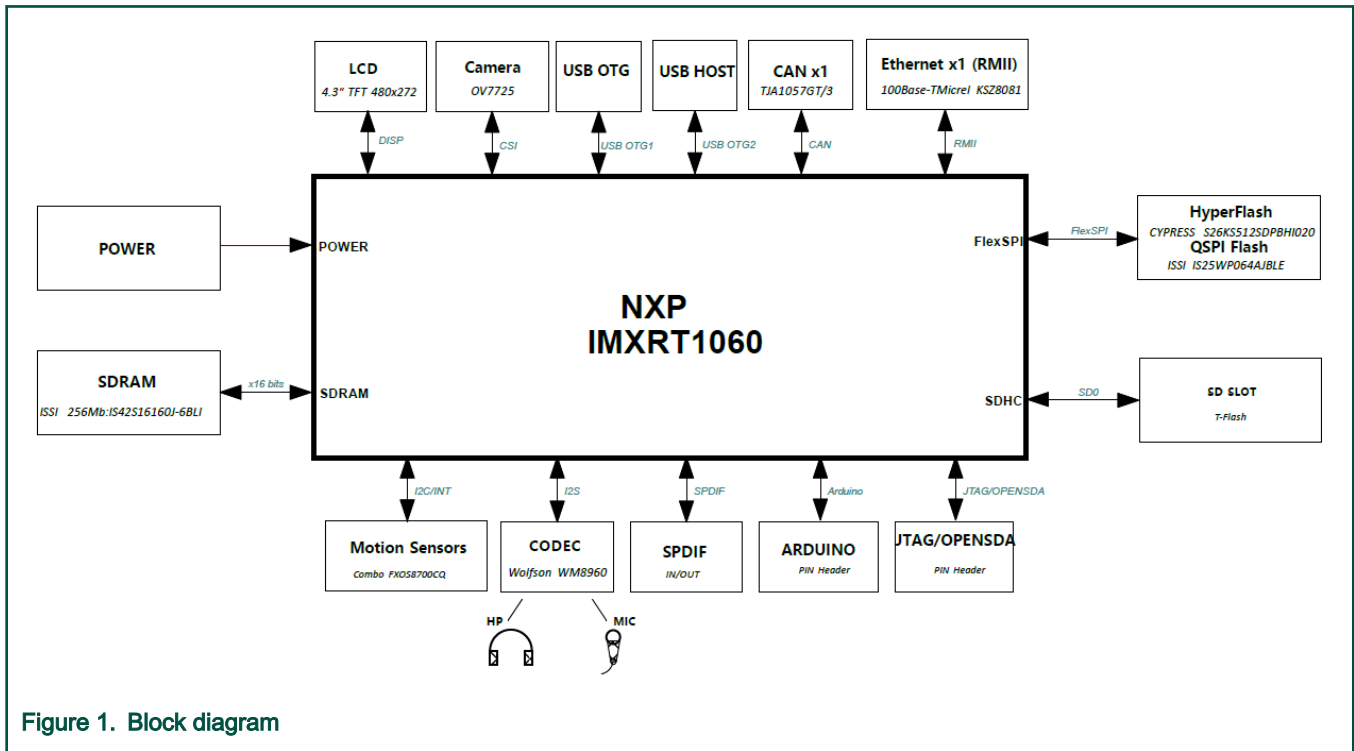


Figure 1. Block diagram

The overview of the MIMXRT1060 EVK board is shown in [Figure 2](#) and [Figure 3](#).

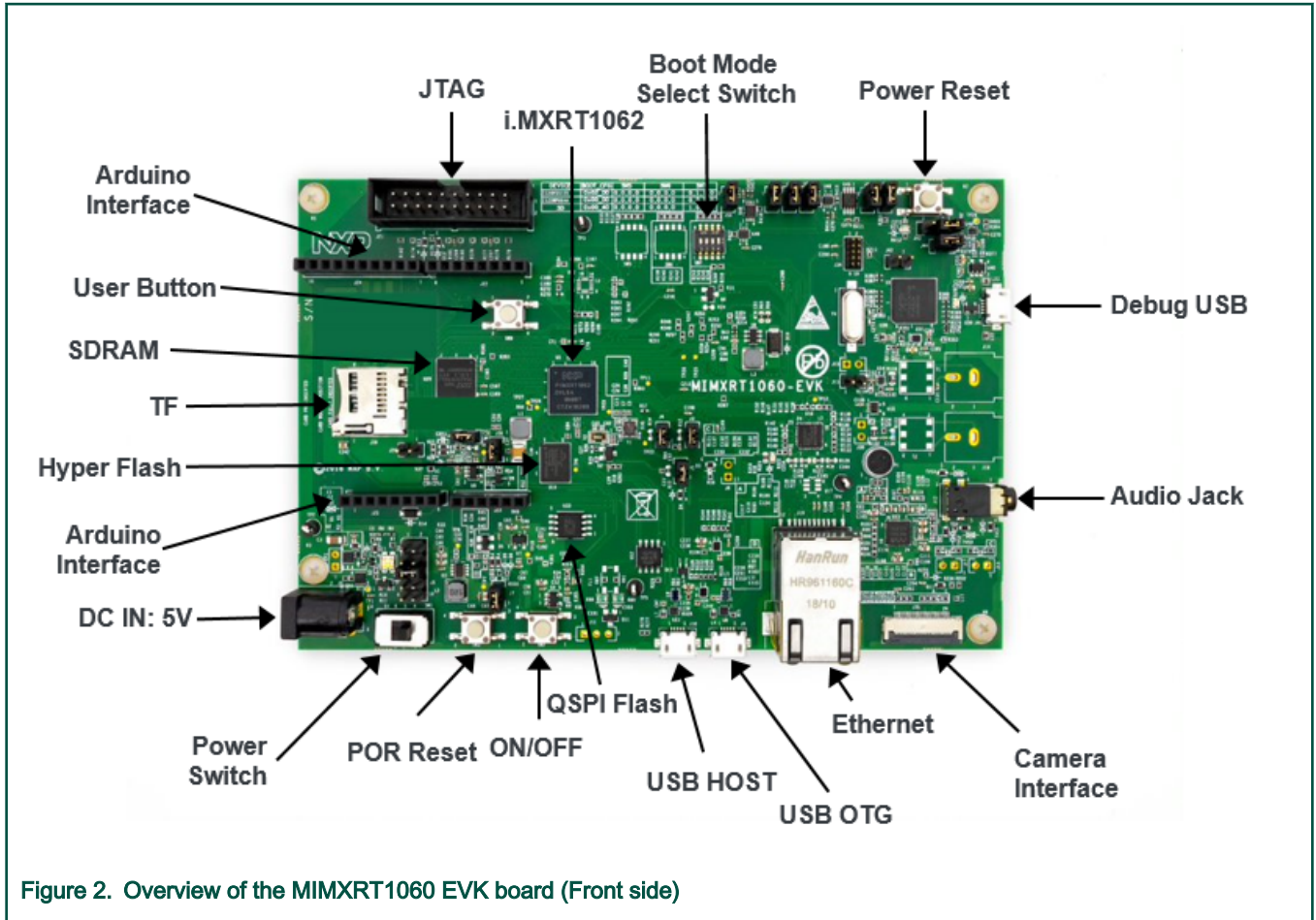


Figure 2. Overview of the MIMXRT1060 EVK board (Front side)

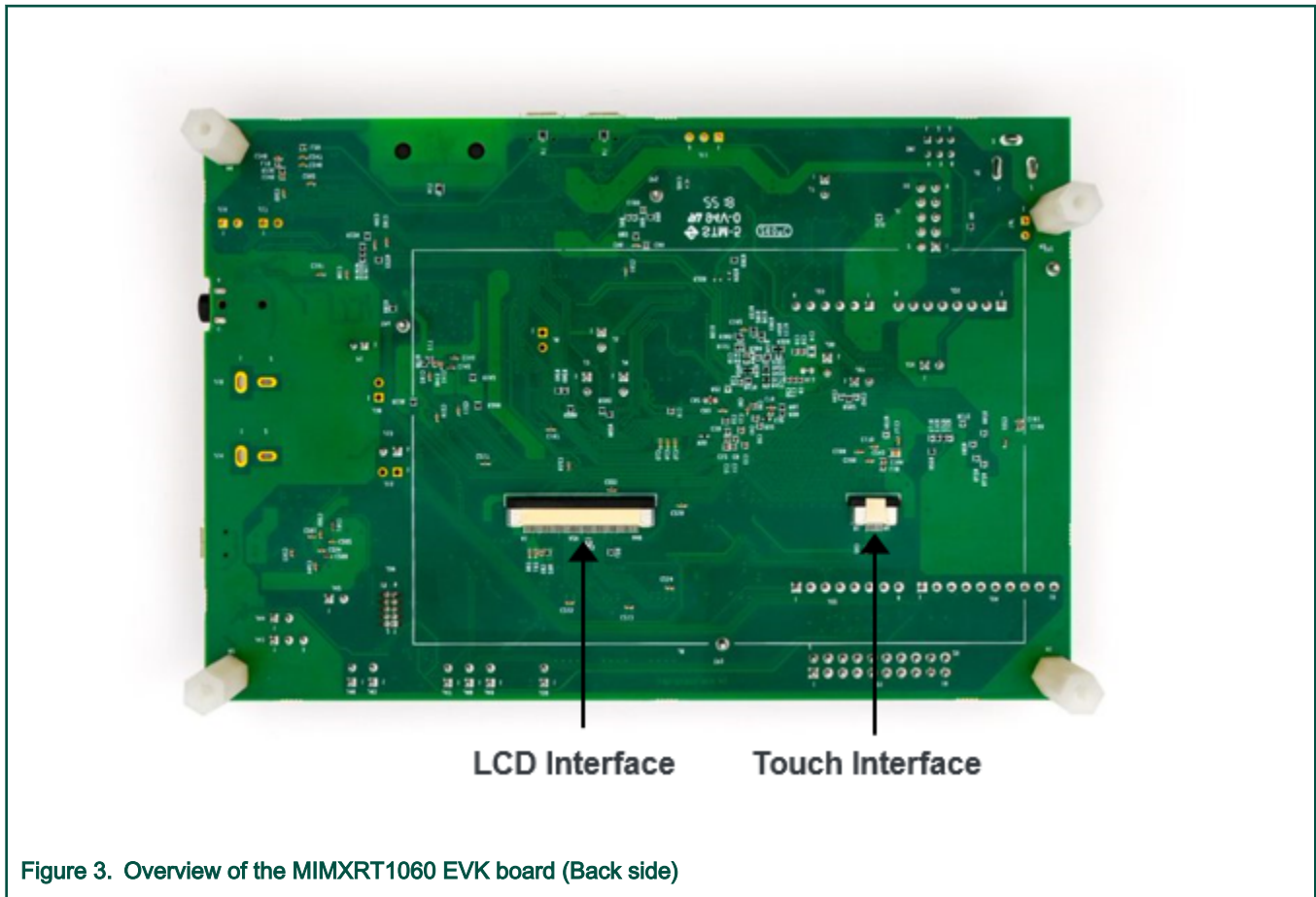


Figure 3. Overview of the MIMXRT1060 EVK board (Back side)

2.1 i.MX RT1060/1064 processor

The i.MX RT1060/1064 is a new processor family featuring NXP advanced implementation of the Arm Cortex-M7 Core. It provides high CPU performance and best real-time response. i.MX RT1060/1064 provides various memory interfaces, including SDRAM, Raw NAND flash, NOR flash, SD/eMMC, Quad SPI, HyperBus, and a wide range of other interfaces for connecting peripherals, such as WLAN, Bluetooth™, GPS, displays, and camera sensors. i.MX RT1060/1064 has rich audio and video features, including LCD display, basic 2D graphics, camera interface, S/PDIF, and I2S audio interface.

The i.MX RT1060/1064 applications processor can be used in areas such as industrial HMI, IoT, motor control, and home appliances. The flexibility of the architecture enables it to be used in a wide variety of other general embedded applications too. The i.MX RT processor provides all interfaces necessary to connect peripherals such as WLAN, Bluetooth™, GPS, camera sensors, and multiple displays.

The more detail information about i.MX RT1060/1064 can be found in the [Datasheet and Reference Manual](#).

2.2 Boot mode configurations

The device has four boot modes (one is reserved for NXP use). The boot mode is selected based on the binary value stored in the internal BOOT_MODE register.

Switch (SW7-3 and SW7-4) is used to select the boot mode on the MIMXRT1060/1064 EVK board.

Table 2. Boot mode pin settings

BOOT_MODE[1:0] (SW7-3 SW7-4)	BOOT Type
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Table continues on the next page...

Table 2. Boot mode pin settings (continued)

00	Boot From Fuses
01	Serial Downloader
10	Internal Boot
11	Reserved

Typically, the internal boot is selected for normal boot, which is configured by external BOOT_CFG GPIOs. [Table 3](#) shows the typical Boot Mode and Boot Device settings.

Table 3. Typical boot mode and boot device settings for RT1060

SW7-1	SW7-2	SW7-3	SW7-4	Boot Device
OFF	ON	ON	OFF	Hyper flash
OFF	OFF	ON	OFF	QSPI flash
ON	OFF	ON	OFF	SD card

NOTE

For more information about boot mode configuration, see the System Boot chapter of the [MIMXRT1060 Reference Manual](#).

For more information about MIMXRT1060 EVK boot device selection and configuration, see the [main board schematic](#).

Table 4. Typical boot mode and boot device settings for RT1064

SW7-1	SW7-2	SW7-3	SW7-4	Boot Device
OFF	OFF	ON	OFF	QSPI flash
ON	OFF	ON	OFF	SD card

2.3 Power tree

A DC 5 V external power supply is used to supply the MIMXRT1060/1064 EVK board at J2, and a slide switch SW1 is used to turn the Power ON/OFF. J41 and J9 is used to supply the EVK board.

[Table 5](#) lists different J1 jumper settings for different power supply.

Table 5. Jumper settings for power supply

Power Supply	J1 Setting
J2	1-2
J9	3-4
J41	5-6

The power tree is shown in the following figure.

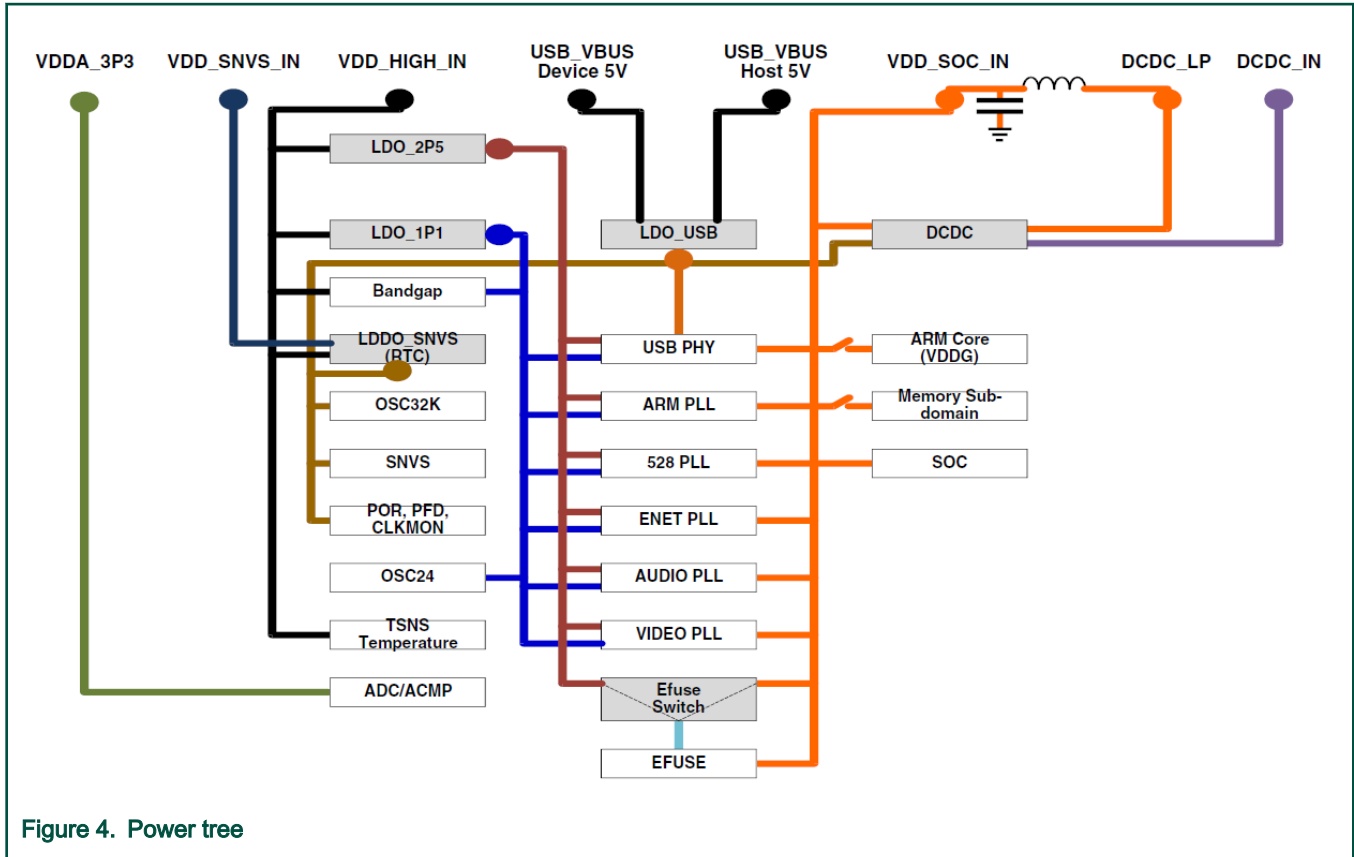


Figure 4. Power tree

The power control logic of the MIMXRT1060/1064 EVK board is shown in the [Figure 5](#).

- SNVS is powered first and then PMIC_REQ_ON is switched on to enable external DC/DC to power up other power domains.
- ON/OFF button is used to switch ON/OFF PMIC_REQ_ON to control power modes.
- RESET button and WDOG output are used to reset the system power.

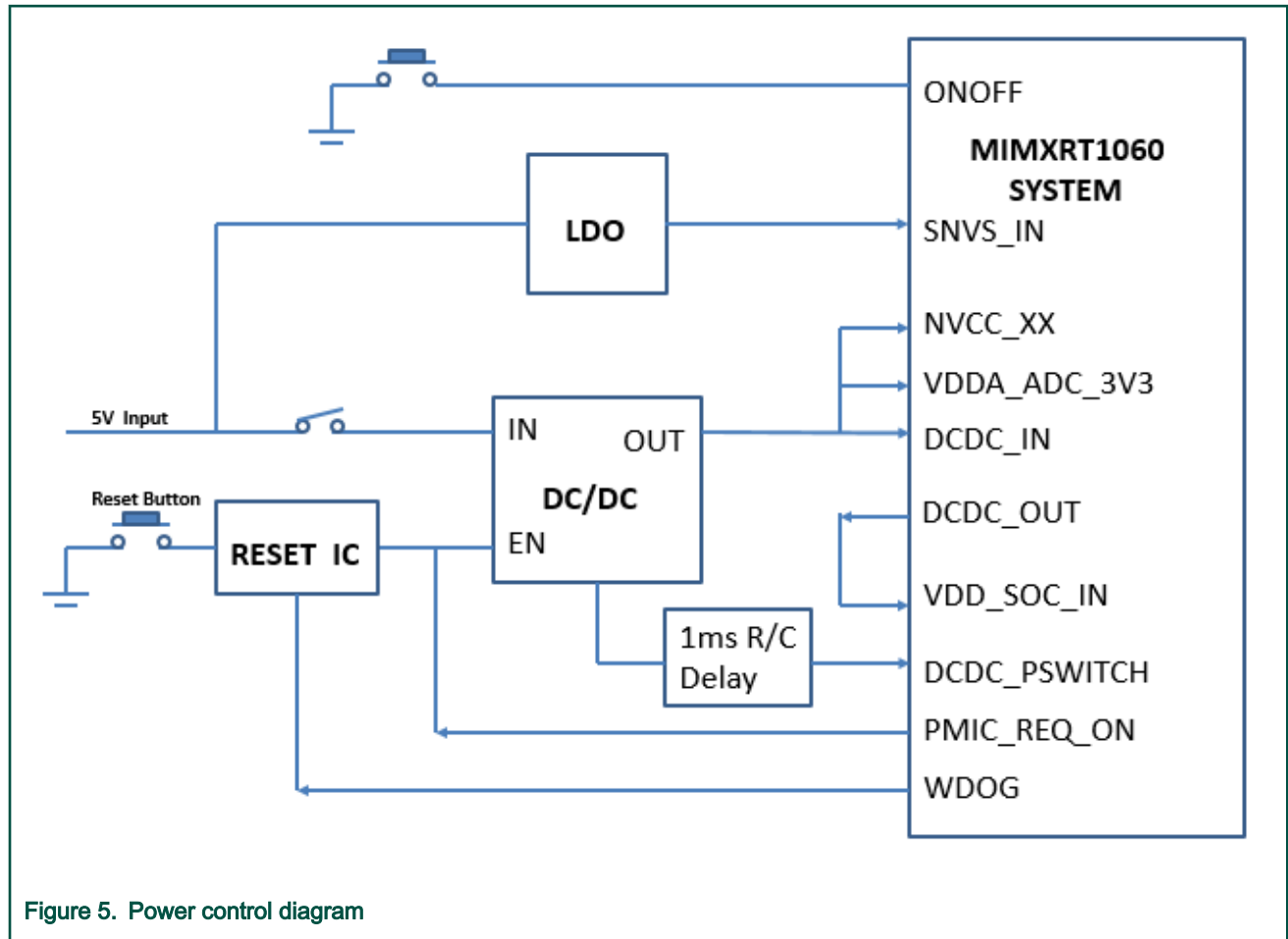


Figure 5. Power control diagram

The power rails on the board are shown in [Table 6](#).

Table 6. Power rails

Power Rail	MIN (V)	TYP (V)	MAX (V)	Description
VDD_SOC_IN	0.925	--	1.3	Core supplies input voltage
VDD_HIGH_IN	3	3.3	3.7	VDD_HIGH_IN supply voltage
DCDC_IN	3	3.3	3.6	Power for DCDC
VDD_SNVS_IN	2.4	3	3.6	Power for SNVS and RTC
USB_OTG1_VBUS USB_OTG2_VBUS	4.4	5	5.5	Power for USB VBUS
VDDA_ADC	3	3.3	3.6	Power for 12-bit ADC

Table continues on the next page...

Table 6. Power rails (continued)

Power Rail	MIN (V)	TYP (V)	MAX (V)	Description
NVCC_SD0	3	3.3	3.6	Power for GPIO in SDIO1 bank (3.3 V mode)
	1.65	1.8	1.95	Power for GPIO in SDIO1 bank (1.8 V mode)
NVCC_SD1	3	3.3	3.6	Power for GPIO in SDIO2 bank (3.3 V mode)
	1.65	1.8	1.95	Power for GPIO in SDIO2 bank (1.8 V mode)
NVCC_EMC	3	3.3	3.6	IO supply for GPIO in EMC bank (3.3 V mode)
	1.65	1.8	1.95	IO supply for GPIO in EMC bank (1.8 V mode)
NVCC_GPIO	3	3.3	3.6	IO power for GPIO

2.4 SDRAM memory

256 Mbit, 166 MHz SDRAM (IS42S16160J-6BLI) is used on the EVK board.

2.5 SD card slot

There is an SD card slot (J39) on the MIMXRT1060/1064 EVK board. J39 is the Micro SD slot for USDHC1 interface. To boot from the SD card, the boot device switch (SW7) settings should be: ON, OFF, ON, OFF, as shown in [Typical boot mode and boot device settings](#).

2.6 Hyper flash

On the MIMXRT1060/1064 EVK board, there is one 512 Mbit hyper flash device. To boot from the Hyper Flash, the boot device switch (SW7) settings should be: OFF, ON, ON, OFF, as shown in [Table 3](#). By default, this hyper flash is disabled on the EVK.

To enable the onboard hyper flash, update the following settings.

1. Weld resistors: R356, R361 - R366.
2. Removed 0Ω resistors: R153 - R158.

NOTE

The boot from hyper flash only supports RT1060.

2.7 QSPI flash

A 64 Mbit QSPI flash is used on the MIMXRT1060/1064 EVK board. If the developer wants to boot from the QSPI flash, the boot device switch (SW7) settings should be: OFF, OFF, ON, OFF, as shown in [Table 3](#). The QSPI flash is the default onboard flash.

NOTE

The boot from QSPI flash only supports RT1060.

2.8 Ethernet connector

There are two Ethernet Mac controllers in the MIMXRT1060/1064 processor. The Ethernet subsystem of the MIMXRT1060/1064 EVK board is provided by the KSZ8081RNB 10/100 M Ethernet Transceiver (U16) and an RJ45 (J19) with integrated magnetic.

2.9 USB PHY connector

MIMXRT1060/1064 contains two integrated USB 2.0 PHYs capable of connecting USB host/device systems at:

- USB low-speed (LS) rate of 1.5 Mbits/s
- USB full-speed (FS) rate of 12 Mbits/s
- USB 2.0 high-speed (HS) rate of 480 Mbits/s

2.10 Audio input/output connector

The audio codec used on the MIMXRT1060/1064 EVK board is Wolfson's low power, high-quality stereo codec, WM8960.

The MIMXRT1060/1064 EVK board includes:

- one headphone interface (J12)
- one onboard MIC (P1)
- two speaker interfaces (J16, J17)
- S/PDIF interface (J14 and J18, DNP).

NOTE

J12 is a 3.5 mm audio-stereo headphone jack, which supports jack detect.

2.11 OpenSDA circuit (DAP-Link)

The OpenSDA circuit (CMSIS-DAP) is an open-standard serial and debug adapter. It bridges serial and debug communications between a USB host and an embedded target processor.

CMSIS-DAP features a mass storage device (MSD) bootloader, which provides a quick and easy mechanism for loading different CMSIS-DAP applications such as flash programmers, run-control debug interfaces, serial-to-USB converters, and more.

Two or more CMSIS-DAP applications can run simultaneously. For example, run-control debug application and serial-to-USB converter run in parallel to provide a virtual COM communication interface while allowing code debugging via CMSIS-DAP with single USB connection.

For the MIMXRT1060/1064 EVK board, J41 is the connector between the USB host and the RT1060/1064. To update the Open SDA firmware, press the SW8 and Power on the board. There is a disk named "MAINTENANCE". Drag/drop the new firmware to the "MAINTENANCE" and re-power the board. The firmware is updated.

2.12 JTAG connector

J21 is a standard 20-pin/2.54 mm box header connector JTAG. The pin definitions are shown in [Figure 6](#). It supports SWD by default.

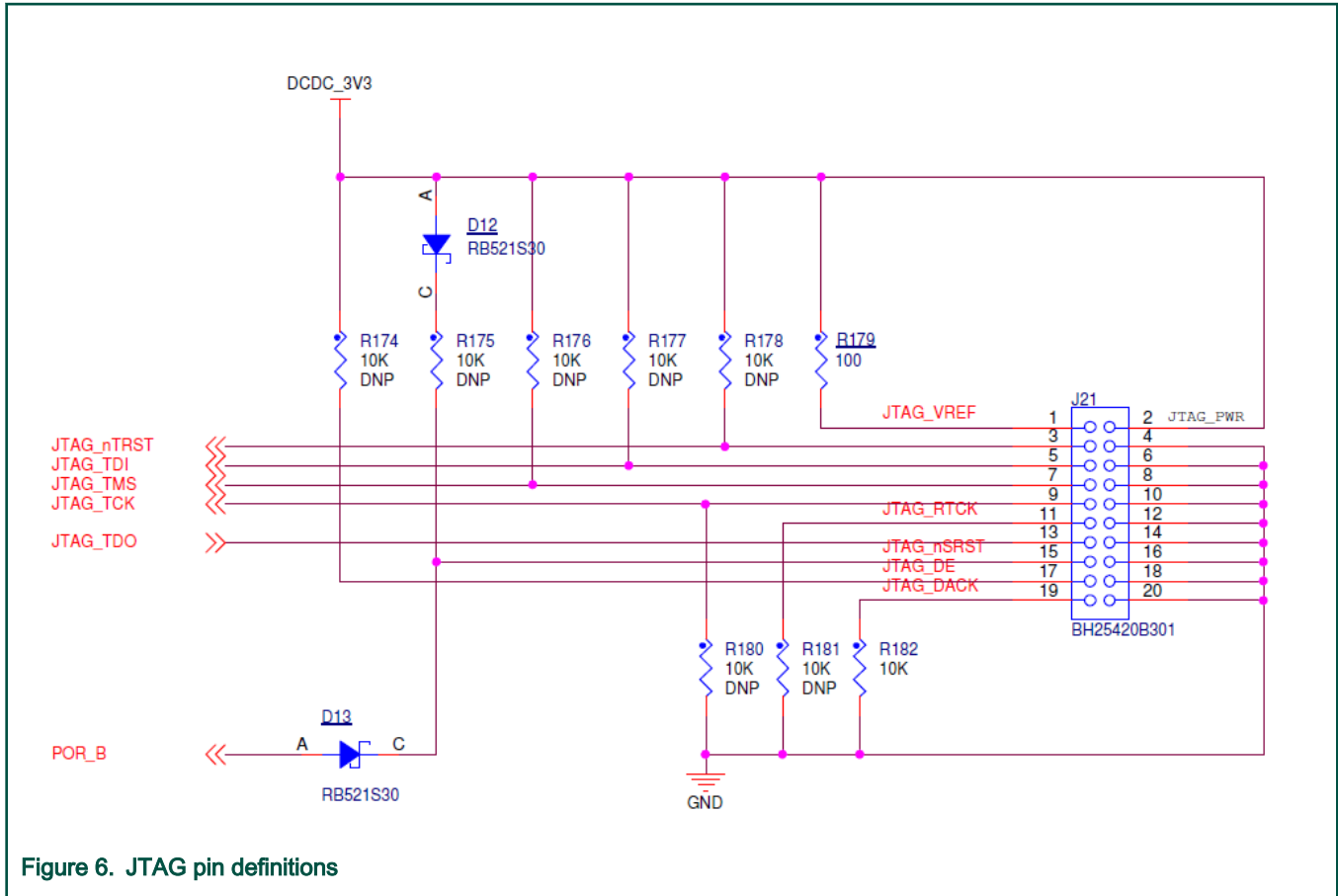


Figure 6. JTAG pin definitions

NOTE

To use the JTAG port, remove J47 and J48.

2.13 Arduino expansion port

J22 – J25 is defined as Arduino interface. Table 7 lists the pin definitions of Arduino interface.

Table 7. Arduino Interface pin definitions

J22	J23
UART_RX/D0	A0/ADC0
UART_TX/D1	A1/ADC1
D2/INT0	A2/ADC2
D3/INT1/PWM/OC2B	A3/ADC3
D4/T0/XCK	A4/ADC4/SDA
D5/T1/PWM	A5/ADC5/SCL
D6/AIN0/PWM/OC0A	
D7/AIN1/PWM	

J24	J25
D8/CLKO/ICP1	NC
D9/OC1A/PWM	IOREF
D10/SPI_CS	RESET
D11/OC2A/PWM/SPI_MOSI	3.3 V
D12/SPI_MISO	5 V
D13/SPI_CLK	GND
GND	GND
AREF	
D14/I2C_SDA	
D15/I2C_SCL	

2.14 Camera module connector

i.MX RT1060/1064 supports one parallel CSI (Camera Sensor Interface). There is a camera module connector (J35) on the MIMXRT1060/1064 EVK board. The CA031C based on OV7725 and CA111C based on MT9M114 are used directly.

NOTE

J35 supports both MT9M114 and OV7725 camera module, but 3.3 V is a violation to MT9M114 spec 3.1 V. It proved fine for evaluation/demo with 3.3 V supply, but in product design, it is recommended to adjust DCDC output or add level shifter.

2.15 User interface switch

There are four user interface switches on the MIMXRT1060/1064 EVK board.

- [Power switch](#)
- [ON/OFF button](#)
- [Reset button](#)
- [USER button](#)

2.15.1 Power switch

SW1 is a slide switch to control the power of the MIMXRT1060/1064 EVK board when the power supply is from J2.

- Sliding the switch to the ON position connects the 5 V power supply to the evaluation board main power system.
- Sliding the switch to the OFF position immediately removes all power from the board.

2.15.2 ON/OFF button

SW2 is the ON/OFF button for MIMXRT1060/1064 EVK board. A short pressing in OFF mode causes the internal power management state machine to change state to ON. In ON mode, a short pressing generates an interrupt as a software-controllable power-down. An approximate 5 seconds or more pressing causes a forced OFF. However, you can disconnect both the boot mode inputs.

2.15.3 Reset button

There are two Reset buttons on the EVK board. SW3 is the power-on reset button. Pressing SW3 in the power on state forces to reset the system power except SNVS domain. The processor immediately turns off and reinitiates a boot cycle from the processor power off state. SW9 is a reset button.

2.15.4 USER button

SW8 is a USER button (GPIO5-00). Pressing the USER button can produce changes in high and low levels.

2.16 Sensor

U32 on the EVK board is a 6-Axis Ecompass (3-Axis Mag, 3-Axis Accel) sensor FXOS8700CQ. The Ecompass is connected to i.MX RT1060/1064 I2C1 port.

NOTE

The sensor is not populated on some boards.

2.17 User interface LED indicator

There are four LED status indicators on the EVK board.

The functions of these LEDs include:

- Main Power Supply (D3)
 - Green: DC 5 V main supply is normal.
 - Red: J2 input voltage is over 5.6 V.
 - Off: Board is not powered.
- Reset RED LED (D21)
- OpenSDA LED (D20)
- USER LED (D18)

2.18 LCD interface

The enhanced Liquid Crystal Display Interface (eLCDIF) is a general-purpose display controller.

The eLCDIF block supports the following:

- Displays that support moving pictures and require the RGB interface mode (DOTCLK interface).

The eLCDIF provides fully programmable functionality to supported interfaces:

- Bus master interface to source frame buffer data for display refresh.
- 8/16/18/24/32 bit LCD data bus support available depending on I/O MUX options.
- Programmable timing and parameters for DOTCLK LCD interfaces.

To use the LCD, NXP provides an optional LCD module RK043FN02H-CT. RK043FN02H-CT has a 4.3 inches touch screen and supports a resolution of up to 480*3(RGB)*272. This module contains two FPC cables. The LCD interface is connected to J8 (A1-A40) and the CPT interface can be connected to J8 (B1-B6). You can purchase LCD modules from www.nxp.com.

Chapter 3

PCB information

The MIMXRT1060/1064 EVK board uses the standard 4-layer technology. The material used is FR-4. The PCB stack-up information is shown in [Table 8](#).

Table 8. Board stack-up information

Layer	Description	Copper(Oz)	Dielectric Thickness(mil)
1	Signal	1	—
	Dielectric	—	3
2	GND	1	—
	Dielectric	—	52
3	Power	1	—
	Dielectric	—	3
4	Signal	1	—

Chapter 4

EVK design files

You can download, the schematics, layout files, and gerber files (including Silkscreen) from nxp.com/MIMXRT1060-EVK.

Chapter 5

EVK contents

The following table lists the contents on the evaluation kit.

Table 9. EVK contents

Item	Description
EVK board	EVK board with processor, memory, interfaces and so on.
USB cable	USB cable (Micro-B to Standard-A).
Camera	CA111C based on MT9M114.

NOTE

Power adapter, micro-SD card, and LCD module are not standard parts of the evaluation kit.

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