AN12878
Migration Guide from i.MX RT1020 to i.MX RT1024

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1 Introduction

The i.MX RT1024 processor contains 4 MB on-chip flash and 256 KB on-chip RAM. Different from the i.MX RT1020, i.MX RT1024 is embedded with one 4 MB QSPI flash, which helps customers to save the space and simply circuit design.

This document intends to introduce how to migrate from i.MX RT1020 to i.MX RT1024 from system point of view.

2 Feature comparison

The i.MX RT1024 combines the i.MXRT1020 and one 4 MB QSPI flash in chip. Table1 listed the function comparison between RT1020 and RT1024.

During the migration, be aware of the following items:

- The i.MX RT1024 chip can't directly replace the i.MXRT1020 chip.

- The i.MX RT1024 can boot from the internal QSPI flash only while the i.MXRT1020 can boot from external flash.

Table 1. RT1020 vs RT1024

	RT1020	RT1024
Package	144LQFP	144LQFP
Frequency	500 MHz, consumer grade 396 MHz, Industrial grade	500 MHz, consumer grade 396 MHz, Industrial grade
RAM	256 KB	256 KB
Flash	NA	4 MB
CAN	2	2
Ethernet	1	1
1588 EVENT	4	2
eMMC4.5/SD3.0	2	2
USB OTG	1	1
SAI	3	3
SPDIF	1	1
Timer	2	2
PWM	2	2
KPP	8 × 8	5 × 5

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Table 1. RT1020 vs RT1024 (continued)

	RT1020	RT1024
UART	8	8
I^{2}C	4	4
SPI	4	4
ADC	2	2
ACMP	4	4
GPIO	96	90

3 Boot option change

The i.MX RT1020 and i.MX RT1024 take different XIP boot options, which means they boot by different FlexSPI pin group. The i.MX RT1020 can use three options for FlexSPI and i.MXRT1024 uses only one option.

Please see following tables for the differences on boot pins.

Table 2 and Table 3 describe the XIP boot pins for i.MXRT1020 and i.MXRT1024.

Table 2. i.MXRT1020 XIP boot options

Peripheral	Port (IO function)	PAD	Description
FlexSPI	FLEXSPI_B_DATA3	GPIO_SD_B1_00	Boot option to connect the external XIP flash, such as, QSPI flash, Octal flash and Hyper flash, and so on.
	FLEXSPI_B_DATA2	GPIO_SD_B1_03	
	FLEXSPI_B_DATA1	GPIO_SD_B1_04	
	FLEXSPI_B_DATA0	GPIO_SD_B1_02	
	FLEXSPI_B_SCLK	GPIO_SD_B1_01	
	FLEXSPI_B_DQS	GPIO_SD_B0_05	
	FLEXSPI_B_SS0_B	GPIO_SD_B0_04	
	FLEXSPI_B_SS1_B	GPIO_SD_B0_01	
	FLEXSPI_A_DQS	GPIO_SD_B1_05	
	FLEXSPI_A_SS0_B	GPIO_SD_B1_11	
	FLEXSPI_A_SS1_B	GPIO_SD_B0_00	
	FLEXSPI_A_SCLK	GPIO_SD_B1_07	
	FLEXSPI_A_DATA0	GPIO_SD_B1_08	
	FLEXSPI_A_DATA1	GPIO_SD_B1_10	
	FLEXSPI_A_DATA2	GPIO_SD_B1_09	

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Table 2. i.MXRT1020 XIP boot options (continued)

Peripheral	Port (IO function)	PAD	Description
	FLEXSPI_A_DATA3	GPIO_SD_B1_06	
FlexSPI 2nd option	FLEXSPI_A_DATA3	GPIO_AD_B1_00	The other boot option, just available to connect QSPI flash.
	FLEXSPI_A_DATA2	GPIO_AD_B1_03	
	FLEXSPI_A_DATA1	GPIO_AD_B1_04	
	FLEXSPI_A_DATA0	GPIO_AD_B1_02	
	FLEXSPI_A_SCLK	GPIO_AD_B1_01	
	FLEXSPI_A_SS0_B	GPIO_AD_B1_05	

Table 3. i.MXRT1024 XIP boot option

Peripheral	Port (IO function)	PAD	Description
FlexSPI	FLEXSPI_A_DATA3	GPIO_AD_B1_00	Connected to the embedded QSPI flash for booting.
	FLEXSPI_A_DATA2	GPIO_AD_B1_03	
	FLEXSPI_A_DATA1	GPIO_AD_B1_04	
	FLEXSPI_A_DATA0	GPIO_AD_B1_02	
	FLEXSPI_A_SCLK	GPIO_AD_B1_01	
	FLEXSPI_A_SS0_B	GPIO_AD_B1_05	
	FLEXSPI_A_DQS	GPIO_SD_B1_05	

----- NOTE -----

For RT1024 XIP boot option, those PAD is used for internal flash and not available for users.

RT1024 has only one FlexSPI port and is used for internal flash. RT1024 doesn't support external FlexSPI flash, please use internal SIP flash instead.

4 PINMUX changes

During the migration from the i.MX RT1020 to i.MX RT1024, there are PINMUX changes, as shown in Table 4.

Table 4. PINMUX changes

Pin name	Pin number	RT1020	RT1024
GPIO_AD_B1_00	87	Available	NA
GPIO_AD_B1_01	88	Available	NA
GPIO_AD_B1_02	89	Available	NA

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Table 4. PINMUX changes (continued)

Pin name	Pin number	RT1020	RT1024
GPIO_AD_B1_03	90	Available	NA
GPIO_AD_B1_04	91	Available	NA
GPIO_AD_B1_05	92	Available	NA
NVCC_GPIO4	77	Available	NA
NVCC_GPIO5	104	Available	NA

5 EVK pin assignment changes

Please refer to for the changes between i.MX RT1020EVK and i.MX RT1024EVK, it lists the pin assignment change for power, audio and FlexSPI flash.

NOTE

- SEMC SDRAM MAX R/W speed is 133 MHz normally. However, if `GPIO_EMC_28` pin is configured as `SAI3_MCLK`, it can't be configured as `SEMC_DQS` at the same time and the SEMC SDRAM MAX R/W speed will be limited to 66 MHz.

- For RT1024, even if using internal SIP flash, it still needs to leave `GPIO_SD_B1_05` pin floating to achieve the speed of 133 MHz R/W.

Table 5. i.MXRT1020EVK VS i.MXRT1024EVK

i.MX RT1020EVK		i.MX RT1024EVK	
Module	Pin assignment	Module	Pin assignment
SAI1	GPIO_AD_B1_00(SAI1_MCLK)	SAI3	GPIO_EMC_28(SAI3_MCLK)
	GPIO_AD_B1_01(SAI1_T X_BCLK)		GPIO_SD_B1_06(SAI3_TX_BCLK)
	GPIO_AD_B1_02(SAI1_T X_SYNC)		GPIO_SD_B1_07(SAI3_TX_SYNC)
	GPIO_AD_B1_03(SAI1_TXD)		GPIO_SD_B1_08(SAI3_TXD)
	GPIO_AD_B1_04(AUD_INT)		GPIO_SD_B1_09(AUD_INT)
	GPIO_AD_B1_05(SAI1_RXD)		GPIO_SD_B1_11(SAI3_RXD)
FlexSPI	GPIO_SD_B1_05(FlexSPI_DQS_A)	FlexSPI	GPIO_SD_B1_05(FlexSPI_DQS_A)
	GPIO_SD_B1_06(FlexSPI_D3_A)		SIP Flash
	GPIO_SD_B1_07(FlexSPI_CLK)		
	GPIO_SD_B1_08(FlexSPI_D0_A)		
	GPIO_SD_B1_09(FlexSPI_D2_A)		

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Table 5. i.MXRT1020EVK VS i.MXRT1024EVK (continued)

i.MX RT1020EVK		i.MX RT1024EVK	
Module	Pin assignment	Module	Pin assignment
	GPIO_SD_B1_10(FlexSPI_D1_A)		
	GPIO_SD_B1_11(FlexSPI_SS0)		
Power	NVCC_GPIO5	Power	NC
	NVCC_GPIO6		NC

6 Software changes

Due to such hardware resource different between RT1020 and RT1024 mentioned in this document, software need to be updated accordingly as well.

For details, please refer to MCUXpresso SDK release package for RT1024 (https://mcuxpresso.nxp.com)

7 Other changes

There are some other changes from i.MX RT1020 to i.MX RT1024.

1. ENET lost some IEEE1588 function. The impacted signals include:
   - ENET_1588_EVENT2_IN
   - ENET_1588_EVENT2_OUT
   - ENET_1588_EVENT3_IN
   - ENET_1588_EVENT3_OUT

2. GPIOs number decrease from 96 to 90. The impacted signals include:
   - FLEXIO1_FLEXIO10
   - FLEXIO1_FLEXIO11
   - FLEXIO1_FLEXIO12
   - FLEXIO1_FLEXIO13
   - FLEXIO1_FLEXIO14
   - FLEXIO1_FLEXIO15
   - GPIO1_IO16
   - GPIO1_IO17
   - GPIO1_IO18
   - GPIO1_IO19
   - GPIO1_IO20
   - GPIO1_IO21

3. 8 × 8 key board decrease to 5 × 5 key board. The impacted signals include:
   - KPP_COL4
   - KPP_COL5
   - KPP_COL6

- KPP_ROW4

- KPP_ROW5

- KPP_ROW6

4. RT1024 has eight NC pins while comparing with RT1020, ones should make those pins floating in the hardware design. The number for those 8 NC pins are 77, 87-92, and 104.

8 Conclusion

This document introduces how to migrate from the i.MXRT1020 to the i.MXRT1024, which helps customers to move the project to i.MXRT1024 smoothly.

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