NXP Semiconductors
User Guide

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i.MX 8M Nano Soundbar Application Guide

Contents

Chapter 1
Introduction

This document aims to help hardware and system engineers understand how to design soundbar systems with i.MX 8M Nano series processors. It provides support information, an overview of the soundbar system, resources assignment, and use cases for reference.

This guide is released with relevant device-specific hardware documentation, such as datasheets, reference manuals, and application notes. All these documents are available on Evaluation Kit for the i.MX 8M Nano Applications Processor.

1.1 Acronyms and abbreviations

Table 1 defines the acronyms and abbreviations used in this document.

Table 1. Acronyms and abbreviations

Acronym	Definition
ADC	Analog-to-Digital Converter
AP	Application Processor
AUX	Auxiliary
BT	Bluetooth
CA53	Arm Cortex A53 Core
CM7	Arm Cortex M7 Core
DAMP	Digital Audio Amplifier
eARC	Enhanced Audio Return Channel
ECSPI	Enhanced Configurable SPI
EQ	Equalization
GPIO	General-Purpose I/O
GPT	General-Purpose Timer
HDMI	High-Definition Multimedia Interface
HMI	Human-Machine interaction
I^2S	Inter-IC Sound
I^2C	Inter-Integrated Circuit
PCM	Pulse-Code Modulation
RX	Receive
SAI	Synchronous Audio Interface
S/PDIF	Sony/Philips Digital Interface
TX	Transmit
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus

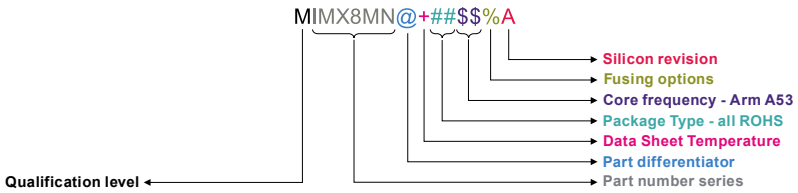
Table continues on the next page...

Table 1. Acronyms and abbreviations (continued)

Acronym	Definition
USDHC	Ultra Secured Digital Host Controller
WAMP	Wireless Audio Streaming Amplifier
WDOG	Watchdog

Chapter 2
Support information

The soundbar application built with i.MX 8M Nano and supported by the NXP Immersiv3D Audio Framework SDK. As the part-number nomenclature is shown in Figure 1, only the parts with specific B, C, and D fusing options can support Immersiv3D. To get the parts, EVK boards, and support of Immersiv3D, consult with the NXP representative.



Qualification level	
Samples	P
Mass Production	M

Part number series	Description
IMX8MN	i.MX 8M Nano

Part differentiator	@
i.MX 8M Nano Quad GPU, 4x A53	6
i.MX 8M Nano QuadLite *i.MX 8M Nano UltraLite Quad No GPU, 4x A53	5
i.MX 8M Nano Dual GPU, 2x A53	4
i.MX 8M Nano DualLite *i.MX 8M Nano UltraLite Dual No GPU, 2x A53	3
i.MX 8M Nano Solo GPU, 1x A53	2
i.MX 8M Nano Solo Lite *i.MX 8M Nano UltraLite Solo No GPU, 1x A53	1

Temperature Tj	+
Consumer: 0 to +95 °C	D
Industrial: -40 to 105 °C	C

Package Type	ROHS
FCBGA486 14 x 14 mm, 0.5 mm pitch	UC
FCBGA306 11 x 11 mm, 0.5 mm pitch	VP

A53 core frequency	$$
1.5 GHz	JZ
1.4 GHz	IZ

Fusing	%
Default	A
Immersiv3D	B
Immersiv3D with Dolby Atmos	C
Immersiv3D with Dolby Atmos & DTS	D

Silicon Rev	A
Rev A0	A

*i.MX 8M Nano UltraLite Quad/Dual/Solo (11 x 11 package) has no MIPI DSI

Figure 1. Part number nomenclature - i.MX 8M Nano family of processors

Chapter 3
Overview of soundbar system

This section gives an overview of the soundbar system.

3.1 Block diagram

To provide Immersive3D surround sound performance in home theater, up-firing and side-firing speakers are introduced in the soundbar system.

Figure 2 shows the functional modules in a typical soundbar system.

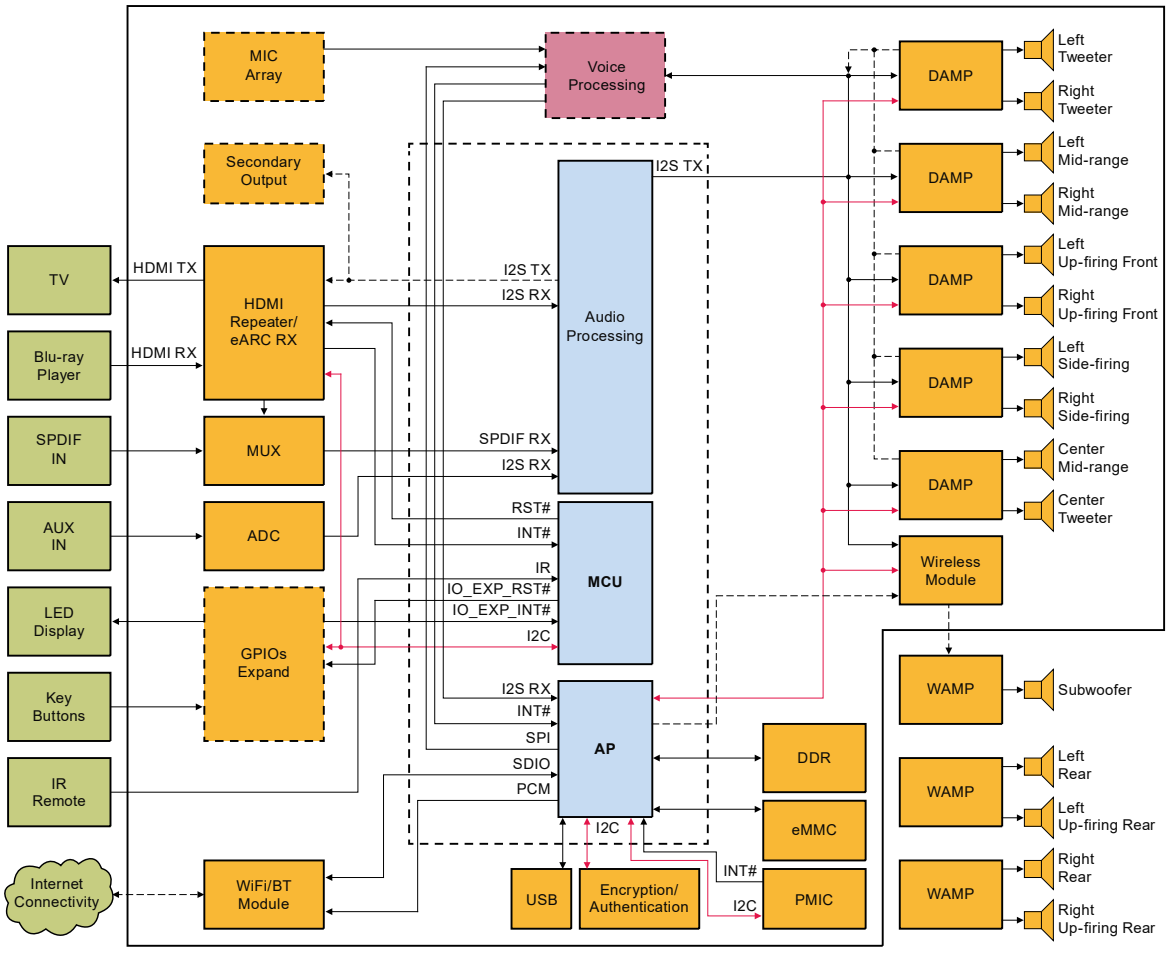


Figure 2. Soundbar system block diagram

3.2 Application Processor (AP)

The AP is used for Internet services, connectivity services, voice services, USB connections, and audio output control.

3.3 Wi-Fi / BT module

The Wi-Fi / BT module provides Internet and wireless connectivity connections.

3.4 Encryption / Authentication module

The Encryption / Authentication module can be connected with I^2C interface for customized or third-party application.

3.5 USB

Besides normal USB applications, the USB port can be used for software download and / or headphone connection.

3.6 MCU

The MCU is used to handle the low-power mode activity management to accomplish the power consumption requirement.

3.7 HMI

HMI provides interactions between humans and machines. In the soundbar system, it includes an LED display, keypad (touch and / or tactile buttons), IR remote, and so on.

3.8 Audio processing

The audio processing module is used to decode kinds of audio streams in different formats, and implement pre-processing and / or post-processing on the audio stream. It shall provide enough audio input and output ports (I^2S or TDM) for the system.

3.9 DAMP and wireless module

The DAMP is used to drive the speakers built inside the soundbar.

The wireless module is used to transmit digital audio data to the wireless speakers built with WAMP. The WiSA compatible transmitter is recommended. Currently, the wireless module cannot transmit audio stream with a sample rate higher than 96 kHz. It is recommended to connecting the wireless module with I^2S / TDM interface different from that for the main speakers.

3.10 Secondary output

The secondary output is used to send down-mixed 2-channel audio stream to an external device, such as a headphone. As an option, the same audio stream can be sent to TV from the `HDMI TX` port too.

3.11 HDMI repeater and eARC receiver

The HDMI repeater is used to extract audio data from the `HDMI RX` port and send it to the audio processing module. The video data (or together with the processed audio data) has to be looped back from the `HDMI TX` port.

The eARC receiver is used to receive the audio data returned from the TV and send it to the audio processing module.

3.12 S/PDIF-IN and AUX-IN

S/PDIF-IN is used to input digital audio signal from an external device. The S/PDIF input signal can be sent into the audio processing module directly.

AUX-IN is used for analog audio input. The analog audio signal must be converted into PCM data and sent to the audio processing module with `I2S IF` by the ADC.

3.13 Voice processing

The voice processing module is used to provide voice services, such as AEC, key work triggering, voice command recognition.

The voice processing module is connected to the microphone array with `PDM IF`. The reference input channels for voice processing come from the main stream output of the audio processing module or the output of the DAMP. The processed voice data is sent to the AP with `I2S IF`. The configuration setting and commands are sent between the AP and the voice processing module with `SPI IF`.

For more details about the voice processing, contact the NXP support team.

Chapter 4
Resources assignment

i.MX 8M Nano is a heterogeneous multicore system built with Cortex-A53 and Cortex-M7. The A53 and M7 cannot handle the same resource at the same time, the inter-core communication shall be enabled with RPMsg instead. The Immersiv3D is run on Jailhouse Hypervisor, and it cannot handle the resource at the same time with Linux also, and RPMsg shall be used for the same reason. Resources assignment for A53, M7, and Immersiv3D shall not cause any operating conflict.

The concept of the resources assignment is listed below.

- Support as many speakers as possible to meet different system configurations in practice.
- Avoid conflict between A53, M7, and Immersiv3D.
- To meet the power consumption requirement.

4.1 I²C

Basically, `I2C1` is reserved for PMIC control which is handled by A53 / Linux, and it might be used for low-load connections in case the loading on other I²C interfaces is too heavy.

`I2C2` is used for encryption / authentication application that is handled by A53 / Linux, it is also used for DAMPs configuration, such as volume control. Since it has many DAMPs in the system, `I2C3` is assigned for DAMPs and wireless module also. Normally, `I2C2` and `I2C3` is handled by A53 / Linux.

`I2C4` is assigned for HDMI repeater / eARC receiver and HMI devices (such as LED display and IO expanded for key buttons) that shall be alive in standby mode and must be handled by M7 / SDK to accomplish the low-power consumption requirement. For the assignment of I²C modules, see Table 2.

Table 2. I²C assignment

Instance	Port name	PAD assigned	MUX	Power group	Function description
I2C1	I2C1_SCL	I2C1_SCL	ALT0	NVCC_I2C/3V3	PMIC, low loading connections
	I2C1_SDA	I2C1_SDA	ALT0		
I2C2	I2C2_SCL	I2C2_SCL	ALT0		Encryption / Authentication, DAMP
	I2C2_SDA	I2C2_SDA	ALT0		
I2C3	I2C3_SCL	I2C3_SCL	ALT0		DAMP, Wireless Module
	I2C3_SDA	I2C3_SDA	ALT0		
I2C4	I2C4_SCL	I2C4_SCL	ALT0		HDMI / eARC, LED Display and IO Expand
	I2C4_SDA	I2C4_SDA	ALT0		

4.2 SAI

`SAI2 RX` is assigned to receive voice data stream from the voice processing module. `SAI6` is used as `PCM IF` for the Wi-Fi / BT module. `SAI7 RX` is assigned for the `AUX_IN ADC`. The `SAI5 RX` with four data lanes is assigned for the HDMI repeater / eARC receiving to support high definition and multi-channel audio stream.

`SAI7 TX` can be assigned as the secondary output and / or input audio source of `HDMI TX`.

To support as many speakers as possible, SAI2 TX together with SD2 IF are multiplexed as SAI5 TX with four data lanes. SAI3_RXD is multiplexed as SAI3_TX_DATA1 to compose SAI3 TX with two data lanes, including the SAI7 TX with one data lane. 7 SAI TX data lanes in total are available to support 14 speakers in I²S mode or as many as 28 speakers in TDM4 mode. For the assignment of SAI modules, see Table 3.

Table 3. SAI assignment

Instance	Port name	PAD assigned	MUX	Power group	Function description
SAI2	SAI2_RX_SYNC	SAI2_RXFS	ALT0	NVCC_SAI2/3V3	2ch I²S input from voice processor
	SAI2_RX_BCLK	SAI2_RXC	ALT0		
	SAI2_RX_DATA0	SAI2_RXD0	ALT0		
SAI3	SAI3_TX_SYNC	SAI3_TXFS	ALT0	NVCC_SAI3/3V3	4-channel I²S or 8-channel TDM4 output for DAMP / wireless module or second output / HDMI input
	SAI3_TX_BCLK	SAI3_TXC	ALT0		
	SAI3_TX_DATA0	SAI3_TXD	ALT0		
	SAI3_TX_DATA1	SAI3_RXD	ALT3		
SAI5	SAI5_RX_SYNC	SAI5_RXFS	ALT0	NVCC_SAI5/3V3	8-channel I²S input for HDMI / eARC
	SAI5_RX_BCLK	SAI5_RXC	ALT0		
	SAI5_RX_DATA0	SAI5_RXD0	ALT0		
	SAI5_RX_DATA1	SAI5_RXD1	ALT0		
	SAI5_RX_DATA2	SAI5_RXD2	ALT0		
	SAI5_RX_DATA3	SAI5_RXD3	ALT0		
	SAI5_MCLK	SAI5_MCLK	ALT0	NVCC_SAI5/3V3	8-channel I²S or 16-channel TDM4 output for DAMP / wireless module or second output / HDMI Input
	SAI5_TX_SYNC	SD2_DATA1	ALT1	NVCC_SD2/3V3	
	SAI5_TX_BCLK	SD2_DATA2	ALT1		
	SAI5_TX_DATA0	SD2_DATA3	ALT1		
	SAI5_TX_DATA1	SAI2_TXFS	ALT1	NVCC_SAI2/3V3	
	SAI5_TX_DATA2	SAI2_TXC	ALT1		
	SAI5_TX_DATA3	SAI2_TXD0	ALT1		
SAI6	SAI6_TX_DATA0	ENET_MDC	ALT2	NVCC_ENET/3V3	PCM IF for Wi-Fi / BT that is 1.8 V level signal normally, level shifter shall be added
	SAI6_TX_SYNC	ENET_MDIO	ALT2		
	SAI6_TX_BCLK	ENET_TD3	ALT2		

Table continues on the next page...

Table 3. SAI assignment (continued)

Instance	Port name	PAD assigned	MUX	Power group	Function description
	SAI6_RX_DATA0	ENET_TD2	ALT2		
SAI7	SAI7_TX_DATA0	ENET_TXC	ALT2	NVCC_ENET/3V3	2-channel I^2S or 4-channel TDM4 output for DAMP / wireless, or second Output / HDMI Input
	SAI7_TX_SYNC	ENET_RX_CTL	ALT2		
	SAI7_TX_BCLK	ENET_RXC	ALT2		
	SAI7_RX_DATA0	ENET_RD0	ALT2	NVCC_ENET/3V3	2-channel I^2S input for AUX_IN ADC
	SAI7_RX_SYNC	ENET_RD1	ALT2		
	SAI7_RX_BCLK	ENET_RD2	ALT2		
	SAI7_MCLK	ENET_RD3	ALT2		

When different SAI modules are used to drive speakers in the same phase, they shall be connected in synchronization. Figure 3 shows how SAI5 and SAI3 TX modules are connected in sync by setting SAI5 TX as master mode and SAI3 TX module as slave mode. SAI5_TX_SYNC and SAI5_TX_BCLK are set as outputs while SAI3_TX_SYNC and SAI3_TX_BCLK are set as inputs. SAI5_TX_SYNC / SAI5_TX_BCLK is used to drive SAI3_TX_SYNC / SAI3_TX_BCLK and SYNC / BCLK inputs of all DAMPs.

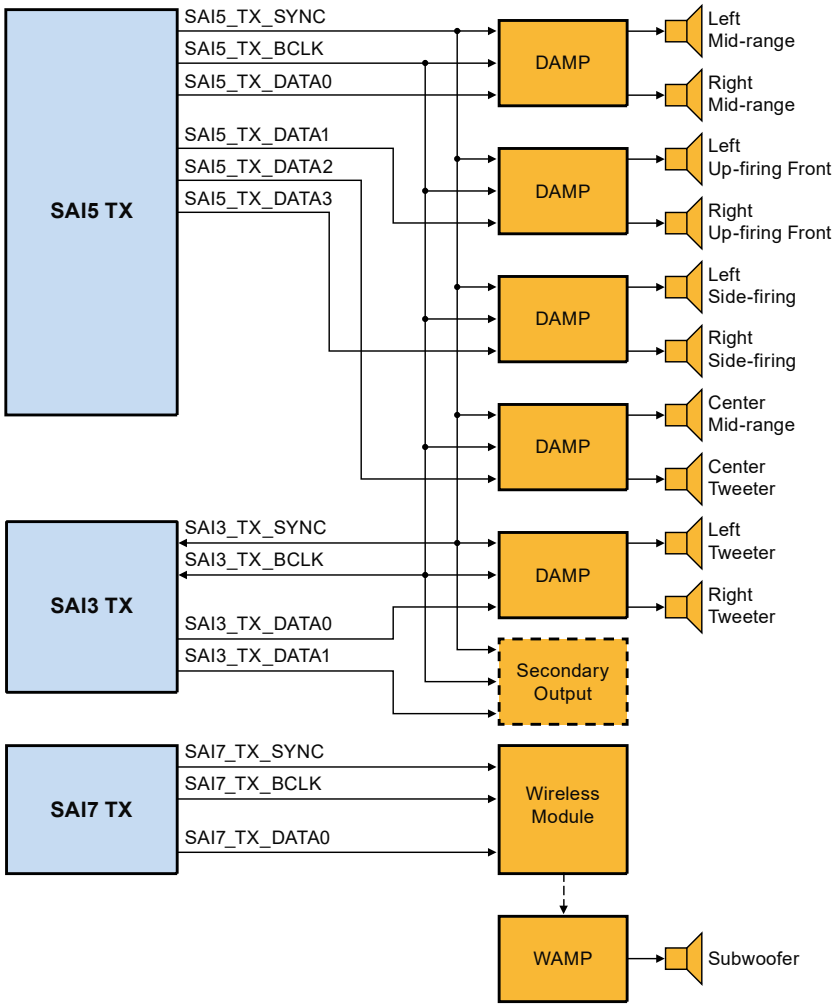


Figure 3. SAI TX modules synchronized connection

4.3 GPIO

Since the resources in the same instance cannot be handled by A53 / Linux, M7 / SDK and Immersiv3D at the same time, GPIO1, and GPIO2 are reserved for A53 / Linux. GPIO3 and GPIO4 are reserved for A53 / Linux (in case M7 is unused) or M7 / SDK, and GPIO5 is reserved for Immsiv3D to prevent conflict. For assignment of GPIO groups, see Table 4.

Table 4. GPIO assignment

Instance	Port name	PAD assigned	MUX	Power group	Function description
GPIO1	GPIO1_IO01	GPIO1_IO01	ALT0	NVCC_GPIO1/1V8	For A53 / Linux
	GPIO1_IO03	GPIO1_IO03	ALT0		PMIC_nINT from PMIC
	GPIO1_IO04	GPIO1_IO04	ALT0		For A53 / Linux
	GPIO1_IO05	GPIO1_IO05	ALT0		

Table continues on the next page...

Table 4. GPIO assignment (continued)

Instance	Port name	PAD assigned	MUX	Power group	Function description
	GPIO1_IO06	GPIO1_IO06	ALT0		
	GPIO1_IO07	GPIO1_IO07	ALT0		
	GPIO1_IO08	GPIO1_IO08	ALT0		
	GPIO1_IO09	GPIO1_IO09	ALT0		
	GPIO1_IO10	GPIO1_IO10	ALT0		
	GPIO1_IO11	GPIO1_IO11	ALT0		
	GPIO1_IO12	GPIO1_IO12	ALT0		
	GPIO1_IO13	GPIO1_IO13	ALT0		
	GPIO1_IO14	GPIO1_IO14	ALT0		
	GPIO1_IO15	GPIO1_IO15	ALT0		
	GPIO1_IO20	ENET_TD1	ALT5	NVCC_ENET/3V3	For A53 / Linux
	GPIO1_IO21	ENET_TD0	ALT5		
	GPIO1_IO22	ENET_TX_CTL	ALT5		
GPIO2	GPIO2_IO06	SD1_DATA4	ALT5	NVCC_SD1/1V8	BT_REG_ON for BT
	GPIO2_IO07	SD1_DATA5	ALT5		BT_WAKE_DEV for BT
	GPIO2_IO08	SD1_DATA6	ALT5		BT_WAKE_HOST for BT
	GPIO2_IO09	SD1_DATA7	ALT5		WL_WAKE_HOST for Wi-Fi
	GPIO2_IO10	SD1_RESET_B	ALT5		WL_REG_ON for Wi-Fi
	GPIO2_IO11	SD1_STROBE	ALT5		For A53 / Linux
	GPIO2_IO12	SD2_CD_B	ALT5	NVCC_SD2/3V3	Do not pull up externally
	GPIO2_IO13	SD2_CLK	ALT5		Escaped out as test points for manufacture mode
	GPIO2_IO14	SD2_CMD	ALT5		
	GPIO2_IO15	SD2_DATA0	ALT5		
	GPIO2_IO19	SD2_RESET_B	ALT5		For A53 / Linux
	GPIO2_IO20	SD2_WP	ALT5		

Table continues on the next page...

Table 4. GPIO assignment (continued)

Instance	Port name	PAD assigned	MUX	Power group	Function description
GPIO3	GPIO3_IO00	NAND_ALE	ALT5	NVCC_NAND/1V8	For M7 / SDK
	GPIO3_IO01	NAND_CE0_B	ALT5		
	GPIO3_IO06	NAND_DATA00	ALT5		
	GPIO3_IO07	NAND_DATA01	ALT5		SPDIF_SEL from M7
	GPIO3_IO08	NAND_DATA02	ALT5		IO_EXP_nINT to M7
	GPIO3_IO09	NAND_DATA03	ALT5		IO_EXP_nRST from M7
	GPIO3_IO14	NAND_DQS	ALT5		HDMI_PWR_EN from M7
	GPIO3_IO16	NAND_READY_B	ALT5		SYS_STATUS for debug
GPIO4	GPIO4_IO27	SAI2_MCLK	ALT5	NVCC_SAI2/3.3V	HDMI_nRST from M7
	GPIO4_IO28	SAI3_RXFS	ALT5	NVCC_SAI3/3.3V	IR remote receive to M7
	GPIO4_IO29	SAI3_RXC	ALT5		HDMI_nINT to M7
GPIO5	GPIO5_IO02	SAI3_MCLK	ALT5	NVCC_SAI3/3.3V	For Immersiv3D debug
	GPIO5_IO03	SPDIF_TX	ALT5		
	GPIO5_IO05	SPDIF_EXT_CLK	ALT5		
	GPIO5_IO08	ECSPI1_MISO	ALT5	NVCC_ECSPI/3.3V	
	GPIO5_IO09	ECSPI1_SS0	ALT5		

4.4 CCM, WDOG, GPT, and S/PDIF

GPIO1_IO00 is multiplexed as CCM_REF_CLK_32K to output 32 kHz reference clock for the Wi-Fi / BT module, and GPIO1_IO02 is multiplexed as WDOG1_WDOG_B to output WDOG_B signal for the system exception handling.

SAI3_RXFS can be multiplexed as GPT1_CAPTURE1 or GPIO4_IO28 to receive the IR remote signal.

S/PDIF signal from HDMI repeater / eARC receiver or external coaxial / optical connector is input from SPDIF_IN.

For the assignment of CCM, GPT, and WDOG modules, see Table 5.

Table 5. CCM, WDOG, GPT, and S/PDIF assignment

Instance	Port name	PAD assigned	MUX	Power group	Function description
CCM	CCM_REF_CLK_32K	GPIO1_IO00	ALT5	NVCC_GPIO1/1V8	For Wi-Fi / BT module
WDOG1	WDOG1_WDOG_B	GPIO1_IO02	ALT1		System WDOG_B output

Table continues on the next page...

Table 5. CCM, WDOG, GPT, and S/PDIF assignment (continued)

Instance	Port name	PAD assigned	MUX	Power group	Function description
GPT1	GPT1_CAPTURE1	SAI3_RXFS	ALT1	NVCC_SAI3/3V3	IR remote receiver
SPDIF1	SPDIF1_IN	SPDIF_IN	ALT0		S/PDIF signal input

4.5 USDHC

USDHC1 is assigned as SDIO IF for Wi-Fi / BT module and USDHC3 is assigned to connect eMMC for system boot image.

The USDHC2 signals SD2_CLK, SD2_CMD, and SD2_DATA0 are recommended to be escaped out as test points for firmware loading in manufacture mode. They can be multiplexed as GPIO2_IO13, GPIO2_IO14, and GPIO2_IO15 if necessary. For the assignment of USDHC modules, see Table 6.

Table 6. USDHC assignment

Instance	Port name	PAD assigned	MUX	Power group	Function description
USDHC1	USDHC1_CLK	SD1_CLK	ALT0	NVCC_SD1/1V8	SDIO for Wi-Fi / BT module
	USDHC1_CMD	SD1_CMD	ALT0		
	USDHC1_DATA0	SD1_DATA0	ALT0		
	USDHC1_DATA1	SD1_DATA1	ALT0		
	USDHC1_DATA2	SD1_DATA2	ALT0		
	USDHC1_DATA3	SD1_DATA3	ALT0		
USDHC2	USDHC2_CLK	SD2_CLK	ALT0	NVCC_SD2/3V3	Escaped out as test points for manufacture mode
	USDHC2_CMD	SD2_CMD	ALT0		
	USDHC2_DATA0	SD2_DATA0	ALT0		
USDHC3	USDHC3_CLK	NAND_WE_B	ALT2	NVCC_NAND/1V8	eMMC for system boot image
	USDHC3_CMD	NAND_WP_B	ALT2		
	USDHC3_DATA0	NAND_DATA04	ALT2		
	USDHC3_DATA1	NAND_DATA05	ALT2		
	USDHC3_DATA2	NAND_DATA06	ALT2		
	USDHC3_DATA3	NAND_DATA07	ALT2		
	USDHC3_DATA4	NAND_RE_B	ALT2		
	USDHC3_DATA5	NAND_CE2_B	ALT2		

Table continues on the next page...

Table 6. USDHC assignment (continued)

Instance	Port name	PAD assigned	MUX	Power group	Function description
	USDHC3_DATA6	NAND_CE3_B	ALT2		
	USDHC3_DATA7	NAND_CLE	ALT2		
	USDHC3_STROBE	NAND_CE1_B	ALT2		

4.6 UART

UART1 is assigned for the Wi-Fi / BT module. UART2 is reserved for A53 / Linux debug and UART4 is reserved for M7 or Immersiv3D debug.

UART3 can be multiplexed on ECSPI1 IF for Immersiv3D debug in case UART4 is already used for M7 debug. It can also be assigned to connect with other devices if necessary.

ECSPI1_MISO and ECSPI1_SS0 can be assigned as GPIO5_IO08 and GPIO5_IO09 for Immersiv3D debug if necessary. For the assignment of UART modules, see Table 7.

Table 7. UART assignment

Instance	Port name	PAD assigned	MUX	Power group	Function description
UART1	UART1_RX	UART1_RXD	ALT0	NVCC_UART/3V3	For Wi-Fi / BT module
	UART1_TX	UART1_TXD	ALT0		
	UART1_CTS_B	UART3_RXD	ALT1		
	UART1_RTS_B	UART3_TXD	ALT1		
UART2	UART2_RX	UART2_RXD	ALT0	NVCC_UART/3V3	For A53 debug
	UART2_TX	UART2_TXD	ALT0		
UART3	UART3_RX	ECSPI1_SCLK	ALT1	NVCC_ECSPI/3V3	For Immersiv3D debug
	UART3_TX	ECSPI1_MOSI	ALT1		
	UART3_CTS_B	ECSPI1_MISO	ALT1		
	UART3_RTS_B	ECSPI1_SS0	ALT1		
UART4	UART4_RX	UART4_RXD	ALT0	NVCC_UART/3V3	For M7 debug
	UART4_TX	UART4_TXD	ALT0		

4.7 ECSPI

ECSPI1 can be assigned for connection between the A53 / Linux and the NXH3675 wireless module, or reserved for Immersiv3D debug.

ECSPI2 is assigned for connection between the A53 / Linux and the voice processor. For the assignment of ECSPI modules, see Table 8.

Table 8. ECSPI assignment

Instance	Port name	PAD assigned	MUX	Power group	Function description
ECSPI1	ECSPI1_SCLK	ECSPI1_SCLK	ALT0	NVCC_ECSPI/3V3	For NXH3670 wireless module configuration or reserved for Immersiv3D debug
	ECSPI1_MOSI	ECSPI1_MOSI	ALT0		
	ECSPI1_MISO	ECSPI1_MISO	ALT0		
	ECSPI1_SS0	ECSPI1_SS0	ALT0		
ECSPI2	ECSPI2_SCLK	ECSPI2_SCLK	ALT0	NVCC_ECSPI/3V3	For voice processor
	ECSPI2_MOSI	ECSPI2_MOSI	ALT0		
	ECSPI2_MISO	ECSPI2_MISO	ALT0		
	ECSPI2_SS0	ECSPI2_SS0	ALT0		

4.8 USB

The USB port is used for software download and / or headphone connection. For the assignment of USB module, see Table 9.

Table 9. USB assignment

Instance	Port name	PAD assigned	MUX	Power group	Function description
USB1	USB1_ID	USB1_ID	-	VDD_USB_1P8	For software download and / or headphone connection
	USB1_VBUS	USB1_VBUS	-	VDD_USB_3P3	
	USB1_DP	USB1_DP	-		
	USB1_DN	USB1_DN	-		

Chapter 5
Use cases

This section gives the details about typical use cases with 2.1.2, 3.1.2, 4.1.2, 5.1.2, 5.1.4, and 7.1.4 speaker configurations for reference.

5.1 Use case 1 - 2.1.2 soundbar system

Figure 4 shows the use case of a soundbar system with 2.1.2 speaker configurations in which the subwoofer is built at the middle of the bar.

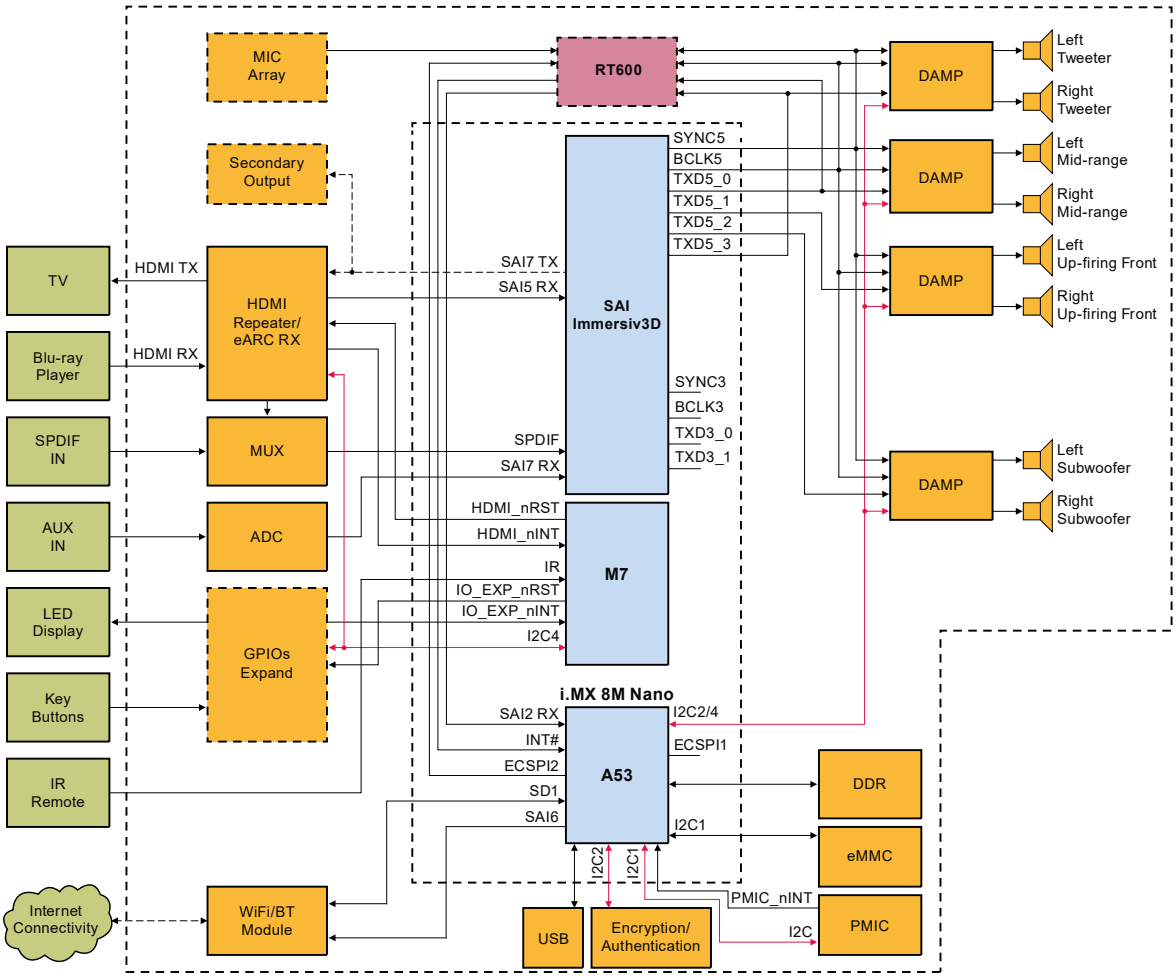


Figure 4. Soundbar system with 2.1.2 speaker configuration

5.2 Use case 2 - 3.1.2 soundbar system

Figure 5 shows the use case of a soundbar system with 3.1.2 speaker configurations in which the subwoofer is built at the left and right sides of the bar.

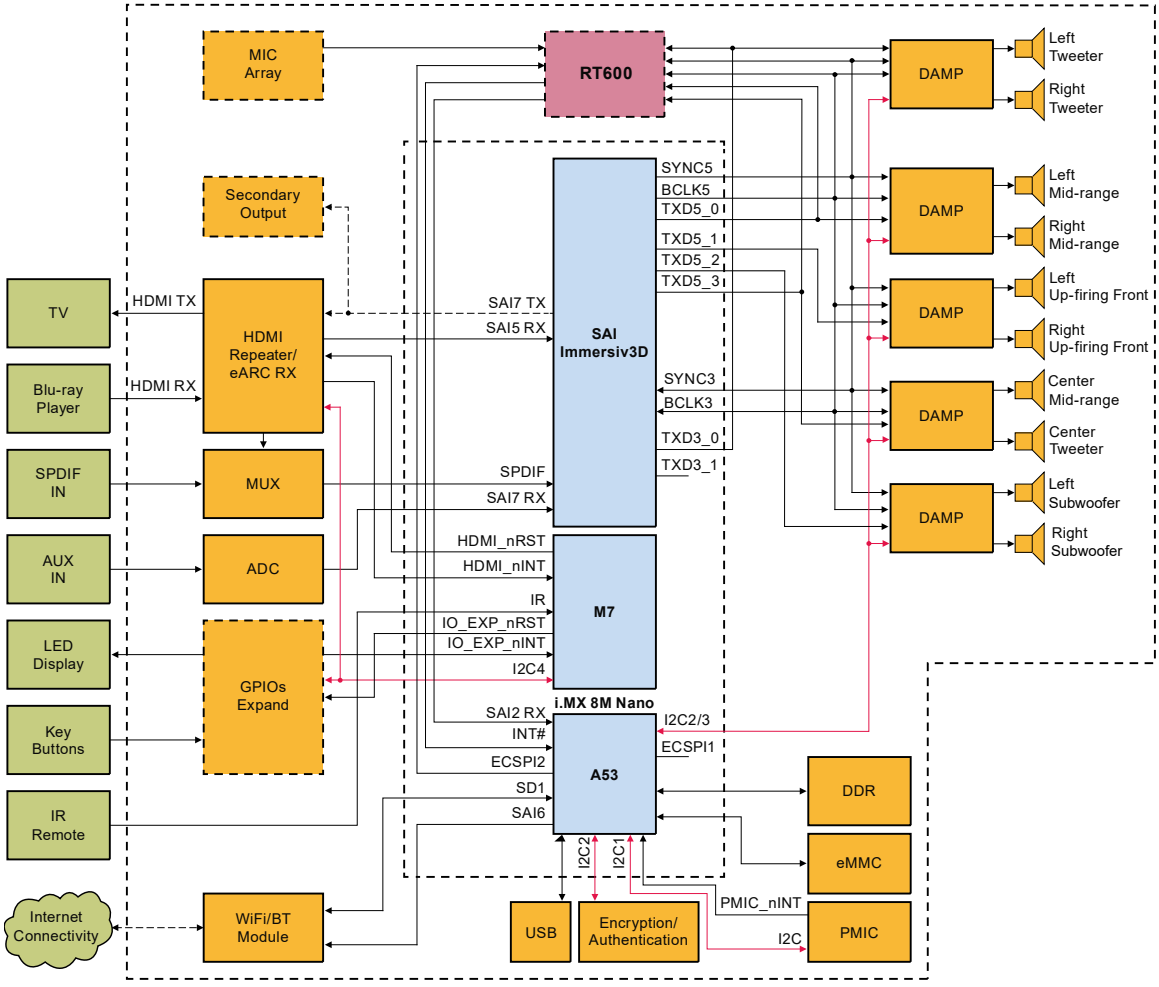


Figure 5. Soundbar system with 3.1.2 speaker configuration

5.3 Use case 3 - 4.1.2 soundbar system

Figure 6 shows the use case of a soundbar system with 4.1.2 speaker configurations in which the subwoofer is built at the middle of the bar.

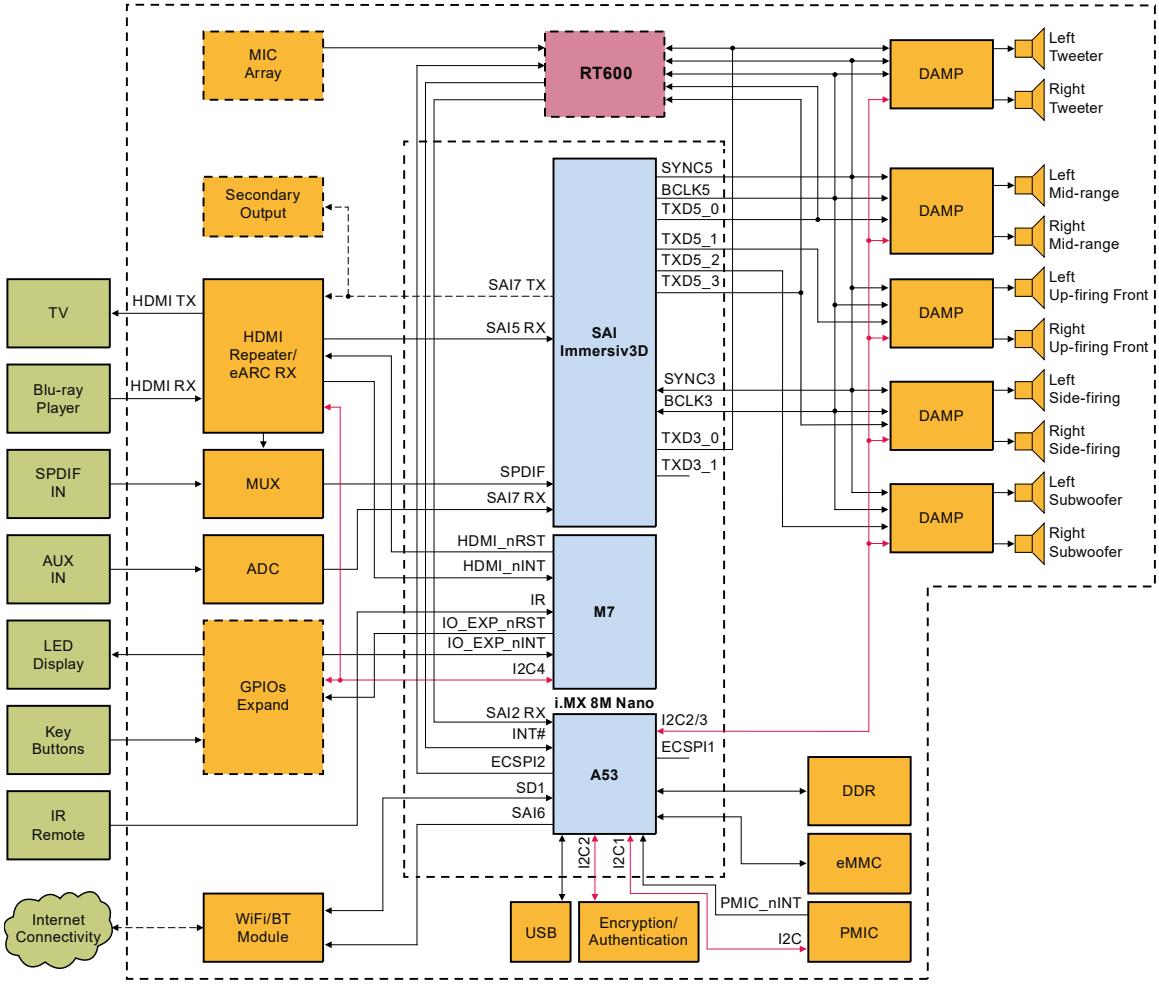


Figure 6. Soundbar system with 4.1.2 speaker configuration

5.4 Use case 4 - 5.1.2 soundbar system

Figure 7 shows the use case of a soundbar system with 5.1.2 speaker configurations in which the wireless module for subwoofer is connected with independent `SAI7 TX` in I^2S mode.

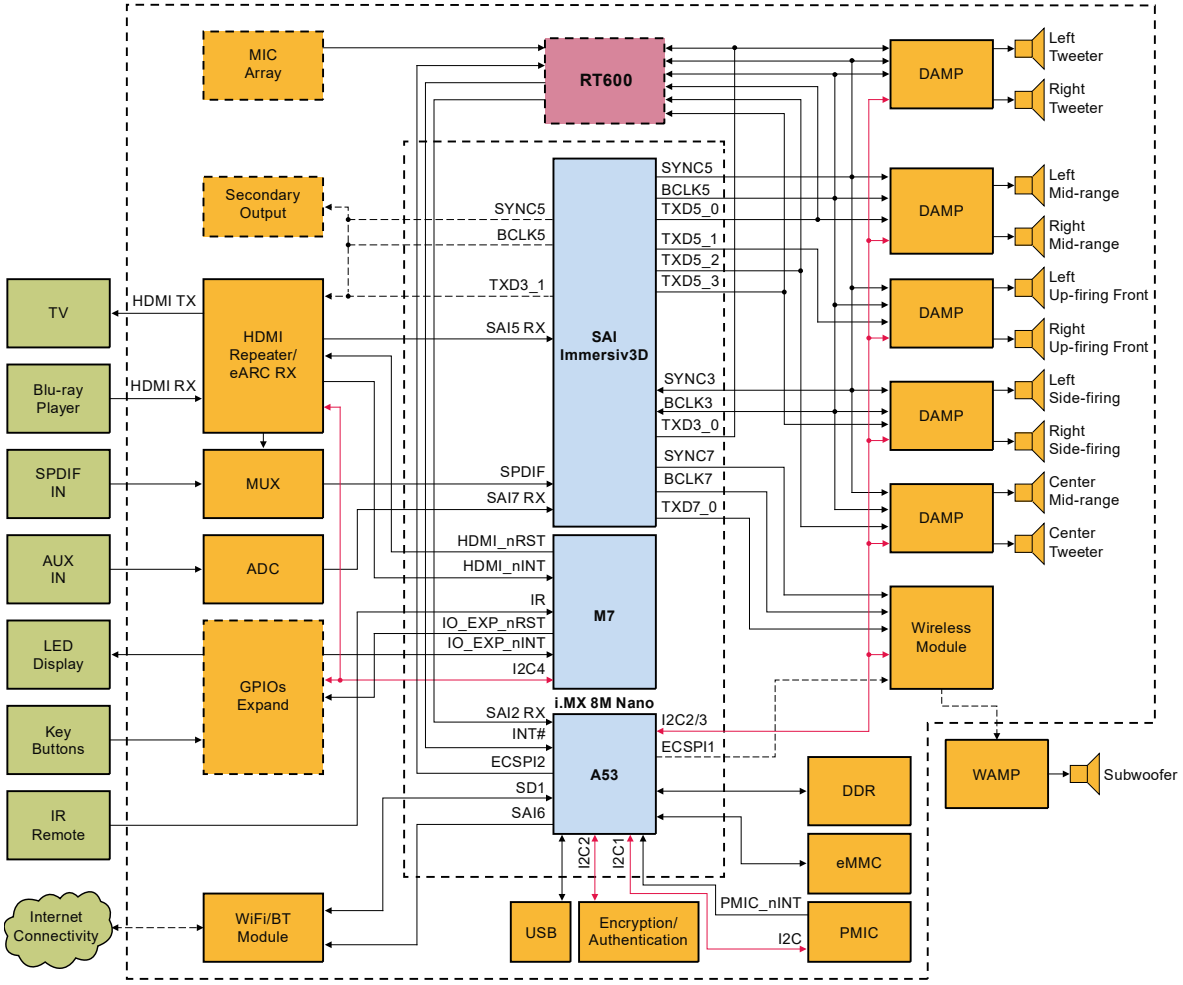


Figure 7. Soundbar system with 5.1.2 speaker configuration

5.5 Use case 5 - 5.1.4 soundbar system 1

Figure 8 shows the use case of a soundbar system with 5.1.4 speaker configurations in which the subwoofer is built at the left and right sides of the bar and the wireless module for wireless speakers is connected with independent `SAI3 TX` in I^{2}S mode.

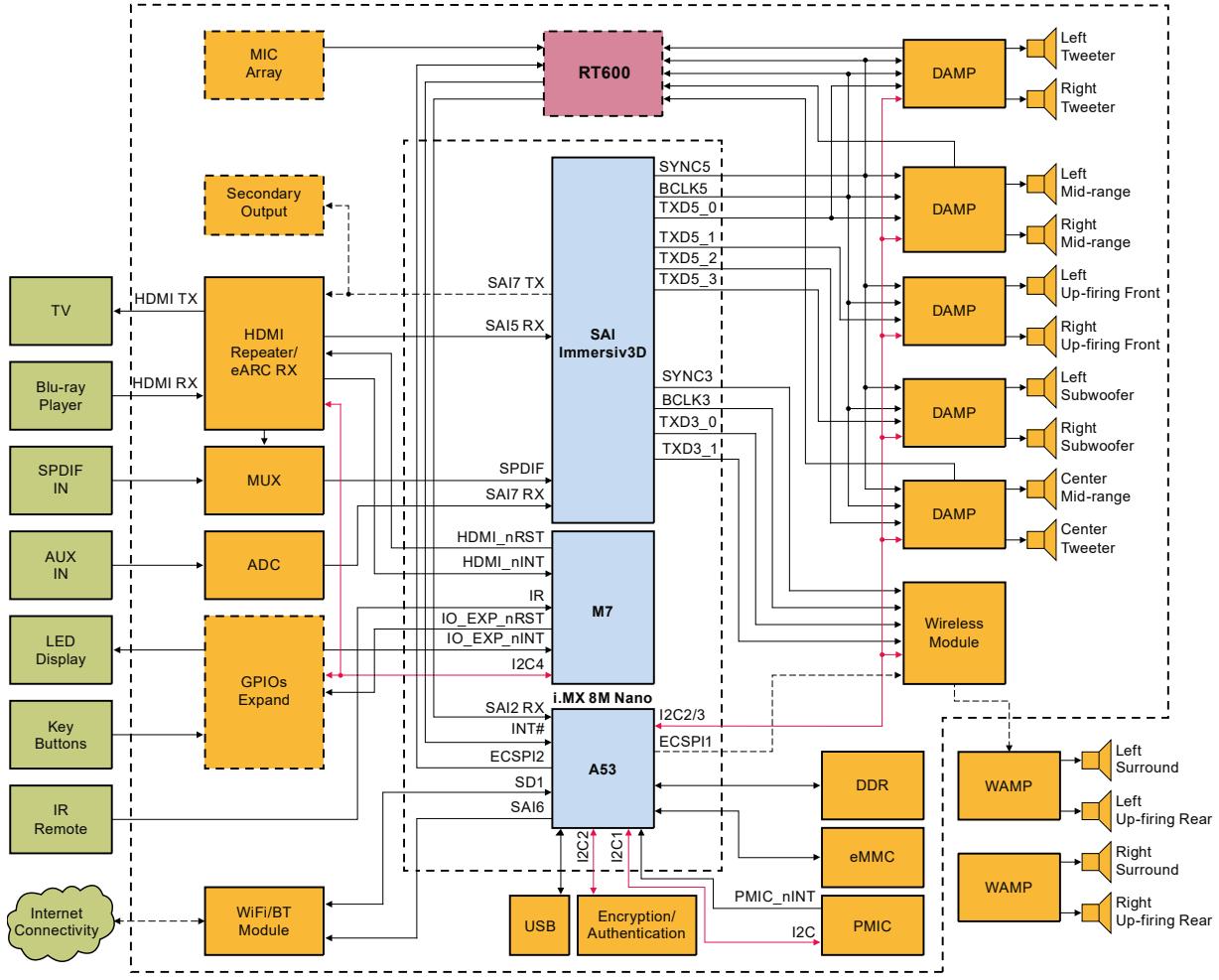


Figure 8. Soundbar system with 5.1.4 speaker configuration (built in subwoofer)

5.6 Use case 6 - 5.1.4 soundbar system 2

Figure 9 shows the use case of a soundbar system with 5.1.4 speaker configurations in which the wireless module for wireless speakers is connected with synchronized `SAI3 TX` and `SAI7 TX` in I^2S mode.

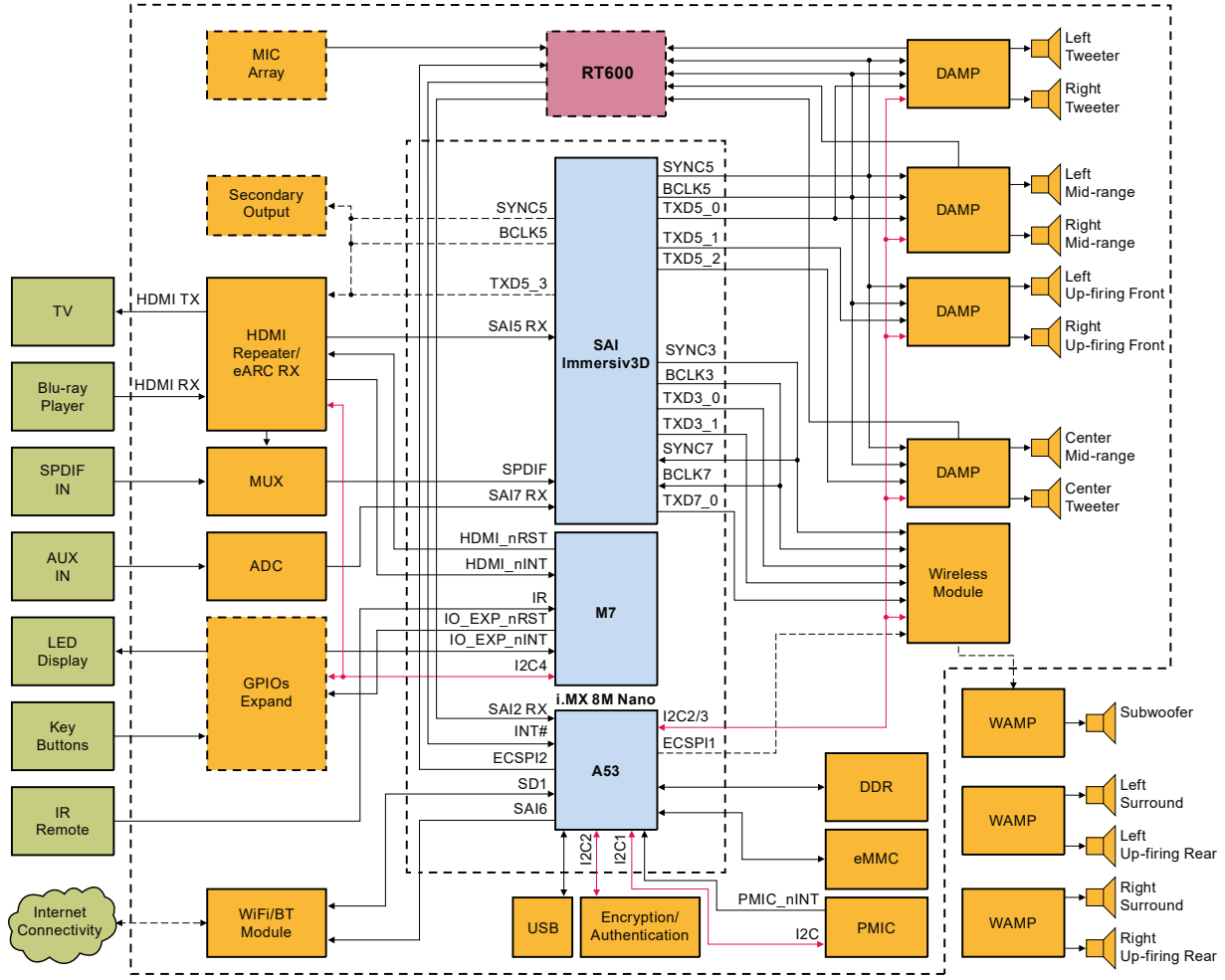


Figure 9. Soundbar system with 5.1.4 speaker configuration (wireless subwoofer)

5.7 Use case 7 - 7.1.4 soundbar system 1

Figure 10 shows the use case of a soundbar system with 7.1.4 speaker configurations in which the wireless module for wireless speakers is connected with synchronized `SAI3 TX` and `SAI7 TX` in I^2S mode.

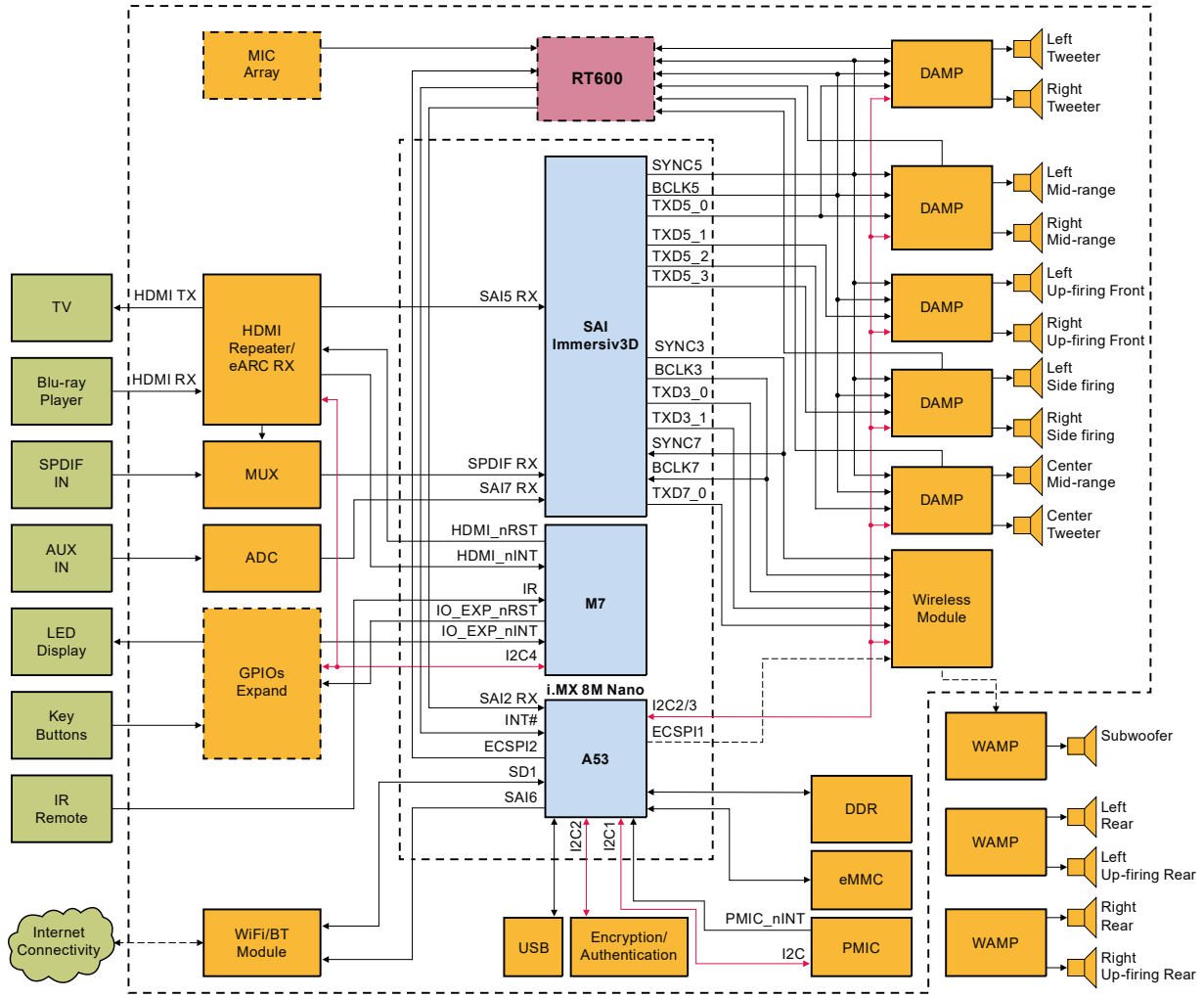


Figure 10. Soundbar system with 7.1.4 speaker configuration without secondary output

5.8 Use case 8 - 7.1.4 soundbar system 2

Figure 11 shows the use case of a soundbar system with 7.1.4 speaker configurations in which the wireless module for wireless speakers is connected with independent `SAI3 TX` in `TDM4` mode.

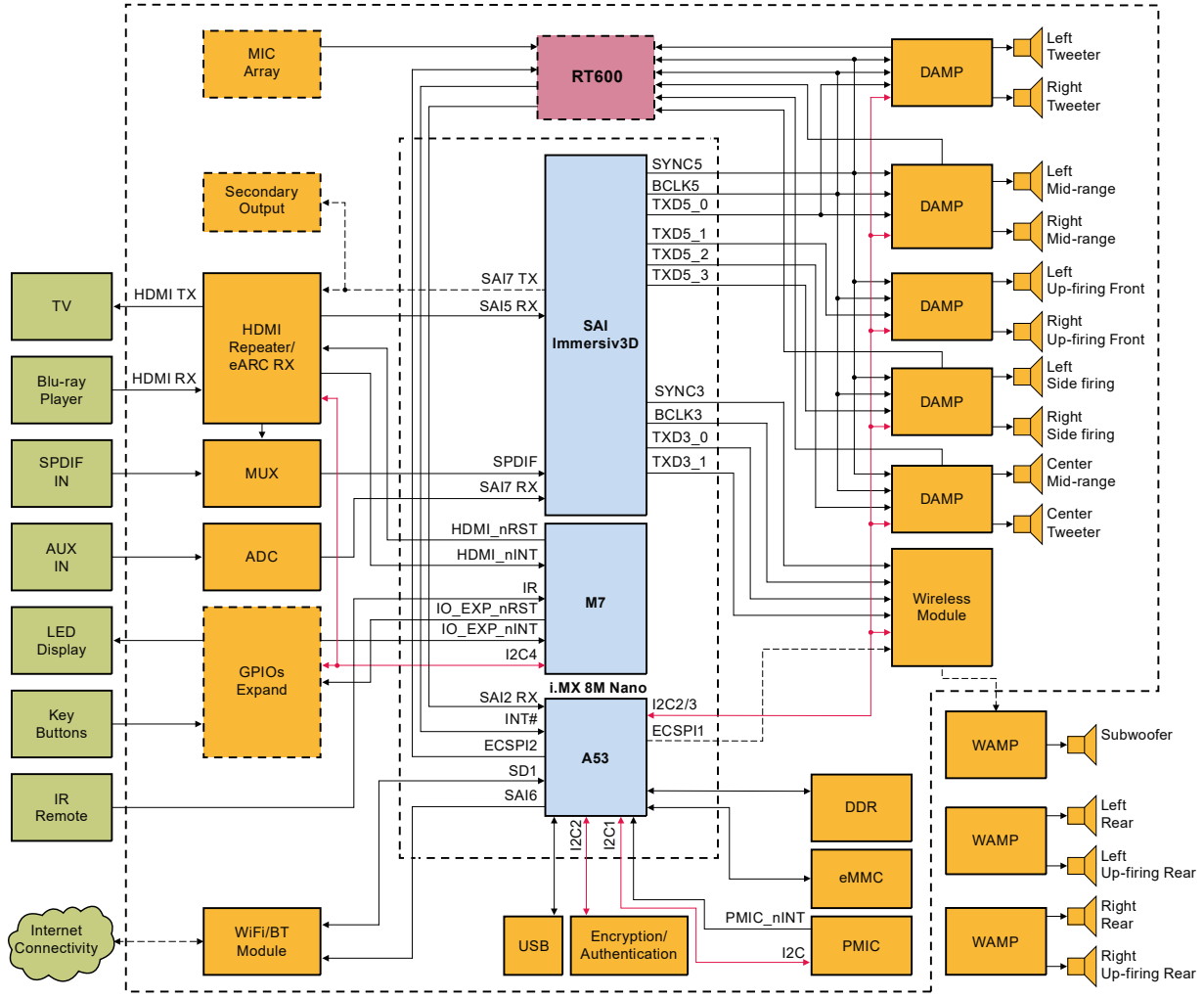


Figure 11. Soundbar system with 7.1.4 speaker configuration with secondary output

Chapter 6
Reference

Refer to the following documents for further reference:

- i.MX 8M Nano Applications Processor Datasheet for Consumer Products (document IMX8MNCEC)
- i.MX 8M Nano Applications Processor Reference Manual (document IMX8MNRM)
- i.MX 8M Nano Hardware Developer’s Guide (document IMX8MNHDG)
- See i.MX 8M Nano EVK schematics and layout files on Evaluation Kit for the i.MX 8M Nano Applications Processor

Chapter 7
Revision history

Table 10 summarizes the changes done to this document since the initial release.

Table 10. Revision history

Revision number	Date	Substantive changes
0	11 February 2022	Initial release

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