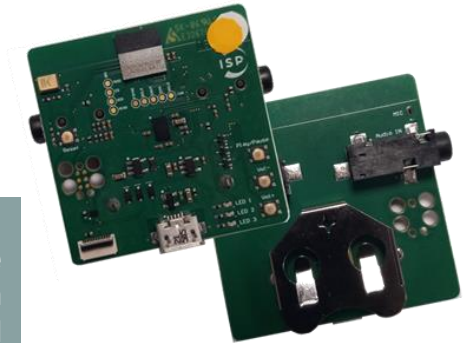


BLE 5.2 Audio Demo

This small audio demonstrator provides an example of the tremendous capabilities of the ISP2053 module based on nRF5340 Chip. With a powerful Cortex™ M33 CPU, flash and RAM memory combined with an optimized antenna, ISP2053 offers the best-in-class Bluetooth 5.2 performance and low power consumption.



Key Features

- Bluetooth v5.2 - 2.4GHz low energy RF Transceiver
- Based on Insight SiP 2053-AX Module
- Dual ARM Cortex M33
- Fully integrated RF matching and Antenna
- Integrated 32 MHz and 32.768 kHz Clocks
- Audio codec
- Programmable buttons and LEDs
- USB port interface
- Power supply on coin cell battery CR2032 or with USB interface
- Overall Size 40 x 40 mm²
- Temperature -25 to 85 °C



Applications

- Sport and fitness sensors
- Health care sensors
- Industrial sensors
- Gaming sensors
- Motion detection and transmission

Certifications

- FCC certification
- CE certification
- IC certification
- TELEC certification
- Bluetooth SIG certification
- RoHS compliant

Document Revision History

Revision	Date	Ref	Change Description
R0	05/01/2023	jf pg	Initial release

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1. Block Diagram & Features

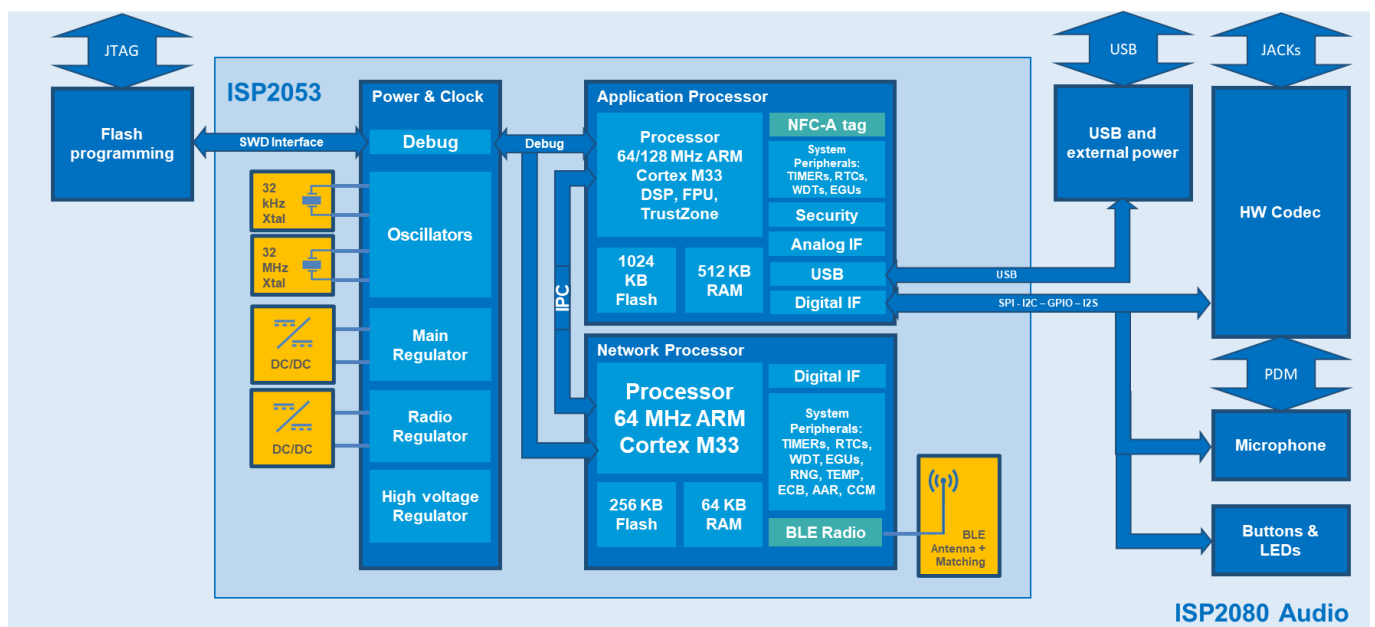
ISP2080 is an autonomous low-power device for wireless audio transmission. Overall size of the device is 40 x 40 mm².

The complete device makes use of Insight SiP ISP2053-AX BT5.2 module together with a microphone, Audio codec and Jack connectors powered by a button cell battery CR2032 or by USB.

The host processor that handles the autonomous application, and the communication with the audio codec is a low power 32-bit MCU (ARM Cortex-M33 based), integrating 1 MB Flash memory and 512 KB RAM. The BLE stack is handled by a coprocessor (also ARM Cortex-M33 based), integrating 256 KB Flash memory and 64 KB RAM.

The Audio Codec CS47L63 is used to:

- Convert analog audio from the "Audio IN" Jack connector to digital audio (I2S)
- Convert digital audio (I2S) to analog audio for the "Audio OUT" Jack connector.
- Convert digital audio (PDM) from the VM3011 to digital audio (I2S).



2. Specifications

2.1. RF Specification

The performance of Bluetooth 5.2 radio is related to ISP2053-AX specification.

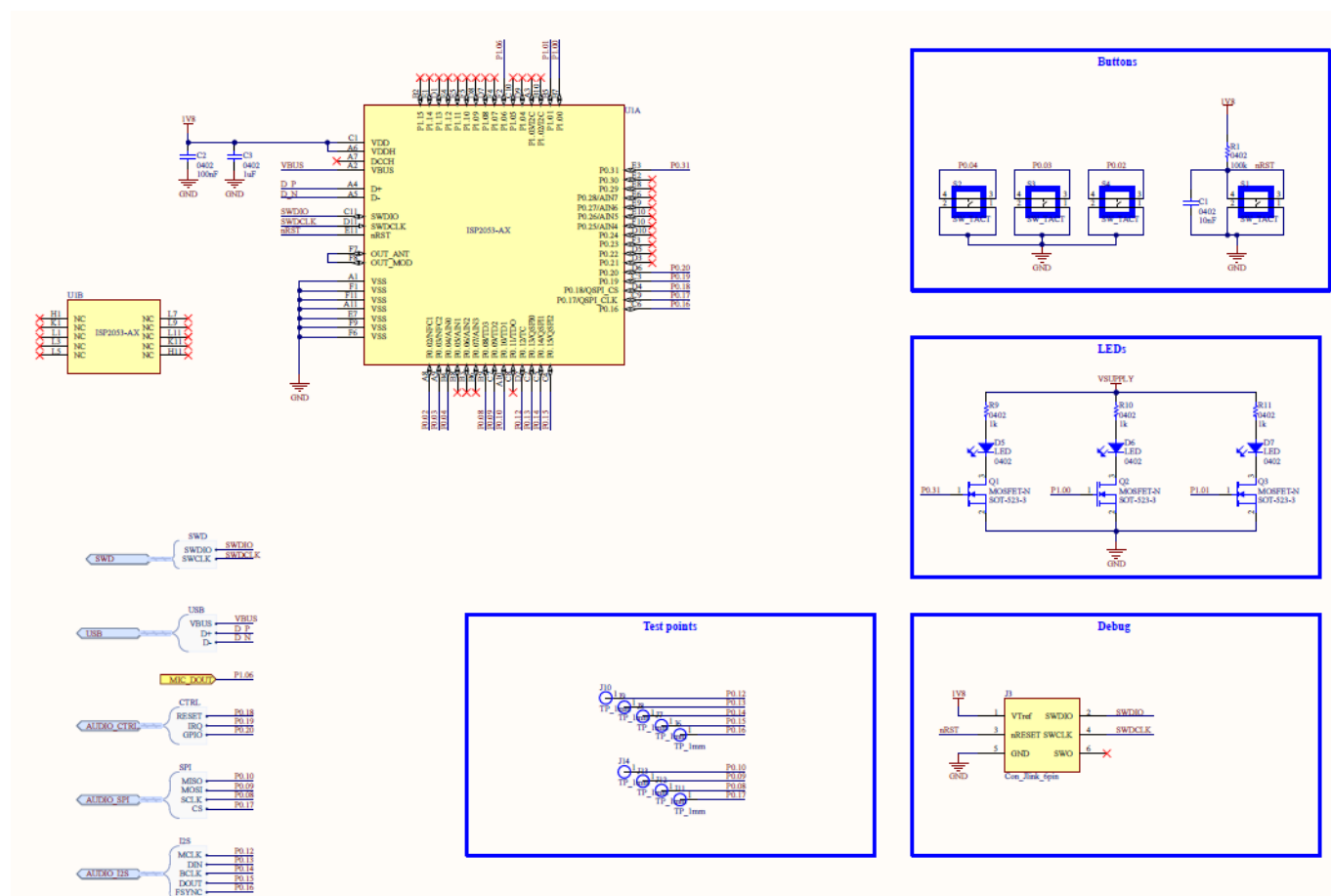
Parameter	Min	Typ	Max	Unit
Frequency Range	2360		2500	MHz
Maximum Output Power			+3	dBm
Rx Sensitivity Level, BLE1 Mbps		-98		dBm
Rx Sensitivity Level, BLE Long Range 125 kbps		-104		dBm
Antenna Gain		0.6		dBi
EIRP	-19.4		3.6	dBm
Data Rate	125		2000	kbps

2.2. Audio Specification

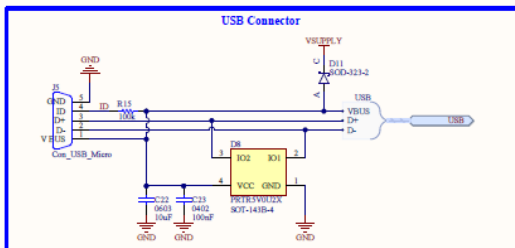
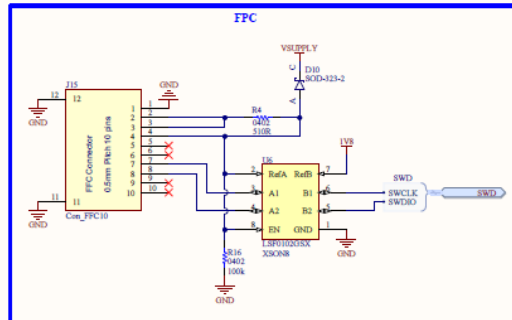
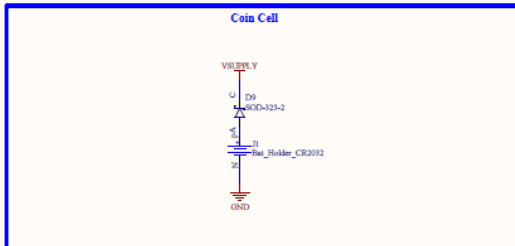
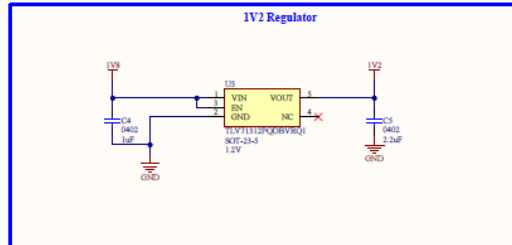
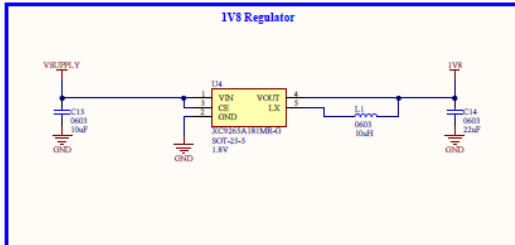
The performance of the audio is related to CS47L63 specification.

Parameter	Min	Typ	Max	Unit
Analog input resistance	9	10.5		kΩ
Analog input capacitance			5	pF
Analog input programmable gain	0		29	dB
Headphone output resistance	15		100	Ω
Headphone output capacitance			100	pF
Headphone maximum output			1	Vrms

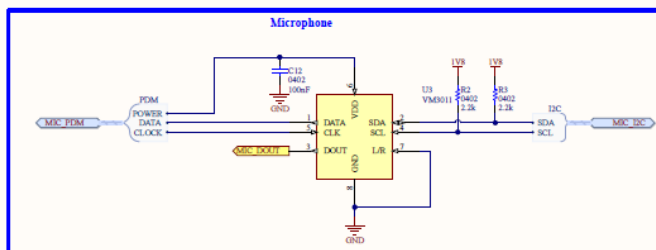
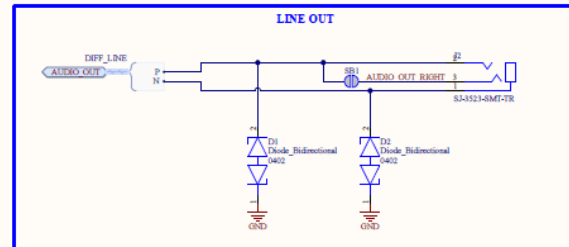
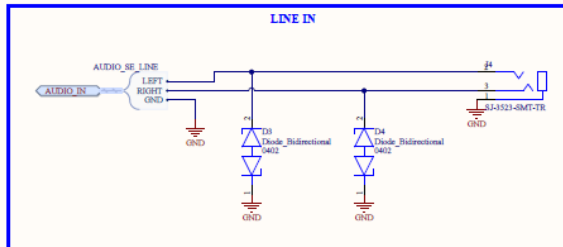
3.1. MCU & Connector



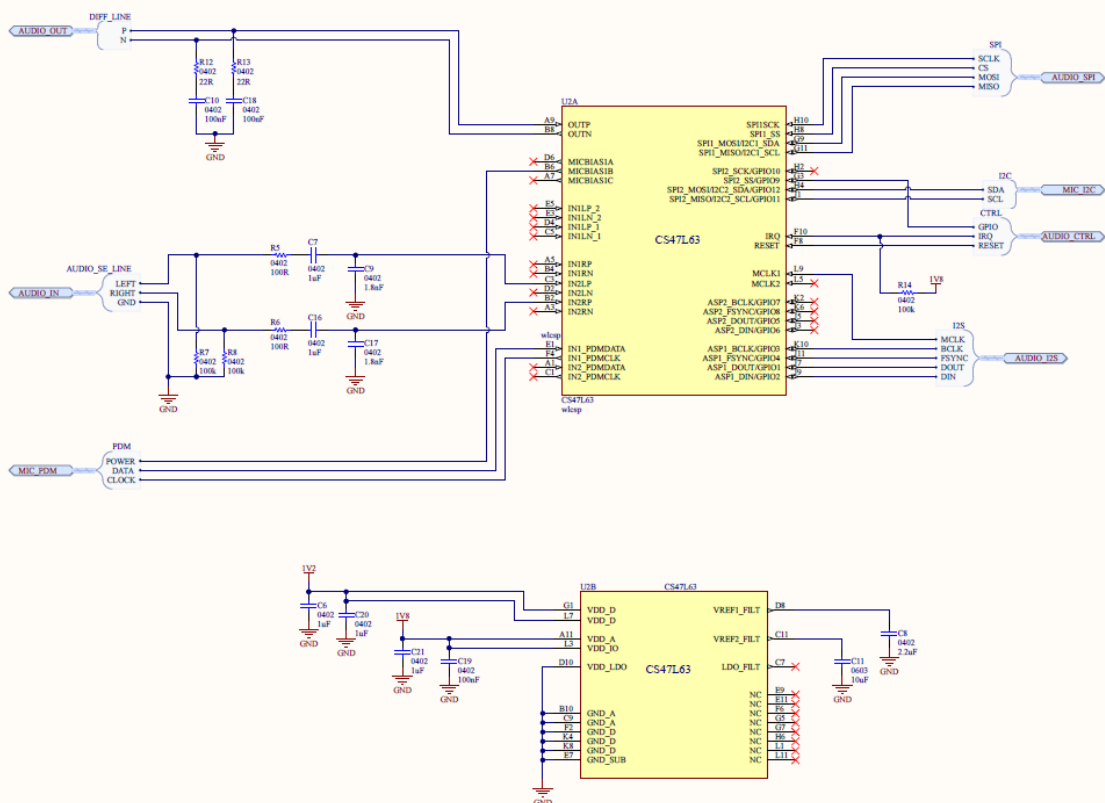
3.2. Power Supply & Debug



3.3. Audio In and Out



3.4. HW Codec



4. Product Development Tools

In order to assist clients in using the ISP2080 audio board, Insight SIP provides an application note that can be downloaded here:

http://www.insightsip.com/fichiers_insightsip/pdf/ble/ISP2053/isp_ble_AN221201.pdf

4.1. Hardware

For further specific development, it is also possible to acquire an Evaluation Board containing:

- One Interface Board with J-Link Seeger integrated
- One ISP2053-AX Test Board
- Cables

Using this evaluation board, product developers can use a working solution as starting point to develop their own applications. Please refer to the documentation for more information:

http://www.insightsip.com/fichiers_insightsip/pdf/ble/ISP2053/isp_ble_DS2053_DK.pdf

http://www.insightsip.com/fichiers_insightsip/pdf/ble/ISP2053/isp_ble_AN211001.pdf

4.2. Firmware

ISP2053 supports Bluetooth Low Energy protocol stacks. It also provides extensive software support for ANT, ZIGBEE and THREAD applications as well as 2.4 GHz protocol stacks, including Gazell.

nRF Connect SDK is the development environment for nRF53 solutions. The SDK is running on the Zephyr operating system

The recommended development tools and software for using the ISP2080 board are:

- nRF Connect for Desktop
Downloadable at <https://www.nordicsemi.com/Products/Development-tools/nrf-connect-for-desktop>
This tool includes utilities to setup the development environment.
- Visual Studio IDE
Downloadable at <https://code.visualstudio.com/>

More information about the nRF Connect SDK at:

https://developer.nordicsemi.com/nRF_Connect_SDK/doc/latest/nrf/index.html

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