Getting started with the STEVAL-VOICE-UI voice user interface evaluation kit

Introduction

The STEVAL-VOICE-UI Amazon™ qualified evaluation kit is designed to allow the evaluation of a cost-effective way to integrate AVS for AWS IoT Services® into smart devices, implementing a state-of-art, hands-free voice control based on natural language comprehension.

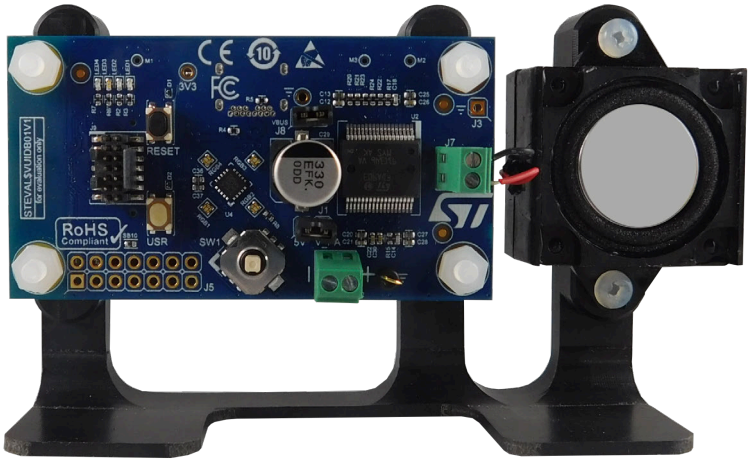
You can enjoy a heightened experience with the target IoT end products, which can talk to Amazon Alexa® and control smart home devices, get assistance, listen to the news, check the weather forecast, play music, etc.

The software package implements audio front-end, Amazon wake word, audio playback, and Amazon Alexa® communication protocol software. The SDK runs on internal memories only, offering the maximum integration and cost-effective solutions.

The kit contains an FCC and IC certified radio module (FCC ID: VPYLB1DX and IC: 772C-LB1DX).

The STEVAL-VOICE-UI is built with a modular approach for easy prototyping and debugging purposes as well as easy adaptation to specific microphone spacings, user interface, and audio output requirements.

Figure 1. STEVAL-VOICE-UI voice user interface evaluation kit



1 Overview

The STEVAL-VOICE-UI kit features:

- STM32H753VIT6E high-performance MCU with 2 MB embedded Flash, 1 Mb embedded SRAM and in cost-effective LQFP package
- 2.4 GHz Wi-Fi subsystem with Murata 1DX module used in bypass mode coupled to ISSI IS25LP016D 2 MBytes NOR Flash memory
- 3 x MP23DB01HP MEMS microphones with 36 and 30 mm spacing
- FDA903D class D digital input automotive audio amplifier
- 8 Ohm loudspeaker
- 4 RGB LEDs and 4 simple LEDs
- Joystick, reset and user push buttons
- High modularity with mother/daughter board
- Small 36x65 mm² footprint with simple and cost-effective PCB design

1.1 Kit components

The STEVAL-VOICE-UI kit package includes:

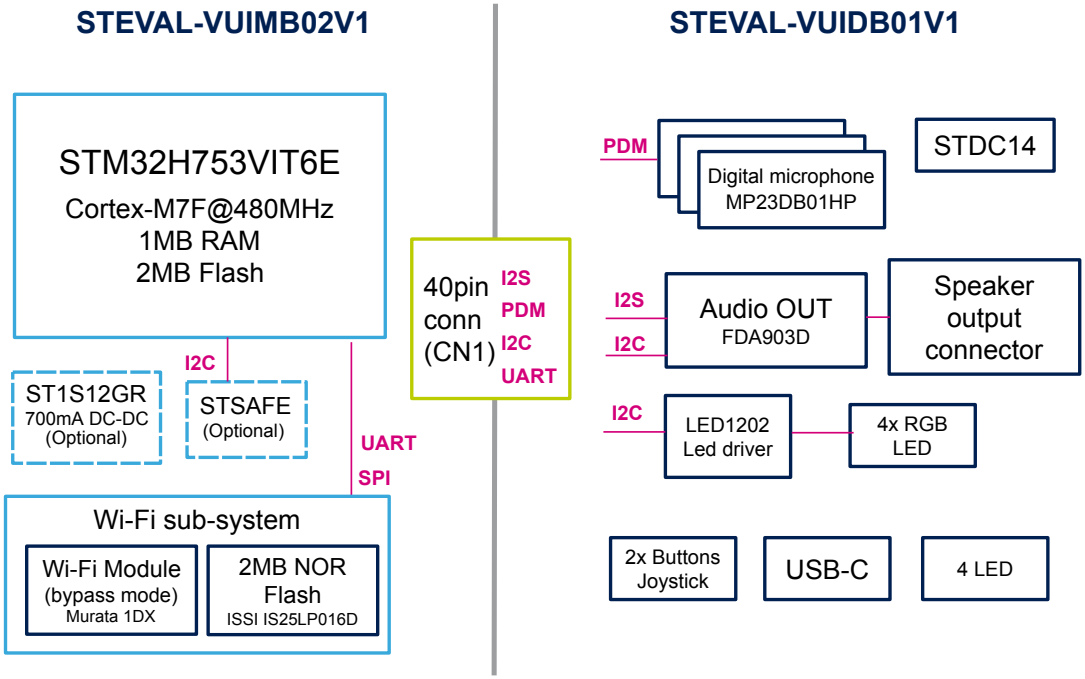
- STEVAL-VUIMB02V1: VUI mother board embedding the STM32H753VIT6E MCU and the Wi-Fi module
- STEVAL-VUIDB01V1: VUI daughter board including the audio front-end (MP23DB01HP microphones and FDA903D audio amplifier) and the user interface (buttons, joystick, LEDs and USB)
- 8 Ohm speaker
- Mechanical parts
- STLINK-V3MINI debugger/programmer for STM32 with programming cable
- USB A to C connector cable

1.2 RF specifications

- Integrated radio module/chipset: MURATA LBEE5KL1DX-626 2.4 GHz Wi-Fi module
- RF power: 17.93 dBm
- Operating band: 2401-2483 MHz (Wi-Fi channel 1 to 13)
- Channel spacing: 22 MHz

1.3 Functional block diagram

Figure 2. **STEVAL-VOICE-UI functional block diagram**



1.4 System requirements

- Windows® OS (7, 8 and 10), Linux® 64-bit, or MacOS®
- html5 web browser version
- Companion app requires Android 7 or iOS 14

1.5 Development toolchains

- IAR Systems - IAR Embedded Workbench® EWARM

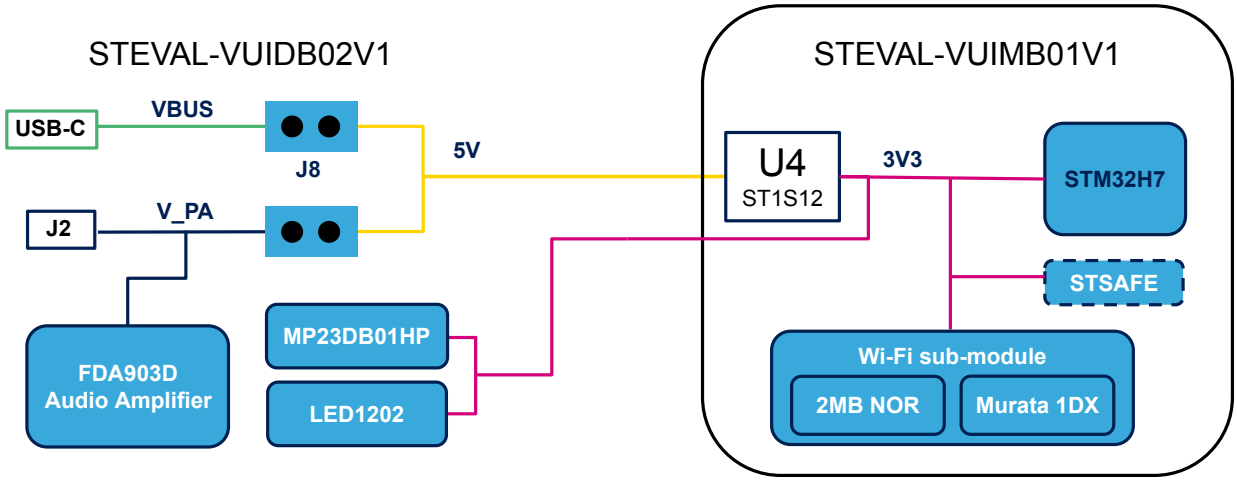
1.6 Power supply

The easiest way to power the STEVAL-VOICE-UI kit is via the USB-C connector.

Table 1. **Power supply options**

J1	J8	Description
CLOSE	CLOSE	Single power supply from USB. Do not connect V_PA (J2)
CLOSE	OPEN	Single power supply from V_PA (J2) → up to 5 V
OPEN	CLOSE	Dual power supply: • 5 V from USB • V_PA from J2 → Up to 18 V
OPEN	OPEN	5 V from external source (CN1)

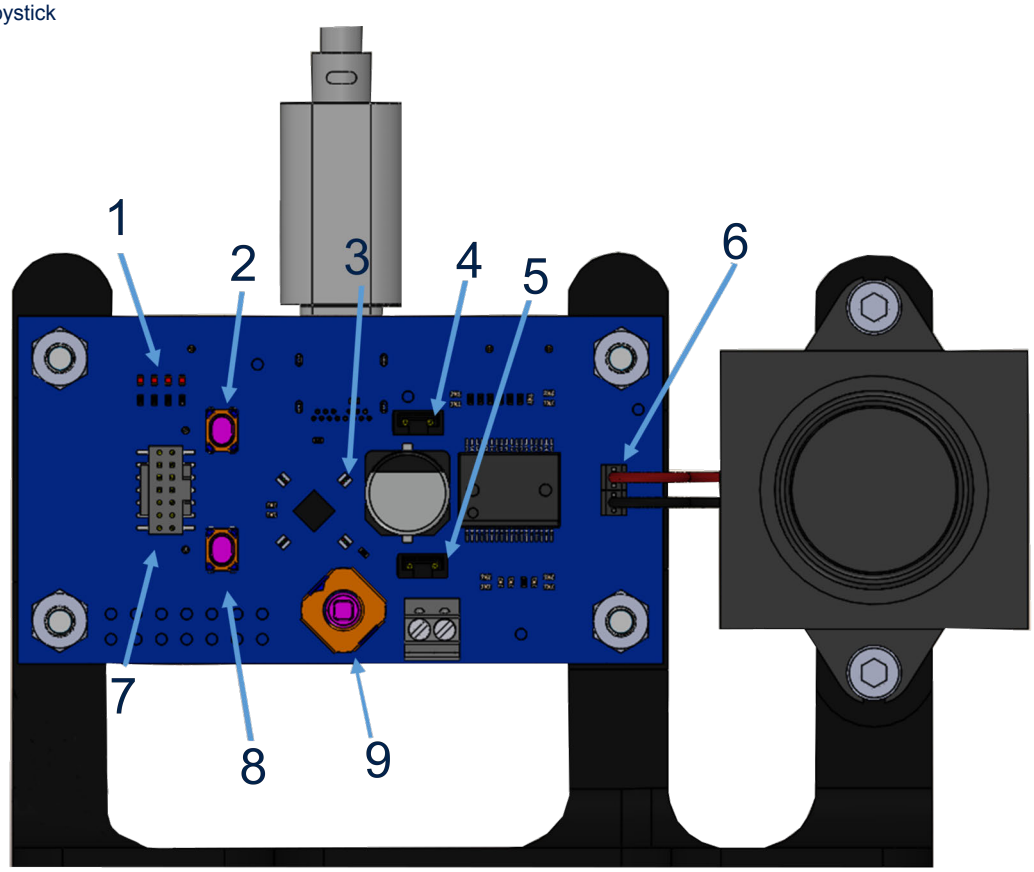
Figure 3. **STEVAL-VOICE-UI power supply block diagram**



1.7 User interfaces

Figure 4. **STEVAL-VOICE-UI user interfaces**

1. 4 LEDs
2. Reset button
3. 4 RGB LEDs
4. J8
5. J1
6. Loudspeaker terminals
7. Programming connector (STDC14)
8. User button
9. Joystick



2 Demo firmware

2.1 Pre-requisites

The pre-installed ST_VOICE_UI flashed demo firmware demonstrates a voice service solution able to connect to AVS for AWS IoT.

A direct Internet connection is needed (without proxy).

As an Alexa® device, you need a regular Amazon™ account to connect to AVS for AWS IoT service.

The account can be created on www.amazon.com or other local versions.

The users who have registered to Amazon Music service will be able to play music on the device.

2.2 Device setup

Step 1. Power the device through a USB C cable.

Step 2. Configure the network connection.

Step 3. Register to AVS for AWS IoT service.

Step 2 and 3 can be performed using a smartphone application (Section 2.2.1) or the embedded http console (Section 2.2.2), as described in the following chapters.

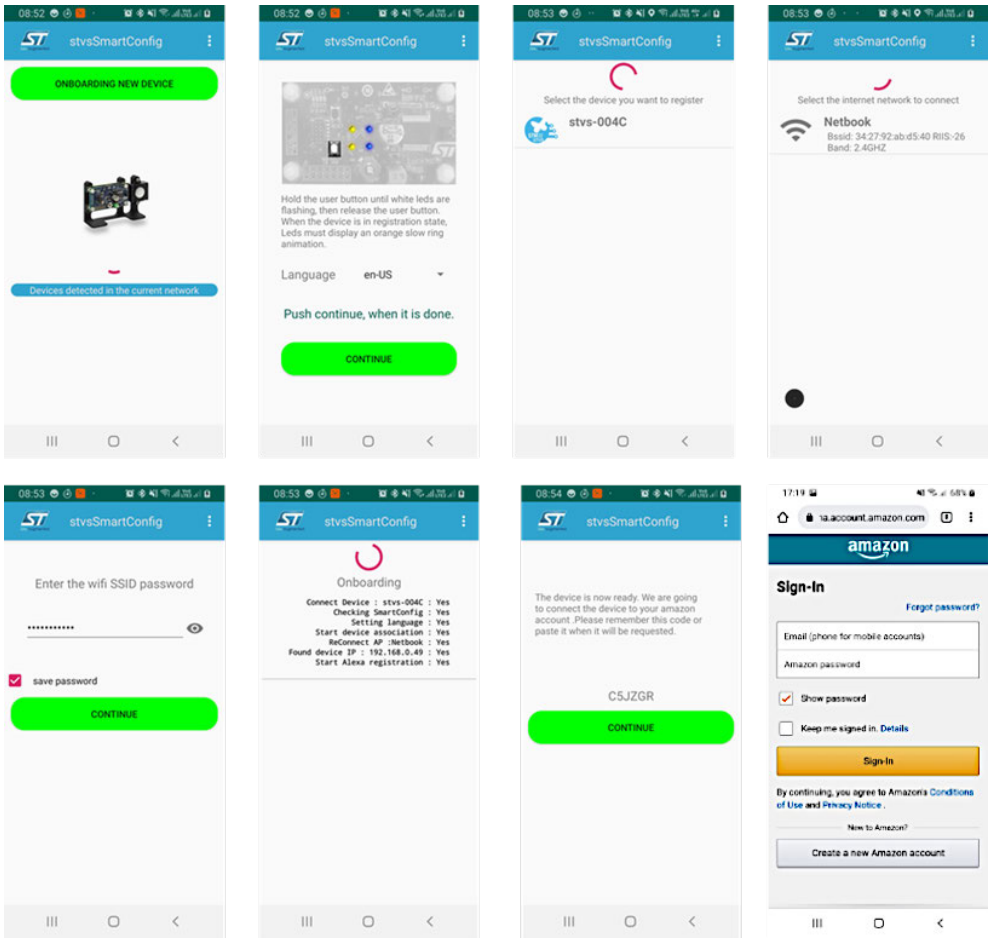
2.2.1 Android and iOS users

stvs Smart Config is a smart phone application that allows configuring the device and the demos.

It also manages localization. The application is available on both Google Play and Apple stores.

Step 1. To configure a new device, push the [**Onboarding new device**] button and follow the instructions.

Figure 5. stvsSmartConfig procedure



2.2.2 Other users - HTTP UI

The device embeds an HTTP service that the consumer can connect to via smartphone or PC and an HTML5 browser (Safari or Chrome). To connect to the server, the smartphone must be connected to the same Wi-Fi spot of the board.

The HTTP UI interface tab allows checking the service status and changing some configurations.

Two cases must be distinguished:

1. Wi-Fi connection
2. Other connections (Wi-Fi information already logged in)

2.2.2.1 *Wi-Fi connection*

2.2.2.1.1 Wi-Fi configuration

By default, the device comes in Wi-Fi AP mode and offers a hotspot whose name looks like stvs-xxxx.

Step 1. Ensure the device is in Access Point (AP) mode.

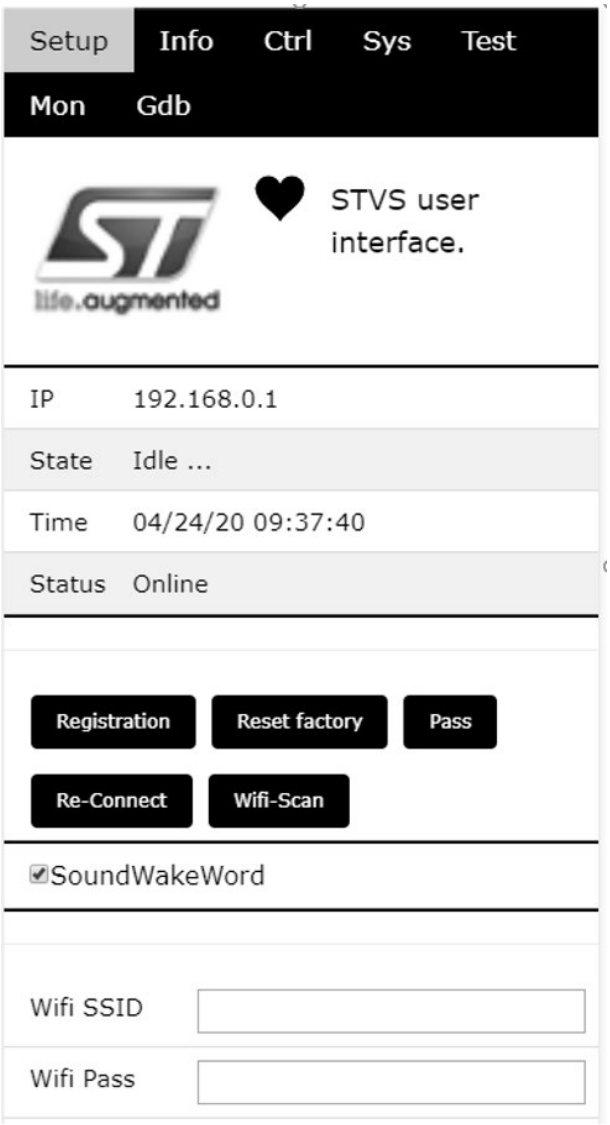
Step 1a. Check the current mode using the RGB LEDs (see Table 2).

Step 1b. If not in AP mode, refer to Section 2.8 .

Step 2. Connect your PC or smartphone to the hotspot and then connect the browser to the address `192.168.0.1`.

Step 3. Go to STVS UI [**Setup**] tab.

Figure 6. STVS user interface



Step 4. Push the [**Wi-Fi-Scan**] button.
All visible Wi-Fi hotspots will be listed in the scan results.

Step 5. Scroll down and select your home network (in this case the hotspot is called [**Netbook**]).

Step 6. Scroll back and type the Wi-Fi password.

Step 7. Scroll down and select the connection type ([**Wi-Fi STA**].

Step 8. To connect the board, scroll up and select [**Re-connect**].

Step 9. Check RGB LEDs on the board (see Table 2).
After few seconds, the Wi-Fi state should switch from “disconnected” to “connected “.
The board reboots and connects to the network via Wi-Fi using a new IP address.

2.2.2.2 *Connection to Wi-Fi STA*

In this case, hotspot Wi-Fi information has already been configured and the board is properly connected to it (refer to Section 2.2.2.1.1 , step 6).

Step 1. Get the board IP address available in the serial console.

Step 2. Refer to Section 2.10 to access the traces.

Note: Traces with the IP address looks like:

```
00:00:00 :  192.168.X.X  :  06:STVS_EVT_NETWORK_IP(0x3001D5BC)
```

The IP is no longer in the AP mode (address = `192.168.0.1`).

Step 3. Connect to the UI using the given address.

Step 4. If there is no serial console connected to the board, scan the network using a free application.

Once installed, the application shows all STVS devices available in the neighborhood and allows connecting to them:

- iPhone users can install “Bonjour HTTP search” from the App Store;
- Android users can download “BonjourBrowser” from the Android Store;
- PC users can install “bonjour browser” from www.tildesoft.com.

2.2.3 Device registration

Step 1. If not yet connected to the http console, go to Section 2.2.2.2 .

Step 2. Under [**Setup**] tab, click [**Registration**](HTML5 browser required).

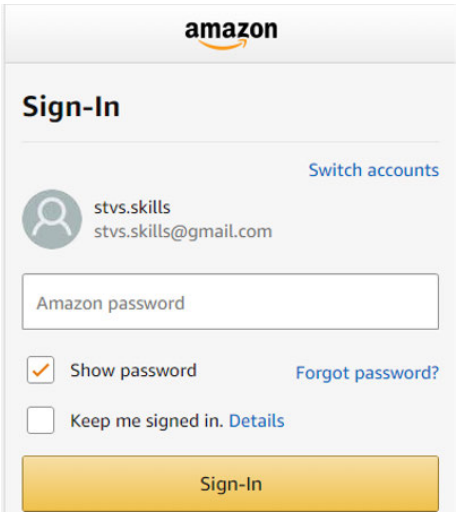
The browser will display a code and a link (amazon.com/code).

Step 3. Copy the code and click on the link.

Figure 7. CBL device registration code

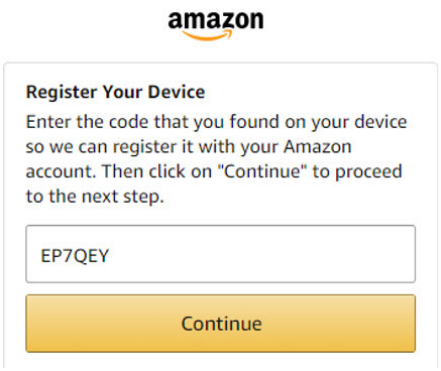
You will be redirected to an Amazon sign-in page.

Figure 8. Amazon sign-in page



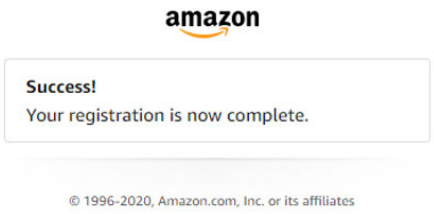
Step 4. Enter you Amazon credentials.
If credentials are correct, you will be redirected to the following page.

Figure 9. Register device page



Step 5. Paste or enter the code given in the previous page and click on continue.
If this step is successful, the board connects to AVS for AWS IoT and the LEDs turn off after few seconds.

Figure 10. Successful registration



Now you can test the device. You can talk to Alexa (for example, asking: “Alexa, what time is it ?”)

2.3 Privacy mode

The device enters privacy mode when you briefly push the white user button.

A red LED switches on and the device does not send any other audio request to the cloud, even when saying "Alexa".

2.4 Alarms

When an alarm or a timer is set and the device rings, you have to press the joystick to acknowledge and stop the alert.

Example of voice requests:

- “Alexa set a timer for 2 minutes”;
- “Alexa set an alarm at 5 pm”;
- “Alexa set alarm” → Alexa will ask for details.

2.5 Amazon music control

If the Amazon account used to register the board is registered to Amazon music, it is possible to ask Alexa to play some songs or playlists and navigate it.

The joystick is also used to navigate music playlists.

2.6 LED UI animations

Table 2. RGB LED animations indicating device state

Effects	Color	Internal service ID	Animation	Comment
	Blue	Restarting	Solid	Just after the reset. It remains like this until the first event is dispatched.
	Blue/Cyan	Booting	Normal beat	It remains like this during the basic system initialization.
	Cyan/Orange	configuration_changes	Normal beat	It signals a configuration state, mainly when the board is in Access Point mode.

Effects	Color	Internal service ID	Animation	Comment
	Blue/Yellow	has_ip	Very fast blinking	During the boot, it signals by a sort event that the network has an IP address.
	Red/Purple	error_need_credentials	Fast blinking	It signals an error, the system needs AWS and AVS credentials. It should occur only during test and development configuration.
	Green/Red	error_need_registration	Slow rotation	It signals an error. The system needs an AVS registration (refer to Section 2.2.3).
	Yellow/Green	connecting	Fast counterclockwise rotation	It signals a reconnection to the AVS for AWS IoT service.
	Red	Privacy	Very long pulsation	It signals the privacy mode is ON.
	Blue/Black	Wakeup	Very fast rotation	Short signal when a Wakeup occurs.
	Black	Idle	All off	It signals the board is ready for interactions.
	Blue	activeListening	Very long pulsation	The AVS for AWS IoT service is listening for utterance.
	Black	stopListening	All off	Not signalled yet.
	Black	startListening	All off	Not signalled yet.
	Cyan	activeSpeaking	Very very long pulsation	The AVS for AWS IoT service is speaking or playing.
	Black	stopSpeaking	All off	Not signalled yet.
	Black	startSpeaking	All off	Not signalled yet.
	Black	thinking	All off	Not signalled yet.
	Red/Black	alerting	Slow counterclockwise rotation	A timer/alarm/ notification/remember is triggered.
	Green	blinkGreen	Slow blinking	It signals a general purpose event (Debug).
	Red	blinkRed	Slow blinking	It signals a general purpose event (Debug).
	Yellow	notification	Very long pulsation	It signals a notification.

Effects	Color	Internal service ID	Animation	Comment
	Purple	dnd	Very long pulsation	It notifies a do not disturb.
	White	SwitchNetwork (6sec) FactoryReset (10sec)	Very fast rotation	It signals the user has made a long push (see Section 2.8 and Section 2.9).

2.7 Buttons and joystick

The STEVAL-VOICE-UI has two push buttons and one joystick.

The black (reset) push button reboots the board, whereas the white (user) button is for mute/privacy state.

A long white button push is used to change the board network configuration (see Section 2.8 and Section 2.9).

Table 3. User button

Click type	Mode	Reference
Short click	Privacy mode	See Section 2.3 .
Long click	1 bip or voice: Switch network	See Section 2.8 .
	2 bips or voice: Factory Reset	See Section 2.9 .

The joystick is mapped to control play and stop. This mapping is arbitrary and is customizable by the user.

Table 4. Joystick default mapping

Action	Result
Stop	Select
Previous	Left
Next	Right
Down	Volume down
Up	Volume up

2.8 Network switching

If the device keeps trying to connect to the Wi-Fi and the fast white circular sequence on RGB LEDs occurs or if you want to connect to Ethernet, you have to re-enter or modify Wi-Fi credentials and the device has to be in AP mode.

In such cases, follow the below procedure to switch to another network.

Step 1. Push the white user button for about 6 seconds.

A circular RGB LED sequence occurs while the button is pushed (see Section 2.6).

Note: Do not push for 10 seconds to avoid starting the sequence described in Section 2.9 .

Step 2. After 6 seconds, check the log traces to know what mode you switched to (refer to Section 2.10).

If the device does not switch to the desired network, repeat the procedure starting from step 1.

2.9 Factory reset

Step 1. Push the white user button for about 10 seconds.

A first circular sequence on RGB LEDs occurs for 6 seconds, indicating the Wi-Fi configuration is switching back to AP mode.

Then, a second sequence starts for 4 seconds more.

Step 2. Release the button.
The device reboots with factory default settings.

2.10 Log traces and STLINK-V3MINI connection

Step 1. Connect the provided STLINK-V3MINI between the board and a PC to get some debugging traces.

Step 2. Connect with any serial terminal such as Tera Term, for instance.
The UART configuration is:

- Baud rate = 921600
- Data = 8-bit
- Parity = none
- Stop = 1-bit
- Flow control = none

The level of log traces can be tuned through the HTTP UI.

Step 3. Select [**Gdb**] tabs and click on the additional debug level(s) you need.

Important: Printing debug info might disturb the state machine. The debug level is not designed to print everything. Only a set of levels can be printed at once.

3 Kit layout

3.1 STEVAL-VUIMB02V1 mother board layout

The STEVAL-VUIMB02V1 mother board includes the processing power capabilities and the main connectivity module.

Figure 11. STEVAL-VUIMB02V1 layout (top view)

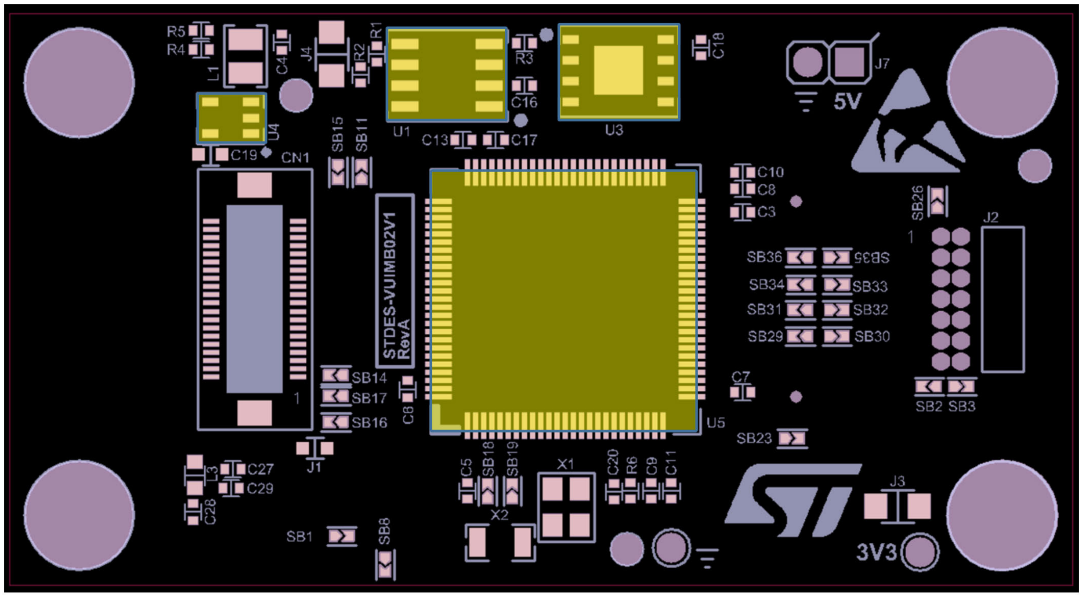
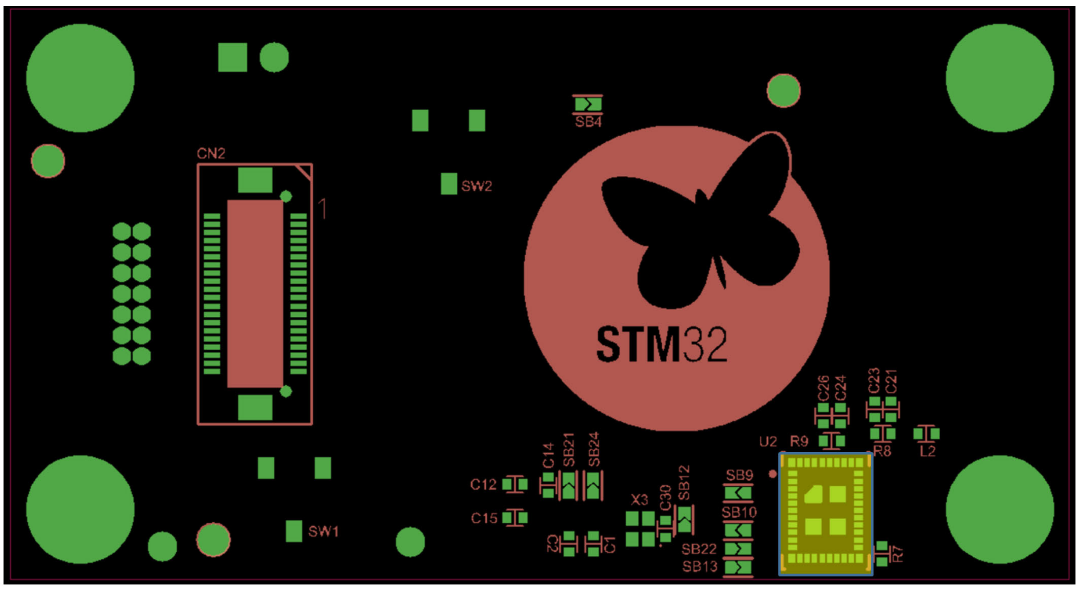


Figure 12. STEVAL-VUIMB02V1 layout (bottom view)



- U1: STSAFE-A110, authentication and brand protection secure solution (footprint only)
- U2: Murata 1DX, Wi-Fi module
- U3: ISSI IS25LP016D, 2MB QSPI NOR memory
- U4: ST1S12GR 0.7 A, 1.7 MHz adjustable, step-down switching regulator
- U5: STM32H753VIT6E high-performance ARM Cortex-M7 MCU
- J9: STDC14, STLink-V3 programming connector

- CN3: USB-C socket

3.2 STEVAL-VUIDB01V1 daughter board layout

Figure 13. **STEVAL-VUIDB01V1 layout (top view)**

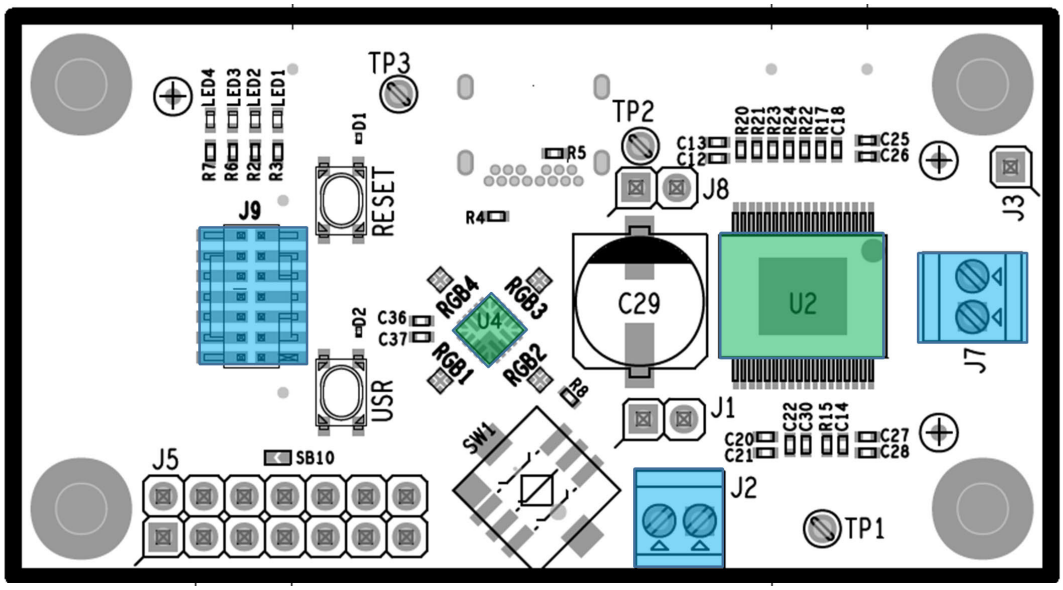
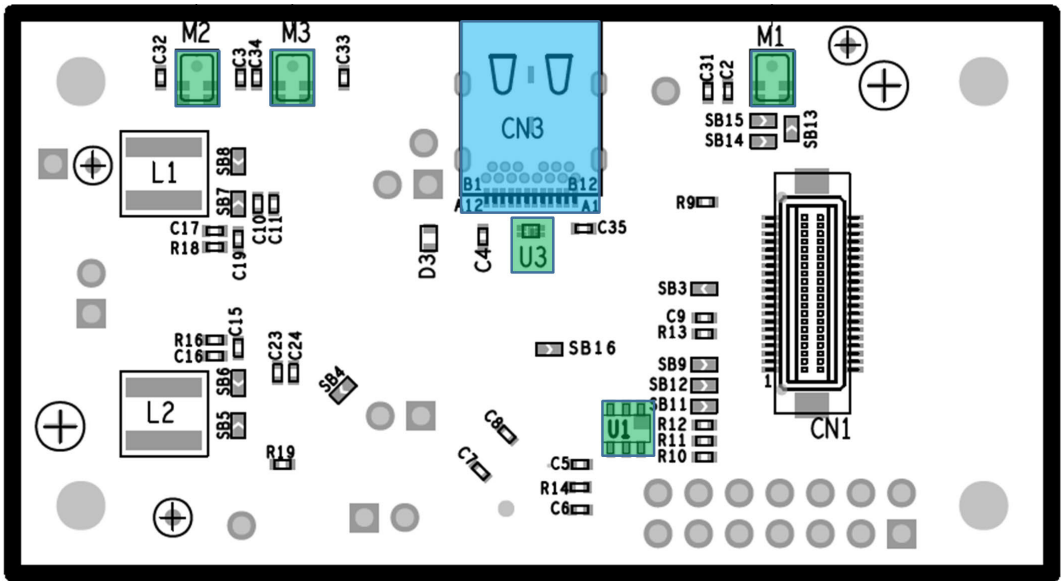


Figure 14. **STEVAL-VUIDB01V1 layout (bottom view)**



- U1:ESDA6V1-5SC6 Transil (TVS) array for ESD protection
- U2: FDA903D 45 W class D digital input power amplifier
- U3: HSP061-2N4 2-line ESD protection for high speed lines
- U4: LED1202QTR 12-channel low quiescent current LED driver
- M1, M2, M3: MP23DB01HP
- J2: Audio out power supply connector
- J7: Audio out connector (loudspeaker)

4 Main devices

4.1 STM32H753VIT6E

STM32H753xI devices are based on the high-performance Arm® Cortex®-M7 32-bit RISC core operating at up to 480 MHz. The Cortex® -M7 core features a floating point unit (FPU) which supports Arm® double-precision (IEEE 754 compliant) and single-precision data-processing instructions and data types. STM32H753xI devices support a full set of DSP instructions and a memory protection unit (MPU) to enhance application security.

STM32H753xI devices incorporate high-speed embedded memories with a dual-bank Flash memory of 2 Mbytes, up to 1 Mbyte of RAM (including 192 Kbytes of TCM RAM, up to 864 Kbytes of user SRAM and 4 Kbytes of backup SRAM), as well as an extensive range of enhanced I/Os and peripherals connected to APB buses, AHB buses, 2x32-bit multi-AHB bus matrix and a multi layer AXI interconnect supporting internal and external memory access.

All the devices offer three ADCs, two DACs, two ultra-low power comparators, a low-power RTC, a high-resolution timer, 12 general-purpose 16-bit timers, two PWM timers for motor control, five low-power timers, a true random number generator (RNG), and a cryptographic acceleration cell. The devices support four digital filters for external sigma-delta modulators (DFSDM). They also feature standard and advanced communication interfaces.

4.2 ST1S12GR

The ST1S12 is a step down DC-DC converter optimized for powering low-voltage digital cores in HDD applications and, generally, to replace the high current linear solution when the power dissipation may cause high heating of the application environment. It provides up to 0.7 A over an input voltage range of 2.5 V to 5.5 V.

A high switching frequency (1.7 MHz) allows the use of tiny surface-mount components. In addition to the resistor divider, only an inductor and two capacitors are required to set the output voltage value. Moreover, a low output ripple is guaranteed by the current mode PWM topology and by the use of low ESR SMD ceramic capacitors.

The device is thermally protected and the current is limited to prevent damage due to accidental short-circuit.

4.3 STSAFE-A110 (footprint only)

The STSAFE-A110 is a highly secure solution that acts as a secure element providing authentication and secure data management services to a local or remote host. It consists of a full turnkey solution with a secure operating system running on the latest generation of secure microcontrollers.

The STSAFE-A110 can be integrated in IoT (Internet of things) devices, smart-home, smart-city and industrial applications, consumer electronics devices, consumables and accessories.

4.4 FDA903D

The FDA903D is a single bridge class D amplifier, designed in the most advanced BCD technology, intended for any automotive audio application (car radio, telematics and e-call, noise and tone generators, etc).

The FDA903D integrates a high performance D/A converter together with powerful MOSFET outputs in class D, so it is very compact and powerful. Moreover, it reaches outstanding efficiency performance (90%).

It has a very wide operating range with standard car battery levels (5.5-18 V operating, compatible to load dump pulse) and with external step-down generated voltages or emergency battery (since it is compatible to minimum 3.3 V operative).

The feedback loop includes the output L-C low-pass filter allowing superior frequency response linearity and lower distortion.

FDA903D is configurable through I²C bus interface and integrates a complete diagnostics array specially designed for automotive applications, including innovative open load and DC offset detection in play mode.

Thanks to the solutions implemented to solve EMI problems, the device can be used in standard single DIN car-radio boxes together with the tuner.

FDA903D also features a configurable power limiting function and can be optionally operated under no I^2C mode (legacy mode).

4.5 LED1202

The LED1202 is a 12-channel low quiescent current LED driver which guarantees 5 V output driving capability. Each channel is able to provide up to 20 mA with a headroom voltage of 350 mV (typ.) only. The output current can be adjusted separately for each channel by 8-bit analog and 12-bit digital dimming control.

A slow turn-on and turn-off time improves the system low noise generation performance. Moreover, the phase shifting function helps to reduce the inrush current. Eight patterns can be stored in the internal registers for automatic sequencing without MCU intervention.

The pattern sequence can be also configured for duration time and number of repetition. For multi-device applications, a common clock domain can be shared for timing synchronization. The device also includes thermal shutdown and open LED detection.

4.6 HSP061-2

The HSP061-2 is a 2-channel ESD array with a rail-to-rail architecture specifically designed for the protection of high speed differential lines.

The ultra-low variation of the capacitance ensures very low influence on signal skew. The large bandwidth makes it compatible with 5 Gbps.

5 Schematic diagrams

Figure 15. **STEVAL-VUIMB02V1 schematic (1 of 3)**

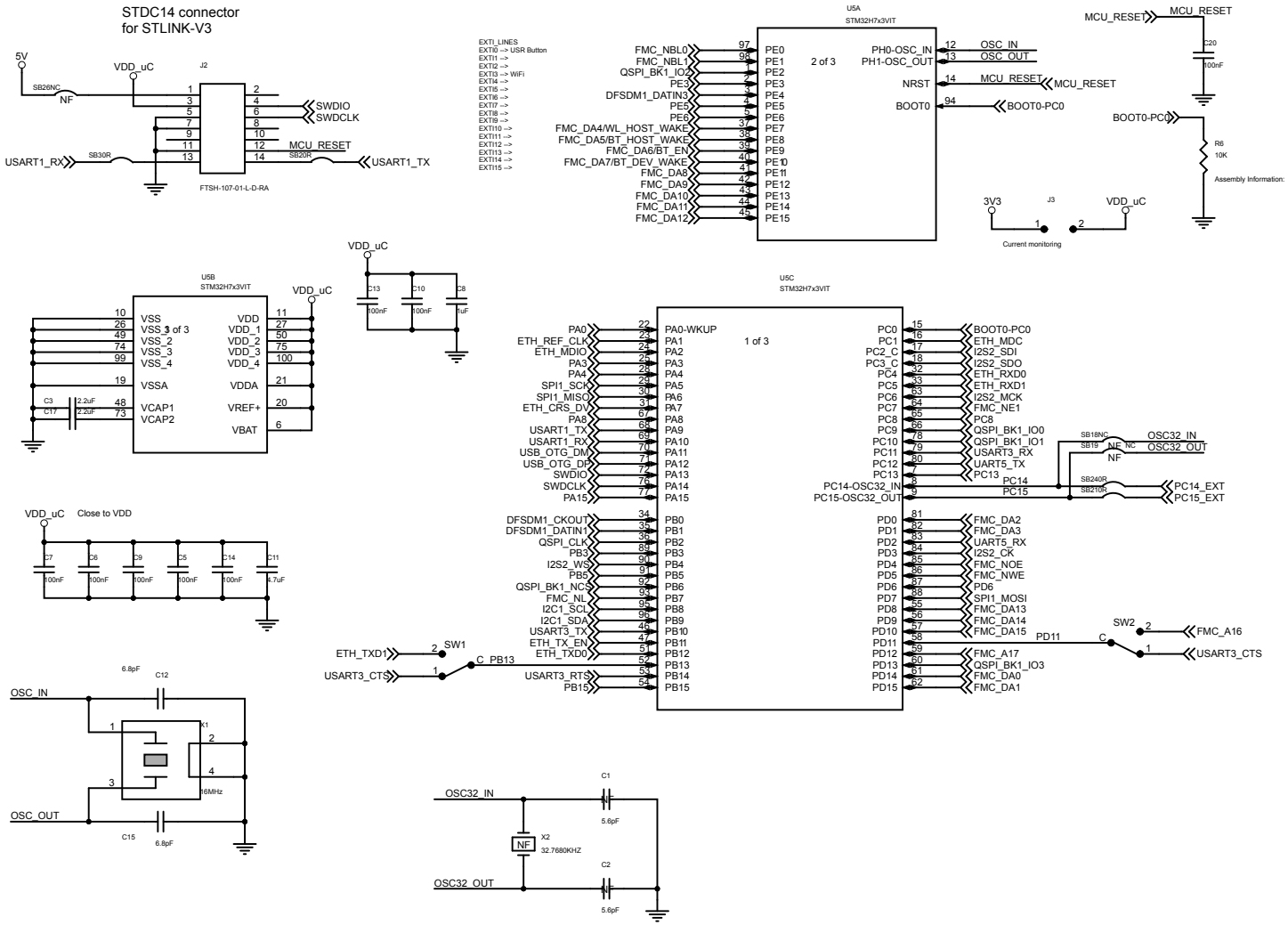
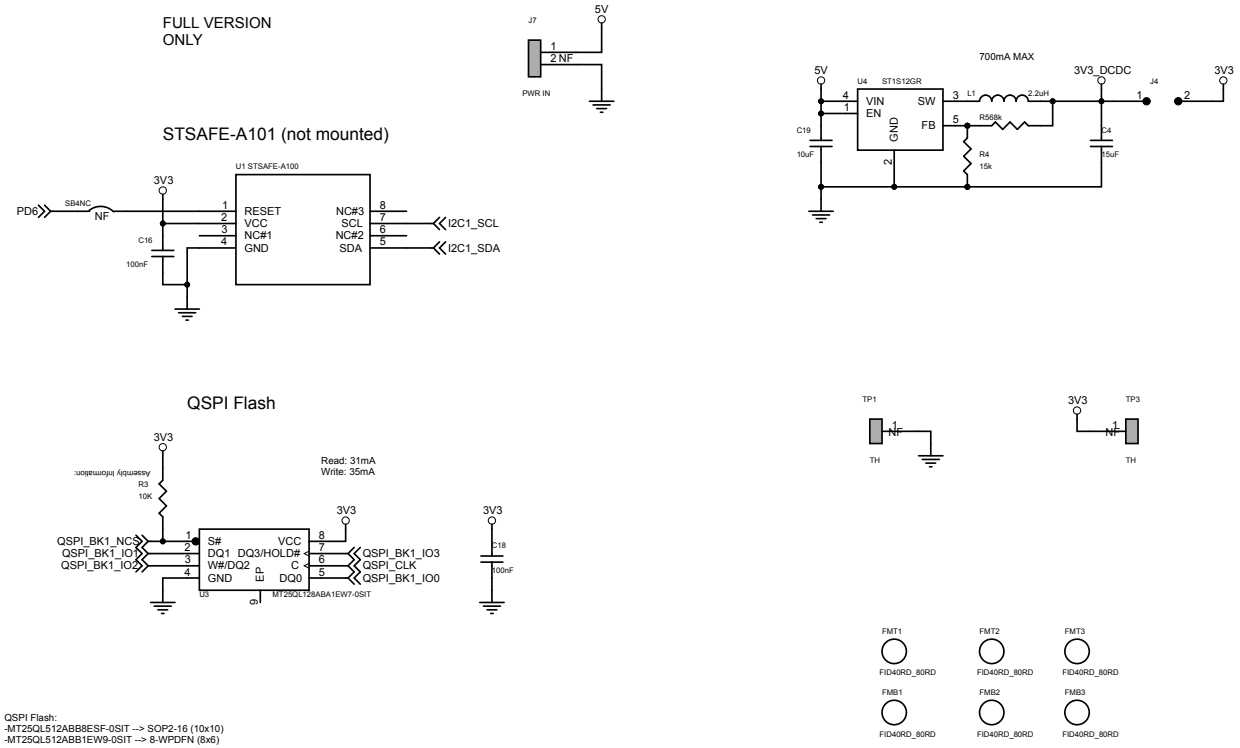


Figure 16. STEVAL-VUIMB02V1 schematic (2 of 3)



QSPI Flash:
-MT25QL512ABB8ESF-0SIT --> SOP2-16 (10x10)
-MT25QL512ABB1EW9-0SIT --> 8-WPDFN (8x6)

-MT25QL128ABA1ESE-0SIT --> 8-SOIC (8x5.5) --> not available
-MT25QL128ABA1EW7-0SIT --> 8-WPDFN (6x5)

Figure 17. STEVAL-VUIMB02V1 schematic (3 of 3)

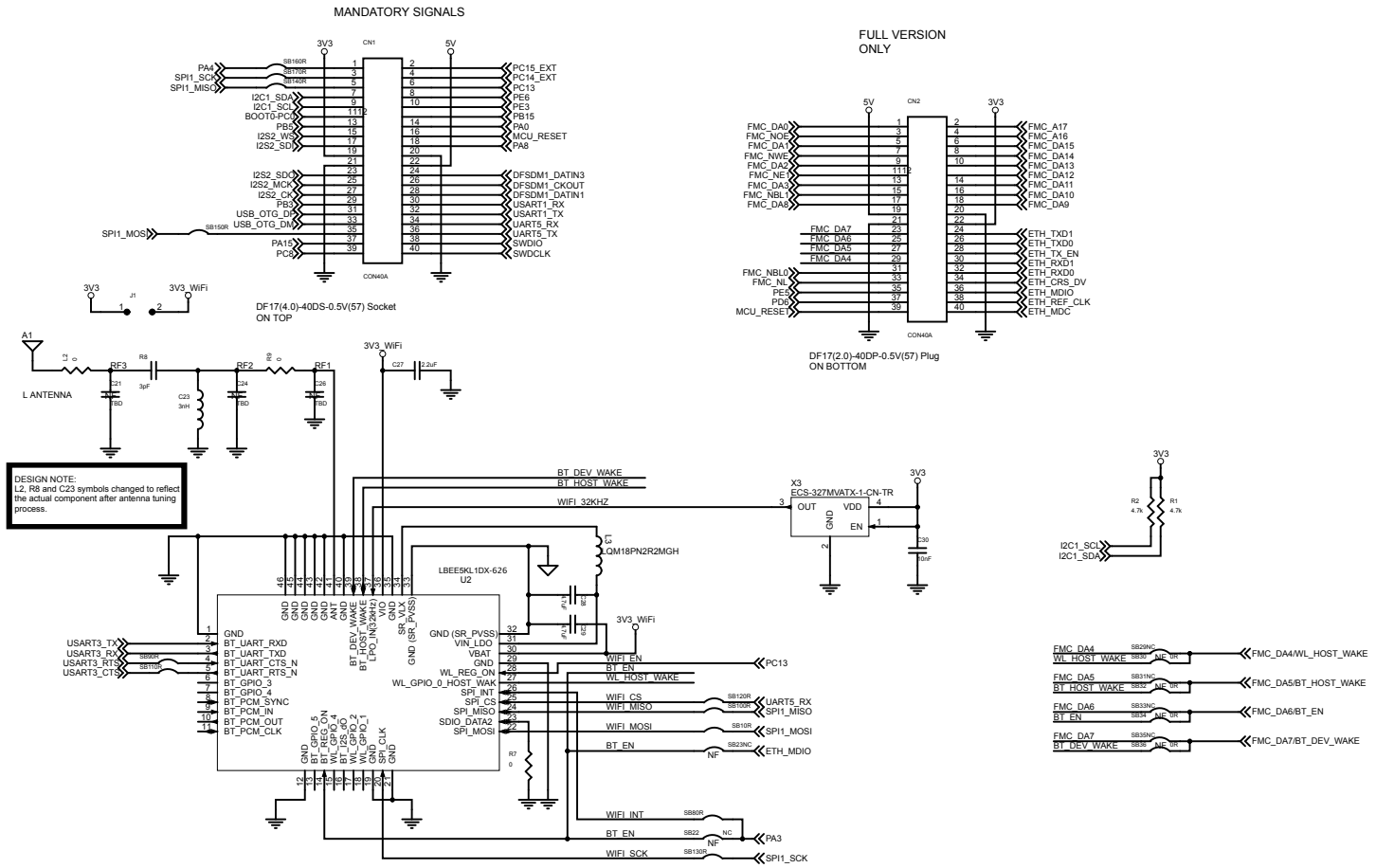


Figure 18. STEVAL-VUIDB01V1 schematic (1 of 3)

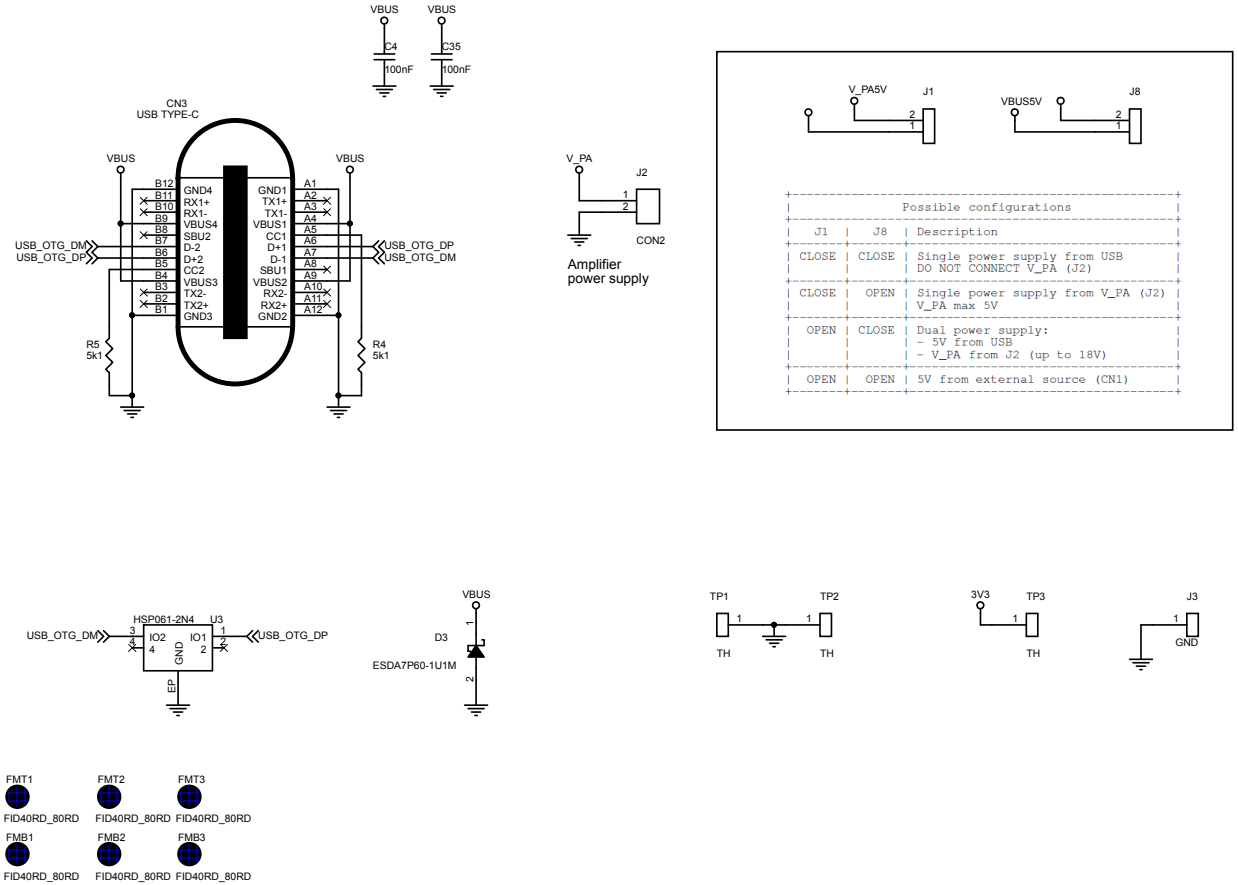


Figure 19. STEVAL-VUIDB01V1 schematic (2 of 3)

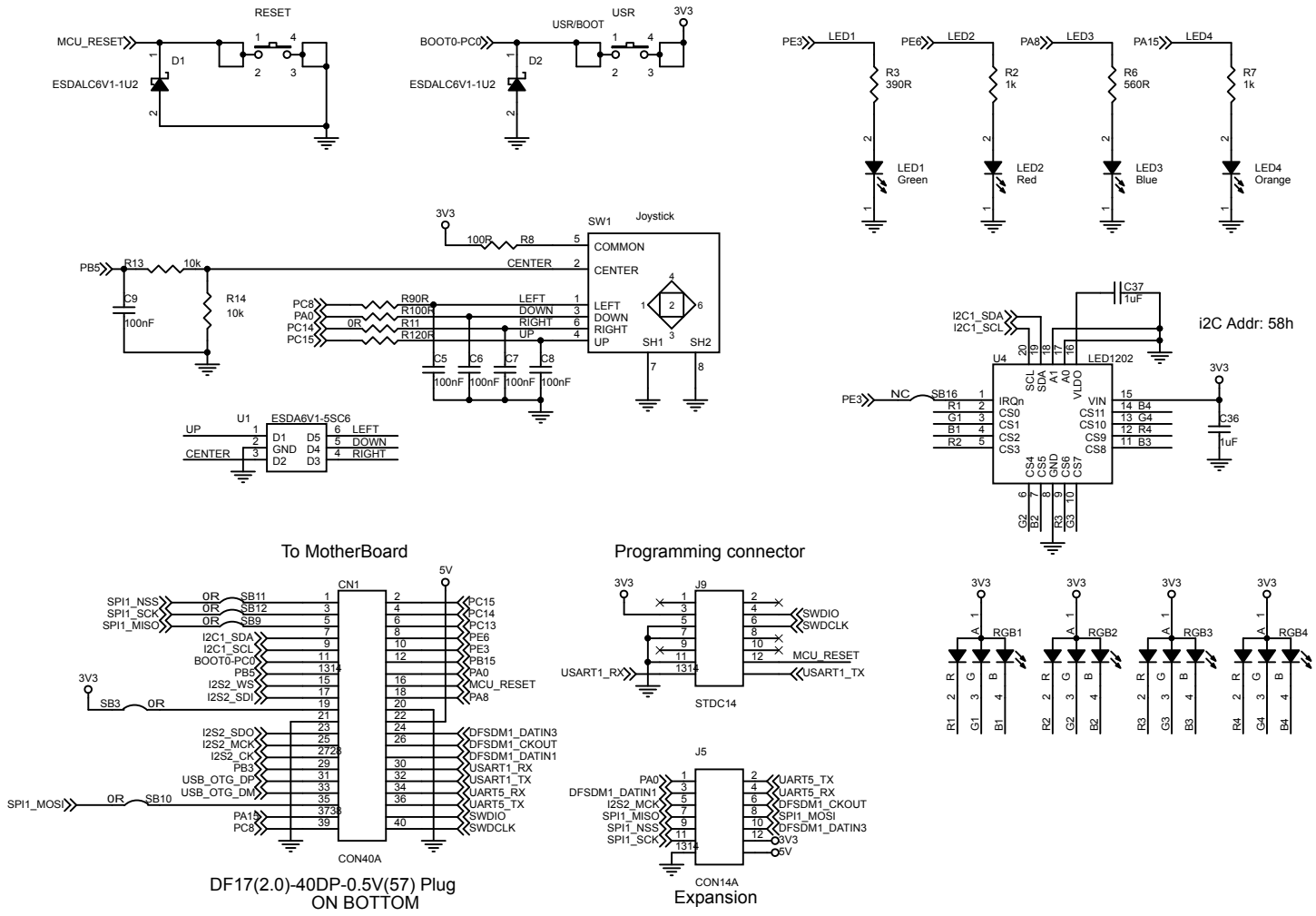
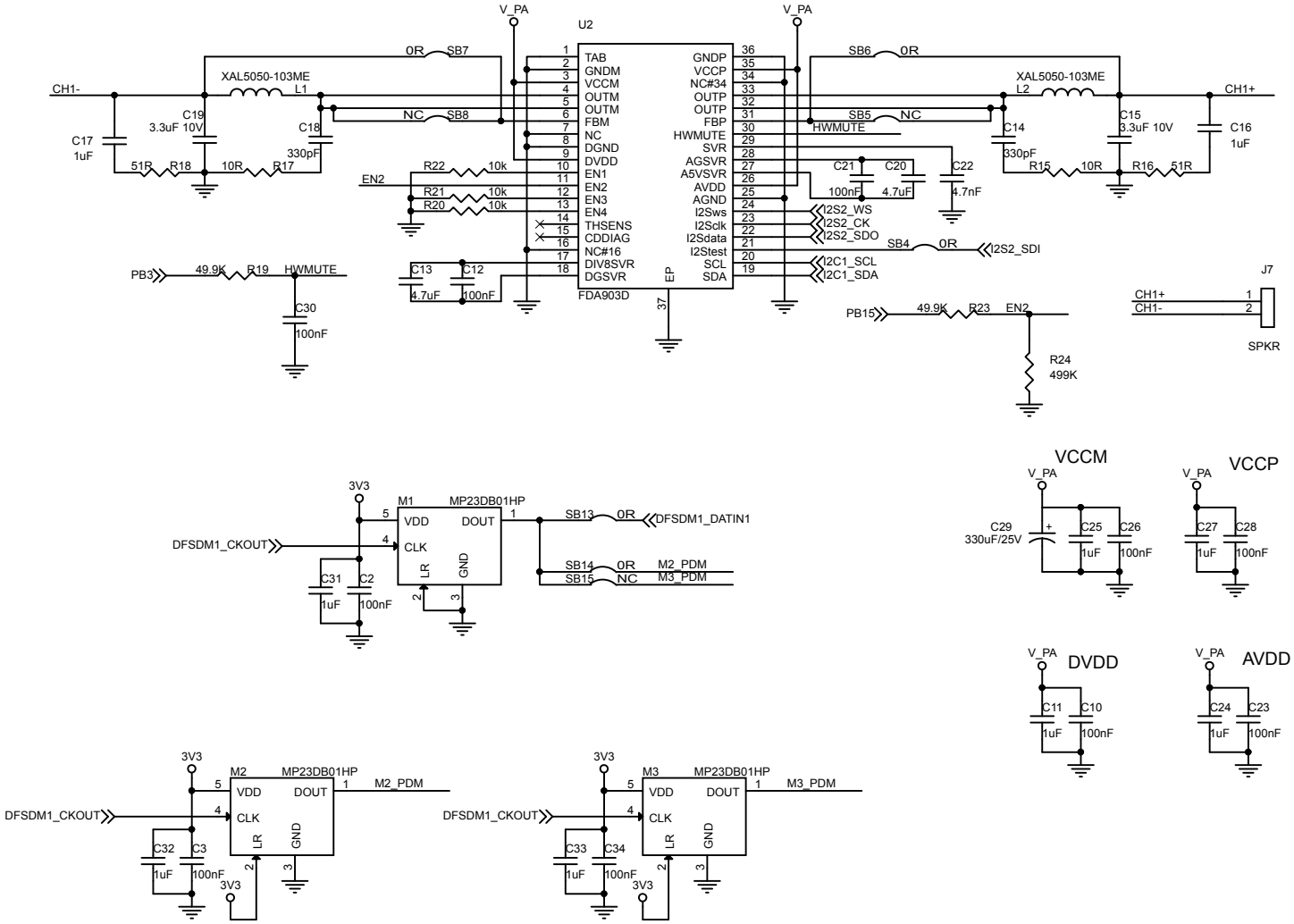


Figure 20. STEVAL-VUIDB01V1 schematic (3 of 3)



6 Bill of materials

Table 5. STEVAL-VOICE-UI bill of materials

Item	Q.ty	Ref.	Part/Value	Description	ManµFacturer	Order code
1	1	Table 6. STEVAL-VUIMB02V1		Main board	ST	Not available for separate sale
2	1	Table 7. STEVAL-VUIDB01V1		Daughter board	ST	Not available for separate sale

Table 6. STEVAL-VUIMB02V1 bill of materials

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
1	3	C3, C17, C27	2.2µF, 0402 (1005 Metric)	CAP CER 2.2µF 10V X5R 0402	Wurth Electronics Inc.	Wurth-885012105013
2	1	C4	15µF, 0402 (1005 Metric)	CAP CER 15µF 6.3V X5R 0402	Murata	GRM155R60J156ME05D
3	10	C5, C6, C7, C9, C10, C13, C14, C16, C18, C20	100nF, 0402 (1005 Metric)	CAP CER 0.1µF 16V X7R 0402	Murata Electronics North America	GRM155R71C104KA88J
4	1	C8	1µF, 0402 (1005 Metric)	CAP CER 1µF 10V X5R 0402	Taiyo Yuden	JMK105BJ105KV-F
5	3	C11, C28, C29	4.7µF, 0402 (1005 Metric)	CAP CER 4.7µF 10V X5R 0402	Murata Electronics North America	GRM155R61A475MEAAD
6	2	C12, C15	6.8pF, 0402 (1005 Metric)	CAP CER 6.8PF 10V C0G/NP0 0402	Murata Electronics North America	GRM0225C1E6R8CA03L
7	1	C19	10µF, 0402 (1005 Metric)	CAP CER 10µF 10V X5R 0402	Samsung Electro-Mechanics America, Inc.	CL05A106MP8NUB8
8	1	C23	3nH, 0402 (1005 Metric)	FIXED IND 3NH 1.35A 63 MOHM SMD	Murata	LQW15AN3N0C80D
9	1	C30	10nF, 0402 (1005 Metric)	Cap Ceramic 0.01µF 50V X7R 10% SMD 0402 125C Paper T/R	Murata	GCM155R71H103KA55D
10	1	CN1	CON40A	40pin B-to-B Socket	Hirose	DF17(4.0)-40DS-0.5V(57)
11	1	CN2	CON40A	40pin B-to-B plug	Hirose	DF17(2.0)-40DP-0.5V(57)
12	1	J1		RES SMD 0 OHM 0603	Yageo	AC0603JR-070RL
13	1	J2	FTSH-107-01-L-D-RA, not mounted	STDC14 - 90deg TH	Samtec	FTSH-107-01-L-D-RA

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
14	2	J3, J4		RES SMD 0 OHM 1206 or 2.54 Jumper	Yageo	AF1206JR-070RL
15	1	L1	2.2uH,	2.2 uH, 20%, 1.3A	Wurth	Wurth-74438323022
16	3	L2, R7, R9		Fixed resistors	Vishay Dale	CRCW04020000Z0ED
17	1	L3		Inductor, 2.2µH, 20%, Isat 0.35A, DCR 0.2Ohm, 0603	Murata	LQM18PN2R2MGH
18	2	R1, R2	4.7k, 0402 (1005 Metric)	RES SMD 4.7K OHM 1% 1/16W 0402	TE Connectivity Passive Product	CRG0402F4K7
19	2	R3, R6	10K, 0402 (1005 Metric)	RES SMD 10K OHM 1% 1/16W 0402	Yageo	RC0402FR-0710KL
20	1	R4	15k, 0402 (1005 Metric)	RES SMD 15K OHM 1% 1/16W 0402	TE Connectivity Passive Product	CRG0402F15K
21	1	R5	68k, 0402 (1005 Metric)	RES SMD 68K OHM 1% 1/16W 0402	TE Connectivity Passive Product	CRG0402F68K
22	1	R8	3pF, 0402 (1005 Metric)	CAP CER 3PF 50V C0G/NP0 0402	Murata	GJM1555C1H3R0CB01D
23	19	SB1, SB2, SB3, SB8, SB9, SB10, SB11, SB12, SB13, SB14, SB15, SB16, SB17, SB21, SB24, SB30, SB32, SB34, SB36	0R	RES SMD 0 OHM 1% 1/16W 0402	Vishay Dale	CRCW04020000Z0ED
24	2	SW1, SW2	TDD01H0SB1R	SWITCH SLIDE DIP SPDT 25MA 24V	ITT C&K	TDD01H0SB1R
25	1	U1	STSAFE-A110, not mounted	Authentication, state-of-the-art security for peripherals and IoT devices	ST	STSAFE-A110
26	1	U2	LBEE5KL1DX-626	Wi-Fi 11b/g/n + Bluetooth 5.1 module - 1DX-SPI	Murata	LBEE5KL1DX-626
27	1	U3	IS25LP016D-JKLE	Flash	ISSI	IS25LP016D-JKLE

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
28	1	U4	ST1S12GR	Step-down switching regulator	ST	ST1S12GR
29	1	U5	STM32H7x3VIT	ARM Cortex-M7 core MCU	ST	STM32H753VIT6E
30	1	X1	16MHz	16.00MHz Crystal 8pF	NDK	NX3225GA-16MHZ-STD-CRG-1
31	1	X3	ECS-327MVATX-1-CN-TR		ECS International	ECS-327MVATX-1-CN-TR

Table 7. STEVAL-VUIDB01V1 bill of materials

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Part Number
1	1	CN1	CON40A	40pin B-to-B plug	Hirose	DF17(2.0)-40DP-0.5V(57)
2	1	CN3		USB Type-C	Wurth Electronics Inc	632723x00011
3	17	C2,C3, C4, C5, C6, C7, C8, C9, C10,C12, C21, C23, C26, C28, C30, C34, C35	100nF, 0402 (1005 Metric), X7R V, 10 %,	CAP CER 0.1UF 16V X7R 0402	Murata Electronics North America	GRM155R71C104KA88J
4	11	C11, C16, C17, C24, C25, C27,C31, C32, C33, C36, C37	1µF, 0402 (1005 Metric), X5R V, 10 %,	CAP CER X5R 0402	Taiyo Yuden	JMK105BJ105KV-F
5	2	C13, C20	4.7µF, 0402 (1005 Metric), X5R V, 20 %,	CAP CER 10V X5R 0402	Murata Electronics North America	GRM155R61A475MEAAD
6	2	C14, C18	330pF, 0402 (1005 Metric), C0G/NP0 V, ±5 %	CAP CER C0G/NP0 0402	Murata Electronics North America	GCM1555C1H331JA16D
7	2	C15, C19	3.3µF 10V, 0402 (1005 Metric), X5R V, ±10 %	CAP CER 3.3UF 10V X5R 0402	TDK	C1005X5R1A335M050BC
8	1	C22	4.7nF, 0402 (1005 Metric), X7R V, ±10 %	CAP CER 4.7nF 10V X7R 0402	Murata Electronics North America	GCM155R71H472KA37D
9	1	C29	330µF/25V, 8x8x10, ±20 %	CAP ALUM 330UF 20% 25V SMD	Nichicon	UUD1E331MNL1GS
10	2	D1, D2	ESDALC6V1-1U2, ST0201	Single-line low capacitance Transil for ESD protection	ST	ESDALC6V1-1U2
11	1	D3	ESDA7P60-1U1M, 1610	High power transient voltage suppressor	ST	ESDA7P60-1U1M

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Part Number
12	2	J1, J8	CON5_0	Header p2.54 M	Any	
13	1	J2	CON2	Morsettiera a 2 vie, passo 2.54mm	Amphenol	VN02A1500000G
14	1	J3	GND, not mounted	Test Point Through Hole	Any	
15	1	J5	CON14A, not mounted		Any	
16	1	J7	SPKR	Morsettiera a 2 vie, passo 2.54mm	Amphenol	VN02A1500000G
17	1	J9	STDC14	STDC14 - ARM MIPI10 compatible	Samtec	FTSH-107-01-L-DV-K
18	1	LED1	Green, LED_0402	GREEN LED	Panasonic Electronic Components	LNJ347W83RA
19	1	LED2	Red, LED_0402	RED LED	Any	
20	1	LED3	Blue, LED_0402	BLUE LED	Any	
21	1	LED4	Orange, LED_0402	ORANGE LED	Any	
22	2	L1, L2	XAL5050-103ME, 6x6	Fixed Inductors 10uH 20% 4.9A 45mOhms	COILCRAFT	XAL5050-103ME
23	3	M1, M2, M3	MP23DB01HP, RHLGA 3.5x2.65	MEMS audio sensor multi-performance mode digital microphone	ST	MP23DB01HP
24	1	RESET	SW PUSHBUTTON-SPST-2, 4.2x3.2x2.5mm	Push Button Black	ALPS	SKRPADE010
25	4	RGB1, RGB2, RGB3, RGB4		RGB LEDs	OSRAM	LRTBR48G-P9Q7-1+R7S5-26+N5P-68
26	2	R2, R7	1k, 0402 (1005 Metric), 100ppm/C V, ±1 %	RES SMD 1K OHM 1% 1/16W 0402	Yageo	RC0402FR-071KL
27	1	R3	390R, 0402 (1005 Metric), 100ppm/C V, ±1 %	RES SMD 390 OHM 1% 1/16W 0402	Yageo	RC0402FR-07390RL
28	2	R4, R5	5k1, 0402 (1005 Metric), 100ppm/C V, ±1 %	RES SMD 5k1 OHM 1% 1/16W 0402	Yageo	RC0402JR-075K1L
29	1	R6	560R, 0402 (1005 Metric), 100ppm/C V, ±1 %	RES SMD 560 OHM 1% 1/16W 0402	Yageo	RC0402FR-07560RL

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Part Number
30	1	R8	100R, 0402 (1005 Metric), 100ppm/C V, ±1 %	RES SMD 100 OHM 1% 1/16W 0402	Yageo	RC0402JR-07100RL
31	4	R9, R10, R11, R12	0R, 0402 (1005 Metric), 100ppm/C V, ±1 %	RES SMD 0 OHM 1% 1/16W 0402	Vishay Dale	CRCW04020000Z0ED
32	5	R13, R14, R20, R21, R22	10k, 0402 (1005 Metric), 100ppm/C V, ± 1 %	RES SMD 10K OHM 1% 1/16W 0402	Yageo	RC0402FR-0710KL
33	2	R15, R17	10R, 0402 (1005 Metric), 100ppm/C V, ±1 %	RES SMD 10 OHM 1% 1/16W 0402	Yageo	RC0402JR-0710RL
34	2	R16, R18	51R, 0402 (1005 Metric), 100ppm/C V, ±1 %	RES SMD 51 OHM 1% 1/16W 0402	Yageo	RC0402JR-0751RL
35	2	R19, R23	49.9K, 0402 (1005 Metric), 100ppm/C V, ±1 %	RES SMD 49.9K OHM 1% 1/16W 0402	Yageo	RC0402FR-0749K9L
36	1	R24	499K, 0402 (1005 Metric), 100ppm/C V, ±1 %	RES SMD 49.9K OHM 1% 1/16W 0402	Yageo	RC0402FR-0749K9L
37	10	SB3, SB4, SB6, SB7, SB9, SB10, SB11, SB12, SB13, SB14	0R, 0402 (1005 Metric), Jumper	RES SMD 0 OHM 1% 1/16W 0402	Vishay Dale	CRCW04020000Z0ED
38	4	SB5, SB8, SB15, SB16	NC, 0402 (1005 Metric) Jumper, not mounted	RES SMD 0 OHM 1% 1/16W 0402	Vishay Dale	CRCW04020000Z0ED
39	1	SW1		Joystick	Alps	SKRHADE010
40	1	TP1	TH	Test Point Through Hole	Keystone Electronics	5001
41	2	TP2, TP3	TH, not mounted	Test Point Through Hole	Any	
42	1	USR	SPST-2, 4.2x3.2x2.5mm	Push Button	ALPS	SKRPABE010
43	1	U1	ESDA6V1-5SC6	ESD Protection	ST	ESDA6V1-5SC6
44	1	U2	FDA903D	Class D digital input automotive audio amplifier	ST	FDA903D
45	1	U3	HSP061-2N4, uQFN-4L	2-line ESD protection for high speed lines	ST	HSP061-2N4

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Part Number
46	1	U4	LED1202, QFN20 3x3	12-channel current LED driver	ST	LED1202QTR

7 Kit versions

Table 8. **STEVAL-VOICE-UI versions**

PCB version	Schematic diagrams	Bill of materials
The evaluation kit with order code STEVAL-VOICE-UI contains the board STEVAL$VUIMB02V1 and the board STEVAL$VUIDB01V1 (1)	STEVAL-VOICE-UI schematic diagrams	STEVAL-VOICE-UI bill of materials

1. *This codes identify the first version of the boards contained in the kit. They are printed on the boards PCB.*

8 Regulatory compliance information

Formal Notices Required by the U.S. Federal Communications Commission (FCC)

Responsible party's contact located in the United States: name: Terry Blanchard; address: STMicroelectronics, Inc., 750 Canyon Drive, Suite 300 Coppell, TX, 75019, U.S.A; e-mail: terry.blanchard@st.com

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. Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

Standard applied: FCC CFR Part 15 Subpart B. Test method applied: ANSI C63.4 (2014+A1/2017).

Formal Product Notice Required by Industry Canada

Responsible party's contact located in Canada: name: John Langner; address: STMicroelectronics, Inc., 350 Burnhamthorpe Road West, Suite 303 L5B 3J1, Mississauga, ON, Canada; e-mail: john.langner@st.com

Innovation, Science and Economic Development Canada Compliance

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence exempt RSS(s). Operation is subject to the following two conditions: (1) This device may not cause interference. (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Standard applied: ICES-003 Issue 7 (2020), Class B. Test method applied: ANSI C63.4 (2014+A1/2017).

Conformité à Innovation, Sciences et Développement Économique Canada

L'emetteur/recepteur exempt de licence contenu dans le present appareil est conforme aux CNR d'Innovation, Sciences et Developpement economique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisee aux deux conditions suivantes: (1) L'appareil ne doit pas produire de brouillage; (2) L'appareil doit accepter tout brouillage radioelectrique subi, meme si le brouillage est susceptible d'en compromettre le fonctionnement.

Norme appliquée: NMB-003, 7e édition (2020), Classe B. Méthode d'essai appliquée: ANSI C63.4 (2014+A1/2017).

Notice for the European Union

The STEVAL-VOICE-UI is in conformity with the essential requirements of the Directive 2014/53/EU (RED) and of the Directive 2015/863/EU (RoHS). Harmonized standards applied are listed in the EU Declaration of Conformity.

Revision history

Table 9. **Document revision history**

Date	Version	Changes
18-Nov-2020	1	Initial release.
04-May-2021	2	Updated Section 1.1 Kit components, Section 2.1 Pre-requisites, Section 2.2 Device setup, Section 2.2.1 Android and iOS users, Section 2.2.2.1.1 Wi-Fi configuration, Section 2.2.3 Device registration and Section 6 Bill of materials.
01-Jun-2021	3	Updated Section 5 Schematic diagrams and Section 6 Bill of materials.
11-May-2022	4	Updated introduction. Added Section 7 Kit versions and Section 8 Regulatory compliance information.
16-Jun-2022	5	Added Section 1.2 RF specifications.

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