Getting started with STEVAL-ROBKIT1

Introduction

The STEVAL-ROBKIT1 is an evaluation kit which is a hardware and software package designed as a platform for the development of robotic technology and its applications. This evaluation kit consists of a main board which houses the STM32H7 series MCU, integrates various functionalities, and controls the motor board and imaging board connected to the kit.

The robotics evaluation kit is designed in such a way that it can demonstrate the various robotics applications. This board is designed with a vision of its reusage for an even higher robotics application platform that provides the scope of easy expansion and customization due to its modular design. This robotics evaluation kit is useful for students, hobbyists, and professionals who want to explore robotics, develop various algorithms, and understand how different components interact in a robotic system.

Figure 1. STEVAL-ROBKIT1
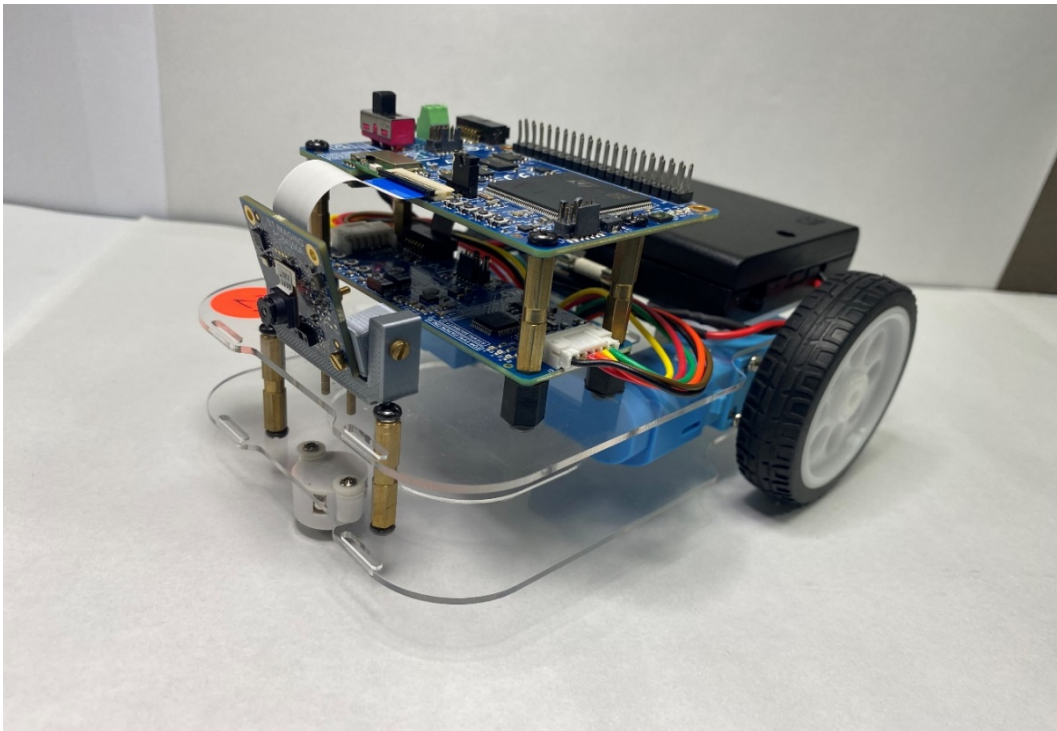
Notice: *For dedicated assistance, submit a request through our online support portal at www.st.com/support.*

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1 Laser safety considerations

The VL53L8CX Time-of-Flight sensor contains a laser emitter and corresponding drive circuitry. The laser output is designed to remain within Class 1 laser safety limits under all reasonably foreseeable conditions including single faults, in compliance with IEC 60825-1:2014 (third edition). The laser output remains within Class 1 limits as long as STMicroelectronic's recommended device settings are used, and the operating conditions specified in the datasheet are respected. The laser output power must not be increased by any means and no optics should be used with the intention of focusing the laser beam.

CLASS 1
LASER PRODUCT
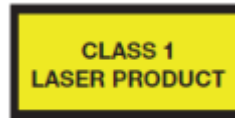
2 Getting started

2.1 Overview

The STEVAL ROBKIT1 kit consists of the following boards:

- STEVAL-ROBKIT1-1 (main board having the STM32H725IGT6 controller)
- STEVAL-ROBKIT1-2 (motor board having the STM32G071CBT6 controller)
- STEVAL-ROBKIT1-3 (imaging board having the ToF sensor and camera module)

The main board has the STM32H725IGT6 microcontroller, which is a high-performance microcontroller from the STM32 family. The Arm Cortex®-M7 core, the heart of this microcontroller, is renowned for its tremendous processing capacity and sensitivity in real time. It handles the power supply and distribution to the other boards and components in the kit.

The STM32G071CBT6 microcontroller, a part of the STM32G0 family, is renowned for providing affordable, low-power solutions that are appropriate for motor control applications. With its Arm Cortex®-M0+ core, the STM32G071CBT6 provides effective motor control that is used to manage the motor's direction, speed, and other attributes.

The robotic kit's imaging component is the STEVAL-ROBKIT1-3. Its ability to acquire and analyze visual information from the surroundings is essential for activities like environmental mapping, object detection, and navigation. It consists of a monochrome camera and a multizone Time-of-Flight sensor. It transmits image data via communication with the main board for additional processing and decision-making.
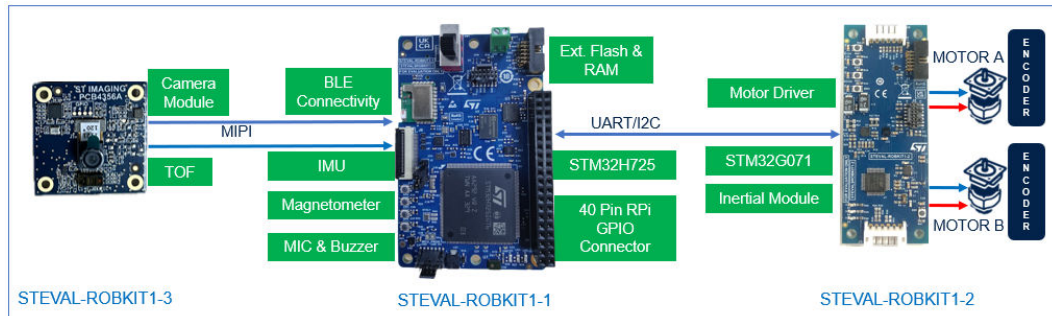
Figure 2. STEVAL ROBKIT1 kit component placement
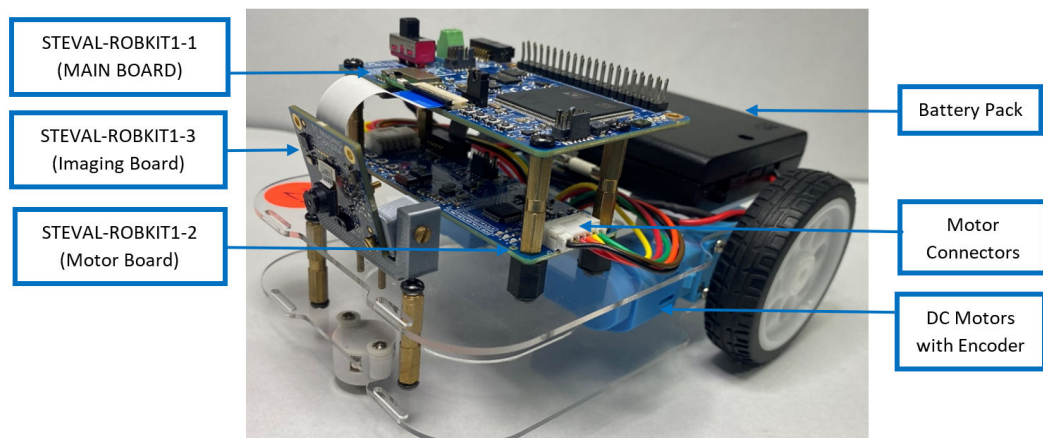
The evaluation kit is designed in such a way that it accommodates the main board and daughterboards in a comprehensive design with the following features:

- Based on the high-performance STM32H7 MCU
- STM32G0 controller for navigation
- DC motor with encoder
- ToF sensor for Free + Follow-me navigation, obstacle, cliff detection
- Monochrome camera for object detection & QR code scanner
- BLE (Bluetooth® Low Energy) connectivity

Figure 3. **STEVAL-ROBKIT1 architecture block diagram**

The STEVAL ROBKIT1-1 main board of the robotic evaluation kit is responsible for controlling and coordinating various components of the robot. The figure below shows the component placement on the board.

Figure 4. **STEVAL-ROBKIT1-1 component placement details**
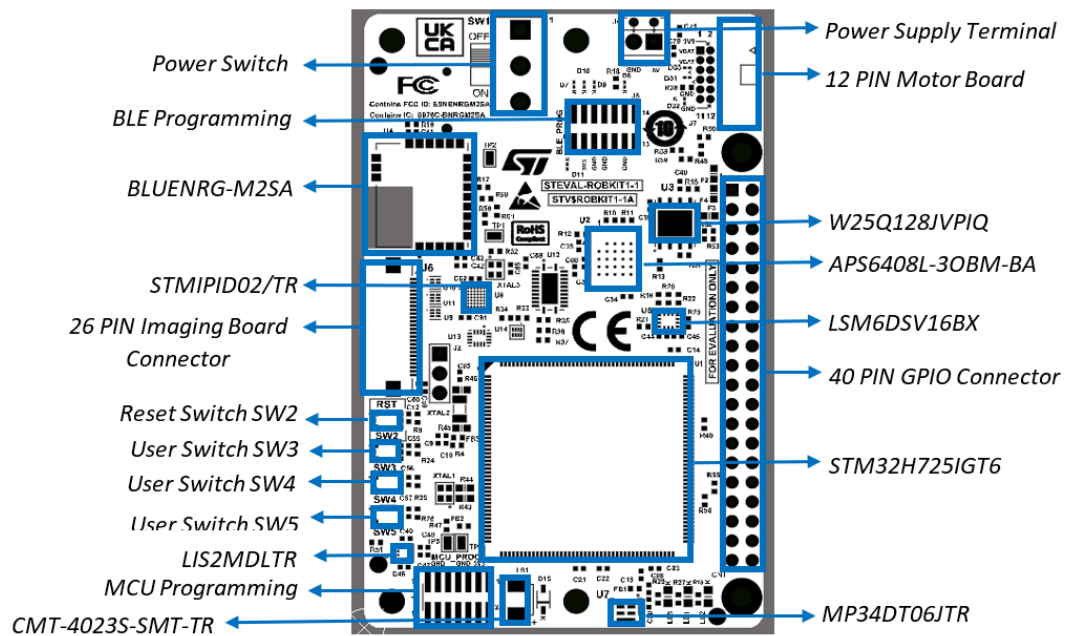
The main board, STEVAL-ROBKIT1-1, has the STM32H725IGT6 microcontroller that is capable of incorporating high-speed embedded memories with up to 1 Mbyte of flash memory, up to 564 Kbytes of RAM, as well as an extensive range of enhanced I/Os and peripherals connected to APB buses, AHB buses, 2x32-bit multi-AHB bus matrix, and a multilayer AXI interconnect supporting internal and external memory access. To improve application robustness, all memories feature error code correction.

The main board, STEVAL-ROBKIT1-1, is equipped with a variety of sensors and components that are controlled by the STM32H725IGT6 microcontroller.

The board includes motion sensors, such as an Inertial Measurement Unit (IMU) and a magnetometer. The IMU sensor provides crucial data on the robot's acceleration and angular velocity, which is essential for navigation and stability control. The microcontroller reads the IMU data to determine the robot's orientation and movement. Additionally, the magnetometer measures the magnetic field around the robot and the microcontroller processes this data to ensure accurate directional control. For audio sensing, the board is equipped with a MEMS microphone that captures audio signals, enhancing the robot's interactivity.

Connectivity is facilitated by the BLE module, which enables wireless communication between the robot and a mobile phone application.

In terms of memory, the board includes external PSRAM and flash memory, providing additional data storage and processing capabilities. The microcontroller accesses these memories to store and retrieve data as needed, ensuring efficient performance. The main board also features a 40-pin Raspberry Pi compatible GPIO connector, allowing it to interface with Raspberry Pi accessories and peripherals. The microcontroller communicates with these peripherals through the connector, expanding the robot's functionality and compatibility with various external devices.

The user interface includes signalizing LEDs that provide visual feedback on the status of the robot. The microcontroller controls these LEDs to indicate power status, connectivity, and other operational states, offering clear and immediate information to the user. Additionally, there are user switches for manual input and control. The microcontroller reads the state of these switches to perform specific actions based on user input, enhancing the robot's interactivity. A reset switch is also available, allowing the user to reset the microcontroller, which is useful for restarting the robot or recovering from errors.

Figure 5. **STEVAL ROBKIT1-1 system block diagram**
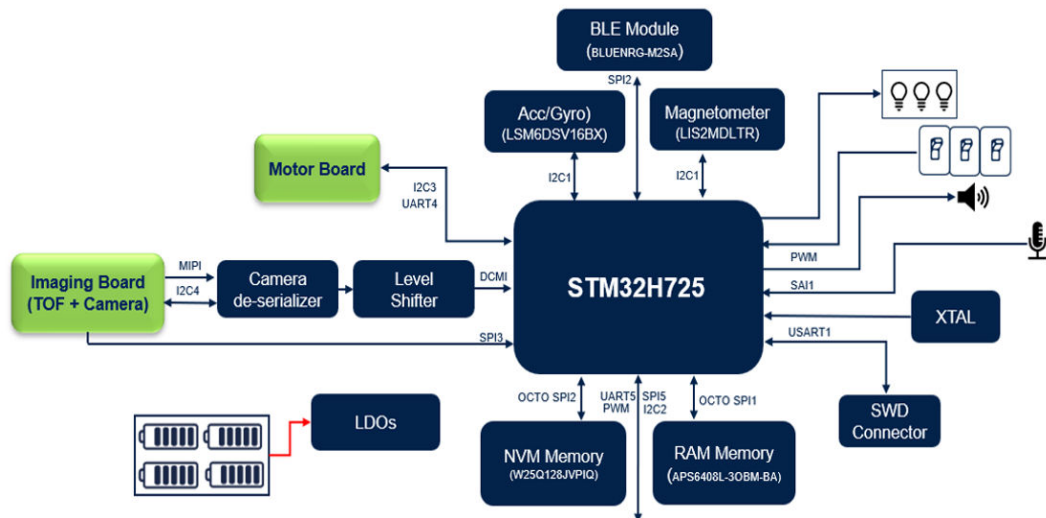
For programming and updates, the board includes an MCU programming connector and a BLE module programming connector. These connectors are used for programming the microcontroller and the BLE module, respectively, allowing for firmware updates and debugging to ensure the system remains up-to-date and functional. Power management is handled by voltage regulators, which convert the 6 V input power supply to 3.3 V and 5 V, as required by various components on the board. The microcontroller ensures proper power distribution and management, maintaining the stability and efficiency of the system.

The STEVAL ROBKIT1-2 motor control board is responsible for controlling the 2 DC geared motors. The heart of the motor control board is an STM32G071 microcontroller. The motors are controlled through an STSPIN240 dual brush DC motor driver through PWM and direction pins. The motors consist of a two-channel Hall effect encoder which gives the pulses according to the speed of the motor; the encoder signals are given as input to the microcontroller and are used as feedback for the motor control. The motor control board also consists of an IMU LSM6DSR for linear acceleration and angular velocity. The figure below shows the component placement on the board.

Figure 6. STEVAL ROBKIT1-2 component placement details
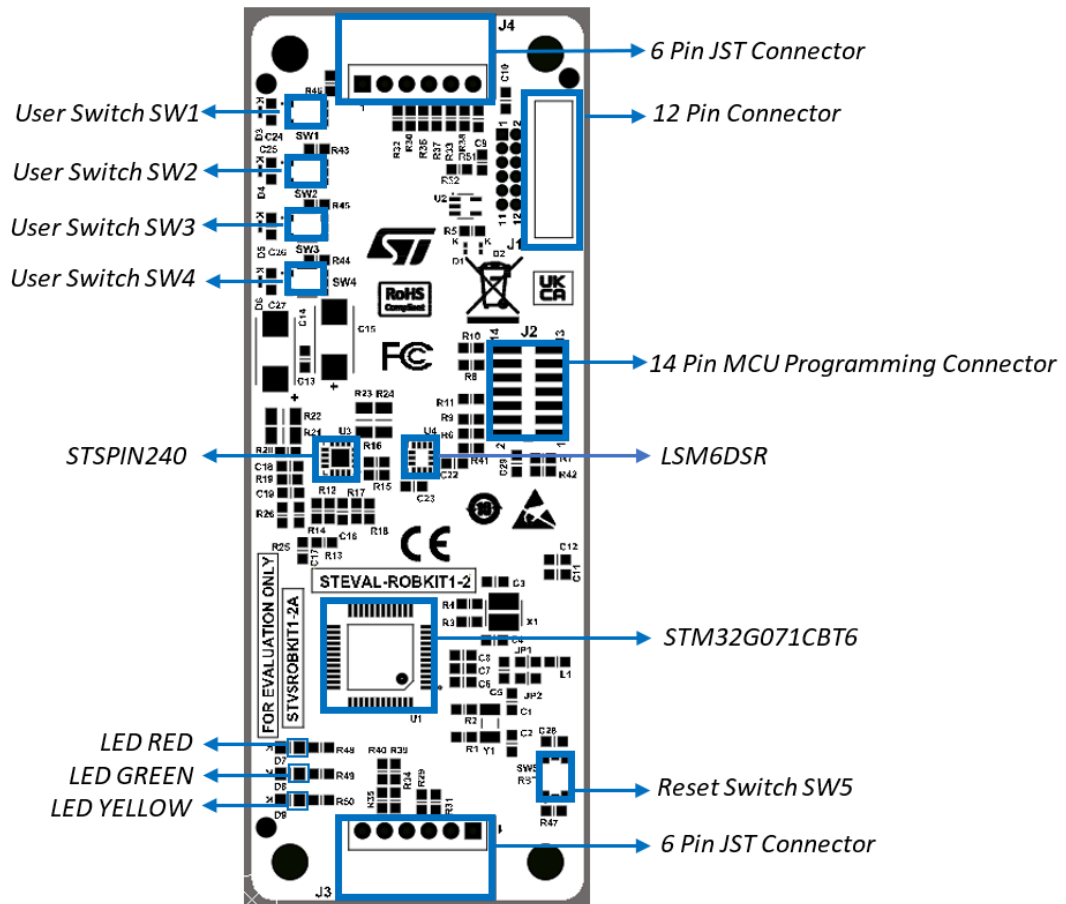
The motor board, STEVAL-ROBKIT1-2, is a critical component of the robotic kit that drives the robot's movement and ensures precise control over its motors. The STM32G071CBT6 is a high-performance and low-power consumption microcontroller, making it ideal for motor control applications. It features up to 128 Kbytes of flash memory and 36 Kbytes of SRAM, providing ample space for firmware and real-time processing. The STM32G071CBT6 also includes a variety of peripherals and interfaces that facilitate seamless communication and control.

One of the main components on the motor board is the STSPIN240, a motor driver that is specifically designed for driving DC motors with high efficiency and low noise. The STSPIN240 includes protection features such as overcurrent, overtemperature, and undervoltage lockout, ensuring the safety and reliability of the motor control system.

The motor board is equipped with two JST connectors that allow for the connection of DC motors with encoders. The encoders provide feedback to the microcontroller, which processes this data to ensure accurate motor control. In addition to motor control, the motor board includes an Inertial Measurement Unit (IMU) sensor. The IMU sensor provides data on the board's acceleration and angular velocity, which is essential for maintaining stability and control during operation. The microcontroller reads and processes this data to make real-time adjustments to the motor control algorithms.

The motor board also features a reset switch, which allows users to reset the microcontroller. This is useful for restarting the system or recovering from errors. User switches are included for manual input and control, enabling users to interact with the motor board directly. The microcontroller reads the state of these switches to perform specific actions based on user input. Signalizing LEDs are present on the motor board to provide visual feedback on the status of the system. These LEDs indicate power status, motor activity, and other operational states, offering clear and immediate information to the user. The microcontroller controls these LEDs to ensure accurate and timely feedback.

The motor board is designed to connect seamlessly with the main board via a dedicated connector. This connector not only facilitates communication between the two boards but also supplies the motor board with the necessary power. The motor board receives a 3.3 V supply for the microcontroller and a 6 V supply for the motors, ensuring that all components operate within their specified voltage ranges.

Figure 7. STEVAL ROBKIT1-2 system block diagram
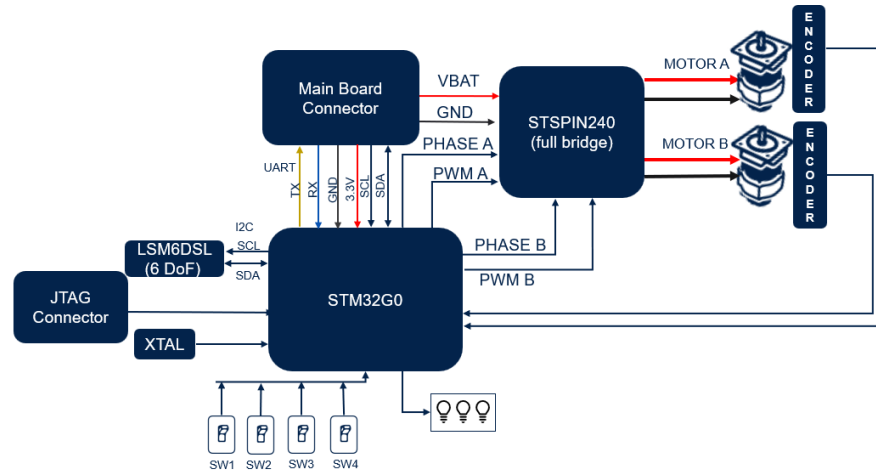
For programming and updates, the motor board includes an MCU programming connector. This connector is used for programming the STM32G071CBT6 microcontroller, allowing for firmware updates and debugging to ensure the system remains up-to-date and functional.

The STEVAL ROBKIT1-3 imaging board is used to capture visual information and process images for the implementation of various use cases such as object detection, cliff detection, follow-me navigation and so on. The imaging board enables the robotic evaluation kit to perceive and interact with its environment using visual data. The imaging board used in the STEVAL-ROBKIT1 consists mainly of a camera module and Time-of-Flight sensor (VL53L8CX) interfaced using an MIPI (Mobile Industry Processor Interface) & SPI interface respectively. The figure below shows the component placement on the board.

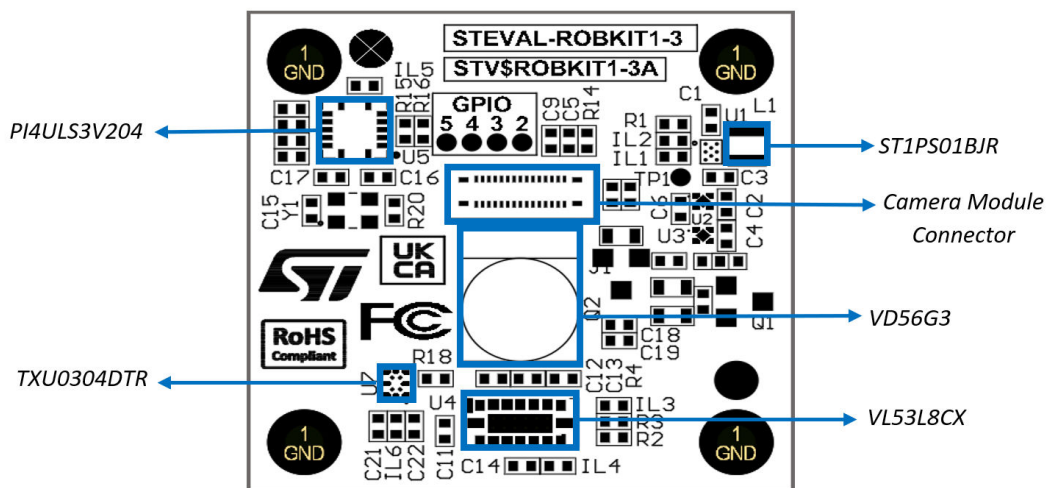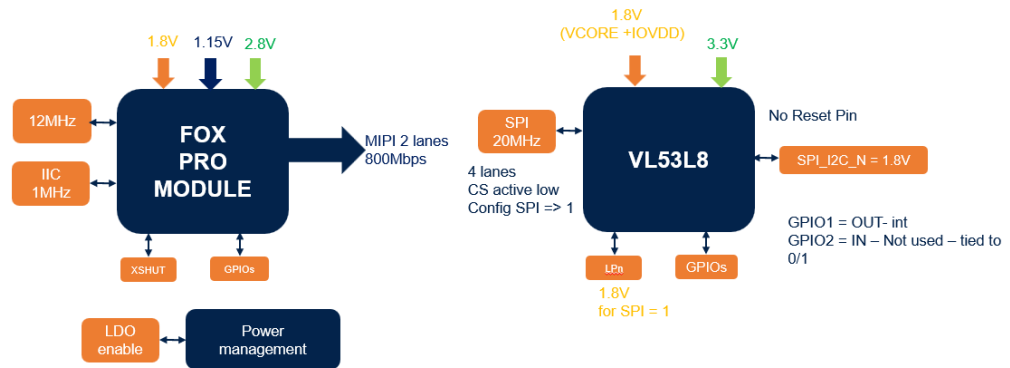**Figure 8. STEVAL ROBKIT1-3 component placement details**

Figure 9. STEVAL ROBKIT1-3 system block diagram

2.2 System requirements

To run the STEVAL-ROBKIT1, you need:

- A laptop/desktop (with Windows 10 or above)
- STLINK-V3PWR (for connection of debugger with the MCU boards, if required).

Note: *Use only 4 units of 1.5 V AA alkaline batteries. Don't use rechargeable batteries having less than 1.5 V each.*

2.3 Setup specifications and starting the kit

To prepare the setup, follow the steps below.

Step 1. Connect the STEVAL-ROBKIT1-1 board with the STEVAL-ROBKIT1-2 using the 12-pin connector cable.

Figure 10. Connection of 12-pin connector cable
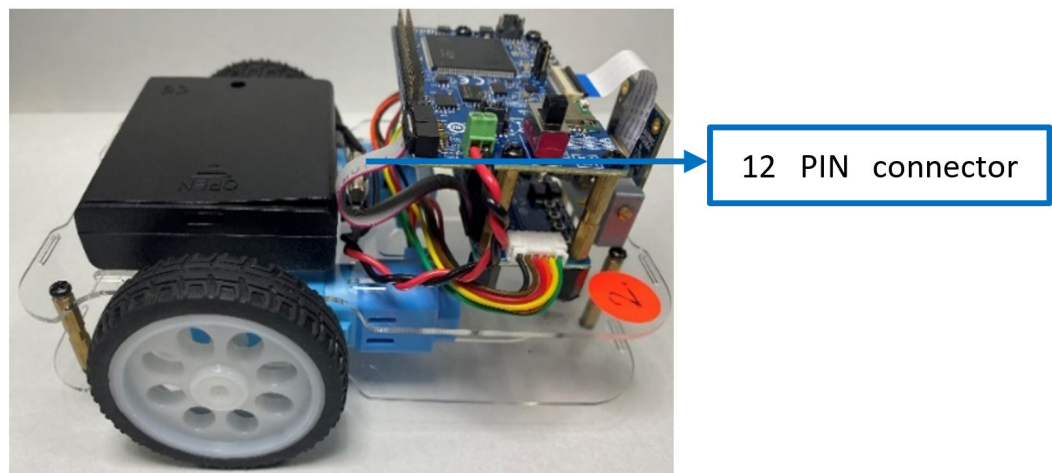
Step 2. Connect the STEVAL-ROBKIT1-2 board with both DC motors using the 6-pin JST connector cable for each motor.

Figure 11. Connection of 6-pin JST connector cable with two BO motors

6 PIN JST connector
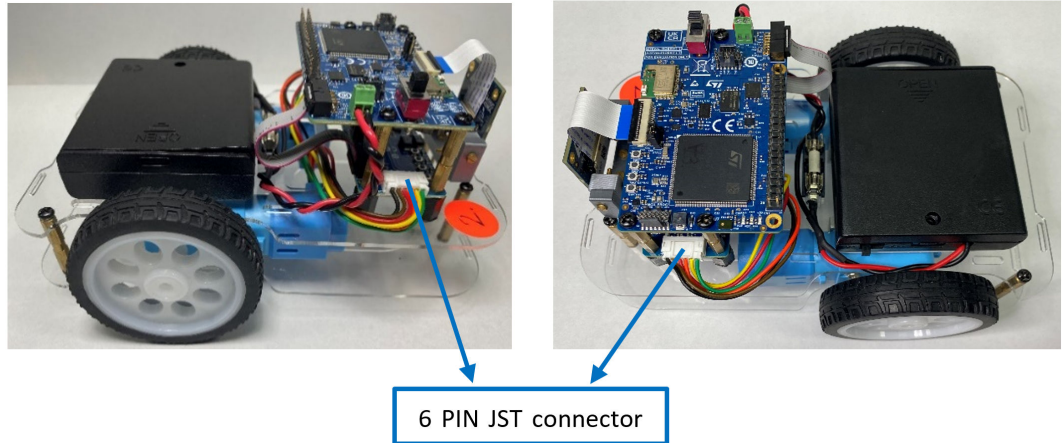
Step 3. Connect the STEVAL-ROBKIT1-1 board with the STEVAL-ROBKIT1-3 using the 26-pin FFC connector cable.

Figure 12. Connection of 26-pin FFC cable


26 Pin FFC Cable
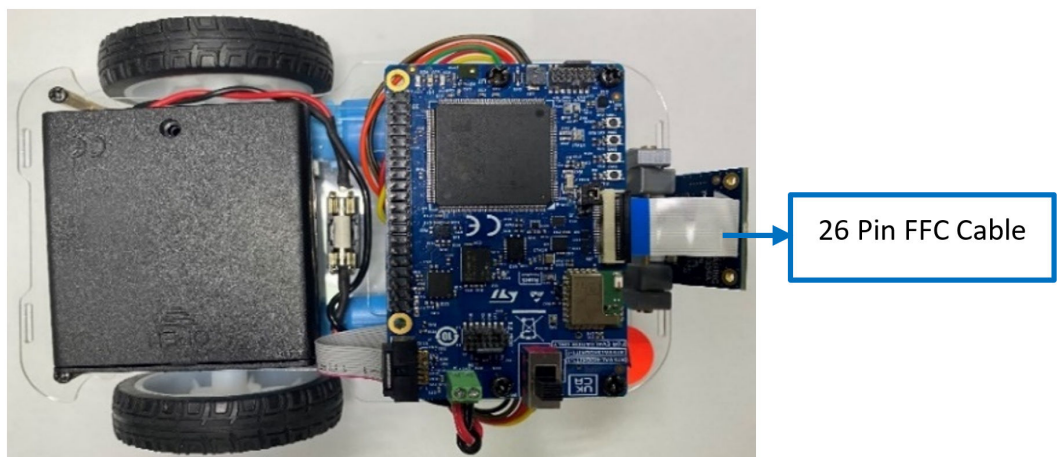
**Step 4.** On the STEVAL-ROBKIT1-1, using the J4 connector, provide 6 V power supply to the boards.

Step 5. Turn on the board with the SW1 switch, on the STEVAL-ROBKIT1-1, to power the whole kit. A welcome tone is generated using an on-board buzzer along with it all three green, red, and yellow LEDs which blink once to indicate proper initialization of all the on-board devices (see Figure 13).

Figure 13. Images shown for signal LEDs
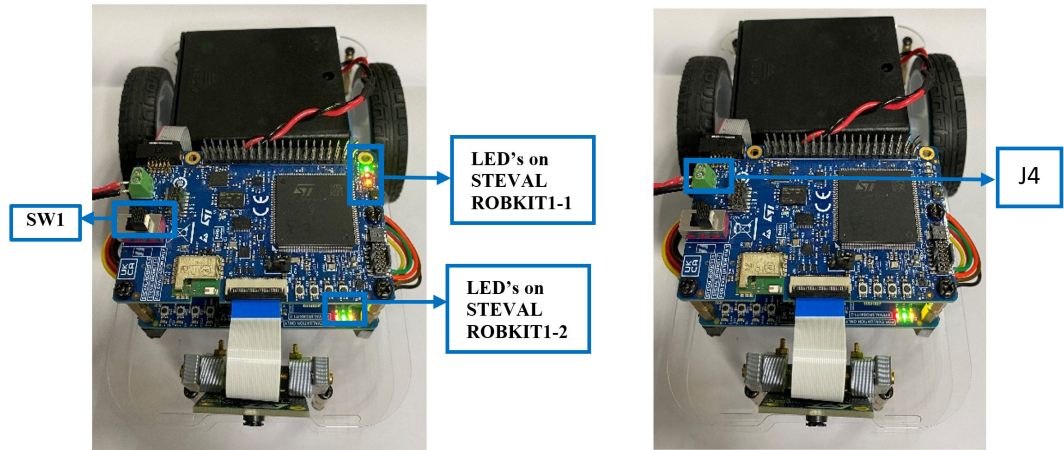
Step 6. Connect the STLINK V3 programmer using the 14-pin programming cable to program the STEVAL-ROBKIT1-11 through the MCU_PROG connector (J1) and STEVAL-ROBKIT1-2 through its J2 connector to flash the respective firmware.

Figure 14. Connection of ST-LINK programmer with STEVAL ROBKIT1-1 and STEVAL ROBKIT1-2
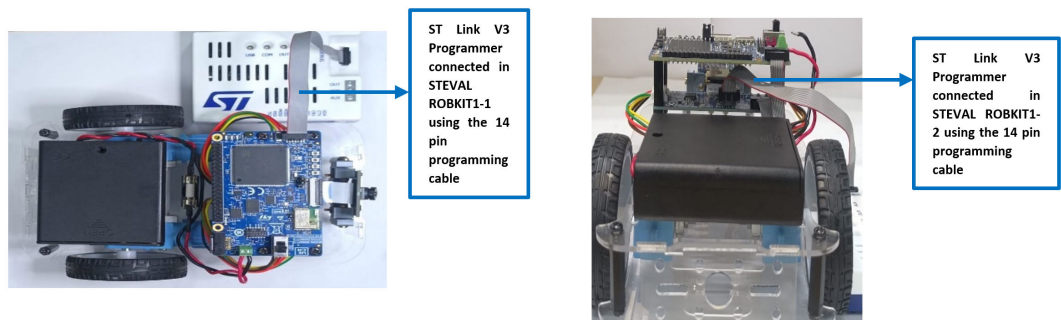
3 Component description

3.1 Component description of STEVAL ROKIT1-1

3.1.1 STM32H725IGT6

The robotic kit's central control unit is designated as the STEVAL-ROBKIT1-1. The STM32H725IGT6 microcontroller, a high-performance member of the STM32 family, powers it. It typically includes various communication interfaces such as UART, SPI, I²C, OCTOSPI, etc. for connecting to other boards and peripherals. It handles the power supply and distribution to the other boards and components in the kit, acts as the main processor for the robotic system, coordinating the actions of the motor and imaging boards, and handles high-level control algorithms, data processing, and system integration.

The MCU is operating on a 3.3 V power supply which is provided by a LDO. A coin cell is there to provide the backup supply for the RTC. It helps to run RTC when Main VDD supply is absent.

The MCU details are shown in Table 1.

Table 1. STM32H725IGT6 MCU details

Features	Description
Device	MCU (STM32H725) (up to 1 Mb dual-bank flash memory) (564 KB RAM (incl. 128 K DTCM + ITCM + 64 Kbytes of backup)
Part number	STM32H725IG (LQFP176)
Voltage range	1.62 V to 3.6 V
Operating voltage	3.3 V
Operating frequency	550 MHz

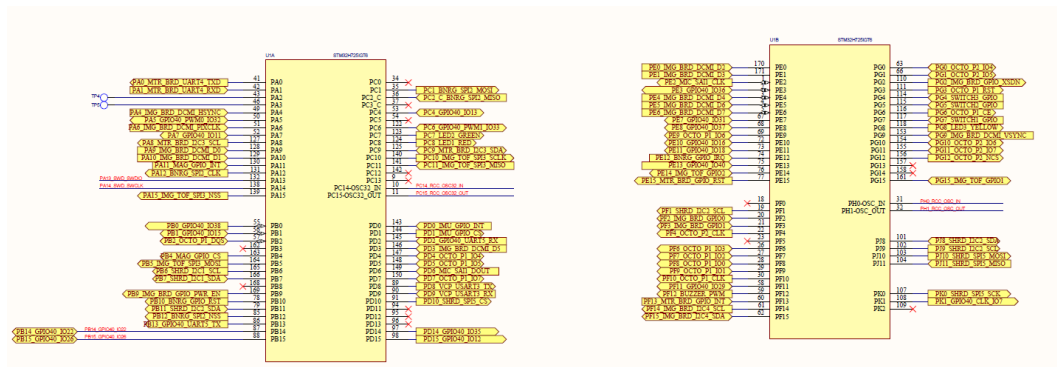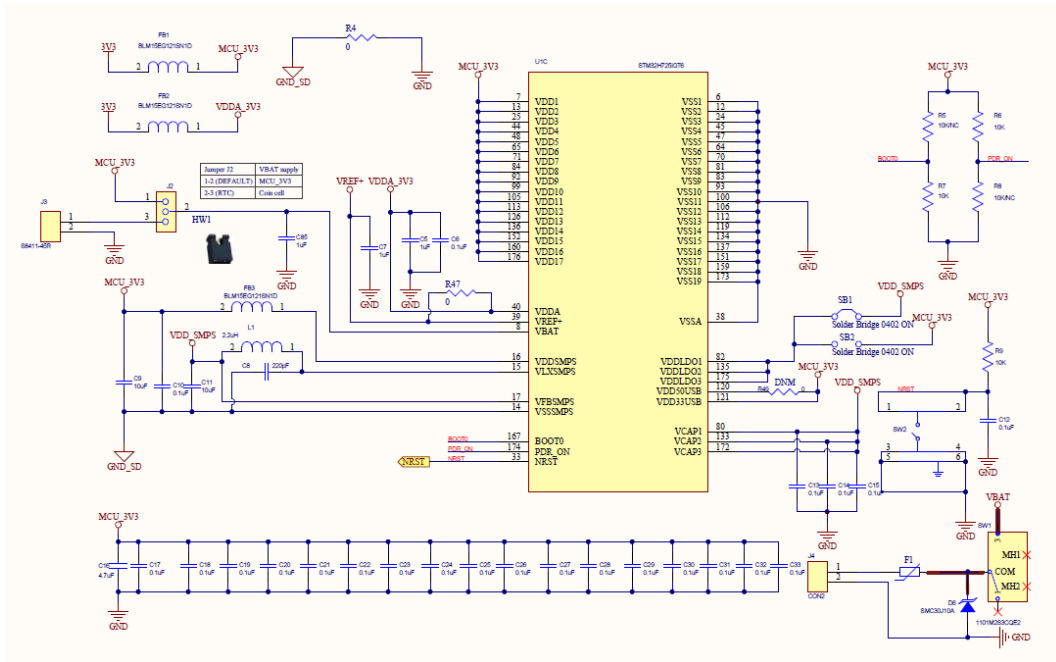**Figure 15. STM32H725IGT6 MCU GPIO section**

Figure 16. STM32H725IGT6 MCU power section


3.1.2 IMU (LSM6DSV16BX)

The LSM6DSV16BX is a high-performance, low-power 6-axis small IMU (Inertial Memory Unit), featuring a 3-axis digital accelerometer and a 3-axis digital gyroscope, that offers the best IMU sensor with a triple-channel architecture for processing acceleration and angular rate data on three separate channels (user interface, OIS, and EIS) with dedicated configuration, processing, and filtering.

The IMU operates on the I²C interface at a speed of 100 kHz, ensuring efficient and reliable communication with the microcontroller.

Table 2. IMU (LSM6DSV16BX) details

| Features	Description
Device	LSM6DSV16BX - 3-axis accelerometer & 3-axis gyroscope (IMU)
Part number	LSM6DSV16BX
Voltage range	1.71 V to 3.6 V
Operating voltage	3.3 V
Operating frequency	960 Hz

Figure 17. IMU (LSM6DSV16BX)
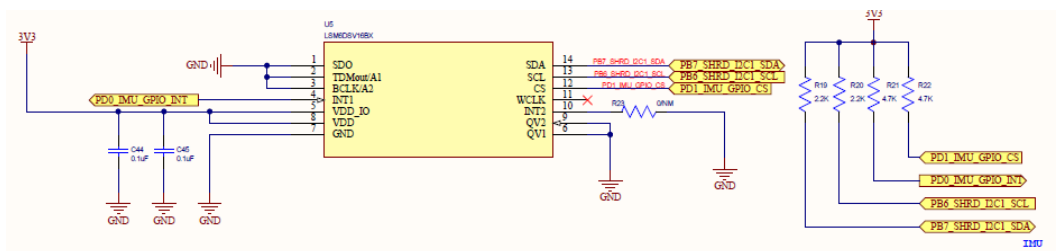
3.1.3 Magnetometer

The LIS2MDL is an ultralow-power, high-performance 3-axis digital magnetometer. It has a magnetic field dynamic range of ±50 gauss. The LIS2MDL includes an I²C serial bus interface that supports standard, fast mode, fast mode plus, and high speed (100 kHz, 400 kHz, 1 MHz, and 3.4 MHz) and in the main board it operates at a standard speed of 100 kHz. The device is configured to generate an interrupt signal for magnetic field detection.

Table 3. Magnetometer details

Features	Description
Device	Magnetometer
Part number	LIS2MDLTR
Voltage range	1.71 V to 3.6 V
Operating voltage	3.3 V
Operating frequency	100 kHz (standard mode)

**Figure 18. Magnetometer (LIS2MDL)**
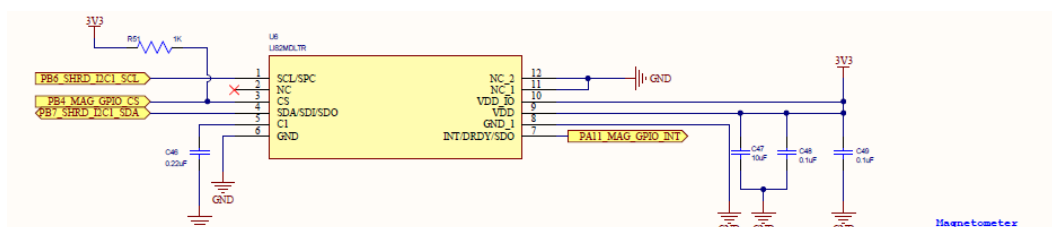
3.1.4 BLE module

The BLUENRG-M2SA is a Bluetooth® Low Energy system-on-chip application processor-certified module; certified under BT specifications v5.2 and BQE qualified. The BlueNRG-M2 module supports multiple roles simultaneously and can act as the Bluetooth master and slave device at the same time. The BLUENRG-M2SA is based on the BlueNRG-2 system-on-chip and the entire Bluetooth® Low Energy stack and protocols are embedded into the module. The BLUENRG-M2SA module provides a complete RF platform in a tiny form factor. Radio, embedded antenna, and high frequency oscillators are integrated to offer a certified solution to optimize the time-to-market of the final applications.

Table 4. BLE module details

Features	Description
Device	BLE module
Part number	BLUENRG-M2SA
Voltage range	1.7 V to 3.6 V
Operating voltage	3.3 V

Along with the BLE module, the STEVAL-ROBKIT1-1 also consists of a BLE programming connector (J5) that is used to program the BLE module.

Figure 19. BlueNRG-M2SA
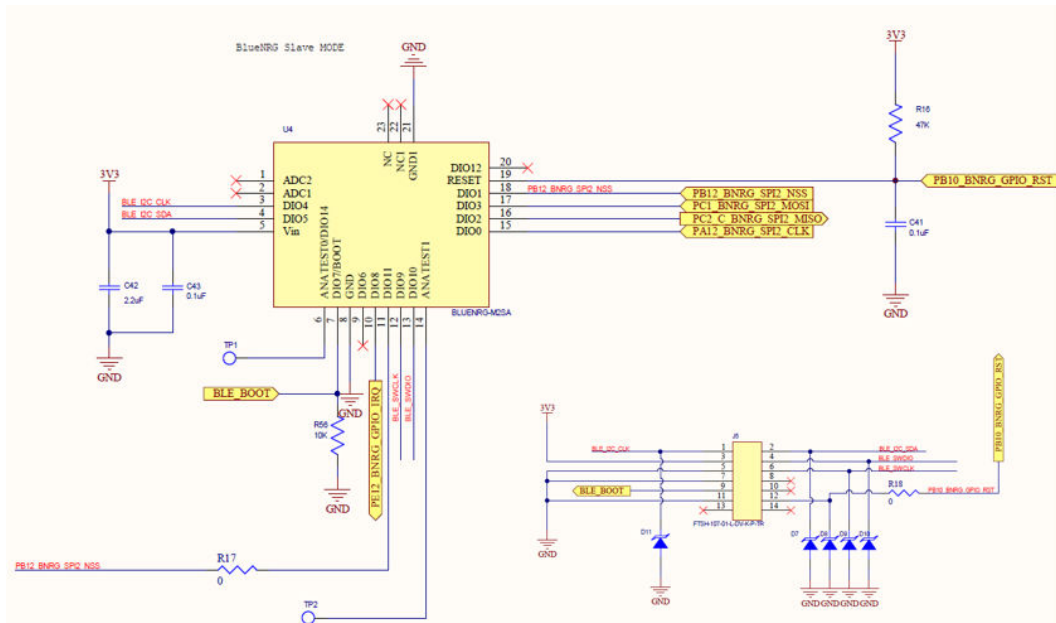
3.1.5 Microphone

The MP34DT06JTR is a digital MEMS microphone built with a capacitive sensing element and an IC interface. The sensing element, capable of detecting acoustic waves, is manufactured using a specialized silicon micromachining process dedicated to producing audio sensors. The IC interface is manufactured using a CMOS process that allows designing a dedicated circuit able to provide a digital signal externally in PDM format. The MP34DT06JTR is a low-distortion digital microphone with a 64 dB signal-to-noise ratio and -26 dBFS ± 1 dB sensitivity.

Table 5. Microphone details

Features	Description
Device	Microphone
Part number	MP34DT06JTR
Voltage range	1.6 V to 3.6 V
Operating voltage	3.3 V/1.8 V
Operating frequency	2.4 MHz

**Figure 20. Microphone (MP34DT06JTR)**
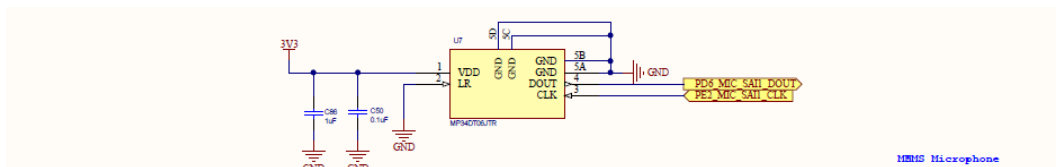
3.1.6 Flash NOR memory

NOR flash is used in a wide array of applications that require fast code execution, high reliability, and secure data storage. Micron offers a broad portfolio of octal, serial, and parallel NOR flash solutions to meet the demanding requirements of automotive, industrial, consumer, and networking applications.

Table 6. Flash NOR memory details

| Features	Description
Device	Flash NOR memory
Part number	W25Q128JVPIQ
Voltage range	2.7 V to 3.6 V
Operating voltage	3.3 V
Operating frequency	133 MHz

Figure 21. Flash NOR memory
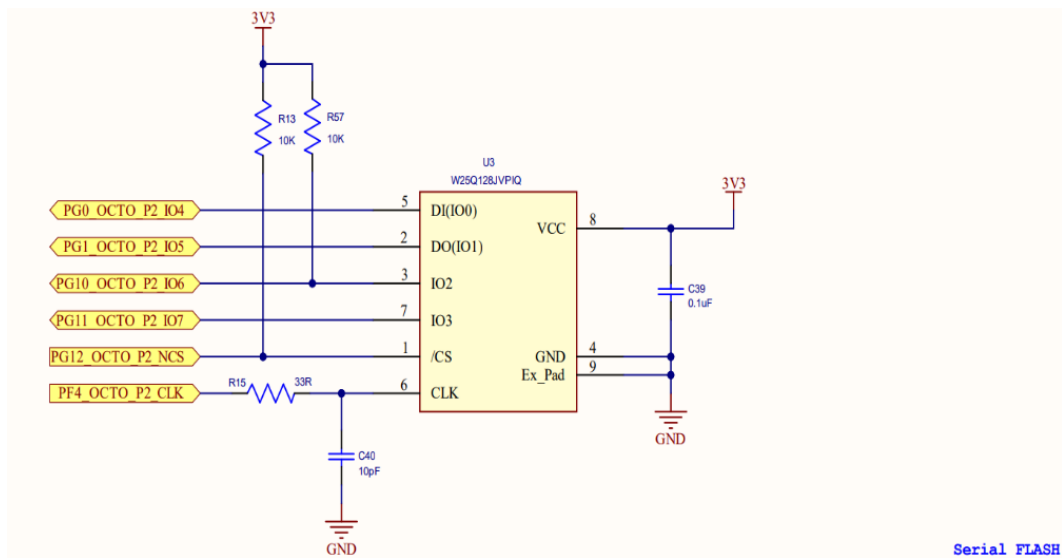
3.1.7 PSRAM

The APS6408L-30BM-BA is a 64 Mbit (8 MB) pseudo-static RAM (PSRAM) organized as 8M x 8-bit. It supports an Octal SPI (OPI) interface with both DDR and SDR modes, providing high-speed data access. Operating at a low voltage of 1.8 V, it is designed for low-power consumption while offering data rates of up to 200 MHz in OPI mode.

Table 7. PSRAM details

| Features	Description
Device	RAM (266 MB/s throughput)
Part number	APS6408L-3OBM-BA
Voltage range	2.7 V to 3.6 V
Operating voltage	3.3 V
Operating frequency	133 MHz

Figure 22. PSRAM memory
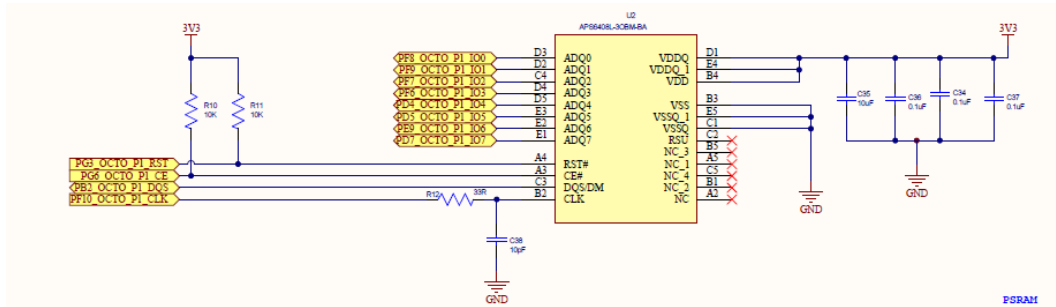
3.1.8 40-pin GPIO connector

A 40-pin Raspberry Pi connector is available on the main board, STEVAL-ROBKIT1-1, allowing it to interface with Raspberry Pi accessories and peripherals. The microcontroller communicates with these peripherals through the connector, expanding the robot's functionality and compatibility with various external devices.

Table 8. 40 PIN GPIO connector details

Features	Description
Device	40-pin GPIO connector
Voltage range	5 V, 3.3 V
Operating voltage	5 V, 3.3 V

Figure 23. 40-pin GPIO connector
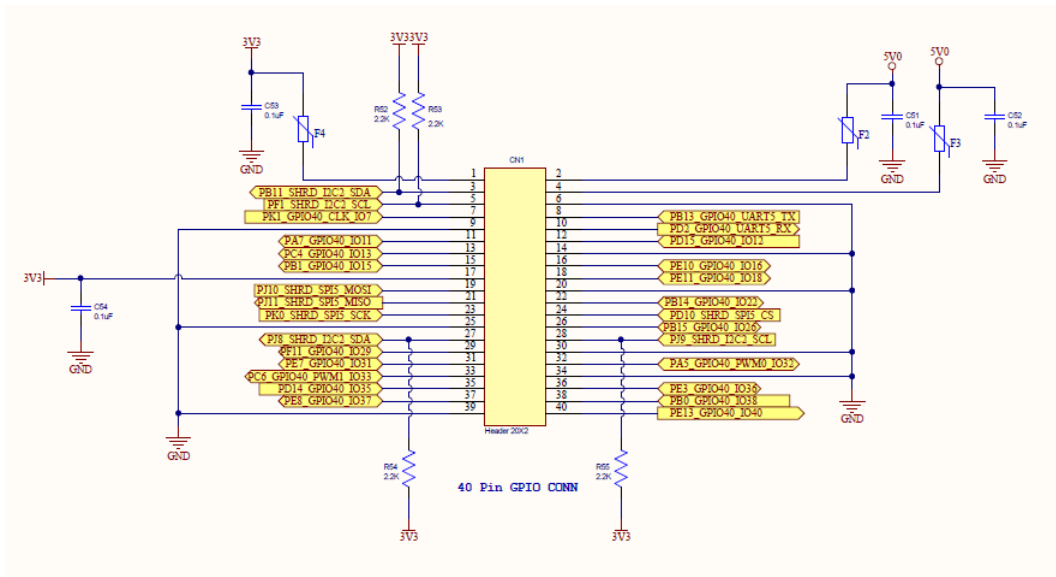
Table 9. 40-pin GPIO connector pin configuration details

Pin No	Name	CN1 connector pin	Pin No	Name	CN1 connector pin
1	3V3	3V3	2	5V0	5V0
3	I2C_SDA	PB11 / I2C2_SDA	4	5V0	5V0
5	I2C_SCL	PB10/ I2C2_SCL	6	GND	GND
7	#7	PK1 / CLK_IO7	8	UART_TX	PB13 / UART5_TX
9	GND	GND	10	UART_RX	PD2 / USART5_RX

Pin No	Name	CN1 connector pin	Pin No	Name	CN1 connector pin
11	#11	PA7 / IO11	12	#12	PDI5 / IO12
13	#13	PC4 / IO13	14	GND	GND
15	#15	PB1 / IO15	16	#16	PE10 / IO16
17	3V3	3V3	18	#18	PE11 / IO18
19	#19	PJ10 / SPI5_MOSI	20	GND	GND
21	#21	PJ11 / SPI5_MISO	22	#22	PB14 / IO22
23	#23	PK0 / SPI5_SCK	24	#24	PD10 / SPI5_CS
25	GND	GND	26	#26	PB15 / IO26
27	#27	PF0 / I2C5_SDA	28	#28	PF1 / I2C5_SCL
29	#29	PF11 / IO29	30	GND	GND
31	#31	PE7 / IO31	32	#32	PA5 / PWM0_IO32
33	#33	PC6 / PWMI_IO33	34	GND	GND
35	#35	PD14 / IO35	36	#36	PE3 / IO36
37	#37	PE8 / IO37	38	#38	PB0 / IO38
39	GND	GND	40	#40	PE13 / IO40

3.1.9 LED

The main board includes three signalizing LEDs that provide visual feedback on the status of the robot. The microcontroller controls these LEDs to indicate power status, connectivity, and other operational states, offering clear and immediate information to the user to prevent it from shattering. A resistor in series is connected with the LED to prevent it from excessive current.

Figure 24. LED
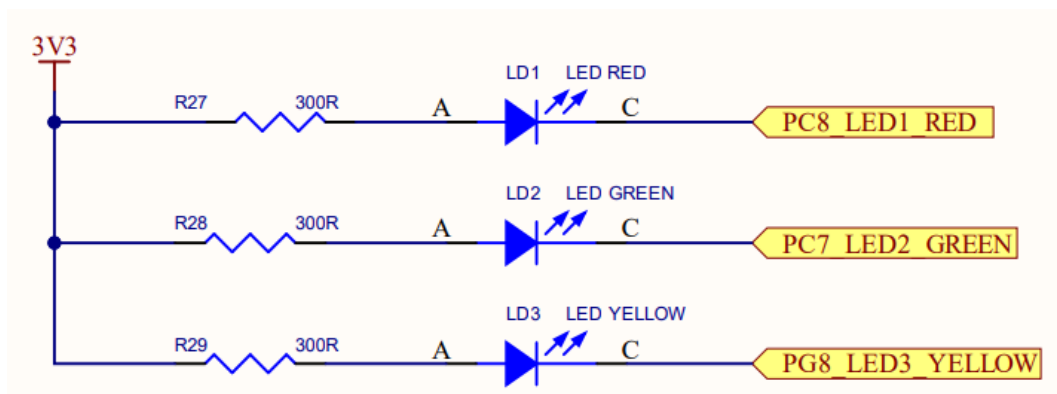
3.1.10 Buzzer

The main board features a CMT-4023S-SMT-TR buzzer, specifically designed for audible alerts or notifications in the robotic kit. With a wide operating voltage range and low power consumption, it is ideal for battery-operated devices. The buzzer provides a high sound pressure level, making it perfect for clear and effective alerts in various robotic applications.

Table 10. Buzzer details

Features	Description
Device	Buzzer
Part number	CMT-4023S-SMT-TR
Voltage range	1.71 V to 3.6 V

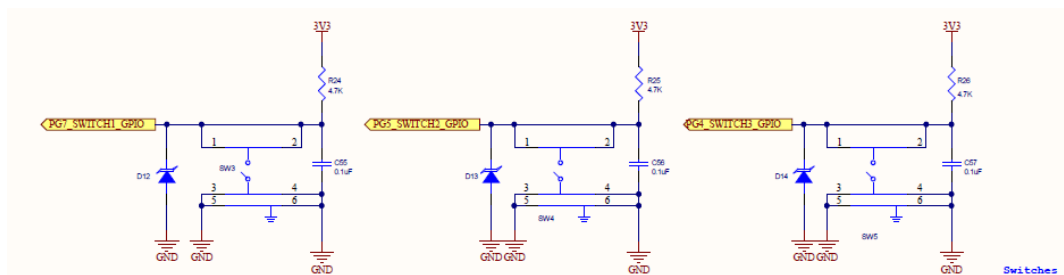| Features	Description
Operating voltage	3.3 V
Operating frequency	100 kHz (standard mode)
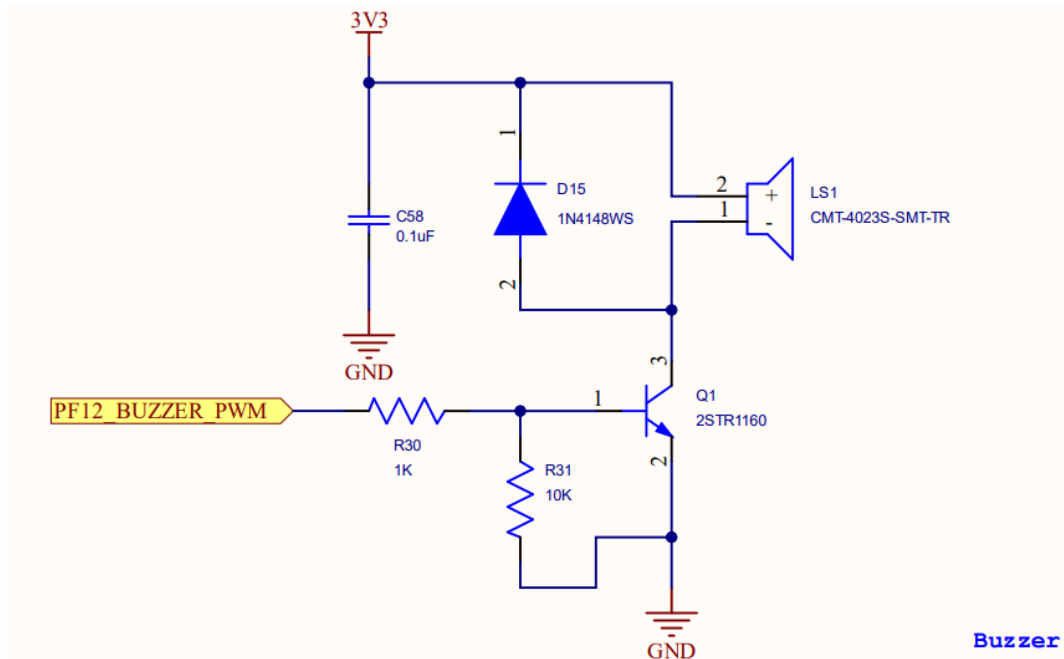
Figure 25. Buzzer

3.1.11 Switches

The main function of the user switches on the STEVAL-ROBKIT1 is to provide an option to control certain functionalities through manual intervention.

Figure 26. User Switches

3.1.12 MCU programming connector

The main board includes a 14-pin MCU programming connector (J1) designed to facilitate the programming and debugging of the microcontroller unit (MCU). This connector provides a reliable interface for connecting external programming tools and debuggers, ensuring efficient development, and troubleshooting of the MCU firmware.

Figure 27. MCU programming connector for STEVAL-ROBKIT1-1
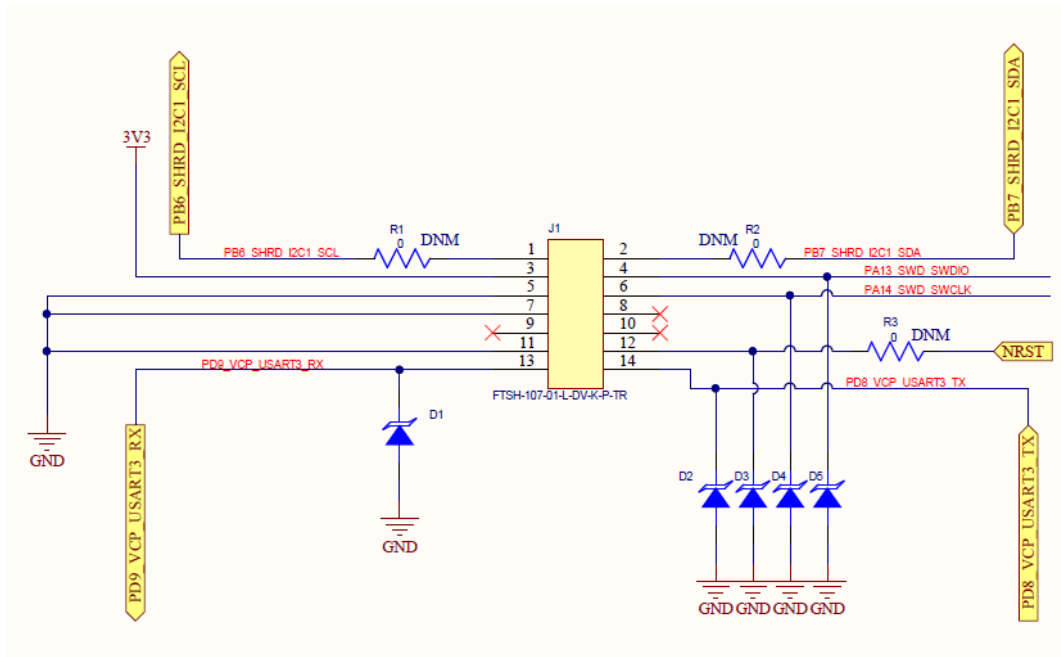
3.1.13 Crystal

The main board is equipped with two crystal oscillators, a 25 MHz crystal and a 32.76 kHz crystal, which are essential for the accurate timing and operation of the MCU STM32H725IGT6. These crystals provide stable clock signals required for various functionalities of the microcontroller.

Table 11. Crystal details

Features	Description (1)	Description (2)
Device	Crystal (1)	Crystal (2)
Part number	CS08742-25M	NX3215SA-32.768KHz-EXS00A-MU00525
Operating frequency	25 MHz	32.768 kHz

Figure 28. Crystal
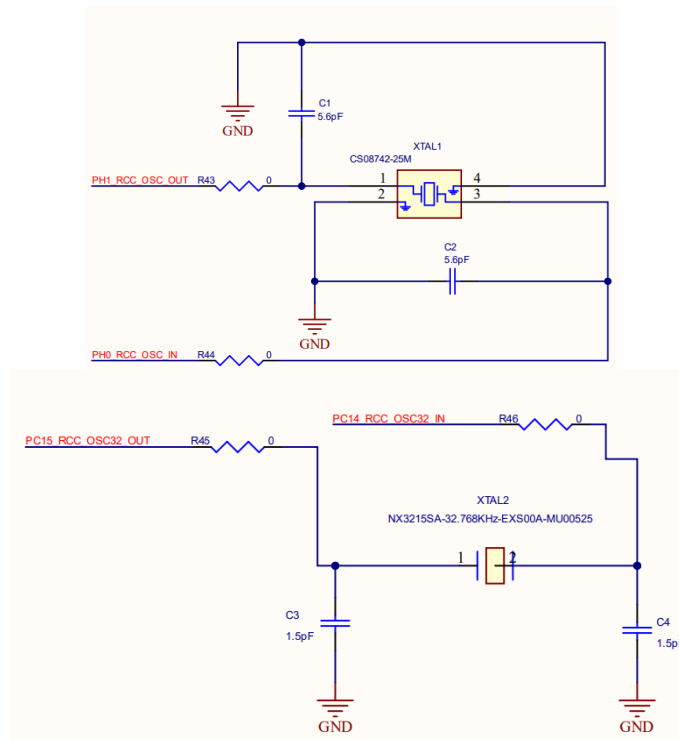
3.1.14 MIPI de-serializer

The imaging board transmits camera signals to the main board, where they are processed by the STMIPID02/TR de-serializer. This high-performance de-serializer converts the serialized camera data into a parallel format that the main board's MCU can efficiently process. The STMIPID02/TR ensures reliable and high-speed data transfer, maintaining the integrity and quality of the camera signals. By converting the high-speed serial data into a manageable parallel format, it enables seamless integration and optimal performance of the imaging system. This de-serializer is crucial for applications requiring precise and real-time image processing, enhancing the overall functionality and reliability of the imaging solution.

Figure 29. MIPI de-serializer, STMIPID02/TR
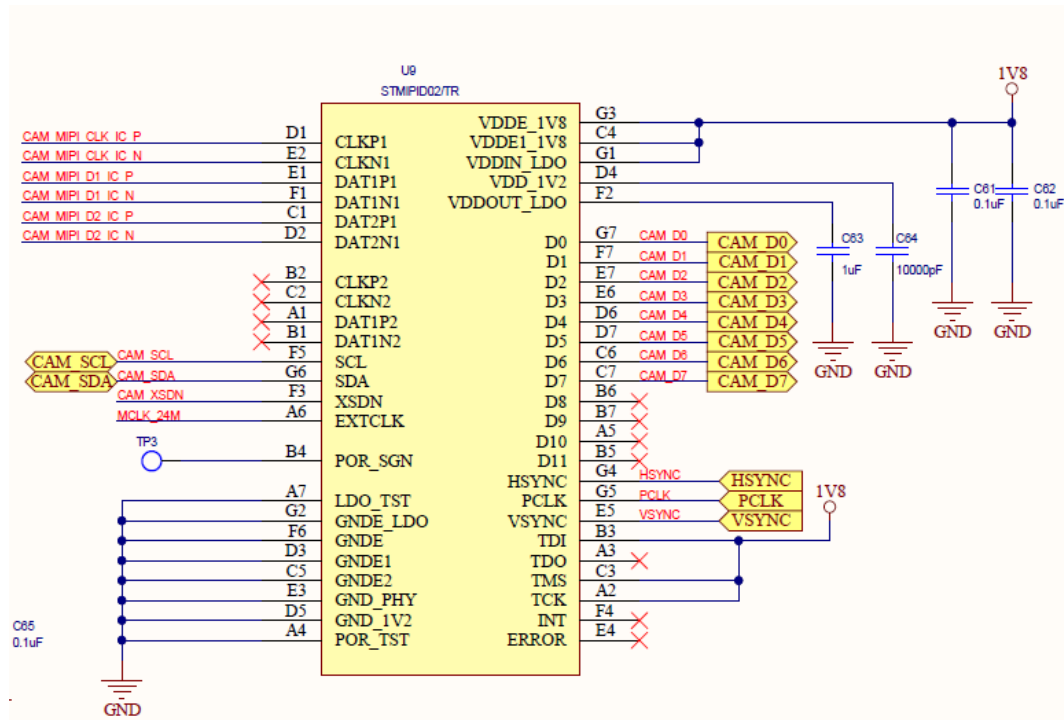
3.2 Component description of STEVAL ROBKIT1-2

3.2.1 STM32G071CBT6

The kit includes a motor board featuring the STM32G071CBT6 microcontroller unit (MCU), a highly efficient and versatile 32-bit Arm Cortex®-M0+ core. This MCU operates at a frequency of up to 64 MHz and is equipped with 128 KB of flash memory and 36 KB of SRAM, providing ample space for complex motor control algorithms. This powerful MCU ensures precise and reliable motor control, enhancing the overall performance and functionality of the kit.

The device is operating at 3.3 V which is provided via LDO by the 12-pin connector (J1). The MCU can be programmed by using the 14-pin (J2) programming connector.

Table 12. STM32G071CBT6 details

Features	Description
Device	STM32G0
Part number	STM32G071CBT6
Voltage range	1.7 V to 3.6 V

Figure 30. STM32G071CBT6 GPIO section
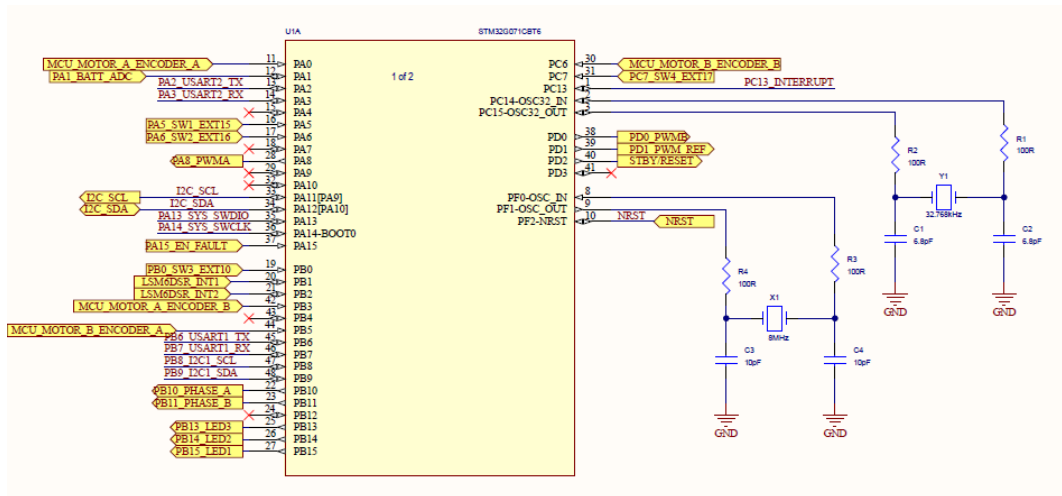
## Figure 31. STM32G071CBT6 power section
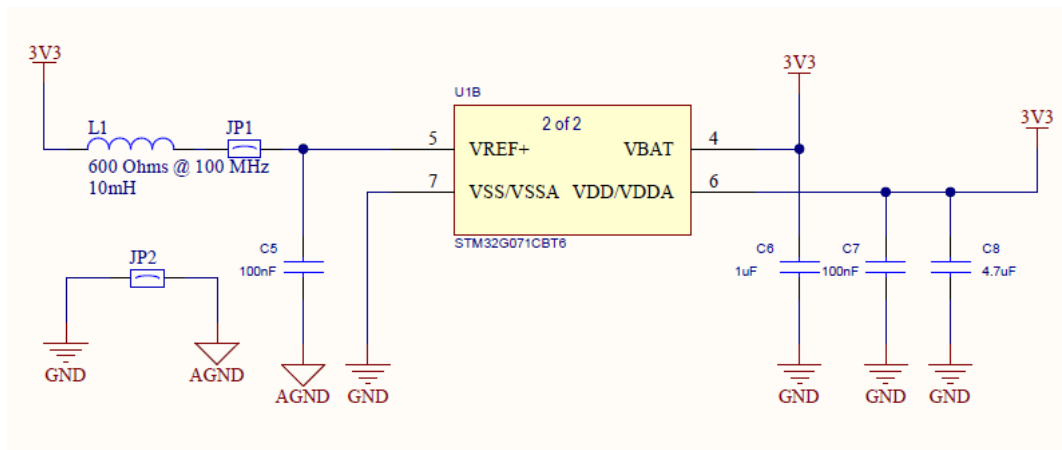
Figure 32. 12-pin box connector and 14-pin programming connector
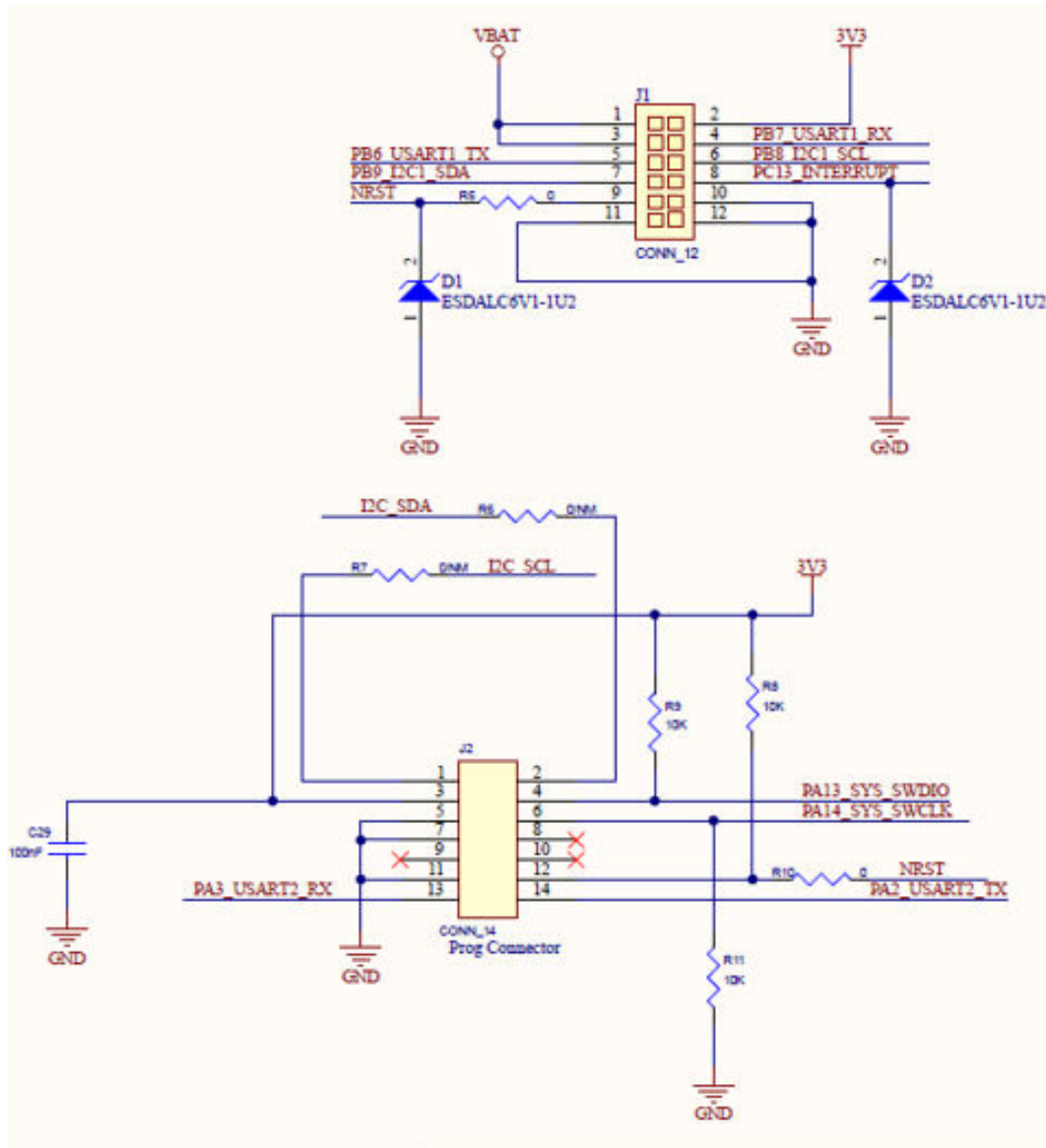
3.2.2 3-axis accelerometer and 3-axis gyroscope (LSM6DSR)

The LSM6DSR is a system-in-package featuring a 3-axis digital accelerometer and a 3-axis digital gyroscope with an extended full-scale range for the gyroscope, up to 4000 dps, and high stability over temperature and time.

Figure 33. **IMU (LSM6DSR)**
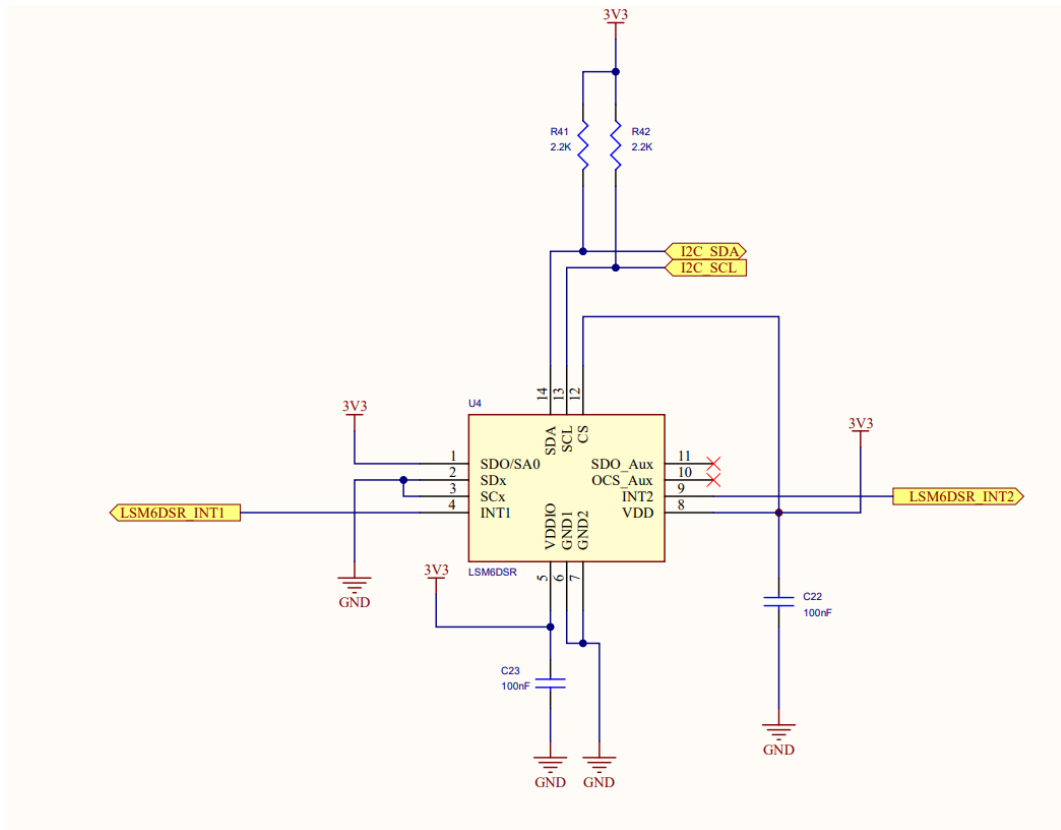
The LSM6DSR has a full-scale acceleration range of ±2/±4/±8/±16 g and an angular rate range of ±125/±250/±500/±1000/±2000/±4000 dps. The LSM6DSR embeds a broad range of advanced functions supporting programmable sensors (suitable for activity recognition).

Table 13. **LSM6DSR details**

Features	Description
Device	3-axis accelerometer and 3-axis gyroscope
Part number	LSM6DSR
Voltage range	1.71 V to 3.6 V

3.2.3 Motor driver (STSPIN240)

The STSPIN240 is a dual brush DC motor driver integrating a low $R_{DS(ON)}$ power stage in a small QFN 3 x 3 mm (about 0.12 in) package. Both the full bridges implement an independent PWM current controller with fixed OFF-time. The device is designed to operate in battery-powered scenarios and can be forced in a zero-consumption state, allowing a significant increase in battery life. The STSPIN240 offers a complete set of protection including overcurrent, overtemperature, and short-circuit protection.

Table 14.

Table 14. **Motor driver (STSPIN240) details**

Features	Description
Device	Motor driver
Part number	STSPIN240
Voltage range	1.8 V to 10 V

Figure 34. Motor driver (STSPIN240)
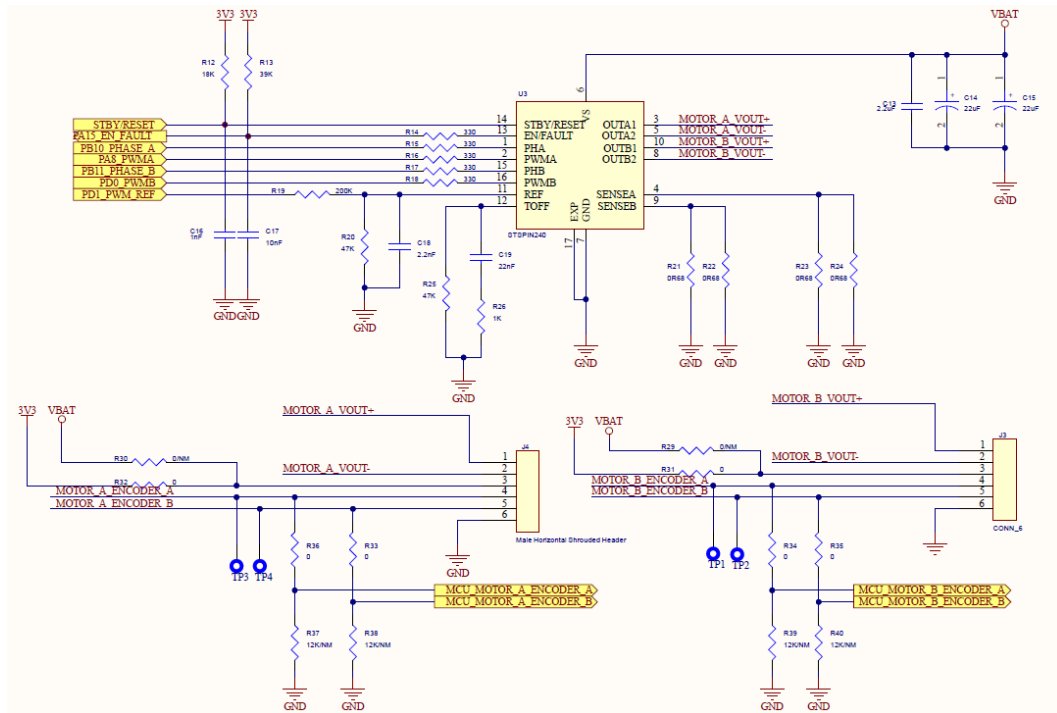
3.2.4 Motor encoder

A motor encoder works by translating mechanical motion into electrical signals, typically through methods such as optical or magnetic sensing. These signals provide feedback on parameters such as position, speed, and direction of rotation, enabling precise control and monitoring of motorized systems.

Figure 35. Encoder
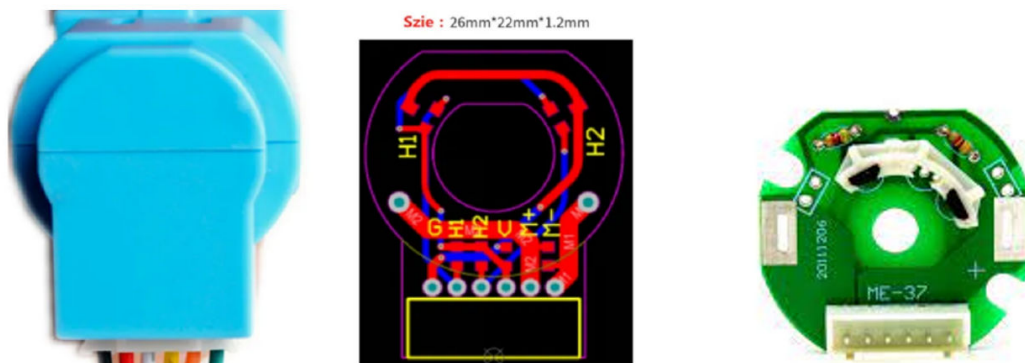
G	Hall power supply negative
H1	Hall H1 output signal, square wave
H2	Hall H2 output signal, square wave
V	Hall power supply positive
M+	Motor power supply positive
M−	Motor power supply negative

3.2.5 DC motors with encoders and motor connectors

The motor is a lightweight DC geared motor which gives good torque and rpm at lower voltages. This motor can run at approximately 100 rpm when driven by a single Li-Ion cell. Perfectly suited to battery operated lightweight robots. An electrical connector is an electromechanical device used to create an electrical connection between parts of an electrical circuit, or between different electrical circuits, thereby joining them into a larger circuit.

Table 15. **Motor specification details**

Product parameters	Values	Product parameters	Values
Product	Double shaft TT motor	Operating current	0.2 – 0.3 A
Motor type	Brush carbon brush	Encoder power supply	3.3 – 5 V
Reduction ratio	1:45 (theoretical)	Encoder lines	3
Rated voltage	6 V(5-13 V)	Maximum count of 1 shaft turn	12
No load current	0.08 A	Maximum count of 1 wheel turn	540
Rated current	0.25 A		

Figure 36. **DC motors and connectors**
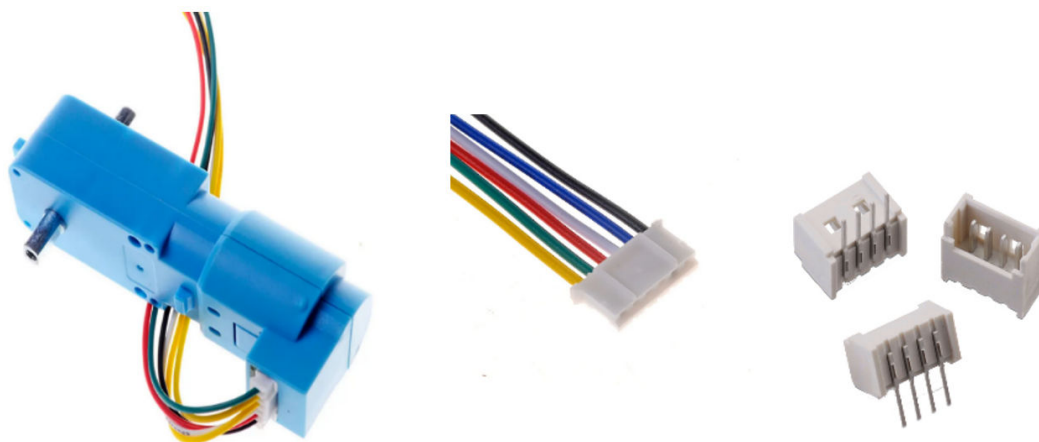
3.3 Component description of STEVAL ROBKIT1-3

3.3.1 Imaging board (STEVAL ROBKIT1-3)

The imaging board is used to capture visual information and process images for the implementation of various use cases such as object detection, cliff detection, follow-me navigation, etc.

The imaging board enables the robotic evaluation kit to perceive and interact with its environment using visual data. The imaging board used in the STEVAL-ROBKIT1 consists mainly of a FOX PRO module and Time-of-Flight sensor VL53L8 operating at a very high speed up to 20 MHz.

3.3.2 Camera module

The imaging board features a high-performance camera module with the part number **VD56G3**, designed to deliver exceptional image quality for various applications. This compact and versatile camera module integrates seamlessly with the main board, providing high-resolution imaging capabilities essential for tasks such as object recognition, tracking, and environmental monitoring. The VD56G3 module supports advanced features like autofocus, low-light performance, and high frame rates, ensuring clear and detailed images even in challenging conditions. Its robust design and compatibility with standard interfaces make it an ideal choice for both consumer electronics and industrial applications, enhancing the overall functionality and reliability of the imaging system.

Table 16. **Camera module details**

Features	Description
Device	Camera module
Part number	VD56G3
Voltage range	2.8 V/1.8 V/1.15 V

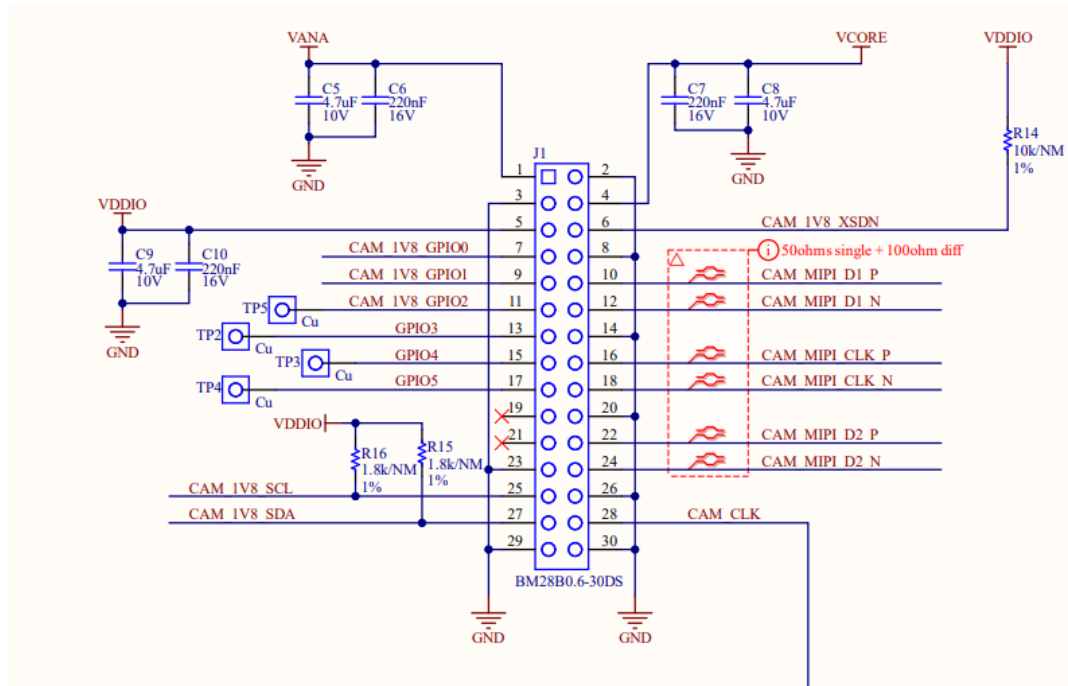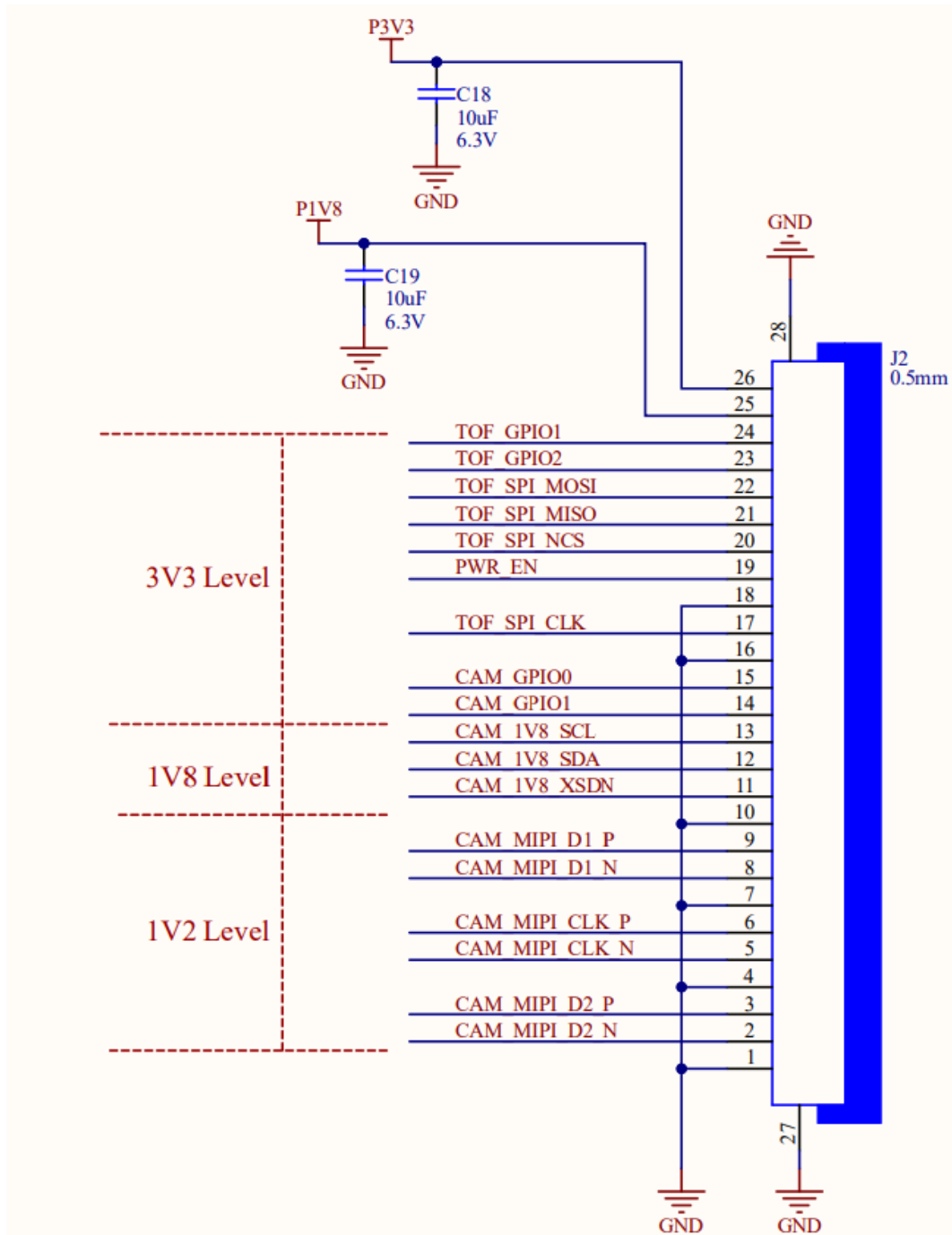## Figure 37. Camera module connector on STEVAL-ROBKIT1-3

Figure 38. **Camera module - mainboard interface**

3.3.3 FPC connector and FFC cable

The imaging board is connected to the main board using a 26-pin FPC (Flexible Printed Circuit) connector and an FFC (Flexible Flat Cable). This combination ensures a reliable and efficient interface between the two boards, facilitating high-speed data transfer and robust signal integrity.

The 26-pin FPC connector is a critical component that provides a secure and stable connection between the imaging board and the main board. Designed for flexibility and durability, it supports the intricate wiring needed for high-performance imaging applications. The FFC cable complements the FPC connector by providing a flexible, flat medium for transmitting signals between the imaging board and the main board. This cable is essential for maintaining signal integrity and minimizing electromagnetic interference (EMI).

Table 17. **Connector - imaging board details**

Device	Entity	Signal	Signal	Signal	Signal	Signal	Signal
FOX	MIPI	CLK+	CLK-	D1+	D1-	D2+	D2-
FOX	MIPI SHIELDING	GND	GND	GND	GND		
FOX	IIC	SDA	SCL				
FOX	RESET	SHUTDOWN					
FOX	I/O	GPIO0	GPIO1				
L8	SPI	MCLK	MISO	MOSI	NCS		
L8	I/O	GPIO1	GPIO2				
PWR	LDO ENABLE	PWREN					
	SUPPLY	3.3 V	(3.3 V)				
	GROUND	GND					

3.3.4   ToF (VL53L8CX)

VL53L8CX is an 8x8 multizone, Time-of-Flight (ToF) ranging sensor that enhances performance under ambient light with reduced power consumption. Based on STMicroelectronics' FlightSense technology, the sensor is designed to provide accurate ranging up to 400 cm (about 13.12 ft) with a 65° diagonal field of view (FoV).

The imaging board integrates the VL53L8CX Time-of-Flight (ToF) sensor, a state-of-the-art distance measurement sensor from STMicroelectronics. This sensor leverages advanced ToF technology to provide accurate and reliable distance measurements, making it ideal for a wide range of applications, including object detection, gesture recognition, and environmental mapping.

Figure 39. **FPC connector and FFC cable**
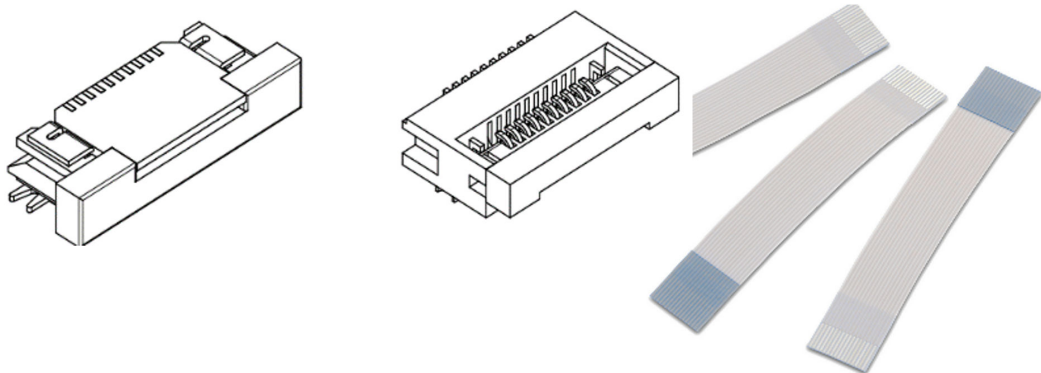
Figure 40. **Time-of-Flight sensor (VL53L8CX)**
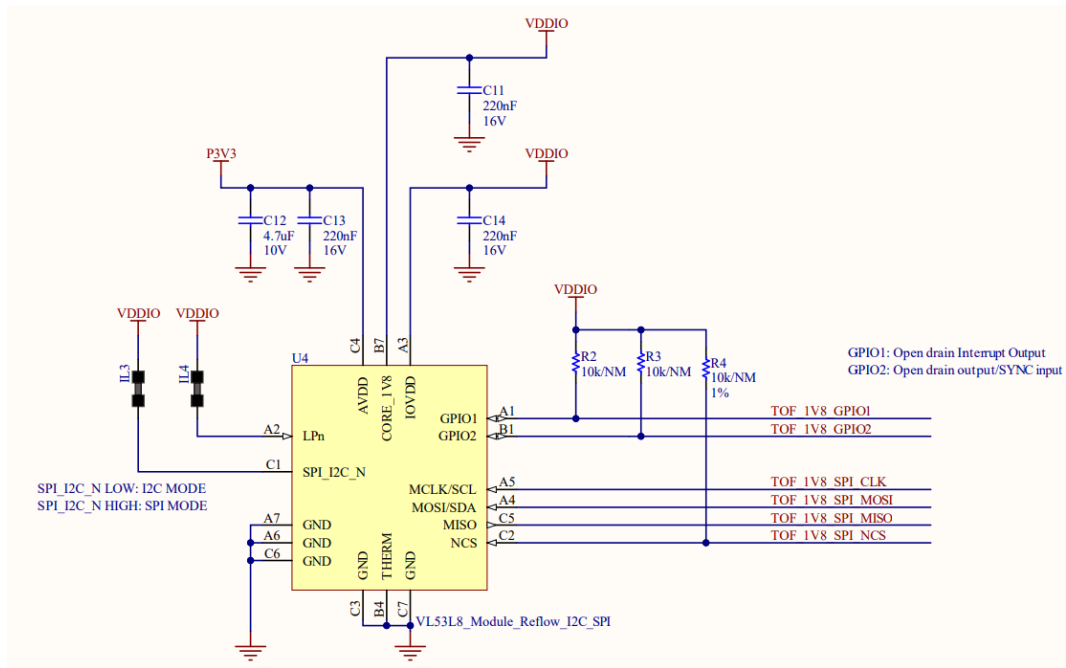
3.4 Component description for the additional components on STEVAL-ROBKIT1

3.4.1 Protective fuse and fuse holder

The kit features a protective switch, a fast-acting 1.6 A, 250 V fuse (021501.6 MXP), and a PCB mounted fuse holder (64700001003) strategically placed between the main board and the 6 V battery pack. This configuration ensures robust overcurrent protection by interrupting the circuit if the current exceeds 1.6 A, thereby safeguarding the main board and battery pack from potential damage. The fuse holder facilitates easy and quick fuse replacement, enhancing user convenience and safety. This setup not only extends the lifespan of the kit but also adds a layer of manual control and safety, ensuring reliable and secure operation.

Figure 41. **Fuse and fuse holder on STEVAL-ROBKIT1 for protection**
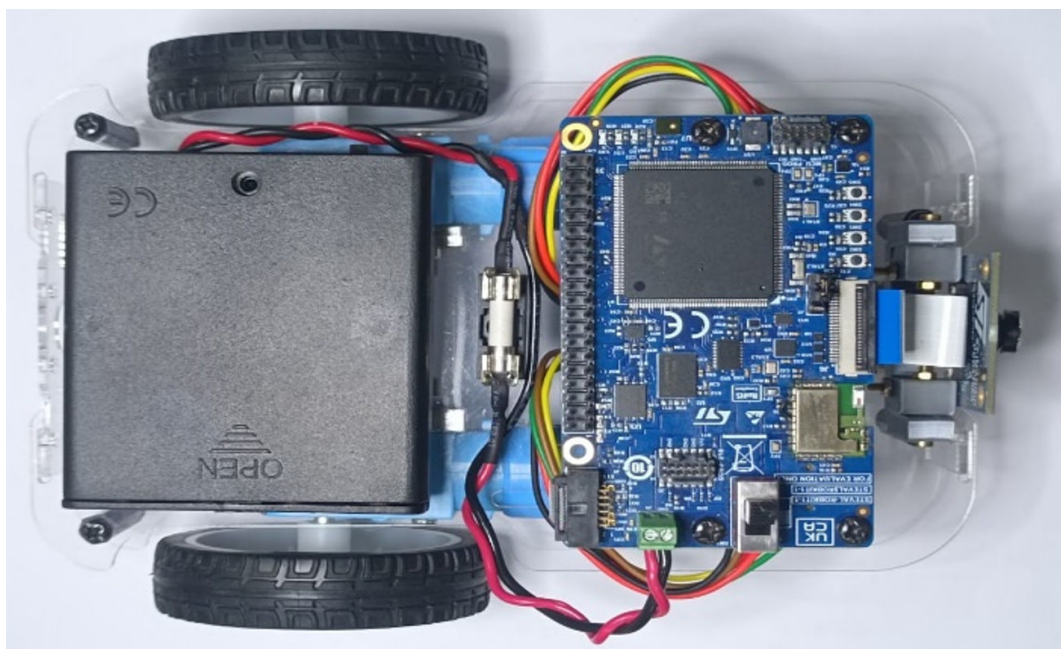
Table 18. Fuse and fuse holder details

Features	Description	Description
Device	Fuse	Fuse holder
Part number	021501.6MXP	64700001003
Voltage range	250 V	250 V
Package / case	5 mm x 20 mm	5 mm x 20 mm

4 Schematic diagrams

Figure 42. STEVAL-ROBKIT1-1 schematic (1 of 12)
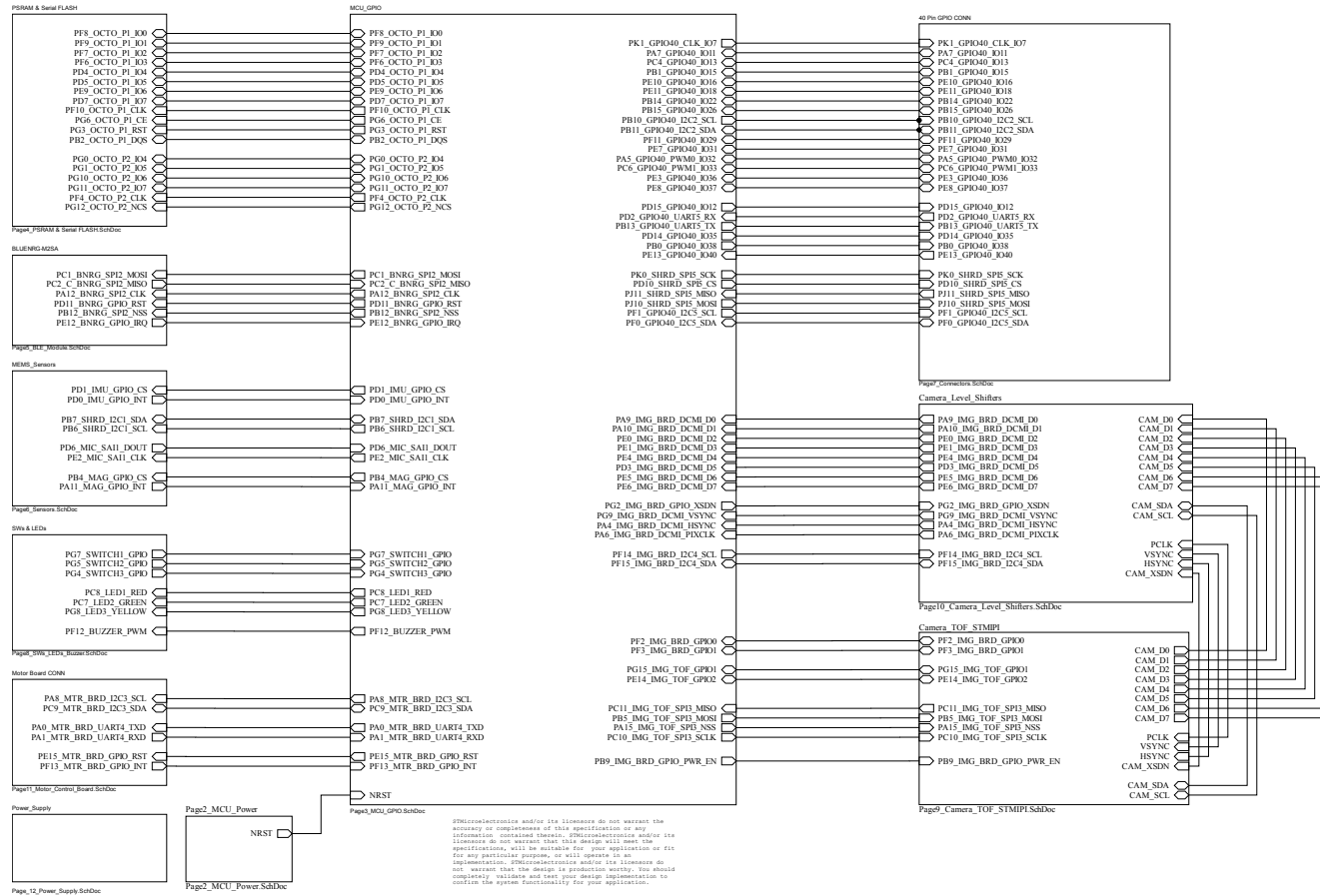
Figure 43. STEVAL-ROBKIT1-1 schematic (2 of 12)

Figure 44. STEVAL-ROBKIT1-1 schematic (3 of 12)

Figure 45. STEVAL-ROBKIT1-1 schematic (4 of 12)
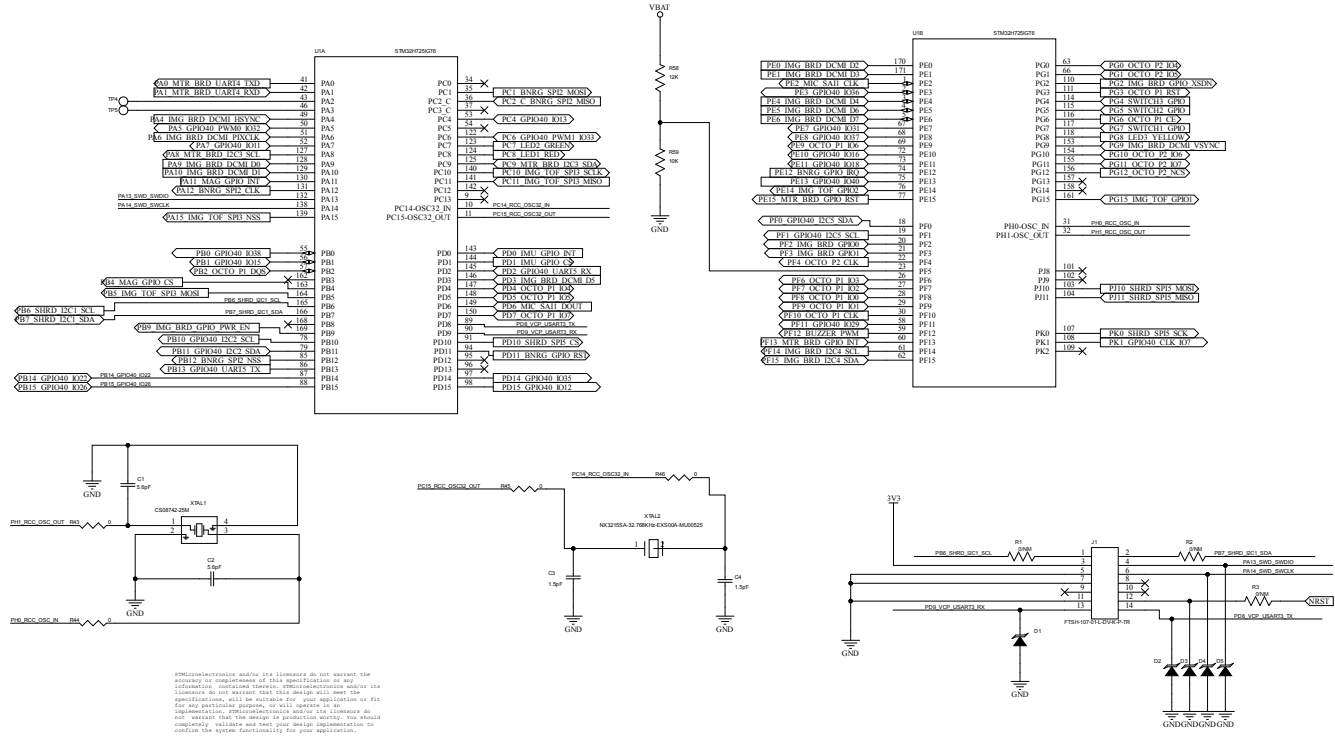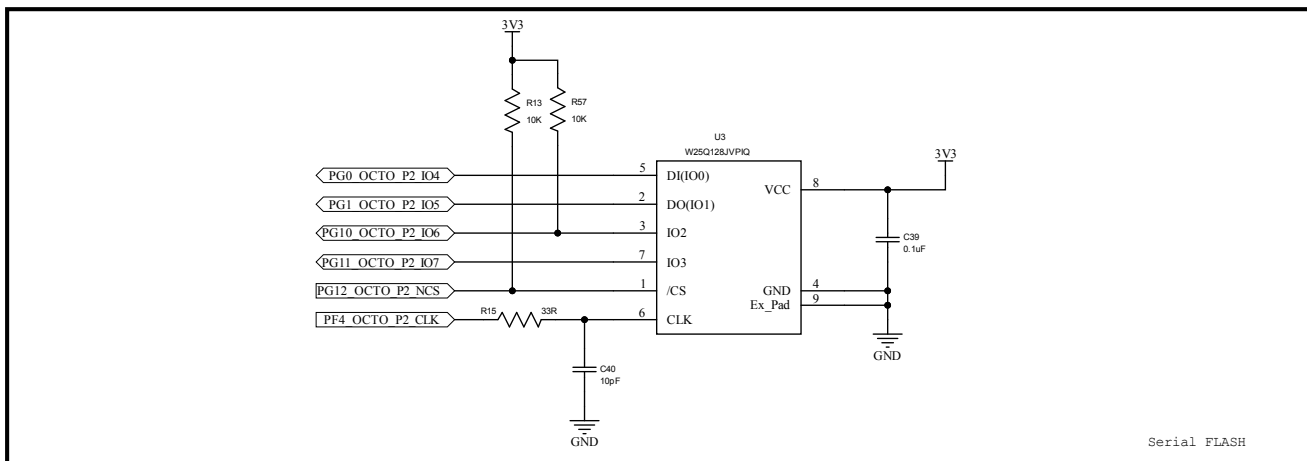

PSRAM
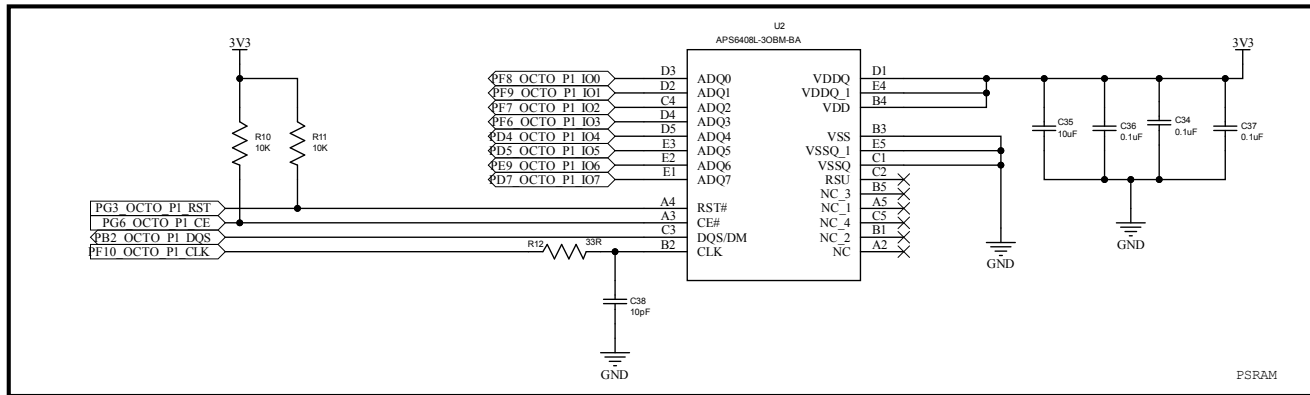
Serial FLASH

Figure 46. STEVAL-ROBKIT1-1 schematic (5 of 12)

BlueNRG Slave MODE

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confirm the system functionality for your application.

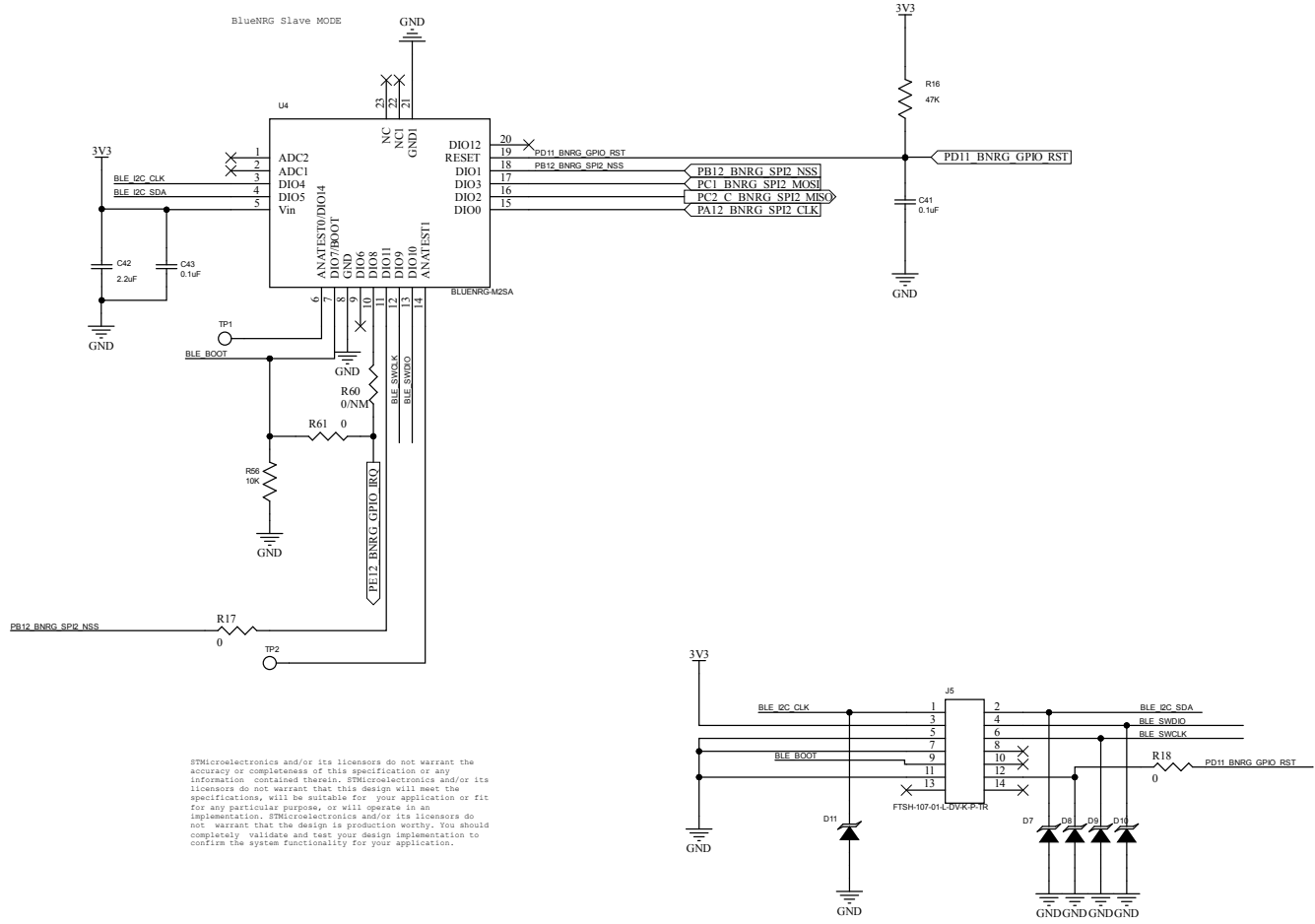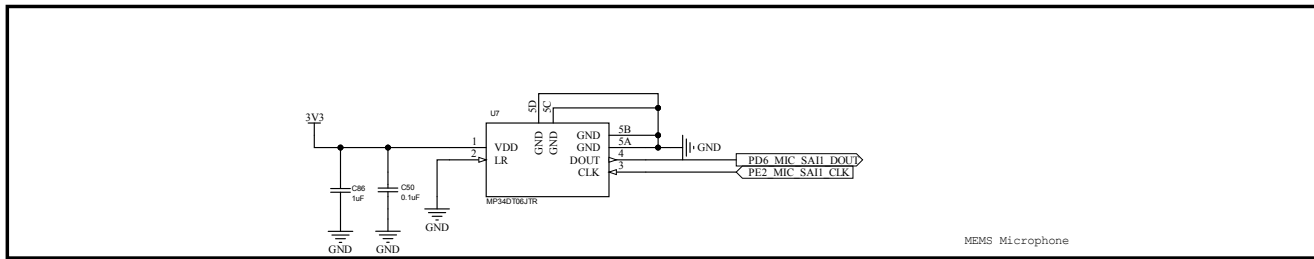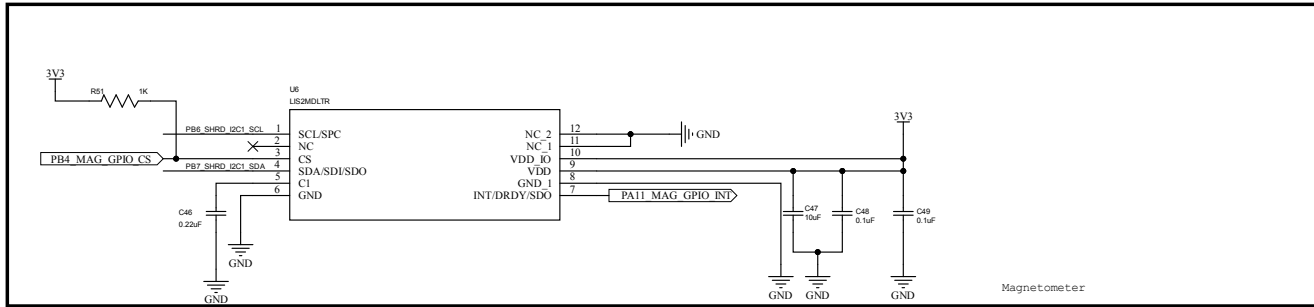## Figure 47. **STEVAL-ROBKIT1-1 schematic (6 of 12)**

IMU

Magnetometer

MEMS Microphone

Figure 48. STEVAL-ROBKIT1-1 schematic (7 of 12)

Figure 49. STEVAL-ROBKIT1-1 schematic (8 of 12)

Switches

LEDs

Buzzer
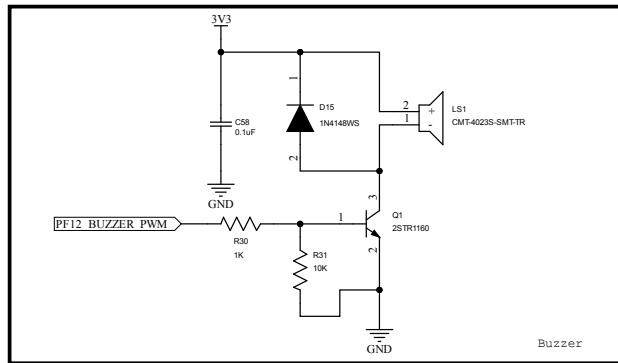
Figure 50. STEVAL-ROBKIT1-1 schematic (9 of 12)

Camera Module Connector

Camera Bridge IC: MIPI To DCMI

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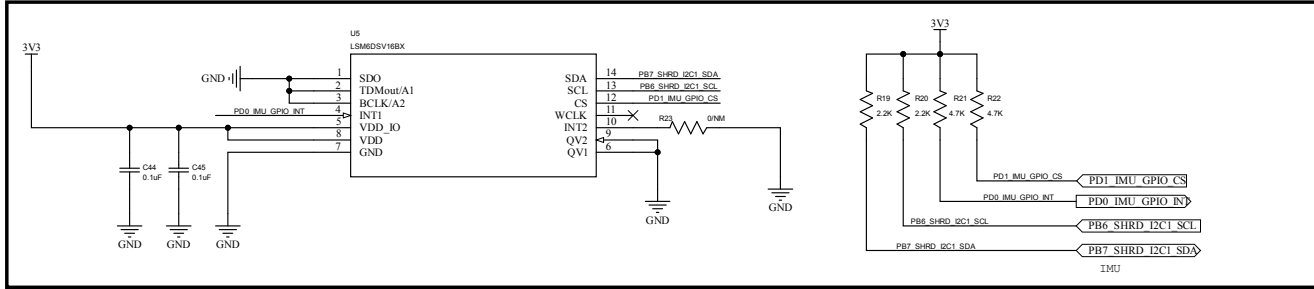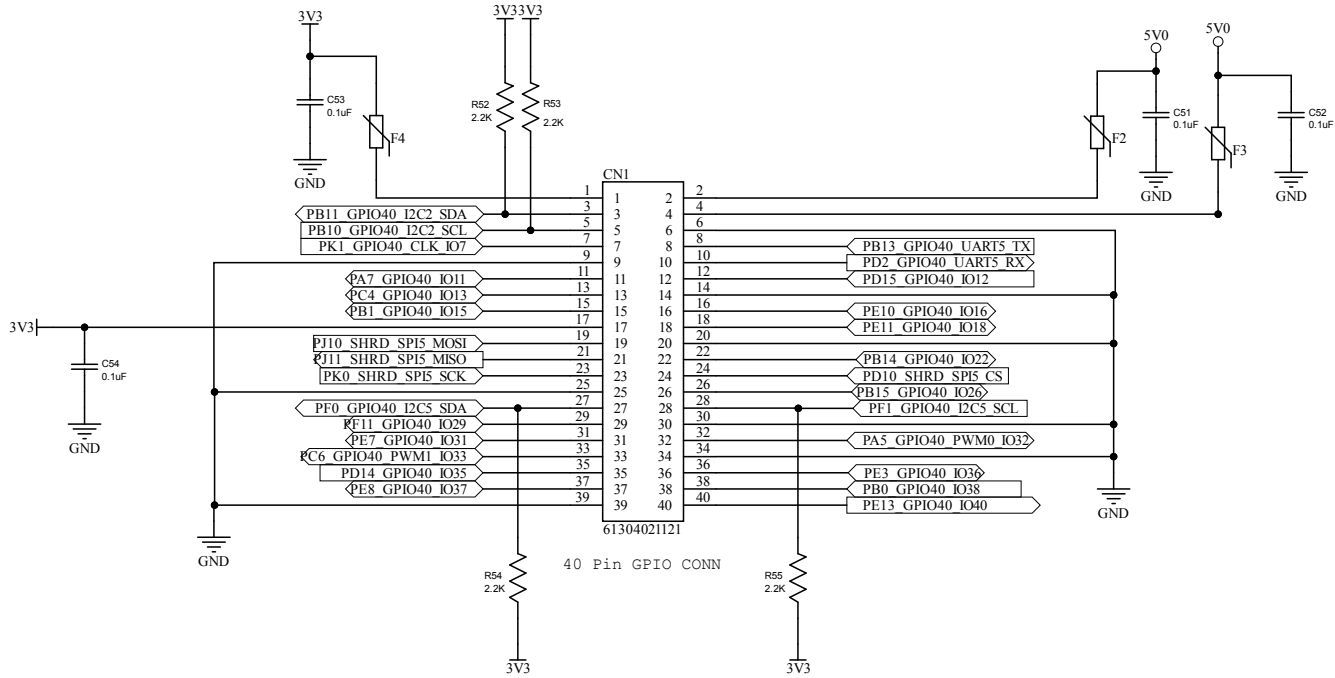## Figure 51. STEVAL-ROBKIT1-1 schematic (10 of 12)

Level Shifter

Figure 52. STEVAL-ROBKIT1-1 schematic (11 of 12)

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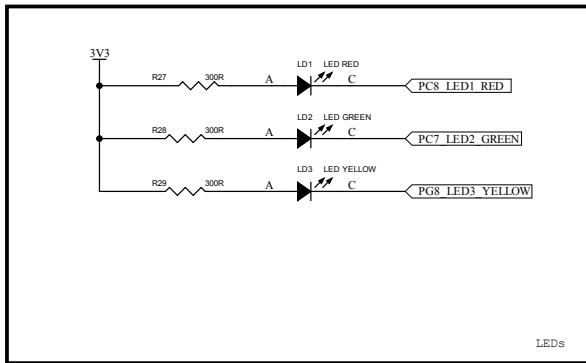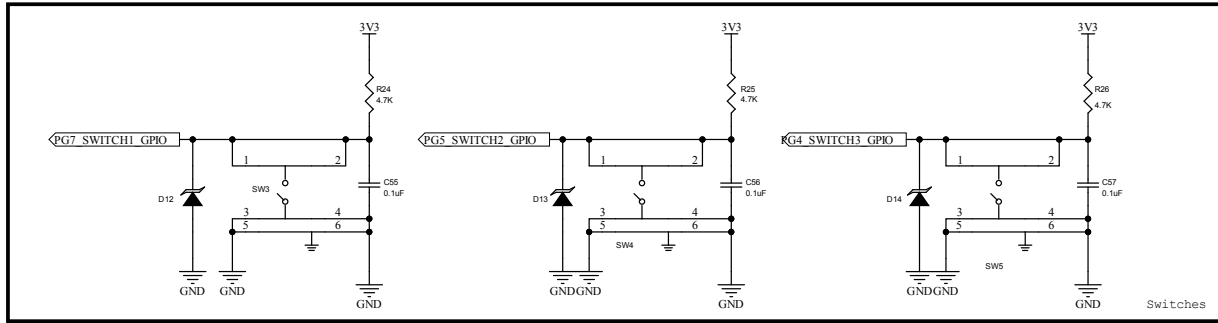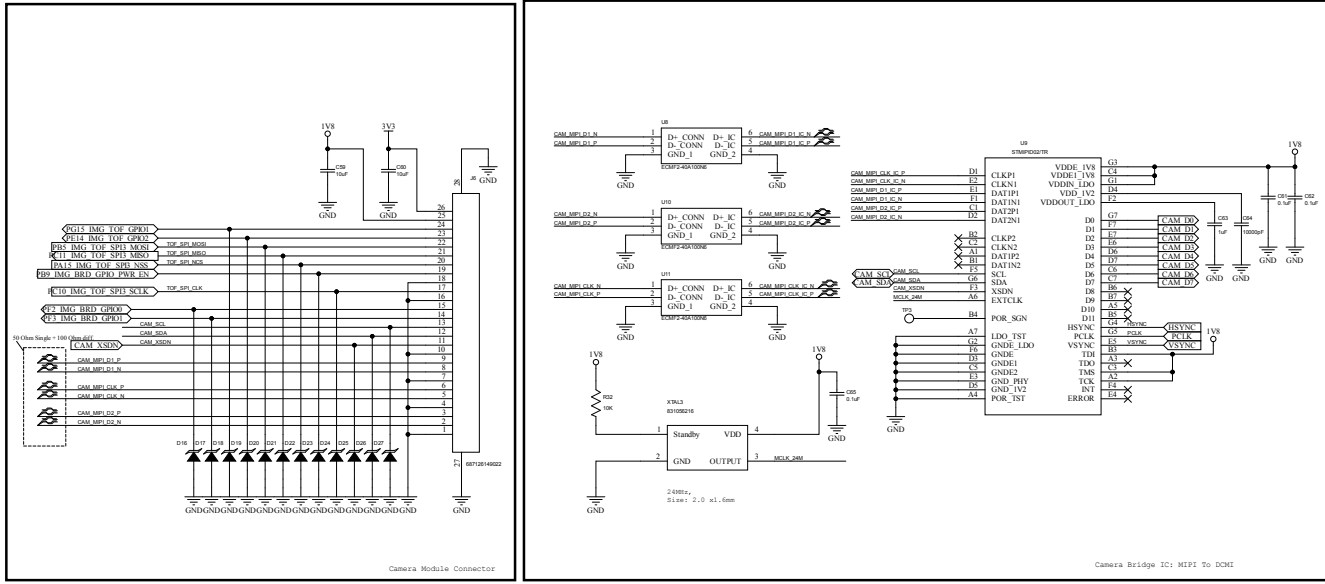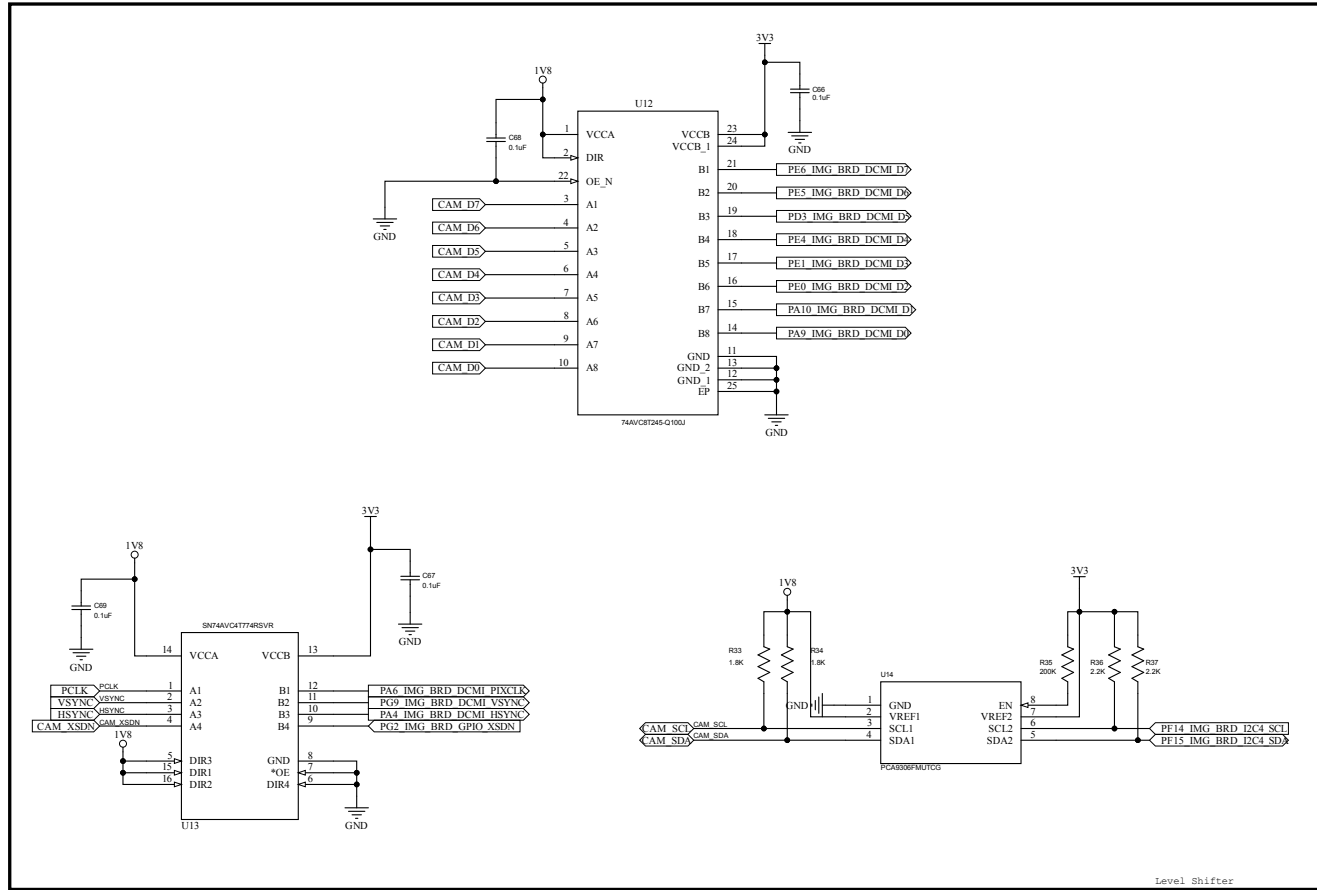
Figure 53. STEVAL-ROBKIT1-1 schematic (12 of 12)

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Figure 54. STEVAL-ROBKIT1-2 schematic (1 of 5)

STM32G071CBT6

LEDs & Switch

PB15_LED1 — PB15_LED1
PB14_LED2 — PB14_LED2
PB13_LED3 — PB13_LED3

NRST — NRST

PA5_SW1_EXT15 — PA5_SW1_EXT15
PA6_SW2_EXT16 — PA6_SW2_EXT16
PB0_SW3_EXT10 — PB0_SW3_EXT10
PC7_SW4_EXT17 — PC7_SW4_EXT17

PA1_BATT_ADC — PA1_BATT_ADC

LEDs & Switch.SchDoc

STSPIN240

MCU_MOTOR_A_ENCODER_A — MCU_MOTOR_A_ENCODER_A
MCU_MOTOR_A_ENCODER_B — MCU_MOTOR_A_ENCODER_B
MCU_MOTOR_B_ENCODER_A — MCU_MOTOR_B_ENCODER_A
MCU_MOTOR_B_ENCODER_B — MCU_MOTOR_B_ENCODER_B

PA8_PWMA — PA8_PWMA
PD0_PWMB — PD0_PWMB
PB10_PHASE_A — PB10_PHASE_A
PB11_PHASE_B — PB11_PHASE_B
PD1_PWM_REF — PD1_PWM_REF

PA15_EN_FAULT — PA15_EN_FAULT

STBY/RESET — STBY/RESET

STSPIN240.SchDoc

LSM6DSR

I2C_SDA — I2C_SDA
I2C_SCL — I2C_SCL

LSM6DSR_INT1 — LSM6DSR_INT1
LSM6DSR_INT2 — LSM6DSR_INT2

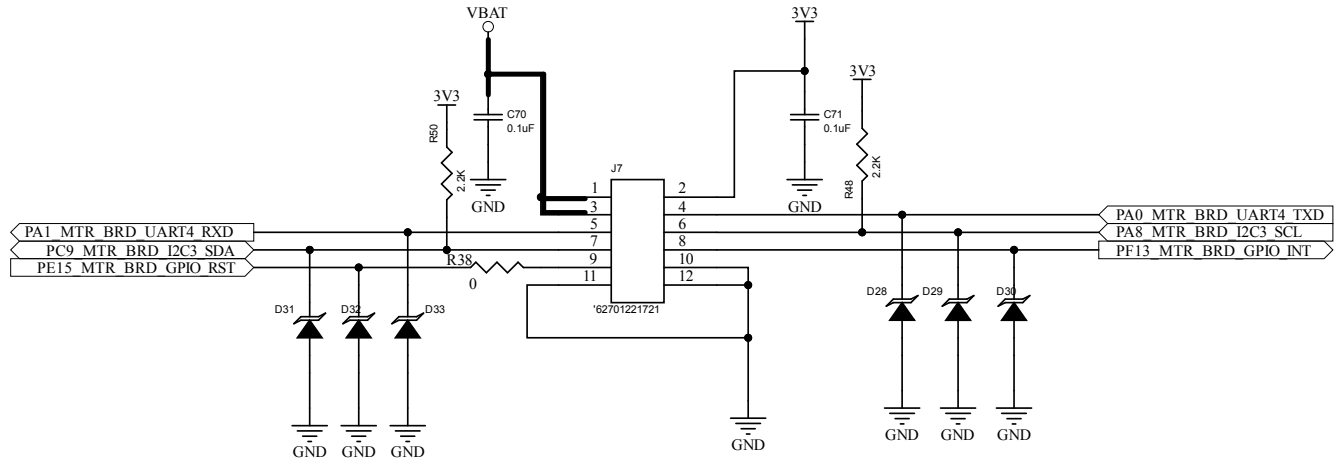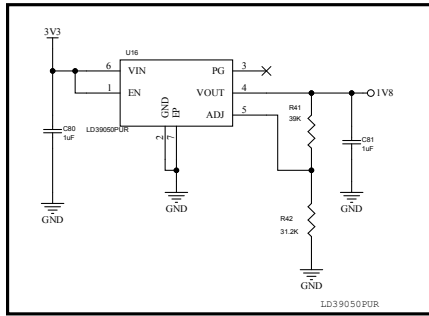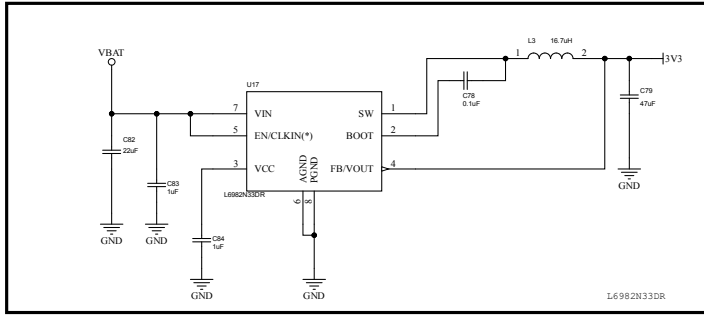STM32G071CBT6.SchDoc

LSM6DSR.SchDoc

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Figure 55. **STEVAL-ROBKIT1-2 schematic (2 of 5)**

MOUNTING HOLES

MH1   M3 HOLE NOT PLATED
MH2   M3 HOLE NOT PLATED
MH3   M3 HOLE NOT PLATED
MH4   M3 HOLE NOT PLATED

LOGO1   LOGO2   LOGOS
LOGO_WEEE   LOGO_ST   ESD SURFACE LOGO
LOGO4
RoHS Compliant
RoHS EU LOGO
`LOGO_RoHS   LOGO_CE   ROHS_CH_LOGO_10

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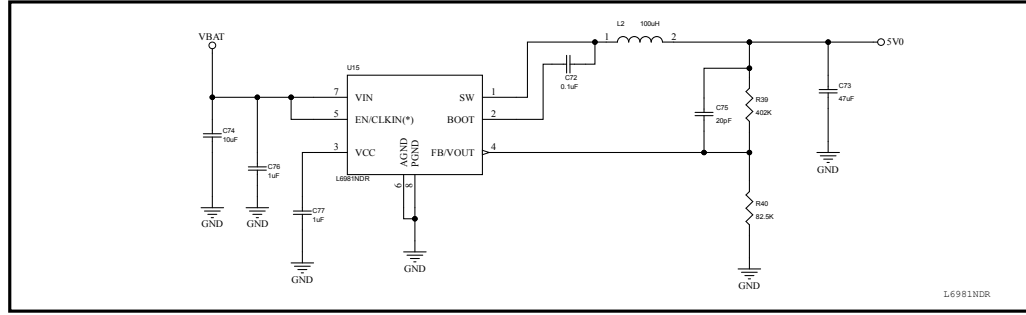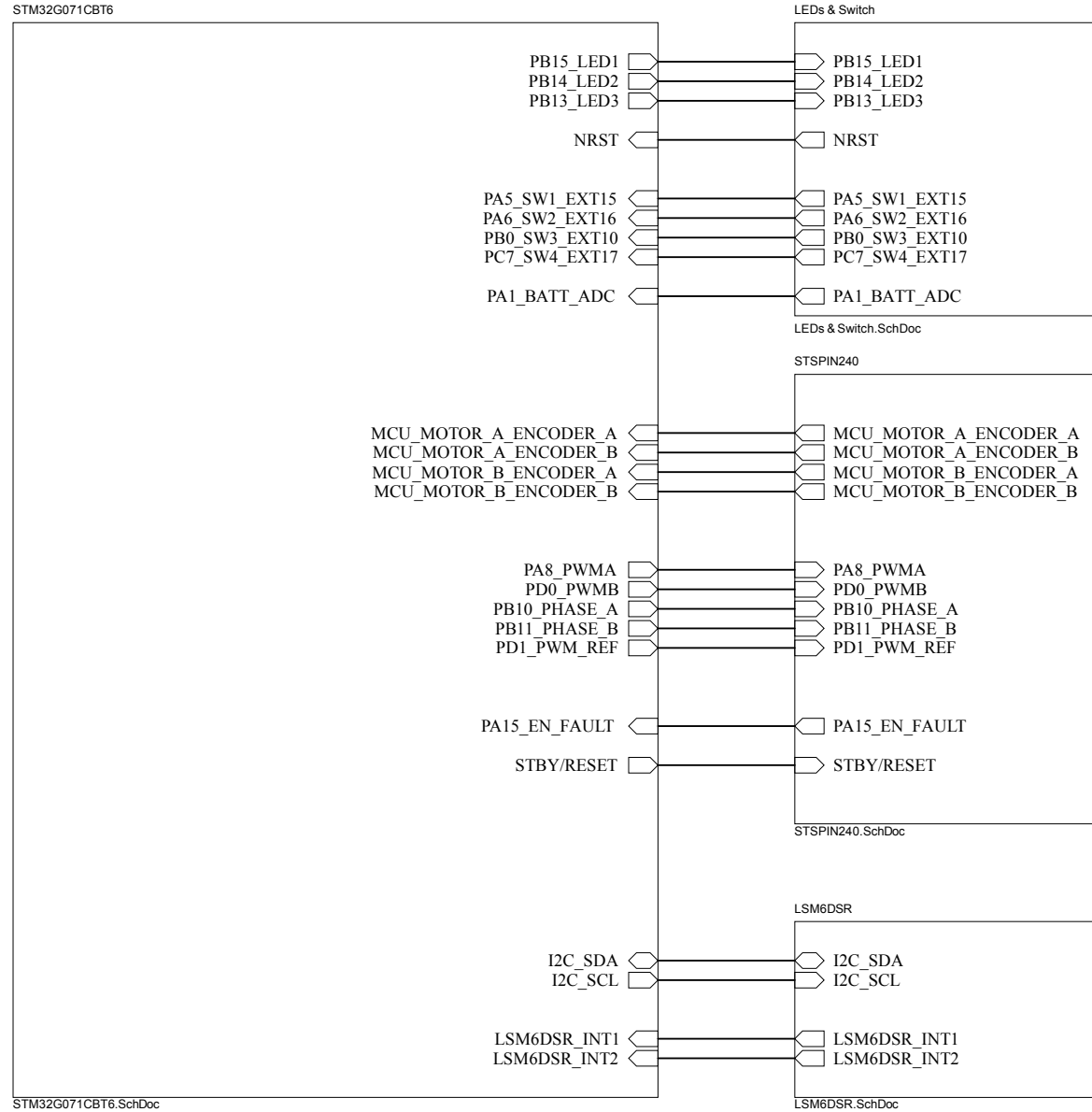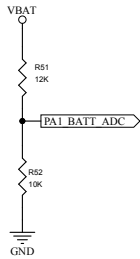
Figure 56. STEVAL-ROBKIT1-2 schematic (3 of 5)
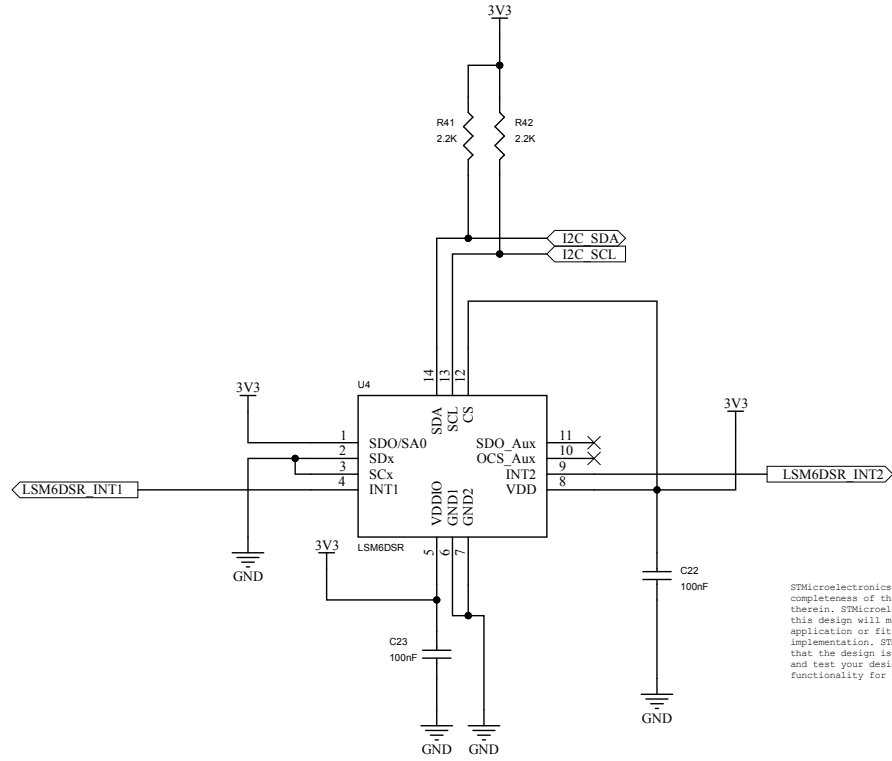
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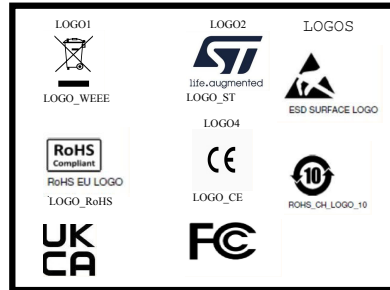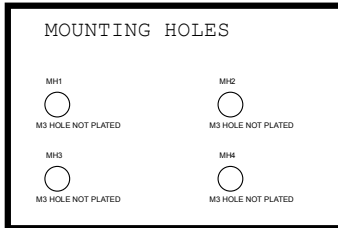
Figure 57. STEVAL-ROBKIT1-2 schematic (4 of 5)
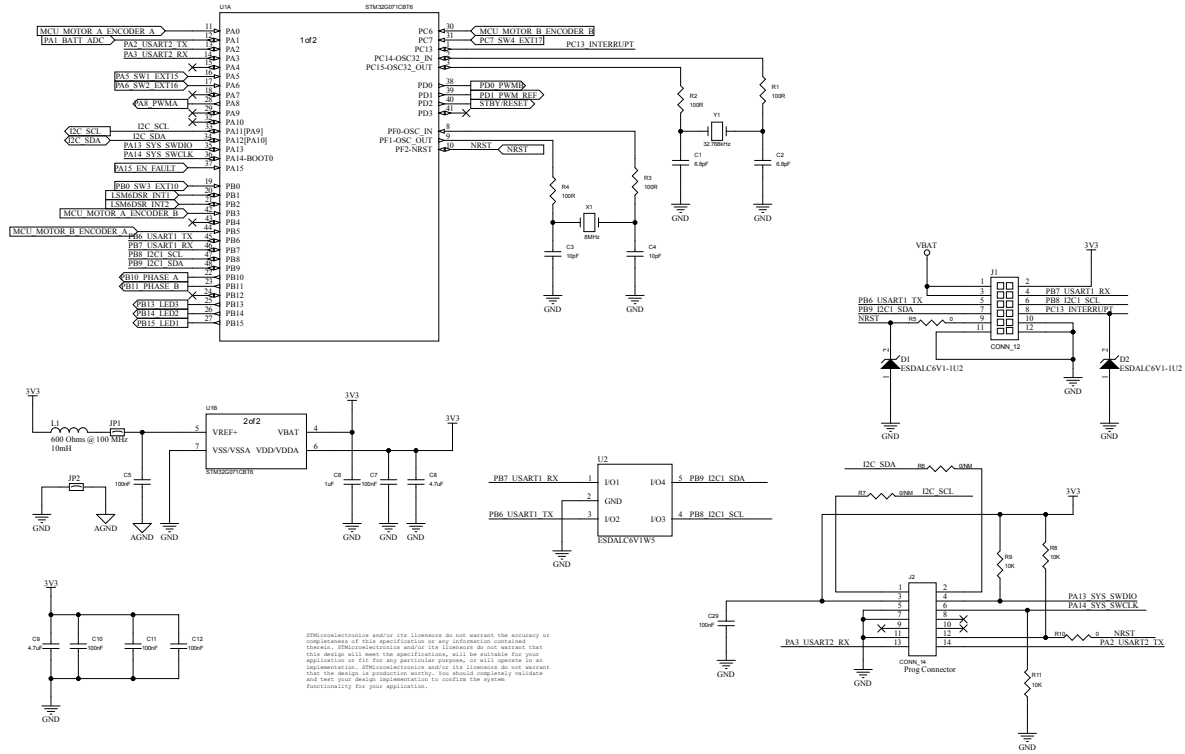
Figure 58. STEVAL-ROBKIT1-2 schematic (5 of 5)
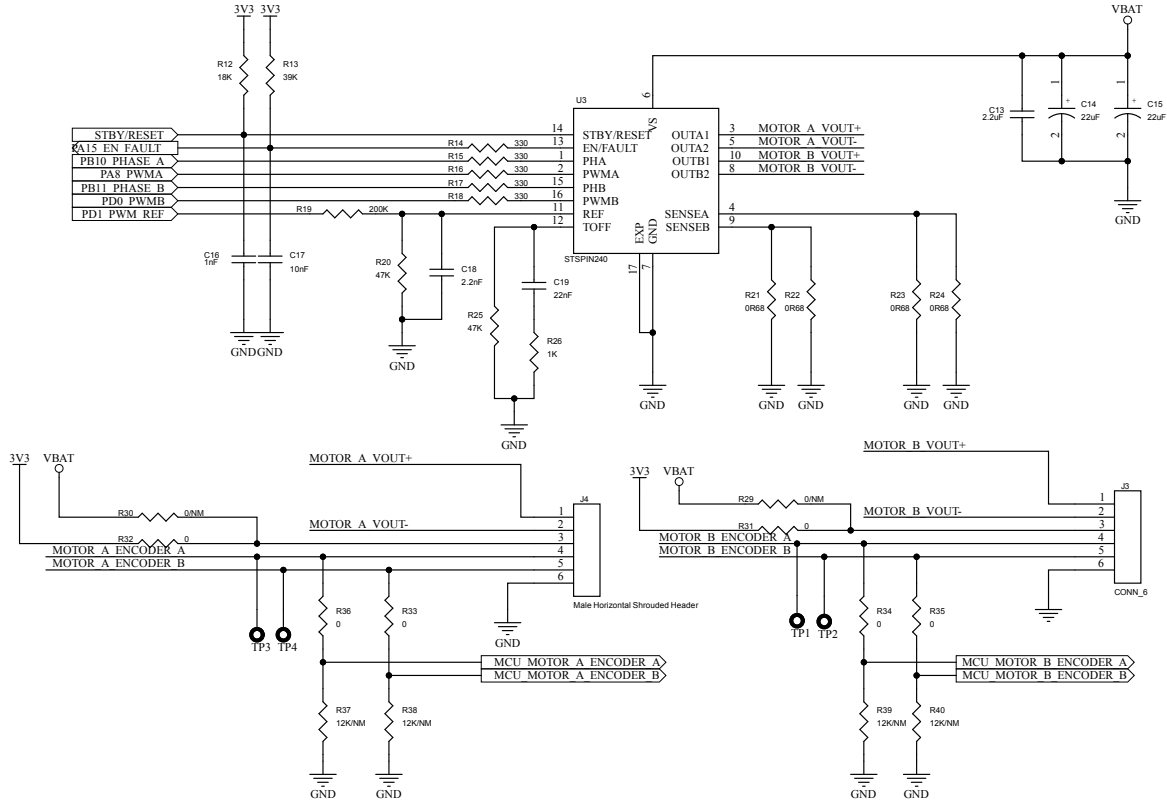
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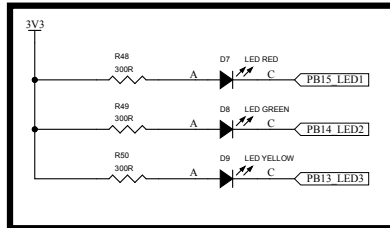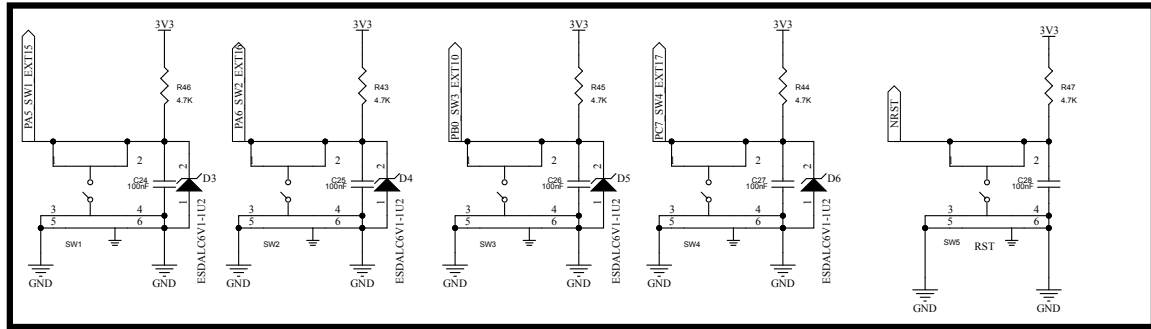
Figure 59. STEVAL-ROBKIT1-3 schematic (1 of 3)

Power
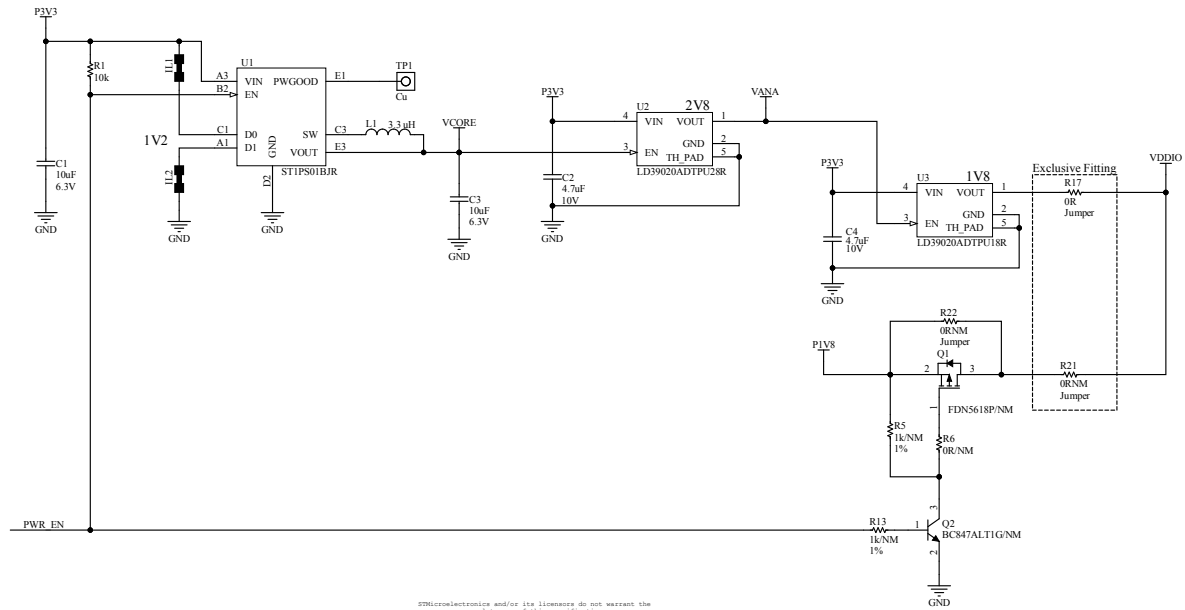
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licensors do not warrant that this design will meet the
specifications, will be suitable for your application or
fit
for any particular purpose, or will operate in an
implementation. STMicroelectronics and/or its licensors do
not warrant that the design is production worthy. You
should
completely validate and test your design implementation to
confirm the system functionality for your application.
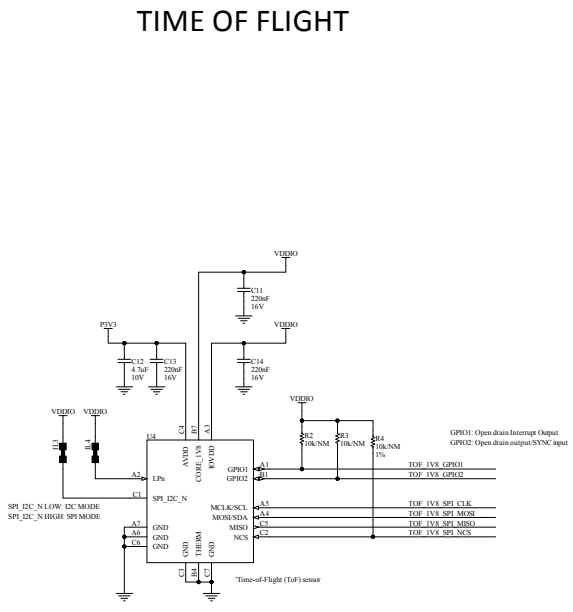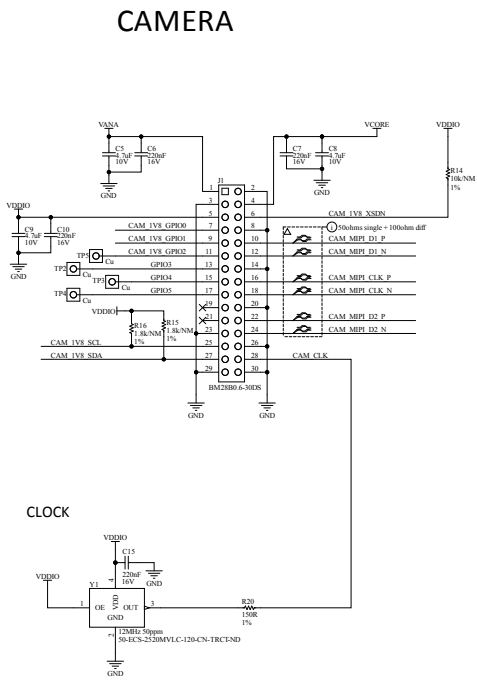
Figure 60. STEVAL-ROBKIT1-3 schematic (2 of 3)

CAMERA

TIME OF FLIGHT

CLOCK

Figure 61. STEVAL-ROBKIT1-3 schematic (3 of 3)

MAINBOARD Interface
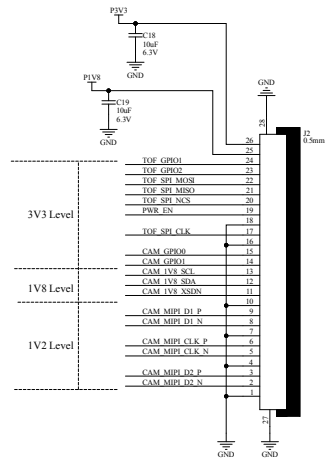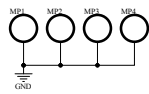
Level Shifting
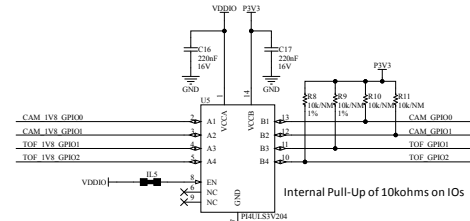
Internal Pull-Up of 10kohms on IOs
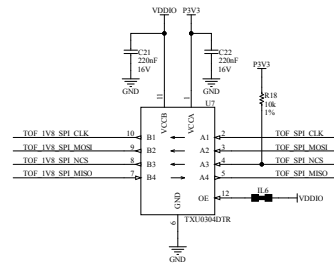
Fixation

5 Bill of materials

Table 19. STEVAL-ROBKIT1 bill of materials

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
1	1	Table 20. STEVAL-ROBKIT1-1	STEVAL-ROBKIT1-1	STEVAL-ROBKIT1-KIT Main board	STMicroelectronics	STEVAL-ROBKIT1-1
2	1	Table 21. STEVAL-ROBKIT1-2	STEVAL-ROBKIT1-2	STEVAL-ROBKIT1-KIT Motor board	STMicroelectronics	STEVAL-ROBKIT1-2
3	1	Table 22. STEVAL-ROBKIT1-3	STEVAL-ROBKIT1-3	STEVAL-ROBKIT1-KIT Imaging board	STMicroelectronics	STEVAL-ROBKIT1-3
4	1	Acrylic chassis (as per provided design 3mm , 8mm, and 10mm transparent sheet respectively)	Acrylic chassis	Acrylic chassis (as per provided design 3mm transparent sheet)	N.A.	N.A.
5	2	DC Motor with encoder	6V/90RPM TT DC Motor with encoder	SparkFun Hobby Motor with encoder	SparkFun	DG01D-E
6	2	6-pin motor cable	6-pin motor cable	6-pin JST PH, 2.0mm, Both side Female 10cm	N.A.	N.A.
7	2	TT Motor 65MM Wheel	TT Motor 65MM Wheel	TT Motor 65MM Wheel	N.A.	N.A.
8	1	Castor wheel with two screws to mount on bottom chassis	Castor wheel	Mini universal wheel for car for Robot chassis	N.A.	N.A.
9	1	Battery holder case	Battery holder case	4AA 1.5V AA battery holder case wired (With case cover preferable)	N.A.	N.A.
10	1	12-pin cable to connect STEVAL-ROBKIT1-1 with STEVAL-ROBKIT1-2	12 Position cable	12 Position Cable Assembly Rectangular Socket to Socket 0.250' (76.20mm, 2.00")	Sametc	FFSD-06-D-02.00-01-N
11	1	26-pin FFC cable to connect STEVAL-ROBKIT1-1 with STEVAL-ROBKIT1-3	26 Position FFC, FPC cable	26 Position FFC, FPC Cable 0.020" (0.50mm) 1.969" (50.00mm) 26 Position FFC, FPC Cable 0.020" (0.50mm) 1.969" (50.00mm)	Wurth Elektronik	687726050002

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
12	1	Additional 14 Position cable for STLINK Connection	14 Position cable	14 Position Cable Assembly Rectangular Socket to Socket, Reversed 0.492' (149.86mm, 5.90")	Samtec	FFSD-07-D-05.90-01-N
13	8	Female-Female Hex Standoff: 4 x Hex Standoff between STEVAL-ROBKIT1-1 and STEVAL-ROBKIT1-2; 4x Hex Standoff between chassis top and chassis bottom part	Female - Female Threaded Hex Standoff, M3, 25mm	Hex Standoff Threaded M3x0.5 Nylon 0.984" (25.00mm) Natural	Harwin-Inc	R30-1612500 R30-1612500
14	4	Male-Female Hex Standoff: 4x between STEVAL-ROBKIT1-2 and acrylic chassis	Male- Female Threaded Hex Standoff, M3, 6mm	Hex Standoff Threaded M3x0.5 Nylon 0.236" (6.00mm) Natural	Essentra	36M30MF006
15	16	M3 Screws: 4 at STEVAL-ROBKIT1-1 board top; 4 at STEVAL-ROBKIT1-2 bottom; 8 for Chassis	PAN HEAD SCREW_M3 X 8MM CROSS SL	M3x8mm Pan Head Machine Screw Phillips Drive Nylon	Wurth Elektronik	97790803111
16	2	Motor Bracket Holder Mount consists of a motor mount + 2 long screws + 2 short screws + 2 nuts) for each motor	TT DC Geared Motor Bracket Holder Mount	TT DC Geared Motor Bracket Holder Mount for Smart Car Robot Parts	N.A.	N.A.
17	6	Hex bolt: 6 x for camera mount assembly	HEX UNSLOTTED BOLT, M3 X 0.5, Head dia: 0.197" (5.00mm), Length below head: 0.787" (20.00mm)	M3x0.5 Hex Head Bolt Hex Socket Drive Nylon, Head dia: 0.197" (5.00mm), Length below head: 0.787" (20.00mm)	Essentra	50M030050J020
18	6	Hex nut: 6 x for bolts used in camera mount assembly	HEX NUT, NATURAL, NYLON, M3 X 0.5	M3x0.5 Hex Nut 0.210" (5.33mm) Nylon	Essentra	04M030050HN

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
19	1	Terminal Wire between J4 of STEVAL-ROBKIT1-1 to battery holder case; Red wire to be connected to 6V (Positive terminal)	Terminal Wire, 120 mm	Terminal wires 120 mm to connect with power terminal, wire of 0.5 sq.mm	Alpha Wire	1856/19 RD005
20	1	Terminal Wire between J4 of STEVAL-ROBKIT1-1 to battery holder case; black wire to be connected to Ground terminal	Terminal Wire, 120 mm	Terminal wires 120 mm to connect with power terminal, wire of 0.5 sq.mm	Alpha Wire	1856/19 BK005
21	1	Fuse Holder	FUSE BLOCK CART 250V 6.3A PCB	Fuse Block 6.3 A 250V 1 Circuit Cartridge chassis Mount	Littelfuse	64700001003
22	1	Fuse Ceramic	FUSE CERAMIC 1.6A 250VAC 5X20MM	1.6 A 250 V AC DC Fuse Cartridge, Ceramic Requires Holder 5mm x 20mm	Littelfuse	021501.6MXP
23	2	Each Ferrite Clamp connected on motor to motor board cable	Ferrite Clamp	Ferrite Clamp On Cores STAR-BUENO Snap 25MHz 125Ohm	Wurth Elektronik	74275812
24	1	Double-sided tape to tape camera module on STEVAL-ROBKIT1-3 board	Acrylic Double Coated Tape	3M 9088 High-performance Acrylic Double Coated Tape, Heavy Duty, Clear, 0.25 in	3M	N.A.
25	1	Double Sided Tape to fix battery Holder on the chassis	Double Coated Tape	3M High-performance Acrylic Double Coated Tape, Heavy Duty, Clear,	3M	

Table 20. STEVAL-ROBKIT1-1 bill of materials

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
1	2	C1, C2	5.6pF	CAP CER 5.6PF 50V C0G/NPO 0402	Yageo	CC0402BRNPO9BN5R6
2	2	C3, C4	1.5pF	Capacitor, MLCC, 1.5pF, 50V, NPO, +-0.25pF, 0402, T=0,5mm	Yageo	CC0402BRNPO9BN1R5
3	11	C5, C7, C63, C76, C77, C80, C81, C83, C84, C85, C86	1uF	CAP CER 1UF 6.3V X5R 0402	Yageo	CC0402MRX5R5BB105

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
4	53	C6, C10, C12, C13, C14, C15, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C34, C36, C37, C39, C41, C43, C44, C45, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C61, C62, C65, C66, C67, C68, C69, C70, C71, C72, C78	0.1uF	CAP CER 0.1UF 50V X7R 0402	Yageo	CC0402KRX7R9BB104
5	1	C8	220pF	CAP CER 220PF 16V X7R 0402	Yageo	CC0402KRX7R7BB221
6	7	C9, C11, C35, C47, C59, C60, C74	10uF	CAP CER 10UF 10V X5R 0402	Yageo	CC0402MRX5R6BB106
7	1	C16	4.7uF	CAP CER 4.7UF 16V X5R 0402	Yageo	CC0402MRX5R7BB475
8	2	C38, C40	10pF	CAP CER 10PF 16V C0G/NPO 0402	Yageo	CC0402KRNPO7BN100
9	1	C42	2.2uF	CAP CER 2.2UF 16V X5R 0402	Murata	GRM155R61C225KE11J
10	1	C46	0.22uF	CAP CER 0.22UF 10V X5R 0402	Yageo	CC0402KPX5R6BB224
11	1	C64	10000pF	CAP CER 10000PF 10V X7R 0402	Yageo	CC0402KRX7R6BB103
12	2	C73, C79	47uF	CAP CER 47UF 10V X5R 0805	Murata	GRM21BR61A476ME15L
13	1	C75	20pF	CAP CER 20PF 25V C0G/NP0 0402	Murata	GRM1555C1E200JA01D
14	1	C82	22uF	CAP CER 22UF 10V X5R 0402	Murata	GRM158R61A226ME15D
15	1	CN1	Header 20X2	Header, 20x2, 2.54mm, VR, TH, Height 5.84mm/ 2.54mm	Würth Elektronik	61304021121

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
16	31	D1, D2, D3, D4, D5, D7, D8, D9, D10, D11, D12, D13, D14, D16, D17, D18, D19, D20, D21, D22, D23, D24, D25, D26, D27, D28, D29, D30, D31, D32, D33	ESDALC6V1-1U2, ST0201	TVS DIODE 3VWM ST0201	STMicroelectronics	ESDALC6V1-1U2
17	1	D6	SMC30J10A, SMC	Tvs Diode Surface Mount SMC	STMicroelectronics	SMC30J10A
18	1	D15	1N4148WS	Diode 75 V 150mA Surface Mount SOD-323F	ON Semiconductor	1N4148WS
19	1	F1	Fuse 3A 8VDC	PTC RESET FUSE 8V 2.6A 1812	Bel Fuse Inc.	0ZCG0260FF2C
20	3	F2, F3, F4	Fuse 5VDC	Polymeric PTC Resettable Fuse 6V 500 mA Ih Surface Mount 0402 (1005 Metric), Concave	Bourns Inc.	MF-ASML050/6-2
21	3	FB1, FB2, FB3	BLM15EG121SN1D	FERRITE BEAD 120 OHM 0402 1LN	Murata Electronics	BLM15EG121SN1D
22	6	FIDUCIAL1, FIDUCIAL2, FIDUCIAL3, FIDUCIAL4, FIDUCIAL5, FIDUCIAL6	Fiducial	FIDUCIALS	-	-
23	1	HW1	HW1	Short Pin Header, 2.54mm	Harwin Inc.	M7567-05
24	2	J1, J5	FTSH-107-01-L-DV-K-P-TR	CONN HEADER SMD 14POS 1.27MM	Samtec Inc.	FTSH-107-01-L-DV-K-P-TR
25	1	J2	CON3	Connector Header Through Hole 3 position 0.100" (2.54mm)	Samtec Inc.	TSW-103-07-F-S
26	1	J3	S8411-45R	BATT HOLDER COIN 12MM 1 CELL SMD	Harwin Inc.	S8411-45R
27	1	J4	CON2	TERM BLK 2P SIDE ENT 2.54MM PCB	Phoenix Contact	1725656
28	1	J6	687126149022	CONN FFC BOTTOM 26POS 0.5MM R/A	Würth Elektronik	687126149022

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
29	1	J7	'62701221721	WR-BHD 1.27MM MALE ANGLED BOX HE	Würth Elektronik	62701221721
30	1	L1	2.2uH	Inductor 2.2uH 138 mOhms 1.2 A, 0806 (2016 metric)	Murata	LQM2MPN2R2MG0L
31	1	L2	100uH	FIXED IND 100NH 200MA 1.6OHM SMD	TDK Corporation	KLZ2012NHR101LTD25
32	1	L3	16.7uH	WE-HCIA SMT FLAT WIRE HIGH CURRE	Würth Elektronik	784325160
33	1	LD1	LED RED	LED RED CLEAR 0603 SMD	Würth Elektronik	150060RS75000
34	1	LD2	LED GREEN	LED GREEN CLEAR 0603 SMD	Würth Elektronik	150060GS75000
35	1	LD3	LED YELLOW	LED YELLOW CLEAR 0603 SMD	Würth Elektronik	150060YS75000
36	1	LS1	CMT-4023S-SMT-TR	BUZZER MAGNETIC 3V 4X4MM SMD	CUI Devices	CMT-4023S-SMT-TR
37	4	MH1, MH2, MH3, MH4	M3 HOLE NOT PLATED	M3 Pan Head Machine Screw Phillips Drive Nylon	Würth Elektronik	97790803111
38	1	Q1	2STR1160, SOT-23	Bipolar (BJT) Transistor NPN 60 V 1 A 500 mW Surface Mount SOT-23-3	STMicroelectronics	2STR1160
39	6	R1, R2, R3, R23, R49, R60	0/NM	RES 0 OHM JUMPER 1/16W 0402	Vishay Beyschlag/ Draloric/BC Components, Vishay	MCS04020Z0000ZE000
40	6	R4, R17, R18, R38, R47, R61	0	RES 0 OHM JUMPER 1/16W 0402	Vishay Beyschlag/ Draloric/BC Components	MCS04020Z0000ZE000
41	2	R5, R8	10K/NM	RES 10K OHM 1% 1/16W 0402	Vishay	CRCW040210K0FKEDC
42	11	R6, R7, R9, R10, R11, R13, R31, R32, R56, R57, R59	10K	RES 10K OHM 5% 1/16W 0402	Yageo	RC0402JR-1010KL
43	2	R12, R15	33R	Thick Film Resistors - SMD 33Ohms 1/16W 0402 5%	Yageo	RC0402JR-7D33RL
44	1	R16	47K	RES 47K OHM 5% 1/16W 0402	Yageo	RC0402JR-1047KL

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
45	10	R19, R20, R36, R37, R48, R50, R52, R53, R54, R55	2.2K	RES SMD 2.2K OHM 0.5% 1/16W 0402	Yageo	RT0402DRE072K2L
46	5	R21, R22, R24, R25, R26	4.7K	RES 4.7K OHM 0.1% 1/16W 0402	Yageo	RP0402BRD074K7L
47	3	R27, R28, R29	300R	RES SMD 300 OHM 1% 1/16W 0402	Yageo	AC0402FR-07300RL
49	2	R30, R51	1K	RES SMD 1K OHM 1% 1/10W 0402	Yageo, Panasonic Electronic Components	ERJ-2RKF1001X
50	2	R33, R34	1.8K	RES SMD 1.8K OHM 0.1% 1/16W 0402	Yageo, MULTICOMP	RT0402BRD071K8L
51	1	R35	200K	RES 200K OHM 1% 1/16W 0402	Yageo	RC0402FR-13200KL
52	1	R39	402K	RES SMD 402K OHM 1% 1/16W 0402	Yageo	RE0402FRE07402KL
53	1	R40	82.5K	RES 82.5K OHM 1% 1/16W 0402	Yageo	RC0402FR-0782K5L
54	1	R41	39K	RES SMD 39K OHM 1% 1/16W 0402	Yageo	RT0402FRE0739KL
55	1	R42	31.2K	RES SMD 31.2KOHM 0.1% 1/10W 0603	Yageo	RT0603BRD0731K2L
56	4	R43, R44, R45, R46	0	Resistor,0R,0603,ULO	Rohm Semiconductor	PMR03EZPJ000
57	1	R58	12K	RES 12K OHM 1% 1/10W 0402	Würth Elektronik	560112110038
58	1	SB1	Solder Bridge 0402 ON	Solder Bridge 0402 ON	Yageo	RC0402JR-070RL
59	1	SB2	Solder Bridge 0402 ON/NM	Solder Bridge 0402 ON	Yageo	RC0402JR-070RL
60	1	SW1	1101M2S3CQE2	Slide Switch SPDT Through Hole	C&K	1101M2S3CQE2
61	4	SW2, SW3, SW4, SW5	PUSHBUTTON	Tactile Switch SPST-NO Top Actuated Surface Mount	Würth Elektronik	435171014816
62	2	TP1, TP2	TEST POINT	PC TEST POINT NATURAL	Harwin Inc.	S2761-46R
63	3	TP3, TP4, TP5	T_POINT_R	PC TEST POINT NATURAL	Harwin Inc.	S2761-46R
64	1	U1	STM32H725IGT6, LQFP 176 24x24x1.4 mm	CONTROLLER / PROCESSOR	STMicroelectronics	STM32H725IGT6

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
65	1	U2	APS6408L-3OBM-BA	RAM 64Mb OPI (x8) DDR 133MHz, 3V, Ind. Temp., BGA24	AP Memory	APS6408L-3OBM-BA
66	1	U3	W25Q128JVPIQ	NOR flash, spiFlash, 3V, 128Mbit, 4KB Uniform Sector	Winbond	W25Q128JVPIQ
67	1	U4	BLUENRG-M2SA, BLUENRG-2 MODULE QFN, CHIP ANT	Very low power application processor module for Bluetooth® Low Energy v5.2	STMicroelectronics	BLUENRG-M2SA
68	1	U5	LSM6DSV16BX, LGA 14L 2.5x3x0.74 mm	6-axis iNEMO INERTIAL MODULE: 3-axis accelerometer	STMicroelectronics	LSM6DSV16BXTR
69	1	U6	LIS2MDLTR, LGA2X2X0.7 12 LEADS	Digital output magnetometer	STMicroelectronics	LIS2MDLTR
70	1	U7	MP34DT06JTR, HCLGA 4MM X 3 MM X 1.00 MM MICRO	MEMS microphones MEMS audio sensor	STMicroelectronics	MP34DT06JTR
71	3	U8, U10, U11	ECMF2-40A100N6, QFN-6L	Common-mode filter with ESD protection for high-speed serial interface	STMicroelectronics	ECMF2-40A100N6
72	1	U9	STMIPID02/TR	Dual-mode MIPI CSI-2/SMIA CCP2 de-serializer	STMicroelectronics	STMIPID02/TR
73	1	U12	74AVC8T245-Q100J	8-bit dual supply translating transceiver with configurable voltage translation; 3-state	Nexperia	74AVC8T245BQ-Q100J
74	1	U13	SN74AVC4T774RSVR	4-Bit Dual-Supply Bus Transceiver with Configurable Voltage-Level Shifting and 3-State Outputs with Independent Direction Control Inputs	TI	SN74AVC4T774RSVR
75	1	U14	PCA9306FMUTCG	Dual Bidirectional I2C Bus	ON Semiconductor	PCA9306FMUTCG
76	1	U15	L6981NDR, SO-8	Switching Voltage Regulators 38 V, 1.5 A	STMicroelectronics	L6981NDR

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
77	1	U16	LD39050PUR, DFN6 3x3	LDO Voltage Regulators ADJ FRM 0.8V	STMicroelectronics	LD39050PUR
78	1	U17	L6982N33DR, SO-8	Switching Voltage Regulators 38 V, 2 A	STMicroelectronics	L6982N33DR
79	1	XTAL1	CS08742-25M	25 MHz Crystal 20pF 80 Ohms 4-SMD, No Lead	NDK America, Inc.	CS08742-25M
80	1	XTAL2	NX3215SA-32.768KHz-EXS00A-MU00525	Crystal 32.768kHz, 6pF, +-20ppm, 50Kohms max, SMD	NDK	NX3215SA-32.768KHz-EXS00A-MU00525
81	1	XTAL3	831056216	WE-SPXO 24.0MHz 50ppm 2.0 x 1.6mm	Würth Elektronik	831056216

Table 21. STEVAL-ROBKIT1-2 bill of materials

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
1	2	C1, C2	6.8pF	Multilayer Ceramic Capacitors MLCC - SMD/SMT 50 V 6.8pF C0G 0603 Tol 0.25pF	Yageo	CC0603CRNPO9BN6R8
2	2	C3, C4	10pF	'CAPACITOR CERAMIC SMD 0603	Yageo	CC0603JRNPO9BN100
3	13	C5, C7, C10, C11, C12, C22, C23, C24, C25, C26, C27, C28, C29	100nF	CAP CER 0.1UF 50V X7R 0603	KEMET	C0603C104K5RACTU
4	1	C6	1uF	CAP CER 1UF 50V X5R 0603	Samsung Electro-Mechanics America, Inc.	CL10A105KB8NNNC
5	2	C8, C9	4.7uF	CAP CER 4.7UF 16V X5R 0603	Murata Electronics	GRM188R61C475KAAJD
6	1	C13	2.2uF	Multilayer Ceramic Capacitors MLCC - SMD/SMT 0603 25VDC 2.2uF 10% B(JIS)	Murata Electronics	GRM188B31E225KA12D
7	2	C14, C15	22uF	CAP TANT 22UF 10% 25V 2312	Vishay Sprague	TR3C226K025C0425

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
8	1	C16	1nF	Multilayer Ceramic Capacitors MLCC - SMD/SMT 50volt 1nF 10%	Vishay Vitramon	GA0603Y102KXAAC31G
9	1	C17	10nF	CAP CER 10000PF 50V X7R 0603	Murata Electronics North America	GRM188R71H103KA01D
10	1	C18	2.2nF	Multilayer Ceramic Capacitors MLCC - SMD/SMT 50V 2200pF X7R 0603 10%	Yageo	CC0603KPX7R9BB222
11	1	C19	22nF	Multilayer Ceramic Capacitors MLCC - SMD/SMT 50V 0.022uF X7R 0603 20%	Yageo	CC0603MRX7R9BB223
12	6	D1, D2, D3, D4, D5, D6	ESDALC6V1-1U2	ESD Suppressors / TVS Diodes single-line Low Cap ESD TVS 0201	STMicroelectronics	ESDALC6V1-1U2
13	1	D7	LED RED	LED RED CLEAR 2SMD	Everlight Electronics Co Ltd	19-217/R6C-AL1M2VY/3T
14	1	D8	LED GREEN	LED GREEN CLEAR 0603 SMD	Würth Elektronik	150060GS75000
15	1	D9	LED YELLOW	LED YELLOW CLEAR 0603 SMD	Würth Elektronik	150060YS75000
16	1	J1	CONN_12	Headers & Wire Housings WR-BHD 1.27mm Male Angled Box Header 12 pins right angled	Würth Elektronik	62701221721
17	1	J2	CONN_14	CONN HEADER SMD 14POS 1.27MM	Samtec Inc.	FTSH-107-01-F-DV-K-P-TR
18	2	J3, J4	Male Horizontal Shrouded Header	WR-WTB 2.0mm Male Horizontal Shrouded Header	Würth Elektronik	62000611722
19	2	JP1, JP2	0ohm	RES 0 OHM JUMPER 1/10W 0603	Yageo	RC0603JR-070RL

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
20	1	L1	600 Ohms @ 100 MHz	600 Ohms @ 100 MHz 1 Ferrite Bead 0603 (1608 Metric) 350mA 500mOhm	TAI-TECH	FCM1608KF-601T03
21	4	R1, R2, R3, R4	100R	RES SMD 100 OHM 1% 1/10W 0603	Yageo	RC0603FR-07100RP
22	8	R5, R10, R31, R32, R33, R34, R35, R36,	0	RES 0 OHM JUMPER 1/10W 0603	Yageo	RC0603FR-070RL, RC0603JR-070RL
23	4	R6, R7, R29, R30	0/NM	RES 0 OHM JUMPER 1/10W 0603	Yageo	RC0603FR-070RL, RC0603JR-070RL
24	4	R8, R9, R11, R52	10K	Thick Film Resistors - SMD 10 kOhms 100mW 0603 1%	Yageo	RC0603FR-0710KL
25	1	R12	18K	Thick Film Resistors - SMD 1/10watt 18Kohms 1%	Vishay/Dale	CRCW060318K0FKEA
26	1	R13	39K	Thick Film Resistors - SMD 39kOhms 1/10W 0603 1%	Yageo	RC0603FR-1039KL
27	5	R14, R15, R16, R17, R18	330	Thick Film Resistors - SMD CRGCQ 0603 330R 1% SMD Resistor	TE Connectivity / Holsworthy	CRGCQ0603F330R
28	1	R19	200K	SMD 200 kOhms 100mW 0603 1%	Yageo	RC0603FR-07200KL
29	2	R20, R25	47K	Thick Film Resistors - SMD 47 kOhms 100mW 0603 1%	Yageo	RC0603FR-0747KL
30	4	R21, R22, R23, R24	0R68	SMD 680 mOhms 100mW 5 % 300 ppm/C AEC-Q200	Panasonic	ERJ-6DQJR68V
31	1	R26	1K	'RES SMD 1K OHM 1% 1/10W 0603	Yageo	RC0603FR-071KL
32	5	R37, R38, R39, R40,	12K/NM	Thick Film Resistors - SMD 12 kOhms 100-200 mW 0603 1%	Yageo	RC0603FR-1312KL
33	1	R51	12K	Thick Film Resistors - SMD 12 kOhms 100-200 mW 0603 1%	Yageo	RC0603FR-1312KL

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
34	2	R41, R42	2.2K	Thick Film Resistors - SMD 2.2 kOhms 100mW 0603 1%	Yageo	RC0603FR-072K2L
35	5	R43, R44, R45, R46, R47	4.7K	Thick Film Resistors - SMD 4.7 kOhms 100 mW 0603 5%	Yageo	RC0603JR-074K7L
36	2	R48, R50	300R	Thick Film Resistors - SMD 300 Ohms 100 mW 0603 1%	Yageo	RC0603FR-10300RL
37	1	R49	75R	Thick Film Resistors - SMD 1/10watt 75ohms 5%	Vishay/Dale	CRCW060375R0JNEA
38	5	SW1, SW2, SW3, SW4, SW5	WS-TASV SMT Tact Switch	SMT 3.0 X 2.6 MM TACT SWITCH WIT	Würth Elektronik	435171014816
39	4	TP1, TP2, TP3, TP4	TP	Solder pads	solder pads	solder pads
40	1	U1	STM32G071CBT6, LQFP 48 7x7x1.4 mm	IC MCU 32BIT 128KB FLASH 48LQFP	STMicroelectronics	STM32G071CBT6
41	1	U2	ESDALC6V1W5, SOT323-5L	ESD Suppressors / TVS Diodes 25W 6.1V Quad Array	STMicroelectronics	ESDALC6V1W5
42	1	U3	STSPIN240, VFQFPN 16 3x3x1.0	IC HALF BRIDGE DRV 1.3A 16VFQFPN	STMicroelectronics	STSPIN240
43	1	U4	LSM6DSR, LGA 14L 2.5x3x0.86 mm	CONSUMER MEMS	STMicroelectronics	LSM6DSRXTR
44	1	X1	8MHz	CRYSTAL 32.7680KHZ 12.5PF SMD	NDK	NX3225GD 8MHz EXS00A-CG04874
45	1	Y1	32.768kHz	CRYSTAL 32.7680KHZ 12.5PF SMD	CTS-Frequency Controls	TFE322P32K7680R

Table 22. STEVAL-ROBKIT1-3 bill of materials

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
1	4	C1, C3, C18, C19	10uF	CAP, CER, 10uF, 6.3V, X5R, 0402	Murata	GRJ155R60J106ME11D
2	6	C2, C4, C5, C8, C9, C12	4.7uF	CAP, CER, 4.7uF, 10V, X5R, 0402	Murata	ZRB15XR61A475KE01D
3	11	C6, C7, C10, C11, C13, C14, C15, C16, C17, C21, C22	220nF	CAP, CER, 220nF, 16V, X7R, 0402	Murata	GRM155R71C224KA12D

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
4	1	J1	BM28B0.6-30DS	CONN RCPT 30POS SMD GOLD, with PLCC28_Fox Module	Hirose	BM28B0.6-30DS/2-0.35V(53)
5	1	J2	0.5mm	CONN FFC FPC BOTTOM 26POS 0.5MM R/A	Wurth Elektronik	687126149022
6	1	L1	3.3 uH	FIXED IND, 3.3uH, 1.9A, 178 mOHM, 1008	TDK	VLS252010HBX-3R3M-1
7	1	Q1	FDN5618P/NM	MOSFET P-CH 60V 1.25A SUPERSOT3	ON Semiconductor	FDN5618P
8	1	Q2	BC847ALT1G/NM	TRANS NPN 45V 100MA SOT23-3	ON Semiconductor	BC847ALT1G
9	2	R1, R18	10k	RES, 10k, 1%, 1/10W, 0402	Panasonic	ERJ-2RKF1002X
10	8	R2, R3, R4, R8, R9, R10, R11, R14,	10k/MN	RES, 10k, 1%, 1/10W, 0402	Panasonic	ERJ-2RKF1002X
11	2	R5, R13	10k/NM	RES, 1k, 1%, 1/10W, 0603	Yageo	RC0603FR-071KL
12	1	R6	1k/NM	RES, 0R, Jumper, 1/10W, 0603	Panasonic	ERJ-3GEY0R00V
13	2	R15, R16	0R/NM	RES, 1.8k, 1%, 1/16W, 0402	Yageo	RC0402FR-071K8L
14	3	R17	1.8k	RES, 0R, Jumper, 1/16W, 0402	Yageo	RC0402JR-070RL
15	2	R21, R22	1.8k/NM	RES, 0R, Jumper, 1/16W, 0402	Yageo	RC0402JR-070RL
16	1	R20	150R	RES, 150R, 1%, 1/16W, 0402	Vishay	CRCW0402150RFKED
17	1	U1	ST1PS01BJR, CSP P 0.4 mm	400 mA nano-quiescent synchronous step-down converter with digit	STMicroelectronics	ST1PS01BJR
18	1	U2	LD39020ADTPU28R, DFN4 1x1	IC, REG, LDO, 2.8V, 0.2A, 4-DFN	STMicroelectronics	LD39020ADTPU28R
19	1	U3	LD39020ADTPU18R, DFN4 1x1	IC, REG, LDO, 1.8V, 0.2A, 4-DFN	STMicroelectronics	LD39020ADTPU18R
20	1	U4	Time-of-Flight (ToF) sensor, OPT. LGA 6.40X3.0	Low-power 8x8 multizone Time-of-Flight (ToF) sensor	STMicroelectronics	VL53L8CXV0GC/1

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
21	1	U5	PI4ULS3V204	IC, 4-Bit Bi-directional Level Shifter, TQFN3.5x3.5-14	Diodes Incorporated	PI4ULS3V204ZBEX
22	1	U7	TXU0304DTR	Voltage Level Translator Bidirectional 1 Circuit 4 Channel	Texas Instruments	TXU0304DTR
23	1	Y1	12MHz 50ppm	XTAL OSC XO 12MHZ CMOS SMD	ECS Inc.	ECS-2520MVLC-120-CN-TR
24	1	Camera module	VD56G3 Promodule	VD56G3 promodule with 152° FoV lens	STMicroelectronics	CAM-6G3-152CLR

6 Kit versions

Table 23. STEVAL-ROBKIT1 versions

PCB version	Schematic diagrams	Bill of materials
STEVAL$ROBKIT1A [1]	STEVAL$ROBKIT1A schematic diagrams	STEVAL$ROBKIT1A bill of materials

1. This code identifies the STEVAL-ROBKIT1 evaluation kit first version. The kit consists of the STEVAL-ROBKIT1-1 motherboard whose version is identified by the code STV$ROBKIT1-1A, the STEVAL-ROBKIT1-2 daughterboard whose version is identified by the code STV$ROBKIT1-2A, and the STEVAL-ROBKIT1-3 daughterboard whose version is identified by the code STV$ROBKIT1-3A.

7 Regulatory compliance information

Notice for US Federal Communication Commission (FCC)

Responsible party's contact located in the United States: name: Francesco Doddo; address: STMicroelectronics Inc, 200 Summit Drive, Suite 405, Burlington MA, 01803, U.S.A.; e-mail: francesco.doddo@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).

Notice for Innovation, Science and Economic Development Canada (ISED)

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).

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).

Notice for the European Union

The kit STEVAL-ROBKIT1 is in conformity with the essential requirements of the Directive 2014/53/EU (RED) and of the Directive 2011/65/EU (RoHS II), including subsequent revisions and additions, as well as amended by the Delegated Directive 2015/863/EU (RoHS III). Harmonized standards applied are listed in the EU Declaration of Conformity.

Exclusion from the Machinery Directive: the manufacturer STMicroelectronics srl declares that the product is "destined for use only in indoor settings, in a R&D laboratory setting (on a desk, for office experiments)"; therefore the Machinery Directive 2006/42/EC is not applicable because excluded by Article 1, point 2, letter (h): "(h) machinery specially designed and constructed for research purposes for temporary use in laboratories".

Notice for the United Kingdom

The kit STEVAL-ROBKIT1 is in compliance with the UK Radio Equipment Regulations 2017 (UK SI 2017 No. 1206 and amendments) and with the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (UK SI 2012 No. 3032 and amendments). Applied standards are listed in the UK Declaration of Conformity.

Revision history

Table 24. Document revision history

Date	Revision	Changes
16-Dec-2024	1	Initial release.

Contents

List of tables

List of figures

IMPORTANT NOTICE – READ CAREFULLY