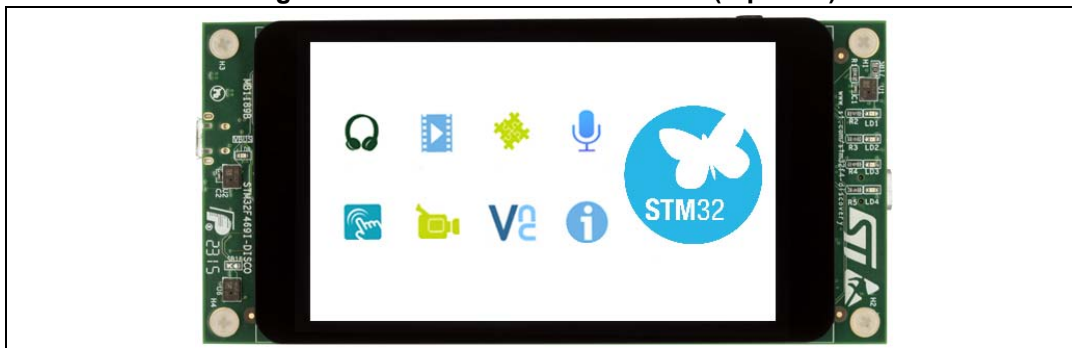


## Introduction

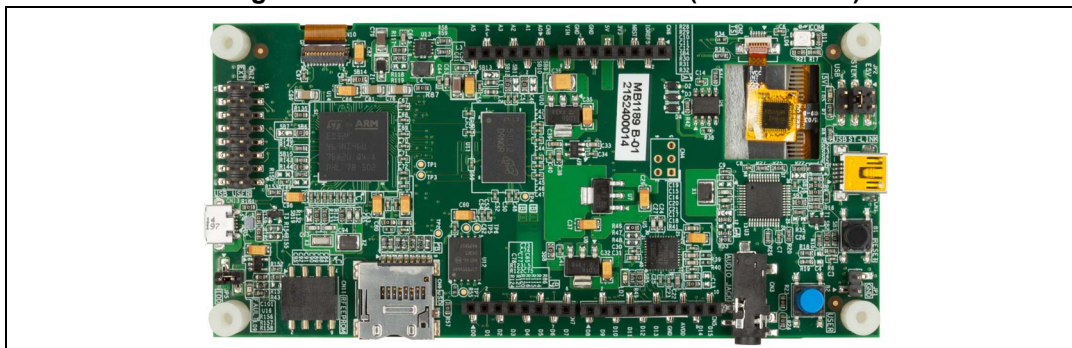
The STM32F469 Discovery kit (32F469IDISCOVERY) is a complete demonstration and development platform for the STMicroelectronics Arm® Cortex®-M4 core-based STM32F469NIH6 microcontroller with Chrom-ART Accelerator. This microcontroller features three I<sup>2</sup>C interfaces, six SPIs with two multiplexed full-duplex I<sup>2</sup>S interfaces, SDIO, four USART ports, four UART ports, two CAN buses, three 12-bit ADCs, two 12-bit DACs, one SAI, 8 to 14-bit digital camera digital module interface, internal 320+4 Kbytes of SRAM and 2-Mbyte flash memory, USB HS OTG and USB FS OTG, Ethernet MAC, FMC interface, MIPI DSI® interface, Quad-SPI interface, JTAG debugging support. This Discovery kit offers everything required for the users to get started quickly and develop applications easily.

The hardware features on the board help the users to evaluate the following peripherals: USB OTG FS, microSD™ card, audio DAC with headset jack, digital microphones, SDRAM, Quad-SPI flash memory, 4" TFT LCD using MIPI DSI® interface with capacitive touch panel. The ARDUINO® compatible connectors expand the functionality with a wide choice of specialized shields. The extension header makes it possible to easily connect a daughterboard for specific application. The integrated ST-LINK/V2-1 provides an embedded in-circuit debugger and programmer for the STM32 microcontroller.

**Figure 1. 32F469IDISCOVERY board (top view)**



**Figure 2. 32F469IDISCOVERY board (bottom view)**



Pictures are not contractual.

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# 1 Features

- STM32F469NIH6 microcontroller, based on the Arm<sup>®(a)</sup> Cortex<sup>®</sup>-M4 processor, with 2 Mbytes of flash memory and 324 Kbytes of RAM, in a BGA216 package
- 4" RGB 800×480 pixel TFT color LCD with MIPI DSI<sup>®</sup> interface and capacitive touch panel
- USB OTG FS
- SAI audio DAC
- 3 ST-MEMS digital microphones
- 128-Mbit Quad-SPI NOR flash memory
- 4 M×32bit SDRAM
- Reset and wake-up push-buttons
- 4 color user LEDs
- Board connectors:
  - microSD<sup>™</sup> card
  - USB with Micro-AB
  - Stereo headphone output jack
  - I<sup>2</sup>C expansion
  - ARDUINO<sup>®</sup> Uno V3 expansion
  - 2.54 mm pitch expansion
- Flexible power-supply options: ST-LINK USB V<sub>BUS</sub>, USB connector, or external sources
- Comprehensive free software libraries and examples available with the STM32Cube MCU Package
- On-board ST-LINK/V2-1 debugger/programmer with USB re-enumeration capability: mass storage, Virtual COM port, and debug port
- Support of a wide choice of Integrated Development Environments (IDEs) including IAR Embedded Workbench<sup>®</sup>, MDK-ARM, and STM32CubeIDE

arm

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a. Arm is a registered trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.

## 2 Ordering information

To order the 32F469IDISCOVERY Discovery kit, refer to [Table 1](#). Additional information is available from the datasheet and reference manual of the target microcontroller.

**Table 1. List of available products**

Order code	Board reference	Target STM32
STM32F469I-DISCO	MB1189	STM32F469NIH6

### 2.1 Codification

The meaning of the codification is explained in [Table 2](#).

**Table 2. Codification explanation**

STM32XXYYZ-TTTT	Description	Example: STM32F469I-DISCO
STM32XX	MCU series in STM32 32-bit Arm Cortex MCUs	STM32F4 Series
YY	MCU product line in the series	STM32F469
Z	STM32 flash memory size: – I for 2 Mbytes	2 Mbytes
TTTT	Toolkit: – DISCO: Discovery kit	Discovery kit

## 3 Development environment

### 3.1 System requirements

- Multi.OS support: Windows® 10, Linux®(a) 64-bit, or macOS® (b) (c)
- USB Type-A or USB Type-C® to Mini-B cable

### 3.2 Development toolchains

- IAR Systems® - IAR Embedded Workbench®(d)
- Keil® - MDK-ARM(d)
- STMicroelectronics - STM32CubeIDE

a. Linux® is a registered trademark of Linus Torvalds.

b. macOS® is a trademark of Apple Inc. registered in the U.S. and other countries.

c. All other trademarks are the property of their respective owners.

d. On Windows® only.

## 4 Hardware layout and configuration

The 32F469IDISCOVERY Discovery board is designed around the STM32F469NIH6 (216-pin BGA package). [Figure 3](#) illustrates the connection between the STM32F469NIH6 and the peripherals (SDRAM, Quad-SPI flash memory, color LCD, USB OTG connector, audio, I<sup>2</sup>C extension connector, microSD™ card, and embedded ST-LINK). [Figure 4: 32F469IDISCOVERY top side layout](#) and [Figure 5: 32F469IDISCOVERY bottom side layout](#) help to locate these features on the actual Discovery board.

**Figure 3. Hardware block diagram**

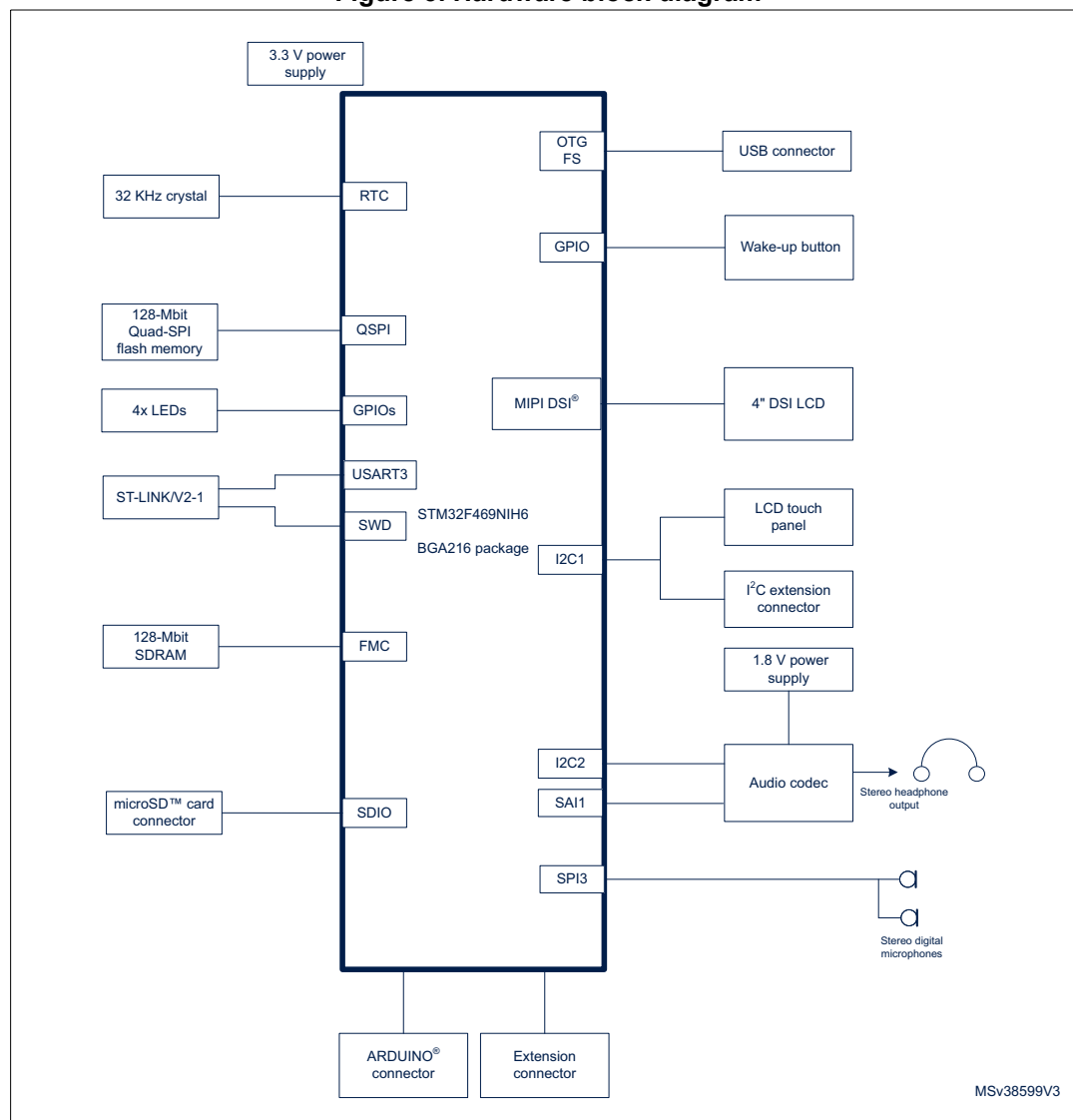




Figure 4. 32F469IDISCOVERY top side layout

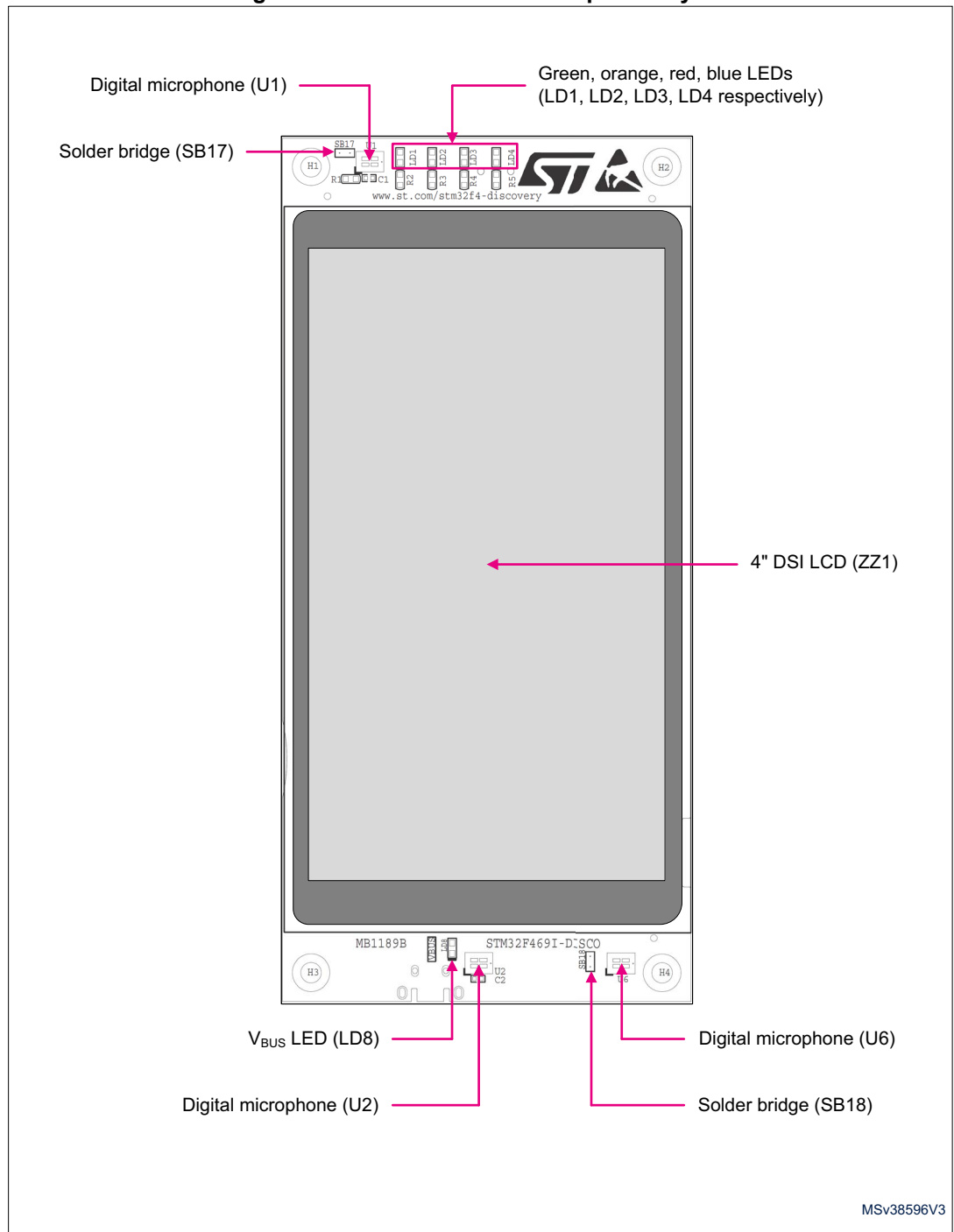
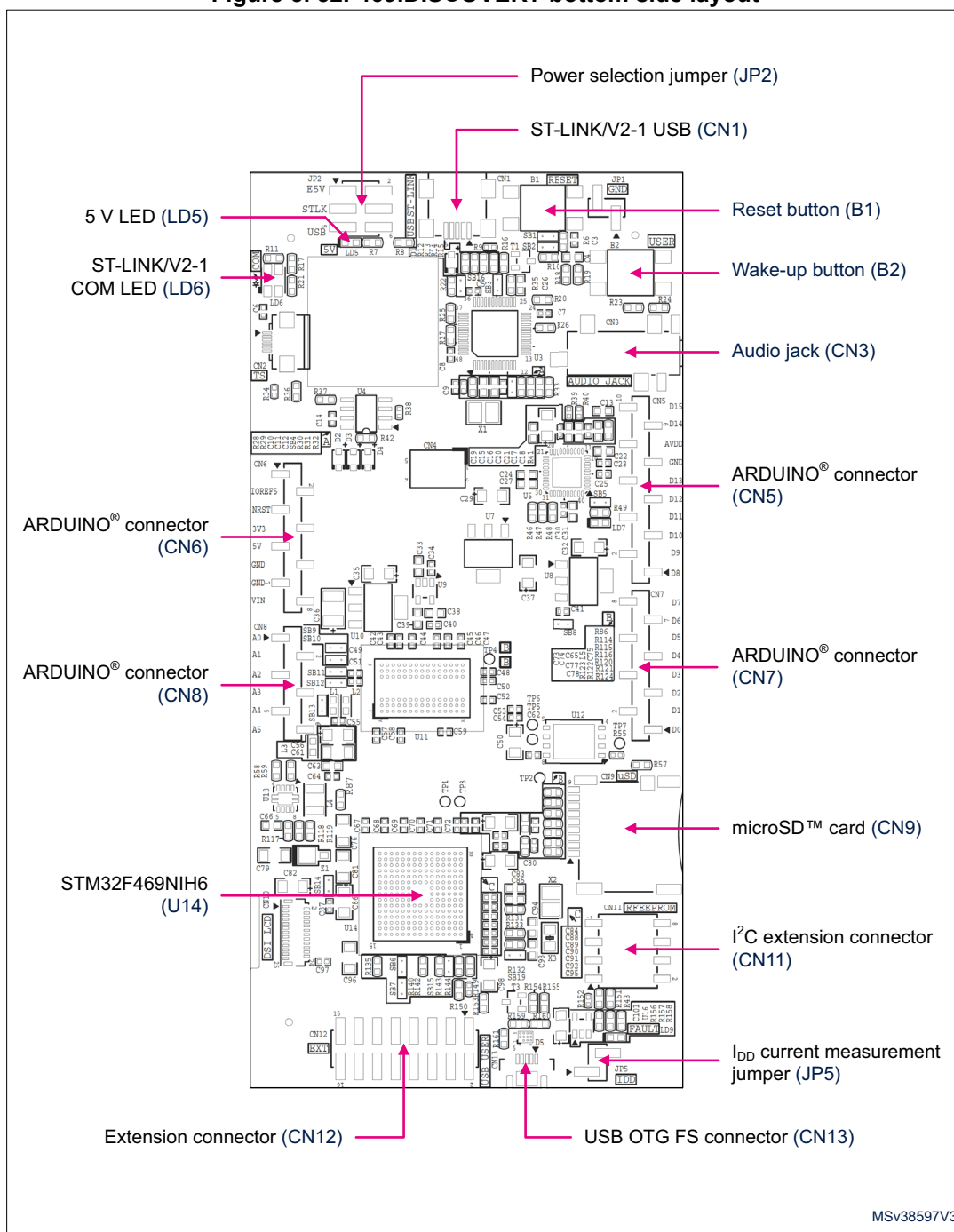


Figure 5. 32F469IDISCOVERY bottom side layout



## 4.1 Embedded ST-LINK/V2-1

The ST-LINK/V2-1 programming and debugging tool is integrated on the 32F469IDISCOVERY board. Compared to ST-LINK/V2 the additional features supported on ST-LINK/V2-1 are:

- USB software re-enumeration
- Virtual COM port interface on USB
- Mass storage interface on USB
- USB power management request for more than 100 mA power on USB

This feature is no more supported on ST-LINK/V2-1:

- SWIM interface

For all general information concerning debugging and programming features common between V2 and V2-1 please refer to ST-LINK/V2 user manual (UM1075) and technical note (TN1235).

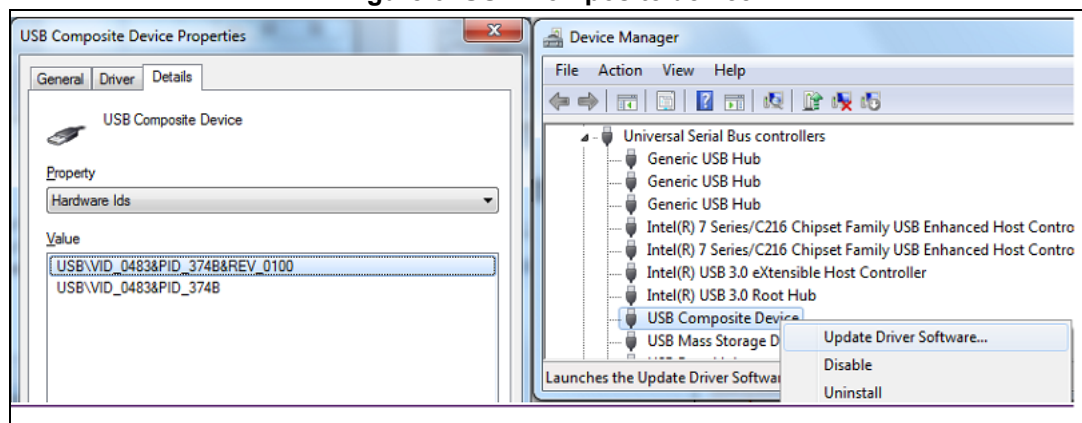
### 4.1.1 Drivers

Before connecting the 32F469IDISCOVERY board to a Windows® 7, Windows® 8 or Windows® 10 PC via USB, a driver for ST-LINK/V2-1 must be installed. It can be downloaded from the [www.st.com](http://www.st.com) webpage.

If the 32F469IDISCOVERY board is connected to the PC before installing the driver, the Windows® device manager may report some USB devices found on 32F469IDISCOVERY as “Unknown”. To recover from this situation, after installing the dedicated driver downloaded from the [www.st.com](http://www.st.com) webpage, the association of “Unknown” USB devices found on 32F469IDISCOVERY to this dedicated driver, must be updated in the device manager manually. It is recommended to proceed using the *USB Composite Device* line, as shown in [Figure 6](#).

*Note:* Prefer using the “USB Composite Device” handle for a full recovery.

**Figure 6. USB Composite device**



### 4.1.2 ST-LINK/V2-1 firmware upgrade

ST-LINK/V2-1 facility for debug and programming of the target microcontroller STM32F469NIH6 is integrated on the 32F469IDISCOVERY board. For its own operation, ST-LINK/V2-1 employs a dedicated MCU with flash memory. Its firmware determines ST-

LINK/V2-1 functionality and performance. The firmware may evolve during the life span of 32F469IDISCOVERY to include new functionality, fix bugs or support new target microcontroller families. It is therefore recommended to keep ST-LINK/V2-1 firmware up to date. The latest version is available at [www.st.com](http://www.st.com). ST-LINK/V2-1 supports a mechanism that allows programming its dedicated MCU via the USB interface on the hosting board, here 32F469IDISCOVERY. The whole process is controlled from a Windows® PC application also available at [www.st.com](http://www.st.com).

## 4.2 Power supply

### 4.2.1 Power supply sources

The 32F469IDISCOVERY board is designed to be powered by the following sources:

- 5 V DC from the ST-LINK/V2-1 USB connector CN1 with 500 mA current limitation. Power mechanism of the board supplied by the USB ST-LINK/V2-1 is explained below (*Section 4.2.2: Supplying the board through ST-LINK/V2-1 USB port*). Pins 3 and 4 of jumper JP2 must be closed by placing a jumper in location called STLK on the silkscreen of the board. Jumper JP5 must be closed. The red LED LD5 lights up to confirm the presence of +5 V voltage.
- 5 V DC from the user USB FS connector CN13. Pins 5 and 6 of jumper JP2 must be closed by placing a jumper in location called USB on the silkscreen of the board. Jumper JP5 must be closed. The red LED LD5 lights up to confirm the presence of +5 V voltage.
- 6 V to 9 V DC from VIN pin of ARDUINO® compatible connector CN6. The voltage must be limited to 9 V to keep the temperature of the regulator U10 within its thermal safe area. Pins 1 and 2 of jumper JP2 must be closed by placing a jumper in location called E5V on the silkscreen of the board. Jumper JP5 must be closed. The red LED LD5 lights up to confirm the presence of +5 V voltage.

In case VIN, +5V is used to power the board, this power source must comply with the standard EN-60950-1: 2006+A11/2009, and must be Safety Extra Low Voltage (SELV) with limited power capability.

### 4.2.2 Supplying the board through ST-LINK/V2-1 USB port

To power the 32F469IDISCOVERY board in this way, the USB host (a PC) gets connected with the 32F469IDISCOVERY board via a USB cable to the ST-LINK/V2-1 connector.

In the first step, only the ST-LINK part U3 is powered by the PC. In fact, before USB enumeration, the host PC provides only 100 mA to the board at that time. The 32F469IDISCOVERY board requests a 500 mA power to the host PC. If the host is able to provide the required power, the enumeration finishes by a “SetConfiguration” command and then, the power switch ST890 U4 is switched ON, the red LED LD5 is turned ON, thus the board can consume no more than 500 mA. If the host is not able to provide such requested current, the enumeration fails. Therefore the ST890 U4 remains OFF and the board is not powered. As a consequence, the red LED LD5 remains turned OFF. In this case, it is mandatory to use another power supply source.

To do this, it is important to power the board before connecting it with the host PC, which requires the following sequence to be respected:

1. Set the jumper in JP2 header in E5V position.
2. Connect an external power source to VIN pin 8 of ARDUINO® connector CN6.
3. Check the red LED LD5 is turned on.
4. Connect host PC to USB connector CN1.

The ST890 power switch protects the USB port of the host against current demand exceeding 600 mA, should a short-circuit occur on the board.

The 32F469IDISCOVERY board can also be supplied from a USB power source not supporting enumeration, such as a USB charger. In this particular case, the solder bridge SB16 must be closed. ST-LINK/V2-1 turns the ST890 power switch U4 ON regardless of enumeration procedure result and passes the power unconditionally to the board.

### 4.2.3 Measurement of current $I_{DD}$ drawn by the STM32F469NI

The jumper JP5 should be closed (default) to supply the STM32F469NI MCU. To measure the current  $I_{DD}$  drawn by the microcontroller STM32F469NIH6 only, remove jumper JP5 and replace it by a multimeter.

### 4.2.4 Power related jumpers

The power supply is configured by setting the related jumpers JP2, JP5 and solder bridge SB8 as described in [Table 3: Power related jumpers](#).

**Table 3. Power related jumpers**

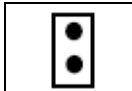
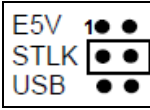



Jumper, solder bridge	Description
JP5	<p>JP5 <math>I_{DD}</math> is used to measure STM32 current consumption manually by multimeter.  <b>Default setting:</b> Closed by a jumper</p> 
SB8	<p>By default SB8 is closed to power +3V3 from regulator U7.          If the board is powered by the pin 1 of extension connector CN12 or by the pin 4 of the ARDUINO® connector CN6, it is mandatory to open SB8 to avoid reverse current injection in regulator U7.  <b>(Default setting):</b> SB8 closed</p>
JP2	<p>JP2 is used to select one of the five possible power supply sources.          To supply the board from the ST-LINK/V2-1 USB connector CN1, JP2 should be set as shown to the right:  <b>(Default Setting)</b></p> 

Table 3. Power related jumpers (continued)

Jumper, solder bridge	Description
JP2	<p>To supply the board from the User USB FS connector USB connector CN13, JP2 should be set as shown to the right:</p> 
	<p>To supply the board from the pin 8 VIN of the ARDUINO® compatible connector CN6, JP2 should be set as shown to the right:</p> 
	<p>To supply the board from pin1 of extension connector CN12 or from pin4 of the ARDUINO® compatible connector CN6, JP2 should be set as shown to the right (no jumper):</p> 

## 4.3 Clock source

### 4.3.1 HSE clock source

By default the HSE clock source of the STM32F469NIH6 is the 8 MHz crystal X2. In that case, zero-ohm R131 is soldered, solder bridge SB19 is open.

It is possible to replace the crystal X2 by the 8 MHz output MCO from the circuit ST-LINK/V2-1 U3. In that case, 100-ohm resistor R35 must be soldered, zero-ohm R131 must be removed, solder bridge SB19 must be closed. C26 is not necessary and remains not populated.

### 4.3.2 LSE clock source

The 32.768 kHz crystal X3 is the clock source for the embedded RTC.

## 4.4 Reset source

The reset signal of 32F469IDISCOVERY board is low active and the reset sources include:

- Reset button B1, providing solder bridge SB1 is closed (default setting)
- Embedded ST-LINK/V2-1, providing solder bridge SB2 is closed (default setting)
- ARDUINO® compatible connector CN6 pin 3
- Extension connector CN12 pin 4

## 4.5 Audio outputs

An audio DAC outputs the audio to a stereo headphone jack connector.

The digital audio interface SAI of STM32F469NIH6 is connected to the digital audio input SDIN of the audio DAC. The STM32F469NIH6 controls the audio DAC via the I2C2 bus. Note that the I<sup>2</sup>C speed of the audio DAC is 100 kHz max.

The PWM loudspeaker output SPKR\_OUTA of the audio DAC is available at pins 15 and 16 of the extension connector CN12. Each of the two terminals of the external loudspeaker must be connected to pins 15 and 16 of CN2 respectively. Ensure that the terminals of the loudspeaker are not connected to the ground.

The port PE3 of STM32F469NIH6 enables the jack headphone output and/or the loudspeaker SPKR\_OUT. Providing the audio DAC registers are properly set, it allows the power down of the loudspeaker and/or headphone outputs.

The I<sup>2</sup>C address of the audio DAC is 0x94.

## 4.6 Digital microphones

Three STMicroelectronics MEMS digital microphones are available on the 32F469IDISCOVERY Discovery board. Two microphones can be used simultaneously in stereo mode using the PDM mode. By default, microphones U2 and U6 are used and connected to the DFSDM of the STM32F469NI microcontroller (solder bridges SB17 opened, and SB18 closed). The PDM clock is generated at port PD13 while PDM data are received by the microcontroller at port PD6.

Instead of using the pair of microphones U2 and U6, it is possible to use the pair of microphones U2 and U1. To enable this possibility the solder bridge SB17 must be closed and SB18 opened.

Solder bridges locations are shown in [Figure 4: 32F469IDISCOVERY top side layout](#).

## 4.7 USB OTG FS

An USB OTG full speed communication is available at connector CN13.

The 32F469IDISCOVERY Discovery board can be powered by the 5 V DC of this USB OTG FS connection. When the 32F469IDISCOVERY is USB host, it supplies the USB peripheral. In this case the board must be supplied by any of the following sources: ST-LINK/V2-1 USB connector CN1 or pin VIN of ARDUINO<sup>®</sup> connector CN6. Refer to [Section 4.2: Power supply](#) for more details on each supply source.

The green LED LD8 lights up in one of these cases:

- 32F469IDISCOVERY works as a USB host and power switch U16 is switched ON.
- V<sub>BUS</sub> is powered by another USB host when 32F469IDISCOVERY works as a USB device.

Red LED LD9 lights up when over-current occurs.

## 4.8 microSD™ card

A microSD™ card with a capacity of 4 GBytes or more can be inserted in the receptacle CN9. 4 bits of the SDIO interface of the STM32F469NIH6 are used to communicate with the microSD™ card. The card detection is read by the GPIO PG2: when a microSD™ card is inserted, the logic level is 0, otherwise it is 1.

## 4.9 SDRAM

A 128-Mbit SDRAM is accessible with the FMC interface of the microcontroller STM32F469NIH6. The data bus is 32-bit wide.

The SDRAM is composed of four banks of 32 Mbits selected by the address bits A14 and A15.

Each of the four banks is organized as 4096 rows by 256 columns by 32 bits. Row and column addresses are pre-selected using the CAS and RAS signals of the FMC bus.

The SDRAM is selected by SDNE0 and can be addressed from 0xC000 0000 to 0xC0FF FFFF.

## 4.10 Quad-SPI NOR flash memory

A 128-Mbit Quad-SPI NOR flash memory is connected to Quad-SPI interface of the STM32F469NIH6 microcontroller.

## 4.11 Virtual COM port

The serial interface USART3 is directly available as a virtual COM port of the PC connected to the ST-LINK/V2-1 USB connector CN1. The virtual COM port settings are configured as: 115200 b/s, 8 bits data, no parity, 1 stop bit, no flow control.

## 4.12 ARDUINO® connectors

CN5, CN6, CN7 and CN8 are female connectors compatible with the ARDUINO® standard. Most shields designed for ARDUINO® Uno V3 can fit to the 32F469IDISCOVERY Discovery board.

**Caution:** The STM32 microcontroller I/Os are 3.3 V compatible while ARDUINO® Uno boards are 5 V compatible.

**Table 4. ARDUINO® compatible connectors**

Connector	Pin	Pin name	MCU Pin	Function
LEFT connectors				
CN6 Power	1	-	-	Not connected
	2	IOREF	-	3.3V Ref
	3	NRST	NRST	Reset
	4	+3V3	-	+3.3V input/output <sup>(1)</sup>



**Table 4. ARDUINO® compatible connectors (continued)**

Connector	Pin	Pin name	MCU Pin	Function
CN6 Power	5	+5V	-	+5V output
	6	GND	-	Ground
	7	GND	-	Ground
	8	VIN	-	+6V to +9V power input <sup>(2)</sup>
CN8 Analog	1	A0	PB1	ADC12_IN9
	2	A1	PC2	ADC12_IN12
	3	A2	PC3	ADC12_IN13
	4	A3	PC4	ADC12_IN14
	5	A4	PC5 or PB9 <sup>(3)</sup>	ADC12_IN15 or I2C1_SDA <sup>(3)</sup>
	6	A5	PA4 or PB8 <sup>(3)</sup>	ADC12_IN4 or I2C1_SCL <sup>(3)</sup>

1. Before using pin4 of CN6 as +3.3V input, the solder bridge SB8 must be removed. Otherwise the board 32F469IDISCOVERY could be damaged by the over-current.
2. The external voltage applied to pin VIN must be in the range from 6 V to 9 V at 25°C ambient temperature. If a higher voltage is applied the regulator U10 may overheat and could be damaged.
3. By default pin 5 and pin 6 of connector CN8 are PC5 and PA4 respectively. They are enabled by the default configuration of solder bridges: SB10 and SB12 closed, SB9 and SB11 opened. If necessary to have an I2C interface on pins 5 and 6 of connector CN8, change the configuration solder bridges: open SB10 and SB12, close SB9 and SB11.

**Table 5. ARDUINO® compatible connectors**

Function	MCU Pin	Pin name	Pin	Connector
RIGHT connectors				
I2C1_SCL	PB8	D15	10	CN5 Digital
I2C1_SDA	PB9	D14	9	
AVDD	-	AVDD	8	
Ground	-	GND	7	
SPI2_SCK	PD3	D13	6	
SPI2_MISO	PB14	D12	5	
TIM12_CH2, SPI2_MOSI	PB15	D11	4	
TIM12_CH1, SPI2_CS	PH6	D10	3	
TIM14_CH1	PA7	D9	2	
-	PG10	D8	1	
-	PG11	D7	8	CN7 Digital
TIM3_CH1	PA6	D6	7	
TIM5_CH3	PA2	D5	6	
-	PG12	D4	5	
TIM5_CH2	PA1	D3	4	

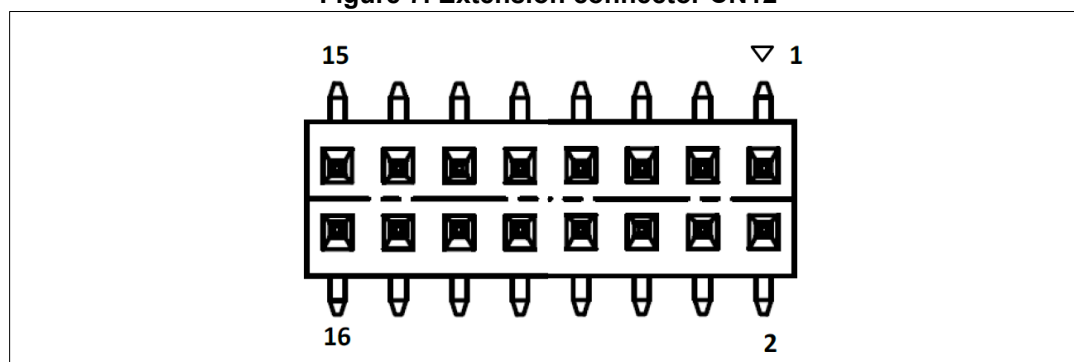
Table 5. ARDUINO® compatible connectors (continued)

Function	MCU Pin	Pin name	Pin	Connector
-	PG13	D2	3	CN7 Digital
USART6_TX	PG14	D1	2	
USART6_RX	PG9	D0	1	

### 4.13 Extension connector CN12

The extension connector CN12 is a 2.54 mm pitch header located at the bottom side of the 32F469IDISCOVERY Discovery board. It is composed of 16 square pins of 0.64 mm arranged in double row and it is compatible with usual connectors mating with 2.54 mm headers, having 0.64 mm square posts. Pins 1, 2, 15 and 16 are marked on the silkscreen of the PCB, pin 1 is signaled by a triangle as shown below:

Figure 7. Extension connector CN12



The extension connector gives access to the following communication buses and features:

- CAN2
- USART6 (TX, RX)
- I2S2
- SPI1
- 7 timer channels
- 2 ADC inputs
- A 1W monophonic loudspeaker output
- System signals: NRST, MCO1, ANTI-TAMP1
- Power supply: +3V3, GND

The STM32F469NIH6 ports and extension connector pins numbers are detailed in the following [Table 6: Extension connector pinout](#):

Table 6. Extension connector pinout

Extension connector pin	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
MCU Port	-	-	PA8	NRST	PB4	PC6	PA5	PC7	PB5	PB13	PA15	PB12	PC13	PC1	-	-
CAN2	-	-	-	-	-	-	-	-	Rx	Tx	-	Rx	-	-	-	-
USART6	-	-	-	-	-	Tx	-	Rx	-	-	-	-	-	-	-	-
I2S2	-	-	-	-	-	MCK	-	-	-	CK	-	WS	-	SD	-	-
SPI1	-	-	-	-	-	-	-	-	MOSI	-	NSS	-	-	-	-	-
TIMER	-	-	TIM1_CH1	-	MISO	TIM3/TIM8_CH1	SCK	TIM3/TIM8_CH2	TIM3_CH2	TIM1_CH1N	TIM2_CH1/2_ETR	TIM1_BKIN	-	-	-	-
ADC	-	-	-	-	-	-	ADC1/ADC2_IN5	-	-	-	-	-	-	ADC123_IN11	-	-
SYSTEM	+3V3	GND	MCO1	NRST	-	-	-	-	-	-	-	-	ANTI TAMP1	-	Speaker OUTAN	Speaker OUTAP

## 4.14 DSI LCD

The LCD module is a 4-inch 800x480 TFT color LCD with capacitive touch panel. The LCD is connected to the MIPI DSI<sup>®</sup> interface of the microcontroller STM32F469NIH6 via the connector CN10. The DSI (Display Serial Interface) is a specification of the MIPI Alliance standard and defines the physical interface and the protocol used by the STM32F469NIH6 microcontroller to communicate with such LCD module.

The following ports of the microcontroller STM32F469NIH6 are dedicated to the DSI interface: DSI\_D0\_N, DSI\_D0\_P, DSI\_CK\_N, DSI\_CK\_P, DSI\_D1\_N, DSI\_D1\_P.

In addition to the DSI dedicated ports, the port PH7 of the microcontroller is used to reset both the DSI LCD module and the capacitive touchscreen controller.

The port PJ2, connected to the LCD signal TE (Tearing Effect) is an input of the microcontroller to synchronize the write access from the microcontroller with the LCD scan refresh, to avoid visible artefacts on the display.

LEDK and LEDA signals of the LCD module are the cathode and anode of the backlight LEDs.

This backlight requires a power supply voltage of typically 25 V generated from the +5 V by a switching mode boost converter.

By controlling the EN pin of the converter by a low-frequency PWM signal, it is possible to switch on/off or to dim the backlight intensity of the LCD module. The control of EN can be done by software or by hardware:

- By default, the EN pin of the converter is controlled by the microcontroller software through DSI commands and CABC signal generated by the LCD module. For such default configuration the resistor R117 is soldered, R119 is not soldered.
- The 32F469IDISCOVERY Discovery board offers the option to control the EN pin by HW through port PA3. In such case, R117 must be removed and R119 soldered.

**Table 7. DSI LCD module connector (CN10)**

CN10 pin	Signal name	Description	MCU pins involved
1	ID	Not connect	-
2	GND	Ground	-
3	CABC	Content Adaptive Brightness Control	-
4	GND	Ground	-
5	RESX	Reset, active low	PH7
6	IOVCC	Digital supply voltage	+3V3
7	GND	Ground	-
8	HSSI_D0_N	MIPI-DSI data lane 0 negative-end I/O	DSI_D0_N
9	NC	Not connect	-
10	HSSI_D0_P	MIPI-DSI data lane 0 positive-end I/O	DSI_D0_P
11	GND	Ground	-
12	HSSI_CLK_N	MIPI-DSI clock lane negative-end input	DSI_CK_N
13	NC	Not connect	-

**Table 7. DSI LCD module connector (CN10) (continued)**

CN10 pin	Signal name	Description	MCU pins involved
14	HSSI_CLK_P	MIPI-DSI clock lane positive-end input	DSI_CLK_P
15	GND	Ground	-
16	HSSI_D1_N	MIPI-DSI data lane 1 negative-end input	DSI_D1_N
17	NC	Not connect	-
18	HSSI_D1_P	MIPI-DSI data lane 1 positive-end input	DSI_D1_P
19	GND	Ground	-
20	NC/ERR	Not connect	-
21	VCC	Analog circuitry power supply	+3V3
22	TE	Tearing effect output pin to synchronize MCU to frame writing	PJ2
23	LEDK	Backlight LED Cathode	-
24	LEDA	Backlight LED Anode	-
25	GND	Ground	-

## 4.15 Buttons and LEDs

The black button B1 located bottom side is the reset of the microcontroller STM32F469NIH6. Refer to the [Figure 5: 32F469DISCOVERY bottom side layout](#).

The blue button B2 located bottom side is available to be used as a digital input or as alternate function Wake-up. When the button is depressed the logic state is 1, otherwise the logic state is 0.

Four LEDs located top side are available for the user. Refer to the [Figure 4: 32F469DISCOVERY top side layout](#). The LEDs are LD1, LD2, LD3, LD4 from left to right with colors green, orange, red, blue respectively. To light a LED a low logic state 0 should be written in the corresponding GPIO. [Table 8](#) gives the assignment of control ports to the LED indicators.

**Table 8. Port assignment for control of LED indicators**

LED	Controlled by MCU port	Color
LD1	PG6	Green
LD2	PD4	Orange
LD3	PD5	Red
LD4	PK3	Blue

## 4.16 I<sup>2</sup>C extension connector CN11

Figure 8. I<sup>2</sup>C extension connector (front view)

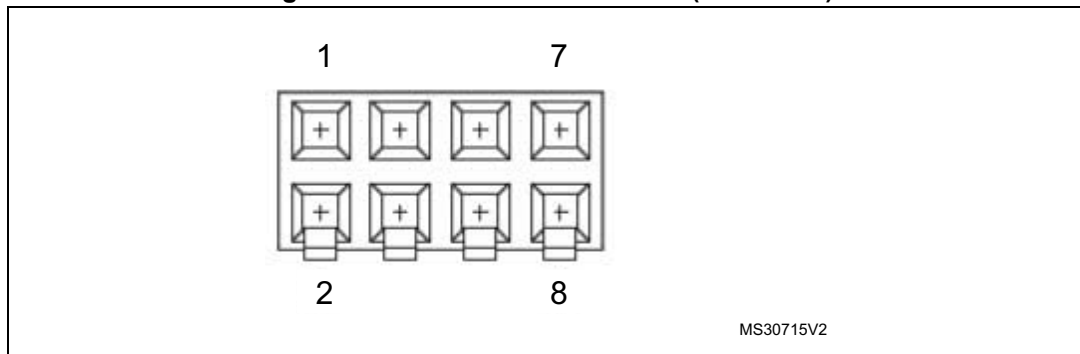


Table 9. I<sup>2</sup>C extension connector pinout

Pin number	Description	Pin number	Description
1	I2C1_SDA (PB9)	5	+3V3
2	NC	6	NC
3	I2C1_SCL (PB8)	7	GND
4	EXT_RESET(PB0)	8	NC

## 4.17 USB OTG FS Micro-AB connector CN13

Figure 9. USB OTG FS Micro-AB connector CN13 (front view)

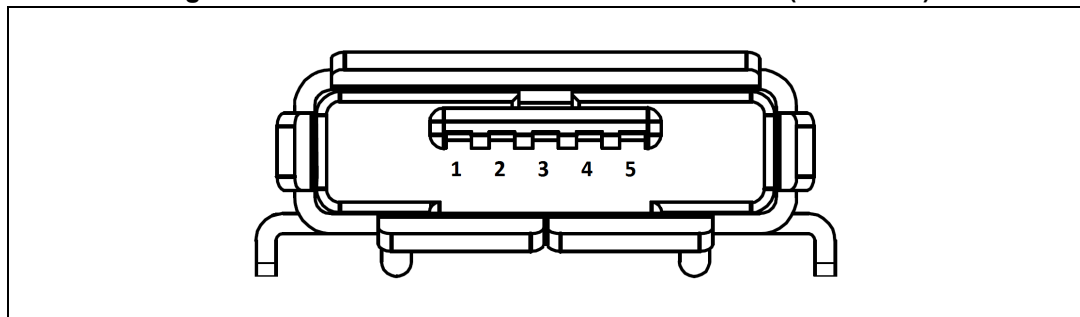


Table 10. USB OTG FS Micro-AB connector CN13

Pin number	Description	Pin number	Description
1	VBUS (PA9)	4	ID (PA10)
2	DM (PA11)	5	GND
3	DP (PA12)	-	-

## 4.18 microSD™ connector CN9

Figure 10. microSD™ connector CN9 (front view)

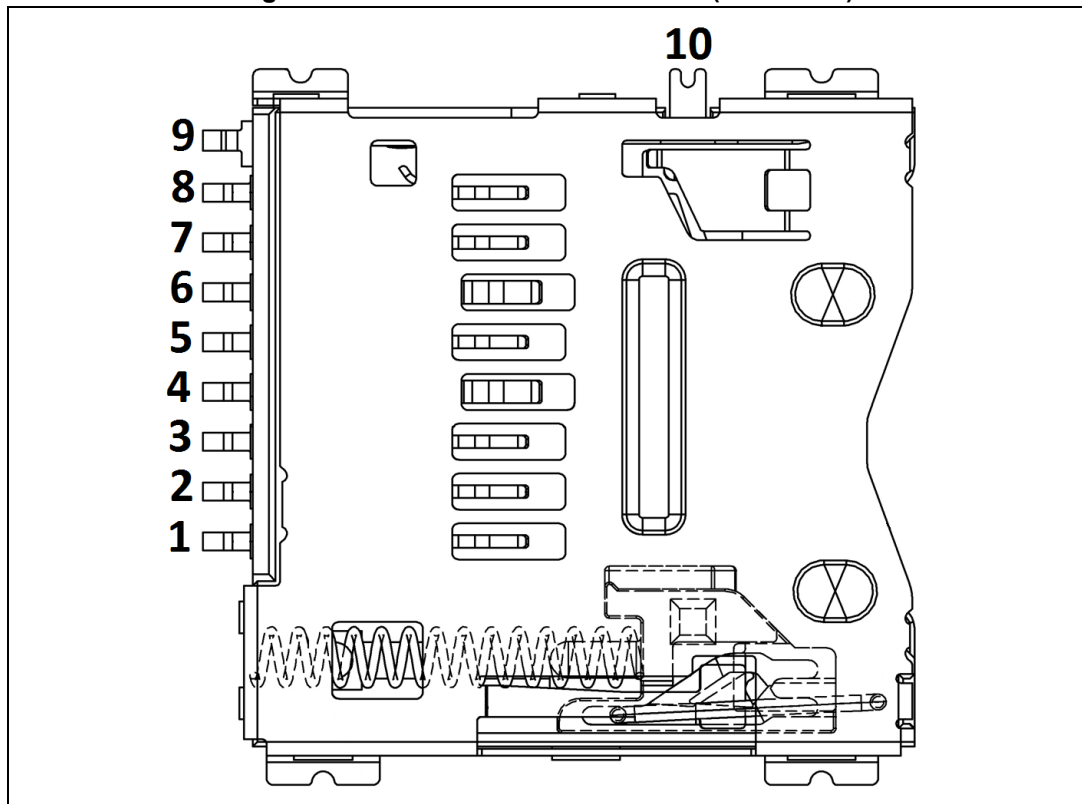


Table 11. microSD™ connector CN9

Pin number	Description	Pin number	Description
1	SDIO_D2 (PC10)	6	GND
2	SDIO_D3 (PC11)	7	SDIO_D0 (PC8)
3	SDIO_CMD (PD2)	8	SDIO_D1 (PC9)
4	+3.3V	9	GND
5	SDIO_CLK (PC12)	10	MicroSDcard_detect (PG2)

4.19 ST-LINK/V2-1 USB Mini-B connector CN1

The USB connector CN1 is used to connect the embedded ST-LINK/V2-1 to the PC.

Figure 11. USB Mini-B connector CN1 (front view)

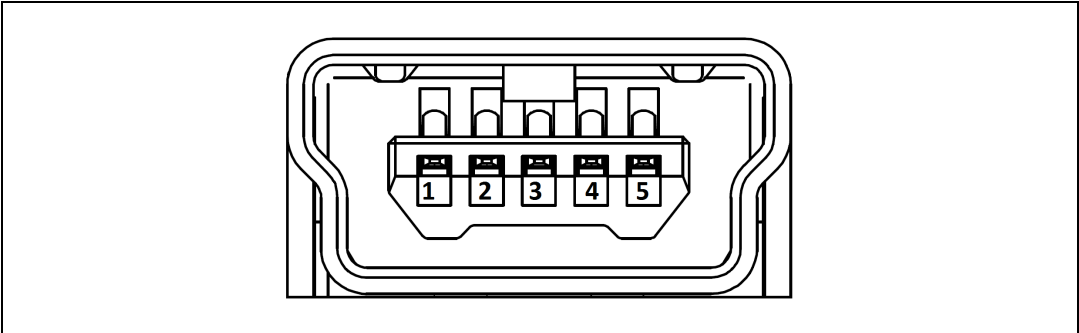


Table 12. USB Mini-B connector CN1

Pin number	Description	Pin number	Description
1	VBUS (power)	4	GND
2	DM	5,6	Shield
3	DP	-	-

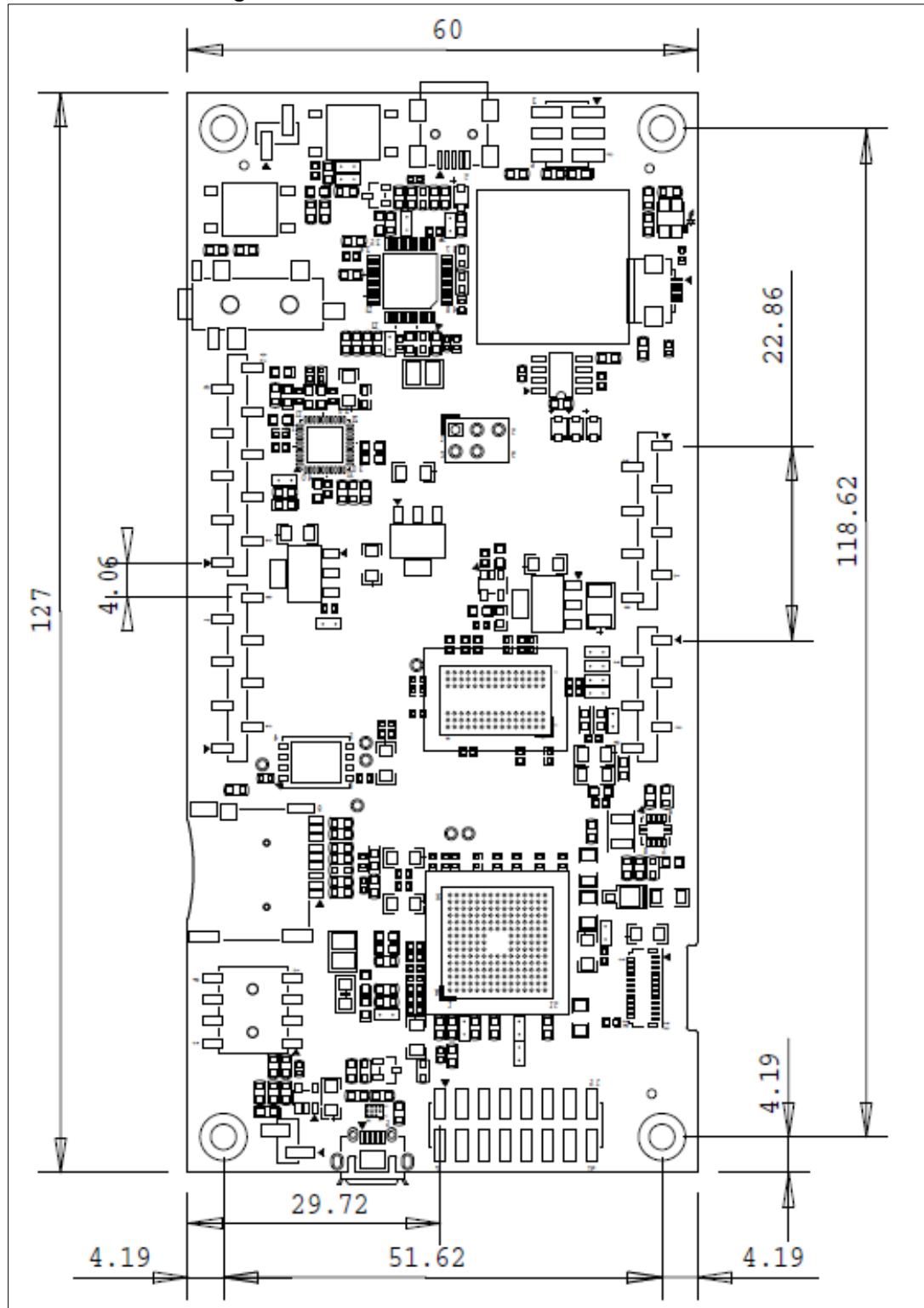
4.20 Audio jack CN3

A 3.5 mm stereo audio jack CN3 is available on 32F469IDISCOVERY discovery board to connect a headphone.



## 5 Mechanical dimensions

Figure 12. Mechanical dimensions in millimeter



## 6 32F469IDISCOVERY Discovery kit information

### 6.1 Product marking

The stickers located on the top or bottom side of the PCB provide product information:

- Product order code and product identification for the first sticker
- Board reference with revision, and serial number for the second sticker

On the first sticker, the first line provides the product order code, and the second line the product identification.

On the second sticker, the first line has the following format: "MBxxxx-Variant-yyz", where "MBxxxx" is the board reference, "Variant" (optional) identifies the mounting variant when several exist, "y" is the PCB revision and "zz" is the assembly revision, for example B01. The second line shows the board serial number used for traceability.

Evaluation tools marked as "ES" or "E" are not yet qualified and therefore they are not ready to be used as reference design or in production. Any consequences deriving from such usage will not be at ST charge. In no event, ST will be liable for any customer usage of these engineering sample tools as reference design or in production.

"E" or "ES" marking examples of location:

- On the targeted STM32 that is soldered on the board (for an illustration of STM32 marking, refer to the STM32 datasheet "Package information" paragraph at the [www.st.com](http://www.st.com) website).
- Next to the evaluation tool ordering part number that is stuck or silk-screen printed on the board.

Some boards feature a specific STM32 device version, which allows the operation of any bundled commercial stack/library available. This STM32 device shows a "U" marking option at the end of the standard part number and is not available for sales.

To use the same commercial stack in their applications, the developers may need to purchase a part number specific to this stack/library. The price of those part numbers includes the stack/library royalties.

### 6.2 32F469IDISCOVERY product history

#### 6.2.1 Product identification 32F469IDISCO/

This product identification is based on the mother board MB1189-F469NIH6-B07.

It embeds the STM32F469NIH6 microcontroller with silicon revision code "A" or "1". The limitations of this silicon revision are detailed in the errata sheet *STM32F469xx and STM32F479xx device errata* (ES0321).

#### 6.2.2 Product identification DK32F469I\$AU1

This product identification is based on the mother board MB1189-F469NIH6-B08.

It embeds the STM32F469NIH6 microcontroller with silicon revision code "A" or "1". The limitations of this silicon revision are detailed in the errata sheet *STM32F469xx and STM32F479xx device errata* (ES0321).

### 6.2.3 Product identification DK32F469I\$AU2

This product identification is based on the mother board MB1189-F469NIH6-C01.

It embeds the STM32F469NIH6 microcontroller with silicon revision code "A" or "1". The limitations of this silicon revision are detailed in the errata sheet *STM32F469xx and STM32F479xx device errata* (ES0321).

## 6.3 Board revision history

### 6.3.1 Board MB1189 revision B-07

The revision B-07 of the MB1189 board is the initial release.

### 6.3.2 Board MB1189 revision B-08

The revision B-08 of the MB1189 board corresponds to:

- Touch panel (ZZ1) replaced with impact on firmware
- Several part references updated due to obsolescence (such as memory or others, see bill of materials for details)

### 6.3.3 Board MB1189 revision C-01

The revision C-01 of the MB1189 board corresponds to the Altium Designer<sup>®(a)</sup> project files.

## 6.4 Board known limitations

### 6.4.1 Board MB1189 revision B-07 limitations

No limitation identified for this board revision.

### 6.4.2 Board MB1189 revision B-08 limitations

No limitation identified for this board revision.

### 6.4.3 Board MB1189 revision C-01 limitations

No demonstration software is provided from this revision.

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a. Altium Designer is a registered trademark of Altium LLC or its affiliated companies.

## 7 Federal Communications Commission (FCC) and Industry Canada (IC) Compliance

### 7.1 FCC Compliance Statement

#### 7.1.1 Part 15.19

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.

#### 7.1.2 Part 15.21

Any changes or modifications to this equipment not expressly approved by STMicroelectronics may cause harmful interference and void the user's authority to operate this equipment.

#### 7.1.3 Part 15.105

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 the 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.

*Note: Use only shielded cables.*

#### Responsible party (in the USA)

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### 7.2 IC Compliance Statement

Industry Canada ICES-003 Compliance Label: *CAN ICES-3 (B)/NMB-3(B)*

## 8 CE conformity

### 8.1 Warning

#### **EN 55032 / CISPR32 (2012) Class B product**

Warning: this device is compliant with Class B of EN55032 / CISPR32. In a residential environment, this equipment may cause radio interference.

Avertissement : cet équipement est conforme à la Classe B de la EN55032 / CISPR 32. Dans un environnement résidentiel, cet équipement peut créer des interférences radio.

## Revision history

**Table 13. Document revision history**

Date	Revision	Revision Details
19-Sep-2015	1	Initial release.
20-Oct-2015	2	Updated <a href="#">Figure 3: Hardware block diagram</a> . Added <a href="#">Section Appendix B: Federal Communications Commission (FCC) and Industry Canada (IC) Compliance</a> and <a href="#">Section 2: Ordering information</a> .
21-Apr-2020	3	Removed <a href="#">Technology partners</a> and <a href="#">Schematics</a> . Added <a href="#">Appendix C: CE conformity</a> and updated <a href="#">Appendix B: Federal Communications Commission (FCC) and Industry Canada (IC) Compliance</a> . Updated <a href="#">Section 4.5: Audio outputs</a> , <a href="#">Section 4.6: Digital microphones</a> , <a href="#">Section 4.9: SDRAM</a> , and <a href="#">Section 4.10: Quad-SPI NOR flash memory</a> . Revised the beginning of the document: – Updated <a href="#">Section 1: Features</a> , <a href="#">Section 2: Ordering information</a> , <a href="#">Section 3.2: Development toolchains</a> , and <a href="#">Section 3.3: Demonstration software</a> – Added <a href="#">Section 2.1: Product marking</a> and <a href="#">Section 2.2: Codification</a>
31-Mar-2022	4	Added chapter <a href="#">Chapter 6: 32F469IDISCOVERY Discovery kit information</a> and reorganized the following chapters. Removed <a href="#">Demonstration software</a> . Updated <a href="#">Introduction</a> , <a href="#">Chapter 1: Features</a> , <a href="#">Section 2.1: Codification</a> , <a href="#">Section 3.1: System requirements</a> , and <a href="#">Section 3.2: Development toolchains</a> . Updated <a href="#">Figure 3: Hardware block diagram</a> , <a href="#">Figure 4: 32F469IDISCOVERY top side layout</a> , <a href="#">Figure 5: 32F469IDISCOVERY bottom side layout</a> , and <a href="#">Section 4.14: DSI LCD</a> . Removed the references to Arm® Mbed™.

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