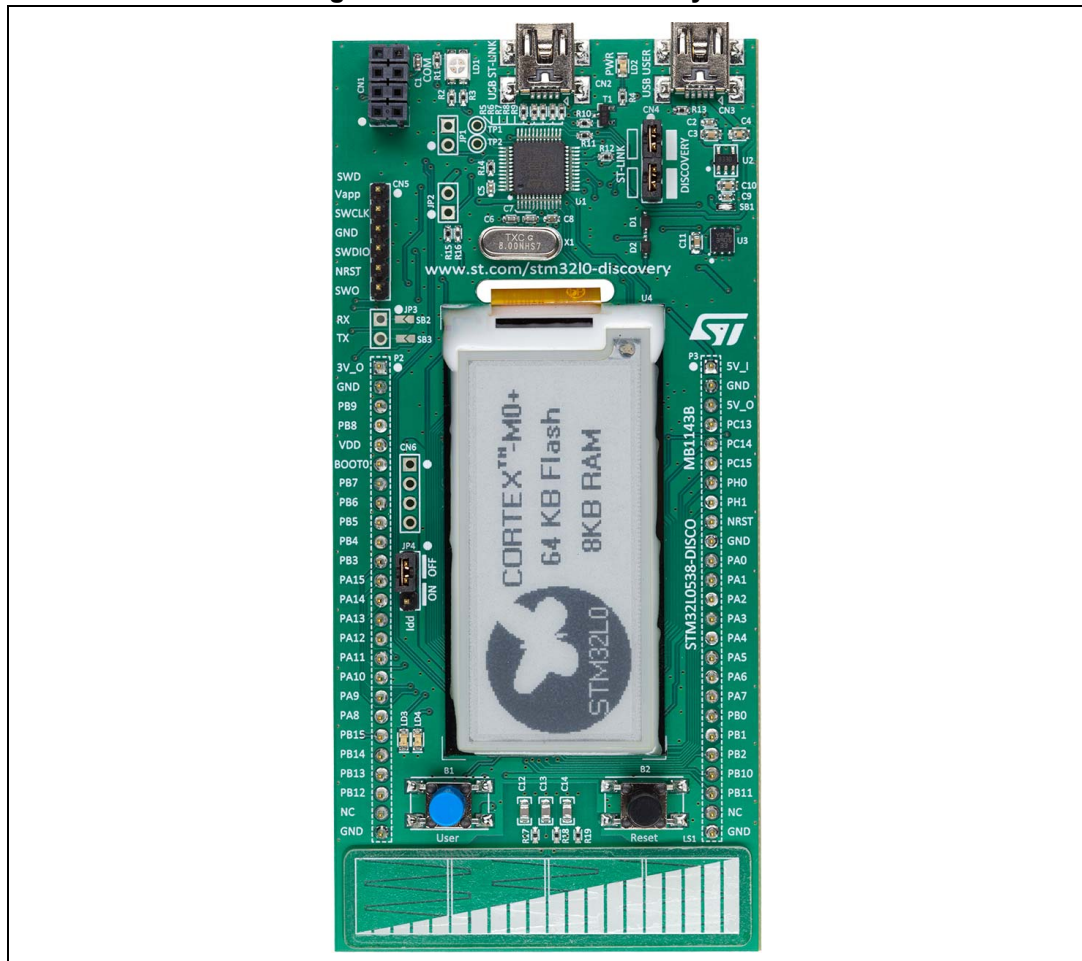


Introduction

The STM32L053 Discovery kit (32L0358DISCOVERY) helps the user to discover the full feature range of the STM32L0 Series and develop applications. It is based on the STM32L053C8T6 microcontroller and includes an embedded ST-LINK/V2-1 debugger/programmer, linear touch sensor, touchkeys, I_{DD} current measurement, 2.13" E-paper display, NFC connector for the PLUG-CR95HF-B board, LEDs, push-buttons and a USB Mini-B connector.

The STM32L053 Discovery kit comes with a comprehensive STM32 software HAL library with various packaged software examples available in the STM32CubeL0 MCU Package.

Figure 1. STM32L053 Discovery board



Picture is not contractual.

Contents

- 1 Features 6**
- 2 Ordering information 7**
 - 2.1 Codification 7
- 3 Development environment 8**
 - 3.1 System requirements 8
 - 3.2 Development toolchains 8
- 4 Conventions 8**
- 5 Quick start 9**
 - 5.1 Getting started 9
- 6 Hardware layout 10**
 - 6.1 Embedded ST-LINK/V2-1 13
 - 6.1.1 Drivers 13
 - 6.1.2 ST-LINK/V2-1 firmware upgrade 14
 - 6.1.3 VCP configuration 14
 - 6.1.4 Using ST-LINK/V2-1 to program/debug the STM32L053C8T6 on board .
15
 - 6.1.5 Using ST-LINK/V2-1 to program/debug an external
STM32 application 16
 - 6.2 Power supply and power selection 17
 - 6.2.1 Power supply input from the USB connector 18
 - 6.2.2 External power supply inputs: 5V_IN or USB USER CN3 19
 - 6.3 LEDs 19
 - 6.4 Pushbuttons 19
 - 6.5 NFC connector for PLUG-CR95HF-B board 20
 - 6.6 Electronic paper display (EPD) 21
 - 6.7 JP4 (I_{DD}) 21
 - 6.8 BOOT0 configuration 22
 - 6.9 Linear touch sensor / touchkeys 22
 - 6.10 USB device support 23

6.11	USART configuration	23
6.12	OSC clock supply	23
6.13	OSC 32 KHz clock supply	24
6.14	Solder bridges	25
6.15	Extension connectors	26
7	Mechanical drawing	32
8	32L0358DISCOVERY Discovery kit information	33
8.1	Product marking	33
8.2	32L0358DISCOVERY product history	34
8.2.1	Product identification 32L0538DISCO/	34
8.2.2	Product identification DK32L0538\$AU1	34
8.3	Board revision history	34
8.3.1	MB1143 revision B-01	34
8.3.2	MB1143 revision B-03	34
8.4	Board known limitations	34
8.4.1	MB1143 revision B-01	34
8.4.2	MB1143 revision B-03	34
9	Federal Communications Commission (FCC) and ISED Canada Compliance Statements	35
9.1	FCC Compliance Statement	35
9.1.1	Part 15.19	35
9.1.2	Part 15.21	35
9.1.3	Part 15.105	35
9.2	ISED Compliance Statement	36
10	CE conformity	37
	Revision history	38

List of tables

Table 1.	Ordering information	7
Table 2.	Codification explanation	7
Table 3.	ON/OFF conventions	8
Table 4.	Jumper states	13
Table 5.	Debug connector CN5 (SWD)	16
Table 6.	NFC connector pinout	21
Table 7.	Solder bridges	25
Table 8.	Extension connectors	26
Table 9.	Document revision history	38

List of figures

Figure 1.	STM32L053 Discovery board	1
Figure 2.	STM32L053 Discovery board hardware block diagram	10
Figure 3.	Top layout	11
Figure 4.	Bottom layout	12
Figure 5.	Updating the list of drivers in device manager	13
Figure 6.	STM32L053 Discovery board connections	15
Figure 7.	ST-LINK/V2-1 connections	17
Figure 8.	NFC board plugged on the STM32L053 Discovery board	20
Figure 9.	Jumper JP4 in position OFF	21
Figure 10.	Jumper JP4 in position ON (default)	22
Figure 11.	No Jumper on JP4	22
Figure 12.	STM32L053 Discovery board mechanical drawing.	32

1 Features

The STM32L053 Discovery kit offers the following features:

- STM32L053C8T6 microcontroller, based on the Arm^{®(a)} Cortex[®]-M0+ processor, with 64 Kbytes of flash memory and 8 Kbytes of RAM, in an LQFP48 package
- 2.13" E-paper display, 122×250 pixels
- USB 2.0 FS
- One linear touch sensor or four touchkeys
- Reset and user push-buttons
- Four LEDs:
 - LD1 (red/green) for USB communication
 - LD2 (red) for 3.3 V power on
 - Two user LEDs: LD3 (green), LD4 (red)
- I_{DD} current measurement
- Board connectors:
 - USB Mini-B connector
 - NFC expansion connector for the PLUG-CR95HF-B daughterboard
 - 2.54 mm pitch expansion header for direct access to various features of the STM32L053C8T6 microcontroller and easy probing of the LQFP48 I/Os
- Flexible power-supply options: ST-LINK USB V_{BUS}, USB connector, or external sources
- External application power supply: 3 V and 5 V
- Comprehensive free software libraries and examples available with the STM32CubeL0 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[®], MDK-ARM, and STM32CubeIDE

arm

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

2 Ordering information

To order the 32L0358DISCOVERY Discovery kit, refer to [Table 1](#). Additional information is available from the datasheet and reference manual of the target microcontroller.

Table 1. Ordering information

Order code	Board reference	Target STM32
STM32L0538-DISCO	MB1143	STM32L053C8T6

2.1 Codification

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

Table 2. Codification explanation

STM32L0XXY-DISCO	Description	Example: STM32L0538-DISCO
STM32L0	MCU series in STM32 32-bit Arm Cortex MCUs	STM32L0 Series
XX	MCU product line in the series	STM32L0x3 includes the STM32L053xx MCUs
Y	STM32 flash memory size: – 8 for 64 Kbytes	64 Kbytes
DISCO	Discovery kit	Discovery kit

3 Development environment

3.1 System requirements

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

3.2 Development toolchains

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

4 Conventions

[Table 3](#) provides the definition of some conventions used in the present document.

Table 3. ON/OFF conventions

Convention	Definition
Jumper JPx ON	Jumper fitted
Jumper JPx OFF	Jumper not fitted
Solder bridge SBx ON	SBx connections closed by solder
Solder bridge SBx OFF	SBx connections left open

-
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 - b. macOS® is a trademark of Apple Inc. registered in the U.S. and other countries. All other trademarks are the property of their respective owners.
 - c. On Windows® only.
 - d. Free MDK-ARM for Arm® Cortex®-M0/M0+ cores.
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5 Quick start

The STM32L053 Discovery kit is a low-cost and easy-to-use development kit to quickly evaluate and start a development with the STM32L053C8T6 ultra-low-power microcontroller in the STM32L0 Series.

Before installing and using the product, accept the Evaluation Product License Agreement from the www.st.com/stm32l0-discovery webpage.

For more information on the STM32L053 Discovery kit, visit the www.st.com/stm32l0-discovery webpage.

5.1 Getting started

Refer to the sequence of operations described on the product packaging.

6 Hardware layout

The STM32L053 Discovery board is designed around the STM32L053C8T6 microcontroller in a 48-pin LQFP package.

Figure 2 illustrates the connections between the STM32L053C8T6 and its peripherals (ST-LINK/V2-1, linear touch sensor, touchkeys, I_{DD} current measurement, 2.13" E-paper display, NFC connector for PLUG-CR95HF-B board, LEDs, push-buttons and an USB Mini-B connector).

Figure 3 and *Figure 4* help users to locate these features on the STM32L053 Discovery board.

Figure 2. STM32L053 Discovery board hardware block diagram

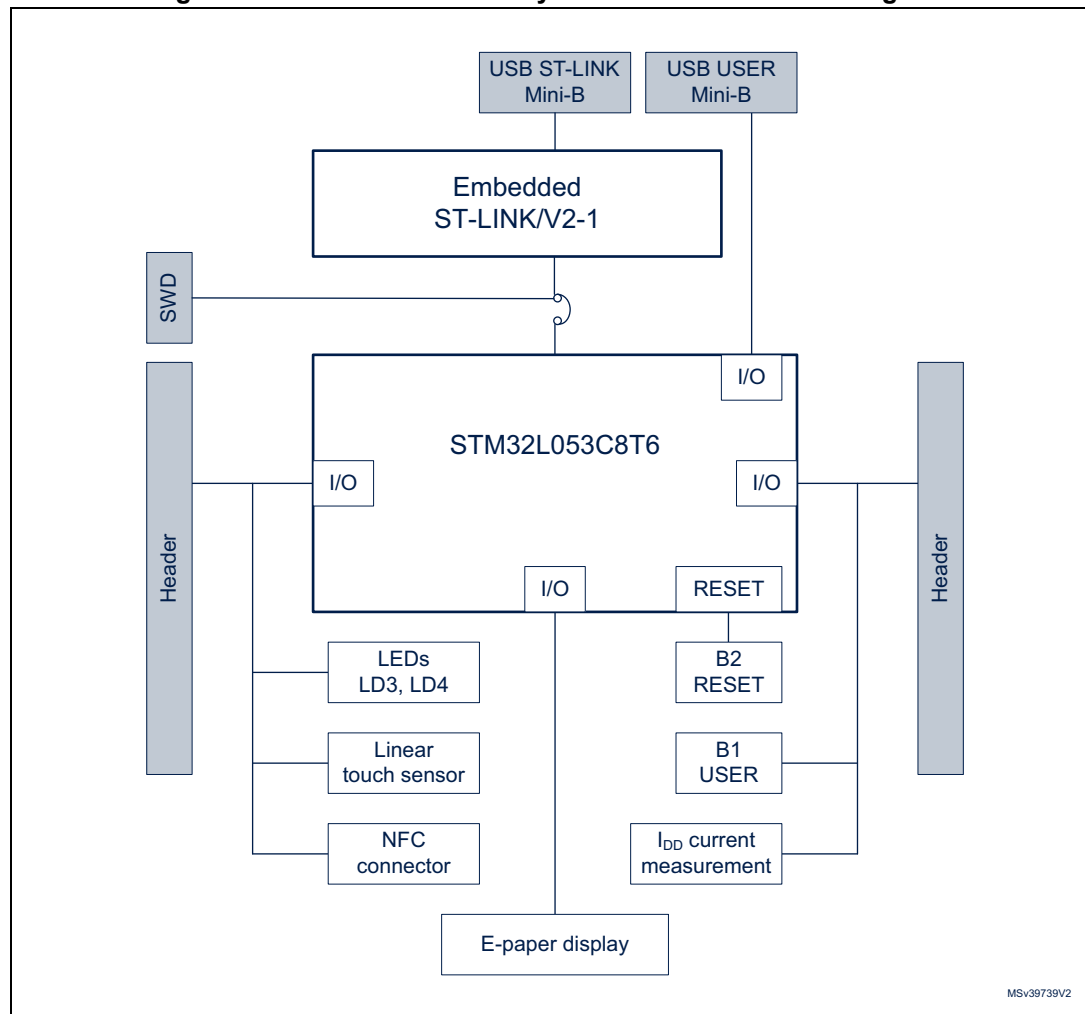


Figure 3. Top layout

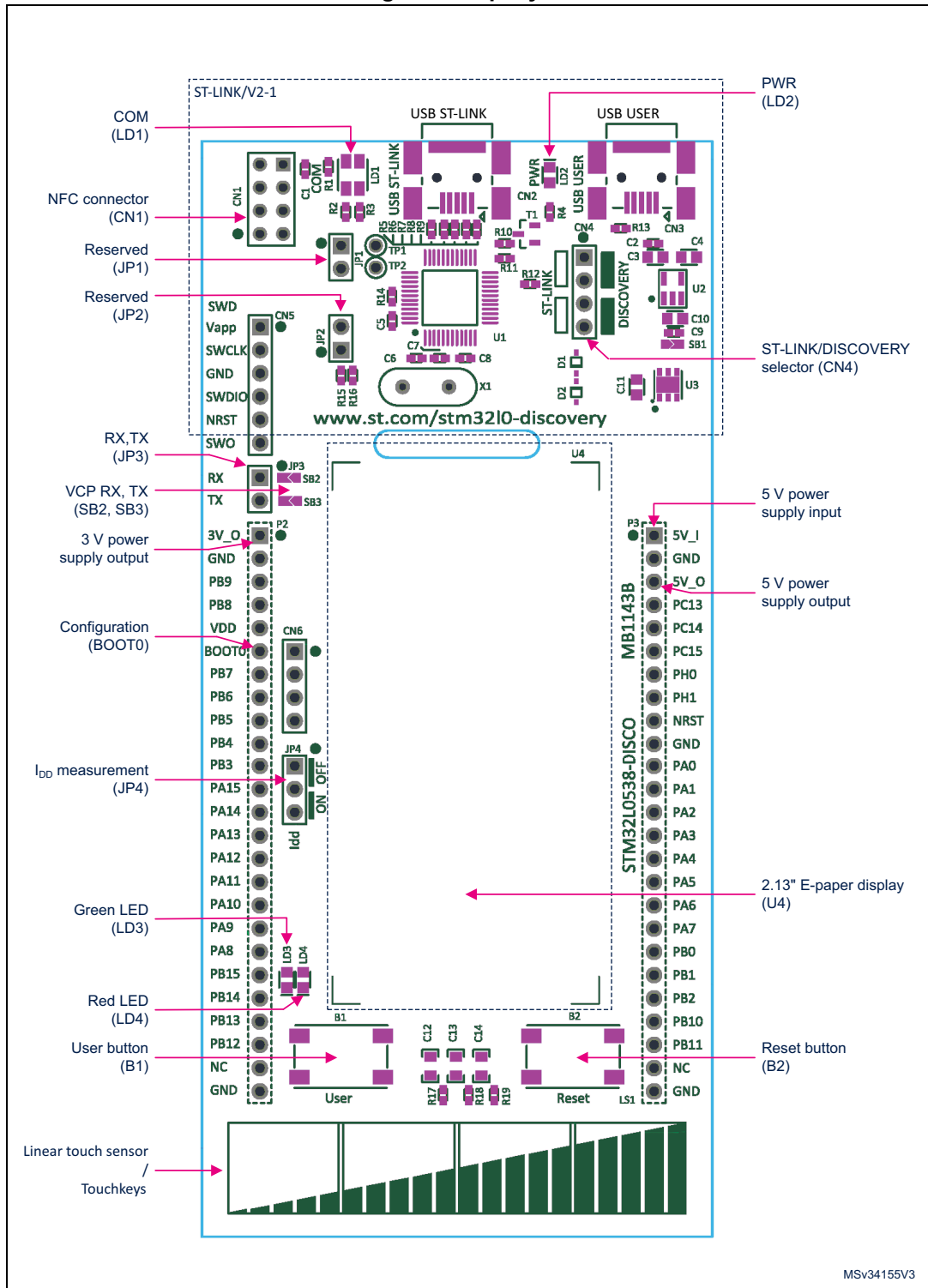
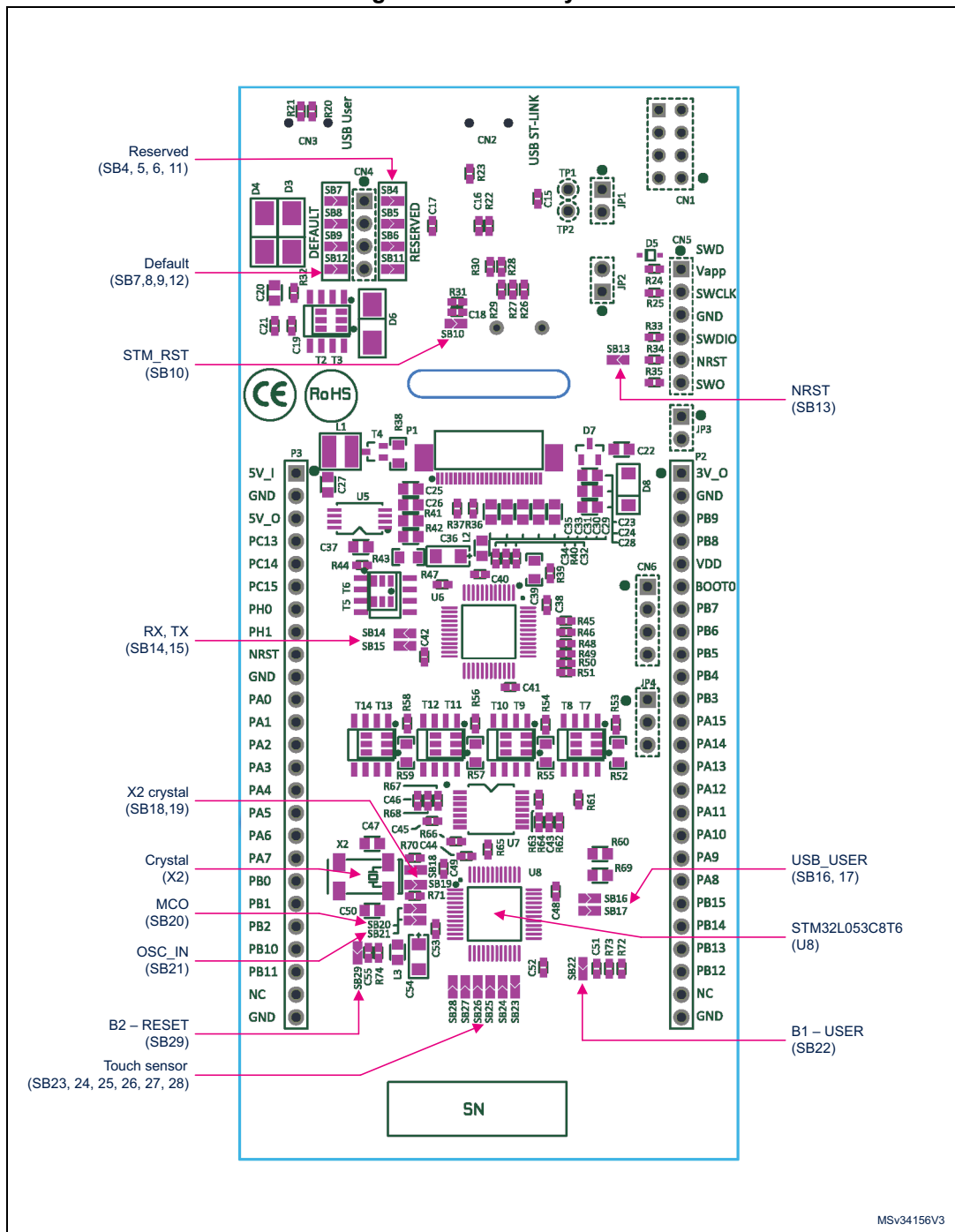


Figure 4. Bottom layout



6.1 Embedded ST-LINK/V2-1

The ST-LINK/V2-1 programming and debugging tool is integrated on the STM32L053 Discovery board.

The embedded ST-LINK/V2-1 supports only SWD for STM32 devices.

For information about the debugging and programming features, refer to the *ST-LINK/V2 in-circuit debugger/programmer for STM8 and STM32* user manual (UM1075). For a comparison of the various ST-LINK solutions, refer to the *Overview of ST-LINK derivatives* technical note (TN1235).

There are two different ways to use the embedded ST-LINK/V2-1 depending on the jumper states (see [Table 4](#)):

- program/debug the MCU on board ([Section 6.1.4](#)).
- program/debug an MCU in an external application board using a cable connected to SWD connector CN5 ([Section 6.1.5](#)).

Table 4. Jumper states

Jumper state	Description
Both CN4 jumpers ON	ST-LINK/V2-1 functions enabled for on board programming (default)
Both CN4 jumpers OFF	ST-LINK/V2-1 functions enabled for application through external CN5 connector (SWD supported)

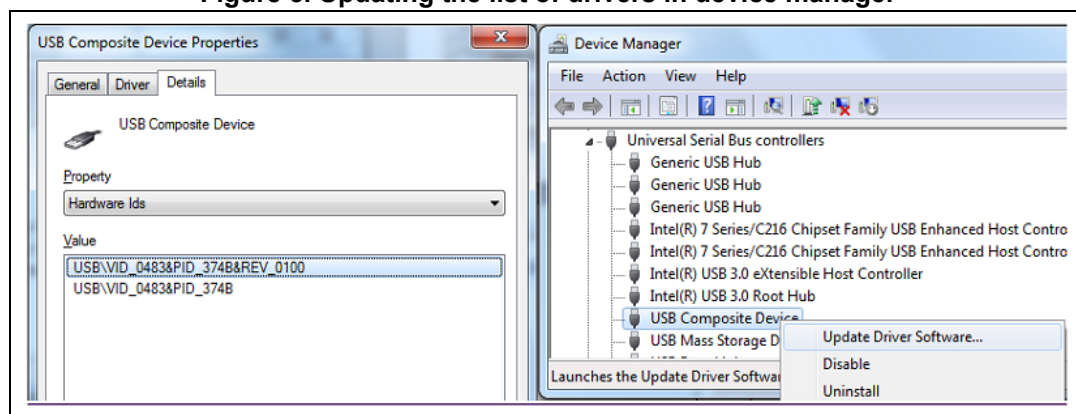
6.1.1 Drivers

ST-LINK/V2-1 requires a dedicated USB driver, which, for Windows® 7, Windows® 8 and Windows® 10, is available from www.st.com.

In cases where the STM32L053 Discovery board is connected to the PC before the driver is installed, some STM32L053 Discovery board interfaces might be declared as “Unknown” in the PC device manager. In such cases, the user must install the dedicated driver files and update the driver of the connected device from the device manager, as shown in [Figure 5](#).

Note: It is preferable to use the “USB Composite Device” handle for a full recovery.

Figure 5. Updating the list of drivers in device manager



6.1.2 ST-LINK/V2-1 firmware upgrade

ST-LINK/V2-1 embeds a mechanism for in-situ firmware upgrade through the USB port. As firmware may evolve during the lifespan of the ST-LINK/V2-1 product (for example new functionalities, bug fixes, support for new microcontroller families), visiting the www.st.com website is recommended before starting to use the STM32L053 Discovery board, then periodically to stay up-to-date with the latest firmware version.

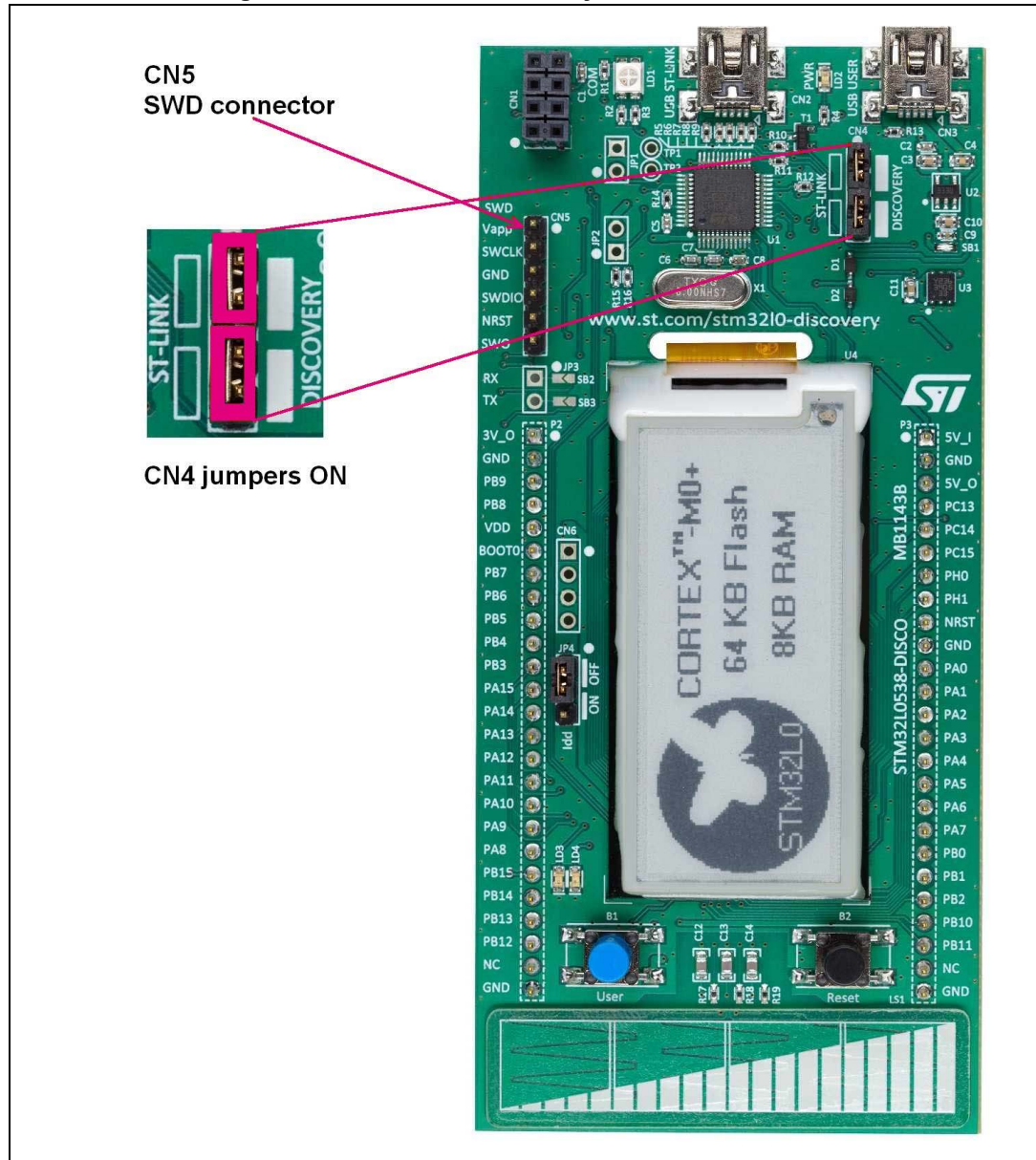
6.1.3 VCP configuration

ST-LINK/V2-1 supports the Virtual COM port (VCP). To enable this function, the solder bridges SB2 and SB3 are closed (See [Figure 3: Top layout](#)). [Table 7: Solder bridges](#) indicates this with the ON state.

6.1.4 Using ST-LINK/V2-1 to program/debug the STM32L053C8T6 on board

To program the STM32L053C8T6 on board, simply plug in the two jumpers on CN4, as shown in *Figure 6* in pink, but do not use the CN5 connector as that could disturb the communication with the STM32L053C8T6 of the STM32L053 Discovery board.

Figure 6. STM32L053 Discovery board connections



6.1.5 Using ST-LINK/V2-1 to program/debug an external STM32 application

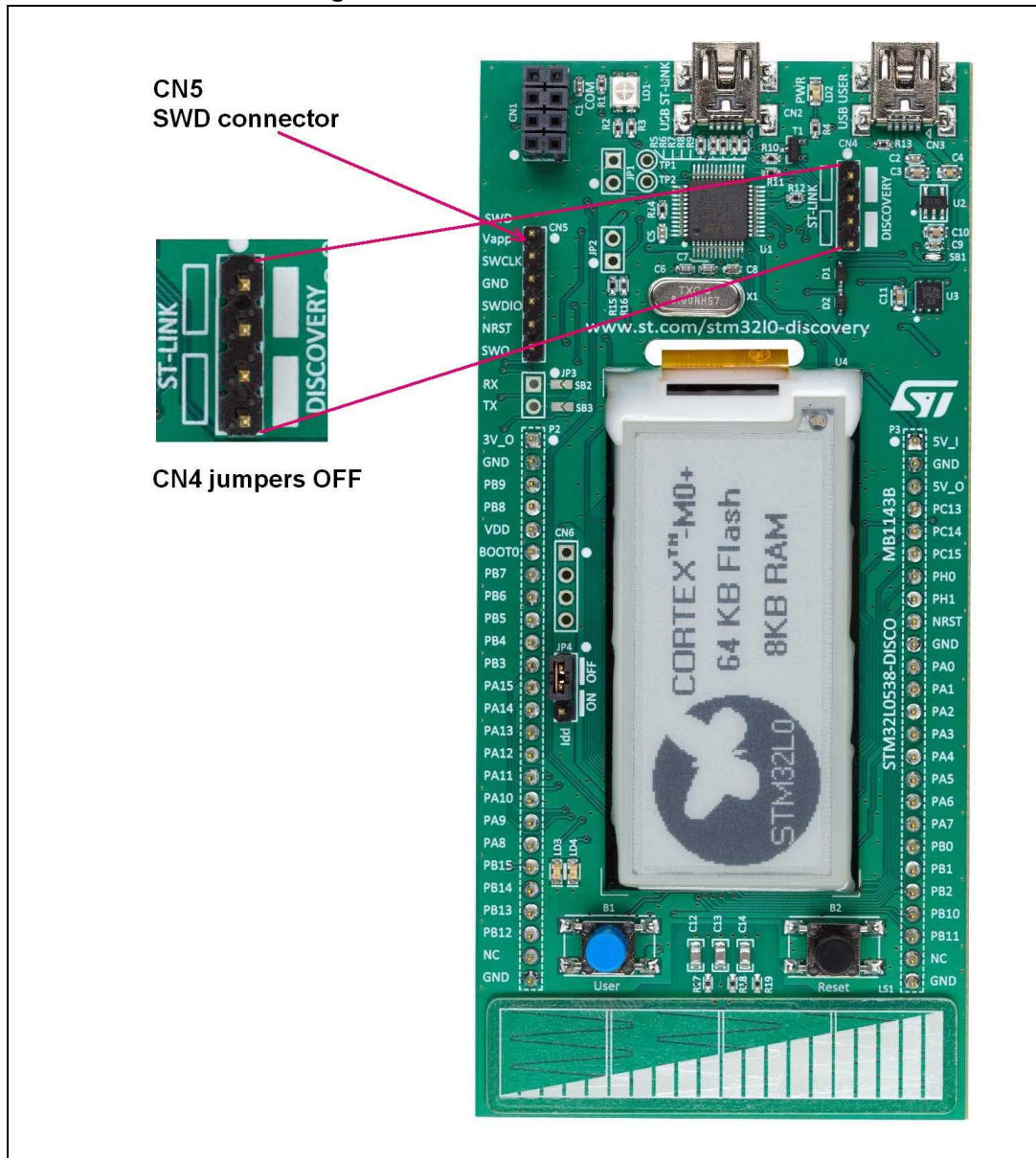
It is very easy to use ST-LINK/V2-1 to program an STM32 microcontroller on an external application. Simply remove the two jumpers from CN4 as shown in [Figure 7](#) and connect the application to the CN5 debug connector according to [Table 5](#).

Note: SB13, must be OFF if CN5 pin 5 (NRST) is used in the external application.

Table 5. Debug connector CN5 (SWD)

Pin	CN5	Designation
1	VDD_TARGET	VDD from application
2	SWLCK	SWD clock
3	GND	Ground
4	SWDIO	SWD data input/output
5	NRST	RESET of target MCU
6	SWO	Reserved

Figure 7. ST-LINK/V2-1 connections



6.2 Power supply and power selection

The power supply is provided either by the host PC through the USB cable, or by an external 5 V power supply.

The STM32L053 Discovery board requires 300 mA from the host PC: about 90 mA are needed by a simple E-paper demo application, 100 mA for an extension board, and 100 mA as a safety margin.

The D3, D4 and D6 diodes protect the 5 V pins from external power supplies:

- 5 V and 3 V can be used as output power supplies when an extension board is connected to pins P2 and P3.
In this case, the 5V_O and 3V_O pins deliver a 5 V or 3.3 V power supply and the power consumption of the extension board must be lower than 100 mA.
- 5 V can also be used as input power supply, for instance when the USB connector is not connected to the PC (pin 5V_I of header P3).
In this case, the STM32L053 Discovery board must be powered by a power supply unit or by an auxiliary equipment complying with standard EN-60950-1: 2006+A11/2009. It must be Safety Extra Low Voltage (SELV) with limited power capability.

6.2.1 Power supply input from the USB connector

ST-LINK/V2-1 supports USB power management allowing the request of more than 100 mA from the host PC.

All parts of the STM32L053 Discovery board and extension board can be powered from the ST-LINK/V2-1 USB connector CN2 (U5V or V_{BUS}). Note that only the ST-LINK/V2-1 part is power supplied before the USB enumeration as the host PC only provides 100 mA to the board at that time. During the USB enumeration, the STM32L053 Discovery board requires 300 mA from the host PC.

- If the host is able to provide the required power, the target STM32 microcontroller is powered and the red LED LD2 is turned ON. The STM32L053 Discovery board and its extension board can consume not more than a maximum of 300 mA.
- If the host is not able to provide the required current, the target STM32 microcontroller and the MCU part including the extension board are not power supplied. As a consequence the red LED LD2 remains turned OFF. In such a case, it is mandatory to use an external power supply as explained in the next section.

Warning: If the maximum current consumption of the STM32L053 Discovery board and its extension board exceeds 300 mA, it is mandatory to power the STM32L053 Discovery board with an external power supply connected to 5V_IN.

Note: In cases where this board is powered by a USB charger or USB battery, there is no USB enumeration. Therefore, LED LD1 remains OFF permanently and the target MCU is not powered. In this specific case, the jumper JP2 must be ON to allow the target MCU to be powered anyway. This is a special use case without enumeration and JP2 is not soldered. To use this optional power supply, solder a 2-pin header in JP2 and set a jumper.

6.2.2 External power supply inputs: 5V_IN or USB USER CN3

The external power source 5V_IN or USB USER CN3 is automatically detected. In this case the current consumption of the STM32L053 Discovery board and its extension board may exceed the allowed current on the USB. In this condition it is still possible to use the USB for communication, for programming or debugging only, but it is mandatory to power supply the board first using 5V_IN or USB USER CN3 then connecting the USB cable to the PC. Proceeding this way ensures that the enumeration occurs with the support of the external power source.

The following power sequence procedure must be respected:

1. Connect the external power source to 5V_IN or USB USER CN3.
2. Power on the external power supply 5V_IN or USB USER CN3.
3. Check that LD2 is turned on.
4. Connect the PC to USB connector CN2.

If this order is not respected, the board may be supplied by V_{BUS} first, then by 5V_IN or USB USER CN3. Consequently, the following risks may be encountered:

1. If more than 300 mA is needed by the board, the PC may be damaged or the current supply can be limited by the PC. As a consequence the board is not powered correctly.
2. 300 mA is requested at enumeration (since JP2 must be OFF) so there is a risk that the request is rejected and the enumeration does not succeed if the PC cannot provide such current. Consequently the board is not power supplied (LED LD2 remains OFF).

6.3 LEDs

- LD1 COM:
LD1 default status is red. LD1 turns to green to indicate that communication is in progress between the PC and ST-LINK/V2-1.
- LD2 PWR:
The red LED indicates that the board is powered.
- User LD3:
The green LED is a user LED connected to the I/O PB4 of the STM32L053C8T6.
- User LD4:
The red LED is a user LED connected to the I/O PA5 of the STM32L053C8T6.

6.4 Pushbuttons

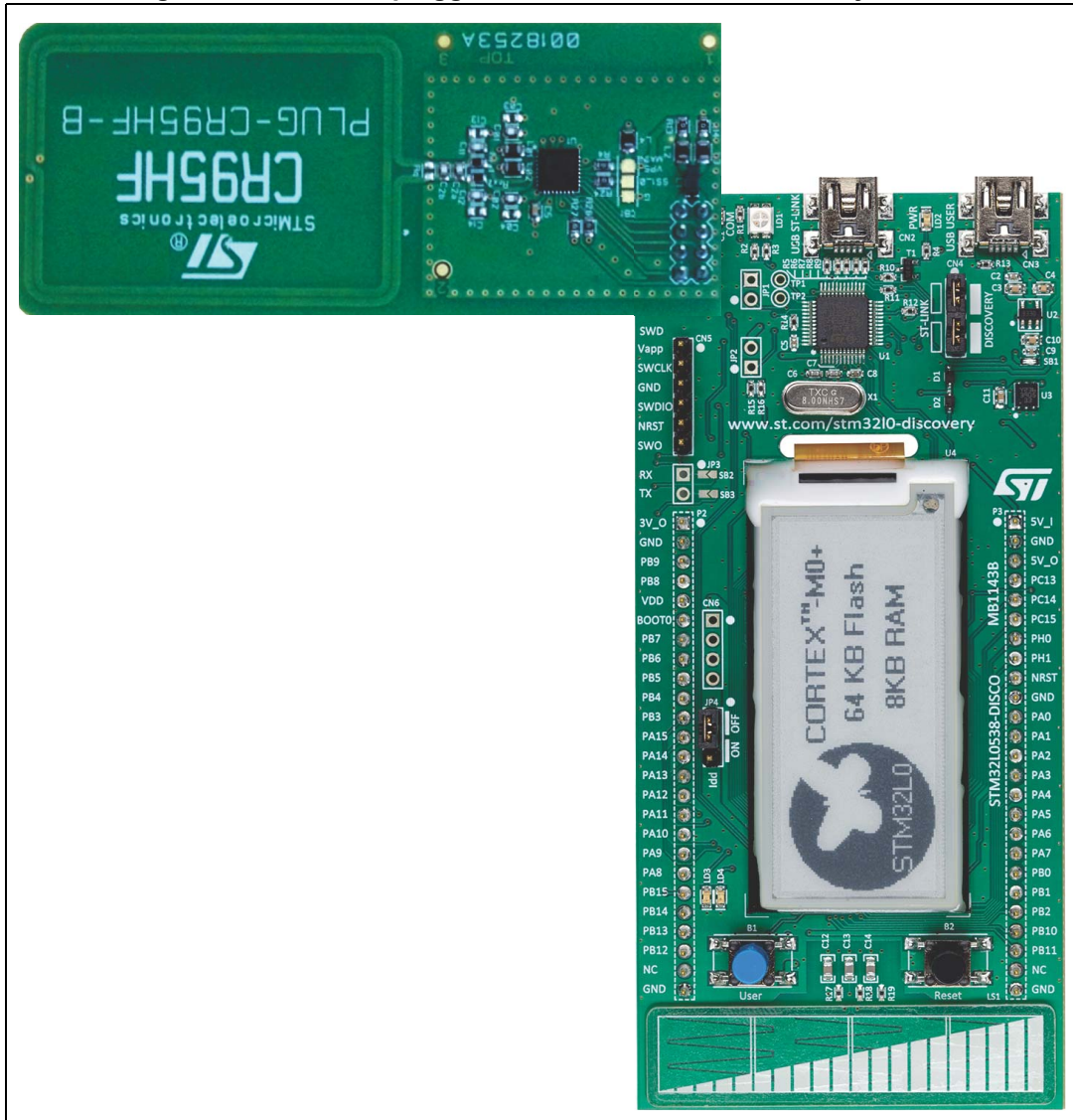
- B1 USER:
User and Wake-Up button connected to the I/O PA0 of the STM32L053C8T6.
- B2 RESET:
The pushbutton connected to NRST is used to RESET the STM32L053C8T6.

6.5 NFC connector for PLUG-CR95HF-B board

A NFC (Near Field Communication) transceiver board can be connected to the STM32L053 Discovery board, for example the PLUG-CR95HF-B board.

The NFC board is plugged in connector CN1 of STM32L053 Discovery board as following:

Figure 8. NFC board plugged on the STM32L053 Discovery board



The NFC board can be accessed in the SPI or UART mode.

Table 6. NFC connector pinout

CN1 pin	NFC signals	STM32L053C8T6	Description
1	NFC_IRQOUTN or UART1_TX	PB7	Interrupt output for NFC connected to STM32L053C8T6 UART1 RX
2	NFC_IRQINN or UART1_RX	PB6	Interrupt input for CR95HF connected to STM32L053C8T6 UART1 TX
3	NFC_NSS	PB12	SPI slave select
4	NFC_MISO	PB14	SPI data, slave output
5	NFC_MOSI	PB15	SPI data, slave input
6	NFC_SCK	PB13	SPI serial clock
7	+3V3	-	Main power supply/power supply for RF drivers
8	GND	-	Ground

6.6 Electronic paper display (EPD)

The STM32L053 Discovery board includes an E-paper display with high contrast, high reflectance and ultra-wide viewing angle.

This display is a TFT active matrix electrophoretic display. The 2.13" active area contains 122×250 pixels and it is capable to display images at 1-bit white, black full display capabilities. An associated integrated circuit contains the buffers, interface, control logic, oscillator, and DC-DC converter.

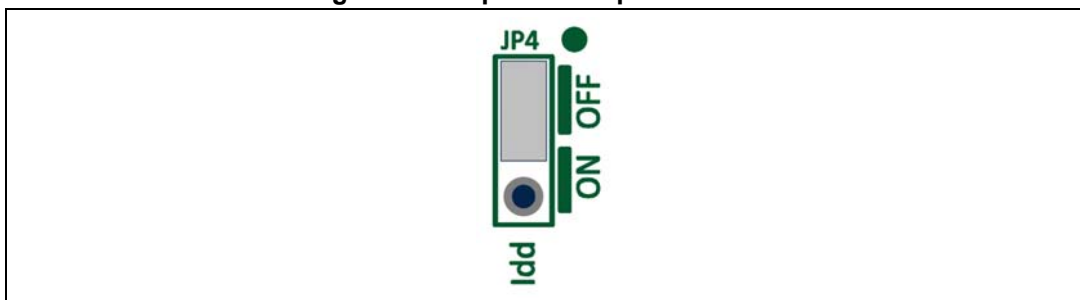
The STM32L053C8T6 controls this peripheral and is able to switch off its power supply.

6.7 JP4 (I_{DD})

Jumper JP4, labeled I_{DD}, allows STM32L053C8T6 consumption direct measurement by a module on board able to measure from 100 nA to 50 mA or by removing the jumper and connecting an ammeter.

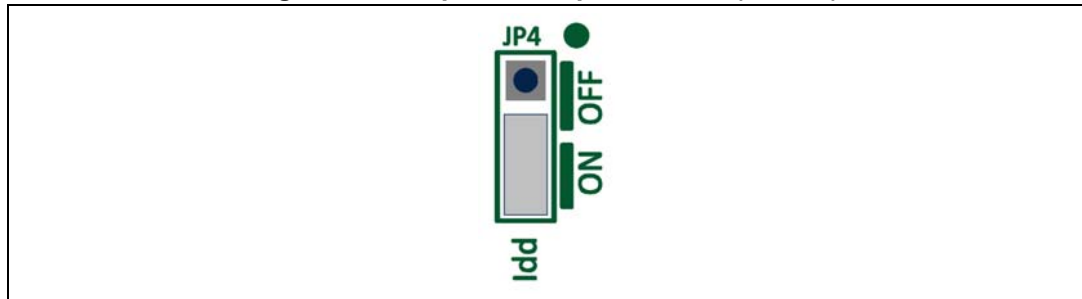
- Jumper in position OFF: STM32L053C8T6 is powered.

Figure 9. Jumper JP4 in position OFF



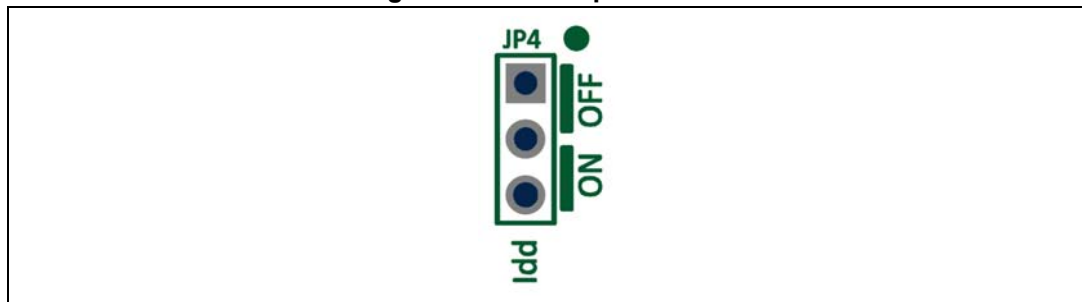
- Jumper in position ON (default): a module onboard is designed to measure from 100 nA to 50 mA by using several MOSFET and switching automatically depending on the read value.

Figure 10. Jumper JP4 in position ON (default)



- NO Jumper on JP4: an ammeter must be connected to measure the STM32L053C8T6 current through pins 1 and 2 (if there is no ammeter, the STM32L053C8T6 is not powered).

Figure 11. No Jumper on JP4



6.8 BOOT0 configuration

BOOT0 is at level "0" through a pull-down R65. To set BOOT0 at level "1", use a configuration with a jumper between P2.6 (BOOT0) and P2.5 (VDD).

Note: To set BOOT0 at level "1" continuously, prefer to unsolder the resistor R65 to avoid a consumption of 6 mA while connecting pin P2.6 (BOOT0) and P2.5 (VDD) with a jumper or a wire.

6.9 Linear touch sensor / touchkeys

To demonstrate touch sensing capabilities, the STM32L053 Discovery board includes a linear touch sensor, which can be used either as a three-position linear touch sensor or as four touchkeys.

Three pairs of I/O ports are assigned to the linear touch sensor / touchkeys. Each pair must belong to the same analog switch group:

- PA2, PA3 (group 1)
- PA6, PA7 (group 2)
- PB0, PB1 (group 3)

To minimize the noise, these pairs are dedicated to the linear touch sensor and touchkeys. They are not connected to external headers. To design a touch sensing application, refer to the following documentation and firmware:

- For details concerning the I/O ports, refer to the STM32L053C8T6 datasheet.
- For more detail concerning touch sensing application design and layout, refer to the application note *Design with surface sensors for touch sensing applications on MCUs* (AN4312).
- STM32 touch sensing library available from www.st.com/stm32i0-discovery.

The STM32L053C8T6 MCU controls the linear touch sensor and the touchkeys.

6.10 USB device support

The STM32L053C8T6 MCU is also used to drive the second USB Mini-B connector (USB USER), which allows the use of the board as a USB Device. The STM32L053 Discovery board can then act as a USB joystick, mouse, or other similar device. If both USBs are connected, diodes D3 and D4 protect the board and use the power from USB ST-LINK or USB USER (see [Section 6.2.2: External power supply inputs: 5V_IN or USB USER CN3](#)).

The board can be powered through this USB USER connector, in which case LED2 PWR lights up, LED1 COM blinks and it can run an application in standalone mode.

The STM32L053C8T6 MCU controls the USB USER through PA11 and PA12.

6.11 USART configuration

The USART1 interface available on PA9 and PA10 of the STM32L053C8T6 can be connected to the ST-LINK/V2-1 MCU to use the Virtual COM port function.

By default, the USART1 communication between the target STM32L053C8T6 and the ST-LINK/V2-1 MCU is not enabled.

To use the Virtual COM port function with:

- The on-board STM32L053C8T6, set SB2 and SB3 ON. (SB14,15 must be OFF)
- An external MCU, remove solder from SB2 and SB3, solder a 2-pin header on JP3, then connect RX and TX of the external MCU directly to RX and TX of JP3

6.12 OSC clock supply

If PH0 is only used as GPIO instead of as a clock, then SB21 is ON. (SB20 must be OFF)

MCO from ST-LINK/V2-1 (from MCO of the STM32L053C8T6)

This frequency cannot be changed, it is fixed at 8 MHz and connected to PH0-OSC_IN of the STM32L053C8T6. The configuration needed is:

- SB20 ON and SB21 OFF

Oscillator from external PH0 (from external oscillator through pin 7 of the P3 connector)

The configuration needed is:

- SB21 ON and SB20 OFF

Note: Refer to application note AN2867 for STM32 microcontrollers oscillator design guide.

6.13 OSC 32 KHz clock supply

If PC14 and PC15 are only used as GPIOs instead of as a clock, then SB18 and SB19 are ON and R70 and R71 are removed.

HSE oscillator onboard from X2 crystal (not provided)

For typical frequencies and its capacitors and resistors, please refer to the STM32L053C8T6 Datasheet. The configuration needed is:

- SB18, SB19 OFF
- X2, R70, R71, C47, C50 soldered

Oscillator from external PC14 (from external oscillator through pin 5 of the P3 connector) the configuration needed is:

- SB18 ON
- SB19 OFF
- R70 removed

Note: Refer to application note AN2867 for STM32 microcontrollers oscillator design guide.

6.14 Solder bridges

Table 7. Solder bridges

Bridge	State ⁽¹⁾	Description
SB18, 19 (X2 crystal)	OFF	X2, C47, C50, R70 and R71 provide a clock. PC14, PC15 are disconnected from P3.
	ON	PC14, PC15 are connected from P3. Remove only R70 and R71
SB7,8,9,12 (default)	ON	Reserved, do not modify
SB4,5,6,11 (reserved)	OFF	Reserved, do not modify
SB14,15 (reserved)	OFF	Reserved, do not modify
SB29 (B2-RESET)	ON	B2 Push Button is connected to NRST of STM32L053C8T6
	OFF	B2 Push Button is not connected to NRST of STM32L053C8T6
SB22 (B1-USER)	ON	B1 Push Button is connected to PA0
	OFF	B1 Push Button is not connected to PA0
SB2,3 (VCP RX, TX) ⁽²⁾	OFF	PA2, PA3 of STM32F103CBT6 are not connected to PA10, PA9 of STM32L053C8T6
	ON	PA2, PA3 of STM32F103CBT6 are connected to PA10, PA9 of STM32L053C8T6
SB16,17 (USB_USER)	OFF	USB1_DP and USB1_DM are dedicated to the USB USER connector CN3
	ON	USB1_DP is connected to PA12 and USB1_DM is connected to PA11. Both are available as GPIO on P2, P3 headers.
SB23,24,25,26,27,28 (touch sensor)	OFF	PA2, PA3, PA6, PA7, PB0, PB1 are dedicated to touch sensor.
	ON	PA2, PA3, PA6, PA7, PB0, PB1 are available as GPIO on P2, P3 headers.
SB1 (ST-LINK/V2-1 PWR)	ON	ST-LINK/V2-1 module is powered
	OFF	ST-LINK/V2-1 module is not powered
SB21 (OSC_IN)	OFF	Clock signal from header P3.7 is connected to OSC_IN of STM32L053C8T6 or PH0 is available as GPIO. SB20 must be OFF
	ON	No connection between header P3.7 and PH0 of STM32L053C8T6
SB13 (NRST)	ON	T_NRST signal from connector CN5 and STM32F103CBT6, is connected to NRST of STM32L053C8T6
	OFF	T_NRST signal is not connected
SB10 (STM_RST)	OFF	No incidence on NRST signal of STM32F103CBT6
	ON	NRST signal of STM32F103CBT6 is connected to GND
SB20 (MCO)	ON	MCO clock signal from STM32F103CBT6 is connected to OSC_IN of STM32L053C8T6. SB21 must be OFF
	OFF	MCO signal of STM32F103CBT6 is not used.

1. Default value is in bold.

2. Default state is OFF for boards labeled MB1143 B-01 and older.

6.15 Extension connectors

The male headers P2 and P3 can connect the STM32L053 Discovery board to a standard prototyping/wrapping board. STM32L053C8T6 GPIOs are available on these connectors. P2 and P3 can also be probed by an oscilloscope, logical analyzer or voltmeter.

Table 8. Extension connectors

MCU pin		Board function															
Main function	LQFP48 pin num.	SYSTEM	VCP	PushButtons	LED	NFC CR95HF-B	USB USER	Linear touch sensor	E-paper Display	Idd Measure	Free I/O	Power Supply	P2	P3	CN1	CN3	SBx ⁽¹⁾
BOOT0	44	BOOT0	-	-	-	-	-	-	-	-	-	-	6	-	-	-	-
NRST	7	NRST	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-
PA0	10	-	-	BP_USER	-	-	-	-	-	-	-	-	-	11	-	-	-
PA1	11	-	-	-	-	-	-	-	-	MFX_WAKEUP	-	-	-	12	-	-	-
PA2	12	-	-	-	-	-	-	TS_G1_IO3	-	-	-	-	-	13	-	-	SB28
PA3	13	-	-	-	-	-	-	TS_G1_IO4	-	-	-	-	-	14	-	-	SB27
PA4	14	-	-	-	-	-	-	-	-	-	PA4	-	-	15	-	-	-
PA5	15	-	-	-	-	RED	-	-	-	-	-	-	-	16	-	-	-
PA6	16	-	-	-	-	-	-	TS_G2_IO3	-	-	-	-	-	17	-	-	SB26

Table 8. Extension connectors (continued)

MCU pin		Board function															
Main function	LQFP48 pin num.	SYSTEM	VCP	PushButtons	LED	NFC CR95HF-B	USB USER	Linear touch sensor	E-paper Display	Idd Measure	Free I/O	Power Supply	P2	P3	CN1	CN3	SBx ⁽¹⁾
PA7	17	-	-	-	-	-	-	TS_G2_IO4	-	-	-	-	-	18	-	-	SB25
PA8	29	-	-	-	-	-	-	-	ePD1_BUSY	-	-	-	19	-	-	-	-
PA9	30	-	USART_TX	-	-	-	-	-	-	-	-	-	18	-	-	-	-
PA10	31	-	USART_RX	-	-	-	-	-	-	-	-	-	17	-	-	-	-
PA11	32	-	-	-	-	-	USB_DM	-	-	-	-	-	16	-	-	2 ⁽²⁾	SB17
PA12	33	-	-	-	-	-	USB_DP	-	-	-	-	-	15	-	-	3 ⁽²⁾	SB16
PA13	34	SWDIO	-	-	-	-	-	-	-	-	-	-	14	-	-	-	-
PA14	37	SWCLK	-	-	-	-	-	-	-	-	-	-	13	-	-	-	-
PA15	38	-	-	-	-	-	-	-	ePD1_CS	-	-	-	12	-	-	-	-
PB0	18	-	-	-	-	-	-	TS_G3_IO2	-	-	-	-	-	19	-	-	SB24

Table 8. Extension connectors (continued)

MCU pin		Board function															
Main function	LQFP48 pin num.	SYSTEM	VCP	PushButtons	LED	NFC CR95HF-B	USB USER	Linear touch sensor	E-paper Display	Idd Measure	Free I/O	Power Supply	P2	P3	CN1	CN3	SBx ⁽¹⁾
PB1	19	-	-	-	-	-	-	TS_G3_IO3	-	-	-	-	-	20	-	-	SB23
PB2	20	-	-	-	-	-	-	-	ePD1_RESET	-	-	-	-	21	-	-	-
PB3	39	-	-	-	-	-	-	-	ePD1_SCK	-	-	-	11	-	-	-	-
PB4	40	-	-	-	GREEN	-	-	-	-	-	-	-	10	-	-	-	-
PB5	41	-	-	-	-	-	-	-	ePD1_MOSI	-	-	-	9	-	-	-	-
PB6	42	-	-	-	-	NFC_IRQINN	-	-	-	-	-	-	8	-	2	-	-
PB7	43	-	-	-	-	NFC_IRQOUTN	-	-	-	-	-	-	7	-	1	-	-
PB8	45	-	-	-	-	-	-	-	-	MFX_I2C_SCL	-	-	4	-	-	-	-

Table 8. Extension connectors (continued)

MCU pin		Board function															
Main function	LQFP48 pin num.	SYSTEM	VCP	PushButtons	LED	NFC CR95HF-B	USB USER	Linear touch sensor	E-paper Display	Idd Measure	Free I/O	Power Supply	P2	P3	CN1	CN3	SBx ⁽¹⁾
PB9	46	-	-	-	-	-	-	-	-	MFX_I2C_SDA	-	-	3	-	-	-	-
PB10	21	-	-	-	-	-	-	-	ePD1_PWR8ENn	-	-	-	-	22	-	-	-
PB11	22	-	-	-	-	-	-	-	ePD1_D/C	-	-	-	-	23	-	-	-
PB12	25	-	-	-	-	NFC_NSS	-	-	-	-	-	-	23	-	3	-	-
PB13	26	-	-	-	-	NFC_SCK	-	-	-	-	-	-	22	-	6	-	-
PB14	27	-	-	-	-	NFC_MISO	-	-	-	-	-	-	21	-	4	-	-
PB15	28	-	-	-	-	NFC_MOSI	-	-	-	-	-	-	20	-	5	-	-
PC13	2	-	-	-	-	-	-	-	-	MFX_IRQ_OUT	-	-	-	4	-	-	-

Table 8. Extension connectors (continued)

MCU pin		Board function															
Main function	LQFP48 pin num.	SYSTEM	VCP	PushButtons	LED	NFC CR95HF-B	USB USER	Linear touch sensor	E-paper Display	Idd Measure	Free I/O	Power Supply	P2	P3	CN1	CN3	SBx ⁽¹⁾
PC14	3	OSC32_IN	.	.	.	.	.	.	.	.	PC14	.	.	5	.	.	.
PC15	4	OSC32_OUT	.	.	.	.	.	.	.	.	PC15	.	.	6	.	.	.
PH0	5	OSC_IN	.	.	.	.	.	.	.	.	.	.	.	7	.	.	.
PH1	6	.	.	.	.	.	.	.	.	.	PH1	.	.	8	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	5V_USB_USER	.	.	.	1	.
.	.	.	.	.	.	.	.	.	.	.	.	3V3	1	.	7	.	.
.	.	.	.	.	.	.	.	.	.	.	.	5V_IN	.	1	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.	5V_OUT	.	3	.	.	.
VDD	24	.	.	.	.	.	.	.	.	.	.	VDD	5	.	.	.	.
VDD	48	.	.	.	.	.	.	.	.	.	.	VDD	.	.	.	.	.
VDD_USB	36	.	.	.	.	.	.	.	.	.	.	VDD	.	.	.	.	.
VDDA	9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
VLCD	1	.	.	.	.	.	.	.	.	.	.	VDD	.	.	.	.	.
VSS	23	.	.	.	.	.	.	.	.	.	.	GND	2	2	8	4 ⁽²⁾	.

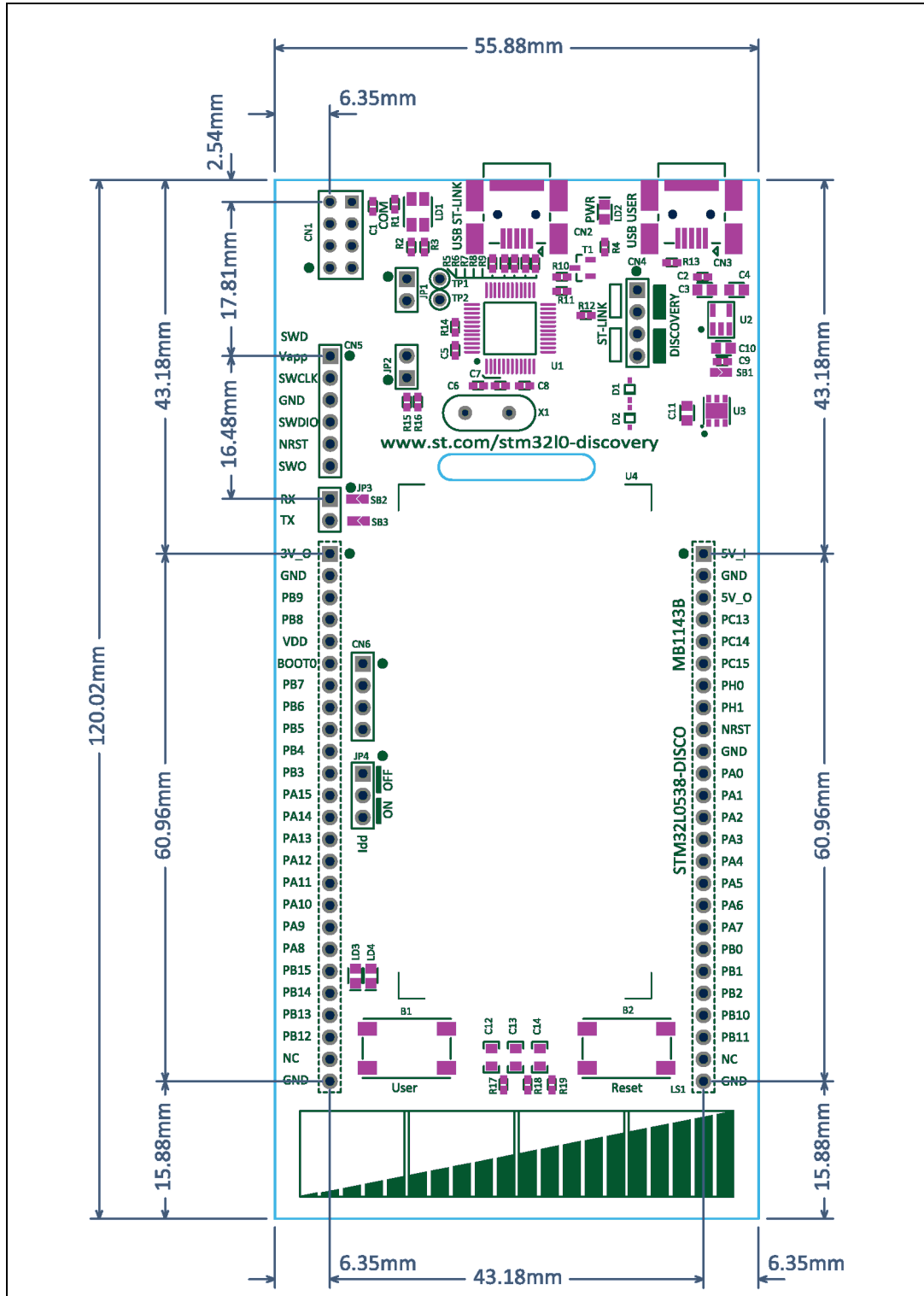
Table 8. Extension connectors (continued)

MCU pin		Board function															
Main function	LQFP48 pin num.	SYSTEM	VCP	PushButtons	LED	NFC CR95HF-B	USB USER	Linear touch sensor	E-paper Display	Idd Measure	Free I/O	Power Supply	P2	P3	CN1	CN3	SBx ⁽¹⁾
VSS	35	-	-	-	-	-	-	-	-	-	-	GND	25	10	-	5	-
VSS	47	-	-	-	-	-	-	-	-	-	-	GND	-	25	-	6	-
VSSA	8	-	-	-	-	-	-	-	-	-	-	GND	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	NC	24	24	-	-	-

1. Signals available depending on SBx value. Refer to [Table 7: Solder bridges](#).
2. Connected through a resistor

7 Mechanical drawing

Figure 12. STM32L053 Discovery board mechanical drawing



8 32L0358DISCOVERY Discovery kit information

8.1 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-yzz", 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 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 designs 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 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.

In order to use the same commercial stack in his application, a developer may need to purchase a part number specific to this stack/library. The price of those part numbers includes the stack/library royalties.

8.2 32L0358DISCOVERY product history

8.2.1 Product identification 32L0538DISCO/

This product identification is based on the mother board MB1143-Default-B01.

It embeds the STM32L053C8T6 microcontroller with silicon revision code "Z". The limitations of this silicon revision are detailed in the errata sheet *STM32L053x6/8 device errata* (ES0253).

8.2.2 Product identification DK32L0538\$AU1

This product identification is based on the mother board MB1143-L053C8T6-B03.

It embeds the STM32L053C8T6 microcontroller with silicon revision code "X" or "P" or "1". The limitations of these silicon revisions are detailed in the errata sheet *STM32L053x6/8 device errata* (ES0253).

8.3 Board revision history

8.3.1 MB1143 revision B-01

The revision B-01 of the MB1143 board is the initial release.

8.3.2 MB1143 revision B-03

The revision B-03 of the MB1143 board corresponds to:

- E-paper display U4 replaced with impact on firmware
- Several part references updated due to obsolescence (such as transistors or others, see bill of materials for details)

8.4 Board known limitations

8.4.1 MB1143 revision B-01

None.

8.4.2 MB1143 revision B-03

No demonstration software is provided from this revision.

9 Federal Communications Commission (FCC) and ISED Canada Compliance Statements

9.1 FCC Compliance Statement

9.1.1 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.

9.1.2 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.

9.1.3 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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9.2 ISED Compliance Statement

Compliance Statement

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

Déclaration de conformité

Étiquette de conformité à la NMB-003 d'ISDE Canada : *CAN ICES-3 (B) / NMB-3 (B)*.

10 CE conformity

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 9. Document revision history

Date	Revision	Changes
20-Jun-2014	1	initial release
24-Jun-2014	2	Removed embedded USB bootloader paragraph.Rev 6
20-Jan-2016	3	mbed-enabled logo added on the cover page. Added mbed-enabled in Section 3: Features . Added Section 2.1: Product marking Windows Vista removed from Section 4.1.1: Drivers . SB14, SB15 swapped with SB2, SB3 in Table 5: Solder bridges , default position of SB2,SB3 set to ON and ports modified from PB4, PB3 to PA10, PA9. Added Section 4.1.3: VCP configuration
10-Sep-2021	4	Removed Electrical schematics and Demonstration software . Added Chapter 8: 32L0358DISCOVERY Discovery kit information , Appendix A: Federal Communications Commission (FCC) and ISED Canada Compliance Statements and Appendix B: CE conformity . Updated Section 6.1: Embedded ST-LINK/V2-1 , Section 6.6: Electronic paper display (EPD) and Section 6.9: Linear touch sensor / touchkeys . Updated Figure 2: STM32L053 Discovery board hardware block diagram and Figure 3: Top layout . Revised the beginning of the document: – Updated Introduction , Section 1: Features , Section 2: Ordering information , Section 3.1: System requirements , Section 3.2: Development toolchains and Section 5.1: Getting started – Added Section 2.1: Codification
6-Dec-2021	5	Updated Section 6.7: JP4 (I_{DD}) with default jumper position ON. Removed the references to Arm [®] Mbed [™] .
24-Feb-2022	6	Updated the board revision history in Section 8.4.2: MB1143 revision B-03 .

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