STSAFE-A Nucleo expansion board hardware description

Introduction

The STSAFE-A Nucleo expansion board, called X-NUCLEO-STSA100, has been designed to allow easy and fast software development using STMicroelectronics STM32 Nucleo and ARDUINO® boards.

The board hosts a personalized STSAFE-A device (STSAFE-A100) usable in association with the STM32CubeExpansion_STSAFE-A100 software package.

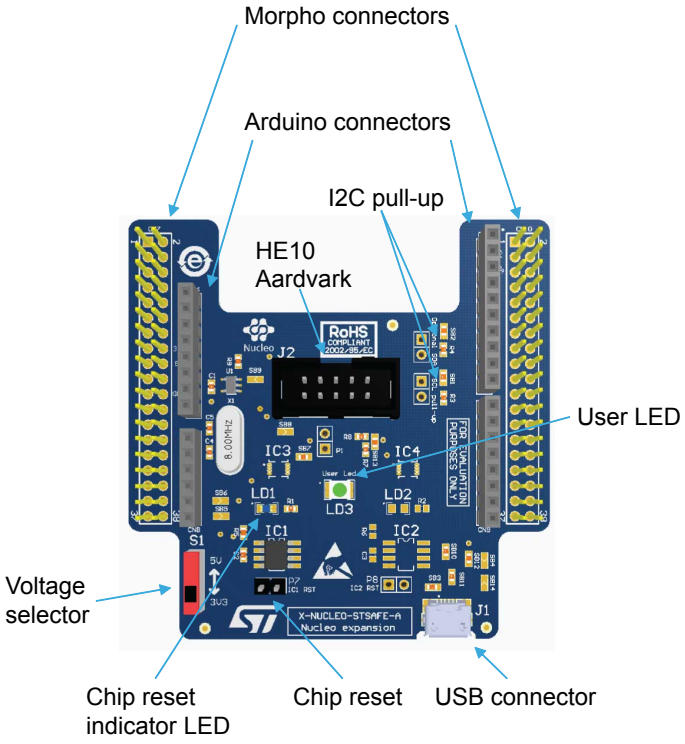
This application note explains all the hardware features of the X-NUCLEO-STSA100 Nucleo expansion boards; the software aspects are not in the scope of this document.

1 Expansion board hardware description

This section describes the components of the X-NUCLEO-STSA100 Nucleo expansion board.

The figure below gives a global view of the board.

Figure 1. Layout of the X-NUCLEO-STSA100 Nucleo expansion board



Information related to STM32 Nucleo boards

The STM32 Nucleo boards are Arm®-based.

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

1.1 Morpho connectors

CN7 & CN10 are the connectors used to couple the expansion board with an STM32 Nucleo board.

1.2 Arduino connectors

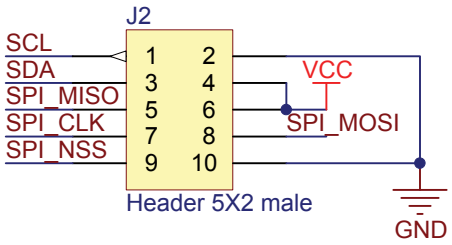
CN5, CN6, CN8 & CN9 are the standard Arduino shield connectors.

To use the expansion board with an Arduino host platform, only the I2C (SDA/SCL) signals and the power supplies (3V3 or 5V/GND) are required. No additional I/O is needed.

1.3 HE10 Aardvark™ connector (J2)

This connector can be used to connect the expansion board to a Total Phase™ Aardvark™ adaptor. The I2C and SPI signals are routed to Morpho and Arduino connectors. The I2C signals are also routed to the STSAFE-A device. Note that the SPI clock signal, SPI_CLK, is mapped to the same signal as the User LED from CN5-6. When SPI_CLK is used, SB13 must be removed.

Figure 2. Connecting the expansion board to an Aardvark adaptor



1.4 Voltage selector (S1)

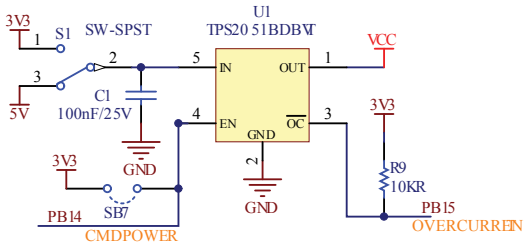
Voltage selector S1 is used to select the supply voltage of the IC1/2/3/4 chips when the expansion board is connected to the Nucleo board.

The power supply can be 3.3 V or 5 V.

The boards are delivered with SB7 populated. As a consequence, there is no need to manage the CN10.PB14 I/O but there is also no way to power off the device.

If the power distribution switch (U1 as illustrated below) is overcurent or overtemperature, CN10-PB15 is driven low.

Figure 3. Power distribution switch



EN	VCC
HIGH	3.3V or 5V
LOW	0V

$\overline{OC}$	OverCurrent OverTem peratur e
HIGH	STATE= OK
LOW	STATE = FAIL

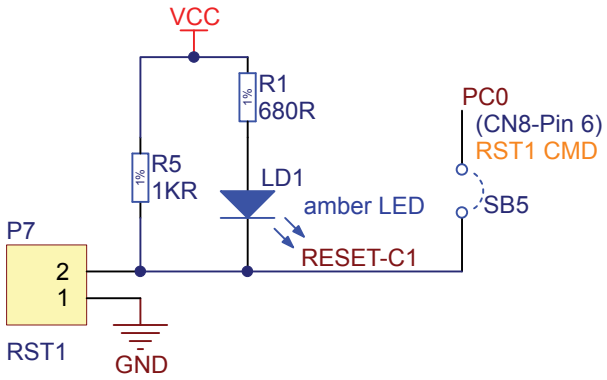
1.5 Chip Reset & LED indicator

IC1 can be forced to the Reset state. This can be done by placing a jumper on RST1.

An alternative is to drive the CN8-PC0 Nucleo I/O low by putting a strap on SB5. When the desired I/O is low, the chip enters the Reset state.

As a result, the amber LD1 turns on.

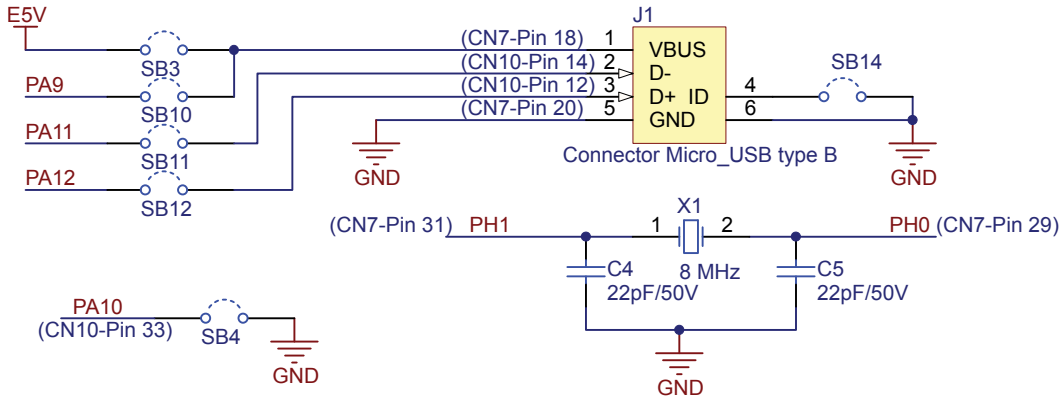
Figure 4. Chip Reset circuit



1.6 USB connector (J1)

This connector can be used to communicate with the Nucleo board though the expansion board. It is applicable only for Nucleo boards with USB capability. By default, the SB10 is set and there is no need to modify the jumper configuration on the Nucleo board.

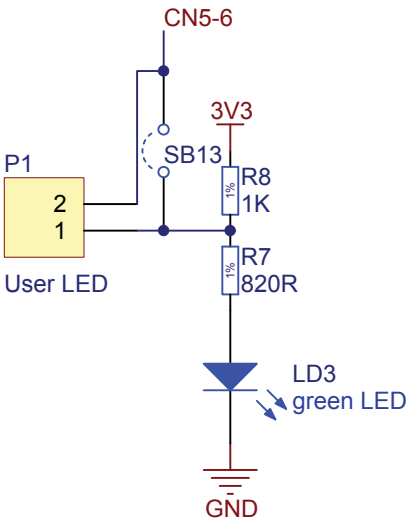
Figure 5. J1 connection



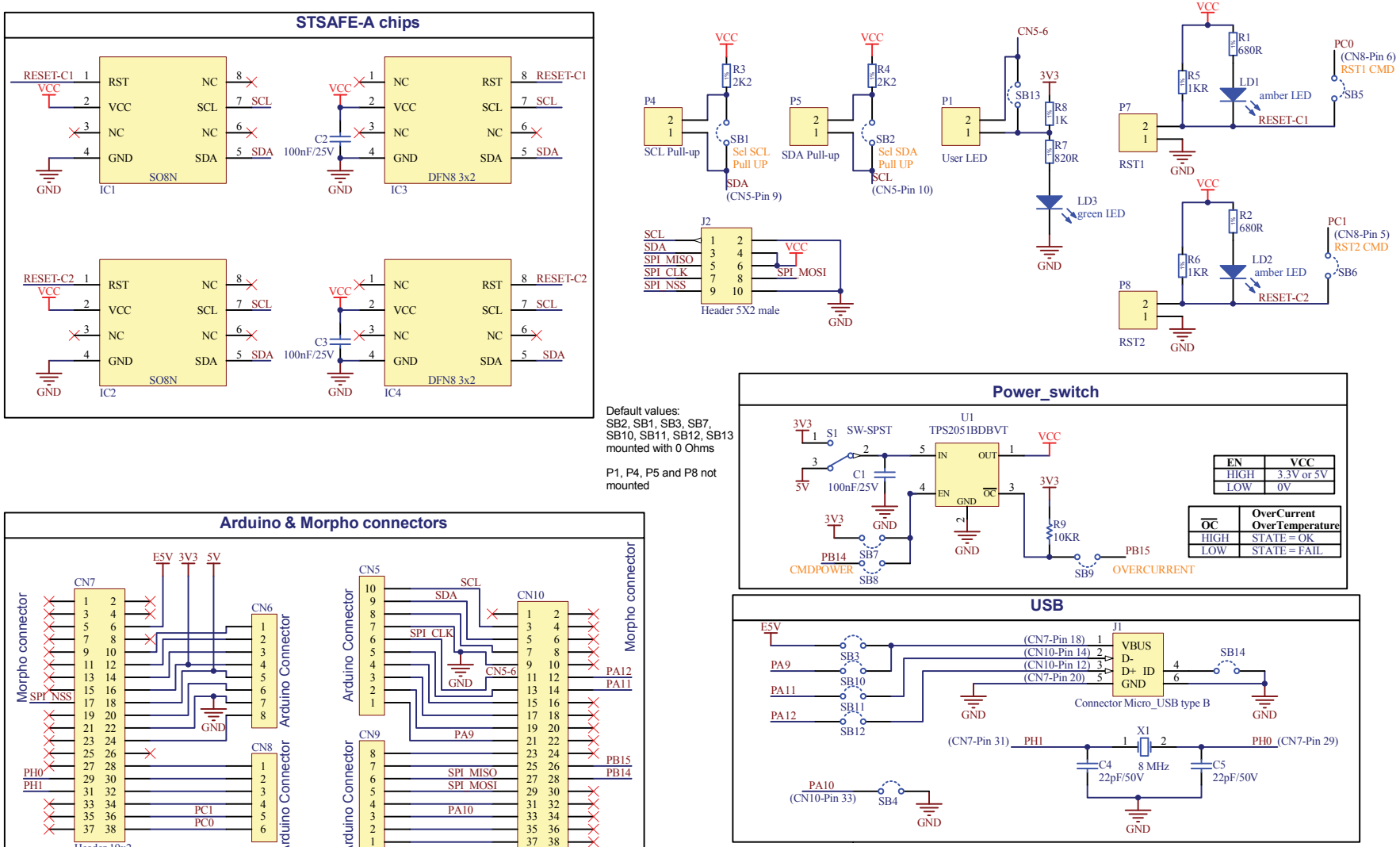
1.7 User LED (LD3)

This LED is the replication of Nucleo User LED LD2. The signal comes from CN5-6.
The figure below illustrates the LD3 connection.

Figure 6. LD3 connection



1.8 X-NUCLEO-STSA100 expansion board schematic



1.9 Connector-pin correspondence

The table below shows the correspondence between the pins and the connectors.

Table 1. Detailed list of connectors

Connector	Pin number	Function
CN5	1	Connected to CN10-21 PA9: USB power signal.
CN5	2	Connected to CN10-19
CN5	3	Connected to CN10-17
CN5	4	Connected to CN10-15
CN5	5	Connected to CN10-13
CN5	6	Connected to CN10-11 Nucleo user LED LD2 signal or SPI_CLK signal. Remove SB13 to avoid any disturbance of the SPI clock.
CN5	7	GND, connected to CN10-9
CN5	8	Connected to CN10-7
CN5	9	SDA pin for I2C communication with extension board chips
CN5	10	SCL pin for I2C communication with extension board chips
CN6	1	Connected to CN7-10
CN6	2	Connected to CN7-12
CN6	3	Connected to CN7-14
CN6	4	3V3 supply from Nucleo board. Connected to CN7-16.
CN6	5	5V supply from Nucleo board. Connected to CN7-18.
CN6	6	Connected to CN7-20.
CN6	7	GND. Connected to CN7-22.
CN6	8	Connected to CN7-24.
CN7	6	E5V: power supply from J1 USB connector (SB3 must be populated) to power the Nucleo STM32. Nucleo JP5 needs also to be placed in E5V position to be operational.
CN7	10	Connected to CN6-1
CN7	12	Connected to CN6-2
CN7	14	Connected to CN6-3
CN7	17	SPI NSS signal
CN7	16	See CN6-4.
CN7	18	See CN6-5.
CN7	20	Connected to CN6-6
CN7	22	See CN6-7.
CN7	24	See CN6-8.
CN7	28	Connected to CN8-1.
CN7	29	8 MHz oscillator PH0 signal for USB.
CN7	30	Connected to CN8-2.
CN7	31	8 MHz oscillator PH1 signal for USB.
CN7	32	Connected to CN8-3.
CN7	34	Connected to CN8-4.

Connector	Pin number	Function
CN7	36	PC1. Connected to CN8-5.
CN7	38	PC0. Connected to CN8-6.
CN8	1	See CN7-28.
CN8	2	See CN7-30.
CN8	3	See CN7-32.
CN8	4	See CN7-34.
CN8	5	See CN7-36.
CN8	6	See CN7-38.
CN9	1	Connected to CN10-37.
CN9	2	Connected to CN10-35.
CN9	3	PA10: Pin to be used to design a USB OTG device with host capability. SB4 needs also to be shorted. Connected to CN10-33.
CN9	4	Connected to CN10-31.
CN9	5	SPI_MOSI signal, connected to CN10-29.
CN9	6	SPI_MISO signal, connected to CN10-27.
CN9	7	Connected to CN10-25.
CN9	8	Connected to CN10-23.
CN10	3	See CN5-10.
CN10	5	See CN5-9.
CN10	7	See CN5-8.
CN10	9	See CN5-7.
CN10	11	See CN5-6.
CN10	12	PA12: Data – USB signal
CN10	13	See CN5-5.
CN10	14	PA11: Data + USB signal
CN10	15	See CN5-4.
CN10	17	See CN5-3.
CN10	19	See CN5-2.
CN10	21	See CN5-1.
CN10	23	See CN9-8.
CN10	25	See CN9-7.
CN10	26	PB15: OVERCURRENT signal from the 3.3 V/5 V voltage regulator. 0 = Failure, 1=OK. SB9 must be present (not present by default).
CN10	27	See CN9-6.
CN10	28	PB14: CMDPOWER signal to the 3.3 V/5 V voltage regulator. 0 = Disable, 1 = Enable. SB8 must be present and SB7 removed (not present by default).
CN10	29	See CN9-5.
CN10	31	See CN9-4.
CN10	33	See CN9-3.
CN10	35	See CN9-2.
CN10	37	See CN9-1.

Revision history

Table 2. **Document revision history**

Date	Version	Changes
19-Jan-2017	1	Initial release.
07-Feb-2019	2	Updated document reference. Added Information related to STM32 Nucleo boards. Small text changes.

Contents

List of figures