STM32
CubeMX

1. Description

1.1. Project

Project Name	TFT_touch_xpt2046_calib
Board Name	custom
Generated with:	STM32CubeMX 6.13.0
Date	12/29/2024

1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F401
MCU name	STM32F401CDUx
MCU Package	UFQFPN48
MCU Pin number	48

1.3. Core(s) information

|	
Core(s)	Arm Cortex-M4

2. Pinout Configuration
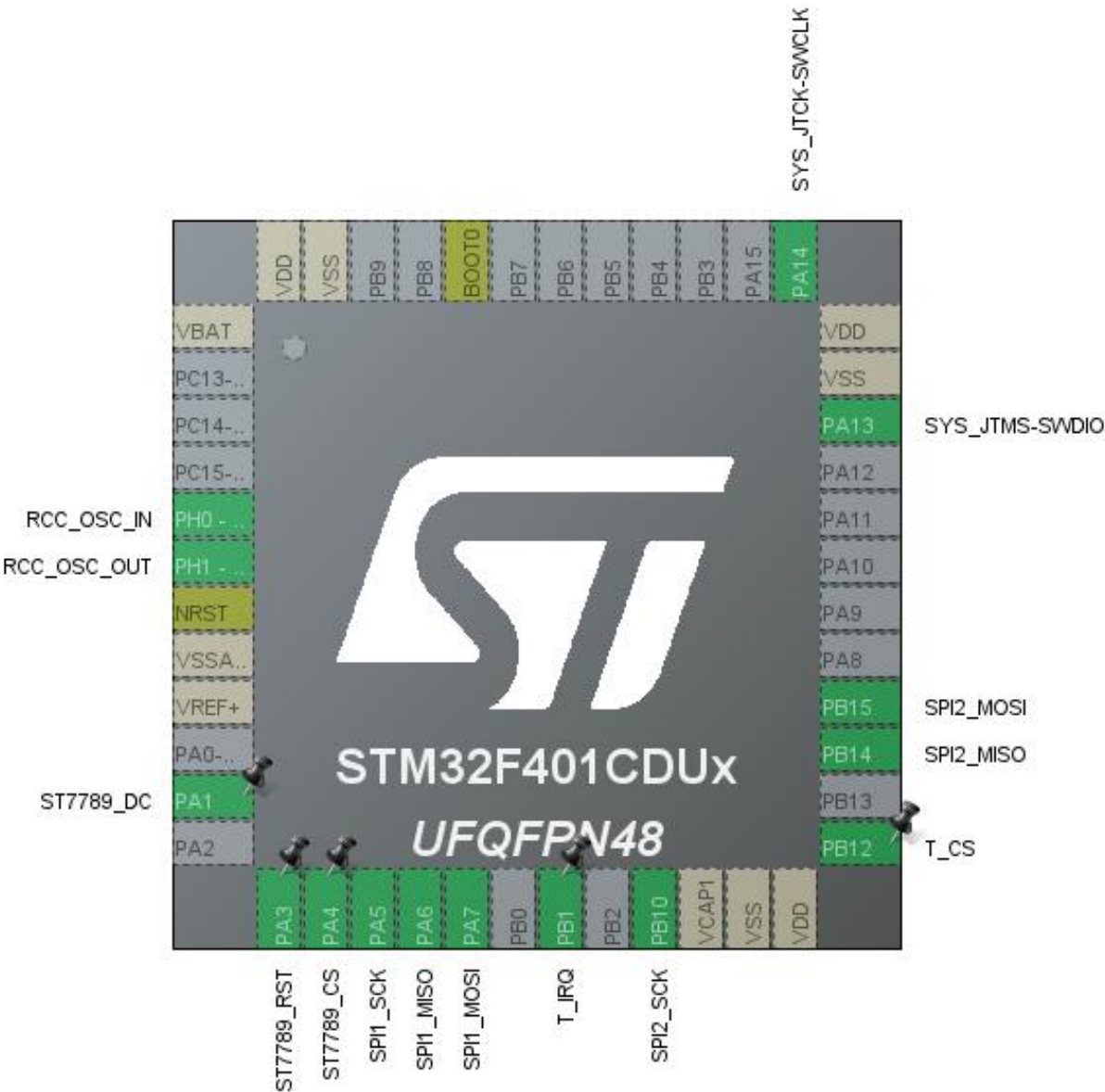
3. Pins Configuration

Pin Number UFQFPN48	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
5	PH0 - OSC_IN	I/O	RCC_OSC_IN	
6	PH1 - OSC_OUT	I/O	RCC_OSC_OUT	
7	NRST	Reset		
8	VSSA/VREF-	Power		
9	VREF+	Power		
11	PA1 *	I/O	GPIO_Output	ST7789_DC
13	PA3 *	I/O	GPIO_Output	ST7789_RST
14	PA4 *	I/O	GPIO_Output	ST7789_CS
15	PA5	I/O	SPI1_SCK	
16	PA6	I/O	SPI1_MISO	
17	PA7	I/O	SPI1_MOSI	
19	PB1	I/O	GPIO_EXTI1	T_IRQ
21	PB10	I/O	SPI2_SCK	
22	VCAP1	Power		
23	VSS	Power		
24	VDD	Power		
25	PB12 *	I/O	GPIO_Output	T_CS
27	PB14	I/O	SPI2_MISO	
28	PB15	I/O	SPI2_MOSI	
34	PA13	I/O	SYS_JTMS-SWDIO	
35	VSS	Power		
36	VDD	Power		
37	PA14	I/O	SYS_JTCK-SWCLK	
44	BOOT0	Boot		
47	VSS	Power		
48	VDD	Power		

* The pin is affected with an I/O function

4. Clock Tree Configuration

1. Power Consumption Calculator report

1.1. Microcontroller Selection

Series	STM32F4
Line	STM32F401
MCU	STM32F401CDUx
Datasheet	DS10086_Rev3

1.2. Parameter Selection

Temperature	25
Vdd	3.3

1.3. Battery Selection

Battery	Li-SOCL2(A3400)
Capacity	3400.0 mAh
Self Discharge	0.08 %/month
Nominal Voltage	3.6 V
Max Cont Current	100.0 mA
Max Pulse Current	200.0 mA
Cells in series	1
Cells in parallel	1

1.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP
Vdd	3.3	3.3
Voltage Source	Battery	Battery
Range	Scale2-Medium	No Scale
Fetch Type	FLASH/ART/PREFETCH	n/a
CPU Frequency	84 MHz	0 Hz
Clock Configuration	HSE PLL	Regulator_LPLV Flash-PwrDwn
Clock Source Frequency	4 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	21.6 mA	10 µA
Duration	0.1 ms	0.9 ms
DMIPS	105.0	0.0
Ta Max	102.72	105
Category	In DS Table	In DS Table

1.5. Results

Sequence Time	1 ms	Average Current	2.17 mA
Battery Life	2 months, 4 days, 8 hours	Average DMIPS	105.0 DMIPS

1.6. Chart

Consumption Profile by Step
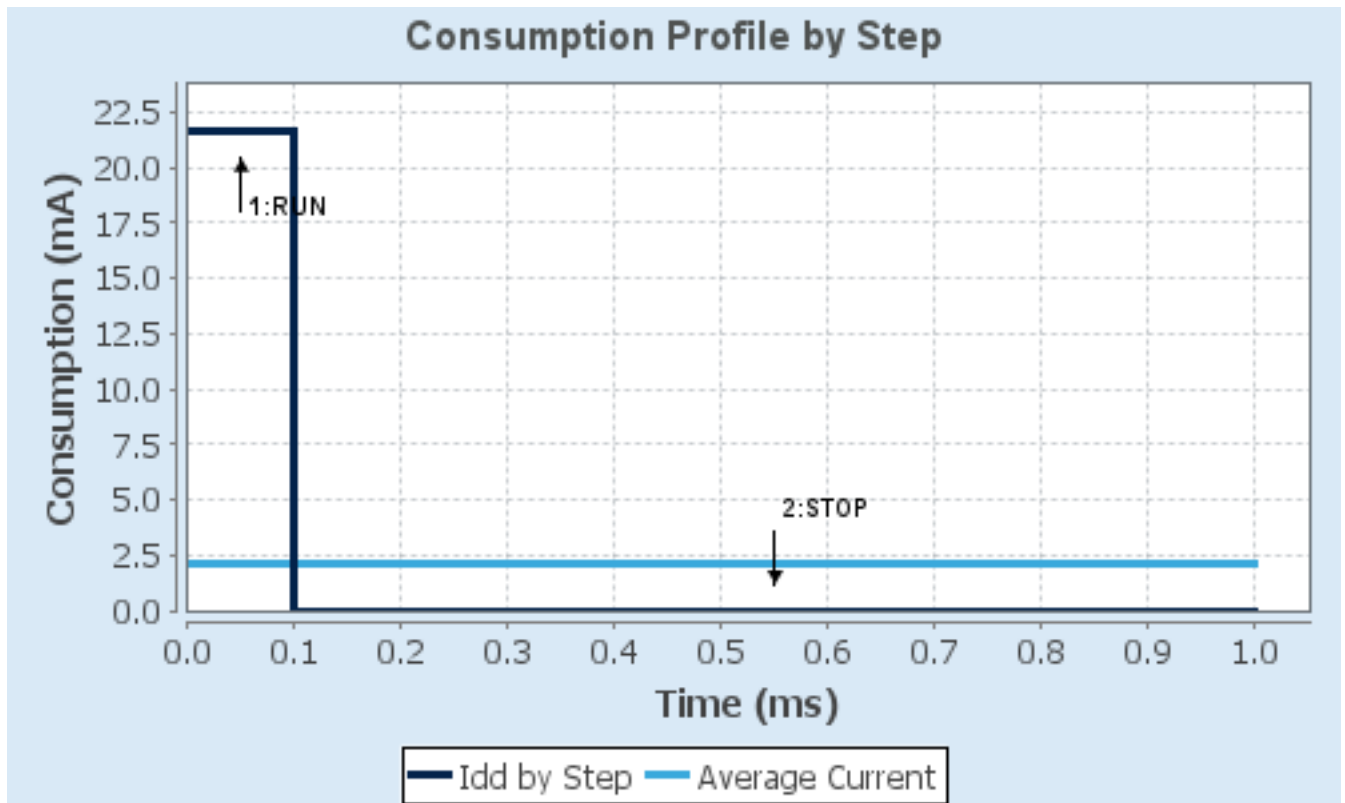
2. Software Project

2.1. Project Settings

Name	Value
Project Name	TFT_touch_xpt2046_calib
Project Folder	D:\TAI_LIEU\20241\AI_and_App\HandWritingRecognition_on_STM32\Impliment_
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_F4 V1.28.1
Application Structure	Advanced
Generate Under Root	Yes
Do not generate the main()	No
Minimum Heap Size	0x200
Minimum Stack Size	0x400

2.2. Code Generation Settings

Name	Value
STM32Cube MCU packages and embedded software	Copy only the necessary library files
Generate peripheral initialization as a pair of '.c/.h' files	No
Backup previously generated files when re-generating	No
Keep User Code when re-generating	Yes
Delete previously generated files when not re-generated	Yes
Set all free pins as analog (to optimize the power consumption)	No
Enable Full Assert	No

2.3. Advanced Settings - Generated Function Calls

Rank	Function Name	Peripheral Instance Name
1	SystemClock_Config	RCC
2	MX_GPIO_Init	GPIO
3	MX_DMA_Init	DMA
4	MX_SPI1_Init	SPI1
5	MX_SPI2_Init	SPI2

3. Peripherals and Middlewares Configuration

3.1. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

3.1.1. Parameter Settings:

System Parameters:

VDD voltage (V)	3.3
Instruction Cache	Enabled
Prefetch Buffer	Enabled
Data Cache	Enabled
Flash Latency(WS)	2 WS (3 CPU cycle)

RCC Parameters:

HSI Calibration Value	16
TIM Prescaler Selection	Disabled
HSE Startup Timout Value (ms)	100
LSE Startup Timout Value (ms)	5000

Power Parameters:

Power Regulator Voltage Scale	Power Regulator Voltage Scale 2

3.2. SPI1

Mode: Full-Duplex Master

3.2.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	**4 ***
Clock Polarity (CPOL)	**High ***
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

3.3. SPI2
Mode: Full-Duplex Master

3.3.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	**16 Bits ***
First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	**8 ***
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

3.4. SYS
Debug: Serial Wire
Timebase Source: SysTick

* User modified value

4. System Configuration

4.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
RCC	PH0 - OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	
	PH1 - OSC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	
SPI1	PA5	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	
	PA6	SPI1_MISO	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	
	PA7	SPI1_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	
SPI2	PB10	SPI2_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	
	PB14	SPI2_MISO	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	
	PB15	SPI2_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
GPIO	PA1	GPIO_Output	**Output Open Drain ***	No pull-up and no pull-down	**High ***	ST7789_DC
	PA3	GPIO_Output	**Output Open Drain ***	No pull-up and no pull-down	**High ***	ST7789_RST
	PA4	GPIO_Output	**Output Open Drain ***	No pull-up and no pull-down	**High ***	ST7789_CS
	PB1	GPIO_EXTI1	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	**n/a**	T_IRQ
	PB12	GPIO_Output	**Output Open Drain ***	No pull-up and no pull-down	**Very High** *	T_CS

4.2. DMA configuration

DMA request	Stream	Direction	Priority
SPI1_TX	DMA2_Stream3	Memory To Peripheral	Low

SPI1_TX: DMA2_Stream3 DMA request Settings:

Mode:	Normal
Use fifo:	Disable
Peripheral Increment:	Disable
Memory Increment:	**Enable ***
Peripheral Data Width:	Byte
Memory Data Width:	Byte

4.3. NVIC configuration

4.3.1. NVIC

Interrupt Table	Enable	Preenmption Priority	SubPriority
Non maskable interrupt	true	0	0
Hard fault interrupt	true	0	0
Memory management fault	true	0	0
Pre-fetch fault, memory access fault	true	0	0
Undefined instruction or illegal state	true	0	0
System service call via SWI instruction	true	0	0
Debug monitor	true	0	0
Pendable request for system service	true	0	0
System tick timer	true	15	0
DMA2 stream3 global interrupt	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
EXTI line1 interrupt	unused		
SPI1 global interrupt	unused		
SPI2 global interrupt	unused		
FPU global interrupt	unused		

4.3.2. NVIC Code generation

Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
Non maskable interrupt	false	true	false
Hard fault interrupt	false	true	false
Memory management fault	false	true	false
Pre-fetch fault, memory access fault	false	true	false
Undefined instruction or illegal state	false	true	false
System service call via SWI instruction	false	true	false
Debug monitor	false	true	false
Pendable request for system service	false	true	false
System tick timer	false	true	true
DMA2 stream3 global interrupt	false	true	true

* User modified value

5. System Views

5.1. Category view

5.1.1. Current

6. Docs & Resources

Type	Link
BSDL files	https://www.st.com/resource/en/bsdl_model/stm32f401_bsdl.zip
IBIS models	https://www.st.com/resource/en/ibis_model/stm32f401_ibis.zip
System View Description	https://www.st.com/resource/en/svd/stm32f4-svd.zip
Presentations	https://www.st.com/resource/en/product_presentation/stm32-stm8_embedded_software_solutions.pdf
Presentations	https://www.st.com/resource/en/product_presentation/stm32_eval-tools_portfolio.pdf
Presentations	https://www.st.com/resource/en/product_presentation/stm32_stm8_functional-safety-packages.pdf
Presentations	https://www.st.com/resource/en/product_presentation/stm32-stm8_software_development_tools.pdf
Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers-stm32-family-overview.pdf
Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers-stm32h7rs-lines-overview.pdf
Brochures	https://www.st.com/resource/en/brochure/products-and-solutions-for-plcs-and-smart-i-os.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32f4x1.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32nucleo.pdf
Flyers	https://www.st.com/resource/en/flyer/flstmcsuite.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32trust.pdf
Product Certifications	https://www.st.com/resource/en/certification_document/stm32_authentication_can.pdf
Application Notes	https://www.st.com/resource/en/application_note/an1709-emc-design-guide-for-stm8-stm32-and-legacy-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an2606-stm32-microcontroller-system-memory-boot-mode-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an2639-soldering-

recommendations-and-package-information-for-leadfree-ecopack-mcus-
and-mpus-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an2945-stm8s-and-
stm32-mcus-a-consistent-832bit-product-line-for-painless-migration-
stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an3070-managing-the-
driver-enable-signal-for-rs485-and-iolink-communications-with-the-
stm32s-usart-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an3126-audio-and-
waveform-generation-using-the-dac-in-stm32-products-
stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an3154-can-protocol-
used-in-the-stm32-bootloader-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an3155-usart-protocol-
used-in-the-stm32-bootloader-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an3156-usb-dfu-
protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an3364-migration-and-
compatibility-guidelines-for-stm32-microcontroller-applications-
stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an3997-audio-playback-
and-recording-using-the-stm32f4discovery-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an3998-pdm-audio-
software-decoding-on-stm32-microcontrollers-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4031-using-the-
stm32f2-stm32f4-and-stm32f7-series-dma-controller-
stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4221-i2c-protocol-
used-in-the-stm32-bootloader-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4286-spi-protocol-
used-in-the-stm32-bootloader-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4488-getting-started-
with-stm32f4xxxx-mcu-hardware-development-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an4566-extending-the-dac-performance-of-stm32-microcontrollers-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an4616-migrating-from-stm32f401-and-stm32f411-lines-to-stm32l4-series-and-stm32l4-series-microcontrollers-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an4646-peripheral-interconnections-on-stm32f401-and-stm32f411-lines-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an4655-virtually-increasing-the-number-of-serial-communication-peripherals-in-stm32-applications-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an4739-stm32cube-firmware-examples-for-stm32f4-series-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an4750-handling-of-soft-errors-in-stm32-applications-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an4776-generalpurpose-timer-cookbook-for-stm32-microcontrollers-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an4803-highspeed-si-simulations-using-ibis-and-boardlevel-simulations-using-hyperlynx-si-on-stm32-mcus-and-mpus-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an4850-stm32-mcus-spreadspectrum-clock-generation-principles-properties-and-implementation-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an4904-migration-of-microcontroller-applications-from-stm32f1-series-to-stm32f4-access-lines-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an4989-stm32-microcontroller-debug-toolbox-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an4995-using-an-electromyogram-technique-to-detect-muscle-activity-stmicroelectronics.pdf

Application Notes   https://www.st.com/resource/en/application_note/an5027-interfacing-pdm-digital-microphones-using-stm32-mcus-and-mpus-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an5073-receiving-spdif-
audio-stream-with-the-stm32f4f7h7-series-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4899-stm32-
microcontroller-gpio-hardware-settings-and-lowpower-consumption-
stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an5612-esd-protection-
of-stm32-mcus-and-mpus-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4838-introduction-to-
memory-protection-unit-management-on-stm32-mcus-
stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an5852-migrating-from-
stm32f401-stm32f410-and-stm32f411-to-stm32h503-mcus-
stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4879-introduction-to-
usb-hardware-and-pcb-guidelines-using-stm32-mcus-
stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an5225-introduction-to-
usb-typec-power-delivery-for-stm32-mcus-and-mpus-
stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an2834-how-to-
optimize-the-adc-accuracy-in-the-stm32-mcus-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an5537-how-to-use-adc-
oversampling-techniques-to-improve-signaltonoise-ratio-on-stm32-mcus-
stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an5036-guidelines-for-
thermal-management-on-stm32-applications-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4230-introduction-to-
random-number-generation-validation-using-the-nist-statistical-test-suite-
for-stm32-mcus-and-mpus-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an2867-guidelines-for-
oscillator-design-on-stm8afals-and-stm32-mcusmpus-
stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4013-introduction-to-
timers-for-stm32-mcus-stmicroelectronics.pdf

Application Notes	https://www.st.com/resource/en/application_note/an4277-how-to-use-pwm-shutdown-for-motor-control-and-digital-power-conversion-on-stm32-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4759-introduction-to-using-the-hardware-realtime-clock-rtc-and-the-tamper-management-unit-tamp-with-stm32-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4908-getting-started-with-usart-automatic-baud-rater-detection-for-stm32-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an5156-introduction-to-security-for-stm32-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an5543-guidelines-for-enhanced-spi-communication-on-stm32-mcus-and-mpus-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an1202_freertos_guide-freertos-guide-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an1602_semihosting_in_truestudio-how-to-do-semihosting-in-truestudio-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an1801_stm32cubeprogrammer_in_truestudio-installing-stm32cubeprogrammer-in-truestudio-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/atollic_editing_keyboard_shortcuts-atollic-editing-keyboard-shortcuts-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/iar_to_atollic_truestudio_migration_guide-truestudio-for-arm-migration-guide-iar-embedded-workbench-to-truestudio-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/stm32cubemx_installation_in_truestudio-stm32cubemx-installation-in-truestudio-stmicroelectronics.pdf
Application Notes for related Tools	https://www.st.com/resource/en/application_note/an2656-stm32f10xxx-lcd-glass-driver-firmware-stmicroelectronics.pdf

& Software

Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an2790-tft-lcd-interfacing-with-the-highdensity-stm32f10xxx-fsmc-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an3078-stm32-inapplication-programming-over-the-ic-bus-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an3116-stm32s-adc-modes-and-their-applications-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an3174-implementing-receivers-for-infrared-remote-control-protocols-using-stm32f10xxx-microcontrollers-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an3241-qvga-tftlcd-direct-drive-using-the-stm32f10xx-fsmc-peripheral-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an3307-guidelines-for-obtaining-iec-60335-class-b-certification-for-any-stm32-application-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an3965-stm32f40xstm32f41x-inapplication-programming-using-the-usart-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an3969-eeprom-emulation-in-stm32f40xstm32f41x-microcontrollers-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4044-floating-point-unit-demonstration-on-stm32-microcontrollers-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4323-getting-started-with-stemwin-library-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4365-using-stm32f4-mcu-power-modes-with-best-dynamic-efficiency-stmicroelectronics.pdf

Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4435-guidelines-for-obtaining-ulcsaiec-607301603351-class-b-certification-in-any-stm32-application-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4457-implementing-an-emulated-uart-on-stm32f4-microcontrollers-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4499-stm32--nrf51822-bluetooth-low-energy-system-solution-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4657-stm32-inapplication-programming-iap-using-the-usart-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4666-parallel-synchronous-transmission-using-gpio-and-dma-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4678-full-duplex-spi-emulation-for-stm32f4-microcontrollers-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4701-proprietary-code-readout-protection-on-microcontrollers-of-the-stm32f4-series-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4739-stm32cube-firmware-examples-for-stm32f4-series-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4758-proprietary-code-readout-protection-on-stm32l4-stm32l4-stm32g4-and-stm32wb-series-mcus-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4841-digital-signal-processing-for-stm32-microcontrollers-using-cmsis-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4968-proprietary-code-read-out-protection-pcrop-on-stm32f72xxx-and-stm32f73xxx-microcontrollers-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an5056-integration-

for related Tools & Software	guide-for-the-xcubesbsfu-stm32cube-expansion-package-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5360-getting-started-with-projects-based-on-the-stm32mp1-series-in-stm32cubeide-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5361-getting-started-with-projects-based-on-dualcore-stm32h7-microcontrollers-in-stm32cubeide-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5394-getting-started-with-projects-based-on-the-stm32l5-series-in-stm32cubeide-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5418-how-to-build-a-simple-usbpd-sink-application-with-stm32cubemx-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5426-migrating-graphics-middleware-projects-from-stm32cubemx-540-to-stm32cubemx-550-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5464-position-control-of-a-threephase-permanent-magnet-motor-using-xcubemcsdk-or-xcubemcsdkful-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5564-getting-started-with-projects-based-on-dualcore-stm32wl-microcontrollers-in-stm32cubeide-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5698-adapting-the-xcubestl-functional-safety-package-for-stm32-iec-61508-compliant-to-other-safety-standards-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5731-stm32cubemx-and-stm32cubeide-threadsafe-solution-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4502-stm32-smbuspmbus-expansion-package-for-stm32cube-stmicroelectronics.pdf
Application Notes for related Tools	https://www.st.com/resource/en/application_note/an5952-how-to-use-cmake-in-stm32cubeide-stmicroelectronics.pdf

& Software	
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5054-how-to-perform-secure-programming-using-stm32cubeprogrammer-stmicroelectronics.pdf
Errata Sheets	https://www.st.com/resource/en/errata_sheet/es0299-stm32f401xd-and-stm32f401xe-device-errata-stmicroelectronics.pdf
Datasheet	https://www.st.com/resource/en/datasheet/dm00102166.pdf
Programming Manuals	https://www.st.com/resource/en/programming_manual/pm0214-stm32-cortexm4-mcus-and-mpus-programming-manual-stmicroelectronics.pdf
Reference Manuals	https://www.st.com/resource/en/reference_manual/rm0368-stm32f401xbc-and-stm32f401xde-advanced-armbased-32bit-mcus-stmicroelectronics.pdf
Technical Notes & Articles	https://www.st.com/resource/en/technical_note/tn0516-overview-of-the-stm32f0xf100xxf103xx-and-stm32f2xxf30xf4xx-mcus-pmsm-singledual-foc-sdk-v40-stmicroelectronics.pdf
Technical Notes & Articles	https://www.st.com/resource/en/technical_note/tn1163-description-of-wlcsp-for-microcontrollers-and-recommendations-for-its-use-stmicroelectronics.pdf
Technical Notes & Articles	https://www.st.com/resource/en/technical_note/tn1204-tape-and-reel-shipping-media-for-stm32-microcontrollers-in-bga-packages-stmicroelectronics.pdf
Technical Notes & Articles	https://www.st.com/resource/en/technical_note/tn1205-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-fpn-packages-stmicroelectronics.pdf
Technical Notes & Articles	https://www.st.com/resource/en/technical_note/tn1206-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-qfp-packages-stmicroelectronics.pdf
Technical Notes & Articles	https://www.st.com/resource/en/technical_note/tn1207-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-so-packages-stmicroelectronics.pdf
Technical Notes & Articles	https://www.st.com/resource/en/technical_note/tn1208-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-tssop-and-ssop-packages-stmicroelectronics.pdf

| Technical Notes & Articles | https://www.st.com/resource/en/technical_note/tn1433-reference-device-marking-schematics-for-stm32-microcontrollers-and-microprocessors-stmicroelectronics.pdf |
| Technical Notes & Articles | https://www.st.com/resource/en/technical_note/tn1489-security-bulletin-tn1489stpsirt-physical-attacks-on-stm32-and-stm32cube-firmware-stmicroelectronics.pdf |