
STM32
CubeMX

1. Description

1.1. Project

Project Name	srprojekt
Board Name	custom
Generated with:	STM32CubeMX 6.15.0
Date	10/26/2025

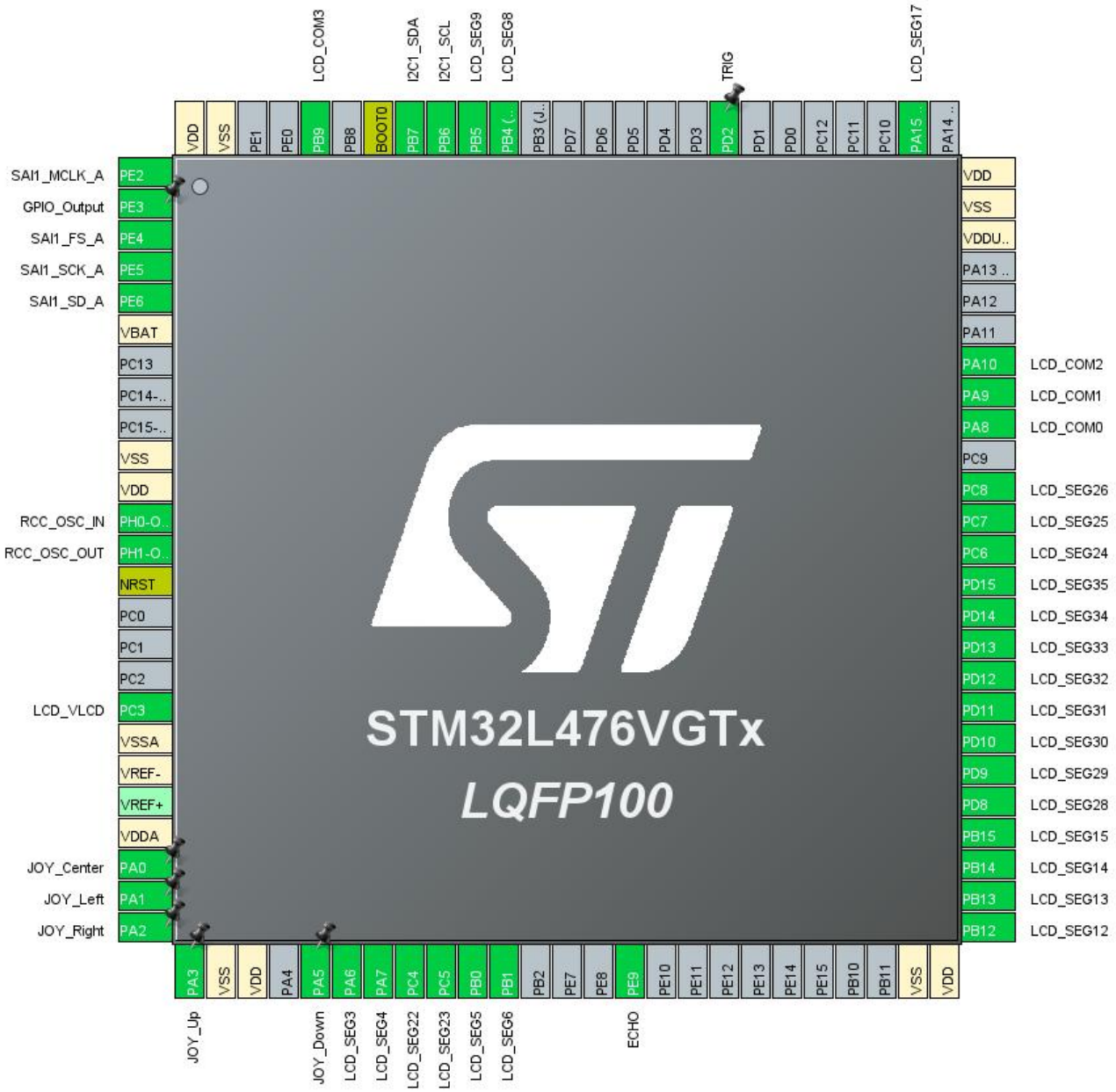
1.2. MCU

MCU Series	STM32L4
MCU Line	STM32L4x6
MCU name	STM32L476VGTx
MCU Package	LQFP100
MCU Pin number	100

1.3. Core(s) information

Core(s)	Arm Cortex-M4

2. Pinout Configuration



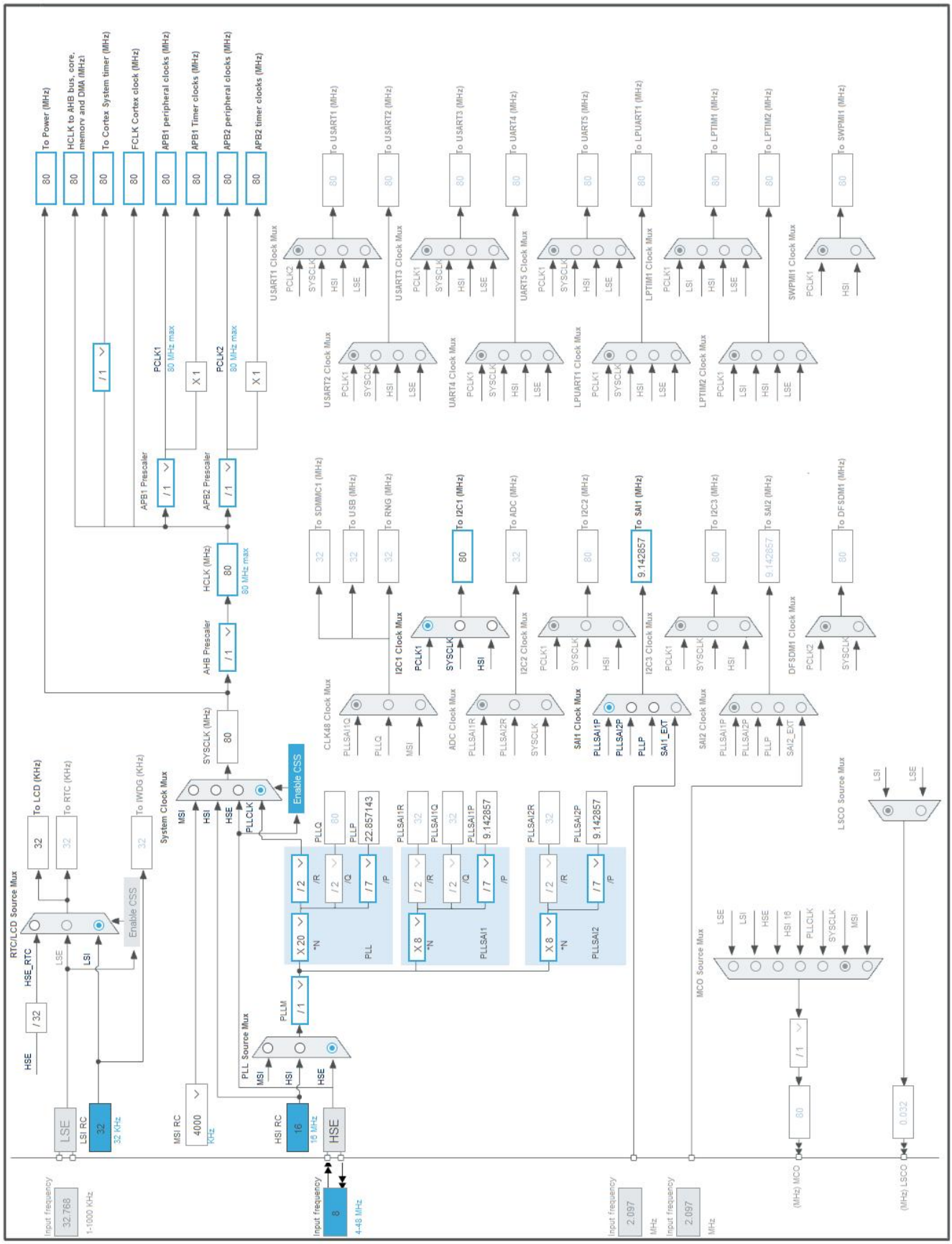
3. Pins Configuration

Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	PE2	I/O	SAI1_MCLK_A	
2	PE3 *	I/O	GPIO_Output	
3	PE4	I/O	SAI1_FS_A	
4	PE5	I/O	SAI1_SCK_A	
5	PE6	I/O	SAI1_SD_A	
6	VBAT	Power		
10	VSS	Power		
11	VDD	Power		
12	PH0-OSC_IN (PH0)	I/O	RCC_OSC_IN	
13	PH1-OSC_OUT (PH1)	I/O	RCC_OSC_OUT	
14	NRST	Reset		
18	PC3	I/O	LCD_VLCD	
19	VSSA	Power		
20	VREF-	Power		
22	VDDA	Power		
23	PA0 *	I/O	GPIO_Input	JOY_Center
24	PA1 *	I/O	GPIO_Input	JOY_Left
25	PA2 *	I/O	GPIO_Input	JOY_Right
26	PA3 *	I/O	GPIO_Input	JOY_Up
27	VSS	Power		
28	VDD	Power		
30	PA5 *	I/O	GPIO_Input	JOY_Down
31	PA6	I/O	LCD_SEG3	
32	PA7	I/O	LCD_SEG4	
33	PC4	I/O	LCD_SEG22	
34	PC5	I/O	LCD_SEG23	
35	PB0	I/O	LCD_SEG5	
36	PB1	I/O	LCD_SEG6	
40	PE9	I/O	TIM1_CH1	ECHO
49	VSS	Power		
50	VDD	Power		
51	PB12	I/O	LCD_SEG12	
52	PB13	I/O	LCD_SEG13	
53	PB14	I/O	LCD_SEG14	
54	PB15	I/O	LCD_SEG15	
55	PD8	I/O	LCD_SEG28	

Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
56	PD9	I/O	LCD_SEG29	
57	PD10	I/O	LCD_SEG30	
58	PD11	I/O	LCD_SEG31	
59	PD12	I/O	LCD_SEG32	
60	PD13	I/O	LCD_SEG33	
61	PD14	I/O	LCD_SEG34	
62	PD15	I/O	LCD_SEG35	
63	PC6	I/O	LCD_SEG24	
64	PC7	I/O	LCD_SEG25	
65	PC8	I/O	LCD_SEG26	
67	PA8	I/O	LCD_COM0	
68	PA9	I/O	LCD_COM1	
69	PA10	I/O	LCD_COM2	
73	VDDUSB	Power		
74	VSS	Power		
75	VDD	Power		
77	PA15 (JTDI)	I/O	LCD_SEG17	
83	PD2 *	I/O	GPIO_Output	TRIG
90	PB4 (NJTRST)	I/O	LCD_SEG8	
91	PB5	I/O	LCD_SEG9	
92	PB6	I/O	I2C1_SCL	
93	PB7	I/O	I2C1_SDA	
94	BOOT0	Boot		
96	PB9	I/O	LCD_COM3	
99	VSS	Power		
100	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	STM32L4
Line	STM32L4x6
MCU	STM32L476VGTx
Datasheet	DS10198_Rev4

1.2. Parameter Selection

Temperature	25
Vdd	3.0

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

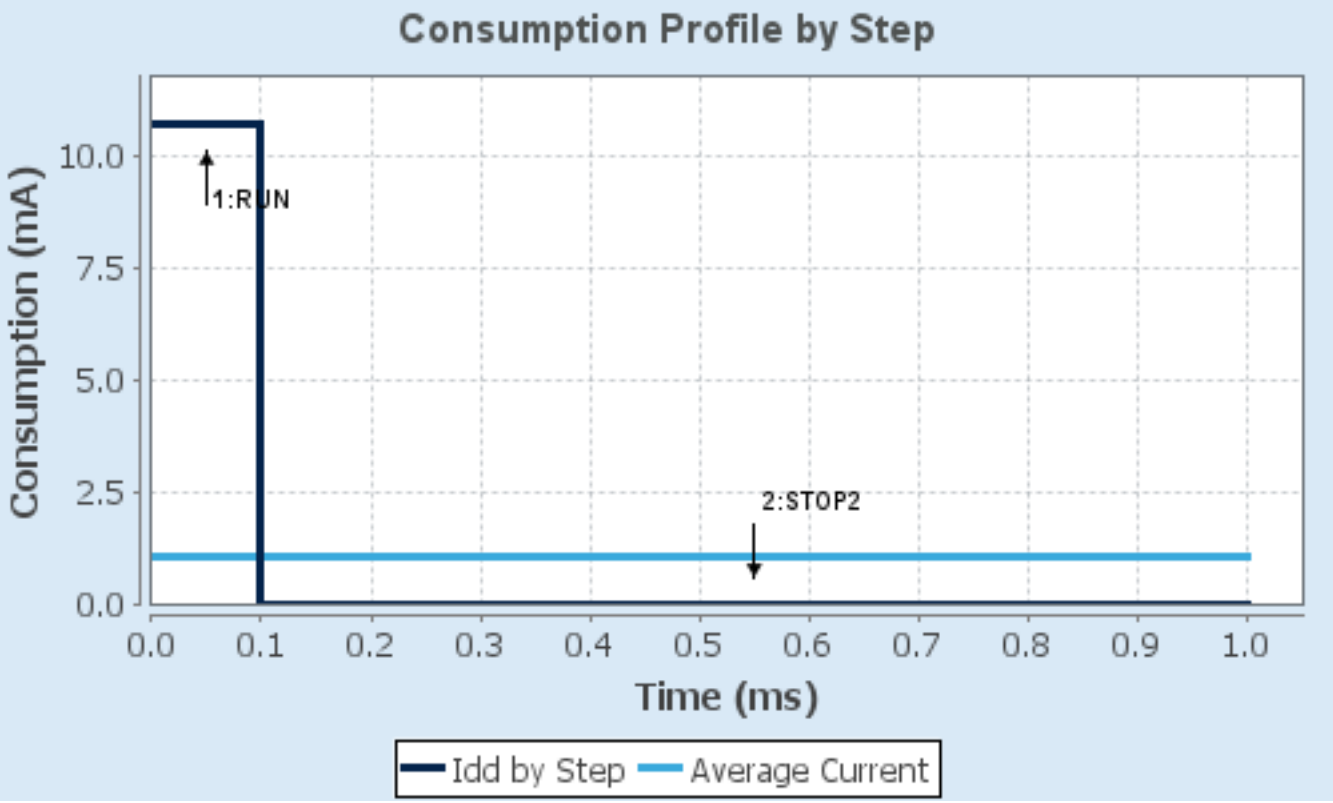
1.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP2
Vdd	3.0	3.0
Voltage Source	Battery	Battery
Range	Range1-High	NoRange
Fetch Type	SRAM2	n/a
CPU Frequency	80 MHz	0 Hz
Clock Configuration	HSE PLL	ALL CLOCKS OFF
Clock Source Frequency	4 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	10.7 mA	1.18 µA
Duration	0.1 ms	0.9 ms
DMIPS	100.0	0.0
Ta Max	103.65	105
Category	In DS Table	In DS Table

1.5. Results

Sequence Time	1 ms	Average Current	1.07 mA
Battery Life	4 months, 10 days, 3 hours	Average DMIPS	100.0 DMIPS

1.6. Chart


Consumption Profile by Step
Consumption (mA)
10.0
7.5
5.0
2.5
0.0
1:RUN
2:STOP2
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Time (ms)
Idd by Step
Average Current

2. Software Project

2.1. Project Settings

Name	Value
Project Name	srprojekt
Project Folder	C:\Users\Joanna Mazur\STM32CubeIDE\workspace_1.18.1\srprojekt
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_L4 V1.18.1
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	Yes
Backup previously generated files when re-generating	No
Keep User Code when re-generating	Yes
Delete previously generated files when not re-generated	No
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_I2C1_Init	I2C1
5	MX_SAI1_Init	SAI1
6	MX_TIM1_Init	TIM1
7	MX_LCD_Init	LCD

3. Peripherals and Middlewares Configuration

3.1. I2C1

I2C: I2C

3.1.1. Parameter Settings:

Timing configuration:

Custom Timing	Disabled
I2C Speed Mode	Standard Mode
I2C Speed Frequency (KHz)	100
Rise Time (ns)	100
Fall Time (ns)	100
Coefficient of Digital Filter	0
Analog Filter	Enabled
Timing	**0x10D19CE4 ***

Slave Features:

Clock No Stretch Mode	Disabled
General Call Address Detection	Disabled
Primary Address Length selection	7-bit
Dual Address Acknowledged	Disabled
Primary slave address	0

3.2. LCD

Mode: 1/4 Duty Cycle

mode: Multiplex Mode

mode: SEG3

mode: SEG4

mode: SEG5

mode: SEG6

mode: SEG8

mode: SEG9

mode: SEG12

mode: SEG13

mode: SEG14

mode: SEG15

mode: SEG17

mode: SEG22
mode: SEG23
mode: SEG24
mode: SEG25
mode: SEG26
mode: SEG28
mode: SEG29
mode: SEG30
mode: SEG31
mode: SEG32
mode: SEG33
mode: SEG34
mode: SEG35

3.2.1. Parameter Settings:

Clock Parameters:

Clock Prescaler	**16 ***
Clock Divider	**17 ***

Basic Parameters:

Duty Selection	1/4
Bias Selector	1/4
Multiplex mode	Enable

Advanced Parameters:

Voltage Source Selection	Internal
Contrast Control	2.60V
Dead Time Duration	No dead Time
High Drive	Disable
Pulse ON Duration	0 pulse
Blink Mode	Disabled
Blink Frequency	fLCD/8

3.3. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

3.3.1. Parameter Settings:

System Parameters:

VDD voltage (V)	3.3

Instruction Cache	Enabled
Prefetch Buffer	Disabled
Data Cache	Enabled
Flash Latency(WS)	4 WS (5 CPU cycle)

RCC Parameters:

HSI Calibration Value	16
MSI Calibration Value	0
MSI Auto Calibration	Disabled
HSE Startup Timout Value (ms)	100
LSE Startup Timout Value (ms)	5000

Power Parameters:

Power Regulator Voltage Scale	Power Regulator Voltage Scale 1

3.4. SAI1

Mode: Master with Master Clock Out

mode: I2S/PCM Protocol

3.4.1. Parameter Settings:

SAI A:

Synchronization Inputs	Asynchronous
Basic Parameters	
Audio Mode	Master Transmit
Output Mode	Stereo
Companding Mode	No companding mode
SAI SD Line Output Mode	Driven
Protocol Parameters	
Protocol	I2S Standard
Data Size	16 Bits
Number of Slots (only Even Values)	2
Clock Parameters	
Master Clock Divider	Enabled
Audio Frequency	**16 KHz ***
Real Audio Frequency	**17.857 KHz ***
Error between Selected	**11.6 % ***
Advanced Parameters	
Fifo Threshold	Empty
Output Drive	Disabled

3.5. SYS

Timebase Source: SysTick

3.6. TIM1

Channel1: Input Capture direct mode

3.6.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**80-1 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	65535
Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 16 bits value)	0
auto-reload preload	Disable

Trigger Output (TRGO) Parameters:

Master/Slave Mode (MSM bit)	Disable (Trigger input effect not delayed)
Trigger Event Selection TRGO	Reset (UG bit from TIMx_EGR)
Trigger Event Selection TRGO2	Reset (UG bit from TIMx_EGR)

Input Capture Channel 1:

Polarity Selection	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter (4 bits value)	0

*** User modified value**

4. System Configuration

4.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
I2C1	PB6	I2C1_SCL	Alternate Function Open Drain	No pull-up and no pull-down	**Very High ***	
	PB7	I2C1_SDA	Alternate Function Open Drain	No pull-up and no pull-down	**Very High ***	
LCD	PC3	LCD_VLCD	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA6	LCD_SEG3	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA7	LCD_SEG4	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PC4	LCD_SEG22	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PC5	LCD_SEG23	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PB0	LCD_SEG5	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PB1	LCD_SEG6	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PB12	LCD_SEG12	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PB13	LCD_SEG13	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PB14	LCD_SEG14	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PB15	LCD_SEG15	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PD8	LCD_SEG28	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PD9	LCD_SEG29	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PD10	LCD_SEG30	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PD11	LCD_SEG31	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PD12	LCD_SEG32	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PD13	LCD_SEG33	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PD14	LCD_SEG34	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PD15	LCD_SEG35	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PC6	LCD_SEG24	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PC7	LCD_SEG25	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PC8	LCD_SEG26	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA8	LCD_COM0	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA9	LCD_COM1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA10	LCD_COM2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA15 (JTDI)	LCD_SEG17	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PB4 (NJTRST)	LCD_SEG8	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PB5	LCD_SEG9	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PB9	LCD_COM3	Alternate Function Push Pull	No pull-up and no pull-down	Low	
RCC	PH0-OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	(PH0)					
	PH1-OSC_OUT (PH1)	RCC_OSC_OUT	n/a	n/a	n/a	
SAI1	PE2	SAI1_MCLK_A	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PE4	SAI1_FS_A	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PE5	SAI1_SCK_A	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PE6	SAI1_SD_A	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM1	PE9	TIM1_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	ECHO
GPIO	PE3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PA0	GPIO_Input	Input mode	**Pull-down ***	n/a	JOY_Center
	PA1	GPIO_Input	Input mode	**Pull-down ***	n/a	JOY_Left
	PA2	GPIO_Input	Input mode	**Pull-down ***	n/a	JOY_Right
	PA3	GPIO_Input	Input mode	**Pull-down ***	n/a	JOY_Up
	PA5	GPIO_Input	Input mode	**Pull-down ***	n/a	JOY_Down
	PD2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	**High ***	TRIG

4.2. DMA configuration

DMA request	Stream	Direction	Priority
SAI1_A	DMA2_Channel1	Memory To Peripheral	**High ***

SAI1_A: DMA2_Channel1 DMA request Settings:

Mode:	**Circular ***
Peripheral Increment:	Disable
Memory Increment:	**Enable ***
Peripheral Data Width:	**Half Word ***
Memory Data Width:	**Half Word ***

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
Prefetch 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
TIM1 capture compare interrupt	true	0	0
DMA2 channel1 global interrupt	true	0	0
PVD/PVM1/PVM2/PVM3/PVM4 interrupts through EXTI lines 16/35/36/37/38	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
TIM1 break interrupt and TIM15 global interrupt	unused		
TIM1 update interrupt and TIM16 global interrupt	unused		
TIM1 trigger and commutation interrupts and TIM17 global interrupt	unused		
I2C1 event interrupt	unused		
I2C1 error interrupt	unused		
SAI1 global interrupt	unused		
LCD 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
Prefetch 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

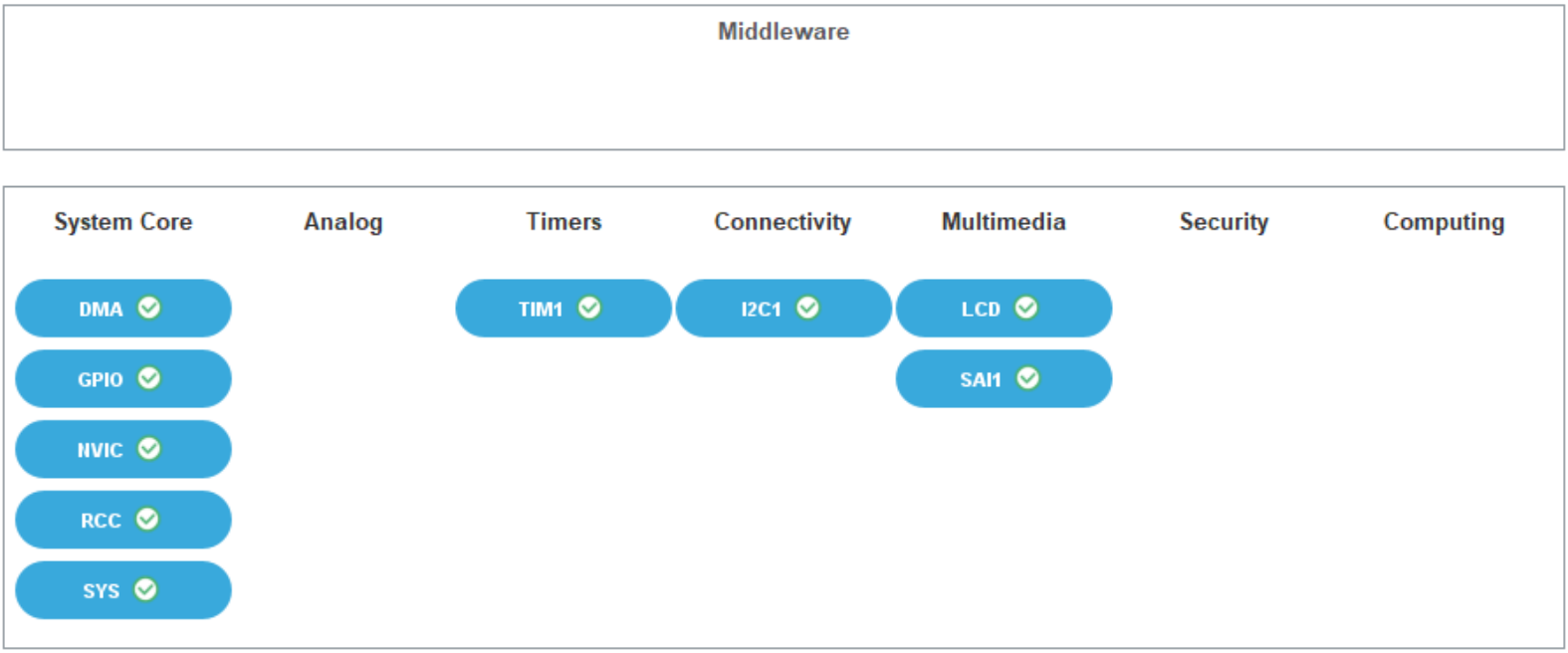
Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
TIM1 capture compare interrupt	false	true	true
DMA2 channel1 global interrupt	false	true	true

*** 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/stm32l4_bsdl.zip
IBIS models	https://www.st.com/resource/en/ibis_model/stm32l4_ibis.zip
System View Description	https://www.st.com/resource/en/svd/stm32l4_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-stm32l4-series-product-overview.pdf
Brochures	https://www.st.com/resource/en/brochure/brstm32ulp.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32l4.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32nucleo.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32trust.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32gui.pdf
Magazine Articles	https://www.st.com/resource/en/magazine/design-elektronik_august2017.pdf
Magazine Articles	https://www.st.com/resource/en/magazine/design-elektronik_october2016.pdf
Product Certifications	https://www.st.com/resource/en/certification_document/sesip-2000002-01-cert.pdf
Product Certifications	https://www.st.com/resource/en/certification_document/sesip-2000002-01-st2.pdf

Product Certifications	https://www.st.com/resource/en/certification_document/psa-certificate_stm32l4.pdf
Security Bulletin	https://www.st.com/resource/en/technical_note/tn1489-security-bulletin-tn1489stpsirt-physical-attacks-on-stm32-and-stm32cube-firmware-stmicroelectronics.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/an3126-audio-and-waveform-generation-using-the-dac-in-stm32-products-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/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/an4555-getting-started-with-stm32l4-series-and-stm32l4-series-hardware-development-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4612-migrating-from-stm32l1-series-to-stm32l4-series-and-stm32l4-series-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/an4621-stm32l4-and-stm32l4-ultralowpower-features-overview-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4629-adc-hardware-oversampling-for-microcontrollers-of-the-stm32-l0-and-l4-series-

	stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4649-migrating-from-stm32f1-series-to-stm32l4-series--stm32l4-series-microntrollers-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/an4726-stm32cube-firmware-examples-for-stm32l4-series-and-stm32l4-series-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4729-stm32l0l4-firewall-overview-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4730-using-the-firewall-embedded-in-stm32l0l4l4-series-mcus-for-secure-access-to-sensitive-parts-of-code-and-data-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4746-optimizing-power-and-performance-with-stm32l4-and-stm32l4-series-microcontrollers-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/an4754-migrating-between-stm32l486xx476xx-and-stm32l443xx433xx-microcontrollers-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4761-using-stm32l476486-fsmc-peripheral-to-drive-external-memories--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/an4809-migrating-between-stm32l0-series-and-stm32l4-series--stm32l4-series-microcontrollers-stmicroelectronics.pdf

Application Notes	https://www.st.com/resource/en/application_note/an4821-migrating-from-stm32f405415-line-and-stm32f407417-line-to-stm32l4-series-and-stm32l4-series-microcontrollers-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4822-migrating-between-stm32l476xx486xx-and-stm32l496xx4a6xx-microcontrollers-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4831-migrating-from-stm32f2x5-line-to-stm32l4-series-and-stm32l4-series-microcontrollers-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4832-migrating-from-stm32f303-line-to-stm32l4-series-and-stm32l4-series-microcontrollers-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/an4990-getting-started-with-sigmadelta-digital-interface-on-applicable-stm32-microcontrollers-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/an5012-analogtodigital-audio-conversion-example-using-stm32l4-series-microcontroller-peripherals-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an5017-migrating-between-stm32l476xx486xx-and-stm32l4-series-microcontrollers-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/an5138-migrating-from-stm32l4-and-stm32l4-to-stm32l5-series-microcontrollers-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4760-quadspi-interface-on-stm32-microcontrollers-and-microprocessors--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/an4991-how-to-wake-up-an-stm32-microcontroller-from-lowpower-mode-with-the-usart-or-the-lpuart-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/an4879-introduction-to-usb-hardware-and-pcb-guidelines-using-stm32-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an5372-migrating-from-stm32l4-and-stm32l4--to-stm32u5-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/an4777-how-to-optimize-power-consumption-on-stm32-mcus-stmicroelectronics.pdf
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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
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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/an2548-introduction-to-dma-controller-for-stm32-mcus-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/an3236-how-to-increase-the-number-of-touchkeys-for-touch-sensing-applications-on-stm32-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an3960-guidelines-for-esd-for-touch-sensing-applications-on-stm32-mcus-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/an4299-how-to-improve-conducted-noise-robustness-for-touch-sensing-applications-on-stm32-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4310-how-to-choose-the-sampling-capacitor-for-touch-sensing-applications-on-stm32-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4312-how-to-design-surface-sensors-for-touch-sensing-applications-on-stm32-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4316-how-to-tune-touch-sensing-applications-on-stm32-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4635-how-to-optimize-lpuart-power-consumption-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/an4943-how-to-use-chromart-accelerator-to-refresh-an-lcdtft-display-on-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	https://www.st.com/resource/en/application_note/cd00211314-how-to-optimize-the-adc-accuracy-in-the-stm32-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an2639-soldering-recommendations-and-package-information-for-leadfree-ecopack2-mcus-and-mpus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an5020-introduction-to-digital-camera-interface-dcmi-for-stm32-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an3154-how-to-use-can-protocol-in-bootloader-on-stm32-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an6099-migrating-from-stm32l4-to-stm32u0-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4566-how-to-extend-the-dac-performance-on-stm32-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an5105-getting-started-with-touch-sensing-control-on-stm32-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an5408-migrating-from-stm32l0-stm32l1-and-stm32l4-series-associated-with-sx12xx-transceiver-to-stm32wl5xex-microcontrollers-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an6051-migrating-from-stm32l4-and-stm32l4-to-stm32u3-mcus-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	https://www.st.com/resource/en/application_note/an4323-getting-started-

for related Tools & Software	with-stemwin-library-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/an4631-how-to-calibrate-an-stm32l0xx-internal-rc-oscillator-stmicroelectronics.pdf
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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/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/an4726-stm32cube-firmware-examples-for-stm32l4-series-and-stm32l4-series-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4736-how-to-calibrate-stm32l4-series-microcontrollers-internal-rc-oscillator-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/an4767-onthefly-firmware-update-for-dual-bank-stm32-microcontrollers-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4834-implementation-of-transmitters-and-receivers-for-infrared-remote-control-protocols-with-stm32cube-stmicroelectronics.pdf
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& Software	
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 for related Tools & Software	https://www.st.com/resource/en/application_note/an5056-integration-guide-for-the-xcubesbsfu-stm32cube-expansion-package-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an5282-using-xcuberccalib-software-to-calibrate-stm32wb-series-internal-rc-oscillators-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/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/an4865-lowpower-timer-lptim-applicative-use-cases-on-stm32-mcus-and-mpus-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/an5857-using-xcuberccalib-software-to-calibrate-stm32c0-series-internal-rc-oscillator-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
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Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4894-how-to-use-eeprom-emulation-on-stm32-mcus-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4635-how-to-optimize-lpuart-power-consumption-on-stm32-mcus-stmicroelectronics.pdf
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Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an6179-how-to-integrate-the-stl-firmware-into-a-time-critical-user-application-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an6202-how-to-calibrate-internal-rc-oscillators-on-stm32h5-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an5676-how-to-

for related Tools & Software	calibrate-internal-rc-oscillators-on-stm32u3-and-stm32u5-series-mcus-stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an6127-getting-started-with-stm32h7rx7sx-mcus-in-stm32cubeide-stmicroelectronics.pdf
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	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
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