



1. Description

1.1. Project

| | |
|-----------------|----------------------|
| Project Name | Application_Firmware |
| Board Name | custom |
| Generated with: | STM32CubeMX 6.6.1 |
| Date | 01/30/2024 |

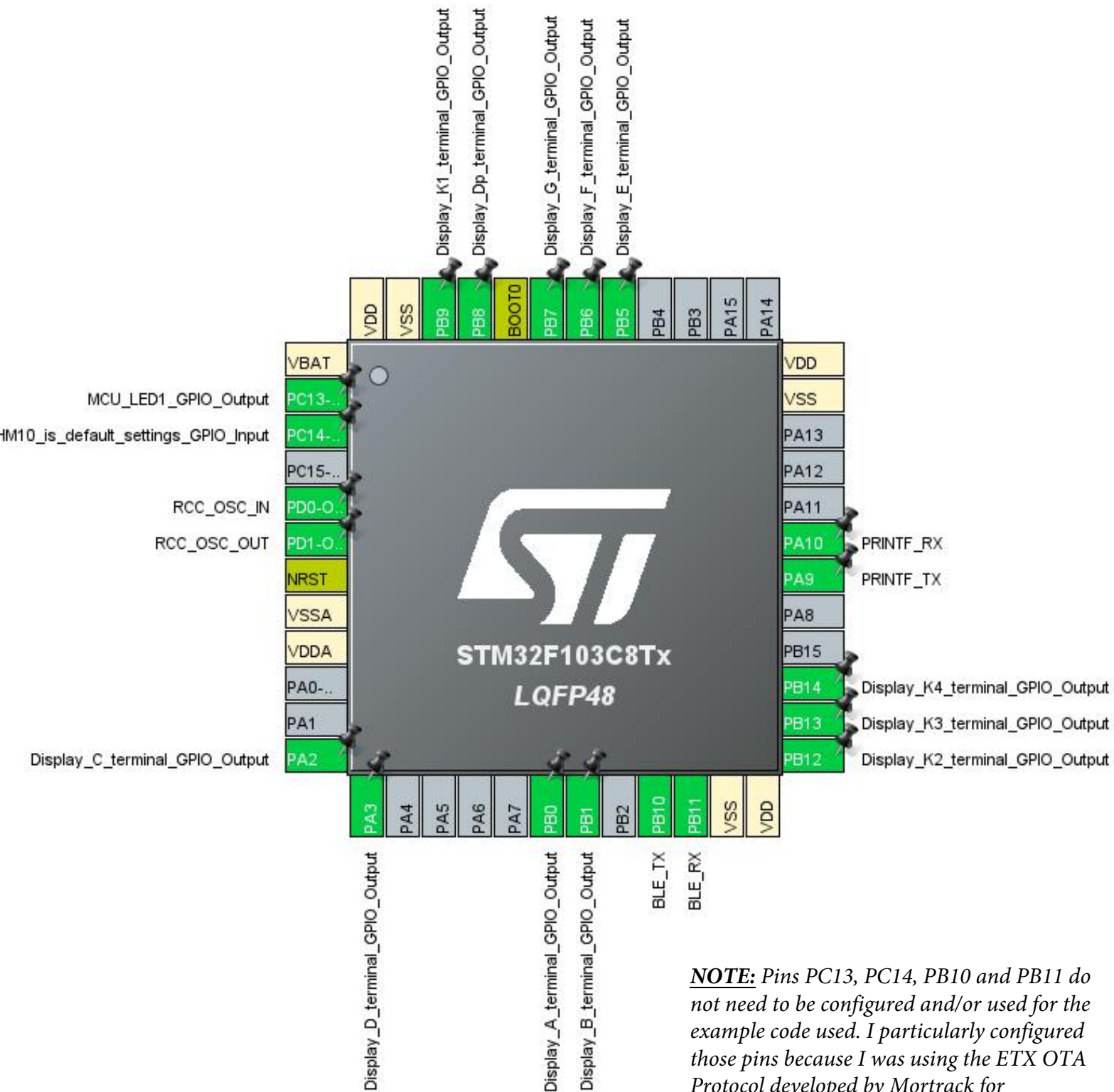
1.2. MCU

| | |
|----------------|---------------|
| MCU Series | STM32F1 |
| MCU Line | STM32F103 |
| MCU name | STM32F103C8Tx |
| MCU Package | LQFP48 |
| MCU Pin number | 48 |

1.3. Core(s) information

| | |
|---------|---------------|
| Core(s) | Arm Cortex-M3 |
|---------|---------------|

2. Pinout Configuration



NOTE: Pins PC13, PC14, PB10 and PB11 do not need to be configured and/or used for the example code used. I particularly configured those pins because I was using the ETX OTA Protocol developed by Mortrack for Firmware Updates in the MCU that I used for the code example, but nothing more.

3. Pins Configuration

| Pin Number LQFP48 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|----------------------|---------------------------------------|----------|--------------------------|---|
| 1 | VBAT | Power | | |
| 2 | PC13-TAMPER-RTC * | I/O | GPIO_Output | MCU_LED1_GPIO_Output |
| 3 | PC14-OSC32_IN * | I/O | GPIO_Input | HM10_is_default_settings_ GPIO_Input |
| 5 | PD0-OSC_IN | I/O | RCC_OSC_IN | |
| 6 | PD1-OSC_OUT | I/O | RCC_OSC_OUT | |
| 7 | NRST | Reset | | |
| 8 | VSSA | Power | | |
| 9 | VDDA | Power | | |
| 12 | PA2 * | I/O | GPIO_Output | Display_C_terminal_GPIO_ Output |
| 13 | PA3 * | I/O | GPIO_Output | Display_D_terminal_GPIO_ Output |
| 18 | PB0 * | I/O | GPIO_Output | Display_A_terminal_GPIO_ Output |
| 19 | PB1 * | I/O | GPIO_Output | Display_B_terminal_GPIO_ Output |
| 21 | PB10 | I/O | USART3_TX | BLE_TX |
| 22 | PB11 | I/O | USART3_RX | BLE_RX |
| 23 | VSS | Power | | |
| 24 | VDD | Power | | |
| 25 | PB12 * | I/O | GPIO_Output | Display_K2_terminal_GPIO_ Output |
| 26 | PB13 * | I/O | GPIO_Output | Display_K3_terminal_GPIO_ Output |
| 27 | PB14 * | I/O | GPIO_Output | Display_K4_terminal_GPIO_ Output |
| 30 | PA9 | I/O | USART1_TX | PRINTF_TX |
| 31 | PA10 | I/O | USART1_RX | PRINTF_RX |
| 35 | VSS | Power | | |
| 36 | VDD | Power | | |
| 41 | PB5 * | I/O | GPIO_Output | Display_E_terminal_GPIO_ Output |
| 42 | PB6 * | I/O | GPIO_Output | Display_F_terminal_GPIO_ Output |
| 43 | PB7 * | I/O | GPIO_Output | Display_G_terminal_GPIO_ Output |
| 44 | BOOT0 | Boot | | |

| Pin Number LQFP48 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|----------------------|---------------------------------------|----------|--------------------------|-------------------------------------|
| 45 | PB8 * | I/O | GPIO_Output | Display_Dp_terminal_GPIO _Output |
| 46 | PB9 * | I/O | GPIO_Output | Display_K1_terminal_GPIO_ Output |
| 47 | VSS | Power | | |
| 48 | VDD | Power | | |

* The pin is affected with an I/O function

5. Software Project

5.1. Project Settings

| Name | Value |
|-----------------------------------|---|
| Project Name | Application_Firmware |
| Project Folder | C:\Users\cmira\OneDrive\Escritorio\GitHub\MTKATR001_ambient_temperature_r |
| Toolchain / IDE | STM32CubeIDE |
| Firmware Package Name and Version | STM32Cube FW_F1 V1.8.5 |
| Application Structure | Advanced |
| Generate Under Root | Yes |
| Do not generate the main() | No |
| Minimum Heap Size | 0x200 |
| Minimum Stack Size | 0x400 |

5.2. 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 |

5.3. Advanced Settings - Generated Function Calls

| Rank | Function Name | Peripheral Instance Name |
|------|---------------------|--------------------------|
| 1 | SystemClock_Config | RCC |
| 2 | MX_GPIO_Init | GPIO |
| 3 | MX_USART1_UART_Init | USART1 |
| 4 | MX_USART3_UART_Init | USART3 |
| 5 | MX_TIM2_Init | TIM2 |

7. Peripherals and Middlewares Configuration

7.1. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

7.1.1. Parameter Settings:

System Parameters:

| | |
|-------------------|--------------------|
| VDD voltage (V) | 3.3 |
| Prefetch Buffer | Enabled |
| Flash Latency(WS) | 0 WS (1 CPU cycle) |

RCC Parameters:

| | |
|--------------------------------|------|
| HSI Calibration Value | 16 |
| HSE Startup Timeout Value (ms) | 100 |
| LSE Startup Timeout Value (ms) | 5000 |

7.2. SYS

Debug: No Debug

Timebase Source: SysTick

7.3. TIM2

Clock Source : Internal Clock

7.3.1. Parameter Settings:

Counter Settings:

| | |
|---|--------------|
| Prescaler (PSC - 16 bits value) | 0 |
| Counter Mode | Up |
| Counter Period (AutoReload Register - 16 bits value) | 416 * |
| Internal Clock Division (CKD) | No Division |
| auto-reload preload | Disable |

Trigger Output (TRGO) Parameters:

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

7.4. USART1

Mode: Asynchronous

7.4.1. Parameter Settings:

Basic Parameters:

| | |
|-------------|---------------------------|
| Baud Rate | 115200 |
| Word Length | 8 Bits (including Parity) |
| Parity | None |
| Stop Bits | 1 |

Advanced Parameters:

| | |
|----------------|----------------------|
| Data Direction | Receive and Transmit |
| Over Sampling | 16 Samples |

7.5. USART3

Mode: Asynchronous

7.5.1. Parameter Settings:

Basic Parameters:

| | |
|-------------|---------------------------|
| Baud Rate | 9600 * |
| Word Length | 8 Bits (including Parity) |
| Parity | None |
| Stop Bits | 1 |

Advanced Parameters:

| | |
|----------------|----------------------|
| Data Direction | Receive and Transmit |
| Over Sampling | 16 Samples |

*** User modified value**

8. System Configuration

8.1. GPIO configuration

| IP | Pin | Signal | GPIO mode | GPIO pull/up pull down | Max Speed | User Label |
|--------|-----------------|-------------|------------------------------|-----------------------------|-----------|-------------------------------------|
| RCC | PD0-OSC_IN | RCC_OSC_IN | n/a | n/a | n/a | |
| | PD1-OSC_OUT | RCC_OSC_OUT | n/a | n/a | n/a | |
| USART1 | PA9 | USART1_TX | Alternate Function Push Pull | n/a | High * | PRINTF_TX |
| | PA10 | USART1_RX | Input mode | No pull-up and no pull-down | n/a | PRINTF_RX |
| USART3 | PB10 | USART3_TX | Alternate Function Push Pull | n/a | High * | BLE_TX |
| | PB11 | USART3_RX | Input mode | No pull-up and no pull-down | n/a | BLE_RX |
| GPIO | PC13-TAMPER-RTC | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | MCU_LED1_GPIO_Output |
| | PC14-OSC32_IN | GPIO_Input | Input mode | Pull-down * | n/a | HM10_is_default_settings_GPIO_Input |
| | PA2 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | Display_C_terminal_GPIO_Output |
| | PA3 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | Display_D_terminal_GPIO_Output |
| | PB0 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | Display_A_terminal_GPIO_Output |
| | PB1 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | Display_B_terminal_GPIO_Output |
| | PB12 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | Display_K2_terminal_GPIO_Output |
| | PB13 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | Display_K3_terminal_GPIO_Output |
| | PB14 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | Display_K4_terminal_GPIO_Output |
| | PB5 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | Display_E_terminal_GPIO_Output |
| | PB6 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | Display_F_terminal_GPIO_Output |
| | PB7 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | Display_G_terminal_GPIO_Output |
| | PB8 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | Display_Dp_terminal_GPIO_Output |
| | PB9 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | Display_K1_terminal_GPIO_Output |

8.2. DMA configuration

nothing configured in DMA service

8.3. NVIC configuration

8.3.1. 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 |
| TIM2 global interrupt | true | 0 | 0 |
| USART3 global interrupt | true | 0 | 0 |
| PVD interrupt through EXTI line 16 | unused | | |
| Flash global interrupt | unused | | |
| RCC global interrupt | unused | | |
| USART1 global interrupt | unused | | |

8.3.2. 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 |
| TIM2 global interrupt | false | true | true |
| USART3 global interrupt | false | true | true |

* User modified value

9. System Views

9.1. Category view

9.1.1. Current

| Middleware | | | | |
|-------------|--------|--------|--------------|-----------|
| System Core | Analog | Timers | Connectivity | Computing |
| DMA | | TIM2 | USART1 | |
| GPIO | | | USART3 | |
| IVIC | | | | |
| RCC | | | | |
| SYS | | | | |

10. Docs & Resources

| Type | Link |
|-------------------------|---|
| BSDL files | https://www.st.com/resource/en/bsdl_model/stm32f1_bsdl.zip |
| IBIS models | https://www.st.com/resource/en/ibis_model/stm32ibis.zip |
| System View Description | https://www.st.com/resource/en/svd/stm32f1_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 |
| Brochures | https://www.st.com/resource/en/brochure/breveco0518.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/flstm32nucleo.pdf |
| Flyers | https://www.st.com/resource/en/flyer/flstmcsuite.pdf |
| Flyers | https://www.st.com/resource/en/flyer/fldpstpfc11120.pdf |
| Product Certifications | https://www.st.com/resource/en/certification_document/1239988349.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/an1181-electrostatic-discharge-sensitivity-measurement-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/an2586-getting-started-with-stm32f10xxx-hardware-development-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an2604-stm32f101xx- |

and-stm32f103xx-rtc-calibration-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/an2834-how-to-get-the-best-adc-accuracy-in-stm32-microcontrollers-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/an3095-stevalisv002v1-stevalisv002v2-3-kw-gridconnected-pv-system-based-on-the-stm32f103xx-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an3108-stlm75-firmware-library-for-the-stm32f10x-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/an3128-stm32-embedded-graphic-objectstouchscreen-library-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/an3422-migration-of-microcontroller-applications-from-stm32f1-to-stm32l1-series-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an3427-migrating-a-microcontroller-application-from-stm32f1-to-stm32f2-series-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an3429-stm32-proprietary-code-protection-overview-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an3961-stevalime003v1-demonstration-board-based-on-the-sthv748-ultrasound-pulser-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4013-stm32-crossseries-timer-overview-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4070-250-w-grid-connected-microinverter-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4076-two-or-three-shunt-resistor-based-current-sensing-circuit-design-in-3phase-inverters-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4088-migrating-between-stm32f1-and-stm32f0-series-microcontrollers-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4228-migrating-from-stm32f1-series-to-stm32f3-series-microcontrollers-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4229-how-to-implement-a-vocoder-solution-using-stm32-microcontrollers-stmicroelectronics.pdf
- Application Notes https://www.st.com/resource/en/application_note/an4277-using-stm32-device-pwm-shutdown-features-for-motor-control-and-digital-power-conversion-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/an4649-migrating-from-stm32f1-series-to-stm32l4-series--stm32l4-series-microntrrollers-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/an4724-stm32cube-firmware-examples-for-stm32f1-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/an4904-migration-of-microcontroller-applications-from-stm32f1-series-to-stm32f4-access-lines-stmicroelectronics.pdf
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& Software

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& Software

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& Software

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& Software

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for related Tools interface-with-stm32f10x-and-stm32l1xx-microcontrollers-
& Software stmicroelectronics.pdf](https://www.st.com/resource/en/application_note/an2598-smartcard-interface-with-stm32f10x-and-stm32l1xx-microcontrollers-stmicroelectronics.pdf)

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& Software oversampling-stmicroelectronics.pdf](https://www.st.com/resource/en/application_note/an2668-improving-stm32f1-series-stm32f3-series-and-stm32lx-series-adc-resolution-by-oversampling-stmicroelectronics.pdf)

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for related Tools highdensity-stm32f103xx-microcontroller-to-play-audio-files-with-an-
& Software external-is-audio-codec-stmicroelectronics.pdf](https://www.st.com/resource/en/application_note/an2739-how-to-use-the-highdensity-stm32f103xx-microcontroller-to-play-audio-files-with-an-external-is-audio-codec-stmicroelectronics.pdf)

Application Notes [https://www.st.com/resource/en/application_note/an2784-using-the-
for related Tools highdensity-stm32f10xxx-fsmc-peripheral-to-drive-external-memories-
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