STMicroelectronics X-NUCLEO-NFC03A1

NUCLEO-F411RE STM32 Nucleo-64 Development Board User Manual

Model: X-NUCLEO-NFC03A1

1. Introduction

The STM32 Nucleo-64 development boards offer an accessible and adaptable platform for exploring new concepts and developing prototypes utilizing STM32 microcontrollers. These boards provide a range of performance, power consumption, and feature combinations. For compatible boards, the integrated SMPS significantly reduces power consumption during Run mode.
This manual provides essential information for setting up, operating, and maintaining your NUCLEO-F411RE STM32 Nucleo-64 Development Board.

2. Product Features

- **Microcontroller:** STM32 STM32F411RE microcontroller with Cortex-M4 core in LQFP64 package.
- **User Interface:** 1 user LED shared with Arduino, 1 user push-button, and 1 reset push-button.
- **Expansion Connectors:** Arduino Uno V3 and ST morpho extension pin headers for comprehensive access to all STM32 I/Os.
- **Integrated Debugger/Programmer:** On-board ST-LINK/V2-1 debugger/programmer with USB re-enumeration capability. Supports three interfaces via USB: mass storage, Virtual COM port, and debug port.
- **Software Support:** Comprehensive free software libraries and examples available with the STM32Cube MCU Package.
- **Online Resources:** Direct access to Arm Mbed online resources athttp://mbed.org.

3. Setup Guide

Follow these steps to set up your STM32 Nucleo-64 Development Board:

1. **Unpacking:** Carefully remove the development board from its packaging. Inspect for any visible damage.
2. **Power Connection:** Connect the board to your computer using a standard USB cable (not included). The board is powered via the USB connection.
3. **Driver Installation:** Your operating system should automatically recognize the ST-LINK/V2-1

debugger/programmer. If not, download and install the necessary drivers from the STMicroelectronics official website.

4. **Software Environment Setup:** Download and install the STM32Cube MCU Package, which includes comprehensive software libraries and examples. Consider using an Integrated Development Environment (IDE) compatible with STM32 microcontrollers, such as STM32CubeIDE or Keil MDK-ARM.
5. **First Program:** Refer to the provided examples within the STM32Cube MCU Package to load and run your first program on the board.

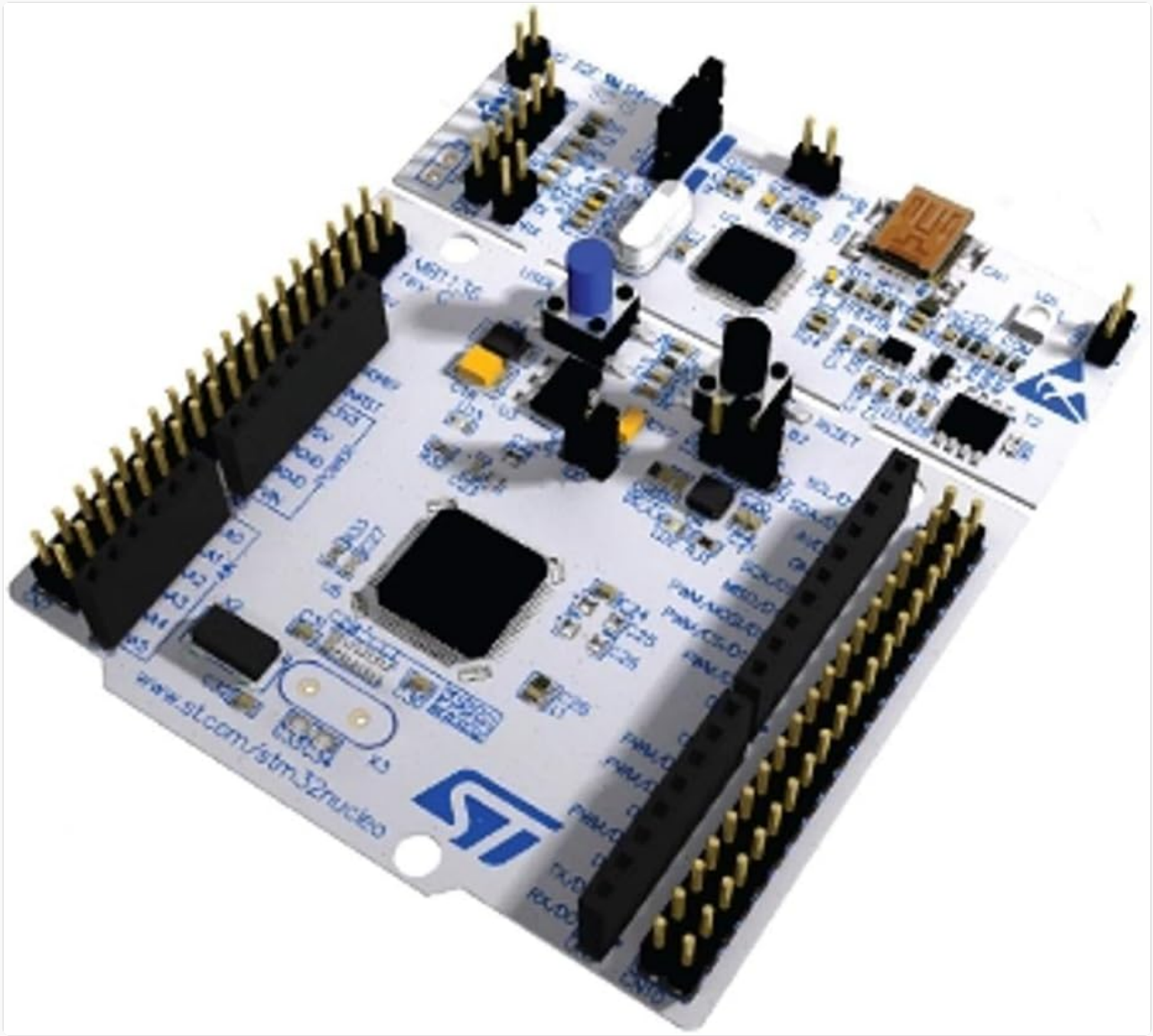


Figure 1: Overview of the NUCLEO-F411RE STM32 Nucleo-64 Development Board. This image displays the top view of the white circuit board, highlighting the central STM32F411RE microcontroller, various smaller electronic components, two blue push-buttons, and multiple rows of gold-plated pin headers for expansion and connectivity. A USB connector is visible on the upper right side.

4. Operating Instructions

The STM32 Nucleo-64 board is designed for flexible development. Here are key aspects of its operation:

- **Programming and Debugging:** Utilize the integrated ST-LINK/V2-1 for programming and debugging your STM32 applications. This allows for direct code upload and real-time debugging without external tools.
- **Virtual COM Port:** The board's USB connection can emulate a Virtual COM Port, enabling serial communication with your computer for data logging or command input.

- **Mass Storage Device:** The ST-LINK/V2-1 can also appear as a mass storage device, allowing easy drag-and-drop programming of firmware files.
- **Expansion with Shields:** Leverage the Arduino Uno V3 and ST morpho headers to expand the board's functionality with a wide array of compatible shields. Ensure proper pin alignment and power requirements when connecting shields.
- **User LED and Buttons:** The user LED and push-buttons can be programmed for various application-specific functions, providing immediate feedback or input.
- **Power Consumption:** For compatible boards, the SMPS (Switch Mode Power Supply) feature helps in reducing power consumption, especially in Run mode. Refer to the STM32Cube documentation for details on optimizing power.

5. Maintenance

Proper care and maintenance will ensure the longevity and reliable operation of your development board:

- **Handling:** Always handle the board by its edges to avoid touching components, especially sensitive pins or integrated circuits.
- **Storage:** Store the board in a dry, anti-static environment, away from direct sunlight, extreme temperatures, and humidity. Use the original packaging or an anti-static bag when not in use.
- **Cleaning:** If necessary, gently clean the board with a soft, dry, lint-free cloth. Avoid using liquids or abrasive cleaners. For stubborn dust, use compressed air.
- **Power Off:** Always disconnect the power (USB cable) before connecting or disconnecting any shields or external components.
- **Component Inspection:** Periodically inspect the board for any loose connections, bent pins, or damaged components.

6. Troubleshooting

If you encounter issues with your STM32 Nucleo-64 Development Board, consider the following troubleshooting steps:

- **No Power/LEDs Off:**
  - Ensure the USB cable is securely connected to both the board and your computer.
  - Try a different USB port or cable.
  - Verify your computer's USB port is providing sufficient power.
- **Board Not Recognized by Computer:**
  - Check Device Manager (Windows) or System Information (macOS/Linux) for unrecognized devices.
  - Reinstall the ST-LINK drivers from the STMicroelectronics website.
  - Ensure your IDE is correctly configured to detect the ST-LINK/V2-1.
- **Program Upload Failure:**
  - Verify your code compiles without errors.
  - Check that the correct target device (STM32F411RE) is selected in your IDE.
  - Ensure no other applications are using the debug port.
  - Try resetting the board using the reset button before attempting to upload.

- **Unexpected Behavior:**
  - Review your code for logical errors.
  - Check external connections and shield compatibility.
  - Consult the STM32Cube MCU Package documentation and online forums for similar issues.

If problems persist, contact STMicroelectronics support or refer to their extensive online resources and community forums.

7. Specifications

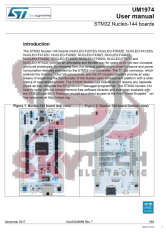
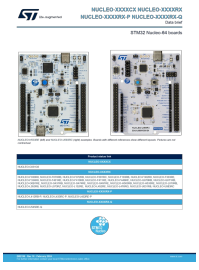
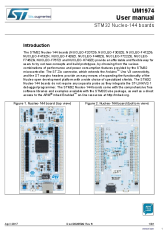
Feature	Detail
Brand	STMicroelectronics
Model Name	NUCLEO-F411RE STM32 Nucleo-64 Development Board
Item Model Number	X-NUCLEO-NFC03A1
Microcontroller	STM32F411RE (ARM Cortex-M4 with DSP and FPU)
CPU Speed	100 MHz
Flash Memory	512 Kbytes
Operating System Support	Linux (and other compatible OS for development)
Connectivity Technology	USB
Included Components	ST-LINK/V2-1 debugger and programmer
Item Weight	0.16 ounces
Product Dimensions (LxWxH)	4 x 3 x 1 inches

8. Warranty and Support

Warranty Information: Specific warranty terms for the NUCLEO-F411RE STM32 Nucleo-64 Development Board are provided by the manufacturer, STMicroelectronics. Please refer to the official STMicroelectronics website or contact their customer service for detailed warranty coverage and terms.
Technical Support: For technical assistance, documentation, software downloads, and community forums, please visit the official STMicroelectronics website. They offer extensive resources to support developers using their products.

Manufacturer: STMicroelectronics

Related Documents - X-NUCLEO-NFC03A1

	[STM32 Nucleo-64 Boards (MB1136) User Manual | STMicroelectronics] User manual for STMicroelectronics STM32 Nucleo-64 development boards (MB1136). Learn about features, ordering, hardware, and getting started with STM32 microcontrollers.
	[STM32 Nucleo-64 Boards User Manual UM1724] User manual for STMicroelectronics STM32 Nucleo-64 development boards (MB1136 series), detailing features, ordering information, hardware layout, configuration, and quick start guides for embedded system development.
	[STM32 Nucleo-64 Boards User Manual] Comprehensive user manual for STMicroelectronics STM32 Nucleo-64 development boards, detailing features, hardware layout, power options, connectors, and programming guides for various STM32 microcontroller variants.
	[STM32 Nucleo-144 Boards User Manual | STMicroelectronics] Explore the STM32 Nucleo-144 boards with this comprehensive user manual. Learn about features, hardware layout, configuration, power supply options, and connectivity for STM32 microcontrollers. Ideal for prototyping and development.
	[STM32 Nucleo-64 Boards: Data Brief and Ordering Information] Explore the STM32 Nucleo-64 boards from STMicroelectronics. This data brief provides an overview, features, ordering information, and development environment details for the NUCLEO-XXXXCX, NUCLEO-XXXXRX, NUCLEO-XXXXRX-P, and NUCLEO-XXXXRX-Q series.
	[STM32 Nucleo-144 Boards: User Manual for Prototyping and Development] Official user manual for STMicroelectronics STM32 Nucleo-144 development boards. Covers features, hardware, ordering, and configuration for STM32 microcontrollers, including NUCLEO-F207ZG, NUCLEO-F767ZI, and others.