STMicroelectronics NUCLEO-F303RE

STM32 Nucleo-64 Development Board User Manual

Model: NUCLEO-F303RE | Brand: STMicroelectronics

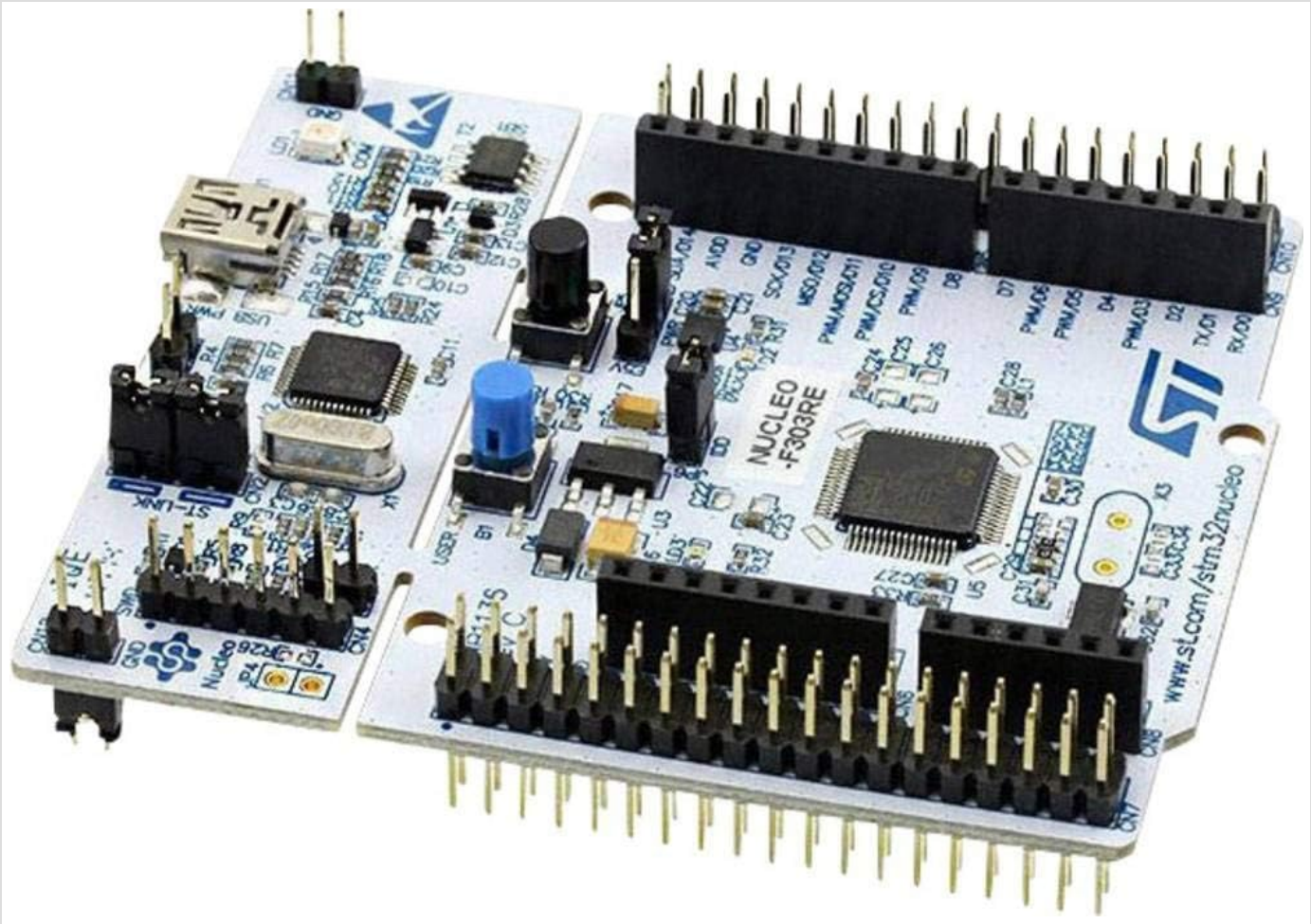
Introduction

The STM32 Nucleo-64 development board, featuring the STM32F303RE microcontroller, provides an affordable and flexible way for users to try out new concepts and build prototypes with the STM32 microcontroller. This board supports Arduino Uno V3 and ST Morpho connectivity, allowing for easy expansion with a wide range of specialized shields.

It integrates an on-board ST-LINK/V2-1 debugger/programmer, eliminating the need for a separate debug probe. The board can be powered directly from the USB connection, offering convenience for development. It includes essential user interfaces such as three LEDs and two push-buttons for basic interaction and debugging.

The Nucleo-64 board is compatible with various Integrated Development Environments (IDEs), including IAR, ARM Keil, and GCC-based IDEs, providing flexibility for developers.

Product Overview



An overhead view of the STM32 Nucleo-64 Development Board, showcasing its various components including the STM32F303RE MCU, USB connector, ST-LINK debugger, and various pin headers for expansion.

The Nucleo-64 board is designed for rapid prototyping and development. Key components include:

- **STM32F303RE Microcontroller:** A mainstream mixed-signal MCU with ARM Cortex-M4 core, DSP, FPU, 512 Kbytes Flash, and 72 MHz CPU.
- **On-board ST-LINK/V2-1 Debugger/Programmer:** Facilitates easy code upload and debugging via a SWD connector.
- **USB Connectivity:** For power supply and communication with the host PC.
- **User LEDs:** Three LEDs for status indication and user applications.
- **User Push-buttons:** Two push-buttons for user input and reset functionality.
- **Arduino Uno V3 and ST Morpho Headers:**Provide extensive expansion capabilities.

Setup Guide

1. **Unboxing:** Carefully remove the Nucleo-64 board from its packaging. Inspect for any visible damage.
2. **Software Installation:**
    - Download and install the necessary drivers for the ST-LINK/V2-1 from the official STMicroelectronics website.
    - Choose and install your preferred Integrated Development Environment (IDE), such as STM32CubeIDE, Keil MDK-ARM, IAR Embedded Workbench, or a GCC-based IDE.
    - Install the STM32CubeF3 microcontroller package, which includes examples and hardware abstraction layer (HAL) libraries.
3. **Connecting the Board:**

- Connect the Nucleo-64 board to your computer using a standard USB cable (Type-A to Mini-B, typically). The board will be powered via the USB connection.
- Observe the power LED on the board, which should illuminate, indicating successful power-up.
- Your computer should recognize the ST-LINK/V2-1 as a mass storage device and a virtual COM port.

4. **First Program (Blinky):**
   - Open your chosen IDE and create a new project for the STM32F303RE microcontroller.
   - Load a simple "Blinky" example program (often provided with the STM32CubeF3 package or within the IDE). This program typically toggles one of the on-board LEDs.
   - Compile the program and then download it to the Nucleo board using the integrated ST-LINK debugger.
   - Verify that the LED on the board starts blinking, confirming successful setup and programming.

Operating Instructions

Once the board is set up, you can begin developing and testing your applications. The Nucleo-64 board offers various functionalities for embedded system development.

- **Programming and Debugging:**
  Use the integrated ST-LINK/V2-1 debugger for flashing firmware onto the STM32F303RE MCU and for real-time debugging. Most IDEs provide a seamless interface for these operations.
- **Using GPIOs and Peripherals:**
  The Arduino Uno V3 and ST Morpho headers expose a wide array of GPIO pins and peripheral interfaces (e.g., UART, SPI, I2C, ADC, DAC, Timers). Refer to the STM32F303RE datasheet and the Nucleo-64 board schematics for detailed pin assignments and peripheral capabilities.
- **Power Supply:**
  The board is primarily powered via the USB connector. It can also be powered externally through the VIN pin on the Arduino connector or via the ST Morpho connector, provided the voltage is within the specified range (typically 7V to 12V for VIN, or 5V for 5V pin).
- **User Interface Elements:**
  - **User LEDs:** Program these LEDs to indicate application status or for simple visual feedback.
  - **User Button (B1):** Can be configured as a general-purpose input for user interaction.
  - **Reset Button:** Used to reset the microcontroller, restarting the currently loaded program.
- **Expansion with Shields:**
  Attach compatible Arduino shields to the Arduino Uno V3 connectors to extend the board's functionality (e.g., Wi-Fi, Bluetooth, motor drivers, sensors). Ensure power compatibility and pin assignments before connecting shields.

Maintenance

Proper care and maintenance will ensure the longevity and reliable operation of your Nucleo-64 development board.

- **Handling:** Always handle the board by its edges to avoid touching sensitive components or introducing static discharge. Consider using an anti-static wrist strap.
- **Cleaning:** If necessary, gently clean the board with a soft, dry, lint-free cloth. For stubborn dirt, use isopropyl alcohol and a soft brush, ensuring the board is powered off and completely dry before re-powering. Avoid using water or harsh chemicals.
- **Storage:** Store the board in an anti-static bag or a protective enclosure when not in use, especially in environments with high humidity or dust.

- **Environmental Conditions:** Operate and store the board within its specified temperature and humidity ranges to prevent damage. Avoid extreme temperatures, direct sunlight, and moisture.
- **Firmware Updates:** Regularly check the STMicroelectronics website for updated ST-LINK firmware or STM32CubeIDE versions to ensure optimal performance and access to the latest features.

Troubleshooting

This section addresses common issues you might encounter with your Nucleo-64 board.

- **Board Not Powering On:**
  - Ensure the USB cable is securely connected to both the board and the computer.
  - Try a different USB port or cable.
  - Verify that your computer's USB port provides sufficient power.
- **ST-LINK Not Recognized by PC:**
  - Install or update the ST-LINK drivers from the STMicroelectronics website.
  - Check Device Manager (Windows) or `lsusb` (Linux) to see if the device is listed.
  - Try connecting the board to a different computer.
- **Cannot Flash Program to MCU:**
  - Ensure the correct target microcontroller (STM32F303RE) is selected in your IDE.
  - Verify that the ST-LINK firmware is up to date.
  - Check for any error messages in the IDE's console.
  - Ensure no other software is using the ST-LINK interface.
- **Program Not Running as Expected:**
  - Use the debugger to step through your code and identify the issue.
  - Check pin configurations and peripheral initialization in your code.
  - Ensure proper power supply to the board and any connected peripherals.
- **Arduino Shield Compatibility Issues:**
  - Verify that the shield is compatible with 3.3V logic levels, as the STM32 operates at 3.3V.
  - Check for pin conflicts between the shield and the Nucleo board.
  - Ensure the shield is receiving adequate power.

Specifications

Feature	Detail
Microcontroller	STM32F303RET6 (ARM Cortex-M4 with DSP and FPU)
Flash Memory	512 Kbytes
CPU Speed	72 MHz
On-board Debugger/Programmer	ST-LINK/V2-1 (with SWD connector)
Connectivity	USB (for power and communication), Arduino Uno V3, ST Morpho headers

Feature	Detail
User Interface	3 LEDs (Power, USB communication, User), 2 Push-buttons (User, Reset)
Power Supply	USB VBUS or external source (VIN, 5V)
Dimensions	Approximately 4 x 3 x 1 inches (10.16 x 7.62 x 2.54 cm)
Weight	Approximately 0.705 ounces (20 grams)
Supported IDEs	IAR, ARM Keil, GCC-based IDEs (e.g., STM32CubeIDE)

What's in the Box

The standard package for the STM32 Nucleo-64 Development Board (NUCLEO-F303RE) typically includes:

- STM32 Nucleo-64 Development Board with STM32F303RE MCU
- Integrated ST-LINK/V2-1 debugger/programmer
- Three LEDs (Power, USB communication, User)
- Two Push-buttons (User, Reset)

Note: A USB cable is typically required but may not be included in all retail packages.

Warranty and Support

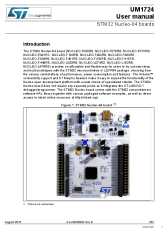
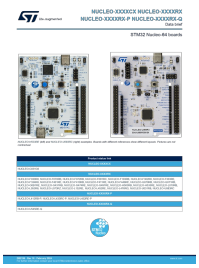
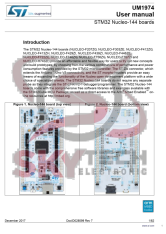
For detailed warranty information regarding your STM32 Nucleo-64 Development Board, please refer to the documentation provided with your purchase or visit the official STMicroelectronics website. Warranty terms and conditions may vary by region and retailer.

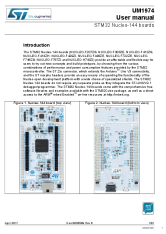
For technical support, software downloads, documentation, and community forums, please visit the official STMicroelectronics support portal:

www.st.com/stm32nucleo

STMicroelectronics provides extensive resources for developers, including application notes, example code, and a vibrant online community to assist with your development projects.

Related Documents - NUCLEO-F303RE

	[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-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 | 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.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	[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.