Networking in One Day!

SOMRT1061 Quickstart Guide

NetBurner, Inc. 26-Mar-2024

1 Introduction

1.1 Quick Start Guide Overview

The NetBurner Network Development Kit (NNDK) is designed as a complete development platform for NetBurner's hardware devices. This quickstart guide will help with the installation of the NetBurner software, hardware setup and accessing the factory application running on the device.

1.2   Software Licensing

The Software included in your NetBurner Network Development Kit is licensed to run only on NetBurner provided hardware. Please read the license.txt file located (by default) in your \Nburn\docs directory.

If your application involves manufacturing your own hardware, please contact   sales@netburner.com for details on a royalty-free software license.

1.3   Kit Contents

- Quick start guide

- SOMRT1061 System on a Module mounted on a Carrier Board Adapter to provide header pins

- DEV-SOMRT1061-100IR Development Board

- USB cable for power and/or serial communication

- Serial cable

- Standard Ethernet Cable (Blue)

- Red card with NetBurner Development Kit registration key code and tools download link
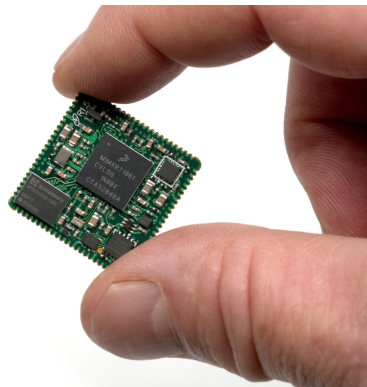
1.4   SOMRT1061 SOM

Figure 1 SOMRT1061

Key Features

- NXP i.MX RT1061, 528MHz, ARM M7, Industrial Temp.

- Flash: 1MB boot, 8MB application

- SRAM: 1MB on processor

- RAM: 32MB

- Floating Point Unit (FPU)

- Dual 10/100 Ethernet

- Up to two 10/100 Ethernet ports with 1588. One Ethernet PHY located on SOM, second Ethernet port requires external PHY

- 7 UARTs, 6 with RTS/CTS

- 3 CAN (including 1 CAN FD)

- 3 I2C

- 3 SPI

- Up to 2 single/dual channel Quad SPI FLASH with XIP support

- Up to 67 General Purpose I/O with interrupt capability

- SDHC flash card interface

- 2 Analog-Digital-Converters (ADC), 8 channels, 12-bit. 4 channels can be used as analog comparators

- Address/Data bus: 12/16, 28/16 with external address latch hardware

- Industrial temperature range -40C to +85C

- 1 inch (25.4mm) square form factor
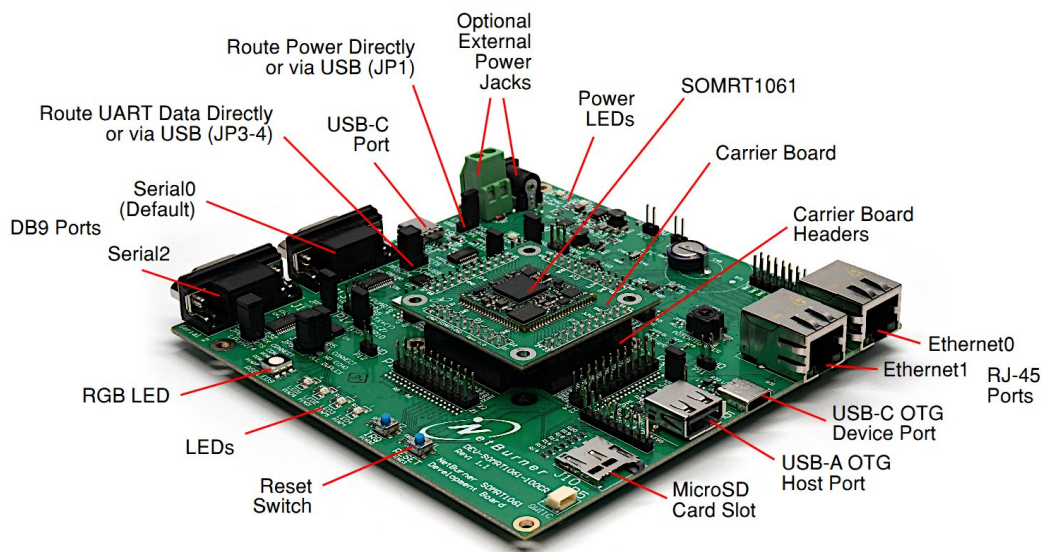
1.5   DEV-SOMRT1061 Development Board

Figure 2 DEV-SOMRT1061 Development Board

The NNDK-SOMRT1061-KIT includes a DEV-SOMRT1061 development board with a SOMRT1061-200IR SOM soldered onto a small CAR-SOMRT1061 carrier board. The carrier board enables you to remove or replace the SOMRT1061 SOM on the development board. The information in this section details the connectors, jumpers and headers on the development board as well as suggestions for use.

A typical configuration is:

- USB for power and serial communication. The serial port provides status messages as the system runs, and can be used for your application status messages as well. The default microprocessor serial port is LPUART3. Alternatively, you can adjust the jumpers and use the RS-232 DB9 port J13. The boot LPUART is selectable though the configuration screen of the SOM.

- The input power range is 5V to 24V.

- J1-J4 and P1-P4 are the same SOMRT1061 signals. The headers are provided for ease of use during development.

- Ethernet 0 utilizes the Ethernet PHY on the SOMRT1061-200IR. Ethernet 1 requires an external PHY, which is located on the DEV-SOMRT1061.

1.5.1 Connectors

Connector	Description
J1	SOMRT1061 Carrier Socket Pins 1-22
J2	SOMRT1061 Carrier Socket Pins 23-44
J3	SOMRT1061 Carrier Socket Pins 45-66
J4	SOMRT1061 Carrier Socket Pins 67-88
J5	Ethernet 0 RJ-45
J6	Ethernet 1 RJ-45
J7	External input power terminal block
J8	External input power barrel jack
J9	USB Type-C Port, connected to processor LPUART3 (boot UART)
J10	MicroSD Flash card connector
J11	USB OTG1 Typc-C client port
J12	USB OTG2 Type-A Host port
J13	RS-232 DB9 connected to LPUART3 (boot UART)
J14	RS-232 DB9 connected to LPUART4
J15	USB OTG2 Type-C Host port

1.5.2 Headers

Header	Description
P1	SOMRT1061 Pin Header, Pins 1-22
P2	SOMRT1061 Pin Header, Pins 23-44
P3	SOMRT1061 Pin Header, Pins 45-66
P4	SOMRT1061 Pin Header, Pins 67-88
P5	QWICC expansion header
P6	NetBurner Wifi/GPS expansion header
P7	Analog to Digital header
P8	FLEXCAN2 header
P9	FLEXCAN3 header
P10	Vcc 3.3 VDC
P11	Ground
P12	Ground

Header	Description
P13	Ground
P14	Vcc 5 VDC
P17	RS-485 header

1.5.3 Jumper Settings

Jumper	Default	Description
JP1	2-3	Input power. 1-2 barrel jack, 2-3 USB (default).
JP2	1	USB Host VBUS Power Enable. Default = disabled.
JP3	2-3	USB UART3 RX enable. 1-2 RS-232(J13), 2-3 USB (default).
JP4	2-3	USB UART3 CTS enable. 1-2 RS-232(J13), 2-3 USB (default).
JP5	1-2	RS-232 UART4 RX connect. Default = connected.
JP6	1-2	RS-232 UART4 CTS connect. Default = connected.
JP7	1	UART7 RS-485 half-duplex echo disable. Default = enabled.
JP8	1	UART7 RS-485 RX connect. Default = not connected.
JP9	1	UART7 RS-485 Full duplex enable. Default = disabled.
JP10	1-2	UART7 RS-485 ZY 120ohm termination. Default = enabled.
JP11	1-2	UART7 RS-485 AB 120ohm termination. Default = enabled.
JP12	1-2	Flexcan2 120ohm termination. Default = enabled.
JP13	1-2	Flexcan3 120ohm termination. Default = enabled.

2 Software Installation

The NetBurner Network Development Kit includes all the software and documentation you need to develop an application for NetBurner hardware. To begin development, the first step is to install all software, drivers and documentation required to write an application and learn about the hardware.

2.1 Download the NNDK

All software used in this development kit must be downloaded from the NetBurner website. NNDK software download instructions are available at: http://www.netburner.com/get-tools

Note

Java Runtime Environment (JRE) (64-bit) is required to run the NetBurner NBEclipse IDE. This software is not included with our installation. Please ensure that your OS Java tools are installed before running the Net↩ Burner NBEclipse IDE. The following free Java Development Kits (JDKs) include the required JRE, have been tested, and are compatible with our tools:

```
– OpenJDK 8 (LTS), available from https://adoptium.net
– OpenJDK 11 (LTS), available from https://adoptium.net
```

2.2 Installing the Tools

After downloading the NNDK Software, run the setup application and follow the on screen directions to install the NNDK. During the installation, you must provide a valid serial number for each NetBurner platform type you wish to install. For example, if you have a MOD5441X and a MODM7AE70, you should include both a valid MOD5441X and a valid MODM7AE70 serial number in the serial number validation page.

Note

> The serial number for your installation can be found on the red card that is included with your NNDK kit.

2.3 Tools Provided

The following software utilities are installed on your computer once the NNDK setup process is complete:

Tool	Function
NBEclipse	IDE used to develop, download and debug applications
AutoUpdate	Update your 2.x device to 3.0
IPSetup∗	Identify NetBurner modules on local Network
MTTTY	PC to NetBurner Serial communication
Application Wizard	Auto-generate basic applications
TaskScan	Monitor applications currently running on modules
TFTP Server	Host a TFTP Server
UDPTerminal	Send and receive UDP packets
WinAddr2Line	Decipher trap messages to get source location of program faults
Local Discovery	Discover local NetBurner devices running NNDK 3.0 based applications on your local network
NBUpdate	Download a new application to your device from the command line

Note

> IPSetup is now only used for discovering your devices, and cannot be used for device configuration. For that, please see our configuration system overview provided later in this guide.

> AutoUpdate is now only used to migrate compatible devices running applications built with NNDK 2.x or earlier to applications built with NNDK 3.x. For more information, please see the section on updating your device to 3.x, later in this guide.

2.4 Documentation

The following provide specific information on using the NetBurner tools, the various systems available, and the API. They can be accessed by opening \nburn\docs\NetBurner\NetBurner-Documentation.html. Additionally, the most up-to-date version can always be accessed at https://www.netburner.com/NBDocs/↩Developer/html/index.html.

NetBurner Guides	Purpose
NBEclipse Getting Started Guide	How to start using NBEclipse. This is required reading before using the integrated development environment (IDE).
NetBurner Programmers Guide	This guide provides background information on the various systems available to developers as well as their general functionality.
NetBurner Runtime Libraries & RTOS Library	Reference guides which list the function libraries available in the NNDK, as well as for the NetBurner real-time operating system.
NetBurner Utilities Reference Guide	Reference manual for NetBurner tools, such as IPSetup, Auto↩Update, and MTTTY.

The documents listed below provide further information on the processors and compilers used with our modules and tools.

General Documentation	Purpose
ARM Documentation	Detailed reference manuals for the CPU components of ARM family microprocessors/microcontrollers.
Microchip Documentation	Detailed reference documentation for the Microchip processors.
NXP Manual	Detailed reference manual for the NXP ColdFire microprocessor.
GNU Manuals	Manuals for GNU C/C++ libraries, compiler and linker. This includes the C/C++ language API functions.

Platform Reference and Hardware Schematic | NetBurner hardware manuals that include memory map and design guides

3 Running the Factory Application

3.1 Network Setup

Once your device is powered on and plugged in to the network, you may need to configure the network settings of the device. If a DHCP server in running on the local network, then the module will automatically use the DHCP server when the factory application is running.

3.1.1 Dynamic IP Address (DHCP)

When the factory application boots, it will first attempt to obtain an address from a DHCP server. If you are connected to a network with a DHCP server, then the device IP address, network mask and gateway should be configured automatically. If your PC is on the same DHCP network, you will be able to communicate with the device after a short boot period of 2-3 seconds.

3.1.2 Static IP Address

If the module is plugged in to a network that does not have a DHCP server, you must provide a static IP address, network mask and gateway. These addresses should be provided by your network administrator. Ensure that the IP address and mask selected are able to communicate with the static IP settings of your PC.

3.1.3 Auto IP Address (APIPA)

The default factory application contains an auto IP negotiation system. This allows the device to automatically configure its address in the absence of a central DHCP server, and without the need or a static IP address. This scheme is utilized as a fallback that will activate when both dynamic and static IP addresses fail to initialize. In order to communicate with a device in auto IP mode, the host system must support auto IP. auto IP support is included in both Windows and OS X operating systems. By default, auto IP addressing starts in the 169.XXX.XXX.XXX address range.

The factory application that is included with the NetBurner module includes a simple web page, network configuration options and a demo of some of the hardware available on the device.

3.2 Find your Device

To begin, you need to find out the IP address of your module. There are several ways to do this. The recommended option is to locate your device using our online discovery service, if both you and the NetBurner device are on the same network and both have Internet access (the same WAN IP.) You can do this by opening a browser and navigating to `https://discover.netburner.com`. This webpage should load a table that shows devices on your local area network which are running applications built with NNDK 3.x. From this table, you can access the web interface served from the device by clicking on the link in the "Web Page" column. To access a device's configuration record, click on the link in the "Config" column.

If you don't have internet access from your location, you can run our utility, Local Discovery. This program sends out a request to all NetBurner devices on the local network. It opens a browser page on the first device to respond that lists all of the discovered devices, or a page that shows that no devices were found.

Another option to find the IP address of your device is to use the NBEclipse IDE. As before, ensure that your device is powered on and plugged into the same network as your PC. Open NBEclipse, and in the bottom left of the workspace, NBFind can be found running. NBFind lists the IP, application, and MAC address of all NetBurner devices on your local network.

You can also attempt to contact the device using its mDNS (Bonjour) network name. The default name is `nburn`↩ `XXXXXX.local` where `XXXXXX` is the last 6 characters of the MAC address. So if your NetBurner device has a MAC address label of `0003f4123456` then its default mDNS name will be `nburn123456.local`.

A final option is to use the included utility IPSetup. If the device is powered on and plugged into the same network as your PC, run IPSetup. This application shows all NetBurner devices on your network. Be aware that as of NNDK 3.x, IPSetup can not be used to configure your device. Our configuration system now handles this, as described later in this guide.

Note: If these options are failing, there may be a firewall issue blocking the applications from sending the UDP broadcast that is used to locate NetBurner devices. You will need to grant NetBurner applications the ability to get through your OS firewall and ensure that UDP port 20034 is open for use.

3.3 View the Web Page

The factory application runs a web server with a basic web page detailing some of the features of the device and development board. Once you have found your device's IP address, open your favorite browser and point it at the IP address of the device.

3.4   View the Config Page

NetBurner devices are now configured through the use of the configuration page. You can access this page via a web browser. To do so, open a web browser and navigate to the IP address of your device on port 20034. (Port 20034 is the default port number for the NetBurner device config system because the ASCII initials "NB" are 0x4e42 in hex, which is 20034 in decimal.) This URL request should look like the following:

```
http://<Device IP>:20034
```

Where <Device IP> is replaced with the corresponding IP address. The configuration page allows you to view and modify all of the device's boot and network settings. Additionally, you can use this page to download a new application to the device. For more on the configuration system, please refer to the "Config Server Programming Guide" section of the "Programmers Guide".

3.5   Develop your own Application

Now that the NetBurner tools are installed, the hardware is set up and you have verified this by accessing the device's web server. You have now graduated beyond this quick start guide.

To begin writing an application, we recommend reading through the NBEclipse Getting Started guide and the Net↩ Burner Programmers Guide. In the NBEclipse guide, you will find information on writing NetBurner applications, sending new applications to the module and debugging with the graphical debugger. The Programmers guide will teach you more about the NetBurner libraries, operating system, and writing of applications in a multitask environment. Both of these documents can be found in the \nburn\docs\NetBurner folder of your NNDK software installation by opening the file NetBurner-Documentation.html.

3.6   NetBurner Examples

The NNDK includes a multitude of examples that demonstrate the various hardware and software applications of the kit. These examples can be found in your NNDK installation directory, under the examples folder. The default location is \nburn\examples.

4   Hardware Errata

For the most up to date pin references and schematics, visit the product page for your device at http://www.↩ netburner.com

5   Disclaimers

5.1   Life Support Disclaimer

NetBurner's products both hardware and software (including tools) are not authorized for use as critical components in life supports or systems, without the express written approval of NetBurner, Inc. prior to use. As used herein: (1) Life support s or systems are s or systems that (a) are intended for surgical implant into the body or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user. (2) A critical component is any component of a life support or system whose failure to perform can be reasonably expected to cause the failure of the life support or system, or to affect its safety or effectiveness.

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Under U.S. law, infringement may result in civil damages of up to $150,000, and/or criminal penalties of up to five years imprisonment, and/or a $250,000 fine. In addition, NetBurner, Inc. may seek to recover its attorneys' fees.

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