QINO

User

MANUAL

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1   Description

The QINO is a multi-purpose wireless enabled module built around the MT7620A Mediatek processor and the OpenWRT OS. Users can take advantage of the OpenWRT software integration and of the high-performance CPU to effortlessly deploy wireless, security and VOIP applications. The QINO provides a 2T2R IEE 802.11n (Wi-Fi) interface capable of supporting wireless communications up to 300 Mbps. The module embeds a 128 Mbit SPI Flash and a 512 Mbit DDR2 RAM together with a broad set of communication interfaces: Ethernet, USB 2.0, I2C, SPI, UART and GPIOS (20).

2   Specifications

IMG | 1 QINO

Hardware features

CPU	MT7620A
CPU Architecture	MIPS24KEc (580 MHz)
Total DMIPs	580 x 1.6 DMIPs
I-Cache, D-Cache	64 KB, 32 KB
I.2 Cache	n/a
HNAT/HQos	HNAT 2 Gbps forwarding
Memory	
DRAM controller	16 b
DDR2	512 Mb, 120 MHz
SPI Flash	128 Mbit
SD	Support for SD-XC (class 10)
RF	2T2R 802.11n 2.4 GHz
USB 2.0	1
Ethernet	4 LAN and 1 WAN (10/100)
I2S	1
PCM	1
I2C	1
UART	1 console and 1 full with handshaking
JTAG	1

Software features

Python 2.7
Lua scripting language support
OpenSSL
Web server daemon with proper CGI support
Ubus for system administration via the RPC
CLI (command line interface) for config file parsing and modification
DHCP Server
IPv6 support

PCB Measures	
Height	14 mm
Width	40 mm
Length	62 mm
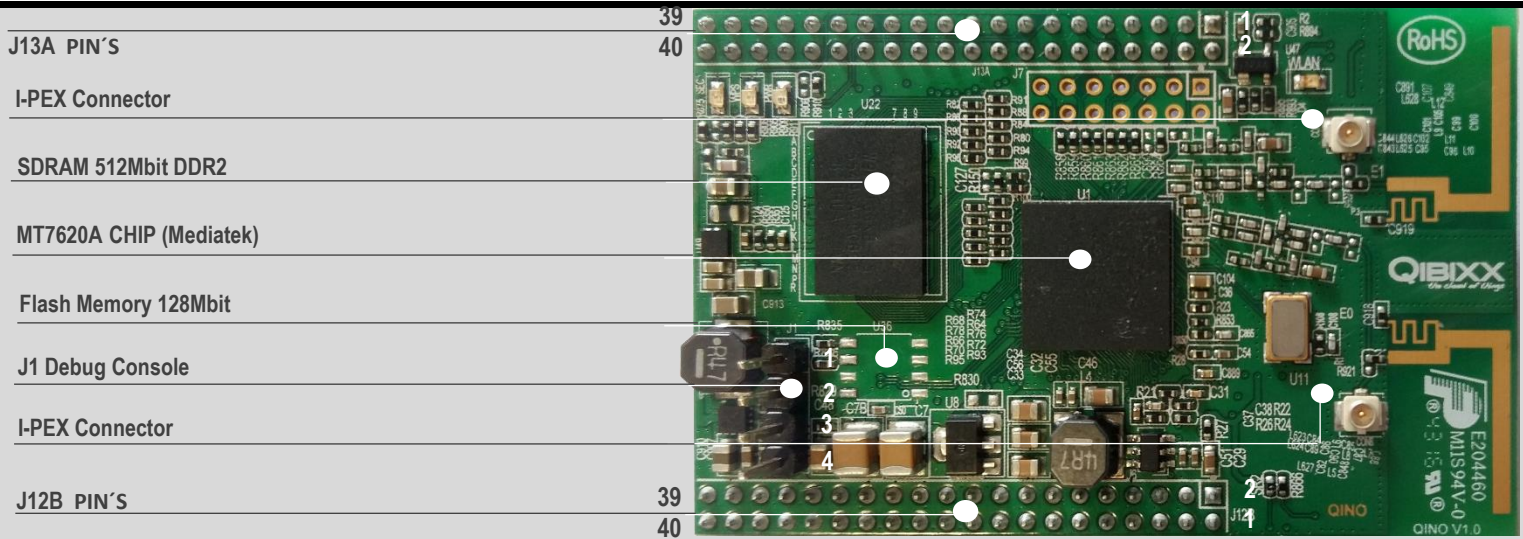
J13A PIN´S

I-PEX Connector

SDRAM 512Mbit DDR2

MT7620A CHIP (Mediatek)

Flash Memory 128Mbit

J1 Debug Console

I-PEX Connector

J12B PIN´S

J13A PIN´S

PIN	SIGNAL	FUNCTION
1	SPI MISO	Master In Slave Out
3	SPI MOSI	Master Out Slave In
5	SPI CLK	Serial Clock
7	SPI CS0	SPI CS0
9	SPI CS1	SPI CS1
11	SPI WP	SPI WP
13	SPI HOLD	SPI HOLD
15	PWR_LED	LED OUTPUT – POWER STATUS
17	TXD	Serial Data out
19	RTS	Request To Send / I2SCLK
21	DCD	Data Carrier Detect / PCMCLK
23	DTR	Data Terminal Ready / PCMFS
25	RIN	Ring Indicator / PCMDTX I2S
27	CTS	Clear To Send / I2SSDO
29	RXD	Serial Data In / I2SSDI
31	I2C SCLK	I2C Serial Clock
33	I2C SD	I2C Serial Data
35	RST_PBC	Push Button Configuration
37	RSTSW	RESET Input, active LOW
39	GND	Ground
2	SD_D0	SD card Data0
4	SD_D1	SD card Data1
6	SD_D2	SD card Data2
8	SD_D3	SD card Data3
10	SD_CMD	SD card CMD
12	SD_CD	SD card detect
14	SD_CLK	SD card clock
16	SD_WP	SD card Write protect
18	LINK4	10/100 Ethernet Port 4 activity Led/ JTAG TRST_N
20	LINK1	10/100 Ethernet Port 1 activity Led/ JTAG JTAG_TDI
22	LINK0	10/100 Ethernet Port 0 activity Led/ JTAG JTAG_TDO
24	LINK2	10/100 Ethernet Port 2 activity Led/ JTAG JTAG_TMS
26	LINK3	10/100 Ethernet Port 3 activity Led/ JTAG CLK
28	GPIO#63	General I/O
30	GPIO#65	General I/O
32	GPIO#66	General I/O
34	GPIO#68	General I/O
36	GPIO#69	General I/O
38	GPIO#67	General I/O
40	GPIO#70	General I/O

J12B PIN´S

PIN	SIGNAL	FUNCTION
1	TXOM4	Ethernet Port4 transmit pair
3	TXOP4	Ethernet Port4 transmit pair
5	RXIM4	Ethernet Port4 receive pair
7	RXIP4	Ethernet Port4 receive pair
9	RXIP3	Ethernet Port3 receive pair
11	RXIM3	Ethernet Port3 receive pair
13	TXOM3	Ethernet Port3 transmit pair
15	TXOP3	Ethernet Port3 transmit pair
17	TXOP2	Ethernet Port2 transmit pair
19	TXOM2	Ethernet Port2 transmit pair
21	RXIM2	Ethernet Port2 receive pair
23	RXIP2	Ethernet Port2 receive pair
25	RXIM1	Ethernet Port1 receive pair
27	RXIP1	Ethernet Port1 receive pair
29	TXOM1	Ethernet Port1 transmit pair
31	TXOP1	Ethernet Port1 transmit pair
33	TXOM0	Ethernet Port0 transmit pair
35	TXOP0	Ethernet Port0 transmit pair
37	RXIM0	Ethernet Port0 receive pair
39	RXIP0	Ethernet Port0 receive pair
2	UPHY0_PADP_0	USB D+ signal
4	UPHY0_PADM_0	USB D- signal
6	GOIO#35	General I/O
8	GPIO#34	General I/O
10	GPIO#30	General I/O
12	GPIO#31	General I/O
14	GPIO#32	General I/O
16	GPIO#33	General I/O
18	GPIO#29	General I/O
20	GPIO#28	General I/O
22	GPIO#24	General I/O
24	GPIO#25	General I/O
26	GPIO#26	General I/O
28	GPIO#27	General I/O
30	GPIO#22	General I/O
32	GND	Ground
34	GND	Ground
36	3.3V	3.3V output voltage supply
38	5V	Power Supply Input 5V
40	5V	Power Supply Input 5V

J1 PIN´S

PIN	SIGNAL	FUNCTION
1	3.3V	3.3V output voltage supply
2	RX	UART RX
3	TX	UART TX

PIN	SIGNAL	FUNCTION
4	GND	Ground

3   Board Connection

Although the QINO was design to fit as a shield that enables several features to other boards, it can also be connected in a standalone version, providing that the user plugs a **stable voltage of 5 VDC at 1.5A to pin 40 or 38 and GND to pin 32 and 34 of the J12B connector**

Once connected, a Wi-Fi network will be available for the user with the SSID "OPENWRT". The default password for gaining access to the network is "QINO".

4   Serial Port Connection

To connect via serial port to the QINO0, the case opening is required. Please make sure to **use a USB RS232 TLL with 3.3V logic levels** to the DPI Port and follow this connection table:

QINO DPI Port	USB RS232 TTL
3.3V	-
TX	RX
RX	TX
GND	GND

To establish a serial session a terminal application like PuTTY can be used. The following steps Configure the session accordingly (check system properties for finding the correct serial port and configure speed to 115200 baud).
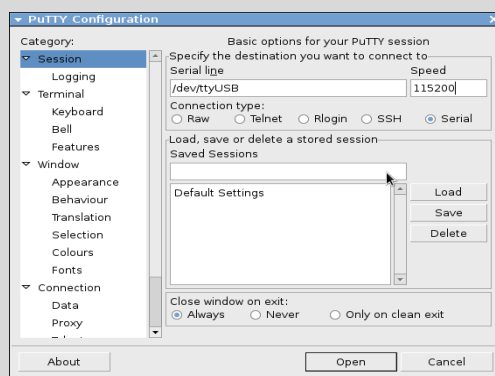
IMG | 2 Settings for the PuTTY connection to the QINO

The OpenWRT shell is now available by pressing the Enter Key. No password is required for this session.

The board can be accessed through the network via SSH terminal by establishing a connection to its default IP addresses 192.168.2.51 on the LAN port and the IP computer must match the same network, example, setting it to 192.168.2.2.

In the event that a very old computer is used to connect to the QINO, make sure to connect an Ethernet crossover cable between the computer and the QINO. This is not necessary in recent PCs, as they are able to automatically switch between the direct and crossover connection configuration.

The IP address of the QINO is 192.168.253.1 and the PC must use a fixed IP address on the same broadcast domain, for example, choose the IP address 192.168.253.2 for the computer.

Before establishing the connection, the application will open a black window asking for updating the key. Press the "Update Button" to proceed. The **default user** is "root" and **password** is empty.

If no password is defined or is forgotten, please connect using the serial port and define default password by typing the "passwd" command and twice the desired password:

```
root@QINO:~# passwd
Changing password for root
New password:
Bad password: too short
Retype password:
Password for root changed by root
```

4.1   Uploading files

To upload other files to the QINO, an application such as WinSCP can be used. Employ the IP address of the QINO (e.g., 192.168.2.51), the username "root" and the password used for SSH connection (default: blank).
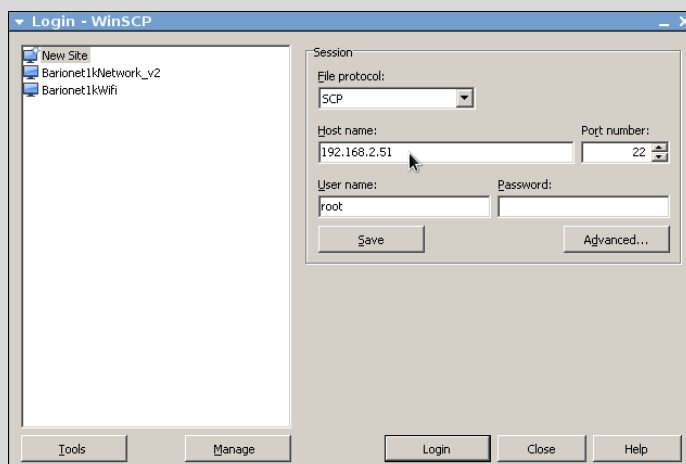
IMG | 3 WinSCP main window

Drag the file to be uploaded, for example File_Name_YYYY-MM-DD_HH.tar.gz, to the folder "/" (filesystem root).

In the serial console, change the current path to the root directory ("cd" or "cd /root") and decompress the previously uploaded file using the following commands:

```
root@QINO: ~# cd
root@QINO: ~# gzip -d  File_Name_2016-04-21_16.tar.gz
root@QINOt: ~# tar -xvf File_Name_2016-04-21_16.tar
...
```

4.2   OpenWRT Main Page

The management and configuration of the QINO as a router can be realized on its Web interface through a Web browser. Type in the browser's address bar the IP of the QINO (192.168.2.51 if connected through LAN or 192.168.253.1 when using WLAN). A Web page with an overview of the memory and disk usage will be shown after the required login process (user: root password: blank). The following images depict the QINO login screen and the status page.

IMG | 4 QINO login page

IMG | 5 QINO main page

4.3   Full Factory Erase

To erase all data to factory defaults, type the following command in the command line:

```
~# jffs2reset -y && reboot
```

After entering the command the unit will perform an erase to the overlay partition, leaving the unit to the original settings and program files and then it reboots to validate the process.

4.4 System Restore Process

The following procedure should be used to perform a system upgrade by reprogramming the QINO image.

Warning: This process erases all existing configurations.

The following extra precautions should be taken into account before proceeding:

- Employ a stable power supply, preferably connected to an UPS.

- Employ a good quality cable.

To access the QINO serial port on the J1 connector, the case must be opened to reveal the Molex connector.

Connect the USB to UART converter with 3.3VDC logic levels as described in section 2.2 and open the PuTTy application.

Network configuration for transferring an image

Configure the IP address of the PC to match the QINO network (e.g., 192.168.2.55).

Rename the image openwrt-ramips-mt7620-<boardname>-squashfs-sysupgrade.bin to openwrt.bin on the PC.

Get and install the TFTPD32 without the server option in the installation process for Windows or Linux (Wine). Execute the application and add the openwrt.bin image.

Source for the TFTPD32 to Windows / Linux (Wine)

- http://tftpd32.jounin.net/download/Tftpd32-4.52-setup.exe

NOTE | Please make sure that the port 69 is open for TFTP on the firewall definitions of the PC

Transfer the System Image

Boot the QINO board and monitor its messages on the serial terminal. Press the key "2" to enter the TFTP program mode and press "Y" to accept, as shown in the list below.

```
============================================
Ralink UBoot Version: 4.1.1.0
--------------------------------------------
ASIC 7620_MP (Port5<->None)
DRAM component: 512 Mbits DDR, width 16
DRAM bus: 16 bit
Total memory: 64 MBytes
Flash component: SPI Flash
Date:Nov 12 2015  Time:15:09:10
============================================
icache: sets:512, ways:4, linesz:32 ,total:65536
dcache: sets:256, ways:4, linesz:32 ,total:32768

##### The CPU freq = 580 MHZ ####
```
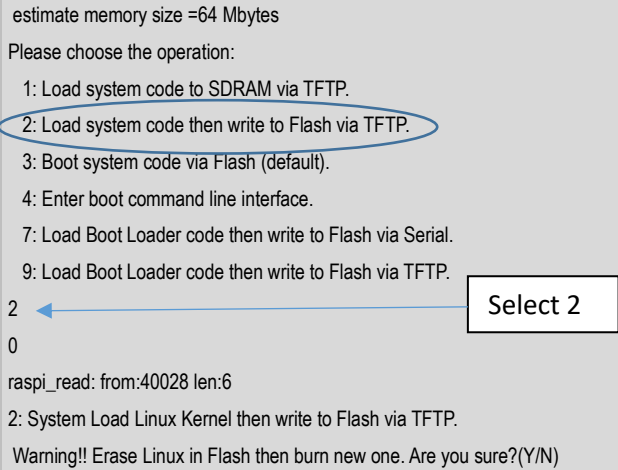
```
 estimate memory size =64 Mbytes
Please choose the operation:
   1: Load system code to SDRAM via TFTP.
   2: Load system code then write to Flash via TFTP.
   3: Boot system code via Flash (default).
   4: Enter boot command line interface.
   7: Load Boot Loader code then write to Flash via Serial.
   9: Load Boot Loader code then write to Flash via TFTP.
2
0
raspi_read: from:40028 len:6
2: System Load Linux Kernel then write to Flash via TFTP.
 Warning!! Erase Linux in Flash then burn new one. Are you sure?(Y/N)
```

Select 2

1 - Configure the "Input device IP" address as 192.168.2.51

Hint: Use the key <BackSpace> to erase the IP and write it manually, validating with the <Enter> Key

2 - Configure the "Input server IP" accordingly (e.g., 192.168.2.55)

3 - Configure the "Input Linux Kernel filename" with the value "openwrt.bin" as shown bellow.

```
2: System Load Linux Kernel then write to Flash via TFTP.
 Warning!! Erase Linux in Flash then burn new one. Are you sure?(Y/N)
 Please Input new ones /or Ctrl-C to discard
           Input device IP (192.168.2.1) ==:192.168.2.51
           Input server IP (192.168.2.10) ==:192.168.2.55
           Input Linux Kernel filename () ==:openwrt.bin
```

If everything is properly configured, the firmware update should show a progress bar made of "#" characters. Otherwise, if shows the "T" character it means there are connectivity issues. In this case, check the connectivity and firewall configuration for port 69.

4.5   Reboot

To perform a safe reboot to the system the user can execute the script "reboot.sh" and after 5 seconds the unit reboots:

```
~# ./reboot.sh
```

5 Regulatory Information

5.1 FCC Statement

DECLARATION OF CONFORMITY WITH FCC RULES FOR ELECTROMAGNETIC COMPATIBILITY

We, Qibixx AG, from Ringstrasse 15A | 8600 Dübendorf | Switzerland, declare under our sole responsibility that the device, QINO certified under the FCC ID: 2ALAR-QINO, complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

Caution: Exposure to Radio Frequency Radiation. The device shall be used in such a manner that the potential for human contact normal operation is minimized This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body.

Federal Communications Commission Notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.

• Increase the distance between the equipment and the receiver.

• Connect the equipment to an outlet on a circuit different

from that to which the receiver is connected.

• Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could

void the user's authority to operate this equipment. This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

·Reorient or relocate the receiving antenna.
·Increase the separation between the equipment and receiver.
·Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
·Consult the dealer or an experienced radio/TV technician for help.

5.2   Europe

European Union Radio products with the CE or CE alert marking comply with the RED Directive(2014/53/EU) issued by the Commission of the European Community. Compliance with this directive implies conformity to the following European Norms (in brackets are the equivalent international standards).

•   ETSI EN 300 328 Technical requirement for radio equipment

Products with the CE marking comply with the EMC Directive (2014/30/EU) issued by the Commission of the European Community. Compliance with these directives implies conformity to the following European Product Family Standards:

•   EN 55032 (CISPR 32) – Electromagnetic Interference
•   EN 55024 (CISPR 24) – Electromagnetic Immunity
•   ETS EN 301 489 - General EMC requirements for radio equipment.
•   EN 61000-3-2 (IEC610000-3-2) - Power Line Harmonics
•   EN 61000-3-3 (IEC610000) - Power Line Flicker
•   EN 60950-1 (IEC60950-1) - Product Safety

Products with the CE marking comply with the Low Voltage Directive (2014/35/EU) issued by the Commission of the European Community. Compliance with this directive implies conformity to the following European Product Family Standard:

This device is intended only for OEM integrators under the following conditions:

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2) The transmitter module may not be co-located with any other transmitter or antenna.
3) For all products market in United States, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band by supplied firmware programming tool. And OEM shall not supply any tool or info to the end-user regarding to change the domain selection.
As long as 3 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

IMPORTANT NOTE: In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling
This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users (for example: Access point, Wireless Router, Notebook, etc.). The final end product must be labeled in a visible area with the following: "Contains FCC ID: 2ALAR-QINO".

Module Antenna Type: Integral PCB ANT, 2dBi gain