LS1043ARGWGSG

QorIQ LS1043A Residential Gateway (RGW) Getting Started Guide

Rev. 3 — 12/2019

User's Guide

1 Introduction

This document describes the LS1043A Residential Gateway (RGW) and its related hardware kit containing the board. It also explains the basic board operations in a step-by-step manner.

This document describes the settings required to connect switches, connectors, jumpers, push buttons, and LEDs to the peripheral devices.

Optional hardware components that are not included in the LS1043ARGW hardware kit are:

- SFP transceiver modules
- CodeWarrior TAP (CWTAP)
- MicroSD card

2 Related documentation

The table below lists the additional documents that you can refer to, for more information on LS1043ARGW.

Some of these documents may be available only under a non-disclosure agreement (NDA). To request access to these documents, contact your local field applications engineer or sales representative.

Document	Description
QorIQ LS1043A Reference Manual (LS1043ARM)	Provides a detailed description on the LS1043A multicore processor and its features, such as memory map, serial interfaces, power supply, chip features, and clock information
QorIQ LS1043A Data Sheet (LS1043A)	Contains information on LS1043A pin assignments, electrical characteristics, hardware design considerations, package information, and ordering information
LS1043ARDB Reference Manual (LS1043ARDBRM)	Explains NXP LS1043ARDB board interfaces and board configuration.

Table continues on the next page...

Contents

1 Introduction....1
2 Related documentation....1
3 LS1043ARGW block diagram....2
4 LS1043ARGW chassis front and rear view....2
4.1 LS1043ARGW board view....3
5 Assembly and disassembly instructions....5
5.1 Assembly instructions....5
5.2 Disassembly instructions....10
6 Switch configurations....11
7 Jumpers settings....12
8 Prerequisites....13
9 Setting up CodeWarrior TAP....13
10 Booting LS1043ARGW....13
11 Restart board....14
12 Ethernet port map....14
13 10G optical SFP+ interface....15
14 Mini-PCI express slots....15
15 NAND memory map....16
16 NAND flashing instructions (U-Boot). 16
16.1 Flashing pre-built ASK images on LS1043ARGW....16
16.2 Bootargs settings....17
17 Revision history....17

Table continued from the previous page...

Document	Description
QorIQ LS1043A ASK Release Notes	This document explains the steps to get started with Applications Solutions Kit (ASK) for LS1043A. For ASK documentation, please contact your local NXP field applications engineer or sales representative.
LS1043ARGW Antenna Assembly Instructions	Lists the instructions for internal antenna assembly. For antenna assembly instructions along with the schematics/layout files, visit: http://www.nxp.com/LS1043A-RGW

The Hardware kit contents can be found in the attached packing list provided with the board support package.

3 LS1043ARGW block diagram

The figure below shows the LS1043ARGW block diagram.

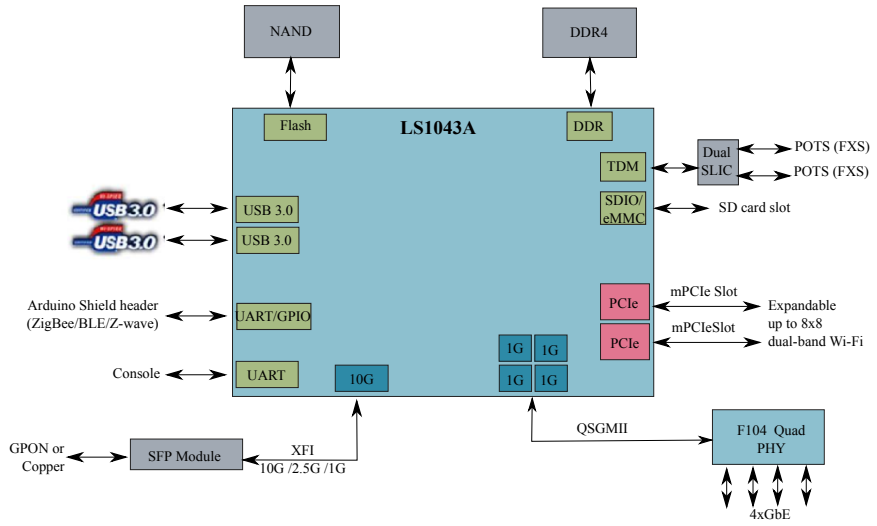

Figure 1. LS1043ARGW block diagram

4 LS1043ARGW chassis front and rear view

The following pictures shows the front and rear views of the LS1043ARGW.

Figure 2. LS1043ARGW chassis front and rear view

4.1 LS1043ARGW board view

The figure below shows the board view of LS1043ARGW.

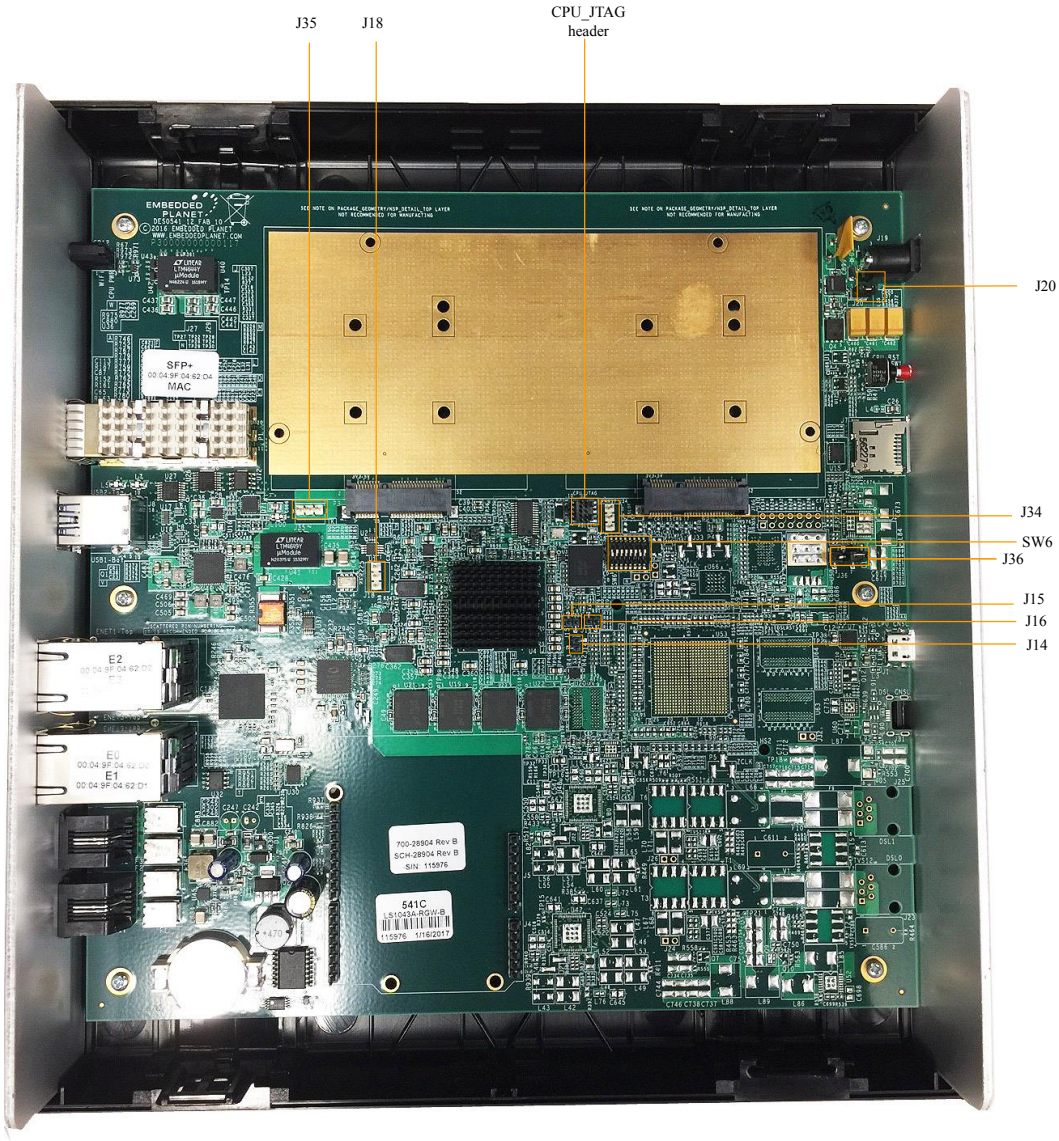

Figure 3. LS1043ARGW board

The figure below shows the board interface view of LS1043ARGW.

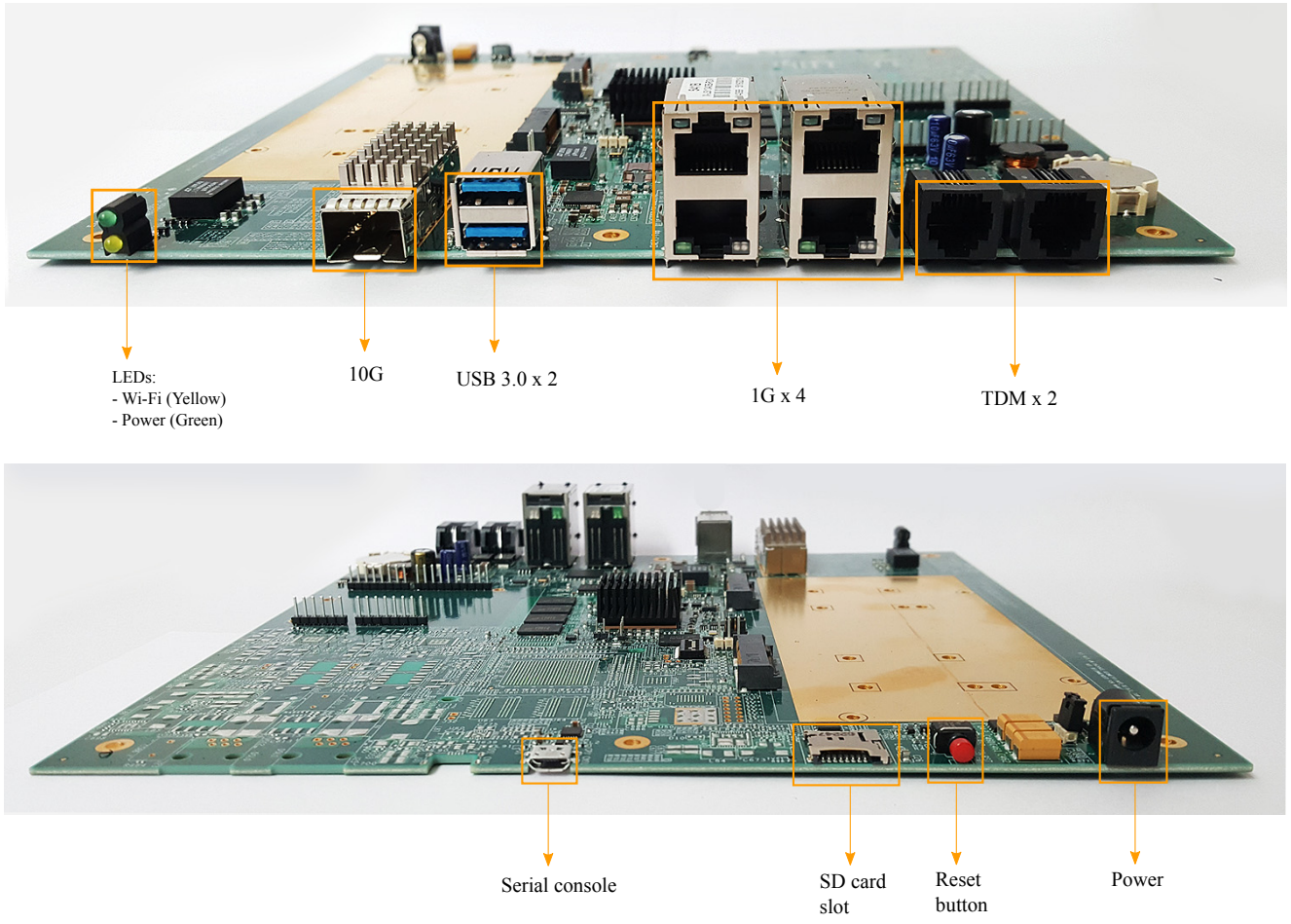

Figure 4. LS1043ARGW board interface view

5 Assembly and disassembly instructions

This sections explains how to assemble and disassemble the LS1043ARGW:

- Assembly instructions
- Disassembly instructions

5.1 Assembly instructions

Below are the steps to assemble the LS1043ARGW:

1. Place the aluminum front and back panel at either end of the PCB assembly. These need to be aligned with the connectors on the PCB assembly before connecting the PCB assembly into the bottom of the enclosure.

Figure 5. PCB assembly with aluminum panels

2. Connect the enclosure paying close attention to the grooves, ensure that the front and rear panels fit into it.
3. Tighten the six screws to the side portion of the enclosure to fix the PCB assembly in its place. The image below shows the screws that need to be tightened.

Figure 6. PCB assembly

4. Locate the extra part number serial number labels and place one across the group of four 1GB Ethernet connectors ETH0, ETH1, ETH2, and ETH3. This will be used to identify the PN and SN after the enclosure cover is attached.

Figure 7. LS1043ARGW front chassis

5. Connect the internal antennas. See, *LS1043ARGW Antenna Assembly Instructions* for more details.
6. Combine and tape all eight antenna leads together, then tape them to the rear side of the enclosure. This is done to eliminate the potential of shorts during power ON when a WiFi card is not connected.

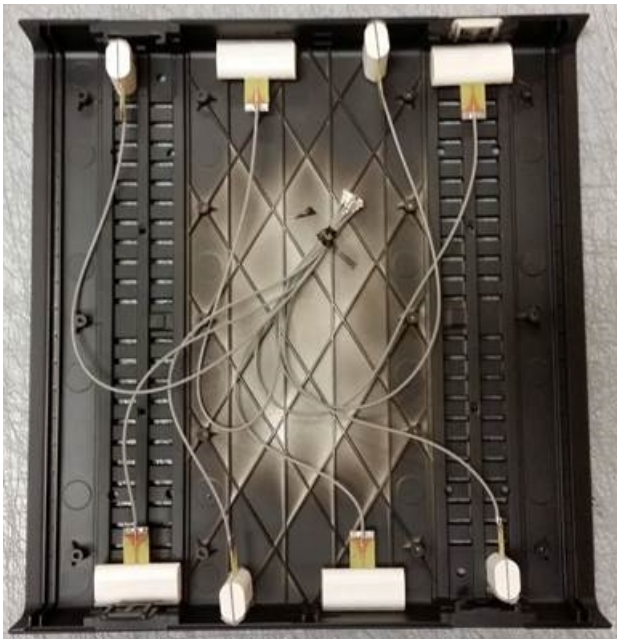

Figure 8. Internal antenna assembly

7. Push the two sides of the enclosure together. The image below shows the tabs this step is referring to.

Figure 9. LS1043ARGW cover

Listen for the audible 'click' sound to know that the sides are locked together.

8. Connect the four narrow covers, two per side, onto the enclosure paying close attention to the two posts per cover that need to fit into the holes in the enclosure sides. The image below point out the posts and the holes.

Figure 10. LS1043ARGW enclosures

NOTE

The green tool is used to pop these covers off, allowing access to the tabs that lock the two parts of the enclosure together.

9. Insert the front and rear stands into the slots of the enclosure by holding and bending the stands outward.

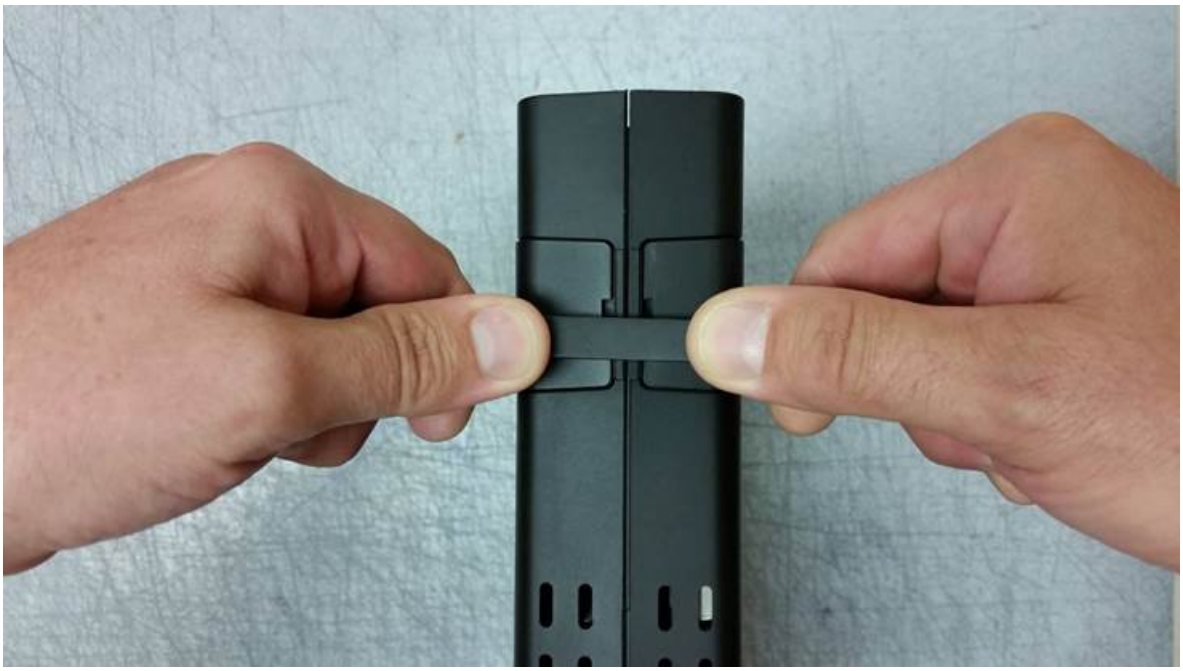

Figure 11. Front and rear stand

NOTE

Use caution while applying force, do not break the stands.

5.2 Disassembly instructions

Below are the steps to disassemble the LS1043ARGW:

1. Remove the stands from the enclosure by gripping them as shown in Figure 11 and bending them outward to remove them from the slots in the narrow side covers.

NOTE

Use caution while applying force, do not break the stands.

2. Use the green tool to open the narrow side covers. A narrow flat blade screw driver can also be used.

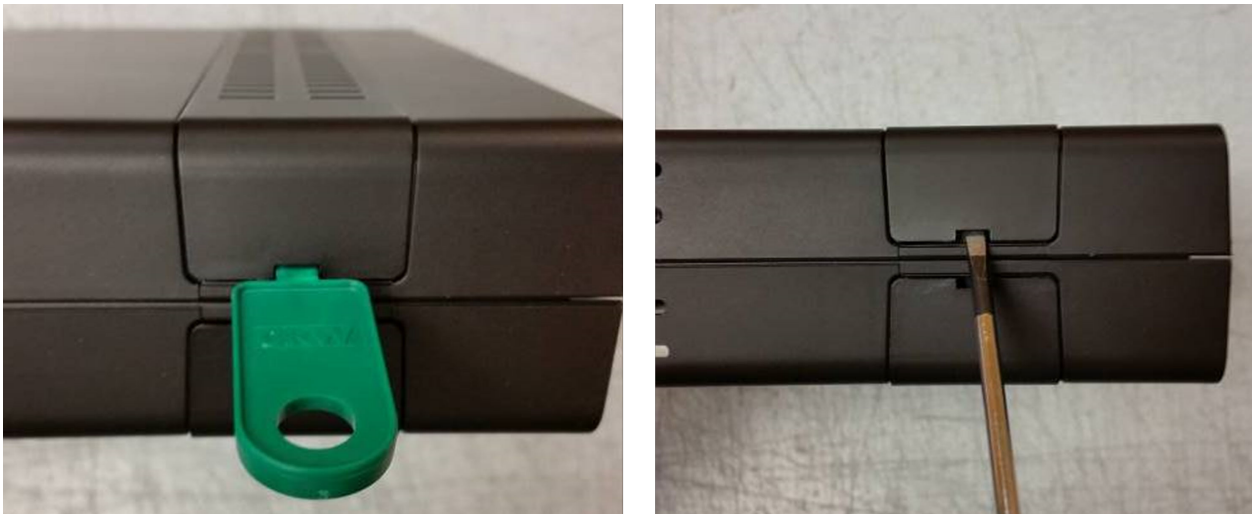

Figure 12. Opening the side covers

3. After all four narrow side covers are removed, use the green tool or the screw driver to release the inner clips holding the enclosure together, then separate the two halves.

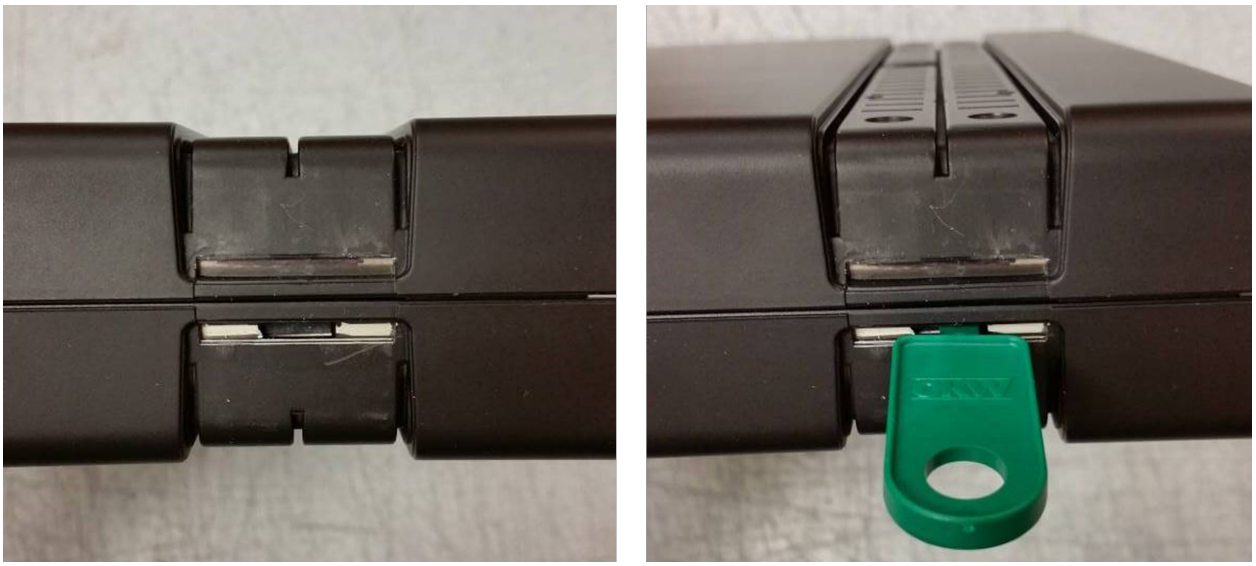

Figure 13. Opening the enclosures

6 Switch configurations

There is only one switch (SW6) on the board. The switch is used to select either to boot from the SD card or NAND flash. The figure below shows the SW6 switch on the LS1043ARGW.

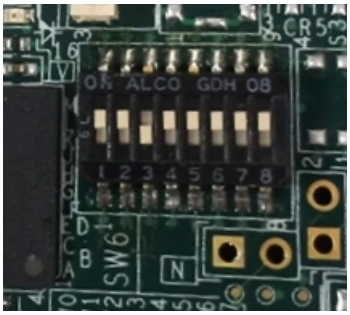

Figure 14. SW6 switch

NOTE

For these types of DIP switches:

- When a switch is ON, the value is 0.
- When a switch is OFF, the value is 1.

The below table shows the available switches and also indicates the default settings.

Table 1. Switch settings

SW6[1:8]	Description
00100000	Boot from SD card **NOTE** J36 needs to be at 1-2 position in order to boot from the SD card.

Table continues on the next page...

Table 1. Switch settings (continued)

SW6[1:8]	Description
10000010	Boot from NAND flash (Default)

7 Jumpers settings

Some options are selected with jumpers (shorting headers), especially those which do not change often or involve power conduction. See Figure 3 for the jumper locations.

The table below lists the factory default jumper settings for the LS1043ARGW. These are the same across all revisions.

Table 2. LS1043ARGW jumper settings

Jumper	Size	Name/function	Description
J14	1x2 pin	TA_BB_VDD Voltage Setting	Open: GND (default) Shorted: 1.0V
J15	1x2 pin	PWR_PROG_SFP Voltage Setting	Open: GND (default) Shorted: 1.8V
J16	1x2 pin	PWR_PROG_MTR Voltage setting	Open: GND (default) Shorted: 1.8V
J20	1x2 pin	Power switch	Open: Power switch is disabled Shorted: Power switch is functional (default)
J17	1x2 pin	FA_CV pin voltage setting	Open: GND (default) Shorted: 1.0V
J18	1x3 pin	Fan header	1- Ground, 2- +12V, 3- Ground, No fan (default)
J34	1x3 pin	WiFi card power amplifier voltage select for PCIe 2	Open (default) 1-2: 3.3V 2-3: 5V
J35	1x3 pin	WiFi card power amplifier voltage select for PCIe 2	Open (default) 1-2: 3.3V 2-3: 5V
J36	1x3 pin	Clock selection for SD or TDM function	1-2: SD clock selection (default) 2-3: TDM clock selection

NOTE

Most of these jumpers should be installed during assembly and will not normally need to change.

8 Prerequisites

Table 3. Prerequisites

Items	Description
Software	
LS1043A ASK latest release images	Download ASK Loadable binaries for LS1043A from the following location. https://www.nxp.com/design/software/development-software/vortiqa-software-for-networking/vortiqa-application-solutions-kits/layerscape-1043a-multicore-communications-processor-broadband-home-router-application-solutions-kit:QORIQ-LS1043A-BHR-ASK?tab=Design_Tools_Tab In this document, we are providing steps for updating pre-built images on the board.

To ensure correct board setup, prepare the board using the steps below:

1. Verify the LS1043ARGW switch settings. See Switch configurations for details.
2. Verify the LS1043ARGW jumper settings. See Jumpers settings for details.
3. Optionally, connect the CodeWarrior TAP to the LS1043ARGW. See Setting up CodeWarrior TAP for details.

9 Setting up CodeWarrior TAP

The CodeWarrior TAP allows you to debug and control of the LS1043ARGW system using the CodeWarrior IDE.

NOTE

CodeWarrior TAP is not included in the LS1043ARGW hardware kit.

For more information about CodeWarrior TAP, see https://www.nxp.com/design/software/development-software/codewarrior-development-tools/run-control-devices/codewarrior-tap:CW_TAP.

Follow the instructions provided with the CodeWarrior package to set up the environment and attach the host (for example, USB or Ethernet)

To attach the CodeWarrior TAP to the LS1043ARGW (the JTAG 10 pin header), follow the steps below:

1. Connect the 10-pin micro adapter included with the CodeWarrior TAP (CWH-CTP-CTX10-YE).
2. Connect the 10-wire cable (both ends are keyed and can be connected on either side).
3. Connect the serial port capture cable between the RJ45 connection of the CodeWarrior TAP to the RJ45 of the PC.

   The CodeWarrior TAP is now ready to use. Follow the directions in the CodeWarrior kit to complete the environment setup.

10 Booting LS1043ARGW

Once the system has been properly setup, use the following procedure to power-up and use the LS1043ARGW:

1. Connect the serial console using the USB cable to the USB port on the PC.
2. Connect the AC power cord from the chassis to the local main outlet to turn on the unit.

   There is no power ON/OFF button on the unit. The power LED will blink and become solid green.

The board boots up, the console window (or the CodeWarrior IDE) shows the U-Boot messages as illustrated below.

```
U-Boot 2016.012.0+ga9b437f (Nov 11 2016 - 12:07:43 -0500)

SoC:  LS1043E Rev1.1 (0x87920011)
Clock Configuration:
       CPU0(A53):1400 MHz  CPU1(A53):1400 MHz  CPU2(A53):1400 MHz
       CPU3(A53):1400 MHz
       Bus:      300  MHz  DDR:      1600 MT/s  FMAN:     600  MHz
Reset Configuration Word (RCW):
       00000000: 0610000e 0c000000 00000000 00000000
       00000010: 14550002 80004002 e0106000 c1002000
       00000020: 00000000 00000000 00000000 01030940
       00000030: 00000000 24003004 00000096 00000001
I2C:   ready
Model: LS1043A RGW Board
Board: LS1043ARGW, boot from NAND
SERDES Reference Clocks:
SD1_CLK1 = 156.25MHZ, SD1_CLK2 = 100.00MHZ
DRAM:  Detected UDIMM Fixed DDR on board
2 GiB (DDR4, 32-bit, CL=11, ECC off)
Retimer:
       Revision 0x03, ID 0x01
SEC0: RNG instantiated
Waking secondary cores to start from ffd1b000
All (4) cores are up.
Using SERDES1 Protocol: 5205 (0x1455)
NAND:  128 MiB
MMC:   FSL_SDHC: 0
PCIe1: disabled
PCIe2: Root Complex no link, regs @ 0x3500000
PCIe3: Root Complex no link, regs @ 0x3600000
In:    serial
Out:   serial
Err:   serial
Assign to qe-tdm clk, rcwpmuxcr0=4311
Firmware 'Microcode version 0.0.1 for LS1021a r1.0' for 1021 V1.0
QE: uploading microcode 'Microcode for LS1021a r1.0' version 0.0.1
Net:   Fman1: Uploading microcode version 108.4.10
FM1@DTSEC1, FM1@DTSEC2 [PRIME], FM1@DTSEC5, FM1@DTSEC6, FM1@TGEC1
Hit any key to stop autoboot:  0
```

NOTE

Please note that U-Boot log on your board may vary, based on the ASK release version available on the board.

11 Restart board

To restart or reset the system, use the reset button next to the power button.

12 Ethernet port map

The tables below shows how the Ethernet port can be mapped to Linux, U-Boot, and label on the 1U box.

Table 4. Ethernet port map

Label on 1U box	Port in U-Boot	Port in Linux
ETH0	FM1@DTSEC1	fm1-mac1
ETH1	FM1@DTSEC2	fm1-mac2
ETH2	FM1@DTSEC5	fm1-mac5
ETH3	FM1@DTSEC6	fm1-mac6
SFP+	FM1@TGEC1	fm1-mac9

13 10G optical SFP+ interface

The LS1043ARGW supports a single SFP+ optical interface. To use, with the power off, install the SFP Transceiver Module in the cage, and attach the appropriate fiber optic cable.

NOTE

The SFP transceiver modules are not included with the LS1043ARGW kit.

14 Mini-PCI express slots

There are two Mini-PCI express connectors on the board. The Mini-PCI express connectors are primarily intended to support WiFi cards, though any PCI Express compliant card may be used.

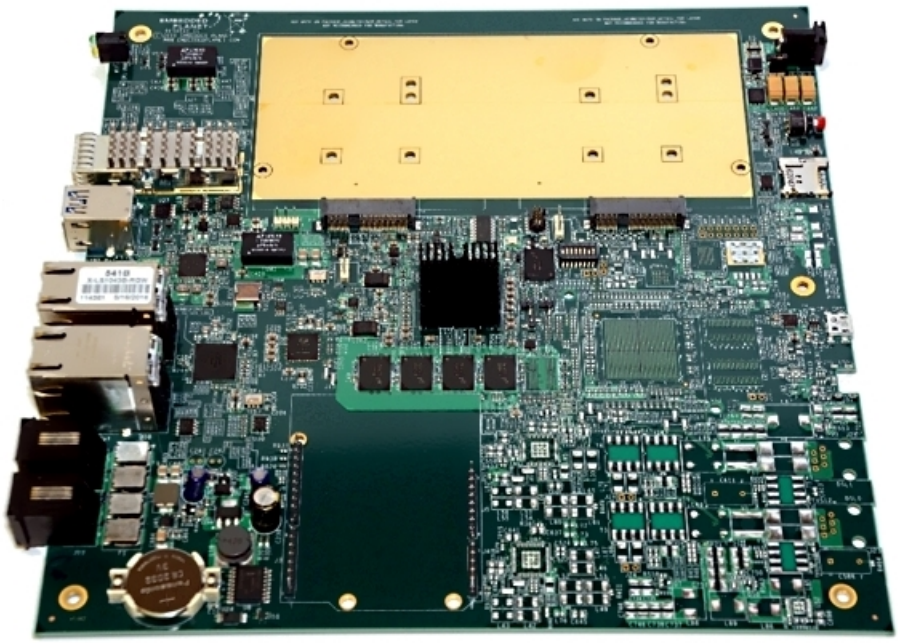

Figure 15. Mini-PCI express slots

NOTE

When installing a WiFi card, be sure to place the thermal conductive material below the card to insure sufficient heat removal. Install all standoffs and screws to insure thermal connection.

15 NAND memory map

The following table shows the NAND memory map.

Table 5. NAND memory map

Start address	End address	Description
0x0000000	0x011FFFF	RCW, SPL, U-Boot
0x0120000	0x013FFFF	FMAN ucode
0x0140000	0x015FFFF	QE ucode
0x0160000	0x315FFFF	FIT image
0x3160000	0x7FFFFFF	User space

16 NAND flashing instructions (U-Boot)

- Flashing pre-built ASK images on LS1043ARGW
- Bootargs settings

16.1 Flashing pre-built ASK images on LS1043ARGW

For updating pre-built ASK images on the LS1043ARGW:

1. Power OFF and then power ON the board.
2. To download the latest ASK binaries, follow these steps:
   a. Go to the following web page: https://www.nxp.com/design/software/development-software/vortiqa-software-for-networking/vortiqa-application-solutions-kits/layerscape-1043a-multicore-communications-processor-broadband-home-router-application-solutions-kit:QORIQ-LS1043A-BHR-ASK?tab=Design_Tools_Tab
   b. Click on *ASK Loadable binaries for LS1043A* to download the latest ASK binaries.
3. Connect the ETH0 Ethernet port to TFTP server.

   NOTE

   For steps to install and run a TFTP server, see https://askubuntu.com/questions/201505/how-do-i-install-and-run-a-tftp-server.

4. Boot the board and stop in the U-Boot.
5. Setup the TFTP settings to get the image files, make sure you are able to ping the server.

```
=> setenv serverip 192.168.1.1  -----> Change this IP(tftp-server-ip) as per the setup.
=> setenv ipaddr 192.168.1.10   -----> Keep this IP in tftp server domain as per the setup
=> ping $serverip               -----> Check the server connectivity
Using FM1@DTSEC1 device
host 192.168.1.1 is alive

=> saveenv
Saving Environment to NAND...
Erasing NAND...
Erasing at 0x100000 -- 100% complete.
Writing to NAND... OK
```

6. For the ASK, there is a single consolidated image, which includes rcw, bootloader, fman, kernel, and rootfs images. Run this TFTP command to flash the image:

```
=> tftp 0xa0000000 openwrt-layerscape-armv8_64b-ls1043argw-ubifs-firmware.bin
=> nand erase.chip
=> nand write 0xa0000000 0 $filesize
```

16.2 Bootargs settings

```
=> pri bootcmd
bootcmd=run lede_nand_boot

=> pri lede_nand_boot
lede_nand_boot=run eth_setenv;run lede_nand_setenv;run lede_nand_run

=> pri lede_nand_setenv
lede_nand_setenv=setenv loadaddr 82000000 && setenv fdtaddr 8f000000 && setenv bootargs ubi.mtd=7
root=ubi0:rootfs rw rootfstype=ubifs noinitrd coherent_pool=32M earlycon=uart8250,mmio,0x21c0500
console=ttyS0,115200 mtdparts=7e800000.flash:4M(u-boot-
rcw),2M(ppa),3M(reserved-1),256k(fman),5888k(reserved-2),1M(dtb),16M(kernel),64M(rootfs),64M(otherbank
)

=> pri lede_nand_run
lede_nand_run=nand read $fdtaddr f00000 100000 && nand read $loadaddr 1000000 1000000 && bootm
$loadaddr - $fdtaddr

=> pri eth_setenv
eth_setenv=setenv serverip 192.168.1.1 && setenv ipaddr 192.168.1.10 && setenv ethact  FM1@DTSEC1 &&
setenv eth0addr 00:04:9F:04:62:b2 && setenv eth1addr 00:04:9F:04:62:b3 && setenv eth2addr
00:04:9F:04:62:b4 && setenv eth3addr 00:04:9F:04:62:b5 && setenv eth4addr 00:04:9F:04:62:b6 && setenv
eth5addr 00:04:9F:04:62:b7 && setenv eth6addr 00:04:9F:04:62:b8
```

Reboot the board to get the updated fman changes and board will boot with the updated image by default.

```
  => reset
```

17 Revision history

The table below summarizes revisions to this document

Revision	Date	Topic cross-reference	Description
Rev. 3	12/2019	Prerequisites	Updated the link to download ASK Loadable binaries in Table 3.
		Setting up CodeWarrior TAP	Added a note, to include more information about CodeWarrior TAP.
		Flashing pre-built ASK images on LS1043ARGW	• Added a note to inlude more information about

Table continues on the next page...

Table continued from the previous page...

Revision	Date	Topic cross-reference	Description
			setting up and running a TFTP server. • Updated steps to flash ASK image on LS1043ARGW.
		-	Removed topic 'Booting the board using SD card'.
Rev. 2	06/2017	LS1043ARGW board view	Updated Figure 3.
		Switch configurations	Updated Table 1.
		Jumpers settings	Added details of 'J36'.
		Booting the board from SD card	Updated steps of booting the board using the SD card.
Rev. 1	10/2016	Introduction	Added 'MicroSD card' in the list of items that are not included in the LS1043ARGW hardware kit.
		Jumpers settings	Updated description of 'J15' and 'J16'.
Rev. 0	09/2016	-	Initial public release.

How To Reach Us

Home Page:

nxp.com

Web Support:

nxp.com/support

Information in this document is provided solely to enable system and software implementers to use NXP products. There are no express or implied copyright licenses granted hereunder to design or fabricate any integrated circuits based on the information in this document. NXP reserves the right to make changes without further notice to any products herein.

NXP makes no warranty, representation, or guarantee regarding the suitability of its products for any particular purpose, nor does NXP assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. “Typical” parameters that may be provided in NXP data sheets and/or specifications can and do vary in different applications, and actual performance may vary over time. All operating parameters, including “typicals,” must be validated for each customer application by customer's technical experts. NXP does not convey any license under its patent rights nor the rights of others. NXP sells products pursuant to standard terms and conditions of sale, which can be found at the following address: nxp.com/SalesTermsandConditions.

While NXP has implemented advanced security features, all products may be subject to unidentified vulnerabilities. Customers are responsible for the design and operation of their applications and products to reduce the effect of these vulnerabilities on customer’s applications and products, and NXP accepts no liability for any vulnerability that is discovered. Customers should implement appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP, the NXP logo, NXP SECURE CONNECTIONS FOR A SMARTER WORLD, COOLFLUX, EMBRACE, GREENCHIP, HITAG, I2C BUS, ICODE, JCOP, LIFE VIBES, MIFARE, MIFARE CLASSIC, MIFARE DESFire, MIFARE PLUS, MIFARE FLEX, MANTIS, MIFARE ULTRALIGHT, MIFARE4MOBILE, MIGLO, NTAG, ROADLINK, SMARTLX, SMARTMX, STARPLUG, TOPFET, TRENCHMOS, UCODE, Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, Layerscape, MagniV, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, QorIQ Qonverge, Ready Play, SafeAssure, the SafeAssure logo, StarCore, Symphony, VortiQa, Vybrid, Airfast, BeeKit, BeeStack, CoreNet, Flexis, MXC, Platform in a Package, QUICC Engine, SMARTMOS, Tower, TurboLink, and UMEMS are trademarks of NXP B.V. All other product or service names are the property of their respective owners. AMBA, Arm, Arm7, Arm7TDMI, Arm9, Arm11, Artisan, big.LITTLE, Cordio, CoreLink, CoreSight, Cortex, DesignStart, DynamIQ, Jazelle, Keil, Mali, Mbed, Mbed Enabled, NEON, POP, RealView, SecurCore, Socrates, Thumb, TrustZone, ULINK, ULINK2, ULINK-ME, ULINK-PLUS, ULINKpro, µVision, Versatile are trademarks or registered trademarks of Arm Limited (or its subsidiaries) in the US and/or elsewhere. The related technology may be protected by any or all of patents, copyrights, designs and trade secrets. All rights reserved. Oracle and Java are registered trademarks of Oracle and/or its affiliates. The Power Architecture and Power.org word marks and the Power and Power.org logos and related marks are trademarks and service marks licensed by Power.org.

© NXP B.V. 2019. **All rights reserved.**

For more information, please visit: http://www.nxp.com

For sales office addresses, please send an email to: salesaddresses@nxp.com

Date of release: 12/2019

Document identifier: LS1043ARGWGSG

arm