conga-QMX8-X (Revision Y.1)

Sample Distribution Set for congatec Qseven 2.0 Development

Quick Start Guide

Revision 1.1

Preface

This quick start guide provides information about the contents of the conga-QMX8-X (Revision Y.0) sample distribution set and how to set it up.

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Revision History

Revision	Date (yyyy-mm-dd)	Author	Changes
1.0	2019-01-28	BEU	First release for X.0
1.1	2020-11-18	BEU	Update for Y.1

1 Hardware

1.1 Sample Distribution Set Contents

The contents of the conga-QMX8-X sample distribution set are listed below:

Part #	Rev.	Name	Description	Qty
007005	B.5	conga-QEVAL/Qseven 2.0 ARM	Evaluation carrier board for standard Qseven modules based on Qseven Specification 2.0	1
016500 or 016503 or 016513	Y.1	conga-QMX8-X/ QXP-4G eMMC16 or QXP-2G eMMC16 or i-QXP-2G eMMC16	Qseven 2.0 engineering sample module with NXP i.MX 8QuadXPlus applications processor, 16 GB onboard HS400 eMMC, and 4GB or 2GB LPDDR4.	1
016453	X.1	conga-QMX8/HSP-T	Standard heatspreader for Qseven module conga-QMX8 with IHS CPU. All stand-offs are bore hole 2.7 mm.	1
011115	B.0	conga-LDVI/EPI	LVDS to DVI converter board for digital flat panels with onboard EEPROM.	1
033331	A	cab-LVDV-DAT-34-15	15 cm data cable LVDS to DVI adapter	1
052147	A	cab-LVDV-PWR-10-15	15 cm power cable LVDS to DVI adapter	1
48000023	A	RS232 adapter cable	MOLEX 6-pin PicoBlade to 2x D-SUB 9 adapter	1
10000285	A	MicroSDHC-Card UHS-I	Kingston industrial SDCIT/EU Class 10 8 GB microSD card with SD card adapter and preinstalled image.	1
N/A	1.1	Quick Start Guide	conga-QMX8-X Sample Distribution Set Quick Start Guide	1

1.2 conga-QMX8-X

The conga-QMX8-X (Revision Y.1) included in this sample distribution set is a Qseven 2.0 engineering sample module featuring the NXP i.MX 8QuadXPlus applications processor, 16 GB HS400 onboard eMMC, and 4GB or 2 GB LPDDR4 onboard memory.

For information about the Mass Production (MP) variants, refer to the datasheet available at www.congatec.com.

1.2.1 Pinout Description

The conga-QMX8-X pinout description is available at the link below. The pinout description lists which signals of the NXP i.MX 8QuadXPlus applications processor are routed to the Qseven connector.

https://git.congatec.com/arm-nxp/imx8-family/doc/cgtimx8_pinlist/-/raw/cgtqx8x_pinlist/cgtqx8x_pin_connection.xlsx

1.3 conga-QEVAL/Qseven 2.0 ARM

The conga-QEVAL/Qseven 2.0 ARM included in this sample distribution set is an evaluation carrier board based on the Qseven Specification 2.0.

For information about the conga-QEVAL/Qseven 2.0 ARM, refer to the User's Guide available at www.congatec.com.

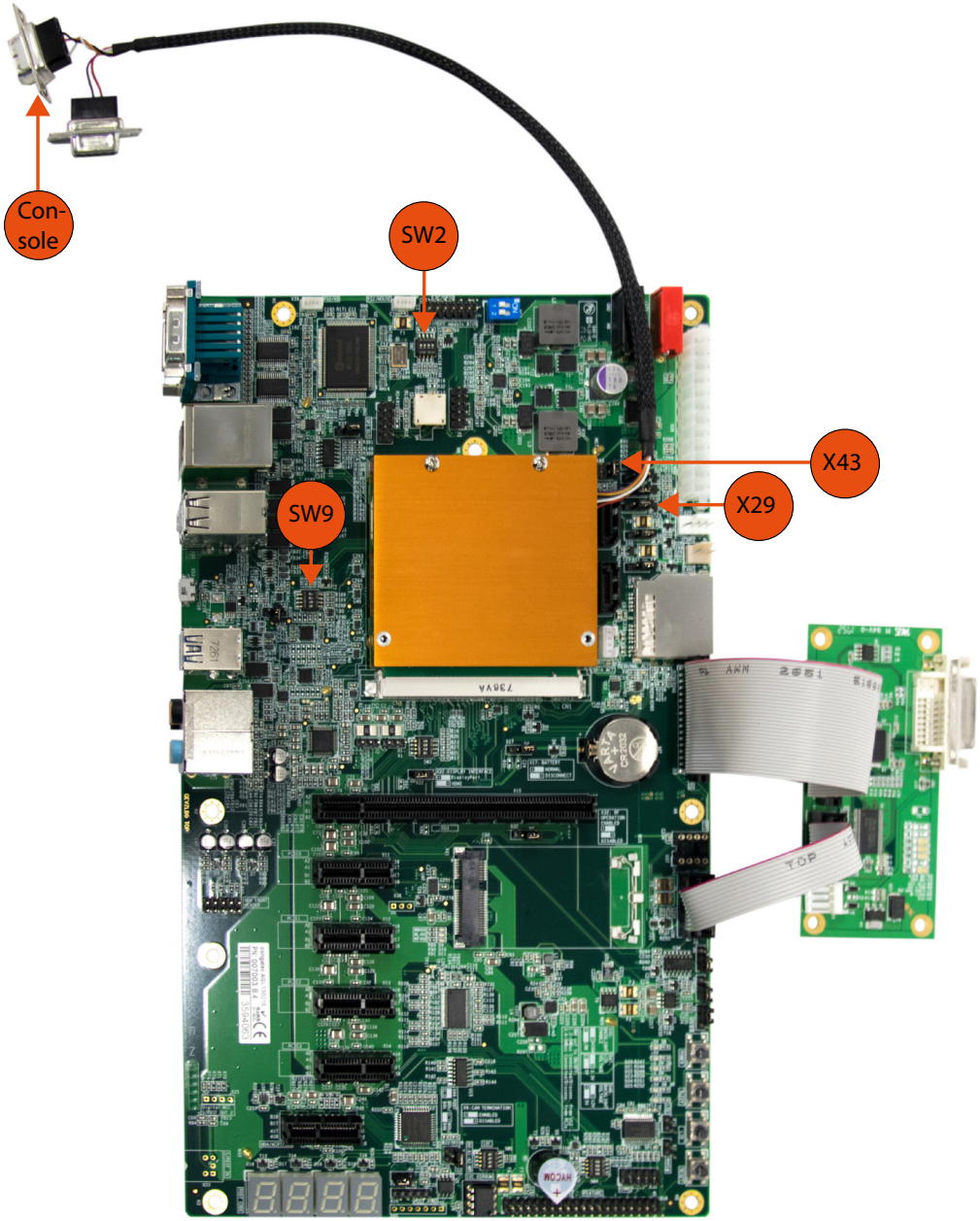
1.4 Hardware Setup

Follow the steps below to assemble the hardware:

1. Ensure the hardware is protected from the effects of electrostatic discharge (ESD).
2. On the module, select **SPI** as the boot source via DIP switch SW1[1]:

SW1				Selected Boot Source[1]
#4	#3	#2	#1	
OFF	OFF	OFF	OFF	Boot from fuse
OFF	OFF	OFF	ON	Serial download
OFF	OFF	ON	OFF	eMMC0
OFF	OFF	ON	ON	SD1 boot
OFF	**ON**	**ON**	**OFF**	**SPI**

4. On the carrier board, set:
   - jumper X29 to position 3-4 (AT mode)[2]
   - jumper X43 to position 3-4 (PWGIN generated by AT/ATX power supply)
   - DIP switch SW9 #1,2,3,4 as desired (USB ports configuration)[2]
5. Connect the RS232 adapter cable to the connector on the module.
6. Connect the USB 2.0 to Serial Adapter to the RS232 adapter cable port labeled "CONSOLE".
7. Ensure the included microSD card is inside the slot of the module.
8. Mount the module and heatspreader onto the carrier board. (Final torque: 0.4 Nm)
9. Connect the conga-LDVI/EPI as shown in the image on the right.
10. Connect a Power Supply Unit (PSU) to the carrier board.
11. To start the system, switch the PSU on.



Note

1. *Boot source selection via DIP switch will not be implemented on Mass Production (MP) variants. Fastboot is currently not supported.*
2. *USB 3.0 is only supported on port 0. USB ports 5, 6 and 7 are not supported. For more information, refer to section 5.2.7 "Universal Serial Bus (USB)" of the conga-QEVAL/Qseven 2.0 ARM User's Guide.*

2 Software

2.1 Starting Up

The conga-QMX8-X uses U-Boot as standard bootloader. The bootloader is GNU GPL open source software. A serial terminal connection is required in order to display the boot process and to modify the boot behavior. The boot behavior is controlled via environment variables.

The included RS232 adapter cable has two connectors. The RX/TX signals are already crossed. Therefore, do NOT use a crossover-cable. Use the connector labeled "Console" for the U-Boot console output. Use the unlabeled connector for the System Controller Unit Firmware (SCFW) debug output.

To establish a terminal connection, a terminal program such as TeraTerm or Putty can be used.

Use the following communication parameters:

Baud rate:	115200
Data:	8 bit
Parity:	none
Stop:	1 bit
Flow control:	none

The following console output is displayed when the system is powered on:

```
U-Boot 2018.03-00811-g8d00e8c (Jan 14 2019 - 18:17:00 +0100)

CPU:   Freescale i.MX8QXP revB A35 at 1200 MHz at 34C
Model: congatec QMX8-X aka QX8X
Board: conga-QMX8-X aka QX8X
Boot:  SD1
DRAM:  3 GiB
MMC:   FSL_SDHC: 0, FSL_SDHC: 1
Loading Environment from MMC... Run CMD11 1.8V switch
*** Warning - bad CRC, using default environment

Failed (-5)
[pcie_ctrlb_sata_phy_init_rc] LNK DOWN 8600000
In:    serial
Out:   serial
Err:   serial

 BuildInfo:
  - SCFW 06ff1979, SECO-FW 31fabbff, IMX-MKIMAGE 7f7b5b25, ATF 30d73be
  - U-Boot 2018.03-00811-g8d00e8c

Run CMD11 1.8V switch
switch to partitions #0, OK
mmc1 is current device
flash target is MMC:1
Run CMD11 1.8V switch
Net:
Warning: ethernet@5b040000 (eth0) using random MAC address - a6:60:4c:31:08:48
eth0: ethernet@5b040000 [PRIME]
Fastboot: Normal
Normal Boot
Hit any key to stop autoboot:  0
```

2.2 Boot Process

The conga-QMX8-X boot process starts at Power On Reset (POR), where the hardware reset logic forces the ARM core to begin execution. The on-chip boot ROM loads the boot container which usually consists of SCFW, Security Controller (SECO) firmware, ARM Trusted Firmware (ATF) and the bootloader binary (U-Boot).

After SCFW loading, the bootloader is executed and performs basic system initialization (serial console, etc.). Afterwards, the environment settings are parsed and the system boot continues as specified.

Press any key during startup to stop autoboot and to get to U-Boot console. At the U-Boot console, the environment settings can be displayed using the "print" command. In addition, useful functionality is available (such as memory dump, access to the SPI and the I2C system, etc.). The "help" command will display any command supported by the U-Boot.

If autoboot is not interrupted by pressing a key, the boot process goes ahead and the module will boot the Linux operating system that is installed on the microSD card.

2.3 U-Boot Environment Variables

The U-Boot environment is located in SPI Flash (in microSD card for prototypes and engineering samples). One of the benefits of the U-Boot bootloader is the possibility to specify its run time configuration using environment variables.

The environment variables of U-Boot can be displayed using the printenv (or the print) command.

During the boot process, the bootloader evaluates the "bootcmd" variable and executes it. The boot command tries to load a bootscript or a kernel from the boot device. If this is successful, the script or kernel will be started, otherwise a fallback to network boot is performed. The variable "mmcdev" specifies the mmc boot device. Furthermore, the variable "mmcroot" is passed to the kernel in order to specify the location of the root filesystem.

The following environment variables are predefined for conga-QMX8-X (Revision Y.1):

Name	Default value	Description
bootcmd		Defines the startup command of the bootloader, i.e. how the system performs the boot process
fdt_file	imx8qxp-cgtqx8x.dtb	The device tree blob, might be exchanged in order to enhance functionality
image	Image	The name of the kernel image file that is loaded during boot process
ipaddr	not specified	Address of the system (used for network boot)
serverip	not specified	Address of the remote host (used for network boot)
netmask	not specified	Netmask of the network (used for network boot)
nfsroot	not specified	The location where the NFS root filesystem is stored (used for network boot)
mmcdev	"1" (onboard microSD card)	The boot device number (used for mmcboot)
mmcpart	"1" (first partition)	The number of the bootpartiton on the bootdevice (used for mmcboot)
mmcroot	"/dev/mmcblk1p2 rootwait rw" (2nd partition on device 1)	The root filesystem (used for mmcboot), might also be used to extend the kernel command line

Following, some frequently used scripts:

Name	Description
mmcboot	Boots the system from mmc (with the specified parameters for mmcboot), i.e. eMMC, SD card, microSD card
mmcargs	Configures the bootargs for mmcboot
netboot	Boots the system from network (with the specified parameters for network boot)
netargs	Configures the bootargs for network boot
loadbootscript	Used during boot, loads an eventually existing boot script
loadimage	Used during boot, loads the kernel
loadfdt	Used during boot, loads the device tree blob file

There are several commands to change the behavior of the bootloader and to customize the boot process. The help command can be used to display a list of all available commands.

2.4 Linux

By default, the bootloader loads the Linux operating system stored on the microSD card. The operating system image is built by Yocto.

Booting to the Linux desktop may take some time. To speed up the boot process significantly, install the root filesystem onto the onboard eMMC device.

Note

In order to maintain the integrity of the file system, it is recommended to always shut down the system by issuing the command "poweroff" in the console terminal.

2.5 Additional Information

The software provided on the included microSD card is based on the Yocto Project (www.yoctoproject.org) and i.MX 8QuadXPlus specific add-on layers provided by NXP and congatec.

The conga-QMX8-X software documentation is available at:
https://wiki.congatec.com

The conga-QMX8-X sources required to build the root filesystem image, kernel and bootloader are available at:
https://git.congatec.com/imx8x_early_access

Caution

Using the wrong source can cause damage to the hardware and/or loss of data. For the conga-QMX8-X Revision Y.1, only use sources from branches ending with "_cgtqx8x-Y1".

Note

Contact congatec technical support to get access to the sources on git.