conga-QMX8 Sample Distribution Set

Quick Start Guide

Revision 1.0

Preface

This quick start guide provides information on the contents of the conga-QMX8 sample distribution set and how to set it up.

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1 Hardware

1.1 conga-QMX8 and conga-QEVAL

The conga-QMX8 is designed according to Qseven® specification 2.1 and features application processors from the NXP i.MX8 product family with up to 8 GB LPDDR4 onboard RAM and 64 GB onboard HS400 eMMC 5.1. It is available in commercial and industrial temperature range.

The conga-QEVAL is designed according to Qseven® specification 2.0 and supports both x86 and ARM modules. With this dual architecture support, customers can test modules with different architectures on a single carrier board, thereby reducing production cost and time. The customers need to make sure the switches and jumpers for the shared pins are set correctly to avoid possible malfunction or damage to the module/carrier board.

1.2 Set Content

Part #	Name	Description	Qty
007005	conga-QEVAL/Qseven 2.0 ARM Revision B.4	Qseven 2.0 evaluation carrier board for ARM based Qseven Modules.	1
016490	conga-QMX8/a-QCM-6GB eMMC16	Qseven 2.1 module with NXP automotive i.MX8 QuadMax processor (Alpha Sample). 6GB LPDDR4 and 16GB onboard eMMC HS400.	1
016455	conga-QMX8/CSA-T	Active cooling solution. All stand-offs are M2.5 threaded.	1
48000023	RS232 adapter cable	MOLEX 6-Pin PicoBlade to two D-SUB 9.	1
10000285	MicroSDHC-Card UHS-I	8GB - Kingston industrial SDCIT/EU Class 10 with preinstalled image.	1
011115	conga-LDVI/EPI	LVDS to DVI converter board for digital flat panels with onboard EEPROM.	1
033331	cab-LVDV-DAT-34-15	15cm data cable LVDS to DVI adapter	1
052147	cab-LVDV-PWR-10-15	15cm power cable LVDS to DVI adapter	1
500025	conga-HDMI add-on card	Used to connect an HDMI display to the "PCIe x16 for Graphic Card Adapter" on the conga-QEVAL.	1

Note: Future conga-QEVAL revisions (B.5 and later) will provide improved SD card compatibility and improved audio performance via a congatec specific audio card. The current sample distribution set includes the conga-QEVAL revision B.4 and does not include the congatec specific audio card.

1.3   Connecting the Hardware

1. Ensure the hardware is protected from the effects of electrostatic discharge (ESD).

2. Set the DIP switches as described in section 1.5 "DIP Switch Settings".

3. Set the jumpers set as described in section 1.6 "Jumper Settings".

4. Ensure the included microSD card is inserted into the slot of the module.

    Note: SD cards with 1.8 V currently not supported by carrier board slot.

5. Attach the RS232 adapter cable to the connector on the module.

6. Attach the conga-QMX8 module to the carrier board.

7. Mount the conga-QMX8/CSA-T active cooling solution.

8. Connect the cables and adapters as shown in the picture below.
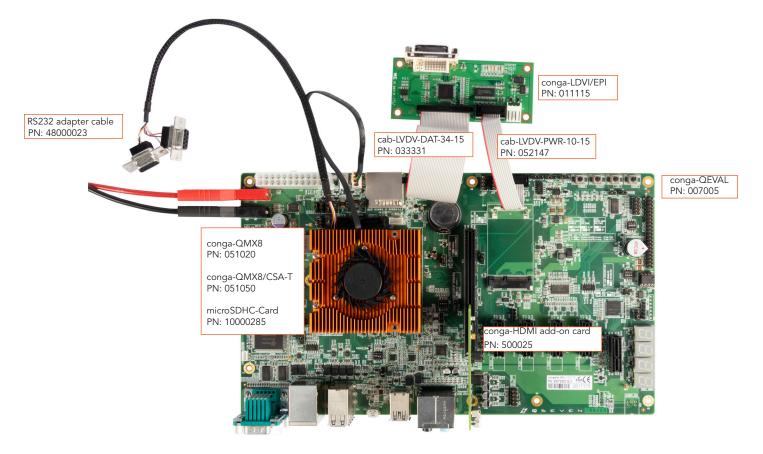
    Note: Connect the fan of the cooling solution to the 3-pin connector. Otherwise, the fan will not turn on. The 4-pin connector is currently not supported.

9. Connect an AT/ATX PSU or +12 VDC lab PSU to the carrier board.

    Note: ATX mode is currently not supported.

10. To power on the system, switch on the connected PSU.

    Note: The power, sleep, and LID buttons currently have no function.

RS232 adapter cable
PN: 48000023

conga-LDVI/EPI
PN: 011115

cab-LVDV-DAT-34-15
PN: 033331

cab-LVDV-PWR-10-15
PN: 052147

conga-QEVAL
PN: 007005

conga-QMX8
PN: 051020

conga-QMX8/CSA-T
PN: 051050

microSDHC-Card
PN: 10000285

conga-HDMI add-on card
PN: 500025

1.4 Interfaces

ATX

+12V

GND

CPU FAN

SYS. FAN

SD/MMC Socket

LVDS

EEPROM Socket

LCD Power

POWER ON

SLEEP

LID

RESET

LID

WAKE

COM2 Header

Auxiliary Power

GND

CMOS Battery

Feature Connector

SATA0

SATA1

GND

Mini PCIE

GND

Speaker

MXM Connector

Internal Use

LPC/GPIO Header

Digital Display Port (DDI)

U6

EEPROM SO8 Socket

CAN

MOUSE

SPI Header

PCIE0

PCIE1

PCIE2

PCIE3

Audio Card Conector

DEBUG Display

KEYBOARD

GND

GND

GND

GND

L8

LAN USB2 USB3

USB 7
USB 6
USB 5
USB 4

USB OTG

SuperSpeed USB Ports
USB 1
USB 2

5.1 Audio Channel

SPDIF

HDA Header

COM1
COM0

GND

1.5   DIP Switch Settings

M13 - DIP Switch

Switch #	Switch ON	Switch OFF
1	Serial download mode	Boot from module*
2	SPI flash (U4) on hold	SPI flash (U4) normal operation*

SW1 - DIP Switch

Switch 1	Switch 2	Switch 3	Switch 4	Selected I2C Address
ON	OFF	OFF	OFF	A0
OFF	ON	OFF	OFF	A1
OFF	OFF	ON	OFF	A2
OFF*	OFF*	OFF*	ON*	WP (Write Protect)

SW2 - DIP Switch

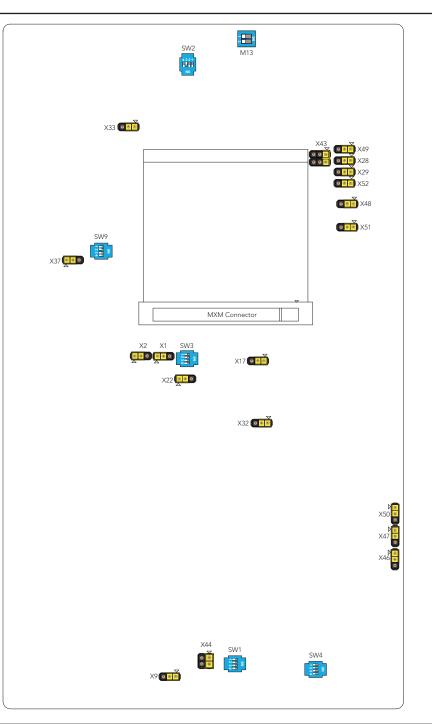| Switch #	Switch ON	Switch OFF
1	Super I/O enabled*	Disabled
2	KBC enabled*	Disabled
3	Super I/O address 4Eh	Super I/O address 2Eh*
4	POST display enabled*	Disabled

SW3 - DIP Switch

Switch #	Switch ON	Switch OFF
1	LVDS_BL_CTRL enabled*	Disabled
2	FAN_PWMOUT enabled*	Disabled
3	SPKR enabled*	Disabled
4	FAN_TACHOIN enabled*	Disabled

SW4 - DIP Switch

Switch #	Switch ON	Switch OFF
1	Connect SMB clock signal to PCIe clock buffer*	Disconnect
2	Connect SMB data signal to PCIe clock buffer*	Disconnect
3	Connect SMB clock signal to PCIe slots*	Disconnect
4	Connect SMB data signal to PCIe slots*	Disconnect

*Default setting. Change to the setting highlighted in red for conga-QMX8 module.

SW9 - DIP Switch

Switch #	Switch ON	Switch OFF
1	Selects USB 3.0 port 0 (disables USB 2.0 port 6 and 7 of connector X35)	Selects USB 2.0 port 6 and 7 (disables USB 3.0 port 0 of connector X34)*
2	Selects USB 3.0 port 1 (disables USB 2.0 port 4 and 5 of connector X35)	Selects USB 2.0 port 4 and 5 (disables USB 3.0 port 1 of connector X34)*
3	Routes USB 2.0 signals to port 2 of connector CN7 (disables mini-PCIe)	Routes USB 2.0 signals to mini-PCIe connector X31 (disables USB 2.0 port 2)*
4	Routes USB 2.0 port 1 signals to connector X53 (micro USB AB connector)	Routes USB 2.0 port 1 signals to USB A connector X34 (disables USB OTG)*

1.6 Jumper Settings

X9 - CAN Term

Pin	Configuration
1-2	Enabled
2-3	Disabled*

X17 - RTC Battery

Pin	Configuration
1-2	Normal oprtation*
2-3	RTC battery disconnected

X22 - HDMI/DP

Pin	Configuration
1-2	HDMI_HPD#*
2-3	DP_HPD#

X28 - PS_ON# Control

Pin	Configuration
1-2	via S3#*
2-3	via S5#

X29 - ATX PSON#

Pin	Configuration
1-2	ATX Mode*
2-3	AT Mode / Always ON

X32 - WiFi @ mini PCIe

Pin	Configuration
1-2	Enabled*
2-3	Disabled

X33 - LAN LEDs

Pin	Configuration
1-2	Standby powered*
2-3	Main powered

X37 - USB OTG ID-Pin

Pin	Configuration
1-2	X53 USB B ... ID=open*
2-3	X53 USB A ... ID=GND

X43 - PWR_OK (PWGIN)

Pin	Configuration
1-2	Pull-up resistor*
2-3	ATX power source
4-6	DC/DC converter

X44 - Debug Display

Pin	Configuration
1-2	80h and 84h output*
2-3	90h and 94h output

X46 - LCD BKLT Power

Pin	Configuration
1-2	12 V*
2-3	5 V

X47 - LCD Panel Power

Pin	Configuration
1-2	3.3 V
2-3	5 V*

X48 - CPU FAN Power

Pin	Configuration
1-2	12 V*
2-3	5 V

X49 - +5V_SB ATX PSU

Pin	Configuration
1-2	Enabled*
2-3	Disabled

X50 - LCD BKLT_EN

Pin	Configuration
1-2	HIGH active*
2-3	LOW active

X51 - SYS. FAN Power

Pin	Configuration
1-2	12 V*
2-3	5 V

X52 - SYS. FAN Control

Pin	Configuration
1-2	Without control*
2-3	With control

* Default setting. Change to the setting highlighted in red for the conga-QMX8 module.
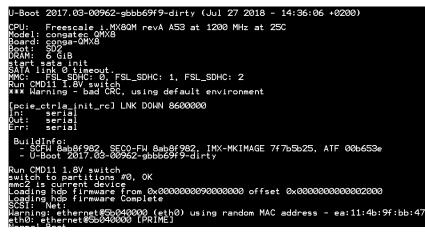
2 Software

2.1 Starting Up

The conga-QMX8 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.

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 will be displayed when the system is powered on.

```
U-Boot 2017.03-00962-gbbb69f9-dirty (Jul 27 2018 - 14:36:06 +0200)

CPU:   Freescale i.MX8QM revA A53 at 1200 MHz at 25C
Model: congatec QMX8
Board: conga-QMX8
Boot:  SD2
DRAM:  6 GiB
start sata init
SATA link 0 timeout.
MMC:   FSL_SDHC: 0, FSL_SDHC: 1, FSL_SDHC: 2
Run CMD11 1.8V switch
*** Warning - bad CRC, using default environment

[pcie_ctrla_init_rc] LNK DOWN 8600000
In:    serial
Out:   serial
Err:   serial

 BuildInfo:
  - SCFW 8ab8f982, SECO-FW 8ab8f982, IMX-MKIMAGE 7f7b5b25, ATF 00b653e
  - U-Boot 2017.03-00962-gbbb69f9-dirty

Run CMD11 1.8V switch
switch to partitions #0, OK
mmc2 is current device
Loading hdp firmware from 0x0000000090000000 offset 0x0000000000002000
Loading hdp firmware Complete
SCSI:  Net:
Warning: ethernet@5b040000 (eth0) using random MAC address - ea:11:4b:9f:bb:47
eth0: ethernet@5b040000 [PRIME]
Normal Boot
```

2.2 Boot Process

The conga-QMX8 boot process starts at Power On Reset (POR), where the hardware reset logic forces the ARM core to begin execution, starting from the on-chip boot ROM of the processor.

After loading, the bootloader will be executed and will perform basic system initialization (e.g. the system memory, serial console, etc.). Afterwards, the environment settings are parsed and the system boot will go ahead 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 for prototypes). 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:

Name	Default value	Description
bootcmd		Defines the startup command of the bootloader, i.e. how the system performs the boot process
fdt_file	imx8qm-cgtqmx8.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
hdp_file	hdmitxfw.bin	The binary firmware file for enabling HDMI transmit, essential to load if video output to HDMI is desired
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	"2" (onboard microSD)	The boot device number (used for mmcboot)
mmcpart	"1" (first partition)	The number of the bootpartiton on the bootdevice (used for mmcboot)
mmcroot	"/dev/mmcblk2p2 rootwait rw" (2nd partition on device 2)	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
loadhpd	Used during boot, loads the hdmi firmware 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 system boots the Linux operating system that is stored on the microSD card. The operating system image is Yocto.

Booting to the Linux desktop may take some time. This is because the complete system initialization occurs from a microSD card connected via a 4-bit interface.

To speed up the boot process significantly, install the root filesystem onto the onboard eMMC device or an external SATA device.

Note

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

2.5 Additional Information

The software provided with the conga-QMX8 sample distribution set is based on the Yocto Project (www.yoctoproject.org) and i.MX8 specific add-on layers provided by NXP and congatec.

In order to rebuild the root filesystem image, kernel and bootloader for conga-QMX8, the complete kernel source, bootloader source and individual patches can be obtained from the congatec source code repository:
https://git.congatec.com/imx8_early_access

Further software documentation can be found here:
https://git.congatec.com/imx8_early_access/meta-fsl-bsp-release

Note

Contact congatec technical support to get access to the repository.