conga-SMX8

Sample Distribution Set for congatec SMARC 2.1 Development

Quick Start Guide

Revision 1.0

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Revision History

Revision	Date (yyyy-mm-dd)	Author	Changes
1.0	2022-05-04	BEU	First Release

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1 Hardware

1.1 Sample Distribution Set

The following items are included in the sample distribution set:

Part #	Rev.	Name	Description
051000/ 051001/ 051002/ 051020/ 051021/ 051022	A.2	conga-SMX8/QCM-4GB conga-SMX8/QCP-4GB conga-SMX8/QCP-2GB conga-SMX8/i-QCM-4GB conga-SMX8/i-QCP-4GB conga-SMX8/i-QCP-2GB	SMARC 2.1 module with NXP i.MX 8 processor. Module variant depending on sample availability and customer request. For options, see section 1.2 "conga-SMX8" below.
051050	A.0	conga-SMX8/i-CSP-B	Passive cooling solution (051050) or heatspreader (051051) depending on customer request. All standoffs are with 2.7 mm bore hole.
051051	A.0	conga-SMX8/i-HSP-B	
007010	C.1	conga-SEVAL	Evaluation carrier board for SMARC modules.
48000023	A	Console Cable	MOLEX 6-Pin PicoBlade to two D-SUB 9
10000116	A	RS-232 / USB Adapter FTDI	USB 2.0 to standard serial port. Based on FTDI-Chipset.
10000413	A	microSD Card	SANDISK Ultra 16GB Class 10 UHS-1
011115	B.0	conga-LDVI/EPI	LVDS to DVI converter board for digital flat panels with onboard EEPROM.
033331	A	cab-LVDV-DAT-34-15	15 cm data cable LVDS to DVI adapter
052147	A	cab-LVDV-PWR-10-15	15 cm power cable LVDS to DVI adapter

Note

A power supply is not included. An ATX power supply is recommended.

1.2 conga-SMX8

The included conga-SMX8 module variant depends on sample availability and customer request. The key features and differences of the variants are summarized in the following tables:

Commercial Variants

Part #	051000	051001	051002
Processor	NXP i.MX 8QuadMax	NXP i.MX 8QuadPlus	NXP i.MX 8QuadPlus
LPDDR4	4 GB	4 GB	2 GB
eMMC	16 GB	16 GB	16 GB
Temp. Range	Commercial (0°C to 60°C)	Commercial (0°C to 60°C)	Commercial (0°C to 60°C)

Industrial Variants

Part #	051020	051021	051022
Processor	NXP i.MX 8QuadMax	NXP i.MX 8QuadPlus	NXP i.MX 8QuadPlus
LPDDR4	4 GB	4 GB	4 GB
eMMC	16 GB	16 GB	16 GB
Temp. Range	Industrial (-40°C to 85°C)	Industrial (-40°C to 85°C)	Industrial (-40°C to 85°C)

For more information about the conga-SMX8 module variants and features, refer to the datasheet or User's Guide available at www.congatec.com

1.2.1 Pinout Description

The pinout description lists which signals of the NXP i.MX 8 processor are routed to the SMARC connector.

Use the link below to directly download the conga-SMX8 pinout as an Excel file:

https://git.congatec.com/arm-nxp/imx8-family/doc/cgtimx8_pinlist/-/raw/cgtsmx8_pinlist/cgtsmx8_pin_connection.xlsx

Alternatively, use the link below and follow the instructions to download it:

https://git.congatec.com/arm-nxp/imx8-family/doc/cgtimx8_pinlist

1.3 conga-SEVAL

The conga-SEVAL (Revision C.1) included in this sample distribution set is an evaluation carrier board based on the SMARC Specification.

For more information about the conga-SEVAL, refer to the datasheet or User's Guide available at www.congatec.com

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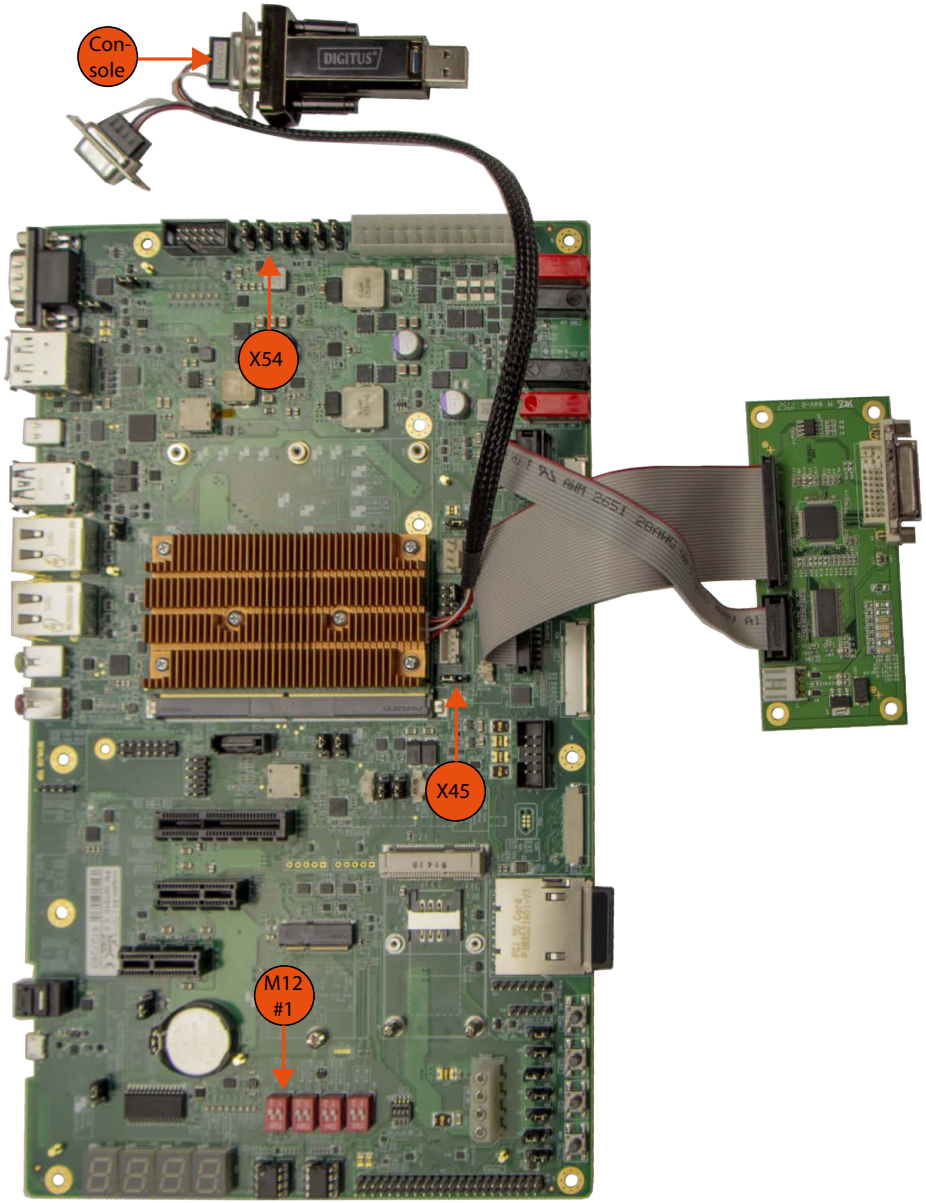
1.4 Hardware Setup

Follow the steps below to set up the hardware:

1. Ensure the hardware is protected from the effects of electrostatic discharge (ESD).
2. On the carrier board, set DIP switch M12 #1 to OFF (Audio: I²S)
3. Insert the microSD card into the slot on the back of the module.[1]
4. Connect the RS-232 adapter cable to the connector on the module.
5. Connect the USB 2.0 to Serial Adapter to the RS-232 adapter cable port labeled "CONSOLE".
6. Mount the cooling solution onto the module. (Final torque: 0.4 Nm)
7. Mount the module onto the carrier board. (Final torque: 0.4 Nm)
8. Set carrier board jumper X54 to position 2-3 (CARRIER_PWRON).
9. Connect the conga-LDVI/EPI as shown in the picture.[2]
10. Connect an ATX Power Supply Unit (PSU) to the carrier board.
11. To start the system, switch the ATX PSU on.[3]



Note

1. *Refer to section 2.1 "Building the Image" to build the image first.*
2. *LVDS is the default video output. Other video outputs (HDMI®, eDP, or multi-screen) require a dtb file.*
3. *To enable serial downloader mode, set carrier board jumper X45 to position 2-3.*

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2 Software

2.1 Building the Image

To build the Linux or Android operating system image for the conga-SMX8, follow the instructions described in the website below:

https://wiki.congatec.com

Note

In case of questions, contact congatec technical support.

2.2 Starting Up

The conga-SMX8 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

2.3 Boot Process

The conga-SMX8 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.

2.4 U-Boot Environment Variables

The u-boot environment is located in the onboard SPI Flash. 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.

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The following environment variables are predefined for conga-SMX8:

Name	Default value	Description
bootcmd		Defines the startup command of the bootloader, i.e. how the system performs the boot process
fdt_file	imx8qm-cgtsmx8.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 slot)	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.

2.5 Linux

By default, the system boots the operating system that is stored on the microSD card.

Booting to a graphical user interface (GUI) 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. In case of questions, contact congatec technical support.

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.

2.6 Additional Information

The NXP i.MX 8 processor documentation is available at www.nxp.com

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