conga-SMX8-Mini (Prototype Revision X.2)

Sample Distribution Set for congatec SMARC 2.0 Development

Quick Start Guide

Revision 1.2

Preface

This quick start guide provides information about the contents of the conga-SMX8-Mini (Prototype Revision X.2) sample distribution set and how to set it up.

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Revision History

Revision	Date (yyyy-mm-dd)	Author	Changes
1.0	2019-10-17	BEU	First release
1.1	2019-11-06	BEU	Update for Revision X.2
1.2	2019-11-25	BEU	Removed list of limitations

1 Hardware

1.1 Sample Distribution Set Contents

The contents of the conga-SMX8-Mini (Prototype Revision X.2) sample distribution set are listed below:

Part #	Rev.	Name	Description	Qty
007010	C.0	conga-SEVAL	Evaluation carrier board for standard SMARC modules based on SMARC Specification 2.0	1
051203	X.2	conga-SMX8-Mini/ QC-2G eMMC16 (Prototype)	SMARC 2.0 prototype module with NXP i.MX 8M Mini Quad applications processor, 2 GB LPDDR4 onboard memory and 16 GB onboard HS400 eMMC.	1
051250	X.0	conga-SX8M/CSP-B	Passive cooling for SMARC 2.0 module conga-SMX8. 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
10000355	A	SDHC UHS-I 16 GB	Sandisk Extreme 16 GB SD card with preinstalled image.	1
N/A	1.0	Quick Start Guide	conga-SMX8-Mini Sample Distribution Set Quick Start Guide	1

1.2 conga-SMX8-Mini

The conga-SMX8-Mini (Prototype Revision X.2) included in this sample distribution set is a SMARC 2.0 prototype module featuring the NXP i.MX 8M Mini Quad applications processor, 2 GB LPDDR4 onboard memory and 8 GB HS400 onboard eMMC.

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

1.2.1 Pinout Description

The conga-SMX8-Mini (Prototype Revision X.2) pinout description is available under the link below. The pinout description lists which signals of the NXP i.MX 8M Mini applications processor are routed to the SMARC connector.

https://git.congatec.com/imx8m_early_access/imx8m_sx8m_pinlist

Note

Contact congatec technical support to get access to the pinout description.

1.3 conga-SEVAL

The conga-SEVAL (Revision C.0) included in this sample distribution set is an evaluation carrier board based on the SMARC Specification 2.0.

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

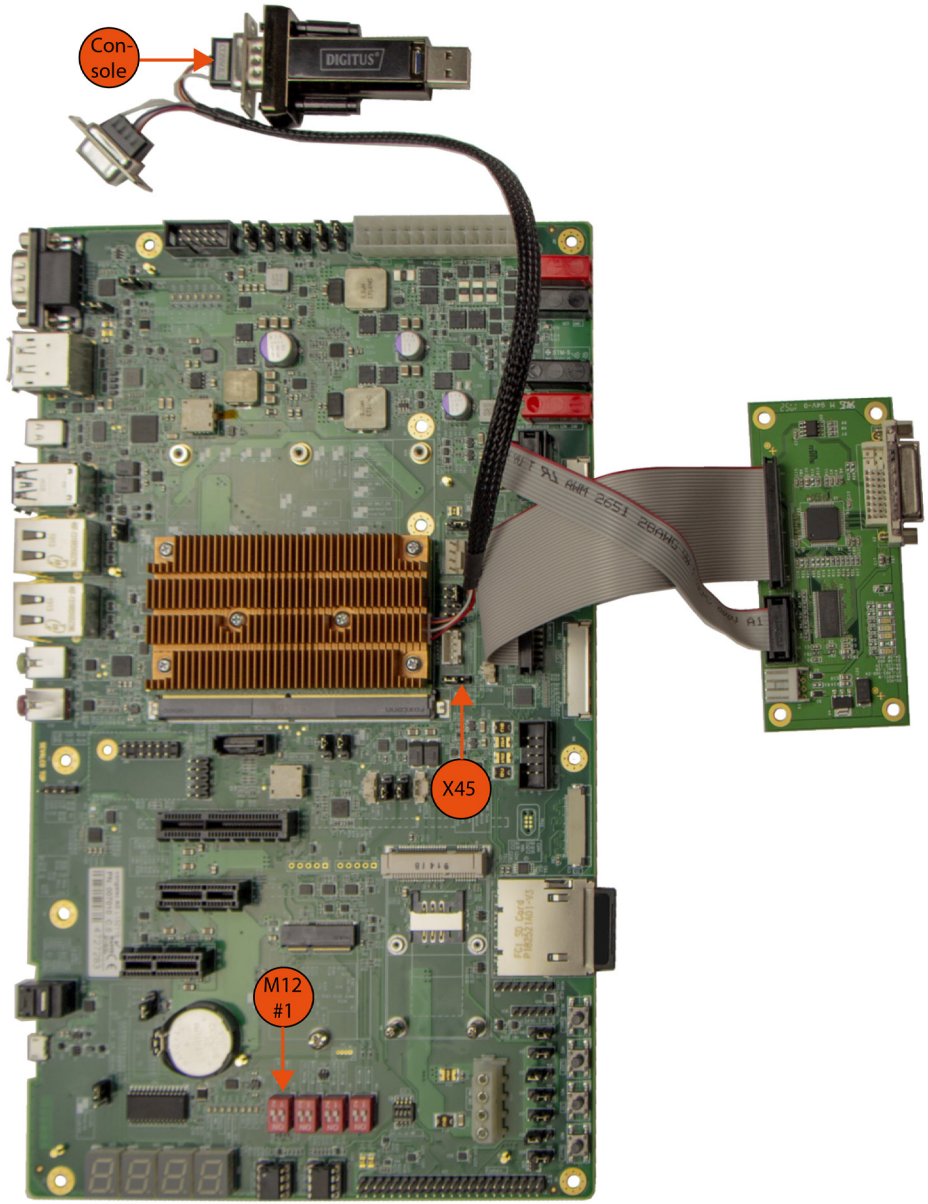
1.4 Hardware Setup

Follow the steps below to assemble the hardware:

1. Ensure the hardware is protected from the effects of electrostatic discharge (ESD).
2. On the carrier board, set DIP switch M12 #1 to OFF (Audio: I²S).
3. Insert the SD card into the SD card slot of the carrier board.
4. Connect the RS232 adapter cable to the connector on the module.
5. Connect the USB 2.0 to Serial Adapter to the RS232 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. Connect the conga-LDVI/EPI as shown in the image on the right.
9. Connect an ATX Power Supply Unit (PSU) to the carrier board.
10. To start the system, switch the ATX PSU on.

Note

To enable serial downloader mode, set jumper X45 to position 2-3.



2 Software

2.1 Starting Up

The conga-SMX8-Mini 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.

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 2018.03-cgt_v2018.03_4.14.98_2.0.0_ga+gcb9f6dd (Sep 10 2019 - 15:18:32 +0000)

CPU:   Freescale i.MX8MMQ rev1.0 1800 MHz (running at 1200 MHz)
CPU:   Commercial temperature grade (0C to 95C) at 31C
Reset cause: POR
Model: congatec SX8M board
DRAM:  2 GiB
MMC:   FSL_SDHC: 0, FSL_SDHC: 1
Loading Environment from MMC... *** Warning - bad CRC, using default environment

Failed (-5)
Panel defaults to MIPI2LVDS
SN65DSI84 init: DSI85
Display: MIPI2LVDS (1280x720)
Video: 1280x720x24
In:    serial
Out:   serial
Err:   serial

 BuildInfo:
  - ATF 1cb68fa
  - U-Boot 2018.03-cgt_v2018.03_4.14.98_2.0.0_ga+gcb9f6dd
```

2.2 Boot Process

The conga-SMX8-Mini 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 bootloader.

After 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 SD card.

2.3 U-Boot Environment Variables

The U-Boot environment is located in SPI Flash (in SD card 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-SMX8-Mini:

Name	Default value	Description
bootcmd		Defines the startup command of the bootloader, i.e. how the system performs the boot process
fdt_file	imx8mm-cgtsx8m.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" (external SD 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
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 system boots the Linux operating system that is stored on the SD card. The operating system image is 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 SD card is based on the Yocto Project (www.yoctoproject.org) and i.MX 8M Mini specific add-on layers provided by NXP and congatec.

The conga-SMX8-Mini software documentation is available at:
https://git.congatec.com/imx8m_early_access/meta-fsl-bsp-release

The conga-SMX8-Mini sources required to build the root filesystem image, kernel and bootloader are available at:
https://git.congatec.com/imx8m_early_access

Note

Contact congatec technical support to get access to the repositories.