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.

Disclaimer

The information contained within this quick start guide, including but not limited to any product specification, is subject to change without notice.

congatec AG provides no warranty with regard to this guide or any other information contained herein and hereby expressly disclaims any implied warranties of merchantability or fitness for any particular purpose with regard to any of the foregoing. congatec AG assumes no liability for any damages incurred directly or indirectly from any technical or typographical errors or omissions contained herein or for discrepancies between the product and this guide. In no event shall congatec AG be liable for any incidental, consequential, special, or exemplary damages, whether based on tort, contract or otherwise, arising out of or in connection with this guide or any other information contained herein or the use thereof.

Intended Audience

This guide is intended for technically qualified personnel. It is not intended for general audiences.

Lead-Free Designs (RoHS)

All congatec AG designs are created from lead-free components and are completely RoHS compliant.

Electrostatic Sensitive Device

All congatec AG products are electrostatic sensitive devices. They are enclosed in static shielding bags, and shipped enclosed in secondary packaging (protective packaging). The secondary packaging does not provide electrostatic protection.

Do not remove the device from the static shielding bag or handle it, except at an electrostatic-free workstation. Also, do not ship or store electronic devices near strong electrostatic, electromagnetic, magnetic, or radioactive fields unless the device is contained within its original packaging. Be aware that failure to comply with these guidelines will void the congatec AG Limited Warranty.

Copyright Notice

Copyright © 2019, congatec AG. All rights reserved. All text, pictures and graphics are protected by copyrights. No copying is permitted without written permission from congatec AG.

congatec AG has made every attempt to ensure that the information in this document is accurate yet the information contained within is supplied “as-is”.

Trademarks

Product names, logos, brands, and other trademarks featured or referred to within this guide, or the congatec website, are the property of their respective trademark holders. These trademark holders are not affiliated with congatec AG, our products, or our website.

Certification

congatec AG is certified to DIN EN ISO 9001 standard.
Warranty

congatec AG makes no representation, warranty or guaranty, express or implied regarding the products except its standard form of limited warranty (“Limited Warranty”) per the terms and conditions of the congatec entity, which the product is delivered from. These terms and conditions can be downloaded from www.congatec.com. congatec AG may in its sole discretion modify its Limited Warranty at any time and from time to time.

The products may include software. Use of the software is subject to the terms and conditions set out in the respective owner’s license agreements, which are available at www.congatec.com and/or upon request.

Beginning on the date of shipment to its direct customer and continuing for the published warranty period, congatec AG represents that the products are new and warrants that each product failing to function properly under normal use, due to a defect in materials or workmanship or due to non conformance to the agreed upon specifications, will be repaired or exchanged, at congatec’s option and expense.

Customer will obtain a Return Material Authorization (“RMA”) number from congatec AG prior to returning the non conforming product freight prepaid. congatec AG will pay for transporting the repaired or exchanged product to the customer.

Repaired, replaced or exchanged product will be warranted for the repair warranty period in effect as of the date the repaired, exchanged or replaced product is shipped by congatec, or the remainder of the original warranty, whichever is longer. This Limited Warranty extends to congatec’s direct customer only and is not assignable or transferable.

Except as set forth in writing in the Limited Warranty, congatec makes no performance representations, warranties, or guarantees, either express or implied, oral or written, with respect to the products, including without limitation any implied warranty (a) of merchantability, (b) of fitness for a particular purpose, or (c) arising from course of performance, course of dealing, or usage of trade.

congatec AG shall in no event be liable to the end user for collateral or consequential damages of any kind. congatec shall not otherwise be liable for loss, damage or expense directly or indirectly arising from the use of the product or from any other cause. The sole and exclusive remedy against congatec, whether a claim sound in contract, warranty, tort or any other legal theory, shall be repair or replacement of the product only.

Technical Support

congatec AG technicians and engineers are committed to providing the best possible technical support for our customers so that our products can be easily used and implemented. We request that you first visit our website at www.congatec.com for the latest documentation, utilities and drivers, which have been made available to assist you. If you still require assistance after visiting our website then contact our technical support department by email at support@congatec.com

Revision History

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date (yyyy-mm-dd)</th>
<th>Author</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>2019-10-17</td>
<td>BEU</td>
<td>First release</td>
</tr>
<tr>
<td>1.1</td>
<td>2019-11-06</td>
<td>BEU</td>
<td>Update for Revision X.2</td>
</tr>
<tr>
<td>1.2</td>
<td>2019-11-25</td>
<td>BEU</td>
<td>Removed list of limitations</td>
</tr>
</tbody>
</table>
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:

<table>
<thead>
<tr>
<th>Part #</th>
<th>Rev.</th>
<th>Name</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>007010</td>
<td>C.0</td>
<td>conga-SEVAL</td>
<td>Evaluation carrier board for standard SMARC modules based on SMARC Specification 2.0</td>
<td>1</td>
</tr>
<tr>
<td>051203</td>
<td>X.2</td>
<td>conga-SMX8-Mini/ QC-2G eMMC16 (Prototype)</td>
<td>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.</td>
<td>1</td>
</tr>
<tr>
<td>051250</td>
<td>X.0</td>
<td>conga-SX8M/CSP-B</td>
<td>Passive cooling for SMARC 2.0 module conga-SMX8. All stand-offs are bore hole 2.7 mm.</td>
<td>1</td>
</tr>
<tr>
<td>011115</td>
<td>B.0</td>
<td>conga-LDVI/EPI</td>
<td>LVDS to DVI converter board for digital flat panels with onboard EEPROM.</td>
<td>1</td>
</tr>
<tr>
<td>033331</td>
<td>A</td>
<td>cab-LVDS-DAT-34-15</td>
<td>15 cm data cable LVDS to DVI adapter</td>
<td>1</td>
</tr>
<tr>
<td>052147</td>
<td>A</td>
<td>cab-LVDS-PWR-10-15</td>
<td>15 cm power cable LVDS to DVI adapter</td>
<td>1</td>
</tr>
<tr>
<td>48000023</td>
<td>A</td>
<td>RS232 adapter cable</td>
<td>MOLEX 6-pin PicoBlade to 2x D-SUB 9 adapter</td>
<td>1</td>
</tr>
<tr>
<td>10000355</td>
<td>A</td>
<td>SDHC UHS-I 16 GB</td>
<td>Sandisk Extreme 16 GB SD card with preinstalled image.</td>
<td>1</td>
</tr>
<tr>
<td>N/A</td>
<td>1.0</td>
<td>Quick Start Guide</td>
<td>conga-SMX8-Mini Sample Distribution Set Quick Start Guide</td>
<td>1</td>
</tr>
</tbody>
</table>

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.

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.*
## 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:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baud rate</td>
<td>115200</td>
</tr>
<tr>
<td>Data</td>
<td>8 bit</td>
</tr>
<tr>
<td>Parity</td>
<td>none</td>
</tr>
<tr>
<td>Stop</td>
<td>1 bit</td>
</tr>
<tr>
<td>Flow control</td>
<td>none</td>
</tr>
</tbody>
</table>

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

```
CPU: Freescale iMX8MMP rev1.0 1800 MHz (running at 1200 MHz)
CPU: Commercial temperature grade (0C to 55C) at 31C
Reset Cause: POR
Model: congatec SX8M board
DRAM: 2 GB
MMC: FSL SDHC: 0, FSL SDHC: 1
Loading Environment from MMC... *** Warning - bad CRC, using default environment
Failed (-)
Panel defaults to MIP12LV05
SNES DSL916 qult: 05165
Display: MIP12LV05 [1280x720]
Video: 1280x720@256x24
In: serial
Out: serial
Err: serial
BuildInfo:
- ATi 100817a
- U-Boot 2018.03-cgt_v2018.03_4.14.90_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:

<table>
<thead>
<tr>
<th>Name</th>
<th>Default value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bootcmd</td>
<td></td>
<td>Defines the startup command of the bootloader, i.e. how the system performs the boot process</td>
</tr>
<tr>
<td>fdt_file</td>
<td>imx8mm-cgtsx8m.dtb</td>
<td>The device tree blob, might be exchanged in order to enhance functionality</td>
</tr>
<tr>
<td>image</td>
<td>Image</td>
<td>The name of the kernel image file that is loaded during boot process</td>
</tr>
<tr>
<td>ipaddr</td>
<td>not specified</td>
<td>Address of the system (used for network boot)</td>
</tr>
<tr>
<td>serverip</td>
<td>not specified</td>
<td>Address of the remote host (used for network boot)</td>
</tr>
<tr>
<td>netmask</td>
<td>not specified</td>
<td>Netmask of the network (used for network boot)</td>
</tr>
<tr>
<td>nfsroot</td>
<td>not specified</td>
<td>The location where the NFS root filesystem is stored (used for network boot)</td>
</tr>
<tr>
<td>mmcdev</td>
<td>&quot;1&quot; (external SD card)</td>
<td>The boot device number (used for mmcboot)</td>
</tr>
<tr>
<td>mmcpart</td>
<td>&quot;1&quot; (first partition)</td>
<td>The number of the boot partition on the boot device (used for mmcboot)</td>
</tr>
<tr>
<td>mmcrout</td>
<td>&quot;/dev/mmcblk1p2 rootwait rw&quot; (2nd partition on device 1)</td>
<td>The root filesystem (used for mmcboot), might also be used to extend the kernel command line</td>
</tr>
</tbody>
</table>

Following, some frequently used scripts:

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

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.