conga-STDA4 (Prototype Rev. X.0)

Sample Distribution Set for congatec SMARC 2.1 Development

Quick Start Guide

Revision 1.00

Preface

This quick start guide provides information about the contents of the Sample Distribution Set for conga-STDA4 (Prototype Rev. X.0) and how to set it up.

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Revision History

Revision	Date (yyyy-mm-dd)	Author	Changes
1.00	2023-11-29	BEU	First Release

1   Hardware

This section describes the hardware included in the Sample Distribution Set for conga-STDA4 (Rev. X.0) and how to set it up.

1.1   Sample Distribution Set

The hardware in the table below is included in the Sample Distribution Set for conga-STDA4 (Prototype Rev. X.0).

Part #	Rev.	Name	Description
051512	X.0	conga-STDA4/i-DRA829J-4G eMMC32	Engineering sample: SMARC Module based on high-performance industrial TI ARM networking processor DRA829. Features 2x ARM Cortex-A72 @ 2.0GHz +2x ARM Cortex-R5F, 4GB onboard LPDDR4x memory and 32GB onboard eMMC. Industrial grade temperature range from -40°C to 85°C.
or			
051520	X.0	conga-STDA4/i-TDA4VM-2G eMMC32 MAYA-W260	Engineering Sample: SMARC Module based on high-performance industrial TI ARM processor TDA4VM. Features 2x ARM Cortex-A72 @ 2.0GHz +2x ARM Cortex-R5F + 8 TOPS MMA (deep-learning matrix multiply accelerator), 2GB onboard LPDDR4x memory and 32GB onboard eMMC. Features U-Blox Wifi/BT module MAYA-W260. Industrial grade temperature range from -40°C to 85°C.
007010	C.2	conga-SEVAL	Evaluation carrier board for SMARC modules.
051550	X.0	conga-STDA4/CSP-B	Passive cooling solution for SMARC Module conga-STDA4 based on TI ARM processor. All standoffs are with 2.7mm bore hole.
48000023	A	Console Cable	MOLEX 6-Pin PicoBlade to two D-SUB 9
10000355	A	SD Card	SDHC UHS-I 16GB (standard SD card size)
10000116	A	RS-232 / USB Adapter FTDI	USB 2.0 to standard serial port. Based on FTDI-Chipset.
N.A	1.0	Quick Start Guide	Quick Start Guide for conga-STDA4 (Rev. X.0) Sample Distribution Set

Note

1. The conga-STDA4 (Prototype Rev. X.0) module variant included in the Sample Distribution Set depends on sample availability and customer request.
2. The conga-STDA4 Mass Production (MP) module variants will not provide the onmodule EEPROM and thermal sensors.
3. A power supply is not included. It is recommended to use an ATX power supply.

1.2   conga-STDA4

For information about the planned conga-STDA4 Mass Production (MP) module variants, refer to the datasheet available at:

www.congatec.com/us/products/smarc/conga-stda4/

1.2.1   Pinout Description

The pinout description lists which signals of the processor are routed to the SMARC® connector.

Use the link below to download the conga-STDA4 (Prototype Rev. X.0) pinout as an Excel file: [1]

https://git.congatec.com/arm-ti/jacinto-family-ea/doc/cgtj721e_pinlist/-/tree/cgtst4m_pinlist

Note

1. Contact congatec support to get access to the pinout.

1.3   conga-SEVAL

The conga-SEVAL (Revision C.2) included in this prototype kit 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/us/products/accessories/conga-seval/

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. Set the carrier SD card as the boot source via DIP switches:

DIP M18		DIP M17		Boot Source
M18.2	M18.1	M17.2	M17.1	
OFF	ON	ON	ON	Carrier SD Card
OFF	OFF	ON	OFF	Reserved
OFF	OFF	OFF	ON	Module eMMC
OFF	OFF	OFF	OFF	Module SPI

5. Insert the included SD card [2, 3]

6. Connect the console cable to the connector X1 on the module

7. Connect the RS-232 / USB Adapter FTDI to the console cable port labeled "CONSOLE"

8. Mount the cooling solution onto the module (Final torque: 0.4 Nm)

9. Mount the module onto the carrier board (Final torque: 0.4 Nm)

10. Connect a monitor to the DisplayPort [4]

11. Optionally, connect the conga-LDVI/EPI as shown in the picture [5]

12. Connect an ATX Power Supply Unit (PSU) to the carrier board

13. To start the system, switch the ATX PSU on

Note

1. *To enable USB DFU mode, set carrier board jumper X45 to position 2-3.*
2. *Refer to section 2.1 "Building the Image" to build the image first.*
3. *UHS microSD cards in an SD card adapter may not function.*
4. *DisplayPort is the default video output.*
5. *LVDS is not enabled in the dtb file by default. The conga-LDVI/EPI is not included in the sample distribution set.*
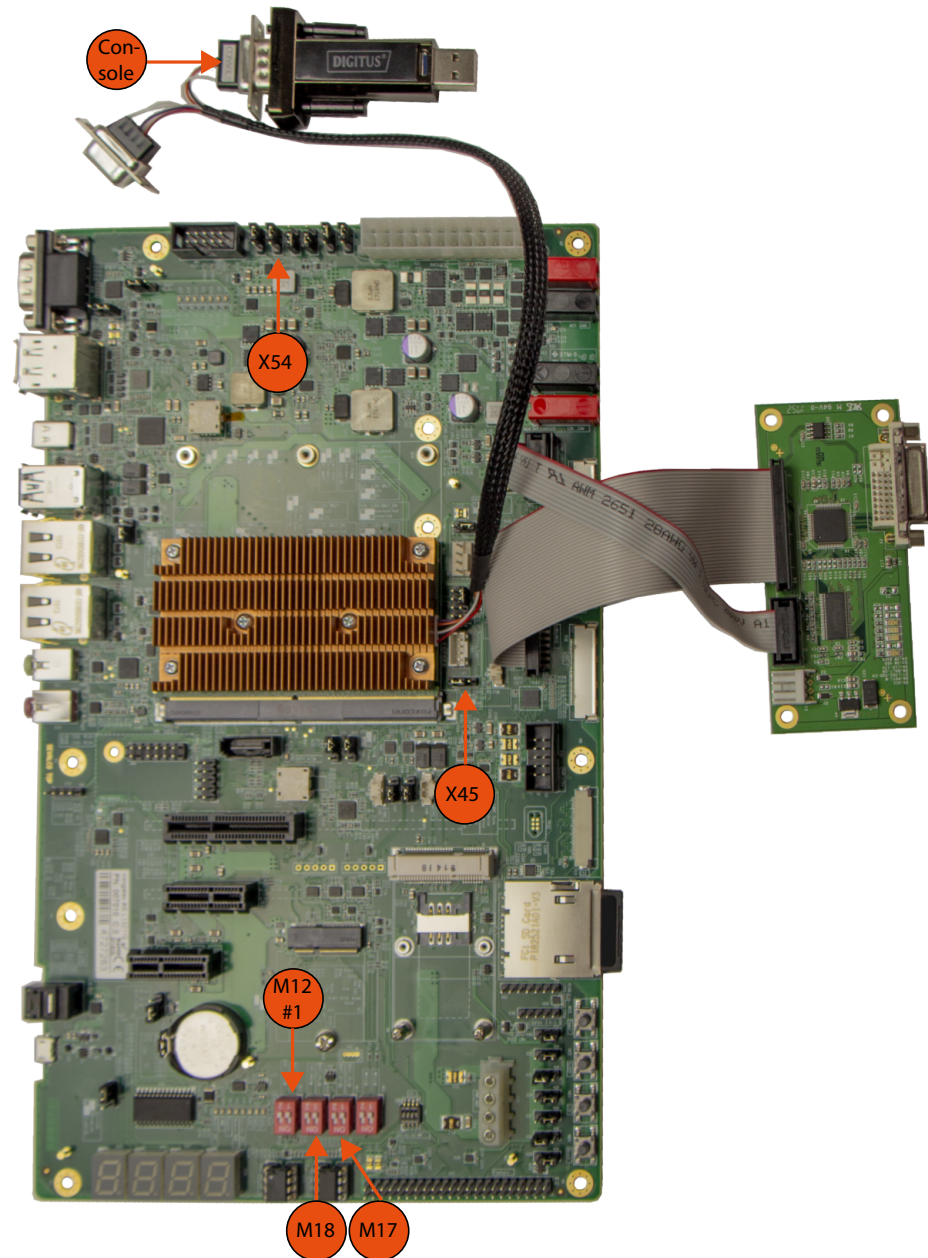
2   Software

2.1   Building the Image

To build the Linux operating system image for the conga-STDA4, follow the instructions described in the website below:

https://congatec.atlassian.net/wiki

Note

In case of questions, contact congatec technical support.

2.2   Starting Up

The conga-STDA4 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-STDA4 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 operating system that is installed on the SD card.

2.4   U-Boot Environment Variables

The u-boot environment of the conga-STDA4 (Prototype Rev. X.0) is stored on the SD card. One of the benefits of the u-boot bootloader is the possibility to specify its run time configuration using environment variables.

Note

Mass Production (MP) revisions store the u-boot environment in SPI Flash.

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-STDA4 (Prototype Rev. X.0):

Name	Default value	Description
bootcmd		Defines the startup command of the bootloader, i.e. how the system performs the boot process
default_ device_ tree	k3-j721e-cgtst4m.dtb	The device tree blob, might be exchanged in order to enhance functionality
name_ kern	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)
bootpart	"1:2" (second partition)	The number of the bootpartiton on the bootdevice (used for mmcboot)

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
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 SD card.

Booting to a graphical user interface (GUI) may take some time. This is because the complete system initialization occurs from an SD card connected via a 4-bit interface.

To speed up the boot process significantly, install the root filesystem onto the onboard eMMC 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 TI Jacinto™ 7 processor documentation is available at:

www.ti.com