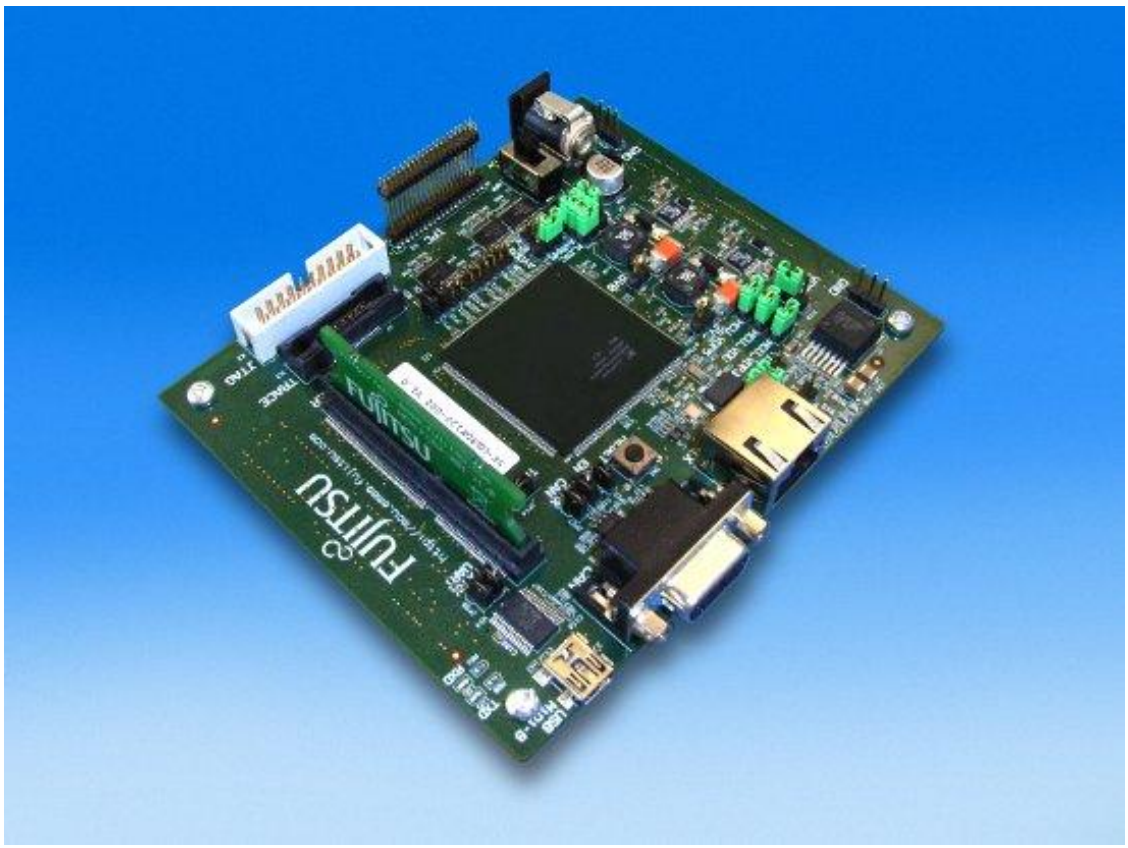
Fujitsu Semiconductor Europe GmbH
User Guide

FSEUMCU-UG-9E0004-16

FCR4 FAMILY
FCR4 CLUSTER SERIES
STARTERKIT
SK-MB9DF120-001 / -002

USER GUIDE



Revision History

Date	Issue
2011-06-21	V0.1, OBe First draft
2011-09-29	V1.0, OBe First release
2011-10-18	V1.1 OBe / MSt Corrected some typos, chapter Abbreviations added
2011-11-22	V1.2, MSt Corrected Pin numbers in Table 6-9
2012-01-05	V1.3 MSt Added further description for clock changes in chapter 2.4.1
2012-03-20	V1.4, MNa Added EU declaration of conformity chapter, updated recycling chapter, updated information in the WWW chapter, updated warranty disclaimer chapter
2012-07-31	V1.5, MSt Chapter 7 Known Issues: Added information Trace connector not useable in SK-MB9DF120-002 PCB V1.0
2013-07-12	V1.6, MSt Corrected chapter 1.2 Features, Information of power supply corrected

Applies To

Order-No.	Reference	Description
SK-MB9DF120-001	TRACE	Full-featured variant with independent trace-capability.
SK-MB9DF120-002	SOCKET	176-pin socket variant. Tracing blocks some MCU-ports.

If not mentioned otherwise, this guide applies to all boards listed in the table above. Variant-specific features/differences are tagged by the name listed under “Reference”.

This document contains 44 pages.

Abbreviations

ARM®	ARM® is a registered trademark of ARM Limited in the EU and other countries
APIX®	Automotive Pixel Link is a registered mark of INOVA Semiconductors GmbH
CAN	Controller Area Network
FSEU	Fujitsu Semiconductor Europe GmbH
MCU	Microcontroller Unit
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus

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Contents

1 Overview

1.1 Introduction

The SK-MB9DF120-001 is a quick evaluation board for the Fujitsu FCR4 Cluster series flash microcontroller MB96DF126 (Atlas). It can be used stand-alone for software development and testing or as a simple target board to work with the debug system.

Optionally, the adapter board ADA-FCR4-MULTIIO-001 is available as plug-under. It extends the capabilities by additional interfaces and headers which provide easy access to the MCU-signals.

As an addition to the Multi-IO board, the ADA-FCR4-CLUSTER-001 is available. It provides a complete automotive dashboard solution without separate microcontroller (all signals are controlled from the SK-MB9DE120). It is connected to the Multi-IO board using a flat-cable.

1.2 Features

- Supports Fujitsu's FCR4 Cluster series MB9DF126 (Atlas) microcontrollers
- Requires 12V external DC power supply (e.g. PSU_FIX12V-24W)
- On-board 5V, 3V3 and 1V2 voltage regulators for I/O- and MCU supply
- Power-LEDs for all regulated supply-rails
- Selectable 5V and 3V3 voltage for specific digital (VDP5 and DVCC) and analogue (AVCC5 and AVRH5) power domains
- Reset-button with LED-indicator
- On-board voltage supply supervisor
- In-Circuit serial Flash programming using the JTAG port
- 4-20MHz main crystal oscillator for APIX and MCU clock.
- 32 kHz crystal for sub clock operation (realtime clock, low-power operation)
- Full APIX high-speed serial interface on-board. An RJ-45 connector allows to connect a standard Cat6e/Cat7 network-cable.
- Riser-card connector for external bus-interface (EBI) and high-speed QSPI. Signals not used on Riser-card are routed to b2b connectors.
- Riser-cards with various memory-types (QSPI NOR-Flash, NAND-Flash, SDRAM) available, passive (all signals passed back to SK-board) card included.
- All GPIO-pins not used on-board are available thru Board-to-Board connectors on the bottom-side.
- Fujitsu IPC connector with AIC-, SPI-ports and some GPIOs/interrupt-lines providing connection to UI-boards (LCD, instrumentation, etc.) or customer solutions.
- USB to serial converter (FT232R) connected to USART0 provides direct PC-serial connection using a standard USB-A (PC) to Mini-B (SK) cable.
- One CAN-Bus interface on male D-Sub-09 connector with industry-standard pinout
- ARM standard 20 pin IDC JTAG connector for flash-programming and debugging
- Trace-probe connector for 8 (variant SOCKET) or 16 (variant TRACE) bit wide tracing
- Test-points for internal signals

1.3 Kit contents

- Variant TRACE or variant SOCKET PCB.
- USB-A to Mini-B cable.
- Screws with spacers to mount onto a carrier-board or place on the table.
- MEM-FCR4-001 pass-through Riser-Board.

2 Hardware

2.1 PCB Overview

2.1.1 Top-View

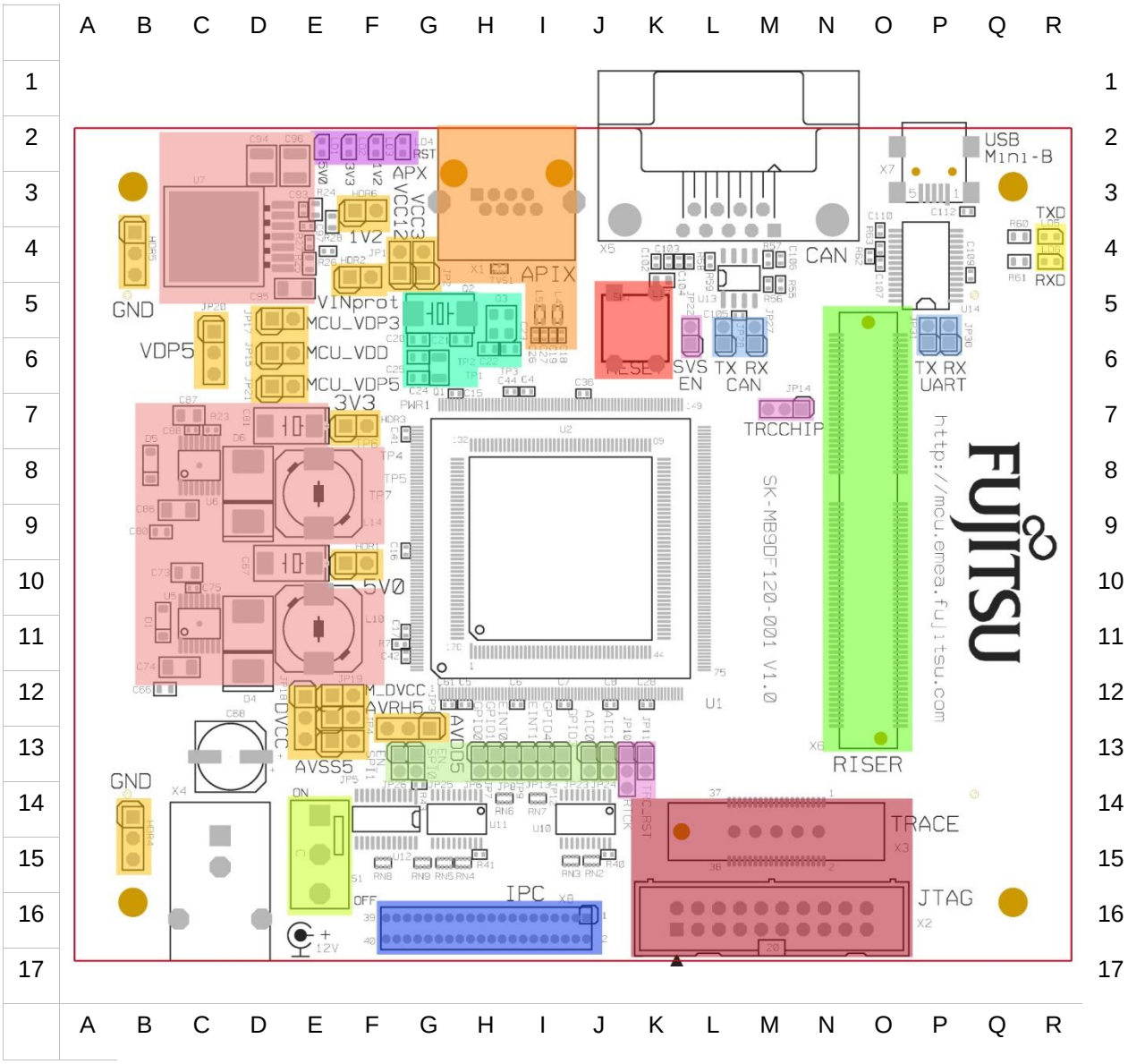


Figure 2-1: Top View PCB-Rev.1.0

- Variant TRACE - U1: MCU – MB9DF126 (Atlas) microcontroller in QFP296 package
- Variant SOCKET - U2: MCU – MB9DF126 (Atlas) microcontroller in QFP176 socket (removable)
- Q1: 32768Hz RTC-crystal (SubClk)
- Variant SOCKET - Q2/Q4: 4..20MHz crystal (Q4 only PCB-Rev.1.1 for 20MHz crystal) for MainClk.
- Variant TRACE - Q3: 20MHz crystal for MainClk (values down to 4MHz possible, if same package).

- 12V external DC power supply, 5V, 3V3 and 1V2 voltage regulators, S1 power switch
- Power-LEDs for the 5V0, 3V3 and 1V2 power rails, SW1 Reset-button, Reset-LED
- X2, X3: debug and trace ports for standard connectors
- APIX, USB (UART-emulation) and CAN (native) connectors

2.1.2 Bottom View

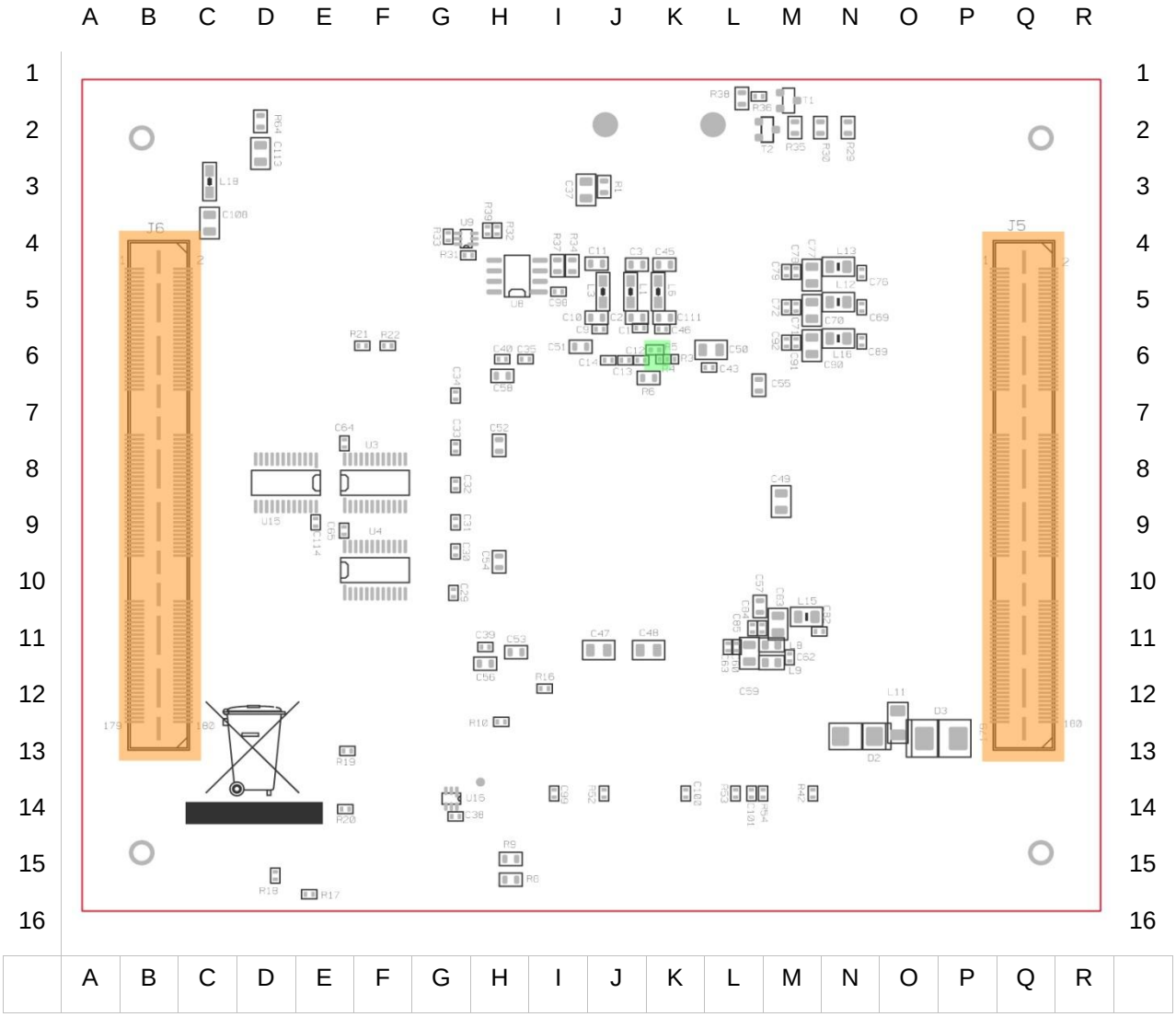


Figure 2-2: Bottom View PCB-Rev.1.0

- J5, J6 - Board-to-Board connectors to Multi-IO
- R4, R5: Solder-Jumper to select 4MHz Fallback-Oscillator (defaults to 20MHz Osc.)

2.2 Power Supply

The power supply circuit consists of the input-stage and three voltage-regulators. The regulators are switch-mode types (step-down).

Having the enables of the lower voltage supplies tied to the next higher voltage supply guarantees correct sequencing in the order required (5V0 → 3V3 → 1V2). Power-down/disconnect of power-domains and/or -rails is not supported.

All regulators are supplied from the input-rail Vin_prot (filtered input voltage, no regulator-staggering).

Headers are connected to each voltage-rail to allow measuring the voltages. They should not be used to power custom electronics. Each stage provides a header connected to connect to the

corresponding domain. Care must be taken when connecting to the 1V2-domain as noise on this rail will have much more impact on this rail due to the low absolute voltage.

2.2.1 Input-stage

The power-supply connector is a standard DC-plug for a wall-cube adapter. Allowed input voltage ranges from 9 to 12V, the adaptor should have a minimum power-rating of 6W (500mA @ 12V).

After the power-switch, a reverse-voltage protection diode (D2) and a TVS (D3) follow. The latter suppresses/damps high voltage surges from the wall-cube which would otherwise pass the following inductor and capacitors.

The inductor (L11) filters noise generated on-board, before it reaches the supply-cable which presents a good antenna for EMI. Filtering incoming noise is a bonus.

2.2.2 I/O Supplies

The 5V0 and 3V3 supplies use the same regulator-type, each fixed to the desired output-voltage. As with all switching regulators, the designs are critical in terms of switching noise radiation (over the air and along the traces).

Each regulator provides up to 3A on its rail.

2.2.3 MCU Core supply

The 1V2 supply for the MCU core is generated by a DC/DC switching module providing up to 3A.

2.2.4 Supply-Rail Monitors (LEDs)

Each supply-rail has its own LED-indicator. For the 1V2 rail, the LED is driven from the 3V3 rail and just switched from the 1V2 rail.

All three rails are additionally monitored by a system-voltage supervisor which generates reset if any rail fails.

2.2.5 Power distribution

The three stabilized voltages drive the various MCU power-domains either directly (single-voltage domains MCU_VDD, MCU_VDP3) or through a 3-pin jumper (dual-voltage domains VDP5, DVCC).

Additionally, there is a jumper before each domain's EMI-filter to allow injection of external power or measuring current-consumption of the domain.

2.3 Reset

Board-Reset can be generated by basically two sources. Both are connected to the system-reset which includes the MCU RST_X signal. Both sources can be disconnected from the reset-net by separate jumpers, thus excluding them from generating the reset-signal,

U8 generates the reset to the MCU and all other devices if one of the three system-voltages fails (System Voltage Supervisor). It also monitors a push-button, generating a short reset-pulse (~100µs) if this reset-button is pressed shortly. A longer pulse will be generated if the button is pressed for some seconds. Caution: the SVS monitors the on-board generated voltages, not the MCU power-domains. If any of the domains is supplied externally, it is left to the user to provide a proper reset signal (if required).

Another reset source comes from the two debugging connectors JTAG and TRACE. Their shared signal can also be disconnected from the internal net.

Having the reset-pin on the MCU belonging to the VDP5 domain and the memory-interface pins driven by the VDP3 domain, two reset-signals are required.

While RST_X_3V3 is driven together with RST_X_VDP5, it cannot generate a reset by itself. Therefore, all resets must originate from RST_X_VDP5. Both signals are open-drain with a 10kR pull-up to the corresponding MCU power-domain.

RST_X_3V3 is only available on the riser-board connector. The b2b-connectors on the rear-side only provide RST_X_VDP5.

RST_X_VDP5 also drives a LED which lights when the signal is active (low). On power-up or a press of the reset-button, the LED will flash according to the pulse generated by the SVS. If the reset-button is pressed only for a short time, although the LED also flashes, this cannot be observed directly as this pulse is too short to be detected by the human eye.

2.4 MCU Clocks

2.4.1 Main Clock

The MCU is clocked using its internal 4-20MHz oscillator as this is the MainClk net, it controls all timing of the MCU, including the APIX-Phy.

Variant TRACE: The default delivery is a 20MHz crystal at Q3. A 4MHz alternative oscillator is available using Q2 (Q4 is not to be used for this variant). The oscillator to be used is determined by the solder-jumper R4/R5 (defaults to the 20MHz-oscillator).

Default:

- R4: 0R, R5 open
- C20 = 0R

Change to 4MHz (Q2) Chrystal:

- Open R4, solder 0R to R5
- Replace C22 (0R) with 8pF
- Replace C20 (8pF) with 0R

Variant SOCKET: Q2/Q4 (Q4 with board-rev. 1.1) are used as clock-references. Either one can be populated, not both. The default crystal-frequency is a 20MHz (Q4 for board-rev. 1.1) oscillator.

Default: 20MHz:

- Q2 (PCB V1.0) or Q4 (PCBV1.0)

Change to 4MHz:

- Solder 4MHz crystal to Q2
- In case of PCB V1.1: Remove Q4 before soldering Q2.

Caution: changing the crystal requires special soldering-tools. Otherwise the PCB may be damaged. Warranty will be void if soldering has been done on the PCB.

When replacing the crystal, make sure to choose the correct load-capacitors for the new crystal. See the crystal's datasheet for specifications.

2.4.2 Sub-Clock (RTC-Clock)

Q1 is a 32.768kHz crystal connected to the MCU's real-time clock oscillator. This clock is used to track time, while the other crystal oscillator is disabled.

2.5 On-Board Peripherals

The board provides three interfaces for external communication.

2.5.1 UART/USB-Serial Interface

Two port-signals (P0_45, P0_47) are connected to a USB-Serial converter chip (FT232R). The ports can be controlled by USART0, thus allowing a serial interface between the MCU and a PC.

For the interface-converter, drivers exist for all major operating systems (OSX, Linux, Windows) either built-in (Linux) or for download (Windows). They provide a standard serial interface ("COM-port"/"ttyUSB") to the applications, so any terminal program can be used to transmit data between the MCU and a PC.

The interface does not provide hardware-handshake, thus it is left to the software to provide some kind of flow-control and/or resynchronization, if necessary.

There is one LED per direction (RX, TX) signalling data-transmission.

The two ports can be disconnected from the converter by two jumpers, freeing them for other usage (the two signals are also available on the B2B connector J5).

The converter chip is powered from the USB-connector, making its operation independent on the power-status of the board. However, as the supply of the serial interface I/O lines is powered from VDP5, the voltages here always match the requirements of the connected port-signals.

2.5.2 CAN-Bus Interface

Two ports from the MCU (P2_40, P2_41) are connected to a CAN-Bus transceiver. The CAN-bus itself is connected to a standard D-sub connector. The two signals are also RX and TX of the internal CAN0-controller.

As with the UART, jumpers are available for each port to disconnect them from the interface, freeing them for use from the B2B connector J5.

2.5.3 APIX

The MB96DF126 (Atlas) provides a dedicated (non-multiplexed) PHY for the APIX high-speed serial interface. The signals are routed to a RJ-45 connector allowing standard twisted-pair cable to be used.

2.6 Expansion Connectors

2.6.1 Board-to-Board (B2B) Connectors

On the bottom-side, there are two board-to-board (b2b) connectors (J5, J6). All MCU ports are available here, along with power-supply and additional control-signals like reset.

Layout and placement of the SK-MB9DF120-xxx allows to plug a Fujitsu Multi-I/O board (ADA-FCR4-MULTIIO-001) under the board, providing direct access to the ports via standard-raster headers along with other features.

Alternatively, a custom PCB can be connected.

2.6.2 Riser-Board Connector

X6 is a double-sided card-edge connector with 2*70 contacts. All ports providing either HSSPI (high-speed QSPI) or external bus interface (EBI) signals are routed to one side of this connector together with VDP3 and RST_X_VDP3 (VDP3-based reset-signal).

The pins opposite of the each port-signal are routed to the B2B connectors.

This structure allows to insert various PCBs ("Riser-Cards") requiring the external bus or high-speed SPI without passing the long path through the expansion connectors and a plug-under board. With the optimized routing of all signals, the full speed of the two interfaces can be utilized, allowing connection to fast QSPI Flash-devices, SDRAMs or other critical hardware.

Ports not used for a particular application must be passed-through by the riser-card. For example, the default card shipped with the starter kit consists completely of direct connections between the front- and rear-side pads, passing all ports to the bottom B2B connectors.

2.6.3 IPC Connector

This is a 1.27mm (0.05in) header which is used to connect a Fujitsu graphics-card like Emerald or Jade to the SK-MB9DF120-xxx. It provides two normal SPI interfaces along with two AIC ports and some GPIO signals with interrupt-capabilities.

As all signals are also available on the rear B2B-connectors, bus-switches (for AICs and SPIs) and jumpers (for GPIOs) are provided to disconnect the signals from the header. The bus-switches are controlled by jumpers, so each group of signals can be (dis-)connected separately.

2.7 Debugging Facilities

The Starter-kit provides a JTAG-Interface on a 20-pin 2.54mm (0.1in) IDC-header for debugging. The header uses the ARM standard pin out.

The second facility is an ARM-standard trace-connector. This combines the JTAG-interface with an up to 16-bit trace-port for extended debugging features.

Only one connector may be used at the same time, as some signals are shared between them. Debugging requires a proper interface and corresponding software on the host system.

3 Installation

3.1 First Contact

After opening the box, please check first if all parts are included. If any parts are missing, ask your vendor.

The kit includes electrostatic sensitive devices. Unpacking should be done in an anti-static environment.

After removing the packing-material, check all parts and especially the PCB for damages. Also check the jumper-settings before initial powering up the board.

3.2 Engage

To power-up the board, first change the slider-switch (S1) to the “off”-position. Then connect an AC-adaptor Connect the DC-plug (inner is positive) to the board (X4), then turn on the slider-switch.

The AC-adaptor must provide 9-12V/1A min. The positive (+) supply must be on the inner tip, while the negative supply (-/GND) is on the outer ring. The power-input includes reverse-polarity protection.

3.3 Lifesigns

After powering-up by turning switch S1, the power-LEDs should turn on without noticeable delay.

Additionally, the reset-LED flashes once, signalling release of the reset-signal by the voltage supervisor.

If no LED lights op, turn off the power switch and check the polarity of the supply. If this is ok, or if some power-LEDs are missing, flicker or show otherwise strange behaviour, check the power-rails for shorts to GND and each other before retrying.

If the reset-LED flashes from time to time (maybe with a constant frequency), the power-supply may be too weak to supply the required current. Also check the voltages to detect drop. Most times this occurs, one or multiple power-rails are at the edge of the SVS' trigger-level and drop below, eg. if more current is drawn by a device.

Use HDR1, 3 and 6 to measure voltages. **Never short these Headers!**

4 Configuration and Test-Points

4.1 Jumpers

The SK-MB9DF-120-001 provides multiple options to access signals and configure its properties. For this, it has two variants of jumpers:

- (regular) Jumpers consist of two or three pin-headers and a small cap. They can be changed without extra tools. They are used where changes are likely to occur. Wide jumpers (W) use a 2.54mm raster, while small jumpers use 2.00mm . The former are used for power-connections where also measuring may be required, while the latter are sole configuration jumpers.
- solder-jumpers change more basic options, the vast majority of applications do not require changing them from their defaults. A solder-jumper is either a single 0R0 resistor or two resistors of which only one may be placed. For the latter, a shared pad is often used to avoid placing both resistors accidentally.

Name	Label	Description	Type	Default	Position
JP1	APX_VCC12	open = access 1.2V supply for APIX. *Caution: the APIX is an analog subsystem and therefore sensitive to noise induced from the power-supply lines.*	2-pin wide	closed	top G-4
JP2	APX_VCC3	open = access 3.3V supply for APIX. *Caution: the APIX is an analog subsystem and therefore sensitive to noise induced from the power-supply lines.*	2-pin wide	closed	top G-4
JP3	AVDD5	select ADC-supply: 1-2 = AVRH5 2-3 = VDP5 open = external *Caution: the ADC is an analog subsystem and therefore sensitive to noise induced from the power-supply lines.*	3-pin wide	2-3	top G-11
JP4	AVRH5	open = access ADC VRH5 (reference input). *Caution: the ADC is an analog subsystem and therefore sensitive to noise induced from the power-supply lines.*	2-pin wide	closed	top E/F-11
JP5	AVSS5	open = access ADC VSS. *Caution: the APIX is an analog subsystem and therefore sensitive to noise induced from the power-supply lines.*	2-pin wide	closed	top E/F-11/12
JP20	VDP5	select VDP5 supply-rail: 1-2 = 3V3 (3.3V on-board rail) 2-3 = 5V0 (5.0V on-board rail) open = external	3-pin wide	2-3	top C/D-5/6
JP18	DVCC	select DVCC supply-rail: 1-2 = 3V3 (3.3V on-board rail) 2-3 = 5V0 (5.0V on-board rail) open = external	3-pin wide	2-3	top E-11
JP15	MCU_VDD	open = access 1.2V supply for MCU.	2-pin wide	closed	top D/E-5/6
JP17	MCU_VDP3	open = access VDP3 domain for MCU.	2-pin wide	closed	top D/E-5
JP21	MCU_VDP5	open = access VDP5 domain for MCU.	2-pin wide	closed	top D/E-6
JP19	MCU_DVCC	open = access DVCC domain for MCU.	2-pin wide	closed	top E/F-11
JP14	TRCCHIP	Select trace-signals for trace-port: 1-2 = dedicated trace-port/disable 2-3 = multiplexed ports (176pin pkg) open = none (should not be used)	3-pin small	1-2	top M-6

Name	Label	Description	Type	Default	Position
		For the 296-pin package, there is no reason to choose any other setting than 1-2. *For any package, any other than this setting also disconnects the multiplexed port-signals from their normal connection, rendering these ports unusable. Therefore, the 2-3 setting should never be chosen unless tracing with a 176-pin package is required.*			
JP10	RTCK-sel	enable/disable RTCK on JTAG: 1-2 = disable (pulled to GND) 2-3 = enable open = **invalid** *see also solder-jumper **R7***	3-pin small	1-2	top J/K-11/12
JP11	TRC_RST	closed = enable resets from debug and trace connector. *Quite likely not to be changed.*	2-pin small	closed	top K-11/12
JP22	SVS_EN	closed = enable resets from system-voltage supervisor chip. As the SVS also monitors the reset-button, this also disables manual reset if open. *Quite likely not to be changed.*	2-pin small	closed	top K/L-5
JP6	IPC_GPIO0	closed = connect GPIO0 on IPC connector to MCU-port P1_8	2-pin small	open	top H-11/12
JP7	IPC_GPIO1	closed = connect GPIO1 on IPC connector to MCU-port P1_9	2-pin small	open	top H-11/12
JP8	IPC_EINT0	closed = connect EINT0 on IPC connector to MCU-port P1_10	2-pin small	open	top H/I-11/12
JP9	IPC_EINT1	closed = connect EINT on IPC connector to MCU-port P1_11	2-pin small	open	top I-11/12
JP12	IPC_GPIO3	closed = connect GPIO0 on IPC connector to MCU-port P3_16 (via Riser-Board)[1]	2-pin small	open	top I-11/12
JP13	IPC_GPIO4	closed = connect GPIO0 on IPC connector to MCU-port P3_14 (via Riser-Board)[1]	2-pin small	open	top I-11/12
JP23	AIC0_EN	closed = connect AIC0 on IPC connector to MCU-ports P1_0 to P1_5	2-pin small	open	top J-11/12
JP24	AIC1_EN	closed = connect AIC0 on IPC connector to MCU-ports P1_6, P1_7, P1_20 to P1_23.	2-pin small	open	top J-11/12
JP25	SPI0_EN	closed = connect SPI0 on IPC connector to MCU-ports P1_12 to P1_15.	2-pin small	open	top G-11/12
JP26	SPI1_EN	closed = connect SPI1 on IPC connector to MCU-ports P1_16 to P1_19.	2-pin small	open	top G-11/12
JP27	CAN_RXD	closed = connect RXD on CAN-Interface to MCU-port P2_41	2-pin small	closed	top L/M-5
JP28	CAN_TXD	closed = connect TXD on CAN-Interface to MCU-port P2_40	2-pin small	closed	top L-5

1 If no Riser-Board is plugged into, or if the port is not passed through from the Riser-Board, the signal is not available here (same as opening the jumper). Furthermore, the Riser-Board may connect this signal to a different MCU-signal (this latter will not happen for regular Fujitsu Riser-Boards).

Name	Label	Description	Type	Default	Position
JP30	UART_RXD	closed = connect RXD on UART-Interface to MCU-port P0_45	2-pin small	closed	top P-5
JP31	UART_TXD	closed = connect TXD on UART-Interface to MCU-port P0_47	2-pin small	closed	top O/P-5
R7		closed = enable RTCK *open to avoid disturbance on TCK line if RTCK is not used. If operating on lower frequencies, can be left connected if no problems arise with TCK.*	solder, 1R	closed	top G-10 (directly at 296pin footprint)
R4/R5		Variant TRACE only: R4 = 20MHz oscillator selected R5 = 4MHz oscillator selected	solder, 2R	R4	top J-5/6

Table 4-1: Default Jumper settings and location

On wide jumpers, the cap can be replaced by an amperemeter to measure current. However, care must be taken to avoid inducing noise into the connected cables. Alternatively, if the cap is removed, external power can be feed into the corresponding domain. **Caution: do not back-drive current into the supply-rails. Check the schematics before connecting an external power-supply to a jumper's output pin (the pin which drives the power-domain). Double-check before powering up!**

DVCC, AVCC5 and VDP5 (see further description below) must be set to the same voltage-rail when zero point detection (ZPD) on any of the SMC ports is to be used. Check the datasheet for further requirements on the combination of voltages.

4.2 Headers

Headers are intended to access interesting nets on the PCB. They have the same sizes as wide jumpers, but may never be shortened.

Name	Label	Description	Type	Position
HDR1	5V0	5.0V rail voltage measuring header. Do not inject any current here!	2-pin wide	top F-9
HDR2	VIN_prot	Filtered and protected (against surges and reverse polarity) input voltage. May be used to inject an external supply.	2-pin wide	top F-4
HDR3	3V3	3.3V rail voltage measuring header. Do not inject any current here!	2-pin wide	top F-6/7
HDR4, 5	GND	Access-points to the GND-plane. Can be used as reference for scopes, logic-analyzers, voltmeters, etc.	3-pin wide (each)	top B-4, B-13
HDR6	1V2	1.2V rail voltage measuring header. Do not inject any current here!	2-pin wide	top F-3

Table 4-2: Header location

4.3 Test Points

Test points are not for permanent connection, but mostly for failure-tracking. Normally, there is no need to access them.

Name	Label	Description	Position

Name	Label	Description	Position
TP1	SubClk	input of 32768Hz crystal-oscillator (RTC, etc.).	top H-6
TP2	MainClk	MainClk frequency for variant SOCKET (Q2/Q4).	top H-5/6
TP3	APIXClk	MainClk frequency for variant TRACE (Q3).	top H-6
TP4	SYSC_CKOT	MCU-port P0_41 which can have this signal multiplexed on its output.	top F-7
TP5	SYSC_CKOTX	MCU-port P0_42 which can have this signal multiplexed on its output.	top F-7
TP6	RTC_WOT	MCU-port P0_40 which can have this signal multiplexed on its output.	top F-7
TP7	WDG_OBSERVE	MCU-port P0_43 which can have this signal multiplexed on its output.	top F-7

Table 4-3: Test point location

The crystal test points TP1-3 are very sensitive to noise and load-factors, especially capacitive loads can change the frequency dramatically. If possible, the clocks should be measured indirectly using a high-speed timer or SYSC_CKOT.

5 Status Display

For user information, there are four LEDs on the board. Each power-rail (the supply generated on-board), is monitored by a single LED.

In addition, the reset-LED shows the status of the reset-line. For the default configuration and no external reset (JTAG, button or from a plugged-under PCB), this is the status of the system-voltage supervisor (SVS). It will be lit if any voltage-rail is out of its allowed limits.

Name	Label	Description (when lit)	Position
LD1	orange	5V0 rail up	top E-2
LD2	yellow	3V3 rail up	top F-2
LD3	green	1V2 rail up (driven by 3V3-rail)	top F-2
LD4	red	reset active	top G-2

Table 5-1: LED position and meaning

6 Connectors

The following table lists the location of all connectors on the board. The pin-out of each connector is listed in separate sections.

Name	Type	Description	Position
J5	SAMTEC QSH-090-01-L-D-A	board-to-board connector. Allows to connect a Multi-IO board or any other matching I/O-board.	bottom Q-4:12
J6	SAMTEC QSH-090-01-L-D-A	B2B, Further signals from the MCU.	bottom B-4:12
X8	SAMTEC FTSH-120-04-L-D	IPC connector. 2*20pin 1.27mm*1.27mm pin-header for IDC cable. Allows connection of a emerald display board (or any other board supporting the provided connections).	F:J-14
X2	2*10 2.54mm IDC header (male)	Standard ARM 20pin debug-header with JTAG-interface. Must not be connected at the same time as X3.	K:O-14
X3	TYCO 5767054-1	38pin connector for standard ARM trace interface (16 bits). Includes also JTAG. Must not be connected at the same time as X2.	K:O-12/13
X6	SAMTEC MEC617002-SDVA	2*70pin card-edge connector for Riser-Board. Used for high-speed interfaces like QSPI-Flash and/or SDRAM. Can also be used for custom extensions requiring the external bus of the MCU.	N/O-5:11
X4	DC-plug	2.1mm pin DC plug for external power-supply.	C/D-13/14
X5	9pin Dsub male	CAN-Bus connector with standard-pinout.	J:N-1:3
X7	USB Mini-B plug	Standard USB plug to connect a PC whith USB-Serial protocol driver.	O/P-2/3
X1	RJ-45 plug	High-Speed differential APIX interface signals (RX, TX).	H/I-2:4

Table 6-1: Connector location

The two B2B connectors provide all MCU ports, power supplies and control-signals.

6.1 B2B Connectors (J5, J6)

These two connectors provide all signals to a plug-under board like the Multi-IO-Board. Signals include all MCU ports as well as reset and power supplies from the SK-board.

Signals are always routed to these connectors, even if they are used on the SK-MB9DF120-001 themselves. When using a signal on a plug-under board which is also connected to an on-board peripheral or connector (like the IPC-connector), it must be disconnected from the on-board resource by pulling the corresponding jumper. Some signals can be disconnected separately, while other signals are disconnected as a whole function-block.

Fitting mates for the other board are SAMTEC QTH type connectors.

6.1.1 J5 Pinout

Special Signals

Pin(s)	Signal	Description
1,2,6,7,12,13,54,55, 65,66,97,98,101,102,109,110,113, 137,138,162,167,171,172, Shield	GND	System Ground
3-5,8-11,14-53,99,100,112,119	n.c.	not connected
103,105,107	reserved	do not use
104,106,108	VDP5	VDP5 power domain
164,166,168,170	5V0	5.0V power rail
173,175,177,179	Vin	Raw input power (after the power-switch, but before any filter/protection. Should not be used.
174, 176, 178, 180	Vin_prot	Vin after the filter. May be used to supply SK-MB9DF120 from a plug-under board.
169	RST_X_VDP5	System-Reset. Open-Collector (pull-up on SK-MB9DF120). input/output

Table 6-2: LED position and meaning

MCU-Ports

ADA-FCR4-MULTIIO-001 Signal	MCU Port	J5 Pin	J5 Pin	MCU Port	ADA-FCR4-MULTIIO-001 Signal
GND	-	55	56	P2_38	GPIO0
UARTA_RX	P0_45	57	58	P0_40	UARTB_RX
UARTA_TX	P0_47	59	60	P0_42	UARTB_TX
CANA_RX	P2_41	61	62	P2_45	CANB_RX
CANA_TX	P2_40	63	64	P2_44	CANB_TX
GND	-	65	66	-	GND
EXTN2_GPIO00	R_P3_0	67	68	R_P3_1	EXTN2_GPIO01

ADA-FCR4-MULTIIO-001 Signal	MCU Port	J5 Pin	J5 Pin	MCU Port	ADA-FCR4-MULTIIO-001 Signal
EXTN2_GPIO02	R_P3_2	69	70	R_P3_3	EXTN2_GPIO03
EXTN2_GPIO04	R_P3_4	71	72	R_P3_5	EXTN2_GPIO05
EXTN2_GPIO06	R_P3_6	73	74	R_P3_7	EXTN2_GPIO07
EXTN2_GPIO08	R_P3_8	75	76	R_P3_9	EXTN2_GPIO09
EXTN2_GPIO10	R_P3_10	77	78	R_P3_11	EXTN2_GPIO11
EXTN2_GPIO12	R_P3_12	79	80	R_P3_13	EXTN2_GPIO13
EXTN2_GPIO14	R_P3_14	81	82	R_P3_15	EXTN2_GPIO15
EXTN2_GPIO16	R_P3_16	83	84	R_P3_17	EXTN2_GPIO17
EXTN2_GPIO18	R_P3_18	85	86	R_P3_19	EXTN2_GPIO19
EXTN2_GPIO20	R_P3_20	87	88	R_P3_21	EXTN2_GPIO21
EXTN2_GPIO22	R_P3_22	89	90	R_P3_23	EXTN2_GPIO23
EXTN2_GPIO24	R_P3_24	91	92	R_P3_25	EXTN2_GPIO25
EXTN2_GPIO26	R_P3_26	93	94	R_P3_27	EXTN2_GPIO27
EXTN2_GPIO28	R_P3_28	95	96	R_P3_29	EXTN2_GPIO29
GND	-	97	98	-	GND
GPIO1	NC	99	100	NC	GPIO2
GND	-	101	102	-	GND
P_1V2	-	103	104	-	VDP5
P_1V2	-	105	106	-	VDP5
P_1V2	-	107	108	-	VDP5
GND	-	109	110	-	GND
POTI_AN	P0_44	111	112	NC	SOUND_SGA
GND	-	113	114	P2_47	SOUND_SGO
CLUSTER_EXT_INT0	P0_46	115	116	P2_36	CLUSTER_PWM0
CLUSTER_EXT_INT1	P2_39	117	118	P2_37	CLUSTER_PWM1
GPIO3	NC	119	120	P2_38	CLUSTER_PWM2
CLUSTER_SMC00	P1_0	121	122	P1_4	CLUSTER_SMC10
CLUSTER_SMC01	P1_1	123	124	P1_5	CLUSTER_SMC11
CLUSTER_SMC02	P1_2	125	126	P1_6	CLUSTER_SMC12
CLUSTER_SMC03	P1_3	127	128	P1_7	CLUSTER_SMC13
CLUSTER_SMC20	P1_8	129	130	P1_12	CLUSTER_SMC30
CLUSTER_SMC21	P1_9	131	132	P1_13	CLUSTER_SMC31
CLUSTER_SMC22	P1_10	133	134	P1_14	CLUSTER_SMC32

ADA-FCR4-MULTIIO-001 Signal	MCU Port	J5 Pin	J5 Pin	MCU Port	ADA-FCR4-MULTIIO-001 Signal
CLUSTER_SMC23	P1_11	135	136	P1_15	CLUSTER_SMC33
GND	-	137	138	-	GND
CLUSTER_GPIO0	P0_41	139	140	R_P3_33	LED0
CLUSTER_GPIO1	P0_43	141	142	R_P3_34	LED1
CLUSTER_GPIO2	P2_42	143	144	R_P3_35	LED2
CLUSTER_GPIO3	P2_43	145	146	R_P3_36	LED3
CLUSTER_GPIO4	P2_46	147	148	R_P3_37	LED4
CLUSTER_GPIO5	P1_16	149	150	R_P3_38	LED5
CLUSTER_GPIO6	P1_17	151	152	R_P3_39	LED6
CLUSTER_GPIO7	P1_18	153	154	R_P3_40	LED7
CLUSTER_GPIO8	P1_19	155	156	P0_48	BUTTON_EXT_INT0
CLUSTER_GPIO9	P1_20	157	158	P0_49	BUTTON_EXT_INT1
CLUSTER_GPIO10	P1_21	159	160	P0_50	BUTTON_EXT_INT2
CLUSTER_GPIO11	P1_22	161	162	-	GND
CLUSTER_GPIO12	P1_23	163	164	-	P_5V
BUTTON_EXT_INT3	P0_51	165	166	-	P_5V
GND	-	167	168	-	P_5V
BOARD_RST_X	-	169	170	-	P_5V
GND	-	171	172	-	GND
P_12V	-	173	174	-	P_12V_P
P_12V	-	175	176	-	P_12V_P
P_12V	-	177	178	-	P_12V_P
P_12V	-	179	180	-	P_12V_P

Table 6-3: J5 signal assignment

Signals R_P* are indirect connections. They come from the “output”-side of the Riser-Board, thus are not connected anywhere unless the Riser-Board connects them the corresponding MCU-port. The numbering used here is for a standard Riser-Board (MEM-FCR4-001) which connects all MCU-ports to the adjacent “output” R_P*-signal without any crossover. For other Riser-Boards, some to all of the R_P*-signals are not available (unconnected). Although possible, a Riser-Board should not pass an input-port from the MCU on a different R_P*-signal.

Note:

MCU Port Pin P2_28 is connected twice at J5: Pin 56 (GPIO Signal) and Pin 120 (CLUSTER_PWM2).

6.1.2 J6 Pinout

Special Signals

Pin(s)	Signal	Description
5,6,25,26,31,32,37,38,46,47,51,52, 65,66,71,72,77,78,83,84,,89,90,95, 96,100,101,114,115, 125,126,131,132,137,138,143,144, 149,150,155,156,160-162,175,176, Shield	GND	System Ground
7-24,33-36,41-44,53-60, 61-64,67-70,73-76,79-82,85-88,91-94,97,99,103,105,107, 121-124,127-130,133-136,139-142,145-148,151-154,157-159,163-168,170,172-174	n.c.	not connected
1-4,177-180	3V3	3.3V power rail.

Table 6-4: J6 power supply pins

MCU-Ports

ADA-FCR4-MULTIIO-001 Signal	MCU Port Pin	J6 Pin	J6 Pin	MCU Port Pin	ADA-FCR4-MULTIIO-001 Signal
I2SA_ECLK	P2_32	27	28	P2_35	I2SA_SCK
I2SA_SD	P2_33	29	30	P2_34	I2SA_WS
GND	-	31	32	-	GND
I2SB_ECLK	NC	33	34	NC	I2SB_SCK
I2SB_SD	NC	35	36	NC	I2SB_WS
GND	-	37	38	-	GND
I2CA_SDA	P0_63	39	40	P0_62	I2CA_SCL
I2CC_SDA	NC	41	42	NC	I2CB_SCL
P3V3_EXT_INT2	NC	43	44	NC	I2CC_SCL
P3V3_EXT_INT2	R_P3_32	45	46	-	GND
GND	-	47	48	R_P3_41	P3V3_EXT_INT0
CAP_CLK	NC	49	50	R_P3_42	P3V3_EXT_INT1
GND	-	51	52	-	GND
CAP_VI0	NC	53	54	NC	CAP_VI1
CAP_VI2	NC	55	56	NC	CAP_VI3
CAP_VI4	NC	57	58	NC	CAP_VI5
CAP_VI6	NC	59	60	NC	CAP_VI7
DISP1_R0	NC	61	62	NC	DISP1_R2
DISP1_R1	NC	63	64	NC	DISP1_R3

ADA-FCR4-MULTIIO-001 Signal	MCU Port Pin	J6 Pin	J6 Pin	MCU Port Pin	ADA-FCR4-MULTIIO-001 Signal
GND	-	65	66	-	GND
DISP1_R4	NC	67	68	NC	DISP1_R6
DISP1_R5	NC	69	70	NC	DISP1_R7
GND	-	71	72	-	GND
DISP1_G0	NC	73	74	NC	DISP1_G2
DISP1_G1	NC	75	76	NC	DISP1_G3
GND	-	77	78	-	GND
DISP1_G4	NC	79	80	NC	DISP1_G6
DISP1_G5	NC	81	82	NC	DISP1_G7
GND	-	83	84	-	GND
DISP1_B0	NC	85	86	NC	DISP1_B2
DISP1_B1	NC	87	88	NC	DISP1_B3
GND	-	89	90	-	GND
DISP1_B4	NC	91	92	NC	DISP1_B6
DISP1_B5	NC	93	94	NC	DISP1_B7
GND	-	95	96	-	GND
DISP1_DCLK	NC	97	98	R_P1_24	DISP1_DCLKI
DISP1_DISP25	NC	99	100	-	GND
GND	-	101	102	R_P1_25	DISP1_TSIG6
DISP1_HSYNC	NC	103	104	R_P1_26	DISP1_TSIG7
DISP1_VSYNC	NC	105	106	R_P1_27	DISP1_TSIG8
DISP1_DE	NC	107	108	R_P1_28	DISP1_TSIG9
DISP1_TSIG3	R_P1_29	109	110	R_P1_30	DISP1_TSIG10
DISP1_TSIG4	R_P1_31	111	112	R_P1_32	DISP1_TSIG11
DISP1_TSIG5	R_P1_33	113	114	-	GND
GND	-	115	116	R_P1_34	P3V3_GPIO00
P3V3_GPIO03	R_P1_35	117	118	R_P1_36	P3V3_GPIO01
P3V3_GPIO04	R_P1_37	119	120	R_P1_38	P3V3_GPIO02
DISP0_R0	NC	121	122	NC	DISP0_R2
DISP0_R1	NC	123	124	NC	DISP0_R3
GND	-	125	126	-	GND
DISP0_R4	NC	127	128	NC	DISP0_R6
DISP0_R5	NC	129	130	NC	DISP0_R7
GND	-	131	132	-	GND
DISP0_G0	NC	133	134	NC	DISP0_G2

ADA-FCR4-MULTIIO-001 Signal	MCU Port Pin	J6 Pin	J6 Pin	MCU Port Pin	ADA-FCR4-MULTIIO-001 Signal
DISP0_G1	NC	135	136	NC	DISP0_G3
GND	-	137	138	-	GND
DISP0_G4	NC	139	140	NC	DISP0_G6
DISP0_G5	NC	141	142	NC	DISP0_G7
GND	-	143	144	-	GND
DISP0_B0	NC	145	146	NC	DISP0_B2
DISP0_B1	NC	147	148	NC	DISP0_B3
GND	-	149	150	-	GND
DISP0_B4	NC	151	152	NC	DISP0_B6
DISP0_B5	NC	153	154	NC	DISP0_B7
GND	-	155	156	-	GND
DISP0_DCLK	NC	157	158	NC	DISP0_DCLKI
DISP0_DISP25	NC	159	160	-	GND
GND	-	161	162	-	GND
DISP0_HSYNC	NC	163	164	NC	DISP0_TSIG6
DISP0_VSYNC	NC	165	166	NC	DISP0_TSIG7
DISP0_DE	NC	167	168	NC	DISP0_TSIG8
DISP0_TSIG3	R_P3_30	169	170	NC	DISP0_TSIG9
DISP0_TSIG4	R_P3_31	171	172	NC	DISP0_TSIG10
DISP0_TSIG5	NC	173	174	NC	DISP0_TSIG11
GND	-	175	176	-	GND
P_3V3	-	177	178	-	P_3V3
P_3V3	-	179	180	-	P_3V3

Table 6-5: J6 signal assignment

Signals R_P* are indirect connections. They come from the “output”-side of the Riser-Board, thus are not connected anywhere unless the Riser-Board connects them the corresponding MCU-port. The numbering used here is for a standard Riser-Board (MEM-FCR4-001) which connects all MCU-ports to the adjacent “output” R_P*-signal without any crossover. For other Riser-Boards, some to all of the R_P*-signals are not available (unconnected). Although possible, a Riser-Board should not pass an input-port from the MCU on a different R_P*-signal.

6.2 IPC Connector (X8)

This is a standard 2*20pin, 1.27mm pitch IDC-header.

MCU Port	Signal	Pin	Pin	Signal	MCU Port
P1_5	AIC0_TDA0	1	2	AIC0_TDA1	P1_4
P1_0	AIC0_CLK	3	4	GND	
	GND	5	6	AIC0_RCLK	P1_1
P1_2	AIC0_RDA0	7	8	AIC0_RDA1	P1_3
	GND	9	10	GND	
P1_7	AIC1_TDA0	11	12	AIC1_TDA1	P1_6
P1_20	AIC1_CLK	13	14	GND	
	GND	15	16	AIC1_RCLK	P1_21
P1_22	AIC1_RDA0	17	18	AIC1_RDA1	P1_23
	GND	19	20	GND	
P1_8	GPIO0	21	22	GPIO1	P1_9
P1_10	EXTINT0	23	24	EXTINT1	P1_11
R_P3_16	GPIO3	25	26	GPIO4	R_P3_14
	n.c.	27	28	n.c.	
	GND	29	30	GND	
P1_15	SPI0_CLK	31	32	SPI0_TDI	P1_14
P1_13	SPI0_TDO	33	34	SPI0_CS	P1_12
	GND	35	36	GND	
P1_19	SPI1_CLK	37	38	SPI1_TDI	P1_18
P1_17	SPI1_TDO	39	40	SPI1_CS	P1_16

Table 6-6: X8 signal assignment

All Signals are also available on the B2B connectors. However, a group of signals must not be used if they are used on the IPC-header. Signal-groups (AIC0/1, SPI0/1 and each single GPIO/EXTINT) can be disconnected from the IPC independently of each other by jumpers. For the single-pin functions (GPIOs and EXTINTs), there is a single jumper for each signal, while the peripheral-groups AIC and SPI have one jumper per group. The actual (dis)connection is done by voltage-limiting bus-switches. These allow the usage of the IPC (which is always 3.3V) even if P1 operates at 5.0V and introduce almost no extra delay. Observe that for 5.0V operation of the port while using 3.3V IPC, the input-cells of the MCU must be programmed for TTL-threshold.

6.3 Debug Connector (X2)

This is an ARM standard 20 pin JTAG connector.

Pin	Signal	Description
1	Vsns	Target voltage reference
2	VCCt	Target power
3	nTRST	JTAG TAP reset, active low
4	GND	Ground
5	TDI	JTAG Test Data In
6	GND	Ground
7	TMS	JTAG Test Machine State
8	GND	Ground
9	TCK	JTAG TAP Clock
10	GND	Ground
11	RTCK	Return TCK (optional)
12	GND	Ground
13	TDO	JTAG Test Data Out
14	GND	Ground
15	nRESET	Target reset, active low (system reset)
16	GND	Ground
17	DBREQ	Debug Request (not used)
18	GND	Ground
19	TVcc	Debug Acknowledge (not used)
20	GND	Ground

Table 6-7: Debug connector (X2) assignment

RTCK is deactivated by jumpers by default. It is only required for high-speed clocking. See jumper-settings on how to enable this functionality.

This connector must not be used at the same time as the trace-connector.

6.4 Trace Connector (X3)

Much like the Debug-connector, this is also defined by ARM.

Pin	Signal	Description
1-4, 10	NC	No connection
5, 30, 32	GND	Signal Ground
14, 34	VSUPPLY	Voltage Supply pin
12	VTREF	Target reference voltage
6	TRACECLK	Trace Clock pin
7	DBREQ	Probe Debug Request (unused)
8	DBACK	Probe Debug Acknowledge (unused)
9	nRESET	Target reset, active low
11	TDO	JTAG Test Data Out
13	RTCK	JTAG Return TCK (optional)
15	TCK	JTAG TAP Clock
16	TRACE7	Trace data
17	TMS	JTAG Test Machine State
18	TRACE6	Trace data
19	TDI	JTAG Test Data In
20	TRACE5	Trace data
21	nTRST	JTAG TAP Reset, active low
22	TRACE4	Trace data
23	TRACE15	Trace data
24	TRACE3	Trace data
25	TRACE14	Trace data
26	TRACE2	Trace data
27	TRACE13	Trace data
28	TRACE1	Trace data
29	TRACE12	Trace data
31	TRACE11	Trace data
33	TRACE10	Trace data
35	TRACE9	Trace data
36	TRACECTL	Trace Control
37	TRACE8	Trace data
38	TRACE0	Trace data

Table 6-8: Trace connector (X3) assignment

For the JTAG-signals see section 6.3 for details.

Trace-width is 16 bit for the 296-pin package. For the 176-pin package, 8 MCU port-lines can be connected to the trace-port using a jumper. As this disconnects the signals from their normal

interface, it is possible to trace the MCU while still having the external connections. However, the signals will not pass to the MCU, of course.

This connector must not be used at the same time as the debug-connector.

6.5 Riser-Board Connector (X6)

This is a card-edge connector. It includes al signals related to the external bus-interface of the MB96DF126 (Atlas) and the high-speed QSPI signals. Also included are the necessary 3.3V power supply and the corresponding (3V3) reset-signal.

This connector allows to connect reliable high-speed devices either to the HSSPI (serial QSPI-Flash) or external bus (SDRAM, NAND-Flash, external bus-mapped ethernet-controller, etc.). MCU ports not used for a particular Riser-Board application can be connected to the adjacent pad which is routed to the b2b connector, allowing to use this signal otherwise.

Signal	Riser pad	Pin	Pin	Riser Pad	Signal
3V3	A1	1	2	B1	GND
3V3	A2	3	4	B2	GND
3V3	A3	5	6	B3	RST_X_3V3
3V3	A4	7	8	B4	GND
R_P1_34	A5	9	10	B5	P1_34
R_P1_35	A6	11	12	B6	P1_35
R_P1_36	A7	13	14	B7	P1_36
R_P1_37	A8	15	16	B8	P1_37
R_P1_38	A9	17	18	B9	P1_38
R_P1_30	A10	19	20	B10	P1_30_B
R_P1_31	A11	21	22	B11	P1_31_B
R_P1_32	A12	23	24	B12	P1_32_B
R_P1_33	A13	25	26	B13	P1_33_B
R_P3_0	A14	27	28	B14	P3_0
R_P3_1	A15	29	30	B15	P3_1
R_P3_2	A16	31	32	B16	P3_2
GND	A17	33	34	B17	GND
R_P3_3	A18	35	36	B18	P3_3
R_P3_4	A19	37	38	B19	P3_4
R_P3_5	A20	39	40	B20	P3_5
R_P3_6	A21	41	42	B21	P3_6
R_P3_7	A22	43	44	B22	P3_7
R_P3_8	A23	45	46	B23	P3_8
R_P3_9	A24	47	48	B24	P3_9
R_P3_10	A25	49	50	B25	P3_10
R_P3_11	A26	51	52	B26	P3_11
R_P3_12	A27	53	54	B27	P3_12
R_P1_24	A28	55	56	B28	P1_24_B

Signal	Riser pad	Pin	Pin	Riser Pad	Signal
R_P1_25	A29	57	58	B29	P1_25_B
GND	A30	59	60	B30	GND
R_P3_33	A31	61	62	B31	P3_33
R_P3_34	A32	63	64	B32	P3_34
R_P3_35	A33	65	66	B33	P3_35
R_P3_36	A34	67	68	B34	P3_36
R_P3_37	A35	69	70	B35	P3_37
R_P3_38	A36	71	72	B36	P3_38
R_P3_39	A37	73	74	B37	P3_39
R_P3_40	A38	75	76	B38	P3_40
R_P3_41	A39	77	78	B39	P3_41
R_P3_42	A40	79	80	B40	P3_42
R_P3_13	A41	81	82	B41	P3_13
R_P3_14	A42	83	84	B42	P3_14
GND	A43	85	86	B43	GND
R_P3_15	A44	87	88	B44	P3_15
R_P3_16	A45	89	90	B45	P3_16
R_P3_17	A46	91	92	B46	P3_17
R_P3_18	A47	93	94	B47	P3_18
R_P3_19	A48	95	96	B48	P3_19
R_P3_20	A49	97	98	B49	P3_20
R_P3_21	A50	99	100	B50	P3_21
R_P3_22	A51	101	102	B51	P3_22
R_P3_23	A52	103	104	B52	P3_23
R_P3_24	A53	105	106	B53	P3_24
R_P3_25	A54	107	108	B54	P3_25
R_P3_26	A55	109	110	B55	P3_26
GND	A56	111	112	B56	GND
R_P3_27	A57	113	114	B57	P3_27
R_P3_28	A58	115	116	B58	P3_28
R_P3_29	A59	117	118	B59	P3_29
R_P3_30	A60	119	120	B60	P3_30
R_P3_31	A61	121	122	B61	P3_31
R_P3_32	A62	123	124	B62	P3_32
R_P1_26	A63	125	126	B63	P1_26_B
R_P1_27	A64	127	128	B64	P1_27_B
R_P1_28	A65	129	130	B65	P1_28_B
R_P1_29	A66	131	132	B66	P1_29_B

Signal	Riser pad	Pin	Pin	Riser Pad	Signal
3V3	A67	133	134	B67	3V3
3V3	A68	135	136	B68	3V3
3V3	A69	137	138	B69	3V3
3V3	A70	139	140	B70	3V3

Table 6-9: Riser-Board Connector (X6) assignment

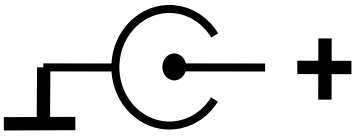
The “Riser-Pad” column in the table above lists the name of the corresponding pad on the card-edge riser-card (these use A or B for top/bottom layer and linear numbering on each side).

The R_P*-signals adjacent to the corresponding MCU-port. They are intended to be connected directly to the MCU-signal if not used on the Riser-Board. The default Riser-Board which ships with the SK-MB9DF120 has no active devices on it, so it passes all ports through.

Signals ending with “_B” are passed thru a limiting switch. They may be used as trace-signals (only useful for the 176pin package). If so, they are disconnected from the Riser-Board, rendering bus-functions requiring these signals unusable.

6.6 DC In Plug (X4)

The following figure shows the power connection plug. This connector is used to connect an external DC power supply with 12V/1.5A DC to the evaluation board. Observe the polarity of the power-supply lines.



6.7 CAN-Bus Connector (X5)

This is a standard pin-out used for industrial CAN.

Pin	Signal	Description
1	NC	Not used
2	CANL	default low CAN-bus signal (inverted differential line)
3	GND	Ground
4	NC	Not used
5	NC	Not used
6	NC	Not used
7	CANH	default high CAN-bus signal (non-inverted differential line)
8	NC	Not used
9	NC	Not used
Shield	Shield	Tied to GND via 1M0||100nF

Table 6-10: Can Bus Connector (X5) assignment

Check jumpers when using CAN to have the signals connected to the bus-driver. Also make sure the related ports are not connected elsewhere via the B2B connectors.

6.8 USB Connector (X7)

Standard USB Mini-B Plug.

Pin	Signal	Description
1	VBUS	+5.0V Supply from Host. Powers the USB/Serial Converter FT232R
2	D-	inverted data-line
3	D+	non-inverted data-line
4	ID	leave open
5	GND	Reference-voltage
Shield	Shield	Tied to GND via 1M0||100nF

Table 6-11: USB Connector (X7) assignment

Check jumpers when using USB/UART to have the signals connected to the bus-driver. Also make sure the related ports are not connected elsewhere via the B2B connectors.

6.9 APIX Connector (X1)

Pin	Signal	Description
1	SDOUTP	Serial Output, positive
2	SDOUTM	Serial Output, negative
3	n.c.	
4	SDINP.	Serial Input, positive
5	SDINM	Serial Input, negative
6	n.c.	
7	n.c.	
8	n.c.	
Shield	Shield	Tied to GND via 1M0||100nF

Table 6-12: APIX Connector (X1) assignment

7 Known Issues

- On the IPC-connector, the AIC-signals RDA1 and RDA0 are swapped for both channels (pins 7,8 and 17,18). This affects AIC operation and will be solved in the near future.
- When using ADA-FCR4-MULTIIO-001 board check jumper settings of CAN interface at this board. By default same CAN MCU signals are used as used on the starter kit, resulting that both CAN transceiver are connected together. Change default jumper setting at ADA-FCR4-MULTIIO-001 board or open Jumper at starter kit
- TRACE connector X3 is not usable for SK-MB9DF120-002 PCB V1.0. Connector is wrong positioned (180°). Do not connect any Trace probes to this connector.

8 Trouble shooting

9 Related Products

SK-MB9EF120-001	Calypso MCU starterkit (QFP 296)
SK-MB9EF120-002	Calypso MCU starterkit (BGA-320)
EMA-MB9DF120-001	MB96DF126 (Atlas) Emulation Adapter
ADA-FCR4-MULTIIO-001	Base board for using of MCU board with several IO interfaces like CAN, LIN, MediaLB, Ethernet, Video and Audio accessing
ADA-FCR4-CLUSTER-001	Automobile dashboard sample with stepper-motors and other functions.

10 Appendix

10.1 Tables

10.2 Figures

11 Information in the WWW

Information about FUJITSU SEMICONDUCTOR Products
can be found on the following Internet pages:

Microcontrollers (8-, 16- and 32bit), Graphics Controllers
Datasheets and Hardware Manuals, Support Tools (Hard- and Software)

http://mcu.emea.fujitsu.com/

Power Management Products

http://www.fujitsu.com/emea/services/microelectronics/powerman/index.html

For more information about FUJITSU SEMICONDUCTOR

http://emea.fujitsu.com/semiconductor

12 EU-Konformitätserklärung / EU declaration of conformity

Hiermit erklären wir,

Fujitsu Semiconductor Europe GmbH, Pittlerstrasse 47, 63225 Langen, Germany

dass dieses Board aufgrund seiner Konzipierung und Bauart sowie in den von uns in Verkehr gebrachten Ausführung(en) den grundlegenden Anforderungen der EU-Richtlinie 2004/108/EC „Elektromagnetische Verträglichkeit“ entspricht. Durch eine Veränderung des Boards (Hard- und/ oder Software) verliert diese Erklärung ihre Gültigkeit!

We,

Fujitsu Semiconductor Europe GmbH, Pittlerstrasse 47, 63225 Langen, Germany

hereby declare that the design, construction and description circulated by us of this board complies with the appropriate basic requirements according to the EU Guideline 2004/108/EC entitled ’Electro-Magnetic Compatibility’. Any changes to the equipment (hardware and/ or software) will render this declaration invalid!

Note:

All data and power supply lines connected to this starter kit should be kept as short as possible, with a maximum allowable length of 3m. Shielded cables should be used for data lines. As a rule of thumb, the cable length used when connecting external circuitry to the MCU pin header connectors for example should be less than 20cm. Longer cables may affect EMC performance and cause radio interference.

This evaluation board is a **Class A** product according to EN61326-1. It is intended to be used only in a laboratory environment and might cause radio interference when used in residential areas. In this case, the user must take appropriate measures to control and limit electromagnetic interference.

13 China-RoHS regulation

This board is compliant with China RoHS.

14 Recycling

Gültig für EU-Länder:

Gemäß der Europäischen WEEE-Richtlinie und deren Umsetzung in landesspezifische Gesetze nehmen wir dieses Gerät wieder zurück.

Zur Entsorgung schicken Sie das Gerät bitte an die folgende Adresse:

Fujitsu Semiconductor Europe GmbH

Warehouse/Disposal

Monzastraße 4a

D-63225 Langen

Valid for European Union Countries:

According to the European WEEE-Directive and its implementation into national laws we take this device back.

For disposal please send the device to the following address:

Fujitsu Semiconductor Europe GmbH

Warehouse/Disposal

Monzastraße 4a

D-63225 Langen

GERMANY

-- END --

