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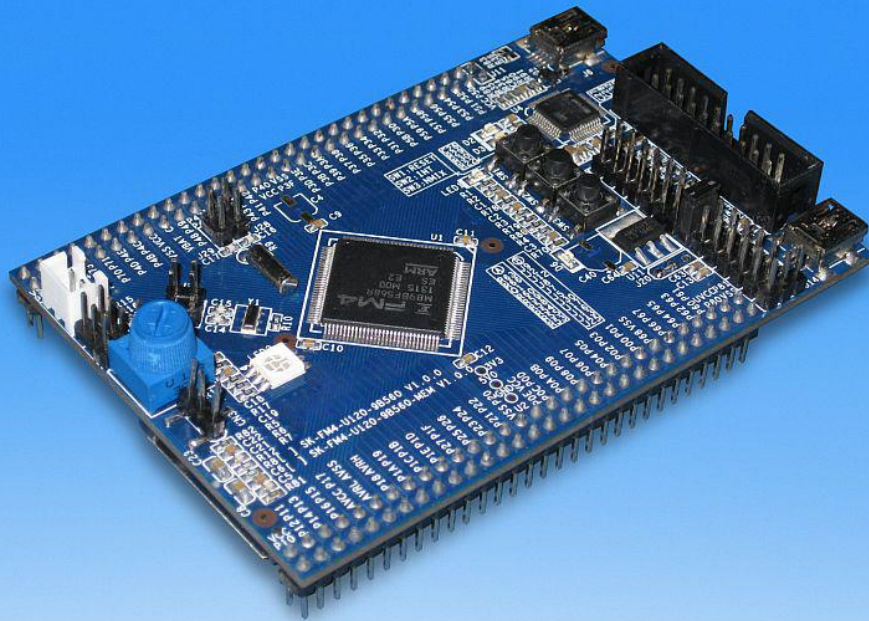
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China





CYPRESS[®]

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Starter kit User Guide

SK-FM4-U120-9B560

SK-FM4-U120-9B560-MEM

Hardware V1.1 / Documentation V1.7



Document Number: 002-09878 Rev. *A

Warranty and Disclaimer



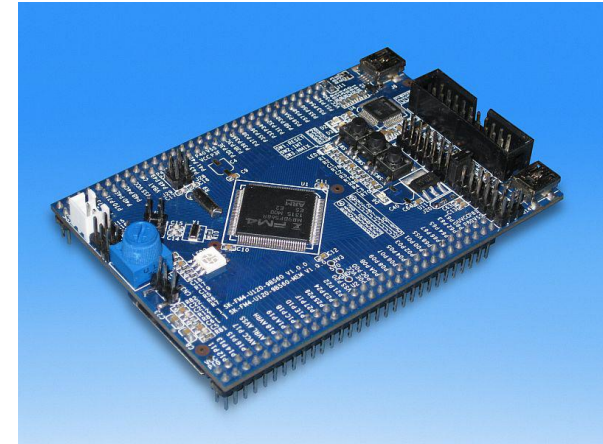
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- For your convenience this user guide includes external links that simplify installing of drivers, software utilities, and quick jumps to documentation.
- Some PDF viewer do not allow access to external content by links because of security reasons.
- A viewer called “PDF XChange” is provided in the software package of this starter kit. It’s use is free of charge and no additional installation is required.
- Launching “start.bat” opens this user guide in the PDF XChange viewer.
- Please ensure you have copied the complete software package related to this starter kit in order to use and run the links and examples given on the next pages.
- Please contact the [Cypress Support](#) in case of any question.

- [MCU Features](#), [Board Features](#) & [Contents](#)
- [Please check jumper setting](#) / [Test it by a GUI](#)
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- [The Jumper Table](#) / [Jumper Default](#)
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- [JTAG / CMSIS-DAP](#)
- [IAR-Embedded Workbench](#)
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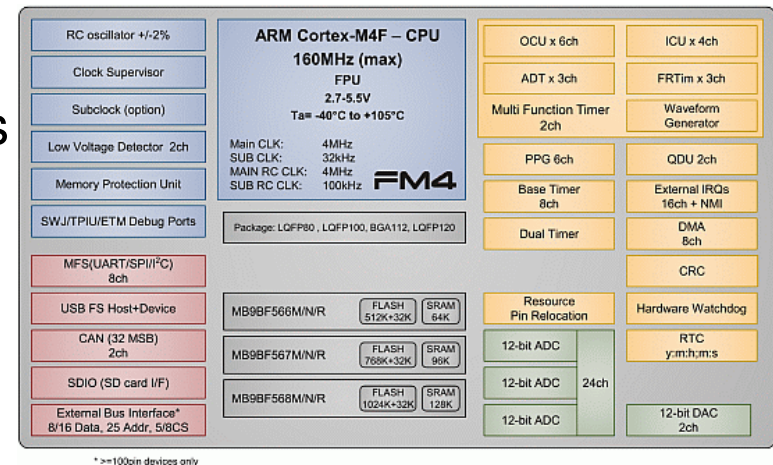
■ [Additional documents](#)

- [Schematic](#)
- [Factsheet](#)
- [Data sheet MB9B560R Series](#) and [Errata](#)
- [Peripheral Manual](#) and [Errata](#)
- [Peripheral Manual \(Timer Part\)](#) and [Errata](#)
- [Peripheral Manual \(Analog Part\)](#)
- [Peripheral Manual \(Communication Part\)](#) and [Errata](#)
- [Flash Programming Manual](#) and [Errata](#)

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Features of the microcontroller

- The SK-FM4-U120-9B560 and SK-FM4-U120-9B560-MEM are based on the Cypress ARM[®] Cortex[®]-M4 device MB9BF568R
- The MB9B560R Series includes the following features:
 - Up to 1 MByte Flash Memory and 32 KByte Work Flash Memory
 - Up to 128 KByte RAM
 - Up to 160MHz clock
 - Up to 2 CAN controller 2.0A/B
 - Up to 8 UART / LIN / SPI / I²C interfaces
 - USB-Host/-Device interface
 - SD-Card interface
 - Three 12 bit ADCs, up to 24 channels
 - Two 12 bit DACs
 - Up to 16 channel external interrupts
 - Two Multifunction timer with waveform generator, e.g. Motor control
 - Timers (ICUs, OCUs, PPGs, others)



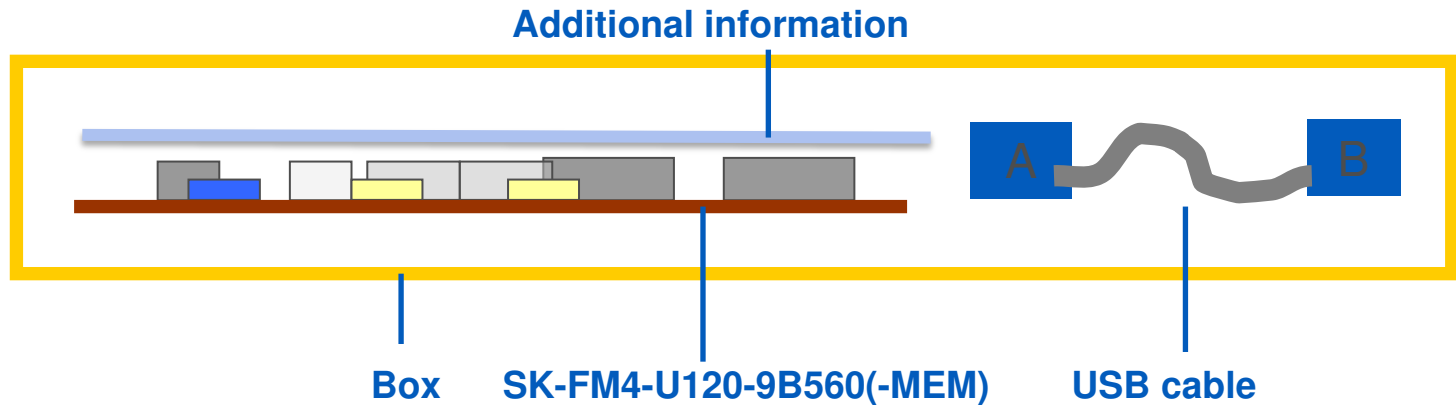
Features of the board

- The SK-FM4-U120-9B560(-MEM) is available in two versions:

Feature	SK-FM4-U120-9B560	SK-FM4-U120-9B560-MEM
External Power Supply	USB, DAP, JTAG or from SK-FM4-U-PERIPHERAL	
On-board Voltage	3.3V or 5V	3.3V
User-LEDs, Reset-LED	3x User-LEDs (R,G,B) + Reset	
Buttons	3x buttons: Reset + External Interrupt + NMI	
Potentiometer	AN18 (0V .. On-board voltage 3.3V/5V)	
Debug interface	On-board CMSIS-DAP incl. Status LEDs (connected, running) (optional 20 pin JTAG-IF to be used with external JTAG adapter)	
Virtual COM port (USB-2-UART bridge)	Yes	
USB interface	USB Function (Mini-USB Type B)	
SD-Card interface	Yes	No
External Memory	No	NAND-Flash: 32MByte SDRAM: 16MByte

Contents SK-FM4-U120-9B560

- The SK-FM4-U120-9B560(-MEM) contents
 - The SK-FM4-U120-9B560 or SK-FM4-U120-9B560-MEM evaluation board
 - One USB mini cable
 - 1-page flyer

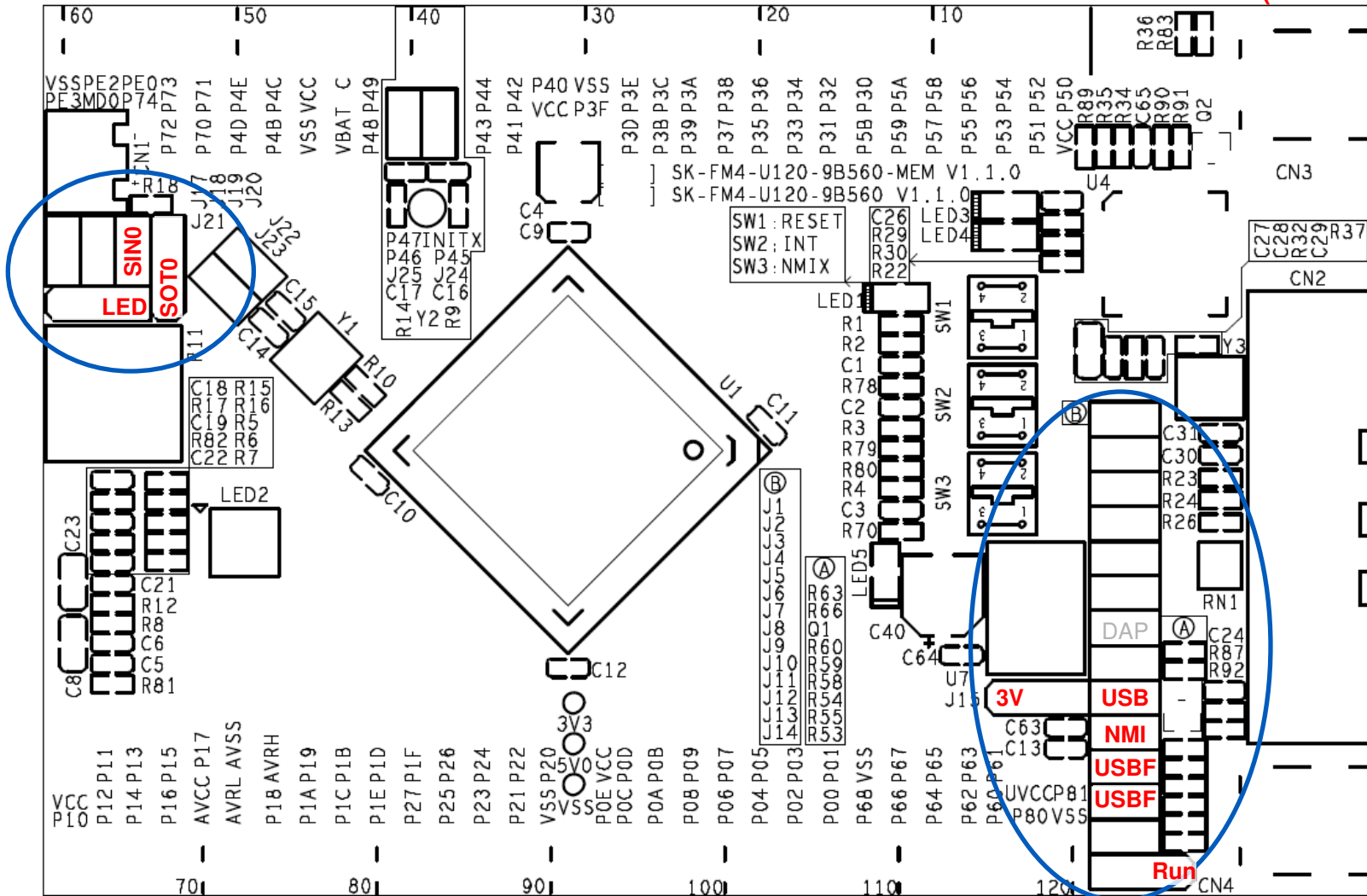


Please check jumper setting

SK-FM4-U120-9B560 supports 5V and 3.3V operation
SK-FM4-U120-9B560-MEM supports only 3.3V operation

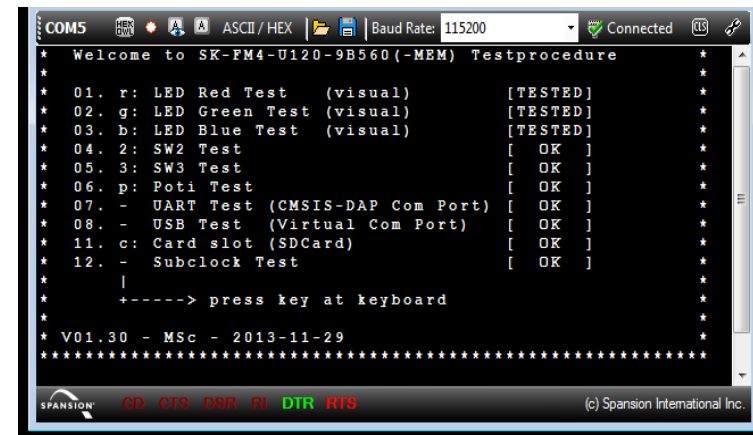
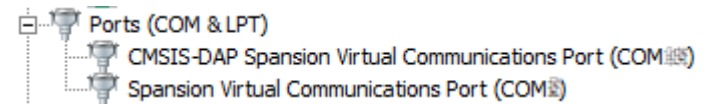
Note:

Please set **J9 (USB)** instead of **J7 (CMSIS-DAP)**
Please set **J19 and J20:1-2 (SINO/SOTO)**



Test it by terminal using USB

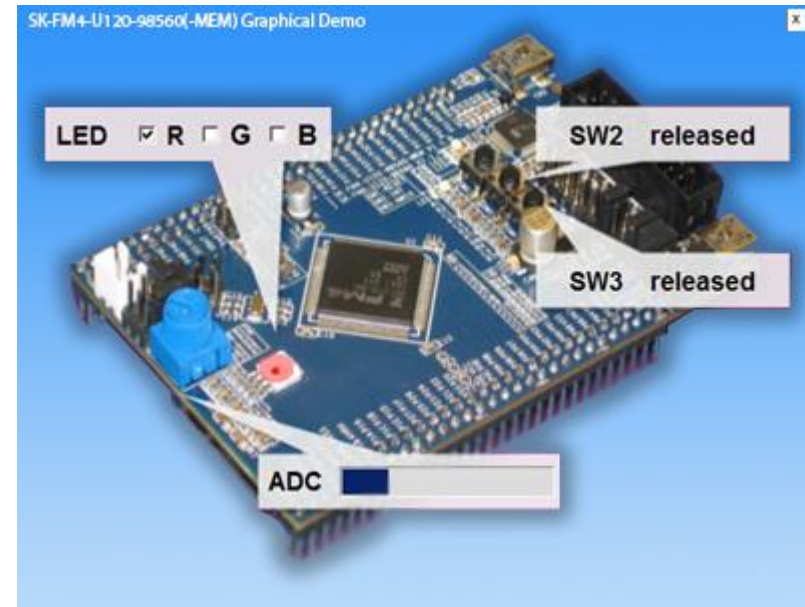
- The microcontroller on the SK-FM4-U120-9B560(-MEM) is already preprogrammed with a test application (<drive:>\sw-examples\testsoftware)
 - Install the USB driver first <drive:>\drivers\driverinstaller.exe
 - Connect the starter kit to CN4 (USB) with your PC
 - ✓ Ensure jumper J9 (USB) is set for correct power supply
 - ✓ Ensure jumper J19 and J20:1-2 are set correctly for use of SIN0/SOT0
 - Press the ,Reset'- Button
 - Check the availability for virtual COM port
 - ✓ e.g. Windows Device Manager
 - Open a serial terminal tool
 - ✓ e.g. Cypress Serial Port Viewer
 - <drive:>\tools\serialportviewer\setup.exe
 - ✓ Settings 115200 baud, 8N1
 - Press <space> to show welcome menu
 - Please select any function to test the on-board features



```
COM5  Baud Rate: 115200  Connected
* Welcome to SK-FM4-U120-9B560(-MEM) Testprocedure *
* 01. r: LED Red Test (visual) [TESTED] *
* 02. g: LED Green Test (visual) [TESTED] *
* 03. b: LED Blue Test (visual) [TESTED] *
* 04. 2: SW2 Test [ OK ] *
* 05. 3: SW3 Test [ OK ] *
* 06. p: Pot1 Test [ OK ] *
* 07. - UART Test (CMSIS-DAP Com Port) [ OK ] *
* 08. - USB Test (Virtual Com Port) [ OK ] *
* 11. c: Card slot (SDCard) [ OK ] *
* 12. - Subclock Test [ OK ] *
* | *
* +-----> press key at keyboard *
* *
* V01.30 - MSc - 2013-11-29 *
*****
SPANSTON  CD  CTS  DSR  RI  DTR  RTS  (c) Spansion International Inc.
```

Test it by a GUI

- The microcontroller on the SK-FM4-U120-9B560(-MEM) is already preprogrammed with a test application (<drive:>\sw-examples\testsoftware)
 - Install the USB driver first <drive:>\drivers\driverinstaller.exe
 - Connect the starter kit to CN4 (USB) with your PC
 - Open the PC software <drive:>\sw-examples\testsoftware\SK-FM4-U120-9B560_demo.exe
 - The picture of the board will be shown with current status of on-board features
 - LED allows control of the RGB-LED
 - ✓ Just click to the checkboxes
 - Status of user-buttons SW2 and SW3 are shown interactively
 - ADC represents the potentiometer R11



- You finished successfully the first test

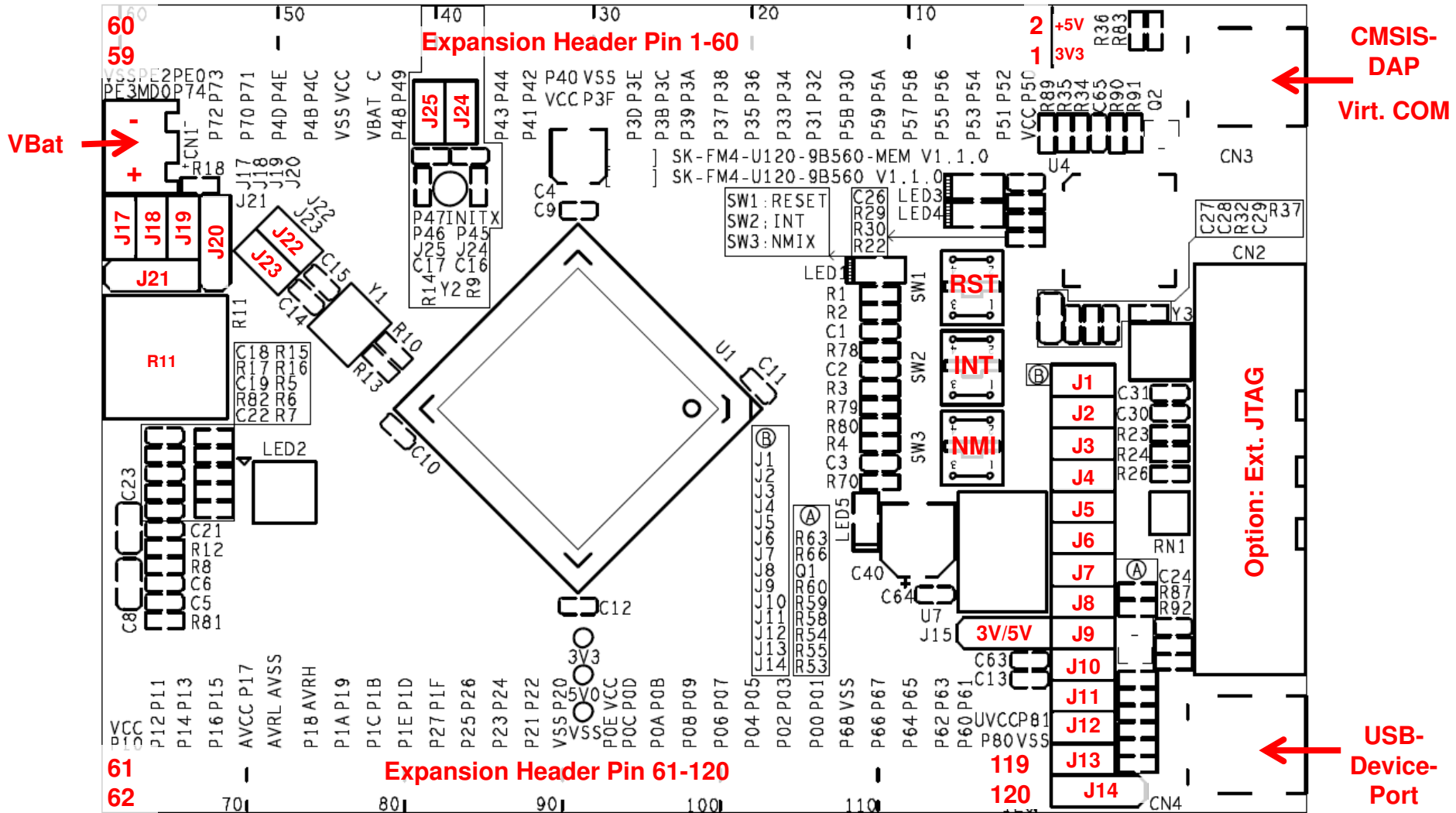
Congratulation!

- Next section covers:
 - The on-board features
 - How to program the Flash
 - ✓ Serial ROM Boot loader
 - USB Direct
 - UART0
 - ✓ On-board CMSIS-DAP
 - ✓ JTAG with optional emulator
 - How to start with IAR-Embedded-Workbench and KEIL μ Vision

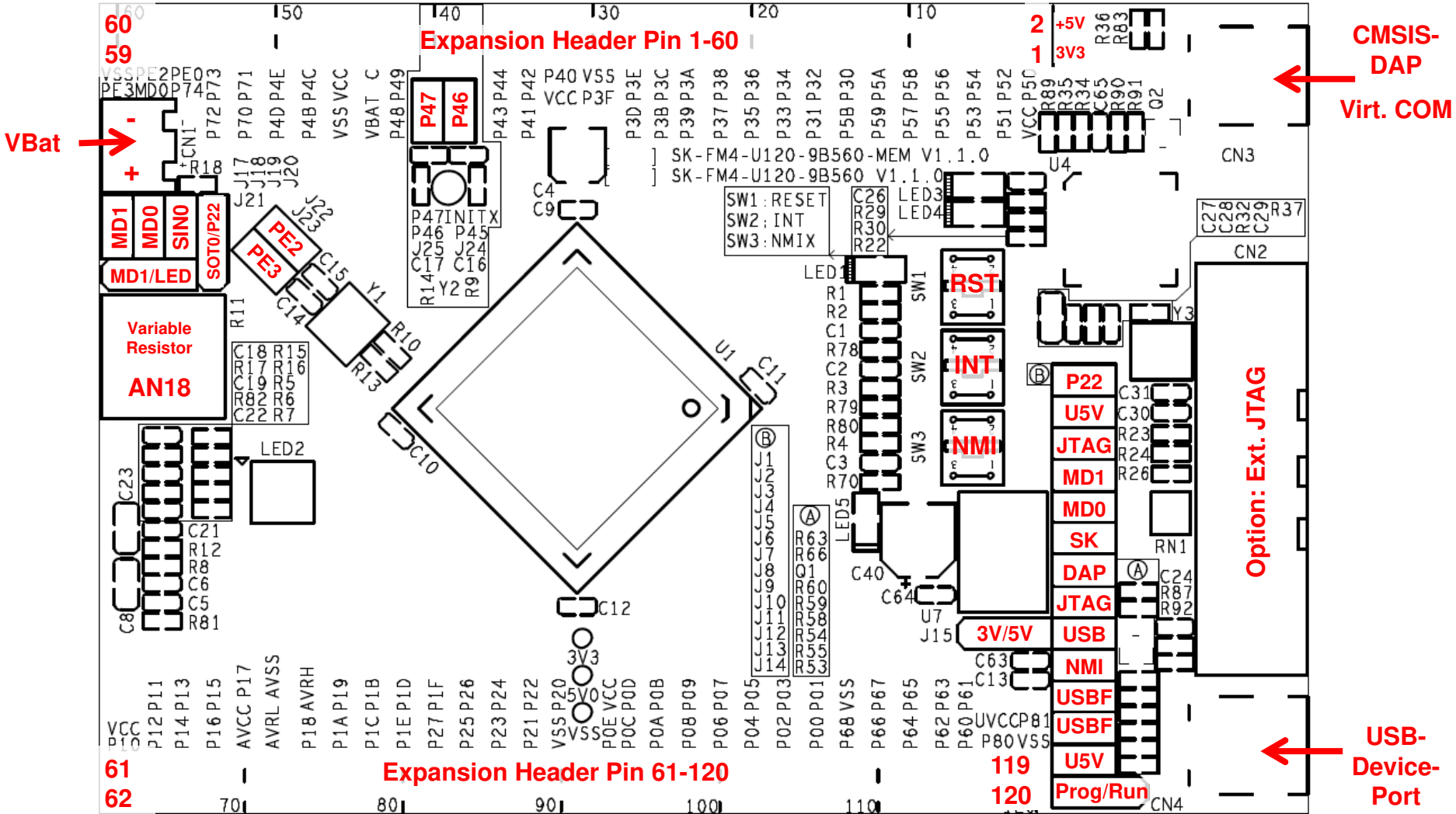


Hardware

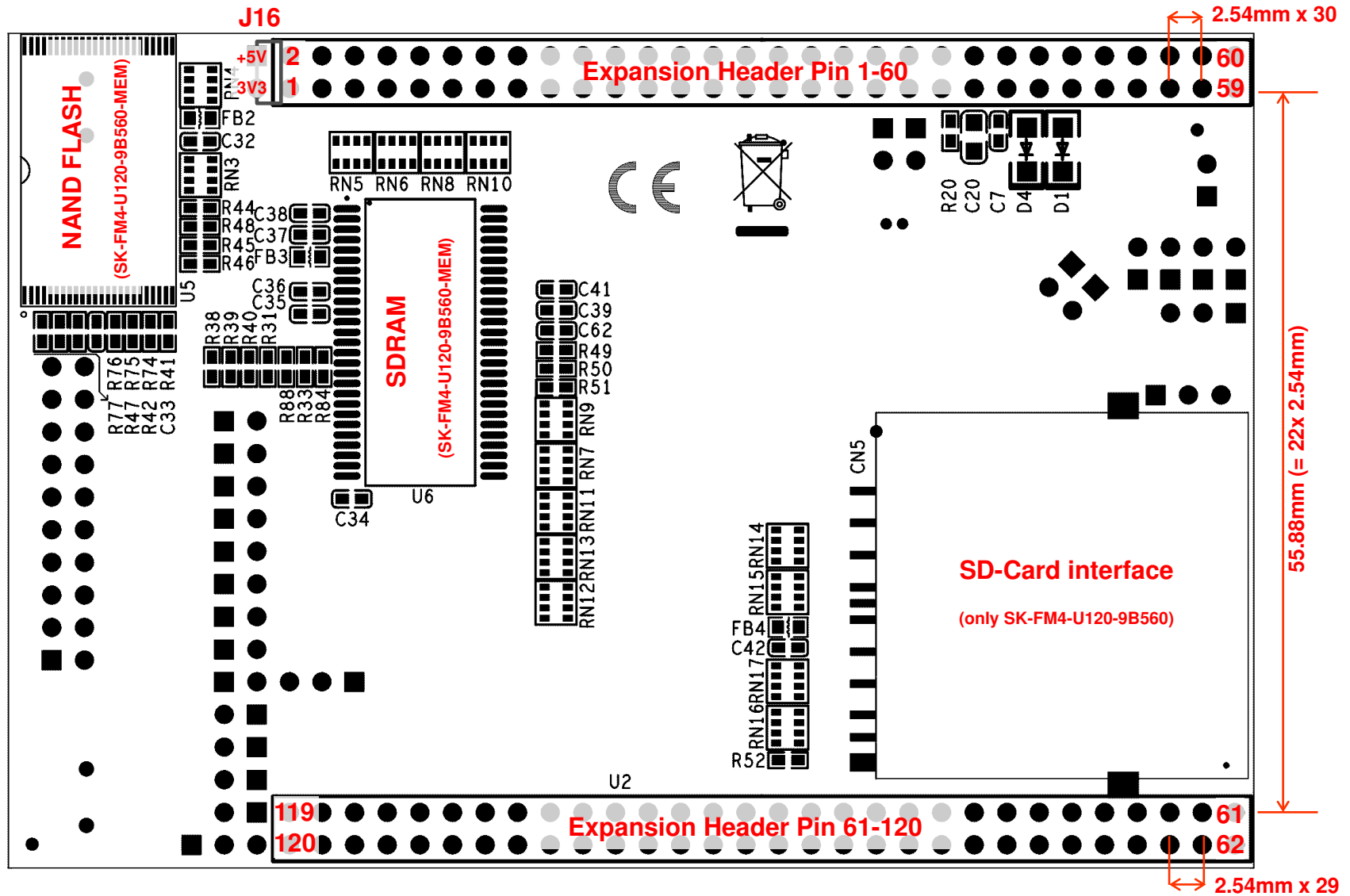
The Hardware (Top Side) – Jumper Overview



The Hardware (Top Side) – Jumper Function Overview



The Hardware (Bottom Side)



The Hardware – Pin Overview 1 - 20



Pin	Microcontroller-Function	SK-FM4-U120-9B560	SK-FM4-U120-9B560-MEM
1	VCC	VCC_MCU 3V3 or 5V0	VCC_MCU 3V3 or 5V0
2	P50/CTS4_0/AIN0_2/RTO10_0/INT00_0/MADATA00_0		SDRAM, NAND FLASH
3	P51/RTS4_0/BIN0_2/RTO11_0/INT01_0/MADATA01_0		SDRAM, NAND FLASH
4	P52/SCK4_0/ZIN0_2/RTO12_0/MADATA02_0		SDRAM, NAND FLASH
5	P53/TIOA1_2/SOT4_0/RTO13_0/MADATA03_0		SDRAM, NAND FLASH
6	P54/TIOB1_2/SIN4_0/RTO14_0/INT02_0/MADATA04_0		SDRAM, NAND FLASH
7	P55/ADTG_1/SIN6_0/RTO15_0/INT07_2/MADATA05_0		SDRAM, NAND FLASH
8	P56/SOT6_0/DTTI1X_0/INT08_2/MADATA06_0		SDRAM, NAND FLASH
9	P57/SCK6_0/MADATA07_0		SDRAM, NAND FLASH
10	P58/SIN4_2/AIN1_0/INT04_2/MADATA08_0		SDRAM
11	P59/RX1_1/SOT4_2/BIN1_0/INT07_1/MADATA09_0		SDRAM
12	P5A/TX1_1/SCK4_2/ZIN1_0/MADATA10_0		SDRAM
13	P5B/CTS4_2/MADATA11_0		SDRAM
14	P30/TIOB0_1/RTS4_2/INT15_2/WKUP1/MADATA12_0		SDRAM
15	P31/TIOB1_1/SIN3_1/INT09_2/MADATA13_0		SDRAM
16	P32/TIOB2_1/SOT3_1/INT10_1/MADATA14_0		SDRAM
17	P33/ADTG_6/TIOB3_1/SCK3_1/INT04_0/MADATA15_0		SDRAM
18	P34/TX0_1/TIOB4_1/FRCK0_0/MNALE_0		NAND FLASH
19	P35/RX0_1/TIOB5_1/IC03_0/INT08_1/MNCLE_0		NAND FLASH
20	P36/SIN5_2/IC02_0/INT09_1/MNWEX_0		NAND FLASH

The Hardware – Pin Overview 21 - 40



Pin	Microcontroller-Function	SK-FM4-U120-9B560	SK-FM4-U120-9B560-MEM
21	P37/SOT5_2/IC01_0/INT05_2/MNREX_0		NAND FLASH
22	P38/SCK5_2/IC00_0/INT06_2	LED_G	LED_G
23	P39/ADTG_2/DTTI0X_0/RTCCO_2/SUBOUT_2/MSDCLK_0		SDRAM
24	P3A/TIOA0_1/AIN0_0/RTO00_0/MSDCKE_0		SDRAM
25	P3B/TIOA1_1/BIN0_0/RTO01_0/MRASX_0		SDRAM
26	P3C/TIOA2_1/ZIN0_0/RTO02_0/MCASX_0		SDRAM
27	P3D/TIOA3_1/RTO03_0/MAD00_0		SDRAM
28	P3E/TIOA4_1/RTO04_0/MAD01_0		SDRAM
29	P3F/TIOA5_1/RTO05_0/MAD02_0		SDRAM
30	VSS	GND	GND
31	VCC	VCC_MCU 3V3 or 5V0	VCC_MCU 3V3 or 5V0
32	P40/TIOA0_0/RTO10_1/INT12_1		
33	P41/TIOA1_0/RTO11_1/INT13_1		
34	P42/TIOA2_0/RTO12_1/MSDWEX_0		SDRAM
35	P43/ADTG_7/TIOA3_0/RTO13_1/MCSX8_0		SDRAM
36	P44/TIOA4_0/RTO14_1/DA0		
37	P45/TIOB0_0/RTO15_1/DA1		
38	INITX	Button Reset / JTAG	Button Reset / JTAG
39	P46/X0A	Sub-Crystal 32.768 kHz	Sub-Crystal 32.768 kHz
40	P47/X1A	Sub-Crystal 32.768 kHz	Sub-Crystal 32.768 kHz

The Hardware – Pin Overview 41 - 60



Pin	Microcontroller-Function	SK-FM4-U120-9B560	SK-FM4-U120-9B560-MEM
41	P48/VREGCTL		
42	P49/VWAKEUP	Pull-Down resistor	Pull-Down resistor
43	VBAT	Battery (CN1)	Battery (CN1)
44	C	Capacitor 4u7	Capacitor 4u7
45	VSS	GND	GND
46	VCC	VCC_MCU 3V3 or 5V0	VCC_MCU 3V3 or 5V0
47	P4B/TIOB1_0/SCS7_1/MAD03_0		SDRAM
48	P4C/TIOB2_0/SCK7_1/AIN1_2/MAD04_0		SDRAM
49	P4D/TIOB3_0/SOT7_1/BIN1_2/INT13_2/MAD05_0		SDRAM
50	P4E/TIOB4_0/SIN7_1/ZIN1_2/FRCK1_1/INT11_1/WKUP2/MAD06_0		SDRAM
51	P70/TX0_0/TIOA4_2/AIN0_1/IC13_1		
52	P71/RX0_0/TIOB4_2/BIN0_1/IC12_1/INT15_1		
53	P72/TIOA6_0/SIN2_0/ZIN0_1/IC11_1/INT14_2		
54	P73/TIOB6_0/SOT2_0/IC10_1/INT03_2	USB	USB
55	P74/SCK2_0/DTT11X_1		
56	PE0/MD1	LED_B / MD1	LED_B / MD1
57	MD0	MD0	MD0
58	PE2/X0	Main-Crystal 4 MHz	Main-Crystal 4 MHz
59	PE3/X1	Main-Crystal 4 MHz	Main-Crystal 4 MHz
60	VSS	GND	GND

The Hardware – Pin Overview 61 - 80



Pin	Microcontroller-Function	SK-FM4-U120-9B560	SK-FM4-U120-9B560-MEM
61	VCC	VCC_MCU 3V3 or 5V0	VCC_MCU 3V3 or 5V0
62	P10/AN00/RX1_2/SIN1_1/FRCK0_2/INT02_1/MAD07_0		SDRAM
63	P11/AN01/TX1_2/SOT1_1/IC00_2/MAD08_0		SDRAM
64	P12/AN02/SCK1_1/IC01_2/RTCCO_1/SUBOUT_1/MAD09_0		SDRAM
65	P13/AN03/SIN0_1/IC02_2/INT03_1/MAD10_0		SDRAM
66	P14/AN04/SOT0_1/IC03_2/MAD11_0		SDRAM
67	P15/AN05/SCK0_1/MAD12_0		
68	P16/AN06/SIN2_2/INT14_1/MAD13_0		
69	P17/AN07/SOT2_2/WKUP3/MAD14_0		SDRAM
70	AVCC	VCC_MCU	VCC_MCU
71	AVSS	GND	GND
72	AVRL	GND	GND
73	AVRH	VCC_MCU	VCC_MCU
74	P18/AN08/SCK2_2/MAD15_0		SDRAM
75	P19/AN09/SIN4_1/IC00_1/INT05_1/MAD16_0		
76	P1A/AN10/SOT4_1/IC01_1/MAD17_0		
77	P1B/AN11/SCK4_1/IC02_1/MAD18_0		
78	P1C/AN12/CTS4_1/IC03_1/MAD19_0		
79	P1D/AN13/RTS4_1/DTTIOX_1/MAD20_0		
80	P1E/AN14/ADTG_5/FRCK0_1/MAD21_0		

The Hardware – Pin Overview 81 - 100



Pin	Microcontroller-Function	SK-FM4-U120-9B560	SK-FM4-U120-9B560-MEM
81	P1F/ADTG_4/TIOB6_2/RTO05_1		
82	P27/TIOA6_2/RTO04_1/INT02_2	LED_R	LED_R
83	P26/TIOB5_0/SCK2_1/RTO03_1		
84	P25/TX1_0/TIOA5_0/SOT2_1/RTO02_1		
85	P24/RX1_0/SIN2_1/RTO01_1/INT01_2		
86	P23/AN15/TIOA7_1/SCK0_0/RTO00_1/MAD22_0		
87	P22/CROUT_0/AN16/TIOB7_1/SOT0_0/ZIN1_1	JTAG	JTAG
88	P21/AN17/SIN0_0/BIN1_1/INT06_1/MAD23_0	JTAG	JTAG
89	P20/AN18/AIN1_1/INT05_0/MAD24_0	Potentiometer R11	Potentiometer R11
90	VSS	GND	GND
91	VCC	VCC_MCU 3V3 or 5V0	VCC_MCU 3V3 or 5V0
92	P0E/TIOB5_2/SCS6_1/IC13_0/S_CLK_0/MDQM1_0	SD-Card	SDRAM
93	P0D/TIOA5_2/SCK6_1/IC12_0/S_CMD_0/MDQM0_0	SD-Card	SDRAM
94	P0C/TIOA6_1/SOT6_1/IC11_0/S_DATA1_0/MALE_0	SD-Card	
95	P0B/TIOB6_1/SIN6_1/IC10_0/INT00_1/S_DATA0_0/MCSX0_0	SD-Card	NAND FLASH
96	P0A/SIN1_0/FRCK1_0/INT12_2/S_DATA3_0/MCSX1_0	SD-Card	
97	P09/AN19/TRACED0/TIOA3_2/SOT1_0/S_DATA2_0/MCSX5_0	SD-Card	
98	P08/AN20/TRACED1/TIOB3_2/SCK1_0/MCSX4_0		
99	P07/AN21/TRACED2/TIOA0_2/SCK7_0/MCLKOUT_0		
100	P06/AN22/TRACED3/TIOB0_2/SOT7_0/MCSX3_0		

The Hardware – Pin Overview 101 - 120



Pin	Microcontroller-Function	SK-FM4-U120-9B560	SK-FM4-U120-9B560-MEM
101	P05/AN23/ADTG_0/TRACECLK/SIN7_0/INT01_1/MCSX2_0		
102	P04/TDO/SWO	JTAG	JTAG
103	P03/TMS/SWDIO	JTAG	JTAG
104	P02/TDI/MCSX6_0	JTAG	JTAG
105	P01/TCK/SWCLK	JTAG	JTAG
106	P00/TRSTX/MCSX7_0	JTAG	JTAG
107	VSS	GND	GND
108	P68/TIOB7_2/SCK3_0/INT00_2	Button INT	Button INT
109	P67/TIOA7_2/SOT3_0		
110	P66/ADTG_8/SIN3_0/INT11_2		
111	P65/TIOB7_0/SCK5_1		
112	P64/TIOA7_0/SOT5_1/INT10_2		
113	P63/CROUT_1/RX0_2/SIN5_1/INT03_0/S_CD_0/MWEX_0	SD-Card	
114	P62/ADTG_3/TX0_2/SIN5_0/INT04_1/S_WP_0/MOEX_0	SD-Card	
115	P61/UHCONX0/TIOB2_2/SOT5_0/RTCCO_0/SUBOUT_0	USB	USB
116	P60/TIOA2_2/SCK5_0/NMIX/WKUP0/MRDY_0	Button NMIX	Button NMIX
117	USBVCC	3V3	3V3
118	P80/UDM0	USB	USB
119	P81/UDP0	USB	USB
120	VSS	GND	GND

Jumper table

Jumper	Function	SK-FM4-U120-9B560(-MEM) (Default setting marked bold)
J1 (2 pin)	CMSIS-DAP Crystal (P22) (Do not change!)	Open: 4MHz Closed: 48MHz
J2 (2 pin)	VBUS detection of CMSIS-DAP	Open: 3V3 Closed: 5V (only for SK-FM4-U120-9B560)
J3 (2 pin)	CMSIS-DAP reset	Open: CMSIS-DAP normal operation Closed: CMSIS-DAP reset assert
J4 (2 pin)	Operation of MD1 (CMSIS-DAP)	Open: Run-Mode Closed: Test-Mode
J5 (2 pin)	Operation of MD0 (CMSIS-DAP)	Open: Run-Mode (CMSIS-DAP) Closed: Firmware update of CMSIS-DAP
J6-J9	Power Supply Source Please select just one power source!	J9: USB Host powered (CN4) J8: JTAG powered (CN2) J7: CMSIS-DAP powered (CN3) J6: Powered by SK-FM4-U-PERIPHERAL (J16)
J10 (2 pin)	SW3 NMI Jumper J10 needs to be opened for programming	Open: Button SW3 disconnected / Programming mode Closed: Button SW3 (NMI) is connected
J11 (2 pin)	USB D+	Open: USB is disconnected Closed: USB is connected
J12 (2 pin)	USB D-	Open: USB is disconnected Closed: USB is connected
J13 (2 pin)	VBUS detection	Open: 3V3 Closed: 5V (only for SK-FM4-U120-9B560)

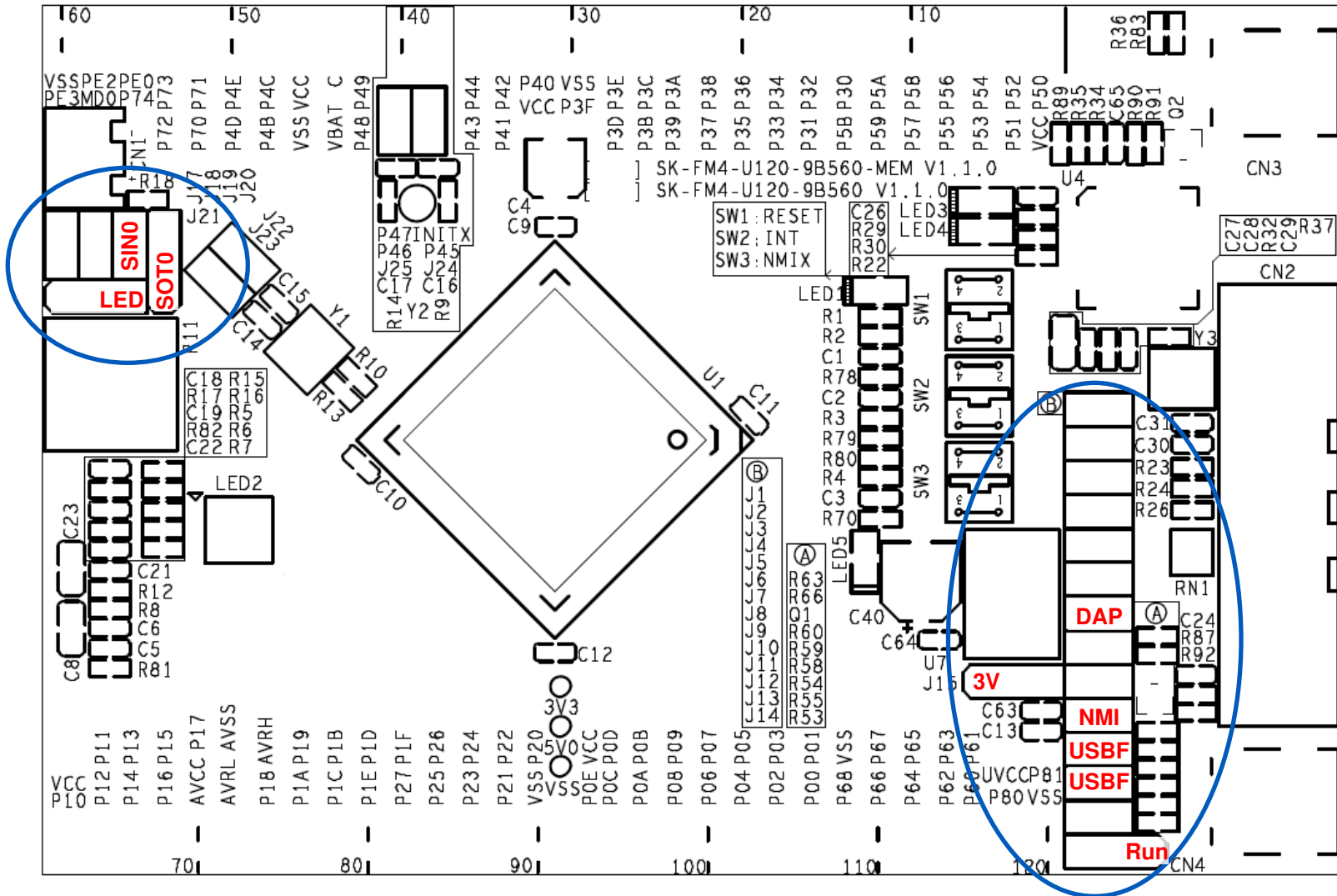
Jumper table (continued)

Jumper	Function	SK-FM4-U120-9B560(-MEM) (Default setting marked bold)
J14 (3 pin)	USB VBUS detection See also J10	1-2: VBUS is connected to INT03_2 (Run-Mode) 2-3: VBUS is connected to NMIX (Programming Mode)
J15 (3 pin)	MCU voltage selection SK-FM4-U120-9B560-MEM can be used with 3V3 only	1-2: MCU is powered from 3V3 2-3: MCU is powered from 5V (not SK-FM4-U120-9B560-MEM)
J17 (2 pin)	Operation of MD1 (Do not change!)	Open: Run-Mode and Programming-Mode Closed: Test-Mode
J18 (2 pin)	Operation of MD0	Open: Run-Mode Closed: Programming-Mode
J19 (2 pin)	CMSIS-DAP Virtual COM port (SIN0_0)	Open: SIN0 is disconnected from CMSIS-DAP Closed: CMSIS-DAP's virtual COM port is connected
J20 (3 pin)	CMSIS-DAP Virtual COM port (SOT0_0)	2-3: SOT0/P22 is used for USB programming 1-2: CMSIS-DAP's virtual COM port is connected
J21 (3 pin)	MD1/PE0 See also J17	1-2: MD1 (Programming-Mode) 2-3: PE0 (LED Blue)
J22 (2 pin)	X0/PE2 Do not close J22 if crystal Y1 is assembled.	Open: PE2 is disconnected Closed: PE2 is connected to pin header U2
J23 (2 pin)	X1/PE3 Do not close J23 if crystal Y1 is assembled.	Open: PE3 is disconnected Closed: PE3 is connected to pin header U2
J24 (2 pin)	X0A/P46 Do not close J24 if crystal Y2 is assembled.	Open: P46 is disconnected Closed: PE2 is connected to pin header U2
J25 (2 pin)	X1A/P47 Do not close J25 if crystal Y2 is assembled.	Open: P47 is disconnected Closed: PE2 is connected to pin header U2

Jumper – Default (Run mode, CMSIS-DAP)

SK-FM4-U120-9B560 supports 5V and 3.3V operation

SK-FM4-U120-9B560-MEM supports only 3.3V operation



Jumper – Programming Mode (USB Direct mode)

