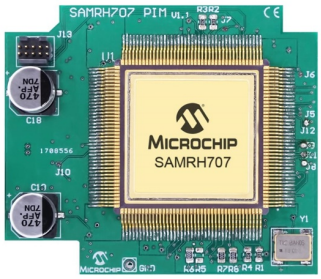


MICROCHIP SAMRH707 EK Evaluation Kit User Guide

SAMRH707
SAMRH707F18-EK Evaluation Kit User Guide

Contents

Introduction

The SAMRH707F18-EK is an evaluation platform designed for evaluating the Radiation-Hardened Arm -M7

SAMRH707 microcontroller.
Cortex X Integrated Development Environment (IDE) and provides easy access to the SAMRH707 device features. It supports stand-alone debuggers and includes an on-board embedded debugger. When the on-board debugger is used, no external tool is required to debug the embedded code or to program the microcontroller.
The SAMRH707 evaluation kit is supported by Microchip's MPLAB® The Xplained Pro headers enable support for additional peripherals to extend the features of the board and ease the development of custom designs.

Features

- SAMRH707 Microcontroller
  – Embedded ceramic package
  – Optional plastic package
- Human Machine Interface
  – One mechanical Reset pushbutton
  – One mechanical NMIC pushbutton
  – Four mechanical user pushbuttons
  – Six user LEDs
  – DIP switch for boot setup
- On-board Memories
  – 512K x 8 Flash
  – 512K x 8 SRAM
  – 64 Mbit SPI Flash
- On-board Clock Management
  – 32.768 kHz crystal
  – 10 MHz oscillator
- Communication Interfaces
  – One UART emulation through USB debug port
  – Two CAN ports through extension header
- Embedded ATA6563 transceivers
  – Two SpaceWire ports
- Micro D-Sub 9 connectors
- Direct use of LVDS mode
- Optional use of TTL mode (add-on board)
  – Two 1553 ports
- TRB Connectors
- Debug Resources
  – JTAG debug connector
  – Trace connector
  – Embedded debugger (PKoB)
  • Programming and debugging
  • USB micro-B debug port
  • Virtual COM port (CDC)
  • One yellow status LED
  • One green active LED
- Extension Capability

– Three Xplained Pro extension headers
• One General Purpose
• One Motor Control
• One ADC
– Processor pins extension headers (4)
• Plastic package add-on board

- Analog
  – 3 DAC outputs
  • SMB Connectors
  • HE10 Connectors
  • Buzzer
  – 16 ADC inputs
  • 2 inputs connected to SMB Connectors
  • 16 inputs connected to extension headers
  • 1 input connected to a potentiometer
- +5V External Power Supply
  – USB-C port
  – One power status LED

References

- SAMRH707 Device Datasheet, DS60001634, Microchip Technology Inc.
- Cortex M7 Technical Reference Manual, Arm Limited (**https://documentation-service.arm.com/static/5e906b038259fe2368e2a7bb?token=**)
- MPLAB X IDE User's Guide, DS50002027, Microchip Technology Inc. (**www.microchip.com/downloads/en/DeviceDoc/50002027D.pdf**)

Kit Overview

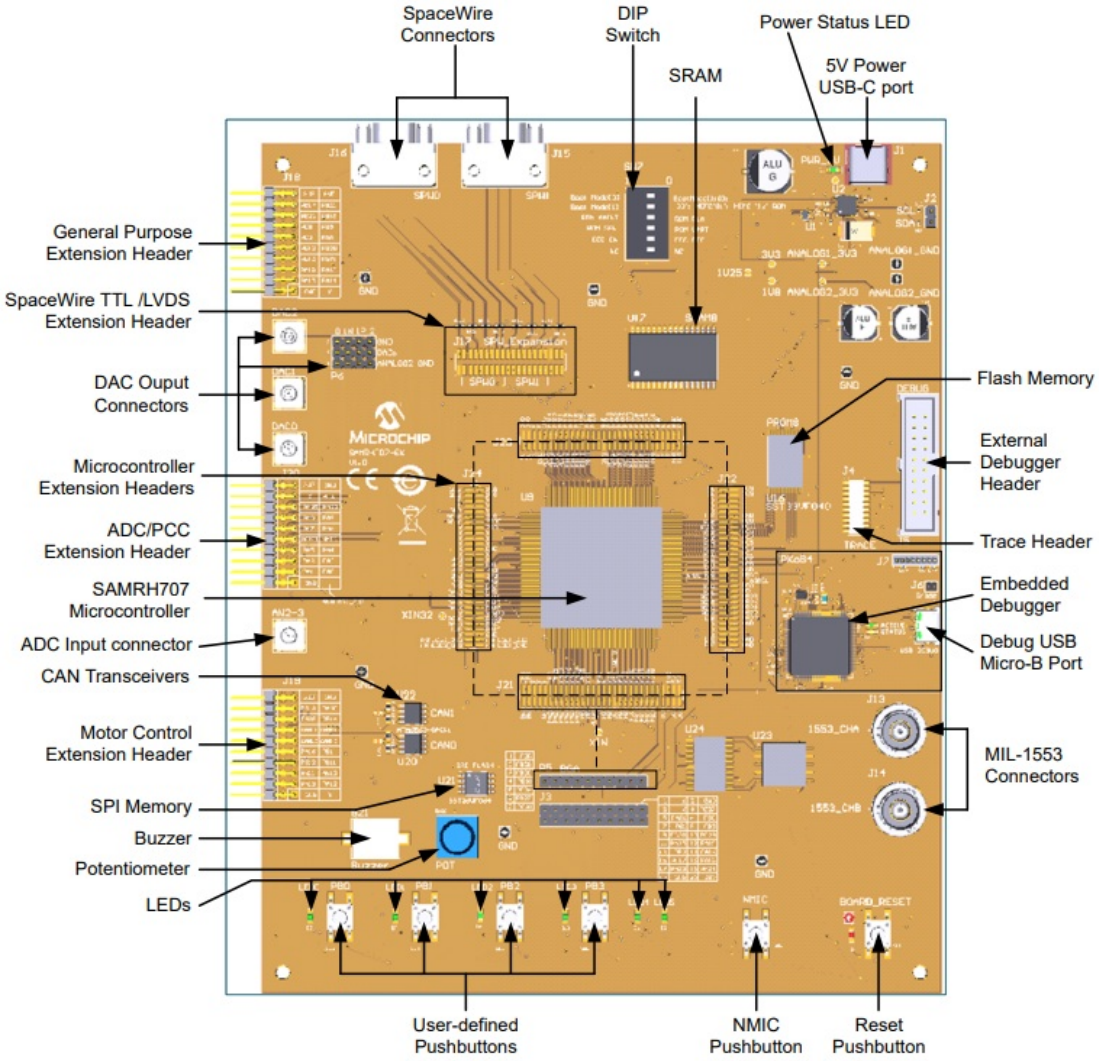
The SAMRH707 evaluation kit consists of the following boards:

- One main board
- One SpaceWire Add-on board (optional, provided on demand)

1.1 Main Board

The main board offers a set of features that enables customers to prototype their own application with the RadiationHardened SAMRH707 microcontroller. The following figure shows the board layout of SAMRH707F18-EK.

Figure 1-1. SAMRH707F18-EK Board Layout



1.2 SpaceWire Add-on Board

The SpaceWire link can work in LVDS mode or TTL mode. The main board supports natively the LVDS mode only.

An add-on board (see Figure 1-2) must be connected to the main board to support the TTL mode after having configured the solder PADs (see Figure 1-3).

Figure 1-2. SpaceWire TTL Add-on Board

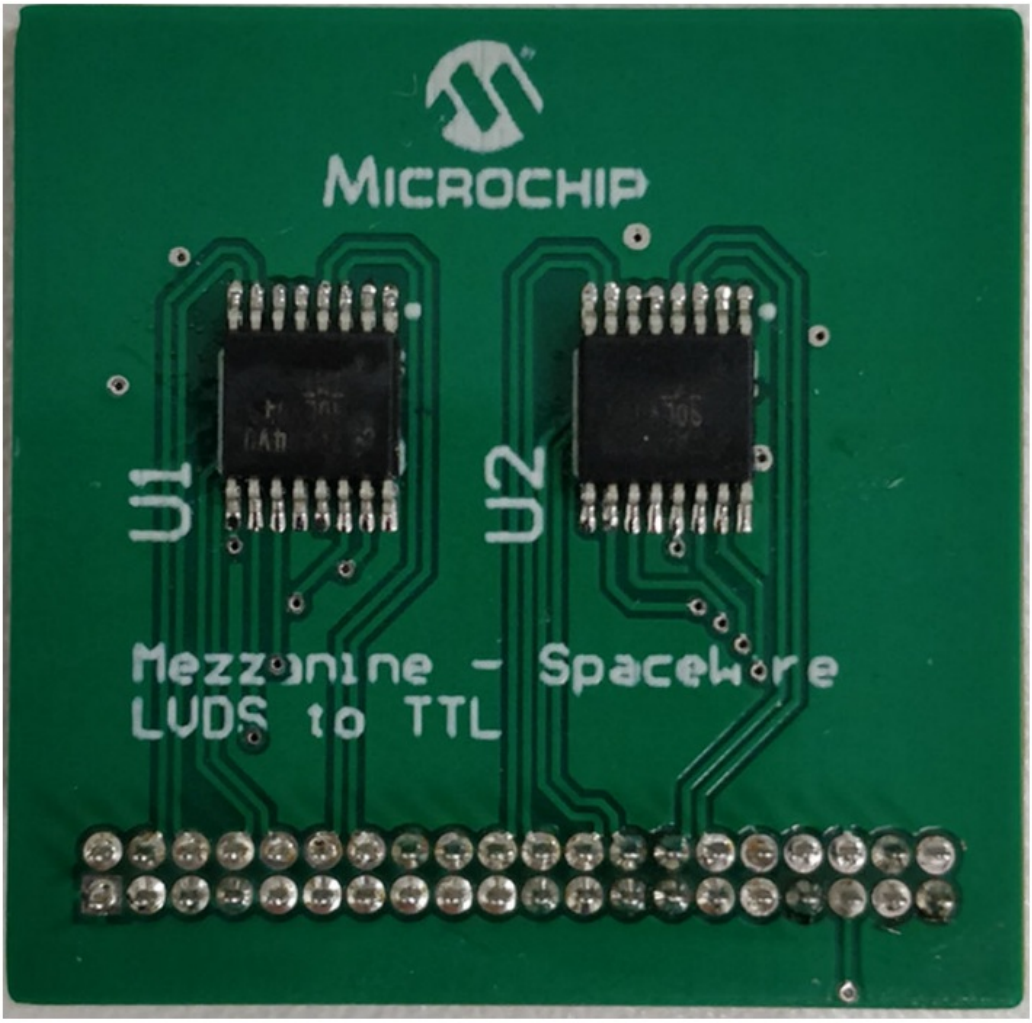
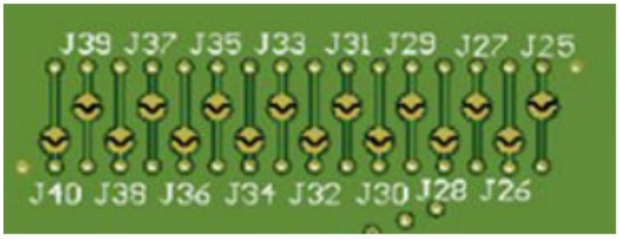


Figure 1-3. Solder PADs



1.2.1 TTL Mode

The add-on board is connected to the SPW TTL/LVDS Extension Header (J17).

All 16 solder PADs (J25-J40) must be disconnected by removing the drops of solder before inserting the add-on board.

1.2.2 LVDS Mode

J17 connector is not used.

All 16 solder PADs (J25-J40) are connected by default. The connections are made by drops of solder. The solder PADs are located on the bottom side of the main board.

Getting Started

This section provides information about the software and hardware tools for the SAMRH707 evaluation kit.

2.1 Software Development Tools

MPLAB X IDE is an expandable, highly configurable software program that incorporates powerful tools to help you discover, configure, develop, and debug. The MPLAB X IDE ecosystem includes many free plugins and compilers.

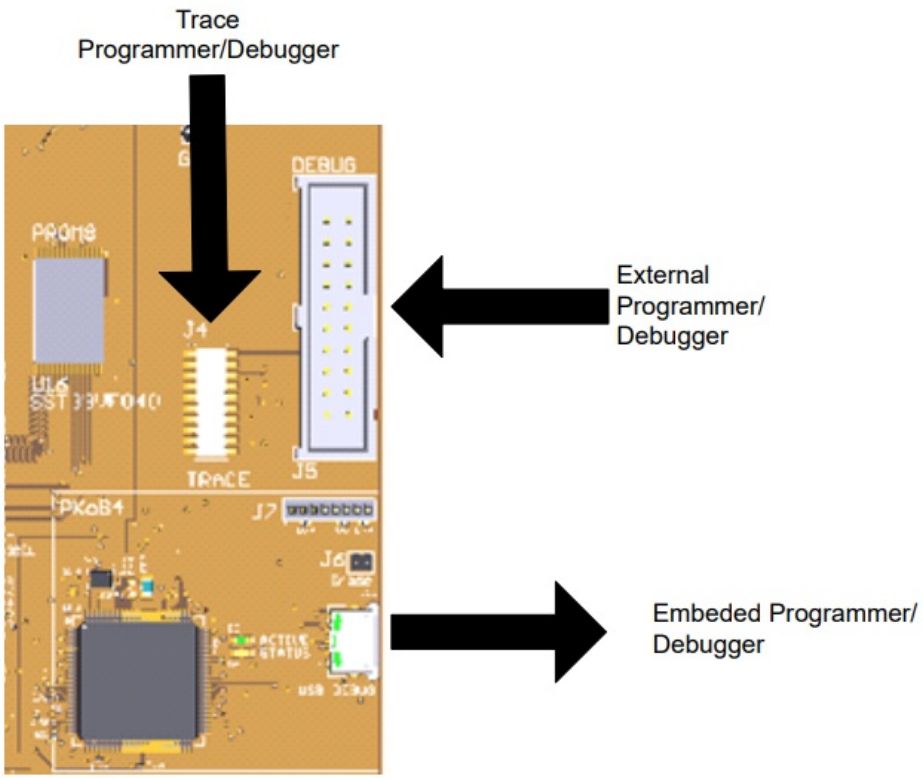
2.2 Hardware Development Tools

The main board supports natively three different debugging tools:

- An embedded debugger

- An external debugger
- A trace debugger

Figure 2-1. Debugging Resources



2.2.1 Embedded Debugger

The PKoB embedded programmer/debugger is accessible through the debugging USB port (J12).
No external tool is required to debug the embedded code or to program the microcontroller.

2.2.2 External Debugger

The Debugger Header (J5) supports an external programmer/debugger device that must be acquired separately.
It can be one the following devices:

- J32 programmer/debugger (P/N: DV164232). It is available at:
  https://www.microchip.com/DevelopmentTools/ProductDetails/PartNO/DV164232
  Figure 2-2. J32 Programmer/Debugger (P/N: DV164232)

- ICD 4 In-Circuit Debugger (DV164045). It is available at:
  https://www.microchip.com/DevelopmentTools/ProductDetails/DV164045
  Figure 2-3. ICD 4 In-Circuit Debugger (DV164045)

- PICkit 4 In-Circuit Debugger (PG164140). It is available at:

https://www.microchip.com/Developmenttools/ProductDetails/PG164140

Figure 2-4. PICkit 4 In-Circuit Debugger (PG164140)

The devices described above can be possibly used with the following adapter:

- Debugger Board (AC102015). It is available at:
  www.microchip.com/Developmenttools/ProductDetails/AC102015

  Figure 2-5. Debugger Adapter Board (AC102015)

2.2.3 The Trace Debugger

The Trace Header (J4) supports external trace/programmer/debugger device that must be acquired separately.

Hardware Overview

3.1 Human Machine Interface

This section provides information about the LEDs, DIP switch, and pushbuttons in the evaluation board.

3.1.1 LEDs

The SAMRH707 evaluation kit has eight green LEDs, one red LED, and one yellow LED.
The LED specification is provided in the following table.

Table 3-1. LED Specification

P/N	Manufacturer
LG R971-KN-1	OSRAM

The following table lists the LED pin connections.
Table 3-2. LED Pin Connections

Signal Name	Function	Color	SAMRH707 Pin	Shared Functionality	Peripheral
PWR_SU	+5V Input Status	Green	—	—	—
BOARD_RESET	Board Reset State	Red	—	—	—
ACTIVE	Embedded Debugger Communication Status	Green	—	—	—
STATUS	Embedded Debugger State	Yellow	—	—	—
LED0	General Purpose	Green	PB11	PWMC0_PWMH0 TCLK3	A C
LED1	General Purpose	Green	PB12	PWMC0_PWML0 TCLK4	A C
LED2	General Purpose	Green	PB13	PWMC0_PWMH1 TIOA4	A C
LED3	General Purpose	Green	PB14	PWMC0_PWML1 TIOB4	A C
LED4	General Purpose	Green	PA17	FLEXCOM0_IO2	A
LED5	General Purpose	Green	PA18	FLEXCOM0_IO3	A

3.1.2 Mechanical Buttons

The SAMRH707 evaluation kit has six pushbuttons:

- One Reset button
- One NMIC button
- Four general purpose buttons connected to the I/O lines of the microcontroller.

The following table provides functions of pushbuttons.

Table 3-3. Mechanical Buttons Pins Connections

Signal Name	Function	SAMRH707 Pin	Shared Functionality	Peripheral
BOARD_RESET	System Reset	NRST	—	—
NMIC	Non-Maskable Interrupt	NMIC_NMI	—	—
PB0 (Pushbutton)	General Purpose	PA31 (I/O)	PCK1 FLEXCOM1_IO6	A B
PB1 (Pushbutton)	General Purpose	PB0 (I/O)	TIOA2	A
PB2 (Pushbutton)	General Purpose	PB1 (I/O)	PWMC0_PWMEXTRG1 TCLK5	B C
PB3 (Pushbutton)	General Purpose	PB2 (I/O)	RTCOUT0	A

3.1.3 DIP Switch (SW7)

The evaluation kit has a DIP switch to configure the SAMRH707 default setup after Reset. The Boot mode and the associated configuration feature applicable to the external memories can be configured through this DIP switch. The following convention has been implemented: On = 0 and Off = 1.

Table 3-4. DIP Switch Function

DIP Switch	Function	SAMRH707 Pin	Notes
SW7-1	BOOT_MODE [0]	PC30	—
SW7-2	BOOT_MODE [1]	PC29	—
SW7-3	ROM Phase Selection	PA19	—
SW7-4	CFG2	PA25	The use of SW7-4 and SW-5 is exclusive. Only one can be configured at a time. SW7-5 is reserved for internal use and should not be set.
SW7-5		PC27	
SW7-6	Not Used		

Table 3-5. DIP Switch Configuration

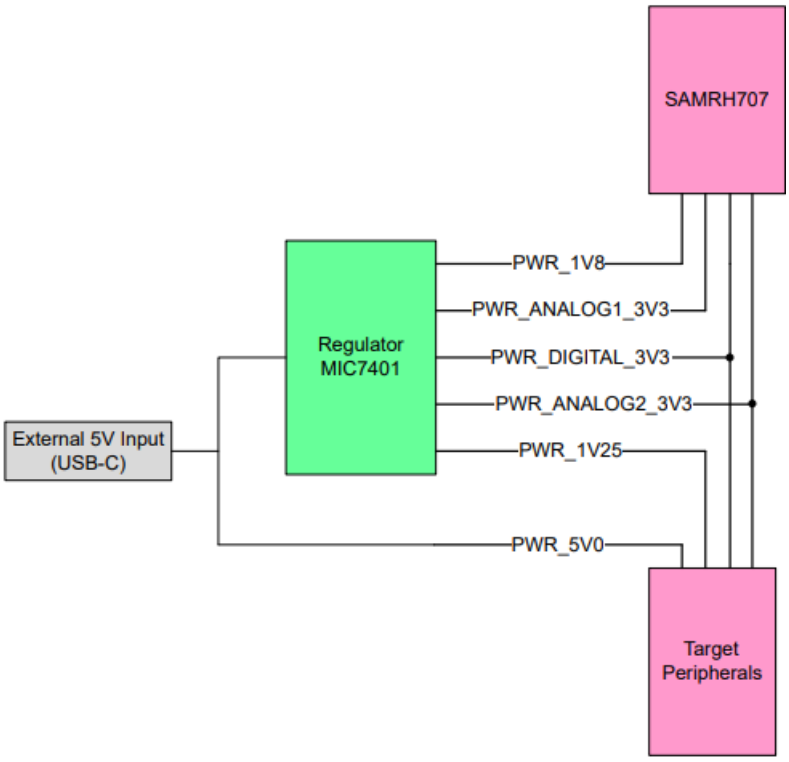
<table>
<tr><td>SW 7-2</td><td>SW 7-1</td><td>SW 7-3</td><td>SW 7-4</td><td>SW 7-5</td><td>Active Memory</td><td colspan="2">Configurations</td><td></td><td>Default</td></tr>
<tr><td rowspan="6">On</td><td>On</td><td>X</td><td>X</td><td>X</td><td colspan="3">Internal Flash Memory (HEFC)</td><td rowspan="6">HECC Controller</td><td rowspan="11">Internal Flash Memory (HEFC)</td></tr>
<tr><td rowspan="2">Off</td><td>X</td><td>X</td><td>On</td><td rowspan="5">External Flash (HEMC) (ROM/Flash/SRAM)</td><td>HECC Off</td><td rowspan="2">Internal Use Only</td></tr>
<tr><td>X</td><td>X</td><td>Off</td><td>HECC On</td></tr>
<tr><td rowspan="2">Of</td><td>X</td><td>On</td><td>X</td><td>HECC Off</td><td>All microcontrollers</td></tr>
<tr><td>X</td><td>Off</td><td>X</td><td>HECC On</td><td></td></tr>
<tr><td rowspan="5">Of</td><td>On</td><td rowspan="2">Off</td><td rowspan="3">On</td><td rowspan="3">X</td><td rowspan="3">Internal ROM Run Phase</td><td colspan="2">SpaceWire 0 LVDS mode</td><td rowspan="6">Active TM/TC Link</td></tr>
<tr><td>Off</td><td colspan="2">SpaceWire 0 TTL mode</td></tr>
<tr><td>X</td><td>On</td><td colspan="2">FlexCOM 1 UART mode</td></tr>
<tr><td>X</td><td>On</td><td rowspan="3">Of</td><td rowspan="3">X</td><td rowspan="3">Internal ROM Maintenance Phase</td><td colspan="2">FlexCOM 1 UART mode</td></tr>
<tr><td>On</td><td rowspan="2">Off</td><td colspan="2">SpaceWire 0 LVDS mode</td></tr>
<tr><td>Off</td><td colspan="2">SpaceWire 0 TTL mode</td></tr>
</table>

3.2 Power Distribution

The evaluation kit is powered by an external 5V. The following internal power supplies are provided by a Configurable Power Management Device (Microchip MIC 7401):

- 3.3V for SAMRH707 I/Os, analog, and digital peripherals
- 1.8V SAMRH707 core and PLLs
- 1.25V for SpaceWire reference voltage
- 5V for CAN transceivers

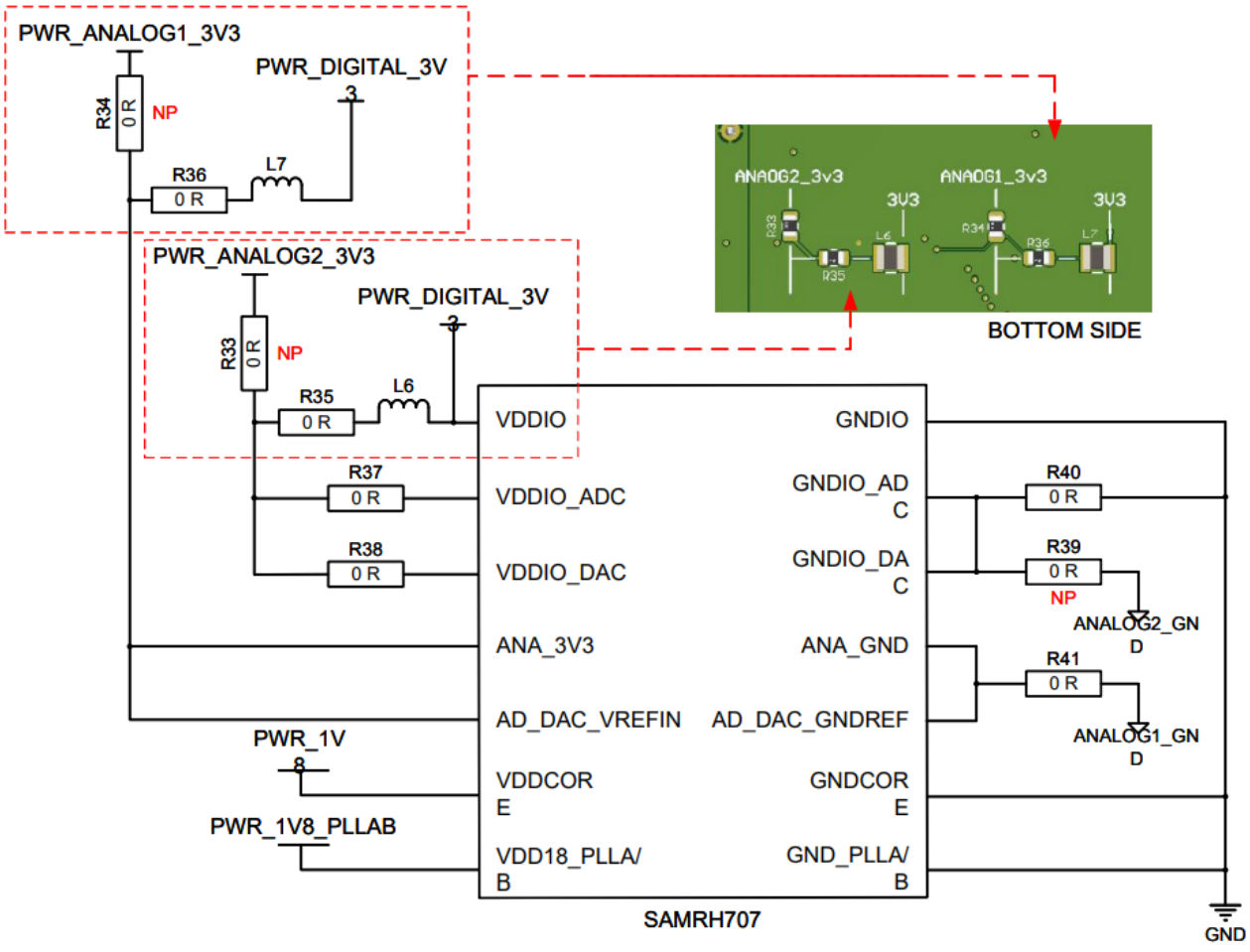
Figure 3-1. Power Supply



3.2.1 Microcontroller Power Supplies

The microcontroller can be supplied power from several power supplies. Part of these power supplies are configurable. The configurations are described in the following tables and figures and a part of them are made from the PCB's bottom side as shown in the bottom side figures.

Figure 3-2. Microcontroller Power Supplies



Note: NP = Not Populated

Figure 3-3. Board's Grounds

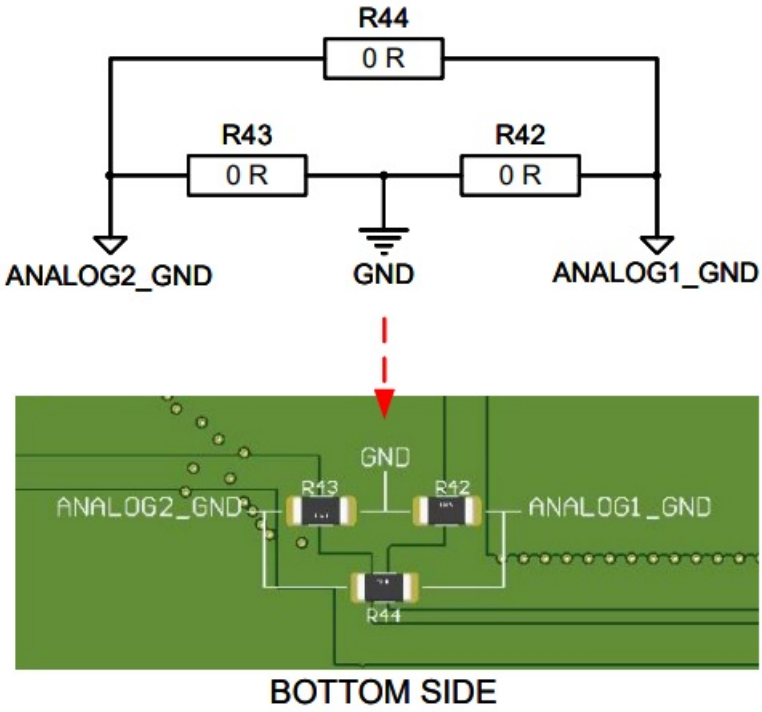


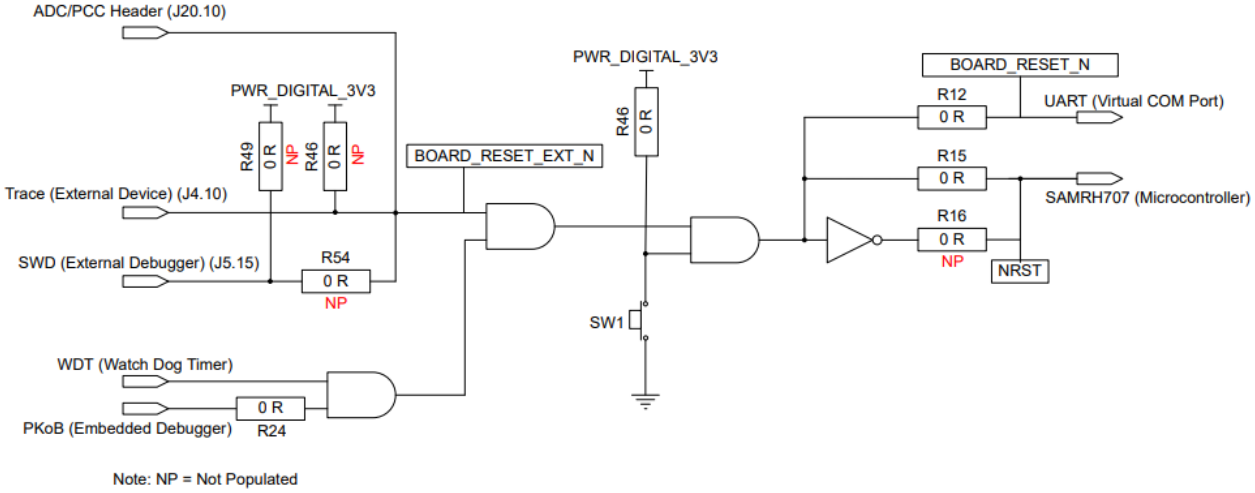
Table 3-6. Microcontroller Power Supply Configurations

Microcontroller Pins	Common Power Ground (Default)		Separate Grounds	
VDDIO_ADC/GNDIO_ADC VDDIO_DAC/GNDIO_DAC	PWR_DIGITAL_3V3 GND	R35: On / R33: Off R40: On / R39: Off	PWR_ANALOG2_3V3 ANALOG2_GND	R35: Off / R33: On / R37: On / R38: On R40: Off / R39: On
ANA_3V3/ANA_GND AD_DAC_VREFIN/ AD_DAC_GNDVREF	PWR_DIGITAL_3V3 GND	R36: On / R34: Off R41: On	PWR_ANALOG1_3V3 ANALOG1_GND	R36: Off / R34: On R41: On
ANALOG1_GND ANALOG2_GND	GND GND	R42: On / R44: Off R43: On / R44: Off	GND GND	R42: Off / R44: Off R43: Off / R44: Off

3.3 Reset Network

The following schematics show the board's Reset network.

Figure 3-4. Reset Network



Note: NP = Not Populated

3.4 External Memory

The evaluation kit has the following memory devices:

- 512K x 8 Flash
- 512K x 8 SRAM
- 64 Mbit SPI Flash (can be used with the embedded bootloader)

Figure 3-5. Memory Structure

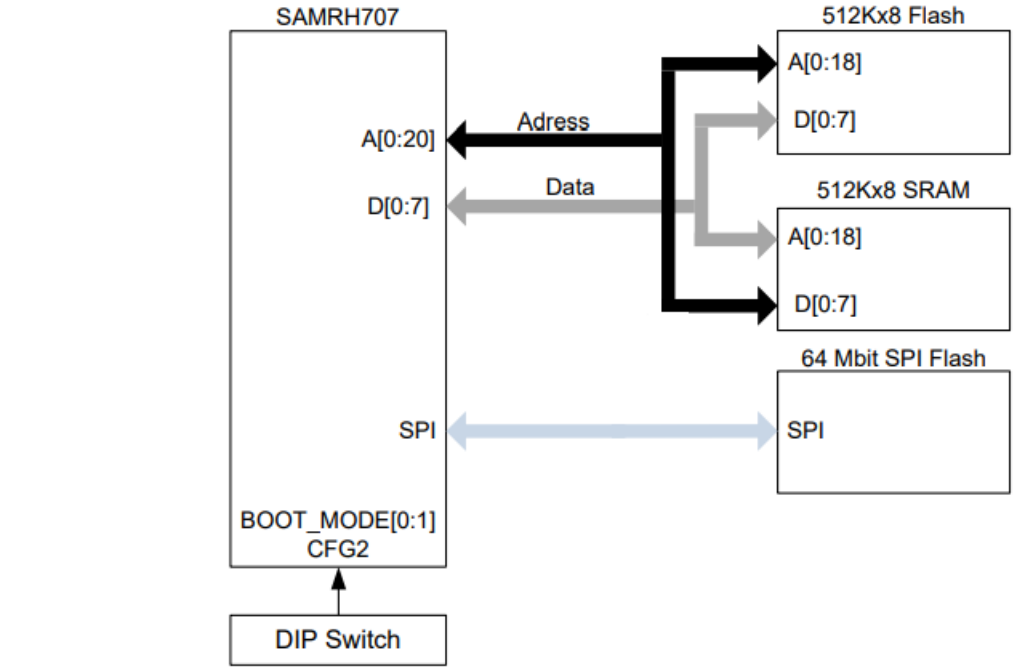


Table 3-7. Memory Devices

Memory Type	Memory Size	Device P/N	Manufacturer
Flash	512×8	SST39VF040	Microchip Technology
SRAM	512×8	CY62148EV30LL-45ZSXI	Cypress
SPI Flash	64 Mbit	SST26VF064BA	Microchip Technology

3.5 Connectors

The following section describes the implementation of the relevant connectors and headers on the SAMRH707F18EK evaluation kit and their connection to the microcontroller. The tables also provide the signals that are shared between the headers and on-board functionality.

3.5.1 Board Power Supply

The board's power is supplied through an USB C connector with the following pin assignment.

Table 3-8. USB C connector

Pin	Name	Description	Pin	Name	Description
A1	GND	Ground	B12	GND	Ground
A2	TX1+	Not used	B11	RX1+	Not used
A3	TX1-		B10	RX1-	
A4	Vbus	5V power supply	B9	Vbus	5V power supply
A5	CC1	Not used	B8	SBU2	Not used
A6	D+		B7	D-	
A7	D-		B6	D+	
A8	SBU1		B5	CC2	
A9	Vbus	5V power supply	B4	Vbus	5V power supply
A10	RX2-	Not used	B3	TX2-	Not used
A11	RX2+		B2	TX2+	
A12	GND	Ground	B1	GND	Ground

3.5.2 Test Points

The board provides the following test points for signal monitoring or measuring.

Table 3-9. List of Test Points

Name	Signal	Application
TP1	GND	—
TP2	ANALOG1_GND	—
TP3	ANALOG2_GND	—

……..continued		
Name	Signal	Application
TP4	PWR_5V	CAN Transceivers
TP5	PWR_1V25	Space Wire Reference Voltage
TP6	PWR_DIGITAL_3V3	SAMRH707 I/Os, Digital Peripherals
TP7	PWR_ANALOG1_3V3	ADC, DAC Reference Voltage (if selected)
TP8	PWR_ANALOG2_3V3	ADC, DAC I/Os (if selected)
TP9	PWR_1V8	SAMRH707 Core and PLLs
TP10	Board Reset	—
TP12 – TP16	GND	—
TP17	XIn32	32,768 KHz Real Time Clock
TP18	XIn	10 MHz Microcontroller Main Clock
TP19	Xin PKoB	12 MHz Embedded Debugger Clock

3.5.3 Board Extension Headers

The SAMRH707F18-EK extension headers J18, J19, and J20 allow to connect add-on boards to expand the evaluation kit features. The headers are compatible with the Microchip Xplained Pro interface. They have a pitch of 2.54 mm.

Table 3-10. General Purpose Extension Header (J18)

Header Pin	SAMRH707 Pin	Alternate Function	PIO Periph. A	PIO Periph. B	PIO Periph. C	PIO Periph. D	PIO Periph. E
1 [IDEX]	—	—	—	—	—	—	—
2 [GND]	GND						
3 [ADC+]	PA14	AD14	—	FLEXCOM1_IO6	—	PCCDATA14	—
4 [ADC-]	PA15	AD15	—	FLEXCOM1_IO5	—	PCCDATA15	—
5 [GPIO]	PA17	—	FLEXCOM0 _IO2	—	—	—	—
6 [GPIO]	PA18	—	FLEXCOM0 _IO3	—	—	—	—
7 [PWM+]	PB15	—	PWMC0_PWMH2	—	TIOB5	—	—
8 [PWM-]	PB16	—	PWMC0_PWML2	FLEXCOM3_IO5	TIOA5	—	—
9 [GPIO]	PB20	—	—	FLEXCOM3_IO4	—	—	—

……..continued							
Header Pin	SAMRH707 Pin	Alternate Function	PIO Periph. A	PIO Periph. B	PIO Periph. C	PIO Periph. D	PIO Periph. E
10 [GPIO]	PB19	—	—	FLEXCOM3_IO6	TCLK2	—	—
11 [TWI_SDA]	PD8	—	PCK2	NWAIT	FLEXCOM2_IO0	—	—
12 [TWI_SCL]	PD9	—	—	RTCOUT1	FLEXCOM2_IO1	—	—
13 [UART_RX]	PD9	—	—	RTCOUT1	FLEXCOM2_IO1	—	—
14 [UART_TX]	PD8	—	PCK2	NWAIT	FLEXCOM2_IO0	—	—
15 [SPI_SS]	PB18	—	PWMC0_PWML3	FLEXCOM3_IO3	TCLK0	—	—
16 [SPI_MOSI]	PB22	—	—	FLEXCOM3_IO0	—	—	—
17 [SPI_MISO]	PB21	—	—	FLEXCOM3_IO1	—	—	—
18 [SPI_SCK]	PB17	—	PWMC0_PWMH3	FLEXCOM3_IO2	TIOB1	—	—
19 [GND]	GND						
20 [VCC]	PWR_DIGITAL_3V3						

Table 3-11. Motor Control Extension Header (J19)

Header Pin	SAMRH707 Pin	Alternate Function	PIO Periph. A	PIO Periph. B	PIO Periph. C	PIO Periph. D	PIO Periph. E
1 [IDEX]	—	—	—	—	—	—	—
2 [GND]	GND						
3 [ADC+]	PA12	AD12	—	—	—	PCCDATA12	—
4 [ADC-]	PA13	AD13	—	—	—	PCCDATA13	—
5 [GPIO]	PA10	AD10	—	—	—	PCCDATA10	—
6 [GPIO]	PA11	AD11	—	—	—	PCCDATA11	—
7 [PWM+]	PB11	—	PWMC0_PWMH0	—	TCLK3	—	—
8 [PWM-]	PB12	—	PWMC0_PWML0	—	TCLK4	—	—

……..continued							
Header Pin	SAMRH707 Pin	Alternate Function	PIO Periph. A	PIO Periph. B	PIO Periph. C	PIO Periph. D	PIO Periph. E
9 [GPIO]	PB01	—	—	PWMC0_ PWMEXTRG1	TCLK5	—	—
10 [GPIO]	PA16	—	—	FLEXCOM1_ IO5	PWMC0_ PWMFI2	—	—
11 [TWI_SDA]	CANH0						
12 [TWI_SCL]	CANL0						
13 [UART_RX]	CANH1						
14 [UART_TX]	CANL1						
15 [SPI_SS]	PB14	—	PWMC0_ PWML1	—	TIOB4	—	—
16 [SPI_MOSI]	PA29	—		FLEXCOM1_ IO3	TIOA0	PWMC0_ PWMFI0	TRACED0
17 [SPI_MISO]	PA30	—	PCK1	FLEXCOM1_ IO2	TIOB0	PWMC0_ PWMFI1	TRACED1
18 [SPI_SCK]	PB13	—	PWMC0_ PWMH1	—	TIOA4	—	—
19 [GND]	GND						
20 [VCC]	PWR_DIGITAL_3V3						

Table 3-12. ADC/PCC Extension Header (J20)

Header Pin	SAMRH707 Pin	Alternate Function	PIO Periph. A	PIO Periph. B	PIO Periph. C	PIO Periph. D	PIO Periph. E
1 [IDEX]	PWR_ANALOG2_3V3						
2 [GND]	GND						
3 [ADC+]	PA0	AD0	—	—	—	PCCDATA0	—
4 [ADC-]	PA1	AD1	—	—	—	PCCDATA1	—
5 [GPIO]	PA2	AD2	—	—	—	PCCDATA2	—
6 [GPIO]	PA3	AD3	—	—	—	PCCDATA3	—
7 [PWM+]	PA4	AD4	—	—	—	PCCDATA4	—
8 [PWM-]	PA5	AD5	—	—	—	PCCDATA5	—
9 [GPIO]	HE10_NMIC						
10 [GPIO]	BOARD_RESET_EXT_N						
11 [TWI_SDA]	PA6	AD6	—	—	—	PCCDATA6	—

……..continued

Header Pin	SAMRH707 Pin	Alternate Function	PIO Periph. A	PIO Periph. B	PIO Periph. C	PIO Periph. D	PIO Periph. E
12 [TWI_SCL]	PA7	AD7	—	—	—	PCCDATA7	—
13 [UART_RX]	PA8	AD8	—	—	—	PCCDATA8	—
14 [UART_TX]	PA9	AD9	—	—	—	PCCDATA9	—
15 [SPI_SS]	PA20	—	FLEXCOM0_IO6	—	TCLK1	PCCCLK	TRACECLK
16 [SPI_MOSI]	PA25	CFG2	FLEXCOM0_IO4	—	TCLK2	PCCDEN2	TDO_ TRACESWO
17 [SPI_MISO]	PA27	—	FLEXCOM0_IO5	—	TIOA1	PCCDEN1	TRACED3
18 [SPI_SCK]	—						
19 [GND]	GND						
20 [VCC]	PWR_DIGITAL_3V3						

3.5.4 SpaceWire Communication Ports

The evaluation kit has two SpaceWire ports using Micro D9 Female connectors. These ports can be used in LVDS mode or TTL mode (See 1.2. SpaceWire Add-on Board)

Table 3-13. Port 0 Connections (J16)

Port 0	Signal Name	Function
J16-1	SPW0_DIN_P	SpaceWire Data Input 0
J16-6	SPW0_DIN_N	
J16-2	SPW0_SIN_P	SpaceWire Strobe Input 0
J16-7	SPW0_SIN_N	
J16-3	GND	
J16-8	SWP0_SOUT_P	SpaceWire Strobe Output 0
J16-4	SWP0_SOUT_N	
J16-9	SPW0_DOUT_P	SpaceWire Data Output 0
J16-5	SPW0_DOUT_N	

Table 3-14. Port 1 Connections (J15)

Port 1	Signal Name	Function
J15-1	SPW1_DIN_P	SpaceWire Data Input 1
J15-6	SPW1_DIN_N	

……..continued		
Port 1	Signal Name	Function
J15-2	SPW1_SIN_P	SpaceWire Strobe Input 1
J15-7	SPW1_SIN_N	
J15-3	GND	
J15-8	SWP1_SOUT_P	SpaceWire Strobe Output 1
J15-4	SWP1_SOUT_N	
J15-9	SPW1_DOUT_P	SpaceWire Data Output 1
J15-5	SPW1_DOUT_N	

3.5.5 1553 Communication Ports

The evaluation kit has one 1553 Communication link with two ports supporting the Bus Controller and Remote Terminal configurations as defined in the MIL-STD-1553B standard. The 1553 port A and B are connected to the on-board HI-1579 physical transceiver. The following tables show the pin assignment of port A and B connectors.
Table 3-15. Port A (J13)

PortA	Signal Name	Function
J13-1	BUSA_DIFF_P	MIL-STD-1533 bus driver A, positive signal
J13-2	BUSA_DIFF_N	MIL-STD-1553 bus driver A, negative signal
J13-3	MNT1	GND
J13-4	MNT2	
J13-5	MNT3	
J13-6	MNT4	

Table 3-16. Port B (J14)

PortA	Signal Name	Function
J13-1	BUSB_DIFF_P	MIL-STD-1533 bus driver B, positive signal
J13-2	BUSB_DIFF_N	MIL-STD-1553 bus driver B, negative signal
J13-3	MNT1	GND
J13-4	MNT2	
J13-5	MNT3	
J13-6	MNT4	

The following table shows connections between SAMRH707 and the 1553 transceiver.
Table 3-17. 1553 Connections

1553 Transceiver	Function	SAMRH707 Pin	Functionality	Peripheral
TXA	Complemented and Nominal Reception line (to transceiver)	PB25	ATXOUTP	A
NXTA		PB26	ATXOUTN	A
RXA	Complemented and Nominal Reception line (from transceiver)	PB27	ARXINP	A
NRXA		PB28	ARXINN	A
TXB	Redundant Complemented and Redundant Nominal Reception line (to transceiver)	PD0	BTXOUTP	A
NTXB		PD1	BTXOUTN	A
RXB	Redundant Complemented and Redundant Nominal Reception line (from transceiver)	PD2	BRXINP	A
NRXB		PD3	BRXINN	A

3.5.6 Embedded Debugger USB Port

The composite debugger USB port provides access to the PKoB embedded debugger and the virtual COM port. Its pin assignment is provided in the following table.
Table 3-18. Embedded Debugger Port

Pin	Name	Description
1	VBUS	+5V
2	D-	Data
3	D+	
4	ID	Not used
5	GND	Ground

3.5.7 Microcontroller Extension Headers

Four extension headers (J21, J22, J23, and J24) located around SAMRH707 provide access to all the microcontroller pins.

3.5.8 Cortex Debug Connectors

The evaluation kit has a 2×10 pin Cortex Debug Header (J5) compliant with the SWD interface used to attach external debuggers such as Microchip's J32 programmer/debugger, ICD 4, and PICkit 4 In-Circuit debuggers.

Table 3-19. SWD Header (J5)

Header Pin	Name	SAMRH707 Pin
1-2	PWR_DIGITAL_3V3	
3-11-17-19	NC	—
4-6-8-10-12-14-16-18-20	GND	
5	TDI	PA26
7	TMS	PB23

……..continued		
Header Pin	Name	SAMRH707 Pin
9	TCK/SWCLK	PB24
13	TDO/SWO	PA25
15	NRESET	–

The evaluation kit has a 2×10 pin Cortex Debug Header (J4) compliant with Embedded Trace Module (ETM) that can be used to attach external trace debuggers to the SAMRH707.

Table 3-20. Trace Connector (J4)

Header Pin	Name	SAMRH707 Pin
1	PWR_DIGITAL_3V3	
2	SWDIO/TMS	PB23
4	SWCLK/TCK	PB24
6	SWO/TDO	PB25
8	TDI	PA26
10	NRESET	—
12	TRACECLK	PA20
14	TRACED0	PA29
16	TRACED1	PA30
18	TRACED2	PA28
20	TRACED3	PA27
7-11-13	NC	—
3-5-9-15-17-19	GND	

3.6 Peripherals

3.6.1 Crystals

The SAMRH707 evaluation kit embeds the following crystals.

Table 3-21. Crystals

Frequency	Function	Device	Dedicated Test Point
10 MHz	Main Clock	SAMRH707	TP18
32.765 KHz	Real-Time Clock	SAMRH707	TP17
12 MHz	Main Clock	Embedded Debugger	TP19
24 MHz	Main Clock	Virtual COM Port	—

3.6.2 CAN Communication Ports

The evaluation kit has two CAN communication ports compliant with ISO 11898-1:2015 that meet Bosch CAN-FD specifications.

CAN0 and CAN1 ports are connected to on-board ATA6563 physical transceivers. The following table shows connections between SAMRH707 and the CAN transceivers.

Table 3-22. CAN0 Connections

CAN Bus	CAN Transceiver	SAMRH707 Pin	Functionality	Peripheral
	TXD0	PB7	CANTX0	A
CANL0/CANH0	RXD0	PB8	CANRX0	A
	CAN0 Standby	PA23	GPIO	—
GND	GND			

Table 3-23. CAN1 Connections

CAN Bus	CAN Transceiver	SAMRH707 Pin	Functionality	Peripheral
	TXD1	PB10	CANTX1	A
CANL1/CANH1	RXD1	PB9	CANRX1	A
	CAN1 Standby	PA24	GPIO	—
GND	GND			

3.6.3 UART

The evaluation kit has one UART module that performs communication through USB. The UART Tx and Rx are connected to an on-board CP2103 UART-To-USB converter. The following table shows connections between SAMRH707 and the UART-To-USB converter.

Table 3-24. UART Connections

UART-To-USB Converter	SAMRH707 Pin	Functionality	Peripheral
TXD	PB4	FLEXCOM1_IO0	B

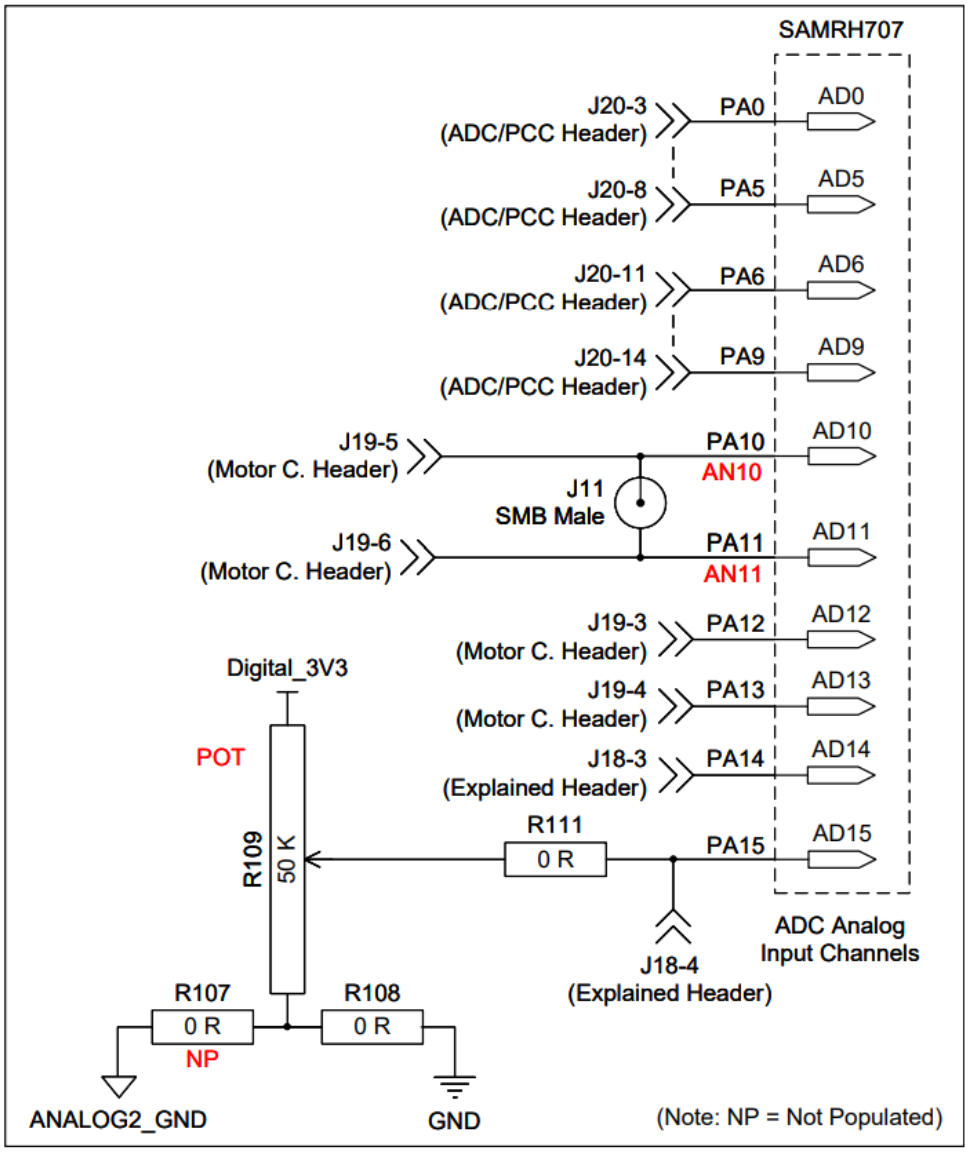
……..continued			
UART-To-USB Converter	SAMRH707 Pin	Functionality	Peripheral
RXD	PB5	FLEXCOM1_IO1	B
GND	GND		

3.6.4 Analog Digital Converter (ADC)

The board embeds hardware resources that can be connected to specific channels of the SAMRH707's ADC. Channels AD10 and AD11 can be fed by the external signals injected on the SMB male connector (AN2-3). Channel AD15 can be fed by the variable DC voltage supplied by the embedded 50K potentiometer (POT).

Figure 3-6. ADC Analog Input Channels

Figure 3-6. ADC Analog Input Channels



3.6.5 Digital Converter (DAC)

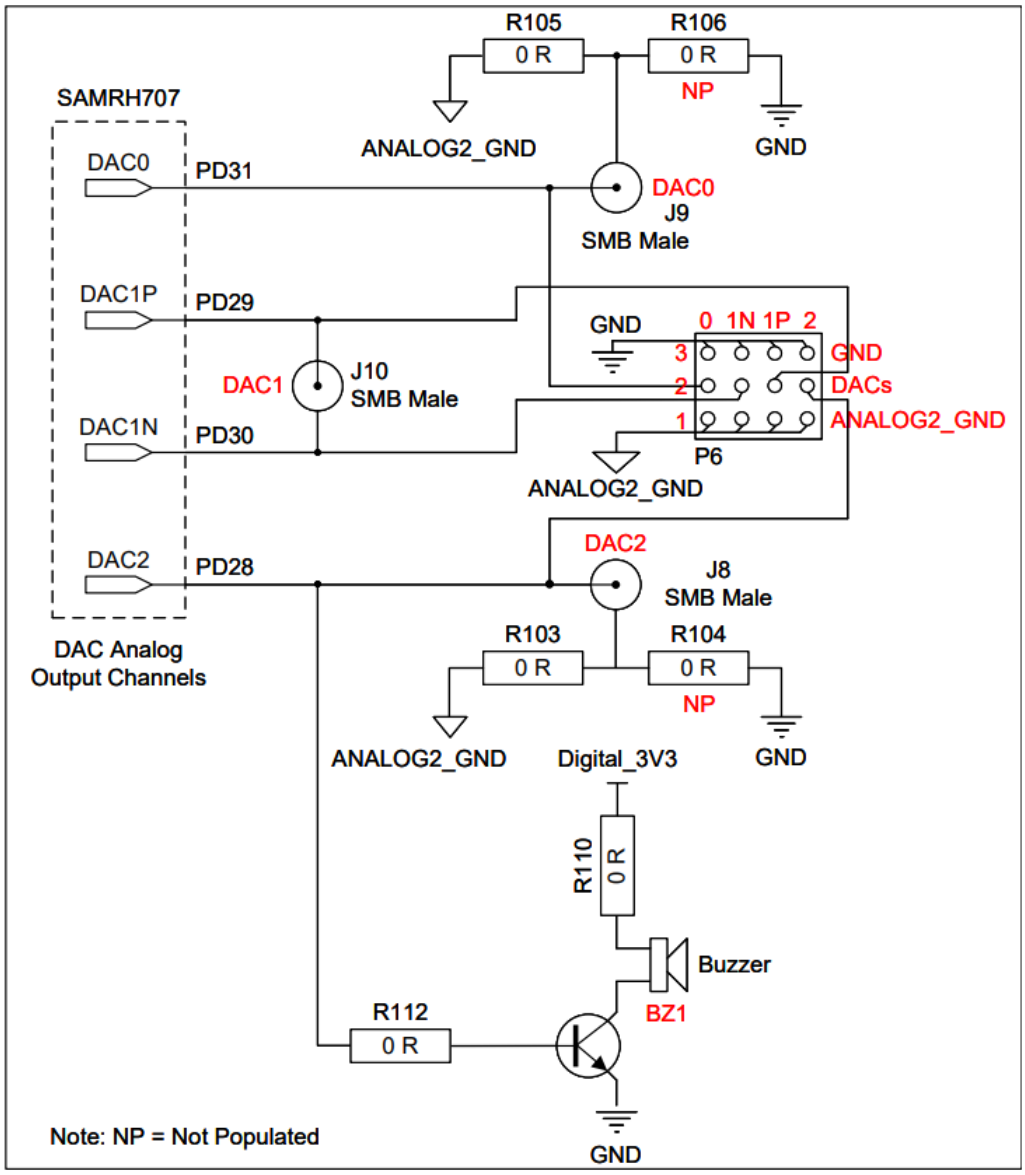
The board embeds hardware resources that enables use of analog output channels of the SAMRH707's DAC. Channels DAC0, DAC1, and DAC2 are connected to DAC0, DAC1, and DAC2 SMB connectors respectively. Additionally, the DAC2 output can drive a buzzer. Specification of the buzzer is provided in the following table.

Table 3-25. Buzzer Specification

P/N	Manufacturer
KMTG1102-A1	Kingstate

Figure 3-7. DAC Analog Output Channels

Figure 3-7. DAC Analog Output Channels



Revision History

The revision history table describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.
Table 4-1. Revision History

Revision	Date	Description
B	02/2022	Updated SAMRH707-EK to SAMRH707F18-EK
A	11/2021	The first publication of the document (Internal release).

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