TXA5

Computer On Module

- Processor — Atmel SAMA5D42, 528 MHz
- RAM — 256MB 32-bit DDR2 SDRAM
- ROM — 128MB NAND Flash / 4GB eMMC
- Power supply — Single 3.1V to 5.5V
- Size — 26mm SO-DIMM
- Temperature — -40°C/-25°C to 85°C

Key Features

- ARM Cortex-A5 Core
  - ARMv7-A Thumb2® instruction set
  - ARM TrustZone
  - NEON Multimedia Architecture
  - 832 MIPS @ 528 MHz in worst conditions
  - 128 Kbyte L2 Cache

- Peripherals
  - 10/100Mbps Ethernet
  - Two High Speed USB 2.0 ports
  - LCD TFT controller, 24bpp, 4 overlays with rotation and alpha blending
  - ITU-R BT. 601/656 Image Sensor Interface
  - 3x UART
  - High-speed memory card host (eMMC 4.3 and SD 2.0)
  - Synchronous Serial Audio Controller (I2S)
  - Two-wire Interface up to 400 Kbits/s (I2C)
  - Master/Slave Serial Peripheral Interface (SPI)
  - Up to 103 General Purpose I/Os

- 3.3V I/O

OS Support

- Linux

528 MHz Cortex A5

Ka-Ro electronics GmbH - Pascalstr. 22, D-52076 Aachen, Germany - Tel.: +49 2408 1402-0 (FAX -10)
www.karo-electronics.de

Processor

The Atmel® | SMART SAMA5D4 Series is a high-performance, power-efficient ARM® Cortex®-A5 processor MPU capable of running up to 528 MHz. It integrates the ARM NEON™ SIMD engine for accelerated signal processing, multimedia and graphics as well as a 128 KB L2-Cache for high system performance. The device features the ARM TrustZone® enabling a strong security perimeter for critical software, as well as several hardware security features. The device also features advanced user interface and connectivity peripherals.

The SAMA5D4 features an internal multi-layer bus architecture associated with 32 DMA channels to sustain the high bandwidth required by the processor and the high-speed peripherals. The comprehensive peripheral set includes an LCD controller with overlays for hardware-accelerated image composition, a resistive touch screen function, and a CMOS sensor interface. Connectivity peripherals include a dual 10/100 Ethernet MAC with IEEE1588, HS USB ports, UARTs, SPIs and I2Cs.

Security features includes an "on-the-fly" encryption-decryption process from the external DDR memory, tamper detection pins, secure storage of critical data, an integrity check monitor (ICM) to detect modification of the memory contents and a secure boot. The product also includes a dedicated coprocessor for public key cryptography such as RSA and elliptic curves algorithms (ECC), as well as AES, 3DES, hashing function and TRNG. These features permit to protect the system against counterfeiting, to safeguard sensitive data, authenticate safe program or secure external data transfers.

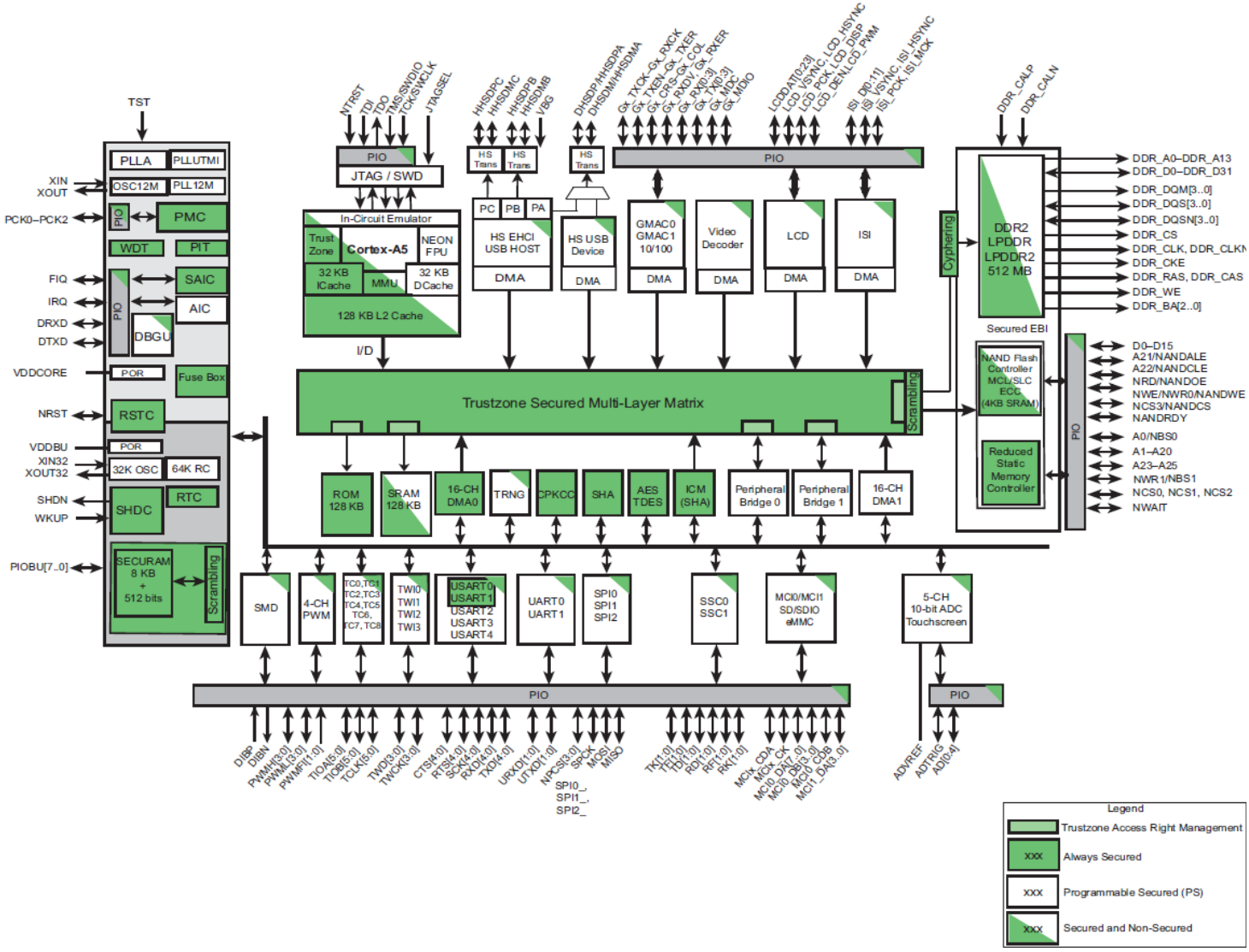
The SAMA5D4 series is optimized for control panel/HMI applications needing video playback and applications that require high levels of connectivity in the industrial and consumer market. Its security features makes the SAMA5D4 well suited for secure gateways or for the IoT.

Board highlights:

- Highly integrated
- Standard TX-DIMM pinout
- as small as possible - only 26 mm
- The TXA5 accepts an input voltage from various sources:
  - 1-cell Li-Ion/Polymer (up to 4.2V)
  - 5.0V USB supply or AC wall adapter
  - 3.3V

Read more in our TX-Guide:

www.karo-electronics.com/TX-Guide



Order Number	CPU	SDRAM	Flash	Temp. Grade
TXA5/528/256S/128F/I	528MHz SAMA5D42	256MB	128MB	-40°C..85°C
TXA5/528/256S/4GF/E85	528MHz SAMA5D42	256MB	4GB	-25°C..85°C

2015-04-08

PINOUT

PIN	Type	Function	SAMA5D4 Primary Signal Name	Alternate functions	GPIO	Reset State	Description (refer to SAMA5D4l manuals for details)
POWER SUPPLY & RESET							
1-4	power	VIN					Module power supply input (3.3V-5V, observe DIMM socket contact current rating)
5-7, 9-12	power	VOUT					3.3V power supply output (up to 1A under observance of the max. rated VIN current)
8	3V3	BOOTMODE					Boot mode select H: Boot from NAND / L: Boot from UART/USB
13	power	VBACKUP	VDDBU				SAMA5D4 RTC backup power supply. Supply voltage must be held between 2V and VIN for proper RTC operation. This pin can be connected to a primary cell such as a lithium button cell.
14		PMIC_PWR_BTN					Connected to ACT8865 PWRHLD
15	3V3	#RESET_OUT	PE30	DIBN UTXD0 TWCK1	PE30	PIO, O, LOW	#RESET_OUT may be used to reset peripherals on the carrier board. This signal can be controlled by a GPIO function during runtime.
16		#POR					Power On Reset — Active low input signal Leave unconnected, if not used.
17		#RESET_IN	NRST			I (10K-PU)	
18	GND	GND					
Ethernet							
19	analog	ETN_TXN					Transmit Data Negative: 100Base-TX or 10Base-T differential transmit output to magnetics.
20	3V3	#ETN_LED2					Active low - output is driven active when the operating speed is 100Mbps. This LED will go inactive when the operating speed is 10Mbps or during line isolation.
21	analog	ETN_TXP					Transmit Data Positive: 100Base-TX or 10Base-T differential transmit output to magnetics.
22	power	ETN_3V3					+3.3V analog power supply output to magnetics
23	analog	ETN_RXN					Receive Data Negative: 100Base-TX or 10Base-T differential receive input from magnetics.
24	3V3	#ETN_LED1					Active low - output is driven active whenever the device detects a valid link, and blinks indicating activity.
25	analog	ETN_RXP					Receive Data Positive: 100Base-TX or 10Base-T differential receive input from magnetics.
26	GND	GND					
USB-HOST							
27	3V3	USBH_VBUSEN	PE11	A11 TCLK2	PE11	A11, PD	Active high external supply enable. This pin is used to enable the external VBUS power supply.
28	3V3	#USBH_OC	PD9	FIQ	PD9	PIO, I, PU, ST (10K-PU)	Active low over-current indicator.
29	analog	USBH_DM	USB_H1_DN				D- pin of the USB cable
30					Not connected		
31	analog	USBH_DP	USB_H1_DP				D+ pin of the USB cable
32	GND	GND					
USB-OTG							
33	3V3	USBOTG_ID					
34	3V3	USBOTG_VBUSEN	PE10	A10 TIOB2	PE10	A10, PD	Active high external supply enable. This pin is used to enable the external VBUS power supply.
35	analog	USBOTG_DM	USB_OTG_DN				D- pin of the USB cable
36	3V3	#USBOTG_OC	PD8	PCK0	PD8	PIO, I, PU, ST (10K-PU)	Active low over-current indicator.
37	analog	USBOTG_DP	USB_OTG_DP				D+ pin of the USB cable
38	5V	USBOTG_VBUS	PE31	ADTRG	PE31	PIO, O, LOW	VBUS pin of the USB cable. (Voltage divider 4K7 in series, 10K to GND)
39	GND	GND					

PIN	Type	Function	SAMA5D4 Primary Signal Name	Alternate functions	GPIO	Reset State	Description (refer to SAMA5D4l manuals for details)
I2C							
40	3V3	I2C_DATA	PA30	TWD0	PA30	PIO, I, PU, ST	I2C Data
41	3V3	I2C_CLK	PA31	TWCK0	PA31	PIO, I, PU, ST	I2C Clock
PWM							
42	3V3	PWM	PA24	LCDPWM	PA24	PIO, I, PU, ST	PWM Output
1-WIRE							
43	3V3	OWDAT	PB5	G0_COL TXD2 PCK2	PB5	PIO, I, PU, ST	1-Wire bus. Requires an external pull-up resistor. The recommended resistor is specified by the generic 1-Wire device used in a given system.
SPI – Serial Peripheral Interface							
44	3V3	CSPI_SS	PB21	SPI1_NPCS0 D11	PB21	PIO, I, PU, ST	Slave Select
45	3V3	CSPI_SS	PB22	SPI1_NPCS1 D12	PB22	PIO, I, PU, ST	Slave Select
46	3V3	CSPI_MOSI	PB19	SPI1_MOSI D9	PB19	PIO, I, PU, ST	Master Out/Slave In signal
47	3V3	CSPI_MISO	PB18	SPI1_MISO D8	PB18	PIO, I, PU, ST	Master In/Slave Out signal
48	3V3	CSPI_SCLK	PB20	SPI1_SPCK D10	PB20	PIO, I, PU, ST	Serial Clock signal
49	3V3	CSPI_RDY	PB23	SPI1_NPCS2 D13	PB23	PIO, I, PU, ST	
50	GND	GND					
SD – Secure Digital Interface 1							
51	3V3	SD1_CD	PE6	A6 TIOA3	PE6	PIO, O, LOW	SD Card Detect – connected to a GPIO
52	3V3	SD1_D[0]	PE20	A20 TCLK5 MCI1_DA0	PE20	A20, PD	SD Data bidirectional signals—If the system designer does not want to make use of the internal pull-up, via the Pull-up enable register, a 50 K–69 K external pull up resistor must be added.
53	3V3	SD1_D[1]	PE21	A23 TIOA4 MCI1_DA1	PE21	A23, PD	
54	3V3	SD1_D[2]	PE22	A24 TIOB4 MCI1_DA2	PE22	A24, PD	
55	3V3	SD1_D[3]	PE23	A25 TCLK4 MCI1_DA3	PE23	A25, PD	
56	3V3	SD1_CMD	PE19	A19 TIOB5 MCI1_CDA	PE19	A19, PD	SD Command bidirectional signal
57	3V3	SD1_CLK	PE18	A18 TIOA5 MCI1_CK	PE18	A18, PD	SD Output Clock.
58	GND	GND					
1st UART							
59	3V3	TXD	PD13	TXD0 SPI2_MOSI	PD13	PIO, I, PU, ST	Application UART Transmit Data output signal
60	3V3	RXD	PD12	RXD0	PD12	PIO, O, PD	Application UART Receive Data input signal
61	3V3	RTS	PD10	CTS0	PD10	PIO, I, PU, ST	Application UART RTS/CTS **input** signal
62	3V3	CTS	PD11	RTS0 SPI2_MISO	PD11	PIO, I, PU, ST	Application UART CTS/RTS **output** signal

PIN	Type	Function	SAMA5D4 Primary Signal Name	Alternate functions	GPIO	Reset State	Description (refer to SAMA5D4l manuals for details)
2nd UART							
63	3V3	TXD	PD17	TXD1 SPI2_NPCS0	PD17	PIO, I, PU, ST	Application UART Transmit Data output signal
64	3V3	RXD	PD16	RXD1	PD16	PIO, O, PD	Application UART Receive Data input signal
65	3V3	RTS	PD14	CTS1	PD14	PIO, I, PU, ST	Application UART RTS/CTS **input** signal
66	3V3	CTS	PD15	RTS1 SPI2_SPCK	PD15	PIO, I, PU, ST	Application UART CTS/RTS **output** signal
3rd UART							
67	3V3	TXD	PE17	A17 TXD3 TCLK0	PE17	A17, PD	Application UART Transmit Data output signal
68	3V3	RXD	PE16	A16 RXD3 TIOB0	PE16	A16, PD	Application UART Receive Data input signal
69	3V3	RTS	PE5	A5 CTS3	PE5	A5, PD	Application UART RTS/CTS **input** signal
70	3V3	CTS	PE24	NCS0 RTS3	PE24	NCS0	Application UART CTS/RTS **output** signal
71	GND	GND					
KEYPAD							
72	3V3	KP_COL[0]	PD18		PD18	PIO, I, PU, ST	
73	3V3	KP_COL[1]	PD19		PD19	PIO, I, PU, ST	
74	3V3	KP_COL[2]	PD20		PD20	PIO, I, PU, ST	
75	3V3	KP_COL[3]	PD21		PD21	PIO, I, PU, ST	
76	3V3	TXCAN	PD22		PD22	PIO, I, PU, ST	
77	3V3	KP_ROW[0]	PD23		PD23	PIO, I, PU, ST	
78	3V3	KP_ROW[1]	PD24		PD24	PIO, I, PU, ST	
79	3V3	KP_ROW[2]	PD25		PD25	PIO, I, PU, ST	
80	3V3	KP_ROW[3]	PD26		PD26	PIO, I, PU, ST	
81	3V3	RXCAN	PD27		PD27	PIO, I, PU, ST	
82	GND	GND					
SSI 1 - Serial Audio Port 1							
83	3V3	SSI1_INT	PE4	A4 MCI0_DB3	PE4	A4, PD	GPIO
84	3V3	SSI1_RXD	PB29	TWD2 RD0 PWML1	PB29	PIO, I, PU, ST	Serial Audio Interface serial data line 1
85	3V3	SSI1_TXD	PB28	SPI2_NPCS3 TD0 PWMH1	PB28	PIO, I, PU, ST	Serial Audio Interface serial data line 0
86	3V3	SSI1_CLK	PB26	PCK0 RK0 PWMH0	PB26	PIO, I, PU, ST	Serial Audio Interface serial bit clock Connected to two SAMA5D4 pins
			PB27	SPI1_NPCS3 TK0 PWML0	PB27	PIO, I, PU, ST	

PIN	Type	Function	SAMA5D4 Primary Signal Name	Alternate functions	GPIO	Reset State	Description (refer to SAMA5D4l manuals for details)
87	3V3	SSI1_FS	PB30	TWCK2 RF0	PB30	PIO, O, LOW	Serial Audio Interface left/right clock
			PB31	TF0	PB31	PIO, I, PU, ST	Connected to two SAMA5D4 pins
88	GND	GND					
SSI 2 - Serial Audio Port 2							
89	Not connected						
90	Not connected						
91	Not connected						
92	Not connected						
93	Not connected						
94	GND						
Secure Digital Interface 2							
95	Not connected						
96	Not connected						
97	Not connected						
98	Not connected						
99	USBHS		HHSDPC	DHSDM		O, PD	
100	Not connected						
101	USBHS		HHSDMC	DHSDP		O, PD	
102	Not connected						
101	Not connected						
102	GND						
CMOS Sensor Interface							
103	3V3	CSI0_DAT12	PC19	ISI_D0 TK1	PC19	PIO, I, PU, ST	
104	3V3	CSI0_DAT13	PC20	ISI_D1 TF1	PC20	PIO, I, PU, ST	
105	3V3	CSI0_DAT14	PC21	ISI_D2 TD1	PC21	PIO, I, PU, ST	
106	3V3	CSI0_DAT15	PC22	ISI_D3 RF1	PC22	PIO, I, PU, ST	
107	3V3	CSI0_DAT16	PC23	ISI_D4 RD1	PC23	PIO, I, PU, ST	
108	3V3	CSI0_DAT17	PC24	ISI_D5 RK1 PCK1	PC24	PIO, I, PU, ST	
109	3V3	CSI0_DAT18	PC25	ISI_D6 TWD3 URXD1	PC25	PIO, I, PU, ST	
110	3V3	CSI0_DAT19	PC26	ISI_D7 TWCK3 UTXD1	PC26	PIO, I, PU, ST	
111	GND	GND					
112	3V3	CSI0_HSYNC	PB4	G0_CRS RXD2 ISI_HSYNC	PB4	PIO, I, PU, ST	
113	3V3	CSI0_VSYNC	PB3	G0_TXER CTS2 ISI_VSYNC	PB3	PIO, I, PU, ST	
114	3V3	CSI0_PIXCLK	PB1	G0_RXCK SCK2 ISI_PCK	PB1	PIO, I, PU, ST	
115	3V3	CSI0_MCLK	PB10	G0_RX2 PCK2 PWML1	PB10	PIO, I, PU, ST	
116	GND	GND					

PIN	Type	Function	SAMA5D4 Primary Signal Name	Alternate functions	GPIO	Reset State	Description (refer to SAMA5D4l manuals for details)
LCD Controller and Smart LCD Controller							
117	3V3	LD0	PA0	LCDDAT0 TMS	PA0	TMS, PU	
118	3V3	LD1	PA1	LCDDAT1	PA1	PIO, I, PU, ST	
119	3V3	LD2	PA2	LCDDAT2 G1_TXCK	PA2	PIO, I, PU, ST	
120	3V3	LD3	PA3	LCDDAT3 G1_RXCK	PA3	PIO, I, PU, ST	
121	3V3	LD4	PA4	LCDDAT4 G1_TXEN	PA4	PIO, I, PU, ST	
122	3V3	LD5	PA5	LCDDAT5 G1_TXER	PA5	PIO, I, PU, ST	
123	3V3	LD6	PA6	LCDDAT6 G1_CRS	PA6	PIO, I, PU, ST	
124	3V3	LD7	PA7	LCDDAT7	PA7	PIO, I, PU, ST	
125	3V3	LD8	PA8	LCDDAT8 TCK	PA8	TCK, PU	
126	3V3	LD9	PA9	LCDDAT9 G1_COL	PA9	PIO, I, PU, ST	
127	3V3	LD10	PA10	LCDDAT10 G1_RXDV	PA10	PIO, I, PU, ST	
128	3V3	LD11	PA11	LCDDAT11 G1_RXER	PA11	PIO, I, PU, ST	
129	GND	GND					
130	3V3	LD12	PA12	LCDDAT12 G1_RX0	PA12	PIO, I, PU, ST	
131	3V3	LD13	PA13	LCDDAT13 G1_RX1	PA13	PIO, I, PU, ST	
132	3V3	LD14	PA14	LCDDAT14 G1_TX0	PA14	PIO, I, PU, ST	
133	3V3	LD15	PA15	LCDDAT15 G1_TX1	PA15	PIO, I, PU, ST	
134	3V3	LD16	PA16	LCDDAT16 NTRST	PA16	NTRST, PU	
135	3V3	LD17	PA17	LCDDAT17	PA17	PIO, I, PU, ST	
136	3V3	LD18	PA18	LCDDAT18 G1_RX2	PA18	PIO, I, PU, ST	
137	3V3	LD19	PA19	LCDDAT19 G1_RX3	PA19	PIO, I, PU, ST	
138	3V3	LD20	PA20	LCDDAT20 G1_TX2	PA20	PIO, I, PU, ST	
139	3V3	LD21	PA21	LCDDAT21 G1_TX3	PA21	PIO, I, PU, ST	
140	3V3	LD22	PA22	LCDDAT22 G1_MDC	PA22	PIO, I, PU, ST	
141	3V3	LD23	PA23	LCDDAT23 G1_MDIO	PA23	PIO, I, PU, ST	
142	GND	GND					

PIN	Type	Function	SAMA5D4 Primary Signal Name	Alternate functions	GPIO	Reset State	Description (refer to SAMA5D4l manuals for details)
143	3V3	HSYNC	PA27	LCDHSYNC PWML0 SPI1_NPCS2	PA27	PIO, I, PU, ST	
144	3V3	VSYNC	PA26	LCDVSYNC PWMH0 SPI1_NPCS1	PA26	PIO, I, PU, ST	
145	3V3	OE_ACD	PA29	LCDDEN PWML1	PA29	PIO, I, PU, ST	
146	3V3	LSCLK	PA28	LCDPCK PWMH1 SPI1_NPCS3	PA28	PIO, I, PU, ST	
147	GND	GND					
Module Specific Signals							
148	3V3		PB11	G0_RX3 RTS2 PWMH1	PB11	PIO, I, PU, ST	
149	3V3		PB14	G0_TX2 SPI2_NPCS1 PWMH0	PB14	PIO, I, PU, ST	
150	3V3		PA25	LCDDISP TD0	PA25	PIO, I, PU, ST	
151	3V3		PB15	G0_TX3 SPI2_NPCS2 PWML0	PB15	PIO, I, PU, ST	
152	3V3		PD28	SCK0	PD28	PIO, I, PU, ST	
153	3V3		PD29	SCK1	PD29	PIO, I, PU, ST	
154	3V3		PD31	SPI0_NPCS2 PCK1	PD31	PIO, I, PU, ST	
155	3V3		PE0	A0/NBS0 MCI0_CDB CTS4	PE0	A0, PD	
156	3V3		PE2	A2 MCI0_DB1	PE2	A2, PD	
157	3V3		PE3	A3 MCI0_DB2	PE3	A3, PD	
158	3V3		PE7	A7 TIOB3 PWMFI1	PE7	A7, PD	
159	3V3		PE8	A8 TCLK3 PWML3	PE8	A8, PD	
160	GND	GND					
161	3V3		PC0	SPI0_MISO PWMH2 ISI_D8	PC0	PIO, I, PU, ST	
162	3V3		PC1	SPI0_MOSI PWML2 ISI_D9	PC1	PIO, I, PU, ST	
163	3V3		PC2	SPI0_SPCK PWMH3 ISI_D10	PC2	PIO, I, PU, ST	
164	3V3		PC3	SPI0_NPCS0 PWML3 ISI_D11	PC3	PIO, I, PU, ST	
165	3V3		PE9	A9 TIOA2	PE9	A9, PD	
166	3V3		PE12	A12 TIOA1 PWMH2	PE12	A12, PD	
167	3V3		PE13	A13 TIOB1 PWML2	PE13	A13, PD	
168	3V3		PE14	A14 TCLK1 PWMH3	PE14	A14, PD	

PIN	Type	Function	SAMA5D4 Primary Signal Name	Alternate functions	GPIO	Reset State	Description (refer to SAMA5D4I manuals for details)
169	3V3		PE15	A15 SCK3 TIOA0	PE15	A15, PD	
170	3V3		PE25	NCS1 SCK4 IRQ	PE25	NCS1	
171	GND	GND					
172	3V3		PE26	NCS2 RXD4 A18	PE26	NCS2	
173	3V3		PE27	NWR1/NBS1 TXD4	PE27	PIO, I, PD	
174	3V3		PE28	NWAIT RTS4 A19	PE28	PIO, I, PD	
175	3V3		PE29	DIBP URXD0 TWD1	PE29	PIO, O, LOW	
176	2V		PIOBU0		PIOBU0	I, PU	
177	2V		PIOBU1		PIOBU1	I, PU	
178	2V		PIOBU2		PIOBU2	I, PU	
179	2V		PIOBU3		PIOBU3	I, PU	
180	2V		PIOBU4		PIOBU4	I, PU	
181	2V		PIOBU5		PIOBU5	I, PU	
182	2V		PIOBU6		PIOBU6	I, PU	
183	GND						
184	Not connected						
185	3V3		PC28	AD1 SPI0_NPCS2 PWML1	PC28	PIO, I, PU, ST	
186	3V3		PC27	AD0 SPI0_NPCS1 PWML0	PC27	PIO, I, PU, ST	
187	3V3		PC30	AD3 PWMH0	PC30	PIO, I, PU, ST	
188	3V3		PC29	AD2 SPI0_NPCS3 PWMFI0	PC29	PIO, I, PU, ST	
189	3V3		PC31	AD4 PWMH1	PC31	PIO, I, PU, ST	
190	Not connected						
191	Not connected						
192	Not connected						
193	Not connected						
194	Not connected						
195	Not connected						
196	Not connected						
197	Not connected						
198	Not connected						
199	Not connected						
200	GND						