SAM9X75-DDR3-EB

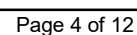## SAM9X75-DDR3-EB Early Adopters Guide

Scope

This guide provides essential information on the overall design and functions of the SAM9X75-DDR3 Engineering Board.

Contents

Main features

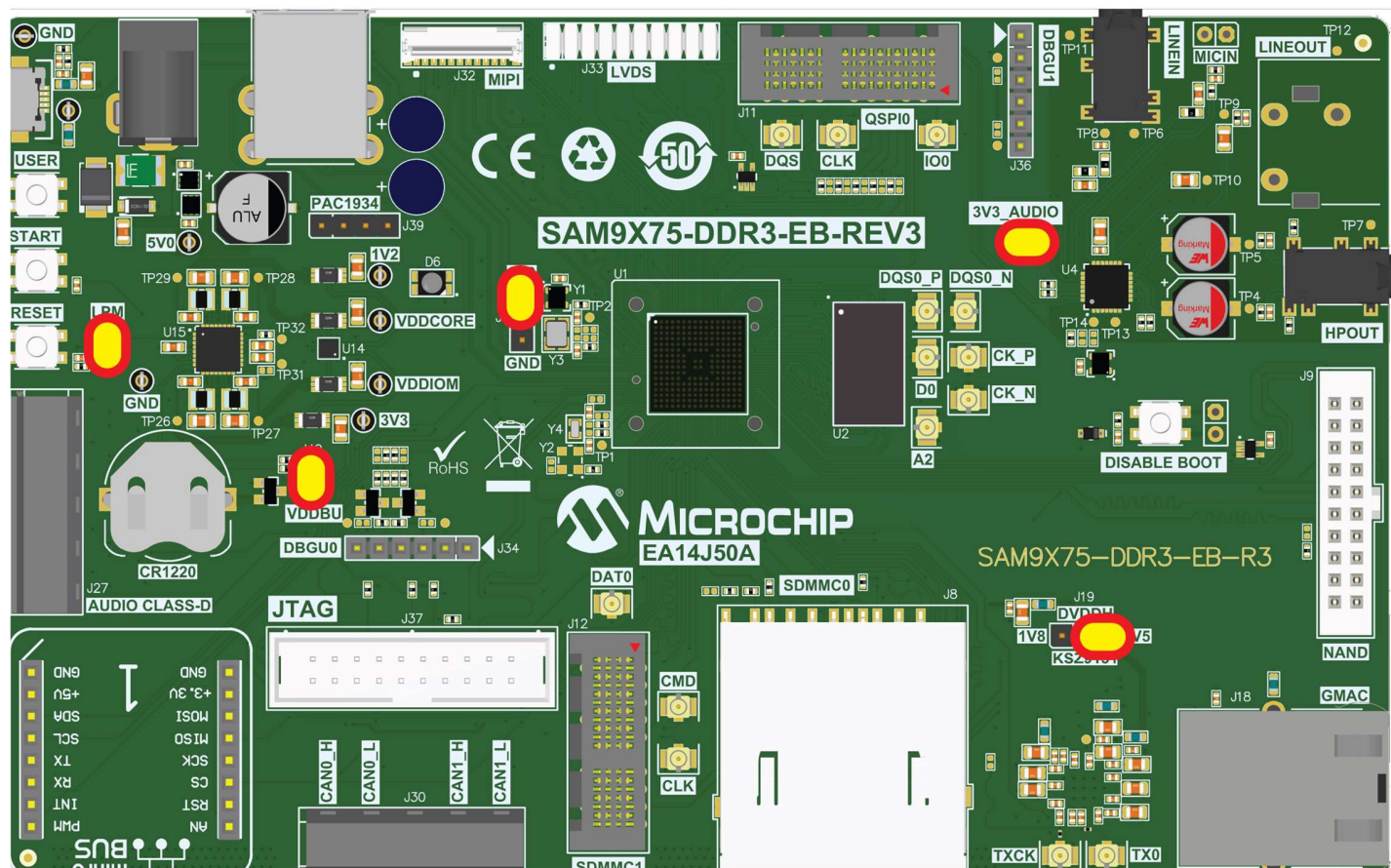| Characteristics	Specification	
Processor	SAM9X75 240-ball TFBGA, 11x11mm body, pitch –0.65mm	
Clock speed	- 24MHz DSC6xx/DSC1xx MEMS - 32.768KHz. Crystal - 25MHz Clock generator for two PHY ETH.	- DSC1001CI5-024.0000 Microchip - NX2012SA 032.768 NDK (DNP) - DSC1001DI5-025.0000 Microchip
Memory	- 256MB DDR3L @266MHz 16bit - 4-bit PCIe eMMC adapter - 1 * EEPROM w/ Mac Address - 8-bit PCIe OctaSPI adapter	- MT41K256M16 Micron - 1 * 24AA025E48 Microchip
USB	- USB 2.0 Host/Device High Speed µAB	
	- 2*USB 2.0 Host High Speed A-type	
Ethernet	- Gigabit Ethernet connector + RGMII PHY (10/100/1000 GMAC0)	- KSZ9131RNXV Microchip
Audio	- Stereo CLASS D amplifier - Stereo Audio CODEC	 - WM8731 Cirrus Logic
CAN	- 2*CAN Interface	- MCP2542FD Microchip
Power monitor	- PAC1934	
Debug	- UART FTDI	
	- JTAG/ICE debug interface	
Board supply	- 5 Vdc from USBA (optional)	- Automatic power switch. DC Jack prioritized
	- 5 Vdc from DC Jack	
Board Monitor Expansion	- RGB leds (Blue, Green, Red)	
	- 4 * Push button switches (DIS_BOOT, NRST, nSTART, User_BT)	
	- RPi CM4 DSI CSI PF-22 Camera Connector	
	- SD-Card Slot	
	- 1 * MikroBUS	
	- LVDS 20-pin Connector	
Power particularity	– Battery (Backup VDDBU), minimum 1 day retention – Power Management Unit MCP16502TAB	
Temperature	- Operating: -40° to +85° C	
Relative humidity	- 0 to 90% (non condensing)	
Dimensions:	- PCB 160 x 100 mm, FR4, 4 layers	
RoHS status:	- Compliant	

Functions overview

Default jumper settings

The following picture shows the default jumper settings (red/yellow bullet = jumper ON).

Jumper	State	Function
J1	Pin 1-2 (3V3)	24MHz oscillator is enabled
J3	ON	Audio CODEC digital domain is powered
J19	Pin 2-3 (2V5)	Gigabit Ethernet is 2V5 powered
J40	ON	VDDBU is powered
J41	ON	MCP16502 PMIC input LPM is forced to logic 0

Bill of Material

Designator	Not mounted	Description	Value	Manufacturer
BT1		BATT HOLDER 1 COIN 12MM TH 3V	HOLDER 1xCR1220	Keystone Electronics
C1, C8, C23, C56		CAP CER 2.2uF 10V 10% X7S SMD 0402	2.2uF	TDK
C2, C3, C4, C5, C6, C7, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C24, C25, C26, C33, C34, C35, C36, C37, C38, C39, C40, C41, C43, C44, C45, C46, C47, C48, C49, C50, C51, C53, C55, C57, C58, C59		CAP CER 0.1uF 16V 10% X7S 0201	0.1uF	Murata
C27, C62, C65, C66, C67, C68, C69, C87, C93, C95, C97, C99, C101, C116, C118, C120, C122, C124, C138, C150, C151, C154, C155, C157, C160, C163, C164, C165, C166, C171, C174, C176, C177, C178		CAP CER 0.1uF 10V 10% X7R SMD 0402	0.1uF	KEMET
C28	X	CAP CER 0.1uF 10V 10% X7R SMD 0402	0.1uF	KEMET
C29, C32		CAP CER 20pF 50V 5% C0G SMD 0402	20pF	Yageo
C30, C31		CAP CER 18pF 50V 5% C0G SMD 0402	18pF	Murata
C42, C54, C60, C61, C63, C64, C179, C181, C183, C185, C187, C188, C189, C190		CAP CER 4.7uF 10V 10% X7S SMD 0603	4.7uF	Murata
C52	X	CAP CER 22pF 50V 5% C0G 0201	22pF	Murata
C70, C73, C77, C81, C91, C92, C94, C96, C98, C100, C112, C113, C117, C119, C121, C123, C125, C126, C127, C128, C131, C132, C133, C134, C139, C140, C141, C142, C144, C145, C146, C147		CAP CER 10uF 10V 10% X7R SMD 0805	10uF	Samsung
C71, C72, C74, C75, C76, C78, C79, C80, C82, C83, C84, C88, C89, C90		CAP CER 0.01uF 50V 10% X7R SMD 0402	0.01uF	TDK
C85, C86	X	Ceramic capacitor, SMD 0402, 20pF, C0G, 50V, +/-2%	20pF	Samsung
C102, C108, C109		CAP CER 1uF 16V 10% X7R SMD 0603	1uF	Wurth Electronics
C103, C106, C107, C110, C111, C114, C115		CAP CER 220pF 50V 5% NP0 SMD 0402	220pF	Murata
C104, C105		CAP ALU POLY 220uF 10V 20% SMD W6.6L6.6H5.8	220uF	Wurth Electronics
C129, C130, C135, C136		CAP CER 10000pF 25V 20% X7R SMD 0402	10000pF	TDK
C137		CAP CER 20pF 50V 5% C0G SMD 0402	20pF	Murata
C143, C148		CAP ALU 100uF 25V 20% RAD P2.5D6H11	100uF	Panasonic
C149, C153		Ceramic capacitor, SMD 0402, X7R, 50V, +/-10%	4700pF	KEMET
C152, C156		Ceramic capacitor, SMD 0402, C0G, 50V, +/-10%, 15pF	15pF	Samsung
C167, C168, C169, C170, C172, C173, C180, C182, C184, C186		CAP CER 22uF 10V 20% X7S SMD 0805	22uF	TDK
C175		CAP ALU 330uF 25V 20% SMD F	330uF	KEMET
CBL1		MECH HW CABLE USB Male-A to Male Micro-B Clear 4'	USB Male-A to Male Micro-B	DongGuan ZhanXin
D1, D2, D3, D4		DIO RECT 1N4148W 1.25V 150mA 75V SOD-323	1N4148W	Diodes
D5		DIO SCTKY B0520WS 430mV 500mA 20V SOD-323	B0520WS	Diodes
D6		DIO LED TRI RED, GREEN, BLUE 1.9V, 3V, 3V 20mA, 20mA, 20mA SMD 4-PLCC	RED, GREEN, BLUE	Cree LED
D7		DIO SCTKY STPS2L40U 340mV 2A 40V DO-214AA_SMB	STPS2L40U	STMicroelectronics
D8		DIO ZNR MMSZ4689 5.1V 500mW SMD SOD-123	5.1V	ON Semiconductor / Fairchild
D9		DIO SCTKYARR BAT54C 1V@100mA 200mA 30V SOT-23-3	BAT54CW-7-F	Diodes
F1		RES FUSE RESETTABLE 2A 12V PTC SMD 1812	2A	Littelfuse
FB1, FB2, FB3, FB4, FB5, FB6, FB7, FB8, FB9, FB10, FB11, FB12, FB13, FB14, FB15, FB16, FB17, FB18		FERRITE 120R@100MHz 2A SMD 0603	120R	Murata
J1, J19		CON HDR-2.54 Male 1x3 AU 5.84MH TH VERT	HDR-2.54 Male 1x3	Samtec
J2, J3, J4, J5, J6, J7, J10, J13, J14, J15, J16, J17, J20, J21		CON RF Coaxial Ultra Miniature Male SMD VERT	RF Coaxial U.FL Male	Hirose
J8		12 (9 + 3) Position Card Connector SD Surface Mount, Right Angle Gold	SD	Amphenol ICC / FCI
J9		CON HDR-2.54 Female 2x10 Gold TH	HDR-2.54 Female 2x10	Sullins
J11, J12		CONN EDGE PCIe 1mm 36P Female TH VERT	EDGE 36P Female	Samtec

Reference	X	Description	Value	Manufacturer
J18		CON MODULAR JACK RJ45 10G MAGNETICS 2xLEDs SHIELD TH R/A	MODULAR RJ45	Adam Tech
J22, J35	X	CON HDR-2.54 Male 1x2 Tin 5.84MH TH VERT	HDR-2.54 Male 1x2	Sullins
J23, J24		CON JACK Stereo Phone 3.5mm Female R/A SMT	JACK Stereo Phone 3.5mm	Tensility International Corp
J25	X	CON JACK 2xPhono 3.2mm Red Female TH R/A	PJRAS1X2S01X	Switchcraft
J26, J40, J41		CON HDR-2.54 Male 1x2 Tin 5.84MH TH VERT	HDR-2.54 Male 1x2	Sullins
J27, J30		CON TERMINAL 5mm 1x5 Female 16-30AWG 13.5A TH R/A	282836-5	TE Connectivity
J28		CON USB2.0 Micro-B Female SMD R/A	USB2.0 Micro-B Female	Wurth Electronics
J29		CON USB2.0 STD-A DUAL FEMALE TH R/A	USB-A-D-RA	Wurth Electronics
J31		SOCKET mikroBUS HOST DIP 16 TH	mikroBUS HOST	Sullins
J32		CON FFC/FPC 501951 0.5mm 22P Female SMD VERT	501951-2230	Molex
J33		CON HDR-2 Male 2x10 Gold 4MH TH VERT	HDR-2 Male 2x10	TE Connectivity AMP
J34, J36		CON HDR-2.54 Male 1x6 Gold 5.84MH TH VERT	HDR-2.54 Male 1x6	Amphenol ICC / FCI
J37		CON HDR-2.54 Male 2x10 Gold Shroud 9.1MH TH VERT	HDR-2.54 Male 2x10	Sullins
J38		CON POWER 2.1mm 5.5mm Switch Slotted TH R/A	2.1mm	Memory Protection Devices
J39		CON HDR-2.54 Male 1x4 Gold 5.84MH TH VERT	HDR-2.54 Male 1x4	Wurth Electronics
JP1, JP2, JP3		MECH HW JUMPER 2.54mm 1x2	Shunt 2.54mm 1x2	3M
JP4		MECH HW JUMPER 2.54mm 1x2 GOLD	Shunt 2.54mm 1x2	Wurth Electronics
L1, L2, L3, L4		INDUCTOR 1.5uH 3.5A 20% SMD 1008	1.5uH	Murata
LABEL1		LABEL, ASSY W/REV LEVEL (SMALL MODULES) PER MTS-0002	LABEL Need Help Small	
PAD1, PAD2, PAD3, PAD4, PAD5, PAD6	X	MECH HW RUBBER PAD Cylindrical flat top D16.51H10.16 Black	D16.51H10.16	Bumper Specialties
Q1, Q3		TRANS FET P-CH DMG2305UX-13 -20V -4.2A 0.052R 1.4W SOT-23-3	DMG2305UX-13	Diodes
Q2, Q4, Q13, Q14, Q15, Q18, Q19, Q20, Q21		MCHP ANALOG MOSFET N-CH TN2106 60V 280mA 360mW 2.5R SOT23-3	TN2106	Microchip Technology
Q5, Q7, Q9, Q11		TRANS FET P-CH SSM3J56ACT 20V 1.4A 0.39R 0.5W SOT-883	SSM3J56ACT	Toshiba
Q6, Q8, Q10, Q12		TRANS FET N-CH SSM3K56ACT 20V 1.4A 0.235R 0.5W SOT-883	SSM3K56ACT	Toshiba
Q16, Q17		TRANS FET DUAL P+P SIA913ADJ-T1-GE3 -12V -4.5A 6.5W SC70-6L	SIA913ADJ-T1-GE3	Vishay Siliconix
R1, R2, R3, R4, R5, R6, R8, R10, R11, R12, R14, R15, R17, R19, R20, R22, R23, R25, R28, R30, R31, R33, R34, R35, R36, R94, R104, R161, R162, R170, R171		RES TKF 22R 1% 1/20W SMD 0402	22R	Panasonic
R7, R9, R24, R27		RES TKF 2.2k 1% 1/10W SMD 0402	2.2k	Panasonic
R13, R16, R18, R21, R26, R29, R32	X	RES TKF 22R 1% 1/20W SMD 0402	22R	Panasonic
R37, R39, R43, R45, R50, R105, R107, R108, R132, R134, R153	X	RES TKF 0R SMD 0402	0R	Panasonic
R38		RES TKF 5.62K 1% 1/20W SMD 0201	5.62K	Yageo
R40		RES TKF 4.02k 1% 1/20W SMD 0201	4.02k	Yageo
R41, R42, R112		RES TKF 51R 1% 1/5W SMD 0402	51R	Panasonic
R44, R46, R49, R106, R128, R130, R133, R154, R191		RES TKF 0R SMD 0402	0R	Panasonic
R47, R48	X	RES TKF 1M 1% 1/10W SMD 0402	1M	Panasonic
R51		RES TKF 23.2k 1% 1/20W SMD 0201	23.2k	Panasonic
R52, R53		RES TKF 1k 1% 1/20W SMD 0201	1k	Panasonic
R54		RES TKF 240R 1% 1/20W SMD 0201	240R	Yageo
R55, R56, R57, R58, R59, R60, R74, R75, R79, R80, R81, R82, R113, R114		RES TKF 953R 1% 1/20W SMD 0201	953R	Vishay
R61, R62, R63, R64, R119, R120, R121, R126, R127, R129, R131		RES TKF 47k 1% 1/10W SMD 0402	47k	Panasonic
R65, R66, R67, R68, R69, R70, R76, R77, R83, R84, R85, R89, R90, R91, R92, R93, R135, R136, R137, R138, R139, R140, R141, R142, R145, R146, R147, R148, R181, R183, R189, R190, R193, R197, R198, R199		RES TKF 10k 1% 1/10W SMD 0402	10k	Panasonic
R71, R78, R109, R110, R179		RES TKF 100R 1% 1/16W SMD 0402	100R	Yageo
R72, R73, R88, R176, R196	X	RES TKF 10k 1% 1/10W SMD 0402	10k	Panasonic
R86, R87, R102, R194, R195		RES TKF 1k 1% 1/10W SMD 0402	1k	Panasonic
R95, R96, R97, R98, R99, R100		RES TKF 33R 1% 1/10W SMD 0402	33R	Panasonic
R101, R103	X	RES TKF 1k 1% 1/10W SMD 0402	1k	Panasonic
R111		RES TKF 6.04k 1% 1/10W AEC-Q200 SMD 0402	6.04k	Panasonic
R115		RES TKF 680R 1% 1/16W SMD 0402	680R	Rohm
R116		RES TKF 40.2k 1% 1/10W SMD 0603	40.2k	Yageo
R117, R118		RES TKF 1M 1% 1/10W SMD 0402	1M	Panasonic

R122, R123, R124, R125		RES TKF 5.6k 1% 1/10W SMD 0603	5.6k	Yageo
R143, R163, R172, R173, R174, R175, R182, R188, R192		RES TKF 100k 1% 1/10W SMD 0402	100k	Panasonic
R144		RES TKF 200k 1% 1/10W SMD 0402	200k	Panasonic
R149, R150, R151, R152		RES TKF 62R 1% 1/2W SMD 1210	62R	Yageo
R155, R156, R159, R160, R164, R165, R168, R169		RES TKF 3.3k 1% 1/10W SMD 0402	3.3k	Panasonic
R157, R158, R166, R167	X	RES TKF 100k 1% 1/10W SMD 0402	100k	Panasonic
R177		RES TKF 750R 1% 1/5W SMD 0402	750R	Vishay Dale
R178, R180		RES TKF 330R 1% 1/16W SMD 0402	330R	Yageo
R184, R185, R186, R187		RES SHUNT 0.01R 1% 1/4W 1206	0.01R	Yageo
SW1, SW2, SW3, SW4		SWITCH TACT SPST 16V 100mA 7914G-1-032E SMD	SPST	Bourns
TP19, TP20, TP21, TP22, TP23, TP24, TP25, TP30		MISC, TEST POINT MULTI PURPOSE MINI BLACK	TP LOOP Black	Keystone Electronics
U1		MCHP MCU 32-BIT 800 MHz 64kB SAM9X70-V/4PB TFBGA240	SAM9X70-V/4PB	Microchip Technology
U2		IC MEMORY MT41K128M16JT-125 AAT:K DDR3L 2GBIT 800MHZ FBGA-96	MT41K128M16JT-125 AAT:K	Micron Technology
U3		MCHP INTERFACE KSZ9131RNXI 10/100/1000BASE-T QFN-48	KSZ9131RNXI	Microchip Technology
U4		IC AUDIO WM8731CSEFL Portable CODEC QFN-28	WM8731CSEFL	Cirrus Logic Wolfson
U5		MCHP MEMORY SERIAL EEPROM 2kb I2C 24AA02E48T-E/OT SOT-23-5	24AA02E48T-E/OT	Microchip Technology
U6, U7		MCHP ANALOG POWER SWITCH 5.5V 0.5A MIC2095-1YMT-TR MLF-6	MIC2095-1YMT	Microchip Technology
U8, U9		MCHP INTERFACE CAN MCP2542FDT-E/MF DFN-8	MCP2542	Microchip
U10, U12		IC BUFFER 74AHC1G126SE-7 SINGLE SC-70-5	74AHC1G126	Diodes
U14		MCHP ANALOG POWER CURRENT SENSE MONITOR PAC1934T-I/J6CX WLCSP-16	PAC1934	Microchip Technology
U15		MCHP ANALOG PMIC SWITCHER Buck ADJ MCP16502TAE-E/S8B QFN-32 for SAMA9X6 MPU	MCP16502TAE-E/S8B	Microchip
Y1		MCHP CLOCK OSCILLATOR SINGLE 24MHz DSC1001DL5-024.0000 VDFN-4	24MHz	Microchip Technology
Y2	X	MCHP CLOCK OSCILLATOR SINGLE 32.768Hz DSC6083CE2A-032K768 SMD DFN-4	32.768Hz	Microchip
Y3		CRYSTAL 24MHz 8pF SMD L3.2W2.5H0.8	24MHz	ECS International
Y4		CRYSTAL 32.768kHz 12.5pF SMD FK12AEIHI	32.768KHz	Fox Electronics
Y5	X	CRYSTAL 25MHz 20pF SMD L3.2W2.5H0.8	25MHz	ECS International
Y6		MCHP CLOCK OSCILLATOR SINGLE 25MHz DSC1003DL5-025.0000 VDFN-4	25 MHz	Microchip Technology
Y7		MCHP CLOCK OSCILLATOR SINGLE 12.288MHZ DSC1001DL5-012.2880 VDFN-4	12.288MHz	Microchip Technology

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