

Stamp9X25/Stamp9X35

Technical Reference

Stamp9X25/Stamp9X35: Technical Reference

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1. Introduction

The Stamp9X25 and Stamp9X35 are intended to be used as small size "intelligent" CPU modules as well as a universal Linux CPU cards. They can be used anywhere where restricted energy and space requirements play a role. The design of the Stamp9X5 is limited to the processors core needs like SDRAM and Flash, thus giving the customer a wide-ranged choice of configurations of the peripherals and environment.

The Stamp9X5 has all the necessary interfaces to support a huge variety of peripheral devices. Equipped with a 16-Bit parallel bus it gives fast access to a number of chips and additional devices.

The ARM architecture as a modern and widely supported processor architecture is currently the platform of choice for medium performance embedded devices. Almost all major processor manufacturers have ARM products in their portfolio.

The availability of the widespread operating system "Linux" for the ARM platform opens access to a broad range of software, including tools, drivers, and software libraries. Programs written for ARM can easily be employed on the PC platform for testing and debugging.

Examples of actual or potential applications are: protocol converters, measuring and test equipment, data-logging, as well as any simple or more complex control and automation tasks.

2. Scope

This document describes the most important hardware features of the Stamp9X5. It includes all informations necessary to develop a customer specific hardware for the Stamp9X5. The Operating System Linux is described in a further document. There are two variants of the Stamp9X5 available, the Stamp9X35 and the Stamp9X25.

The stamp9X25 has an additional second ethernet MAC, while the Stamp9X35 has a LCD/TFT controller.

The manual comprises only a brief description of the AT91SAM9Xx5 processor, as this is already described in depth in the manual of the manufacturer Atmel. Descriptions of the ARM core ARM926EJ-S are available from Atmel and also at <http://www.arm.com>. It is much recommended to have a look at these documents for a thorough understanding of the processor and its integrated peripherals.

3. Overview of Technical Characteristics

3.1. CPU

- CPU Clock 400 MHz
- 16KB Instruction Cache
- 16KB Data Cache
- MMU
- 3.3V Supply Voltage, 1.8V Memory Bus Voltage, 1.0V Core Voltage

3.2. Memory

- 256 MB NAND flash memory (optional more)
- 128 MB DDR2
- 2 x 16 KB SRAM
- 128 Bytes EEPROM
- 1 MB Serial Dataflash

3.3. Interfaces and external signals

- 2x 100-pin fine-pitch low-profile Connectors (Hirose FX8)
- Ethernet 10/100 Mbit MAC (2 Stamp9X25)
- Dual USB 2.0 High Speed Hosts
- USB 2.0 High Speed Device
- 6x UART/USART (7 Stamp9X25)
- Synchronous Serial Controller (SSC, I²S)
- Two Serial Peripheral Interfaces (SPI)
- Three Two Wire Interface (TWI, I²C)
- Two MultiMedia Card Interfaces
- JTAG debug port
- Digital Ports - up to 80 available
- Control Signals: IRQs, BMS, SHDN, WKUP

- 4 Programmable Clocks
- External RTC (optional)
- Two Can Bus Controller
- Analog-to-Digital Converter
- 16-Bit parallel CPU-Bus
- LCD/TFT RGB Controller, 24 Bit, 800x600 Pixel

Some of the various functions are realized by multiplexing connector pins; therefore not all functions may be used at the same time (see Appendix B, *Stamp9X25 Pin Assignment* and Appendix C, *Stamp9X35 Pin Assignment*)).

3.4. Miscellaneous

- Four 16-Bit Timer/Counter
- Real Time Timer (RTT), with battery backup support
- Periodic Interval Timer (PIT)
- Watchdog Timer (WDT)
- Unique Hardware Serial Number

3.5. Power Supply

- 3.3V power supply
- 3V backup power supply, e.g. from a lithium battery

3.6. Dimensions

- Dimensions: 53x38x6.1 mm (WxDxH)

Appendix A. Peripheral Color Codes

This table matches the color used to identify various peripherals in tables.

Power Supply/Ground
USART
Debug UART
TWI (I ² C-Bus)
SD-Card/MMC
SPI
USB Host
USB Device
Reserved
Synchronous Serial Controller (SSC)
JTAG
Control
Ethernet
Genral Purpose I/O Port
Programmable Clock Output
Analog-to-digital Converter
Timer Counter
Image Sensor Interface
LCD/TFT Controller Interface
Embedded Trace Macrocell
Static Memory Controller
Compact Flash Interface
Pulse Width Modulator
Touch Controller
Can Controller
AC97 Sound Interface
Encryption Device
Soft Modem
True Random Generator

Appendix B. Stamp9X25 Pin Assignment

Pin	GPIO	Periph. A	Periph. B	Periph. C	Add. Function	Add. Function	Periph. C	Periph. B	Periph. A	GPIO	Pin
1		VMEM					VMEM				2
3		A0/NBS0					A1/NBS2/NWR2/DQM2				4
5		A2					A3				6
7		A4					A5				8
9		A6					A7				10
11		A8					A9				12
13		A10					A11				14
15		A12					A13				16
17		A14					A15				18
19		Reserved					Reserved				20
21		Reserved					Reserved				22
23		Reserved					Reserved				24
25		Reserved					Reserved				26
27		Reserved					Reserved				28
29		GND					GND				30
31		Reserved					Reserved				32
33		Reserved					Reserved				34
35		NCS0					NCS1/SDCS				36
37		NCS2					VMEM				38
39		NCS4					NCS5				40
41		Reserved					Reserved				42
43		NRD					NWR0/NWE				44
45		NWR1/NBS1					Reserved				46
47		DIBN					DIBP				48
49		GND					GND				50
51		VCC					VCC				52
53		D0					D1				54
55		D2					D3				56
57		D4					D5				58
59		D6					D7				60
61		D8					D9				62
63		D10					D11				64
65		D12					D13				66
67		D14					D15				68
69		GND					GND				70
71	PA21	TIOA0	SPI1 MISO					SPI1 MOSI	TIOA1	PA22	72
73	PA23	TIOA2	SPI1 SPCK			AD9			E0 TXER	PB8	74
75	PB18	IRQ	ADTRG					Reserved			76
77		Reserved					Reserved				78
79		Reserved					Reserved				80
81		Reserved					Reserved				82
83		Reserved					Reserved				84
85		Reserved					Reserved				86
87		SHDN					WKUP				88
89		NRST					VBATT				90
91		RTCK					NWAIT				92
93		NTRST					JTAGESEL				94
95		TDI					TMS				96
97		TDO					TCK				98

Stamp9X25 Pin Assignment

Pin	GPIO	Periph. A	Periph. B	Periph. C	Add. Function	Add. Function	Periph. C	Periph. B	Periph. A	GPIO	Pin
99	GND					GND					100

Table B.1. Pin Assignment Stamp9X25 BUS Interface X2

Pin	GPIO	Periph. A	Periph. B	Periph. C	Add. Function	Add. Function	Periph. C	Periph. B	Periph. A	GPIO	Pin
1	VCC					VCC					2
3	PB4	E0 TXCK	TWD2					SPI0 NPCS3	E0 RXDV	PB3	4
5	PB13	E0 RX2	PWM2		AD2	AD3		PWM3	E0 RX3	PB14	6
7	BMS					TSADVREF					8
9	PC27		E1 TXEN	RTS1			CTS1	E1 CRSDV		PC28	10
11	PC30		E1 MDC					E1 TXCK		PC29	12
13	PC26		SCK3				TWD1			PC0	14
15	PC1			TWCK1			TIOA3			PC2	16
17	PC3			TIOB3			TCLK3			PC4	18
19	PC5			TIOA4			TIOB4			PC6	20
21	PC7			TCLK4			UTXD0			PC8	22
23	PC9			URXD0			PWM0			PC10	24
25	GND					GND					26
27	PC11			PWM1			TIOA5			PC12	28
29	PC13			TIOB5			TCLK5			PC14	30
31	PC15			PCK0			UTXD1	E1 RXER		PC16	32
33	PC17			URXD1			PWM0	E1 TX0		PC18	34
35	PC19		E1 TX1	PWM1			PWM2	E1 RX0		PC20	36
37	PC21		E1 RX1	PWM3				TXD3		PC22	38
39	PC23		RXD3					MC11 CK	SPI0 SPCK	PA13	40
41	PA11	SPI0 MISO	MC11 DA0					MC11 CDA	SPI0 MOSI	PA12	42
43	PA14	SPI0 NPCS0						RTS3		PC24	44
45	PC25		CTS3				PCK1	E1 MDIO	FIQ	PC31	46
47	PA30	TWD0	SPI1 NPCS3	E0 MDC			E0 TXEN	SPI1 NPCS2	TWCK0	PA31	48
49	GND					GND					50
51	VCC					VCC					52
53	PA0	TXD0	SPI1 NPCS1					SPI0 NPCS2	RXD0	PA1	54
55	PA2	RTS0	MC11 DA1	E0 TX0			E0 TX1	MC11 DA2	CTS0	PA3	56
57	PB15	E0 RXCK			AD4	AD5			E0 CRS	PB16	58
59	PB17	E0 COL			AD6		E0 TXER	MC11 DA3	SCK0	PA4	60
61	PA5	TXD1	CANTX1					CANRX1	RXD1	PA6	62
63	PC27		E1 TXEN	RTS1			CTS1	E1 CRSDV		PC28	64
65	PA7	TXD2	SPI0 NPCS1					SPI0 NPCS0	RXD2	PA8	66
67	PB11	E0 TX2	PWM0		AD0	AD1		PWM1	E0 TX3	PB12	68
69	PA10	DTXD	CANTX0					CANRX0	DRXD	PA9	70
71	PC22		TXD3					RXD3		PC23	72
73	PA25	TCLK1	TF					RF	TIOB2	PA29	74
75	PA24	TCLK0	TK					RK	TIOB1	PA28	76
77	PA26	TCLK2	TD					RD	TIOB0	PA27	78
79	PA16	MC10 CDA							MC10 CK	PA17	80
81	PA15	MC10 DA0							MC10 DA1	PA18	82
83	PA19	MC10 DA2							MC10 DA3	PA20	84
85	HDMA					HDFPA					86
87	HDMB					HDPB					88
89	DDM					DDP					90

Stamp9X25 Pin Assignment

Pin	GPIO	Periph. A	Periph. B	Periph. C	Add. Function	Add. Function	Periph. C	Periph. B	Periph. A	GPIO	Pin
91	GND					GND					92
93	PB9	E0 TX0	PCK1		AD10	AD11		PCK0	E0 TX1	PB10	94
95	PB0	E0 RX0	RTS2					CTS2	E0 RX1	PB1	96
97	PB2	E0 RXER	SCK2			AD8			E0 TXEN	PB7	98
99	PB6	E0 MDC			AD7			TWCK2	E0 MDIO	PB5	100

Table B.2. Pin Assignment Stamp9X25 IO Interface X1

Appendix C. Stamp9X35 Pin Assignment

Pin	GPIO	Periph. A	Periph. B	Periph. C	Add. Function	Add. Function	Periph. C	Periph. B	Periph. A	GPIO	Pin
1		VMEM					VMEM				2
3		A0/NBS0					A1/NBS2/NWR2/DQM2				4
5		A2					A3				6
7		A4					A5				8
9		A6					A7				10
11		A8					A9				12
13		A10					A11				14
15		A12					A13				16
17		A14					A15				18
19		Reserved					Reserved				20
21		Reserved					Reserved				22
23		Reserved					Reserved				24
25		Reserved					Reserved				26
27		Reserved					Reserved				28
29		GND					GND				30
31		Reserved					Reserved				32
33		Reserved					Reserved				34
35		NCS0					NCS1/SDCS				36
37		NCS2					VMEM				38
39		NCS4					NCS5				40
41		Reserved					Reserved				42
43		NRD					NWR0/NWE				44
45		NWR1/NBS1					Reserved				46
47		DIBN					DIBP				48
49		GND					GND				50
51		VCC					VCC				52
53		D0					D1				54
55		D2					D3				56
57		D4					D5				58
59		D6					D7				60
61		D8					D9				62
63		D10					D11				64
65		D12					D13				66
67		D14					D15				68
69		GND					GND				70
71	PA21	TIOA0	SPI1 MISO					SPI1 MOSI	TIOA1	PA22	72
73	PA23	TIOA2	SPI1 SPCK			AD9				PB8	74
75	PB18	IRQ	ADTRG					Reserved			76
77		Reserved					Reserved				78
79		Reserved					Reserved				80
81		Reserved					Reserved				82
83		Reserved					Reserved				84
85		Reserved					Reserved				86
87		SHDN					WKUP				88
89		NRST					VBATT				90
91		RTCK					NWAIT				92
93		NTRST					JTAGSEL				94
95		TDI					TMS				96
97		TDO					TCK				98

Stamp9X35 Pin Assignment

Pin	GPIO	Periph. A	Periph. B	Periph. C	Add. Function	Add. Function	Periph. C	Periph. B	Periph. A	GPIO	Pin
99	GND					GND					100

Table C.1. Pin Assignment Stamp9X35 BUS Interface X2

Pin	GPIO	Periph. A	Periph. B	Periph. C	Add. Function	Add. Function	Periph. C	Periph. B	Periph. A	GPIO	Pin
1	VCC					VCC					2
3	PB4	ETXCK	TWD2					SPI0 NPCS3	ERXDV	PB3	4
5	PB13		PWM2		AD2	AD3		PWM3		PB14	6
7	BMS					TSADVREF					8
9	PC27	LCDVSYNC		RTS1			CTS1		LCDHSYNC	PC28	10
11	PC30	LCDPCK							LCDDEN	PC29	12
13	PC26	LCDPWM					TWD1		LCDDAT0	PC0	14
15	PC1	LCDDAT1		TWCK1			TIOA3		LCDDAT2	PC2	16
17	PC3	LCDDAT3		TIOB3			TCLK3		LCDDAT4	PC4	18
19	PC5	LCDDAT5		TIOA4			TIOB4		LCDDAT6	PC6	20
21	PC7	LCDDAT7		TCLK4			UTXD0		LCDDAT8	PC8	22
23	PC9	LCDDAT9		URXD0			PWM0		LCDDAT10	PC10	24
25	GND					GND					26
27	PC11	LCDDAT11		PWM1			TIOA5		LCDDAT12	PC12	28
29	PC13	LCDDAT13		TIOB5			TCLK5		LCDDAT14	PC14	30
31	PC15	LCDDAT15		PCK0			UTXD1		LCDDAT16	PC16	32
33	PC17	LCDDAT17		URXD1			PWM0		LCDDAT18	PC18	34
35	PC19	LCDDAT19		PWM1			PWM2		LCDDAT20	PC20	36
37	PC21	LCDDAT21		PWM3					LCDDAT22	PC22	38
39	PC23	LCDDAT23						MC11 CK	SPI0 SPCK	PA13	40
41	PA11	SPI0 MISO	MC11 DA0					MC11 CDA	SPI0 MOSI	PA12	42
43	PA14	SPI0 NPCS0							LCDDISP	PC24	44
45	PC25						PCK1		FIQ	PC31	46
47	PA30	TWD0	SPI1 NPCS3	EMDC			ETXEN	SPI1 NPCS2	TWCK0	PA31	48
49	GND					GND					50
51	VCC					VCC					52
53	PA0	TXD0	SPI1 NPCS1					SPI0 NPCS2	RXD0	PA1	54
55	PA2	RTS0	MC11 DA1	ETX0			ETX1	MC11 DA2	CTS0	PA3	56
57	PB15				AD4	AD5				PB16	58
59	PB17				AD6			MC11 DA3	SCK0	PA4	60
61	PA5	TXD1	CANTX1					CANRX1	RXD1	PA6	62
63	PC27	LCDVSYNC		RTS1			CTS1		LCDHSYNC	PC28	64
65	PA7	TXD2	SPI0 NPCS1					SPI0 NPCS0	RXD2	PA8	66
67	PB11		PWM0		AD0	AD1		PWM1		PB12	68
69	PA10	DTXD	CANTX0					CANRX0	DRXD	PA9	70
71	PC22	LCDDAT22							LCDDAT23	PC23	72
73	PA25	TCLK1	TF					RF	TIOB2	PA29	74
75	PA24	TCLK0	TK					RK	TIOB1	PA28	76
77	PA26	TCLK2	TD					RD	TIOB0	PA27	78
79	PA16	MC10 CDA							MC10 CK	PA17	80
81	PA15	MC10 DA0							MC10 DA1	PA18	82
83	PA19	MC10 DA2							MC10 DA3	PA20	84
85	HDMA					HDFPA					86
87	HDMB					HDPB					88
89	DDM					DDP					90

Stamp9X35 Pin Assignment

Pin	GPIO	Periph. A	Periph. B	Periph. C	Add. Function	Add. Function	Periph. C	Periph. B	Periph. A	GPIO	Pin
91	GND					GND					92
93	PB9	ETX0	PCK1		AD10	AD11		PCK0	ETX1	PB10	94
95	PB0	ERX0	RTS2					CTS2	ERX1	PB1	96
97	PB2	ERXER	SCK2			AD8			ETXEN	PB7	98
99	PB6	EMDC			AD7			TWCK2	EMDIO	PB5	100

Table C.2. Pin Assignment Stamp9X35 IO Interface X1

Appendix D. Stamp9X5 Electrical Characteristics

Ambient temperature 25°C, unless otherwise indicated

Symbol	Description	Parameter	Min.	Typ.	Max	Unit
V_{CC}	Operating Voltage		3.0	3.3	3.6	V
V_{MEM}	Memory Bus Voltage		1.65	1.8	1.95	V
V_{RES}	Reset Treshhold			2.9		V
T_{RES}	Duration of Reset Pulse		150		280	ms
V_{IH}	High-Level Input Voltage	3.3V	2.0		$V_{CC} + 0.3$	V
		(PIOC4 - PIOC31) 1.8V	1.26		2.1	V
V_{IL}	Low-Level Input Voltage	3.3V	-0.3		0.8	V
		(PIOC4 - PIOC31) 1.8V	-0.3		0.54	V
P	Normal Operation			tbd		mW
	Full Load	max.		tbd		mW
	Stand-By			tbd		mW
	Power-Down			tbd		mW
	Full Load with Ethernet			tbd		mW
V_{BATT}	Battery Voltage		2.0	3.0	V_{CC}	V
I_{BATT}	Battery Current	Ambient temp. = 25°C		5		μA
		Ambient temp. = 70°C			17	μA
		Ambient temp. = 85°C			22	μA

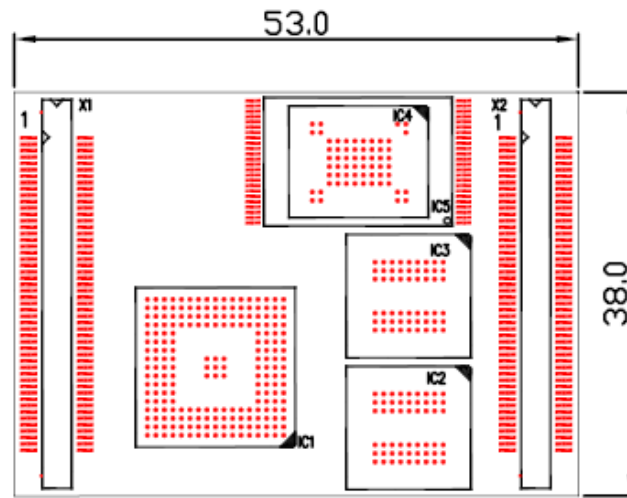
Table D.1. Electrical Characteristics

Appendix E. Stamp9X5 Environmental Ratings

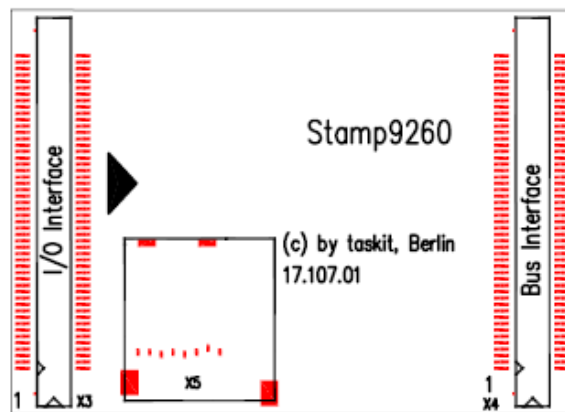
Symbol	Description	Parameter	Operating		Storage		Unit
			Min.	Max.	Min.	Max.	
T _A	Ambient temperature		-30	85	-45	85	°C
	Relative Humidity	no condensation		90		90	%RH
	Absolute Humidity		<= Humidity@T _A = 60°C, 90%RH				
	Corrosive Gas		not admissible				

Table E.1. Environmental Ratings

Appendix F. Stamp9X5 Dimensions



COMPONENT SIDE TOP



COMPONENT SIDE BOTTOM

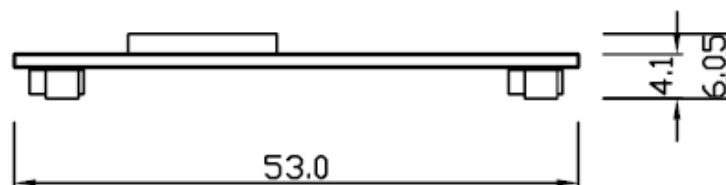


Figure F.1. Stamp9X5 Dimensions

Appendix G. Starterkit Schematics

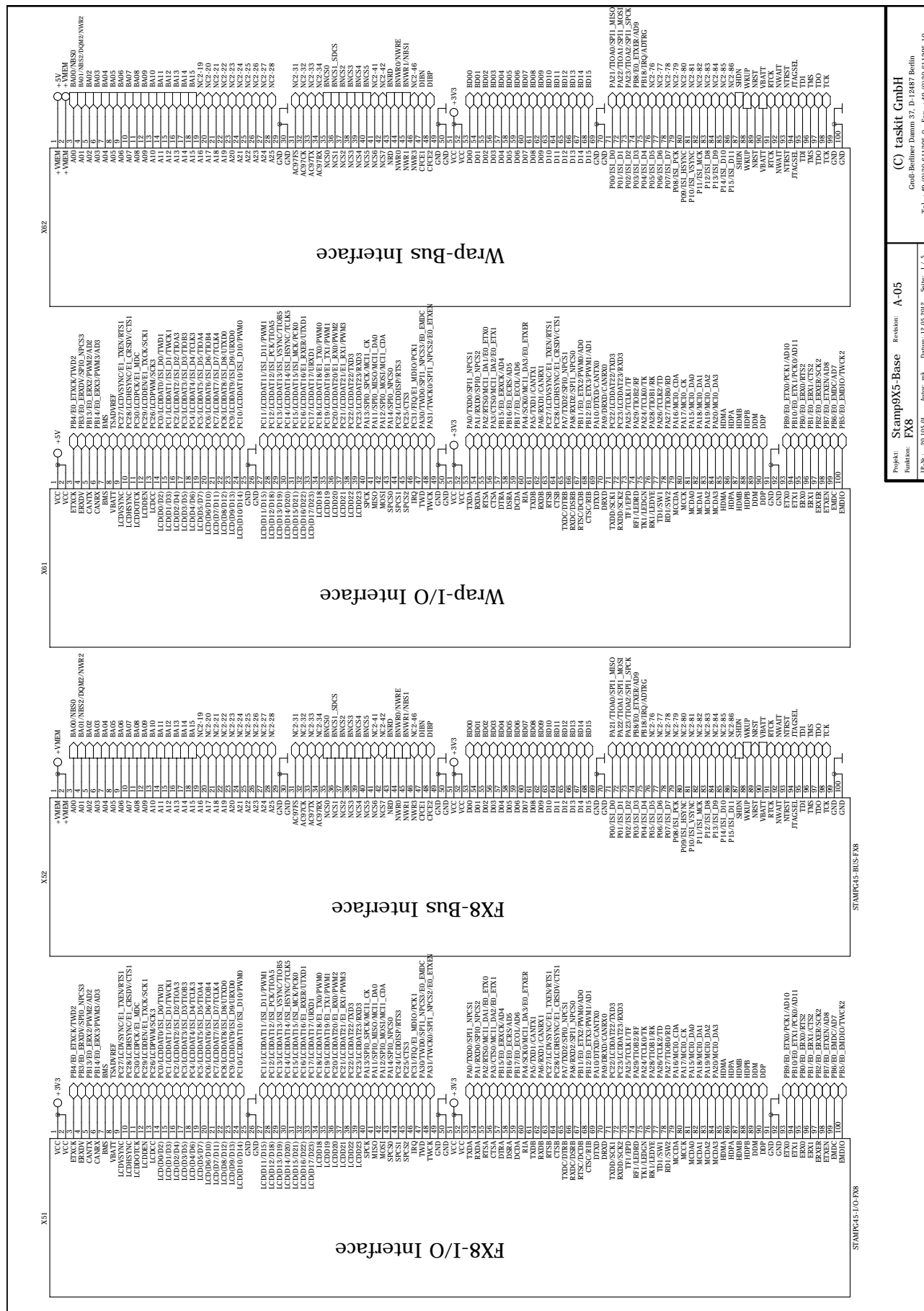
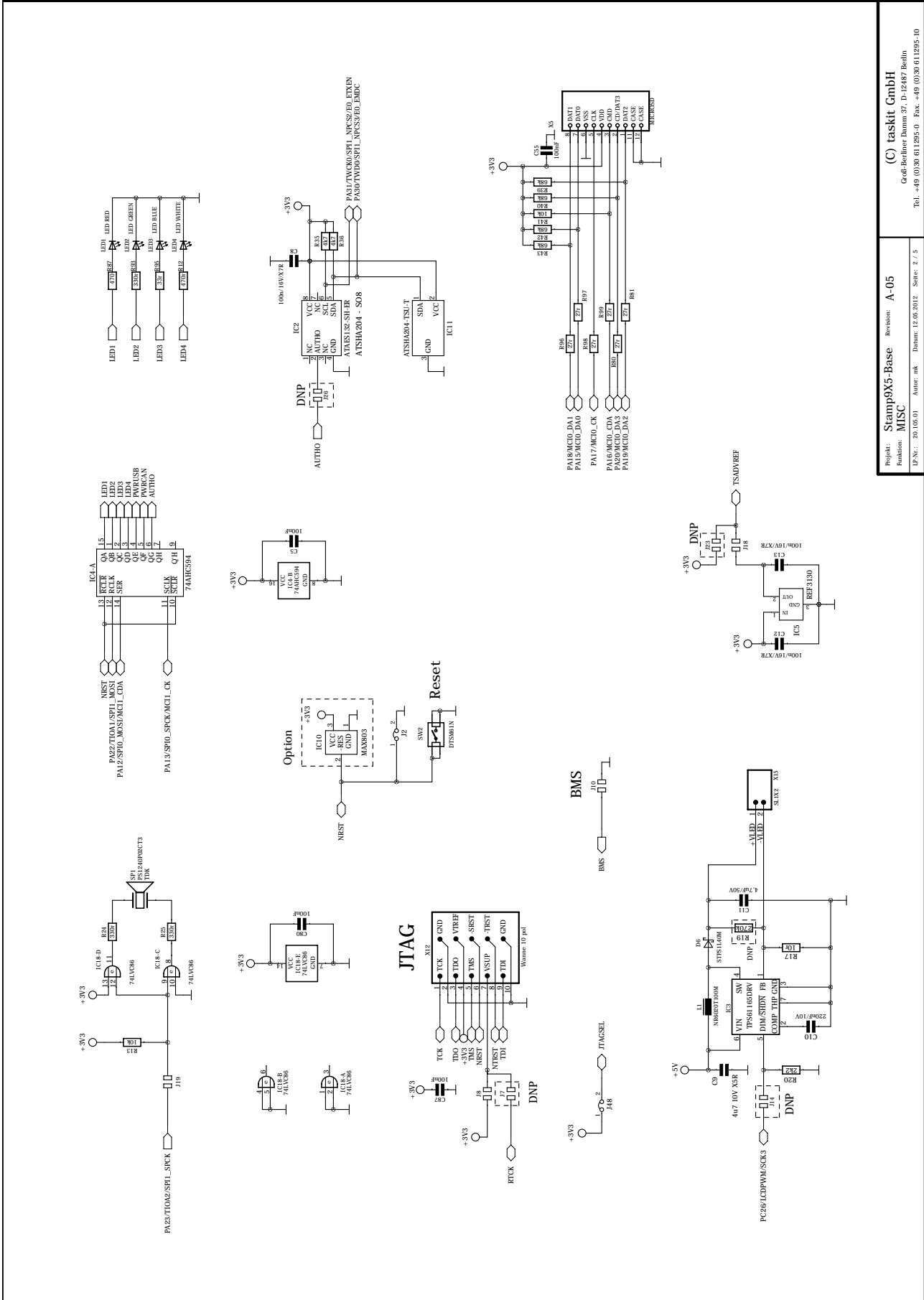


Figure G.1. Stamp9X5 Starterkit FX8



Project: Stamp9X5-Base Revision: A-05
 Funktion: MISC
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Figure G.2. Stamp9X5 Starterkit miscellaneous

