

# **Microsys**

**User Manual**

**XM250 Rev. 1**

**1<sup>st</sup> edition**

# Declaration of Conformity

We, Manufacturer  
MicroSys Electronics GmbH  
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Germany

declare that the product

**XM250**

is in conformity with:

**EN 50081-1 Generic emission standard**  
**EN 50082-1 Generic immunity standard**

in accordance with **89/336 EEC-EMC Directive**.

We also declare the conformity of the above-mentioned product with the actual required safety standards in accordance with Low Voltage Directive **73/23 EEC**.

Date:

Signature:

Position:       General Manager

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## Edition

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# 1. Introduction

## 1.1 Short Description

With its tiny dimensions of only 55x55mm<sup>2</sup> the XM250 is the smallest **miriac**<sup>™</sup> module. Based on the Intel PXA255 XScale processor it offers impressive 400MHz performance at lowest power consumption rates. The PXA250 includes numerous I/O ports like LCD, Audio, USB and MMC. An onboard 100MBit Ethernet controller makes the XM250 probably the smallest Windows CE computer worldwide. All I/O ports and the processor bus are made available on two 100pin connectors.

## 1.2 Specifications

The power requirements for the XM250 board are shown in the following table.

Power Requirements:

+3.3V, +5%/-2.5%,	<450 mA (typ. @400 MHz) <sup>*)</sup>
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\*) measured value

Environmental Requirements:

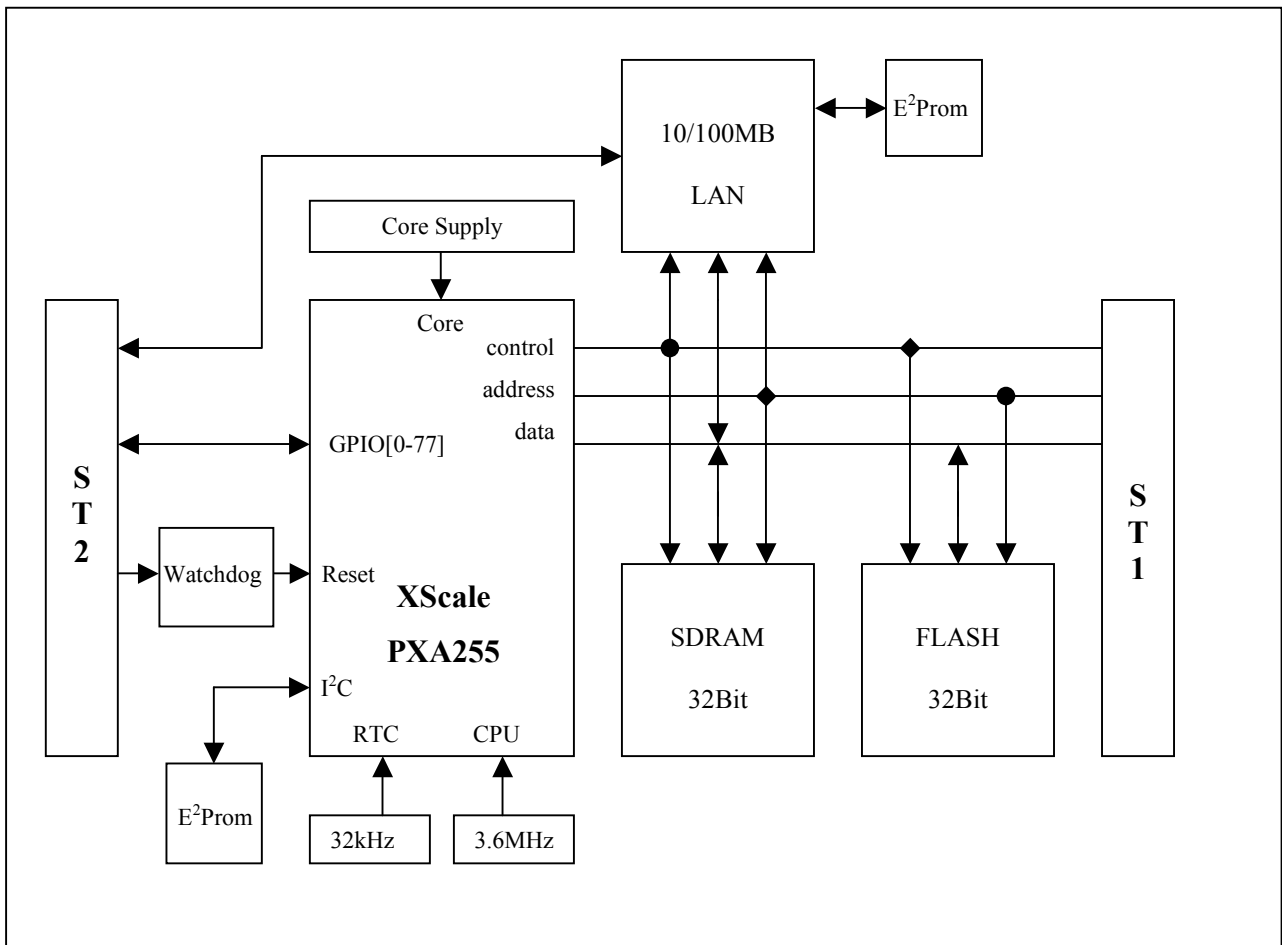
Operating Temperature	0 ° C to +70 ° C -40°C to +85°C optional
Relative Humidity	0 to 95 % (non-condensing)
Storage Temperature	-40 ° C to + 85 ° C

## 1.3 Related Documentation

The following manuals are applicable to the XM250:

- PXA255 XScale Microprocessor User's Manual
- SDRAM Data Sheet
- Intel Strata Flash Memory Data Sheet
- LAN91C111 Ethernet Controller User's Manual
- X24C164 EEPROM Data Sheet

## 1.4 The XM250 Module Block Diagram



## 2. Delivery

### 2.1 Items shipped with this unit

- User's Manual XM250 Hardware
- MicroSys shipping carton



**ATTENTION: STATIC DISCHARGE CAN DESTROY UNIT**

### 2.2 Hints for unpacking, handling and storing

- Avoid touching areas of integrated circuitry.
- Unit should only be placed on a static-free conductive surface
- Unit must only be transported using anti-static bags or MicroSys shipping carton
- Packing should be saved if unit needs to be reshipped or returned
- When the unit needs to be stored, it should be placed in a moist free, dust free environment. The storage temperatures and humidity specifications are shown in chapter 1

## 3. Installation

### 3.1 Items required for XM250 installation

For installation of the XM250, the following items are required.

- Carrier board (e.g. CR250)
- Adequate rated power supply

### 3.2 Points to be observed

Before the unit is mounted onto the carrier, the following points should be observed.

- Unit requires +3.3V (+ 5 %, - 2,5 %).
- Check default jumper setting.



**The supply voltage and operating temperature must never exceed its specified range.**

**GUARANTEE IS VOID IF UNIT IS OPERATED**

**OUT OF ITS SPECIFICATIONS!**

## 4. Board Overview

### 4.1 Features of the XM250

- Dimensions: only 55x55mm<sup>2</sup>
- Intel<sup>(R)</sup> PXA255 XScale™ Processor @ 400MHz
- Lowest Power Design
- Up to 128MB SDRAM and 64MB Flash
- Graphics Interface, supports LCD Panels up to 1024x1024 Pixel
- Audio Port (AC97, I<sup>2</sup>S)
- 10/100MBit Ethernet
- Compact Flash Card Interface (CF)
- MultiMedia Card Interface (MMC)
- USB Client
- Infrared Interface (FIR / SIR)
- SPI, I<sup>2</sup>C Ports
- Multiple UARTs
- Multiple PWMs
- Single 3,3V Supply
- Extended Temperature (option)

## 5. The Memory Areas

### 5.1 The SDRAM

The XM250 is fitted out with two synchronous dynamic ram devices which allows for a total capacity of 32MByte, 64MByte or 128MByte depending on the used chip sizes. The 32 bits wide ram bank is directly controlled by the PXA255 according to following table.

CPU Signal	SDRAM Signal	Description
MA10	A0	LSB of multiplexed RAM address
MA11-21	A1-A11	multiplexed RAM addresses
MA22	A12	MSB of multiplexed RAM address
MA23	BA0	LSB of bank select lines
MA24	BA1	MSB of bank select lines
SDCLK1	CLK	clock line
SDCKE1	CLKE	clock enable line
SDQM0-3	U/LDQM	data qualifier lines mask
SDRAS#	RAS#	row address select line
SDCAS#	CAS#	column address select line
SDCS0#	CS#	select line
WE#	WE#	write enable line
MD0-7	D0-7	LSByte of data bus
MD8-15	D8-15	LSB+1 of data bus
MD16-23	D0-7	MSB-1 of data bus
MD24-31	D8-15	MSByte of data bus

## 5.2 The FLASH Memory

The main flash memory area of the XM250 consists of two devices with a total capacity up to 64Mbyte. The 32 bit wide main flash bank is controlled by the PXA255 according to following table.

CPU Signal	SDRAM Signal	Description
---	A0	connected to GND
MA2	A1	LSByte of address bus
MA3-24	A2-A23	address bus
MA25	A24	MSByte of address bus
---	BYTE#	tied to VDD
---	CE2#	connected to GND
---	CE1#	connected to GND
CS0#	CE0#	select line
OE#	OE#	output enable line
WE#	WE#	write enable line
---	RP/RST#	t.b.d.
---	STS	tied to VDD
---	VPEN	tied to VDD via R19, tied to GND via R20
SDCLK0	CLK	synchronous flash type clock line
SDCAS#	ADV#	synchronous flash type address valid line
---	WAIT	not connected
---	WP#	tied to VDD
MD0-7	D0-7	LSByte of data bus
MD8-15	D8-15	LSB+1 of data bus
MD16-23	D0-7	MSB-1 of data bus
MD24-31	D8-15	MSByte of data bus

## 5.3 The I<sup>2</sup>C EPROM

A 16kbit serial EEPROM is available for storing e.g. manufacturing and configuration data. It is connected to the PXA255 I<sup>2</sup>C interface.

CPU Signal	24C164 Signal	Description
SCL	SCL	clock line
SDA	SDA	data line
The memory device responds within the I <sup>2</sup> C address range \$B0-\$BF		

## 6. The LAN Controller

The onboard network controller is defined to facilitate the implementation of a third generation of Fast Ethernet connectivity solutions for embedded applications. The LAN91C111 is a mixed signal analog/digital device that implements the MAC and PHY portion of the CSMA/CD protocol at 10 and 100 Mbps. This design minimizes the number of additional necessary components. Only the magnetics and a RJ45 connector have to be added on the carrier board.

CPU Signal	LAN91C111 Signal	Description
---	A1	connected to GND
MA2	A2	LSB of address bus
MA3-14	A3-A14	address bus
MA15	A15	MSB of address bus
SDQM0	BE0#	LSByte enable
SDQM1	BE1#	LSB+1 enable
SDQM2	BE2#	MSB-1 enable
SDQM3	BE3#	MSByte enable
CS1#	AEN	select line 1
WE#	WR#	write enable line
OE#	RD#	output enable line
RDY	ARDY	ready line
GPIO4	INTR0	interrupt line via R21
MD0-7	D0-7	LSB of data bus
MD8-15	D8-15	LSB+1 of data bus
MD16-23	D0-7	MSB-1 of data bus
MD24-31	D8-15	MSB of data bus
---	LEDA#/LEDB#	connected to ST2
---	TPOP-TPON	connected to ST2
---	TPIP-TPIN	connected to ST2
---	EEDO	connected to NVROM 93LC46
---	EEDI	connected to NVROM 93LC46
---	EESK	connected to NVROM 93LC46
---	EECS	connected to NVROM 93LC46
---	XTAL1	connected to 25MHz crystal
---	XTAL2	connected to 25MHz crystal

---

## 7. The Watchdog Timer Circuit

The MAX823 watchdog causes a hard reset to the XM250 Module after the time out sequence of 1.6 seconds has elapsed. The timer is started by a low active pulse at the WDGE# line on pin 24 of the ST2 connector. This signal must be connected to a software controllable line. Once this line has been driven low, it must toggle every 1.6 seconds to restart the watchdog timer. This function can only be disabled by a hard reset. If the WDGE# pin is not connected, the watchdog feature is disabled.

## 8. Pinout of the Module Connectors

### 8.1 The Pinout of Module Connector ST1

Signal	function	ST1	ST1	function	Signal	
GND	Ground	1	2	3.3V	VDD	
MD15	Data	3	4	Data	MD0	
MD14		5	6		MD1	
MD13		7	8		MD2	
MD12		9	10		MD3	
MD11		Bus	11		12	MD4
MD10			13		14	MD5
MD9			15		16	MD6
MD8			17		18	MD7
GND	Ground	19	20	Ground	GND	
SDQM1	Byte Select	21	22	Byte Select	SDQM0	
GND	Ground	23	24	Ground	GND	
SDA	I <sup>2</sup> C	25	26	Address	MA0	
SCL	Bus	27	28		MA1	
USBP	USB	29	30		MA2	
USBN	Slave	31	32		MA3	
GND		33	34		MA4	
TDI	JTAG	35	36		MA5	
TDO		37	38		MA6	
TMS		Port	39		40	MA7
TCK			41		42	MA8
TRST#		43	44		MA9	
SRST#	System Reset	45	46		MA10	
GND	Ground	47	48		MA11	
CS1#	GPIO15	49	50		MA12	
CS2#	GPIO78	51	52		MA13	
CS3#	GPIO79	53	54		MA14	
CS4#	GPIO80	55	56		MA15	
CS5#	GPIO33	57	58		MA16	
RDY	GPIO18	59	60		MA17	
OE#	Device	61	62		MA18	
WE#	Memory	63	64		MA19	
RW#	Control	65	66		MA20	
GND	Ground	67	68		MA21	
SDCLK2	SDRAM	69	70		MA22	
SDCS2#		Control	71		72	MA23
SDRAS#			73		74	MA24
SDCAS#			75	76	MA25	
GND	Ground	77	78	Ground	GND	
SDQM3	Byte Select	79	80	Byte Select	SDQM2	
GND	Ground	81	82	Ground	GND	
MD23	Data	83	84	Data	MD24	
MD22		85	86		MD25	
MD21		87	88		MD26	
MD20		89	90		MD27	
MD19		Bus	91		92	MD28
MD18			93		94	MD29
MD17			95		96	MD30
MD16			97		98	MD31
GND	Ground	99	100	3.3V	VDD	

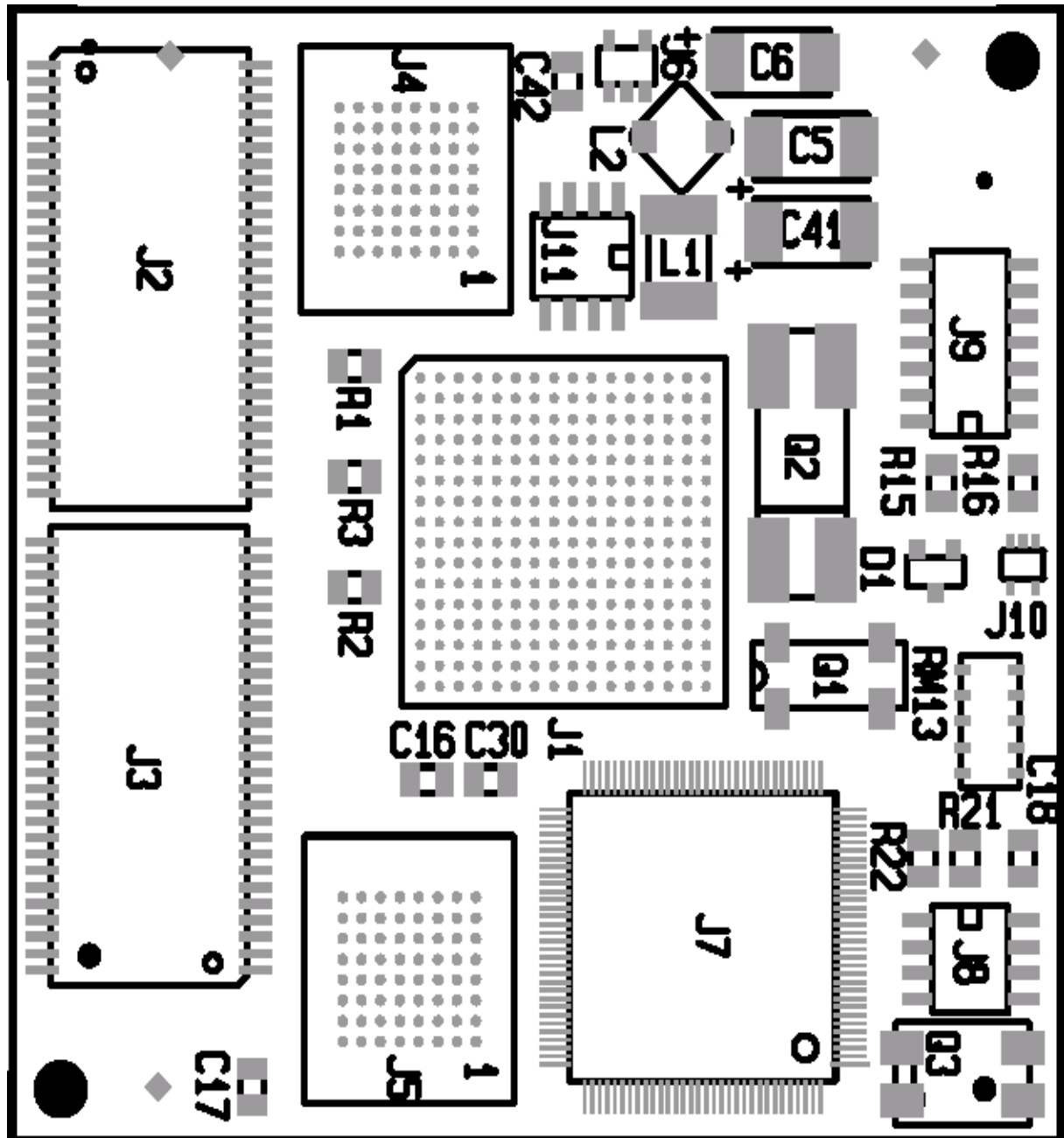
## 1.8.1 The Pinout of Module Connector ST2

Signal	function	ST2	ST2	function	Signal
GND	Ground	1	2	3.3V	VDD
ACRESET#	Audio Reset	3	4	Key Reset	KRST#
GPIO57	IOIS16#	5	6	LAN Led A	LEDA#
GPIO56	PWAIT#	7	8	LAN Led B	LEDB#
GPIO55	PREG#	9	10	LAN TX+	TPOP
GPIO54	PSKTSEL#	11	12	LAN TX-	TPON
GPIO53	PCE2#	13	14	LAN RX+	TPIP
GPIO52	PCE1#	15	16	LAN RX-	TPIN
GPIO51	PIOW#	17	18	Battery Fault In	BATFLT#
GPIO50	PIOR#	19	20	VDD Fault In	VDDFLT#
GND	Ground	21	22	Ground	GND
GPIO49	PWE#	23	24	Watchdog Input	WDGE#
GPIO48	POE#	25	26	GPIO	GPIO22
GPIO17	PWM1	27	28	GPIO	GPIO21
GPIO16	PWM0	29	30	DREQ0	GPIO20
GPIO14	MBREQ	31	32	DRQE1	GPIO19
GPIO13	MBGNT	33	34	32kHz Out	GPIO12
GPIO11	3.6MHz Out	35	36	RTC Out	GPIO10
GPIO9	MMC-CS1	37	38	MMC-CS0	GPIO8
GPIO7	48MHz Out	39	40	MMC-CLK	GPIO6
GND	Ground	41	42	3.3V	VDD
GPIO5	GPIO	43	44	GPIO	GPIO4
GPIO3	GPIO	45	46	GPIO	GPIO2
GPIO1	GP-RST#	47	48	GPIO	GPIO0
MMCDAT	MMC	49	50	MMC	MMCCMD
GPIO46	IR-RXD	51	52	IR-TXD	GPIO47
GPIO44	BT-CTS	53	54	BT-RTS	GPIO45
GPIO42	BT-RXD	55	56	BT-TXD	GPIO43
GPIO40	FF-DTR	57	58	FF-RTS	GPIO41
GND	Ground	59	60	3.3V	VDD
GPIO38	FF-RI	61	62	FF-TXD	GPIO39
GPIO36	FF-DCD	63	64	FF-DSR	GPIO37
GPIO34	FF-RXD	65	66	FF-CTS	GPIO35
GPIO31	SYNC	67	68	SDATA-IN1	GPIO32
GPIO29	SDATA-IN0	69	70	SDATA-OUT	GPIO30
GPIO27	SSP-EXTCLK	71	72	BITCLK	GPIO28
GPIO25	SSP-TXD	73	74	SSP-RXD	GPIO26
GPIO23	SSP-SCLK	75	76	SSP-SFRM	GPIO24
GPIO59	L-DD1	77	78	L-DD0	GPIO58
GND	Ground	79	80	Ground	GND
GPIO61	L-DD3	81	82	L-DD2	GPIO60
GPIO63	L-DD5	83	84	L-DD4	GPIO62
GPIO65	L-DD7	85	86	L-DD6	GPIO64
GPIO67	L-DD9	87	88	L-DD8	GPIO66
GPIO69	L-DD11	89	90	L-DD10	GPIO68
GPIO71	L-DD13	91	92	L-DD12	GPIO70
GPIO73	L-DD15	93	94	L-DD14	GPIO72
GPIO75	L-LCLK	95	96	L-FCLK	GPIO74
GPIO77	L-BIAS	97	98	L-PCLK	GPIO76
GND	Ground	99	100	3.3V	VDD

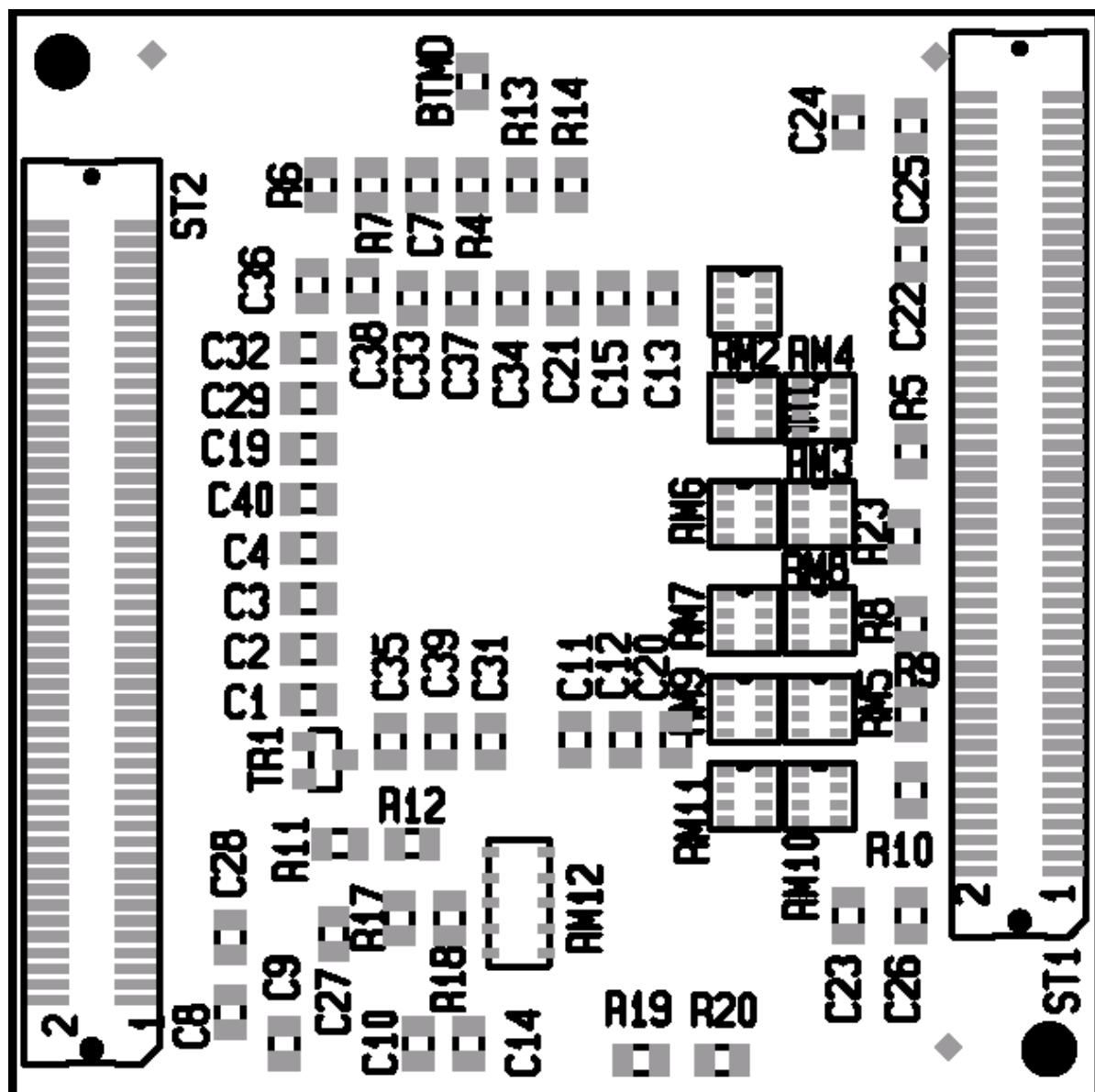
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# Appendices

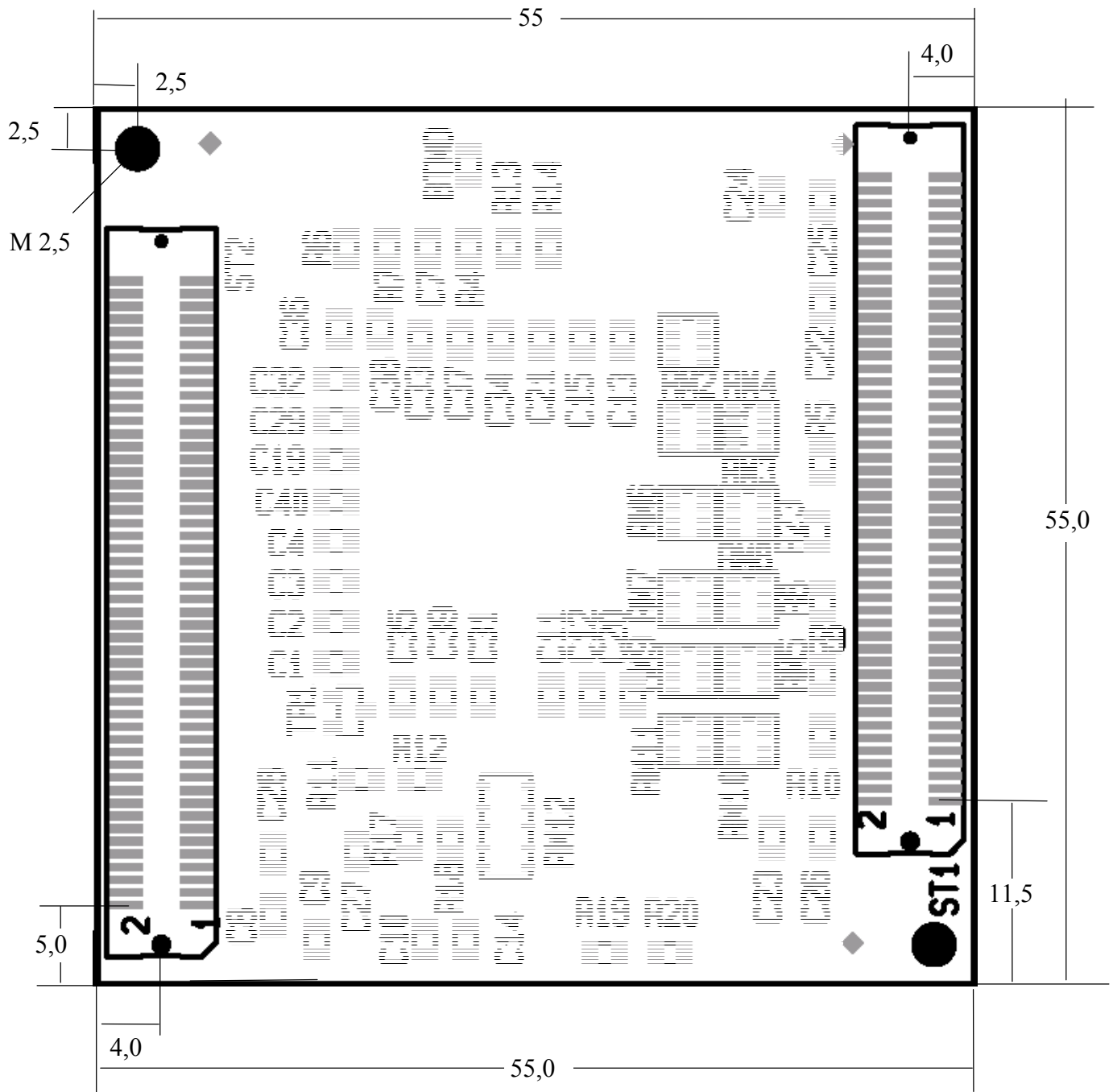
# Layout Component Side



# Layout Solder Side



## Physical Dimensions (Bottom View)



All dimensions are given in millimeters

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## Physical Dimensions continued

The used connectors on the XM250 are 100 pin receptacles with 0,8mm pitch.

AMP 0177983-4 series

**For carrier boards the mating plugs are necessary.**

AMP 0177984-4 series for 5mm Board to Board distance

AMP 0179029-4 series for 6mm Board to Board distance

AMP 0179030-4 series for 7mm Board to Board distance

AMP 0179031-4 series for 8mm Board to Board distance

### Maximum component hight:

Solder side:	1.5mm
Component side including PCB:	5.5mm

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## Schematics XM250 (on request)