TEXAS INSTRUMENTS

MSC1210 Precision ADC with 8051 Microcontroller and Flash Memory Evaluation Module

User's Guide

2002 *Data Acquisition Products*

SBAU073

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the analog input voltage range of 0V to 5V, 6V to 12V for input power and the output voltage range of 5V. The included AC/DC power module is used to supply power.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

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During normal operation, some circuit components may have case temperatures greater than 40°C. The EVM is designed to operate properly with certain components above 40°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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Read This First

About This Manual

This users guide describes the function and operation of the MSC1210EVM. This manual will help you quickly set up the evaluation module and its accompanying software, so that you can rapidly test and evaluate the MSC1210. A complete circuit description, as well as schematic diagram and bill of materials, is included.

How to Use This Manual

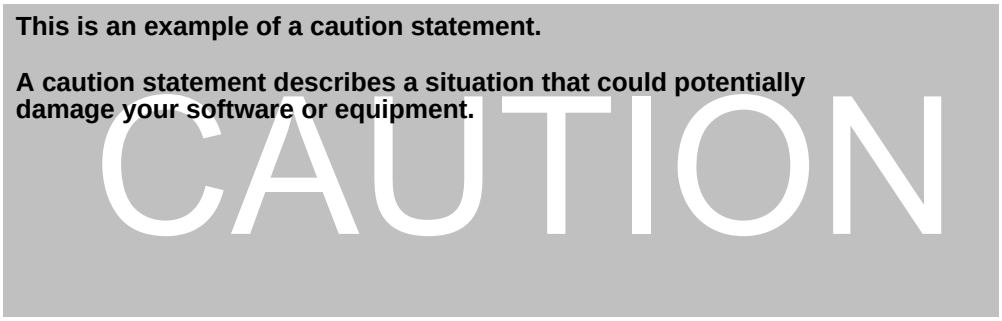
This manual begins with an introductory chapter that describes the EVM and what it can do. If you're anxious to set things up and start testing, we suggest you read at least the first two chapters. These two chapters introduce you to the board and how to set it up to start working with it. Later chapters go into more detail on the board's design and how to access its many features.

Information About Cautions and Warnings

This book may contain cautions.

This is an example of a caution statement.

A caution statement describes a situation that could potentially damage your software or equipment.



The information in a caution is provided for your protection. Please read each caution carefully.

Related Documentation from Texas Instruments

Data Sheets:	Literature Number:
MSC1210	SBAS203A
TLC555CD	SLFX043
REG1117-5.0, REG1117-3.3	SBVS001
OPA340NA	PDS-1404C
DAC8531E	SBAS192
MAX3243CPWR	SLLS350
TPS3837L30DBVT, TPS3838L30DBVT	SLVS292
SN74HC573ADW	SCLS147
SN74AC10PWR	SCAS529
SN74AHC1G08DBVR	SCLS3141
SN74AHC138PWR	SCLS2581

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Chapter 1

Introduction

This chapter provides an overview of the MSC1210EVM evaluation module and software.

1.1 The MSC1210

The MSC1210 is a precision 24-bit delta-sigma Analog-to-Digital Converter (ADC) with an 8051 microcontroller and up to 32K of Flash Memory. It has eight differential/single-ended analog input channels. The delta-sigma architecture employed in the MSC1210 enables the device to achieve 22 bits of effective resolution (0.45ppm rms noise) at a data rate of 10Hz. It can be programmed for other data rates up to 1kHz that have lower effective resolution. In addition to the standard 8051 peripherals and functions, the MSC1210 includes a 32-bit accumulator, high-speed SPI interface, 16-bit PWM output, Data Flash Memory, 1280 bytes of Data Ram, Dual UARTS, and dual DPTR registers.

The MSC1210 has an enhanced 8051 core which only requires 4 clock cycles per machine cycle. It has extra timers, Watchdog, Brownout, Low-Voltage Detect circuits, Power Management Control, and hardware Breakpoint Registers.

1.2 EVM System Overview

A block diagram of the MSC1210 evaluation module is shown in Figure 1.

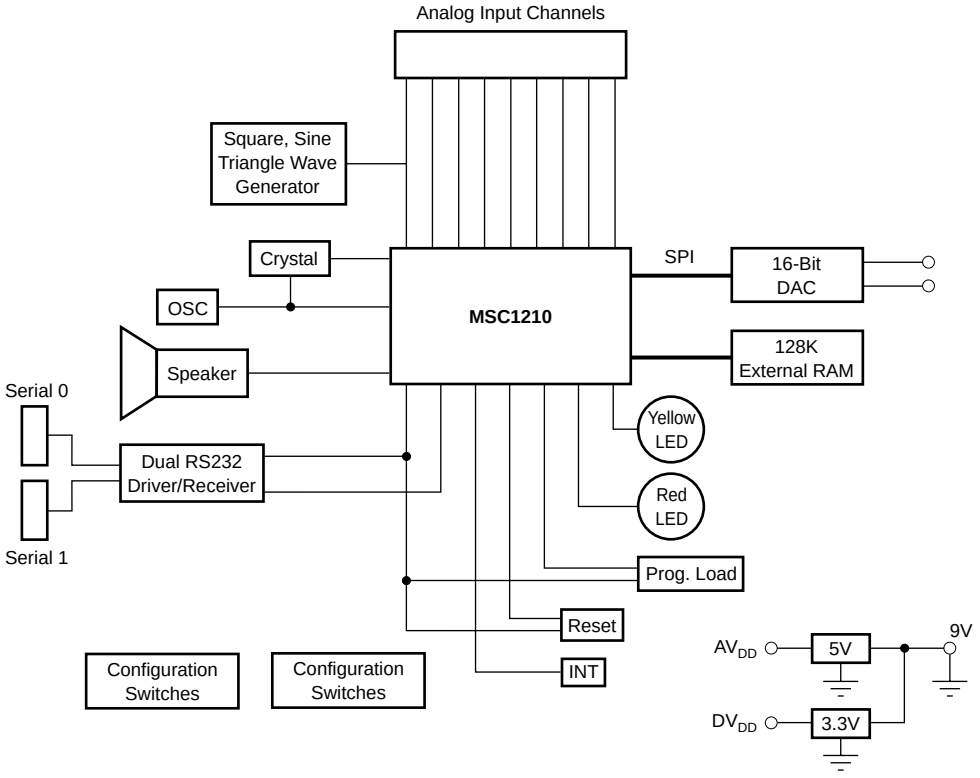

Figure 1. MSC1210EVM Block Diagram.

During normal operation, programs are developed on the PC and then downloaded into the MSC1210 for execution. The primary development environment is Keil for assembly and C language programming. There is also a Basic interpreter available from MDL-Labs.

1.3 Analog Inputs

Analog input is supplied through the ten-way screw terminal block J13. The nine inputs are connected to the MSC1210 through a 1kΩ resistor. There is also a terminal block for AGND. The inputs only have the 1kΩ resistor to protect against overvoltage.

1.4 Prototyping Area

A prototyping area is provided on the MSC1210EVM. This may be used to incorporate additional circuitry, such as special reference or conditioning circuits, into the system. All of the signals on the MSC1210 are brought to connector pads. Additionally, there are digital and analog power and ground holes in the prototyping area.

1.5 Power Requirements

The MSC1210EVM must be supplied with 5.5V to 15V for proper operation. Power can be supplied through barrel jack J1 (tip positive), square pin connectors J15 and J16, or with a 9V battery connected to battery snap B1.

A 9V “wall-wart” power supply is included with the MSC1210EVM.

1.6 Host Computer Requirements

The Keil software development environment is designed to run on a PC running any Windows platform (Windows 95, 98, NT, 2000, etc).

Minimum Requirements:

- IBM-Compatible 486 PC or Higher
- Windows 95, 98, 2000, or NT4.0
- 64MB RAM Minimum
- 20MB Available Hard Disk Space
- CD-ROM Drive
- Available Serial Port

Chapter 2

Getting Started

This chapter will guide you through unpacking your EVM, and setting it up so you can begin working with it immediately.

Topic **Page**

2.1 Unpacking the EVM

After unpacking the MSC1210EVM kit, check to make sure you received all of the items listed here:

- ❏ MSC1210EVM Board
- ❏ 9V “Wall-Wart” Power Supply
- ❏ 9-Pin D-Sub Male-Female Serial Cable
- ❏ This User Guide
- ❏ Software CD-ROM

If any of these items are missing, contact Texas Instruments to receive replacements.

2.2 Default Configuration

Although much of the MSC1210EVM’s operation is controlled by the host PC, some configuration must be done directly on the board using four jumpers (shorting blocks). The MSC1210EVM is configured as shown in Table 1 at the factory:

Table 1. Factory Jumper Settings.

Jumper Identifier	Description	Default Setting
JP1	Analog Power-Supply Source	1-2
JP2	Digital Power-Supply Source	1-2
J8	External Reference Select	1-2, 3-4

For more information about the jumpers, see section 3.1.

2.3 Quick Start

Once the MSC1210EVM has been unpacked from its shipping container, and you have verified that the board is configured as shown in Table 1, it can be powered on and tested.

First, connect the board to the host PC using the supplied 9-pin serial cable. Apply power to the board by plugging the wall power adapter into a suitable AC power source and plugging the barrel plug into the barrel jack on the MSC1210EVM. (You do not have to connect the serial cable first; it is also acceptable to apply power to the board first.) When the board is properly powered on, the two green “power-good” indicator lamps near the power connectors will glow brightly.

Place the CD-ROM into your PC's CD-ROM drive. You should then see the installation screen shown in Figure 2.

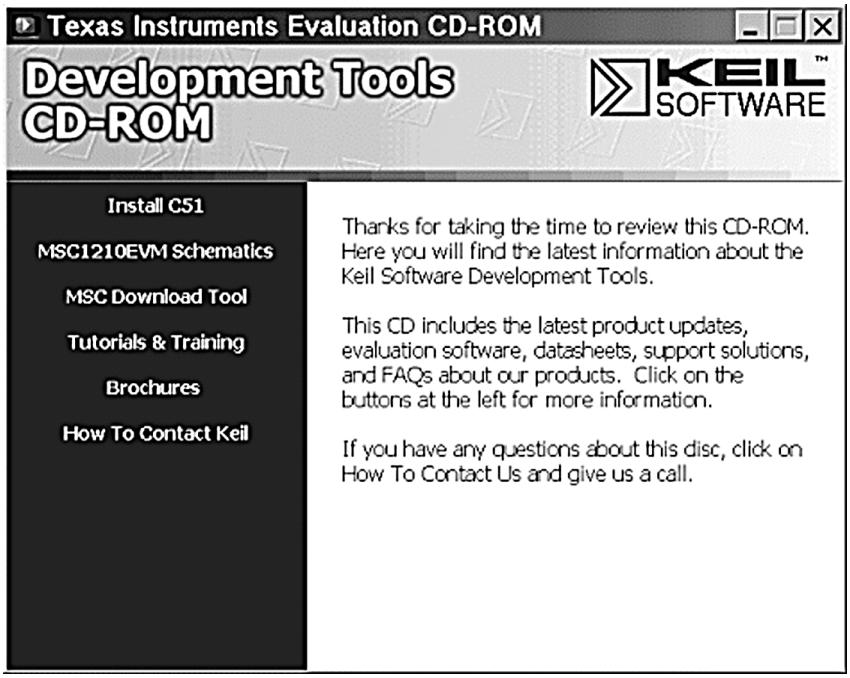

Figure 2. Installation Screen.

From this installation screen you want to install two pieces of software. Install C51 and the MSC1210 Download Tool on your PC. If you are running a Windows platform that is NT-based, such as Windows NT or Windows 2000, you will need administrator privileges to install the software. Follow the instructions that the installer gives you.

The latest version of the Download Tool is located in the “related software” section of the MSC1210 product folder (http://focus.ti.com/docs/prod/folders/print/msc1210.html).

Once the programs have been successfully installed, you can execute them. When the Keil µVision2 development system is run, it will display a title screen, and then you will see something like the display in Figure 3.

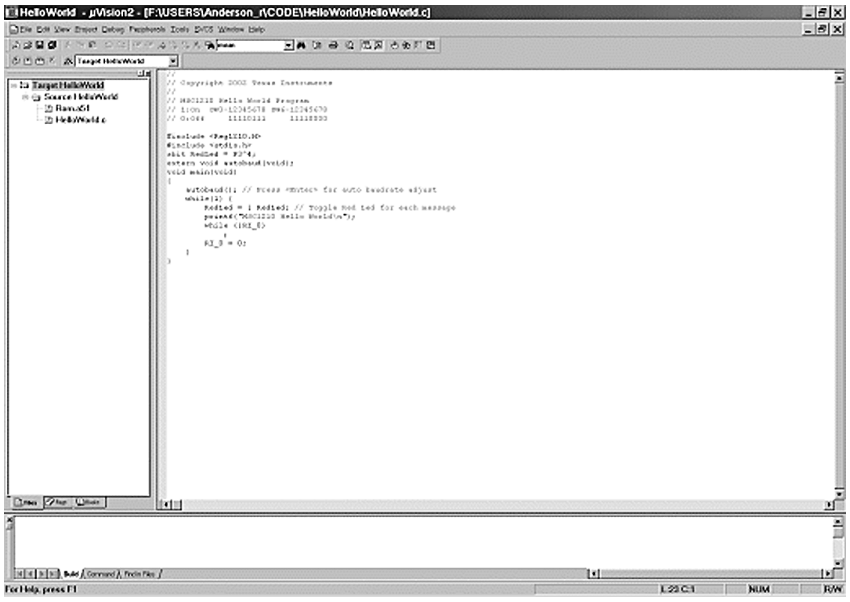

Figure 3. Keil µVision2.

Refer to the Keil documentation and Help menus for more information about how to interact with the Keil environment. When a program is compiled, it can be immediately downloaded into the MSC1210EVM using the MSC1210 download utility program.

In the Project Menu, select **Options for target '. . .'** Then select the **output** tab. You will have a screen like the one shown in Figure 4.

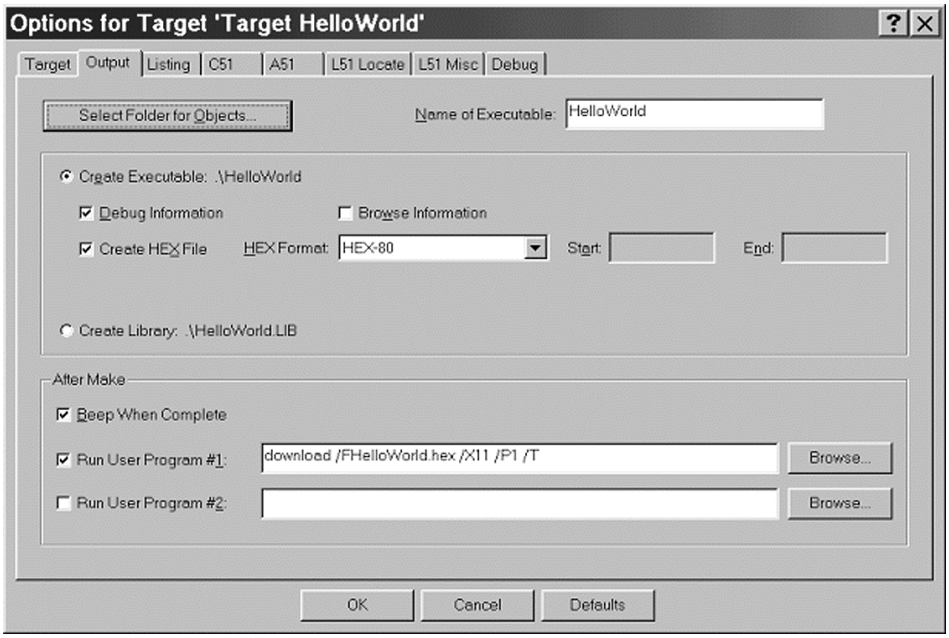

Figure 4. Options for Target (Output).

Check the box to "Create HEX File" and "Run User Program #1", then enter the download command with its parameters in the window. The download.exe file will need to be in the current directory or the Windows path.

All operands should immediately follow the switch character with no spaces except between options. i.e.,

download.exe /Fconv.hex /B9600 /P1

If the filename, crystal frequency, or port is not included, then a screen will prompt for the values.

/Ffile	hex file, #H in the Keil environment will substitute the hex file (required).
/Xfreq	MSC1210 Xtal Clock frequency (required).
/Pport	PC Comm port 1, 2, 3, or 4 (required).
/Bbaud	Baud rate (standard rates), otherwise it is computed from /Xfreq.
/H	If this flag is present the configuration bytes will be erased.
/T	This flag requests a terminal window after download.

Chapter 3

Operation

This chapter describes each function of the MSC1210EVM, and how to use the accompanying software to program and use the MSC1210.

3.1 Jumpers

Table 2 shows the function of each jumper on the EVM:

Table 2. Jumper/Function Reference.

Reference Designator	Setting/Pin	Function	Default	Subsection
JP1	1 to 2	Onboard AV_{DD}	1-2	3.1.1
	2 to 3	External AV_{DD} from J15		
JP2	1 to 2	Onboard DV_{DD}	1-2	3.1.2
	2 to 3	External DV_{DD} from J16		
J8	1	AGND	1-2	3.1.3
	2	REF IN–		
	3	REF IN+	3-4	
	4	REF_{OUT}		
J15	1	JP1 Pin 3 for External AV_{DD}	Disconnected	3.1.4
	2	AGND		
J16	1	JP2 Pin 3 for External DV_{DD}	Disconnected	3.1.5
	2	AGND		

3.1.1 JP1: AV_{DD} Power Source Select

The MSC1210EVM can use an externally supplied AV_{DD} power supply, the output, or the 5.0V output from onboard voltage regulator U2; use JP1 to connect the desired voltage source. Shorting pins 1 and 2 connects the onboard 5.0V regulator; shorting pins 2 to 3 connects AV_{DD} to pin 1 of J15.

3.1.2 JP2: DV_{DD} Power Source Select

The MSC1210 has separate analog and digital power supplies. Use JP2 to connect the desired voltage source for the digital power supply, DV_{DD}. Shorting pins 1 and 2 connects the onboard 3.3V regulator; shorting pins 2 to 3 connects DV_{DD} to pin 1 of J16.

3.1.3 J8: Reference Disconnect

J8 has four pins. The two middle pins are the REF IN+ and REF IN– pins. An external reference voltage can be connected to these two pins. The other two pins of J8 enable use of the internal reference voltage. Pin 4 is the output from the on-chip voltage reference which can be conveniently connected to pin 3 REF IN+. Pin 1 is AGND, which can be easily connected to pin 2 (REF IN–).

3.1.4 J15: External AV_{DD} Power

If a jumper is between pins 2 and 3 of JP1, then J15 can be used to supply the analog power, AV_{DD}. One pin connects to AGND and the other to JP1, pin 3.

3.1.5 J16: External DV_{DD} Power

If a jumper is between pins 2 and 3 of JP2, then J16 can be used to supply the digital power, DV_{DD}. One pin connects to DGND and the other to JP2, pin 3.

3.2 INT Switch

Switch SW2 is a miniature pushbutton which, when pressed, shorts Port 3.2 to ground. This pin is the $\overline{INT0}$ pin and, therefore, can be setup to cause an interrupt when this pin goes LOW.

3.3 Reset Switch

Switch SW5 is a miniature pushbutton which, when pressed, forces the MSC1210 RST line HIGH. When released, the MSC1210 will enter a reset cycle. If communication becomes disrupted between the host and the board, or the board is unresponsive, pressing RESET will return the system to normal operation.

3.4 PRG LD Switch

Switch SW4 is a miniature pushbutton which, when pressed, forces the MSC1210 RST line HIGH. It also pulls the $\overline{PSEN}$ line LOW so that, when released, the MCU will enter a reset cycle in the Program Load mode. Program execution will be from the on-chip ROM and it first starts by waiting for a carriage return so that it can perform an autobaud function.

3.5 I/O Connectors and Signals

The various connectors on the MSC1210EVM are described in this section.

3.5.1 J5: Serial 0 RS-232 connector

The host PC communicates with the MSC1210EVM through this connector, which is a 9-pin female D-shell type, pinned out in the usual manner. Certain flow control lines are used for special purposes by the MSC1210EVM board; these are described in Table 3.

In the RS-232 electrical specification, –5V to –15V on a line indicates a logic “HIGH” (mark), and +5V to +15V indicates logic “LOW” (space). Line states are described here according to their logical states.

If a “non-handshaking” RS-232 cable is used—i.e., one which connects only RD, TD, and signal ground—the board can still operate normally, but it cannot be reset by the host PC, and bootstrap firmware upgrading cannot be performed through the serial port.

Table 3. J5: RS-232 Port Pinout.

Pin Number	Signal Name	RS-232 Name	Direction (at board)	Function
1	DCD	Data Carrier Detect	Output	None
2	RD	Receive Data	Output	Serial Data Output to Host PC
3	TD	Transmit Data	Input	Serial Data Input from Host PC
4	DTR	Data Terminal Ready	Input	Connected to the reset circuit. A LOW to HIGH transition on this line resets the MCU.
5	SG	Signal ground	Power	Ground Reference
6	DSR	Data Set Ready	Output	None
7	RTS	Request To Send	Input	Connected to PROG LOAD function. Used to enter serial programming mode. A HIGH to LOW transition resets the MCU and put it into the serial programming mode.
8	CTS	Clear To Send	Output	None
9	RI	Ring Indicator	Output	None

3.5.2 J4: Serial 1 RS-232 Connector

This connector is available for use with the second UART in the MSC1210. Only the TD and RD lines are used. The DTR pin is connected to the DSR pin and the RTS pin is connected to the CTS pin, as shown in Table 4.

In the RS-232 electrical specification, –5V to –15V on a line indicates a logic "HIGH" (mark), and +5V to +15V indicates logic "LOW" (space). Line states are described here according to their logical states.

Table 4. J4: RS-232 Port Pinout.

Pin Number	Signal Name	RS-232 Name	Direction (at board)	Function
1	DCD	Data Carrier Detect	Output	None
2	RD	Receive Data	Output	Serial Data Output to Host PC
3	TD	Transmit Data	Input	Serial Data Input from Host PC
4	DTR	Data Terminal Ready	Input	Connected to DSR
5	SG	Signal Ground	Power	Ground Reference
6	DSR	Data Set Ready	Output	Connected to DTR
7	RTS	Request To Send	Input	Connected to CTS
8	CTS	Clear To Send	Output	Connected to RTS
9	RI	Ring Indicator	Output	None

3.5.3 J14, J15, J16, B1: Power Connectors

The MSC1210EVM features a flexible power supply. Externally generated power, the onboard regulator circuitry and supplied "wall-wart", or a 9V battery may all be used to supply power. The separated analog and digital power supplies may, furthermore, be powered differently; e.g., the analog power supply may be powered externally, and the digital power supply may use the on board regulator, at the same time. (This is configured using jumpers JP1 and JP2.) The exception to this is that the battery and "wall-wart" cannot be used at the same time (see the paragraph below).

Four power connectors are provided: screw terminal blocks J15 and J16 for external power, battery terminal B1 for a 9V "transistor radio" battery, and J14 for the supplied "wall-wart". J14 is a "switched" jack: connecting a plug to J14 automatically disconnects the battery terminal. This prevents the battery and J14 from supplying power simultaneously.

Battery power is regulated by the same circuitry that regulates J14 ("wall-wart") power. Note that when a battery is connected to B1, approximately one-half of the prototyping area is covered up by the battery.

WARNING: Be **very** careful when connecting external power supplies to J15 and J16. They are not protected against reversed polarity. If you connect them backwards (i.e., with reversed polarity), it is likely that the MSC1210EVM will be permanently damaged.

CAUTION

Table 5. J14: Unregulated Power Input Connector.

Terminal Name	Function
Tip	Positive Power-Supply Input
Sleeve	Power Ground

Table 6. J16: External Digital Power-Supply Input Connector.

Terminal Number	Function
1	Digital Positive Power-Supply Input
2	Digital Ground

Table 7. J15: External Analog Power-Supply Input Connector.

Terminal Number	Function
1	Analog Positive Power-Supply Input
2	Analog Ground

Table 8. B1: 9V Battery Connector.

Terminal Name	Function
Split (“female”) Ring	Positive (mates with solid / “male” post on battery)
Solid (“male”) Ring	Negative (mates with split / “female” post on battery)

3.5.4 J13: Analog Inputs

Terminal block J13 is the main analog input to the MSC1210EVM. One terminal is provided for each of the MSC1210’s nine differential inputs. Each terminal is connected to the MSC1210 through a 1kΩ resistor.

Table 9. J13: Analog Inputs.

Terminal Number	Terminal Name	MSC1210	Function
1	AIN0	18	Analog Input 0
2	AIN1	19	Analog Input 1
3	AIN2	20	Analog Input 2
4	AIN3	21	Analog Input 3
5	AIN4	22	Analog Input 4
6	AIN5	23	Analog Input 5
7	AIN6/EXTD	24	Analog Input 6 and Digital Low Voltage Detect
8	AIN7/EXTA	25	Analog Input 7 and Analog Low Voltage Detect
9	AINCOM	26	Analog Common
10	AGND	17, 27	Analog Ground

3.5.5 J8: External Reference Input

The MSC1210EVM has an onboard 2.5V/1.25V band-gap reference. If a lower-noise reference source or a reference with a different voltage is desired, it can be connected to square pin connector J8. The reference source—onboard or external—is selected using the pins of J8. C27 and C28 provide bypassing for the Reference Inputs. To use the internal REF_{OUT} signal, connect pin 1 to 2 and 3 to 4.

Table 10. J8: External Reference Input.

Terminal Number	Function
1	AGND—Analog Ground
2	REF IN–
3	REF IN+
4	REF_{OUT}

3.5.6 SW3: Configuration Switch

SW3 provides the means to enable or disable many of the functions on the MSC1210EVM.

Table 11. SW3: Configuration Control Switch.

Switch Number	Function
1	Enables pin P3.5 to control the Yellow LED D5.
2	Enables pin P3.4 to control the Red LED D4.
3	Enables pin P3.3 to drive the speaker.
4	Enables pin P3.0 to receive data from Serial 0 (J5).
5	Disables onboard 11.0592MHz crystal oscillator.
6	Enables pin P1.2 to receive data from Serial 1 (J4).
7	Allows DTR from Serial 0 to reset MSC1210.
8	Allows RTS from Serial 0 to reset to Prog. Load mode.

3.5.7 SW6: Emulation and Control Switch

SW6 provides the means to break several signals so that they can be controlled by an emulator plugged into J11. This switch also provides a means to set the operating mode of the MSC1210.

Table 12. SW3: Configuration Control Switch.

Switch Number	Function
1	Enables the $\overline{RD}$ signal or breaks for emulator use.
2	Enables the $\overline{WR}$ signal or breaks for emulator use.
3	Enables the Reset signal or breaks for emulator use.
4	Enables the $\overline{PSEN}$ signal or breaks for emulator use.
5	Provides a method to pull $\overline{PSEN}$ LOW.
6	Enables banks switching of 128K RAM memory
7	Provides a method to pull ALE LOW.
8	Connects $\overline{EA}$ to DGND.

3.5.8 SW1: Signal Generator Control

SW6 provides the means to enable the signal generator and select several waveforms.

Table 13. SW3: Configuration Control Switch.

Switch Numbers	Function
1 and 3	Connects a sine wave to AIN7.
2	Connects a square wave to AIN7.
3	Connects a ramp waveform to AIN7.
4	Turns on the power to the signal generator circuit.

3.5.9 TP1-6: Test Points

The test points can be used to monitor certain signals on the board.

Consult the MSC1210 datasheet for information on the signals connected directly to the MSC1210.

Table 14. TP1-6: Test Points.

Test Point Designator	MSC1210 Pin Number	AMSC1210 Pin Name	Signal Description
TP1	6	P3.3/INT1n/PWM	PWM Output Connected to the Speaker
TP2	13	RST	Reset Signal to the MSC1210
TP3	44	$\overline{\text{PSEN}}$	Program Select Enable from MSC1210
TP4	48	$\overline{\text{EA}}$	External Memory Enable
TP5	45	ALE	Address Latch Enable
TP6	—	—	GND

3.6 Circuit Description

The MSC1210EVM combines the MSC1210 microcontroller, 128K RAM, DAC8531, 11.0592 MHz oscillator, support for two serial ports, and other support circuits to aid in the evaluation of the MSC1210.

3.6.1 MSC1210

The MSC1210 (U7) is clocked by the 11.0592MHz crystal oscillator, unless it is disabled with switch SW3-6. When the oscillator is disabled, the MSC1210 can use crystal X2 to provide the clock source using on-chip circuitry. Inputs come from J13 through current-limiting resistors R1-R9.

Programs can be loaded into the 32K bytes of Flash memory using the serial port (Serial 0). The MSC1210 has 1380 bytes of RAM on-chip. Extra RAM is available through the use of the 128K RAM (U12). 64K of the RAM is directly addressable, with P1.4 providing the means for bank switching.

For detailed information about the MSC1210, consult the MSC1210 (literature number SBAA076) product datasheet at our web site www.ti.com.

3.6.2 Programming and Host Communication

The Keil integrated software environment and the TI Downloader program make for a convenient system of program development, download, and execution.

Full source code for the MSC1210EVM firmware is included on the CD-ROM.

3.6.3 Power Supply

Power is brought into the board through external power connectors J15 and J16, battery B1, or unregulated power input J14. If a wall power adapter is plugged into J14, the battery is disconnected. Power supplied from the battery or through J14 is regulated by voltage regulators U2 and U3, which provide +3.3V digital and +5V analog supplies. Power supplied from the external connectors (J15 and J16) is not filtered; regulated power of the correct voltages must be supplied to these connectors. The board is laid out with separate “analog” and “digital” power supplies. “Analog” power is 5V and is supplied from regulator U2, or external power connector J15. 3.3V “digital” power is supplied from regulator U3 or J16. When the external power connector J14 is used, it supplies regulators U2 and U3.

Chapter 4

Physical Description

This chapter contains the schematic drawings and PCB layouts for the MSC1210EVM board.

4.1 Schematics

4.1.1 MSC1210 Page 1 Processor

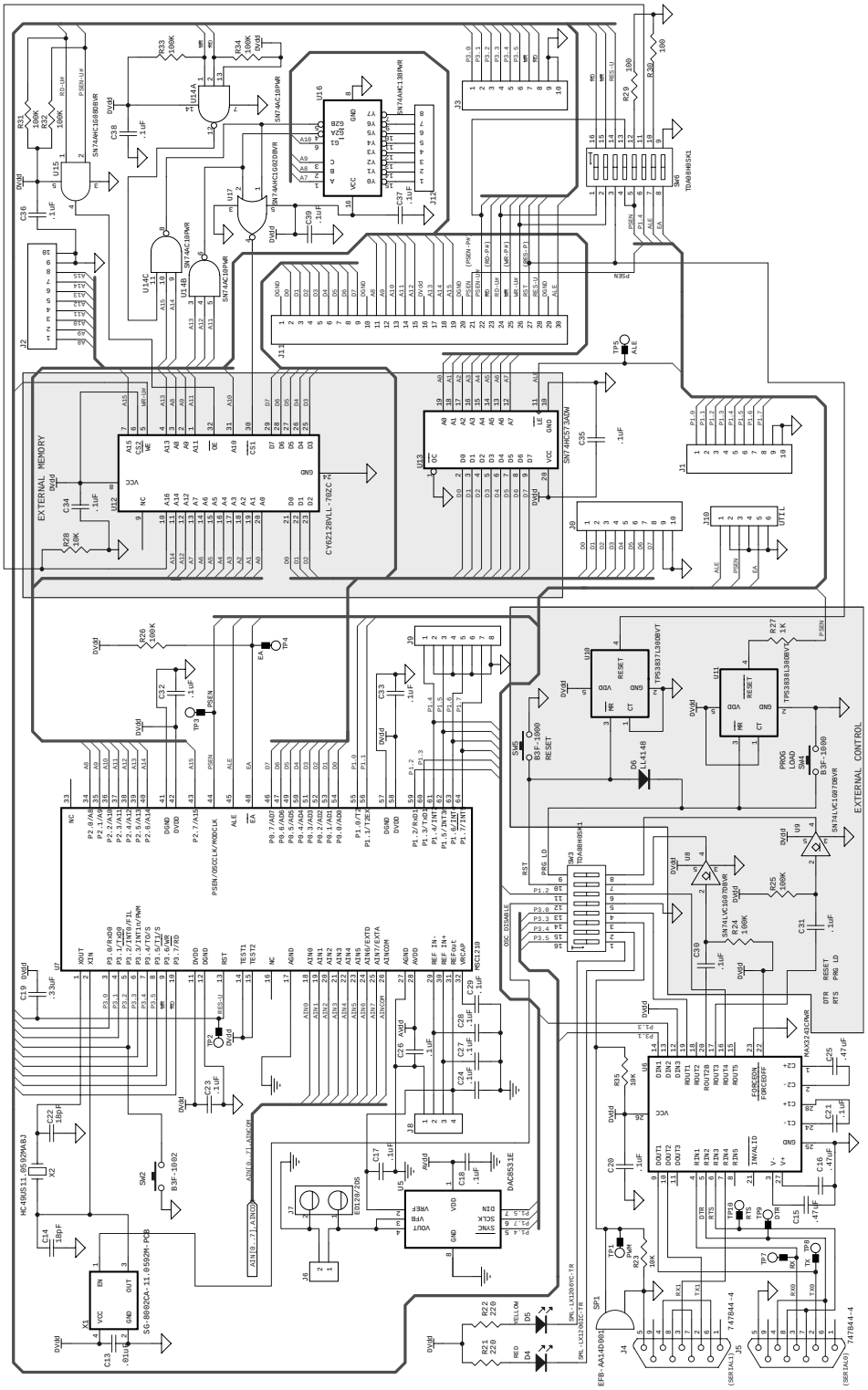

Figure 5. MSC1210EVM Processor Schematic.

4.1.2 MSC1210 Page 2 Power and Analog Inputs

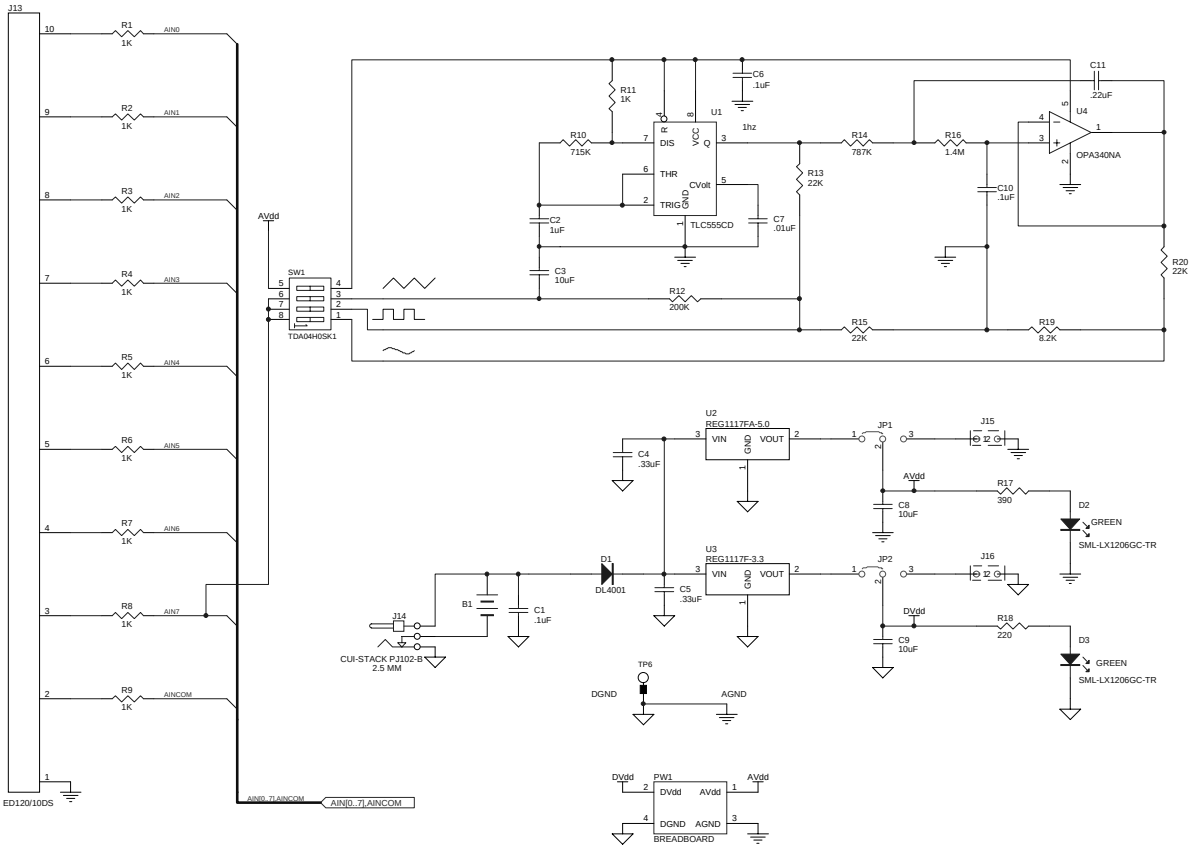

Figure 6. MSC1210EVM Power Schematic.

4.2 Component Locations

4.2.1 MSC1210EVM

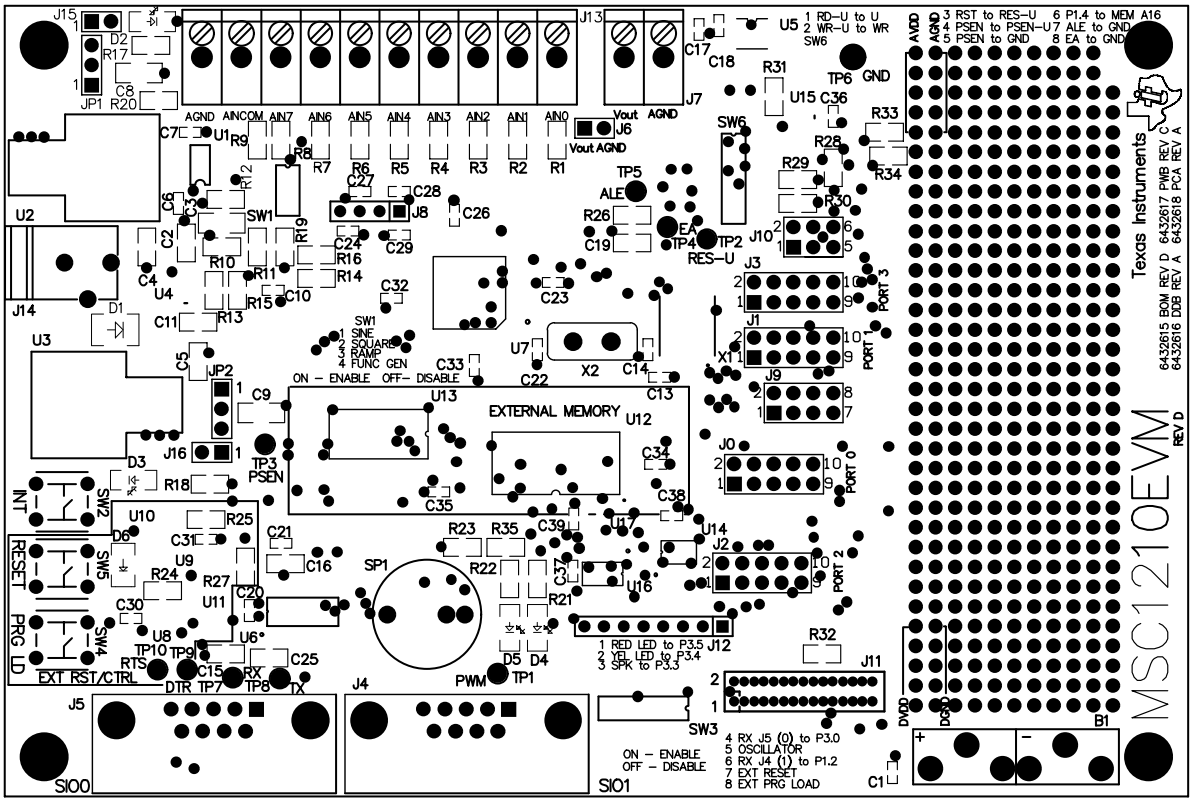

Figure 7. MSC1210EVM Silk Screen.

4.3 Bill of Materials

Table 15. Bill of Materials.

Item Number	Value	Reference Designators	Qty	Mfg	Mfg's Part Number	Description
1		B1 (+)	1	Keystone	594	9V Battery Clip, Female
2		B1 (–)	1	Keystone	593	9V Battery Clip, Male
Not Installed	18pF	C14, C22	2	Panasonic or Alternate	ECJ-1VC1H180J	CAP 18pF 50V 5% CERAMIC CHIP 603
3	0.01µF	C7, C13	2	Panasonic or Alternate	ECJ-1VB1C103K	CAP 0.01µF 16V 10% CERAMIC CHIP 603
4	0.1µF	C1, C6, C10, C17, C18, C20, C21, C23, C24, C26-C39	23	Panasonic or Alternate	ECJ-1VB1C104K	CAP 0.1µF 16V 10% CERAMIC CHIP 603
5	0.22µF	C11	1	Panasonic or Alternate	ECJ-2VB1C224K	CAP 0.22µF 16V 10% CERAMIC CHIP 805
6	0.33µF	C4, C5, C19	3	Panasonic or Alternate	ECJ-2YB1C334K	CAP 0.33µF 16V 10% CERAMIC CHIP 805
7	0.47µF	C15, C16, C25	3	Panasonic or Alternate	ECJ-2YB1C474K	CAP 0.47µF 16V 10% CERAMIC CHIP 805
8	1µF	C2	1	Panasonic or Alternate	ECJ-2YB1A105K	CAP 1µF 10V 10% CERAMIC CHIP 805
9	10µF	C3, C8, C9	3	Panasonic or Alternate	ECJ-3YB0J106K	CAP 10µF 6.3V 10% CERAMIC CHIP 1206
10		D1	1	Micro Commercial Corp	DL4001	Diode 1A 50V SMD MELF
11		D6	1	Diodes Incorporated	LL4148	Diode Fast Switching SMD MiniMELF
12		D2, D3	2	Lumex	SML-LX1206GC-TR	LED Green Clear Lens 1206 SMD
13		D4	1	Lumex	SML-LX1206IC-TR	LED Red Clear Lens 1206 SMD
14		D5	1	Lumex	SML-LX1206YC-TR	LED Yellow Clear Lens 1206 SMD
15		J14	1	CUI-Stack	PJ-102B	2.5mm Power Connector
16		J7	1	On Shore Technology	ED120/2DS	2 Contact Screw Terminal Block
17		J13	1	On Shore Technology	ED120/10DS	10 Contact Screw Terminal Block
18		J4, J5	2	AMP Incorporated	747844-4	DB9 Right Angle Female Conn. W/ Board Locks
19		J8	1	Samtec	TSW-104-07-L-S	4-Pin Single Row Header (4x1)
Not Installed		J9	1			
Not Installed		J10	1			
Not Installed		J0-J3	4			
Not Installed		J6	1			
Not Installed		J11	2	Mill-Max	851-93-050-10-001 (15)	1x15 Single Row Socket 0.050″ Spacing
Not Installed		J12	1			
20		J15, J16	2	Samtec	TSW-102-07-L-S	2-Pin Single Row Header (2x1)
21		JP1, JP2	2	Samtec	TSW-103-07-L-S	3-Pin Single Row Header (3x1)
22	100	R29, R30	2	Panasonic or Alternate	ERJ-6GEYJ101V	RES 100Ω 1/10W 5% 805 SMD
23	220	R18, R21, R22	3	Panasonic or Alternate	ERJ-6GEYJ221V	RES 220Ω 1/10W 5% 805 SMD
24	390	R17	1	Panasonic or Alternate	ERJ-6GEYJ391V	RES 390Ω 1/10W 5% 805 SMD
25	1k	R1-R9, R11, R27	11	Panasonic or Alternate	ERJ-6GEYJ102V	RES 1kΩ 1/10W 5% 805 SMD
26	8.2k	R19	1	Panasonic or Alternate	ERJ-6GEYJ822V	RES 8.2kΩ 1/10W 5% 805 SMD
27	10k	R23, R28, R35	3	Panasonic or Alternate	ERJ-6GEYJ103V	RES 10kΩ 1/10W 5% 805 SMD
28	22k	R13, R15, R20	3	Panasonic or Alternate	ERJ-6GEYJ223V	RES 22kΩ 1/10W 5% 805 SMD
29	100k	R24-R26, R31-R34	7	Panasonic or Alternate	ERJ-6GEYJ104V	RES 100kΩ 1/10W 5% 805 SMD
30	200k	R12	1	Panasonic or Alternate	ERJ-6GEYJ204V	RES 200kΩ 1/10W 5% 805 SMD
31	715k	R10	1	Panasonic or Alternate	ERJ-6GEYJ153V	RES 715kΩ 1/10W 1% 805 SMD
32	787k	R14	1	Panasonic or Alternate	ERJ-6ENF7873V	RES 787kΩ 1/10W 1% 805 SMD
33	1.4M	R16	1	Phycomp or Alternate	9C08052A1404FKHFT	RES 1.4MΩ 1/10W 1% 805 SMD
34		SP1	1	Panasonic	EFB-AA14D001	Piezoelectric Ceramic Buzzer

Item Number	Value	Reference Designators	Qty	Mfg	Mfg's Part Number	Description
35		SW2, SW4, SW5	3	Omron	B3F-1002	Momentary Pushbutton Tact Switch
36		SW1	1	C&K Components, Inc.	TDA4H0SK1	4 Pos DIP Switch, Half Pitch SMD
37		SW3, SW6	2	C&K Components, Inc.	TDA8H0SK1	8 Pos DIP Switch, Half Pitch SMD
38		TP1-TP5	5	Keystone Electronics	5004	Miniature Thru-Hole Test Point
39		TP6	1	Keystone Electronics	5011	Multipurpose Thru-Hole Test Point
Not Installed		TP7-TP10	4			
40		U1	1	Texas Instruments	TLC555CD	Linear CMOS Timer
41		U2	1	Texas Instruments	REG1117FA-5.0	+5V 1A Low Dropout Voltage Regulator SMD
42		U3	1	Texas Instruments	REG1117F-3.3	3.3 800mA Low Dropout Voltage Regulator SMD
43		U4	1	Texas Instruments	OPA340NA	Single-Supply Rail-to-Rail Operational Amplifier
44		U5	1	Texas Instruments	DAC8531E	16-Bit Serial Input Digital-to-Analog Converter
45		U6	1	Texas Instruments	MAX3243CPWR	3V to 5V Multi-Channel RS-232 Line Driver/Receiver
46		U7	1	Texas Instruments	MSC1210	24-Bit Intelligent Analog-to-Digital Converter
47		U8, U9	2	Texas Instruments	SN74LVC1G07DBVR	Single Open-Drain Buffer SMD
48		U10	1	Texas Instruments	TPS3837L30DBVT	Supervisory Circuit Active HIGH Reset SMD
49		U11	1	Texas Instruments	TPS3838L30DBVT	Supervisory Circuit Active LOW Open-Drain Reset SMD
50		U12	1	Cypress	CY62128VLL-70ZC	3.3V 128K x 8 Static RAM TSOP Type 1
51		U13	1	Texas Instruments	SN74HC573ADW	Octal D-Type Latches with 3-State Outputs SMD
52		U14	1	Texas Instruments	SN74AC10PWR	Triple 3-Input NAND Gates SMD
53		U15	1	Texas Instruments	SN74AHC1G08DBVR	Single 2-Input NAND Gate SMD
54		U16	1	Texas Instruments	SN74HC138PWR	3-Line to 8-Line Decoder/Demultiplexer SMD
55		U17	1	Texas Instruments	SN74AHC1G02DBVR	Single 2 Input, Positive-NOR Gate
56		X1	1	Epson America Inc.	SG-8002CA-11.0592M-PCB	3.3V 11.0592MHz Programmable Oscillator SMD
Not Installed		X2	1	Citizen	HC49US11.0592MABJ	11.0592MHz Quartz Crystal Thru-Hole
57		N/A	7	Samtec or Alternate	SNT-100-BK-TH	Shorting Jumper
58		N/A	4	Keystone Electronics or Alternate	1808	1/4″ x 0.625_H 4-40 Threaded Standoff
59		N/A	4	Building Fasteners or Alternate	PMS 440 0050 PH	Pan Head Machine Screws 4-40 x 1/2″ Phillips
60		DDB	0	Texas Instruments	6432616	Data Base
61		PWB	0	Texas Instruments	6432617	Printed Wiring Board
62		PCA	0	Texas Instruments	6432618	Printed Circuit Assembly
63		KIT	0	Texas Instruments	6435420	Kitting List
64		SFT	0	Texas Instruments	6435421	Software

4.3.1 Appendix 1. Declaration of Conformity for Power Supply Included in the MSC1210EVM.

03-JAN-2000 14:14 VON -FRIWO SALES EXPORT +49-2532-81-112 T-170 P.003/004 F-587

FRIWO Gerätebau GmbH
Von-Liebig-Str. 11
D-48346 Ostbevern
Germany

FRIWO

CE-Konformitätserklärung
Declaration of Conformity

Wir, der Hersteller, erklären hiermit, daß das Produkt:
We, the manufacturer, hereby confirm, that the product:

Typ: *Type:* **FW 7207/9**

Zeichnungs-Nr.: *Part-No.:* **15.0661.500-00**

weitere Merkmale:
additional information:

mit der beiliegenden Beschreibung die Anforderungen der Niederspannungsrichtlinie 73/23/EWG, CE-Kennzeichnungsrichtlinie 93/68/EWG und der EMV-Richtlinien 89/336/EWG, 92/31/EWG erfüllt.
with the enclosed description fulfills the requirements of the Low Voltage Directive 73/23/EEC, CE Marking Standard 93/68/EEC and the regulations of the EMC Directives 89/336/EEC, 92/31/EEC.

Das Gerät entspricht der:
The unit corresponds to:

a) Niederspannungsrichtlinie
Low Voltage Directive

- ☐ **EN 60742 9/95**
- ☐ EN 60335 5/95
- ☒ EN 60950 9/94
- ☐ EN 60601 9/94

b) EMV-Richtlinie
EMC-Directive

- ☒ EN 50081-1 3/93
- ☐ EN 50081-2 3/94
- ☐ EN 50082-1 3/93
- ☒ **EN 50082-2 2/96**

Ausstelidatum:
Date of issue: 98-10-02

FRIWO Gerätebau GmbH
Von-Liebig-Straße 11
48346 Ostbevern

Firmenstempel Company stamp

Quality Manager ppa. Busche

R & D Manager i.V. Dr. Ebert

checked: R & D Electr. Man. i. V. Schulz

4.3.2