DS-MPE-SER4M

PCIe MiniCard 4-Port High Speed Serial Module

Rev A.1 May 2013

Revision	Date	Comment
A.0	2/21/2013	Initial release
A.1	5/15/13	Additional information added

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CONTENTS

1. IMPORTANT SAFE HANDLING INFORMATION

WARNING!

ESD-Sensitive Electronic Equipment

Observe ESD-safe handling procedures when working with this product.

Always use this product in a properly grounded work area and wear appropriate ESD-preventive clothing and/or accessories.

Always store this product in ESD-protective packaging when not in use.

Safe Handling Precautions

This board contains a high density connector with many connections to sensitive electronic components. This creates many opportunities for accidental damage during handling, installation and connection to other equipment. The list here describes common causes of failure found on boards returned to Diamond Systems for repair. This information is provided as a source of advice to help you prevent damaging your Diamond (or any vendor's) embedded computer boards.

ESD damage – This type of damage is usually almost impossible to detect, because there is no visual sign of failure or damage. The symptom is that the board eventually simply stops working, because some component becomes defective. Usually the failure can be identified and the chip can be replaced. To prevent ESD damage, always follow proper ESD-prevention practices when handling computer boards.

Damage during handling or storage – On some boards we have noticed physical damage from mishandling. A common observation is that a screwdriver slipped while installing the board, causing a gouge in the PCB surface and cutting signal traces or damaging components.

Another common observation is damaged board corners, indicating the board was dropped. This may or may not cause damage to the circuitry, depending on what is near the corner. Most of our boards are designed with at least 25 mils clearance between the board edge and any component pad, and ground / power planes are at least 20 mils from the edge to avoid possible shorting from this type of damage. However these design rules are not sufficient to prevent damage in all situations.

A third cause of failure is when a metal screwdriver tip slips, or a screw drops onto the board while it is powered on, causing a short between a power pin and a signal pin on a component. This can cause overvoltage / power supply problems described below. To avoid this type of failure, only perform assembly operations when the system is powered off.

Sometimes boards are stored in racks with slots that grip the edge of the board. This is a common practice for board manufacturers. However our boards are generally very dense, and if the board has components very close to the board edge, they can be damaged or even knocked off the board when the board tilts back in the rack. Diamond recommends that all our boards be stored only in individual ESD-safe packaging. If multiple boards are stored together, they should be contained in bins with dividers between boards. Do not pile boards on top of each other or cram too many boards into a small location. This can cause damage to connector pins or fragile components.

Power supply wired backwards – Our power supplies and boards are not designed to withstand a reverse power supply connection. This will destroy each IC that is connected to the power supply (i.e. almost all ICs). In this case the board will most likely will be unrepairable and must be replaced. A chip destroyed by reverse power or by excessive power will often have a visible hole on the top or show some deformation on the top surface due to vaporization inside the package. **Check twice before applying power!**

Overvoltage on digital I/O line – If a digital I/O signal is connected to a voltage above the maximum specified voltage, the digital circuitry can be damaged. On most of our boards the acceptable range of voltages connected to digital I/O signals is 0-5V, and they can withstand about 0.5V beyond that (-0.5 to 5.5V) before being damaged. However logic signals at 12V and even 24V are common, and if one of these is connected to a 5V logic chip, the chip will be damaged, and the damage could even extend past that chip to others in the circuit

2. INTRODUCTION

2.1 Description

DS-MPE-SER4M offers 4 RS-232/422/485 serial ports in a PCIe MiniCard form factor with extended -40°C to +85°C temperature operation. Data rates on every port are up to 1Mbps in RS-232 mode and 10Mbps in RS-422 and RS-485 modes. The board's protocols are selected with GPIO lines built into the UART and controlled via software. I/O signals are provided on two miniature connectors with 2 ports per connector.

2.2 Features

- XR17V354 PCIe interface quad UART with 256-byte FIFOs and 16 GPIO lines
- SP336 multi-mode transceivers support RS-232, RS-422, and RS-485
- 4 RS-232/422/485 serial ports with protocol selected by software via the GPIO lines or jumpers
- RS-422/485 termination jumper selectable
- +/-15KV ESD protection on all serial ports

2.3 Operating System Support

- Linux 2.6.16, 2.6.27, 2.6.31, and 2.6.32
- Windows XP

2.4 Mechanical, Electrical, Environmental

- PCIe MiniCard full size format
- Dimensions: 50.95mm x 30mm (2" x 1.18")
- -40°C to +85°C ambient operating temperature
- Power input requirements: +3.3VDC +/- 5%

3. PACKING LIST

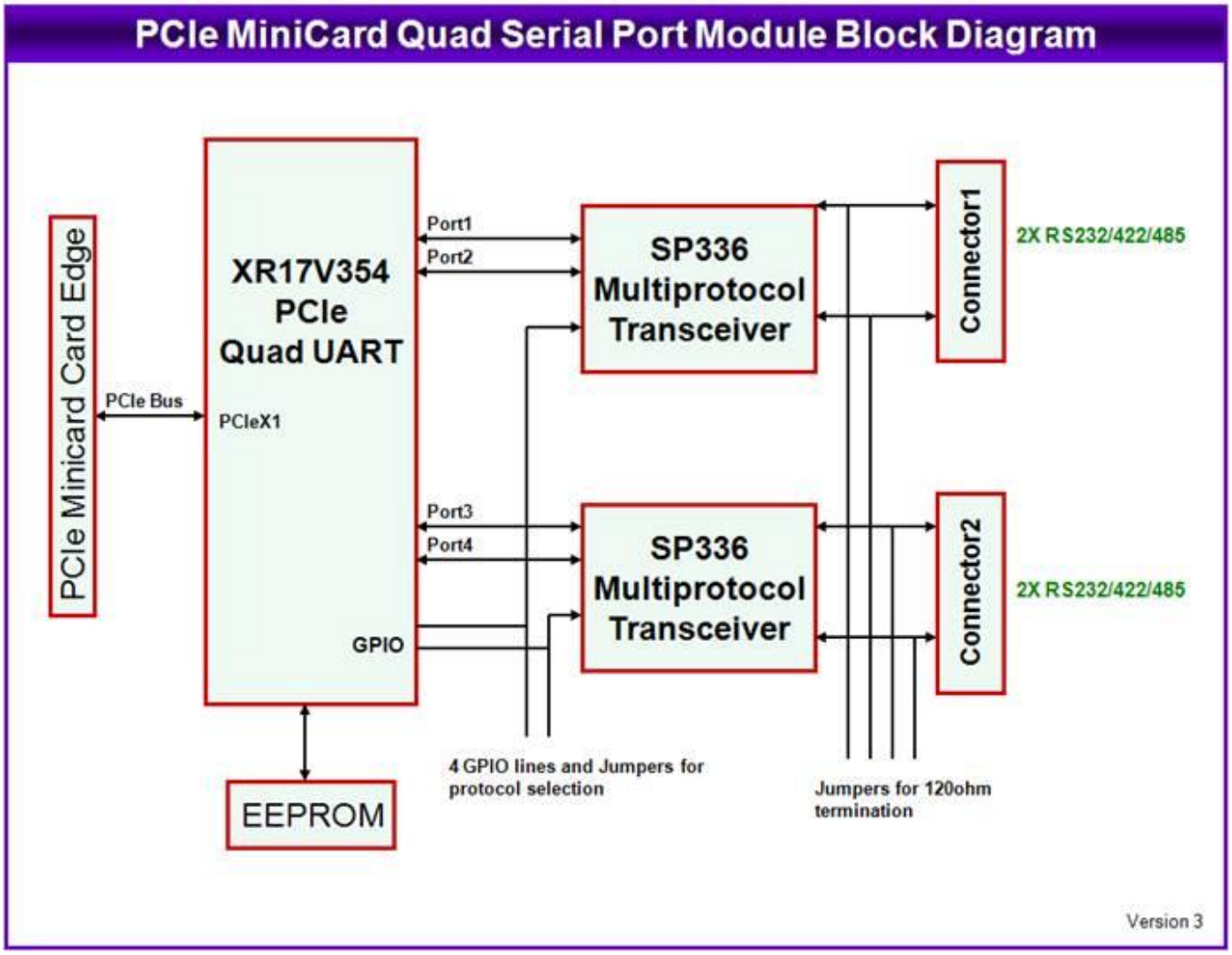
The DS-MPE-SER4M product comes with the PCIe MiniCard hardware assembly, a cable kit with two dual serial cables, and a hardware kit containing jumpers and mounting screws.

Quantity	Part Number	Description
1	9150500	DS-MPE-SER4M hardware assembly
1	6800500	Hardware Kit with jumpers and screws
1	CK-SER4M	Cable Kit with two dual serial cables

4. FUNCTIONAL OVERVIEW

4.1 Functional Block Diagram

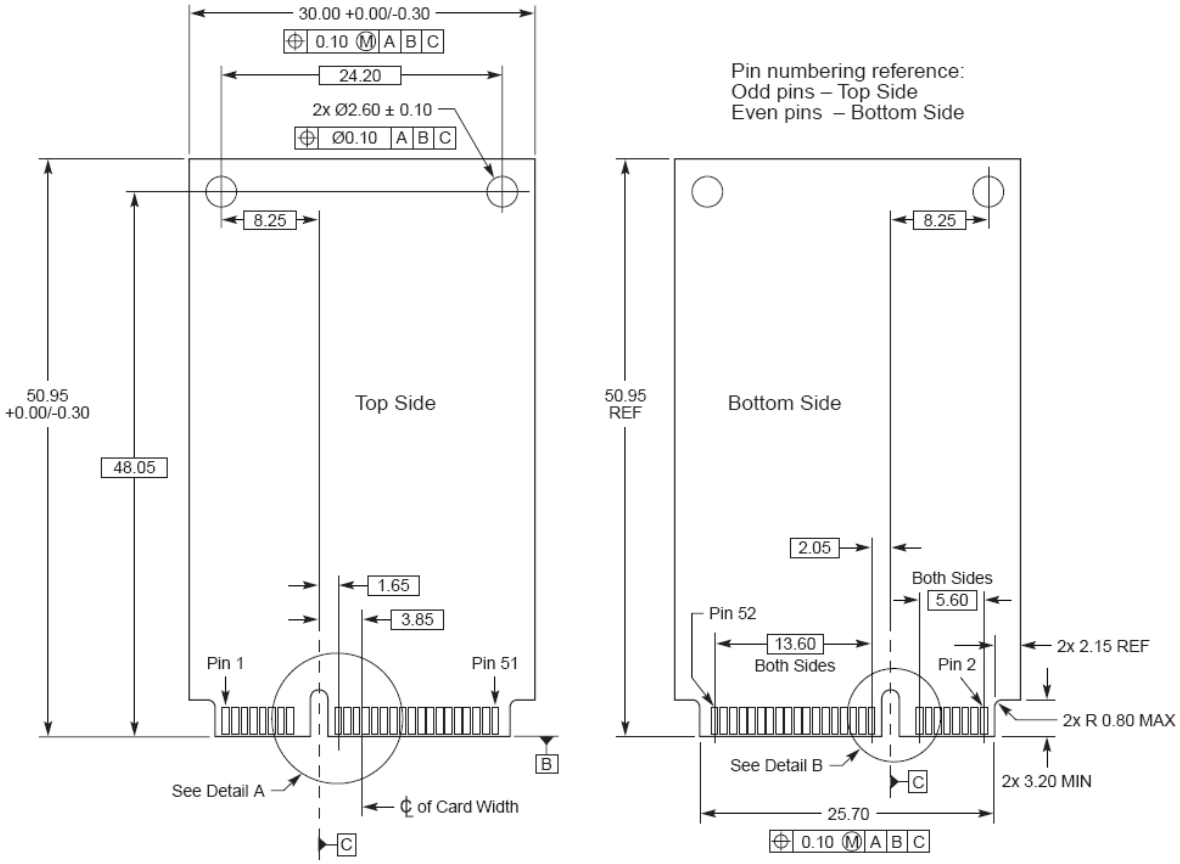
The DS-MPE-SER4M block diagram is shown below.



4.2 Mechanical Board Drawing

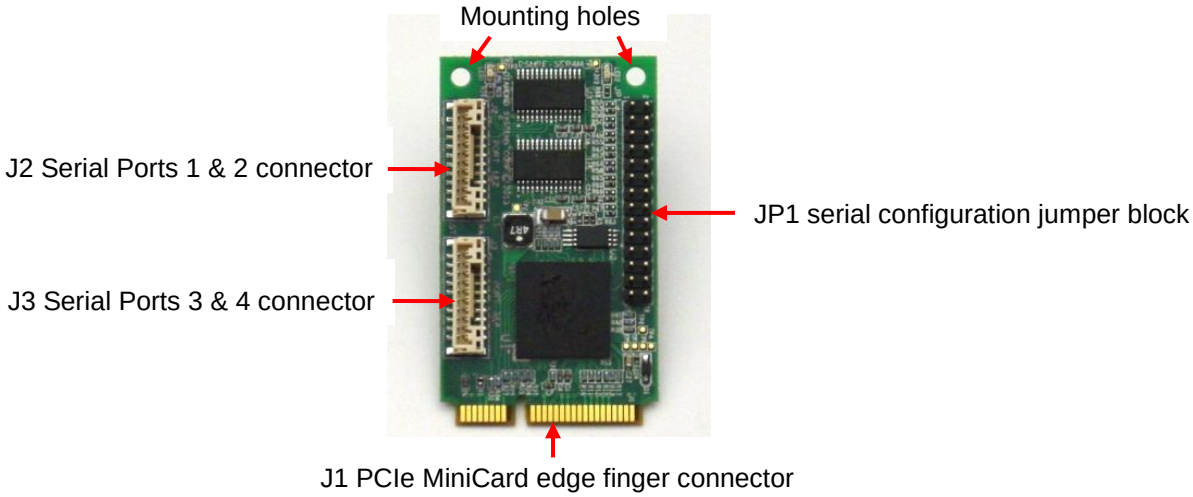
The DS-MPE-SER4M conforms to the PCIe MiniCard electromechanical specification revision 1.2, full size format. Overall dimensions are 50.95mm L x 30.00mm W.

The two mounting holes are isolated from the CPU ground and not connected to any ground lines.



5. INSTALLATION

The DS-MPE-SER4M plugs in to any socket meeting the PCIe MiniCard specifications. It has two connectors, one for each pair of serial ports, a protocol configuration jumper block, and a pair of mounting holes. To install the DS-MPE-SER4M, fully insert the board into a PCIe MiniCard connector and secure in place by inserting one screw from the hardware kit into each of the mounting holes, see the diagram below.



6. CONNECTOR PINOUT AND PIN DESCRIPTION

6.1 PCIe MiniCard Edge Connector (J1)

The DS-MPE-SER4M module is compatible with the standard Mini PCIe socket pinout as shown below.

WAKE#	1	2	+3.3VAUX_3
COEX1	3	4	GND9
COEX2	5	6	+1.5V_1
CLKREQ#	7	8	UIM_PWR
GND1	9	10	UIM_DATA
REFCLK-	11	12	UIM_CLK
REFCLK+	13	14	UIM_RESET
GND2	15	16	UIM_VPP
	KEY		
RSVD(UIM_C8)	17	18	GND10
RSVD(UIM_C4)	19	20	W_DISABLE#
GND3	21	22	PERST#
PERN0	23	24	+3.3VAUX_4
PERP0	25	26	GND11
GND4	27	28	+1.5V_2
GND5	29	30	SMB_CLK
PETN0	31	32	SMB_DATA
PETP0	33	34	GND12
GND6	35	36	USB_D-
GND7	37	38	USB_D+
+3.3VAUX_1	39	40	GND13
+3.3VAUX_2	41	42	LED_WWAN#
GND8	43	44	LED_WLAN#
RSVD1	45	46	LED_WPAN#
RSVD2	47	48	+1.5V_3
RSVD3	49	50	GND14
RSVD4	51	52	+3.3VAUX_5

6.2 Serial Ports (J2, J3)

The four serial ports are provided on two miniature 10-pin headers with 2 ports per header. The pin definition depends on the serial protocol selected. The pinouts below describe each protocol for the first connector (J2) with ports 1 and 2. The second connector (J3) offers the identical pinout for ports 3 and 4.

Pin	RS-232	RS-422	RS-485
1	TX1	TX1+	TX/RX 1+
2	RX1	RX1+	NC
3	RTS1	TX1-	TX/RX 1-
4	CTS1	RX1-	NC
5	Ground	Ground	Ground
6	TX2	TX2+	TX/RX 2+
7	RX2	RX2+	NC
8	RTS2	TX2-	TX/RX 2-
9	CTS2	RX2-	NC
10	Ground	Ground	Ground

Connector Part Number / Description

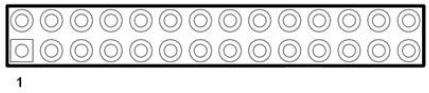
BM10B-GHS-TBT Conn, HDR, 10pos, 2mm, Straight, SMD

7. JUMPER CONFIGURATION

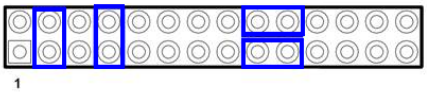
The DS-MPE-SER4M board has the following jumper-selectable serial protocol configurations on jumper block JP1. The default configuration is for RS-232 protocol on all four ports and has no jumpers installed. Ports must be configured in pairs as follows. The serial protocols can also be configured via software, see section 8.

Jumper Block	*Description*
JP1	RS-232/422/485 termination and mode selections

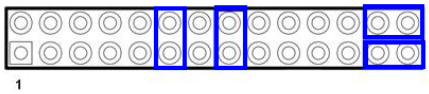
JP1 RS-232/422/485 termination and mode selections (default configuration)



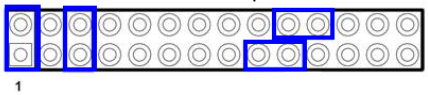
COM1/2: RS-422 Full Duplex



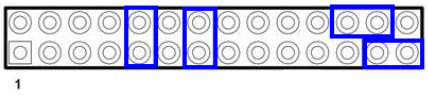
COM3/4: RS-422 Full Duplex



COM1/2: RS-485 Half Duplex

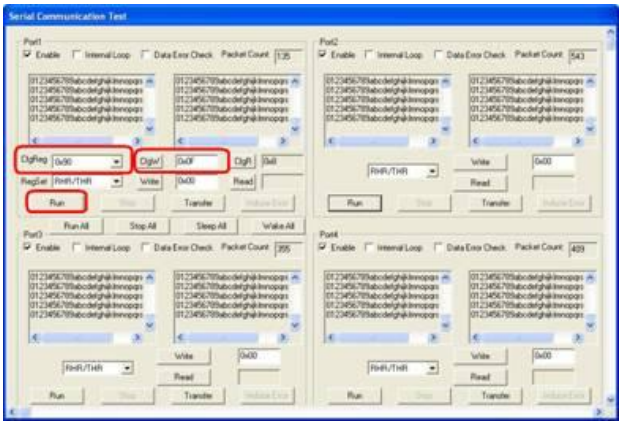


COM3/4: RS-485 Half Duplex



8. PROTOCOL SELECTION

This section explains how the protocol can be configured on the four serial ports using the EXAR_GUI_Utility for Windows XP as shown at the right. This utility is used to control the registers and in turn configure the protocol on the ports. The utility is available for download on the DS-MPE-SER4M webpage at the Diamond Systems' website. The serial protocol can also be configured with jumpers, see section 7.



The ports can be configured with software for various protocols using the GPIO lines from the UART. The GPIO lines 0-3 are used to control the protocol on the transceiver chip. All 4 ports cannot be individually configured to be a different protocol, instead ports1&2 and ports 3&4 are configured to the same protocol in pairs. When the software method is used to control the protocol, all the protocol selection jumpers must be removed as they override the software selection.

Power up state:

All the ports are set to RS-232 mode on power up. The protocol selection made using software commands is volatile and will be lost on every power up or power on reset condition.

Software Configuration Method:

Since the protocol selection is made using GPIO lines, the process to configure the protocol is to simply write to the UART registers updating the GPIO lines. The EXAR_GUI_Utility Version 1.0.0.7 running on Windows XP can be used to control the registers and configure the protocol on the ports.

Steps to Configure the Protocol:

1. Set the GPIO lines 0-3 to output mode.
   a. To do this, the UART register at offset 0x093 should be written with a value of 0xF0.

   The GPIO pins are defined as follows.

GPIO Pin	Net Name
MPIO1	UART01_SEL0
MPIO2	UART01_SEL1
MPIO3	UART23_SEL0
MPIO4	UART23_SEL1

2. Configure the protocol:

   To configure the protocol, the UART register at offset 0x090 should be written with values ranging from 0x00 to 0x0F for various protocols.

   The table below shows the values to write to the register for various protocol selections.

Register 0x90 Value	Port 1&2 Protocol	Port 3&4 Protocol
0x00	RS-232	RS-232
0x01	RS-485	RS-232
0x02	RS-232	RS-232
0x03	RS-422	RS-232
0x04	RS-232	RS-485
0x05	RS-485	RS-485
0x06	RS-232	RS-485
0x07	RS-422	RS-485
0x08	RS-232	RS-232
0x09	RS-485	RS-232
0x0A	RS-232	RS-232
0x0B	RS-422	RS-232
0x0C	RS-232	RS-422
0x0D	RS-485	RS-422
0x0E	RS-232	RS-422
0x0F	RS-422	RS-422

3. Select “Run” to transmit the data and set the ports.

9. SPECIFICATIONS

Number of serial ports	4
Protocols	RS-232/422/485 on each port jumper or software configured
Maximum baud rate	RS-232: 1Mbps RS-422/485: 10Mbps
UARTs	16550 compatible
FIFO	256-byte TX/RX
LEDs	LED 1: Power to Exar UART chip LED 2: +3.3V power
ESD protection	+/-15KV
Input power	+3.3VDC +/-5%
Power consumption	0.462W @ 3.3V
Software drivers	Windows XP Linux 2.6.16, 2.6.27, 2.6.31, and 2.6.32
Operating temperature	-40°C to +85°C
MTBF	xxx hours
Dimensions	50.95mm x 30mm (2” x 1.18”)
Weight	8.5g (0.3oz)
RoHS Compliant	Yes