

MCS8140 Memory Application Note

1. General Description

The MosChip MCS8140 is a highly integrated general purpose network processor that can be used in a variety of products that require network connectivity. The CPU subsystem of the MCS8140 contains a 170 MHz ARM926EJ-S, 32-bit RISC microprocessor delivering approximately 1.1 MIPS per MHz. The MCS8140 network processor contains four high speed USB 2.0 ports. These ports have been designed to connect a wide range of USB-based devices to an Ethernet network (Internet or Intranet). The 32-bit, 33MHz PCI host interface is compatible to the PCI 2.2 standard. The PCI controller can support up to two PCI devices. This allows the MCS8140 to connect to a variety of PCI devices such as 802.11x peripherals as well as audio, SATA, and IDE controllers. The Ethernet controller in the MCS8140 contains an independent media access controller (MAC) and physical layer (PHY). The Ethernet interface can be connected directly to external magnetics, LED's and connectors. The MCS8140 can interface upto 128MB, 32 bit SDRAM and upto 32MB 8-bit parallel Flash in various combinations.

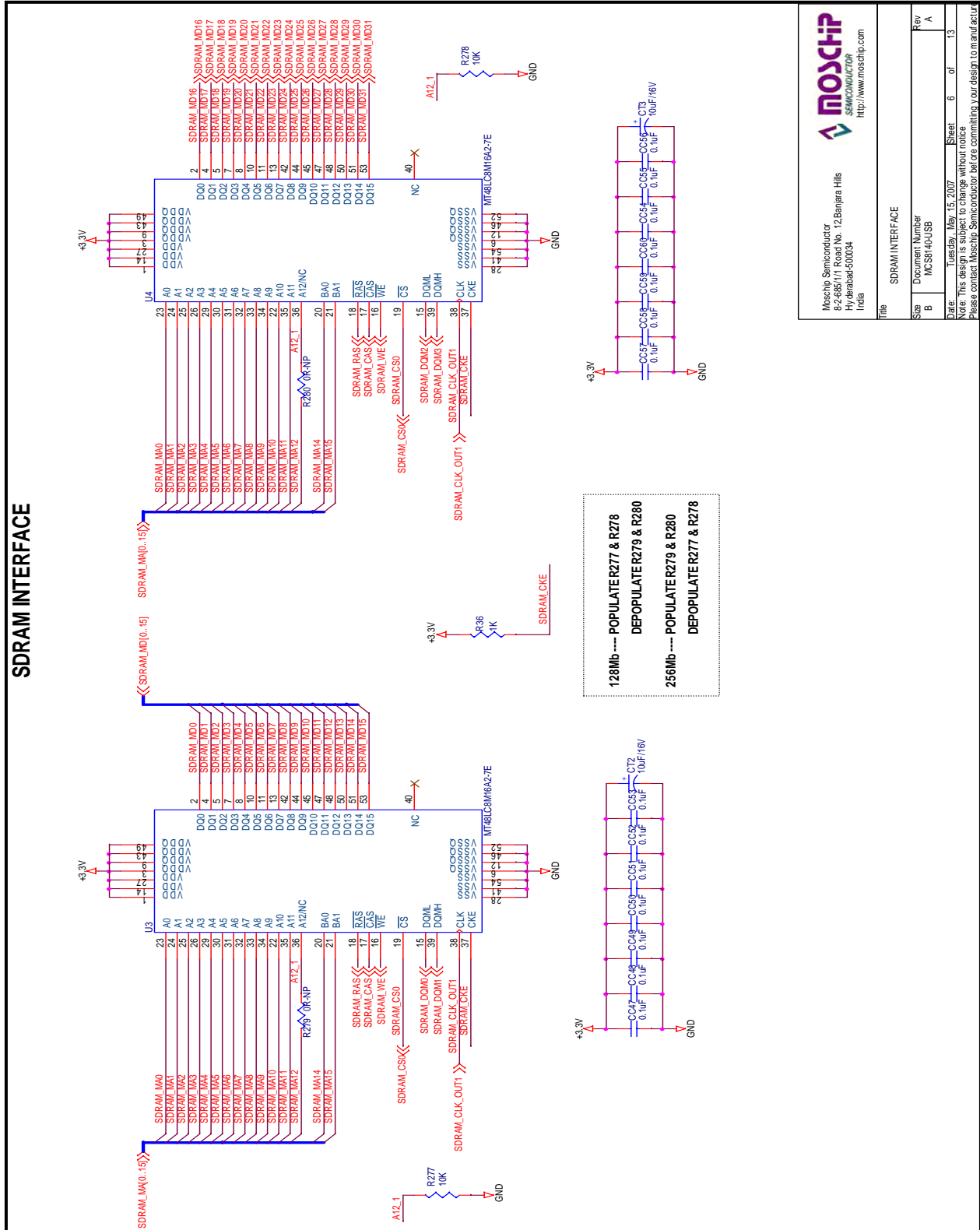
2. Interfacing SDRAM

The MCS8140 memory controller is capable of interfacing upto 128 MB, 32 bit of SDRAM. It provides two SDRAM chip selects, SDRAM_CS_0 and SDRAM_CS_1. There are 15 address lines (A0 to A15, with A13 not being used for SDRAM) giving a total of 64MB address space per chip select. Depending upon the system implementation, the boot-loader should configure the memory controller on power-up so that the correct SDRAM size and organization is reported to the on-board OS. The MCS8140 supports the following SDRAM combinations:

SDRAM Size	SDRAM Organization	Total Bus width	Number of chips	Total size	#Rows	#Columns	Bank Addresses	Micron Part#
64Mbit	1 Meg X 16 X 4	X16	1	8MB	4K(A0-A11)	256(A0-A7)	4(BA0-BA1)	MT48LC4 M16A2
64Mbit	1 Meg X 16 X 4	X32	2	16MB	4K(A0-A11)	256(A0-A7)	4(BA0-BA1)	MT48LC4 M16A2
128Mbit	2 Meg X 16 X 4	X16	1	16MB	4K(A0-A11)	512(A0-A8)	4(BA0-BA1)	MT48LC8 M16A2
128Mbit	2 Meg X 16 X 4	X32	2	32MB	4K(A0-A11)	512(A0-A8)	4(BA0-BA1)	MT48LC8 M16A2
256Mbit	4 Meg X 16 X 4	X16	1	32MB	8K(A0-A12)	512(A0-A8)	4(BA0-BA1)	MT48LC1 6M16A2
256Mbit	4 Meg X 16 X 4	X32	2	64MB	8K(A0-A12)	512(A0-A8)	4(BA0-BA1)	MT48LC1 6M16A2
256Mbit	4 Meg X 16 X 4	X32	4(Two per CS)	128MB	8K(A0-A12)	512(A0-A8)	4(BA0-BA1)	MT48LC1 6M16A2

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Lines A14 and A15 are always Bank Addresses. Address lines A0 through A12 are distributed to row and column addresses. The following figure shows how the MCS8140 can interface to two 128Mbit X 16 SDRAMs to give 32MB X 32 bit SDRAM:



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3. Interfacing FLASH

The MCS8140 memory controller is capable of interfacing upto 128 MB, 16 bit of FLASH. It provides four FLASH chip selects, ADC_CS_0, ADC_CS_1, ADC_CS_2, ADC_CS_3. There are 26 address lines (A0 to A25, with A16 through A25 multiplexed with D20 through D29) giving a total of 32MB address space per chip select. However, the boot FLASH should always be 8-bit and connected to ADC_CS_3 only as required by the memory controller on power-up, to look for boot code. Depending upon the system implementation, the boot-loader should configure the memory controller on power-up so that the correct FLASH size and organization is reported to the on-board OS.

Since the MCS8140 memory controller's FLASH interface is fully programmable depending on the FLASH access times and timing requirements, it can be connected to any 8/16-bit parallel FLASH size upto 128 MB. This programmability also allows the remaining ADC chip selects to interface to any memory mapped 8/16-bit device such as an LCD display etc. Some FLASH combinations are shown below as examples.

Each FLASH Size	Bus width	Number of chips	Total size	Example part#
2MB	X8	1	2MB	LH28F160S3T-L10A
4MB	X8	1	4MB	M58LW032D
8MB	X8	1	8MB	M58LW064D/TE28F640J3D75/LH28F640SPHT
8MB	X8	2	16MB	M58LW064D/TE28F640J3D75/LH28F640SPHT

The above mentioned flash memories are TSOP-56 compatible.

Following are the few more Flash combinations with TSOP-48 compatible

Each FLASH Size	Bus width	Number of chips	Total size	Example part#
2MB	X8	1	2MB	M29W160B
4MB	X8	1	4MB	M29W320DB
8MB	X8	1	8MB	M29W640/MX29LV640
8MB	X8	2	16MB	M29W640/MX29LV640

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4. Summary

The MCS8140 is capable of interfacing with a wide variety of SDRAM and FLASH storage organizations, giving the system designer high flexibility between performance and price by choosing the configuration appropriate for the application.

Important Note :-

- a) 32MB, 32bit SDRAM (by using 2 Units of Micron MT48LC8M16A2 or CSI IC42S 16800 – 7T) and 16 MB / 8 MB 8bit Flash (2 x M58LW064D / 1 x M58LW064D) are used as default configurations on MosChip MCS8140 EVB.
- b) SDRAM size of 64MB (32MB per region) was confirmed on MosChip ASIC Evaluation boards by using 2 Units of x32bit mode SDRAM's. SDRAM size beyond 64MB confirmed over simulation environment & expected to work.
- c) Flash size up to 16MB (8MB x 2, 8bit Parallel Flash) was confirmed on MosChip ASIC Evaluation boards. Flash size beyond 16MB confirmed over simulation environment & expected to work.

5. Technical support

Write to support-8140@moschip.com for further queries.