intel®

iSBC® MM01, MM02, MM04, MM08
HIGH PERFORMANCE MEMORY MODULES

- **Provides High Speed Parity Memory Expansion for Intel's iSBC 286/2X, iSBC 386/2X and iSBC 386/10X CPU Boards**
- **Available in 1M, 2M, 4M, and 8M Byte Sizes**
- **32 Bits Wide with Byte Parity**

- **Stackable to Provide up to 16M Bytes of High Speed Memory**
- **Supports 32-Bit, 16-Bit and 8-Bit Data Paths**
- **Supports Independent Read/Writes**
- **Easily Installed**

The iSBC MM01, iSBC MM02, iSBC MM04, and iSBC MM08 DRAM memory modules are members of Intel's complete line of iSBC memory and I/O expansion boards. The MM-Series of memory modules use a dedicated interface to maximize CPU/memory performance. The iSBC MM series of memory modules have been designed to provide both the on-board and expansion memory for the iSBC 286/2X, the iSBC 386/2X and the iSBC 386/10X CPU Boards.

The modules contain (respectively) 1M byte, 2M, 4M, and 8M bytes of read/write memory using surface mounted DRAM components (see Figure 1).

Due to the high speed interface of the memory modules, they are ideally suited in applications where memory performance is critical.
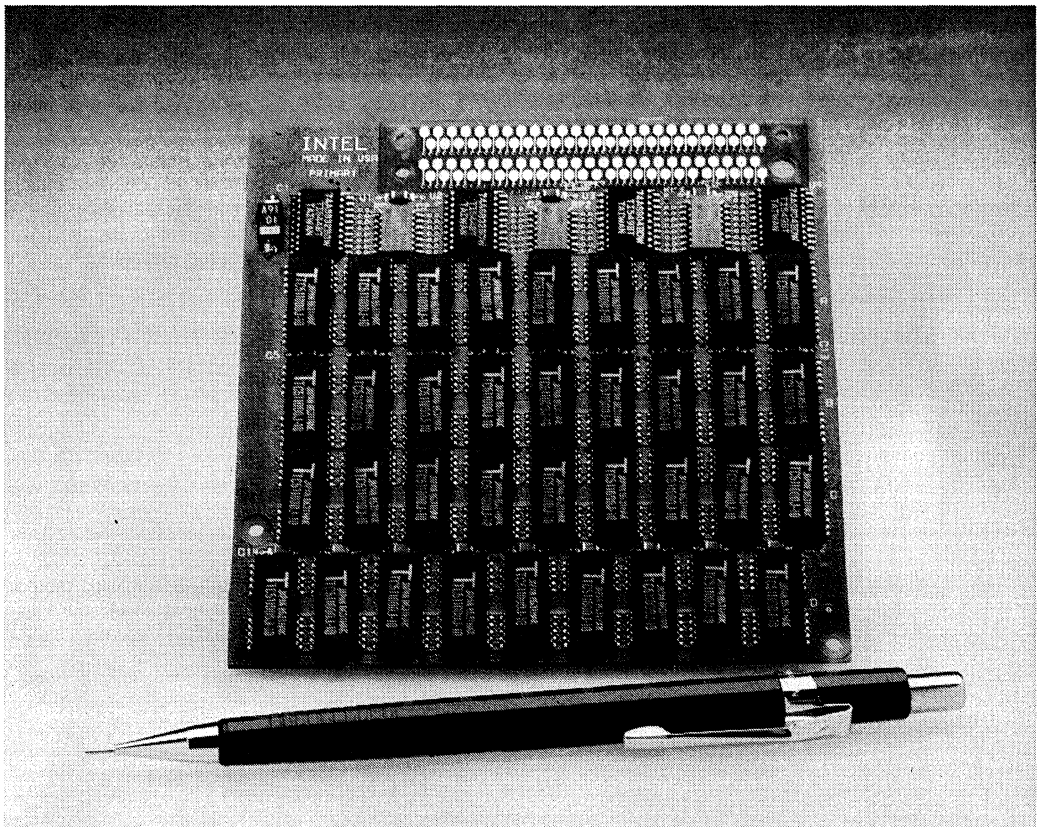

Figure 1. iSBC® MM08 Memory Module   280346–1

FUNCTIONAL DESCRIPTION

The iSBC MMxx memory modules provide high performance, 32-bit parity DRAM memory for the iSBC 286/2X and iSBC 386/2X MULTIBUS CPU boards and for the iSBC 386/10X MULTIBUS II CPU boards. These CPU boards come standard with one MMxx module installed, with memory expansion available through the addition of a second stackable iSBC MMxx module.

Memory Access Capabilities

The dynamic RAM memory of the memory modules is accessed through the dedicated memory module interface.

The MM memory module is designed for direct transfer of data between the CPU and the memory module without accessing the MULTIBUS interface.

MM01/MM02/MM04/MM08 Memory Size

The iSBC MM01, iSBC MM02, iSBC MM04, and iSBC MM08 modules can be stacked on the CPU baseboard in any combination of two memory modules to provide a total of 1-, 2-, 3-, 4-, 5-, 6-, 8-, 9-, 10-, 12-, or 16-M bytes of memory.

Data Bus Structure

The MMxx-series memory modules use a 32-bit wide data path with storage for byte parity that can accommodate 8-bit byte, 16-bit or 32-bit word data transfers. In addition, the data path is capable of independent byte operations. This means that one byte can be written while the other three bytes (or any other combination) can be read.

Parity

One parity bit is provided for each of the four, 8-bit bytes in the 32-bit wide data path. For special applications, the parity bits can serve as data bits making possible 9-, 18-, or 36-bit data transfers.

Memory Function

The module protocol supports standard dynamic RAM READ, WRITE, RAS* only REFRESH cycles, and CAS* before RAS* REFRESH.

Installation

The iSBC MMxx memory modules are easily installed by the user. Each module includes all necessary connectors, screws, and other hardware for installation, either as a second stacked module or as a replacement for a module with less memory.

SPECIFICATIONS

Word Size Supported

8-, 16-, or 32-bits

Memory Size

iSBC MM01	1,048,576 bytes
iSBC MM02	2,097,152 bytes
iSBC MM04	4,194,304 bytes
iSBC MM08	8,388,608 bytes

Access Time (All Densities)

Read/Write — 107ns (max)

The MMxx-series memory modules run with the iSBC 286/2X Boards at 10 MHz, and with the iSBC 386/2X and iSBC 386/10X Boards at 16 MHz and 20 MHz. Wait state performance information with each of these CPU baseboards is contained in the Hardware Reference Manual for the specific CPU baseboard.
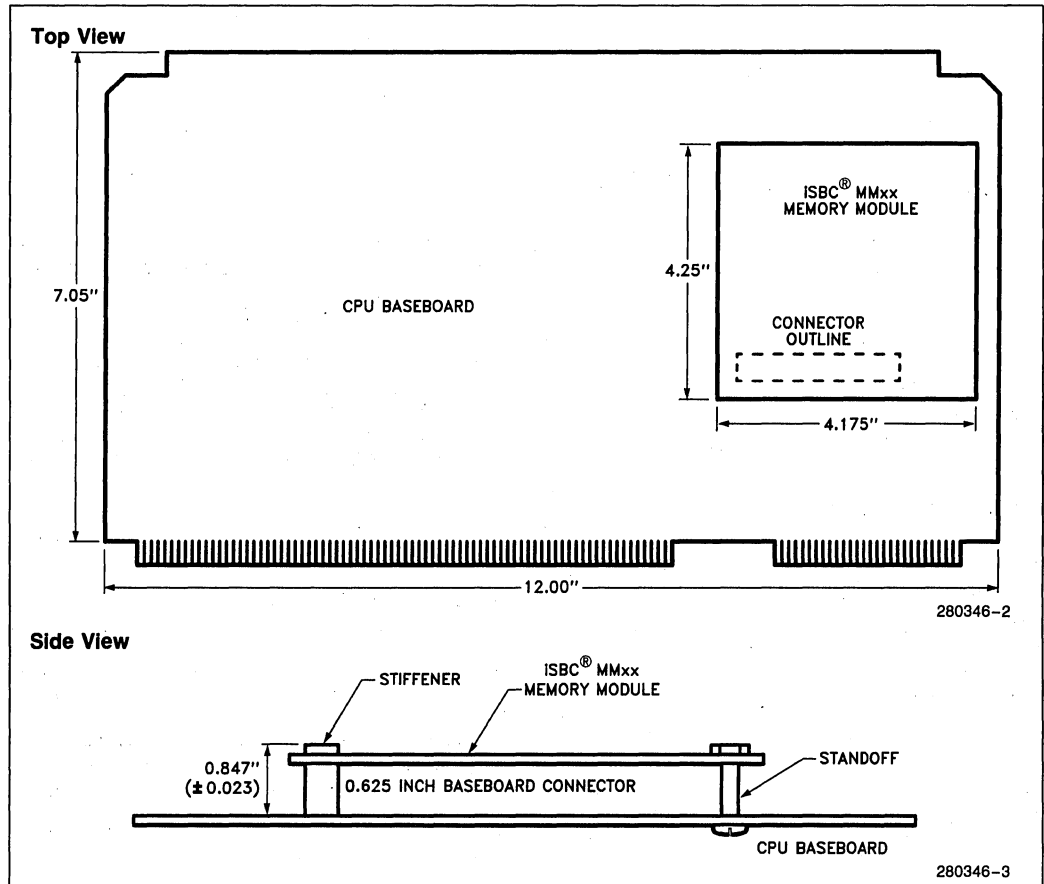
Cycle Time (All Densities)
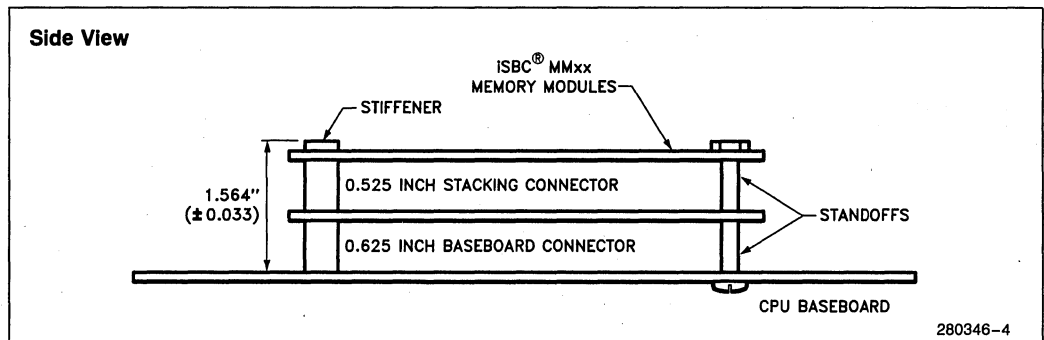
Read/Write — 200ns (min)

Power Requirements

Voltage −5 VDC ±5%

Memory addressing for the iSBC MMxx memory modules is controlled by the host CPU board over the memory module interface. The maximum system RAM size is 16M Bytes.

Top View

7.05"

CPU BASEBOARD

ISBC® MMxx
MEMORY MODULE

4.25"

CONNECTOR
OUTLINE

4.175"

12.00"

280346-2

Side View

STIFFENER

ISBC® MMxx
MEMORY MODULE

0.847"
(±0.023)

0.625 INCH BASEBOARD CONNECTOR

STANDOFF

CPU BASEBOARD

280346-3

Single iSBC® MMxx Memory Module

Side View

ISBC® MMxx
MEMORY MODULES

STIFFENER

1.564"
(±0.033)

0.525 INCH STACKING CONNECTOR

0.625 INCH BASEBOARD CONNECTOR

STANDOFFS

CPU BASEBOARD

280346-4

Stacked iSBC® MMxx Memory Modules

Environmental Requirements

Operating Temperature — 0°C to 60°C

Storage Temperature — 40°C to +75°C

Cooling Requirement — 3 cubic feet per minute of airflow at an ambient temperature of 0°C to 60°C

Operating Humidity — To 95% relative humidity without condensation

Physical Dimensions

Module Alone:

Width — 4.250 inches (10,795 cm)

Length — 4.175 inches (10,604 cm)

Height — 0.500 inches (1,270 cm)

Weight — iSBC MM01/MM04: 2.5 ounces (70.0 gm)

iSBC MM02/MM08: 3.5 ounces (110.0 gm)

Module and Connector:

Weight — 1.7 ounces (47,4 gm) connector and stiffener only

Total Weight — iSBC MM01/MM04 and connector: 4.2 ounces (117,4 gm)

iSBC MM02/MM08 and connector: 5.2 ounces (145,4 gm)

Height — height from the top of the CPU baseboard to the highest point of the Memory Module:

ORDERING INFORMATION

Part Number	Description
iSBC MM01	1M Byte RAM Memory Module
iSBC MM02	2M Byte RAM Memory Module
iSBC MM04	4M Byte RAM Memory Module
iSBC MM08	8M Byte RAM Memory Module

The Memory Modules ship with the required hardware (connectors, mounting screws, stand-offs, etc.) to stack a second module on the module already mounted on the base CPU board.

For example, an iSBC MM01 stacked on an iSBC 286/21 will provide 2M bytes of total memory; an iSBC MM01 stacked on an iSBC 286/22 will provide 3M bytes total memory; an iSBC MM02 stacked on an iSBC 286/22 will provide 4M bytes of total memory; and so on.

REFERENCE MANUAL

iSBC 286/2X Hardware Reference Manual Order Number: 148920

iSBC 386/21/22/24/28 Single Board Computer Hardware Reference Manual Order Number: 149094

Manuals may be ordered from any Intel Sales Representative, Distributor Office or from the Intel Literature Department, 3065 Bowers Avenue, Santa Clara, CA 95051.