

### FEATURES

- Bit organization
  - 1Mb x 16 (word mode only)
- Fast access time
  - Random access:70ns(max.)
- Current
  - Operating:15mA
  - Standby:15uA(max.)
- Supply voltage
  - VCC : 2.7 ~ 3.6V
  - VCCQ : 2.7 ~ 3.6V
- Package
  - 48 pin TSOP (12mm X 20mm)
  - 48 ball mini BGA (8.0mm X 6.0mm, ball pitch 0.75mm)
- Temperature
  - 40~85° C

### PIN DESCRIPTION

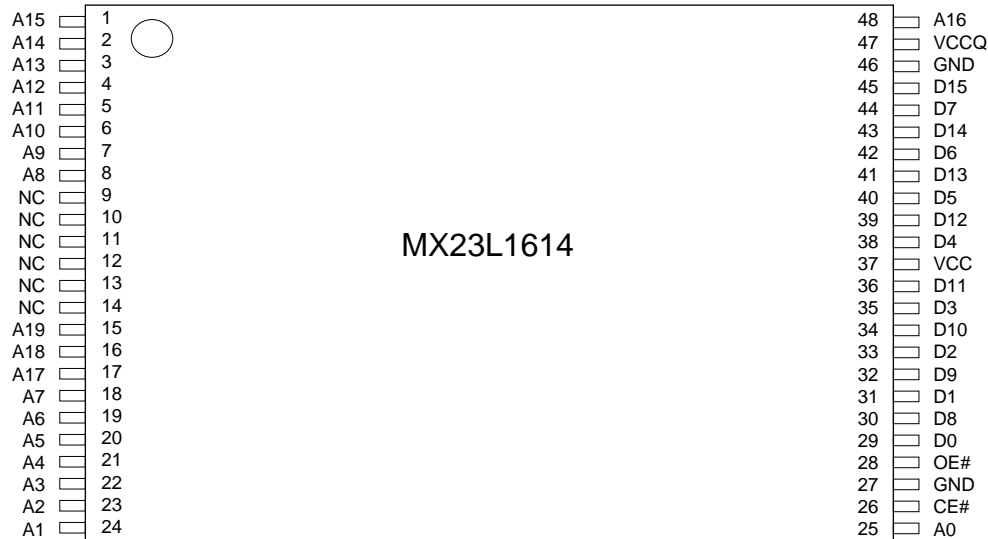
| Symbol | Pin Function        |
|--------|---------------------|
| A0~A19 | Address Inputs      |
| D0~D15 | Data Outputs        |
| CE#    | Chip Enable Input   |
| OE#    | Output Enable Input |
| VCC    | Power Supply Pin    |
| VCCQ   | Output VCC Pin      |
| GND    | Ground Pin          |
| NC     | No Connection       |

### MODE SELECTION

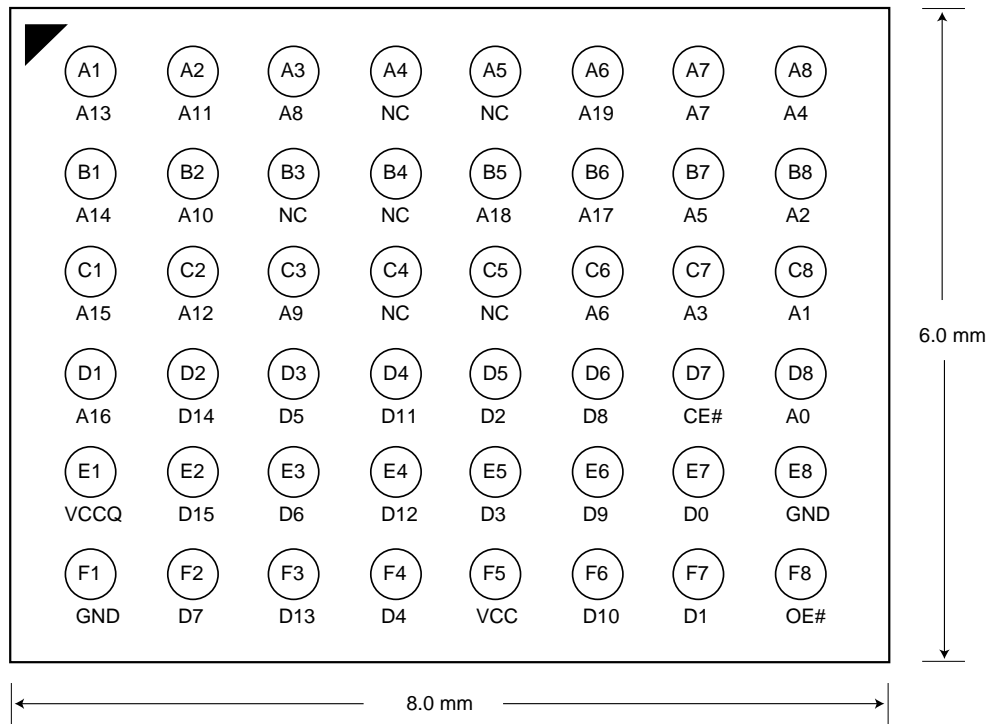
| CE# | OE# | D0~D15 | Power    |
|-----|-----|--------|----------|
| H   | X   | High Z | Stand-by |
| L   | H   | High Z | Active   |
| L   | L   | D0~D15 | Active   |

### PIN CONFIGURATION

#### 48 TSOP (Top View)



## 48 Mini BGA (Top View, Ball Down)



## ORDER INFORMATION

| Part No.       | Speed | Package          | Grade      |
|----------------|-------|------------------|------------|
| MX23L1614TI-70 | 70ns  | 48 pin TSOP      | Industrial |
| MX23L1614TI-90 | 90ns  | 48 pin TSOP      | Industrial |
| MX23L1614TI-10 | 100ns | 48 pin TSOP      | Industrial |
| MX23L1614XI-70 | 70ns  | 48 ball mini BGA | Industrial |
| MX23L1614XI-90 | 90ns  | 48 ball mini BGA | Industrial |
| MX23L1614XI-10 | 100ns | 48 ball mini BGA | Industrial |

Note: Industrial grade temperature: -40 ~ 85° C  
 Commercial grade temperature: 0 ~ 70° C

**ABSOLUTE MAXIMUM RATINGS**

| Item                               | Symbol | Ratings          |
|------------------------------------|--------|------------------|
| Voltage on any Pin Relative to VSS | VIN    | -0.3V to 3.9V    |
| Ambient Operating Temperature      | Topr   | -40° C to 85° C  |
| Storage Temperature                | Tstg   | -65° C to 125° C |

**DC CHARACTERISTICS** (Ta = -40° C ~ 85° C, VCC = 2.7V~3.6V)

| Item                   | Symbol | MIN.  | MAX.      | Conditions                                  |
|------------------------|--------|-------|-----------|---|
| Output High Voltage    | VOH    | 2.4V  | -         | IOH = -400uA                                |
| Output Low Voltage     | VOL    | -     | 0.4V      | IOL = 1.6mA                                 |
| Input High Voltage     | VIH    | 2.2V  | VCCQ+0.3V |   |
| Input Low Voltage      | VIL    | -0.4V | 0.4V      |   |
| Input Leakage Current  | ILI    | -     | 5uA       | 0V, VCC                                     |
| Output Leakage Current | ILO    | -     | 5uA       | 0V, VCC                                     |
| Operating Current      | ICC    | -     | 15mA      | f=5MHz, CE#=VIL, OE#=VIH<br>all output open |
| Standby Current (CMOS) | ISTB   | -     | 15uA      | CE#>VCC-0.2V                                |
| Input Capacitance      | CIN    | -     | 10pF      | Ta = 25° C, f = 1MHZ                        |
| Output Capacitance     | COUT   | -     | 10pF      | Ta = 25° C, f = 1MHZ                        |

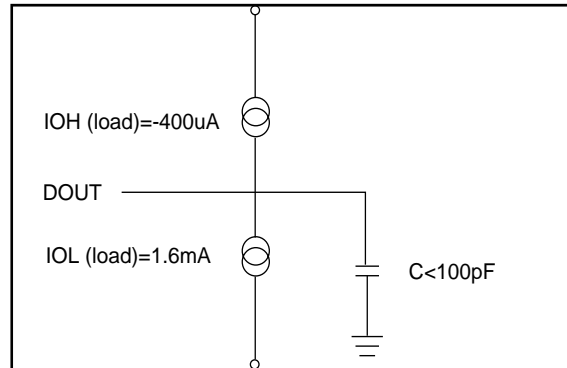
**AC CHARACTERISTICS** (Ta = -40° C ~ 85° C, VCC = 2.7V~3.6V)

| Item                      | Symbol | MX23L1614-70 |      | MX23L1614-90 |      | MX23L1614-10 |       |
|---------------------------|--------|--------------|------|--------------|------|--------------|-------|
|                           |        | MIN.         | MAX. | MIN.         | MAX. | MIN.         | MAX.  |
| Read Cycle Time           | tRC    | 70ns         | -    | 90ns         | -    | 100ns        | -     |
| Address Access Time       | tAA    | -            | 70ns | -            | 90ns | -            | 100ns |
| Chip Enable Access Time   | tACE   | -            | 70ns | -            | 90ns | -            | 100ns |
| Output Enable Time        | tOE    | -            | 20ns | -            | 20ns | -            | 30ns  |
| Output Hold After Address | tOH    | 0ns          | -    | 0ns          | -    | 0ns          | -     |
| Output High Z Delay       | tHZ    | -            | 20ns | -            | 20ns | -            | 20ns  |

Note: Output high-impedance delay (tHZ) is measured from OE# or CE# going high, and this parameter guaranteed by design over the full voltage and temperature operating range - not tested.

## AC Test Conditions

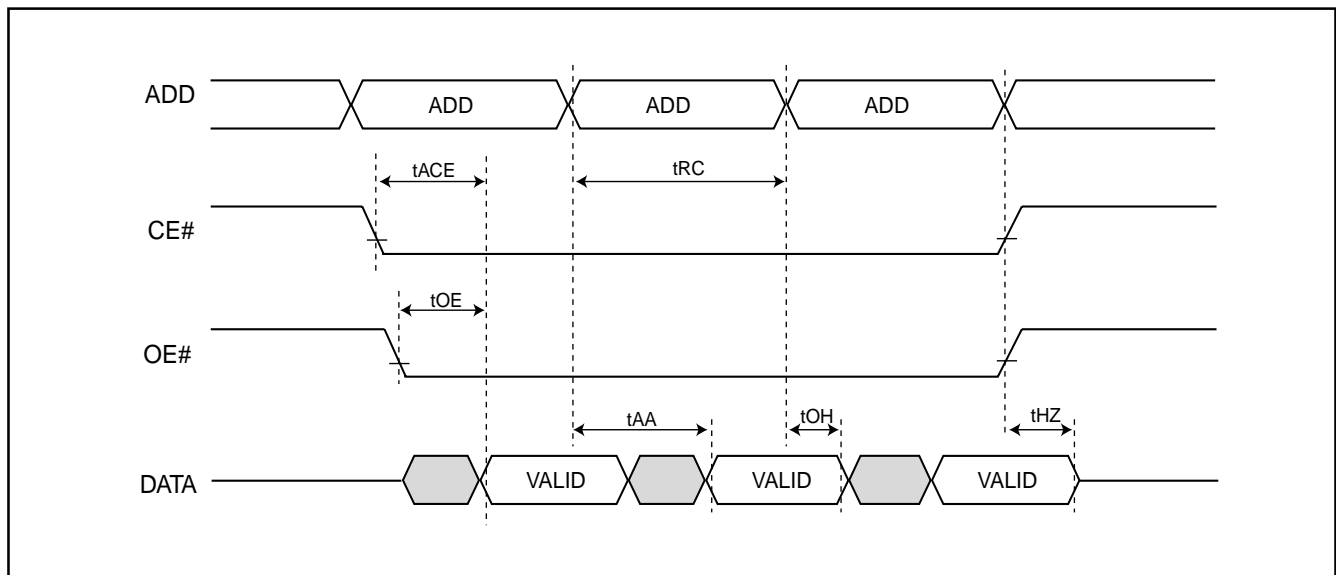
|                           |  |
|---------------------------|--|
| Input Pulse Levels        | 0.4V~2.4V                                      |
| Input Rise and Fall Times | 5ns  |
| Input Timing Level        | 1.5V   |
| Output Timing Level       | 1.5V   |
| Output Load               | See Figure<br>100pF output load<br>capacitance |

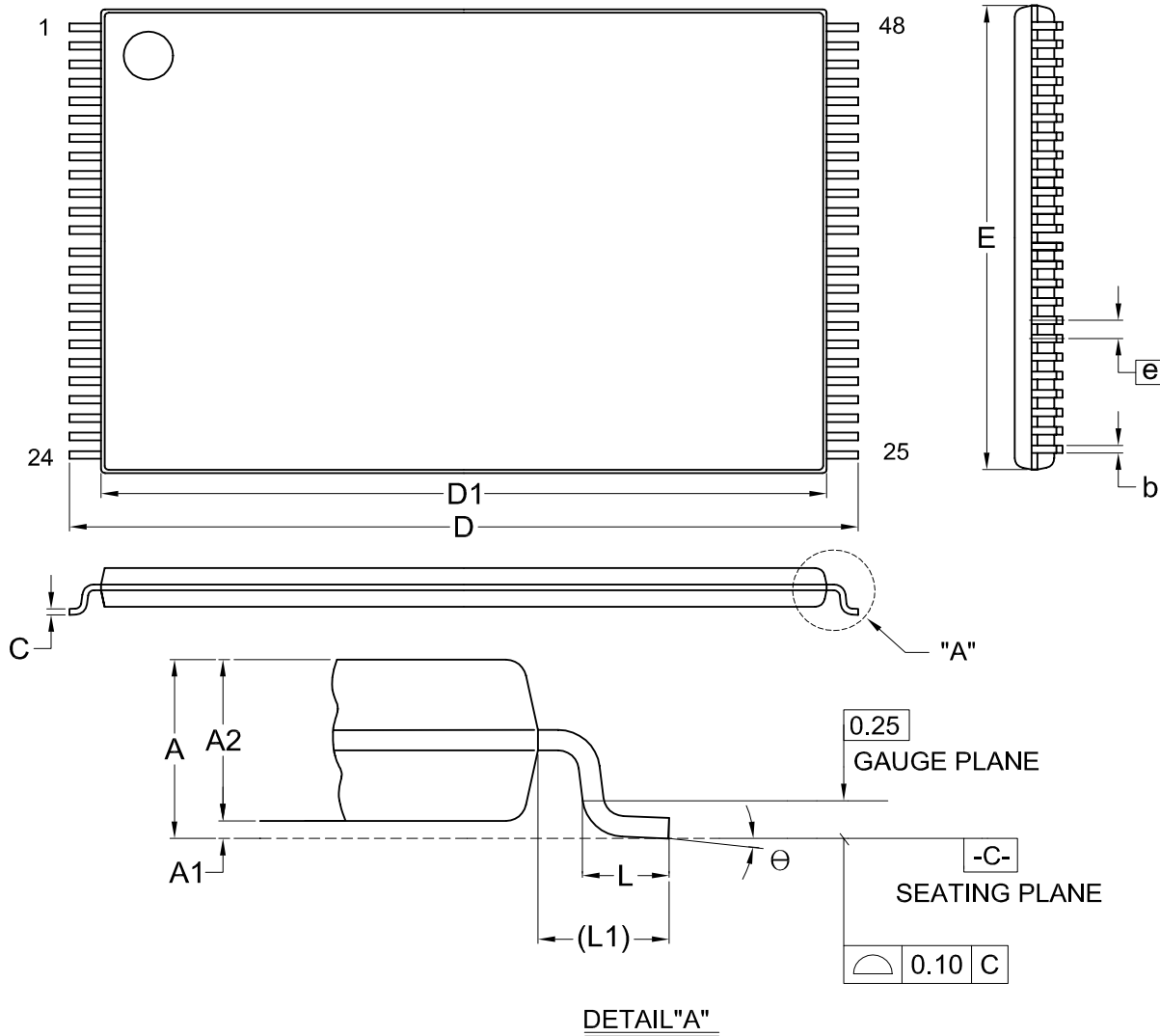


Note: No output loading is present in tester load board.  
Active loading is used and under software programming control.  
Output loading capacitance includes load board's and all stray capacitance.

## TIMING DIAGRAM

### RANDOM READ



**PACKAGE INFORMATION**
**Title: Package Outline for TSOP(I) 48L (12X20mm)NORMAL FORM**

DETAIL "A"

Dimensions (inch dimensions are derived from the original mm dimensions)

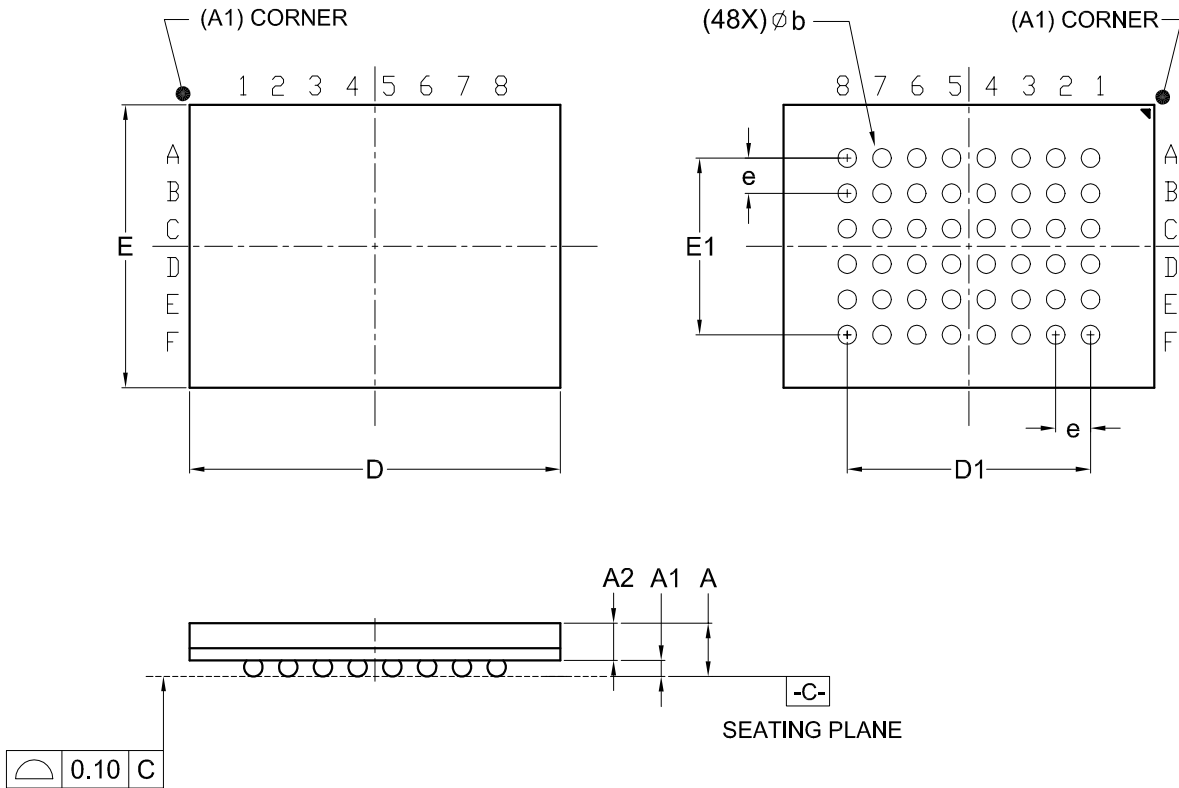
| SYMBOL |      | A     | A1    | A2    | b     | C     | D     | D1    | E     | e     | L     | L1    | $\theta$ |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| UNIT   |      |       |       |       |       |       |       |       |       |       |       |       |          |
| mm     | Min. | ---   | 0.05  | 0.95  | 0.17  | 0.10  | 19.80 | 18.30 | 11.90 |       | 0.50  | 0.70  | 0        |
|        | Nom. | ---   | 0.10  | 1.00  | 0.20  | 0.13  | 20.00 | 18.40 | 12.00 | 0.50  | 0.60  | 0.80  | 5        |
|        | Max. | 1.20  | 0.15  | 1.05  | 0.27  | 0.21  | 20.20 | 18.50 | 12.10 |       | 0.70  | 0.90  | 8        |
| Inch   | Min. | ---   | 0.002 | 0.037 | 0.007 | 0.004 | 0.780 | 0.720 | 0.469 |       | 0.020 | 0.028 | 0        |
|        | Nom. | ---   | 0.004 | 0.039 | 0.008 | 0.005 | 0.787 | 0.724 | 0.472 | 0.020 | 0.024 | 0.031 | 5        |
|        | Max. | 0.047 | 0.006 | 0.041 | 0.011 | 0.008 | 0.795 | 0.728 | 0.476 |       | 0.028 | 0.035 | 8        |

| DWG.NO.   | REVISION | REFERENCE |      |  | ISSUE DATE |
|-----------|----------|-----------|------|--|------------|
|           |          | JEDEC     | EIAJ |  |            |
| 6110-1607 | 7        | MO-142    |      |  | 12-01-'03  |

Title: Package Outline for CSP 48BALL(8X6X1.2MM,BALL PITCH 0.75MM,BALL DIAMETER 0.35MM)

TOP VIEW

BOTTOM VIEW



Dimensions (inch dimensions are derived from the original mm dimensions)

| SYMBOL |      | A     | A1    | A2    | b     | D     | D1    | E     | E1    | e     |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| mm     | Min. | ---   | 0.22  | 0.65  | 0.30  | 7.90  |       | 5.90  |       |       |
|        | Nom. | ---   | 0.27  | ---   | 0.35  | 8.00  | 5.25  | 6.00  | 3.75  | 0.75  |
|        | Max. | 1.20  | 0.32  | ---   | 0.40  | 8.10  |       | 6.10  |       |       |
| Inch   | Min. | ---   | 0.009 | 0.026 | 0.012 | 0.311 |       | 0.232 |       |       |
|        | Nom. | ---   | 0.011 | ---   | 0.014 | 0.315 | 0.207 | 0.236 | 0.148 | 0.030 |
|        | Max. | 0.047 | 0.013 | ---   | 0.016 | 0.319 |       | 0.240 |       |       |

| DWG.NO.   | REVISION | REFERENCE |      |  | ISSUE DATE |
|-----------|----------|-----------|------|--|------------|
|           |          | JEDEC     | EIAJ |  |            |
| 6110-4208 | 4        | MO-207    |      |  | 12-15-'05  |

**REVISION HISTORY**

| <b>Revision</b> | <b>Description</b>   | <b>Page</b> | <b>Date</b> |
|-----------------|--|-------------|-------------|
| 1.1             | Modify Standby Current 7uA-->15uA  | P1,2        | AUG/08/2000 |
|                 | Modify Operating Current 18mA-->15mA   | P1,2        |             |
|                 | Modify Pin Description/Pin Configuration VSS-->GND   | P1,2        |             |
|                 | Modify Random Access:90ns-->110ns  | P1          |             |
| 1.2             | Add Pin Configuration--48 Mini BGA   | P1          | OCT/17/2000 |
|                 | Add AC Characteristics--MX23L1614-80/90/100  | P2          |             |
| 1.3             | Modify Package-48 ball mini BGA(8mm x 10mm)-->(6.0mm x 8.0mm)  | P1          | NOV/24/2000 |
|                 | Modify 48-pin PIN Configuration  | P2          |             |
| 1.4             | Modify Mode Selection--> L, H, High Z, Active  | P1          | DEC/19/2000 |
| 1.5             | Modify Fast Access Time:80ns-->70ns(max.)  | P1,2        | JAN/18/2001 |
| 1.6             | Modify Pin Configuration--48 mini BGA  | P1          | JUN/29/2001 |
|                 | Add Package Information  | P5,6        |             |
| 1.7             | Added Order Information  | P2          | JUL/10/2001 |
| 1.8             | 1.Modify DC Characteristics--VOH:VCCQ-0.1V-->2.4V, IOH=-100uA-->-400uA, VOL:0.1V-->0.4V, IOL:100uA-->1.6mA, VIH:VCCQ-0.4V-->2.2V | P3          | SEP/10/2001 |
|                 | 2.Modify AC Test Conditions--Input Pulse Levels:0~VCCQ-->0.4V~2.4V, P4   |             |             |
|                 | Input/Output Timing Level:VCCQx0.5-->1.5V, Output Load:50pF-->100pF output load capacitance                                      |             |             |
| 1.9             | Add CE#=VIL, OE#=VIH in DC Characteristics's ICC   | P3          | SEP/28/2001 |
| 2.0             | Modify 48-Ball BAG Package Information   | P6          | MAR/12/2002 |
| 2.1             | 1. To modify Package Information   | P5,6        | MAR/28/2003 |



**MX23L1614**

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**MACRONIX INTERNATIONAL Co., LTD.**

**Headquarters:**

TEL:+886-3-578-6688

FAX:+886-3-563-2888

**Europe Office :**

TEL:+32-2-456-8020

FAX:+32-2-456-8021

**Hong Kong Office :**

TEL:+86-755-834-335-79

FAX:+86-755-834-380-78

**Japan Office :**

**Kawasaki Office :**

TEL:+81-44-246-9100

FAX:+81-44-246-9105

**Osaka Office :**

TEL:+81-6-4807-5460

FAX:+81-6-4807-5461

**Singapore Office :**

TEL:+65-6346-5505

FAX:+65-6348-8096

**Taipei Office :**

TEL:+886-2-2509-3300

FAX:+886-2-2509-2200

**MACRONIX AMERICA, INC.**

TEL:+1-408-262-8887

FAX:+1-408-262-8810

*<http://www.macronix.com>*

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