

## 32M-BIT MASK ROM (8/16-BIT OUTPUT)

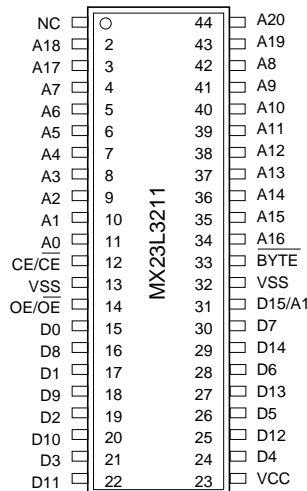
### FEATURES

- Bit organization
  - 4M x 8 (byte mode)
  - 2M x 16 (word mode)
- Fast access time
  - Random access: 70ns (max.)
  - Page access: 25ns (max.)
- Page Size
  - 8 words per page

- Current
  - Operating: 40mA
  - Standby: 5uA
- Supply voltage
  - 3.0V ~ 3.6V for 90ns and 70ns speed grades
  - 2.7V ~ 3.6V for 100ns and 120ns speed grades
- Package
  - 44 pin SOP (500mil)
  - 48 pin TSOP (12mm x 20mm)

### PIN CONFIGURATION

#### 44 SOP



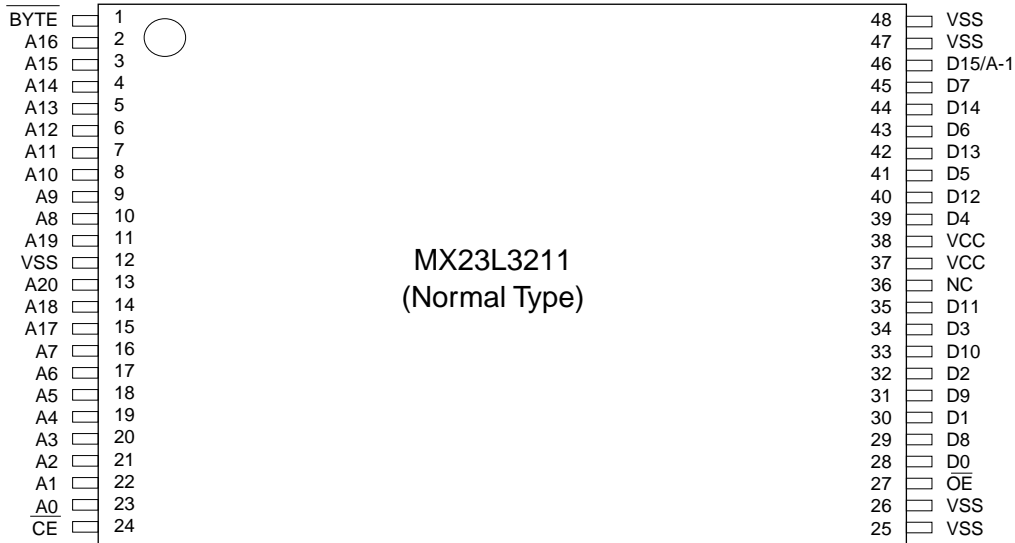
### PIN DESCRIPTION

| Symbol          | Pin Function                             |
|-----------------|--|
| A0~A20          | Address Inputs                           |
| D0~D14          | Data Outputs                             |
| D15/A-1         | D15 (Word Mode)/ LSB Address (Byte Mode) |
| $\overline{CE}$ | Chip Enable Input                        |
| $\overline{OE}$ | Output Enable Input                      |
| Byte            | Word/ Byte Mode Selection                |
| VCC             | Power Supply Pin                         |
| VSS             | Ground Pin                               |
| NC              | No Connection                            |

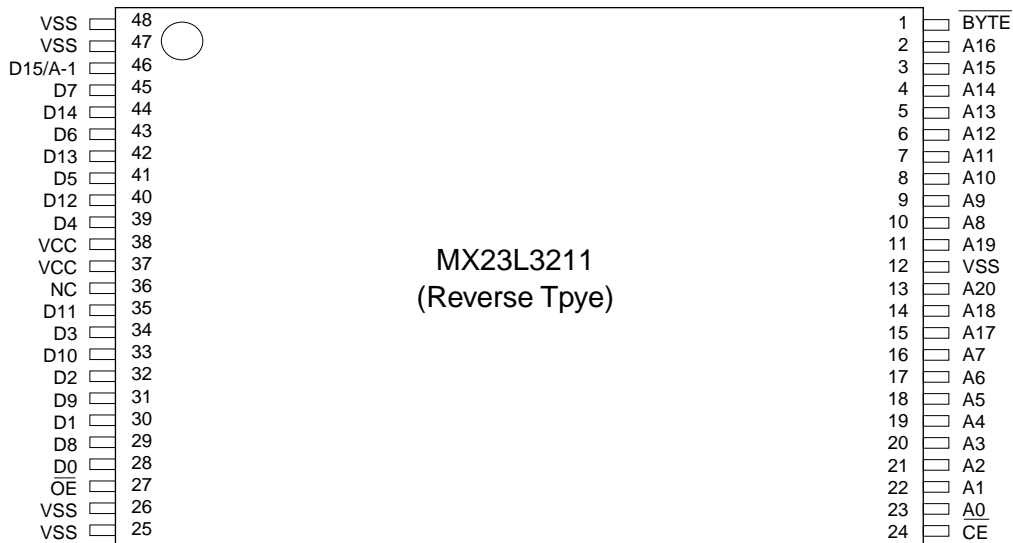
### ORDER INFORMATION

| Part No.        | Access Time | Page Access Time | Package                   | Remark  |
|-----------------|-------------|------------------|---------------------------|---------|
| MX23L3211MC-70  | 70ns        | 25ns             | 44 pin SOP                |         |
| MX23L3211MC-90  | 90ns        | 25ns             | 44 pin SOP                |         |
| MX23L3211MC-10  | 100ns       | 30ns             | 44 pin SOP                |         |
| MX23L3211MC-12  | 120ns       | 50ns             | 44 pin SOP                |         |
| MX23L3211MC-10G | 100ns       | 30ns             | 44 pin SOP                | Pb-free |
| MX23L3211MC-12G | 120ns       | 50ns             | 44 pin SOP                | Pb-free |
| MX23L3211TC-90  | 90ns        | 25ns             | 48 pin TSOP               |         |
| MX23L3211TC-10  | 100ns       | 30ns             | 48 pin TSOP               |         |
| MX23L3211TC-12  | 120ns       | 50ns             | 48 pin TSOP               |         |
| MX23L3211TC-10G | 100ns       | 30ns             | 48 pin TSOP               | Pb-free |
| MX23L3211TC-12G | 120ns       | 50ns             | 48 pin TSOP               | Pb-free |
| MX23L3211RC-90  | 90ns        | 25ns             | 48 pin TSOP(Reverse type) |         |
| MX23L3211RC-10  | 100ns       | 30ns             | 48 pin TSOP(Reverse type) |         |
| MX23L3211RC-12  | 120ns       | 50ns             | 48 pin TSOP(Reverse type) |         |

## 48 TSOP (Normal Type)



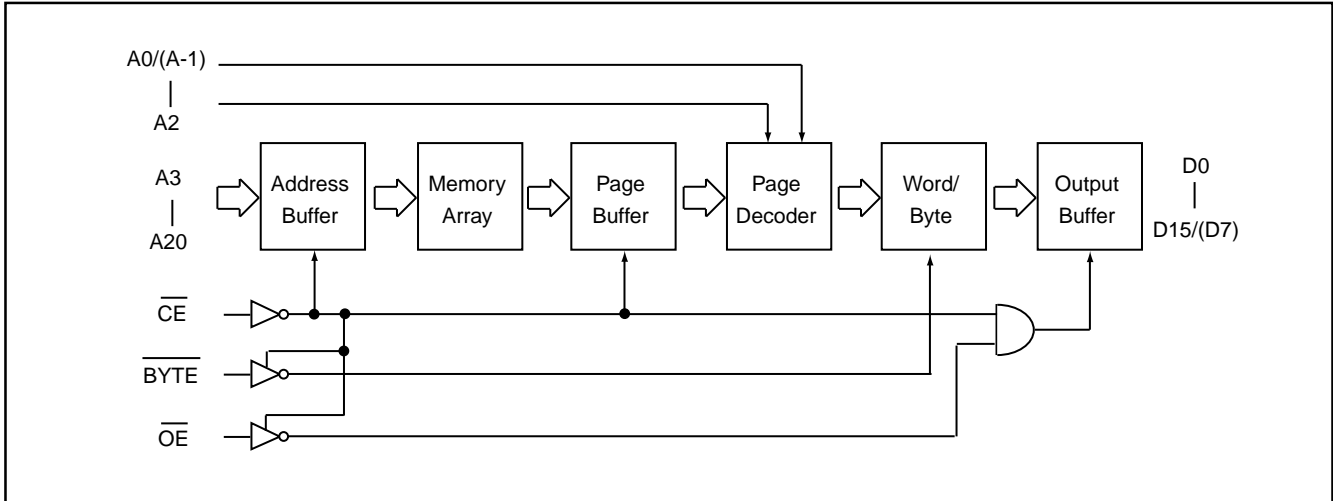
## 48 TSOP (Reverse Type)



## MODE SELECTION

| $\overline{\text{CE}}$ | $\overline{\text{OE}}$ | $\overline{\text{Byte}}$ | D15/A-1 | D0~D7  | D8~D15 | Mode | Power    |
|------------------------|------------------------|--------------------------|---------|--------|--------|------|----------|
| H                      | X                      | X                        | X       | High Z | High Z | -    | Stand-by |
| L                      | H                      | X                        | X       | High Z | High Z | -    | Active   |
| L                      | L                      | H                        | Output  | D0~D7  | D8~D15 | Word | Active   |
| L                      | L                      | L                        | Input   | D0~D7  | High Z | Byte | Active   |

**BLOCK DIAGRAM**



**ABSOLUTE MAXIMUM RATINGS**

| Item                               | Symbol | Ratings             |
|------------------------------------|--------|---------------------|
| Supply Voltage Relative to VSS     | VCC    | -0.3V to 4.3V       |
| Voltage on any Pin Relative to VSS | VIN    | -0.5V to VCC + 2.0V |
| Ambient Operating Temperature      | Topr   | 0°C to 70°C         |
| Storage Temperature                | Tstg   | -65°C to 125°C      |

**DC CHARACTERISTICS** (Ta = 0°C ~ 70°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  | VCC+0.3V |                              |
| Input Low Voltage      | VIL    | -0.3V | 0.8V     |                              |
| Input Leakage Current  | ILI    | -     | 5uA      | 0V, VCC                      |
| Output Leakage Current | ILO    | -     | 5uA      | 0V, VCC                      |
| Operating Current      | ICC1   | -     | 40mA     | tRC = 100ns, all output open |
| Standby Current (TTL)  | ISTB1  | -     | 1mA      | CE = VIH                     |
| Standby Current (CMOS) | ISTB2  | -     | 5uA      | 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 = 0°C ~ 70°C, VCC = 2.7V~3.6V)

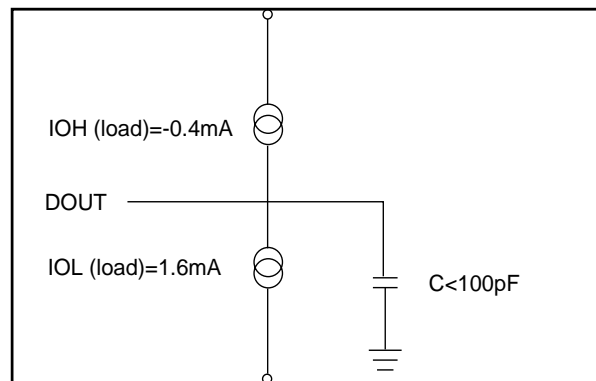
| Item                      | Symbol | 23L3211-70* |      | 23L3211-90 |      | 23L3211-10 |       | 23L3211-12 |       |
|---------------------------|--------|-------------|------|------------|------|------------|-------|------------|-------|
|                           |        | MIN.        | MAX. | MIN.       | MAX. | MIN.       | MAX.  | MIN.       | MAX.  |
| Read Cycle Time           | tRC    | 70ns        | -    | 90ns       | -    | 100ns      | -     | 120ns      | -     |
| Address Access Time       | tAA    | -           | 70ns | -          | 90ns | -          | 100ns | -          | 120ns |
| Chip Enable Access Time   | tACE   | -           | 70ns | -          | 90ns | -          | 100ns | -          | 120ns |
| Page Mode Access Time     | tPA    | -           | 25ns | -          | 25ns | -          | 30ns  | -          | 50ns  |
| Output Enable Time        | tOE    | -           | 25ns | -          | 25ns | -          | 30ns  | -          | 50ns  |
| Output Hold After Address | tOH    | 0ns         | -    | 0ns        | -    | 0ns        | -     | 0ns        | -     |
| Output High Z Delay       | tHZ*   | -           | 20ns | -          | 20ns | -          | 20ns  | -          | 20ns  |

Note:

- Output high-impedance delay (tHZ) is measured from  $\overline{OE}$  or  $\overline{CE}$  going high, and this parameter guaranteed by design over the full voltage and temperature operating range - not tested.
- For 70ns speed grade, the VCC range is 3.0~3.6V, operating temperature 0~55°C, and output load is 30pF.

## AC Test Conditions

|                           |            |
|---------------------------|------------|
| Input Pulse Levels        | 0.4V~ 2.6V |
| Input Rise and Fall Times | 10ns       |
| Input Timing Level        | 1.4V       |
| Output Timing Level       | 1.4V       |
| Output Load               | See Figure |

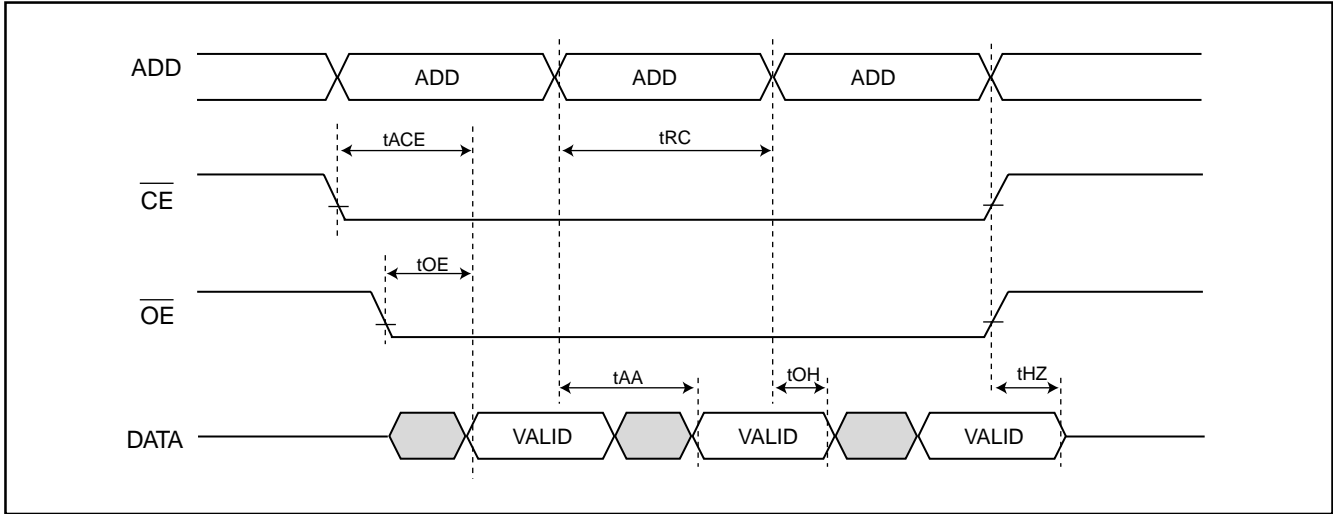


Note:

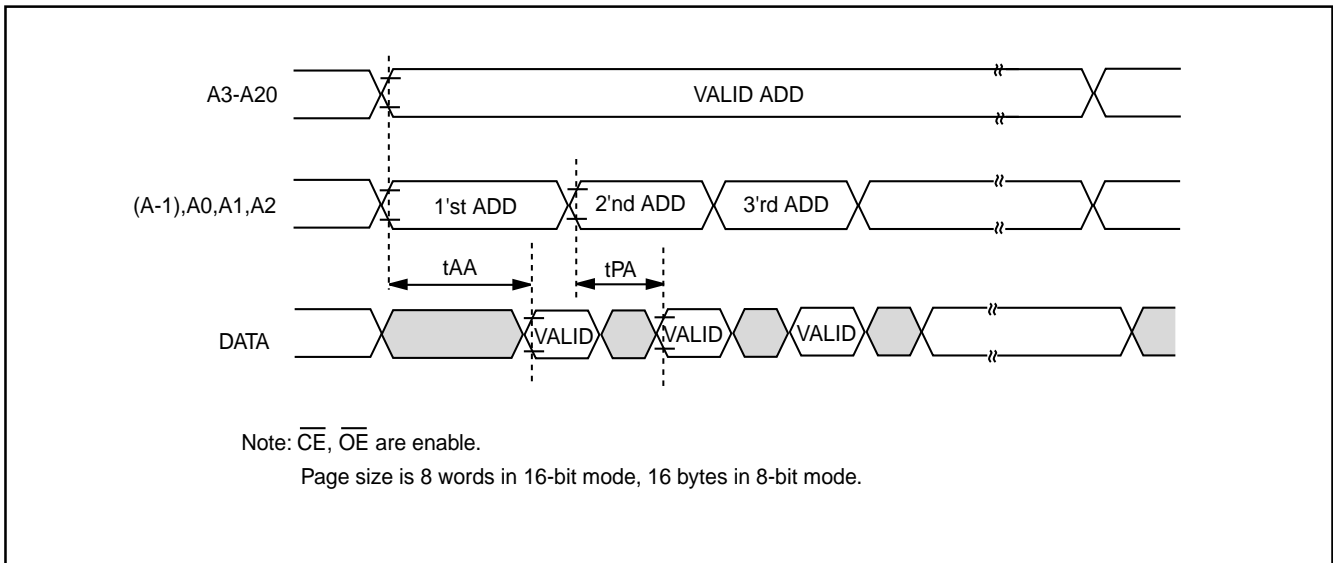
- No output loading is present in tester load board.
- Active loading is used and under software programming control.
- Output loading capacitance includes load board's and all stray capacitance.

**TIMING DIAGRAM**

**RANDOM READ**

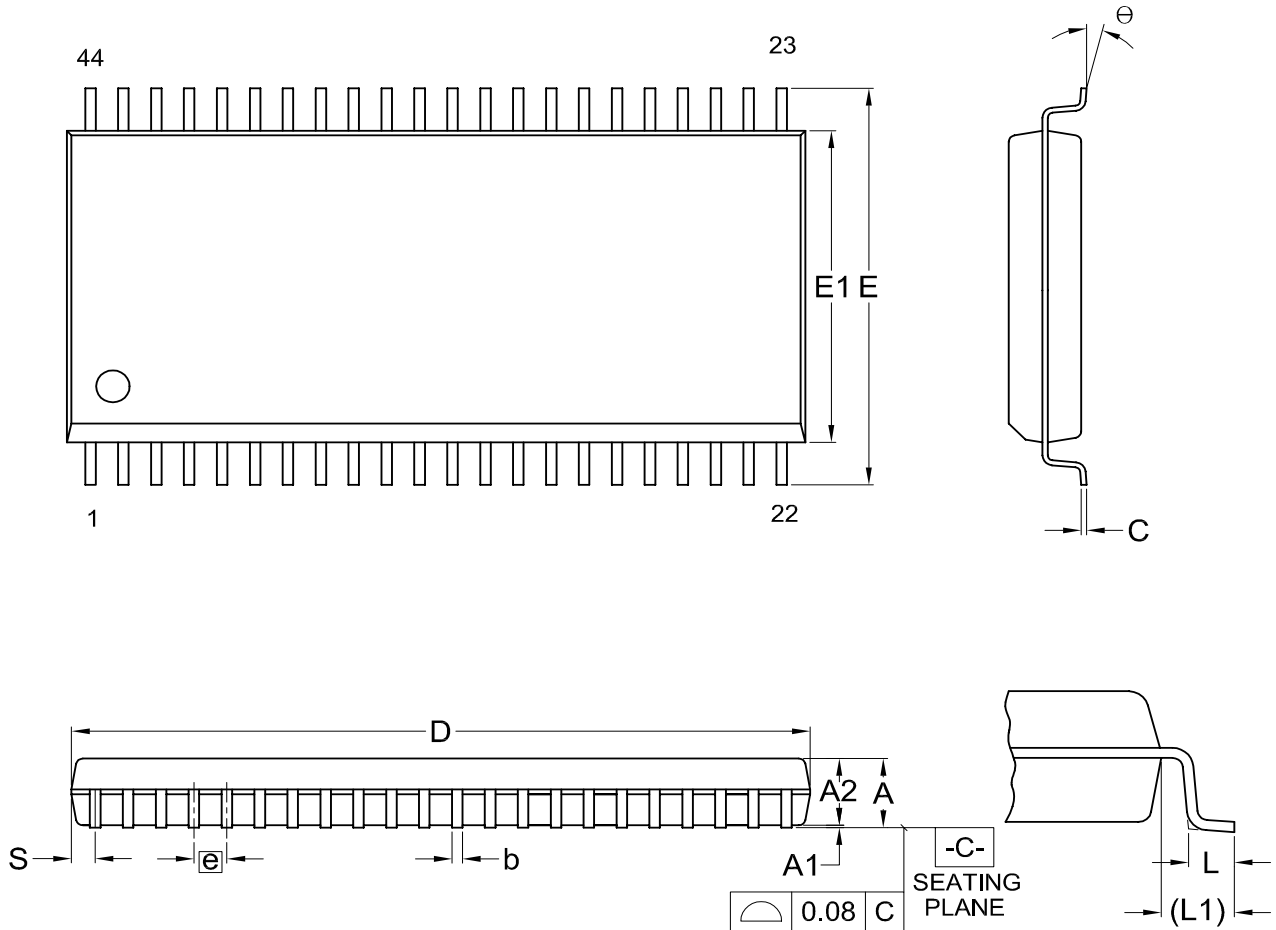


**PAGE READ**



**PACKAGE INFORMATION**

**Title:** Package Outline for SOP 44L (500MIL)

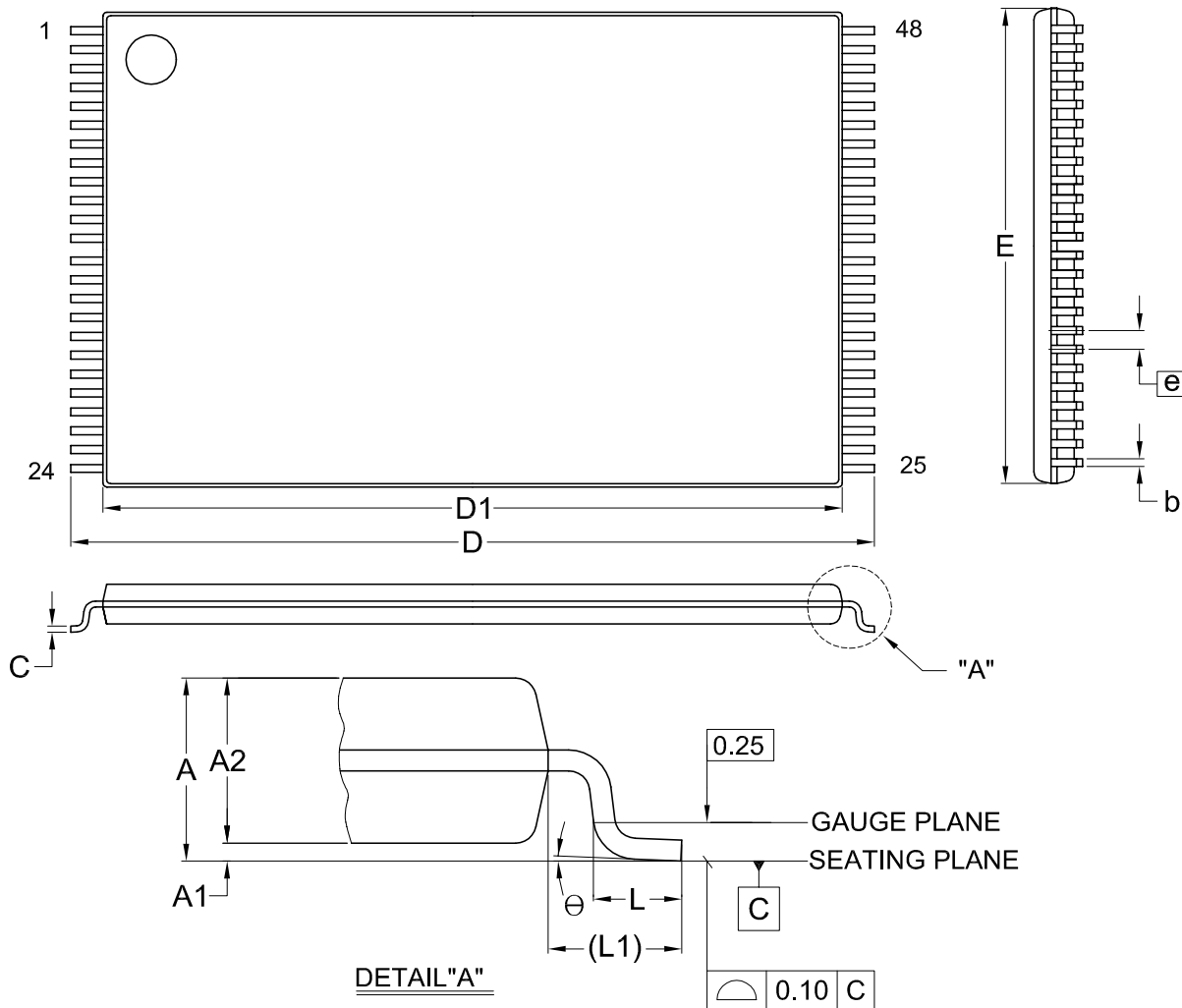


Dimensions (inch dimensions are derived from the original mm dimensions)

| SYMBOL |      | A     | A1    | A2    | b     | C     | D     | E     | E1    | e     | L     | L1    | S     | $\theta$ |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| UNIT   |      |       |       |       |       |       |       |       |       |       |       |       |       |          |
| mm     | Min. | ---   | 0.10  | 2.59  | 0.36  | 0.15  | 28.37 | 15.83 | 12.47 |       | 0.56  | 1.51  | 0.78  | 0        |
|        | Nom. | ---   | 0.15  | 2.69  | 0.41  | 0.20  | 28.50 | 16.03 | 12.60 | 1.27  | 0.76  | 1.71  | 0.91  | 5        |
|        | Max. | 3.00  | 0.20  | 2.80  | 0.51  | 0.25  | 28.63 | 16.23 | 12.73 |       | 0.96  | 1.91  | 1.04  | 10       |
| Inch   | Min. | ---   | 0.004 | 0.102 | 0.014 | 0.006 | 1.117 | 0.623 | 0.491 |       | 0.022 | 0.059 | 0.031 | 0        |
|        | Nom. | ---   | 0.006 | 0.106 | 0.016 | 0.008 | 1.122 | 0.631 | 0.496 | 0.050 | 0.030 | 0.067 | 0.036 | 5        |
|        | Max. | 0.118 | 0.008 | 0.110 | 0.020 | 0.010 | 1.127 | 0.639 | 0.501 |       | 0.038 | 0.075 | 0.041 | 10       |

| DWG.NO.   | REVISION | REFERENCE |      |  | ISSUE DATE |
|-----------|----------|-----------|------|--|------------|
|           |          | JEDEC     | EIAJ |  |            |
| 6110-1405 | 6        | MO-175    |      |  | 11-26-'03  |

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

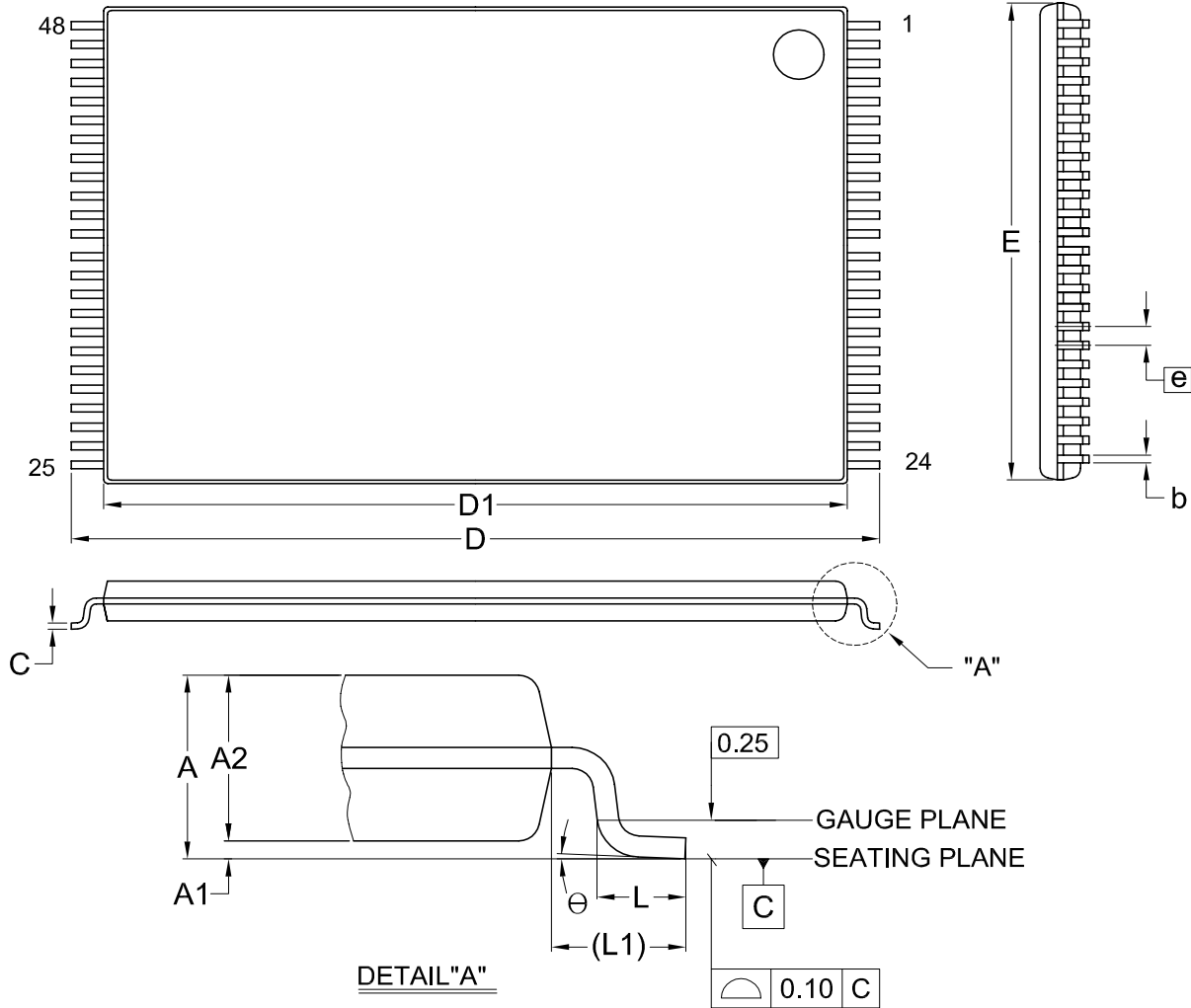


Dimensions (inch dimensions are derived from the original mm dimensions)

| SYMBOL |      | A     | A1    | A2    | b     | C     | D     | D1    | E     | e     | L     | L1    | θ |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---|
| 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 | 8        | MO-142    |      |  | 2007/08/03 |

**Title: Package Outline for TSOP(I) 48L (12X20mm)REVERSE FORM**



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

| SYMBOL |      | A     | A1    | A2    | b     | C     | D     | D1    | E     | e     | L     | L1    | $\theta$ |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| 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 |  |            |
| 6110-1607.1 | 9        | MO-142    |      |  | 2007/08/07 |





**REVISION HISTORY**

| <b>REVISION</b> | <b>DESCRIPTION</b>  | <b>PAGE</b> | <b>DATE</b> |
|-----------------|---|-------------|-------------|
| 2.0             | Output hold after address (tOH) spec is revised as 0ns(min.)<br>120ns speed grade's voltage range is revised as 2.7V~3.6V | P4<br>P1    | JAN/22/1999 |
| 2.1             | Modify Package Information  | P6~7        | JUL/17/2001 |
| 2.2             | 1. Add supply voltage relative to VSS<br>2. Change voltage on any pin relative to VSS:-0.5V to VCC+2.0                    | P3<br>P3    | JUL/25/2002 |
| 2.3             | 1. Supply voltage change to 2.7V ~ 3.6V   | P1          | JUL/26/2002 |
| 2.4             | 1. Modify VIN : -0.5V to VCC + 2V --> -0.5V to VCC + 2.0V<br>2. Add 48-TSOP reverse type package information              | P3<br>P8    | AUG/21/2002 |
| 2.5             | To modify Package Information   | P6~8        | NOV/21/2002 |
| 2.6             | 1. Add access time:70ns, 90ns   | P1,4        | JAN/20/2003 |
| 2.7             | 1. Add MX23L3211MC-90 in Order Information  | P1          | JAN/22/2003 |
| 2.8             | 1. Modify Timing Diagram--Page Read   | P5          | JAN/23/2003 |
| 2.9             | 1. Add Pb-free package in order information   | P1          | MAY/11/2004 |
| 3.0             | 1. Added statement  | P10         | NOV/07/2006 |



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**MX23L3211**

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