

### FEATURES

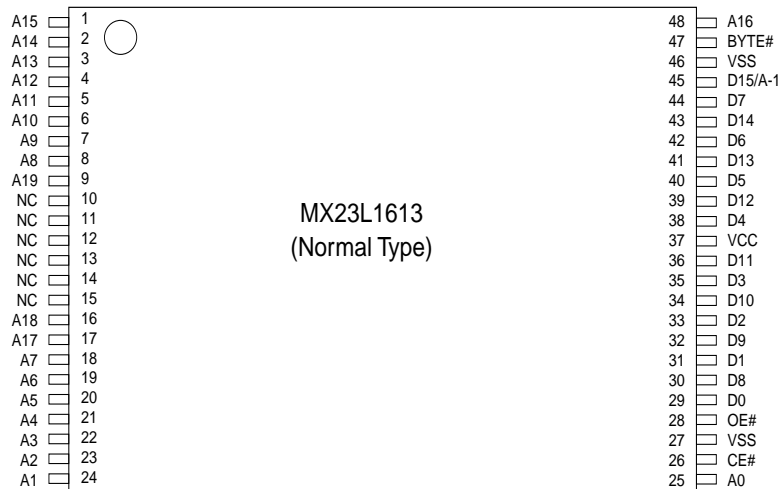
- Bit organization
  - 2M x 8 (byte mode)
  - 1M x 16 (word mode)
- Fast access time
  - Random access:70ns(max.)
- Current
  - Operating:25mA
  - Standby:5uA
- Supply voltage
  - 2.7V ~ 3.6V
- Package
  - 48 pin TSOP(12mm x 20mm)
- Temperature
  - -40 ~ 85° C

### PIN DESCRIPTION

Symbol	Pin Function
A0~A19	Address Inputs
D0~D14	Data Outputs
D15/A-1	D15 (Word Mode)/ LSB Address (Byte Mode)
CE#	Chip Enable Input
OE#	Output Enable Input
Byte#	Word/ Byte Mode Selection
VCC	Power Supply Pin
VSS	Ground Pin
NC	No Connection

### PIN CONFIGURATION

#### 48 TSOP (Top View)



### ORDER INFORMATION

Part No.	Speed	Package	Grade
MX23L1613TC-70	70ns	48 pin TSOP	Commercial
MX23L1613TC-90	90ns	48 pin TSOP	Commercial
MX23L1613TC-70G	70ns	48 pin TSOP (Pb-free, RoHS Compliant)	Commercial
MX23L1613TC-90G	90ns	48 pin TSOP (Pb-free, RoHS Compliant)	Commercial
MX23L1613TI-70	70ns	48 pin TSOP	Industrial
MX23L1613TI-90	90ns	48 pin TSOP	Industrial
MX23L1613TI-70G	70ns	48 pin TSOP (Pb-free, RoHS Compliant)	Industrial
MX23L1613TI-90G	90ns	48 pin TSOP (Pb-free, RoHS Compliant)	Industrial

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

**MODE SELECTION**

CE#	OE#	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

**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	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	ICC	-	25mA	f=5MHz, CE#=VIL, OE#=VIH all output open
Standby Current (CMOS)	ISTB	-	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 = -40° C ~ 85° C, VCC = 2.7V~3.6V)

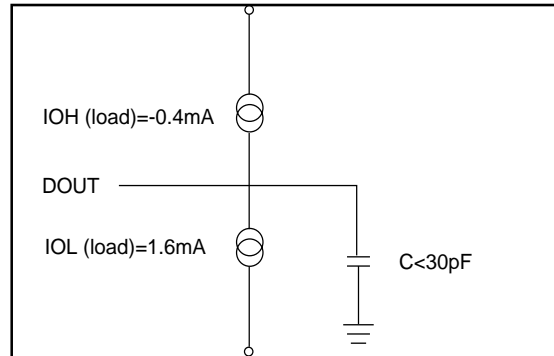
Item	Symbol	23L1613-70		23L1613-90	
		MIN.	MAX.	MIN.	MAX.
Read Cycle Time	tRC	70ns	-	90ns	-
Address Access Time	tAA	-	70ns	-	90ns
Chip Enable Access Time	tACE	-	70ns	-	90ns
Output Enable Time	tOE	-	30ns	-	40ns
Output Hold After Address	tOH	0ns	-	0ns	-
Output High Z Delay	tHZ	-	20ns	-	20ns

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	0V~ 3.0V
Input Rise and Fall Times	5ns
Input Timing Level	1.5V
Output Timing Level	1.5V
Output Load	See Figure

Note: 30pF output load capacitance for 70 and 90ns speed grade



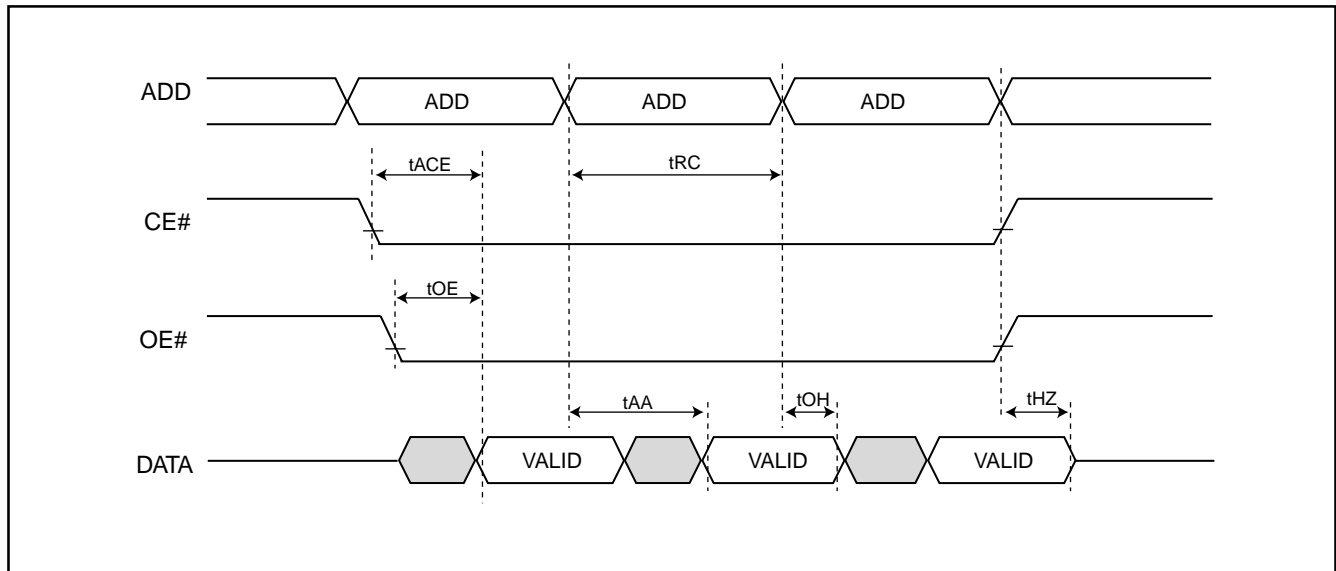
Note: No output loading is present in tester load board.

Active loading is used and under software programming control.

Output loading capacitance includes load board's and all stray capacitance.

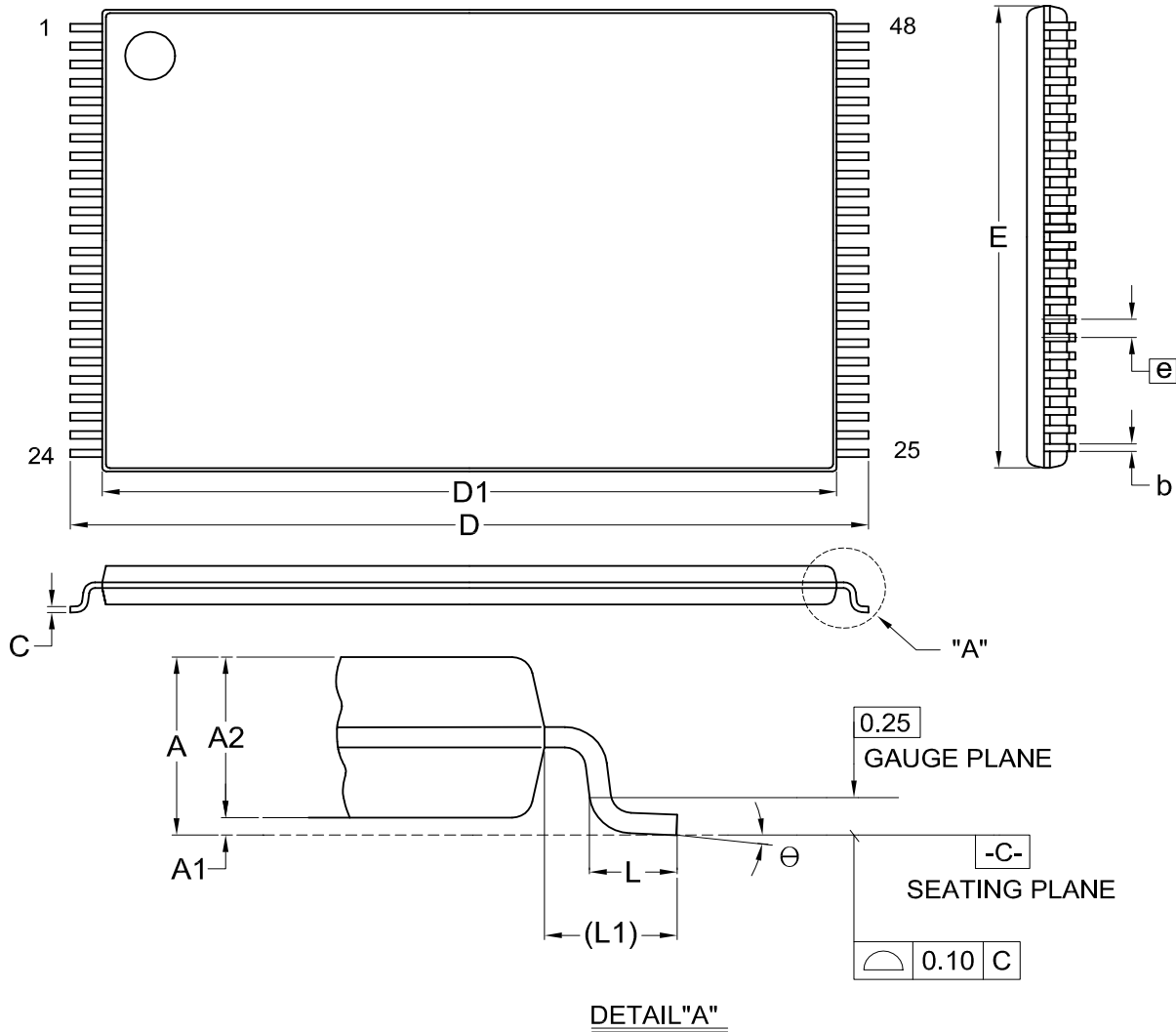
## TIMING DIAGRAM

### 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	θ
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

**Revision History**

<b>Revision No.</b>	<b>Description</b>	<b>Page</b>	<b>Date</b>
1.2	Modify Package 48-ball mini BGA 8mm x 13mm-->8mm x 9mm	P1	APR/27/2000
1.3	Modify Fast access time:100ns-->70ns Add AC Characteristics--23L1613-70&90	P1 P3	JAN/18/2001
1.4	1.Modify Pin Configuration--48 mini BGA 2.Added 48-Ball mini BGA--Package Information	P1,2 P6	JUN/28/2001
1.5	Added Order Information Add Temperature:-40~85° C	P2 P1	JUL/16/2001
1.6	Add CE#=VIL, OE#=VIH in DC Characteristics's ICC Add MX23L1613TC-70 in Order Information	P3 P2	OCT/02/2001
1.7	Modify Package Information	P5~6	NOV/22/2002
1.8	1. Removed 48-ball BGA package 2. Removed 100ns & 120ns speed	All P1,2	NOV/28/2005



**MX23L1613**

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