

**OKI semiconductor****MSC23V13258D-xxBS2**

1,048,576 Word X 32 Bit DYNAMIC RAM MODULE

**DESCRIPTION**

The Oki MSC23V13258D-xxBS2 is a fully decoded, 1,048,576-word X 32 bit CMOS dynamic random access memory composed of two 16-Mb (1Mx16) DRAMs in TSOP packages. The mounting of two DRAMs together with decoupling capacitors on a 100-pin glass epoxy DIMM Package supports any application where high density and large capacity of storage memory are required.

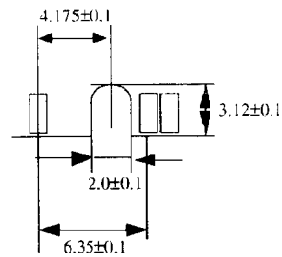
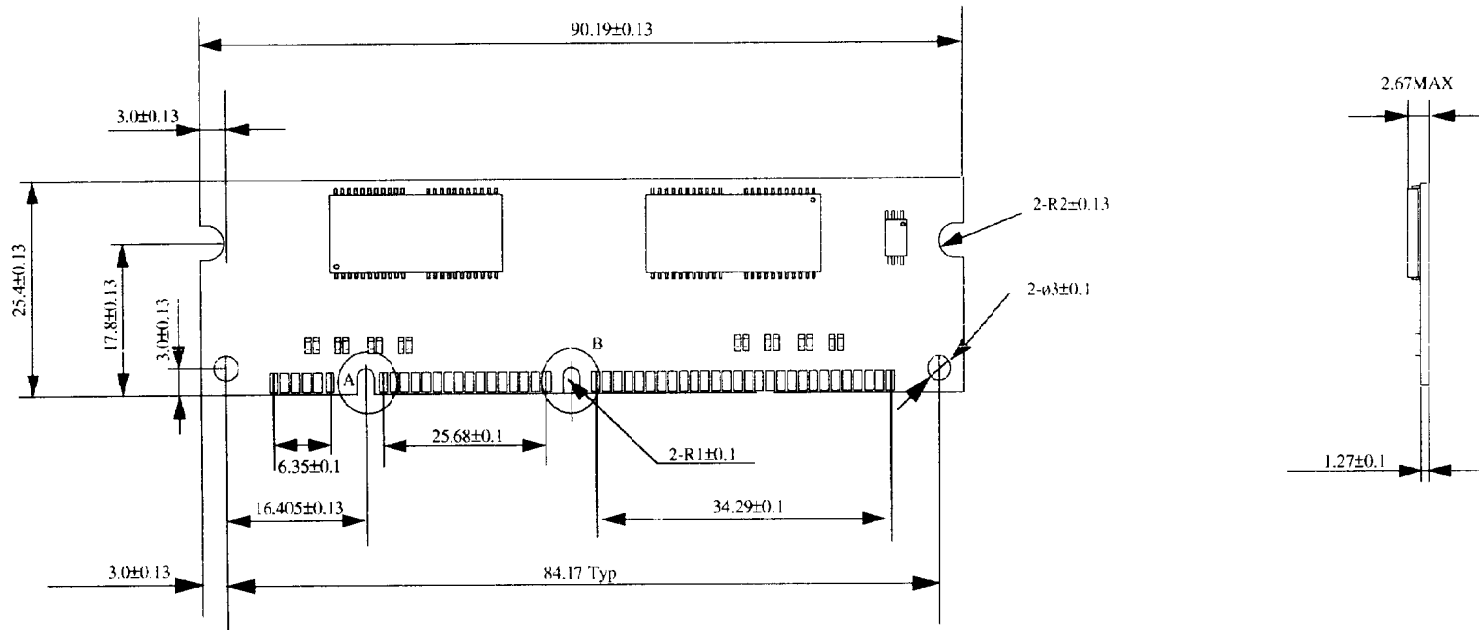
**FEATURES**

- 1,048,576- word X 32-Bit organization
- Single 3.3V supply  $\pm 0.3V$  tolerance
- Input : LVTTTL compatible
- Output : LVTTTL compatible, 3-state, nonlatch
- Refresh : 1024 cycles/16 ms (10 Row/10 Column Addresses)
- $\overline{CAS}$  before  $\overline{RAS}$  refresh,  $\overline{CAS}$  before  $\overline{RAS}$  hidden refresh,  $\overline{RAS}$  only refresh capability
- Fast Page Mode With EDO capability
- Serial Presence Detect
- Unbuffered, with damping resistors on all DQ signals.

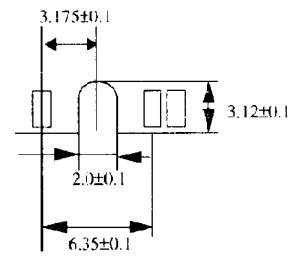
**FAMILY ORGANIZATION**

FAMILY	ACCESS TIME (MAX)				Cycle Time (MAX)	Power Dissipation	
	t <sub>RAC</sub>	t <sub>AA</sub>	t <sub>CAC</sub>	t <sub>OEA</sub>		Operating (MAX)	Standby (Max)
MSC23V13258D-60BS2	60ns	30ns	15ns	15ns	104ns	1152mW	
MSC23V13258D-70BS2	70ns	35ns	20ns	20ns	124ns	1008mW	3.6mW

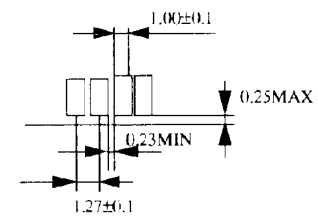
# MSC23V13258D-60BS2



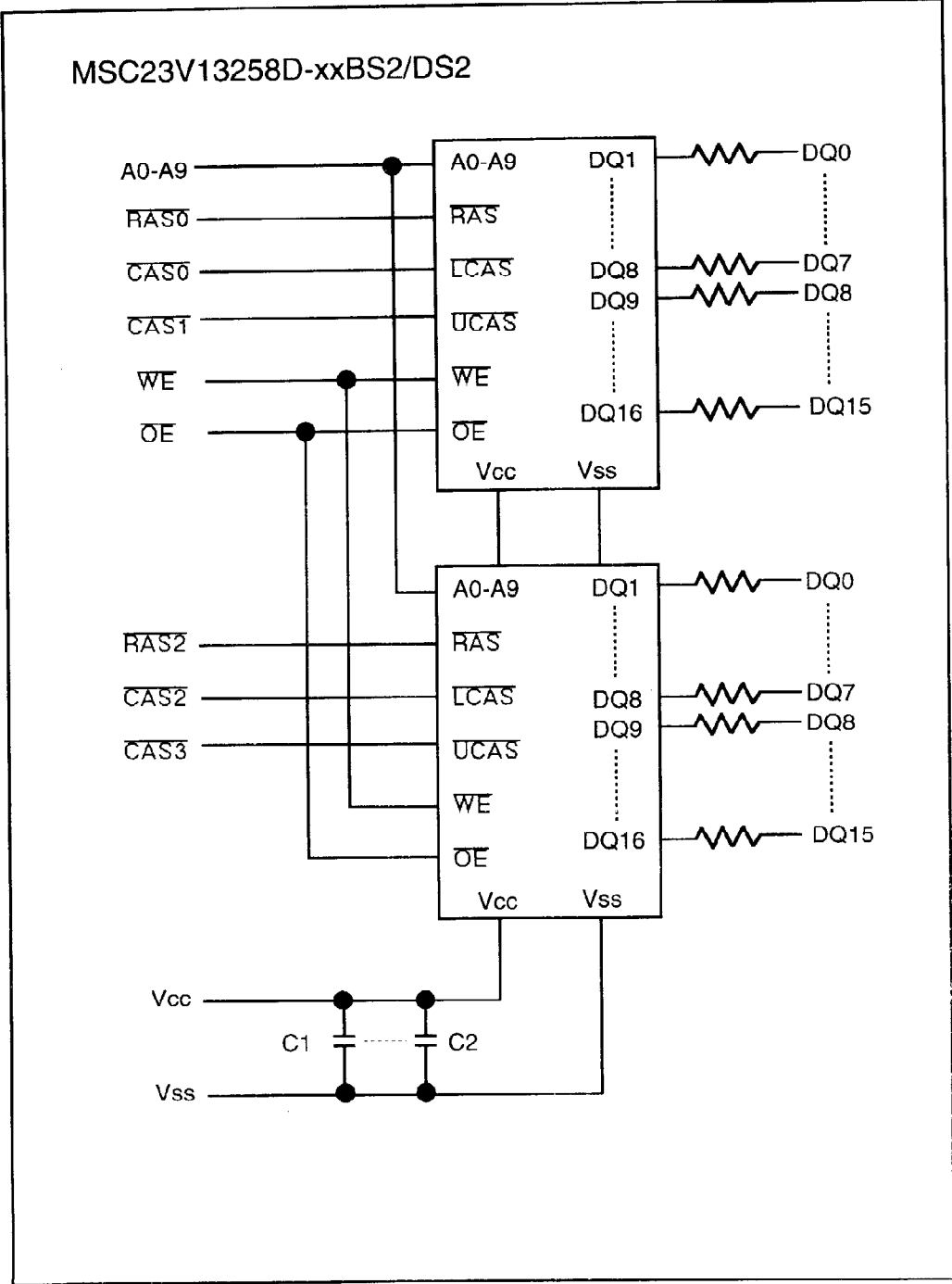
DETAIL A



DETAIL B



# FUNCTIONAL BLOCK DIAGRAM



**PIN CONFIGURATION****MSC23V13258D-xxBS2****Front Side**

Pin No.	Pin name	Pin No.	Pin name	Pin No.	Pin name	Pin No.	Pin name
1	Vss	16	A6	31	Vcc	46	DQ23
2	DQ0	17	A8	32	NC	47	Vss
3	DQ1	18	NC	33	NC	48	SDA
4	DQ2	19	NC	34	NC	49	SCL
5	DQ3	20	NC	35	NC	50	Vcc
6	Vcc	21	Vcc	36	Vss		
7	DQ4	22	NC	37	CAS2		
8	DQ5	23	NC	38	DQ16		
9	DQ6	24	NC	39	DQ17		
10	DQ7	25	NC	40	DQ18		
11	CAS0	26	Vss	41	DQ19		
12	Vss	27	NC	42	Vcc		
13	A0	28	WE	43	DQ20		
14	A2	29	RAS0	44	DQ21		
15	A4	30	RAS2	45	DQ22		

**Back Side**

Pin No.	Pin name	Pin No.	Pin name	Pin No.	Pin name	Pin No.	Pin name
51	Vss	66	A7	81	Vcc	96	DQ31
52	DQ8	67	A9	82	NC	97	Vss
53	DQ9	68	NC	83	NC	98	SA0
54	DQ10	69	NC	84	NC	99	SA1
55	DQ11	70	NC	85	NC	100	SA2
56	Vcc	71	Vcc	86	Vss		
57	DQ12	72	NC	87	CAS3		
58	DQ13	73	NC	88	DQ24		
59	DQ14	74	NC	89	DQ25		
60	DQ15	75	NC	90	DQ26		
61	CAST	76	Vss	91	DQ27		
62	Vss	77	NC	92	Vcc		
63	A1	78	OE	93	DQ28		
64	A3	79	NC	94	DQ29		
65	A5	80	NC	95	DQ30		

## Serial PD Matrix

Byte Number	HEX DATA	Remark
0	0D	Number of Byte used(13 Byte)
1	08	Total SPD Memory size (256 Bytes)
2	02	Memory type(EDO)
3	0A	Number of Rows(10)
4	0A	Number of Columns(10)
5	01	Number of Banks(1)
6	20	Module Data With(32)
7	00	Not defined
8	01	Supply Voltage(3.3v, LVTTTL)
9(-60)	3C	RAS Access time(60ns)
9(-70)	46	RAS Access time(70ns)
10(-60)	0F	CAS Access time(15ns)
10(-70)	14	CAS Access time(20ns)
11	00	Non-Parity
12	00	Normal Refresh

## ELECTRICAL CHARACTERISTICS

### ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Voltage on any pin relative to Vss	$V_{IN}, V_{OUT}$	-0.5 ~ +4.6	V
Voltage Vcc supply relative to Vss	$V_{CC}$	-0.5 ~ +4.6	V
Short circuit output current	$I_{OS}$	50	mA
Power dissipation	$P_D$	2	W
Operating temperature	$T_{OPR}$	-0 ~ +70	°C
Storage temperature	$T_{STG}$	-40 ~ +125	°C

NOTE: Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. Functional operation should be restricted to the conditions as detailed in the operational sections of this data sheet. Exposure to absolute maximum rating conditions for extended period may affect device reliability.

### RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	MIN	TYPE	MAX	UNIT	Operating temperature
Supply Voltage	$V_{CC}$	3.0	3.3	3.6	V	0 °C ~ +70 °C
	$V_{SS}$	0	0	0	V	
Input high voltage	$V_{IH}$	2.0	-	$V_{CC}+0.3$	V	
Input low voltage	$V_{IL}$	-0.3	-	0.8	V	

### CAPACITANCE

Parameter	Symbol	Type	MAX	Unit
Input Capacitance(A0-A9)	$C_{IN1}$	-	16	pF
Input Capacitance(RAS0, RAS2)	$C_{IN2}$	-	13	pF
Input Capacitance(CAS0-CAS3)	$C_{IN3}$	-	13	pF
Input Capacitance(WE)	$C_{IN4}$	-	20	pF
I/O Capacitance(DQ0-DQ31)	CDQ	-	13	pF

NOTE: Capacitance measured with Boonton Meter.

**DC CHARACTERISTICS**  
 (V<sub>cc</sub> = 3.3V ± 0.3V, T<sub>a</sub> = 0–70)

Parameter	Symbol	Condition	MSC23V13258D -60BS2		MSC23V13258D -70BS2		Unit	Note
			Min	Max	Min	Max		
Input Leakage Current	I <sub>LI</sub>	0V ≤ V <sub>in</sub> ≤ V <sub>cc</sub> + 0.3V: All other pins not under test = 0V	-20	20	-20	20	μA	
Output Leakage Current	I <sub>LO</sub>	DQ=disable 0V ≤ V <sub>out</sub> ≤ V <sub>cc</sub> + 0.3V	-10	10	-10	10	μA	
Output High Voltage	V <sub>OH</sub>	I <sub>OH</sub> = 2.0mA	2.4	V <sub>cc</sub>	2.4	V <sub>cc</sub>	V	
Output Low Voltage	V <sub>OL</sub>	I <sub>OL</sub> = 2.0mA	0	0.4	0	0.4	V	
Average power supply current (Operating)	I <sub>CC1</sub>	RAS cycling, CAS cycling RC=min	-	320	-	280	mA	1,2
Power supply current (Standby)	I <sub>CC2</sub>	RAS, CAS = V <sub>IH</sub>	-	4	-	4	mA	
		RAS ≥ V <sub>cc</sub> - 0.2V CAS ≥ V <sub>cc</sub> - 0.2V	-	1	-	1	mA	
Average power supply current (RAS only refresh)	I <sub>CC3</sub>	RAS cycling, CAS = V <sub>IH</sub> , t <sub>RC</sub> =min	-	320	-	280	mA	1,2
Average power supply current (CAS before RAS refresh)	I <sub>CC6</sub>	RAS cycling, CAS before RAS refresh	-	320	-	280	mA	1
Average power supply current (Fast page)	I <sub>CC7</sub>	RAS = V <sub>IL</sub> , CAS cycling t <sub>PC</sub> = min	-	320	-	280	mA	1,3

- NOTE:
- I<sub>CC</sub> Max. is Specified as I<sub>CC</sub> for output open condition.
  - Address can be changed once or less while RAS = V<sub>IL</sub>
  - Address can be changed once or less while CAS = V<sub>IH</sub>

**AC CHARACTERISTIC**(V<sub>CC</sub> = 3.3V ± 0.3V, T<sub>a</sub> = 0 ~ +70)**NOTE 1.2.3.9.10**

Parameter	Symbol	MSC23V13258D -60BS2		MSC23V13258D -70BS2		UNIT	NOTE
		MIN	MAX	MIN	MAX		
Random read or write cycle time	t <sub>RC</sub>	104	-	124	-	ns	
Fast page mode cycle time	t <sub>HPC</sub>	25	-	30	-	ns	
Access time from RAS	t <sub>RAC</sub>	-	60	-	70	ns	4,5,6
Access time from CAS	t <sub>CAC</sub>	-	15	-	20	ns	4,5
Access time from column address	t <sub>AA</sub>	-	30	-	35	ns	4,6
Access time from CAS precharge	t <sub>CPA</sub>	-	35	-	40	ns	4
Access time from OE	t <sub>OEA</sub>	-	15	-	20	ns	4
CAS to output in Low-Z	t <sub>CLZ</sub>	0	-	0	-	ns	4
Data Output Hold After CAS Low	t <sub>DOH</sub>	5	-	5	-	ns	
CAS to Data Output Buffer Turn-off Delay Time	t <sub>CEZ</sub>	0	15	0	20	ns	7,8
RAS to Data Output Buffer Turn-off Delay Time	t <sub>REZ</sub>	0	15	0	20	ns	7,8
OE to Data Output Buffer Turn-off Delay Time	t <sub>OEZ</sub>	0	15	0	20	ns	7
WE to Data Output Buffer Turn-off Delay Time	t <sub>WEZ</sub>	0	15	0	20	ns	7
Transition time	t <sub>T</sub>	1	50	1	50	ns	3
Refresh period	t <sub>REF</sub>	-	16	-	16	ms	
RAS precharge time	t <sub>RP</sub>	40	-	50	-	ns	
RAS pulse width	t <sub>RAS</sub>	60	10K	70	10K	ns	
RAS pulse width (Fast page mode)	t <sub>RASP</sub>	60	100K	70	100K	ns	
RAS hold time	t <sub>RSH</sub>	10	-	13	-	ns	
RAS hold time referenced to OE	t <sub>ROH</sub>	10	-	13	-	ns	
CAS precharge time	t <sub>CP</sub>	10	-	10	-	ns	
CAS pulse width	t <sub>CAS</sub>	10	10K	13	10K	ns	
CAS hold time	t <sub>CSH</sub>	40	-	45	-	ns	
CAS to RAS precharge time	t <sub>CRP</sub>	5	-	5	-	ns	
RAS to CAS delay time	t <sub>RCD</sub>	14	45	14	50	ns	5
RAS to column address delay time	t <sub>RAD</sub>	12	30	12	35	ns	6
Row address set-up time	t <sub>ASR</sub>	0	-	0	-	ns	
Row address hold time	t <sub>RAH</sub>	10	-	10	-	ns	
Column address set-up time	t <sub>ASC</sub>	0	-	0	-	ns	
Column address hold time	t <sub>CAH</sub>	10	-	13	-	ns	



**AC CHARACTERISTICS** (Continued)(V<sub>cc</sub> = 5V ± 10%, T<sub>a</sub> = 0 ~70 °C)

NOTE 1.2.3.9.10

Parameter	Symbol	MSC23V13258D -60BS2		MSC23V13258D -70BS2		UNIT	NOTE
		MIN	MAX	MIN	MAX		
Column address to RAS lead time	t <sub>RAL</sub>	30	-	35	-	ns	
Read command set-up time	t <sub>RCS</sub>	0	-	0	-	ns	
Read command hold time	t <sub>RCH</sub>	0	-	0	-	ns	9
Read command hold time reference to RAS	t <sub>RRH</sub>	0	-	0	-	ns	9
Write command set-up time	t <sub>WCS</sub>	0	-	0	-	ns	10
Write command hold time	t <sub>WCH</sub>	10	-	13	-	ns	
Write command pulse width	t <sub>WP</sub>	10	-	10	-	ns	
Write command pulse width	t <sub>WPE</sub>	10	-	10	-	ns	
OE command hold time	t <sub>OEH</sub>	10	-	13	-	ns	
OE precharge time	t <sub>OEP</sub>	10	-	10	-	ns	
OE low to CAS high delay time	t <sub>OCH</sub>	10	-	10	-	ns	
Write command to RAS lead time	t <sub>RWL</sub>	10	-	13	-	ns	
Write command to CAS lead time	t <sub>CWL</sub>	10	-	13	-	ns	
Data-in set-up time	t <sub>DS</sub>	0	-	0	-	ns	
Data-in hold time	t <sub>DH</sub>	10	-	13	-	ns	
OE to data-in delay time	t <sub>OED</sub>	15	-	20	-	ns	
CAS to WE delay time	t <sub>CWD</sub>	34	-	44	-	ns	10
Column address to WE delay time	t <sub>AWD</sub>	49	-	59	-	ns	10
RAS to WE delay time	t <sub>RWD</sub>	79	-	94	-	ns	10
CAS precharge WE delay time	t <sub>CPWD</sub>	54	-	64	-	ns	10
CAS active delay time from RAS precharge	t <sub>RPC</sub>	5	-	5	-	ns	
RAS to CAS set-up time (CAS before RAS)	t <sub>CSR</sub>	5	-	5	-	ns	
RAS to CAS hold time (CAS before RAS)	t <sub>CHR</sub>	10	-	10	-	ns	

- NOTES: 1) An initial pause of 200  $\mu$ s is required after power-up followed by a minimum of 8 initializatin cycles (examples:  $\overline{RAS}$  only refresh or  $\overline{CAS}$  before  $\overline{RAS}$  refresh) before proper device operation is achieved.
- 2) The AC measurements assume  $t_T = 2$  ns.
- 3)  $V_{IH}$  (min.) and  $V_{IL}$  (max.) are reference levels for measuring the timing of the input signals. Transition times are measured between  $V_{IH}$  and  $V_{IL}$ .
- 4) Measured with a load circuit equivalent to 2 TTL + 100 pF.
- 5) Operation within the  $t_{RCD}$  (max) limit insures that  $t_{RAC}$  (max) can be met.  $t_{RCD}$ (max) is specified as a reference point only: if  $t_{RCD}$  is greater than the specified  $t_{RCD}$ (max) limit, then access time is controlled by  $t_{CAC}$ .
- 6) Operation within the  $t_{RAD}$  (max) limit insures that  $t_{RAC}$  (max) can be met.  $t_{RAD}$ (max) is specified as a reference point only: if  $t_{RAD}$  is greater than the specified  $t_{RAD}$  (max) limit, then access time is controlled by  $t_{AA}$ .
- 7) The  $t_{CEZ}$  (max.),  $t_{REZ}$  (max.),  $T_{WEZ}$  (max.) and  $t_{OEZ}$  (max.) defines the time at which the output achieves the open circuit condition and are not referenced to output voltage levels.
- 8) The  $t_{CEZ}$  and  $t_{REZ}$  must be satisfied for open circuit condition.
- 9)  $t_{RCH}$  or the  $t_{REZ}$  must be satisfied for a read cycle.
- 10)  $t_{WCS}$ ,  $t_{CWD}$ ,  $t_{RWD}$ ,  $t_{AWD}$  and  $t_{CPWD}$  are not restrictive operating parameters. they are included in the data sheet as electrical characteristics only. If  $t_{WCS} \geq t_{WCS}(\text{min.})$ , the cycle is an early write cycle and the data out will remain open circuit (high impedance) throughout the entire cycle. If  $t_{CWD} \geq t_{CWD}(\text{min.})$ ,  $t_{RWD} \geq t_{RWD}(\text{min.})$ ,  $t_{AWD} \geq t_{AWD}(\text{min.})$  and  $t_{CPWD} \geq t_{CPWD}(\text{min.})$ , the cycle is a read modify write cycle and data out will contain data read from the selected cell; If neither of the above sets of conditions is satisfied, the condition of the data(at access time) is indeterminate