

OKI Semiconductor

MSC23V26468TD-xxBS8

2,097,152-Word x 64-Bit DYNAMIC RAM MODULE : FAST PAGE MODE TYPE WITH EDO

DESCRIPTION

The MSC23V26468TD-xxBS8 is a 2,097,152-word x 64-bit CMOS dynamic random access memory module which is composed of eight 16Mb(1Mx16) DRAMs in TSOP packages mounted with eight decoupling capacitors. This is an 168-pin dual in-line memory module. This module supports any application where high density and large capacity of storage memory are required.

FEATURES

- 2,097,152-word x 64-bit organization
- 168-pin Dual In-line Memory Module
- Gold tab
- Single 3.3V power supply, $\pm 0.3V$ tolerance
- Input : LVTTTL compatible
- Output : LVTTTL compatible, 3-state
- Refresh : 1024cycles/ 16ms
- /CAS before /RAS refresh, hidden refresh, /RAS only refresh capability
- Fast page mode with EDO, read modify write capability
- Serial Presence Detect

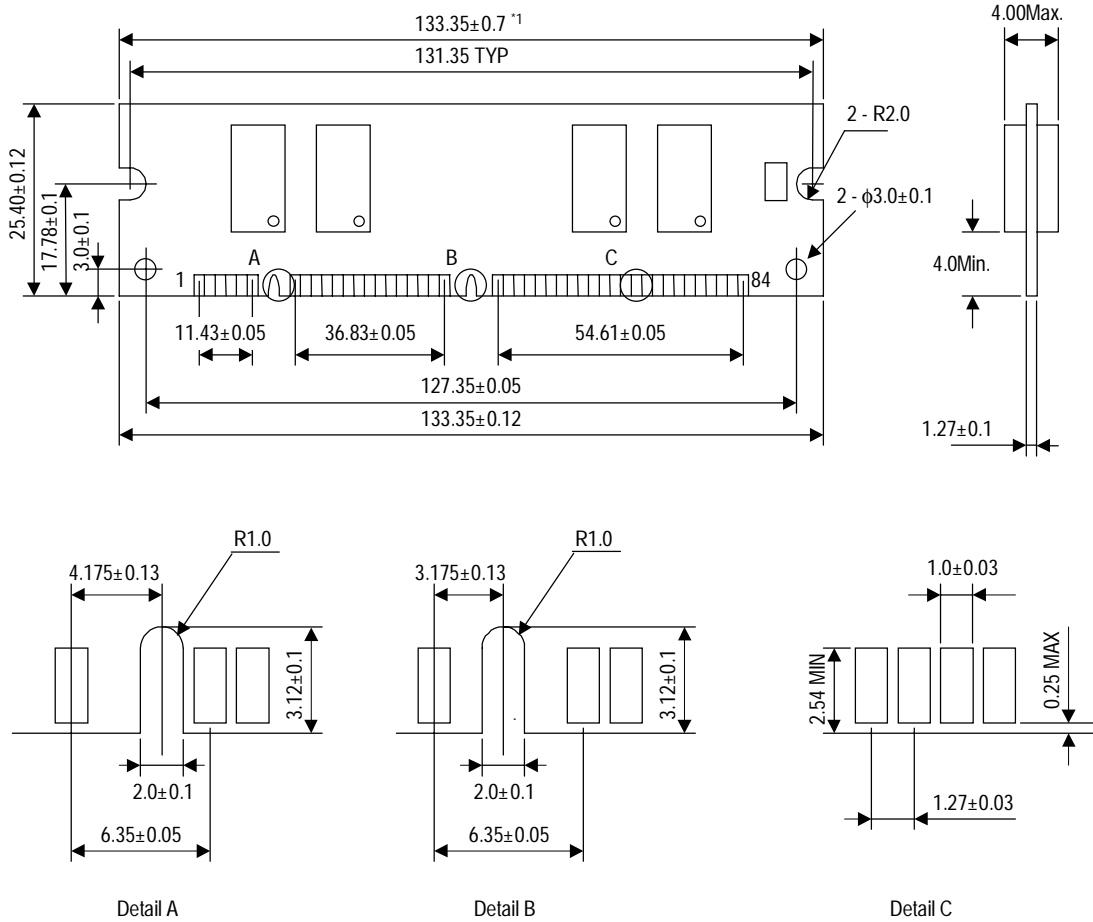
PRODUCT FAMILY

Family	Access Time (Max.)				Cycle Time (Min.)	Power Dissipation (Max.)	
	t _{RAC}	t _{AA}	t _{CAC}	t _{OEA}		Operating	Standby
MSC23V26468TD-50BS8	50ns	25ns	13ns	13ns	84ns	1872mW	14.4mW
MSC23V26468TD-60BS8	60ns	30ns	15ns	15ns	104ns	1728mW	
MSC23V26468TD-70BS8	70ns	35ns	20ns	20ns	124ns	1584mW	

MODULE OUTLINE

MSC23V26468TD-xxBS8

(Unit : mm)



Note:

1. Tolerance over 19.78mm from bottom edge is ± 0.7 .

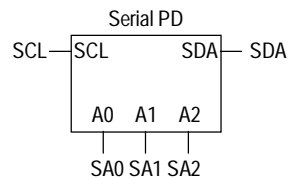
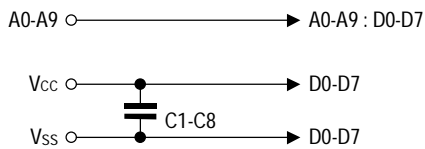
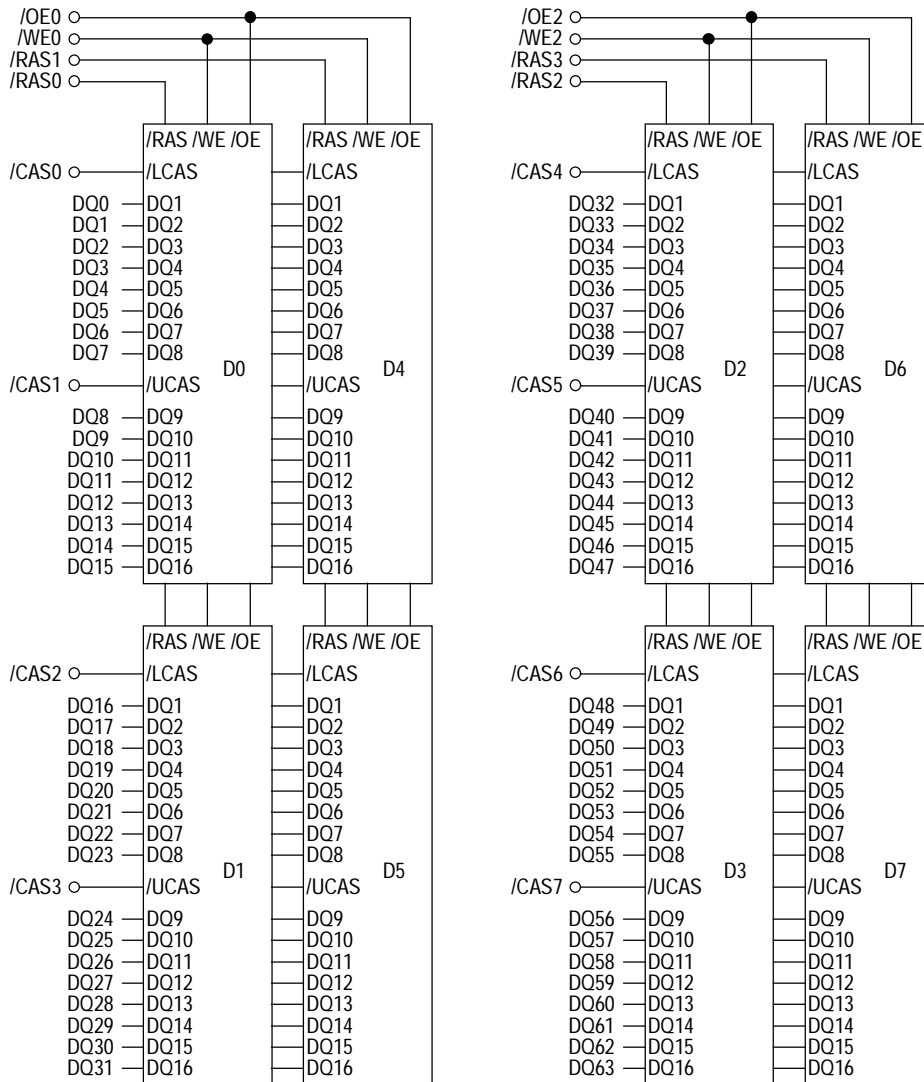
PIN CONFIGURATION

Front Side		Back Side		Front Side		Back Side	
Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name
1	V _{SS}	85	V _{SS}	43	V _{SS}	127	V _{SS}
2	DQ0	86	DQ32	44	/OE2	128	NC
3	DQ1	87	DQ33	45	/RAS2	129	/RAS3
4	DQ2	88	DQ34	46	/CAS2	130	/CAS6
5	DQ3	89	DQ35	47	/CAS3	131	/CAS7
6	V _{CC}	90	V _{CC}	48	/WE2	132	NC
7	DQ4	91	DQ36	49	V _{CC}	133	V _{CC}
8	DQ5	92	DQ37	50	NC	134	NC
9	DQ6	93	DQ38	51	NC	135	NC
10	DQ7	94	DQ39	52	NC	136	NC
11	DQ8	95	DQ40	53	NC	137	NC
12	V _{SS}	96	V _{SS}	54	V _{SS}	138	V _{SS}
13	DQ9	97	DQ41	55	DQ16	139	DQ48
14	DQ10	98	DQ42	56	DQ17	140	DQ49
15	DQ11	99	DQ43	57	DQ18	141	DQ50
16	DQ12	100	DQ44	58	DQ19	142	DQ51
17	DQ13	101	DQ45	59	V _{CC}	143	V _{CC}
18	V _{CC}	102	V _{CC}	60	DQ20	144	DQ52
19	DQ14	103	DQ46	61	NC	145	NC
20	DQ15	104	DQ47	62	NC	146	NC
21	NC	105	NC	63	NC	147	NC
22	NC	106	NC	64	V _{SS}	148	V _{SS}
23	V _{SS}	107	V _{SS}	65	DQ21	149	DQ53
24	NC	108	NC	66	DQ22	150	DQ54
25	NC	109	NC	67	DQ23	151	DQ55
26	V _{CC}	110	V _{CC}	68	V _{SS}	152	V _{SS}
27	/WE0	111	NC	69	DQ24	153	DQ56
28	/CAS0	112	/CAS4	70	DQ25	154	DQ57
29	/CAS1	113	/CAS5	71	DQ26	155	DQ58
30	/RAS0	114	/RAS1	72	DQ27	156	DQ59
31	/OE0	115	NC	73	V _{CC}	157	V _{CC}
32	V _{SS}	116	V _{SS}	74	DQ28	158	DQ60
33	A0	117	A1	75	DQ29	159	DQ61
34	A2	118	A3	76	DQ30	160	DQ62
35	A4	119	A5	77	DQ31	161	DQ63
36	A6	120	A7	78	V _{SS}	162	V _{SS}
37	A8	121	A9	79	NC	163	NC
38	NC	122	NC	80	NC	164	NC
39	NC	123	NC	81	NC	165	SA0
40	V _{CC}	124	V _{CC}	82	SDA	166	SA1
41	V _{CC}	125	NC	83	SCL	167	SA2
42	NC	126	NC	84	V _{CC}	168	V _{CC}

Serial PD Matrix

Byte No.	Function described	SPD Value (Hex)	Note	
0	Number of Byte used	80	128 Bytes	
1	Total SPD Memory size	08	256 Bytes	
2	Memory type	02	EDO	
3	Number of Rows	0A	10	
4	Number of Columns	0A	10	
5	Number of Banks	02	2	
6	Module Data Width	40	64	
7	Module Data Width Continued	00	0	
8	Supply Voltage	01	LVTTL	
9	/RAS Access Time	-50	32	50ns
		-60	3C	60ns
		-70	46	70ns
10	/CAS Access Time	-50	0D	13ns
		-60	0F	15ns
		-70	14	20ns
11	DIMM Configuration type	00	Non-Parity	
12	Refresh Rate/Type	00	Normal Refresh	
13	Primary DRAM Width	10	x16	
14	Error Checking DRAM Width	00		
15-61	Superset Information	00	Reserved	
62	SPD Data Revision Code	01	1	
63	Checksum for Byte 0-62	-50	31	
		-60	3D	
		-70	4C	
64-127	Reserved	00		
128-255	Unused Storage Location (Reserved)	FF		

BLOCK DIAGRAM



ELECTRICAL CHARACTERISTICS**Absolute Maximum Ratings**

Parameter	Symbol	Rating	Unit
Voltage on Any Pin Relative to V_{SS}	V_{IN}, V_{OUT}	-0.5 to 4.6	V
Voltage on V_{CC} Supply Relative to V_{SS}	V_{CC}	-0.5 to 4.6	V
Short Circuit Output Current	I_{OS}	50	mA
Power Dissipation	P_D^*	8	W
Operating Temperature	T_{OPR}	0 to 70	°C
Storage Temperature	T_{STG}	-40 to 125	°C

* $T_a = 25^\circ\text{C}$ **Recommended Operating Conditions** $(T_a = 0^\circ\text{C to } 70^\circ\text{C})$

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power Supply Voltage	V_{CC}	3.0	3.3	3.6	V
	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 $(V_{CC} = 3.3V \pm 0.3V, T_a = 25^\circ\text{C}, f = 1\text{ MHz})$

Parameter	Symbol	Typ.	Max.	Unit
Input Capacitance (A0 - A9)	C_{IN1}	-	49	pF
Input Capacitance (/RAS0 - /RAS3)	C_{IN2}	-	20	pF
Input Capacitance (/CAS0 - /CAS7)	C_{IN3}	-	20	pF
Input Capacitance (/WE0, /WE2, /OE0, /OE2)	C_{IN4}	-	35	pF
I/O Capacitance (DQ0 - DQ63)	$C_{I/O}$	-	20	pF

DC Characteristics

 $(V_{CC} = 3.3V \pm 0.3V, T_a = 0^\circ C \text{ to } 70^\circ C)$

Parameter	Symbol	Condition	-50		-60		-70		Unit	Note
			Min.	Max.	Min.	Max.	Min.	Max.		
Output High Voltage	V_{OH}	$I_{OH} = -2.0mA$	2.4	V_{CC}	2.4	V_{CC}	2.4	V_{CC}	V	
Output Low Voltage	V_{OL}	$I_{OL} = 2.0mA$	0	0.4	0	0.4	0	0.4	V	
Input Leakage Current	I_{LI}	$0V \leq V_{IN} \leq V_{CC}+0.3V$; All other pins not under test = 0V	-80	80	-80	80	-80	80	μA	
Output Leakage Current	I_{LO}	DQ disable $0V \leq V_{OUT} \leq V_{CC}$	-20	20	-20	20	-20	20	μA	
Average Power Supply Current (Operating)	I_{CC1}	/RAS, /CAS cycling, $t_{RC} = \text{Min.}$	-	520	-	480	-	440	mA	1, 2
Power Supply Current (Standby)	I_{CC2}	/RAS, /CAS = V_{IH}	-	16	-	16	-	16	mA	1
		/RAS, /CAS $\geq V_{CC}-0.2V$	-	4	-	4	-	4	mA	
Average Power Supply Current (/RAS only refresh)	I_{CC3}	/RAS cycling, /CAS = V_{IH} , $t_{RC} = \text{Min.}$	-	520	-	480	-	440	mA	1, 2
Average Power Supply Current (/CAS before /RAS refresh)	I_{CC6}	/RAS cycling, /CAS before /RAS	-	520	-	480	-	440	mA	1, 2
Average Power Supply Current (Fast Page Mode)	I_{CC7}	/RAS = V_{IL} , /CAS cycling, $t_{HPC} = \text{Min.}$	-	520	-	480	-	440	mA	1, 3

- Notes: 1. I_{CC} Max. is specified as I_{CC} for output open condition.
 2. The address can be changed once or less while /RAS = V_{IL} .
 3. The address can be changed once or less while /CAS = V_{IH} .

AC Characteristics (1/2)

 $(V_{CC} = 3.3V \pm 0.3V, T_a = 0^\circ C \text{ to } 70^\circ C)$ Note: 1, 2, 3

Parameter	Symbol	-50		-60		-70		Unit	Note
		Min.	Max.	Min.	Max.	Min.	Max.		
Random Read or Write Cycle Time	t_{RC}	84	-	104	-	124	-	ns	
Read Modify Write Cycle Time	t_{RWC}	110	-	135	-	160	-	ns	
Fast Page Mode Cycle Time	t_{HPC}	20	-	25	-	30	-	ns	
Fast Page Mode Read Modify Write Cycle Time	t_{HPRWC}	58	-	68	-	78	-	ns	
Access Time from /RAS	t_{RAC}	-	50	-	60	-	70	ns	4, 5, 6
Access Time from /CAS	t_{CAC}	-	13	-	15	-	20	ns	4, 5
Access Time from Column Address	t_{AA}	-	25	-	30	-	35	ns	4, 6
Access Time from /CAS Precharge	t_{CPA}	-	30	-	35	-	40	ns	4
Access Time from /OE	t_{OEA}	-	13	-	15	-	20	ns	4
Output Low Impedance Time from /CAS	t_{CLZ}	0	-	0	-	0	-	ns	4
Data Output Hold After /CAS Low	t_{DOH}	5	-	5	-	5	-	ns	
/CAS to Data Output Buffer Turn-off Delay Time	t_{CEZ}	0	13	0	15	0	20	ns	7, 8
/RAS to Data Output Buffer Turn-off Delay Time	t_{REZ}	0	13	0	15	0	20	ns	7, 8
/OE to Data Output Buffer Turn-off Delay Time	t_{OEZ}	0	13	0	15	0	20	ns	7
/WE to Data Output Buffer Turn-off Delay Time	t_{WEZ}	0	13	0	15	0	20	ns	7
Transition Time	t_T	1	50	1	50	1	50	ns	3
Refresh Period	t_{REF}	-	16	-	16	-	16	ms	
/RAS Precharge Time	t_{RP}	30	-	40	-	50	-	ns	
/RAS Pulse Width	t_{RAS}	50	10K	60	10K	70	10K	ns	
/RAS Pulse Width (Fast Page Mode with EDO)	t_{RASP}	50	100K	60	100K	70	100K	ns	
/RAS Hold Time	t_{RSH}	7	-	10	-	13	-	ns	
/RAS Hold Time referenced to /OE	t_{ROH}	7	-	10	-	13	-	ns	
/CAS Precharge Time (Fast Page Mode with EDO)	t_{CP}	7	-	10	-	10	-	ns	
/CAS Pulse Width	t_{CAS}	7	10K	10	10K	13	10K	ns	
/CAS Hold Time	t_{CSH}	35	-	40	-	45	-	ns	
/CAS to /RAS Precharge Time	t_{CRP}	5	-	5	-	5	-	ns	
/RAS Hold Time from /CAS Precharge	t_{RHCP}	30	-	35	-	40	-	ns	
/OE Hold Time from /CAS (DQ Disable)	t_{CHO}	5	-	5	-	5	-	ns	
/RAS to /CAS Delay Time	t_{RCD}	11	37	14	45	14	50	ns	5
/RAS to Column Address Delay Time	t_{RAD}	9	25	12	30	12	35	ns	6
Row Address Set-up Time	t_{ASR}	0	-	0	-	0	-	ns	
Row Address Hold Time	t_{RAH}	7	-	10	-	10	-	ns	
Column Address Set-up Time	t_{ASC}	0	-	0	-	0	-	ns	
Column Address Hold Time	t_{CAH}	7	-	10	-	13	-	ns	
Column Address to /RAS Lead Time	t_{RAL}	25	-	30	-	35	-	ns	

AC Characteristics (2/2)

(V_{CC} = 3.3V ± 0.3V, T_a = 0°C to 70°C) Note: 1, 2, 3

Parameter	Symbol	-50		-60		-70		Unit	Note
		Min.	Max.	Min.	Max.	Min.	Max.		
Read Command Set-up Time	t _{RCS}	0	-	0	-	0	-	ns	
Read Command Hold Time	t _{RCH}	0	-	0	-	0	-	ns	9
Read Command Hold Time referenced to /RAS	t _{RRH}	0	-	0	-	0	-	ns	9
Write Command Set-up Time	t _{WCS}	0	-	0	-	0	-	ns	10
Write Command Hold Time	t _{WCH}	7	-	10	-	13	-	ns	
Write Command Pulse Width	t _{WP}	7	-	10	-	10	-	ns	
/WE Pulse Width (DQ Disable)	t _{WPE}	7	-	10	-	10	-	ns	
/OE Command Hold Time	t _{OEH}	7	-	10	-	13	-	ns	
/OE Precharge Time	t _{OEP}	7	-	10	-	10	-	ns	
/OE Command Hold Time	t _{OCH}	7	-	10	-	10	-	ns	
Write Command to /RAS Lead Time	t _{RWL}	7	-	10	-	13	-	ns	
Write Command to /CAS Lead Time	t _{CWL}	7	-	10	-	13	-	ns	
Data-in Set-up Time	t _{DS}	0	-	0	-	0	-	ns	
Data-in Hold Time	t _{DH}	7	-	10	-	13	-	ns	
/OE to Data-in Delay Time	t _{OED}	13	-	15	-	20	-	ns	
/CAS to /WE Delay Time	t _{CWD}	30	-	34	-	44	-	ns	10
Column Address to /WE Delay Time	t _{AWD}	42	-	49	-	59	-	ns	10
/RAS to /WE Delay Time	t _{RWD}	67	-	79	-	94	-	ns	10
/CAS Precharge /WE Delay Time	t _{CPWD}	47	-	54	-	64	-	ns	10
/CAS Active Delay Time from /RAS Precharge	t _{RPC}	5	-	5	-	5	-	ns	
/RAS to /CAS Set-up Time (/CAS before /RAS)	t _{CSR}	5	-	5	-	5	-	ns	
/RAS to /CAS Hold Time (/CAS before /RAS)	t _{CHR}	10	-	10	-	10	-	ns	

- Notes:
1. A start-up delay of 200 μ s is required after power-up, followed by a minimum of eight initialization cycles (/RAS only refresh or /CAS before /RAS refresh) before proper device operation is achieved.
 2. The AC characteristics assume $t_T = 2$ ns.
 3. $V_{IH}(\text{Min.})$ and $V_{IL}(\text{Max.})$ are reference levels for measuring input timing signals. Transition times (t_T) are measured between V_{IH} and V_{IL} .
 4. This parameter is measured with a load circuit equivalent to 1 TTL load and 100pF. The output timing reference levels are $V_{OH} = 2.0$ V and $V_{OL} = 0.8$ V.
 5. Operation within the $t_{RCD}(\text{Max.})$ limit ensures that $t_{RAC}(\text{Max.})$ can be met. $t_{RCD}(\text{Max.})$ is specified as a reference point only. If t_{RCD} is greater than the specified $t_{RCD}(\text{Max.})$ limit, then the access time is controlled by t_{CAC} .
 6. Operation within the $t_{RAD}(\text{Max.})$ limit ensures that $t_{RAC}(\text{Max.})$ can be met. $t_{RAD}(\text{Max.})$ is specified as a reference point only. If t_{RAD} is greater than the specified $t_{RAD}(\text{Max.})$ limit, then the access time is controlled by t_{AA} .
 7. $t_{CEZ}(\text{Max.})$, $t_{REZ}(\text{Max.})$, $t_{WEZ}(\text{Max.})$ and $t_{OEZ}(\text{Max.})$ define the time at which the output achieves the open circuit condition and are not referenced to output voltage levels.
 8. t_{CEZ} or t_{REZ} must be satisfied for open circuit condition.
 9. t_{RCH} or t_{RRH} 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 $t_{WCS} \geq t_{WCS}(\text{Min.})$, then 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 $t_{CPWD} \geq t_{CPWD}(\text{Min.})$, then 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, then the condition of the data out (at access time) is indeterminate.