PRELIMINARY

Notice: This is not a final specification
Some parametric limits are subject to change

MH51208ANA-85L,-10L,-12L,-15L/ MH51208ANA-85H,-10H,-12H,-15H

4194304-BIT(524288-WORD BY 8-BIT)CMOS STATIC RAM MODULE

DESCRIPTION

The MH51208ANA is a 4194304 bits CMOS static RAM module organized as 524288-words by 8-bits. It consists of four industry standard 128K×8 static RAMs (M5M51008VP/RV) and one decoder.

The stand-by current is low enough for a battery back-up application. It is mounted a TSOP package.

FEATURES

Type	Access time (max)	Power supply current	
		Active (max)	Stand-by (max)
MH51208ANA-85L	85ns	110mA	400μA
MH51208ANA-10L	100ns		
MH51208ANA-12L	120ns		
MH51208ANA-15L	150ns		
MH51208ANA-85H	85ns		80μA
MH51208ANA-10H	100ns		
MH51208ANA-12H	120ns		
MH51208ANA-15H	150ns		

- Single +5V Power Supply
- No Clocks, No Refresh
- Data-Hold on +2V Power Supply
- Three-State Outputs: OR-tie Capability
- Simple Memory Expantion by $\overline{S}$
- $\overline{OE}$ Prevents Data Contention in the I/O Bus
- Common Data I/O

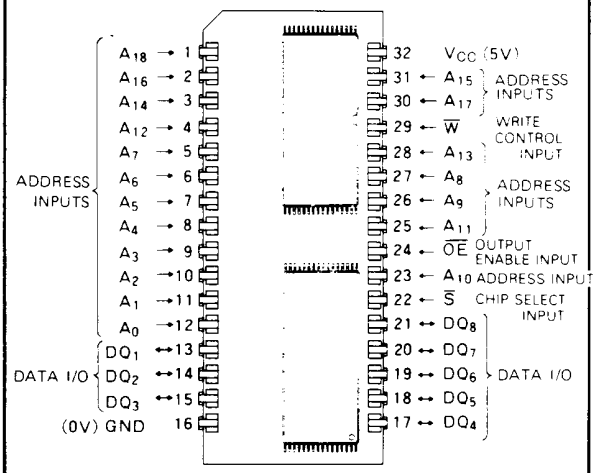
APPLICATION

Small Capacity Memory Units.

FUNCTION

The operation mode of the MH51208ANA is determined by a combination of the device control inputs $\overline{S}$, $\overline{W}$ and $\overline{OE}$. Each mode is summarized in the function table. (see next page)

PIN CONFIGURATION (TOP VIEW)



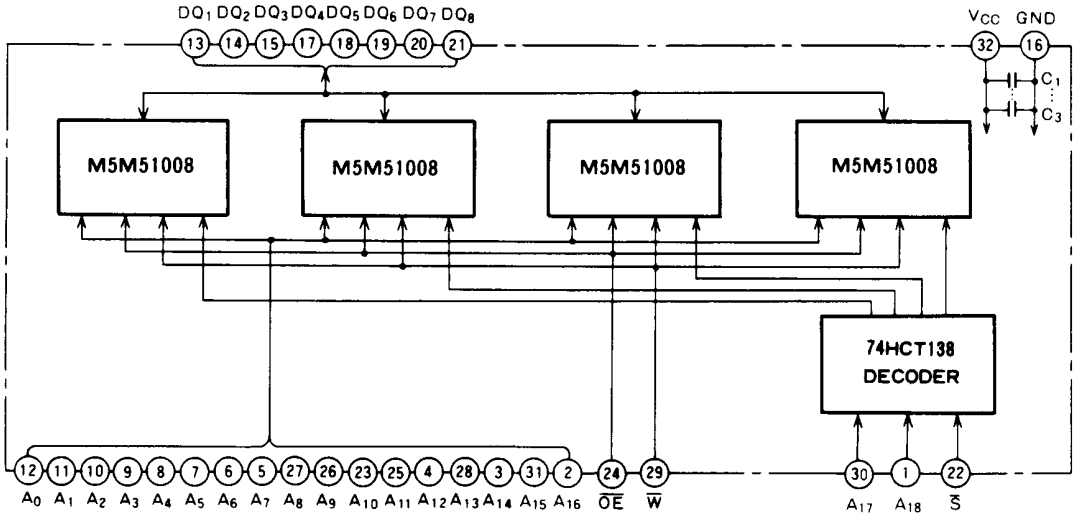
Outline 32N1D

A write cycle is executed whenever the low level $\overline{W}$ overlaps with the low level $\overline{S}$. The address must be set up before the write cycle and must be stable during the entire cycle. The data is latched into a cell on the trailing edge of $\overline{W}$, $\overline{S}$, whichever occurs first, requiring the set-up and hold time relative to these edge to be maintained. The output enable $\overline{OE}$ directly controls the output stage. Setting the $\overline{OE}$ at a high level, the output stage is in a high-impedance state, and the data bus contention problem in the write cycle is eliminated.

A read cycle is executed by setting $\overline{W}$ at a high level and $\overline{OE}$ at a low level while $\overline{S}$ are in an active state.

When setting $\overline{S}$ at a high level, the chip is in a non-

BLOCK DIAGRAM



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MH51208ANA-85L,-10L,-12L,-15L/ MH51208ANA-85H,-10H,-12H,-15H

4194304-BIT(524288-WORD BY 8-BIT)CMOS STATIC RAM MODULE

selectable mode in which both reading and writing are disabled. In this mode, the output stage is in a high-impedance state, allowing OR-tie with other chips and memory expantion by $\overline{S}$. The power supply current is reduced as low as the stand-by current which is specified as I_{CC3} or I_{CC4}, and the memory data can be held +2V power supply, enabling battery back-up operation during power failure or power-down operation in the non-selected mode.

FUNCTION TABLE

$\overline{S}$	$\overline{W}$	$\overline{OE}$	Mode	DQ	I_{CC}
H	X	X	Non selection	High-impedance	Standby
L	L	X	Write	D_{IN}	Active
L	H	L	Read	D_{OUT}	Active
L	H	H		High-impedance	Active

RECOMMENDED OPERATING CONDITIONS ($T_a = 0 \sim 70°C$, unless otherwise noted)

Symbol	Parameter	Limits			Unit
		Min	Typ	Max	
V_{CC}	Supply voltage	4.5	5	5.5	V
GND	Supply voltage		0		V
V_{IL}	Low input voltage	−0.3		0.8	V
V_{IH}	High input voltage	3.2		V_{CC}+0.3	V

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Conditions	Ratings	Unit
V_{CC}	Supply voltage	With respect to GND	−0.3~7	V
V_I	Input voltage		−0.3~V_{CC}+0.3	V
V_O	Output voltage		0~V_{CC}	V
P_d	Power dissipation	$T_a = 25°C$	700	mW
T_{opr}	Operating temperature		0~70	°C
T_{stg}	Storage temperature		−40~100	°C

ELECTRICAL CHARACTERISTICS ($T_a = 0 \sim 70°C$, $V_{CC} = 5V \pm 10\%$, unless otherwise noted)

Symbol	Parameter	Test conditions		Limits			Unit
				Min	Typ	Max	
V_{IH}	High input voltage			3.2		V_{CC}+0.3	V
V_{IL}	Low input voltage			−0.3		0.8	V
V_{OH}	High output voltage	$I_{OH} = -1mA$		2.4			V
V_{OL}	Low output voltage	$I_{OL} = 2mA$				0.4	V
I_I	Input current	$V_I = 0 \sim V_{CC}$				±4	μA
I_O	Output current	$\overline{S} = V_{IH}$ or $\overline{OE} = V_{IH}$ $V_{I/O} = 0 - V_{CC}$				±4	μA
I_{CC1}	Active supply current (AC. MOS level)	$\overline{S} < 0.2$, $\overline{W} > V_{CC} - 0.3$ output open other input < 0.2 or $> V_{CC} - 0.3$ Min. cycle			65	100	mA
I_{CC2}	Active supply current (AC. TTL level)	$\overline{S} = V_{IL}$, $\overline{W} = V_{IH}$ output open other input $= V_{IL}$ or V_{IH} Min. cycle			75	110	mA
I_{CC3}	Stand-by supply current	$\overline{S} \geq V_{CC} - 0.2V$ A_{17}, A_{18} ≤ 0.2 or $\geq V_{CC} - 0.2$ Other inputs $= 0 \sim V_{CC}$	ANA-L			400	μA
			ANA-H			80	μA
I_{CC4}	Stand-by supply current	$\overline{S} = V_{IH}$, Other inputs $= 0 \sim V_{CC}$				24	mA
C_I	Input capacitance (T_a = 25°C)	$V_I = GND$, $V_i = 25mVmrs$, $f = 1MHz$				30	pF
C_O	Output capacitance (T_a = 25°C)	$V_O = GND$, $V_O = 25mVrms$, $f = 1MHz$				30	pF

Note 1. Direction for current flowing into IC is indicated as positive (no mark)
2. Typical value is V_{CC} = 5V, T_a = 25°C

SWITCHING CHARACTERISTICS (T_a = 0 ~ 70°C, V_{CC} = 5V ± 10%, unless otherwise noted)

Read cycle

Symbol	Parameter	Limits												Unit
		MH51208ANA-85			MH51208ANA-10			MH51208ANA-12			MH51208ANA-15			
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
t_{CR}	Read cycle time	85			100			120			150			ns
$t_{a(A)}$	Address access time			85			100			120			150	ns
$t_{a(S)}$	Chip select access time			85			100			120			150	ns
$t_{a(OE)}$	Output enable access time			35			45			50			60	ns
$t_{dis(S)}$	Output disable time after $\overline{S}$ high			40			45			50			55	ns
$t_{dis(OE)}$	Output disable time after $\overline{OE}$ high			25			30			35			40	ns
$t_{en(S)}$	Output enable time after $\overline{S}$ low	5			5			5			5			ns
$t_{en(OE)}$	Output enable time after $\overline{OE}$ low	5			5			5			5			ns
$t_{v(A)}$	Data valid time after address change	10			10			10			10			ns

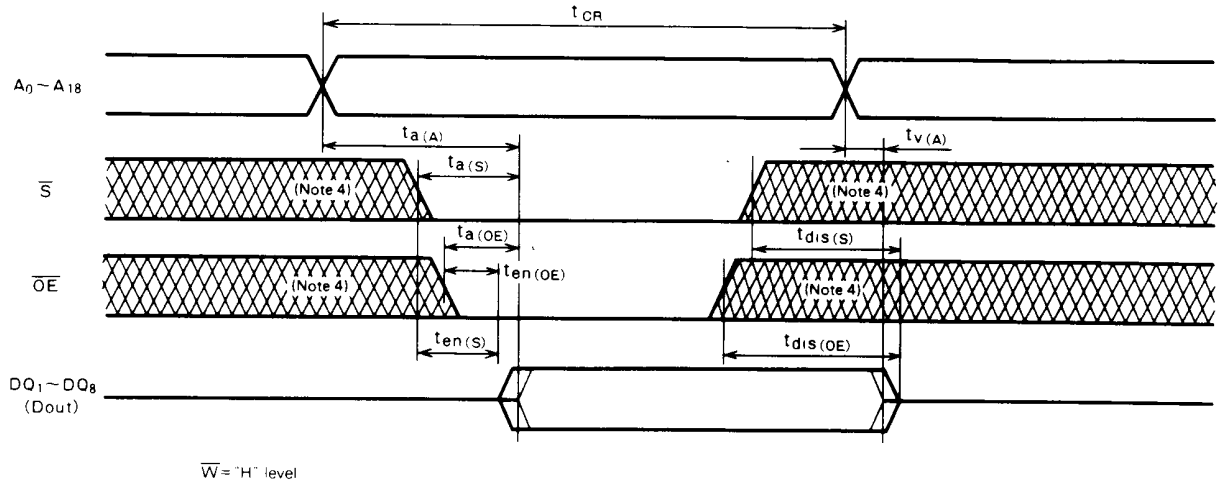
TIMING REQUIREMENTS (T_a = 0 ~ 70°C, V_{CC} = 5V ± 10%, unless otherwise noted)

Write cycle

Symbol	Parameter	Limits												Unit
		MH51208ANA-85			MH51208ANA-10			MH51208ANA-12			MH51208ANA-15			
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
t_{CW}	Write cycle time	85			100			120			150			ns
$t_{w(W)}$	Write pulse width	55			65			75			85			ns
$t_{su(A)}$	Address set up time	0			0			0			0			ns
$t_{su(A-\overline{W}H)}$	Address set up time with respect to $\overline{W}$ high	65			75			85			100			ns
$t_{su(S)}$	Chip select set up time	80			90			100			115			ns
$t_{su(D)}$	Data set up time	30			35			40			45			ns
$t_{h(D)}$	Data hold time	0			0			0			0			ns
$t_{rec(W)}$	Write recovery time	0			0			0			0			ns
$t_{dis(W)}$	Output disable time after $\overline{W}$ low			25			30			35			40	ns
$t_{dis(OE)}$	Output disable time after $\overline{OE}$ high			25			30			35			40	ns
$t_{en(W)}$	Output enable time after $\overline{W}$ high	5			5			5			5			ns
$t_{en(OE)}$	Output enable time after $\overline{OE}$ low	5			5			5			5			ns

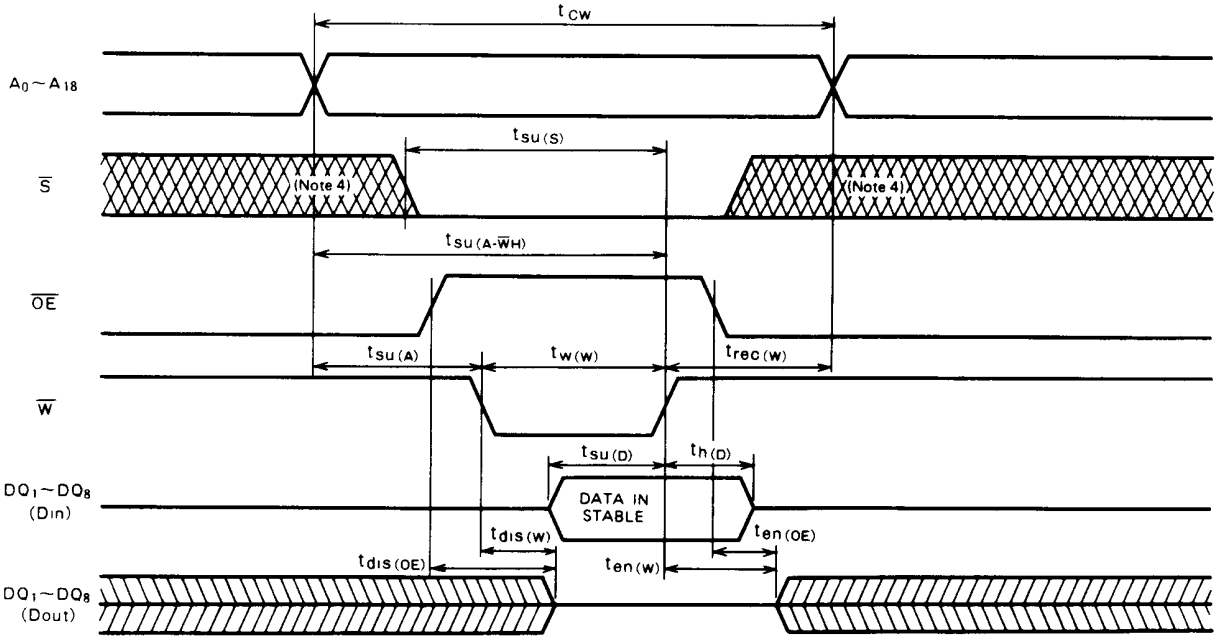
TIMING DIAGRAM

Read cycle

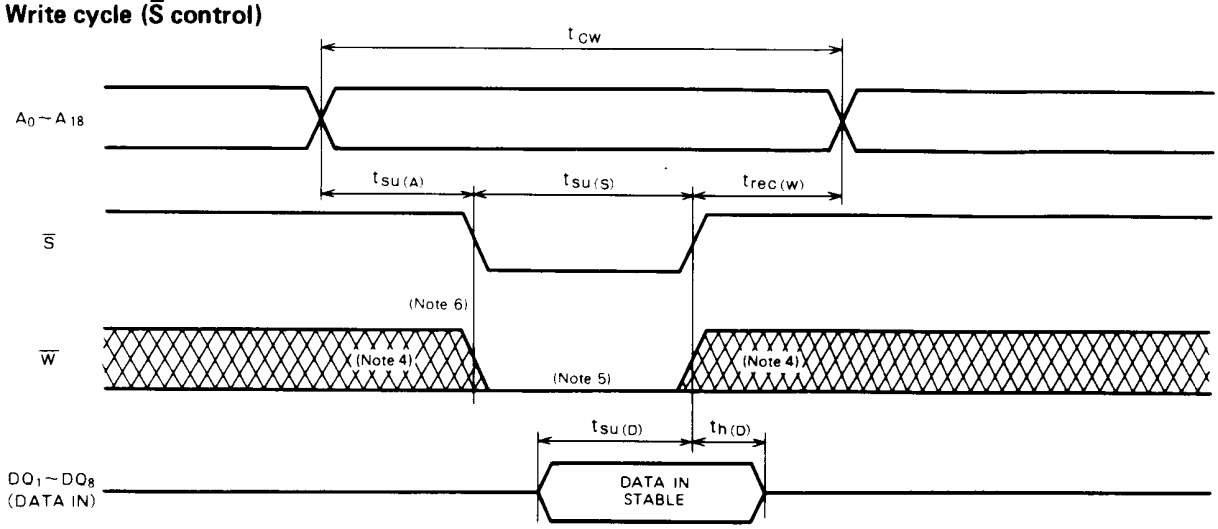


W = "H" level

Write cycle ($\overline{W}$ control)



Write cycle ($\overline{S}$ control)



4 Hatching indicates the state is don't care.
5 Writing is executed in overlap of $\overline{S}$ and $\overline{W}$ low.
6 If $\overline{W}$ goes low simultaneously with or prior to $\overline{S}$, the output remains in the high-impedance state.
7 Don't active inverted phase signal externally when DQ pin is in output mode.

POWER DOWN CHARACTERISTICS

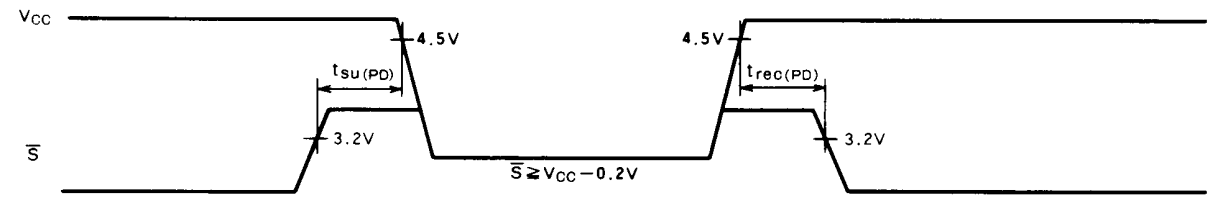
ELECTRICAL CHARACTERISTICS ($T_a = 0 \sim 70°C$, unless otherwise noted)

Symbol	Parameter	Test conditions		Limits			Unit
				Min	Typ	Max	
$V_{CC(PD)}$	Power down supply voltage			2			V
$V_{I(\overline{S})}$	Chip select input $\overline{S}$	$2.2V \leqq V_{CC(PD)}$		3.2			V
		$2V \leqq V_{CC(PD)} \leqq 2.2V$			$V_{CC(PD)}$		V
$I_{CC(PD)}$	Power down supply current	$V_{CC} = 3V$, A_{17}, A_{18} < 0.2 or $> V_{CC} - 0.2$ other inputs $= 0 \sim V_{CC}$	ANA-L			200	μA
			ANA-H			40	μA

TIMING REQUIREMENTS ($T_a = 0 \sim 70°C$, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$t_{su(PD)}$	Power down setup time		0			ns
$t_{rec(PD)}$	Power down recovery time		t_{CR}			ns

POWER DOWN CHARACTERISTICS

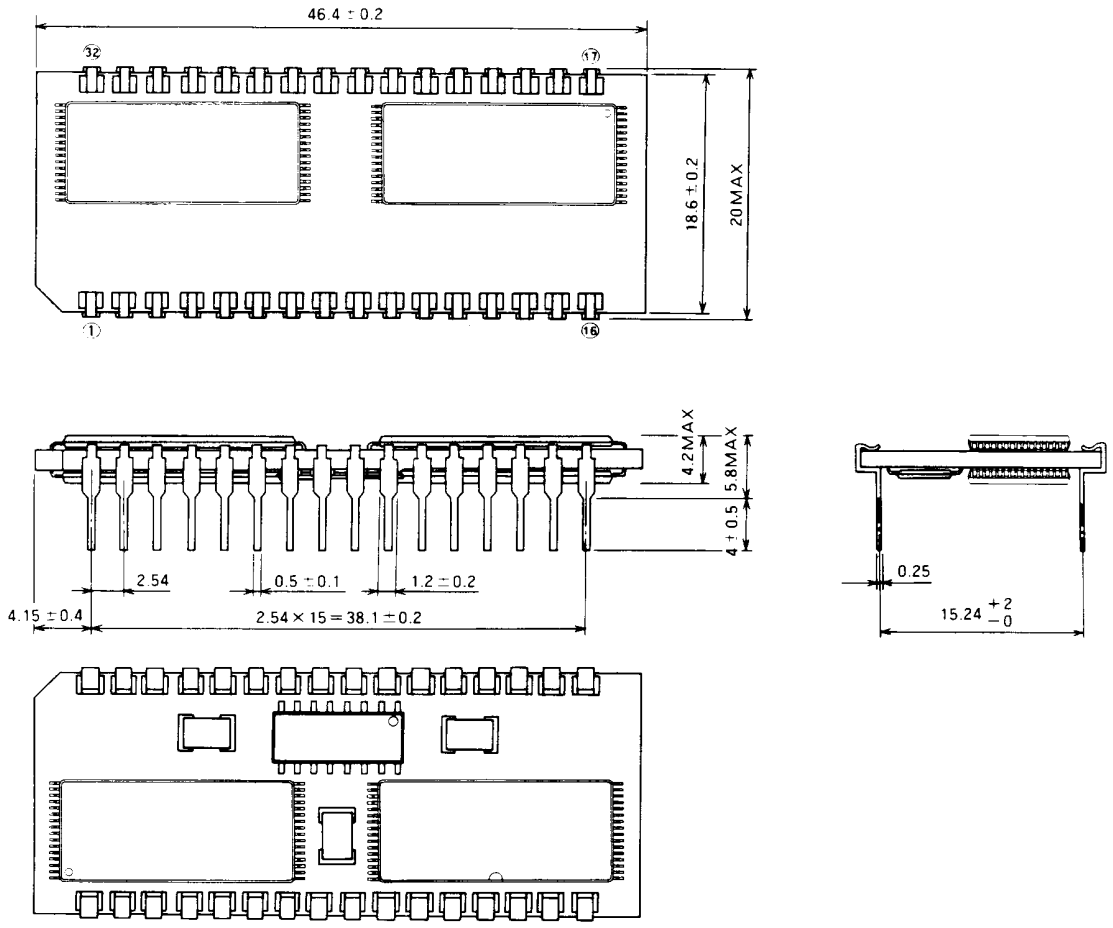


MH51208ANA-85L,-10L,-12L,-15L/ MH51208ANA-85H,-10H,-12H,-15H

4194304-BIT(524288-WORD BY 8-BIT)CMOS STATIC RAM MODULE

32N1D **32pin SRAM Module**

Dimension in mm



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