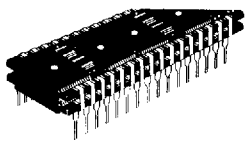


MH51208TNA-85L,-10L,-12L,-15L/ MH51208TNA-85H,-10H,-12H,-15H

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

MITSUBISHI (MEMORY/ASIC)

DESCRIPTION

The MH51208TNA is a 4194304 bits CMOS static RAM module organized as 524288-words by 8-bits. It consists of eight industry standard 32K x 8 static RAMs and one decoder.

The stand-by current is low enough for a battery backup application. It is mounted a flat package on a 32-pin dual in line package.

FEATURES

Type	Access time (max)	Power supply current	
		Active (max)	Stand-by (max)
MH51208TNA-85L	85ns	80 mA	800 μA
MH51208TNA-10L	100ns		
MH51208TNA-12L	120ns		
MH51208TNA-15L	150ns		
MH51208TNA-85H	85ns		360 μA
MH51208TNA-10H	100ns		
MH51208TNA-12H	120ns		
MH51208TNA-15H	150ns		

- Single +5V Power Supply
- No Clocks, No Refresh
- Data-Hold on +2V Power Supply
- Directly TTL Compatible: All Inputs and Outputs
- 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

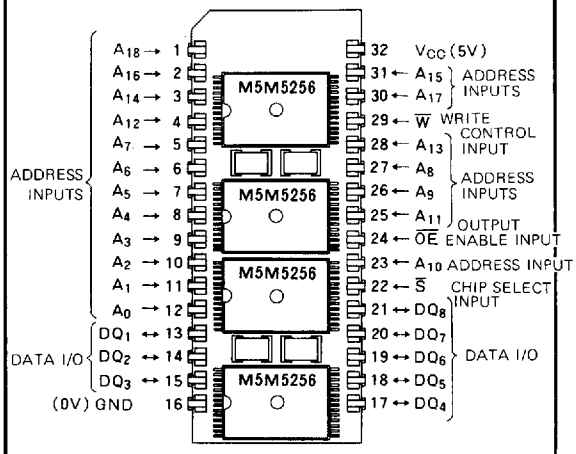
APPLICATION

Small Capacity Memory Units.

FUNCTION

The operation mode of the MH51208TNA 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)



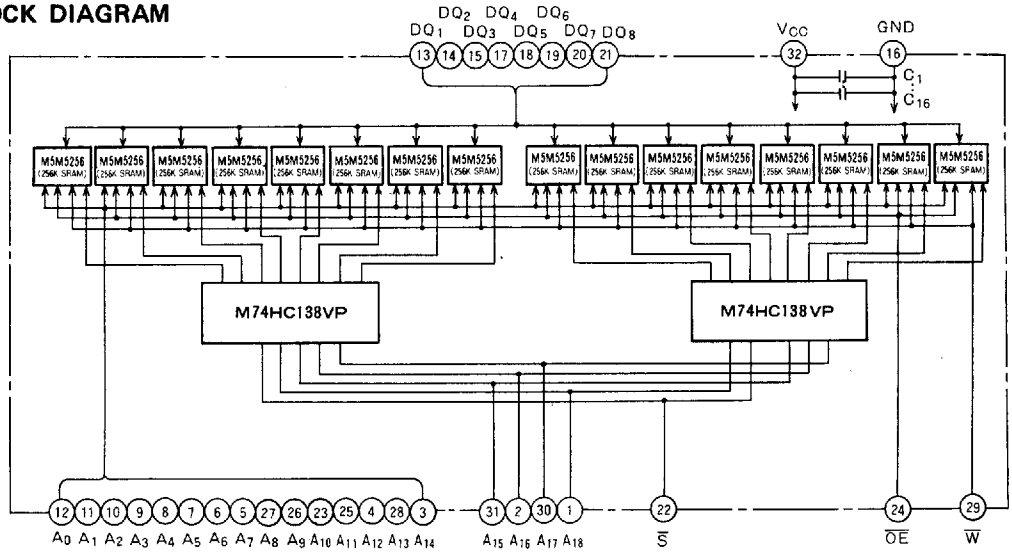
Outline 32N1B

A write cycle is executed whenever the low lever $\overline{W}$ 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



MH51208TNA-85L,-10L,-12L,-15L/ MH51208TNA-85H,-10H,-12H,-15H

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

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 ~ 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
Pd	Power dissipation	T_a = 25°C	700	mW
Topr	Operating temperature		0 ~ 70	°C
Tstg	Storage temperature		−40 ~ 100	°C

ELECTRICAL CHARACTERISTICS (T_a = 0 ~ 70°C, V_{CC} = 5V ±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 ~ V_{CC}				±1	μA
I_{OZH}	High level output current in off-state	$\overline{S}$ = V_{IH} or $\overline{OE}$ = V_{IH}				1	μA
I_{OZL}	Low level output current in off-state	$V_{I/O}$ = 0 − V_{CC}				−1	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			35	75	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			40	80	mA
I_{CC3}	Stand-by supply current	$\overline{S}$ ≧ V_{CC} − 0.2V A_{15} ~ A_{18} ≦ 0.2 or ≧ V_{CC} − 0.2 Other inputs = 0 ~ V_{CC}	TNA-L			800	μA
			TNA-H			360	
I_{CC4}	Stand-by supply current	$\overline{S}$ = V_{IH}, Other inputs = 0 ~ V_{CC}				24	mA
C_I	Input capacitance (T_a = 25°C)	V_I = GND, V_i = 25mVmrs, f = 1MHz				80	pF
C_O	Output capacitance (T_a = 25°C)	V_O = GND, V_O = 25mVrms, f = 1MHz				80	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

MH51208TNA-85L,-10L,-12L,-15L/ MH51208TNA-85H,-10H,-12H,-15H

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

MITSUBISHI (MEMORY/ASIC)

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

Read cycle

Symbol	Parameter	Limit												Unit
		MH51208TNA-85L MH51208TNA-85H			MH51208TNA-10L MH51208TNA-10H			MH51208TNA-12L MH51208TNA-12H			MH51208TNA-15L MH51208TNA-15H			
		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			45			50			60			75	ns
$t_{dis(S)}$	Output disable time after $\overline{S}$ high			30			35			40			45	ns
$t_{dis(OE)}$	Output disable time after $\overline{OE}$ high			30			35			40			45	ns
$t_{en(S)}$	Output enable time after $\overline{S}$ low	10			10			10			10			ns
$t_{en(OE)}$	Output enable time after $\overline{OE}$ low	10			10			10			10			ns
$t_{v(A)}$	Data valid time after address change	20			20			20			20			ns

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

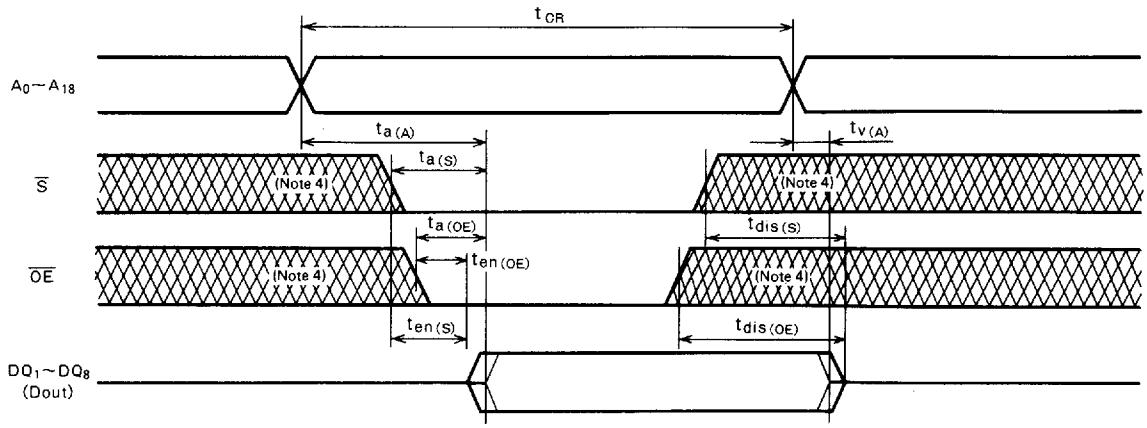
Write cycle

Symbol	Parameter	Limit												Unit
		MH51208TNA-85L MH51208TNA-85H			MH51208TNA-10L MH51208TNA-10H			MH51208TNA-12L MH51208TNA-12H			MH51208TNA-15L MH51208TNA-15H			
		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	60			60			70			80			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	75			80			85			90			ns
$t_{su(S)}$	Chip select set up time	75			80			85			90			ns
$t_{su(D)}$	Data set up time	35			35			40			50			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			30			35			40			45	ns
$t_{dis(OE)}$	Output disable time after $\overline{OE}$ high			30			35			40			45	ns
$t_{en(W)}$	Output enable time after $\overline{W}$ high	10			10			10			10			ns
$t_{en(OE)}$	Output enable time after $\overline{OE}$ low	10			10			10			10			ns

MITSUBISHI (MEMORY/ASIC)

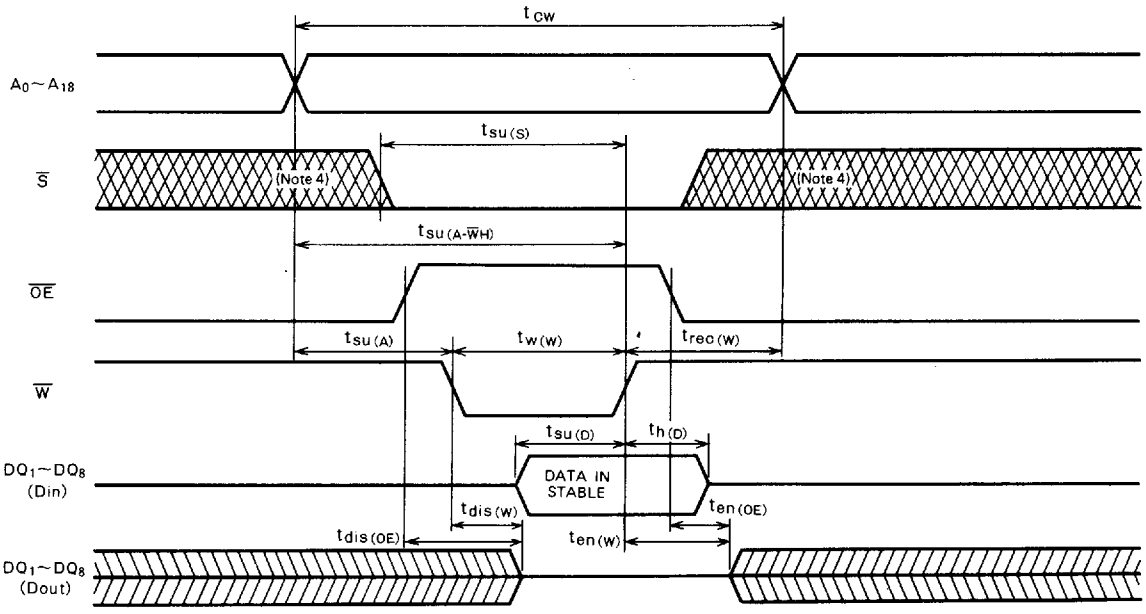
TIMING DIAGRAM

Read cycle



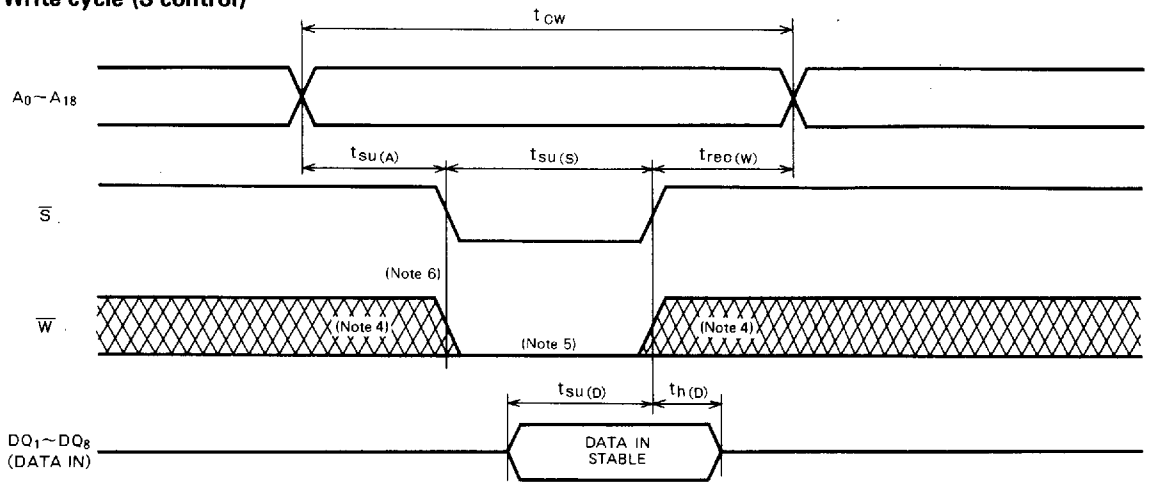
W="H" level

Write cycle (W control)



MITSUBISHI (MEMORY/ASIC)

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



Note 3: Test condition
Input pulse level: 0.6~2.4V
Input pulse rise fall time: 10ns
Load: 1 TTL, C_L = 100pF
Conditions of assessment: 1.5V
4: Hatching indicates the state is don't care.
5: Writing is executed in overlap of $\overline{S}$ and $\overline{W}$ low.
6: If 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=0~70°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≦$V_{CC(PD)}$		2.2			V
		2V≦$V_{CC(PD)}$≦2.2V			$V_{CC(PD)}$		
$I_{CC(PD)}$	Power down supply current	V_{CC}=3V, A_{15}~A_{18} <0.2 or >V_{CC}−0.2 other inputs=0~V_{CC}	TNA-L			400	μA
			TNA-H			160	

TIMING REQUIREMENTS (T_a=0~70°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