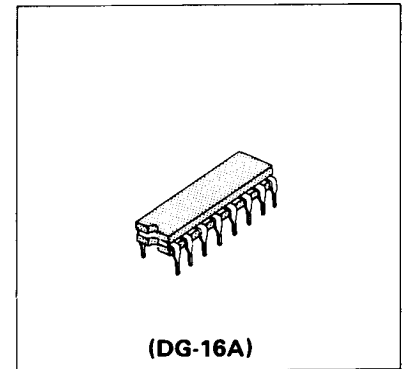


# HM2511, HM2511-1

## 1024-word × 1-bit Fully Decoded Random Access Memory

The HM2511 Series item is a 1024-word × 1-bit read/write random access memory with tri-state output developed for application to buffer memories, control memories, high-speed main memories, etc. It is a fully decoded, read/write, random access memory perfectly compatible with standard DTL and TTL logic families.

- Level ..... TTL compatible
- Construction ..... 1024-word × 1 bit
- Read access time ..... HM2511: 70ns (max)  
HM2511-1: 45ns (max)
- Chip select access time ..... HM2511: 40ns (max)  
HM2511-1: 30ns (max)
- Power consumption ..... 0.5 mW/bit
- Output ..... tri-state



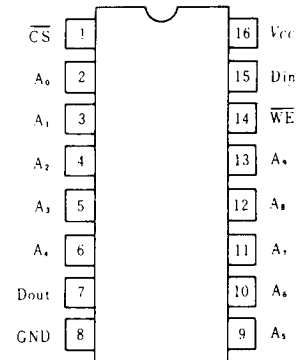
■ PIN ARRANGEMENT

### ■ TRUTH TABLE

Input			Output Open Collector	Mode
CS	WE	Din		
H	×	×	High Z	Not Selected
L	L	L	High Z	Write "0"
L	L	H	High Z	Write "1"
L	H	×	Dout *	Read

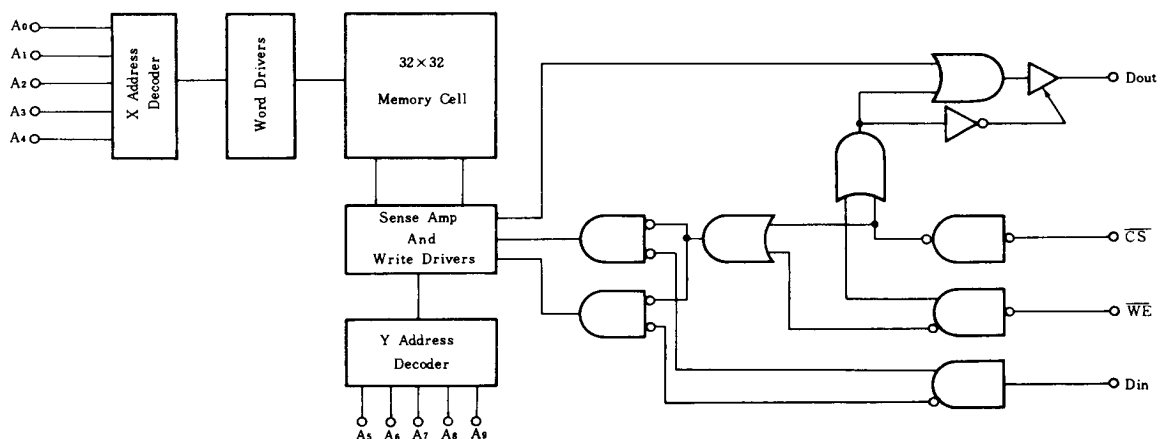
× : Don't care

\* : Read out noninverted



(Top View)

### ■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

Item	Symbol	HM2511 Series	Unit
Supply Voltage	$V_{CC}$	-0.5 to +7.0	V
Input Voltage	$V_{in}$	-0.5 to +5.5	V
Input Current	$I_{in}$	-12 to +5.0	mA
Output Voltage (Output High)	$V_{out}$	-0.5 to +5.5	V
Output Voltage (DC Output Low)	$I_{out}$	+20	mA
Storage Temperature	$T_{stg}$	-65 to +150	°C
Storage Temperature	$T_{stg}$ (Bias)*	-55 to +125	°C

\* Under Bias

■ ELECTRICAL CHARACTERISTICS

● DC CHARACTERISTICS ( $V_{CC}=5.0V \pm 5\%$ ,  $T_a=0$  to  $+75^\circ C$ , air flow exceeding 2m/sec)

Item	Symbol	Test Condition	HM2511 Series			Unit
			min.	typ.	max.	
Output Low Voltage	$V_{OL}$	$V_{CC}=4.75V$ , $I_{OL}=16mA$	—	0.3	0.45	V
Input Voltage	$V_{IH}$	Guaranteed Input Voltage High	2.1	1.6	—	V
	$V_{IL}$	Guaranteed Input Voltage Low	—	1.5	0.8	V
Input Current	$I_{IH1}$	$V_{CC}=5.25V$ , $V_{in}=4.5V$	—	0	40	$\mu A$
	$I_{IH2}$	$V_{CC}=5.25V$ , $V_{in}=5.25V$	—	0	1.0	mA
	$I_{IL}$	$V_{CC}=5.25V$ , $V_{in}=0.4V$	—	-250	-400	$\mu A$
Output Current (High Z)	$I_{OFF1}$	$V_{CC}=5.25V$ , $V_{out}=2.4V$	—	—	50	$\mu A$
	$I_{OFF2}$	$V_{CC}=5.25V$ , $V_{out}=0.5V$	—	—	-50	$\mu A$
Output Current Short Circuit to Ground	$I_{OS}$	$V_{CC}=5.25V$	—	—	-100	mA
Output High Voltage	$V_{OH}$	$I_{OH}=-10.3mA$ , $V_{CC}=5.0V \pm 5\%$	2.4	—	—	V
Input Clamp Voltage	$V_I$	$V_{CC}=5.25V$ , $I_{in}=-10mA$	—	-1.0	-1.5	V
Supply Current	$I_{CC}$	$V_{CC}=5.25V$ $0 \leq T_a < 25^\circ C$	—	—	155	mA
		All input GND $T_a \geq 25^\circ C$	—	95	130	mA

● AC CHARACTERISTICS ( $V_{CC}=5.0V \pm 5\%$ ,  $T_a=0$  to  $+75^\circ C$ , air flow exceeding 2m/sec)

1. READ MODE

Item	Symbol	Test Condition	HM2511			HM2511-1			Unit
			min.	typ.	max.	min.	typ.	max.	
Chip Select Access Time	$t_{ACS}$		—	15	40	—	—	30	ns
Chip Select to High Z	$t_{ZRCS}$		—	20	40	—	—	30	ns
Address Access Time	$t_{AA}$		—	40	70	—	35	45	ns

2. WRITE MODE

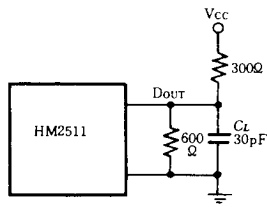
Item	Symbol	Test Condition	HM2511			HM2511-1			Unit	
			min.	typ.	max.	min.	typ.	max.		
Write Pulse Width	$t_w$	$t_{WSA} = \min$	50	25	—	35	10	—	ns	
Data Setup Time	$t_{WSD}$		5	0	—	5	—	—	ns	
Data Hold Time	$t_{WHD}$		5	0	—	5	—	—	ns	
Address Setup Time	$t_{WSA}$		$t_w = \min$	15	0	—	5	—	—	ns
Address Hold Time	$t_{WHA}$		5	0	—	5	—	—	ns	
Chip Select Setup Time	$t_{WSCS}$		5	0	—	5	—	—	ns	
Chip Select Hold Time	$t_{WHCS}$		5	0	—	5	—	—	ns	
Write Disable to High Z	$t_{ZWS}$		—	20	40	—	20	35	ns	
Write Recovery Time	$t_{WR}$		—	42	55	—	30	45	ns	

3. CAPACITANCE

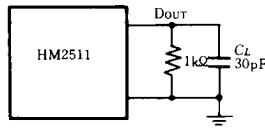
Item	Symbol	Test Condition	HM2511 Series			Unit
			min.	typ.	max.	
Input Capacitance	$C_{in}$		—	3	5	pF
Output Capacitance	$C_{out}$		—	9	11	pF

■ TEST CIRCUIT AND WAVEFORMS

1. LOADING CONDITION



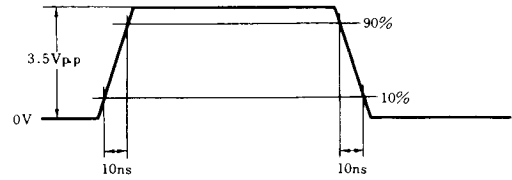
Load A



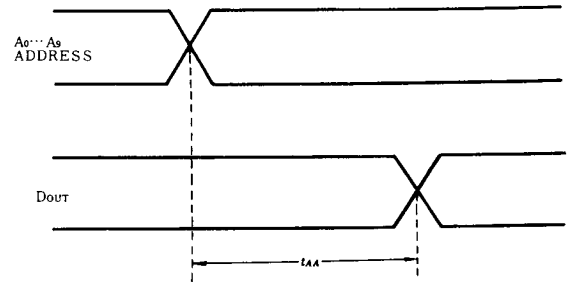
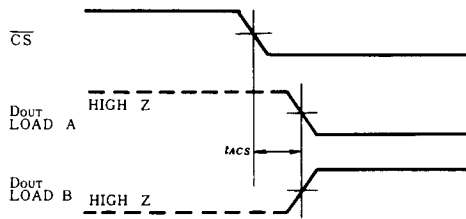
Load B

Note:  $C_L$  includes probe and stray capacitance

2. INPUT PULSE

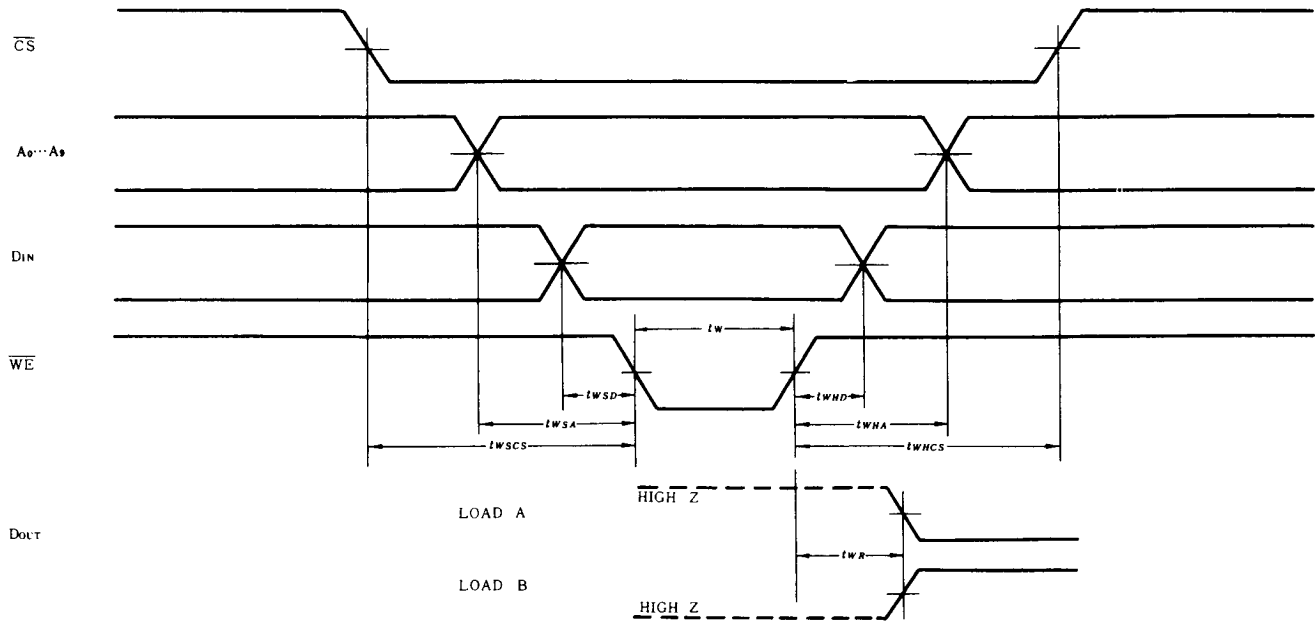


3. READ MODE



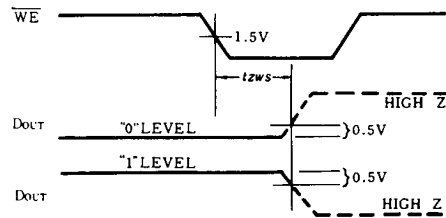
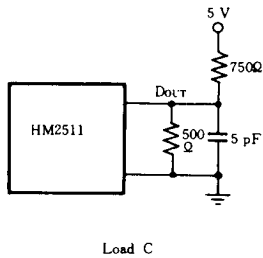
(All time measurements refer to 1.5V)

4. WRITE MODE

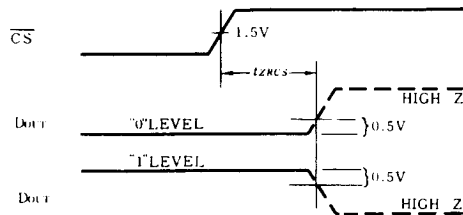


(All above measurements referenced to 1.5V)

5. WRITE ENABLE TO HIGH Z DELAY



6. PROPAGATION DELAY FROM CHIP SELECT TO HIGH Z



(All  $t_{ZXXX}$  parameters are measured at a delta of 0.5V from the logic level and using Load C.)