

## DATA SHEET

# HM 65161

## 2 k x 8 GENERAL PURPOSE CMOS SRAM

### FEATURES

- **ACCESS TIME**  
 MILITARY: 90 ns (max)  
 INDUSTRIAL : 80 ns (max)  
 COMMERCIAL : 70 ns (max)
- **LOW POWER CONSUMPTION**  
 ACTIVE : 240 mW (typ)  
 STANDBY : 25  $\mu$ W (typ)  
 DATA RETENTION : 4  $\mu$ W (typ)
- **600 MILS WIDTH PACKAGE**
- **TTL COMPATIBLE INPUTS AND OUTPUTS**
- **ASYNCHRONOUS**
- **SINGLE 5 VOLT SUPPLY**
- **EQUAL CYCLE AND ACCESS TIME**
- **NO CLOCK AND STROBES REQUIRED**
- **GATED INPUTS**
- **WIDE TEMPERATURE RANGE : - 55 TO + 125°C**

### DESCRIPTION

The HM 65161 is a low power CMOS static RAM organized as 2048 x 8 bits. It is manufactured using the MHS high performance CMOS technology.

70 ns access time for commercial temperature range is available with a maximum power consumption of only 385mW.

The HM 65161 features fully static operation requiring no external clocks or timing strobes. Thanks to the special input buffer "gated inputs", the circuit stays in stand

by mode when the  $\overline{CS}$  goes to an intermediate level (VIH).

Easy memory expansion is provided by an active low chip select ( $\overline{CS}$ ), an active low output enable ( $\overline{OE}$ ) and three state drivers.

The HM 65161 are TTL compatible and operate from single 5 V supply thus simplifying system design.

The HM-65161 is processed following the test methods of MIL STD 883C.

7

### PACKAGES

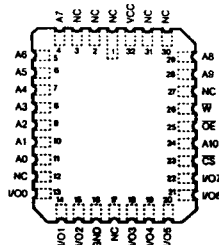
Plastic 600 mils, 24 pins, DIL.  
 Ceramic 600 mils, 24 pins, DIL.

LCC, 32 pins.

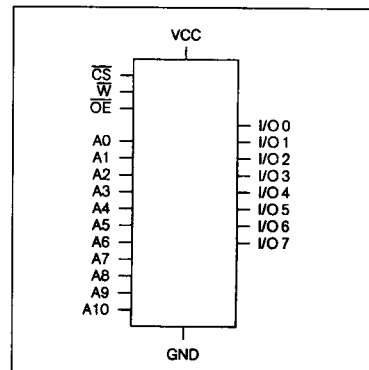
**Pinout DIL 24 pins (top view)**

**Pinout LCC 32 pins (top view)**

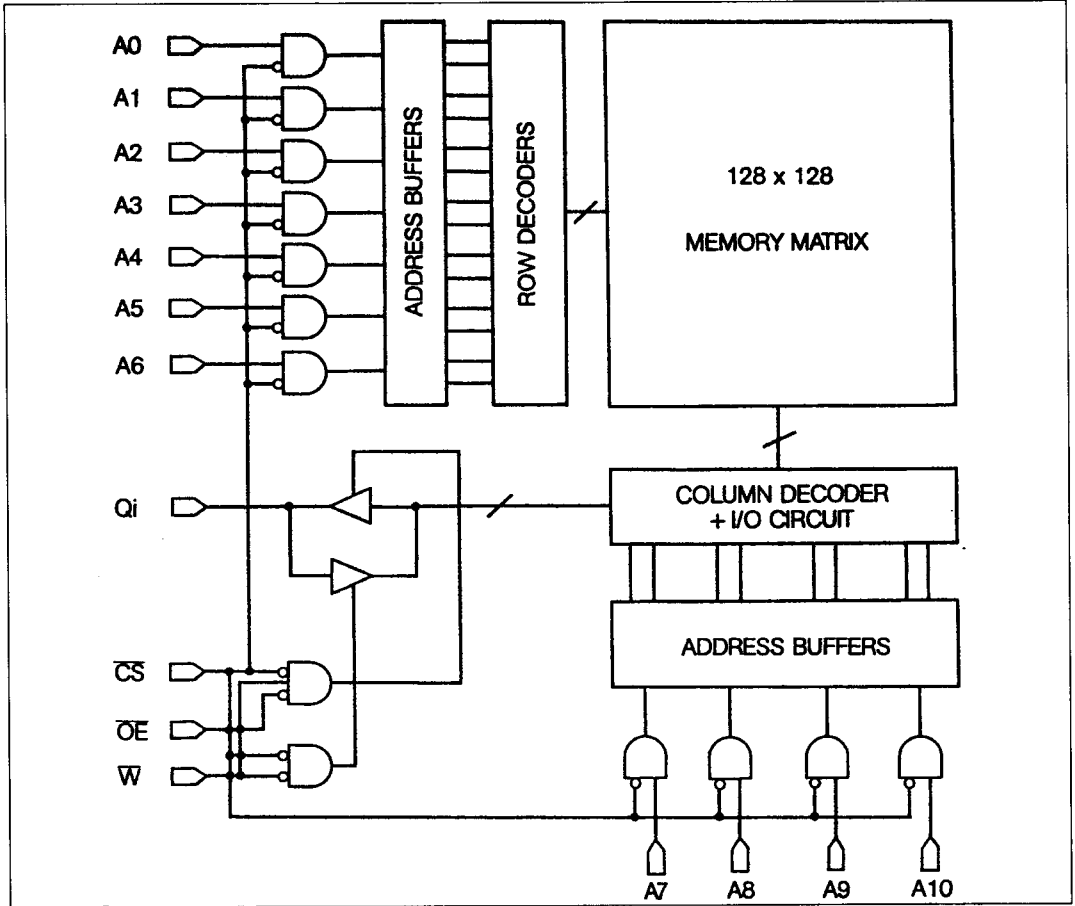
A7	1	24	VCC
A6	2	23	A8
A5	3	22	A9
A4	4	21	$\overline{W}$
A3	5	20	$\overline{OE}$
A2	6	19	A10
A1	7	18	$\overline{CS}$
A0	8	17	I/O7
I/O0	9	16	I/O6
I/O1	10	15	I/O5
I/O2	11	14	I/O4
GND	12	13	I/O3



### LOGIC SYMBOL



BLOCK DIAGRAM



7

PIN NAMES

A0-A10 : Address inputs	I/O0-I/O7 : Input/Output
Vcc : Power	$\overline{CS}$ : Chip Select
$\overline{OE}$ : Output enable	$\overline{W}$ : Write Enable

TRUTH TABLE

CS1	OE	W	DATA-IN	DATA-OUT	MODE
H	X	X	Z	Z	Deselect
L	L	H	Z	Valid	Read
L	H	L	Valid	Z	Write
L	L	L	Valid	Z	Write

L = low, H = high, X = H or L, Z = high impedance.

**ABSOLUTE MAXIMUM RATINGS**

Supply voltage to GND potential : - 0.3 V to + 7.0 V

Input or Output voltage applied : (Gnd - 0.3 V) to (Vcc + 0.3 V)

Storage temperature : - 65°C to + 150°C

OPERATING RANGE		OPERATING VOLTAGE	OPERATING TEMPERATURE
Military	(- 2)	Vcc ± 10 %	- 55°C to + 125°C
Industrial	(- 9)	Vcc ± 10 %	- 40°C to + 85°C
Commercial	(- 5)	Vcc ± 10 %	0°C to + 70°C

**RECOMMENDED DC OPERATING CONDITIONS**

PARAMETER	DESCRIPTION	MINIMUM	TYPICAL	MAXIMUM	UNIT
V <sub>CC</sub>	Supply voltage	4.5	5.0	5.5	V
Gnd	Ground	0.0	0.0	0.0	V
V <sub>IL</sub> (1)	Input low voltage	- 0.3	0.0	0.8	V
V <sub>IH</sub>	Input high voltage	2.2	3.5	V <sub>CC</sub> + 0.3V	V

Note : 1. V<sub>IL</sub> min = - 0.3 V or - 1.0 V pulse width 50 ns.**CAPACITANCE**

PARAMETER	DESCRIPTION	MINIMUM	TYPICAL	MAXIMUM	UNIT
C <sub>in</sub> (2)	Input capacitance	-	-	8	pF
C <sub>out</sub> (2)	Output capacitance	-	-	10	pF

Note : 2. TA = 25°C, f = 1 MHz, V<sub>CC</sub> = 5.0 V, these parameters are not 100 % tested.

**ELECTRICAL CHARACTERISTICS DC PARAMETER**

PARAMETER	DESCRIPTION	MINIMUM	TYPICAL	MAXIMUM	UNIT
IIX (3)	Input leakage current	- 1.0*	-	1.0*	μA
IOZ (3)	Output leakage current	- 1.0*	-	1.0*	μA
VOL (4)	Output low voltage	-	-	0.4	V
VOH (4)	Output high voltage	2.4	-	-	V

Notes : 3. Gnd < Vin < Vcc, Gnd < Vout < Vcc output disabled.  
 \* Specified to ± 2 μA for the HM-65161  
 4. Vcc min, IOL = 3.2 mA, IOH = - 1.0 mA.

**Consumption for Commercial specification (- 5) :**

SYMBOL	PARAMETER	65161-5	UNIT	VALUE
ICCSB (5)	Standby supply current	2.0	mA	max
ICCSB1 (6)	Standby supply current	100.0	μA	max
ICC (7)	Operating supply current	70.0	mA	max
ICCOP (8)	Operating supply current	70.0	mA	max

**Consumption for Industrial specification (- 9) :**

SYMBOL	PARAMETER	65161-9	UNIT	VALUE
ICCSB (5)	Standby supply current	3.0	mA	max
ICCSB1 (6)	Standby supply current	350.0	μA	max
ICC (7)	Operating supply current	80.0	mA	max
ICCOP (8)	Operating supply current	80.0	mA	max

**Consumption for Military specification (- 2) :**

SYMBOL	PARAMETER	65161-2	UNIT	VALUE
ICCSB (5)	Standby supply current	4.0	mA	max
ICCSB1 (6)	Standby supply current	1000.0	μA	max
ICC (7)	Operating supply current	85.0	mA	max
ICCOP (8)	Operating supply current	85.0	mA	max

Notes : 5. CS ≥ VIH  
 6. CS ≥ Vcc - 0.3 V, Iout = 0 mA  
 7. CS ≤ VIL, Iout = 0 mA, Vin = Gnd/Vcc  
 8. Vcc max, Iout = 0 mA, f = 1 MHz and 5 mA/MHz, Vin = Gnd/Vcc

7

**DATA RETENTION MODE**

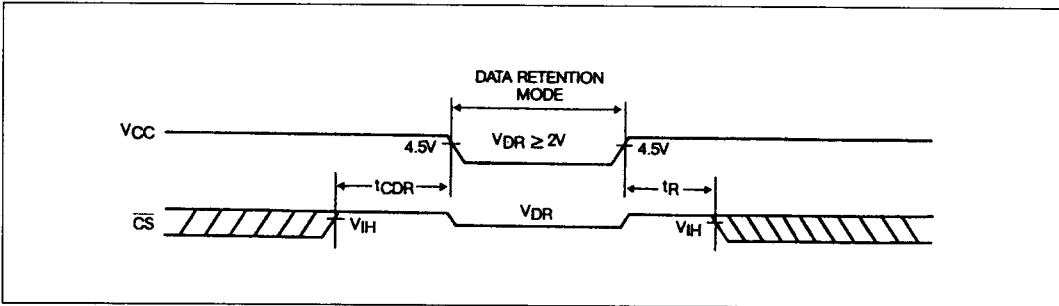
MHS CMOS RAM's are designed with battery backup in mind. Data retention voltage and supply current are guaranteed over temperature. The following rules insure data retention :

1. Chip select ( $\overline{CS}$ ) must be held high during data retention ; within  $V_{CC}$  to  $V_{CC} + 0.3 V$

2. Output Enable ( $\overline{OE}$ ) should be held high to keep the RAM outputs high impedance, minimizing power dissipation

3.  $\overline{CS}$  and  $\overline{OE}$  must kept between  $V_{CC} + 0.3 V$  and 70 % of  $V_{CC}$  during the power up and power down transitions.

**TIMING**



**DATA RETENTION CHARACTERISTICS**

PARAMETER	DESCRIPTION	MINIMUM	TYPICAL (9)	MAXIMUM	UNIT
VCCDR	Vcc for data retention	2.0	-	-	V
TCDR	Chip deselect to data retention time	0.0	-	-	ns
TR	Operation recovery time	TAVAV (10)	-	-	ns
ICCDR1 (11)	Data retention current @ 2.0 V : HM-65161-5	-	2.0	30.0	$\mu A$
	HM-65161-9	-	2.0	140.0	$\mu A$
	HM-65161-2	-	2.0	400.0	$\mu A$
ICCDR2 (11)	Data retention current @ 3.0 V : HM-65161-5	-	3.0	45.0	$\mu A$
	HM-65161-9	-	3.0	210.0	$\mu A$
	HM-65161-2	-	3.0	600.0	$\mu A$

Notes : 9. TA = 25°C  
 10. TAVAV = Read cycle time  
 11. CS = Vcc, Vin = Gnd/Vcc, this parameter is only tested to Vcc = 2 V.

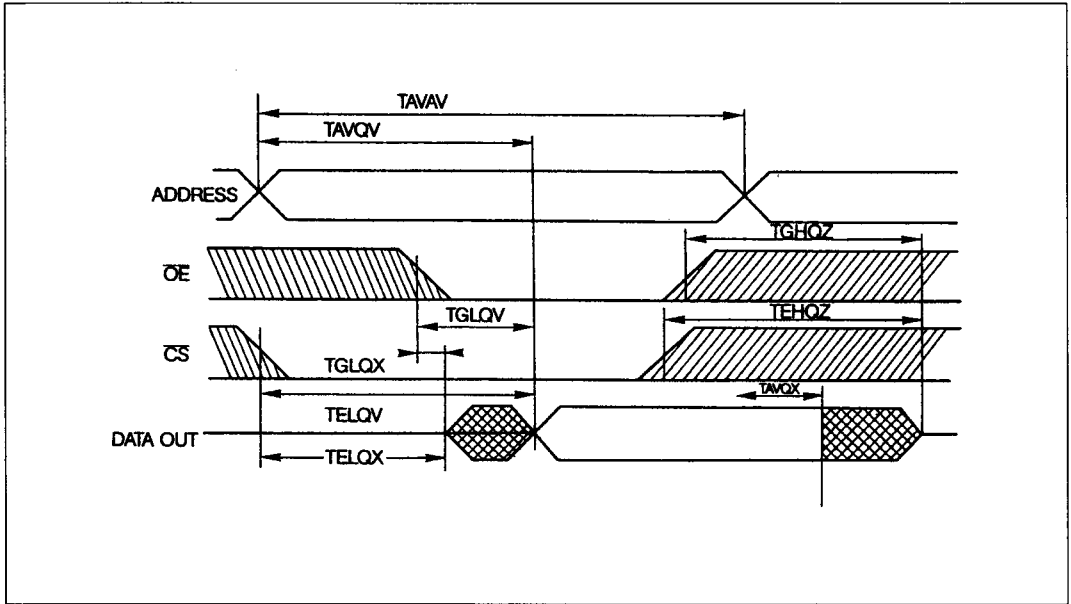
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READ CYCLE

SYMBOL	PARAMETER	65161 -5	65161 -9	65161 -2	UNIT	VALUE
TAVAV	READ cycle time	70	80	90	ns	min
TAVQV	Address access time	70	80	90	ns	max
TAVQX	Address valid to low Z	10	10	10	ns	min
TELQV	Chip-select access time	70	80	90	ns	max
TELQX	$\overline{CS}$ low to low Z	10	10	10	ns	min
TEHQZ	$\overline{CS}$ high to high Z	35	35	35	ns	max
TGLQV	Ouput Enable access time	40	40	60	ns	max
TGLQX	$\overline{OE}$ low to low Z	0	0	0	ns	min
TGHQZ	$\overline{OE}$ high to high Z	35	35	35	ns	max

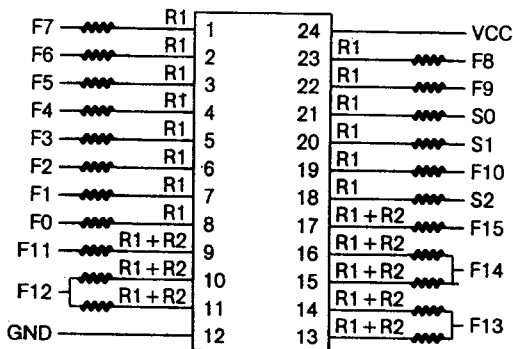
READ CYCLE



ORDERING INFORMATION

Package	Device type	Level
HM1	65161	- 5
0 - Chip form 1 - Ceramic 24 pins 3 - Plastic 24 pins 4 - LCC 32 pins	2 k x 8 general purpose static RAM	- 5 : Commercial - 5+ : Commercial with B.I. - 9 : Industrial - 9+ : Industrial with B.I. - 2 : Military - 8 : Military with B.I. (B.I. = Burn-in)

BURN-IN SCHEMATICS



$R1 = 220 \Omega$  per row  
 $R2 = 2.2 K\Omega$  per driver  
 $Fo = 25 KHz \pm 20 \%$   
 $Fn = 1/2 F_{n-1}$   
 S0, S1, S2 : programmable signals for write / read cycles  
 $VCC = 5.5 V$

7