Fast 8K x 8 SRAM

Features

- Fast 8192 x 8 bit static CMOS RAM
- 20 ns, 25 ns, 35 ns Access Times
- Bidirectional data inputs and data outputs
- Three-state outputs
- Data retention current at 3 V: < 10 µA (standard)
- Standby current standard < 30 µA
- Standby current low power (L) < 5 µA
- TTL/CMOS-compatible
- Automatic reduction of power dissipation in long Read or Write cycles
- Power supply voltage 5 V
- Operating temperature ranges:
  - 0 to 70 °C
  - -25 to 85 °C
  - -40 to 85 °C
- Quality assessment according to CECC 90000, CECC 90100 and CECC 90111
- ESD protection > 2000 V (MIL STD 883C M3015.7)
- Latch-up immunity > 200 mA
- Packages: PDIP28 (300 mil)
  SOJ28 (300 mil)

Description

The U62H64 is a static RAM manufactured using a CMOS process technology with the following operating modes:

- Read   - Standby
- Write   - Data Retention

The memory array is based on a 6-transistor cell.

The circuit is activated by the rising edge of E2 (at $\overline{E1}$ = L), or the falling edge of $\overline{E1}$ (at E2 = H). The address and control inputs open simultaneously.
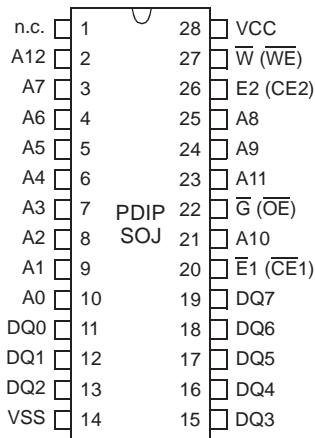
According to the information of $\overline{W}$ and $\overline{G}$, the data inputs, or outputs, are active. During the active state ($\overline{E1}$ = L and E2 = H), each address change leads to a new Read or Write cycle. In a Read cycle, the data outputs are activated by the falling edge of $\overline{G}$, afterwards the data word read will be available at the outputs DQ0 - DQ7. After the address change, the data outputs go High-Z until the new read information is available. The data outputs have no preferred state. If the memory is driven by CMOS levels in the active state, and if there is no change of the address, data input and control signals $\overline{W}$ or $\overline{G}$, the operating current (at I_O = 0 mA) drops to the value of the operating current in the Standby mode. The Read cycle is finished by the falling edge of E2 or $\overline{W}$, or by the rising edge of $\overline{E1}$, respectively.

Data retention is guaranteed down to 2 V.

With the exception of $\overline{E1}$ and E2, all inputs consist of NOR gates, so that no pull-up/pull-down resistors are required. This gate circuit allows to achieve low power standby requirements by activation with TTL-levels too.

Pin Configuration

```
        n.c. ⧄  1        28  ⧄ VCC
        A12  ⧄  2        27  ⧄ W̅ (W̅E̅)
        A7   ⧄  3        26  ⧄ E2 (CE2)
        A6   ⧄  4        25  ⧄ A8
        A5   ⧄  5        24  ⧄ A9
        A4   ⧄  6        23  ⧄ A11
        A3   ⧄  7  PDIP  22  ⧄ G̅ (O̅E̅)
        A2   ⧄  8  SOJ   21  ⧄ A10
        A1   ⧄  9        20  ⧄ E̅1 (C̅E̅1)
        A0   ⧄  10       19  ⧄ DQ7
        DQ0  ⧄  11       18  ⧄ DQ6
        DQ1  ⧄  12       17  ⧄ DQ5
        DQ2  ⧄  13       16  ⧄ DQ4
        VSS  ⧄  14       15  ⧄ DQ3
```

Top View

Pin Description

Signal Name	Signal Description
A0 - A12	Address Inputs
DQ0 - DQ7	Data In/Out
$\overline{E1}$	Chip Enable 1
E2	Chip Enable 2
$\overline{G}$	Output Enable
$\overline{W}$	Write Enable
VCC	Power Supply Voltage
VSS	Ground
n.c.	not connected

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U62H64

Block Diagram
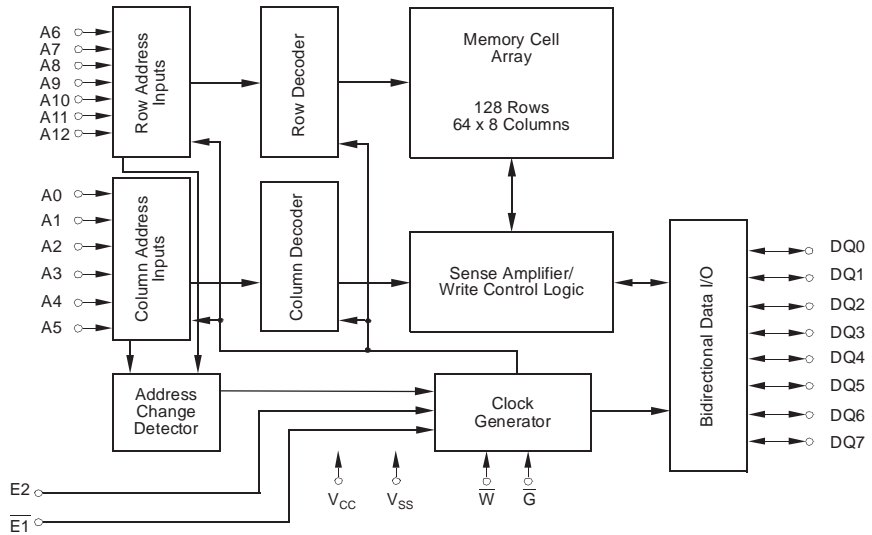
Truth Table

Operating Mode	$\overline{E1}$	E2	$\overline{W}$	$\overline{G}$	DQ0 - DQ7
Standby/not selected	*	L	*	*	High-Z
	H	*	*	*	High-Z
Internal Read	L	H	H	H	High-Z
Read	L	H	H	L	Data Outputs Low-Z
Write	L	H	L	*	Data Inputs High-Z

* H or L

Characteristics

All voltages are referenced to V_{SS} = 0 V (ground).
All characteristics are valid in the power supply voltage range and in the operating temperature range specified.
Dynamic measurements are based on a rise and fall time of $\leq$ 3 ns, measured between 10 % and 90 % of V_I, as well as input levels of V_{IL} = 0 V and V_{IH} = 3 V. The timing reference level of all input and output signals is 1.5 V, with the exception of the t_{dis}-times and t_{en}-times, in which cases transition is measured $\pm$ 200 mV from steady-state voltage.

Maximum Ratings	Symbol	Min.	Max.	Unit
Power Supply Voltage	V_{CC}	-0.3	7	V
Input Voltage	V_I	-0.3	V_{CC} + 0.5	V
Output Voltage	V_O	-0.3	V_{CC} + 0.5	V
Operating Temperature C-Type G-Type K-Type	T_a	0 -25 -40	70 85 85	°C °C °C
Storage Temperature	T_{stg}	-55	125	°C
Output Short-Circuit Current at V_{CC} = 5 V and V_O = 0 V *	$|I_{OS}|$		300	mA

* Not more than 1 output should be shorted at one time. Duration of the short circuit should not exceed 30 s.

December 12, 1997

Recommended Operating Conditions	Symbol	Conditions	Min.	Max.	Unit
Power Supply Voltage	V_{CC}		4.5	5.5	V
Data Retention Voltage	$V_{CC(DR)}$		2.0	-	V
Input Low Voltage *	V_{IL}		-0.3	0.8	V
Input High Voltage	V_{IH}		2.2	V_{CC} + 0.3	V

* -2 V at Pulse Width 10 ns

Electrical Characteristics	Symbol	Conditions	Min.	Max.	Unit
Supply Current - Operating Mode	$I_{CC(OP)}$	V_{CC} = 5.5 V V_{IL} = 0.8 V V_{IH} = 2.2 V t_{cW} = 20 ns t_{cW} = 25 ns t_{cW} = 35 ns		 70 55 50	 mA mA mA
Supply Current - Standby Mode (CMOS level) Standard Low Power (L)	$I_{CC(SB)}$	V_{CC} = 5.5 V $V_{\overline{E1}} = V_{E2}$ = V_{CC} - 0.2 V		 30 5	 µA µA
Supply Current - Standby Mode (TTL level)	$I_{CC(SB)1}$	V_{CC} = 5.5 V $V_{\overline{E1}} = V_{E2}$ = 2.2 V		5 (typ. 2)	mA
Supply Current - Data Retention Mode (Standard)	$I_{CC(DR)}$	$V_{CC(DR)}$ = 3 V $V_{\overline{E1}} = V_{E2}$ = $V_{CC(DR)}$ - 0.2 V		10	µA
Output High Voltage	V_{OH}	V_{CC} = 4.5 V I_{OH} = -4.0 mA	2.4	-	V
Output Low Voltage	V_{OL}	V_{CC} = 4.5 V I_{OL} = 8.0 mA	-	0.4	V
Output High Current	I_{OH}	V_{CC} = 4.5 V V_{OH} = 2.4 V	-	-4.0	mA
Output Low Current	I_{OL}	V_{CC} = 4.5 V V_{OL} = 0.4 V	8.0	-	mA
Input High Leakage Current	I_{IH}	V_{CC} = 5.5 V V_{IH} = 5.5 V	-	2	µA
Input Low Leakage Current	I_{IL}	V_{CC} = 5.5 V V_{IL} = 0 V	-2	-	µA
Output Leakage Current High at Three-State Outputs	I_{OHZ}	V_{CC} = 5.5 V V_{OH} = 5.5 V	-	2	µA
Low at Three-State Outputs	I_{OLZ}	V_{CC} = 5.5 V V_{OL} = 0 V	-2	-	µA

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| Switching Characteristics	Symbol		Min.			Max.			Unit
	Alt.	IEC	20	25	35	20	25	35	
Time to Output in Low-Z from									
$\overline{E1}$ LOW or E2 HIGH	t_{LZCE}	$t_{en(E)}$	5	5	5				ns
$\overline{G}$ LOW	t_{LZOE}	$t_{en(G)}$	0	0	0				ns
$\overline{W}$ HIGH	t_{LZWE}	$t_{en(W)}$	0	0	0				ns
Cycle Time									
Write Cycle Time	t_{WC}	t_{cW}	20	25	35				ns
Read Cycle Time	t_{RC}	t_{cR}	20	25	35				ns
Access Time									
$\overline{E1}$ LOW or E2 HIGH to Data Valid	t_{ACE}	$t_{a(E)}$				20	25	35	ns
$\overline{G}$ LOW to Data Valid	t_{OE}	$t_{a(G)}$				10	12	15	ns
Address to Data Valid	t_{AA}	$t_{a(A)}$				20	25	35	ns
Pulse Widths									
Write Pulse Width	t_{WP}	$t_{w(W)}$	15	15	20				ns
Chip Enable to End of Write	t_{CW}	$t_{w(E)}$	15	20	25				ns
Setup Times									
Address Setup Time	t_{AS}	$t_{su(A)}$	0	0	0				ns
Chip Enable to End of Write	t_{CW}	$t_{su(E)}$	15	20	25				ns
Write Pulse Width	t_{WP}	$t_{su(W)}$	15	15	20				ns
Data Setup Time	t_{DS}	$t_{su(D)}$	10	10	15				ns
Data Hold Time	t_{DH}	$t_{h(D)}$	0	0	0				ns
Address Hold from End of Write	t_{AH}	$t_{h(A)}$	0	0	0				ns
Output Hold Time from Address Change	t_{OH}	$t_{v(A)}$	5	5	5				ns
$\overline{E1}$ HIGH or E2 LOW to Output in High-Z	t_{HZCE}	$t_{dis(E)}$				8	10	15	ns
$\overline{W}$ LOW to Output in High-Z	t_{HZWE}	$t_{dis(W)}$				8	10	15	ns
$\overline{G}$ HIGH to Output in High-Z	t_{HZOE}	$t_{dis(G)}$				8	10	12	ns
$\overline{E1}$ LOW or E2 HIGH to Power-Up	t_{PU}		0	0	0				ns
$\overline{E1}$ HIGH or E2 LOW to Power-Down	t_{PD}					20	25	35	ns

Data Retention Mode $\overline{E1}$-Controlled
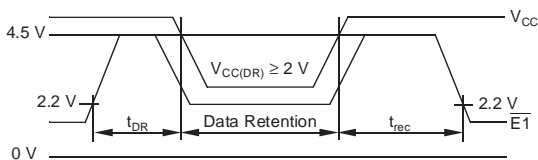
$$V_{E2(DR)} \geq V_{CC(DR)} - 0.2\ V \text{ or } V_{E2(DR)} \leq 0.2\ V$$

$$V_{CC(DR)} - 0.2\ V \leq V_{E1(DR)} \leq V_{CC(DR)} + 0.3\ V$$

Data Retention Mode E2-Controlled
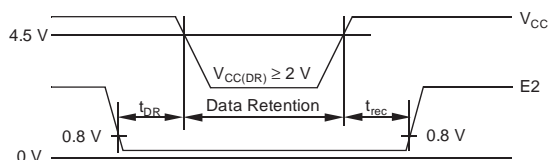
$$V_{E1(DR)} \geq V_{CC(DR)} - 0.2\ V \text{ or } V_{E1(DR)} \leq 0.2\ V$$
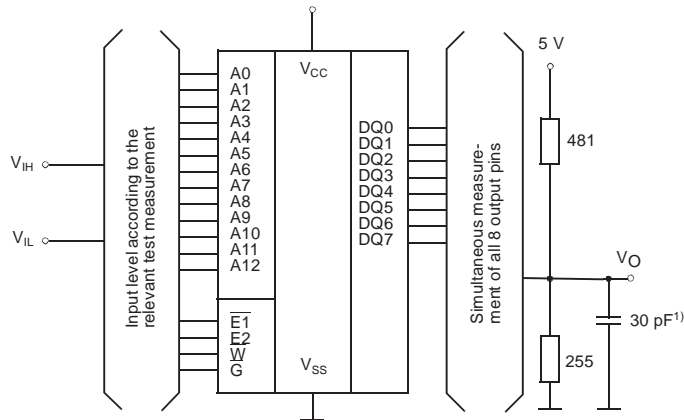
$$V_{E2(DR)} \leq 0.2\ V$$

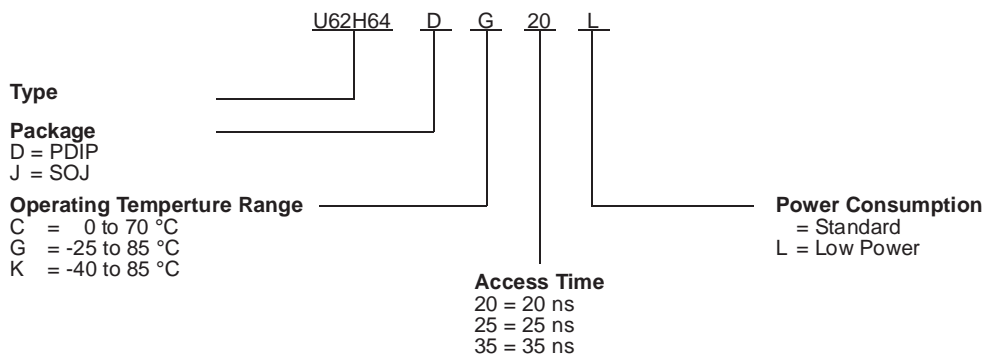|		
Chip Deselect to Data Retention Time	t_{DR}:	min 0 ns
Operating Recovery Time at $V_{CC(DR)}$	t_{rec}:	min t_{cR}

Test Configuration for Functional Check

1) In measurement of $t_{dis(E)}$, $t_{dis(W)}$, $t_{dis(G)}$, $t_{en(E)}$, $t_{en(W)}$, $t_{en(G)}$ the capacitance is 5 pF.

Capacitance	Conditions	Symbol	Min.	Max.	Unit
Input Capacitance	V_{CC} = 5.0 V V_I = V_{SS}	C_I		8	pF
Output Capacitance	f = 1 MHz T_a = 25 °C	C_O		10	pF

All pins not under test must be connected with ground by capacitors.

IC Code Numbers

Example

U62H64   D   G   20   L

Type

Package
D = PDIP
J = SOJ

Operating Temperture Range
C = 0 to 70 °C
G = -25 to 85 °C
K = -40 to 85 °C

Access Time
20 = 20 ns
25 = 25 ns
35 = 35 ns

Power Consumption
= Standard
L = Low Power

The date of manufacture is given by the last 4 digits of the mark, the first 2 digits indicating the year, and the last 2 digits the calendar week.

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Read Cycle 1 (during Read cycle: $\overline{E1} = \overline{G} = V_{IL}$, $E2 = \overline{W} = V_{IH}$, A_i-controlled)
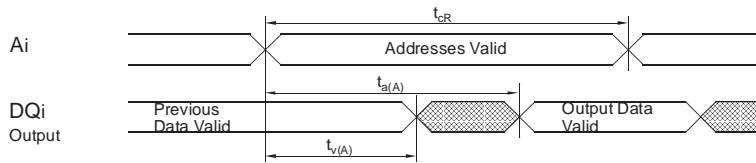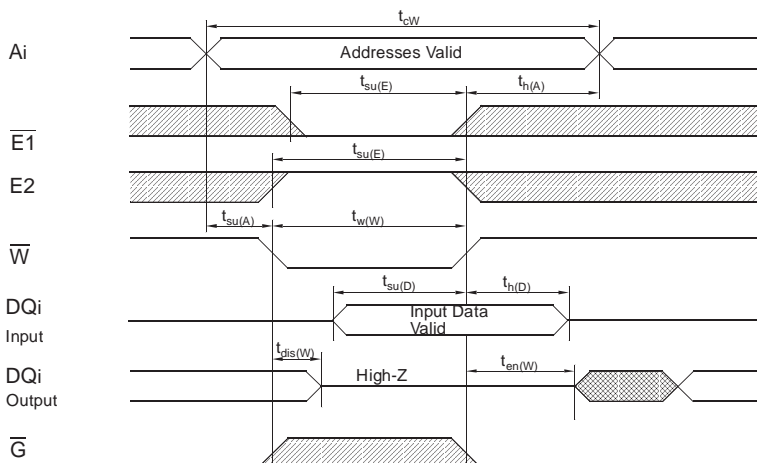

Read Cycle 2 (during Read cycle: $\overline{W} = V_{IH}$, $\overline{G}$-, $\overline{E1}$- or E2-controlled)
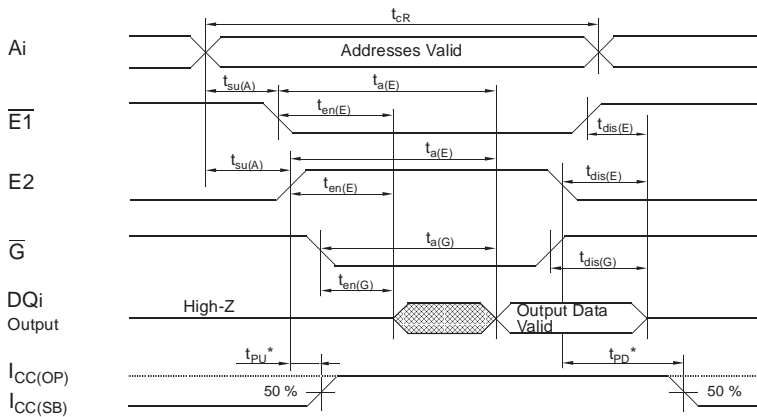
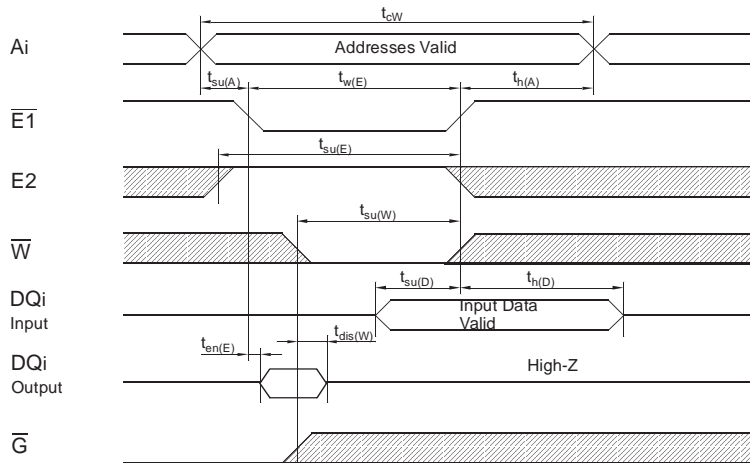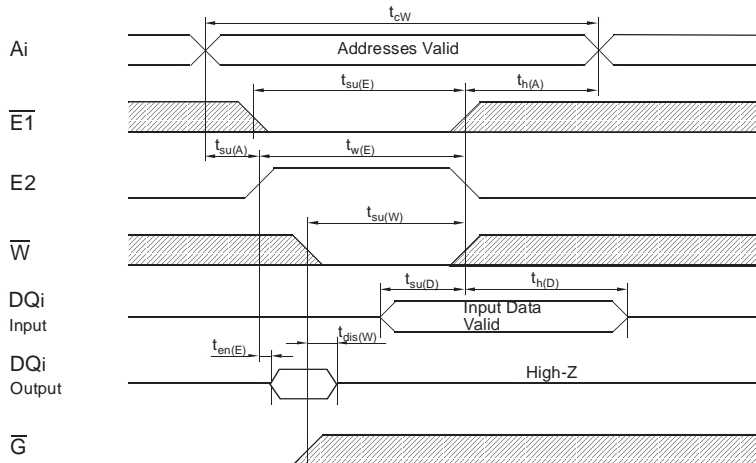
* The same applies to $\overline{E1}$
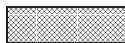
Write Cycle 1 ($\overline{W}$-controlled)

Write Cycle 2 ($\overline{\text{E1}}$-controlled)

Write Cycle 3 (E2-controlled)

undefined	L- or H-level

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