

Document Title**32K x8 bit 2.7~5.5V Low Power CMOS slow SRAM**Revision History

<u>Revision No</u>	<u>History</u>	<u>Draft Date</u>	<u>Remark</u>
00	Revision History Insert Revised - Datasheet format change - PDIP package type insert - Pin configuration change	Jul.07.2000	Final
01	Marking Information Add Revised - AC Test Condition Add : 5pF Test Load - tCLZ Value Change : 15ns - > 10ns - tOLZ Value Change : 10ns - > 5ns	Dec.04.2000	Final
02	Changed Logo - HYUNDAI -> hynix	Apr.30.2001	Final

DESCRIPTION

The GM76C256CW is a high-speed, low power and 32,786 X 8-bits CMOS Static Random Access Memory fabricated using Hynix's high performance CMOS process technology. It is suitable for use in low voltage operation and battery back-up application. This device has a data retention mode that guarantees data to remain valid at the minimum power supply voltage of 2.0 volt.

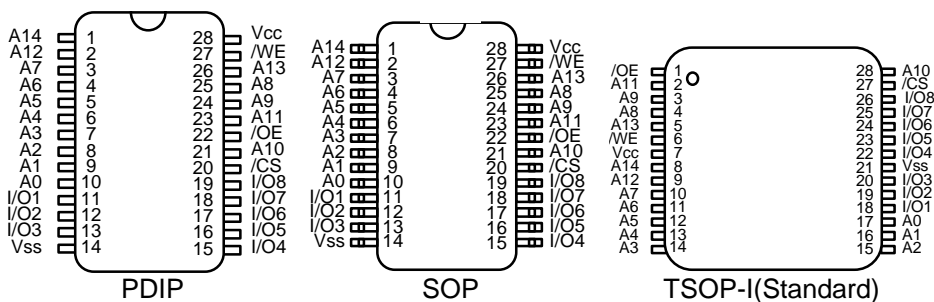
FEATURES

- Fully static operation and Tri-state output
- TTL compatible inputs and outputs
- Low power consumption
- Battery backup(L/LL-part)
- 2.0V(min.) data retention
- Standard pin configuration
- 28 pin 600mil PDIP
- 28 pin 330mil SOP
- 28 pin 8x13.4 mm TSOP-I (Standard)

Product No.	Voltage (V)	Speed (ns)	Operation Current(mA)	Standby Current(uA)		Temperature (°C)
				L	LL	
GM76C256CW	5.0	55/70	10	40	20	0~70(Normal)
	3.0	120/150	2	20	10	

Note 1. Current value is max.

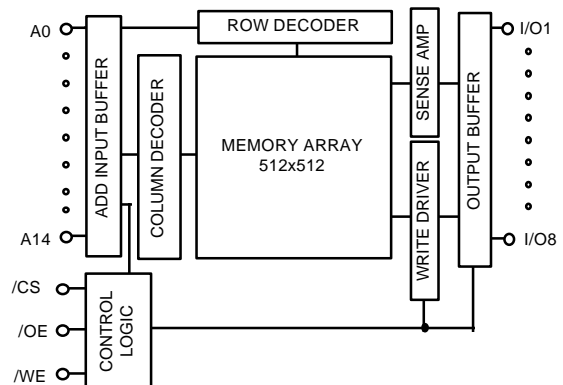
PIN CONNECTION



PIN DESCRIPTION

Pin Name	Pin Function
/CS	Chip Select
/WE	Write Enable
/OE	Output Enable
A0 ~ A14	Address Inputs
I/O1 ~ I/O8	Data Input/Output
Vcc	Power(+5.0V)
Vss	Ground

BLOCK DIAGRAM



ORDERING INFORMATION

Part No.	Speed	Power	Temp	Package
GM76C256CL-W	55/70	L-part	0 to 70°C	PDIP
GM76C256CLL-W	55/70	LL-part	0 to 70°C	PDIP
GM76C256CLFW-W	55/70	L-part	0 to 70°C	SOP
GM76C256CLLFW-W	55/70	LL-part	0 to 70°C	SOP
GM76C256CLT-W	55/70	L-part	0 to 70°C	TSOP-I Standard
GM76C256CLLT-W	55/70	LL-part	0 to 70°C	TSOP-I Standard

ABSOLUTE MAXIMUM RATING (1)

Symbol	Parameter	Rating	Unit
V _{CC} , V _{IN} , V _{OUT}	Power Supply, Input/Output Voltage	-0.3 to 7.0	V
T _A	Operating Temperature	0 to 70	°C
T _{STG}	Storage Temperature	-65 to 150	°C
P _D	Power Dissipation	1.0	W
I _{OUT}	Data Output Current	50	mA
T _{SD}	Lead Soldering Temperature & Time	260 •10	°C•sec

Note

- Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is stress rating only and the functional operation of the device under these or any other conditions above those indicated in the operation of this specification is not implied. Exposure to the absolute maximum rating conditions for extended period may affect reliability.

RECOMMENDED DC OPERATING CONDITIONS

Symbol	Parameter	V _{CC} = 5V			V _{CC} = 2.7 ~ 5.5V			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V _{CC}	Power Supply Voltage	4.5	5.0	5.5	2.7	3.0	5.5	V
V _{SS}	Ground	0	0	0	0	0	0	V
V _{IH}	Input High Voltage	2.2	-	V _{CC} +0.3	2.2	-	V _{CC} +0.3	V
V _{IL}	Input Low Voltage	-0.3(1)	-	0.8	-0.3(1)	-	0.4	V

Note

- V_{IL} = -3.0V for pulse width less than 50ns

TRUTH TABLE

/CS	/WE	/OE	Mode	I/O Operation
H	X	X	Standby	High-Z
L	H	H	Output Disabled	High-Z
L	H	L	Read	Data Out
L	L	X	Write	Data In

Note

- H=V_{IH}, L=V_{IL}, X=Don't Care

DC CHARACTERISTICS

V_{CC} = 3V ±10%, 5V ±10%, T_A = 0°C to 70°C, unless otherwise specified.

Symbol	Parameter	Test Condition	V _{CC} = 3V _i 10%			V _{CC} = 5V _i 10%			Unit
			Min	Typ	Max	Min	Typ	Max	
I _{LI}	Input Leakage Current	V _{SS} ≤ V _{IN} ≤ V _{CC}	-1	-	1	-1	-	1	uA
I _{LO}	Output Leakage Current	V _{SS} ≤ V _{OUT} ≤ V _{CC} , /CS = V _{IH} or /OE = V _{IH} or /WE = V _{IL}	-1	-	1	-1	-	1	uA
I _{CC}	Operating Power Supply Current	/CS = V _{IL} , V _{IN} = V _{IH} or V _{IL} , I _{I/O} = 0mA	-	0.6	2	-	7	10	mA
I _{CC1}	Average Operating Current	/CS = V _{IL} , I _{I/O} = 0mA, Min. Duty Cycle = 100%, V _{IN} = V _{IH} or V _{IL}	-	-	30	-	-	70	mA
		/CS = V _{IL} , I _{I/O} = 0mA, Cycle = 1us, V _{IN} = V _{IH} or V _{IL}	-	-	5	-	-	10	mA
I _{SB}	TTL Standby Current (TTL Inputs)	/CS = V _{IH} , V _{IN} = V _{IH} or V _{IL}	-	-	0.3	-	-	1	mA
I _{SB1}	CMOS Standby Current (CMOS Inputs)	/CS ≥ V _{CC} - 0.2V, V _{IN} ≥ V _{CC} - 0.2V or V _{IN} ≤ V _{SS} + 0.2V	L		20	-	-	40	uA
			LL		10	-	-	20	uA
V _{OL}	Output Low Voltage	I _{OL} = 2.1mA			0.4	-	-	0.4	V
V _{OH}	Output High Voltage	I _{OH} = -1.0mA	2.2			2.4	-	-	V

Note : Typical values are at V_{CC} = 3.0V/5.0V, T_A = 25°C

AC CHARACTERISTICS(I)

V_{CC} = 3V ±10%, T_A = 0°C to 70°C (Normal) unless otherwise specified.

#	Symbol	Parameter	-55		-70		Unit
			Min.	Max.	Min.	Max.	
READ CYCLE							
1	t _{RC}	Read Cycle Time	120	-	150	-	ns
2	t _{AA}	Address Access Time	-	120	-	150	ns
3	t _{ACS}	Chip Select Access Time	-	120	-	150	ns
4	t _{OE}	Output Enable to Output Valid	-	55	-	60	ns
5	t _{CLZ}	Chip Select to Output in Low Z	10	-	10	-	ns
6	t _{OLZ}	Output Enable to Output in Low Z	5	-	5	-	ns
7	t _{CHZ}	Chip Disable to Output in High Z	0	40	0	50	ns
8	t _{OHZ}	Out Disable to Output in High Z	0	40	0	50	ns
9	t _{OH}	Output Hold from Address Change	10	-	10	-	ns
WRITE CYCLE							
10	t _{WC}	Write Cycle Time	120	-	150	-	ns
11	t _{CW}	Chip Selection to End of Write	100	-	120	-	ns
12	t _{AW}	Address Valid to End of Write	100	-	120	-	ns
13	t _{AS}	Address Set-up Time	0	-	0	-	ns
14	t _{WP}	Write Pulse Width	65	-	70	-	ns
15	t _{WR}	Write Recovery Time	0	-	0	-	ns
16	t _{WHZ}	Write to Output in High Z	0	40	0	50	ns
17	t _{DW}	Data to Write Time Overlap	40	-	50	-	ns
18	t _{DH}	Data Hold from Write Time	0	-	0	-	ns
19	t _{OW}	Output Active from End of Write	10	-	15	-	ns

AC CHARACTERISTICS(II)

V_{CC} = 5V ±10%, T_A = 0°C to 70°C (Normal) unless otherwise specified.

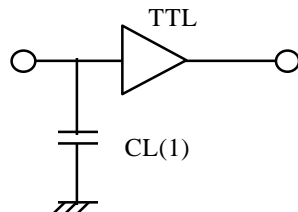
#	Symbol	Parameter	-55		-70		Unit
			Min.	Max.	Min.	Max.	
READ CYCLE							
1	t _{RC}	Read Cycle Time	55	-	70	-	ns
2	t _{AA}	Address Access Time	-	55	-	70	ns
3	t _{ACS}	Chip Select Access Time	-	55	-	70	ns
4	t _{OE}	Output Enable to Output Valid	-	30	-	35	ns
5	t _{CLZ}	Chip Select to Output in Low Z	10	-	10	-	ns
6	t _{OLZ}	Output Enable to Output in Low Z	5	-	5	-	ns
7	t _{CHZ}	Chip Disable to Output in High Z	0	20	0	25	ns
8	t _{OHZ}	Out Disable to Output in High Z	0	20	0	25	ns
9	t _{OH}	Output Hold from Address Change	5	-	10	-	ns
WRITE CYCLE							
10	t _{WC}	Write Cycle Time	55	-	70	-	ns
11	t _{CW}	Chip Selection to End of Write	50	-	65	-	ns
12	t _{AW}	Address Valid to End of Write	50	-	60	-	ns
13	t _{AS}	Address Set-up Time	0	-	0	-	ns
14	t _{WP}	Write Pulse Width	45	-	50	-	ns
15	t _{WR}	Write Recovery Time	0	-	0	-	ns
16	t _{WHZ}	Write to Output in High Z	0	20	0	25	ns
17	t _{DW}	Data to Write Time Overlap	25	-	30	-	ns
18	t _{DH}	Data Hold from Write Time	0	-	0	-	ns
19	t _{OW}	Output Active from End of Write	5	-	5	-	ns

AC TEST CONDITIONS

T_A = 0°C to 70°C (Normal) unless otherwise specified.

Parameter		Value
Input Pulse Level	5V	0.6V to 2.4V
	3V	0.4V to 2.2V
Input Rise and Fall Time		5ns
Input and Output Timing Reference Level		1.5V
Output Load	t _{CLZ} , t _{OLZ} , t _{CHZ} , t _{OHZ} , t _{WHZ} , t _{OW}	CL = 5pF + 1TTL Load
	Others	CL = 100pF + 1TTL Load

AC TEST LOADS



Note : Including jig and scope capacitance

CAPACITANCE

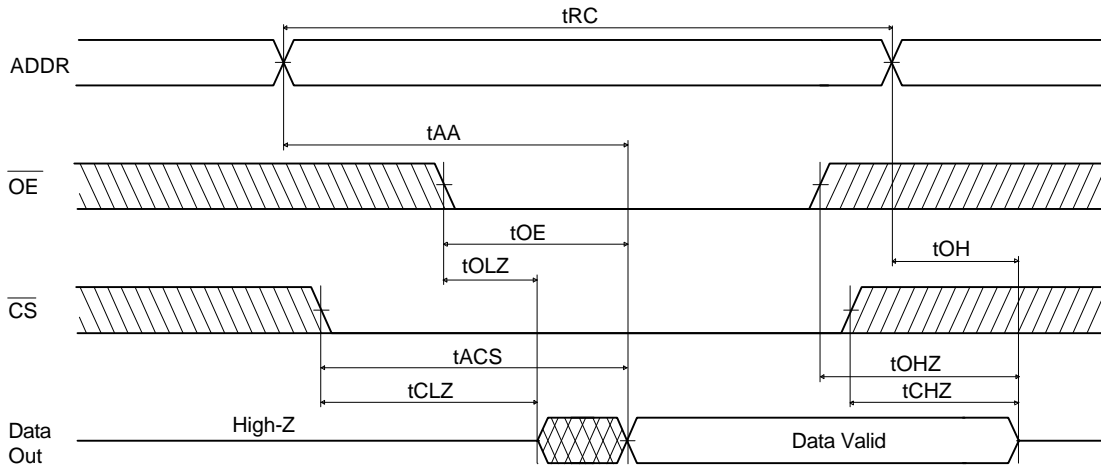
T_A = 25°C, f = 1.0MHz

Symbol	Parameter	Condition	Max.	Unit
C _{IN}	Input Capacitance	V _{IN} = 0V	6	pF
C _{I/O}	Input /Output Capacitance	V _{I/O} = 0V	8	pF

Note : These parameters are sampled and not 100% tested

TIMING DIAGRAM

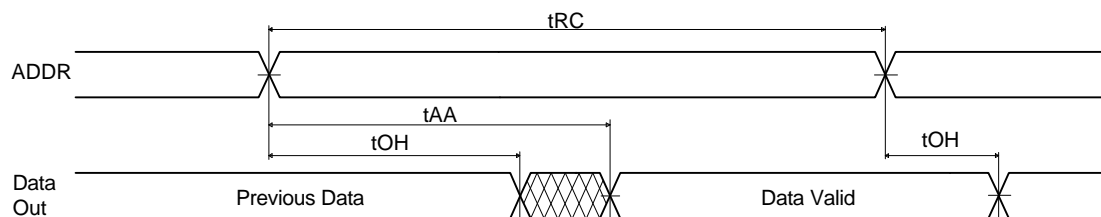
READ CYCLE 1



Note(READ CYCLE):

1. t_{CHZ} and t_{OHZ} are defined as the time at which the outputs achieve the open circuit conditions and are not referenced to output voltage levels.
2. At any given temperature and voltage condition, t_{CHZ} max. is less than t_{CLZ} min. both for a given device and from device to device.
3. \overline{WE} is high for the read cycle.

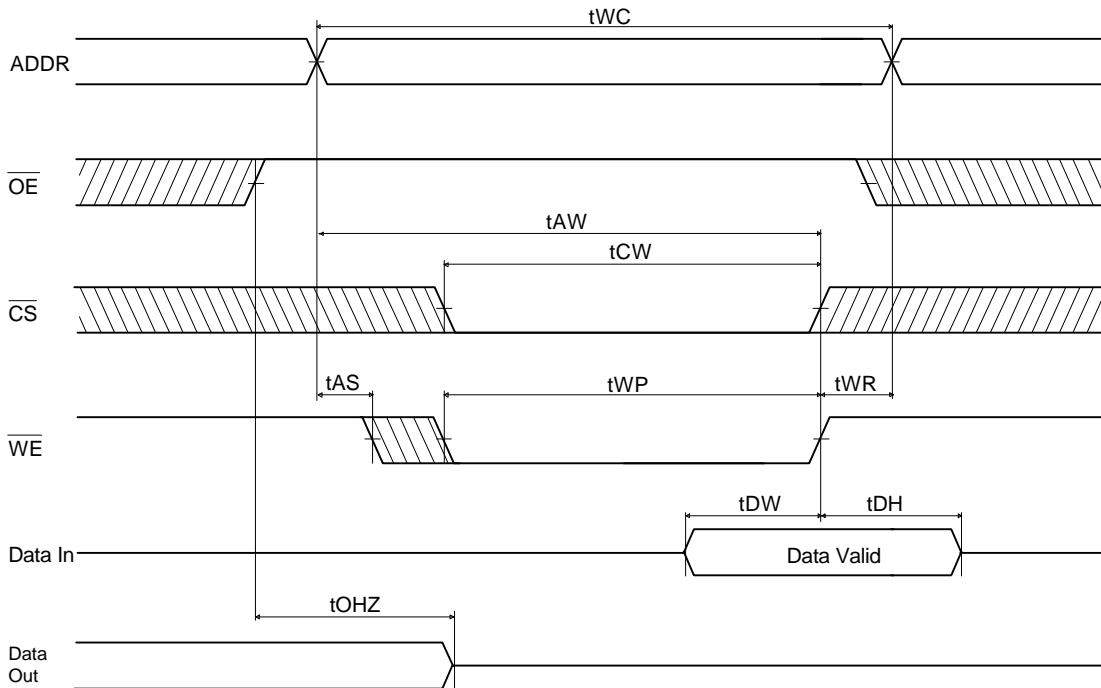
READ CYCLE 2



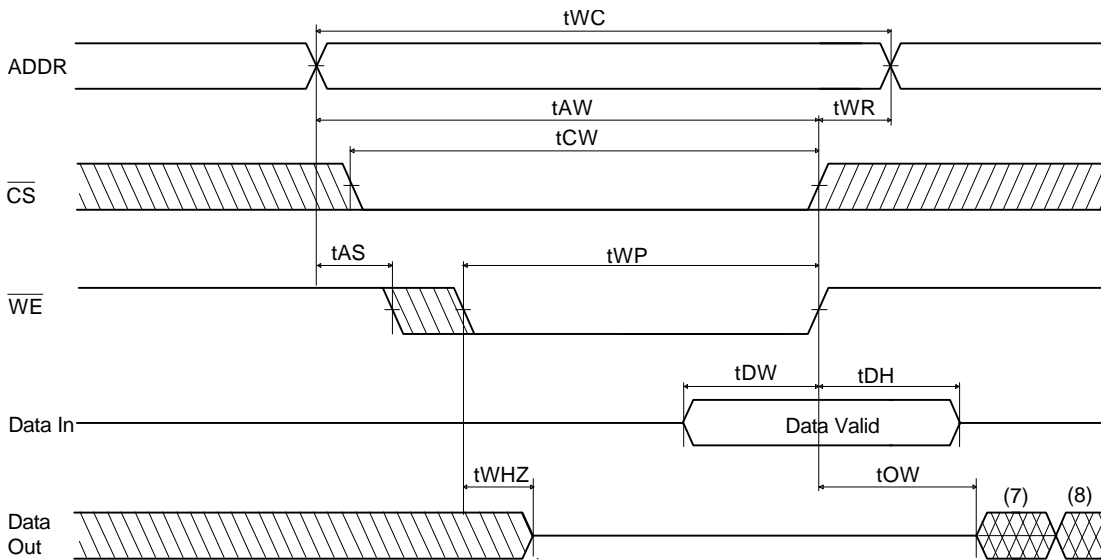
Note(READ CYCLE):

1. \overline{WE} is high for the read cycle.
2. Device is continuously selected $\overline{CS} = V_{IL}$.
3. $\overline{OE} = V_{IL}$.

WRITE CYCLE 1 (/OE Clocked)



WRITE CYCLE 2 (/OE Low Fixed)



Notes(WRITE CYCLE):

1. A write occurs during the overlap of a low /CS and a low /WE. A write begins at the latest transition among /CS going low and /WE going low: A write ends at the earliest transition among /CS going high and /WE going high. tWP is measured from the beginning of write to the end of write.
2. tcw is measured from the later of /CS going low to the end of write .
3. tAS is measured from the address valid to the beginning of write.
4. tWR is measured from the end of write to the address change. tWR is applied in case a write ends as /CS, or /WE going high.
5. If /OE and /WE are in the read mode during this period, and the I/O pins are in the output low-Z state, input of opposite phase of the output must not be applied because bus contention can occur.
6. If /CS goes low simultaneously with /WE going low, or after /WE going low, the outputs remain in high impedance state.
7. DOUT is the same phase of the latest written data in this write cycle.
8. DOUT is the read data of the new address.

DATA RETENTION CHARACTERISTIC

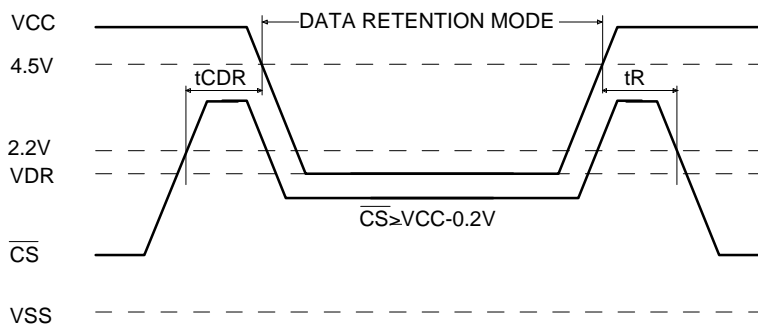
Ta=0°C to 70°C (Normal)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
VDR	Vcc for Data Retention	CS>Vcc-0.2V, VIN>Vcc-0.2V or VIN<Vss+0.2V	2.0	-	-	V
ICCDR	Data Retention Current	Vcc=3.0V, /CS>Vcc-0.2V, VIN>Vcc-0.2V or VIN<Vss+0.2V	L	1	50	uA
			LL	0.5	10	uA
tCDR	Chip Deselect to Data Retention Time	See Data Retention	0	-	-	ns
tR	Operating Recovery Time	Timing Diagram	tRC(2)	-	-	ns

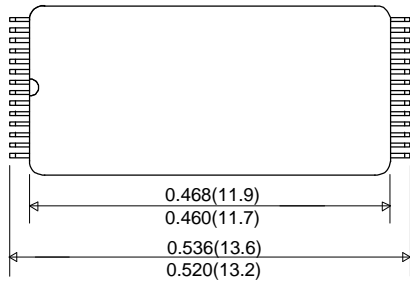
Notes

1. Typical values are under the condition of TA = 25°C.
2. tRC is read cycle time.

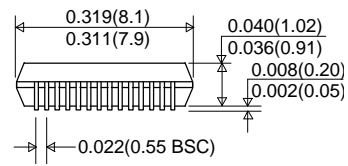
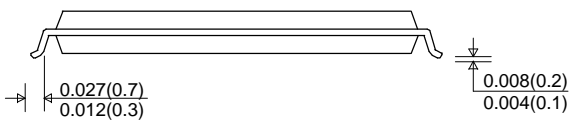
DATA RETENTION TIMING DIAGRAM



28pin 8x13.4mm Thin Small Outline Package Standard(T)



UNIT : INCH(mm) ^{MAX.}
_{MIN.}



MARKING INFORMATION

Package	Marking Example
<p style="text-align: center;">PDIP</p>	
<p style="text-align: center;">SOP</p>	
<p style="text-align: center;">TSOP-I</p>	

Index	
• HYUNDAI	: Hynix Logo
• KOREA	: Origin Country
• GM76C256C	: Part Name
• cc	: Power Consumption
	- L : Low Power
	- LL : Low Low Power
• Blank / FW / T	: Package Type
	- Blank : DIP
	- FW : SOP
	- T : TSOP-I
• ss	: Speed
	- 55 : 55ns
	- 70 : 70ns
• W	: Wide Voltage
• yy	: Year (ex : 00 = year 2000, 01 = year 2001)
• ww	: Work Week (ex : 12 = ww12)
Note	
- Capital Letter	: Fixed Item
- Small Letter	: Non-fixed Item