

Document Title**128K x16 bit 2.5 V Low Power Full CMOS slow SRAM**Revision History

<u>Revision No</u>	<u>History</u>	<u>Draft Date</u>	<u>Remark</u>
00	Initial	Apr.07.2001	Preliminary
01	Correct Pin Connection	Apr.25.2001	
02	Correct Marking Information	May.08.2001	
03	Correct Pin Configuration DNU -> NC	May.10.2001	
04	Part Number Revision Power Supply 2.5V : Q -> L	May. 15.2001	

DESCRIPTION

The HY62LF16206A is a high speed, super low power and 2Mbit full CMOS SRAM organized as 128K words by 16bits. The HY62LF16206A uses high performance full CMOS process technology and is designed for high speed and low power circuit technology. It is particularly well-suited for the high density low power system application. This device has a data retention mode that guarantees data to remain valid at a minimum power supply voltage of 1.2V.

FEATURES

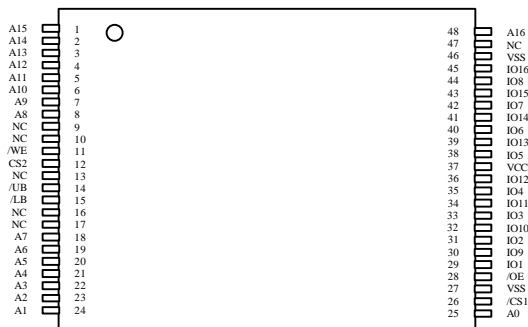
- Fully static operation and Tri-state output
- TTL compatible inputs and outputs
- Battery backup(L-part)
 - 1.2V(min) data retention
- Standard pin configuration
 - 48-TSOP1

Product No.	Voltage (V)	Speed (ns)	Operation Current/I _{cc} (mA)	Standby Current(uA)	Temperature (°C)
				L	
HY62LF16206A	2.3~2.7	120	3	100	0~70

Notes :

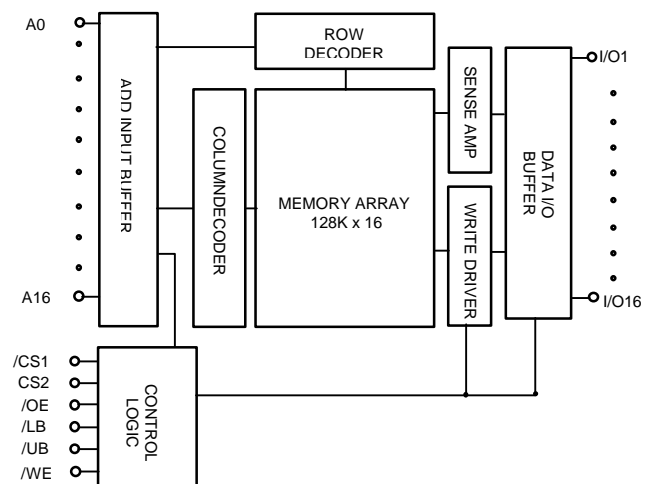
1. Current value is max.

PIN CONNECTION



48-TSOP1(Forward)

BLOCK DIAGRAM



PIN CONNECTION

Pin Name	Pin Function	Pin Name	Pin Function
/CS1	Chip Select 1	I/O1~I/O16	Data Inputs / Outputs
CS2	Chip Select 2	A0~A16	Address Inputs
/WE	Write Enable	V _{cc}	Power(2.3V~2.7V)
/OE	Output Enable	V _{ss}	Ground
/LB	Lower Byte Control(I/O1~I/O8)	NC	No Connection
/UB	Upper Byte Control(I/O9~I/O16)		

ORDERING INFORMATION

Part No.	Speed	Power	Temp.	Package
HY62LF16206A-LT12C	120	L-part	0 to 70	48-TSOP1

ABSOLUTE MAXIMUM RATINGS (1)

Symbol	Parameter	Rating	Unit	Remark
V _{IN} , V _{OUT}	Input/Output Voltage	-0.3 to 3.3	V	
V _{CC}	Power Supply	-0.3 to 3.3	V	
T _A	Operating Temperature	0 to 70	°C	
T _{STG}	Storage Temperature	-40 to 125	°C	
P _D	Power Dissipation	1.0	W	
T _{SOLDER}	Ball 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.

TRUTH TABLE

/CS1	CS2	/WE	/OE	/LB	/UB	Mode	I/O		Power
							I/O1~I/O8	I/O9~I/O16	
H	X	X	X	X	X	Deselected	High-Z	High-Z	Standby
X	L	X	X	X	X		High-Z	High-Z	
X	X	X	X	H	H		High-Z	High-Z	
L	H	H	H	L	X	Output Disabled	High-Z	High-Z	Active
L	H	H	H	X	L		High-Z	High-Z	
L	H	H	L	L	H	Read	DOUT	High-Z	
				H	L		High-Z	DOUT	
				L	L		DOUT	DOUT	
L	H	L	X	L	H	Write	DIN	High-Z	
				H	L		High-Z	DIN	
				L	L		DIN	DIN	

Note:

- H=V_{IH}, L=V_{IL}, X=don't care(V_{il} or V_{Ih})
- UB, LB(Upper, Lower Byte enable)

These active LOW inputs allow individual bytes to be written or read.
 When LB is LOW, data is written or read to the lower byte, I/O 1 -I/O 8.
 When UB is LOW, data is written or read to the upper byte, I/O 9 -I/O 16.

RECOMMENDED DC OPERATING CONDITION

Symbol	Parameter	Min.	Typ.	Max.	Unit
V _{CC}	Supply Voltage	2.3	2.5	2.7	V
V _{SS}	Ground	0	0	0	V
V _{IH}	Input High Voltage	2.0	-	V _{CC} +0.3	V
V _{IL}	Input Low Voltage	-0.3(1)	-	0.4	V

Note :

1. V_{IL} = -1.5V for pulse width less than 30ns

DC ELECTRICAL CHARACTERISTICS

V_{CC} = 2.3V~2.7V, T_A = 0°C to 70°C

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
I _{LI}	Input Leakage Current	V _{SS} ≤ V _{IN} ≤ V _{CC}	-1	-	1	uA
I _{LO}	Output Leakage Current	V _{SS} ≤ V _{OUT} ≤ V _{CC} , /CS1 = V _{IH} or CS2 = V _{IL} , /OE = V _{IH} or /WE = V _{IL} , or /UB = /LB = V _{IH}	-1	-	1	uA
I _{CC}	Operating Power Supply Current	/CS1 = V _{IL} , CS2 = V _{IH} , V _{IN} = V _{IH} or V _{IL} , I _{I/O} = 0mA	-	-	3	mA
I _{CC1}	Average Operating Current	Cycle Time=Min.100% duty, /CS1 = 0.2V, CS2 = V _{CC} -0.2V, /WE = V _{CC} -0.2V, I _{I/O} = 0mA Other Inputs = V _{CC} -0.2V/0.2V	-	-	20	mA
		Cycle time = 1us, /CS1 ≤ 0.2V, CS2 _i V _{CC} -0.2V, V _{IN} <0.2V or Vin _i V _{CC} -0.2V, I _{I/O} = 0mA	-	-	4	mA
I _{SB}	Standby Current (TTL Input)	/CS1 = V _{IH} , CS2 = V _{IL} /UB = /LB = V _{IH} , V _{IN} = V _{IH} or V _{IL}	-	-	0.3	mA
I _{SB1}	Standby Current (CMOS Input)	/CS1 ≥ V _{CC} - 0.2V or CS2 ≤ V _{SS} +0.2V or /UB = /LB ≥ V _{CC} - 0.2V, V _{IN} ≥ V _{CC} - 0.2V or V _{IN} ≤ V _{SS} + 0.2V	-	-	100	uA
V _{OL}	Output Low Voltage	I _{OL} = 1.0mA	-	-	0.4	V
V _{OH}	Output High Voltage	I _{OH} = -0.5mA	1.8	-	-	V

Notes :

1. Typical values are at V_{CC} = 2.5V, T_A = 25°C
2. Typical values are sampled and not 100% tested

CAPACITANCE

(Temp = 25°C, f = 1.0MHz)

Symbol	Parameter	Condition	Max.	Unit
C _{IN}	Input Capacitance(Add, /CS, /WE, /OE)	V _{IN} = 0V	10	pF
C _{OUT}	Output Capacitance(I/O)	V _{I/O} = 0V	10	pF

Note :

1. These parameters are sampled and not 100% tested

AC CHARACTERISTICS

V_{CC} = 2.3V~2.7V, T_A = 0°C to 70°C, unless otherwise specified

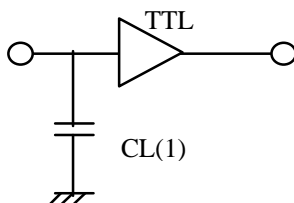
#	Symbol	Parameter	-12		Unit
			Min.	Max.	
READ CYCLE					
1	t _{RC}	Read Cycle Time	120	-	ns
2	t _{AA}	Address Access Time	-	120	ns
3	t _{ACS}	Chip Select Access Time	-	120	ns
4	t _{OE}	Output Enable to Output Valid	-	80	ns
5	t _{BA}	/LB, /UB Access Time	-	120	ns
6	t _{CLZ}	Chip Select to Output in Low Z	10	-	ns
7	t _{OLZ}	Output Enable to Output in Low Z	5	-	ns
8	t _{BLZ}	/LB, /UB Enable to Output in Low Z	10	-	ns
9	t _{CHZ}	Chip Deselection to Output in High Z	0	45	ns
10	t _{OHZ}	Out Disable to Output in High Z	0	45	ns
11	t _{BHZ}	/LB, /UB Disable to Output in High Z	0	45	ns
12	t _{OH}	Output Hold from Address Change	10	-	ns
WRITE CYCLE					
13	t _{WC}	Write Cycle Time	120	-	ns
14	t _{CW}	Chip Selection to End of Write	100	-	ns
15	t _{AW}	Address Valid to End of Write	100	-	ns
16	t _{BW}	/LB, /UB Valid to End of Write	100	-	ns
17	t _{AS}	Address Set-up Time	0	-	ns
18	t _{WP}	Write Pulse Width	85	-	ns
19	t _{WR}	Write Recovery Time	0	-	ns
20	t _{WHZ}	Write to Output in High Z	0	35	ns
21	t _{DW}	Data to Write Time Overlap	60	-	ns
22	t _{DH}	Data Hold from Write Time	0	-	ns
23	t _{OW}	Output Active from End of Write	10	-	ns

AC TEST CONDITIONS

T_A = 0°C to 70°C, unless otherwise specified

Parameter		Value
Input Pulse Level		0.4V to 2.2V
Input Rise and Fall Time		5ns
Input and Output Timing Reference Level		1.1V
Output Load	t _{CLZ} , t _{OLZ} , t _{BLZ} , t _{CHZ} , t _{OHZ} , t _{BHZ} , t _{WHZ} , t _{OW}	CL = 5pF + 1TTL Load
	Others	CL = 30pF + 1TTL Load

AC TEST LOADS

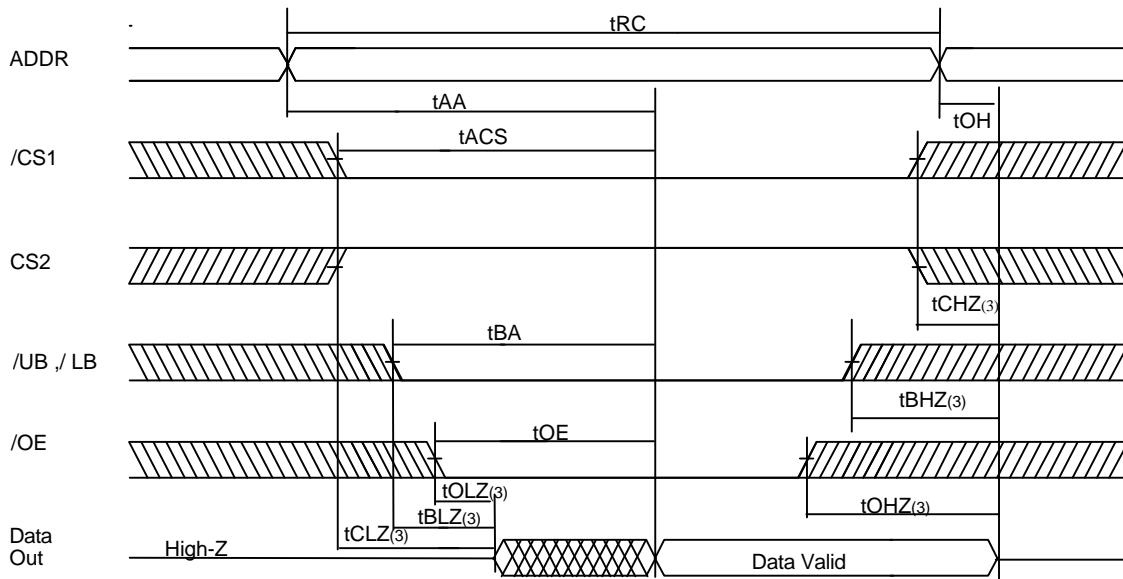


Note :

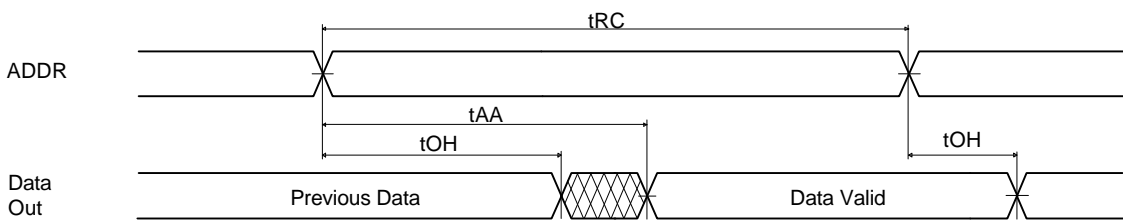
1. Including jig and scope capacitance

TIMING DIAGRAM

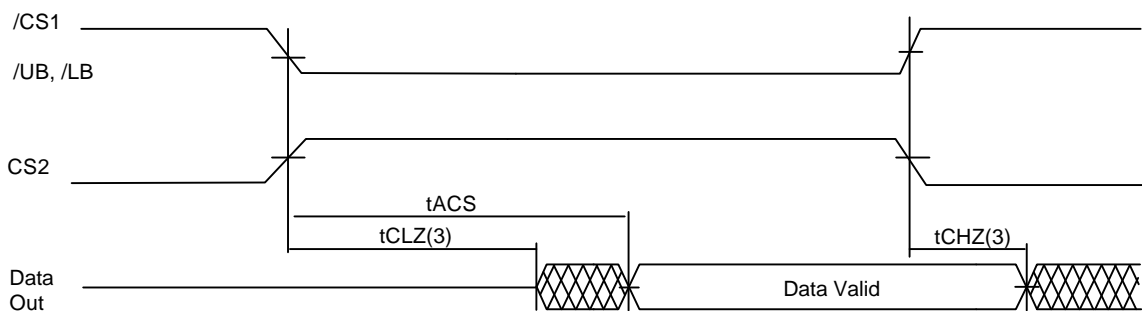
READ CYCLE 1 (Note 1,4)



READ CYCLE 2 (Note 2,3,4)

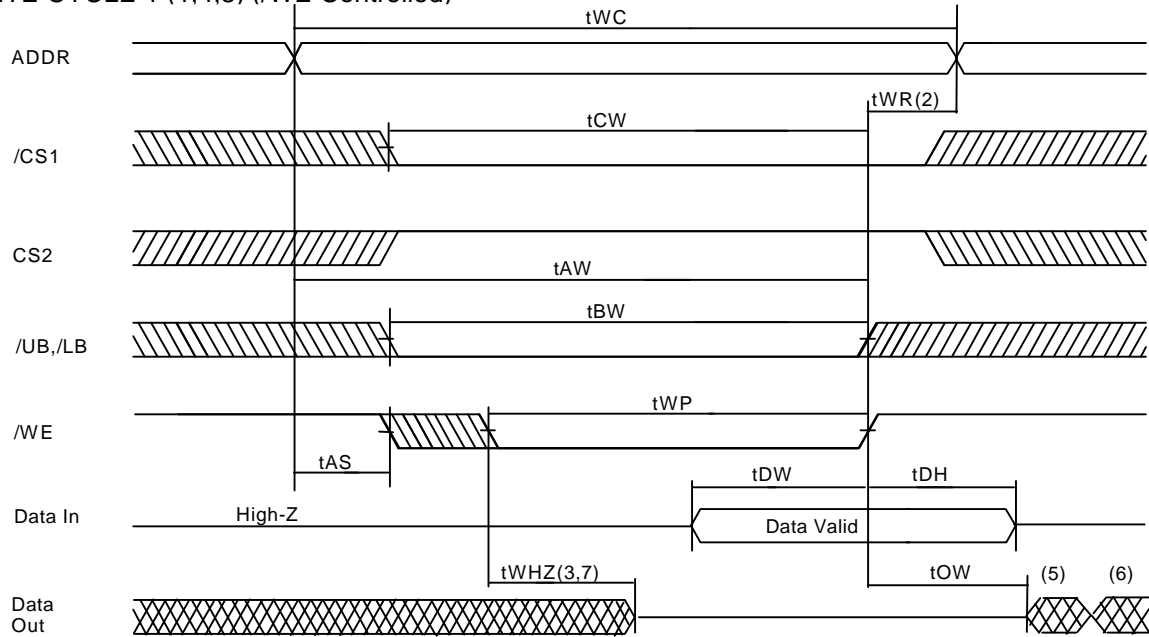
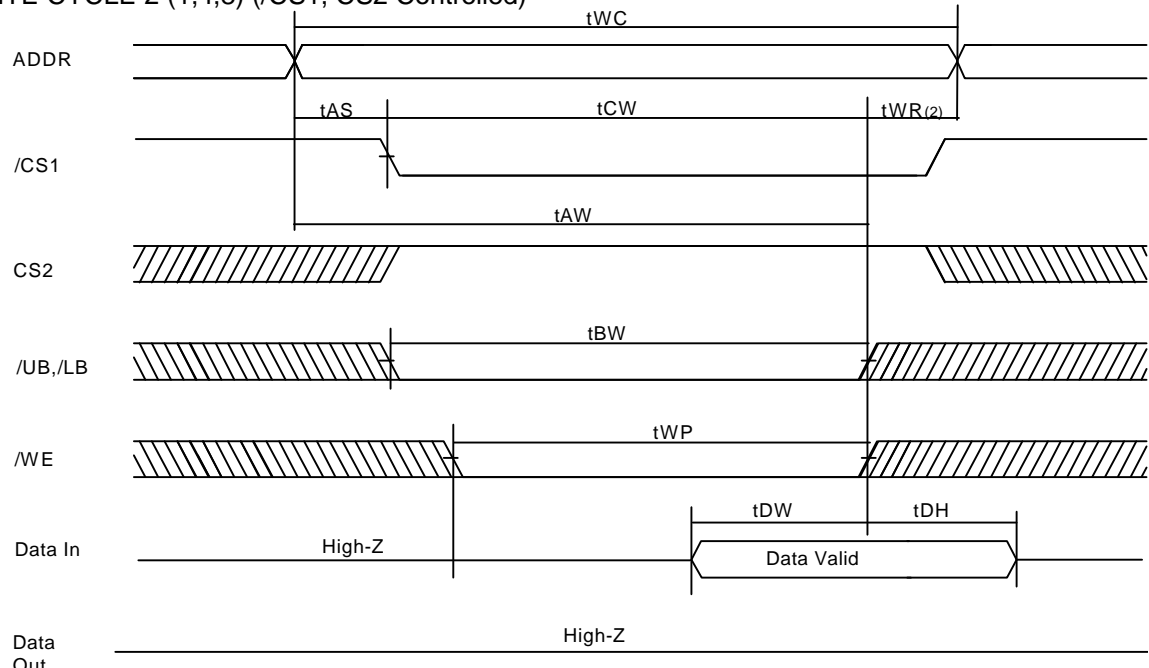


READ CYCLE 3 (Note 1,2,4)



Notes:

1. A read occurs during the overlap of a low /OE, a high /WE, a low /CS1, a high CS2 and low /UB and/or /LB.
2. /OE = V_{IL}
3. Transition is measured $\pm 200\text{mV}$ from steady state voltage.
This parameter is sampled and not 100% tested.
4. /CS1 in high for the standby, low for active. CS2 in low for the standby, high for active.
/UB and /LB in high for the standby, low for active

WRITE CYCLE 1 (1,4,8) (/WE Controlled)

WRITE CYCLE 2 (1,4,8) (/CS1, CS2 Controlled)

Notes:

1. A write occurs during the overlap of a low /WE, a low /CS1, a high CS2 and low /UB and/or /LB.
2. tWR is measured from the earlier of /CS, /LB, /UB, or /WE going high or CS2 going low to the end of write cycle.
3. During this period, I/O pins are in the output state so that the input signals of opposite phase to the output must not be applied.
4. If the /CS1, /LB and /UB low transition with CS2 high transition occur simultaneously with the /WE low transition or after the /WE transition, outputs remain in a high impedance state.
5. Q(data out) is the same phase with the write data of this write cycle.
6. Q(data out) is the read data of the next address.
7. Transition is measured \downarrow 200mV from steady state.
This parameter is sampled and not 100% tested.
8. /CS1 in high for the standby, low for active. CS2 in low for the standby, high for active.
/UB and /LB in high for the standby, low for active

DATA RETENTION ELECTRIC CHARACTERISTIC

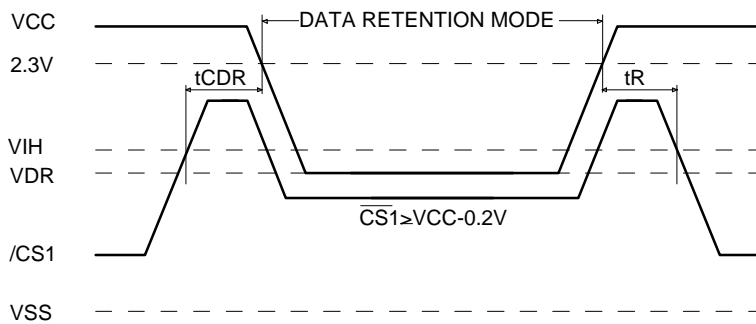
$T_A = 0^\circ\text{C}$ to 70°C

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
VDR	Vcc for Data Retention	$/\text{CS1} \geq V_{\text{cc}} - 0.2\text{V}$ or $\text{CS2} \leq V_{\text{ss}} + 0.2\text{V}$ or $/\text{UB} = /\text{LB} \geq V_{\text{cc}} - 0.2\text{V}$, $V_{\text{IN}} \geq V_{\text{cc}} - 0.2\text{V}$ or $V_{\text{IN}} \leq V_{\text{ss}} + 0.2\text{V}$	1.2	-	2.7	V
ICCDR	Data Retention Current	$V_{\text{cc}} = 1.5\text{V}$, $/\text{CS1} \geq V_{\text{cc}} - 0.2\text{V}$, $\text{CS2} \leq V_{\text{ss}} + 0.2\text{V}$, $/\text{UB} = /\text{LB} \geq V_{\text{cc}} - 0.2\text{V}$ or $V_{\text{IN}} \geq V_{\text{cc}} - 0.2\text{V}$ or $V_{\text{IN}} \leq V_{\text{ss}} + 0.2\text{V}$	-	-	100	μA
tCDR	Chip Deselect to Data Retention Time	See Data Retention Timing Diagram	0	-	-	ns
tR	Operating Recovery Time		tRC(3)	-	-	ns

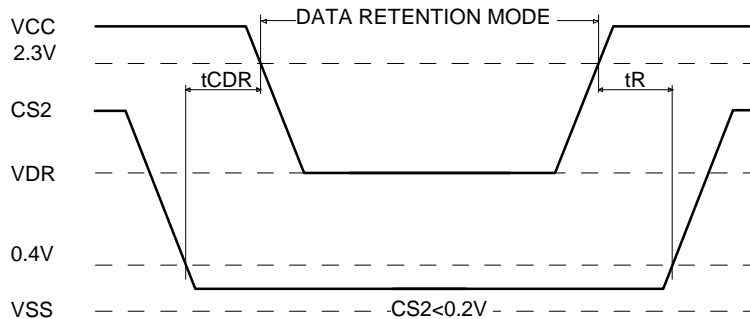
Notes:

1. Typical values are under the condition of $T_A = 25^\circ\text{C}$.
2. Typical Values are sampled and not 100% tested
3. tRC is read cycle time.

DATA RETENTION TIMING DIAGRAM 1

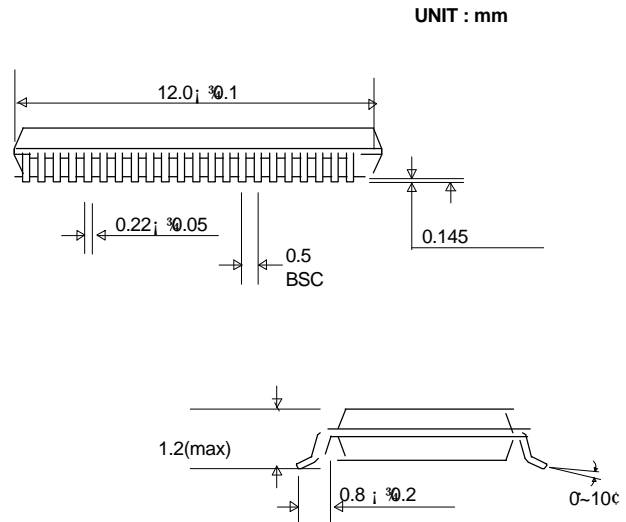
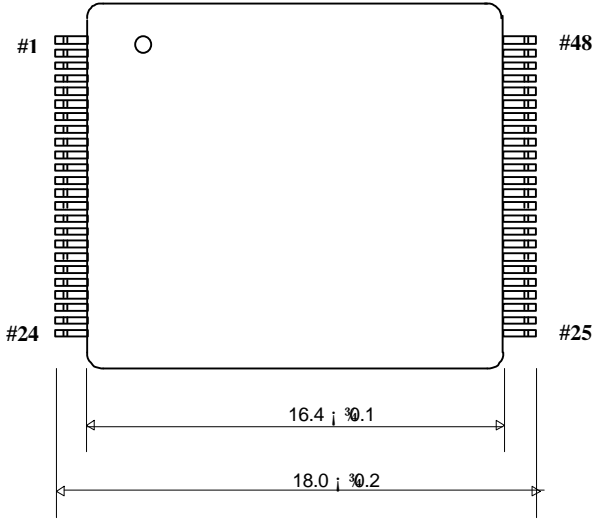


DATA RETENTION TIMING DIAGRAM 2




PACKAGE INFORMATION

48pin Thin Small Outline Package Forward



MARKING INSTRUCTION

- Top Side

Package	Marking Example
TSOP-I (Forward)	

Index	
<ul style="list-style-type: none"> • hynix • KOREA 	<ul style="list-style-type: none"> : Hynix Logo : Origin Country
<ul style="list-style-type: none"> • HY62QF16206A HY 62 L F 16 20 6 A 	<ul style="list-style-type: none"> : Part Name : HYNIX : Product Group : Slow SRAM : Operating Voltage : 2.5V(2.3V ~ 2.7V) : Tech. + Classification : Full CMOS : Organization : x16 : Density : 2M : Mode : 2CS with /UB,/LB;tCS : Version : 2nd Generation
<ul style="list-style-type: none"> • yy • ww • p 	<ul style="list-style-type: none"> : Year (ex : 00 = year 2000, 01 = year 2001) : Work Week (ex : 12 = ww12) : Process Code <ul style="list-style-type: none"> - TA : Before Qualification - A : After Qualification
<ul style="list-style-type: none"> • L • T • 12 • C 	<ul style="list-style-type: none"> : Power Consumption : Low Power : Package Type : TSOP-I : Speed : 120ns : Temperature : Commercial (0 ~ 70 °C)
Note	<ul style="list-style-type: none"> - Capital Letter : Fixed Item - Small Letter : Non-fixed Item

- Bottom Side

Package	Marking Example									
<p>TSOP-I (Forward)</p>	<div style="text-align: center;"> <table border="1" style="margin: auto;"> <tr> <td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td> </tr> </table> </div>	x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x		

Index	
<p>• xxxxxxxx</p>	<p>: FAB Run No.</p>
<p>Note</p> <ul style="list-style-type: none"> - Capital Letter : Fixed Item - Small Letter : Non-fixed Item 	