

Document Title

**512K x 8bit 2.7 ~ 3.6V Super low Power FC MOS Slow SRAM**

Revision History

<u>Revision No</u>	<u>History</u>	<u>Draft Date</u>	<u>Remark</u>
00	Initial Draft	Mar.21.2001	Final
01	Changed Isb1 values	Jun.07.2001	Final

**DESCRIPTION**

The HY62KF08401C is a high speed, super low power and 4Mbit full CMOS SRAM organized as 512K words by 8bits. The HY62KF08401C 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.

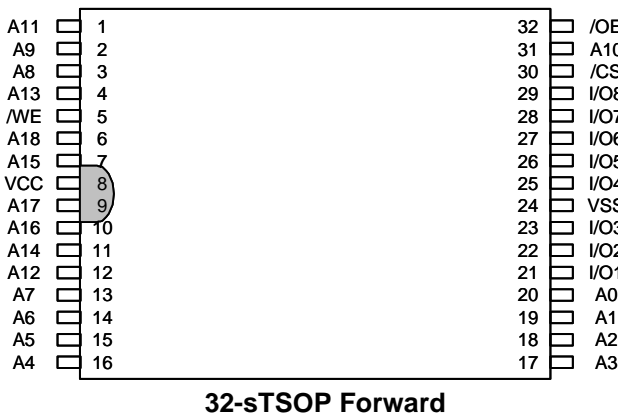
**FEATURES**

- Fully static operation and Tri-state output
- TTL compatible inputs and outputs
- Battery backup
  - 1.2V(min) data retention
- Standard pin configuration
  - 32 - sTSP - 8X13.4(Standard)

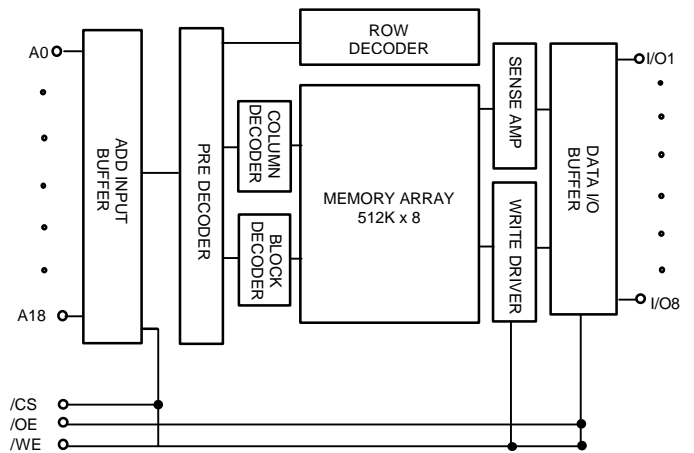
Product No.	Voltage (V)	Speed (ns)	Operation Current/Icc(mA)	Standby Current(uA)		Temperature (°C)
				LL	SL	
HY62KF08401C-I	2.7~3.6	55/70	5	15	6	-40~85

Note 1. I : Industrial  
 2. Current value is max.

**PIN CONNECTION**



**BLOCK DIAGRAM**



**PIN DESCRIPTION**

Pin Name	Pin Function	Pin Name	Pin Function
/CS	Chip Select	I/O1 ~ I/O8	Data Input/Output
/WE	Write Enable	Vcc	Power (2.7~3.6V)
/OE	Output Enable	Vss	Ground
A0 ~ A18	Address Input		

**ORDERING INFORMATION**

Part No.	Speed	Power	Temp	Package
HY62KF08401C-DS(I)	55/70	LL-part	I	sTSOP
HY62KF08401C-SS(I)	55/70	SL-part	I	sTSOP

Note 1. I : Industrial

**ABSOLUTE MAXIMUM RATINGS (1)**

Symbol	Parameter	Rating	Unit	Remark
V <sub>IN</sub> , V <sub>OUT</sub>	Input/Output Voltage	-0.3 to 3.6	V	
V <sub>CC</sub>	Power Supply	-0.3 to 4.6	V	
T <sub>A</sub>	Operating Temperature	-40 to 85	°C	HY62KF08401C-I
T <sub>STG</sub>	Storage Temperature	-55 to 150	°C	
P <sub>D</sub>	Power Dissipation	1.0	W	
T <sub>SOLDER</sub>	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**

/CS	/WE	/OE	MODE	I/O OPERATION	Supply Current
H	X	X	Deselected	High-Z	Standby
L	H	H	Output Disabled	High-Z	Active
		L	Read	Dout	Active
	L	X	Write	Din	

Note:

- H=V<sub>IH</sub>, L=V<sub>IL</sub>, X=don't care (V<sub>IL</sub> or V<sub>IH</sub>)

## RECOMMENDED DC OPERATING CONDITION

Symbol	Parameter	Min.	Typ	Max.	Unit
V <sub>CC</sub>	Supply Voltage	2.7	3.0 or 3.3	3.6	V
V <sub>SS</sub>	Ground	0	0	0	V
V <sub>IH</sub>	Input High Voltage	2.2	-	V <sub>CC</sub> +0.3	V
V <sub>IL</sub>	Input Low Voltage	-0.3 <sup>1</sup>	-	0.6	V

Note : 1. Undershoot : V<sub>IL</sub> = -1.5V for pulse width less than 30ns  
 2. Undershoot is sampled, not 100% tested.

## DC ELECTRICAL CHARACTERISTICS

T<sub>A</sub> = -40°C to 85°C

Sym	Parameter	Test Condition	Min	Typ <sup>1</sup>	Max	Unit
I <sub>LI</sub>	Input Leakage Current	V <sub>SS</sub> ≤ V <sub>IN</sub> ≤ V <sub>CC</sub>	-1	-	1	uA
I <sub>LO</sub>	Output Leakage Current	V <sub>SS</sub> ≤ V <sub>OUT</sub> ≤ V <sub>CC</sub> , /CS = V <sub>IH</sub> or /OE = V <sub>IH</sub> or /WE = V <sub>IL</sub>	-1	-	1	uA
I <sub>CC</sub>	Operating Power Supply Current	/CS = V <sub>IL</sub> , V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , I <sub>I/O</sub> = 0mA			5	mA
I <sub>CC1</sub>	Average Operating Current	/CS = V <sub>IL</sub> , V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , Cycle Time = Min, 100% Duty, I <sub>I/O</sub> = 0mA	2.7~3.6V		45	mA
			2.7~3.3V		40	mA
		/CS ≤ 0.2V, V <sub>IN</sub> ≤ 0.2V or V <sub>IN</sub> ≥ V <sub>CC</sub> -0.2V, Cycle Time = 1us, 100% Duty, I <sub>I/O</sub> = 0mA			5	mA
I <sub>SB</sub>	Standby Current (TTL Input)	/CS = V <sub>IH</sub> or V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>			0.5	mA
I <sub>SB1</sub>	Standby Current (CMOS Input)	/CS ≥ V <sub>CC</sub> - 0.2V or V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.2V or V <sub>IN</sub> ≤ V <sub>SS</sub> + 0.2V	LL	0.2	15	uA
			SL	0.2	6	uA
V <sub>OL</sub>	Output Low	I <sub>OL</sub> = 2.1mA	-	-	0.4	V
V <sub>OH</sub>	Output High	I <sub>OH</sub> = -1.0mA	2.4	-	-	V

Note

1. Typical values are at V<sub>CC</sub> = 3.0V T<sub>A</sub> = 25°C
2. Typical values are not 100% tested

## CAPACITANCE

(Temp = 25°C, f = 1.0MHz)

Symbol	Parameter	Condition	Max.	Unit
C <sub>IN</sub>	Input Capacitance (Add, /CS, /WE, /OE)	V <sub>IN</sub> = 0V	8	pF
C <sub>OUT</sub>	Output Capacitance (I/O)	V <sub>I/O</sub> = 0V	10	pF

Note : These parameters are sampled and not 100% tested

### AC CHARACTERISTICS

TA = -40°C to 85°C, unless otherwise specified

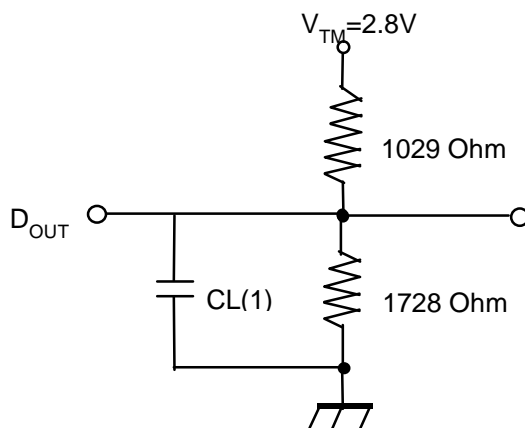
#	Symbol	Parameter	55ns		70ns		Unit
			Min.	Max.	Min.	Max.	
READ CYCLE							
1	tRC	Read Cycle Time	55	-	70	-	ns
2	tAA	Address Access Time	-	55	-	70	ns
3	tACS	Chip Select Access Time	-	55	-	70	ns
4	tOE	Output Enable to Output Valid	-	30	-	35	ns
5	tCLZ	Chip Select to Output in Low Z	10	-	10	-	ns
6	tOLZ	Output Enable to Output in Low Z	5	-	5	-	ns
7	tCHZ	Chip Deselection to Output in High Z	0	30	0	30	ns
8	tOHZ	Out Disable to Output in High Z	0	30	0	30	ns
9	tOH	Output Hold from Address Change	10	-	10	-	ns
WRITE CYCLE							
10	tWC	Write Cycle Time	55	-	70	-	ns
11	tCW	Chip Selection to End of Write	50	-	60	-	ns
12	tAW	Address Valid to End of Write	50	-	60	-	ns
13	tAS	Address Set-up Time	0	-	0	-	ns
14	tWP	Write Pulse Width	45	-	50	-	ns
15	tWR	Write Recovery Time	0	-	0	-	ns
16	tWHZ	Write to Output in High Z	0	20	0	20	ns
17	tDW	Data to Write Time Overlap	25	-	30	-	ns
18	tDH	Data Hold from Write Time	0	-	0	-	ns
19	tOW	Output Active from End of Write	5	-	5	-	ns

### AC TEST CONDITIONS

TA = -40°C to 85°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		1.5V
Output Load	tCLZ, tOLZ, tCHZ, tOHZ, tWHZ, tOW	CL = 5pF + 1TTL Load
	Others	CL = 30pF + 1TTL Load

### AC TEST LOADS

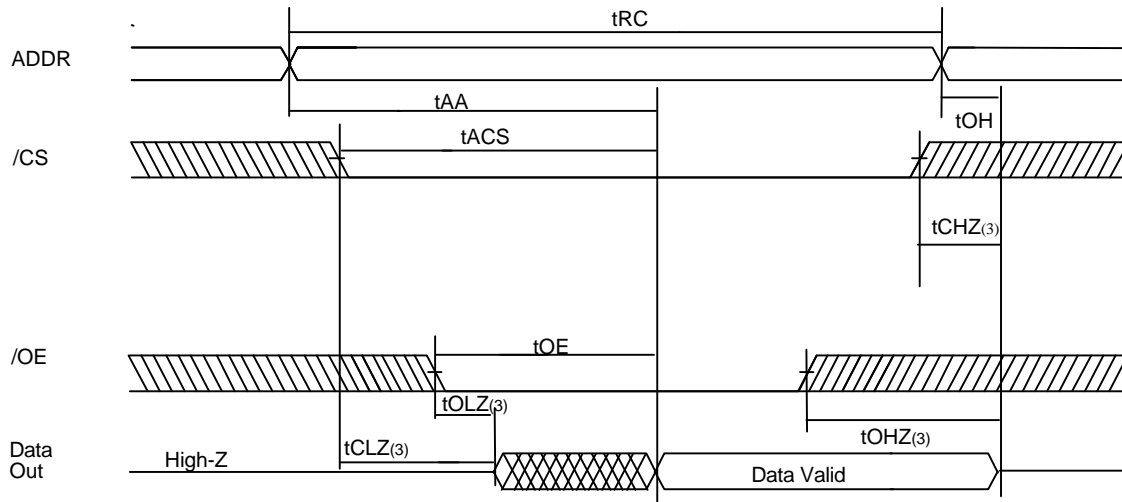


Note

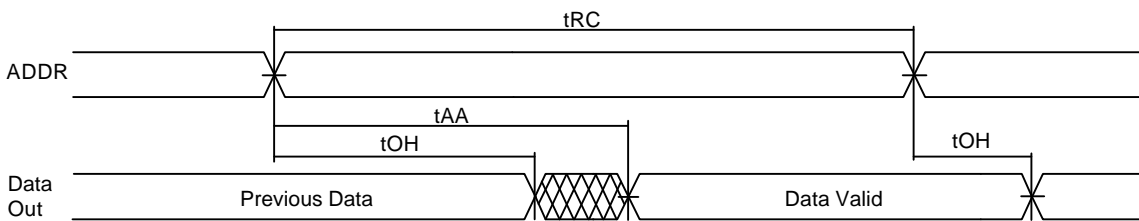
1. Including jig and scope capacitance

**TIMING DIAGRAM**

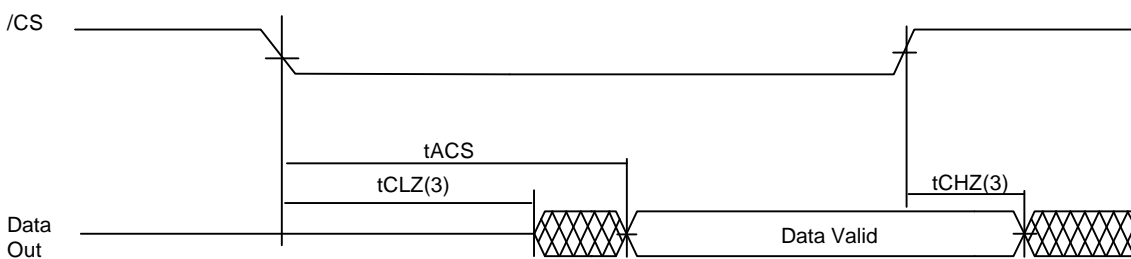
READ CYCLE 1 (Note 1,4)



READ CYCLE 2 (Note 1,2,4)



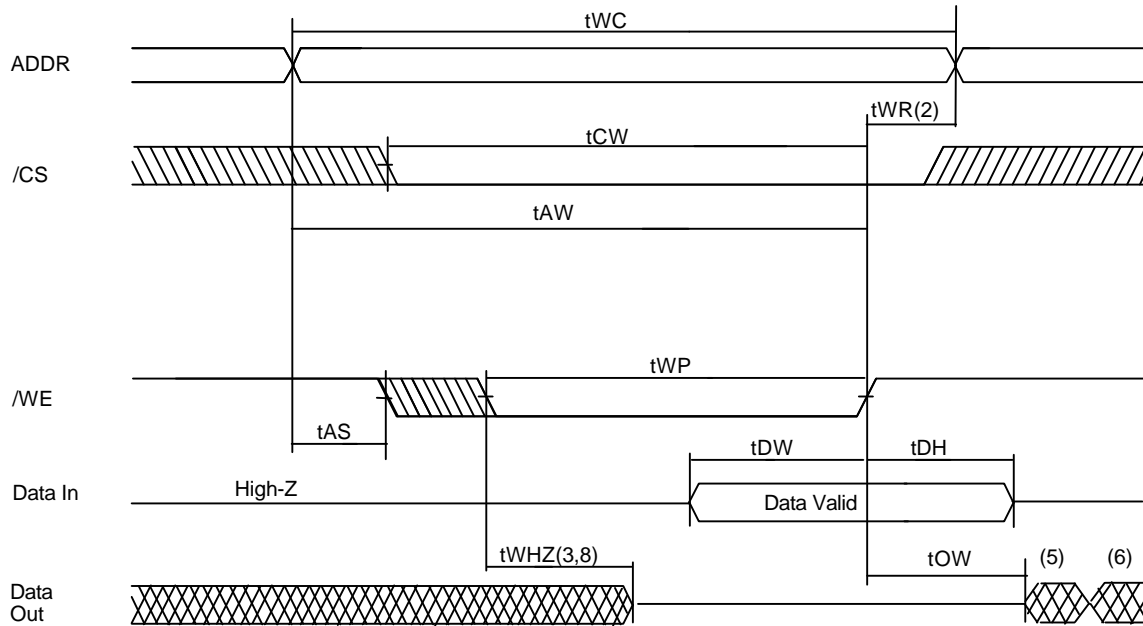
READ CYCLE 3 (Note 1,2,4)



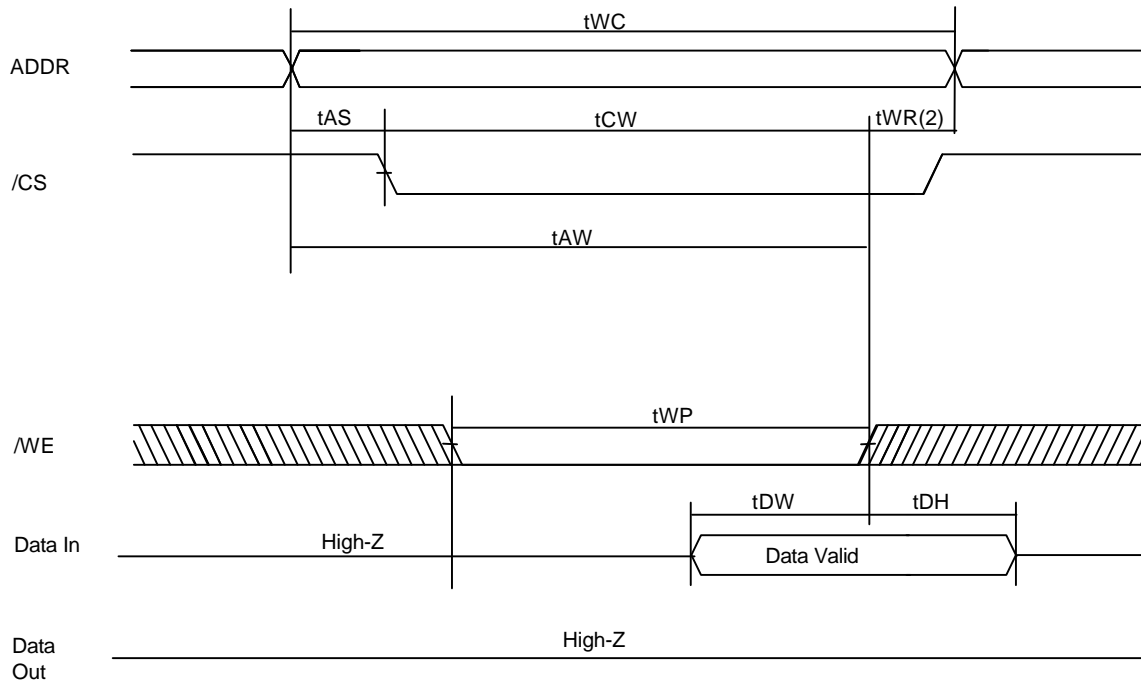
Notes:

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

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



WRITE CYCLE 2 (Note 1,4,8) (/CS Controlled)



Notes:

1. A write occurs during the overlap of a low /WE and a low /CS.
2. tWR is measured from the earlier of /CS or /WE going high 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 /CS low transition occurs 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  $\pm 200\text{mV}$  from steady state.  
This parameter is sampled and not 100% tested.
8. /CS in high for the standby, low for active

**DATA RETENTION ELECTRIC CHARACTERISTIC**

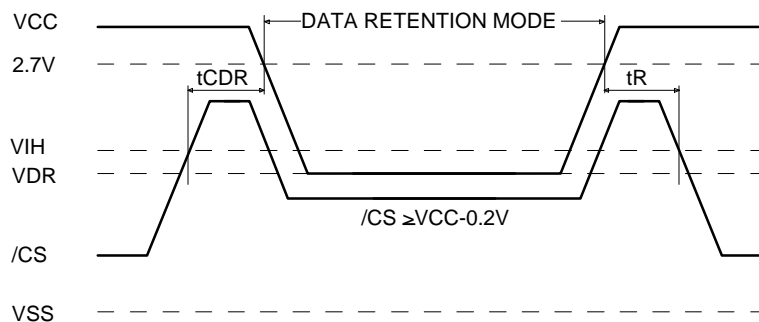
TA = -40°C to 85°C

Symbol	Parameter	Test Condition	Min	Typ <sup>1</sup>	Max	Unit	
VDR	Vcc for Data Retention	/CS $\geq$ Vcc - 0.2V, VIN $\geq$ Vcc - 0.2V or VIN $\leq$ Vss + 0.2V	1.2	-	3.6	V	
Iccdr	Data Retention Current	Vcc=1.5V, /CS $\geq$ Vcc - 0.2V or VIN $\geq$ Vcc - 0.2V or VIN $\leq$ Vss + 0.2V	LL	-	0.1	10	uA
			SL	-	0.1	3	uA
tCDR	Chip Deselect to Data Retention Time	See Data Retention Timing Diagram	0	-	-	ns	
tR	Operating Recovery Time		tRC	-	-	ns	

Notes:

1. Typical values are under the condition of TA = 25°C.
2. Typical value are sampled and not 100% tested

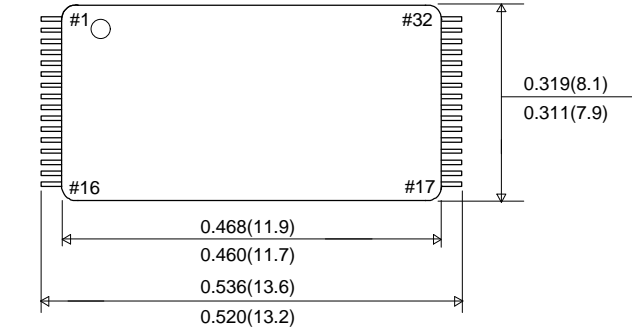
**DATA RETENTION TIMING DIAGRAM**



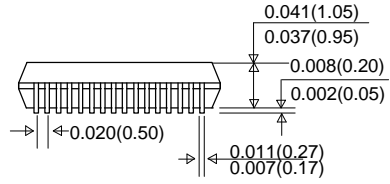
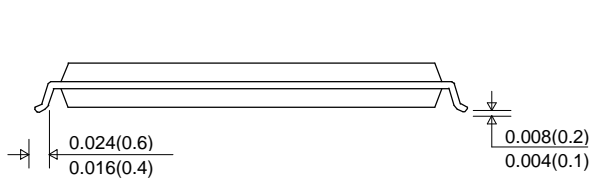


**PACKAGE INFORMATION**

32pin 8x13.4mm Smaller Thin Small Outline Package Standard(S)



UNIT : INCH(mm)



MARKING INFORMATION

Package	Marking Example																														
sTSOP	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>H</td><td>Y</td><td>6</td><td>2</td><td>K</td><td>F</td><td>0</td><td>8</td><td>4</td><td>0</td> </tr> <tr> <td>1</td><td>C</td><td>-</td><td>c</td><td>S</td><td>s</td><td>s</td><td>t</td><td></td><td></td> </tr> <tr> <td>y</td><td>y</td><td>w</td><td>w</td><td>p</td><td></td><td></td><td>K</td><td>O</td><td>R</td> </tr> </table>	H	Y	6	2	K	F	0	8	4	0	1	C	-	c	S	s	s	t			y	y	w	w	p			K	O	R
H	Y	6	2	K	F	0	8	4	0																						
1	C	-	c	S	s	s	t																								
y	y	w	w	p			K	O	R																						

Index

• <b>HY62KF08401C</b>	: Part Name
• <b>c</b>	: Power Consumption - D : Low Low Power - S : Super Low Power
• <b>S</b>	: Package Type - S : sTSOP
• <b>ss</b>	: Speed - 55 : 55ns - 70 : 70ns
• <b>t</b>	: Temperature - I : Industrial ( -40 ~ 85 °C )
• <b>yy</b>	: Year ( ex : 00 = year 2000, 01 = year 2001 )
• <b>ww</b>	: work week ( ex : 12 = ww12 )
• <b>p</b>	: Process Code
• <b>KOR</b>	: Origin Country
<b>Note</b>	
- Capital Letter	: Fixed Item
- Small Letter	: Non-fixed Item