

[Document Title](#)**512K x 8bit 3.0 ~ 3.6V Super low Power FCMOS Slow SRAM**[Revision History](#)

| <u>Revision No</u> | <u>History</u>      | <u>Draft Date</u> | <u>Remark</u> |
|--------------------|---------------------|-------------------|---------------|
| 00                 | Initial Draft       | Dec.18.2000       | Final         |
| 01                 | Changed Logo        | Mar.23.2001       | Final         |
| 02                 | Changed Isb1 values | Jun.07.2001       | Final         |

## DESCRIPTION

The HY62VF08401C is a high speed, super low power and 4Mbit full CMOS SRAM organized as 512K words by 8bits. The HY62VF08401C 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.

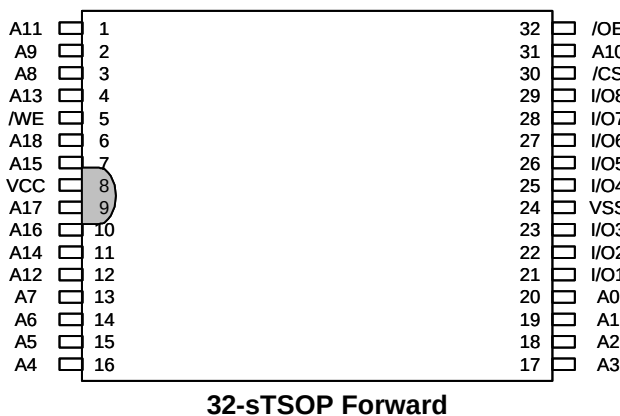
## FEATURES

- 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)

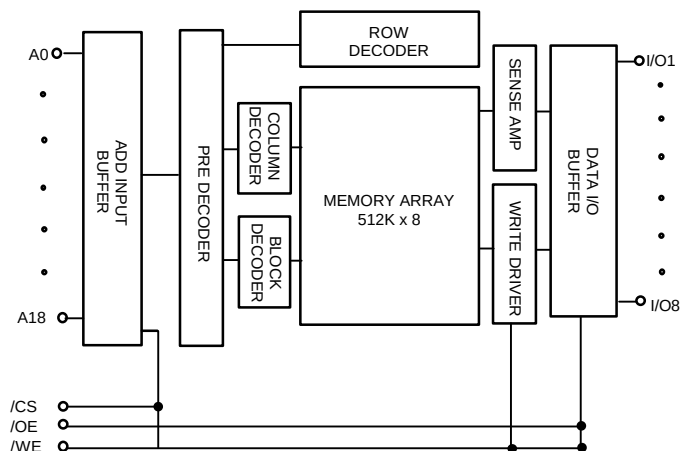
| Product No.    | Voltage (V) | Speed (ns) | Operation Current/Icc(mA) | Standby Current(uA) |    | Temperature (°C) |
|----------------|-------------|------------|---------------------------|---------------------|----|------------------|
|                |             |            |                           | LL                  | SL |                  |
| HY62VF08401C-I | 3.0~3.6     | 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 (3.0V~3.6V) |
| /OE      | Output Enable | Vss         | Ground            |
| A0 ~ A18 | Address Input |             |                   |

## ORDERING INFORMATION

| Part No.           | Speed | Power   | Temp | Package |
|--------------------|-------|---------|------|---------|
| HY62VF08401C-DS(I) | 55/70 | LL-part | I    | sTSOP   |
| HY62VF08401C-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 4.0 | V      |                |
| V <sub>CC</sub>                    | Power Supply                      | -0.3 to 4.6 | V      |                |
| T <sub>A</sub>                     | Operating Temperature             | -40 to 85   | °C     | HY62VF08401C-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     | 3.0               | 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> ,<br>/CS = V <sub>IH</sub> or<br>/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> ,<br>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> ,<br>Cycle Time = Min,<br>100% Duty, I <sub>I/O</sub> = 0mA    |     |                  | 45  | mA   |
|                  |                                | /CS ≤ 0.2V,<br>V <sub>IN</sub> ≤ 0.2V or V <sub>IN</sub> ≥ V <sub>CC</sub> -0.2V,<br>Cycle Time = 1us,<br>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<br>V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.2V or<br>V <sub>IN</sub> ≤ V <sub>SS</sub> + 0.2V                  | SL  | 0.2              | 6   | uA   |
|                  |                                |                                                                                                                                             | LL  | 0.2              | 15  | 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> = 3.3V 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

T<sub>A</sub> = -40°C to 85°C, unless otherwise specified

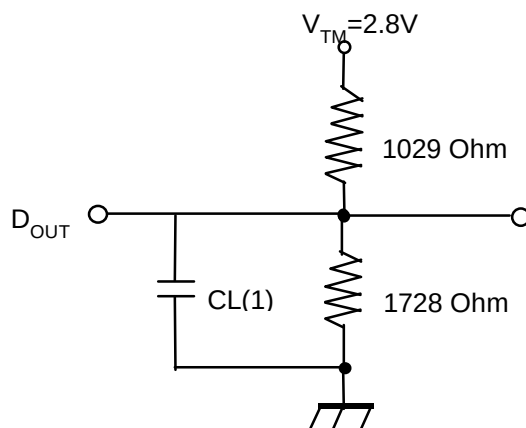
| #           | Symbol | Parameter                            | 55ns |      | 70ns |      | Unit |
|-------------|--------|--------------------------------------|------|------|------|------|------|
|             |        |                                      | Min. | Max. | Min. | Max. |      |
| READ 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

T<sub>A</sub> = -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                             | t <sub>CLZ</sub> , t <sub>OLZ</sub> , t <sub>CHZ</sub> , t <sub>OHZ</sub> , t <sub>WHZ</sub> , t <sub>OW</sub> | CL = 5pF + 1TTL Load  |
|                                         | Others                                                                                                         | CL = 30pF + 1TTL Load |

## AC TEST LOADS

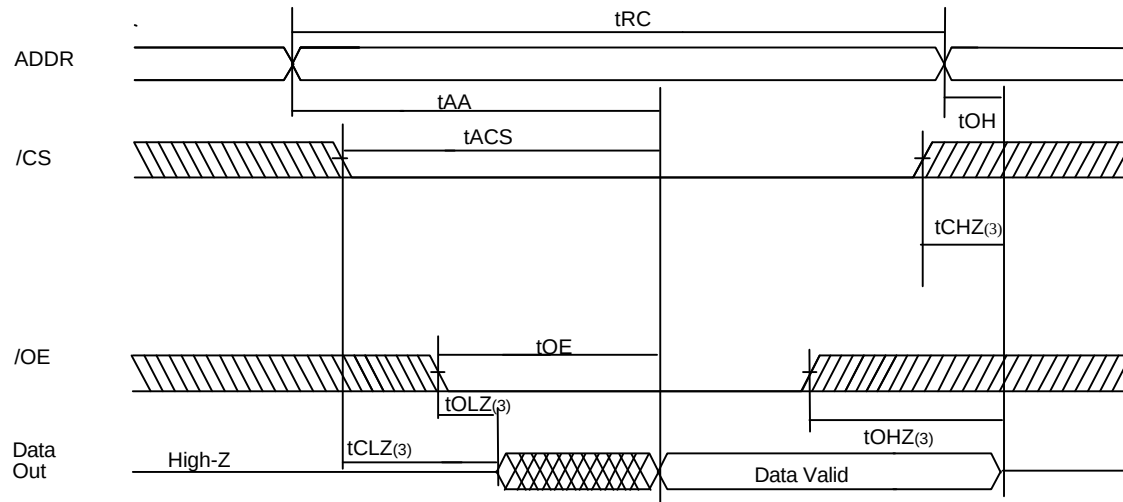


Note

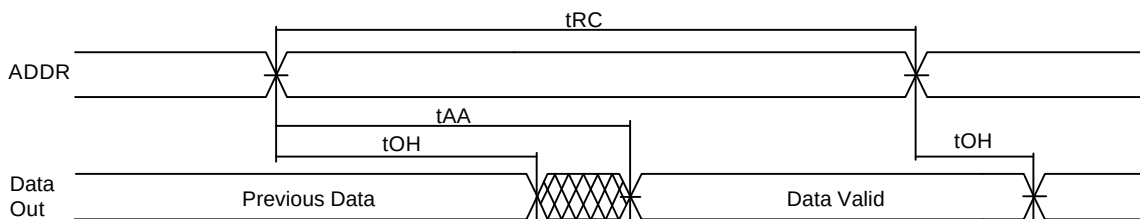
1. Including jig and scope capacitance

### TIMING DIAGRAM

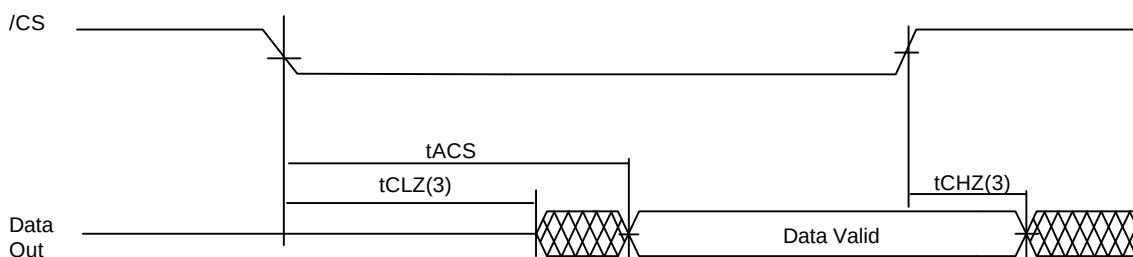
READ CYCLE 1 (Note 1,4)



READ CYCLE 2 (Note 1,2,4)



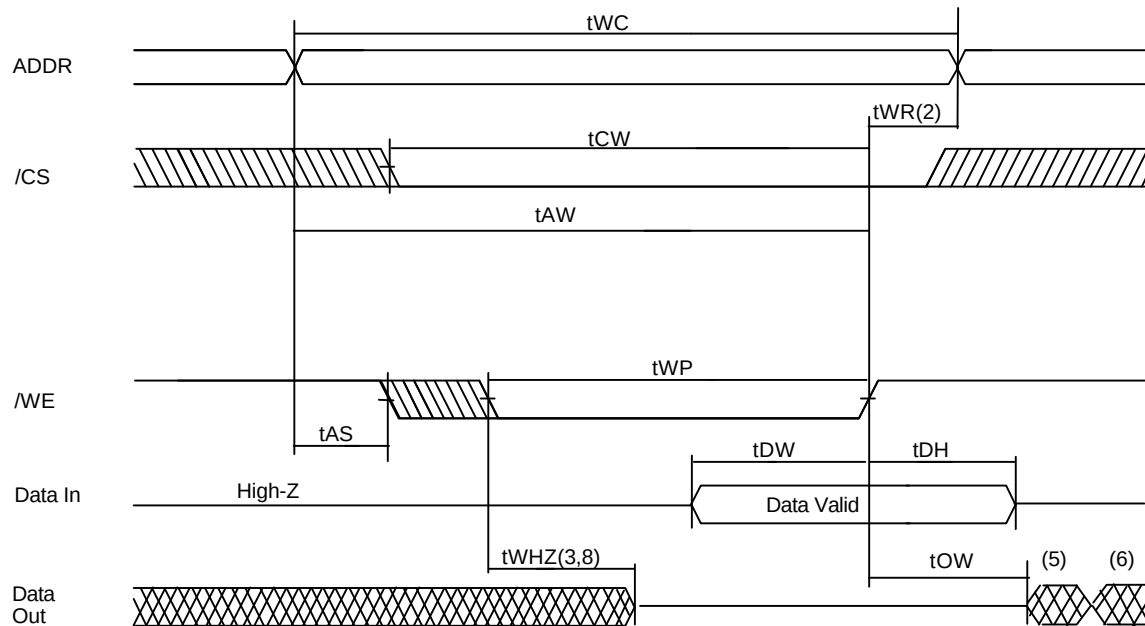
READ CYCLE 3 (Note 1,2,4)



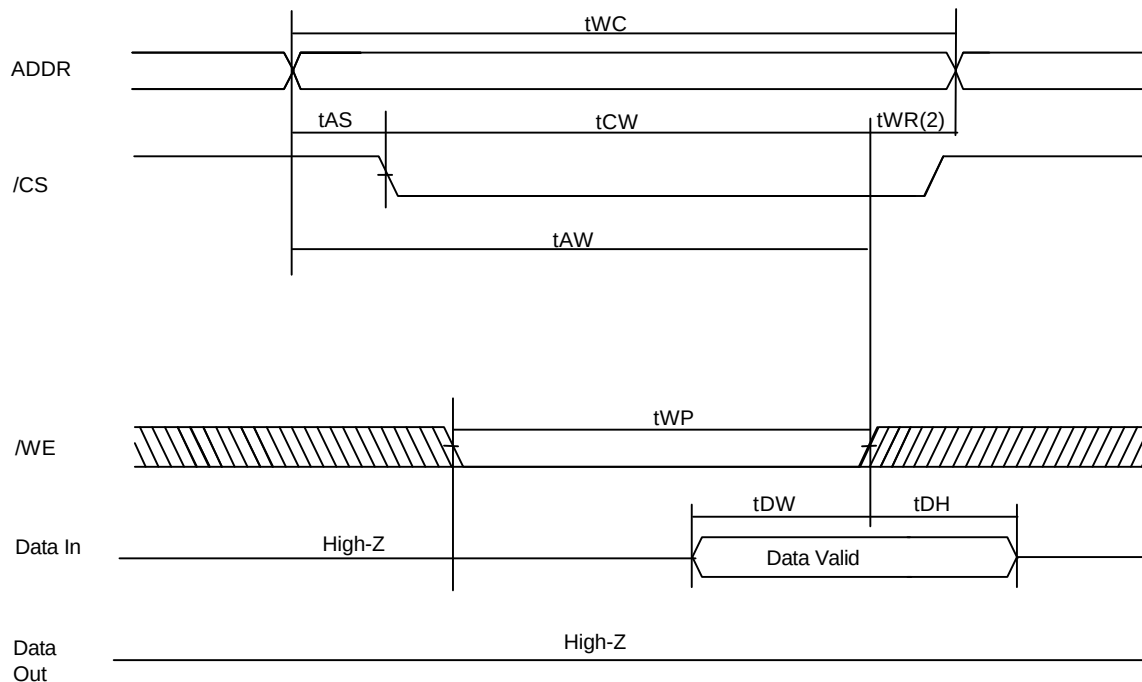
#### Notes:

1. A read occurs during the overlap of a low /OE, a high /WE and a low /CS.
2. /OE = V<sub>IL</sub>
3. Transition is measured  $\pm 200\text{mV}$  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)

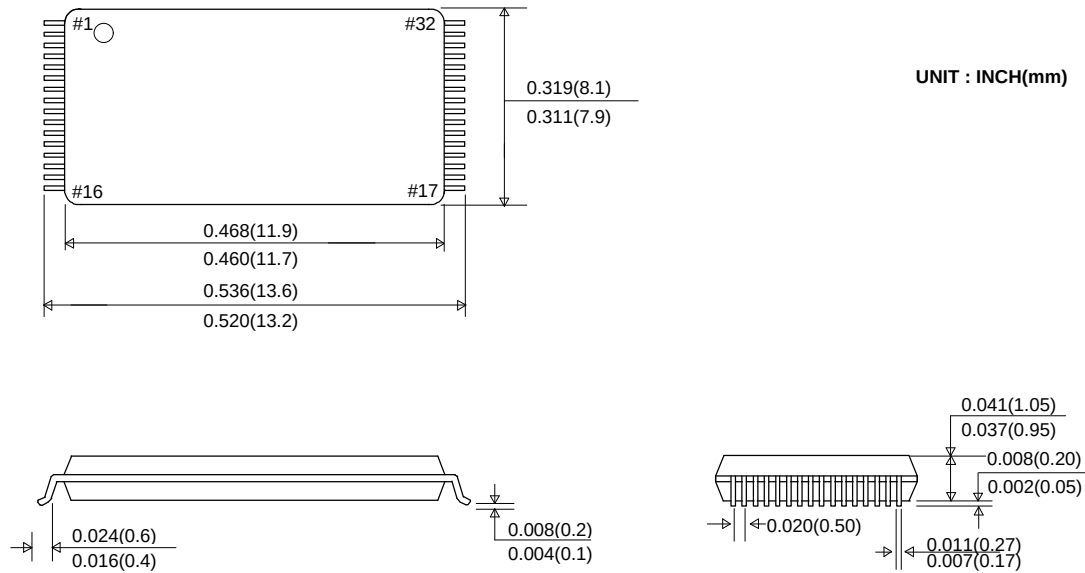


1. A write occurs during the overlap of a low /WE and a low /CS.
2. tWR is measured from the earlier of /CS or /WE going high to the end of write cycle.
3. During this period, I/O pins are in the output state so that the input signals of opposite phase to the output must not be applied.
4. If the /CS 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



## PACKAGE INFORMATION

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



## MARKING INFORMATION

| Package | Marking Example                                                                                                                                                                                                                                                                                                                                                                                         |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| sTSOP   | <div><div>H</div><div>Y</div><div>6</div><div>2</div><div>U</div><div>F</div><div>0</div><div>8</div><div>4</div><div>0</div></div> <div><div>1</div><div>C</div><div>-</div><div>c</div><div>S</div><div>s</div><div>s</div><div>t</div><div></div><div></div></div> <div><div>y</div><div>y</div><div>w</div><div>w</div><div>p</div><div></div><div></div><div>K</div><div>O</div><div>R</div></div> |

| Index                 |                                                |                              |
|-----------------------|------------------------------------------------|------------------------------|
| • <b>HY62UF08401C</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                               |                              |