# STC

## Very Low Power/Voltage CMOS SRAM
## 32K X 8 bit

# STC62WV256

## ■ FEATURES

- Wide Vcc operation voltage : 2.4V ~ 5.5V
- Very low power consumption :
  - Vcc = 3.0V C-grade : 20mA (Max.) operating current
    I- grade : 25mA (Max.) operating current
    0.01uA (Typ.) CMOS standby current
  - Vcc = 5.0V C-grade : 35mA (Max.) operating current
    I- grade : 40mA (Max.) operating current
    0.4uA (Typ.) CMOS standby current
- High speed access time :
  - -70 70ns (Max.) at Vcc=3.0V
- Automatic power down when chip is deselected
- Three state outputs and TTL compatible
- Fully static operation
- Data retention supply voltage as low as 1.5V
- Easy expansion with $\overline{CE}$ and $\overline{OE}$ options

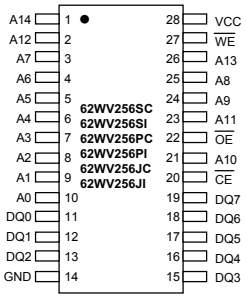
## ■ DESCRIPTION

The STC62WV256 is a high performance, very low power CMOS Static Random Access Memory organized as 32,768 words by 8 bits and operates from a wide range of 2.4V to 5.5V supply voltage.
Advanced CMOS technology and circuit techniques provide both high speed and low power features with a typical CMOS standby current of 0.01uA and maximum access time of 70ns in 3V operation.
Easy memory expansion is provided by active LOW chip enable ($\overline{CE}$), active LOW output enable ($\overline{OE}$) and three-state output drivers.
The STC62WV256 has an automatic power down feature, reducing the power consumption significantly when chip is deselected.
The STC62WV256 is available in the DICE form, JEDEC standard 28pin 330mil Plastic SOP, 300mil Plastic SOJ, 600mil Plastic DIP and 8mm x 13.4mm TSOP (normal type).

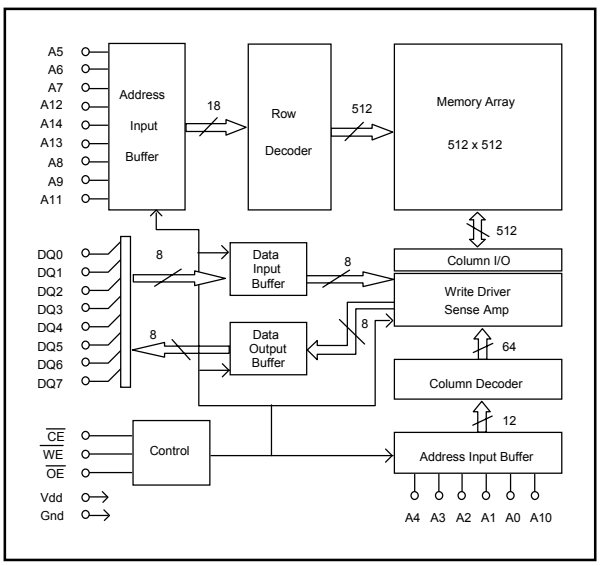
## ■ PRODUCT FAMILY

| PRODUCT FAMILY | OPERATING TEMPERATURE | Vcc RANGE | SPEED (ns) | POWER DISSIPATION | | | | PKG TYPE |
|---|---|---|---|---|---|---|---|---|
| | | | | STANDBY ($I_{CCSB1}$, Max) | | Operating ($I_{CC}$, Max) | | |
| | | | Vcc= 3.0V | Vcc= 5.0V | Vcc= 3.0V | Vcc= 5.0V | Vcc= 3.0V | |
| STC62WV256SC | 0 $^{O}$C to +70 $^{O}$C | 2.4V ~ 5.5V | 70 | 1uA | 0.2uA | 35mA | 20mA | SOP-28 |
| STC62WV256TC | | | | | | | | TSOP-28 |
| STC62WV256PC | | | | | | | | PDIP-28 |
| STC62WV256JC | | | | | | | | SOJ-28 |
| STC62WV256DC | | | | | | | | DICE |
| STC62WV256SI | -40 $^{O}$C to +85 $^{O}$C | 2.4V ~ 5.5V | 70 | 2uA | 0.4uA | 40mA | 25mA | SOP-28 |
| STC62WV256TI | | | | | | | | TSOP-28 |
| STC62WV256PI | | | | | | | | PDIP-28 |
| STC62WV256JI | | | | | | | | SOJ-28 |
| STC62WV256DI | | | | | | | | DICE |

## ■ PIN CONFIGURATIONS



## ■ BLOCK DIAGRAM

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## ■ PIN DESCRIPTIONS

| Name | Function |
|---|---|
| **A0-A14 Address Input** | These 15 address inputs select one of the 32768 x 8-bit words in the RAM |
| **$\overline{CE}$ Chip Enable Input** | $\overline{CE}$ is active LOW. Chip enables must be active when data read from or write to the device. If chip enable is not active, the device is deselected and is in a standby power mode. The DQ pins will be in the high impedance state when the device is deselected. |
| **$\overline{WE}$ Write Enable Input** | The write enable input is active LOW and controls read and write operations. With the chip selected, when $\overline{WE}$ is HIGH and $\overline{OE}$ is LOW, output data will be present on the DQ pins; when $\overline{WE}$ is LOW, the data present on the DQ pins will be written into the selected memory location. |
| **$\overline{OE}$ Output Enable Input** | The output enable input is active LOW. If the output enable is active while the chip is selected and the write enable is inactive, data will be present on the DQ pins and they will be enabled. The DQ pins will be in the high impedance state when $\overline{OE}$ is inactive. |
| **DQ0 – DQ7 Data Input/Output Ports** | These 8 bi-directional ports are used to read data from or write data into the RAM. |
| **Vcc** | Power Supply |
| **Gnd** | Ground |

## ■ TRUTH TABLE

| MODE | $\overline{WE}$ | $\overline{CE}$ | $\overline{OE}$ | I/O OPERATION | Vcc CURRENT |
|---|---|---|---|---|---|
| Not selected | X | H | X | High Z | $I_{CCSB}$, $I_{CCSB1}$ |
| Output Disabled | H | L | H | High Z | $I_{CC}$ |
| Read | H | L | L | DOUT | $I_{CC}$ |
| Write | L | L | X | DIN | $I_{CC}$ |

## ■ ABSOLUTE MAXIMUM RATINGS(1)

| SYMBOL | PARAMETER | RATING | UNITS |
|---|---|---|---|
| VTERM | Terminal Voltage with Respect to GND | -0.5 to Vcc+0.5 | V |
| TBIAS | Temperature Under Bias | -40 to +125 | °C |
| TSTG | Storage Temperature | -60 to +150 | °C |
| PT | Power Dissipation | 1.0 | W |
| IOUT | DC Output Current | 20 | mA |

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

## ■ OPERATING RANGE

| RANGE | AMBIENT TEMPERATURE | Vcc |
|---|---|---|
| Commercial | 0 °C to +70 °C | 2.4V ~ 5.5V |
| Industrial | -40 °C to +85 °C | 2.4V ~ 5.5V |

## ■ CAPACITANCE (1) (TA = 25°C, f = 1.0 MHz)

| SYMBOL | PARAMETER | CONDITIONS | MAX. | UNIT |
|---|---|---|---|---|
| CIN | Input Capacitance | VIN=0V | 6 | pF |
| CDQ | Input/Output Capacitance | VI/O=0V | 8 | pF |

1. This parameter is guaranteed and not 100% tested.

## ■ DC ELECTRICAL CHARACTERISTICS ( TA =0°C to + 70°C)

| PARAMETER NAME | PARAMETER | TEST CONDITIONS | | MIN. | TYP. (1) | MAX. | UNITS |
|---|---|---|---|---|---|---|---|
| $V_{IL}$ | Guaranteed Input Low Voltage(2) | | Vcc=3.0V | -0.5 | -- | 0.8 | V |
| | | | Vcc=5.0V | | | | |
| $V_{IH}$ | Guaranteed Input High Voltage(2) | | Vcc=3.0V | 2.0 | -- | Vcc+0.2 | V |
| | | | Vcc=5.0V | 2.2 | | | |
| $I_{IL}$ | Input Leakage Current | Vcc = Max, $V_{IN}$= 0V to Vcc | | -- | -- | 1 | uA |
| $I_{LO}$ | Output Leakage Current | Vcc = Max, $\overline{CE}$ = $V_{IH}$, or $\overline{OE}$ = $V_{IH}$, $V_{I/O}$ = 0V to Vcc | | -- | -- | 1 | uA |
| $V_{OL}$ | Output Low Voltage | Vcc = Max, $I_{OL}$ = 2mA | Vcc=3.0V | -- | -- | 0.4 | V |
| | | | Vcc=5.0V | | | | |
| $V_{OH}$ | Output High Voltage | Vcc = Min, $I_{OH}$ = -1mA | Vcc=3.0V | 2.4 | -- | -- | V |
| | | | Vcc=5.0V | | | | |
| $I_{CC}$ | Operating Power Supply Current | $\overline{CE}$ = $V_{IL}$, $I_{DQ}$ = 0mA, F = Fmax(3) | Vcc=3.0V | -- | -- | 20 | mA |
| | | | Vcc=5.0V | -- | -- | 35 | |
| $I_{CCSB}$ | Standby Current-TTL | $\overline{CE}$ = $V_{IH}$, $I_{DQ}$ = 0mA | Vcc=3.0V | -- | -- | 1 | mA |
| | | | Vcc=5.0V | -- | -- | 2 | |
| $I_{CCSB1}$ | Standby Current-CMOS | $\overline{CE}$ ≧ Vcc-0.2V, $V_{IN}$ ≧ Vcc - 0.2V or $V_{IN}$ ≦ 0.2V | Vcc=3.0V | -- | 0.01 | 0.2 | uA |
| | | | Vcc=5.0V | -- | 0.4 | 1.0 | |

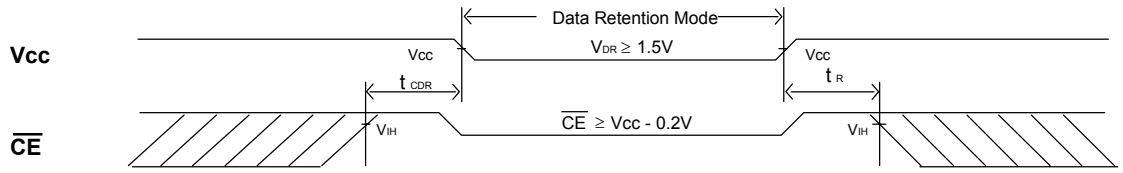
1. Typical characteristics are at TA = 25°C.
2. These are absolute values with respect to device ground and all overshoots due to system or tester notice are included.
3. Fmax = $1/t_{RC}$ .

## ■ DATA RETENTION CHARACTERISTICS ( TA = 0°C to + 70°C )

| SYMBOL | PARAMETER | TEST CONDITIONS | MIN. | TYP. (1) | MAX. | UNITS |
|---|---|---|---|---|---|---|
| $V_{DR}$ | Vcc for Data Retention | $\overline{CE}$ ≧ Vcc - 0.2V<br>$V_{IN}$ ≧ Vcc - 0.2V or $V_{IN}$ ≦ 0.2V | 1.5 | -- | -- | V |
| $I_{CCDR}$ | Data Retention Current | $\overline{CE}$ ≧ Vcc -0.2V<br>$V_{IN}$ ≧ Vcc - 0.2V or $V_{IN}$ ≦ 0.2V | -- | 0.01 | 0.20 | uA |
| $t_{CDR}$ | Chip Deselect to Data Retention Time | See Retention Waveform | 0 | -- | -- | ns |
| $t_R$ | Operation Recovery Time | | $T_{RC}$ (2) | -- | -- | ns |

1. Vcc = 1.5V, $T_A$ = + 25°C
2. $t_{RC}$ = Read Cycle Time

## ■ LOW $V_{CC}$ DATA RETENTION WAVEFORM ( $\overline{CE}$ Controlled )



## ■ AC TEST CONDITIONS

| | |
|---|---|
| Input Pulse Levels | Vcc/0V |
| Input Rise and Fall Times | 1V/ns |
| Input and Output Timing Reference Level | 0.5Vcc |

## ■ AC TEST LOADS AND WAVEFORMS

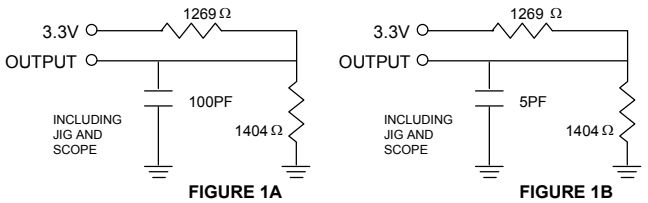



FIGURE 1A FIGURE 1B

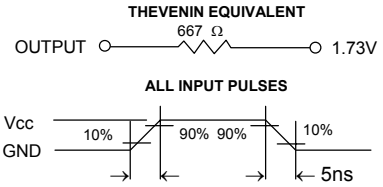
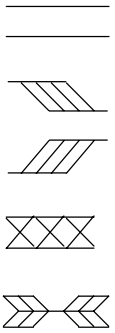



FIGURE 2

## ■ KEY TO SWITCHING WAVEFORMS



| WAVEFORM | INPUTS | OUTPUTS |
|---|---|---|
| | MUST BE STEADY | MUST BE STEADY |
| | MAY CHANGE FROM H TO L | WILL BE CHANGE FROM H TO L |
| | MAY CHANGE FROM L TO H | WILL BE CHANGE FROM L TO H |
| | DON'T CARE: ANY CHANGE PERMITTED | CHANGE : STATE UNKNOWN |
| | DOES NOT APPLY | CENTER LINE IS HIGH IMPEDANCE "OFF "STATE |

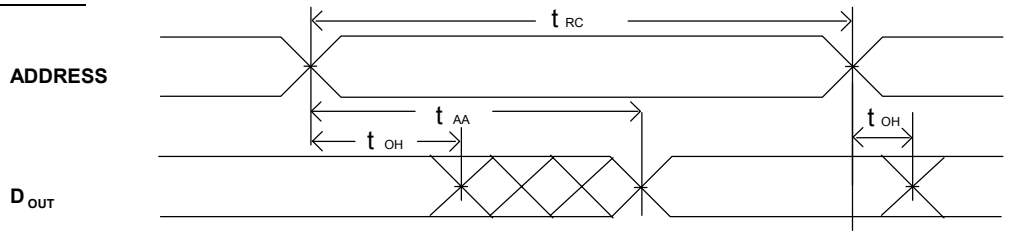
## ■ AC ELECTRICAL CHARACTERISTICS ( TA =0ºC to + 70ºC and Vcc=3.0V)

### READ CYCLE

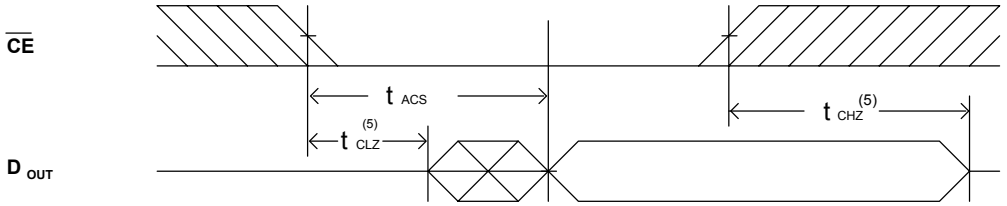
| JEDEC PARAMETER NAME | PARAMETER NAME | DESCRIPTION | CYCLE TIME : 70ns MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $t_{AVAX}$ | $t_{RC}$ | Read Cycle Time | 70 | -- | -- | ns |
| $t_{AVQV}$ | $t_{AA}$ | Address Access Time | -- | -- | 70 | ns |
| $t_{ELQV}$ | $t_{ACS}$ | Chip Select Access Time | -- | -- | 70 | ns |
| $t_{GLQV}$ | $t_{OE}$ | Output Enable to Output Valid | -- | -- | 50 | ns |
| $t_{ELQX}$ | $t_{CLZ}$ | Chip Select to Output Low Z | 10 | -- | -- | ns |
| $t_{GLQX}$ | $t_{OLZ}$ | Output Enable to Output in Low Z | 10 | -- | -- | ns |
| $t_{EHQZ}$ | $t_{CHZ}$ | Chip Deselect to Output in High Z | -- | -- | 35 | ns |
| $t_{GHQZ}$ | $t_{OHZ}$ | Output Disable to Output in High Z | -- | -- | 30 | ns |
| $t_{AXOX}$ | $t_{OH}$ | Data Hold from Address Change | 10 | -- | -- | ns |

## ■ SWITCHING WAVEFORMS (READ CYCLE)

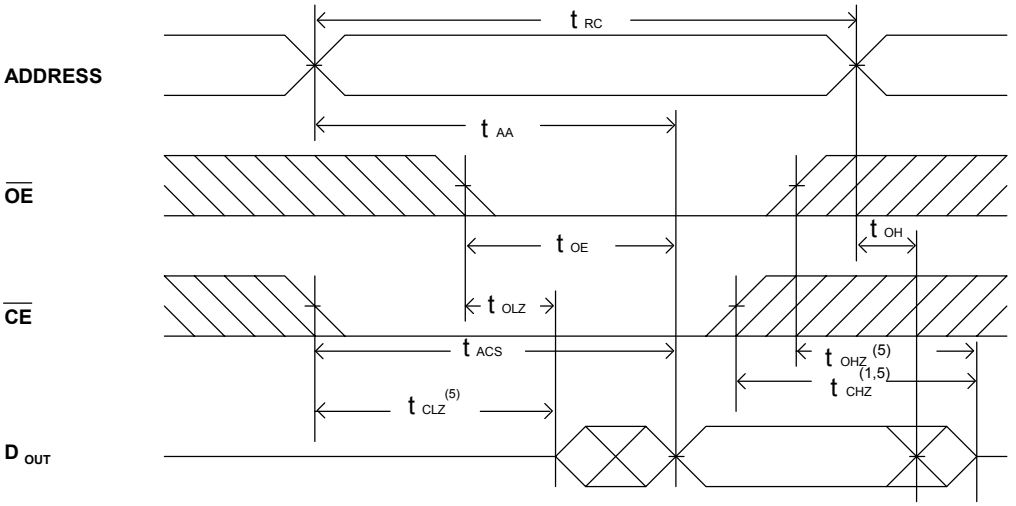
**READ CYCLE1** (1,2,4)




**READ CYCLE2** (1,3,4)




**READ CYCLE3** (1,4)




NOTES:
1. $\overline{WE}$ is high in read Cycle.
2. Device is continuously selected when $\overline{CE}$ = $V_{IL}$.
3. Address valid prior to or coincident with $\overline{CE}$ transition low.
4. $\overline{OE}$ = $V_{IL}$ .
5. Transition is measured ±500mV from steady state with $C_L$ = 5pF as shown in Figure 1B. The parameter is guaranteed but not 100% tested.

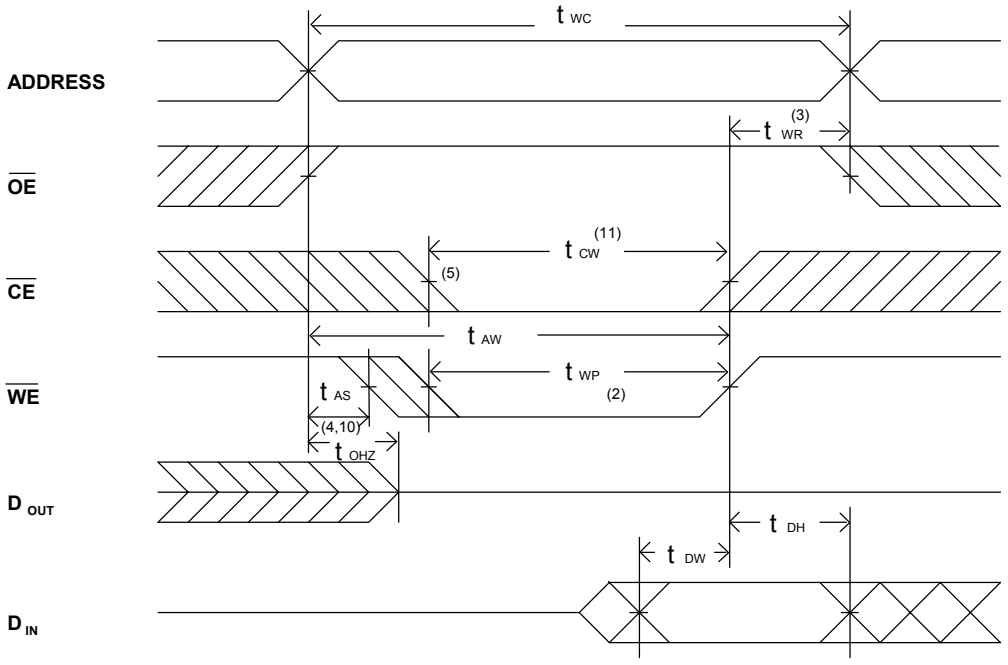
## ■ AC ELECTRICAL CHARACTERISTICS ( TA =0°C to + 70°C and Vcc=3.0V)

### WRITE CYCLE

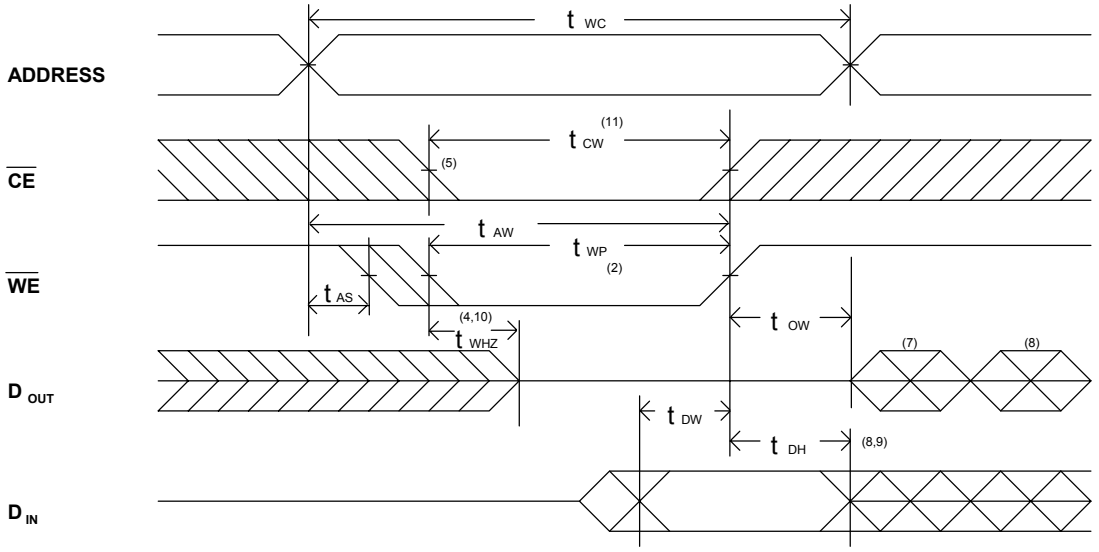
| JEDEC PARAMETER NAME | PARAMETER NAME | DESCRIPTION | CYCLE TIME : 70ns MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $t_{AVAX}$ | $t_{WC}$ | Write Cycle Time | 70 | -- | -- | ns |
| $t_{E1LWH}$ | $t_{CW}$ | Chip Select to End of Write | 70 | -- | -- | ns |
| $t_{AVWL}$ | $t_{AS}$ | Address Set up Time | 0 | -- | -- | ns |
| $t_{AVWH}$ | $t_{AW}$ | Address Valid to End of Write | 70 | -- | -- | ns |
| $t_{WLWH}$ | $t_{WP}$ | Write Pulse Width | 50 | -- | -- | ns |
| $t_{WHAX}$ | $t_{WR}$ | Write Recovery Time ($\overline{CE}$ , $\overline{WE}$) | 0 | -- | -- | ns |
| $t_{WLOZ}$ | $t_{WHZ}$ | Write to Output in High Z | -- | -- | 30 | ns |
| $t_{DVWH}$ | $t_{DW}$ | Data to Write Time Overlap | 40 | -- | -- | ns |
| $t_{WHDX}$ | $t_{DH}$ | Data Hold from Write Time | 0 | -- | -- | ns |
| $t_{GHOZ}$ | $t_{OHZ}$ | Output Disable to Output in High Z | -- | -- | 30 | ns |
| $t_{WHQX}$ | $t_{OW}$ | End ot Write to Output Active | 5 | -- | -- | ns |

## ■ SWITCHING WAVEFORMS (WRITE CYCLE)

**WRITE CYCLE1** (1)



**WRITE CYCLE2** (1,6)




NOTES:

1. $\overline{WE}$ must be high during address transitions.
2. The internal write time of the memory is defined by the overlap of $\overline{CE}$ and $\overline{WE}$ low. All signals must be active to initiate a write and any one signal can terminate a write by going inactive. The data input setup and hold timing should be referenced to the second transition edge of the signal that terminates the write.
3. $T_{WR}$ is measured from the earlier of $\overline{CE}$ or $\overline{WE}$ going high at the end of write cycle.
4. During this period, DQ pins are in the output state so that the input signals of opposite phase to the outputs must not be applied.
5. If the $\overline{CE}$ low transition occurs simultaneously with the $\overline{WE}$ low transitions or after the $\overline{WE}$ transition, output remain in a high impedance state.
6. $\overline{OE}$ is continuously low ($\overline{OE}$ = $V_{IL}$ ).
7. $D_{OUT}$ is the same phase of write data of this write cycle.
8. $D_{OUT}$ is the read data of next address.
9. If $\overline{CE}$ is low during this period, DQ pins are in the output state. Then the data input signals of opposite phase to the outputs must not be applied to them.
10. Transition is measured $\pm$ 500mV from steady state with $C_L$ = 5pF as shown in Figure 1B. The parameter is guaranteed but not 100% tested.
11. $T_{CW}$ is measured from the later of $\overline{CE}$ going low to the end of write.

## ■ ORDERING INFORMATION

**STC62WV256** X X Z Y Y

**SPEED**
70: 70ns

**PKG MATERIAL**
-: Normal
G: Green
P: Pb free

**GRADE**
C: +0°C ~ +70°C
I: -40°C ~ +85°C

**PACKAGE**
J: SOJ
S: SOP
P: PDIP
T: TSOP (8mm x 13.4mm)
D: DICE

Note:
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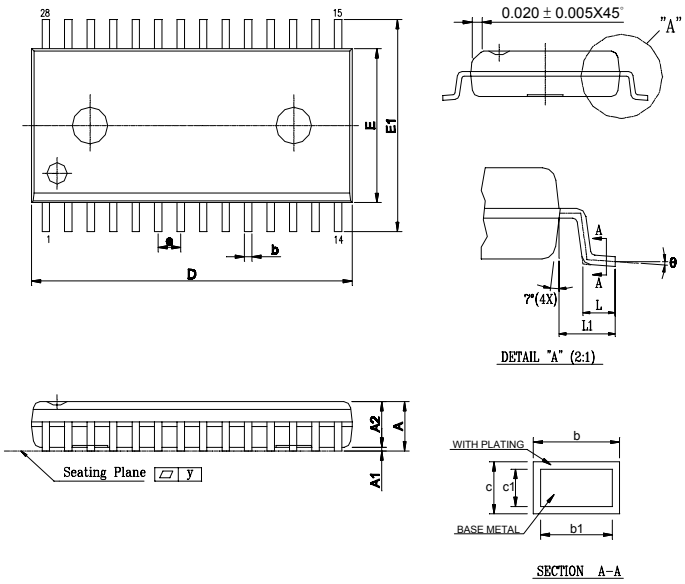
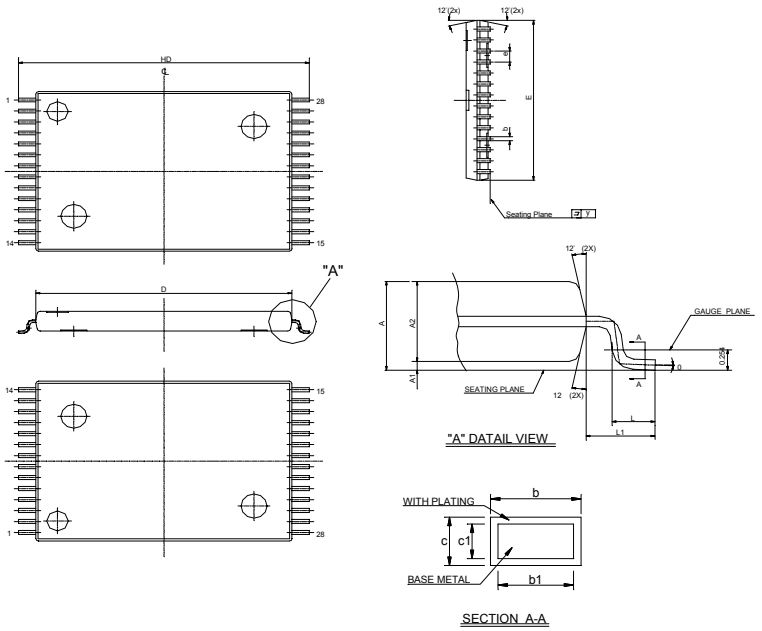
## ■ PACKAGE DIMENSIONS




| UNIT / SYMBOL | INCH | MM |
|---|---|---|
| A | 0.106±0.006 | 2.692±0.152 |
| A1 | 0.009±0.005 | 0.226±0.124 |
| A2 | 0.098±0.005 | 2.489±0.127 |
| b | 0.014 ~ 0.020 | 0.35 ~ 0.50 |
| b1 | 0.014 ~ 0.018 | 0.35 ~ 0.45 |
| c | 0.008 ~ 0.012 | 0.20 ~ 0.32 |
| c1 | 0.008 ~ 0.011 | 0.20 ~ 0.28 |
| D | 0.713±0.005 | 18.110±0.127 |
| E | 0.331±0.005 | 8.407±0.127 |
| E1 | 0.465±0.012 | 11.811±0.305 |
| e | 0.050±0.006 | 1.270±0.152 |
| L | 0.0380±0.0104 | 0.964±0.264 |
| L1 | 0.0677±0.0079 | 1.72±0.2 |
| y | 0.004 Max. | 0.1 Max. |
| θ | 0° ~ 10° | 0° ~ 10° |

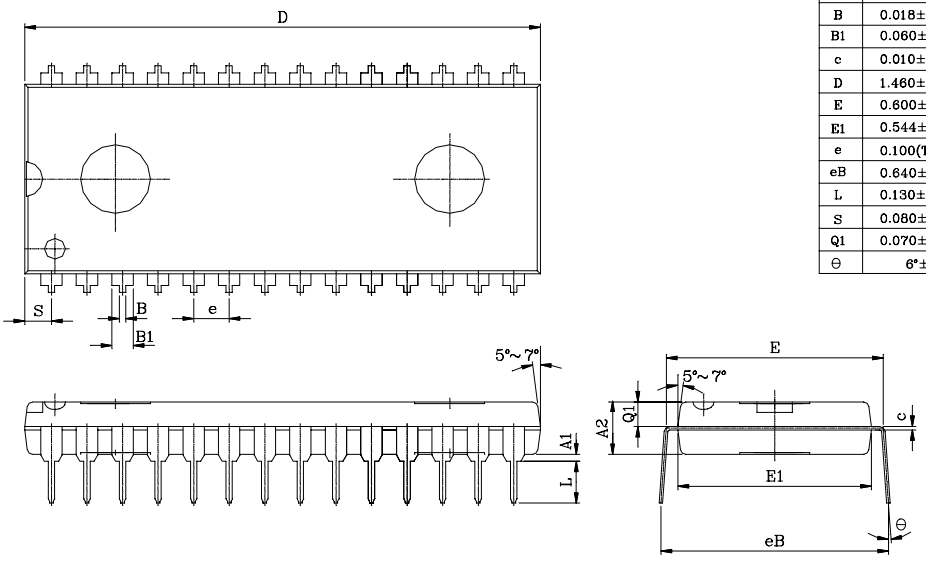
*SOP - 28*

■ **PACKAGE DIMENSIONS (continued)**




| UNIT / SYMBOL | INCH | MM |
|---|---|---|
| A | 0.0433±0.004 | 1.10±0.10 |
| A1 | 0.0045±0.0026 | 0.115±0.065 |
| A2 | 0.039±0.002 | 1.00±0.05 |
| b | 0.009±0.002 | 0.22±0.05 |
| b1 | 0.008±0.001 | 0.20±0.03 |
| c | 0.004 ~ 0.008 | 0.10 ~ 0.21 |
| c1 | 0.004 ~ 0.006 | 0.10 ~ 0.16 |
| D | 0.465±0.004 | 11.80±0.10 |
| E | 0.315±0.004 | 8.00±0.10 |
| e | 0.022±0.004 | 0.55±0.10 |
| HD | 0.528±0.008 | 13.40±0.20 |
| L | 0.0197 $^{+0.008}_{-0.004}$ | 0.50 $^{+0.20}_{-0.10}$ |
| L1 | 0.0315±0.004 | 0.80±0.10 |
| y | 0.004 Max. | 0.1 Max. |
| θ | 0°~ 8° | 0°~ 8° |

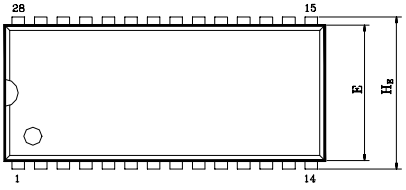
*TSOP - 28*

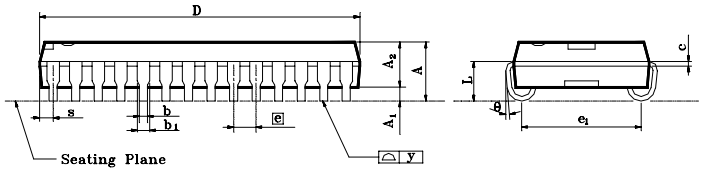



| UNIT / SYMBOL | INCH(BASE) | MM(REF) |
|---|---|---|
| A1 | 0.010(MIN) | 0.254(MIN) |
| A2 | 0.150±0.005 | 3.810±0.127 |
| B | 0.018±0.005 | 0.457±0.127 |
| B1 | 0.060±0.010 | 1.524±0.254 |
| c | 0.010±0.004 | 0.254±0.102 |
| D | 1.460±0.005 | 37.084±0.127 |
| E | 0.600±0.010 | 15.240±0.254 |
| E1 | 0.544±0.004 | 13.818±0.102 |
| e | 0.100(TYP) | 2.540(TYP) |
| eB | 0.640±0.020 | 16.256±0.508 |
| L | 0.130±0.010 | 3.302±0.254 |
| S | 0.080±0.010 | 2.032±0.254 |
| Q1 | 0.070±0.005 | 1.778±0.127 |
| θ | 6°±3° | 6°±3° |

*PDIP - 28*

## ■ PACKAGE DIMENSIONS (continued)




| Symbol | Dimension in inch | | | Dimension in mm | | |
|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max |
| A | — | — | 0.140 | — | — | 3.56 |
| $A_1$ | 0.027 | — | — | 0.69 | — | — |
| $A_2$ | 0.095 | 0.100 | 0.105 | 2.41 | 2.54 | 2.67 |
| $b_1$ | 0.026 | 0.028 | 0.032 | 0.66 | 0.71 | 0.81 |
| b | 0.016 | 0.018 | 0.022 | 0.41 | 0.46 | 0.56 |
| c | 0.008 | 0.010 | 0.014 | 0.20 | 0.25 | 0.36 |
| D | — | 0.710 | 0.730 | — | 18.03 | 18.54 |
| E | 0.295 | 0.300 | 0.305 | 7.49 | 7.62 | 7.75 |
| e | 0.044 | 0.050 | 0.056 | 1.12 | 1.27 | 1.42 |
| $e_1$ | 0.245 | 0.265 | 0.285 | 6.22 | 6.73 | 7.24 |
| $H_E$ | 0.327 | 0.337 | 0.347 | 8.31 | 8.56 | 8.81 |
| L | 0.077 | 0.087 | 0.097 | 1.96 | 2.21 | 2.46 |
| S | — | — | 0.045 | — | — | 1.14 |
| y | — | — | 0.004 | — | — | 0.10 |
| θ | 0° | — | 10° | 0° | — | 10° |

Note:
1. Dimension D Max & s include mold flash or tie bar burrs.
2. Dimension b does not include dambar protrusion/intrusion
3. Dimension D & E include mold mismatch and are determined at the mold parting line.
4. Controlling dimension: Inch
5. General appearance spec. should be based on final visual inspection spec.

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