

FEATURES

- 25, 45 ns Read Access & R/W Cycle Times
- Unlimited Read/Write Endurance
- Automatic Non-Volatile *STORE* on Power Loss
- Non-Volatile *STORE* Under Hardware Control
- Automatic *RECALL* to SRAM on Power Up
- Unlimited *RECALL* Cycles
- 1 Million *STORE* Cycles
- 100-Year Non-volatile Data Retention
- Single 5V \pm 10% Operation
- Commercial, Industrial, and Military Temperatures
- 28-Pin 300 mil SOIC or 330 mil SOIC (RoHS-Compliant)

DESCRIPTION

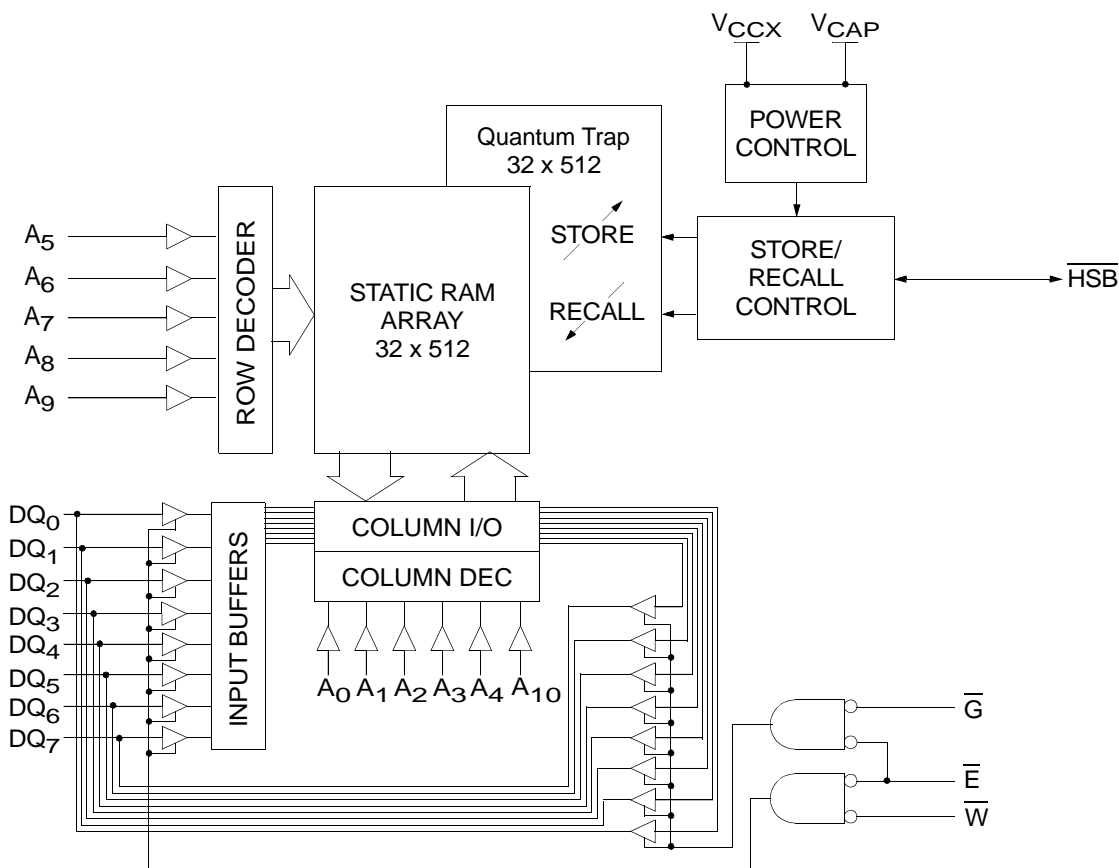
The Simtek STK22C48 is a 16Kb fast static RAM with a nonvolatile Quantum Trap storage element included with each memory cell.

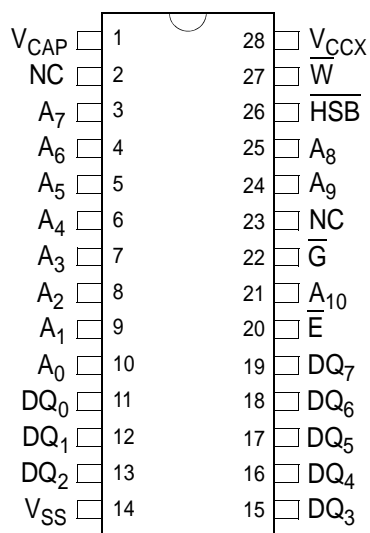
The SRAM provides the fast access & cycle times, ease of use, and unlimited read & write endurance of a normal SRAM.

Data transfers automatically to the non-volatile storage cells when power loss is detected (the *STORE* operation). On power-up, data is automatically restored to the SRAM (the *RECALL* operation). Both *STORE* and *RECALL* operations are also available under software control.

The Simtek nvSRAM is the first monolithic non-volatile memory to offer unlimited writes and reads. It is the highest-performance, most reliable non-volatile memory available.

BLOCK DIAGRAM



PIN CONFIGURATIONS**28-pin 300 mil SOIC****28-pin 330 mil SOIC****PIN NAMES**

| Pin Name | I/O | Description |
|----------------------------------|--------------|--|
| A ₁₀ -A ₀ | Input | Address: The 11 address inputs select one of 2,048 bytes in the nvSRAM array |
| DQ ₇ -DQ ₀ | I/O | Data: Bi-directional 8-bit data bus for accessing the nvSRAM |
| \overline{E} | Input | Chip Enable: The active low \overline{E} input selects the device |
| \overline{W} | Input | Write Enable: The active low \overline{W} enables data on the DQ pins to be written to the address location latched by the falling edge of \overline{E} |
| \overline{G} | Input | Output Enable: The active low \overline{G} input enables the data output buffers during read cycles. De-asserting \overline{G} high caused the DQ pins to tri-state. |
| V _{CC} | Power Supply | Power: 5.0V, ±10% |
| V _{SS} | Power Supply | Ground |

ABSOLUTE MAXIMUM RATINGS^a

Voltage on Input Relative to Ground -0.5V to 7.0V
 Voltage on Input Relative to V_{SS} -0.6V to ($V_{CC} + 0.5V$)
 Voltage on DQ₀₋₇ or HSB -0.5V to ($V_{CC} + 0.5V$)
 Temperature under Bias -55°C to 125°C
 Storage Temperature -65°C to 150°C
 Power Dissipation 1W
 DC Output Current (1 output at a time, 1s duration) 15mA

Note a: 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 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.

DC CHARACTERISTICS

($V_{CC} = 5.0V \pm 10\%$)^e

| SYMBOL | PARAMETER | COMMERCIAL | | INDUSTRIAL | | UNITS | NOTES |
|-------------|---|---------------|---------------|---------------|---------------|----------|---|
| | | MIN | MAX | MIN | MAX | | |
| I_{CC1}^b | Average V_{CC} Current | | 85 65 | | 90 65 | mA mA | $t_{AVAV} = 25ns$ $t_{AVAV} = 45ns$ |
| I_{CC2}^c | Average V_{CC} Current during <i>STORE</i> | | 3 | | 3 | mA | All Inputs Don't Care, $V_{CC} = \max$ |
| I_{CC3}^b | Average V_{CC} Current at $t_{AVAV} = 200ns$ 5V, 25°C, Typical | | 10 | | 10 | mA | $\overline{W} \geq (V_{CC} - 0.2V)$ All Others Cycling, CMOS Levels |
| I_{CC4}^c | Average V_{CAP} Current during AutoStore Cycle | | 2 | | 2 | mA | All Inputs Don't Care |
| I_{SB1}^d | Average V_{CC} Current (Standby, Cycling TTL Input Levels) | | 25 18 | | 26 19 | mA mA | $t_{AVAV} = 25ns, \overline{E} \geq V_{IH}$ $t_{AVAV} = 45ns, \overline{E} \geq V_{IH}$ |
| I_{SB2}^d | V_{CC} Standby Current (Standby, Stable CMOS Input Levels) | | 1.5 | | 1.5 | mA | $\overline{E} \geq (V_{CC} - 0.2V)$ All Others $V_{IN} \leq 0.2V$ or $\geq (V_{CC} - 0.2V)$ |
| I_{ILK} | Input Leakage Current | | ± 1 | | ± 1 | μA | $V_{CC} = \max$ $V_{IN} = V_{SS}$ to V_{CC} |
| I_{OLK} | Off-State Output Leakage Current | | ± 5 | | ± 5 | μA | $V_{CC} = \max$ $V_{IN} = V_{SS}$ to V_{CC} , \overline{E} or $\overline{G} \geq V_{IH}$ |
| V_{IH} | Input Logic "1" Voltage | 2.2 | $V_{CC} + .5$ | 2.2 | $V_{CC} + .5$ | V | All Inputs |
| V_{IL} | Input Logic "0" Voltage | $V_{SS} - .5$ | 0.8 | $V_{SS} - .5$ | 0.8 | V | All Inputs |
| V_{OH} | Output Logic "1" Voltage | 2.4 | | 2.4 | | V | $I_{OUT} = -4mA$ except \overline{HSB} |
| V_{OL} | Output Logic "0" Voltage | | 0.4 | | 0.4 | V | $I_{OUT} = 8mA$ except \overline{HSB} |
| V_{BL} | Logic "0" Voltage on \overline{HSB} Output | | 0.4 | | 0.4 | V | $I_{OUT} = 3mA$ |
| T_A | Operating Temperature | 0 | 70 | -40 | 85 | °C | |

Note b: I_{CC1} and I_{CC3} are dependent on output loading and cycle rate. The specified values are obtained with outputs unloaded.

Note c: I_{CC2} and I_{CC4} are the average currents required for the duration of the respective *STORE* cycles (t_{STORE}).

Note d: $\overline{E} \geq V_{IH}$ will not produce standby current levels until any nonvolatile cycle in progress has timed out.

Note e: V_{CC} reference levels throughout this datasheet refer to V_{CCX} if that is where the power supply connection is made, or V_{CAP} if V_{CCX} is connected to ground.

AC TEST CONDITIONS

Input Pulse Levels 0V to 3V
 Input Rise and Fall Times $\leq 5ns$
 Input and Output Timing Reference Levels 1.5V
 Output Load See Figure 1

CAPACITANCE^f ($T_A = 25^\circ C$, $f = 1.0MHz$)

| SYMBOL | PARAMETER | MAX | UNITS | CONDITIONS |
|-----------|--------------------|-----|-------|----------------------|
| C_{IN} | Input Capacitance | 8 | pF | $\Delta V = 0$ to 3V |
| C_{OUT} | Output Capacitance | 7 | pF | $\Delta V = 0$ to 3V |

Note f: These parameters are guaranteed but not tested.

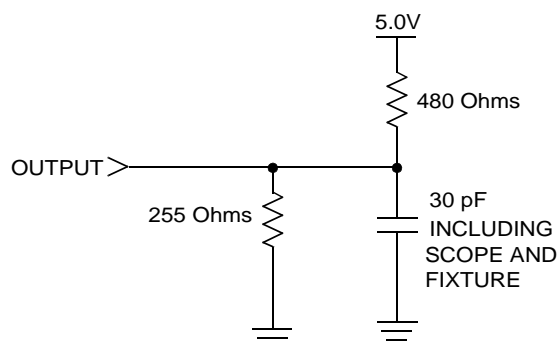


Figure 1: AC Output Loading

SRAM READ CYCLES #1 & #2

(V_{CC} = 5.0V ± 10%)^e

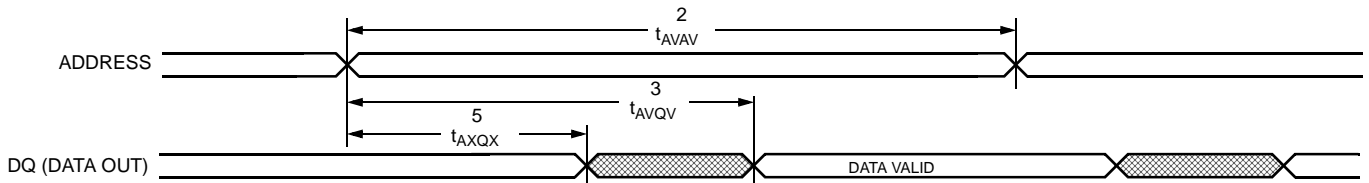
| NO. | SYMBOLS | | PARAMETER | STK22C48-25 | | STK22C48-45 | | UNITS |
|-----|----------------------------------|------------------|-----------------------------------|-------------|-----|-------------|-----|-------|
| | #1, #2 | Alt. | | MIN | MAX | MIN | MAX | |
| 1 | t _{ELQV} | t _{ACS} | Chip Enable Access Time | | 25 | | 45 | ns |
| 2 | t _{AVAV} ^g | t _{RC} | Read Cycle Time | 25 | | 45 | | ns |
| 3 | t _{AVQV} ^h | t _{AA} | Address Access Time | | 25 | | 45 | ns |
| 4 | t _{GLQV} | t _{OE} | Output Enable to Data Valid | | 10 | | 20 | ns |
| 5 | t _{AXQX} ^h | t _{OH} | Output Hold after Address Change | 5 | | 5 | | ns |
| 6 | t _{ELQX} | t _{LZ} | Chip Enable to Output Active | 5 | | 5 | | ns |
| 7 | t _{EHQZ} ⁱ | t _{HZ} | Chip Disable to Output Inactive | | 10 | | 15 | ns |
| 8 | t _{GLQX} | t _{OLZ} | Output Enable to Output Active | 0 | | 0 | | ns |
| 9 | t _{GHQZ} ⁱ | t _{OHZ} | Output Disable to Output Inactive | | 10 | | 15 | ns |
| 10 | t _{ELICCH} ^f | t _{PA} | Chip Enable to Power Active | 0 | | 0 | | ns |
| 11 | t _{EHICCL} ^f | t _{PS} | Chip Disable to Power Standby | | 25 | | 45 | ns |

Note g: \overline{W} and \overline{HSB} must be high during SRAM READ cycles.

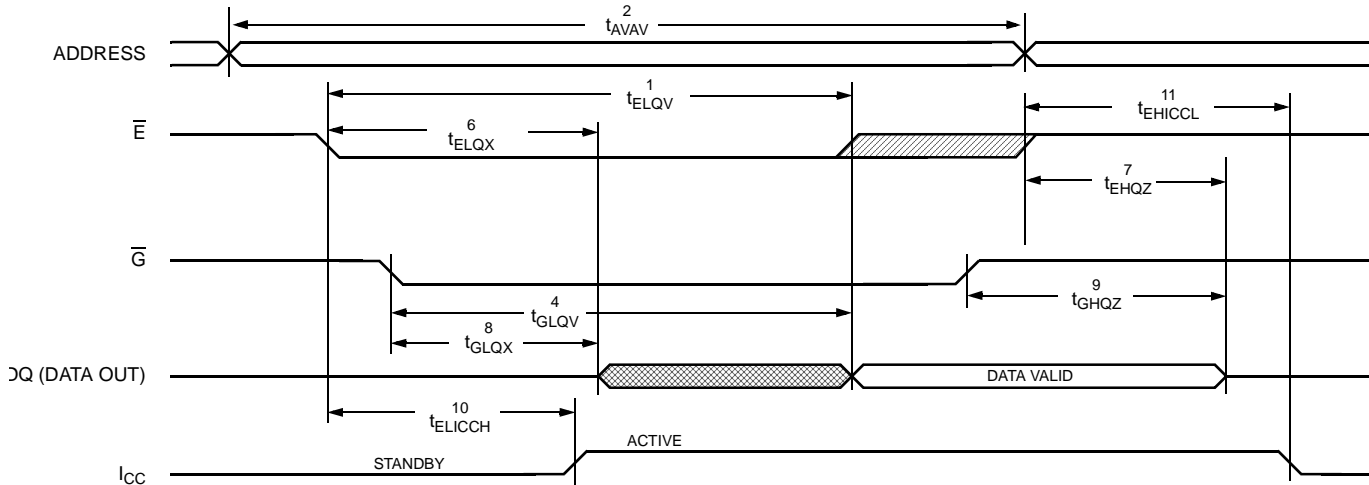
Note h: Device is continuously selected with \overline{E} and \overline{G} both low.

Note i: Measured ± 200mV from steady state output voltage.

SRAM READ CYCLE #1: Address Controlled^{g, h}



SRAM READ CYCLE #2: \overline{E} Controlled^g



SRAM WRITE CYCLES #1 & #2

(V_{CC} = 5.0V ± 10%)^e

| NO. | SYMBOLS | | | PARAMETER | STK22C48-25 | | STK22C48-45 | | UNITS |
|-----|-------------------|-------------------|-----------------|-------------------|-------------|-----|-------------|-----|-------|
| | #1 | #2 | Alt. | | MIN | MAX | MIN | MAX | |
| 12 | t _{AVAV} | t _{AVAV} | t _{WC} | Write Cycle Time | 25 | | 45 | | ns |
| 13 | t _{WLWH} | t _{WLEH} | t _{WP} | Write Pulse Width | 20 | | 30 | | ns |

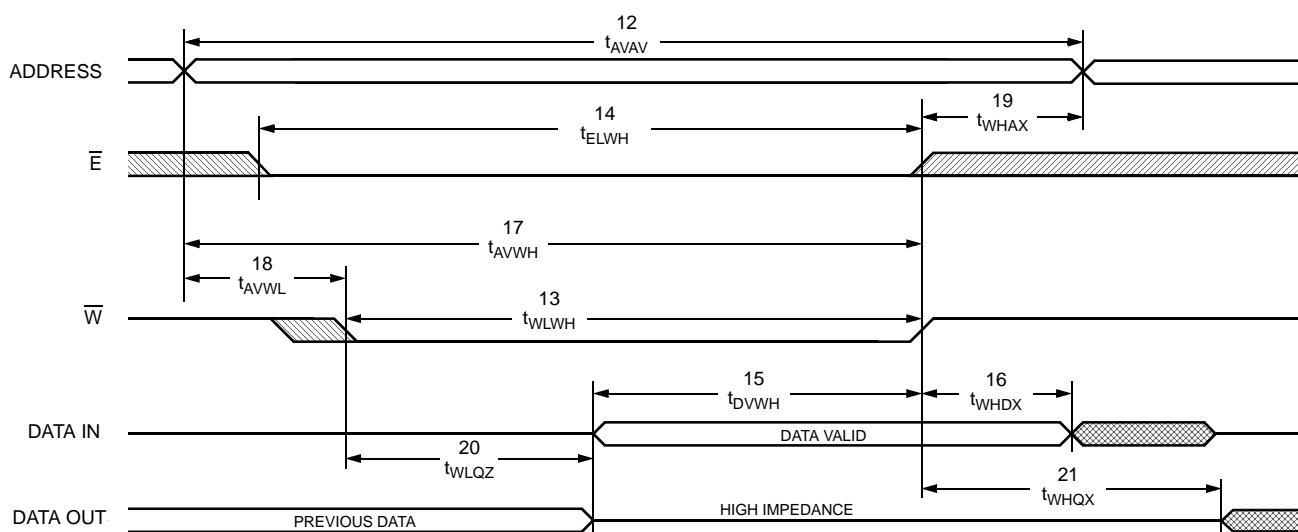
| NO. | SYMBOLS | | | PARAMETER | STK22C48-25 | | STK22C48-45 | | UNITS |
|-----|------------------|------------|----------|----------------------------------|-------------|-----|-------------|-----|-------|
| | #1 | #2 | Alt. | | MIN | MAX | MIN | MAX | |
| 14 | t_{ELWH} | t_{ELEH} | t_{CW} | Chip Enable to End of Write | 20 | | 30 | | ns |
| 15 | t_{DVWH} | t_{DVEH} | t_{DW} | Data Set-up to End of Write | 10 | | 15 | | ns |
| 16 | t_{WHDX} | t_{EHDX} | t_{DH} | Data Hold after End of Write | 0 | | 0 | | ns |
| 17 | t_{AVWH} | t_{AVEH} | t_{AW} | Address Set-up to End of Write | 20 | | 30 | | ns |
| 18 | t_{AVWL} | t_{AVEL} | t_{AS} | Address Set-up to Start of Write | 0 | | 0 | | ns |
| 19 | t_{WHAX} | t_{EHAX} | t_{WR} | Address Hold after End of Write | 0 | | 0 | | ns |
| 20 | $t_{WLQZ}^{i,j}$ | | t_{WZ} | Write Enable to Output Disable | | 10 | | 15 | ns |
| 21 | t_{WHQX} | | t_{OW} | Output Active after End of Write | 5 | | 5 | | ns |

Note j: If \overline{W} is low when \overline{E} goes low, the outputs remain in the high-impedance state.

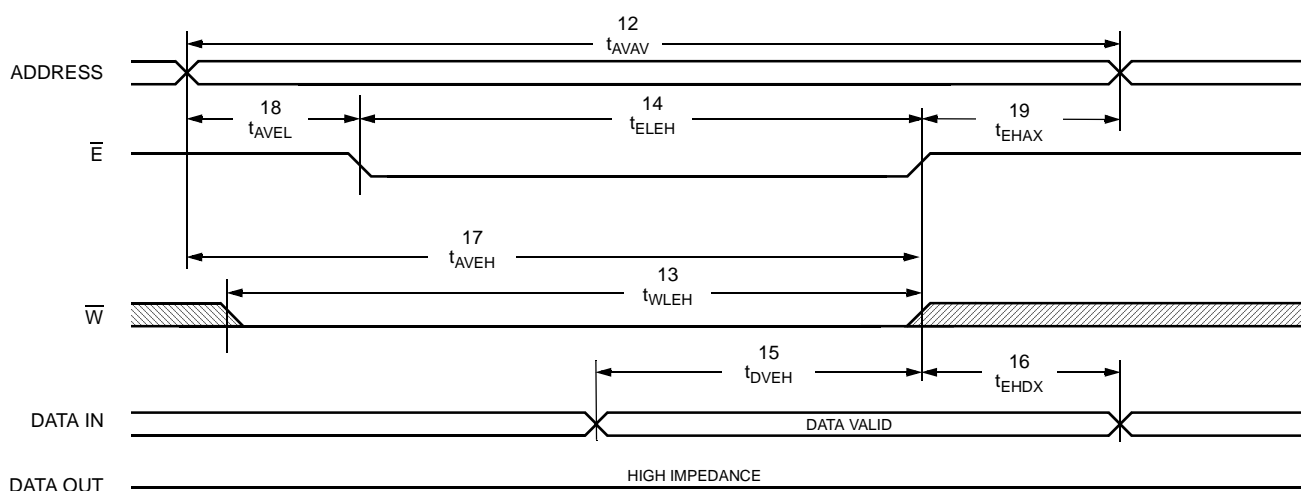
Note k: \overline{E} or \overline{W} must be $\geq V_{IH}$ during address transitions.

Note l: HSB must be high during SRAM WRITE cycles.

SRAM WRITE CYCLE #1: \overline{W} Controlled^{k, l}



SRAM WRITE CYCLE #2: \overline{E} Controlled^{k, l}



HARDWARE MODE SELECTION

| \overline{E} | \overline{W} | \overline{HSB} | A ₁₂ - A ₀ (hex) | MODE | I/O | POWER | NOTES |
|----------------|----------------|------------------|--|-------------------|---------------|------------------|-------|
| H | X | H | X | Not Selected | Output High Z | Standby | |
| L | H | H | X | Read SRAM | Output Data | Active | n |
| L | L | H | X | Write SRAM | Input Data | Active | |
| X | X | L | X | Nonvolatile STORE | Output High Z | I _{CC2} | m |

Note m: \overline{HSB} STORE operation occurs only if an SRAM write has been done since the last nonvolatile cycle. After the STORE (if any) completes, the part will go into standby mode, inhibiting all operations until \overline{HSB} rises.

Note n: I/O state assumes $\overline{G} \leq V_{IL}$. Activation of nonvolatile cycles does not depend on state of \overline{G} .

HARDWARE STORE CYCLE

(V_{CC} = 5.0V ± 10%)^e

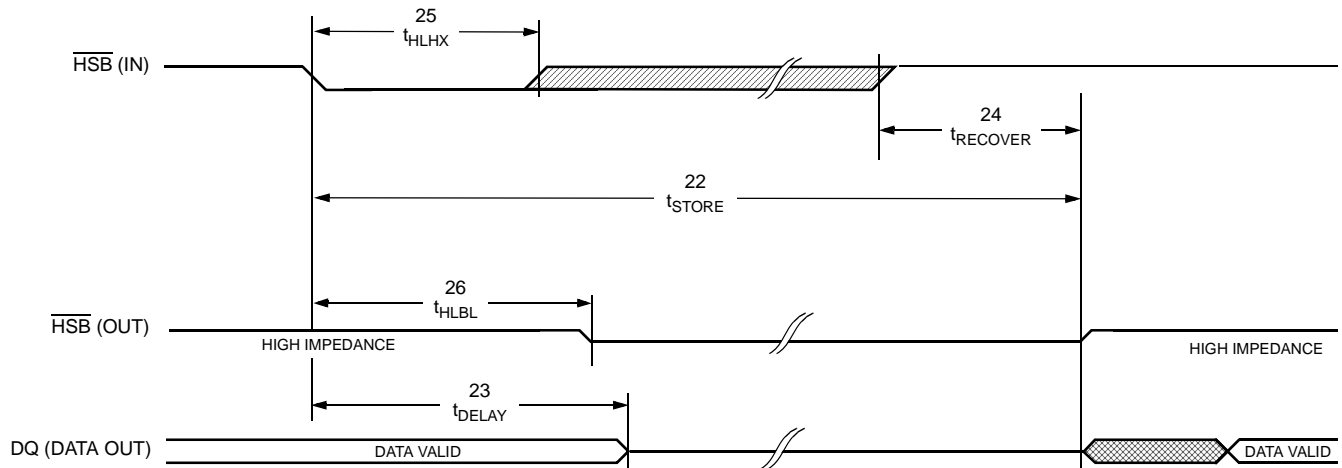
| NO. | SYMBOLS | | PARAMETER | STK22C48 | | UNITS | NOTES |
|-----|----------------------|-------------------|-------------------------------------|----------|-----|-------|-------|
| | Standard | Alternate | | MIN | MAX | | |
| 22 | t _{STORE} | t _{HLHZ} | STORE Cycle Duration | | 10 | ms | i, o |
| 23 | t _{DELAY} | t _{HLQZ} | Time Allowed to Complete SRAM Cycle | 1 | | μs | i, p |
| 24 | t _{RECOVER} | t _{HHQX} | Hardware STORE High to Inhibit Off | | 700 | ns | o, q |
| 25 | t _{HLHX} | | Hardware STORE Pulse Width | 15 | | ns | |
| 26 | t _{HLBL} | | Hardware STORE Low to Store Busy | | 300 | ns | |

Note o: \overline{E} and \overline{G} low for output behavior.

Note p: \overline{E} and \overline{G} low and \overline{W} high for output behavior.

Note q: t_{RECOVER} is only applicable after t_{STORE} is complete.

HARDWARE STORE CYCLE

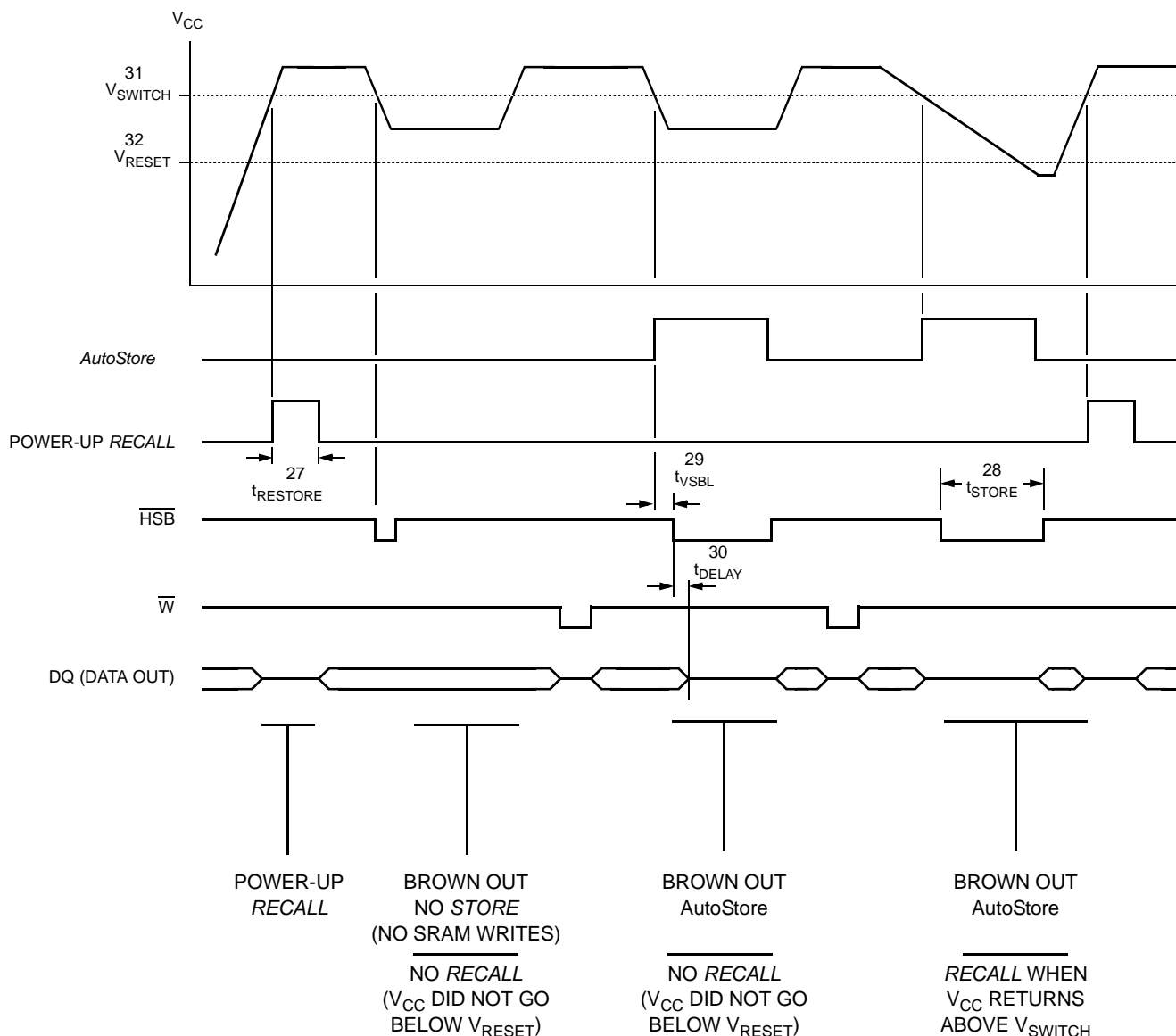


AutoStore / POWER-UP RECALL
 $(V_{CC} = 5.0V \pm 10\%)^e$

| NO. | SYMBOLS | | PARAMETER | STK22C48 | | UNITS | NOTES |
|-----|----------------------|-------------------|--|----------|-----|---------------|-------|
| | Standard | Alternate | | MIN | MAX | | |
| 27 | t_{RESTORE} | | Power-up <i>RECALL</i> Duration | | 550 | μs | r |
| 28 | t_{STORE} | t_{HLHZ} | <i>STORE</i> Cycle Duration | | 10 | ms | p, s |
| 29 | t_{VSBL} | | Low Voltage Trigger (V_{SWITCH}) to $\overline{\text{HSB}}$ Low | | 300 | ns | l |
| 30 | t_{DELAY} | t_{BLQZ} | Time Allowed to Complete SRAM Cycle | 1 | | μs | o |
| 31 | V_{SWITCH} | | Low Voltage Trigger Level | 4.0 | 4.5 | V | |
| 32 | V_{RESET} | | Low Voltage Reset Level | | 3.6 | V | |

Note r: t_{RESTORE} starts from the time V_{CC} rises above V_{SWITCH} .

Note s: $\overline{\text{HSB}}$ is asserted low for $1\mu\text{s}$ when V_{CAP} drops through V_{SWITCH} . If an SRAM write has not taken place since the last nonvolatile cycle, $\overline{\text{HSB}}$ will be released and no *STORE* will take place.

AutoStore / POWER-UP RECALL


nvSRAM OPERATION

The STK22C48 has two separate modes of operation: SRAM mode and nonvolatile mode. In SRAM mode, the memory operates as a standard fast static RAM. In nonvolatile mode, data is transferred from SRAM to Nonvolatile Elements (the *STORE* operation) or from Nonvolatile Elements to SRAM (the *RECALL* operation). In this mode SRAM functions are disabled.

NOISE CONSIDERATIONS

The STK22C48 is a high-speed memory and so must have a high-frequency bypass capacitor of approximately 0.1 μ F connected between V_{CAP} and V_{SS} , using leads and traces that are as short as possible. As with all high-speed CMOS ICs, normal careful routing of power, ground and signals will help prevent noise problems.

SRAM READ

The STK22C48 performs a *READ* cycle whenever \overline{E} and \overline{G} are low and \overline{W} and \overline{HSB} are high. The address specified on pins A_{0-10} determines which of the 2,048 data bytes will be accessed. When the *READ* is initiated by an address transition, the outputs will be valid after a delay of t_{AVQV} (*READ* cycle #1). If the *READ* is initiated by \overline{E} or \overline{G} , the outputs will be valid at t_{ELQV} or at t_{GLQV} , whichever is later (*READ* cycle #2). The data outputs will repeatedly respond to address changes within the t_{AVQV} access time without the need for transitions on any control input pins, and will remain valid until another address change or until \overline{E} or \overline{G} is brought high, or \overline{W} or \overline{HSB} is brought low.

SRAM WRITE

A *WRITE* cycle is performed whenever \overline{E} and \overline{W} are low and \overline{HSB} is high. The address inputs must be stable prior to entering the *WRITE* cycle and must remain stable until either \overline{E} or \overline{W} goes high at the end of the cycle. The data on the common I/O pins DQ_{0-7} will be written into the memory if it is valid t_{DVWH} before the end of a \overline{W} controlled *WRITE* or t_{DVEH} before the end of an \overline{E} controlled *WRITE*.

It is recommended that \overline{G} be kept high during the entire *WRITE* cycle to avoid data bus contention on common I/O lines. If \overline{G} is left low, internal circuitry will turn off the output buffers t_{WLQZ} after \overline{W} goes low.

POWER-UP RECALL

During power up, or after any low-power condition ($V_{CAP} < V_{RESET}$), an internal *RECALL* request will be latched. When V_{CAP} once again exceeds the sense voltage of V_{SWITCH} , a *RECALL* cycle will automatically be initiated and will take $t_{RESTORE}$ to complete.

If the STK22C48 is in a *WRITE* state at the end of power-up *RECALL*, the SRAM data will be corrupted. To help avoid this situation, a 10K Ω resistor should be connected either between \overline{W} and system V_{CC} or between \overline{E} and system V_{CC} .

AutoStore OPERATION

The STK22C48 can be powered in one of three modes.

During normal AutoStore operation, the STK22C48 will draw current from V_{CCX} to charge a capacitor connected to the V_{CAP} pin. This stored charge will be used by the chip to perform a single *STORE* operation. After power up, when the voltage on the V_{CAP} pin drops below V_{SWITCH} , the part will automatically disconnect the V_{CAP} pin from V_{CCX} and initiate a *STORE* operation.

Figure 2 shows the proper connection of capacitors for automatic store operation. A charge storage capacitor having a capacity of between 68 μ F and 220 μ F ($\pm 20\%$) rated at 6V should be provided.

In system power mode (Figure 3), both V_{CCX} and V_{CAP} are connected to the + 5V power supply without the 68 μ F capacitor. In this mode the AutoStore function of the STK22C48 will operate on the stored system charge as power goes down. The user must, however, guarantee that V_{CCX} does not drop below 3.6V during the 10ms *STORE* cycle.

If an automatic *STORE* on power loss is not required, then V_{CCX} can be tied to ground and + 5V applied to V_{CAP} (Figure 4). This is the AutoStore Inhibit mode, in which the AutoStore function is disabled. If the STK22C48 is operated in this configuration, references to V_{CCX} should be changed to V_{CAP} throughout this data sheet. In this mode, *STORE* operations may be triggered with the \overline{HSB} pin. It is not permissible to change between these three options "on the fly."

In order to prevent unneeded *STORE* operations, automatic *STOREs* as well as those initiated by externally driving \overline{HSB} low will be ignored unless at

least one WRITE operation has taken place since the most recent *STORE* or *RECALL* cycle.

If the power supply drops faster than 20 $\mu\text{s}/\text{volt}$ before V_{CCX} reaches V_{SWITCH} , then a 2.2 ohm resistor should be inserted between V_{CCX} and the system supply to avoid momentary excess of current between V_{CCX} and V_{CAP} .

HSB OPERATION

The STK22C48 provides the $\overline{\text{HSB}}$ pin for controlling and acknowledging the *STORE* operations. The $\overline{\text{HSB}}$ pin is used to request a hardware *STORE* cycle. When the $\overline{\text{HSB}}$ pin is driven low, the STK22C48 will conditionally initiate a *STORE* operation after t_{DELAY} ; an actual *STORE* cycle will only begin if a WRITE to the SRAM took place since the last *STORE* or *RECALL* cycle. The $\overline{\text{HSB}}$ pin acts as an open drain driver that is internally driven low to indicate a busy condition while the *STORE* (initiated by any means) is in progress. Pull up this pin with an external 10K ohm resistor to V_{CAP} if $\overline{\text{HSB}}$ is used as a driver.

SRAM READ and WRITE operations that are in progress when $\overline{\text{HSB}}$ is driven low by any means are given time to complete before the *STORE* operation is initiated. After $\overline{\text{HSB}}$ goes low, the STK22C48 will continue SRAM operations for t_{DELAY} . During t_{DELAY} , multiple SRAM READ operations may take place. If a WRITE is in progress when $\overline{\text{HSB}}$ is pulled low it will be allowed a time, t_{DELAY} , to complete. However, any SRAM WRITE cycles requested after $\overline{\text{HSB}}$ goes low will be inhibited until $\overline{\text{HSB}}$ returns high.

The $\overline{\text{HSB}}$ pin can be used to synchronize multiple STK22C48s while using a single larger capacitor. To

operate in this mode the $\overline{\text{HSB}}$ pin should be connected together to the $\overline{\text{HSB}}$ pins from the other STK22C48s. An external pull-up resistor to + 5V is required since $\overline{\text{HSB}}$ acts as an open drain pull down. The V_{CAP} pins from the other STK22C48 parts can be tied together and share a single capacitor. The capacitor size must be scaled by the number of devices connected to it. When any one of the STK22C48s detects a power loss and asserts $\overline{\text{HSB}}$, the common $\overline{\text{HSB}}$ pin will cause all parts to request a *STORE* cycle (a *STORE* will take place in those STK22C48s that have been written since the last nonvolatile cycle).

During any *STORE* operation, regardless of how it was initiated, the STK22C48 will continue to drive the $\overline{\text{HSB}}$ pin low, releasing it only when the *STORE* is complete. Upon completion of the *STORE* operation the STK22C48 will remain disabled until the $\overline{\text{HSB}}$ pin returns high.

If $\overline{\text{HSB}}$ is not used, it should be left unconnected.

PREVENTING STORES

The *STORE* function can be disabled on the fly by holding $\overline{\text{HSB}}$ high with a driver capable of sourcing 30mA at a V_{OH} of at least 2.2V, as it will have to overpower the internal pull-down device that drives $\overline{\text{HSB}}$ low for 20 μs at the onset of a *STORE*. When the STK22C48 is connected for AutoStore operation (system V_{CC} connected to V_{CCX} and a 68 μF capacitor on V_{CAP}) and V_{CC} crosses V_{SWITCH} on the way down, the STK22C48 will attempt to pull $\overline{\text{HSB}}$ low; if $\overline{\text{HSB}}$ doesn't actually get below V_{IL} , the part will stop trying to pull $\overline{\text{HSB}}$ low and abort the *STORE* attempt.

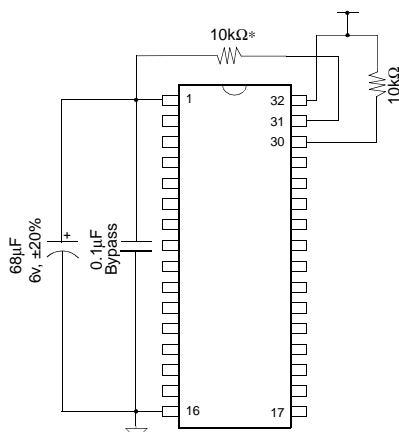


Figure 2: AutoStore Mode

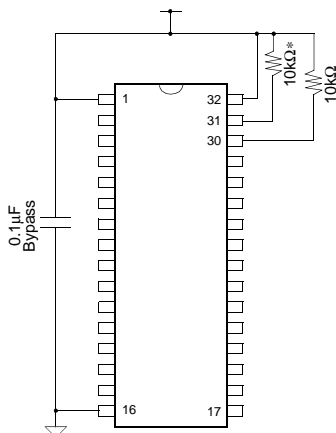


Figure 3: System Power Mode

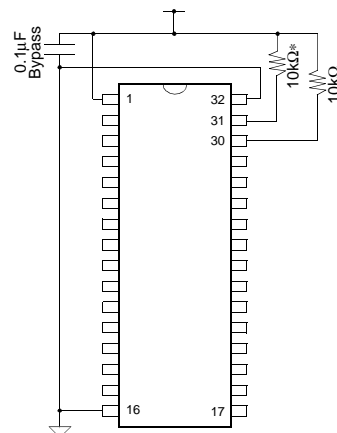


Figure 4: AutoStore Inhibit Mode

*If $\overline{\text{HSB}}$ is not used, it should be left unconnected.

HARDWARE PROTECT

The STK22C48 offers hardware protection against inadvertent *STORE* operation and SRAM WRITES during low-voltage conditions. When $V_{CAP} < V_{SWITCH}$, all externally initiated *STORE* operations and SRAM WRITES are inhibited.

AutoStore can be completely disabled by tying V_{CCX} to ground and applying + 5V to V_{CAP} . This is the AutoStore Inhibit mode; in this mode *STOREs* are only initiated by explicit request using the HSB pin.

LOW AVERAGE ACTIVE POWER

The STK22C48 draws significantly less current when it is cycled at times longer than 50ns. Figure 5

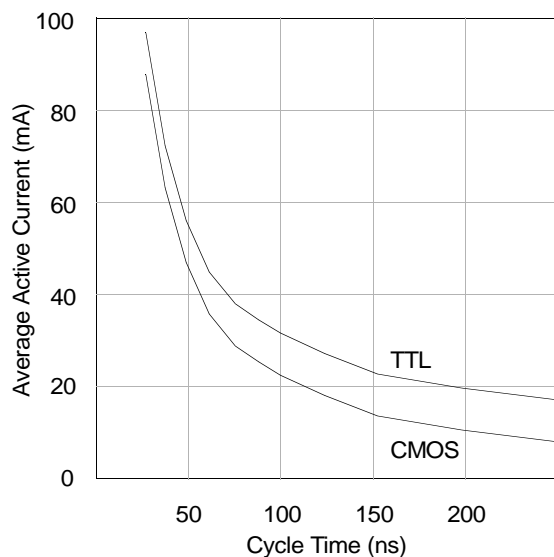


Figure 5: I_{cc} (max) Reads

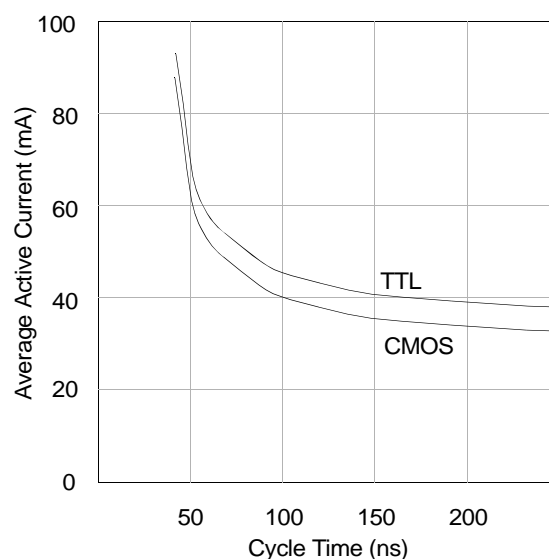


Figure 6: I_{cc} (max) Writes

shows the relationship between I_{CC} and READ cycle time. Worst-case current consumption is shown for both CMOS and TTL input levels (commercial temperature range, $V_{CC} = 5.5V$, 100% duty cycle on chip enable). Figure 6 shows the same relationship for WRITE cycles. If the chip enable duty cycle is less than 100%, only standby current is drawn when the chip is disabled. The overall average current drawn by the STK22C48 depends on the following items: 1) CMOS vs. TTL input levels; 2) the duty cycle of chip enable; 3) the overall cycle rate for accesses; 4) the ratio of READs to WRITEs; 5) the operating temperature; 6) the V_{CC} level; and 7) I/O loading.

ORDERING INFORMATION**STK22C48 - N F 45 I TR****Packing Option**

Blank = Tube

TR = Tape and Reel

Temperature Range

Blank = Commercial (0 to 70°C)

I = Industrial (-40 to 85°C)

Access Time

25 = 25ns

45 = 45ns

Lead Finish

F = 100% Sn (Matte Tin)

Package

N = Plastic 28-pin 300 mil SOIC

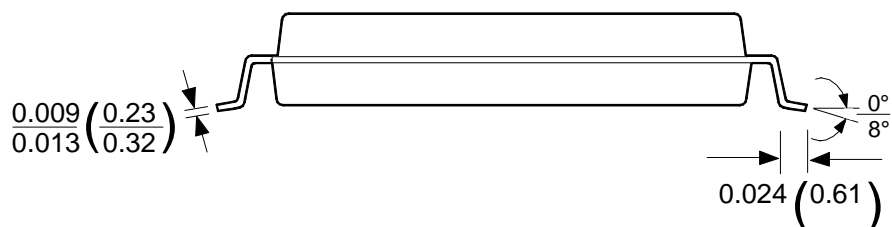
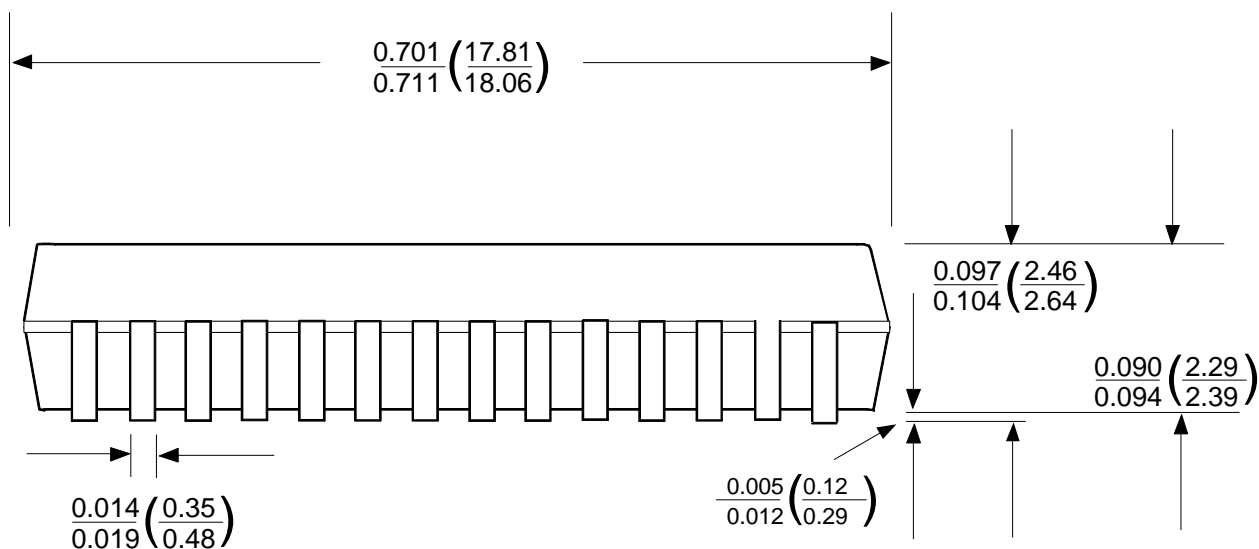
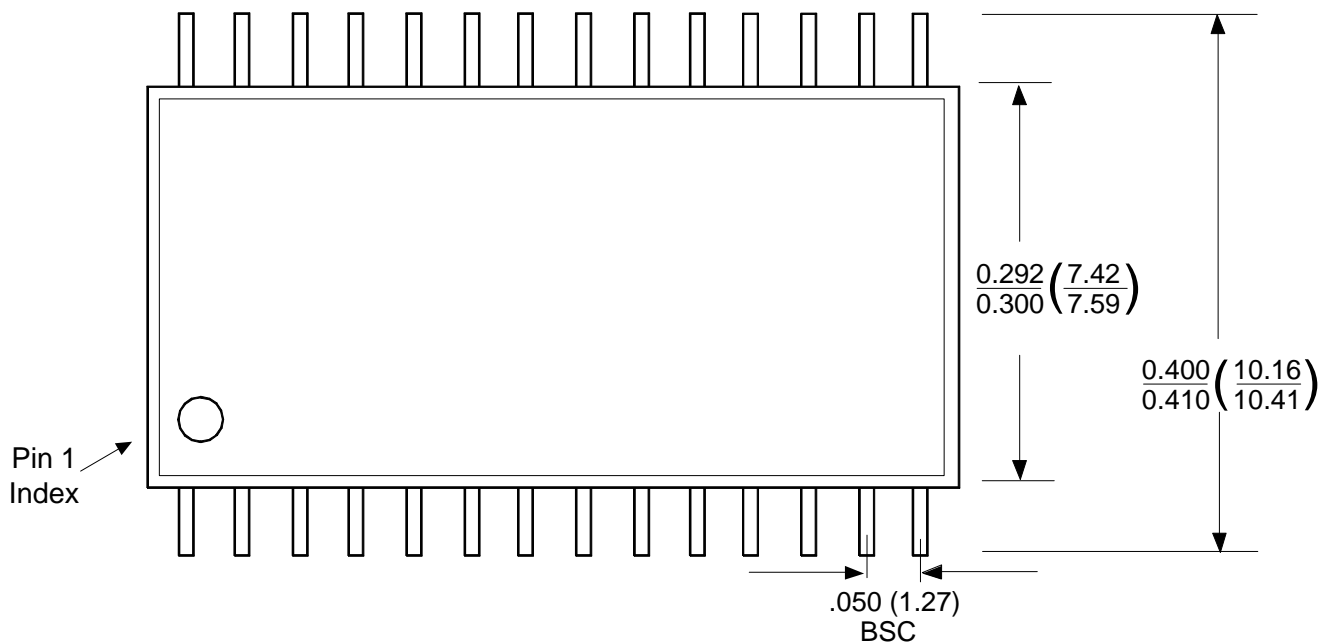
S = Plastic 28-pin 330 mil SIOC

Ordering Information

| Item Number | Item Name | Temperature |
|------------------|-------------------------------------|-------------|
| STK22C48-NF25 | 5V 2Kx 8 AutoStore nvSRAM SOP28-300 | Commercial |
| STK22C48-NF45 | 5V 2Kx 8 AutoStore nvSRAM SOP28-300 | Commercial |
| STK22C48-SF25 | 5V 2Kx 8 AutoStore nvSRAM SOP28-330 | Commercial |
| STK22C48-SF45 | 5V 2Kx 8 AutoStore nvSRAM SOP28-330 | Commercial |
| STK22C48-NF25TR | 5V 2Kx 8 AutoStore nvSRAM SOP28-300 | Commercial |
| STK22C48-NF45TR | 5V 2Kx 8 AutoStore nvSRAM SOP28-300 | Commercial |
| STK22C48-SF25TR | 5V 2Kx 8 AutoStore nvSRAM SOP28-330 | Commercial |
| STK22C48-SF45TR | 5V 2Kx 8 AutoStore nvSRAM SOP28-330 | Commercial |
| STK22C48-NF25I | 5V 2Kx 8 AutoStore nvSRAM SOP28-300 | Industrial |
| STK22C48-NF45I | 5V 2Kx 8 AutoStore nvSRAM SOP28-300 | Industrial |
| STK22C48-SF25I | 5V 2Kx 8 AutoStore nvSRAM SOP28-330 | Industrial |
| STK22C48-SF45I | 5V 2Kx 8 AutoStore nvSRAM SOP28-330 | Industrial |
| STK22C48-NF25ITR | 5V 2Kx 8 AutoStore nvSRAM SOP28-300 | Industrial |
| STK22C48-NF45ITR | 5V 2Kx 8 AutoStore nvSRAM SOP28-300 | Industrial |
| STK22C48-SF25ITR | 5V 2Kx 8 AutoStore nvSRAM SOP28-330 | Industrial |
| STK22C48-SF45ITR | 5V 2Kx 8 AutoStore nvSRAM SOP28-330 | Industrial |

Package Diagrams

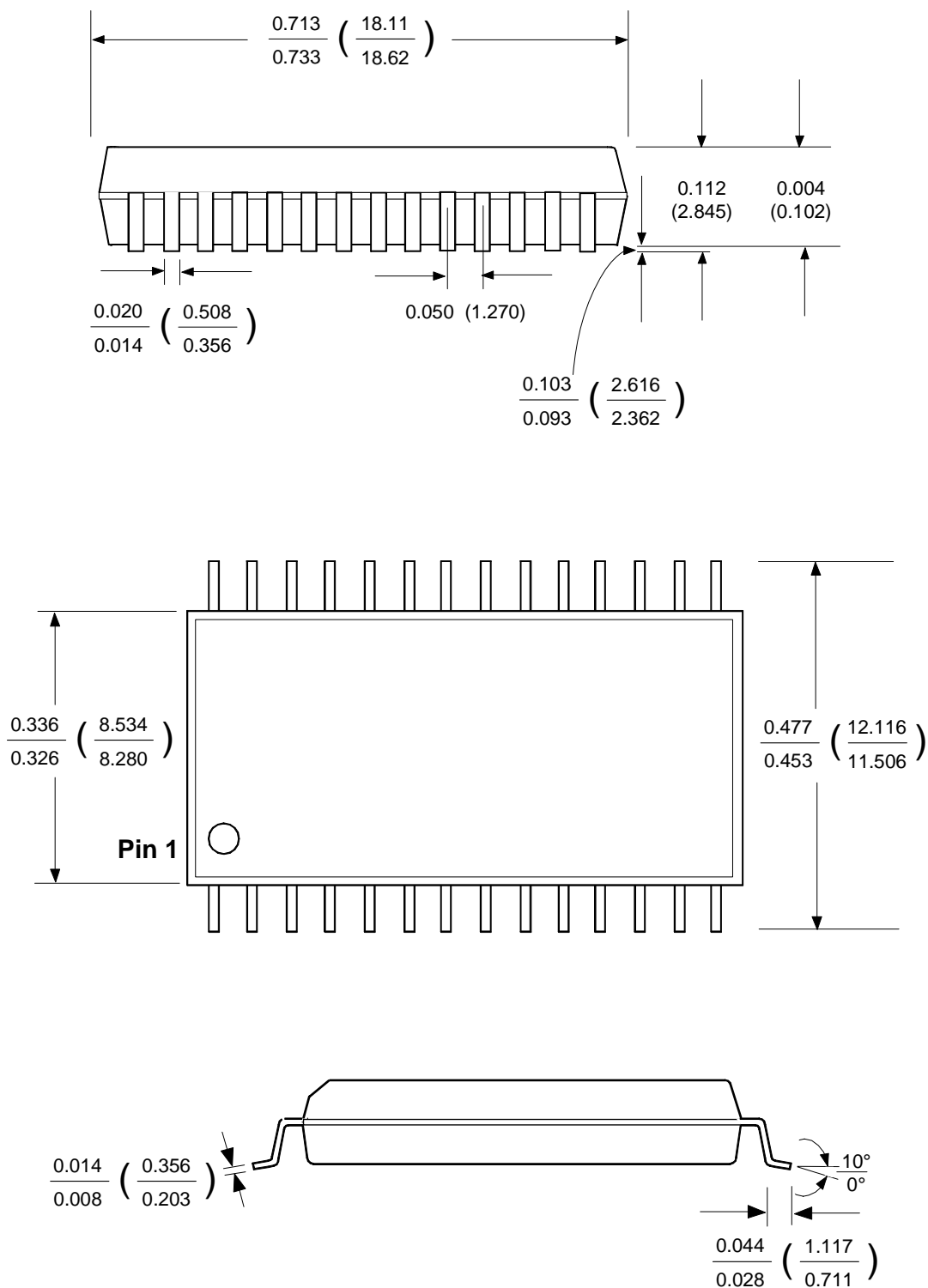
28-Lead, 300 mil SOIC Gull Wing



DIM = INCHES MIN
MAX

DIM = mm (MIN
MAX)

28-Lead, 330 mil SOIC Gull Wing



DIM = INCHES $\frac{\text{MIN}}{\text{MAX}}$

DIM = mm $\left(\frac{\text{MIN}}{\text{MAX}} \right)$

Document Revision History

| Revision | Date | Summary |
|----------|----------------|--|
| 0.0 | December 2002 | Removed 20 nsec device. |
| 0.1 | September 2003 | Added lead-free lead finish |
| 0.2 | March 2006 | Obsolete: 35ns speed grade, Plastic DIP packages and Leaded Lead Finish |
| 0.3 | February 2007 | Add Fast Power-Down Slew Rate Information Add Tape Reel Ordering Options Add Product Ordering Code Listing Add Package Drawings Reformat Entire Document |

SIMTEK STK22C48 Datasheet, February 2007

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