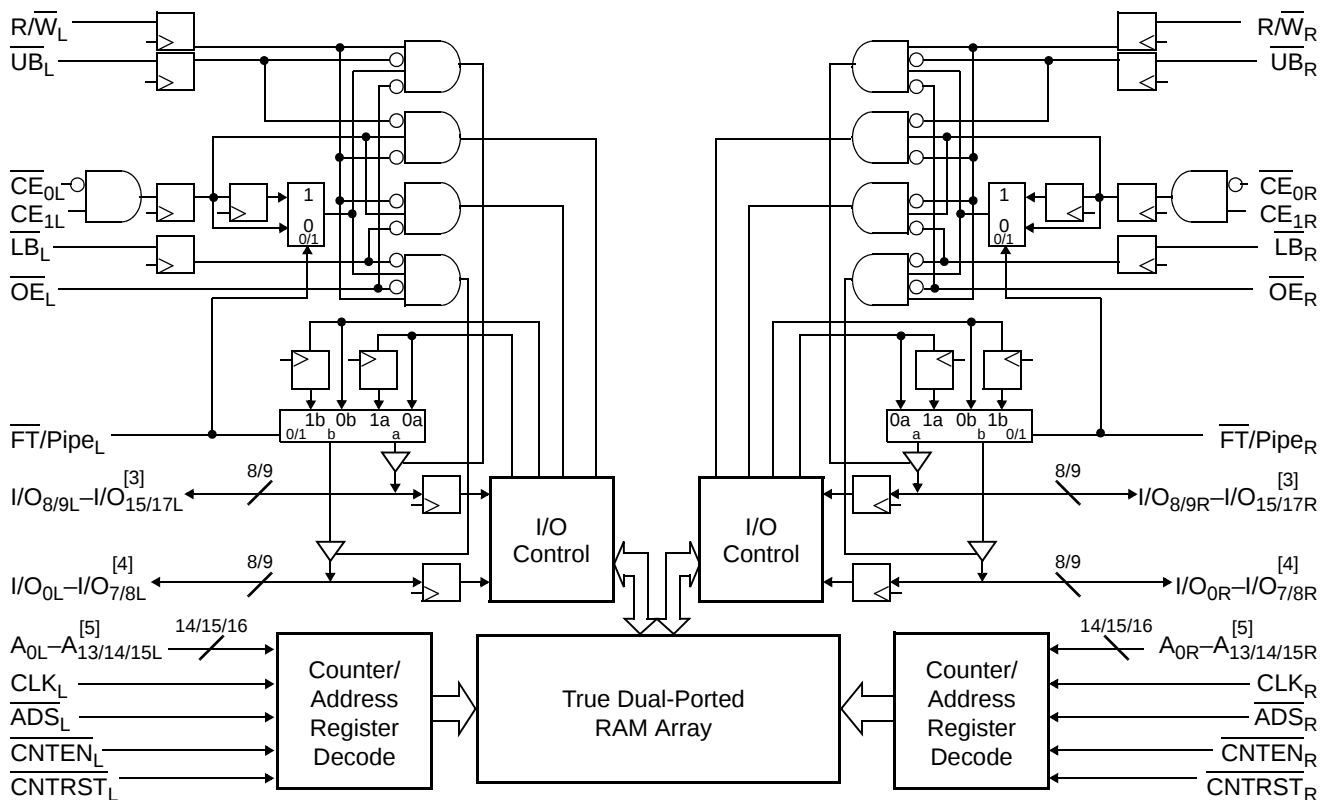


# 3.3V 16K/32K/64K x 16/18 Synchronous Dual-Port Static RAM

## Features

- True dual-ported memory cells that allow simultaneous access of the same memory location
- Six flow through/pipelined devices:
  - 16K x 16/18 organization (CY7C09269V/369V)
  - 32K x 16/18 organization (CY7C09279V/379V)
  - 64K x 16/18 organization (CY7C09289V/389V)
- Three modes:
  - Flow through
  - Pipelined
  - Burst
- Pipelined output mode on both ports allows fast 100 MHz operation
- 0.35 micron CMOS for optimum speed and power
- High speed clock to data access: 6.5<sup>[1, 2]</sup>, 7.5<sup>[2]</sup>, 9, 12 ns (max)
- 3.3V low operating power:
  - Active = 115 mA (typical)
  - Standby = 10  $\mu$ A (typical)
- Fully synchronous interface for easier operation
- Burst counters increment addresses internally:
  - Shorten cycle times
  - Minimize bus noise
  - Supported in flow through and pipelined modes
- Dual chip enables easy depth expansion
- Upper and lower byte controls for bus matching
- Automatic power down
- Commercial and industrial temperature ranges
- Pb-Free 100-pin TQFP package available

## Logic Block Diagram

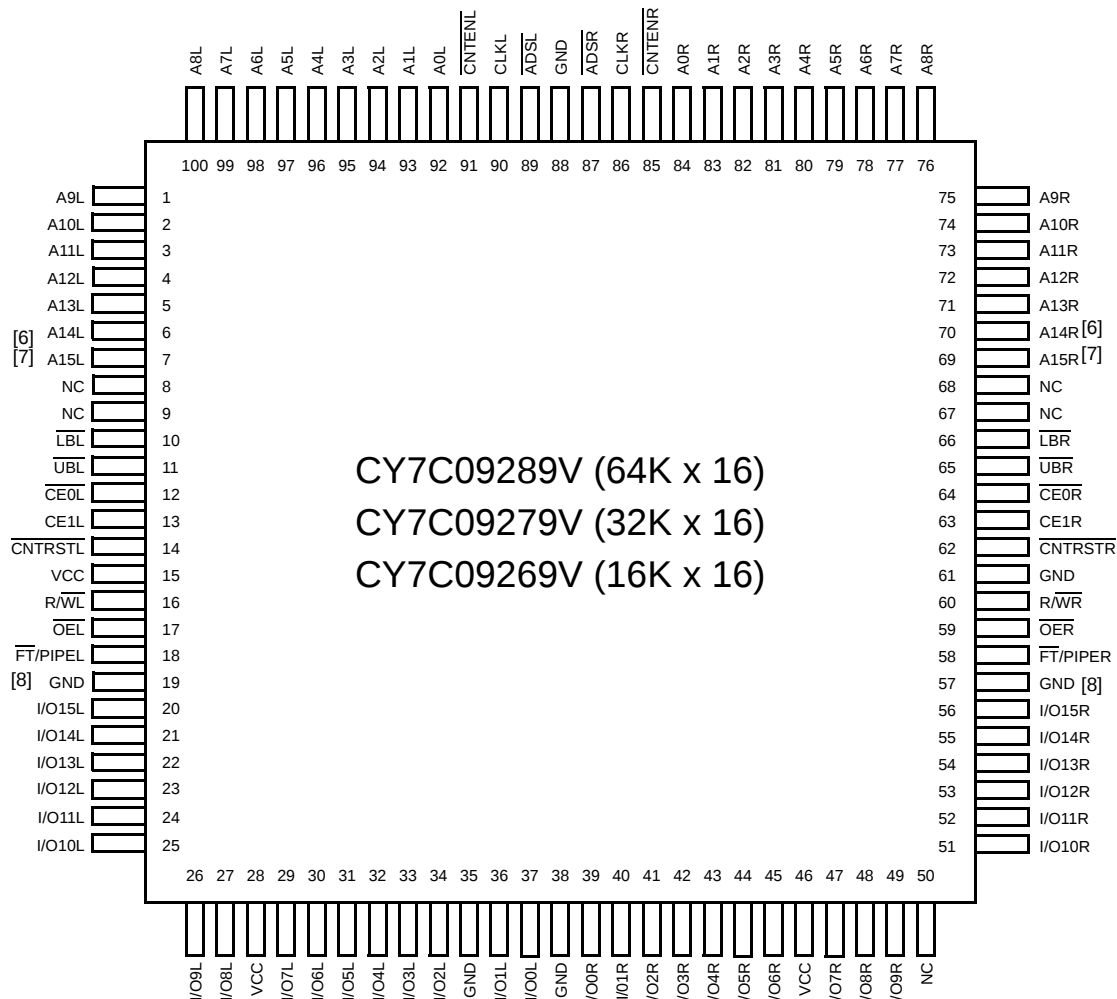


## Notes

1. Call for availability.
2. See page 6 for Load Conditions.
3. I/O<sub>8</sub>-I/O<sub>15</sub> for x16 devices; I/O<sub>9</sub>-I/O<sub>17</sub> for x18 devices.
4. I/O<sub>0</sub>-I/O<sub>7</sub> for x16 devices. I/O<sub>0</sub>-I/O<sub>8</sub> for x18 devices.
5. A<sub>0</sub>-A<sub>13</sub> for 16K; A<sub>0</sub>-A<sub>14</sub> for 32K; A<sub>0</sub>-A<sub>15</sub> for 64K devices.

## Pinouts

**Figure 1. 100-Pin TQFP (Top View)**

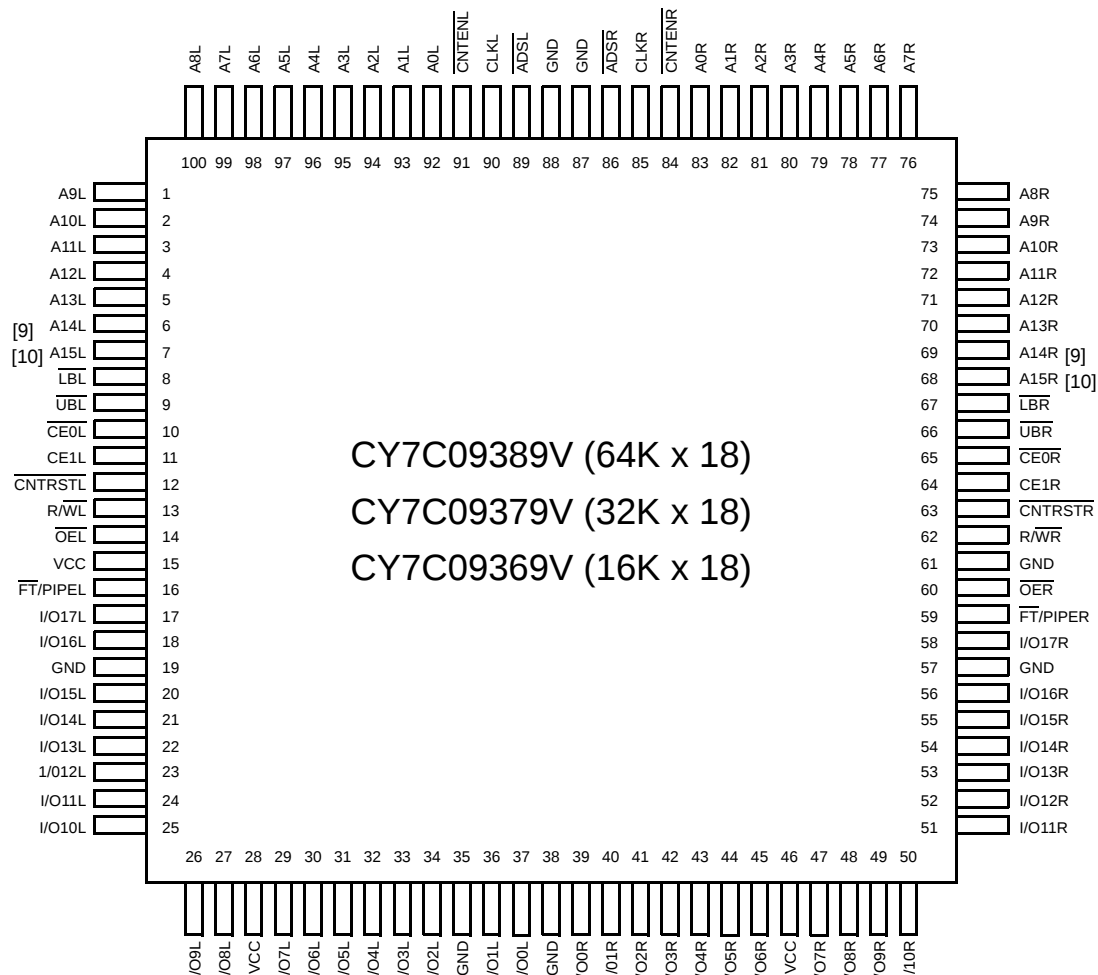


### Notes

6. This pin is NC for CY7C09269V.
7. This pin is NC for CY7C09269V and CY7C09279V.
8. For CY7C09269V and CY7C09279V, pin #18 connected to V<sub>CC</sub> is pin compatible to an IDT 5V x16 pipelined device; connecting pin #18 and #58 to GND is pin compatible to an IDT 5V x16 flow through device.

## Pinouts (continued)

**Figure 2. 100-Pin TQFP (Top View)**



## Selection Guide

| Specifications                                                                  | CY7C09269V/79V/89V<br>CY7C09369V/79V/89V<br>-6 <sup>[1, 2]</sup> | CY7C09269V/79V/89V<br>CY7C09369V/79V/89V<br>-7 <sup>[2]</sup> | CY7C09269V/79V/89V<br>CY7C09369V/79V/89V<br>-9 | CY7C09269V/79V/89V<br>CY7C09369V/79V/89V<br>-12 |
|---------------------------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------|------------------------------------------------|-------------------------------------------------|
| f <sub>MAX2</sub> (MHz) (Pipelined)                                             | 100                                                              | 83                                                            | 67                                             | 50                                              |
| Max. Access Time (ns)<br>(Clock to Data, Pipelined)                             | 6.5                                                              | 7.5                                                           | 9                                              | 12                                              |
| Typical Operating Current<br>I <sub>CC</sub> (mA)                               | 175                                                              | 155                                                           | 135                                            | 115                                             |
| Typical Standby Current for<br>I <sub>SB1</sub> (mA)<br>(Both Ports TTL Level)  | 25                                                               | 25                                                            | 20                                             | 20                                              |
| Typical Standby Current for<br>I <sub>SB3</sub> (μA)<br>(Both Ports CMOS Level) | 10                                                               | 10                                                            | 10                                             | 10                                              |

### Notes

9. This pin is NC for CY7C09369V.

10. This pin is NC for CY7C09369V and CY7C09379V.

## Pin Definitions

| Left Port                             | Right Port                            | Description                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A <sub>0L</sub> –A <sub>15L</sub>     | A <sub>0R</sub> –A <sub>15R</sub>     | <b>Address Inputs</b> (A <sub>0</sub> –A <sub>14</sub> for 32K, A <sub>0</sub> –A <sub>13</sub> for 16K devices).                                                                                                                                                                                                                                             |
| ADS <sub>L</sub>                      | ADS <sub>R</sub>                      | <b>Address Strobe Input.</b> Used as an address qualifier. This signal must be asserted LOW to access the part using an externally supplied address. Asserting this signal LOW also loads the burst counter with the address present on the address pins.                                                                                                     |
| CE <sub>0L</sub> , CE <sub>1L</sub>   | CE <sub>0R</sub> , CE <sub>1R</sub>   | <b>Chip Enable Input.</b> To select either the left or right port, both CE <sub>0</sub> AND CE <sub>1</sub> must be asserted to their active states (CE <sub>0</sub> ≤ V <sub>IL</sub> and CE <sub>1</sub> ≥ V <sub>IH</sub> ).                                                                                                                               |
| CLK <sub>L</sub>                      | CLK <sub>R</sub>                      | <b>Clock Signal.</b> This input can be free running or strobed. Maximum clock input rate is f <sub>MAX</sub> .                                                                                                                                                                                                                                                |
| CNTEN <sub>L</sub>                    | CNTEN <sub>R</sub>                    | <b>Counter Enable Input.</b> Asserting this signal <u>LOW</u> increments the <u>burst address</u> counter of its respective port on each rising edge of CLK. CNTEN is disabled if ADS or CNTRST are asserted LOW.                                                                                                                                             |
| CNTRST <sub>L</sub>                   | CNTRST <sub>R</sub>                   | <b>Counter Reset Input.</b> Asserting this signal <u>LOW</u> <u>resets</u> the <u>burst address</u> counter of its respective port to zero. CNTRST is not disabled by asserting ADS or CNTEN.                                                                                                                                                                 |
| I/O <sub>0L</sub> –I/O <sub>17L</sub> | I/O <sub>0R</sub> –I/O <sub>17R</sub> | <b>Data Bus Input/Output</b> (I/O <sub>0</sub> –I/O <sub>15</sub> for x16 devices).                                                                                                                                                                                                                                                                           |
| LB <sub>L</sub>                       | LB <sub>R</sub>                       | <b>Lower Byte Select Input.</b> Asserting this signal LOW enables read and write operations to the <u>lower byte</u> . (I/O <sub>0</sub> –I/O <sub>8</sub> for x18, I/O <sub>0</sub> –I/O <sub>7</sub> for x16) of the memory array. For read operations both the LB and OE signals must be asserted to drive output data on the lower byte of the data pins. |
| UB <sub>L</sub>                       | UB <sub>R</sub>                       | <b>Upper Byte Select Input.</b> Same function as LB, but to the upper byte (I/O <sub>8/9L</sub> –I/O <sub>15/17L</sub> ).                                                                                                                                                                                                                                     |
| OE <sub>L</sub>                       | OE <sub>R</sub>                       | <b>Output Enable Input.</b> This signal must be asserted LOW to enable the I/O data pins during read operations.                                                                                                                                                                                                                                              |
| R/W <sub>L</sub>                      | R/W <sub>R</sub>                      | <b>Read/Write Enable Input.</b> This signal is asserted LOW to write to the dual port memory array. For read operations, assert this pin HIGH.                                                                                                                                                                                                                |
| FT/PIPE <sub>L</sub>                  | FT/PIPE <sub>R</sub>                  | <b>Flow Through/Pipelined Select Input.</b> For flow through mode operation, assert this pin LOW. For pipelined mode operation, assert this pin HIGH.                                                                                                                                                                                                         |
| GND                                   |                                       | <b>Ground Input.</b>                                                                                                                                                                                                                                                                                                                                          |
| NC                                    |                                       | <b>No Connect.</b>                                                                                                                                                                                                                                                                                                                                            |
| V <sub>CC</sub>                       |                                       | <b>Power Input.</b>                                                                                                                                                                                                                                                                                                                                           |

## Functional Description

The CY7C09269V/79V/89V and CY7C09369V/79V/89V are high speed 3.3V synchronous CMOS 16K, 32K, and 64K x 16/18 dual-port static RAMs. Two ports are provided, permitting independent, simultaneous access for reads and writes to any location in memory<sup>[11]</sup>. Registers on control, address, and data lines allow for minimal setup and hold times. In pipelined output mode, data is registered for decreased cycle time. Clock to data valid t<sub>CD2</sub> = 6.5 ns<sup>[1, 2]</sup> (pipelined). Flow through mode can also be used to bypass the pipelined output register to eliminate access latency. In flow through mode, data is available t<sub>CD1</sub> = 18 ns after the address is clocked into the device. Pipelined output or flow through mode is selected through the FT/Pipe pin.

Each port contains a burst counter on the input address register. The internal write pulse width is independent of the LOW to HIGH transition of the clock signal. The internal write pulse is self timed to allow the shortest possible cycle times.

A HIGH on  $\overline{\text{CE}}_0$  or LOW on CE<sub>1</sub> for one clock cycle powers down the internal circuitry to reduce the static power consumption. The use of multiple Chip Enables enables easier banking of multiple chips for depth expansion configurations. In the pipelined mode, one cycle is required with  $\overline{\text{CE}}_0$  LOW and CE<sub>1</sub> HIGH to reactivate the outputs.

Counter enable inputs are provided to stall the operation of the address input and use the internal address generated by the internal counter for fast interleaved memory applications. A port's burst counter is loaded with the port's Address Strobe (ADS). When the port's Count Enable (CNTEN) is asserted, the address counter increments on each LOW to HIGH transition of that port's clock signal. This reads/writes one word from or into each successive address location, until CNTEN is deasserted. The counter can address the entire memory array and loop back to the start. Counter Reset (CNTRST) is used to reset the burst counter.

All parts are available in 100-pin Thin Quad Plastic Flatpack (TQFP) packages.

### Note

11. When writing simultaneously to the same location, the final value cannot be guaranteed.

## Maximum Ratings <sup>[12]</sup>

Exceeding maximum ratings may impair the useful life of the device. These user guidelines are not tested.

Storage Temperature ..... -65°C to +150°C

Ambient Temperature with  
Power Applied..... -55°C to +125°C

Supply Voltage to Ground Potential ..... -0.5V to +4.6V

DC Voltage Applied to Outputs  
in High Z State ..... -0.5V to  $V_{CC}+0.5V$

DC Input Voltage ..... -0.5V to  $V_{CC}+0.5V$

Output Current into Outputs (LOW)..... 20 mA

Static Discharge Voltage..... > 1100V  
(per MIL-STD-883, Method 3015)

Latch up Current..... > 200 mA

## Operating Range

| Range      | Ambient Temperature | $V_{CC}$      |
|------------|---------------------|---------------|
| Commercial | 0°C to +70°C        | 3.3V ± 300 mV |
| Industrial | -40°C to +85°C      | 3.3V ± 300 mV |

## Electrical Characteristics

Over the Operating Range

| Parameter        | Description                                                                                                                             |         | CY7C09269V/79V/89V<br>CY7C09369V/79V/89V |     |     |                   |     |     |     |     |     |     |     |     | Unit |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---------|------------------------------------------|-----|-----|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|
|                  |                                                                                                                                         |         | -6 <sup>[1, 2]</sup>                     |     |     | -7 <sup>[2]</sup> |     |     | -9  |     |     | -12 |     |     |      |
|                  |                                                                                                                                         |         | Min                                      | Typ | Max | Min               | Typ | Max | Min | Typ | Max | Min | Typ | Max |      |
| V <sub>OH</sub>  | Output HIGH Voltage<br>(V <sub>CC</sub> = Min. I <sub>OH</sub> = −4.0 mA)                                                               |         | 2.4                                      |     |     | 2.4               |     |     | 2.4 |     |     | 2.4 |     |     | V    |
| V <sub>OL</sub>  | Output LOW Voltage<br>(V <sub>CC</sub> = Min. I <sub>OH</sub> = +4.0 mA)                                                                |         |                                          |     | 0.4 |                   |     | 0.4 |     |     | 0.4 |     |     | 0.4 | V    |
| V <sub>IH</sub>  | Input HIGH Voltage                                                                                                                      |         | 2.0                                      |     |     | 2.0               |     |     | 2.0 |     |     | 2.0 |     |     | V    |
| V <sub>IL</sub>  | Input LOW Voltage                                                                                                                       |         |                                          |     | 0.8 |                   |     | 0.8 |     |     | 0.8 |     |     | 0.8 | V    |
| I <sub>OZ</sub>  | Output Leakage Current                                                                                                                  |         | −10                                      |     | 10  | −10               |     | 10  | −10 |     | 10  | −10 |     | 10  | μA   |
| I <sub>CC</sub>  | Operating Current<br>(V <sub>CC</sub> = Max, I <sub>OUT</sub> = 0 mA)<br>Outputs Disabled                                               | Com'l.  |                                          | 175 | 320 |                   | 155 | 275 |     | 135 | 230 |     | 115 | 180 | mA   |
|                  |                                                                                                                                         | Indust. |                                          |     |     |                   | 275 | 390 |     | 185 | 300 |     |     |     | mA   |
| I <sub>SB1</sub> | Standby Current<br>(Both Ports TTL Level) <sup>[13]</sup><br>CE <sub>L</sub> & CE <sub>R</sub> ≥ V <sub>IH</sub> , f = f <sub>MAX</sub> | Com'l.  |                                          | 25  | 95  |                   | 25  | 85  |     | 20  | 75  |     | 20  | 70  | mA   |
|                  |                                                                                                                                         | Indust. |                                          |     |     |                   | 85  | 120 |     | 35  | 85  |     |     |     | mA   |
| I <sub>SB2</sub> | Standby Current<br>(One Port TTL Level) <sup>[13]</sup><br>CE <sub>L</sub>   CE <sub>R</sub> ≥ V <sub>IH</sub> , f = f <sub>MAX</sub>   | Com'l.  |                                          | 115 | 175 |                   | 105 | 165 |     | 95  | 155 |     | 85  | 140 | mA   |
|                  |                                                                                                                                         | Indust. |                                          |     |     |                   | 165 | 210 |     | 105 | 165 |     |     |     | mA   |
| I <sub>SB3</sub> | Standby Current<br>(Both Ports CMOS Level) <sup>[13]</sup><br>CE <sub>L</sub> & CE <sub>R</sub> ≥ V <sub>CC</sub> − 0.2V, f = 0         | Com'l.  |                                          | 10  | 250 |                   | 10  | 250 |     | 10  | 250 |     | 10  | 250 | μA   |
|                  |                                                                                                                                         | Indust. |                                          |     |     |                   | 10  | 250 |     | 10  | 250 |     |     |     | μA   |
| I <sub>SB4</sub> | Standby Current<br>(One Port CMOS Level) <sup>[13]</sup><br>CE <sub>L</sub>   CE <sub>R</sub> ≥ V <sub>IH</sub> , f = f <sub>MAX</sub>  | Com'l.  |                                          | 105 | 135 |                   | 95  | 125 |     | 85  | 115 |     | 75  | 100 | mA   |
|                  |                                                                                                                                         | Indust. |                                          |     |     |                   | 125 | 170 |     | 95  | 125 |     |     |     | mA   |

## Capacitance

Tested initially and after any design or process changes that may affect these parameters.

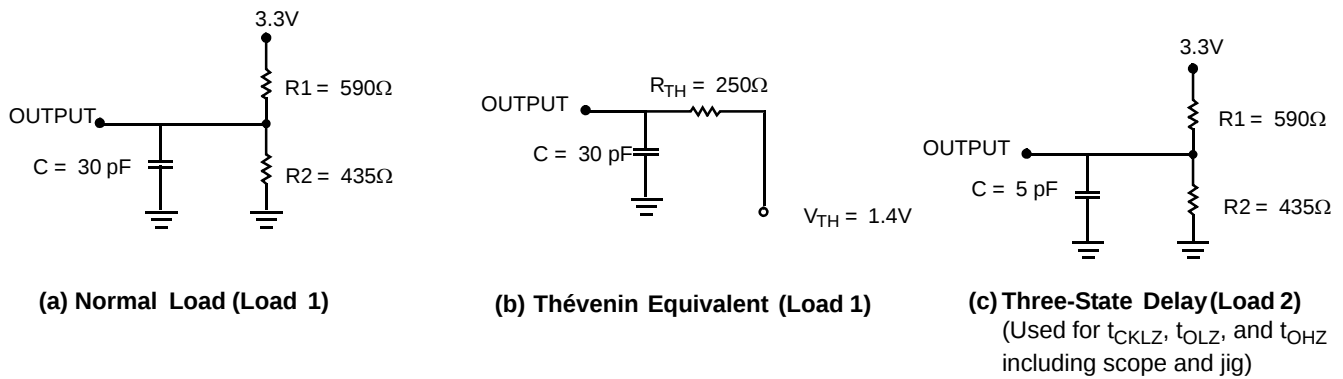
| Parameter | Description        | Test Conditions                                                  | Max | Unit |
|-----------|--------------------|------------------------------------------------------------------|-----|------|
| $C_{IN}$  | Input Capacitance  | $T_A = 25^\circ\text{C}$ , $f = 1 \text{ MHz}$ , $V_{CC} = 3.3V$ | 10  | pF   |
| $C_{OUT}$ | Output Capacitance |                                                                  | 10  | pF   |

### Notes

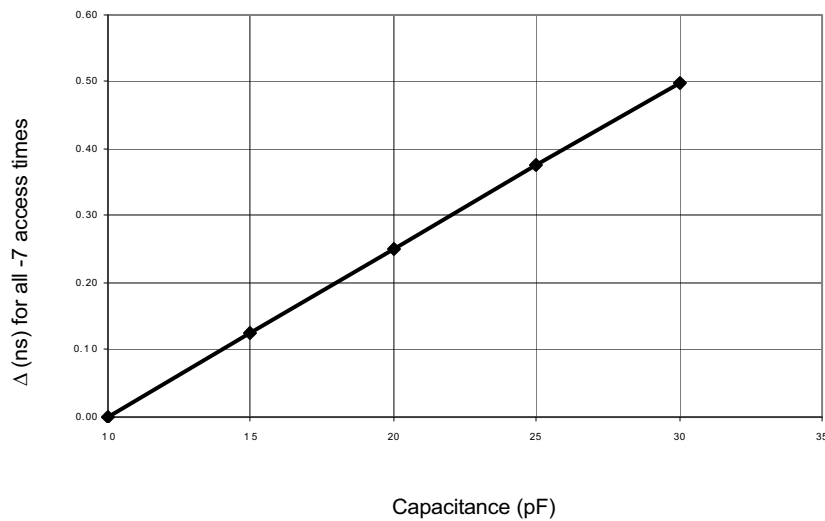
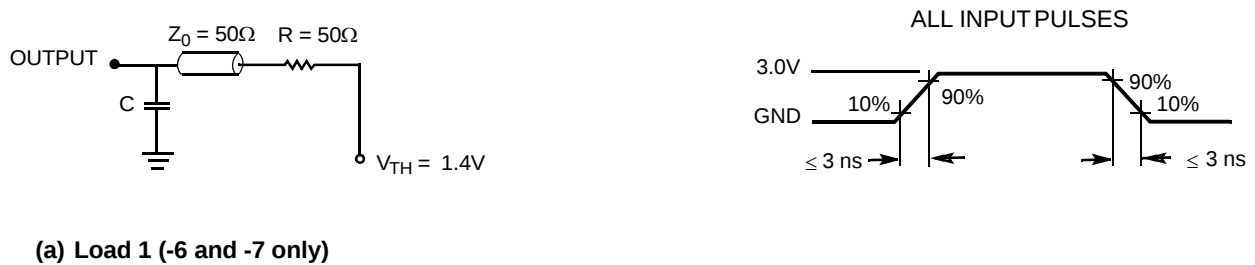
12. The voltage on any input or I/O pin can not exceed the power pin during power up.

13.  $\overline{CE}_L$  and  $\overline{CE}_R$  are internal signals. To select either the left or right port, both  $\overline{CE}_0$  and  $\overline{CE}_1$  must be asserted to their active states ( $\overline{CE}_0 \leq V_{IL}$  and  $\overline{CE}_1 \geq V_{IH}$ ).

**Figure 3. AC Test Loads and Waveforms**



**Figure 4. AC Test Loads (Applicable to -6 and -7 only) <sup>[14]</sup>**



**(b) Load Derating Curve**

**Note**

14. Test Conditions:  $C = 10$  pF.

## Switching Characteristics

Over the Operating Range

| Parameter                           | Description                              | CY7C09269V/79V/89V<br>CY7C09369V/79V/89V |     |                   |     |     |     |     |     | Unit |
|-------------------------------------|------------------------------------------|------------------------------------------|-----|-------------------|-----|-----|-----|-----|-----|------|
|                                     |                                          | -6 <sup>[1, 2]</sup>                     |     | -7 <sup>[2]</sup> |     | -9  |     | -12 |     |      |
|                                     |                                          | Min                                      | Max | Min               | Max | Min | Max | Min | Max |      |
| f <sub>MAX1</sub>                   | f <sub>Max</sub> Flow Through            |                                          | 53  |                   | 45  |     | 40  |     | 33  | MHz  |
| f <sub>MAX2</sub>                   | f <sub>Max</sub> Pipelined               |                                          | 100 |                   | 83  |     | 67  |     | 50  | MHz  |
| t <sub>CYC1</sub>                   | Clock Cycle Time - Flow Through          | 19                                       |     | 22                |     | 25  |     | 30  |     | ns   |
| t <sub>CYC2</sub>                   | Clock Cycle Time - Pipelined             | 10                                       |     | 12                |     | 15  |     | 20  |     | ns   |
| t <sub>CH1</sub>                    | Clock HIGH Time - Flow Through           | 6.5                                      |     | 7.5               |     | 12  |     | 12  |     | ns   |
| t <sub>CL1</sub>                    | Clock LOW Time - Flow Through            | 6.5                                      |     | 7.5               |     | 12  |     | 12  |     | ns   |
| t <sub>CH2</sub>                    | Clock HIGH Time - Pipelined              | 4                                        |     | 5                 |     | 6   |     | 8   |     | ns   |
| t <sub>CL2</sub>                    | Clock LOW Time - Pipelined               | 4                                        |     | 5                 |     | 6   |     | 8   |     | ns   |
| t <sub>R</sub>                      | Clock Rise Time                          |                                          | 3   |                   | 3   |     | 3   |     | 3   | ns   |
| t <sub>F</sub>                      | Clock Fall Time                          |                                          | 3   |                   | 3   |     | 3   |     | 3   | ns   |
| t <sub>SA</sub>                     | Address Set-Up Time                      | 3.5                                      |     | 4                 |     | 4   |     | 4   |     | ns   |
| t <sub>HA</sub>                     | Address Hold Time                        | 0                                        |     | 0                 |     | 1   |     | 1   |     | ns   |
| t <sub>SC</sub>                     | Chip Enable Setup Time                   | 3.5                                      |     | 4                 |     | 4   |     | 4   |     | ns   |
| t <sub>HC</sub>                     | Chip Enable Hold Time                    | 0                                        |     | 0                 |     | 1   |     | 1   |     | ns   |
| t <sub>SW</sub>                     | R/W Set-Up Time                          | 3.5                                      |     | 4                 |     | 4   |     | 4   |     | ns   |
| t <sub>HW</sub>                     | R/W Hold Time                            | 0                                        |     | 0                 |     | 1   |     | 1   |     | ns   |
| t <sub>SD</sub>                     | Input Data Setup Time                    | 3.5                                      |     | 4                 |     | 4   |     | 4   |     | ns   |
| t <sub>HD</sub>                     | Input Data Hold Time                     | 0                                        |     | 0                 |     | 1   |     | 1   |     | ns   |
| t <sub>SAD</sub>                    | $\overline{\text{ADS}}$ Set-Up Time      | 3.5                                      |     | 4                 |     | 4   |     | 4   |     | ns   |
| t <sub>HAD</sub>                    | $\overline{\text{ADS}}$ Hold Time        | 0                                        |     | 0                 |     | 1   |     | 1   |     | ns   |
| t <sub>SCN</sub>                    | $\overline{\text{CNTEN}}$ Setup Time     | 3.5                                      |     | 4.5               |     | 5   |     | 5   |     | ns   |
| t <sub>HCN</sub>                    | $\overline{\text{CNTEN}}$ Hold Time      | 0                                        |     | 0                 |     | 1   |     | 1   |     | ns   |
| t <sub>SRST</sub>                   | $\overline{\text{CNTRST}}$ Setup Time    | 3.5                                      |     | 4                 |     | 4   |     | 4   |     | ns   |
| t <sub>HRST</sub>                   | $\overline{\text{CNTRST}}$ Hold Time     | 0                                        |     | 0                 |     | 1   |     | 1   |     | ns   |
| t <sub>OE</sub>                     | Output Enable to Data Valid              |                                          | 8   |                   | 9   |     | 10  |     | 12  | ns   |
| t <sub>OLZ</sub> <sup>[15,16]</sup> | $\overline{\text{OE}}$ to Low Z          | 2                                        |     | 2                 |     | 2   |     | 2   |     | ns   |
| t <sub>OHZ</sub> <sup>[15,16]</sup> | $\overline{\text{OE}}$ to High Z         | 1                                        | 7   | 1                 | 7   | 1   | 7   | 1   | 7   | ns   |
| t <sub>CD1</sub>                    | Clock to Data Valid - Flow Through       |                                          | 15  |                   | 18  |     | 20  |     | 25  | ns   |
| t <sub>CD2</sub>                    | Clock to Data Valid - Pipelined          |                                          | 6.5 |                   | 7.5 |     | 9   |     | 12  | ns   |
| t <sub>DC</sub>                     | Data Output Hold After Clock HIGH        | 2                                        |     | 2                 |     | 2   |     | 2   |     | ns   |
| t <sub>CKZ</sub> <sup>[15,16]</sup> | Clock HIGH to Output High Z              | 2                                        | 9   | 2                 | 9   | 2   | 9   | 2   | 9   | ns   |
| t <sub>CKZ</sub> <sup>[15,16]</sup> | Clock HIGH to Output Low Z               | 2                                        |     | 2                 |     | 2   |     | 2   |     | ns   |
| Port to Port Delays                 |                                          |                                          |     |                   |     |     |     |     |     |      |
| t <sub>CWDD</sub>                   | Write Port Clock HIGH to Read Data Delay |                                          | 30  |                   | 35  |     | 40  |     | 40  | ns   |
| t <sub>CCS</sub>                    | Clock to Clock Setup Time                |                                          | 9   |                   | 10  |     | 15  |     | 15  | ns   |

### Notes

15. Test conditions used are Load 2.

16. This parameter is guaranteed by design, but it is not production tested.

## Switching Waveforms

Figure 5. Read Cycle for Flow Through Output ( $\overline{\text{FT/PIPE}} = V_{\text{IL}}$ ) [17, 18, 19, 20]

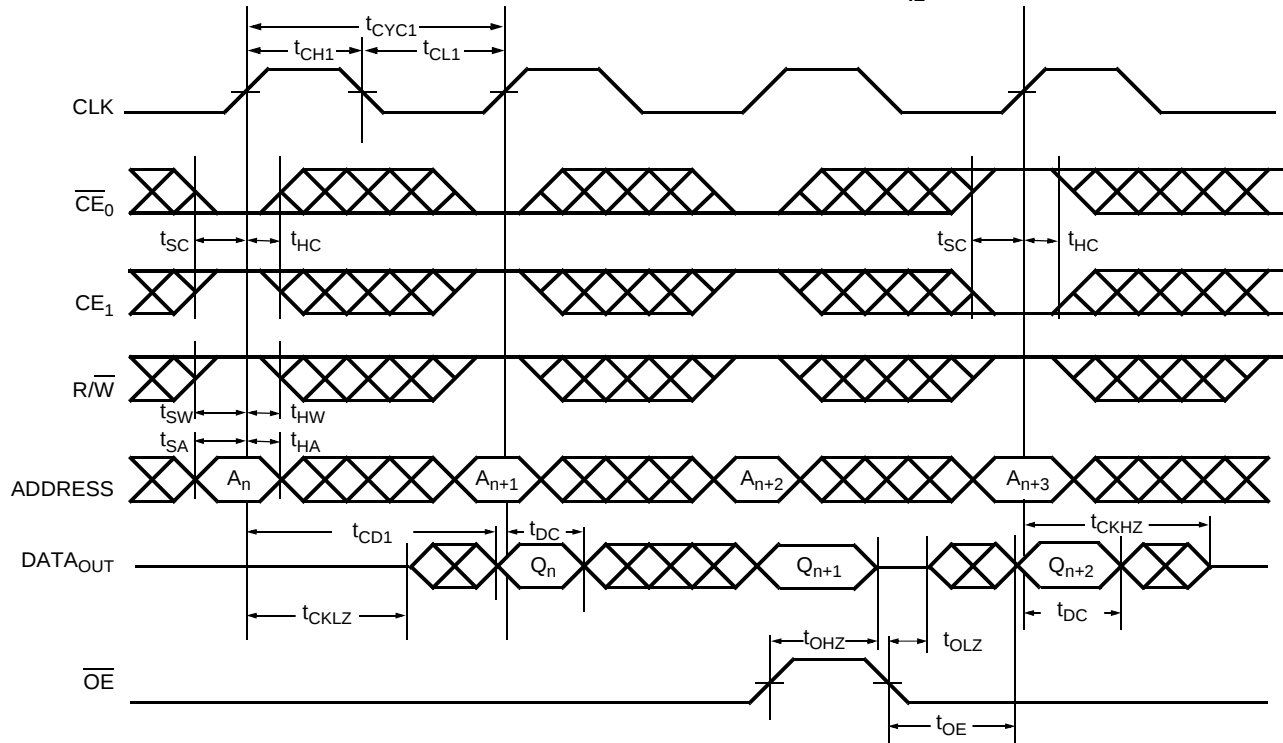
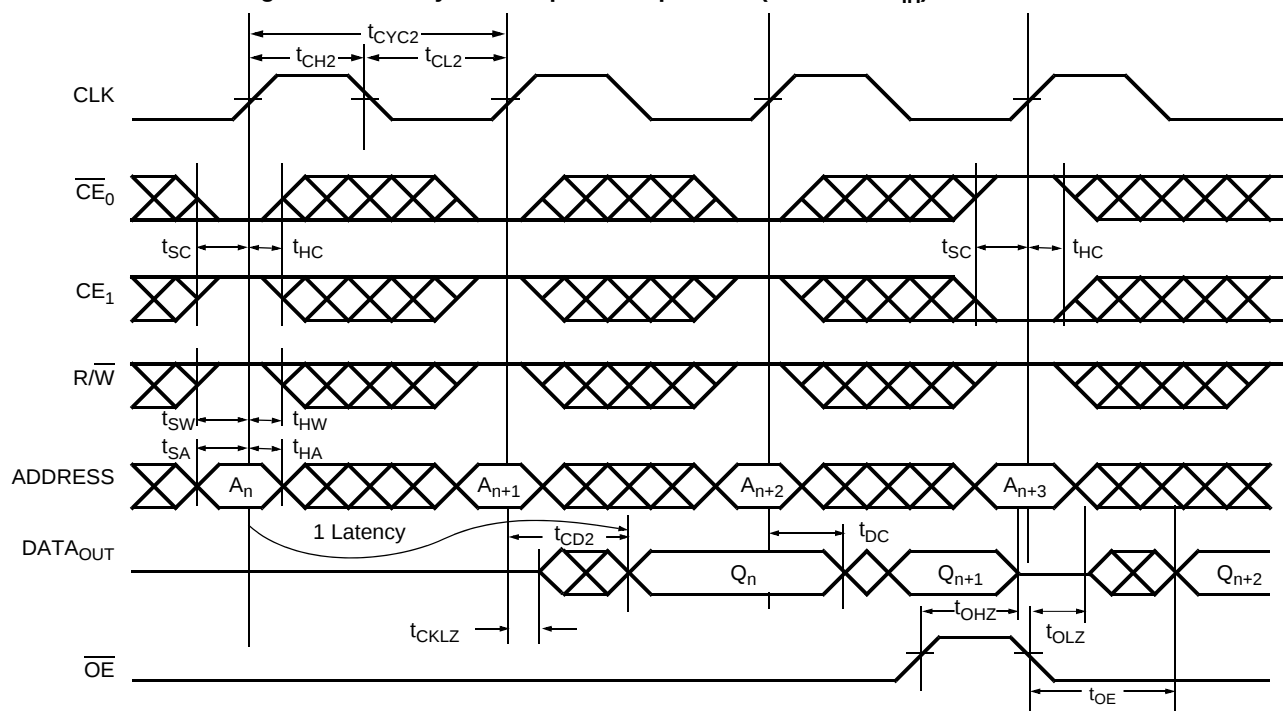


Figure 6. Read Cycle for Pipelined Operation ( $\overline{\text{FT/PIPE}} = V_{\text{IH}}$ ) [17, 18, 19, 20]



### Notes

17.  $\overline{\text{OE}}$  is asynchronously controlled; all other inputs are synchronous to the rising clock edge.

18.  $\text{ADS} = V_{\text{IL}}$ ,  $\text{CNTEN}$  and  $\text{CNTRST} = V_{\text{IH}}$ .

19. The output is disabled (high impedance state) by  $\overline{\text{CE}}_0 = V_{\text{IH}}$  or  $\overline{\text{CE}}_1 = V_{\text{IL}}$  following the next rising edge of the clock.

20. Addresses do not have to be accessed sequentially since  $\text{ADS} = V_{\text{IL}}$  constantly loads the address on the rising edge of the CLK. Numbers are for reference only.

## Switching Waveforms (continued)

Figure 7. Bank Select Pipelined Read<sup>[21, 22]</sup>

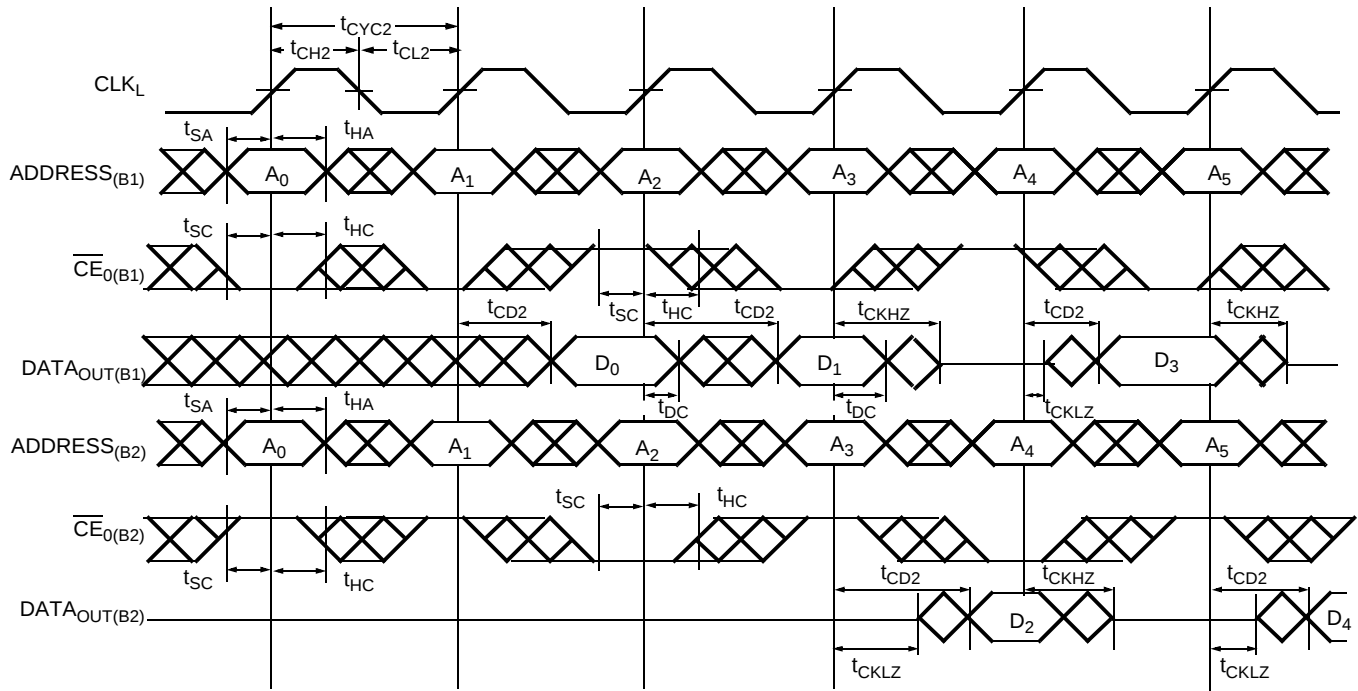
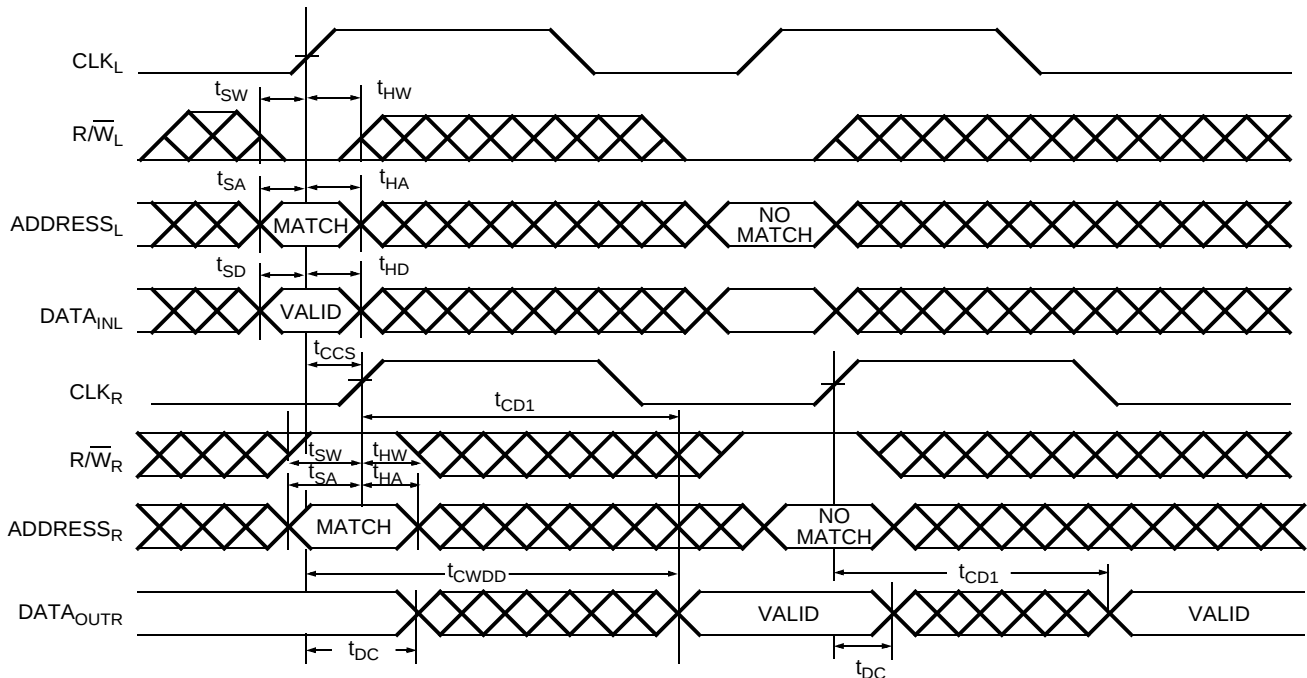


Figure 8. Left Port Write to Flow Through Right Port Read<sup>[23, 24, 25, 26]</sup>



### Notes

21. In this depth expansion example, B1 represents Bank #1 and B2 is Bank #2; Each Bank consists of one Cypress dual-port device from this datasheet.
22.  $\overline{UB}$ ,  $\overline{LB}$ ,  $\overline{OE}$  and  $\overline{ADS} = V_{IL}$ ;  $\overline{CE_1(B1)}$ ,  $\overline{CE_1(B2)}$ ,  $\overline{R/W}$ ,  $\overline{CNTEN}$ , and  $\overline{CNTRST} = V_{IH}$ .
23. The same waveforms apply for a right port write to flow through left port read.
24.  $\overline{CE_0}$ ,  $\overline{UB}$ ,  $\overline{LB}$ , and  $\overline{ADS} = V_{IL}$ ;  $\overline{CE_1}$ ,  $\overline{CNTEN}$ , and  $\overline{CNTRST} = V_{IH}$ .
25.  $\overline{OE} = V_{IL}$  for the Right Port, which is being read from.  $\overline{OE} = V_{IH}$  for the Left Port, which is being written to.
26. If  $t_{CCS} \leq$  maximum specified, then data from right port READ is not valid until the maximum specified for  $t_{CWDD}$ . If  $t_{CCS} >$  maximum specified, then data is not valid until  $t_{CCS} + t_{CD1}$ .  $t_{CWDD}$  does not apply in this case.

## Switching Waveforms (continued)

Figure 9. Pipelined Read-to-Write-to-Read ( $\overline{OE} = V_{IL}$ )<sup>[20, 27, 28, 29]</sup>

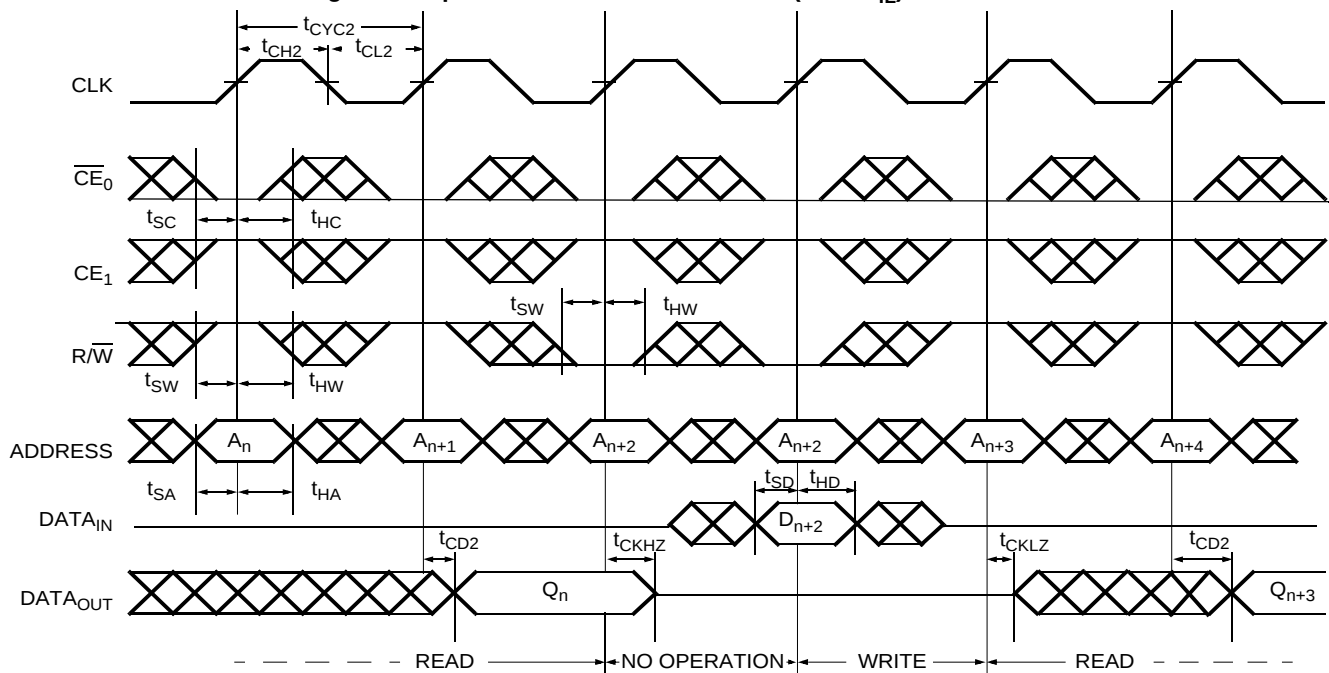
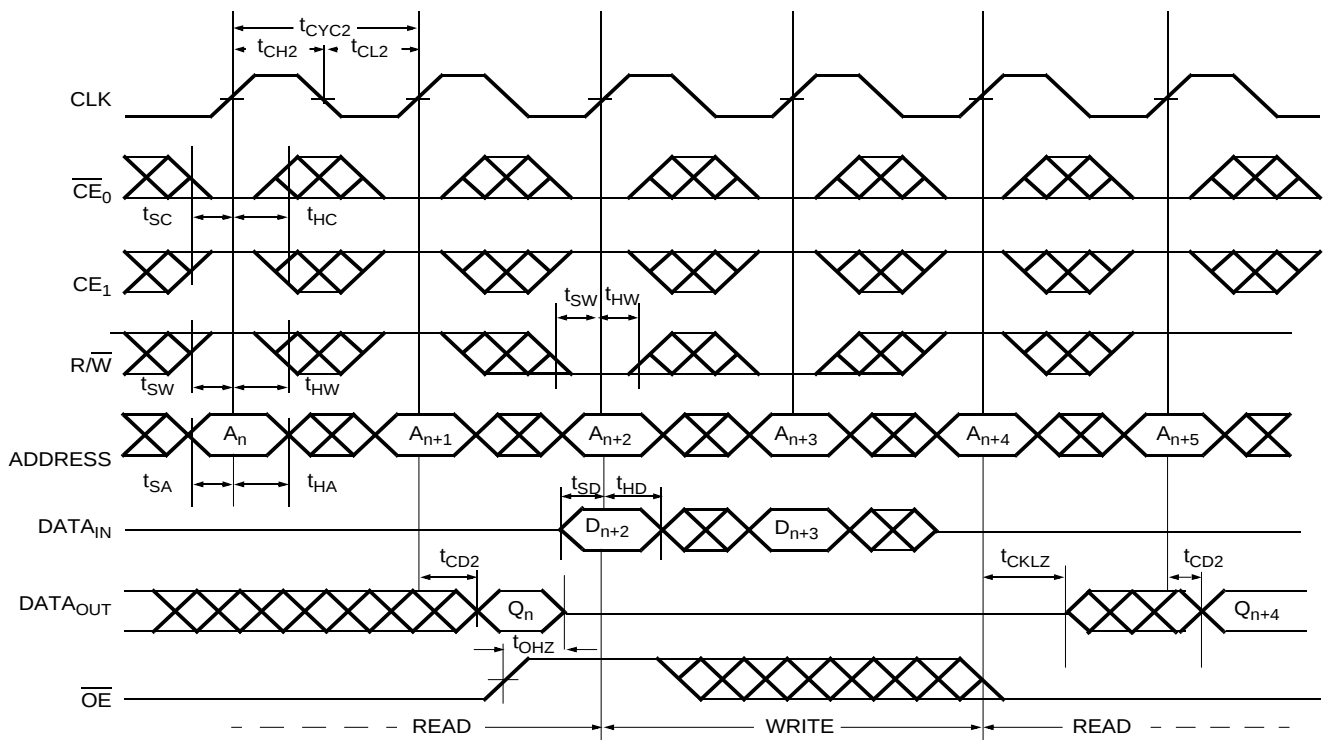


Figure 10. Pipelined Read-to-Write-to-Read ( $\overline{OE}$  Controlled)<sup>[20, 27, 28, 29]</sup>



### Notes

27. Output state (High, LOW, or high impedance) is determined by the previous cycle control signals.

28.  $\overline{CE}_0$  and  $\overline{ADS} = V_{IL}$ ;  $\overline{CE}_1$ ,  $\overline{CNTEN}$ , and  $\overline{CNTNST} = V_{IH}$ .

29. During "No Operation", data in memory at the selected address may be corrupted and must be rewritten to ensure data integrity.

## Switching Waveforms (continued)

Figure 11. Flow Through Read-to-Write-to-Read ( $\overline{OE} = V_{IL}$ )<sup>[18, 20, 28, 29]</sup>

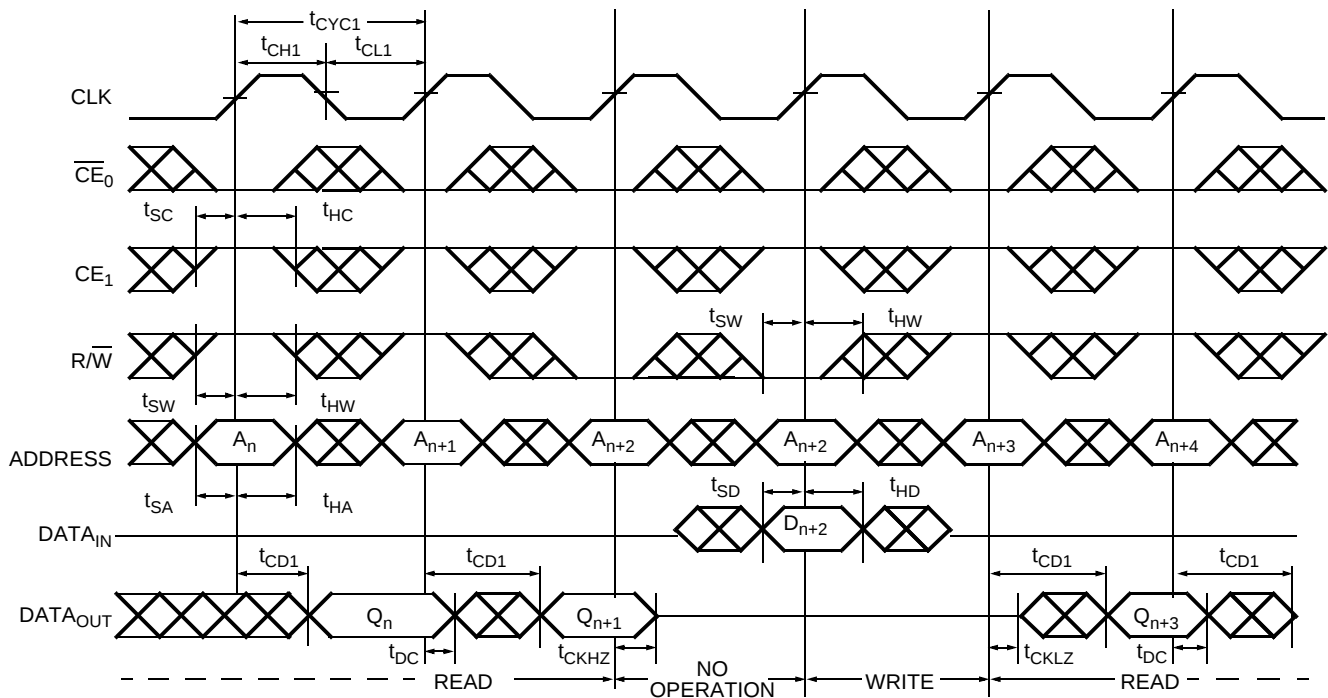
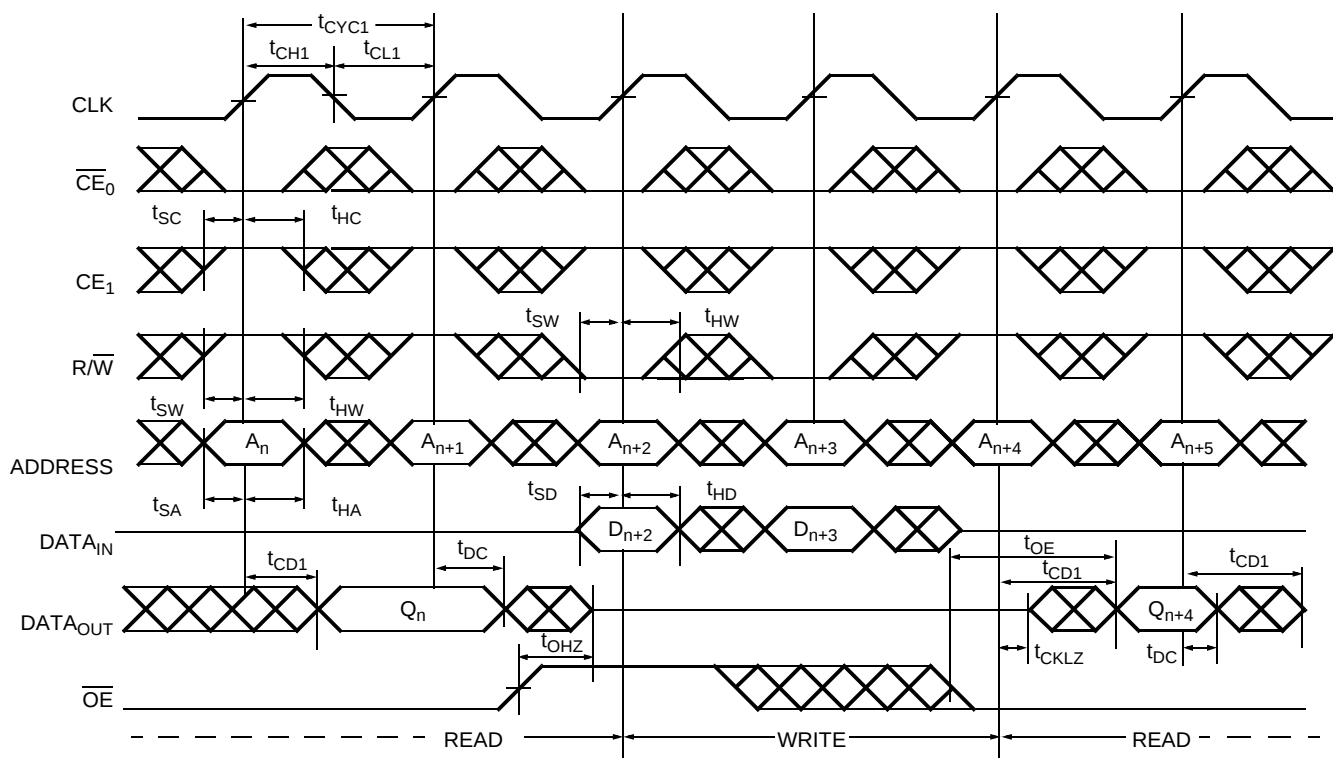


Figure 12. Flow Through Read-to-Write-to-Read ( $\overline{OE}$  Controlled)<sup>[18, 20, 27, 28, 29]</sup>



## Switching Waveforms (continued)

Figure 13. Pipelined Read with Address Counter Advance<sup>[30]</sup>

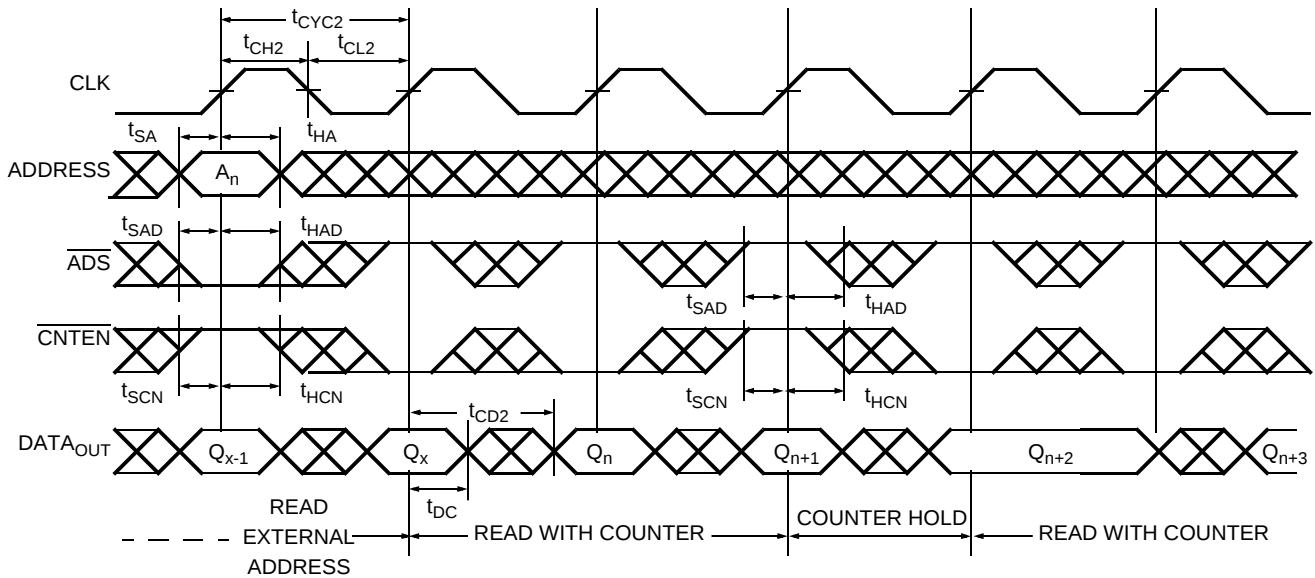
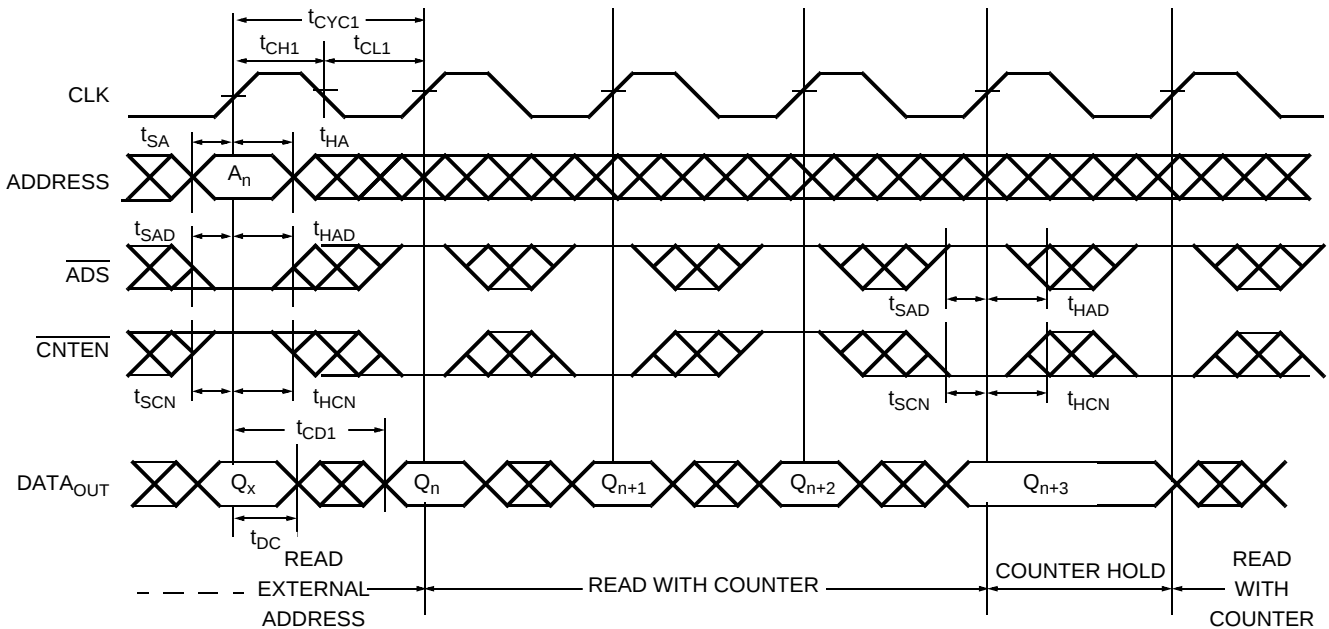


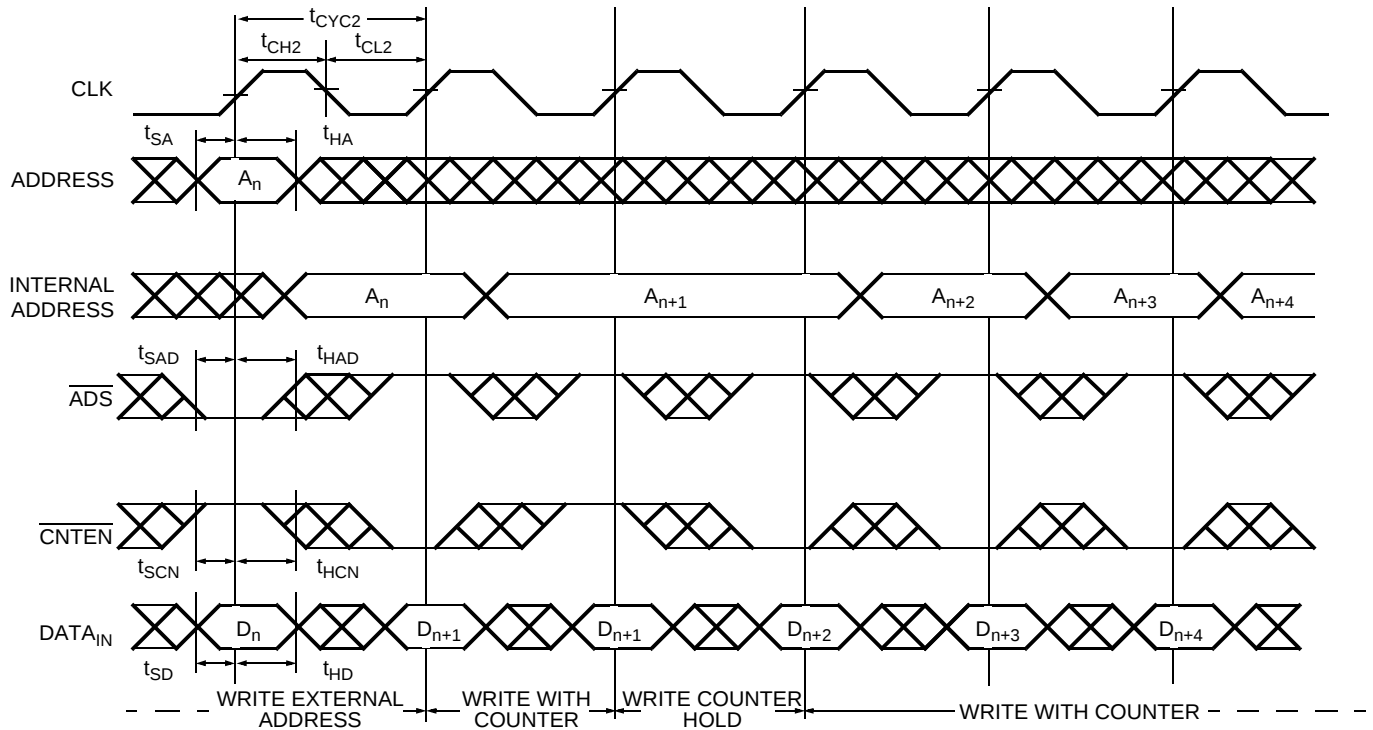
Figure 14. Flow Through Read with Address Counter Advance<sup>[30]</sup>



**Note**  
30.  $\overline{CE}_0$  and  $\overline{OE} = V_{IL}$ ;  $CE_1$ ,  $R/\overline{W}$  and  $\overline{CNTNST} = V_{IH}$ .

## Switching Waveforms (continued)

Figure 15. Write with Address Counter Advance (Flow Through or Pipelined Outputs)<sup>[31, 32]</sup>



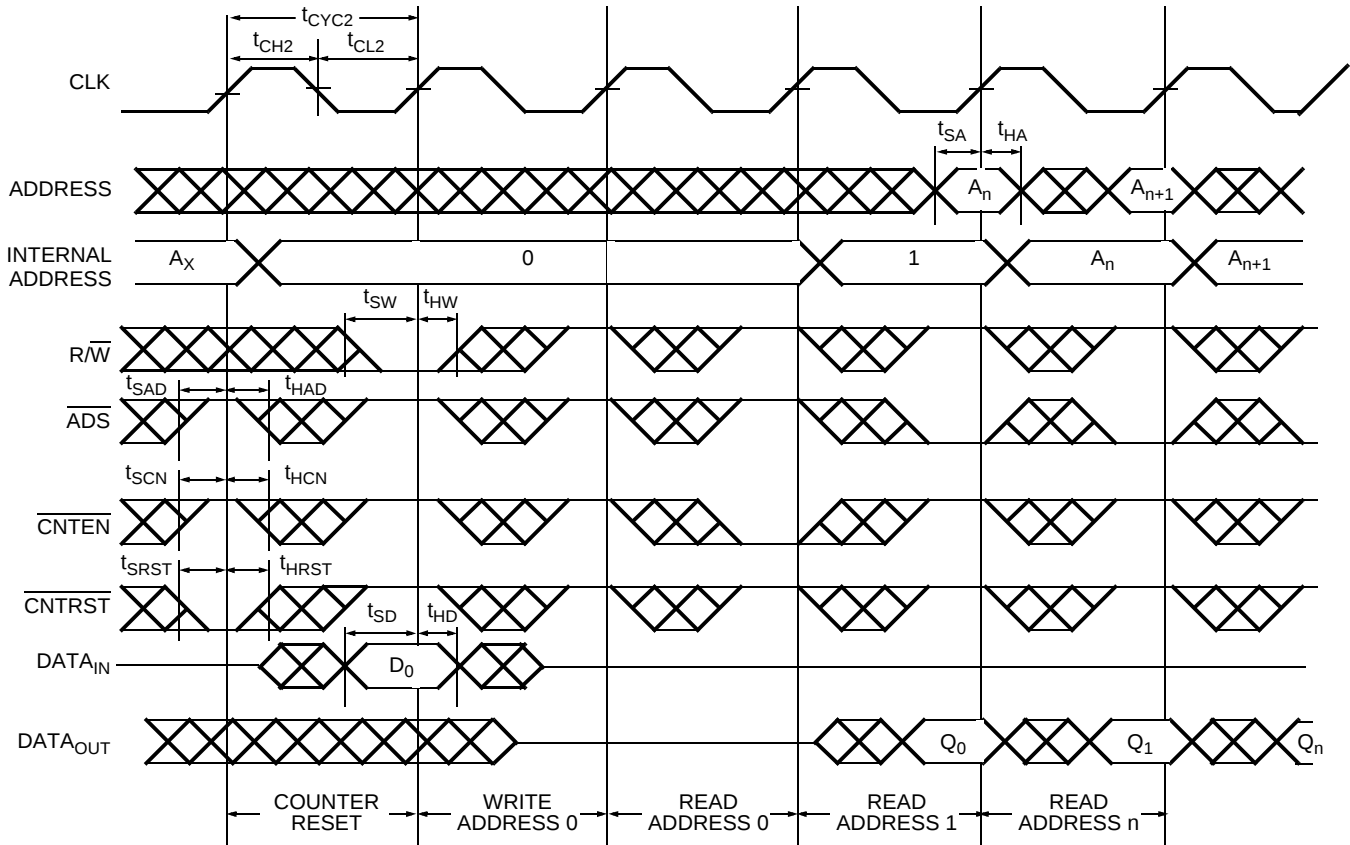
### Notes

31.  $\overline{CE_0}$ ,  $\overline{UB}$ ,  $\overline{LB}$ , and  $\overline{R/\overline{W}} = V_{IL}$ ;  $\overline{CE_1}$  and  $\overline{CNTRST} = V_{IH}$ .

32. The "Internal Address" is equal to the "External Address" when  $\overline{ADS} = V_{IL}$  and equals the counter output when  $\overline{ADS} = V_{IH}$ .

## Switching Waveforms (continued)

Figure 16. Counter Reset (Pipelined Outputs)<sup>[20, 27, 33, 34]</sup>



### Notes

33.  $\overline{CE_0}$ ,  $\overline{UB}$ , and  $\overline{LB} = V_{IL}$ ;  $CE_1 = V_{IH}$ .

34. No dead cycle exists during counter reset. A READ or WRITE cycle may be coincidental with the counter reset.

**Read/Write and Enable Operation**<sup>[35, 36, 37]</sup>

| Inputs |                                                                                   |                 |                 |     | Outputs                             | Operation                  |
|--------|-----------------------------------------------------------------------------------|-----------------|-----------------|-----|-------------------------------------|----------------------------|
| OE     | CLK                                                                               | CE <sub>0</sub> | CE <sub>1</sub> | R/W | I/O <sub>0</sub> –I/O <sub>17</sub> |                            |
| X      |  | H               | X               | X   | High-Z                              | Deselected <sup>[38]</sup> |
| X      |  | X               | L               | X   | High-Z                              | Deselected <sup>[38]</sup> |
| X      |  | L               | H               | L   | D <sub>IN</sub>                     | Write                      |
| L      |  | L               | H               | H   | D <sub>OUT</sub>                    | Read <sup>[35]</sup>       |
| H      | X                                                                                 | L               | H               | X   | High-Z                              | Outputs Disabled           |

**Address Counter Control Operation**<sup>[35, 39, 40, 41]</sup>

| Address        | Previous Address | CLK                                                                                | ADS | CNTEN | CNTRST | I/O                   | Mode      | Operation                                   |
|----------------|------------------|------------------------------------------------------------------------------------|-----|-------|--------|-----------------------|-----------|---------------------------------------------|
| X              | X                |   | X   | X     | L      | D <sub>out(0)</sub>   | Reset     | Counter Reset to Address 0                  |
| A <sub>n</sub> | X                |   | L   | X     | H      | D <sub>out(n)</sub>   | Load      | Address Load into Counter                   |
| X              | A <sub>n</sub>   |   | H   | H     | H      | D <sub>out(n)</sub>   | Hold      | External Address Blocked—Counter Disabled   |
| X              | A <sub>n</sub>   |   | H   | L     | H      | D <sub>out(n+1)</sub> | Increment | Counter Enabled—Internal Address Generation |
| X              | A <sub>n</sub>   |  | H   | L     | H      | D <sub>out(n+1)</sub> | Increment | Counter Enabled—Internal Address Generation |

**Notes**

35. "X" = "Don't Care", "H" = V<sub>IH</sub>, "L" = V<sub>IL</sub>.

36. ADS, CNTEN, CNTRST = "Don't Care".

37. OE is an asynchronous input signal.

38. When CE changes state in the pipelined mode, deselection and read happen in the following clock cycle.

39. CE<sub>0</sub> and OE = V<sub>IL</sub>; CE<sub>1</sub> and R/W = V<sub>IH</sub>.

40. Data shown for flow through mode; pipelined mode output is delayed by one cycle.

41. Counter operation is independent of CE<sub>0</sub> and CE<sub>1</sub>.

## Ordering Information

### 16K x16 3.3V Synchronous Dual-Port SRAM

| Speed (ns)            | Ordering Code    | Package Diagram | Package Type                          | Operating Range |
|-----------------------|------------------|-----------------|---------------------------------------|-----------------|
| 6.5 <sup>[1, 2]</sup> | CY7C09269V-6AC   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09269V-6AXC  |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |
| 7.5 <sup>[2]</sup>    | CY7C09269V-7AC   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09269V-7AXC  |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |
| 9                     | CY7C09269V-9AC   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09269V-9AXC  |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |
|                       | CY7C09269V-9AI   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Industrial      |
| 12                    | CY7C09269V-12AC  | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09269V-12AXC |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |

### 32K x16 3.3V Synchronous Dual-Port SRAM

| Speed (ns)            | Ordering Code    | Package Diagram | Package Type                          | Operating Range |
|-----------------------|------------------|-----------------|---------------------------------------|-----------------|
| 6.5 <sup>[1, 2]</sup> | CY7C09279V-6AC   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09279V-6AXC  |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |
| 7.5 <sup>[2]</sup>    | CY7C09279V-7AC   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09279V-7AXC  |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |
| 9                     | CY7C09279V-9AC   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09279V-9AI   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Industrial      |
| 12                    | CY7C09279V-12AC  | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09279V-12AXC |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |

### 64K x16 3.3V Synchronous Dual-Port SRAM

| Speed (ns)            | Ordering Code    | Package Diagram | Package Type                          | Operating Range |
|-----------------------|------------------|-----------------|---------------------------------------|-----------------|
| 6.5 <sup>[1, 2]</sup> | CY7C09289V-6AC   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09289V-6AXC  |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |
| 7.5 <sup>[2]</sup>    | CY7C09289V-7AC   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09289V-7AXC  |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |
| 9                     | CY7C09289V-9AC   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09289V-9AXC  |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |
|                       | CY7C09289V-9AI   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Industrial      |
|                       | CY7C09289V-9AXI  |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |
| 12                    | CY7C09289V-12AC  | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09289V-12AXC |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |

## Ordering Information (Continued)

### 16K x18 3.3V Synchronous Dual-Port SRAM

| Speed (ns)            | Ordering Code    | Package Diagram | Package Type                          | Operating Range |
|-----------------------|------------------|-----------------|---------------------------------------|-----------------|
| 6.5 <sup>[1, 2]</sup> | CY7C09369V-6AC   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09369V-6AXC  |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |
| 7.5 <sup>[2]</sup>    | CY7C09369V-7AC   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09369V-7AXC  |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |
|                       | CY7C09369V-7AI   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Industrial      |
| 9                     | CY7C09369V-9AC   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09369V-9AXC  |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |
|                       | CY7C09369V-9AI   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Industrial      |
| 12                    | CY7C09369V-12AC  | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09369V-12AXC |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |

### 32K x18 3.3V Synchronous Dual-Port SRAM

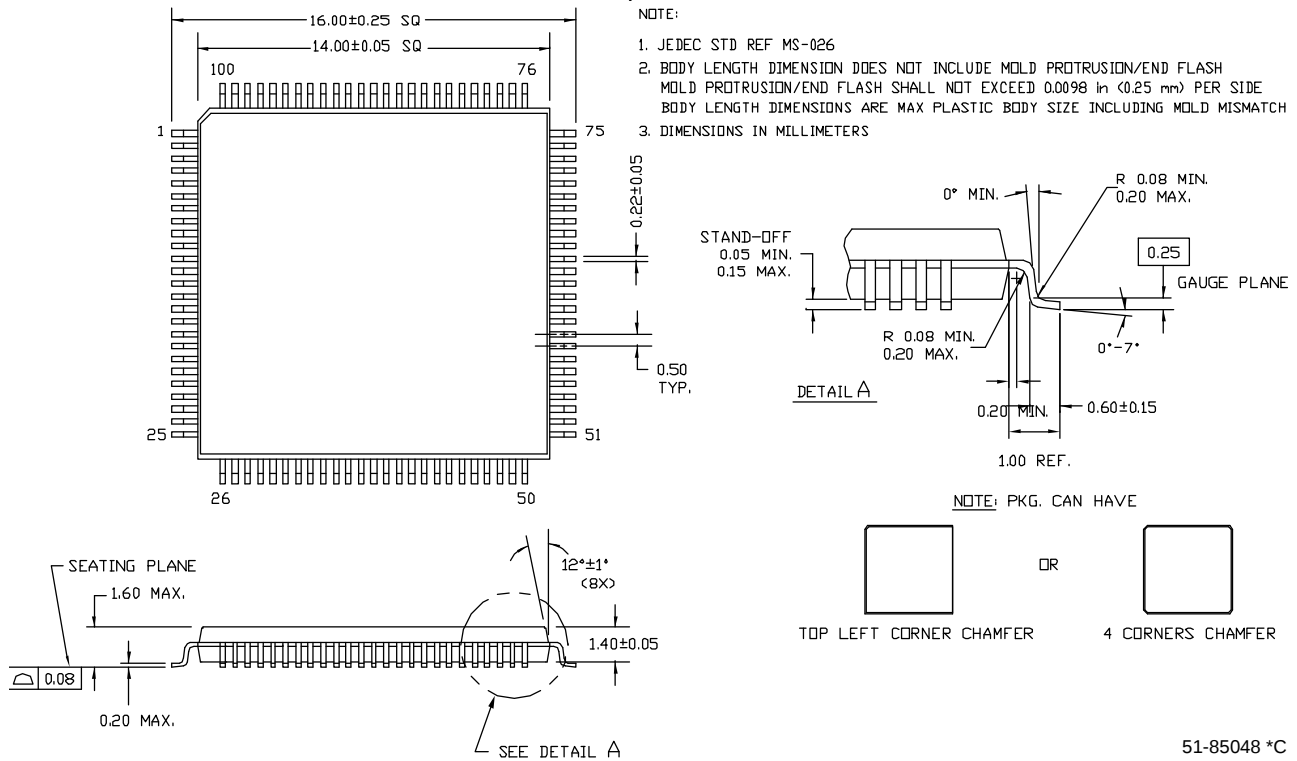
| Speed (ns)            | Ordering Code     | Package Diagram | Package Type                          | Operating Range |
|-----------------------|-------------------|-----------------|---------------------------------------|-----------------|
| 6.5 <sup>[1, 2]</sup> | CY7C09379V-6AC    | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09379V-6AXC   |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |
| 7.5 <sup>[2]</sup>    | CY7C09379V-7AC    | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
| 9                     | CY7C09379V-9AC    | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09379V-9AI    | 51-85048        | 100-Pin Thin Quad Flat Pack           | Industrial      |
| 12                    | CY7C09379V-12AC   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09379V-12AXC  |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |
|                       | CY7C09379V-12AXCT |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |

### 64K x18 3.3V Synchronous Dual-Port SRAM

| Speed (ns)            | Ordering Code    | Package Diagram | Package Type                          | Operating Range |
|-----------------------|------------------|-----------------|---------------------------------------|-----------------|
| 6.5 <sup>[1, 2]</sup> | CY7C09389V-6AC   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09389V-6AXC  |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |
| 7.5 <sup>[2]</sup>    | CY7C09389V-7AC   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09389V-7AXC  |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |
| 9                     | CY7C09389V-9AC   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09389V-9AXC  |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |
|                       | CY7C09389V-9AI   | 51-85048        | 100-Pin Thin Quad Flat Pack           | Industrial      |
|                       | CY7C09389V-9AXI  |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |
| 12                    | CY7C09389V-12AC  | 51-85048        | 100-Pin Thin Quad Flat Pack           | Commercial      |
|                       | CY7C09389V-12AXC |                 | 100-Pin Thin Quad Flat Pack (Pb-Free) |                 |

## Package Diagrams

Figure 17. 100-Pin Thin Plastic Quad Flat Pack (TQFP), 51-85048



## Document History Page

| Document Title: CY7C09269V/79V/89V CY7C09369V/79V/89V 3.3V 16K/32K/64K x 16/18 Synchronous Dual-Port Static RAM<br>Document Number: 38-06056 |         |                 |                 |                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------|---------|-----------------|-----------------|------------------------------------------------------------|
| Revision                                                                                                                                     | ECN     | Submission Date | Orig. of Change | Description of Change                                      |
| **                                                                                                                                           | 110215  | 12/18/01        | SZV             | Change from Spec number: 38-00668 to 38-06056              |
| *A                                                                                                                                           | 122306  | 12/27/02        | RBI             | Power up requirements added to Maximum Ratings Information |
| *B                                                                                                                                           | 344354  | See ECN         | PCX             | Added Pb-Free Part Ordering Information                    |
| *C                                                                                                                                           | 2678221 | 03/25/2009      | VKN/AESA        | Added CY7C09379V-12AXCT part. Updated 51-85048 to *C.      |

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