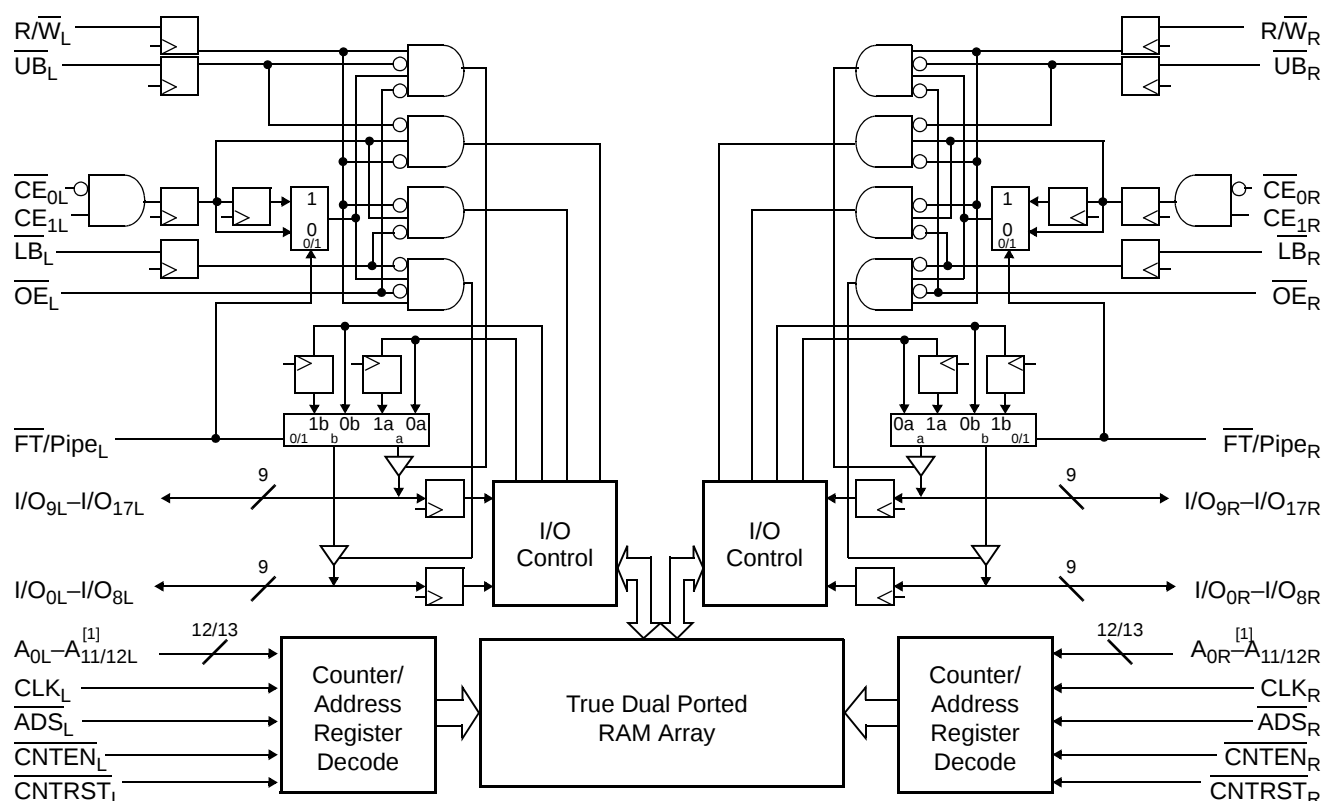


# 3.3 V 4 K/8 K × 18 Synchronous Dual Port Static RAM

## Features

- True dual ported memory cells which allow simultaneous access of the same memory location
- Two flow-through/pipelined devices
  - 4 K × 18 organization (CY7C09349AV)
  - 8 K × 18 organization (CY7C09359AV)
- Three modes
  - Flow-through
  - Pipelined
  - Burst
- Pipelined output mode on both ports allows fast 67-MHz operation
- 0.35-micron complementary metal oxide semiconductor (CMOS) for optimum speed/power
- High-speed clock to data access 9 and 12 ns (max)
- 3.3 V low operating power
  - Active = 135 mA (typical)
  - Standby = 10 μA (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 for easy depth expansion
- Upper and lower byte controls for bus matching
- Automatic power-down
- Available in 100-pin thin quad flat pack (TQFP)

## Logic Block Diagram



### Note

1. A<sub>0</sub>-A<sub>11</sub> for 4 K; A<sub>0</sub>-A<sub>12</sub> for 8 K devices.

## Functional Description

The CY7C09349AV and CY7C09359AV are high-speed 3.3 V synchronous CMOS 4 K and 8 K × 18 dual-port static RAMs. Two ports are provided, permitting independent, simultaneous access for reads and writes to any location in memory.<sup>[2]</sup> Registers on control, address, and data lines allow for minimal set-up and hold times. In pipelined output mode, data is registered for decreased cycle time. Clock to data valid  $t_{CD2} = 9$  ns (pipelined). Flow-through mode can also be used to bypass the pipelined output register to eliminate access latency. In flow-through mode data will be available  $t_{CD1} = 20$  ns after the address is clocked into the device. Pipelined output or flow-through mode is selected via the  $\overline{FT}/Pipe$  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  $\overline{CE}_0$  or LOW on  $CE_1$  for one clock cycle will power down the internal circuitry to reduce the static power consumption. The use of multiple chip enables allows easier banking of multiple chips for depth expansion configurations. In the pipelined mode, one cycle is required with  $\overline{CE}_0$  LOW and  $CE_1$  HIGH to reactivate the outputs.

Counter enable inputs are provided to stall the operation of the address input and utilize 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 will increment on each LOW-to-HIGH transition of that port's clock signal. This will read/write one word from/into each successive address location until CNTEN is deasserted. The counter can address the entire memory array and will 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

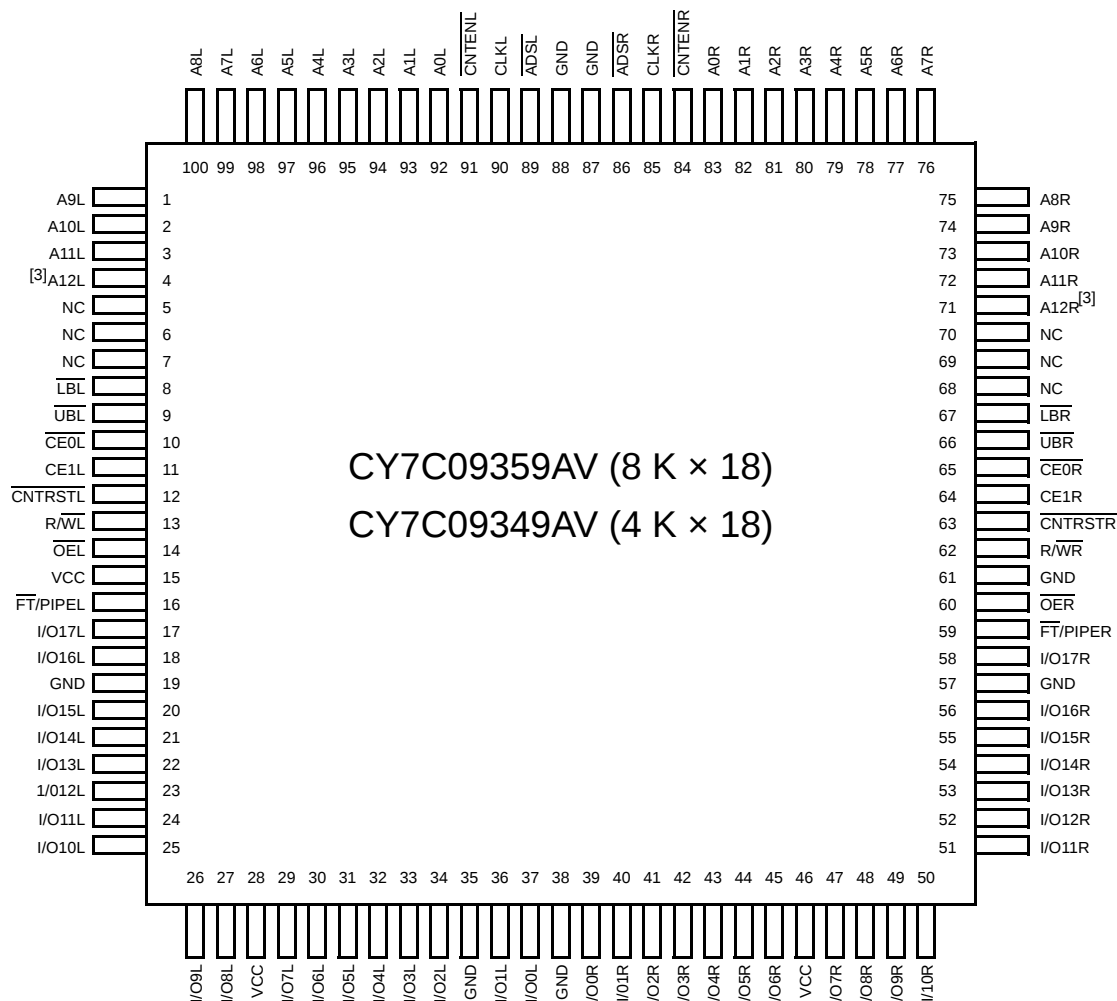
2. When simultaneously writing to the same location, final value cannot be guaranteed.

## Contents

|                                                       |          |                                                      |            |
|-------------------------------------------------------|----------|------------------------------------------------------|------------|
| <b>PPin Configuration .....</b>                       | <b>4</b> | Pipelined Read with Address Counter Advance.....     | 12         |
| <b>Selection Guide .....</b>                          | <b>4</b> | Flow-through Read with Address Counter Advance ..    | 12         |
| <b>Pin Definitions .....</b>                          | <b>5</b> | Write with Address Counter Advance (Flow-through or  |            |
| <b>Maximum Ratings .....</b>                          | <b>5</b> | Pipelined Outputs) .....                             | 13         |
| <b>Operating Range.....</b>                           | <b>5</b> | Counter Reset (Pipelined Outputs.....)               | 14         |
| <b>Electrical Characteristics.....</b>                | <b>6</b> | <b>Read/Write and Enable Operatio.....</b>           | <b>n15</b> |
| <b>Capacitance .....</b>                              | <b>6</b> | <b>Address Counter Control Operation.....</b>        | <b>15</b>  |
| <b>AC Test Loads .....</b>                            | <b>6</b> | <b>Ordering Information.....</b>                     | <b>16</b>  |
| <b>Switching Characteristics.....</b>                 | <b>7</b> | 4 K × 18 3.3 V Synchronous Dual-Port SRAM.....       | 16         |
| <b>Switching Waveforms .....</b>                      | <b>8</b> | 8 K × 18 3.3 V Synchronous Dual-Port SRAM.....       | 16         |
| Read Cycle for Flow-through                           |          | Ordering Code Definitions .....                      | 16         |
| Output (FT/PIPE = VIL) .....                          | 8        | <b>Package Diagram.....</b>                          | <b>17</b>  |
| Read Cycle for Pipelined                              |          | <b>Acronyms .....</b>                                | <b>18</b>  |
| Operation (FT/PIPE = VIH).....                        | 8        | <b>Document Conventions .....</b>                    | <b>18</b>  |
| Bank Select Pipelined Read .....                      | 9        | Units of Measure .....                               | 18         |
| Left Port Write to Flow-through Right Port Read.....  | 9        | <b>Document History Page .....</b>                   | <b>19</b>  |
| Pipelined Read-to-Write-to-Read (OE = VIL) .....      | 10       | <b>Sales, Solutions, and Legal Information .....</b> | <b>20</b>  |
| Pipelined Read-to-Write-to-Read (OE Controlled) ..... | 10       | Worldwide Sales and Design Support.....              | 20         |
| Flow-through Read-to-Write-to-Read (OE = VIL) .....   | 11       | Products .....                                       | 20         |
| Flow-through Read-to-Write-to-Read                    |          | PSoC Solutions .....                                 | 20         |
| (OE Controlled) .....                                 | 11       |                                                      |            |

## Pin Configuration

Figure 1. 100-pin TQFP (Top View)



## Selection Guide

|                                                                           | <b>CY7C09349AV</b><br><b>CY7C09359AV</b><br><b>-9</b> | <b>CY7C09349AV</b><br><b>-12</b> |
|---------------------------------------------------------------------------|-------------------------------------------------------|----------------------------------|
| f <sub>MAX2</sub> (MHz) (pipelined)                                       | 67                                                    | 50                               |
| Max access time (ns) (clock to data, pipelined)                           | 9                                                     | 12                               |
| Typical operating current I <sub>CC</sub> (mA)                            | 135                                                   | 115                              |
| Typical standby current for I <sub>SB1</sub> (mA) (both ports TTL level)  | 20                                                    | 20                               |
| Typical standby current for I <sub>SB3</sub> (μA) (both ports CMOS level) | 10                                                    | 10                               |

### Note

3. This pin is NC for CY7C09349AV.

## Pin Definitions

| Left Port                             | Right Port                            | Description                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A <sub>0L</sub> –A <sub>12L</sub>     | A <sub>0R</sub> –A <sub>12R</sub>     | Address inputs (A <sub>0</sub> –A <sub>11</sub> for 4 K, A <sub>0</sub> –A <sub>12</sub> for 8 K devices).                                                                                                                                                                                                                                    |
| ADS <sub>L</sub>                      | ADS <sub>R</sub>                      | Address strobe input. Used as an address qualifier. This signal should be asserted LOW during normal read or write transactions. Asserting this signal LOW also loads the burst address counter with data present on the I/O pins.                                                                                                            |
| CE <sub>0L</sub> , CE <sub>1L</sub>   | CE <sub>0R</sub> , CE <sub>1R</sub>   | Chip enable input. 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>                      | Clock signal. 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>                    | Counter enable input. Asserting this signal LOW increments the burst address 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>                   | Counter reset input. Asserting this signal LOW resets the burst address 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> | Data bus input/output (I/O <sub>0</sub> –I/O <sub>15</sub> for ×16 devices).                                                                                                                                                                                                                                                                  |
| LB <sub>L</sub>                       | LB <sub>R</sub>                       | Lower byte select input. Asserting this signal LOW enables read and write operations to the lower byte (I/O <sub>0</sub> –I/O <sub>8</sub> for ×18, I/O <sub>0</sub> –I/O <sub>7</sub> for ×16) 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>                       | Upper byte select input. 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>                       | Output enable input. 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>                      | Read/write enable input. 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>                  | Flow-through/pipelined select input. For flow-through mode operation, assert this pin LOW. For pipelined mode operation, assert this pin HIGH.                                                                                                                                                                                                |
| GND                                   |                                       | Ground input.                                                                                                                                                                                                                                                                                                                                 |
| NC                                    |                                       | No connect.                                                                                                                                                                                                                                                                                                                                   |
| V <sub>CC</sub>                       |                                       | Power input.                                                                                                                                                                                                                                                                                                                                  |

## Maximum Ratings

Exceeding maximum ratings may impair the useful life of the device. 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 ..... –0.5 V to +4.6 V

DC voltage applied to outputs in high Z state ..... –0.5 V to V<sub>CC</sub> + 0.5 V

DC input voltage ..... –0.5 V to V<sub>CC</sub> + 0.5 V

Output current into outputs (LOW) ..... 20 mA

Static discharge voltage ..... > 2001 V

Latch-up current ..... > 200 mA

## Operating Range

| Range      | Ambient Temperature | V <sub>CC</sub> |
|------------|---------------------|-----------------|
| Commercial | 0 °C to +70 °C      | 3.3 V ± 300 mV  |
| Industrial | –40 °C to +85 °C    | 3.3 V ± 300 mV  |

## Electrical Characteristics

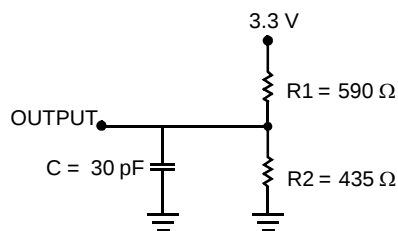
Over the Operating Range

| Parameter        | Description                                                                                                                           |            | CY7C09349AV<br>CY7C09359AV |            |     |     |     |     | Unit |    |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------|------------|-----|-----|-----|-----|------|----|
|                  |                                                                                                                                       |            | -9                         |            |     | -12 |     |     |      |    |
|                  |                                                                                                                                       |            | Min                        | Typ        | Max | Min | Typ | Max |      |    |
| V <sub>OH</sub>  | Output HIGH voltage (V <sub>CC</sub> = Min, I <sub>OH</sub> = -4.0 mA)                                                                |            | 2.4                        | -          | -   | 2.4 | -   | -   | V    |    |
| V <sub>OL</sub>  | Output LOW voltage (V <sub>CC</sub> = Min, I <sub>OH</sub> = +4.0 mA)                                                                 |            | -                          |            | 0.4 | -   |     | 0.4 | V    |    |
| V <sub>IH</sub>  | Input HIGH voltage                                                                                                                    |            | 2.0                        |            | -   | 2.0 |     | -   | V    |    |
| V <sub>IL</sub>  | Input LOW voltage                                                                                                                     |            | -                          |            | 0.8 | -   |     | 0.8 | V    |    |
| I <sub>OZ</sub>  | Output leakage current                                                                                                                |            | -10                        |            | 10  | -10 |     | 10  | μA   |    |
| I <sub>CC</sub>  | Operating current (V <sub>CC</sub> = Max, I <sub>OUT</sub> = 0 mA) outputs disabled                                                   | Commercial | -                          | 135        | 230 | -   | 115 | 180 | mA   |    |
|                  |                                                                                                                                       | Industrial |                            | -          |     |     | 155 | 250 | mA   |    |
| I <sub>SB1</sub> | Standby current (both ports TTL level) <sup>[4]</sup><br>CE <sub>L</sub> and CE <sub>R</sub> ≥ V <sub>IH</sub> , f = f <sub>MAX</sub> |            |                            | Commercial | 20  |     | 75  | 20  | 70   | mA |
|                  |                                                                                                                                       |            |                            | Industrial | -   |     | 30  | 80  | mA   |    |
| I <sub>SB2</sub> | Standby current (one port TTL level) <sup>[4]</sup><br>CE <sub>L</sub> or CE <sub>R</sub> ≥ V <sub>IH</sub> , f = f <sub>MAX</sub>    |            |                            | Commercial | 95  |     | 155 | 85  | 140  | mA |
|                  |                                                                                                                                       |            |                            | Industrial | -   |     | 95  | 150 | mA   |    |
| I <sub>SB3</sub> | Standby current (both ports CMOS level) <sup>[4]</sup><br>CE <sub>L</sub> and CE <sub>R</sub> ≥ V <sub>CC</sub> - 0.2 V, f = 0        |            |                            | Commercial | 10  |     | 500 | 10  | 500  | μA |
|                  |                                                                                                                                       |            |                            | Industrial | -   |     | 10  | 500 | μA   |    |
| I <sub>SB4</sub> | Standby current (one port CMOS level) <sup>[4]</sup><br>CE <sub>L</sub> or CE <sub>R</sub> ≥ V <sub>IH</sub> , f = f <sub>MAX</sub>   |            |                            | Commercial | 85  |     | 115 | 75  | 100  | mA |
|                  |                                                                                                                                       |            |                            | Industrial | -   |     | 85  | 110 | mA   |    |

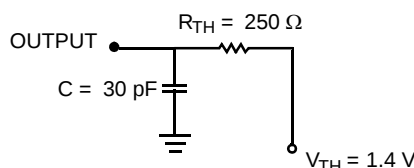
## Capacitance

| Parameter        | Description        | Test Conditions                                               | Max | Unit |
|------------------|--------------------|---------------------------------------------------------------|-----|------|
| C <sub>IN</sub>  | Input capacitance  | T <sub>A</sub> = 25 °C, f = 1 MHz,<br>V <sub>CC</sub> = 3.3 V | 10  | pF   |
| C <sub>OUT</sub> | Output capacitance |                                                               | 10  | pF   |

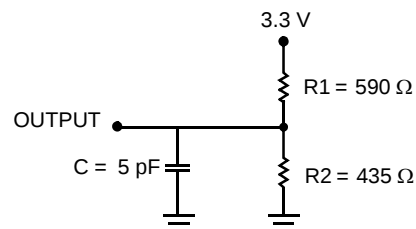
## AC Test Loads



(a) Normal Load (Load 1)



(b) Thévenin Equivalent (Load 1)



(c) Three-State Delay (Load 2)  
(Used for t<sub>CKLZ</sub>, t<sub>OLZ</sub>, & t<sub>OHZ</sub> including scope and jig)

### Notes

4. CE<sub>L</sub> and CE<sub>R</sub> are internal signals. 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>).

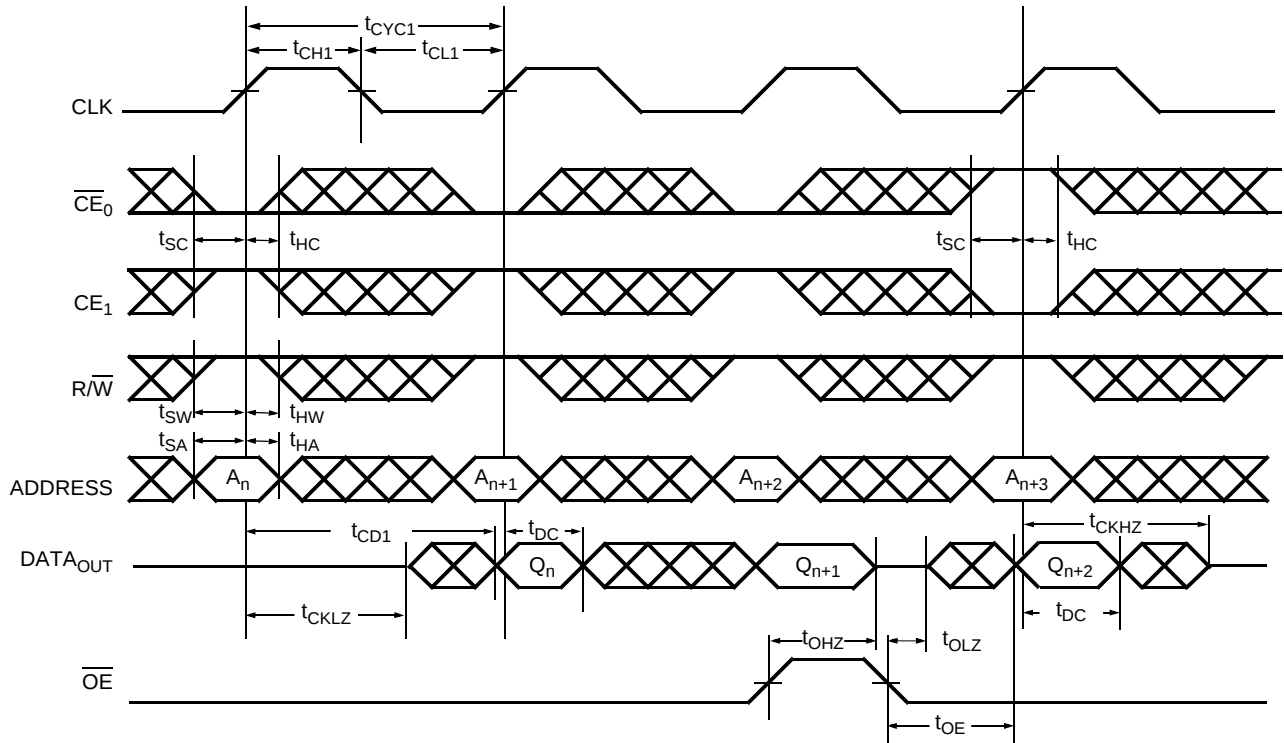
## Switching Characteristics

Over the Operating Range

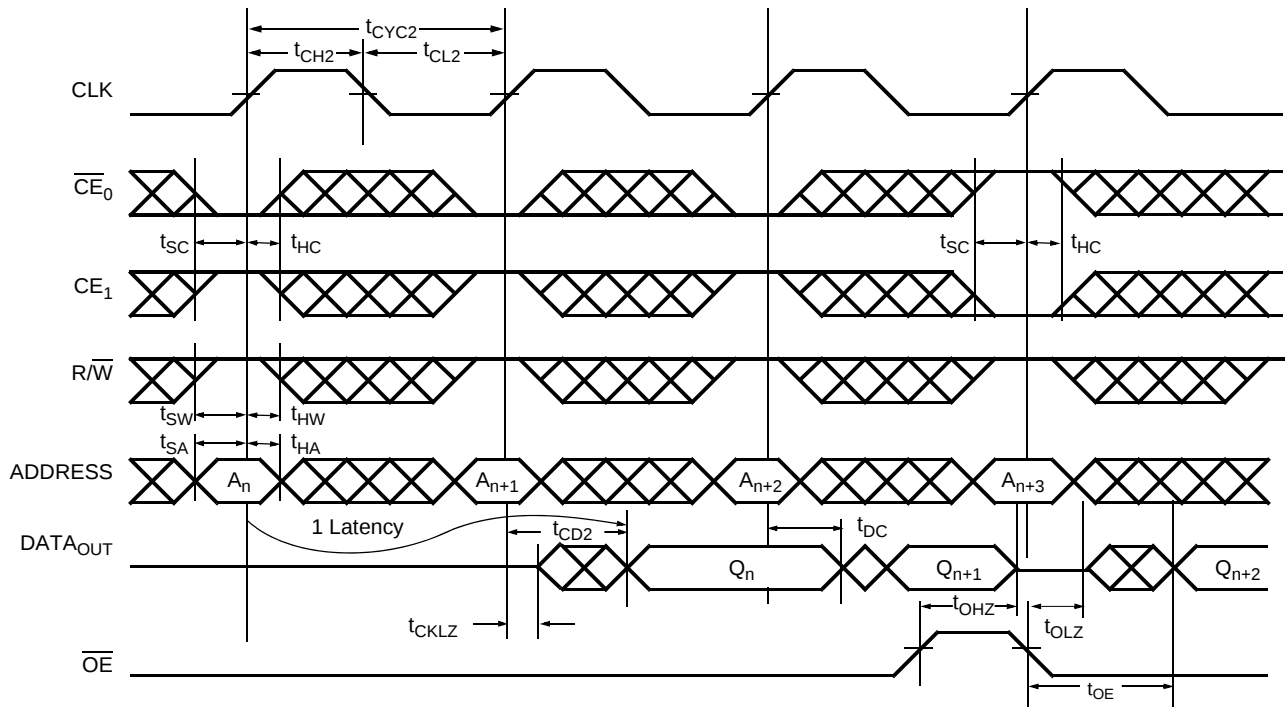
| Parameter           | Description                              | CY7C09349AV<br>CY7C09359AV |     |     |     | Unit |
|---------------------|------------------------------------------|----------------------------|-----|-----|-----|------|
|                     |                                          | –9                         |     | –12 |     |      |
|                     |                                          | Min                        | Max | Min | Max |      |
| f <sub>MAX1</sub>   | f <sub>Max</sub> flow-through            | –                          | 40  | –   | 33  | MHz  |
| f <sub>MAX2</sub>   | f <sub>Max</sub> pipelined               | –                          | 67  | –   | 50  | MHz  |
| t <sub>CYC1</sub>   | Clock cycle time – flow-through          | 25                         | –   | 30  | –   | ns   |
| t <sub>CYC2</sub>   | Clock cycle time – pipelined             | 15                         | –   | 20  | –   | ns   |
| t <sub>CH1</sub>    | Clock HIGH time – flow-through           | 12                         | –   | 12  | –   | ns   |
| t <sub>CL1</sub>    | Clock LOW time – flow-through            | 12                         | –   | 12  | –   | ns   |
| t <sub>CH2</sub>    | Clock HIGH time – pipelined              | 6                          | –   | 8   | –   | ns   |
| t <sub>CL2</sub>    | Clock LOW time – pipelined               | 6                          | –   | 8   | –   | ns   |
| t <sub>R</sub>      | Clock rise time                          | –                          | 3   | –   | 3   | ns   |
| t <sub>F</sub>      | Clock fall time                          | –                          | 3   | –   | 3   | ns   |
| t <sub>SA</sub>     | Address set-up time                      | 4                          | –   | 4   | –   | ns   |
| t <sub>HA</sub>     | Address hold time                        | 1                          | –   | 1   | –   | ns   |
| t <sub>SC</sub>     | Chip enable set-up time                  | 4                          | –   | 4   | –   | ns   |
| t <sub>HC</sub>     | Chip enable hold time                    | 1                          | –   | 1   | –   | ns   |
| t <sub>SW</sub>     | R/W set-up time                          | 4                          | –   | 4   | –   | ns   |
| t <sub>HW</sub>     | R/W hold time                            | 1                          | –   | 1   | –   | ns   |
| t <sub>SD</sub>     | Input data set-up time                   | 4                          | –   | 4   | –   | ns   |
| t <sub>HD</sub>     | Input data hold time                     | 1                          | –   | 1   | –   | ns   |
| t <sub>SAD</sub>    | ADS set-up time                          | 4                          | –   | 4   | –   | ns   |
| t <sub>HAD</sub>    | ADS hold time                            | 1                          | –   | 1   | –   | ns   |
| t <sub>SCN</sub>    | CNTEN set-up time                        | 4                          | –   | 4   | –   | ns   |
| t <sub>HCN</sub>    | CNTEN hold time                          | 1                          | –   | 1   | –   | ns   |
| t <sub>SRST</sub>   | CNTRST set-up time                       | 4                          | –   | 4   | –   | ns   |
| t <sub>HRST</sub>   | CNTRST hold time                         | 1                          | –   | 1   | –   | ns   |
| t <sub>OE</sub>     | Output enable to data valid              | –                          | 10  | –   | 12  | ns   |
| t <sub>OLZ</sub>    | OE to low Z                              | 2                          | –   | 2   | –   | ns   |
| t <sub>OHZ</sub>    | OE to high Z                             | 1                          | 7   | 1   | 7   | ns   |
| t <sub>CD1</sub>    | Clock to data valid – flow-through       | –                          | 20  | –   | 25  | ns   |
| t <sub>CD2</sub>    | Clock to data valid – pipelined          | –                          | 9   | –   | 12  | ns   |
| t <sub>DC</sub>     | Data output hold after clock HIGH        | 2                          | –   | 2   | –   | ns   |
| t <sub>CKHZ</sub>   | Clock HIGH to output high Z              | 2                          | 9   | 2   | 9   | ns   |
| t <sub>CKLZ</sub>   | Clock HIGH to output low Z               | 2                          | –   | 2   | –   | ns   |
| Port to port delays |                                          |                            |     |     |     |      |
| t <sub>CWDD</sub>   | Write port clock HIGH to read data delay | –                          | 40  | –   | 40  | ns   |
| t <sub>CCS</sub>    | Clock to clock set-up time               | –                          | 15  | –   | 15  | ns   |

## Switching Waveforms

### Read Cycle for Flow-through Output ( $\overline{\text{FT/PIPE}} = V_{\text{IL}}$ )<sup>[5, 6, 7, 8]</sup>



### Read Cycle for Pipelined Operation ( $\overline{\text{FT/PIPE}} = V_{\text{IH}}$ )<sup>[5, 6, 7, 8]</sup>

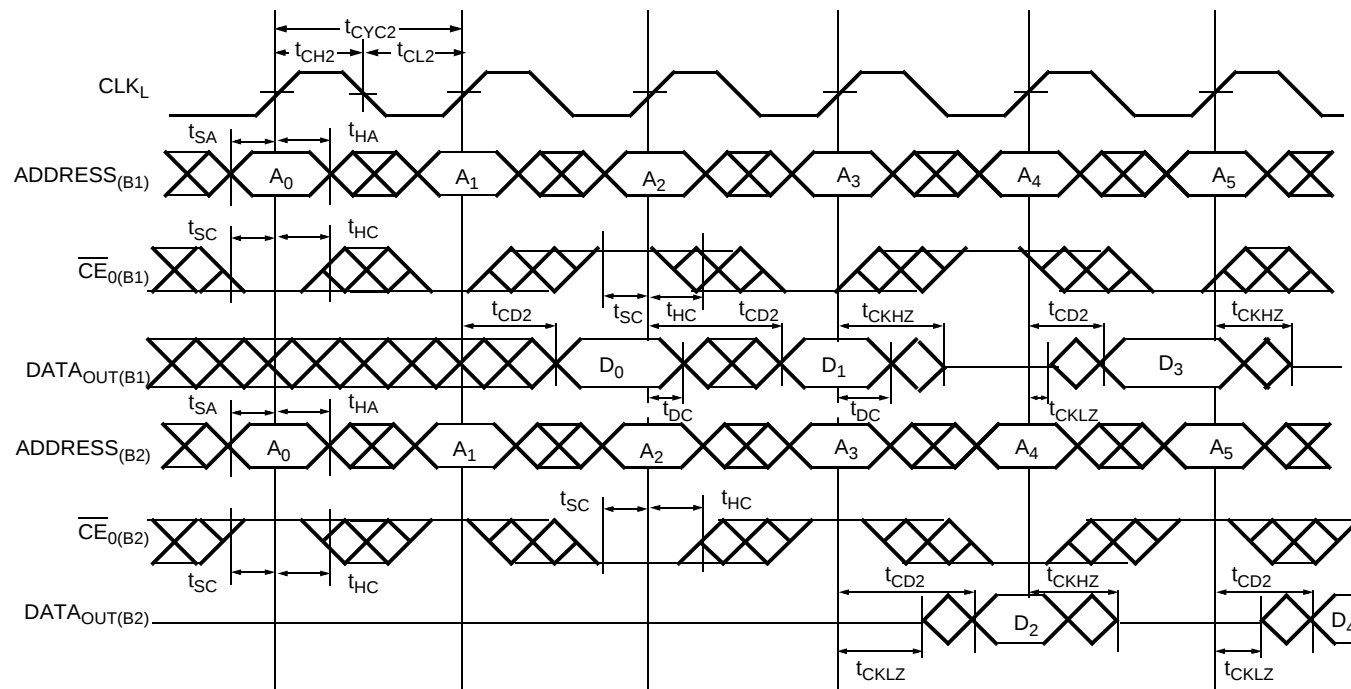


#### Notes

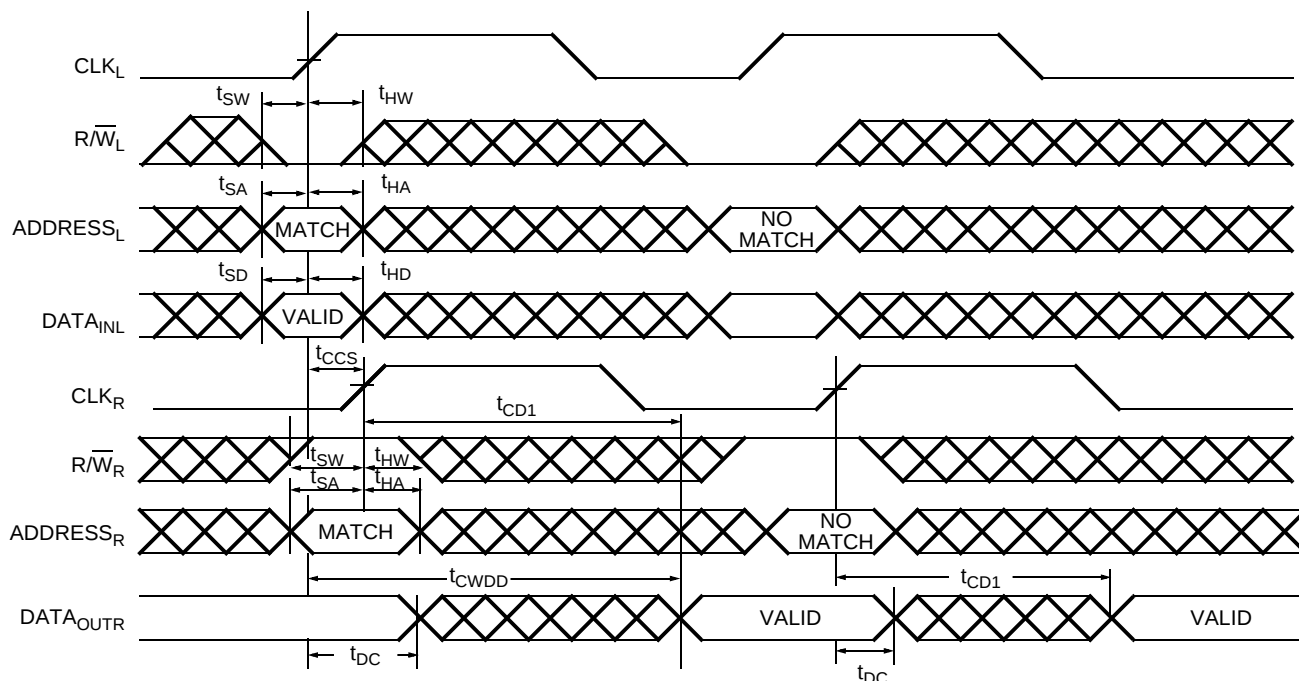
5.  $\overline{\text{OE}}$  is asynchronously controlled; all other inputs are synchronous to the rising clock edge.
6.  $\text{ADS} = V_{\text{IL}}$ ,  $\text{CNTEN}$  and  $\text{CNTRST} = V_{\text{IH}}$ .
7. The output is disabled (high-impedance state) by  $\overline{\text{CE}}_0 = V_{\text{IH}}$  or  $\text{CE}_1 = V_{\text{IL}}$  following the next rising edge of the clock.
8. 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)

### Bank Select Pipelined Read<sup>[9, 10]</sup>



### Left Port Write to Flow-through Right Port Read<sup>[11, 12, 13, 14]</sup>



#### Notes

9. 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 data sheet.

ADDRESS<sub>(B1)</sub> = ADDRESS<sub>(B2)</sub>.

10. UB, LB, OE and ADS = V<sub>IL</sub>; CE<sub>1(B1)</sub>, CE<sub>1(B2)</sub>, R/W, CNTEN, and CNTRST = V<sub>IH</sub>.

11. The same waveforms apply for a right port write to flow-through left port read.

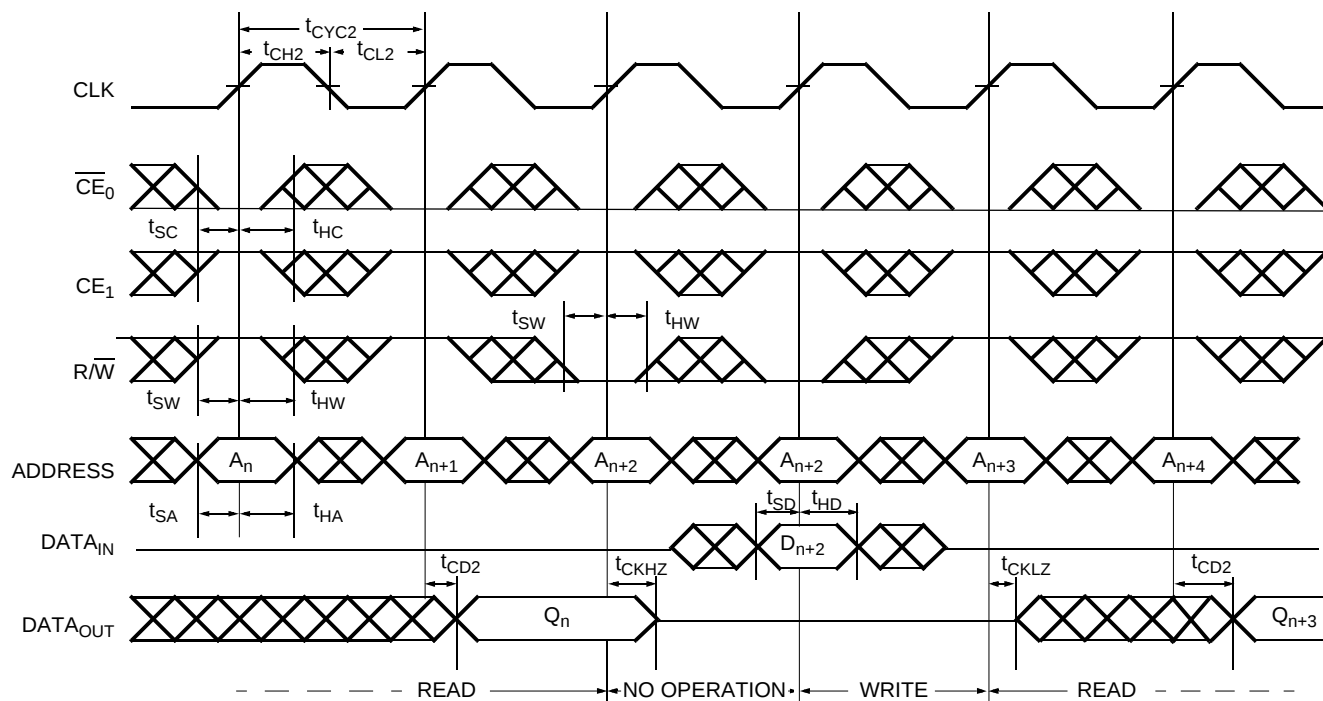
12. CE<sub>0</sub>, UB, LB, and ADS = V<sub>IL</sub>; CE<sub>1</sub>, CNTEN, and CNTRST = V<sub>IH</sub>.

13. OE = V<sub>IL</sub> for the right port, which is being read from. OE = V<sub>IH</sub> for the left port, which is being written to.

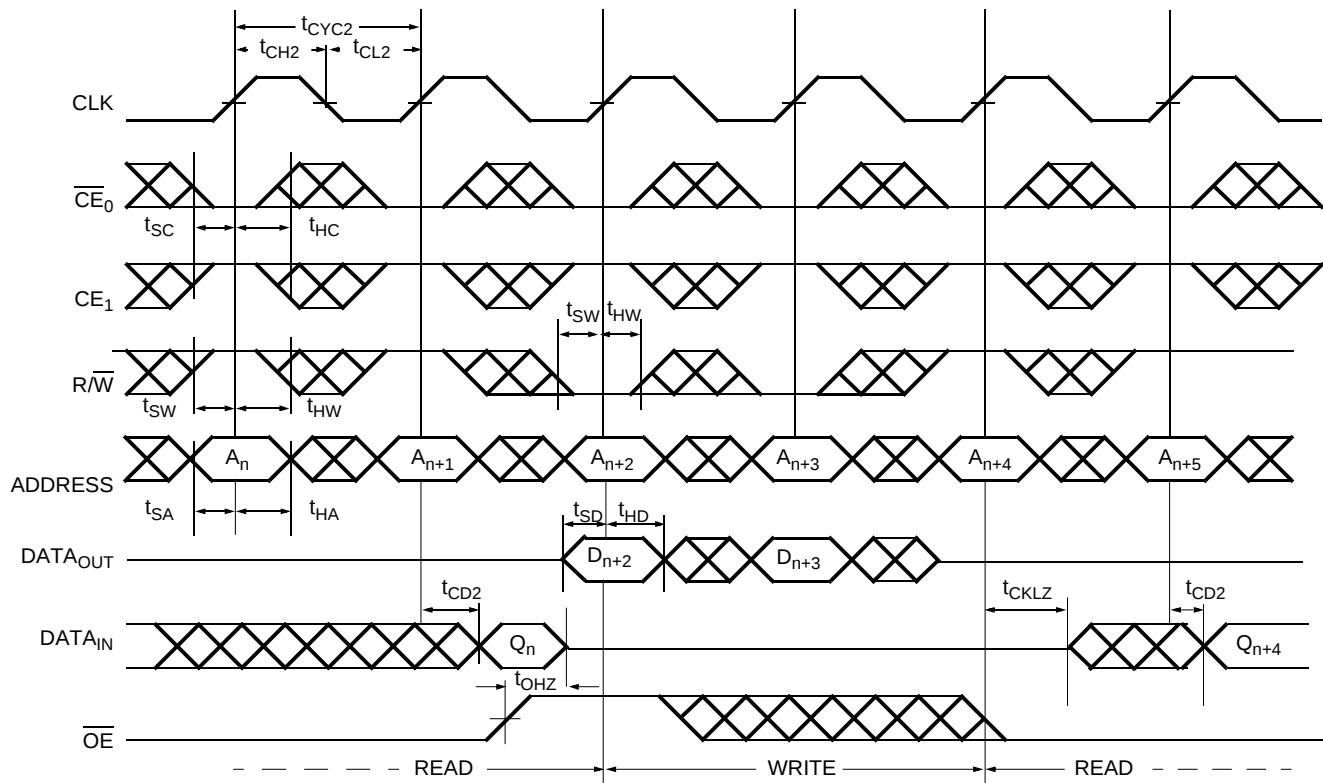
14. If t<sub>CCS</sub> ≤ maximum specified, then data from right port READ is not valid until the maximum specified for t<sub>CWDD</sub>. If t<sub>CCS</sub> > maximum specified, then data is not valid until t<sub>CCS</sub> + t<sub>CD1</sub>. t<sub>CWDD</sub> does not apply in this case.

## Switching Waveforms (continued)

### Pipelined Read-to-Write-to-Read ( $\overline{OE} = V_{IL}$ )<sup>[15, 16, 17, 18]</sup>



### Pipelined Read-to-Write-to-Read ( $\overline{OE}$ Controlled)<sup>[15, 16, 17, 18]</sup>

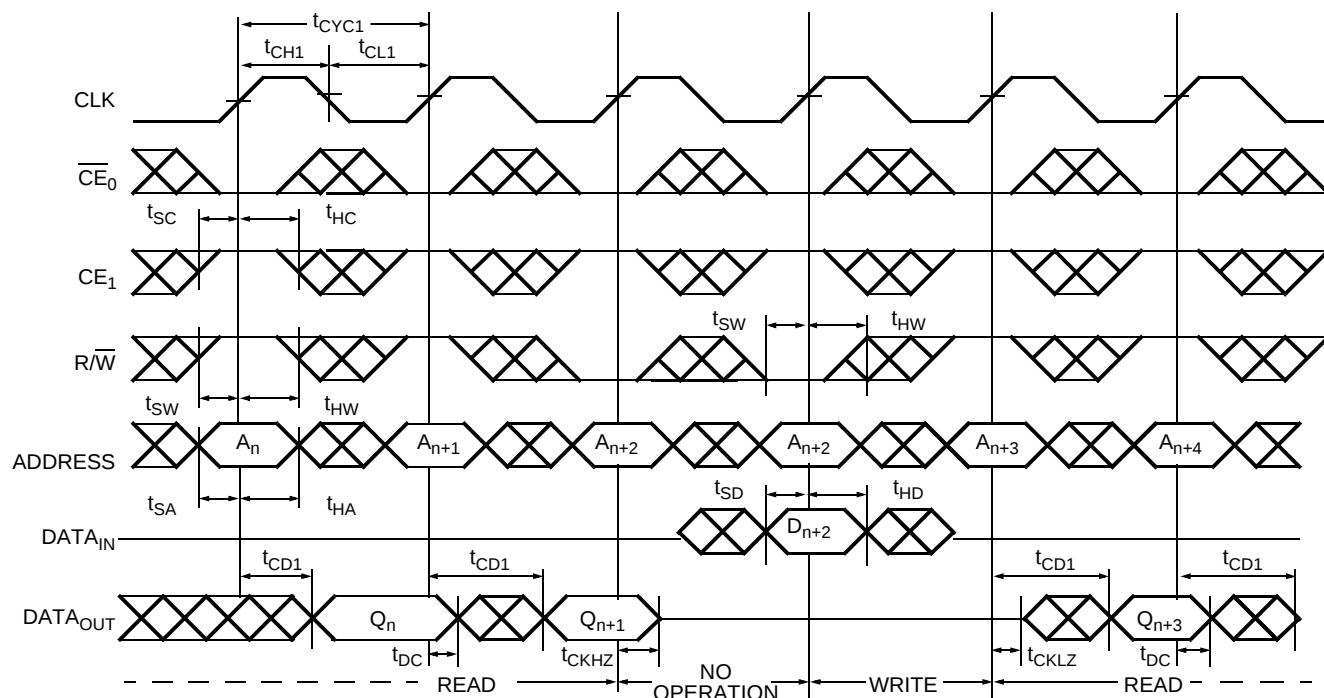


#### Notes

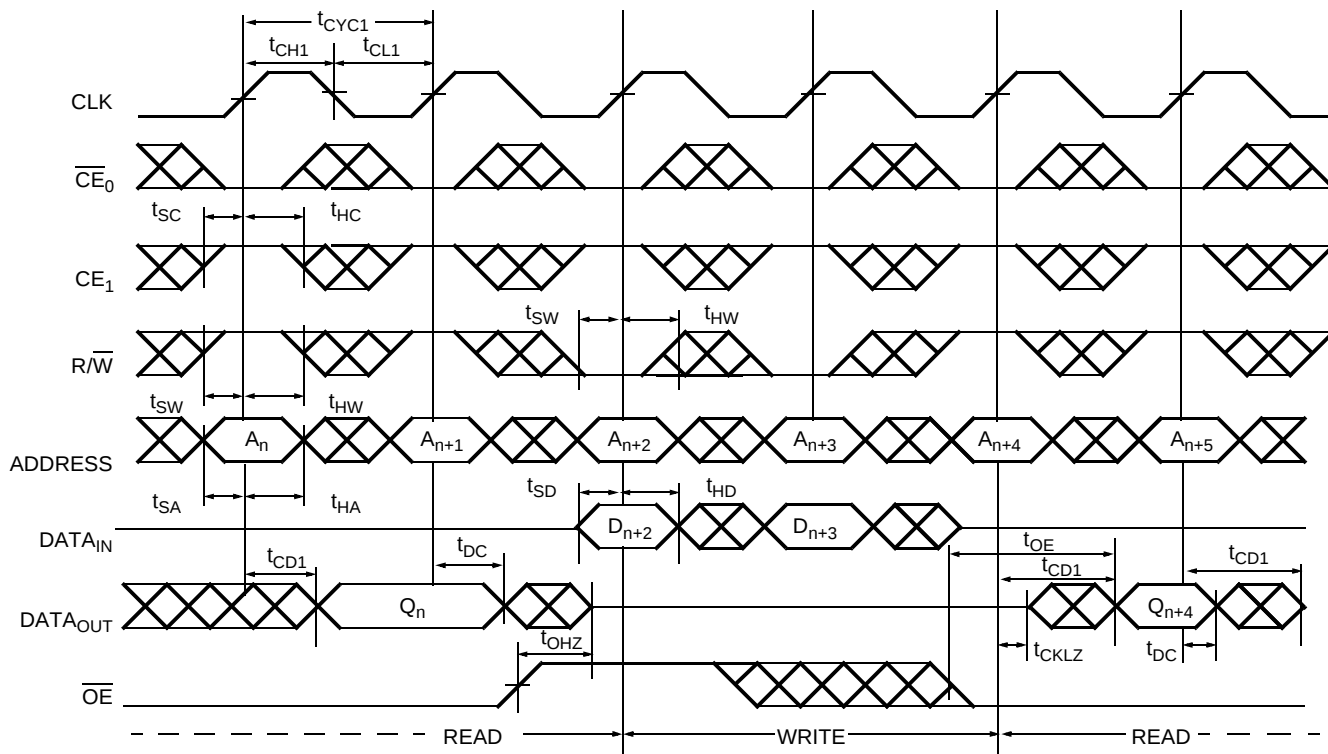
15. Addresses do not have to be accessed sequentially since  $\overline{ADS} = V_{IL}$  constantly loads the address on the rising edge of the CLK. Numbers are for reference only.
16. Output state (HIGH, LOW, or high-impedance) is determined by the previous cycle control signals.
17.  $\overline{CE}_0$  and  $\overline{ADS} = V_{IL}$ ;  $CE_1$ ,  $\overline{CNTEN}$ , and  $\overline{CNTRST} = V_{IH}$ .
18. During "No operation", data in memory at the selected address may be corrupted and should be rewritten to ensure data integrity.

## Switching Waveforms (continued)

### Flow-through Read-to-Write-to-Read ( $\overline{OE} = V_{IL}$ )<sup>[19, 20, 22, 23]</sup>



### Flow-through Read-to-Write-to-Read ( $\overline{OE}$ Controlled)<sup>[19, 20, 21, 22, 23]</sup>



#### Notes

19.  $ADS = V_{IL}$ ;  $\overline{CNTEN}$  and  $\overline{CNTRST} = V_{IH}$ .

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

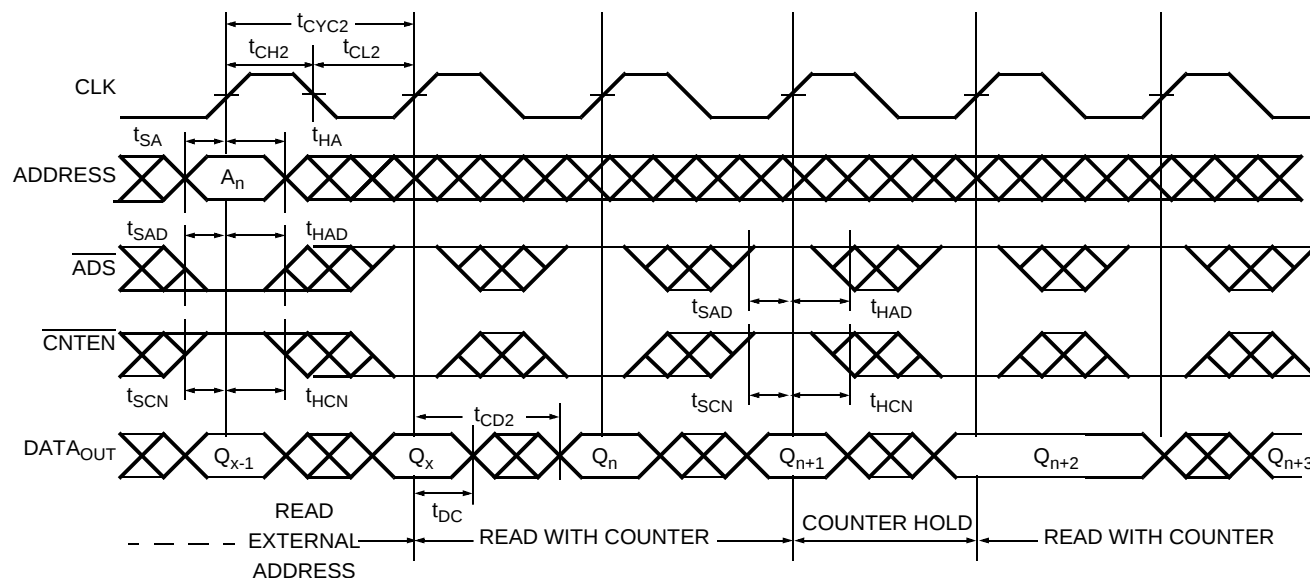
21. Output state (HIGH, LOW, or high-impedance) is determined by the previous cycle control signals.

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

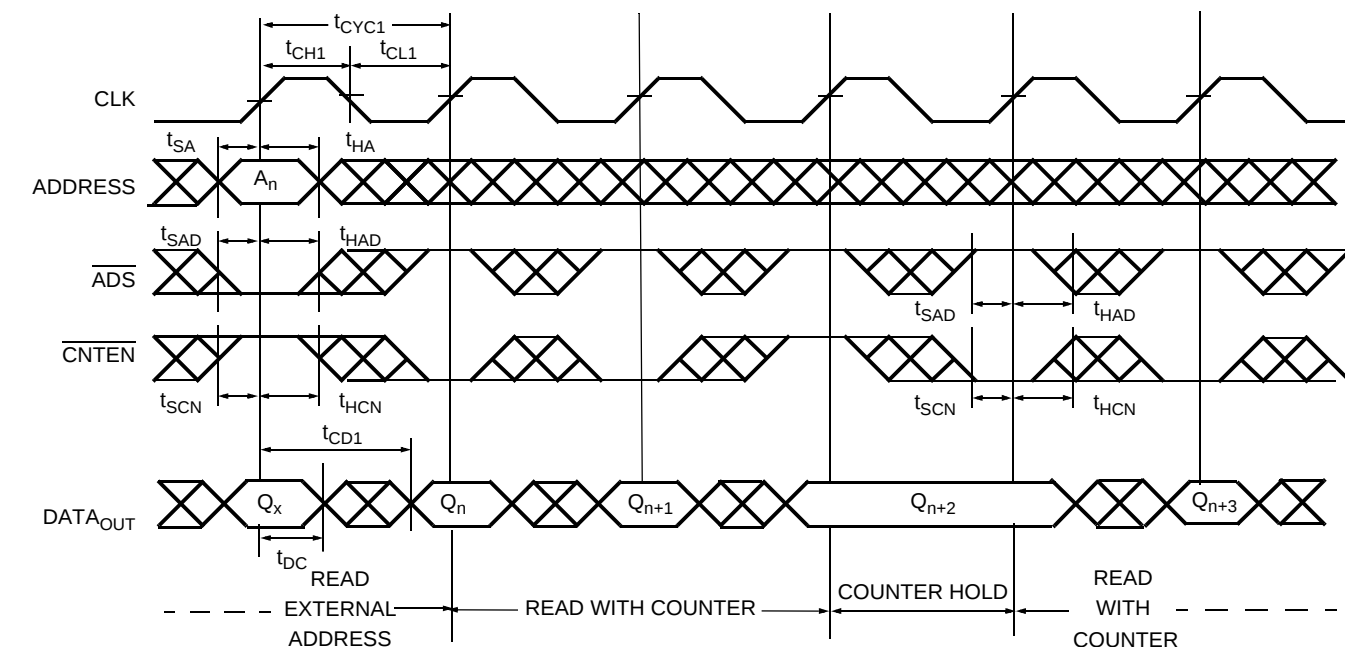
23. During "No operation," data in memory at the selected address may be corrupted and should be rewritten to ensure data integrity.

## Switching Waveforms (continued)

### Pipelined Read with Address Counter Advance<sup>[24]</sup>



### Flow-through Read with Address Counter Advance<sup>[24]</sup>

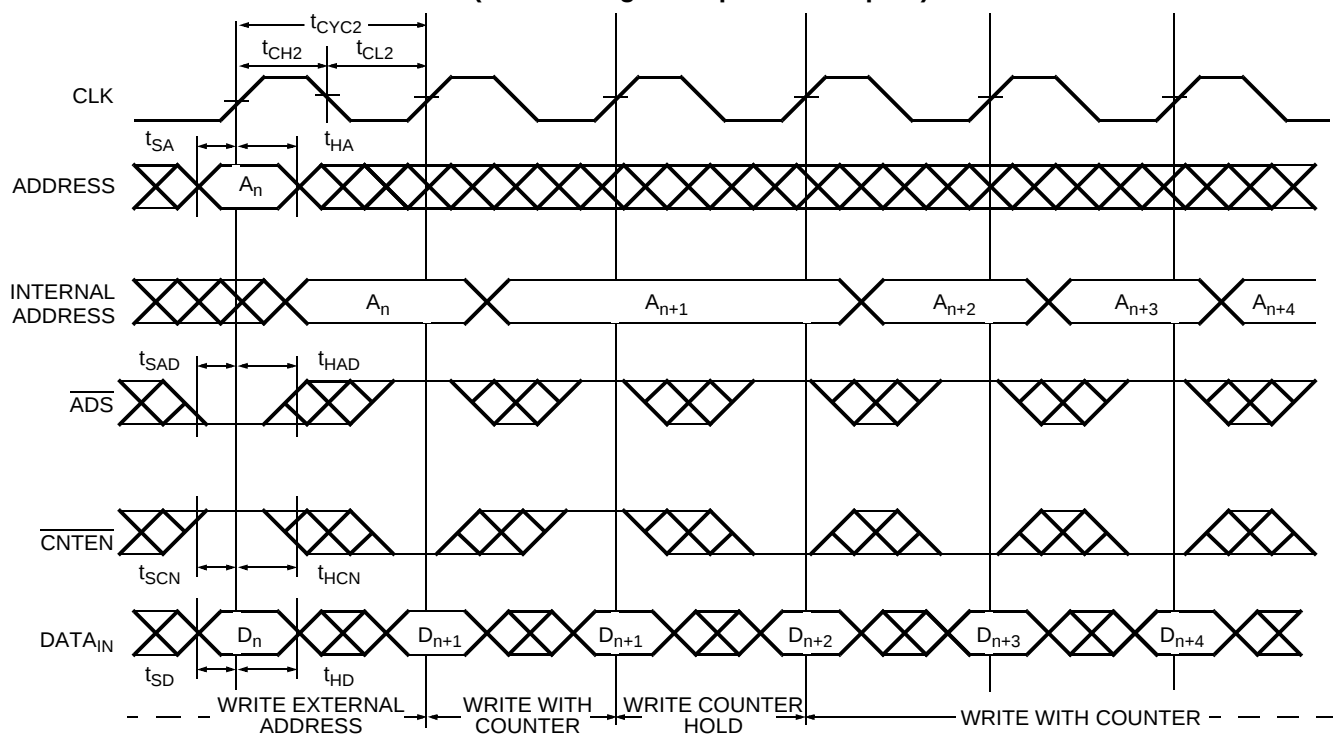


#### Note

24.  $\overline{CE_0}$  and  $\overline{OE} = V_{IL}$ ;  $\overline{CE_1}$ ,  $\overline{R/\overline{W}}$  and  $\overline{CNTRST} = V_{IH}$ .

## Switching Waveforms (continued)

### Write with Address Counter Advance (Flow-through or Pipelined Outputs)<sup>[25, 26]</sup>



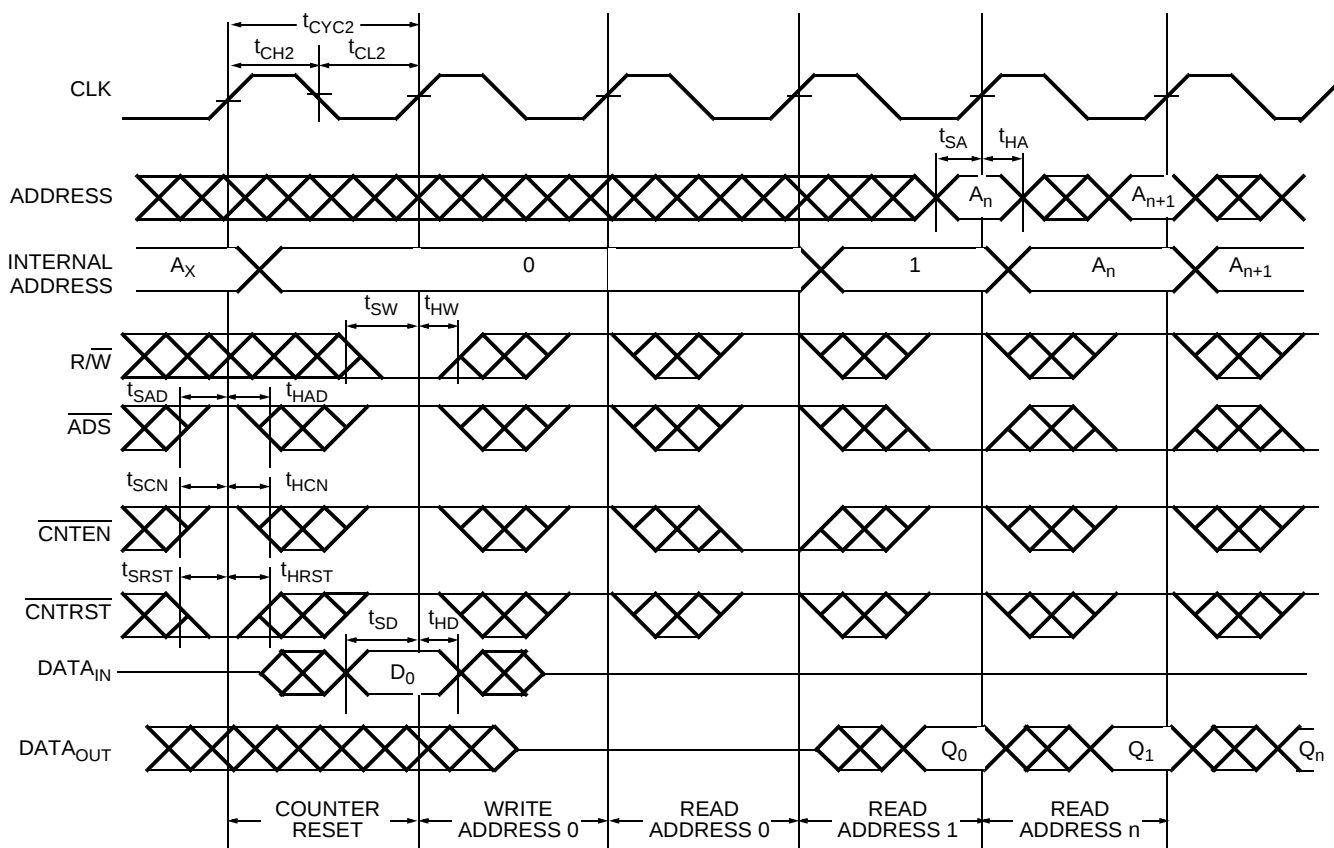
#### Notes

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

26. 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)

### Counter Reset (Pipelined Outputs)<sup>[27, 28, 29, 30]</sup>



#### Notes

27. Addresses do not have to be accessed sequentially since  $\overline{ADS} = V_{IL}$  constantly loads the address on the rising edge of the CLK. Numbers are for reference only.
28. Output state (HIGH, LOW, or high-impedance) is determined by the previous cycle control signals.
29.  $CE_0$ , UB, and LB =  $V_{IL}$ ;  $CE_1 = V_{IH}$ .
30. 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>[31, 32, 33]</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>[34]</sup> |
| X      |  | X               | L               | X   | High Z                              | Deselected <sup>[34]</sup> |
| X      |  | L               | H               | L   | D <sub>IN</sub>                     | Write                      |
| L      |  | L               | H               | H   | D <sub>OUT</sub>                    | Read <sup>[34]</sup>       |
| H      | X                                                                                 | L               | H               | X   | High Z                              | Outputs disabled           |

**Address Counter Control Operation**<sup>[31, 35, 36, 37]</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 |

**Notes**

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

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

33. OE is an asynchronous input signal.

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

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

36. Data shown for flow-through mode; pipelined mode output will be delayed by one cycle.

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

## Ordering Information

### 4 K × 18 3.3 V Synchronous Dual-Port SRAM

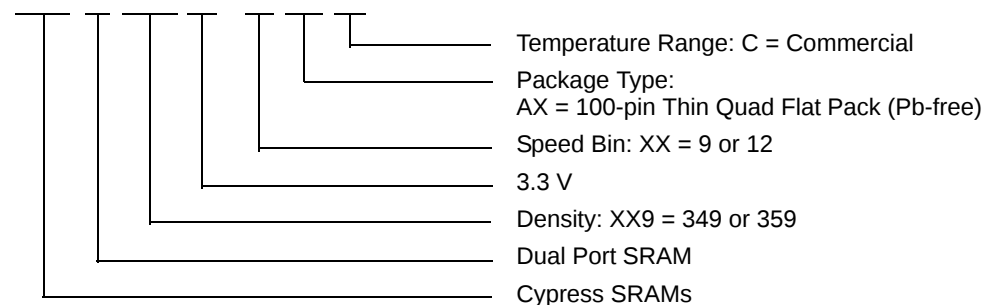
| Speed (ns) | Ordering Code     | Package Name | Package Type                        | Operating Range |
|------------|-------------------|--------------|-------------------------------------|-----------------|
| 9          | CY7C09349AV-9AXC  | A100         | 100-pin Pb-free Thin Quad Flat Pack | Commercial      |
| 12         | CY7C09349AV-12AXC | A100         | 100-pin Pb-free Thin Quad Flat Pack | Commercial      |

### 8 K × 18 3.3 V Synchronous Dual-Port SRAM

| Speed (ns) | Ordering Code    | Package Name | Package Type                        | Operating Range |
|------------|------------------|--------------|-------------------------------------|-----------------|
| 9          | CY7C09359AV-9AXC | A100         | 100-pin Pb-free Thin Quad Flat Pack | Commercial      |

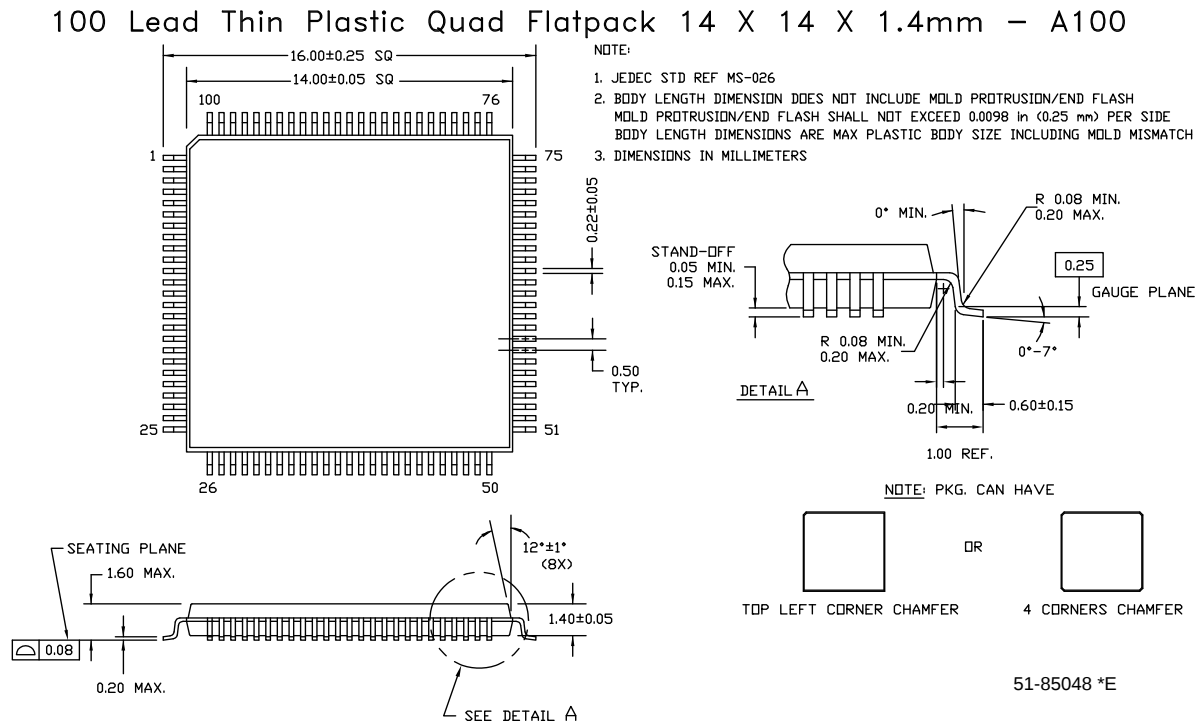
## Ordering Code Definitions

CY7C 09 XX9 AV - XX AX C



## Package Diagram

Figure 2. 100-pin Thin Plastic Quad Flat Pack (TQFP) A100



## Acronyms

| Acronym | Description                             |
|---------|-----------------------------------------|
| CE      | chip enable                             |
| CLK     | clock                                   |
| CMOS    | complementary metal oxide semiconductor |
| I/O     | Input/output                            |
| OE      | output enable                           |
| SRAM    | static random access memory             |
| TQFP    | thin quad flat pack                     |

## Document Conventions

### Units of Measure

| Symbol | Unit of Measure |
|--------|-----------------|
| °C     | degree Celcius  |
| MHz    | megahertz       |
| μA     | microamperes    |
| mA     | milliamperes    |
| mV     | millivolts      |
| mW     | milliwatts      |
| ns     | nanoseconds     |
| pF     | picofarad       |
| V      | volts           |
| W      | watts           |

## Document History Page

| Document Title: CY7C09349AV/CY7C09359AV 3.3 V 4 K/8 K × 18 Synchronous Dual Port Static RAM<br>Document Number: 001-63888 |         |            |                 |                                                                |
|---------------------------------------------------------------------------------------------------------------------------|---------|------------|-----------------|----------------------------------------------------------------|
| REV.                                                                                                                      | ECN NO. | Issue Date | Orig. of Change | Description of Change                                          |
| **                                                                                                                        | 2998931 | 09/16/2010 | RAME            | New Datasheet                                                  |
| *A                                                                                                                        | 3386551 | 09/28/2011 | ADMU            | Updated footnotes<br>Updated <a href="#">Package Diagram</a> . |

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