

# 4-Mbit (256K × 18) Flow-Through Sync SRAM

## Features

- 256K × 18 common I/O
- 3.3 V core power supply ( $V_{DD}$ )
- 2.5 V or 3.3 V I/O power supply ( $V_{DDQ}$ )
- Fast clock-to-output times
- 6.5 ns (133 MHz version)
- Provide high performance 2-1-1-1 access rate
- User selectable burst counter supporting Intel Pentium interleaved or linear burst sequences
- Separate processor and controller address strobes
- Synchronous self timed write
- Asynchronous output enable
- Available in Pb-free 100-pin TQFP package
- “ZZ” sleep mode option

## Functional Description

The CY7C1325H is a 256K × 18 synchronous cache RAM designed to interface with high speed microprocessors with minimum glue logic. Maximum access delay from clock rise is

6.5 ns (133 MHz version). A 2-bit on-chip counter captures the first address in a burst and increments the address automatically for the rest of the burst access. All synchronous inputs are gated by registers controlled by a positive-edge-triggered Clock Input (CLK). The synchronous inputs include all addresses, all data inputs, address-pipelining chip enable ( $\overline{CE}_1$ ), depth-expansion chip enables ( $\overline{CE}_2$  and  $\overline{CE}_3$ ), burst control inputs (ADSC, ADSP, and ADV), write enables ( $BW_{[A:B]}$ , and BWE), and global write (GW). Asynchronous inputs include the output enable ( $\overline{OE}$ ) and the ZZ pin.

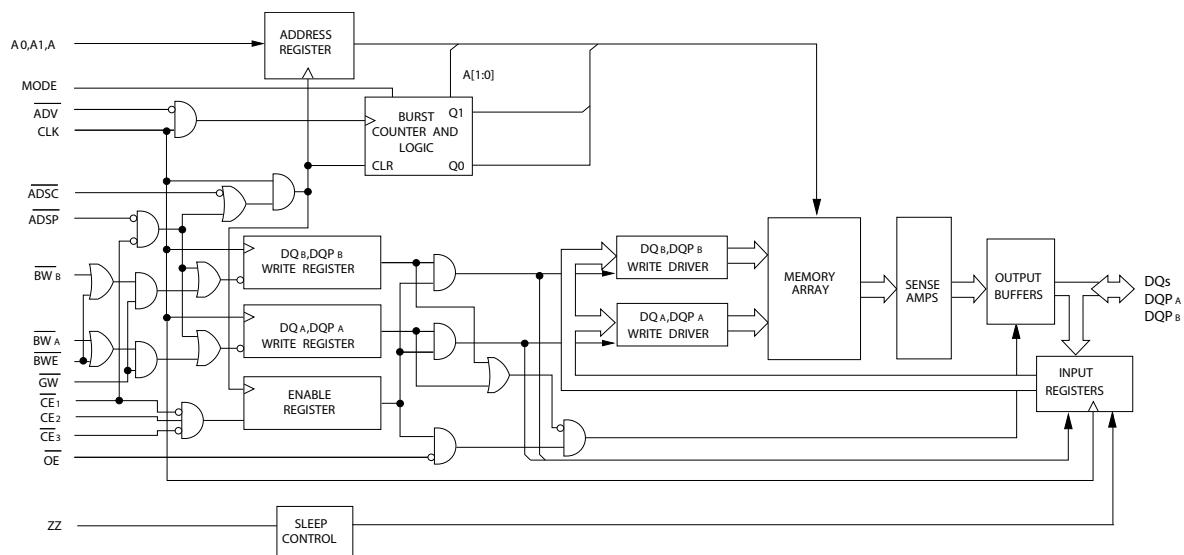
The CY7C1325H allows either interleaved or linear burst sequences, selected by the MODE input pin. A HIGH selects an interleaved burst sequence, while a LOW selects a linear burst sequence. Burst accesses can be initiated with the processor address strobe (ADSP) or the cache controller address strobe (ADSC) inputs.

Addresses and chip enables are registered at rising edge of clock when either address strobe processor (ADSP) or address strobe controller (ADSC) are active. Subsequent burst addresses can be internally generated as controlled by the advance pin (ADV).

The CY7C1325H operates from a +3.3 V core power supply while all outputs may operate with either a +2.5 or +3.3 V supply. All inputs and outputs are JEDEC-standard JESD8-5-compatible.

For a complete list of related documentation, click [here](#).

## Logic Block Diagram



## Contents

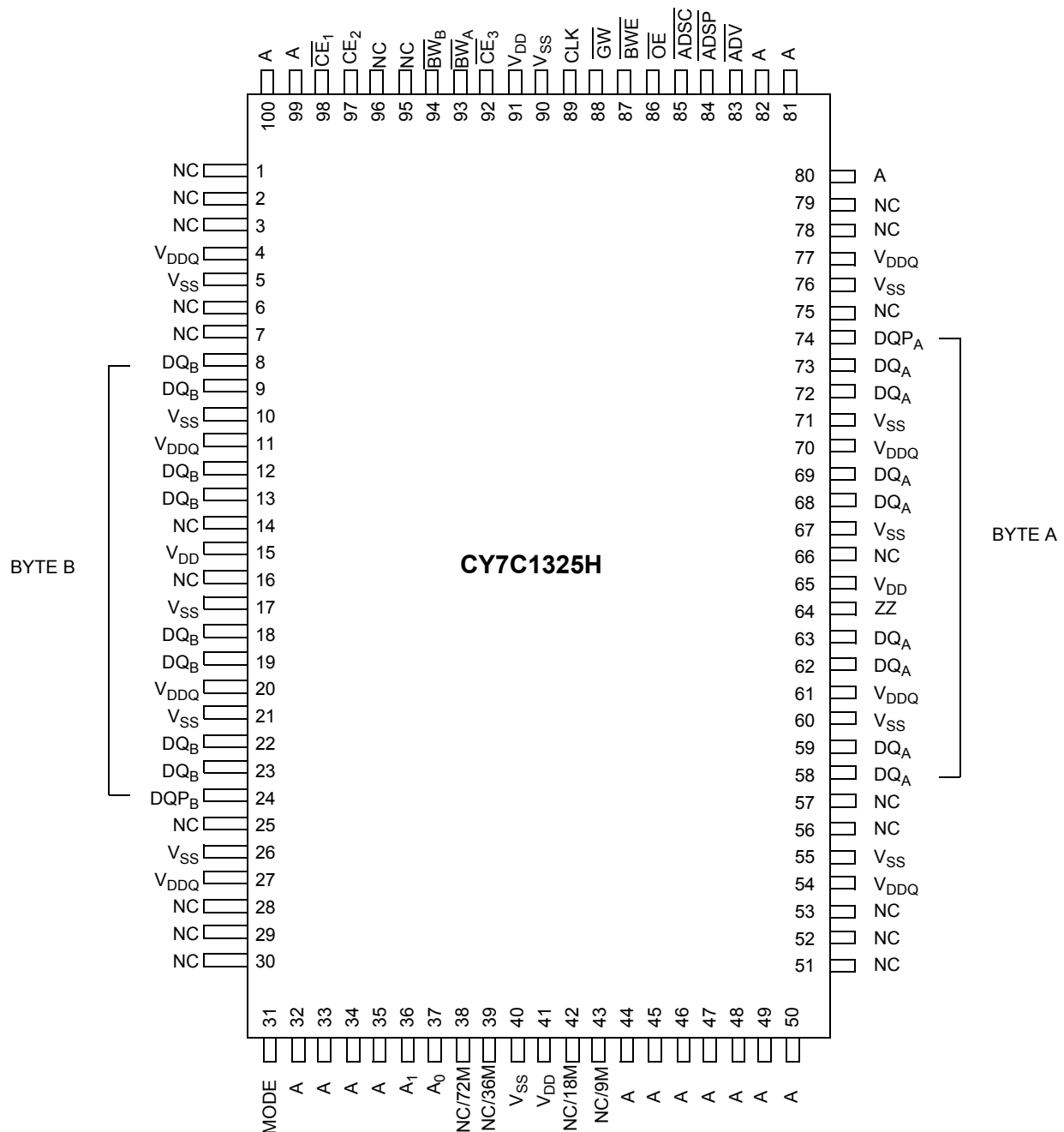
<b>Selection Guide .....</b>	<b>3</b>	<b>Capacitance .....</b>	<b>10</b>
<b>Pin Configurations .....</b>	<b>3</b>	<b>Thermal Resistance .....</b>	<b>10</b>
<b>Pin Definitions .....</b>	<b>4</b>	<b>AC Test Loads and Waveforms .....</b>	<b>11</b>
<b>Functional Overview .....</b>	<b>5</b>	<b>Switching Characteristics .....</b>	<b>12</b>
Single Read Accesses .....	5	<b>Timing Diagrams .....</b>	<b>13</b>
Single Write Accesses Initiated by $\overline{\text{ADSP}}$ .....	5	<b>Ordering Information .....</b>	<b>17</b>
Single Write Accesses Initiated by ADSC .....	5	Ordering Code Definitions .....	17
Burst Sequences .....	5	<b>Package Diagrams .....</b>	<b>18</b>
Sleep Mode .....	5	<b>Acronyms .....</b>	<b>19</b>
Interleaved Burst Address Table .....	6	<b>Document Conventions .....</b>	<b>19</b>
Linear Burst Address Table .....	6	Units of Measure .....	19
ZZ Mode Electrical Characteristics .....	6	<b>Document History Page .....</b>	<b>20</b>
<b>Truth Table .....</b>	<b>7</b>	<b>Sales, Solutions, and Legal Information .....</b>	<b>21</b>
<b>Truth Table for Read/Write .....</b>	<b>8</b>	Worldwide Sales and Design Support .....	21
<b>Maximum Ratings .....</b>	<b>9</b>	Products .....	21
<b>Operating Range .....</b>	<b>9</b>	PSoC@Solutions .....	21
<b>Neutron Soft Error Immunity .....</b>	<b>9</b>	Cypress Developer Community .....	21
<b>Electrical Characteristics .....</b>	<b>9</b>	Technical Support .....	21

## Selection Guide

Description	133 MHz	Unit
Maximum access time	6.5	ns
Maximum operating current	225	mA
Maximum standby current	40	mA

## Pin Configurations

Figure 1. 100-pin TQFP (14 × 20 × 1.4 mm) pinout



## Pin Definitions

Name	I/O	Description
A <sub>0</sub> , A <sub>1</sub> , A	Input-synchronous	<b>Address inputs used to select one of the 256 K address locations.</b> Sampled at the rising edge of the CLK if ADSP or ADSC is active LOW, and CE <sub>1</sub> , CE <sub>2</sub> , and CE <sub>3</sub> are sampled active. A <sub>[1:0]</sub> feed the 2 bit counter.
BW <sub>A</sub> , BW <sub>B</sub>	Input-synchronous	<b>Byte write select inputs, active LOW.</b> Qualified with BWE to conduct byte writes to the SRAM. Sampled on the rising edge of CLK.
GW	Input-synchronous	<b>Global write enable input, active LOW.</b> When asserted LOW on the rising edge of CLK, a global write is conducted (all bytes are written, regardless of the values on BW <sub>[A:B]</sub> and BWE).
BWE	Input-synchronous	<b>Byte write enable input, active LOW.</b> Sampled on the rising edge of CLK. This signal must be asserted LOW to conduct a byte write.
CLK	Input-clock	<b>Clock input.</b> Used to capture all synchronous inputs to the device. Also used to increment the burst counter when ADV is asserted LOW, during a burst operation.
CE <sub>1</sub>	Input-synchronous	<b>Chip enable 1 input, active LOW.</b> Sampled on the rising edge of CLK. Used in conjunction with CE <sub>2</sub> and CE <sub>3</sub> to select/deselect the device. ADSP is ignored if CE <sub>1</sub> is HIGH. CE <sub>1</sub> is sampled only when a new external address is loaded.
CE <sub>2</sub>	Input-synchronous	<b>Chip enable 2 input, active HIGH.</b> Sampled on the rising edge of CLK. Used in conjunction with CE <sub>1</sub> and CE <sub>3</sub> to select/deselect the device. CE <sub>2</sub> is sampled only when a new external address is loaded.
CE <sub>3</sub>	Input-synchronous	<b>Chip enable 3 input, active LOW.</b> Sampled on the rising edge of CLK. Used in conjunction with CE <sub>1</sub> and CE <sub>2</sub> to select/deselect the device. CE <sub>3</sub> is sampled only when a new external address is loaded.
OE	Input-asynchronous	<b>Output enable, asynchronous input, active LOW.</b> Controls the direction of the I/O pins. When LOW, the I/O pins behave as outputs. When deasserted HIGH, I/O pins are tristated, and act as input data pins. OE is masked during the first clock of a read cycle when emerging from a deselected state.
ADV	Input-synchronous	<b>Advance input signal, sampled on the rising edge of CLK.</b> When asserted, it automatically increments the address in a burst cycle.
ADSP	Input-synchronous	<b>Address strobe from processor, sampled on the rising edge of CLK, active LOW.</b> When asserted LOW, addresses presented to the device are captured in the address registers. A <sub>[1:0]</sub> are also loaded into the burst counter. When ADSP and ADSC are both asserted, only ADSP is recognized. ADSP is ignored when CE <sub>1</sub> is deasserted HIGH.
ADSC	Input-synchronous	<b>Address strobe from controller, sampled on the rising edge of CLK, active LOW.</b> When asserted LOW, addresses presented to the device are captured in the address registers. A <sub>[1:0]</sub> are also loaded into the burst counter. When ADSP and ADSC are both asserted, only ADSP is recognized.
ZZ	Input-asynchronous	<b>ZZ “sleep” input, active HIGH.</b> When asserted HIGH places the device in a non-time-critical “sleep” condition with data integrity preserved. During normal operation, this pin has to be low or left floating. ZZ pin has an internal pull-down.
DQs DQP <sub>A</sub> , DQP <sub>B</sub>	I/O-synchronous	<b>Bidirectional data I/O lines.</b> As inputs, they feed into an on-chip data register that is triggered by the rising edge of CLK. As outputs, they deliver the data contained in the memory location specified by the addresses presented during the previous clock rise of the read cycle. The direction of the pins is controlled by OE. When OE is asserted LOW, the pins behave as outputs. When HIGH, DQs and DQP <sub>[A:B]</sub> are placed in a tristate condition.
V <sub>DD</sub>	Power supply	<b>Power supply inputs to the core of the device.</b>
V <sub>SS</sub>	Ground	<b>Ground for the core of the device.</b>
V <sub>DDQ</sub>	I/O power supply	<b>Power supply for the I/O circuitry.</b>
MODE	Input-static	<b>Selects burst order.</b> When tied to GND selects linear burst sequence. When tied to V <sub>DD</sub> or left floating selects interleaved burst sequence. This is a strap pin and should remain static during device operation. Mode pin has an internal pull-up.
NC	–	<b>No connects.</b> Not Internally connected to the die.

## Pin Definitions (continued)

Name	I/O	Description
NC/9M, NC/18M, NC/36M, NC/72M, NC/144M, NC/288M, NC/576M, NC/1G	–	<b>No connects.</b> Not internally connected to the die. NC/9M, NC/18M, NC/36M, NC/72M, NC/144M, NC/288M, NC/576M and NC/1G are address expansion pins that are not internally connected to the die.

## Functional Overview

All synchronous inputs pass through input registers controlled by the rising edge of the clock. Maximum access delay from the clock rise ( $t_{CDV}$ ) is 6.5 ns (133 MHz device).

The CY7C1325H supports secondary cache in systems utilizing either a linear or interleaved burst sequence. The interleaved burst order supports Pentium and i486 processors. The linear burst sequence is suited for processors that utilize a linear burst sequence. The burst order is user-selectable, and is determined by sampling the MODE input. Accesses can be initiated with either the processor address strobe (ADSP) or the controller address strobe (ADSC). Address advancement through the burst sequence is controlled by the ADV input. A two bit on-chip wraparound burst counter captures the first address in a burst sequence and automatically increments the address for the rest of the burst access.

Byte write operations are qualified with the byte write enable (BWE) and byte write select ( $BW_{[A:B]}$ ) inputs. A global write enable (GW) overrides all byte write inputs and writes data to all four bytes. All writes are simplified with on-chip synchronous self timed write circuitry.

Three synchronous chip selects ( $\overline{CE}_1$ ,  $\overline{CE}_2$ ,  $\overline{CE}_3$ ) and an asynchronous output enable (OE) provide for easy bank selection and output tristate control. ADSP is ignored if  $\overline{CE}_1$  is HIGH.

### Single Read Accesses

A single read access is initiated when the following conditions are satisfied at clock rise: (1)  $\overline{CE}_1$ ,  $\overline{CE}_2$ , and  $\overline{CE}_3$  are all asserted active, and (2) ADSP or ADSC is asserted LOW (if the access is initiated by ADSC, the write inputs must be deasserted during this first cycle). The address presented to the address inputs is latched into the address register and the burst counter/control logic and presented to the memory core. If the OE input is asserted LOW, the requested data is available at the data outputs, a maximum to  $t_{CDV}$  after clock rise. ADSP is ignored if  $\overline{CE}_1$  is HIGH.

### Single Write Accesses Initiated by ADSP

This access is initiated when the following conditions are satisfied at clock rise: (1)  $\overline{CE}_1$ ,  $\overline{CE}_2$ ,  $\overline{CE}_3$  are all asserted active, and (2) ADSP is asserted LOW. The addresses presented are loaded into the address register and the burst inputs (GW, BWE, and  $BW_{[A:B]}$ ) are ignored during this first clock cycle. If the write inputs are asserted active (see Write Cycle Descriptions table for appropriate states that indicate a write) on the next clock rise, the

appropriate data is latched and written into the device. Byte writes are allowed. During byte writes,  $BW_A$  controls  $DQ_A$  and  $BW_B$  controls  $DQ_B$ . All I/Os are tristated during a byte write. Since this is a common I/O device, the asynchronous OE input signal must be deasserted and the I/Os must be tristated prior to the presentation of data to  $DQ_S$ . As a safety precaution, the data lines are tristated after a write cycle is detected, regardless of the state of OE.

### Single Write Accesses Initiated by ADSC

This write access is initiated when the following conditions are satisfied at clock rise: (1)  $\overline{CE}_1$ ,  $\overline{CE}_2$ , and  $\overline{CE}_3$  are all asserted active, (2) ADSC is asserted LOW, (3) ADSP is deasserted HIGH, and (4) the write input signals (GW, BWE, and  $BW_{[A:B]}$ ) indicate a write access. ADSC is ignored if ADSP is active LOW.

The addresses presented are loaded into the address register and the burst counter/control logic and delivered to the memory core. The information presented to  $DQ_{[A:D]}$  is written into the specified address location. Byte writes are allowed. During byte writes,  $BW_A$  controls  $DQ_A$ ,  $BW_B$  controls  $DQ_B$ . All I/Os are tristated when a write is detected, even a byte write. Since this is a common I/O device, the asynchronous OE input signal must be deasserted and the I/Os must be tristated prior to the presentation of data to  $DQ_S$ . As a safety precaution, the data lines are tristated after a write cycle is detected, regardless of the state of OE.

### Burst Sequences

The CY7C1325H provides an on-chip two bit wraparound burst counter inside the SRAM. The burst counter is fed by  $A_{[1:0]}$ , and can follow either a linear or interleaved burst order. The burst order is determined by the state of the MODE input. A LOW on MODE selects a linear burst sequence. A HIGH on MODE selects an interleaved burst order. Leaving MODE unconnected causes the device to default to a interleaved burst sequence.

### Sleep Mode

The ZZ input pin is an asynchronous input. Asserting ZZ places the SRAM in a power conservation "sleep" mode. Two clock cycles are required to enter into or exit from this "sleep" mode. While in this mode, data integrity is guaranteed. Accesses pending when entering the "sleep" mode are not considered valid nor is the completion of the operation guaranteed. The device must be deselected prior to entering the "sleep" mode.  $\overline{CE}_S$ , ADSP, and ADSC must remain inactive for the duration of  $t_{ZZREC}$  after the ZZ input returns LOW.

### Interleaved Burst Address Table

(MODE = Floating or  $V_{DD}$ )

First Address A1:A0	Second Address A1:A0	Third Address A1:A0	Fourth Address A1:A0
00	01	10	11
01	00	11	10
10	11	00	01
11	10	01	00

### Linear Burst Address Table

(MODE = GND)

First Address A1:A0	Second Address A1:A0	Third Address A1:A0	Fourth Address A1:A0
00	01	10	11
01	10	11	00
10	11	00	01
11	00	01	10

### ZZ Mode Electrical Characteristics

Parameter	Description	Test Conditions	Min	Max	Unit
$I_{DDZZ}$	Sleep mode standby current	$ZZ \geq V_{DD} - 0.2 \text{ V}$	–	40	mA
$t_{ZZS}$	Device operation to ZZ	$ZZ \geq V_{DD} - 0.2 \text{ V}$	–	$2t_{CYC}$	ns
$t_{ZZREC}$	ZZ recovery time	$ZZ \leq 0.2 \text{ V}$	$2t_{CYC}$	–	ns
$t_{ZZI}$	ZZ active to sleep current	This parameter is sampled	–	$2t_{CYC}$	ns
$t_{RZZI}$	ZZ inactive to exit sleep current	This parameter is sampled	0	–	ns

## Truth Table

The Truth Table for part CY7C1325H is as follows. [1, 2, 3, 4, 5]

Cycle Description	Address Used	$\overline{CE}_1$	$CE_2$	$\overline{CE}_3$	ZZ	$\overline{ADSP}$	$\overline{ADSC}$	$\overline{ADV}$	$\overline{WRITE}$	$\overline{OE}$	CLK	DQ
Deselected cycle, power-down	None	H	X	X	L	X	L	X	X	X	L-H	Tri-state
Deselected cycle, power-down	None	L	L	X	L	L	X	X	X	X	L-H	Tri-state
Deselected cycle, power-down	None	L	X	H	L	L	X	X	X	X	L-H	Tri-state
Deselected cycle, power-down	None	L	L	X	L	H	L	X	X	X	L-H	Tri-state
Deselected cycle, power-down	None	X	X	H	L	H	L	X	X	X	L-H	Tri-state
Sleep mode, power-down	None	X	X	X	H	X	X	X	X	X	X	Tri-state
Read cycle, begin burst	External	L	H	L	L	L	X	X	X	L	L-H	Q
Read cycle, begin burst	External	L	H	L	L	L	X	X	X	H	L-H	Tri-state
Write cycle, begin burst	External	L	H	L	L	H	L	X	L	X	L-H	D
Read cycle, begin burst	External	L	H	L	L	H	L	X	H	L	L-H	Q
Read cycle, begin burst	External	L	H	L	L	H	L	X	H	H	L-H	Tri-state
Read cycle, continue burst	Next	X	X	X	L	H	H	L	H	L	L-H	Q
Read cycle, continue burst	Next	X	X	X	L	H	H	L	H	H	L-H	Tri-state
Read cycle, continue burst	Next	H	X	X	L	X	H	L	H	L	L-H	Q
Read cycle, continue burst	Next	H	X	X	L	X	H	L	H	H	L-H	Tri-state
Write cycle, continue burst	Next	X	X	X	L	H	H	L	L	X	L-H	D
Write cycle, continue burst	Next	H	X	X	L	X	H	L	L	X	L-H	D
Read cycle, suspend burst	Current	X	X	X	L	H	H	H	H	L	L-H	Q
Read cycle, suspend burst	Current	X	X	X	L	H	H	H	H	H	L-H	Tri-state
Read cycle, suspend burst	Current	H	X	X	L	X	H	H	H	L	L-H	Q
Read cycle, suspend burst	Current	H	X	X	L	X	H	H	H	H	L-H	Tri-state
Write cycle, suspend burst	Current	X	X	X	L	H	H	H	L	X	L-H	D
Write cycle, suspend burst	Current	H	X	X	L	X	H	H	L	X	L-H	D

### Notes

1. X = "Don't Care." H = Logic HIGH, L = Logic LOW.
2.  $\overline{WRITE} = L$  when any one or more Byte Write enable signals ( $\overline{BW}_A$ ,  $\overline{BW}_B$ ) and  $\overline{BWE} = L$  or  $\overline{GW} = L$ .  $\overline{WRITE} = H$  when all Byte write enable signals ( $\overline{BW}_A$ ,  $\overline{BW}_B$ ),  $\overline{BWE}$ ,  $\overline{GW} = H$ .
3. The DQ pins are controlled by the current cycle and the  $\overline{OE}$  signal.  $\overline{OE}$  is asynchronous and is not sampled with the clock.
4. The SRAM always initiates a read cycle when  $\overline{ADSP}$  is asserted, regardless of the state of  $\overline{GW}$ ,  $\overline{BWE}$ , or  $\overline{BW}_{[A:B]}$ . Writes may occur only on subsequent clocks after the  $\overline{ADSP}$  or with the assertion of  $\overline{ADSC}$ . As a result,  $\overline{OE}$  must be driven HIGH prior to the start of the write cycle to allow the outputs to tristate.  $\overline{OE}$  is a don't care for the remainder of the write cycle.
5.  $\overline{OE}$  is asynchronous and is not sampled with the clock rise. It is masked internally during write cycles. During a read cycle all data bits are tristate when  $\overline{OE}$  is inactive or when the device is deselected, and all data bits behave as output when  $\overline{OE}$  is active (LOW).

## Truth Table for Read/Write

The Truth Table for Read/Write for part CY7C1325H is as follows. <sup>[6]</sup>

Function	$\overline{GW}$	$\overline{BWE}$	$\overline{BW}_B$	$\overline{BW}_A$
Read	H	H	X	X
Read	H	L	H	H
Write byte A – (DQ <sub>A</sub> and DQP <sub>A</sub> )	H	L	H	L
Write byte B – (DQ <sub>B</sub> and DQP <sub>B</sub> )	H	L	L	H
Write all bytes	H	L	L	L
Write all bytes	L	X	X	X

### Note

6. X = "Don't Care." H = Logic HIGH, L = Logic LOW.



## Maximum Ratings

Exceeding maximum ratings may shorten 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 on  $V_{DD}$  relative to GND ..... -0.5 V to +4.6 V

Supply voltage on  $V_{DDQ}$  relative to GND ..... -0.5 V to + $V_{DD}$

DC voltage applied to outputs  
in tristate ..... -0.5 V to  $V_{DDQ} + 0.5$  V

DC input voltage ..... -0.5 V to  $V_{DD} + 0.5$  V

Current into outputs (LOW) ..... 20 mA

Static discharge voltage  
(per MIL-STD-883, method 3015) ..... > 2001 V

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

## Operating Range

Range	Ambient Temperature	$V_{DD}$	$V_{DDQ}$
Industrial	-40 °C to +85 °C	3.3 V – 5% / + 10%	2.5 V – 5% to $V_{DD}$

## Neutron Soft Error Immunity

Parameter	Description	Test Conditions	Typ	Max*	Unit
LSBU	Logical single bit upsets	25 °C	361	394	FIT/Mb
LMBU	Logical multi bit upsets	25 °C	0	0.01	FIT/Mb
SEL	Single event latch up	85 °C	0	0.1	FIT/Dev

\* No LMBU or SEL events occurred during testing; this column represents a statistical  $\chi^2$ , 95% confidence limit calculation. For more details refer to Application Note AN54908 "Accelerated Neutron SER Testing and Calculation of Terrestrial Failure Rates".

## Electrical Characteristics

Over the Operating Range

Parameter [7, 8]	Description	Test Conditions	Min	Max	Unit
$V_{DD}$	Power supply voltage		3.135	3.6	V
$V_{DDQ}$	I/O supply voltage		2.375	$V_{DD}$	V
$V_{OH}$	Output HIGH voltage	for 3.3 V I/O, $I_{OH} = -4.0$ mA	2.4	–	V
		for 2.5 V I/O, $I_{OH} = -1.0$ mA	2.0	–	V
$V_{OL}$	Output LOW voltage	for 3.3 V I/O, $I_{OL} = 8.0$ mA	–	0.4	V
		for 2.5 V I/O, $I_{OL} = 1.0$ mA	–	0.4	V
$V_{IH}$	Input HIGH voltage	for 3.3 V I/O	2.0	$V_{DD} + 0.3$	V
		for 2.5 V I/O	1.7	$V_{DD} + 0.3$	V
$V_{IL}$	Input LOW voltage <sup>[7]</sup>	for 3.3 V I/O	-0.3	0.8	V
		for 2.5 V I/O	-0.3	0.7	V
$I_X$	Input leakage current except ZZ and MODE	$GND \leq V_I \leq V_{DDQ}$	-5	5	$\mu$ A
	Input current of MODE	Input = $V_{SS}$	-30	–	$\mu$ A
		Input = $V_{DD}$	–	5	$\mu$ A
	Input current of ZZ	Input = $V_{SS}$	-5	–	$\mu$ A
		Input = $V_{DD}$	–	30	$\mu$ A
$I_{OZ}$	Output leakage current	$GND \leq V_I \leq V_{DDQ}$ , output disabled	-5	5	$\mu$ A
$I_{DD}$	$V_{DD}$ operating supply current	$V_{DD} = \text{Max}$ , $I_{OUT} = 0$ mA, $f = f_{MAX} = 1/t_{CYC}$	–	225	mA
		7.5 ns cycle, 133 MHz			

### Notes

7. Overshoot:  $V_{IH(AC)} < V_{DD} + 1.5$  V (Pulse width less than  $t_{CYC}/2$ ), undershoot:  $V_{IL(AC)} > -2$  V (Pulse width less than  $t_{CYC}/2$ ).

8.  $T_{power\ up}$ : Assumes a linear ramp from 0 V to  $V_{DD(min)}$  within 200 ms. During this time  $V_{IH} < V_{DD}$  and  $V_{DDQ} \leq V_{DD}$ .

## Electrical Characteristics *(continued)*

Over the Operating Range

Parameter <sup>[7, 8]</sup>	Description	Test Conditions		Min	Max	Unit
$I_{SB1}$	Automatic CE power-down current – TTL inputs	Max $V_{DD}$ , device deselected, $V_{IN} \geq V_{IH}$ or $V_{IN} \leq V_{IL}$ , $f = f_{MAX}$ , inputs switching	7.5 ns cycle, 133 MHz	–	90	mA
$I_{SB2}$	Automatic CE power-down current – CMOS inputs	Max $V_{DD}$ , device deselected, $V_{IN} \geq V_{DD} - 0.3$ V or $V_{IN} \leq 0.3$ V, $f = 0$ , inputs static	7.5 ns cycle, 133 MHz	–	40	mA
$I_{SB3}$	Automatic CE power-down current – CMOS inputs	Max $V_{DD}$ , device deselected, $V_{IN} \geq V_{DDQ} - 0.3$ V or $V_{IN} \leq 0.3$ V, $f = f_{MAX}$ , inputs switching	7.5 ns cycle, 133 MHz	–	75	mA
$I_{SB4}$	Automatic CE power-down current – TTL inputs	Max $V_{DD}$ , device deselected, $V_{IN} \geq V_{DD} - 0.3$ V or $V_{IN} \leq 0.3$ V, $f = 0$ , inputs static	7.5 ns cycle, 133 MHz	–	45	mA

## Capacitance

Parameter <sup>[9]</sup>	Description	Test Conditions	100-pin TQFP Max	Unit
$C_{IN}$	Input capacitance	$T_A = 25^\circ\text{C}$ , $f = 1$ MHz, $V_{DD} = 3.3$ V, $V_{DDQ} = 3.3$ V	5	pF
$C_{CLK}$	Clock input capacitance		5	pF
$C_{I/O}$	Input/Output capacitance		5	pF

## Thermal Resistance

Parameter <sup>[9]</sup>	Description	Test Conditions	100-pin TQFP Package	Unit
$\Theta_{JA}$	Thermal resistance (junction to ambient)	Test conditions follow standard test methods and procedures for measuring thermal impedance, per EIA/JESD51.	30.32	$^\circ\text{C/W}$
$\Theta_{JC}$	Thermal resistance (junction to case)		6.85	$^\circ\text{C/W}$

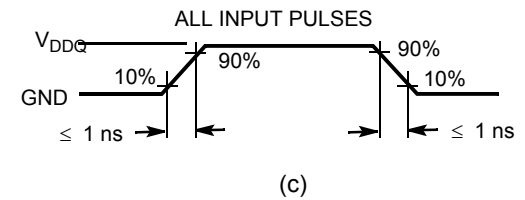
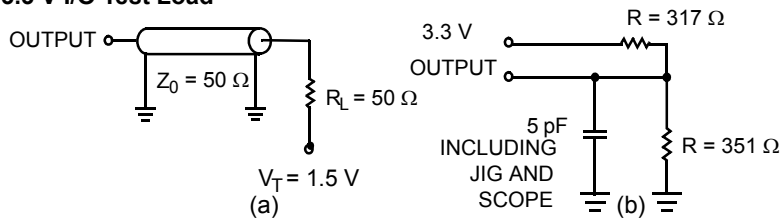
### Note

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

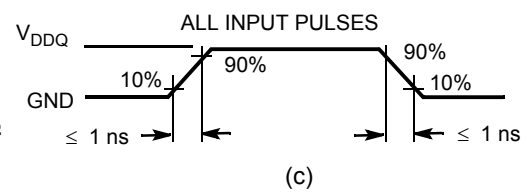
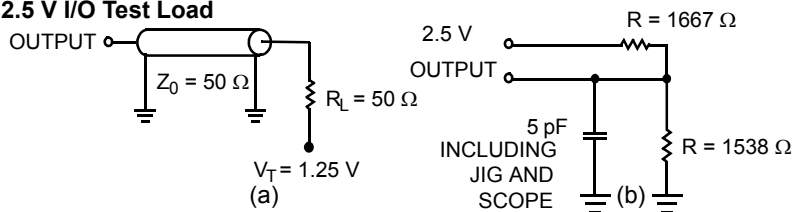
## AC Test Loads and Waveforms

Figure 2. AC Test Loads and Waveforms

### 3.3 V I/O Test Load



### 2.5 V I/O Test Load



## Switching Characteristics

Over the Operating Range

Parameter <sup>[10, 11]</sup>	Description	-133		Unit
		Min	Max	
t <sub>POWER</sub>	V <sub>DD</sub> (typical) to the first access <sup>[12]</sup>	1	–	ms
<b>Clock</b>				
t <sub>CYC</sub>	Clock cycle time	7.5	–	ns
t <sub>CH</sub>	Clock HIGH	2.5	–	ns
t <sub>CL</sub>	Clock LOW	2.5	–	ns
<b>Output Times</b>				
t <sub>CDV</sub>	Data output valid after CLK rise	–	6.5	ns
t <sub>DOH</sub>	Data output hold after CLK rise	2.0	–	ns
t <sub>CLZ</sub>	Clock to low Z <sup>[13, 14, 15]</sup>	0	–	ns
t <sub>CHZ</sub>	Clock to high Z <sup>[13, 14, 15]</sup>	–	3.5	ns
t <sub>OE<sub>V</sub></sub>	$\overline{\text{OE}}$ LOW to output valid	–	3.5	ns
t <sub>OE<sub>LZ</sub></sub>	$\overline{\text{OE}}$ LOW to output low Z <sup>[13, 14, 15]</sup>	0	–	ns
t <sub>OE<sub>HZ</sub></sub>	$\overline{\text{OE}}$ HIGH to output high Z <sup>[13, 14, 15]</sup>	–	3.5	ns
<b>Setup Times</b>				
t <sub>AS</sub>	Address setup before CLK rise	1.5	–	ns
t <sub>ADS</sub>	ADSP, ADSC setup before CLK rise	1.5	–	ns
t <sub>ADVS</sub>	$\overline{\text{ADV}}$ setup before CLK rise	1.5	–	ns
t <sub>WES</sub>	GW, BWE, BW <sub>X</sub> setup before CLK rise	1.5	–	ns
t <sub>DS</sub>	Data input setup before CLK rise	1.5	–	ns
t <sub>CES</sub>	Chip enable setup	1.5	–	ns
<b>Hold Times</b>				
t <sub>AH</sub>	Address hold after CLK rise	0.5	–	ns
t <sub>ADH</sub>	ADSP, ADSC hold after CLK rise	0.5	–	ns
t <sub>WEH</sub>	GW, BWE, BW <sub>X</sub> hold after CLK rise	0.5	–	ns
t <sub>ADVH</sub>	$\overline{\text{ADV}}$ hold after CLK rise	0.5	–	ns
t <sub>DH</sub>	Data input hold after CLK rise	0.5	–	ns
t <sub>CEH</sub>	Chip enable hold after CLK rise	0.5	–	ns

### Notes

10. Timing reference level is 1.5 V when V<sub>DDQ</sub> = 3.3 V and is 1.25 V when V<sub>DDQ</sub> = 2.5 V.

11. Test conditions shown in (a) of [Figure 2 on page 11](#) unless otherwise noted.

12. This part has a voltage regulator internally; t<sub>POWER</sub> is the time that the power needs to be supplied above V<sub>DD(minimum)</sub> initially before a read or write operation can be initiated.

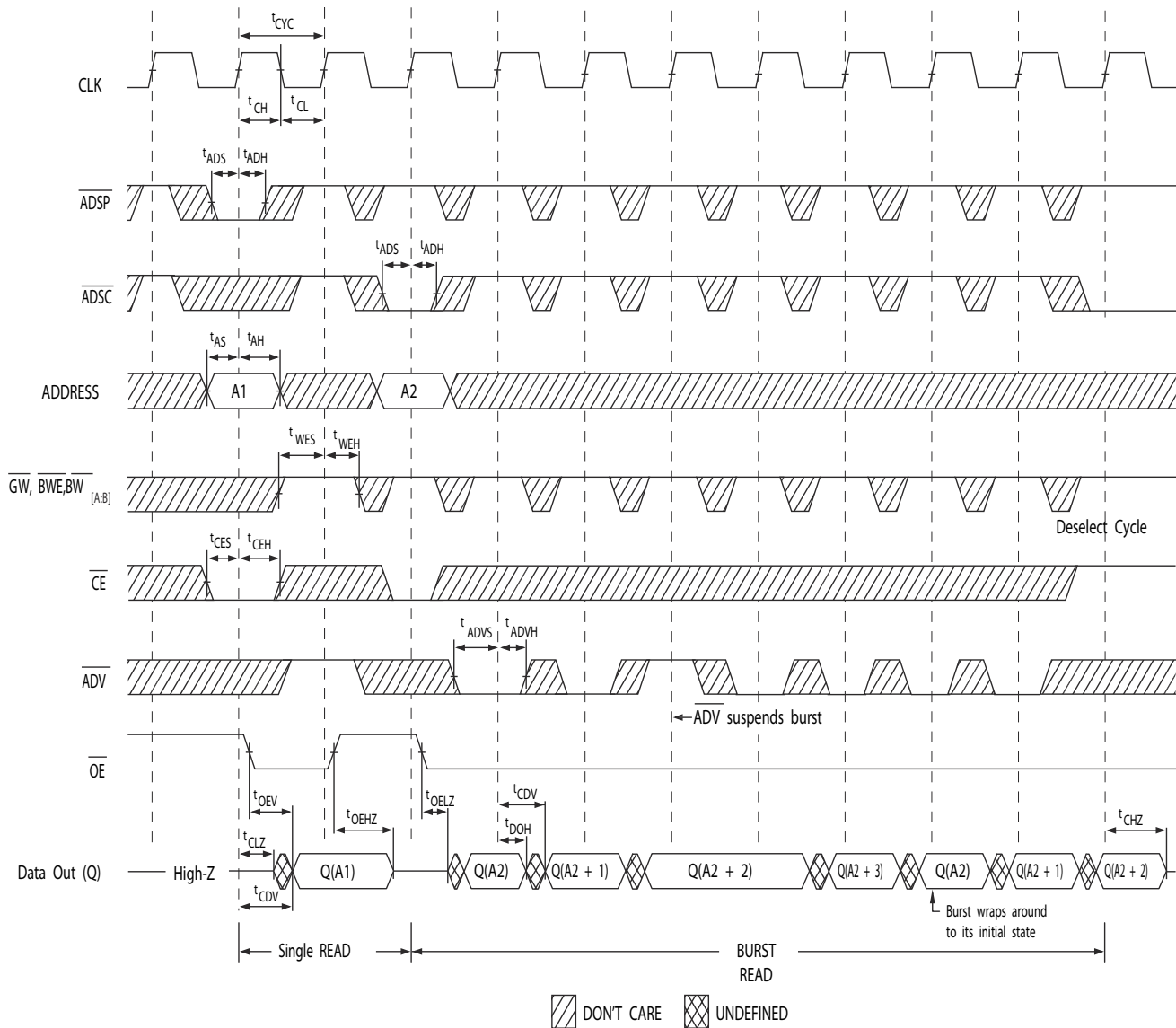
13. t<sub>CHZ</sub>, t<sub>CLZ</sub>, t<sub>OE<sub>LZ</sub></sub>, and t<sub>OE<sub>HZ</sub></sub> are specified with AC test conditions shown in part (b) of [Figure 2 on page 11](#). Transition is measured ± 200 mV from steady-state voltage.

14. At any voltage and temperature, t<sub>OE<sub>HZ</sub></sub> is less than t<sub>OE<sub>LZ</sub></sub> and t<sub>CHZ</sub> is less than t<sub>CLZ</sub> to eliminate bus contention between SRAMs when sharing the same data bus. These specifications do not imply a bus contention condition, but reflect parameters guaranteed over worst case user conditions. Device is designed to achieve high Z prior to low Z under the same system conditions.

15. This parameter is sampled and not 100% tested.

## Timing Diagrams

**Figure 3. Read Cycle Timing** <sup>[16]</sup>

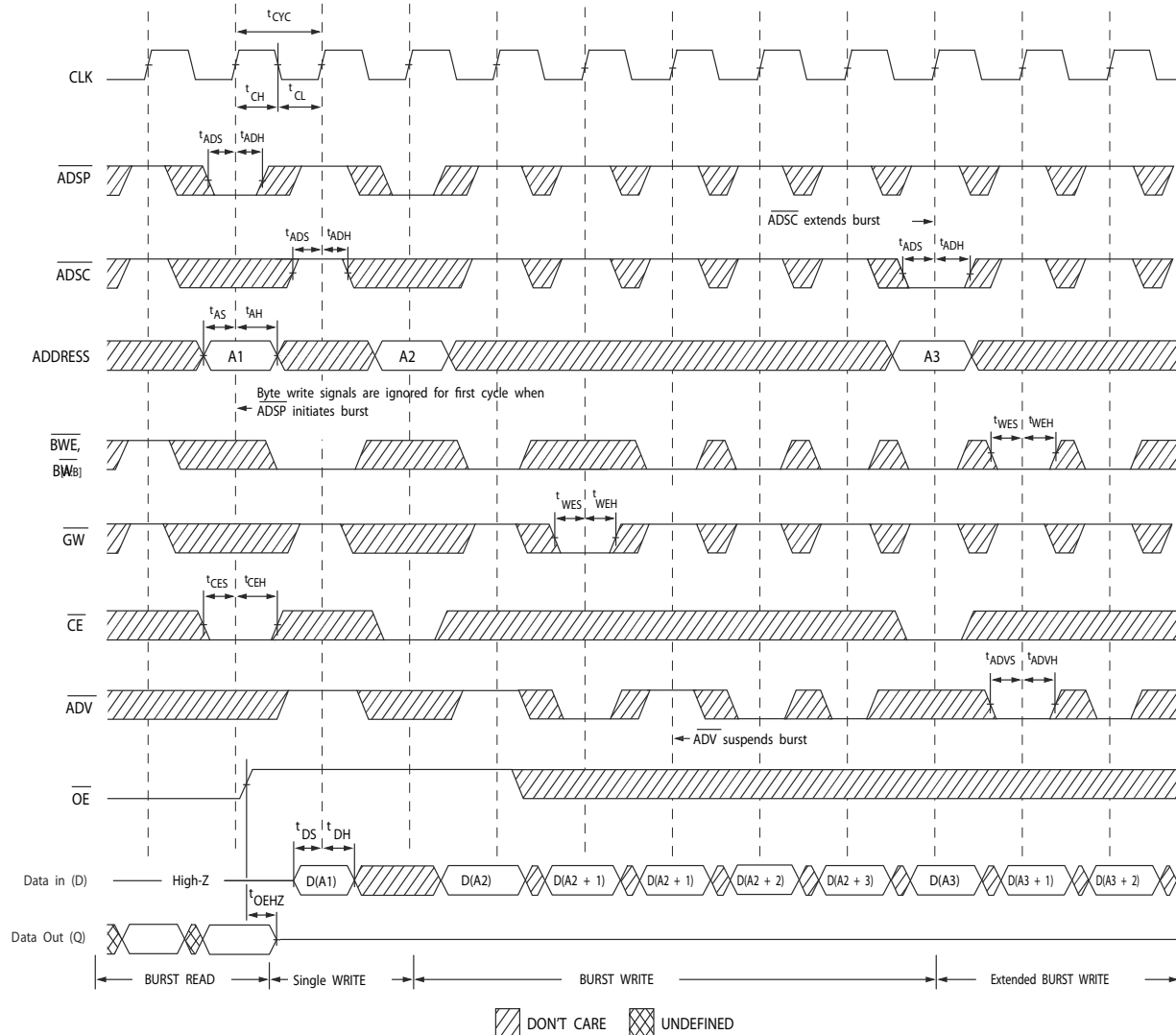


### Note

16. On this diagram, when  $\overline{CE}$  is LOW:  $\overline{CE}_1$  is LOW,  $\overline{CE}_2$  is HIGH and  $\overline{CE}_3$  is LOW. When  $\overline{CE}$  is HIGH:  $\overline{CE}_1$  is HIGH or  $\overline{CE}_2$  is LOW or  $\overline{CE}_3$  is HIGH.

## Timing Diagrams (continued)

**Figure 4. Write Cycle Timing** [17, 18]

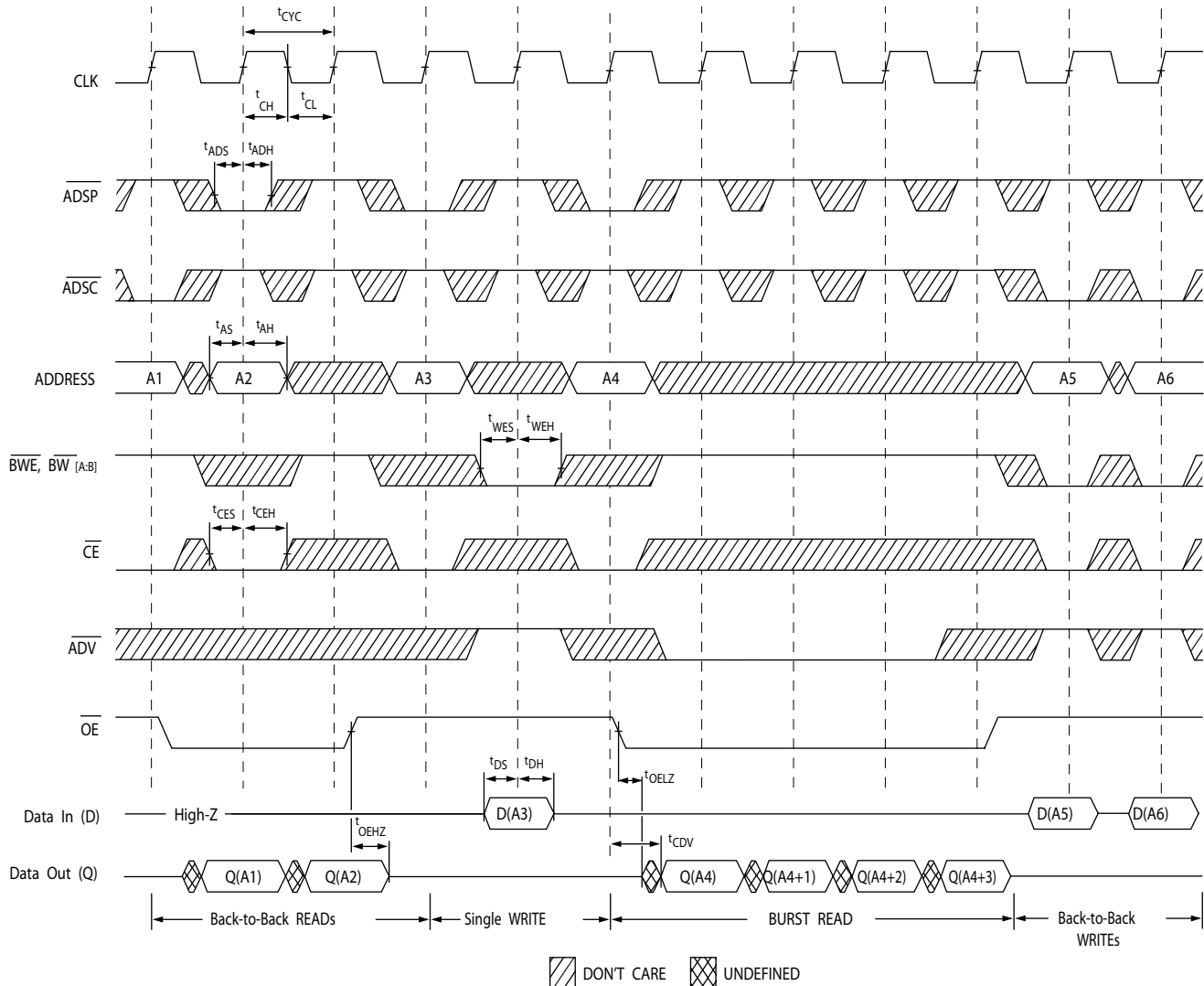


### Notes

17. On this diagram, when  $\overline{CE}$  is LOW:  $\overline{CE}_1$  is LOW,  $\overline{CE}_2$  is HIGH and  $\overline{CE}_3$  is LOW. When  $\overline{CE}$  is HIGH:  $\overline{CE}_1$  is HIGH or  $\overline{CE}_2$  is LOW or  $\overline{CE}_3$  is HIGH.  
 18. Full width write can be initiated by either GW LOW; or by GW HIGH, BWE LOW and  $BW_{[A:B]}$  LOW.

## Timing Diagrams (continued)

**Figure 5. Read/Write Timing** [19, 20, 21]

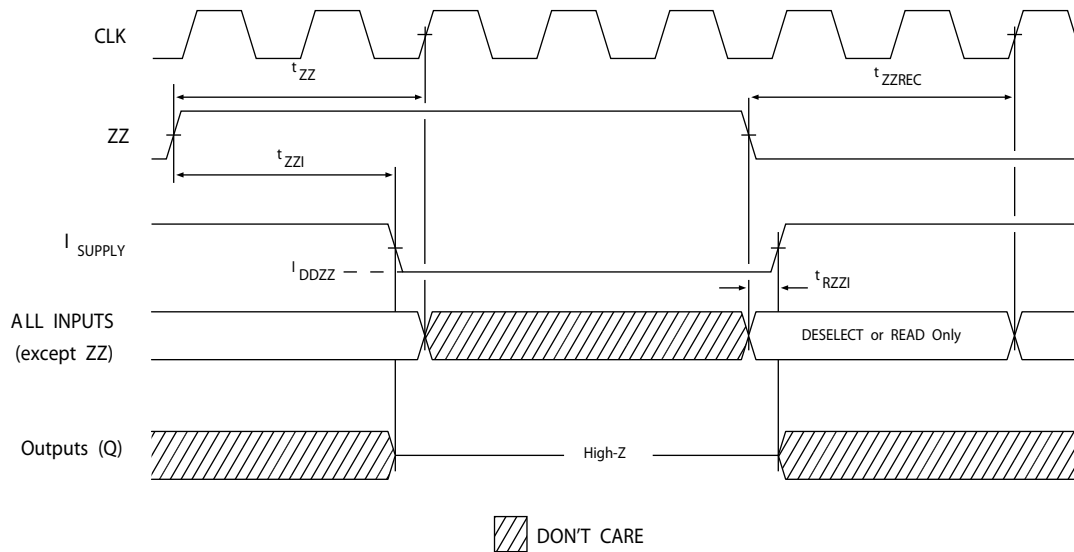


### Notes

19. On this diagram, when  $\overline{CE}$  is LOW:  $\overline{CE}_1$  is LOW,  $\overline{CE}_2$  is HIGH and  $\overline{CE}_3$  is LOW. When  $\overline{CE}$  is HIGH:  $\overline{CE}_1$  is HIGH or  $\overline{CE}_2$  is LOW or  $\overline{CE}_3$  is HIGH.  
 20. The data bus (Q) remains in High Z following a WRITE cycle, unless a new read access is initiated by ADSP or ADSC.  
 21.  $\overline{GW}$  is HIGH.

## Timing Diagrams (continued)

**Figure 6. ZZ Mode Timing** [22, 23]



### Notes

22. Device must be deselected when entering ZZ mode. See Cycle Descriptions table for all possible signal conditions to deselect the device.
23. DQs are in High Z when exiting ZZ sleep mode.



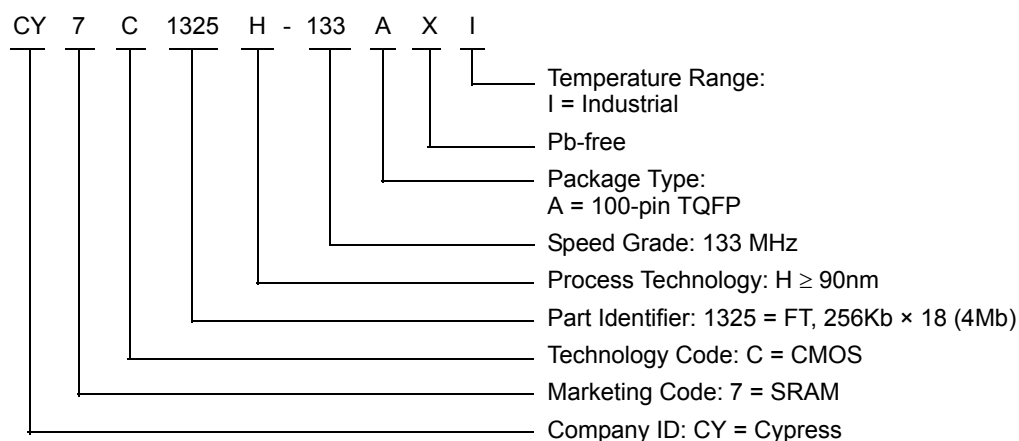
## Ordering Information

The table below contains only the parts that are currently available. If you don't see what you are looking for, please contact your local sales representative. For more information, visit the Cypress website at [www.cypress.com](http://www.cypress.com) and refer to the product summary page at <http://www.cypress.com/products>

Cypress maintains a worldwide network of offices, solution centers, manufacturer's representatives and distributors. To find the office closest to you, visit us at <http://www.cypress.com/go/datasheet/offices>

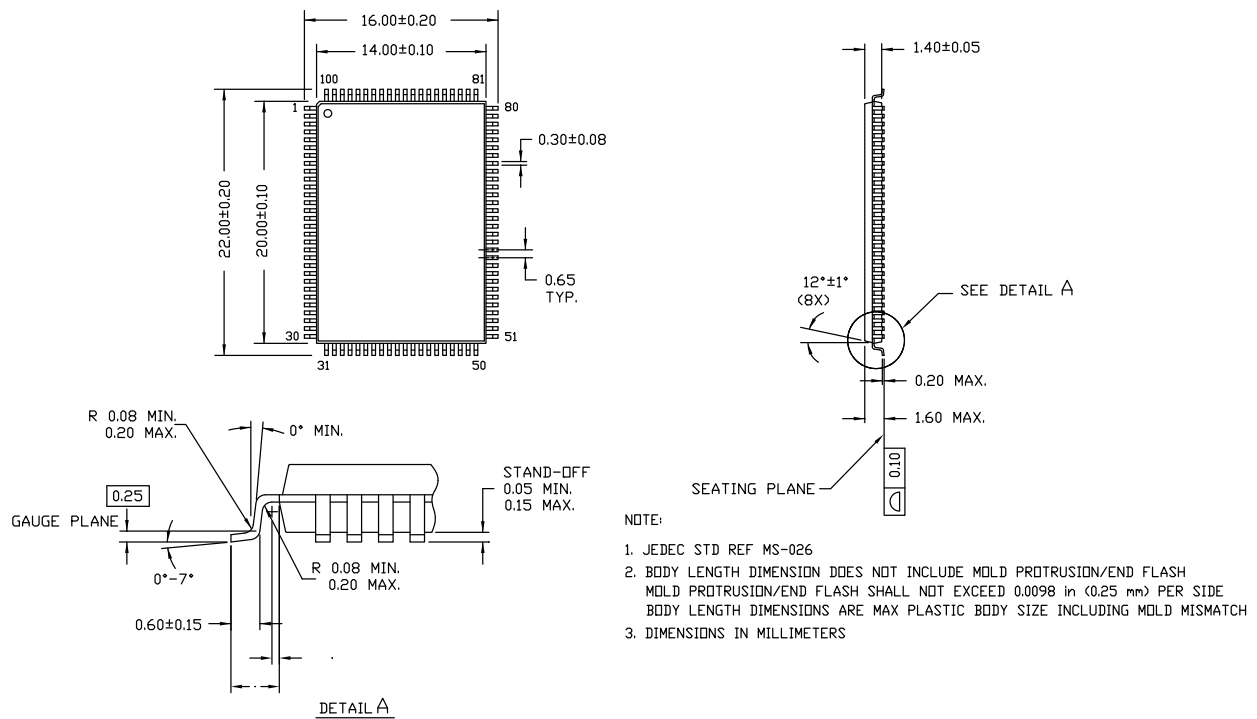
Speed (MHz)	Ordering Code	Package Diagram	Part and Package Type	Operating Range
133	CY7C1325H-133AXI	51-85050	100-pin TQFP (14 × 20 × 1.4 mm) Pb-free	Industrial

## Ordering Code Definitions



## Package Diagrams

**Figure 7. 100-pin TQFP (14 × 20 × 1.4 mm) Package Outline, 51-85050**



51-85050 \*E

## Acronyms

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
$\overline{CE}$	Chip Enable
$\overline{CEN}$	Clock Enable
EIA	Electronic Industries Alliance
I/O	Input/Output
JEDEC	Joint Electron Devices Engineering Council
$\overline{OE}$	Output Enable
SRAM	Static Random Access Memory
TQFP	Thin Quad Flat Pack
TTL	Transistor-Transistor Logic
$\overline{WE}$	Write Enable

## Document Conventions

### Units of Measure

Symbol	Unit of Measure
°C	degree Celsius
MHz	megahertz
μA	microampere
mA	milliampere
mm	millimeter
ms	millisecond
mV	millivolt
ns	nanosecond
Ω	ohm
%	percent
pF	picofarad
V	volt
W	watt

## Document History Page

Document Title: CY7C1325H, 4-Mbit (256K × 18) Flow-Through Sync SRAM Document Number: 001-86114				
Rev.	ECN No.	Orig. of Change	Submission Date	Description of Change
**	3908939	PRIT	02/20/2013	New data sheet.
*A	4291116	PRIT	02/25/2014	Updated <a href="#">Package Diagrams</a> : spec 51-85050 – Changed revision from *D to *E. Updated to new template. Completing Sunset Review.
*B	4571750	PRIT	11/18/2014	Updated <a href="#">Functional Description</a> : Added “For a complete list of related documentation, click <a href="#">here</a> .” at the end.
*C	5097432	PRIT	01/21/2016	Updated to new template. Completing Sunset Review.
*D	5321039	PRIT	06/23/2016	Updated <a href="#">Truth Table</a> . Updated to new template.

## Sales, Solutions, and Legal Information

### Worldwide Sales and Design Support

Cypress maintains a worldwide network of offices, solution centers, manufacturer's representatives, and distributors. To find the office closest to you, visit us at [Cypress Locations](#).

#### Products

ARM® Cortex® Microcontrollers	<a href="http://cypress.com/arm">cypress.com/arm</a>
Automotive	<a href="http://cypress.com/automotive">cypress.com/automotive</a>
Clocks & Buffers	<a href="http://cypress.com/clocks">cypress.com/clocks</a>
Interface	<a href="http://cypress.com/interface">cypress.com/interface</a>
Lighting & Power Control	<a href="http://cypress.com/powerpsoc">cypress.com/powerpsoc</a>
Memory	<a href="http://cypress.com/memory">cypress.com/memory</a>
PSoC	<a href="http://cypress.com/psoc">cypress.com/psoc</a>
Touch Sensing	<a href="http://cypress.com/touch">cypress.com/touch</a>
USB Controllers	<a href="http://cypress.com/usb">cypress.com/usb</a>
Wireless/Rf	<a href="http://cypress.com/wireless">cypress.com/wireless</a>

#### PSoC® Solutions

[PSoC 1](#) | [PSoC 3](#) | [PSoC 4](#) | [PSoC 5LP](#)

#### Cypress Developer Community

[Forums](#) | [Projects](#) | [Video](#) | [Blogs](#) | [Training](#) | [Components](#)

#### Technical Support

[cypress.com/support](http://cypress.com/support)

© Cypress Semiconductor Corporation, 2013-2016. This document is the property of Cypress Semiconductor Corporation and its subsidiaries, including Spansion LLC ("Cypress"). This document, including any software or firmware included or referenced in this document ("Software"), is owned by Cypress under the intellectual property laws and treaties of the United States and other countries worldwide. Cypress reserves all rights under such laws and treaties and does not, except as specifically stated in this paragraph, grant any license under its patents, copyrights, trademarks, or other intellectual property rights. If the Software is not accompanied by a license agreement and you do not otherwise have a written agreement with Cypress governing the use of the Software, then Cypress hereby grants you a personal, non-exclusive, nontransferable license (without the right to sublicense) (1) under its copyright rights in the Software (a) for Software provided in source code form, to modify and reproduce the Software solely for use with Cypress hardware products, only internally within your organization, and (b) to distribute the Software in binary code form externally to end users (either directly or indirectly through resellers and distributors), solely for use on Cypress hardware product units, and (2) under those claims of Cypress's patents that are infringed by the Software (as provided by Cypress, unmodified) to make, use, distribute, and import the Software solely for use with Cypress hardware products. Any other use, reproduction, modification, translation, or compilation of the Software is prohibited.

TO THE EXTENT PERMITTED BY APPLICABLE LAW, CYPRESS MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARD TO THIS DOCUMENT OR ANY SOFTWARE OR ACCOMPANYING HARDWARE, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. To the extent permitted by applicable law, Cypress reserves the right to make changes to this document without further notice. Cypress does not assume any liability arising out of the application or use of any product or circuit described in this document. Any information provided in this document, including any sample design information or programming code, is provided only for reference purposes. It is the responsibility of the user of this document to properly design, program, and test the functionality and safety of any application made of this information and any resulting product. Cypress products are not designed, intended, or authorized for use as critical components in systems designed or intended for the operation of weapons, weapons systems, nuclear installations, life-support devices or systems, other medical devices or systems (including resuscitation equipment and surgical implants), pollution control or hazardous substances management, or other uses where the failure of the device or system could cause personal injury, death, or property damage ("Unintended Uses"). A critical component is any component of a device or system whose failure to perform can be reasonably expected to cause the failure of the device or system, or to affect its safety or effectiveness. Cypress is not liable, in whole or in part, and you shall and hereby do release Cypress from any claim, damage, or other liability arising from or related to all Unintended Uses of Cypress products. You shall indemnify and hold Cypress harmless from and against all claims, costs, damages, and other liabilities, including claims for personal injury or death, arising from or related to any Unintended Uses of Cypress products.

Cypress, the Cypress logo, Spansion, the Spansion logo, and combinations thereof, PSoC, CapSense, EZ-USB, F-RAM, and Traveo are trademarks or registered trademarks of Cypress in the United States and other countries. For a more complete list of Cypress trademarks, visit [cypress.com](http://cypress.com). Other names and brands may be claimed as property of their respective owners.