



Preliminary W25S243A

64K × 64 BURST PIPELINED HIGH-SPEED CMOS STATIC RAM

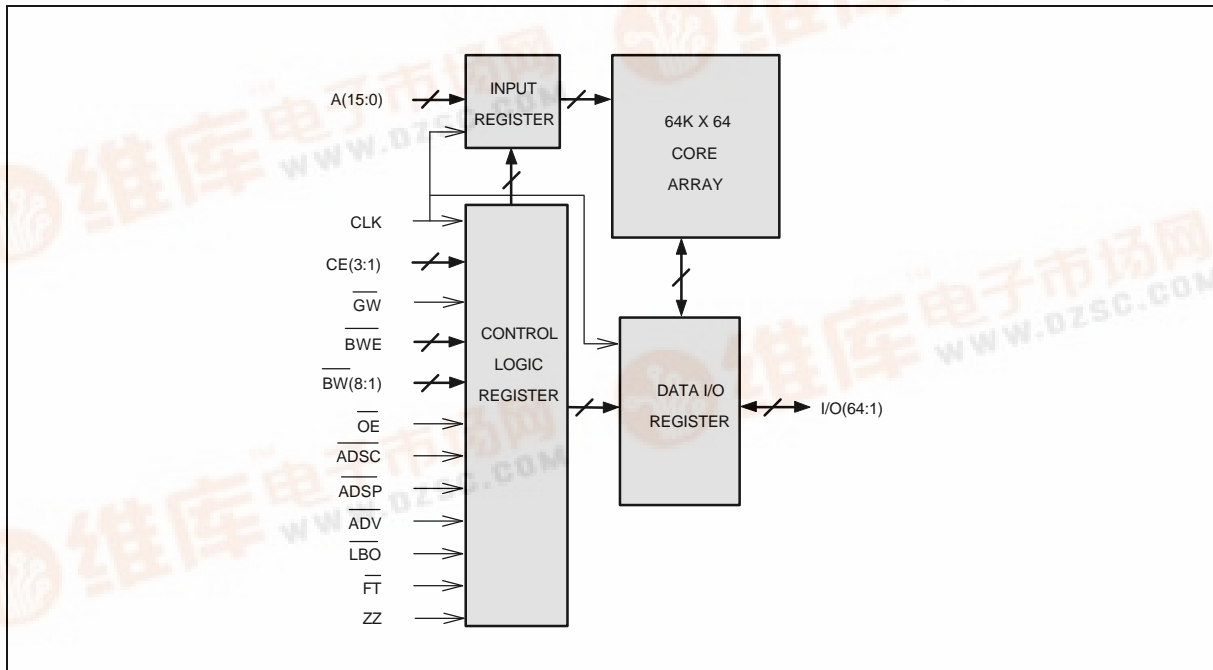
GENERAL DESCRIPTION

The W25S243A is a high-speed, low-power, synchronous-burst pipelined, CMOS static RAM organized as 65,536 × 64 bits that operates on a single 3.3-volt power supply. A built-in two-bit burst address counter supports both Pentium™ burst mode and linear burst mode. The mode to be executed is controlled by the $\overline{\text{LBO}}$ pin. Pipelining or non-pipelining of the data outputs is controlled by the $\overline{\text{FT}}$ pin. A snooze mode can reduce power dissipation. This device supports 3-1-1-1-2-1-1-1 in a two-bank, back-to-back burst read cycle.

FEATURES

- Synchronous operation
- High-speed access time: 12 nS
- Single +3.3V power supply
- Individual byte write capability
- 3.3V LVTTTL compatible I/O
- Clock-controlled and registered input
- Asynchronous output enable
- Pipelined/non-pipelined data output capability
- Supports snooze mode (low-power state)
- Internal burst counter supports Intel burst (Interleaved) mode & linear burst mode
- Supports 2T/1T mode
- Packaged in 128-pin QFP and TQFP

BLOCK DIAGRAM



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PIN DESCRIPTION

SYMBOL	TYPE	DESCRIPTION
A0–A15	Input, Synchronous	Host address
I/O1–I/O64	I/O, Synchronous	Data Inputs/Outputs
CLK	Input, Clock	Processor host bus clock
$\overline{CE1}$, $\overline{CE2}$, $\overline{CE3}$	Input, Synchronous	Chip enables
\overline{GW}	Input, Synchronous	Global write
\overline{BWE}	Input, Synchronous	Byte write enable from cache controller
$\overline{BW1}$ – $\overline{BW8}$	Input, Synchronous	Host bus byte enables used with \overline{BWE}
\overline{OE}	Input, Asynchronous	Output enable input
\overline{ADV}	Input, Synchronous	Internal burst address counter advance
\overline{ADSC}	Input, Synchronous	Address status from Chip Set
\overline{ADSP}	Input, Synchronous	Address status from CPU
ZZ	Input, Asynchronous	Snooze pin for low-power state, internal pull low
\overline{FT}	Input, Static	Connected to VSSQ: Device operates in flow-through (non-pipelined) mode. Connected to VDDQ or unconnected: Device operates in pipelined mode.
\overline{LBO}	Input, Static	Lower address burst order Connected to VSSQ: Device is in linear mode. Connected to VDDQ or unconnected: Device is in non-linear mode.
VDDQ		I/O power supply
VSSQ		I/O ground
VDD		Power supply
VSS		Ground
RSV		Reserved pin, don't use these pins
NC		No connection

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FUNCTIONAL DESCRIPTION

The W25S243A is a synchronous-burst pipelined SRAM designed for use in high-end personal computers. It supports two burst address sequences for Intel™ systems (Interleaved mode) and linear mode, which can be controlled by the $\overline{\text{LBO}}$ pin. The burst cycles are initiated by $\overline{\text{ADSP}}$ or $\overline{\text{ADSC}}$ and the burst counter is incremented whenever $\overline{\text{ADV}}$ is sampled low. The device can also be switched to non-pipelined mode if necessary.

BURST ADDRESS SEQUENCE

	INTEL SYSTEM ($\overline{\text{LBO}} = \text{VDDQ}$)				LINEAR MODE ($\overline{\text{LBO}} = \text{VSSQ}$)			
	A[1:0]	A[1:0]	A[1:0]	A[1:0]	A[1:0]	A[1:0]	A[1:0]	A[1:0]
External Start Address	00	01	10	11	00	01	10	11
Second Address	01	00	11	10	01	10	11	00
Third Address	10	11	00	01	10	11	00	01
Fourth Address	11	10	01	00	11	00	01	10

The device supports several types of write mode operations. $\overline{\text{BWE}}$ and $\overline{\text{BW}} [8:1]$ support individual byte writes. The $\overline{\text{BE}} [7:0]$ signals can be directly connected to the SRAM $\overline{\text{BW}} [8:1]$. The $\overline{\text{GW}}$ signal is used to override the byte enable signals and allows the cache controller to write all bytes to the SRAM, no matter what the byte write enable signals are. The various write modes are indicated in the Write Table below. Note that in pipelined mode, the byte write enable signals are not latched by the SRAM with addresses but with data. In pipelined mode, the cache controller must ensure the SRAM latches both data and valid byte enable signals from the processor.

TRUTH TABLE

CYCLE	ADDRESS USED	$\overline{\text{CE1}}$	$\overline{\text{CE2}}$	$\overline{\text{CE3}}$	$\overline{\text{ADSP}}$	$\overline{\text{ADSC}}$	$\overline{\text{ADV}}$	$\overline{\text{OE}}$	DATA	WRITE*
Unselected	No	1	X	X	X	0	X	X	Hi-Z	X
Unselected	No	0	X	1	0	X	X	X	Hi-Z	X
Unselected	No	0	0	X	0	X	X	X	Hi-Z	X
Unselected	No	0	X	1	1	0	X	X	Hi-Z	X
Unselected	No	0	0	X	1	0	X	X	Hi-Z	X
Begin Read	External	0	1	0	0	X	X	X	Hi-Z	X
Begin Read	External	0	1	0	1	0	X	X	Hi-Z	Read
Continue Read	Next	X	X	X	1	1	0	1	Hi-Z	Read
Continue Read	Next	X	X	X	1	1	0	0	D-Out	Read
Continue Read	Next	1	X	X	X	1	0	1	Hi-Z	Read
Continue Read	Next	1	X	X	X	1	0	0	D-Out	Read
Suspend Read	Current	X	X	X	1	1	1	1	Hi-Z	Read
Suspend Read	Current	X	X	X	1	1	1	0	D-Out	Read
Suspend Read	Current	1	X	X	X	1	1	1	Hi-Z	Read
Suspend Read	Current	1	X	X	X	1	1	0	D-Out	Read

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Truth Table, continued

CYCLE	ADDRESS USED	$\overline{CE1}$	CE2	$\overline{CE3}$	\overline{ADSP}	\overline{ADSC}	\overline{ADV}	\overline{OE}	DATA	WRITE*
Begin Write	Current	X	X	X	1	1	1	X	Hi-Z	Write
Begin Write	Current	1	X	X	X	1	1	X	Hi-Z	Write
Begin Write	External	0	1	0	1	0	X	X	Hi-Z	Write
Continue Write	Next	X	X	X	1	1	0	X	Hi-Z	Write
Continue Write	Next	1	X	X	X	1	0	X	Hi-Z	Write
Suspend Write	Current	X	X	X	1	1	1	X	Hi-Z	Write
Suspend Write	Current	1	X	X	X	1	1	X	Hi-Z	Write

Notes:

1. For a detailed definition of read/write, see the Write Table below.
2. An "X" means don't care, "1" means logic high, and "0" means logic low.
3. The \overline{OE} pin enables the data output but is not synchronous with the clock. All signals of the SRAM are sampled synchronous to the bus clock except for the \overline{OE} pin.
4. On a write cycle that follows a read cycle, \overline{OE} must be inactive prior to the start of write cycle to allow write data to setup the SRAM. \overline{OE} must also disable the output buffer prior to the finish of a write cycle to ensure the SRAM data hold timings are met.

WRITE TABLE

READ/WRITE FUNCTION	GW	BWE	BW8	BW7	BW6	BW5	BW4	BW3	BW2	BW1
Read	1	1	X	X	X	X	X	X	X	X
Read	1	0	1	1	1	1	1	1	1	1
Write byte 1 I/O1–I/O8	1	0	1	1	1	1	1	1	1	0
Write byte 2 I/O9–I/O16	1	0	1	1	1	1	1	1	0	1
Write byte 2, byte 1	1	0	1	1	1	1	1	1	0	0
Write byte 3 I/O17–I/O24	1	0	1	1	1	1	1	0	1	1
Write byte 3, byte 1	1	0	1	1	1	1	1	0	1	0
Write byte 3, byte 2	1	0	1	1	1	1	1	0	0	1
Write byte 3, byte 2, byte 1	1	0	1	1	1	1	1	0	0	0
Write byte 4, I/O25–I/O32	1	0	1	1	1	1	0	1	1	1
Write byte 4, byte 1	1	0	1	1	1	1	0	1	1	0
Write byte 4, byte 2	1	0	1	1	1	1	0	1	0	1
Write byte 4, byte 2, byte 1	1	0	1	1	1	1	0	1	0	0
Write byte 4, byte 3	1	0	1	1	1	1	0	0	1	1
Write byte 4, byte 3, byte 1	1	0	1	1	1	1	0	0	1	0
Write byte 4, byte 3, byte 2	1	0	1	1	1	1	0	0	0	1
Write byte 4, byte 3, byte 2, byte 1	1	0	1	1	1	1	0	0	0	0
Write byte 5, I/O33–I/O40	1	0	1	1	1	0	1	1	1	1
Write byte 5, byte 1	1	0	1	1	1	0	1	1	1	0

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Write Table, continued

READ/WRITE FUNCTION	\overline{GW}	\overline{BWE}	$\overline{BW8}$	$\overline{BW7}$	$\overline{BW6}$	$\overline{BW5}$	$\overline{BW4}$	$\overline{BW3}$	$\overline{BW2}$	$\overline{BW1}$
Write byte 5, byte 2	1	0	1	1	1	0	1	1	0	1
Write byte 5, byte 2, byte 1	1	0	1	1	1	0	1	1	0	0
Write byte 5, byte 3	1	0	1	1	1	0	1	0	1	1
Write byte 5, byte 3, byte 1	1	0	1	1	1	0	1	0	1	0
Write byte 5, byte 3, byte 2	1	0	1	1	1	0	1	0	0	1
Write byte 5, byte 3, byte 2, byte 1	1	0	1	1	1	0	1	0	0	0
Write byte 5, byte 4	1	0	1	1	1	0	0	1	1	1
Write byte 5, byte 4, byte 1	1	0	1	1	1	0	0	1	1	0
Write byte 5, byte 4, byte 2	1	0	1	1	1	0	0	1	0	1
Write byte 5, byte 4, byte 2, byte 1	1	0	1	1	1	0	0	1	0	0
Write byte 5, byte 4, byte 3	1	0	1	1	1	0	0	0	1	1
Write byte 5, byte 4, byte 3, byte 1	1	0	1	1	1	0	0	0	1	0
Write byte 5, byte 4, byte 3, byte 2	1	0	1	1	1	0	0	0	0	1
Write byte 5, byte 4, byte 3, byte 2, byte 1	1	0	1	1	1	0	0	0	0	0
Write byte 6	1	0	1	1	0	1	1	1	1	1
Write byte 6, byte 1	1	0	1	1	0	1	1	1	1	0
Write byte 6, byte 2	1	0	1	1	0	1	1	1	0	1
Write byte 6, byte 2, byte 1	1	0	1	1	0	1	1	1	0	0
..... and so on .....	...	...	...	...	...	...	...	...	...	...
Write byte 8, byte 7, byte 6, byte 5, byte 4, byte 2, byte 1	1	0	0	0	0	0	0	1	0	0
Write byte 8, byte 7, byte 6, byte 5, byte 4, byte 3	1	0	0	0	0	0	0	0	1	1
Write byte 8, byte 7, byte 6, byte 5, byte 4, byte 3, byte 1	1	0	0	0	0	0	0	0	1	0
Write byte 8, byte 7, byte 6, byte 5, byte 4, byte 3, byte 2	1	0	0	0	0	0	0	0	0	1
Write all bytes	1	0	0	0	0	0	0	0	0	0
Write all bytes	0	x	x	x	x	x	x	x	x	x

The ZZ state is a low-power state in which the device consumes less power than in the unselected mode. Enabling the ZZ pin for a fixed period of time will force the SRAM into the ZZ state. Pulling the ZZ pin low for a set period of time will wake up the SRAM again. While the SRAM is in ZZ mode, data retention is guaranteed, but the chip will not monitor any input signal except for the ZZ pin. In the unselected mode, on the other hand, all the input signals are monitored.

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DC CHARACTERISTICS

Absolute Maximum Ratings

PARAMETER	RATING	UNIT
Core Supply Voltage to Vss	-0.5 to 4.6	V
I/O Supply Voltage to Vss	-0.5 to 4.6	V
Input/Output to VssQ Potential	VSSQ -0.5 to VDDQ +0.5	V
Allowable Power Dissipation	1.0	W
Storage Temperature	-65 to 150	°C
Operating Temperature	0 to +70	°C

Note: Exposure to conditions beyond those listed under Absolute Maximum Ratings may adversely affect the life and reliability of the device.

Operating Characteristics

(VDD/VDDQ = 3.15V to 3.6V, Vss/VssQ = 0V, TA = 0 to 70° C)

PARAMETER	SYM.	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Input Low Voltage	VIL	-	-0.5	-	+0.8	V
Input High Voltage	VIH	-	+2.0	-	VDD +0.3	V
Input Leakage Current	ILI	VIN = VSSQ to VDDQ	-10	-	+10	μA
Output Leakage Current	ILO	VIO = VSSQ to VDDQ, and data I/O pins in high-Z state defined in truth table	-10	-	+ 10	μA
Output Low Voltage	VOL	IOL = +8.0 mA	-	-	0.4	V
Output High Voltage	VOH	IOH = -4.0 mA	2.4	-	-	V
Operating Current	IDD	Tcyc ≥ min. , I/O = 0 mA	-	-	350	mA
Standby Current	ISB	Unselected mode defined in truth table, VIN, VIO = VIH (min.) /VIL (max.) Tcyc ≥ min.	-	-	80	mA
ZZ Mode Current	IZZ	ZZ mode, Tcyc ≥ min.	-	-	5	mA

Note: Typical characteristics are measured at VDD = 3.3V, TA = 25° C.

CAPACITANCE

(VDD = 3.3V, TA = 25° C, f = 1 MHz)

PARAMETER	SYM.	CONDITIONS	MAX.	UNIT
Input Capacitance	CIN	VIN = 0V	6	pF
Input/Output Capacitance	CIO	VOUT = 0V	8	pF

Note: These parameters are sampled but not 100% tested.

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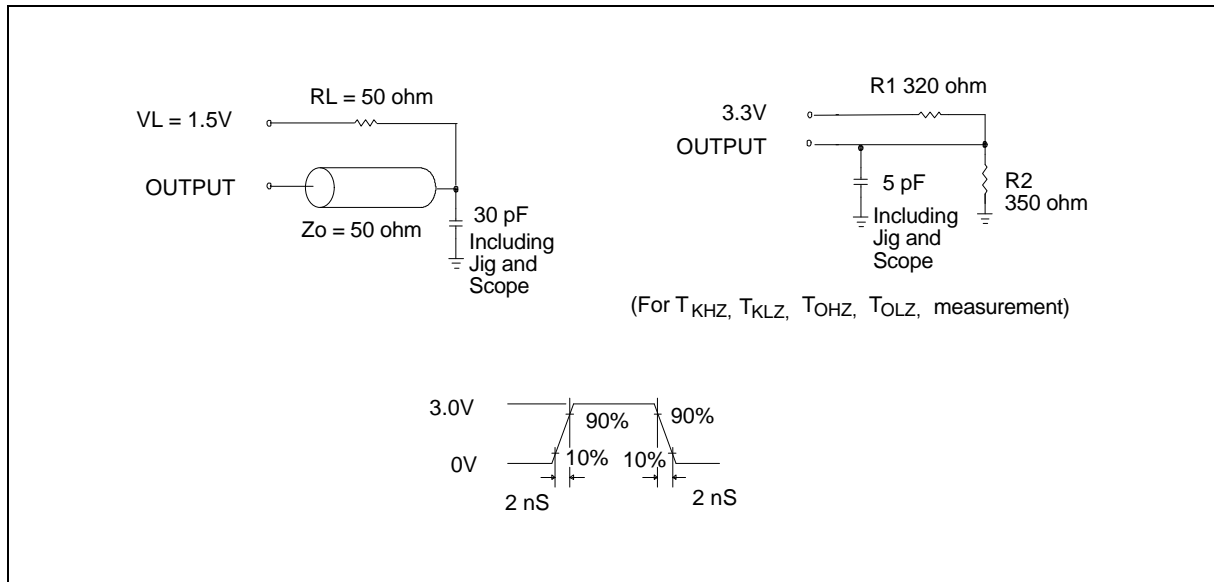


AC CHARACTERISTICS

AC Test Conditions

PARAMETER	CONDITIONS
Input Pulse Levels	0V to 3V
Input Rise and Fall Times	2 nS
Input and Output Timing Reference Level	1.5V
Output Load	CL = 30 pF, IOH/IOL = -4 mA/8 mA

AC Test Loads and Waveform



AC Timing Characteristics

($V_{DD}/V_{DDQ} = 3.15V$ to $3.6V$, $V_{SS}/V_{SSQ} = 0V$, $T_A = 0$ to $70^\circ\ \text{C}$, all timings measured in pipelined mode)

PARAMETER	SYMBOL	W25S243A-12		UNIT	NOTES
		MIN.	MAX.		
Add. Setup Time	TAS	2.5	-	nS	
Add. Hold Time	TAH	0.5	-	nS	
Write Data Setup Time	TDS	2.5	-	nS	
Write Data Hold Time	TDH	0.5	-	nS	
$\overline{\text{ADV}}$ Setup Time	TADVS	2.5	-	nS	
$\overline{\text{ADV}}$ Hold Time	TADVH	0.5	-	nS	

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AC Timing Characteristics, continued

PARAMETER	SYMBOL	W25S243A-12		UNIT	NOTES
		MIN.	MAX.		
$\overline{\text{ADSP}}$ Setup Time	TADSS	2.5	-	nS	
$\overline{\text{ADSP}}$ Hold Time	TADSH	0.5	-	nS	
$\overline{\text{ADSC}}$ Setup Time	TADCS	2.5	-	nS	
$\overline{\text{ADSC}}$ Hold Time	TADCH	0.5	-	nS	
$\overline{\text{CE1}}$, $\overline{\text{CE2}}$, $\overline{\text{CE3}}$ Setup Time	TCES	2.5	-	nS	
$\overline{\text{CE1}}$, $\overline{\text{CE2}}$, $\overline{\text{CE3}}$ Hold Time	TCEH	0.5	-	nS	
$\overline{\text{GW}}$, $\overline{\text{BWE}}$ X Setup Time	TWS	2.5	-	nS	
$\overline{\text{GW}}$, $\overline{\text{BWE}}$ X Hold Time	TWH	0.5	-	nS	
Clock Cycle Time	TCYC	15	-	nS	
Clock High Pulse Width	TKO	6	-	nS	
Clock Low Pulse Width	TKL	6	-	nS	
Clock to Output Valid	TKQ	-	12	nS	
Clock to Output High-Z	TKHZ	2	15	nS	1
Clock to Output Low-Z	TKLZ	0	-	nS	1
Clock to Output Invalid	TKX	2	-	nS	1
Output Enable to Output Valid	TOE	-	7	nS	
Output Enable to Output High-Z	TOHZ	-	7	nS	1
Output Enable to Output Low-Z	TOLZ	0	-	nS	1
Output Enable to Output Invalid	TOX	0	-	nS	
ZZ Standby Time	TZZS	-	100	nS	2
ZZ Recover Time	TZZR	100	-	nS	3

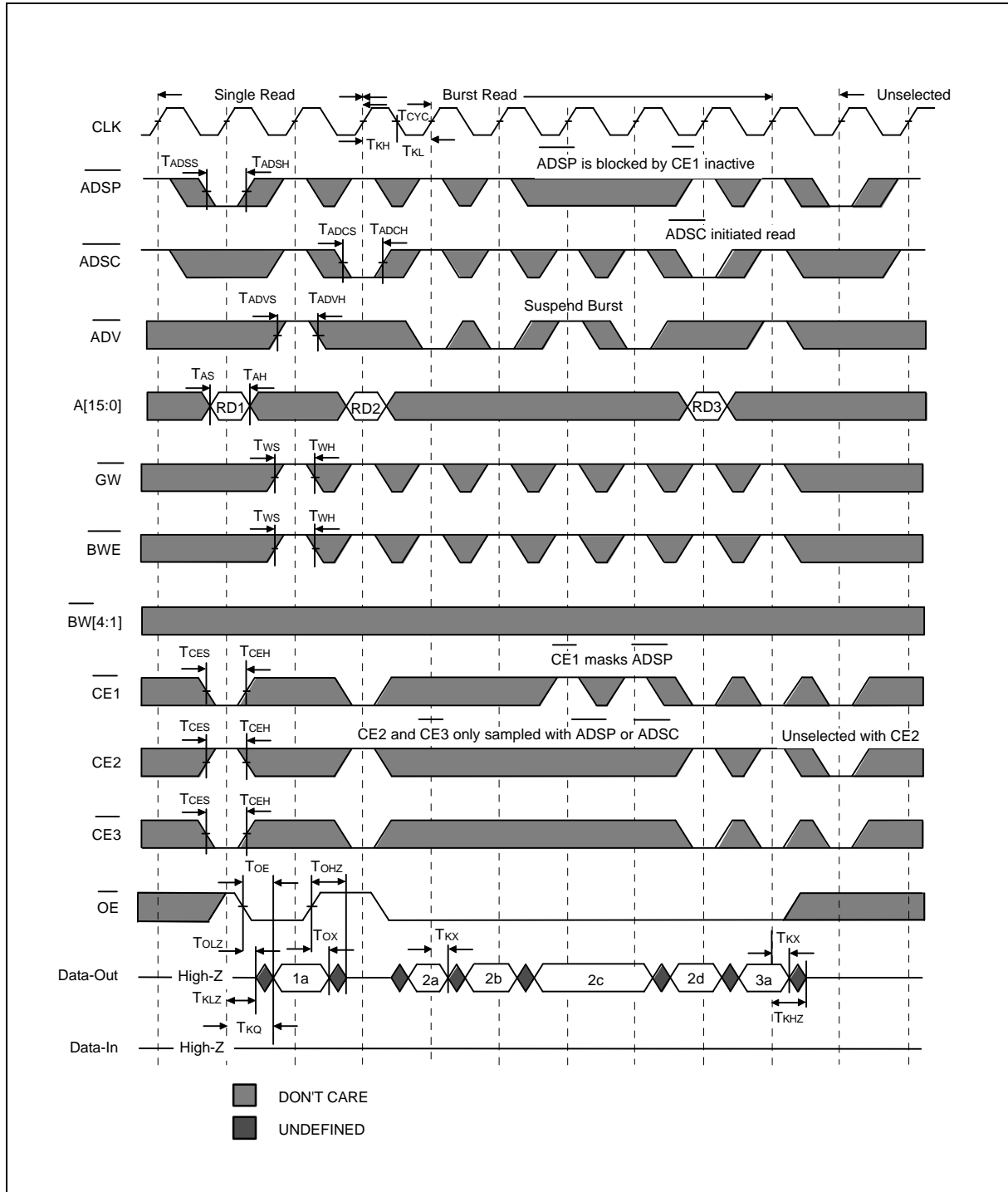
Notes:

1. These parameters are sampled but not 100% tested
2. In the ZZ mode, the SRAM will enter a low-power state. In this mode, data retention is guaranteed and the clock is active.
3. $\overline{\text{ADSC}}$ and $\overline{\text{ADSP}}$ should not be accessed for at least 100 nS after chip leaves ZZ mode.
4. Configuration signals $\overline{\text{LBO}}$ and $\overline{\text{FT}}$ are static and should not be changed during operation.



TIMING WAVEFORMS

Read Cycle Timing

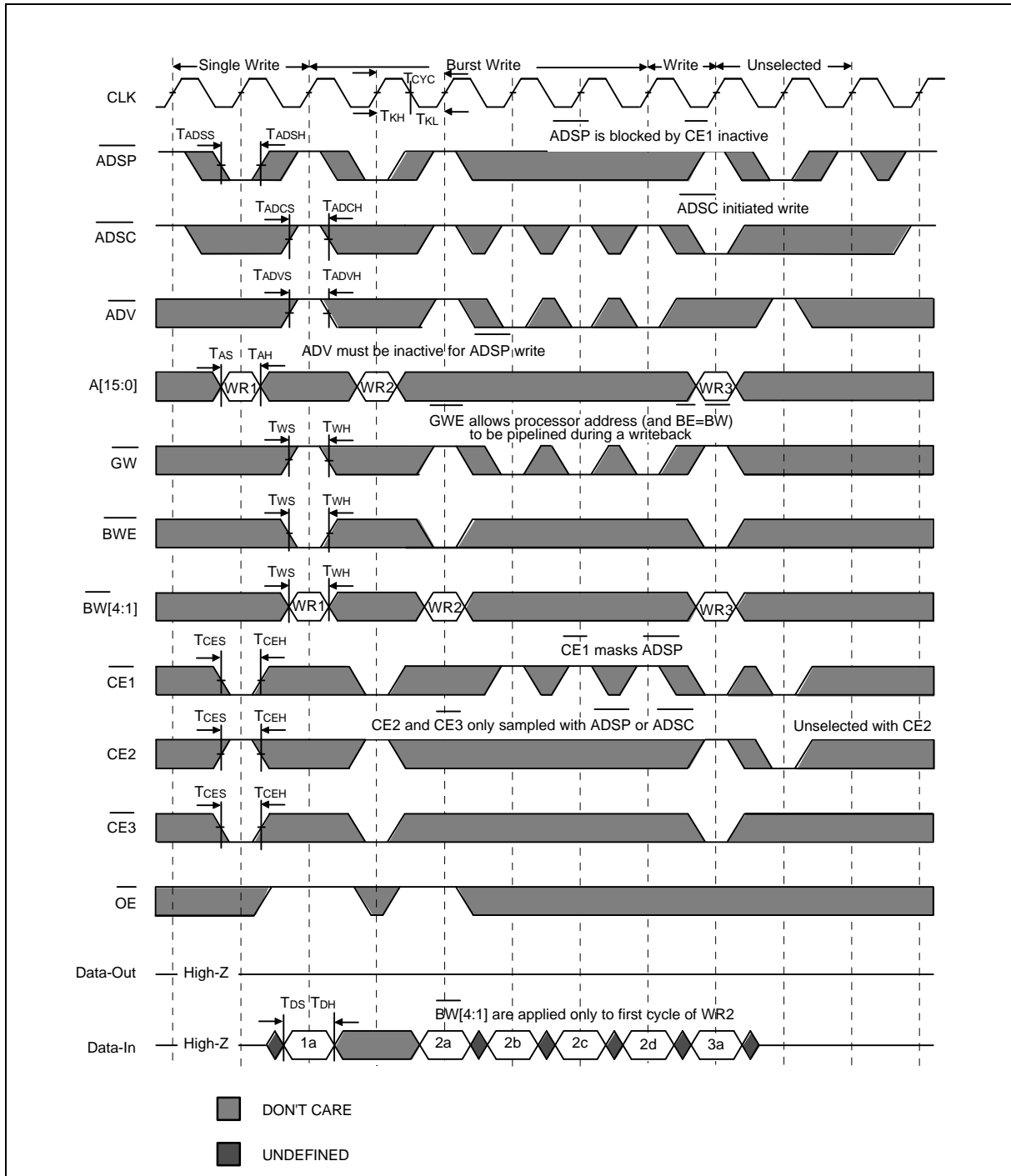


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Timing Waveforms, continued

Write Cycle Timing

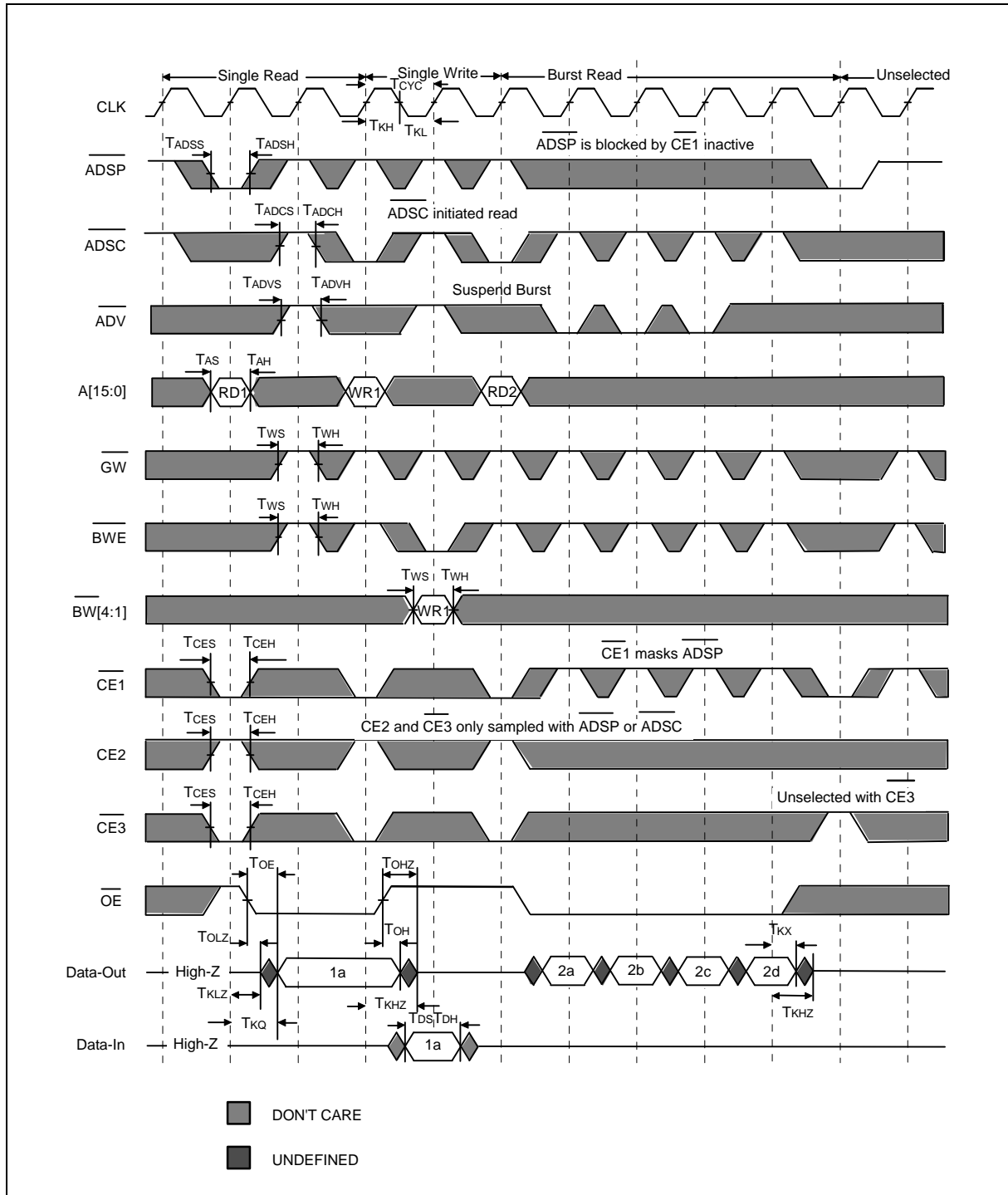


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Timing Waveforms, continued

Read/Write Cycle Timing

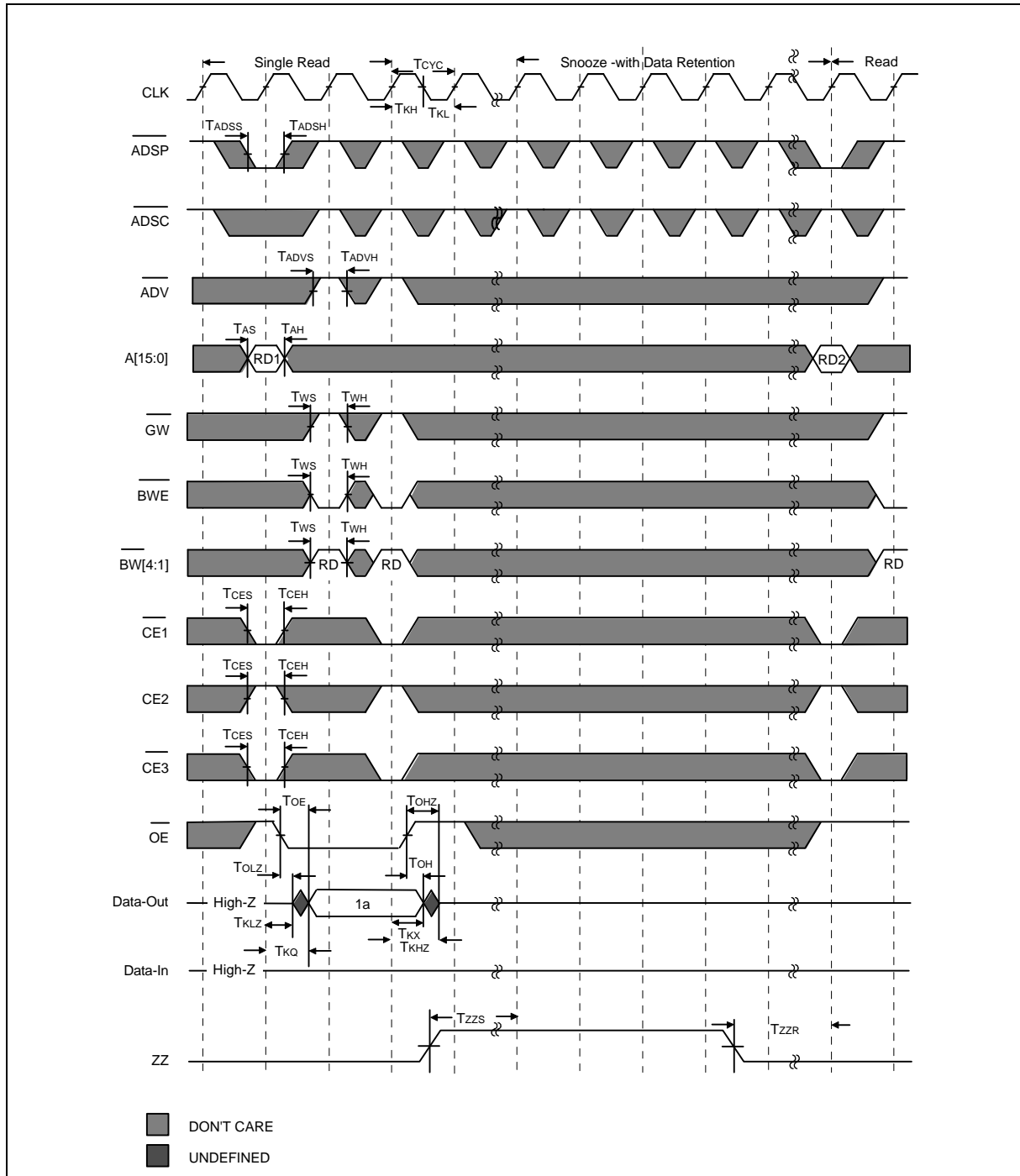


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Timing Waveforms, continued

ZZ and RD Timing



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ORDERING INFORMATION

PART NO.	ACCESS TIME (nS)	OPERATING CURRENT MAX. (mA)	STANDBY CURRENT MAX. (mA)	PACKAGE
W25S243AF-12	12	350	80	128-pin QFP
W25S243AD-12	12	350	80	128-pin TQFP

Notes

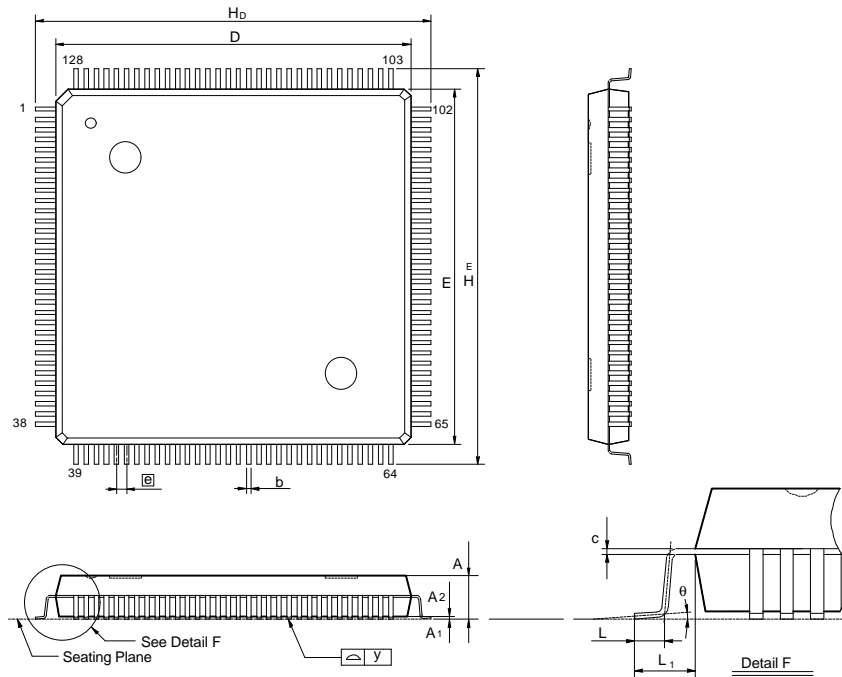
1. Winbond reserves the right to make changes to its products without prior notice.
2. Purchasers are responsible for performing appropriate quality assurance testing on products intended for use in applications where personal injury might occur as a consequence of product failure.

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PACKAGE DIMENSIONS

128-pin QFP



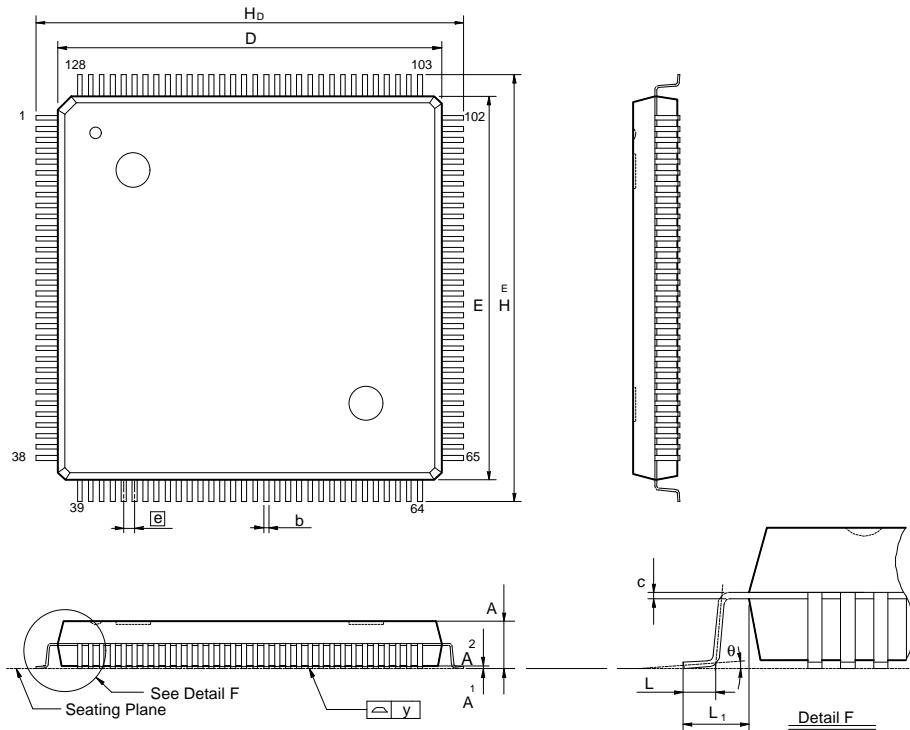
Symbol	Dimension in inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	—	—	0.134	—	—	3.40
A ₁	0.004	—	—	0.10	—	—
A ₂	0.101	0.107	0.113	2.57	2.72	2.87
b	0.006	0.008	0.010	0.15	0.20	0.25
c	0.004	0.006	0.010	0.10	0.15	0.25
D	0.547	0.551	0.555	13.90	14.00	14.10
E	0.783	0.787	0.791	19.90	20.00	20.10
e	—	0.020	—	—	0.50	—
H _D	0.669	0.677	0.685	17.00	17.20	17.40
H _E	0.905	0.913	0.921	23.00	23.20	23.40
L	0.023	0.031	0.039	0.60	0.80	1.00
L ₁	0.055	0.063	0.071	1.40	1.60	1.80
y	—	—	0.004	—	—	0.10
θ	0°	—	12°	0°	—	12°

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Package Dimensions, continued

128-pin TQFP



Symbol	Dimension in inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	—	—	0.063	—	—	1.60
A ₁	0.002	—	—	0.05	—	—
A ₂	0.053	0.055	0.057	1.35	1.40	1.45
b	0.006	0.008	0.011	0.15	0.20	0.27
c	0.004	0.006	0.010	0.10	0.15	0.25
D	0.547	0.551	0.555	13.90	14.00	14.10
E	0.783	0.787	0.791	19.90	20.00	20.10
e	—	0.020	—	—	0.50	—
H _D	0.626	0.630	0.634	15.90	16.00	16.10
H _E	0.862	0.866	0.870	21.90	22.00	22.10
L	0.018	0.024	0.030	0.45	0.60	0.75
L ₁	—	0.039	—	—	1.00	—
y	—	—	0.004	—	—	0.10
θ	0°	—	12°	0°	—	12°

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VERSION HISTORY

VERSION	DATE	PAGE	DESCRIPTION
A1	Nov. 1998		Initial Issued



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Note: All data and specifications are subject to change without notice.