IS61LF6436A
IS61LF6432A

Long-term Support
World Class Quality

64Kx32, 64Kx36
SYNCHRONOUS FLOW-THROUGH STATIC RAM

MAY 2017

FEATURES

- Internal self-timed write cycle
- Individual Byte Write Control and Global Write
- Clock controlled, registered address, data and control
- Interleaved or linear burst sequence control using MODE input
- Three chip enables for simple depth expansion and address pipelining
- Common data inputs and data outputs
- Power-down control by ZZ input
- JEDEC 100-Pin TQFP package
- Power Supply:
  +3.3V V_{DD}
  +3.3V or 2.5V V_{DDQ}
- Control pins mode upon power-up:
  – MODE in interleave burst mode
  – ZZ in normal operation mode
- Industrial Temperature Available:
  (-40°C to +85°C)
- Lead-free available

DESCRIPTION

The *ISSI* IS61LF6432A and IS61LF6436A are high-speed, low-power synchronous static RAM designed to provide a burstable, high-performance, memory. IS61LF6432A is organized as 65,536 words by 32 bits. IS61LF6436A is organized as 65,536 words by 36 bits. They are fabricated with *ISSI*'s advanced CMOS technology. The device integrates a 2-bit burst counter, high-speed SRAM core, and high-drive capability outputs into a single monolithic circuit. All synchronous inputs pass through registers controlled by a positive-edge-triggered single clock input.

Write cycles are internally self-timed and are initiated by the rising edge of the clock input. Write cycles can be from one to four bytes wide as controlled by the write control inputs.

Separate byte enables allow individual bytes to be written. $\overline{BWa}$ controls DQa, $\overline{BWb}$ controls DQb, $\overline{BWc}$ controls DQc, $\overline{BWd}$ controls DQd, conditioned by $\overline{BWE}$ being LOW. A LOW on $\overline{GW}$ input would cause all bytes to be written.

Bursts can be initiated with either $\overline{ADSP}$ (Address Status Processor) or $\overline{ADSC}$ (Address Status Cache Controller) input pins. Subsequent burst addresses can be generated internally by the IS61LF6432A/36A and controlled by the $\overline{ADV}$ (burst address advance) input pin.

The mode pin is used to select the burst sequence order. Linear burst is achieved when this pin is tied LOW. Interleave burst is achieved when this pin is tied HIGH or left floating.

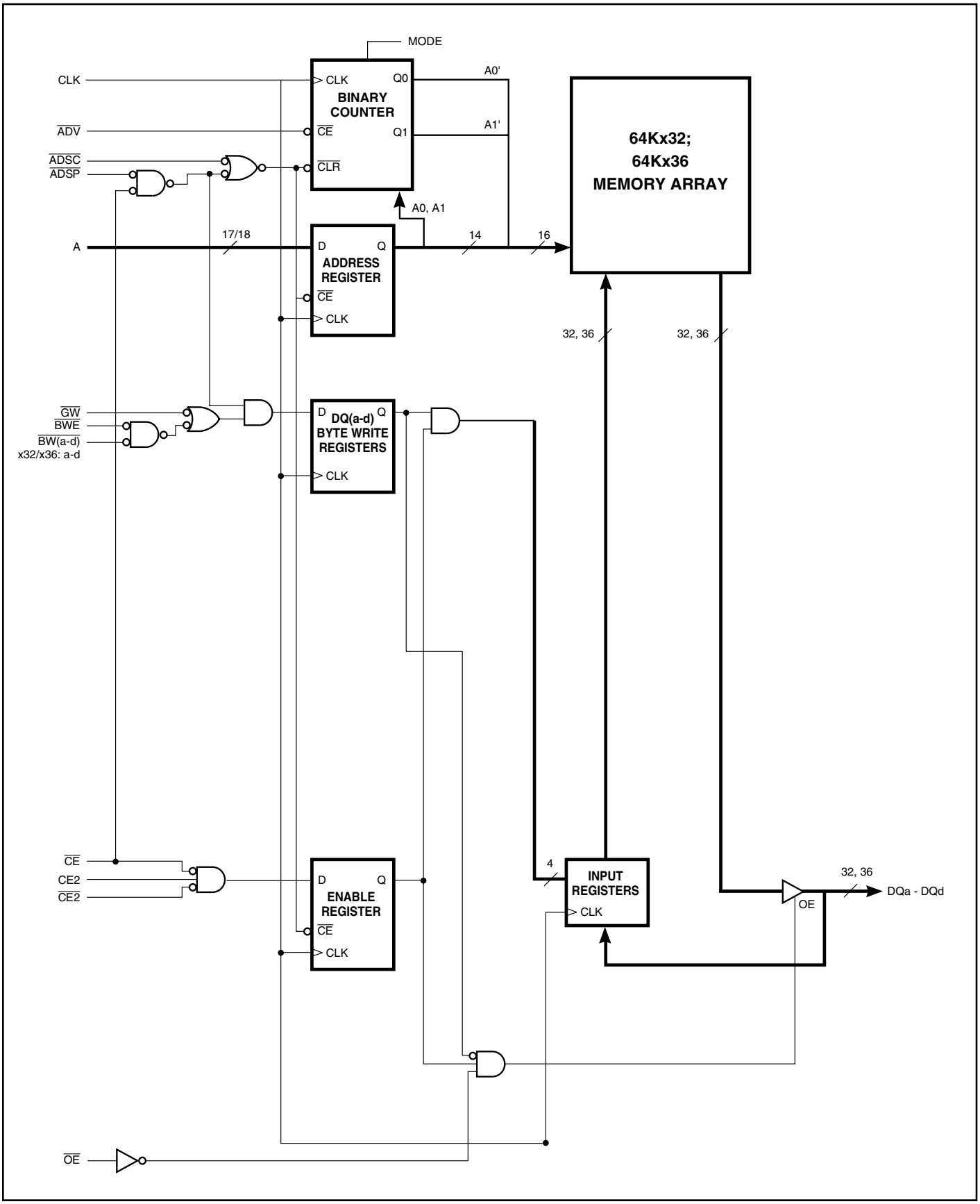
FAST ACCESS TIME

Symbol	Parameter	8.5	Unit
t_{KQ}	Clock Access Time	8.5	ns
t_{KC}	Cycle Time	11	ns
	Frequency	90	MHz

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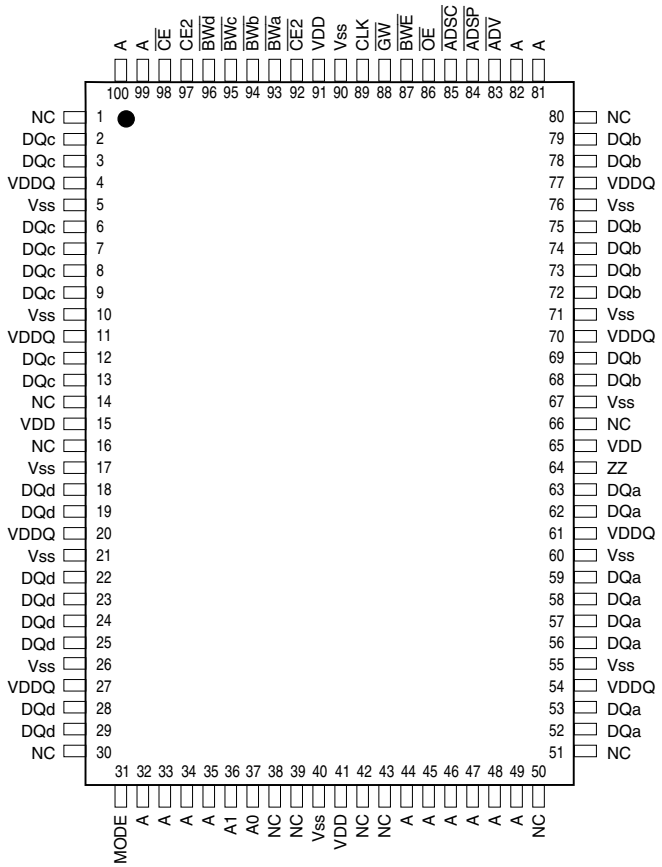
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a.) the risk of injury or damage has been minimized;
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BLOCK DIAGRAM



PIN CONFIGURATION

100-Pin TQFP



64K x 32

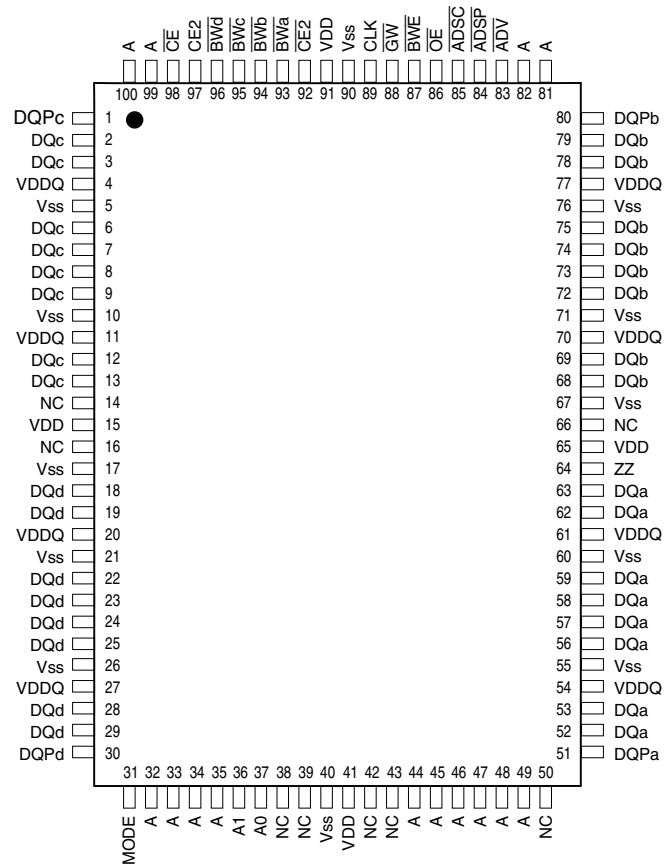
PIN DESCRIPTIONS

A0, A1	Synchronous Address Inputs. These pins must tied to the two LSBs of the address bus.
A	Synchronous Address Inputs
CLK	Synchronous Clock
$\overline{ADSP}$	Synchronous Processor Address Status
$\overline{ADSC}$	Synchronous Controller Address Status
$\overline{ADV}$	Synchronous Burst Address Advance
$\overline{BWa}$-$\overline{BWd}$	Individual Byte Write Enable
$\overline{BWE}$	Synchronous Byte Write Enable

$\overline{GW}$	Synchronous Global Write Enable
$\overline{CE}$, $\overline{CE2}$, CE2	Synchronous Chip Enable
$\overline{OE}$	Output Enable
DQa-DQd	Synchronous Data Input/Output
MODE	Burst Sequence Mode Selection
V_{DD}	+3.3V Power Supply
Vss	Ground
V_{DDQ}	Isolated Output Buffer Supply: +3.3V or 2.5V
ZZ	Snooze Enable

PIN CONFIGURATION

100-Pin TQFP



64K x 36

PIN DESCRIPTIONS

A0, A1	Synchronous Address Inputs. These pins must tied to the two LSBs of the address bus.
A	Synchronous Address Inputs
CLK	Synchronous Clock
$\overline{ADSP}$	Synchronous Processor Address Status
$\overline{ADSC}$	Synchronous Controller Address Status
$\overline{ADV}$	Synchronous Burst Address Advance
$\overline{BWa}$-$\overline{BWd}$	Individual Byte Write Enable
$\overline{BWE}$	Synchronous Byte Write Enable
$\overline{GW}$	Synchronous Global Write Enable
$\overline{CE}$, $\overline{CE2}$, CE2	Synchronous Chip Enable
$\overline{OE}$	Output Enable
DQa-DQd	Synchronous Data Input/Output
MODE	Burst Sequence Mode Selection
V_{DD}	+3.3V Power Supply
Vss	Ground
V_{DDQ}	Isolated Output Buffer Supply: +3.3V or 2.5V
ZZ	Snooze Enable
DQPa-DQPd	Parity Data I/O

TRUTH TABLE

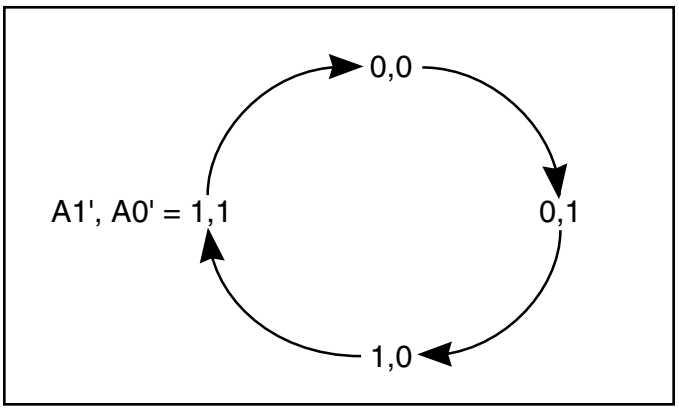
Operation	Address Used	$\overline{CE}$	CE2	$\overline{CE2}$	$\overline{ADSP}$	$\overline{ADSC}$	$\overline{ADV}$	$\overline{WRITE}$	$\overline{OE}$	DQ
Deselected, Power-down	None	H	X	X	X	L	X	X	X	High-Z
Deselected, Power-down	None	L	X	H	L	X	X	X	X	High-Z
Deselected, Power-down	None	L	L	X	L	X	X	X	X	High-Z
Deselected, Power-down	None	X	X	H	H	L	X	X	X	High-Z
Deselected, Power-down	None	X	L	X	H	L	X	X	X	High-Z
Read Cycle, Begin Burst	External	L	H	L	L	X	X	X	X	Q
Read Cycle, Begin Burst	External	L	H	L	H	L	X	Read	X	Q
Write Cycle, Begin Burst	External	L	H	L	H	L	X	Write	X	D
Read Cycle, Continue Burst	Next	X	X	X	H	H	L	Read	L	Q
Read Cycle, Continue Burst	Next	X	X	X	H	H	L	Read	H	High-Z
Read Cycle, Continue Burst	Next	H	X	X	X	H	L	Read	L	Q
Read Cycle, Continue Burst	Next	H	X	X	X	H	L	Read	H	High-Z
Write Cycle, Continue Burst	Next	X	X	X	H	H	L	Write	X	D
Write Cycle, Continue Burst	Next	H	X	X	X	H	L	Write	X	D
Read Cycle, Suspend Burst	Current	X	X	X	H	H	H	Read	L	Q
Read Cycle, Suspend Burst	Current	X	X	X	H	H	H	Read	H	High-Z
Read Cycle, Suspend Burst	Current	H	X	X	X	H	H	Read	L	Q
Read Cycle, Suspend Burst	Current	H	X	X	X	H	H	Read	H	High-Z
Write Cycle, Suspend Burst	Current	X	X	X	H	H	H	Write	X	D
Write Cycle, Suspend Burst	Current	H	X	X	X	H	H	Write	X	D

PARTIAL TRUTH TABLE

Function	$\overline{GW}$	$\overline{BWE}$	$\overline{BWa}$	$\overline{BWb}$	$\overline{BWc}$	$\overline{BWd}$
Read	H	H	X	X	X	X
Read	H	L	H	H	H	H
Write Byte 1	H	L	L	H	H	H
Write All Bytes	H	L	L	L	L	L
Write All Bytes	L	X	X	X	X	X

INTERLEAVED BURST ADDRESS TABLE (MODE = V_{DD} or No Connect)

External Address A1 A0	1st Burst Address A1 A0	2nd Burst Address A1 A0	3rd Burst Address A1 A0
00	01	10	11
01	00	11	10
10	11	00	01
11	10	01	00



ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Parameter	Value	Unit
T_{STG}	Storage Temperature	–55 to +150	°C
P_D	Power Dissipation	1.6	W
I_{OUT}	Output Current (per I/O)	100	mA
V_{IN}, V_{OUT}	Voltage Relative to Vss for I/O Pins	–0.5 to V_{DDQ} + 0.3	V
V_{IN}	Voltage Relative to Vss for for Address and Control Inputs	–0.5 to V_{DD} + 0.5	V
V_{DD}	Voltage on V_{DD} Supply Relative to Vss	–0.5 to 4.6	V

Notes:

1. Stress greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
2. This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields; however, precautions may be taken to avoid application of any voltage higher than maximum rated voltages to this high-impedance circuit.
3. This device contains circuitry that will ensure the output devices are in High-Z at power up.

OPERATING RANGE

Range	Ambient Temperature	V_{DD}	3.3V (I/O) V_{DDQ}	2.5V (I/O) V_{DDQ}
Industrial	–40°C to +85°C	3.3V, +10%, –5%	3.3V, +10%, –5%	2.5V ± 5%

DC ELECTRICAL CHARACTERISTICS(1) (Over Operating Range)

Symbol	Parameter	Test Conditions	2.5V (I/O) Min.	2.5V (I/O) Max.	3.3V (I/O) Min.	3.3V (I/O) Max.	Unit
V_{OH}	Output HIGH Voltage	I_{OH} = –4.0 mA (3.3V) I_{OH} = 1.0 mA (2.5V)	2.0	—	2.4	—	V
V_{OL}	Output LOW Voltage	I_{OL} = 8.0 mA (3.3V) I_{OL} = 1.0 mA (2.5V)	—	0.4	—	0.4	V
V_{IH}	Input HIGH Voltage		1.7	V_{DD} + 0.3	2.0	V_{DD} + 0.3	V
V_{IL} V		Input LOW Voltage		–0.3	0.7	–0.3	0.8
I_{LI}	Input Leakage Current	$V_{SS} \le V_{IN} \le V_{DD}$	–5	5	–5	5	µA
I_{LO}	Output Leakage Current	$V_{SS} \le V_{OUT} \le V_{DDQ}$, $\overline{OE} = V_I$	–5	5	–5	5	µA

POWER SUPPLY CHARACTERISTICS (Over Operating Range)

Symbol	Parameter	Test Conditions		8.5 Max.	Unit
I_{CC}	AC Operating Supply Current	Device Selected, $\overline{OE}$ = V_{IH}, ZZ ≤ V_{IL}, All Inputs ≤ 0.2V or ≥ V_{DD} – 0.2V, Cycle Time ≥ t_{KC} min.	IND.	150	mA
$I_{SB}1$	Standby Current CMOS Input	Device Deselected, V_{DD} = Max., $V_{IN} \le V_{SS}$ + 0.2V or ≥V_{DD} – 0.2V f = 0	IND.	75	mA
I_{ZZ}	Sleep Mode	ZZ>V_{IH}	IND.	35	mA

Notes:
1. The MODE pin has an internal pullup. This pin may be a No Connect, tied to Vss, or tied to V_{DD}.
2. The MODE pin should be tied to V_{DD} or Vss. It exhibits ±10 µA maximum leakage current when tied to ≤ Vss + 0.2V or ≥ V_{DD} – 0.2V.

CAPACITANCE[1,2]

Symbol	Parameter	Conditions	Max.	Unit
C_{IN}	Input Capacitance	V_{IN} = 0V	6	pF
C_{OUT}	Input/Output Capacitance	V_{OUT} = 0V	8	pF

Notes:

1. Tested initially and after any design or process changes that may affect these parameters.
2. Test conditions: T_A = 25°C, f = 1 MHz, V_{DD} = 3.3V.

3.3V I/O AC TEST CONDITIONS

Parameter	Unit
Input Pulse Level	0V to 3.0V
Input Rise and Fall Times	1.5 ns
Input and Output Timing and Reference Level	1.5V
Output Load	See Figures 1 and 2

3.3V I/O OUTPUT LOAD EQUIVALENT

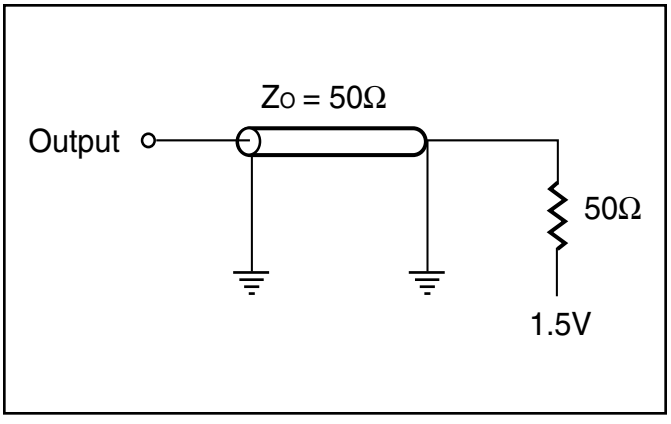


Figure 1

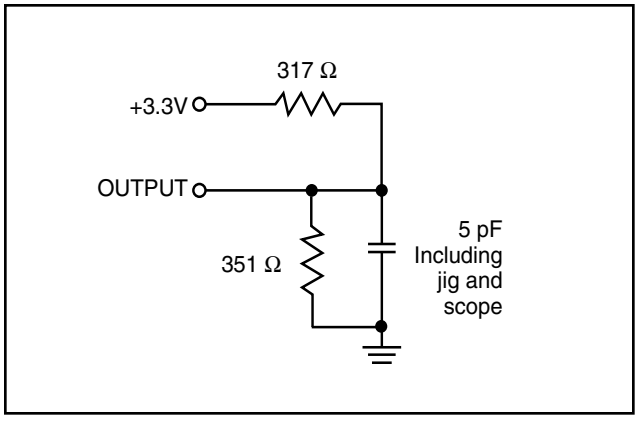


Figure 2

2.5V I/O AC TEST CONDITIONS

Parameter	Unit
Input Pulse Level	0V to 2.5V
Input Rise and Fall Times	1ns
Input and Output Timing and Reference Level	1.25V
Output Load	See Figures 3 and 4

2.5V I/O OUTPUT LOAD EQUIVALENT

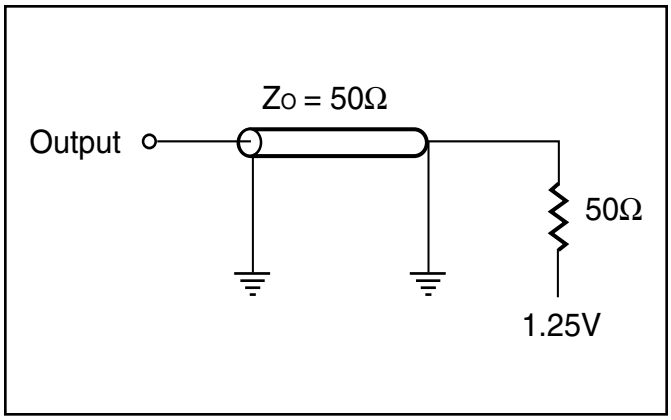


Figure 3

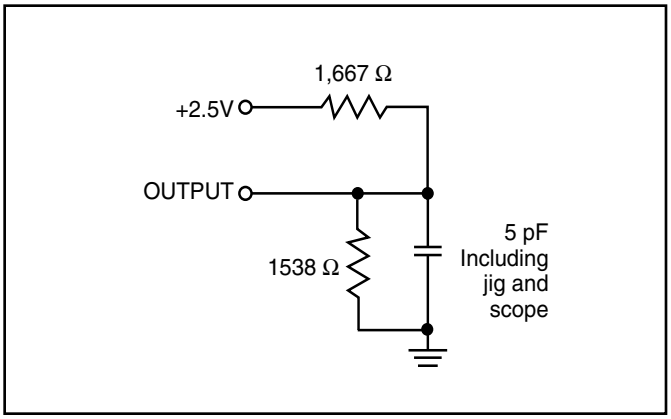


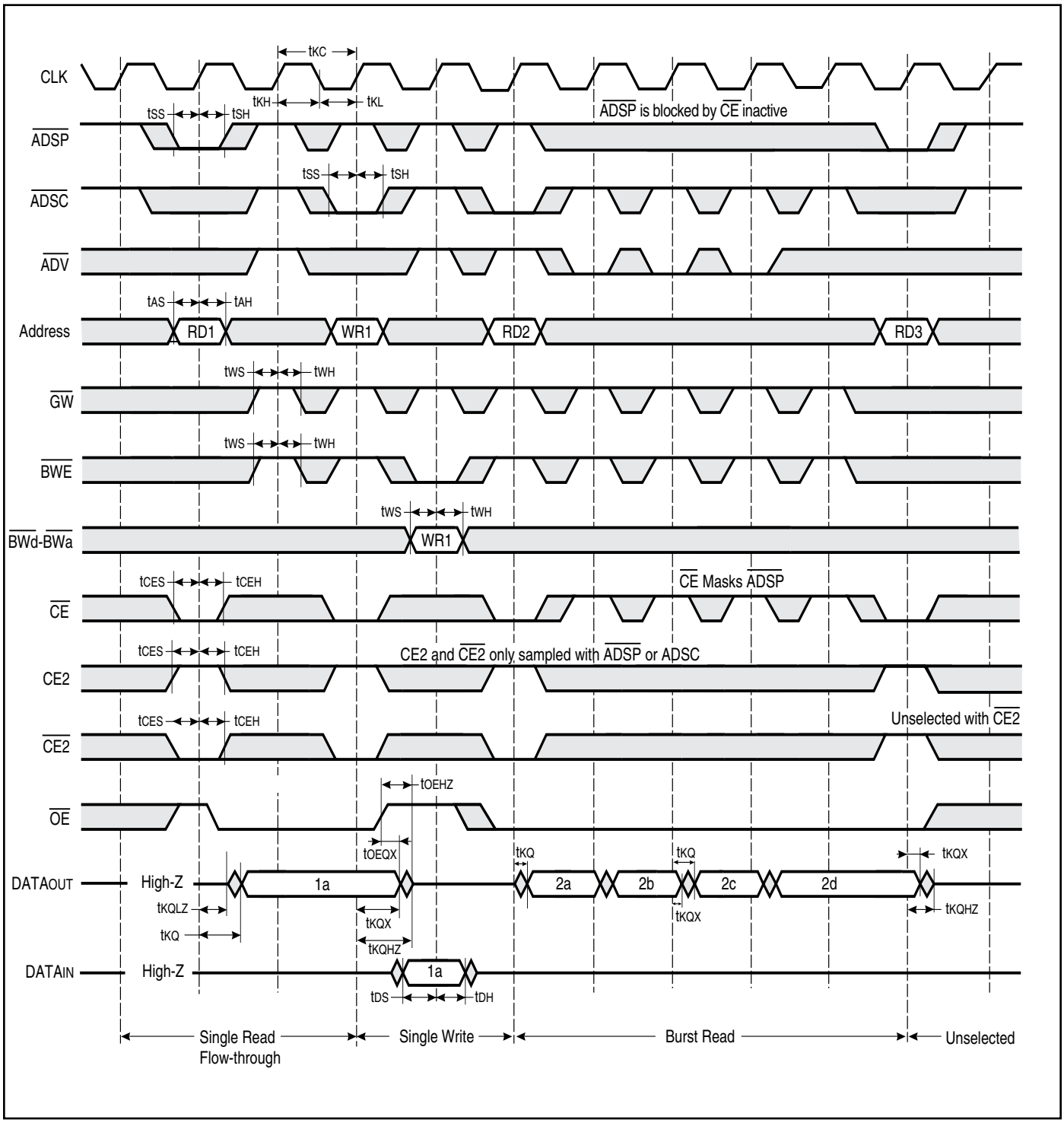
Figure 4

READ/WRITE CYCLE SWITCHING CHARACTERISTICS (Over Operating Range)

		8.5		
Symbol	**Parameter**	**Min.**	**Max.**	**Unit**
f_{MAX}[3]	Clock Frequency	—	90	MHz
t_{KC}[3]	Cycle Time	11	—	ns
t_{KH}	Clock High Time	4.5	—	ns
t_{KL}[3]	Clock Low Time	4.5	—	ns
t_{KQ}[3]	Clock Access Time	—	8.5	ns
t_{KQX}[1]	Clock High to Output Invalid	2	—	ns
t_{KQLZ}[1,2]	Clock High to Output Low-Z	0	—	ns
t_{KQHZ}[1,2]	Clock High to Output High-Z	2	3.5	ns
t_{OEQ}[3]	Output Enable to Output Valid	—	4.0	ns
t_{OEQX}[1]	Output Enable to Output Invalid		2 —	ns
t_{OELZ}[1,2]	Output Enable to Output Low-Z		0 —	ns
t_{OEHZ}[1,2]	Output Disable to Output High-Z	—	5.0	ns
t_{AS}[3]	Address Setup Time	2	—	ns
t_{SS}[3]	Address Status Setup Time	2	—	ns
t_{WS}[3]	Write Setup Time	2	—	ns
t_{CES}[3]	Chip Enable Setup Time	2	—	ns
t_{AVS}[3]	Address Advance Setup Time	2	—	ns
t_{AH}[3]	Address Hold Time	1	—	ns
t_{SH}[3]	Address Status Hold Time	0.5	—	ns
t_{WH}[3]	Write Hold Time	0.5	—	ns
t_{CEH}[3]	Chip Enable Hold Time	0.5	—	ns
t_{AVH}[3]	Address Advance Hold Time	0.5	—	ns

Notes:
1. Guaranteed but not 100% tested. This parameter is periodically sampled.
2. Tested with load in Figure 2.
3. Tested with load in Figure 1.

READ/WRITE CYCLE TIMING

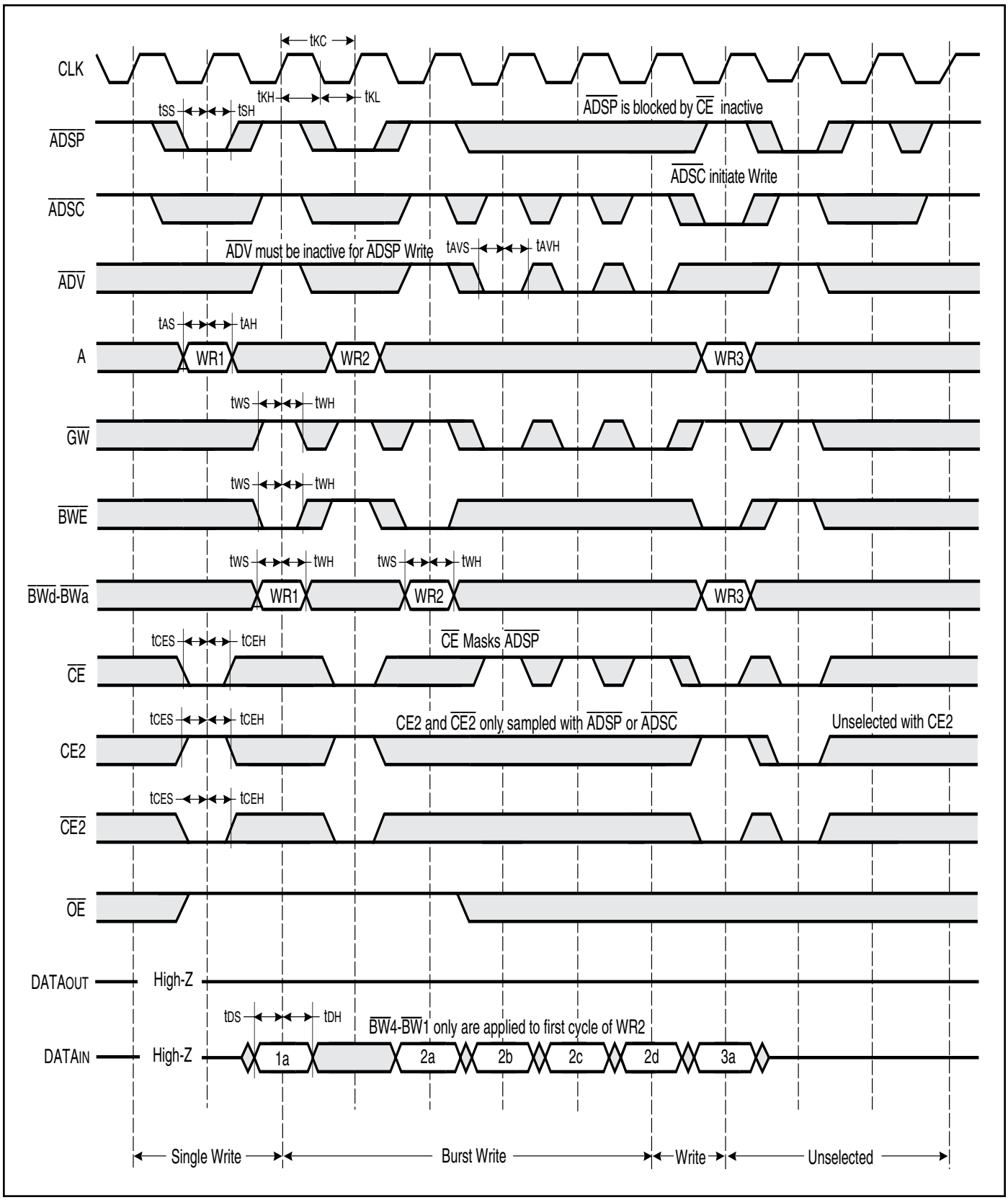


WRITE CYCLE SWITCHING CHARACTERISTICS (Over Operating Range)

		8.5		
Symbol	**Parameter**	**Min.**	**Max.**	**Unit**
t_{KC}[1]	Cycle Time	11	—	ns
t_{KH}[1]	Clock High Time	4.5	—	ns
t_{KL}[1]	Clock Low Time	4.5	—	ns
t_{AS}[1]	Address Setup Time	2	—	ns
t_{SS}[1]	Address Status Setup Time	2	—	ns
t_{WS}[1]	Write Setup Time	2	—	ns
t_{DS}[1]	Data In Setup Time	3	—	ns
t_{CES}[1]	Chip Enable Setup Time	2	—	ns
t_{AVS}[1]	Address Advance Setup Time	2	—	ns
t_{AH}[1]	Address Hold Time	1	—	ns
t_{SH}[1]	Address Status Hold Time	0.5	—	ns
t_{DH}[1]	Data In Hold Time	1	—	ns
t_{WH}[1]	Write Hold Time	0.5	—	ns
t_{CEH}[1]	Chip Enable Hold Time	0.5	—	ns
t_{AVH}[1]	Address Advance Hold Time	0.5	—	ns

Notes:
1. Tested with load in Figure 1.

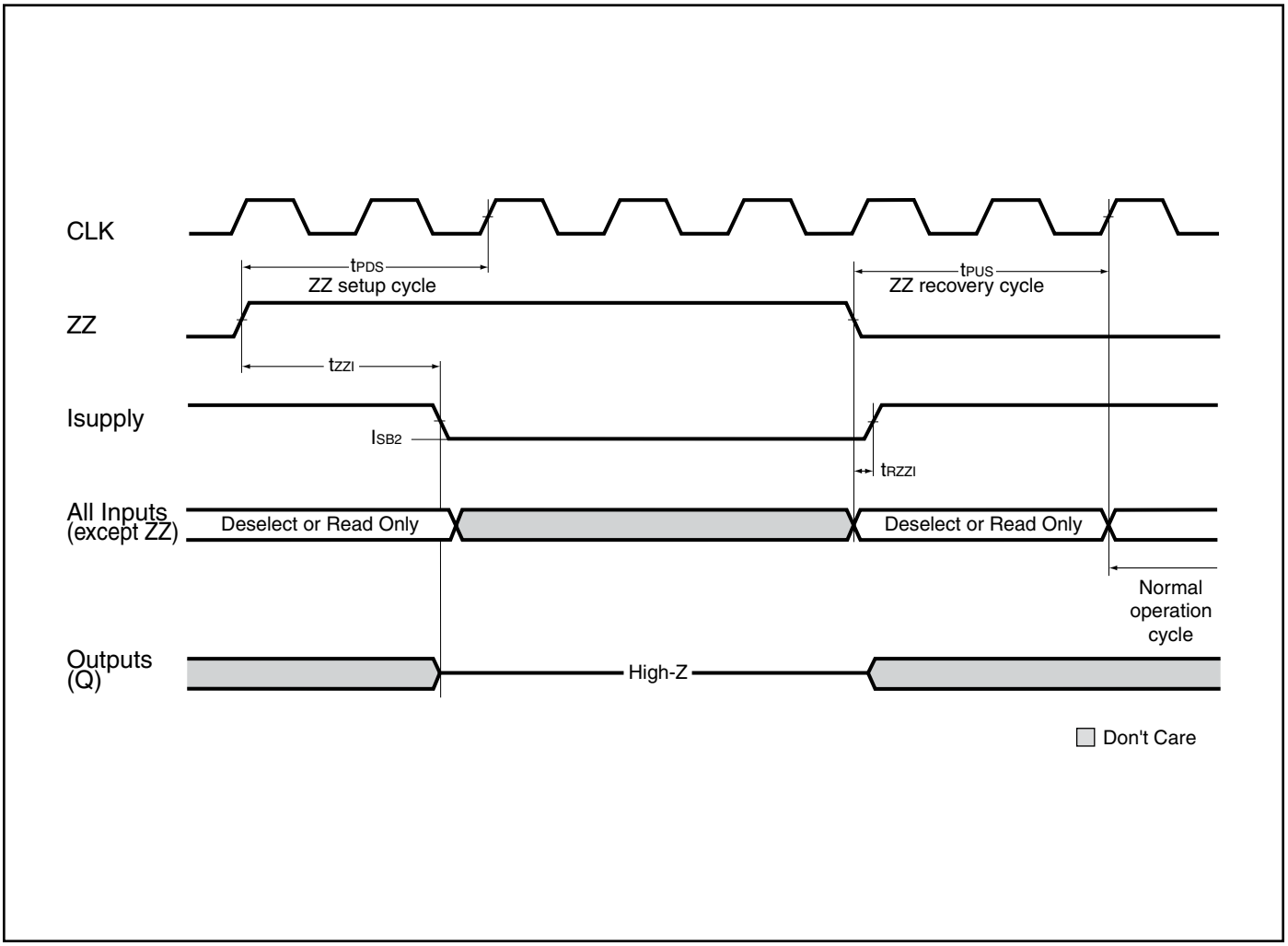
WRITE CYCLE TIMING



SNOOZE MODE ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	Min.	Max.	Unit
I_{SB2}	Current during SNOOZE MODE	ZZ ≥ Vih	—	35	mA
t_{PDS}	ZZ active to input ignored		—	2	cycle
t_{PUS}	ZZ inactive to input sampled		2	—	cycle
t_{ZZI}	ZZ active to SNOOZE current		—	2	cycle
t_{RZZI}	ZZ inactive to exit SNOOZE current		0	—	ns

SNOOZE MODE TIMING



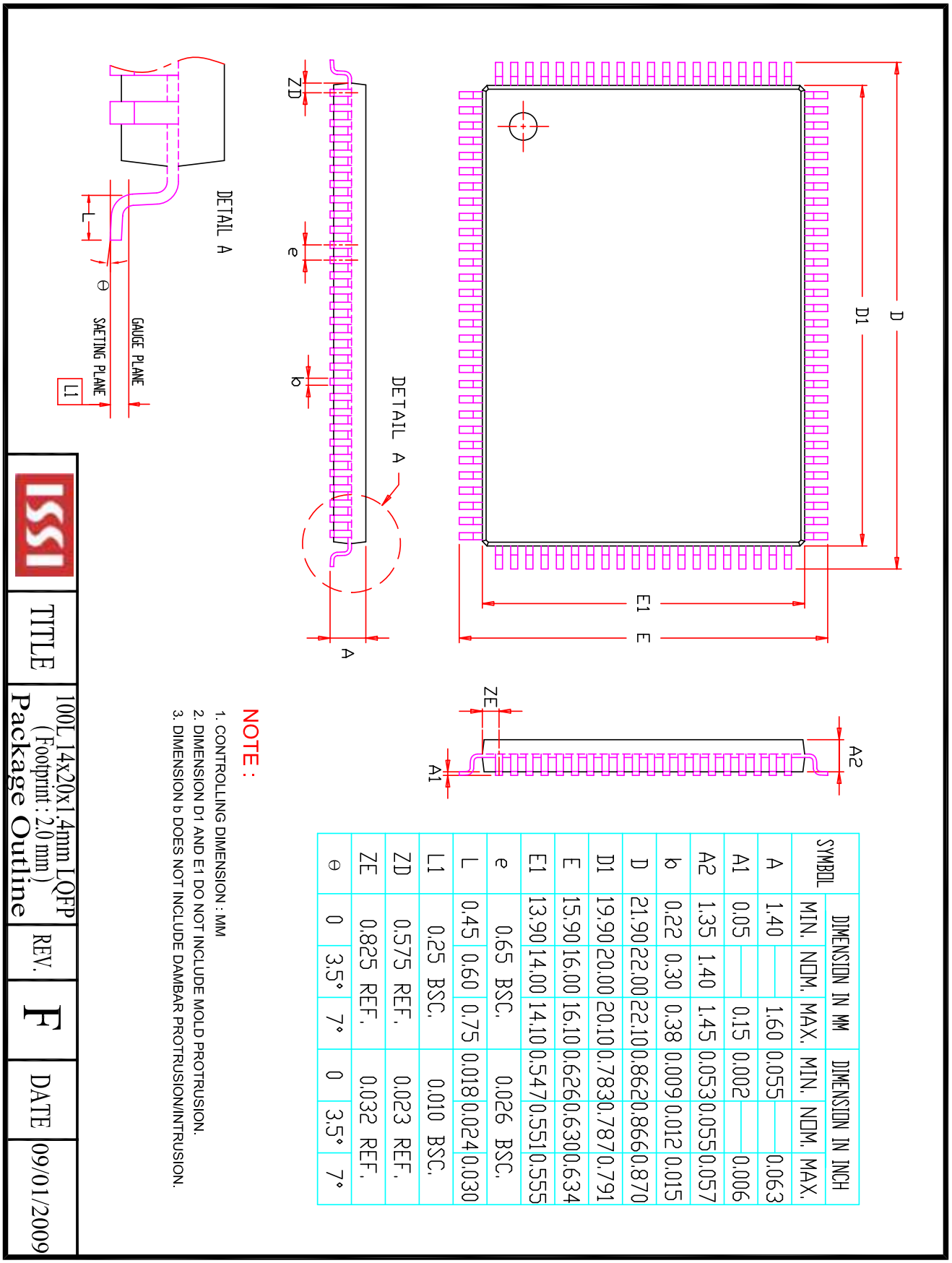
ORDERING INFORMATION

3.3V I/O OR 2.5V I/O

Industrial Range: -40°C TO +85°C

Speed (ns)	Order Part No.	Package
8.5	IS61LF6432A-8.5TQLI	TQFP, Lead-free
8.5	IS61LF6436A-8.5TQLI	TQFP, Lead-free

PACKAGE OUTLINE DRAWING



SYMBOL	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.40	—	1.60	0.055	—	0.063
A1	0.05	—	0.15	0.002	—	0.006
A2	1.35	1.40	1.45	0.053	0.055	0.057
b	0.22	0.30	0.38	0.009	0.012	0.015
D	21.90	22.00	22.10	0.862	0.866	0.870
D1	19.90	20.00	20.10	0.783	0.787	0.791
E	15.90	16.00	16.10	0.626	0.630	0.634
E1	13.90	14.00	14.10	0.547	0.551	0.555
e		0.65 BSC.			0.026 BSC.	
L	0.45	0.60	0.75	0.018	0.024	0.030
L1		0.25 BSC.			0.010 BSC.	
ZD		0.575 REF.			0.023 REF.	
ZE		0.825 REF.			0.032 REF.	
θ	0°	3.5°	7°	0°	3.5°	7°

NOTE :

1. CONTROLLING DIMENSION : MM
2. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION/INTRUSION.

TITLE	100L 14x20x1.4mm LQFP (Footprint : 2.0 mm) Package Outline	REV.	F	DATE 09/01/2009

280-600-011 REV. A