



128K ´ 8 CMOS STATIC RAM

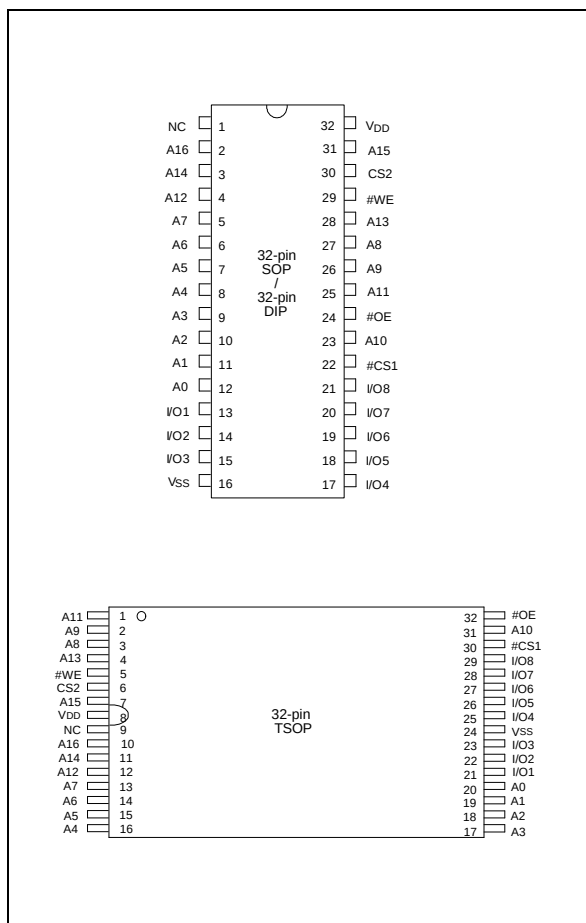
GENERAL DESCRIPTION

The W24100 is a normal-speed, very low-power CMOS static RAM organized as 131072×8 bits that operates on a single 5-volt power supply. This device is manufactured using Winbond's high performance CMOS technology.

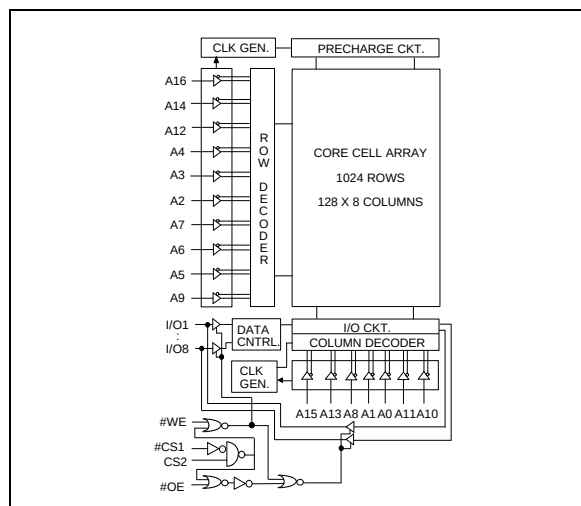
FEATURES

- Low power consumption:
 - Active: 385 mW (max.)
- Access time: 70 nS
- Single 5V power supply
- Fully static operation
- All inputs and outputs directly TTL compatible
- Three-state outputs
- Battery back-up operation capability
- Data retention voltage: 2V (min.)
- Package: 32-pin 600 mil DIP, 32-pin 450 mil SOP, standard type one TSOP (8 mm $\times$ 20 mm) and small type one TSOP (8 mm $\times$ 13.4 mm)

PIN CONFIGURATIONS



BLOCK DIAGRAM



PIN DESCRIPTION

SYMBOL	DESCRIPTION
A0–A16	Address Inputs
I/O1–I/O8	Data Inputs/Outputs
#CS1, CS2	Chip Select Input
#WE	Write Enable Input
#OE	Output Enable Input
VDD	Power Supply
VSS	Ground
NC	No Connection

TRUTH TABLE

#CS1	CS2	#OE	#WE	MODE	I/O1 - I/O8	V _{DD} CURRENT
H	X	X	X	Not Selected	High Z	ISB, ISB1
X	L	X	X	Not Selected	High Z	ISB, ISB1
L	H	H	H	Output Disable	High Z	I _{DD}
L	H	L	H	Read	Data Out	I _{DD}
L	H	X	L	Write	Data In	I _{DD}

DC CHARACTERISTICS

Absolute Maximum Ratings

PARAMETER		RATING	UNIT
Supply Voltage to V _{SS} Potential		-0.5 to +7.0	V
Input/Output to V _{SS} Potential		-0.5 to V _{DD} +0.5	V
Allowable Power Dissipation		1.0	W
Storage Temperature		-65 to +150	°C
Operating Temperature	L/LL	0 to 70	°C
	LE	-20 to 85	

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

Operating Characteristics

(V_{DD} = 5V ±10%; V_{SS} = 0V; T_A (°C) = 0 to 70 for LL, -20 to 85 for LE)

PARAMETER	SYM.	TEST CONDITIONS	MIN.	TYP.*	MAX.	UNIT
Input Low Voltage	V _{IL}	-	-0.5	-	+0.8	V
Input High Voltage	V _{IH}	-	+2.2	-	V _{DD} +0.5	V
Input Leakage Current	I _{LI}	V _{IN} = V _{SS} to V _{DD}	-1	-	+1	μA
Output Leakage Current	I _{LO}	V _{I/O} = V _{SS} to V _{DD} , #CS1 = V _{IH} (min.) or #OE = V _{IH} (min.) or #WE = V _{IL} (max.)	-1	-	+1	μA
Output Low Voltage	V _{OL}	I _{OL} = +2.1 mA	-	-	0.4	V
Output High Voltage	V _{OH}	I _{OH} = -1.0 mA	2.4	-	-	V
Operating Power Supply Current	I _{DD}	#CS1 = V _{IL} (max.) and CS2 = V _{IH} (min.), I/O = 0 mA Cycle = min., Duty = 100%	-	-	70	mA
Standby Power Supply Current	ISB	#CS1 = V _{IH} (min.), Cycle = min. Duty = 100%	-	-	3	mA
	ISB1	#CS1 ≥ V _{DD} -0.2V or CS2 ≤ 0.2V	LL/LE	-	50/70	μA
			L	-	100	



DC Characteristics, Continued

Note: Typical parameter is measured under ambient temperature $T_A = 25^\circ\text{C}$ and $V_{DD} = 5\text{V}$.

CAPACITANCE

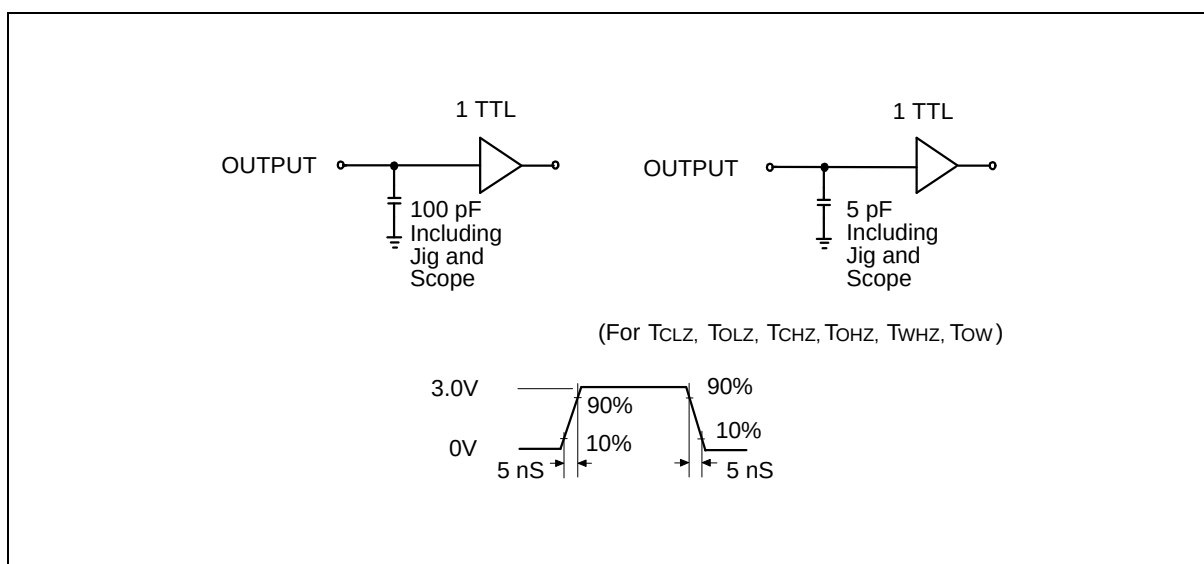
($V_{DD} = 5\text{V}$, $T_A = 25^\circ\text{C}$, $f = 1\text{MHz}$)

PARAMETER	SYM.	CONDITIONS	MAX.	UNIT
Input Capacitance	C_{IN}	$V_{IN} = 0\text{V}$	6	pF
Input/Output Capacitance	$C_{I/O}$	$V_{OUT} = 0\text{V}$	8	pF

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

AC CHARACTERISTICS**AC Test Conditions**

PARAMETER	CONDITIONS
Input Pulse Levels	0V to 3.0V
Input Rise and Fall Times	5 nS
Input and Output Timing Reference Level	1.5V
Output Load	See the drawing below

AC Test Loads and Waveform

AC Characteristics, continued

(V_{DD} = 5V ±10%; V_{SS} = 0V; T_A (°C) = 0 to 70 for LL, -20 to 85 for LE)

Read Cycle

PARAMETER	SYM.	W24100-70L		W24100-70LL/LE		UNIT
		MIN.	MAX.	MIN.	MAX.	
Read Cycle Time	TRC	70	-	70	-	nS
Address Access Time	TAA	-	70	-	70	nS
Chip Select Access Time	TACS	-	70	-	70	nS
Output Enable to Output Valid	TAOE	-	35	-	35	nS
Chip Selection to Output in Low Z	TCLZ*	10	-	10	-	nS
Output Enable to Output in Low Z	TOLZ*	5	-	5	-	nS
Chip Deselection to Output in High Z	TCHZ*	-	30	-	30	nS
Output Disable to Output in High Z	TOHZ*	-	30	-	30	nS
Output Hold from Address Change	TOH	10	-	10	-	nS

* These parameters are sampled but not 100% tested

Write Cycle

PARAMETER		SYM.	W24100-70L		W24100-70LL/LE		UNIT
			MIN.	MAX.	MIN.	MAX.	
Write Cycle Time		TWC	70	-	70	-	nS
Chip Selection to End of Write		TCW	50	-	50	-	nS
Address Valid to End of Write		TAW	50	-	50	-	nS
Address Setup Time		TAS	0	-	0	-	nS
Write Pulse Width		TWP	50	-	50	-	nS
Write Recovery Time	#CS1, CS2, #WE	TWR	0	-	0	-	nS
Data Valid to End of Write		TDW	30	-	30	-	nS
Data Hold from End of Write		TDH	0	-	0	-	nS
Write to Output in High Z		TWHZ*	-	25	-	25	nS
Output Disable to Output in High Z		TOHZ*	-	25	-	25	nS
Output Active from End of Write		TOW	5	-	5	-	nS

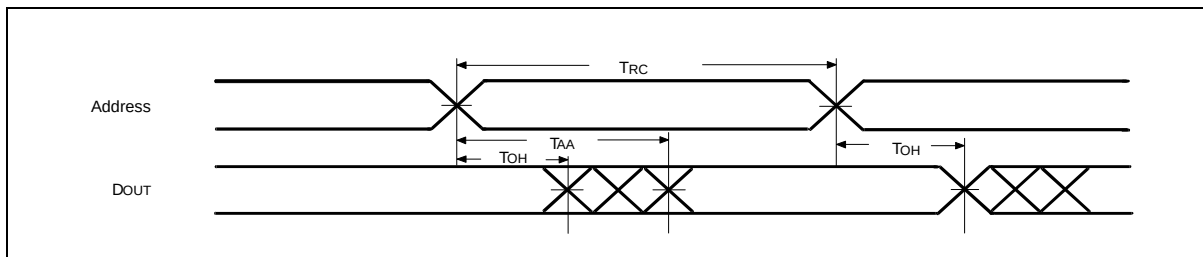
* These parameters are sampled but not 100% tested



TIMING WAVEFORMS

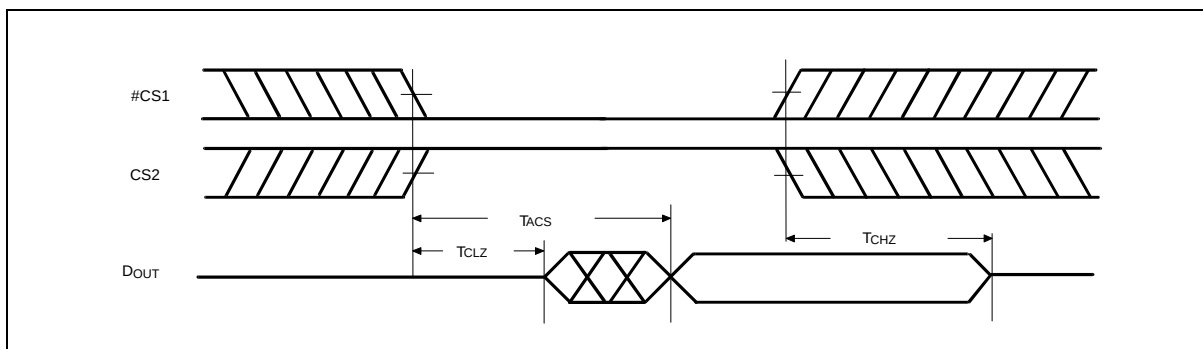
Read Cycle 1

(Address Controlled)



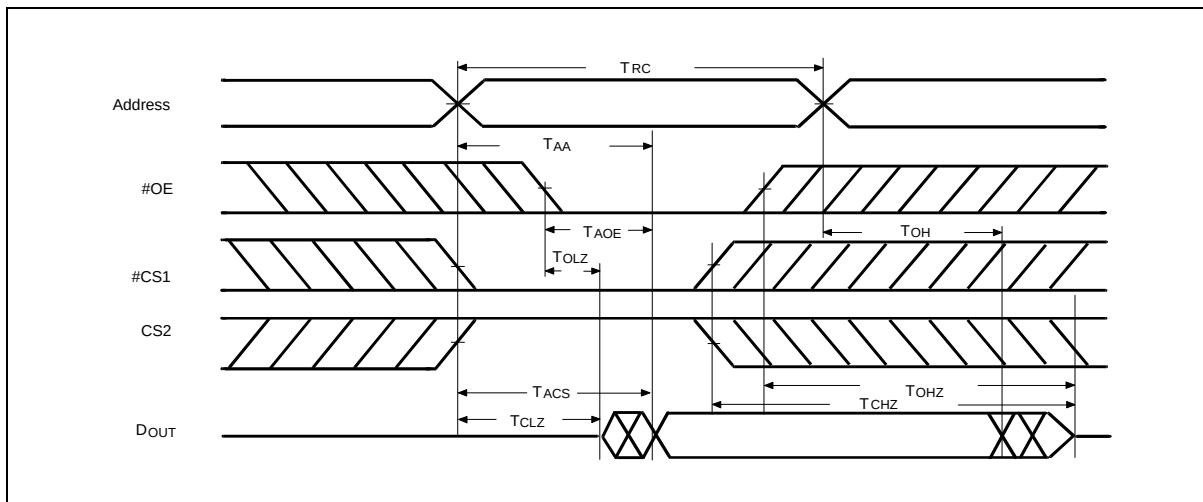
Read Cycle 2

(Chip Select Controlled)

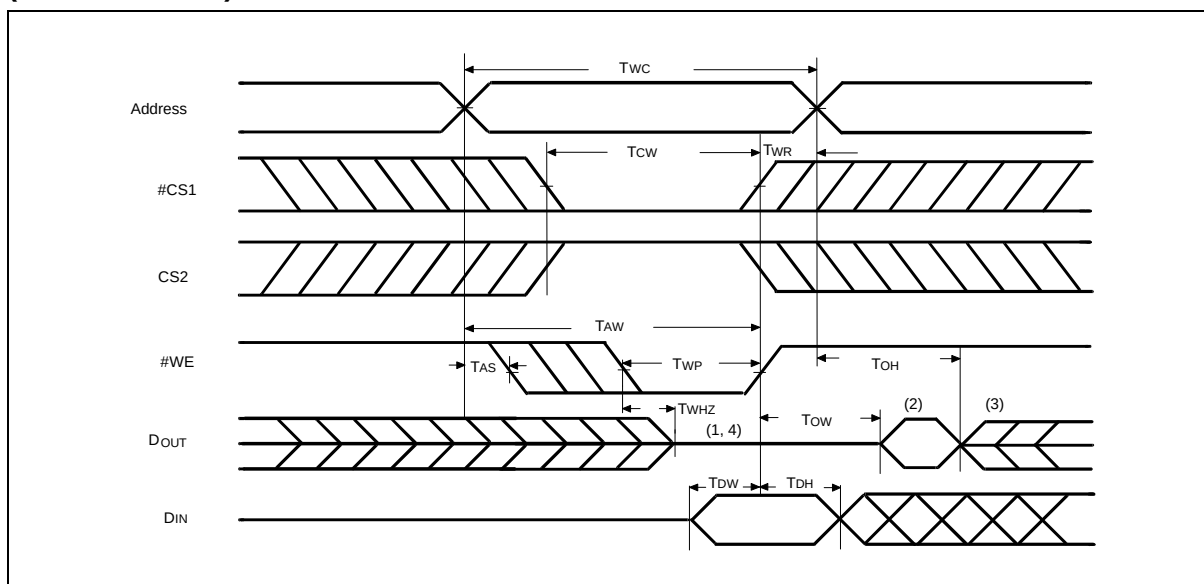
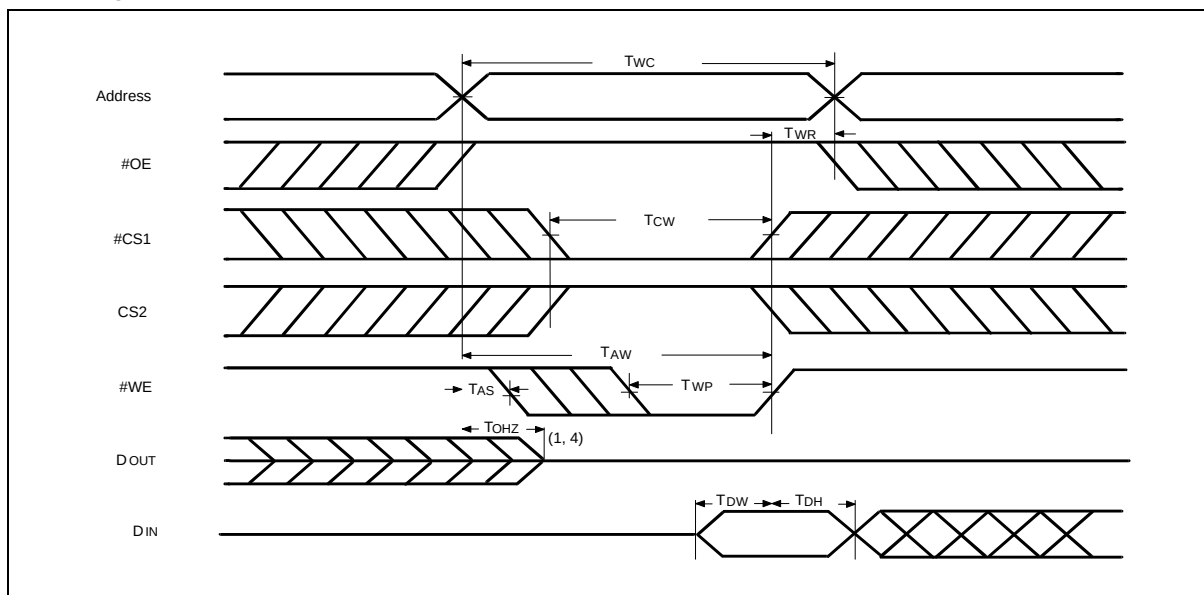


Read Cycle 3

(Output Enable Controlled)



Write Cycle 1



1. During this period, I/O pins are in the output state, so input signals of opposite phase to the outputs should not be applied.
2. The data output from D_{OUT} are the same as the data written to D_{IN} during the write cycle.
3. D_{OUT} provides the read data for the next address.
4. Transition is measured ± 500 mV from steady state with C_L = 5 pF. This parameter is guaranteed but not 100% tested.

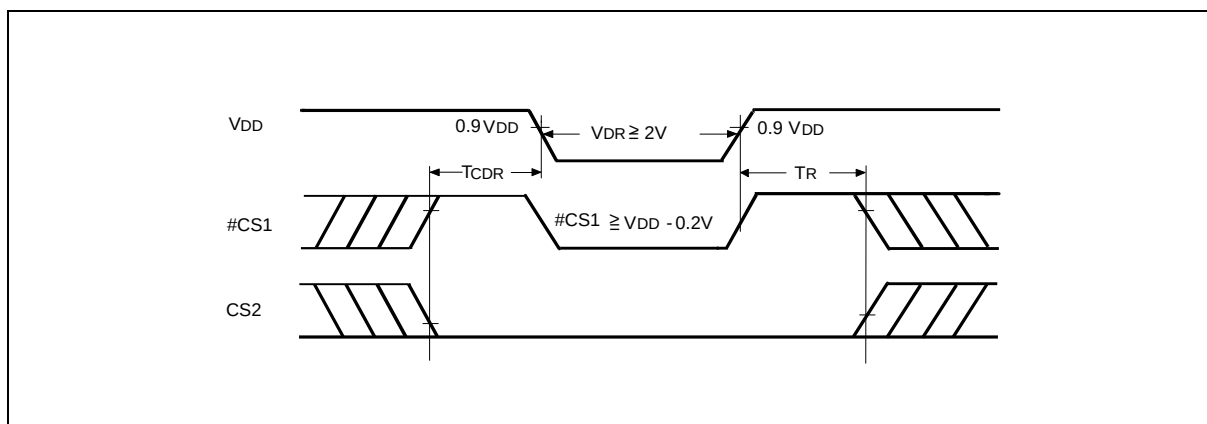
DATA RETENTION CHARACTERISTICS

(T_A (°C) = 0 to 70 for LL, -20 to 85 for LE)

PARAMETER	SYM.	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
V _{DD} for Data Retention	V _{DR}	#CS1 ≥ V _{DD} - 0.2V	2.0	-	-	V
Data Retention Current	I _{DDDR}	#CS1 ≥ V _{DD} - 0.2V, V _{DD} = 3V	-	-	50	μA
Chip Deselect to Data Retention Time	T _{CDR}	See data retention waveform	0	-	-	nS
Operation Recovery Time	T _R		T _{RC} *	-	-	nS

* Read Cycle Time

DATA RETENTION WAVEFORM



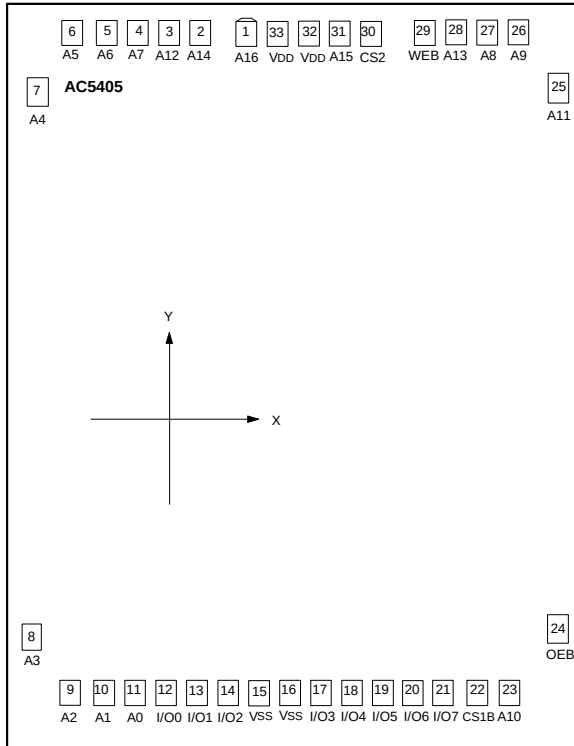
ORDERING INFORMATION

PART NO.	ACCESS TIME (nS)	OPERATING CURRENT MAX. (mA)	STANDBY CURRENT MAX. (mA)	PACKAGE
W24100-70L	70	70	100	600 mil DIP
W24100-70LL	70	70	50	600 mil DIP
W24100-70LE	70	70	70	600 mil DIP
W24100S-70L	70	70	100	450 mil SOP
W24100S-70LL	70	70	50	450 mil SOP
W24100S-70LE	70	70	70	450 mil SOP
W24100T-70L	70	70	100	Standard type one TSOP
W24100T-70LL	70	70	50	Standard type one TSOP
W24100T-70LE	70	70	70	Standard type one TSOP
W24100Q-70L	70	70	100	Small type one TSOP
W24100Q-70LL	70	70	50	Small type one TSOP
W24100Q-70LE	70	70	70	Small type one TSOP

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.

BONDING PAD DIAGRAM

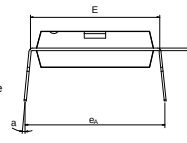
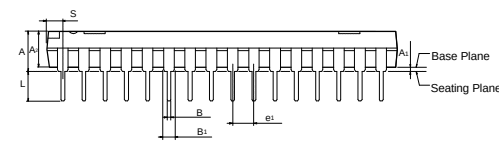
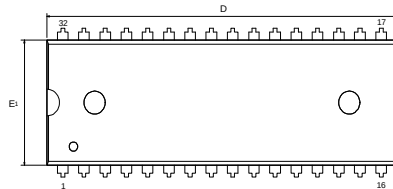


PAD NO.	X	Y
1	-485.31	2376.64
2	-1200.87	2376.64
3	-1341.05	2376.64
4	-1480.80	2376.64
5	-1622.21	2376.64
6	-1767.47	2376.64
7	-1993.03	2228.49
8	-1990.55	-2275.79
9	-1789.57	-2382.05
10	-1556.20	-2382.05
11	-1405.83	-2382.05
12	-1169.73	-2383.00
13	-870.28	-2383.00
14	-567.65	-2383.00
15	-336.94	-2385.00
16	-112.55	-2385.00
17	224.85	-2383.00
18	497.55	-2383.00
19	772.25	-2383.00
20	1044.95	-2383.00
21	1319.65	-2383.00
22	1537.77	-2382.05
23	1773.94	-2382.05
24	1985.78	-2297.62
25	1987.47	2221.27
26	1669.63	2376.64
27	1451.03	2376.64
28	1196.59	2376.64
29	956.65	2376.64
30	219.67	2376.64
31	79.47	2376.64
32	-145.06	2343.58
33	-353.56	2343.58

Note: For bare chip form (C.O.B.) applications, the substrate must be connected to VDD or left floating in the PCB layout.

PACKAGE DIMENSIONS

32-pin P-DIP

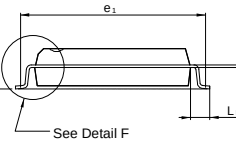
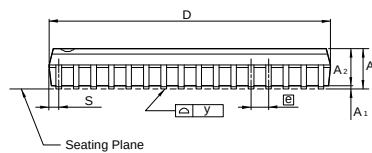
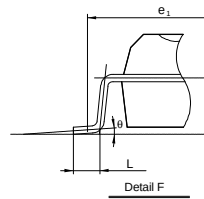
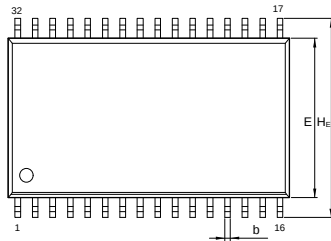


Symbol	Dimension in inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	—	—	0.210	—	—	5.33
A ₁	0.010	—	—	0.25	—	—
A ₂	0.150	0.155	0.160	3.81	3.94	4.06
B	0.016	0.018	0.022	0.41	0.46	0.56
B ₁	0.048	0.050	0.054	1.22	1.27	1.37
C	0.008	0.010	0.014	0.20	0.25	0.36
D	—	1.650	1.660	—	41.91	42.16
E	0.590	0.600	0.610	14.99	15.24	15.49
E ₁	0.545	0.550	0.555	13.84	13.97	14.10
e ₁	0.090	0.100	0.110	2.29	2.54	2.79
L	0.120	0.130	0.140	3.05	3.30	3.56
a	0	—	15	0	—	15
e _A	0.630	0.650	0.670	16.00	16.51	17.02
S	—	—	0.085	—	—	2.16

Notes:

- Dimensions D Max. & S include mold flash or tie bar burrs.
- Dimension E₁ does not include interlead flash.
- Dimensions D & E₁ include mold mismatch and are determined at the mold parting line.
- Dimension B₁ does not include dambar protrusion/intrusion.
- Controlling dimension: Inches
- General appearance spec. should be based on final visual inspection spec.

32-pin SOP Wide Body



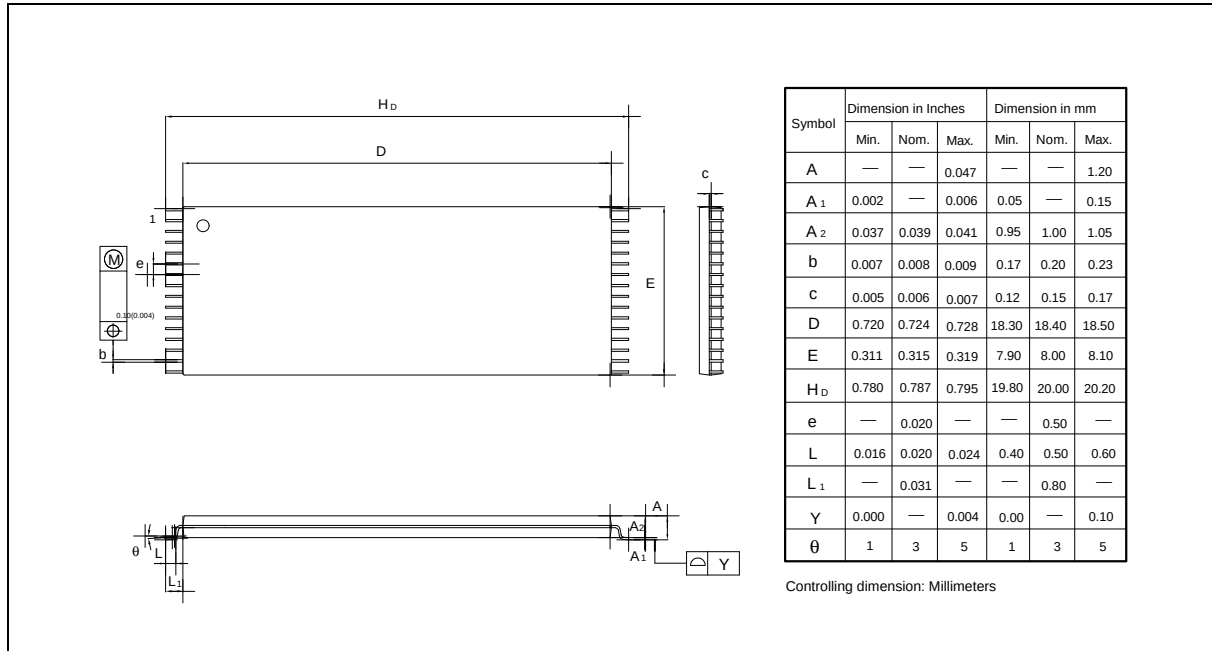
Symbol	Dimension in inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	—	—	0.118	—	—	3.00
A ₁	0.004	—	—	0.10	—	—
A ₂	0.101	0.106	0.111	2.57	2.69	2.82
b	0.014	0.016	0.020	0.36	0.41	0.51
c	0.006	0.008	0.012	0.15	0.20	0.31
D	—	0.805	0.817	—	20.45	20.75
E	0.440	0.445	0.450	11.18	11.30	11.43
E ₁	0.044	0.050	0.056	1.12	1.27	1.42
H _E	0.546	0.556	0.556	13.87	14.12	14.38
L	0.023	0.031	0.039	0.58	0.79	0.99
L _e	0.047	0.055	0.063	1.19	1.40	1.60
S	—	—	0.036	—	—	0.91
y	—	—	0.004	—	—	0.10
θ	0°	—	10°	0°	—	10°

Notes:

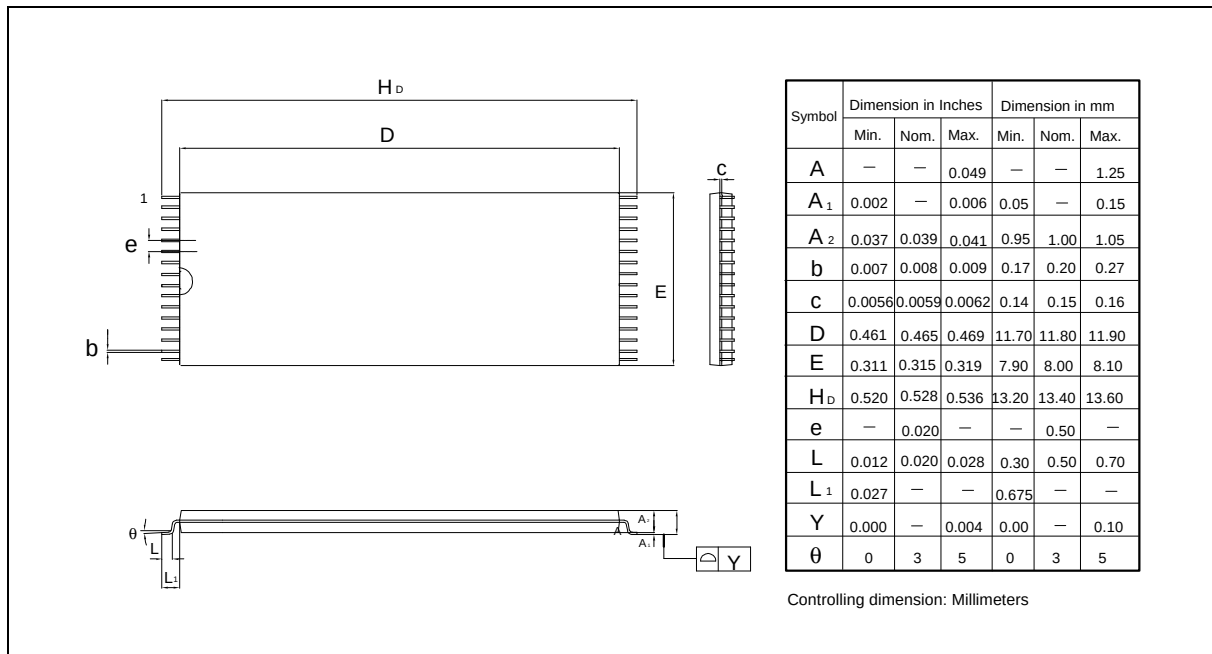
- Dimensions D Max. & S include mold flash or tie bar burrs.
- Dimension b does not include dambar protrusion/intrusion.
- Dimensions D & E include mold mismatch and are determined at the mold parting line.
- Controlling dimension: Inches
- General appearance spec should be based on final visual inspection spec.

Package Dimensions, continued

32-pin Standard Type One TSOP



32-pin Small Type One TSOP



**VERSION HISTORY**

VERSION	DATE	PAGE	DESCRIPTION
A1	Oct. 1999	-	Initial Issued
A2	May 2000	1, 2, 7, 8, 9	Add LE in Operating Characteristics, Data Retention Characteristics, Ordering Info; & Delete 32-pin P-DIP Package.
		9	Add in Bonding Pad Diagram
		2, 8	Standby Current for LE is 70 μ A
A3	Sep. 6, 2001	1, 8, 10	Add in 32-pin P-DIP Package

**Headquarters**

No. 4, Creation Rd. III,
Science-Based Industrial Park,
Hsinchu, Taiwan
TEL: 886-3-5770066
FAX: 886-3-5796096
<http://www.winbond.com.tw/>
Voice & Fax-on-demand: 886-2-27197006

Taipei Office

11F, No. 115, Sec. 3, Min-Sheng East Rd.,
Taipei, Taiwan
TEL: 886-2-27190505
FAX: 886-2-27197502

Winbond Electronics (H.K.) Ltd.

Unit 9-15, 22F, Millennium City,
No. 378 Kwun Tong Rd;
Kowloon, Hong Kong
TEL: 852-27513100
FAX: 852-27552064

Winbond Electronics North America Corp

Winbond Memory Lab.
Winbond Microelectronics Corp.
Winbond Systems Lab.

2727 N. First Street, San Jose,
CA 95134, U.S.A.
TEL: 408-9436666
FAX: 408-5441798

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