



8K × 8 CMOS STATIC RAM

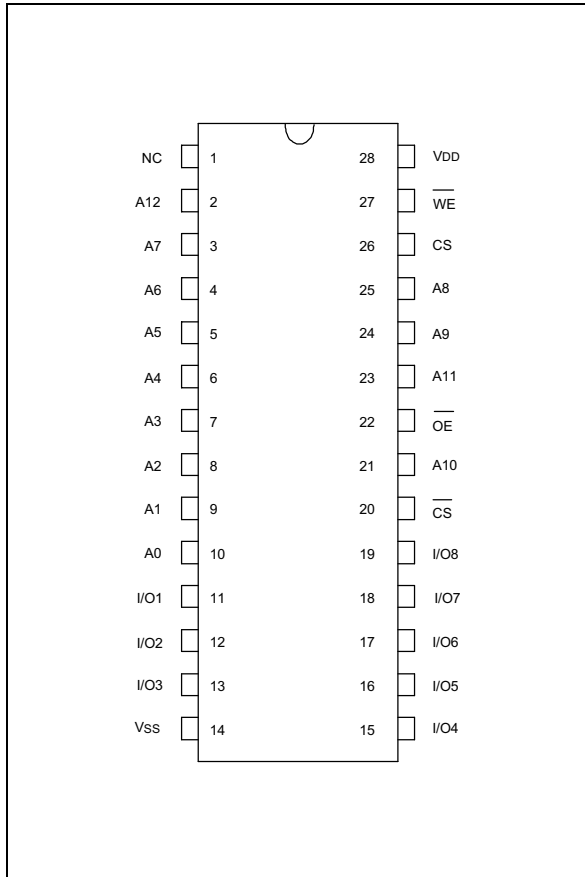
GENERAL DESCRIPTION

The W2465 is a slow-speed, low-power CMOS static RAM organized as 8192 × 8 bits that operates on a single 5-volt power supply. This device is manufactured using Winbond's high performance CMOS technology.

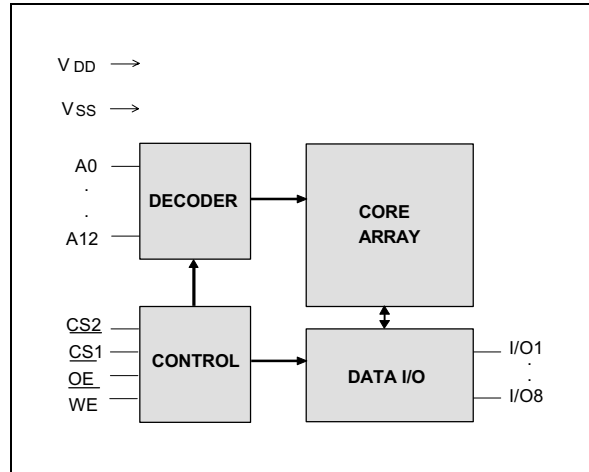
FEATURES

- Low power consumption:
 - Active: 250 mW (max.)
 - Standby: 100 μW (max.)(LL-version)
250 μW (max.)(L-version)
- Access time: 70/100 nS (max.)
- 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.)
- Available packages: 28-pin 600 mil DIP, 330 mil SOP and 300 mil skinny DIP

PIN CONFIGURATION



BLOCK DIAGRAM



PIN DESCRIPTION

SYMBOL	DESCRIPTION
A0–A12	Address Inputs
I/O1–I/O8	Data Inputs/Outputs
CS1, CS2	Chip Select Inputs
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	I _{SB} , I _{SB1}
X	L	X	X	Not Selected	High Z	I _{SB} , I _{SB1}
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	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

(V_{DD} = 5V ±10%, V_{SS} = 0V, T_A = 0 to 70° C)

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}	-2	-	+2	μA	
Output Leakage Current	I _{LO}	V _{I/O} = V _{SS} to V _{DD} CS1 = V _{IH} (min.) or CS2 = V _{IL} (max.) or OE = V _{IH} (min.) or WE = V _{IL} (max.)	-2	-	+2	μA	
Output Low Voltage	V _{OL}	I _{OL} = +4.0 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.), CS2 = V _{IH} (min.) I/O = 0 mA, Cycle = min. Duty = 100%	70	-	-	70	mA
			100	-	-	60	mA
Standby Power Supply Current	I _{SB}	CS1 = V _{IH} (min.) or CS2 = V _{IL} (max.), Cycle = min. Duty = 100%	-	-	3	mA	
	I _{SB1}	CS1 ≥ V _{DD} -0.2V or CS2 ≤ 0.2V	LL	-	-	20	μA
L			-	-	50	μA	

Note: Typical characteristics are at V_{DD} = 5 V, T_A = 25° C.



CAPACITANCE

(V_{DD} = 5V, T_A = 25° C, f = 1 MHz)

PARAMETER	SYM.	CONDITIONS	MAX.	UNIT
Input Capacitance	C _{IN}	V _{IN} = 0V	6	pF
Input/Output Capacitance	C _{I/O}	V _{OUT} = 0V	8	pF

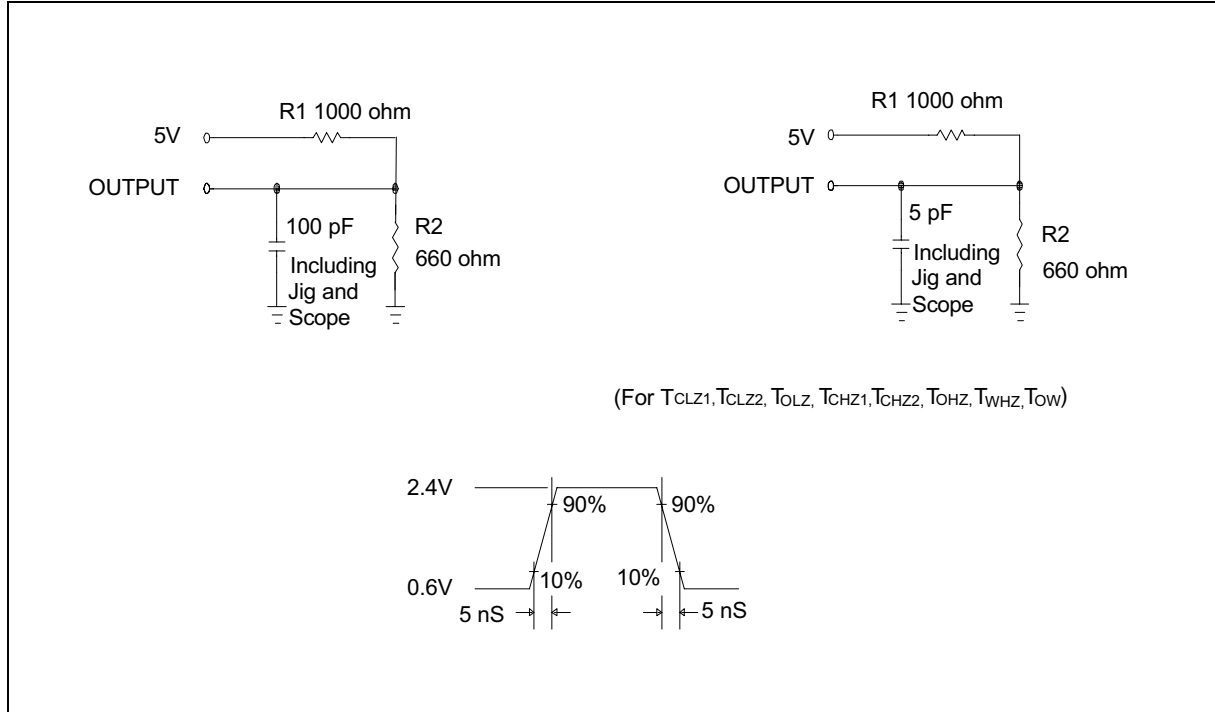
Note: These parameters are sampled but not 100% tested.

AC CHARACTERISTICS

AC Test Conditions

PARAMETER	CONDITIONS
Input Pulse Levels	0.6V to 2.4V
Input Rise and Fall Times	5 nS
Input and Output Timing Reference Level	1.5V
Output Load	C _L = 100 pF, I _{OH} /I _{OL} = -1 mA/4 mA

AC Test Loads and Waveform





AC Characteristics, continued

(V_{DD} = 5V ±10%, V_{SS} = 0V, T_A = 0 to 70° C)**Read Cycle**

PARAMETER	SYM.	W2465-70		W2465-10		UNIT	
		MIN.	MAX.	MIN.	MAX.		
Read Cycle Time	TRC	70	-	100	-	nS	
Address Access Time	TAA	-	70	-	100	nS	
Chip Select Access Time	$\overline{\text{CS1}}$	TACS1	-	70	-	100	nS
	CS2	TACS2	-	70	-	100	nS
Output Enable to Output Valid	TAOE	-	35	-	50	nS	
Chip Selection to Output in Low Z	$\overline{\text{CS1}}$	TCLZ1*	5	-	10	-	nS
	CS2	TCLZ2*	5	-	10	-	nS
Output Enable to Output in Low Z	TOLZ*	5	-	5	-	nS	
Chip Deselection to Output in High Z	$\overline{\text{CS1}}$	TCHZ1*	-	30	-	35	nS
	CS2	TCHZ2*	-	30	-	35	nS
Output Disable to Output in High Z	TOHZ*	-	30	-	35	nS	
Output Hold from Address Change	TOH	10	-	10	-	nS	

* These parameters are sampled but not 100% tested.

Write Cycle

PARAMETER	SYM.	W2465-70		W2465-10		UNIT	
		MIN.	MAX.	MIN.	MAX.		
Write Cycle Time	TWC	70	-	100	-	nS	
Chip Selection to End of Write	$\overline{\text{CS1}}$	TCW1	60	-	80	-	nS
	CS2	TCW2	60	-	80	-	nS
Address Valid to End of Write	TAW	60	-	80	-	nS	
Address Setup Time	TAS	0	-	0	-	nS	
Write Pulse Width	TWP	45	-	60	-	nS	
Write Recovery Time	$\overline{\text{CS1}}, \overline{\text{WE}}$	TWR1	0	-	0	-	nS
	CS2	TWR2	0	-	0	-	nS
Data Valid to End of Write	TDW	30	-	40	-	nS	
Data Hold from End of Write	TDH	0	-	0	-	nS	
Write to Output in High Z	TWHZ*	-	30	-	30	nS	
Output Disable to Output in High Z	TOHZ*	-	30	-	30	nS	
Output Active from End of Write	TOW	0	-	0	-	nS	

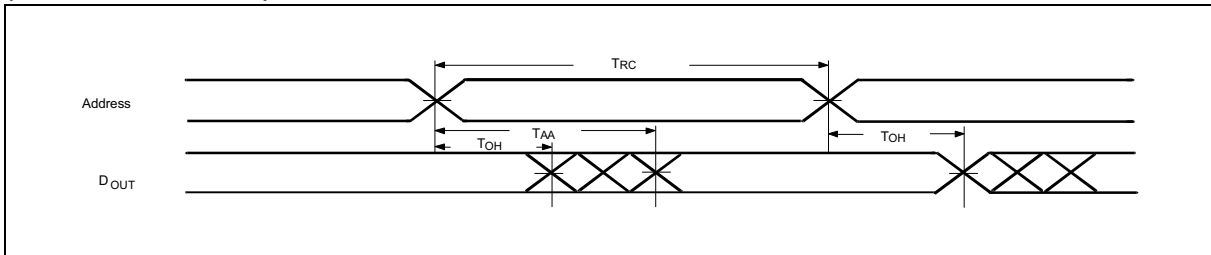
* These parameters are sampled but not 100% tested.



TIMING WAVEFORMS

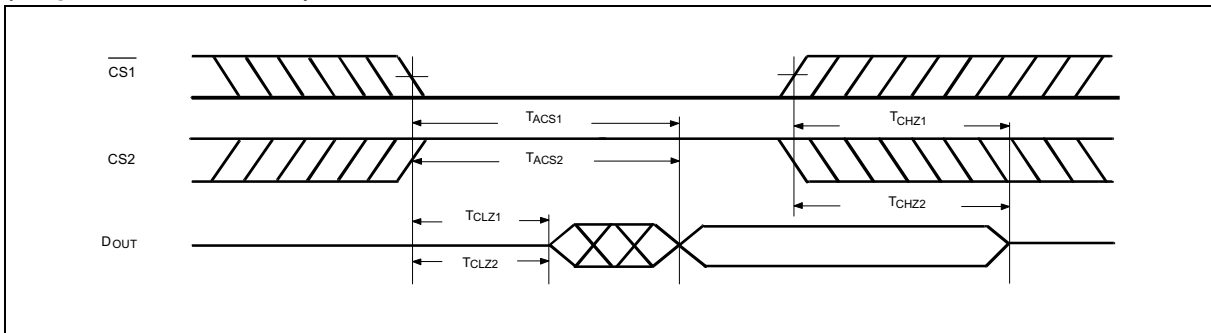
Read Cycle 1

(Address Controlled)



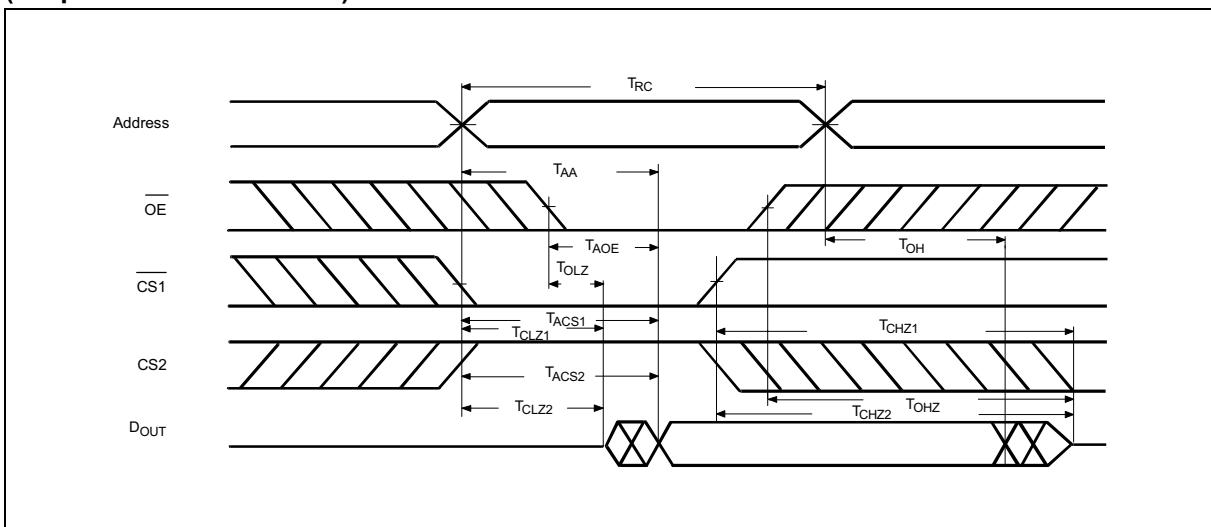
Read Cycle 2

(Chip Select Controlled)



Read Cycle 3

(Output Enable Controlled)





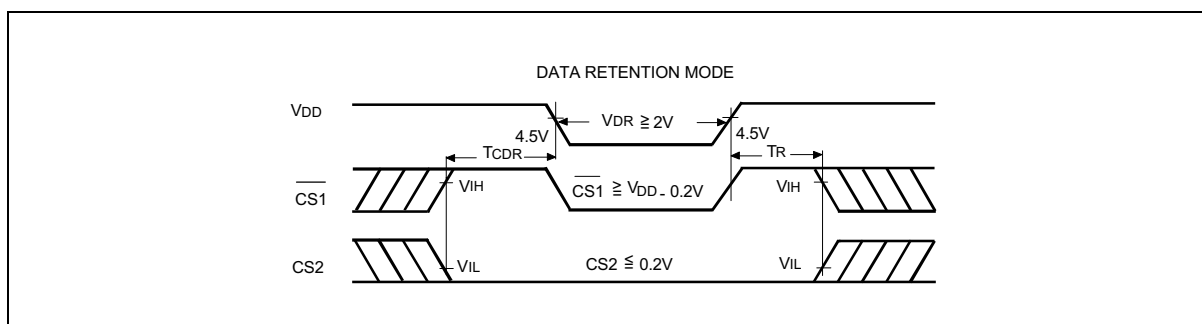
DATA RETENTION CHARACTERISTICS

(TA = 0 to 70° C)

PARAMETER	SYM.	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
VDD for Data Retention	VDR	$\overline{CS1} \geq V_{DD} - 0.2V$, or $CS2 \leq 0.2V$	2.0	-	-	V	
Data Retention Current	IDDDR	$\overline{CS1} \geq V_{DD} - 0.2V$, or $CS2 \leq 0.2V$ $V_{DD} = 3V$	LL	-	-	10	μA
			L	-	-	20	μA
Chip Deselect to Data Retention Time	TCDR	See data retention waveforms	0	-	-	nS	
Operation Recovery Time	TR		TRC*	-	-	nS	

TRC* = Read Cycle Time

DATA RETENTION WAVEFORMS



ORDERING INFORMATION

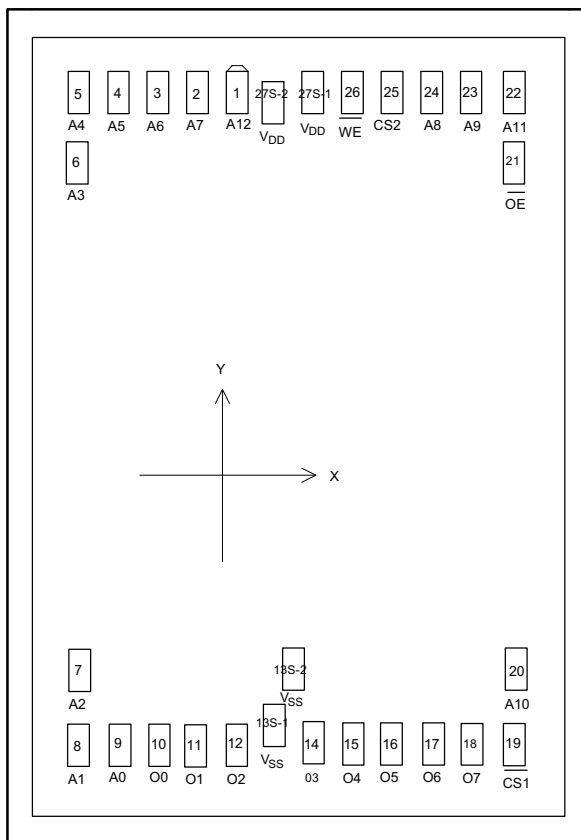
PART NO.	ACCESS TIME (nS)	OPERATING CURRENT MAX. (mA)	STANDBY CURRENT MAX. (μA)	PACKAGE
W2465-70LL	70	70	20	600 mil DIP
W2465-10L	100	60	50	600 mil DIP
W2465S-70LL	70	70	20	330 mil SOP
W2465S-10L	100	60	50	330 mil SOP
W2465K-70LL	70	70	20	300 mil Skinny
W2465K-10L	100	60	50	300 mil Skinny

Notes:

- Winbond reserves the right to make changes to its products without prior notice.
- 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

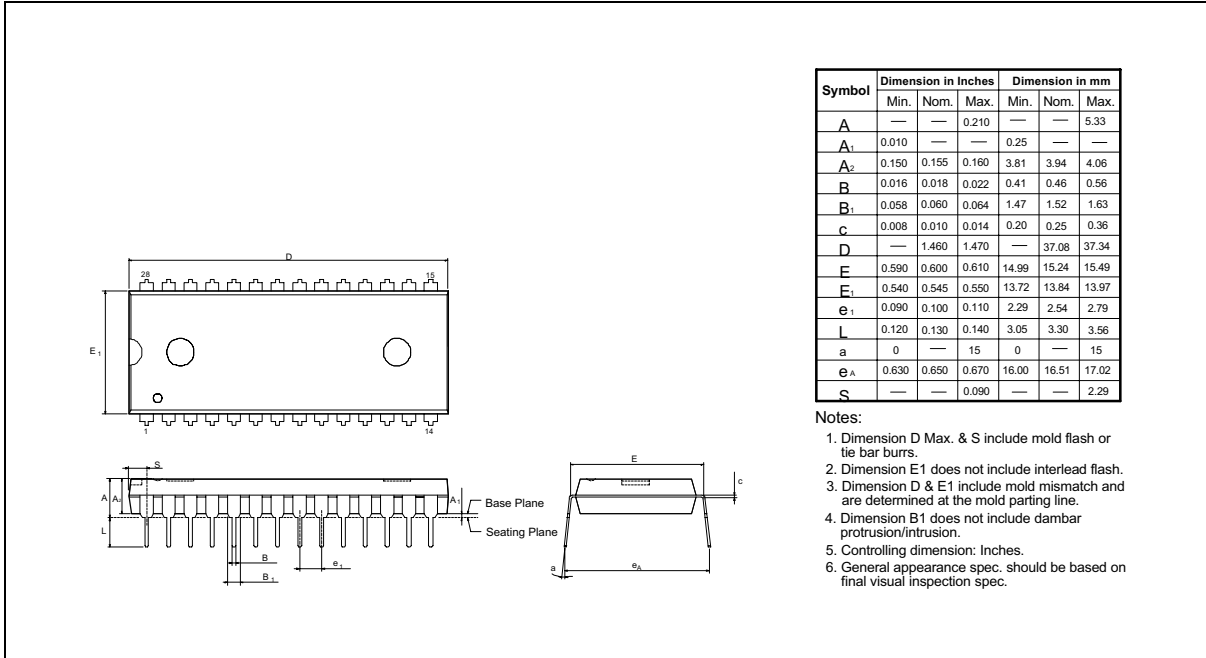


PAD NO.	X	Y
1	-226.95	1526.15
2	-350.95	1526.15
3	-484.10	1526.15
4	-608.10	1526.15
5	-739.75	1526.15
6	-741.75	1315.10
7	-741.75	-1231.85
8	-741.75	-1456.30
9	-610.60	-1456.30
10	-481.50	-1466.30
11	-343.80	-1466.30
12	-206.10	-1466.30
13S-1	-73.00	-1401.10
13S-2	-8.35	-1212.80
14	60.10	-1466.30
15	193.30	-1466.30
16	332.40	-1466.30
17	465.60	-1466.30
18	603.30	-1466.30
19	738.15	-1456.30
20	740.15	-1221.45
21	740.15	1310.80
22	738.15	1526.15
23	606.50	1526.15
24	482.50	1526.15
25	349.35	1526.15
26	225.35	1526.15
27S-1	94.20	1526.15
27S-2	-50.40	1456.10

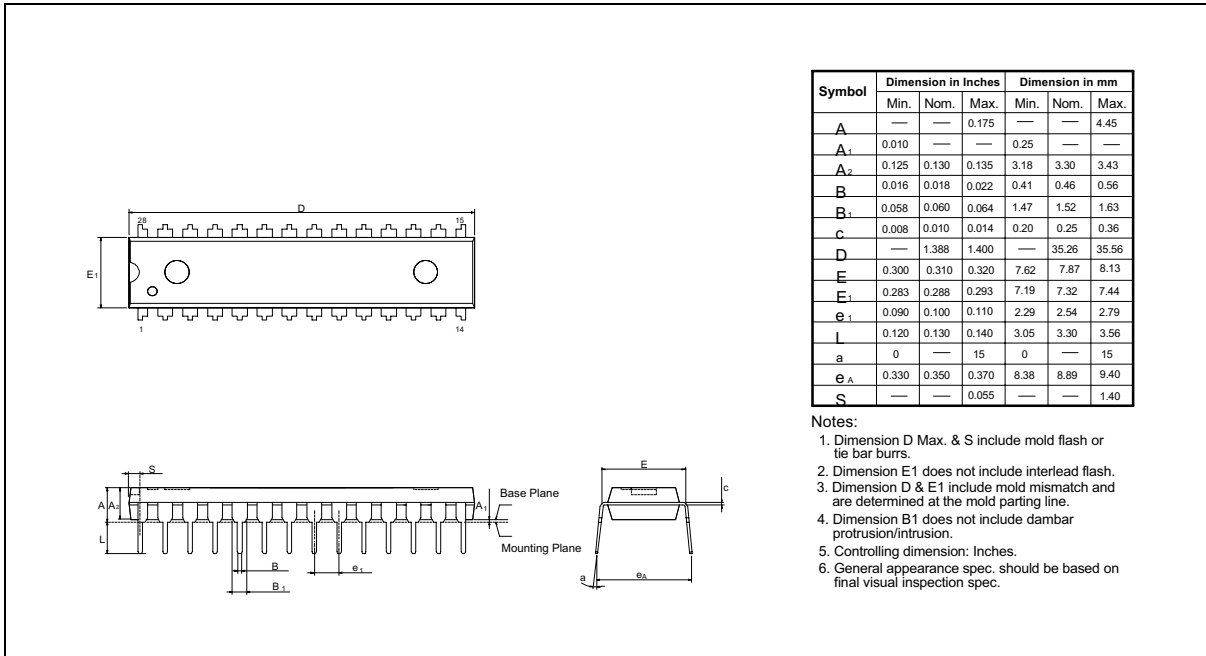
Note: For bare chip form (C.O.B.) applications, the substrate must be connected to VDD or left floating in the PCB layout.

PACKAGE DIMENSIONS

28-pin P-DIP



28-pin P-DIP Skinny





Package Dimensions, continued

28-pin SO Wide Body

Symbol	Dimension in Inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	—	—	0.112	—	—	2.85
A ₁	0.004	—	—	0.10	—	—
A ₂	0.093	0.098	0.103	2.36	2.49	2.62
b	0.014	0.016	0.020	0.36	0.41	0.51
c	0.008	0.010	0.014	0.20	0.25	0.36
D	—	0.713	0.733	—	18.11	18.62
F	0.326	0.331	0.336	8.28	8.41	8.53
ⓐ	0.044	0.050	0.056	1.12	1.27	1.42
H _E	0.453	0.465	0.477	11.51	11.81	12.12
L	0.028	0.036	0.044	0.71	0.91	1.12
L _E	0.059	0.067	0.075	1.50	1.70	1.91
S	—	—	0.047	—	—	1.19
y	—	—	0.004	—	—	0.10
θ	0°	—	10°	0°	—	10°

Notes:

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



Headquarters

No. 4, Creation Rd. III,
 Science-Based Industrial Park,
 Hsinchu, Taiwan
 TEL: 886-3-5770066
 FAX: 886-3-5792647
<http://www.winbond.com.tw/>
 Voice & Fax-on-demand: 886-2-7197006

Taipei Office

11F, No. 115, Sec. 3, Min-Sheng East Rd.,
 Taipei, Taiwan
 TEL: 886-2-7190505
 FAX: 886-2-7197502

Winbond Electronics (H.K.) Ltd.

Rm. 803, World Trade Square, Tower II,
 123 Hoi Bun Rd., Kwun Tong,
 Kowloon, Hong Kong
 TEL: 852-27513100
 FAX: 852-27552064

Winbond Electronics North America Corp.

Winbond Memory Lab.
Winbond Microelectronics Corp.
Winbond Systems Lab.
 2730 Orchard Parkway, San Jose,
 CA 95134, U.S.A.
 TEL: 1-408-9436666
 FAX: 1-408-9436668

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