Winbond Electronics Corp.

128K × 8 CMOS STATIC RAM

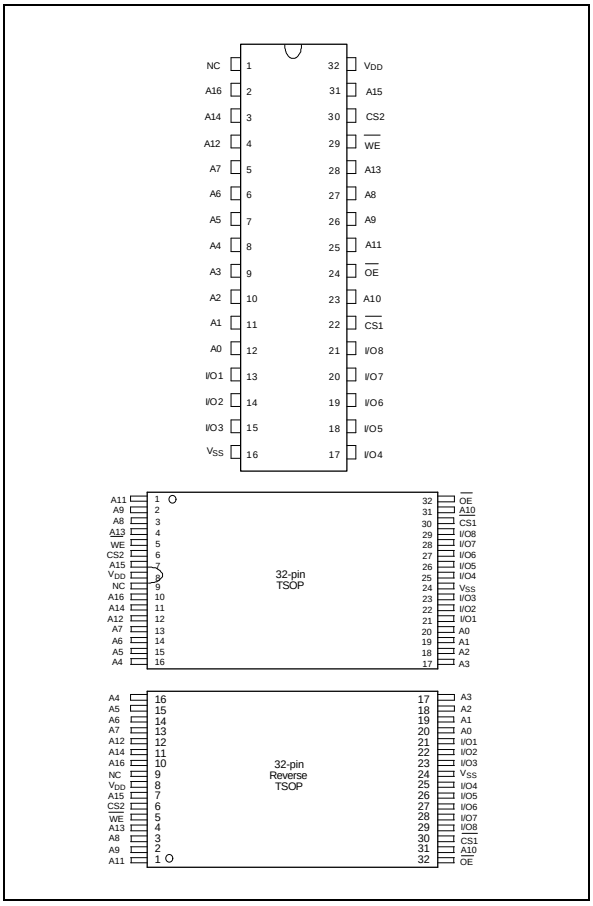
GENERAL DESCRIPTION

The W24010 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.

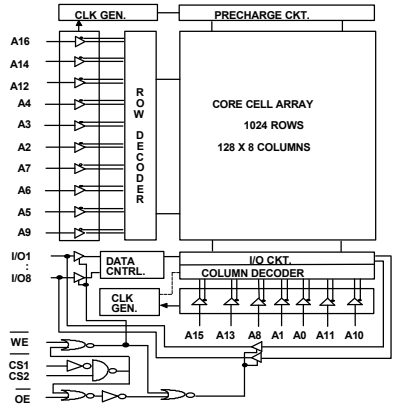
FEATURES

- Low power consumption:
  - Active: 350 mW (max.)
  - Standby: 250 µW (max.)
- Access time: 70 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.)
- Packaged in 32-pin 600 mil DIP, 450 mil SOP, standard type one TSOP (8 mm × 20 mm), reverse type one TSOP (8 mm × 20 mm), small type one TSOP (8 mm × 13.4 mm) and reverse small type one TSOP (8 mm × 13.4 mm)

PIN CONFIGURATIONS



BLOCK DIAGRAM



PIN DESCRIPTION

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

TRUTH TABLE

$\overline{CS1}$	CS2	$\overline{OE}$	$\overline{WE}$	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° C 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}	-1	-	+1	µA
Output Leakage Current	I_{LO}	$V_{I/O}$ = V_{SS} to V_{DD}, $\overline{CS}$ = V_{IH} (min.) or $\overline{OE}$ = V_{IH} (min.) or $\overline{WE}$ = 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}	$\overline{CS}$ = V_{IL} (max.), I/O = 0 mA, Cycle = min. Duty = 100%	-	-	70	mA
Standby Power Supply Current	I_{SB}	$\overline{CS}$ = V_{IH} (min.), Cycle = min. Duty = 100%	-	-	3	mA
	I_{SB1}	$\overline{CS}$ ≥ V_{DD} -0.2V	-	-	50	µA

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

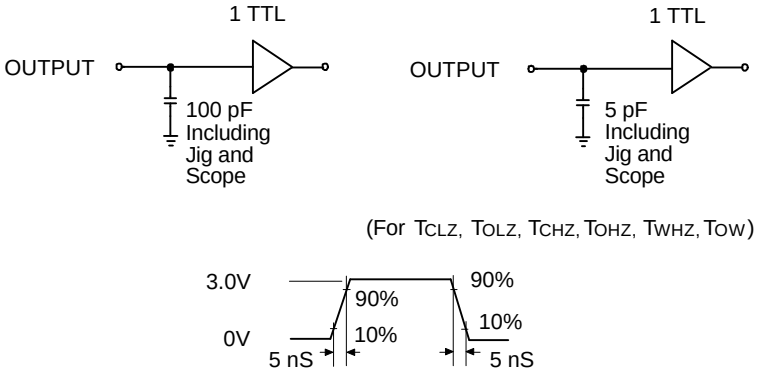
Note: These parameters are sampled but not 100% tested.

AC CHARACTERISTICS

AC Test Conditions

PARAMETER	CONDITIONS
Input Pulse Levels	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 = 0° C to 70° C)

Read Cycle

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Read Cycle Time	T_{RC}	70	-	nS
Address Access Time	T_{AA}	-	70	nS
Chip Select Access Time	T_{ACS}	-	70	nS
Output Enable to Output Valid	T_{AOE}	-	35	nS
Chip Selection to Output in Low Z	T_{CLZ}*	10	-	nS
Output Enable to Output in Low Z	T_{OLZ}*	5	-	nS
Chip Deselection to Output in High Z	T_{CHZ}*	-	30	nS
Output Disable to Output in High Z	T_{OHZ}*	-	30	nS
Output Hold from Address Change	T_{OH}	10	-	nS

*These parameters are sampled but not 100% tested

Write Cycle

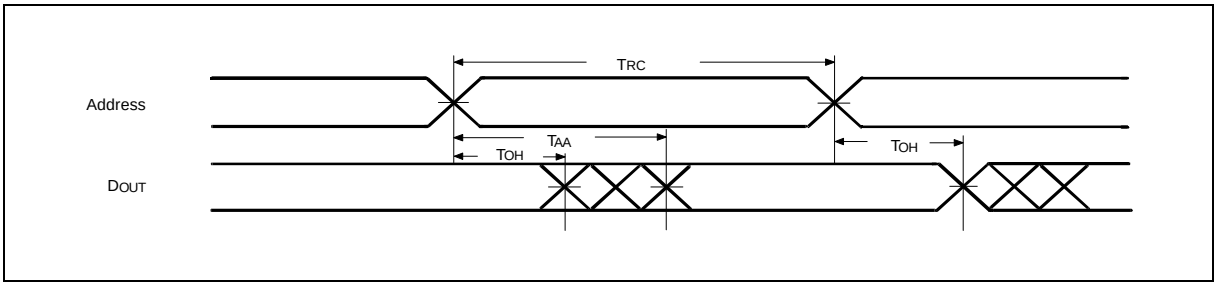
PARAMETER		SYMBOL	MIN.	MAX.	UNIT
Write Cycle Time		T_{WC}	70	-	nS
Chip Selection to End of Write		T_{CW}	50	-	nS
Address Valid to End of Write		T_{AW}	50	-	nS
Address Setup Time		T_{AS}	0	-	nS
Write Pulse Width		T_{WP}	50	-	nS
Write Recovery Time	$\overline{CS1}$, CS2, $\overline{WE}$	T_{WR}	0	-	nS
Data Valid to End of Write		T_{DW}	30	-	nS
Data Hold from End of Write		T_{DH}	0	-	nS
Write to Output in High Z		T_{WHZ}*	-	25	nS
Output Disable to Output in High Z		T_{OHZ}*	-	25	nS
Output Active from End of Write		T_{OW}	5	-	nS

*These parameters are sampled but not 100% tested

TIMING WAVEFORMS

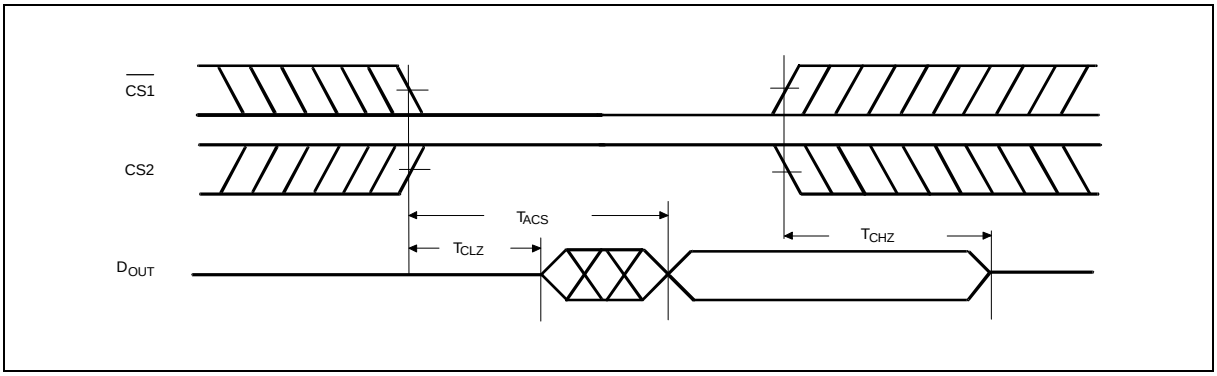
Read Cycle 1

(Address Controlled)



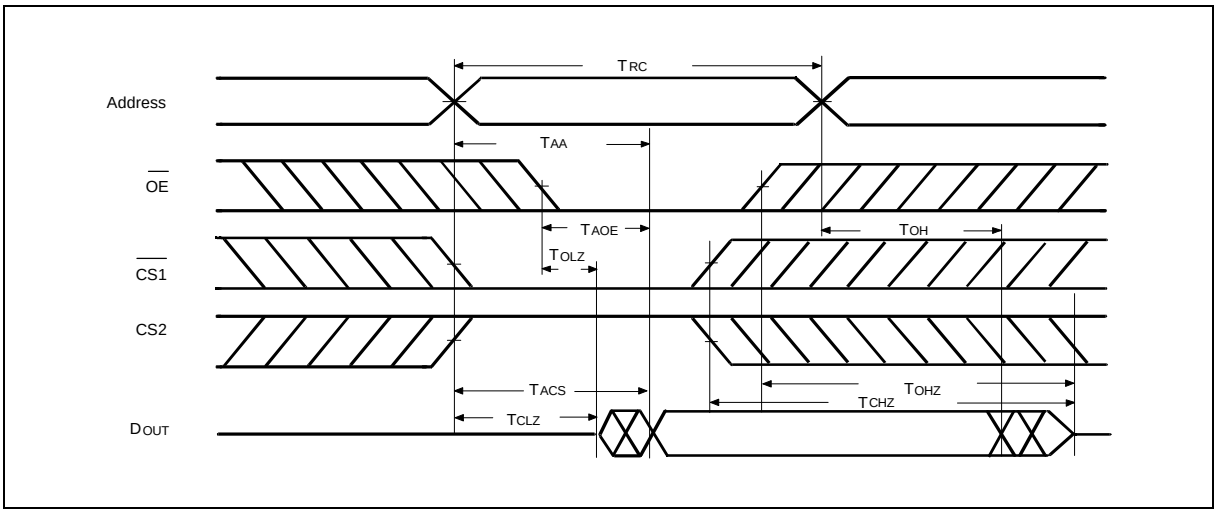
Read Cycle 2

(Chip Select Controlled)



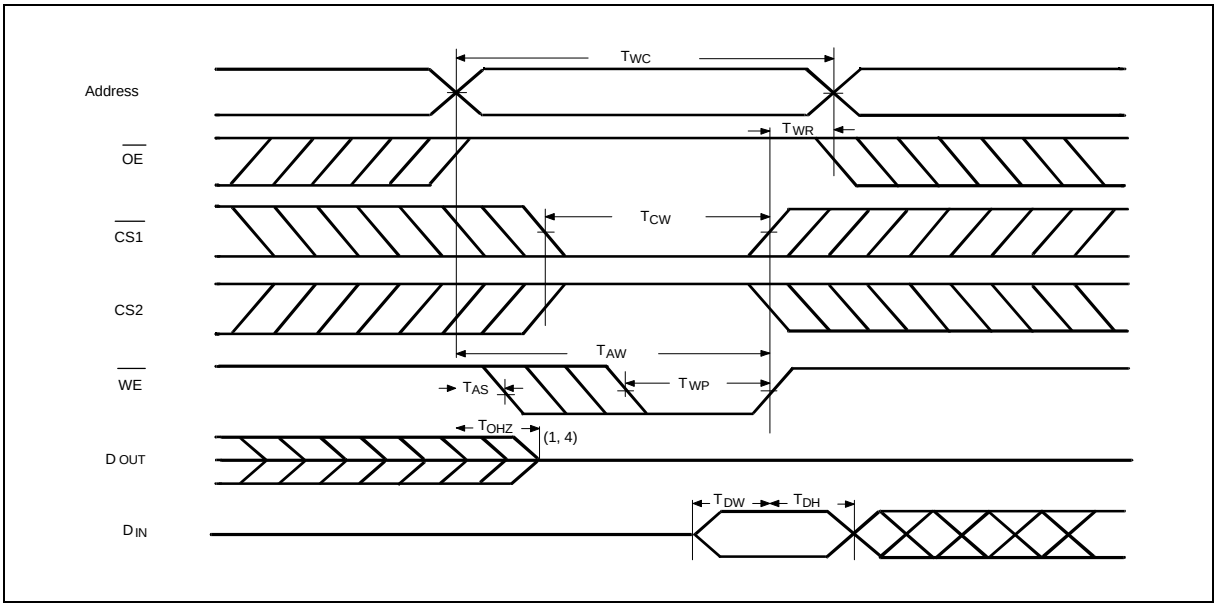
Read Cycle 3

(Output Enable Controlled)



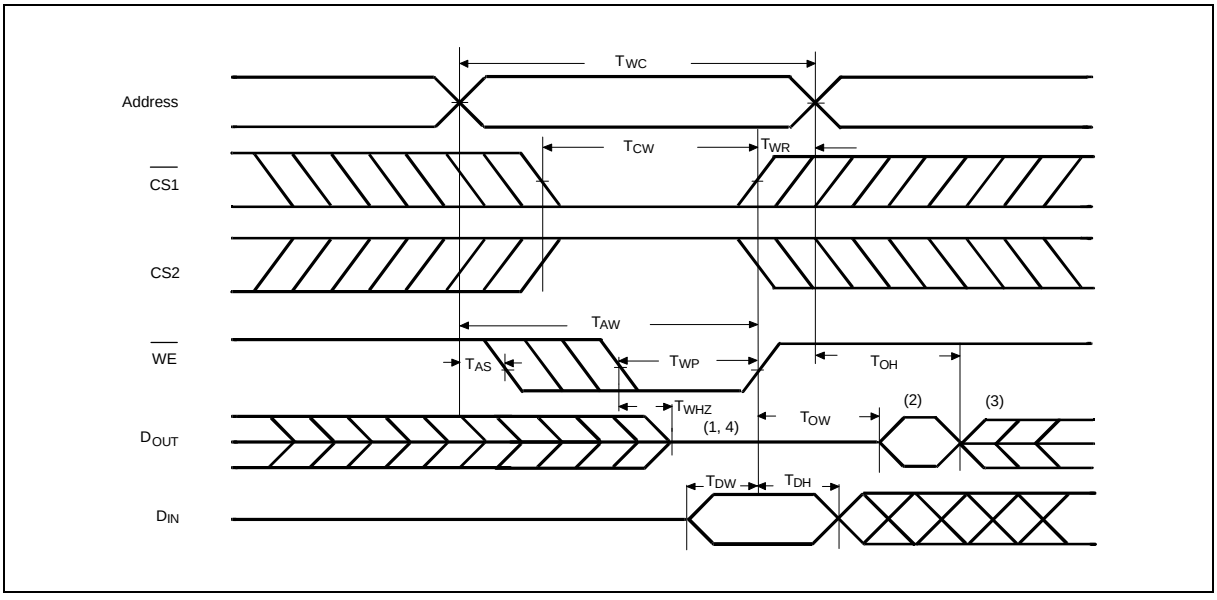
Timing Waveforms, continued

Write Cycle 1



Write Cycle 2

($\overline{OE}$ = V_{IL} Fixed)



Notes:

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.

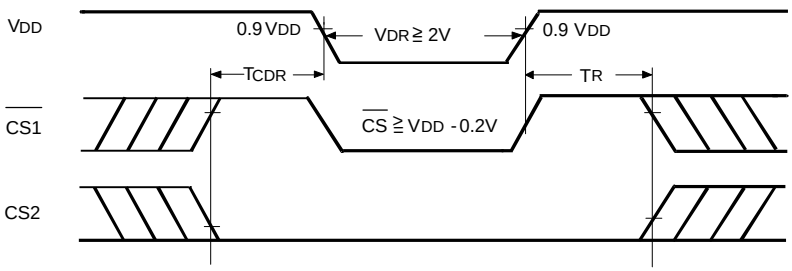
DATA RETENTION CHARACTERISTICS

(T_A = 0° C to 70° C)

PARAMETER	SYM.	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{DD} for Data Retention	V_{DR}	$\overline{CS} \geq V_{DD}$ -0.2V	2.0	-	-	V
Data Retention Current	I_{DDDR}	$\overline{CS} \geq V_{DD}$ -0.2V, V_{DD} = 3V	-	-	20	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. (μA)	PACKAGE
W24010-70LL	70	70	50	600 mil DIP
W24010S-70LL	70	70	50	450 mil SOP
W24010T-70LL	70	70	50	Standard type one TSOP
W24010U-70LL	70	70	50	Reverse type one TSOP
W24010Q-70LL	70	70	50	Small type one TSOP
W24010V-70LL	70	70	50	Reverse small type one TSOP

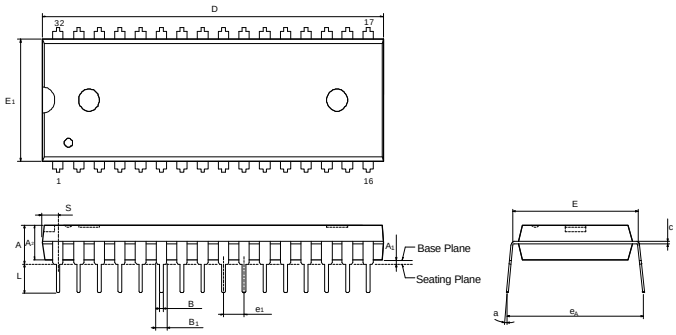
Notes:

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.

Winbond Electronics Corp.

PACKAGE DIMENSIONS

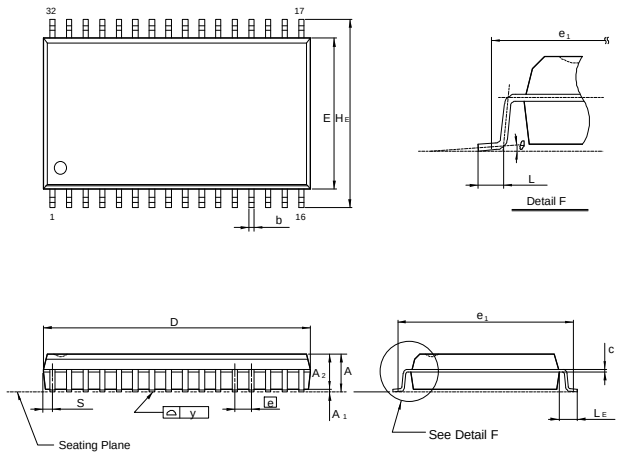
32-pin P-DIP



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

32-pin SOP Wide Body

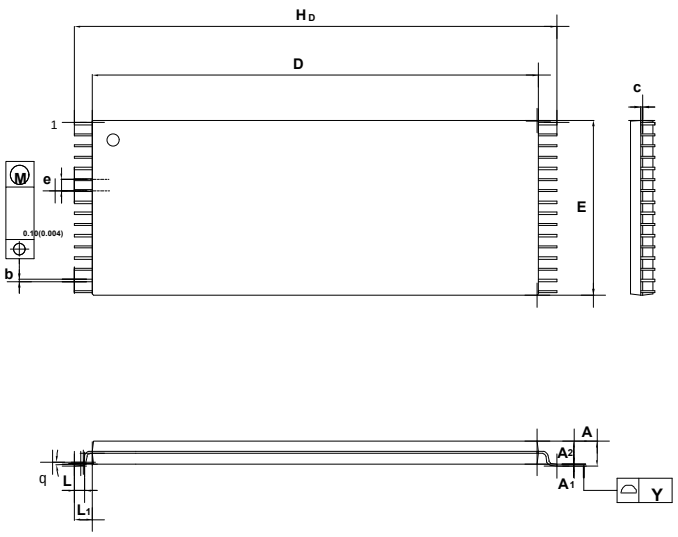


Symbol	Dimension in Inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	—	—	0.118	—	—	3.00
A_1	0.004	—	—	0.10	—	—
A_2	0.101	0.106	0.111	2.57	2.69	2.82
b	0.014	0.016	0.020	0.36	0.41	0.51
c	0.006	0.008	0.012	0.15	0.20	0.31
D	—	0.805	0.817	—	20.45	20.75
E	0.440	0.445	0.450	11.18	11.30	11.43
e	0.044	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:
1. Dimensions D Max. & S include mold flash or tie bar burrs.
2. Dimension b does not include dambar protrusion/intrusion.
3. Dimensions 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.

Package Dimensions, continued

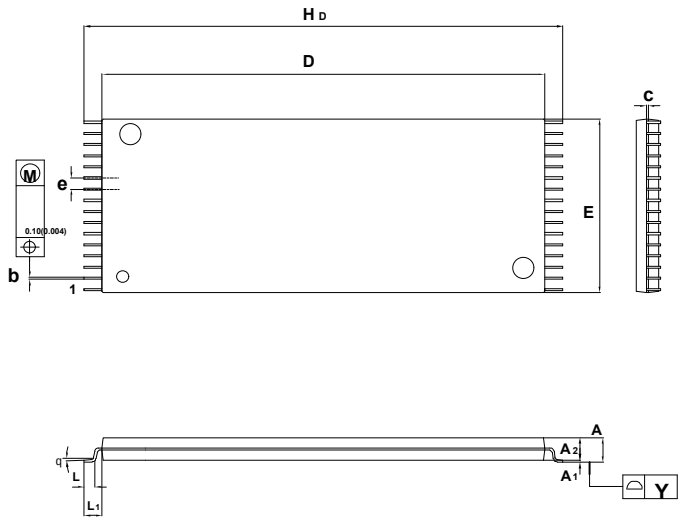
32-pin Standard Type One TSOP



Symbol	Dimension in Inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	—	—	0.047	—	—	1.20
A_1	0.002	—	0.006	0.05	—	0.15
A_2	0.037	0.039	0.041	0.95	1.00	1.05
b	0.007	0.008	0.009	0.17	0.20	0.23
c	0.005	0.006	0.007	0.12	0.15	0.17
D	0.720	0.724	0.728	18.30	18.40	18.50
E	0.311	0.315	0.319	7.90	8.00	8.10
H_D	0.780	0.787	0.795	19.80	20.00	20.20
e	—	0.020	—	—	0.50	—
L	0.016	0.020	0.024	0.40	0.50	0.60
L_1	—	0.031	—	—	0.80	—
Y	0.000	—	0.004	0.00	—	0.10
q	1	3	5	1	3	5

Controlling dimension: Millimeters

32-pin Reverse Type One TSOP

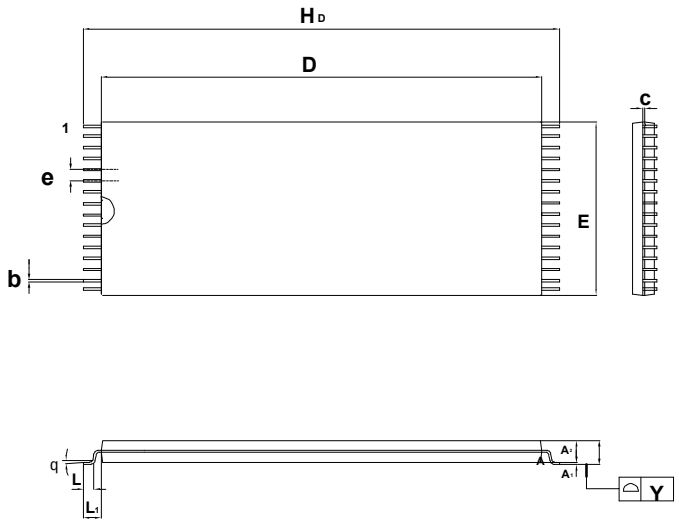


Symbol	Dimension in Inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	—	—	0.047	—	—	1.20
A_1	0.002	—	0.006	0.05	—	0.15
A_2	0.037	0.039	0.041	0.95	1.00	1.05
b	0.007	0.008	0.009	0.17	0.20	0.23
c	0.005	0.006	0.007	0.12	0.15	0.17
D	0.720	0.724	0.728	18.30	18.40	18.50
E	0.311	0.315	0.319	7.90	8.00	8.10
H_D	0.780	0.787	0.795	19.80	20.00	20.20
e	—	0.020	—	—	0.50	—
L	0.016	0.020	0.024	0.40	0.50	0.60
L_1	—	0.031	—	—	0.80	—
Y	0.000	—	0.004	0.00	—	0.10
q	1	3	5	1	3	5

Controlling dimension: Millimeters

Package Dimensions, continued

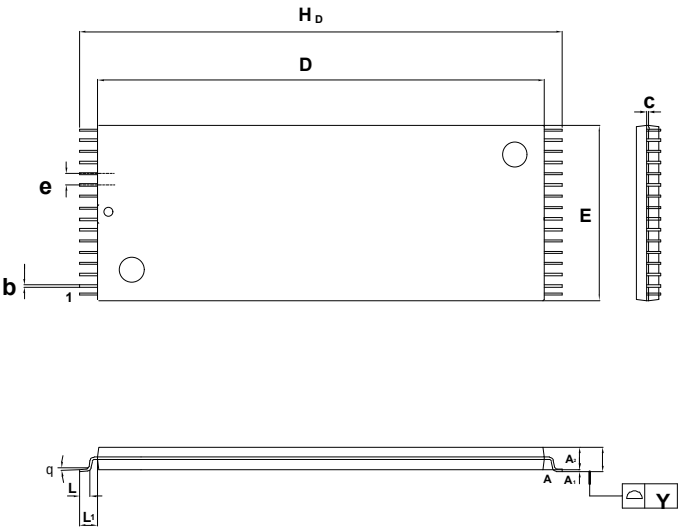
32-pin Small Type One TSOP



Symbol	Dimension in Inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A			0.049			1.25
A_1	0.002		0.006	0.05		0.15
A_2	0.037	0.039	0.041	0.95	1.00	1.05
b	0.007	0.008	0.009	0.17	0.20	0.27
c	0.0056	0.0059	0.0062	0.14	0.15	0.16
D	0.461	0.465	0.469	11.70	11.80	11.90
E	0.311	0.315	0.319	7.90	8.00	8.10
H_D	0.520	0.528	0.536	13.20	13.40	13.60
e		0.020			0.50	
L	0.012	0.020	0.028	0.30	0.50	0.70
L_1	0.027			0.675		
Y	0.000		0.004	0.00		0.10
q	0	3	5	0	3	5

Controlling dimension: Millimeters

32-pin Reverse Small Type One TSOP



Symbol	Dimension in Inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A			0.049			1.25
A_1	0.002		0.006	0.05		0.15
A_2	0.037	0.039	0.041	0.95	1.00	1.05
b	0.007	0.008	0.009	0.17	0.20	0.27
c	0.0056	0.0059	0.0062	0.14	0.15	0.16
D	0.461	0.465	0.469	11.70	11.80	11.90
E	0.311	0.315	0.319	7.90	8.00	8.10
H_D	0.520	0.528	0.536	13.20	13.40	13.60
e		0.020			0.50	
L	0.012	0.020	0.028	0.30	0.50	0.70
L_1	0.027			0.675		
Y	0.000		0.004	0.00		0.10
q	0	3	5	0	3	5

Controlling dimension: Millimeters

Winbond Electronics Corp.

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.
2727 N. First Street, San Jose,
CA 95134, U.S.A.
TEL: 1-408-9436666
FAX: 1-408-5441798