



FEATURES

- Access time : 35/55/70ns (max.)
- Low power consumption :  
Operating : 60/50/40 mA (typical)  
Standby : 2µA (typical) L-version  
1µA (typical) LL-version
- Single 5V power supply
- All inputs and outputs TTL compatible
- Fully static operation
- Three state outputs
- Data retention voltage : 2V (min.)
- Package : 32-pin 600 mil PDIP  
32-pin 450 mil SOP  
32-pin 8mmx20mm TSOP-1  
32-pin 8mmx13.4mm STSOP

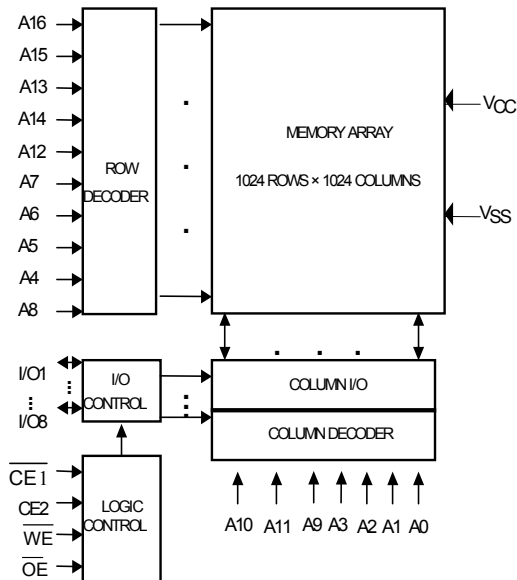
GENERAL DESCRIPTION

The UT621024 is a 1,048,576-bit low power CMOS static random access memory organized as 131,072 words by 8 bits. It is fabricated using high performance, high reliability CMOS technology.

The UT621024 is designed for low power application. It is particularly well suited for battery back-up nonvolatile memory application.

The UT621024 operates from a single 5V power supply and all inputs and outputs are fully TTL compatible.

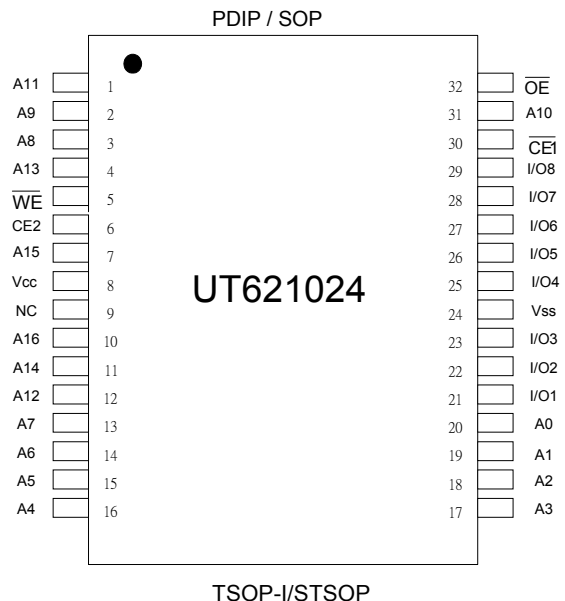
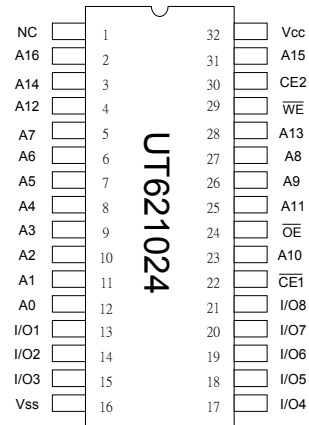
FUNCTIONAL BLOCK DIAGRAM



PIN DESCRIPTION

SYMBOL	DESCRIPTION
A0 - A16	Address Inputs
I/O1 - I/O8	Data Inputs/Outputs
CE1, CE2	Chip enable 1,2 Inputs
WE	Write Enable Input
OE	Output Enable Input
VCC	Power Supply
VSS	Ground
NC	No Connection

PIN CONFIGURATION



**ABSOLUTE MAXIMUM RATINGS\***

PARAMETER	SYMBOL	RATING	UNIT
Terminal Voltage with Respect to V <sub>SS</sub>	V <sub>TERM</sub>	-0.5 to +7.0	V
Operating Temperature	T <sub>A</sub>	0 to +70	°C
Storage Temperature	T <sub>STG</sub>	-65 to +150	°C
Power Dissipation	P <sub>D</sub>	1	W
DC Output Current	I <sub>OUT</sub>	50	mA
Soldering Temperature (under 10 sec)	T <sub>solder</sub>	260	°C

\*Stresses 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 or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to the absolute maximum rating conditions for extended period may affect device reliability.

**TRUTH TABLE**

MODE	CE1	CE2	OE	WE	I/O OPERATION	SUPPLY CURRENT
Standby	H	X	X	X	High - Z	I <sub>SB</sub> , I <sub>SB1</sub>
Standby	X	L	X	X	High - Z	I <sub>SB</sub> , I <sub>SB1</sub>
Output Disable	L	H	H	H	High - Z	I <sub>CC</sub>
Read	L	H	L	H	D <sub>OUT</sub>	I <sub>CC</sub>
Write	L	H	X	L	D <sub>IN</sub>	I <sub>CC</sub>

Note: H = V<sub>IH</sub>, L = V<sub>IL</sub>, X = Don't care.

**DC ELECTRICAL CHARACTERISTICS (V<sub>CC</sub> = 5V ± 10%, T<sub>A</sub> = 0°C to 70°C)**

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT			
Input High Voltage	V <sub>IH</sub>		2.2	-	V <sub>CC</sub> +0.5	V			
Input Low Voltage	V <sub>IL</sub>		-0.5	-	0.8	V			
Input Leakage Current	I <sub>IL</sub>	V <sub>SS</sub> ≤ V <sub>IN</sub> ≤ V <sub>CC</sub>	-1	-	1	μA			
Output Leakage Current	I <sub>OL</sub>	V <sub>SS</sub> ≤ V <sub>I/O</sub> ≤ V <sub>CC</sub> CE1 = V <sub>IH</sub> or CE2 = V <sub>IL</sub> or OE = V <sub>IH</sub> or WE = V <sub>IL</sub>	-1	-	1	μA			
Output High Voltage	V <sub>OH</sub>	I <sub>OH</sub> = -1mA	2.4	-	-	V			
Output Low Voltage	V <sub>OL</sub>	I <sub>OL</sub> = 4mA	-	-	0.4	V			
Average Operating Power Supply Current	I <sub>CC</sub>	Cycle time=min, 100% duty, CE1 = V <sub>IL</sub> , CE2 = V <sub>IH</sub> , I <sub>I/O</sub> = 0mA	-35	-	60	100	mA		
			-55	-	50	85	mA		
			-70	-	40	70	mA		
	I <sub>CC1</sub>	Cycle time=1μs, 100% duty, I <sub>I/O</sub> =0mA CE1 ≤ 0.2V, CE2 ≥ V <sub>CC</sub> -0.2V, other pins at 0.2V or V <sub>CC</sub> -0.2V,	-	-	10	mA			
Standby Power Supply Current	I <sub>SB</sub>	CE1 = V <sub>IH</sub> or CE2 = V <sub>IL</sub> other pins at 0.2V or V <sub>CC</sub> -0.2V,	-	-	3	mA			
			I <sub>SB1</sub>	CE1 ≥ V <sub>CC</sub> -0.2V or CE2 ≤ 0.2V other pins at 0.2V or V <sub>CC</sub> -0.2V,	-L	-	2	100 40*	μA
					-LL	-	1	50 15*	μA

\*Those parameters are for reference only under 50°C

**CAPACITANCE** ( $T_A=25^{\circ}\text{C}$ ,  $f=1.0\text{MHz}$ )

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Input Capacitance	$C_{IN}$	-	8	pF
Input/Output Capacitance	$C_{I/O}$	-	10	pF

Note : These parameters are guaranteed by device characterization, but not production tested.

**AC TEST CONDITIONS**

Input Pulse Levels	0V to 3.0V
Input Rise and Fall Times	5ns
Input and Output Timing Reference Levels	1.5V
Output Load	$C_L=100\text{pF}$ , $I_{OH}/I_{OL}=-1\text{mA}/4\text{mA}$

**AC ELECTRICAL CHARACTERISTICS** ( $V_{CC} = 5V \pm 10\%$ ,  $T_A = 0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ )**(1) READ CYCLE**

PARAMETER	SYMBOL	UT621024-35		UT621024-55		UT621024-70		UNIT
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
Read Cycle Time	$t_{RC}$	35	-	55	-	70	-	ns
Address Access Time	$t_{AA}$	-	35	-	55	-	70	ns
Chip Enable Access Time	$t_{ACE1}$ , $t_{ACE2}$	-	35	-	55	-	70	ns
Output Enable Access Time	$t_{OE}$	-	25	-	30	-	35	ns
Chip Enable to Output in Low-Z	$t_{CLZ1}^*$ , $t_{CLZ2}^*$	10	-	10	-	10	-	ns
Output Enable to Output in Low-Z	$t_{OLZ}^*$	5	-	5	-	5	-	ns
Chip Disable to Output in High-Z	$t_{CHZ1}^*$ , $t_{CHZ2}^*$	-	25	-	30	-	35	ns
Output Disable to Output in High-Z	$t_{OHZ}^*$	-	25	-	30	-	35	ns
Output Hold from Address Change	$t_{OH}$	5	-	5	-	5	-	ns

**(2) WRITE CYCLE**

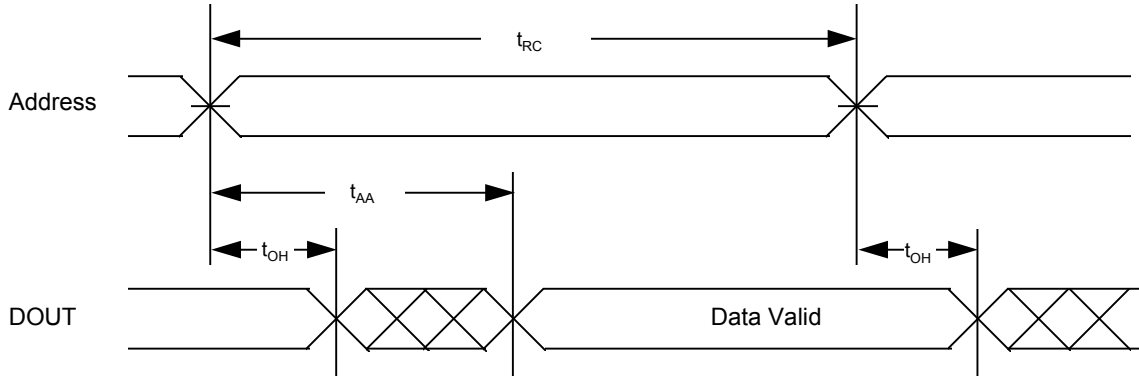
PARAMETER	SYMBOL	UT621024-35		UT621024-55		UT621024-70		UNIT
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
Write Cycle Time	$t_{WC}$	35	-	55	-	70	-	ns
Address Valid to End of Write	$t_{AW}$	30	-	50	-	60	-	ns
Chip Enable to End of Write	$t_{CW1}$ , $t_{CW2}$	30	-	50	-	60	-	ns
Address Set-up Time	$t_{AS}$	0	-	0	-	0	-	ns
Write Pulse Width	$t_{WP}$	25	-	40	-	45	-	ns
Write Recovery Time	$t_{WR}$	0	-	0	-	0	-	ns
Data to Write Time Overlap	$t_{DW}$	20	-	25	-	30	-	ns
Data Hold from End of Write-Time	$t_{DH}$	0	-	0	-	0	-	ns
Output Active from End of Write	$t_{OW}^*$	5	-	5	-	5	-	ns
Write to Output in High-Z	$t_{WHZ}^*$	-	15	-	20	-	25	ns

\*These parameters are guaranteed by device characterization, but not production tested.

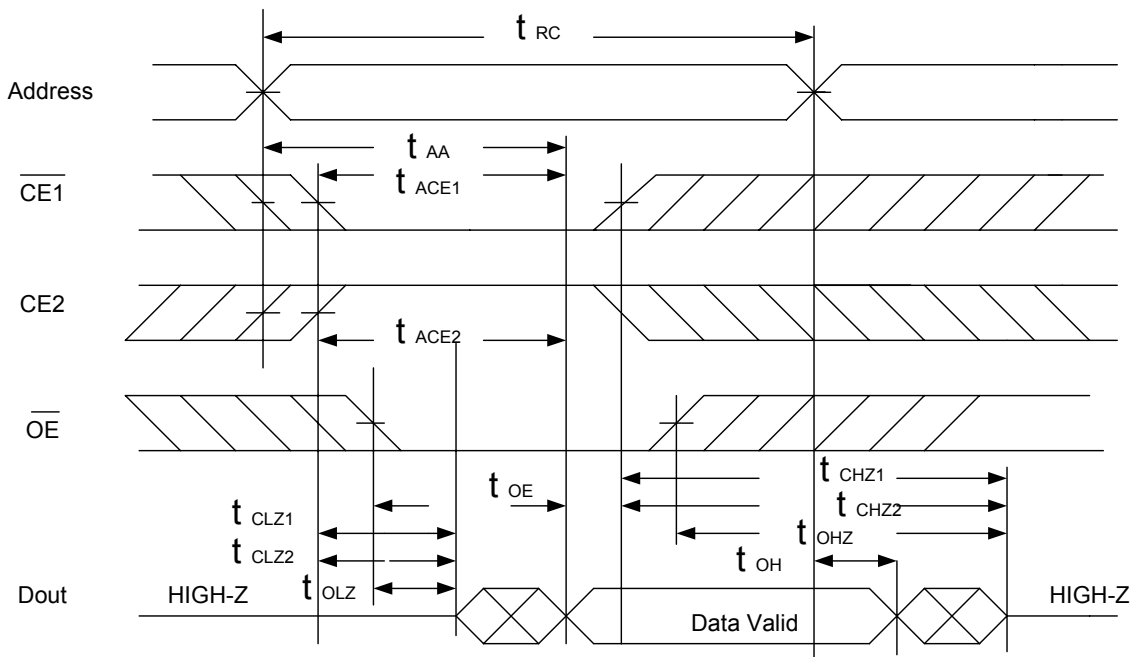


TIMING WAVEFORMS

READ CYCLE 1 (Address Controlled) (1,2,4)



READ CYCLE 2 ( $\overline{CE1}$ , CE2 and  $\overline{OE}$  Controlled) (1,3,5,6)

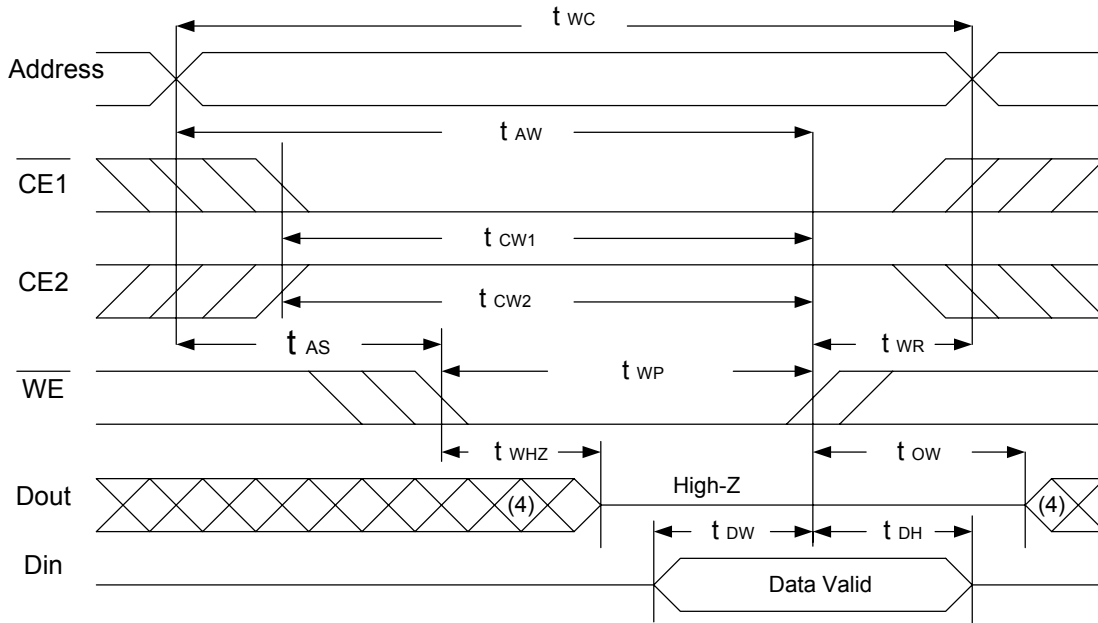


Notes :

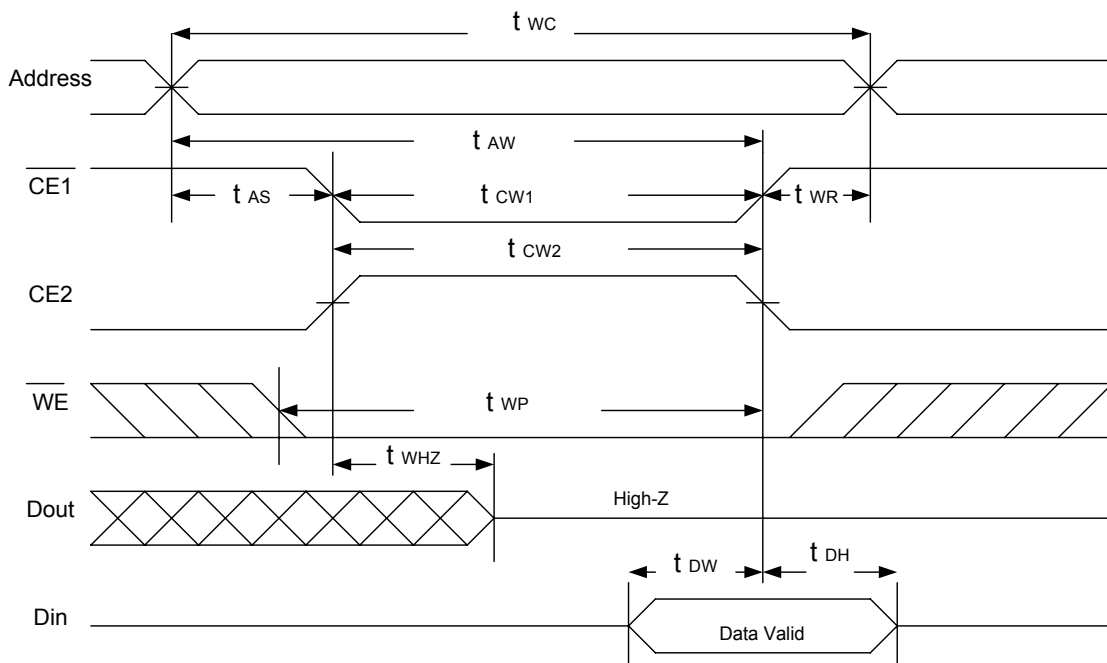
1.  $\overline{WE}$  is HIGH for a read cycle.
2. Device is continuously selected  $\overline{OE}$ ,  $\overline{CE1} = V_{IL}$  and  $CE2 = V_{IH}$ .
3. Address must be valid prior to or coincident with  $\overline{CE1}$  low and CE2 high transition; otherwise  $t_{AA}$  is the limiting parameter.
4.  $\overline{OE}$  is low.
5.  $t_{CLZ1}$ ,  $t_{CLZ2}$ ,  $t_{OLZ}$ ,  $t_{CHZ1}$ ,  $t_{CHZ2}$  and  $t_{OHZ}$  are specified with  $C_L = 5pF$ . Transition is measured  $\pm 500mV$  from steady state.
6. At any given temperature and voltage condition,  $t_{CHZ1}$  is less than  $t_{CLZ1}$ ,  $t_{CHZ2}$  is less than  $t_{CLZ2}$ ,  $t_{OHZ}$  is less than  $t_{OLZ}$ .



WRITE CYCLE 1 ( $\overline{WE}$  Controlled) (1,2,3,5)



WRITE CYCLE 2 ( $\overline{CE1}$  and  $\overline{CE2}$  Controlled) (1,2,5)



Notes :

1.  $\overline{WE}$  or  $\overline{CE1}$  must be HIGH or  $\overline{CE2}$  must be LOW during all address transitions.
2. A write occurs during the overlap of a low  $\overline{CE1}$ , a high  $\overline{CE2}$  and a low  $\overline{WE}$ .
3. During a  $\overline{WE}$  controlled with write cycle with  $\overline{OE}$  LOW,  $t_{WP}$  must be greater than  $t_{WHZ}+t_{DW}$  to allow the I/O drivers to turn off and data to be placed on the bus.
4. During this period, I/O pins are in the output state, and input signals must not be applied.
4. If the  $\overline{CE1}$  LOW transition occurs simultaneously with or after  $\overline{WE}$  LOW transition, the outputs remain in a high Impedance state.
6.  $t_{OW}$  and  $t_{WHZ}$  are specified with  $C_L=5pF$ . Transition is measured  $\pm 500mV$  from steady state.



DATA RETENTION CHARACTERISTICS (T<sub>A</sub> = 0°C ~ +70°C )

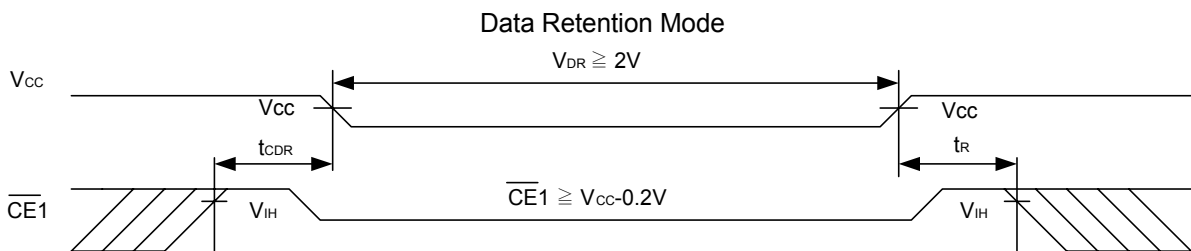
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
V <sub>cc</sub> for Data Retention	V <sub>DR</sub>	$\overline{CE1} \geq V_{cc}-0.2V$ or $CE2 \leq 0.2V$	2.0	-	-	V	
Data Retention Current	I <sub>DR</sub>	V <sub>cc</sub> =3V $\overline{CE1} \geq V_{cc}-0.2V$ or $CE2 \leq 0.2V$	- L	-	1	40 20*	μA
			- LL	-	0.5	20 10*	μA
Chip Disable to Data Retention Time	t <sub>CDR</sub>	See Data Retention Waveforms (below)	0	-	-	ns	
Recovery Time	t <sub>R</sub>		t <sub>RC</sub> *	-	-	ns	

t<sub>RC</sub>\* = Read Cycle Time

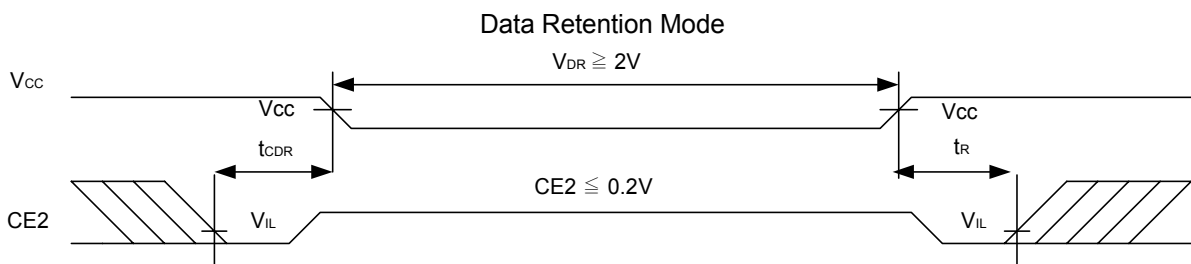
\*Those parameters are for reference only under 50°C

DATA RETENTION WAVEFORM

Low V<sub>cc</sub> Data Retention Waveform (1) ( $\overline{CE1}$  controlled)



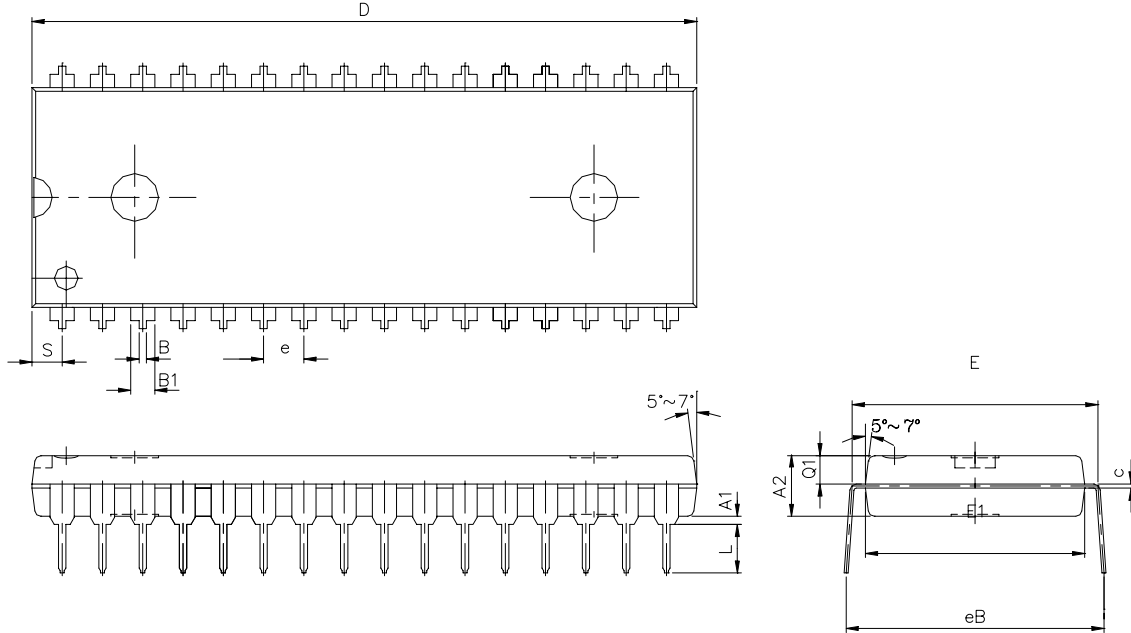
Low V<sub>cc</sub> Data Retention Waveform (2) (CE2 controlled)





PACKAGE OUTLINE DIMENSION

32 pin 600 mil PDIP Package Outline Dimension

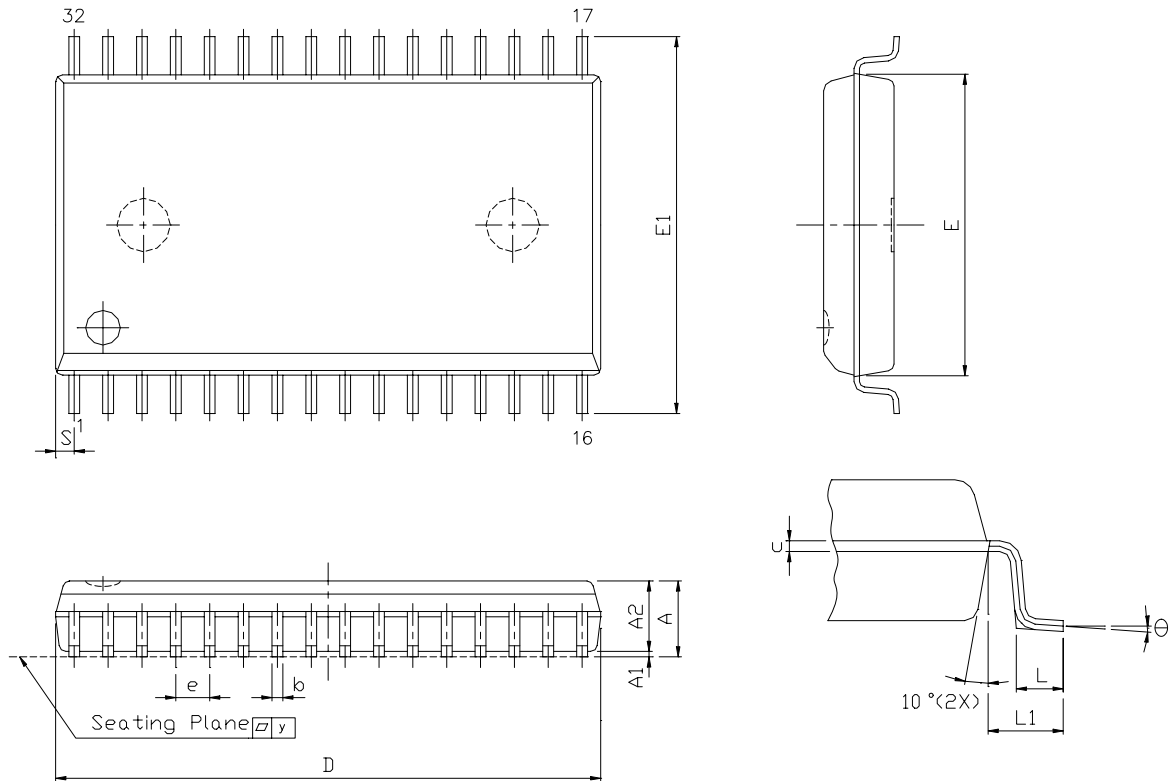


SYMBOL \ UNIT	INCH(BASE)	MM(REF)
A1	0.010(MIN)	0.254(MIN)
A2	0.150±0.005	3.810±0.127
B	0.018±0.005	0.457±0.127
B1	0.050±0.005	1.270±0.127
c	0.010±0.004	0.254±0.102
D	1.650±0.005	41.910±0.127
E	0.600±0.010	15.240±0.254
E1	0.544±0.004	13.818±0.102
e	0.100(TYP)	2.540(TYP)
eB	0.640±0.020	16.256±0.508
L	0.130±0.010	3.302±0.254
S	0.075±0.010	1.905±0.254
Q1	0.070±0.005	1.778±0.127

NOTE : 1.D/E1/S DIMENSION DO NOT INCLUDE MOLD FLASH.



32 pin 450mil SOP Package Outline Dimension

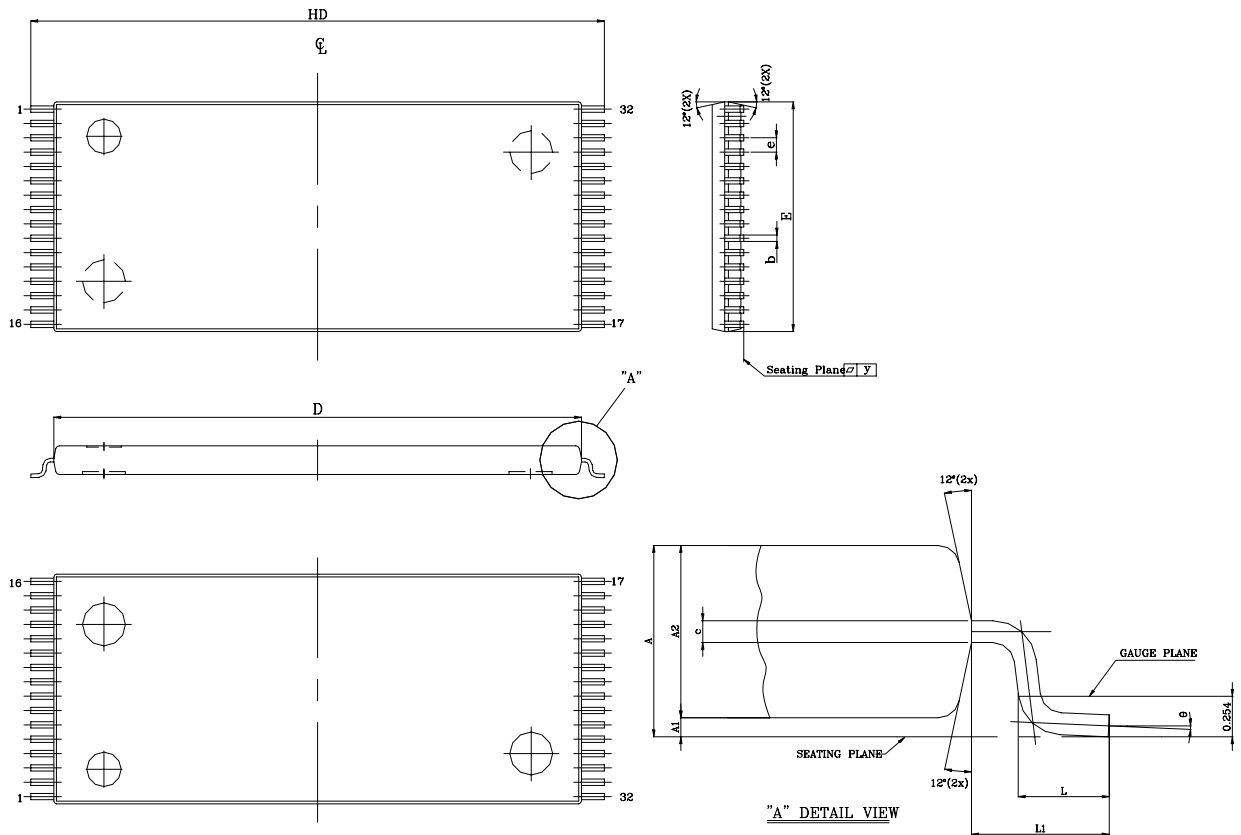


UNIT SYMBOL	INCH(REF)	MM(BASE)
A	0.118 (MAX)	2.997 (MAX)
A1	0.004(MIN)	0.102(MIN)
A2	0.111(MAX)	2.82(MAX)
b	0.016(TYP)	0.406(TYP)
c	0.008(TYP)	0.203(TYP)
D	0.817(MAX)	20.75(MAX)
E	0.445 ± 0.005	11.303 ± 0.127
E1	0.555 ± 0.012	14.097 ± 0.305
e	0.050(TYP)	1.270(TYP)
L	0.0347 ± 0.008	0.881 ± 0.203
L1	0.055 ± 0.008	1.397 ± 0.203
S	0.026(MAX)	0.660 (MAX)
y	0.004(MAX)	0.101(MAX)
θ	0° -10°	0° -10°





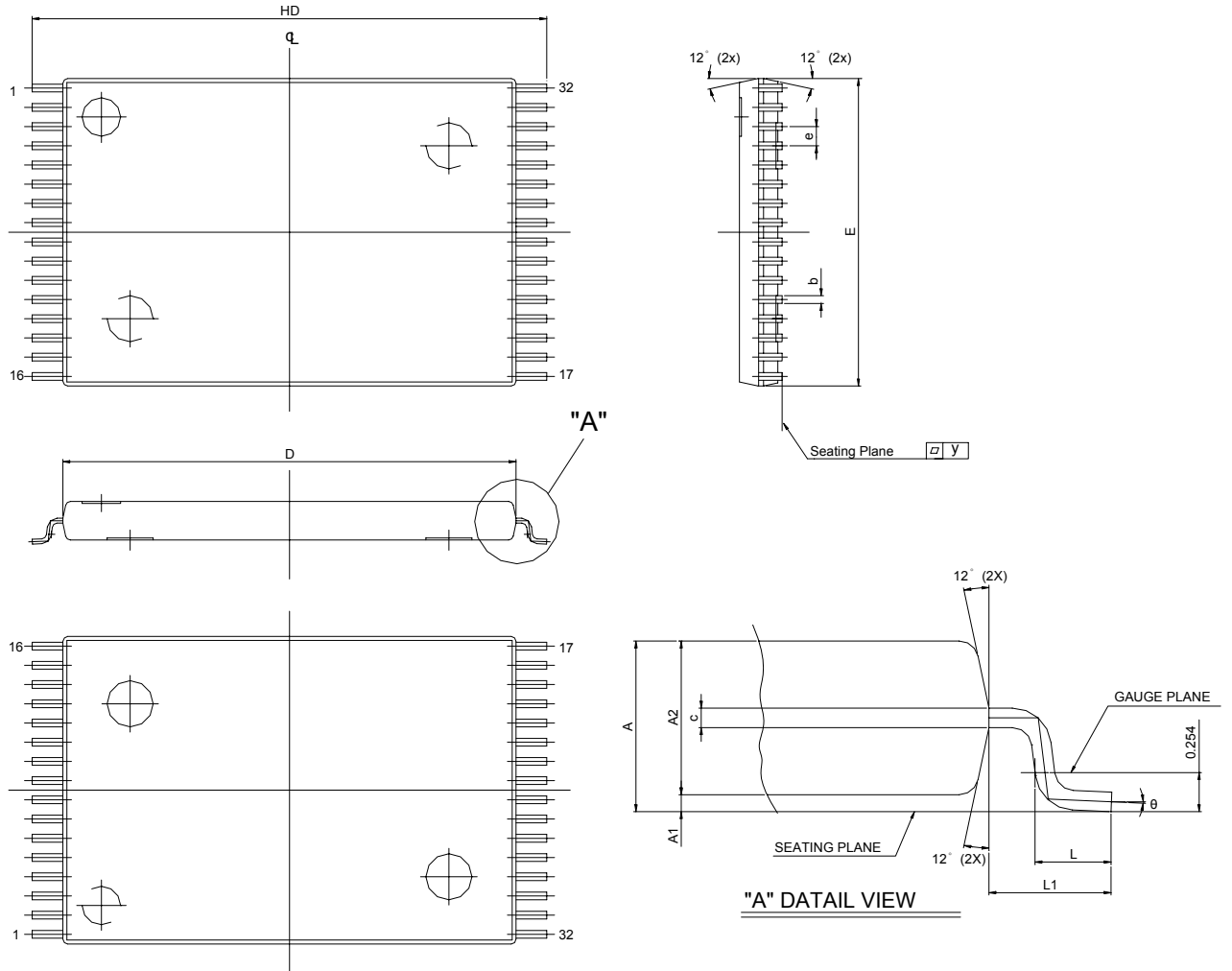
32 pin TSOP-I Package Outline Dimension



UNIT SYMBOL	INCH(BASE)	MM(REF)
A	0.047 (MAX)	1.20 (MAX)
A1	0.004 ± 0.002	0.10 ± 0.05
A2	0.039 ± 0.002	1.00 ± 0.05
b	0.008 + 0.002 - 0.001	0.20 + 0.05 - 0.03
c	0.005 (TYP)	0.127 (TYP)
D	0.724 ± 0.004	18.40 ± 0.10
E	0.315 ± 0.004	8.00 ± 0.10
e	0.020 (TYP)	0.50 (TYP)
HD	0.787 ± 0.008	20.00 ± 0.20
L	0.0197 ± 0.004	0.50 ± 0.10
L1	0.0315 ± 0.004	0.8 ± 0.10
y	0.003 (MAX)	0.076 (MAX)
$\theta$	0°~5°	0°~5°



32 pin 8mm x 13.4mm STSOP Package Outline Dimension



UNIT SYMBOL	INCH(BASE)	MM(REF)
A	0.049 (MAX)	1.25 (MAX)
A1	0.005 ± 0.002	0.130 ± 0.05
A2	0.039 ± 0.002	1.00 ± 0.05
b	0.008 ± 0.001	0.200 ± 0.025
c	0.005 (TYP)	0.127 (TYP)
D	0.465 ± 0.004	11.80 ± 0.10
E	0.315 ± 0.004	8.00 ± 0.10
e	0.020 (TYP)	0.50 (TYP)
HD	0.528 ± 0.008	13.40 ± 0.20
L	0.0197 ± 0.004	0.50 ± 0.10
L1	0.0315 ± 0.004	0.8 ± 0.10
y	0.003 (MAX)	0.076 (MAX)
θ	0°~5°	0°~5°

**ORDERING INFORMATION**

<b>PART NO.</b>	<b>ACCESS TIME (ns)</b>	<b>STANDBY CURRENT (<math>\mu</math>A)</b>	<b>PACKAGE</b>
UT621024PC-35L	35	100	32 PIN PDIP
UT621024PC-35LL	35	50	32 PIN PDIP
UT621024SC-35L	35	100	32 PIN SOP
UT621024SC-35LL	35	50	32 PIN SOP
UT621024LC-35L	35	100	32 PIN TSOP-I
UT621024LC-35LL	35	50	32 PIN TSOP-I
UT621024LS-35L	35	100	32 PIN STSOP
UT621024LS-35LL	35	50	32 PIN STSOP
UT621024PC-55L	55	100	32 PIN PDIP
UT621024PC-55LL	55	50	32 PIN PDIP
UT621024SC-55L	55	100	32 PIN SOP
UT621024SC-55LL	55	50	32 PIN SOP
UT621024LC-55L	55	100	32 PIN TSOP-I
UT621024LC-55LL	55	50	32 PIN TSOP-I
UT621024LS-55L	55	100	32 PIN STSOP
UT621024LS-55LL	55	50	32 PIN STSOP
UT621024PC-70L	70	100	32 PIN PDIP
UT621024PC-70LL	70	50	32 PIN PDIP
UT621024SC-70L	70	100	32 PIN SOP
UT621024SC-70LL	70	50	32 PIN SOP
UT621024LC-70L	70	100	32 PIN TSOP-I
UT621024LC-70LL	70	50	32 PIN TSOP-I
UT621024LS-70L	70	100	32 PIN STSOP
UT621024LS-70LL	70	50	32 PIN STSOP

**REVISION HISTORY**

<b>REVISION</b>	<b>DESCRIPTION</b>	<b>DATE</b>
REV. 1.0	Original.	Apr. 05 2000
REV. 1.1	NA	--
REV. 1.2	NA	--
REV. 1.3	Add STSOP-I Package	Aug. 29.2000
REV. 1.4	Modify the format of power consumption	Sep. 01.2000
REV. 1.5	1. Operating : 60/40 -> 60/50/40 2. Standby Current : 10 ->2 (L-version) 3. Add I <sub>CC</sub> -data as (-55, TYP 50, MAX 85) 4. Revise I <sub>SB1</sub> TYP : 10-> 2, MAX : 300/100 ->100/40 5. The symbols CE1# ,OE# & WE# are revised as $\overline{CE1}$ , $\overline{OE}$ & $\overline{WE}$	Jun. 18,2001