REVISION HISTORY

Revision	Description	Issue Date
Rev. 1.0	Initial Issue	Jul.25.2004
Rev. 1.1	Revised sym. b of 32 pin 450mil SOP package outline dimension in page 8	Jan.17.2007
Rev. 1.2	Added SL(C-grade) Spec.	Jun.14.2007
Rev. 1.3	Revised $I_{SB}/I_{DR(MAX.)}$ Added SL(E/I-grade) Spec. Deleted L Spec.	Aug.20.2008
Rev. 1.4	Revised $I_{SB1}/I_{DR(MAX.)}$ Added I_{SB1}/I_{DR} values when T_A = 25℃ and T_A = 40℃ Revised **FEATURES** & **ORDERING INFORMATION** **Lead free and green package available** to **Green package available** Added packing type in **ORDERING INFORMATION** Deleted T_{SOLDER} in **ABSOLUTE MAXIMUN RATINGS**	Mar.30.2009
Rev. 1.5	Revised V_{DR}	Sep.11.2009

Lyontek Inc.

LY621024

Rev. 1.5

128K X 8 BIT LOW POWER CMOS SRAM

FEATURES

- Fast access time : 35/55/70ns
- Low power consumption:
  Operating current : 24/17/15mA (TYP.)
  Standby current : 2μA@5V(TYP.) LL/SL version
  0.8μA@3V(TYP.) SL version
- Single 5V power supply
- All inputs and outputs TTL compatible
- Fully static operation
- Tri-state output
- Data retention voltage : 1.5V (MIN.)
- **Green package available**
- Package : 32-pin 450 mil SOP
  32-pin 600 mil P-DIP
  32-pin 8mm x 20mm TSOP-I
  32-pin 8mm x 13.4mm STSOP
  36-ball 6mm x 8mm TFBGA

GENERAL DESCRIPTION

The LY621024 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 very high performance, high reliability CMOS technology. Its standby current is stable within the range of operating temperature.

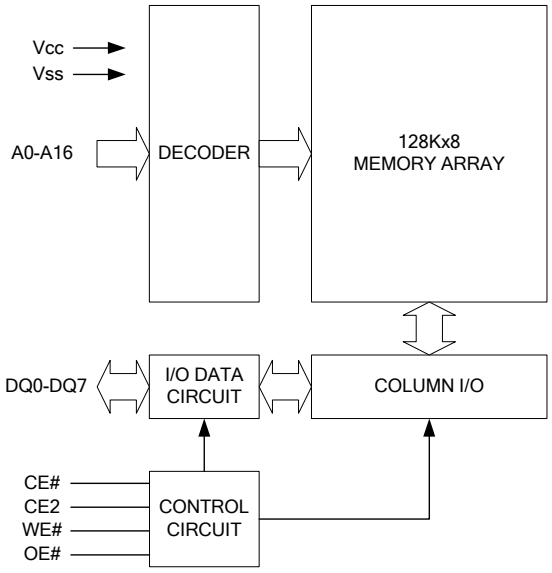
The LY621024 is well designed for very low power system applications, and particularly well suited for battery back-up nonvolatile memory application.

The LY621024 operates from a single power supply of 5V and all inputs and outputs are fully TTL compatible

PRODUCT FAMILY

Product Family	Operating Temperature	Vcc Range	Speed	Power Dissipation		
				Standby(I_{SB1},TYP.)		Operating(Icc,TYP.)
LY621024(LL)	0 ~ 70℃	4.5 ~ 5.5V	35/55/70ns	-	2μA@5V	24/17/15mA
LY621024(LLE)	-20 ~ 80℃	4.5 ~ 5.5V	35/55/70ns	-	2μA@5V	24/17/15mA
LY621024(LLI)	-40 ~ 85℃	4.5 ~ 5.5V	35/55/70ns	-	2μA@5V	24/17/15mA
LY621024(SL)	0 ~ 70℃	4.5 ~ 5.5V	35/55/70ns	0.8μA@3V	2μA@5V	24/17/15mA
LY621024(SLE)	-20 ~ 80℃	4.5 ~ 5.5V	35/55/70ns	0.8μA@3V	2μA@5V	24/17/15mA
LY621024(SLI)	-40 ~ 85℃	4.5 ~ 5.5V	35/55/70ns	0.8μA@3V	2μA@5V	24/17/15mA

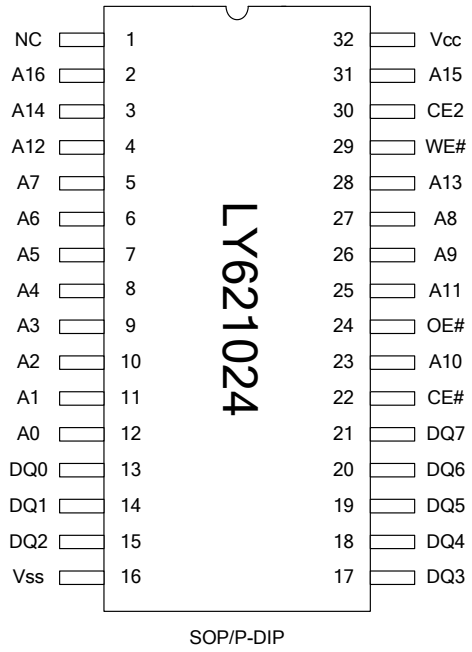
FUNCTIONAL BLOCK DIAGRAM



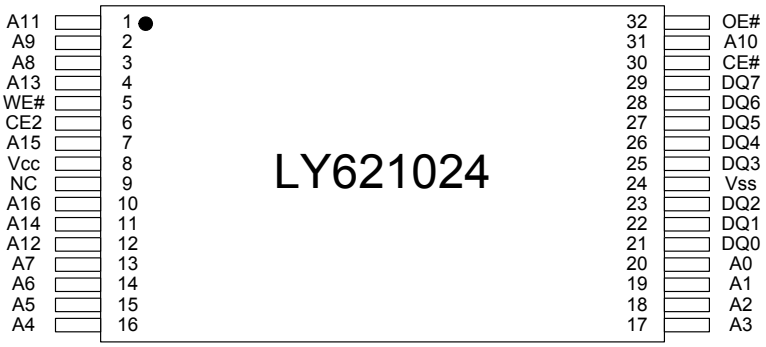
PIN DESCRIPTION

SYMBOL	DESCRIPTION
A0 - A16	Address Inputs
DQ0 – DQ7	Data Inputs/Outputs
CE#, CE2	Chip Enable Inputs
WE#	Write Enable Input
OE#	Output Enable Input
V_{CC}	Power Supply
V_{SS}	Ground
NC	No Connection

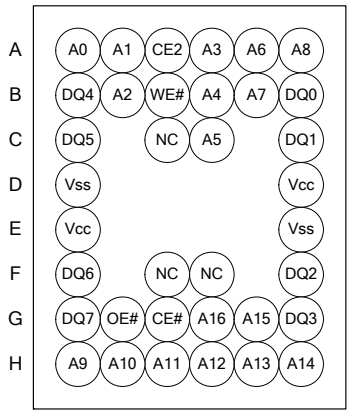
PIN CONFIGURATION



SOP/P-DIP



TSOP-I/STSOP



TFBGA

ABSOLUTE MAXIMUN RATINGS*

PARAMETER	SYMBOL	RATING	UNIT
Voltage on V_{CC} relative to V_{SS}	V_{T1}	-0.5 to 6.5	V
Voltage on any other pin relative to V_{SS}	V_{T2}	-0.5 to V_{CC}+0.5	V
Operating Temperature	T_A	0 to 70(C grade)	℃
		-20 to 80(E grade)	
		-40 to 85(I grade)	
Storage Temperature	T_{STG}	-65 to 150	℃
Power Dissipation	P_D	1	W
DC Output Current	I_{OUT}	50	mA

*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	CE#	CE2	OE#	WE#	I/O OPERATION	SUPPLY CURRENT
Standby	H	X	X	X	High-Z	I_{SB1}
	X	L	X	X	High-Z	I_{SB1}
Output Disable	L	H	H	H	High-Z	I_{CC},I_{CC1}
Read	L	H	L	H	D_{OUT}	I_{CC},I_{CC1}
Write	L	H	X	L	D_{IN}	I_{CC},I_{CC1}

Note: H = V_{IH}, L = V_{IL}, X = Don't care.

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION		MIN.	TYP. *4	MAX.	UNIT
Supply Voltage	V_{CC}			4.5	5.0	5.5	V
Input High Voltage	V_{IH} *1			2.4	-	V_{CC}+0.3	V
Input Low Voltage	V_{IL} *2			- 0.2	-	0.6	V
Input Leakage Current	I_{LI}	$V_{CC} \geqq V_{IN} \geqq V_{SS}$		- 1	-	1	µA
Output Leakage Current	I_{LO}	$V_{CC} \geqq V_{OUT} \geqq V_{SS}$, Output Disabled		- 1	-	1	µA
Output High Voltage	V_{OH}	I_{OH} = -1mA		2.4	-	-	V
Output Low Voltage	V_{OL}	I_{OL} = 2mA		-	-	0.4	V
Average Operating Power supply Current	I_{CC}	Cycle time = Min. CE# = V_{IL} and CE2 = V_{IH} , $I_{I/O}$ = 0mA Other pins at V_{IL} or V_{IH}	- 35	-	24	80	mA
			- 55	-	17	60	mA
			- 70	-	15	50	mA
	I_{CC1}	Cycle time = 1µs CE# = 0.2V and CE2$\geqq V_{CC}$-0.2V, $I_{I/O}$ = 0mA Other pins at 0.2V or V_{CC} - 0.2V		-	2	10	mA
Standby Power Supply Current	I_{SB1}	CE# $\geqq V_{CC}$-0.2V or CE2$\leqq$0.2V Others at 0.2V or V_{CC} - 0.2V	LL	-	2	15	µA
			LLE/LLI	-	2	30	µA
			SL*5 SLE*5 SLI*5 25℃	-	0.8	2	µA
			SL*5 SLE*5 SLI*5 40℃	-	1	2	µA
			SL	-	2	7	µA
			SLE/SLI	-	2	10	µA

Notes:
1. V_{IH}(max) = V_{CC} + 3.0V for pulse width less than 10ns.
2. V_{IL}(min) = V_{SS} - 3.0V for pulse width less than 10ns.
3. Over/Undershoot specifications are characterized, not 100% tested.
4. Typical values are included for reference only and are not guaranteed or tested. Typical values are measured at V_{CC} = V_{CC}(TYP.) and T_A = 25℃
5. This parameter is measured at V_{CC} = 3.0V

CAPACITANCE (T_A = 25℃, f = 1.0MHz)

PARAMETER	SYMBOL	MIN.	MAX	UNIT
Input Capacitance	C_{IN}	-	6	pF
Input/Output Capacitance	$C_{I/O}$	-	8	pF

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

AC TEST CONDITIONS

Input Pulse Levels	0.2V to V_{CC} - 0.2V
Input Rise and Fall Times	3ns
Input and Output Timing Reference Levels	1.5V
Output Load	C_L = 50pF + 1TTL, I_{OH}/I_{OL} = -1mA/2mA

AC ELECTRICAL CHARACTERISTICS

(1) READ CYCLE

PARAMETER	SYM.	LY621024-35		LY621024-55		LY621024-70		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_{ACE}	-	35	-	55	-	70	ns
Output Enable Access Time	t_{OE}	-	25	-	30	-	35	ns
Chip Enable to Output in Low-Z	t_{CLZ}*	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_{CHZ}*	-	15	-	20	-	25	ns
Output Disable to Output in High-Z	t_{OHZ}*	-	15	-	20	-	25	ns
Output Hold from Address Change	t_{OH}	10	-	10	-	10	-	ns

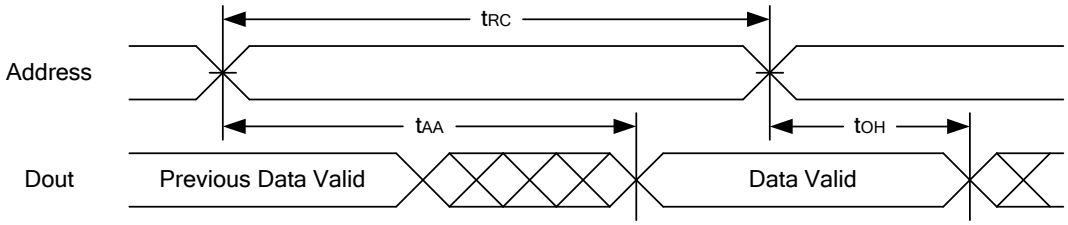
(2) WRITE CYCLE

PARAMETER	SYM.	LY621024-35		LY621024-55		LY621024-70		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_{CW}	30	-	50	-	60	-	ns
Address Set-up Time	t_{AS}	0	-	0	-	0	-	ns
Write Pulse Width	t_{WP}	25	-	45	-	55	-	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

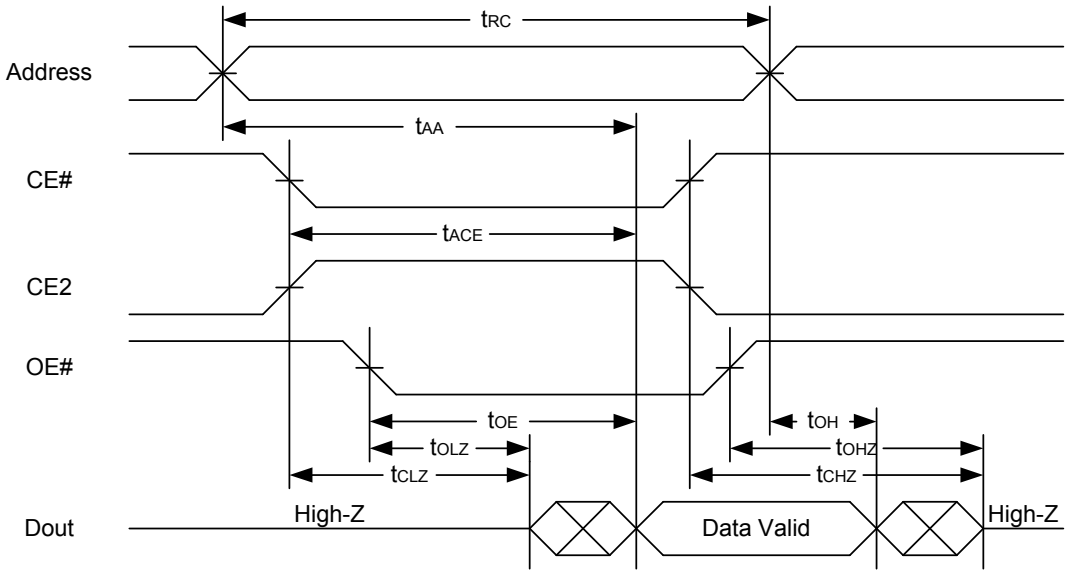
*These parameters are guaranteed by device characterization, but not production tested.

TIMING WAVEFORMS

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

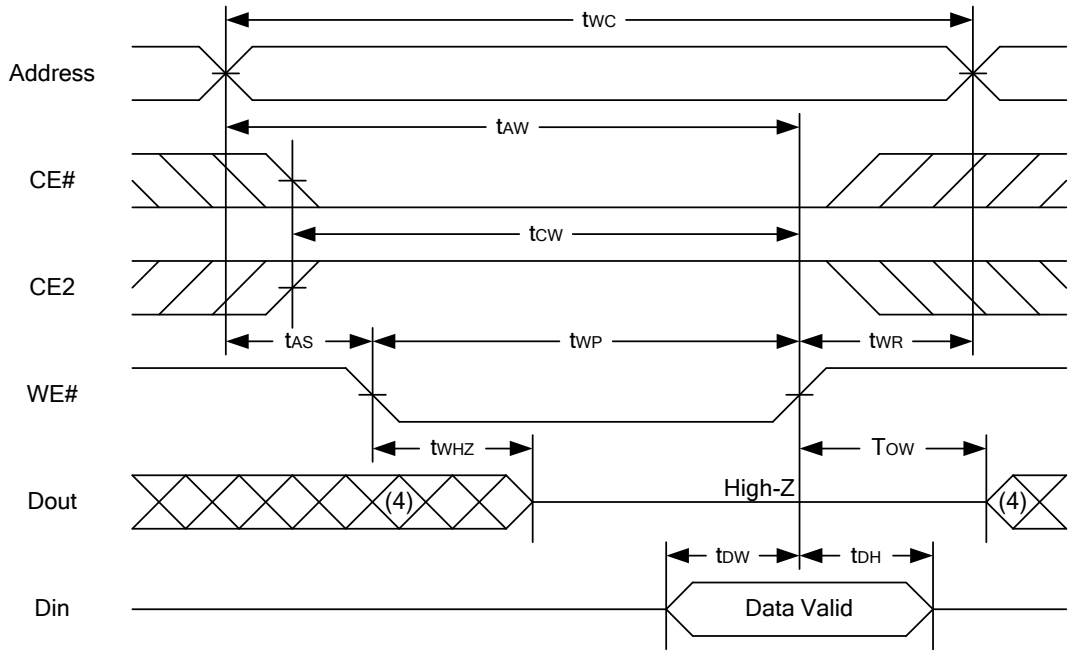


READ CYCLE 2 (CE# and CE2 and OE# Controlled) (1,3,4,5)

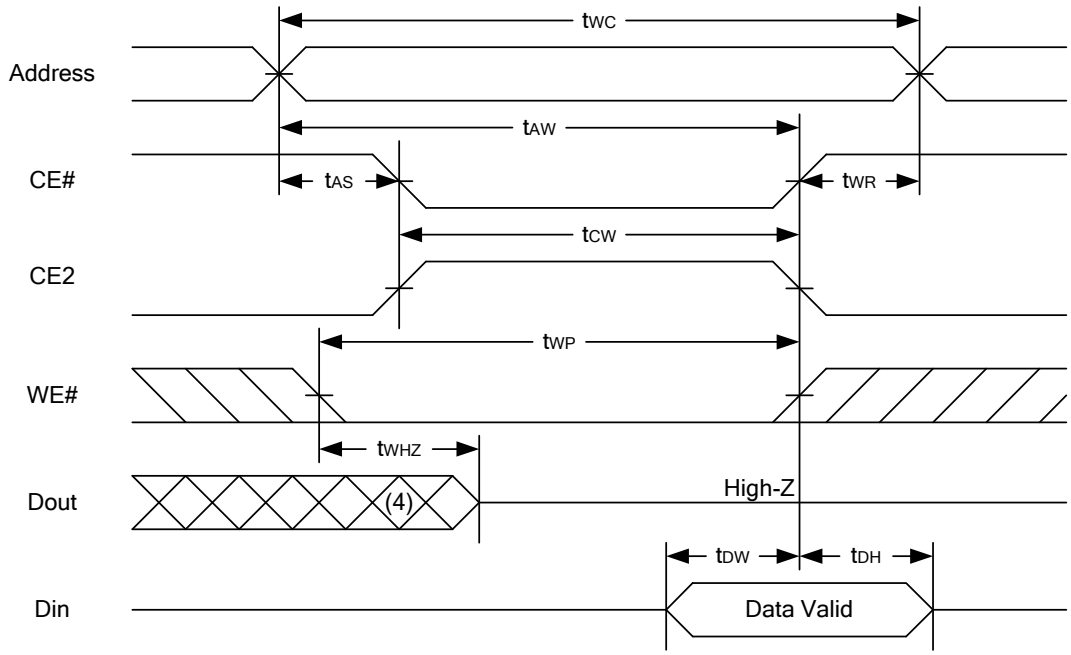


Notes :
1.WE# is high for read cycle.
2.Device is continuously selected OE# = low, CE# = low., CE2 = high.
3.Address must be valid prior to or coincident with CE# = low, CE2 = high; otherwise t_{AA} is the limiting parameter.
4.t_{CLZ}, t_{OLZ}, t_{CHZ} and t_{OHZ} are specified with C_L = 5pF. Transition is measured ±500mV from steady state.
5.At any given temperature and voltage condition, t_{CHZ} is less than t_{CLZ} , t_{OHZ} is less than t_{OLZ}.

WRITE CYCLE 1 (WE# Controlled) (1,2,3,5,6)



WRITE CYCLE 2 (CE# and CE2 Controlled) (1,2,5,6)



Notes :
1.WE#, CE# must be high or CE2 must be low during all address transitions.
2.A write occurs during the overlap of a low CE#, high CE2, low WE#.
3.During a WE#controlled write cycle with OE# low, t_{WP} must be greater than $t_{WHZ} + t_{DW}$ to allow the 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.
5.If the CE#low transition and CE2 high transition occurs simultaneously with or after 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 ±500mV from steady state.

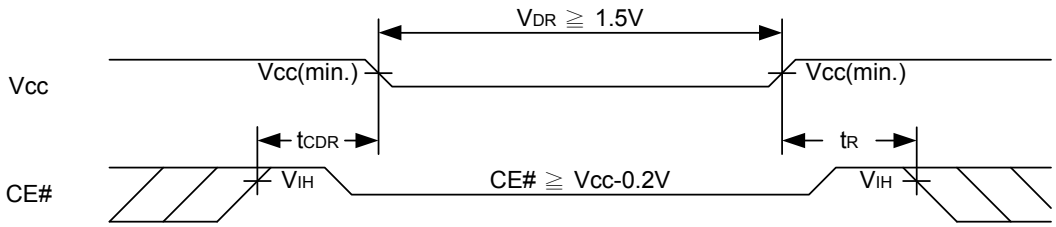
DATA RETENTION CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION			MIN.	TYP.	MAX.	UNIT
V_{CC} for Data Retention	V_{DR}	CE# ≧ V_{CC} - 0.2V or CE2 ≦ 0.2V			1.5	-	5.5	V
Data Retention Current	I_{DR}	V_{CC} = 1.5V CE# ≧ V_{CC} - 0.2V or CE2 ≦ 0.2V Other pins at 0.2V or V_{CC}-0.2V	LL		-	0.5	12	µA
			LLE/LLI		-	0.5	30	µA
			SL SLE SLI	25℃	-	0.4	2	µA
				40℃	-	0.5	2	µA
			SL		-	0.4	5	µA
			SLE/SLI		-	0.4	8	µA
Chip Disable to Data Retention Time	t_{CDR}	See Data Retention Waveforms (below)			0	-	-	ns
Recovery Time	t_R				t_{RC*}	-	-	ns

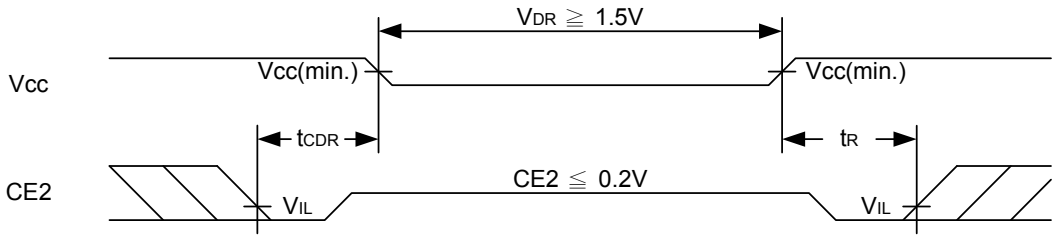
t_{RC*} = Read Cycle Time

DATA RETENTION WAVEFORM

Low Vcc Data Retention Waveform (1) (CE# controlled)

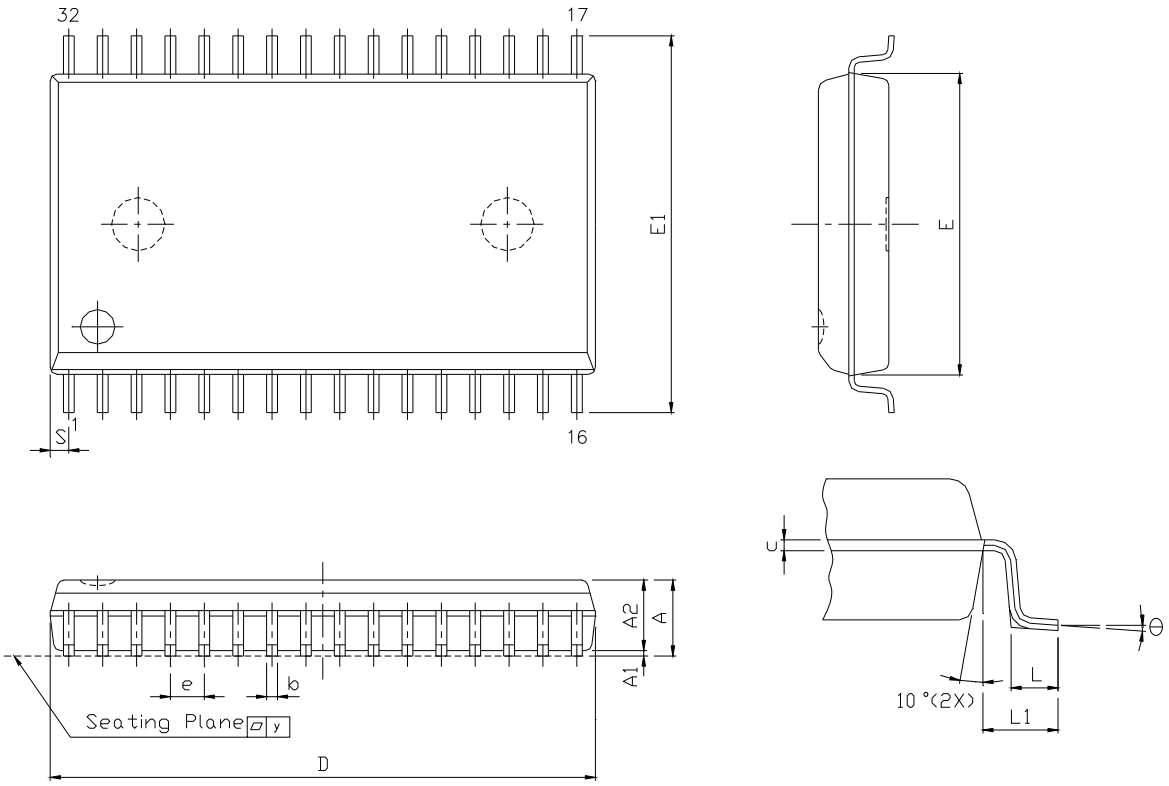


Low Vcc Data Retention Waveform (2) (CE2 controlled)



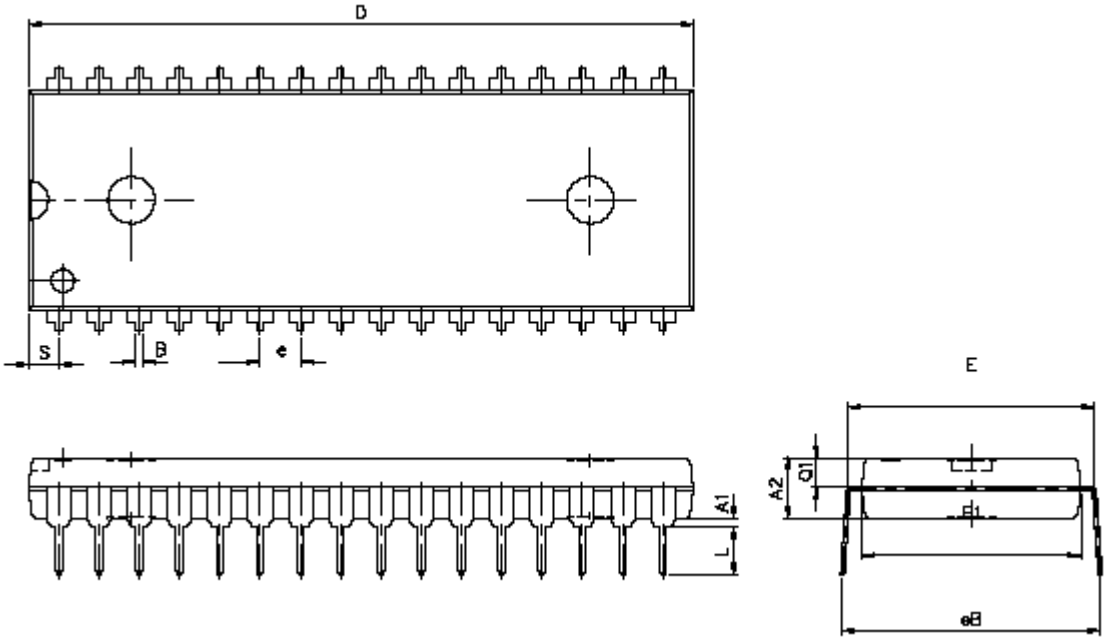
PACKAGE OUTLINE DIMENSION

32 pin 450 mil SOP Package Outline Dimension



SYM. \ UNIT	INCH.(BASE)	MM(REF)
A	0.118 (MAX)	2.997 (MAX)
A1	0.004(MIN)	0.102(MIN)
A2	0.111(MAX)	2.82(MAX)
b	0.016 +0.004 -0.002	0.406 +0.102 -0.051
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^{o} -10^{o}	0^{o} -10^{o}

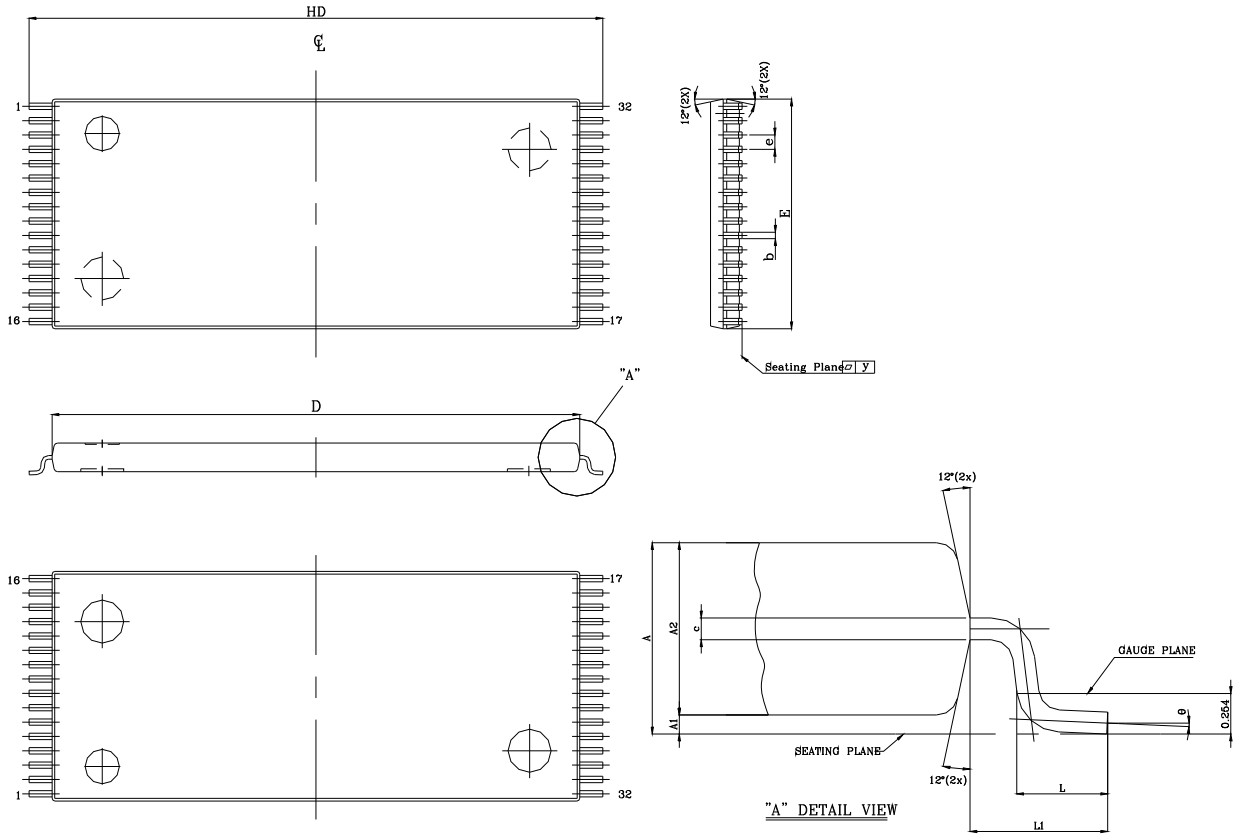
32 pin 600 mil P-DIP Package Outline Dimension



SYM. \ UNIT	INCH(BASE)	MM(REF)
A1	0.001 (MIN)	0.254 (MIN)
A2	0.150 ± 0.005	3.810 ± 0.127
B	0.018 ± 0.005	0.457 ± 0.127
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

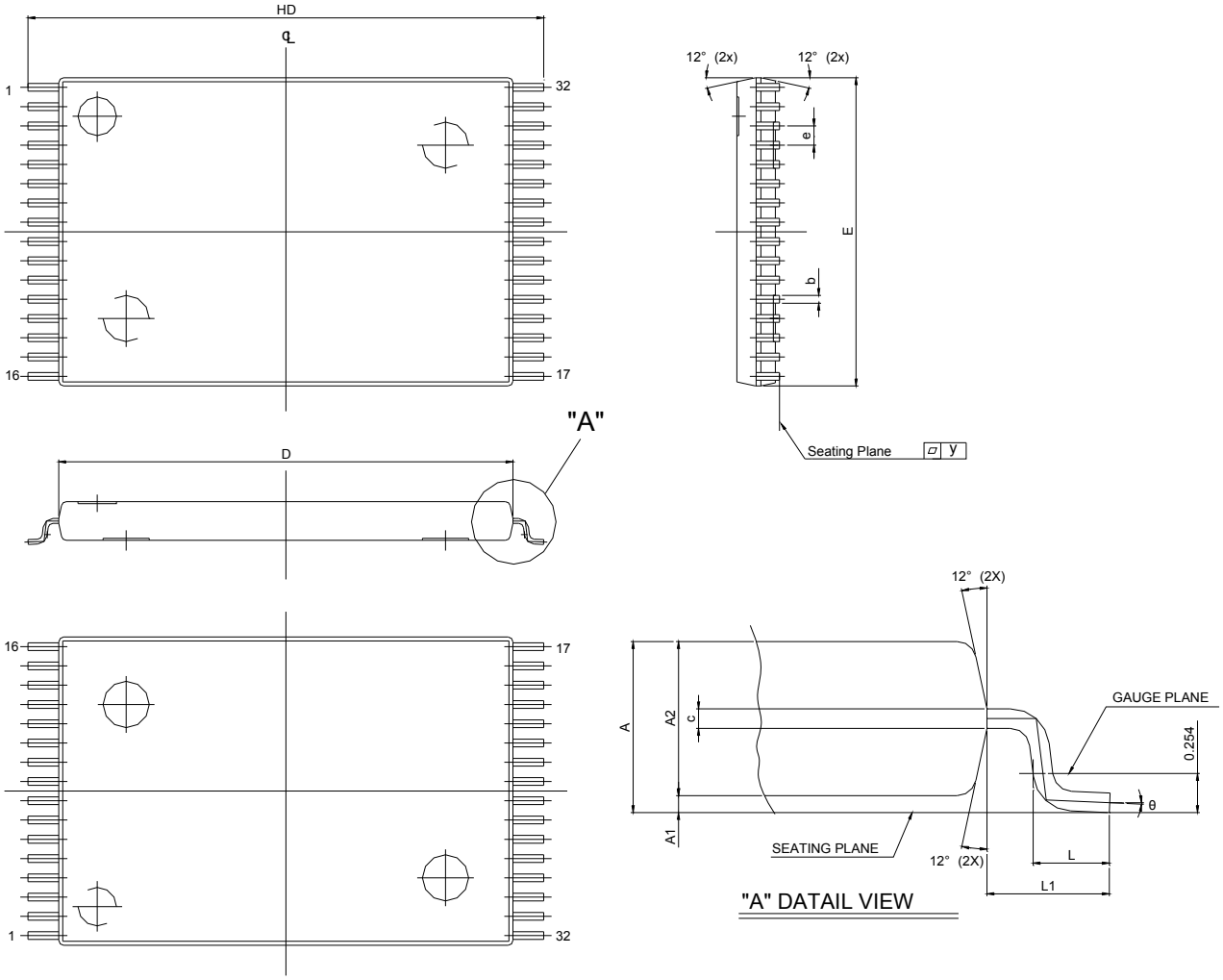
Note : D/E1/S dimension do not include mold flash.

32 pin 8mm x 20mm TSOP-I Package Outline Dimension



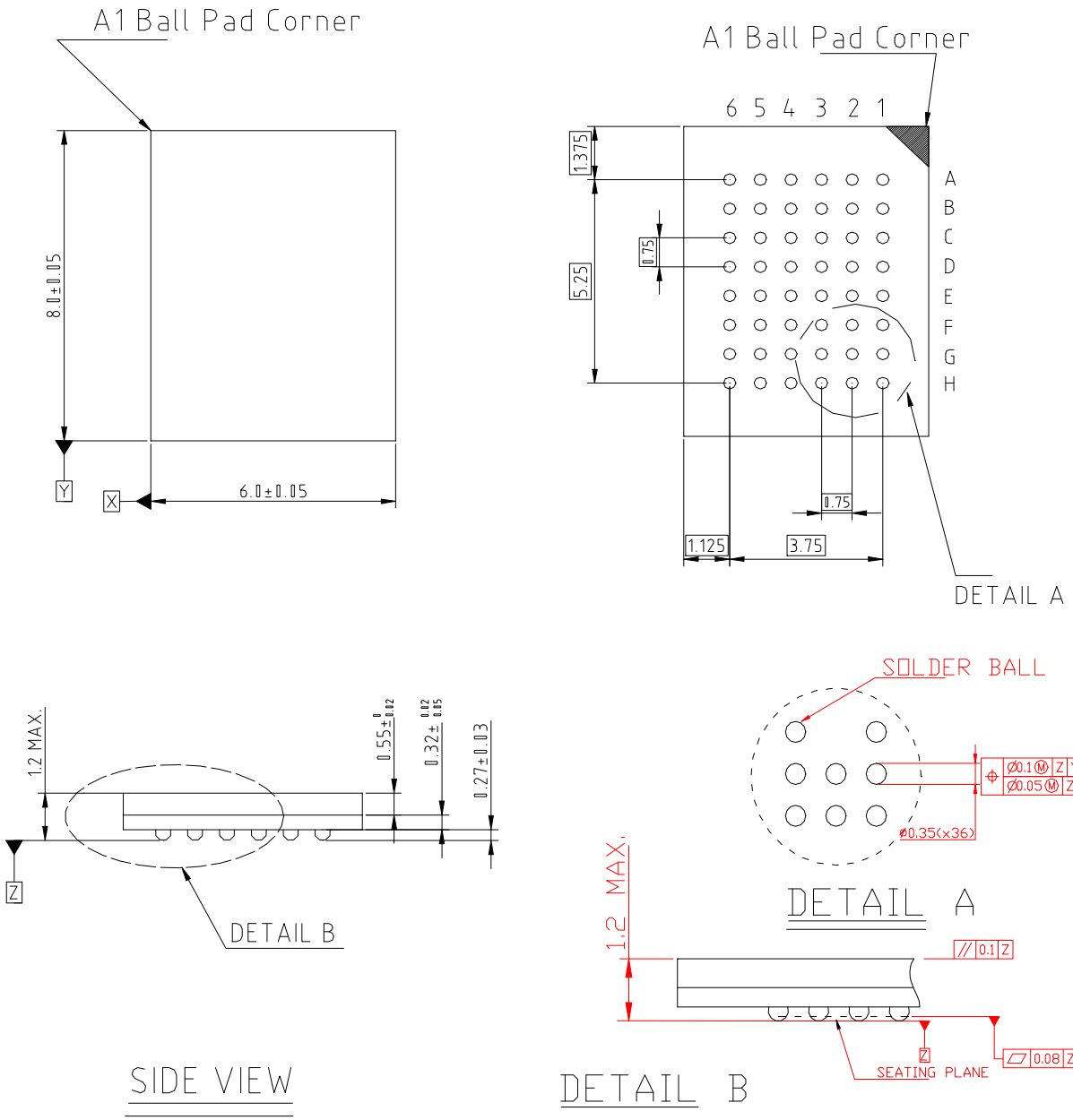
SYM. \ UNIT	INCH(BASE)	MM(REF)
A	0.047 (MAX)	1.20 (MAX)
A1	0.004 ±0.002	0.10 ±0.05
A2	0.039 ±0.002	1.00 ±0.05
b	0.008 + 0.002 - 0.001	0.20 + 0.05 -0.03
c	0.005 (TYP)	0.127 (TYP)
D	0.724 ±0.004	18.40 ±0.10
E	0.315 ±0.004	8.00 ±0.10
e	0.020 (TYP)	0.50 (TYP)
HD	0.787 ±0.008	20.00 ±0.20
L	0.0197 ±0.004	0.50 ±0.10
L1	0.0315 ±0.004	0.08 ±0.10
y	0.003 (MAX)	0.076 (MAX)
Θ	0°～5°	0°～5°

32 pin 8mm x 13.4mm STSOP Package Outline Dimension



UNIT / SYM.	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 ±0.01	0.20±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°

36 ball 6mm × 8mm TFBGA Package Outline Dimension



ORDERING INFORMATION

LY621024 U V - WW XX Y Z

Z : Packing Type
Blank : Tube or Tray
T : Tape Reel

Y : Temperature Range
Blank : (Commercial) 0°C ~ 70°C
E : (Extended) -20°C ~ +80°C
I : (Industrial) -40°C ~ +85°C

XX : Power Type
LL : Ultra Low Power
SL : Special Ultra Low Power

WW : Access Time(Speed)

V : Lead Information
L : Green Package

U : Package Type
S : 32-pin 450 mil SOP
P : 32-pin 600 mil P-DIP
L : 32-pin 8 mm x 20 mm TSOP-I
R : 32-pin 8 mm x 13.4 mm STSOP
G : 36-ball 6 mm x 8 mm TFBGA

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