



Lyontek Inc.

LY69L1024A

**128K X 8 BIT LOW POWER CMOS SRAM
With Error-Correcting Code (ECC)**

Rev. 1.0

REVISION HISTORY

<u>Revision</u>	<u>Description</u>	<u>Issue Date</u>
Rev. 1.0	Initial Issue	Aug.24.2023

FEATURES

- Fast access time : 45/55ns
- Low power consumption:
Operating current : 12/10mA (TYP.)
Standby current : 1 μ A (TYP.)
- Single 2.7V ~ 3.6V power supply
- ECC : 1-bit error correction per byte
- All inputs and outputs TTL compatible
- Fully static operation
- Tri-state output
- Data retention voltage : 1.5V (MIN.)
- **Green package available**
- Package : 32-pin 450mil SOP
32-pin 8mm x 20mm TSOP I
32-pin 8mm x 13.4mm sTSOP
36-ball 6mm x 8mm TFBGA

The LY69L1024A 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 LY69L1024A embeds error-correcting code (ECC) which can correct single-bit error per byte. It is well designed for very low power system applications, and particularly well suited for battery back-up nonvolatile memory application.

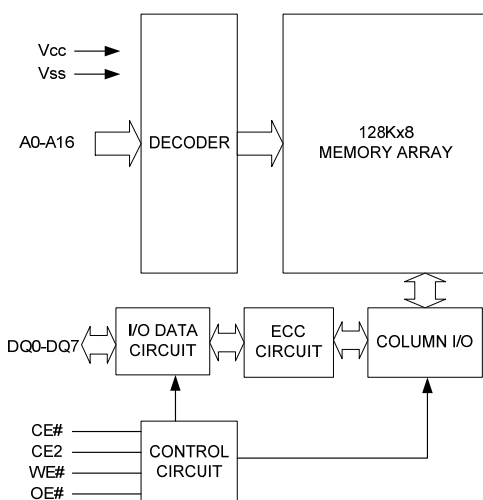
The LY69L1024A operates from a single power supply of 2.7V ~ 3.6V and all inputs and outputs are fully TTL compatible.

GENERAL DESCRIPTION

PRODUCT FAMILY

Product Family	Operating Temperature	V _{CC} Range	Speed	Power Dissipation	
				Standby(I _{SB1} , TYP.)	Operating(I _{CC} , TYP.)
LY69L1024A	0 ~ 70°C	2.7 ~ 3.6V	45/55ns	1 μ A	12/10mA
LY69L1024A(I)	-40 ~ 85°C	2.7 ~ 3.6V	45/55ns	1 μ A	12/10mA

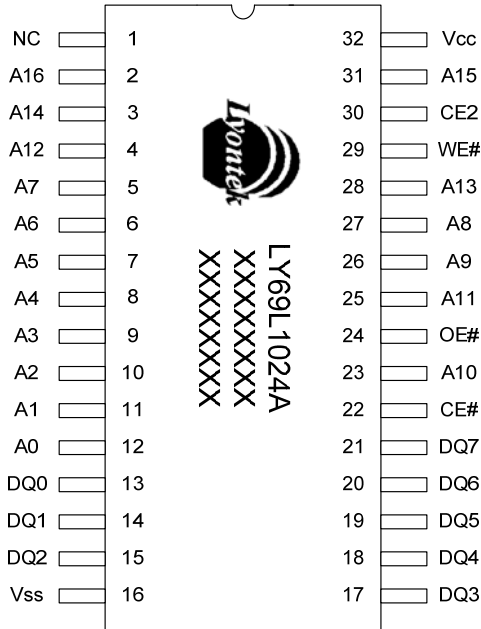
FUNCTIONAL BLOCK DIAGRAM



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

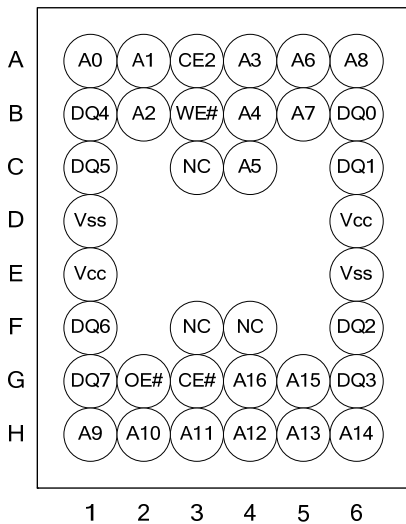
PIN CONFIGURATION



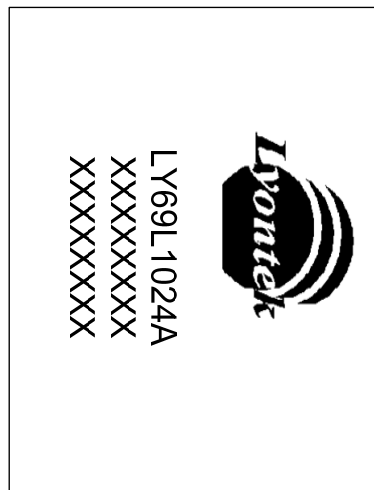
SOP



TSOP I/TSOP



TFBGA(See through with Top View)



TFBGA(Top View)



ABSOLUTE MAXIMUM RATINGS*

PARAMETER	SYMBOL	RATING	UNIT
Voltage on V_{CC} relative to V_{SS}	V_{T1}	-0.5 to 4.6	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)	°C
		-40 to 85(I grade)	
Storage Temperature	T_{STG}	-65 to 150	°C
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}		2.7	3.0	3.6	V		
Input High Voltage	V _{IH} *1		2.2	-	V _{CC} +0.3	V		
Input Low Voltage	V _{IL} *2		- 0.2	-	0.6	V		
Input Leakage Current	I _{LI}	V _{CC} ≥ V _{IN} ≥ V _{SS}	- 1	-	1	μA		
Output Leakage Current	I _{LO}	V _{CC} ≥ V _{OUT} ≥ V _{SS} , Output Disabled	- 1	-	1	μA		
Output High Voltage	V _{OH}	I _{OH} = -1mA	2.2	2.7	-	V		
Output Low Voltage	V _{OL}	I _{OL} = 2mA	-	-	0.4	V		
Average Operating Power supply Current	I _{CC}	Cycle time = MIN. CE# = 0.2V and CE2 ≥ V _{CC} -0.2V, I _{I/O} = 0mA Other pins at 0.2V or V _{CC} - 0.2V	- 45	-	12	20	mA	
			- 55	-	10	17	mA	
	I _{CC1}	Cycle time = 1μs CE# = 0.2V and CE2 ≥ V _{CC} -0.2V, I _{I/O} = 0mA Other pins at 0.2V or V _{CC} - 0.2V	-	3	5	mA		
Standby Power Supply Current	I _{SB1}	CE# ≥ V _{CC} -0.2V or CE2 ≤ 0.2V Others at 0.2V or V _{CC} - 0.2V	SL*5	25°C	-	1	3	μA
			SLI*5	40°C	-	1	3	μA
			SL		-	1	5	μA
			SLI		-	1	10	μA

Notes:

- V_{IH}(max) = V_{CC} + 3.0V for pulse width less than 10ns.
- V_{IL}(min) = V_{SS} - 3.0V for pulse width less than 10ns.
- Over/Undershoot specifications are characterized on engineering evaluation stage, not for mass production test.
- 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°C
- This parameter is measured at V_{CC} = 3.0V



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

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 $V_{CC} - 0.2\text{V}$
Input Rise and Fall Times	3ns
Input and Output Timing Reference Levels	1.5V
Output Load	$C_L = 30\text{pF} + 1\text{TTL}$, $I_{OH}/I_{OL} = -1\text{mA}/2\text{mA}$

AC ELECTRICAL CHARACTERISTICS

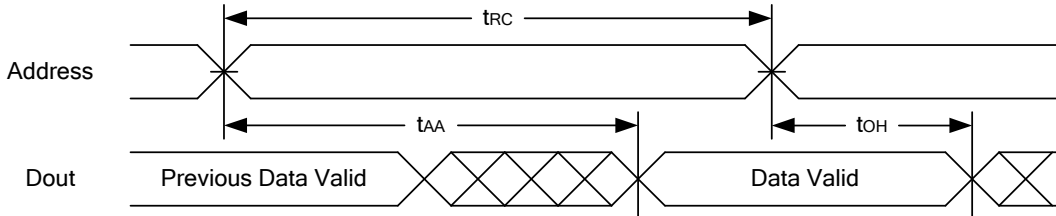
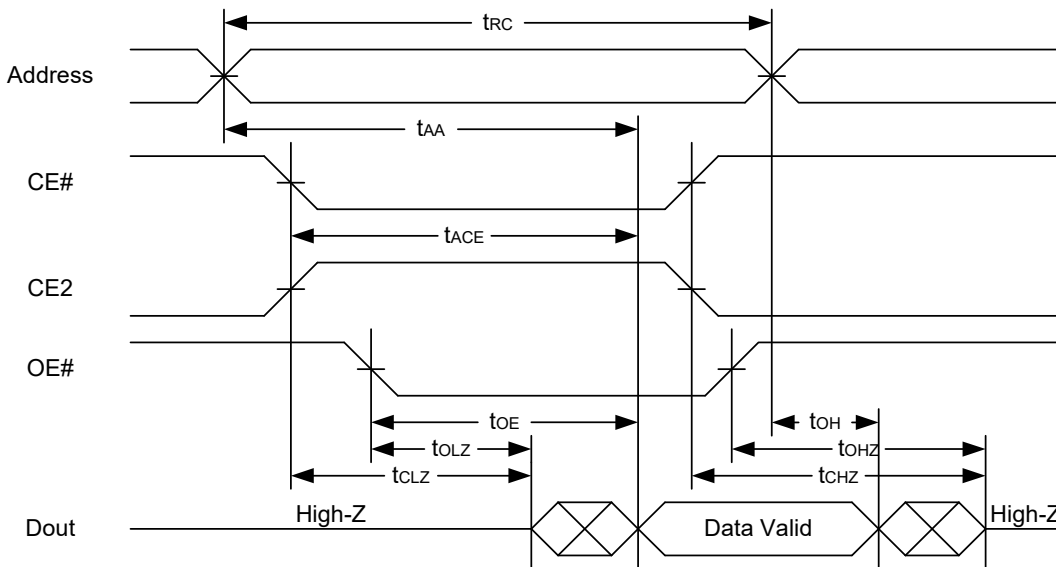
(1) READ CYCLE

PARAMETER	SYM.	LY69L1024A-45		LY69L1024A-55		UNIT
		MIN.	MAX.	MIN.	MAX.	
Read Cycle Time	t_{RC}	45	-	55	-	ns
Address Access Time	t_{AA}	-	45	-	55	ns
Chip Enable Access Time	t_{ACE}	-	45	-	55	ns
Output Enable Access Time	t_{OE}	-	20	-	25	ns
Chip Enable to Output in Low-Z	t_{CLZ}^*	10	-	10	-	ns
Output Enable to Output in Low-Z	t_{OLZ}^*	5	-	5	-	ns
Chip Disable to Output in High-Z	t_{CHZ}^*	-	15	-	20	ns
Output Disable to Output in High-Z	t_{OHZ}^*	-	15	-	20	ns
Output Hold from Address Change	t_{OH}	10	-	10	-	ns

(2) WRITE CYCLE

PARAMETER	SYM.	LY69L1024A-45		LY69L1024A-55		UNIT
		MIN.	MAX.	MIN.	MAX.	
Write Cycle Time	t_{WC}	45	-	55	-	ns
Address Valid to End of Write	t_{AW}	40	-	50	-	ns
Chip Enable to End of Write	t_{CW}	40	-	50	-	ns
Address Set-up Time	t_{AS}	0	-	0	-	ns
Write Pulse Width	t_{WP}	35	-	45	-	ns
Write Recovery Time	t_{WR}	0	-	0	-	ns
Data to Write Time Overlap	t_{DW}	20	-	25	-	ns
Data Hold from End of Write Time	t_{DH}	0	-	0	-	ns
Output Active from End of Write	t_{OW}^*	5	-	5	-	ns
Write to Output in High-Z	t_{WHZ}^*	-	15	-	20	ns

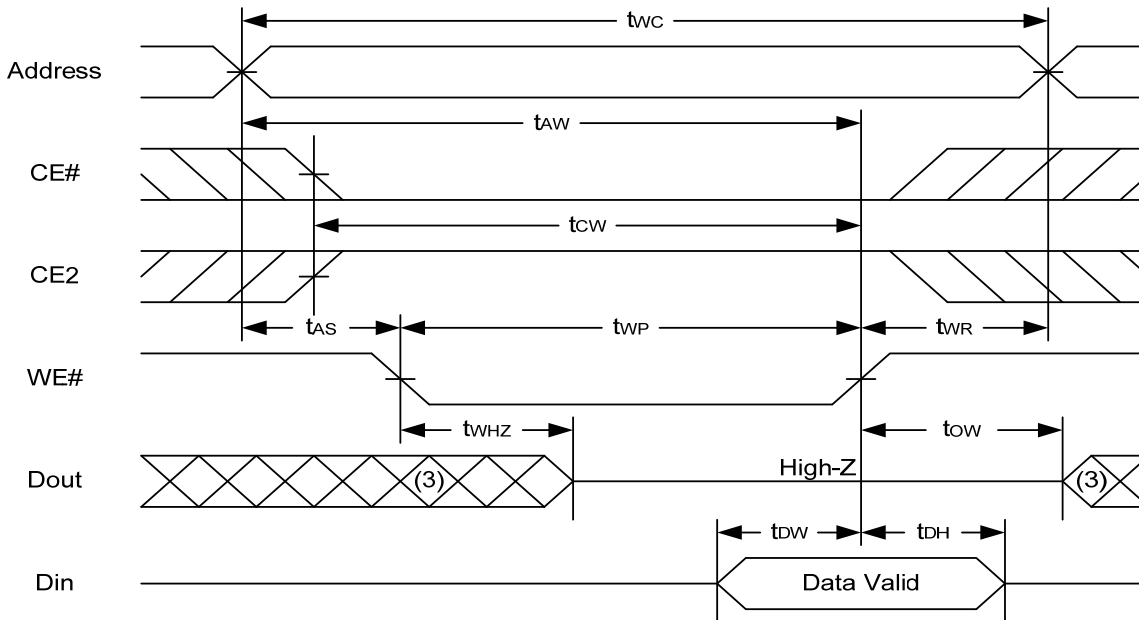
*These parameters are guaranteed by device characterization, but not production tested.

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

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

Notes :

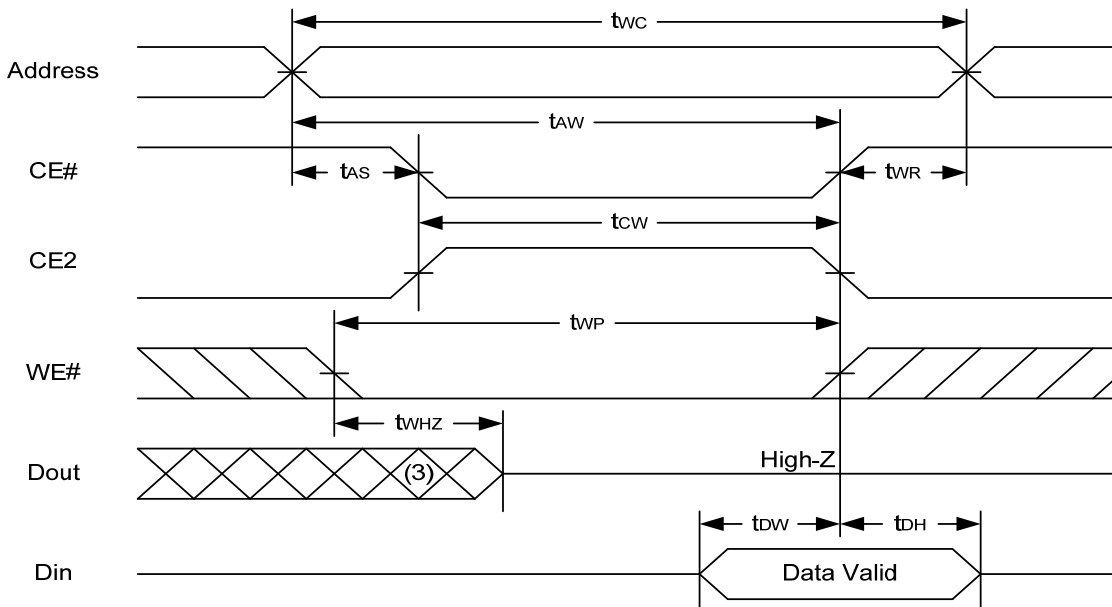
1. WE# is high for read cycle.
2. Device is continuously selected OE# = low, CE# = low., CE2 = high.
3. Address must be valid prior to or coincident with CE# = low, CE2 = high; otherwise tAA is the limiting parameter.
4. tCLZ, tOLZ, tCHZ and tOHZ are specified with CL = 5pF. Transition is measured ±500mV from steady state.
5. At any given temperature and voltage condition, tCHZ is less than tCLZ, tOHZ is less than tOLZ.



WRITE CYCLE 1 (WE# Controlled) (1,2,4,5)



WRITE CYCLE 2 (CE# and CE2 Controlled) (1,4,5)



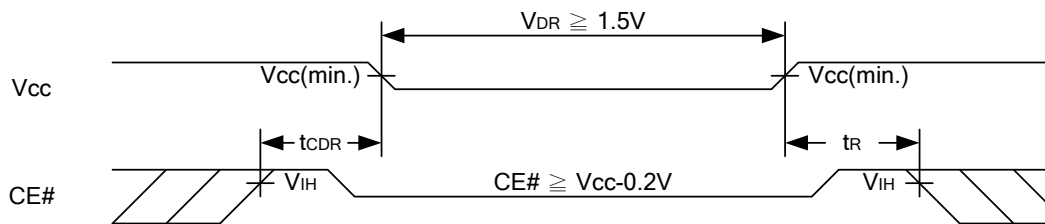
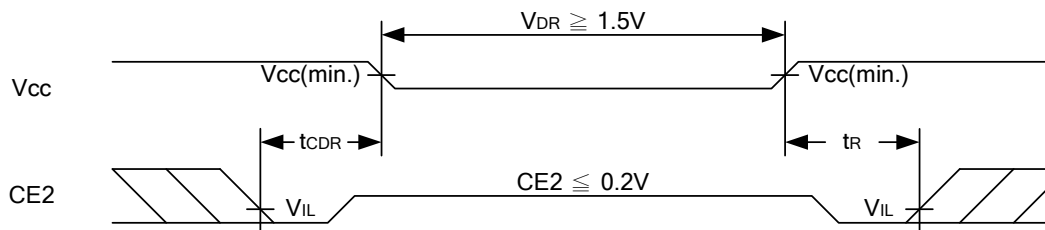
Notes :

1. A write occurs during the overlap of a low CE#, high CE2, low WE#.
2. During a WE# controlled write cycle with OE# low, t_{WP} must be greater than t_{WHZ} + t_{OW} to allow the drivers to turn off and data to be placed on the bus.
3. During this period, I/O pins are in the output state, and input signals must not be applied.
4. 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.
5. 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	-	3.6	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	SL	25°C	-	1	3	μA
			SLI	40°C	-	1	3	μA
			SL		-	1	5	μA
			SLI		-	1	10	μA
Chip Disable to Data Retention Time	t _{CDR}	See Data Retention Waveforms (below)	0	-	-	ns		
Recovery Time	t _R		t _{RC} *	-	-	ns		

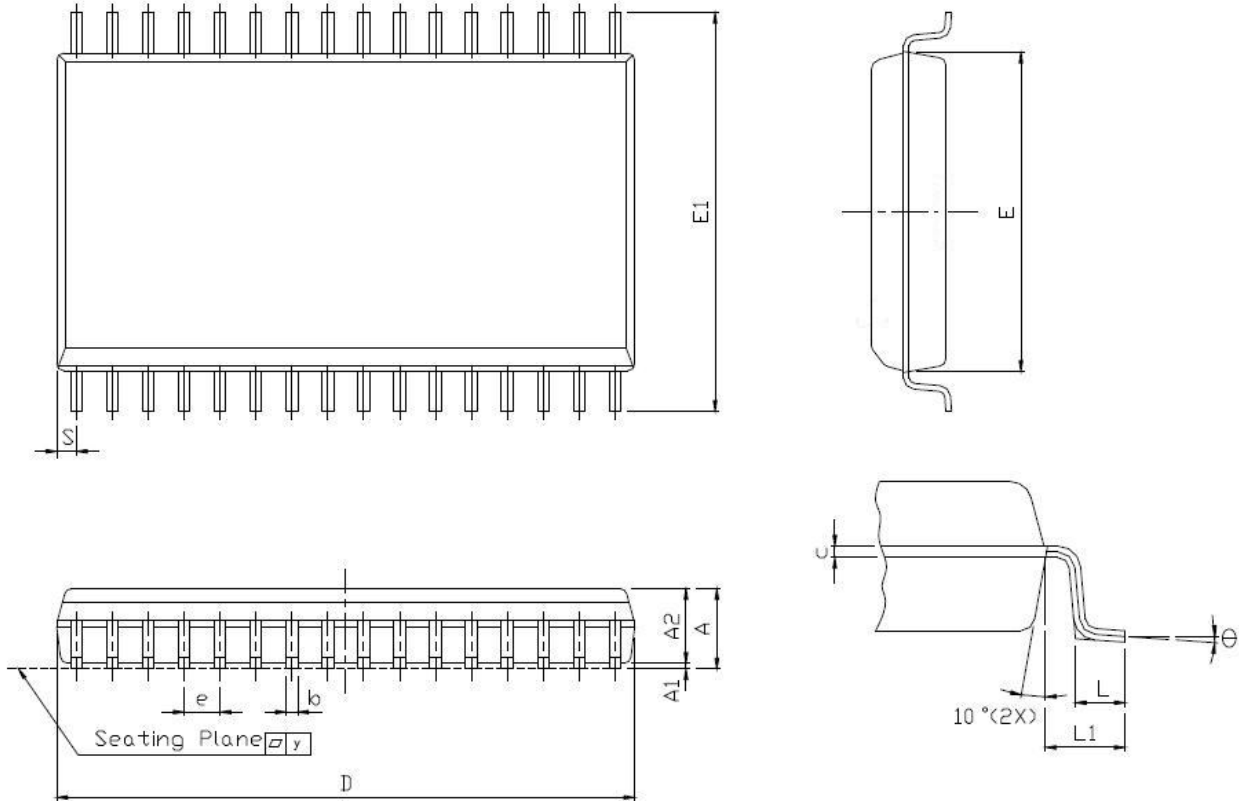
 t_{RC}* = Read Cycle Time

DATA RETENTION WAVEFORM
Low V_{CC} Data Retention Waveform (1) (CE# controlled)

Low V_{CC} Data Retention Waveform (2) (CE2 controlled)




PACKAGE OUTLINE DIMENSION

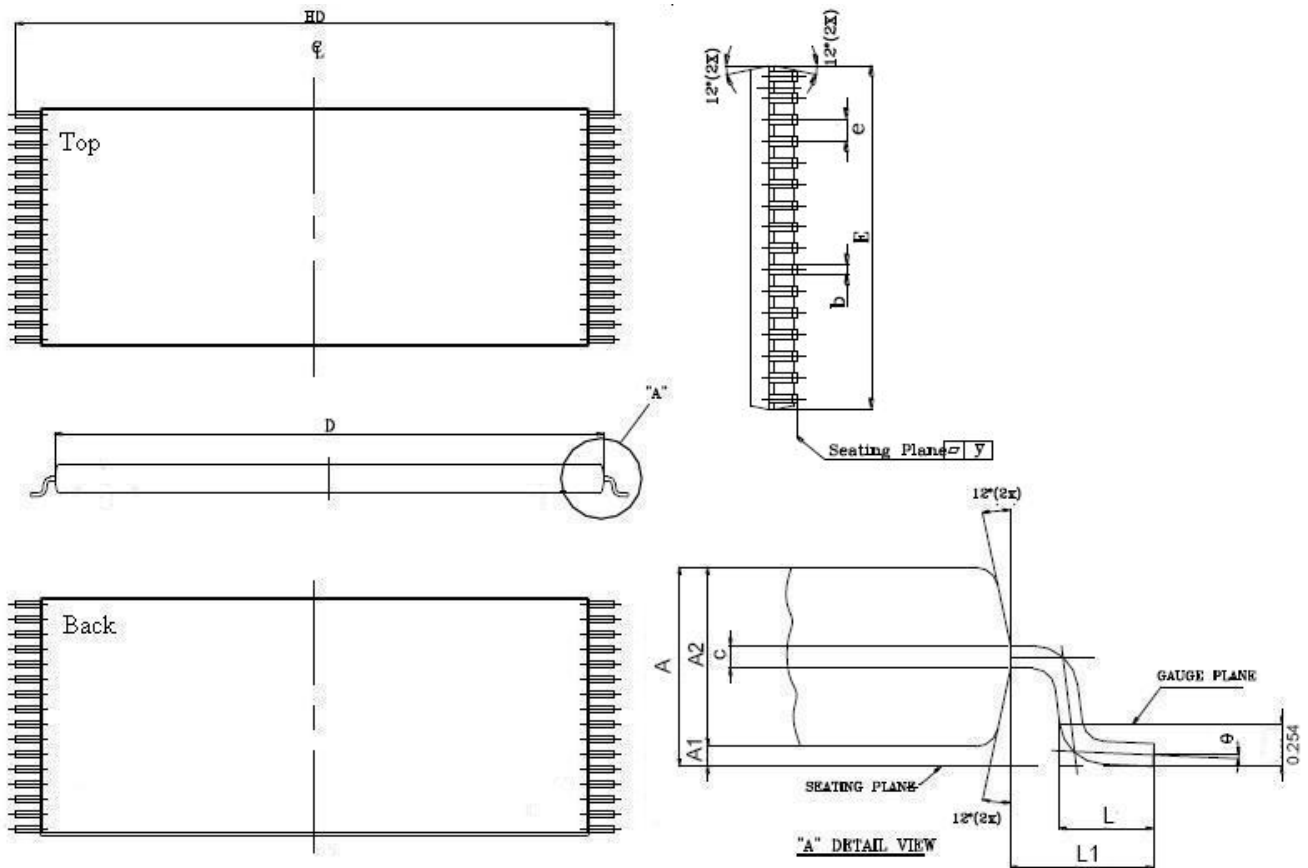
32-pin 450 mil SOP Package Outline Dimension



SYM.	UNIT	INCH.(BASE)	MM(REF)
A		0.120(MAX)	3.048(MAX)
A1		0.004(MIN)	0.102(MIN)
A2		0.116(MAX)	2.946(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±0.006	11.303±0.152
E1		0.555±0.025	14.097±0.635
e		0.050(TYP)	1.270(TYP)
L		0.033±0.017	0.838±0.432
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°



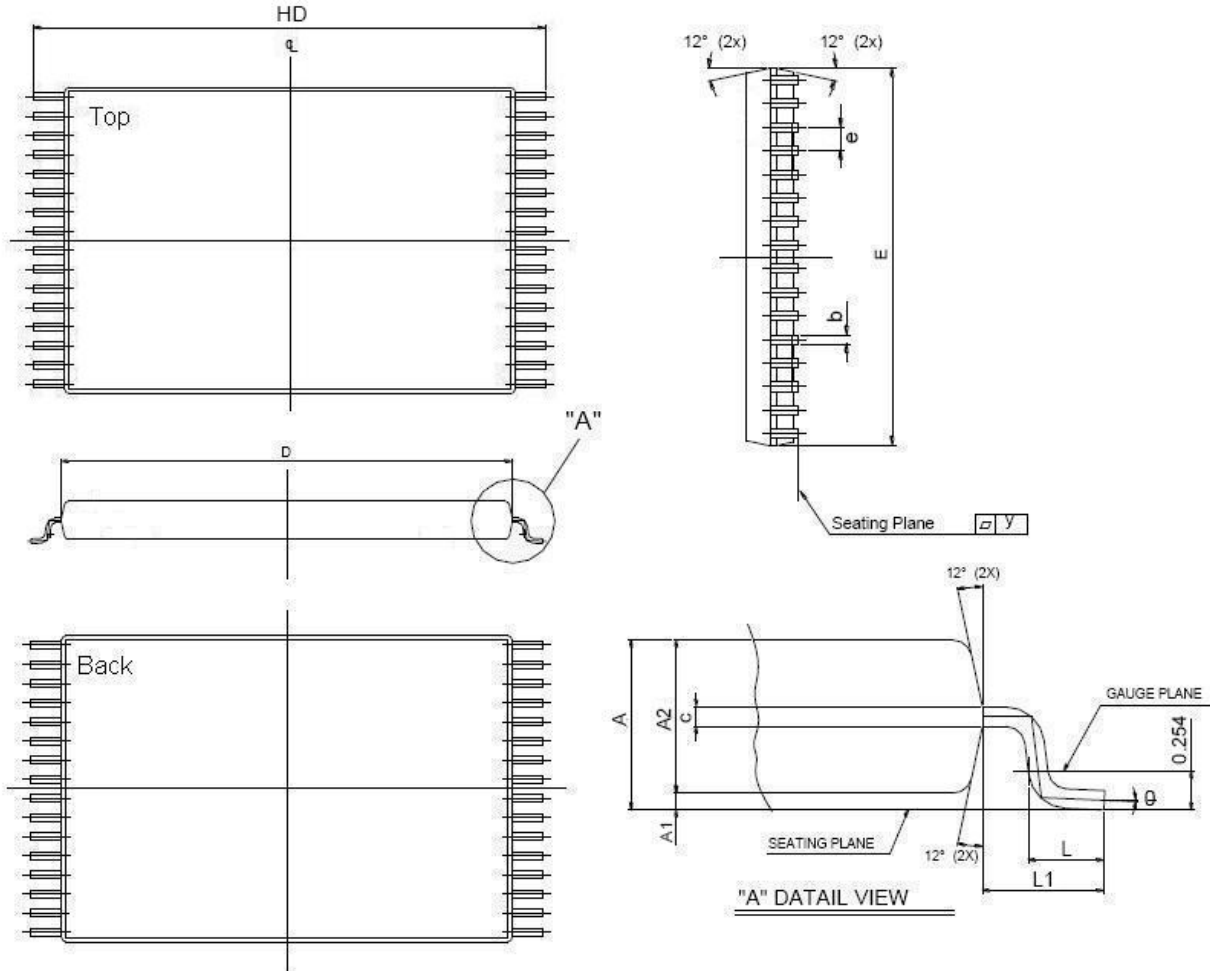
32-pin 8mm x 20mm TSOP I Package Outline Dimension



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		0.009 ±0.002	0.22 ±0.05
c		0.006 ±0.002	0.155 ±0.055
D		0.724 ±0.008	18.40 ±0.20
E		0.315 ±0.008	8.00 ±0.20
e		0.020 (TYP)	0.50 (TYP)
HD		0.787 ±0.008	20.00 ±0.20
L		0.024 ±0.004	0.60 ±0.10
L1		0.0315 ±0.004	0.08 ±0.10
y		0.003 (MAX)	0.08 (MAX)
θ		0°~5°	0°~5°



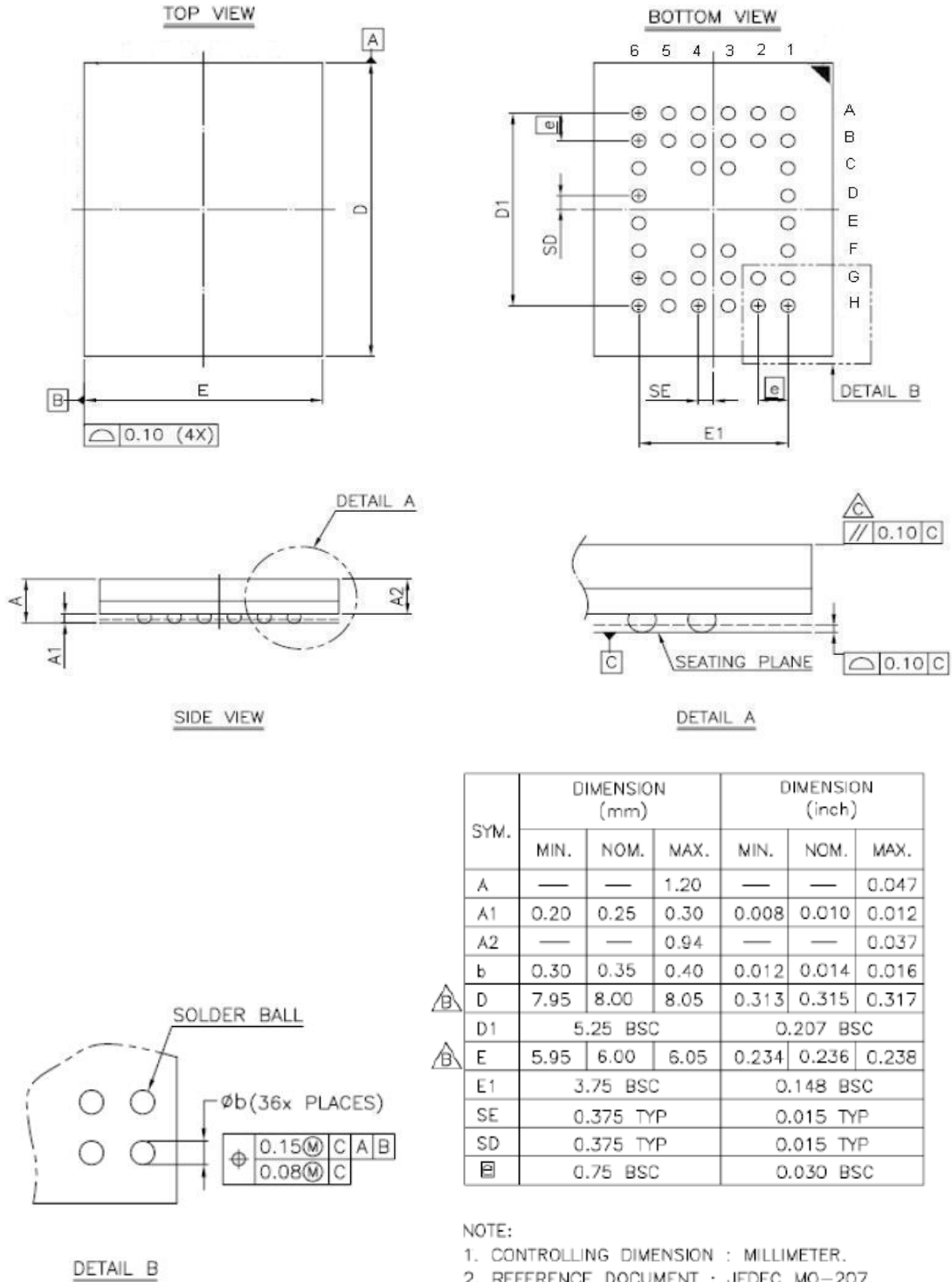
32-pin 8mm x 13.4mm sTSP Package Outline Dimension



SYM.	UNIT	INCH(BASE)	MM(REF)
A		0.049 (MAX)	1.25 (MAX)
A1		0.004 ±0.002	0.10 ±0.05
A2		0.039 ±0.002	1.00 ±0.05
b		0.009 ±0.002	0.22 ±0.05
c		0.006 ±0.002	0.155 ±0.055
D		0.465 ±0.008	11.80 ±0.20
E		0.315 ±0.008	8.00 ±0.20
e		0.020 (TYP)	0.50 (TYP)
HD		0.528±0.008	13.40 ±0.20.
L		0.02 ±0.008	0.50 ±0.20
L1		0.031 ±0.005	0.8 ±0.125
y		0.003 (MAX)	0.076 (MAX)
Θ		0°~5°	0°~5°



36-ball 6mm × 8mm TFBGA Package Outline Dimension





ORDERING INFORMATION

Package Type	Access Time (Speed)(ns)	Power Type	Temperature Range(°C)	Packing Type	Lyontek Item No.
32-pin (450mil) SOP	45	Special Ultra Low Power	0°C~70°C	Tray	LY69L1024ASL-45SL
				Tape Reel	LY69L1024ASL-45SLT
			-40°C~85°C	Tray	LY69L1024ASL-45SLI
				Tape Reel	LY69L1024ASL-45SLIT
	55	Special Ultra Low Power	0°C~70°C	Tray	LY69L1024ASL-55SL
				Tape Reel	LY69L1024ASL-55SLT
			-40°C~85°C	Tray	LY69L1024ASL-55SLI
				Tape Reel	LY69L1024ASL-55SLIT



ORDERING INFORMATION

Package Type	Access Time (Speed)(ns)	Power Type	Temperature Range(°C)	Packing Type	Lyontek Item No.
32-pin (8mm x 20mm) TSOP I	45	Special Ultra Low Power	0°C~70°C	Tray	LY69L1024ALL-45SL
				Tape Reel	LY69L1024ALL-45SLT
			-40°C~85°C	Tray	LY69L1024ALL-45SLI
				Tape Reel	LY69L1024ALL-45SLIT
	55	Special Ultra Low Power	0°C~70°C	Tray	LY69L1024ALL-55SL
				Tape Reel	LY69L1024ALL-55SLT
			-40°C~85°C	Tray	LY69L1024ALL-55SLI
				Tape Reel	LY69L1024ALL-55SLIT



ORDERING INFORMATION

Package Type	Access Time (Speed)(ns)	Power Type	Temperature Range(°C)	Packing Type	Lyontek Item No.
32-pin (8mm x 13.4mm) sTSOP	45	Special Ultra Low Power	0°C~70°C	Tray	LY69L1024ARL-45SL
				Tape Reel	LY69L1024ARL-45SLT
			-40°C~85°C	Tray	LY69L1024ARL-45SLI
				Tape Reel	LY69L1024ARL-45SLIT
	55	Special Ultra Low Power	0°C~70°C	Tray	LY69L1024ARL-55SL
				Tape Reel	LY69L1024ARL-55SLT
			-40°C~85°C	Tray	LY69L1024ARL-55SLI
				Tape Reel	LY69L1024ARL-55SLIT



ORDERING INFORMATION

Package Type	Access Time (Speed)(ns)	Power Type	Temperature Range(°C)	Packing Type	Lyontek Item No.
36-ball (6mm x 8mm) TFBGA	45	Special Ultra Low Power	0°C~70°C	Tray	LY69L1024AGL-45SL
				Tape Reel	LY69L1024AGL-45SLT
			-40°C~85°C	Tray	LY69L1024AGL-45SLI
				Tape Reel	LY69L1024AGL-45SLIT
	55	Special Ultra Low Power	0°C~70°C	Tray	LY69L1024AGL-55SL
				Tape Reel	LY69L1024AGL-55SLT
			-40°C~85°C	Tray	LY69L1024AGL-55SLI
				Tape Reel	LY69L1024AGL-55SLIT



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