



REVISION HISTORY

<u>Revision</u>	<u>Description</u>	<u>Issue Date</u>
Rev. 1.0	Initial Issue	Jul.19.2005
Rev. 1.1	Revised I _{SB1} /I _{DR} Revised Test Condition of I _{CC}	Oct.31.2005
Rev. 1.2	Added -45ns Spec.	Sep.20.2006
Rev. 1.3	Added P-DIP PKG	Jan.12.2007
Rev. 1.4	Revised Test Condition of I _{SB1} /I _{DR}	May.14.2007
Rev. 1.5	Adding PKG type : 44 TSOP II	Jun.4.2007
Rev. 2.0	Adding SL Spec. Revised <u>ABSOLUTE MAXIMUM RATINGS</u>	Jul.11.2007
Rev. 2.1	Added I _{SB1} /I _{DR} values when T _A = 25°C and T _A = 40°C Revised <u>FEATURES & ORDERING INFORMATION</u> Lead <u>free and green package available</u> to <u>Green package available</u> Added packing type in <u>ORDERING INFORMATION</u> Deleted T _{SOLDER} in <u>ABSOLUTE MAXIMUM RATINGS</u> Deleted -35ns Spec.	Mar.30.2009
Rev. 2.2	Revised V _{DR}	Sep.11.2009
Rev. 2.3	Revised <u>PACKAGE OUTLINE DIMENSION</u> in page 11/12/13/14	May.7.2010
Rev. 2.4	Revised <u>ORDERING INFORMATION</u> in page 16	Aug.30.2010
Rev. 2.5	Deleted PKG type : 44 TSOP II	Feb.21.2012
Rev. 2.6	Revised V _{IL(max)} from 0.6V to 0.8V	May 8.2014
Rev. 2.7	Revised <u>ORDERING INFORMATION</u> in page 18/19	May 22.2015
Rev. 2.8	Revised <u>TEST CONDITION</u> of I _{CC} /I _{CC1} /I _{SB1} in <u>DC ELECTRICAL CHARACTERISTICS</u> (page 5) and I _{DR} in <u>DATA RETENTION CHARACTERISTICS</u> (page 9)	Jun.2.2015
Rev. 2.9	Deleted <u>WRITE CYCLE</u> Notes : 1. WE#,CE# must be high during all address transitions. in page 8 Revised <u>ORDERING INFORMATION</u> in page 16	Jun.29.2016
Rev. 2.10	Removed Package Type : BGA	Apr.08. 2019
Rev. 2.11	Revised Packing Type of 32Pin(450mil) SOP in <u>ORDERING INFORMATION</u> in page 13	Feb.24. 2021



FEATURES

- Fast access time : 45/55/70ns
- Low power consumption:
Operating current : 45/40/30mA (TYP.)
Standby current : 5 μ A@5V(TYP.) LL/SL version
3 μ A@3V(TYP.) SL version
- Single 4.5V ~ 5.5V 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 PDIP
32-pin 8mm x 20mm TSOP I
32-pin 8mm x 13.4mm sTSOP

GENERAL DESCRIPTION

The LY625128 is a 4,194,304-bit low power CMOS static random access memory organized as 524,288 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.

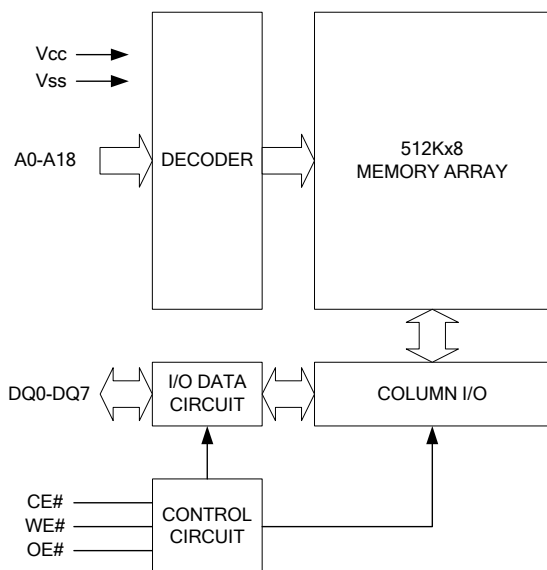
The LY625128 is well designed for very low power system applications, and particularly well suited for battery back-up nonvolatile memory application.

The LY625128 operates from a single power supply of 4.5V ~ 5.5V and all inputs and outputs are fully TTL compatible

PRODUCT FAMILY

Product Family	Operating Temperature	V _{CC} Range	Speed	Power Dissipation		
				Standby(I _{SB1} , TYP.)	Operating(I _{CC} , TYP.)	
LY625128(LL)	0 ~ 70°C	4.5 ~ 5.5V	45/55/70ns	-	5 μ A@5V	45/40/30mA
LY625128(LLE)	-20 ~ 80°C	4.5 ~ 5.5V	45/55/70ns	-	5 μ A@5V	45/40/30mA
LY625128(LLI)	-40 ~ 85°C	4.5 ~ 5.5V	45/55/70ns	-	5 μ A@5V	45/40/30mA
LY625128(SL)	0 ~ 70°C	4.5 ~ 5.5V	45/55/70ns	3 μ A@3V	5 μ A@5V	45/40/30mA
LY625128(SLE)	-20 ~ 80°C	4.5 ~ 5.5V	45/55/70ns	3 μ A@3V	5 μ A@5V	45/40/30mA
LY625128(SLI)	-40 ~ 85°C	4.5 ~ 5.5V	45/55/70ns	3 μ A@3V	5 μ A@5V	45/40/30mA

FUNCTIONAL BLOCK DIAGRAM

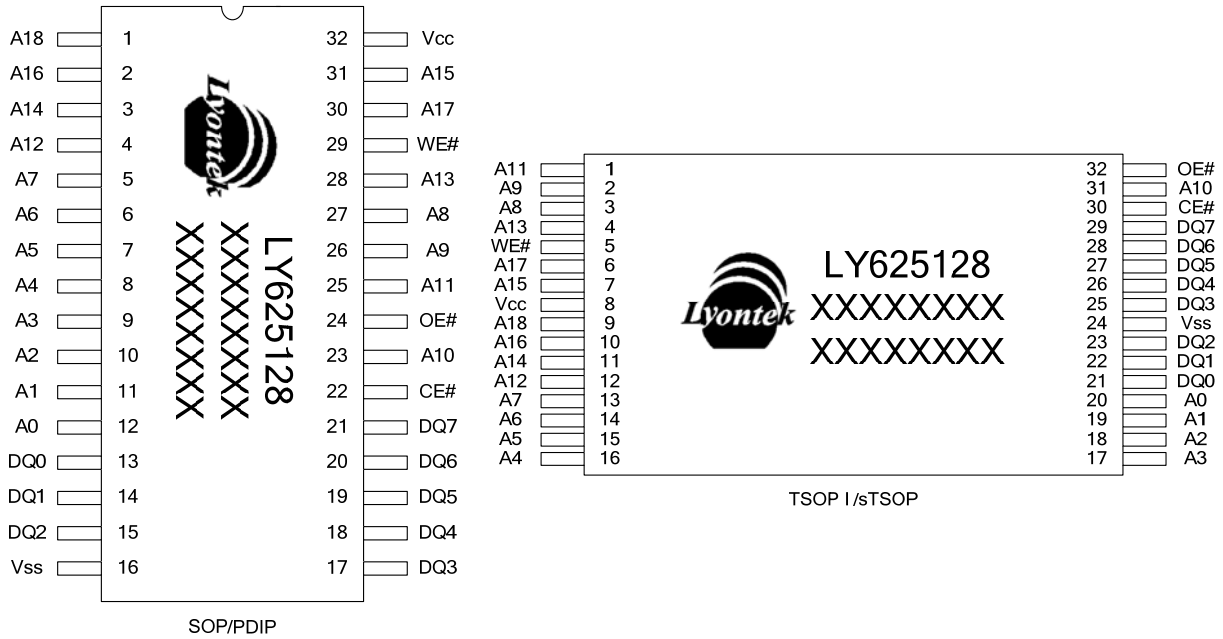


PIN DESCRIPTION

SYMBOL	DESCRIPTION
A0 - A18	Address Inputs
DQ0 - DQ7	Data Inputs/Outputs
CE#	Chip Enable Inputs
WE#	Write Enable Input
OE#	Output Enable Input
V _{CC}	Power Supply
V _{SS}	Ground
NC	No Connection



PIN CONFIGURATION



**ABSOLUTE MAXIMUM 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)	°C
		-20 to 80(E grade)	
		-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#	OE#	WE#	I/O OPERATION	SUPPLY CURRENT
Standby	H	X	X	High-Z	I _{SB1}
Output Disable	L	H	H	High-Z	I _{CC} , I _{CC1}
Read	L	L	H	D _{OUT}	I _{CC} , I _{CC1}
Write	L	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	-	0.8	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	2.4	-	-	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} , I _{I/O} = 0mA Other pins at V _{IL} or V _{IH}	- 45	-	45	70	mA	
			- 55	-	40	60	mA	
			- 70	-	30	50	mA	
	I _{CC1}	Cycle time = 1μs CE# = 0.2V, I _{I/O} = 0mA Other pins at 0.2V or V _{CC} - 0.2V	-	4	10	mA		
Standby Power Supply Current	I _{SB1}	CE# ≥ V _{CC} -0.2V Others at 0.2V or V _{CC} - 0.2V	LL/LLE/LLI	-	5	50	μA	
			SL ^{*5}	25°C	-	3	10	μA
			SLE ^{*5}	40°C	-	3	10	μA
			SLI ^{*5}	40°C	-	3	10	μA
		SL/SLE/SLI	-	5	25	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, not 100% tested.
- 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°C, 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 = 30pF + 1TTL, I _{OH} /I _{OL} = -2mA/4mA



AC ELECTRICAL CHARACTERISTICS

(1) READ CYCLE

PARAMETER	SYM.	LY625128-45		LY625128-55		LY625128-70		UNIT
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
Read Cycle Time	t _{RC}	45	-	55	-	70	-	ns
Address Access Time	t _{AA}	-	45	-	55	-	70	ns
Chip Enable Access Time	t _{ACE}	-	45	-	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} *	-	20	-	20	-	25	ns
Output Disable to Output in High-Z	t _{OHZ} *	-	20	-	20	-	25	ns
Output Hold from Address Change	t _{OH}	10	-	10	-	10	-	ns

(2) WRITE CYCLE

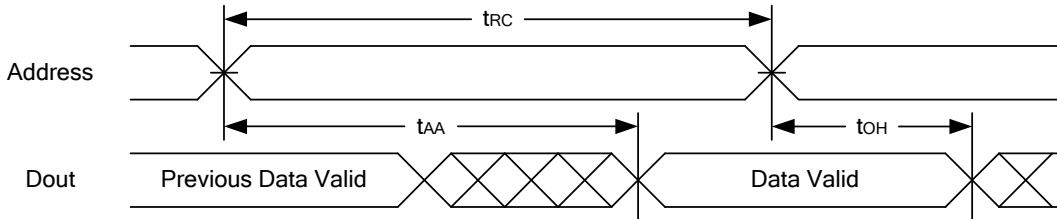
PARAMETER	SYM.	LY625128-45		LY625128-55		LY625128-70		UNIT
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
Write Cycle Time	t _{WC}	45	-	55	-	70	-	ns
Address Valid to End of Write	t _{AW}	40	-	50	-	60	-	ns
Chip Enable to End of Write	t _{CW}	40	-	50	-	60	-	ns
Address Set-up Time	t _{AS}	0	-	0	-	0	-	ns
Write Pulse Width	t _{WP}	35	-	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} *	-	20	-	20	-	25	ns

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

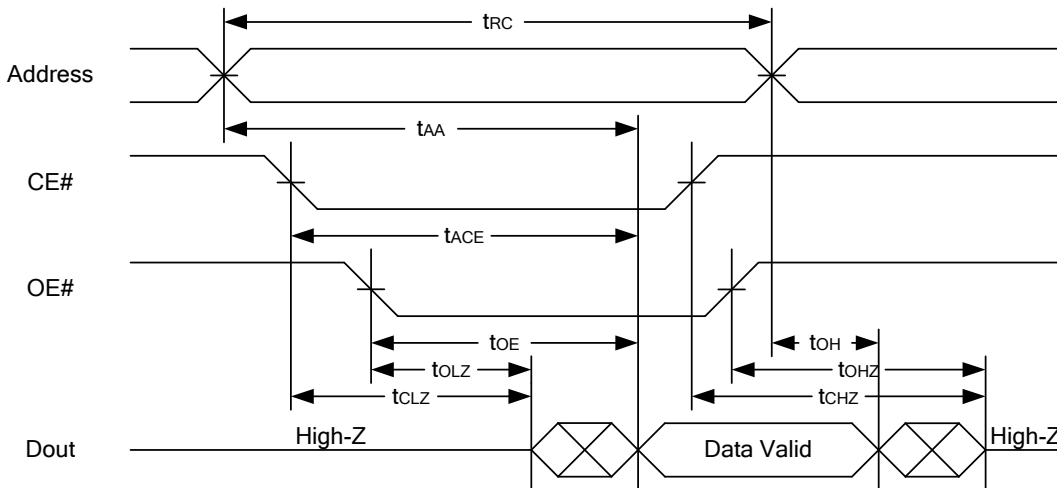


TIMING WAVEFORMS

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



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

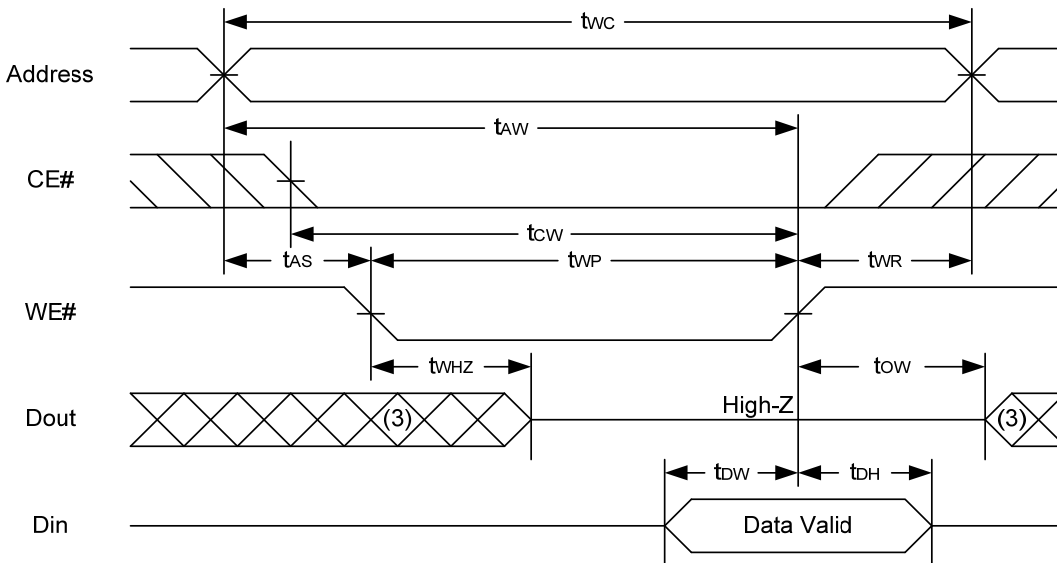


Notes :

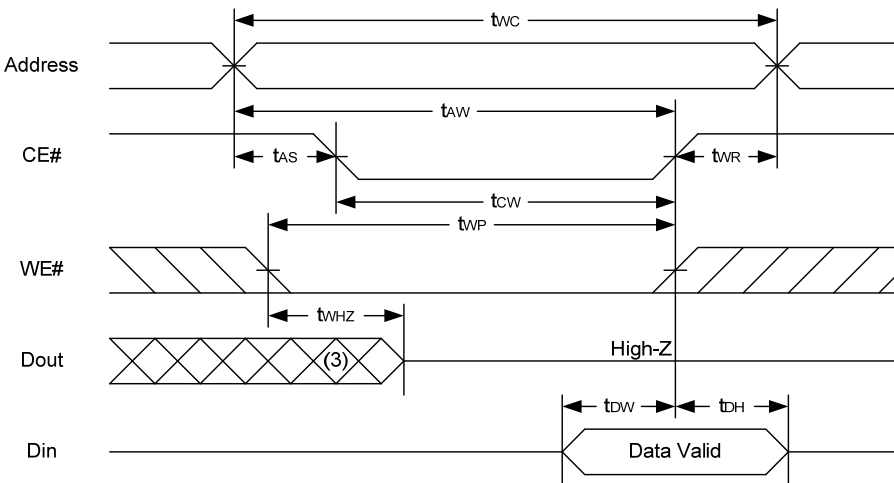
1. WE# is high for read cycle.
2. Device is continuously selected OE# = low, CE# = low.
3. Address must be valid prior to or coincident with CE# = low,; otherwise tAA is the limiting parameter.
4. tCLZ, tOLZ, tCHZ and tOHZ are specified with CL = 5pF. Transition is measured ±500mV from steady state.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



Notes :

1. A write occurs during the overlap of a low CE#, low WE#.
2. 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.
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 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 $\pm 500mV$ from steady state.

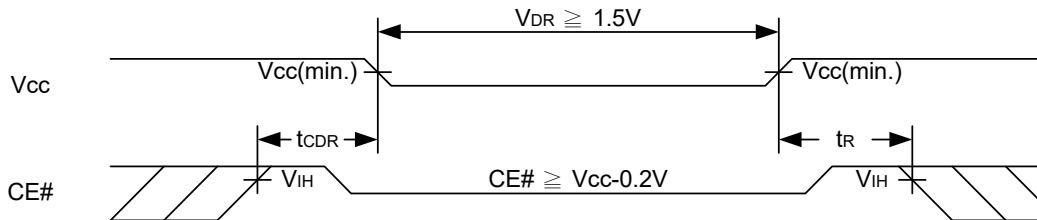


DATA RETENTION CHARACTERISTICS

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 Other pins at 0.2V or V _{CC} -0.2V	LL	-	2	30	μA	
			SL	25°C	-	2	8	μA
				40°C	-	2	8	μA
			SL	-	2	23	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

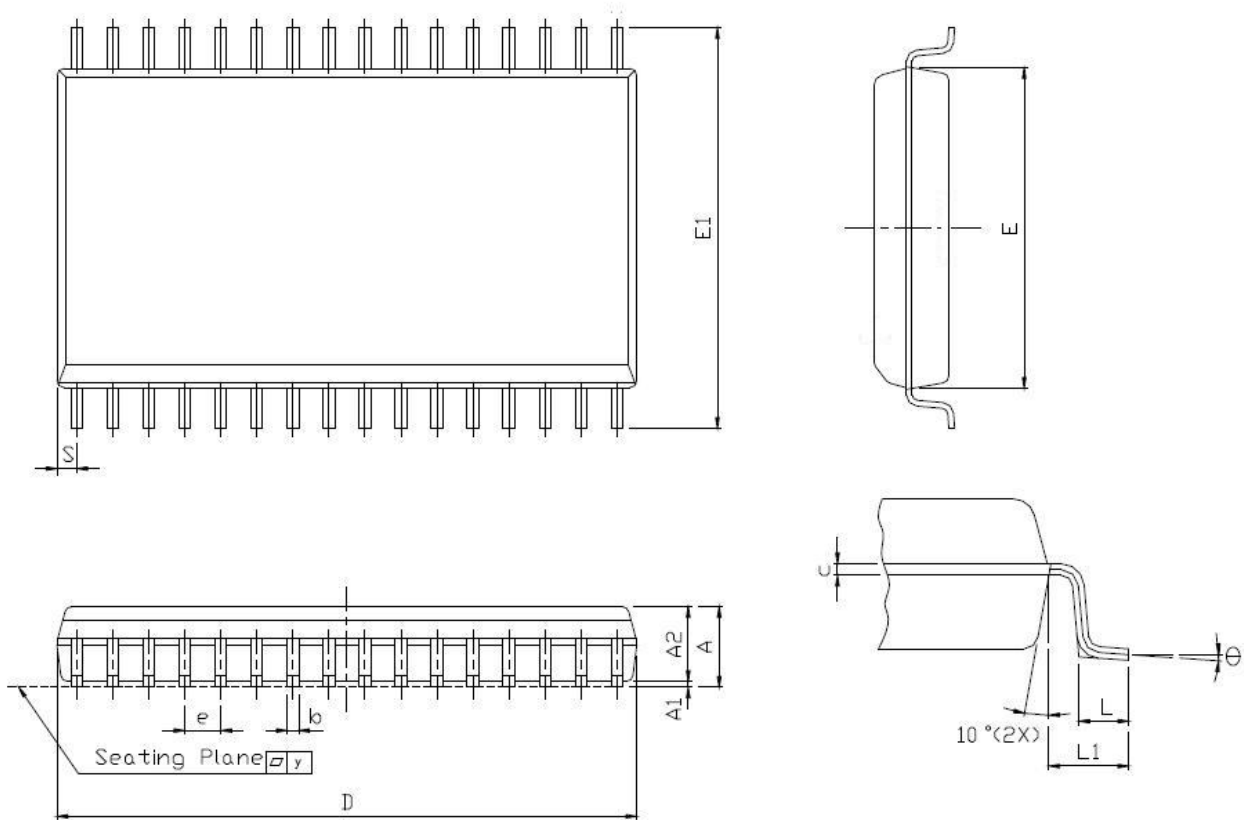
DATA RETENTION WAVEFORM





PACKAGE OUTLINE DIMENSION

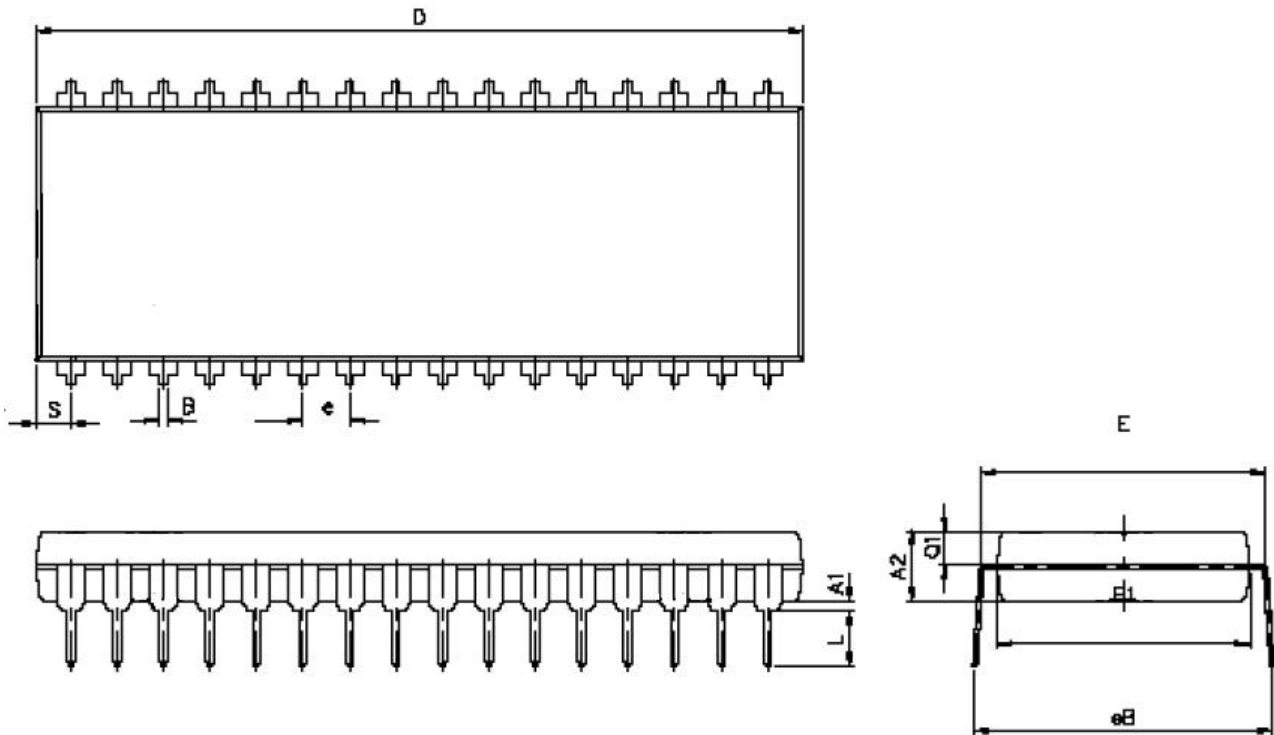
32 pin 450 mil SOP Package Outline Dimension



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 600 mil PDIP Package Outline Dimension

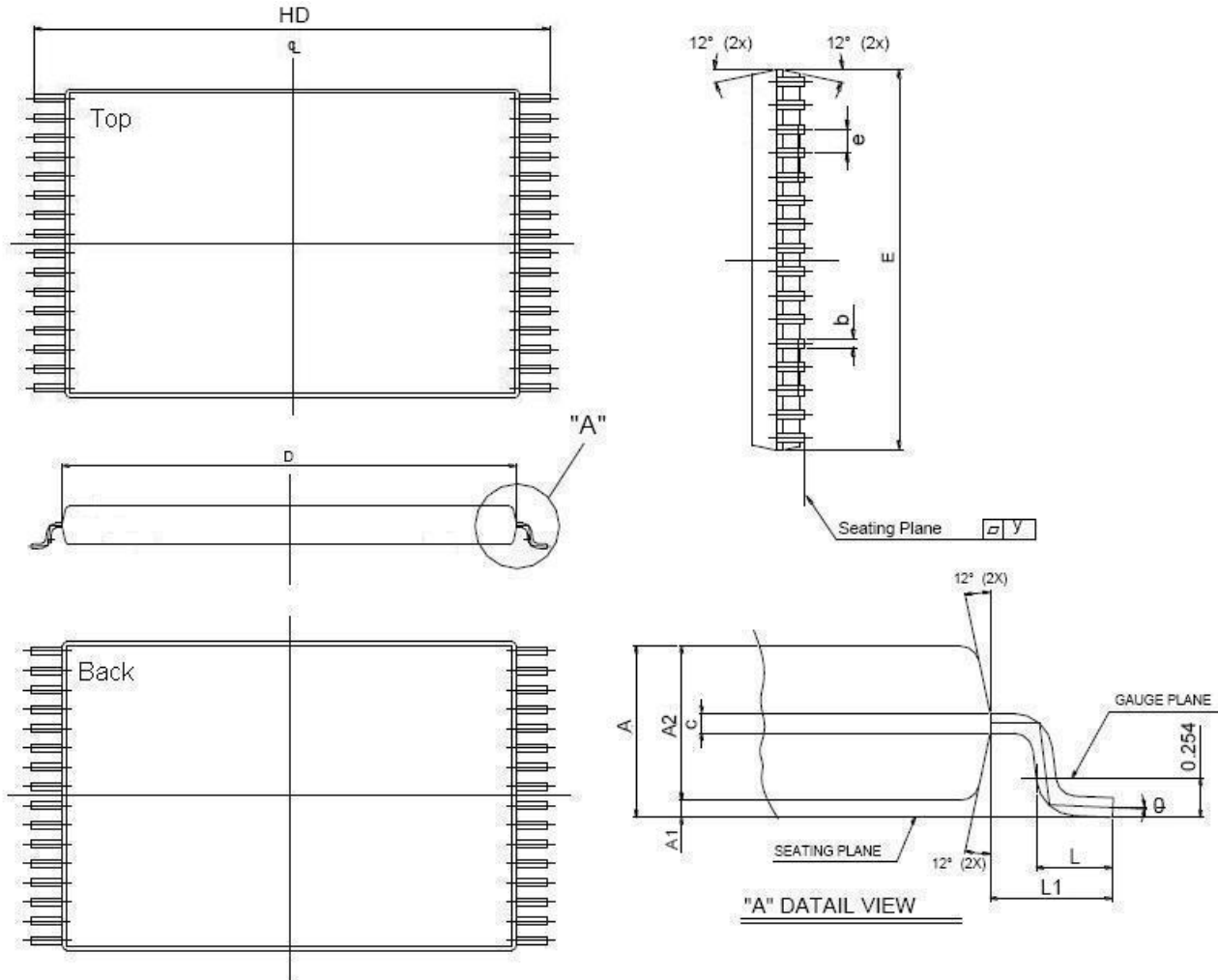


SYM.	UNIT	INCH(BASE)	MM(REF)
A1		0.015(MIN)	0.381(MIN)
A2		0.155±0.005	3.937±0.127
B		0.018±0.005	0.457±0.127
D		1.650±0.01	41.910±0.254
E		0.600±0.010	15.240±0.254
E1		0.545±0.005	13.843±0.127
e		0.100(TYP)	2.540(TYP)
eB		0.650±0.020	16.510±0.508.
L		0.158±0.043	4.013±1.092
S		0.075±0.010	1.905±0.254
Q1		0.070±0.005	1.778±0.127

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



32 pin 8mm x 13.4mm sTSPQ 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)
∅	0°~5°	0°~5°



ORDERING INFORMATION

Package Type	Access Time (Speed)(ns)	Power Type	Temperature Range(°C)	Packing Type	Lyontek Item No.
32Pin(450mil) SOP	45	Special Ultra Low Power	0°C~70°C	Tray	LY625128SL-45SL
				Tape Reel	LY625128SL-45SLT
			-20°C~80°C	Tray	LY625128SL-45SLE
				Tape Reel	LY625128SL-45SLET
			-40°C~85°C	Tray	LY625128SL-45SLI
				Tape Reel	LY625128SL-45SLIT
		Ultra Low Power	0°C~70°C	Tray	LY625128SL-45LL
				Tape Reel	LY625128SL-45LLT
			-20°C~80°C	Tray	LY625128SL-45LLE
				Tape Reel	LY625128SL-45LLET
			-40°C~85°C	Tray	LY625128SL-45LLI
				Tape Reel	LY625128SL-45LLIT
	55	Special Ultra Low Power	0°C~70°C	Tray	LY625128SL-55SL
				Tape Reel	LY625128SL-55SLT
			-20°C~80°C	Tray	LY625128SL-55SLE
				Tape Reel	LY625128SL-55SLET
			-40°C~85°C	Tray	LY625128SL-55SLI
				Tape Reel	LY625128SL-55SLIT
		Ultra Low Power	0°C~70°C	Tray	LY625128SL-55LL
				Tape Reel	LY625128SL-55LLT
			-20°C~80°C	Tray	LY625128SL-55LLE
				Tape Reel	LY625128SL-55LLET
			-40°C~85°C	Tray	LY625128SL-55LLI
				Tape Reel	LY625128SL-55LLIT
70	Special Ultra Low Power	0°C~70°C	Tray	LY625128SL-70SL	
			Tape Reel	LY625128SL-70SLT	
		-20°C~80°C	Tray	LY625128SL-70SLE	
			Tape Reel	LY625128SL-70SLET	
		-40°C~85°C	Tray	LY625128SL-70SLI	
			Tape Reel	LY625128SL-70SLIT	
	Ultra Low Power	0°C~70°C	Tray	LY625128SL-70LL	
			Tape Reel	LY625128SL-70LLT	
		-20°C~80°C	Tray	LY625128SL-70LLE	
			Tape Reel	LY625128SL-70LLET	
		-40°C~85°C	Tray	LY625128SL-70LLI	
			Tape Reel	LY625128SL-70LLIT	



ORDERING INFORMATION

Package Type	Access Time (Speed)(ns)	Power Type	Temperature Range(°C)	Packing Type	Lyontek Item No.
32Pin(600mil) PDIP	45	Special	0°C~70°C	Tube	LY625128PL-45SL
		Ultra Low Power	-20°C~80°C	Tube	LY625128PL-45SLE
			-40°C~85°C	Tube	LY625128PL-45SLI
			0°C~70°C	Tube	LY625128PL-45LL
		Ultra Low Power	-20°C~80°C	Tube	LY625128PL-45LLE
			-40°C~85°C	Tube	LY625128PL-45LLI
	55		Special	0°C~70°C	Tube
		Ultra Low Power	-20°C~80°C	Tube	LY625128PL-55SLE
			-40°C~85°C	Tube	LY625128PL-55SLI
			Ultra Low Power	0°C~70°C	Tube
		-20°C~80°C		Tube	LY625128PL-55LLE
		-40°C~85°C		Tube	LY625128PL-55LLI
	70	Special	0°C~70°C	Tube	LY625128PL-70SL
			-20°C~80°C	Tube	LY625128PL-70SLE
			-40°C~85°C	Tube	LY625128PL-70SLI
		Ultra Low Power	0°C~70°C	Tube	LY625128PL-70LL
			-20°C~80°C	Tube	LY625128PL-70LLE
			-40°C~85°C	Tube	LY625128PL-70LLI



ORDERING INFORMATION

Package Type	Access Time (Speed)(ns)	Power Type	Temperature Range(°C)	Packing Type	Lyontek Item No.
32Pin (8mmx20mm) TSOP I	45	Special Ultra Low Power	0°C~70°C	Tray	LY625128LL-45SL
				Tape Reel	LY625128LL-45SLT
			-20°C~80°C	Tray	LY625128LL-45SLE
				Tape Reel	LY625128LL-45SLET
			-40°C~85°C	Tray	LY625128LL-45SLI
				Tape Reel	LY625128LL-45SLIT
		Ultra Low Power	0°C~70°C	Tray	LY625128LL-45LL
				Tape Reel	LY625128LL-45LLT
			-20°C~80°C	Tray	LY625128LL-45LLE
				Tape Reel	LY625128LL-45LLET
			-40°C~85°C	Tray	LY625128LL-45LLI
				Tape Reel	LY625128LL-45LLIT
	55	Special Ultra Low Power	0°C~70°C	Tray	LY625128LL-55SL
				Tape Reel	LY625128LL-55SLT
			-20°C~80°C	Tray	LY625128LL-55SLE
				Tape Reel	LY625128LL-55SLET
			-40°C~85°C	Tray	LY625128LL-55SLI
				Tape Reel	LY625128LL-55SLIT
		Ultra Low Power	0°C~70°C	Tray	LY625128LL-55LL
				Tape Reel	LY625128LL-55LLT
			-20°C~80°C	Tray	LY625128LL-55LLE
				Tape Reel	LY625128LL-55LLET
			-40°C~85°C	Tray	LY625128LL-55LLI
				Tape Reel	LY625128LL-55LLIT
70	Special Ultra Low Power	0°C~70°C	Tray	LY625128LL-70SL	
			Tape Reel	LY625128LL-70SLT	
		-20°C~80°C	Tray	LY625128LL-70SLE	
			Tape Reel	LY625128LL-70SLET	
		-40°C~85°C	Tray	LY625128LL-70SLI	
			Tape Reel	LY625128LL-70SLIT	
	Ultra Low Power	0°C~70°C	Tray	LY625128LL-70LL	
			Tape Reel	LY625128LL-70LLT	
		-20°C~80°C	Tray	LY625128LL-70LLE	
			Tape Reel	LY625128LL-70LLET	
		-40°C~85°C	Tray	LY625128LL-70LLI	
			Tape Reel	LY625128LL-70LLIT	



ORDERING INFORMATION

Package Type	Access Time (Speed)(ns)	Power Type	Temperature Range(°C)	Packing Type	Lyontek Item No.
32Pin (8mmx13.4mm) sTSOP	45	Special Ultra Low Power	0°C~70°C	Tray	LY625128RL-45SL
				Tape Reel	LY625128RL-45SLT
			-20°C~80°C	Tray	LY625128RL-45SLE
				Tape Reel	LY625128RL-45SLET
			-40°C~85°C	Tray	LY625128RL-45SLI
				Tape Reel	LY625128RL-45SLIT
		Ultra Low Power	0°C~70°C	Tray	LY625128RL-45LL
				Tape Reel	LY625128RL-45LLT
			-20°C~80°C	Tray	LY625128RL-45LLE
				Tape Reel	LY625128RL-45LLET
			-40°C~85°C	Tray	LY625128RL-45LLI
				Tape Reel	LY625128RL-45LLIT
	55	Special Ultra Low Power	0°C~70°C	Tray	LY625128RL-55SL
				Tape Reel	LY625128RL-55SLT
			-20°C~80°C	Tray	LY625128RL-55SLE
				Tape Reel	LY625128RL-55SLET
			-40°C~85°C	Tray	LY625128RL-55SLI
				Tape Reel	LY625128RL-55SLIT
		Ultra Low Power	0°C~70°C	Tray	LY625128RL-55LL
				Tape Reel	LY625128RL-55LLT
			-20°C~80°C	Tray	LY625128RL-55LLE
				Tape Reel	LY625128RL-55LLET
			-40°C~85°C	Tray	LY625128RL-55LLI
				Tape Reel	LY625128RL-55LLIT
70	Special Ultra Low Power	0°C~70°C	Tray	LY625128RL-70SL	
			Tape Reel	LY625128RL-70SLT	
		-20°C~80°C	Tray	LY625128RL-70SLE	
			Tape Reel	LY625128RL-70SLET	
		-40°C~85°C	Tray	LY625128RL-70SLI	
			Tape Reel	LY625128RL-70SLIT	
	Ultra Low Power	0°C~70°C	Tray	LY625128RL-70LL	
			Tape Reel	LY625128RL-70LLT	
		-20°C~80°C	Tray	LY625128RL-70LLE	
			Tape Reel	LY625128RL-70LLET	
		-40°C~85°C	Tray	LY625128RL-70LLI	
			Tape Reel	LY625128RL-70LLIT	



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