REVISION HISTORY

Revision	Description	Issue Date
Rev. 1.0	Initial Issue	Aug.03.2005
Rev. 1.1	Revised **sTSOP Package Outline Dimension**	Mar.26.2008
Rev. 1.2	Revised **TEST CONDITION** of I_{SB1}/I_{DR} Revised V_{TERM} to V_{T1} and V_{T2} Revised **FEATURES** & **ORDERING INFORMATION** **Lead free and green package available** to **Green package available** Deleted T_{SOLDER} in **ABSOLUTE MAXIMUN RATINGS** Added packing type in **ORDERING INFORMATION**	Apr.17.2009
Rev. 1.3	Revised **PACKAGE OUTLINE DIMENSION** in page 10	May.07.2010
Rev. 1.4	Revised **ORDERING INFORMATION** in page 11	Aug.31.2010
Rev. 1.5	Revised **ORDERING INFORMATION** in page 12 Deleted -8/10ns Spec. Deleted **WRITE CYCLE** Notes : 1. WE#, CE# must be high or CE2 must be low during all address transitions. In page 6.	Dec.13.2016

Lyontek Inc.

LY6164

Rev. 1.5

8K X 8 BIT HIGH SPEED CMOS SRAM

FEATURES

- Fast access time : 12/15ns
- Low power consumption:
  Operating current: 90/80mA (TYP.)
  Standby current: 1mA (TYP.)
- Single 5V power supply
- All inputs and outputs TTL compatible
- Fully static operation
- Tri-state output
- Data retention voltage : 2.0V (MIN.)
- **Green package available**
- Package : 28-pin 300 mil SOJ
  28-pin 300 mil Skinny PDIP
  28-pin 8mm x 13.4mm sTSOP

GENERAL DESCRIPTION

The LY6164 is a 65,536-bit high speed CMOS static random access memory organized as 8,192 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.

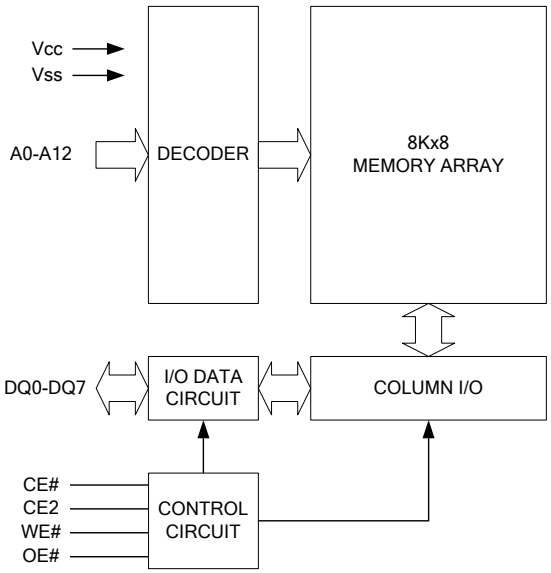
The LY6164 is well designed for high speed system applications, and particularly well suited for battery back-up nonvolatile memory application.

The LY6164 operates from a single power supply of 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.)
LY6164	0 ~ 70℃	4.5 ~ 5.5V	12/15ns	1mA	90/80mA
LY6164(E)	-20 ~ 80℃	4.5 ~ 5.5V	12/15ns	1mA	90/80mA
LY6164(I)	-40 ~ 85℃	4.5 ~ 5.5V	12/15ns	1mA	90/80mA

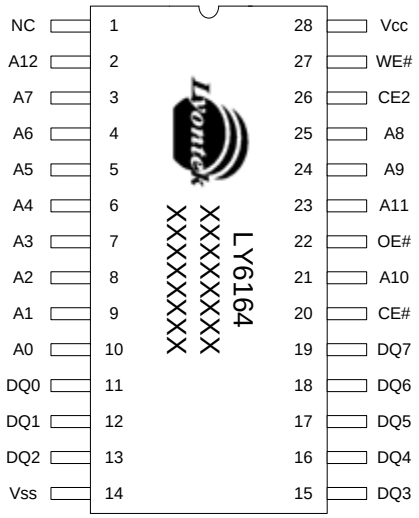
FUNCTIONAL BLOCK DIAGRAM



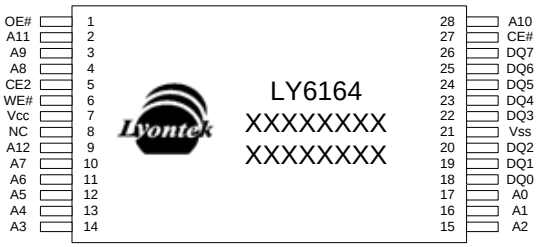
PIN DESCRIPTION

SYMBOL	DESCRIPTION
A0 - A12	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



Skinny PDIP / SOJ



sTSOP

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}
Read	L	H	L	H	D_{OUT}	I_{CC}
Write	L	H	X	L	D_{IN}	I_{CC}

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}+0.5	V
Input Low Voltage	V_{IL} *2			- 0.5	-	0.8	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_{IH} or V_{IL}	-12	-	90	160	mA
			-15	-	80	140	mA
Standby Power Supply Current	I_{SB1}	CE# $\geqq$ V_{CC}-0.2V or CE2 $\leqq$ 0.2V, Other pins at 0.2V or V_{CC}-0.2V		-	1	5	mA

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 valued are measured at V_{CC} = V_{CC}(TYP.) and T_A = 25℃

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 = 30pF + 1TTL, I_{OH}/I_{OL} = -4mA/8mA

AC ELECTRICAL CHARACTERISTICS

(1) READ CYCLE

PARAMETER	SYM.	LY6164-12		LY6164-15		UNIT
		MIN.	MAX.	MIN.	MAX.	
Read Cycle Time	t_{RC}	12	-	15	-	ns
Address Access Time	t_{AA}	-	12	-	15	ns
Chip Enable Access Time	t_{ACE}	-	12	-	15	ns
Output Enable Access Time	t_{OE}	-	6	-	7	ns
Chip Enable to Output in Low-Z	t_{CLZ}*	3	-	4	-	ns
Output Enable to Output in Low-Z	t_{OLZ}*	0	-	0	-	ns
Chip Disable to Output in High-Z	t_{CHZ}*	-	6	-	7	ns
Output Disable to Output in High-Z	t_{OHZ}*	-	6	-	7	ns
Output Hold from Address Change	t_{OH}	3	-	3	-	ns

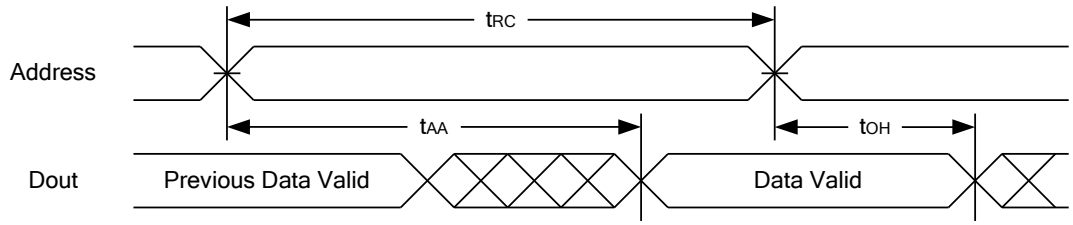
(2) WRITE CYCLE

PARAMETER	SYM.	LY6164-12		LY6164-15		UNIT
		MIN.	MAX.	MIN.	MAX.	
Write Cycle Time	t_{WC}	12	-	15	-	ns
Address Valid to End of Write	t_{AW}	10	-	12	-	ns
Chip Enable to End of Write	t_{CW}	10	-	12	-	ns
Address Set-up Time	t_{AS}	0	-	0	-	ns
Write Pulse Width	t_{WP}	9	-	10	-	ns
Write Recovery Time	t_{WR}	0	-	0	-	ns
Data to Write Time Overlap	t_{DW}	7	-	8	-	ns
Data Hold from End of Write Time	t_{DH}	0	-	0	-	ns
Output Active from End of Write	t_{OW}*	3	-	4	-	ns
Write to Output in High-Z	t_{WHZ}*	-	7	-	8	ns

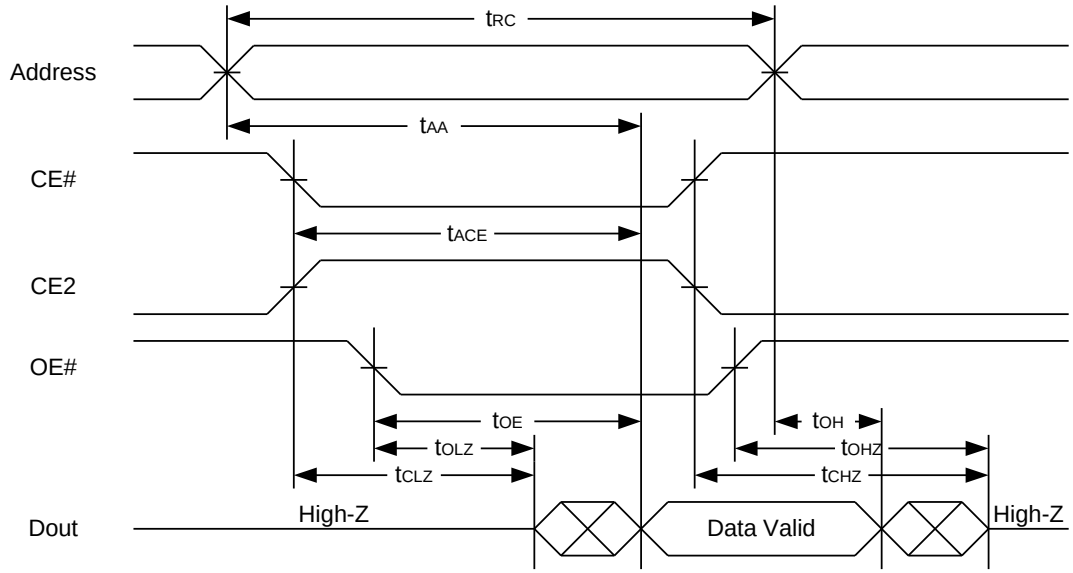
*These parameters are guaranteed by device characterization, but not production tested.

TIMING WAVEFORMS

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

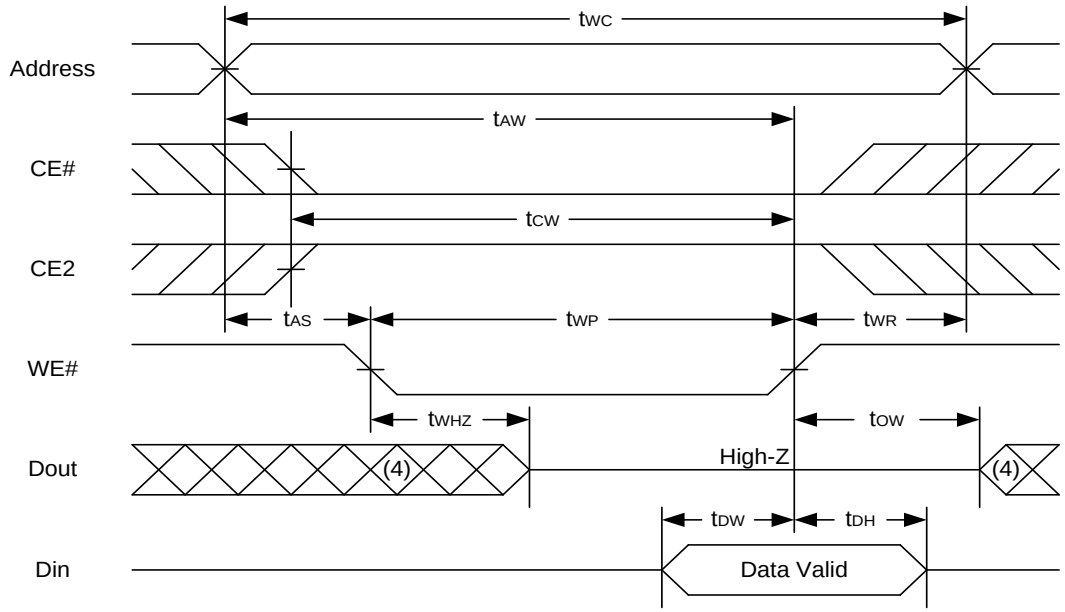


READ CYCLE 2 (CE# and CE2 and OE# Controlled) (1,3,4,5)

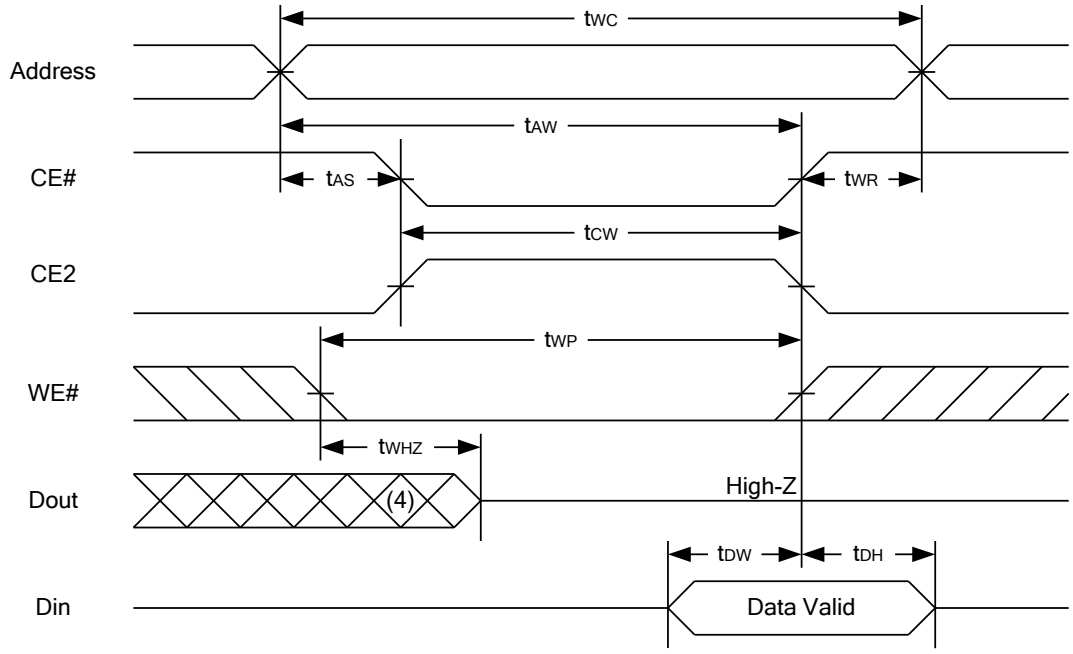


Notes :
1.WE# is high for read cycle.
2.Device is continuously selected OE# = low, CE# = low., CE2 = high.
3.Address must be valid prior to or coincident with CE# = low, CE2 = high; otherwise t_{AA} is the limiting parameter.
4.t_{CLZ}, t_{OLZ}, t_{CHZ} and t_{OHZ} are specified with C_L = 5pF. Transition 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) (1,2,4,5)



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 $t_{WHZ} + t_{DW}$ 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 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.

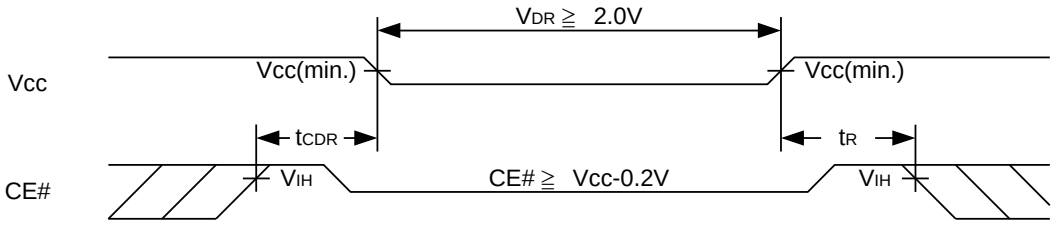
DATA RETENTION CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
V_{CC} for Data Retention	V_{DR}	CE# ≧ V_{CC} - 0.2V or CE2 ≦ 0.2V	2.0	-	5.5	V
Data Retention Current	I_{DR}	V_{CC} = 2.0V CE# ≧ V_{CC} - 0.2V or CE2 ≦ 0.2V Others at 0.2V or V_{CC}-0.2V	-	0.6	3	mA
Chip Disable to Data Retention Time	t_{CDR}	See Data Retention Waveforms (below)	0	-	-	ns
Recovery Time	t_R		t_{RC*}	-	-	ns

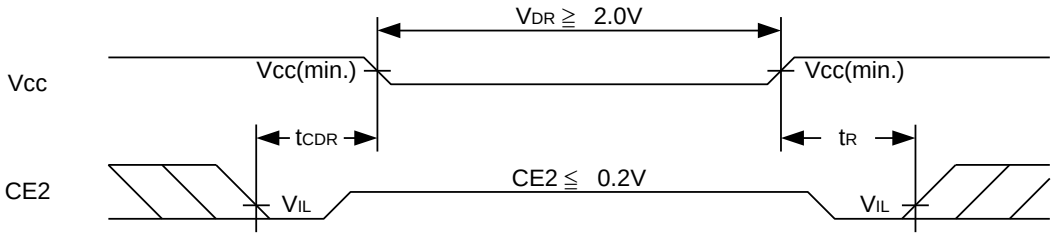
t_{RC*} = Read Cycle Time

DATA RETENTION WAVEFORM

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

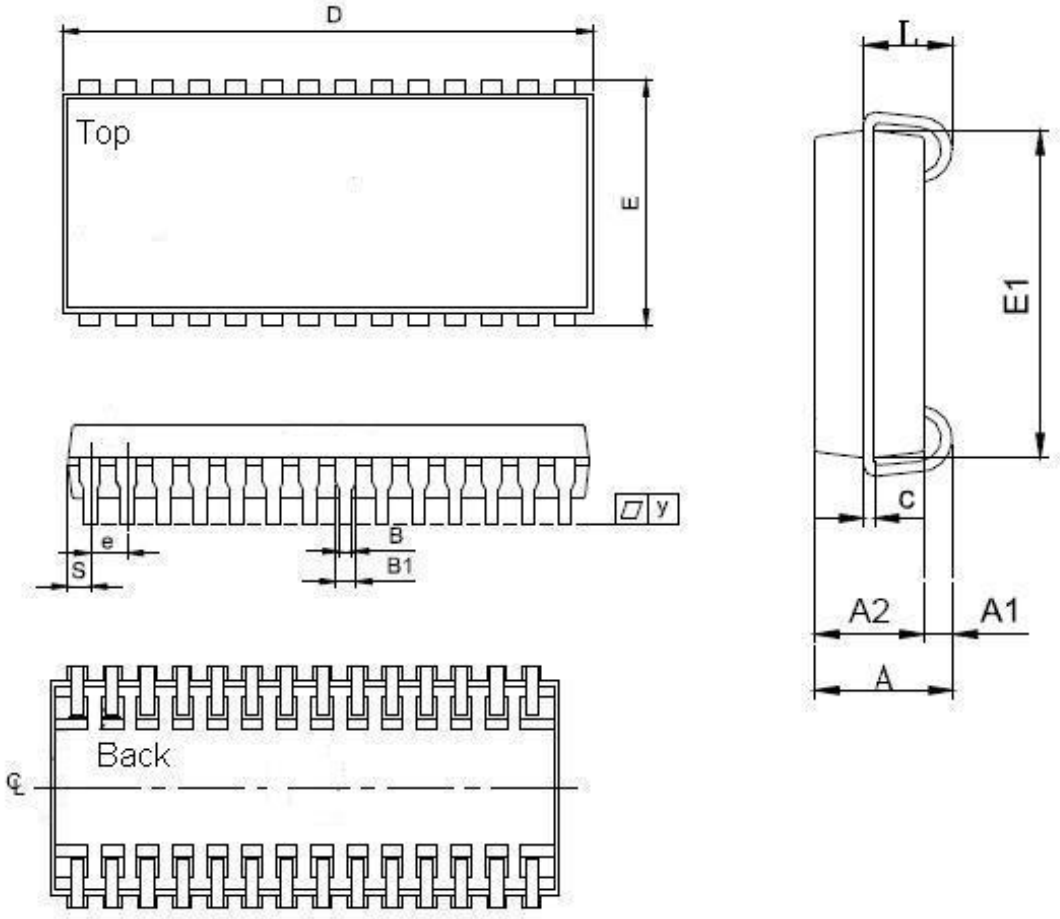


Low V_{CC} Data Retention Waveform (2) (CE2 controlled)



PACKAGE OUTLINE DIMENSION

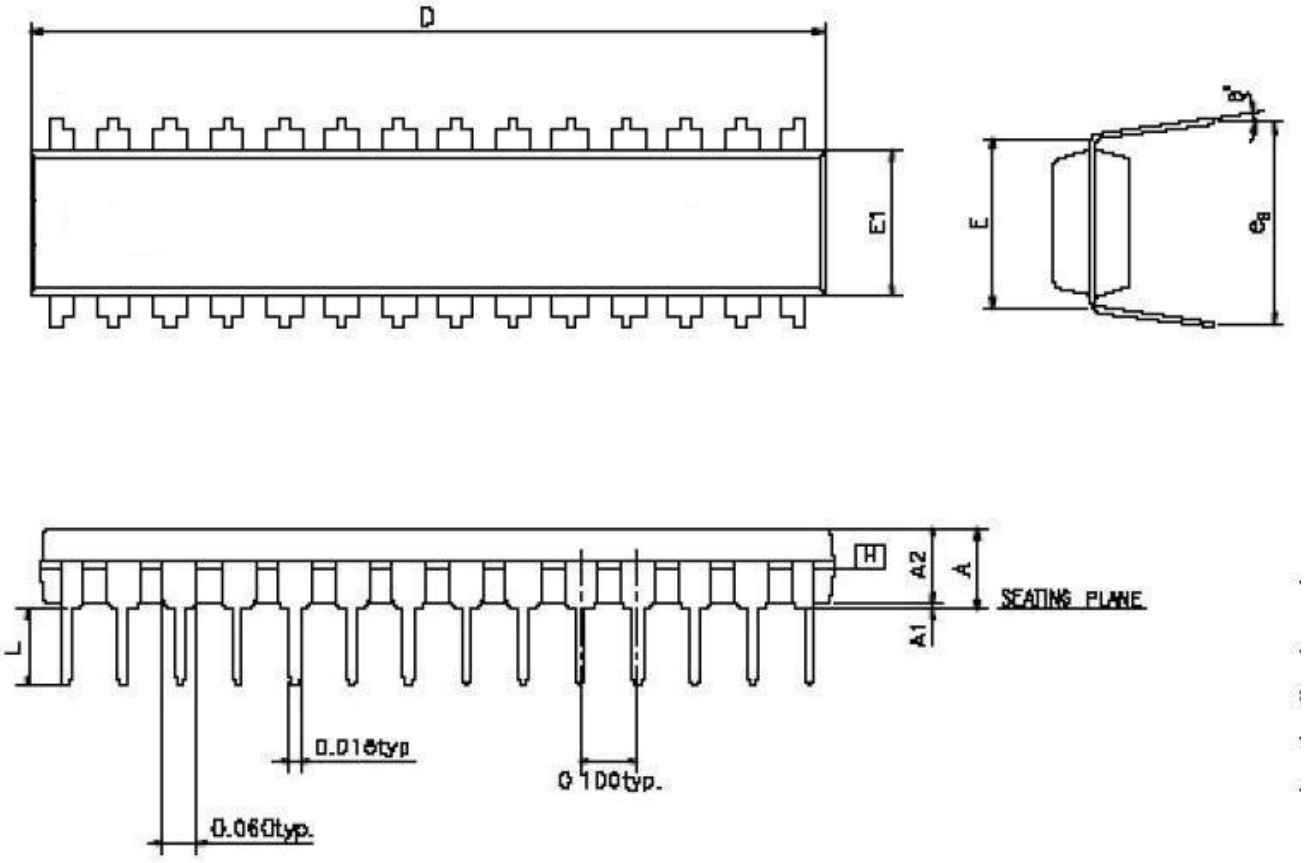
28-pin 300mil SOJ Package Outline Dimension



UNIT / SYM.	INCH(REF)	MM(BASE)
A	0.140(MAX)	3.556(MAX)
A1	0.025(MIN)	0.635(MIN)
A2	0.100±0.015	2.540±0.381
B	0.018±0.004	0.457±0.102
B1	0.028±0.004	0.711±0.102
c	0.010±0.004	0.254±0.102
D	0.710±0.020	18.03±0.508
E	0.337±0.010	8.560±0.254
E1	0.300±0.005	7.620±0.127
e	0.050±0.006	1.270±0.152
L	0.087±0.010	2.210±0.254
S	0.045(MAX)	1.143(MAX)
Y	0.004(MAX)	0.102(MAX)

Note : 1.S/E/D dimension is not including mold flash.
2.The end flash in package lengthwise is not more than 10 mils each side.

28-pin 300mil PDIP Package Outline Dimension



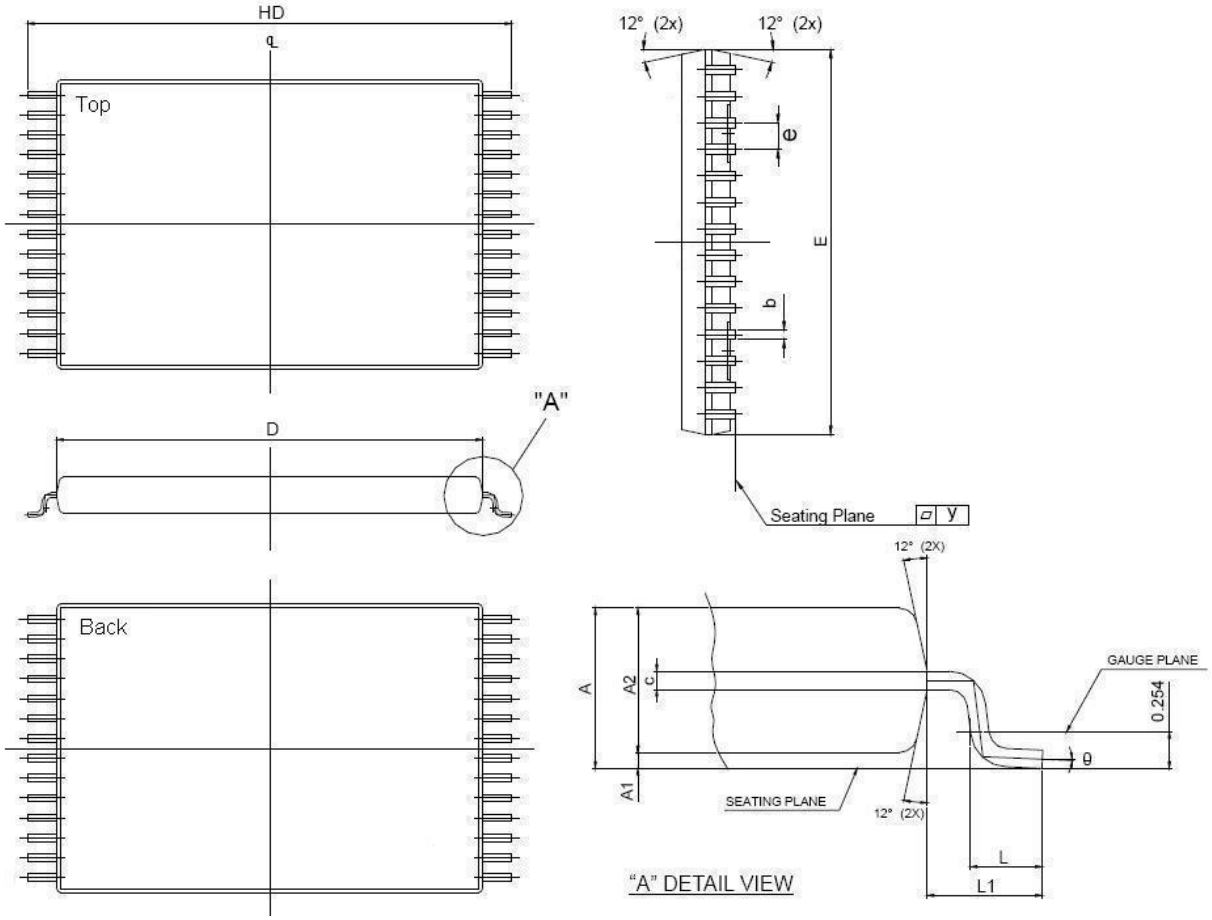
SYMBOLS	MIN.	NOR.	MAX.
A	–	–	0.210
A1	0.015	–	–
A2	0.125	0.130	0.135
D	1.385	1.390	1.400
E		0.310 BSC	
E1	0.283	0.288	0.293
L	0.115	0.130	0.150
e_B	0.330	0.350	0.370
θ°	0	7	15

UNIT : INCH

NOTE:

1.JEDEC OUTLINE : MS-015 AH

28-pin 8mm x 13.4mm sTSOP Package Outline Dimension



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.00	1.10	1.20	0.040	0.043	0.047
A1	0.05	-	0.15	0.002	-	0.006
A2	0.91	1.00	1.05	0.036	0.039	0.041
b	0.17	0.22	0.27	0.007	0.009	0.011
c	0.07	0.15	0.23	0.003	0.006	0.009
HD	13.20	13.40	13.60	0.520	0.528	0.535
D	11.60	11.80	12.00	0.457	0.465	0.472
E	7.80	8.00	8.20	0.307	0.315	0.323
e	-	0.55	-	-	0.0216	-
L	0.30	0.50	0.70	0.012	0.020	0.028
L1	0.675	-	-	0.027	-	-
Y	0.00	-	0.076	0.000	-	0.003
θ	0°	3°	5°	0°	3°	5°

ORDERING INFORMATION

Package Type	Access Time (Speed)(ns)	Temperature Range(℃)	Packing Type	Lyontek Item No.
28-pin (300mil) SOJ	12	0℃~70℃	Tube	LY6164JL-12
			Tape Reel	LY6164JL-12T
		-20℃~80℃	Tube	LY6164JL-12E
			Tape Reel	LY6164JL-12ET
		-40℃~85℃	Tube	LY6164JL-12I
			Tape Reel	LY6164JL-12IT
	15	0℃~70℃	Tube	LY6164JL-15
			Tape Reel	LY6164JL-15T
		-20℃~80℃	Tube	LY6164JL-15E
			Tape Reel	LY6164JL-15ET
		-40℃~85℃	Tube	LY6164JL-15I
			Tape Reel	LY6164JL-15IT

ORDERING INFORMATION

Package Type	Access Time (Speed)(ns)	Temperature Range(℃)	Packing Type	Lyontek Item No.
28-pin (300mil) PDIP	12	0℃~70℃	Tube	LY6164DL-12
		-20℃~80℃	Tube	LY6164DL-12E
		-40℃~85℃	Tube	LY6164DL-12I
	15	0℃~70℃	Tube	LY6164DL-15
		-20℃~80℃	Tube	LY6164DL-15E
		-40℃~85℃	Tube	LY6164DL-15I

ORDERING INFORMATION

Package Type	Access Time (Speed)(ns)	Temperature Range(℃)	Packing Type	Lyontek Item No.
28-pin (8mm x 13.4mm) sTSOP	12	0℃~70℃	Tray	LY6164RL-12
			Tape Reel	LY6164RL-12T
		-20℃~80℃	Tray	LY6164RL-12E
			Tape Reel	LY6164RL-12ET
		-40℃~85℃	Tray	LY6164RL-12I
			Tape Reel	LY6164RL-12IT
	15	0℃~70℃	Tray	LY6164RL-15
			Tape Reel	LY6164RL-15T
		-20℃~80℃	Tray	LY6164RL-15E
			Tape Reel	LY6164RL-15ET
		-40℃~85℃	Tray	LY6164RL-15I
			Tape Reel	LY6164RL-15IT

THIS PAGE IS LEFT BLANK INTENTIONALLY.