

Document Title**64Kx8 bit Low Power CMOS Static RAM****Revision History**

<u>Revision No.</u>	<u>History</u>	<u>Draft Data</u>	<u>Remark</u>
0.0	Initial draft	November 28, 1993	Design target
0.1	Revision	May 13, 1994	Preliminary
1.0	Finalize	December 1, 1994	Final
2.0	Revision - Add 45ns part with 30pf test load.	August 12, 1995	Final
3.0	Revision - Change Data Sheet format : One data sheets for industrial and commercial product	April 15, 1996	Final
4.0	Revision - Change Data Sheet format - Remove 45ns part from commercial product and 100ns part from industrial product - Remove low power part form TSOP package	January 9, 1998	Final

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64Kx8 bit Low Power CMOS Static RAM

FEATURES

- Process Technology: Poly Load
- Organization: 64Kx8
- Power Supply Voltage: 4.5–5.5V
- Low Data Retention Voltage: 2V(Min)
- Three state output and TTL Compatible
- Package Type: 32-SOP-525, 32-TSOP1-0820F

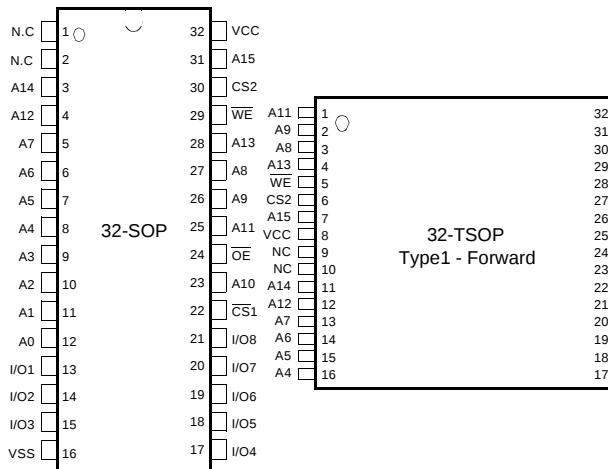
GENERAL DESCRIPTION

The K6L0908C2A families are fabricated by SAMSUNG's advanced CMOS process technology. The families support various operating temperature ranges and have various package types for user flexibility of system design. The families also support low data retention voltage for battery back-up operation with low data retention current.

PRODUCT FAMILY

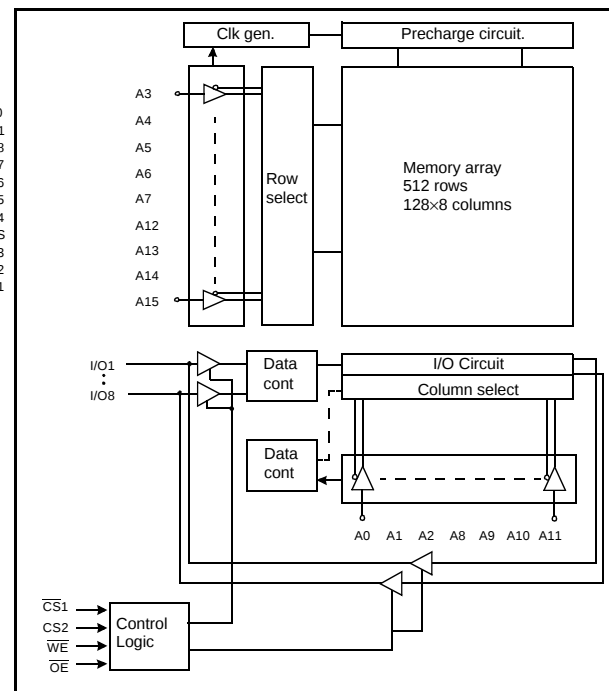
Product Family	Operating Temperature	Vcc Range	Speed	Power Dissipation		PKG Type
				Standby (I _{SB1} , Max)	Operating (I _{CC2} , Max)	
K6L0908C2A-L K6L0908C2A-B	Commercial (0–70°C)	4.5 to 5.5V	55/70ns	100µA 20µA	70mA	32-SOP 32-TSOP1-F
K6L0908C2A-P K6L0908C2A-F	Industrial (-40–85°C)		70ns	100µA 50µA		

PIN DESCRIPTION



Name	Function
CS ₁ , CS ₂	Chip Select Inputs
OE	Output Enable Input
WE	Write Enable Input
A ₀ –A ₁₅	Address Inputs
I/O ₁ –I/O ₈	Data Inputs/Outputs
Vcc	Power
Vss	Ground
N.C	No Connection

FUNCTIONAL BLOCK DIAGRAM



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PRODUCT LIST

Commercial Temperature Products(0~70°C)		Industrial Temperature Products(-40~85°C)	
Part Name	Function	Part Name	Function
K6L0908C2A-GL55	32-SOP, 55ns, L-pwr	K6L0908C2A-GP70	32-SOP, 70ns, L-pwr
K6L0908C2A-GB55	32-SOP, 55ns, LL-pwr	K6L0908C2A-GF70	32-SOP, 70ns, LL-pwr
K6L0908C2A-GL70	32-SOP, 70ns, L-pwr	K6L0908C2A -TF70	32-TSOP1-F, 70ns, LL-pwr
K6L0908C2A-GB70	32-SOP, 70ns, LL-pwr		
K6L0908C2A-TB55	32-TSOP1-F, 55ns, LL-pwr		
K6L0908C2A-TB70	32-TSOP1-F, 70ns, LL-pwr		

FUNCTIONAL DESCRIPTION

$\overline{CS}_1$	CS_2	$\overline{OE}$	$\overline{WE}$	I/O Pin	Mode	Power
H	X ¹⁾	X ¹⁾	X ¹⁾	High-Z	Deselected	Standby
X ¹⁾	L	X ¹⁾	X ¹⁾	High-Z	Deselected	Standby
L	H	H	H	High-Z	Output Disabled	Active
L	H	L	H	Dout	Read	Active
L	H	X ¹⁾	L	Din	Write	Active

1. X means don't care.(Must be low or high state)

ABSOLUTE MAXIMUM RATINGS¹⁾

Item	Symbol	Ratings	Unit	Remark
Voltage on any pin relative to Vss	V _{IN} ,V _{OUT}	-0.5 to 7.0	V	-
Voltage on Vcc supply relative to Vss	V _{CC}	-0.5 to 7.0	V	-
Power Dissipation	P _D	1.0	W	-
Storage temperature	T _{STG}	-65 to 150	°C	-
Operating Temperature	T _A	0 to 70	°C	K6L0908C2A-C
		-40 to 85	°C	K6L0908C2A-I
Soldering temperature and time	T _{SOLDER}	260°C, 10sec(Lead Only)	-	-

1. Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. Functional operation should be restricted to recommended operating condition. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

RECOMMENDED DC OPERATING CONDITIONS¹⁾

Item	Symbol	Min	Typ	Max	Unit
Supply voltage	V _{CC}	4.5	5.0	5.5	V
Ground	V _{SS}	0	0	0	V
Input high voltage	V _{IH}	2.2	-	V _{CC} +0.5V ²⁾	V
Input low voltage	V _{IL}	-0.5 ³⁾	-	0.8	V

Note

1. Commercial Product : T_A=0 to 70°C, unless otherwise specifiedIndustrial Product : T_A=-40 to 85°C, unless otherwise specified2. Overshoot : V_{CC}+3.0V in case of pulse width≤30ns

3. Undershoot : -3.0V in case of pulse width≤30ns

4. Overshoot and undershoot are sampled, not 100% tested

CAPACITANCE¹⁾(f=1MHz, T_A=25°C)

Item	Symbol	Test Condition	Min	Max	Unit
Input capacitance	C _{IN}	V _{IN} =0V	-	6	pF
Input/Output capacitance	C _{IO}	V _{IO} =0V	-	8	pF

1. Capacitance is sampled, not 100% tested

DC AND OPERATING CHARACTERISTICS

Item		Symbol	Test Conditions	Min	Typ	Max	Unit	
Input leakage current		I _{LI}	V _{IN} =V _{SS} to V _{CC}	-1	-	1	μA	
Output leakage current		I _{LO}	$\overline{CS_1}$ =V _{IH} or CS ₂ =V _{IL} or $\overline{OE}$ =V _{IH} or $\overline{WE}$ =V _{IL} , V _{IO} =V _{SS} to V _{CC}	-1	-	1	μA	
Operating power supply current		I _{CC}	I _{IO} =0mA, $\overline{CS_1}$ =V _{IL} , CS ₂ =V _{IH} , V _{IN} =V _{IH} or V _{IL}	-	7	15	mA	
Average operating current		I _{CC1}	Cycle time=1μs, 100% duty, I _{IO} =0mA $\overline{CS_1}$ ≤0.2V, CS ₂ ≥V _{CC} -0.2V, V _{IN} ≤0.2V or V _{IN} ≥V _{CC} -0.2V	-	-	10	mA	
		I _{CC2}	Cycle time=Min, 100% duty, I _{IO} =0mA, $\overline{CS_1}$ =V _{IL} , CS ₂ =V _{IH} , V _{IN} =V _{IH} or V _{IL}	-	-	70	mA	
Output low voltage		V _{OL}	I _{OL} =2.1mA	-	-	0.4	V	
Output high voltage		V _{OH}	I _{OH} =-1.0mA	2.4	-	-	V	
Standby Current(TTL)		I _{SB}	$\overline{CS_1}$ =V _{IH} , CS ₂ =V _{IL} , Other inputs =V _{IH} or V _{IL}	-	-	3	mA	
Standby Current (CMOS)	K6L0908C2A-L/-B	I _{SB1}	$\overline{CS_1}$ ≥V _{CC} -0.2V, CS ₂ ≥V _{CC} -0.2V or CS ₂ ≤0.2V Other inputs =0 ~ V _{CC}	Low Power Low Low Power	- -	2 1	100 20	μA
	K6L0908C2A-P/-F		Low Power Low Low Power	- -	2 1	100 50	μA	

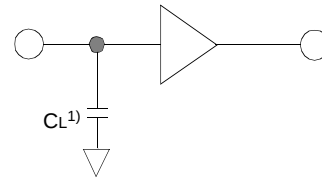
AC OPERATING CONDITIONS

TEST CONDITIONS (Test Load and Input/Output Reference)

Input pulse level : 0.8 to 2.4V

Input rising and falling time : 5ns

Input and output reference voltage : 1.5V

Output load(see right) : $C_L=100\text{pF}+1\text{TTL}$ 

1. Including scope and jig capacitance

AC CHARACTERISTICS ($V_{CC}=4.5\sim 5.5\text{V}$, K6L0908C2A-C Family: $T_A=0$ to 70°C , K6L0908C2A-I Family: $T_A=-40$ to 85°C)

Parameter List		Symbol	Speed Bins				Units
			55ns		70ns		
			Min	Max	Min	Max	
Read	Read cycle time	t _{RC}	55	-	70	-	ns
	Address access time	t _{AA}	-	55	-	70	ns
	Chip select to output	t _{CO1} , t _{CO2}	-	55	-	70	ns
	Output enable to valid output	t _{OE}	-	25	-	35	ns
	Chip select to low-Z output	t _{LZ}	10	-	10	-	ns
	Output enable to low-Z output	t _{OLZ}	5	-	5	-	ns
	Chip disable to high-Z output	t _{HZ}	0	20	0	25	ns
	Output disable to high-Z output	t _{OHZ}	0	20	0	25	ns
	Output hold from address change	t _{OH}	10	-	10	-	ns
Write	Write cycle time	t _{WC}	55	-	70	-	ns
	Chip select to end of write	t _{CW}	45	-	60	-	ns
	Address set-up time	t _{AS}	0	-	0	-	ns
	Address valid to end of write	t _{AW}	45	-	60	-	ns
	Write pulse width	t _{WP}	40	-	50	-	ns
	Write recovery time	t _{WR}	0	-	0	-	ns
	Write to output high-Z	t _{WHZ}	0	20	0	25	ns
	Data to write time overlap	t _{DW}	25	-	30	-	ns
	Data hold from write time	t _{DH}	0	-	0	-	ns
	End write to output low-Z	t _{OW}	5	-	5	-	ns

DATA RETENTION CHARACTERISTICS

Item	Symbol		Test Condition		Min	Typ	Max	Unit
Vcc for data retention	VDR		$\overline{\text{CS}}_1^1 \geq \text{Vcc}-0.2\text{V}$		2.0	-	5.5	V
Data retention current	IDR	K6L0908C2A-L/-B	$\text{Vcc}=3.0\text{V}$ $\overline{\text{CS}}_1 \geq \text{Vcc}-0.2\text{V}$	L-Ver	-	1	50	μA
				LL-Ver	-	0.5	10	
		K6L0908C2A-P/-F	$\text{CS}_2 \geq \text{Vcc}-0.2\text{V}$ or $\text{CS}_2 \leq 0.2\text{V}$	L-Ver	-	-	50	
				LL-Ver	-	-	25	
Data retention set-up time	tSDR		See data retention waveform		0	-	-	ms
Recovery time	tRDR				5	-	-	

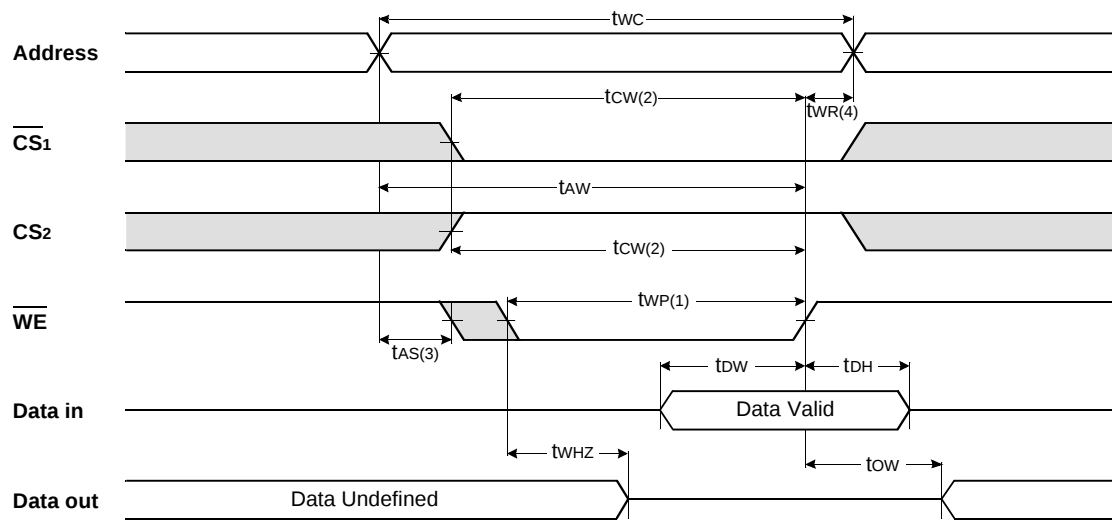
1. $\overline{CS_1} \geq V_{CC}-0.2\text{V}$, $\overline{CS_2} \geq V_{CC}-0.2\text{V}$ ($\overline{CS_1}$ controlled) or $\overline{CS_2} \leq 0.2\text{V}$ ($\overline{CS_2}$ controlled).

TIMING WAVEFORM OF READ CYCLE(1) (Address Controlled, $\overline{\text{CS}}1=\overline{\text{OE}}=V_{\text{IL}}$, $\overline{\text{WE}}=V_{\text{IH}}$)

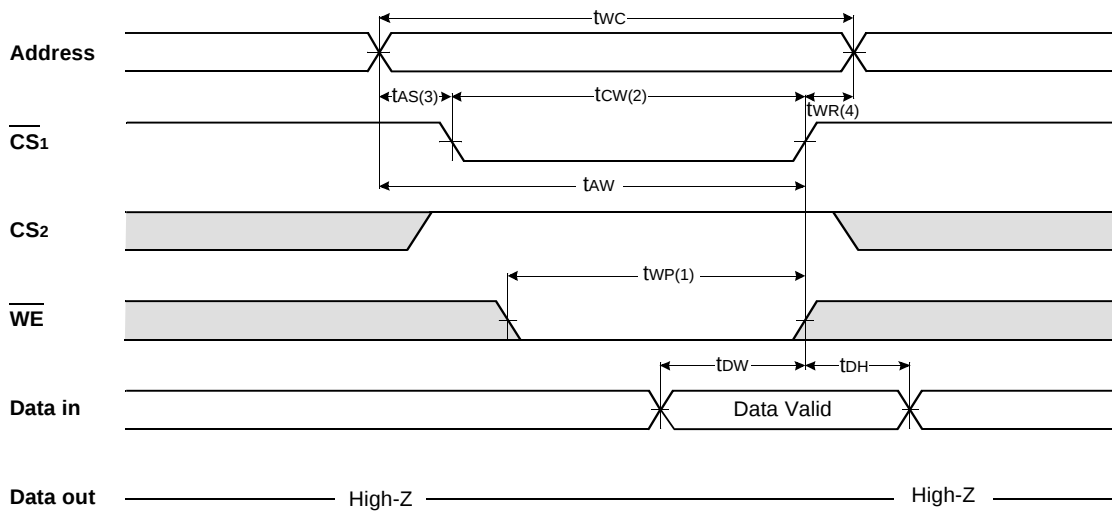


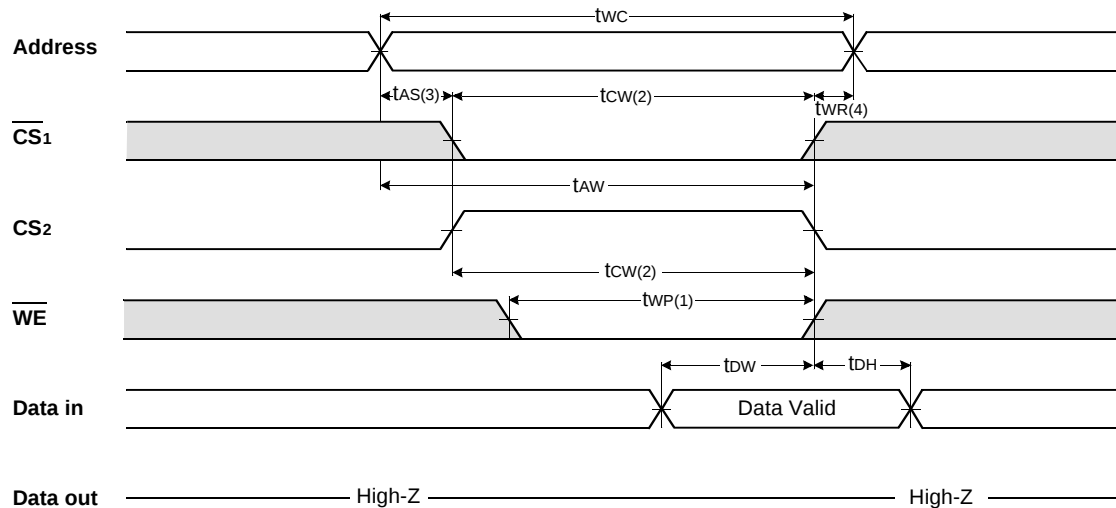
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TIMING WAVEFORM OF WRITE CYCLE(1) ($\overline{WE}$ Controlled)



TIMING WAVEFORM OF WRITE CYCLE(2) ($\overline{CS1}$ Controlled)

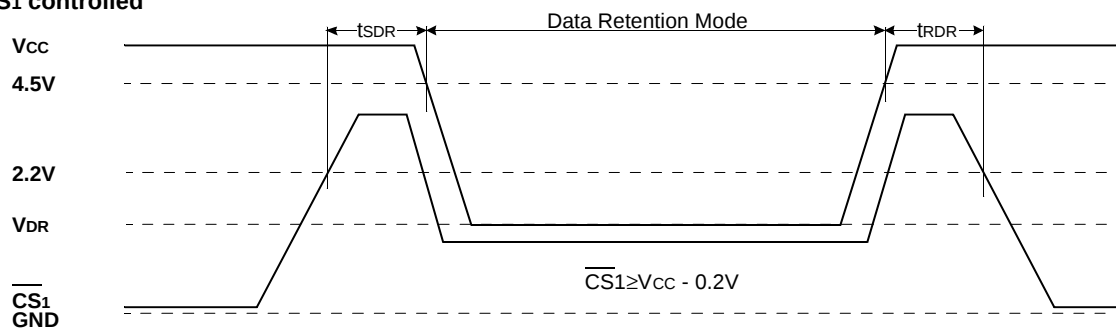
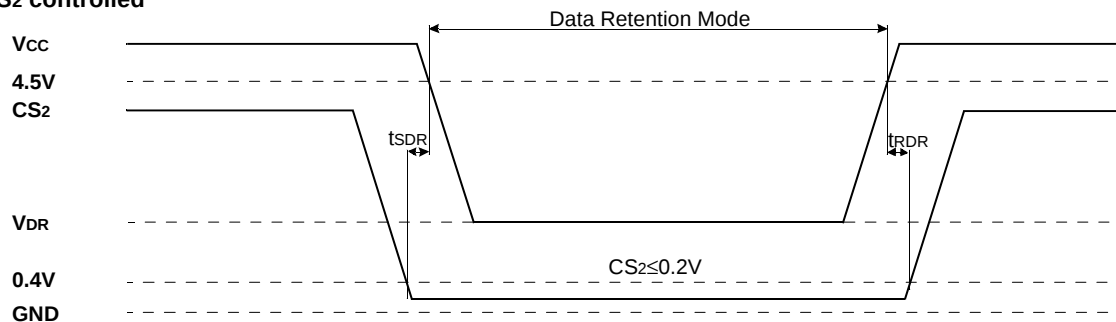


TIMING WAVEFORM OF WRITE CYCLE(3) (CS₂ Controlled)

NOTES (WRITE CYCLE)

1. A write occurs during the overlap of a low $\overline{CS_1}$, a high $\overline{CS_2}$ and a low $\overline{WE}$. A write begins at the latest transition among $\overline{CS_1}$ goes low, $\overline{CS_2}$ going high and $\overline{WE}$ going low : A write ends at the earliest transition among $\overline{CS_1}$ going high, $\overline{CS_2}$ going low and $\overline{WE}$ going high, t_{WP} is measured from the beginning of write to the end of write.
2. t_{CW} is measured from the $\overline{CS_1}$ going low or $\overline{CS_2}$ going high to the end of write.
3. t_{AS} is measured from the address valid to the beginning of write.
4. t_{WR} is measured from the end of write to the address change. $t_{WR(1)}$ applied in case a write ends as $\overline{CS_1}$ or $\overline{WE}$ going high $t_{WR(2)}$ applied in case a write ends as $\overline{CS_2}$ going to low.

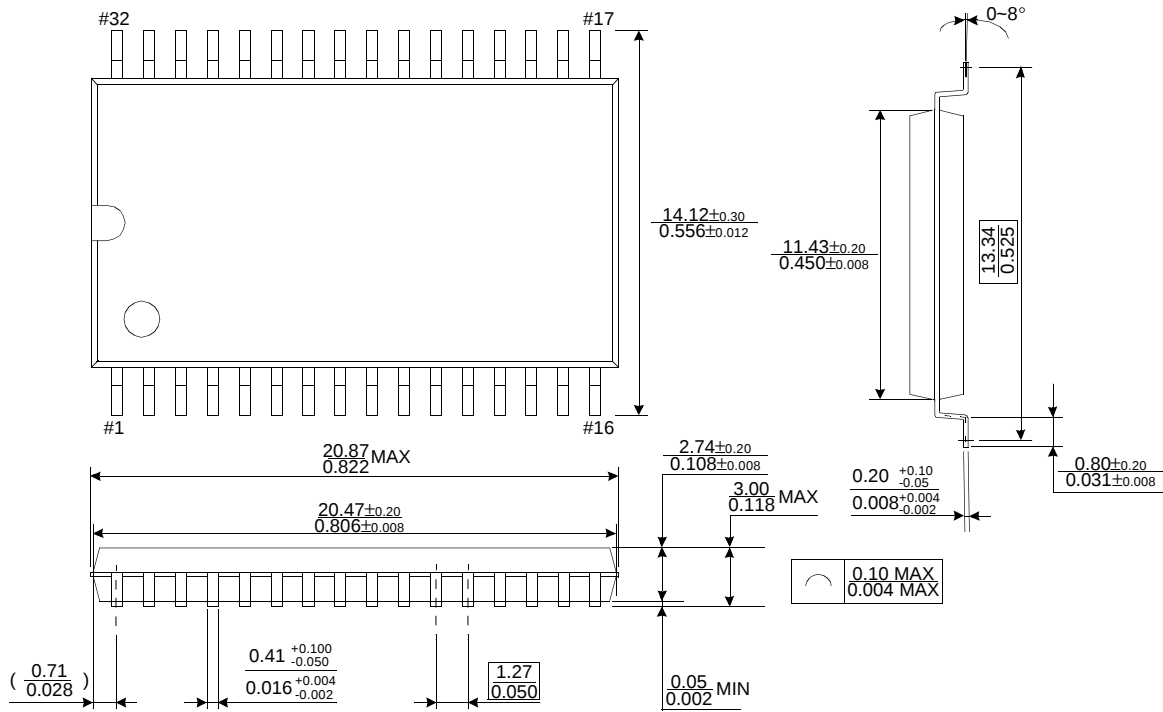
DATA RETENTION WAVE FORM

 $\overline{CS_1}$ controlledCS₂ controlled

PACKAGE DIMENSIONS

Units: millimeter(Inch)

32 PIN SMALL OUTLINE PACKAGE (525mil)



32-THIN SMALL OUTLINE PACKAGE TYPE I (0820F)

