

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

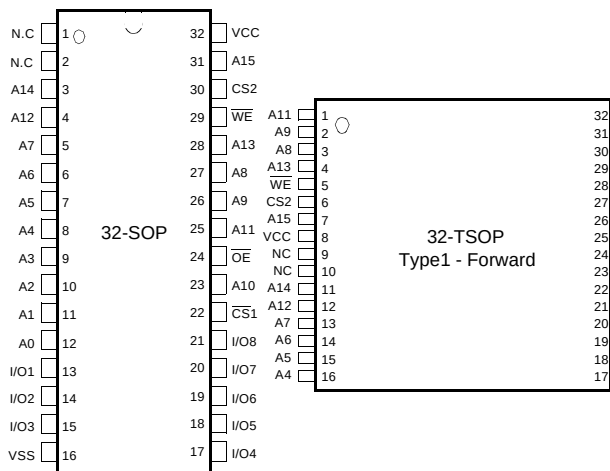
GENERAL DESCRIPTION

The KM68512A 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

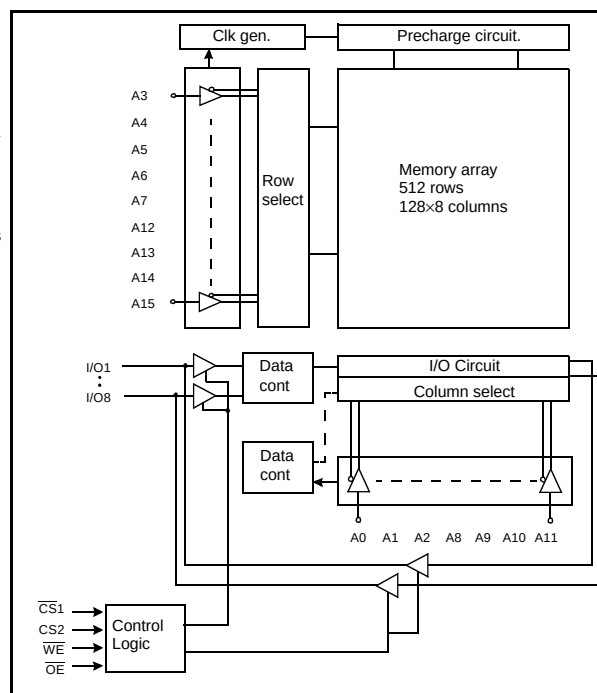
Product Family	Operating Temperature	Vcc Range	Speed	Power Dissipation		PKG Type
				Standby (I _{SB1} , Max)	Operating (I _{CC2} , Max)	
KM68512AL	Commercial (0~70°C)	4.5 to 5.5V	55/70ns	100µA	70mA	32-SOP 32-TSOP1-F
KM68512AL-L				20µA		
KM68512ALI	Industrial (-40~85°C)		70ns	100µA		
KM68512ALI-L				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
KM68512ALG-5	32-SOP, 55ns, L-pwr	KM68512ALGI-7	32-SOP, 70ns, L-pwr
KM68512ALG-5L	32-SOP, 55ns, LL-pwr	KM68512ALGI-7L	32-SOP, 70ns, LL-pwr
KM68512ALG-7	32-SOP, 70ns, L-pwr		
KM68512ALG-7L	32-SOP, 70ns, LL-pwr	KM68512ALTI-7L	32-TSOP1-F, 70ns, LL-pwr
KM68512ALT-5L	32-TSOP1-F, 55ns, LL-pwr		
KM68512ALT-7L	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	KM68512A
		-40 to 85	°C	KM68512AI
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

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

- Capacitance is sampled, not 100% tested

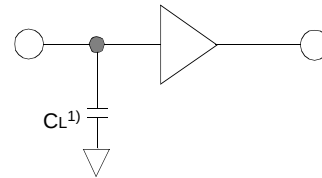
DC AND OPERATING CHARACTERISTICS

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)	KM68512AL/L-L	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	-	2	100	μA
	Low Low Power			-	1	20		
	KM68512ALI/LI-L		Low Power	-	2	100	μA	
			Low Low Power	-	1	50		

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 ($V_{CC}=4.5\sim 5.5\text{V}$, KM68512A Family: $T_A=0$ to 70°C , KM68512AI Family: $T_A=-40$ to 85°C)

Parameter List		Symbol	Speed Bins				Units
			55ns		70ns		
			Min	Max	Min	Max	
Read	Read cycle time	trc	55	-	70	-	ns
	Address access time	tAA	-	55	-	70	ns
	Chip select to output	tCO1, tCO2	-	55	-	70	ns
	Output enable to valid output	tOE	-	25	-	35	ns
	Chip select to low-Z output	tLZ	10	-	10	-	ns
	Output enable to low-Z output	tOLZ	5	-	5	-	ns
	Chip disable to high-Z output	tHZ	0	20	0	25	ns
	Output disable to high-Z output	tOHZ	0	20	0	25	ns
	Output hold from address change	tOH	10	-	10	-	ns
Write	Write cycle time	tWC	55	-	70	-	ns
	Chip select to end of write	tCW	45	-	60	-	ns
	Address set-up time	tAS	0	-	0	-	ns
	Address valid to end of write	tAW	45	-	60	-	ns
	Write pulse width	tWP	40	-	50	-	ns
	Write recovery time	tWR	0	-	0	-	ns
	Write to output high-Z	tWHZ	0	20	0	25	ns
	Data to write time overlap	tdW	25	-	30	-	ns
	Data hold from write time	tdH	0	-	0	-	ns
	End write to output low-Z	tOW	5	-	5	-	ns

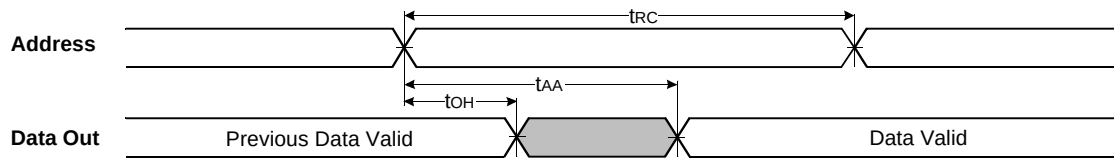
DATA RETENTION CHARACTERISTICS

Item	Symbol		Test Condition		Min	Typ	Max	Unit	
Vcc for data retention	V _{DR}		$\overline{\text{CS}}_1^{1)} \geq \text{Vcc}-0.2\text{V}$		2.0	-	5.5	V	
Data retention current	I _{DR}	KM68512AL/L-L	$\text{Vcc}=3.0\text{V}$ $\overline{\text{CS}}_1 \geq \text{Vcc}-0.2\text{V}$	L-Ver	-	1	50	μA	
		LL-Ver		-	0.5	10			
		KM68512ALI/LI-L	$\text{CS}_2 \geq \text{Vcc}-0.2\text{V}$ or $\text{CS}_2 \leq 0.2\text{V}$		L-Ver	-	-		50
					LL-Ver	-	-		25
Data retention set-up time	t _{SDR}		See data retention waveform		0	-	-	ms	
Recovery time	t _{RDR}				5	-	-		

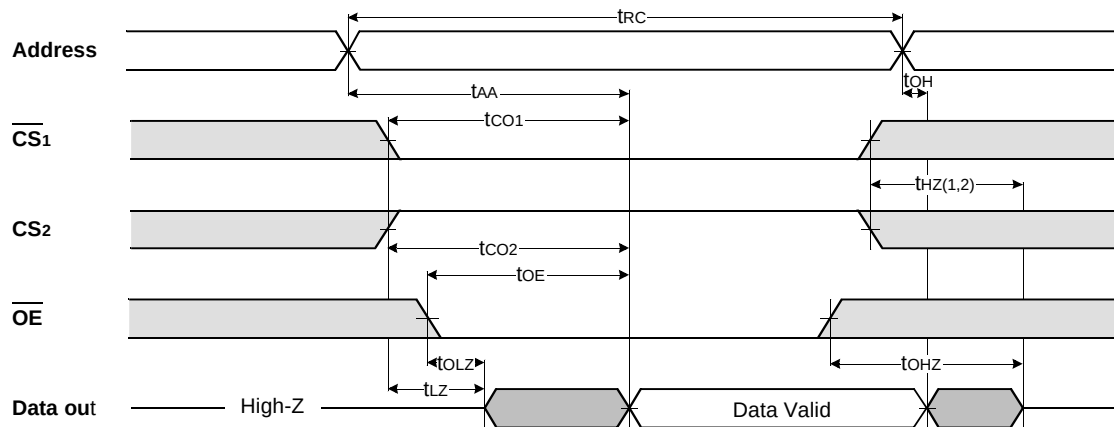
1. $\overline{CS}_1 \geq V_{CC}-0.2\text{V}$, $CS_2 \geq V_{CC}-0.2\text{V}$ ($\overline{CS}_1$ controlled) or $CS_2 \leq 0.2\text{V}$ (CS_2 controlled).

TIMMING DIAGRAMS

TIMING WAVEFORM OF READ CYCLE(1) (Address Controlled, $\overline{CS1}=\overline{OE}=V_{IL}$, $\overline{WE}=V_{IH}$)



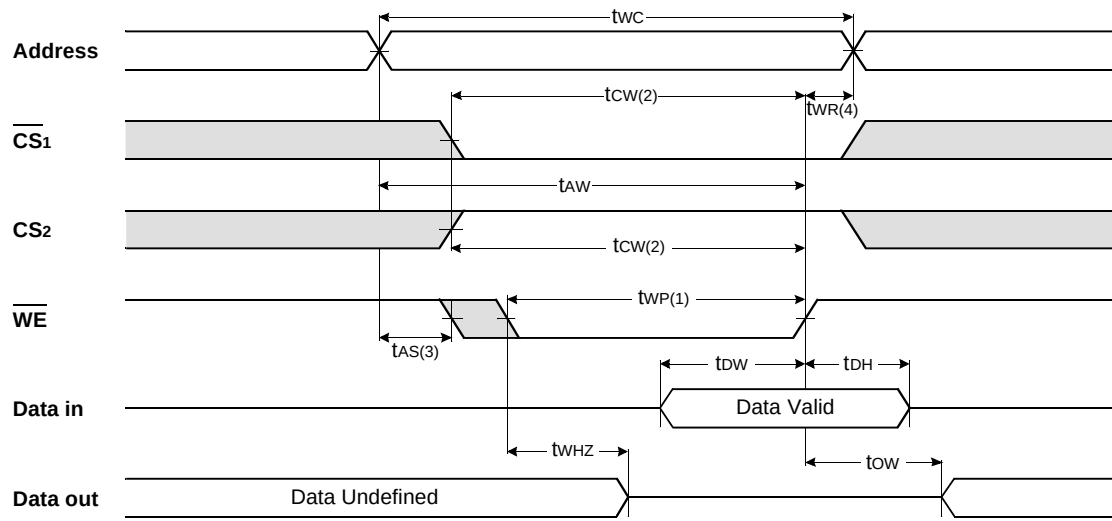
TIMING WAVEFORM OF READ CYCLE(2) ($\overline{WE}=V_{IH}$)



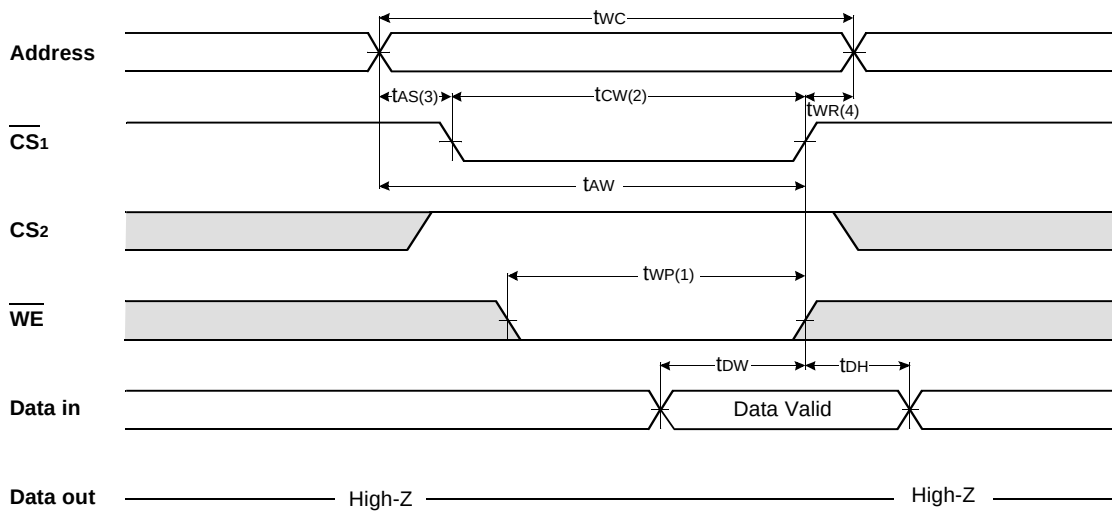
NOTES (READ CYCLE)

1. t_{HZ} and t_{OHZ} are defined as the time at which the outputs achieve the open circuit conditions and are not referenced to output voltage levels.
2. At any given temperature and voltage condition, $t_{HZ}(\text{Max.})$ is less than $t_{LZ}(\text{Min.})$ both for a given device and from device to device interconnection.

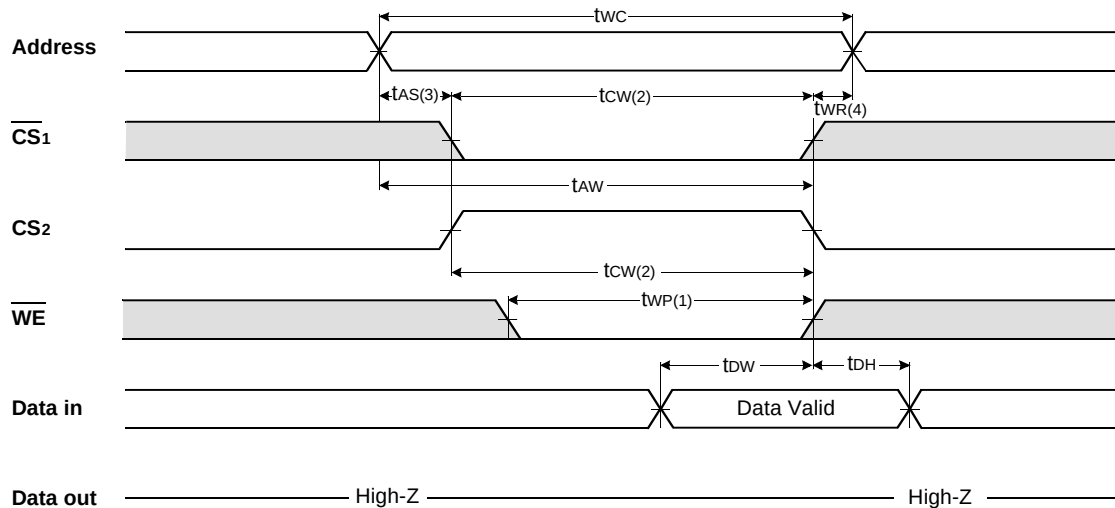
TIMING WAVEFORM OF WRITE CYCLE(1) ($\overline{\text{WE}}$ Controlled)



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



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

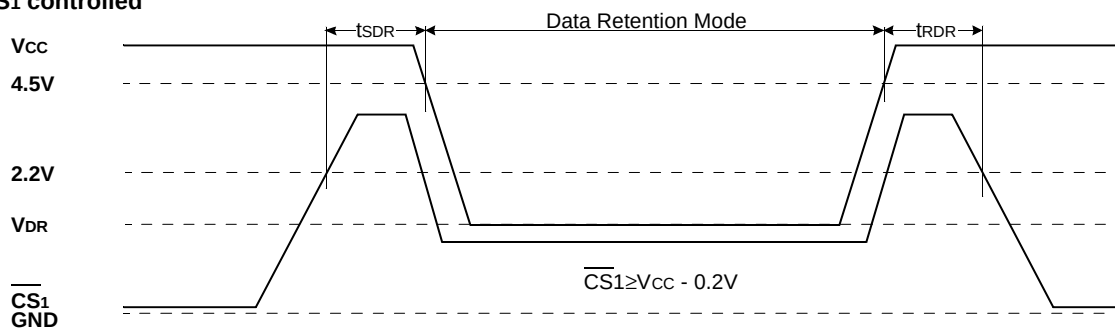


NOTES (WRITE CYCLE)

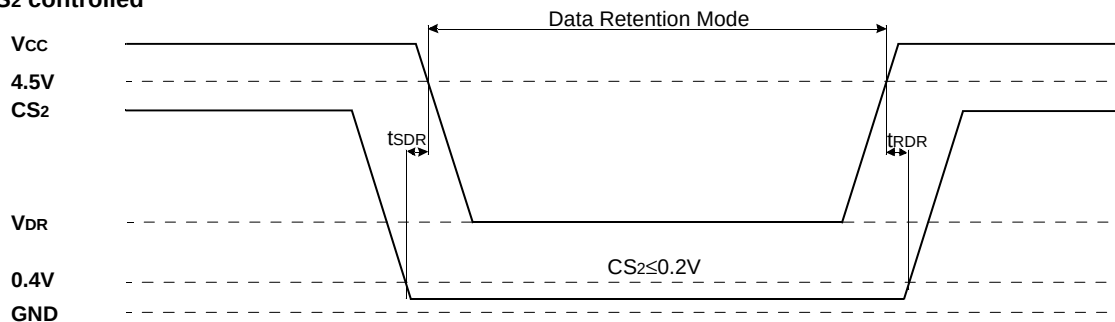
1. A write occurs during the overlap of a low $\overline{CS_1}$, a high $\overline{CS_2}$ and a low $\overline{WE}$. A write begins at the latest transition among $\overline{CS_1}$ goes low, $\overline{CS_2}$ going high and $\overline{WE}$ going low : A write ends at the earliest transition among $\overline{CS_1}$ 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

$\overline{CS_1}$ controlled



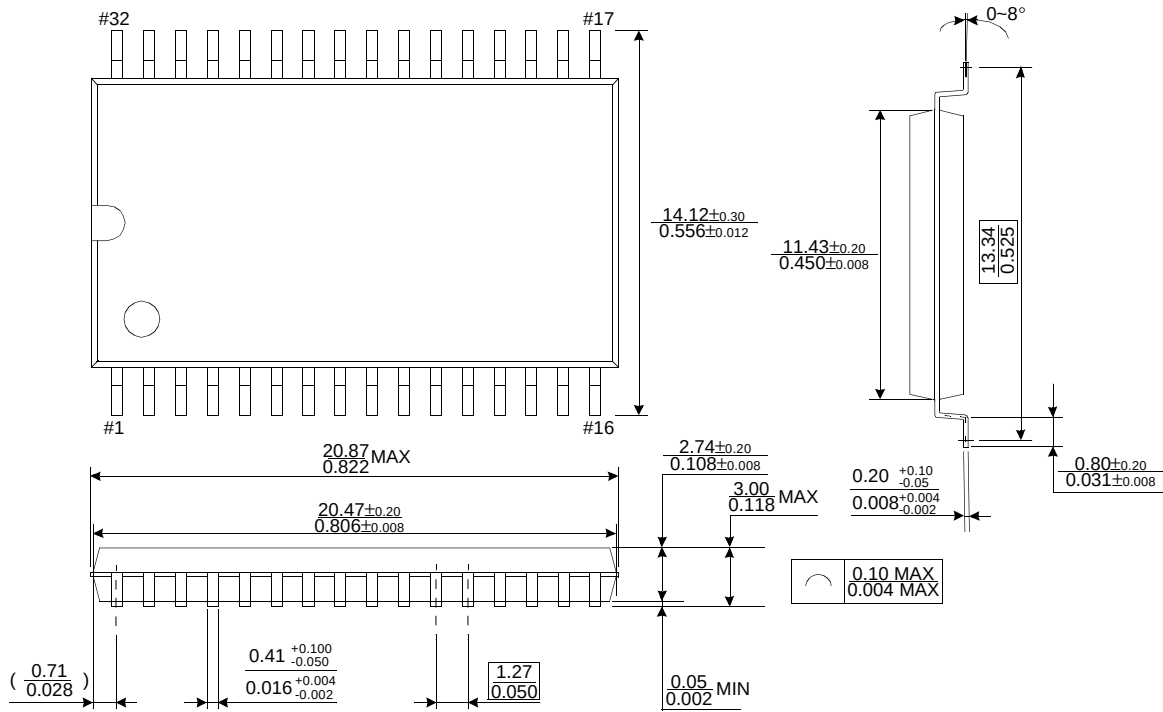
CS₂ controlled



PACKAGE DIMENSIONS

Units: millimeter(Inch)

32 PIN SMALL OUTLINE PACKAGE (525mil)



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

