

**Document Title****32Kx8 bit Low Power and Low Voltage CMOS Static RAM****Revision History**

<b><u>Revision No.</u></b>	<b><u>History</u></b>	<b><u>Draft Data</u></b>	<b><u>Remark</u></b>
0.0	Initial draft	April 1, 1997	Preliminary
1.0	Finalize - Add 70ns part in KM62U256D Family - Show I <sub>cc</sub> read only, and increased value I <sub>cc</sub> = 2mA → I <sub>cc</sub> Read = 5mA - Separate I <sub>cc1</sub> read and write I <sub>cc1</sub> = 5mA → I <sub>cc1</sub> Read = 5mA, I <sub>cc1</sub> Write = 10mA - Improved standby current(I <sub>SB1</sub> ) Commercial part : 10μA → 5μA Extended and Industrial part : 20μA → 5μA - Improved V <sub>IL</sub> (Min.) : 0.4V → 0.6V - Improved power dissipation : 0.7W → 1W	November 12, 1997	Final

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## 32Kx8 bit Low Power and Low Voltage CMOS Static RAM

### FEATURES

- Process Technology : TFT
- Organization : 32Kx8
- Power Supply Voltage
  - KM62V256D family : 2.7~3.3V
  - KM62U256D family : 3.0~3.6V
- Low Data Retention Voltage : 2V(Min)
- Three state output and TTL Compatible
- Package Type : 28-SOP-450
  - 28-TSOP1-0813.4F/R

### GENERAL DESCRIPTION

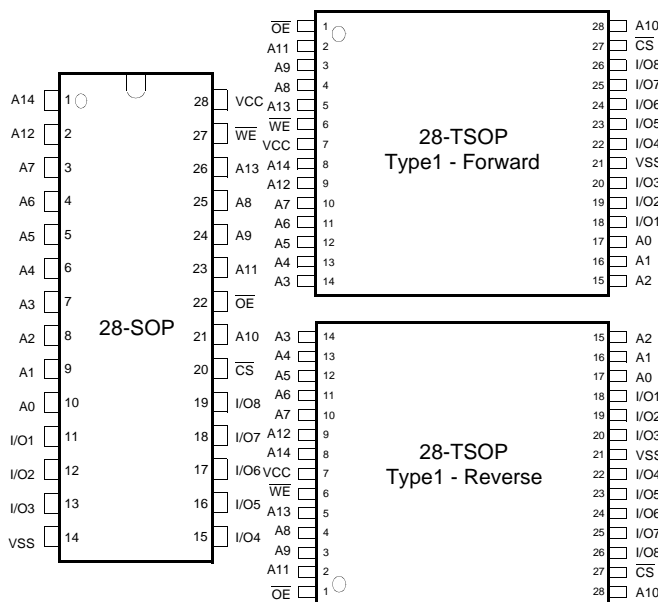
The KM62V256D and KM62U256D families are fabricated by SAMSUNG's advanced CMOS process technology. The families support various operating temperature range and have various package types for user flexibility of system design. The families also support low data retention voltage for battery back-up operation with low data retention current.

### PRODUCT FAMILY

Product Family	Operating Temperature	Vcc Range	Speed (ns)	Power Dissipation		PKG Type
				Standby (I <sub>SB1</sub> , Max)	Operating (I <sub>CC2</sub> )	
KM62V256DL-L KM62U256DL-L	Commercial(0~70°C)	3.0V ~3.6V 2.7V ~ 3.3V	70 <sup>1)</sup> /100 70 <sup>1)</sup> /85/100	5μA	35mA	28-SOP <sup>2)</sup> 28-TSOP1-F/R
KM62V256DLE-L KM62U256DLE-L	Extended(-25~85°C)	3.0V ~3.6V 2.7V ~ 3.3V	70 <sup>1)</sup> /100 70 <sup>1)</sup> /85/100			
KM62V256DLI-L KM62U256DLI-L	Industrial(-40~85°C)	3.0V ~3.6V 2.7V ~ 3.3V	70 <sup>1)</sup> /100 70 <sup>1)</sup> /85/100			

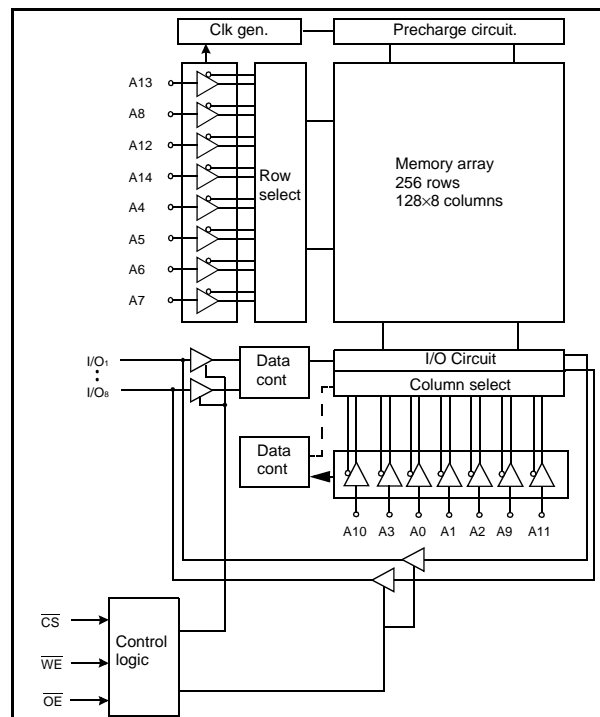
1. The parameter is measured with 30pF test load.
2. KM62V256D Family support SOP package without 100ns speed bin.

### PIN DESCRIPTION



Pin Name	Function	Pin Name	Function
$\overline{CS}$	Chip Select Input	I/O1~I/O8	Data Inputs/Outputs
$\overline{OE}$	Output Enable Input	Vcc	Power
$\overline{WE}$	Write Enable Input	Vss	Ground
A0~A14	Address Inputs	NC	No connect

### FUNCTIONAL BLOCK DIAGRAM



SAMSUNG ELECTRONICS CO., LTD. reserves the right to change products and specifications without notice.

## PRODUCT LIST

Commercial Temperature Products (0~70°C)		Extended Temperature Products (-25~85°C)		Industrial Temperature Products (-40~85°C)	
Part Name	Function	Part Name	Function	Part Name	Function
KM62V256DLG-7L	28-SOP, 70ns, 3.3V	KM62V256DLGE-7L	28-SOP, 70ns, 3.3V	KM62V256DLGI-7L	28-SOP, 70ns, 3.3V
KM62V256DLTG-7L	28-TSOP F, 70ns, 3.3V	KM62V256DLTGE-7L	28-TSOP F, 70ns, 3.3V	KM62V256DLTGI-7L	28-TSOP F, 70ns, 3.3V
KM62V256DLTG-10L	28-TSOP F, 100ns, 3.3V	KM62V256DLTGE-10L	28-TSOP F, 100ns, 3.3V	KM62V256DLTGI-10L	28-TSOP F, 100ns, 3.3V
KM62V256DLRG-7L	28-TSOP R, 70ns, 3.3V	KM62V256DLRGE-7L	28-TSOP R, 70ns, 3.3V	KM62V256DLRGI-7L	28-TSOP R, 70ns, 3.3V
KM62V256DLRG-10L	28-TSOP R, 100ns, 3.3V	KM62V256DLRGE-10L	28-TSOP R, 100ns, 3.3V	KM62V256DLRGI-10L	28-TSOP R, 100ns, 3.3V
KM62U256DLG-7L	28-SOP, 70ns, 3.0V	KM62U256DLGE-7L	28-SOP, 70ns, 3.0V	KM62U256DLGI-7L	28-SOP, 70ns, 3.0V
KM62U256DLG-8L	28-SOP, 85ns, 3.0V	KM62U256DLGE-8L	28-SOP, 85ns, 3.0V	KM62U256DLGI-8L	28-SOP, 85ns, 3.0V
KM62U256DLG-10L	28-SOP, 100ns, 3.0V	KM62U256DLGE-10L	28-SOP, 100ns, 3.0V	KM62U256DLGI-10L	28-SOP, 100ns, 3.0V
KM62U256DLTG-7L	28-TSOP F, 70ns, 3.0V	KM62U256DLTGE-7L	28-TSOP F, 70ns, 3.0V	KM62U256DLTGI-7L	28-TSOP F, 70ns, 3.0V
KM62U256DLTG-8L	28-TSOP F, 85ns, 3.0V	KM62U256DLTGE-8L	28-TSOP F, 85ns, 3.0V	KM62U256DLTGI-8L	28-TSOP F, 85ns, 3.0V
KM62U256DLTG-10L	28-TSOP F, 100ns, 3.0V	KM62U256DLTGE-10L	28-TSOP F, 100ns, 3.0V	KM62U256DLTGI-10L	28-TSOP F, 100ns, 3.0V
KM62U256DLRG-7L	28-TSOP R, 70ns, 3.0V	KM62U256DLRGE-7L	28-TSOP R, 70ns, 3.0V	KM62U256DLRGI-7L	28-TSOP R, 70ns, 3.0V
KM62U256DLRG-8L	28-TSOP R, 85ns, 3.0V	KM62U256DLRGE-8L	28-TSOP R, 85ns, 3.0V	KM62U256DLRGI-8L	28-TSOP R, 85ns, 3.0V
KM62U256DLRG-10L	28-TSOP R, 100ns, 3.0V	KM62U256DLRGE-10L	28-TSOP R, 100ns, 3.0V	KM62U256DLRGI-10L	28-TSOP R, 100ns, 3.0V

## FUNCTIONAL DESCRIPTION

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

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

## ABSOLUTE MAXIMUM RATINGS<sup>1)</sup>

Item	Symbol	Ratings	Unit	Remark
Voltage on any pin relative to Vss	V <sub>IN</sub> , V <sub>OUT</sub>	-0.5 to V <sub>CC</sub> +0.5	V	-
Voltage on Vcc supply relative to Vss	V <sub>CC</sub>	-0.5 to 4.6	V	-
Power Dissipation	P <sub>D</sub>	1.0	W	-
Storage temperature	T <sub>STG</sub>	-65 to 150	°C	-
Operating Temperature	T <sub>A</sub>	0 to 70	°C	KM62V256DL, KM62U256DL
		-25 to 85	°C	KM62V256DLE, KM62U256DLE
		-40 to 85	°C	KM62V256DLI, KM62U256DLI
Soldering temperature and time	T <sub>SOLDER</sub>	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 CONDITIONS<sup>1)</sup>

Item	Symbol	Product	Min	Typ	Max	Unit
Supply voltage	V <sub>CC</sub>	KM62V256D Family	3.0	3.3	3.6	V
		KM62U256D Family	2.7	3.0	3.3	
Ground	V <sub>SS</sub>	ALL	0	0	0	V
Input high voltage	V <sub>IH</sub>	KM62V256D, KM62U256D Family	2.2	-	V <sub>CC</sub> +0.3	V
Input low voltage	V <sub>IL</sub>	KM62V256D, KM62U256D Family	-0.3 <sup>3)</sup>	-	0.6	V

Note:

- Commercial Product : T<sub>A</sub>=0 to 70°C, otherwise specified  
Industrial Product : T<sub>A</sub>=-40 to 85°C, otherwise specified
- Overshoot : V<sub>CC</sub>+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

## CAPACITANCE<sup>1)</sup> (f=1MHz, T<sub>A</sub>=25°C)

Item	Symbol	Test Condition	Min	Max	Unit
Input capacitance	C <sub>IN</sub>	V <sub>IN</sub> =0V	-	8	pF
Input/Output capacitance	C <sub>IO</sub>	V <sub>IO</sub> =0V	-	10	pF

- Capacitance is sampled, not 100% tested

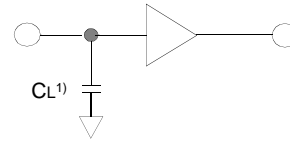
## DC AND OPERATING CHARACTERISTICS

Item	Symbol	Test Conditions	Min	Typ	Max	Unit	
Input leakage current	I <sub>LI</sub>	V <sub>IN</sub> =V <sub>SS</sub> to V <sub>CC</sub>	-1	-	1	μA	
Output leakage current	I <sub>LO</sub>	$\overline{CS}=V_{IH}$ or $\overline{OE}=V_{IH}$ or $\overline{WE}=V_{IL}$ , V <sub>IO</sub> =V <sub>SS</sub> to V <sub>CC</sub>	-1	-	1	μA	
Operating power supply current	I <sub>CC</sub>	I <sub>IO</sub> =0mA, $\overline{CS}=V_{IL}$ , V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , Read	-	2	5	mA	
Average operating current	I <sub>CC1</sub>	Cycle time=1μs, 100% duty, I <sub>IO</sub> =0mA $\overline{CS} \leq 0.2V$ , V <sub>IN</sub> ≤0.2V, V <sub>IN</sub> ≥V <sub>CC</sub> -0.2V	Read	-	1.5	5	mA
			Write	-	6	10	
	I <sub>CC2</sub>	Cycle time=Min, 100% duty, I <sub>IO</sub> =0mA, $\overline{CS}=V_{IL}$ , V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub>	-	23	35	mA	
Output low voltage	V <sub>OL</sub>	I <sub>OL</sub> =2.1mA	-	-	0.4	V	
Output high voltage	V <sub>OH</sub>	I <sub>OH</sub> =-1.0mA	2.4	-	-	V	
Standby Current(TTL)	I <sub>SB</sub>	$\overline{CS}=V_{IH}$ , Other inputs=V <sub>IH</sub> or V <sub>IL</sub>	-	-	0.3	mA	
Standby Current (CMOS)	I <sub>SB1</sub>	$\overline{CS} \geq V_{CC}-0.2V$ , Other inputs=0~V <sub>CC</sub>	-	0.1	5	μA	

## AC OPERATING CONDITIONS

### TEST CONDITIONS (Test Load and Test Input/Output Reference)

- Input pulse level : 0.4 to 2.4V
- Input rising and falling time : 5ns
- Input and output reference voltage : 1.5V
- Output load (See right) :  $C_L=100\text{pF}+1\text{TTL}$   
 $C_L^{(1)}=30\text{pF}+1\text{TTL}$



1. Including scope and jig capacitance

1. Refer to AC CHARACTERISTICS

## AC CHARACTERISTICS

(KM62V256D Family:  $V_{CC}=3.0\sim 3.6\text{V}$ , KM62U256D Family:  $V_{CC}=2.7\sim 3.3\text{V}$   
 Commercial product :  $T_A=0$  to  $70^\circ\text{C}$ , Extended product :  $T_A=-25$  to  $85^\circ\text{C}$ , Industrial product :  $T_A=-40$  to  $85^\circ\text{C}$ )

Parameter List		Symbol	Speed Bins						Units
			70 <sup>1</sup> ns		85ns		100ns		
			Min	Max	Min	Max	Min	Max	
Read	Read cycle time	t <sub>RC</sub>	70	-	85	-	100	-	ns
	Address access time	t <sub>AA</sub>	-	70	-	85	-	100	ns
	Chip select to output	t <sub>CO</sub>	-	70	-	85	-	100	ns
	Output enable to valid output	t <sub>OE</sub>	-	35	-	40	-	50	ns
	Chip select to low-Z output	t <sub>LZ</sub>	10	-	10	-	10	-	ns
	Output enable to low-Z output	t <sub>OLZ</sub>	5	-	5	-	5	-	ns
	Chip disable to high-Z output	t <sub>HZ</sub>	0	30	0	30	0	35	ns
	Output disable to high-Z output	t <sub>OHZ</sub>	0	30	0	30	0	35	ns
	Output hold from address	t <sub>OH</sub>	5	-	10	-	15	-	ns
Write	Write cycle time	t <sub>WC</sub>	70	-	85	-	100	-	ns
	Chip select to end of write	t <sub>CW</sub>	60	-	70	-	80	-	ns
	Address set-up time	t <sub>AS</sub>	0	-	0	-	0	-	ns
	Address valid to end of write	t <sub>AW</sub>	60	-	70	-	80	-	ns
	Write pulse width	t <sub>WP</sub>	50	-	60	-	70	-	ns
	Write recovery time	t <sub>WR</sub>	0	-	0	-	0	-	ns
	Write to output high-Z	t <sub>WHZ</sub>	0	25	0	25	0	35	ns
	Data to write time overlap	t <sub>DW</sub>	30	-	35	-	40	-	ns
	Data hold from write time	t <sub>DH</sub>	0	-	0	-	0	-	ns
	End write to output low-Z	t <sub>OW</sub>	5	-	10	-	10	-	ns

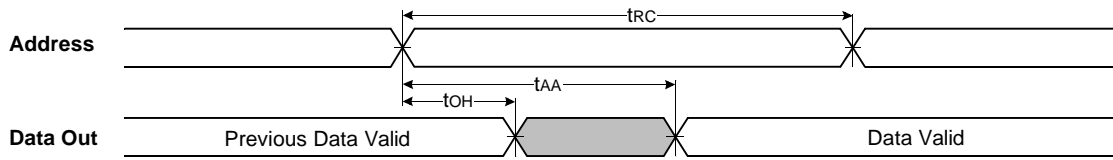
1. The parameter is measured with 30pF test load

## DATA RETENTION CHARACTERISTICS

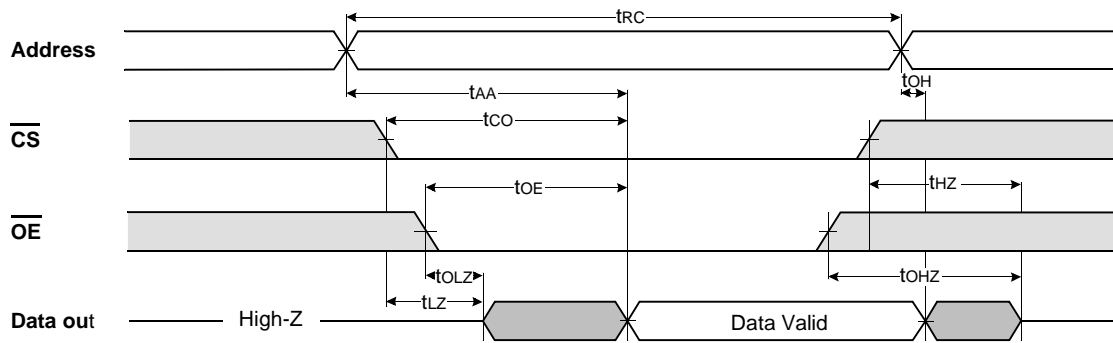
Item	Symbol	Test Condition	Min	Typ	Max	Unit
V <sub>CC</sub> for data retention	V <sub>DR</sub>	$\overline{CS} \geq V_{CC}-0.2\text{V}$	2.0	-	3.6	V
Data retention current	I <sub>DR</sub>	$V_{CC}=3.0\text{V}$ , $\overline{CS} \geq V_{CC}-0.2\text{V}$	-	-	5	μA
Data retention set-up time	t <sub>SDR</sub>	See data retention waveform	0	-	-	ms
Recovery time	t <sub>RDR</sub>		5	-	-	

TIMMING DIAGRAMS

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



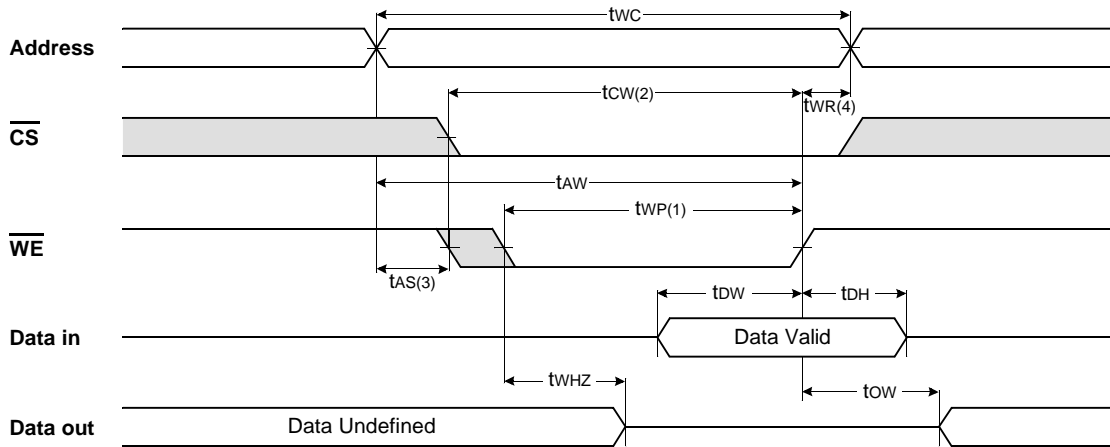
TIMING WAVEFORM OF READ CYCLE(2) ( $\overline{WE}=V_{IH}$ )



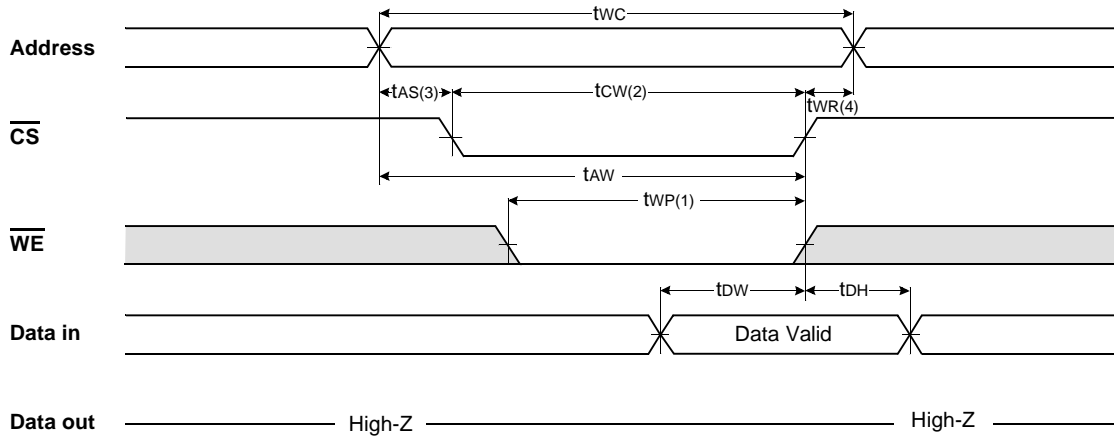
NOTES (READ CYCLE)

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) (WE Controlled)



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

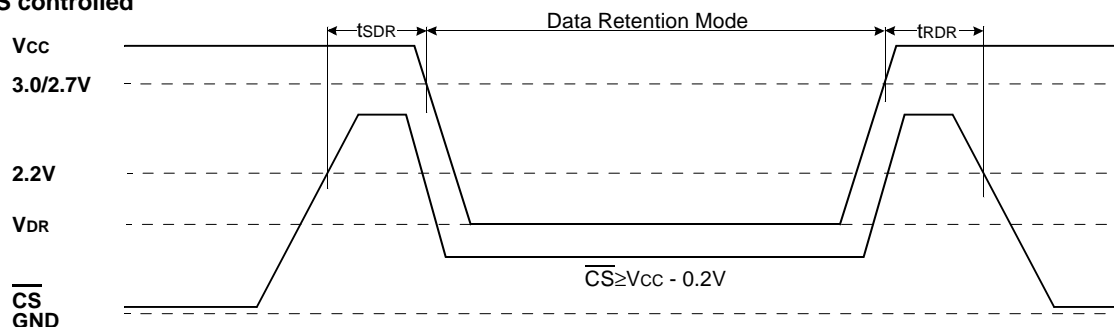


### NOTES (WRITE CYCLE)

1. A write occurs during the overlap of a low  $\overline{CS}$  and a low  $\overline{WE}$ . A write begins at the latest transition among  $\overline{CS}$  going Low and  $\overline{WE}$  going low : A write ends at the earliest transition among  $\overline{CS}$  going high and  $\overline{WE}$  going high,  $t_{WP}$  is measured from the beginning of write to the end of write.
2.  $t_{OW}$  is measured from the  $\overline{CS}$  going low to 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.  $t_{WR}$  applied in case a write ends as  $\overline{CS}$  or  $\overline{WE}$  going high.

## DATA RETENTION WAVE FORM

### $\overline{CS}$ controlled



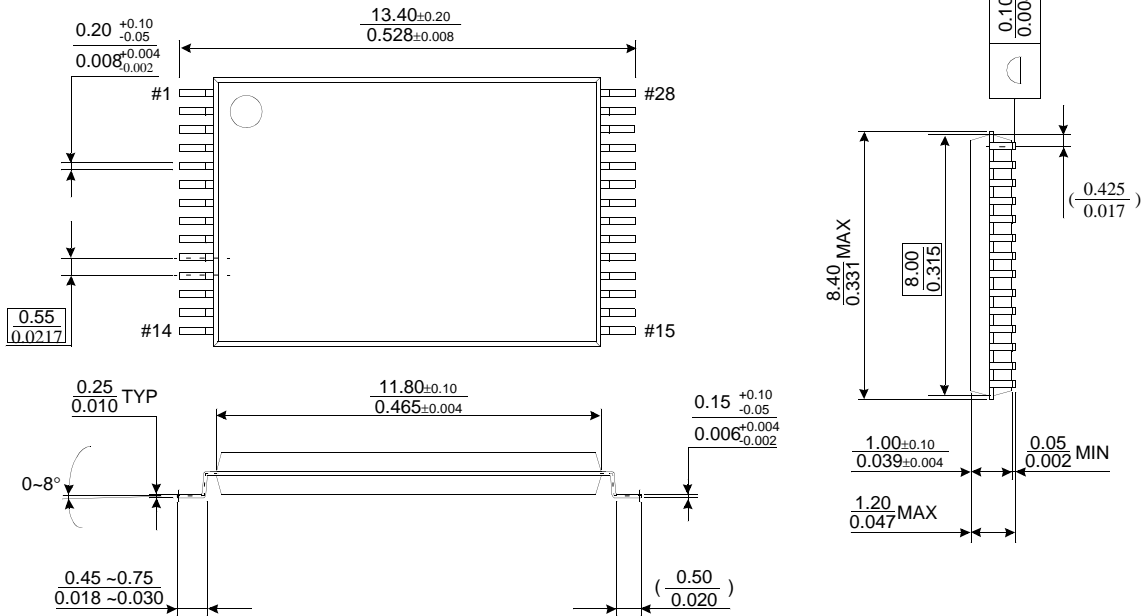




## PACKAGE DIMENSIONS

Units : millimeter(inch)

### 28 PIN THIN SMALL OUTLINE PACKAGE TYPE1 (0813.4F)



### 28 PIN THIN SMALL OUTLINE PACKAGE TYPE1 (0813.4R)

