

256Kx16 bit Low Power & Low Vcc CMOS Static RAM

FEATURE SUMMARY

- Process Technology : 0.4µm CMOS
- Organization : 256Kx16
- Power Supply Voltage
 - KM68V4000A Family : 3.3 ± 0.3V
 - KM68U4000A Family : 3.0 ± 0.3V
- Low Data Retention Voltage : 2V(Min)
- Three state output and TTL Compatible
- Package Type : JEDEC Standard
 - 44-TSOP(II)-Forward/Reverse

GENERAL DESCRIPTION

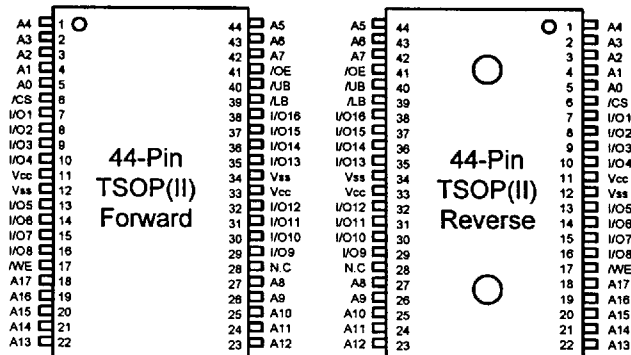
The KM616V4000B and KM616U4000B family are fabricated by SAMSUNG's advanced CMOS process technology. The family can support various operating temperature ranges and have various package types for user flexibility of system design. The family also support low data retention voltage for battery back-up operation with low data retention current.

PRODUCT FAMILY

Product List	Operating Temp.	Vcc Range	Speed (ns)	PKG Type	Power Dissipation	
					Standby (I _{sb1} , Max)	Operating (I _{cc2})
KM616V4000BL-L	Commercial(0~70°C)	3.0~3.6V	70*/85*/100	44-TSOP(II)-R/F	15µA	90mA
KM616V4000BLI-L	Industrial(-40~85°C)	3.0~3.6V	70*/85*/100	44-TSOP(II)-R/F	20µA	
KM616U4000BL-L	Commercial(0~70°C)	2.7~3.3V	70*/85*/100	44-TSOP(II)-R/F	15µA	
KM616U4000BLI-L	Industrial(-40~85°C)	2.7~3.3V	70*/85*/100	44-TSOP(II)-R/F	20µA	

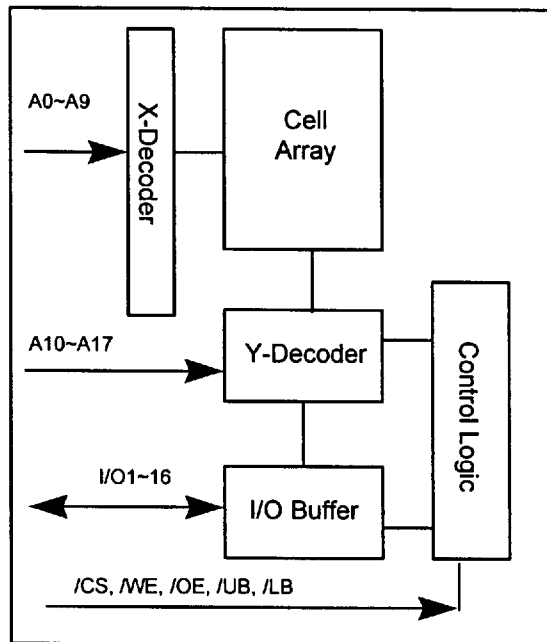
* measured with 30pF test load

PIN DESCRIPTION



Name	Function	Name	Function
A0~A17	Address Inputs	/LB	Lower Byte(I/O1~8)
/WE	Write Enable Input	/UB	Upper Byte(I/O9~16)
/CS	Chip Select Input	Vcc	Power
/OE	Output Enable Input	Vss	Ground
I/O1~I/O16	Data Input/Output	N.C	No Connection

FUNCTIONAL BLOCK DIAGRAM

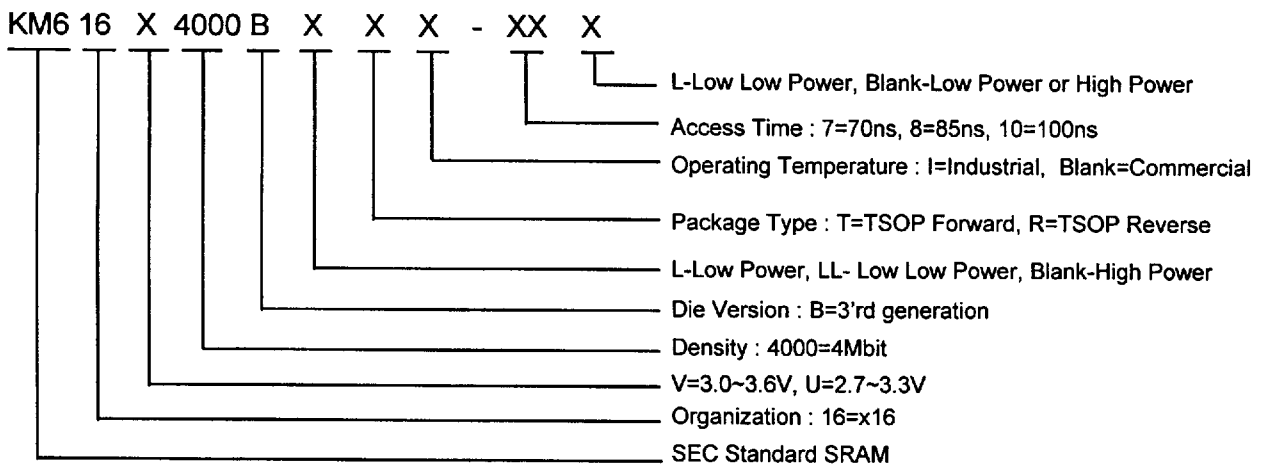


PRODUCT LIST & ORDERING INFORMATION

PRODUCT LIST

Commercial Temp Products (0~70°C)		Industrial Temp Products (-40~85°C)	
Part Name	Function	Part Name	Function
KM616V4000BLT-7L	44-TSOP (II) F, 70ns, 3.3V, LL	KM616V4000BLTI-7L	44-TSOP (II) F, 70ns, 3.3V, LL
KM616V4000BLT-8L	44-TSOP (II) F, 85ns, 3.3V, LL	KM616V4000BLTI-8L	44-TSOP (II) F, 85ns, 3.3V, LL
KM616V4000BLT-10L	44-TSOP (II) F, 100ns, 3.3V, LL	KM616V4000BLTI-10L	44-TSOP (II) F, 100ns, 3.3V, LL
KM616V4000BLR-7L	44-TSOP (II) R, 70ns, 3.3V, LL	KM616V4000BLRI-7L	44-TSOP (II) R, 70ns, 3.3V, LL
KM616V4000BLR-8L	44-TSOP (II) R, 85ns, 3.3V, LL	KM616V4000BLRI-8L	44-TSOP (II) R, 85ns, 3.3V, LL
KM616V4000BLR-10L	44-TSOP (II) R, 100ns, 3.3V, LL	KM616V4000BLRI-10L	44-TSOP (II) R, 100ns, 3.3V, LL
KM616U4000BLT-7L	44-TSOP (II) F, 70ns, 3.0V, LL	KM616U4000BLTI-7L	44-TSOP (II) F, 70ns, 3.0V, LL
KM616U4000BLT-8L	44-TSOP (II) F, 85ns, 3.0V, LL	KM616U4000BLTI-8L	44-TSOP (II) F, 85ns, 3.0V, LL
KM616U4000BLT-10L	44-TSOP (II) F, 100ns, 3.0V, LL	KM616U4000BLTI-10L	44-TSOP (II) F, 100ns, 3.0V, LL
KM616U4000BLR-7L	44-TSOP (II) R, 70ns, 3.0V, LL	KM616U4000BLRI-7L	44-TSOP (II) R, 70ns, 3.0V, LL
KM616U4000BLR-8L	44-TSOP (II) R, 85ns, 3.0V, LL	KM616U4000BLRI-8L	44-TSOP (II) R, 85ns, 3.0V, LL
KM616U4000BLR-10L	44-TSOP (II) R, 100ns, 3.0V, LL	KM616U4000BLRI-10L	44-TSOP (II) R, 100ns, 3.0V, LL

ORDERING INFORMATION



ABSOLUTE MAXIMUM RATINGS *

Item	Symbol	Ratings	Unit	Remark
Voltage on any pin relative to Vss	Vin, Vout	-0.5 to Vcc+0.5	V	-
Voltage on Vcc supply relative to Vss	Vcc	-0.3 to 4.6	V	-
Power Dissipation	Pd	0.7	W	-
Storage temperature	Tstg	-65 to 150	°C	-
Operating Temperature	Ta	0 to 70	°C	KM616V4000BL-L KM616U4000BL-L
		-40 to 85	°C	KM616V4000BLI-L KM616U4000BLI-L
Soldering temperature and time	Tsolder	260°C , 10sec (Lead Only)	-	-

* 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 at these or any other conditions above those indicated in the operating section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

RECOMMENDED DC OPERATING CONDITIONS*

Item	Symbol	Product	Min	Typ**	Max	Unit
Supply voltage	Vcc	KM616V4000B Family	3.0	3.3	3.6	V
		KM616U4000B Family	2.7	3.0	3.3	V
Ground	Vss	All Family	0	0	0	V
Input high voltage	Vih	KM616V4000B Family	2.2	-	Vcc+0.3	V
		KM616U4000B Family	2.2	-	Vcc+0.3	V
Input low voltage	Vil	KM616V4000B Family	-0.3***	-	0.4	V
		KM616U4000B Family	-0.3***	-	0.4	V

* 1) Commercial Product : Ta=0 to 70 °C unless otherwise specified

2) Industrial Product : Ta=-40 to 85°C unless otherwise specified

** Ta=25 °C

*** Vil(min)=-3.0V for • 80ns pulse width

CAPACITANCE * (f=1MHz, Ta=25°C)

Item	Symbol	Test Condition	Min	Max	Unit
Input capacitance	Cin	Vin=0V	-	8	pF
Input/Output capacitance	Cio	Vio=0V	-	10	pF

* Capacitance is sampled not 100% tested

DC AND OPERATING CHARACTERISTICS

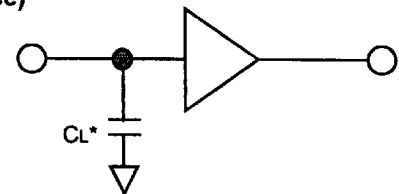
Item		Symbol	Test Conditions*	Min	Typ**	Max	Unit	
Input leakage current		I _{ii}	V _{in} =V _{ss} to V _{cc}	-1	-	1	μA	
Output leakage current		I _{lo}	/CS=V _{ih} or V _{il} V _{io} =V _{ss} to V _{cc}	-1	-	1	μA	
Operating power supply current Average operating current	I _{cc}	/CS=V _{il} , V _{in} =V _{ih} or V _{il} , I _{io} =0mA	Read	-	-	20	mA	
			Write	-	-	40		
	I _{cc1}	Cycle time=1μs 100% duty /CS= 0.2V, V _{ih} = 0.2V, V _{ih} = V _{cc} -0.2V, I _{io} =0mA	Read	-	-	20	mA	
			Write	-	-	40		
I _{cc2}		Min cycle, 100% duty /CS=V _{il} , I _{io} =0mA, V _{in} =V _{ih} or V _{il}	-	-	90	mA		
Output low voltage		V _{ol}	I _{ol} =2.1mA	-	-	0.4	V	
Output high voltage		V _{oh}	I _{oh} =-1.0mA	2.2	-	-	V	
Standby Current(TTL)		I _{sb}	/CS=V _{ih}	-	-	0.5	mA	
Standby Current (CMOS)	KM616V4000BL-L	I _{sb1}	/CS= V _{cc} -0.2V Others = 0~V _{cc}	Low Low Power	-	-	15	μA
	KM616V4000BLI-L			Low Low Power	-	-	20	μA
	KM616U4000BL-L			Low Low Power	-	-	15	μA
	KM616U4000BLI-L			Low Low Power	-	-	20	μA

* 1) Commercial Product : Ta=0 to 70°C, V_{cc}=3.3 ± 0.3V(616V4000BH Family), V_{cc}=3.0 ± 0.3V(616U4000B Family)
 2) Industrial Product : Ta=-40 to 85°C, V_{cc}=3.3 ± 0.3V(616V4000BI Family), V_{cc}=3.0 ± 0.3V(616U4000BI Family)
 ** Ta= 25°C

A.C CHARACTERISTICS

TEST CONDITIONS (1. Test Load and Test Input/Output Reference)*

Item	Value	Remark
Input pulse level	0.4 to 2.2V	-
Input rise fall time	5ns	-
Input and output reference voltage	1.5V	-
Output load(See right)	C _L =100pF+1TTL C _L =30pF+1TTL	-



* Including scope and jig capacitance

* See test condition of DC and Operating characteristics

TEST CONDITIONS (2. Temperature and Vcc Conditions)

Product Family	Temperature	Power Supply(Vcc)	Speed Bin	Comments
KM68V4000BL-L	0~70°C	3.3V ± 0.3	70*/85*/100ns	Commercial
KM68V4000BLI-L	-40~85°C	3.3V ± 0.3	70*/85*/100ns	Industrial
KM68U4000BL-L	0~70°C	3.0V ± 0.3	70*/85*/100ns	Commercial
KM68U4000BLI-L	-40~85 °C	3.0V ± 0.3	70*/85*100ns	Industrial

* All the parameters are measured with 30pF test load

PARAMETER LIST FOR EACH SPEED BIN

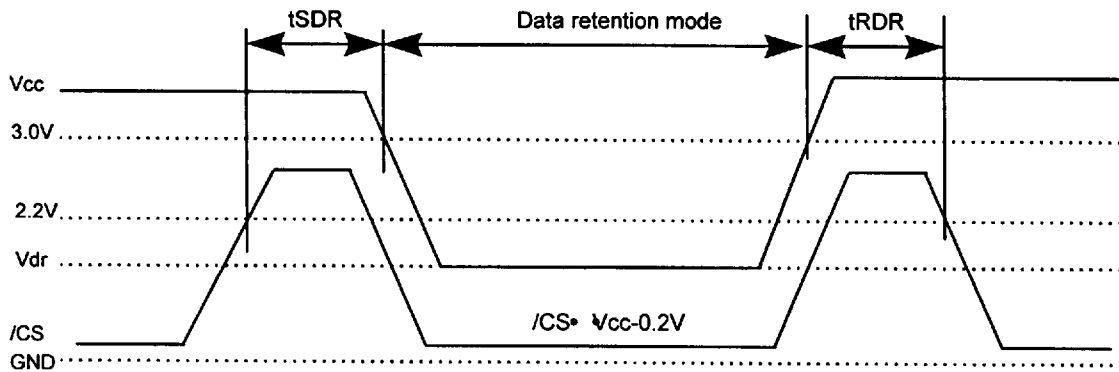
Parameter List		Symbol	Speed Bins						Units
			70ns		85ns		100ns		
			Min	Max	Min	Max	Min	Max	
Read	Read cycle time	tRC	70	-	85	-	100	-	ns
	Address access time	tAA	-	70	-	85	-	100	ns
	Chip select to output	tCO	-	70	-	85	-	100	ns
	Output enable to valid output	tOE	-	35	-	40	-	50	ns
	Chip select to low-Z output	tLZ	10	-	10	-	10	-	ns
	Output enable to low-Z output	tOLZ	5	-	5	-	5	-	ns
	Chip disable to high-Z output	tHZ	0	25	0	25	0	30	ns
	/OE disable to high-Z output	tOHZ	0	25	0	25	0	30	ns
	Output hold from address change	tOH	10	-	10	-	15	-	ns
/LB,/UB valid to data output	tBA	-	35	-	40	-	50	ns	
Write	/UB,LB disable to high-Z output	tBHZ	0	25	0	25	0	30	ns
	Write cycle time	tWC	70	-	85	-	100	-	ns
	Chip select to end of write	tCW	60	-	70	-	80	-	ns
	Address set-up time	tAS	0	-	0	-	0	-	ns
	Address valid to end of write	tAW	60	-	70	-	80	-	ns
	Write pulse width	tWP	55	-	55	-	70	-	ns
	Write recovery time	tWR	0	-	0	-	0	-	ns
	Write to output high-Z	tWHZ	0	25	0	25	0	30	ns
	Data to write time overlap	tDW	30	-	35	-	40	-	ns
	Data hold from write time	tDH	0	-	0	-	0	-	ns
	End write to output low-Z	tOW	5	-	5	-	5	-	ns
/LB,/UB valid to end of write	tBW	60	-	70	-	80	-	ns	

DATA RETENTION CHARACTERISTICS

Item	Symbol	Test Condition*	Min	Typ**	Max	Unit	
Vcc for data retention	Vdr	/CS• Vcc-0.2V	2.0	-	3.6	V	
Data retention current	Idr	Vcc=3.0V	LL-Ver	-	0.5	15	μA
			LL-Ver	-	-	20	
		/CS• Vcc-0.2V	LL-Ver	-	0.5	15	
			LL-Ver	-	-	20	
Data retention set-up time	tSDR	See data retention waveform	0	-	-	ms	
Recovery time	tRDR		5	-	-		

* 1) Commercial Product : Ta=0 to 70°C, unless otherwise specified
 2) Industrial Product : Ta=-40 to 85°C, unless otherwise specified
 ** Ta=25°C

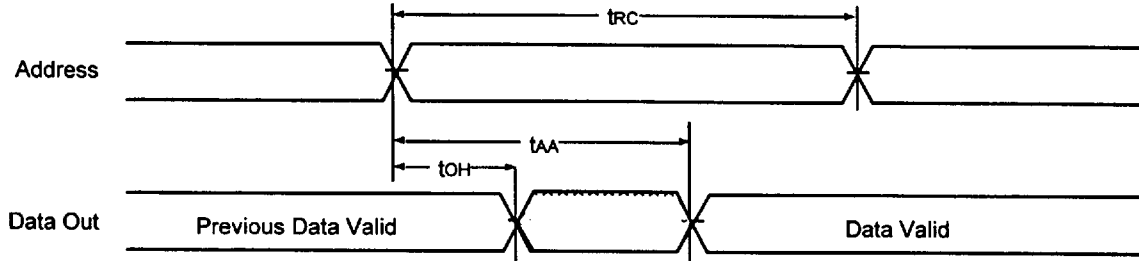
DATA RETENTION TIMING DIAGRAM



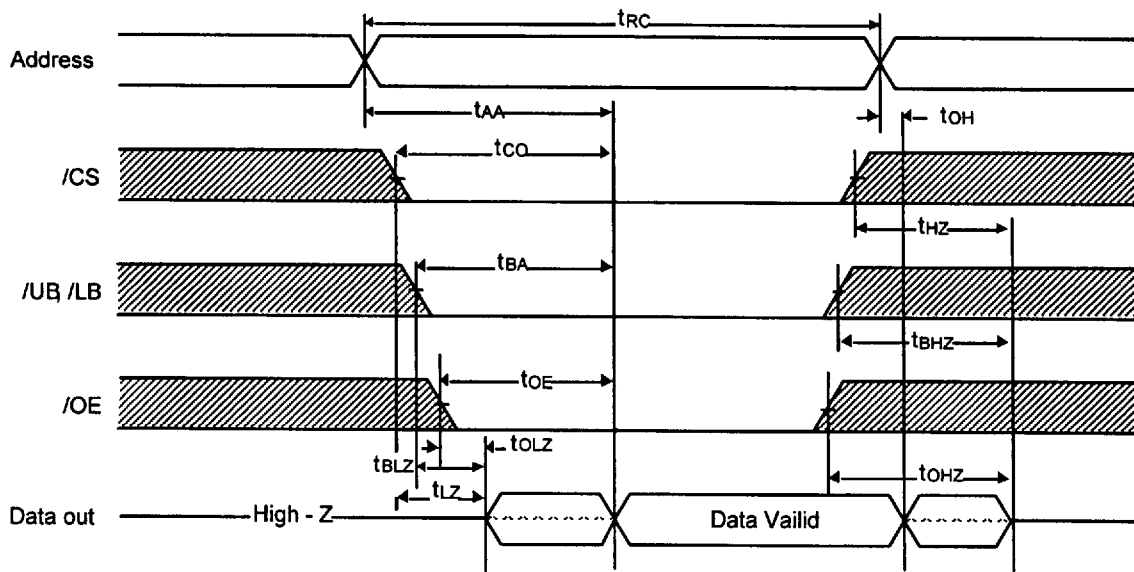
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TIMING DIAGRAMS

TIMING WAVEFORM OF READ CYCLE (1) (Address Controlled)
 (/CS=/OE=Vil, /WE=Vih, /UB or, and /LB=Vil)



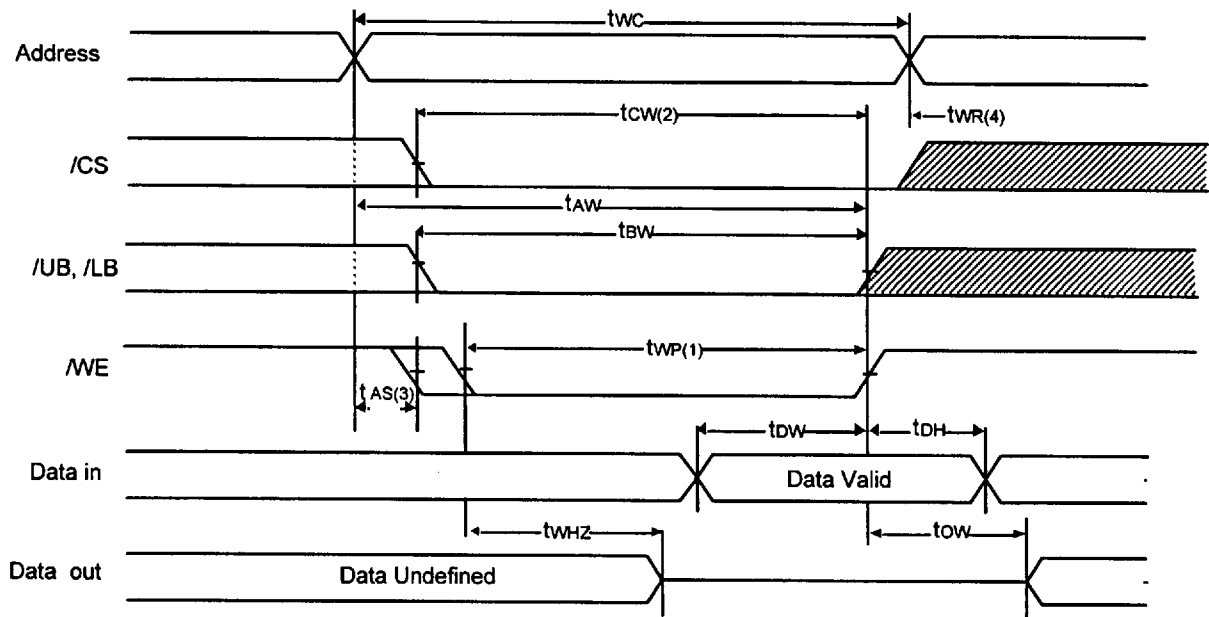
TIMING WAVEFORM OF READ CYCLE (/WE= Vih)



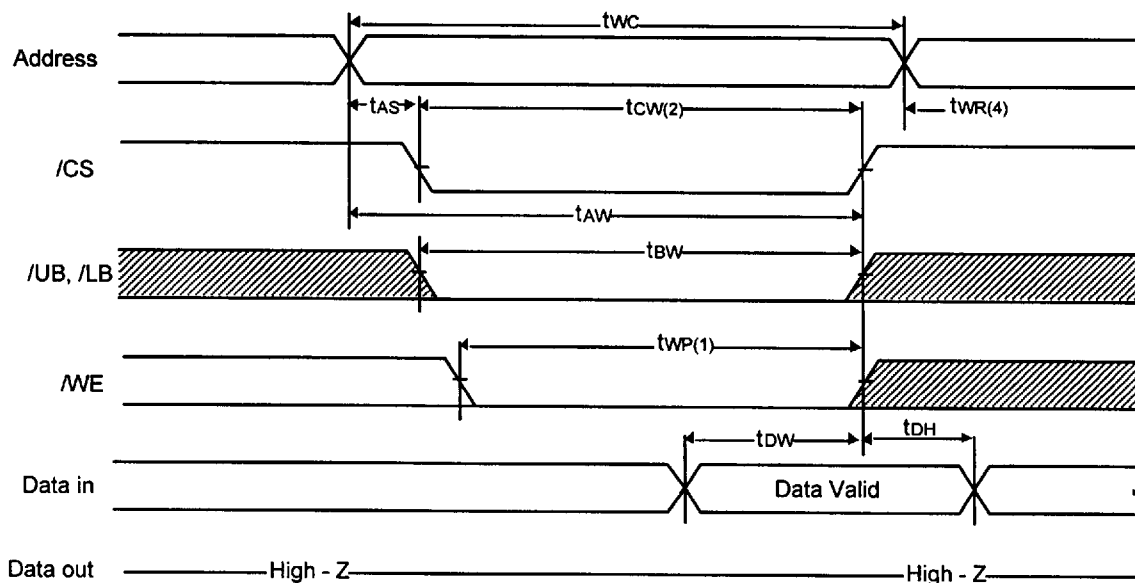
Notes (READ CYCLE)

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, $t_{HZ}(\max.)$ is less than $t_{LZ}(\min.)$ both for a given device and from device to device.

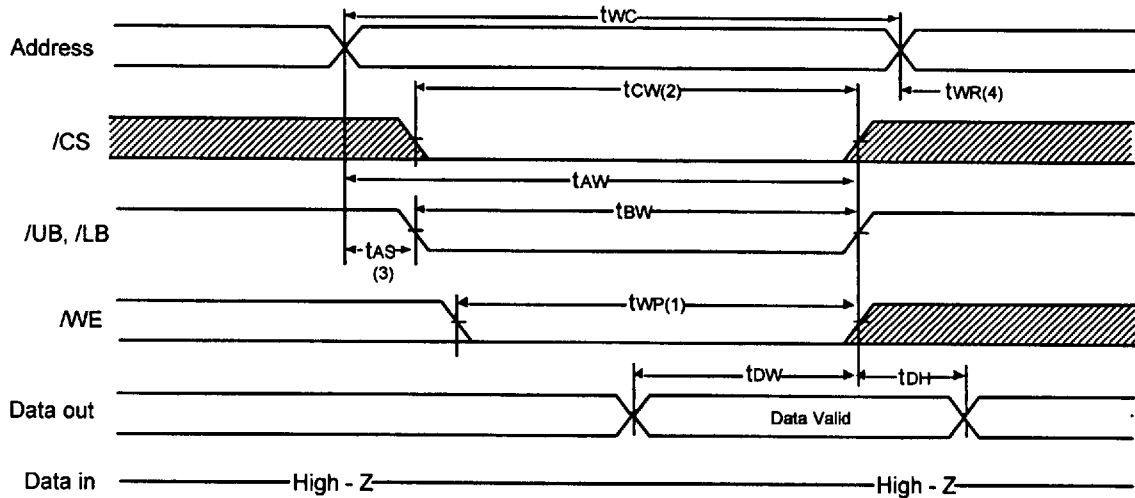
TIMING WAVE FORM OF WRITE CYCLE (WE Controlled)



TIMING WAVE FORM OF WRITE CYCLE (/CS Controlled)



TIMING WAVEFORM OF WRITE CYCLE (/UB,/LB Controlled)



Notes (WRITE CYCLE)

1. A write occurs during the overlap(t_{WP}) of a low /CS and low /WE. A write begins when /CS goes low and /WE goes low with asserting /UB or /LB for single byte operation or simultaneous asserting /UB and /LB for double byte operation. A write ends at the earliest transition when /CS goes high and /WE goes high. The t_{WP} is measured from the beginning of write to the end of write.
2. t_{CW} is measured from the /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 /CS, or /WE going high.

FUNCTIONAL DESCRIPTION

/CS	/LB	/UB	/WE	/OE	Mode	I/O1~8	I/O 9~16	Current Mode
H	X	X	X	X	Not Select	High-Z	High-Z	I _{sb1}
L	X	X	H	H	Output	High-Z	High-Z	I _{cc}
L	H	H	X	X	Disable	High-Z	High-Z	
L	L	H	H	L	Read	Dout	High-Z	I _{cc}
	H	L				Dout	Dout	
	L	L				Dout	Dout	
L	L	H	L	X	Write	Din	High	I _{cc}
	H	L				High-Z	Din	
	L	L				Din	Din	

* X means don't care(Must be in low or high state)

PACKAGE DIMENSION

44 PIN THIN SMALL OUTLINE PACKAGE TYPE II
(400mil, Forward and Reverse)

Unit : Millimeters (Inches)

