LG Semicon Co.,Ltd.

GM76FV8128,GM76FU8128,GM76FS8128,GM76FR8128
131,072 WORDS x 8 BIT
CMOS STATIC RAM

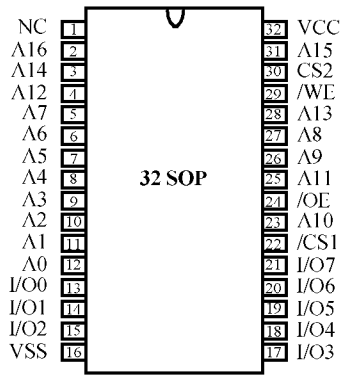
Description

The GM76FV8128 / GM76FU8128 / GM76FS8128 / GM76FS8128 is a 1,048,576 bits static random access memory organized as 131,072 words by 8 bits. Using a 0.35μm advanced Full CMOS technology and it provides high speed operation with minimum cycle time of 70/85ns. The device is placed in a low power standby mode with /CS1 high or CS2 low and the output enable (/OE) allows fast memory access. Thus it is suitable for high speed and low super power applications, especially where battery back-up is required.

Features

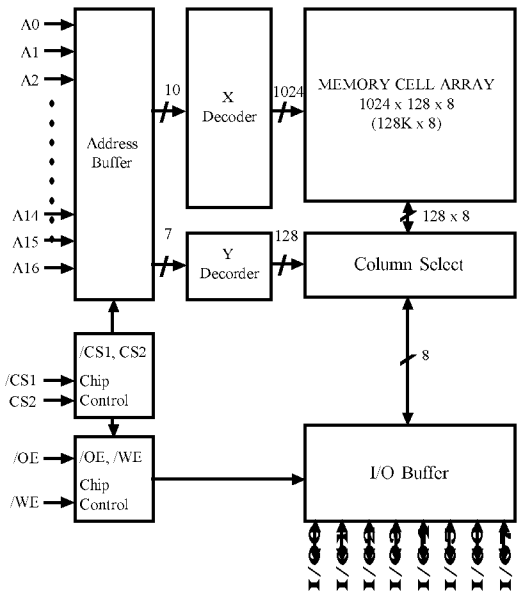
- Fast Speed : 70/85ns
- Power Supply /Speed
  GM76FV8128 : 3.3V±0.3V / 70/85ns
  GM76FU8128 : 3.0V±0.3V / 70/85ns
  GM76FS8128 : 2.5V±0.2V / 100/120ns
  GM76FR8128 : 2.0V±0.2V / 150/200ns
- Low Power Standby
  5uA(LL) / 1uA(SL)
- Completely Static RAM : No Clock or Timing Strobe Required
- Equal Access and Cycle Time
- TTL compatible inputs and outputs
- Capability of Battery Back-up Operation
- Standard 32DIP,SOP and TSOP-I,STSOP-I
- Temperature Range
  Commercial(0 ~ 70℃)
  Industrial (-40 ~ 85℃)

Pin Configuration



(Top View)

Block Diagram



Pin Description

Pin	Function
A0-A16	Address Inputs
/WE	Write Enable Input
/CS1, CS2	Chip Select Input
/OE	Output Enable Input
I/O0-I/O7	Data Inputs/Outputs
Vcc	Power Supply (1.8V ~3.3V)
Vss	Ground
NC	No Connection

Absolute Maximum Ratings*

Symbol	Parameter		Rating	Unit
T_A	Ambient Temperature under Bias	GM76FV8128 GM76FU8128 GM76FR8128 GM76FS8128	0 ~ 70	℃
		GM76FV8128-I GM76FU8128-I GM76FR8128-I GM76FS8128-I	-40 ~ 85	℃
T_{STG}	Storage Temperature		-55 ~ 150	℃
T_{SOL}	Soldering Temperature and Time		260, 5 (at lead)	℃, S
V_{CC}	Supply Voltage		-0.2 ~ 4.6V	V
V_{IN}	Input Voltage		-0.2 ~ 3.9V	V
$V_{I/O}$	Input and Output Voltage		-0.2 ~ 3.9V	V

*: 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 sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Recommended DC Operating Conditions (T_A = - 40 ~ 85℃)

Symbol	Parameter	Product	Min	Typ	Max	Unit
V_{CC}	Supply Voltage	GM76FV8128-(I) GM76FU8128-(I) GM76FS8128-(I) GM76FR8128-(I)	3.0 2.7 2.2 1.8	3.3 3.0 2.5 2.0	3.6 3.3 2.8 2.2	V
V_{IH}	Input High Voltage	GM76FV8128-(I) GM76FU8128-(I) GM76FS8128-(I) GM76FR8128-(I)	2.2 2.2 2.0 1.6	-	V_{CC} + 0.2	V
V_{IL}	Input Low Voltage	Family	-0.2*	-	0.4	V

*Note : V_{IL}(min) = -1.5V for ≤ 30ns pulse

Truth Table

/CS1	CS2	/OE	/WE	A0 to A16	DATA I/O	MODE
L	H	L	H	Stable	Output Data	Read
L	H	X	L	Stable	Input Data	Write
L	H	H	H	Stable	Hi-Z	Output Disable
H	X	X	X	-	Hi-Z	Standby
X	L	X	X	-	Hi-Z	

*Note: X means don't care

Capacitance (f = 1MHz, T_A = 25℃)

Symbol	Parameter	Test Conditions	Min	Max	Unit
C_{IN}	Input Capacitance	V_I = 0V	-	6	pF
$C_{I/O}$	Output Capacitance	V_O = 0V	-	8	pF

*Note: This parameter is sampled and not 100% tested.

AC Operating Characteristics

Test Conditions (T_A = - 40 ~ 85℃, unless otherwise noted.)

Parameter	Value
Input Pulse Level	0.4 to 2.2V for Vcc=3.3V,3.0V,2.5V 0.4 to 1.8V for Vcc=2.0V
Input Rise and Fall Time	5ns
Input and Output Timing Reference Levels	1.5V for Vcc=3.3V,3.0V 1.1V for Vcc=2.5V 0.9V for Vcc=2.0V
Output Load	C_L = 30 pF + 1TTL Load

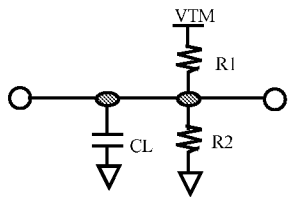
DC and Operating Characteristics (T_A = - 40 ~ 85℃)

Symbol	Parameter	Conditions		Min	*Typ	Max	Unit
$I_{I(L)}$	Input Leakage Current	V_{IN} = Vss to V_{CC}		-1	-	1	uA
$I_{O(L)}$	Output Leakage Current	/CS1 = V_{IH} or CS2 = V_{IL} /OE = V_{IH}, Vss ≤ V_{OUT} ≤ V_{CC}		-1	-	1	uA
V_{OH}	High Level Output Voltage	I_{OH}	-1.0mA at Vcc=3.0/3.3V -0.5mA at Vcc=2.5V -0.44mA at Vcc=2.0V	2.4 2.0 1.6	-	-	V
V_{OL}	Low Level Output Voltage	I_{OL}	2.1mA at Vcc=3.0/3.3V 0.5mA at Vcc=2.5V 0.33mA at Vcc=2.0V	-	-	0.4	V
I_{CC}	Operating Supply Current	/CS1 = V_{IL} and CS2 = V_{IH} V_{IN} = V_{IH}/V_{IL}, I_{OUT} = 0mA		-	-	5.0	mA
I_{CC1}	Average Operating Current	/CS1=V_{IL},CS2=V_{IH} V_{IN} = V_{IH} or V_{IL} I_{OUT} = 0mA tcycle = Min	Vcc=3.0/3.3V Vcc=2.5V Vcc=2.0V	-	-	50 30 15	mA
I_{CC2}		/CS1=0.2V,CS2= V_{CC} -0.2V V_{IN} = V_{CC} - 0.2V/0.2V I_{OUT} = 0mA tcycle = 1*u*s		-	-	10	mA
I_{CCS1}	Standby Current (TTL)	/CS1 = V_{IH} CS2 = V_{IL}	Vcc=3.0/3.3V Vcc=2.5/2.0	-	-	0.5 0.3	mA
I_{CCS2}	Standby Current(CMOS)	/CS1=V_{CC}-0.2V CS2=0.2V	LL - Version SL - Version	- -	- -	5 1	uA

*Typ. Values are measured at 25℃

AC Test Load Conditions.

1. Including scope and jig capacitance
2. R1=3070Ω , R2=3150Ω
3. VTM=2.8V Vcc=3.0V/3.3V
   VTM=2.3V Vcc=2.5V
   VTM=1.8V Vcc=2.0V
4. CL=30pF + 1TTL
   5pF + 1TTL(For tCLZ1,tCLZ2,tOLZ,tCHZ1 tCHZ2,tOHZ,tWHZ,tOW)



AC Operating Characteristics (V_{CC} = 3.3V±0.3V, 3.3V±0.3V, T_A = -40~85℃)

Read Cycle

Symbol	Parameter	GM76FV8128-70 GM76FU8128-70		GM76FV8128-85 GM76FU8128-85		Unit
		Min	Max	Min	Max	
t_{RC}	Read Cycle Time	70	-	85	-	ns
t_{AA}	Address Access Time	-	70	-	85	ns
t_{ACS1}	Chip Select 1 Access Time	-	70	-	85	ns
t_{ACS2}	Chip Select 2 Access Time	-	70	-	85	ns
t_{OE}	Output Enable Access Time	-	35	-	45	ns
t_{CLZ1}	Chip Select 1 Output Setup Time	5	-	10	-	ns
t_{CHZ1}	Chip Select 1 Output Floating	-	25	-	30	ns
t_{CLZ2}	Chip Select 2 Output Setup Time	5	-	10	-	ns
t_{CHZ2}	Chip Select 2 Output Floating	-	25	-	30	ns
t_{OLZ}	Output Enable Output Setup Time	0	-	0	-	ns
t_{OHZ}	Output Enable Output Floating	-	25	-	30	ns
t_{OH}	Output Hold Time	10	-	10	-	ns

Write Cycle

Symbol	Parameter	GM76FV8128-70 GM76FU8128-70		GM76FV8128-85 GM76FU8128-85		Unit
		Min	Max	Min	Max	
t_{WC}	Write Cycle Time	70	-	85	-	ns
t_{CW1}	Chip Select Time 1	65	-	75	-	ns
t_{CW2}	Chip Select Time 2	65	-	75	-	ns
t_{AW}	Address Enable Time	60	-	70	-	ns
t_{AS}	Address Setup Time	0	-	0	-	ns
t_{WP}	Write Pulse Width	50	-	60	-	ns
t_{WR}	Write Recovery Time	0	-	0	-	ns
t_{DW}	Input Data Setup Time	30	-	35	-	ns
t_{DH}	Input Data Hold Time	0	-	0	-	ns
t_{WHZ}	Write to Output in High-Z	-	25	-	30	ns
t_{OW}	Output Active from End of Write	0	-	0	-	ns

AC Operating Characteristics (V_{CC} = 2.5V ± 0.2V, T_A = -40 ~ 85℃)

Read Cycle

Symbol	Parameter	GM76FS8128-10		GM76FS8128-12		Unit
		Min	Max	Min	Max	
t_{RC}	Read Cycle Time	100	-	120	-	ns
t_{AA}	Address Access Time	-	100	-	120	ns
t_{ACS1}	Chip Select 1 Access Time	-	100	-	120	ns
t_{ACS2}	Chip Select 2 Access Time	-	100	-	120	ns
t_{OE}	Output Enable Access Time	-	50	-	60	ns
t_{CLZ1}	Chip Select 1 Output Setup Time	10	-	10	-	ns
t_{CHZ1}	Chip Select 1 Output Floating	-	35	-	40	ns
t_{CLZ2}	Chip Select 2 Output Setup Time	10	-	10	-	ns
t_{CHZ2}	Chip Select 2 Output Floating	-	35	-	40	ns
t_{OLZ}	Output Enable Output Setup Time	0	-	0	-	ns
t_{OHZ}	Output Enable Output Floating	-	35	-	40	ns
t_{OH}	Output Hold Time	15	-	15	-	ns

Write Cycle

Symbol	Parameter	GM76FS8128-10		GM76FS8128-12		Unit
		Min	Max	Min	Max	
t_{WC}	Write Cycle Time	100	-	120	-	ns
t_{CW1}	Chip Select Time 1	80	-	100	-	ns
t_{CW2}	Chip Select Time 2	80	-	100	-	ns
t_{AW}	Address Enable Time	80	-	100	-	ns
t_{AS}	Address Setup Time	0	-	0	-	ns
t_{WP}	Write Pulse Width	70	-	80	-	ns
t_{WR}	Write Recovery Time	0	-	0	-	ns
t_{DW}	Input Data Setup Time	40	-	50	-	ns
t_{DH}	Input Data Hold Time	0	-	0	-	ns
t_{WHZ}	Write to Output in High-Z	-	30	-	35	ns
t_{OW}	Output Active from End of Write	5	-	5	-	ns

AC Operating Characteristics (V_{CC} = 2.0V ± 0.2V, T_A = -40 ~ 85℃)

Read Cycle

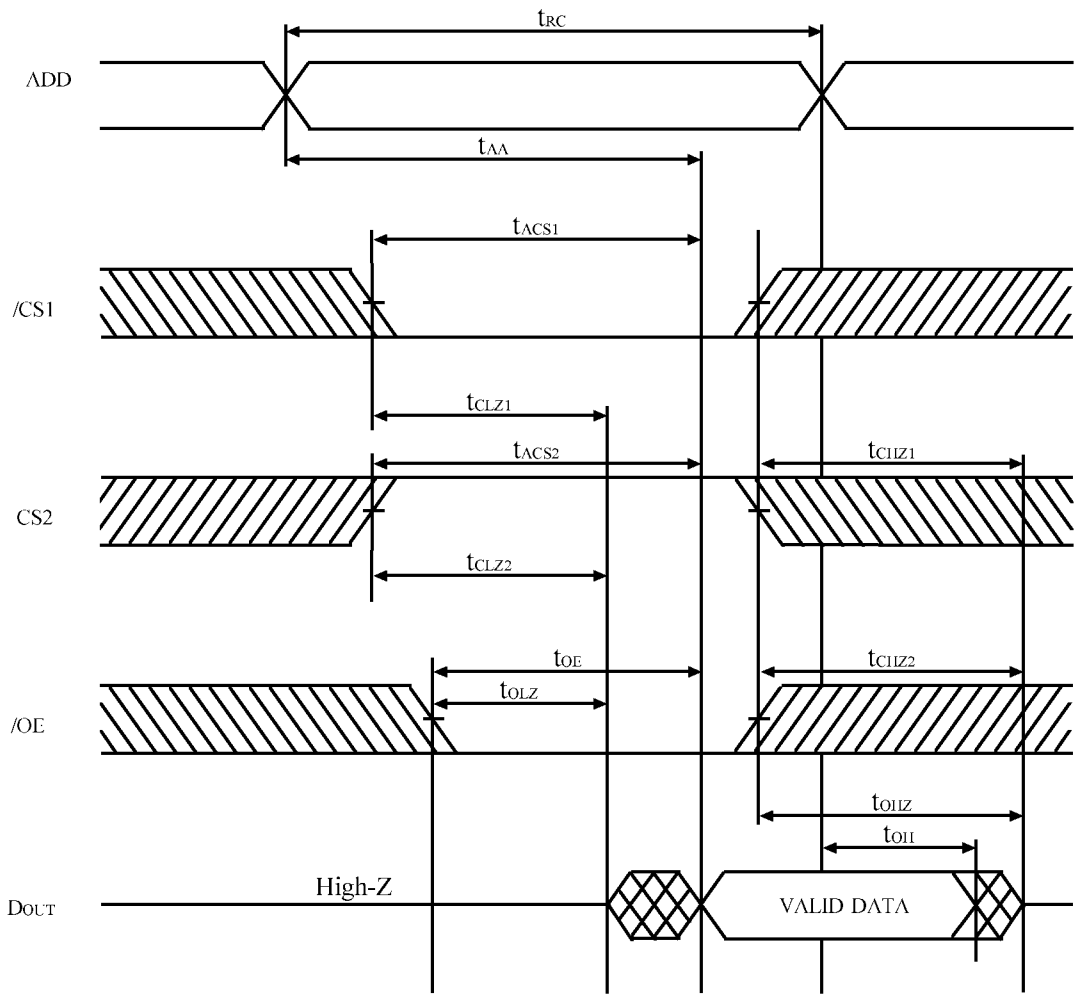
Symbol	Parameter	GM76FR8128-15		GM76FR8128-20		Unit
		Min	Max	Min	Max	
t_{RC}	Read Cycle Time	150	-	200	-	ns
t_{AA}	Address Access Time	-	150	-	200	ns
t_{ACS1}	Chip Select 1 Access Time	-	150	-	200	ns
t_{ACS2}	Chip Select 2 Access Time	-	150	-	200	ns
t_{OE}	Output Enable Access Time	-	70	-	80	ns
t_{CLZ1}	Chip Select 1 Output Setup Time	15	-	15	-	ns
t_{CHZ1}	Chip Select 1 Output Floating	-	40	-	45	ns
t_{CLZ2}	Chip Select 2 Output Setup Time	15	-	15	-	ns
t_{CHZ2}	Chip Select 2 Output Floating	-	40	-	45	ns
t_{OLZ}	Output Enable Output Setup Time	0	-	0	-	ns
t_{OHZ}	Output Enable Output Floating	-	40	-	45	ns
t_{OH}	Output Hold Time	15	-	15	-	ns

Write Cycle

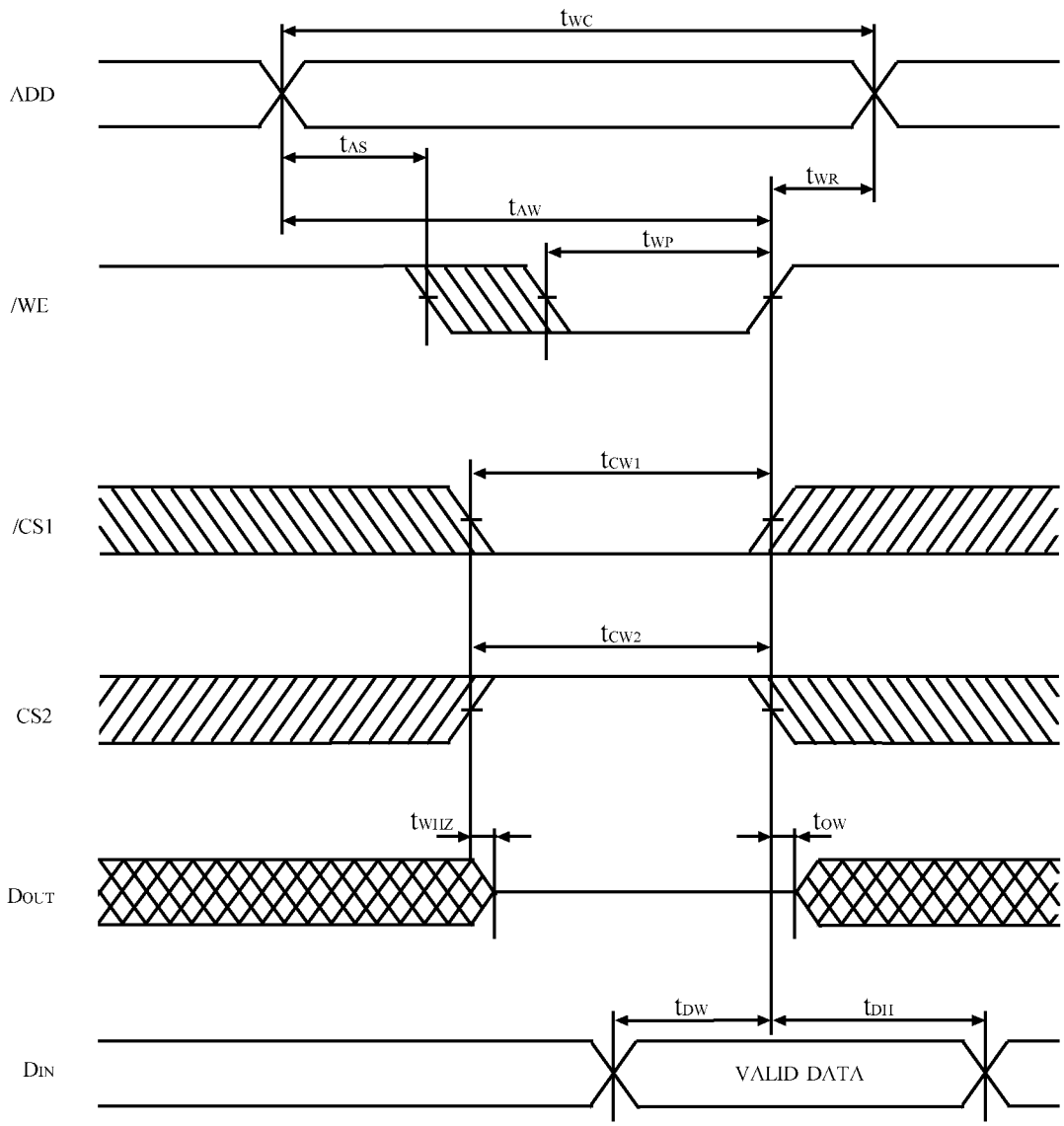
Symbol	Parameter	GM76FR8128-15		GM76FR8128-20		Unit
		Min	Max	Min	Max	
t_{WC}	Write Cycle Time	150	-	200	-	ns
t_{CW1}	Chip Select Time 1	120	-	150	-	ns
t_{CW2}	Chip Select Time 2	120	-	150	-	ns
t_{AW}	Address Enable Time	120	-	150	-	ns
t_{AS}	Address Setup Time	0	-	0	-	ns
t_{WP}	Write Pulse Width	100	-	120	-	ns
t_{WR}	Write Recovery Time	0	-	0	-	ns
t_{DW}	Input Data Setup Time	60	-	80	-	ns
t_{DH}	Input Data Hold Time	0	-	0	-	ns
t_{WHZ}	Write to Output in High-Z	-	35	-	40	ns
t_{OW}	Output Active from End of Write	10	-	10	-	ns

Timing Waveforms

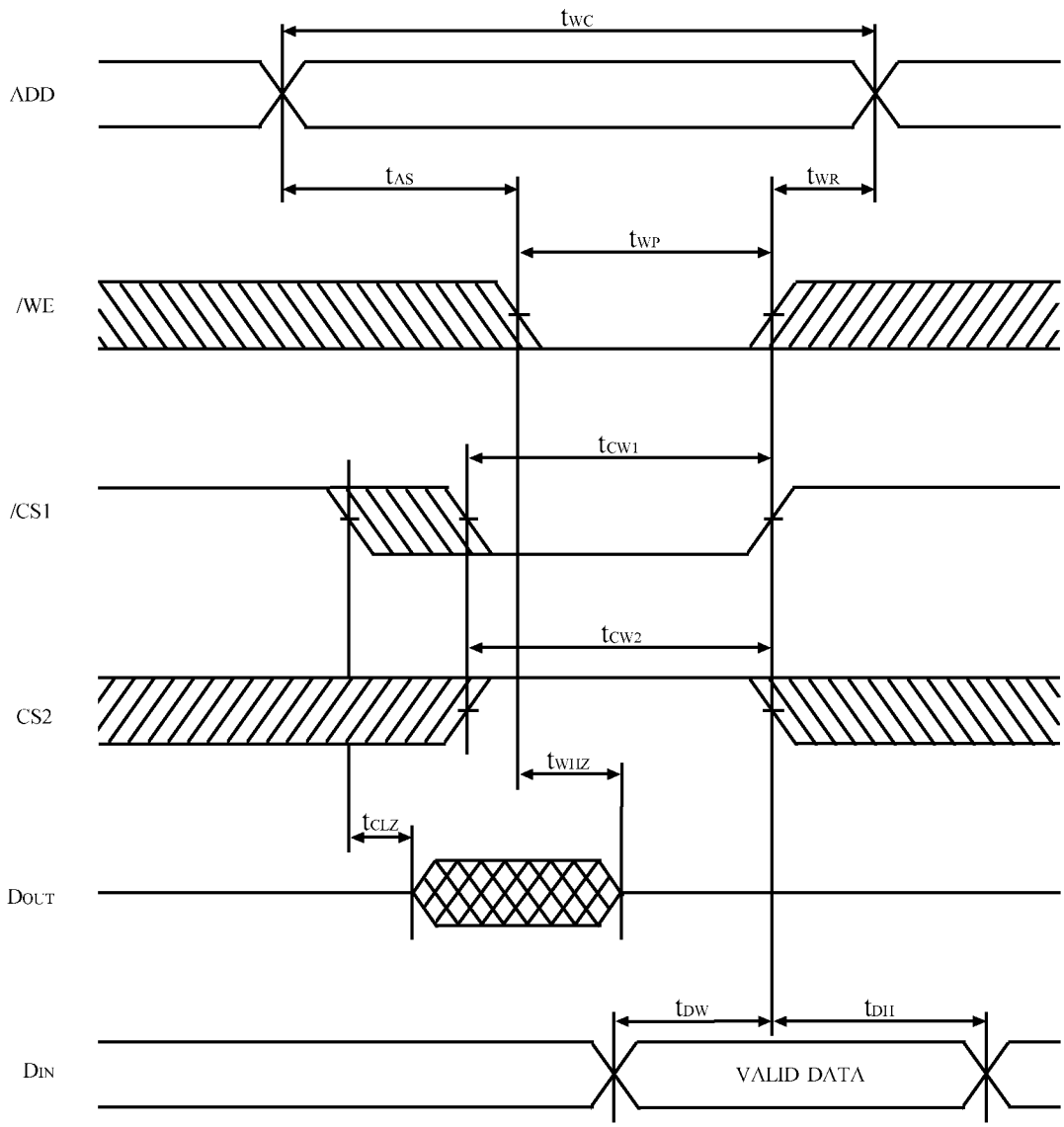
Read Cycle (Note 1)



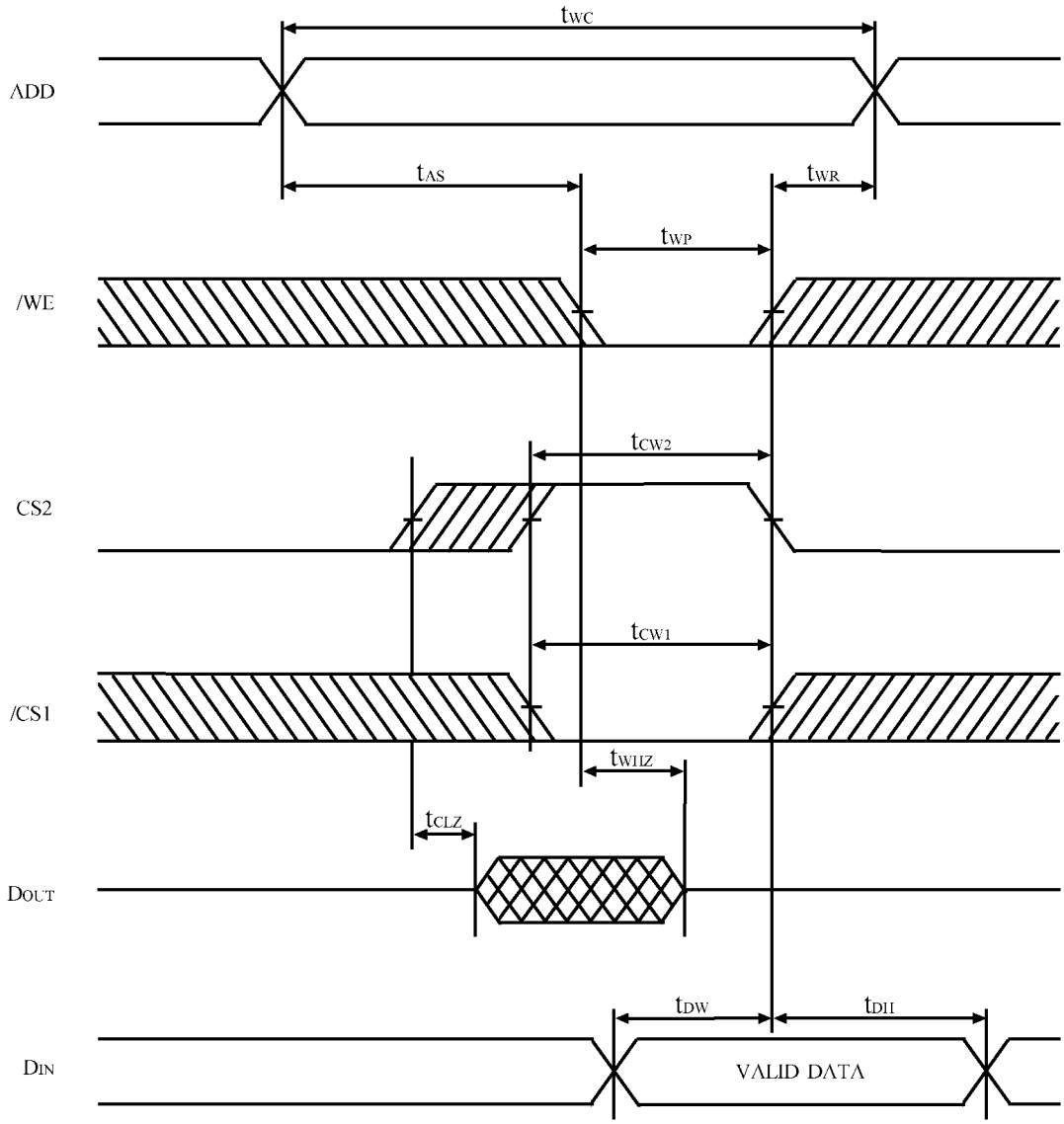
Write Cycle (1) (/WE Controlled) (Notes 2, 3, 4)



Write Cycle (2) (/CS1 Controlled) (Notes 4)



Write Cycle (3) (CS2 Controlled) (Notes 4)

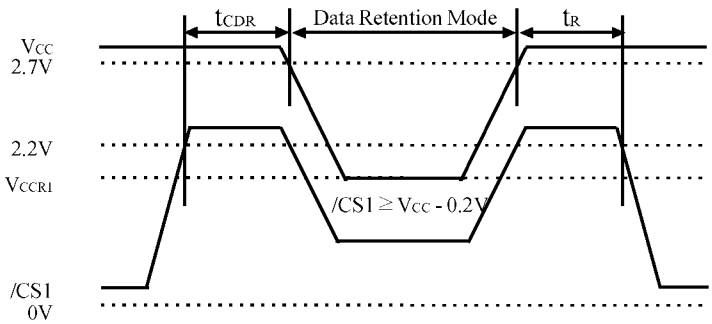


Notes:
1. /WE is High for Read Cycle.
2. Assuming that /CS1 Low transition or CS2 High transition occurs coincident with or after /WE Low transition. Outputs remain in a high impedance state.
3. Assuming that /CS1 High transition or CS2 Low transition occurs coincident with or prior to /WE High transition. Outputs remain in a high impedance state.
4. Assuming that /OE is high for write cycle. Outputs are in a high impedance state during this period.

Data Retention Characteristics

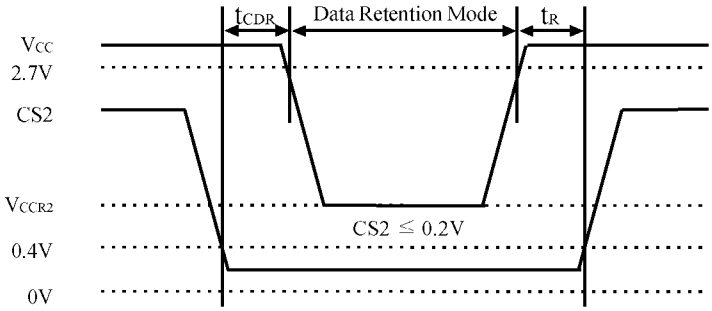
Symbol	Parameter		Min	Typ	Max	Unit
V_{CCR}	Data Retention Supply Voltage		1.5	-	3.6	V
I_{CCR}	Data Retention Current	LL- Version SL - Version	- -		5 1	*u*A
t_{CDR}	Chip Select to Data Retention Time		0	-	-	ms
t_R	Operation Recovery Time		5	-	-	ms

• **Low V_{CC} Data Retention Mode:** (1) /CS1 Controlled



/CS1 ≥ V_{CC} -0.2V,
CS2 ≤ 0.2V or ≥ V_{CC} -0.2V

• **Low V_{CC} Data Retention Mode:** (2) CS2 Controlled

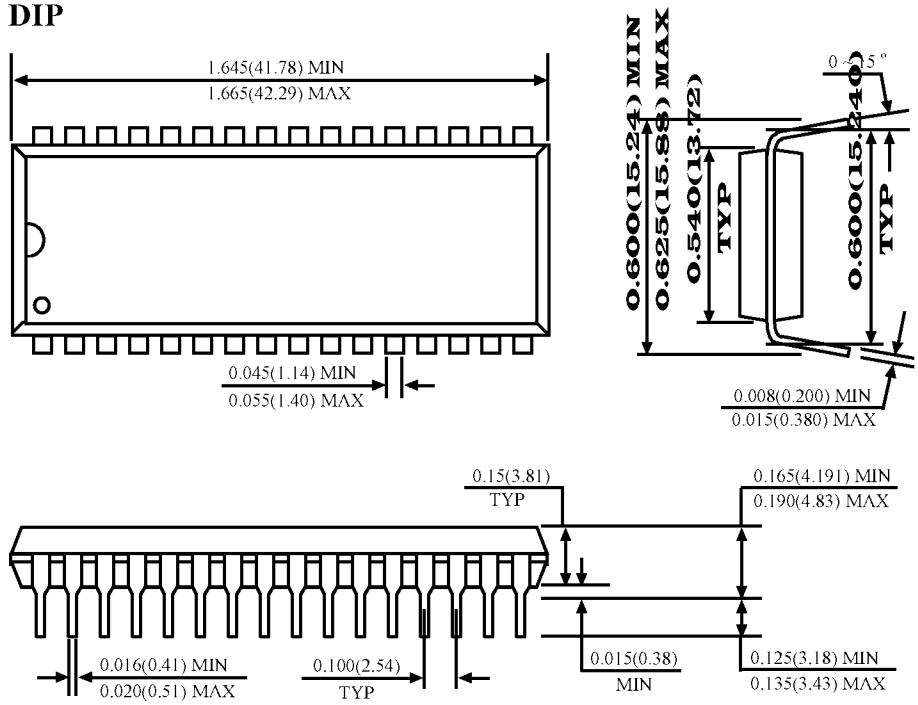


Notes: In Data Retention Mode, CS2 controls the Address, /WE, /CS1, /OE and D_{IN} buffer. If CS2 controls data retention mode, V_{IN} for these inputs can be in the high impedance state. If /CS1 controls the data retention mode, CS2 must satisfy either CS2 ≥V_{CC} - 0.2V or CS2≤0.2V. The other input levels (Address, /WE, /OE, I/O) can be in the high impedance state.

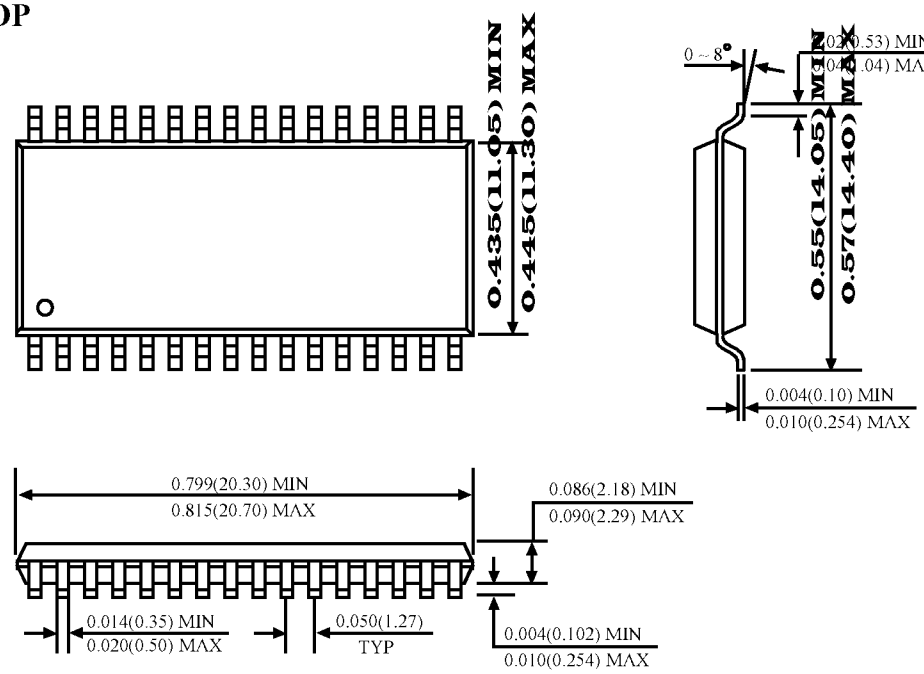
Package Dimensions

Unit: Inches (mm)

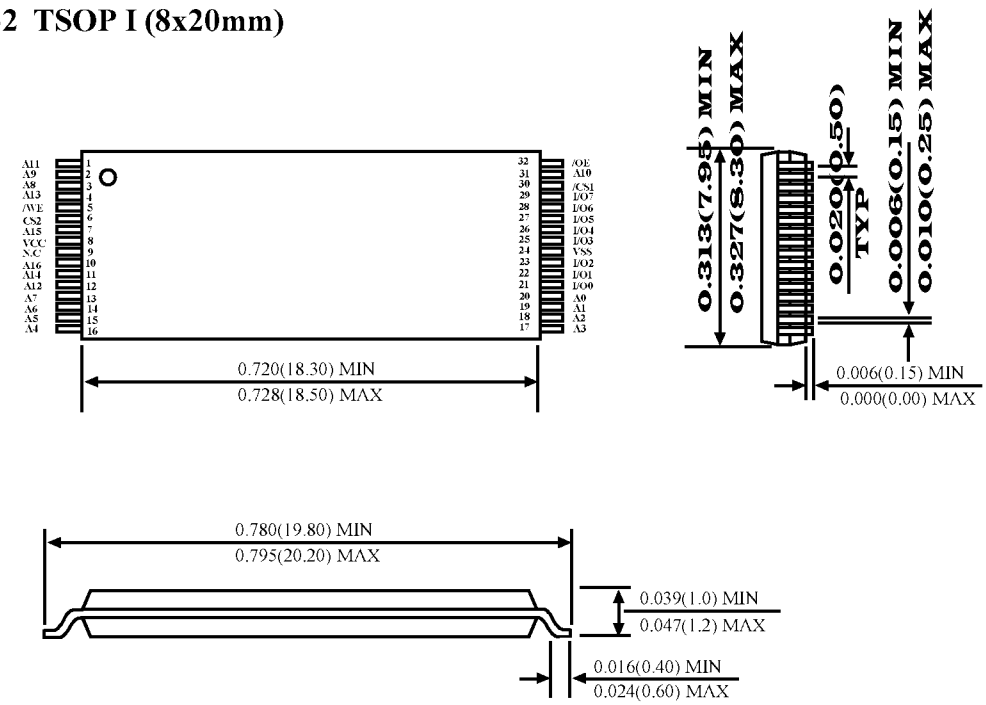
32 DIP



32 SOP



32 TSOP I (8x20mm)



32Small TSOP-I(8x13.4mm)