SRM20256L10/12

CMOS 256K-BIT STATIC RAM

■DESCRIPTION

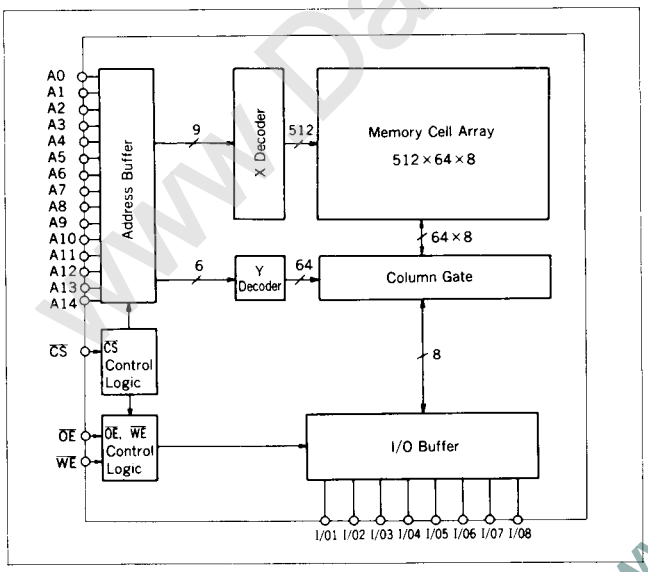
The SRM20256L10/12 is a 32,768 words x 8 bits asynchronous, static, random access memory fabricated using an advanced CMOS technology. Its very low standby power requirement makes it ideal for applications requiring non-volatile storage with back-up batteries. The asynchronous and static nature of the memory requires no external clock or refresh circuit. Input and output ports are TTL compatible and the three-state output allows easy expansion of memory capacity.

■FEATURES

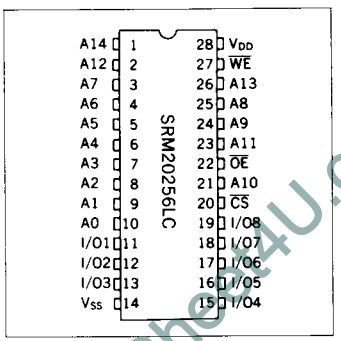
- Fast access time ..... SRM20256L10 100ns (Max)
  SRM20256L12 120ns (Max)
- Low supply current ..... Standby : 2μA (Typ)
  Operation: 13mA/1MHz (Typ)

- Completely static ..... No clock required
- Single power supply ..... 5V ± 10%
- TTL compatible inputs and outputs
- 3-state output
- Battery back-up operation
- Package ..... SRM20256LC10/12 28-pin DIP(plastic)
  SRM20256LM10/12 28-pin SOP (plastic)
  SRM20256LS10/12 28-pin Shrink DIP (plastic)
  SRM20256L10/12 28-pin TSOP (plastic)

■BLOCK DIAGRAM



■PIN CONFIGURATION



■PIN DESCRIPTION

A0 to A14	Address Input
WE	Write Enable
OE	Output Enable
CS	Chip Select
I/O1 to 8	Data Input/Output
VDD	Power Supply (+5V)
VSS	Power Supply (0V)

■ABSOLUTE MAXIMUM RATINGS

(V_{SS}=0V)

Parameter	Symbol	Ratings	Unit
Supply voltage	V_{DD}	−0.5 to 7.0	V
Input voltage	V_I	−0.5* to 7.0	V
Input/Output voltage	$V_{I/O}$	−0.5* to V_{DD}+0.3	V
Power dissipation	P_D	1.0	W
Operating temperature	T_{opr}	0 to 70	°C
Storage temperature	T_{stg}	−65 to 150	°C
Soldering temperature and time	T_{sol}	260°C, 10s (Lead only)	—

*V_I, $V_{I/O}$(Min)=−1.0V when pulse width is less or equal to 50ns

■DC RECOMMENDED OPERATING CONDITIONS

(V_{SS}=0V, Ta=0 to 70°C)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply voltage	V_{DD}		4.5	5.0	5.5	V
	V_{SS}		0	0	0	V
Input voltage	V_{IH}		2.2	3.5	V_{DD}+0.3	V
	V_{IL}		−0.3*	0	0.8	V

*V_{IL}(Min)=−1.0V when pulse width is less or equal to 50ns

■ELECTRICAL CHARACTERISTICS

●DC Electrical Characteristics

(V_{DD}=5V±10%, V_{SS}=0V, Ta=0 to 70°C)

Parameter	Symbol	Conditions	SRM20256LC10			SRM20256LC12			Unit
			Min	Typ*	Max	Min	Typ*	Max	
Input leakage	I_{LI}	V_I=0 to V_{DD}	−1	—	1	−1	—	1	μA
Standby supply current	I_{DDS}	$\overline{CS}=V_{IH}$	—	1.5	3.0	—	1.5	3.0	mA
	I_{DDS1}	$\overline{CS}\geq V_{DD}-0.2V$	—	2	100	—	2	100	μA
Average operating current	I_{DDA}	$V_I=V_{IL}, V_{IH}$ $I_{I/O}$=0mA t_{cyc}=Min	—	40	70	—	37	70	mA
	I_{DDA1}	$V_I=V_{IL}, V_{IH}$ $I_{I/O}$=0mA t_{cyc}=1μs	—	13	—	—	13	—	mA
Operating supply current	I_{DDO}	$V_I=V_{IL}, V_{IH}$ $I_{I/O}$=0mA	—	35	65	—	35	65	mA
Output leakage	I_{LO}	$\overline{CS}=V_{IH}$ or $\overline{WE}=V_{IL}$ or $\overline{OE}=V_{IH}$ $V_{I/O}$=0 to V_{DD}	−1	—	1	−1	—	1	μA
High level output voltage	V_{OH}	I_{OH}=−1.0mA	2.4	V_{DD}−0.1	—	2.4	V_{DD}−0.1	—	V
Low level output voltage	V_{OL}	I_{OL}=2.1mA	—	0.2	0.4	—	0.2	0.4	V

*Typical values are measured at Ta=25°C and V_{DD}=5.0V

●Terminal Capacitance

(f=1MHz, Ta=25°C)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Address Capacitance	C_{ADD}	V_{ADD}=0V	—	—	10	pF
Input Capacitance	C_I	V_I=0V	—	—	10	pF
I/O Capacitance	$C_{I/O}$	$V_{I/O}$=0V	—	—	10	pF

●AC Electrical Characteristics

○Read Cycle

(V_{DD}=5V±10%, V_{SS}=0V, Ta=0 to 70°C)

Parameter	Symbol	Conditions	SRM20256LC10		SRM20256LC12		Unit
			Min	Max	Min	Max	
Read cycle time	t_{RC}	*1	100	—	120	—	ns
Address access time	t_{ACC}		—	100	—	120	ns
$\overline{CS}$ access time	t_{ACS}		—	100	—	120	ns
$\overline{OE}$ access time	t_{OE}		—	50	—	60	ns
$\overline{CS}$ output set time	t_{CLZ}	*2	10	—	10	—	ns
$\overline{CS}$ output floating	t_{CHZ}		—	35	—	40	ns
$\overline{OE}$ output set time	t_{OLZ}		5	—	5	—	ns
$\overline{OE}$ output floating	t_{OHZ}		—	35	—	40	ns
Output hold time	t_{OH}	*1	10	—	10	—	ns

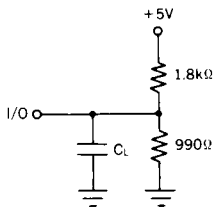
○ Write Cycle

(V_{DD} = 5V ± 10%, V_{SS} = 0V, Ta = 0 to 70°C)

Parameter	Symbol	Conditions	SRM20256LC10		SRM20256LC12		Unit
			Min	Max	Min	Max	
Write cycle time	t_{WC}	*1	100	—	120	—	ns
Chip select time	t_{CW}		80	—	85	—	ns
Address valid to end of write	t_{AW}		80	—	85	—	ns
Address setup time	t_{AS}		0	—	0	—	ns
Write pulse width	t_{WP}		75	—	80	—	ns
Address hold time	t_{WR}		0	—	0	—	ns
Input data set time	t_{DW}		45	—	50	—	ns
Input data hold time	t_{DH}		0	—	0	—	ns
Write to Output floating	t_{WHZ}	*2	—	35	—	40	ns
Output Active from end of write	t_{OW}		10	—	10	—	ns

*1 Test Conditions

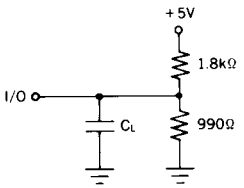
1. Input pulse level : 0.6V to 2.4V
2. tr = tf = 5ns
3. Input and output timing reference levels : 1.5V
4. Output load C_L = 100pF



C_L = 100pF (Includes Jig Capacitance)

*2 Test Conditions

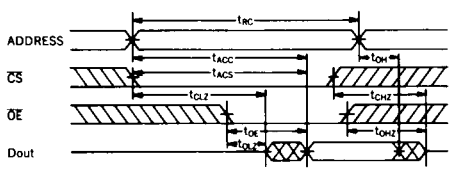
1. Input pulse level : 0.6V to 2.4V
2. tr = tf = 5ns
3. Input timing reference levels : 1.5V
4. Output timing reference levels : ±200mV (the level displaced from stable output voltage level)
5. Output load C_L = 5pF



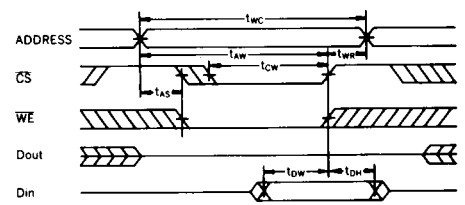
C_L = 5pF (Includes Jig Capacitance)

● Timing Chart

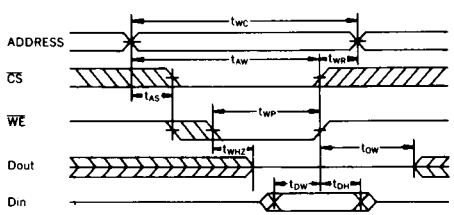
○ Read Cycle



○ Write Cycle ($\overline{CS}$ Control)



○ Write Cycle (2) ($\overline{WE}$ Control)



Note :

1. During read cycle time, $\overline{WE}$ is to be "H" level.
2. During write cycle time that is controlled by $\overline{CS}$, Output Buffer is in high impedance state, whether $\overline{OE}$ level is "H" or "L".
3. During write cycle time that is controlled by $\overline{WE}$, Output Buffer is in high impedance state if $\overline{OE}$ is "H" level.

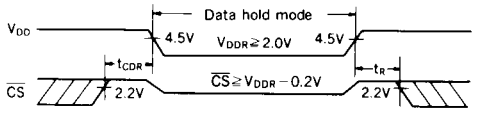
■DATA RETENTION CHARACTERISTIC WITH LOW VOLTAGE POWER SUPPLY

(V_{SS}=0V, Ta=0 to 70°C)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Data retention supply voltage	V_{DDR}		2.0	—	5.5	V
Data retention current	I_{DDR}	V_{DD}=3V, $\overline{CS} \geq V_{DDR}-0.2V$	—	1	50	μA
Chip select data hold time	t_{CDR}		0	—	—	ns
Operation recovery time	t_R		t_{RC}*	—	—	ns

*t_{RC}=Read cycle time

Data retention timing



■FUNCTIONS

●Truth Table

$\overline{CS}$	$\overline{OE}$	$\overline{WE}$	A0 to A14	DATA I/O	Mode	I_{DD}
H	—	—	—	Hi—Z	Standby	I_{DDS}, I_{DDS1}
L	X	L	Stable	D_{IN}	Write	I_{DDA}, I_{DDA1}
L	L	H	Stable	D_{OUT}	Read	I_{DDA}, I_{DDA1}
L	H	H	Stable	Hi—Z	Output disable	I_{DDA}, I_{DDA1}

●Read Mode

The Data appear when the address is setted while holding $\overline{CS}$="L", $\overline{OE}$="L" and $\overline{WE}$="H". When $\overline{OE}$="H", Data I/O terminals are in high impedance state, that makes circuit design and bus control easy.

●Write Mode

There are the following 3 ways of writing data into memory.

(1) Hold $\overline{CS}$="L" and $\overline{WE}$="L", set address.

(2) Hold $\overline{CS}$="L" then set address and give "L" pulse to $\overline{WE}$.

(3) After setting addresses, give "L" pulse to both $\overline{CS}$ and $\overline{WE}$.

In above any case data on the DATA I/O terminals are latched up into the SRM20256L10/12 when $\overline{CS}$ or $\overline{WE}$ is in positive-going. Since DATA I/O terminals are high impedance when $\overline{CS}$ or $\overline{OE}$="H", bus contention between data driver and memory outputs can be avoided.

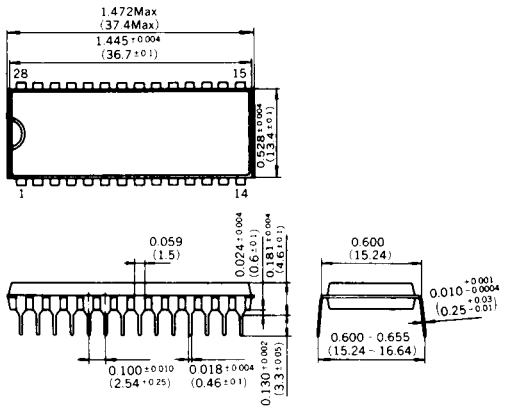
●Standby Mode

When $\overline{CS}$ is "H" the SRM20256L10/12 become in the stand-by mode. In this mode, data I/O terminals are Hi-Z, and all inputs of addresses, $\overline{WE}$ and data can be any "H" or "L". When $\overline{CS}$ is over than V_{DD}−0.2V, the SRM20256L10/12 is in the data retention battery back-up mode, in this case, there is a small current in the SRM20256L10/12 which flow through the high resistances of the memory cells.

■PACKAGE DIMENSIONS

C28

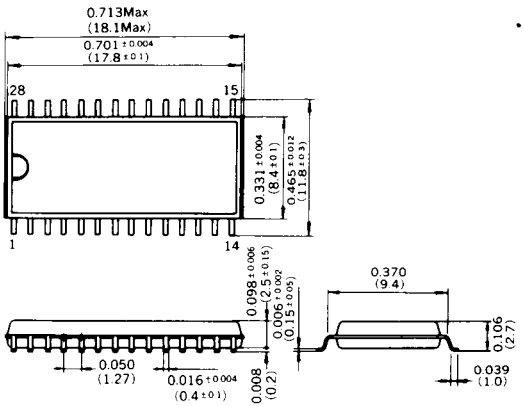
28-pin DIP



unit : inch
(mm)

M28-2 *1

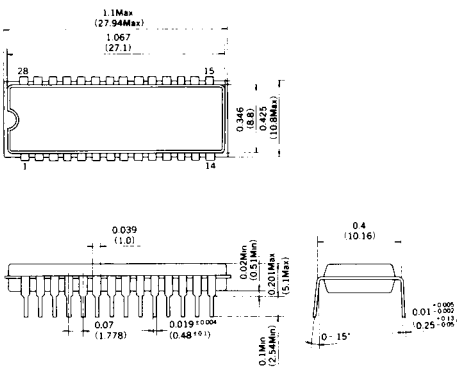
28-pin SOP



unit : inch
(mm)

S28 *2

28-pin Shrink DIP

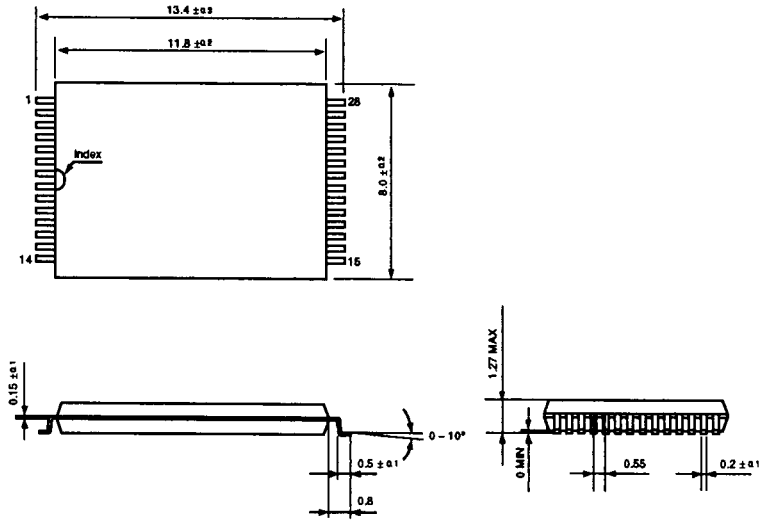


unit : inch
(mm)

*1 Represents SRM20256LM10/12 that has the same electrical characteristics as SRM20256LC10/12.
*2 Represents SRM20256LS10/12 that has the same electrical characteristics as SRM20256LC10/12.

PACKAGE DIMENSIONS

28-pin TSOP



■CHARACTERISTICS CURVES