

SRM2016_{10/12}

CMOS 16K-BIT STATIC RAM

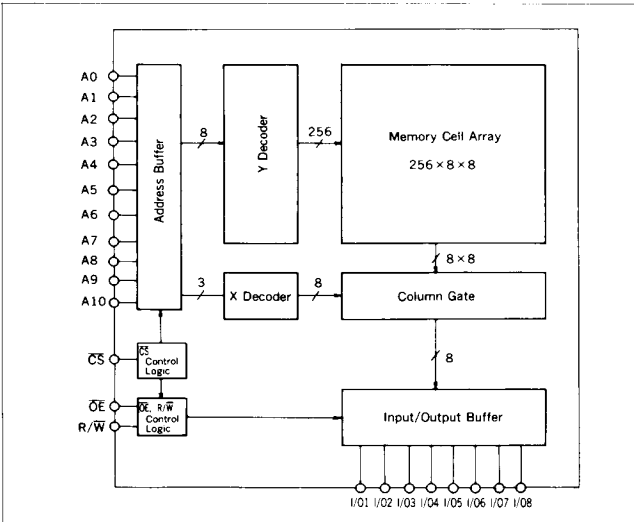
DESCRIPTION

The SRM2016_{10/12} is a 2,048 words x 8 bits asynchronous, static, random access memory on a monolithic CMOS chip. 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 refreshing circuit. Both the input and output ports are TTL compatible and the three-state output allows easy expansion of memory capacity.

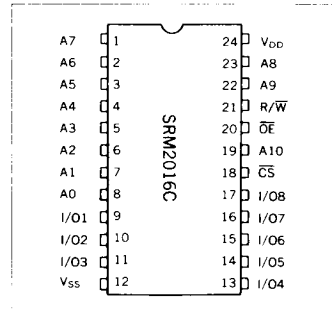
FEATURES

- Access time SRM2016₁₀ 100ns (Max)
SRM2016₁₂ 120ns (Max)
- Low supply current Standby : 1 μ A (Typ)
Operation: SRM2016₁₀ 30mA (Typ)
SRM2016₁₂ 25mA (Typ)
- Completely static operation
- Single power supply .. 5V \pm 10%
- TTL compatible inputs and outputs
- 3-state output with wired-OR capability
- Non-volatile storage with back-up batteries
- Package SRM2016C_{10/12} 24-pin DIP (plastic)
SRM2016M_{10/12} 24-pin SOP (plastic)
SRM2016N_{10/12} 24-pin Skinny DIP (plastic)

BLOCK DIAGRAM



PIN CONFIGURATION



PIN DESCRIPTION

A0 to A10	Address Input
R/W	Read/Write
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 temp. & time	T _{sol}	260°C, 10s (at lead)	—

*V_I, V_{I/O} = -1.0V when pulse width is 50 ns

■ RECOMMENDED OPERATING CONDITIONS

(T_a = 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*	—	0.8	V

*V_{IL}(Min) = -1.0V when pulse width is 50ns

■ ELECTRICAL CHARACTERISTICS

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

● DC Electrical Characteristics

Parameter	Symbol	Conditions	SRM201610			SRM201612			Unit
			Min	Typ*	Max	Min	Typ*	Max	
Input leakage current	I _{LI}	V _{DD} = 5.5V, V _I = 0 to V _{DD}	-1	—	1	-1	—	1	μA
Output leakage current	I _{LO}	CS = V _{IH} , or OE = V _{IH} , V _{I/O} = 0 to V _{DD}	-1	—	1	-1	—	1	μA
Operating supply current	I _{DD0}	CS = V _{IL} , I _{I/O} = 0mA	—	30	60	—	25	50	mA
	I _{DD01}	V _{IH} = 3.5V, V _{IL} = 0.6V, I _{I/O} = 0mA	—	16	—	—	16	—	mA
Average operating current	I _{DDA}	Min. cycle, duty = 100%, I _{I/O} = 0mA	—	30	60	—	25	50	mA
Standby supply current	I _{DDS}	CS = V _{IH}	—	1.5	3.0	—	1.5	3.0	mA
	I _{DDS1}	CS = V _{DD} - 0.2V	—	1	50	—	1	50	μA
Output voltage	V _{OL}	I _{OL} = 4.0mA	—	—	0.4	—	—	0.4	V
	V _{OH}	I _{OH} = -1.0mA	2.4	—	—	2.4	—	—	V

* Typical values are for reference, with V_{DD} = 5V and T_a = 25°C assumed

● Terminal Capacitance

(f = 1MHz, T_a = 25°C)

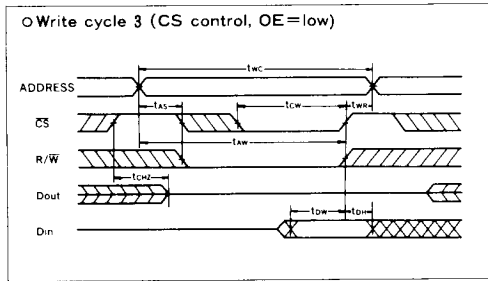
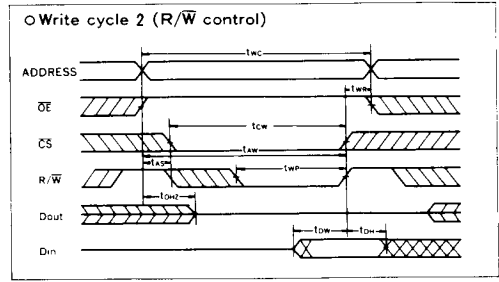
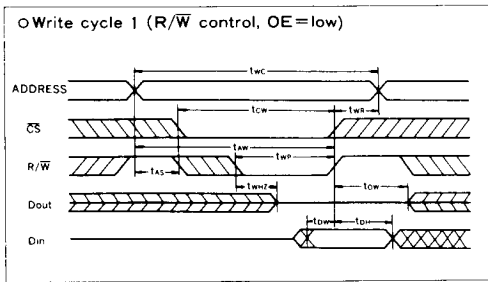
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input capacitance	C _I	V _I = 0V	—	4	6	pF
I/O capacitance	C _{I/O}	V _{I/O} = 0V	—	6	8	pF

● AC Electrical Characteristics

○ Read Cycle

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

Parameter	Symbol	Conditions	SRM201610		SRM201612		Unit
			Min	Max	Min	Max	
Read cycle time	t _{RC}		100	—	120	—	ns
Address access time	t _{ACC}	*1	—	100	—	120	ns
CS access time	t _{ACS}		—	100	—	120	ns
CS output setup time	t _{CLZ}	*2	10	—	10	—	ns
OE access time	t _{OE}	*1	—	55	—	60	ns
OE output setup time	t _{OLZ}		5	—	10	—	ns
CS output floating	t _{CHZ}	*2	0	40	0	40	ns
OE output floating	t _{OHZ}		0	40	0	40	ns
Output hold time	t _{OH}	*1	10	—	10	—	ns



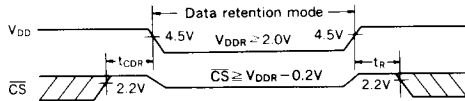
■ DATA RETENTION CHARACTERISTICS WITH LOW VOLTAGE POWER SUPPLY

(Ta = 0 to 70°C)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Data retention supply voltage	V _{DDR}	$\overline{CS} \geq V_{DDR} - 0.2V$	2.0	—	5.5	V
Data retention current	I _{DDR}	V _{DD} = 3.0V, $\overline{CS} \geq 2.8V$	—	—	25	μA
Chip select data hold time	t _{CDR}	Refer to the figure below.	0	—	—	ns
Operation recovery time	t _R		t _{RC} *	—	—	ns

* t_{RC}: read cycle time

Data retention timing



Note: When retaining data in standby mode, supply voltage can be lowered within a certain range. Read or write cycle cannot be performed while the supply voltage is low.

■ FUNCTIONS

● Truth Table

CS	OE	R/W	A0 to A10	DATA I/O	Mode	I _{DD}
H	—	—	—	Hi-Z	Unselected	I _{DD5} , I _{DD51}
L	L	H	Stable	Output data	Read	I _{DD0}
L	H	L	Stable	Input data	Write	I _{DD0}
L	L	L	Stable	Input data	Write	I _{DD0}

X: "H" or "L" —: "H", "L" or "Hi"

● Reading Data

Data can be read out if an address is set while \overline{CS} and \overline{OE} are held low, and $\overline{R/W}$ is held high.

● Writing Data

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

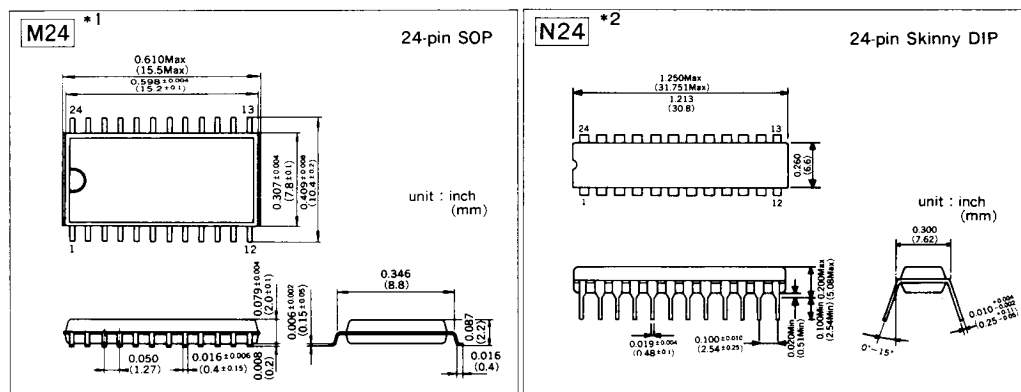
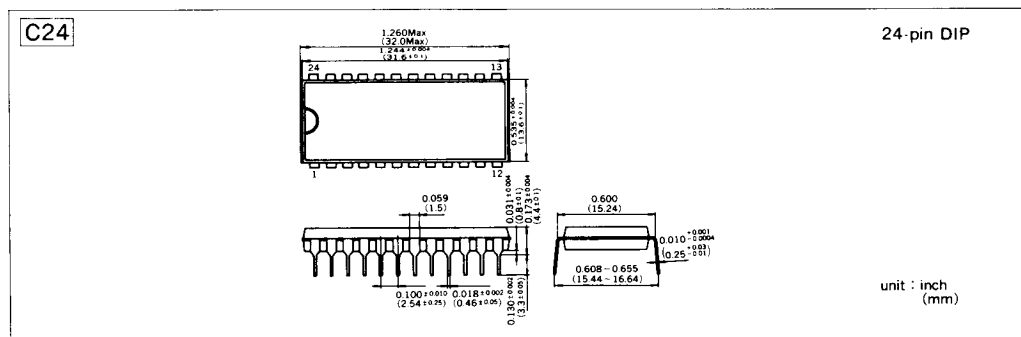
- (1) Hold \overline{CS} low, set the address, and apply a low pulse to R/\overline{W} .
- (2) Hold R/\overline{W} low, set the address, and apply a low pulse to \overline{CS} .
- (3) Set the address, then apply low pulses to both \overline{CS} and R/\overline{W} .

In each case, data from the DATA I/O terminal is fetched into the SRM201610/12 at the last transition of a section in which both \overline{CS} and R/\overline{W} are low. Because the DATA I/O terminal is in high-impedance state when \overline{CS} or \overline{OE} is high, or R/\overline{W} is low, contention of the data driver on the bus and memory output is avoided.

● Standby Mode

When \overline{CS} is high, SRM201610/12 is in the stand-by mode and only retains the data. At this time the DATA I/O terminal is in high-impedance state, and input of an address, R/\overline{W} signal, or data is prohibited. When \overline{CS} is above $V_{DD} - 0.2V$, current flowing within the SRM201610/12 chip is only that in the high-resistance portion of the memory cells and leakage current.

■ PACKAGE DIMENSIONS



* 1 Represents model SRM2016M10/12 that has the same electrical characteristics as model SRM2016C10/12.

* 2 Represents model SRM2016N10/12 that has the same electrical characteristics as model SRM2016C10/12.

■ CHARACTERISTICS CURVES

