EPSON

SRM2AL256LLM

256K-Bit Static RAM

Wide Voltage Operation Products

- Extended Supply Voltage Range
- Extremely Low Standby Current
- Access Time 150ns (2.7V) /85ns (4.5V)
- 32,768 Words×8-Bit Asynchronous

■ DESCRIPTION

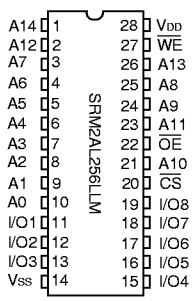
The SRM2AL256LLM is a low voltage operating 32,768 words × 8-bit asynchronous, static, random access memory fabricated using an advanced CMOS technology. Its very low standby power consumption makes it ideal for applications requiring non-volatile storage with back-up batteries. The asynchronous and static nature of the memory requires no external clock or refresh circuit. Output ports are 3-state output allows easy expansion of memory capacity. These features makes the SRM2AL256LLM usable for wide range of applications from microprocesser systems to terminal devices.

■ FEATURES

- Extended supply voltage range .....2.7 to 5.5V
- Fast access time .....150ns (3V±10%)
  85ns (5V±10%)
- Extremely low standby current .....LL Version
- Completely static .....no clock required
- 3-state output
- Battery back-up operation
- Package ..... SRM2AL256LLM SOP2-28pin (plastic)
  SRM2AL256LLTM TSOP (I)-28pin (plastic)
  SRM2AL256LLRM TSOP(I)-28pin-R1 (plastic)

■ PIN CONFIGURATION

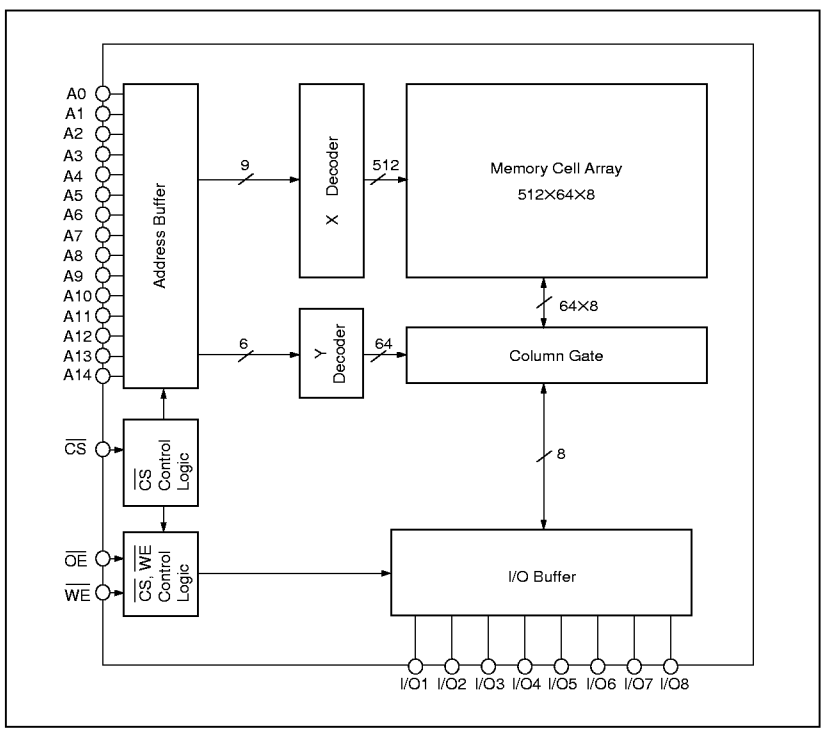
(SOP2)



(TSOP)

(TSOP-R1) (Reverse bending)

■ BLOCK DIAGRAM



■ PIN DESCRIPTION

A0 to A14	Address Input
$\overline{WE}$	Write Enable
$\overline{OE}$	Output Enable
$\overline{CS}$	Chip Select
I/O1 to I/O8	Data Input/Output
V_{DD}	Power Supply(2.7 to 5.5V)
V_{SS}	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(at lead)	–

* V_I, $V_{I/O}$ (Min)=–3.0V when pulse width is less or equal to 50ns

■ DC RECOMMENDED OPERATING CONDITIONS

(V_{SS}=0V, Ta=0 to 70°C)

Parameter	Symbol	V_{DD}=2.7V~5.5V			V_{DD}=5V±10%			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
Supply voltage	V_{DD}	2.7	–	5.5	4.5	5.0	5.5	V
	V_{SS}	0	–	0	0	0	0	V
Input voltage	V_{IH}	2.2	–	V_{DD}+0.3	2.2	3.5	V_{DD}+0.3	V
	V_{IL}	– 0.3*	–	0.4	–0.3*	0	0.8	V

* V_{IL} (Min)= –3V when pulse width is less or equal to 50ns

■ ELECTRICAL CHARACTERISTICS

● DC Electrical Characteristics

(V_{SS}=0V, Ta=0 to 70°C)

Parameter	Symbol	Conditions	V_{DD}=3V±10%			V_{DD}=5V±10%			Unit
			Min.	Typ.*1	Max.	Min.	Typ.*2	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}	–	–	2	–	–	3	mA
	I_{DDS1}	$\overline{CS}$ V_{DD}–0.2V	–	0.6	30	–	1.0	50	µA
Average operating current	I_{DDA}	V_I=V_{IL}, V_{IH} $I_{I/O}$=0mA, t_{cyc}=Min.	–	10	20	–	30	60	mA
	I_{DDA1}	V_I=V_{IL}, V_{IH} $I_{I/O}$=0mA, t_{cyc}=1µs	–	–	5	–	–	10	mA
Operating supply current	I_{DDO}	V_I=V_{IL}, V_{IH} $I_{I/O}$=0mA	–	–	5	–	–	10	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, –0.5mA*3	2.4	–	–	2.4	V_{DD}–0.1	–	V
Low level output voltage	V_{OL}	I_{OL}=2.1mA, 1.0mA*3	–	–	0.4	–	0.2	0.4	V

*1 Typical values are measured at Ta=25°C and V_{DD}=3.0V
*2 Typical values are measured at Ta=25°C and V_{DD}=5.0V
*3 V_{DD}=3V±10%

● Terminal Capacitance

(f=1MHz, Ta=25°C)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Address Capacitance	C_{ADD}	V_{ADD}=0V	–	–	8	pF
Input Capacitance	C_I	V_I=0V	–	–	8	pF
I/O Capacitance	$C_{I/O}$	$V_{I/O}$=0V	–	–	10	pF

● AC Electrical Characteristics

❍ Read Cycle

(V_{SS}=0V, Ta=0 to 70°C)

Parameter	Symbol	Conditions	V_{DD}=3V±10%		V_{DD}=5V±10%		Unit
			Min.	Max.	Min.	Max.	
Read cycle time	t_{RC}	*1	150	–	85	–	ns
Address access time	t_{ACC}		–	150	–	85	ns
$\overline{CS}$ access time	t_{ACS}		–	150	–	85	ns
$\overline{OE}$ access time	t_{OE}		–	100	–	45	ns
$\overline{CS}$ output set time	t_{CLZ}	*2	10	–	10	–	ns
$\overline{CS}$ output floating	t_{CHZ}		–	60	–	30	ns
$\overline{OE}$ output set time	t_{OLZ}		5	–	5	–	ns
$\overline{OE}$ output floating	t_{OHZ}		–	60	–	30	ns
Output hold time	t_{OH}	*1	10	–	10	–	ns

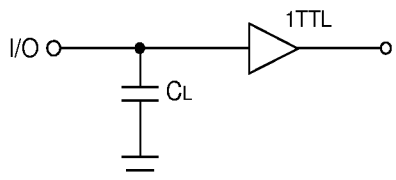
❍ Write Cycle

(V_{SS}=0V, Ta=0 to 70°C)

Parameter	Symbol	Conditions	V_{DD}=3V±10%		V_{DD}=5V±10%		Unit
			Min.	Max.	Min.	Max.	
Write cycle time	t_{WC}	✻1	150	–	85	–	ns
Chip select time	t_{CW}		140	–	70	–	ns
Address valid to end of write	t_{AW}		140	–	70	–	ns
Address setup time	t_{AS}		0	–	0	–	ns
Write pulse width	t_{WP}		130	–	65	–	ns
Address hold time	t_{WR}		0	–	0	–	ns
Input data set time	t_{DW}		80	–	35	–	ns
Input data hold time	t_{DH}		0	–	0	–	ns
Write to Output floating	t_{WHZ}	✻2	–	60	–	30	ns
Output Active from end to wirte	t_{OW}		5	–	5	–	ns

✻1 Test Conditions

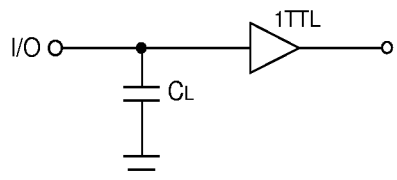
1. Input pulse level: 0.6V to 2.4V(5V)/0.4V to 2.2V(3V)
2. t_r=t_f=5ns
3. Input and output timing reference levels : 1.5V
4. Output load C_L=100pF



C_L=100pF(Includes Jig Capacitance)

✻2 Test Conditions

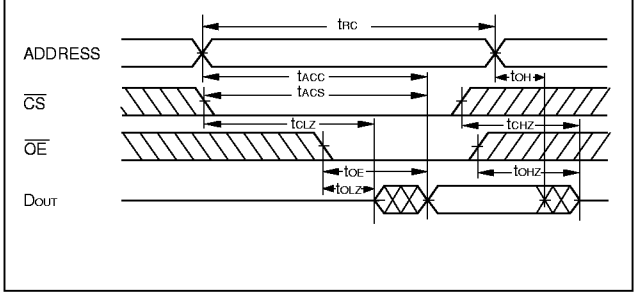
1. Input pulse level : 0.6V to 2.4V(5v)/0.4V to 2.2V(3v)
2. tr=tf=5ns
3. Input timing reference levels: 1.5V
4. Output timing reference levels:
   ±200mV (the level displaced from stable output voltage level)
5. Output load C_L=5pF



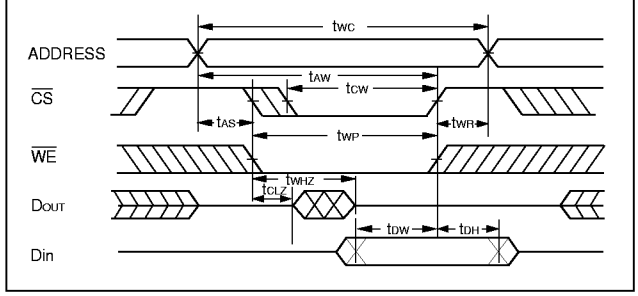
C_L=5pF(Includes Jig Capacitance)

● Timing chart

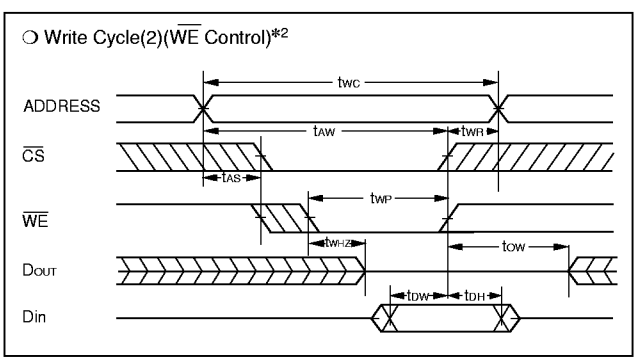
❍ Read Cycle✻1



❍ Write Cycle (1) ($\overline{CS}$ Control)✻2



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



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.

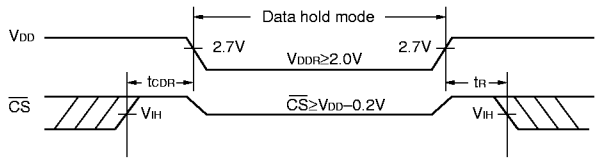
● DATA RETENTION CHARACTERISTIC WITH LOW VOLTAGE POWER SUPPLY

(V_{SS}=0V, Ta=0 to 70°C)

Parameter	Symbol	Conditions	Min.	Typ.*1	Max.	Unit
Data retention Supply voltage	V_{DDR}		2.0	–	5.5	V
Data retention current	I_{DDR}	V_{DD}=3V, $\overline{CS} \geq V_{DD}-0.2V$	–	0.5	25(4*2)	µA
Chip select data hold time	t_{CDR}		0	–	–	ns
Operation recovery time	t_R		5	–	–	ms

*1 Typical values are measured at 25°C *2 Typical values are measured at 40°C

Data retention timing



Note: During standby mode in which the data is retentive, the supply voltage (V_{DD} can) be in low voltage until $V_{DD}=V_{DDR}$.
At this mode data reading and writing are impossible.

■ FUNCTIONS

● Truth Table

$\overline{CS}$	$\overline{OE}$	$\overline{WE}$	A0 to A14	DATA I/O	Mode	I_{DD}
H	X	X	–	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}

X : "H" or "L",– : "H", "L" or "Hi-Z"

● 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 $\overline{WE}$.

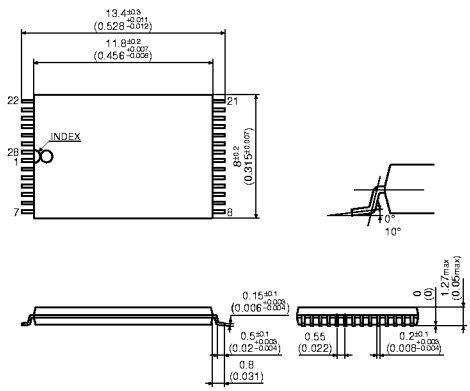
In above any case data on the DATA I/O terminals are latched up into the chip when $\overline{CS}$ or $\overline{WE}$ is in positive-going. Since DATA I/O terminals are high impedance when $\overline{CS}$ or $\overline{OE}$="H", bus contention between data driver and memory outputs can be avoided.

● Standby Mode

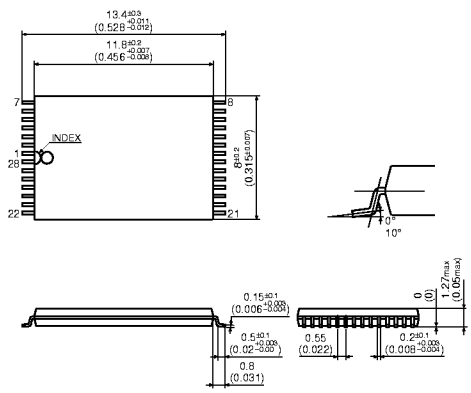
When $\overline{CS}$ is "H" the chip become in the stand-by mode. In this mode, DATA I/O terminals are high impedance and all inputs of addresses, $\overline{WE}$ and data can be any "H" or "L". When $\overline{CS}$ is over than V_{DD}-0.2V, the chip is in the data retention battery back-up mode, in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

■ PACKAGE DIMENSIONS

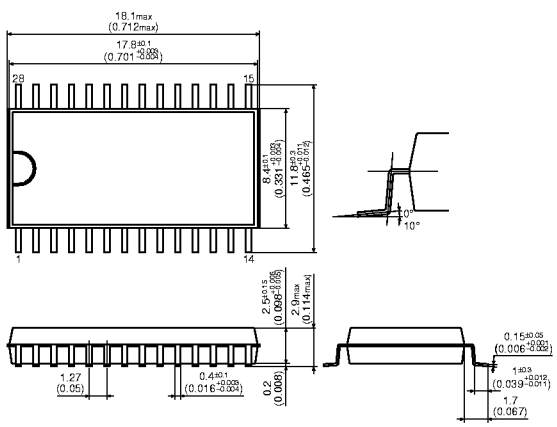
Plastic TSOP(I)-28pin



Plastic TSOP (I)-28pin-R1

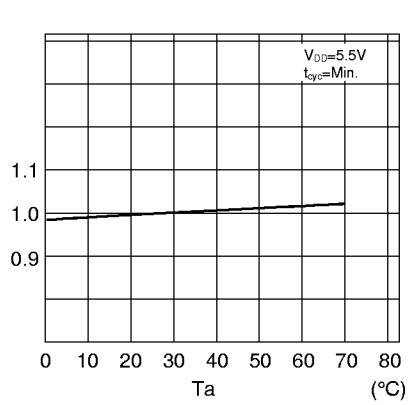


Plastic SOP2-28pin

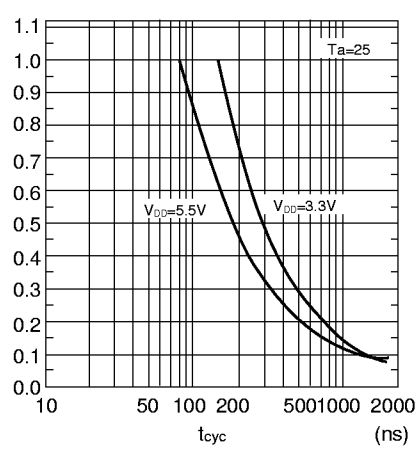


■ CHARACTERISTICS CURVES

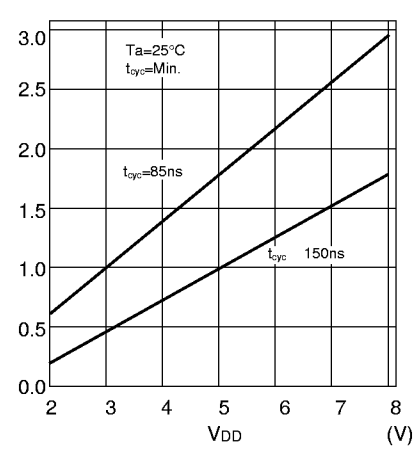
Normalized I_{DDA}–Ta



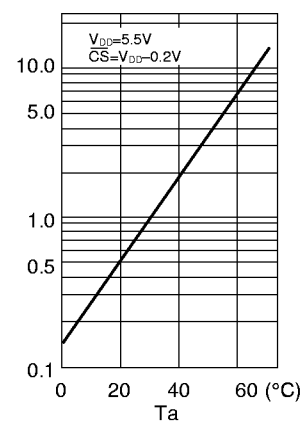
Normalized I_{DDA}–t_{cyc}



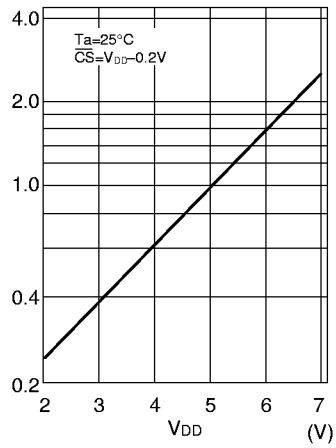
Normalized I_{DDA}–V_{DD}



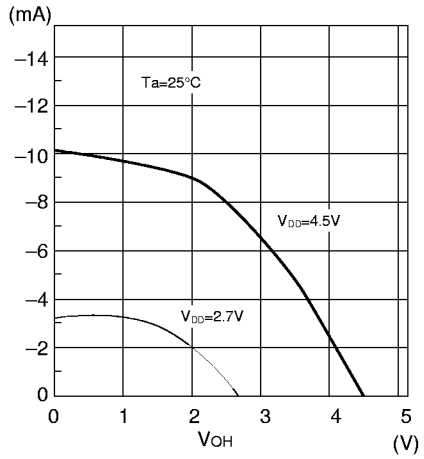
Normalized I_{DDS1}–Ta



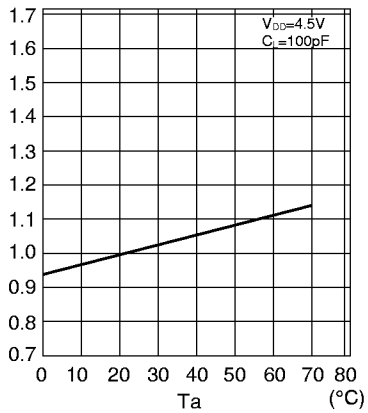
Normalized I_{DDS1}–V_{DD}



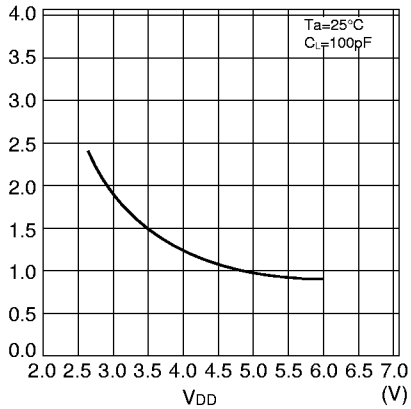
I_{OH}–V_{OH}



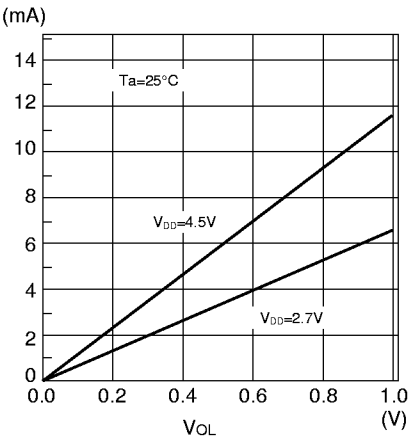
Normalized t_{ACC}, t_{ACS}–Ta



Normalized t_{ACC}, t_{ACS}–V_{DD}



I_{OL}–V_{OL}



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