

SANYO

No. 4819

LC36256ALL, AMLL-70W/85W/10W/12W**256 K (32768 words × 8 bits) SRAM****Preliminary****Overview**

The LC36256ALL, AMLL-70W/85W/10W/12W are fully asynchronous silicon gate CMOS static RAMs with an 32,768 words × 8 bits.

This series has $\overline{CE}$ chip enable pin for device select/nonselect control and an $\overline{OE}$ output enable pin for output control, and features high speed, low power dissipation, and wide temperature range.

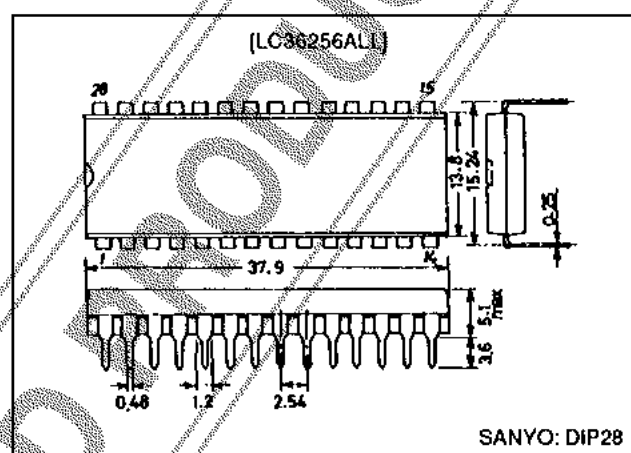
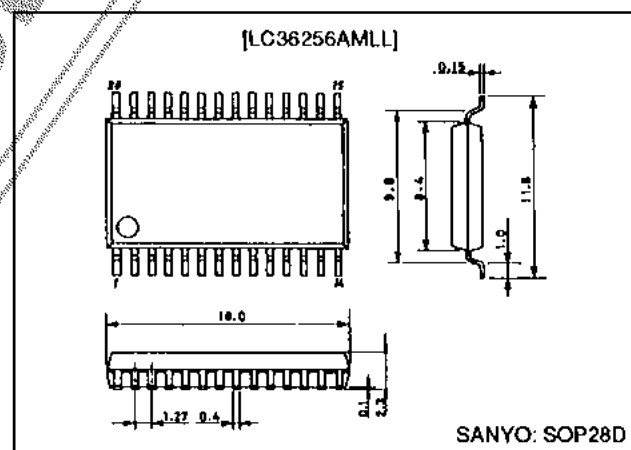
Current dissipation is notably reduced during standby and data retention. For these reasons, this series is most suited for use in systems requiring high speed, low power dissipation, and long-term battery backup. Simple memory capacity expansion is also supported.

Features

- Access time
 - 70 ns (max.) : LC36256ALL-70W,
LC36256AMLL-70W
 - 85 ns (max.) : LC36256ALL-85W,
LC36256AMLL-85W
 - 100 ns (max.) : LC36256ALL-10W,
LC36256AMLL-10W
 - 120 ns (max.) : LC36256ALL-12W,
LC36256AMLL-12W
- Low current dissipation
 - During standby
 - 0.5 μ A (max.) / $T_a = 25^\circ\text{C}$
 - 1 μ A (max.) / $T_a = -10$ to $+40^\circ\text{C}$
 - 5 μ A (max.) / $T_a = -10$ to $+70^\circ\text{C}$
 - During data retention
 - 0.3 μ A (max.) / $T_a = 25^\circ\text{C}$
 - 0.6 μ A (max.) / $T_a = -10$ to $+40^\circ\text{C}$
 - 3 μ A (max.) / $T_a = -10$ to $+70^\circ\text{C}$
 - During operation (DC)
 - 10 mA (max.)
- Single 5 V power supply: $5\text{ V} \pm 10\%$
- Data retention power supply voltage: 2.0 to 5.5 V
- No clock required (Fully static memory)
- All input/output levels are TTL compatible
- Common input/output pins, with three output states
- Packages
 - DIP 28-pin plastic package (600 mil) : LC36256ALL
 - SOP 28D-pin plastic package (450 mil): LC36256AMLL

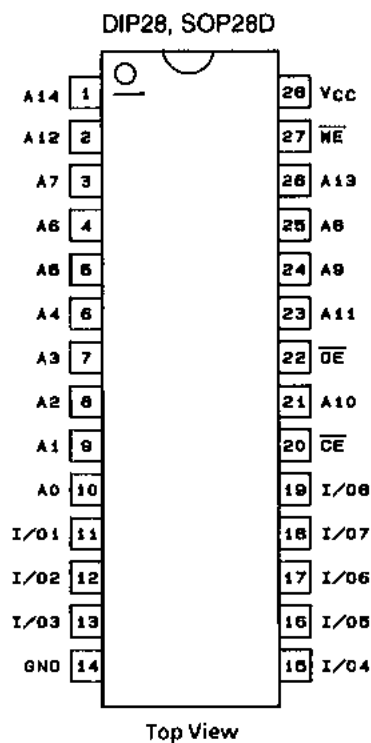
Package Dimensions

unit: mm

3012A-DIP28**3187-SOP28D****SANYO Electric Co., Ltd. Semiconductor Business Headquarters**

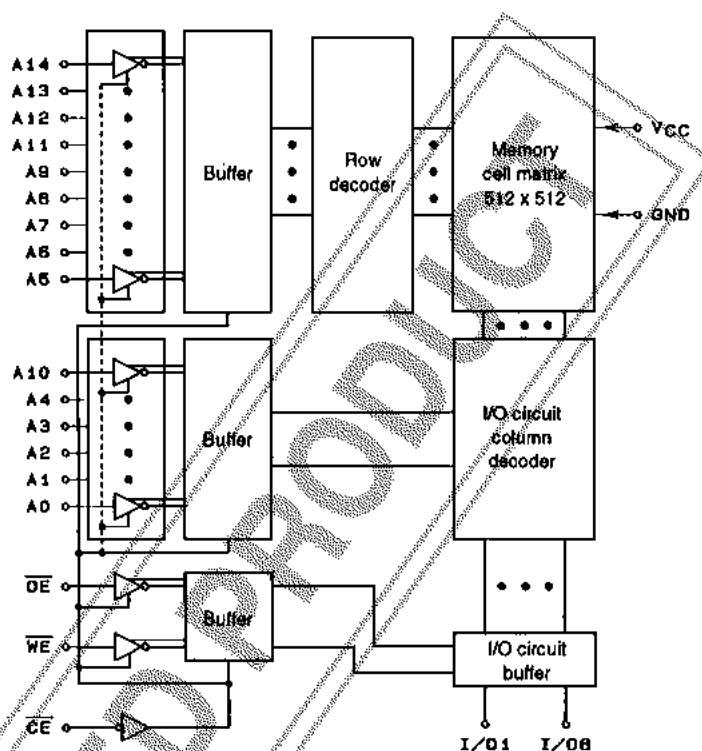
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Pin Assignment



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Block Diagram



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Pin Functions

A ₀ to A ₁₄	Address input
WE	Read/write control input
OE	Output enable input
CE	Chip enable input
I/O ₁ to I/O ₈	Data input/output
V _{CC} , GND	Power supply pins

Functions Logic

Mode	CE	OE	WE	I/O	Supply current
Read cycle	L	L	H	Data output	I _{CCA}
Write cycle	L	X	L	Data input	I _{CCA}
Output disable	L	H	H	High impedance	I _{CCA}
Nonselect	H	X	X	High impedance	I _{CCS}

X: H or L

Specifications

Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		7.0	V
Input pin voltage	V_{IN}		-0.5^* to $V_{CC} + 0.5$	V
I/O pin voltage	V_{IO}		-0.5^* to $V_{CC} + 0.5$	V
Allowable power dissipation	P_d max	LC36256ALL	1.0	W
		LC36256AMLL	0.7	W
Operating temperature range	T_{opr}		-10 to $+70$	$^\circ\text{C}$
Storage temperature range	T_{stg}		-55 to $+150$	$^\circ\text{C}$

* -3.0 V when pulse width is less than 50 ns

DC Recommended Operating Ranges at $T_a = -10$ to $+70^\circ\text{C}$

Parameter	Symbol	min	typ	max	Unit
Power supply voltage	V_{CC}	4.5	5.0	5.5	V
Input high level voltage	V_{IH}	2.2		$V_{CC} + 0.3$	V
Input low level voltage	V_{IL}	-0.3^*		$+0.8$	V

* -3.0 V when pulse width is less than 50 ns

DC Electrical Characteristics at $T_a = -10$ to $+70^\circ\text{C}$, $V_{CC} = 5\text{ V} \pm 10\%$

Parameter	Symbol	Conditions			min.	typ*	max	Unit
Input leakage current	I_{LI}	$V_{IN} = 0$ to V_{CC}			-0.5		+0.5	μA
I/O leakage current	I_{LO}	$V_{CE} = V_{IH}$ or $V_{OE} = V_{IH}$, $V_{IO} = 0$ to V_{CC}			-0.5		+0.5	μA
Output high level voltage	V_{OH}	$I_{OH} = -1.0$ mA			2.4			V
Output low level voltage	V_{OL}	$I_{OL} = 2.1$ mA					0.4	V
Operating supply current (DC)	I_{CCA1}	$V_{CE} \leq 0.2$ V, $V_{IN} \leq 0.2$ V or $V_{IN} = V_{CC} - 0.2$ V $I_{IO} = 0$ mA				1	5	mA
	I_{CCA2}	$V_{CE} = V_{IL}$, $I_{IO} = 0$ mA				3	10	mA
Average operating supply current	I_{CCA3}	min cycle Duty = 100% $I_{IO} = 0$ mA	Access time	70 ns		30	50	mA
				85 ns		25	50	
				100 ns		23	50	
				120 ns		20	50	
Standby supply current	I_{CCS1}	$V_{CE} \geq V_{CC} - 0.2$ V	-10 to +70°C				5	μA
			-10 to +40°C				1	
			25°C		0.2	0.5		
	I_{CCS2}	$V_{CE} = V_{IH}$				0.4	2	mA

* Reference values at $V_{CC} = 5\text{ V}$, $T_a = 25^\circ\text{C}$

Input/Output Capacitance at $T_a = 25^\circ\text{C}$, $f = 1\text{ MHz}$

Parameter	Symbol	Conditions	min	typ	max	Unit
Input/output capacitance	C_{IO}	$V_{IO} = 0\text{ V}$			8	pF
Input capacitance	C_{IN}	$V_{IN} = 0\text{ V}$			6	pF

These parameters were obtained through sampling, and not full-lot measurement.

AC Electrical Characteristics at $T_a = -10$ to $+70^\circ\text{C}$, $V_{CC} = 5\text{ V} \pm 10\%$

AC testing conditions

- Input pulse voltage level : 0.8 V, 2.2 V
 Input rise and fall time : 5 ns
 Input - output timing level : 1.5 V
 Output load : 1 TTL gate + $C_L = 100\text{ pF}$ (85 ns/100 ns/120 ns)
 1 TTL gate + $C_L = 30\text{ pF}$ (70 ns)
 (including scope and jig capacitance)

Read Cycle

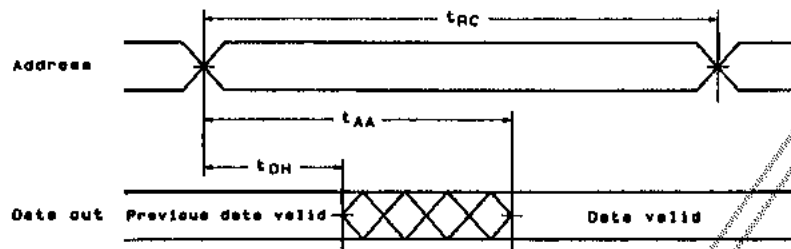
Parameter	Symbol	LC36256ALL-70W LC36256AMLL-70W		LC36256ALL-85W LC36256AMLL-85W		LC36256ALL-10W LC36256AMLL-10W		LC36256ALL-12W LC36256AMLL-12W		Unit
		min	max	min	max	min	max	min	max	
Read cycle time	t_{RC}	70		85		100		120		ns
Address access time	t_{AA}		70		85		100		120	ns
CE access time	t_{CA}		70		85		100		120	ns
OE access time	t_{OA}		35		45		50		60	ns
Output hold time	t_{OH}	20		20		20		20		ns
CE output enable time	t_{COE}	10		10		10		10		ns
OE output enable time	t_{OOE}	5		5		5		5		ns
CE output disable time	t_{COD}	0	30	0	30	0	30	0	30	ns
OE output disable time	t_{OOD}	0	30	0	30	0	30	0	30	ns

Write Cycle

Parameter	Symbol	LC36256ALL-70W LC36256AMLL-70W		LC36256ALL-85W LC36256AMLL-85W		LC36256ALL-10W LC36256AMLL-10W		LC36256ALL-12W LC36256AMLL-12W		Unit
		min	max	min	max	min	max	min	max	
Write cycle time	t_{WC}	70		85		100		120		ns
Address valid to end of write	t_{AW}	65		75		80		100		ns
Address setup time	t_{AS}	0		0		0		0		ns
Write pulse width	t_{WP}	50		50		60		70		ns
CE setup time	t_{CW}	85		75		80		100		ns
Write recovery time (WE)	t_{WR}	0		0		0		0		ns
Write recovery time (OE)	t_{WR}	0		0		0		0		ns
Data setup time	t_{DS}	30		30		35		40		ns
Data hold time	t_{DH}	0		0		0		0		ns
WE output enable time	t_{WOE}	10		10		10		10		ns
WE output disable time	t_{WOD}	0	25	0	25	0	25	0	25	ns

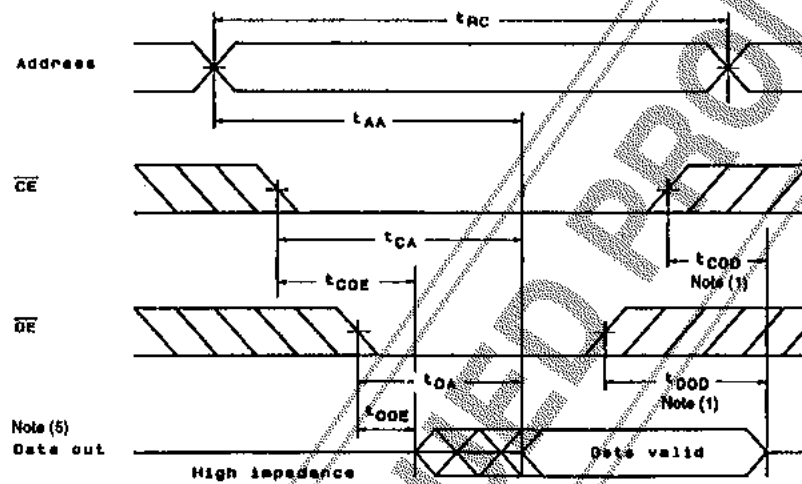
Timing Chart

- Read Cycle (1): $\overline{CE} = \overline{OE} = V_{IL}$, $WE = V_{IH}$



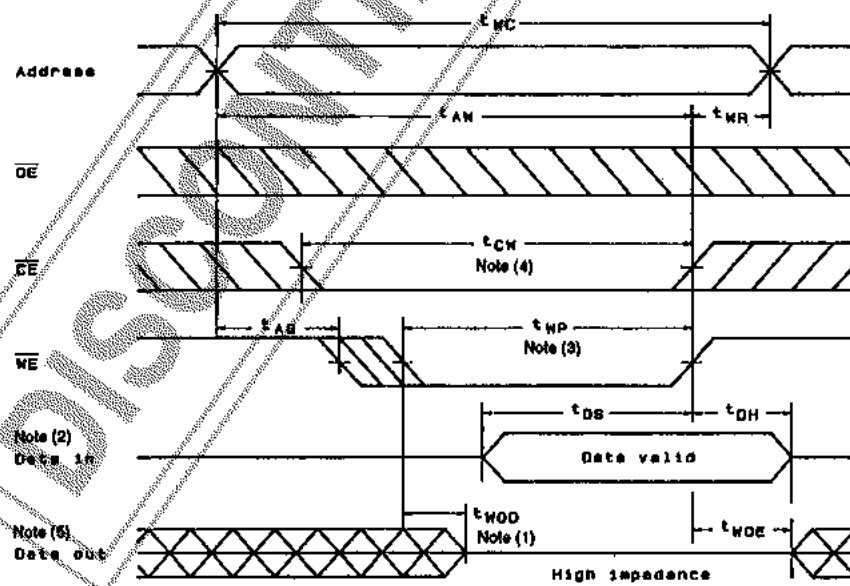
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- Read Cycle (2): $WE = V_{IH}$

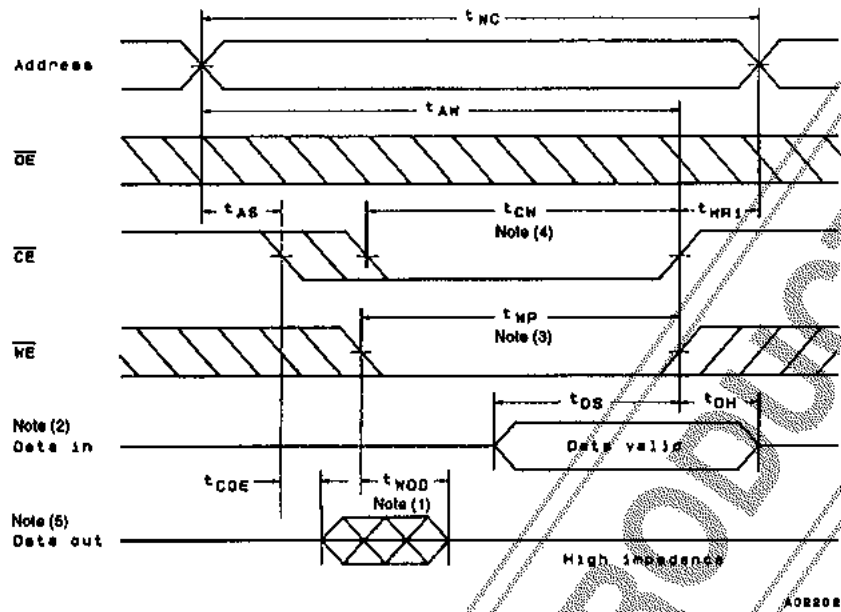


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- Write Cycle (1): WE Control Note (6)



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• Write Cycle (2): $\overline{\text{CE}}$ Control Note (6)

Notes: (1) t_{COD} , t_{OOD} , and t_{WOD} are defined as the time at which the outputs becomes the high impedance state and are not referred to output voltage levels.

(2) An external antiphase signal must not be applied when D_{OUT} is in the output state.

(3) t_{WP} is the time interval that $\overline{\text{CE}}$ and $\overline{\text{WE}}$ are low-level and is defined as the interval from the falling of $\overline{\text{WE}}$ to the rising of $\overline{\text{CE}}$ or $\overline{\text{WE}}$ whichever is earlier.

(4) t_{CW} is the time interval that $\overline{\text{CE}}$ and $\overline{\text{WE}}$ are low-level and is defined as the time from the falling of $\overline{\text{CE}}$ to the rising of $\overline{\text{CE}}$ or $\overline{\text{WE}}$, whichever is earlier.

(5) D_{OUT} goes to the high-impedance state when either $\overline{\text{OE}}$ is high-level, $\overline{\text{CE}}$ is high-level, or $\overline{\text{WE}}$ is low-level.

(6) When $\overline{\text{OE}}$ is high-level during the write cycle, D_{OUT} goes to the high-impedance state.

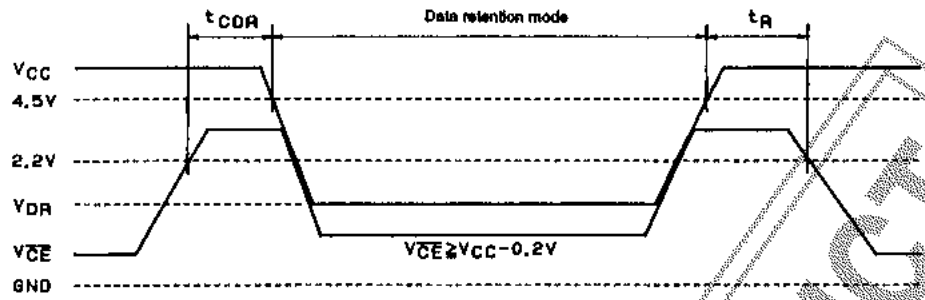
Data Retention Characteristics at $T_a = -10$ to $+70^\circ\text{C}$

Parameter	Symbol	Conditions	min	typ ^{*1}	max	Unit
Data retention supply voltage	V_{DR}	$V_{\text{CE}} \geq V_{\text{CC}} - 0.2 \text{ V}$	2.0		5.5	V
Data retention supply current	I_{CCDR1}	$V_{\text{CC}} = 3.0 \text{ V}, V_{\text{CE}} \geq 2.8 \text{ V}$	-10 to $+70^\circ\text{C}$		3	μA
			-10 to $+40^\circ\text{C}$		0.6	
	I_{CCDR2}	$V_{\text{CC}} = 2.0$ to $5.5 \text{ V}, V_{\text{CE}} \geq V_{\text{CC}} - 0.2 \text{ V}$	25 $^\circ\text{C}$	0.1	0.3	μA
$\overline{\text{CE}}$ setup time	t_{CDR}		0			ns
$\overline{\text{CE}}$ hold time	t_{H}		t_{RC}^{*2}			ns

* 1. Reference values at $V_{\text{CC}} = 5 \text{ V}, T_a = 25^\circ\text{C}$

* 2. t_{RC} = Read Cycle time

Data Retention Waveform



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DISCONTINUED PRODUCT