

LH571000/J

CMOS 1M (128K × 8) OTPROM/EPROM

FEATURES

- 131,072 × 8 bit organization
- Access times:
 - LH571000J: 120/150 ns (MAX.)
 - LH571000: 150 ns (MAX.)
- Single +5 V power supply
- High speed programming:
 - SHARP original programming algorithm
 - (26 second programming)
- Low power consumption:
 - Operating: 220 mW (MAX.)
 - Standby: 550 μW (MAX.)
- Fully static operation
- Three-state outputs
- TTL compatible I/O
- Packages:
 - EPROM
 - 32-pin, 600-mil Cerdip
 - OTPROM
 - 32-pin, 600-mil DIP
- JEDEC standard 28-pin 1M mask ROM pinout

DESCRIPTION

The LH571000J is a CMOS UV erasable and electrically programmable read-only-memory organized as 131,072 × 8 bits.

The LH571000 is a one-time PROM packaged in plastic DIP.

PIN CONNECTIONS

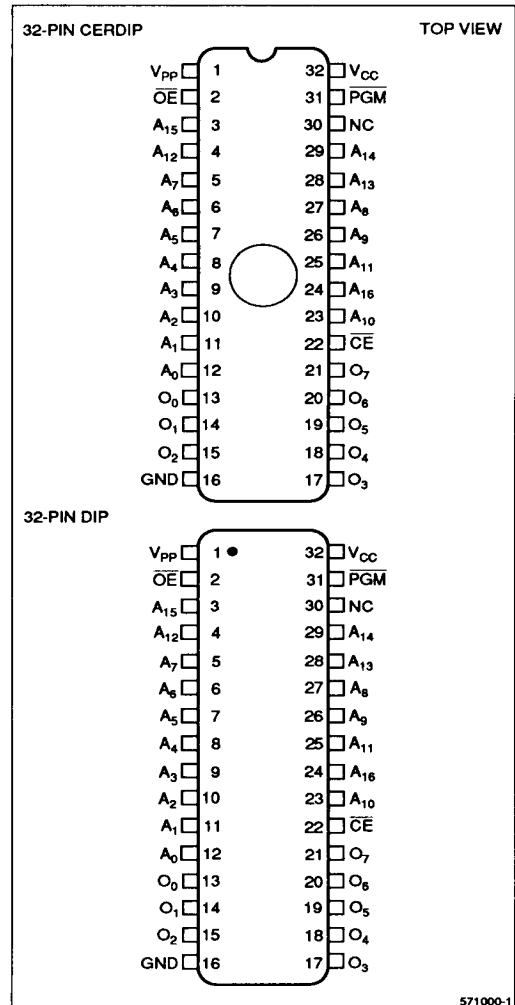


Figure 1. Pin Connections for Cerdip and DIP Packages

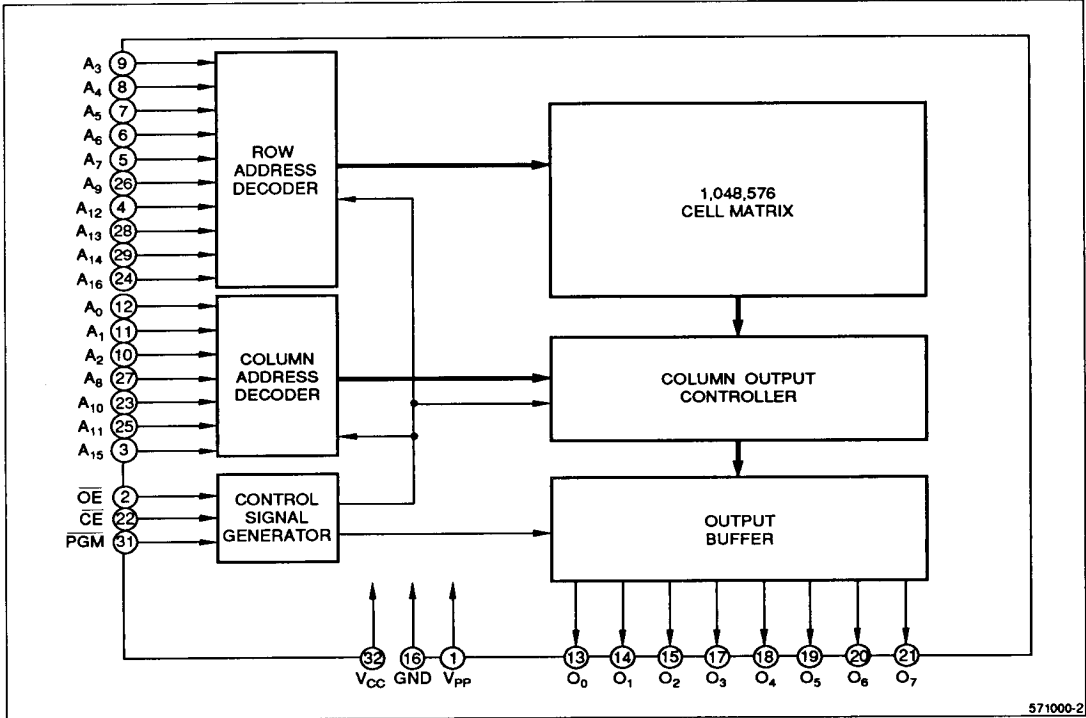


Figure 2. LH571000/J Block Diagram

PIN DESCRIPTION

SIGNAL	PIN NAME	NOTE	SIGNAL	PIN NAME	NOTE
A ₀ - A ₁₆	Address input		V _{PP}	Program power	
O ₀ - O ₇	Data output (input)	1	V _{CC}	Power supply	
CE	Chip Enable input		GND	Ground	
OE	Output Enable input		NC	Non connection	
PGM	Program input				

NOTE:
1. O₀ - O₇ pins are also used to input data to the column output controller through input buffers in programming mode.

TRUTH TABLE

MODE		O ₀ - O ₇	CE	OE	PGM	V _{CC}	V _{PP}
Read	Read	Data out	L	L	X	+5 V	+5 V
	Output disable	High-Z	L	H	X	+5 V	+5 V
	Standby	High-Z	H	X	X	+5 V	+5 V
Program	Program	Data in	L	H	L	+6.5 V	+12.75 V
	Program verify	Data out	L	L	H	+6.5 V	+12.75 V
	Program inhibit	High-Z	H	X	X	+6.5 V	+12.75 V

NOTE:
X = H or L, H = V_{IH}, L = V_{IL}

ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATING	UNIT	NOTE
Supply voltage	V _{CC}	-0.6 to +7.0	V	1
	V _{PP}	-0.6 to +13.5		
	V _{IN} , V _{OUT}	-0.6 to +7.0		
Operating temperature	T _{opr}	0 to +70	°C	
Storage temperature	T _{stg}	-65 to +150	°C	2
		-55 to +150		3

NOTES:

1. The maximum applicable voltage on any pin with respect to GND.
Maximum ratings are those values beyond which damage to the device may occur.
2. Applied to ceramic package.
3. Applied to plastic package.

RECOMMENDED OPERATING CONDITIONS (Read Mode) (T_A = 0 to +70°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V _{CC}	4.5	5.0	5.5	V
	V _{PP}	-0.1		5.5	
Input "Low" voltage	V _{IL}	-0.1		0.8	V
Input "High" voltage	V _{IH}	2.2		V _{CC} + 0.3	V

DC CHARACTERISTICS (Read Mode) (V_{CC} = 5 V ± 10%, V_{PP} ≤ V_{CC}, T_A = 0 to +70°C)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	Unit	NOTE
Input "Low" voltage	V _{IL}		-0.1		0.8	V	
Input "High" voltage	V _{IH}		2.2		V _{CC} + 0.3	V	
Output "Low" voltage	V _{OL}	I _{OL} = 2.1 mA			0.45	V	
Output "High" voltage	V _{OH}	I _{OH} = -400 μA	2.4			V	
Input load current	I _{LI}	V _{IN} = GND or V _{CC}	-10		10	μA	
Output leakage current	I _{LO}	V _{OUT} = GND or V _{CC}	-10		10	μA	
V _{CC} operating current	I _{CC1}	$\overline{CE}$ = GND ± 0.3 V			40	mA	1, 2
	I _{CC2}	$\overline{CE}$ = V _{IL}			40	mA	1, 3
V _{PP} supply current	I _{PP}	V _{PP} ≤ V _{CC}			10	μA	
V _{PP} pin voltage	V _{PP}		0.1		V _{CC}	V	
V _{CC} standby current	I _{SB1}	$\overline{CE}$ = V _{CC} ± 0.3 V			100	μA	2
	I _{SB2}	$\overline{CE}$ = V _{IH}			2	mA	3

NOTES:

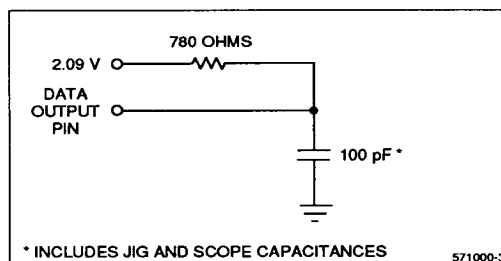
1. f = 5MHz, I_{OUT} = 0 mA
2. CMOS level: V_{IN} = GND ± 0.3 V or V_{CC} ± 0.3 V
3. TTL input: V_{IN} = V_{IL} or V_{IH}

AC CHARACTERISTICS (Read Mode) ($V_{CC} = 5\text{ V} \pm 10\%$, $T_A = 0$ to $+70^\circ\text{C}$)

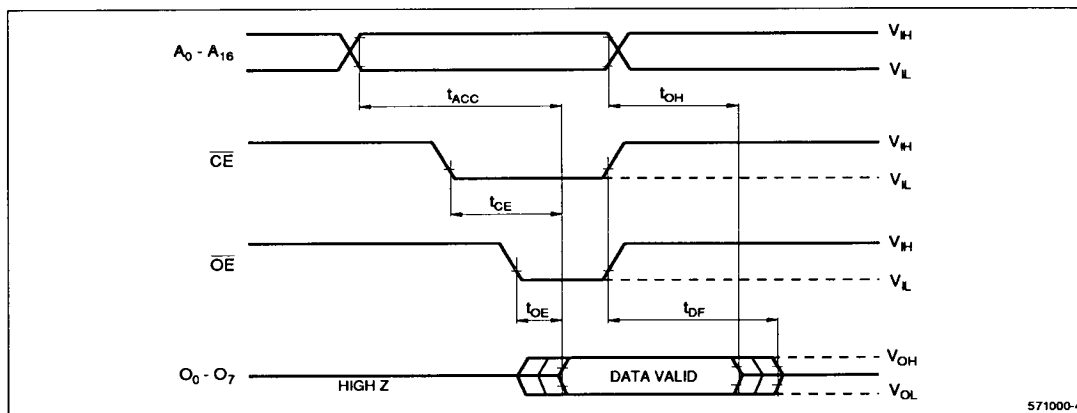
PARAMETER	SYMBOL	LH571000J-12		LH571000J-15 LH571000-15		UNIT
		MIN.	MAX.	MIN.	MAX.	
Address to output delay	t_{ACC}		120		150	ns
$\overline{CE}$ to output delay	t_{CE}		120		150	ns
$\overline{OE}$ to output delay	t_{OE}		40		50	ns
Output disable high to output float	t_{DF}	0	40	0	50	ns
Address to output hold	t_{OH}	0		0		ns

AC TEST CONDITIONS

PARAMETER	MODE
Input voltage amplitude	0.45 V to 2.4 V
Input rise/fall time	≤ 10 ns
Input reference level	1 V, 2 V
Output reference level	0.8 V, 2 V

**Figure 3. Output Load Circuit****CAPACITANCE ($T_A = 25^\circ\text{C}$, $f = 1\text{ MHz}$)**

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Input capacitance	C_{IN}	$V_{IN} = 0\text{ V}$		4	6	pF
Output capacitance	C_{OUT}	$V_{OUT} = 0\text{ V}$		8	12	pF

**Figure 4. Timing Diagram (Read Mode)**

RECOMMENDED OPERATING CONDITIONS (Program Mode) ($T_A = 25^\circ\text{C} \pm 5^\circ\text{C}$)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage	V_{CC}	4.75		6.75	V
	V_{PP}	12.5	12.75	13.0	
Input "Low" voltage	V_{IL}	-0.1		0.8	V
Input "High" voltage	V_{IH}	2.4		$V_{CC} + 0.3$	V

DC CHARACTERISTICS (Program Mode)

($V_{CC} = 4.75\text{ V to }6.75\text{ V}$, $V_{PP} = 12.75\text{ V} \pm 0.25\text{ V}$, $T_A = 25^\circ\text{C} \pm 5^\circ\text{C}$)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Input leakage current	I_{LI}	$V_{IN} = V_{CC}$ or 0.45 V	-10		10	μA
V_{CC} supply current	I_{CC}				40	mA
V_{PP} supply current	I_{PP}	$\overline{CE} = \text{PGM} = V_{IL}$			50	mA
Input "Low" voltage	V_{IL}		-0.1		0.45	V
Input "High" voltage	V_{IH}		2.4		$V_{CC} + 0.3$	V
Output "Low" voltage	V_{OL}	$I_{OL} = 2.1\text{ mA}$			0.45	V
Output "High" voltage	V_{OH}	$I_{OH} = -400\text{ }\mu\text{A}$	2.4			V

AC CHARACTERISTICS (Program Mode)

($V_{CC} = 4.75\text{ to }6.75\text{ V}$, $V_{PP} = 12.75 \pm 0.25\text{ V}$, $T_A = 25^\circ\text{C} \pm 5^\circ\text{C}$)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Address setup time	t_{AS}	2			μs
Data setup time	t_{DS}	2			μs
Output enable setup time	t_{OES}	2			μs
Address hold time	t_{AH}	0			μs
Data hold time	t_{DH}	2			μs
Data valid from output enable	t_{OE}			150	ns
Chip enable to output float delay	t_{DF}	0		150	ns
V_{PP} setup time	t_{VPS}	2			μs
V_{CC} setup time	t_{VCS}	2			μs
Program pulse width *	t_{PW}	95	100	105	μs
Chip enable setup time	t_{CES}	2			μs

* The pulse width is defined by the Program Flowchart (Figure 6).

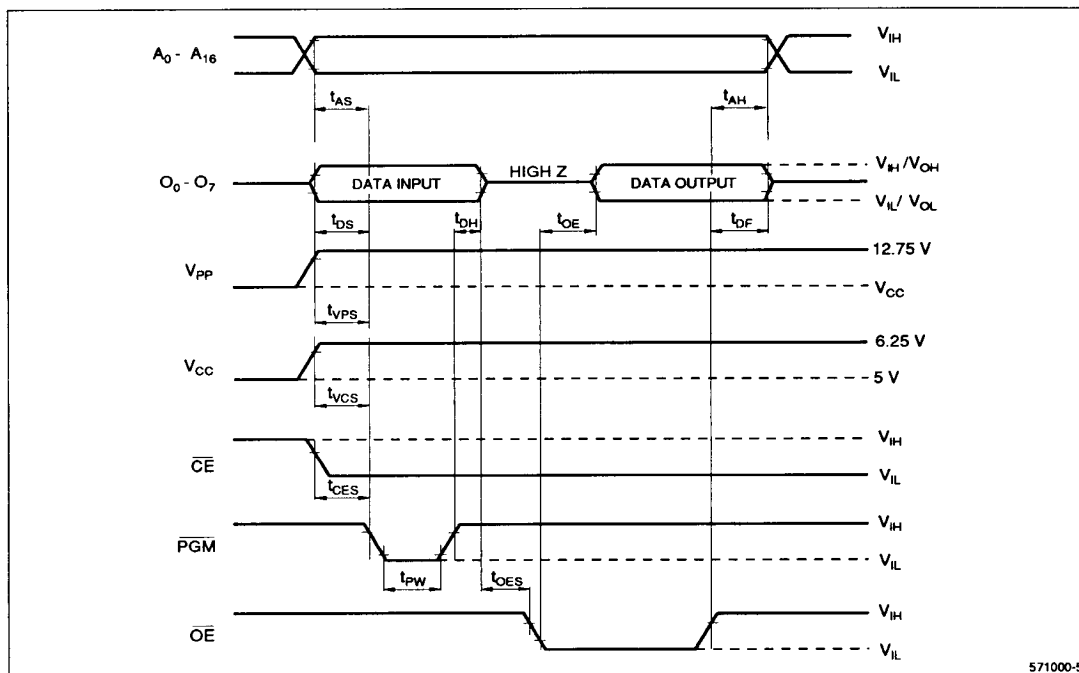


Figure 5. Timing Diagram (Program Mode)

PROGRAMMING

Upon delivery from SHARP or after each erasure (see Erasure section), the LH571000 and LH571000J have all $131,072 \times 8$ bits in the "1", or high state. "0's" are loaded into the LH571000 and LH571000J through the procedure of programming.

The programming mode is entered when +12.75 V is applied to the V_{PP} pin and $\overline{CE}$ is at V_{IL} . A $0.1 \mu F$ capacitor between V_{PP} and GND is needed to prevent excessive voltage transients, which could damage the device. The address to be programmed is applied to the proper address pins. 8-bit patterns are placed on the respective data pins. The voltage levels should be standard TTL levels.

ERASURE

In order to clear all locations of their programmed contents, it is necessary to expose the LH571000J to an ultra-violet light source. A dosage of 15 W-second/cm² is required to completely erase an LH571000J. This dosage can be obtained by exposure to an ultra-violet lamp (wave-length of 2,537 Angstroms (Å)) with intensity of 12,000 $\mu W/cm^2$ for 20 to 30 minutes. The LH571000J should be about one inch from the source and all filters should be removed from the UV light source prior to erasure.

It is important to note that the LH571000J and similar devices will erase with light sources having wave-length shorter than 4,000 Å. Although erasure times will be

much longer than with UV sources at 2,537 Å, the exposure to fluorescent light and sunlight will eventually erase the LH571000J and exposure to them should be prevented to realize maximum system reliability. If used in such an environment, the package windows should be covered by an opaque label or substance.

CAUTION

Fluorescent light and sunlight contain UV rays which will erase the EPROM. To prevent deterioration of EPROM data due to UV rays, it is recommended that EPROMs should not be left under direct sunlight or fluorescent light, or the package window should be covered with an opaque material.

Care must be taken to avoid friction between package window and plastics or the like, as the resulting static-electric build-up may cause faulty operation.

1. V_{CC} must be applied either coincidently or before V_{PP} and removed either coincidently or after V_{PP} .
2. V_{PP} must not be greater than 13.5 volts including overshoot.
3. During $\overline{CE} = \overline{PGM} = V_{IL}$, V_{PP} must not be switched from 5 volts to 12.75 volts or vice-versa.
4. Removing or inserting the device while 12.75 volts is supplied may harm the reliability of the device.

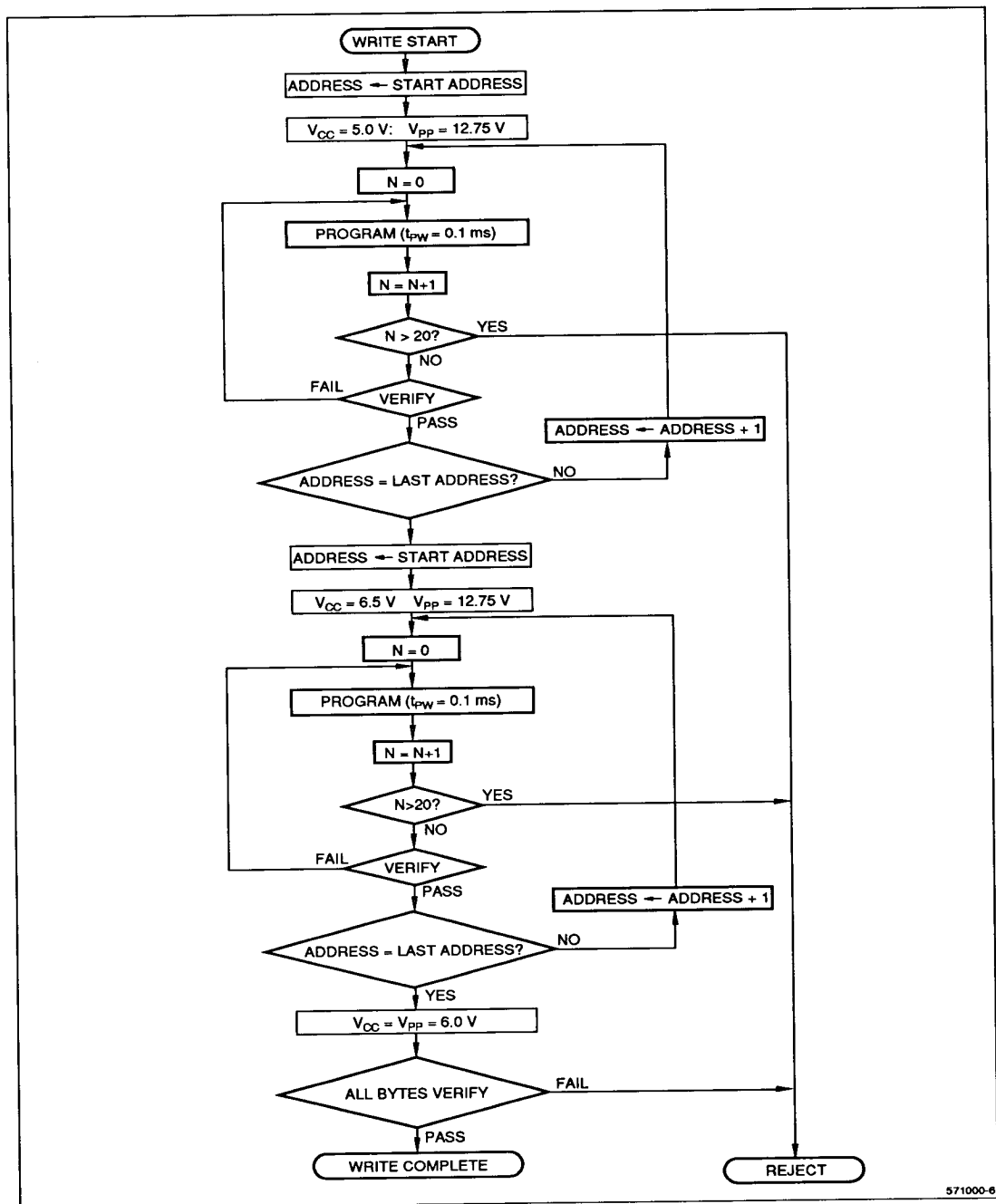


Figure 6. Programming Flowchart

ORDERING INFORMATION

