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Military CMOS Memory Products	

# 27HC641

## 64k-bit CMOS PROM (8k × 8)

### DESCRIPTION

The 27HC641 is a CMOS, high-speed UV erasable, electronically programmed Read Only Memory. It is organized as 8192 words of 8 bits and operates from a single 5 volts +/- 10% power supply. All outputs offer 3-State operation and are fully TTL compatible.

The 27HC641 uses advanced CMOS circuitry which allows operation at bipolar PROM speeds while consuming lower power. The highest degree of protection against latch-up is achieved through epitaxial processing, simplifying the design of electronic equipment which is subject to a high noise environment.

The 27HC641 is available in the industry standard 24-pin Dual-In-Line (DIP) package with the same pin out as most 64K bipolar PROMs, thereby making it easier to upgrade systems currently using higher power bipolar PROMs, and allowing the designer to provide a lower power memory system solution. Also available in a standard 32-Pin LLCC.

Ordering codes are listed in the Ordering Information Table.

### FEATURES

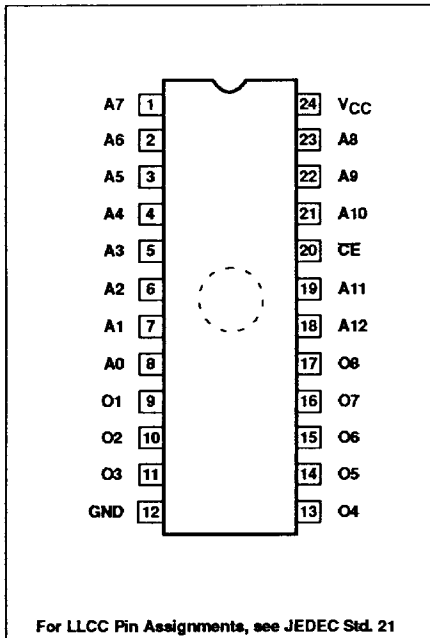
- Address access times 55ns and 70ns
- Max operating ICC of 110mA

- 3-State outputs
- Direct replacement of Bipolar PROMs
- Programmed on industry standard EPROM programmers
- Fully TTL compatible

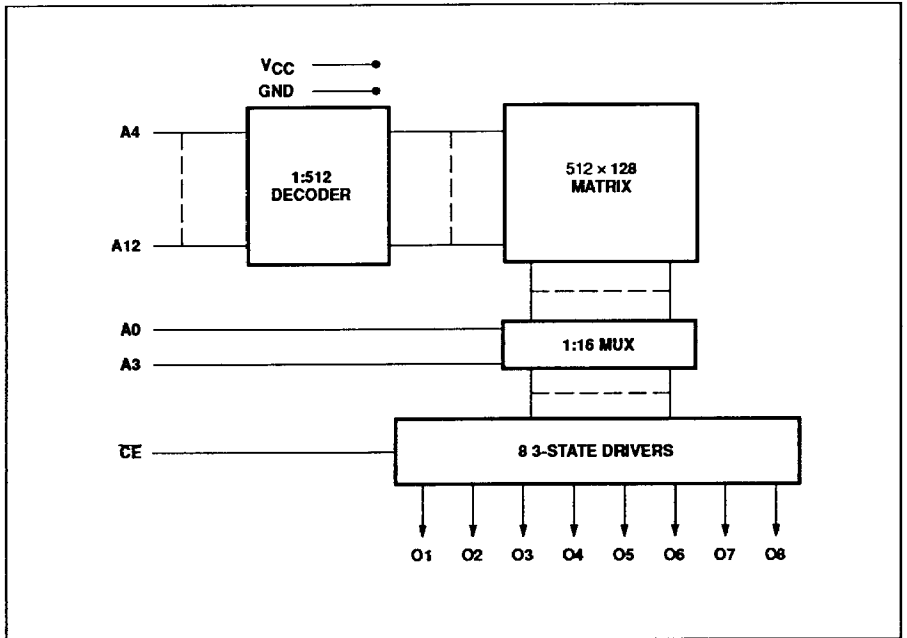
### APPLICATIONS

- Prototyping and volume production
- High performance memory systems
- Sequential controllers
- Microprogramming
- Random Logic Replacement

### PIN CONFIGURATION



### BLOCK DIAGRAM



**64K-bit CMOS PROM (8K × 8)****27HC641****ORDERING INFORMATION**

DESCRIPTION	ORDER CODE	
	55 nsec	70 nsec
24-Pin 600mil wide Cerdip w/Quartz Window	27HC641/BJA-55	27HC641/BJA-70
24-Pin Cerdip w/o Window <sup>1</sup>	27HC641/BXA-55 OT	27HC641/BXA-70 OT
28-Pin LLCC w/Quartz Window	27HC641/B3A-55	27HC641/B3A-70
28-Pin LLCC w/o Window <sup>1</sup>	27HC641/B3A-55 OT	27HC641/B3A-70 OT

**ABSOLUTE MAXIMUM RATINGS<sup>2</sup>**

SYMBOL	PARAMETER	RATING	UNIT
T <sub>A</sub>	Operating temperature range	-55 to +125	°C
T <sub>STG</sub>	Storage temperature range	-65 to +150	°C
V <sub>I<sup>3</sup></sub>	Voltage on $\overline{CE}$ pin with respect to GND	-0.5 to +13.5	V
V <sub>I<sup>3</sup></sub>	Voltage on any other pin with respect to GND	-0.5 to +7	V

**RECOMMENDED OPERATING CONDITIONS**

SYMBOL	PARAMETER	LIMITS			UNIT
		MIN	NOM	MAX	
V <sub>CC</sub>	Supply Voltage	4.5	5.0	5.5	V
V <sub>IH</sub>	Input voltage High	2.0		V <sub>CC</sub> + 1	V
V <sub>IL</sub>	Input voltage Low	-0.1		0.8	V

**DC CHARACTERISTICS**-55°C ≤ T<sub>A</sub> ≤ +125°C, 4.5V ≤ V<sub>CC</sub> ≤ 5.5V

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS		UNIT
			MIN	MAX	
I <sub>IL</sub>	Input leakage current Low	V <sub>I</sub> = +0.45V, V <sub>CC</sub> = Max		±10	μA
I <sub>IH</sub>	Input leakage current High	V <sub>I</sub> = V <sub>CC</sub> , V <sub>CC</sub> = Max		±10	μA
I <sub>OZ</sub>	Output current Hi-Z State	V <sub>O</sub> = 0.45V, V <sub>CC</sub> = Max		-10	μA
		V <sub>O</sub> = V <sub>CC</sub> , V <sub>CC</sub> = Max		10	μA
V <sub>OL</sub>	Output voltage Low	V <sub>CC</sub> = Min, I <sub>OL</sub> = 16mA		0.45	V
V <sub>OH</sub>	Output voltage High	V <sub>CC</sub> = Min, I <sub>OH</sub> = -2mA	2.4		V
I <sub>CC</sub>	Supply current	V <sub>CC</sub> = Max		110	mA
V <sub>IK</sub>	Input clamp voltage (All input pins except $\overline{CE}$ )	V <sub>I</sub> = -18mA, V <sub>CC</sub> = Min		-1.2	V
V <sub>IK</sub>	Input clamp voltage ( $\overline{CE}$ )	V <sub>I</sub> = -12mA, V <sub>CC</sub> = Min		-1.2	V
I <sub>OS</sub>	Short circuit output current <sup>6</sup>	V <sub>O</sub> = 0V, V <sub>CC</sub> = Max	-10	-85	mA
C <sub>IN</sub>	Input capacitance <sup>4</sup>	f = 1.0MHz, T <sub>amb</sub> = 25°C		6	pF
C <sub>OUT</sub>	Output capacitance <sup>4</sup>	V <sub>CC</sub> = 5.0V, V <sub>IN</sub> = 0V, V <sub>OUT</sub> = 5.0V		12	pF

**AC ELECTRICAL CHARACTERISTICS<sup>5</sup>**-55°C ≤ T<sub>A</sub> ≤ +125°C, 4.5V ≤ V<sub>CC</sub> ≤ 5.5V

SYMBOL	PARAMETER	-55 LIMITS		-70 LIMITS		UNIT
		MIN	MAX	MIN	MAX	
t <sub>AA</sub>	Address access time		55		70	ns
t <sub>CE</sub>	Chip enable access time		35		40	ns
t <sub>CD</sub>	Output disable time from chip enable		35		40	ns

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## 27HC641

## AC ELECTRICALS DURING PROGRAMMING

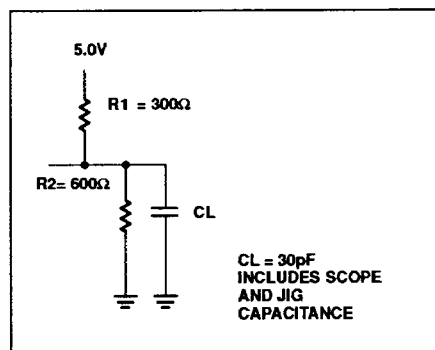
 $T_A = 25^\circ\text{C} \pm 5^\circ\text{C}$ ,  $V_{CC} = 5\text{V} \pm 5\%$ ,  $V_{PP} = 12.5\text{V} \pm 0.5\text{V}$ 

SYMBOL	PARAMETER	LIMITS		UNIT
		MIN	MAX	
$t_W$	Write pulse width	10		ms
$t_R$	Rise time	10		$\mu\text{s}$
$t_F$	Fall time	10		$\mu\text{s}$
$t_{AS}$	Address setup time	10		$\mu\text{s}$
$t_{DS}$	Data setup time	10		$\mu\text{s}$
$t_{CS}$	Chip enable setup time	10		$\mu\text{s}$
$t_{AH}$	Address hold time	10		$\mu\text{s}$
$t_{DH}$	Data hold time	10		$\mu\text{s}$
$t_{CH}$	Chip enable hold time	10		$\mu\text{s}$

## NOTES:

- Erase characteristics do not apply for one time programming (OT).
- Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other condition above those indicated in the operation section of this specification is not implied.
- Minimum DC input voltage is  $-0.5\text{V}$  during transitions. The inputs may undershoot to  $-2.0\text{V}$  for periods less than 20ns.
- $C_{IN}$  and  $C_{OUT}$  are measured initially and after any design changes which may affect capacitance.
- Test conditions ( $C_L = 30\text{pF}$ ,  $R_1 = 300\Omega$ , and  $R_2 = 600\Omega$ ).
- Duration of short circuit should not exceed 1 second and short only one output at a time.

## EQUIVALENT AC TEST LOAD CIRCUIT



## ERASURE CHARACTERISTICS

The 27HC641 is erased by exposure to ultraviolet light. The recommended erasure procedure is exposure to short-wave ultraviolet light which has a wavelength of 2537 Angstroms ( $\text{\AA}$ ). The integrated dose (i.e., UV intensity  $\times$  exposure time) for erasure should be a minimum of  $15\text{Wsec}/\text{cm}^2$ . The erasure time with this dosage is approximately 15 to 20 minutes using an ultraviolet lamp with  $12,000\mu\text{W}/\text{cm}^2$  power rating.

The 27HC641 should be placed within one inch of the lamp tubes during erasure. The maximum integrated dose a 27HC641 can be exposed to without damage is  $7258\text{Wsec}/\text{cm}^2$  (1 week @  $12000\mu\text{W}/\text{cm}^2$ ). Exposure of this CMOS EPROM to high-intensity UV light for longer periods may cause permanent damage. Some erasure may occur with exposure to light sources having wavelengths shorter than 4000 ( $\text{\AA}$ ) such as sunlight or fluorescent

light. For maximum system reliability, precautions should be taken by placing opaque labels over the quartz window when used in these environments.

## PROGRAMMING THE 27HC641

Initially, and after each erasure, all bits of the 27HC641 are in an undefined state. Data is introduced by programming "1"s and "0"s into the desired bit locations. Both "1"s and "0"s must be present in the data word to define each bit. The only way to change a bit to the opposite state is by ultraviolet light erasure and programming it to the desired state.

The 27HC641 is in the programming mode when the Output Enable ( $\bar{G}$ ) pin is at 12.5V. The data to be programmed is applied 8 bits in parallel to the data output pins. The levels required for the address and data inputs are standard TTL logic levels.

## INTELLIGENT IDENTIFIER

The intelligent identifier mode allows the reading out of a binary code from an EPROM that will identify its manufacturer and type. This mode is intended for use by programming equipment for the purpose of automatically matching the device to be programmed with its corresponding programming algorithm. This mode is functional in the  $25^\circ\text{C} \pm 5^\circ\text{C}$  ambient temperature range that is required when programming the 27HC641.

To activate this mode, the programming equipment must force 11.5V to 12.5V on address line  $A_9$  (Pin 22) of the 27HC641. Two bytes may then be read from the device outputs by toggling address line  $A_0$  (Pin 8) from

$V_{IL}$  to  $V_{IH}$ . The  $\bar{G}$  and all other address lines must be held at  $V_{IL}$  during interrogation.

The identifier information for Signetics 27HC641 is as follows:

When  $A_0 = V_{IL}$   
data is "Manufacturer"  $15_{[\text{HEX}]}$   
When  $A_0 = V_{IH}$   
data is "Product"  $21_{[\text{HEX}]}$

## PROGRAMMING INFORMATION

Complete programming system specifications for the Programming Algorithm are available upon request from Signetics Memory Marketing.

Signetics encourages the purchase of programming equipment from a manufacturer who has a full line of programming products to offer. Signetics also encourages the manufacturers of PROM programming equipment to submit their equipment for verification of electrical parameters and programming procedures. Information on manufacturers offering equipment certified by Signetics is available upon request from Signetics Memory Marketing.

## SIGNETICS DISCOURAGES THE CONSTRUCTION AND USE OF "HOMEMADE" PROGRAMMING EQUIPMENT

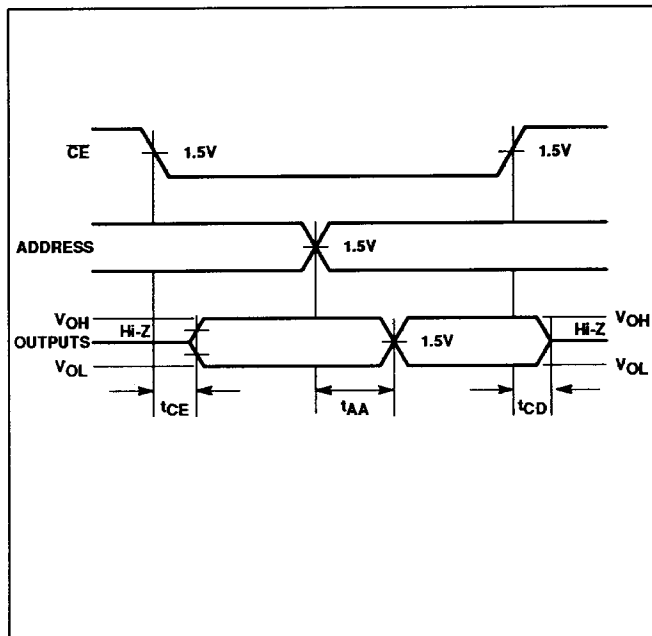
In order to consistently achieve excellent programming yields, periodic calibration of the programming equipment is required. Consult the equipment manufacturer for the recommended calibration interval. Signetics

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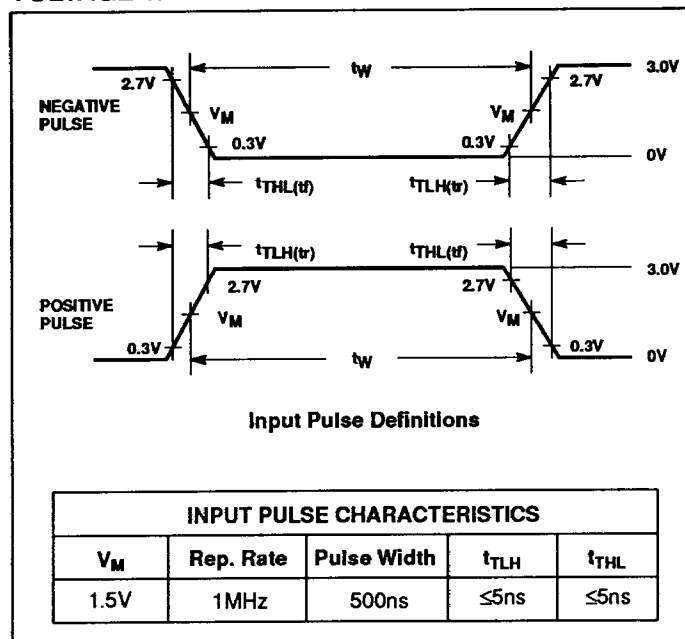
# 27HC641

warranty for programmability extends only to product that has been programmed on certified equipment that has been serviced to the manufacturer's recommendations.

## AC VOLTAGE WAVEFORMS



## VOLTAGE WAVEFORMS



## DEFINITIONS

Data Sheet Identification	Product Status	Definition
Objective Specification	Formative or in Design	This data sheet contains the design target or goal specifications for product development. Specifications may change in any manner without notice.
Preliminary Specification	Preproduction Product	This data sheet contains preliminary data, and supplementary data will be published at a later date. Signetics reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
Product Specification	Full Production	This data sheet contains Final Specifications. Signetics reserves the right to make changes at any time without notice, in order to improve design and supply the best possible product.

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