



, INC.

27CX010 1M (128K x 8) CMOS High-Speed EPROM

Features

■ Advanced CMOS EPROM Technology

■ High Performance

- 27CX010C-45 t_{AA} = 45ns max
- 27CX010C-55 t_{AA} = 55ns max
- 27CX010C-70 t_{AA} = 70ns max

■ Low Power Consumption

- 90mA Max Active
- 20mA Max Standby, TTL interface
- 1mA Max Standby, CMOS interface

■ TTL-Compatible I/O

■ Reprogrammability

- Adds convenience, reduces costs
- Windowed package for UV erasure
- Allows 100% factory testing

■ Programming Support

- Supported by popular programmers
- Fast programming algorithm
- Auto Select mode feature

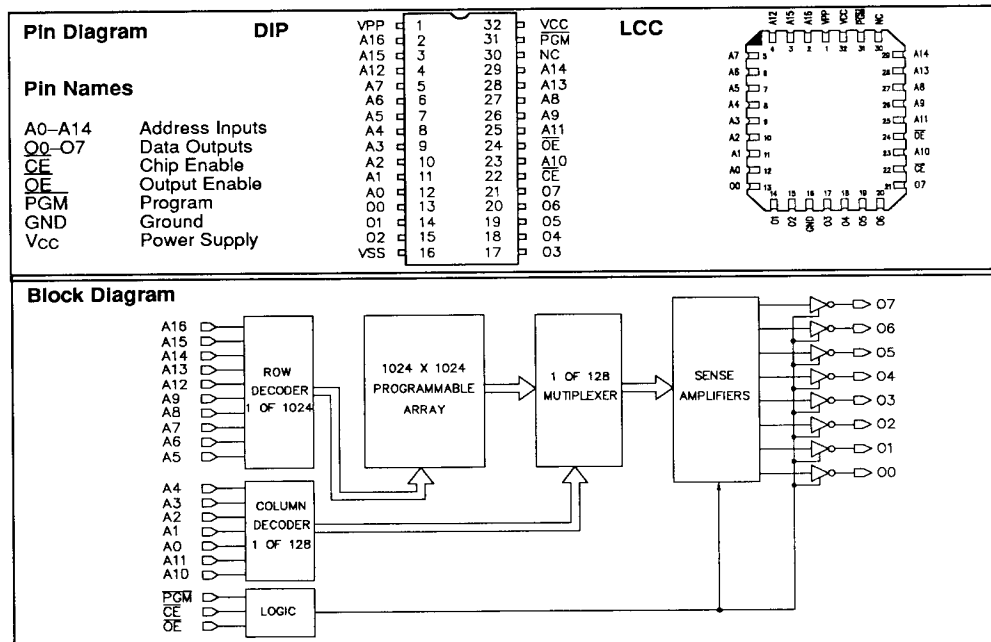
■ Packaging

- JEDEC-standard 32-pin Ceramic
- Pin compatible upgrades from 512K through 8M-bits

General Description

The ICT 27CX010 is a 1,048,576-bit CMOS high-speed UV-Erasable Programmable Read Only Memory, organized as 128K-bytes of 8 bits each. Available in a JEDEC-standard 32-pin package, the 27CX010 allows pin-compatible upgrades from 512K through 8M-bit EPROMS with minimal or no hardware changes. The 27CX010 is designed using advanced CMOS EPROM technology which provides ultra-fast access times (45, 55, 70ns max) and a low active power consumption (90mA max). The power consumption is further reduced (1mA max) with its special CMOS standby mode, when

pin \overline{CE} is deselected. The high-speed of the 27CX010 makes it ideal for operation with fast 16-bit and 32-bit microprocessors, eliminating the necessity of wait states. The 27CX010's high density allows the storage of operating systems and applications software, freeing the system's RAM for other uses. Popular third party vendor EPROM programmers will support the 27CX010 programming. An Auto Select mode provides for foolproof programmer operation by allowing EPROM programmers to read a special code from the 27CX010 to identify manufacturer and part type.



Functional Description

Erase Characteristics

The 27CX010 is erased by exposure to an ultraviolet light source. For complete erasure, the recommended minimum integrated dose (UV intensity X exposure time) is 15 Watt-second/cm² of ultraviolet light with a wavelength of 2537 Å. For an ultraviolet lamp with a 12mW/cm² power rating, the exposure time should be approximately 20 minutes, with the device placed within one inch of the lamp during erasure. Exposing the CMOS EPROM to high-intensity UV light for extended periods may affect device reliability. Also, exposure to fluorescent light or sunlight may erase the EPROM. Therefore, an opaque label or substance should be placed over the package window if the device is used in such an environment.

Programming Mode

After erasure, all bits of the EPROM are set to 1's. Programming of the 27CX010 stores 0's in the selected bit positions. The program mode is entered when a voltage between 12.0V and 13.0V is applied to the VPP pin, while /CE, /OE and /PGM are held low.

Programming support is available from third-party manufacturers, including Data I/O (model no. 29B with Unipak 2 or 2B). For more information on programming support and programming specifications, please contact ICT.

Read Mode

The 27CX010 has two control functions, Chip Enable (/CE) and Output Enable (/OE), which must both be held low for data to be accessed from the EPROM. /CE is the power control and should be used for device selection. /OE is the output control and should be used to gate data to the output pins if the device is selected.

Assuming the addresses are stable, address access time (t_{ACC}) is equal to the delay from /CE to the output (t_{CS}). Data is available at the outputs t_{OE} after the falling edge of /OE, assuming /CE has been low and addresses have been stable for at least t_{ACC}-t_{OE}.

Standby Mode

The 27CX010 has two standby modes, a CMOS standby mode (/CE input held at VCC ± 0.3V) and a TTL standby mode (/CE held at VIH). In the CMOS standby mode or power-down mode, the current consumed is less than 1mA. During standby mode the outputs O0-O7 are in the high impedance state, independent of /OE input.

Auto Select Mode

The Auto Select Mode allows the reading out of a two-byte binary code from the EPROM that will identify its manufacturer and part type. This mode is intended for use by programming equipment for the purpose of automatically matching the device being programmed with its corresponding programming algorithm. The two codes identified are the Manufacturer code and the Device code. This mode is functional at 25 ± 5°C ambient temperature.

Byte 0 (A0=VIL) and byte 1 (A0=VIH) represents the manufacturer's code and device identifier code, respectively. These codes are given in the Mode table. All identifiers for manufacturers and devices will exhibit odd parity with the MSB (O7) defined as the parity bit.

Program Inhibit Mode

Multiple 27CX010 devices can be programmed in parallel by wiring all like inputs of the EPROMs except for /CE or /PGM. Different data can also, be programmed into each EPROM while in parallel. Devices with /CE and /PGM held HIGH are inhibited from being programmed. The chosen device can then be programmed by setting /CE to a LOW TTL level, pulsing /PGM with a TTL LOW pulse, and applying 12.5 ± 0.5V to VPP.

Program Verify Mode

A verify should be performed on the programmed bits of the 27CX010 to determine the correct programming of the EPROM. This is accomplished by taking /CE and /OE to VIL, setting /PGM at VIH, and applying 12.5V to VPP.

Output OR-Tying

To accommodate multiple memory connections, a two-line control function is provided to allow for: 1) Low memory power dissipation, and 2) Assurance that output bus contention will not occur.

It is recommended that /CE be decoded and used as the primary device selecting function, while /OE should be made a common connection to all devices in the array and connected to the read line from the system control bus. This will assure that all deselected memory devices are in their low-power standby mode and that the output pins are only active when data is desired from a particular device.



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27CX010

Exposure to absolute maximum ratings over extended periods of time may affect device reliability. Exceeding absolute maximum ratings may cause permanent damage

Absolute Maximum Ratings

Symbol	Parameter	Conditions	Rating	Unit
V _{CC}	Supply Voltage	Relative to GND	- 0.6 to +7.0	V
V _{IO}	Voltage Applied to All Pins Ex-	Relative to GND	-0.6 to V _{CC} +0.6	V
T _A	Ambient Temp., Power Applied		-65 to +150	°C
T _{ST}	Storage Temperature		-65 to +150	°C
T _{LT}	Lead Temperature	Soldering 10 seconds	+ 300	°C

Operating Ranges

Symbol	Parameter	Conditions	Min	Max	Unit
T _A	Ambient Temperature	Commercial	0	70	C
V _{CC}	Supply Voltage (Read)	Commercial	4.5	5.5	V
V _{CC}	Supply Voltage (Program)	Commercial	4.5	6.5	V
V _{PP}	Supply Voltage	Commercial	12.0	13.0	V

D.C. Electrical Characteristics¹

Over the operating range

Symbol	Parameter	Conditions	Min	Max	Unit
V _{IH}	Input HIGH Level		2.0	V _{CC} +5	V
V _{IL}	Input LOW Level		-0.5	0.8	V
V _{OH}	Output HIGH Voltage ²	V _{CC} = Min, I _{OH} = -4.0mA	2.4		V
V _{OL}	Output LOW Voltage ²	V _{CC} = Min, I _{OL} = 12mA		0.45	V
I _{LI}	Input Load Current	V _{IN} = 0V to V _{CC}		10	μA
I _{LIT}	Input Load Current in Test Mode	V _{CC} = 7.5V, V _{IN} = 12.0V		35	μA
I _{LO}	Output Leakage Current	V _{out} = 0V to V _{CC}		10	μA
I _{CC1}	V _{CC} Standby Current (TTL)	/CE=V _{IH} , /OE=V _{IL}		20	mA
I _{CC2}	V _{CC} Standby Current (CMOS)	/CE=V _{CC} -0.3V to V _{CC} +0.3V		1	mA
I _{CC3}	V _{CC} Active Current	/CE=/OE=V _{IL} , f=tacc max	0.1	90	mA
I _{PP1}	V _{PP} Current During Read	V _{PP} = 0 to V _{CC} + 0.5V		100	μA

Capacitance

These measurements are periodically sample tested.

Symbol	Parameter	Conditions	Min	Max	Unit
C _{IN}	Input Capacitance	T _A = 25°C V _{CC} = 5.0V @ f = 1MHz		8	pF
C _{OUT}	Output Capacitance			8	pF
C _{IN2}	V _{PP} Input Capacitance			20	pF

Notes:

- V_{CC} must be applied simultaneously or before V_{PP}, and removed simultaneously or after V_{PP}.
- The 27CX010 provides true CMOS output interface levels. The specifications shown are for a TTL interface.

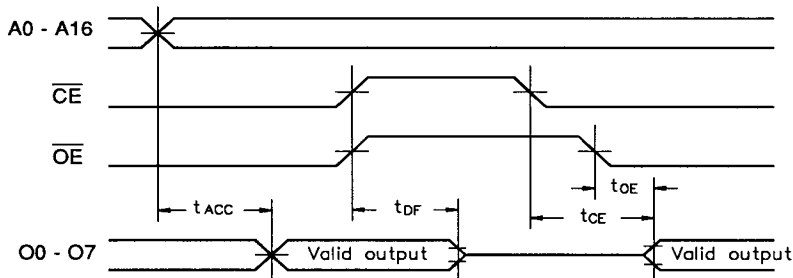


A.C. Electrical Characteristics

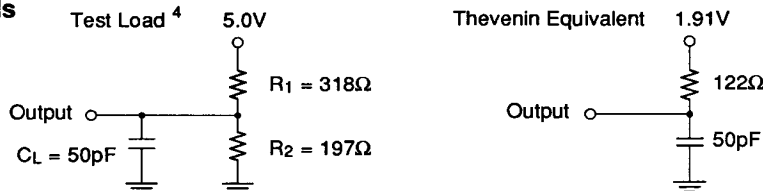
Over the Operating Range³

Symbol	Parameter	27CX010-45		27CX010-55		27CX010-70		Unit
		Min	Max	Min	Max	Min	Max	
t _{ACC}	Access Time From Address To Output		45		55		70	nS
t _{CE}	Access Time From Chip Enable To Output		45		55		70	nS
t _{OE}	Access Time From Output Enable To Output ⁴		30		40		50	nS
t _{DF}	Chip Disable to High-Z ^{4,5}		30		40		50	nS

Switching Waveforms



Test Loads



Notes:

- Test conditions assume: signal transition times of 5 nS or less from the 10% and 90% points; timing reference levels of 1.5V (unless otherwise specified); and test loads shown.
- t_{CE} and t_{OE} are measured from the input transition to V_{REF} ± 0.1V. t_{CD} is measured from the input transition to V_{OH} - 0.1V or V_{OL} + 0.1V.
- C_L includes scope and jig capacitance. t_{OE} is tested with C_L = 5pF.

Mode Table

Mode		$\overline{\text{CE}}$	$\overline{\text{OE}}$	$\overline{\text{PGM}}$	V _{PP}	V _{CC}	A ₉	A ₀	Output
Read		VIL	VIL	X	X	VCC	X	X	DOUT
Standby		VIH	X	X	X	VCC	X	X	HI-Z
Output Disable		VIL	VIH	X	X	VCC	X	X	HI-Z
Program		VIL	VIH	VIL	VPP	VCC	X	X	DIN
Program Verify		VIL	VIL	VIH	VPP	VCC	X	X	DOUT
Program Inhibit		VIH	X	X	VPP	VCC	X	X	HI-Z
Auto Select	Manufacturer	VIL	VIL	X	X	VCC	VH	VIL	01H
	Device	VIL	VIL	X	X	VCC	VH	VIH	0EH

VIL = Input Low Voltage, VIH = Input High Voltage, VH = High Voltage (12.5V), X = VIL or VIH