



INTERNATIONAL CMOS
TECHNOLOGY, INC.

27CX321/27CX322

4,096 x 8-bit CMOS High-Speed Erasable PROM

Features

■ Advanced CMOS EPROM Technology

■ High Performance

- 27CX321/322-35 $t_{AA} = 35\text{nS}$ max
- 27CX321/322-40 $t_{AA} = 40\text{nS}$ max
- 27CX321/322-45 $t_{AA} = 45\text{nS}$ max

■ Low Power Consumption

- $I_{CC} = 40\text{mA}$ max - Active (Commercial)
- $I_{SB} = 500\mu\text{A}$ max typical - Standby Mode

■ TTL-Compatible I/O

■ Reprogrammability

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

■ Bipolar PROM replacement

- Pin-compatible with Bipolar PROMs
- Higher speed
- Lower power consumption
- 300-mil and 600-mil packages

■ Commercial and Industrial Versions

General Description

The ICT 27CX321 and 27CX322 are 4,096 X 8-bit CMOS high-speed UV-erasable PROMs that provide a low-power, reprogrammable alternative to bipolar fuse-link PROMs. Available in both 600mil (27CX321) and 300mil (27CX322) packages, these devices are pin/socket-compatible with many popular bipolar PROMs. The 27CX321/322 are designed in an advanced CMOS EPROM technology and use differential memory-cell techniques to provide access times comparable to high-speed

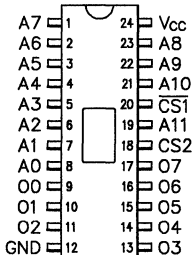
bipolar PROMs (as fast as 35nS), with a significant improvement in power consumption. A special, user-programmable, low-power standby mode reduces power consumption even further when the device is deselected. The reprogrammability of the 27CX321/322 not only adds convenience and reduces development and field retrofit costs, but enhances factory testability, allowing for 100% field programmability and function.

Pin Diagrams

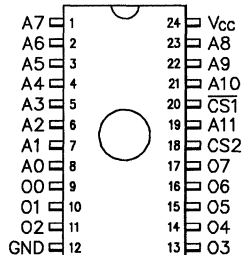
PinNames

- A0-A11 Address Inputs
Q0-Q7 Data Outputs
CS1 Chip Select
CS2 Chip Select

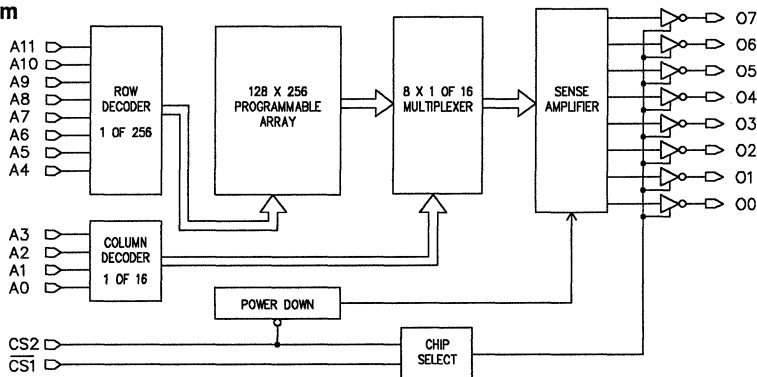
27CX322 (300 mil)



27CX321 (600 mil)



Block Diagram





Absolute Maximum Ratings

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

Symbol	Parameter	Conditions	Rating	Unit
V _{CC}	Supply Voltage	Relative to GND	- 0.6 to +7.0	V
V _{IO}	Voltage Applied to Any Pin	Relative to GND	-0.6 to V _{CC} +0.6	V
T _A	Ambient Temp., Power Applied		-10 to +85	°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
V _{CC}	Supply Voltage	Commercial	4.75	5.25	V
V _{CC}	Supply Voltage	Industrial	4.50	5.50	V
T _A	Ambient Temperature	Commercial	0	70	°C
T _A	Ambient Temperature	Industrial	-40	85	°C

D.C. Electrical Characteristics

Over the operating range

Symbol	Parameter	Conditions	Min	Max	Unit
V _{IH}	Input HIGH Level		2.0(2.4) ¹		V
V _{IL}	Input LOW Level			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 _L	Input Leakage Current	V _{CC} = Max, GND ≤ V _I ≤ V _{CC}		10	μA
I _{OS}	Output Short Circuit Current ³	V _{CC} = Max, V _O = GND CS1 = V _{IL} and CS2 = V _{IH}	-15	-90	mA
I _{OZ}	Output Leakage Current	V _{CC} = Max, V _O = V _{CC} or GND CS1 V _{IH} or CS2 = V _{IL}		10	μA
I _{CC}	Power Supply Current	All inputs=(GND or V _{CC}) ±		40(60) ¹	mA
I _{SB}	Standby Power Supply Current ⁴ (Typical values ~ 500μA)	CS2 = V _{IL} , All other inputs = (GND or V _{CC}) ± 0.3V.	0.1	5	mA
V _{IC}	Input Clamp Voltage	V _{CC} = Min, I _{IN} = -18mA		-1.2	V

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		6	pF
C _{OUT}	Output Capacitance			12	pF
C _{CS1}	CS1 Pin Capacitance			15	pF
C _{CS2}	CS2 Pin Capacitance			6	pF

Notes:

1. Industrial specification.
2. The 27CX321/27CX322 provide true CMOS output interface levels. The specifications shown are for TTL interface.
3. No more than one output should be shorted at a time. Duration of short circuit should not be more than one second.
4. Applicable only if standby mode is programmed.

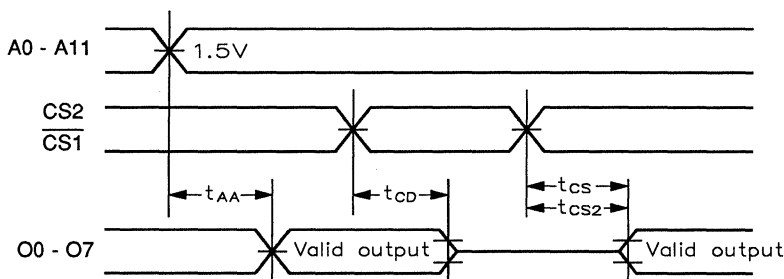


A.C. Electrical Characteristics

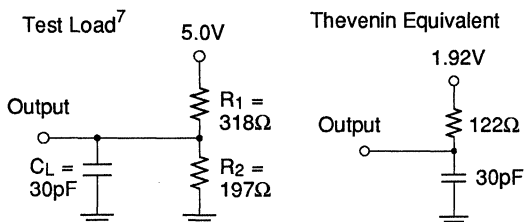
Over the Operating Range ⁵

Symbol	Parameter	27CX321-35		27CX321-40		27CX321-45		Unit
		Min	Max	Min	Max	Min	Max	
tAA	Access Time From Address To Output		35		40		45	nS
tCS	Access Time From Chip Select 1 or 2 to Output ⁵		20		25		25	nS
tCS2	Chip Select 2 to Output in Standby Mode ^{4,6}		30		30		35	nS
tCD	Chip Select 1 and 2 Disable to High-Z ^{6,7}		20		20		25	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.
- tCS and tCS2 are measured from the input transition to VREF ± 0.1V. tCD is measured from the input transition to VOH - 0.1V or VOL + 0.1V.
- CL includes scope and jig capacitance. tCD is tested with CL = 5pF.

Standby Low-Power Mode

The low-power standby mode is a user-selectable option that can be set using programming equipment that supports the 27CX321/27CX322. If this mode is set, the 27CX321/27CX322 will power-down to typically 500μA supply current while CS2 is asserted low. The delay from CS2 low to power-down is approximately 45nS. Note that chip-select-to-data-out timing for CS2 will change if the standby mode is selected (refer to the specification for tCS2 under A.C. Electrical Characteristics). For information on selecting the standby option, please contact your programmer manufacturer or ICT.

Erasure Characteristics

The 27CX321/27CX322 are erased by exposure to ultraviolet light. 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 2537Å. For an ultraviolet

lamp with a 12mW/cm² power rating, the exposure time would be approximately 20 minutes. The 27CX321/27CX322 should be 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.

Programming the 27CX321/322

The 27CX321/27CX322 employ a dual-transistor differential memory cell design. Initially, and after erasure, all bits of the 27CX321/322 are in an undefined state. Thus, verifying a blank device will yield erroneous results. The desired state of each bit must be programmed into the device to ensure proper operation.

Programming support is available from ICT and third-party vendors, including DATA I/O (model no. 29B with Unipak 2 or 2B - firmware version V15). For more information on programming support and programming specifications, please contact ICT.