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

- **Low Power Consumption**
  - I_{CC} = 40mA max - Active (Commercial)
  - I_{SB} = 500μA 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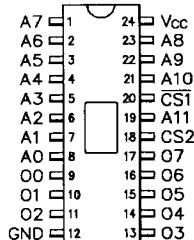 provide access times comparable to high-speed bipolar PROMs (as fast as 35nS), with a significant improvement in power consumption. A special, user-programmable, low-power standby mode reduces power consumption even further when the device is deselected. The reprogrammability of the 27CX321/322 not only adds convenience and reduces development and field retrofit costs, but enhances factory testability, allowing for 100% field programmability and function.
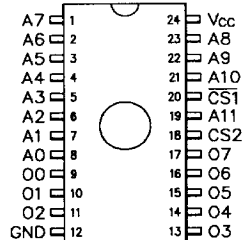
Pin Diagrams

PinNames

A0-A11	Address Inputs
O0-O7	Data Outputs
CS1	Chip Select
CS2	Chip Select

27CX322 (300 mil)

Pin		Pin	
A7	1	24	Vcc
A6	2	23	A8
A5	3	22	A9
A4	4	21	A10
A3	5	20	CS1
A2	6	19	A11
A1	7	18	CS2
A0	8	17	O7
O0	9	16	O6
O1	10	15	O5
O2	11	14	O4
GND	12	13	O3

27CX321 (600 mil)

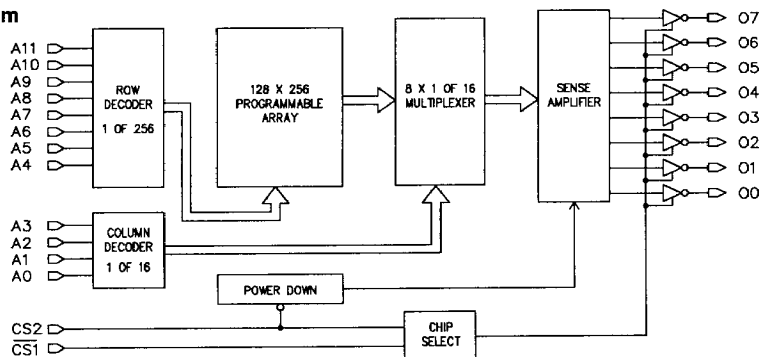| Pin		Pin	
A7	1	24	Vcc
A6	2	23	A8
A5	3	22	A9
A4	4	21	A10
A3	5	20	CS1
A2	6	19	A11
A1	7	18	CS2
A0	8	17	O7
O0	9	16	O6
O1	10	15	O5
O2	11	14	O4
GND	12	13	O3

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	Comercial	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 $\overline{CS1}$ = V_{IL} and CS2 = V_{IH}	−15	−90	mA
I_{OZ}	Output Leakage Current	V_{CC} = Max, V_O = V_{CC} or GND $\overline{CS1}$ 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			6	pF
C_{OUT}	Output Capacitance	T_A = 25°C V_{CC} = 5.0V @ f = 1MHz		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	
t_{AA}	Access Time From Address To Output		35		40		45	nS
t_{CS}	Access Time From Chip Select 1 or 2 to Output [5]		20		25		25	nS
t_{CS2}	Chip Select 2 to Output in Standby Mode [4,6]		30		30		35	nS
t_{CD}	Chip Select 1 and 2 Disable to High-Z [6,7]		20		20		25	nS

Switching Waveforms
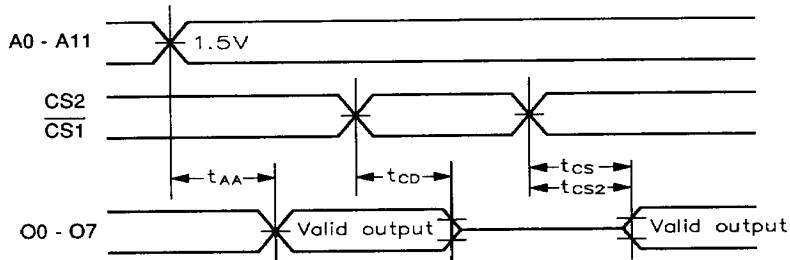
Test Loads
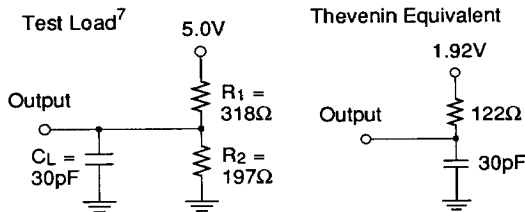
Notes:
5. Test conditions assume: signal transition times of 5 nS or less from the 10% and 90% points; timing reference levels of 1.5V (unless otherwise specified); and test loads shown.

6. t_{CS} and t_{CS2} are measured from the input transition to $V_{REF} \pm 0.1V$. t_{CD} is measured from the input transition to $V_{OH} - 0.1V$ or $V_{OL} + 0.1V$.

7. C_L includes scope and jig capacitance. t_{CD} is tested with $C_L = 5pF$.

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 t_{CS2} 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.