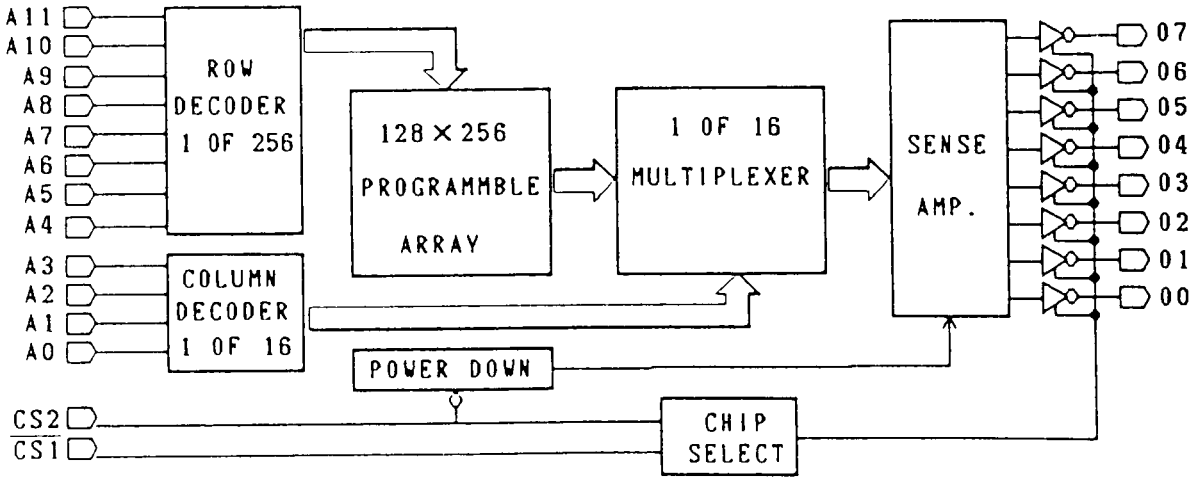
AK27CX321 / 322

32Kbit CMOS High-Speed UV-Erasable PROM

Features

- ☐ 4096word × 8bit
- ☐ Advanced CMOS EPROM Technology
- ☐ High Performance
  - — AK27CX321/322-35 · · t_{AA} = 35ns max.
  - — AK27CX321/322-40 · · t_{AA} = 40ns max.
  - — AK27CX321/322-45 · · t_{AA} = 45ns max.
- ☐ Low Power Consumption
  - — I_{CC} = 40mA max. - Active
  - — I_{SB} = 500μA typ. - 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(AK27CX322) and 600-mil(AK27CX321) packages

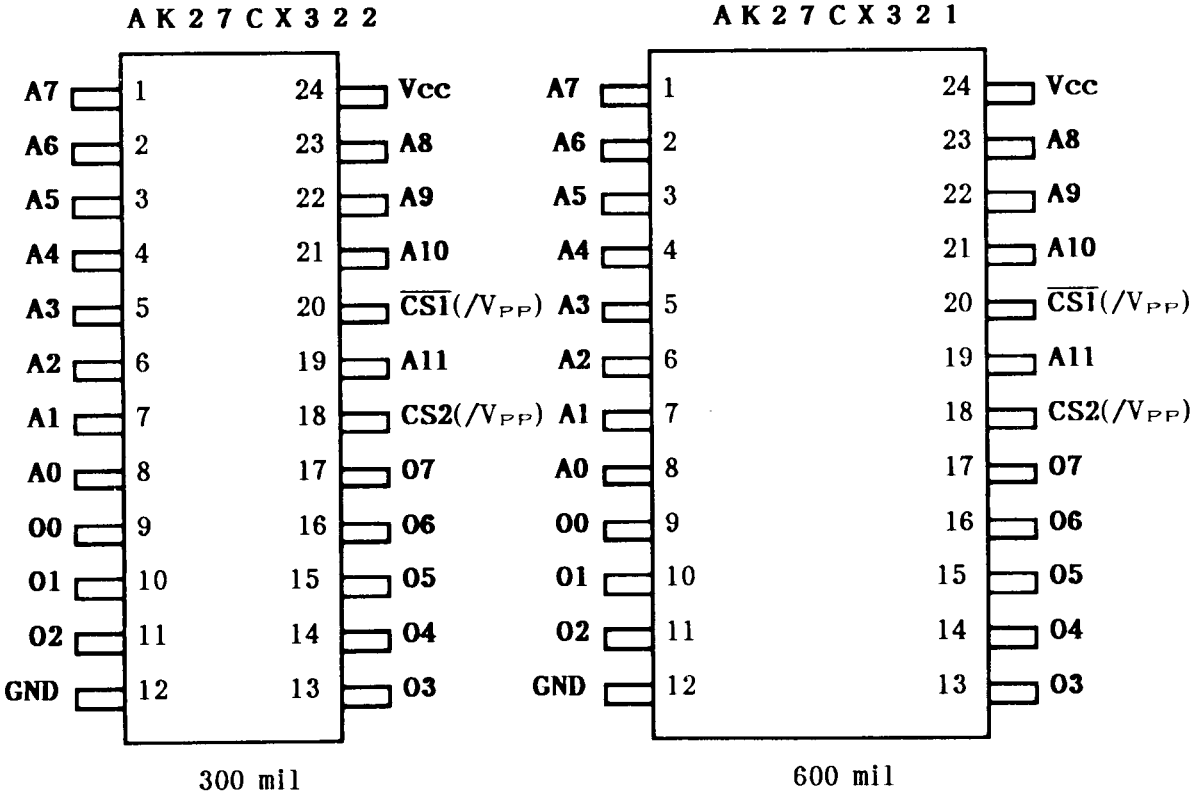


Block Diagrams

General Description

The AKM AK27CX321 and AK27CX322 are 4096 × 8bit, CMOS, high-speed, UV-erasable PROMs that provide a low-power, reprogrammable alternative to bipolar fuse-link PROMs. Available in both 600mil(AK27CX321) and 300mil(AK27CX322) packages, these devices are pin/socket-compatible with many popular bipolar PROMs. The AK27CX321/322 is designed in an advanced CMOS EPROM technology and utilize 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 AK27CX321/322 not only adds convenience and reduces development and field retrofit costs, but enhances factory testability, allowing for 100% field programmability and function.

■ Pin Diagrams



A0-A11 = Address Input
O0-O7 = Data Output
$\overline{CS1}$ = $\overline{\text{Chip Select 1}}$ (/VPP Programming Voltage)
CS2 = Chip Select 2 (/VPP Power-down set Voltage)
GND = Ground
Vcc = Power Supply(+5V)

Standby Low-Power Mode

The low-power standby mode is a user-selectable option that can be set using programming equipment that supports the AK27CX321/322. If this mode is set, the AK27CX321/322 will power-down to typically 500 μA 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 AKM.

Erasure Characteristics

The AK27CX321/322 is erased by exposure to ultraviolet light. For complete erasure, the recommended minimum integrated dose (UV intensity × exposure time) is 15 Watt-second/cm^2 of ultraviolet light with a wavelength of 2537 . For an ultraviolet lamp with a 12mW/cm^2 power rating, the exposure time would be approximately 20 minutes. The AK27CX321/322 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 AK27CX321/322

The AK27CX321/322 employs a dual-transistor differential memory cell design. Initially, and after erasure, all bits of the AK27CX321/322 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.

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 ~ +7.0	V
V_{IO}	Voltage Applied to Any Pin	Relative to GND	-0.6 ~ V_{CC}+0.6	V
T_A	Ambient Temp., Power Applied		-10 ~ +85	℃
T_{ST}	Storage Temperature		-65 ~ +125	℃
T_{LT}	Lead Temperature	Soldering 10 seconds	+260	℃

Read Operation

Operation Ranges

Symbol	Parameter	Conditions	min.	max.	Unit
V_{CC}	Supply Voltage		4.75	5.25	V
T_A	Ambient Temperature		0	70	℃

D.C. Electrical Characteristics Over the operating range

Symbol	Parameter	Conditions	min.	max.	Unit
V_{IH}	Input HIGH Level		2.0		V
V_{IL}	Input LOW Level			0.8	V
V_{OH}	Output HIGH Voltage*1	V_{CC}=min., I_{OH}=-4.0mA	2.4		V
V_{OL}	Output LOW Voltage	V_{CC}=min., I_{OL}=12mA		0.45	V
I_L	Input Leakage Current	V_{CC}=max., GND$\leq V_I \leq V_{CC}$		10	μA
I_{OS}	Output Short Circuit Current*2	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., Vo=Vcc or GND $\overline{CS1}$ V_{IH} or CS2=V_{IL}		10	μA
I_{CC}	Power Supply Current	All inputs=(GND or V_{CC})±0.3V		40	mA
I_{SB}	Sutandby Current*3	CS2=V_{IL}, OtherInputs =(GND or V_{CC})±0.3V	0.1	5	mA
V_{IC}	Input Clamp Voltage	V_{CC}=min., I_{IN}=-10mA		-1.2	V

Notes :

1. The AK27CX321/322 provide true CMOS output interface levels. The specifications shown are for TTL interface.
2. No more than one output should be shorted at a time. Duration of short circuit should not be more than one second.
3. Applicable only if standby mode is programmed.

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
$C_{\overline{CS1}}$	$\overline{CS1}$ Pin Capacitance			15	pF
C_{CS2}	CS2 Pin Capacitance			6	pF

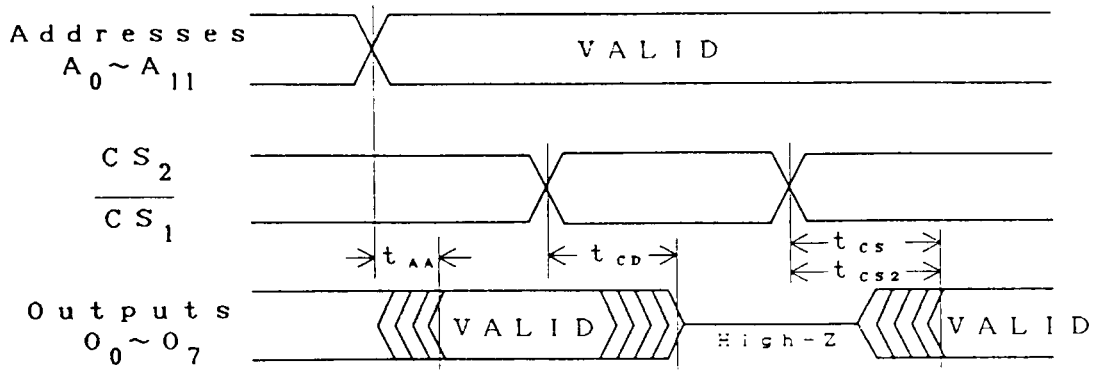
A.C. Electrical Characteristics Over the Operating Range[4]

Symbol	Parameter	27CX321-35 27CX322-35		27CX321-40 27CX322-40		27CX321-45 27CX322-45		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[*6]		20		25		25	ns
t_{CSP}	Chip Select 2 to Output in Standby Mode[*3, *5]		30		30		35	ns
t_{CD}	Chip Select 1 and 2 Disable to High-Z [*5, *6]		20		20		25	ns

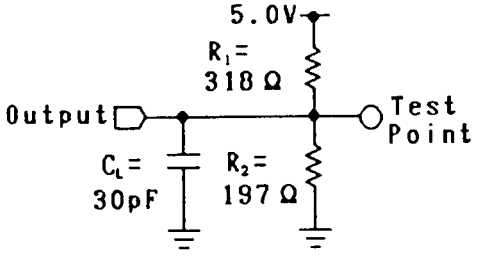
Note :

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

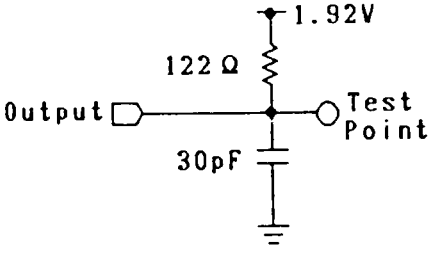
Switching Waveforms



Test Loads



Test Load



Thevenin Equivalent

Note :

5. t_{CS}, t_{CS2}, and t_{CD} are measured at the midpoint between output (O_{0-7}) steady-state high-Z level and V_{OH} or V_{OL}.
6. C_L includes scope and jig capacitance. t_{CD} is tested with C_L=5pF.

Program operation

Operation Ranges

Symbol	Parameter	Conditions	min.	max.	Unit
T_A	Ambient Temperature		20	30	℃

D.C. Electrical Characteristics

Ta = 25℃

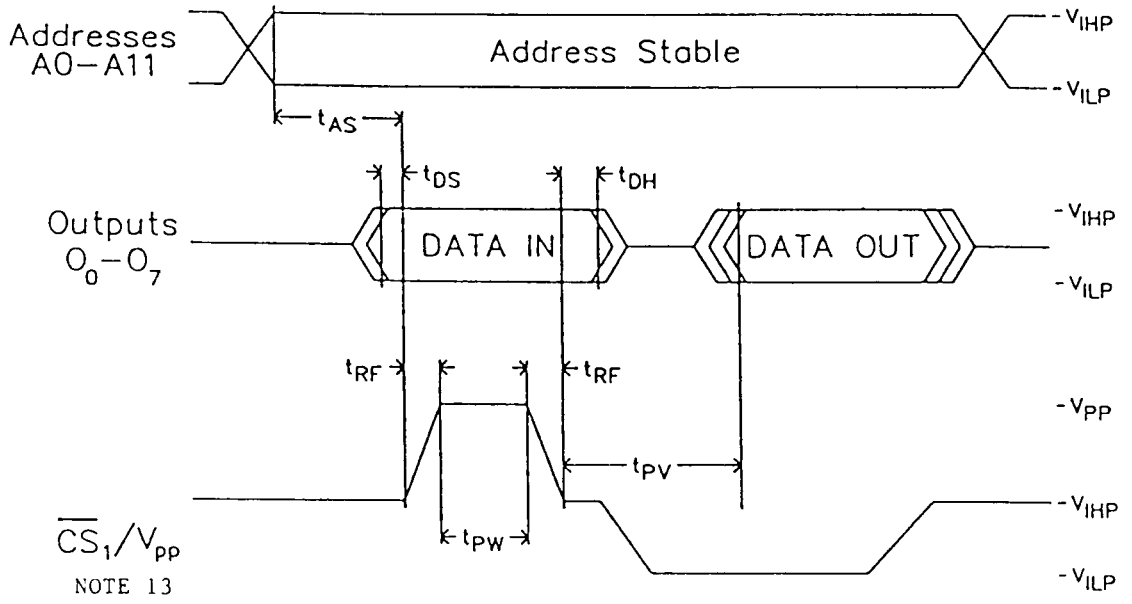
Symbol	Parameter	min.	typ.	max.	Unit
Vccp	Vcc during programming	5.75	6	6.25	V
V_{IHP}	Input HIGH Level during programming	2.4		6.25	V
V_{ILP}	Input LOW Level during programming	0		0.45	V
Vpp	Programming Voltage	12.2	12.5	12.8	V
Ipp	Vpp Supply Current		20	50	mA

A.C. Electrical Characteristics

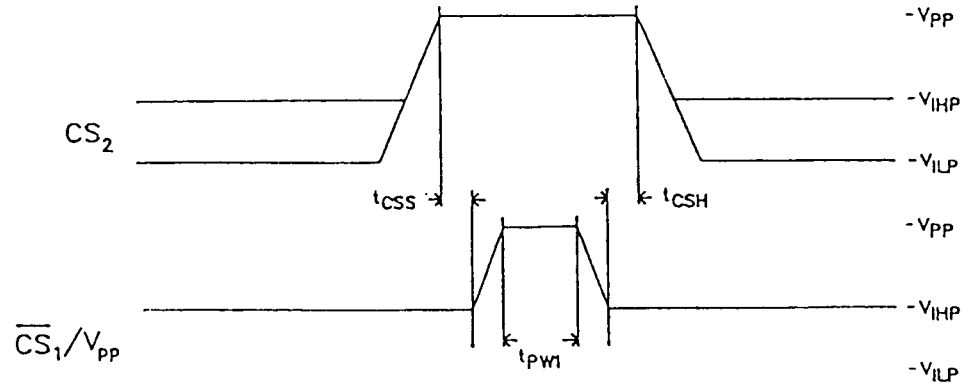
Ta = 25℃

Symbol	Parameter	min.	typ.	max.	Unit
t_{AS}	Address set-up to Vpp pulse	0			ns
t_{DS}	Data set-up to Vpp pulse	0			ns
t_{PW}	Vpp program pulse width *7			50	μs
t_{PWI}	VPP pulse wudth for (set) power-down mode			100	ms
t_{RF}	Vpp rise and fall ramp time *8	1			ns/V
t_{DH}	Data hold time	10			ns
t_{PV}	Vpp pulse to verify delay *9		2	5	μs
t_{CSS}	Chip select 2 set-up to V_{PP}	10			ns
t_{CSH}	Chip select 2 hold after V_{PP}	10			ns

Switching Waveforms (PROGRAMMING) <Vccp=6V>



Switching Waveforms (SET POWER-DOWN) <Vccp=6V>



Note :

*7: It is recommended to use 50 μ s for the Vpp Program pilse width in the interetive section to ensure maximum device performance.

*8: In using the recommended rise and fall ramp times, any overshoot due to system and/or tester noise must not exceed the maximum Vccp voltage.

*9: This timing parameter is the device internal delay. After the $\overline{CS1}$/Vpp pin has been ramped down from the Vpp to the V_{ILP} voltage (to do a data read for data verification), the outputs will have a t_{PV} delay before they are valid .

Programming Flow