PRELIMINARY

Am27X800

Advanced Micro Devices

8 Megabit (1,048,576 x 8-Bit/524,288 x 16-Bit) CMOS ExpressROM™ Device

- **As an OTP EPROM alternative:**
  - — Factory optimized programming
  - — Fully tested and guaranteed
- **As a Mask ROM alternative:**
  - — Shorter leadtime
  - — Lower volume per code
- **Fast access time**
  - — 150 ns
- **Single +5 V power supply**
- **Compatible with JEDEC-approved EPROM pinout**
- **±10% power supply tolerance**
- **High noise immunity**
- **Low power dissipation**
  - — 100 µA maximum CMOS standby current
- **Available in Plastic Dual In-Line Package (PDIP) and Plastic Leaded Chip Carrier (PLCC)**
- **Latch-up protected to 100 mA from –1 V to V_{CC} +1 V**
- **Versatile features for simple interfacing**
  - — Both CMOS and TTL input/output compatibility
  - — Two line control functions

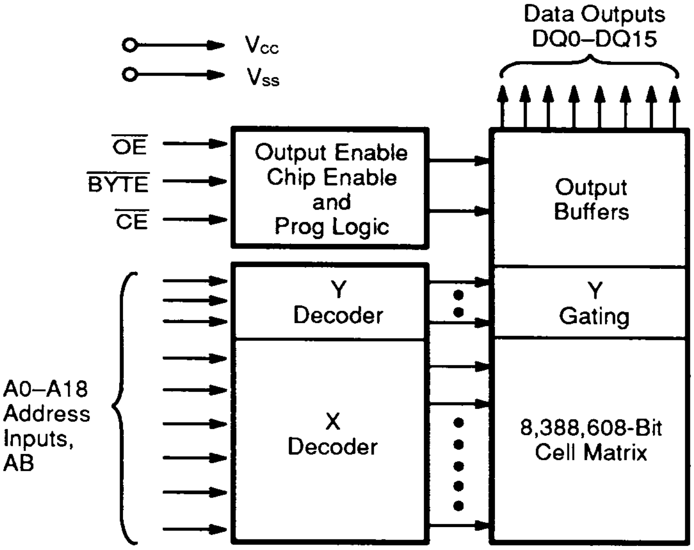
GENERAL DESCRIPTION

The Am27X800 is a factory programmed and tested OTP EPROM. It is programmed after packaging prior to final test. Every device is rigorously tested under AC and DC operating conditions to your stable code. It is organized as 1,048,576 by 8 bits/524,288 x 16 bits and is available in plastic dual in-line (PDIP) as well as plastic leaded chip carrier (PLCC) packages. ExpressROM devices provide a board-ready memory solution for medium to high volume codes with short leadtimes. This offers manufacturers a cost-effective and flexible alternative to OTP EPROMs and mask programmed ROMs.

Access times as fast as 150 ns allow operation with high-performance microprocessors with reduced WAIT states. The Am27X800 offers separate Output Enable ($\overline{OE}$) and Chip Enable ($\overline{CE}$) controls, thus eliminating bus contention in a multiple bus microprocessor system.

AMD's CMOS process technology provides high speed, low power, and high noise immunity. Typical power consumption is only 150 mW in active mode, and 100 µW in standby mode.

BLOCK DIAGRAM



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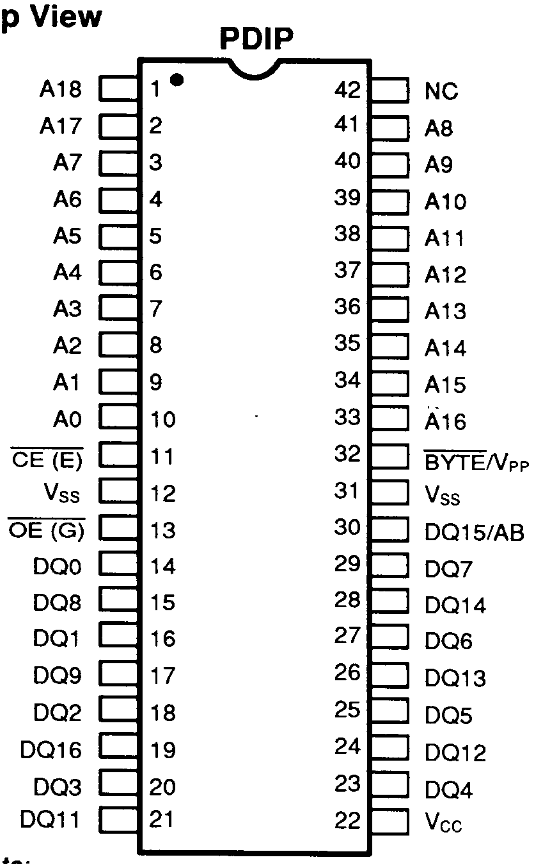
PRODUCT SELECTOR GUIDE

Family Part No	**Am27X800**		
Ordering Part No:			
V_{CC} ±5%	**-155**		**-255**
V_{CC} ±10%	**-150**	**-200**	
Max Access Time (ns)	150	200	250
$\overline{CE}$ ($\overline{E}$) Access (ns)	150	200	250
$\overline{OE}$ ($\overline{G}$) Access (ns)	65	75	100

CONNECTION DIAGRAMS

Top View



Note:

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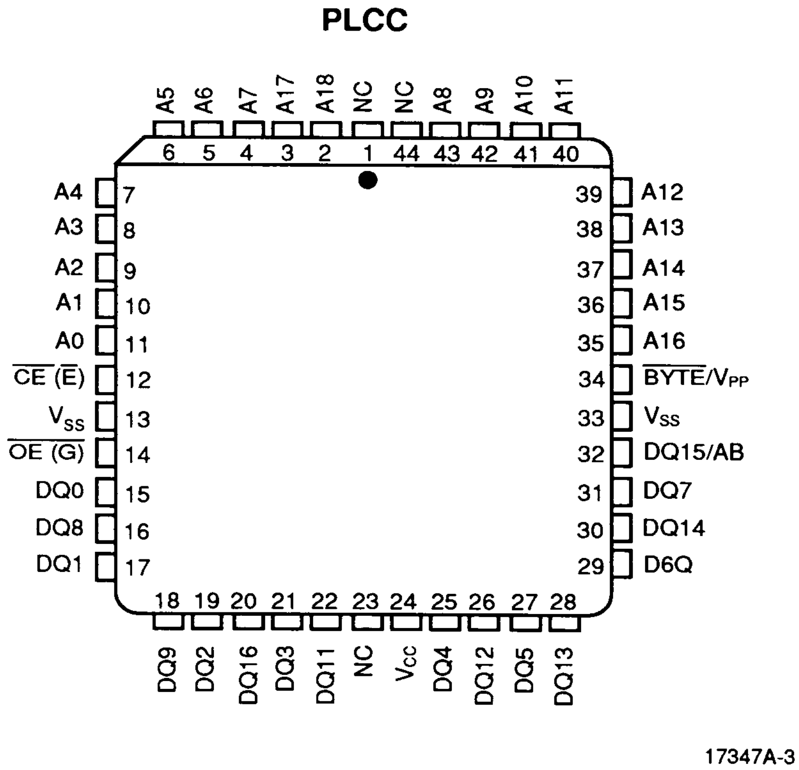
1. *JEDEC nomenclature is in parenthesis.*



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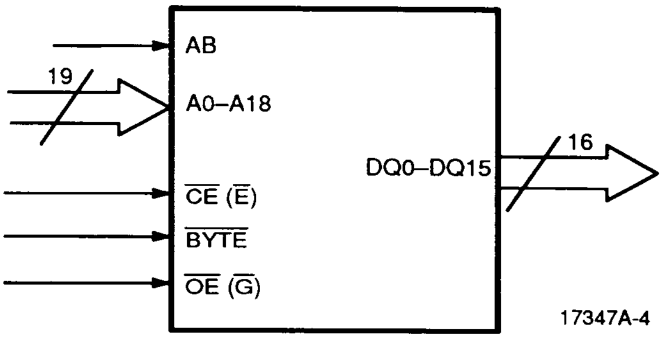
PIN DESIGNATIONS

AB = Address Inputs ($\overline{BYTE}$ Mode)
A0–A18 = Address Inputs
$\overline{BYTE}$ = Byte/Word Switch
$\overline{CE}$ ($\overline{E}$) = Chip Enable Input
DQ0–DQ15 = Data Inputs/Outputs
NC = No Internal Connection
$\overline{OE}$ ($\overline{G}$) = Output Enable Input
V_{CC} = V_{CC} Supply Voltage
V_{PP} = Program Supply Voltage
V_{SS} = Ground

LOGIC SYMBOL



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ORDERING INFORMATION

Standard Products

AMD standard products are available in several packages and operating ranges. The ordering number (Valid Combination) is formed by a combination of:

AM27X800 -150 J C XXXXX

CODE DESIGNATION
Assigned by AMD

TEMPERATURE RANGE
C = Commercial (0°C to +70°C)
I = Industrial (–40°C to +85°C)

PACKAGE TYPE
P = 42-Pin Plastic Dual In-Line Package (PD 042)
J = 44-Pin Rectangular Plastic Leaded Chip Carrier (PL 044)

SPEED OPTION
See Product Selector Guide and Valid Combinations

DEVICE NUMBER/DESCRIPTION
Am27X800
8 Megabit (1,048,576 x 8-Bit/524,288 x 16-Bit)
CMOS ExpressROM™ Device

Valid Combinations	
Am27X800-150	PC, JC, PI, JI
Am27X800-155	
Am27X800-200	
Am27X800-255	

Valid Combinations

Valid Combinations list configurations planned to be supported in volume for this device. Consult the local AMD sales office to confirm availability of specific valid combinations and to check on newly released combinations.

FUNCTIONAL DESCRIPTION

Read Mode

The Am27X800 has two control functions, both of which must be logically satisfied in order to obtain data at the outputs. Chip Enable ($\overline{\text{CE}}$) is the power control and should be used for device selection. Output Enable ($\overline{\text{OE}}$) is the output control and should be used to gate data to the output pins, independent of device selection. Assuming that addresses are stable, address access time (t_{ACC}) is equal to the delay from $\overline{\text{CE}}$ to output (t_{CE}). Data is available at the outputs t_{OE} after the falling edge of $\overline{\text{OE}}$, assuming that $\overline{\text{CE}}$ has been LOW and addresses have been stable for at least t_{ACC}–t_{OE}.

Byte Mode

The user has the option of reading data in either 16-bit words or 8-bit bytes under control of the $\overline{\text{BYTE}}$ input. With the $\overline{\text{BYTE}}$ input HIGH, input A0–A18 will address 512K words of 16-bit data. When the $\overline{\text{BYTE}}$ input is LOW, AB functions as the least significant address input and 1 Mbyte of data can be accessed. The 8 bits of data will appear on DQ0–DQ7.

Standby Mode

The Am27X800 has a CMOS standby mode which reduces the maximum V_{CC} current to 100 µA. It is placed in CMOS-standby when $\overline{\text{CE}}$ is at V_{CC} ± 0.3 V. The Am27X800 also has a TTL-standby mode which reduces the maximum V_{CC} current to 1.0 mA. It is placed in TTL-standby when $\overline{\text{CE}}$ is at V_{IH}. When in standby mode, the outputs are in a high-impedance state, independent of the $\overline{\text{OE}}$ input.

Output OR-Tieing

To accommodate multiple memory connections, a two-line control function is provided to allow for:

- Low memory power dissipation
- Assurance that output bus contention will not occur

It is recommended that $\overline{\text{CE}}$ be decoded and used as the primary device-selecting function, while $\overline{\text{OE}}$ be made a common connection to all devices in the array and connected to the READ line from the system control bus. This assures 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 memory device.

System Applications

During the switch between active and standby conditions, transient current peaks are produced on the rising and falling edges of Chip Enable. The magnitude of these transient current peaks is dependent on the output capacitance loading of the device. At a minimum, a 0.1 µF ceramic capacitor (high frequency, low inherent inductance) should be used on each device between V_{CC} and V_{SS} to minimize transient effects. In addition, to overcome the voltage drop caused by the inductive effects of the printed circuit board traces on ExpressROM Device arrays, a 4.7 µF bulk electrolytic capacitor should be used between V_{CC} and V_{SS} for each eight devices. The location of the capacitor should be close to where the power supply is connected to the array.

MODE SELECT TABLE

Pins Mode	$\overline{\text{CE}}$	$\overline{\text{OE}}$	V_{PP}	Outputs
Read	V_{IL}	V_{IL}	X	DOUT
Output Disable	V_{IL}	V_{IH}	X	Hi-Z
Standby (TTL)	V_{IH}	X	X	Hi-Z
Standby (CMOS)	V_{CC} ± 0.3 V	X	X	Hi-Z

Note:

1. X = Either V_{IH} or V_{IL}

ABSOLUTE MAXIMUM RATINGS

Storage Temperature	
OTP Products	−65°C to +125°C
All Other Products	−65°C to +150°C
Ambient Temperature with Power Applied	−55°C to +125°C
Voltage with Respect to V_{SS}	
All pins except V_{CC}	−0.6 V to V_{CC} + 0.6 V
V_{CC}	−0.6 V to +7.0 V

Note:

1. *Minimum DC voltage on input or I/O pins is −0.5 V. During transitions, the inputs may overshoot V_{SS} to −2.0 V for periods of up to 20 ns. Maximum DC voltage on input and I/O pins is V_{CC} +0.5 V which may overshoot to V_{CC} + 2.0 V for periods up to 20 ns.*

Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure of the device to absolute maximum rating conditions for extended periods may affect device reliability.

OPERATING RANGES

Commercial (C) Devices	
Case Temperature (T_C)	0°C to +70°C
Industrial (I) Devices	
Case Temperature (T_C)	−40°C to +85°C
Supply Read Voltages	
V_{CC} for Am27X800-XX5	+4.75 V to +5.25 V
V_{CC} for Am27X800-XX0	+4.50 V to +5.50 V

Operating ranges define those limits between which the functionality of the device is guaranteed.

DC CHARACTERISTICS over operating range unless otherwise specified (Notes 1, 2 and 4)

Parameter Symbol	Parameter Description	Test Conditions	Min	Max	Unit
V_{OH}	Output HIGH Voltage	$I_{OH} = -400\ \mu A$	2.4		V
V_{OL}	Output LOW Voltage	$I_{OL} = 2.1$ mA		0.45	V
V_{IH}	Input HIGH Voltage		2.0	$V_{CC}+0.5$	V
V_{IL}	Input LOW Voltage		−0.5	+0.8	V
I_{LI}	Input Load Current	$V_{IN} = 0$ V to $+V_{CC}$		1.0	µA
I_{LO}	Output Leakage Current	$V_{OUT} = 0$ V to $+V_{CC}$		5.0	µA
I_{CC1}	V_{CC} Active Current (Note 3)	$\overline{CE} = V_{IL}$, f = 5 MHz, $I_{OUT} = 0$ mA		50	mA
I_{CC2}	V_{CC} TTL Standby Current	$\overline{CE} = V_{IH}$		1.0	mA
I_{CC3}	V_{CC} CMOS Standby Current	$\overline{CE} = V_{CC} \pm 0.3$ V		100	µA

Notes:

1. *V_{CC} must be applied simultaneously or before V_{PP}, and removed simultaneously or after V_{PP}.*
2. ***Caution:** The Am27X800 must not be removed from (or inserted into) a socket when V_{CC} or V_{PP} is applied.*
3. *I_{CC1} is tested with $\overline{OE} = V_{IH}$ to simulate open outputs.*
4. *Minimum DC Input Voltage is −0.5 V during transactions, the inputs may overshoot to −2.0 V for periods less than 20 ns. Maximum DC Voltage on output pins is V_{CC} + 0.5 V, which may overshoot to V_{CC} + 2.0 V for periods less than 20 ns.*

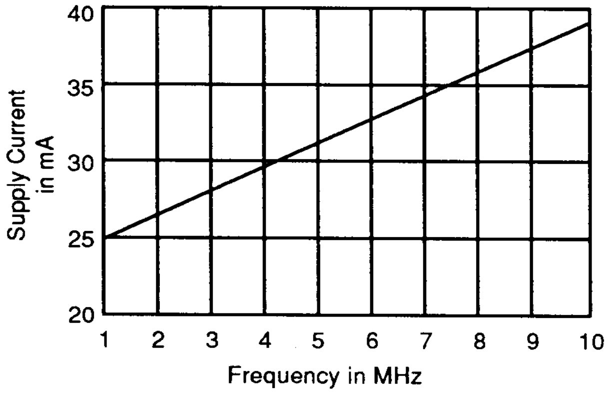

Figure 1. Typical Supply Current vs. Frequency
V_{CC} = 5.5 V, T = 25°C

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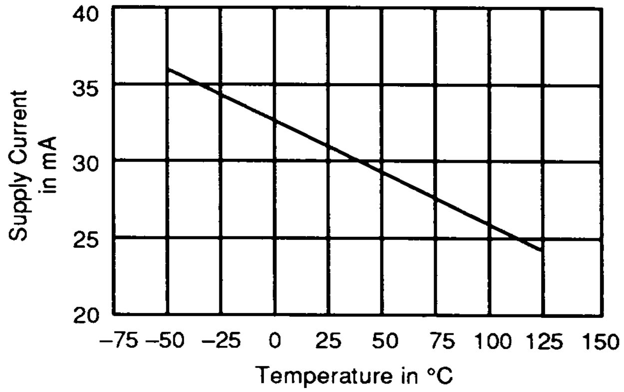

Figure 2. Typical Supply Current vs. Temperature
V_{CC} = 5.5 V, f = 5 MHz

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CAPACITANCE

Parameter Symbol	Parameter Description	Test Conditions	PD 042		PL 044		Unit
			Typ	Max	Typ	Max	
C_{IN}	Input Capacitance	$V_{IN} = 0$ V	10	18	10	18	pF
C_{OUT}	Output Capacitance	$V_{OUT} = 0$ V	10	18	10	18	pF

Notes:

1. *This parameter is only sampled and not 100% tested.*
2. *$T_A = +25°C$, $f = 1$ MHz.*

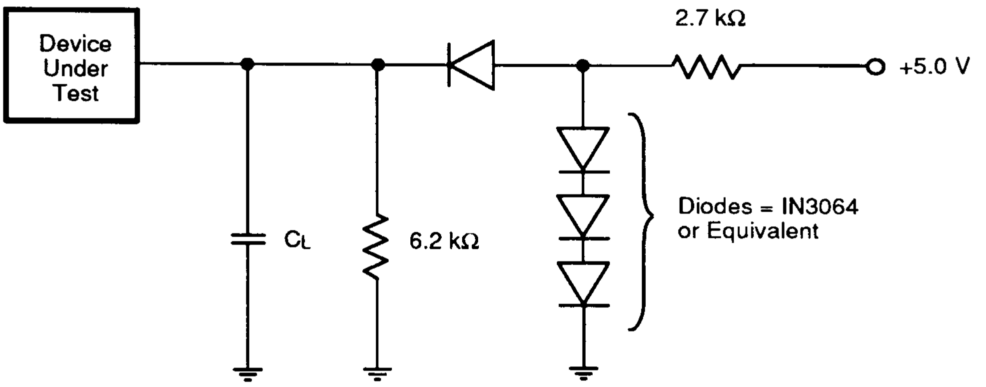
SWITCHING CHARACTERISTICS over operating range unless otherwise specified (Notes 1, 3, and 4)

Parameter Symbols		Parameter Description	Test Conditions		Am27X800			Unit
JEDEC	Standard				-155 -150	-200	-255	
t_{AVQV}	t_{RCC}	Address to Output Delay	$\overline{CE} = \overline{OE} = V_{IL}$	Min	–	–	–	ns
				Max	150	200	250	
t_{ELQV}	t_{CE}	Chip Enable to Output Delay	$\overline{OE} = V_{IL}$	Min	–	–	–	ns
				Max	150	200	250	
t_{GLQV}	t_{OE}	Output Enable to Output Delay	$\overline{CE} = V_{IL}$	Min	–	–	–	ns
				Max	55	60	60	
t_{EHQZ} t_{GHQZ}	t_{DF} (Note 2)	Chip Enable HIGH or Output Enable HIGH, whichever comes first, to Output Float		Min	0	0	0	ns
				Max	40	40	60	
t_{AXQX}	t_{OH}	Output Hold from Addresses, $\overline{CE}$, or $\overline{OE}$, whichever occurred first		Min	0	0	0	ns
				Max	–	–	–	

Notes:

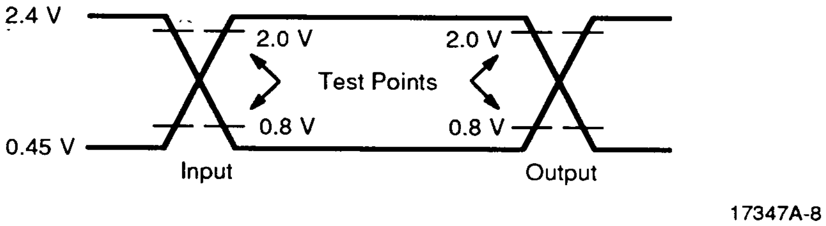
1. *V_{CC} must be applied simultaneously or before V_{PP}, and removed simultaneously or after V_{PP}.*
2. *This parameter is only sample and not 100% tested.*
3. ***Caution:** The Am27X800 must not be removed from (or inserted into) a socket or board when V_{PP} or V_{CC} is applied.*
4. *Output Load: 1 TTL gate and $C_L = 100$ pF*
   Input Rise and Fall Times: 20 ns
   Input Pulse Levels: 0.45 V to 2.4 V
   Timing Measurement Reference Level: 0.8 V and 2 V for inputs and outputs

SWITCHING TEST CIRCUIT



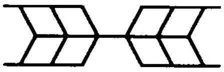
C_L = 100 pF including jig capacitance

SWITCHING TEST WAVEFORM



AC Testing: Inputs are driven at 2.4 V for a Logic “1” and 0.45 V for a Logic “0”. Input pulse rise and fall times are ≤ 20 ns.

KEY TO SWITCHING WAVEFORMS

WAVEFORM	INPUTS	OUTPUTS
	Must be Steady	Will be Steady
	May Change from H to L	Will be Changing from H to L
	May Change from L to H	Will be Changing from L to H
	Don't Care, Any Change Permitted	Changing, State Unknown
	Does Not Apply	Center Line is High-Impedance "Off" State

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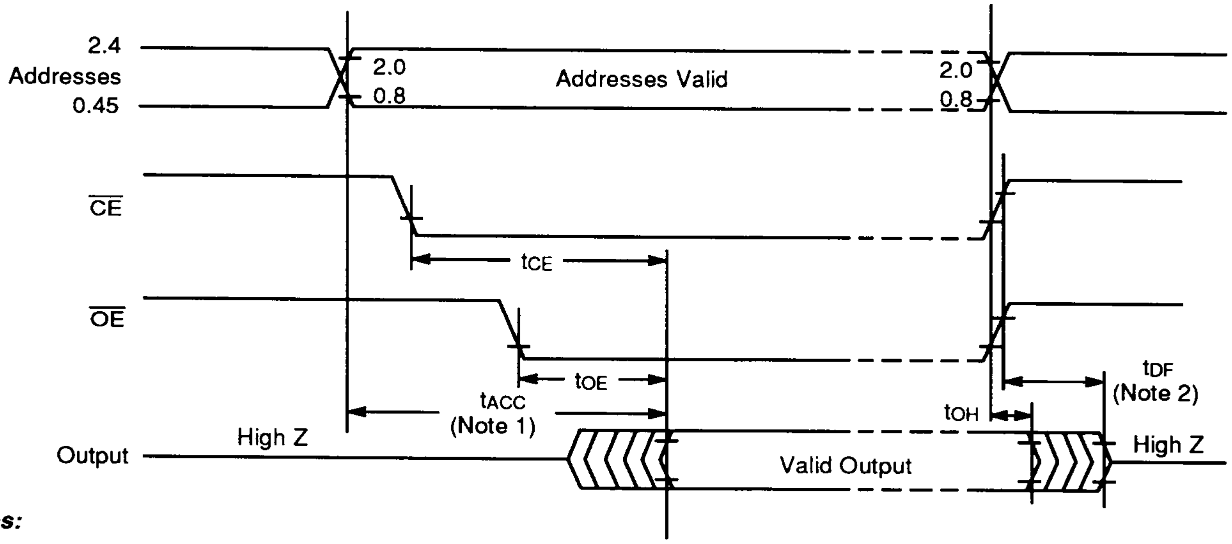
SWITCHING WAVEFORMS



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Notes:

1. *OE may be delayed up to $t_{ACC} - t_{OE}$ after the falling edge of the addresses without impact on t_{ACC}.*
2. *t_{DF} is specified from OE or CE, whichever occurs first.*