

2. APPLICABLE DOCUMENTS

2.1 Government specification and standard. Unless otherwise specified, the following specification and standard, of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this drawing to the extent specified herein.

SPECIFICATION

MILITARY

MIL-M-38510 - Microcircuits, General Specification for.

STANDARD

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.

(Copies of the specification and standard required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing shall take precedence.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices" and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-M-38510 and herein.

3.2.1 Logic diagram. The logic diagram shall be as specified on figure 1.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 2.

3.2.3 Truth table. The truth table shall be as specified on figure 3.

3.2.3.1 Unprogrammed or erased devices. The truth table for unprogrammed devices shall be as specified on figure 3.

3.2.3.2 Programmed devices. The requirements for supplying programmed devices are not part of this drawing.

3.2.4 Case outline. The case outline shall be in accordance with 1.2.2 herein.

3.3 Electrical performance characteristics. Unless otherwise specified, the electrical performance characteristics are as specified in table I and apply over the full case operating temperature range.

3.4 Marking. Marking shall be in accordance with MIL-STD-883 (see 3.1 herein). The part shall be marked with the part number listed in 1.2 herein. In addition, the manufacturer's part number may also be marked as listed in 6.4 herein.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C < T _C < +125°C 4.5 V < V _{CC} < 5.5 V	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Input load current	I _{LI}	V _{IN} = 5.5 V	1, 2, 3	A11		10	μA
Output leakage current	I _{LO}	V _{OUT} = 5.5 V	1, 2, 3	A11		10	μA
V _{CC} standby current	I _{CC1}	CE = V _{IH}	1, 2, 3	A11		40	mA
V _{CC} current (active)	I _{CC2}	CE = OE/V _{PP} = V _{IL}	1, 2, 3	A11		150	mA
Input low voltage	V _{IL}		1, 2, 3	A11	-0.1 1/	+0.8	V
Input high voltage	V _{IH}		1, 2, 3	A11	2.0	V _{CC} +1 1/	V
Output low voltage	V _{OL}	I _{OL} = 2.1 mA	1, 2, 3	A11		0.45	V
Output high voltage	V _{OH}	I _{OH} = -400 μA	1, 2, 3	A11	2.4		V
Address to output delay	t _{ACC}	CE = OE/V _{PP} = V _{IL} 2/	9, 10, 11	01		250	ns
				02		350	
				03		300	
				04		450	
				05		200	
CE to output delay	t _{CE}	OE/V _{PP} = V _{IL} 2/	9, 10, 11	01		250	ns
				02		350	
				03		300	
				04		450	
				05		200	
OE to output delay	t _{OE}	CE = V _{IL} 2/	9, 10, 11	01		100	ns
				02, 03		120	
				04		150	
				05		75	
				05		75	
OE/V _{PP} high to output float	t _{DF} 1/	CE = V _{IL} 2/	9, 10, 11	01		60	ns
				02, 03		105	
				04		130	
				05		55	
				05		55	

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C < T _C < +125°C 4.5 V < V _{CC} < 5.5 V	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Output hold from addresses \overline{CE} or \overline{OE} whichever occurred first	t _{OH} <u>1/</u>	$\overline{CE} = \overline{OE}/V_{pp} = V_{IL}$ <u>2/</u>	9, 10, 11	A11	0		ns
Input capacitance except \overline{OE}/V_{pp}	C _{IN1}	V _{IN} = 0 V See 4.3.1c	4	A11		7	pF
Output capacitance	C _{OUT}	V _{OUT} = 0 V See 4.3.1c	4	A11		12	pF
\overline{OE}/V_{pp} input capacitance	C _{IN2}	V _{OUT} = 0 V See 4.3.1c	4	A11		20	pF

1/ May not be tested, but shall be guaranteed to the limits specified in table I.
 2/ See figures 4 and 5.

3.5 Processing EPROMS. All testing requirements and quality assurance provisions herein shall be satisfied by the manufacturer prior to delivery.

3.5.1 Erasure of EPROMS. When specified, devices shall be erased in accordance with the procedures and characteristics specified in 4.4.

3.5.2 Programmability of EPROMS. When specified, devices shall be programmed to the specified pattern using the procedures and characteristics specified in 4.5 and table III.

3.5.3 Verification of erasure of programmability of EPROMS. When specified, devices shall be verified as either programmed to the specified pattern or erased. As a minimum, verification shall consist of performing a functional test (subgroup 7) to verify that all bits are in the proper state. Any bit that does not verify to be in the proper state shall constitute a device failure, and shall be removed from the lot.

3.6 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in 6.4. The certificate of compliance submitted to DESC-ECS prior to listing as an approved source of supply shall state that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.7 Certificate of conformance. A certificate of conformance as required in MIL-STD-883 (see 3.1 herein) shall be provided with each lot of microcircuits delivered to this drawing.

3.8 Notification of change. Notification of change to DESC-ECS shall be required in accordance with MIL-STD-883 (see 3.1 herein).

3.9 Verification and review. DESC, DESC's agent, and the acquiring activity retain the option to review the manufacturer's facility and applicable required documentation. Offshore documentation shall be made available onshore at the option of the reviewer.

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4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with section 4 of MIL-M-38510 to the extent specified in MIL-STD-883 (see 3.1 herein).

4.2 Screening. Screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to quality conformance inspection. The following additional criteria shall apply:

- a. Burn-in test (method 1015 of MIL-STD-883).
 - (1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.5 herein).
 - (2) $T_A = +125^\circ\text{C}$, minimum.
- b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.
- c. A data retention stress test shall be included as part of the screening procedure and shall consist of the following steps:

Margin test method A.

- (1) Program greater than 95 percent of the bit locations, including the slowest programming cell (see 3.5.2).
- (2) Bake, unbiased, for 12 hours at 200°C .
- (3) Perform a margin test using $V_m = V_{CC} = 6.0\text{ V}$ at 25°C using loose timing.
- (4) Erase device, then program 45 percent to 50 percent of the bits to a worst case speed pattern.
- (5) Perform dynamic burn-in (see 4.2a).
- (6) Perform a margin test using $V_m = V_{CC} = 6.0\text{ V}$ at 25°C .
- (7) Perform 100 percent electrical testing at $+125^\circ\text{C}$, $+25^\circ\text{C}$, and -55°C .
- (8) Erase device (see 3.5.1), except devices submitted for groups A, B, C, and D.
- (9) Verify erasure (see 3.5.3).

Margin test method B.

- (1) Program greater than 95% of the bit locations, including the slowest programming cell (see 3.5.2). The remaining cells shall provide a worst case speed pattern.
- (2) Bake, unbiased, for 72 hours at $+140^\circ\text{C}$ to screen for data retention lifetime.
- (3) Perform a margin test using $V_m = +5.9$ at 25°C using loose timing (i.e., $t_{ACC} = 1\ \mu\text{s}$).
- (4) Perform dynamic burn-in (see 4.2a).
- (5) Margin at $V_m = +5.9\text{ V}$.

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(6) Perform electrical tests (see 4.2).

(7) Erase (see 3.5.1), except devices submitted for groups A, B, C, and D testing.

(8) Verify erasure (see 3.5.3).

4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with method 5005 of MIL-STD-883 including groups A, B, C, and D inspections. The following additional criteria shall apply.

4.3.1 Group A inspection.

- a. Tests shall be as specified in table II herein.
- b. Subgroups 5 and 6 in table I, method 5005 of MIL-STD-883 shall be omitted.
- c. Subgroup 4 (C_{IN} and C_{OUT} measurement) shall be measured only for the initial test and after process design changes which may affect capacitance.
- d. All devices selected for testing shall have the EPROM programmed with a checkerboard pattern or equivalent. After completion of all testing, the devices shall be erased and verified (except devices submitted for group C and D testing).
- e. Subgroups 7 and 8 shall consist of verifying the EPROM pattern specified.

4.3.2 Groups C and D inspections.

- a. End-point electrical parameters shall be as specified in table II herein.
- b. Steady-state life test conditions, method 1005 of MIL-STD-883.
 - (1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.6 herein).
 - (2) $T_A = +125^\circ\text{C}$, minimum.
 - (3) Test duration: 1,000 hours, except as permitted by and method 1005 of MIL-STD-883.

4.4 Erasing procedures. The recommended erasure procedure is exposure to shortwave ultraviolet light which has a wavelength of 2537 Angstroms (Å). The integrated dose (i.e., UV intensity x exposure time) for erasure should be a minimum of fifteen (15) Ws/cm^2 . The erasure time with this dosage is approximately 15 to 20 minutes using an ultraviolet lamp with a $1200 \mu\text{W}/\text{cm}^2$ power rating. The device should be placed within one inch of the lamp tubes during erasure. The maximum integrated dose the device can be exposed to without damage is $7258 \text{Ws}/\text{cm}^2$ (1 week at $12000 \mu\text{W}/\text{cm}^2$). Exposure of the device to high intensity UV light for long periods may cause permanent damage.

4.5 Programming procedures for method A. The programming characteristics in table III and the following procedures shall be used for programming the device.

- a. Connect the device in the electrical configuration for programming the waveforms of figure 6 and programming characteristics of table III shall apply.
- b. Initially and after each erasure all bits are in the "1" state. Information is introduced by selectively programming "0" into the desired bit locations. A programmed "0" can be changed to a "1" by ultraviolet light erasure (see 4.4).
- c. Programming occurs when the \overline{OE}/V_{pp} input is at 12.5 V and \overline{CE} is at TTL low.

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TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (per method 5005, table I)
Interim electrical parameters (method 5004)	---
Final electrical test parameters (method 5004)	1*, 2, 3, 7*, 8, 9, 10, 11
Group A test requirements (method 5005)	1, 2, 3, 7, 8, 9, 10, 11**
Groups C and D end-point electrical parameters (method 5005)	2, 8 (125°C), 10

* PDA applies to subgroup 1 (see 4.2c).
 ** Subgroups 10 and 11, if not tested, shall be
 guaranteed to the specified limits in table I.

4.6 Electrostatic discharge sensitivity inspection. Electrostatic discharge sensitivity (ESDS) testing shall be performed in accordance with MIL-STD-883, method 3015, and MIL-M-38510. The option to categorize devices as ESD sensitive without performing the test is not allowed. Only those device types that pass ESDS testing at 1,000 volts or greater shall be considered as conforming to the requirements of this drawing. ESDS testing shall be measured only for initial testing and after process or design changes which may effect ESDS classification.

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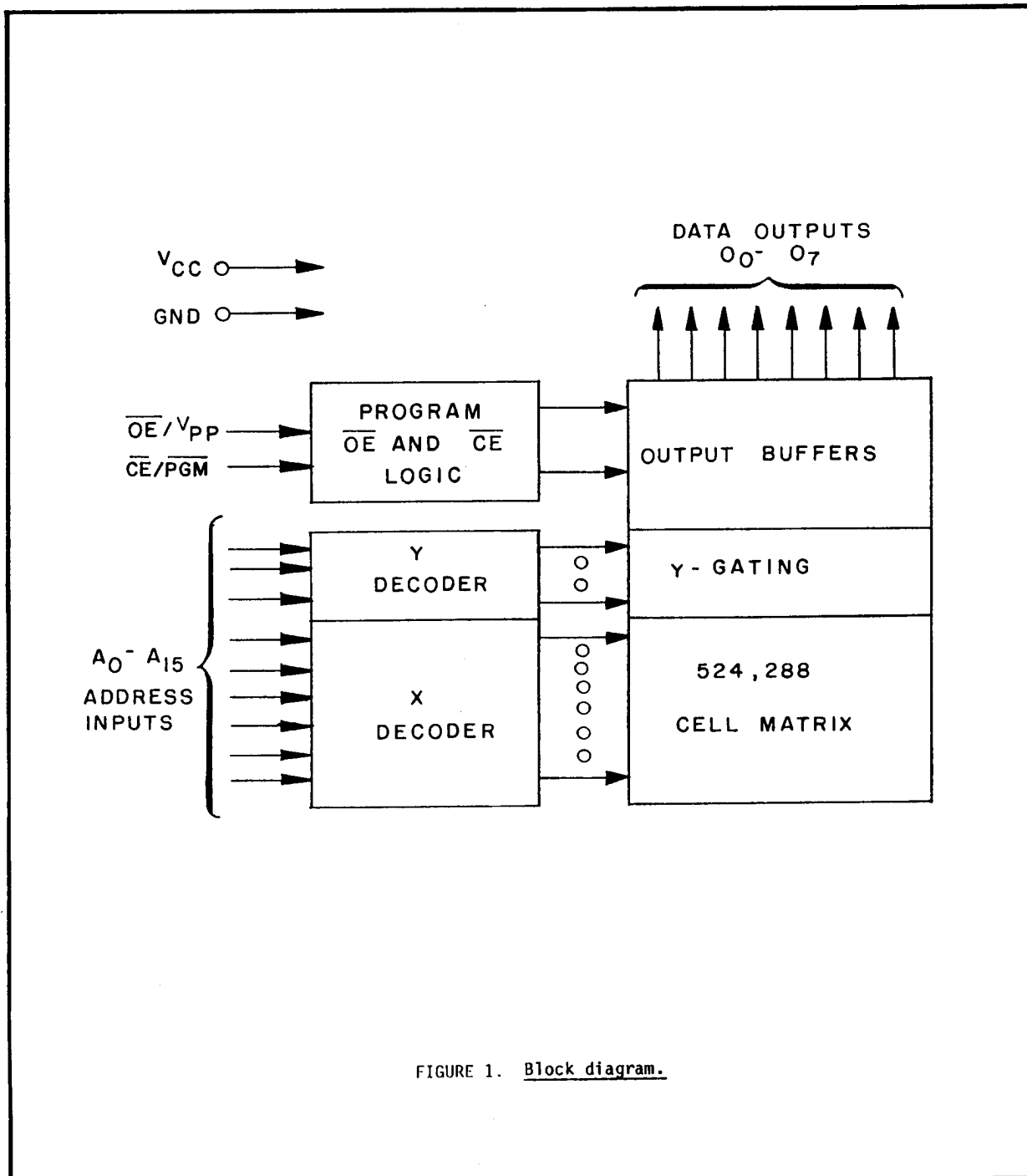


FIGURE 1. Block diagram.

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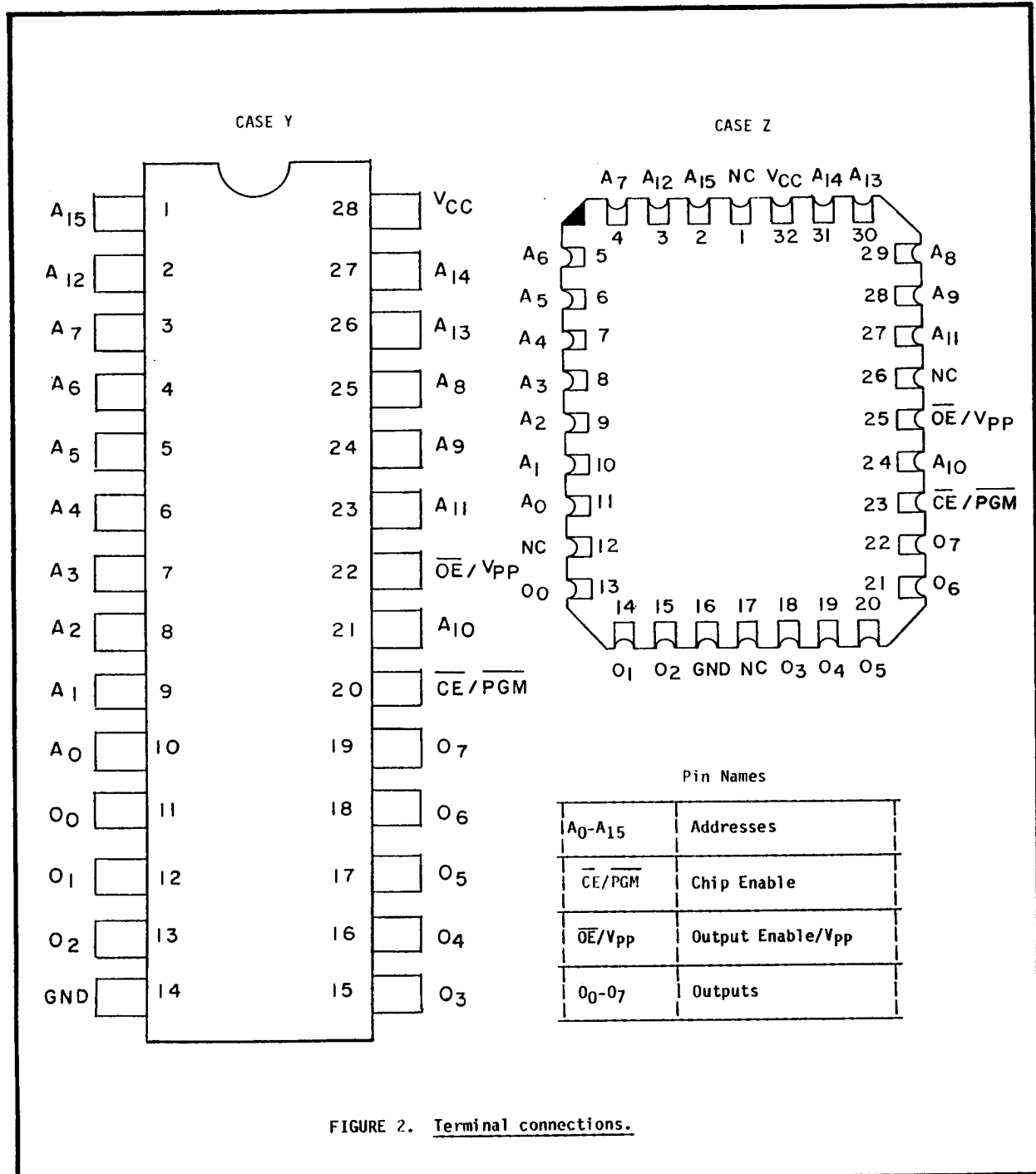


FIGURE 2. Terminal connections.

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Mode	Pins	\overline{CE}	\overline{OE}/V_{pp}	A_9	V_{CC}	Outputs
Read		V_{IL}	V_{IL}	X	V_{CC}	D_{OUT}
Output Disable		V_{IL}	V_{IH}	X	V_{CC}	High Z
Standby		V_{IH}	X	X	V_{CC}	High Z
Intelligent Programming		V_{IL}	V_{pp}	X	V_{CC}	D_{IN}
Program Inhibit		V_{IH}	V_{pp}	X	V_{CC}	High Z
Intelligent Identifier		V_{IL}	V_{IL}	V_H	V_{CC}	Code

- NOTES:
1. X can be V_{IH} or V_{IL}
2. $V_H = 12.0 V \pm 0.5 V$

FIGURE 3. Truth table.

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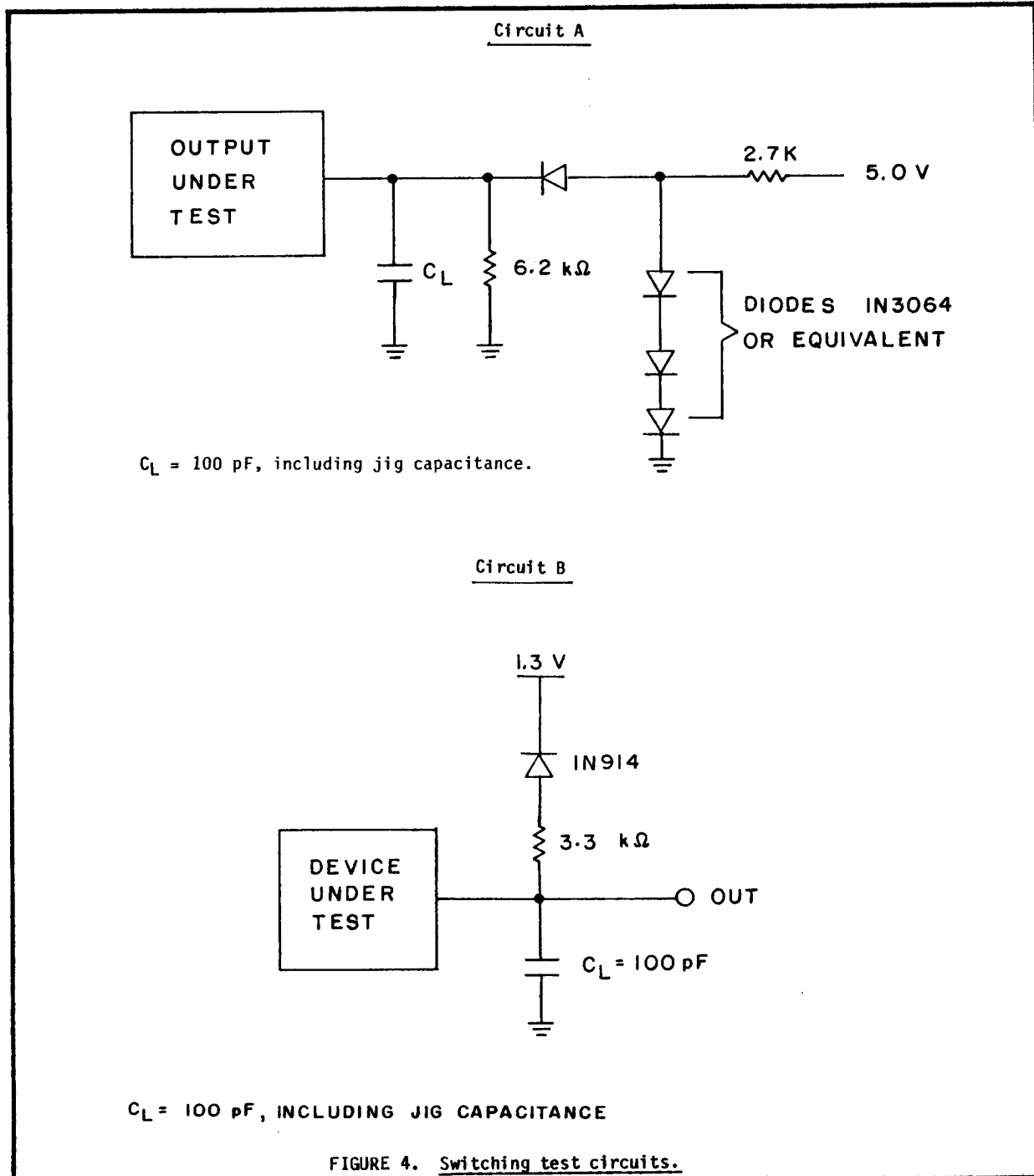


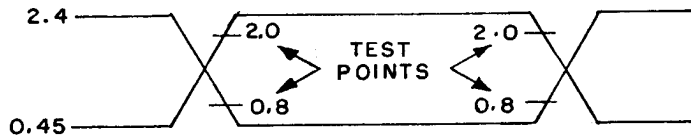
FIGURE 4. Switching test circuits.

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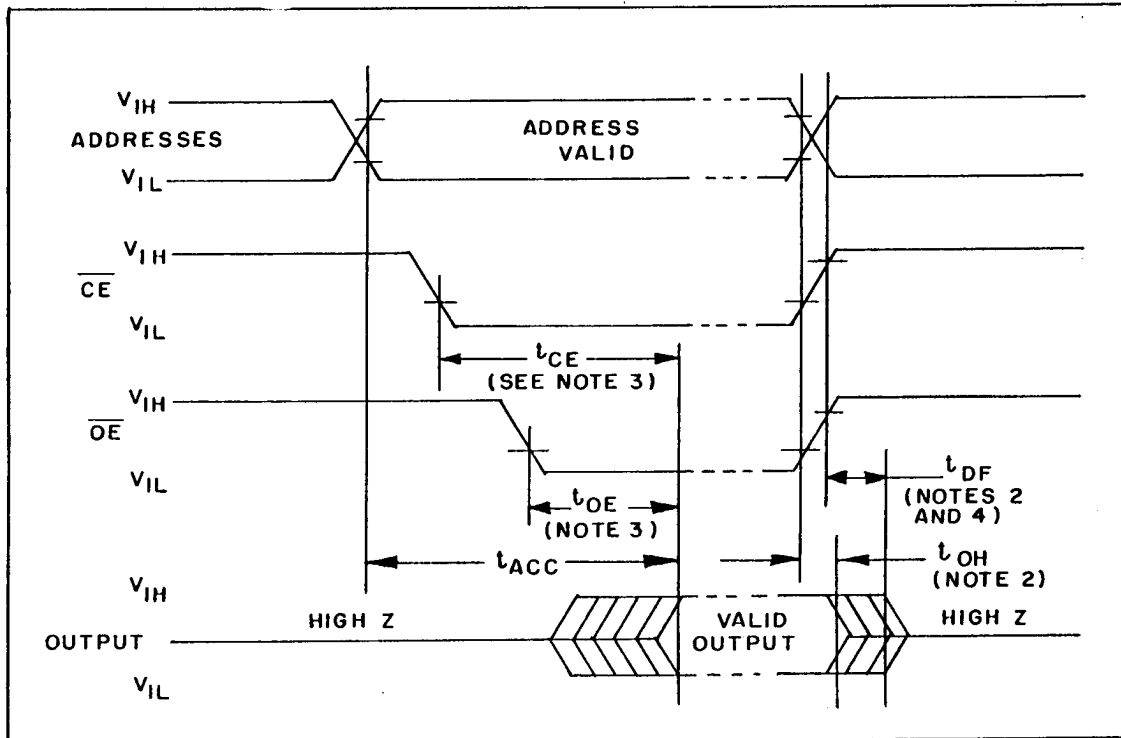
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AC TESTING INPUT/OUTPUT WAVEFORM



AC TESTING INPUTS ARE DRIVEN AT 2.4 V FOR A LOGIC "1" AND .045 V FOR A LOGIC "0". TIMING MEASUREMENTS ARE MADE AT 2.0 V FOR A LOGIC "1" AND 0.8 V FOR A LOGIC "0".



NOTES:

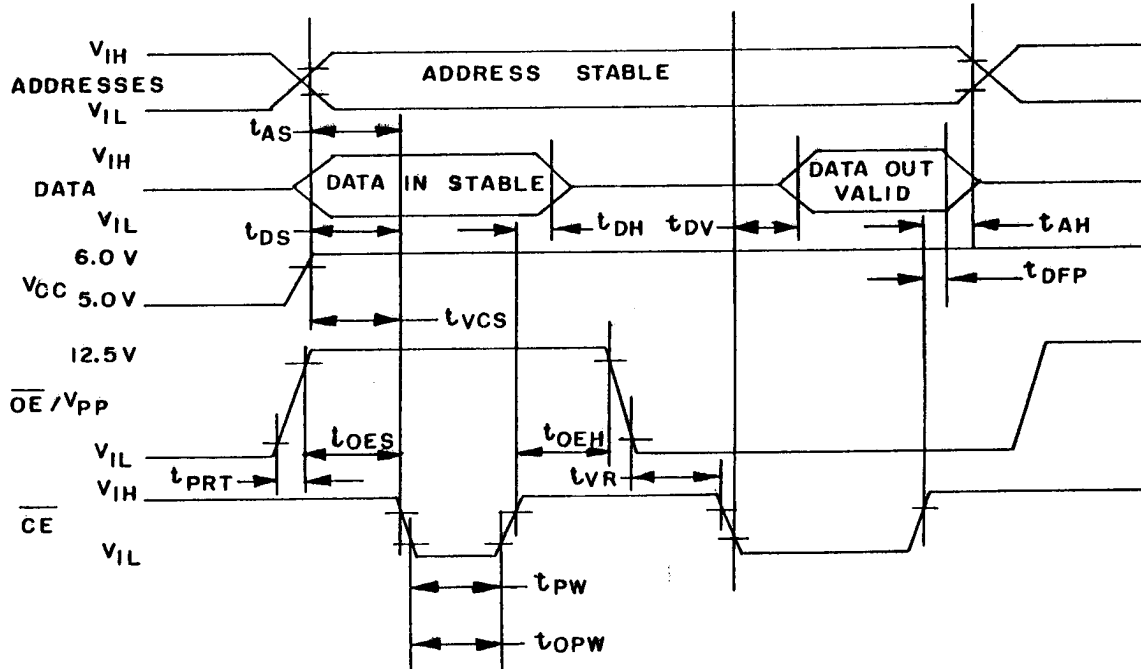
1. Typical values are for $T_A = 25^\circ\text{C}$ and nominal supply voltages.
2. This parameter is only sampled and is not 100% tested.
3. \overline{OE}/V_{pp} may be delayed up to $t_{CE} - t_{OE}$ after the falling edge of \overline{CE} without impact on t_{CE} .
4. t_{DF} is specified from \overline{OE}/V_{pp} or \overline{CE} , whichever occurs first.

FIGURE 5. AC waveforms.

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- NOTES:
1. The input timing reference level is 0.8 V for a V_{IL} and 2.0 V for a V_{IH} .
 2. t_{OE} and t_{DFP} are characteristics of the device but must be accommodated by the programmer.

FIGURE 6. Programming waveforms.

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TABLE III. Programming characteristics for method A.

Parameter	Symbol	Conditions ^{1/} T _A = 25°C ±5°C, V _{CC} = 6.0 V ±0.25 V OE/V _{pp} = 12.5 V ±0.5 V	Group A subgroups	Limits		Unit
				Min	Max	
Input current (all inputs)	I _{LI}	V _{IN} = V _{IL} or V _{IH}			10	μA
Input low level (all inputs)	V _{IL}			-0.1	0.8	V
Input high level	V _{IH}			2.0	V _{CC} +1	V
Output low voltage during verify	V _{OL}	I _{OL} = 2.1 mA			0.45	V
Output high voltage during verify	V _{OH}	I _{OH} = -400 μA		2.4		V
V _{CC} supply current	I _{CC2}				150	mA
V _{pp} supply current (program)	I _{pp2}	CE = V _{IL}			50	mA
A9 intelligent identifier voltage	V _{ID}			11.5	12.5	V
Address setup time	t _{AS}			2		μs
OE/V _{pp} setup time	t _{OES}			2		μs
OE/V _{pp} hold time	t _{OEH}			2		μs
Data setup time	t _{DS}			2		μs
Address hold time	t _{AH}			0		μs
Data hold time	t _{DH}			2		μs
Output enable to output float delay	t _{DFP} _{2/}			0	130	ns

See footnotes at end of table.

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TABLE III. Programming characteristics for method A - Continued.

Parameter	Symbol	Conditions ^{1/} T _A = 25°C ±5°C, V _{CC} = 6.0 V ±0.25 V OE/V _{pp} - 12.5 V ±0.5 V	Group A subgroups	Limits		Unit
				Min	Max	
V _{CC} setup time	t _{VCS}			2		μs
CE initial program pulse width	t _{pw} ^{3/}			0.95	1.05	ms
CE overprogram pulse width	t _{OPW} ^{4/}			2.85	78.75	ms
Data valid from CE	t _{DV}				1	μs
OE/V _{pp} recovery time	t _{VR}			2		μs
OE/V _{pp} pulse rise time during programming	t _{PRT}			50		ns

- 1/ V_{CC} must be applied simultaneously or before OE/V_{pp} and removed simultaneously or after EO/V_{pp}.
 2/ This parameter is only sampled and is not 100 percent tested. Output float is defined as the point where data is no longer driven, see timing diagram.
 3/ Initial program pulse width tolerance is 1 ms ±5 percent.
 4/ The length of the overprogram pulse may vary from 2.85 ms to 78.75 ms as a function of the iteration counter value X.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use when military specifications do not exist and qualified military devices that will perform the required function are not available for OEM application. When a military specification exists and the product covered by this drawing has been qualified for listing on QPL-38510, the device specified herein will be inactivated and will not be used for new design. The QPL-38510 product shall be the preferred item for all applications.

6.2 Replaceability. Replaceability is determined as follows:

- a. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.
- b. When a QPL source is established, the part numbered device specified in this drawing will be replaced by the microcircuit identified as part number M38510/2700XB.

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6.3 Comments. Comments on this drawing should be directed to DESC-ECS, Dayton, OH 45444, or telephone 513-296-5375.

6.4 Approved sources of supply. Approved sources of supply are listed herein. Additional sources will be added as they become available. The vendors listed herein have agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to DESC-ECS.

Military drawing part number	Vendor CAGE number	Vendor similar part number <u>1/</u>	Replacement military specification part number	Margin test method	Switching test circuit
5962-8513501YX	34649 34335	MD27512-25/B AM27512-25/BXA	M38510/27002BYX	B A	B A
5962-8513502YX	34649	MD27512-35/B	M38510/27001BYX	B	B
5962-8513503YX 5962-8513503ZX	34335 34335	AM27512-30/BXA AM27512-30/BUA		A A	A A
5962-8513504YX 5962-8513504ZX	34335 34335	AM27512-45/BXA AM27512-45/BUA		A A	A A
5962-8513505YX	34649	MD27512-20/B	M38510/27003BYX	B	B

1/ Caution: Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

Vendor CAGE number

Vendor name and address

34335

Advanced Micro Devices
901 Thompson Place
P. O. Box 3453
Sunnyvale, CA 94088

34649

Intel Corporation
3065 Bowers Avenue
Santa Clara, CA 95051

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