REVISIONS

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Page 1: Document inactive for new design as of 81-09-25 use M38510/17002B.	81-9-25	N.A. Hauck
B	Convert to SMD format. Technical changes to table II. Editorial changes throughout. Redrawn.	92-11-18	M.L. Poelking
C	Add device type 02. Add cage 34371 as source of supply. Technical changes in 1.3 and 1.4 and table I. Boilerplate update. Editorial changes throughout.	93-11-18	M. L. Poelking

THE ORIGINAL FIRST PAGE OF THIS DRAWING HAS BEEN REPLACED.

CURRENT CAGE CODE 67268

REV															
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REV															
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REV STATUS OF SHEETS	REV	C	C	C	C	C	C	C	C	C	C	C	C	
	SHEET	1	2	3	4	5	6	7	8	9	10	11	12	

PMIC N/A	PREPARED BY William E. Shoup	DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444

STANDARDIZED MILITARY DRAWING

THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

AMSC N/A

| CHECKED BY C.R. Jackson |
| APPROVED BY N.A. Hauck |
| DRAWING APPROVAL DATE 77-12-20 |
| REVISION LEVEL C |

MICROCIRCUIT, DIGITAL, CMOS DUAL 4-INPUT AND GATES, MONOLITHIC SILICON

SIZE A	CAGE CODE 14933	77059
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1. SCOPE

1.1 Scope. This drawing describes device requirements for class B microcircuits 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".

1.2 Part or Identifying Number (PIN). The complete PIN shall be as shown in the following example:

77059	01	C	X
Drawing number	Device type (See 1.2.1)	Case outline (See 1.2.2)	Lead finish per MIL-M-38510

1.2.1 Device type(s). The device type(s) shall identify the circuit function as follows:

Device type	Generic number	Circuit function
01	4082B	Dual 4-input AND gate
02	4082B	Dual 4-input AND gate

1.2.2 Case outline(s). The case outline(s) shall be as designated in MIL-STD-1835 and as follows:

Outline letter	Descriptive designator	Terminals	Package style
C	GDIP1-T14 or CDIP2-T14	14	Dual-in-line package
D	GDFP1-F14 or CDFP2-F14	14	Flat package

1.2.3 Lead finish. The lead finish shall be as specified in MIL-STD-883 (see 3.1 herein). Finish letter "X" shall not be marked on the microcircuit or its packaging. The "X" designation is for use in specifications when lead finishes A, B, and C are considered acceptable and interchangeable without preference.

1.3 Absolute maximum ratings.

Supply voltage range (V_{DD}) (01) - - - - - - - - - - - - - - - - -0.5 V to +18 V
Supply voltage range (V_{DD}) (02) - - - - - - - - - - - - - - - - -0.5 V to +20 V
(voltages referenced to V_{SS} terminal):
Input voltage range- -0.5 V to V_{DD} + 0.5 V
Storage temperature range- - - - - - - - - - - - - - - - - - -65°C to +150°C
Maximum power dissipation, P_D (01) - - - - - - - - - - - - - - 200 mW 1/
Maximum power dissipation, P_D (02) - - - - - - - - - - - - - - 500 mW 1/
Lead temperature (soldering, 10 seconds) - - - - - - - - - - - +260°C
Thermal resistance, junction-to-case (Θ_{JC}) - - - - - - - - - - - See MIL-STD-1835
Junction temperature (T_J)- - - - - - - - - - - - - - - - - - - +175°C

1.4 Recommended operating conditions.

Supply voltage range (V_{DD}) (01) - - - - - - - - - - - - - - - - - +3.0 V minimum to +15 V maximum
Supply voltage range (V_{DD}) (02) - - - - - - - - - - - - - - - - - +3.0 V minimum to +18 V maximum
Minimum high level input voltage (V_{IH}) - - - - - - - - - - - - - +3.5 V at V_{DD} = 5 V
Maximum low level input voltage (V_{IL})- - - - - - - - - - - - - - +1.5 V at V_{DD} = 5 V
Case operating temperature range - - - - - - - - - - - - - - - - -55°C to +125°C

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2. APPLICABLE DOCUMENTS

   2.1 Government specification, standard, and bulletin. Unless otherwise specified, the following specification, standard, and bulletin 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-I-38535   -   Intergrated Circuits (Microcircuits) Manufacturing, General Specification for.

   STANDARD

   MILITARY

   MIL-STD-883   -   Test Methods and Procedures for Microelectronics.
   MIL-STD-1835   -   Microcircuit Case Outlines.

   BULLETIN

   MILITARY

   MIL-BUL-103   -   List of Standardized Military Drawings (SMD's).

(Copies of the specification, standard, and bulletin 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. Product built to this drawing that is produced by a Qualified Manufacturer Listing (QML) certified and qualified manufacturer or a manufacturer who has been granted transitional certification to MIL-I-38535 may be processed as QML product in accordance with the manufacturers approved program plan and qualifying activity approval in accordance with MIL-I-38535. This QML flow as documented in the Quality Management (QM) plan may make modifications to the requirements herein. These modifications shall not affect form, fit, or function of the device. These modifications shall not affect the PIN as described herein. A "Q" or "QML" certification mark in accordance with MIL-I-38535 is required to identify when the QML flow option is used.

   3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-STD-883 (see 3.1 herein) and herein.

   3.2.1 Case outline(s). The case outline(s) shall be in accordance with 1.2.2 herein.

   3.2.2 Terminal connections. The terminal connections shall be as specified on figure 1.

   3.2.3 Truth table. The truth table shall be as specified on figure 2.

   3.2.4 Logic diagram. The logic diagram shall be as specified on figure 3.

   3.2.5 Switching time waveforms. The switching time waveforms shall be as specified on figure 4.

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

   3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are described in table I.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C \leq T_C \leq +125°C$ unless otherwise specified		Group A subgroups	Device type	Limits Min	Limits Max	Unit
High level output voltage	V_{OH}	$V_{DD} = 5.0$ V $V_{DD} = 10$ V $V_{DD} = 15$ V	$V_{IN} = 0$ or V_{DD}	1,2,3	01	4.95 9.95 14.95		V
Low level output voltage	V_{OL}	$V_{DD} = 5.0$ V $V_{DD} = 10$ V $V_{DD} = 15$ V	$V_{IN} = V_{DD}$ or 0				0.05 0.05 0.05	
Low level input voltage	V_{IL} 1/	$V_O = 4.5$ V or 0.5 V	$V_{DD} = 5.0$ V				1.5	
		$V_O = 9.0$ V or 1.0 V	$V_{DD} = 10$ V				3.0	
		$V_O = 13.5$ V or 1.5 V	$V_{DD} = 15$ V				4.0	
High level input voltage	V_{IH} 1/	$V_O = 4.5$ V or 0.5 V	$V_{DD} = 5.0$ V			3.5		
		$V_O = 9.0$ V or 1.0 V	$V_{DD} = 10$ V			7.0		
		$V_O = 13.5$ V or 1.5 V	$V_{DD} = 15$ V			11.0		
High level output current	I_{OH}	$V_O = 4.6$ V	$V_{DD} = 5.0$ V			-0.3		mA
		$V_O = 9.5$ V	$V_{DD} = 10$ V			-0.65		
		$V_O = 13.5$ V	$V_{DD} = 15$ V			-2.2		
Low level output current	I_{OL}	$V_{OL} = 0.4$ V	$V_{DD} = 5.0$ V			0.3		
		$V_{OL} = 0.5$ V	$V_{DD} = 10$ V			0.65		
		$V_{OL} = 1.5$ V	$V_{DD} = 15$ V			2.2		
Input current	I_{IN}	$V_{DD} = 15$ V		1,2,3			± 1.0	μA
Input capacitance	C_{IN}	$V_{IN} = 0$ V See 4.3.1b		4			7.5	pF
Quiescent current	I_{DD}	$V_{DD} = 5.0$ V $V_{DD} = 10$ V $V_{DD} = 15$ V		1,2,3			10.0 20.0 30.0	μA
Functional tests		See 4.3.1c		7,8				

See footnotes at end of table

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TABLE I. <u>Electrical performance characteristics</u> - Continued.

Test	Symbol	Conditions -55°C ≤ T$_C$ ≤ +125°C unless otherwise specified		Group A subgroups	Device type	Limits		Unit
						Min	Max	
Propagation delay time	t$_{PHL}$	C$_L$ = 50 pF Min R$_L$ = 200 kΩ 3/	V$_{DD}$ = 5.0 V 2/V$_{DD}$ = 10 V 2/V$_{DD}$ = 15 V	9	01		320 130 100	ns
		C$_L$ = 50 pF Min R$_L$ = 200 kΩ 3/ 2/	V$_{DD}$ = 5.0 V V$_{DD}$ = 10 V V$_{DD}$ = 15 V	10,11			480 195 150	
	t$_{PLH}$	C$_L$ = 50 pF Min R$_L$ = 200 kΩ 3/	V$_{DD}$ = 5.0 V 2/V$_{DD}$ = 10 V 2/V$_{DD}$ = 15 V	9			420 170 130	
		C$_L$ = 50 pF Min R$_L$ = 200 kΩ 3/ 2/	V$_{DD}$ = 5.0 V V$_{DD}$ = 10 V V$_{DD}$ = 15 V	10,11			630 255 195	
Transition time	t$_{THL}$, t$_{TLH}$	C$_L$ = 50 pF Min R$_L$ = 200 kΩ 3/	V$_{DD}$ = 5.0 V 2/V$_{DD}$ = 10 V 2/V$_{DD}$ = 15 V	9			200 100 80	
		C$_L$ = 50 pF Min R$_L$ = 200 kΩ 3/ 2/	V$_{DD}$ = 5.0 V V$_{DD}$ = 10 V V$_{DD}$ = 15 V	10,11			300 150 120	

See footnotes at end of table.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C \leq T_C \leq +125°C$ unless otherwise specified		Group A subgroups	Device type	Limits		Unit
						Min	Max	
High level output voltage	V_{OH}	V_{DD} = 5 V 2/ V_{DD} = 10 V 2/ V_{DD} = 15 V	V_{IN} = 0 or V_{DD}	1,2,3	02	4.95 9.95 14.95		V
Low level output voltage	V_{OL}	V_{DD} = 5 V 2/ V_{DD} = 10 V 2/ V_{DD} = 15 V	V_{IN} = V_{DD} or 0				0.05 0.05 0.05	
Low level input voltage	V_{IL} 1/	V_O = 4.5 V or 0.5 V	V_{DD} = 5.0 V				1.5	
		V_O = 9.0 V or 1.0 V	V_{DD} = 10 V				3.0	
		V_O = 13.5 V or 1.5 V	V_{DD} = 15 V				4.0	
High level input voltage	V_{IH} 1/	V_O = 4.5 V or 0.5 V	V_{DD} = 5.0 V			3.5		
		V_O = 9.0 V or 1.0 V	V_{DD} = 10 V			7.0		
		V_O = 13.5 V or 1.5 V	V_{DD} = 15 V			11.0		
High level output current 4/	I_{OH}	V_O = 4.6 V	V_{DD} = 5.0 V			-0.36		mA
		V_O = 9.5 V	V_{DD} = 10 V			-0.9		
		V_O = 13.5 V	V_{DD} = 15 V			-2.4		
Low level output current 4/	I_{OL}	V_{OL} = 0.4 V	V_{DD} = 5.0 V			0.36		
		V_{OL} = 0.5 V	V_{DD} = 10 V			0.9		
		V_{OL} = 1.5 V	V_{DD} = 15 V			2.4		
Input current	I_{IN}	V_{DD} = 20 V 5/		1,2,3			± 1.0	µA
Input capacitance	C_{IN}	V_{IN} = 0 V See 4.3.1b		4			7.5	pF
Quiescent current	I_{DD}	V_{DD} = 5.0 V 2/ V_{DD} = 10 V 2/ V_{DD} = 15 V 2/ V_{DD} = 20 V 5/		1,2,3			7.5 15.0 30.0 150	µA
Functional tests		See 4.3.1c		7,8				

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 unless otherwise specified			Group A subgroups	Device type	Limits		Unit
							Min	Max	
Propagation delay time	t_{PHL}	C_L = 50 pF Min R_L = 200 kΩ 3/	V_{DD} = 5.0 V 2/V_{DD} = 10 V 2/V_{DD} = 15 V		9	02		250 120 90	ns
		C_L = 50 pF Min R_L = 200 kΩ 3/ 2/	V_{DD} = 5.0 V V_{DD} = 10 V V_{DD} = 15 V		10,11			375 180 135	
	t_{PLH}	C_L = 50 pF Min R_L = 200 kΩ 3/	V_{DD} = 5.0 V 2/V_{DD} = 10 V 2/V_{DD} = 15 V		9			250 120 90	
		C_L = 50 pF Min R_L = 200 kΩ 3/ 2/	V_{DD} = 5.0 V V_{DD} = 10 V V_{DD} = 15 V		10,11			375 180 135	
Transition time	t_{THL}, t_{TLH}	C_L = 50 pF Min R_L = 200 kΩ 3/	V_{DD} = 5.0 V 2/V_{DD} = 10 V 2/V_{DD} = 15 V		9			200 100 80	
		C_L = 50 pF Min R_L = 200 kΩ 3/ 2/	V_{DD} = 5.0 V V_{DD} = 10 V V_{DD} = 15 V		10,11			300 150 120	

1/ V_{IH} and V_{IL} tests are not required if applied as forcing functions for the V_{OH} and V_{OL} tests.
2/ This condition is guaranteed if not tested to the specification limits in table I.
3/ See figure 4 for switching waveforms.
4/ Subgroups 2 and 3 maybe guaranteed, if not tested, to the specification limits in table I.
5/ At -55°C test is performed with V_{DD} = 18 V.

3.5 <u>Marking</u>. Marking shall be in accordance with MIL-STD-883 (see 3.1 herein). The part shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's PIN may also be marked as listed in MIL-BUL-103 (see 6.6 herein).

3.6 <u>Certificate of compliance</u>. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in MIL-BUL-103 (see 6.6 herein). The certificate of compliance submitted to DESC-EC prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.7 <u>Certificate of conformance</u>. 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 <u>Notification of change</u>. Notification of change to DESC-EC shall be required in accordance with MIL-STD-883 (see 3.1 herein).

3.9 <u>Verification and review</u>. 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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Device type	All
Case outlines	C and D
Terminal number	Terminal symbol
1	OUT A
2	IN 1A
3	IN 2A
4	IN 3A
5	IN 4A
6	NC
7	V_{SS}
8	NC
9	IN 1B
10	IN 2B
11	IN 3B
12	IN 4B
13	OUT B
14	V_{DD}

FIGURE 1. Terminal connections.

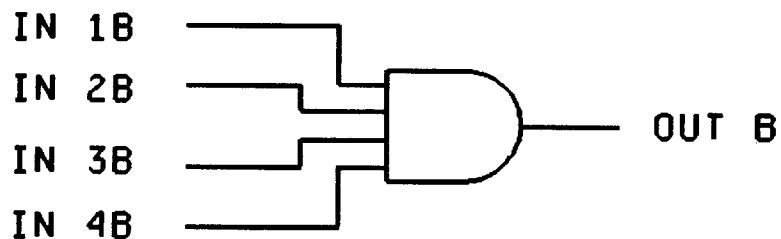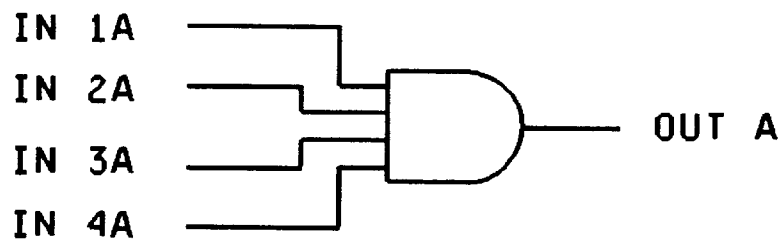| INPUTS				OUTPUT
1n	2n	3n	4n	out n
L	L	L	L	L
H	L	L	L	L
L	H	L	L	L
H	H	L	L	L
L	L	H	L	L
H	L	H	L	L
L	H	H	L	L
H	H	H	L	L
L	L	L	H	L
H	L	L	H	L
L	H	L	H	L
H	H	L	H	L
L	L	H	H	L
H	L	H	H	L
L	H	H	H	L
H	H	H	H	H

FIGURE 2. Truth table.

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IN 1A ———┐
IN 2A ———┐│
IN 3A ———┤│
IN 4A ———┘ ⟩ OUT A

IN 1B ———┐
IN 2B ———┐│
IN 3B ———┤│
IN 4B ———┘ ⟩ OUT B

V_{DD} = PIN 14
V_{SS} = PIN 7

FIGURE 3. Logic Diagram.

■■ 9004708 0012003 TT3 ■

INPUT

t_r t_f

90%   90% V_{DD}

50%   50% V_{GEN}

10%   10% V_{SS}

t_{PLH} t_{PHL}

OUTPUT

                                  V_{OH}

90%   90%

50%   50%

10%   10% V_{OL}

t_{TLH} t_{THL}
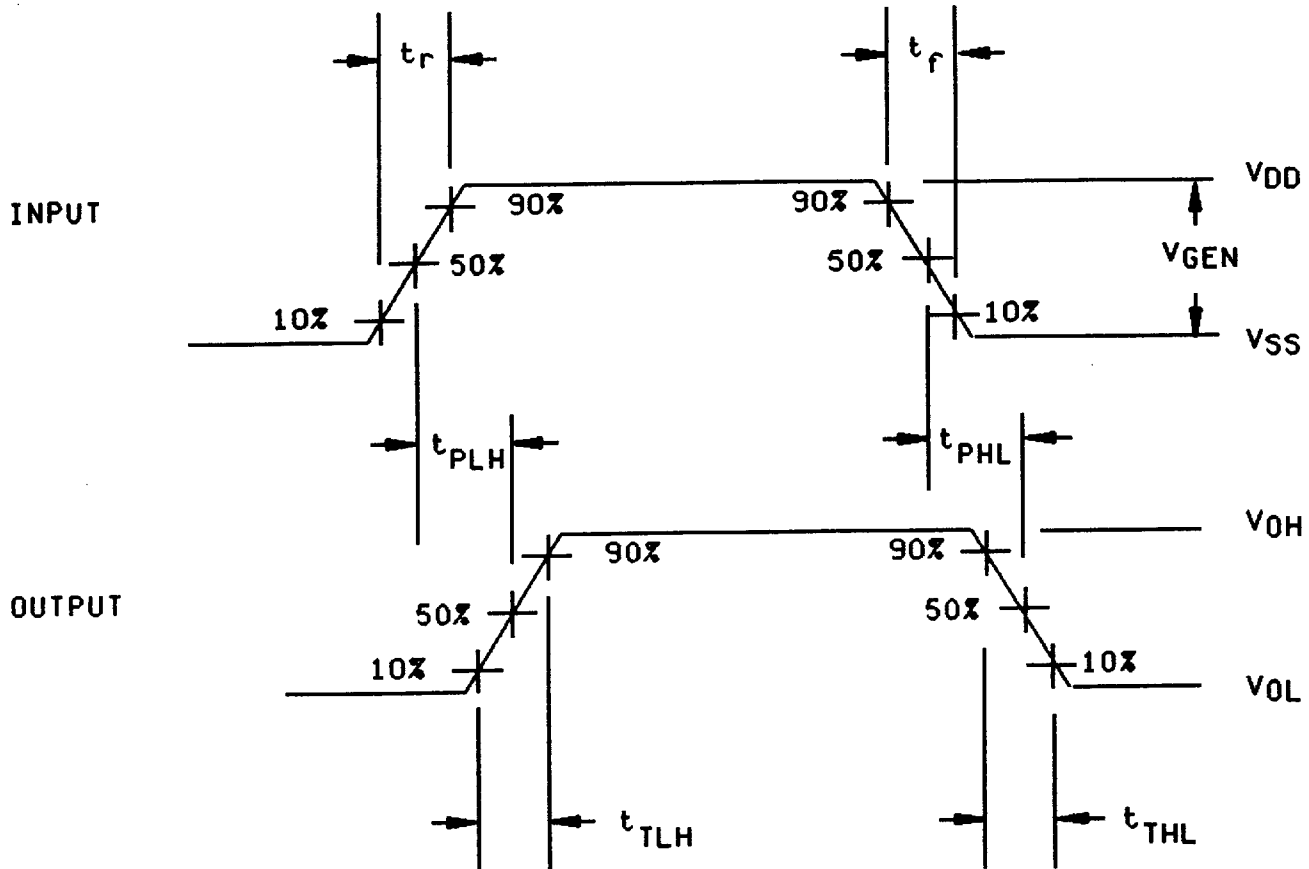
DYNAMIC TEST WAVEFORMS-01

Input pulse
V_{GEN} = V_{DD} ±1.0%
t_{PH} = 1.0 ±0.1 μs
t_r = t_f = 20 ±2 ns
PRR = 200 kHz

DYNAMIC TEST WAVEFORMS-02

Input pulse
V_{GEN} = V_{DD}
t_{PH} = 1.0 μs
t_r = t_f = 20 ns
PRR = 200 kHZ

FIGURE 4. Switching time waveforms.

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4. QUALITY ASSURANCE PROVISIONS

4.1 **Sampling and inspection.** Sampling and inspection procedures shall be in accordance with 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. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1015 of MIL-STD-883.

     (2) T_A = +125°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.

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. Subgroup 4 (C_{IN} measurement) shall be measured only for the initial test and after process or design changes which may affect input capacitance. Capacitance shall be measured between the designated terminal and V_{SS} at a frequency of 1 MHz. Test all applicable pins on 5 devices with zero failures.

   c. Subgroups 7 and 8 tests shall verify the truth table as shown on figure 2.

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. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1005 of MIL-STD-883.

     (2) T_A = +125°C, minimum.

     (3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

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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, 9
Group A test requirements (method 5005)	1, 2, 3, 4, 7, 8, 9, 10,** 11**
Groups C and D end-point electrical parameters (method 5005)	1, 2, 3

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

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-STD-883 (see 3.1 herein).

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use for Government microcircuit applications (original equipment), design applications, and logistics purposes.

6.2 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contrcator prepared specification or drawing.

6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated with the users of record for the individual documents. This coordination will be accomplished in accordance with MIL-STD-973 using DD Form 1692, Engineering Change Proposal.

6.4 Record of users. Military and industrial users shall inform Defense Electronics Supply Center when a system application requires configuration control and the applicable SMD. DESC will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronics devices (FSC 5962) should contact DESC-EC, telephone (513) 296-6047.

6.5 Comments. Comments on this drawing should be directed to DESC-EC, Dayton, Ohio 45444, or telephone (513) 296-8525.

6.6 Approved sources of supply. Approved sources of supply are listed in MIL-BUL-103. The vendors listed in MIL-BUL-103 have agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DESC-EC.

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