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DSCC-VAC

12-July-04

MEMORANDUM FOR MILITARY/INDUSTRY DISTRIBUTION

SUBJECT: Initial Draft of MIL-M-38510/50 revision F; Project Number 5962-2043

The initial draft for this subject document, dated 12-July-04, is now available for viewing and downloading from the DSCC-VA Web site:

<http://www.dscc.dla.mil/Programs/MilSpec/DocSearch.asp>

The changes to this document are to update the document to the latest requirements of MIL-PRF-38535 and to reactivate the specification and update the boilerplate to the latest MIL-STD-961 revision E requirements.

Concurrence or comments are required at this Center within 45 days from the date of this letter. Late comments will be held for the next coordination of the document. Comments from military departments must be identified as either "Essential" or "Suggested". Essential comments must be justified with supporting data. Military review activities should forward comments to their custodians of this office, as applicable, in sufficient time to allow for consolidating the department reply.

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/ signed /

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Chief
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CC:
VSC
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NOTE: This draft, dated 12 July 2004, prepared by the Defense Supply Center Columbus (DSCC-VAC) has not been approved and is subject to modification. DO NOT USE PRIOR TO APPROVAL.
(Project 5962-2043)

INCH-POUND
MIL-M-38510/50F
DRAFT

SUPERSEDING
MIL-M-38510/50E
30 April 1984

MILITARY SPECIFICATION
MICROCIRCUITS, DIGITAL, CMOS, NAND GATES,
MONOLITHIC SILICON, POSITIVE LOGIC

Reactivated after xx xxxx. 2004 and may be used for new and existing designs and acquisitions.

This specification is approved for use by all Departments
and Agencies of the Department of Defense.

The requirements for acquiring the product herein shall consist of this specification sheet and MIL-PRF 38535

1. SCOPE

1.1 Scope. This specification covers the detail requirements for monolithic silicon, CMOS, logic microcircuits. Two product assurance classes and a choice of case outlines, lead finishes, and radiation hardness assurance (RHA) are provided and are reflected in the complete Part or Identifying Number (PIN). For this product, the requirements of MIL-M-38510 have been superseded by MIL-PRF-38535 (see 6.3).

1.2 Part or identifying number (PIN). The PIN is in accordance with MIL-PRF-38535 and as specified herein.

1.2.1 Device types. The device types are as follows:

<u>Device type</u>	<u>Circuit</u>
01	Quadruple 2-input NAND gate
02	Dual 4-input NAND gate
03	Triple 3-input NAND gate
51	Quadruple 2-input NAND gate
52	Dual 4-input NAND gate
53	Triple 3-input NAND gate

1.2.2 Device class. The device class is the product assurance level as defined in MIL-PRF-38535.

1.2.3 Case outlines. The case outlines are as designated in MIL-STD-1835 and as follows:

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Package style</u>
A	GDFP5-F14 or CDFP6-F14	14	Flat pack
C	GDIP1-T14 or CDIP2-T14	14	Dual-in-line
D	GDFP1-F14 or CDFP2-F14	14	Flat pack
T	CDFP3-F14	14	Flat pack
X <u>1/ 2/</u>	GDFP5-F14 or CDFP6-F14	14	Flat pack, except A dimension equals 0.1" (2.54 mm) max
Y <u>1/ 2/</u>	GDFP1-F14 or CDFP2-F14	14	Flat pack, except A dimension equals 0.1" (2.54 mm) max

- 1/ As an exception to MIL-PRF-38535, appendix A, for case outlines X and Y only, the leads of bottom brazed ceramic packages (i.e., configuration 2 of case outlines A or D) may have electroless nickel undercoating which shall be 50 to 200 microinches (1.27 to 5.08 μm) thick provided the lead finish is hot solder dip (i.e., finish letter A) and provided that, after any lead forming, an additional hot solder dip coating is applied which shall extend from the outer tip of the lead to no more than 0.015 inch (0.38 mm) from the package edge.
- 2/ For bottom or side brazed packages, case outlines X and Y only, the S₁ dimension may go to .000 inch (.00 mm) minimum.

Comments, suggestions, or questions on this document should be addressed to: Commander, Defense Supply Center Columbus, ATTN: DSCC-VAC, P.O. Box 3990, Columbus, OH 43218-3990, or email CMOS@dsc.dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at www.dodssp.daps.mil.

1.3 Absolute maximum ratings.

Supply voltage range (V_{DD} - V_{SS}):	
Device types 01, 02, 03.....	-0.5 V dc to +15.5 V dc
Device types 51, 52, 53.....	-0.5 V dc to +18.0 V dc
Input current (each input)	± 10 mA
Input voltage range	$(V_{SS} - 0.5 \text{ V}) \leq V_I \leq (V_{DD} + 0.5 \text{ V})$
Storage temperature range (T_{STG}).....	-65° to +175°C
Maximum power dissipation (P_D)	200 mW
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance, junction to case (θ_{JC}).....	See MIL-STD-1835
Junction temperature (T_J)	175°C

1.4 Recommended operating conditions.

Device types 01, 02, 03:

Supply voltage range (V_{DD} - V_{SS})	4.5 V dc to 12.5 V dc
Input low voltage range (V_{IL})	0.0 V to 0.85 V dc @ $V_{DD} = 5.0$ V dc 0.0 V to 2.0 V dc @ $V_{DD} = 10.0$ V dc 0.0 V to 2.1 V dc @ $V_{DD} = 12.5$ V dc
Input high voltage range (V_{IH}).....	3.95 V to 5.0 V dc @ $V_{DD} = 5.0$ V dc 8.0 V to 10.0 V dc @ $V_{DD} = 10.0$ V dc 10 V to 12.5 V dc @ $V_{DD} = 12.5$ V dc

Device types 51, 52, 53:

Supply voltage range (V_{DD} - V_{SS})	4.5 V dc to 15.0 V dc
Input low voltage range (V_{IL})	$V_{OL} = 10\% V_{DD}$, $V_{OH} = 90\% V_{DD}$ 0.0 V to 1.5 V dc @ $V_{DD} = 5.0$ V dc 0.0 V to 2.0 V dc @ $V_{DD} = 10.0$ V dc 0.0 V to 4.0 V dc @ $V_{DD} = 15.0$ V dc
Input high voltage range (V_{IH})	$V_{OL} = 10\% V_{DD}$, $V_{OH} = 90\% V_{DD}$ 3.5 V to 5.0 V dc @ $V_{DD} = 5.0$ V dc 8.0 V to 10.0 V dc @ $V_{DD} = 10.0$ V dc 11 V to 15.0 V dc @ $V_{DD} = 15.0$ V dc
Ambient operating temperature range (T_A)	-55°C to +125°C
Load capacitance.....	50 pF maximum

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications and Standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATION

MIL-PRF-38535 - Integrated Circuits (Microcircuits) Manufacturing, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-883 - Test Method Standard Microcircuits.
MIL-STD-1835 - Interface Standard Electronic Component Case Outlines.

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch/> or www.dodssp.daps.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. Microcircuits furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturers list before contract award (see 4.3 and 6.4).

3.2 Item requirements. The individual item requirements shall be in accordance with MIL-PRF-38535 and as specified herein or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not affect the form, fit, or function as described herein.

3.3 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38535 and herein. Although eutectic die bonding is preferred, epoxy die bonding may be performed. However, the resin used shall be Dupont 5504 Conductive Silver Paste, or equivalent, which is cured at $200^{\circ}\text{C} \pm 10^{\circ}\text{C}$ for a minimum of 2 hours. The use of equivalent epoxies or cure cycles shall be approved by the qualifying activity. Equivalency shall be demonstrated in data submitted to the qualifying activity for verification.

3.3.1 Logic diagrams and terminal connections. The logic diagrams and terminal connections shall be as specified on figure 1.

3.3.2 Truth tables and logic equations. The truth tables and logic equations shall be as specified on figure 2.

3.3.3 Switching time test circuit and waveforms. The switching time test circuit and waveforms shall be as specified on figure 3.

3.3.4 Schematic circuits. The schematic circuits shall be maintained by the manufacturer and made available to the qualifying activity or preparing activity upon request.

3.3.5 Case outlines. The case outlines shall be as specified in 1.2.3.

3.4 Lead material and finish. The lead material and finish shall be in accordance with MIL-PRF-38535 (see 6.6).

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

3.6 Electrical test requirements. The electrical test requirements for each device class shall be the subgroups specified in table II. The electrical tests for each subgroup are described in table III.

3.7 Marking. Marking shall be in accordance with MIL-PRF-38535.

3.7.1 Radiation hardness assurance identifier. The radiation hardness assurance identifier shall be in accordance with MIL-PRF-38535 and 4.5.4 herein.

3.8 Microcircuit group assignment. The devices covered by this specification shall be in microcircuit group number 36 (see MIL-PRF-38535, appendix A).

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ $V_{SS} = 0 \text{ V}$ $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ Unless otherwise specified	Device type	Limits		Unit
				Min	Max	
Positive clamping input to V_{DD}	$V_{IC(\text{POS})}$	$T_A = +25^\circ\text{C}$, $V_{DD} = \text{GND}$ $V_{SS} = \text{Open}$, Output = Open $I_{IN} = 1 \text{ mA}$	All		1.5	V dc
Negative clamping input to V_{SS}	$V_{IC(\text{NEG})}$	$T_A = +25^\circ\text{C}$, $V_{DD} = \text{Open}$ $V_{SS} = \text{GND}$, Output = Open $I_{IN} = -1 \text{ mA}$	All		-6.0	V dc
Quiescent supply current	I_{SS}	All input combinations	$V_{DD} = 15 \text{ V dc}$ $V_{DD} = 18 \text{ V dc}$	01, 02, 03 51, 52, 53	-750	nA
High level output voltage	V_{OH1}	$V_{DD} = 5 \text{ V dc}$, $I_{OH} = -175 \mu\text{A}$ Any one input = V_{IL} (see table III)	All	4.2		V dc
	V_{OH2}	$V_{DD} = 5 \text{ V dc}$, $I_{OH} = 0.0 \text{ A}$ Any one input = V_{IL} (see table III)	All	4.95		
	V_{OH3}	$V_{DD} = 12.5 \text{ V dc}$, $I_{OH} = 0.0 \text{ A}$ Any one input = V_{IL} (see table III)	All	11.25		
	V_{OH4}	$V_{DD} = 15 \text{ V dc}$, $I_{OH} = 0.0 \text{ A}$	51, 52, 53	14.95		
Low level output voltage	V_{OL1}	$V_{DD} = 5 \text{ V dc}$, $I_{OL} = 175 \mu\text{A}$ All inputs = V_{IH} (see table III)	01		0.5	V dc
		$V_{DD} = 5 \text{ V dc}$, $I_{OL} = 85 \mu\text{A}$ All inputs = V_{IH} (see table III)	02, 03		0.7	
	V_{OL2}	$V_{DD} = 5 \text{ V dc}$, $I_{OL} = 0.0 \text{ A}$ All inputs = V_{IH} (see table III)	All		0.05	
	V_{OL3}	$V_{DD} = 12.5 \text{ V dc}$, $I_{OL} = 0.0 \text{ A}$ All inputs = V_{IH} (see table III)	All		1.25	
	V_{OL4}	$V_{DD} = 15 \text{ V dc}$, $I_{OL} = 0.0 \text{ A}$	51, 52, 53		0.05	
Input high voltage	V_{IH1}	$V_{DD} = 5 \text{ V dc}$ $V_O = 0.5 \text{ V}$ $ I_O \leq 1 \mu\text{A}$	51, 52, 53	3.5		V dc
	V_{IH2}	$V_{DD} = 10 \text{ V dc}$ $V_O = 1.0 \text{ V}$ $ I_O \leq 1 \mu\text{A}$	51, 52, 53	7.0		V dc
	V_{IH3}	$V_{DD} = 15 \text{ V dc}$ $V_O = 1.5 \text{ V}$ $ I_O \leq 1 \mu\text{A}$	51, 52, 53	11.0		V dc
Input low voltage	V_{IL1}	$V_{DD} = 5 \text{ V dc}$ $V_O = 4.5 \text{ V dc}$ $ I_O \leq 1 \mu\text{A}$	51, 52, 53		1.5	V dc
	V_{IL2}	$V_{DD} = 10 \text{ V dc}$ $V_O = 9.0 \text{ V dc}$ $ I_O \leq 1 \mu\text{A}$	51, 52, 53		3.0	V dc
	V_{IL3}	$V_{DD} = 15 \text{ V dc}$ $V_O = 13.5 \text{ V dc}$ $ I_O \leq 1 \mu\text{A}$	51, 52, 53		4.0	V dc

See footnotes at end of the table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions 1/ $V_{SS} = 0 \text{ V}$ $-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ Unless otherwise specified	Device type	Limits		Unit
				Min	Max	
Output low (sink) current	I_{OL1}	$V_{DD} = 5 \text{ V dc}$ $V_{IN} = 5.0 \text{ V}$ $V_{OL} = 0.4 \text{ V dc}$	51, 52, 53	0.36		mA dc
	I_{OL2}	$V_{DD} = 15 \text{ V dc}$ $V_{IN} = 15 \text{ V}$ $V_{OL} = 1.5 \text{ V dc}$	51, 52, 53	2.4		mA dc
Output high (source) current	I_{OH1}	$V_{DD} = 5 \text{ V dc}$ Any one input = V_{SS} All other inputs = V_{DD} $V_{OH} = 4.6 \text{ V dc}$	51, 52, 53	-0.36		mA dc
	I_{OH2}	$V_{DD} = 15 \text{ V dc}$ Any one input = V_{SS} All other inputs = V_{DD} $V_{OL} = 13.5 \text{ V dc}$	51, 52, 53	-2.4		mA dc
Input leakage current, high	I_{IH} 2/	Measure inputs sequentially	$V_{DD} = 15 \text{ V dc}$	01, 02, 03	100.0	nA
			$V_{DD} = 18 \text{ V dc}$	51, 52, 53		
Input leakage current, low	I_{IL} 2/	Measure inputs sequentially	$V_{DD} = 15 \text{ V dc}$	01, 02, 03	-100.0	nA
			$V_{DD} = 18 \text{ V dc}$	51, 52, 53		
Input capacitance	C_i	$V_{DD} = 0 \text{ V dc}, f = 1 \text{ MHz},$ $T_A = 25^{\circ}\text{C}$	All		12	pF
Propagation delay time, high to low level	t_{PHL}	$V_{DD} = 5 \text{ V dc}, C_L = 50 \text{ pF}$ $R_L = 200 \text{ k}\Omega$ (See figure 3)	01	13	300	ns
			02	13	490	
			03	13	265	
			51	13	300	
			52	13	490	
			53	13	265	
Propagation delay time, low to high level	t_{PLH}	$01, 03$ 02 $51, 53$ 52	13	225	ns	
			13	375		
			13	225		
			13	375		
Transition time, high to low level	t_{THL}	$V_{DD} = 5 \text{ V dc}, C_L = 50 \text{ pF}$ $R_L = 200 \text{ k}\Omega$ (See figure 3)	01	10	450	ns
			02	10	825	
			03	10	375	
			51	10	450	
			52	10	825	
			53	10	375	

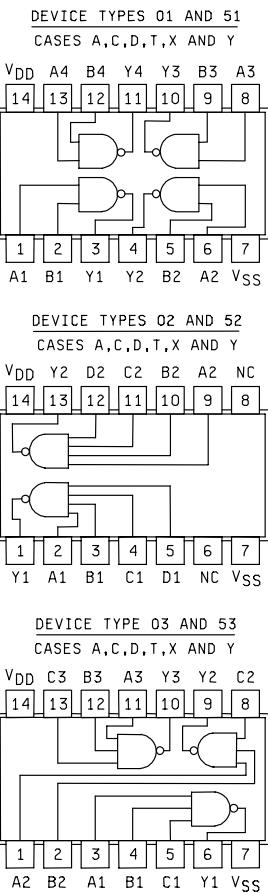
See footnotes at end of the table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions 1/ $V_{SS} = 0 \text{ V}$ $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ Unless otherwise specified	Device type	Limits		Unit
				Min	Max	
Transition time, low to high level	t_{TLH}	$V_{DD} = 5 \text{ V dc}$, $C_L = 50 \text{ pF}$ $R_L = 200 \text{ k}\Omega$ (See figure 3)	01	10	450	ns
			02	10	640	
			03	10	450	
			51	10	450	
			52	10	640	
			53	10	450	

1/ Complete terminal conditions shall be as specified in table III.

2/ Input current at one input node.

FIGURE 1. Logic diagrams and terminal connections.

Device types 01 and 51

Truth table, each gate		
Input		Output
A	B	Y
L	L	H
H	L	H
L	H	H
H	H	L

$$\text{Positive logic } Y = \overline{A} \bullet B$$

Device types 02 and 52

Truth table, each gate				Output
Input			Y	
A	B	C	D	Y
L	L	L	L	H
H	L	L	L	H
L	H	L	L	H
H	H	L	L	H
L	L	H	L	H
H	L	H	L	H
L	H	H	L	H
H	H	H	L	H
L	L	L	H	H
H	L	L	H	H
L	H	L	H	H
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L	L	H	H	H
H	L	H	H	H
L	H	H	H	H
H	H	H	H	L

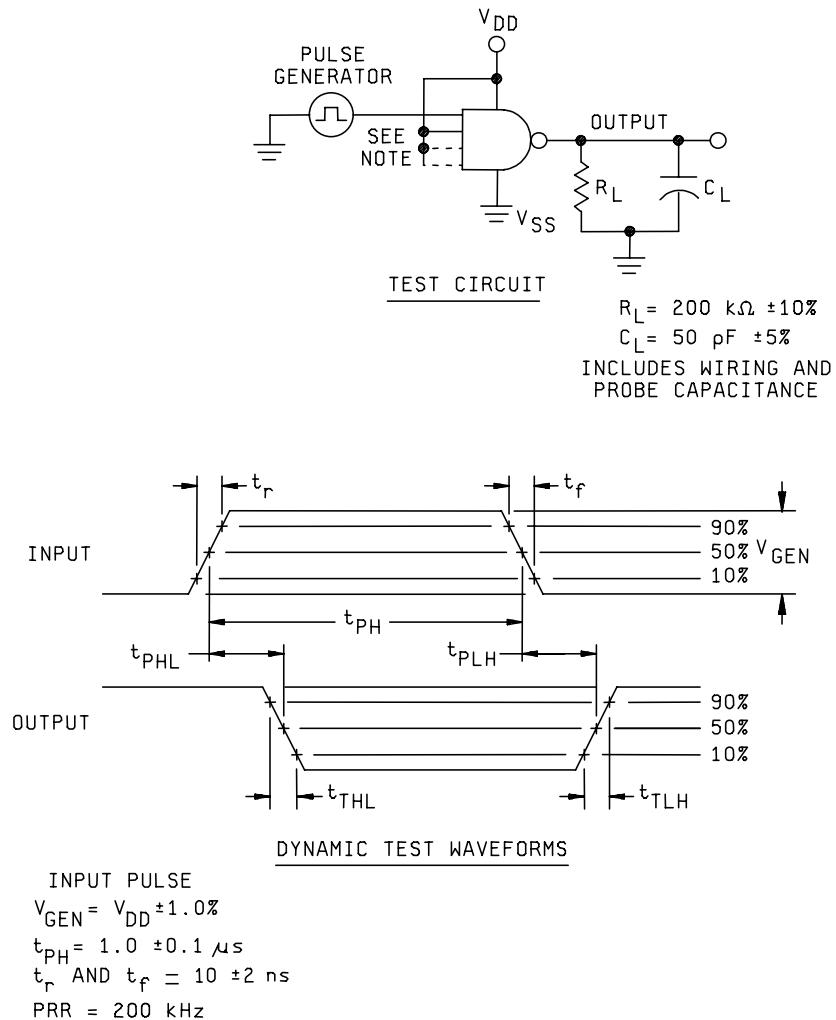
$$\text{Positive logic } Y = A \bullet B \bullet C \bullet D$$

Device types 03 and 53

Truth table, each gate			
Input			Output
A	B	C	Y
L	L	L	H
H	L	L	H
L	H	L	H
H	H	L	H
L	L	H	H
H	L	H	H
L	H	H	H
H	H	H	L

$$\text{Positive logic } Y = \overline{A} \bullet B \bullet C$$

FIGURE 2. Truth tables and logic equations.



NOTE: All unused inputs must be tied to V_{DD} .

FIGURE 3. Switching time test circuit and waveforms.

4. VERIFICATION

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-PRF-38535 or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not affect the form, fit, or function as described herein.

4.2 Screening. Screening shall be in accordance with MIL-PRF-38535 and shall be conducted on all devices prior to qualification and quality conformance inspection. The following additional criteria shall apply:

- a. The burn-in test duration, test condition, and test temperature, or approved alternatives shall be as specified in the device manufacturer's QM plan in accordance with MIL-PRF-38535. The burn-in test circuit shall be maintained under document control by the device manufacturer's Technology Review Board (TRB) in accordance with MIL-PRF-38535 and shall be made available to the acquiring or preparing 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.
- b. Delete the sequence specified as initial (pre-burn-in) electrical parameters through interim (post-burn-in) electrical parameters of method 5004 and substitute lines 1 through 7 of table II herein.
- c. Burn-in (method 1015 of MIL-STD-883).
 - (1) Unless otherwise specified in the manufacturers QM plan for static tests (test condition A), ambient temperature (T_A) shall be +125°C minimum. Test duration for each static test shall be 24 hours minimum for class S devices and in accordance with table I of method 1015 for class B devices.
 - i. For static burn-in I, all inputs shall be connected to 0.0 V.
 - ii. For static burn-in II, all inputs shall be connected to V_{DD} .
 - iii. Except for V_{DD} and V_{SS} , the terminal shall be connected through resistors whose value is 2 kΩ to 47 kΩ. The actual measured value of the resistor selected shall not exceed ±20% of its branded value due to use, heat or age.
 - iv. Output may be open or connected to $V_{DD}/2$.
 - v. $V_{DD} = 12.5$ V minimum, 15 V maximum for device 01, 02, 03.
 $V_{DD} = 15$ V minimum, 18 V maximum for device 51, 52, 53.
 $V_{DD}/2 = V_{DD}/2 \pm 1.0$ V; $V_{SS} = 0.0$ V.
 - (2) Unless otherwise specified in the manufacturers QM plan for dynamic test (test condition D), ambient temperature shall be +125°C minimum. Test duration shall be in accordance with table I of method 1015.
 - i. Except for V_{DD} and V_{SS} , the terminals shall be connected through resistors whose value is 2 kΩ to 47 kΩ. The actual measured value of the resistor selected shall not exceed ±20% of its branded value due to use, heat or age.
 - ii. Input signal requirements: Square wave, 50% duty cycle; 25 kHz < PRR < 1 MHz; t_{TLH} and $t_{TTHL} < 1$ μs. Voltage level: Minimum = $V_{SS} - 0.5$ V, +10% V_{DD} ; Maximum = $V_{DD} + 0.5$ V, -10% V_{DD} .
 - iii. For device types 01, and 51:
 - (a) Connect pins 14, 2, and 11 together.
 - (b) Connect pins 7, 4, and 9 together.
 - (c) Connect pins 13 and 8 together.
 - (d) Connect pins 1 and 5 together.

- iv $V_{DD} = 12.5$ V minimum, 15 V maximum for device 01, 02, 03.
 $V_{DD} = 15$ V minimum, 18 V maximum for device 51, 52, 53.
 $V_{DD}/2 = V_{DD}/2 \pm 1.0$ V; $V_{SS} = 0.0$ V.

- d. Interim and final electrical test parameters shall be as specified in table II.
- e. For class S devices, post dynamic burn-in, or class B devices, post static burn-in, electrical parameter measurements may, at the manufacturer's option, be performed separately or included in the final electrical parameter requirements.

TABLE II. Electrical test requirements.

Line no.	MIL-PRF-38535 test requirements	Class S device 1/			Class B device 1/		
		Ref. par.	Table III Subgroups 2/	Table IV delta limits 3/	Ref. par.	Table III subgroups 2/	Table IV delta limits 3/
1	Interim electrical parameters		1			1	
2	Static burn-in I (method 1015)	4.2c 4.5.2					
3	Same as line 1		1	Δ			
4	Static burn-in II (method 1015)	4.2c 4.5.2			4.2c 4.5.2	4/ 4/	
5	Same as line 1	4.2e	1*	Δ	4.2e	1*	Δ
6	Dynamic burn-in (method 1015)	4.2c 4.5.2					
7	Same as line 1	4.2e	1*	Δ			
8	Final electrical parameters (method 5004)		1*, 2, 3, 9			1*, 2, 3, 9	
9	Group A test requirements (method 5005)	4.4.1	1, 2, 3, 4, 9, 10, 11		4.4.1	1, 2, 3, 4, 9, 10, 11	
10	Group B test when using method 5005 QCI option	4.4.2	1, 2, 3, 9, 10, 11	Δ			
11	Group C end-point electrical parameters (method 5005)				4.4.3	1, 2,3	Δ
12	Group D end-point electrical parameters (method 5005)	4.4.4	1, 2, 3		4.4.4	1, 2, 3	

1/ Blank spaces indicate tests are not applicable.

2/ * indicates PDA applies to subgroup 1 (see 4.2.1).

3/ Δ indicates delta limits shall be required only on table III subgroup 1, where specified, and the delta values shall be computed with reference to the previous interim electrical parameters.

4/ The device manufacturer may at his option either perform delta measurements or within 24 hours after burn-in (or removal of bias) perform the final electrical parameter measurements.

4.2.1 Percent defective allowable (PDA).

- a. The PDA for class S devices shall be 5 percent for static burn-in and 5 percent for dynamic burn-in, based on the exact number of devices submitted to each separate burn-in.
- b. Static burn-in I and II failure shall be cumulative for determining the PDA.
- c. The PDA for class B devices shall be in accordance with MIL-PRF-38535 for static burn-in. Dynamic burn-in is not required.
- d. Those devices whose measured characteristics, after burn-in, exceed the specified delta (Δ) limits or electrical parameter limits specified in table III, subgroup 1, are defective and shall be removed from the lot. The verified failures divided by the total number of devices in the lot initially submitted to burn-in shall be used to determine the percent defective for the lot and the lot shall be accepted or rejected based on the specified PDA.

4.3 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-38535.

4.3.1 Qualification extension. When authorized by the qualifying activity, if a manufacturer qualifies to a 51, 52, or 53 device type which is manufactured identically to a 01, 02, or 03 device type on this specification, then the 01, 02, or 03 device type may be part I qualified by conducting only group A electrical tests and any electricals specified as additional group C subgroups and submitting data in accordance with MIL-PRF-38535.

4.4 Technology Conformance inspection (TCI). Technology conformance inspection shall be in accordance with MIL-PRF-38535 and herein for groups A, B, C, D, and E inspections (see 4.4.1 through 4.4.5).

4.4.1 Group A inspection. Group A inspection shall be in accordance with table III of MIL-PRF-38535 and as follows:

- a. Tests shall be performed in accordance with table II herein.
- b. Subgroups 5, 6, 7, and 8 shall be omitted.
- c. Subgroup 4 (C_i measurement) shall be measured only for initial qualification and after process or design changes that may affect input capacitance. Capacitance shall be measured between the designated terminal and V_{SS} at a frequency of 1 MHz.
- d. Subgroups 9 and 11 shall be measured only for initial qualification and after process or design changes which may affect dynamic performance.
- e. When device types 01 through 03 are qualified by extension (see 4.3.1), these device types will be inspected (QCI) according to the requirements for device types 51 through 53, respectively.

4.4.2 Group B inspection. Group B inspection shall be in accordance with table II of MIL-PRF-38535.

4.4.3 Group C inspection. Group C inspection shall be in accordance with table IV of MIL-PRF-38535 and as follows:

- a. End-point electrical parameters shall be as specified in table II herein. Delta limits shall apply only to subgroup 1 of group C inspection and shall consist of tests specified in table IV herein.
- b. The steady-state life test duration, test condition, and test temperature, or approved alternatives shall be as specified in the device manufacturer's QM plan in accordance with MIL-PRF-38535. The burn-in test circuit shall be maintained under document control by the device manufacturer's Technology Review Board (TRB) in accordance with MIL-PRF-38535 and shall be made available to the acquiring or preparing 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.
- c. When device types 01 through 03 are qualified by extension (see 4.3.1), these device types will be inspected (QCI) according to the requirements for device types 51 through 53, respectively.

TABLE III. Group A inspection for device type 01 – Continued.

Symbol	MIL-STD-883 method	Cases A, C,D,T,X,Y	For terminal conditions and limits, see 1/ and 3/														Measured terminal	Test limits					Unit					
			1		2		3		4		5		6		7		8		9		10		11		12			
			Test no.	1A	1B	1Y	2Y	2B	2A	V _{SS}	3A	3B	3Y	4Y	4B	4A	V _{DD}	Subgroup 1 T _A = 25°C	Subgroup 2 T _A = 125°C	Subgroup 3 T _A = -55°C	Min	Max						
V _{OL2} “ “ “ “	3007 “ “ “ “	48 49 50 51	V _{IH1} GND “ “	V _{IH1} GND “ “				GND V _{IH1} GND “ “	GND V _{IH1} GND “ “	GND “ “	GND V _{IH1} GND “ “	GND V _{IH1} GND “ “			GND “ “	GND V _{IH1} GND “ “	5.0V	1Y 2Y 3Y 4Y	0.05 “ “ “ “	0.05 “ “ “ “	0.05 “ “ “ “	0.05 “ “ “ “	V “ “ “ “					
		52 53 54 55	V _{IH2} GND “ “	V _{IH2} GND “ “				V _{IH2} GND “ “	V _{IH2} GND “ “	V _{IH2} GND “ “	V _{IH2} GND “ “	V _{IH2} GND “ “			GND “ “	GND V _{IH2} GND “ “	12.5V	1Y 2Y 3Y 4Y	1.25 “ “ “ “	1.25 “ “ “ “	1.25 “ “ “ “	1.25 “ “ “ “	“ “ “ “					
I _{IH1 2/}	3010	56	15.0V	15.0V				15.0V	15.0V	“	15.0V	15.0V				15.0V	15.0V	15.0V	All together	800					nA			
I _{IH2} “ “ “ “	57 58 59 60 61 62 63 64	“ “ “ “	“ “ “ “	“ “ “ “	“ “ “ “	“ “ “ “	“ “ “ “	“ “ “ “	“ “ “ “	“ “ “ “	“ “ “ “	“ “ “ “	“ “ “ “	“ “ “ “	“ “ “ “	“ “ “ “	“ “ “ “	“ “ “ “	1A 1B 2B 2A 3A 3B 4B 4A	100.0 “ “ “ “	100.0 “ “ “ “				“ “ “ “			
I _{IL1 2/}	3009	65	GND	GND				GND	GND	“	GND	GND				GND	GND	“	All together	-800					“ “ “ “			
I _{IL2} “ “ “ “	66 67 68 69 70 71 72 73	“ “ “ “	15.0V GND 15.0V	15.0V GND 15.0V				15.0V “ “	15.0V “ “	“	15.0V GND 15.0V	15.0V “ “				15.0V “ “	15.0V GND 15.0V	“	1A 1B 2B 2A 3A 3B 4B 4A	-100.0 “ “ “ “	-100.0 “ “ “ “				“ “ “ “			
Subgroup 4 T _A = 25°C																												
C _I “ “ “ “	3012 “ “ “ “	74 75 76 77 78 79 80 81	F F				F	F		GND “ “								GND “ “	1A 1B 2B 2A 3A 3B 4B 4A	12.0 “ “ “ “						pF “ “ “ “		
Subgroup 9 T _A = 25°C																												
t _{PHL} Fig. 3	3003 Fig. 3	82 83 84 85 86 87 88 89	IN 5.0V	5.0V IN 5.0V	OUT OUT	OUT OUT	5.0V IN 5.0V	5.0V “ “	GND “ “	5.0V “ “	5.0V IN 5.0V	5.0V “ “	5.0V OUT OUT		5.0V “ “	5.0V OUT OUT	5.0V IN 5.0V	5.0V IN 5.0V	5.0V IN 5.0V	1A to 1Y 1B to 1Y 2B to 2Y 2A to 2Y 3A to 3Y 3B to 3Y 4B to 4Y 4A to 4Y	13 200	18 300	13 200	13 200	ns			

See footnotes at end of device type 03.

TABLE III. Group A inspection for device type 01 – Continued.

Symbol	MIL-STD-883 method	Cases A, C,D,T,X,Y	For terminal conditions and limits, see 1/ and 3/														Measured terminal	Test limits						Unit	
			1	2	3	4	5	6	7	8	9	10	11	12	13	14		Subgroup 9 T _A = 25°C		Subgroup 10 T _A = 125°C		Subgroup 11 T _A = -55°C			
			Test no.	1A	1B	1Y	2Y	2B	2A	V _{SS}	3A	3B	3Y	4Y	4B	4A	V _{DD}	Min	Max	Min	Max	Min	Max		
t _{LH}	3003	90	IN	5.0V	OUT	OUT	5.0V	5.0V	GND	5.0V	5.0V			5.0V	5.0V	5.0V	1A to 1Y	13	150	18	225	13	150	ns	
"	Fig. 3	91	IN 5.0V	IN 5.0V	OUT OUT	OUT OUT	"	"	"	"	"	"	"	"	"	"	"	1B to 1Y	"	"	"	"	"	"	"
"	"	92	" 5.0V	" 5.0V			IN	5.0V	IN	5.0V	IN	5.0V	IN	5.0V	OUT	OUT	OUT OUT	2B to 2Y	"	"	"	"	"	"	"
"	"	93	" "	" "			5.0V	"	"	"	"	"	"	"	"	"	OUT OUT	2A to 2Y	"	"	"	"	"	"	"
"	"	94	" "	" "			"	"	5.0V	"	"	"	"	"	"	"	IN 5.0V	3A to 3Y	"	"	"	"	"	"	"
"	"	95	" "	" "			"	"	"	5.0V	"	"	"	"	"	"	IN 5.0V	3B to 3Y	"	"	"	"	"	"	"
"	"	96	" "	" "			"	"	"	"	5.0V	"	"	"	"	"	IN	4B to 4Y	"	"	"	"	"	"	"
"	"	97	" "	" "			"	"	"	"	"	5.0V	"	"	"	"	IN	4A to 4Y	"	"	"	"	"	"	"
t _{HL}	3004	98	IN 5.0V	IN 5.0V	OUT OUT	OUT OUT	"	"	"	"	"	"	"	"	"	5.0V	"	1Y	10	300	14	450	10	300	"
"	Fig. 3	99	" 5.0V	" 5.0V			IN	5.0V	IN	5.0V	"	"	"	"	"	"	OUT OUT	1Y	"	"	"	"	"	"	"
"	"	100	" "	" "			OUT OUT	OUT OUT	"	"	"	"	"	"	"	"	OUT OUT	2Y	"	"	"	"	"	"	"
"	"	101	" "	" "			"	"	IN	5.0V	"	"	"	"	"	OUT OUT	2Y	"	"	"	"	"	"	"	
"	"	102	" "	" "			"	"	"	"	IN	5.0V	"	"	"	OUT OUT	3Y	"	"	"	"	"	"	"	
"	"	103	" "	" "			"	"	"	"	"	IN	5.0V	"	"	OUT OUT	3Y	"	"	"	"	"	"	"	
"	"	104	" "	" "			"	"	"	"	"	"	IN	5.0V	"	OUT OUT	4Y	"	"	"	"	"	"	"	
"	"	105	" "	" "			"	"	"	"	"	"	"	"	"	IN	4Y	"	"	"	"	"	"	"	
t _{LH}	"	106	IN 5.0V	IN 5.0V	OUT OUT	OUT OUT	"	"	"	"	"	"	"	"	"	5.0V	"	1Y	10	"	14	"	10	"	"
"	"	107	" 5.0V	" 5.0V			OUT OUT	OUT OUT	IN	5.0V	IN	5.0V	"	"	"	OUT OUT	1Y	"	"	"	"	"	"	"	"
"	"	108	" "	" "			"	"	"	"	"	"	"	"	"	OUT OUT	2Y	"	"	"	"	"	"	"	"
"	"	109	" "	" "			"	"	IN	5.0V	"	"	"	"	"	OUT OUT	2Y	"	"	"	"	"	"	"	"
"	"	110	" "	" "			"	"	"	5.0V	"	IN	5.0V	"	OUT OUT	3Y	"	"	"	"	"	"	"	"	
"	"	111	" "	" "			"	"	"	"	5.0V	"	5.0V	"	OUT OUT	3Y	"	"	"	"	"	"	"	"	
"	"	112	" "	" "			"	"	"	"	"	5.0V	"	"	OUT OUT	4Y	"	"	"	"	"	"	"	"	
"	"	113	" "	" "			"	"	"	"	"	"	"	"	IN	"	4Y	"	"	"	"	"	"	"	

See footnotes at end of device type 03.

TABLE III. Group A inspection for device type 02 – Continued.

Symbol	MIL-STD-883 method	Cases A,C,D,T,X,Y	For terminal conditions and limits, see 1/ and 3/														Measured terminal	Test limits						Unit				
			1		2		3		4		5		6		7		8		9		10		11		12			
			Test no.	1Y	1A	1B	1C	1D	NC	V _{SS}	NC	2A	2B	2C	2D	2Y	V _{DD}	Subgroup 9 T _A = 25°C	Subgroup 10 T _A = 125°C	Subgroup 11 T _A = -55°C	Min	Max	Min	Max	Min	Max		
t_{PLH}	3003 Fig. 3	86	OUT	IN 5.0V	5.0V IN 5.0V	5.0V IN 5.0V	5.0V IN 5.0V	5.0V IN 5.0V	GND	"	"	5.0V " IN 5.0V	5.0V OUT	5.0V IN	1A to 1Y 1B to 1Y 1C to 1Y 1D to 1Y 2A to 2Y 2B to 2Y 2C to 2Y 2D to 2Y	13	250	18	375	13	250	ns	"					
		87	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	
		88	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	
		89	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	
		90	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	
		91	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	
		92	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	
		93	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	
t_{THL}	3004 Fig. 3	94	OUT	IN 5.0V	"	"	"	"	"	"	"	"	"	"	"	"	5.0V	"	"	1Y	10	550	14	825	10	550	"	
		95	"	"	IN 5.0V	"	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y	"	"	"	"	"	"	"	
		96	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y	"	"	"	"	"	"	"	
		97	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y	"	"	"	"	"	"	"	
		98	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	OUT	"	2Y	"	"	"	"	"	"	
		99	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Y	"	"	"	"	"	"	"	
		100	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Y	"	"	"	"	"	"	"	
		101	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Y	"	"	"	"	"	"	"	
t_{TLH}		102	OUT	IN 5.0V	"	"	"	"	"	"	"	"	"	"	"	"	5.0V	"	"	1Y	10	425	14	640	10	425	"	
		103	"	"	IN 5.0V	"	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y	"	"	"	"	"	"	"	
		104	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y	"	"	"	"	"	"	"	
		105	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y	"	"	"	"	"	"	"	
		106	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	OUT	"	2Y	"	"	"	"	"	"	
		107	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Y	"	"	"	"	"	"	"	
		108	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Y	"	"	"	"	"	"	"	
		109	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Y	"	"	"	"	"	"	"	

See footnotes at end of device type 03.

TABLE III. Group A inspection for device type 03.

Symbol	MIL-STD-883 method	Cases A,C,D, T,X,Y	For terminal conditions and limits, see 1/ and 3/														Measured terminal	Test limits						Unit		
			1	2	3	4	5	6	7	8	9	10	11	12	13	14		Subgroup 1 $T_A = 25^\circ\text{C}$		Subgroup 2 $T_A = 125^\circ\text{C}$		Subgroup 3 $T_A = -55^\circ\text{C}$				
			Test no.	2A	2B	1A	1B	1C	1Y	V_{SS}	2C	2Y	3Y	3A	3B	3C	V_{DD}	Min	Max	Min	Max	Min	Max			
$V_{IC(\text{pos})}$ 1/ " " " "		1 2 3 " " " 5 6 7 8 9	1mA	1mA	1mA		1mA			1mA			1mA	1mA	1mA	GND	2A	2B	2C	1A	1B	1C	3A	1.5 " " " " " " " "	V " " " " " " " "	
		10 11 12 " " " 14 15 16 " " " 18	-1mA	-1mA	-1mA		-1mA			GND	" " " " " " " "	-1mA			-1mA	-1mA	-1mA	-1mA	2A	2B	2C	1A	1B	1C	3A	-6.0 "
		19 20 21 " " " 22	GND 15.0V	15.0V " " " " GND 15.0V	15.0V " " " " GND 15.0V	15.0V " " " " GND	15.0V " " " " GND	15.0V " " " " GND	15.0V " " " " GND	15.0V " " " " GND	15.0V " " " " GND	15.0V " " " " GND	V _{SS}	-25.0 " " " " " " " " " " " "	-750 " " " " " " " " " " " "	nA " " " " " " " " " " " "										
I_{SS} 1/ " " " 2005		23 24 25 " " " 26 27 28 " " " 29 30 31	V_{IL1} 5.0V	GND	GND	"	"	"	"	5.0V " " " " I_{OH1}	I_{OH1}	"	GND	GND	GND	GND	5.0V " " " " V_{IL1} 5.0V	2Y	4.2 " " " " " " " "	4.2 " " " " " " " "	4.2 " " " " " " " "	4.2 " " " " " " " "	4.2 " " " " " " " "	V " " " " " " " "		
		32 33 34 " " " 35 36 37 " " " 38 39 40	V_{IL1} 5.0V	GND	GND	"	"	"	"	5.0V " " " " V_{IL1} 5.0V		"	GND	GND	GND	GND	5.0V " " " " V_{IL1} 5.0V	2Y	4.95 " " " " " " " "	4.95 " " " " " " " "	4.95 " " " " " " " "	4.95 " " " " " " " "	4.95 " " " " " " " "	V " " " " " " " "		
		41 42 43 " " " 44 45 46 " " " 47 48 49	V_{IL2} 12.5V	GND	GND	"	"	"	"	12.5V " " " " V_{IL2} 12.5V		"	GND	GND	GND	GND	12.5V " " " " V_{IL2} 12.5V	2Y	11.25 " " " " " " " "	11.25 " " " " " " " "	11.25 " " " " " " " "	11.25 " " " " " " " "	11.25 " " " " " " " "	V " " " " " " " "		

See footnotes at end of device type 03.

TABLE III. Group A inspection for device type 03 – Continued.

Symbol	MIL-STD-883 method	Cases A,C,D,T,X,Y	For terminal conditions and limits, see 1/ and 3/														Measured terminal	Test limits						Unit						
			1		2		3		4		5		6		7		8		9		10		11		12					
			Test no.	2A	2B	1A	1B	1C	1Y	V _{SS}	2C	2Y	3Y	3A	3B	3C	V _{DD}	Subgroup 1 T _A = 25°C	Subgroup 2 T _A = 125°C	Subgroup 3 T _A = -55°C	Min	Max	Min	Max	Min	Max				
V _{OL1}	3007	50	V _{IH1} GND	V _{IH1} GND	GND V _{IH1} GND	GND V _{IH1} GND	GND V _{IH1} GND	I _{OL1}	GND “	V _{IH1} GND	I _{OL1}	GND “	V _{IH1} GND	GND “	GND V _{IH1}	5.0V	2Y 1Y 3Y	0.7 “ “	0.7 “ “	0.7 “ “	0.7 “ “	0.7 “ “	0.7 “ “	V	V					
V _{OL2}	“	53	V _{IH1} GND	V _{IH1} GND	V _{IH1} GND	V _{IH1} GND	V _{IH1} GND	“	“	V _{IH1} GND	“	“	V _{IH1} GND	GND “	GND V _{IH1}	GND “	2Y 1Y 3Y	0.05 “ “	0.05 “ “	0.05 “ “	0.05 “ “	0.05 “ “	0.05 “ “	“	“					
V _{OL3}	“	56	V _{IH2} GND	V _{IH2} GND	V _{IH2} GND	V _{IH2} GND	V _{IH2} GND	“	“	V _{IH2} GND	“	“	V _{IH2} GND	GND “	GND V _{IH2}	GND “	12.5V 2Y 1Y 3Y	1.25 “ “	1.25 “ “	1.25 “ “	1.25 “ “	1.25 “ “	1.25 “ “	“	“					
I _{IH1 2/}	3010	59	15.0V	15.0V	15.0V	15.0V	15.0V	15.0V	15.0V	15.0V	15.0V	15.0V	15.0V	15.0V	15.0V	15.0V	All together	900						nA						
I _{IH2}	“	60	“	“	“	“	“	“	“	“	“	“	“	“	“	“	“	2A 2B 2C 1A 1B 1C 3A 3B 3C	100.0 “ “ “ “ “ “ “ “	100.0 “ “ “ “ “ “ “ “	100.0 “ “ “ “ “ “ “ “	“	“	“	“	“	“	“	“	“
I _{IL1 2/}	“	69	GND	GND	GND	GND	GND	GND	“	GND	“	GND	“	GND	GND	GND	“	All together	-900						“					
I _{IL2}	“	70	“	15.0V	15.0V	15.0V	15.0V	15.0V	15.0V	“	“	15.0V	“	15.0V	15.0V	15.0V	“	2A 2B 2C 1A 1B 1C 3A 3B 3C	-100.0 “ “ “ “ “ “ “ “ “	-100.0 “ “ “ “ “ “ “ “ “	-100.0 “ “ “ “ “ “ “ “ “	“	“	“	“	“	“	“	“	“
C _i	3012	79	F	F	F	F	F	F	F	GND “	F	“	“	F	“	GND “	2A 2B 2C 1A 1B 1C 3A 3B 3C	12.0 “ “ “ “ “ “ “ “ “							pF “	pF “				
	“	80																												
	“	81																												
	“	82																												
	“	83																												
	“	84																												
	“	85																												
	“	86																												
	“	87																												

See footnotes at end of device type 03.

TABLE III. Group A inspection for device type 51 – Continued.

Symbol	MIL-STD-883 method	Cases A,C,D,T,X,Y	For terminal conditions, see 1/														Measured terminal	Test limits						Unit			
			1		2		3		4		5		6		7		8		9		10		11		12		
			Test no.	1A	1B	1Y	2Y	2B	2A	V _{SS}	3A	3B	3Y	4Y	4B	4A	V _{DD}	Subgroup 1 T _A = 25°C	Subgroup 2 T _A = 125°C	Subgroup 3 T _A = -55°C	Min	Max	Min	Max			
I _{OH2}		96	15V GND	GND 15V	13.5V GND	13.5V 13.5V		GND 15V	GND GND	GND “	GND “	GND “	GND “	GND “	GND “	GND “	15V	1Y	-3.4		-2.4					mA	
		97	“	“	“	“		“	“	“	“	“	“	“	“	“	“	1Y	“	“	“	“	“	“	“	“	
		98	“	“	“	“		“	“	“	“	“	“	“	“	“	“	2Y	“	“	“	“	“	“	“	“	
		99	“	“	“	“		“	“	“	“	“	“	“	“	“	“	2Y	“	“	“	“	“	“	“	“	
		100	“	“	“	“		“	“	“	“	“	“	“	“	“	“	3Y	“	“	“	“	“	“	“	“	
		101	“	“	“	“		“	“	“	“	“	“	“	“	“	“	3Y	“	“	“	“	“	“	“	“	
		102	“	“	“	“		“	“	“	“	“	“	“	“	“	“	4Y	“	“	“	“	“	“	“	“	
		103	“	“	“	“		“	“	“	“	“	“	“	“	“	“	4Y	“	“	“	“	“	“	“	“	
I _{IH1}	3010	104	18V	18V				18V	18V	“	18V	18V				18V	18V	18V	18V	All inputs together		800			nA		
I _{IL2}		105	“	“				“	“	“	“	“	“	“	“	“	“	1A		100.0		100.0				“	
I _{IL1}		106	“	“	“			“	“	“	“	“	“	“	“	“	“	1B	“	“	“	“	“	“	“	“	
		107	“	“	“			“	“	“	“	“	“	“	“	“	“	2B	“	“	“	“	“	“	“	“	
		108	“	“	“			“	“	“	“	“	“	“	“	“	“	2A	“	“	“	“	“	“	“	“	
		109	“	“	“			“	“	“	“	“	“	“	“	“	“	3A	“	“	“	“	“	“	“	“	
		110	“	“	“			“	“	“	“	“	“	“	“	“	“	3B	“	“	“	“	“	“	“	“	
		111	“	“	“			“	“	“	“	“	“	“	“	“	“	4B	“	“	“	“	“	“	“	“	
		112	“	“	“			“	“	“	“	“	“	“	“	“	“	4A	“	“	“	“	“	“	“	“	
I _{IL1}	3009	113	GND	GND				GND	GND	“	GND	GND				GND	GND	“	All inputs together		-800				“		
I _{IL2}		114	“	18V	18V			18V	18V	“	18V	18V				18V	18V	“	1A		-100.0		-100.0			“	
C _i		115	18V	GND	18V			GND	18V	“	GND	18V				GND	18V	“	1B	“	“	“	“	“	“	“	
		116	“	“	“			“	“	“	“	“	“	“	“	“	“	2B	“	“	“	“	“	“	“	“	
		117	“	“	“			“	“	“	“	“	“	“	“	“	“	2A	“	“	“	“	“	“	“	“	
		118	“	“	“			“	“	“	“	“	“	“	“	“	“	3A	“	“	“	“	“	“	“	“	
		119	“	“	“			“	“	“	“	“	“	“	“	“	“	3B	“	“	“	“	“	“	“	“	
		120	“	“	“			“	“	“	“	“	“	“	“	“	“	4B	“	“	“	“	“	“	“	“	
		121	“	“	“			“	“	“	“	“	“	“	“	“	“	4A	“	“	“	“	“	“	“	“	
																			Subgroup 4 T _A = 25°C								
C _i	3012	122	3/	3/				3/	3/	GND	“	“	“	“	“	“	“	1A	1B	2B	2A	3A	3B	4B	4A	pF	
																			12.0	“	“	“	“	“	“	“	“

See footnotes at end of device type 53.

TABLE III. Group A inspection for device type 52.

Symbol	MIL-STD-883 method	Cases A,C,D,T,X,Y	For terminal conditions, see 1/														Measured terminal	Test limits						Unit		
			1	2	3	4	5	6	7	8	9	10	11	12	13	14		Subgroup 1 T _A = 25°C		Subgroup 2 T _A = 125°C		Subgroup 3 T _A = -55°C				
			Test no.	1Y	1A	1B	1C	1D	NC	V _{SS}	NC	2A	2B	2C	2D	2Y	V _{DD}	Min	Max	Min	Max	Min	Max			
V _{IC(pos)} 1/ “ “ “ “ “ “ “ “ “		1 2 3 4 5 6 7 8			1mA	1mA	1mA	1mA				1mA	1mA	1mA	1mA	GND	“	1A 1B 1C 1D 2A 2B 2C 2D	“	1.5 “ “ “ “ “ “ “				V “ “ “ “ “ “ “ “		
		9 10 11 12 13 14 15 16			-1mA	-1mA	-1mA	-1mA				-1mA	-1mA	-1mA	-1mA	GND	“	1A 1B 1C 1D 2A 2B 2C 2D	“	-6.0 “ “ “ “ “ “ “				“ “ “ “ “ “ “ “		
		17 18 19 20 21			GND 18.0V	18.0V GND	18.0V GND	18.0V GND		“	“	GND 18.0V	18.0V GND	18.0V GND	18.0V GND	18.0V GND	“	V _{SS}	“	-25.0 “ “ “ “ “	-750.0 “ “ “ “ “		nA “ “ “ “ “			
		22 23 24 25 26 27 28 29			GND 15V	15V GND	15V GND	15V GND		“	“	GND 15V	15V GND	15V GND	15V GND	15V GND	“	15.0V	1Y 1Y 1Y 1Y 2Y 2Y 2Y 2Y	14.95 “ “ “ “ “ “ “	14.95 “ “ “ “ “ “ “	14.95 “ “ “ “ “ “ “	14.95 “ “ “ “ “ “ “	V “ “ “ “ “ “ “ “		
		3006 “ “ “ “ “ “ “ “			3007 “ 31	15V GND	15V GND	15V GND	15V GND		“	“	GND 15V	GND 15V	GND 15V	GND 15V	GND 15V	“	1Y 2Y	“	0.05 “	0.05 “	0.05 “	0.05 “	“ “ “ “ “ “ “ “	
		32 33			3007 “ 31	3.5V GND	3.5V GND	3.5V GND	3.5V GND		“	“	GND 3.5V	GND 3.5V	GND 3.5V	GND 3.5V	GND 3.5V	“	5V “	1Y 2Y	“	0.5 “	0.5 “	0.5 “	0.5 “	“ “ “ “ “ “ “ “
		34 35			34 35	7.0V GND	7.0V GND	7.0V GND	7.0V GND		“	“	GND 7.0V	GND 7.0V	GND 7.0V	GND 7.0V	GND 7.0V	“	10V “	1Y 2Y	“	1.0 “	1.0 “	1.0 “	1.0 “	“ “ “ “ “ “ “ “
		36 37			36 37	11V GND	11V GND	11V GND	11V GND		“	“	GND 11V	GND 11V	GND 11V	GND 11V	GND 11V	“	15V “	1Y 2Y	“	1.5 “	1.5 “	1.5 “	1.5 “	“ “ “ “ “ “ “ “
		38 39 40 41 42 43 44 45			38 39 40 41 42 43 44 45	1.5V 3.5V	3.5V 1.5V	3.5V 3.5V	3.5V 1.5V		“	“	GND 1.5V	GND 3.5V	GND 3.5V	GND 1.5V	GND 3.5V	“	5V “	1Y 1Y 1Y 1Y 2Y 2Y 2Y 2Y	4.5 “	4.5 “	4.5 “	4.5 “	“ “ “ “ “ “ “ “	

See footnotes at end of device type 53.

TABLE III. Group A inspection for device type 52 – Continued.

Symbol	MIL-STD-883 method	Cases A,C,D,T,X,Y	For terminal conditions, see 1/														Measured terminal	Test limits						Unit		
																		Subgroup 1 T _A = 25°C		Subgroup 2 T _A = 125°C		Subgroup 3 T _A = -55°C				
			1	2	3	4	5	6	7	8	9	10	11	12	13	14		Min	Max	Min	Max	Min	Max			
			Test no.	1Y	1A	1B	1C	1D	NC	V _{SS}	NC	2A	2B	2C	2D	2Y	V _{DD}									
V _{IL2}		46 “ “ 48 49 “ 50 51 52 “ 53		3.0V 7.0V “ GND “ “ “ “ “ “	7.0V 3.0V 7.0V “ GND “ “ “ “ “	7.0V “ 7.0V “ GND “ “ “ “ “	7.0V “ 7.0V “ GND “ “ “ “ “	GND “ “ “ “ “ “ “ “ “	GND “ “ “ “ “ “ “ “ “	GND “ “ “ “ “ “ “ “ “	GND “ “ “ “ “ “ “ “ “	10V “ “ “ “ “ “ “ “ “	1Y 1Y 1Y 1Y 2Y 2Y 2Y 2Y 2Y	9.0 “ “ “ “ “ “ “ “	9.0 “ “ “ “ “ “ “ “	9.0 “ “ “ “ “ “ “ “	9.0 “ “ “ “ “ “ “ “	V “ “ “ “ “ “ “ “								
V _{IL3}		54 “ 56 57 “ 58 59 60 “ 61		4.0V 11V “ GND “ “ “ “ “	11V 4.0V “ 11V 4.0V “ 11V “ “	11V “ “ “ 4.0V “ “ “ “	11V “ “ “ GND “ “ “ “	“ “ “ “ “ “ “ “ “	GND “ “ “ “ “ “ “ “	GND “ “ “ “ “ “ “ “	GND “ “ “ “ “ “ “ “	15V “ “ “ “ “ “ “ “	1Y 1Y 1Y 1Y 2Y 2Y 2Y 2Y	13.5 “ “ “ “ “ “ “ “	13.5 “ “ “ “ “ “ “ “	13.5 “ “ “ “ “ “ “ “	“ “ “ “ “ “ “ “									
I _{OL1}		62 63	0.4V	5.0V GND	5.0V GND	5.0V GND	5.0V GND	5.0V GND	“	“	GND 5.0V	GND 5.0V	GND 5.0V	GND 5.0V	0.4V	5.0V	1Y 2Y	0.51	0.36	0.36	0.64	0.64	“ “			
I _{OL2}		64 65	1.5V	15V GND	15V GND	15V GND	15V GND	15V GND	“	“	GND 15V	GND 15V	GND 15V	GND 15V	1.5V	15V “	1Y 2Y	3.4 “	2.4 “	2.4	4.2 “	4.2 “	“ “			
I _{OH1}		66 67 68 69 70 71 72 “ 73	4.6V “ 5.0V “ “ GND “ “ “ “	5.0V GND “ 5.0V GND “ GND “ “	5.0V “ 5.0V “ 5.0V GND “ “ “	5.0V “ “ “ 5.0V “ “ “ “	5.0V “ “ “ GND “ “ “ “	“ “ “ “ “ “ “ “ “	GND “ “ “ “ “ “ “ “	GND “ “ “ “ “ “ “ “	GND “ “ “ “ “ “ “ “	5.0V “ “ “ 5.0V “ “ “ “	1Y 1Y 1Y 1Y 2Y 2Y 2Y 2Y	-0.51 “ “ “ “ “ “ “ “	-0.36 “ “ “ “ “ “ “ “	-0.36 “ “ “ “ “ “ “ “	-0.64 “ “ “ “ “ “ “ “	“ “ “ “ “ “ “ “								
I _{OH2}		74 75 76 77 “ 78 79 80 “ 81	13.5V “ 15V “ “ GND “ “ “ “	15V GND 15V GND “ 15V GND “ “ “	15V “ 15V “ 15V GND “ “ “	15V “ “ “ 15V “ “ “ “	15V “ “ “ GND “ “ “ “	“ “ “ “ “ “ “ “ “	GND “ “ “ “ “ “ “ “	GND “ “ “ “ “ “ “ “	GND “ “ “ “ “ “ “ “	15V “ “ “ 15V “ “ “ “	1Y 1Y 1Y 1Y 2Y 2Y 2Y 2Y	-3.4 “ “ “ “ “ “ “ “	-2.4 “ “ “ “ “ “ “ “	-2.4 “ “ “ “ “ “ “ “	-4.2 “ “ “ “ “ “ “ “	“ “ “ “ “ “ “ “								
I _{IH1}	2/	3010	82		18V	18V	18V	18V	“	“	18V	18V	18V	18V	18V	All inputs together		800				nA				
I _{IH2}		83 84 85 86 “ 87 88 89 “ 90		“ “ “ “ “ “ “ “ “ “	“ “ “ “ “ “ “ “ “ “	“ “ “ “ “ “ “ “ “ “	“ “ “ “ “ “ “ “ “ “	“ “ “ “ “ “ “ “ “ “	“ “ “ “ “ “ “ “ “ “	“ “ “ “ “ “ “ “ “ “	“ “ “ “ “ “ “ “ “ “	1A 1B 1C 1D 2A 2B 2C 2D		100.0 “ “ “ “ “ “ “	100.0 “ “ “ “ “ “ “	100.0 “ “ “ “ “ “ “	“ “ “ “ “ “ “ “									

See footnotes at end of device type 53.

TABLE III. Group A inspection for device type 52 – Continued.

Symbol	MIL-STD-883 method	Cases A,C,D,T,X,Y	For terminal conditions, see 1/													Measured terminal	Test limits						Unit			
																	Subgroup 9 T _A = 25°C		Subgroup 10 T _A = 125°C		Subgroup 11 T _A = -55°C					
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	Min	Max	Min	Max	Min	Max				
t_{THL}	3004 Fig. 3	124	OUT	IN 5.0V	5.0V	5.0V	5.0V		GND		5.0V	5.0V	5.0V	5.0V		5.0V	1Y	10	550	14	825	10	550	ns		
		125	"	"	"	"	"	IN 5.0V	"	"	"	"	"	"	"	"	1Y	"	"	"	"	"	"	"		
		126	"	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y	"	"	"	"	"	"	"		
		127	"	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y	"	"	"	"	"	"	"		
		128	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Y	"	"	"	"	"	"	"		
		129	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Y	"	"	"	"	"	"	"		
		130	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Y	"	"	"	"	"	"	"		
		131	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Y	"	"	"	"	"	"	"		
		132	OUT	IN 5.0V	"	"	"	"	"	"	"	"	"	"	"	5.0V		"	1Y	10	425	14	640	10	425	"
		133	"	"	"	"	"	IN 5.0V	"	"	"	"	"	"	"	"		1Y	"	"	"	"	"	"	"	
t_{TLH}		134	"	"	"	"	"	"	"	"	"	"	"	"	"	"	OUT	"	1Y	"	"	"	"	"	"	
		135	"	"	"	"	"	"	"	"	"	"	"	"	"	"	1Y	"	"	"	"	"	"	"	"	
		136	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Y	"	"	"	"	"	"	"	"	
		137	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Y	"	"	"	"	"	"	"	"	
		138	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Y	"	"	"	"	"	"	"	"	
		139	"	"	"	"	"	"	"	"	"	"	"	"	"	"	2Y	"	"	"	"	"	"	"	"	

See footnotes at end of device type 53.

4.4.4 Group D inspection. Group D inspection shall be in accordance with table V of MIL-PRF-38535. End-point electrical parameters shall be as specified in table II herein.

4.4.5 Group E inspection. Group E inspection is required only for parts intended to be marked as radiation hardness assured (see 3.7 herein). RHA levels for device classes B and S shall be as specified in MIL-PRF-38535 and 4.5.4 herein.

4.5 Methods of inspection. Methods of inspection shall be specified and as follows:

4.5.1 Voltage and current. Unless otherwise specified, all voltages given are referenced to the microcircuit V_{SS} terminal. Currents given are conventional current and positive when flowing into the referenced terminal.

4.5.2 Burn-in and life test cool down procedures. When the burn-in and life tests are completed and prior to removal of bias voltages, the devices under test (DUT) shall be cooled to a temperature of $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$; then, electrical parameter end-point measurements shall be performed.

TABLE IV. Delta limits at 25°C .

Parameter 1/	Device types	
	01, 02, 03	51, 52, 53
I_{SS}	$\pm 10 \text{ nA}$	$\pm 10 \text{ nA}$
V_{OL1}	$\pm 0.04 \text{ V}$	
V_{OH1}	$\pm 0.08 \text{ V}$	
I_{OL1}		$\pm 15\%$
I_{OH1}		$\pm 15\%$

1/ Each of the above parameters shall be recorded before and after the required burn-in and life tests to determine delta (Δ).

4.5.3 Quiescent supply current (I_{SS} test). When performing quiescent supply current measurements (I_{SS}), the meter shall be placed so that all currents flow through the meter.

4.5.4 Radiation hardness assurance (RHA) testing. The RHA testing shall be performed in accordance with test procedures and sampling specified in MIL-PRF-38535 and herein.

- a. Before irradiation, selected samples shall be assembled in qualified packages and pass the governing electrical parameters (group A subgroup 1 at 25°C) and also be subjected to the threshold-voltage test in table VII in order to calculate the delta threshold (ΔV_T) after irradiation.
- b. The devices shall be subjected to a total radiation dose as specified in MIL-PRF-38535 for the radiation hardness assurance level being tested, and meet the end-point electrical parameters as defined in table V at 25°C , after exposure. The start and completion of the end-point electrical parameter measurements shall not exceed 2 hours following irradiation.
- c. Threshold-voltage test circuit conditions shall be as specified in table VII and figure 4. In situ and remote testing, the tests shall be performed with the devices biased in accordance with table VI and the bias may be interrupted for up to 1 minute to remove devices to the remote bias fixture.
- d. After irradiation, the devices shall pass the truth table test as specified in subgroup 7 in table III or if subgroup 7 is not required, then an equivalent truth table test shall be performed.

TABLE V. Radiation hardened end-point electrical parameters at 25°C.

Parameter	All device types	V_{DD}	
		Device types	
		01, 02, 03	51, 52, 53
V_{TN}	0.3 V min	10 V	10 V
V_{TP}	2.8 V max	10 V	10 V
ΔV_T	1.4 V max	10 V	10 V
I_{SS}	100 x max limit	15 V	18 V
t_{PLH}	1.35 x max limit	5 V	5 V
t_{PHL}	1.35 x max limit	5 V	5 V

TABLE VI. Bias during exposure to radiation.

Device type	Pin connections 1/		
	$V_{DD} = 10$ V dc (through a 30 kΩ to 60 kΩ resistor)	$V_{SS} = GND$	$V_{DD} = 10$ V dc
01, 51	1, 2, 5, 6, 8, 9, 12, 13	7	14
02, 52	2, 3, 4, 5, 9, 10, 11, 12	7	14
03, 53	1, 2, 3, 4, 5, 8, 11, 12, 13	7	14

1/ Pins not designated are open, or may be tied to 10 V dc through a 30 kΩ to 60 kΩ resistor.

4.6 Data reporting. When specified in the purchase order or contract, a copy of the following data, as applicable, shall be supplied.

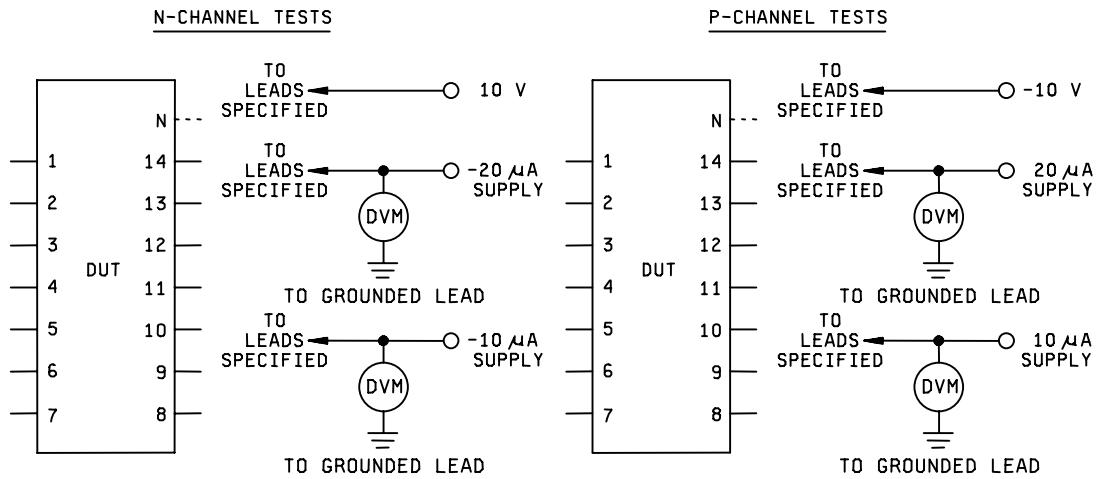
- a. Attributes data for all screening tests (see 4.2) and variables data for all static burn-in, dynamic burn-in, and steady-state life tests (see 3.6).
- b. A copy of each radiograph.
- c. The technology conformance inspection (TCI) data (see 4.4).
- d. Parameter distribution data on parameters evaluated during burn-in (see 3.6).
- e. Final electrical parameters data (see 4.2d).
- f. RHA delta limits.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of material is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department of Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

6.1 Intended use. Microcircuits conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

FIGURE 4. Threshold-voltage test circuit.TABLE VII. Threshold-voltage test circuit conditions.

Device type	GND	10 V	V_{TN} measured at		GND	-10 V	V_{TP} measured at	
			-20 μ A supply	-10 μ A supply			20 μ A supply	10 μ A supply
01, 51	2	1, 14		5-9, 12, 13	2	5-9, 12, 13		1, 14
02, 52	2	3-5, 14		7, 9-12	2	7, 9-12		3-5, 14
03, 53	3	4, 5, 14		1, 2, 7, 8, 11, 12, 13	3	1, 2, 7, 8, 11, 12, 13		4, 5, 14

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of the specification.
- b. PIN and compliance identifier, if applicable (see 1.2).
- c. Requirements for delivery of one copy of the quality conformance inspection data pertinent to the device inspection lot to be supplied with each shipment by the device manufacturer, if applicable.
- d. Requirements for certificate of compliance, if applicable.
- e. Requirements for notification of change of product or process to contracting activity in addition to notification to the qualifying activity, if applicable.
- f. Requirements for failure analysis (including required test condition of method 5003 of MIL-STD-883), corrective action, and reporting of results, if applicable.
- g. Requirements for product assurance and radiation hardness assurance options.
- h. Requirements for special carriers, lead lengths, or lead forming, if applicable. These requirements should not affect the part number. Unless otherwise specified, these requirements will not apply to direct purchase by or direct shipment to the Government.
- i. Requirements for "JAN" marking.
- j. Packaging requirements. (see 5.1)

6.3 Superseding information. The requirements of MIL-M-38510 have been superseded to take advantage of the available Qualified Manufacturer Listing (QML) system provided by MIL-PRF-38535. Previous references to MIL-M-38510 in this document have been replaced by appropriate references to MIL-PRF-38535. All technical requirements now consist of this specification and MIL-PRF-38535. The MIL-M-38510 specification sheet number and PIN have been retained to avoid adversely impacting existing government logistics systems and contractors parts lists.

6.4 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers List QML-38535 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from DSCC-VQ, P.O. Box 3990, Columbus, Ohio 43218-3990.

6.5 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein are defined in MIL-PRF-38535, MIL-HDBK-1331, and as follows:

C_i	Input terminal-to-GND capacitance.
GND	Ground zero voltage potential.
I_{SS}	Quiescent supply current.
T_A	Free air temperature.
V_{DD}	Positive supply voltage.
V_{SS}	Negative supply voltage.

6.6 Logistic support. Lead materials and finishes (see 3.4) are interchangeable. Unless otherwise specified, microcircuits acquired for Government logistic support will be acquired to device class S for National Aeronautics and Space Administration or class B for Department of Defense (see 1.2.2), lead material and finish A (see 3.4). Longer length leads and lead forming should not affect the part number.

6.7 Substitutability. The cross-reference information below is presented for the convenience of users. Microcircuits covered by this specification will functionally replace the listed generic-industry type. Generic-industry microcircuit types may not have equivalent operational performance characteristics across military temperature ranges, post irradiation performance or reliability factors equivalent to MIL-M-38510 device types and may have slight physical variations in relation to case size. The presence of this information should not be deemed as permitting substitution of generic-industry types for MIL-M-38510 types or as a waiver of any of the provisions of MIL-PRF-38535.

Military device type	Generic-industry type
01	4011A
02	4012A
03	4023A
51	4011B
52	4012B
53	4023B

6.8 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodians:
 Army - CR
 Navy - EC
 Air Force - 11
 DLA - CC

Preparing activity:
 DLA - CC
 (Project 5962-2043)

Review activities:
 Army - MI, SM
 Navy - AS, CG, MC, SH, TD
 Air Force – 03, 19, 99

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using ASSIST Online database at www.dodssp.daps.mil.