

QUALIFICATION
REQUIREMENTS
REMOVED

MIL-M-38510/35B
28 February 1984
SUPERSEDING
MIL-M-38510/35A
24 May 1982

MILITARY SPECIFICATION
MICROCIRCUITS, DIGITAL CLOCK DRIVERS,
MONOLITHIC SILICON

INACTIVE FOR NEW DESIGN AFTER DATE OF THIS REVISION.

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

1. SCOPE

1.1 Scope. This specification covers the detail requirements for monolithic silicon bipolar drivers for MOS clocks. One product assurance class and a choice of case outlines and lead finishes are provided for each type and are reflected in the complete part number.

1.2 Part number. The part number shall be in accordance with MIL-M-38510, with the exception that the "JAN" or "J" certification shall not be used.

1.2.1 Device type. The device type shall be as follows:

<u>Device type</u>	<u>Circuit</u>
01	Dual clock driver

1.2.2 Device class. The device class shall be the product assurance level as defined in MIL-M-38510.

1.2.3 Case outlines. The case outline shall be designated as follows:

<u>Letter</u>	<u>Case outlines, (see MIL-M-38510, appendix C)</u>
C	D-1 (14-lead, 1/4" x 3/4"), dual-in-line package
G	A-1 (8-lead can)
M	A-3 (12-lead can)

1.3 Absolute maximum ratings.

Supply voltage, V_{CC} to V_{EE} - - - - -	+22 V
Peak output current - - - - -	1.5 A
Input voltage - - - - -	10 V
Storage temperature range - - - - -	-65°C to +150°C
Lead temperature (soldering, 10 seconds) - - -	+300°C
Junction temperature (T_J) - - - - -	+175°C
Thermal resistance, junction to case (θ_{JC}) - -	60°C/W for flat-package; 40°C/W for cans

1.4 Recommended operating conditions.

Case operating temperature range (T_C) - - -	-55°C to +125°C
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Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Rome Air Development Center, (RBE-2), Griffiss AFB, NY 13441, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

2. APPLICABLE DOCUMENTS

2.1 Government specifications and standards. Unless otherwise specified, the following specifications and standards, 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 specification 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 specifications, standards, handbooks, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

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

3. REQUIREMENTS

3.1 Detail specifications. The individual item requirements shall be in accordance with MIL-M-38510, 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 1.2.3 herein.

3.2.1 Circuit diagram and terminal connections. The circuit diagram and terminal connections shall be as specified on figure 1.

3.3 Lead material and finish. The lead material and finish shall be in accordance with MIL-M-38510 (see 6.5).

3.4 Electrical performance characteristics. The electrical performance characteristics are as specified in table I, and apply over the full recommended case operating temperature range, unless otherwise specified.

3.5 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 III.

3.6 Marking. Marking shall be in accordance with MIL-M-38510 and 1.2 herein. The "JAN" or "J" certification mark shall not be used.

3.7 Manufacturer eligibility. To be eligible to supply microcircuits to this specification, a manufacturer shall have a manufacturer certification in accordance with MIL-M-38510 for at least one line. Not necessarily the line producing the device type described herein.

3.8 Certification. Certification in accordance with MIL-M-38510 is not required for this device.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-M-38510 and methods 5005 and 5007, as applicable, of MIL-STD-883, except as modified herein.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions	Limits		Unit
			Min	Max	
High-level input voltage	V_{IH}	$V_{OUT} = V_{EE} + 1.0 \text{ V}$	2.5		V
Low-level input voltage	V_{IL}	$V_{OUT} = V_{CC} - 1.0 \text{ V}$		0.4	V
High-level input current	I_{IH}	$V_{IN} - V_{EE} = 2.5 \text{ V}$ $V_{OUT} = V_{EE} + 1.0 \text{ V}$		15	mA
Low-level input current	I_{IL}	$V_{IN} - V_{EE} = 0 \text{ V}$ $V_{OUT} = V_{CC} - 1.0 \text{ V}$		-10	μA
High-level output voltage	V_{OH}	$V_{IN} = -11.6 \text{ V}, V_{CC} = 5.0 \text{ V}$ $V_{EE} = -12.0 \text{ V}$	4.0		V
Low-level output voltage	V_{OL}	$V_{IN} = -9.5 \text{ V}, V_{CC} = 5.0 \text{ V}$ $V_{EE} = -12.0 \text{ V}$		-11	V
"ON" supply current	I_{CCL}	$V_{CC} - V_{EE} = 20 \text{ V}$ $V_{IN} - V_{EE} = 2.5 \text{ V}$		40	mA
"OFF" supply current	I_{CCH}	$V_{CC} - V_{EE} = 20 \text{ V}$ $V_{IN} - V_{EE} = 0 \text{ V}$		500	μA
Propagation delay time, high-to-low-level	t_{PHL}	$V_{CC} = 0 \text{ V}$ $V_{EE} = -20 \text{ V}$ $C_L = 1,000 \text{ pF}$	0	12	ns
Propagation delay time, low-to-high-level	t_{PLH}		0	15	ns
Transition time, high-to-low-level	t_{THL}			35	ns
Transition time, low-to-high-level	t_{TLH}			25	ns

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (see table III) Class B devices
Interim electrical test parameters (pre burn-in) (method 5004)	1
Final electrical test parameters (method 5004)	1*,2,3,9
Group A test requirements (method 5005)	1,2,3,9
Group C end-point electrical parameters (method 5005)	1,2,3
Group D end-point electrical parameters (method 5005)	1,2,3
Additional electrical subgroups for group C periodic inspection	10,11

*PDA applies to subgroup 1 (see 4.2c).

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:

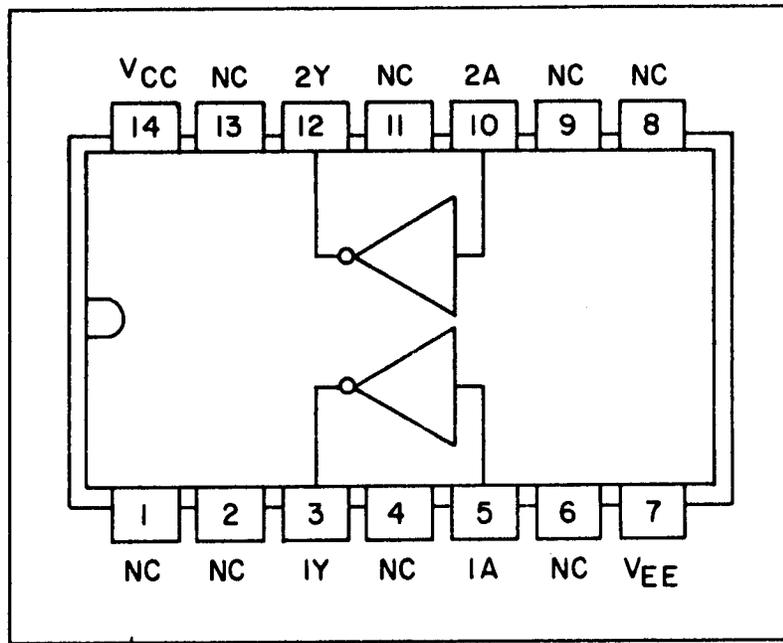
- a. Burn-in test (method 1015 of MIL-STD-883).
 - (1) Test condition D or E, using the circuit shown on figure 2, or equivalent.
 - (2) $T_A = 125^\circ\text{C}$ minimum.
- b. Interim and final electrical test parameters shall be as specified in table II, except interim electrical parameters test prior to burn-in is optional at the discretion of the manufacturer.
- c. The percent defective allowable (PDA) for class B devices shall be 10 percent based on failures from group A, subgroup 1 test after cooldown as final electrical test in accordance with method 5004 of MIL-STD-883, and with no intervening electrical measurements. If interim electrical parameter tests are performed prior to burn-in, failures resulting from pre burn-in screening may be excluded from the PDA. If interim electrical parameter tests prior to burn-in are omitted, then all screening failures shall be included in the PDA. The verified failures of group A, subgroup 1, after burn-in divided by the total number of devices submitted for burn-in in that lot shall be used to determine the percent defective for that lot, and the lot shall be accepted or rejected based on the PDA for the applicable device class.

4.3 Qualification inspection. Qualification inspection is not required.

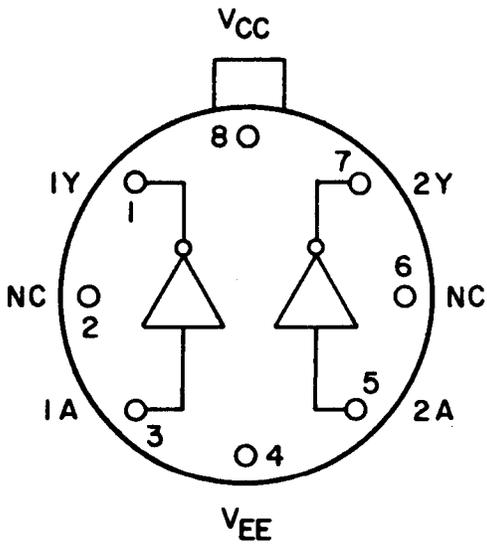
4.4 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-M-38510. Inspections to be performed shall be those specified in method 5005 of MIL-STD-883 and herein for groups A, B, C, and D inspections (see 4.4.1 through 4.4.4). Quality conformance inspection shall be completed on the specific devices covered by this specification before they are shipped. The retention of qualification requirement of MIL-M-38510 shall apply.

4.4.1 Group A inspection. Group A inspection shall be in accordance with table I of method 5005 of MIL-STD-883 and as follows:

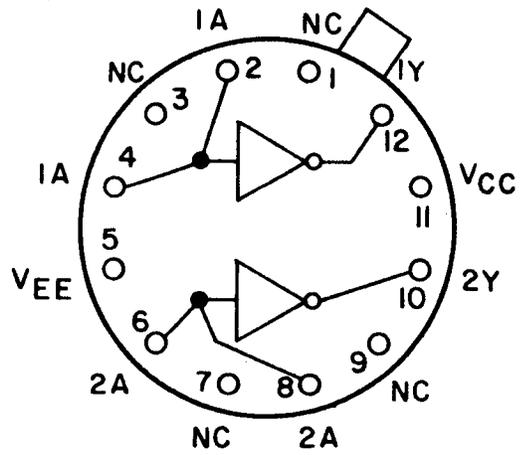
- a. Tests shall be as specified in table II.
- b. Subgroups 4, 5, 6, and 8 of table I of method 5005 of MIL-STD-883 shall be omitted.



CASE C

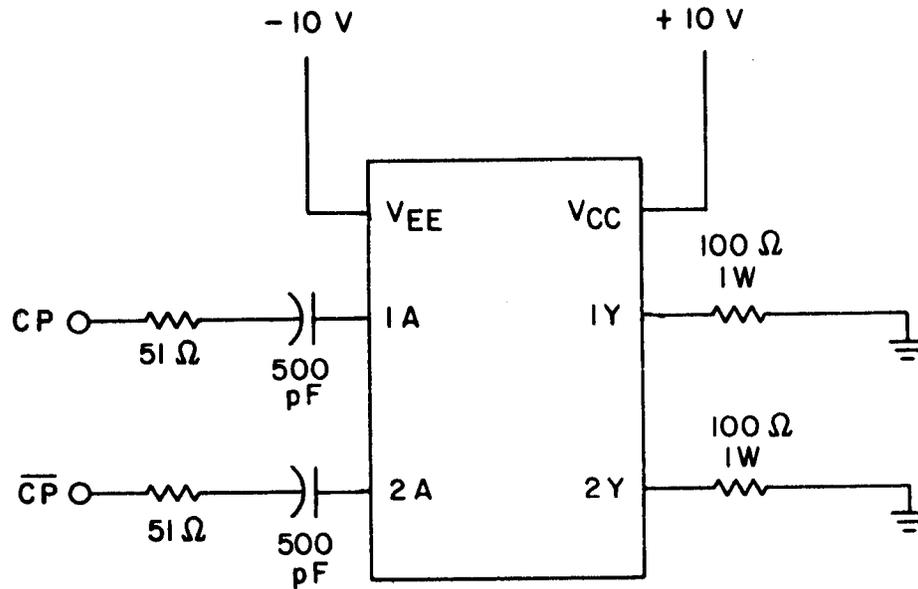


CASE G



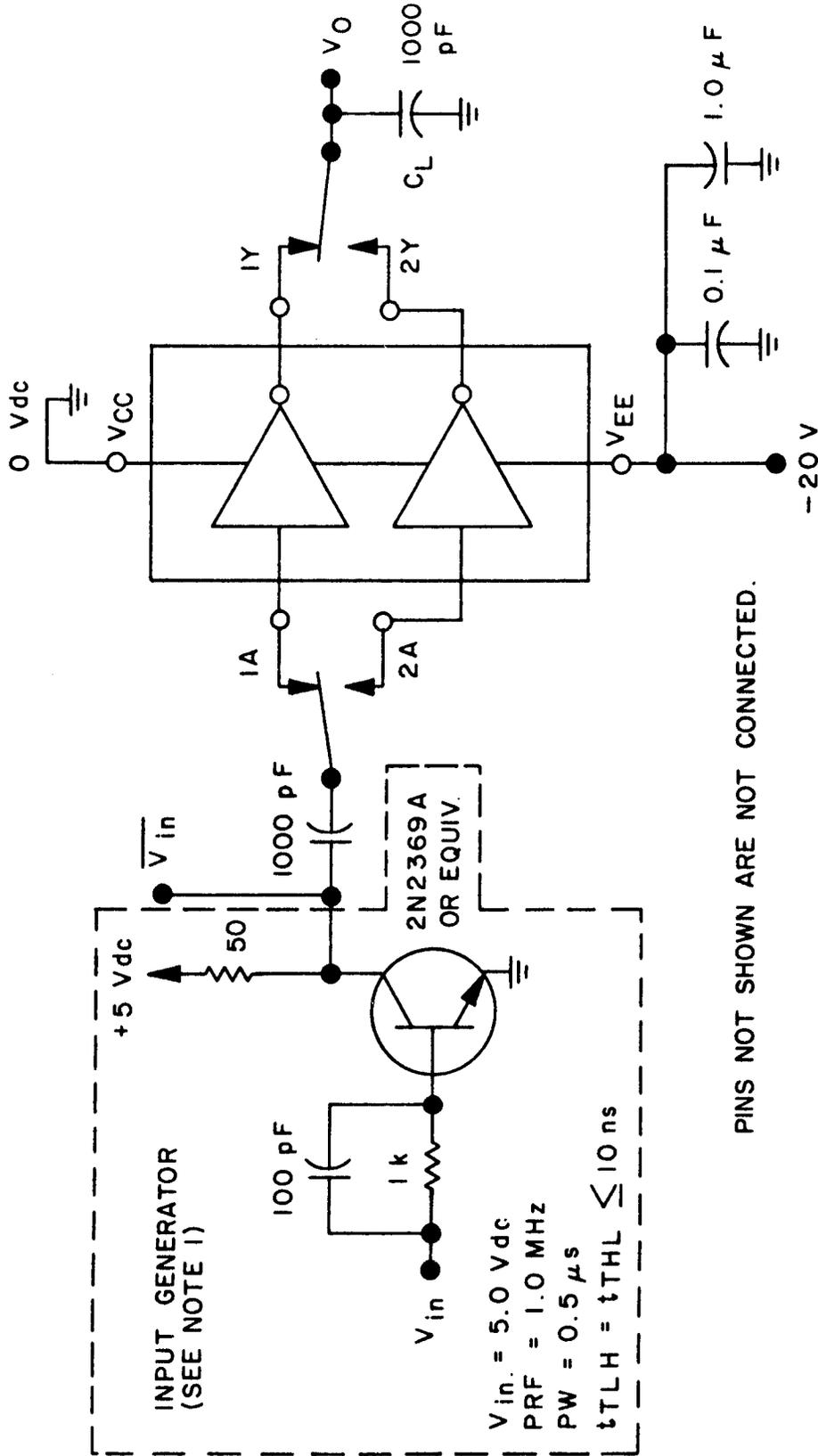
CASE M

FIGURE 1. Terminal connections.

**NOTES:**

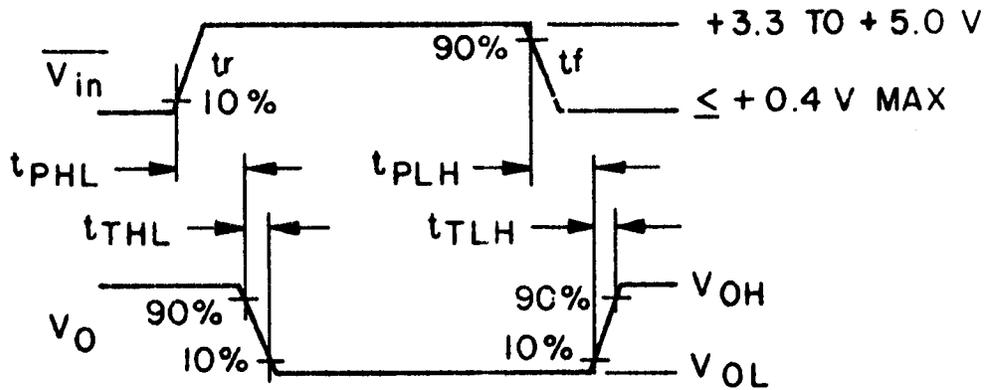
1. All resistances $\pm 5\%$.
2. CP = 100 kHz, 0.4 V to 2.5 V square wave, 50% duty cycle.

FIGURE 2. Burn-in and steady state life test circuit.



NOTE: The input generator shown or its functional equivalent may be used to generate $\overline{V_{in}}$.

FIGURE 3. Switching time test circuit.



V_{in} pulse characteristics: Pulse width = $0.5 \mu\text{s}$
 Rep rate = 1.0 MHz
 t_r, t_f = 10 ns max

Source impedance = 50Ω

FIGURE 4. Switching waveforms.

TABLE III. Group A inspection for device type 01.
Terminal conditions (pins not designated are open)

Subgroup	Symbol	MIL-STD-883 method	Case C											Limits		Unit				
			1	2	3	4	5	6	7	8	9	10	11	12	13		14	Measured terminal	Min	Max
1 T _C = 25°C	V _{OL} V _{OL}	3007	---	2	1	3	4	5	6	7	8	9	10	11	12	13	14	1Y 2Y	-11.0 -11.0	Vdc Vdc
		3007	NC	NC	2	1	3	4	5	6	7	8	9	10	11	12	13			
	V _{OH} V _{OH}	3006	---	2	1	3	4	5	6	7	8	9	10	11	12	13	14	1Y 2Y	4.0 4.0	Vdc Vdc
		3006	NC	NC	2	1	3	4	5	6	7	8	9	10	11	12	13			
	I _{IH} I _{IH}	3010	---	2	1	3	4	5	6	7	8	9	10	11	12	13	14	1A 2A	15 15	mA mA
		3010	NC	NC	2	1	3	4	5	6	7	8	9	10	11	12	13			
	I _{IL} I _{IL}	3009	---	2	1	3	4	5	6	7	8	9	10	11	12	13	14	1A 2A	-10 -10	mA mA
		3009	NC	NC	2	1	3	4	5	6	7	8	9	10	11	12	13			
	I _{CCL} I _{CCL}	3005	---	2	1	3	4	5	6	7	8	9	10	11	12	13	14	Vcc Vcc	40 40	mA mA
		3005	NC	NC	2	1	3	4	5	6	7	8	9	10	11	12	13			
	I _{CCH}	3005	---	2	1	3	4	5	6	7	8	9	10	11	12	13	14	Vcc	100	mA
3005		NC	NC	2	1	3	4	5	6	7	8	9	10	11	12	13	14			
2	Same tests, terminal conditions, and limits as for subgroup 1, except T _C = 125°C and the I _{CCH} test limit maximum shall be 500 μA.																			
3	Same tests, terminal conditions, and limits as for subgroup 1, except T _C = -55°C.																			
9 T _C = 25°C	t _{pHL} t _{pHL}	3003	---	2	1	3	4	5	6	7	8	9	10	11	12	13	14	1Y 2Y	12 12	ns
		3003	NC	NC	2	1	3	4	5	6	7	8	9	10	11	12	13			
	t _{pLH} t _{pLH}	3004	---	2	1	3	4	5	6	7	8	9	10	11	12	13	14	1Y 2Y	15 15	ns
		3004	NC	NC	2	1	3	4	5	6	7	8	9	10	11	12	13			
	t _{rHL} t _{rHL}	3004	---	2	1	3	4	5	6	7	8	9	10	11	12	13	14	1Y 2Y	35 35	ns
		3004	NC	NC	2	1	3	4	5	6	7	8	9	10	11	12	13			
t _{rLH} t _{rLH}	3004	---	2	1	3	4	5	6	7	8	9	10	11	12	13	14	1Y 2Y	25 25	ns	
	3004	NC	NC	2	1	3	4	5	6	7	8	9	10	11	12	13				14
10	Same tests, terminal conditions and limits as for subgroup 9, except T _C = 125°C.																			
11	Same tests, terminal conditions and limits as for subgroup 9, except T _C = -55°C.																			

4.4.2 Group B inspection. Group B inspection shall be in accordance with table II of method 5005 of MIL-STD-883.

4.4.3 Group C inspection. Group C inspection shall be in accordance with table III of method 5005 of MIL-STD-883 and as follows:

- a. End-point electrical parameters shall be as specified in table II herein.
- b. Subgroups 3 and 4 shall be added to the group C inspection requirements for class B devices and shall consist of the tests, conditions, and limits specified for subgroups 10 and 11 of group A inspection.
- c. Steady state life test (method 1005 of MIL-STD-883) conditions:
 - (1) Test condition D or E, using the circuit shown on figure 2, or equivalent.
 - (2) $T_A = +125^\circ\text{C}$ minimum.
 - (3) Test duration: 1,000 hours, except as permitted by appendix B of MIL-M-38510 and method 1005 of MIL-STD-883.

4.4.4 Group D inspection. Group D inspection shall be in accordance with table IV of method 5005 of MIL-STD-883. End-point electrical parameters shall be as specified in table II herein.

4.5 Methods of inspection. Methods of inspection shall be as specified in the appropriate tables and as follows:

4.5.1 Voltage and current. All voltages given are referenced to the microcircuit ground terminal. Currents given are conventional and positive when flowing into the referenced terminal.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be as specified in MIL-M-38510.

6. NOTES

6.1 Notes. The notes specified in MIL-M-38510 are applicable to this specification.

6.2 Intended use. Microcircuits conforming to this specification are intended for logistic support of existing equipment.

6.3 Ordering data. The acquisition document should specify the following:

- a. Complete part number (see 1.2).
- b. 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.
- c. Requirement for certificate of compliance, if applicable.
- d. Requirements for notification of change of product or process to contracting activity in addition to notification to the qualifying activity, if applicable.
- e. Requirements for packaging and packing.
- f. Requirements for special carriers, lead lengths, or lead forming, if applicable. These requirements shall not affect the part number. Unless otherwise specified, these requirements will not apply to direct purchase by or direct shipment to the Government.

6.4 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein are defined in MIL-M-38510, MIL-STD-1331, and as follows:

- GND - - - - - Electrical ground (common terminal)
- V_{IN} - - - - - Voltage level at an input terminal
- I_{IN} - - - - - Current flowing into an input terminal
- T_C - - - - - Case temperature

6.5 Logistic support. Lead materials and finishes (see 3.3), are interchangeable. Unless otherwise specified, microcircuits acquired for Government logistic support will be acquired to device class B (see 1.2.2) and lead material and finish C (see 3.3). Longer length leads and lead forming shall not affect the part number.

6.6 Generic test data. Generic test data may be used to satisfy the requirements of 4.4.3. Group C generic test data shall be on date codes no more than one year old and on a die in the same microcircuit group (see appendix E of MIL-M-38510) with the same material, design and process and from the same plant as the die represented. Group D (see 4.4.4) generic data shall be on date codes no more than one year old and on the same package type (see terms, definitions, and symbols of MIL-M-38510) and from the same plant as the package represented. The vendor is required to retain the generic data for a period of not less than 36 months from the date of shipment.

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 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 shall 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-M-38510.

<u>Military device type</u>	<u>Generic-industry type</u>
01	MMH0026, 0026, DS0026

6.8 Ordering guidance. Since the qualification and certification requirements have been removed from the specification, orders may be placed immediately.

6.9 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:
 Army - ER
 Navy - EC
 Air Force - 17
 NASA - NA

Preparing activity:
 Air Force - 17
 (Project 5962-0659)

Review activities:
 Army - AR, MI
 Navy - OS, SH
 Air Force - 11, 19, 85, 99
 DLA - ES

User activities:
 Army - SM
 Navy - AS, CG, MC

Agent:
 DLA - ES