

MILITARY SPECIFICATION

MICROCIRCUITS, DIGITAL, CMOS, POSITIVE LOGIC, FOUR-BIT FULL ADDER,
 MONOLITHIC SILICON

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, CMOS logic microcircuits. Two product assurance classes and a choice of case outline/lead finish 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.

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

<u>Device type</u>	<u>Circuit</u>
01	Four-bit full adder
51	Four-bit full adder

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

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

<u>Letter</u>	<u>Case outline (see MIL-M-38510, appendix C)</u>
E	D-2 (16-lead, 1/4" x 7/8", dual-in-line pack)
F	F-5 (16-lead, 1/4" x 3/8", flat pack)
Z	F-5 (16-lead, 1/4" x 3/8", flat pack, except A dimension = .1" (2.54 mm) max).

NOTES

1. As an exception to 3.5.6.2.3 of MIL-M-38510, for case outline Z only, the leads of bottom brazed ceramic packages (i.e. configuration 2 of case outline F-5) may have electroless nickel undercoating which shall be 50 to 200 microinches (1.27 to 5.08 μ m) 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 outline Z only, the S₁ dimension may go to .000 inch (.00 mm) minimum.

1.3 Absolute maximum ratings.

Supply voltage range (V _{DD} - V _{SS}):	
Device type 01	-0.5 V to +15.5 V
Device type 51	-0.5 V to +18.0 V
Input current (each input)	± 10 mA
Input voltage range	(V _{SS} -0.5 V) \leq V _I \leq (V _{DD} + 0.5 V)

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: George C. Marshall Space Flight Center, National Aeronautics and Space Administration, ATTN: EG02, Marshall Space Flight Center, AL 35812, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

MIL-M-38510/54D

Storage temperature range- - - - -	-65°C to +175°C
Maximum power dissipation, P _D - - -	200 mW
Lead temperature (soldering, 10 seconds)- - - - -	300°C
Thermal resistance, junction to case - -	(See MIL-M-38510, appendix C)
Junction temperature - - - - -	T _J - 175°C

1.4 Recommended operating conditions.

Supply voltage range (V _{DD} - V _{SS}):	
Device type 01- - - - -	4.5 V dc to 12.5 V dc
Device type 51- - - - -	4.5 V dc to 15.0 V dc
Input low (V _{IL}) voltage range:	
Device type 01- - - - -	0 to 0.85 V dc at V _{DD} = 5 V; 0 to 2.1 V dc at V _{DD} = 12.5 V
Device type 51- - - - -	0 to 1.5 V dc at V _{DD} = 5.0 V, V _{OL} = 10 percent V _{DD} , V _{OH} = 90 percent V _{DD} ; 0 to 4.0 V dc at V _{DD} = 15 V; 0 to 2.0 V dc at V _{DD} = 10 V
Input high (V _{IH}) voltage range:	
Device type 01- - - - -	3.95 to 5.0 V dc at V _{DD} = 5 V; 10.0 to 12.5 V dc at V _{DD} = 12.5 V
Device type 51- - - - -	3.5 to 5.0 V dc at V _{DD} = 5.0 V, V _{OL} = 10 percent V _{DD} , V _{OH} = 90 percent V _{DD} ; 11.0 to 15.0 V dc at V _{DD} = 15 V; 8.0 to 10.0 V dc at V _{DD} = 10 V
Load capacitance- - - - -	50 pF maximum
Ambient operating temperature range - -	-55°C to +125°C

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 specification. 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 herein. Although eutectic die bonding is preferred, epoxy die bonding may be performed. However, the resin used shall be Dupont 5504 Conductive Silver Paste, which is cured at $200^{\circ} + 10^{\circ}\text{C}$ 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.

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

3.2.2 Logic diagrams. The logic diagrams shall be as specified on figure 2.

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

3.2.4 Schematic circuits. The schematic circuits shall be submitted to the preparing activity prior to inclusion of a manufacturer's device in this specification and shall be submitted to the qualifying activity as a prerequisite for qualification. All qualified manufacturers' schematics shall be maintained and available upon request.

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

3.3 Lead material and finish. The lead material and finish shall be in accordance with MIL-M-38510 and 6.4 herein.

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

3.5 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. V_{IL} and V_{IH} testing requires only a summary of attributes data.

3.6 Marking. Marking shall be in accordance with MIL-M-38510.

3.6.1 Total dose radiation hardness identifier. Total dose radiation hardness identifier shall be in accordance with MIL-M-38510 and 4.5.5 herein.

3.6.2 Serialization. All class S devices shall be serialized in accordance with MIL-M-38510.

3.6.3 Correctness of indexing and markings. All devices shall be subjected to the final electrical tests specified in table II after part number marking to verify that they are correctly indexed and identified by part number. Optionally, an approved electrical test may be devised especially for this requirement.

3.7 Microcircuit group assignment. The devices covered by this specification shall be in microcircuit group number 39 (see MIL-M-38510, appendix E).

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.

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

- a. Delete the sequence specified in 3.1.9 through 3.1.13 of method 5004 and substitute sequentially lines 1 through 7 of table II herein.
- b. Burn-in tests (method 1015 of MIL-STD-883).
 1. Static tests (test condition A) use circuit shown on figure 4, or equivalent. 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 method 1015 for class B devices.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ $V_{SS} = 0\text{ V}$ $-55^{\circ}\text{C} < T_A < 125^{\circ}\text{C}$ Unless otherwise specified	Device type	Limits		Unit
				Min	Max	
Positive clamping input to V_{DD}	$V_{IC(POS)}$	$T_A = 25^{\circ}\text{C}$, $V_{DD} = \text{GND}$, $V_{SS} = \text{Open}$, Output = Open, $I_I = 1\text{ mA}$	ATI		1.5	V
Negative clamping input to V_{SS}	$V_{IC(NEG)}$	$T_A = 25^{\circ}\text{C}$, $V_{DD} = \text{Open}$, $V_{SS} = \text{GND}$, Output = Open, $I_I = -1\text{ mA}$	ATI		-6	V
Quiescent supply current	I_{SS}	Any combination of inputs	$V_{DD} = 15.0\text{ V}$	01		
			$V_{DD} = 18.0\text{ V}$	51		-5
High level output voltage	V_{OH1}	$V_{DD} = 5.0\text{ V}$, $I_{OH} = -0.05\text{ mA}$ (see table III)	01	4.5		V
	V_{OH2}	$V_{DD} = 5.0\text{ V}$, $I_{OH} = 0$ (see table III)	01	4.95		V
	V_{OH3}	$V_{DD} = 12.5\text{ V}$, $I_{OH} = 0$ (see table III)	01	11.25		V
	V_{OH4}	$V_{DD} = 15.0\text{ V}$, $I_{OH} = 0$ (see table III)	51	14.95		V
Low level output voltage	V_{OL1}	$V_{DD} = 5.0\text{ V}$, $I_{OL} = 0.05\text{ mA}$ (see table III)	01		0.50	V
	V_{OL2}	$V_{DD} = 5.0\text{ V}$, $I_{OL} = 0$ (see table III)	01		0.05	V
	V_{OL3}	$V_{DD} = 12.5\text{ V}$, $I_{OL} = 0$ (see table III)	01		1.25	V
	V_{OL4}	$V_{DD} = 15.0\text{ V}$, $I_{OL} = 0$ (see table III)	51		0.05	V
Input high voltage	V_{IH1}	$V_{DD} = 5.0\text{ V}$ $V_O = 0.5\text{ V}$ $ I_{O} \leq 1\ \mu\text{A}$	51	3.5		V
	V_{IH2}	$V_{DD} = 10.0\text{ V}$ $V_O = 1.0\text{ V}$ $ I_{O} \leq 1\ \mu\text{A}$	51	7.0		V
	V_{IH3}	$V_{DD} = 15.0\text{ V}$ $V_O = 1.5\text{ V}$ $ I_{O} \leq 1\ \mu\text{A}$	51	11.0		V
Input low voltage	V_{IL1}	$V_{DD} = 5.0\text{ V}$ $V_O = 4.5\text{ V}$ $ I_{O} \leq 1\ \mu\text{A}$	51		1.5	V
	V_{IL2}	$V_{DD} = 10.0\text{ V}$ $V_O = 9.0\text{ V}$ $ I_{O} \leq 1\ \mu\text{A}$	51		3.0	V
	V_{IL3}	$V_{DD} = 15.0\text{ V}$ $V_O = 13.5\text{ V}$ $ I_{O} \leq 1\ \mu\text{A}$	51		4.0	V
Output low (sink) current	I_{OL1}	$V_{DD} = 5.0\text{ V}$, $V_{IN} = V_{SS}$ $V_{OL} = 0.4\text{ V}$	51	0.36		mA

See footnotes at end of table.

TABLE I. Electrical performance characteristics -Continued.

Test	Symbol	Conditions ^{1/} V _{SS} = 0 V -55°C < T _A < 125°C Unless otherwise specified	Device type	Limits		Unit	
				Min	Max		
Output low (sink) current	I _{OL2}	V _{DD} = 15.0 V, V _{IN} = V _{SS} V _{OL} = 1.5 V	51	2.4		mA	
Output high (source) current	I _{OH1}	V _{DD} = 5.0 V, V _{IN} = V _{DD} V _{OH} = 4.6 V	51	-0.36		mA	
	I _{OH2}	V _{DD} = 15.0 V, V _{IN} = V _{DD} V _{OH} = 13.5 V	51	2.4		mA	
Input leakage current ^{2/} (high)	I _{IH}	Measure inputs sequentially	V _{DD} = 15.0 V	01	45	nA	
			V _{DD} = 18.0 V				51
Input leakage current ^{2/} (low)	I _{IL}	Measure inputs sequentially	V _{DD} = 15.0 V	01	-45	nA	
			V _{DD} = 18.0 V				51
Input voltage	V _{ZAP}	C _i = 100 pF, R ₂ = 1.5 kΩ (see 4.5.3)	A11	400		V	
Input capacitance	C _i	V _{DD} = 0 V, f = 1 MHz T _A = 25°C	A11		12	pF	
Propagation delay high to low level - Sum input to sum output	t _{PHL1}	V _{DD} = 5.0 V, C _L = 50 pF (see figure 8)	A11		3375	ns	
Propagation delay high to low level - Carry input to sum output	t _{PHL2}		A11		3375	ns	
Propagation delay high to low level - Sum input to carry output	t _{PHL3}		A11		1125	ns	
Propagation delay high to low level - Carry input to carry output	t _{PHL4}		A11		450	ns	
Propagation delay low to high level - Sum input to sum output	t _{PLH1}		A11		4350	ns	
Propagation delay low to high level - Carry input to sum output	t _{PLH2}		A11		4350	ns	
Propagation delay low to high level - Sum input to carry output	t _{PLH3}		A11		1125	ns	
Propagation delay low to high level - Carry input to carry output	t _{PLH4}		A11	31	450	ns	
Transition times at sum outputs	t _{THL}		A11			15000	ns
	t _{TLH}						
Transition times at carry outputs	t _{THL}		A11			780	ns
	t _{TLH}						

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

^{2/} Input current at one input node.

TABLE II. Burn-in and electrical test requirements.

Line no.	Applicable tests and MIL-STD-883 test methods	Class S device 3/				Class B device 3/			
		Ref. par.	Table 2/ III sub-groups	Table 1/ IV delta limits	Test circuit figure	Ref. par.	Table 2/ III sub-groups	Table 1/ IV delta limits	Test circuit figure
1	Interim electrical parameters (method 5004)		1				1		
2	Static burn-in I (method 1015)	4.2b. 4.5.2			4				
3	Same as line 1		1	Δ					
4	Static burn-in II (method 1015)	4.2b. 4.5.2			4	4.2b. 4.5.2	4/		4
5	Same as line 1	4.2d.	1*	Δ		4.2d.	1*	Δ	
6	Dynamic burn-in (method 1015)	4.2b. 4.5.2			5				
7	Same as line 1	4.2d.	1*	Δ					
8	Final electrical parameters (method 5004)		1*,2,3,7, 9				1*,2,3,7, 9		
9	Group A end point electrical parameters (method 5005)	4.4.1	1,2,3,4, 7,8,9, 10,11			4.4.1	1,2,3, 4,7,9, 10,11		
10	Group B end point electrical parameters (method 5005)	4.4.2	1,2,3,7, 8,9,10,11	Δ					
11	Group C end-point electrical parameters (method 5005)					4.4.3c.	1,2,3	Δ	
12	Additional group C tests (method 5005)					4.4.3c.	10,11		
13	Group D end-point electrical parameters (method 5005)	4.4.4	1,2,3			4.4.4	1,2,3		

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

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

3/ Blank spaces indicate tests are not applicable.

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.

Cases E, F and Z

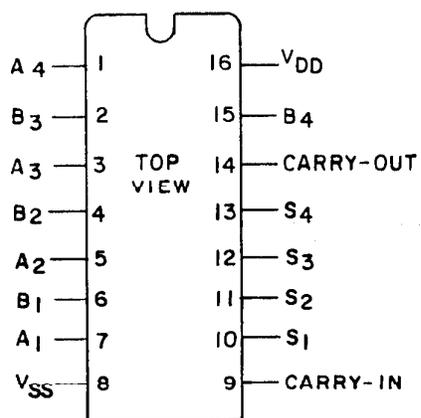


FIGURE 1. Terminal connections.

Device types 01 and 51

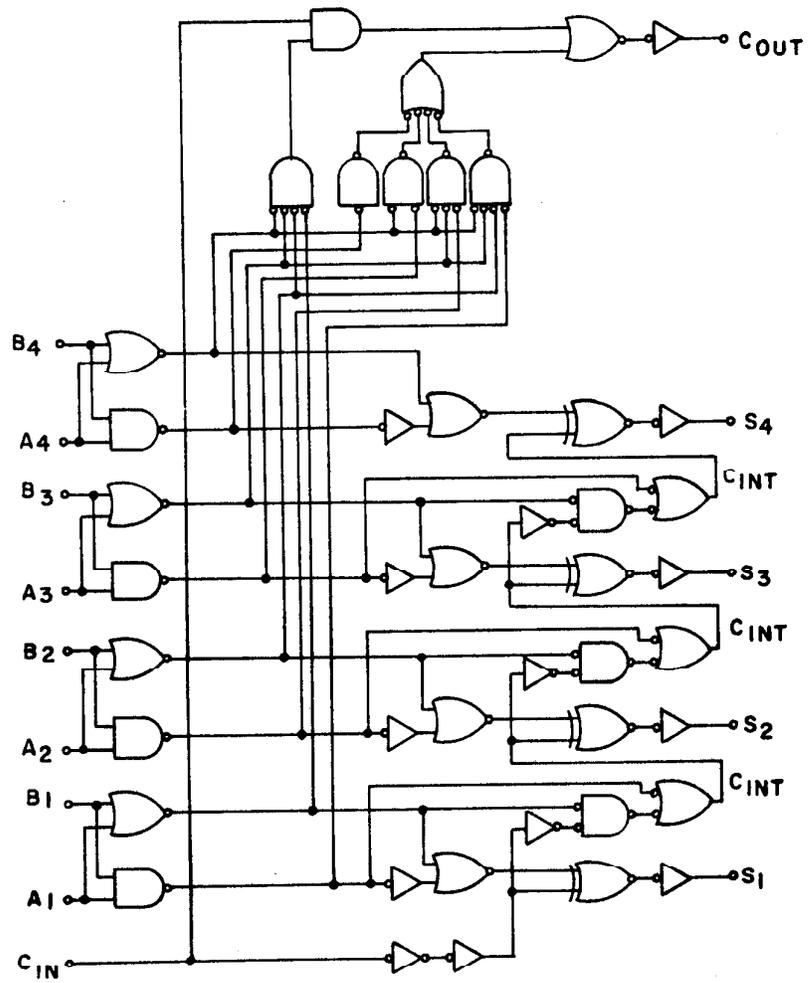
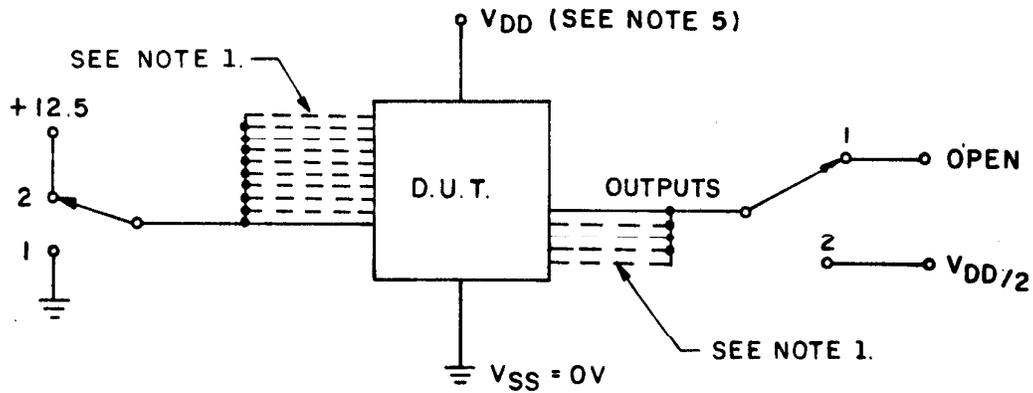


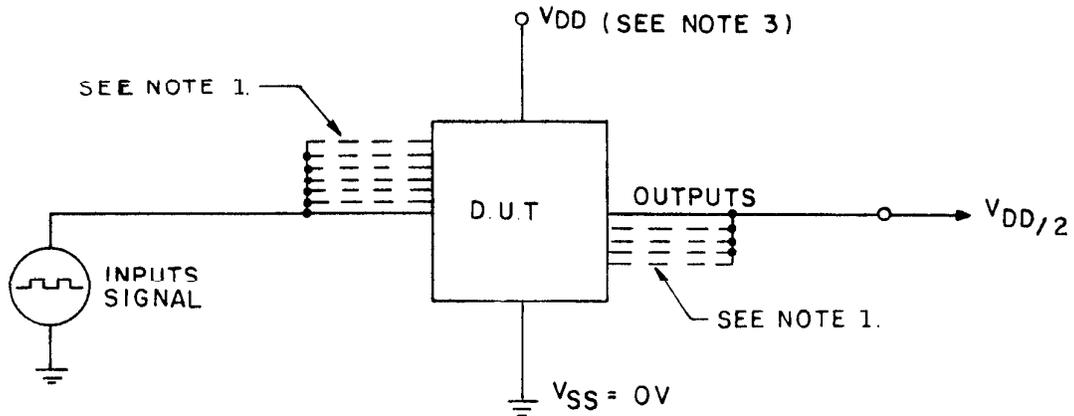
FIGURE 2. Logic diagram.



NOTES:

1. For static burn-in I, all inputs are connected to 0 volts, switch position 1.
2. For static burn-in II, all inputs are connected to V_{DD} , switch position 2.
3. Except for V_{DD} and V_{SS} , each terminal shall be connected through a resistor whose value is 2 k Ω to 47 k Ω . The actual measured value of the resistor selected shall not exceed $\pm 20\%$ of its branded value due to use, heat or age.
4. Output may be in switch position 1 or 2.
5. V_{DD} = 12.5 V minimum, 15.0 V maximum for device types 01.
 V_{DD} = 15.0 V minimum, 18.0 V maximum for device types 51.
 $V_{DD}/2$ = $V_{DD}/2 \pm 1.0$ V for all devices.
 V_{SS} = 0.0 V.

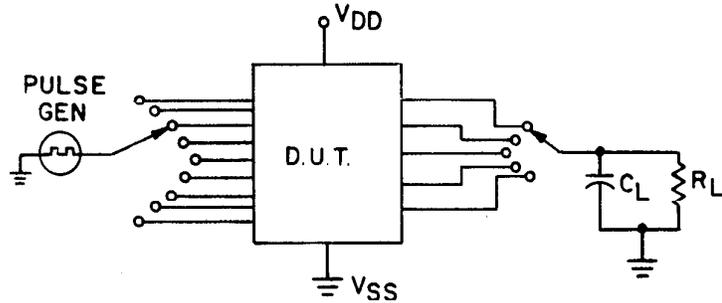
FIGURE 4. Static burn-in test circuits.



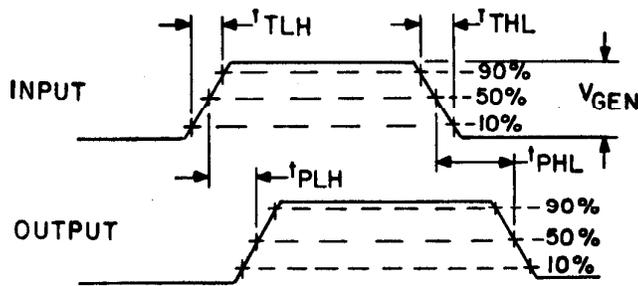
NOTES:

1. Except for V_{DD} and V_{SS} , each terminal shall be connected through a resistor whose value is $2\text{ k}\Omega$ to $47\text{ k}\Omega$. The actual measured value of the resistor selected shall not exceed $\pm 20\%$ of its branded value due to use, heat or age.
2. Input signal requirements:
 - a. Square wave, 50% duty cycle.
 - b. $25\text{ kHz} < \text{PRR} < 1\text{ MHz}$.
 - c. t_{TLH} and $t_{THL} < 1\ \mu\text{s}$.
 - d. Voltage level:
 - Minimum = $V_{SS} - 0.5\text{ V}, +10\% V_{DD}$.
 - Maximum = $V_{DD} + 0.5, -10\% V_{DD}$.
3. $V_{DD} = 12.5\text{ V}$ minimum, 15.0 V maximum for device types 01.
 $V_{DD} = 15\text{ V}$ minimum, 18 V maximum for device types 51.
 $V_{DD/2} = V_{DD}/2 \pm 1.0\text{ V}$.
 $V_{SS} = 0.0\text{ V}$.

FIGURE 5. Dynamic burn-in and steady state life test circuit.



$R_L = 200 \text{ k}\Omega \pm 10\%$.
 $C_L = 50 \text{ pF} \pm 5.0$ (includes wiring and probe capacitance)



NOTES:

1. The pulse generator has the following characteristics: $V_{gen} = V_{DD} \pm 1\%$,
 duty cycle = 50%, $t_{TLH} = t_{THL} = 20 \pm 2.0 \text{ ns}$ and pulse repetition period = $50 \pm 5 \text{ }\mu\text{s}$.
2. See table III for complete terminal conditions.

FIGURE 6. Switching time test circuit and waveforms.

TABLE III. Group A inspection for device type 31 - Continued.

Symbol	Case E.F.Z. Sym ² method	Terminal conditions V										Test limits																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
		Terminal conditions V										Measur ¹ terminal	Subgroup 4 $T_A=25^\circ C$		Subgroup 2 $T_A=55^\circ C$		Unit																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
		1	2	3	4	5	6	7	8	9	10		11	12	13	14		15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221	1222	1223	1224	1225	1226	1227	1228	1229	1230	1231	1232	1233	1234	1235	1236	1237	1238	1239	1240	1241	1242	1243	1244	1245	1246	1247	1248	1249	1250	1251	1252	1253	1254	1255	1256	1257	1258	1259	1260	1261	1262	1263	1264	1265	1266	1267	1268	1269	1270	1271	1272	1273	1274	1275	1276	1277	1278	1279	1280	1281	1282	1283	1284	1285	1286	1287	1288	1289	1290	1291	1292	1293	1294	1295	1296	1297	1298	1299	1300	1301	1302	1303	1304	1305	1306	1307	1308	1309	1310	1311	1312	1313	1314	1315	1316	1317	1318	1319	1320	1321	1322	1323	1324	1325	1326	1327	1328	1329	1330	1331	1332	1333	1334	1335	1336	1337	1338	1339	1340	1341	1342	1343	1344	1345	1346	1347	1348	1349	1350	1351	1352	1353	1354	1355	1356	1357	1358	1359	1360	1361	1362	1363	1364	1365	1366	1367	1368	1369	1370	1371	1372	1373	1374	1375	1376	1377	1378	1379	1380	1381	1382	1383	1384	1385	1386	1387	1388	1389	1390	1391	1392	1393	1394	1395	1396	1397	1398	1399	1400	1401	1402	1403	1404	1405	1406	1407	1408	1409	1410	1411	1412	1413	1414	1415	1416	1417	1418	1419	1420	1421	1422	1423	1424	1425	1426	1427	1428	1429	1430	1431	1432	1433	1434	1435	1436	1437	1438	1439	1440	1441	1442	1443	1444	1445	1446	1447	1448	1449	1450	1451	1452	1453	1454	1455	1456	1457	1458	1459

TABLE III. Group A Inspection for device type 51 -Continued.

Symbol	ML-STD-883 method	Cases E1,F2	Terminal conditions 1/															Test limits																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
																		Subgroup 7 IA = 25°C		Subgroup 10 IA = 125°C		Subgroup 11 IA = -55°C																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221	1222	1223	1224	1225	1226	1227	1228	1229	1230	1231	1232	1233	1234	1235	1236	1237	1238	1239	1240	1241	1242	1243	1244	1245	1246	1247	1248	1249	1250	1251	1252	1253	1254	1255	1256	1257	1258	1259	1260	1261	1262	1263	1264	1265	1266	1267	1268	1269	1270	1271	1272	1273	1274	1275	1276	1277	1278	1279	1280	1281	1282	1283	1284	1285	1286	1287	1288	1289	1290	1291	1292	1293	1294	1295	1296	1297	1298	1299	1300	1301	1302	1303	1304	1305	1306	1307	1308	1309	1310	1311	1312	1313	1314	1315	1316	1317	1318	1319	1320	1321	1322	1323	1324	1325	1326	1327	1328	1329	1330	1331	1332	1333	1334	1335	1336	1337	1338	1339	1340	1341	1342	1343	1344	1345	1346	1347	1348	1349	1350	1351	1352	1353	1354	1355	1356	1357	1358	1359	1360	1361	1362	1363	1364	1365	1366	1367	1368	1369	1370	1371	1372	1373	1374	1375	1376	1377	1378	1379	1380	1381	1382	1383	1384	1385	1386	1387	1388	1389	1390	1391	1392	1393	1394	1395	1396	1397	1398	1399	1400	1401	1402	1403	1404	1405	1406	1407	1408	1409	1410	1411	1412	1413	1414	1415	1416	1417	1418	1419	1420	1421	1422	1423	1424	1425	1426	1427	1428	1429	1430	1431	1432	1433	1434	1435	1436	1437	1438	1439	1440	1441	1442	1443	1444	1445	1446	1447	1448	1449	1450	1451	1452	1453	1454	1455	1456	1457	1458	1459	1460	1461	1462	1463

- 1/ Pins not designated may be high level logic, low level logic, or open. Exceptions are as follows: VIC(POE) tests, the VSS terminal shall be open; VIC(NEG) tests, the VDD terminal shall be open; ISS tests, the output terminals shall be open.
- 2/ The ISS test measurements shall be performed in sequence.
- 3/ The following timing sequence and input/output conditions shall apply:

Inputs				Outputs	
A _N	B _N	C _{IN}	*C _{INT}	C _{OUT}	Sum
L	L	L	L	L	L
H	L	L	L	L	H
L	H	L	L	L	H
H	H	L	H	L(H**)	L
L	L	H	L	L	H
H	L	H	H	L(H**)	L
L	H	H	H	L(H**)	L
H	H	H	H	L(H**)	H

*Internal carry

**C_{OUT} = H when N = 4

- 4/ The device manufacturer may, at his option, measure I_{IL} and I_{IH} at 25°C for individual input or measure all inputs together.
- 5/ See 4.4.1c.
- 6/ The truth table tests shall be performed at V_{IH} and V_{DD} ±5 Vdc and ≥18 Vdc. L = V_{SS} + 0.50 V maximum and E = V_{DD} - 0.50 Vdc.
- 7/ The truth table tests shall be performed at V_{IH} and V_{DD} ±5 Vdc and ≥18 Vdc. L = V_{SS} + 0.50 V maximum and E = V_{DD} - 0.50 Vdc.

Input/output conditions

Test	VDD Volts	Input levels		Output levels	
		1	0	1	0
V _{IH1} V _{IL1}	5.0	V _{DD} 3.5 V	1.5 V V _{SS}	4.5 V	0.5 V
V _{IH2} V _{IL2}	10.0	V _{DD} 7.0 V	3.0 V V _{SS}	9.0 V	1.0 V
V _{IH3} V _{IL3}	15.0	V _{DD} 11.0 V	4.0 V V _{SS}	13.5 V	1.5 V

2. Dynamic tests (test condition D) use circuit shown on figure 7, or equivalent. T_A shall be 125°C minimum. Test duration shall be in accordance with table I method 1015.
- c. Interim and final electrical test parameters shall be as specified in table II herein.
- d. 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 measurements.

4.2.1 Percent defective allowable (PDA).

- a. The class S devices PDA 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 failures shall be cumulative for determining PDA.
- c. The class B devices PDA shall be in accordance with MIL-M-38510. 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 to the burn-in 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-M-38510. Inspections to be performed shall be those specified in method 5005 of MIL-STD-883 and herein for groups A, B, C, D, and E inspections (see 4.4.1 through 4.4.5).

4.3.1 Qualification extension. When authorized by the qualifying activity, for qualification inspection, if a manufacturer qualifies to a 51 device type which is manufactured identically to a 01 device type on this specification. Then the 01 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-M-38510, appendix (i.e., groups A, B, C, D, and E tests are not required).

4.4 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-M-38510 and as specified herein. Inspections to be performed shall be those specified in method 5005 of MIL-STD-883 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 I of method 5005 of MIL-STD-883 and as follows:

- a. Tests shall be as specified in table II herein.
- b. Subgroups 5 and 6 of table I of method 5005 of MIL-STD-883 shall be omitted.
- c. Subgroup 4 (Ci measurements) shall be measured only for initial qualification 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.

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

- a. Class S steady state life (accelerated) test circuits shall be submitted to the qualifying activity for approval. When the alternate steady state life test is used, the circuit on figure 3, or equivalent, shall be used.
- b. A special subgroup shall be added using an LTPD of 15 for class S and B, and shall be performed on each inspection lot for device types 01, and measured only for initial qualification and after process or design changes for device types 51. This subgroup shall consist of a high voltage test of the input protection circuits, V_{ZAP} (see 4.5.3).

- c. End point electrical parameters shall be as specified in table II herein, and shall consist of those subgroups specified in table IIa of test method 5005 of MIL-STD-883, and table II herein also. Delta limits shall apply only to subgroup 5 of group B inspections, and shall consist of tests specified in table IV herein.

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. Delta limits shall apply only to subgroup 1 of group C inspection, and shall consist of tests specified in table IV herein.
- b. Steady state life test (method 1005 of MIL-STD-883) conditions:
 1. Test condition D, as specified in 4.5.2, and as shown on figure 5, 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.

4.4.5 Group E inspection. Group E inspection is required only for device types intended to be marked as radiation hardened (see 3.6.1). When group E testing is performed it shall be in accordance with table V of method 5005 of MIL-STD-883 and 4.5.5 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 V_{SS} terminal, unless otherwise specified. Currents given are conventional current and positive when flowing into the referenced terminal.

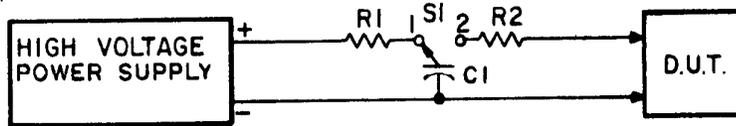
4.5.2 Burn-in and life test cooldown procedures. When these tests are completed and prior to removal of bias voltages, the devices under test (DUT) shall be cooled to a temperature of $25 \pm 3^\circ\text{C}$, and the electrical parameter end-point measurements shall then be performed.

TABLE IV. Delta limits at 25°C .

Parameter	Device type	
	01	51
I_{SS}	$\pm 125 \text{ nA}$	$\pm 125 \text{ nA}$
V_{OL1}	$\pm .04 \text{ V}$	---
V_{OH1}	$\pm .08 \text{ V}$	---
I_{OL1}	---	$\pm 15 \text{ percent}$
I_{OH1}	---	$\pm 15 \text{ percent}$

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

4.5.3 High voltage (V_{ZAP}) test of input protection circuits. All input terminals (up to a maximum of four) of the DUT shall be subjected to a voltage pulse from a 100 pF source charged to 400 volts. This destructive test shall be conducted as follows using the test circuit on figure 7.



NOTES:

1. $V_{ZAP} = 400$ V charge on C1.
2. $1 \text{ M}\Omega < R1 < 50 \text{ M}\Omega$.
3. $R2 = 1.5 \text{ k}\Omega$.
4. C1 = 100 pF.
5. S1 = Hg-wetted "bounceless" relay.

FIGURE 7. High voltage (V_{ZAP}) test circuit.

- a. Measure I_{IL} and I_{IH} at the inputs selected, as stated above, at 25°C . The test limit for each input tested shall be ± 10 nA at the specified V_{DD} . Measure I_{SS} on the DUT at 25°C . The test limit for this measurement shall be increased a maximum of 20 percent of the specified I_{SS} table III limit at the specified V_{DD} .
- b. V_{ZAP} is applied to the DUT in the following modes (see table V) by charging C1 to V_{ZAP} with S1 in position 1 and then switching to position 2.

TABLE V. Modes for high-voltage test.

Mode	+ Terminal	- Terminal
1	V_{DD}	Input
2	Input	V_{SS}
3	Input	Associated output

- c. Within 24 hours repeat the I_{SS} , I_{IH} , and I_{IL} measurements on the same terminals as performed above. If the DUT exhibits leakage currents in excess of the specified limits after the V_{ZAP} test, it shall be classified as a failure.

4.5.4 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.

4.5.5 Radiation hardness assurance (RHA) testing. The RHA testing shall be performed in accordance with test procedures and sampling specified in table V of method 5005 of MIL-STD-883 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 VIII 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-M-38510 for the radiation hardness assurance (RHA) level being tested and meet the end point electrical parameters as defined in table VI 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 VIII and figure 7. In situ and remote testing, the tests shall be performed with the devices biased in accordance with table VII and 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 VI. Radiation hardness end-point electrical parameters at 25 C.

Parameter	Test Limits (all device types)	V _{DD}	
		Device 01	Device 51
V _{TN}	0.3 V min	10 V dc	10 V dc
V _{TP}	2.8 V max	10 V dc	10 V dc
ΔV _T	1.4 V max	10 V dc	10 V dc
I _{SS}	100 x max limit	15 V dc	18 V dc
t _{PLH}	1.35 x max limit	5 V dc	5 V dc
t _{PHL}	1.35 x max limit	5 V dc	5 V dc

TABLE VII. Bias during exposure to radiation.

Device type	Pfn connections 1/		
	10 V dc through a 30 kΩ to 60 kΩ resistor	V _{SS} = GND	V _{DD} = 10 V dc
01 and 51	1,2,3,4,5,6,7,9,15	8	16

1/ Pins not designated are open or connected 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:

- 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.
- A copy of each radiograph.
- The quality conformance inspection data (see 4.4).
- Parameter distribution data on parameters evaluated during burn-in (see 3.5).
- Final electrical parameter data (see 4.2c).

5. PACKAGING

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

6. NOTES

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

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

- Complete part number (see 1.2).
- 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.
- Requirements for certificate of compliance, if applicable.

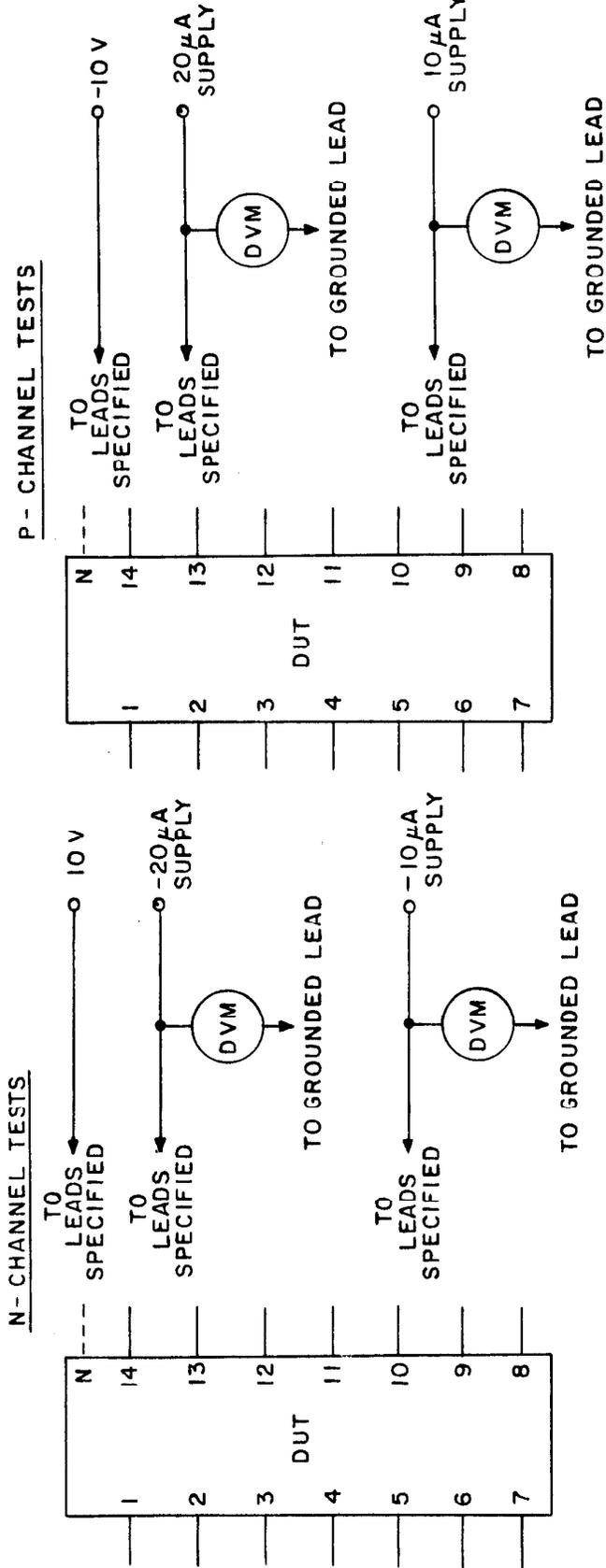


FIGURE 7. Threshold-voltage test current.

TABLE VIII. Threshold-voltage test circuit conditions.

Device type	GND	10 V	V _{IN} measured at		-10 V	V _{TP} measured at	
			-20 µA supply	-10 µA supply		20 µA supply	10 µA supply
01	9	2, 4, 6, 15, 16	1, 3, 5, 7, 8		9	1, 3, 5, 7, 8	2, 4, 6, 5, 16
51	9						

- d. Requirements for notification of change of product or process to procuring activity in addition to notification to the qualifying activity, if applicable.
- e. Requirements for failure analysis (including required test condition of method 5003 of MIL-STD-883), corrective action, and reporting of results, if applicable.
- f. Requirements for product assurance options.
- g. 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.
- h. Requirements for "JAN" marking.
- i. Requirements for total dose radiation testing (see 3.6.1 and 4.5.5), if applicable.

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

Ci	- - - - -	Input terminal-to-V _{SS} capacitance.
CIN	- - - - -	Carry-in count from preceding stage.
CINT	- - - - -	Internal count carry.
COUT	- - - - -	Carry-out count to next stage.
GND	- - - - -	Ground. Zero voltage potential.
TA	- - - - -	Free air temperature.
VZAP	- - - - -	Input test voltage.
VIC	- - - - -	Input clamp voltage.
VDD	- - - - -	Positive supply voltage.
VSS	- - - - -	Negative supply voltage.
ISS	- - - - -	Quiescent supply current.

6.4 Logistic support. Unless otherwise specified, microcircuits procured for Government logistic support shall be procured to device class S for National Aeronautics and Space Administration or class B for Department of Defense (see 1.2.2), and lead finish C (see 3.3). Longer length leads and lead forming shall not affect the part number.

6.5 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	4008A
51	4008B

6.6 Handling. MOS devices must be handled with certain precautions to avoid damage due to accumulation of static charge. Input protection devices have been designed in the chip to minimize the effect of this static buildup. However, the following handling practices are recommended:

- a. Devices should be handled on benches with conductive and grounded surfaces.
- b. Ground test equipment and tools.
- c. Do not handle devices by the leads.
- d. Store devices in conductive foam or carriers.
- e. Avoid use of plastic, rubber, or silk in MOS areas.
- f. Maintain relative humidity above 50 percent, if practical.

6.7 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:
NASA - NA

(Project 5962-0638-4)

Review activities:

Army - MI
Air Force - 11, 19, 85, 99
DLA - ES

User activities:

Army - AR, SM
Navy - AS, OS, CG, MC, SH

Agent:

DLA - ES