REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED

REV																								
SHEET																								
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REV STATUS OF SHEETS	REV																							
	SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18					

PMIC N/A

STANDARDIZED MILITARY DRAWING

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

AMSC N/A

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DRAWING APPROVAL DATE: 24 JANUARY 1990

REVISION LEVEL:

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUIT, LINEAR, SINGLE 16-CHANNEL ANALOG MUX/DMUX WITH OVERVOLTAGE PROTECTION, MONOLITHIC SILICON

SIZE	CAGE CODE	
A	67268	5962-87538

SHEET 1 OF 1

DESC FORM 193
SEP 87

5962-E1332

1. SCOPE

1.1 Scope. This drawing describes device requirements for class B microcircuits in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices".

1.2 Part number. The complete part number shall be as shown in the following example:

5962	M,D, or -	87538	01	X	X
Drawing number prefix	RHA designator (1.2.1)	Drawing number suffix	Device type (1.2.2)	Case outline (1.2.3)	Lead finish per MIL-M-38510

1.2.1 Radiation hardness assurance (RHA) designator. RHA marked devices shall meet the specified RHA levels (M or D only) in accordance with MIL-M-38510, a dash (-) indicates a non RHA device.

1.2.2 Device type. The device type shall identify the circuit function as follows:

Device type	Generic number	Circuit function
01	HS-1840RH	Single 16-channel analog MUX/DEMUX with high impedance analog input overvoltage protection.

1.2.3 Case outlines. The case outlines shall be as designated in appendix C of MIL-M-38510, and as follows:

Outline letter	Case outline
X	D-10 (28-lead, 1.490" x .610" x .232"), dual-in-line package
Y	F-17 (28-lead, .730" x .380" x .090"), flat package

1.3 Absolute maximum ratings.

Supply voltage between V+ and V-	40 V dc
Supply voltage between V+ and GND	+20 V dc
Supply voltage between V- and GND	-20 V dc
V_{REF} to GND	+20 V dc
Digital input overvoltage range	$((GND)-4\ V) \leq V_A \leq (V_{REF})+4\ V$
Analog input overvoltage range (power on/off)	$-25\ V \leq V_S \leq +25\ V$
Storage temperature range	-65°C to +150°C
Maximum power dissipation (P_D): 1/	
Case X	1600 mW
Case Y	1400 mW
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance, junction-to-case (θ_{JC})	See MIL-M-38510, appendix C
Junction temperature (T_J)	+175°C

1/ The derating factor for case X shall be 20.4 mW/°C above T_A = +95°C, and for case Y shall be 18.5 mW/°C above +95°C.

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1.4 Recommended operating conditions.

Positive supply voltage (V+)	+15 V dc
Negative supply voltage (V-)	-15 V dc
V_{REF}	5 V dc (+10 V dc) 2/
V_{AH}	4.0 V dc (+7 V dc) 2/
V_{AL}	0.8 V dc 2/
V_{EN}	0.8 V dc
Ambient operating temperature range (T_A)	-55°C to +125°C

2. APPLICABLE DOCUMENTS

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

SPECIFICATION

MILITARY

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

STANDARD

MILITARY

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

BULLETIN

MILITARY

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

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

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

3. REQUIREMENTS

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

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

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

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

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

2/ For V_{REF} = 5.0 V dc, V_{AH} = 4.0 V dc minimum. For V_{REF} = 10 V dc, V_{AH} = 7.0 V dc. For either V_{REF} voltages, V_{AL} = 0.8 V dc maximum.

3.2.4 RHA biasing circuit. The RHA biasing circuit shall be as specified on figure 4.

3.2.5 Case outlines. The case outlines shall be in accordance with 1.2.3 herein.

3.3 Electrical performance characteristics and post irradiation end-point electrical parameter limits. Unless otherwise specified, the electrical performance characteristics and post irradiation parameter limits are as specified in table I and apply over the full ambient operating temperature range.

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

3.5 Marking. Marking shall be in accordance with MIL-STD-883 (see 3.1 herein). The part shall be marked with the part number listed in 1.2 herein. In addition, the manufacturer's part number may also be marked as listed in MIL-BUL-103 (see 6.7 herein).

3.5.1 Radiation hardness assurance (RHA) designator. RHA parts shall be marked with M or D in place of the dash (-) in accordance with 1.2.1 herein.

3.6 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in MIL-BUL-103 (see 6.7 herein). The certificate of compliance submitted to DESC-ECS prior to listing as an approved source of supply shall state that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

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

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

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

4. QUALITY ASSURANCE PROVISIONS

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

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

a. Burn-in test, method 1015 of MIL-STD-883.

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.6 herein).

(2) T_A = +125°C, minimum.

b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

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

TABLE I. Electrical performance characteristics and post irradiation end-point electrical parameter limits.

Test	Symbol	Test conditions unless otherwise specified 1/		Group A subgroups (test method)	(-55/+25°C) Limits Min	(-55/+25°C) Limits Max	(+125°C) Limits Min	(+125°C) Limits Max	Unit
Input leakage current, address or enable pins 2/	I_{AH}	Measure inputs sequentially, ground all unused pins		1, 2, 3		1.0		1.0	µA
			M	1 3/		1.0			
			D			1.0			
	I_{AL}			1, 2, 3		-1.0		-1.0	
			M	1 3/		-1.0			
			D			-1.0			
Leakage current into the source terminal of an off switch	$I_{S(OFF)}$	V_S = -10 V, all unused inputs and output = +10 V See figure 5		1, 2, 3		±100		±100	nA
			M	1 3/		±100			
			D			±100			
		V_S = +10 V, all unused inputs and output = -10 V See figure 5		1, 2, 3		±100		±100	
			M	1 3/		±100			
			D			±100			
Leakage current into the source terminal of an off switch with power off	$I_{S(OFF)}$ power off	V_S = +25 V, V_A = 0 V, V_{EN} = 0 V, V^- = 0 V, V^+ = 0 V, V_{REF} = 0 V, all unused inputs tied to GND See figure 5		1, 2, 3		±100		±100	nA
			M	1 3/		±100			
			D			±100			

See footnotes at end of table.

TABLE I. Electrical performance characteristics and post irradiation end-point electrical parameter limits - Continued.

Test	Symbol	Test conditions unless otherwise specified 1/		Group A subgroups (test method)	(-55/+25°C) Limits		(+125°C) Limits		Unit
					Min	Max	Min	Max	
Leakage current into the source terminal of an off switch with overvoltage applied	$I_{S(OFF)}$ overvoltage	V_S = +25 V, V_D = 0 V, all unused inputs tied to GND See figure 5		1, 2, 3		±1		±1	µA
			M	1 3/		±1			
			D			±1			
		V_S = -25 V, V_D = 0 V, all unused inputs tied to GND See figure 5		1, 2, 3		±1		±1	
			M	1 3/		±1			
			D			±1			
Leakage current into the drain terminal of an off switch with overvoltage applied	$I_{D(OFF)}$ overvoltage	V_S = +25 V, V_D = 0 V, all unused inputs tied to GND See figure 5		1, 2, 3		±1		±1	µA
			M	1 3/		±1			
			D			±1			
		V_S = -25 V, V_D = 0 V, all unused inputs tied to GND See figure 5		1, 2, 3		±1		±1	
			M	1 3/		±1			
			D			±1			
Leakage current into the drain terminal of an off switch	$I_{D(OFF)}$	V_D = -10 V, all unused inputs = +10 V See figure 5		1, 2, 3		±100		±100	nA
			M	1 3/		±100			
			D			±100			

See footnotes at end of table.

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TABLE I. Electrical performance characteristics and post irradiation end-point electrical parameter limits - Continued.

Test	Symbol	Test conditions unless otherwise specified 1/		Group A subgroups (test method)	(-55/+25°C) Limits		(+125°C) Limits		Unit
					Min	Max	Min	Max	
Leakage current into the drain terminal of an off switch	$I_{D(OFF)}$	V_D = +10 V, all unused inputs = -10 V See figure 5		1, 2, 3		±100		±100	nA
			M	1 3/		±100			
			D			±100			
Leakage current from an on driver into the switch (drain and source)	$I_{D(ON)}$	V_S = +10 V, V_D = +10 V V_{EN} = 0.8 V, all unused input = +10 V See figure 5		1, 2, 3		±100		±100	nA
			M	1 3/		±100			
			D			±100			
		V_S = -10 V, V_D = -10 V V_{EN} = 0.8 V, all unused inputs = +10 V See figure 5		1, 2, 3		±100		±100	
			M	1 3/		±100			
			D			±100			
Positive supply current	I(+)	V_A = 0 V, V_{EN} = 0.8 V		1, 2, 3		0.5		0.5	mA
			M	1 3/		0.5			
			D			0.5			
Negative supply current	I(-)	V_A = 0 V, V_{EN} = 0.8 V		1, 2, 3		0.5		0.5	
			M	1 3/		0.5			
			D			0.5			

See footnotes at end of table.

TABLE I. Electrical performance characteristics and post irradiation end-point electrical parameter limits - Continued.

Test	Symbol	Test conditions unless otherwise specified 1/		Group A subgroups (test method)	(-55/+25°C) Limits		(+125°C) Limits		Unit
					Min	Max	Min	Max	
Positive standby supply current	$^{+}I_{SBY}$	V_A = 0 V, V_{EN} = 4.0 V		1, 2, 3		0.5		0.5	mA
			M	1 3/		0.5			
			D			0.5			
Negative standby supply current	$-I_{SBY}$	V_A = 0 V, V_{EN} = 4.0 V		1, 2, 3		0.5		0.5	
			M	1 3/		0.5			
			D			0.5			
Switch on resistance	$R_{DS(ON)}$	V_S = +15 V, I_D = -1 mA, V_{EN} = 0.8 V See figure 5		1, 2, 3		1.0		1.0	kΩ
			M	1 3/		1.0			
			D			1.0			
		V_S = +15 V, I_D = -1 mA, V_{EN} = 0.8 V See figure 5		1, 2, 3		4.0		4.0	
			M	1 3/		4.0			
			D			4.0			
Capacitance: digital input	C_A	V^+ = V^- = 0 V, f = 1 MHz, T_A = +25°C See 4.3.1c		4		7			pF
Capacitance: channel input	$C_{S(OFF)}$	V^+ = V^- = 0 V, f = 1 MHz, T_A = +25°C See 4.3.1c		4		5			
Capacitance: channel output	$C_{D(OFF)}$	V^+ = V^- = 0 V, f = 1 MHz, T_A = +25°C See 4.3.1c		4		50			

See footnotes at end of table.

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TABLE I. Electrical performance characteristics and post irradiation end-point electrical parameter limits - Continued.

Test	Symbol	Test conditions unless otherwise specified 1/		Group A subgroups (test method)	(-55/+25°C) Limits		(+125°C) Limits		Unit
					Min	Max	Min	Max	
Off isolation input or output	V_{ISO}	V_{EN} = 4.0 V, f = 500 kHz, C_L = 7 pF, R_L = 1 kΩ, V_S = 3 V_{RMS}, T_A = +25°C See 4.3.1c		4		-45			dB
Function test		See 4.3.1d		7					
Break-before-make time delay	t_D	R_L = 1 kΩ, C_L = 50 pF See figure 6		9, 10, 11	20		20		ns
			M	9 3/	20				
			D		20				
Propagation delay time address inputs to I/O channels	$t_{ON(A)}$, $t_{OFF(A)}$	R_L = 10 MΩ, C_L = 50 pF See figure 6		9, 10, 11		1		1	µs
			M	9 3/		1			
			D			1			
Propagation delay time enable to I/O channels	$t_{ON(EN)}$, $t_{OFF(EN)}$	R_L = 1 kΩ, C_L = 50 pF See figure 6		9, 10, 11		1		1	
			M	9 3/		1			
			D			1			

1/ -55°C ≤ T_A ≤ +125°C
V_{AH} (logic level high) = 4.0 V dc
V_{AL} (logic level low) = 0.8 V dc
V^+ = +15 V dc, V- = -15 V dc
V_{EN} = 4.0 V unless otherwise specified
V_{REF} = 5.0 V dc

2/ Input current of one node.

3/ When testing to a radiation hardness assurance level, the test shall be performed at T_A = +25°C. Limits shown are guaranteed only at T_A = +25°C ±5 percent.

Device type	01
Case outlines	X and Y
Terminal number	Terminal symbol
1	V+
2	NC
3	NC
4	IN 16
5	IN 15
6	IN 14
7	IN 13
8	IN 12
9	IN 11
10	IN 10
11	IN 9
12	GND
13	V_{REF}
14	A_3
15	A_2
16	A_1
17	$\overline{A_0}$
18	$\overline{EN}$
19	IN 1
20	IN 2
21	IN 3
22	IN 4
23	IN 5
24	IN 6
25	IN 7
26	IN 8
27	V-
28	OUT

FIGURE 1. Terminal connections.

Truth table					
A_3	A_2	A_1	A_0	$\overline{EN}$	On channel
X	X	X	X	H	None
L	L	L	L	L	1
L	L	L	H	L	2
L	L	H	L	L	3
L	L	H	H	L	4
L	H	L	L	L	5
L	H	L	H	L	6
L	H	H	L	L	7
L	H	H	H	L	8
H	L	L	L	L	9
H	L	L	H	L	10
H	L	H	L	L	11
H	L	H	H	L	12
H	H	L	L	L	13
H	H	L	H	L	14
H	H	H	L	L	15
H	H	H	H	L	16

FIGURE 2. Truth table.

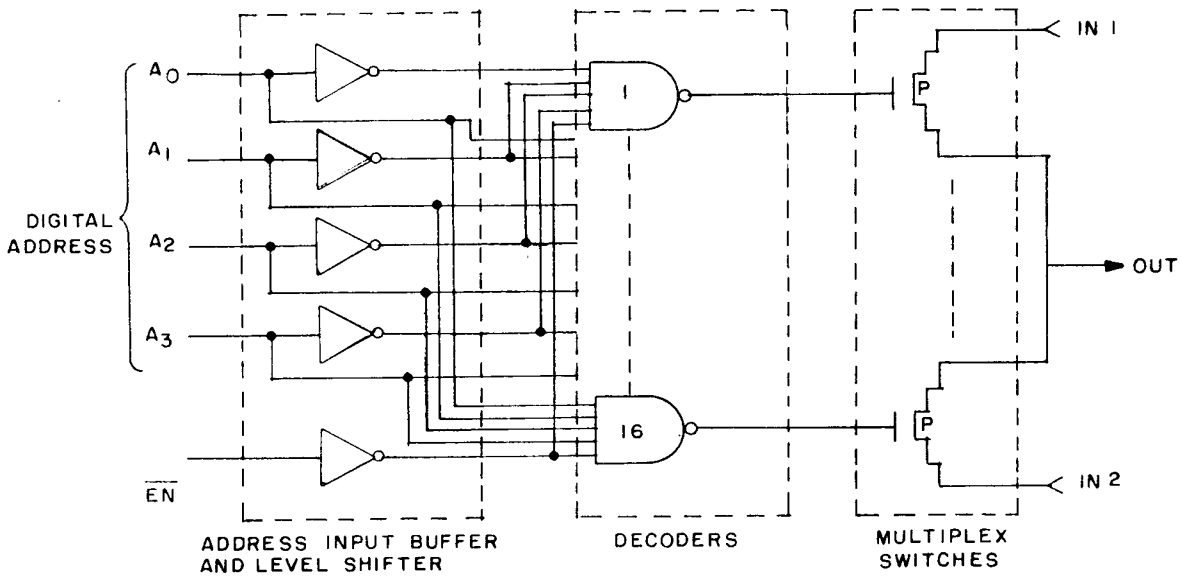


FIGURE 3. Logic diagram.

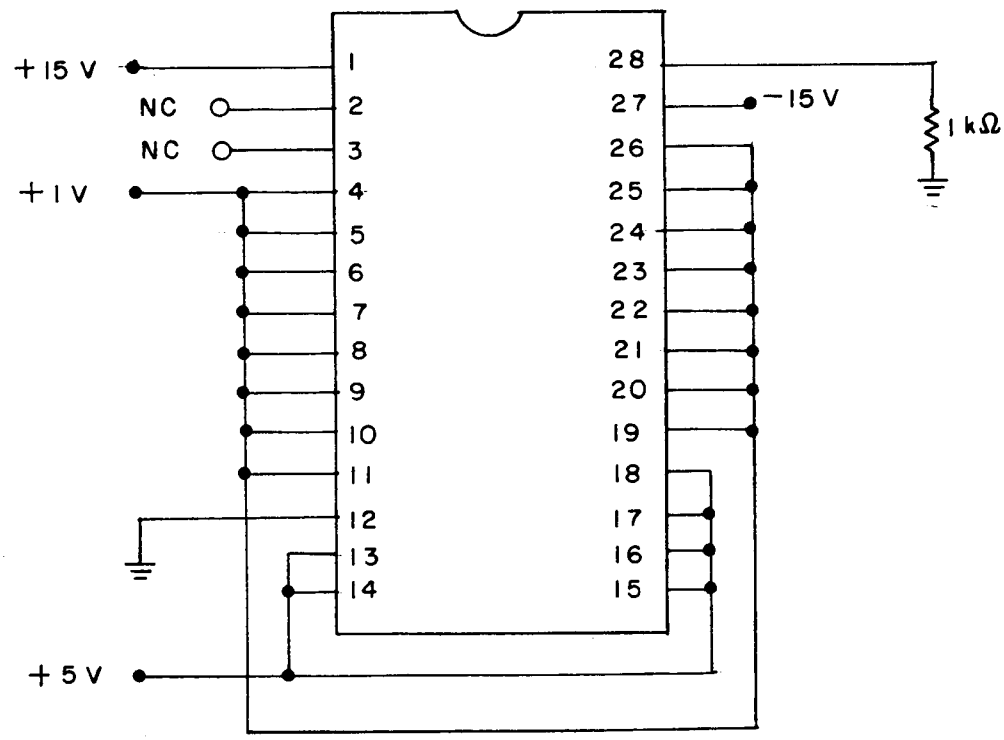


FIGURE 4. RHA biasing circuit.

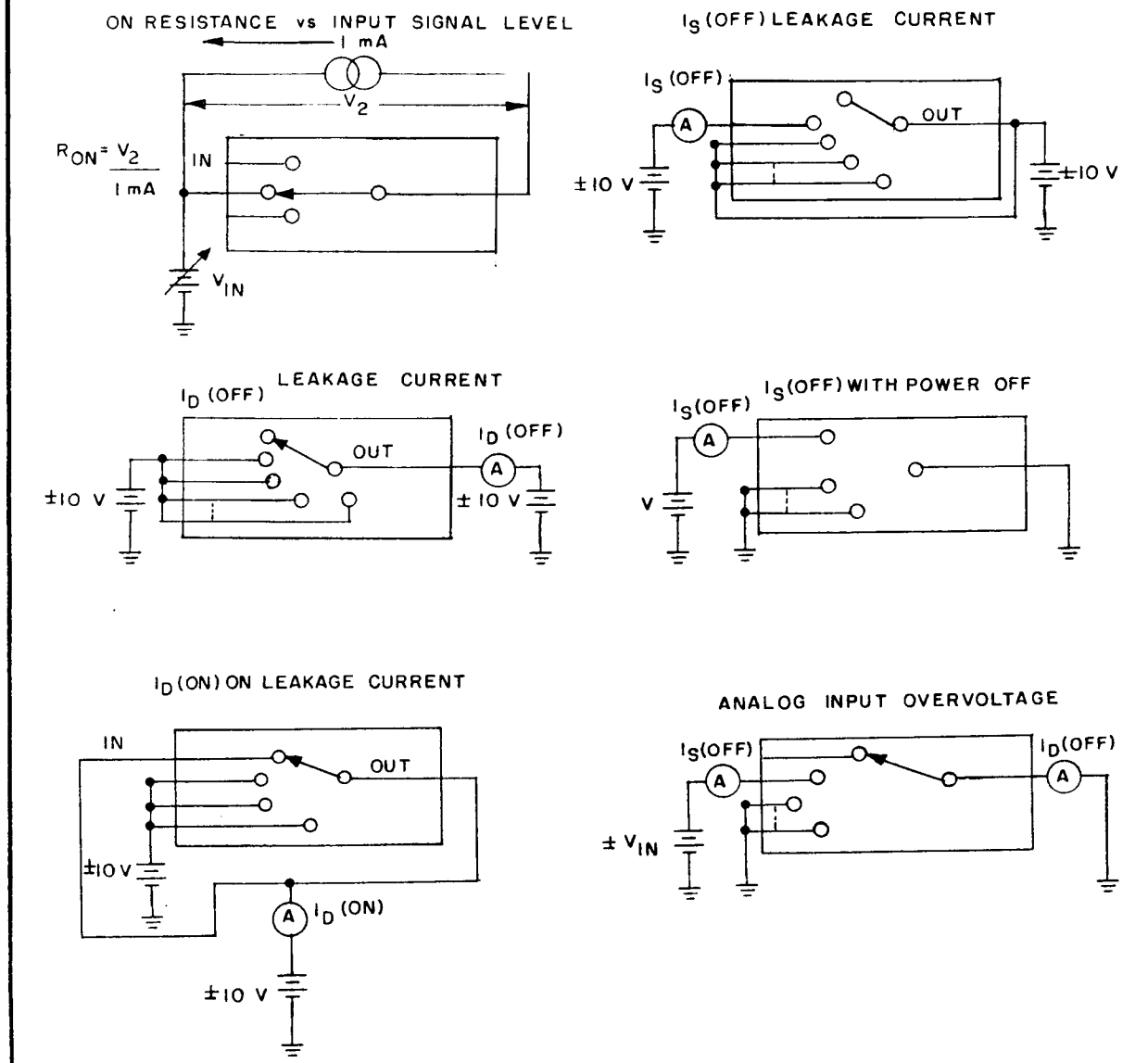
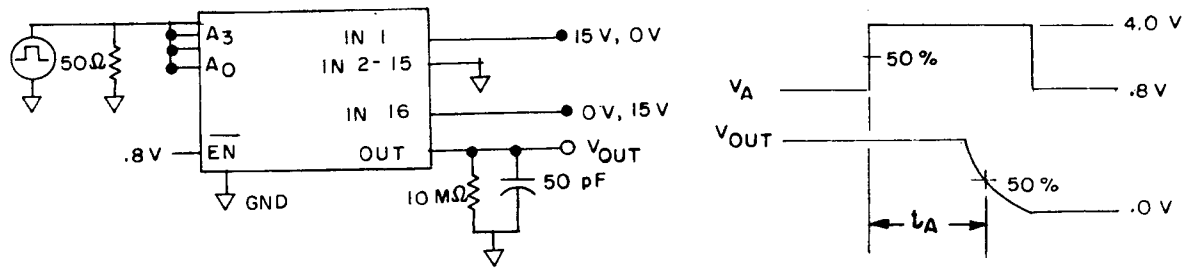
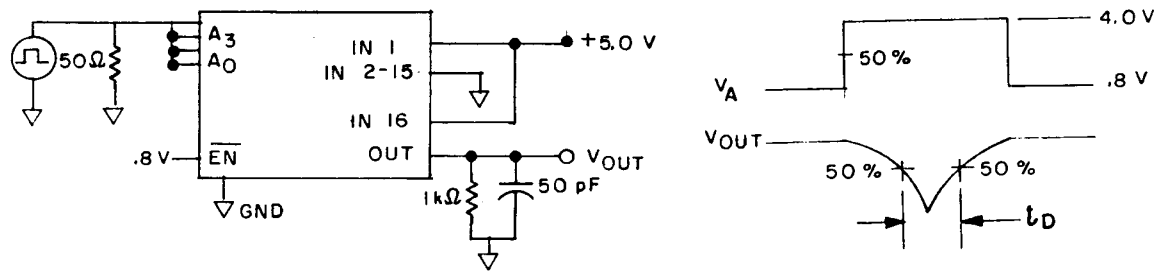


FIGURE 5. Test circuits for dc levels.

ADDRESS TIME, LOGIC LEVEL HIGH



BREAK BEFORE MAKE DELAY



ENABLE DELAY $t_{ON(EN)}$, $t_{OFF(EN)}$

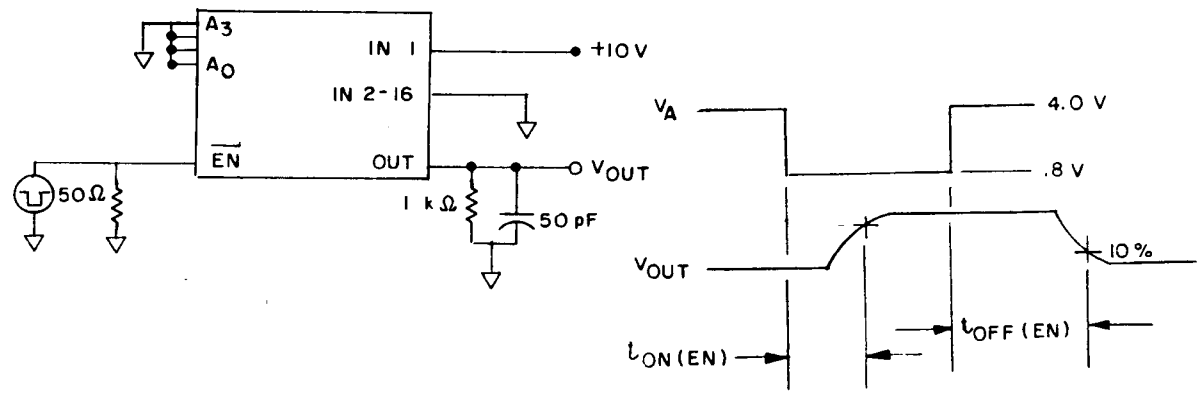


FIGURE 6. Test circuits and waveforms for ac levels.

4.3.1 Group A inspection.

a. Tests shall be as specified in table II herein.

b. Subgroups 5, 6, and 8 in table I, method 5005 of MIL-STD-883 shall be omitted.

c. Subgroup 4 (C_A, C_S, C_D, C_{DS}, and V_{ISO} measurements) shall be measured only for the initial test and after process or design changes which may affect the capacitance or off isolation. Test 15 devices with 0 failures.

d. Subgroups 7 tests shall verify of the truth table.

4.3.2 Groups C and D inspections.

a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test conditions, method 1005 of MIL-STD-883.

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.6 herein).

(2) T_A = +125°C, minimum.

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

4.3.3 Group E inspection. Group E inspection is required only for parts intended to be marked as radiation hardness assured (see 3.5.1 herein). For radiation hardness assured devices, the manufacturer shall maintain lot travelers to document the completion of required processing steps from wafer diffusion.

a. End-point electrical parameters shall be as specified in table II herein.

b. Prior to total dose irradiation, each selected sample shall be assembled in its qualified package. It shall pass the specified group A electrical parameters in table I for subgroups specified in table II herein.

c. The devices shall be subjected to radiation hardness assured tests as specified in MIL-M-38510 for the RHA level being tested, and meet the post irradiation end-point electrical parameter limits as defined in table I at T_A = +25°C ±5 percent, after exposure.

d. Prior to and during total dose irradiation testing, the devices shall be biased in accordance with figure 4 herein.

e. Subgroups 1 and 2 of table V (method 5005) of MIL-STD-883 shall be tested as appropriate for device construction.

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (per method 5005, table I)
Interim electrical parameters (method 5004)	1
Final electrical test parameters (method 5004)	1*, 2, 3, 9
Group A test requirements (method 5005)	1, 2, 3, 4, 7, 9, 10**, 11**
Group C and D end-point electrical parameters (method 5005)	1
Group E end-point electrical parameters (method 5005)	1, 7, 9

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

5. PACKAGING

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

6. NOTES

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

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

6.3 Additional acquisition and data reporting requirements. When specified in the purchase order or contract, a copy of the following, as applicable shall be supplied.

Requirements for RHA options.

6.4 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated with the users of record for the individual documents. This coordination will be accomplished in accordance with MIL-STD-481 using DD Form 1693, Engineering Change Proposal (Short Form).

6.5 Record of users. Military and industrial users shall inform Defense Electronics Supply Center when a system application requires configuration control and the applicable SMD. DESC will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronics devices (FSC 5962) should contact DESC-ECS, telephone (513) 296-6022.

6.6 Comments. Comments on this drawing should be directed to DESC-ECS, Dayton, Ohio 45444, or telephone (513) 296-5375.

6.7 Approved source of supply. An approved source of supply is listed in MIL-BUL-103. Additional sources will be added to MIL-BUL-103 as they become available. The vendor listed in MIL-BUL-103 has agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DESC-ECS. The approved source of supply listed below is for information purposes only and is current only to the date of the last action of this document.

Military drawing part number	Vendor CAGE number	Vendor similar part number 1/
5962D8753801XX	34371	HS1-1840RH
5962D8753801YX		HS9-1840RH

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

Vendor CAGE number	Vendor name and address
34371	Harris Semiconductor P.O. Box 883 Melbourne, FL 32901

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