

**REVISIONS**

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Changes in accordance with NOR 5962-R082-95.	95-03-01	K. A. Cottongim
B	Add device type 13. Rewrite entire document.	96-01-22	K. A. Cottongim

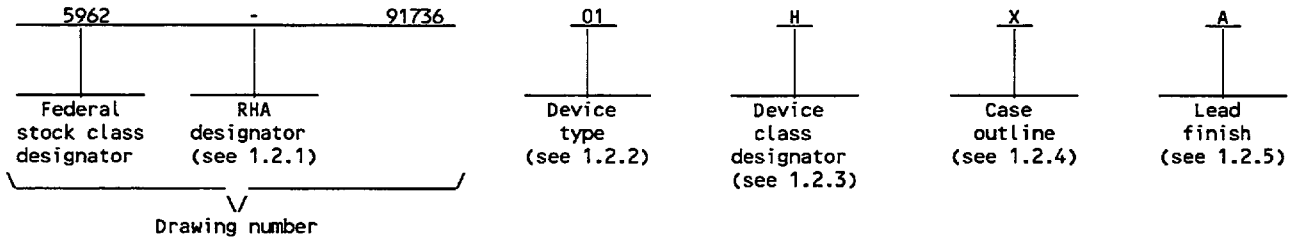
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REV STATUS OF SHEETS	REV	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B				
	SHEET	1	2	3	4	5	6	7	8	9	10	11	12							

<p>PMIC N/A</p> <p align="center"><b>STANDARD MICROCIRCUIT DRAWING</b></p> <p>THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE</p> <p align="center">AMSC N/A</p>	<p>PREPARED BY Steve L. Duncan</p>	<p align="center"><b>DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444</b></p>					
	<p>CHECKED BY Michael C. Jones</p>				<p>MICROCIRCUIT, HYBRID, LINEAR, 11.8 VOLT, SYNCHRO AND RESOLVER TO DIGITAL CONVERTER</p>		
	<p>APPROVED BY Kendall A. Cottongim</p>	<p>SIZE <b>A</b></p>	<p>CAGE CODE <b>67268</b></p>	<p><b>5962-91736</b></p>			
	<p>DRAWING APPROVAL DATE 92-12-16</p>	<p>SHEET 1 OF 12</p>					
	<p>REVISION LEVEL B</p>						

1. SCOPE

1.1 Scope. This drawing documents two product assurance classes, high reliability (device class H) and space application (device class K) and a choice of case outlines and lead finishes are available and are reflected in the Part or Identifying Number (PIN). When available, a choice of radiation hardness assurance levels are reflected in the PIN.

1.2 PIN. The PIN shall be as shown in the following example:



1.2.1 Radiation hardness assurance (RHA) designator. Device classes H and K RHA marked devices shall meet the MIL-PRF-38534 specified RHA levels and shall be marked with the appropriate RHA designator. A dash (-) indicates a non-RHA device.

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

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>	<u>Accuracy Frequency</u>	<u>±1 LSB</u>	<u>BIT/VEL</u>
01	SDC14600-112	14-bit, 11.8 V S/D converter	400 Hz	4 min	VEL
02	SDC14600T-112	14-bit, 11.8 V S/D converter	400 Hz	4 min	BIT
03	SDC14601-112	14-bit, 11.8 V R/D converter	400 Hz	4 min	VEL
04	SDC14601T-112	14-bit, 11.8 V R/D converter	400 Hz	4 min	BIT
05	SDC14605-112	16-bit, 11.8 V S/D converter	400 Hz	4 min	VEL
06	SDC14605T-112	16-bit, 11.8 V S/D converter	400 Hz	4 min	BIT
07	SDC14606-112	16-bit, 11.8 V R/D converter	400 Hz	4 min	VEL
08	SDC14606T-112	16-bit, 11.8 V R/D converter	400 Hz	4 min	BIT
09	SDC14605-114	16-bit, 11.8 V S/D converter	400 Hz	2 min	VEL
10	SDC14605T-114	16-bit, 11.8 V S/D converter	400 Hz	2 min	BIT
11	SDC14606-114	16-bit, 11.8 V R/D converter	400 Hz	2 min	VEL
12	SDC14606T-114	16-bit, 11.8 V R/D converter	400 Hz	2 min	BIT
13	SDC14601-603	14-bit, 11.8 V R/D converter	400 Hz	4 min	VEL

1.2.3 Device class designator. This device class designator shall be a single letter identifying the product assurance level as follows:

<u>Device class</u>	<u>Device performance documentation</u>
H or K	Certification and qualification to MIL-PRF-38534

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

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Package style</u>
X	See figure 1	28	Dual-in-line

1.2.5 Lead finish. The lead finish shall be as specified in MIL-PRF-38534 for classes H and K.

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**1.3 Absolute maximum ratings. 1/**

Positive supply voltage ( $V_{CC}$ ) . . . . .	+7.0 V dc
Negative supply voltage ( $V_{EE}$ ) . . . . .	-7.0 V dc
Reference input voltage . . . . .	35 V rms
Digital input voltage range . . . . .	-0.3 V dc to +7.0 V dc
Power dissipation, $T_A = +125^\circ\text{C}$ ( $P_D$ ) . . . . .	350 mW
Storage temperature range . . . . .	-65°C to +150°C
Lead temperature (soldering, 10 seconds) . . . . .	+300°C
Thermal resistance, junction-to-case ( $\theta_{JC}$ ) . . . . .	8.0°C/W
Thermal resistance, junction-to-ambient ( $\theta_{JA}$ ) . . . . .	20°C/W

**1.4 Recommended operating conditions.**

Positive supply voltage range ( $V_{CC}$ ) . . . . .	+4.75 V dc to +5.25 V dc
Negative supply voltage range ( $V_{EE}$ ) . . . . .	-4.75 V dc to -5.25 V dc
Reference input voltage range . . . . .	2.0 V rms to 35 V rms
Reference input carrier frequency range . . . . .	360 Hz to 5000 Hz
Signal input voltage range . . . . .	10.62 V rms to 12.98 V rms
Ambient operating temperature range ( $T_A$ ) . . . . .	-55°C to +125°C

**2. APPLICABLE DOCUMENTS**

**2.1 Government specification, standards, and handbook.** The following specification, standards, and handbook form a part of this drawing to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

**SPECIFICATION**

**DEPARTMENT OF DEFENSE**

MIL-PRF-38534 - Hybrid Microcircuits, General Specification for.

**STANDARDS**

**DEPARTMENT OF DEFENSE**

- MIL-STD-883 - Test Methods and Procedures for Microelectronics.
- MIL-STD-973 - Configuration Management.
- MIL-STD-1835 - Microcircuit Case Outlines.

**HANDBOOK**

**DEPARTMENT OF DEFENSE**

MIL-HDBK-780 - Standard Microcircuit Drawings.

(Unless otherwise indicated, copies of the specification, standards, and handbook are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

**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 takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

1/ Stresses above the absolute maximum rating may cause permanent damage to the device. Extended operation at the maximum levels may degrade performance and affect reliability.

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**3. REQUIREMENTS**

**3.1 Item requirements.** The individual item performance requirements for device classes H and K shall be in accordance with MIL-PRF-38534 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.

**3.2 Design, construction, and physical dimensions.** The design, construction, and physical dimensions shall be as specified in MIL-PRF-38534 and herein.

**3.2.1 Case outline(s).** The case outline(s) shall be in accordance with 1.2.4 herein and figure 1.

**3.2.2 Terminal connections.** The terminal connections shall be as specified on figure 2.

**3.2.3 Block diagram.** The block diagram shall be as specified on figure 3.

**3.3 Electrical performance characteristics.** Unless otherwise specified herein, the electrical performance characteristics are as specified in table I and shall apply over the full specified 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 defined in table I.

**3.5 Marking of Device(s).** Marking of device(s) shall be in accordance with MIL-PRF-38534. The device shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's vendor similar PIN may also be marked as listed in QML-38534.

**3.6 Data.** In addition to the general performance requirements of MIL-PRF-38534, the manufacturer of the device described herein shall maintain the electrical test data (variables format) from the initial quality conformance inspection group A lot sample, for each device type listed herein. Also, the data should include a summary of all parameters manually tested, and for those which, if any, are guaranteed. This data shall be maintained under document revision level control by the manufacturer and be made available to the preparing activity (DESC-EL) upon request.

**3.7 Certificate of compliance.** A certificate of compliance shall be required from a manufacturer in order to supply to this drawing. The certificate of compliance (original copy) submitted to DESC-EL shall affirm that the manufacturer's product meets the performance requirements of MIL-PRF-38534 and herein.

**3.8 Certificate of conformance.** A certificate of conformance as required in MIL-PRF-38534 shall be provided with each lot of microcircuits delivered to this drawing.

**4. QUALITY ASSURANCE PROVISIONS**

**4.1 Sampling and inspection.** Sampling and inspection procedures shall be in accordance with MIL-PRF-38534 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-38534, and shall be conducted on all devices prior to conformance and periodic inspections. The following additional criteria shall apply:

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

(1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DESC-EL or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1015 of MIL-STD-883.

(2)  $T_A$  as specified in accordance with table I of method 1015 of MIL-STD-883.

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.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C ≤ T <sub>C</sub> ≤ +125°C V <sub>CC</sub> = +5 V dc, V <sub>EE</sub> = -5 V dc unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Resolution 1/	RES		7,8A,8B	01-04, 13	14		Bits
				05 - 12	16		
Output accuracy 2/	AOUT		7,8A,8B	01-04, 13	-4	+4	LSB
				05 - 08	-13	+13	
				09 - 12	-7	+7	
Accuracy repeatability 2/ 3/	AR		7,8A,8B	All	-1.0	+1.0	LSB
Reference input voltage range 3/	V <sub>IN1</sub>		4,5,6	All	2.0	35	V rms
Reference input impedance 3/	Z <sub>IN1</sub>	Single ended	4,5,6	All	60		kΩ
		Differential			120		
Reference input common mode range 3/	V <sub>CM1</sub>		4,5,6	All	- 50	+50	V pk
Signal input common mode range 3/	V <sub>CM2</sub>		4,5,6	All	-30	+30	V pk
Signal input impedance 3/	Z <sub>IN2</sub>	Line-to-line	4,5,6	01,02, 05,06, 09,10	52		kΩ
		Line-to-ground			34		
		Single ended		03,04, 07,08, 11,12, 13	70		
		Differential			140		
Digital output low voltage	V <sub>OL</sub>	I <sub>OL</sub> = -1.6 mA	1,2,3	All		0.4	V

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C ≤ T <sub>C</sub> ≤ +125°C V <sub>CC</sub> = +5 V dc, V <sub>EE</sub> = -5 V dc unless otherwise specified		Group A subgroups	Device type	Limits		Unit
						Min	Max	
Digital output high voltage	V <sub>OH</sub>	I <sub>OH</sub> = 0.4 mA		1,2,3	All	2.8		V
Output leakage current	I <sub>OZ</sub>			1,2,3	All	-40	+40	μA
Digital input high voltage <sup>1/</sup>	V <sub>IH</sub>	Digital inputs INH, EL, and EM	V <sub>IH</sub> = 2.0 V	1,2,3	All	pass /fail		
Digital input low voltage <sup>1/</sup>	V <sub>IL</sub>		V <sub>IL</sub> = 0.8 V	1,2,3	All		pass /fail	
Digital input current <sup>1/</sup>	I <sub>IN</sub>	Internal pullup		4,5,6	All		10	μA
Inhibit voltage <sup>1/</sup>	V <sub>INH</sub>	No digital angles change while INH is logic 0 and analog input is rotating		7,8A,8B	All		0.8	V
Enable voltage <sup>1/</sup>	V <sub>E</sub>	EM controls output bits 1 through 8 and EL controls output bits 9 through 14 for device types 01 through 04 and 9 through 16 for device types 05 through 12		7,8A,8B	All		0.8	V
Disable voltage (high impedance) <sup>1/</sup>	V <sub>D</sub>			7,8A,8B	All	2.0		V
Positive supply current	I <sub>CC</sub>	V <sub>CC</sub> = +5.25 V, each channel		1,2,3	All		+17	mA
Negative supply current	I <sub>EE</sub>	V <sub>EE</sub> = -5.25 V, each channel		1,2,3	All		-17	mA
Analog velocity output voltage	V <sub>OUT</sub>	<sup>4/</sup>		7,8A,8B	01 - 12	2.56	3.84	V
					13	4.23	4.77	
Bandwidth <sup>1/</sup>	BW			7,8A,8B	All	72	134	Hz

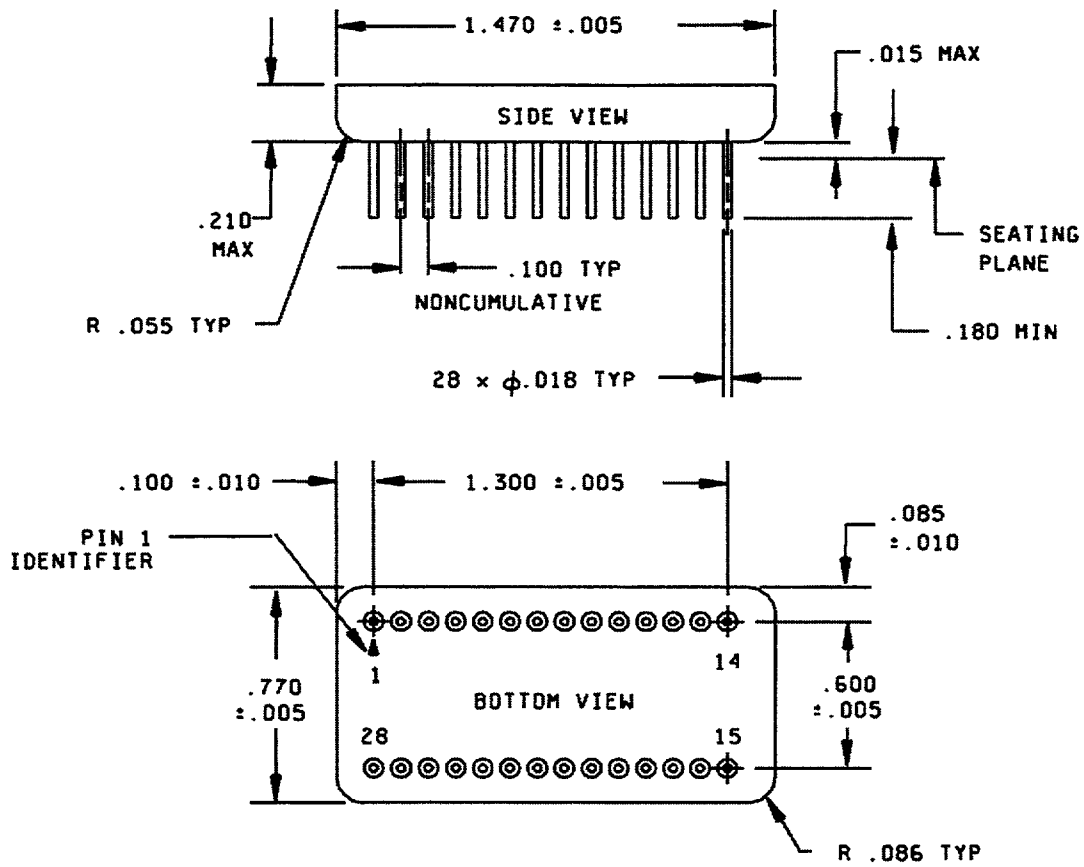
<sup>1/</sup> These parameters are tested on a go-no-go basis only or in conjunction with other measured parameters and are not directly testable.

<sup>2/</sup> Output accuracy is measured at angles from 0 to 180°, in 15° increments, and at 225°, 270°, and 315°.

<sup>3/</sup> Parameters shall be tested as part of device initial characterization and after design and process changes. Parameters shall be guaranteed to the limits specified in table I for all lots not specifically tested.

<sup>4/</sup> Analog output voltage is tested at 8 revolutions per second for device types 01 through 04, at 2 revolutions per second for device types 05 through 12, and at 10 revolutions per second for device type 13.

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Inches	mm	Inches	mm
.015	.38	.180	4.57
.018	.46	.210	5.33
.055	1.40	.600	15.24
.085	2.16	.770	19.56
.086	2.18	1.300	33.02
.100	2.54	1.470	37.33

**NOTES:**

1. Dimensions are in inches.
2. Metric equivalents are given for information only.
3. Lead identification numbers are for reference only.
4. Lead spacing dimensions apply only at seating plane.

FIGURE 1. Case outline.

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Case outline X

Device type	01	02	03 and 13	04
Terminal number	Terminal symbol			
1	S1 A	S1 A	S1 A	S1 A
2	S2 A	S2 A	S2 A	S2 A
3	S3 A	S3 A	S3 A	S3 A
4	N/C	N/C	S4 A	S4 A
5	BIT 1/9	BIT 1/9	BIT 1/9	BIT 1/9
6	BIT 2/10	BIT 2/10	BIT 2/10	BIT 2/10
7	BIT 3/11	BIT 3/11	BIT 3/11	BIT 3/11
8	BIT 4/12	BIT 4/12	BIT 4/12	BIT 4/12
9	BIT 5/13	BIT 5/13	BIT 5/13	BIT 5/13
10	BIT 6/14	BIT 6/14	BIT 6/14	BIT 6/14
11	BIT 7	BIT 7	BIT 7	BIT 7
12	<u>BIT 8</u>	<u>BIT 8</u>	<u>BIT 8</u>	<u>BIT 8</u>
13	<u>INH</u>	<u>INH</u>	<u>INH</u>	<u>INH</u>
14	VEL B	BIT B	VEL B	BIT B
15	S1 B	S1 B	S1 B	S1 B
16	S2 B	S2 B	S2 B	S2 B
17	S3 B	S3 B	S3 B	S3 B
18	N/C	N/C	S4 B	S4 B
19	<u>EM B</u>	<u>EM B</u>	<u>EM B</u>	<u>EM B</u>
20	EL B	EL B	EL B	EL B
21	V <sub>CC</sub>	V <sub>CC</sub>	V <sub>CC</sub>	V <sub>CC</sub>
22	GND	GND	GND	GND
23	<u>EL A</u>	<u>EL A</u>	<u>EL A</u>	<u>EL A</u>
24	EM A	<u>EM A</u>	EM A	<u>EM A</u>
25	VEL A	BIT A	VEL A	BIT A
26	V <sub>EE</sub>	V <sub>EE</sub>	V <sub>EE</sub>	V <sub>EE</sub>
27	-REF	-REF	-REF	-REF
28	+REF	+REF	+REF	+REF

FIGURE 2. Terminal connections.

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Case outline X

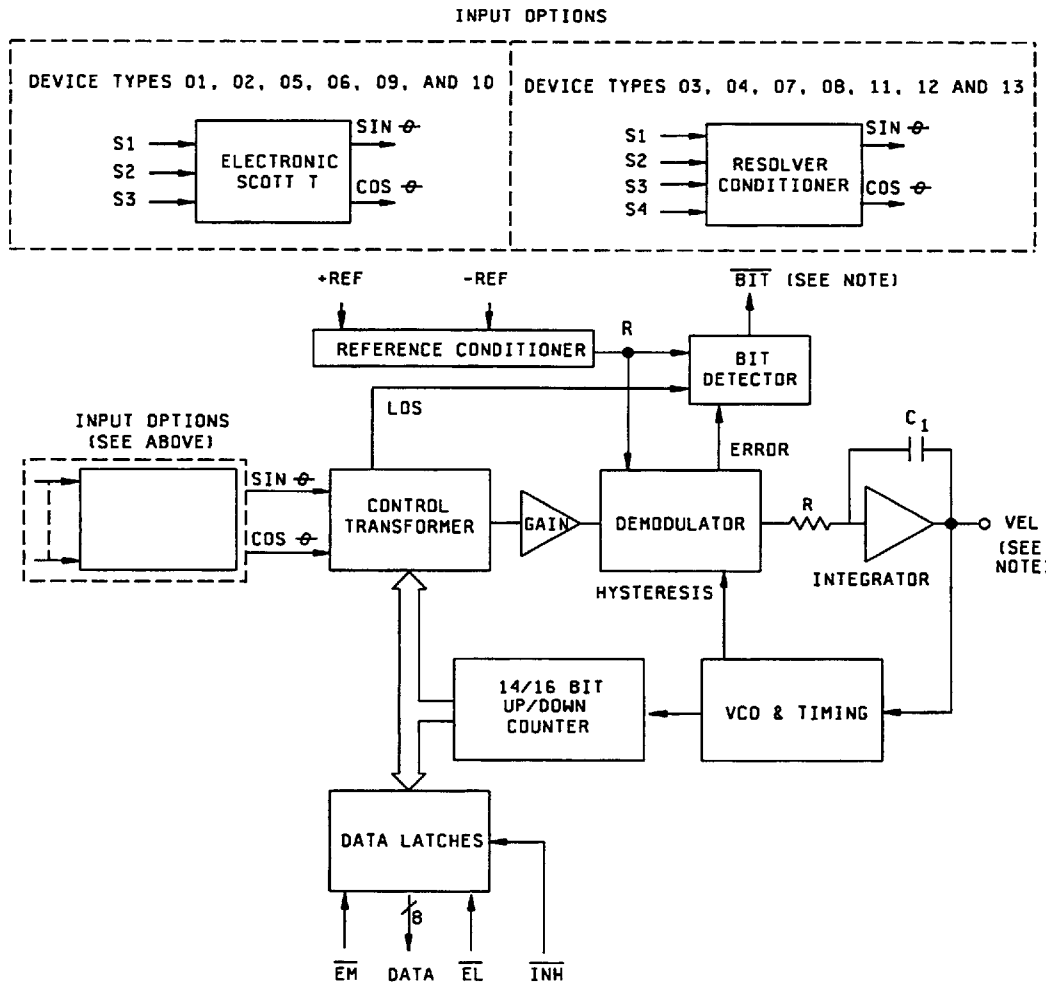
Device type	05, 09	06, 10	07, 11	08, 12
Terminal number	Terminal symbol			
1	S1 A	S1 A	S1 A	S1 A
2	S2 A	S2 A	S2 A	S2 A
3	S3 A	S3 A	S3 A	S3 A
4	N/C	N/C	S4 A	S4 A
5	BIT 1/9	BIT 1/9	BIT 1/9	BIT 1/9
6	BIT 2/10	BIT 2/10	BIT 2/10	BIT 2/10
7	BIT 3/11	BIT 3/11	BIT 3/11	BIT 3/11
8	BIT 4/12	BIT 4/12	BIT 4/12	BIT 4/12
9	BIT 5/13	BIT 5/13	BIT 5/13	BIT 5/13
10	BIT 6/14	BIT 6/14	BIT 6/14	BIT 6/14
11	BIT 7/15	BIT 7/15	BIT 7/15	BIT 7/15
12	BIT 8/16	BIT 8/16	BIT 8/16	BIT 8/16
13	INH	INH	INH	INH
14	VEL B	BIT B	VEL B	BIT B
15	S1 B	S1 B	S1 B	S1 B
16	S2 B	S2 B	S2 B	S2 B
17	S3 B	S3 B	S3 B	S3 B
18	N/C	N/C	S4 B	S4 B
19	EM B	EM B	EM B	EM B
20	EL B	EL B	EL B	EL B
21	V <sub>CC</sub>	V <sub>CC</sub>	V <sub>CC</sub>	V <sub>CC</sub>
22	GND	GND	GND	GND
23	EL A	EL A	EL A	EL A
24	EM A	EM A	EM A	EM A
25	VEL A	BIT A	VEL A	BIT A
26	V <sub>EE</sub>	V <sub>EE</sub>	V <sub>EE</sub>	V <sub>EE</sub>
27	-REF	-REF	-REF	-REF
28	+REF	+REF	+REF	+REF

FIGURE 2. Terminal connections - Continued.

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NOTE:  $\overline{\text{BIT}}$  is not connected on device types 01, 03, 05, 07, 09, 11, and 13. VEL is not connected on device types 02, 04, 06, 08, 10, and 12.

FIGURE 3. Block diagram.

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TABLE II. Electrical test requirements.

MIL-PRF-38534 test requirements	Subgroups (in accordance with MIL-PRF-38534, group A test table)
Interim electrical parameters	1,4,7,9
Final electrical test parameters	1*,2,3,4,5,6,7,8A,8B
Group A test requirements	1,2,3,4,5,6,7,8A,8B
Group C end-point electrical parameters	1,2,3,4,5,6,7,8A,8B
MIL-STD-883, group E end-point electrical parameters for RHA devices	Subgroups ** (in accordance with method 5005, group A test table)

\* PDA applies to subgroup 1.

\*\* When applicable to this standard microcircuit drawing, the subgroups shall be defined.

4.3 Conformance and periodic inspections. Conformance inspection (CI) and periodic inspection (PI) shall be in accordance with MIL-PRF-38534 and as specified herein.

4.3.1 Group A inspection (CI). Group A inspection shall be in accordance with MIL-PRF-38534 and as follows:

- a. Tests shall be as specified in table II herein.
- b. Subgroups 9, 10, and 11 shall be omitted.

4.3.2 Group B inspection (PI). Group B inspection shall be in accordance with MIL-PRF-38534.

4.3.3 Group C inspection (PI). Group C inspection shall be in accordance with MIL-PRF-38534 and as follows:

- a. End-point electrical parameters shall be as specified in table II herein.
- b. Steady-state life test, method 1005 of MIL-STD-883.
  - (1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DESC-EL or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1005 of MIL-STD-883.
  - (2)  $T_A$  as specified in accordance with table I of method 1005 of MIL-STD-883.
  - (3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

4.3.4 Group D inspection (PI). Group D inspection shall be in accordance with MIL-PRF-38534.

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4.3.5 Group E inspection. Group E inspection is required only for parts intended to be marked as radiation hardness assured (see 3.5 herein). RHA levels for device classes H and K shall be M, D, R, and H. RHA quality conformance inspection sample tests shall be performed at the RHA level specified in the acquisition document.

- a. RHA tests for device classes H and K for levels M, D, R, and H shall be performed through each level to determine at what levels the devices meet the RHA requirements. These RHA tests shall be performed for initial qualification and after design or process changes which may affect the RHA performance of the device.
- b. End-point electrical parameters shall be as specified in table II herein.
- c. 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.
- d. For device classes H and K, the devices shall be subjected to radiation hardness assured tests as specified in MIL-PRF-38534 for RHA level being tested, and meet the postirradiation end-point electrical parameter limits as defined in table I at  $T_A = +25^{\circ}\text{C} \pm 5$  percent, after exposure.
- e. Prior to and during total dose irradiation testing, the devices shall be biased to establish a worst case condition as specified in the radiation exposure circuit.
- f. For device classes H and K, subgroups 1 and 2 in table V, method 5005 of MIL-STD-883 shall be tested as appropriate for device construction.
- g. When specified in the purchase order or contract, a copy of the RHA delta limits shall be supplied.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-PRF-38534.

6. NOTES

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

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

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

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

6.5 Comments. Comments on this drawing should be directed to DESC-EL, Dayton, Ohio 45444, or telephone (513) 296-5373.

6.6 Sources of supply for device classes H and K. Sources of supply for device classes H and K are listed in QML-38534. The vendors listed in QML-38534 have submitted a certificate of compliance (see 3.7 herein) to DESC-EL and have agreed to this drawing.

<b>STANDARD MICROCIRCUIT DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444</b>	<b>SIZE A</b>		<b>5962-91736</b>
		<b>REVISION LEVEL B</b>	<b>SHEET 12</b>

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