

**REVISIONS**

REV	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Add device type 03. Changed drawing to reflect MIL-H-38534 processing.	91-01-28	W. Heckman
B	Add case outline Y. Rewrite entire document.	93-05-06	K. A. Cottongim

REV																				
SHEET																				
REV	B																			
SHEET	15																			

REV STATUS OF SHEETS	REV	B	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	13	14		

<p align="center"><b>STANDARDIZED MILITARY DRAWING</b></p> <p>THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE</p> <p>AMSC N/A</p>	PREPARED BY Steve Duncan	DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444		
	CHECKED BY Robert M. Heber			
	APPROVED BY William K. Heckman	MICROCIRCUIT, LINEAR, RESOLVER OR SYNCHRO-TO-DIGITAL CONVERTER, HYBRID		
	DRAWING APPROVAL DATE 88-11-08			
	REVISION LEVEL B	SIZE <b>A</b>	CAGE CODE <b>67268</b>	<b>5962-87687</b>
	SHEET 1 OF 15			

1. SCOPE

1.1 Scope. This drawing describes device requirements for class H hybrid microcircuits to be processed in accordance with MIL-H-38534.

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1.2 Part or Identifying Number (PIN). The complete PIN shall be as shown in the following example:



1.2.1 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 (±1.0 LSB)</u>
01	HSDC-8920A, RDC14505-658	400 Hz resolver to digital converter	±2.6 arc minutes
02	HSDC-8920, RDC14505 639	400 Hz resolver to digital converter	±4.0 arc minutes
03	RDC14505-641	400 Hz resolver to digital converter, 6 volt input	±2.6 arc minutes

1.2.2 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	36	Dual-in-Line
Y	See figure 1	36	Dual-in-Line

1.2.3 Lead finish. The lead finish shall be as specified in MIL-H-38534. Finish letter "X" shall not be marked on the microcircuit or its packaging. The "X" designation is for use in specifications when lead finishes A, B, and C are considered acceptable and interchangeable without preference.

1.3 Absolute maximum ratings. 1/

Supply voltage ( $V_S$ )	+18 V dc
Logic input voltage ( $V_L$ )	+15 V dc
Reference input	130 V rms
Digital inputs	-0.3 V dc to $V_L$
Power dissipation ( $P_D$ )	270 mW 2/
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 ( $\theta_{JA}$ )	28°C/W
Junction temperature ( $T_J$ )	150°C

1.4 Recommended operating conditions.

Supply voltage ( $V_S$ )	+11 V dc to +16.5 V dc
Logic input voltage ( $V_L$ )	+4.5 V dc to +15 V supply
Ambient operating temperature range ( $T_A$ )	-55°C to +125°C

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.

2/ Power dissipation applies up to  $T_A = +125^\circ\text{C}$ .

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2. APPLICABLE DOCUMENTS  
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2.1 Government specification and standards. Unless otherwise specified, the following specification 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 drawing to the extent specified herein.

SPECIFICATION

MILITARY

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

STANDARDS

MILITARY

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

(Copies of the specification and standards 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 MIL-H-38534 and as specified herein.

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

3.2.1 Case outline(s). The case outline(s) shall be in accordance with 1.2.2 herein.

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.

3.2.4 Digital angle outputs. Digital angle outputs shall be as specified on figure 4.

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 described in table I.

3.5 Marking. Marking shall be in accordance with MIL-H-38534. The part shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's PIN may also be marked as listed in QML-38534 (see 6.6 herein).

3.6 Manufacturer eligibility. In addition to the general requirements of MIL-H-38534, the manufacturer of the part described herein shall maintain the electrical test data (variables format) from the initial quality conformance inspection group A lot sample, produced on the certified line, for each device type listed herein. The data should also 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-EC) upon request.

3.7 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 QML-38534 (see 6.6 herein). The certificate of compliance submitted to DESC-EC prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-H-38534 and the requirements herein.

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

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions <sup>1/</sup> -55°C ≤ T <sub>A</sub> ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Resolution control		14 bits fail/pass	7,8	ALL			
Output accuracy		Measured at angles of 0, 15, 30, 45, 60, 75, 90, 105, 120, 135, 150, 165, 180, 225, 270, and 315 degrees	7,8	ALL		2/	

Reference Input

Input voltage range	V <sub>IN</sub>		4,5,6	ALL	4.0	130	V rms
Carrier frequency			4,5,6	ALL	360	1000	Hz
Input impedance <sup>3/</sup>	Z <sub>INREF</sub>	Single ended	4,5,6	ALL	250		kΩ
		Differential			500		
Common mode voltage <sup>3/</sup> range	V <sub>CMREF</sub>		4,5,6	ALL	-210	210	V(pk)

Signal Input

Common mode range <sup>3/</sup>	V <sub>CM SIG</sub>		4,5,6	ALL	-60	60	V(pk)
Input impedance <sup>3/</sup>	Z <sub>INSIG</sub>	Differential	4,5,6	ALL	46		kΩ
		Line to line			23		
		Each line to ground			23		
Line to line input voltage	V <sub>IN<sup>L</sup>-L</sub>		4,5,6	01,02	10.62	12.98	V rms
				03	5.40	6.60	

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions <sup>1/</sup> -55°C ≤ T <sub>A</sub> ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Digital Outputs (Bits 1 through 14 and CB)							
Drive capability	V <sub>OL</sub>	Logic 0, 1 TTL load at -1.6 mA	1,2,3	ALL		0.4	V dc
	V <sub>OH</sub>	Logic 1, 10 TTL load at 0.4 mA	1,2,3	ALL	2.8		V dc
	I <sub>X</sub>	High impedance load	1,2,3	ALL	-1.0	-10	μA
Converter busy	CB	Positive pulse	9,10,11	ALL	0.5	2.0	μs
Analog output							
AC error	e	For ±1.0 LSB change, near null to ground	4,5,6	ALL	12.8	19.2	mV rms/LSB
DC velocity voltage	0	At 2.1 rps	4,5,6	ALL	0.8	1.2	V dc
Filtered dc error	E	Per + LSB of error	4,5,6	ALL	-1.2	0.8	V dc
Velocity <sup>4/</sup>	v	Full scale max, positive direction	4,5,6	ALL	3.72	5.70	V dc
		Full scale max, negative direction	4,5,6	ALL	-3.73	-5.70	V dc

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions <sup>1/</sup> -55°C ≤ T <sub>a</sub> ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Digital Inputs (INH, EN 1 through 6, EN 7 through 14, and digital bits 1 through 14 while operating in CT mode)							
Voltage inputs	V <sub>IL</sub>	Logic 0, V <sub>L</sub> = 5.0 V dc	1,2,3	ALL		1.5	V dc
	V <sub>IH</sub>	Logic 1, V <sub>L</sub> = 5.0 V dc	1,2,3	ALL	3.5		V dc
Loading	I <sub>LOAD</sub>	Internal pull up	1,2,3	ALL	-1.0	-10	μA
Inhibit	<u>5/</u> INH		7,8	ALL			
Enable bits 1 through 6	<u>6/</u> EM		7,8	ALL			
Enable bits 7 through 14	<u>6/</u> EL		7,8	ALL			
Set	<u>7/</u> S		7,8	ALL			
Power Supplies							
Supply current	I <sub>S</sub>	Logic = 0, V <sub>S</sub> = +16.5 V dc	1,2,3	ALL		25	mA
Logic supply current	I <sub>L</sub>	V <sub>L</sub> = +15 V dc	1,2,3	ALL		1.0	mA

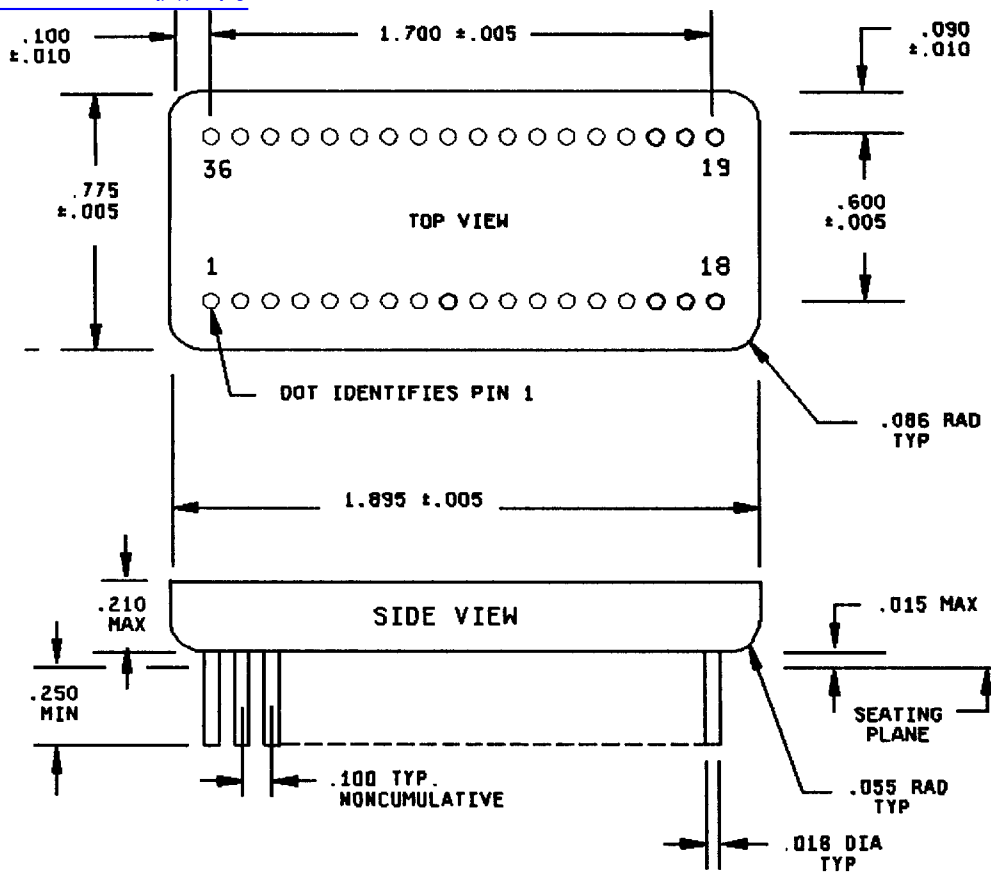
- 1/ +11 V dc ≤ V<sub>S</sub> ≤ +16.5 V dc and +4.5 V dc ≤ V<sub>L</sub> ≤ +15 V supply.
- 2/ Output accuracy for device types 01 and 03 is ±2.6 arc minutes ±1.0 LSB and output accuracy for device type 02 is ±4.0 arc minutes ±1.0 LSB.
- 3/ Parameter shall be tested as part of device initial characterization and after design and process changes. Parameter shall be guaranteed to the limits specified in table I for lots not specifically tested.
- 4/ Test is performed at full speed of 10 rps.
- 5/ Test should verify no digital angles change while INH is Logic 0 and analog input is rotating.
- 6/ Test should verify logic 0 enables, logic 1 high impedance.
- 7/ Test should verify logic 0 for use in CT mode.

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Case outline X.



Inches	mm	Inches	mm
.005	0.13	.100	2.54
.010	0.25	.210	5.33
.015	0.38	.250	6.35
.018	0.46	.600	15.24
.055	1.40	.775	19.68
.086	2.18	1.700	43.18
.090	2.29	1.895	48.13

NOTES:

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

FIGURE 1. Case outline(s).

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Case outline Y.

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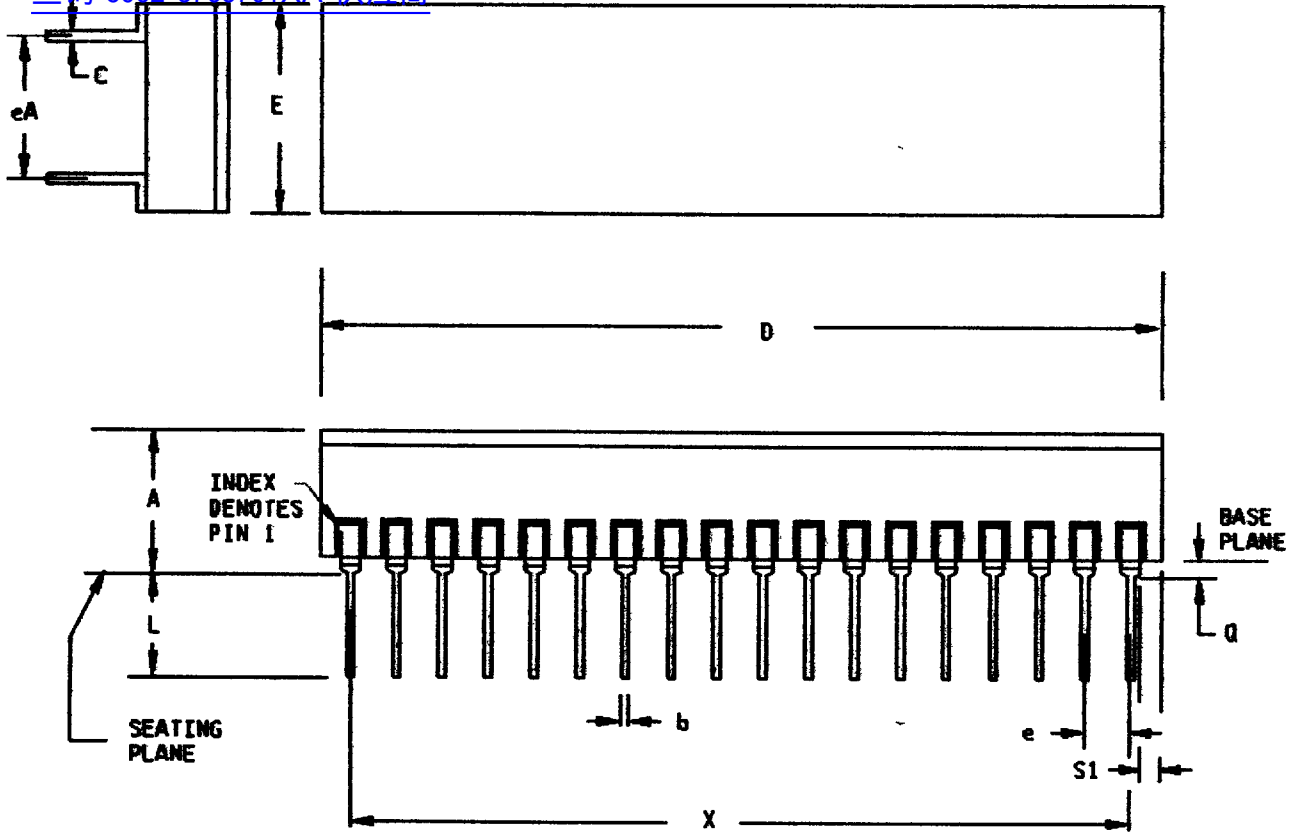


FIGURE 1. Case outline(s) - Continued.

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Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A		5.33		0.210
b	0.41	0.51	0.016	0.020
c	0.41	0.51	0.016	0.020
D		48.26		1.900
E		20.32		0.800
e	2.54 BSC		0.100 BSC	
eA	15.11	15.37	0.595	0.605
L	6.10	6.60	0.240	0.260
Q		0.72		0.030
s1	2.18	2.44	0.086	0.096
X	43.18 BSC		1.700 BSC	

NOTES:

1. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall rule.
2. Pin numbers are for reference only.
3. Lead clusters to be located within ( $\pm 0.005$ ) 1.27 mm of case center line.

FIGURE 1. Case outline(s) - Continued.

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Device type	ALL	Device type	ALL
Case outline	X and Y	Case outline	X and Y
Terminal number	Terminal symbol	Terminal number	Terminal symbol
1	S1	19	RH (Ref. High)
2	S2	20	RL (Ref. Low)
3	S3	21	N.C.
4	S4	22	E (Filtered DC Error Out)
5	Bit 1 MSB	23	o (Analog Velocity Out)
6	Bit 2	24	CB (Converter busy)
7	Bit 3	25	$\overline{\text{EN 7-14}}$ (Enable, Bits 7 to 14)
8	Bit 4	26	$\overline{\text{EN 1-6}}$ (Enable, Bits 1 to 6)
9	Bit 5	27	e (AC Error Out)
10	Bit 6	28	$V_L$ (Logic Voltage Input)
11	Bit 7	29	GND
12	Bit 8	30	$\overline{\text{S}}$
13	Bit 9	31	Ge (Gain Control)
14	Bit 10	32	+15 V (Power Supply In)
15	Bit 11	33	INH (Inhibit)
16	Bit 12	34	V (Internal DC REF.)
17	Bit 13	35	BC (Buffered Cos)
18	Bit 14 LSB	36	BC (Buffered Sin)

NOTE: BS and BC pins are used in other applications.

FIGURE 2. Terminal connections.

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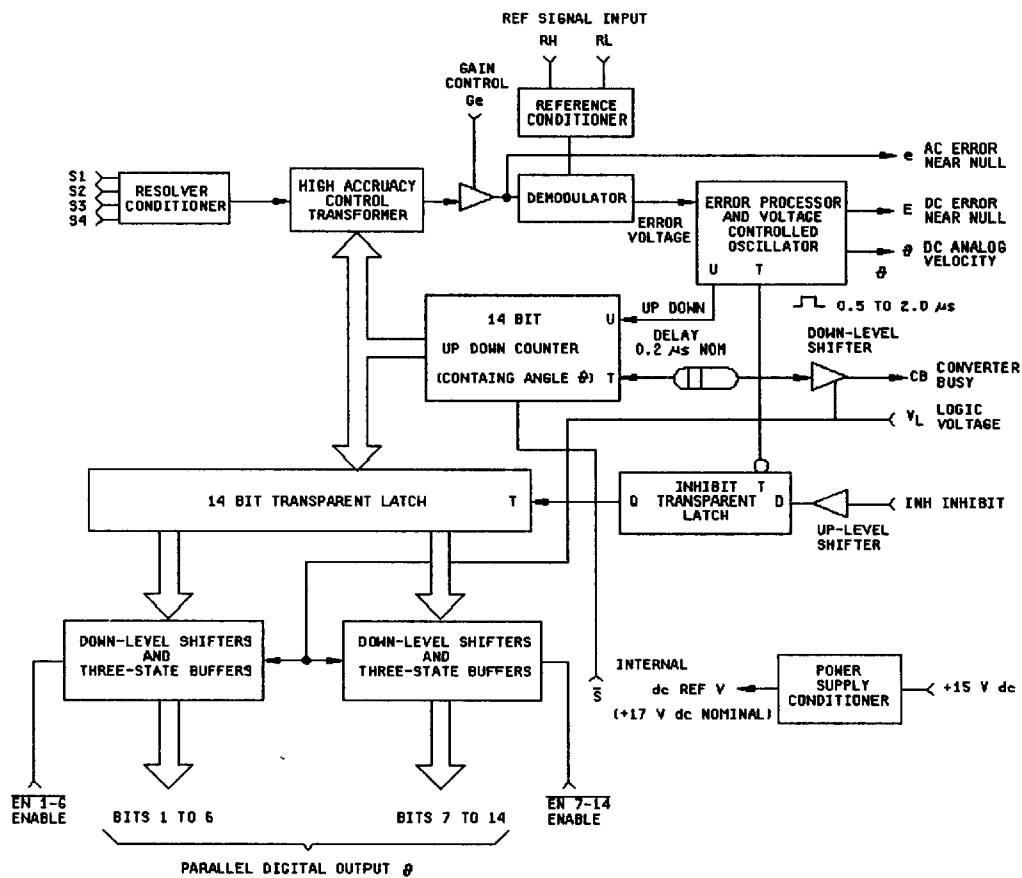


FIGURE 3. Block diagram.

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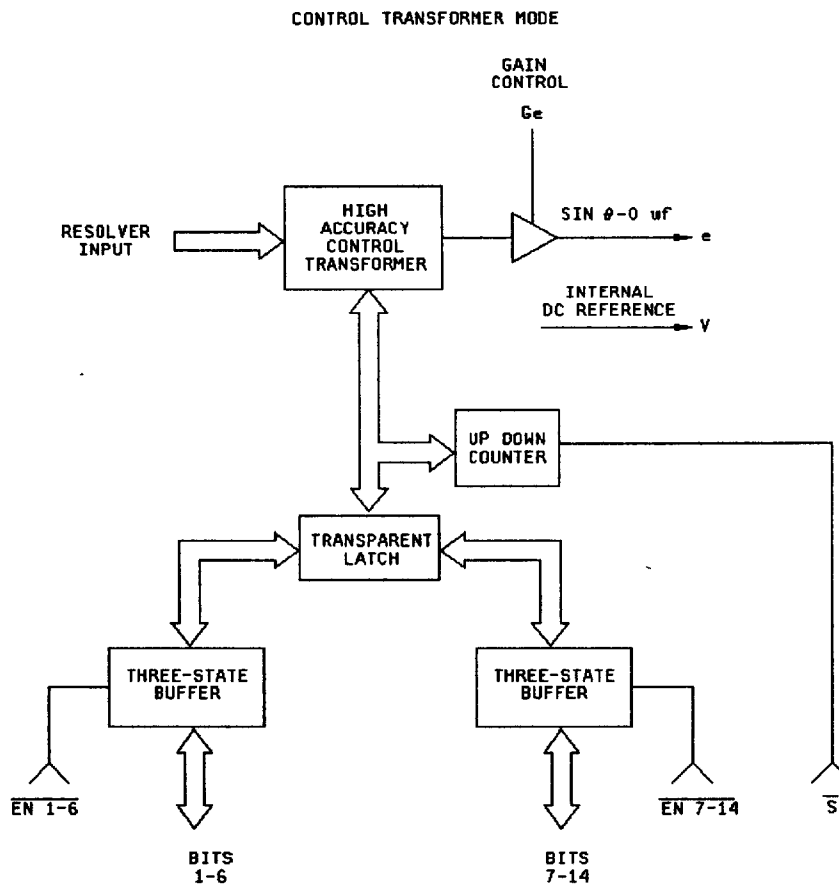


FIGURE 3. Block diagram - Continued.

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Bit	Degrees/bit	Minutes/bit
1 MSB	180	10,800
2	90	5,400
3	45	2,700
4	22.5	1,350
5	11.25	675
6	5.625	387.5
7	2.813	168.75
8	1.405	84.38
9	0.7031	42.19
10	0.3516	21.09
11	0.1758	10.55
12	0.0879	5.27
13	0.0439	2.64
14 LSB	0.0220	1.32

FIGURE 4. Digital angle outputs.

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TABLE II. Electrical test requirements.

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MIL-H-38534 test requirements	Subgroups (in accordance with MIL-H-38534, group A test table)
Interim electrical parameters	1,4,7,9
Final electrical test parameters	1*,2,3,4,5,6,7,8,9,10,11
Group A test requirements	1,2,3,4,5,6,7,8,9,10,11
Group C end-point electrical parameters	1,2,3,4,5,6,7,8,9,10,11

\* PDA applies to subgroup 1.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-H-38534.

4.2 Screening. Screening shall be in accordance with MIL-H-38534. 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-EC 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.

4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-H-38534 and as specified herein.

4.3.1 Group A inspection. Group A inspection shall be in accordance with MIL-H-38534 and tests shall be as specified in table II herein.

4.3.2 Group B inspection. Group B inspection shall be in accordance with MIL-H-38534.

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4.3.3 Group C inspection. Group C inspection shall be in accordance with MIL-H-38534 and as follows:

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- 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-EC 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. Group D inspection shall be in accordance with MIL-H-38534.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-H-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-481 using DD Form 1693, Engineering Change Proposal (Short Form).

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 microelectronics devices (FSC 5962) should contact DESC-EC, telephone (513) 296-6047.

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

6.6 Approved sources of supply. Approved sources of supply are listed in QML-38534. Additional sources will be added to QML-38534 as they become available. The vendors listed in QML-38534 have agreed to this drawing and a certificate of compliance (see 3.7 herein) has been submitted to and accepted by DESC-EC.

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