REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Added device type 05 with vendor cage code U4388. Made changes to table I, figure 2, and figure 5. Redrew entire document	95-03-17	K.A. Cottongim

REV																			
SHEET																			
REV	A	A	A	A															
SHEET	15	16	17	18															

REV STATUS OF SHEETS	REV	A	A	A	A	A	A	A	A	A	A	A	A	A	A
	SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14

PMIC N/A

STANDARD MICROCIRCUIT DRAWING

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

AMSC N/A

PREPARED BY
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DRAWING APPROVAL DATE
92-08-11

REVISION LEVEL
A

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUIT, DIGITAL, LOW POWER, SINGLE CHANNEL, DRIVER-RECEIVER, HYBRID

SIZE	CAGE CODE	5962-92085
A	67268	

SHEET 1 OF 18

DESC FORM 193
JUL 94

5962-E049-95

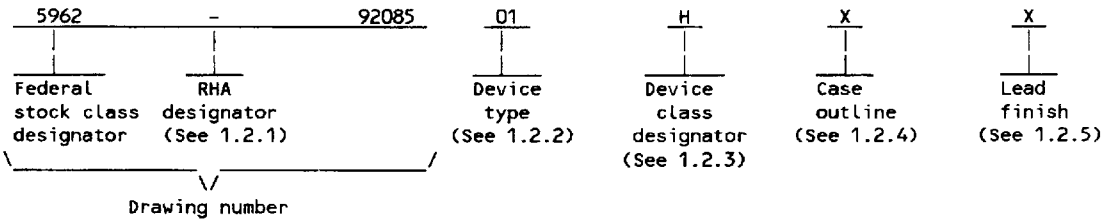
DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

9004708 0012824 T85

1. SCOPE

1.1 Scope. This drawing forms a part of a one part - one part number documentation system (see 6.6 herein). This drawing describes device requirements for hybrid microcircuits to be processed in accordance with MIL-H-38534. Two product assurance classes, military 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-H-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:

Device type	Generic number	Circuit function
01	NHI-1551	Single channel, driver-receiver (universal transceiver) low power, receiver standby low
02	ARX-4451	Single channel, driver-receiver (universal transceiver) low power, receiver standby low
03	ARX-4418	Single channel, driver-receiver (universal transceiver) low power, receiver standby low
04	NHI-1515	Single channel, driver-receiver (universal transceiver) low power, receiver standby low
05	FC155377	Single channel, driver-receiver (universal transceiver) low power, receiver standby low

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

Device class	Device requirements documentation
H or K	Certification and qualification to MIL-H-38534

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

Outline letter	Descriptive designator	Terminals	Package style
X	See figure 1	24	Hybrid package
Y	See figure 1	24	Flat package

1.2.5 Lead finish. The lead finish shall be as specified in MIL-H-38534 for classes H and K. 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 ranges:	
V_{CC}	-0.3 V dc to +18 V dc
V_{EE}	+0.3 V dc to -18 V dc
V_{CCL}	-0.3 V dc to +7 V dc
Logic input voltage range	-0.3 V dc to +5.5 V dc
Receiver differential input voltage	40 Vp-p
Receiver common mode input voltage range	-10 V dc to +10 V dc
Driver peak output current	±300 mA
Storage temperature range	-65°C to +150°C
Lead temperature (soldering, 10 seconds)	+300°C
Junction temperature (T_J)	+160°C
Power dissipation (P_D) total hybrid:	
100 percent duty cycle (T_C = +25°C)	3.24 W
Power dissipation (P_D) hottest die:	
100 percent duty cycle	545 mW
Standby mode	Derates to zero
Thermal resistance:	
Junction-to-case (Θ_{JC}) hottest die	38°C/W
Case-to-ambient	21°C/W
Maximum junction-to-case temperature rise for the hottest die at 100 percent duty cycle	21°C

1.4 Recommended operating conditions.

Supply voltage ranges:	
V_{CC}	+11.4 V dc to +15.75 V dc
V_{EE}	-11.4 V dc to -15.75 V dc
V_{CCL}	+4.5 V dc to +5.5 V dc
Logic input voltage range	0 V dc to +5.0 V dc
Receiver differential voltage	40 Vp-p
Receiver common mode voltage range	-10 V dc to +10 V dc
Driver peak output current	±180 mA
Maximum serial data rate	1.0 MHz
Case operating temperature range (T_C)	-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. APPLICABLE DOCUMENTS

2.1 Government specification, standards, and handbook. Unless otherwise specified, the following specification, standards, and handbook 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-973 - Configuration Management.
MIL-STD-1835 - Microcircuit Case Outlines.

HANDBOOK

MILITARY

MIL-HDBK-780 - Standardized Military Drawings.

(Copies of the specification, standards, and handbook 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 1.2.4 herein and figure 1.

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

3.2.3 Test circuit. The test circuit shall be as specified on figure 3.

3.2.4 Timing waveforms. The timing waveforms shall be as specified on figure 4.

3.2.5 Coupling diagram. The coupling diagram shall be as specified on figure 5.

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.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ $-55°C \le T_C \le +125°C$ unless otherwise specified	Group A subgroups	Device types	Limits		Unit
					Min	Max	
RECEIVER							
Output low voltage	V_{OL}	I_{OL} = 10 mA	1,2,3	01,02, 03,04		0.5	V
		I_{OL} = 4 mA		05		0.5	
Output high voltage	V_{OH}	I_{OH} = -0.4 mA	1,2,3	All	2.5		V
Differential input voltage level	V_I	2/	4,5,6	01,02, 03,04		40	Vp-p
				05			
Differential input impedance	Z_{IN}	1 MHz sinewave 2/	4,5,6	All	10		kΩ
Common mode input voltage range	V_{ICR}	1 MHz sinewave, see figure 3	4,5,6	01,02, 03,04	10		Vp-p
		2/		05			
Input capacitance	C_{IN}	1 MHz sinewave 2/	4	All		5	pF
Threshold voltage	V_{TH}	3/ 4/ 6/	4,5,6	01,02, 03,04	0.6	1.05	Vp-p
		3/ 4/ 10/	4	05	1.10	1.20	
		3/ 4/ 6/	5,6	05	0.56	1.20	
Receiver delay	t_{DR}	Input zero crossing to DATA or DATA, see figure 3 2/	4,5,6	All		450	ns
RECEIVER STROBE							
Input low voltage	V_{SIL}	8/	1,2,3	All		0.7	V
Input high voltage	V_{SIH}	8/	1,2,3	All	2.0		V
Input low current	I_{SIL}	V_{SIL} = 0.4 V	1,2,3	01,02, 03,04	-0.4		mA
				05	-1.6		

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ $-55°C \le T_C \le +125°C$ unless otherwise specified	Group A subgroups	Device types	Limits Min	Limits Max	Unit
RECEIVER STROBE - CONTINUED.							
Input high current	I_{SIH}	V_{SIH} =2.7 V	1,2,3	01,02, 03,04		80	µA
				05		40	
Strobe delay	t_{DS}	Turn-on or turn-off, 2/ see figure 4	9,10,11	All		200	ns
TRANSMITTER							
Input low voltage	V_{IL}	8/	1,2,3	All		0.7	V
Input high voltage	V_{IH}	8/	1,2,3	All	2.0		V
Input low current	I_{IL}	V_{IL} = 0.4 V	1,2,3	01,02, 03,04	-0.4		mA
				05	-1.6		
Input high current	I_{IH}	V_{IH} = 2.7 V	1,2,3	All		40	µA
Differential output	V_O	35Ω load 4/	1,2,3	01,04,05	6.5	9.0	Vp-p
				02, 03	7.0	9.0	
		140Ω load 2/ 5/		01,04,05	26	36	
				02, 03	28	36	
Differential output noise	V_{ON}	Inhibited, 35Ω load 4/	4,5,6	All		10	mVp-p
		140Ω load 2/ 5/				40	
Differential output impedance	Z_{OUT}	1 MHz sinewave, 2/ (transmitter off)	4,5,6	All	10		kΩ
Output capacitance	C_{OUT}	1 MHz sinewave 2/	4	All		5	pF
Differential output offset voltage	V_{OS}	35Ω load	4,5,6	01,02, 03,04	-90	+90	mVpk
		35Ω load 10/		05			
		140Ω load 2/ 5/ 7/			-360	+360	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ $-55°C \le T_C \le +125°C$ unless otherwise specified	Group A subgroups	Device types	Limits		Unit
					Min	Max	
TRANSMITTER - Continued.							
Receiver filter response	FILTER	f = 2 MHz 2/	4,5,6	All	-4.0		dB
		f = 4 MHz 2/			-13.0		
Rise time	t_r	35Ω load, see figure 4	9,10,11	All	220	300	ns
Fall time	t_f	35Ω load, see figure 4	9,10,11	All	220	300	
Transmitter delay	t_{dt}	Transmitter-in to transmitter-out, see figure 4 2/	9,10,11	01, 04		550	
				02,03, 05		300	
Variable amplitude 2/ 5/ level	V_{AL}	V_{IN} = 10 V dc, 140Ω load	1	03, 04	30		V
		V_{IN} = 0 V dc, 140Ω load		03, 04		2	
TRANSMITTER INHIBIT							
Input low voltage	V_{IIL}	8/	1,2,3	All		0.7	V
Input high voltage	V_{IIH}	8/	1,2,3	All	2.0		V
Input low current	I_{IIL}	V_{SIL} = 0.4 V	1,2,3	01,02, 03,04	-0.4		mA
				05	-1.6		
Input high current	I_{IIH}	V_{SIH} = 2.7 V	1,2,3	All		40	µA
Transmitter inhibit delay (high)	t_{DI-H}	0-1 inhibited output, 2/ see figure 4	9,10,11	All		450	ns
Transmitter inhibit delay (low)	t_{DI-L}	1-0 active output, 2/ see figure 4	9,10,11	All		450	

See footnotes at end of table.

TABLE I. Electrical performance characteristic - Continued.

Test	Symbol	Conditions 1/ $-55°C \le T_C \le +125°C$ unless otherwise specified	Group A subgroups	Device types	Limits Min	Limits Max	Unit
POWER SUPPLY							
+Supply (V_{CC})	I_{CC-SB}	Standby mode	1,2,3	All		50	mA
-Supply (V_{EE})	I_{EE-SB}			01, 04, 05		40	
				02, 03		65	
+5 V supply (V_{CCL})	I_{CC1-SB}			01,04, 05		20	
				02, 03		45	
+Supply (V_{CC})	I_{CC-50}	50 percent duty cycle	4,5,6	All		110	mA
-Supply (V_{EE})	I_{EE-50}			All		110	
+Supply (V_{CC})	I_{CC-100}	100 percent duty cycle		All		165	
-Supply (V_{EE})	I_{EE-100}			All		165	

1/ Unless otherwise specified supply voltage ranges are as follows: ($+14.9$ V dc $\le V_{CC} \le +15.1$ V dc), (-14.9 V dc $\le V_{EE} \le -15.1$ V dc), and ($+4.9$ V dc $\le V_{CCL} \le 5.1$ V dc).
2/ 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.
3/ Threshold determined by first missing word of a 33 word transmission to a Harris HD-15530 CMOS Manchester encoder-decoder.
4/ Measured at point AA' of figure 5.
5/ Measured at point BB' of figure 5.
6/ Assumes the internal threshold option is used.
7/ Offset is measured 2.5 µs after the mid-bit zero crossing of the last parity bit of a 600 µs transmission cycle of contiguous words (no dead time in between words).
8/ These parameters are tested on a go-no-go basis in conjuction with other measured parameters and are not directly testable.
9/ This parameter is adjusted and measured with pins 6 and 11 each grounded through a 3830 Ω resistor.
10/ Measured 2.5 µs after parity bit mid zero crossing of a 660 µs message with worse case data word. This parameter is adjusted and tested at 25°C only, -55°C and +125°C limits are guaranteed by design.

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 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 control by the manufacturer and be made available to preparing activity (DESC-EC) 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 submitted to DESC-EC 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.

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.

Case X

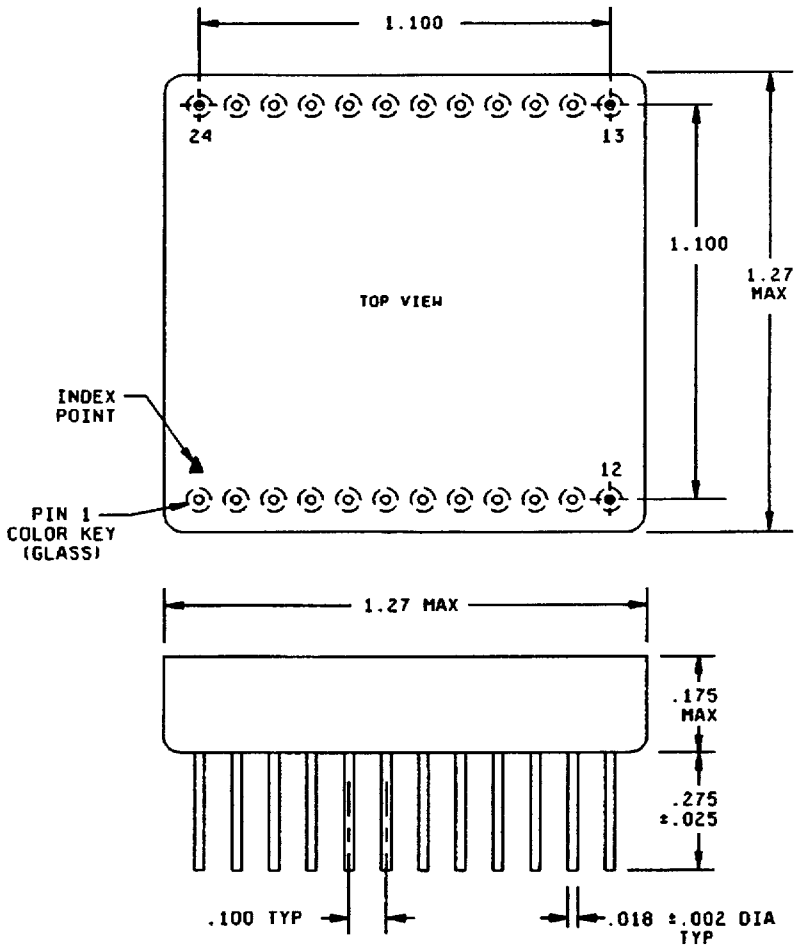
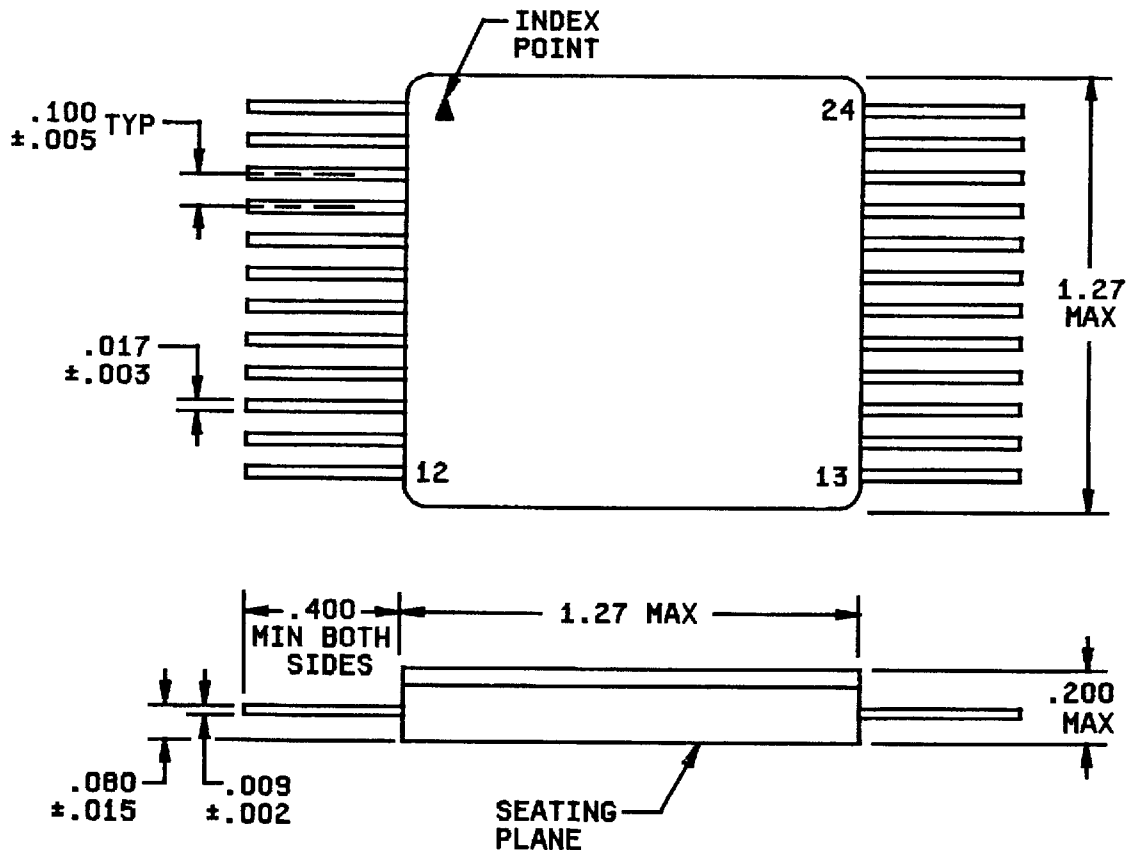


FIGURE 1. Case outlines.

STANDARD MICROCIRCUIT DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-92085
		REVISION LEVEL A	SHEET 10

Case Y



Inches	mm	Inches	mm
.002	0.05	.080	2.03
.003	0.08	.100	2.54
.005	0.13	.175	4.46
.009	0.23	.200	5.08
.015	0.64	.275	6.98
.017	0.43	.400	10.16
.018	0.46	1.100	27.94
.025	0.64	1.27	32.3

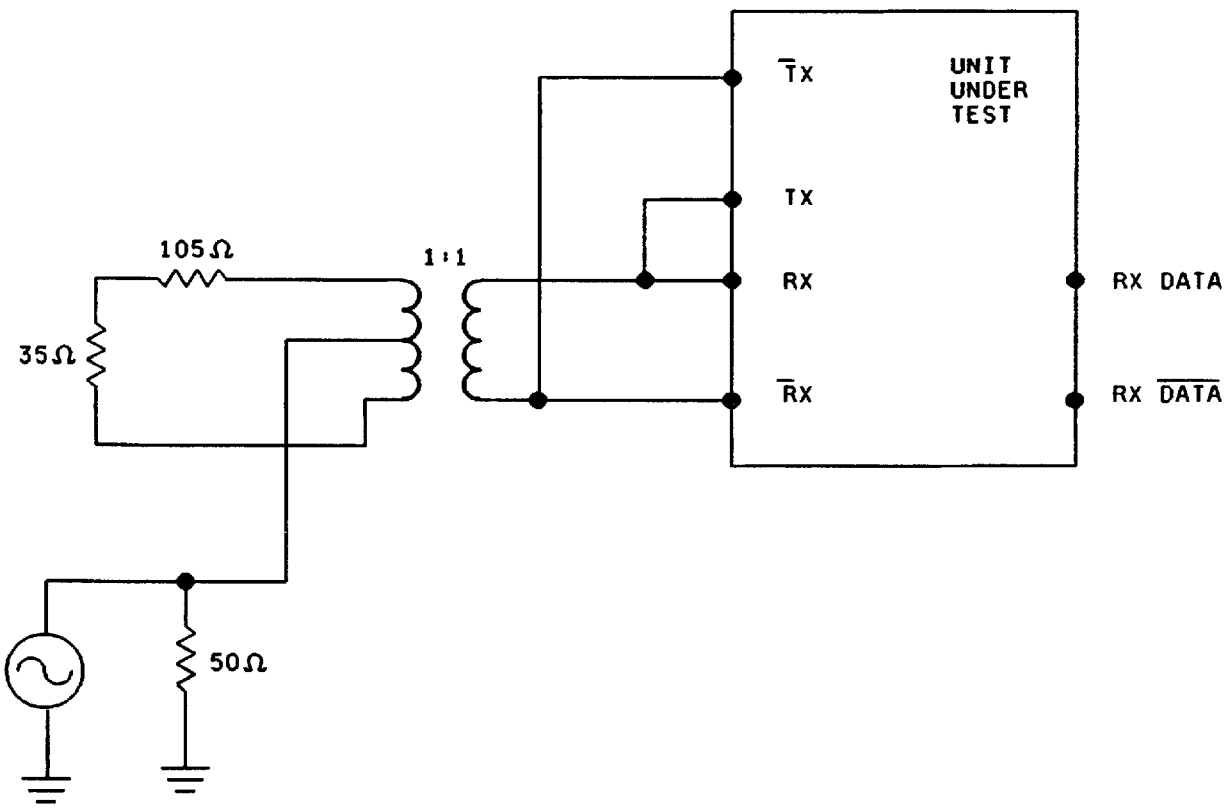
NOTES (for case X and case Y):
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance for three place decimal shall be .005 (0.13 mm).

FIGURE 1. Case outlines - Continued.

Pin	Function	Pin	Function
1	TX DATA OUT	13	V_{CC} RX
2	TX $\overline{\text{DATA}}$ OUT	14	Amp control or NC See note
3	GND C	15	RX DATA IN
4	V_{CC} TX	16	RX $\overline{\text{DATA}}$ IN
5	EXTERNAL DATA THRESHOLD	17	GND A
6	INTERNAL DATA THRESHOLD	18	CASE GND
7	RX DATA OUT	19	V_{EE} RX
8	STROBE	20	V_{CCL}
9	GND B	21	TX INHIBIT
10	RX $\overline{\text{DATA}}$ OUT	22	TX DATA IN
11	INTERNAL $\overline{\text{DATA}}$ THRESHOLD	23	TX $\overline{\text{DATA}}$ IN
12	EXTERNAL $\overline{\text{DATA}}$ THRESHOLD	24	V_{EE} TX

NOTE: Pin 14 is a no connection for device types 01,02 and 05 and amp control for device types 03 and 04.

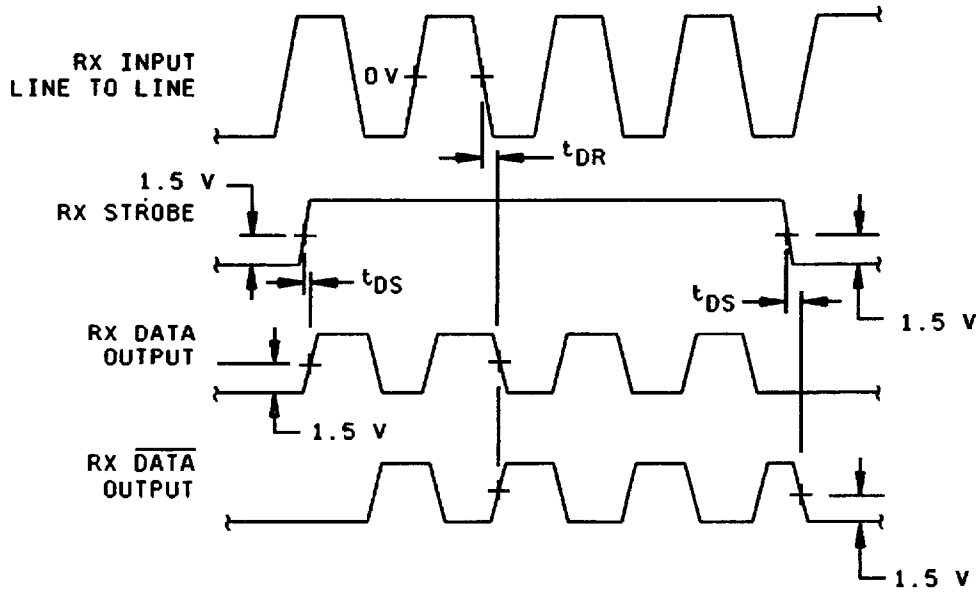
FIGURE 2. Terminal connections.



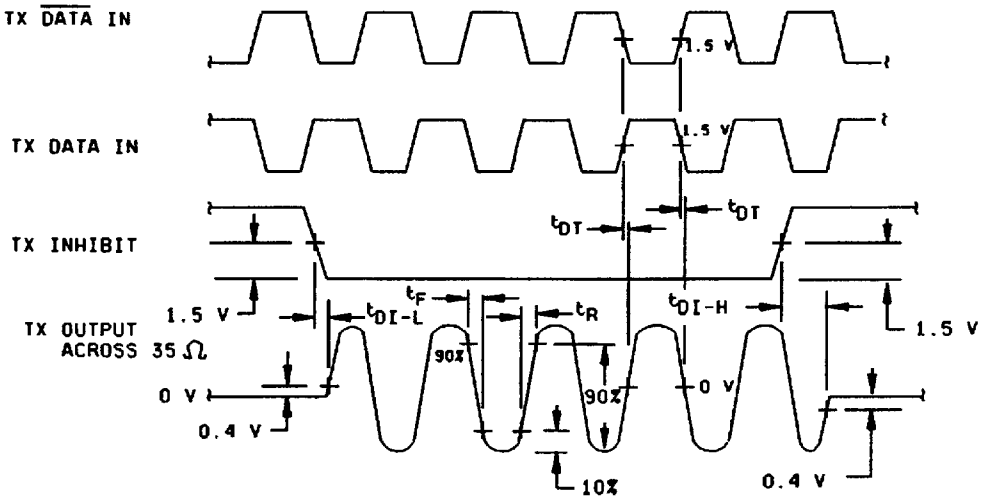
COMMON - MODE TEST

NOTE: Observe no transmission of data at RX DATA and RX $\overline{DATA}$.

FIGURE 3. Test circuit.



RECEIVER TIMING



TRANSMITTER TIMING

FIGURE 4. Timing waveforms.

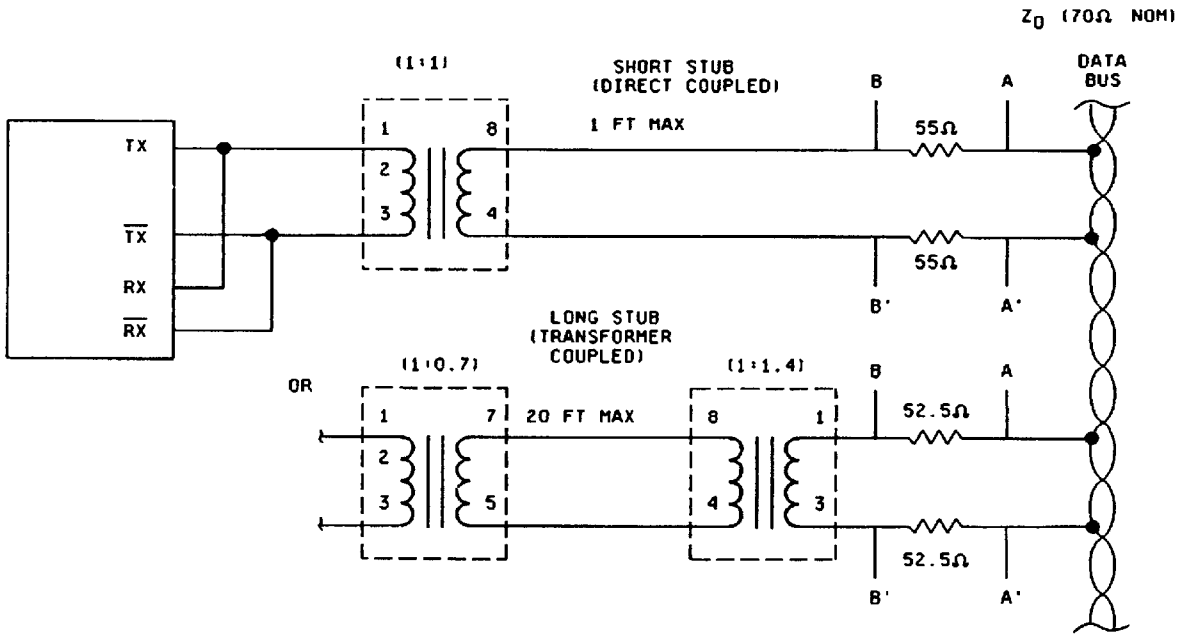


FIGURE 5. Coupling diagram.

TABLE II. Electrical test requirements.

MIL-H-38534 test requirements	Subgroups (in accordance with MIL-H-38534, group A test table)
Interim electrical parameters	1
Final electrical test parameters	1*, 2, 3, 4, 5, 6, 9, 10, 11
Group A test requirements	1, 2, 3, 4, 5, 6, 9, 10, 11
Group C end-point electrical parameters	1, 2, 3
MIL-STD-883, group E end-point electrical parameters for RHA devices	Subgroups ** (per method 5005, group A test table)

*PDA applies to subgroup 1.
**When applicable to this standardized military drawing, the subgroups shall be defined.

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 as follows:

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

b. Subgroups 7 and 8 shall be omitted.

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

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

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. 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.

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-H-38534 for RHA level being tested, and meet the postirradiation end-point electrical parameter limits as defined in table I at T_A = +25°C ±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-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-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-EC, telephone (513) 296-6047.

6.5 Comments. Comments on this drawing should be directed to DESC-EC, Dayton, Ohio 45444, or telephone (513) 296-5374.

6.6 One part - one part number system. The one part - one part number system described below has been developed to allow for transitions between identical generic devices covered by the three major microcircuit requirements documents (MIL-H-38534, MIL-I-38535, and 1.2.1 of MIL-STD-883) without the necessity for the generation of unique PIN's. The three military requirements documents represent different class levels, and previously when a device manufacturer upgraded military product from one class level to another, the benefits of the upgraded product were unavailable to the Original Equipment Manufacturer (OEM), that was contractually locked into the original unique PIN. By establishing a one part number system covering all three documents, the OEM can acquire to the highest class level available for a given generic device to meet system needs without modifying the original contract parts selection criteria.

Military documentation format	Example PIN under new system	Manufacturing source listing	Document listing
New MIL-H-38534 Standardized Military Drawings	5962-XXXXXZZ(H or K)YY	QML-38534	MIL-BUL-103
New MIL-I-38535 Standardized Military Drawings	5962-XXXXXZZ(Q or V)YY	QML-38535	MIL-BUL-103
New 1.2.1 of MIL-STD-883 Standardized Military Drawings	5962-XXXXXZZ(M)YY	MIL-BUL-103	MIL-BUL-103

6.7 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-ECT and have agreed to this drawing.