INTEGRATED CIRCUITS, SILICON MONOLITHIC,

QUAD EIA-422 LINE DRIVER WITH

3-STATE OUTPUTS,

BASED ON TYPES AM26LS31 AND 55ALS192

ESCC Detail Specification No. 9402/012

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FIGURES

APPENDICES (Applicable to specific Manufacturers only)

None.

1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for a silicon monolithic, low power, Quad EIA-422 Line Driver with 3-State Outputs, based on Types AM26LS31 and 55ALS192. It shall be read in conjunction with ESA/SCC Generic Specification No. 9000, the requirements of which are supplemented herein.

1.2 COMPONENT TYPE VARIANTS

Variants of the basic type integrated circuits specified herein, which are also covered by this specification, are given in Table 1(a).

1.3 MAXIMUM RATINGS

The maximum ratings, which shall not be exceeded at any time during use or storage, applicable to the integrated circuits specified herein, are as scheduled in Table 1(b).

1.4 PARAMETER DERATING INFORMATION

As per Figure 1.

1.5 PHYSICAL DIMENSIONS

As per Figure 2.

1.6 PIN ASSIGNMENT

As per Figure 3(a).

1.7 TRUTH TABLE

As per Figure 3(b).

1.8 CIRCUIT SCHEMATIC

As per Figure 3(c).

1.9 FUNCTIONAL DIAGRAM

As per Figure 3(d).

TABLE 1(a) - TYPE VARIANTS

VARIANT	BASED ON TYPE	CASE	FIGURE	LEAD MATERIAL AND/OR FINISH
01	AM26LS31	DIL	2(a)	G4
02	55ALS192	FLAT	2(b)	G4
03	55ALS192	DIL	2(c)	G4
04	55ALS192	CHIP CARRIER	2(d)	7
05	55ALS192	CHIP CARRIER	2(d)	4

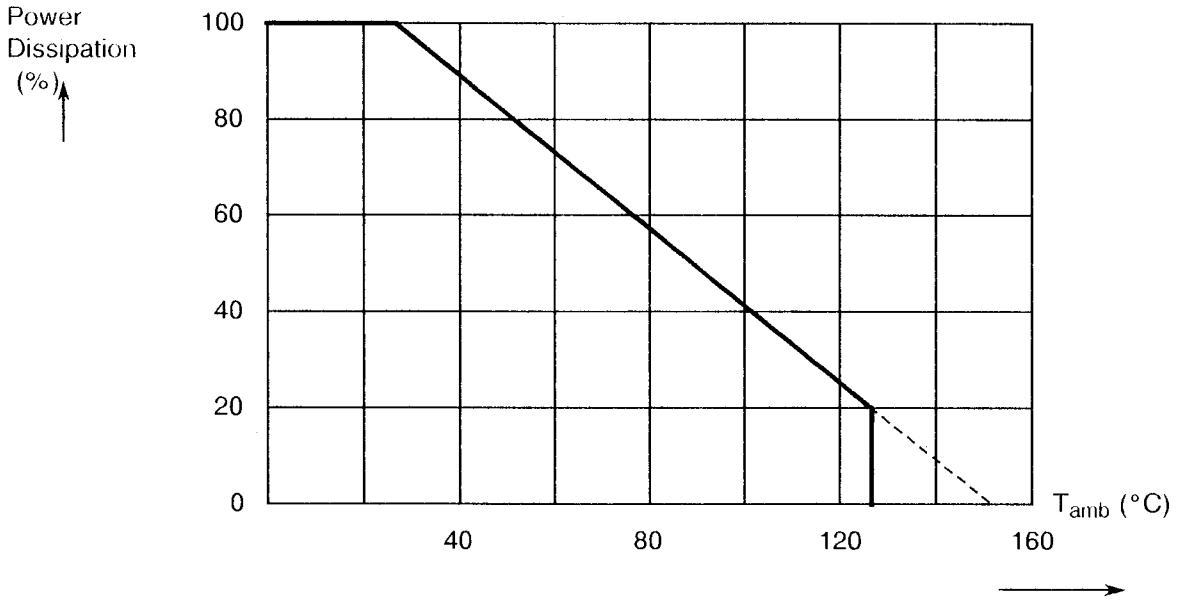
TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATINGS	UNIT	REMARKS
1	Supply Voltage	V_{CC}	7.0	V	-
2	Input Voltage	V_{IN}	7.0	V	-
3	Power Dissipation Variant 01 Variant 02 Variants 03 to 05	P_{tot}	 1.2 1.0 1.4	W	Note 1
4	Operating Temperature Range	T_{op}	– 55 to + 125	°C	T_{amb}
5	Storage Temperature Range	T_{stg}	– 65 to + 150	°C	-
6	Soldering Temperature For DIL For FP and CCP	T_{sol}	+ 300	°C	 Note 2 Note 3
7	Junction Temperature	T_J	+ 150	°C	-
8	Thermal Resistance Variant 01 Variant 02 Variants 03 to 05	$R_{TH\ (J-A)}$	 100 125 91	°C/W	

NOTES

1. At T_{amb} = +25°C. For derating at T_{amb} > +25°C, see Figure 1.
2. Duration 10 seconds maximum at a distance of not less than 1.5mm from the package and the same lead shall not be resoldered until 3 minutes have elapsed.
3. Duration 5 seconds maximum at a distance of not less than 1.5mm from the package and the same lead or terminal shall not be resoldered until 3 minutes have elapsed.

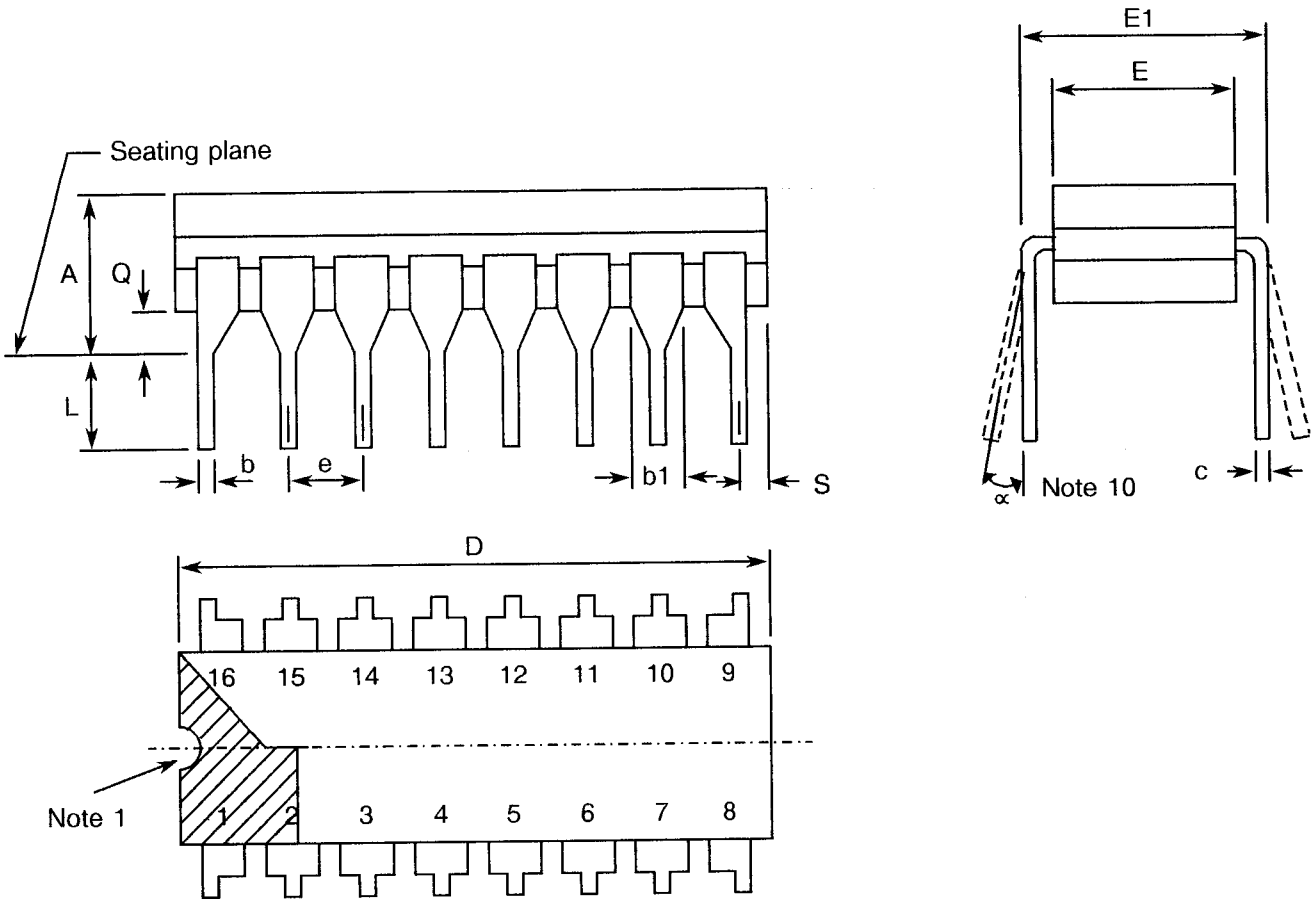
FIGURE 1 - PARAMETER DERATING INFORMATION



Total Device Dissipation versus Temperature

FIGURE 2 - PHYSICAL DIMENSIONS

FIGURE 2(a) - DUAL-IN-LINE PACKAGE, 16-PIN

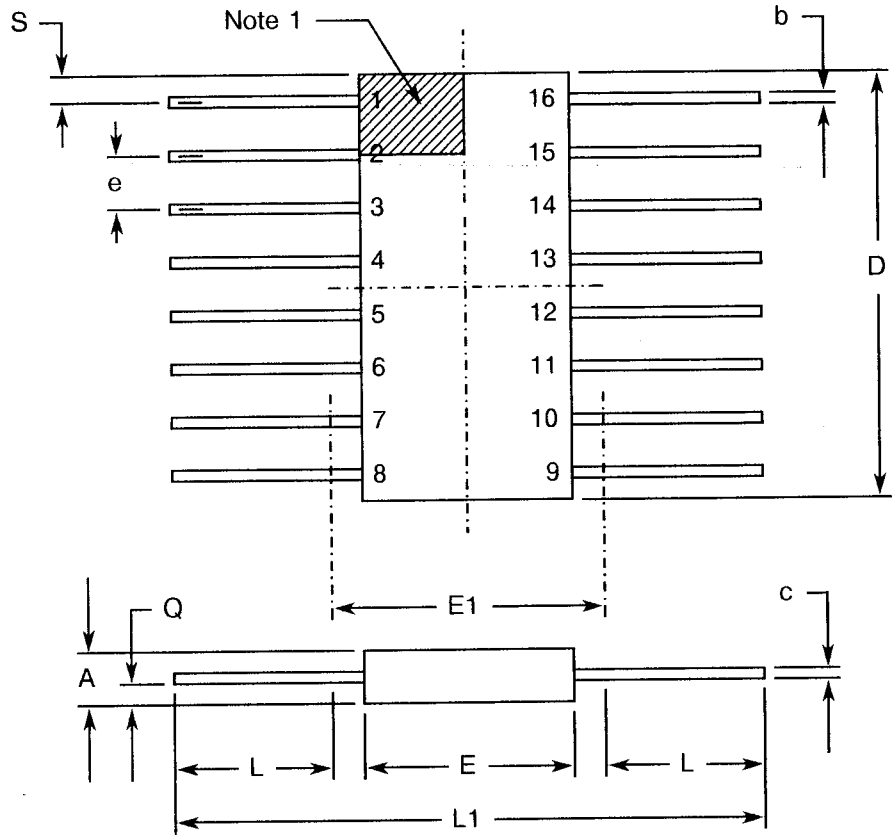


SYMBOL	MILLIMETRES		NOTES
	MIN	MAX	
A	-	5.08	
b	0.39	0.50	8
b1	1.40	1.65	8
c	0.21	0.38	8
D	19.05	19.95	4
E	6.10	7.49	4
E1	7.62 TYPICAL		
e	2.54 TYPICAL		6, 9
L	3.18	4.31	8
Q	0.51	1.01	3
S	0.40	1.10	7
α	0°	15°	10

NOTES: See Page 12.

FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

FIGURE 2(b) - FLAT PACKAGE, 16-PIN

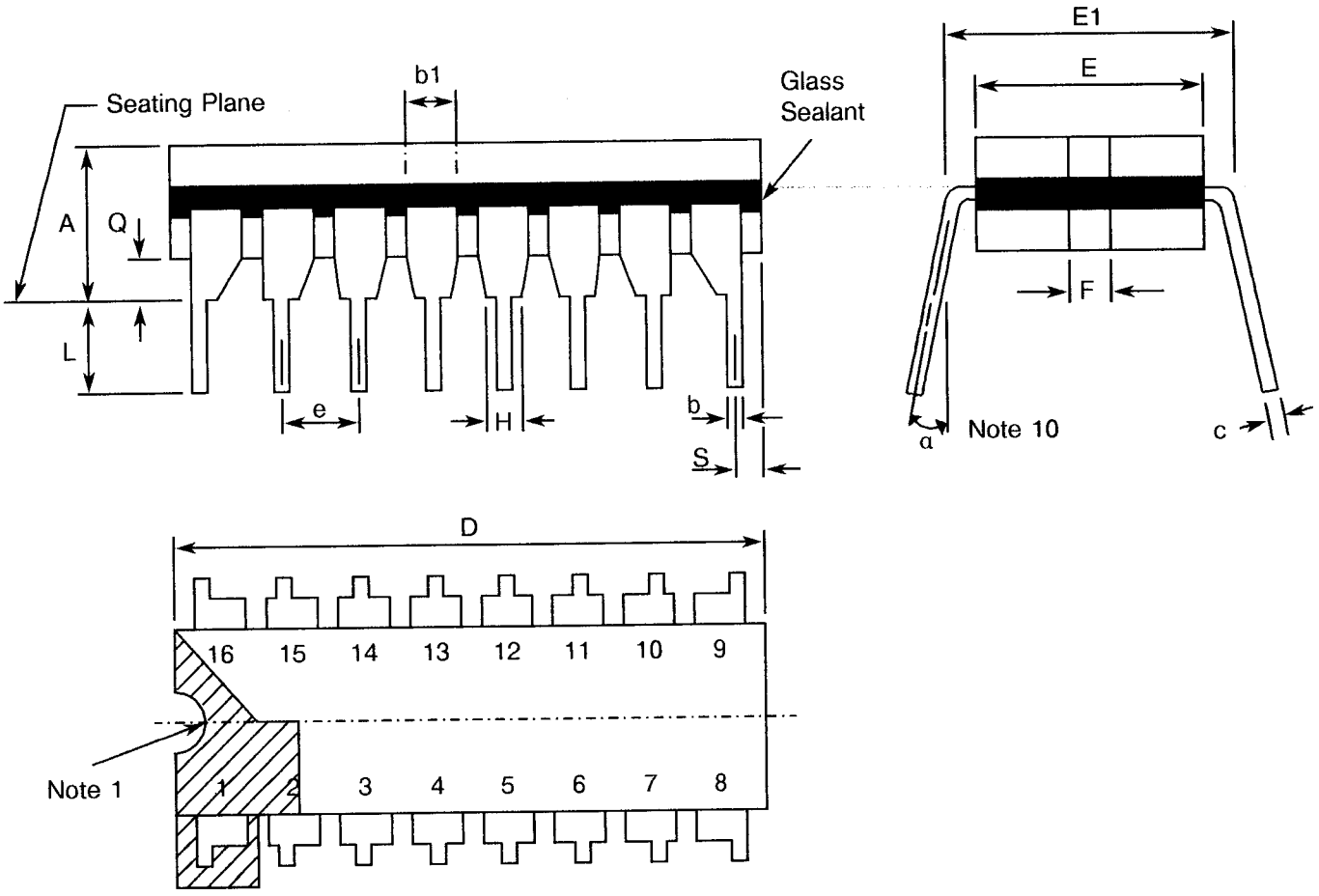


SYMBOL	MILLIMETRES		NOTES
	MIN	MAX	
A	1.27	2.03	
b	0.38	0.56	8
c	0.08	0.23	8
D	9.42	10.16	4
E	6.27	7.24	
E1	7.00 TYPICAL		4
e	1.27 TYPICAL		5, 9
L	7.87	8.89	8
L1	23.88	24.38	
Q	0.51	1.02	2
S	0.25	0.64	7

NOTES: See Page 12.

FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

FIGURE 2(c) - DUAL-IN-LINE PACKAGE, 16-PIN

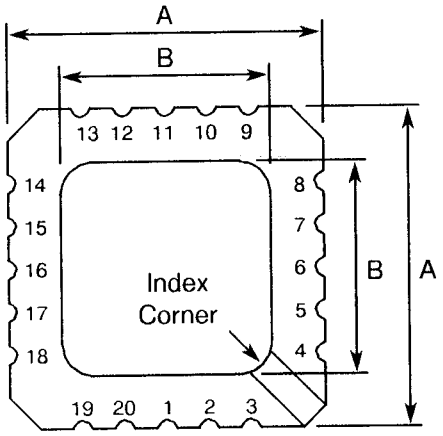


SYMBOL	MILLIMETRES		NOTES
	MIN	MAX	
A	-	5.08	
b	0.38	0.66	8
b1	-	1.78	8
c	0.20	0.44	8
D	19.18	19.94	4
E	6.22	7.62	4
E1	7.37	8.13	
e	2.54 TYPICAL		6, 9
F	1.27 TYPICAL		
H	0.76	-	
L	3.30	5.08	8
Q	0.51	-	3
S	0.38	1.27	7
α	0°	15°	10

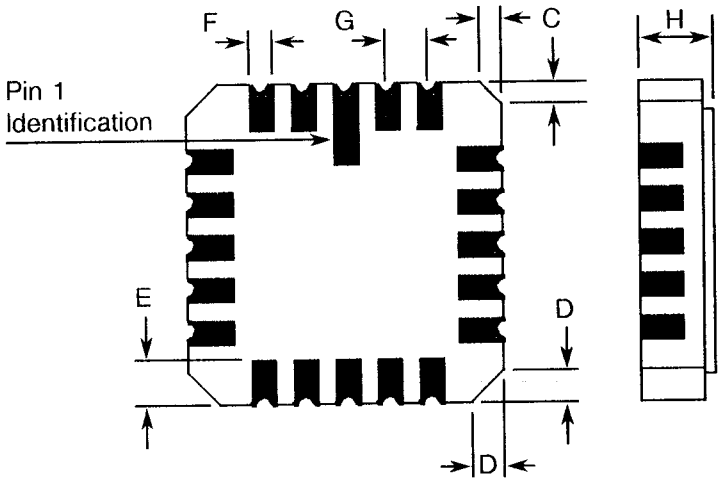
NOTES: See Page 12.

FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

FIGURE 2(d) - SQUARE CHIP CARRIER PACKAGE, 20-TERMINAL



20 TERMINAL



SYMBOL	MILLIMETRES		NOTES
	MIN	MAX	
A	8.69	9.09	
B	7.80	9.09	
C	0.25	0.51	11
D	0.89	1.14	12
E	1.14	1.40	8
F	0.56	0.71	8
G	1.27 TYPICAL		5, 9
H	1.63	2.54	

NOTES: See Page 12.

FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

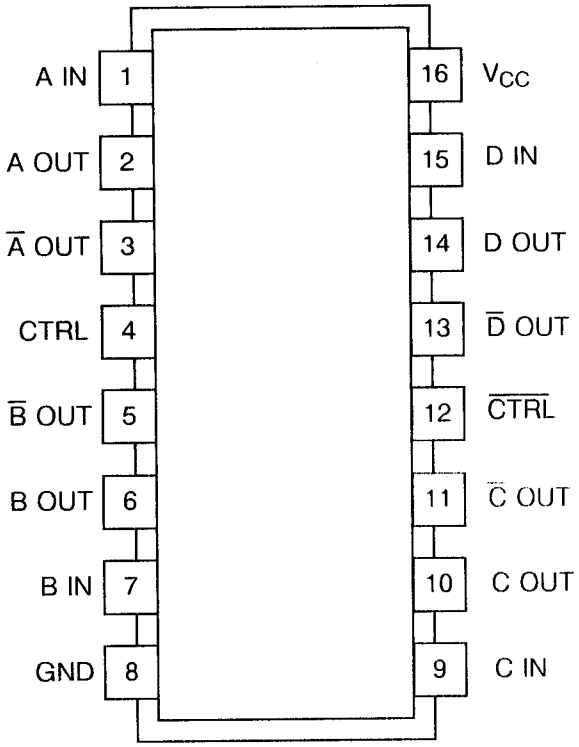
NOTES TO FIGURES 2(a) TO 2(d) INCLUSIVE

1. Index area; a notch or dot shall be located adjacent to Pin 1 and shall be within the shaded area shown. For chip carrier packages the index shall be as defined in Figure 2(d).
2. Dimension Q shall be measured at the point of exit of the lead from the body.
3. The dimension shall be measured from the seating plane to the base plane.
4. This dimension allows for off-centre lids, meniscus and glass overrun.
5. The true position pin or terminal spacing is 1.27mm between centrelines. Each pin or terminal centreline shall be located within ±0.13mm of its true longitudinal position relative to Pins 1 and the highest pin number.
6. The true position pin spacing is 2.54mm between centrelines. Each pin centreline shall be located within ±0.25mm of its true longitudinal position relative to Pins 1 and the highest pin number.
7. Applies to all 4 corners.
8. All leads or terminals.
9. 14 spaces for flat and dual-in-line packages.

   16 spaces for chip carrier packages.
10. Lead centre when α is 0°.
11. Index corner only - 2 dimensions.
12. 3 non-index corners - 6 dimensions.

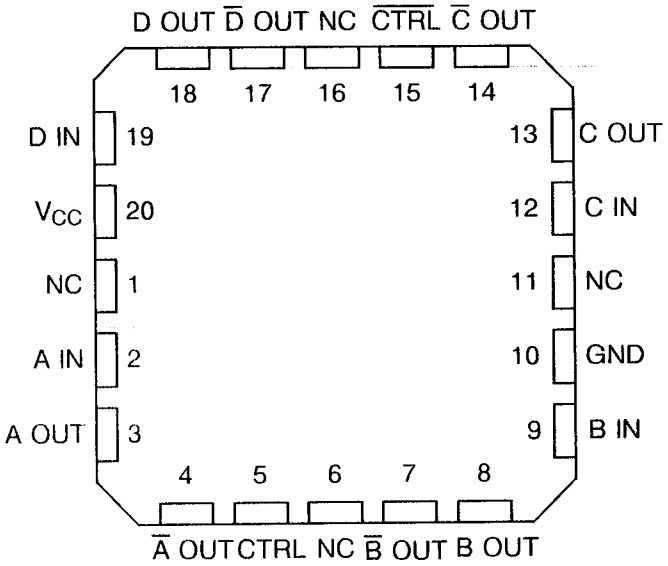
FIGURE 3(a) - PIN ASSIGNMENT

DUAL-IN-LINE AND FLAT PACKAGE



TOP VIEW

CHIP CARRIER PACKAGE



TOP VIEW

FLAT PACKAGE AND DUAL-IN-LINE TO CHIP CARRIER PIN ASSIGNMENT

FLAT PACKAGE AND DUAL-IN-LINE PIN OUTS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CHIP CARRIER PIN OUTS	2	3	4	5	7	8	9	10	12	13	14	15	17	18	19	20

FIGURE 3(b) - TRUTH TABLE (EACH DRIVER)

INPUT A	ENABLES		OUTPUT	
	CTRL	$\overline{CTRL}$	A	$\overline{A}$
H	H	X	H	L
L	H	X	L	H
H	X	L	H	L
L	X	L	L	H
X	L	H	Z	Z

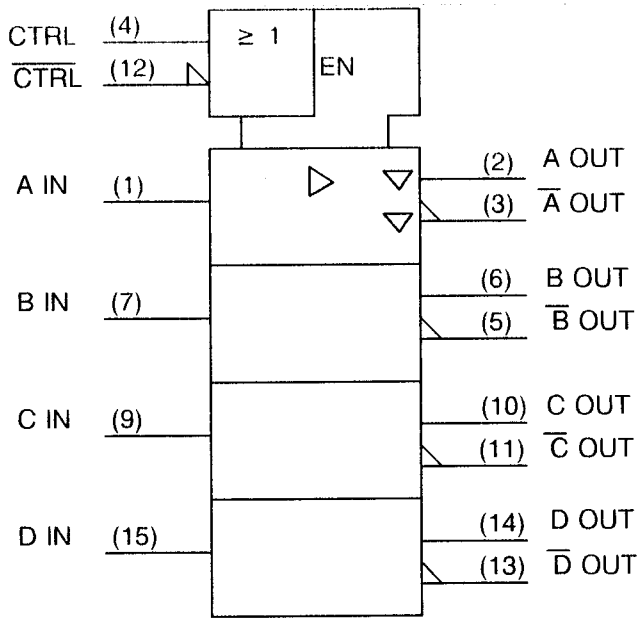
NOTES

1. Logic Level Definitions: L = Low Level, H = High Level, X = Irrelevant, Z = High Impedance.

FIGURE 3(c) - CIRCUIT SCHEMATIC

Not applicable.

FIGURE 3(d) - FUNCTIONAL DIAGRAM



2. APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:-

(a) ESA/SCC Generic Specification No. 9000 for Integrated Circuits.

(b) MIL-STD-883, Test Methods and Procedures for Micro-electronics.

3. TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESA/SCC Basic Specification No. 21300 shall apply. In addition, the following symbols are used:-

I_{CC} = Supply Current.
I_{OZH} = Off-State Output Current, High Level Applied.
I_{OZL} = Off-State Output Current, Low Level Applied.
I_{OS} = Output Short Circuit Current.
V_{IC} = Input Clamp Voltage.

4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the integrated circuits specified herein shall be as stated in this specification and ESA/SCC Generic Specification No. 9000 for Integrated Circuits. Deviations from the Generic Specification, applicable to this specification only, are listed in Para. 4.2.

Deviations from the applicable Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESA/SCC requirements and do not affect the components' reliability, are listed in the appendices attached to this specification.

4.2 DEVIATIONS FROM GENERIC SPECIFICATION

4.2.1 Deviations from Special In-process Controls

None.

4.2.2 Deviations from Final Production Tests (Chart II)

None.

4.2.3 Deviations from Burn-in Tests (Chart III)

(a) Para. 7.1.1(a), High Temperature Reverse Bias test and subsequent electrical measurements related to this test shall be omitted.

4.2.4 Deviations from Qualification Tests (Chart IV)

None.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

None.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the integrated circuits specified herein shall be checked. They shall conform to those shown in Figure 2.

4.3.2 Weight

The maximum weight of the integrated circuits specified herein shall be 2.2 grammes for the dual-in-line package, 0.7 grammes for the flat package and 0.6 grammes for the chip carrier package.

4.4 MATERIALS AND FINISHES

The materials and finishes shall be as specified herein. Where a definite material is not specified, a material which will enable the integrated circuits specified herein to meet the performance requirements of this specification shall be used. Acceptance or approval of any constituent material does not guarantee acceptance of the finished product.

4.4.1 Case

The case shall be hermetically sealed and have a metal body with hard glass seals or a ceramic body and the lids shall be welded, brazed, preform-soldered or glass frit-sealed.

4.4.2 Lead Material and Finish

For dual-in-line and flat packages, the material shall be either Type 'G' with Type '4' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500. For chip carrier packages, the finish shall be either Type '4' or Type '7' in accordance with the requirements of ESA/SCC Basic Specification No. 23500. (See Table 1(a) for Type Variants).

4.5 MARKING

4.5.1 General

The marking of all components delivered to this specification shall be in accordance with the requirements of ESA/SCC Basic Specification No. 21700. Each component shall be marked in respect of:-

(a) Lead Identification.

(b) The SCC Component Number.

(c) Traceability Information.

4.5.2 Lead Identification

For dual-in-line and flat packages, an index shall be located at the top of the package in the position defined in Note 1 to Figure 2 or, alternatively, a tab may be used to identify Pin No. 1. The pin numbering must be read with the index or tab on the left-hand side. For chip carrier packages, the index shall be as defined by Figure 2(d).

4.5.3 The SCC Component Number

Each component shall bear the SCC Component Number which shall be constituted and marked as follows:

940201201B

Detail Specification Number

Type Variant (see Table 1(a))

Testing Level (B or C, as applicable)

4.5.4 Traceability Information

Each component shall be marked in respect of traceability information in accordance with the requirements of ESA/SCC Basic Specification No. 21700.

4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured in respect of electrical characteristics are scheduled in Table 2. Unless otherwise specified, the measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.6.2 Electrical Measurements at High and Low Temperatures

The parameters to be measured at high and low temperatures are scheduled in Table 3. The measurements shall be performed at $T_{amb} = +125(+0-5)$ °C and $-55(+5-0)$ °C respectively.

4.6.3 Circuits for Electrical Measurements

Circuits for use in performing electrical measurements listed in Tables 2 and 3 of this specification are shown in Figure 4.

4.7 BURN-IN TESTS

4.7.1 Parameter Drift Values

The parameter drift values applicable to burn-in are specified in Table 4 of this specification. Unless otherwise stated, measurements shall be performed at $T_{amb} = +22 \pm 3$ °C. The parameter drift values (Δ) applicable to the parameters scheduled, shall not be exceeded. In addition to these drift value requirements, the appropriate limit value specified for a given parameter in Table 2 shall not be exceeded.

4.7.2 Conditions for H.T.R.B. Burn-in

Not applicable.

4.7.3 Conditions for Power Burn-in

The requirements for power burn-in are specified in Section 7 of ESA/SCC Generic Specification No. 9000. The conditions for power burn-in shall be as specified in Table 5 of this specification.

4.7.4 Electrical Circuit for H.T.R.B. Burn-in

Not applicable.

4.7.5 Electrical Circuit for Power Burn-in

A circuit for use in performing the power burn-in tests is shown in Figure 5 of this specification.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - d.c. PARAMETERS

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD 883	TEST FIG.	TEST CONDITIONS (PINS UNDER TEST D/F = DIP AND FP C = CCP)	LIMITS		UNIT
						MIN	MAX	
1 to 48	Functional Test	-	-	4(a)	V_{CC} = 5.0V Verify Truth Table with Load. Note 1	-	-	-
49	Supply Current	I_{CC}	3005	4(b)	V_{IN} = 0V, V_{CC} = 5.5V VCTRL = 0V, $\overline{VCTRL}$ = 3.0V (Pin D/F 16) (Pin C 20)	-	80	mA
50 to 55	Input Current High Level 1 (Max. Input Voltage)	I_{IH1}	3010	4(c)	V_{IN} = 7.0V, V_{CC} = 4.5V VCTRL = $\overline{VCTRL}$ = 7.0V (Pins D/F 1-4-7-9-12-15) (Pins C 2-5-9-12-15-19)	-	100	µA
56 to 61	Input Current High Level 2 (Max. Input Voltage)	I_{IH2}	3010	4(c)	V_{IN} = 7.0V, V_{CC} = 5.5V VCTRL = $\overline{VCTRL}$ = 7.0V (Pins D/F 1-4-7-9-12-15) (Pins C 2-5-9-12-15-19)	-	100	µA
62 to 67	Input Current High Level 3	I_{IH3}	3010	4(c)	V_{IN} = 2.7V, V_{CC} = 4.5V VCTRL = $\overline{VCTRL}$ = 2.7V (Pins D/F 1-4-7-9-12-15) (Pins C 2-5-9-12-15-19)	-	20	µA
68 to 73	Input Current High Level 4	I_{IH4}	3010	4(c)	V_{IN} = 2.7V, V_{CC} = 5.5V VCTRL = $\overline{VCTRL}$ = 2.7V (Pins D/F 1-4-7-9-12-15) (Pins C 2-5-9-12-15-19)	-	20	µA
74 to 77	Input Current Low Level 1	I_{IL1}	3009	4(c)	V_{IN} = 0.4V, V_{CC} = 5.5V VCTRL = $\overline{VCTRL}$ = 2.0V (Pins D/F 1-7-9-15) (Pins C 2-9-12-19)	-	−360	µA
78 to 79	Input Current Low Level 2	I_{IL2}	3009	4(c)	V_{IN} = 2.0V, V_{CC} = 5.5V VCTRL = $\overline{VCTRL}$ = 0.4V (Pins D/F 4-12) (Pins C 5-15)	-	−360	µA
80 to 83	Off-State Output Current 1 (Low Level Applied)	I_{OZL1}	3006	4(d)	V_{IN} = 2.4V, V_{CC} = 4.5V VCTRL = 0.8V, $\overline{VCTRL}$ = 2.0V V_{OUT} = 0.5V (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	-	−20	µA

NOTES: See Page 23.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - d.c. PARAMETERS (CONT'D)

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD 883	TEST FIG.	TEST CONDITIONS (PINS UNDER TEST D/F = DIP AND FP C = CCP)	LIMITS		UNIT
						MIN	MAX	
84 to 87	Off-State Output Current 2 (Low Level Applied)	I_{OZL2}	3006	4(d)	V_{IN} = 0.4V, V_{CC} = 4.5V VCTRL = 0.8V, $\overline{VCTRL}$ = 2.0V $\overline{V_{OUT}}$ = 0.5V (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	-	− 20	µA
88 to 91	Off-State Output Current 1 (High Level Applied)	I_{OZH1}	3006	4(d)	V_{IN} = 0.4V, V_{CC} = 4.5V VCTRL = 0.8V, $\overline{VCTRL}$ = 2.0V V_{OUT} = 2.5V (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	-	20	µA
92 to 95	Off-State Output Current 2 (High Level Applied)	I_{OZH2}	3006	4(d)	V_{IN} = 2.4V, V_{CC} = 4.5V VCTRL = 0.8V, $\overline{VCTRL}$ = 2.0V $\overline{V_{OUT}}$ = 2.5V (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	-	20	µA
96 to 99	Off-State Output Current 3 (Low Level Applied)	I_{OZL3}	3006	4(d)	V_{IN} = 2.4V, V_{CC} = 5.5V VCTRL = 0.8V, $\overline{VCTRL}$ = 2.0V V_{OUT} = 0.5V (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	-	− 20	µA
100 to 103	Off-State Output Current 4 (Low Level Applied)	I_{OZL4}	3006	4(d)	V_{IN} = 0.4V, V_{CC} = 5.5V VCTRL = 0.8V, $\overline{VCTRL}$ = 2.0V $\overline{V_{OUT}}$ = 0.5V (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	-	− 20	µA
104 to 107	Off-State Output Current 3 (High Level Applied)	I_{OZH3}	3006	4(d)	V_{IN} = 0.4V, V_{CC} = 5.5V VCTRL = 0.8V, $\overline{VCTRL}$ = 2.0V V_{OUT} = 2.5V (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	-	20	µA
108 to 111	Off-State Output Current 4 (High Level Applied)	I_{OZH4}	3006	4(d)	V_{IN} = 2.4V, V_{CC} = 5.5V VCTRL = 0.8V, $\overline{VCTRL}$ = 2.0V $\overline{V_{OUT}}$ = 2.5V (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	-	20	µA
112 to 115	Output Voltage Low Level 1	V_{OL1}	3007	4(e)	V_{IN} = 0.8V, V_{CC} = 4.5V I_{OL} = 20mA VCTRL = $\overline{VCTRL}$ = 2.0V (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	-	0.5	V

NOTES: See Page 23.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - d.c. PARAMETERS (CONT'D)

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD 883	TEST FIG.	TEST CONDITIONS (PINS UNDER TEST D/F = DIP AND FP C = CCP)	LIMITS		UNIT
						MIN	MAX	
116 to 119	Output Voltage Low Level 2	V_{OL2}	3007	4(e)	V_{IN} = 2.0V, V_{CC} = 4.5V I_{OL} = 20mA VCTRL = $\overline{VCTRL}$ = 2.0V (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	-	0.5	V
120 to 123	Output Voltage High Level 1	V_{OH1}	3006	4(e)	V_{IN} = 2.0V, V_{CC} = 4.5V I_{OH} = − 20mA VCTRL = $\overline{VCTRL}$ = 0.8V (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	2.5	-	V
124 to 127	Output Voltage High Level 2	V_{OH2}	3006	4(e)	V_{IN} = 0.8V, V_{CC} = 4.5V I_{OH} = − 20mA VCTRL = $\overline{VCTRL}$ = 0.8V (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	2.5	-	V
128 to 131	Output Short Circuit Current 1	I_{OS1}	3011	4(f)	V_{IN} = 2.0V, V_{CC} = 5.5V VCTRL = $\overline{VCTRL}$ = 2.0V V_{OUT} = 0V Note 2 (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	− 30	− 150	mA
132 to 135	Output Short Circuit Current 2	I_{OS2}	3011	4(f)	V_{IN} = 0.8V, V_{CC} = 5.5V VCTRL = $\overline{VCTRL}$ = 2.0V V_{OUT} = 0V Note 2 (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	− 30	− 150	mA
136 to 141	Input Clamp Voltage	V_{IC}	3009	4(g)	I_{IN} = − 18mA, V_{CC} = 4.5V (Pins D/F 1-4-7-9-12-15) (Pins C 2-5-9-12-15-19)	-	− 1.5	V

NOTES: See Page 23.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - a.c. PARAMETERS

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD 883	TEST FIG.	TEST CONDITIONS (PINS UNDER TEST D/F = DIP AND FP C = CCP) (NOTE 3)	LIMITS		UNIT
						MIN	MAX	
142 to 145	Propagation Delay High to Low 1	t_{PHL1}	3004	4(h)	V_{IN} = PIA $\overline{V_{OUT}}$ = POA All other V_{IN} pins = 3.0V VCTRL = 3.0V, $\overline{VCTRL}$ = 0V (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	-	20	ns
146 to 149	Propagation Delay High to Low 2	t_{PHL2}	3004	4(h)	V_{IN} = PIA V_{OUT} = POB All other V_{IN} pins = 0V VCTRL = 3.0V, $\overline{VCTRL}$ = 0V (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	-	20	ns
150 to 153	Propagation Delay Low to High 1	t_{PLH1}	3004	4(h)	$\overline{V_{IN}}$ = PIA $\overline{V_{OUT}}$ = POA All other V_{IN} pins = 3.0V VCTRL = 3.0V, $\overline{VCTRL}$ = 0V (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	-	20	ns
154 to 157	Propagation Delay Low to High 2	t_{PLH2}	3004	4(h)	V_{IN} = PIA V_{OUT} = POB All other V_{IN} pins = 0V VCTRL = 3.0V, $\overline{VCTRL}$ = 0V (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	-	20	ns
158 to 161	Output Enable Time to High Level 1	t_{PZH1}	3003	4(i)	$\overline{V_{IN}}$ = 0V $\overline{V_{OUT}}$ = POF VCTRL = PIC, $\overline{VCTRL}$ = 3.0V (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	-	40	ns
162 to 165	Output Enable Time to High Level 2	t_{PZH2}	3003	4(i)	V_{IN} = 3.0V V_{OUT} = POF VCTRL = PIC, $\overline{VCTRL}$ = 3.0V (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	-	40	ns
166 to 169	Output Enable Time to Low Level 1	t_{PZL1}	3003	4(i)	$\overline{V_{IN}}$ = 3.0V $\overline{V_{OUT}}$ = POE All other V_{IN} pins = 0V VCTRL = PIC, $\overline{VCTRL}$ = 3.0V (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	-	45	ns

NOTES: See Page 23.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - a.c. PARAMETERS (CONT'D)

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD 883	TEST FIG.	TEST CONDITIONS (PINS UNDER TEST D/F = DIP AND FP C = CCP) (NOTE 3)	LIMITS		UNIT
						MIN	MAX	
170 to 173	Output Enable Time to Low Level 2	t_{PZL2}	3003	4(i)	V_{IN} = 0V V_{OUT} = POE VCTRL = PIC, $\overline{VCTRL}$ = 3.0V (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	-	45	ns
174 to 177	Output Disable Time from High Level 1	t_{PHZ1}	3003	4(i)	V_{IN} = 0V V_{OUT} = POC VCTRL = PIB, $\overline{VCTRL}$ = 3.0V (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	-	30	ns
178 to 181	Output Disable Time from High Level 2	t_{PHZ2}	3003	4(i)	V_{IN} = 3.0V V_{OUT} = POC VCTRL = PIB, $\overline{VCTRL}$ = 3.0V (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	-	30	ns
182 to 185	Output Disable Time from Low Level 1	t_{PLZ1}	3003	4(i)	V_{IN} = 3.0V $\overline{V_{OUT}}$ = POD All other V_{IN} pins = 0V VCTRL = PIB, $\overline{VCTRL}$ = 3.0V (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	-	35	ns
186 to 189	Output Disable Time from Low Level 2	t_{PLZ2}	3003	4(i)	V_{IN} = 0V V_{OUT} = POD VCTRL = PIB, $\overline{VCTRL}$ = 3.0V (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	-	35	ns
190	Output SKEW1	SKEW1	-	4(h)	Subtract t_{PLH} (Pins D/F 1 to 2) (Pins C 2 to 3) from t_{PHL} (Pins D/F 1 to 3) (Pins C 2 to 4)	−6.0	6.0	ns
191	Output SKEW2	SKEW2	-	4(h)	Subtract t_{PLH} (Pins D/F 7 to 6) (Pins C 9 to 8) from t_{PHL} (Pins D/F 7 to 5) (Pins C 9 to 7)	−6.0	6.0	ns

NOTES: See Page 23.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - a.c. PARAMETERS (CONT'D)

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD 883	TEST FIG.	TEST CONDITIONS (PINS UNDER TEST D/F = DIP AND FP C = CCP) (NOTE 3)	LIMITS		UNIT
						MIN	MAX	
192	Output SKEW3	SKEW3	-	4(h)	Subtract t_{PLH} (Pins D/F 9 to 10) (Pins C 12 to 13) from t_{PHL} (Pins D/F 9 to 11) (Pins C 12 to 14)	−6.0	6.0	ns
193	Output SKEW4	SKEW4	-	4(h)	Subtract t_{PLH} (Pins D/F 15 to 14) (Pins C 19 to18) from t_{PHL} (Pins D/F 15 to 13) (Pins C 19 to 17)	−6.0	6.0	ns
194	Output SKEW5	SKEW5	-	4(h)	Subtract t_{PHL} (Pins D/F 1 to 2) (Pins C 2 to 3) from t_{PLH} (Pins D/F 1 to 3) (Pins C 2 to 4)	−6.0	6.0	ns
195	Output SKEW6	SKEW6	-	4(h)	Subtract t_{PHL} (Pins D/F 7 to 6) (Pins C 9 to 8) from t_{PLH} (Pins D/F 7 to 5) (Pins C 9 to 7)	−6.0	6.0	ns
196	Output SKEW7	SKEW7	-	4(h)	Subtract t_{PHL} (Pins D/F 9 to 10) (Pins C 12 to 13) from t_{PLH} (Pins D/F 9 to 11) (Pins C 12 to 14)	−6.0	6.0	ns
197	Output SKEW8	SKEW8	-	4(h)	Subtract t_{PHL} (Pins D/F 15 to 14) (Pins C 19 to 18) from t_{PLH} (Pins D/F 15 to 13) (Pins C 19 to 17)	−6.0	6.0	ns

NOTES

1. Go-no-go test with $V_{IL} \leq 0.5V$, $2.5V \leq V_{IH} \leq 3.0V$.
   $1.3V < \text{Trip point} < 1.6V$.
   $50\mu A < I_L < 300\mu A$.
2. Only one output may be shorted at a time and only for 1 second maximum.
3. V_{CC} = 5.0V.

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD 883	TEST FIG.	TEST CONDITIONS (PINS UNDER TEST D/F = DIP AND FP C = CCP)	LIMITS		UNIT
						MIN	MAX	
1 to 48	Functional Test	-	-	4(a)	V_{CC} = 5.0V Verify Truth Table with Load. Note 1	-	-	-
49	Supply Current	I_{CC}	3005	4(b)	V_{IN} = 0V, V_{CC} = 5.5V VCTRL = 0V, $\overline{VCTRL}$ = 3.0V (Pin D/F 16) (Pin C 20)	-	80	mA
50 to 55	Input Current High Level 1 (Max. Input Voltage)	I_{IH1}	3010	4(c)	V_{IN} = 7.0V, V_{CC} = 4.5V VCTRL = $\overline{VCTRL}$ = 7.0V (Pins D/F 1-4-7-9-12-15) (Pins C 2-5-9-12-15-19)	-	100	µA
56 to 61	Input Current High Level 2 (Max. Input Voltage)	I_{IH2}	3010	4(c)	V_{IN} = 7.0V, V_{CC} = 5.5V VCTRL = $\overline{VCTRL}$ = 7.0V (Pins D/F 1-4-7-9-12-15) (Pins C 2-5-9-12-15-19)	-	100	µA
62 to 67	Input Current High Level 3	I_{IH3}	3010	4(c)	V_{IN} = 2.7V, V_{CC} = 4.5V VCTRL = $\overline{VCTRL}$ = 2.7V (Pins D/F 1-4-7-9-12-15) (Pins C 2-5-9-12-15-19)	-	20	µA
68 to 73	Input Current High Level 4	I_{IH4}	3010	4(c)	V_{IN} = 2.7V, V_{CC} = 5.5V VCTRL = $\overline{VCTRL}$ = 2.7V (Pins D/F 1-4-7-9-12-15) (Pins C 2-5-9-12-15-19)	-	20	µA
74 to 77	Input Current Low Level 1	I_{IL1}	3009	4(c)	V_{IN} = 0.4V, V_{CC} = 5.5V VCTRL = $\overline{VCTRL}$ = 2.0V (Pins D/F 1-7-9-15) (Pins C 2-9-12-19)	-	−360	µA
78 to 79	Input Current Low Level 2	I_{IL2}	3009	4(c)	V_{IN} = 2.0V, V_{CC} = 5.5V VCTRL = $\overline{VCTRL}$ = 0.4V (Pins D/F 4-12) (Pins C 5-15)	-	−360	µA
80 to 83	Off-State Output Current 1 (Low Level Applied)	I_{OZL1}	3006	4(d)	V_{IN} = 2.4V, V_{CC} = 4.5V VCTRL = 0.8V, $\overline{VCTRL}$ = 2.0V V_{OUT} = 0.5V (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	-	−20	µA

NOTES: See Page 23.

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES (CONT'D)

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD 883	TEST FIG.	TEST CONDITIONS (PINS UNDER TEST D/F = DIP AND FP C = CCP)	LIMITS		UNIT
						MIN	MAX	
84 to 87	Off-State Output Current 2 (Low Level Applied)	I_{OZL2}	3006	4(d)	V_{IN} = 0.4V, V_{CC} = 4.5V VCTRL = 0.8V, $\overline{VCTRL}$ = 2.0V $\overline{V_{OUT}}$ = 0.5V (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	−20	-	µA
88 to 91	Off-State Output Current 1 (High Level Applied)	I_{OZH1}	3006	4(d)	V_{IN} = 0.4V, V_{CC} = 4.5V VCTRL = 0.8V, $\overline{VCTRL}$ = 2.0V V_{OUT} = 2.5V (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	-	20	µA
92 to 95	Off-State Output Current 2 (High Level Applied)	I_{OZH2}	3006	4(d)	V_{IN} = 2.4V, V_{CC} = 4.5V VCTRL = 0.8V, $\overline{VCTRL}$ = 2.0V $\overline{V_{OUT}}$ = 2.5V (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	-	20	µA
96 to 99	Off-State Output Current 3 (Low Level Applied)	I_{OZL3}	3006	4(d)	V_{IN} = 2.4V, V_{CC} = 5.5V VCTRL = 0.8V, $\overline{VCTRL}$ = 2.0V V_{OUT} = 0.5V (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	-	−20	µA
100 to 103	Off-State Output Current 4 (Low Level Applied)	I_{OZL4}	3006	4(d)	V_{IN} = 0.4V, V_{CC} = 5.5V VCTRL = 0.8V, $\overline{VCTRL}$ = 2.0V $\overline{V_{OUT}}$ = 0.5V (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	-	−20	µA
104 to 107	Off-State Output Current 3 (High Level Applied)	I_{OZH3}	3006	4(d)	V_{IN} = 0.4V, V_{CC} = 5.5V VCTRL = 0.8V, $\overline{VCTRL}$ = 2.0V V_{OUT} = 2.5V (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	-	20	µA
108 to 111	Off-State Output Current 4 (High Level Applied)	I_{OZH4}	3006	4(d)	V_{IN} = 2.4V, V_{CC} = 5.5V VCTRL = 0.8V, $\overline{VCTRL}$ = 2.0V $\overline{V_{OUT}}$ = 2.5V (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	-	20	µA
112 to 115	Output Voltage Low Level 1	V_{OL1}	3007	4(e)	V_{IN} = 0.8V, V_{CC} = 4.5V I_{OL} = 20mA VCTRL = $\overline{VCTRL}$ = 2.0V (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	-	0.5	V

NOTES: See Page 23.

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES (CONT'D)

No.	CHARACTERISTICS	SYMBOL	TEST METHOD MIL-STD 883	TEST FIG.	TEST CONDITIONS (PINS UNDER TEST D/F = DIP AND FP C = CCP)	LIMITS		UNIT
						MIN	MAX	
116 to 119	Output Voltage Low Level 2	V_{OL1}	3007	4(e)	V_{IN} = 2.0V, V_{CC} = 4.5V I_{OL} = 20mA VCTRL = $\overline{VCTRL}$ = 2.0V (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	-	0.5	V
120 to 123	Output Voltage High Level 1	V_{OH1}	3006	4(e)	V_{IN} = 2.0V, V_{CC} = 4.5V I_{OH} = − 20mA VCTRL = $\overline{VCTRL}$ = 0.8V (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	2.5	-	V
124 to 127	Output Voltage High Level 2	V_{OH2}	3006	4(e)	V_{IN} = 0.8V, V_{CC} = 4.5V I_{OH} = − 20mA VCTRL = $\overline{VCTRL}$ = 0.8V (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	2.5	-	V
128 to 131	Output Short Circuit Current 1	I_{OS1}	3011	4(f)	V_{IN} = 2.0V, V_{CC} = 5.5V VCTRL = $\overline{VCTRL}$ = 2.0V V_{OUT} = 0V Note 2 (Pins D/F 2-6-10-14) (Pins C 3-8-13-18)	− 30	− 150	mA
132 to 135	Output Short Circuit Current 2	I_{OS2}	3011	4(f)	V_{IN} = 0.8V, V_{CC} = 5.5V VCTRL = $\overline{VCTRL}$ = 2.0V V_{OUT} = 0V Note 2 (Pins D/F 3-5-11-13) (Pins C 4-7-14-17)	− 30	− 150	mA
136 to 141	Input Clamp Voltage	V_{IC}	3009	4(g)	I_{IN} = − 18mA, V_{CC} = 4.5V (Pins D/F 1-4-7-9-12-15) (Pins C 2-5-9-12-15-19)	-	− 1.5	V

NOTES: See Page 23.

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

FIGURE 4(a) - FUNCTIONAL TEST

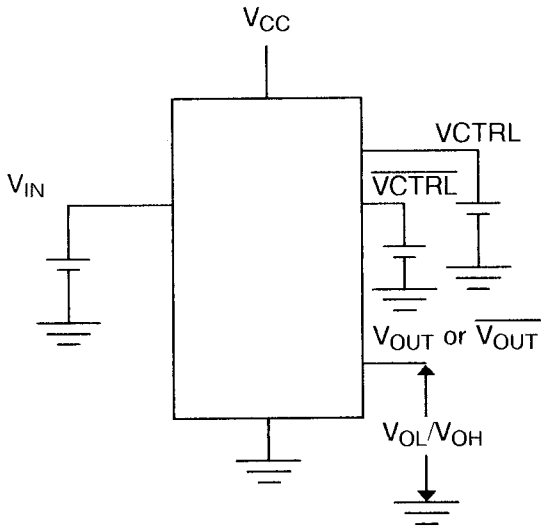


FIGURE 4(b) - SUPPLY CURRENT

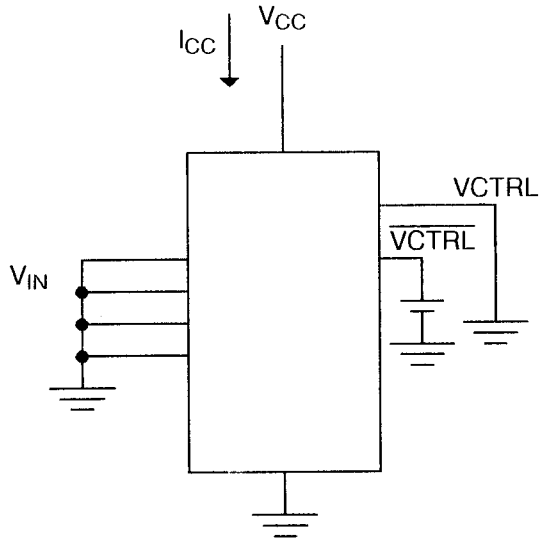
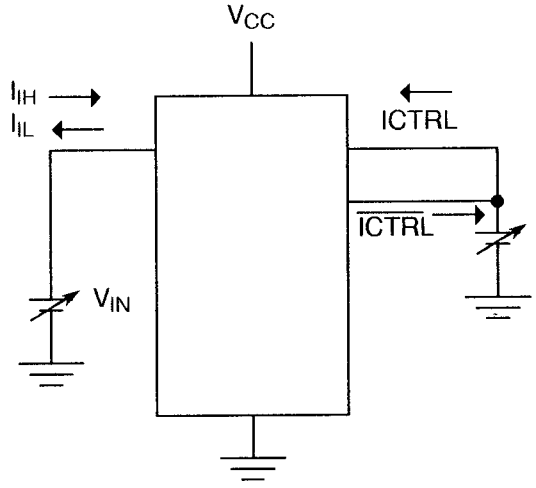


FIGURE 4(c) - INPUT CURRENT

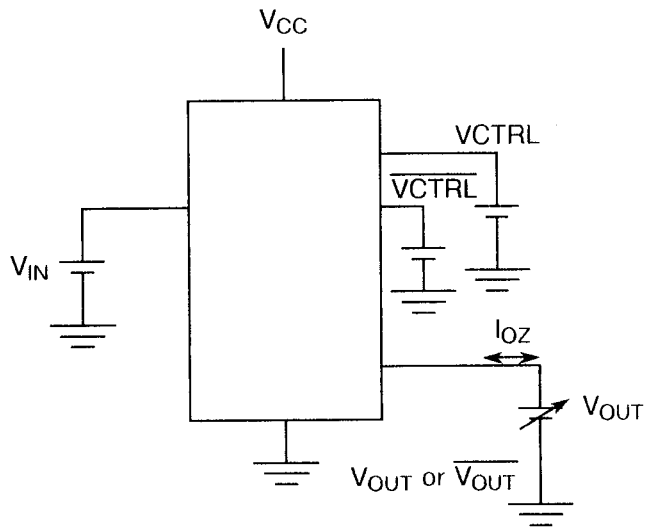


NOTES

1. Each input to be tested separately.

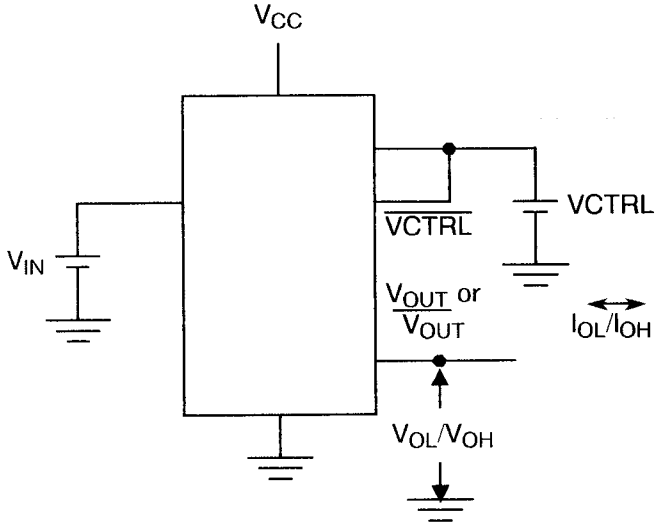
FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS (CONTINUED)

FIGURE 4(d) - OFF-STATE OUTPUT CURRENT



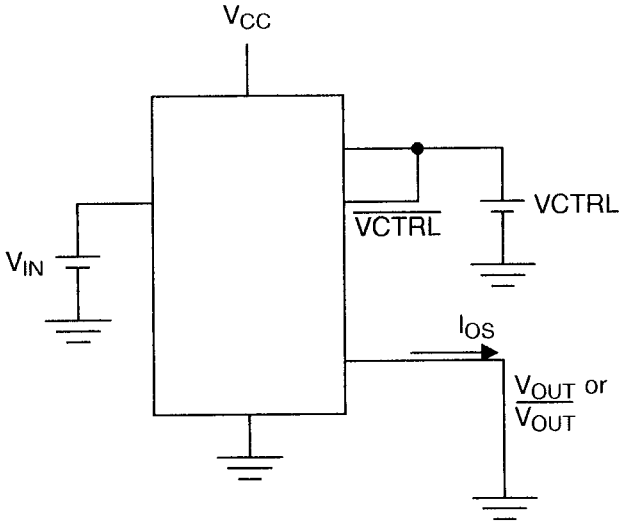
NOTES
1. Each output to be tested separately.

FIGURE 4(e) - OUTPUT LOW LEVEL/HIGH LEVEL VOLTAGE



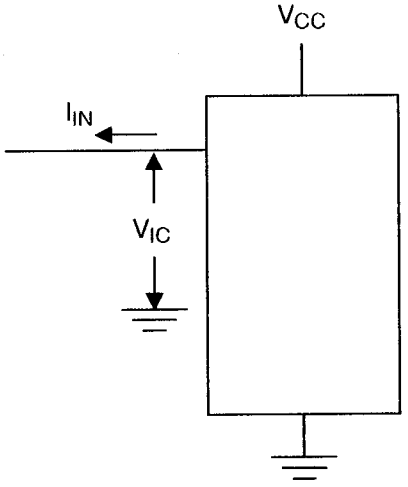
NOTES
1. Each output to be tested separately.

FIGURE 4(f) - OUTPUT SHORT CIRCUIT CURRENT



NOTES
1. Each output to be tested separately.

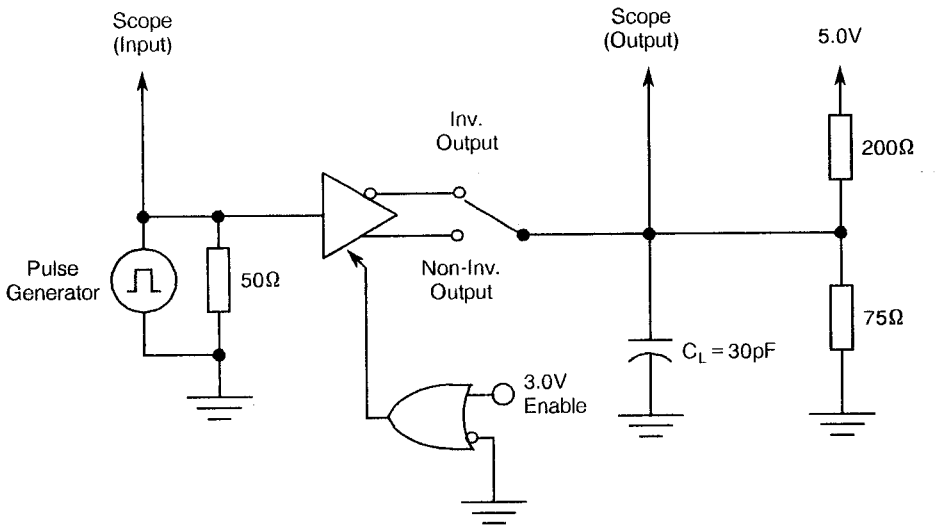
FIGURE 4(g) - INPUT CLAMP VOLTAGE



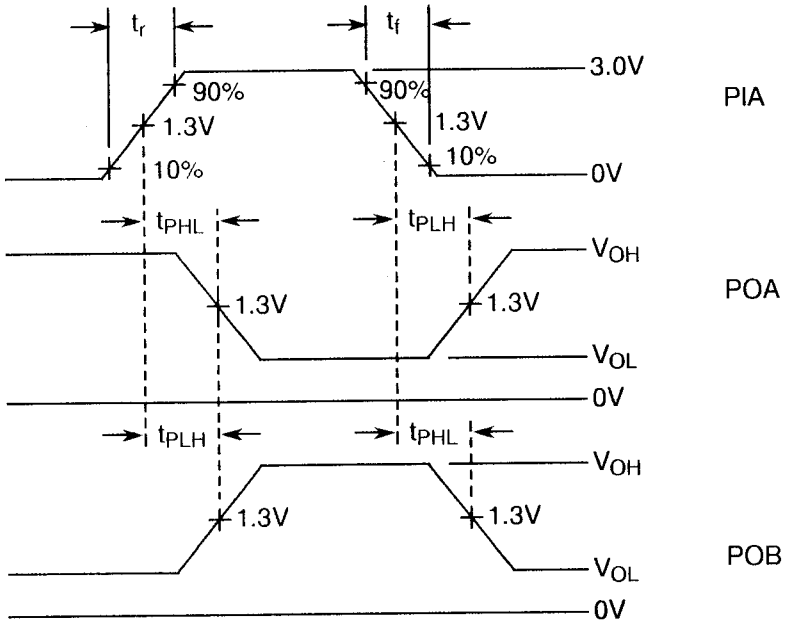
NOTES
1. Each input to be tested separately.

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS (CONTINUED)

FIGURE 4(h) - PROPAGATION DELAY



VOLTAGE WAVEFORMS

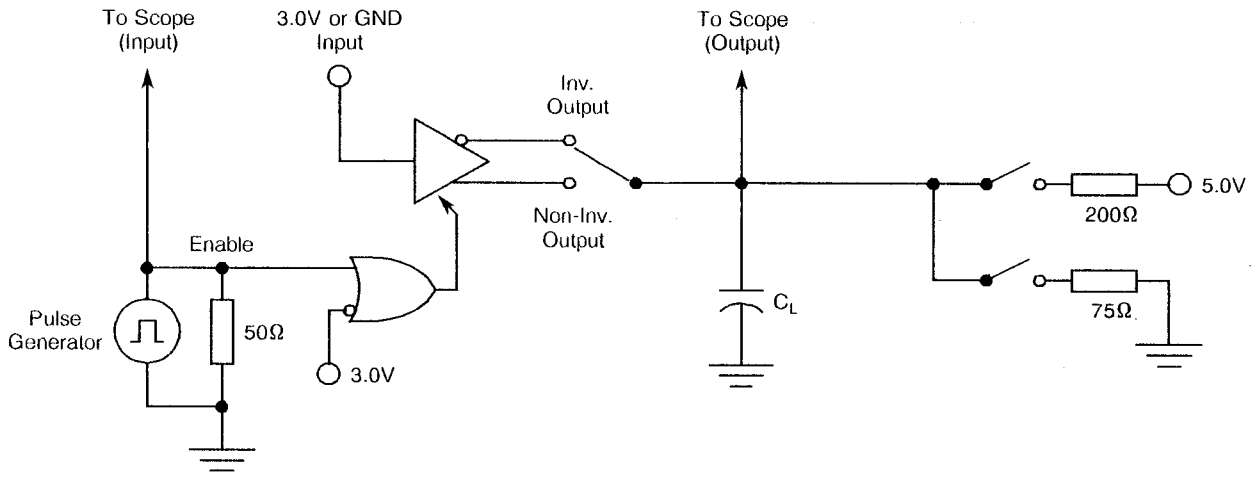


NOTES

1. Pulse generator characteristics: $Z_{OUT} = 50\Omega$, PRR ≤ 1MHz, 50% Duty Cycle, $t_r = t_f \leq 6.0$ns.
2. C_L includes Probe and Jig Capacitance.
3. For Input/Output Conditions see Table 2.

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS (CONTINUED)

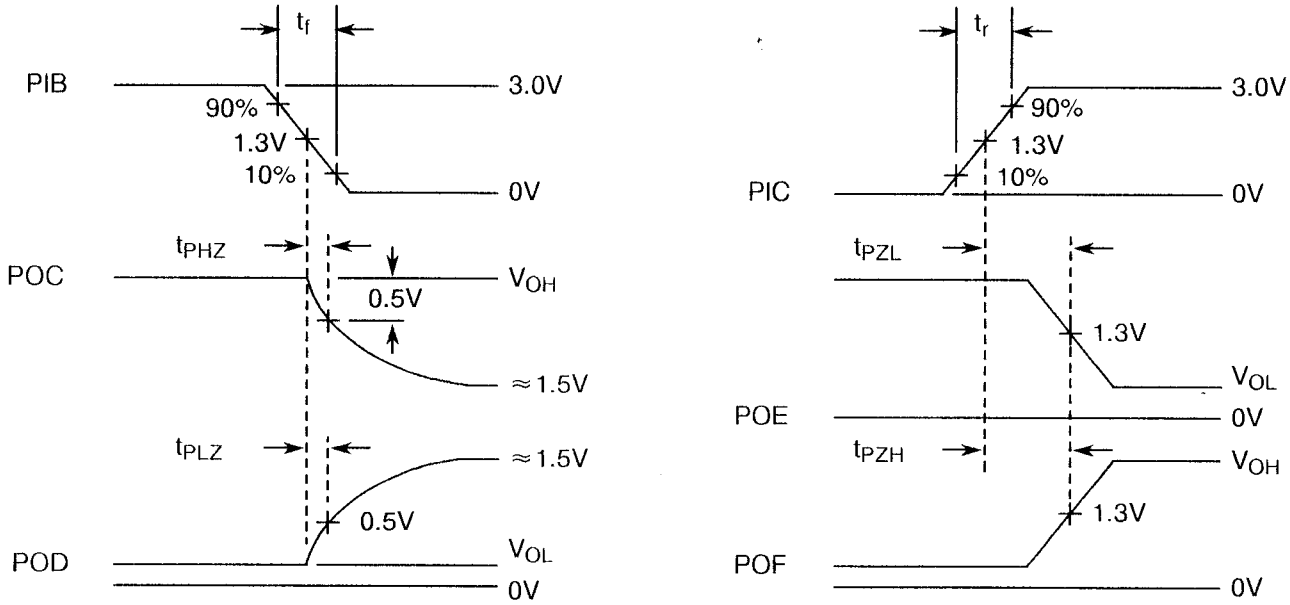
FIGURE 4(i) - ENABLE/DISABLE DELAY



TEST TABLE

TEST	C_L	R_L
t_{PHZ}	30pF	75Ω to GND
t_{PLZ}	30pF	200Ω to V_{CC}
t_{PZH}	30pF	75Ω to GND
t_{PZL}	30pF	200Ω to V_{CC}

VOLTAGE WAVEFORMS



NOTES

1. Pulse generator characteristics: $Z_{OUT} = 50\Omega$, PRR ≤ 1MHz, 50% Duty Cycle, $t_r = t_f \leq 6.0$ns.
2. C_L includes Probe and Jig Capacitance. See Test Table.
3. R_L - see Test Table.
4. For Input/Output Conditions, see Table 2.

TABLE 4 - PARAMETER DRIFT VALUES

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	CHANGE LIMITS (Δ)	UNIT
49	Supply Current	I_{CC}	As per Table 2	As per Table 2	±5.0	mA
68 to 73	Input Current High Level 4	I_{IH4}	As per Table 2	As per Table 2	±4.0	µA
74 to 77	Input Current Low Level 1	I_{IL1}	As per Table 2	As per Table 2	±36	µA
78 to 79	Input Current Low Level 1	I_{IL2}	As per Table 2	As per Table 2	±36	µA
112 to 115	Output Voltage Low Level 1	V_{OL1}	As per Table 2	As per Table 2	±45	mV
116 to 119	Output Voltage Low Level 2	V_{OL2}	As per Table 2	As per Table 2	±45	mV
120 to 123	Output Voltage High Level 1	V_{OH1}	As per Table 2	As per Table 2	±250	mV
124 to 127	Output Voltage High Level 2	V_{OH2}	As per Table 2	As per Table 2	±250	mV

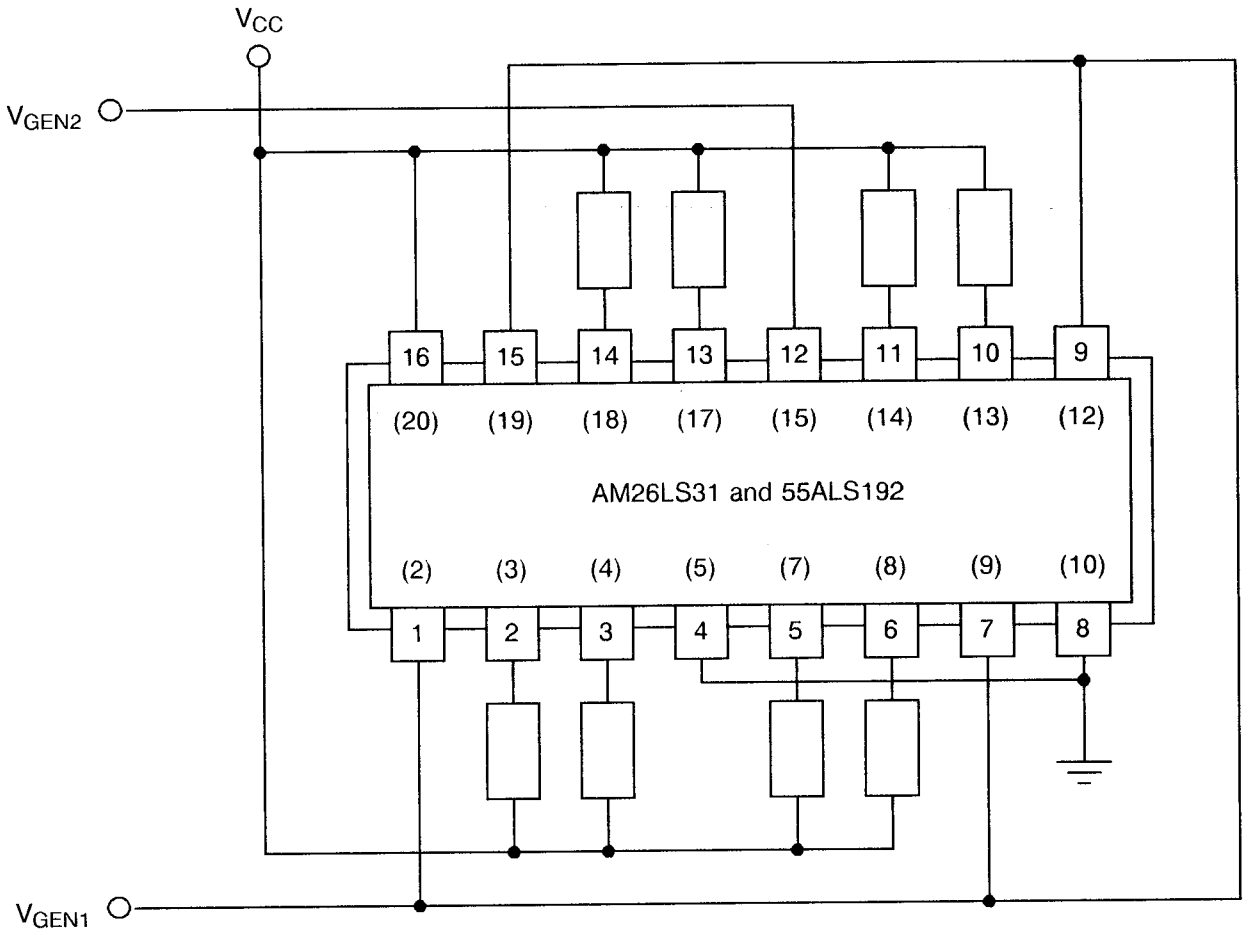
TABLE 5 - CONDITIONS FOR POWER BURN-IN AND OPERATING LIFE TESTS

No.	CHARACTERISTICS	SYMBOL	CONDITIONS	UNIT
1	Ambient Temperature	T_{amb}	+125(+0−5)	°C
2	Outputs - (Pins D/F 2-3-5-6-10-11-13-14) - (Pins C 3-4-7-8-13-14-17-18)	V_{OUT}	V_{CC}	V
3	Inputs - (Pins D/F 1-7-9-15) - (Pins C 2-9-12-19)	V_{IN}	V_{GEN1}	Vac
4	Input - (Pin D/F 12) - (Pin C 15)	V_{IN}	V_{GEN2} (Note 1)	Vac
5	Input - (Pin D/F 4) - (Pin C 5)	V_{IN}	GND	V
6	Pulse Voltage	V_{GEN}	0 to 3.0 (min.)	Vac
7	Pulse Frequency Square Wave	f_{GEN1} f_{GEN2}	100k 50k 50% Duty Cycle $t_r = t_f \leq 10$ns	Hz
8	Positive Supply Voltage (Pin D/F 16) (Pin C 20)	V_{CC}	5.5(+0−0.5)	V
9	Negative Supply Voltage (Pin D/F 8) (Pin C 10)	GND	0	V

NOTES

1. Triggered by V_{GEN1}.
2. Output Load = 1.0kΩ.

FIGURE 5 - ELECTRICAL CIRCUIT FOR POWER BURN-IN AND OPERATING LIFE TESTS



NOTES

1. Pin numbers in parenthesis are for the chip carrier package.

4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESA/SCC GENERIC SPECIFICATION NO. 9000)

4.8.1 Electrical Measurements on Completion of Environmental Tests

The parameters to be measured on completion of environmental tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.8.2 Electrical Measurements at Intermediate Points during Endurance Tests

The parameters to be measured at intermediate points during endurance tests are as scheduled in Table 6 of this specification. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.8.3 Electrical Measurements on Completion of Endurance Tests

The parameters to be measured on completion of endurance testing are as scheduled in Table 6 of this specification. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.8.4 Conditions for Operating Life Tests

The requirements for operating life testing are specified in Section 9 of ESA/SCC Generic Specification No. 9000. The conditions for operating life testing shall be as specified in Table 5 of this specification.

4.8.5 Electrical Circuits for Operating Life Tests

Circuits for use in performing the operating life tests are shown in Figure 5 of this specification.

4.8.6 Conditions for High Temperature Storage Test

The requirements for the high temperature storage test are specified in ESA/SCC Generic Specification No. 9000. The temperature to be applied shall be the maximum storage temperature specified in Table 1(b) of this specification.

TABLE 6 - ELECTRICAL MEASUREMENTS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	CHANGE LIMITS (Δ)	ABSOLUTE		UNIT
						MIN.	MAX.	
1 to 48	Functional Test	-	As per Table 2	As per Table 2	-	-	-	-
49	Supply Current	I_{CC}	As per Table 2	As per Table 2	±5.0	-	80	mA
56 to 61	Input Current High Level 2 (Max. Input Voltage)	I_{IH2}	As per Table 2	As per Table 2	-	-	100	µA
68 to 73	Input Current High Level 4	I_{IH4}	As per Table 2	As per Table 2	±4.0	-	20	µA
74 to 77	Input Current Low Level 1	I_{IL1}	As per Table 2	As per Table 2	±36	-	−360	µA
78 to 79	Input Current Low Level 2	I_{IL2}	As per Table 2	As per Table 2	±36	-	−360	µA
80 to 83	Off-State Output Current 1 (Low Level Applied)	I_{OZL1}	As per Table 2	As per Table 2	-	-	−20	µA
84 to 87	Off-State Output Current 2 (Low Level Applied)	I_{OZL2}	As per Table 2	As per Table 2	-	-	−20	µA
88 to 91	Off-State Output Current 1 (High Level Applied)	I_{OZH1}	As per Table 2	As per Table 2	-	-	20	µA
92 to 95	Off-State Output Current 2 (High Level Applied)	I_{OZH2}	As per Table 2	As per Table 2	-	-	20	µA
112 to 115	Output Voltage Low Level 1	V_{OL1}	As per Table 2	As per Table 2	±0.045	-	0.5	V
116 to 119	Output Voltage Low Level 2	V_{OL2}	As per Table 2	As per Table 2	±0.045	-	0.5	V
120 to 123	Output Voltage High Level 1	V_{OH1}	As per Table 2	As per Table 2	±0.25	2.5	-	V
124 to 127	Output Voltage High Level 2	V_{OH2}	As per Table 2	As per Table 2	±0.25	2.5	-	V