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INTEGRATED CIRCUITS, SILICON MONOLITHIC, BIPOLAR OCTAL BUFFER AND LINE DRIVER WITH 3-STATE OUTPUTS, BASED ON TYPE 54LS240

ESCC Detail Specification No. 9401/014

ISSUE 1 October 2002



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Pages 1 to 30

INTEGRATED CIRCUITS, SILICON MONOLITHIC,

BIPOLAR OCTAL BUFFER AND LINE DRIVER

WITH 3-STATE OUTPUTS,

BASED ON TYPE 54LS240

ESA/SCC Detail Specification No. 9401/014

space components coordination group

		Approved by		
Issue/Rev.	Date	SCCG Chairman	ESA Director General or his Deputy	
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DOCUMENTATION CHANGE NOTICE

This issue supersedes issue 1 and incorporates all modifications defined in Revisions 'A', 'B', 'C', 'D' and 'E' to issue 1 and the following DCR's: Cover page DCN None Table 1(a) Lead Material and/or Finish amended for existing Variants 22881 : Variant 11 and 12 added 22873 : No. 6, existing temperature specified for DIL/FP and Note No. amended to '3' , new temperature and Note reference added for CCP : Note 1 and 12 added 23573 : Note 2 renumbered as "3" and text amended 23573 : Note 4 added 22881 : Figure 2(a) : New figure added 22881 : Figure 3(a) : 2nd outline on 'chip carrier package' added 22881 : Existing Notes deleted, new Notes added 22881 22881 : Figure 3(a) : 2nd outline on 'chip carrier package' added 22881 : Figure 3(a)	Rev. Letter	Rev. Date	CHANGE Reference Item		
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1. <u>GENERAL</u>

1.1 <u>SCOPE</u>

This specification details the ratings, physical and electrical characteristics, test and inspection data for a silicon monolithic, low power bipolar Schottky Octal Buffer and Line Driver with 3-State Outputs, based on Type 54LS240. 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 (FIGURE 1)

Not applicable.

1.5 PHYSICAL DIMENSIONS

The physical dimensions of the integrated circuits specified herein are shown in Figure 2.

- 1.6 <u>PIN ASSIGNMENT</u> As per Figure 3(a).
- 1.7 <u>TRUTH TABLE</u> As per Figure 3(b).
- 1.8 <u>CIRCUIT SCHEMATIC</u> As per Figure 3(c).
- 1.9 <u>FUNCTIONAL DIAGRAM</u> As per Figure 3(d).



TABLE 1(a) - TYPE VARIANTS

VARIANT	CASE	FIGURE	LEAD MATERIAL AND/OR FINISH
02	FLAT	2(a)	G4
05	DIL	2(b)	D7
06	DIL	2(b)	G4
11	CCP	2(c)	7
12	ССР	2(c)	4

TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATINGS	UNIT	REMARKS
1	Supply Voltage	V _{CC}	-0.5 to 7.0	V	-
2	Input Voltage	V _{IN}	-0.5 to 7.0	V	Note 1
3	Device Dissipation	PD	275	mWdc	Note 2
4	Operating Temperature Range	Т _{ор}	55 to + 125	°C	-
5	Storage Temperature Range	T _{stg}	—65 to +150	°C	-
6	Soldering Temperature For FP and DIP For CCP	T _{sol}	+ 265 + 245	°C	Note 3 Note 4

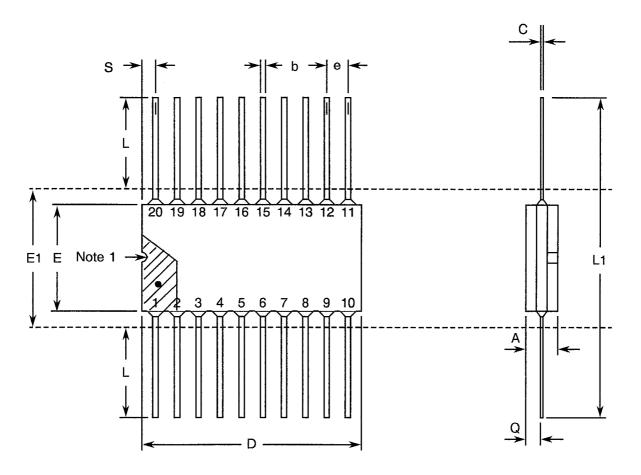
NOTES

- 1. Input current limited to -18mA.
- 2. Must withstand added P_{D} due to short circuit conditions (i.e. $\mathsf{I}_{\mathsf{OS}})$ at one output for 5 seconds.
- 3. Duration 10 seconds maximum at a distance of not less than 1.5mm from the device body and the same lead shall not be resoldered until 3 minutes have elapsed.
- 4. Duration 5 seconds maximum and the same terminal shall not be resoldered until 3 minutes have elapsed.



FIGURE 2 - PHYSICAL DIMENSIONS

FIGURE 2(a) - FLAT PACKAGE

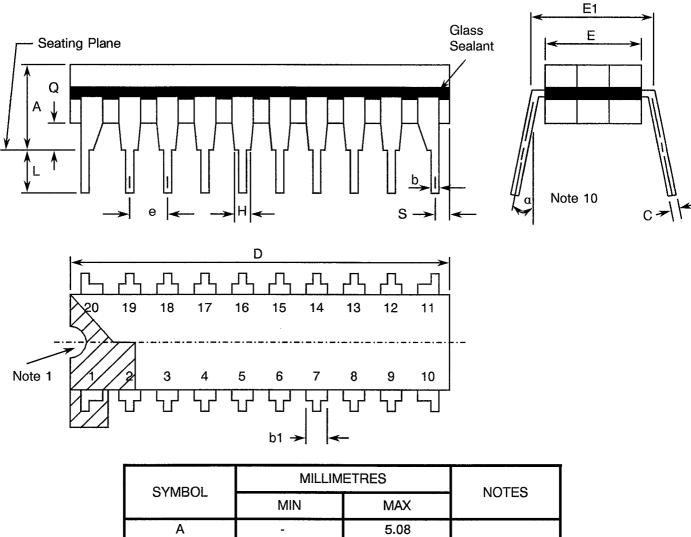


SYMBOL	MILLIMETRES		NOTES
STMBUL	MIN	MAX	NOTES
А	1.14	2.34	
b	0.38	0.56	8
С	0.08	0.23	8
D	-	12.95	4
Е	6.60	7.65	
E1	8.15	TYPICAL	4
е	1.27	TYPICAL	5, 9
L	6.35	9.40	8
L1	18.90	25.90	
Q	0.25	1.02	2
S	0.13	1.14	7



FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

FIGURE 2(b) - DUAL-IN-LINE PACKAGE

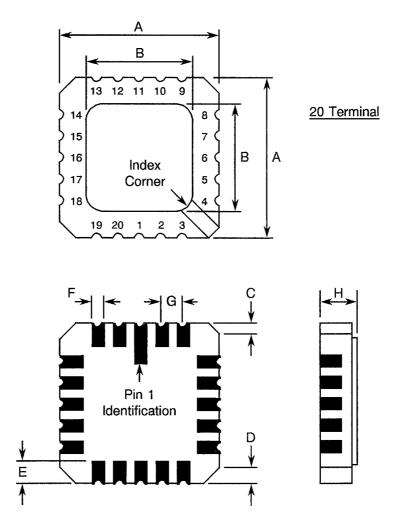


SYMBOL			NOTES
STMBOL	MIN	MAX	NOTES
А	-	5.08	
b	0.38	0.66	8
b1	-	1.78	8
С	0.20	0.44	8
D	23.62	24.76	4
E	6.22	7.62	4
E1	7.37	8.13	
е	2.54 T)	(PICAL	6, 9
F	1.27 T	YPICAL	
н	0.76	-	
L	3.30	5.08	8
Q	0.51	-	3
S	0.38	1.27	7
α	0°	15°	10



FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

FIGURE 2(c) - SQUARE CHIP CARRIER PACKAGE (3 LAYER BASE)



SYMBOL	MILLIMETRES		NOTES	
STWDUL	MIN.	MAX.	NOTES	
A	8.687	9.093	-	
В	7.798	9.093	-	
С	0.250	0.510	11	
D	0.889	1.143	12	
Е	1.140	1.400	8	
F	0.559	0.712	8	
G	1.27 TYPICAL		5, 9	
н	1.630	2.540	-	

NOTES: See Page 10.



FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

NOTES TO FIGURES 2(a) TO 2(c)

- 1. Index area: a notch or a 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 shown in Figure 2(c).
- 2. Dimension Q shall be measured at the point of exit of the lead from the body.
- 3. Dimension Q 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 spacing is 1.27mm between centrelines. Each pin centreline shall be located within ±0.13mm of its true longitudinal position relative to Pins 1 and 20.
- 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 20.
- 7. Applies to all four corners.
- 8. All leads or terminals.
- 18 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.

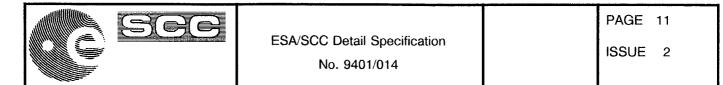
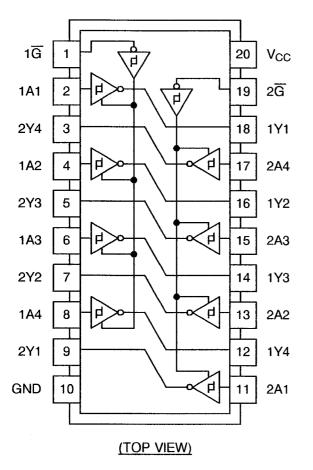
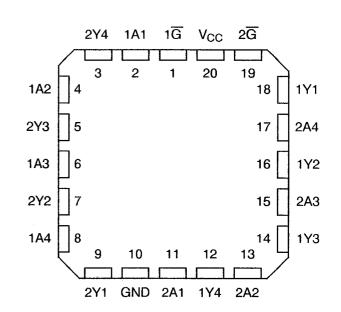


FIGURE 3(a) - PIN ASSIGNMENT

DUAL-IN-LINE AND FLAT PACKAGE





CHIP CARRIER PACKAGE

(TOP VIEW)

- -- -

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

INPUT	S	OUTPUT
1 G , 2 G	А	Y
L	L	Н
L	н	L
Н	Х	Z

NOTES

1. Logic Level Definitions: L = Low Level, H = High Level, Z = High Impedance, X = Don't Care.

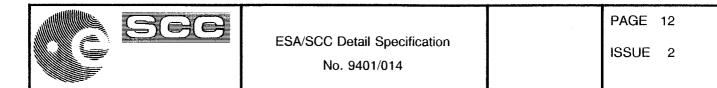


FIGURE 3(c) - CIRCUIT SCHEMATIC

EQUIVALENT OF EACH INPUT

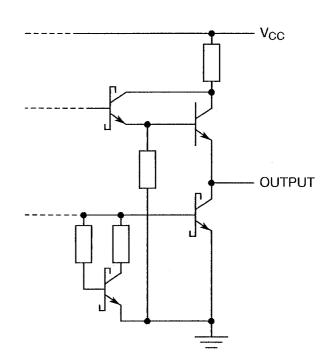
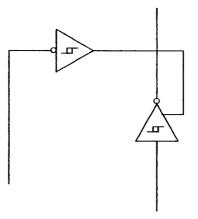


FIGURE 3(d) - FUNCTIONAL DIAGRAM





2. <u>APPLICABLE DOCUMENTS</u>

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 abbreviations are used:-

- V_{IC} = Input Clamp Voltage.
- I_{CC} = Supply Current.
- V_{CC} = Supply Voltage.
- I_{CCZ} = Supply Current, all outputs disabled.
- I_{OZH} = Off-State Current, Outputs High.
- I_{OZL} = Off-State Current, Outputs Low.
- V_H = Hysteresis Voltage (V_{TP} V_{TN}).
- $V_{TP} = V_{IN}$ for V_{OUT} to change when V_{IN} increases from 0V.
- $V_{TN} = V_{IN}$ for V_{OUT} to change when V_{IN} decreases from 5.0V.

4. **REQUIREMENTS**

4.1 <u>GENERAL</u>

The complete requirements for procurement of the integrated circuits specified herein are 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 <u>Deviations from Special In-process Controls</u> None.
- 4.2.2 <u>Deviations from Final Production Tests (Chart II)</u> None.

4.2.3 Deviations from Burn-in Tests (Chart III)

- (a) Para. 7.1.1(a), High Temperature Reverse Bias tests and subsequent electrical measurements related to this test shall be omitted.
- (b) Para. 9.9.2, Electrical Measurements at High and Low Temperatures: Only a test result summary, based on go-no-go tests and presented in histogram form is required.

4.2.4 Deviations from Qualification Tests (Chart IV)

None.



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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 0.9 grammes for the flat package, 3.2 grammes for the dual-in-line 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 <u>Case</u>

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 'D' or Type 'G' with either Type '4' or Type '7' 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(c).



4.5.3 The SCC Component Number

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

	<u>940101402</u> ₽
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 and -55 °C respectively.

4.6.3 <u>Circuits for Electrical Measurements</u>

Circuits for use in performing the 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 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.

4.7.3 Electrical Circuits for Power Burn-in

Circuits for use in performing the power burn-in tests are shown in Figure 5 of this specification.



TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - D.C. PARAMETERS

No.	CHARACTERISTICS	SYMBOL	TEST METHOD	TEST	TEST CONDITIONS	LIM	IITS	UNIT
NU.	CHANAGTERIS 1103	STMBOL	MIL-STD 883	FIG.	a. (PINS UNDER TEST)		МАХ	UNIT
1	Functional Test	-	-	3(b)	Verify Truth Table with Load. Note 1	-	-	-
2 to 11	Input Current High Level 1	l _{iH1}	3010	4(a)	V _{CC} = 5.5V, V _{IN} = 2.7V (Pins 1-2-4-6-8-11-13-15- 17-19)	-	20	μΑ
12 to 21	Input Current High Level 2 (Max. Input Voltage)	l _{ін2}	3010	4(a)	V _{CC} = 5.5V, V _{IN} = 7.0V (Pins 1-2-4-6-8-11-13-15- 17-19)	-	100	μA
22 to 31	Input Clamp Voltage	V _{IC}	3008	4(b)	b) V _{CC} = 4.5V, I _{IN} = - 18mA Note 2 (Pins 1-2-4-6-8-11-13-15- 17-19)		- 1.5	V
32 to 41	Input Current Low Level	۱ _{۱۲}	3009	4(c)	V _{CC} = 5.5V, V _{IN} = 0.4V (Pins 1-2-4-6-8-11-13-15- 17-19)		- 200	μA
42 to 49	Output Voltage Low Level	V _{OL}	3007	4(d)	$V_{CC} = 4.5V, V_{IL} = 0.7V$ $V_{IH} = 2.0V, I_{OL} = 12mA$ (Pins 3-5-7-9-12-14-16-18)	-	0.4	V
50 to 57	Output Voltage High Level 1	V _{OH1}	3006	4(e)	$V_{CC} = 4.5V, V_{IL} = 0.5V$ $V_{IH} = 2.0V, I_{OH} = -3.0mA$ (Pins 3-5-7-9-12-14-16-18)	2.4	-	V
58 to 65	Output Voltage High Level 2	V _{OH2}	3006	4(e)	4(e) $V_{CC} = 4.5V, V_{IL} = 0.7V$ $V_{IH} = 2.0V, I_{OH} = -12mA$ (Pins 3-5-7-9-12-14-16-18)		-	V
66 to 73	Off-State Output Current Low Level Applied	I _{OZL}	3006	4(h)	4(h) $V_{CC} = 5.5V, V_{OUT} = 0.4V$ $V_{IL} = 0.7V, V_{IH} = 2.0V$ (Pins 3-5-7-9-12-14-16-18)		- 20	μА
74 to 81	Off-State Output Current High Level Applied	I _{ОZH}	3006	4(h)	4(h) $V_{CC} = 5.5V, V_{OUT} = 2.7V$ $V_{IL} = 0.7V, V_{IH} = 2.0V$ (Pins 3-5-7-9-12-14-16-18)		20	μΑ
82 to 89	Short Circuit Output Current	los	3011	4(f)	······		- 225	mA

NOTES: See Page 18.



. . .

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

No.	No. CHARACTERISTICS		TEST METHOD	TEST	TEST TEST CONDITIONS	LIMITS		UNIT
110.	CHARACTERISTICS	SYMBOL	MIL-STD 883	FIG.	(PINS UNDER TEST)	MIN	МАХ	UNIT
90	Supply Current Outputs High	Іссн	3005	4(g)	V _{CC} = 5.5V V _{IL} = 0.7V, V _{IH} = 2.0V (Pin 20)	-	27	mA
91	Supply Current Outputs Low	lcc∟	3005	4(g)	V _{CC} = 5.5V V _{IL} = 0.7V, V _{IH} = 2.0V (Pin 20)	-	44	mA
92	Supply Current Outputs Disabled	I _{CCZ}	3005	4(g)	V _{CC} = 5.5V V _{IL} = 0.7V, V _{IH} = 2.0V (Pin 20)	-	50	mA
93 to 102	Input Hysteresis Voltage	V _H	-	4(i)	V _{CC} = 4.5V Note 5 (Pins 1-2-4-6-8-11-13-15- 17-19)	0.2	-	V

NOTES: See Page 18.



TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - A.C. PARAMETERS

No.	CHARACTERISTICS	SYMBOL	TEST METHOD	METHOD TEST TEST CONDITIONS		LIM	ITS	UNIT
110.		STMBOL	MIL-STD 883	FIG.	(PINS UNDER TEST)	MIN	МАХ	UNIT
103 to 110	Propagation Delay, Low to High Level	t _{PLH}	3003	4(j)	$V_{CC} = 5.0V$ $R_L = 667\Omega \pm 5\%$ $C_L = 45pF \pm 5\%$ Note 4	-	14	ns
111 to 118	Propagation Delay, High to Low Level	t _{PHL}			Pins 2 to 18 11 to 9 4 to 16 13 to 7 6 to 14 15 to 5 8 to 12 17 to 3	-	18	
119 to 126	Output Enable Time to Low Level	t _{PZL}	3003	4(j)	$V_{CC} = 5.0V$ $R_L = 667\Omega \pm 5\%$ $C_L = 45pF \pm 5\%$ Pins	•	30	ns
127 to 134	Output Enable Time to High Level	t _{PZH}			1 to 18 19 to 9 1 to 16 19 to 7 1 to 14 19 to 5 1 to 12 19 to 3	-	23	
135 to 142	Output Disable Time from Low Level	t _{PLZ}	3003	4(j)	$V_{CC} = 5.0V$ $R_L = 667\Omega \pm 5\%$ $C_L = 5.0pF \pm 5\%$ Dinc	-	20	ns
143 to 150	Output Disable Time from High Level	tрнz			Pins 1 to 18 19 to 9 1 to 16 19 to 7 1 to 14 19 to 5 1 to 12 19 to 3	-	25	

NOTES

- 1. Go-no-go test with $V_{IL} = 0.3V$; $V_{IH} = 3.0V$; trip point 1.5V.
- 2. All inputs and outputs not under test shall be open.
- 3. No more than one output should be shorted at a time, and only for 1 second maximum.
- 4. Propagation delay measurements shall be performed as a go-no-go test on a 100% basis. Read-and-record measurements shall be performed on an LTPD7 sample basis following the Chart III Burn-in Test.
- 5. Measurement performed during Qualification and Maintenance of Qualification only.



TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES, + 125(+0-5) °C AND - 55(+5-0) °C

No.	CHARACTERISTICS	SYMBOL	TEST METHOD	TEST	TEST CONDITIONS	LIM	IITS	UNIT
INO.	CHANACTERISTICS	STNDUL	MIL-STD 883	FIG.	(PINS UNDER TEST)	MIN	МАХ	UNIT
1	Functional Test	-	-	3(b)	Verify Truth Table with Load. Note 1	-	-	-
2 to 11	Input Current High Level 1	lih1	3010	4(a)	V _{CC} = 5.5V, V _{IN} = 2.7V (Pins 1-2-4-6-8-11-13-15- 17-19)	-	20	μA
12 to 21	Input Current High Level 2 (Max. Input Voltage)	I _{IH2}	3010	4(a)	V _{CC} = 5.5V, V _{IN} = 7.0V (Pins 1-2-4-6-8-11-13-15- 17-19)	-	100	μΑ
22 to 31	Input Clamp Voltage	V _{IC}	3008	4(b)	 V_{CC} = 4.5V, I_{IN} = - 18mA Note 2 (Pins 1-2-4-6-8-11-13-15- 17-19) 		- 1.5	V
32 to 41	Input Current Low Level	l _{iL}	3009	4(c)	V _{CC} = 5.5V, V _{IN} = 0.4V (Pins 1-2-4-6-8-11-13-15- 17-19)	-	- 200	μА
42 to 49	Output Voltage Low Level	V _{OL}	3007	4(d)	$V_{CC} = 4.5V, V_{IL} = 0.7V$ $V_{IH} = 2.0V, I_{OL} = 12mA$ (Pins 3-5-7-9-12-14-16-18)	-	0.4	V
50 to 57	Output Voltage High Level 1	V _{OH1}	3006	4(e)	$V_{CC} = 4.5V, V_{IL} = 0.5V$ $V_{IH} = 2.0V, I_{OH} = -3.0mA$ (Pins 3-5-7-9-12-14-16-18)	2.4	-	V
58 to 65	Output Voltage High Level 2	V _{OH2}	3006	4(e)) $V_{CC} = 4.5V, V_{IL} = 0.7V$ $V_{IH} = 2.0V, I_{OH} = -12mA$ (Pins 3-5-7-9-12-14-16-18)		-	V
66 to 73	Off-State Output Current Low Level Applied	l _{OZL}	3006	4(h)	4(h) $V_{CC} = 5.5V, V_{OUT} = 0.4V$ $V_{IL} = 0.7V, V_{IH} = 2.0V$ (Pins 3-5-7-9-12-14-16-18)		- 20	μА
74 to 81	Off-State Output Current High Level Applied	^I оzн	3006	4(h) $V_{CC} = 5.5V, V_{OUT} = 2.7V$ $V_{IL} = 0.7V, V_{IH} = 2.0V$ (Pins 3-5-7-9-12-14-16-18)		-	20	μΑ
82 to 89	Short Circuit Output Current	los	3011	4(f)	V _{CC} = 5.5V Note 3 (Pins 3-5-7-9-12-14-16-18)	- 40	- 225	mA

NOTES: See Page 18.



TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES, + 125(+0-5) °C AND - 55(+5-0) °C (CONT'D)

No.	No. CHARACTERISTICS		TEST METHOD	METHOD TEST	TEST CONDITIONS	LIMITS		UNIT
NO.	UNANAUTENISTIUS	SYMBOL	MIL-STD 883	FIG.	(PINS UNDER TEST)	MIN	МАХ	UNIT
90	Supply Current Outputs High	Іссн	3005	4(g)	V _{CC} = 5.5V V _{IL} = 0.7V, V _{IH} = 2.0V (Pin 20)	-	27	mA
91	Supply Current Outputs Low	ICCL	3005	4(g)	V _{CC} = 5.5V V _{IL} = 0.7V, V _{IH} = 2.0V (Pin 20)	-	44	mA
92	Supply Current Outputs Disabled	lccz	3005	4(g)	V _{CC} = 5.5V V _{IL} = 0.7V, V _{IH} = 2.0V (Pin 20)	-	50	mA
93 to 102	Input Hysteresis Voltage	V _H	-	4(i)	V _{CC} = 4.5V Note 5 (Pins 1-2-4-6-8-11-13-15- 17-19)	0.2	-	V

NOTES: See Page 18.

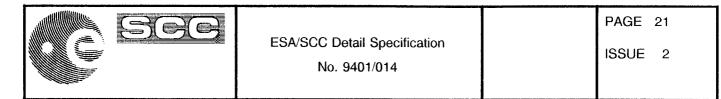
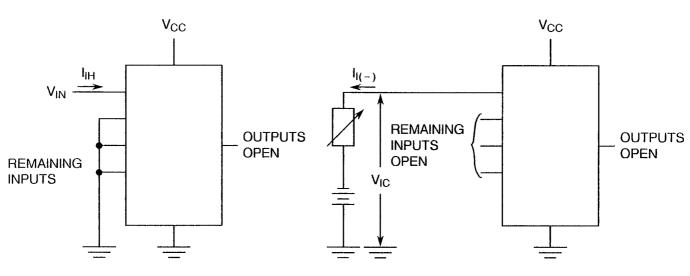


FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

FIGURE 4(a) - HIGH LEVEL INPUT CURRENT

FIGURE 4(b) - INPUT CLAMP VOLTAGE



NOTES

1. Each input to be tested separately.

NOTES 1 Each input to be

1. Each input to be tested separately.

FIGURE 4(c) - LOW LEVEL INPUT CURRENT

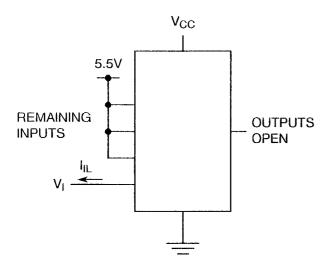
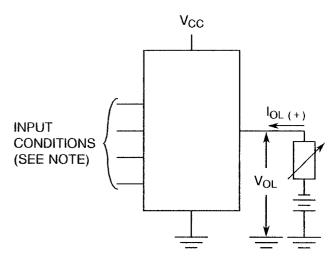


FIGURE 4(d) - LOW LEVEL OUTPUT VOLTAGE



NOTES

1. Each input to be tested separately.

NOTES

Inputs 1G, 2G at V_{IL}.
 Inputs A at V_{IH}.

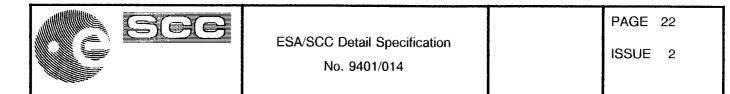
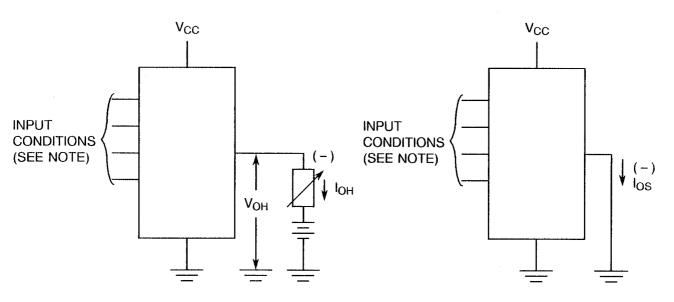


FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS (CONTINUED)

FIGURE 4(e) - HIGH LEVEL OUTPUT VOLTAGE

FIGURE 4(f) - SHORT CIRCUIT OUTPUT CURRENT



NOTES

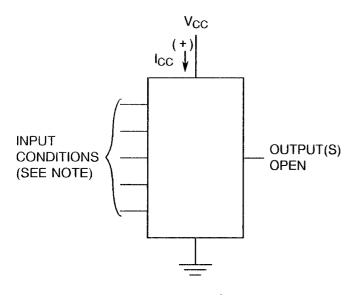
1. All inputs at VIL.

NOTES

1. All inputs at VIL.

FIGURE 4(g) - SUPPLY CURRENT

FIGURE 4(h) - OFF-STATE OUTPUT CURRENT



INPUT CONDITIONS (SEE NOTE)

NOTES

1. See Figure 3(b) for Low, High or Off-State Output.

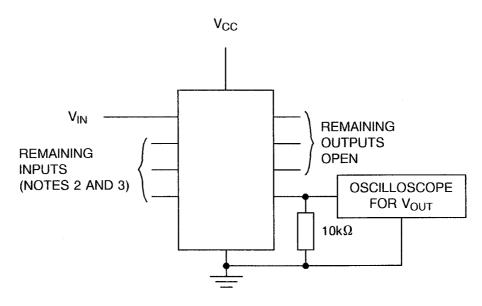
NOTES

1. See Figure 3(b) for Off-State Output.



FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS (CONTINUED)

FIGURE 4(i) - INPUT HYSTERESIS VOLTAGE



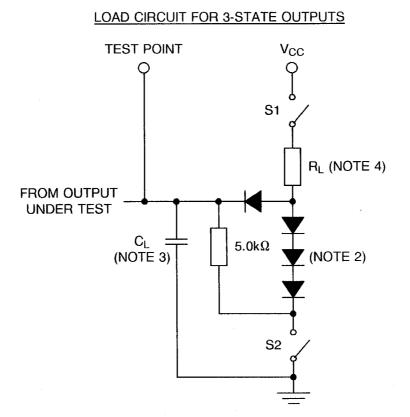
NOTES

- 1. V_H shall be derived as follows:-
 - (i) Slowly increase input voltage (V_{IN}) from 0V until the output condition (V_{OUT}) changes. Record the value of V_{IN} at which the change occurs and call it V_{TP} .
 - (ii) Slowly decrease input voltage (V_{IN}) from 5.0V until the output condition changes. Record the value of V_{IN} at which the change occurs and call it V_{TN} .
 - (iii) $V_H = V_{TP} V_{TN}$.
- 2. Measurement of 'A' inputs shall be performed with $\overline{G} = 0.7V$. Inputs not under test shall be open.
- 3. For measurement of \overline{G} inputs, an appropriate output shall be monitored and the input conditions for that output shall be such that the object is high when enabled.



FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS (CONTINUED)

FIGURE 4(j) - DYNAMIC TEST AND SWITCHING WAVEFORMS



VOLTAGE WAVEFORMS - PROPAGATION DELAY TIME

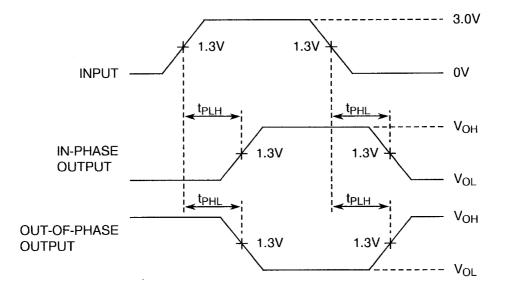
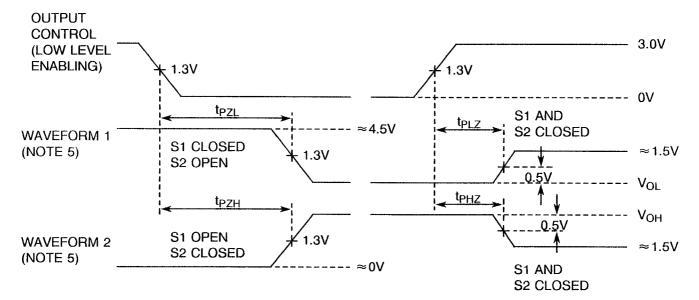




FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS (CONTINUED)

FIGURE 4(j) - DYNAMIC TEST AND SWITCHING WAVEFORMS (CONTINUED)



VOLTAGE WAVEFORMS - ENABLE AND DISABLE TIMES

NOTES

- 1. All inputs are supplied by generators having the following characteristics: $t_r < 15$ ns, $t_p = 0.5 \mu$ s, PRR < 1.0MHz, $Z_{OUT} = 50 \Omega$.
- 2. All diodes are 1N916 or 1N3064.
- 3. $C_L = 45 pF$ or 5.0pF ± 5% (see Table 2) including scope probe, wiring and stray capacitance without package in test fixture.
- 4. $R_L = 667\Omega \pm 5\%$.
- 5. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control.

Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.

6. When measuring propagation delay time of 3-State Outputs, S1 and S2 are closed.



TABLE 4 - PARAMETER DRIFT VALUES

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	CHANGE LIMITS (Δ)	UNIT
2 to 11	Inpuț Current High Level 1	l _{IH1}	As per Table 2	As per Table 2	±20 or (1) ±0.5	% µА
32 to 41	Input Current Low Level	l _{IL}	As per Table 2	As per Table 2	±18	μA
42 to 49	Output Voltage Low Level	V _{OL}	As per Table 2	As per Table 2	± 60	mV
50 to 57	Output Voltage High Level 1	V _{OH1}	As per Table 2	As per Table 2	± 240	mV

NOTES

1. Whichever is greater, referred to the initial value.

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

No.	CHARACTERISTICS	SYMBOL	CONDITION	UNIT
1	Ambient Temperature	T _{amb}	+ 125(+ 0 – 5)	°C
2	Power Supply Voltage	V _{CC}	5(+ 0.5 - 0)	V
3	Pulse Voltage	V _{GEN}	0.5 max. to 3.0 min.	V
4	Frequency	f _{GEN1} GEN2	100 50 (Note 1)	Hz
5	Fan-out	~	10	-
6	Rise Time	tr	50 max.	μs
7	Fall Time	t _f	50 max.	μs
8	Duty Cycle	-	20 min.	%

NOTES

1. Tolerance ±10%.

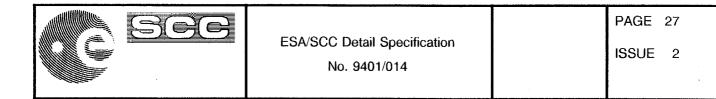
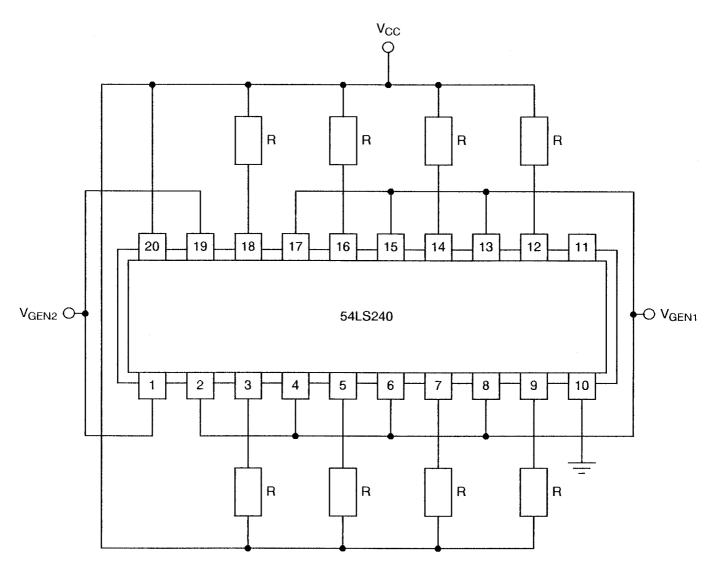


FIGURE 5 - ELECTRICAL CIRCUIT FOR POWER BURN-IN AND OPERATING LIFE TEST



NOTES

1. $R = 1.2k\Omega$.



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

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.

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 $T_{amb} = +22 \pm 3 \text{ °C}$.

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.

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 conditions for high temperature storage shall be $T_{amb} = +150(+0.5)$ °C.



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

No	No. CHARACTERISTICS		SPEC. AND/OR	TEST	CHAN	UNIT	
NO.	CHARACTERISTICS	SYMBOL	TEST METHOD	CONDITIONS	(Δ)	ABSOLUTE	UNIT
2 to 11	Input Current High Level 1	l _{lH1}	As per Table 2	As per Table 2	± 1.0	-	μΑ
12 to 21	Input Current High Level 2	I _{IH2}	As per Table 2	As per Table 2	-	100	μА
32 to 41	Input Current Low Level	l _{iL}	As per Table 2	As per Table 2	<u>+</u> 12	-	μΑ
42 to 49	Output Voltage Low Level	V _{OL}	As per Table 2	As per Table 2	±60	-	mV
50 to 57	Output Voltage High Level 1	V _{OH1}	As per Table 2	As per Table 2	±240	-	mV
90	Supply Current Outputs High	Іссн	As per Table 2	As per Table 2	±20	-	%
91	Supply Current Outputs Low	ICCL	As per Table 2	As per Table 2	±20	-	%



APPENDIX 'A'

Page 1 of 1

AGREED DEVIATIONS FOR TEXAS INSTRUMENTS (F)

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Para. 4.2.1	Scanning Electron Microscope (SEM) Inspection may be performed using TIF document TIF 3.61.610.001.
Para. 4.2.2	Prior to Die Shear Test TIF may perform a Radiographic Inspection on the randomly chosen samples to be subjected to this test, using TIF document TIF 50.42-3002.
Para. 4.2.3	Radiographic Inspection may be performed using TIF document TIF 50.42-3002.