CAPACITORS, MICROWAVE, SILICON, DICE, MOS,

BASED ON TYPES

101MC, 201MC, 250MC, 400MC, 401MC AND 501MC

ESCC Detail Specification No. 5711/001

ISSUE 1

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'A'	Jun. 02	P1. Cover page P2. DCN P10. Figure 2(d) : Dimension B changed	None None 23945

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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 Capacitor, Microwave, Silicon, Dice, MOS, Based on Types 101MC, 201MC, 250MC, 400MC, 401MC and 501MC. It shall be read in conjunction with ESA/SCC Generic Specification No. 5010, the requirements of which are supplemented herein.

1.2 COMPONENT TYPE VARIANTS

Variants of the basic type capacitors 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 capacitors 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 capacitors specified herein are shown in Figure 2.

1.6 FUNCTIONAL DIAGRAM

The functional diagram for the capacitors specified herein, is shown in Figure 3.

1.7 HANDLING PRECAUTIONS

These devices are susceptible to damage by electrostatic discharge. Therefore suitable precautions shall be employed for protection during all phases of manufacture, test, packaging, shipping and handling.

These components are categorised as Class 1 with a Minimum Critical Path Failure Voltage of 1 250V.

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. 5010 for Discrete Microwave Semiconductor Components.

(b) MIL-STD-750, Test Methods for Semiconductor Devices.

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:-

C = Dice capacitance.

I_L = Leakage current.

TC = Temperature coefficient.

V_N = Nominal voltage.

V_T = Test voltage.

TABLE 1(a) - TYPE VARIANTS

MONOPAD CAPACITORS

(1) VARIANT	(2) BASED ON TYPE	(3) NOMINAL DICE CAPACITANCE (pF)	(4) CAPACITANCE TOLERANCE (±%)	(5) NOMINAL VOLTAGE (V_N) (V)	(6) FIGURE
01	501MC106CS0R22M	0.22	20	200	2(a)
02	501MC106CS0R27M	0 27	20	200	2(a)
03	501MC106CS0R33M	0.33	20	200	2(a)
04	501MC106CS0R39M	0.39	20	200	2(a)
05	501MC106CS0R47M	0.47	20	200	2(a)
06	501MC106CS0R56M	0.56	20	200	2(a)
07	501MC106CS0R68M	0.68	20	200	2(a)
08	501MC106CS0R82M	0.82	20	200	2(a)
09	401MC106CS1R0M	1.0	20	200	2(a)
10	401MC106CS1R2M	1.2	20	200	2(a)
11	401MC106CS1R5M	1.5	20	200	2(a)
12	401MC106CS1R8M	1.8	20	200	2(a)
13	201MC106CS2R2M	2.2	20	200	2(a)
14	201MC106CS2R7M	2.7	20	200	2(a)
15	201MC106CS3R3M	3.3	20	200	2(a)
16	101MC106CS3R9M	3.9	20	100	2(a)
17	101MC106CS4R7M	4.7	20	100	2(a)
18	101MC106CS5R6M	5.6	20	100	2(a)
19	101MC106CS6R8M	6.8	20	100	2(a)
20	400MC106CS8R2M	8.2	20	40	2(a)
21	400MC106CS100M	10	20	40	2(a)
22	400MC106CS120M	12	20	40	2(a)
23	400MC106CS150M	15	20	40	2(a)
24	201MC107CS3R9M	3.9	20	200	2(b)
25	201MC107CS4R7M	4.7	20	200	2(b)
26	201MC107CS5R6M	5.6	20	200	2(b)
27	201MC107CS6R8M	6.8	20	200	2(b)
28	201MC107CS8R2M	8.2	20	200	2(b)
29	101MC107CS100M	10	20	100	2(b)
30	101MC107CS120M	12	20	100	2(b)
31	101MC107CS150M	15	20	100	2(b)
32	400MC107CS180M	18	20	40	2(b)
33	400MC107CS220M	22	20	40	2(b)
34	400MC107CS270M	27	20	40	2(b)
35	400MC107CS330M	33	20	40	2(b)
36	400MC107CS390M	39	20	40	2(b)

TABLE 1(a) - TYPE VARIANTS (CONTINUED)

MONOPAD CAPACITORS (CONTINUED)

(1) VARIANT	(2) BASED ON TYPE	(3) NOMINAL DICE CAPACITANCE (pF)	(4) CAPACITANCE TOLERANCE (±%)	(5) NOMINAL VOLTAGE (V_N) (V)	(6) FIGURE
37	201MC108CS100M	10	20	200	2(c)
38	201MC108CS120M	12	20	200	2(c)
39	201MC108CS150M	15	20	200	2(c)
40	201MC108CS180M	18	20	200	2(c)
41	101MC108CS220M	22	20	100	2(c)
42	101MC108CS270M	27	20	100	2(c)
43	101MC108CS330M	33	20	100	2(c)
44	101MC108CS390M	39	20	100	2(c)
45	400MC108CS470M	47	20	40	2(c)
46	400MC108CS560M	56	20	40	2(c)
47	400MC108CS680M	68	20	40	2(c)
48	400MC110CS820M	82	20	40	2(d)
49	400MC110CS101M	100	20	40	2(d)

MULTI-PAD BAR CAPACITORS

(1) VARIANT	(2) BASED ON TYPE	(3) MAXIMUM CAPACITANCE PER PAD (pF)	(4) CAPACITANCE TOLERANCE (±%)	(5) NOMINAL VOLTAGE (V_N) (V)	(6) NUMBER OF PADS	(7) FIGURE
50	250MC130CB101M	100	20	25	3	2(e)
51	400MC130CB680M	68	20	40	3	2(e)
52	101MC130CB400M	40	20	100	3	2(e)
53	201MC130CB200M	20	20	200	3	2(e)
54	401MC130CB100M	10	20	200	3	2(e)
55	501MC130CB8R0M	8.0	20	200	3	2(e)
56	250MC140CB101M	100	20	25	4	2(f)
57	400MC140CB680M	68	20	40	4	2(f)
58	101MC140CB400M	40	20	100	4	2(f)
59	201MC140CB200M	20	20	200	4	2(f)
60	401MC140CB100M	10	20	200	4	2(f)
61	501MC140CB8R0M	8.0	20	200	4	2(f)
62	250MC150CB101M	100	20	25	5	2(g)
63	400MC150CB680M	68	20	40	5	2(g)
64	101MC150CB400M	40	20	100	5	2(g)
65	201MC150CB200M	20	20	200	5	2(g)
66	401MC150CB100M	10	20	200	5	2(g)
67	501MC150CB8R0M	8.0	20	200	5	2(g)

TABLE 1(a) - TYPE VARIANTS (CONTINUED)

MULTI PAD-SIZE CAPACITORS

(1) VARIANT	(2) BASED ON TYPE	(3) PAD CAPACITANCE (pF) (S = 1) (Note 1)	(4) CAPACITANCE TOLERANCE (±%)	(5) NOMINAL VOLTAGE (V_N) (V)	(6) NUMBER OF PADS	(7) FIGURE
68	101MC111CJ0R5M23	0.5	20	100	6	2(h)
69	201MC111CJ0R25M23	0.25	20	200	6	2(h)
70	401MC111CJ0R125M23	0.125	20	200	6	2(h)
71	101MC112CJ0R8M11	0.80	20	100	6	2(i)
72	201MC112CJ0R4M11	0.40	20	200	6	2(i)
73	401MC112CJ0R2M11	0.20	20	200	6	2(i)
74	400MC113CJ100M6	10	20	40	3	2(j)
75	400MC114CJ100M3	10	20	40	2	2(k)

NOTES

1. S = Surface area relevant to capacitance value (see Figure 2).

TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATINGS	UNIT	REMARKS
1	Nominal Voltage	V_N	See Table 1(a)	V	
2	Breakdown Voltage	$V_{(BR)}$	1.5 V_N	V	Minimum
3	Temperature Coefficient	TC	50	10^{-6}/°C	Note 1
4	Operating Temperature Range	T_{op}	−55 to +150	°C	T_{amb}
5	Storage Temperature Range	T_{stg}	−55 to +175	°C	
6	Soldering Temperature	T_{sol}	+320	°C	Note 2

NOTES

1. For information only.
2. Preferred conditions for assembly are as follows:-

   Die attach:
   Au/Sn (80/20) preform is recommended, at a maximum temperature of +320°C for 30 seconds:
   - Under reduced atmosphere (N_2H_2), if thermal cycle is short (less than 5 minutes).
   - Under neutral atmosphere (N_2), for longer thermal cycles.

   Gluing process can also be used.

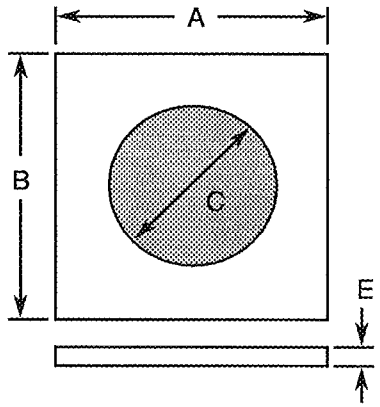
   Wire or ribbon bonding:
   Use only gold wire or gold ribbon (size equal to, or slightly less than gold contact diameter).

FIGURE 1 - PARAMETER DERATING INFORMATION

Not applicable.

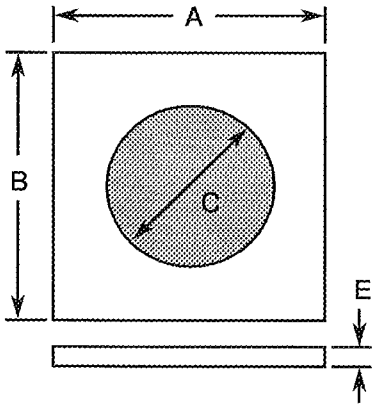
FIGURE 2 - PHYSICAL DIMENSIONS

FIGURE 2(a) - VARIANTS 01 TO 23



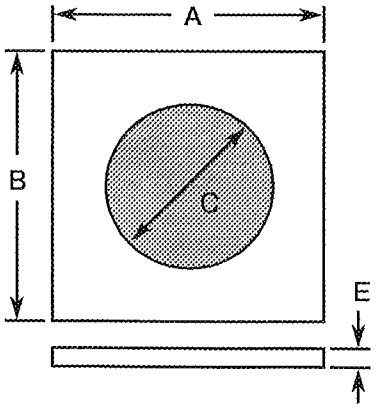
SYMBOL	MILLIMETRES	
	MIN.	MAX.
A	0.34	0.40
B	0.34	0.40
C	0.145	0.31
E	0.18	0.22

FIGURE 2(b) - VARIANTS 24 TO 36



SYMBOL	MILLIMETRES	
	MIN.	MAX.
A	0.54	0.60
B	0.54	0.60
C	0.31	0.49
E	0.18	0.22

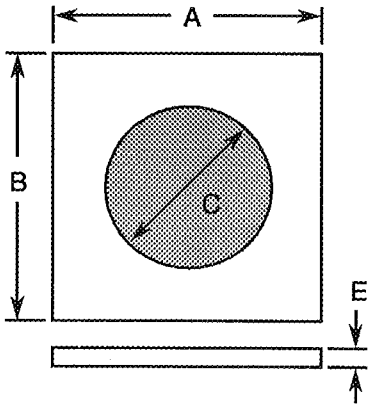
FIGURE 2(c) - VARIANTS 37 TO 47



SYMBOL	MILLIMETRES	
	MIN.	MAX.
A	0.74	0.80
B	0.74	0.80
C	0.54	0.66
E	0.18	0.22

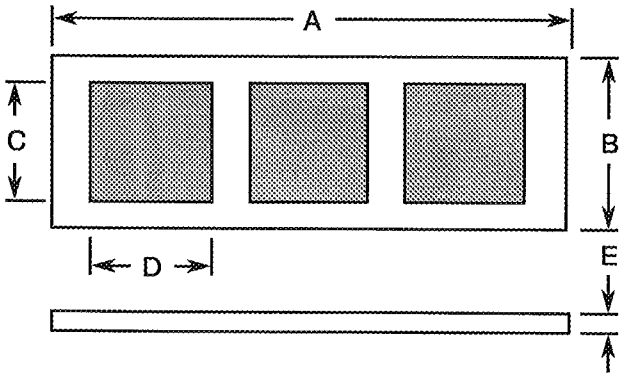
FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

FIGURE 2(d) - VARIANTS 48 TO 49



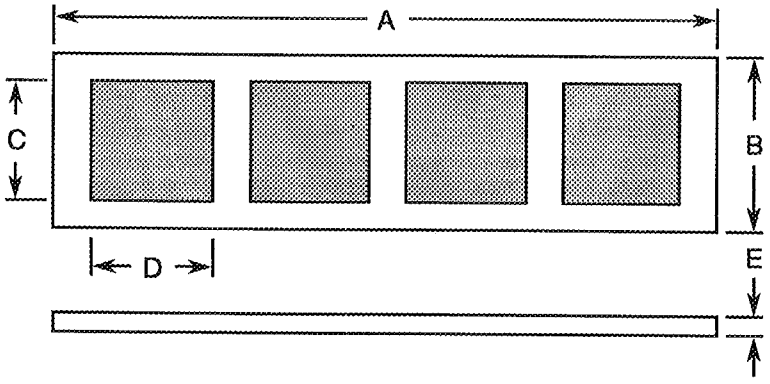
SYMBOL	MILLIMETRES	
	MIN.	MAX.
A	0.94	1.00
B	0.94	1.00
C	0.72	0.78
E	0.18	0.22

FIGURE 2(e) - VARIANTS 50 TO 55



SYMBOL	MILLIMETRES	
	MIN.	MAX.
A	1.52	1.78
B	0.88	0.98
C	0.75	0.85
D	0.30	0.40
E	0.18	0.22

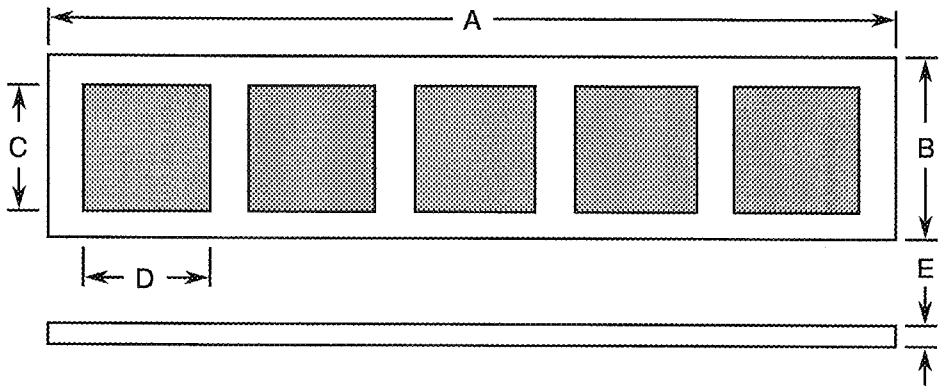
FIGURE 2(f) - VARIANTS 56 TO 61



SYMBOL	MILLIMETRES	
	MIN.	MAX.
A	2.03	2.29
B	0.88	0.98
C	0.75	0.85
D	0.30	0.40
E	0.18	0.22

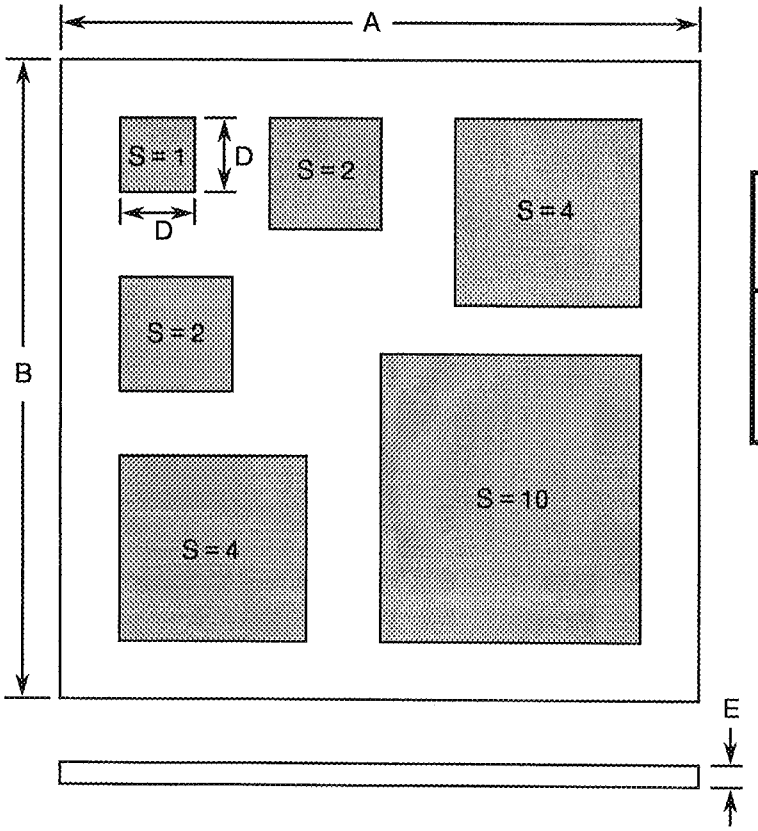
FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

FIGURE 2(g) - VARIANTS 62 TO 67



SYMBOL	MILLIMETRES	
	MIN.	MAX.
A	2.55	2.80
B	0.88	0.98
C	0.75	0.85
D	0.30	0.40
E	0.18	0.22

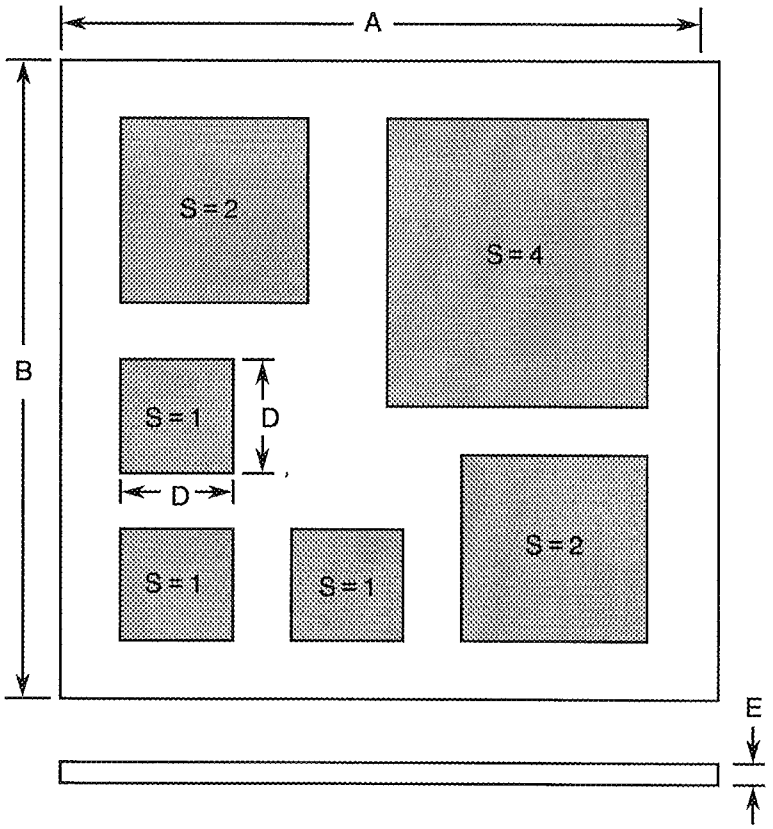
FIGURE 2(h) - VARIANTS 68 TO 70



SYMBOL	MILLIMETRES	
	MIN.	MAX.
A	0.4	0.5
B	0.4	0.5
D	0.06	0.08
E	0.18	0.22

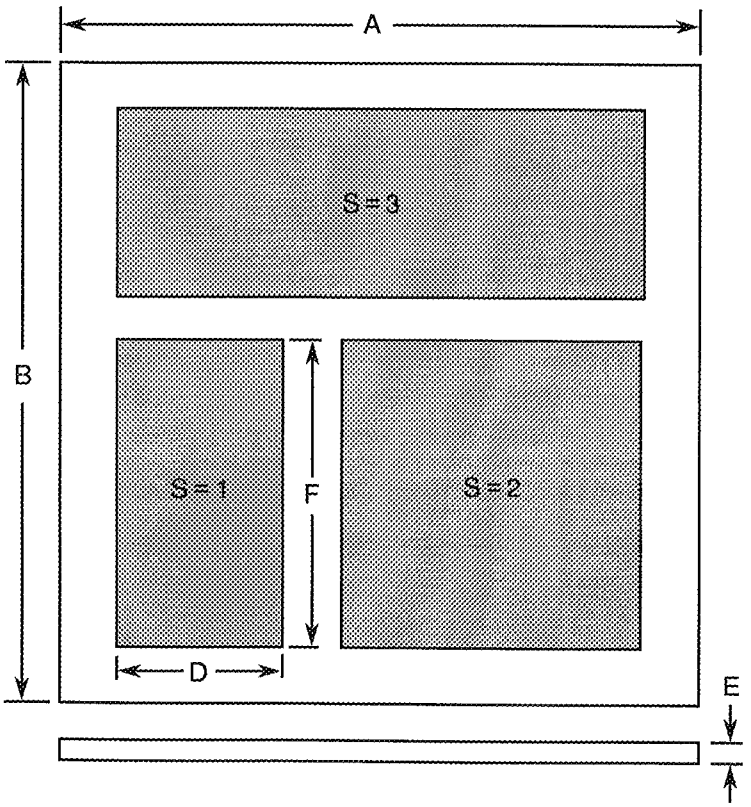
FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

FIGURE 2(i) - VARIANTS 71 TO 73



SYMBOL	MILLIMETRES	
	MIN.	MAX.
A	0.4	0.5
B	0.4	0.5
D	0.08	0.10
E	0.18	0.22

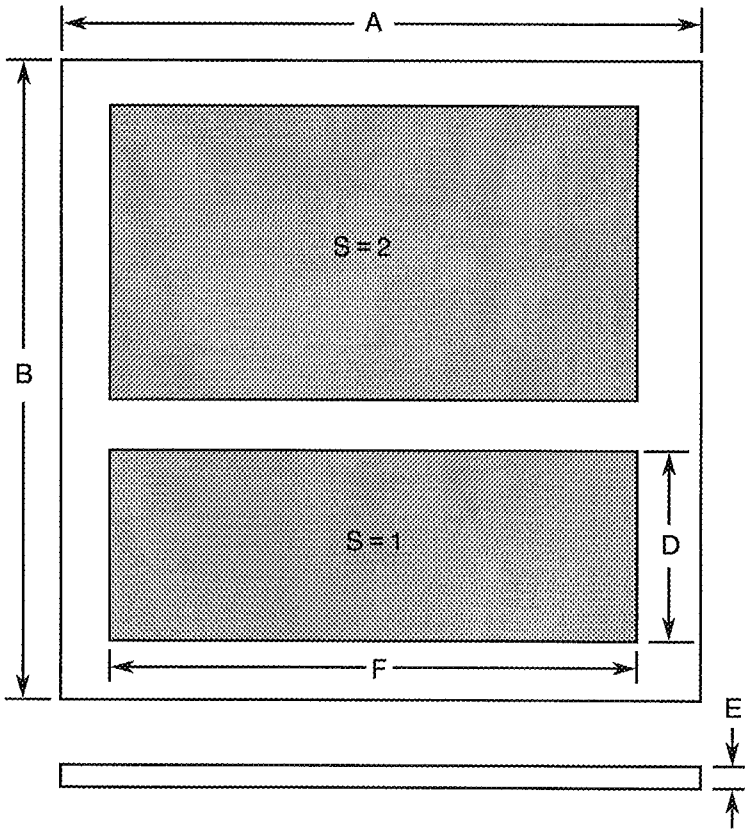
FIGURE 2(i) - VARIANT 74



SYMBOL	MILLIMETRES	
	MIN.	MAX.
A	0.65	0.75
B	0.65	0.75
D	0.17	0.19
E	0.18	0.22
F	0.26	0.28

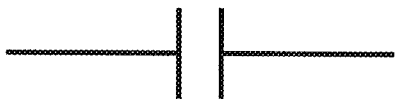
FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

FIGURE 2(k) - VARIANT 75



SYMBOL	MILLIMETRES	
	MIN.	MAX.
A	0.45	0.55
B	0.45	0.55
D	0.10	0.12
E	0.18	0.22
F	0.39	0.42

FIGURE 3 - FUNCTIONAL DIAGRAM



4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the capacitors specified herein shall be as stated in this specification and ESA/SCC Generic Specification No. 5010 for Discrete Microwave Semiconductor Components. 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 (Chart II(a))

None.

4.2.2 Deviations from Final Production Tests (Chart II(b))

No tests from Chart II(b) are required for dice. The following deviations apply to packaged dice subject to Qualification and Lot Acceptance testing:-

None.

4.2.3 Deviations from Burn-in and Electrical Measurements (Chart III)

No tests from Chart III are required for dice. The following deviations apply to packaged dice subject to Qualification and Lot Acceptance testing:-

(a) Para. 9.21, High Temperature Reverse Bias Burn-in test and subsequent electrical measurements related to this test shall be omitted.

4.2 4 Deviations from Qualification Tests (Chart IV)

No tests from Chart IV are required for dice. The following deviations apply to packaged dice subject to Qualification testing:-

(a) Environmental/Mechanical Testing from Subgroup 1: Shall not be performed.

(b) Paras. 9.8.1 and 9.8.2, Seal Test: Shall not be performed.

(c) Para. 9.17, Solderability Test: Shall not be performed.

(d) Para. 9.18, Permanence of Marking: Shall not be performed.

(e) Para. 9.19, Terminal Strength: Shall not be performed.

(f) Para. 9 20.1, Operating Life : Duration shall be 2000 hours.
: Data Points shall be at 1000 ± 48 hours and 2000 ± 48 hours.

(g) Para. 9.23, Special Testing. Shall not be performed.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

No tests from Chart V are required for dice. The following deviations apply to packaged dice subject to Lot Acceptance testing:-

(a) Environmental/Mechanical Testing for Level 1: Shall not be performed.

(b) Para. 9.10, External Visual Inspection: Shall not be performed.

(c) Para. 9.18, Permanence of Marking: Shall not be performed.

(d) Para. 9.19, Terminal Strength: Shall not be performed.

(e) Para. 9.23, Special Testing: Shall not be performed.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

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

4.3.2 Weight

The maximum weight of the capacitors specified herein shall be 1.3µgrammes for Variants 01 to 49 and 65 to 75, 2.3µgrammes for Variants 50 to 55, 3.2µgrammes for Variants 56 to 61 and 3.8µgrammes for Variants 62 to 67.

4.3.3 Terminal Strength

Not applicable.

4.3.4 Bond Strength

The requirements for bond strength are specified in Section 9 of ESA/SCC Generic Specification No. 5010. The test conditions shall be as follows:-

(a) Condition : 'A'

(b) Separating Force : 0.03N minimum

4 3.5 Die Shear

The requirements for die shear are specified in Section 9 of ESA/SCC Generic Specification No. 5010. The test conditions shall be as follows:-

(a) Semiconductor Material Remaining: 50% minimum.

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 capacitors 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

Not applicable.

4.4.2 Pad and Backface Material and Finish

The pad and die backface metallisation material shall be TiAu with a minimum pad thickness of 3.0µm of electrolytic gold. The minimum backface metallisation thickness shall be as follows:

- Variants 01 to 49 and 68 to 75 : 0 6µm of gold.
- Variants 50 to 67 : 3.0µm of electrolytic gold.

4.5 MARKING

4.5.1 General

The marking of all components delivered to this specification shall be in accordance with with the requirements of ESA/SCC Basic Specification No. 21700 and the following paragraphs. When the component is too small to accommodate all of the marking specified, as much as space permits shall be marked and the marking information, in full, shall accompany the component in its primary package.

The information to be marked and the order of precedence, shall be as follows:-

(a) The SCC Component Number.

(b) Traceability Information.

4.5.2 The SCC Component Number

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

571100101B

Detail Specification Number

Type Variant (see Table 1(a))

Testing Level (B or C, as applicable)

4.5.3 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 at room temperature 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. Unless otherwise specified, the measurements shall be performed at $T_{amb} = +150(+0-3)$ °C.

4.7 BURN-IN TESTS

Burn-in shall be Category 2 of Chart III(a).

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 scheduled parameters 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 High Temperature Reverse Bias Burn-in (Table 5(a))

Not applicable.

4 7.3 Conditions for Power Burn-in

The requirements for power burn-in are specified in Section 9 of ESA/SCC Generic Specification No. 5010. The conditions for power burn-in shall be as specified in Table 5(b) of this specification.

4.7.4 Electrical Circuit for High Temperature Reverse Bias Burn-in (Figure 5(a))

Not applicable.

4.7.5 Electrical Circuit for Power Burn-in

The circuit for use in performing the power burn-in test is shown in Figure 5(b) of this specification.

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

NO.	CHARACTERISTICS	SYMBOL	MIL-STD-750 METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
1	Capacitance	C	4001	$V_T = 0V$	Note 1		pF
2	Leakage Current	I_{L1}	4016	$V_T = V_N$ (Note 2)	-	50	nA
3	Voltage Proof Leakage Current	I_{L2}	4016	$V_T = 1.5\ V_N$ (Note 2)	-	100	nA

NOTES

1 See Columns 3 and 4 of Table 1(a).

2. See Column 5 of Table 1(a).

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

NO.	CHARACTERISTICS	SYMBOL	MIL-STD-750 METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
2	Leakage Current	I_{L1}	4016	$V_T = V_N$ (Note 1)	-	1.0	µA

NOTES

1. See Column 5 of Table 1(a).

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

Not applicable.

TABLE 4 - PARAMETER DRIFT VALUES

NO.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	CHANGE LIMITS (Δ)	UNIT
1	Capacitance	C	As per Table 2	As per Table 2	±0.2 or (1) ±2.0	nA %
2	Leakage Current	I_{L1}	As per Table 2	As per Table 2	±5.0 or (1) ±100	nA %

NOTES

1 Whichever is greater, referred to the initial value.

TABLE 5(a) - CONDITIONS FOR HIGH TEMPERATURE REVERSE BIAS BURN-IN

Not applicable.

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

No.	CHARACTERISTICS	SYMBOL	CONDITIONS	UNIT
1	Ambient Temperature	T_{amb}	+ 150 (+ 0 – 3)	°C
2	Test Voltage	V_T	V_N (Note 1)	V
3	Duration	t	For Testing Level 'B'. 240(+ 24 – 0) For Testing Level 'C': 168(+ 24 – 0)	Hours

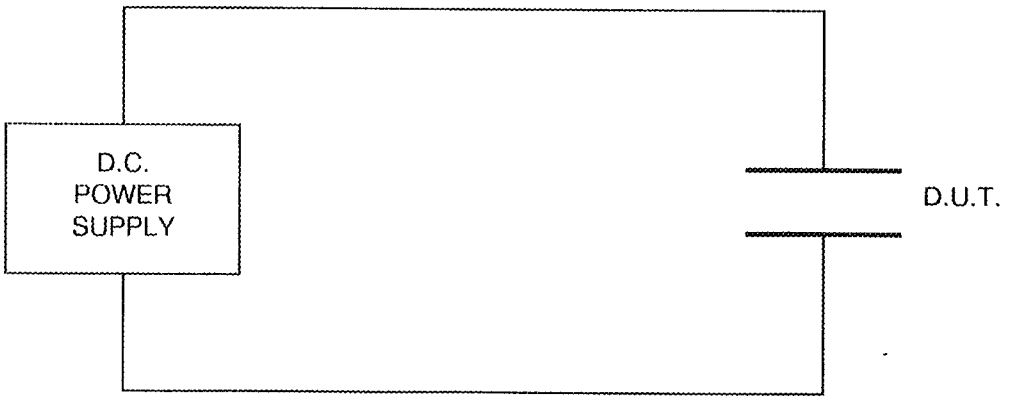
NOTES

1. See Column 5 of Table 1(a).

FIGURE 5(a) - ELECTRICAL CIRCUIT FOR HIGH TEMPERATURE REVERSE BIAS BURN-IN

Not applicable.

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



4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESA/SCC GENERIC SPECIFICATION No. 5010)

4.8.1 Electrical Measurements on Completion of Environmental Tests

The parameters to be measured on completion of environmental tests are scheduled in Table 2. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.8.2 Electrical Measurements at Intermediate Points and on Completion of Endurance Tests

The parameters to be measured at intermediate points and 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

4.8.3 Conditions for Operating Life Tests (Part of Endurance Testing)

The requirements for operating life testing are specified in Section 9 of ESA/SCC Generic Specification No. 5010. The conditions for operating life testing shall be as specified in Table 5(b) of this specification, except that the duration shall be as specified in ESA/SCC Generic Specification No. 5010, Para. 9.20.

4.8.4 Electrical Circuit for Operating LIfe Tests

The circuit for use in performing the operating life test shall be the same as shown in Figure 5(b) for power burn-in.

4 9 TOTAL DOSE IRRADIATION TESTING

Not applicable.

4.10 SPECIAL TESTING

Not applicable.

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

NO.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
1	Capacitance	C	As per Table 2	As per Table 2	Note 1		pF
2	Leakage Current	I_{L1}	As per Table 2	As per Table 2	-	50	nA
3	Voltage Proof Leakage Current	I_{L2}	As per Table 2	As per Table 2	-	100	nA

NOTES 1. See Columns 3 and 4 of Table 1(a)

FIGURE 6 - BIAS CONDITIONS FOR IRRADIATION TESTING

Not applicable.

TABLE 7 - ELECTRICAL MEASUREMENTS DURING AND ON COMPLETION OF IRRADIATION TESTING

Not applicable