



Pages 1 to 20

**POWER INDUCTORS,  
MOULDED, SMD,  
BASED ON SERIES SESI  
ESCC Detail Specification No. 3201/009**

**ISSUE 4  
September 2004**



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**DOCUMENTATION CHANGE NOTICE**

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DCR No.	CHANGE DESCRIPTION
94, 103	Specification upissued to incorporate technical and editorial changes per DCRs.



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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 Surface Mounting Inductors based on Series SESI. It shall be read in conjunction with ESCC Generic Specification No. 3201, the requirements of which are supplemented herein.

**1.2 COMPONENT TYPE VARIANTS AND RANGE OF COMPONENTS**

Variants and range of components of the basic inductors 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 inductors specified herein are scheduled in Table 1(b).

**1.4 PARAMETER DERATING INFORMATION (FIGURE 1)**

Not applicable.

**1.5 PHYSICAL DIMENSIONS**

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

**1.6 FUNCTIONAL DIAGRAM**

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

**2. APPLICABLE DOCUMENTS**

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

- (a) ESCC Generic Specification No. 3201 for R.F. Coils, Fixed.

**3. TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS**

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESCC Basic Specification No. 21300 shall apply.

**TABLE 1(a) - TYPE VARIANTS AND RANGE OF COMPONENTS**

TYPE VARIANTS

Variant	Type	Figure	Terminal Finish	Weight (g)
01	SESI 14	2(a)	SnPb	4
02	SESI 15	2(a)	SnPb	5
03	SESI 15W	2(b)	SnPb	6
04	SESI 18	2(b)	SnPb	11
05	SESI 9.1	2(c)	SnPb	2

RANGE OF COMPONENTS - SESI 14 SERIES (Variant 01)

(1) Inductance (Note 1) L ( $\mu$ H)	(2) Tolerance $\pm$ %	(3) Rated DC Current $I_R$ (A)	(4) Inductance at $I_R$ (Note 2) $L_R$ ( $\mu$ H)	(5) Peak Current (Note 3) $I_P$ (A)	(6) Max. DC Resistance $R_{DC}$ (m $\Omega$ )
3.3	20	5.8	2.3	8.0	15
4.7	20	5.4	3.3	6.9	17.5
6.0	20	4.3	4.2	5.7	26.5
8.2	20	3.7	5.7	5.2	42
10	20	3.3	7.0	4.6	47
15	20	2.7	10.5	3.8	90
22	20	2.2	15.4	3.0	110
33	20	1.8	23.1	2.5	170
47	10	1.6	32.9	2.1	200
56	10	1.5	39.2	1.9	240
68	10	1.3	47.6	1.7	290
82	10	1.2	57.4	1.5	315
100	10	1.1	70	1.4	440
120	10	1.0	84	1.3	500
150	10	0.9	105	1.1	645
180	10	0.83	126	1.0	740
220	10	0.72	154	1.0	980
330	10	0.57	231	0.8	1575

**NOTES:** See Page 9.



RANGE OF COMPONENTS - SESI 15 SERIES (Variants 02 and 03)

(1) Inductance (Note 1) L ( $\mu$ H)	(2) Tolerance $\pm$ %	(3) Rated DC Current $I_R$ (A)	(4) Inductance at $I_R$ (Note 2) $L_R$ ( $\mu$ H)	(5) Peak Current (Note 3) $I_P$ (A)	(6) Max. DC Resistance $R_{DC}$ (m $\Omega$ )
1.5	30	14	0.9	19	5.0
1.8	30	10	1.05	14	5.0
2.7	20	8.2	1.9	11.5	6.5
4.9	20	6.0	3.4	8.5	11
6.4	20	5.3	4.5	7.5	12
8.0	20	4.8	5.6	6.5	16
12	20	4.0	8.4	5.5	23
16	20	3.4	11.2	4.5	27
18	20	3.1	12.6	4.2	29
21	20	2.9	14.7	4.0	36
27	20	2.6	18.9	3.5	44
33	20	2.3	23	3.2	59
48	10	1.9	33	2.7	72
56	10	1.8	39	2.5	82
68	10	1.6	47	2.2	110
82	10	1.5	57	2.1	120
100	10	1.35	70	1.9	155
120	10	1.2	84	1.7	180
150	10	1.1	105	1.5	230
220	10	0.9	154	1.3	355
330	10	0.74	231	1.0	630

**NOTES:** See Page 9.





RANGE OF COMPONENTS - SESI 18 SERIES (Variant 04)

(1) Inductance (Note 1) L ( $\mu$ H)	(2) Tolerance  $\pm$ %	(3) Rated DC Current  $I_R$ (A)	(4) Inductance at $I_R$ (Note 2)  $L_R$ ( $\mu$ H)	(5) Peak Current (Note 3)  $I_P$ (A)	(6) Max. DC Resistance  $R_{dc}$ (m $\Omega$ )
6.8	20	9.8	4.2	13.6	7.5
8.2	20	8.3	5.7	11.5	9.0
11	20	7.2	7.7	10	12
15	20	6.35	10.5	8.9	15
18	20	5.7	12.6	7.9	17
22	20	5.1	15.4	7.2	20
27	20	4.7	18.9	6.5	25
37	10	4.0	25.9	5.6	29
49	10	3.5	34.3	4.8	45
56	10	3.3	39	4.6	48
70	10	2.9	49	4.1	65
86	10	2.6	60	3.7	72
100	10	2.4	70	3.3	75
120	10	2.2	84	3.1	115
150	10	1.95	105	2.7	125
180	10	1.8	126	2.6	175
220	10	1.6	154	2.3	210
330	10	1.34	231	1.9	250

**NOTES:** See Page 9.



RANGE OF COMPONENTS - SESI 9.1 SERIES (Variant 05)

(1) Inductance (Note 1) L ( $\mu$ H)	(2) Tolerance $\pm$ %	(3) Rated DC Current $I_R$ (A)	(4) Inductance at $I_R$ (Note 2) $L_R$ ( $\mu$ H)	(5) Peak Current (Note 3) $I_P$ (A)	(6) Max. DC Resistance $R_{dc}$ (m $\Omega$ )
1.0	30	6.0	0.6	11.0	8.5
1.5	30	5.4	0.9	9.5	11.5
2.0	30	4.3	1.4	8.2	17
2.6	20	3.6	1.8	7.0	23
3.4	20	3.0	2.4	6.2	35
4.3	20	2.8	3.0	5.5	40
6.2	20	2.3	4.3	4.3	59
8.5	20	1.9	6.0	3.7	87
10	20	1.85	7.0	3.4	93
15	20	1.5	10.5	2.8	140
18	20	1.27	12.6	2.5	192
22	20	1.21	15.4	2.3	215
26	20	1.03	18.2	2.14	290
33	10	0.92	23.1	1.9	350
47	10	0.8	32.9	1.6	470
66	10	0.73	46.2	1.3	565
81	10	0.63	56.7	1.21	745
100	10	0.6	70	1.1	795
150	10	0.53	105	0.8	750
220	10	0.43	154	0.7	1165
330	10	0.36	231	0.6	1475
470	10	0.3	329	0.5	2220
680	10	0.25	477	0.4	3255
1000	10	0.2	700	0.34	5865

**NOTES**

1. Inductance measured at 0.25V, 100KHz.
2. Minimum value when the inductance is measured under Rated Current at 110°C.
3. Peak current is the maximum current for a square pulse of duration < 10s.

**TABLE 1(b) - MAXIMUM RATINGS**

No.	Characteristics	Symbol	Maximum Ratings	Unit	Remarks
1	Rated DC Current	$I_R$	See Table 1(a)	A	
2	Dielectric Withstanding Voltage	DWV	500	Vrms	
3	Operating Temperature Range	$T_{op}$	- 55 to + 125	°C	
4	Storage Temperature Range	$T_{stg}$	- 55 to + 140	°C	$T_{amb}$
5	Soldering Temperature	$T_{sol}$	+ 260	°C	Note 1

**NOTES**

1. Duration 5 seconds maximum and the same termination shall not be resoldered until 3 minutes have elapsed.

**FIGURE 1 - PARAMETER DERATING INFORMATION**

Not applicable.

**FIGURE 2 - PHYSICAL DIMENSIONS**

Figure 2a - Variants 01 and 02

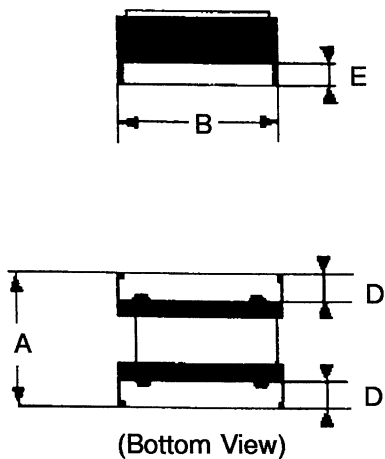


Figure 2b - Variants 03 and 04

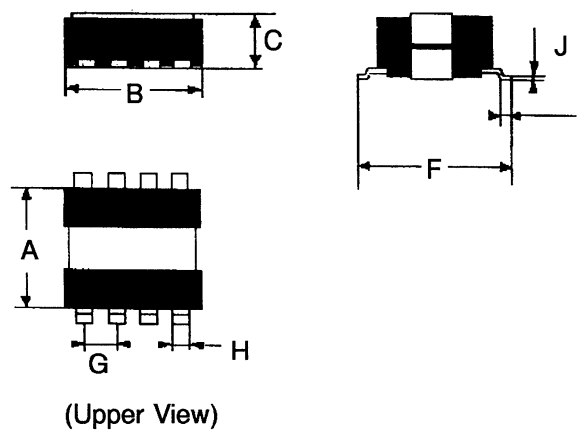
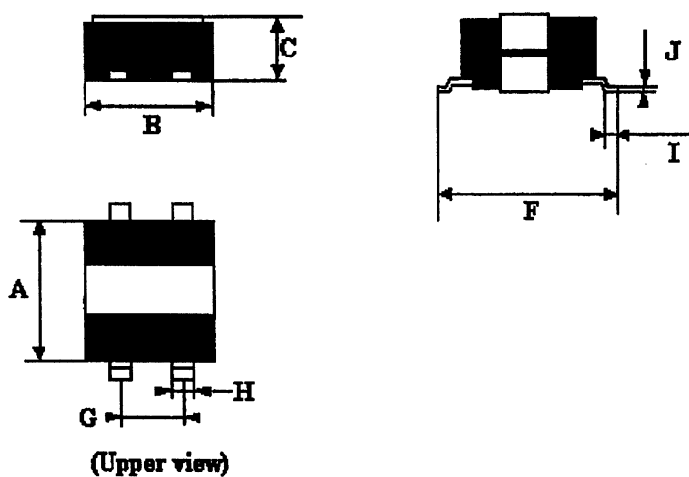


Figure 2c - Variant 05



SYMBOL	Variant 01		Variant 02		Variant 03		Variant 04		Variant 05	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
A	15.7	16.3	15.7	16.3	16	16.5	21.7	22.3	10	10.6
B		16		16		16		19.8		10.7
C		5.4		7.4		7.9		8.9		5.8
D	2.3		2.3							
E	1.0	1.5	1.0	1.5						
F					21.1	22	25.1	26	12.8	13.4
G					3.7	3.9	3.7	3.9	5.6	5.8
H					1.0	1.2	1.9	2.1	1.3	1.5
I					1.3	1.6	1.3	1.6	0.9	1.3
J					0.2		0.2		0.2	

**NOTE:** All dimensions are in millimetres.

**FIGURE 3 - FUNCTIONAL DIAGRAM**



#### 4. REQUIREMENTS

##### 4.1 GENERAL

The complete requirements for procurement of the inductors specified herein are stated in this specification and ESCC Generic Specification No. 3201 for R.F. Coils, Fixed. 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 ESCC 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 and Electrical Measurements (Chart III)

(a) Para. 9.4, Radiographic Inspection: Shall not be performed.

###### 4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Para. 9.17, Immersion: Shall not be performed.

(b) Para. 9.18, Moisture Resistance: There shall be no polarisation voltage during test.

###### 4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Para. 9.18, Moisture Resistance: Shall not be performed.

##### 4.3 MECHANICAL REQUIREMENTS

###### 4.3.1 Dimension Check

The dimensions of the inductors specified herein shall be verified in accordance with the requirements set out in Para. 9.6 of ESCC Generic Specification No. 3201 and they shall conform to those shown in Figure 2 of this specification.



4.3.2 Weight

The maximum weight of the inductors specified herein shall be as given in Table 1(a) - Component Type Variants

4.3.3 Terminal Strength

The requirements for terminal strength testing are specified in Para. 9.12 of ESCC Generic Specification No. 3201.

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 inductors 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

As a minimum, a resin moulding shall ensure the inductor's protection.

4.4.2 Terminal Material and Finish

The terminal material shall be brass, plated with 2.0 to 4.0  $\mu\text{m}$  of nickel, the finish shall be either Sn60Pb40 or Sn90Pb10.

4.5 MARKING

4.5.1 General

The marking of all components delivered to this specification shall be in accordance with the requirements of ESCC 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.

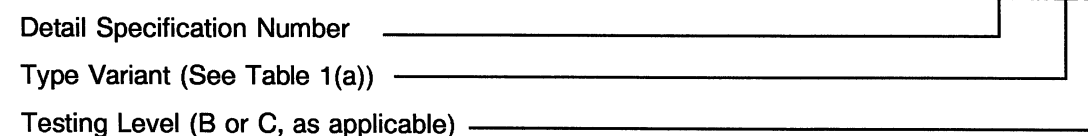
The information to be marked and the order of precedence, shall be as follows:-

- (a) The ESCC Component Number.
- (b) Electrical Characteristics and Ratings.
- (c) Traceability Information.

4.5.2 The ESCC Component Number

The ESCC Component Number shall be constituted and marked as follows:-

320100901B

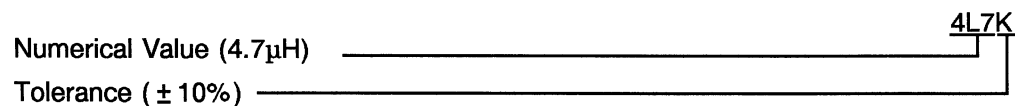


4.5.3 Electrical Characteristics and Ratings

The electrical characteristics and ratings to be marked in the following order of precedence are:-

- (a) Numerical Value.
- (b) Tolerance.

The information shall be constituted and marked as follows:-



4.5.3.1 Numerical Values

The numerical values shall be expressed by means of the following codes. The unit quantity for marking shall be in microhenries.

Numerical Value	Code
0.0XX	L0XX
0.XX	LXX
X.X	XLX
XX	XX0
XX10 <sup>1</sup>	XX1
XX10 <sup>2</sup>	XX2

4.5.3.2 Tolerances

The tolerances on numerical values shall be indicated by the code letters specified hereafter.

Tolerance ( $\pm \%$ )	Code Letter
2.0	G
5.0	J
10	K
20	M
30	N

4.5.4 Traceability Information

Traceability information shall be marked in accordance with the requirements of ESCC 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, 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. Measurements shall be performed at  $T_{amb} = +110(+0-5)$  and  $-55(+5-0)$  °C respectively.

4.6.3 Circuits for Electrical Measurements (Figure 4)

Not applicable.

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#### 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 ( $\Delta$ ) applicable to the parameters scheduled shall not be exceeded. In addition to these drift value requirements for a given parameter, the appropriate limit value specified in Table 2 shall not be exceeded.

##### 4.7.2 Conditions for Burn-in

The requirements for burn-in are specified in Section 7 of ESCC Generic Specification No. 3201. The conditions for burn-in shall be as specified in Table 5(a) of this specification.

On completion of burn-in, a recovery period of  $24 \pm 2$  hours is necessary before the end measurements.

##### 4.7.3 Electrical Circuit for Burn-in (Figure 5(a))

Not applicable.



**TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE**

No.	Characteristics	Symbol	ESCC 3201 Test Method	Test Condition	Limits		Unit
					Min	Max	
1	Inductance (Note 2)	L	Para. 9.3.1.1c	Para. 9.3.1.1	(1)	(1)	$\mu\text{H}$
2	Load Inductance (Note 3)	$L_R$	Para. 9.3.1.1c	Para. 9.3.1.1	(3)	-	$\mu\text{H}$
3	DC Resistance	$R_{dc}$	Para. 9.3.1.4	Para. 9.3.1.4	-	(4)	$\Omega$
4	Insulation Resistance	$R_i$	Para. 9.3.1.6	Para. 9.3.1.6	1.0	-	$\text{G}\Omega$

**NOTES**

1. For actual values see Column 1 of Table 1(a).
2. To be measured at 0.25V 100kHz.
3. To be measured at 0.25V 100kHz with Rated Current as defined in Column 4 of Table 1(a).
4. For actual values see Column 6 of Table 1(a).

**TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES**

No.	Characteristics	Symbol	ESCC 3201 Test Method	Test Condition (Note 1)	Limits		Unit
					Min	Max	
1	Load Inductance (Note 2)	$L_R$	Para. 9.3.1.1c	Para. 9.3.1.1	(2)	-	$\mu\text{H}$

**NOTES**

1. To be performed on 5 components.
2. To be measured at 0.25V 100kHz with Rated Current as defined in Column 4 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 ( $\Delta$ )	Unit
1	Inductance	L	As per Table 2	As per Table 2	$\pm 10$	%

**TABLE 5(a) - CONDITIONS FOR BURN-IN**

No.	Characteristic	Symbol	Condition	Unit
1	Ambient Temperature	$T_{amb}$	+ 125(+ 0 - 3)	$^{\circ}\text{C}$

**TABLE 5(b) - CONDITIONS FOR OPERATING LIFE TESTS**

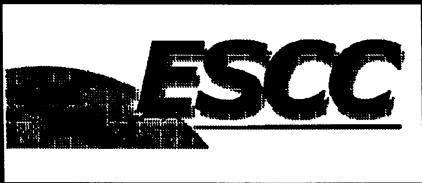
No.	Characteristic	Symbol	Condition	Unit
1	Ambient Temperature	$T_{amb}$	+ 125(+ 0 - 3)	$^{\circ}\text{C}$
2	Loading and Cycling	-	Para. 9.19 of ESCC 3201	-

**FIGURE 5(a) - ELECTRICAL CIRCUIT FOR BURN-IN**

Not applicable.

**FIGURE 5(b) - ELECTRICAL CIRCUIT FOR OPERATING LIFE TESTS**

Not applicable.



4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESCC GENERIC SPECIFICATION NO. 3201)

4.8.1 Measurements and Inspections on Completion of Environmental Tests

The parameters to be measured and inspections to be performed 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 Measurements and Inspections at Intermediate Points during Endurance Tests

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

4.8.3 Measurements and Inspections on Completion of Endurance Tests

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

4.8.4 Conditions for Operating Life Test (Part of Endurance Testing)

The requirements for operating life testing are specified in Section 9 of ESCC Generic Specification No. 3201. The conditions for operating life testing shall be as specified in Table 5(b) of this specification.

4.8.5 Electrical Circuit for Operating Life Test (Figure 5(b))

Not applicable.



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

NO.	ESCC GENERIC SPEC. NO. 3201		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
01	Thermal Shock	Para. 9.2	Visual Examination	Evidence of damage or loosening of terminals	-	-	-	-
02	Solderability	Para. 9.7	Visual Examination	MIL-STD-202 Method 208 Solid Wire Termination Criteria	-	-	-	-
03	Barometric Pressure	Para. 9.8	<b>During Test</b> Dielectric Withstanding Voltage DWV Leakage Current	While still at low pressure Para. 9.3.1.5 of ESCC 3201 500Vrms	$I_L$	-	0.1	mA
04	Temperature Rise	Para. 9.9 and Table 1(a) of this Spec. at +90°C	Temperature Rise	Within 30 seconds of removal of power Temperature Change	$\Delta T$	-	25	°C
05	Overload	Para. 9.10 and Table 1(a) of this spec.	<b>After Test</b> Visual Examination  <b>Final Measurements</b> DC Resistance Insulation Resistance Dielectric Withstanding Voltage DWV Leakage Current	Evidence of cracked cases, charred windings, distorted or softened insulation or loosening of terminals  <b>After 24 hours</b> Table 2 Item 3 Table 2 Item 4 Gen. 3201 Para. 9.3.1.5 500Vrms	$R_{dc}$ $R_i$ $I_L$	Table 2 1.0 -	Table 2 - 0.1	$\Omega$ G $\Omega$ mA
06	Resistance to Soldering Heat	Para. 9.11	<b>Final Measurements</b> Inductance DC Resistance Dielectric Withstanding Voltage DWV Leakage Current  <b>After Test</b> Visual Examination	Table 2 Item 1 Table 2 Item 3 Gen. 3201 Para. 9.3.1.5 500Vrms  Evidence of damage or loosening of terminals	$L$ $R_{dc}$ $I_L$	Table 2 Table 2 -	Table 2 Table 2 0.1	$\mu H$ $\Omega$ mA
07	Terminal Strength	Para. 9.12	Visual Examination	Gen. 3201 Para. 9.12.2  Evidence of damage	-	-	-	-
08	Low Temperature Storage	Para. 9.14 and Table 1(b) of this Spec.	Visual Examination	Evidence of damage or loosening of terminals	-	-	-	-
09	Vibration	Para. 9.15	Visual Examination	-	-	-	-	-
10	Shock (Specified Pulse)	Para. 9.16	Visual Examination	-	-	-	-	-

**NOTES**

1. The tests in this Table refer to either Chart IV or V and shall be used as applicable.

**TABLE 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING (CONT'D)**

NO.	ESCC GENERIC SPEC. NO. 3201		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
11	Immersion	Para. 9.17	Not applicable	-	-	-	-	-
12	Moisture Resistance	Para. 9.18 and Paras. 4.2.4 and 4.2.5 of this Spec. Before Tests, Thermal Shock, MIL-STD-202, Method 107, Cond 'A'	<b>Final Measurements</b>  Dielectric Withstanding Voltage DWV Leakage Current Insulation Resistance Inductance DC Resistance  <b>After Test</b> Visual Examination	Within 30 mins of removal from 1.5 to 3.5 hr Conditioning Gen. 3201 Para. 9.3.1.5 500Vrms Table 2 Item 4 Table 2 Item 1 Table 2 Item 3  No evidence of corrosion	$I_L$ $R_i$ $L$ $R_{dc}$	-	0.1	mA $M\Omega$ $\mu H$ $\Omega$
13	Operating Life	Para. 9.19	<b>Initial Measurements</b> Inductance  <b>Intermediate Measurements</b> Dielectric Withstanding Voltage DWV Leakage Current Inductance Change  <b>Final Measurements</b>  Dielectric Withstanding Voltage DWV Leakage Current Inductance Change DC Resistance Insulation Resistance	Table 2 Item 1  <b>At 1000 hours</b> After a recovery period of 30 mins 500Vrms Table 2 Item 1  <b>At 1000 and 2000 hours</b> After a recovery period of 30 mins Gen. 3201 Para 9.3.1.5 500Vrms Table 2 Item 1 Table 2 Item 3 Table 2 Item 4	$L$  $I_L$ $\Delta L/L$  $I_L$ $\Delta L/L$ $R_{dc}$ $R_i$	Table 2	Table 2	$\mu H$  mA %  mA % $\Omega$ $M\Omega$

**NOTES**

1. The tests in this Table refer to either Chart IV or V and shall be used as applicable.