POWER INDUCTORS,

MOULDED, SMD,

BASED ON SERIES SESI

ESCC Detail Specification No. 3201/009

ISSUE 1

October 2002

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ESA/SCC Detail Specification No. 3201/009

space components
coordination group

Issue/Rev.	Date	Approved by	
		SCCG Chairman	ESA Director General or his Deputy
Issue 1	June 2002		

DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.

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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 Surface Mounting Inductors based on Series SESI. It shall be read in conjunction with ESA/SCC 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) ESA/SCC 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 ESA/SCC 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

RANGE OF COMPONENTS - SESI 14 SERIES

(1) Inductance (Note 1) L (µH)	(2) Tolerance ±%	(3) Rated D.C. Current I_R (A)	(4) Inductance at I_R (Note 2) L_R (µH)	(5) Peak Current (Note 3) I_P (A)	(6) D.C. Resistance (Note 4) R_{dc} (mΩ)
3.3	20	5.7	2.8	8.0	12.5
4.7	20	4.9	3.7	6.9	14.5
6.0	20	4.1	4.7	5.7	22.0
8.2	20	3.7	6.1	5.2	25
10	20	3.3	7.7	4.6	39
15	10	2.7	9.7	3.8	50
22	10	2.2	15.3	3.0	90
33	10	1.8	24.8	2.5	105
47	10	1.5	34.4	2.1	165
56	10	1.3	40.8	1.9	175
68	10	1.2	52	1.7	240
82	10	1.1	62.4	1.5	260
100	10	1.0	77.4	1.4	380
120	10	0.95	90.8	1.3	435
150	10	0.84	115.9	1.1	560
180	10	0.77	132.8	1.0	640
220	10	0.70	164	1.0	850
330	10	0.57	260.8	0.8	1370

NOTES: See Page 8.

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

(1) Inductance (Note 1) L (µH)	(2) Tolerance ±%	(3) Rated D.C. Current I_R (A)	(4) Inductance at I_R (Note 2) L_R (µH)	(5) Peak Current (Note 3) I_P (A)	(6) D.C. Resistance (Note 4) R_{dc} (mΩ)
1.5	20	14	1.1	19	4.0
1.8	20	10	1.2	14	4.0
2.7	20	8.2	1.9	11.5	5.5
4.9	20	6.1	3.3	8.5	8.8
6.4	20	5.4	4.1	7.5	10
8.0	20	4.8	5.1	6.5	10
12	10	4.0	8.1	5.5	18.5
16	10	3.4	10.5	4.5	22
18	10	3.1	12	4.2	24
21	10	2.9	17	4.0	30
27	10	2.6	17	3.5	36
33	10	2.3	22	3.2	49
48	10	1.9	31	2.7	60
56	10	1.8	37	2.5	68
71	10	1.6	50	2.2	92
82	10	1.5	70	2.1	98
100	10	1.3	65	1.9	135
120	10	1.2	81	1.7	155
150	10	1.0	98	1.5	200
220	10	0.9	145	1.3	310
330	10	0.7	232	1.0	550
1000	10	0.4	800	0.6	1850

NOTES: See Page 8.

RANGE OF COMPONENTS - SESI 18 SERIES

(1) Inductance (Note 1) L (µH)	(2) Tolerance ±%	(3) Rated D.C. Current I_R (A)	(4) Inductance at I_R (Note 2) L_R (µH)	(5) Peak Current (Note 3) I_P (A)	(6) D.C. Resistance (Note 4) R_{dc} (mΩ)
6.4	20	9.7	4.2	13.6	6.2
8.2	20	8.2	6	11.5	7.5
11	10	7.2	7.9	10	10
15	10	6.3	10.5	8.9	12.5
18	10	5.6	12.9	7.9	14
22	10	5.1	15.7	7.2	16.5
27	10	4.7	18.9	6.5	20.5
37	10	4.0	25.9	5.6	24
49	10	3.5	34.3	4.8	37
56	10	3.3	39.2	4.6	40
70	10	3.0	49	4.1	54
86	10	2.6	60	3.7	60
100	10	2.4	72	3.3	65
120	10	2.2	85	3.1	100
150	10	1.9	106	2.7	108
180	10	1.8	123	2.6	152
220	10	1.6	159	2.3	185
330	10	1.3	233	1.9	220

NOTES

1. Inductance measured at 0.25V, 100KHz.
2. Minimum value when the inductance is measured under Rated Current.
3. I peak is the maximum current for a squre puls of duration <10s. The peak current may be permanent when the component is glued on a heatsink.
4. R_{dc} Tolerance is ± 15%.

TABLE 1(b) - MAXIMUM RATINGS

No.	Characteristics	Symbol	Maximum Ratings	Unit	Remarks
1	Rated D.C. 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

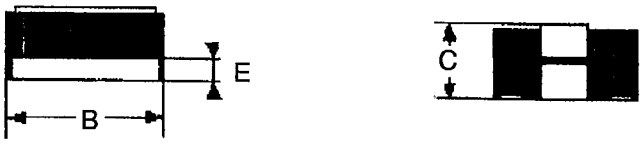
1. Duration 5 seconds maximum and the same termination shall not be resoldered until 3 minutes have elapsed.

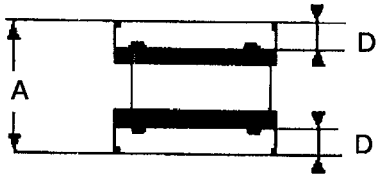
FIGURE 1 - PARAMETER DERATING INFORMATION

Not applicable.

FIGURE 2 - PHYSICAL DIMENSIONS

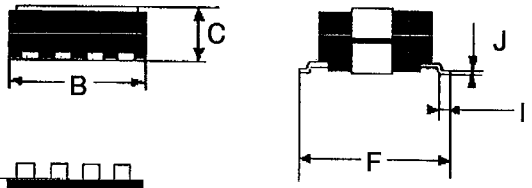
Figure 2a - Variants 01 and 02

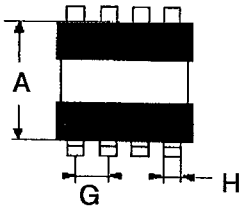




(Bottom View)

Figure 2b - Variants 03 and 04



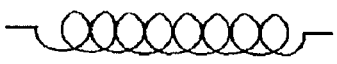


(Upper View)

SYMBOL	Variant 01		Variant 02		Variant 03		Variant 04	
	MIN.	MAX.	MIN	MAX	MIN	MAX	MIN	MAX
A	15.7	16.3	15.7	16.3	16	16.5	21.7	22.3
B		16		16		16		19.8
C		5.4		7.4		7.5		8.7
D	2.3	2.7	2.3	2.7				
E	1.0	1.5	1.0	1.5				
F					21.1	22	25.1	26
G					3.7	3.9	3.7	3.9
H					1.0	1.2	1.9	2.1
I					1.3	1.6	1.3	1.6
J					0.2	0.4	0.2	0.4

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 ESA/SCC 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 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 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: There shall be no polarisation voltage during test.

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 ESA/SCC 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

Not applicable.

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 µm 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 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:-

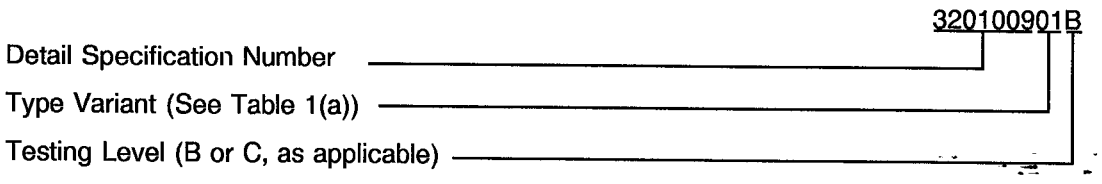
(a) The SCC Component Number.

(b) Electrical Characteristics and Ratings.

(c) Traceability Information.

4.5.2 The SCC Component Number

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



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:-

Numerical Value (4.7μH) ——— 4L7K

Tolerance (±10%) ———

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[1]	XX1
XX10[2]	XX2

4.5.3.2 Tolerances

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

Tolerance (±%)	Code Letter
2.0	G
5.0	J
10	K
20	M

4.5.4 Traceability Information

Traceability information shall be marked 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, 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 $T_{amb} = +125(+0-5)$ and $55(+5-0)$ °C respectively.

4.6.3 Circuits for Electrical Measurements (Figure 4)

Not applicable.

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 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 ESA/SCC 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 ± 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	ESA/SCC 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)	µH
2	Load Inductance (Note 3)	L_R	Para. 9.3.1.1c	Para. 9.3.1.1	(1)	(1)	µH
3	DC Resistance	R_{dc}	Para. 9.3.1.4	Para. 9.3.1.4	-	(1)	Ω
4	Insulation Resistance	Ri	Para. 9.3.1.6	Para. 9.3.1.6	1.0	-	GΩ

NOTES

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

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES (Note 1)

No.	Characteristics	Symbol	ESA/SCC 3201 Test Method	Test Condition (Note 1)	Limits		Unit
					Min	Max	
1	Inductance (Note 2)	L	Para. 9.3.1.1c	Para. 9.3.1.1	(1)	(1)	µH
2	Load Inductance (Note 3)	L_R	Para. 9.3.1.1c	Para. 9.3.1.1	(1)	(1)	µH

NOTES

1. To be performed on 5 components.
2. For actual values see Column 4 of Table 1(a).
3. To be measured at 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 (Δ)	Unit
1	Inductance	L	As per Table 2	As per Table 2	±10	%

TABLE 5(a) - CONDITIONS FOR BURN-IN

No.	Characteristic	Symbol	Condition	Unit
1	Ambient Temperature	T_{amb}	+125(+0−3)	°C

TABLE 5(b) - CONDITIONS FOR OPERATING LIFE TESTS

No.	Characteristic	Symbol	Condition	Unit
1	Ambient Temperature	T_{amb}	+125(+0−3)	°C
2	Loading and Cycling	-	Para. 9.19 of ESA/SCC 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 ESA/SCC 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 Tests (Part of Endurance Testing)

The requirements for operating life testing are specified in Section 9 of ESA/SCC 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 Tests (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.	ESA/SCC 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	**During Test** Dielectric Withstanding Voltage DWV Leakage Current	While still at low pressure Para. 9.3.1.5 of ESA/SCC 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	ΔT	-	25	°C
05	Overload	Para. 9.10 and Table 1(a) of this spec.	**After Test** Visual Examination **Final Measurements** D.C. Resistance Insulation Resistance Dielectric Withstanding Voltage DWV Leakage Current	Evidence of cracked cases, charred windings, distorted or softened insulation or loosening of terminals **After 24 hours** Table 2 Item 3 Table 2 Item 4 Gen. 3201 Para. 9.3.1.5 500Vrms	 R_{dc} Ri I_L	 Table 2 1.0 -	 Table 2 - 0.1	 Ω GΩ mA
06	Resistance to Soldering Heat	Para. 9.11	**Final Measurements** Inductance D.C. Resistance Dielectric Withstanding Voltage DWV Leakage Current **After Test** 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	 µH Ω Ω mA
07	Terminal Strength	Para. 9.12	Not applicable	-	-	-	-	-
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.	ESA/SCC 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'	**Final Measurements**	Within 30 mins of removal from 1.5 to 3.5 hr Conditioning				
			Dielectric Withstanding Voltage	Gen. 3201 Para. 9.3.1.5				
			DWV Leakage Current	500Vrms	I_L	-	0.1	mA
			Insulation Resistanc	Table 2 Item 4	Ri	100	-	MΩ
			Inductance	Table 2 Item 1	L	Table 2	Table 2	μH
			DC Resistance	Table 2 Item 3	R_{dc}	Table 2	Table 2	Ω
			After Test Visual Examination	No evidence of corrosion				
13	Operating Life	Para. 9.19	**Initial Measurements** Inductance	Table 2 Item 1	L	Table 2	Table 2	μH
			Intermediate Measurements	**At 1000 hours** After a recovery period of 30 mins				
			Dielectric Withstanding Voltage	500Vrms				
			DWV Leakage Current		I_L	-	0.1	mA
			Inductance Change	Table 2 Item 1	ΔL/L	−10	+10	%
			Final Measurements	**At 1000 and 2000 hours** After a recovery period of 30 mins				
			Dielectric Withstanding Voltage	Gen. 3201 Para 9.3.1.5				
			DWV Leakage Current	500Vrms	I_L	-	0.1	mA
			Inductance Change	Table 2 Item 1	ΔL/L	−10	+10	%
			DC Resistance	Table 2 Item 3	R_{dc}	Table 2	Table 2	Ω
			Insulation Resistance	Table 2 Item 4	Ri	100	-	MΩ

NOTES

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