



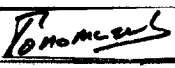
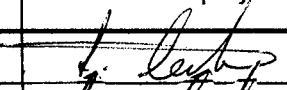
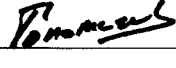
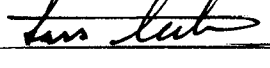
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**SURFACE ACOUSTIC WAVE (SAW)  
BANDPASS FILTER OPERATING IN THE  
FREQUENCY RANGE 10-200MHz  
ESA/SCC Detail Specification No. 3502/001**



**space components  
coordination group**

Issue/Rev.	Date	Approved by	
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**SCC**

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No. 3502/001

Rev. 'A'

PAGE 2

ISSUE 1

**DOCUMENTATION CHANGE NOTICE**

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
'A'	June'1994	P1. Cover page P2. DCN P8. Figure 2	: Definition of axes added	None None 23655

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#### **APPENDICES (Applicable to specific Manufacturers only)**

None.



## 1. GENERAL

### 1.1 SCOPE

This specification details the values, physical and electrical characteristics, test and inspection data for a Surface Acoustic Wave (SAW) Bandpass Filter in hermetically sealed packages, operating in the frequency range 10 - 200MHz.

It shall be read in conjunction with ESA/SCC Generic Specification No. 3502, the requirements for which are supplemented herein.

### 1.2 TYPE VARIANTS

A list of the type variants of the filters specified herein, which are also covered by this specification, is given in "Table 1(a) - Type Variant Summary".

For each type variant, the full electrical and physical characteristics are given in individual Tables 1(a) - "Type Variant Detailed Information" at the end of this specification.

The contents of the individual Tables 1(a) shall be as shown in Table 1(c) and the characteristics therein listed shall relate to the design parameters of the individual filters, optimised for the intended application.

The specific characteristics shall be negotiated between the Manufacturer and the Orderer. The Manufacturer shall then apply to the ESA/SCC Secretariat for a type variant number for each individual filter concerned, by sending a finalised Table 1(a) which shall also be copied to the Qualifying Space Agency (QSA).

### 1.3 MAXIMUM RATINGS

The maximum ratings, which shall not be exceeded at any time during use or storage, applicable to the filters 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 filters specified herein are shown in Figure 2 and the individual Tables 1(a).

### 1.6 FUNCTIONAL DIAGRAM

The functional diagram showing lead identification of the filters 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 any handling.

These components are categorised as Class 1 with a Minimum Critical Path Failure Voltage of 200V.



**TABLE 1(a) - TYPE VARIANT SUMMARY**

VARIANT	PASSBAND LOWER FREQUENCY (MHz)	DESIGN CENTRE FREQUENCY (MHz)	PASSBAND UPPER FREQUENCY (MHz)	MAXIMUM IN-BAND RIPPLE (dB)	INSERTION LOSS		MINIMUM RETURN LOSS (dB)
					MIN (dB)	MAX (dB)	
01	197.623	199.873	202.123	1.5	30	33	1.0

**NOTES**

- Full electrical and physical characteristics are given in the individual Tables 1(a) at the end of this specification.

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

No.	CHARACTERISTIC	SYMBOL	MAXIMUM RATING	UNIT	REMARKS
1	Input Power	$P_{IN}$	10	mW	
2	Frequency Range	f	10 to 200	MHz	
3	Operating Temperature Range	$T_{op}$	Note 1	°C	$T_{amb}$
4	Storage Temperature Range	$T_{stg}$	- 55 to + 125	°C	
5	Soldering Temperature	$T_{sol}$	+ 260	°C	Note 2

**NOTES**

- Individual Tables 1(a).
- 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.

**FIGURE 1 - PARAMETER DERATING INFORMATION**

Not applicable.

**TABLE 1(c) - FORMAT FOR INDIVIDUAL TABLES 1(a)****TABLE 1(a) - TYPE VARIANT DETAILED INFORMATION**

TYPE VARIANT No. \_\_\_\_\_

No.	CHARACTERISTIC	SYMBOL	LIMITS		UNIT	REMARKS
			MIN.	MAX		
1	Passband Lower Frequency	fl			MHz	-
2	Design Centre Frequency	fc			MHz	-
3	Passband Upper Frequency	fu			MHz	-
4	Insertion Loss At fc	IL			dB	-
5	In-Band Ripple (p-p) fl to fu	-	-		dB	-
6	Out-of-band Rejection	f1 to f2 f2 to f3 f4 to f5 f5 to f6 fn-3 to fn-2 fn-2 to fn-1 fn-1 to fn	BR - 1/2 BR - 2/3 BR - 4/5 BR - 5/6 BR - n3/n2 BR - n2/n1 BR - n1/n	- - - - - - -	dB	Note 1
7	Phase Linearity (p-p) fl to fu	PL	-		Degrees (°)	-
8	Group Delay At fc	GD			µs	
9	Group Delay Ripple (p-p) fl to fu	-	-		ns	
10	Return Loss fl to fu	RL		-	dB	-
11	Nominal Impedance At fc	Z			Ω	Note 2
12	Operating Temperature Range	T <sub>op</sub>			°C	T <sub>amb</sub> , Note 3
13	Weight	-	-		g	-
14	Physical Dimensions	E F G H	-  - -		mm	See Figure 2

**NOTES**

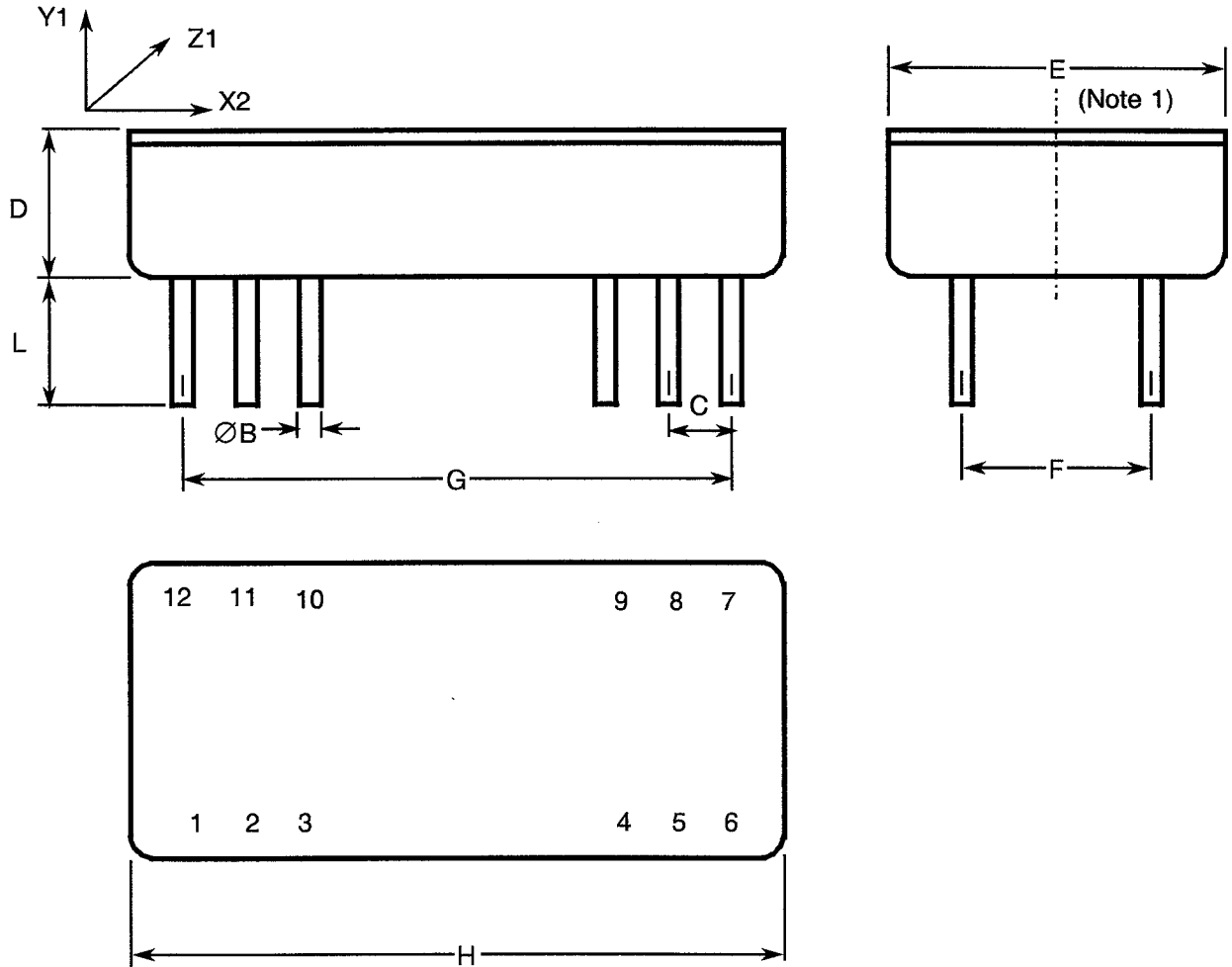
1. Out-of-band rejection can be specified for any number of pairs of frequencies above, or below, the passband, and is measured relative to Insertion Loss.
2. Nominal impedance refers to the impedance of the system in which the device is intended to operate and in which the performance specified shall be achieved.
3. Shall not exceed the Storage Temperature Range specified in Table 1(b) of this specification.



**FIGURE 1 - PARAMETER DERATING INFORMATION**

Not applicable.

**FIGURE 2 - PHYSICAL DIMENSIONS**



SYMBOL	MILLIMETRES	
	MIN	MAX
ØB	0.41	0.51
C	2.44	2.64
D	-	4.9
L	4.5	-

**NOTES**

- Package is symmetrical about centre line.
- Pin 6 has a plain glass to metal seal and Pin 12 has a coloured glass to metal seal with all other pins earthed to the case.
- For dimensions E to H, see Item 14 of the individual Tables 1(a).



**FIGURE 3 - PIN ASSIGNMENT AND FUNCTIONAL DIAGRAM**

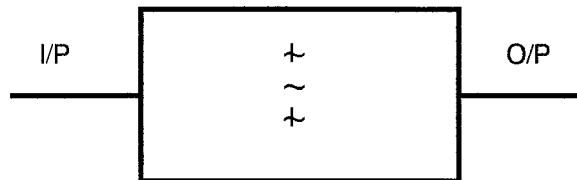
FIGURE 3(a) - PIN ASSIGNMENT

Ground	1		12	Input
Ground	2		11	Ground
Ground	3		10	Ground
Ground	4		9	Ground
Ground	5		8	Ground
Output	6		7	Ground

**NOTES**

1. Top view.

FIGURE 3(b) - FUNCTIONAL DIAGRAM



**2. APPLICABLE DOCUMENTS**

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

- (a) ESA/SCC Generic Specification No. 3502, Surface Acoustic Wave (SAW) Devices (Filters),

**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.

**4. REQUIREMENTS****4.1 GENERAL**

The complete requirements for procurement of the components specified herein shall be as stated in this specification and ESA/SCC Generic Specification No. 3502 for Surface Acoustic Wave (SAW) Devices. 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**

(a) Para. 5.2.4, "Total Dose Irradiation Testing": Shall be performed during qualification and maintenance of qualification.

(b) Para. 5.2.4, "Total Dose Irradiation Testing": If specified in a Purchase Order, shall be performed during procurement on a lot acceptance basis at the total dose irradiation level specified in the Purchase Order.

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

(a) Para. 9.6, "Particle Impact Noise Detection (PIND)" test: Shall not be performed.

**4.2.3 Deviations from Burn-in Tests (Chart III)**

None.

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

None.

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

None.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the components specified herein shall be verified in accordance with the requirements set out in Para. 9.10 of ESA/SCC Generic Specification No. 3502 and shall conform to those shown in Figure 2 and the individual Tables 1(a).

4.3.2 Weight

The maximum weight of the components specified herein shall be as specified in Item 13 of the individual Tables 1(a).

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 components specified herein to meet the performance requirements of this specification shall be used. Acceptance or approval of any constituent material does not guarantee acceptance of the finished product.

4.4.1 Case

The case shall be a solid sidewall D.I.L. with a metal body and hard glass seals. The lid shall be welded.

4.4.2 Lead Material and Finish

The lead material shall be Type 'D' with Type '2' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500.

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

Pin 12 shall be identified by a coloured glass to metal seal.

4.5.3 The SCC Component Number

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

	350200101BF
Detail Specification Number _____	
Type Variant, (see Table 1(a)) _____	
Testing level (B or C, as applicable) _____	
Total Dose Irradiation Level (if applicable) _____	

The Total Dose Irradiation designation shall be added for those devices for which a sample has been successfully tested to the level in question. For these devices, a code shall be added in accordance with the requirements of ESA/SCC Basic Specification No. 22900.



#### 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. Measurements shall be performed at the temperature extremes as defined in Item 12 of the individual Tables 1(a).

#### 4.6.3 Circuits for Electrical Measurements

Circuits for electrical measurements are given in ESA/SCC Generic Specification No. 3502.

### 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, the appropriate limit value specified for a given parameter 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. 3502. The conditions for burn-in shall be as specified in Table 5 of this specification.

#### 4.7.3 Electrical Circuits for Burn-in

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

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

No.	CHARACTERISTICS	SYMBOL	ESA/SCC 3502 TEST METHOD	REQUIREMENT
1	Insertion Loss	IL	Para. 9.8.1.2	Item 4, (1)
2	In-Band Ripple (p-p)	-	Para. 9.8.1.2	Item 5, (1)
3	Out-Of-Band Rejection	BR	Para. 9.8.1.2	Item 6, (1)
4	Phase Linearity (p-p)	PL	Para. 9.8.1.3	Item 7, (1)
5	Group Delay	GD	Para. 9.8.1.4	Item 8, (1)
6	Group Delay Ripple (p-p)	-	Para. 9.8.1.4	Item 9, (1)
7	Return Loss	RL	Para. 9.8.1.5	Item 10, (1)

**NOTES**

- Individual Tables 1(a).

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

No.	CHARACTERISTICS	SYMBOL	ESA/SCC 3502 TEST METHOD	REQUIREMENT
1	Insertion Loss	IL	Para. 9.8.1.2	Item 4, (1)
2	In-Band Ripple (p-p)	-	Para. 9.8.1.2	Item 5, (1)
3	Out-Of-Band Rejection	BR	Para. 9.8.1.2	Item 6, (1)

**NOTES**

- Individual Tables 1(a).

**FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS**

Not applicable.

**TABLE 4 - PARAMETER DRIFT VALUES**

No.	CHARACTERISTICS	SYMBOL	SPEC AND/OR TEST METHOD	CHANGE LIMITS ( $\Delta$ )	UNIT
1	Insertion Loss	IL	As per Table 2	$\pm 1.0$	dB
2	In-Band Ripple (p-p)	-	As per Table 2	$\pm 0.2$	dB



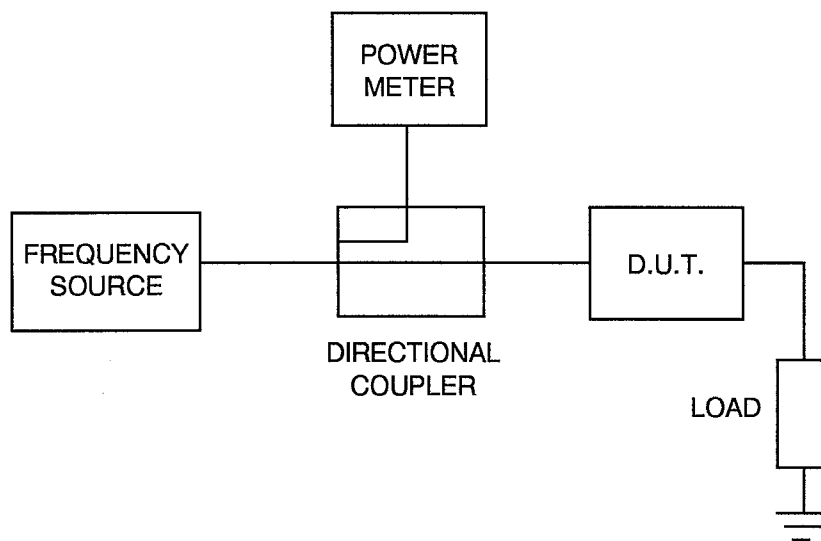
**TABLE 5 - CONDITIONS FOR BURN-IN AND OPERATING LIFE TESTS**

No.	CHARACTERISTICS	SYMBOL	CONDITION	UNIT
1	Ambient Temperature	$T_{amb}$	Higher Temperature of Item 12 (1)	°C
2	Input Power	$P_{IN}$	10	mW
3	Centre Frequency	$f_c$	Item 2 (1)	MHz

**NOTES**

1. Individual Tables 1(a).

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





#### 4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESA/SCC GENERIC SPECIFICATION NO. 3502)

##### 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 and on Completion of Endurance Tests

The parameters to be measured and inspections to be performed at intermediate points and 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.

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

The requirements for the operating life test are specified in Section 9 of ESA/SCC Generic Specification No. 3502. The conditions for operating life testing shall be as specified in Table 5 of this specification.

##### 4.8.4 Electrical Circuits for Operating Life Tests

The circuit for use in performing the operating life test is shown in Figure 5 of this specification.

##### 4.8.5 Conditions for High Temperature Storage Test

The requirements for the high temperature storage test are specified in Section 9 of ESA/SCC Generic Specification No. 3502. The temperature to be applied shall be the maximum storage temperature specified in Table 1(b) of this specification.

#### 4.9 TOTAL DOSE IRRADIATION TESTING

##### 4.9.1 Application

If specified in Para. 4.2.1 of this specification, total dose irradiation testing shall be performed in accordance with the requirements of ESA/SCC Basic Specification No. 22900.

##### 4.9.2 Bias Conditions

Not applicable.

##### 4.9.3 Electrical Measurements

The parameters to be measured prior to irradiation exposure are scheduled in Table 2 of this specification. Only devices which meet the requirements of Table 2 shall be scheduled in the test sample.

The parameters to be measured during and on completion of irradiation testing are scheduled in Table 7 of this specification. Unless otherwise stated, the measurements shall be performed at  $T_{amb} = +22 \pm 3$  °C.



**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. 3502		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
1	Bond Strength	Para. 9.2.2	-	-		-		
2	Rapid Change of Temperature	Para. 9.4	Electrical Measurements Visual Examination	Table 2 -		(2) -		
3	Constant Acceleration	Para. 9.5	Electrical Measurements Visual Examination	Table 2 -		(2) -		
4	Seal Test	Para. 9.7	Fine and Gross Leak	-		-		
5	Vibration	Para. 9.13	Electrical Measurements Visual Examination	Table 2 -		(2) -		
6	Shock or Bump	Para. 9.14	Electrical Measurements Visual Examination	Table 2 -		(2) -		
7	Permanence of Marking	Para. 9.15	-	-		-		
8	Climatic Sequence Dry Heat Cold Test Damp Heat	Para. 9.16 Para. 9.16.2 Para. 9.16.4 Para. 9.16.5	Electrical Measurements Electrical Measurements Electrical Measurements Visual Examination	Table 3 Table 3 Table 2 -		(2) (2) (2) -		
9	Solderability	Para. 9.17	-	-		-		
10	Robustness of Terminations	Para. 9.18	-	-		-		
11	Operating Life	Para. 9.19 Table 5 of this spec.	Initial Electr. Measurements Intermediate Electr. Meas. Final Electr. Measurements Final Electr. Measurements	Table 2 Table 2 Table 2 Table 4		(2) (2) (2) Table 4		
12	High Temperature Storage	Para. 9.20 Higher Temperature of Table 1(b) Item 4 of this spec.	Initial Electr. Measurements Intermediate Electr. Meas. Final Electr. Measurements Final Electr. Measurements	Table 2 Table 2 Table 2 Table 4		(2) (2) (2) Table 4		
13	External Visual Inspection	Para. 9.9	-	-		-		

**NOTES**

1. The tests in this table refer to either Chart IV or V, and shall be used as applicable.
2. Individual Tables 1(a).



**FIGURE 6 - BIAS CONDITIONS FOR IRRADIATION TESTING**

Not applicable.

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

No.	CHARACTERISTICS	SYMBOL	SPEC AND/OR TEST METHOD	CHANGE LIMITS ( $\Delta$ )	UNIT
1	Insertion Loss	IL	As per Table 2	$\pm 0.5$ (1)	dB
2	In Band Ripple (p-p)	-	As per Table 2	$\pm 0.1$ (1)	dB

**NOTES**

1. For Total Dose  $\leq 1.0\text{MRad(Si)}$ .

**TABLE 1(a) - TYPE VARIANT DETAILED INFORMATION**TYPE VARIANT No. 01

No.	CHARACTERISTIC	SYMBOL	LIMITS		UNIT	REMARKS	
			MIN.	MAX			
1	Passband Lower Frequency	fl	197.623		MHz	-	
2	Design Centre Frequency	fc	199.873		MHz	-	
3	Passband Upper Frequency	fu	202.123		MHz	-	
4	Insertion Loss	At fc	IL	30	33	dB	-
5	In-Band Ripple (p-p)	fl to fu	-	-	1.5	dB	-
6	Out-of-band Rejection	197.12 to 196.87 MHz	BR - 1/2	40	-	dB	Note 1
		196.87 to 80 MHz	BR - 2/3	30	-		
		202.62 to 202.87 MHz	BR - 4/5	30	-		
		202.87 to 320 MHz	BR - 5/6	40	-		
		500 to 700 MHz	BR - n2/n1	50	-		
7	Phase Linearity (p-p)	fl to fu	PL	-	6.0	Degrees (°)	-
8	Group Delay	At fc	GD	4.65	4.70	µs	
9	Group Delay Ripple (p-p)	fl to fu	-	-	200	ns	
10	Return Loss	fl to fu	RL	1.0	-	dB	-
11	Nominal Impedance	At fc	Z	50		Ω	Note 2
12	Operating Temperature Range		T <sub>op</sub>	- 40	+ 85	°C	T <sub>amb</sub> , Note 3
13	Weight		-	-	12	g	-
14	Physical Dimensions	E	-	-	20.25	mm	See Figure 2
		F	15.14	15.34			
		G	27.86	28.06			
		H	-	-	34.85		

**NOTES**

1. Out-of-band rejection can be specified for any number of pairs of frequencies above, or below, the passband, and is measured relative to Insertion Loss.
2. Nominal impedance refers to the impedance of the system in which the device is intended to operate and in which the performance specified shall be achieved.
3. Shall not exceed the Storage Temperature Range specified in Table 1(b) of this Specification.