DOCUMENT CHANGE REQUEST

DCR number 164	Changes required for: General	Originator: Steve Thacker
Date: 2005/11/02	Date sent: 2005/11/02	Organisation: ESA/ESTEC
Status: IMPLEMENTED		

Title:	Attenuator, RF Coaxial, Type SMA, DC-22GHz		
Number:	3403/005	Issue:	1
Other documents affected:			
Page:			
Total re-write			
Paragraph:			
Total re-write			
Original wording:			
Proposed wording:			

Total reformat of this Detail Specification as part of the ongoing conversion to the ESCC format.
See below for summary of changes and attached Issue 2 Draft A of the specification.

note: known support for active procurement against this specification includes the following Manufacturer:
RADIALL / F (ESCC QPL listed with qualified Variants 01 to 31)

Summary of changes to the current format, layout and content is as follows:

1. Rewording and restructure of various sections and paragraphs of the specification plus other editorial changes based on the layout and editorial content of other Detail Specifications already converted to ESCC format.
Note: The layout and content of this specification is amended to follow new ESCC Detail specification 3403/008 already submitted to ESCC for publishing together with updated Generic specification ESCC 3403 per DCR138.

2. Deletion of any redundant paragraphs.

3. Para 2 Applicable documents amended to delete reference to 3402/003 and MIL-G-45204 specifications.

4. RF Power rating added to Component Type Variants table for clarification.

5. Figure 1 Parameter Derating Requirements moved to be a note to the Maximum Ratings table.

6. Para 4.3.2 Weight requirements moved to Component Type Variants table.

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7. DC Power rating added to Maximum Ratings table (to be consistent with Generic 3403).

8. Coupling Proof torque added to Maximum Ratings table (to be consistent with Generic 3403). Maximum Coupling torque added to maximum ratings.

9. In Table 1(b), Maximum Ratings table (and also Table 6) unit for RF leakage corrected to be "dBi" (was "dB")

10. Figure 2 Physical dimensions: drawing amended to only include critical dimensions (Dim's D E F G are deleted). Reference to 3402/003 deleted and interface dimension drawings added (male & female).

11. Para 4.2 Deviations from Generic spec amended to be consistent with the updated Generic specification ESCC 3403 (Residual Magnetism deviation added, other existing deviations are deleted)

12. Para 4.3.4 Mating and Unmating Forces: last sentence defining torque during testing of mated connectors is deleted (the maximum coupling nut torque is moved to Maximum Ratings table)

13. Para 4.3.5 Contact Engagement and Separation Forces: Details from 3402/003 included in this para.

14. para 4.4 Materials: contact gold plate reference to MIL spec is deleted, gold thickness is defined as 1.3µm minimum. Gaskets are added to list of included materials.

15. Delete requirement for marking of the testing level letter from the ESCC Component Number as per latest ESCC No. 21700.

16. Table 2 Gain flatness, as defined in the Component Type Variants, is added to the electrical tests (to only be performed during final electrical measurements during Screening).

17. Table 3 "Attenuation Drift" renamed as "Temperature coefficient of Attenuation (spot frequencies)" with symbol "TCAtt".

18. Figure 4 mechanical test schematic is deleted (the requirements for mounting in the generic spec are considered sufficient).

19. Table 4 VSWR added (to be consistent with similar device per 3403/008 already submitted to ESCC for publishing).

20 . Figure 5(b) operating life test set-up is deleted (the requirements for operating life in the generic spec are considered sufficient).

21. Table 6 is amended to be consistent with the updated Generic specification ESCC 3403 (Bump, Coupling Proof Torque, Mating and Unmating Forces, Residual Magnetism, Corrosion, Permanence of Marking are deleted)

Justification:

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(see also change details for each item above):

1. Part of the ongoing activity of conversion of cover-sheeted ESA/SCC specifications to the ESCC format.

2. To make the format and presentation editorially and technically consistent with the various other ESCC Detail Specifications already converted to ESCC format (e.g. 54HCMOS and CMOS 4000B series of ESCC IC specifications plus new ESCC Detail specification 3403/008 for a similar component already submitted to ESCC for publishing).

3. To make the content consistent with the proposed ESCC format Generic Specification No.3403 issue 2 draft B (currently under review with ESCC).

4. To make corrections to several technical errors in 3403/005 issue 1 as detailed above.

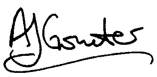
Attachments:

3403005.pdf, null

Modifications:

N/A

Approval signature:



Date signed:

2005-11-02

ATTENUATOR,

RF, COAXIAL, TYPE SMA, DC - 22GHz

ESCC Detail Specification No. 3403/005

Issue 2 - DRAFT A	January 2005

Document Custodian: European Space Agency - see https://escies.org

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DOCUMENTATION CHANGE NOTICE

(Refer to https://escies.org for ESCC DCR content)

DCR No.	CHANGE DESCRIPTION
TBD	Specification upissued to incorporate editorial and technical changes per DCR

TABLE OF CONTENTS

1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics and test and inspection data for the component type variants and/or the range of components specified below. It supplements the requirements of, and shall be read in conjunction with, the ESCC Generic Specification listed under Applicable Documents.

1.2 APPLICABLE DOCUMENTS

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

(a) ESCC Generic Specification No. 3403.

1.3 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.

1.4 THE ESCC COMPONENT NUMBER AND COMPONENT TYPE VARIANTS

1.4.1 The ESCC Component Number

The ESCC Component Number shall be constituted as follows:

Example: 340300501

- Detail Specification Reference: 3403005
- Component Type Variant Number: 01 (as required)

1.4.2 Component Type Variants and Range of Components

The component type variants and range of components applicable to this specification are as follows:

Variant Number	Nominal Attenuation (dB)	Attenuation Tolerance (dB)			Attenuation Flatness	VSWR	Rated RF Power (W)	Weight Max (g)
		DC	DC to 18GHz	18 to 22GHz				
01	0	0.2	0.3	0.4	f ≤ 13GHz	DC < f ≤ 4GHz	2	5
02	0.5	0.2	0.3	0.4	±0.05dB/0.5GHz	<1.15	2	5
03	1	0.2	0.3	0.4			2	5
04	1.5	0.2	0.3	0.4	f > 13GHz	4 < f ≤ 8GHz	2	5
05	2	0.2	0.3	0.4	±0.07dB/0.5GHz	< 1.2	2	5
06	2.5	0.2	0.3	0.4			2	5
07	3	0.2	0.3	0.4		8 < f ≤ 12.4GHz	2	5
08	3.5	0.2	0.3	0.4		< 1.25	2	5
09	4	0.2	0.3	0.4			2	5
10	4.5	0.2	0.3	0.4		12.4 < f ≤ 18GHz	2	5
11	5	0.2	0.3	0.4		< 1.35	2	5
12	5.5	0.2	0.3	0.4			2	5
13	6	0.2	0.3	0.4		18 < f ≤ 22GHz	2	5
14	6.5	0.2	0.3	0.4		< 1.5	2	5
15	7	0.3	0.4	0.5			2	5
16	7.5	0.3	0.4	0.5			2	5
17	8	0.3	0.4	0.5			2	5
18	8.5	0.3	0.4	0.5			2	5
19	9	0.3	0.4	0.5			2	5
20	9.5	0.3	0.4	0.5	f ≤ 13GHz		2	5
21	10	0.3	0.4	0.5	±0.07dB/0.5GHz		2	5
22	11	0.3	0.5	0.6			1	5
23	12	0.3	0.5	0.6	f > 13GHz		1	5
24	13	0.3	0.5	0.6	±0.1dB/0.5GHz		1	5
25	14	0.3	0.5	0.6			1	5
26	15	0.4	0.5	0.6			1	5
27	16	0.4	0.5	0.6			1	5
28	17	0.4	0.5	0.6			1	5
29	18	0.4	0.5	0.6			1	5
30	19	0.4	0.5	0.6			1	5
31	20	0.4	0.5	0.6			1	5

1.5 MAXIMUM RATINGS

The maximum ratings shall not be exceeded at any time during use or storage.

Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

Characteristics	Symbols	Maximum Ratings	Units	Remarks
RF Power	P_{RF}	Note 1	W	Note 2
Peak Power	P_P	200	W	duration 1µs 1ppm duty cycle
DC Power	P_{DC}	Note 1	W	T_{amb}=+25˚C
Impedance	Z	48 to 52	Ω	-
Frequency Range	f_{op}	DC to 22	GHz	-
RF Leakage	E	-85	dBi	-
Operating Temperature Range	T_{op}	-55 to +125	˚C	T_{amb}
Storage Temperature Range	T_{stg}	-55 to +125	˚C	-
Coupling Nut Torque	Tq	120	N.cm	Note 3

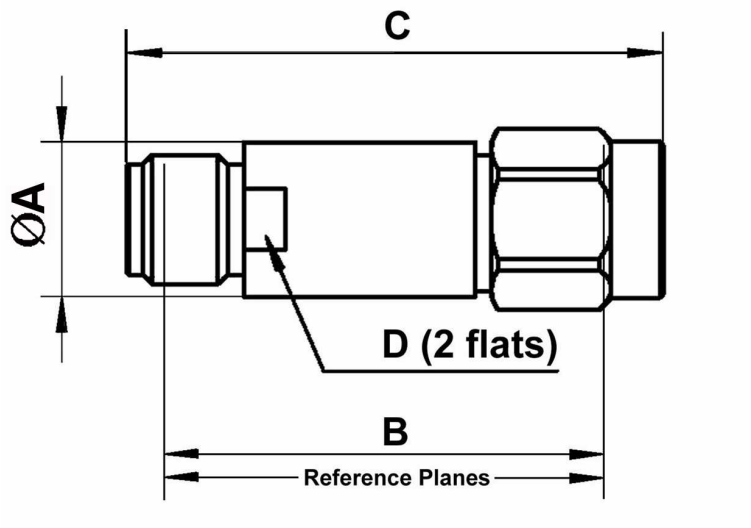
NOTES:

1. The maximum rating for RF Power is specified in Component Type Variants and Range of Components. The maximum rated DC Power shall be the same value.
2. RF Power shall be derated against operating temperature as follows:

   P_{RF} at $T_{op} \leq +25$˚C. Derate linearly to 500mW at $T_{op} = +125$˚C.

3. Coupling Proof Torque: 170N.cm

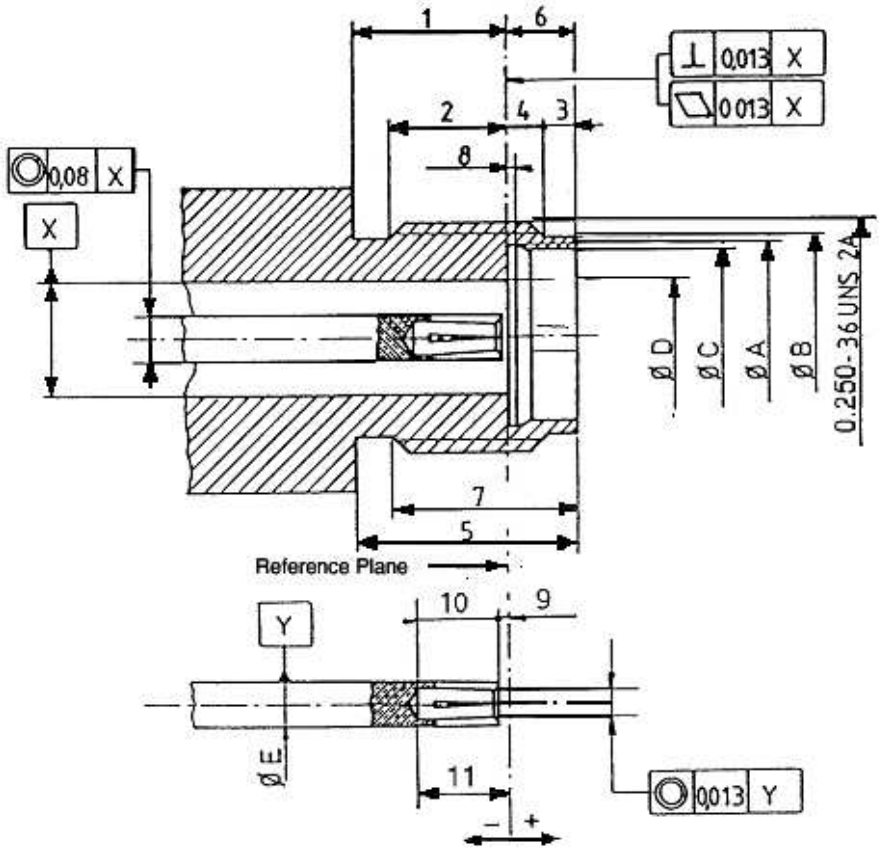
1.6 PHYSICAL DIMENSIONS



Symbols	Dimensions mm	
	Min	Max
ØA	-	7.7
B	16.7	17.1
C	20.9	-
D	6.9	7

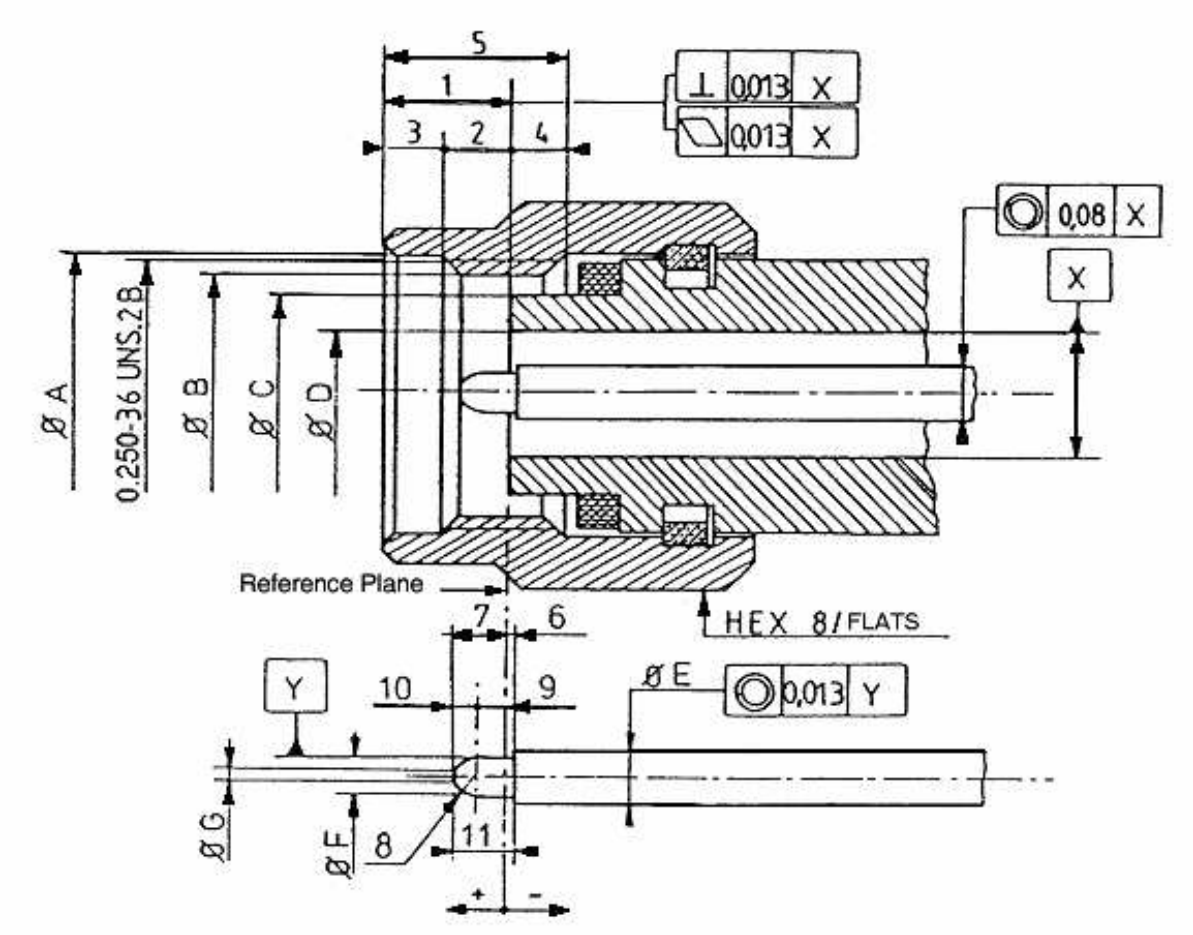
1.6.1 Interface Dimensions

Female Interface



Symbols	Dimensions mm	
	Min	Max
1	3.82	4.32
2	2.87	3.27
3	0.65	0.95
4	0.93	1.33
5	5.8	6.2
6	1.88	1.98
7	4.85	5.15
8	0.3	0.5
9	0	0.08
10	2.4	2.6
11	2.4	2.68
∅A	4.8	5
∅B	5.3	5.35
∅C	4.6	4.63
∅D	2.905	2.945
∅E	1.26	1.28

Male Interface



Symbols	Dimensions mm		Notes
	Min	Max	
1	2.63	3.25	
2	1.58	2.2	
3	0.75	1.15	
4	0.85	1.47	
5	3.8	4.2	
6	0	0.08	
7	1.22	1.4	
8	0.8	0.9	Radius
9	0.493	0.784	
10	0.616	0.727	
11	1.3	1.4	
∅A	6.6	6.7	
∅B	5.59	-	
∅C	4.55	4.58	
∅D	2.905	2.94	
∅E	1.26	1.28	
∅F	0.92	0.94	
∅G	0.2	0.34	

1.7 MATERIALS AND FINISHES

Materials and finishes shall be as follows:

a. Shell: Amagnetic Stainless Steel, electro-passivated
b. Coupling Nut: Amagnetic Stainless Steel, electro-passivated
c. Centre Contact: Beryllium Copper, with nickel underplate (2µm minimum) and Gold plating (1.3µm minimum)
d. Inserts: PTFE
e. Gaskets: Silicone rubber.

2. REQUIREMENTS

2.1 GENERAL

The complete requirements for procurement of the components specified herein are as stated in this specification and the ESCC Generic Specification. Permitted deviations from the Generic Specification, applicable to this specification only, are listed below.

Permitted deviations from the Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESCC

requirement and do not affect the component's reliability, are listed in the appendices attached to this specification.

2.1.1 Deviations from the Generic Specification

2.1.1.1 Deviations from Qualification and Periodic Tests - Chart F4

(a) Residual Magnetism: is not applicable

2.2 MARKING

The marking shall be in accordance with the requirements of ESCC Basic Specification No. 21700 and as follows.

The information to be marked on the component shall be:

(a) The ESCC qualified components symbol (for ESCC qualified components only).
(b) The ESCC Component Number.
(c) Traceability information.

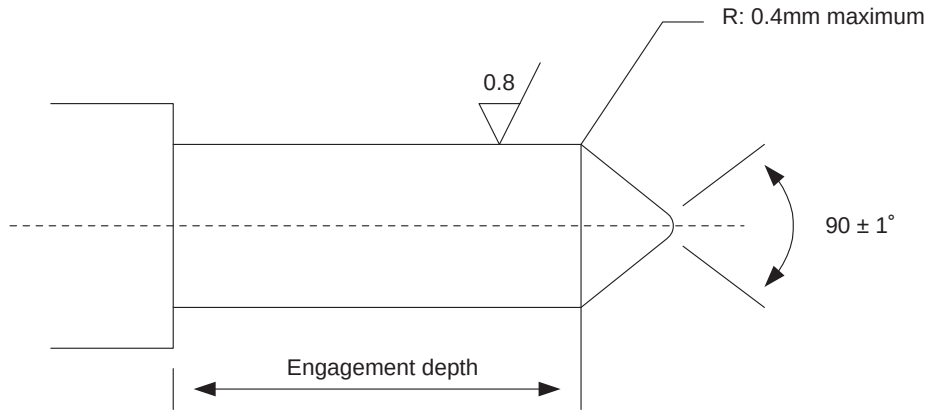
2.3 CONTACT ENGAGEMENT AND SEPARATION FORCES TEST

Ref. Contact Engagement and Separation Forces in the ESCC Generic Specification.

a) Oversize Test Pin
Pin diameter : 0.9525/0.955mm
Insertion depth : 0.76/1.14mm

b) Maximum Diameter Test Pin
Pin diameter : 0.94/0.942mm
Engagement depth : 1.27/1.91mm
Engagement force: 1360g maximum.

c) Minimum Diameter Test Pin
Pin diameter : 0.902/0.904mm
Seperation depth: 1.27/1.91mm
Separation force: 28.4g minimum.



2.4 COUPLING PROOF TORQUE TEST

Ref. Coupling Proof Torque in the ESCC Generic Specification.
Coupling Proof Torque: 170N.cm.

2.5 MATING AND UNMATING FORCES TEST

Ref. Mating and Unmating Forces in the ESCC Generic Specification.
Maximum Torque during mating or unmating: 24N.cm.

2.6 ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES

The measurements shall be performed at room, high and low temperatures.

2.6.1 Room Temperature Electrical Measurements

The measurements shall be performed at T_{amb}=+22 ±3°C.

Characteristics	Symbols	Test Method and Conditions	Limits		Units
			Min	Max	
Voltage Standing Wave Ratio	VSWR	ESCC No. 3403 f = 0 to 22GHz	-	Note 1	-
Attenuation (spot frequencies)	Att	ESCC No. 3403 f =2, 12.4, 22GHz	Note 2	Note 2	dB
Attenuation (full frequency range)	Att	ESCC No. 3403 f = 0 to 22GHz Note 3	Note 2	Note 2	dB
Attenuation Flatness (full frequency range)	AttF	f = 0 to 22GHz Note 3	-	Note 4	dB/0.5GHz

NOTES:

1. The limits for VSWR are as specified in Component Type Variants and Range of Components.
2. The limits for Attenuation are as specified in Component Type Variants and Range of Components: Nominal Attenuation + Attenuation Tolerance.
3. Attenuation and Attenuation Flatness across full frequency range shall only be tested during

Screening Tests during Room Temperature Electrical Measurements.

4. The limits for Attenuation Flatness are as specified in Component Type Variants and Range of Components.

2.6.2 High and Low Temperatures Electrical Measurements

The measurements shall be performed at T_{amb}=+125 (+0 -3) ˚C and T_{amb}=-55 (+3 -0) ˚C.

Characteristics	Symbols	Test Method and Conditions (Note 1)	Limits		Units
			Min	Max	
Temperature Coefficient of Attenuation (spot frequencies)	TC_{Att}	ESCC No. 3403 f=2, 12.4, 22GHz	-	7 x 10^{-4}	dB/dB/˚C

NOTES:

1. Measurements shall be performed during Screening Tests on a sample of 2 components. In the event of any failure a 100% inspection shall be performed.

2.7 PARAMETER DRIFT VALUES

Unless otherwise specified, the measurements shall be performed at T_{amb}=+22 ±3^{o}C.

The test methods and test conditions shall be as per the corresponding test defined in Room Temperature Electrical Measurements.

The drift values (Δ) shall not be exceeded for each characteristic where specified. The corresponding absolute limit values for each characteristic shall not be exceeded.

Characteristics	Symbols	Drift Value Δ	Units
Voltage Standing Wave Ratio	$\frac{\Delta VSWR}{VSWR}$	± 2	%
Attenuation	Δ Att	± 0.05 or (1) ± 0.5	dB %

NOTES:

1. Whichever is greater.

2.8 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

Unless otherwise specified, the measurements shall be performed at T_{amb}=+22 ±3^{o}C.

The test methods and test conditions shall be as per the corresponding test defined in Room Temperature Electrical Measurements.

The drift values (Δ) shall not be exceeded for each characteristic where specified. The corresponding absolute limit values for each characteristic shall not be exceeded.

Test Reference per ESCC No. 3403	Characteristics	Symbols	Limits		Units
			Min	Max	
Vibration Initial Measurements	Attenuation	Att	Note 1	Note 1	dB
Measurements during last cycle	Intermittent contact	-	No discontinuity > 0.5ms No open or short circuit		-
Final Measurements	Attenuation Attenuation Drift (from initial measurement)	Att ΔAtt	Note 1 -	Note 1 ± 0.05 or (2) ± 0.5	dB dB %
Shock Initial Measurements	Attenuation (Note 3)	Att	Note 1	Note 1	dB
Final Measurements	Attenuation Attenuation Drift (from initial measurement)	Att ΔAtt	Note 1 -	Note 1 ± 0.05 or (2) ± 0.5	dB dB %
Rapid Change of Temperature Initial Measurements	Attenuation	Att	Note 1	Note 1	dB
Final Measurements	Attenuation Attenuation Drift (from initial measurement)	Att ΔAtt	Note 1 -	Note 1 ± 0.05 or (2) ± 0.5	dB dB %
Climatic Sequence Initial Measurements	Attenuation (Note 3)	Att	Note 1	Note 1	dB
Measurements during Dry Heat	Temperature Coefficient of Attenuation	TC_{Att}	-	7×10^{-4}	dB/dB/°C
Measurements during Cold	Temperature Coefficient of Attenuation	TC_{Att}	-	7×10^{-4}	dB/dB/°C
Final Measurements	Attenuation Attenuation Drift (from initial measurement)	Att ΔAtt	Note 1 -	Note 1 ± 0.1 or (2) ± 1	dB dB %
Connector Repeatability	Attenuation Attenuation Drift (during test)	Att ΔAtt	Note 1 -	Note 1 ± 0.05 or (2) ± 0.5	dB dB %

Test Reference per ESCC No. 3403	Characteristics	Symbols	Limits		Units
			Min	Max	
Operating Life Initial Measurements	Attenuation (Note 3)	Att	Note 1	Note 1	dB
Final Measurements	Attenuation Attenuation Drift (from initial measurement)	Att ΔAtt	Note 1 -	Note 1 ± 0.1 or (2) ± 1	dB dB %
RF Leakage	RF leakage f = 0 to 22GHz	E	-85	-	dBi
Peak Power Final Measurements	Attenuation	Att	Note 1	Note 1	dB
Power Sensitivity (P_{ref} = 1mW) Initial Measurements	Attenuation	Att	Note 1	Note 1	dB
Final Measurements	Attenuation Attenuation Drift (from initial measurement)	Att ΔAtt	Note 1 -	Note 1 ±0.05 or (2) ±0.5	dB dB %

NOTES:
1. The limits for attenuation are as specified in Component Type Variants and Range of Components: Nominal Attenuation + Attenuation Tolerance.
2. Whichever is greater.
3. This test need not be repeated. The most recent result from the previous test may be used instead.

2.9 BURN-IN CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T_{amb}	+125	^{o}C
Power	P_{in}	0	W

2.10 OPERATING LIFE CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T_{amb}	+25	^{o}C
Power	P_{in}	Note 1	W
Frequency	f_{in}	18	GHz

NOTES:
1. Rated RF Power as specified in Maximum Ratings.