ATTENUATOR, RF, COAXIAL, TYPE SMA, DC - 22GHz

ESCC Detail Specification No. 3403/005

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DOCUMENTATION CHANGE NOTICE

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

DCR No.	CHANGE DESCRIPTION
1146	Specification upissued to incorporate changes per DCR.

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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: 340300533

- Detail Specification Reference: 3403005
- Component Type Variant Number: 33 (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	Weight Max (g)
		DC	DC to 18GHz	18 to 22GHz			
33 (Note 1)	0 DC Shunt	0.2	0.3	0.4	f ≤ 13GHz: ±0.05dB/1GHz	DC < f ≤ 18GHz: < 1.2	5
34	0.5	0.2	0.3	0.4			5
35	1	0.2	0.3	0.4	f > 13GHz: ±0.07dB/1GHz	18 < f ≤ 22GHz: < 1.25	5
36	1.5	0.2	0.3	0.4			5
37	2	0.2	0.3	0.4			5
38	2.5	0.2	0.3	0.4			5
39	3	0.2	0.3	0.4			5
40	3.5	0.2	0.3	0.4			5
41	4	0.2	0.3	0.4			5
42	4.5	0.2	0.3	0.4			5
43	5	0.2	0.3	0.4			5
44	5.5	0.2	0.3	0.4			5
45	6	0.2	0.3	0.4			5
46	6.5	0.2	0.3	0.4			5
47	7	0.3	0.4	0.5			5
48	7.5	0.3	0.4	0.5			5
49	8	0.3	0.4	0.5			5
50	8.5	0.3	0.4	0.5			5
51	9	0.3	0.4	0.5			5
52	9.5	0.3	0.4	0.5	f ≤ 13GHz: ±0.07dB/1GHz		5
53	10	0.3	0.4	0.5			5
54	11	0.3	0.5	0.6	f > 13GHz: ±0.1dB/1GHz		5
55	12	0.3	0.5	0.6			5
56	13	0.3	0.5	0.6			5
57	14	0.3	0.5	0.6			5
58	15	0.4	0.5	0.6			5
59	16	0.4	0.5	0.6			5
60	17	0.4	0.5	0.6			5
61	18	0.4	0.5	0.6			5
62	19	0.4	0.5	0.6			5
63	20	0.4	0.5	0.6			5

NOTES:

1. Variant 33 is a DC shunt attenuator that includes a high value series resistance element.

1.5 MAXIMUM RATINGS

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

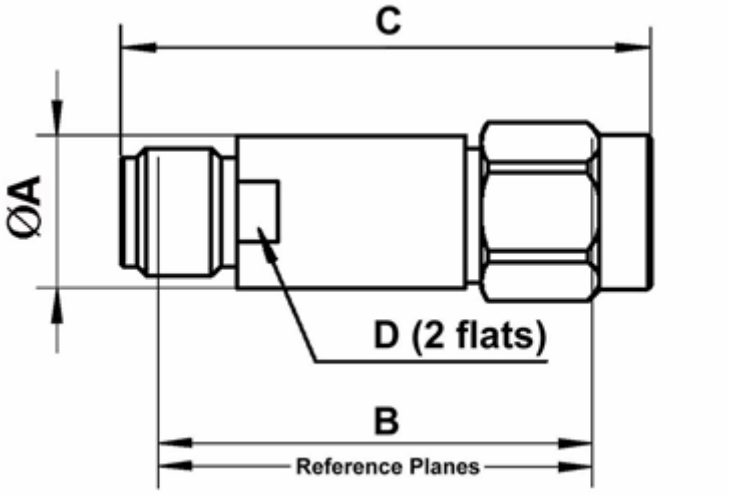
Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

Characteristics	Symbols	Maximum Ratings	Units	Remarks
RF Power	P_{RF}	2	W	$T_{amb} \leq +70°C$ Note 1
Peak Power	P_P	100	W	duration 1µs 1% duty cycle $T_{amb} \leq +25°C$
DC Power	P_{DC}	2	W	$T_{amb} \leq +70°C$
Impedance	Z	47.5 to 52.5	Ω	-
Frequency Range	f_{op}	DC to 22	GHz	-
RF Leakage	E	-90	dBi	-
Operating Temperature Range	T_{op}	-55 to +125	°C	T_{amb}
Storage Temperature Range	T_{stg}	-55 to +125	°C	-
Coupling Nut Torque Range	T_q	80 to 120	N.cm	Note 2

NOTES:

1. RF Power shall be derated against operating temperature as follows: For $T_{amb} > +70°C$, derate linearly to 25% of RF Power at +125°C.
2. Coupling Proof Torque: 170N.cm. During engagement of the component with its mating counterpart, the body of the component shall be restrained by means of the body flats whilst torque is applied to the coupling nuts (see Physical Dimensions).

1.6 PHYSICAL DIMENSIONS



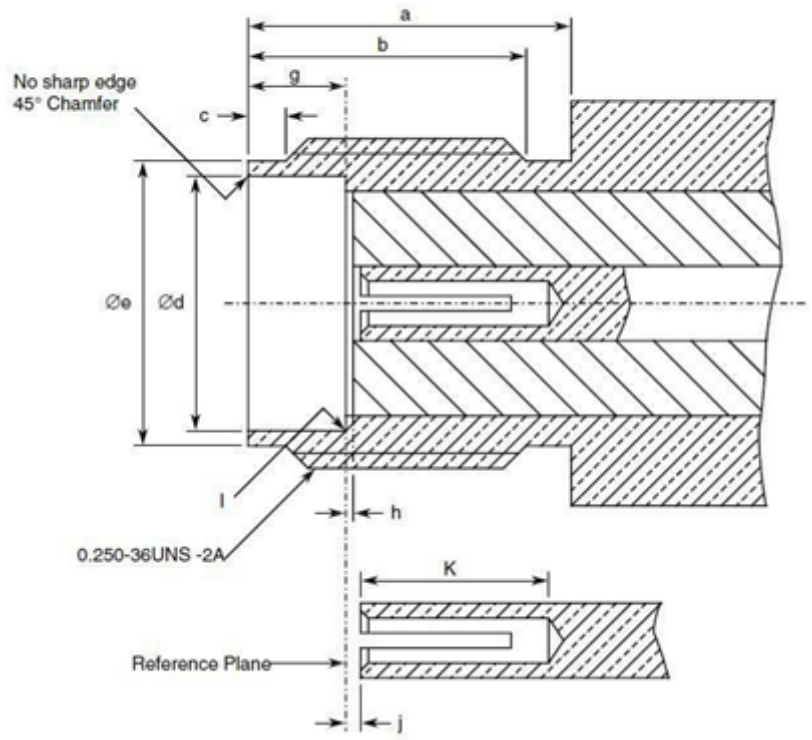
Symbols	Dimensions mm		Notes
	Min	Max	
∅A	-	7.7	-
B	16.7	17.1	-
C	20.9	-	-
D	6.9	7	1

NOTES:

1. The body flats shall be used to restrain the body during engagement whilst torque is applied to the coupling nuts.

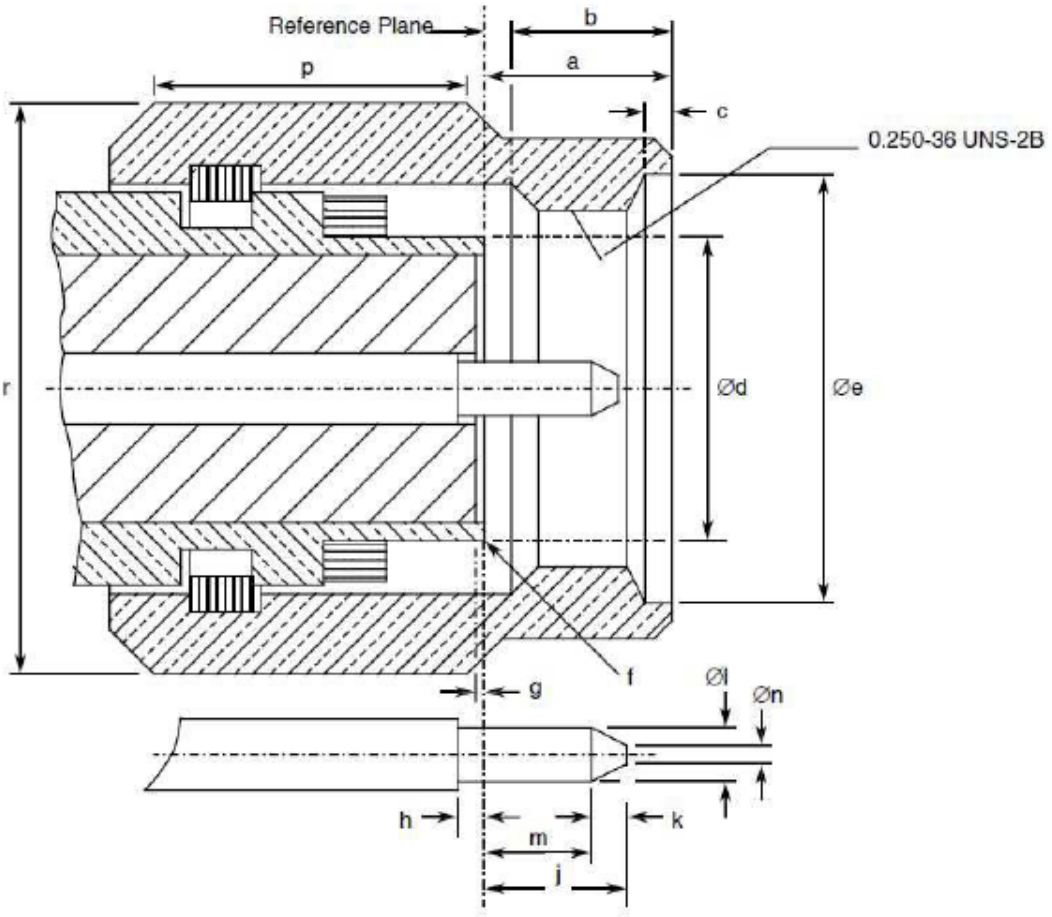
1.6.1 Interface Dimensions

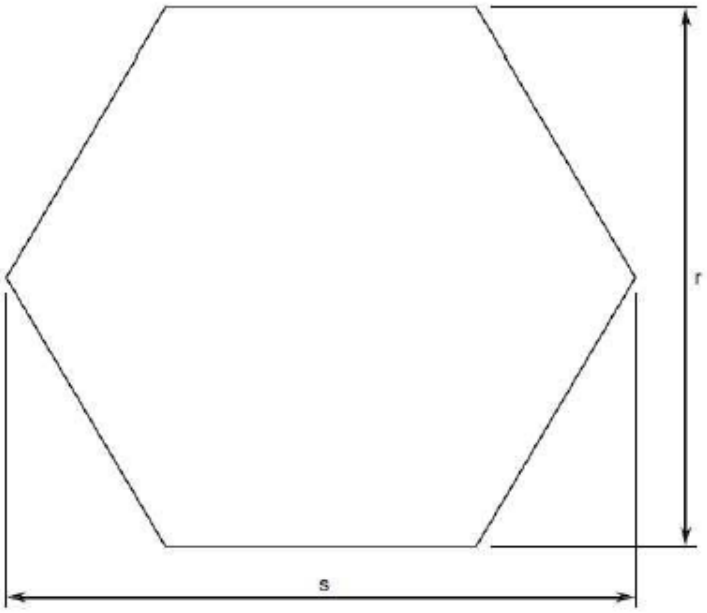
Female Interface



Symbols	Dimensions mm		Notes
	Min	Max	
a	5.54	-	
b	4.32	-	
c	0.38	1.14	
∅d	4.597	4.67	
∅e	5.28	5.49	
g	1.88	1.98	
h	0	0.2	
j	0	0.25	
k	2.92	-	
l	-	0.04	Radius

Male Interface

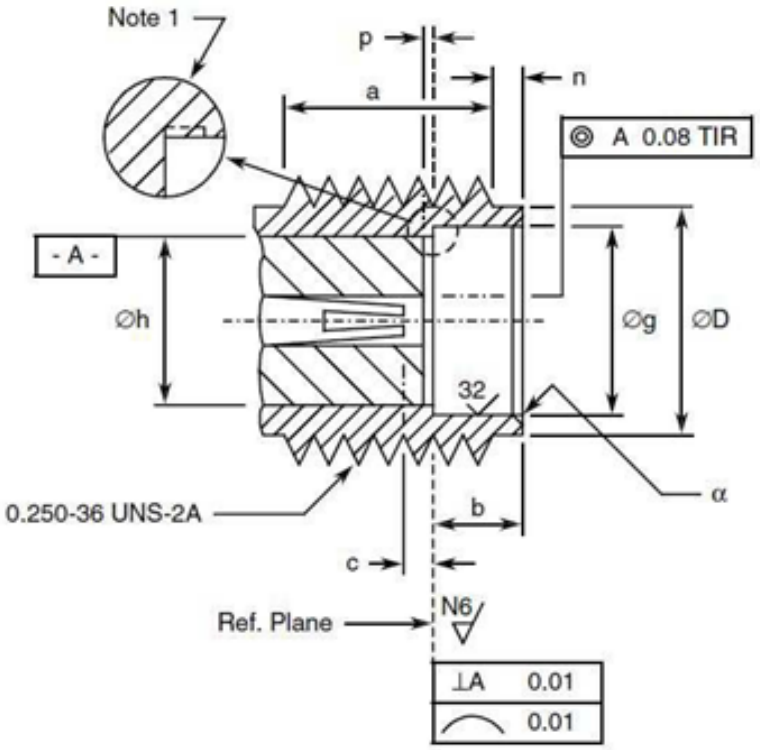




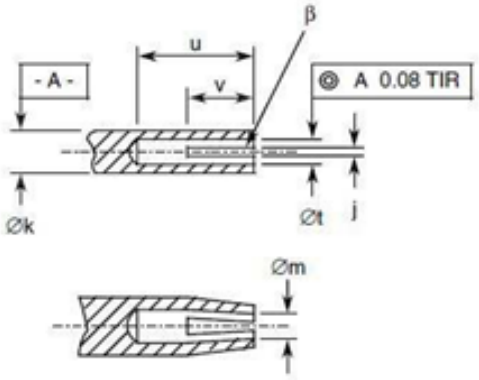
Symbols	Dimensions mm		Notes
	Min	Max	
a	-	3.43	
b	2.54	-	
c	0.38	1.14	
∅d	-	4.592	
∅e	6.35	-	
f	-	0.08	Radius or 45° chamfer
g	0	0.2	
h	0	0.25	
j	-	2.54	
k	0.38	-	
∅l	0.9	0.94	
m	1.27	-	
∅n	-	0.38	
p	3.17	-	
∅q	-	-	
r	7.84	8	Hexagon
s	-	9.2	

1.6.2 Mating Gauge Dimensions

Female Interface



Detailed view of centre contact

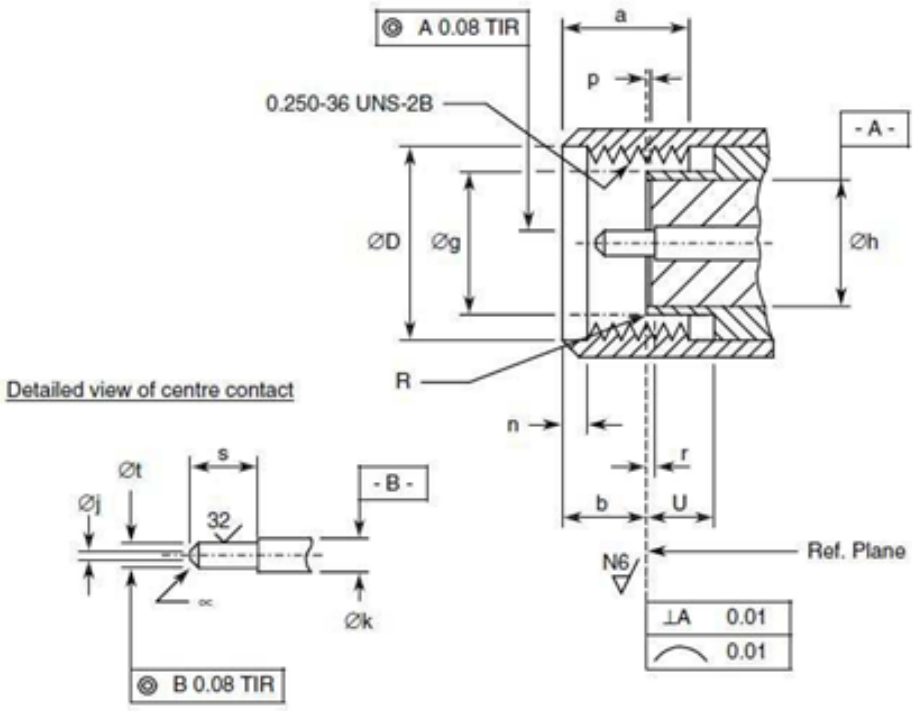


Symbols	Dimensions mm		Notes
	Min	Max	
a	3.81	-	
b	1.88	1.98	
c	0	0.08	Contact recess
∅D	5.28	5.49	
∅g	4.6	4.67	
∅h	4.1	4.13	
j	0.13	0.23	2 or more slots
∅k	1.27	1.29	
∅m	0.72	0.84	After closing
n	0.38	1.14	
p	0	0.05	Insert recess
u	2.54	-	
∅t	0.94	0.99	
v	1.91	2.41	
α	-	0.25	45° Chamfer
β	0.99	1.19	45° Chamfer

NOTES:

1. No fillet permitted. Radial undercut 0.2mm maximum deep x 0.89mm maximum long permitted.

Male Interface



Symbols	Dimensions mm		Notes
	Min	Max	
a	3.71	4.32	
b	2.59	3.35	
∅D	6.48	6.73	
∅g	4.34	4.59	
∅h	4.1	4.13	
∅j	-	0.38	Flat
∅k	1.27	1.29	
n	0.64	1.14	
p	0	0.05	Insert recess
r	0	0.08	Contact recessed
R	-	0.08	Radius
s	2.03	2.29	
∅t	0.9	0.93	
U	2.03	-	
α	-	-	45 ±3° Chamfer

1.7 MATERIALS AND FINISHES

Materials and finishes shall be as follows:

- Shell: Amagnetic Stainless Steel, electro-passivated.
- Coupling Nut: Amagnetic Stainless Steel, electro-passivated.
- Centre Contact: Beryllium Copper, with nickel underplate (2µm minimum) and gold plating (1.3µm minimum). Measurements of plating thickness shall be performed inside the female centre contact at a maximum distance of 0.4mm from the end and on the male centre contact on pin diameter ∅I (see Interface Dimensions).
- Inserts: PTFE
- 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.

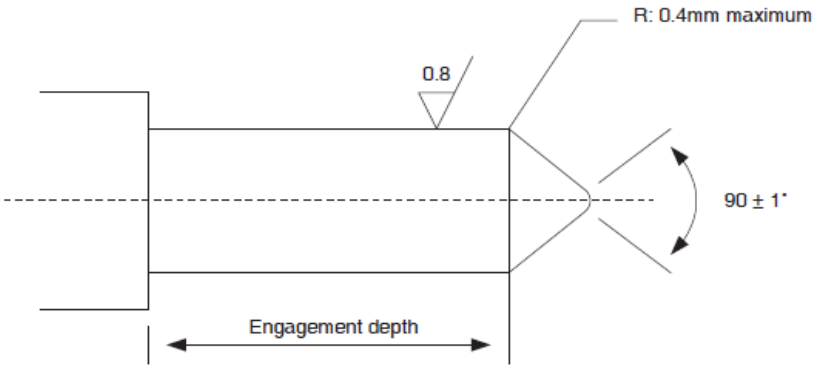
2.3 CONTACT ENGAGEMENT AND SEPARATION FORCES TEST

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
- Separation 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 5	-	Note 4	dB/1GHz
Series Resistance	Rs	f = DC, Note 5 Variant 33 only	4	10	kΩ

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 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.
5. Guaranteed but not tested.

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	-	7×10^{-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°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 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 (Spot frequencies)	ΔAtt	±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°C.

Unless otherwise specified, 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 %
Mechanical 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 %

Test Reference per ESCC No. 3403	Characteristics	Symbols	Limits		Units
			Min	Max	
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 %
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	-90	-	dBi
Peak Power Final Measurements	Attenuation	Att	Note 1	Note 1	dB
Power Sensitivity (Pref = 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	°C
Power	P_{in}	0	W

2.10 OPERATING LIFE CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T_{amb}	+25	°C
Power	P_{in}	2	W
Frequency	f_{in}	Note 1	-

NOTES:

1. Operating Life may be performed at DC, 10GHz, 18GHz or 22GHz.