# DOCUMENT CHANGE REQUEST

| | | | |
|---|---|---|---|
| DCR number 235 | Changes required for: General | Originator: S. Thacker |
| Date: 2006/01/31 | Date sent: 2006/01/31 | Organisation: ESA/ESTEC |
| Status: IMPLEMENTED | | |

| | | | |
|---|---|---|---|
| Title: | Load, RF, Coaxial, Type SMA, DC-18GHz | | |
| Number: | 3403/004 | Issue: | 1 |

Other documents affected:

Page:

Total re-write of specification

Paragraph:

Total re-write of specification

Original wording:

Proposed wording:

Total reformat of this Detail Specification as part of the ongoing conversion of specifications to the ESCC format.

See as follows for a summary of the changes. See also attached Issue 2 Draft C of the specification.

note: known support for active procurement against this specification includes the following Manufacturer: RADIALL/F

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 for similar components already converted to ESCC format plus the converted Generic 3403.

2. Deletion of any redundant paragraphs.

3. Para 2: Applicable Documents is amended to delete the reference to MIL-STD-202 (see 16 below).

4. Table 1(a): VSWR characteristic is added to the Component Type Variants table (for clarification).

5. Table 1(b): DC Power rating is added to the Maximum Ratings table. (to be consistent with Generic 3403).

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6. Table 1(b): "Recommended" input power is deleted from the Maximum Ratings Table leaving the rated value in the Table.
("Recommended" requirements are considered redundant)

7. Table 1(b), 2, 6: Maximum Ratings Table, Room Temperature Electrical Measurements Table, Intermediate and End-point Electrical Measurements Table: change impedance (& resistance) values to be 47.5 ohm minimum to 52.5 ohm maximum.
(This is due a standardisation by the manufacturer (Radiall/F) to a +/-5% tolerance on impedance (& resistance) for 50ohm coaxial components (for Space/Mil/Commercial product)).

8. Table 1(b): Coupling Proof torque is added to the Maximum Ratings table. Maximum Coupling Nut Torque is also added. (to be consistent with Generic 3403 and for consistency/clarification).

9. Table 1(b): Maximum Ratings table (and also Table 6) unit for RF leakage corrected to be "dBi" (was "dB") (clarification/correction of error)

10. Figure 1: Parameter Derating Requirements are moved to be a note to the Maximum Ratings table.

11. Figure 2: Physical dimensions:
The drawing is amended to only include critical dimensions (Dim's D E F are deleted).
Reference to 3402/001 is deleted and the Interface Dimension drawings are added (male).
In addition the Mating Gauge Dimension (Female Interface) is added from 3402/001 with the thread definition corrected to be "0.250-36 UNS-2A" (was "0.260-36 UNS-2A").
(to be consistent with Generic 3403 and for consistency/clarification).

12. Para 4.2: Deviations from Generic spec is amended; i.e. Residual Magnetism deviation is added; the existing deviation on RF Leakage Test is deleted.
(to be consistent with the updated Generic specification ESCC 3403).

13. Para 4.3.2: Weight requirements are moved to the Component Type Variants table.

14. Para 4.3.4: Engagement and Separation Forces is corrected to be Mating and Unmating Forces. The last sentence defining coupling nut torque during testing of mated connectors is deleted (the maximum coupling nut torque is moved to the Maximum Ratings table).
(For clarification and consistency)

15. Para 4.3.5: Residual Magnetism is deleted to match the generic spec requirements. The "information only" limits for variants 02 & 03 are deleted.
("information only" requirements are considered redundant).

16. Para 4.4: Materials: the gold plate reference to MIL spec is deleted. The "Baking" conditions (per MIL-STD-202) for the various materials is deleted. Gaskets are added to list of included materials.
(For consistency with other ESCC detail specs for similar components)

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17. Para 4.5: Marking: Delete requirement for marking of the testing level letter from the ESCC Component Number.
(as per latest ESCC No. 21700).

18. Para 4.7.2: Conditions for Burn-in: Delete the recovery period requirement of 24 +/-2 hours for after burn-in.
(the generic spec allows the test to be performed within 24h; this is considered sufficient).

19. Table 3: "Resistance Drift" is renamed as "Temperature coefficient of Resistance" with symbol "TCR".

20 . Figure 5: 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 include all applicable test requirements.
(to be consistent with the updated Generic specification ESCC 3403).

Justification:

(see also change details for each item above):

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

B. To make the format, presentation and content editorially and technically consistent with the various other ESCC Detail Specifications already converted to ESCC format.

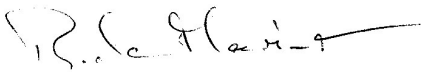
C. To make the content consistent with the proposed ESCC format Generic Specification No.3403 issue 2.

Attachments:

3403004.pdf, null

Modifications:

The following additional changes are included in this DCR, as incorporated into the attached draft specification 3403/004 Issue 2 Draft D (replaces issue 2 Draft C):
Page 6 Table 1(b) (original DCR item 6) Input Power:
Amend rating to be RF Power = 1W max (was 2W) and delete reference to 'recommended' value.
Justification: The 1W Rating is consistent with the Radiall device's actual capability.
Page 6 Table 1(b) Peak Power:
Add duty cycle = 1 percent
Justification: as duty cycle was omitted by mistake
Page 6 Table 1(b) Peak Power:
Amend rating to be Peak Power = 100W max (was 200W).

| |
|---|
| Justification: The 1W Rating is consistent with the Radiall device's actual capability. |
| Approval signature: |
|  |
| Date signed: |
| 2006-01-31 |

Pages 1 to 15

# LOAD,

# RF, COAXIAL, TYPE SMA, DC - 18GHz

## ESCC Detail Specification No. 3403/004

| | |
|---|---|
| Issue 2 - DRAFT C | January 2006 |

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 |

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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: 340300401

- Detail Specification Reference: 3403004
- 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 | Connector Type | Body Material and Finish | VSWR | Weight Max (g) |
|---|---|---|---|---|
| 01 | SMA Male | Beryllium Copper, Copper Underplate, Gold Plated | DC < f ≤ 15GHz<br>≤ 1.05 + 0.0125f (GHz)<br><br>15 < f ≤ 18GHz<br>≤1.3 | 3.5 |
| 02 | SMA Male | Beryllium Copper, Nickel Underplate, Gold Plated | | 3.5 |
| 03 | SMA Male | Amagnetic Stainless Steel, Electro-passi-vated | | 3.5 |

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 | $P_{RF}$ | 2 | W | Note 1, 2 |
| Peak Power | $P_P$ | 200 | W | duration 1µs<br>1ppm duty cycle |
| DC Power | $P_{DC}$ | 2 | W | $T_{amb}$=+25˚C |
| Impedance | Z | 47.5 to 52.5 | Ω | - |
| Frequency Range | $f_{op}$ | DC to 18 | GHz | - |
| RF Leakage | E | -[80 - f(GHz)] | 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 |

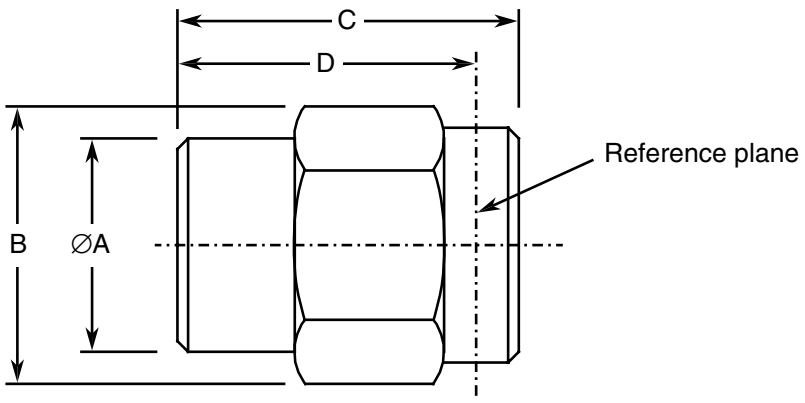
**NOTES:**

1. With Load mated with a mounted square flange SMA connector.
2. RF Power shall be derated against operating temperature as follows:

   $P_{RF}$ at $T_{op} \leq +25$˚C. Derate linearly to 0W at $T_{op} = +125$˚C.

3. Coupling Proof Torque: 170N.cm

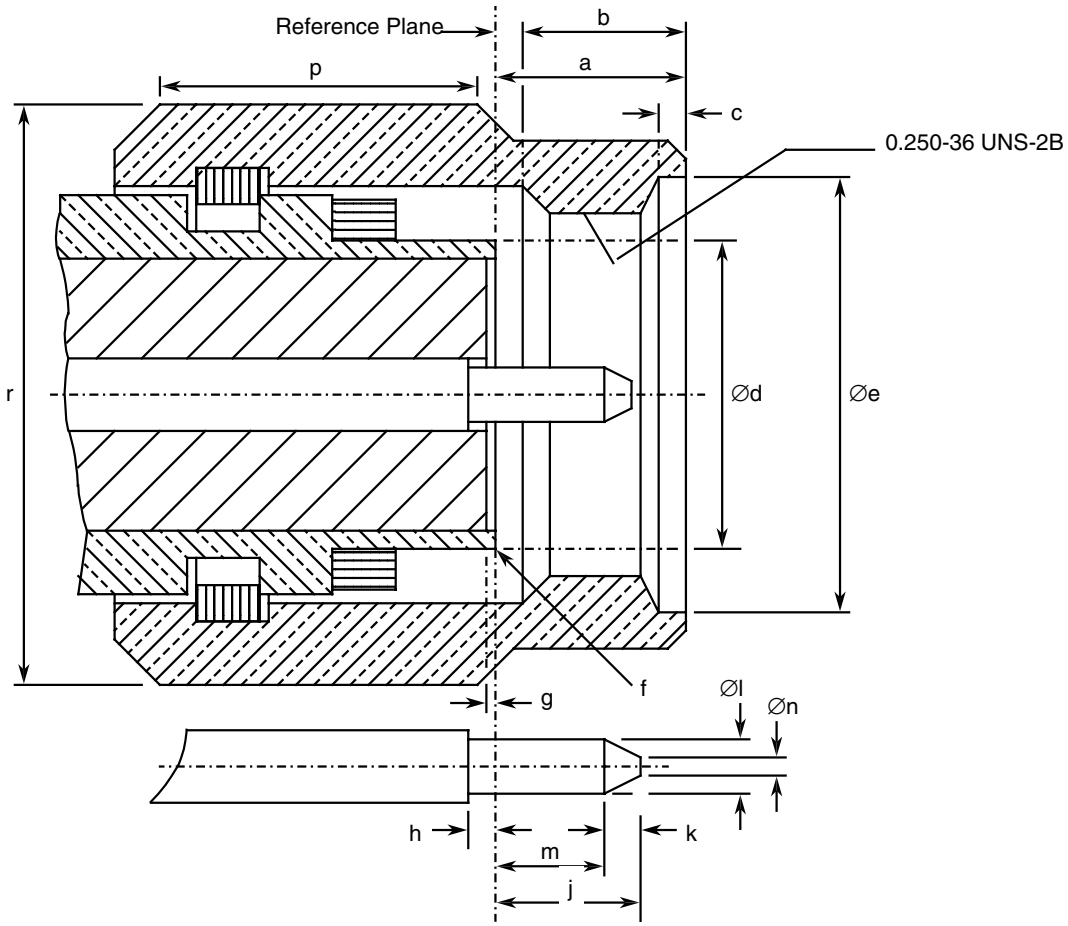
1.6 PHYSICAL DIMENSIONS

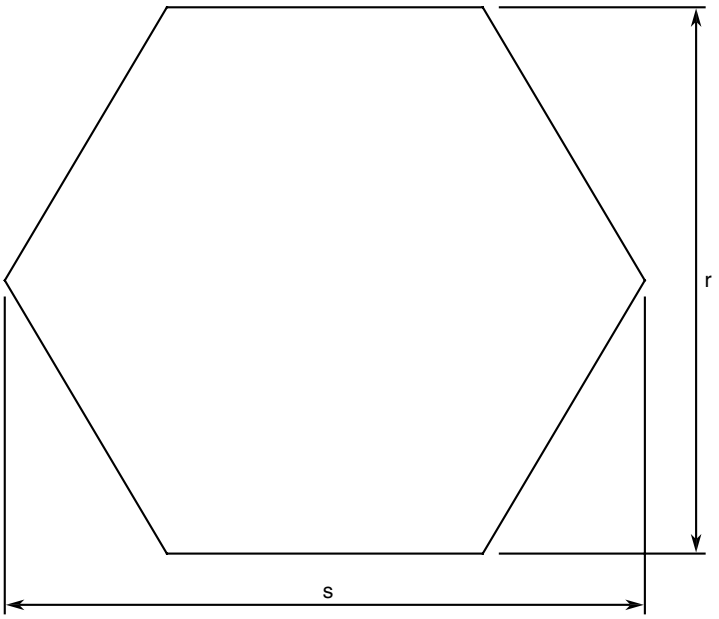


| Symbols | Dimensions mm | |
|---|---|---|
| | Min | Max |
| ØA | 6.2 | 6.4 |
| B | 7.8 | 8 |
| C | - | 12 |
| D | - | 10.5 |

1.6.1 Interface Dimensions

Male Interface

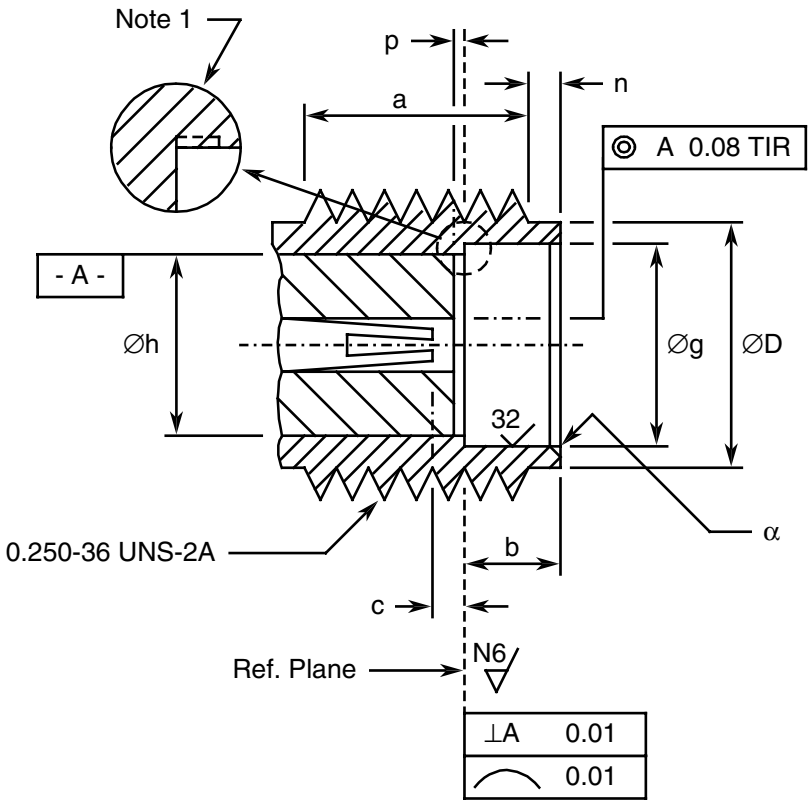




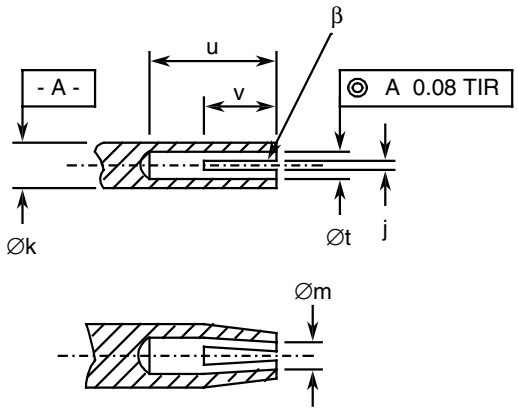

| Symbols | Dimensions mm | | Notes |
|---|---|---|---|
| | Min | Max | |
| a | - | 3.43 | |
| b | 2.54 | - | |
| c | 0.38 | 1.14 | |
| ∅d | - | 4.592 | |
| ∅e | 6.35 | - | |
| f | - | 0.08 | Radius or 45° chamfer |
| g | 0 | 0.2 | |
| h | 0 | 0.25 | |
| j | - | 2.54 | |
| k | 0.38 | - | |
| ∅l | 0.9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

1.7 MATERIALS AND FINISHES

Materials and finishes shall be as follows:

a. Variant 01
   - Shell, Coupling Nut, Centre Contact: Beryllium copper, with copper underplate (2.5µm minimum) and gold plating (2.5µm minimum)
   - Inserts: PTFE
   - Gaskets: Silicone rubber.

b. Variant 02
   - Shell, Coupling Nut, Centre Contact: Beryllium copper, with nickel underplate (2µm minimum) and gold plating (2.5µm minimum)
   - Inserts: PTFE
   - Gaskets: Silicone rubber

c. Variant 03
   - Shell, Coupling Nut: Amagnetic stainless steel, electro-passivated
   - Centre Contact: Beryllium copper with nickel underplate (2µm minimum) and gold plating (2.5µm minimum)
   - 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 to variants 02, 03.

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

2.3 COUPLING PROOF TORQUE TEST

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

2.4 MATING AND UNMATING FORCES TEST

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

2.5 ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES

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

2.5.1 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<br>f = 0 to 18GHz | - | Note 1 | - |
| Resistance | R | DC test | 47.5 | 52.5 | Ω |

**NOTES:**
1. The limits for VSWR are as specified in Component Type Variants and Range of Components.

2.5.2 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 Resistance | $TC_R$ | DC test. Reference Temperature: 25˚C | - | 3 x $10^{-4}$ | Ω/Ω/˚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.

2.6 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 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 | % |
| Resistance | Δ R | ± 250 | mΩ |

2.7 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

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 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<br>Initial Measurements | Resistance<br>Voltage Standing Wave Ratio | R<br>VSWR | 47.5<br>Note 1 | 52.5<br>Note 1 | Ω<br>- |
| Measurements during last cycle | Intermittent contact | - | No discontinuity > 0.5ms<br>No open or short circuit | | - |
| Final Measurements | Resistance | R | 47.5 | 52.5 | Ω |
| | Resistance Drift (from initial measurement) | ΔR | - | ±250 | mΩ |
| | Voltage Standing Wave Ratio | VSWR | Note 1 | Note 1 | - |
| | VSWR Drift (from Initial measurement) | $\frac{\Delta VSWR}{VSWR}$ | - | ±2 | % |
| Shock<br>Initial Measurements | Resistance (Note 2)<br>Voltage Standing Wave Ratio (Note 2) | R<br>VSWR | 47.5<br>Note 1 | 52.5<br>Note 1 | Ω<br>- |
| Final Measurements | Resistance | R | 47.5 | 52.5 | Ω |
| | Resistance Drift (from initial measurement) | ΔR | - | ±250 | mΩ |
| | Voltage Standing Wave Ratio | VSWR | Note 1 | Note 1 | - |
| | VSWR Drift (from Initial measurement) | $\frac{\Delta VSWR}{VSWR}$ | - | ±2 | % |
| Rapid Change of Temperature<br><br>Initial Measurements | Resistance<br>Voltage Standing Wave Ratio | R<br>VSWR | 47.5<br>Note 1 | 52.5<br>Note 1 | Ω<br>- |
| Final Measurements | Resistance | R | 47.5 | 52.5 | Ω |
| | Resistance Drift (from initial measurement) | ΔR | - | ±250 | mΩ |
| | Voltage Standing Wave Ratio | VSWR | Note 1 | Note 1 | - |
| | VSWR Drift (from Initial measurement) | $\frac{\Delta VSWR}{VSWR}$ | - | ±2 | % |
| Climatic Sequence<br><br>Initial Measurements | Resistance (Note 2)<br>Voltage Standing Wave Ratio (Note 2) | R<br>VSWR | 47.5<br>Note 1 | 52.5<br>Note 1 | Ω<br>- |
| Measurements during Dry Heat | Temperature Coefficient of Resistance | $TC_R$ | - | $3 \times 10^{-4}$ | Ω/Ω/°C |
| Measurements during Cold | Temperature Coefficient of Resistance | $TC_R$ | - | $3 \times 10^{-4}$ | Ω/Ω/°C |

| Test Reference per ESCC No. 3403 | Characteristics | Symbols | Limits | | Units |
|---|---|---|---|---|---|
| | | | Min | Max | |
| Final Measurements | Resistance | R | 47.5 | 52.5 | Ω |
| | Resistance Drift (from initial measurement) | ΔR | - | ±250 | mΩ |
| | Voltage Standing Wave Ratio | VSWR | Note 1 | Note 1 | - |
| | VSWR Drift (from Initial measurement) | $\frac{\Delta VSWR}{VSWR}$ | - | ±2 | % |
| Operating Life Initial Measurements | Resistance (Note 2) | R | 47.5 | 52.5 | Ω |
| | Voltage Standing Wave Ratio (Note 2) | VSWR | Note 1 | Note 1 | - |
| Final Measurements | Resistance | R | 47.5 | 52.5 | Ω |
| | Resistance Drift (from initial measurement) | ΔR | - | ±250 | mΩ |
| | Voltage Standing Wave Ratio | VSWR | Note 1 | Note 1 | - |
| | VSWR Drift (from Initial measurement) | $\frac{\Delta VSWR}{VSWR}$ | - | ±2 | % |
| RF Leakage | RF leakage f = 0 to 18GHz | E | -85 | - | dBi |
| Peak Power | | | | | |
| Final Measurements | Resistance<br>Voltage Standing Wave Ratio | R<br>VSWR | 47.5<br>Note 1 | 52.5<br>Note 1 | Ω<br>- |

**NOTES:**

1. The limits for VSWR are as specified in Component Type Variants and Range of Component:
2. This test need not be repeated. The most recent result from the previous test may be used instead.

2.8 BURN-IN CONDITIONS

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

2.9 OPERATING LIFE CONDITIONS

| Characteristics | Symbols | Test Conditions | Units |
|---|---|---|---|
| Ambient Temperature | $T_{amb}$ | +25 | $^{o}C$ |
| Power | $P_{in}$ | Note 1 | W |
| Frequency | $f_{in}$ | 10 | GHz |

**NOTES:**

1. Rated RF Power as specified in Maximum Ratings.