DOCUMENT CHANGE REQUEST

DCR number 536	Changes required for: General	Originator: Steve Thacker - ESCC
Date: 2009/08/18	Date sent: 2009/08/18	Organisation: ESA/ESTEC
Status: IMPLEMENTED		

Title:	Resistors, Fixed, Surface Mount Film, Non-Hermetically Sealed, Based on Type MS1		
Number:	4001/022	Issue:	2

Other documents affected:

Page:

Specification is totally rewritten as part of the ongoing conversion to the ESCC format, as well as making it consistent with the current issue of generic spec ESCC4001.

see attached proposed 4001/022 issue 3 draft A

Paragraph:

Specification is totally rewritten as part of the ongoing conversion to the ESCC format, as well as making it consistent with the current issue of generic spec ESCC4001.

see attached proposed 4001/022 issue 3 draft A

Original wording:

Proposed wording:

ESCC Detail Specification No. 4001/022 issue 2 - RESISTORS, FILM, FIXED, SURFACE MOUNT, NON-HERMETICALLY SEALED, BASED ON TYPE MS1

Total reformat of this Detail Specification (from the range of various ESCC Detail Specifications, 4001/xxx, for resistors under Generic Specification No. 4001) as part of the ongoing conversion to the ESCC format as well as making it consistent with the current issue of Generic Specification ESCC4001.

See below for summary of changes, also see attached the proposed 4001/022 Issue 3 Draft A.

Note: The layout, format and general content of 4001/022 issue 3 is based closely on other re-written/converted, published ESCC Detail Specifications (e.g. 4001/023).

Note: known support for active procurement against this specification includes the following Manufacturer: Vishay-Draloric/Germany (is willing to support procurement of the full range of components).

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

1) General
Rewording, restructure, modification and removal of various sections and paragraphs of the specification, plus other editorial changes based on the usual layout and editorial content of other Detail Specifications already converted to ESCC format under the current issue of Generic Specification ESCC4001.

2) Table 1(b), 'Insulation Voltage' amended to be 'Isolation Voltage' (to be consistent with ESCC4001 & ESCC2134000)(in Para 1.5)

3) Figure 1, Parameter Derating figure/requirements moved to become note 1 to the Maximum Ratings table (in Para 1.5).

4) Figure 2,
Figure amended (to be consistent with the actual component):
- remove the dotted line
- Dimension C amended to be diameter of body (Dim D is diameter of end-caps)
- Dimension E deleted

Note from Para 4.2.3(e) transferred to be new note 1 against dimension B (in Para 1.6):
"1. The end-cap terminal shall be free of contamination by body coating material within B Min."

5) Figure 3 is amended to refer to Rn.

6) Para 4.2, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.2.5
All deviations are amended to make the existing deviations consistent with the contents of ESCC4001;
i.e. replaced by Paras 2.1.1.1 & 2.1.1.2 as follows:
.....
2.1.1.1 Deviations from Screening Tests (Chart F3)
(a) Para. 8.1 Overload
Resistance shall be measured as specified in Room Temperature Electrical Measurements both before and after Overload.
Change in Resistance shall be calculated and shall not exceed the limit as follows:
Change in Resistance during Overload: Â±(0.25%Rn + 0.05ohm) max
(b) Para. 8.4, Burn-in: Not applicable.

2.1.1.2 Deviations from Qualification and Periodic Tests (Chart F4)
(a) Para. 8.8, Rapid Change of Temperature: Not applicable.
(b) Para. 8.9, Vibration: Not applicable.
(c) Para. 8.11.2.2, Substrate Bending Test: Not applicable.
.....

7) Para 4.2.3(d), delete item (per 4001 Seal is only applicable "For hermetically sealed resistors", so there is no need to add this as a deviation for this non-hermetically sealed component).

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8) Para 4.2.3(e) & Para. 4.4.3, delete items (these visual requirements are considered already covered by ESCC Basic specifications 20500 & 2054000 for resistors, as well as by the Manufacturer's PID).

9) Para 4.4.1, Make the coating requirement more generalised by deleting "laquer" from the sentence.

10) Para 4.5.3.4, requirement for marking of TC requirements by a colour code is moved to Appendix A for Vishay Draloric (as this colour code marking is not in accordance with ESCC No. 21700)

11) Para 4.6.2 & Table 3 Note 1. High & Low Temp Electrical Measurements: change the applied sampling to be a fixed sample of 5 components from the total production lot (to be consistent with 4001)(in Para 2.5.2).

12) Table 2, Insulation Resistance test is added to Table 2 but is guaranteed but not tested during screening (in Para 2.5.1)(to be consistent with Para 2.6)

13) Table 3 item 3, amend the limits to reflect the TC value and the worse case temperature difference (125C - 19C = 106C):
15 ppm/C: +/-0.159% (was 0.16%)
25 ppm/C: +/-0.265% (was 0.26%)
50 ppm/C: +/-0.53% (was 0.55%)

14) Figure 5 is deleted.

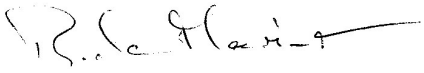
15) Table 6 is amended to be consistent with 4001 including:
- only tests that include electrical measurement are included in Para 2.6.
- delete drying "Procedure I" reference from both Solderability & Resistance to Soldering Heat.

16) New Para 2.4 for Resistance to Soldering Heat test is added (to be consistent with 4001).

Justification:

(see also change details for items above)

Part of the ongoing activity of conversion of ESA/SCC specifications to the ESCC format. Amendments are made to the format and presentation to be consistent with the various other ESCC Detail Specifications, already converted to ESCC format, as well as the ESCC Generic Specification No. 4001 issue 2.

Attachments:
4001022draft3A.pdf, null
Modifications:
N/A
Approval signature:

Date signed:
2009-08-18

Pages 1 to 12

RESISTORS, FIXED, SURFACE MOUNT, FILM, NON-HERMETICALLY SEALED

BASED ON TYPE MS1

ESCC Detail Specification No. 4001/022

Issue 3 Draft A	July 2009

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

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DOCUMENTATION CHANGE NOTICE

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

DCR No.	CHANGE DESCRIPTION
TBD	Specification updated 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. 4001.

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: 4001022012490F3

- Detail Specification Reference: 4001022
- Type Variant Number: 01 (see Note 1)
- Characteristic code: Resistance Value (249Ω): 2490 (as required)
- Characteristic code: Resistance Tolerance (±1%): F (as required)
- Characteristic code: Temperature Coefficient (±50x10^{-6}/°C): 3 (as required)

NOTES:

1. Marking of the type variant number is mandatory. No further reference to type variant number is made in this specification.

1.4.1.1 Characteristics and/or Ratings Codes

Characteristics and/or ratings to be codified as part of the ESCC Component Number shall be as follows:

(a) Resistance Value expressed by means of the following codes in accordance with ESCC Basic Specification No. 21700. The unit quantity shall be ohm (Ω):

Resistance Value (Ω)	Code
XX.X	XXRX
XXX	XXX0
XXX 10^{1}	XXX1

Resistance Value (Ω)	Code
XXX 10^2	XXX2
XXX 10^3	XXX3
XXX 10^4	XXX4

(b) Resistance Tolerance expressed by the following codes in accordance with ESCC Basic Specification No. 21700:

Tolerance (± %)	Code Letter
0.1	B
0.5	D
1	F

(c) Temperature Coefficient expressed by the following codes:

Temperature Coefficient (± 10^{-6}/°C)	Code
15	1
25	2
50	3

1.4.2 Range of Components

The range of components applicable to this specification are as follows:

Resistance Range R_n (Notes 1, 2)		Tolerance (± %) (Note 3)	Temperature Coefficient TC (± 10^{-6}/°C)	Weight max (g)
Min (Ω)	Max (MΩ)			
43.2	1	0.1	50	0.1
10	1	0.5	50	0.1
2.21	5.11	1	50	0.1
43.2	1	0.1	25	0.1
10	1	0.5	25	0.1
10	1	1	25	0.1
43.2	0.221	0.1	15	0.1
10	0.511	0.5	15	0.1

NOTES:

1. Critical resistance is 160kΩ
2. Value series: E96.

1.5 MAXIMUM RATINGS

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

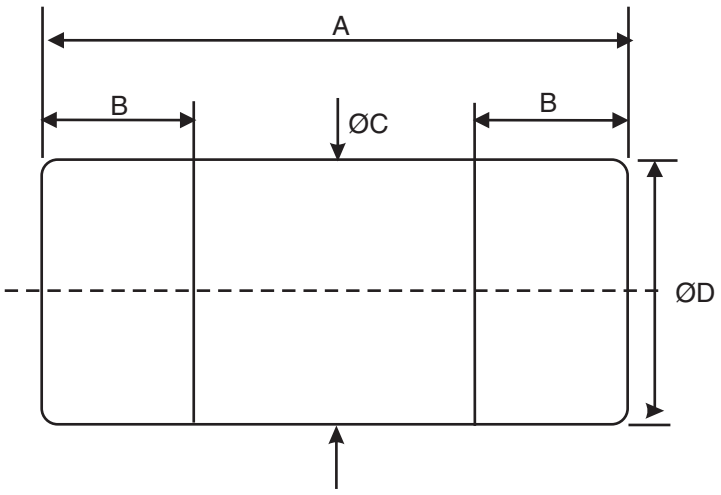
Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

Characteristics	Symbols	Limits	Units	Remarks
Rated Dissipation	P_n	250	mW	Note 1
Limiting Element Voltage	U_L	200	V	-
Rated Voltage	U_R	$\sqrt{(P_n x R_n)}$	V	Note 2
Isolation Voltage	U_i	500	Vrms	-
Operating Temperature Range	T_{op}	-55 to +125	^oC	T_{amb}
Storage Temperature Range	T_{stg}	-65 to +155	^oC	-
Soldering Temperature	T_{sol}	+260	^oC	Note 3

NOTES:

1. At $T_{amb} \leq +70^oC$. For $T_{amb} > +70^oC$ derate linearly to 0W at $T_{amb} = +125^oC$.
2. Shall never exceed Limiting Element Voltage. R_n=Rated Resistance.
3. Duration 10 seconds maximum.

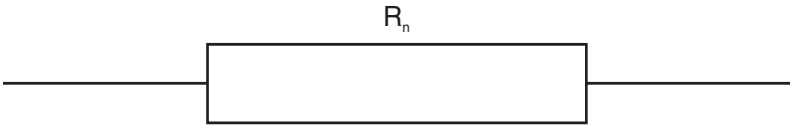
1.6 PHYSICAL DIMENSIONS



Dimensions (mm)							
A		B (Note 1)		ØC (Note 3)		ØD (Note 2)	
Min	Max	Min	Max	Min	Max	Min	Max
3.4	3.6	0.5	0.9	ØD -0.15	ØD	1.3	1.5

NOTES:
1. The end-cap terminals shall be free from contamination by body coating material within B min.
2. Diameter of end-caps.
3. Diameter of body.

1.7 FUNCTIONAL DIAGRAM



1.8 MATERIALS AND FINISHES

1.8.1 Body

The resistive element shall be covered with a suitable coating.

1.8.2 Terminations

The end-cap terminal material and finish shall be steel with 1µm nickel plating and with a tin-lead plated finish (minimum 6% lead).

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 Screening Tests (Chart F3)

(a) Para. 8.1, Overload
Resistance shall be measured as specified in Room Temperature Electrical Measurements both

before and after Overload. Change in Resistance shall be calculated and shall not exceed the limit as follows:
Change in Resistance during Overload: ±(0.25%Rn + 0.05Ω) max

(b) Para. 8.4, Burn-in: Not applicable.

2.1.1.2 Deviations from Qualification and Periodic Tests (Chart F4)

(a) Para. 8.8, Rapid Change of Temperature: Not applicable.
(b) Para. 8.9, Vibration: Not applicable.
(c) Para. 8.11.2.2, Substrate Bending Test: Not applicable.

2.2 MARKING

The marking of all components delivered to this specification shall be in accordance with the requirements of ESCC Basic Specification No. 21700. 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 each component in its primary package.

The information to be marked and the order of precedence, shall be as follows:

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

2.3 OVERLOAD

The test conditions for Overload, tested as specified in the ESCC Generic Specification, shall be as follows:

Voltage: $\sqrt{(10P_n \times R_n)}$ or 630V, whichever is less.
Duration: 0.1±0.01s minimum.

2.4 RESISTANCE TO SOLDERING HEAT

The test conditions for Resistance to Soldering Heat, tested as specified in the ESCC Generic Specification, shall be as follows:

Temperature: 260°C
Duration: $10^{(+0-1)}$s

2.5 ELECTRICAL MEASUREMENTS 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	ESCC 4001 Test Method and Conditions	Tolerance (± %)	Limits		Units
				Min	Max	
Resistance	R_A	Para. 8.3.1.1	0.1	0.999 R_n	1.001 R_n	Ω
			0.5	0.995 R_n	1.005 R_n	
			1	0.99 R_n	1.01 R_n	
Insulation Resistance	R_I	Para. 8.3.1.2 V=100V Note 1	All	1000	-	MΩ

NOTES:
1. Guaranteed but not tested during Screening Tests.

2.5.2 High and Low Temperatures Electrical Measurements

Characteristics	Symbols	ESCC 4001 Test Method and Conditions (Note 1)		Limits		Unit
				Min	Max	
Resistance Change between -55 (+3-0)°C and +22 ± 3°C	$\Delta R_A/R_A$	Para. 8.3.1.1	TC = ±15 x 10^{-6}/°C TC = ±25 x 10^{-6}/°C TC = ±50 x 10^{-6}/°C	-0.12 -0.2 -0.4	+0.12 +0.2 +0.4	%
Resistance Change between +125 (+0 -3)°C and +22 ± 3°C	$\Delta R_A/R_A$	Para. 8.3.1.1	TC = ±15 x 10^{-6}/°C TC = ±25 x 10^{-6}/°C TC = ±50 x 10^{-6}/°C	-0.159 -0.265 -0.53	+0.159 +0.265 +0.53	%

NOTES:
1. The measurements shall be performed on a sample of 5 components selected from the total production lot. The resistors shall be mounted as specified in the ESCC Generic Specification.

2.6 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

The resistors shall be mounted as specified in the ESCC Generic Specification.

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

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

Test Reference per ESCC No. 4001	Characteristics	Symbols	Limits		Units
			Min	Max	
Robustness of Terminations	Resistance	R_A	Record Values		

Test Reference per ESCC No. 4001	Characteristics	Symbols	Limits		Units
			Min	Max	
	Change in Resistance	$\Delta R_A/R_A$	$\pm(0.25 + 0.05\Omega x100/R_n)$		%
Resistance to Soldering Heat	Resistance	R_A	Record Values		
	Change in Resistance	$\Delta R_A/R_A$	$\pm(0.15 + 0.05\Omega x100/R_n)$		%
Solderability	Resistance	R_A	Record Values		
	Change in Resistance	$\Delta R_A/R_A$	$\pm(0.15 + 0.05\Omega x100/R_n)$		%
Climatic Sequence					
Initial Measurements (Procedure 1)	Resistance (after drying)	R_A	Record Values		
Final Measurements	Change in Resistance	$\Delta R_A/R_A$	$\pm(0.5 + 0.05\Omega x100/R_n)$		%
	Insulation Resistance (V_T=100V)	R_I	1000	-	MΩ
Operating Life					
Initial Measurement (0 hour)	Resistance	R_A	Record Values		
Intermediate Measurements (1000 hours)	Change in Resistance	$\Delta R_A/R_A$	$\pm(0.35 + 0.05\Omega x100/R_n)$		%
Intermediate/ Final Measurements (2000 hours)	Change in Resistance	$\Delta R_A/R_A$	$\pm(0.5 + 0.05\Omega x100/R_n)$		%
	Insulation Resistance (V_T=100V)	R_I	1000	-	MΩ

2.7 OPERATING LIFE CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T_{amb}	+70(+0–3)	°C
Test Voltage	V_T	$\sqrt{(P_n x R_n)}$ or U_L whichever is less	V

APPENDIX A

AGREED DEVIATIONS FOR VISHAY DRALORIC (D)

<table>
<tr><th>Items Affected</th><th colspan="3">Description of Deviations</th></tr>
<tr><td rowspan="5">Characteristics and/or Ratings Codes (Para. 1.4.1.1)</td><td colspan="3">Temperature Coefficient may be marked using either a coloured dot on the body or a body colour as follows:</td></tr>
<tr><td>Temperature Coefficient $\pm 10^{-6}/^{o}C$</td><td>Coloured Dot</td><td>Body Colour</td></tr>
<tr><td>15</td><td>Orange</td><td>Violet</td></tr>
<tr><td>25</td><td>Yellow</td><td>Pink</td></tr>
<tr><td>50</td><td>None</td><td>Beige</td></tr>
</table>