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

BASED ON TYPE MS1

ESCC Detail Specification No. 4001/022

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DOCUMENTATION CHANGE NOTICE

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

DCR No.	CHANGE DESCRIPTION
536	Specification updated 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. 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.

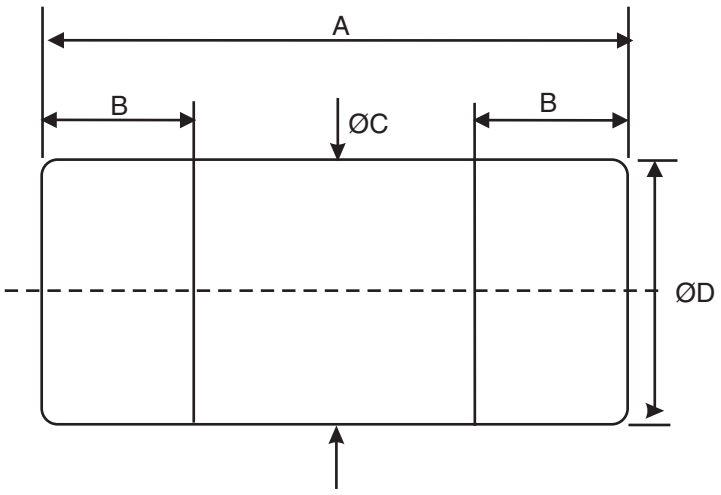
Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

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.

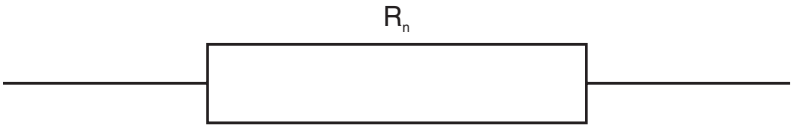
1.6 PHYSICAL DIMENSIONS



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)

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