



DOCUMENT CHANGE REQUEST

DCR number 576

Changes required for: N/A

Originator: nicolas martini

Date: 2010/02/17

Date sent: 2010/02/17

Organisation: CNES

Status: IMPLEMENTED

Title: Resistors fixed film chips, based on type P HR

Number: 4001/023

Issue: 5

Other documents affected:

Page:

1.4; 2.6 and Appendix A
see more details on attached DCR "DCR 100216 TC & OVR"

Paragraph:

1.4; 2.6 and Appendix A
see more details on attached DCR "DCR 100216 TC & OVR"

Original wording:

Proposed wording:

- 1) Add new Temperature Coefficient Code.
- 2) Extension of Ohmic Value Range.
- 3) Editorial Changes.

see more details on attached DCR "DCR 100216 TC & OVR"

Justification:

- 1) Customers needs.
- 3) Customers needs.
- 2) Clarification concerning the ESCC Component Number for PHR and PFRR.

Attachments:

4001023_Draft_6A_for_final_Review.pdf, DCR_100216_TC_&_OVR.pdf, null

Modifications:

as per Draft 6A

Approval signature:

A handwritten signature in black ink, appearing to read "R. S. Hart" with a long horizontal stroke extending to the right.

Date signed:

2010-02-17

ESCC 4001/023 Draft 6A for final review.
Change areas are highlighted.

S.Thacker 08/03/2010



Pages 1 to 15

RESISTORS, FIXED, CHIP, THIN FILM

BASED ON TYPE PHR AND **PFRR**

ESCC Detail Specification No. 4001/023

DRAFT

Issue 6 Draft A	March 2010
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DOCUMENTATION CHANGE NOTICE

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DCR No.	CHANGE DESCRIPTION
576, 522	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 (for type PHR): 4001023012490P9

- **Detail Specification Reference: 4001023**
- **Component Type Variant Number: 01 (01 to 08 as required)**
- **Characteristic code: Resistance Value (249Ω): 2490 (as required)**
- **Characteristic code: Resistance Tolerance (±0.02%): P (as required)**
- **Characteristic code: Temperature Coefficient (±5x10⁻⁶/°C): 9 (as required)**

Example (for type PFRR): 400102309R2490W1

- **Detail Specification Reference: 4001023**
- **Component Type Variant Number: 09 (09 to 12 as required)**
- **Failure Rate Level Letter: R (as applicable; see Note 1)**
- **Characteristic code: Resistance Value (249Ω): 2490 (as required)**
- **Characteristic code: Resistance Tolerance (±0.05%): W (as required)**
- **Characteristic code: Temperature Coefficient (±10x10⁻⁶/°C): 1 (as required)**

NOTES:

1. Failure rate level letter shall be as defined in ESCC Basic Specification No. 26000. When a failure rate level is not applicable the letter shall be omitted.

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
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 (\pm %)	Code Letter
0.01	L
0.02	P
0.05	W
0.1	B

(c) Temperature Coefficient expressed by the following codes:

Temperature Coefficient ($\pm 10^{-6}/^{\circ}\text{C}$)	Code	Remarks
5	0	over T_{amb} +22 $^{\circ}\text{C}$ to + 70 $^{\circ}\text{C}$
10	1	
25	2	
5	9	over T_{amb} -55 $^{\circ}\text{C}$ to + 155 $^{\circ}\text{C}$

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	Type	Style (Note 1)	Resistance Range R_n (Notes 2, 3)		Tolerance (\pm %) (Note 3)	Temperature Coefficient TC ($\pm 10^{-6}/^{\circ}\text{C}$) (Note 4)	Limiting Element Voltage (V)	Stability Class (\pm %) (Note 5)	Terminal Material and Finish	Weight max (g)
			Min (Ω)	Max (M Ω)						
01	PHR	0603	10	0.2	0.01, 0.02, 0.05, 0.1	5, 10, 25	35	0.15	E4	0.003
02	PHR	0805	10	0.25	0.01, 0.02, 0.05, 0.1	5, 10, 25	75	0.15	E4	0.004
03	PHR	1206	10	1	0.01, 0.02, 0.05, 0.1	5, 10, 25	100	0.15	E4	0.01
04	PHR	2010	10	3	0.01, 0.02, 0.05, 0.1	5, 10, 25	150	0.15	E4	0.03
05	PHR	0603	10	0.2	0.01, 0.02, 0.05, 0.1	5, 10, 25	35	0.15	E2 (Note 6)	0.003
06	PHR	0805	10	0.25	0.01, 0.02, 0.05, 0.1	5, 10, 25	75	0.15	E2 (Note 6)	0.004

Variant Number	Type	Style (Note 1)	Resistance Range R_n (Notes 2, 3)		Tolerance (\pm %) (Note 3)	Temperature Coefficient TC ($\pm 10^{-6}/^{\circ}\text{C}$) (Note 4)	Limiting Element Voltage (V)	Stability Class (\pm %) (Note 5)	Terminal Material and Finish	Weight max (g)
			Min (Ω)	Max (M Ω)						
07	PHR	1206	10	1	0.01, 0.02, 0.05, 0.1	5, 10, 25	100	0.15	E2 (Note 6)	0.01
08	PHR	2010	10	3	0.01, 0.02, 0.05, 0.1	5, 10, 25	150	0.15	E2 (Note 6)	0.03
09	PFRR	0603	100	0.261	0.05, 0.1	10, 25	50	0.25	E4	0.003
10	PFRR	0805	100	0.301	0.05, 0.1	10, 25	100	0.25	E4	0.004
11	PFRR	1206	100	1	0.05, 0.1	10, 25	150	0.25	E4	0.01
12	PFRR	2010	100	3.01	0.05, 0.1	10, 25	200	0.25	E4	0.03

NOTES:

1. See Physical Dimensions.
2. Critical resistance is as follows:

Variant Number	Critical Resistance (kΩ)
01, 05	12.25
02, 06	45
03, 07	40
04, 08	45
09	25
10	80
11	90
12	80

3. Available tolerances and resistance values are as follows:

Resistance R_n (Ω)	Variant Number	Available Tolerance (± %)	Available Resistance Values
$10 \leq R_n < 50$	01 to 08	0.1	Any value in the resistance range to 3 significant figures
$50 \leq R_n < 100$	01 to 08	0.05 and 0.1	
$100 \leq R_n < 250$	01 to 08	0.02, 0.05, 0.1	
	09 to 12	0.05, 0.1	
$R_n \geq 250$	01 to 08	0.01, 0.02, 0.05, 0.1	
	09 to 12	0.05, 0.1	

4. Available temperature coefficients are as follows.

Resistance R_n (Ω)	Variant Number	Available Temperature Coefficient and TC code (± 10 ⁻⁶ /°C)	Remarks
≥50	01 to 08	5 (TC code 0)	over $T_{amb} = +22^{\circ}\text{C}$ to $+70^{\circ}\text{C}$; For T_{amb} outside this temperature range, between -55°C to $+155^{\circ}\text{C}$, the TC = $\pm 10 \times 10^{-6}/^{\circ}\text{C}$
≥50	01 to 08	5 (TC code 9)	over $T_{amb} = -55^{\circ}\text{C}$ to $+155^{\circ}\text{C}$
≥20	01 to 08	10 (TC code 1)	over $T_{amb} = -55^{\circ}\text{C}$ to $+155^{\circ}\text{C}$
≥100	09 to 12		
≥10	01 to 08	25 (TC code 2)	over $T_{amb} = -55^{\circ}\text{C}$ to $+155^{\circ}\text{C}$
≥100	09 to 12		

5. Stability class refers to the limit of Change in Resistance, after 2000 hour Operating Life, specified in Intermediate and End-Point Electrical Measurements.
6. Variants 05 to 08 are not suitable for solder assembly methods. They shall be assembled using glue

or wire bond techniques.

1.5 **MAXIMUM RATINGS**

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

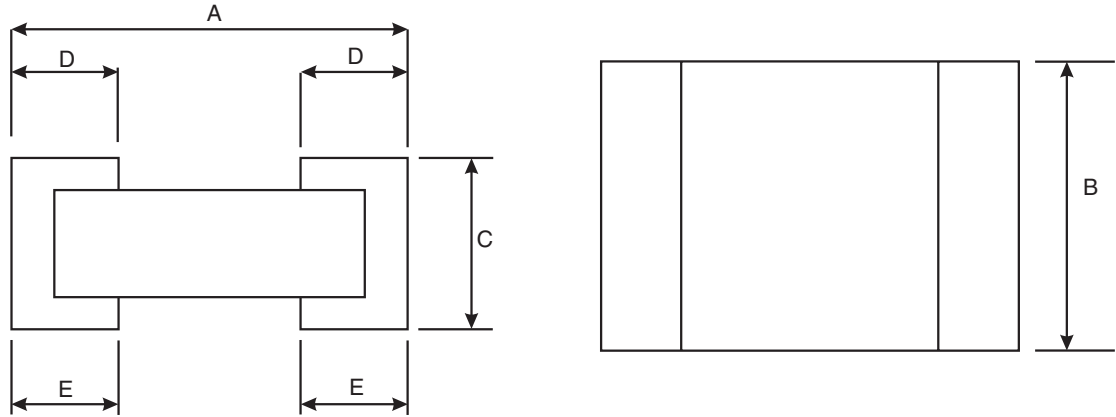
Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

Characteristics	Variant Number	Style	Symbols	Limits	Units	Remarks
Rated Dissipation	01, 05, 09 02, 06, 10 03, 07, 11 04, 08, 12	0603 0805 1206 2010	P_n	100 125 250 500	mW	Note 1
Limiting Element Voltage	01, 05 02, 06 03, 07 04, 08 09 10 11 12	0603 0805 1206 2010 0603 0805 1206 2010	U_L	35 75 100 150 50 100 150 200	V	-
Rated Voltage	All	All	U_R	$\sqrt{(P_n \times R_n)}$	V	Note 2
Isolation Voltage	01, 05, 09 02, 06, 10 03, 07, 11 04, 08, 12	0603 0805 1206 2010	U_i	100 200 300 300	V _{rms}	-
Operating Temperature Range	All	All	T_{op}	-55 to +155	°C	T_{amb}
Storage Temperature Range	All	All	T_{stg}	-55 to +155	°C	-
Soldering Temperature	01 to 04, 09 to 12	All	T_{sol}	+260	°C	Notes 3, 4

NOTES:

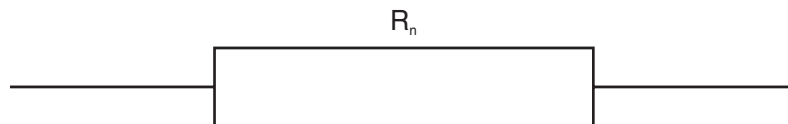
1. At $T_{amb} \leq +70^\circ\text{C}$. For $T_{amb} > +70^\circ\text{C}$ derate linearly to 0W at $T_{amb} = +155^\circ\text{C}$.
2. Shall never exceed Limiting Element Voltage. $R_n = \text{Rated Resistance}$.
3. Duration 10 seconds maximum.
4. Not applicable to Variants 05 to 08.

1.6 PHYSICAL DIMENSIONS



Variant Number	Style	Dimensions (mm)							
		A		B		C		D	
		Min	Max	Min	Max	Min	Max	Min	Max
01, 05, 09	0603	1.39	2.16	0.62	1.01	0.25	1.02	0.25	0.51
02, 06, 10	0805	1.78	2.55	1.14	1.53	0.25	1.02	0.25	0.51
03, 07, 11	1206	2.87	3.64	1.47	1.86	0.25	1.02	0.25	0.51
04, 08, 12	2010	4.95	5.72	2.41	2.8	0.25	1.02	0.35	0.85

1.7 FUNCTIONAL DIAGRAM



1.8 MATERIALS AND FINISHES

1.8.1 Body

The resistive element deposited on the alumina substrate shall be covered with a suitable coating.

1.8.2 Terminations

The terminal material and finish shall be as specified in Component Type Variants and Range of Components in accordance with the requirements of ESCC basic Specification No. 23500.

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. 8.3.2, Room Temperature Electrical Measurements after Burn-in: for $\pm 0.01\%$ and $\pm 0.02\%$ tolerances, components with a resistance outside the limits of Room Temperature Electrical Measurements after burn-in but remaining within a $\pm 0.03\%$ tolerance shall be rejected, but not counted for PDA.

2.1.1.2 *Deviations from Qualification and Periodic Tests (Chart F4)*

- (a) Para. 8.9, Vibration: Not applicable.
- (b) Para. 8.14, Solderability: Not applicable to Variants 05 to 08.

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:	$\sqrt{(6.25P_n \times R_n)}$ or $2U_L$, whichever is less.
Duration:	2s minimum.

2.4 ROBUSTNESS OF TERMINATIONS - SUBSTRATE BENDING TEST

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

- Number of bends: 10.
- Deflection: 2mm (for Variants 01, 02, 03, 05, 06, 07, 09, 10, 11)
1mm (for Variants 04, 08, 12)
- Duration: 5±1s

2.5 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

2.6 ELECTRICAL MEASUREMENTS 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	ESCC 4001 Test Method and Conditions	Tolerance (± %)	Limits		Units
				Min	Max	
Resistance	R _A	Para. 8.3.1.1	0.01	0.9999 R _n	1.0001 R _n	Ω
			0.02	0.9998 R _n	1.0002 R _n	
			0.05	0.9995 R _n	1.0005 R _n	
			0.1	0.999 R _n	1.001 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.

2.6.2 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 = ±5 x 10 ⁻⁶ /°C (TC code 0) TC = ±10 x 10 ⁻⁶ /°C (TC code 1) TC = ±25 x 10 ⁻⁶ /°C (TC code 2) TC = ±5 x 10 ⁻⁶ /°C (TC code 9)	-0.08	+0.08	%
			-0.08	+0.08	
			-0.2	+0.2	
			-0.04	+0.04	
Resistance Change between +155 (+0 -3)°C and +22 ± 3°C	$\Delta R_A/R_A$	Para. 8.3.1.1 TC = ±5 x 10 ⁻⁶ /°C (TC code 0) TC = ±10 x 10 ⁻⁶ /°C (TC code 1) TC = ±25 x 10 ⁻⁶ /°C (TC code 2) TC = ±5 x 10 ⁻⁶ /°C (TC code 9)	-0.136	+0.136	%
			-0.136	+0.136	
			-0.34	+0.34	
			-0.068	+0.068	
Resistance Change between +70 (+0 -3)°C and +22 ± 3°C	$\Delta R_A/R_A$	Para. 8.3.1.1 TC = ±5 x 10 ⁻⁶ /°C (TC code 0)	-0.026	+0.026	%

NOTES:

- 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.

2.7 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	
Rapid Change of Temperature	Resistance	R _A	Record Values		%
Robustness of Terminations	Change in Resistance	$\Delta R_A/R_A$	±(0.05 + 0.05Ωx100/R _n)		
Resistance to Soldering Heat					
Solderability (Note 1)					
Climatic Sequence	Resistance (after drying)	R _A	Record Values		

Test Reference per ESCC No. 4001	Characteristics	Symbols	Limits		Units
			Min	Max	
Final Measurements	Change in Resistance	$\Delta R_A/R_A$	$\pm(0.1 + 0.05\Omega \times 100/R_n)$		%
	Insulation Resistance ($V_T=100V$)	R_I	1000	-	M Ω
Operating Life					
Initial Measurement (0 hour)	Resistance	R_A	Record Values		
Intermediate Measurements (1000 hours)	Change in Resistance	$\Delta R_A/R_A$	$\pm(0.1 + 0.05\Omega \times 100/R_n)$		%
Intermediate/ Final Measurements (2000 hours)	Change in Resistance	$\Delta R_A/R_A$			%
	Variants 01 to 08		$\pm(0.15 + 0.05\Omega \times 100/R_n)$		
	Variants 09 to 12		$\pm(0.25 + 0.05\Omega \times 100/R_n)$		
	Insulation Resistance ($V_T=100V$)	R_I	1000	-	M Ω
Final Measurements (8000 hours) (Note 2)	Change in Resistance	$\Delta R_A/R_A$	$\pm(1 + 0.05\Omega \times 100/R_n)$		%

NOTES:

1. Solderability is applicable to Variants 01 to 04 and 09 to 12 only.
2. Applicable to Failure Rate Endurance Testing only.

2.8

BURN-IN CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T_{amb}	+70 \pm 5	$^{\circ}C$
Test Voltage	V_T	$\sqrt{(P_n \times R_n)}$ or U_L whichever is less	V

NOTES:

1. After Burn-in, the components shall be removed from the chamber and allowed to cool under normal atmospheric conditions for a minimum of 4 hours.

2.9

OPERATING LIFE CONDITIONS

The conditions shall be as specified for Burn-in.

APPENDIX A

AGREED DEVIATIONS FOR VISHAY SFERNICE (F)

Items Affected	Description of Deviations
<p>Deviations from Generic Specification:</p> <p>Special In-Process Controls (Chart F2)</p> <p>Screening Tests (Chart F3)</p> <p>Qualification and Periodic Tests (Chart F4)</p>	<p>Para. 5.2.1, Dimension Check: Guaranteed but not tested.</p> <p>Para. 8.2, Non-Linearity: Not applicable.</p> <p>Para. 8.3.3, High and Low Temperatures Electrical Measurements: For components with TC code 9, High and Low Temperatures Electrical Measurements may be performed prior to Burn-in.</p> <p>Para. 8.15, Permanence of Marking: Not applicable.</p>
<p>Deviations from Generic Specification</p> <p>Screening Tests (Chart F3)</p>	<p>For Variants 09 to 12, when failure rate level qualification approval in accordance with ESCC Basic Specification No. 26000 has been granted, the following deviations shall apply.</p> <p>Para. 8.1 (& Para. 2.3 herein), Overload: Resistance and Change in Resistance shall be measured on a GONOGO basis, in accordance with Room Temperature Electrical Measurements in the Detail Specification, both before and after the test. Change in Resistance shall be related to the initial measurements.</p> <p>The limit for Change in Resistance shall be: $\Delta R_A/R_A = \pm(0.05 + 0.05\Omega \times 100/R_n)\% \text{ max}$</p> <p>Para. 8.4 (& Para. 2.8 herein), Burn-in: Not applicable.</p>
<p>High and Low Temperatures Electrical Measurements</p>	<p>All tests at high and low temperatures, with the exception of Resistance Change characteristics performed on components with TC code 9, are guaranteed but not tested based on temperature coefficient measurements performed on each wafer at +25°C and +75°C in accordance with VISHAY specification CM-SF-00210.</p>

**SCC**

DOCUMENTATION CHANGE REQUEST

*TO BE COMPLETED BY ORIGINATOR*Change request No. (4)
Not yet available

Page 1 of [2] (5)

Originator (1) Nicolas Martini	Originator signature (2) Date : 16/02/2010	NSA or ESA representative signature (3) Date
Affiliation VISHAY S.A.		

DOCUMENT AFFECTED		
Doc. No. (6) ESCC4001 /023	Status (7) Issue 5	Title (8) RESISTORS, FIXED, CHIP, THIN FILM BASED ON TYPE PHR and PFR
Paragraph(s) and page(s) affected (9) 1.4; 2.6; APPENDIX A		

Other documents affected N.A.

PROPOSED WORDING OF CHANGE

1) Add new Temperature Coefficient Code.
2) Extension of Ohmic Value Range.
3) Editorial Changes.

Continuation sheet
 Yes No (12)

JUSTIFICATION

1) Customers needs.
2) Clarification concerning the ESCC Component Number for PHR and PFRR.
3) Customers needs.

Continuation sheet
 Yes No (13)

Changes required for :

Procurement (project)	<input type="checkbox"/>	Qualification	<input type="checkbox"/>	MRB decision	<input type="checkbox"/>
General Improvement of Spec.	<input checked="" type="checkbox"/>	Other	<input type="checkbox"/>		

RESERVED FOR USE BY SCC SECRETARIAT

Date of registration :	Order of Priority for Appr. / Impl. : 1 (high) <input type="checkbox"/> 2 (medium) <input type="checkbox"/> 3 (high) <input type="checkbox"/>
Attachments :1	Qualification Status : Qualified <input type="checkbox"/> In process of qualification <input type="checkbox"/>

RESERVED FOR USE BY APPROVING AUTHORITY

Approved <input type="checkbox"/> Yes <input type="checkbox"/> No Priority <input type="checkbox"/>	Date and signature	Reference to SCCG decision
------------------------------------------------------------------------------------------------------------------	---------------------------	-----------------------------------

Approved wording if different from box 11 or reason for rejection (14)

Continuation sheet
 Yes No



DOCUMENTATION CHANGE REQUEST

CONTINUATION SHEET FOR BOX

[12]

Page of [1]

Change request No.
(4)

Not yet available

Page 2 of [2]

Proposed wording of change and justification

1) Add new Temperature Coefficient Code.

1.1 In Paragraph 1.4.1.1 (c) Temperature coefficient expressed by the following codes:

Add Code 9 for TC $\pm 5\text{ppm}/^\circ\text{C}$ on $-55^\circ\text{C}/+155^\circ\text{C}$

Add NOTES:

1. Code 0 \Rightarrow Temperature Coefficient $\pm 5 \times 10^{-6}/^\circ\text{C}$ over $T_{\text{amb}} = +22^\circ\text{C}$ to $+70^\circ\text{C}$
2. Code 9 \Rightarrow Temperature Coefficient $\pm 5 \times 10^{-6}/^\circ\text{C}$ over $T_{\text{amb}} = -55^\circ\text{C}$ to $+155^\circ\text{C}$

1.2 In Paragraph 1.4.2 Component Type Variants and Range of Components

_ Modify the Note 4 to include new TC with restriction in a table :

TC $5\text{ppm}/^\circ\text{C}$ ($+22^\circ\text{C}/+70^\circ\text{C}$) for $R \geq 50$ Ohms

TC $5\text{ppm}/^\circ\text{C}$ ($-55^\circ\text{C}/+155^\circ\text{C}$) for $R \geq 50$ Ohms

TC $10\text{ppm}/^\circ\text{C}$ ($-55^\circ\text{C}/+155^\circ\text{C}$) for $R \geq 20$ Ohms

TC $25\text{ppm}/^\circ\text{C}$ ($-55^\circ\text{C}/+155^\circ\text{C}$) for $R \geq 10$ Ohms

1.3 In Paragraph 2.6.2 High and Low Temperature Electrical Measurements

Replace in the table the value in Limits (Min & Max) for TC = $\pm 5 \times 10^{-6}/^\circ\text{C}$ by :

Resistance Change between -55 ($+3 -0$) $^\circ\text{C}$ and $+22 \pm 3^\circ\text{C} \Rightarrow$ Limits = ± 0.04 (instead of ± 0.08)

Resistance Change between $+155$ ($+0 -3$) $^\circ\text{C}$ and $+22 \pm 3^\circ\text{C} \Rightarrow$ Limits = ± 0.068 (instead of ± 0.136)

1.4 In APPENDIX A High and Low Temperatures Electrical Measurements

Replace the sentence "All tests at high and low ..." by :

Tests at high and low temperatures are done before the Burn-in step only for the Temperature Coefficient $\pm 5 \times 10^{-6}/^\circ\text{C}$ over $T_{\text{amb}} = -55^\circ\text{C}$ to $+155^\circ\text{C}$. (Code 9)

All other tests at high and low temperatures are guaranteed but not tested based on temperature coefficient measurements performed on each wafer at $+25^\circ\text{C}$ and $+75^\circ\text{C}$ in accordance with VISHAY SFERNICE specification CM-SF-00210.

2) Extension of Ohmic Value Range.

2.1 In Paragraph 1.4.2 Component Type Variants and Range of Components

Replace "50" in Resistance Range R_n Min by "10" for variants 01 to 08

2.2 In Paragraph 1.4.2 Note 3

Modify the table to include Available tolerances for the new ohmic value range (10R to 49.9R) :

$10 \leq R_n < 50$ 0.1%

3) Editorial Changes.

In the title, change PFR by PFRR

3.1 In Paragraph 1.4.1 The ESCC Component Number

Modify the "Example : 4001023..." by :

a) For PHR variants (01 to 08)

Example: 4001023012490P1

with all details...

b) For PFRR variants (09 to 12)

Example : 400102309R2490W1

with all details...

Details For DCR 100104
(new inputs in blue)

1) Add new Temperature Coefficient Code.

1.1 In Paragraph 1.4.1.1 (c)

Add Code 9 for TC $\pm 5\text{ppm}/^\circ\text{C}$ between -55°C and $+155^\circ\text{C}$

Temperature Coefficient ($\pm 10^{-6}/^\circ\text{C}$)	Code
5 (Note 1)	0
10	1
25	2
5 (Note 2)	9

Add NOTES.

NOTES:

- Code 0 => Temperature Coefficient $\pm 5 \times 10^{-6}/^\circ\text{C}$ over $T_{\text{amb}} = +22^\circ\text{C}$ to $+70^\circ\text{C}$
- Code 9 => Temperature Coefficient $\pm 5 \times 10^{-6}/^\circ\text{C}$ over $T_{\text{amb}} = -55^\circ\text{C}$ to $+155^\circ\text{C}$

1.2 In Paragraph 1.4.2 Component Type Variants and Range of Components

Replace Note 4 by :

- The temperature ranges applicable to the temperature coefficients are as follows.
 - $\pm 5 \times 10^{-6}/^\circ\text{C}$ over $T_{\text{amb}} = +22^\circ\text{C}$ to $+70^\circ\text{C}$, together with $\pm 10 \times 10^{-6}/^\circ\text{C}$ over $T_{\text{amb}} = -55^\circ\text{C}$ to $+155^\circ\text{C}$.
 - $\pm 10 \times 10^{-6}/^\circ\text{C}$ over $T_{\text{amb}} = -55^\circ\text{C}$ to $+155^\circ\text{C}$.
 - $\pm 25 \times 10^{-6}/^\circ\text{C}$ over $T_{\text{amb}} = -55^\circ\text{C}$ to $+155^\circ\text{C}$.

4. The temperature ranges applicable to the temperature coefficients are as follows.

TC ($\pm 10^{-6}/^\circ\text{C}$)	Temperature Range	Ohmic Values (Ω)
5	$T_{\text{amb}} +22^\circ\text{C}$ to $+70^\circ\text{C}$	$R_n \geq 50$
5	$T_{\text{amb}} -55^\circ\text{C}$ to $+155^\circ\text{C}$	$R_n \geq 50$
10	$T_{\text{amb}} -55^\circ\text{C}$ to $+155^\circ\text{C}$	$R_n \geq 20$
25	$T_{\text{amb}} -55^\circ\text{C}$ to $+155^\circ\text{C}$	$R_n \geq 10$

1.3 In Paragraph 2.6.2 High and Low Temperature Electrical Measurements

Replace in the table the value in Limits (Min & Max) for TC = $\pm 5 \times 10^{-6}/^\circ\text{C}$ by :

Resistance Change between $-55 (+3 -0)^\circ\text{C}$ and $+22 \pm 3^\circ\text{C}$ => Limits = ± 0.04 (instead of ± 0.08)

Resistance Change between $+155 (+0 -3)^\circ\text{C}$ and $+22 \pm 3^\circ\text{C}$ => Limits = ± 0.068 (instead of ± 0.136)

Characteristics	Symbols	ESCC 4001 Test Method and Conditions	Limits		Unit
			Min	Max	
Resistance Change between $-55 (+3 -0)^\circ\text{C}$ and $+22 \pm 3^\circ\text{C}$	$\Delta R_A/R_A$	Para. 8.3.1.1 TC = $\pm 5 \times 10^{-6}/^\circ\text{C}$ TC = $\pm 10 \times 10^{-6}/^\circ\text{C}$ TC = $\pm 25 \times 10^{-6}/^\circ\text{C}$	-0.04 -0.08 -0.2	+0.04 +0.08 +0.2	%
Resistance Change between $+155 (+0 -3)^\circ\text{C}$ and $+22 \pm 3^\circ\text{C}$	$\Delta R_A/R_A$	Para. 8.3.1.1 TC = $\pm 5 \times 10^{-6}/^\circ\text{C}$ TC = $\pm 10 \times 10^{-6}/^\circ\text{C}$ TC = $\pm 25 \times 10^{-6}/^\circ\text{C}$	-0.068 -0.136 -0.34	+0.068 +0.136 +0.34	%
Resistance Change between $+70 (+0 -3)^\circ\text{C}$ and $+22 \pm 3^\circ\text{C}$	$\Delta R_A/R_A$	Para. 8.3.1.1 TC = $\pm 5 \times 10^{-6}/^\circ\text{C}$	-0.026	+0.026	%

1.4 In APPENDIX A High and Low Temperatures Electrical Measurements

Replace the sentence "All tests at high and low ..." by :

Tests at high and low temperatures are done before the Burn-in step only for the Temperature Coefficient $\pm 5 \times 10^{-6}/^{\circ}\text{C}$ over $T_{\text{amb}} = -55^{\circ}\text{C}$ to $+155^{\circ}\text{C}$. (Code 9)

All other tests at high and low temperatures are guaranteed but not tested based on temperature coefficient measurements performed on each wafer at $+25^{\circ}\text{C}$ and $+75^{\circ}\text{C}$ in accordance with VISHAY SFERNICE specification CM-SF-00210.

2) Extension of Ohmic Value Range.

2.1 In Paragraph 1.4.2 Component Type Variants and Range of Components

Replace "50" in Resistance Range R_n Min by "10" for variants 01 to 08

2.2 In Paragraph 1.4.2 Note 3

Modify the table to include available tolerances for the new ohmic value range (10Ω to 49.9Ω) :

Resistance R_n (Ω)	Variant Number	Available Tolerance (\pm %)	Available Resistance Values
$R_n < 50$	01 to 08	0.1	Any value in the resistance range to 3 significant figures
$50 \leq R_n < 100$	01 to 08	0.05 and 0.1	
$100 \leq R_n < 250$	01 to 08	0.02, 0.05, 0.1	
	09 to 12	0.05, 0.1	
$R_n \geq 250$	01 to 08	0.01, 0.02, 0.05, 0.1	
	09 to 12	0.05, 0.1	

3) Editorial Changes.

2.3 In Paragraph 1.4.1 The ESCC Component Number

Modify the "Example : 4001023..." by :

Example: 400102301R2490P1

- Detail Specification Reference: 4001023
- Component Type Variant Number: 01 (as required)
- Failure Rate Level Letter: R (as applicable; see Note 1)
- Characteristic code: Resistance Value (249Ω): 2490 (as required)
- Characteristic code: Resistance Tolerance ($\pm 0.02\%$): P (as required)
- Characteristic code: Temperature Coefficient ($\pm 10 \times 10^{-6}/^{\circ}\text{C}$): 1 (as required)

a) For PHR variants (01 to 08)

Example: 4001023012490P1

with all details...

b) For PFRR variants (09 to 12)

Example : 400102309R2490W1

with all details...