



VISHAY INTERTECHNOLOGY, INC.

# INTERACTIVE

## data book

---

### THIN FILM PRODUCTS

VISHAY SFERNICE

---

VSE-DB0096-0711

Notes:

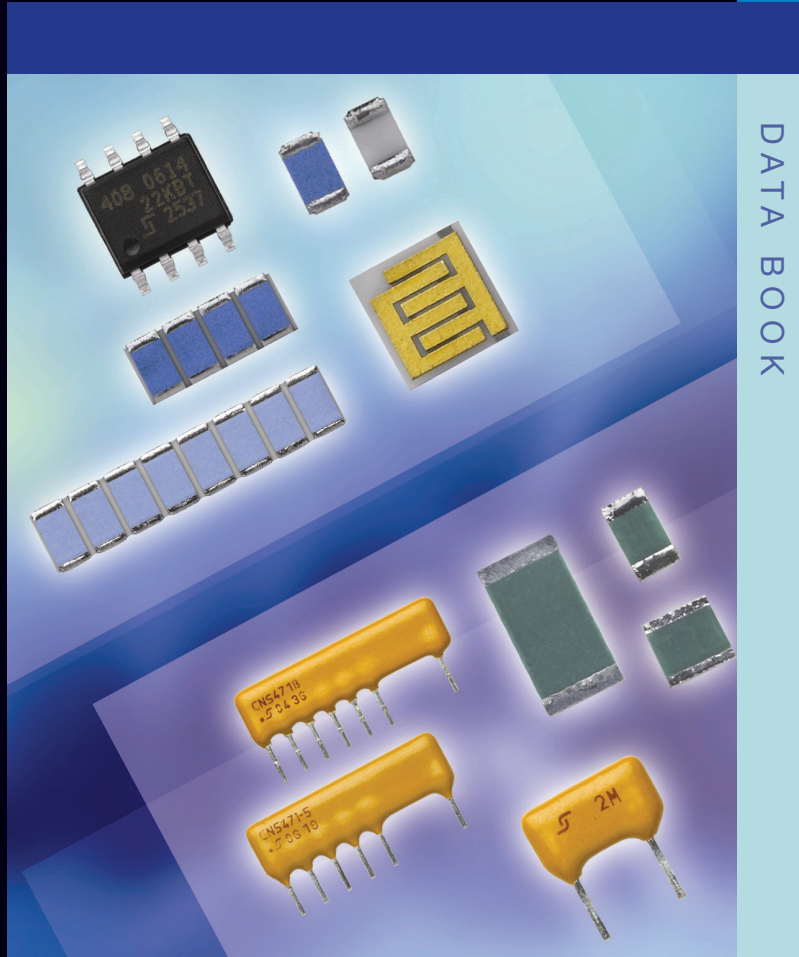
1. To navigate:
  - a) Click on the Vishay logo on any datasheet to go to the Contents page for that section. Click on the Vishay logo on any Contents page to go to the main Table of Contents page.
  - b) Click on the products within the Table of Contents to go directly to the datasheet.
  - c) Use the scroll or page up/page down functions.
  - d) Use the Adobe® Acrobat® page function in the browser bar.
2. To search the text of the catalog use the Adobe® Acrobat® search function.



One of the World's Largest Manufacturers of  
**Discrete Semiconductors and Passive Components**



VISHAY INTERTECHNOLOGY, INC.



DATA BOOK

## THIN FILM PRODUCTS

VISHAY SFERNICE

High Precision Resistors and Networks

## SEMICONDUCTORS

### RECTIFIERS

- Schottky (single, dual)
- Standard, Fast, and Ultra-Fast Recovery (single, dual)
- Bridge
- Superrectifier®
- Sinterglass Avalanche Diodes

### HIGH-POWER DIODES AND THYRISTORS

- High-Power Fast-Recovery Diodes
- Phase-Control Thyristors
- Fast Thyristors

### SMALL-SIGNAL DIODES

- Schottky and Switching (single, dual)
- Tuner/Capacitance (single, dual)
- Bandswitching
- PIN

### ZENER AND SUPPRESSOR DIODES

- Zener (single, dual)
- TVS (TRANSZORB®, Automotive, ESD, Arrays)

### FETs

- Low-Voltage TrenchFET® Power MOSFETs
- High-Voltage TrenchFET® Power MOSFETs
- High-Voltage Planar MOSFETs
- JFETs

### RF TRANSISTORS

- Bipolar Transistors (AF and RF)
- Dual Gate MOSFETs
- MOSMICs®

### OPTOELECTRONICS

- IR Emitters and Detectors, and IR Receiver Modules
- Optocouplers and Solid-State Relays
- Optical Sensors
- LEDs and 7-Segment Displays
- Infrared Data Transceiver Modules
- Custom Products

### ICs

- Power ICs
- Analog Switches
- RF Transceivers and Receiver Modules
- ICs for Optoelectronics

### MODULES AND ASSEMBLIES

- Automotive Modules and Assemblies
- Power Modules (contain power diodes, thyristors, MOSFETs, IGBTs)
- DC/DC Converters

## PASSIVE COMPONENTS

### RESISTIVE PRODUCTS

- Foil Resistors
- Film Resistors
  - Metal Film Resistors
  - Thin Film Resistors
  - Thick Film Resistors
  - Metal Oxide Film Resistors
  - Carbon Film Resistors
- Wirewound Resistors
- Power Metal Strip® Resistors
- Chip Fuses
- Variable Resistors
  - Cermet Variable Resistors
  - Wirewound Variable Resistors
  - Conductive Plastic Variable Resistors
- Networks/Arrays
- Non-Linear Resistors
  - NTC Thermistors
  - PTC Thermistors
  - Varistors

### MAGNETICS

- Inductors
- Transformers

### CAPACITORS

- Tantalum Capacitors
  - Molded Chip Tantalum Capacitors
  - Coated Chip Tantalum Capacitors
  - Solid Through-Hole Tantalum Capacitors
  - Wet Tantalum Capacitors
- Ceramic Capacitors
  - Multilayer Chip Capacitors
  - Disc Capacitors
- Film Capacitors
- Power Capacitors
- Heavy-Current Capacitors
- Aluminum Capacitors
- Silicon RF Capacitors

### STRAIN GAGE TRANSDUCERS AND STRESS ANALYSIS SYSTEMS

- PhotoStress®
- Strain Gages
- Load Cells
- Force Transducers
- Instruments
- Weighing Systems
- Specialized Strain Gage Systems

# Thin Film Products

## Vishay Sfernice

**Vishay S.A.**

199, bd de la Madeleine

B.P. 1159

06003 Nice Cedex 1

France

**Phone:** +33 4 93 37 27 27

**Fax:** +33 4 93 37 27 26

**[www.vishay.com](http://www.vishay.com)**

### **NOTICE**

Specifications of the products displayed herein are subject to change without notice. Vishay Intertechnology, Inc., or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Vishay's terms and conditions of sale for such products, Vishay assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of Vishay products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Vishay for any damages resulting from such improper use or sale.



## Thin Film Products

General Information .....	2
Summary Table.....	15
Selector Guide: Resistors .....	16
Selector Guide: Networks .....	19
<b>HYBRID (Bare Chips and Networks)</b>	
CS 22 .....	22
CS 33 .....	24
RMK 22N .....	26
RMK 33N .....	28
RMK 408N, 508N, 48N, 816N, 914N ( <i>CN</i> ) .....	30
RMK 55N, 515N .....	32
RSK 22N .....	34
RSK 33N .....	36
SA, SB, SC .....	38
TA 22 .....	40
TA 33 .....	42
<b>WRAPAROUND (Chips and Networks)</b>	
CH .....	46
CHP, HCHP .....	54
L .....	57
P .....	60
PHR .....	63
PRA 100, 135, 182 ( <i>CNW</i> ) .....	66
RV .....	69
TFS-W (Wraparound and Single-In-Line) .....	72
EPIC .....	74
CHP HR .....	76
PRA HR .....	77
<b>MOLDED (Networks)</b>	
RMKMS ( <i>CNM</i> ) .....	80
<b>SINGLE-IN-LINE (Resistor and Network)</b>	
CNS 020, CNS 021 .....	84
CNS 471 .....	86
TAS ( <i>CNS</i> ) .....	88
TFS-S (Wraparound and Single-In-Line) .....	72
<b>HERMETIC (Networks)</b>	
RMKD ( <i>CNP</i> ) .....	94
SLCC .....	97

**Note**

- Part number in italic and brackets is a custom part number.

## Thin Film Products

In modern precision electronics the resistive technologies has to evolve for the following reasons:

- SMD is a must
- Higher level of thermal and load stability are needed
- Reduction of lead pitch pushed by integration
- Monolithic level of reliability is mandatory
- Networks should be preferred to discrete

Among the different available resistor technologies on the market thin film technology appears to be the right substitute for other resistive technologies due to the evolution of the electronics.

### THIN FILM TECHNOLOGY

A microscopically thin layer of material that is deposited onto a metal, ceramic or semiconductor base. Typically less than one micron thick, thin films can be resistive, conductive or dielectric (non-conductive).

Various methods of deposition:

- Evaporation
- Sputtering
- Reactive plasma process
- Chemical vapor deposition
- Plasma enhanced CVD

### Sputtering

A popular method for adhering thin films onto a substrate. Sputtering is done by bombarding a target material with a ionized gas (typically argon) which releases atoms in the target that coats the nearby substrate. It all takes place inside a vacuum chamber under low pressure.

The choices of Vishay/Sfernice are:

### Substrates:

- Silicon for high level of integration
- Alumina for high voltage and general purposes

### Resistive layers:

#### Nickel Chromium:

for best stability and tight performances:  
tolerance down to 0.01 %,  
temperature coefficient to 10 ppm/°C (- 55 °C; + 155 °C)  
and 5 ppm/°C (- 25 °C; + 85 °C)

**Tantalum Nitride:** for general purposes

**Chromium Silicium:** for high ohmic

### ADVANTAGES OF THIN FILM INTEGRATED CONSTRUCTIONS

- Extremely close matching of all elements in a network, insuring close tracking over temperature and through-out life.
- Very small, high density, multi-element networks which save printed circuit board real estate.
- Hermetic construction practical in a variety of standard contemporary formats.
- Repeatable and consistent characteristics part-to-part and lot-to-lot.
- Very low inductance
- Outstanding reliability, fewer man-made interconnections
- No thermoelectric effects
- Installed costs no more than discrete, often less.
- Stability tracking outstanding: all resistors in the thin film network tend to have similar changes during life and resistance ratios change far less than absolute values.

### QUALIFICATIONS

Vishay/Sfernice manufacture products dedicated to military and space markets. Vishay Sfernice is against deregulation and hence the qualification by external approval authorities.

So different level of qualification are proposed to customers:

**CECC:** Vishay/Sfernice thin film chip resistors are qualified to CECC 40401-010

**ESCC:** Vishay Sfernice offers various products qualified or in accordance to:  
Generic specification ESCC 4001  
Detailed specifications: ESCC 4001/023, ESCC 4001/025 and ESCC 4001/026

**ESCC with Failure rate:** ESCC 4001/023 (variants 09 to 12): R failure rate achieved.

**ESCC QML:** Vishay/Sfernice is the first manufacturer of passive components to work on the notion of ESCC QML along with the CNES and the ESA. ESCC QML qualification foreseen before end of 2007.



TECHNICAL INFORMATION

AQL (Acceptable Quality Level): The maximum percent defective (or maximum number of defect per hundred units) that, for the purpose of sampling inspection, can be considered satisfactory as process average. Defects may be major and minor, according to definition, and may have different AQLs.

Batch Number (Date Code): In the Vishay glossary a batch number is a combination of the date and the production country in the format YYYYWWFR where Y = year, W = week and FR means: France which is the place where parts have been manufactured. This Batch Number as well called Date Code represents the Date of Inspection of the finished parts. It is not intended for traceability. For traceability, please refer to Lot Number.

Burn-In: Stabilization of a resistor by applying a specified power during a specified period of time. ESCC high reliability qualified resistors are undergoing 100 % Burn-In at end of production process.

Current Noise: An AC component of voltage appearing across a resistor when a direct current is passed through it. Usually expressed in RMS microvolts (µV) per volt applied to the resistor, it may also be expressed in noise index figures of - dB. Typically a Vishay/Sfernice thin film has a level of noise of - 35 dB.

Date Code: See Batch Number.

Derating: The intentional restriction of power application (Pd) below the manufacturers stated power rating (Pn). Derated power will improve stability of resistor.

Dielectric Withstanding Voltage (DWV): As applied to resistors, this is the maximum voltage, between leads tied together and the external case, that can be withstood without

breakdown (arc-over) or other harm to the device. It is normally specified in DC volts for a specified period of time and with some margin of safety.

Electrostatic Discharge (ESD): The application of a high voltage and low current to a device as a result of its coming in contact with or in proximity to a charged object. In very dry climates, charges build up on any moving object including people. These charges pass to any object or electrical ground when the charged body comes into proximity with the uncharged body. Thus the device is said to be ESD sensitive if this passage of charge in any way does harm to the device.

Thin Film resistors are considered as Non ESD sensitive.

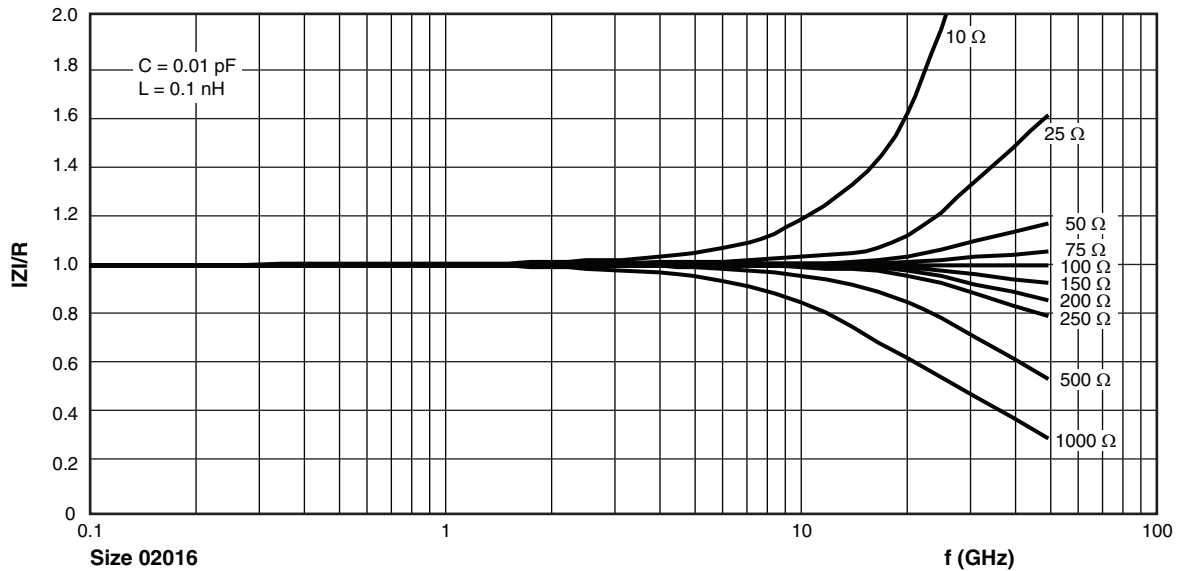
Established Reliability (ER): The demonstrated ability of an item to perform a required function under stated conditions for a stated period of time. This is so called: Failure rate. Qualification and Maintenance testing over and extended period of time demonstrate failure rates such a 0.01 % failures per 1000 hours of testing. This equates to a MTBF of 10 million hours.

Vishay/Sfernice offers an ESCC qualified chip resistor with established reliability variant: R failure rate is achieved (0.01 % per 1000 hours).

Frequency Response: The ability of a resistor to faithfully replicate a signal at specified frequency. In an AC circuit the voltage drop and the current passed are a function of not just the DC resistance but also the reactance at specified frequency. Vishay/Sfernice offers chips wraparound resistors intended for application at frequency up to 20 GHz: the CH series and HCHP series.

Impedance: The vector sum of the resistance and inductive and capacitive reactances of a circuit or a device.

CH INTERNAL IMPEDANCE CURVE

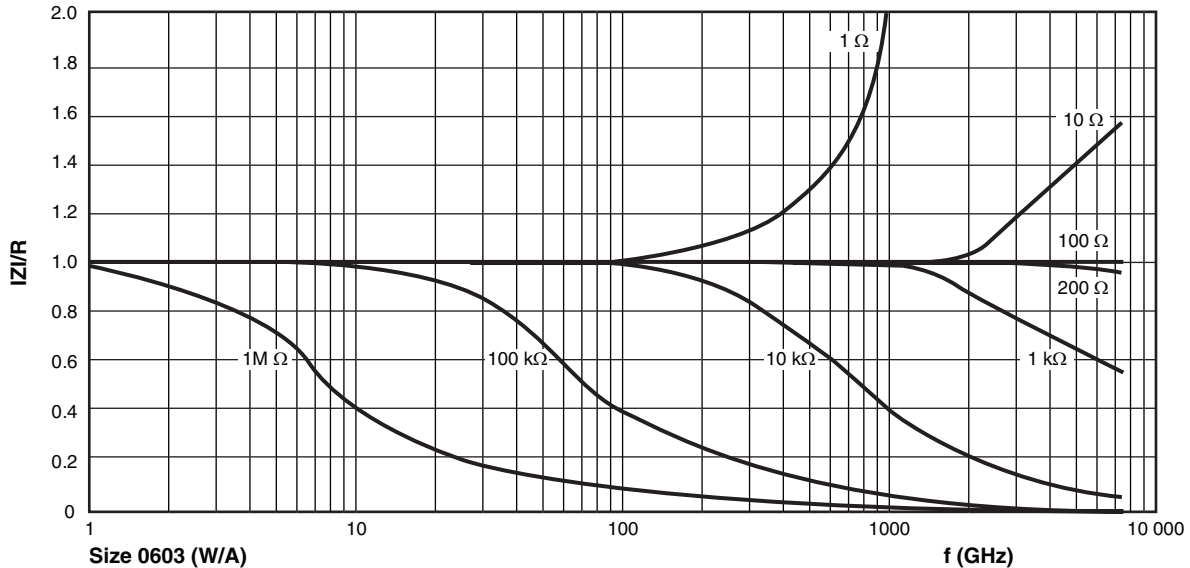


Impedance as a function of frequency for an 02016 Flip Chip resistor





## HCHP INTERNAL IMPEDANCE CURVE



**Load Life Stability:** The measured change in resistance resulting from the application of specified power at specified temperature for a specified time interval. Commonly used time intervals are 1000, 2000 and 10 000 hours and commonly used temperatures are 70 °C, 85 °C and 125 °C. This is expressed in ppm.

Within the thin film technologies, Vishay/Sfernice Ultrafilm offers the most stable devices. Load life stability as low as 500 ppm can be expected under Pd after 2000 hours at 70 °C.

**Lot Number:** Represent the Front End reference of a lot of items which have been produced at the same time under the same conditions.

**Match or Matching:** Two or more resistors grouped into narrower limits within the total tolerance span.

PRA series of Vishay/Sfernice offers tolerance matching down to 0.01 %

**Maximum Working Voltage:** The highest voltage that may be applied (usually continuously) over a long period of time without causing the component to fail or shift outside allowable limits. The voltage may be further limited in lower values by the power rating which must not be exceeded. The value of the resistor for which both power rating and voltage are at the upper limit is called: Critical Resistor (Rc).

**Parts Per Million:** (Conversion of % to ppm)

%	ppm
0.0005	5
0.001	10
0.0025	25
0.005	50
0.01	100
0.02	200
0.025	250
0.05	500
0.1	1000
1.0	10 000

**Operating Temperature Range:** The lowest to the highest ambient temperature range within which a device is expected to operate and remain within the prescribed limits.

Vishay/Sfernice offers options of operation up to 200 °C (please consult).

**Percent Defective Allowed (PDA):** The limiting number of defects in one inspection lot that will permit acceptance of the lot. Tightened inspection may be permitted with a larger PDA and additional samples in the inspection plan.

**Power Rating:** The maximum power that can be applied, under specified conditions of environment and duration, which will not produce a permanent change in excess of specified limits. Drift reduction is obtainable through derating and/or power conditioning. (see also derating).

**Qualified Product List:** A government of Agency listing of products and suppliers currently qualified to a military or space specification.

Vishay/Sfernice offers various qualified products such as PHR, CHP HR and PRA HR. Those products are either in the QPL or in the EPPL (European Preferred Part List) of the ESA (European Space Agency).

**Resistance Range:** The spectrum of resistance values that can be manufactured within a particular product style and still comply with a common set of specifications.

Vishay/Sfernice offers extended resistance range up to 50 MΩ in the P chip wraparound family with performances as tight as 0.25 % and 50 ppm/°C.

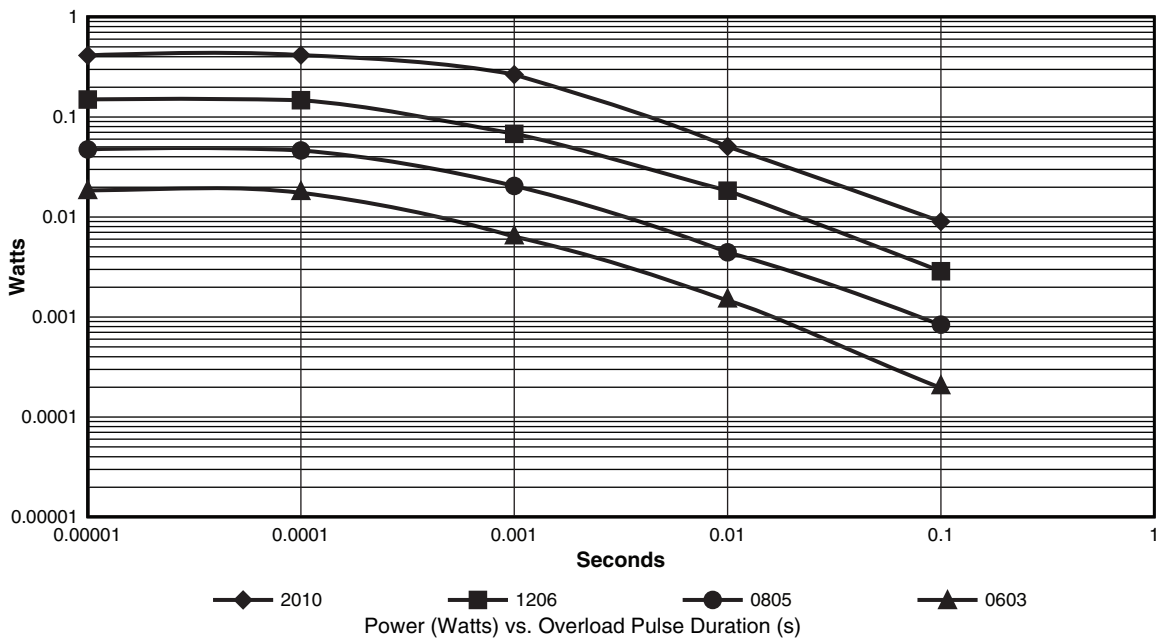
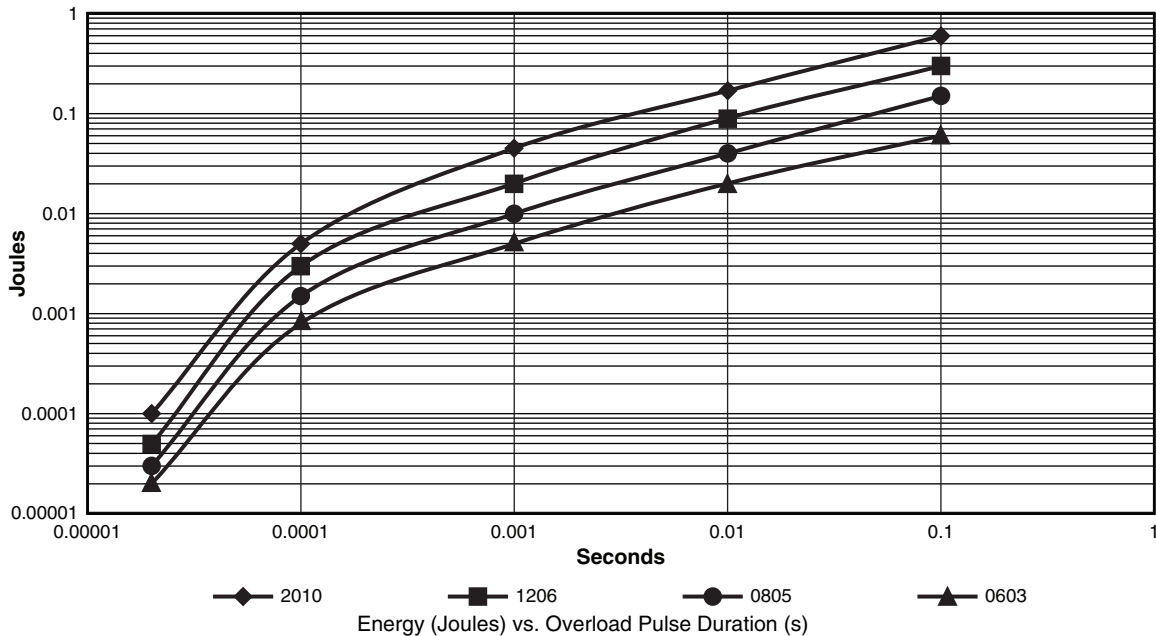
**Self Heating:** The heat generated within the resistive element caused by the application of voltage. Self heating raises the device temperature above the ambient temperature and the internal hot spot temperature is kept within safe limits by adherence to the power rating and derating curves.

**Shelf Life Stability:** The change in resistance value when an item is stored under standard conditions, such as + 25 °C, ± 15 °C and 10 % to 75 % Relative Humidity for a stated period of time.



**Short Time Overload:** The application of a specified extra power for a short period of time. Usually used as a screen test or a qualifying test.

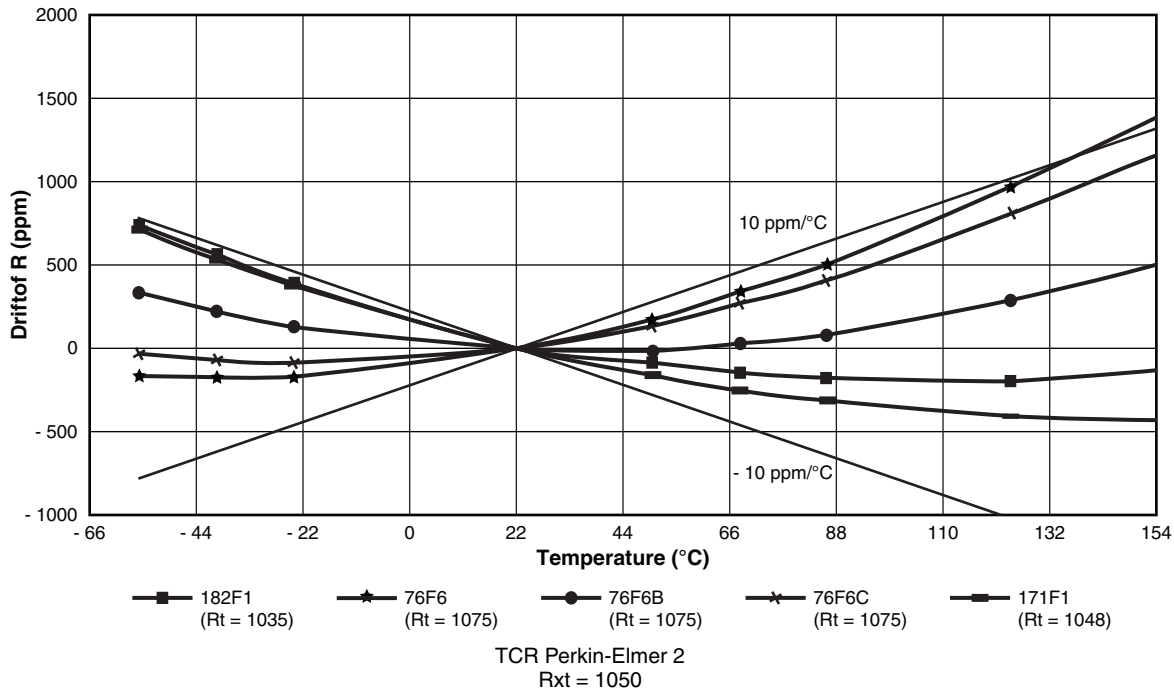
ESCC high reliability qualified resistors are undergoing 100 % Overload at end of production process.



**Source Control Drawing (SCD):** A user generated specification usually in the absence of a military or space specification but embracing much of the discipline of a military or space specification. May require non-standard parts approval before proceeding.

**Temperature Coefficient of Resistance (TCR):** This coefficient relates the change in resistance to any change in temperature. TCR is generally expressed as parts per million, per °C (ppm/°C).

Vishay/Sfernice offers the best possible TCR affordable with thin film technology: 10 ppm/°C (- 55 °C; + 155 °C) and 5 ppm/°C (- 25 °C; + 85 °C).



**Tolerance:** The permissible resistance deviation from nominal expressed in percent (e.g. 0.01 %) at end of production of a resistor.

**Tracking:** Two or more resistors exhibiting similar responses to temperature within specified limits. Vishay/Sfernice offers in standard tracking down to 2 ppm/°C (- 55 °C; + 155 °C) in its PRA series within 2 to 8 resistors (same or unlike values).

**Typical:** A designers reference which represents that 85 % of the units supplied, over a long period of time, will be at least the figure shown or better.

**Voltage Coefficient:** This coefficient relates the anticipated change in resistance to any change in voltage. Vishay/Sfernice thin film voltage coefficient is < 0.1 ppm/V.

## SOLDERING RECOMMENDATIONS/ROHS

Vishay/Sfernice thin film are available in RoHS version.

RoHS certificates are available upon request. Different termination material have been chosen depending of the product series:

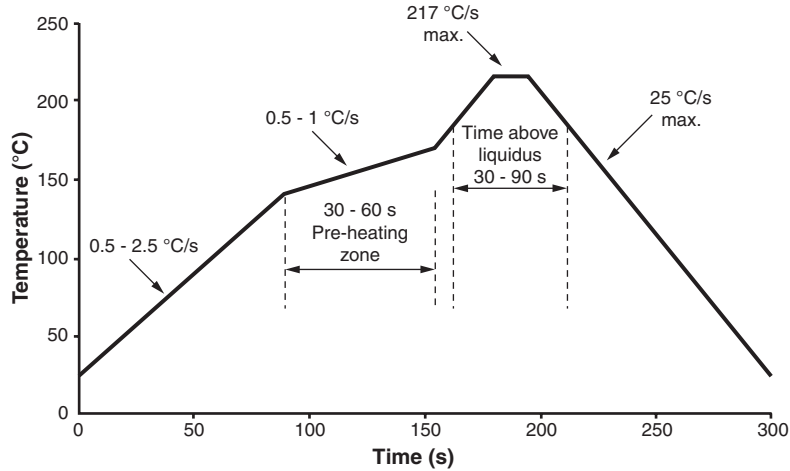
TAS, CNS, TFS-S	SnAg (96.5/3.5)
RMKMS, CNM	100 % Sn
TA, CS, RMK, SA, SB, SC, RSK, CN	No lead
RMKD, CNP	Gold over Nickel
P, RV, CH, CHP, PRA, TFS-W, CNW	SnAg (96.5/3.5)

For Wraparound chip resistors and network, Vishay/Sfernice will carry on offering tin/lead to customer justifying of an exemption to RoHS (military, space applications...)

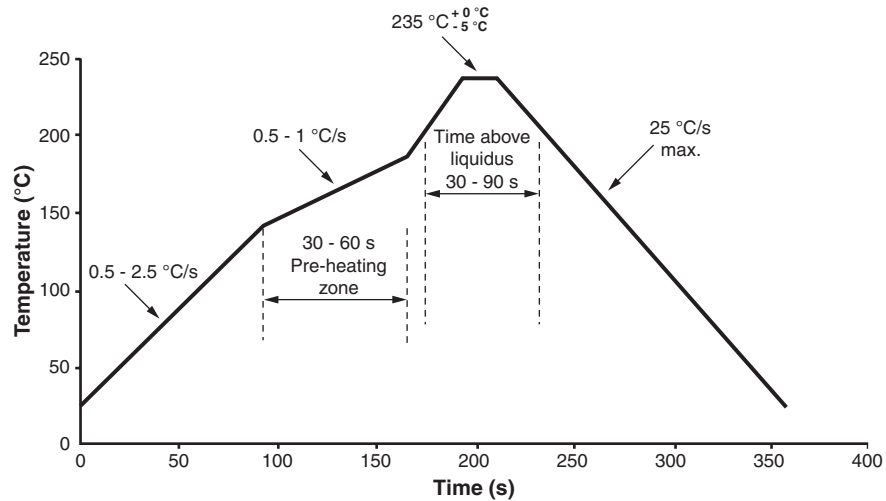


**RECOMMENDED REFLOW PROFILES**

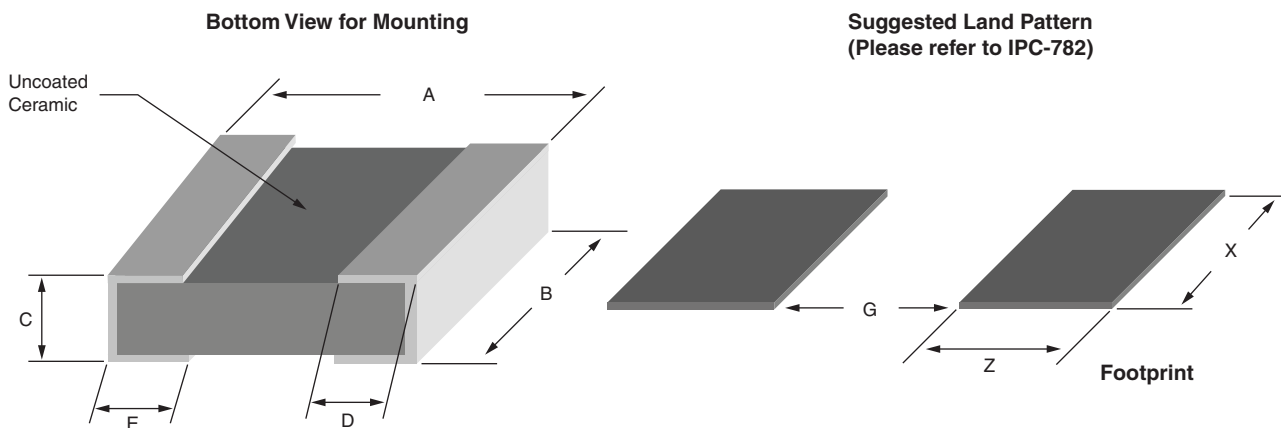
**RECOMMENDED SOLDERING PROFILE**



**RECOMMENDED LEAD (Pb-)FREE SOLDERING PROFILE**

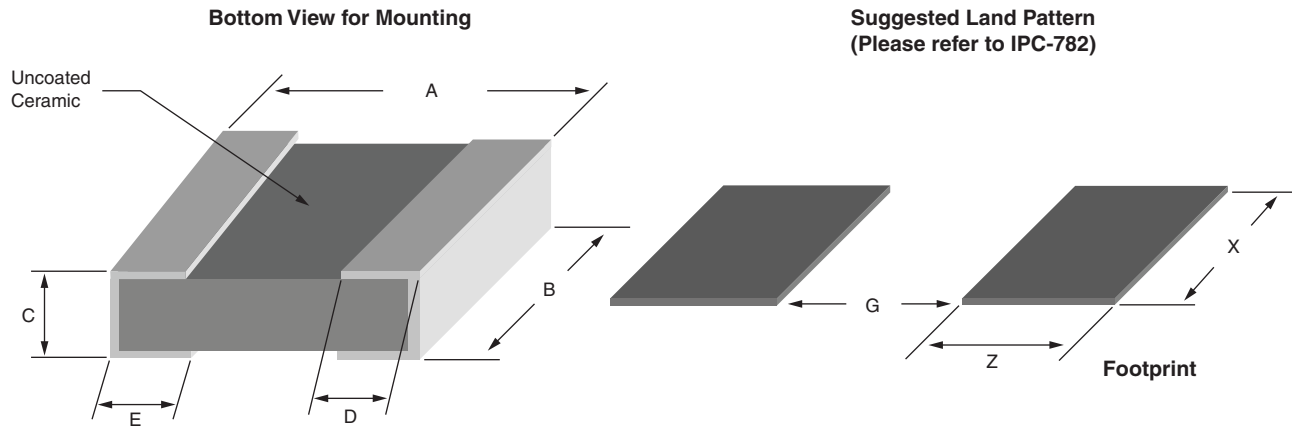


## DIMENSIONS AND LAND PATTERN FOR P in millimeters [inches]



CASE SIZE	DIMENSIONS				CHIP SIZE	DIMENSIONS		
	A	B	C	D/E		Z	X	G
	MAX. TOL. + 0.152 [+ 0.006] MIN. TOL. - 0.152 [- 0.006]	MAX. TOL. + 0.127 [+ 0.005] MIN. TOL. - 0.127 [- 0.005]	MAX. TOL. + 0.127 [+ 0.005] MIN. TOL. - 0.127 [- 0.005]	MAX. TOL. + 0.13 [+ 0.005] MIN. TOL. - 0.13 [- 0.005]				
0402	1.00 [0.040]	0.6 [0.023]	0.5 [0.02]	0.38 [0.015]	0402	0.5	0.650	0.4
0505	1.27 [0.050]	1.27 [0.050]	0.5 [0.02]	0.38 [0.015]	0505	0.6	1.320	0.510
0603	1.52 [0.080]	0.85 [0.033]	0.5 [0.02]	0.38 [0.015]	0603	0.6	0.9	0.760
0705 0805	1.91 [0.075]	1.27 [0.050]	0.5 [0.02]	0.38 [0.015]	0705 0805	0.7	1.3	1.14
1005	2.54 [0.100]	1.27 [0.050]	0.5 [0.02]	0.38 [0.015]	1005	0.7	1.3	1.780
1206	3.06 [0.120]	1.60 [0.063]	0.5 [0.02]	0.38 [0.015]	1206	0.9	1.7	2.1
1505	3.81 [0.150]	1.32 [0.054]	0.5 [0.02]	0.38 [0.015]	1505	0.9	1.42	2.750
2010	5.08 [0.200]	2.54 [0.100]	0.5 [0.02]	0.38 [0.015]	2010	1	2.6	3.9

**DIMENSIONS AND LAND PATTERN FOR CHP** in millimeters [inches]



CASE SIZE	DIMENSIONS				CHIP SIZE	DIMENSIONS		
	A	B	C	D/E		Z	X	G
	MAX. TOL. + 0.152 [+ 0.006] MIN. TOL. - 0.152 [- 0.006]	MAX. TOL. + 0.127 [+ 0.005] MIN. TOL. - 0.127 [- 0.005]	MAX. TOL. + 0.127 [+ 0.005] MIN. TOL. - 0.127 [- 0.005]	MAX. TOL. + 0.13 [+ 0.005] MIN. TOL. - 0.13 [- 0.005]				
0502	1.27 [0.05]	0.6 [0.023]	0.5 [0.02]	0.38 [0.015]	0502	0.6	0.650	0.510
0505	1.27 [0.05]	1.27 [0.050]	0.5 [0.02]	0.38 [0.015]	0505	0.6	1.320	0.510
0603	1.52 [0.080]	0.85 [0.033]	0.5 [0.02]	0.38 [0.015]	0603	0.6	0.9	0.760
0705 0805	1.91 [0.075]	1.27 [0.050]	0.5 [0.02]	0.38 [0.015]	0705 0805	0.7	1.3	1.14
1005	2.54 [0.100]	1.27 [0.050]	0.5 [0.02]	0.38 [0.015]	1005	0.7	1.3	1.780
1206	3.05 [0.120]	1.60 [0.063]	0.5 [0.02]	0.38 [0.015]	1206	0.9	1.7	2
1505	3.81 [0.150]	1.32 [0.054]	0.5 [0.02]	0.38 [0.015]	1505	0.9	1.42	2.750
2010	5.08 [0.200]	2.54 [0.100]	0.5 [0.02]	0.38 [0.015]	2010	1	2.6	3.9
1020	2.54 [0.100]	5.08 [0.200]	0.5 [0.02]	0.38 [0.015]	1020	0.7	5.11	1.78
2208	5.58 [0.22]	1.91 [0.075]	0.5 [0.02]	0.38 [0.015]	2208	1	2.01	4.4
2512	6.35 [0.250]	3.06 [0.02]	0.5 [0.02]	0.38 [0.015]	2512	1	3.2	5.2
1010	2.54 [0.100]	2.54 [0.100]	0.5 [0.02]	0.38 [0.015]	1010	0.7	2.57	1.780



## STANDARD PACKAGING

<b>HYBRIDS: WAFFLE PACK</b>					
<b>SIZE H20:</b> 50.8 x 50.8 mm (2" x 2")					
BOX REFERENCE	DIM COMB <sup>(1)</sup> (mm)	MAX./BOX	SIZE OF PRODUCTS	COLOR <sup>(2)</sup>	PACKAGING PART NUMBER
H20-025-19	0.64 x 0.64 x 0.48	400		White	
H20-030-16	0.76 x 0.76 x 0.41	400	22	Black	85222057
H20-039	1.02 x 1.02 x 0.41	400	33	Black	85222047
H20-045	1.14 x 1.14 x 0.28	400		White	
H20-050 080	2.03 x 1.27 x 0.61	221	22T	Black	
H20-060-24	1.52 x 1.52 x 0.61	400	0402, 0505	White	
			44 and 55	Black	85202007
H20-060 090	2.34 x 1.57 x 0.61	100	0603	White	85203107
			33P	Black	
H20-065 125	3.18 x 1.65 x 0.64	170	22Q, 33T	Black	
H20-095-24	2.41 x 2.41 x 0.61	100	0805, SA, puce 0603	White	85202407
H20-099 144	3.68 x 2.54 x 0.81	140	1206	White	85202307
H20-101 146	3.68 x 2.54 x 0.71		408, 508, 714, 816, 914	Black	
H20-110-24	2.79 x 2.79 x 0.61	100	48	<b>Green</b> (1405)	
H20-125 230	5.84 x 3.18 x 0.89	60	2010	White	85202207
			515	Black	
H20-405	3.3 x 3.3 x 0.89	100	SB, SLCC 16	White	
H20-130 300	7.62 x 3.3 x 0.76	50		White	
H20-140 250	6.35 x 3.56 x 0.46	54		<b>White</b> (1412)	
H20-148 848	21.64 x 3.78 x 0.61	20		White	
H20-150 250	6.35 x 3.81 x 0.61	35		White	
H20-159 509	12.93 x 4.04 x 0.89	24		<b>Blue</b> (1403)	
H20-417	4.32 x 4.32 x 0.41	49	SLCC20	<b>White</b> (1412)	
H20-179 329	8.38 x 4.57 x 0.89	28		<b>Blue</b> (1403)	
H20-230	5.84 x 5.84 x 0.61	36		White	
H20-250 750	19 x 6.32 x 0.61	10		Black	
H20-256 420	10.67 x 6.5 x 1.42	15		White	
H20-258	6.55 x 6.55 x 0.81	25	SC, SLCC24	White	
H20-181 445	4.62 x 11.33 x 0.81	21		White	
<b>SIZE H44:</b> 101.6 x 101.6 mm (4" x 4")					
H44-715 900	18.16 x 22.86 x 3.3	12		White	
H44-500 100	12.7 x 25.4 x 3.94	15		White	
H44-100 150	25.4 x 38.1 x 3.3	6		White	
H44-106 269	26.97 x 68.28 x 1.02	3		White	



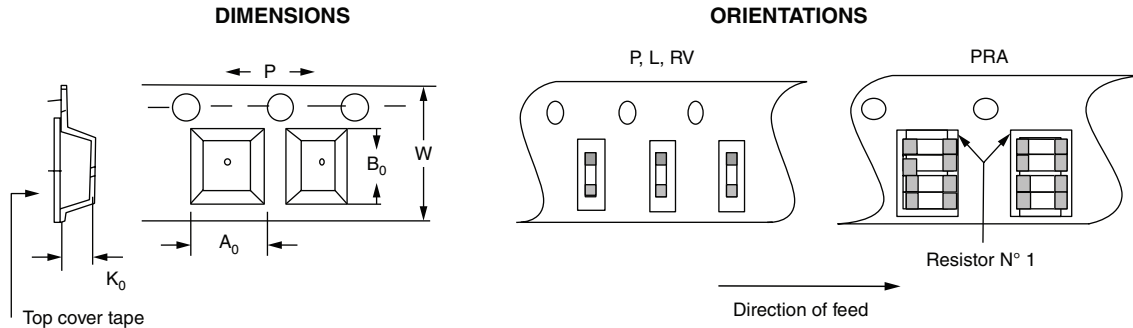
<b>WRAPAROUND: WAFFLE PACK</b> (as standard)				
<b>WHITE BOX:</b> (Ref 1415) <b>TAILLE H20:</b> 50.8 x 50.8 mm (2" x 2")				
TYPE P, PHR, L, RV, CHP		WAFFLEPACK		
TYPE	DIMENSIONS MAX. (mm)	BOX REFERENCE	MAX./BOX	DIM COMB <sup>(1)</sup> (mm)
0402	1.05 x 0.6 x 0.55	H20-060-24	400	1.52 x 1.52 x 0.61
0505	1.5 x 1.4 x 0.55	H20-060 090	100	2.34 x 1.57 x 0.61
0603	1.7 x 0.9 x 0.55			
0708	1.95 x 1.4 x 0.55	H20-095-24	100	2.41 x 2.41 x 0.61
0805				
1005	2.6 x 1.4 x 0.55	H20-110-24	140	2.79 x 2.79 x 0.61
1010	2.6 x 2.65 x 0.55			
1206	3.1 x 1.8 x 0.55	H20-099 144	140	3.68 x 2.54 x 0.81
1020	2.6 x 5.2 x 0.55	H20-125 230	60	5.84 x 3.18 x 0.89
1505	3.7 x 1.4 x 0.55			
2010	5.1 x 2.7 x 0.55			
2512	6.4 x 3.3 x 0.55	H20-130 300	50	7.62 x 3.3 x 0.76
TYPE PRA		WAFFLEPACK		
TYPE	DIMENSIONS MAX. (mm)	BOX REFERENCE	MAX./BOX	DIM COMB <sup>(1)</sup> (mm)
PRA100X2	1.7 x 2 x 0.55	H20-095-24	100	2.41 x 2.41 x 0.61
PRA100X3	1.7 x 3 x 0.55	H20-099 144	140	3.68 x 2.54 x 0.81
PRA100X4	1.7 x 4 x 0.55	H20-125 230	60	5.84 x 3.18 x 0.89
PRA100X5	1.7 x 5 x 0.55	H20-130 300	50	7.62 x 3.3 x 0.76
PRA100X6	1.7 x 6 x 0.55			
PRA100X7	1.7 x 7 x 0.55			
PRA100X8	1.7 x 8 x 0.55	H20-179 329	28 Blue	8.38 x 4.57 x 0.89
PRA135X2	2 x 2.7 x 0.55	H20-099 144	140	3.68 x 2.54 x 0.81
PRA135X3	2 x 4.1 x 0.55	H20-125 230	60	5.84 x 3.18 x 0.89
PRA135X4	2 x 5.4 x 0.55			
PRA135X5	2 x 6.8 x 0.55	H20-130 300	50	7.62 x 3.3 x 0.76
PRA135X6	2 x 8.1 x 0.55	H20-179 329	28 Blue	8.38 x 4.57 x 0.89
PRA135X7	2 x 9.5 x 0.55	H20-159 509	24 Blue	12.93 x 4.04 x 0.89
PRA135X8	2 x 10.8 x 0.55			
PRA182X2	3.1 x 3.7 x 0.55	H20-125 230	60	5.84 x 3.18 x 0.89
PRA182X3	3.1 x 5.5 x 0.55			
PRA182X4	3.1 x 7.3 x 0.55	H20-130 300	50	7.62 x 3.3 x 0.76
PRA182X5	3.1 x 9.1 x 0.55	H20-181 445	21	4.62 x 11.33 x 0.81
PRA182X6	3.1 x 11 x 0.55	H20-159 509	24 Blue	12.93 x 4.04 x 0.89
PRA182X7	3.1 x 12.8 x 0.55			
PRA182X8	3.1 x 14.6 x 0.55	H20-148 848	20	21.64 x 3.78 x 0.61

**Note:**

<sup>(1)</sup> Order of the dimensions X x Y x Z is given with side index on top right angle



## WRAPAROUND: TAPE AND REEL (option)



TYPE P, PHR, L, RV, CHP		TAPE INCREMENT		EMBOSSED TAPE	
TYPE	DIMENSIONS UPPER LIMITS	SIZE (P, W)	CAVITY SIZE (A <sub>0</sub> x B <sub>0</sub> x K <sub>0</sub> )	MAX. QTY PER REEL	TAPE REFERENCE
0402	0.6 x 1.05 x 0.55	4 mm, 8 mm	1.1 x 1.1 x 0.6	4000	08/339
0505	1.4 x 1.5 x 0.55		1.5 x 1.7 x 1.1		08/029
0603 NCS	0.76 x 1.52 x 0.55		1.15 x 1.9 x 0.85		08/100
0603	0.9 x 1.7 x 0.55		1.3 x 1.8 x 0.6		08/131
0705	1.4 x 1.95 x 0.55		1.5 x 2.3 x 0.9		08/247
0805					
1005	1.8 x 3.1 x 0.55		1.9 x 3.5 x 1.1		08/042
1206					
1505	1.4 x 3.7 x 0.55		2 x 3.8 x 0.9		08/015
2010 <sup>(1)</sup>	2.7 x 5.1 x 0.55	8 mm, 8 mm	5.45 x 2.75 x 1.27	1000	08/065
		4 mm, 12 mm	2.8 x 5.3 x 1	2000	12/352
2208		4 mm, 12 mm	3.3 x 5.85	2000	12/488
2512			3.5 x 6.7		12/116

**Note:**

<sup>(1)</sup> Tape size to be defined when ordering, 8 mm (A<sub>0</sub> > B<sub>0</sub>) or 12 mm (A<sub>0</sub> < B<sub>0</sub>) - For 8 mm x 8 mm: parts are rotated by 90°

TYPE PRA		TAPE INCREMENT		EMBOSSED TAPE	
TYPE	DIMENSIONS MAX.	SIZE (P, W)	CAVITY SIZE (A <sub>0</sub> x B <sub>0</sub> x K <sub>0</sub> )	MAX. QTY PER REEL	TAPE REFERENCE
PRA100x2	1.7 x 2 x 0.55	4 mm, 8 mm	1.9 x 2.2 x 1.1	4000	08/457
PRA100x3	1.7 x 3 x 0.55		2.1 x 3.1 x 0.45		08/264
PRA100x4	1.7 x 4 x 0.55	4 mm, 12 mm	1.9 x 4.2 x 1.1		12/458
PRA100x6	1.7 x 6 x 0.55		1.6 x 6.15 x 1.2		12/349
PRA135x2	2 x 2.7 x 0.55	4 mm, 8 mm	2.3 X 2.7 X 1.1		08/031
PRA135x4	2 x 5.4 x 0.55	4 mm, 12 mm	2.2 x 5.5 x 1.5		12/146
PRA182x2	3.1 x 3.7 x 0.55	4 mm, 8 mm	3.05 x 5.5 x 1.5		08/079
PRA182x3	3.1 x 5.5 x 0.55	4 mm, 12 mm	2.8 x 5.3 x 1		12/352
PRA182x4	3.1 x 7.3 x 0.55	4 mm, 16 mm	3.3 x 7.5 x 1.1		16/459
PRA182x5	3.1 x 9.1 x 0.55		3.3 x 9.3 x 1.1		16/460

**Note:**

Other tooling can be created



**SIL**

Blisters: for parts less than 4 terminals and height > 5 mm  
Tubes for all others

**HERMETIC NETWORKS**

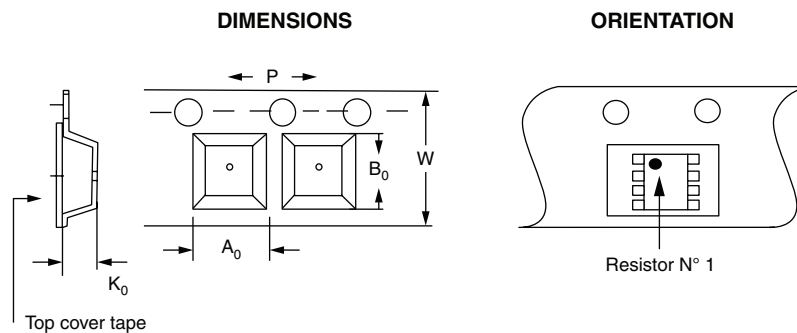
Tubes (standard)  
Tape and Reel (option): for SLCC only

**MOLDED NETWORKS**

Tubes (standard)  
Tape and Reel (option)

TYPE OF PACKAGING	PACK PART NUMBER	TYPE OF CASE	CAPACITY
Antistatic tubes	85202507	S/B 8	48
		S/B 14	27
		S/B 16	24
		S/B 20	19
	85217007	SO16 S/B	51
		LCC 24	52
85221007	LCC 20	63	
	LCC 16	73	
Card box		T0 5	30
		T0 18	20
Blister Antistatic foam	90148107	DIL Techno SIL	26
	01000117	FTFS S	100
		SIL h = 5 mm	40
		SIL = 2 sorties	100
		SIL = 3 sorties	80
		SIL = 4 sorties	80
Antistatic tubes	8522007	SIL = 5 sorties	42
		SIL = 6 sorties	36
		SIL = 7 sorties	31
		SIL = 8 sorties	27
		SIL = 9 sorties	24
		SIL = 10 sorties	22
		SIL = 11 sorties	20
		SIL = 12 sorties	18
		SIL = 13 sorties	17
		Antistatic tubes	85200207 (with ref. ASTRA)
SO 14	56		
SO 16	49		

## MOLDED NETWORKS: TAPE AND REEL (option)



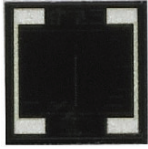





SO TYPE		EMBOSSED TAPE			
TYPE	DIMENSIONS	TAPE INCREMENT SIZE (P, W)	CAVITY SIZE (A <sub>0</sub> x B <sub>0</sub> x K <sub>0</sub> )	MAX. QTY PER REEL	TAPE REFERENCE
SO8	6 x 4.9 x 1.75	4/12 mm	6.8 x 5.6 x 1.9	1000 (Diam 178) 3000 (Diam 330)	12/087
SO14	6 x 8.7 x 1.75	4/16 mm	6.4 x 9 x 2.1		16/183
SOIC	6 x 10 x 1.75		6.5 x 10.3 x 2.1		16/184









## Thin Film Products






SUMMARY TABLE											
PRODUCT NAME	PRODUCT TYPE	CUSTOM	BARE CHIP/NETWORK	SIL	LEADLESS	THROUGH HOLE	SMD	WRAPAROUND	HERMETIC	DIL	MOLDED
CH	Resistor		x				x	x			
CHP, HCHP	Resistor						x	x			
CHP HR	Resistor						x	x			
CN	Network	x	x				x				
CNM	Network	x					x				x
CNP	Network	x				x	x		x		
CNS 020, CNS 021	Resistor			x		x					
CNS 471	Network			x		x					
CNW	Network	x					x	x			
CS 22	Resistor		x				x				
CS 33	Network		x				x				
EPIC	Resistor	x					x	x			
L	Resistor						x	x			
P	Resistor						x	x			
PHR	Resistor						x	x			
PRA 100, 135, 182	Network						x	x			
PRA HR	Network						x	x			
RMK 33N	Network		x				x				
RMK 408N, 508N, 48N, 816N, 914N	Network		x				x				
RMK 55N, 515N	Resistor		x				x				
RMK 22N	Resistor		x				x				
RMKD	Network					x			x	x	
RMKMS	Network						x			x	x
RSK 22N	Resistor		x				x				
RSK 33N	Network		x				x				
RV	Resistor						x	x			
SA, SB, SC	Resistor		x				x				
SLCC	Network				x		x		x		
TA 22	Resistor		x				x				
TA 33	Network		x				x				
TAS	Network			x		x					
TFS-S	Resistor			x		x					
TFS-W	Resistor						x	x			

<b>RESISTORS</b>						
MODEL	CS 22	RMK 22N	RMK 55N, 515N	RSK 22N	TA 22	SA, SB, SC
Picture						
Type	Bare Chip	Bare Chip	Bare Chip	Bare Chip	Bare Chip	Bare Chip
Sizes	20 mil x 20 mil	20 mil x 20 mil	50 mil x 50 mil 150 mil x 50 mil	20 mil x 20 mil	20 mil x 20 mil	1.5 mil x 1.5 mil 3 mil x 3 mil 5 mil x 5 mil
Resistance range	10K to 10M	50R to 300K	1K to 750K 1K to 2M	10R to 500K	10R to 1M	0R05 to 1R
Power rating at 70 °C	50 mW	50 mW	125 mW 250 mW	50 mW	50 mW	500 mW to 6 W
Maximum voltage	100 V	100 V	100 V	100 V	50 V	N/A
Tolerance	0.5 % to 2 %	0.1 % to 1 %	0.01 % to 1 %	0.1 % to 1 %	0.5 % to 2 %	1 % to 5 %
Temperature coefficient	100 ppm/°C (50 ppm upon request)	10 ppm/°C typ.	10 ppm/°C	25 ppm/°C	100 ppm/°C (50 ppm upon request)	100 ppm/°C
Load life stability (2000 h at 70 °C at Pn)	0.10 % typ.	0.03 % typ.	0.03 % typ.	0.05 % typ.	0.07 % typ.	0.10 % typ.
Operating temperature range	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 125 °C
Storage temperature range	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C
Special feature						Current sensor
Qualification						







For performances versus ohmic range, please refer to the data sheet of the product.

<b>RESISTORS</b>						
<b>MODEL</b>	<b>CH</b>	<b>CHP, HCHP</b>	<b>CHP HR</b>	<b>L</b>	<b>P</b>	<b>PHR</b>
<b>Picture</b>						
<b>Type</b>	Wraparound	Wraparound	Wraparound	Wraparound	Wraparound	Wraparound
<b>Sizes</b>	02016 to 2010	0502 to 2512	0603 to 2512	0402 to 2010	0402 to 2010	0603 to 1206
<b>Resistance range</b>	10R to 500R	0R1 to 100MR	1R to 10M	0R1 to 10R	10R to 50M	50R to 1M
<b>Power rating at 70 °C</b>	30 mW to 330 mW	50 mW to 2 W	100 mW to 800 mW	125 mW to 1 W	50 mW to 1 W	100 mW to 250 mW
<b>Maximum voltage</b>	30 V to 75 V	50 V to 250 V	50 V to 300 V	50 V	37 V to 300 V	35 V to 100 V
<b>Tolerance</b>	1 % to 10 %	0.5 % to 5 %	1 % to 5 %	1 % to 20 %	0.01 % to 2 %	0.01 % to 0.1 %
<b>Temperature coefficient</b>	100 ppm/°C	100 ppm/°C to 300 ppm/°C	100 ppm/°C and 200 ppm/°C	50 ppm/°C to 300 ppm/°C	5 ppm/°C to 100 ppm/°C	5 ppm/°C to 25 ppm/°C
<b>Load life stability (2000 h at 70 °C at Pn)</b>	0.25 % typ.	< 0.25 % typ.	1 % typ.	0.15 % typ.	0.05 % typ.	0.02 % typ.
<b>Operating temperature range</b>	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C
<b>Storage temperature range</b>	- 55 °C; + 155 °C	- 55 °C; + 155 °C	655 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C
<b>Special feature</b>	Frequency up to 20 GHz	HCHP: Frequency up to 10 GHz	High temperature storage: 1.5 %		200 °C option	High temperature storage 0.15 %
<b>Qualification</b>		ESA (see CHPHR)	ESA (ESCC 4001/026)		ESA (see PHR)	ESA (ESCC 4001/023)

For performances versus ohmic range, please refer to the data sheet of the product.





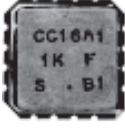

<b>RESISTORS</b>					
MODEL	RV	TFS-W	EPIC	CNS 020, CNS 021	TFS-S
Picture					
Type	Wraparound	Wraparound	Wraparound	SIL	SIL
Sizes	0505 to 1206	0705/1206	0603	0.200" or 0.150" lead spacing	0.100" lead spacing
Resistance range	100R to 1M	25R to 250R	2R to 10R	100R to 10M	25R to 2500R
Power rating at 70 °C	125 mW to 330 mW	N/A	N/A	500 mW	N/A
Maximum voltage	50 V to 75 V	N/A	N/A	300 V	N/A
Tolerance	0.1 % to 5 %	1 % and 2 %	N/A	0.01 % to 1 %	1 % and 2 %
Temperature coefficient	10 ppm/°C and 25 ppm/°C	6180 ppm/°C	N/A	10 ppm/°C	6180 ppm/°C
Load life stability (2000 h at 70 °C at Pn)	0.05 % typ.	0.20 % typ.	N/A	0.10 % typ.	0.20 % typ.
Operating temperature range	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C
Storage temperature range	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C
Special feature		DCT/CT 0.2 %	Electro pyrotechnic initiator: Firing energy 50 μJ/ Firing time 50 μs		DCT/CT 0.2 %
Qualification	CECC 40401-010				

For performances versus ohmic range, please refer to the data sheet of the product.

NETWORKS						
MODEL	CNS 471	CS 33	RMK 33N	RMK 48N, 408N	RSK 33N	TA 33
Picture						
Type	SIL Network	Bare Network	Bare Network	Bare Network	Bare Network	Bare Network
Sizes	6 or 7 terminals	30 mil x 30 mil	30 mil x 30 mil	8 to 16 terminals	30 mil x 30 mil	30 mil x 30 mil
Resistance range	100R to 10M	10K to 5M	1K to 250K	500R to 200K	10R to 500K	50R to 500K
Power rating at 70 °C	100 mW (per resistor)	125 mW	50 mW	125 mW to 250 mW	250 mW	125 mW
Maximum voltage	1200 V	100 V	100 V	100 V	100 V	50 V
Absolute tolerance	0.10 %	0.5 % to 2 %	0.1 % to 1 %	0.1 % to 1 %	0.5 % to 2 %	0.5 % to 2 %
Tolerance ratio	0.03 % to 0.1 %	0.50 %	0.01 % to 0.1 %	0.01 % to 0.05 %	0.05 % to 0.5 %	0.50 %
Absolute temperature coefficient	< 25 ppm/°C	100 ppm/°C	10 ppm/°C	10 ppm/°C	25 ppm/°C	100 ppm/°C
Temperature coefficient ratio	< 2.5 ppm/°C	5 ppm/°C	2 ppm/°C	2 ppm/°C	5 ppm/°C	5 ppm/°C
Load life stability (2000 h at 70 °C at Pn)	0.10 % typ.	0.10 % typ.	0.03 % typ.	0.03 % typ.	0.03 % typ.	0.07 % typ.
Load life stability on ratio (2000 h at 70 °C at Pn)	0.01 % typ.	N/A	N/A	N/A	N/A	N/A
Operating temperature range	0 °C; + 70 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C
Storage temperature range	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C
Special feature	Decade voltage divider	Unequal values upon request	Unequal values upon request		Unequal values upon request	Unequal values upon request
Qualification						
Custom part number		CN	CN	CN	CN	CN

For performances versus ohmic range, please refer to the data sheet of the product.



NETWORKS						
MODEL	PRA	PRA HR	RMKD	RMKMS	SLCC	TAS
Picture						
Type	Wraparound Network	Wraparound Network	Hermetic Network	Molded Network	Hermetic Network	SIL Network
Sizes	100, 135, 182	100, 135, 182	8 to 16 terminals	S08, S014, S016	20	2 to 9 terminals
Resistance range	100R to 1M	100R to 1M	500R to 200K	500R to 200K	50R to 100K	100R to 1M
Power rating at 70 °C	100 mW (per resistor)	100 mW (per resistor)	125 mW to 250 mW	50 mW (per resistor)	50 mW (per resistor)	100 mW (per resistor)
Maximum voltage	35 V to 100 V	35 V to 100 V	100 V	50 V	100 V	100 V
Absolute tolerance	0.1 % to 0.5 %	0.1 % to 1 %	0.05 % and 0.1 %	0.1 % to 1 %	0.1 % to 5 %	0.10 %
Tolerance ratio	0.01 % to 0.1 %	0.05 % to 0.1 %	0.01 % to 0.05 %	0.05 % to 0.5 %	0.1 % to 1 %	0.01 % to 0.05 %
Absolute temperature coefficient	10 ppm/°C	10 ppm/°C	10 ppm/°C	15 ppm/°C	25 ppm/°C	10 ppm/°C
Temperature coefficient ratio	2 ppm/°C	3 ppm/°C to 5 ppm/°C	2 ppm/°C	5 ppm/°C	2 ppm/°C	< 2 ppm/°C
Load life stability (2000 h at 70 °C at Pn)	0.10 % typ.	0.10 % typ.	0.05 % typ.	0.05 % typ.	0.10 % typ.	0.10 % typ.
Load life stability on ratio (2000 h at 70 °C at Pn)	0.02 % typ.	0.02 % typ.	0.03 % typ.	0.02 % typ.	0.05 % typ.	0.005 % typ.
Operating temperature range	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 125 °C	- 55 °C; + 125 °C	- 55 °C; + 125 °C	- 40 °C; + 125 °C
Storage temperature range	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 155 °C	- 55 °C; + 125 °C
Special feature	2 to 8 resistors - unequal values available	2 to 8 resistors - unequal values available	Unequal values upon request	Unequal values upon request		
Qualification	ESA (see PRA HR)	ESA (ESCC 4001/025)				
Custom part number	CNW	CNW	CNP	CNM	CNP	CNS

For performances versus ohmic range, please refer to the data sheet of the product.



# Hybrid

Bare Chips and Networks

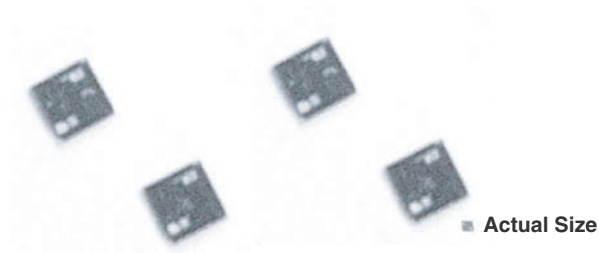


## Model Numbers

CS 22 .....	22
CS 33 .....	24
RMK 22N .....	26
RMK 33N .....	28
RMK 408N, 508N, 48N, 816N, 914N (CN) .....	30
RMK 55N, 515N .....	32
RSK 22N .....	34
RSK 33N .....	36
SA, SB, SC .....	38
TA 22 .....	40
TA 33 .....	42

---

## Single Value Chip Resistor



Chromium silicon thin film is very well suited to produce high density and high ohmic value resistor chips. These high ohmic value chip resistors are available with improved performances and size when compared to thick film counterparts.

### FEATURES

- Small size 20 mil x 20 mil
- Very high ohmic value up to 10 MΩ
- Good stability 0.1 % (2000 h, rated power at + 70 °C)

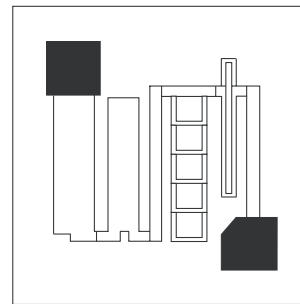


**RoHS**  
COMPLIANT

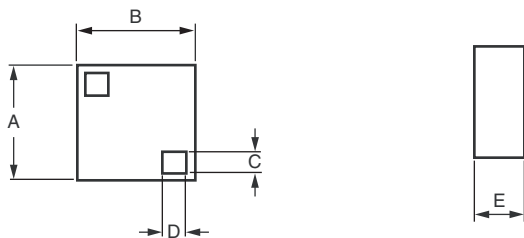
### TYPICAL PERFORMANCE

	ABS
TCR	100 ppm/°C
TOL.	0.5 %

### SCHEMATIC AND PATTERN



STANDARD ELECTRICAL SPECIFICATIONS		
TEST	SPECIFICATIONS	CONDITIONS
MATERIAL	PASSIVATED CHROMIUM SILICON	
Resistance range	10 kΩ to 10 MΩ	
Absolute TCR	± 100 ppm/°C (± 50 ppm/°C on request)	- 55 °C to + 155 °C
Absolute tolerance	± 0.5 %, ± 1 %, ± 2 %	
Power dissipation	100 mW at + 25 °C, 50 mW at + 70 °C, 25 mW at + 125 °C	
Stability	± 0.1 % typical, ± 0.2 maximum	2000 h at + 70 °C at Pn
Working voltage	100 V <sub>DC</sub>	Higher on Al <sub>2</sub> O <sub>3</sub>
Operating temperature range	- 55 °C to + 155 °C	
Storage temperature range	- 55 °C to + 155 °C	
Noise	< - 20 dB typical	MIL-STD-202 Method 308
Thermal EMF	< 0.01 μV/°C	
Shelf life stability	200 ppm	1 year at + 25 °C

**DIMENSIONS**


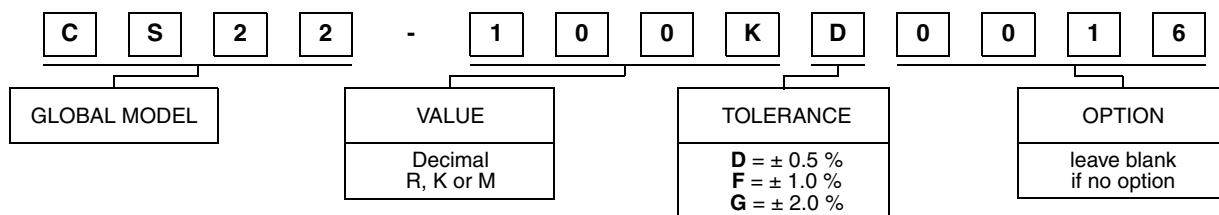
DIMENSION	INCHES	MILLIMETERS
A	0.021 ± 0.002	0.55 ± 0.10
B	0.021 ± 0.002	0.55 ± 0.10
C	0.004	0.10
D	0.004	0.10
E	0.015	0.40 maximum

**MECHANICAL SPECIFICATIONS**

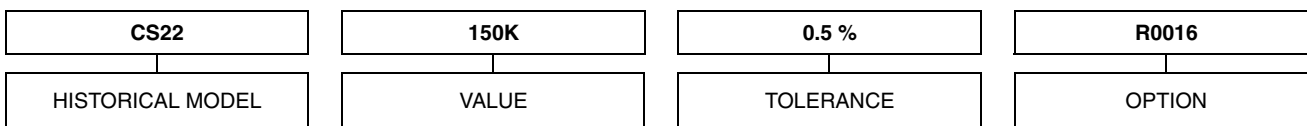
Resistive element	Chromium Silicon
Passivation	Silicon Nitride
Substrate material	Silicon (consult Vishay for Al <sub>2</sub> O <sub>3</sub> )
Bonding pads	Aluminum

**GLOBAL PART NUMBER INFORMATION**

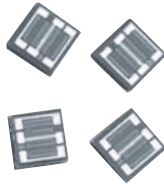
New Global Part Numbering: CS22-100KD0016 (preferred part number format)



Historical Part Number example: CS22 150K 0.5 % R0016 (will continue to be accepted)



## Dual Value Chip Resistors, Center Tap



Actual Size

Chromium silicon thin film is very well suited to produce high density and high ohmic value resistor chips. Performances and sizes are greatly improved compared to Thick Film counterparts. The center tap configuration offers a greater flexibility for hybrid layout design.

### FEATURES

- Center tap feature
- Small size 30 mil x 30 mil
- Very high ohmic values (up to 5 MΩ)
- Good stability 0.1 % (2000 h, rated power, at + 70 °C)

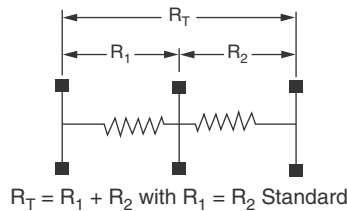


**RoHS**  
COMPLIANT

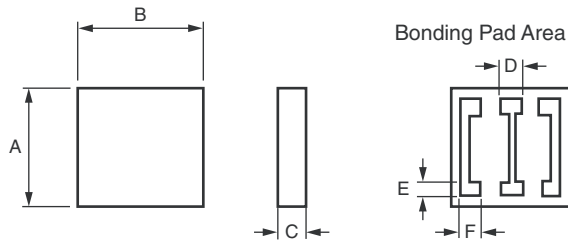
### TYPICAL PERFORMANCE

	ABS	TRACKING
TCR	100 ppm/°C	5 ppm/°C
	ABS	RATIO
TOL.	0.5 %	0.5 %

### SCHEMATIC



STANDARD ELECTRICAL SPECIFICATIONS			
TEST		SPECIFICATIONS	CONDITIONS
MATERIAL		PASSIVATED CHROMIUM SILICON	
Resistance range		10 kΩ to 5 MΩ	for $R_T = R_1 + R_2$
TCR:	Tracking	± 5 ppm/°C	- 55 °C to + 155 °C
	Absolute	± 100 ppm/°C (± 50 ppm/°C on request)	- 55 °C to + 155 °C
Ohmic value	Ratio	1/1 standard (unequal values: please consult)	
Tolerance:	Absolute	± 0.5 %, ± 1 %, ± 2 %	
	Matching	± 0.5 % standard	
Power rating		250 mW at + 25 °C, 125 mW at + 70 °C, 50 mW at + 125 °C	
Stability		± 0.1 % typical, ± 0.2 maximum	2000 h at + 70 °C under Pn
Voltage coefficient		0.1 ppm/V	
Working voltage		100 V <sub>DC</sub> on $R_T$	
Operating temperature range		- 55 °C to + 155 °C	
Storage temperature range		- 55 °C to + 155 °C	
Noise		< - 20 dB typical	MIL-STD-202 Method 308
Thermal EMF		< 0.01 μV/°C	
Shelf life stability		200 ppm	1 year at + 25 °C

**DIMENSIONS**


DIMENSION	INCHES	MILLIMETERS
A	0.03 ± 0.004	0.76 ± 0.10
B	0.03 ± 0.004	0.76 ± 0.10
C	0.01 ± 0.015	0.25 ± 0.40
D	0.004	0.10
E	0.006	0.15
F	0.006	0.15

**MECHANICAL SPECIFICATIONS**

Resistive element	Chromium Silicon
Passivation	Silicone Nitride
Substrate material	Silicon (Consult Vishay for Al <sub>2</sub> O <sub>3</sub> )
Bonding pads	Aluminum

**GLOBAL PART NUMBER INFORMATION**

New Global Part Numbering: CS33-100KF1MD0016 (preferred part number format)

C	S	3	3	-	1	0	0	K	F	1	M	D	0	0	1	6
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

GLOBAL MODEL	R1 VALUE Decimal R, K or M	ABS. TOLERANCE D = ± 0.5 % F = ± 1.0 % G = ± 2.0 %	R2 VALUE Decimal R, K or M	RAT. TOLERANCE D = ± 0.5 %	OPTION leave blank if no option
--------------	----------------------------------	---	----------------------------------	-------------------------------	---------------------------------------

Historical Part Number example: CS 33 100K 1M 1% 0.5% R0016 (will continue to be accepted)

CS 33	100K 1M	1% 0.5%	R0016
HISTORICAL MODEL	R1/R2 VALUE	ABS. TOLERANCE AND RATIO TOLERANCE	OPTION

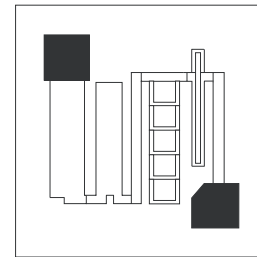
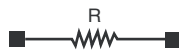
## Single Value Chip Resistors



The demand for high precision, high stability microchips for both military and industrial environments is increasing with the growth and sophistication of modern hybrid circuitry.

The RMK 22 series are single value resistor chips. They provide excellent long term stability 0.03 % (2000 h, rated power, at + 70 °C) and low noise characteristics < 35 dB.

### SCHEMATIC AND PATTERN



### FEATURES

- Small size 20 mil x 20 mil
- Excellent temperature coefficient < 10 ppm/°C
- Excellent stability 0.03 %



**RoHS**  
COMPLIANT

### TYPICAL PERFORMANCE

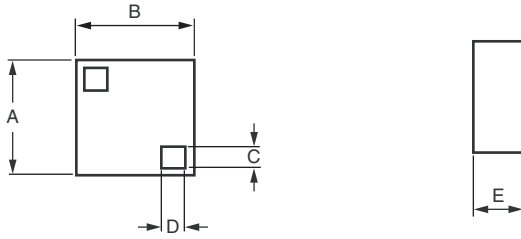
	ABS
TCR	5 ppm/°C
TOL.	0.1 %

STANDARD ELECTRICAL SPECIFICATIONS		
TEST	SPECIFICATIONS	CONDITIONS
MATERIAL	ULTRAFILM®	
Resistance range	R = 50 Ω to 300 kΩ	
TCR	± 5 ppm/°C typical, ± 10 ppm/°C maximum	- 55 °C to + 155 °C maximum
Absolute tolerance	± 0.1 %, ± 0.5 %, ± 1.0 %	
Power rating	50 mW	at + 70 °C
Stability	± 0.03 % typical, ± 0.05 % maximum	2000 h at + 70 °C under Pn
Voltage coefficient	< 0.1 ppm/V	
Working voltage	100 V <sub>DC</sub>	
Operating temperature range	- 55 °C to + 155 °C <sup>(1)</sup>	
Storage temperature range	- 55 °C to + 155 °C	
Noise	< - 35 dB typical	MIL-STD-202 Method 308
Thermal EMF	< 0.01 μV/°C	
Shelf life stability	50 ppm	1 year at + 25 °C

**Note:**

<sup>(1)</sup> For temperature up to 200 °C, please consult factory.

**DIMENSIONS**



DIMENSION	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.021	0.022	0.54	0.56
B	0.021	0.022	0.54	0.56
C	0.004		0.10	
D	0.004		0.10	
E			0.158	0.40

MECHANICAL SPECIFICATIONS	
Resistive element	Nichrome
Passivation	Silicon Nitride
Substrate material	Silicon
Bonding pads	Aluminum

**GLOBAL PART NUMBER INFORMATION**

New Global Part Numbering: **RMK22N100KD0016** (preferred part number format)

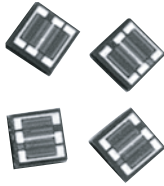
<b>R</b>	<b>M</b>	<b>K</b>	<b>2</b>	<b>2</b>	<b>N</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>K</b>	<b>D</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>6</b>
GLOBAL MODEL			VALUE				TOLERANCE			OPTION				
			Decimal R, K or M				<b>B</b> = ± 0.1 % <b>D</b> = ± 0.5 % <b>F</b> = ± 1.0 %			leave blank if no option				

Historical Part Number example: **RMK 22N 100K 0.5 % R0016** (will continue to be accepted)

<b>RMK 22N</b>	<b>100K</b>	<b>0.5 %</b>	<b>R0016</b>
HISTORICAL MODEL	VALUE	TOLERANCE	OPTION



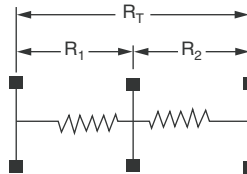
## Dual Value Chip Resistors, Center Tap



Actual Size

The demand for high precision, high stability microchips for both military and industrial environments is increasing with the growth and sophistication of modern day hybrid circuitry. The need for high accuracy ultra stable micro dividers particularly triggered the development of these third generation nickel chromium microchip dividers which offer standards of accuracy and thermal/time stability never achieved before in the conventional second generation thin metal film technologies.

### SCHEMATICS



$R_T = R_1 + R_2$  with  $R_1 = R_2$  Standard  
(Unequal values on request)

### FEATURES

- High precision
- Very low temperature coefficient < 10 ppm/°C
- Excellent stability 0.03 % (2000 h, rated power, at + 70 °C)



**RoHS**  
COMPLIANT

### TYPICAL PERFORMANCE

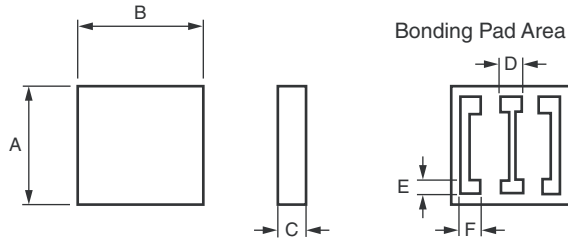
	ABS	TRACKING
TCR	5 ppm/°C	1 ppm/°C
	ABS	RATIO
TOL.	0.1 %	0.01 %

STANDARD ELECTRICAL SPECIFICATIONS		
TEST	SPECIFICATIONS	CONDITIONS
SERIES	ULTRAFILM®	
Resistance range	1 kΩ to 250 kΩ	( $R_T = R_1 + R_2$ )
TCR:	Tracking	± 1 ppm/°C typical (± 2 ppm/°C maximum)
	Absolute	± 5 ppm/°C maximum ± 10 ppm/°C maximum
Tolerance:	Ratio	0.1 %, 0.05 %, 0.02 %, 0.01 %
	Absolute	± 0.1 %, ± 0.5 %, ± 1 %
Power rating	125 mW at 25 °C/50 mW at + 70 °C, 25 mW at + 125 °C	
Stability	300 ppm typical	2000 h at + 70 °C under Pn
Voltage coefficient	< 0.01 ppm/V	
Working voltage	100 V <sub>DC</sub> on R <sub>T</sub>	
Operating temperature range	- 55 °C to + 155 °C <sup>(1)</sup>	
Storage temperature range	- 55 °C to + 155 °C	
Noise	< - 35 dB typical	MIL-STD-202 Method 308
Thermal EMF	< 0.01 μV/°C	
Shelf life stability	50 ppm	1 year

**Note:**

<sup>(1)</sup> For Temperature up to 200 °C, please consult factory.

**DIMENSIONS**



DIMENSION	INCHES	MILLIMETERS
A	0.03 ± 0.004	0.76 ± 0.10
B	0.03 ± 0.004	0.76 ± 0.10
C	0.01 to 0.015	0.25 to 0.40
D	0.006	0.15
E	0.004	0.10
F	0.006	0.15

MECHANICAL SPECIFICATIONS	
Resistive element	Passivated Nichrome
Substrate material	Silicon (Alumina on request)
Body	Silicon
Passivation	Silicone Nitride
Bonding pads	Aluminum

**GLOBAL PART NUMBER INFORMATION**

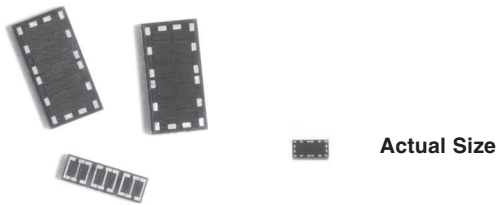
New Global Part Numbering: **RMK33N5KF25KB0016** (preferred part number format)

<b>R</b>	<b>M</b>	<b>K</b>	<b>3</b>	<b>3</b>	<b>N</b>	<b>5</b>	<b>K</b>	<b>F</b>	<b>2</b>	<b>5</b>	<b>K</b>	<b>B</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>6</b>
GLOBAL MODEL		R1 VALUE		ABS. TOLERANCE			R2 VALUE		RAT. TOLERANCE			OPTION				
		Decimal R, K or M		<b>B</b> = ± 0.1 % <b>W</b> = ± 0.05 % <b>D</b> = ± 0.5 % <b>F</b> = ± 1.0 %			Decimal R, K or M		<b>B</b> = ± 0.1 % <b>W</b> = ± 0.05 % <b>P</b> = 0.02 % <b>L</b> = 0.01 %			leave blank if no option				

Historical Part Number example: **RMK 33N 5K 25K 1 % 0.1 % R0016** (will continue to be accepted)

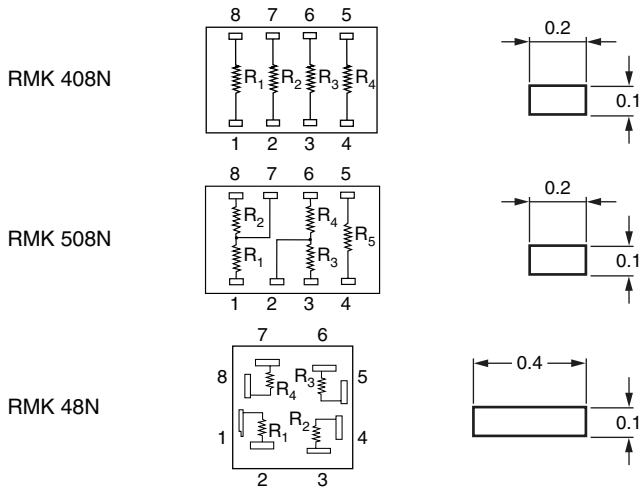
<b>RMK 33N</b>	<b>5K 25K</b>	<b>1 % 0.1 %</b>	<b>R0016</b>
HISTORICAL MODEL	R1/R2 VALUE	ABS. TOLERANCE AND RATIO TOLERANCE	OPTION

## Silicon, Standard Resistor Arrays



Manufactured in ULTRAFILM technology, these resistor network chips have a high level of integration, wide ohmic value range, very low temperature coefficient 10 ppm/°C which are unequaled on the market today. Laser trimming can provide excellent precision down to 0.1 % abs 0.01 % ratio.

### SCHEMATIC



### FEATURES

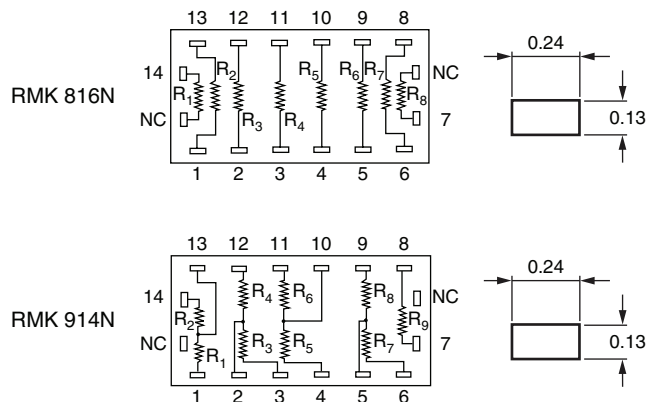
- High precision tolerances down to 0.01 % Ratio
- Very low temperature coefficient: 10 ppm/°C abs., 2 ppm/°C ratio
- Excellent stability < 300 ppm, 2000 h at Pn at + 70 °C



RoHS COMPLIANT

### TYPICAL PERFORMANCE

	ABS	TRACKING
TCR	5 ppm/°C	1 ppm/°C
	ABS	RATIO
TOL.	0.1 %	0.01 %



STANDARD ELECTRICAL SPECIFICATIONS		
TEST	SPECIFICATIONS	CONDITION
SERIES	48N, 408N, 508N, 816N, 914N	
TCR:	Tracking	± 1 ppm/°C typical/± 2 ppm/°C maximum
	Absolute	± 10 ppm/°C maximum/± 5 ppm/°C maximum
Tolerance:	Ratio	± 0.05 %, ± 0.02 %, ± 0.01 %
	Absolute	± 1.0 %, ± 0.5 %, ± 0.25 %, ± 0.1 %
Power rating: (0 W at + 155 °C)	48N = 125 mW, others: 250 mW	at + 70 °C
	48N = 50 mW, others: 125 mW	at + 125 °C
Stability	< 300 ppm	2000 h at + 70 °C under Pn
Voltage coefficient	< 0.1 ppm/V	
Working voltage	100 V	
Operating temperature range	- 55 °C to + 155 °C <sup>(1)</sup>	
Storage temperature range	+ 70 °C	
Noise	< - 35 dB	
Thermal EMF	0.01 μV/°C	
Shelf life stability	50 ppm	1 year at + 25 °C

**Note:**

<sup>(1)</sup> For 200 °C operations please consult factory.

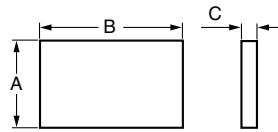


# RMK 408N, 508N, 48N, 816N, 914N (CN)

Silicon, Standard Resistor Arrays

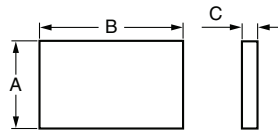
Vishay Sfernice

RMK 408N



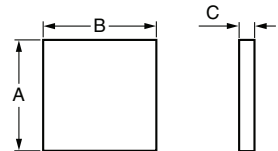
DIMENSIONS in millimeters	
A	1.6 ± 0.1
B	2.6 ± 0.1
C	0.4 maximum

RMK 508N



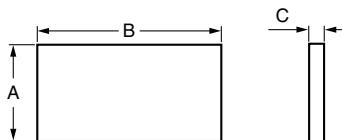
DIMENSIONS in millimeters	
A	1.6 ± 0.1
B	2.6 ± 0.1
C	0.4 maximum

RMK 48N



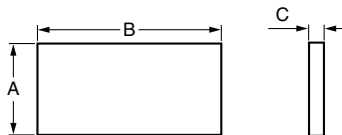
DIMENSIONS in millimeters	
A	2.1 ± 0.1
B	2.1 ± 0.1
C	0.4 maximum

RMK 816N



DIMENSIONS in millimeters	
A	1.8 ± 0.1
B	3.5 ± 0.1
C	0.4 maximum

RMK 914N



DIMENSIONS in millimeters	
A	1.8 ± 0.1
B	3.5 ± 0.1
C	0.4 maximum

MECHANICAL SPECIFICATIONS	
Resistive element	Nichrome
Substrate material	Silicon
Bonding pads	Alumina
Passivation	Silicon Nitride

GLOBAL PART NUMBER INFORMATION															
New Global Part Numbering: RMK408N10KBW (preferred part number format)															
R	M	K	4	0	8	N	1	0	K	B	W	0	0	0	2
GLOBAL MODEL			VALUE			ABS. TOLERANCE			RATIO TOLERANCE			OPTION			
RMK408N RMK508N RMK816N RMK714N RMK914N RMK48N			Decimal: R or K			B = 0.1 % C = 0.25 % D = 0.5 %			W = 0.05 % P = 0.02 % L = 0.01 %			leave blank if no option			
For custom specification:															
CN					1077										
GLOBAL MODEL					REFERENCE										
Historical Part Number example: RMK 408 N 10K 0.1 % abs 0.05 % ratio R0002 (will continue to be accepted)															
RMK 408 N			10K			0.1 % abs 0.05 % ratio			R0002						
HISTORICAL MODEL			VALUE			ABS. AND RATIO TOLERANCE			OPTION						

## Dual Value Chip Resistors



■ **Actual Size**

The demand for high precision, high stability resistive chips for incorporating in hybrid micro-circuits has increased and is catered for by the comprehensive range of VISHAY micro and minichips.

The super stable RMK nickel chromium resistive film has transformed the performances and characteristics of micro resistive chips bringing a “new state-of-the-art” to the technology. A variety of substrates are available in silicon, alumina, glass, or sapphire, to ensure the best possible characteristics compatible with your application needs.

Precision wafer laser trimming is employed to trim each resistor to precise tolerance.

### FEATURES

- Precise tolerance from  $\pm 0.01\%$  to  $\pm 1\%$
- Wide resistance ranges from 1 k $\Omega$  to 2 M $\Omega$
- Low temperature coefficient  $\pm 10$  ppm/ $^{\circ}\text{C}$  maximum
- Excellent stability < 500 ppm (2000 h, at + 70  $^{\circ}\text{C}$  under Pn)



**RoHS**  
COMPLIANT

### TYPICAL PERFORMANCE

	ABS
TCR	5 ppm/ $^{\circ}\text{C}$
TOL.	0.01 %

### SCHEMATIC AND PATTERN



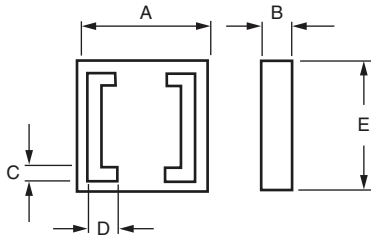
STANDARD ELECTRICAL SPECIFICATIONS		
TEST	SPECIFICATIONS	CONDITIONS
MATERIAL	ULTRAFILM <sup>®</sup>	
Resistance range	1 k $\Omega$ to 750 k $\Omega$ RMK 55 1 k $\Omega$ to 2 M $\Omega$ RMK 515	
Absolute TCR:	$\pm 5$ ppm/ $^{\circ}\text{C}$ $\pm 10$ ppm/ $^{\circ}\text{C}$	0 to + 70 $^{\circ}\text{C}$ - 55 $^{\circ}\text{C}$ to + 155 $^{\circ}\text{C}$
Absolute tolerance:	0.01 % to 1 %	
Stability: $\Delta R/R$	$\pm 0.03\%$	2000 h Pn at + 70 $^{\circ}\text{C}$
Voltage coefficient	< 0.1 ppm/V	
Working voltage	100 V	
Operating temperature range	- 55 $^{\circ}\text{C}$ to + 155 $^{\circ}\text{C}$ (1)	
Storage temperature range	- 55 $^{\circ}\text{C}$ to + 155 $^{\circ}\text{C}$	
Noise	< - 35 dB typical	
Thermal EMF	< 0.01 $\mu\text{V}/^{\circ}\text{C}$	
Shelf life stability	50 ppm	1 year at + 25 $^{\circ}\text{C}$
Power rating	250 mW (RMK 55)/500 mW (RMK515) 125 mW (RMK 55)/250 mW (RMK 515)	25 $^{\circ}\text{C}$ 70 $^{\circ}\text{C}$

**Note:**

(1) For temperature up to 200  $^{\circ}\text{C}$ , please contact factory.

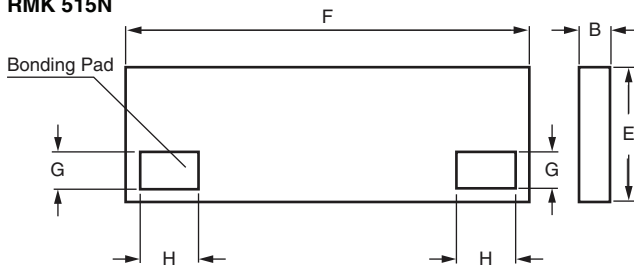
**DIMENSIONS**

RMK 55N



DIMENSION	INCHES	MILLIMETERS
A	0.050	1.27
B	0.015 maximum	0.4 maximum
C	0.005	0.12
D	0.010	0.27
E	0.050	1.27

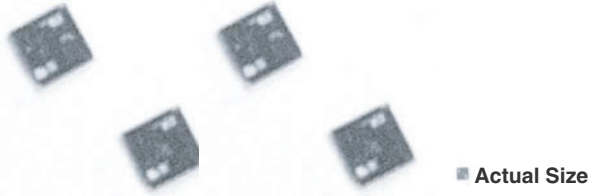
RMK 515N



MECHANICAL SPECIFICATIONS	
Resistive element	Nichrome
Passivation	Silicon Nitride
Substrate material	Silicon
Bonding pads	Aluminum

GLOBAL PART NUMBER INFORMATION			
New Global Part Numbering: RMK55N10KB0002 (preferred part number format)			
R	M	K	5 5 N 1 0 K B 0 0 0 2
GLOBAL MODEL	VALUE	TOLERANCE	OPTION
RMK55N RMK515N	Decimal R, K or M	B = ± 0.1 % D = ± 0.5 % F = ± 1.0 %	leave blank if no option
Historical Part Number example: RMK 55N 10K 0.1 % R0002 (will continue to be accepted)			
RMK 55N	10K	0.1 %	R0002
HISTORICAL MODEL	VALUE	TOLERANCE	OPTION

## Single Value Chip Resistor



The demand for high precision, high stability microchips for both military and industrial environments is increasing with the growth and sophistication of modern hybrid circuitry.

The RSK 22 series are single value resistor chips. They provide excellent long term stability  $\pm 0.05\%$  (2000 h, rated power, at + 70 °C) and low noise characteristics < 35 dB.

### SCHEMATIC AND PATTERN



### FEATURES

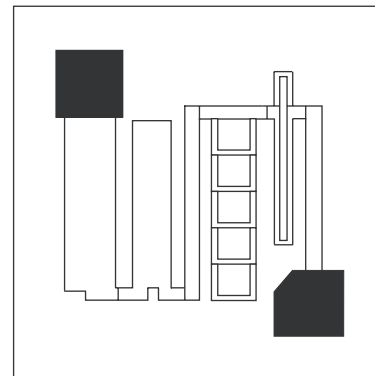
- Small size 20 mil x 20 mil
- Low temperature coefficient 25 ppm/°C
- Excellent stability 0.05 % (2000 h, rated power at + 70 °C)



**RoHS**  
COMPLIANT

### TYPICAL PERFORMANCE

	ABS
TCR	25 ppm/°C
TOL.	0.1 %

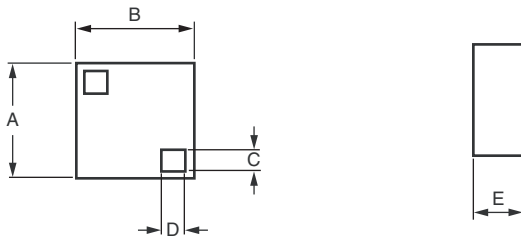


STANDARD ELECTRICAL SPECIFICATIONS		
TEST	SPECIFICATIONS	CONDITIONS
SERIES	ULTRAFILM®	
Resistance range	10 $\Omega$ to 500 k $\Omega$	
Absolute TCR	$\pm 25$ ppm/°C	- 55 °C to + 155 °C
Absolute tolerance	$\pm 0.1\%$ , $\pm 0.5\%$ , $\pm 1\%$	
Power rating	100 mW at 25 °C, 50 mW at + 70 °C, 25 mW at + 125 °C	
Stability	$\pm 0.05\%$ typical, $\pm 0.1\%$ maximum	2000 h at + 70 °C under Pn
Voltage coefficient	< 0.1 ppm/V	
Working voltage	100 V <sub>DC</sub>	
Operating temperature range	- 55 °C to + 155 °C <sup>(1)</sup>	
Storage temperature range	- 55 °C to + 155 °C	(1)
Noise	< - 35 dB typical	MIL-STD-202 Method 308
Thermal EMF	0.01 $\mu$ V/°C	
Shelf life stability	< 50 ppm	

**Note:**

<sup>(1)</sup> For temperature up to 200 °C, please contact factory.

**DIMENSIONS**



DIMENSION	INCHES	MILLIMETERS
A	0.02	0.55 ± 0.10
B	0.02	0.55 ± 0.10
C	0.004	0.10
D	0.004	0.10
E	0.015	0.40 maximum

MECHANICAL SPECIFICATIONS	
Resistive element	Nichrome
Passivation	Silicon Nitride
Substrate material	Standard Silicon
Bonding pads	Aluminum
Body	Silicon

**GLOBAL PART NUMBER INFORMATION**

New Global Part Numbering: RSK22N100KD0016 (preferred part number format)

R	S	K	2	2	N	1	0	0	K	D	0	0	1	6
GLOBAL MODEL			VALUE Decimal R, K or M				TOLERANCE B = ± 0.1 % D = ± 0.5 % F = ± 1.0 %				OPTION leave blank if no option			

Historical Part Number example: RSK 22N 100K 0.5 % R0016 (will continue to be accepted)

RSK 22N	100K	0.5 %	R0016
HISTORICAL MODEL	VALUE	TOLERANCE	OPTION



## Dual Value Chip Resistors, Center Tap

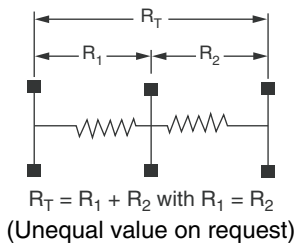


Actual Size

The VISHAY RSK33 resistive dividers are based on a nickel-chromium thin metal film formulation on an oxidized silicon substrate and incorporate two resistors of equal ohmic value for use either as a precision voltage divider or as a four terminal resistor. The RSK33 micro dividers were developed as a low cost, temperature and time stable resistive range for hybrid circuit applications demanding miniaturization with improved parametric performances in both industrial and military environments.

Their close ratio tolerance and TCR tracking performances are particularly relevant to amplifier gain-setting and diverse attenuator and terminator applications.

### SCHEMATIC



### FEATURES

- Economic Cost
- Low TCR < 25 ppm/°C
- Rapid Rise Time
- Low Noise < 35 dB
- Stability 0.03 % (2000 h, rated power, at + 70 °C)



### TYPICAL PERFORMANCE

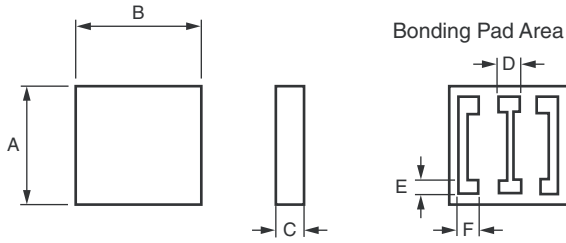
	ABS	TRACKING
TCR	15 ppm/°C	5 ppm/°C
	ABS	RATIO
TOL.	0.5 %	0.05 %

STANDARD ELECTRICAL SPECIFICATIONS		
TEST	SPECIFICATIONS	CONDITIONS
SERIES	ULTRAFILM®	
Resistance range	10 Ω to 500 kΩ	( $R_T = R_1 + R_2$ )
Extended ohmic range	> 500 kΩ to 1 MΩ	$R_1 = R_2$ ( $R_T = \frac{R_T}{2} + \frac{R_T}{2}$ )
		$R_1 \neq R_2$ : Please consult
TCR:	Tracking	± 5 ppm/°C maximum
	Absolute	± 25 ppm/°C maximum (± 15 ppm/°C typical)
Tolerance:	Ratio	± 0.5 % (tighter on request) <sup>(2)</sup>
	Absolute	± 0.5 %, ± 1 %, ± 2 %
Power rating:	250 mW at 70 °C, 50 mW at + 125 °C	
Stability	300 ppm typical	2000 h Pn at + 70 °C
Voltage coefficient	< 0.01 ppm/V	
Working voltage	100 V <sub>DC</sub> on R <sub>T</sub>	
Operating temperature range	- 55 °C to + 155 °C <sup>(1)</sup>	
Storage temperature range	- 55 °C to + 155 °C	
Noise	< - 35 dB typical	MIL-STD-202 Method 308
Thermal EMF	< 0.01 μV/°C	
Shelf life stability	50 ppm	1 year

**Notes:**

<sup>(1)</sup> For temperature up to 200 °C, please contact factory  
<sup>(2)</sup> For tighter ratio: please consult (ohmic range may vary)

**DIMENSIONS**



DIMENSION	INCHES	MILLIMETERS
A	0.029	0.76 ± 0.1
B	0.029	0.76 ± 0.1
C	0.009	0.25 to 0.4
D	0.005	0.15
E	0.004	0.1
F	0.005	0.15

MECHANICAL SPECIFICATIONS	
Resistive element	Passivated Nichrome
Passivation	Silicon Nitride
Substrate material	Silicon
Bonding pads	Aluminum

**GLOBAL PART NUMBER INFORMATION**

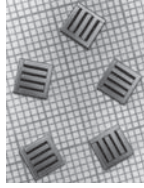
New Global Part Numbering: RSK33N5KD25KB0016 (preferred part number format)

R	S	K	3	3	N	5	K	D	2	5	K	B	0	0	1	6
GLOBAL MODEL		R1 VALUE		ABS. TOLERANCE			R2 VALUE		RAT. TOLERANCE			OPTION				
		Decimal R, K or M		D = ± 0.5 % F = ± 1.0 % G = ± 2.0 %			Decimal R, K or M		D = 0.5 % B = 0.1 % W = 0.05 %			leave blank if no option				

Historical Part Number example: RSK 33N 5K 25K 1% 0.1% R0016 (will continue to be accepted)

RSK 33N	5K 25K	0.5 % 0.1 %	R0016
HISTORICAL MODEL	R1/R2 VALUE	ABS. TOLERANCE AND RATIO TOLERANCE	OPTION

## Current Sensing Bondable Chip Resistors



### FEATURES

- Low ohmic value down to 0.05 Ω
- Tolerance down to 1 %
- Stability 0.1 % < 2000 h at Pn at + 70 °C
- Low noise < 35 dB
- Low TCR 100 ppm/°C

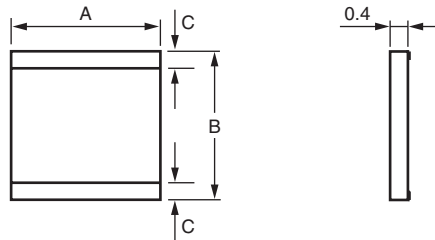


**RoHS**  
COMPLIANT

This thin film chip resistor fits applications as force balance scales, E beam deflection systems, switching power supplies, etc... all rely on current sensors to feed back and control the current.

Gold pads are compatible with thermosonic or ultrasonic bonding of gold and aluminium wires.

### DIMENSIONS in millimeters



SERIES DISSIPATION	POWER	DIMENSIONS		
		A	B	C
SA	0.5 W	1.5	1.5	0.2
SB	2 W	3	3	0.4
SC	6 W	5	5	0.5

### ELECTRICAL SPECIFICATIONS

**Ohmic values and associated tolerance:**  
 $0.05 \Omega \leq R < 0.2 \Omega \pm 5 \%$   
 $0.2 \Omega \leq R < 0.5 \Omega \pm 2 \%$   
 $0.5 \Omega \leq R < 1 \Omega \pm 1 \%$   
 higher values and higher tolerances on request

**Power dissipation at + 70 °C:** SA: 0.5 W  
 SB: 2 W  
 SC: 6 W

**Temperature coefficient:** ± 100 ppm/°C  
 ± 50 ppm/°C on request

**Noise:** - 35 dB maximum

Low ohmic value chip resistors are also available with solderable or weldable wraparound terminations.

### MECHANICAL SPECIFICATIONS

**Substrate:** Alumina  
**Resistive element:** NiCr  
**Glassivation:** Ta<sub>2</sub>O<sub>5</sub>  
**Bonding pads:** gold  
**Backside metallization:** on request Ni Au

### ENVIRONMENTAL SPECIFICATIONS

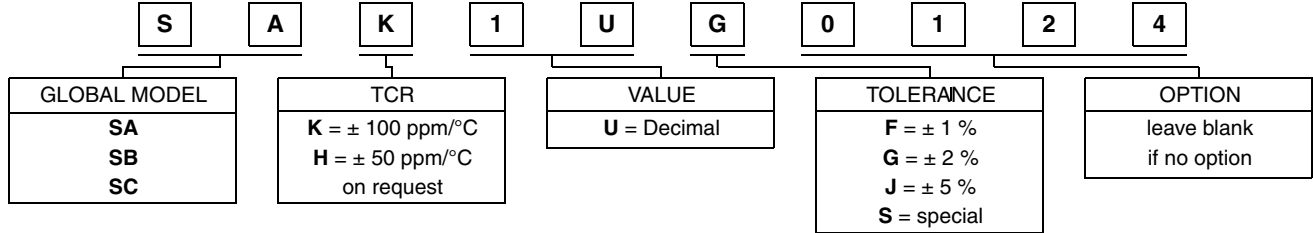
**Operating temperature range:** - 55 °C to + 125 °C  
**Storage temperature:** - 55 °C to + 155 °C

For standard sizes see our data sheet P Document Number: 53017 and ask us about performance.

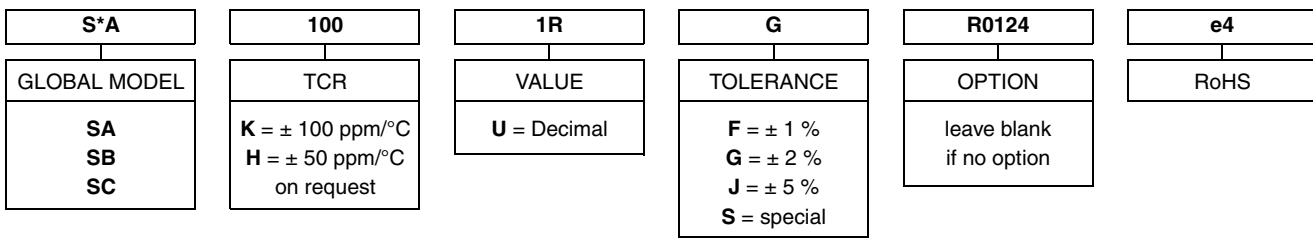


**GLOBAL PART NUMBER INFORMATION**

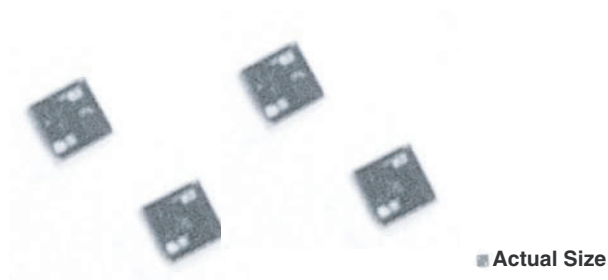
New Global Part Numbering: SAK1UG0124



Historical Part Number example: S\*A 100 1R G R0124 e4

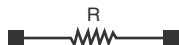


## Single Value Chip Resistor



Thin film resistors are often an excellent solution for analog design problems where space is limited and high packing density is required. Due to their Tantalum Nitride resistive layer these resistors are stable 0.07 % (2000 h, rated power at + 70 °C) and moisture resistant.

### SCHEMATIC AND PATTERN



### FEATURES

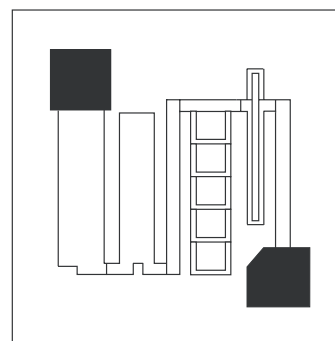
- Small size 20 mil square
- Resistance range 10  $\Omega$  to 1 M $\Omega$
- Resistor material: self-passivating Tantalum Nitride
- Silicon substrate for good power dissipation
- Low cost



**RoHS**  
COMPLIANT

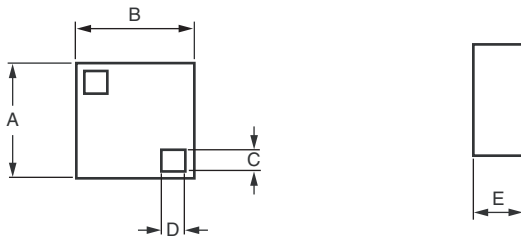
### TYPICAL PERFORMANCE

	ABS
TCR	100 ppm/°C
TOL.	0.5 %



### STANDARD ELECTRICAL SPECIFICATIONS

TEST	SPECIFICATIONS	CONDITIONS
MATERIAL	TANTALUM NITRIDE	
Resistance range	10 $\Omega$ to 1 M $\Omega$	
Absolute TCR	$\pm 100$ ppm/°C ( $\pm 50$ ppm/°C on request)	- 55 °C to + 155 °C
Absolute tolerance	$\pm 0.5$ %, $\pm 1$ %, $\pm 2$ %	
Power dissipation	100 mW at 25 °C, 50 mW at + 70 °C, 25 mW at + 125 °C	
Stability	$\pm 0.07$ % typical, $\pm 0.1$ maximum	2000 h at + 70 °C at Pn
Voltage coefficient	< 0.1 ppm/V	
Working voltage	50 V <sub>DC</sub>	
Operating temperature range	- 55 °C to + 155 °C	
Storage temperature range	- 55 °C to + 155 °C	
Noise	< - 35 dB typical	MIL-STD-202 Method 308
Thermal EMF	< 0.01 $\mu$ V/°C	
Shelf life stability	100 ppm	1 year at + 25 °C

**DIMENSIONS**


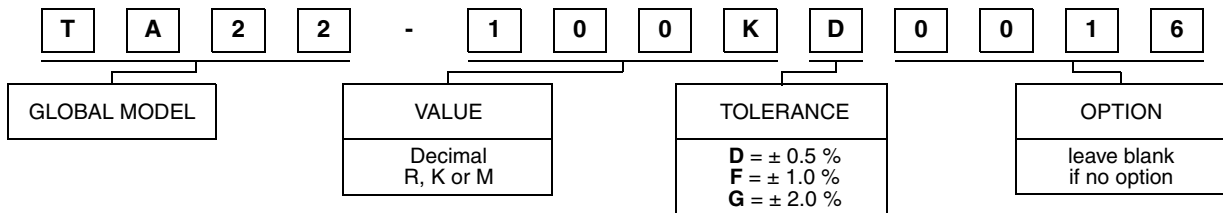
DIMENSION	INCHES	MILLIMETERS
A	0.021 ± 0.002	0.55 ± 0.10
B	0.021 ± 0.002	0.55 ± 0.10
C	0.004	0.10
D	0.004	0.10
E	0.015	0.40 maximum

**MECHANICAL SPECIFICATIONS**

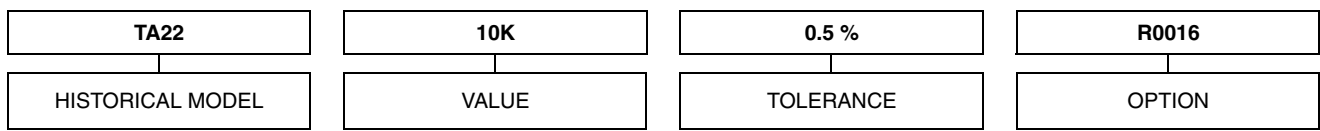
Resistive element	Tantalum Nitride
Passivation	Tantalum Pentoxide (Autopassivation)
Substrate material	Standard Silicon
Bonding pads	Aluminum

**GLOBAL PART NUMBER INFORMATION**

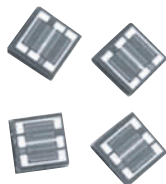
New Global Part Numbering: TA22-100KD0016 (preferred part number format)



Historical Part Number example: TA22 10K 0.5 % R0016 (will continue to be accepted)



## Dual Value Chip Resistors, Center Tap



Actual Size

These tantalum chips combine excellent stability 0.07 % (2000 h, rated power at + 70 °C) with great power handling capacity. Two bonding pads per termination allow greater flexibility in hybrid layout design.

### FEATURES

- Center tap feature
- Resistor material: self-passivating Tantalum Nitride
- Silicon substrate for good power dissipation
- Low cost

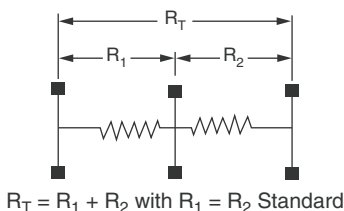


**RoHS**  
COMPLIANT

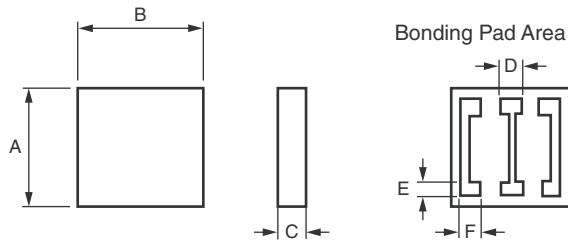
### TYPICAL PERFORMANCE

	ABS	TRACKING
TCR	100 ppm/°C	5 ppm/°C
	ABS	RATIO
TOL.	0.5 %	0.5 %

### SCHEMATIC



STANDARD ELECTRICAL SPECIFICATIONS			
TEST		SPECIFICATIONS	CONDITIONS
MATERIAL		TANTALUM NITRIDE	
Resistance range		50 Ω to 500 kΩ	for $R_T = R_1 + R_2$
TCR:	Tracking	± 5 ppm/°C	- 55 °C to + 155 °C
	Absolute	± 100 ppm/°C (± 50 ppm/°C on request)	- 55 °C to + 155 °C
Ohmic value	Ratio	1/1 standard (unequal values: please consult)	
Tolerance:	Absolute	± 0.5 %, ± 1 %, ± 2 %	
	Matching	± 0.5 % standard	
Power dissipation		250 mW at + 25 °C, 125 mW at + 70 °C, 50 mW at + 125 °C	
Stability		± 0.07 % typical, ± 0.1 maximum	2000 h at + 70 °C under Pn
Working voltage		50 V <sub>DC</sub> on $R_T$	
Operating temperature range		- 55 °C to + 155 °C	
Storage temperature range		- 55 °C to + 155 °C	
Noise		< - 35 dB typical	MIL-STD-202 Method 308
Thermal EMF		0.01 μV/°C	
Shelf life stability		100 ppm	1 year at + 25 °C

**DIMENSIONS**


DIMENSION	INCHES	MILLIMETERS
A	0.03 ± 0.004	0.76 ± 0.10
B	0.03 ± 0.004	0.76 ± 0.10
C	0.01 ± 0.015	0.25 ± 0.40
D	0.004	0.10
E	0.006	0.15
F	0.006	0.15

**MECHANICAL SPECIFICATIONS**

Resistive element	Tantalum Nitride
Substrate material	Silicon
Passivation	Autopassivation
Bonding pads	Aluminum

**GLOBAL PART NUMBER INFORMATION**

New Global Part Numbering: TA33-5K2F25KD0016 (preferred part number format)

T	A	3	3	-	5	K	2	F	2	5	K	D	0	0	1	6
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

GLOBAL MODEL	R1 VALUE Decimal R, K or M	ABS. TOLERANCE D = ± 0.5 % F = ± 1.0 % G = ± 2.0 %	R2 VALUE Decimal R, K or M	RAT. TOLERANCE D = ± 0.5 %	OPTION leave blank if no option
--------------	----------------------------------	---	----------------------------------	-------------------------------	------------------------------------

Historical Part Number example: TA 33 5K2 25K 1 % 0.5 % R0016 (will continue to be accepted)

TA 33	5K2 25K	1 % 0.5 %	R0016
HISTORICAL MODEL	R1/R2 VALUE	ABS. TOLERANCE AND RATIO TOLERANCE	OPTION

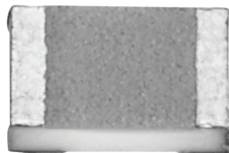






# Wraparound

Chips and Networks



## Model Numbers

CH .....	46
CHP, HCHP .....	54
L .....	57
P .....	60
PHR .....	63
PRA 100, 135, 182 (CNW) .....	66
RV .....	69
TFS .....	72
EPIC .....	74
CHP HR .....	76
PRA HR .....	77

---

## Thin Film Microwave Resistors

### FEATURES

- Small size, down to 20 by 16 mils
- Edged trimmed block resistors
- Pure alumina substrate (99.5 %)
- Various terminations:
  - Pre-tinned over nickel barrier (wraparound or flip chip) for solder reflow
  - Gold pad for wire (or ribbon) bonding (one face only)
- Ohmic range: 10R to 500R
- Small internal reactance (LC down to  $1 \times 10^{-24}$ )
- Tolerance 1 %, 2 %, 5 %, 10 %
- TCR: 100 ppm/°C in (- 55 °C, + 155 °C) temperature range

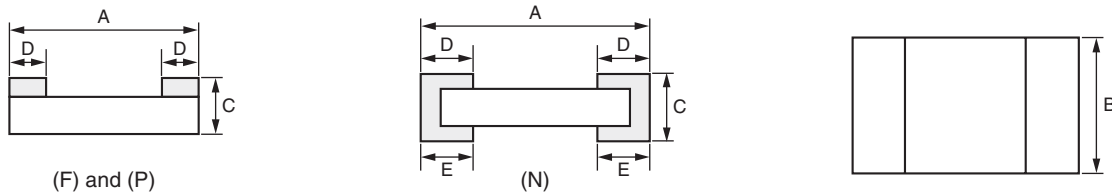


**RoHS**  
COMPLIANT



Those miniaturized components are designed in such a way that their internal reactance is very small. When correctly mounted and utilized, they function as almost pure resistors on a very large range of frequency, up to 20 GHz.

### DIMENSIONS in millimeters [inches]



CASE SIZE MAX. TOL. + 0.1 [+ 0.004] MIN. TOL. - 0.1 [- 0.004]	DIMENSIONS				POWER RATING Pn mW	LIMITING ELEMENT VOLTAGE V
	A	B	C	D/E		
	MAX. TOL. + 0.1 [+ 0.004] MIN. TOL. - 0.1 [- 0.004]	MAX. TOL. + 0.1 [+ 0.004] MIN. TOL. - 0.1 [- 0.004]	MAX. TOL. + 0.127 [+ 0.005] MIN. TOL. - 0.127 [- 0.005]	MAX. TOL. + 0.13 [+ 0.005] MIN. TOL. - 0.13 [- 0.005]		
02016	0.5 [0.020]	0.4 (0.016)	0.5 (0.02)	0.15 [0.006]	30	30
0402	1.00 [0.040]	0.6 (0.023)	0.5 (0.02)	0.38 [0.015]	50	37
0505	1.27 [0.050]	1.27 (0.050)	0.5 (0.02)	0.38 [0.015]	125	50
0603	1.52 [0.060]	0.75 (0.030)	0.5 (0.02)	0.38 [0.015]	125	50
0705/0805	1.91 [0.075]	1.27 (0.050)	0.5 (0.02)	0.38 [0.015]	200	50
1005	2.54 [0.100]	1.27 (0.050)	0.5 (0.02)	0.38 [0.015]	250	75
1206	3.00 [0.126]	1.60 (0.063)	0.5 (0.02)	0.38 [0.015]	330	75

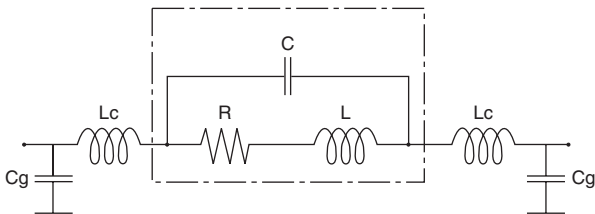
TOLERANCE VERSUS OHMIC VALUES			
OHMIC RANGE	$10 \Omega \leq R < 50 \Omega$	$50 \Omega \leq R < 100 \Omega$	$100 \Omega \leq R \leq 500 \Omega$
TOLERANCE	5 %, 10 %	2 %, 5 %, 10 %	1 %, 2 %, 5 %, 10 %

GLOBAL PART NUMBER INFORMATION											
New Global Part Numbering: CH0402-50RJP <sup>(1)</sup> (preferred part number format)											
C	H	0	4	0	2	-	5	0	R	J	P
GLOBAL MODEL		SIZE		OHMIC VALUE		TOLERANCE		TERMINATION			
CH		02016 0402 0505 0603 0805 1005 1206		10R to 500R		F = 1 % G = 2 % J = 5 % K = 10 %		F (Flip Chip): SnAg over nickel barrier N (W/A): SnAg over nickel barrier (except 02016) P (one face): Gold Bonding Pads			
Historical Part Number example: CH 0402 50R 5% P e2 (will continue to be accepted)											
CH	0402	50R	5 %	P	e2						
HISTORICAL MODEL	SIZE	OHMIC VALUE	TOLERANCE	TERMINATION	LEAD (Pb)-FREE VERSION						
					e2: tin/silver e4: gold						

**Note:**

<sup>(1)</sup> 02016 Not available with N termination - Tape option: Except P termination

**TYPICAL HIGH FREQUENCY PERFORMANCE ELECTRICAL MODEL**



- C:** Internal shunt capacitance
- L:** Internal inductance
- R:** Resistance
- Lc:** External connection inductance
- Cg:** External capacitance to ground

The complex impedance of the chip resistor is given by the following equations:

$$Z = R \frac{1 + j X_L/R}{1 + j R/X_C} \quad \text{with } X_L = 2\pi fL: \text{ Reactance of the internal inductance}$$

$$\theta = \text{Arc tg} \frac{X_L (X_C + X_L) + R^2}{R X_C} \quad \text{with } X_C = 1/2\pi fC: \text{ Reactance of the internal capacitance}$$

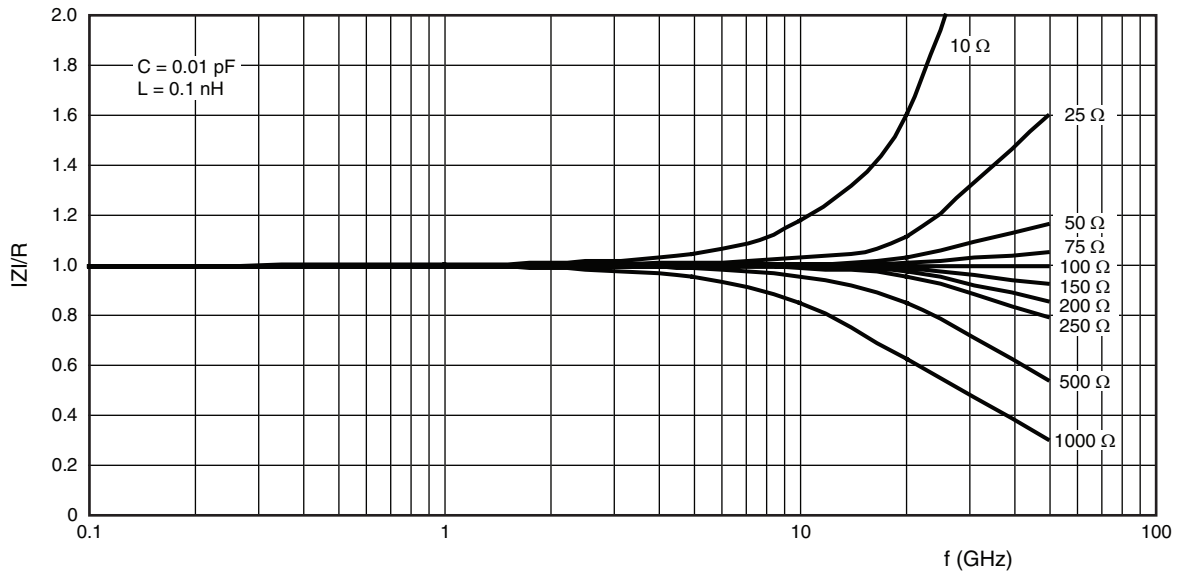
$$|Z| = R \left[ \frac{1 + (X_L/R)^2}{1 + (R/X_C)^2} \right]^{1/2} \quad f = \text{frequency}$$

This can be seen on the graphs relevant to 02016 (R = 100 Ω, LC = 1 x 10<sup>-24</sup>), 0402 (R = 129 Ω, LC = 15 x 10<sup>-24</sup>) and 1206 (R = 200 Ω, LC = 100 x 10<sup>-24</sup>).

**Note:**  
The external reactance (Lc and Cg) depends on the PCB material, the layout and assembly technology. It does affect the HF performance and needs to be estimated. The external reactance can be utilized to compensate the internal one.

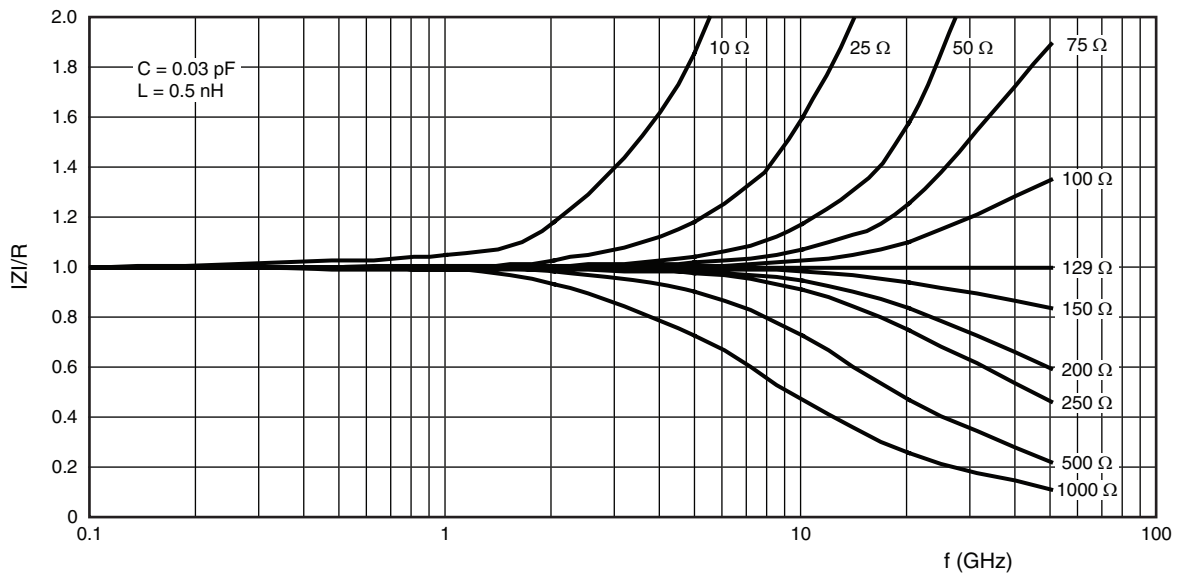
The resistor is purely resistive when R = (L/C)<sup>1/2</sup> = Z<sub>0</sub>. The smaller the LC product the greater the frequency range over which the resistor looks approximately resistive.

**INTERNAL IMPEDANCE CURVE FOR 02016 SIZE**

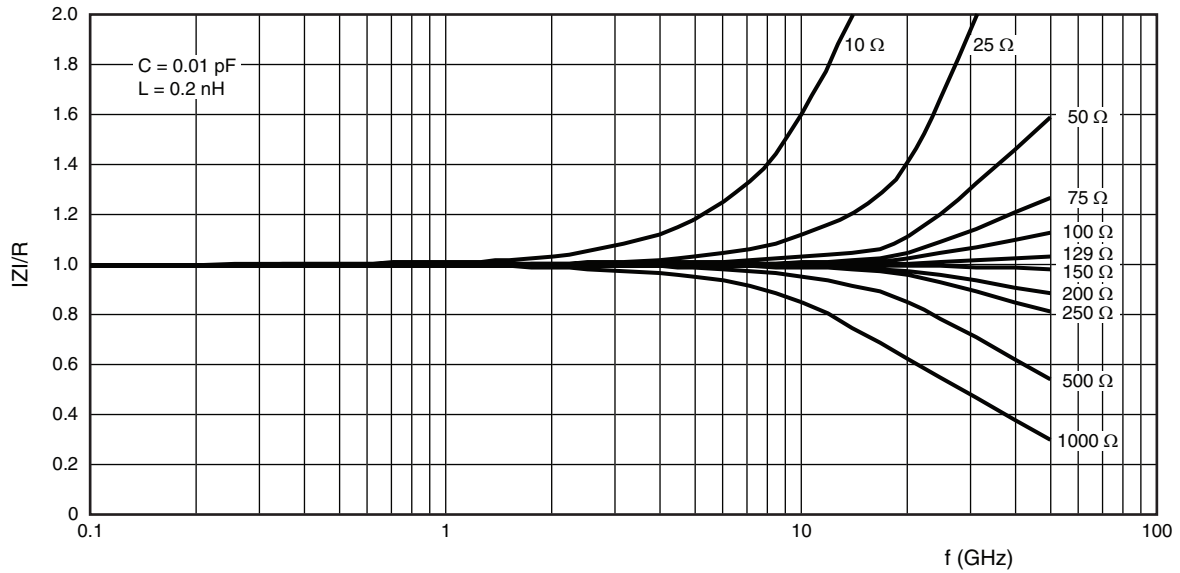


Impedance as a function of frequency for a chip resistor (F and P terminations)

**INTERNAL IMPEDANCE CURVE FOR 0402 SIZE**

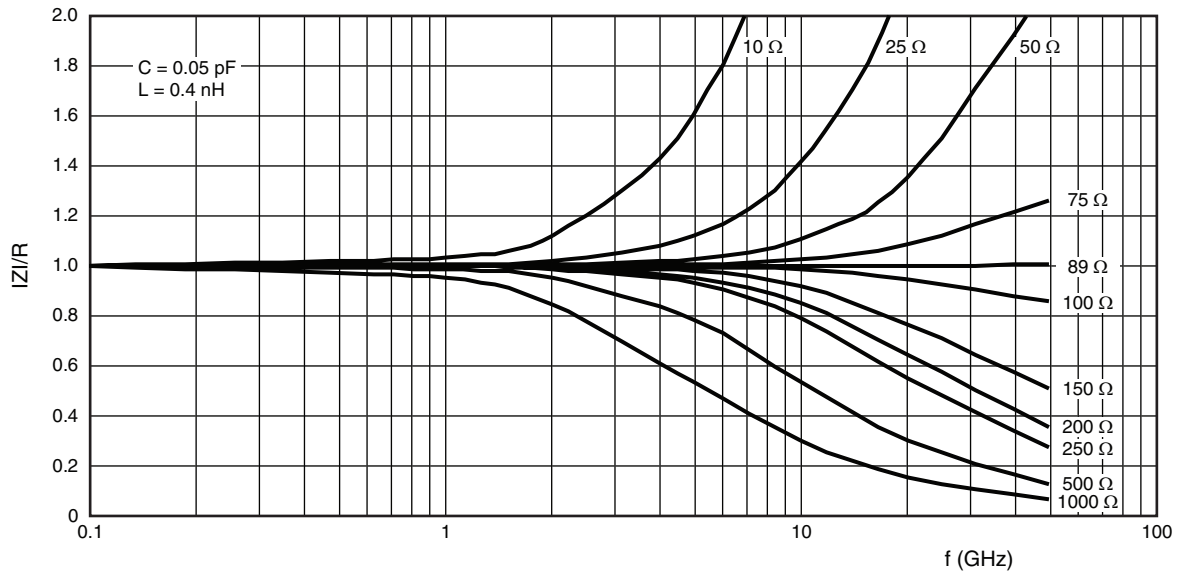


Impedance as a function of frequency for a chip resistor N termination (wraparound)

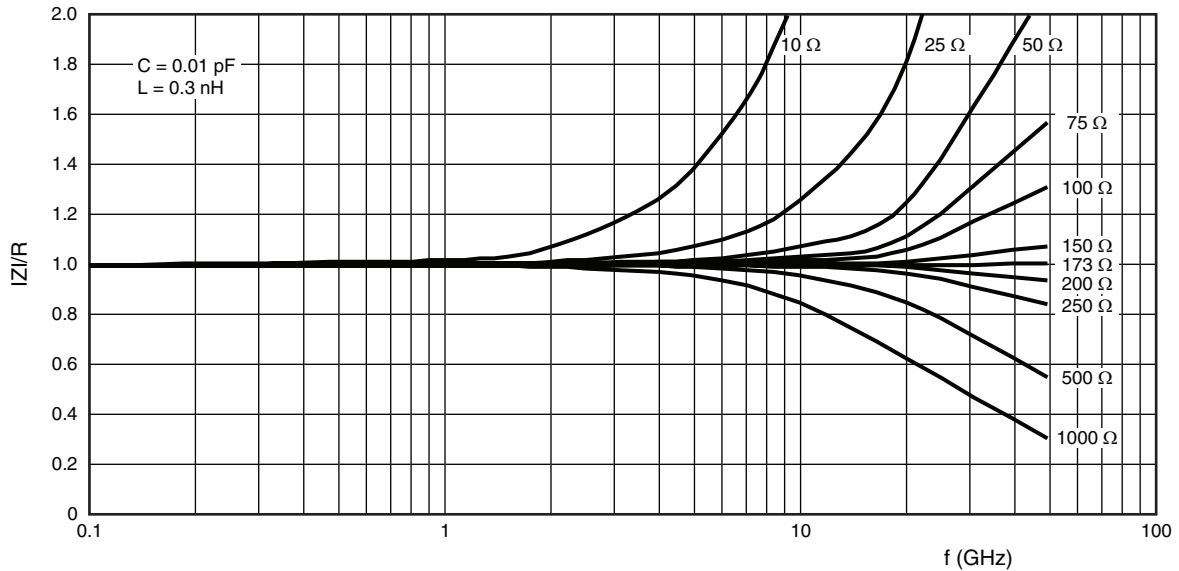


Impedance as a function of frequency for a chip resistor (F and P terminations)

**INTERNAL IMPEDANCE CURVE FOR 0603/0505 SIZE**

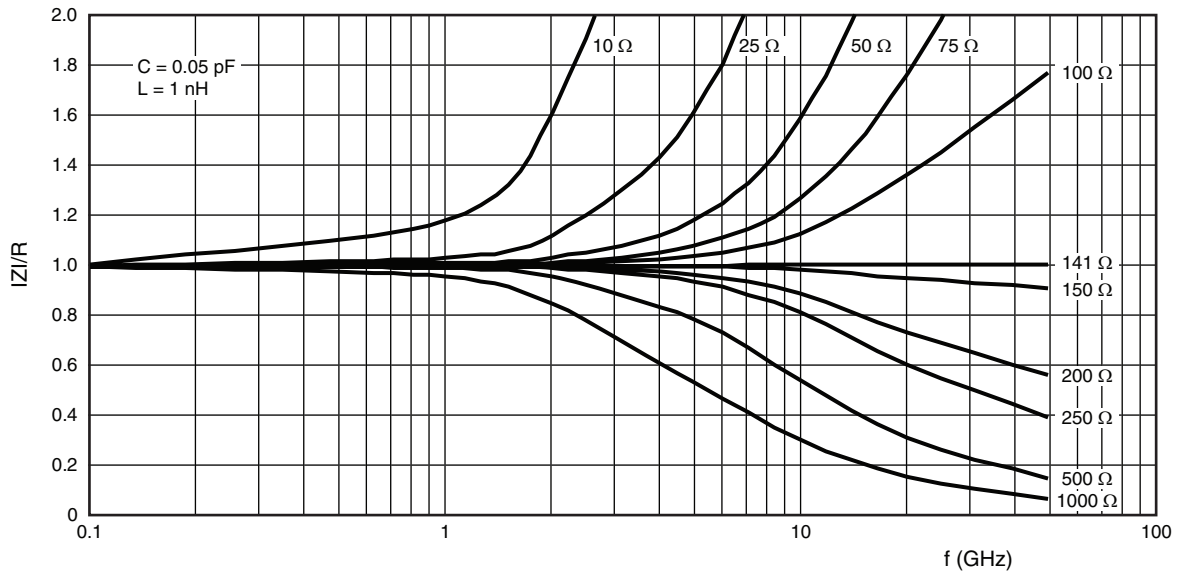


Impedance as a function of frequency for a chip resistor N termination (wraparound)

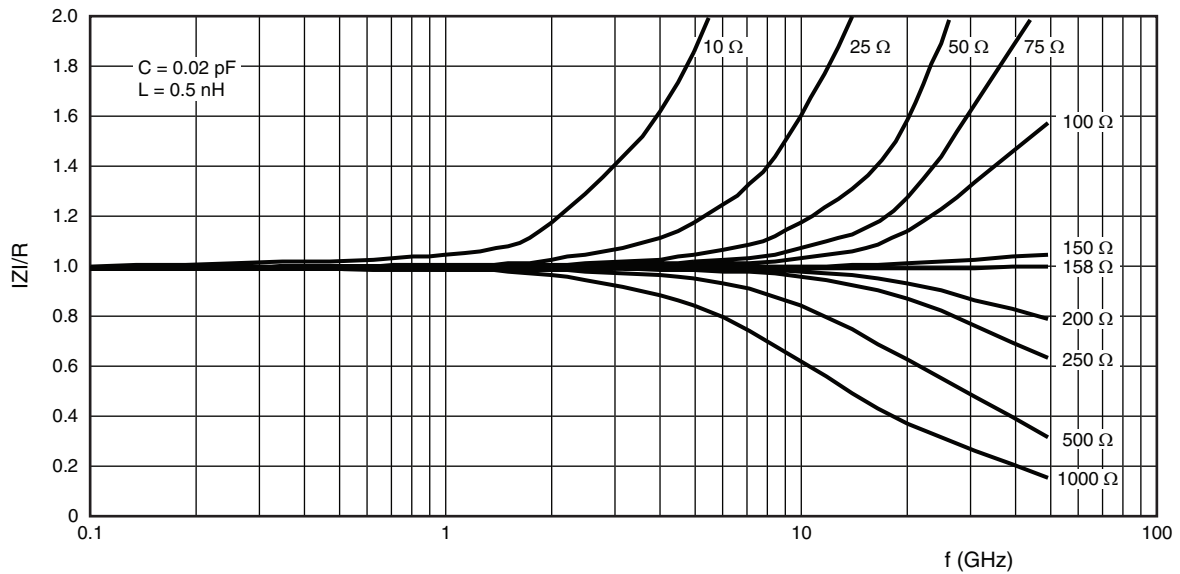


Impedance as a function of frequency for a chip resistor (F and P terminations)

**INTERNAL IMPEDANCE CURVE FOR 0805 SIZE**

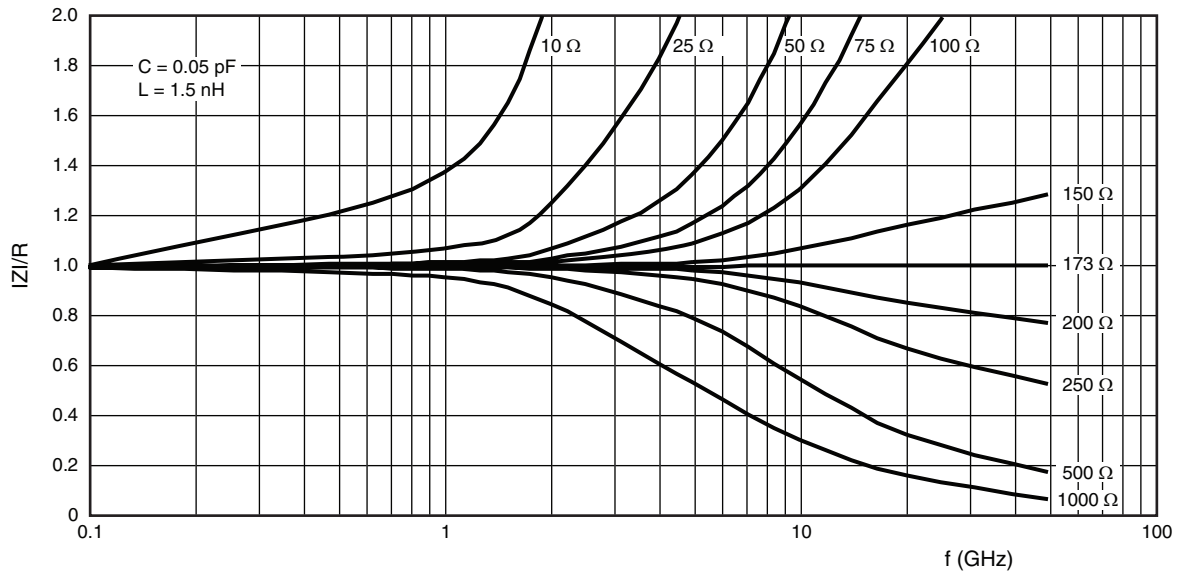


Impedance as a function of frequency for a chip resistor N termination (wraparound)



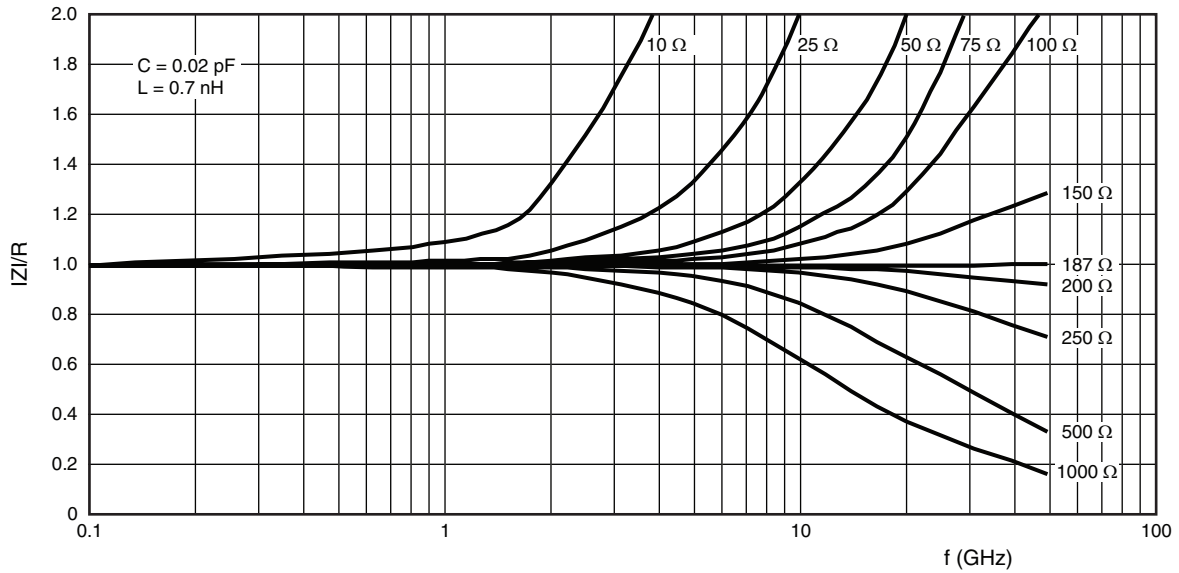
Impedance as a function of frequency for a chip resistor (F and P terminations)

**INTERNAL IMPEDANCE CURVE FOR 1005 SIZE**



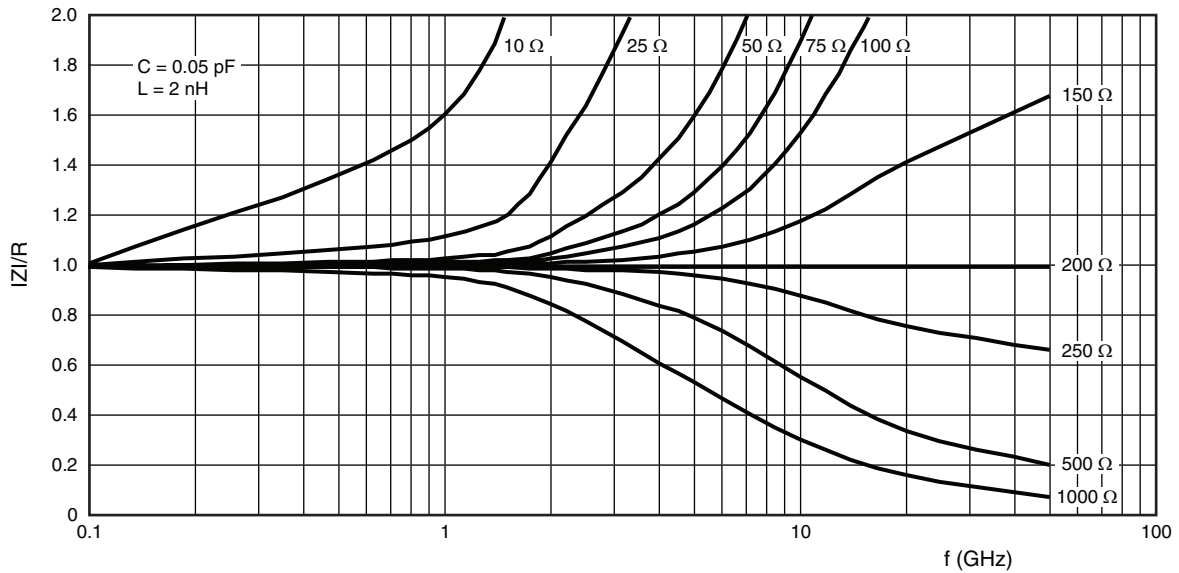
Impedance as a function of frequency for a chip resistor N termination (wraparound)



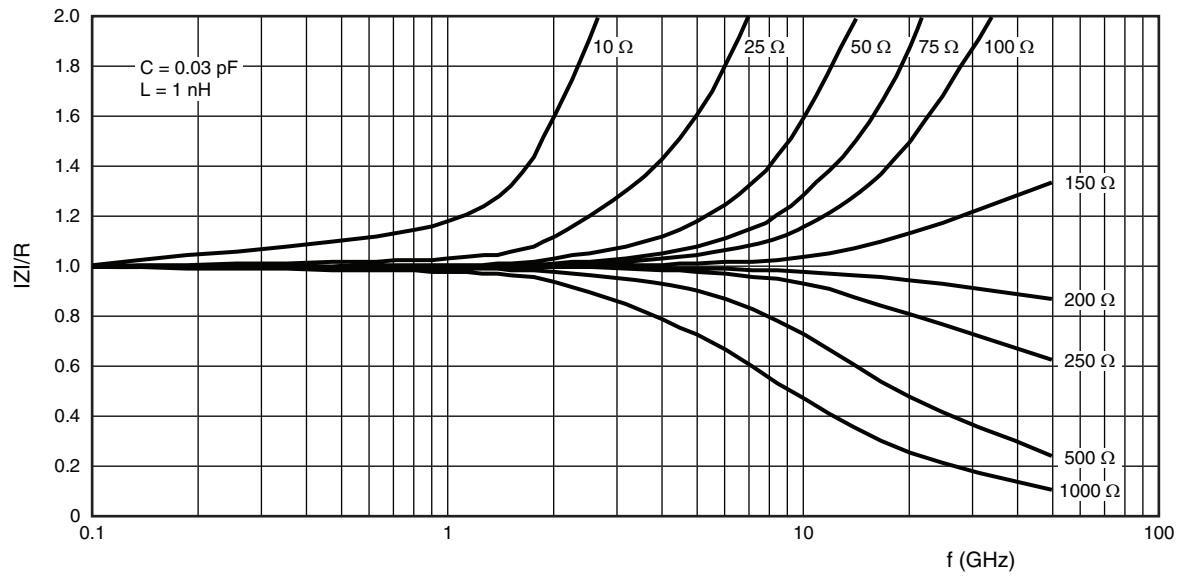


Impedance as a function of frequency for a chip resistor (F and P terminations)

**INTERNAL IMPEDANCE CURVE FOR 1206 SIZE**

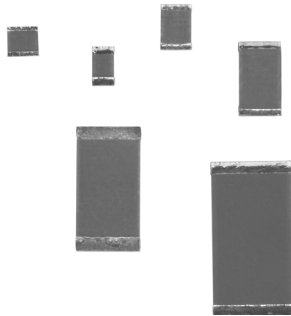


Impedance as a function of frequency for a chip resistor N termination (wraparound)



Impedance as a function of frequency for a chip resistor (F and P terminations)

# High Stability Resistor Chips (< 0.25 % at Pn at 70 °C during 1000 h) Thick Film Technology



## FEATURES

- Robust terminations
- Large ohmic value range 0.1 Ω to 100 MΩ
- Tight tolerance to 0.5 %
- CHP: standard passivated version for industrial, professional and military applications
- HCHP: for high frequency applications
- ESCC approvals in progress



VISHAY SFERNICE thick film resistor chips are specially designed to meet very stringent specifications in terms of reliability, stability < 0.25 % at Pn at + 70 °C during 1000 h, homogeneity, reproductibility and quality.

They conform to specifications NFC 83-240 and MIL-R-55342 D.

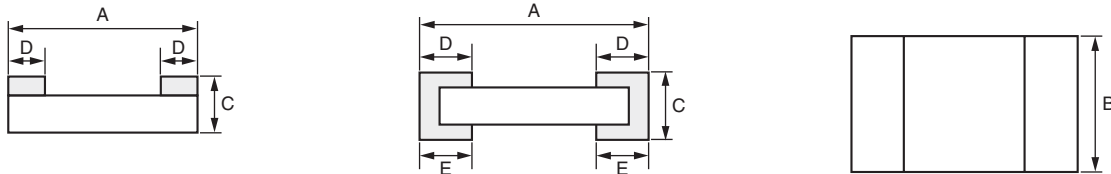
Evaluated to ESCC 4001/026.

Sputtered Thin Film terminations, with nickel barrier, are very convenient for high operating conditions. They can withstand thousands of very severe thermal shocks.

B (W/A), N (W/A) and F (one face) types are for solder reflow assembly.

G (W/A) and W (one face) types are for wire bonding, gluing and even high temperature solder reflow.

## DIMENSIONS in millimeters [inches]



CASE SIZE	DIMENSIONS				POWER RATING Pn mW	LIMITING ELEMENT VOLTAGE V	MAXIMUM <sup>(1)</sup> RESISTANCE MΩ	UNIT WEIGHT IN mg
	A	B	C	D/E				
	MAX .TOL + 0.152 [+ 0.006] MIN. TOL. - 0.152 [- 0.006]	MAX. TOL. + 0.127 [+ 0.005] MIN. TOL. - 0.127 [- 0.005]	MAX. TOL. + 0.127 [+ 0.005] MIN. TOL. - 0.127 [- 0.005]	MAX. TOL. + 0.127 [+ 0.005] MIN. TOL. - 0.127 [- 0.005]				
0502	1.27 [0.05]	0.6 [0.023]	0.5 [0.02]	0.38 [0.015]	50	50	25	1
0505	1.27 [0.05]	1.27 [0.05]	0.5 [0.02]	0.38 [0.015]	125	50	10	3
0603	1.52 [0.08]	0.85 [0.033]	0.5 [0.02]	0.38 [0.015]	125	50	25	2
0705 0805	1.91 [0.075]	1.27 [0.05]	0.5 [0.02]	0.38 [0.015]	200	75	25	4
1005	2.54 [0.100]	1.27 [0.05]	0.5 [0.02]	0.38 [0.015]	250	100	50	5
1206	3.05 [0.120]	1.60 [0.063]	0.5 [0.02]	0.38 [0.015]	250	150	50	8
1505	3.81 [0.150]	1.32 [0.054]	0.5 [0.02]	0.38 [0.015]	500	150	75	8
2010	5.08 [0.200]	2.54 [0.100]	0.5 [0.02]	0.38 [0.015]	1000 <sup>(2)</sup>	200	100	26
1020	2.54 [0.100]	5.08 [0.200]	0.5 [0.02]	0.38 [0.015]	1000 <sup>(2)</sup>	100	10	25
2208	5.58 [0.22]	1.91 [0.075]	0.5 [0.02]	0.38 [0.015]	750	200	100	21
2512	6.35 [0.250]	3.06 [0.120]	0.5 [0.02]	0.38 [0.015]	2000 <sup>(2)</sup>	250	100	42
1010	2.54 [0.100]	2.54 [0.100]	0.5 [0.02]	0.38 [0.015]	500	100	25	12

**Notes:**

<sup>(1)</sup> Shall be read in conjunction with other tables

<sup>(2)</sup> With special assembly care

\* Pb containing terminations are not RoHS compliant, exemptions may apply



High Stability Resistor Chips  
 (< 0.25 % at Pn at 70 °C during 1000 h)  
 Thick Film Technology

Vishay Sfernice

**ELECTRICAL SPECIFICATIONS**

Resistance range: 0.1R to 100M  
 Resistance tolerance: 0.5 % to 10 %  
 Power dissipation: Pn: 50 mW to 2 W  
 Temperature coefficient: K: 100 ppm/°C  
 L: 200 ppm/°C  
 M: 300 ppm/°C

**MECHANICAL SPECIFICATIONS**

Substrate: Alumina  
 Technology: Thick film (Ruthenium oxyde)  
 Protection: Epoxy coating  
 Terminations: **B (W/A)**: SnPb over nickel barrier for solder reflow  
**N (W/A)**: SnAg over nickel barrier for solder reflow  
**F (Flip Chip)**: SnAg over nickel barrier for solder reflow  
**W (one face) and G (W/A) type**: gold over nickel barrier for other applications

**CLIMATIC SPECIFICATIONS**

Operating temp. range: - 55 °C to + 155 °C

**BEST TOL. AND TCR VERSUS OHMIC VALUE (1)**

TIGHTEST TOLERANCE	OHMIC VALUES	BEST TCR ppm/°C
0.5 % (D)	10 Ω < R < 5M	100 (K)
1 % (F)	5 Ω < R < 10M	100 (K)
2 % (G)	1 Ω < R < R max.	200 (L)
5 % (J)	0.1 Ω < R < R max.	200 (L)
10 % (K)	0.1 Ω < R < R max.	300 (M)

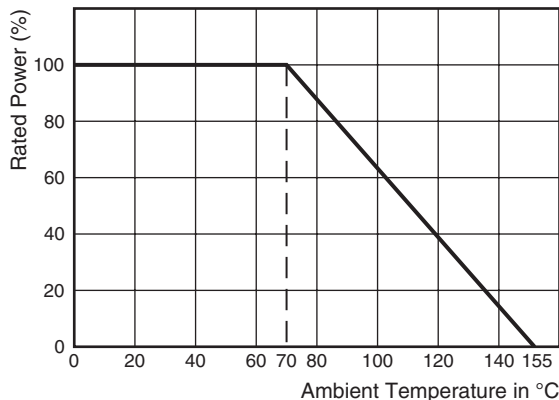
Note:

(1) Improved performance on request

**CHIPS FOR HIGH FREQUENCY APPLICATIONS**

The HF performance of flip chip and W/A types can be improved on request. Please ask for HCHP or CHP with a dedicated release number (R..)

**POWER DERATING CURVE**



**PACKAGING**

Waffle-pack or tape and reel when specified

SIZE	NUMBER OF PIECES PER PACKAGE		TAPE WIDTH
	WAFFLE PACK	TAPE AND REEL	
		MIN.	MAX.
0502	100	100	4000
0505			
0603			
0805			
1005	140	100	4000
1206			
1505	60	1000	8 mm (2)
2010			
1010	100	1000	8 mm (2)
2208	60		8 mm (2)
1020	60	1000	8 mm (2)
2512	45		8 mm (2)

Note:

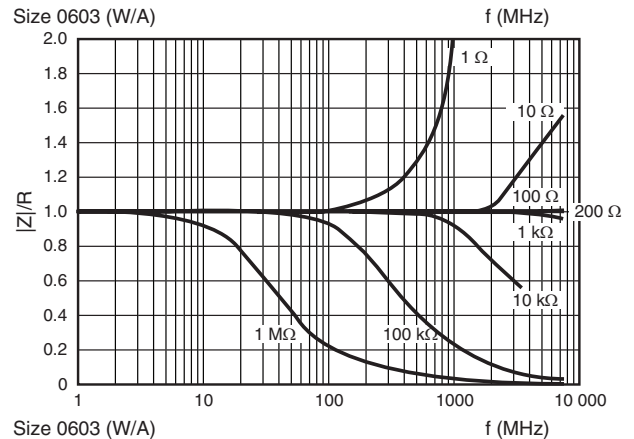
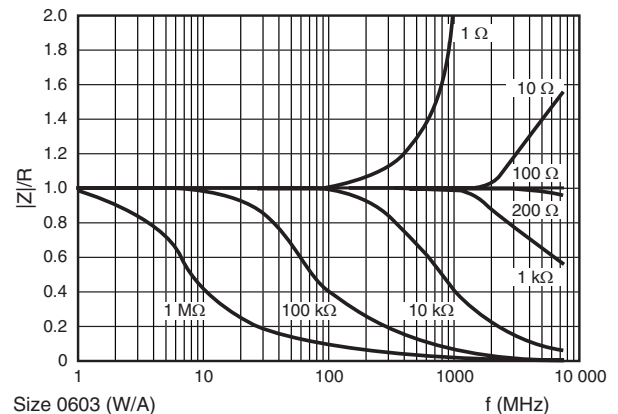
(2) 12 mm on request

**MARKING**

(On request with premium, for size higher than 1206) (4 digit code,) the first three digits are significant figures and the last digit specifies the number of zero's to follow. R designates decimal point.

10R0 = 10 Ω  
 3901 = 3900 Ω  
 1004 = 1 MΩ

**TYPICAL HF PERFORMANCE OF HCHP**



## High Stability Resistor Chips ( < 0.25 % at Pn at 70 °C during 1000 h ) Thick Film Technology

PERFORMANCE			
TESTS	CONDITIONS	REQUIREMENTS	TYPICAL VALUES AND DRIFTS
Termination adhesion	5N for 10 s	± (0.25 % + 0.05 Ω)	< ± 0.1 %
Resistance to solder heat	immersion 10 s in Sn/Pb 60/40 at + 260 °C	± (0.25 % + 0.05 Ω)	< ± 0.1 %
Rapid temperature change	5 cycles - 55 °C                      + 155 °C	± (0.25 % + 0.05 Ω)	< ± 0.1 %
Climatic sequence	Phase A dry heat Phase B damp heat Phase C cold - 55 °C Phase D damp gheat 5 cycles	± (1 % + 0.05 Ω)	< ± 0.2 %
Humidity (steady state)	56 days	± (1 % + 0.05 Ω)	< ± 0.2 %
Short time overload	6.25 Pn for 2 s	± (0.25 % + 0.05 Ω)	< ± 0.1 %
Load life	1000 h at rated power 90'/30' at + 70 °C	1000 h ± (1 % + 0.05 Ω)	1000 h    2000 h    10 000 h < 0.25 %   < 0.5 %   < 1 %

GLOBAL PART NUMBER INFORMATION																	
New Global Part Numbering: <b>CHP0805K1001FBT55</b> (preferred part number format)																	
C	H	P		0	8	0	5	K	1	0	0	1	F	B	T	5	5
GLOBAL MODEL	SIZE	TCR	VALUE	TOLERANCE	TERMINATION	TAPE	OPTION										
<b>CHP</b> <b>HCHP</b> (3 or 4 digits)	<b>0502</b> <b>0505</b> <b>0603</b> <b>0805</b> <b>0705</b> <b>1005</b> <b>1206</b> <b>1505</b> <b>2010</b> <b>1020</b> <b>1010</b> <b>2208</b> <b>2512</b>	<b>K</b> = 100 ppm <b>L</b> = 200 ppm <b>M</b> = 300 ppm	The first 3 digits are significant figures and the last digit specifies the number of zeros to follow. R designates decimal point  10R0 = 10 Ω 3901 = 3900 Ω 1004 = 1 MΩ	<b>D</b> = ± 0.5 % <b>F</b> = ± 1 % <b>G</b> = ± 2 % <b>J</b> = ± 5 %	<b>B</b> : SnPb over nickel barrier <b>N</b> : SnAg over nickel barrier <b>F</b> : SnAg over nickel barrier (one face) <b>G</b> : Gold over nickel barrier <b>W</b> : Gold over nickel barrier (one face)		Leave blank if no option										
								<b>B</b> : Lead bearing version <b>N and G</b> : Lead (Pb)-free/RoHS version									
Historical Part Number example: <b>CHP 0805 100 ppm 1K 1% B TR R0055</b> (will continue to be accepted)																	
<b>CHP</b>	<b>0805</b>	<b>100 ppm</b>	<b>1K</b>	<b>1 %</b>	<b>B</b>	<b>TR</b>	<b>R0055</b>	<b>e2</b>									
HISTORICAL MODEL	SIZE	TCR	VALUE	TOLERANCE	TERMINATION	TAPE	OPTION	RoHS									
<b>CHP</b> <b>HCHP</b> (3 or 4 digits)	<b>0502</b> <b>0505</b> <b>0603</b> <b>0805</b> <b>0705</b> <b>1005</b> <b>1206</b> <b>1505</b> <b>2010</b> <b>1020</b> <b>1010</b> <b>2208</b> <b>2512</b>	in clear	in clear	in clear	<b>B</b> : SnPb over nickel barrier <b>N</b> : SnAg over nickel barrier <b>F</b> : SnAg over nickel barrier (one face) <b>G</b> : Gold over nickel barrier <b>W</b> : Gold over nickel barrier (one face)  <b>B</b> : Lead bearing version <b>N and G</b> : Lead (Pb)-free/RoHS version		Leave blank if no option	e2: tin/silver e4: gold blank: SnPb									

## Ultra Low Value Thin Film Resistors



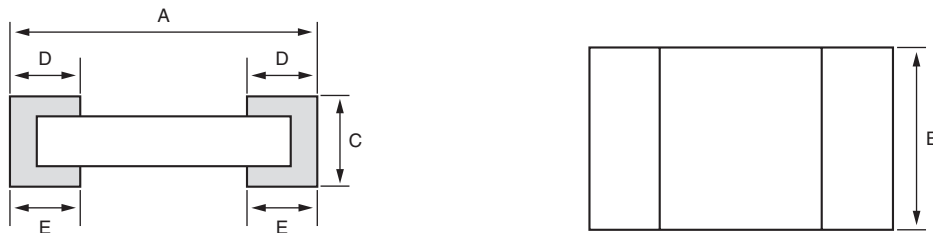
### FEATURES

- NiCr + Ta<sub>2</sub>O<sub>5</sub> resistive layer
- Pre-soldered or gold terminations
- No inductance for high frequency applications
- Alumina substrates for high power handling capability
- Resistance range: 0.1 Ω to 10 Ω
- TCR: down to ± 50 ppm/°C
- Power rating: up to 1 W at + 70 °C


 Available  
**RoHS\***  
 COMPLIANT

With extremely low resistance and high power capabilities, these ultra low value resistors are available with solderable or weldable terminations.

### DIMENSIONS in millimeters [inches]



CASE SIZE	DIMENSION				POWER RATING mW	LIMITING ELEMENT VOLTAGE V	RESISTANCE RANGE
	A	B	C	D/E			
	MAX. TOL. + 0.64 [+ 0.025] MIN. TOL. - 0.13 [- 0.005]	MAX. TOL. + 0.26 [+ 0.010] MIN. TOL. - 0.13 [- 0.005]	MAX. TOL. + 0.64 [+ 0.025] MIN. TOL. - 0.13 [- 0.005]	MAX. TOL. + 0.13 [+ 0.005] MIN. TOL. - 0.13 [- 0.005]			
0505	1.27 [0.050]	1.27 [0.050]	0.38 [0.015]	0.38 [0.015]	125	50	0.1 Ω.. 10 Ω
0603	1.52 [0.060]	0.75 [0.030]	0.38 [0.015]	0.38 [0.015]	125	50	0.1 Ω.. 10 Ω
0705 0805	1.91 [0.075]	1.27 [0.050]	0.38 [0.015]	0.38 [0.015]	200	50	0.1 Ω.. 10 Ω
1005	2.54 [0.100]	1.27 [0.050]	0.38 [0.015]	0.38 [0.015]	250	50	0.1 Ω.. 10 Ω
1206	3.20 [0.126]	1.60 [0.063]	0.38 [0.015]	0.38 [0.015]	330	50	0.1 Ω.. 10 Ω
1505	3.81 [0.150]	1.27 [0.050]	0.38 [0.015]	0.38 [0.015]	500	50	0.1 Ω.. 10 Ω
2010	5.08 [0.200]	2.54 [0.100]	0.38 [0.015]	0.38 [0.015]	1000	50	0.1 Ω.. 10 Ω

\* Pb containing terminations are not RoHS compliant, exemptions may apply

**ELECTRICAL SPECIFICATIONS**

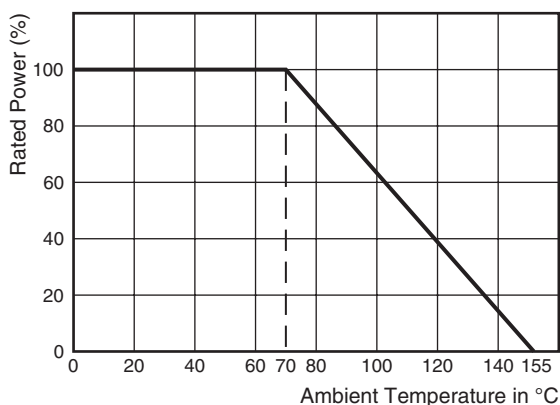
Resistance range: 0.1  $\Omega$  to 10  $\Omega$   
 Resistance tolerance:  $\pm 1\%$  to  $\pm 20\%$   
 Power dissipation: 0.125 mW to 1 W at + 70 °C  
 Temperature coefficient: down to  $\pm 50$  ppm/°C

**MECHANICAL SPECIFICATIONS**

Substrate: Alumina  
 Resistive layer: NiCr + Ta<sub>2</sub>O<sub>5</sub>  
 Coating: Silicone  
 Terminations: Solderable  
**B type:** SnPb over nickel barrier  
**N type:** SnAg over nickel barrier  
**G type:** gold over nickel barrier

**CLIMATIC SPECIFICATIONS**

Operating temp. range: - 55 °C to + 155 °C

**POWER DERATING CURVE****TOLERANCE AND TCR VERSUS OHMIC VALUE**

MINIMUM TOLERANCE	OHMIC VALUES	BEST TCR ppm/°C
$\pm 20\%$	0.1 $\Omega$	$\pm 300$
$\pm 10\%$	0.25 $\Omega$	$\pm 300$
$\pm 5\%$	0.5 $\Omega$	$\pm 100$
$\pm 3\%$	1 $\Omega$	$\pm 100$
$\pm 2\%$	2 $\Omega$	$\pm 100$
$\pm 1\%$	5 $\Omega$	$\pm 50$

**PACKAGING**

Several types of packaging are proposed: tube, waffle-pack and tape and reel.

SIZE	NUMBER OF PIECES PER PACKAGE			TAPE WIDTH	
	TUBE	WAFFLE PACK 2" x 2"	TAPE AND REEL MIN. MAX.		
0505	500	100	100	4000	8 mm
0603					
0805					
0705					
1005	250	140	100	2000	12 mm
1206		00			
1505		00			
2010	100		100	2000	12 mm

**PERFORMANCE**

TESTS	CONDITIONS	VALUES AND DRIFT	
		MIL-R-55342 REQUIREMENTS	TYPICAL PERFORMANCES
Thermal shock	MIL-R-55342 C MIL-STD-702-Method 107	$\pm 0.25\%$	$\pm 0.02\%$
Short time overload	MIL-R-55342 C PARA 3.10.4.7.5	$\pm 0.10\%$	$\pm 0.01\%$
Low temperature operation	MIL-R-55342 C PARA 3.9 and 4.7.4	$\pm 0.25\%$	$\pm 0.01\%$
Resistance to solder heat	MIL-R-55342 C PARA 3.12, 4.7.7, 4.7.1.2	$\pm 0.25\%$	$\pm 0.04\%$
Moisture resistance	MIL-R-55342 C PARA 3.13 and 4.7.8 MIL-STD-202-Method 106	$\pm 0.40\%$	$\pm 0.01\%$
High temperature	MIL-R-55342 C PARA 3.11 and 4.7.6	$\pm 0.20\%$	$\pm 0.075\%$
Load life	MIL-R-55342 C 2000 h Pn at 70 °C MIL-STD-202-Method 108	$\pm 0.50\%$	$\pm 0.15\%$



Ultra Low Value  
Thin Film Resistors

Vishay Sfernice

**GLOBAL PART NUMBER INFORMATION**

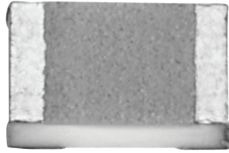
New Global Part Numbering: L0805K1R00GBT0028

L	0	8	0	5	K	1	R	0	0	G	B	T	0	0	2	8	
GLOBAL MODEL	SIZE				TCR	VALUE			TOLERANCE	TERMINATION	TAPE	SPECIAL					
L	0505 0603 0705 0805 1005 1206 1505 2010				H = ± 50 ppm K = ± 100 ppm L = ± 200 ppm M = ± 300 ppm	R designated decimal point			F = ± 1 % G = ± 2 % H = ± 3 % J = ± 5 % K = ± 10 % M = ± 20 %	B: SnPb over nickel barrier N: SnAg over nickel barrier G: gold over nickel barrier			B: Lead bearing version N and G: Lead (Pb)-free/ RoHS version				

Historical Part Number example: L 0805 K 1R00 2 % B T R0028

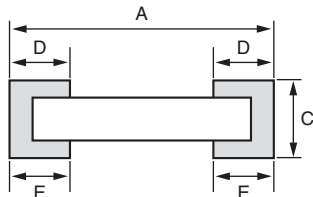


## High Precision Wraparound Thin Film Chip Resistors



For low noise and precision applications, superior stability, low temperature coefficient of resistance, and low voltage coefficient, VISHAY SFERNICE's proven precision thin film wraparound resistors exceed requirements of MIL-PRF-55342G characteristics  $Y \pm 10 \text{ ppm}/^\circ\text{C}$  (-55 °C; +155 °C) down to  $\pm 5 \text{ ppm}/^\circ\text{C}$  (-25 °C; +85 °C).

### DIMENSIONS in millimeters [inches]



### FEATURES

- Load life stability at  $\pm 70 \text{ }^\circ\text{C}$  for 2000 h:  
0.1 % under Pn/0.05 % under Pd
- Low temperature coefficient down to **5 ppm/°C**  
(-25 °C; +85 °C)
- Very low noise < 35 dB and voltage coefficient  
< 0.01 ppm/V
- Resistance range: 10  $\Omega$  to 3 M $\Omega$  depending on size
- Extended ohmic value range (see table)
- Tolerances to  **$\pm 0.01 \%$**
- In lot tracking  $\leq 5 \text{ ppm}/^\circ\text{C}$
- Termination: thin film technology
- Gold plated or pre-tinned terminations over nickel barrier
- Short circuits (jumpers)  $r < 50 \text{ mR}$ ,  $I < 2 \text{ A}$



RoHS\*  
COMPLIANT

CASE SIZE	DIMENSION				POWER RATING mW		LIMITING ELEMENT VOLTAGE V	RESISTANCE RANGE (see below for extended $\Omega$ range)
	A	B	C	D/E	Pn <sup>(1)</sup>	Pd <sup>(1)</sup>		
	MAX. TOL. + 0.152 [+ 0.006] MIN. TOL. - 0.152 [- 0.006]	MAX. TOL. + 0.127 [+ 0.005] MIN. TOL. - 0.127 [- 0.005]	MAX. TOL. + 0.127 [+ 0.005] MIN. TOL. - 0.127 [- 0.005]	MAX. TOL. + 0.13 [+ 0.005] MIN. TOL. - 0.13 [- 0.005]				
0402	1.00 [0.040]	0.60 [0.023]	0.5 [0.02]	0.38 [0.015]	63	40	50	10 $\Omega$ to 100 k $\Omega$
0505	1.35 [0.053]	1.27 [0.050]	0.5 [0.02]	0.38 [0.015]	125	50	50	10 $\Omega$ to 260 k $\Omega$
0603	1.52 [0.060]	0.75 [0.030]	0.5 [0.02]	0.38 [0.015]	125	100	75	10 $\Omega$ to 332 k $\Omega$
0705/ 0805	1.91 [0.075]	1.27 [0.050]	0.5 [0.02]	0.38 [0.015]	200	125	150	10 $\Omega$ to 511 k $\Omega$
1005	2.54 [0.100]	1.27 [0.050]	0.5 [0.02]	0.38 [0.015]	250	125	75	10 $\Omega$ to 500 k $\Omega$
1206	3.06 [0.120]	1.60 [0.063]	0.5 [0.02]	0.38 [0.015]	330	250	200	10 $\Omega$ to 1.5 M $\Omega$
1505	3.81 [0.150]	1.32 [0.054]	0.5 [0.02]	0.38 [0.015]	350	175	75	10 $\Omega$ to 500 k $\Omega$
2010	5.08 [0.200]	2.54 [0.100]	0.5 [0.02]	0.38 [0.015]	1000	500	300	10 $\Omega$ to 3 M $\Omega$

#### Note:

<sup>(1)</sup> Pn = nominal power - Pd = derated power intended to improve stability

EXTENDED OHMIC VALUE RANGE FOR HIGH PRECISION WRAPAROUND THIN FILM CHIP RESISTORS			
SIZE	TIGHTEST TOLERANCE %	EXTENDED OHMIC VALUE RANGE	BEST TCR (ppm/°C)
0402	0.1	> 100K - 1M	50
0505	0.05	260K/300K	25
	0.1	300K/2.5M	50
0603	0.05	332K/500K	25
	0.1	500K/2.5M	50
0705/ 0805	0.05	511K - 750K	25
	0.1	750K - 5M	50
1206	0.05	1.5M - 2M	25
	0.1	2M - 15M	50
2010	0.05	3M - 6M	25
	0.25	6M - 50M	50

#### Note:

• Using special NiCr and CrSi alloys we are able to extend the ohmic value range as indicated above.

\* Pb containing terminations are not RoHS compliant, exemptions may apply



**ELECTRICAL SPECIFICATIONS**

**Resistance range:** 10 Ω to 3 MΩ  
**Resistance tolerance:** ± 0.1 % to ± 5 %  
 ± 0.01 % to ± 0.05 % on Y type  
**Power dissipation:** Pn: 50 mW to 1 W  
 Pd: 37 mW to 500 mW  
 on tolerance tighter than ± 0.05 %  
**Temperature coefficient:** see table below

**MECHANICAL SPECIFICATIONS**

**Substrate:** Alumina  
**Technology:** Thin film  
**Film:** Nickel chromium with mineral passivation or CrSi  
**Protection:** Silicon  
**Terminations:** B type: SnPb over nickel barrier for solder reflow  
 N type: SnAg over nickel barrier  
 G type: gold over nickel barrier for other applications

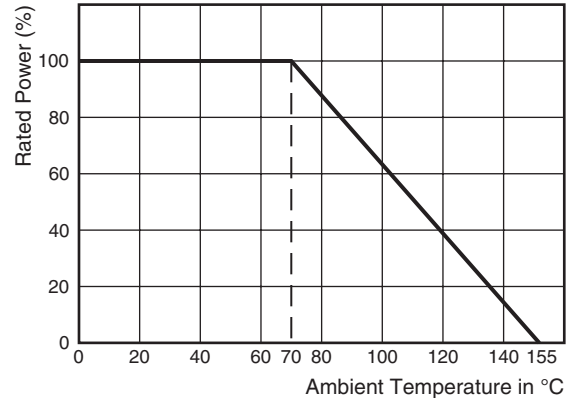
**CLIMATIC SPECIFICATIONS**

**Operating temp. range:** - 55 °C to + 155 °C  
 For temperature up to 200 °C, please consult factory

TEMPERATURE COEFFICIENT		
TCR	CODE	FILM
± 5 ppm/°C (1)	Z	NiCr
± 10 ppm/°C (2)	Y	NiCr
± 25 ppm/°C	E	NiCr
± 50 ppm/°C	H	NiCr or CrSi
± 100 ppm/°C	K	NiCr or CrSi

**Notes:**  
 (1) Reduced operating range: 0 °C; + 70 °C option available for (- 25 °C; + 85 °C)  
 (2) R > 50 Ω on request for lower values

**POWER DERATING CURVE**



**PACKAGING**

Several types of packaging are available: tube, waffle-pack, and tape and reel.

SIZE	NUMBER OF PIECES PER PACKAGE		TAPE WIDTH	
	WAFFLE PACK 2" x 2"	TAPE AND REEL		
		MIN.		MAX.
0402	100	100	4000	8 mm
0505				
0603				
0805 0705				
1005	140	100	2000	8 mm (3)
1206				
1505	60	100	2000	8 mm (3)
2010				

**Note:**  
 (3) 12 mm on request

BEST TOL. AND TCR V RESISTANCE VALUE			
TIGHTEST TOLERANCE	CODE	OHMIC VALUES	TCR ppm/°C
± 0.25 %	C	R > 10 Ω	± 25
± 0.10 %	B	R > 25 Ω	± 20
± 0.05 %	W	R > 39 Ω	± 10 ± 5 (4)
± 0.02 %	P	R > 100 Ω	
± 0.01 %	L	R > 250 Ω	

**Note:**  
 (4) Reduced operating range: 0 °C; + 70 °C option available for (- 25 °C; + 85 °C)



PERFORMANCE					
TESTS	CONDITIONS	Ta <sub>2</sub> N		DRIFTS	
		MIL-PRF-55342G requirements	Typical performances	MIL-PRF-55342G	Typical performances
Thermal shock	MIL-PRF-55342G MIL-STD-202 F-Method 107 F	± 0.25 %	± 0.02 %	± 0.05 %	± 0.02 %
Short time overload	MIL-PRF-55342G PARA 3.10.4.7.5	± 0.10 %	± 0.01 %	± 0.05 %	± 0.01 %
Low temperature operation	MIL-PRF-55342G PARA 3.9 and 4.7.4	± 0.25 %	± 0.01 %	± 0.05 %	± 0.01 %
Resistance to solder heat	MIL-PRF-55342G PARA 3.12, 4.7.7, 4.7.1.2	± 0.25 %	± 0.04 %	± 0.05 %	± 0.03 %
Moisture resistance	MIL-PRF-55342G PARA 3.13 and 4.7.8 MIL-STD-202 F-Method 106 E	± 0.40 %	± 0.01 %	± 0.10 %	± 0.01 %
High temperature	MIL-PRF-55342G PARA 3.11 and 4.7.6	± 0.20 %	± 0.075 %	± 0.05 %	± 0.05 %
Load life	MIL-PRF-55342G 2000 h Pn at 70 °C MIL-STD-202 F-Method 108 A	± 0.50 %	± 0.15 %	± 0.5 %	± 0.10 % <sup>(1)</sup>

Note:

<sup>(1)</sup> 0.05 % under Pd

**GLOBAL PART NUMBER INFORMATION**

New Global Part Numbering: P0505Y1003BBT0933

P 0 5 0 5 Y 1 0 0 3 B B T 0 9 3 3

GLOBAL MODEL	SIZE	TCR	VALUE	TOLERANCE	TERMINATION	PACKAGING	OPTION
P	0402 0505 0603 0705 0805 1005 1206 1505 2010	K = ± 100 ppm/°C H = ± 50 ppm/°C E = ± 25 ppm/°C Y = ± 10 ppm/°C X = Jumper Z = ± 5 ppm (0.70 °C)	The first three digits (2 digits are enough for tolerance G and J) are significant figures and the last digit specifies the number of zeros to follow, R designates decimal point  10R0 = 10 Ω 3901 = 3900 Ω 1004 = 1 MΩ 0R00 = Jumper	L = ± 0.01 % P = ± 0.02 % W = ± 0.05 % B = ± 0.1 % C = ± 0.25 % D = ± 0.5 % F = ± 1 % G = ± 2 % J = ± 5 % S = Special X = Jumper	B: SnPb over nickel barrier N: SnAg over nickel barrier G: Gold over nickel barrier	blank = Waffle Pack T = Tape	Leave blank if no option

B: Lead bearing version  
N and G: Lead (Pb)-free/RoHS version

Historical Part Number example: P 0505 Y 1003 B B TR R0933 e2

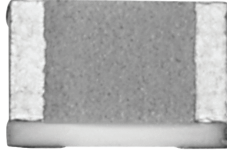
P	0505	Y	1003	B	B	TR	R0933	e2
HISTORICAL MODEL	SIZE	TCR	VALUE	TOLERANCE	TERMINATION	PACKAGING	OPTION	RoHS
P	0402 0505 0603 0705 0805 1005 1206 1505 2010	K = ± 100 ppm/°C H = ± 50 ppm/°C E = ± 25 ppm/°C Y = ± 10 ppm/°C X = Jumper Z = ± 5 ppm (0.70 °C)	The first three digits (2 digits are enough for tolerance G and J) are significant figures and the last digit specifies the number of zeros to follow, R designates decimal point  10R0 = 10 Ω 3901 = 3900 Ω 1004 = 1 MΩ 0R00 = Jumper	L = ± 0.01 % P = ± 0.02 % W = ± 0.05 % B = ± 0.1 % C = ± 0.25 % D = ± 0.5 % F = ± 1 % G = ± 2 % J = ± 5 % S = Special X = Jumper	B: SnPb over nickel barrier N: SnAg over nickel barrier G: Gold over nickel barrier	blank = Waffle Pack TR = Tape	Leave blank if no option	e2: tin/silver e4: gold blank: SnPb

B: Lead bearing version  
N and G: Lead (Pb)-free/RoHS version

Note:

• Chips ready to be trimmed available. (P<sub>trim</sub>) - Please consult Sfernice.

# ESCC (e) 4001/023 Qualified High Precision (5 ppm, 0.01 %), High Stability (0.02 %) Thin Film Chip Resistors

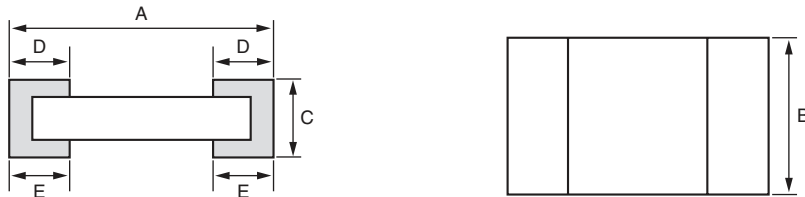


These HiRel components are ideal for low noise and precision applications, superior stability, low temperature coefficient of resistance, and low voltage coefficient, VISHAY SFERNICE's precision thin film wraparound resistors exceed requirements of MIL-PRF-55342G characteristics Y ( $\pm 10$  ppm/ $^{\circ}$ C).

### FEATURES

- Load life stability at  $\pm 70$   $^{\circ}$ C for 2000 h: 0.15 % under Pn
- Low temperature coefficient down to  $\pm 10$  ppm/ $^{\circ}$ C
- Very low noise (< 35 dB) and voltage coefficient (< 0.01 ppm/V)
- Resistance range: 50  $\Omega$  to 1 M $\Omega$  (depending on size)
- Laser trimmed tolerances to  $\pm 0.01$  %
- TCR in lot tracking  $\leq 5$  ppm/ $^{\circ}$ C
- Termination: thin film technology
- Sn62 terminations over nickel barrier
- ESCC 4001 Issue 1 (generic spec)
- ESCC 4001/023 Issue 2 (detailed spec)

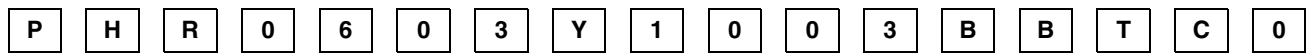
### DIMENSIONS



CASE SIZE	DIMENSIONS in millimeters			
	A MAX. TOL. + 0.64 MIN. TOL. - 0.13	B MAX. TOL. + 0.26 MIN. TOL. - 0.13	C MAX. TOL. + 0.64 MIN. TOL. - 0.13	D/E MAX. TOL. + 0.13 MIN. TOL. - 0.13
0603	1.52	0.75	0.38	0.38
0805	1.91	1.27	0.38	0.38
1206	3.0	1.60	0.38	0.38

### GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: PHR0603Y1003BBTC0 (preferred part number format)



TYPE	TCR	OHMIC VALUE	TOLERANCE	TERMINATION	PACKAGING	LEVEL (1)	LAT (2)
PHR0603 PHR0805 PHR1206	Y = $\pm 10$ ppm/ $^{\circ}$ C (Digit 1) Z = $\pm 5$ ppm/ $^{\circ}$ C (Digit 0) E = $\pm 25$ ppm/ $^{\circ}$ C (Digit 2)	The first three digits (2 digits are enough for tolerance G and J) are significant figures and the last digit specifies the number of zero to follow. R designates decimal point. Example: 10R0 = 10 $\Omega$ 3901 = 3900 $\Omega$ 1004 = 1 M $\Omega$	L = $\pm 0.01$ % P = $\pm 0.02$ % W = $\pm 0.05$ % B = $\pm 0.10$ %	B: Sn62 over nickel barrier	T: for Tape and Reel (3) (Leave blank for waffle pack)	C B	0 = No Lat 1 = Lat1 2 = Lat2 3 = Lat3

Historical Part Number example: PHR 06 03 Y 1003 BB T (will continue to be accepted)

#### Notes:

- (1) Level C is our standard level. Serialization, which is compulsory on Level B, is very difficult to implement. For Level B, 13 extra pieces shall be ordered for destructive TCR measurements.
- (2) Do not forget to order extra parts for Lat1, 2 or 3, respectively 31, 25 or 10. See our price list for Lat charges.
- (3) Tape and reel not available for level B.



Vishay Sfernice ESCC (e) 4001/023 Qualified High Precision (5 ppm, 0.01 %), High Stability (0.02 %) Thin Film Chip Resistors

GLOBAL PART NUMBER INFORMATION															
ESCC Code <sup>(1)</sup>															
4	0	0	1	0	2	3	0	1	C	1	0	0	3	B	1
ESCC SPEC		VARIANT			LEVEL		OHMIC VALUE			TOLERANCE			TCR		
4001023		0603 = 01 or 05 0805 = 02 or 06 1206 = 03 or 07 2010 = 04 or 08			Level C Level B		The first three digits are significant figures and the last digit specifies the number of zero to follow. R designates decimal point. Example: 10R0 = 10 Ω 3901 = 3900 Ω 1004 = 1 MΩ			L = ± 0.01 % P = ± 0.02 % W = ± 0.05 % B = ± 0.10 %			Y = ± 10 ppm/°C (Digit 1) Z = ± 5 ppm/°C (Digit 0) E = ± 25 ppm/°C (Digit 2)		

**Note:**

<sup>(1)</sup> Variants 04, 05, 06, 07 and 08 are not qualified but can be produced "In accordance to ESCC 4001/023"

STANDARD ELECTRICAL SPECIFICATIONS			
VISHAY SFERNICE DESIGNATION	PHR 0603 (e)	PHR 0805 (e)	PHR 1206 (e)
ESA specification applied	ESCC 4001/023		
Variant number	01 - 05	02 - 06	03 - 07
Power rating at + 70 °C (P <sub>n</sub> )	0.1 W	0.125 W	0.25 W
Limiting element voltage (UL)	35 V	75 V	100 V
Ohmic value range	Min. 50 Ω Max. 200 kΩ	Min. 50 Ω Max. 250 kΩ	Min. 50 Ω Max. 1 MΩ
Insulation voltage (U <sub>i</sub> )	70 V	150 V	200 V
Temperature coefficient	± 10 ppm/°C; ± 25 ppm/°C ± 5 ppm/°C (20 to 70 °C)		
Tolerance	± 0.01 % (R > 250 Ω), ± 0.02 % (R > 100 Ω), ± 0.05 %, ± 0.1 %		
Temperature range	- 55 °C/+ 155 °C		
Soldering temperature (T <sub>sol</sub> )	260 °C, immersion 10 s		

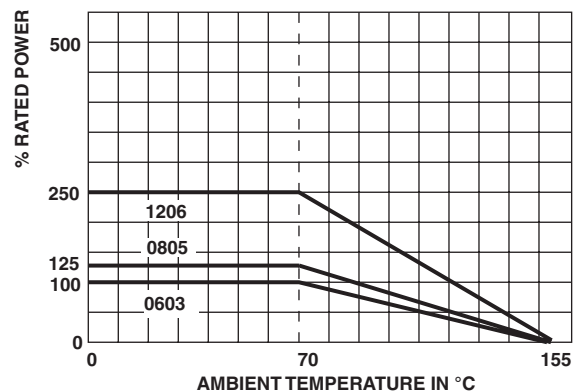
MECHANICAL SPECIFICATIONS	
Substrate material	Alumina
Technology	Thin Film
Film	Nickel Chromium with mineral passivation
Protection	Epoxy and Silicon
Terminations	<b>B type:</b> Sn62 over nickel barrier for solder reflow

PACKAGING				
Two types of packaging are available: waffle-pack and tape and reel.				
SIZE	NUMBER OF PIECES PER PACKAGE			TAPE WIDTH
	WAFFLE PACK 2" x 2"	TAPE AND REEL		
			MIN.	MAX.
0603	100	100	4000	8 mm
0805				
1206				

**Notes:**

Tape and reel not available for Level B

**POWER DERATING CURVE**



**EXTENDED FEATURES**

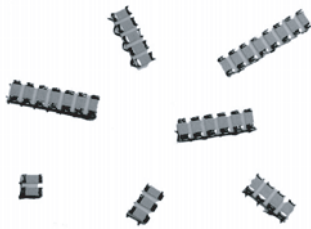
You may consult VISHAY SFERNICE for chip sizes, ohmic values and tolerances outside of the qualified range.



ESCC (e) 4001/023 Qualified High Precision (5 ppm, 0.01 %), Vishay Sfernice High Stability (0.02 %) Thin Film Chip Resistors

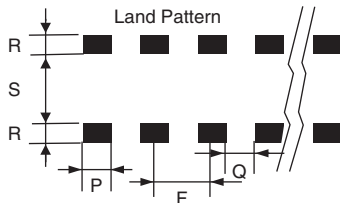
PERFORMANCE				
TEST	CONDITIONS	REQUIREMENTS		TYPICAL
		ESA/SCC 4001/023	MIL-PRF-55342G	
Short time overload	$U = \sqrt{6.25 \times P_n \times R_n / 2s}$ $U_{max} < 2 UL$	± 0.05 % Rn + 0.05 Ω	0.10 %	± 0.01 %
Rapid temperature change	- 55 °C/+ 155 °C 5 cycles CEI 66-2-14 Test Na	± 0.05 % Rn + 0.05 Ω	0.1 % (for 100 cycles)	± 0.01 % ± 0.015 % (for 500 cycles)
Soldering (thermal shock)	260 °C/10 s CEI 68-2-20 A Test T6 (met. 1A)	± 0.05 % Rn + 0.05 Ω	-	± 0.005 %
Terminal strength: adhesion bend strength of end plated facing	CEI 115-1 Clause 4.32 CEI 115-1 Clause 4.33	± 0.05 % Rn + 0.05 Ω	-	± 0.01 %
Climatic sequence	CEI 67-2-1/CEI 68-2-2 CEI 67-2-13/CEI 68-2-30	± 0.10 % Rn + 0.05 Ω	-	± 0.02 % Insulation resistance > 1 GΩ
Load life	2000 h Pn at + 70 °C 90'/30' cycle	± 0.15 % Rn + 0.05 Ω	0.5 %	± 0.02 % Insulation resistance > 1 GΩ
High temperature exposure	2000 h Pn at + 155 °C CEI 68-2-20A Test B	± 0.15 % Rn + 0.05 Ω	± 0.10 % (duration 100 h)	± 0.05 % Insulation resistance > 1 GΩ

## High Precision Resistor Arrays



PRA arrays can be used in most applications requiring a matched pair (or set) of resistor elements. The networks provide 1 ppm/°C TCR tracking, a ratio tolerance as tight as 0.01 % and outstanding stability. They are available in 1 mm, 1.35 mm and 1.82 mm pitch.

### DIMENSIONS



DIM.	PRA100		PRA 135		PRA 182	
	mm	mil	mm	mil	mm	mil
A	1.6 <sup>+0.2</sup> / <sub>-0.1</sub>	63	1.85 <sup>+0.2</sup> / <sub>-0.1</sub>	72	3.0 <sup>+0.2</sup> / <sub>-0.1</sub>	118
B	0.4 <sup>+0.2</sup> / <sub>-0.2</sub>	16	0.4 <sup>+0.2</sup> / <sub>-0.2</sub>	16	0.4 <sup>+0.2</sup> / <sub>-0.2</sub>	16
C	0.65 <sup>+0.15</sup> / <sub>-0.15</sub>	25.5	1.05 <sup>+0.15</sup> / <sub>-0.15</sub>	41	1.3 <sup>+0.35</sup> / <sub>-0.15</sub>	51
D	0.25	10	0.25	10	0.25	10
E <sup>(1)</sup>	E = (N F) ± 0.2 mm		E = (N x F) ± 8 mil			
F	1	40	1.35	53.1	1.82	72
G	0.38 <sup>+0.2</sup> / <sub>0</sub>	15	0.38 <sup>+0.2</sup> / <sub>0</sub>	15	0.38 <sup>+0.2</sup> / <sub>0</sub>	15
P	0.7	27.5	1.05	41.3	1.52	59.8
Q	0.3	12	0.3	12	0.3	12
R	1	40	1	40	1	40
S	0.6	23.5	0.8	31.5	1.8	70.8

**Notes:**

<sup>(1)</sup> E depends on number of resistors

\* Pb containing terminations are not RoHS compliant, exemptions may apply

### FEATURES

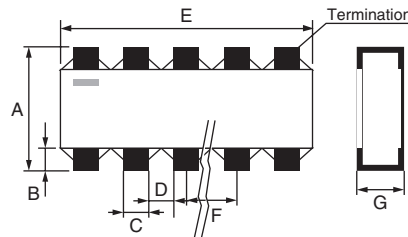
- High stability passivated nichrome resistive layer 0.02 % on ratio, 1000 h at Pn at + 70 °C
- Tight TCR (10 ppm/°C) and TCR tracking (to 1 ppm/°C)
- Very low noise < 35 dB and voltage coefficient < 0.01 ppm/V
- Ratio tolerance to 0.01 % (R ≥ 200R)
- Pre-tinned terminations over nickel barrier
- Lead (Pb)-free available



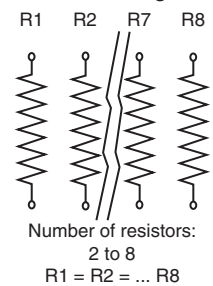
### TYPICAL PERFORMANCE

	ABS	TRACKING
TCR	10 ppm/°C	2 ppm/°C
	ABS	RATIO
TOL	0.1 %	0.05 %

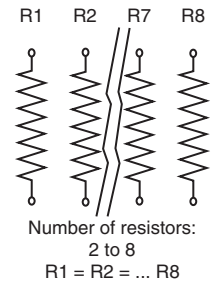
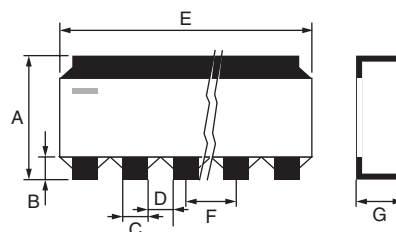
I: Independent resistors



Electrical diagram



C: One common point N resistors





**GLOBAL PART NUMBER INFORMATION**

New Global Part Numbering: P0505Y1003BBT0933

P	R	A	1	0	0	I	4	-	5	K	6	2	B	W	B	T	2	8
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

GLOBAL MODEL	CONFIG.	NUMBERS OF RESISTORS	VALUE	ABS. TOL.	RATIO TOL.	TERMINATION	PACKAGING	OPTION
PRA100 PRA135 PRA182	I: Independent C: Common	2 to 8	Decimal R or K	B = 0.1 % D = 0.5 %	B = 0.1 % W = 0.05 % P = 0.02 % L = 0.01 %	B: SnPb over nickel barrier N: SnAg over nickel barrier G: Gold over nickel barrier	Blank = Waffle Pack T <sup>(1)</sup> = Tape and Reel	Leave blank if no option

B: Lead bearing version  
N and G: Lead (Pb)-free/  
RoHS version

Historical Part Number example: P 0505 Y 1003 B B TR R0933 e2

CNW	1368
GLOBAL MODEL	REFERENCE

Historical Part Number example: P 0505 Y 1003 B B TR R0933 e2

PRA100	I	4	5K62	0.1 %	0.05 %	TR	R0028
HISTORICAL MODEL	CONFIG.	NUMBERS OF RESISTORS	OHMIC VALUE	ABS. TOL.	RATIO TOL.	PACKAGING	OPTION

**Note:**  
(1) Tape and Reel only available for maximum 5 resistors in the network

STANDARD ELECTRICAL SPECIFICATIONS			
TEST		SPECIFICATIONS	CONDITION
Resistance range:	PRA 100	100 Ω to 200 kΩ	
	PRA 135	100 Ω to 300 kΩ	
	PRA 182	100 Ω to 1 MΩ	
Tolerance:	Absolute	± 0.5 % to ± 0.1 %	
	Ratio	0.1 %, 0.05 %, 0.02 %, 0.01 % (R ≥ 200 R)	
TCR:	Absolute	± 10 ppm/°C	- 40 °C + 125 °C
	Ratio	2 ppm/°C (1 ppm/°C on request)	- 40 °C + 125 °C
Power rating:	PRA 100	100 mW per resistor	at + 70 °C
	PRA 135	100 mW per resistor	at + 70 °C
	PRA 182	100 mW per resistor	at + 70 °C
Operating temperature range <sup>(2)</sup>		- 55 °C to + 155 °C	
Noise		≤ - 35 dB	
Voltage coefficient		≤ 0.01 ppm/V	
Limiting voltage:	PRA 100	35 V	
	PRA 135	75 V	
	PRA 182	100 V	

**Note:**  
(2) For temperature up to 200 °C, please consult factory



MECHANICAL SPECIFICATIONS	
Substrate	Alumina
Technology	Thin film
Film	Nickel chromium with mineral passivation
Terminations	<b>B type:</b> SnPb over nickel barrier
	<b>N type:</b> SnAg over nickel barrier
	<b>G type:</b> Gold over nickel barrier

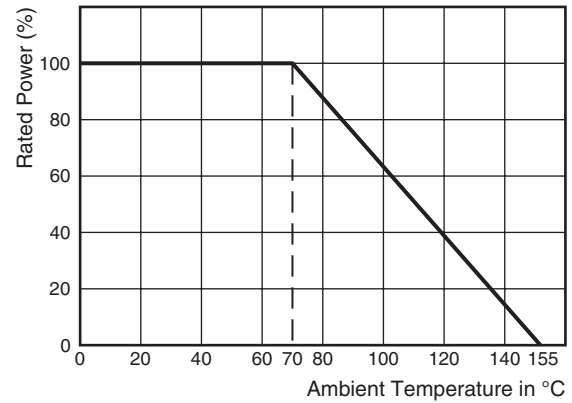
### SPECIAL FEATURES

Resistance values can be different on a given network ( $R_{max}/R_{min}$  as high as 300). Tooling charges might be required depending on the ohmic values in the same network. Please, consult VISHAY SFERNICE for ohmic values, tolerances and also temperature coefficient (e.g.  $\pm 1$  ppm/ $^{\circ}\text{C}$ ) outside the standard range.

### PACKAGING

Several types of packaging are available: waffle-pack and tape and reel.

### POWER RATING



### MARKING

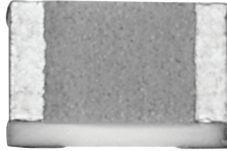
On the primary package, printed information includes VISHAY S.A. trademark series and model, schematic number of resistors, ohmic value, absolute tolerance, ratio tolerance, type of termination: B tinned over nickel barrier.

PERFORMANCE			
TESTS	CONDITIONS CECC REQUIREMENTS	DRIFTS	
		ABSOLUTE PER (Typical Values)	RATIO
Overload	2.5 $U_n/2$ s	0.05 % $R_n$ + 0.05 $\Omega$	0.01 % $R_n$
Climatic sequences	- 55 $^{\circ}\text{C}$ + 155 $^{\circ}\text{C}/5$ moisture cycles	0.1 % $R_n$ + 0.05 $\Omega$	0.01 % $R_n$
Thermal shock	- 55 $^{\circ}\text{C}$ + 155 $^{\circ}\text{C}/5$ cycles 30'	0.05 % $R_n$ + 0.05 $\Omega$	0.01 % $R_n$
Load life	1000 h/ $P_n$ at + 70 $^{\circ}\text{C}$	0.1 % $R_n$ + 0.05 $\Omega$	0.02 % $R_n$
Resistance to solder heat	260 $^{\circ}\text{C}/10$ s	0.05 % $R_n$ + 0.05 $\Omega$	0.01 % $R_n$
Moisture resistance	0.01 $P_n$ at + 40 $^{\circ}\text{C}$ 93 % RH	0.1 % $R_n$ + 0.05 $\Omega$	0.01 % $R_n$
High temperature storage	1000 h/no load at + 155 $^{\circ}\text{C}$	0.1 % $R_n$ + 0.05 $\Omega$	0.02 % $R_n$

**Note:**

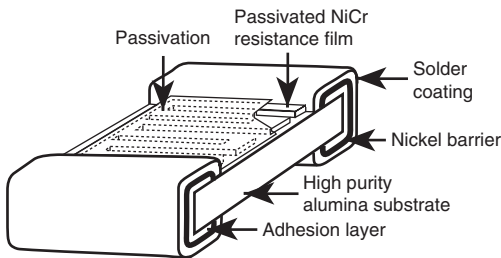
$R_n$ : nominal resistance

# CECC (€) 40401-010 Qualified Thin Film Resistor Chip



Utilizing proven expertise in Thin Film resistors, VISHAY provides a CECC qualified chip with the same reliability and stability found in QPL resistors. These chips are available in a wide range of sizes, values and performance characteristics.

## CONSTRUCTION



## FEATURES

- Nickel barrier for high temperature operating conditions
- Tight TCR < 10 ppm/°C, and in lot tracking < 5 ppm/°C in (- 55 °C, + 155 °C temperature range)
- Very low noise < 35 dB and voltage coefficient 0.1 ppm/V
- Non-inductive
- Laser trimmed down to 0.1 %
- Wraparound resistance less than 0.01 Ω
- Antistatic waffle-pack or tape and reel packaging available
- High stability (0.05 % - 1000 h at Pn at + 70 °C)
- Lead (Pb)-free available


**RoHS\***  
COMPLIANT

## TYPICAL PERFORMANCE

	<b>ABS</b>
<b>TCR</b>	<b>10 ppm/°C</b>
	<b>ABS</b>
<b>TOL.</b>	<b>0.1 %</b>

## STANDARD ELECTRICAL SPECIFICATIONS

TEST	SPECIFICATIONS	CONDITIONS
<b>MODEL</b>	<b>RV €</b>	
<b>Absolute TCR</b>	E: ± 25 ppm/°C Y: ± 10 ppm/°C	- 55 °C to + 155 °C
<b>Absolute tolerance</b>	± 0.1 %, ± 0.5 %, ± 1 %, ± 2 %, ± 5 % (R ≥ 500 Ω)	
	± 0.5 %, ± 1 %, ± 2 %, ± 5 % (R ≥ 100 Ω)	
<b>Voltage coefficient</b>	0.1 ppm/V	
<b>Operating temperature range</b>	- 55 °C to + 155 °C	
<b>Storage temperature range</b>	- 55 °C to + 155 °C	
<b>Noise</b>	- 35 dB typical	
<b>Thermal EMF</b>	< 0.1 μV/°C	
<b>Load life stability</b>	± (0.1 % Rn <sup>(1)</sup> ± 0.05 Ω)	1000 h Pn at + 70 °C

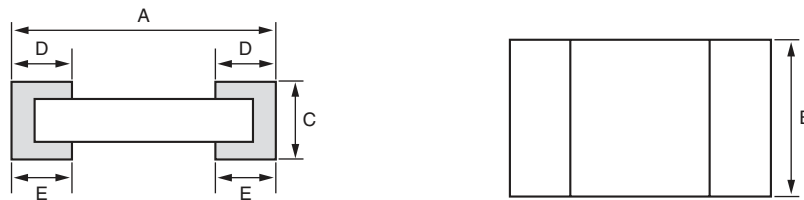
CASE SIZES	0505, 0603	0805	1206
Resistance range <sup>(2)</sup>	100 Ω ... 260 kΩ	100 Ω ... 300 kΩ	100 Ω ... 1 MΩ
Power rating Pn	125 mW	200 mW	330 mW
Limiting voltage (UL)	50 V	50 V	50 V

### Notes:

<sup>(1)</sup> Rn: Nominal resistance

<sup>(2)</sup> Extended resistance range on request

\* Pb containing terminations are not RoHS compliant, exemptions may apply

**DIMENSIONS** in millimeters [inches]

DIMENSIONS								
SERIES/ CASE SIZES	A		B		D/E		C	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
RV 0505	1.14 (0.045)	1.91 (0.075)	1.14 (0.045)	1.52 (0.06)	0.21 (0.008)	0.61 (0.024)	0.25 (0.01)	1.02 (0.04)
RV 0603	1.39 (0.055)	2.16 (0.085)	0.62 (0.025)	1.14 (0.045)	1.02 (0.04)	0.61 (0.024)	0.25 (0.01)	1.02 (0.04)
RV 0805	1.77 (0.07)	2.54 (0.1)	1.14 (0.045)	1.52 (0.06)	0.21 (0.008)	0.61 (0.024)	0.25 (0.01)	1.02 (0.04)
RV 1206	3.00 (0.12)	3.84 (0.15)	1.47 (0.057)	1.85 (0.073)	0.21 (0.008)	0.61 (0.024)	0.25 (0.01)	1.02 (0.04)

ENVIRONMENTAL TEST			
TEST	CONDITIONS	VALUES AND DRIFTS ( $\Delta R/R \pm \%$ )	
		CECC REQUIREMENTS	TYPICAL PERFORMANCE
Overload	6.25 x rated power/2 s (or 2 UL)	0.05 % Rn <sup>(2)</sup> + 0.05 $\Omega$	0.01 % Rn <sup>(2)</sup>
Climatic sequences <sup>(1)</sup>	- 55/+ 155 °C 5 moisture cycles	0.1 % Rn <sup>(2)</sup> + 0.05 $\Omega$	0.02 % Rn <sup>(2)</sup>
Thermal shock <sup>(1)</sup>	- 55/+ 155 °C 5 cycles 30'	0.05 % Rn <sup>(2)</sup> + 0.05 $\Omega$	0.02 % Rn <sup>(2)</sup>
Load life <sup>(1)</sup>	+ 70 °C/Pn 1000 h	0.1 % Rn <sup>(2)</sup> + 0.05 $\Omega$	0.05 % Rn <sup>(2)</sup>
Resistance to solder heat	+ 260 °C/10 s	0.05 % Rn <sup>(2)</sup> + 0.05 $\Omega$	0.02 % Rn <sup>(2)</sup>
Moisture resistance <sup>(1)</sup>	+ 40 °C/93 % HR Pn/10	0.1 % Rn <sup>(2)</sup> + 0.05 $\Omega$	0.01 % Rn <sup>(2)</sup>
High temperature storage	1000 h at + 155 °C	0.1 % Rn <sup>(2)</sup> + 0.05 $\Omega$	0.05 % Rn <sup>(2)</sup>
Bending <sup>(1)</sup>	10 bends/2 mm/5 s	0.05 % Rn <sup>(2)</sup> + 0.05 $\Omega$	0.02 % Rn <sup>(2)</sup>

SPECIFIC CONDITIONS DUE TO TERMINATION TYPE				
TEST	CONDITIONS		VALUES AND DRIFTS	
	B; G	N	VISHAY REQUIREMENTS	TYPICAL PERFORMANCE
Solderability	+ 235 °C/2 s Sn60Pb40 alloy	+ 245 °C/3 s Sn97Ag3 alloy	VISUAL INSPECTION	
High T° reflow profile	N/A	+ 255 °C/40 s (on parts)	0.02 % Rn <sup>(2)</sup> + 0.05 $\Omega$	0.01 % Rn <sup>(2)</sup> + 0.05 $\Omega$

**Notes**

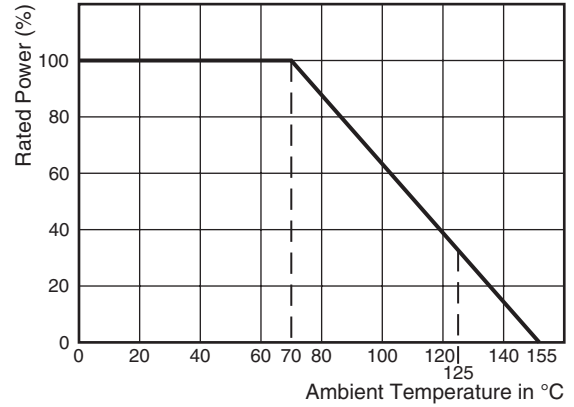
<sup>(1)</sup> Test requiring parts to be mounted on PCB will be performed with the requirement that termination alloy will be the same as solder paste alloy. Gold termination will be tested as B termination.

<sup>(2)</sup> Rn: nominal Resistance  
Pn: nominal Power



PACKAGING INFORMATION				
SIZE	NUMBER OF PIECES PER PACKAGE			TAPE WIDTH
	WAFFLE PACK (2" x 2")	TAPE AND REEL		
		Min.	Max.	
0505	400	100	4000	8 mm (0.315")
0603				
0805	100			
1206	140			

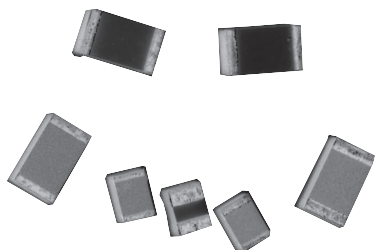
**DERATING CURVE**



MECHANICAL SPECIFICATIONS	
Resistive material	Nichrome
Substrate material	Alumina
Plating	Tin lead over nickel or tin silver over nickel or gold over nickel
Marking resistance to solvents	Per CECC Specs

GLOBAL PART NUMBER INFORMATION																	
New Global Part Numbering: RV0505E1001DBT1016																	
R	V	0	5	0	5	E	1	0	0	1	D	B	T	1	0	1	6
GLOBAL MODEL	SIZE	TCR		VALUE			TOLERANCE	TERMINATION	TAPE	SPECIAL							
	0505 0603 0805 1206	E = ± 25 ppm/°C Y = ± 10 ppm/°C		The first 3 digits (2 digits are enough for tolerance G and J) are significant figures and the last digit specifies the number of zeros to follow. R designates decimal point  10R0 = 10 Ω 3901 = 3900 Ω 1004 = 1 MΩ			B = ± 0.1 % D = ± 0.5 % F = ± 1 % G = ± 2 % J = ± 5 %	B: SnPb over nickel barrier N: SnAg over nickel barrier G: Gold over nickel barrier  B: Lead bearing version N and G: Lead (Pb)-free/ RoHS version	T	1016: Optional							
Historical Part Number example: RV 0505 25PPM 1K 0.5 % B TR R1016																	

## Wraparound and Single-In-Line, Thin Film Temperature Sensors



Vacuum deposited nickel films are used to produce temperature sensors with various characteristics. The small size and small thermal mass of these devices result in a quick response to changes in temperature.

### FEATURES

- Conforms to the DIN 43760 specs in - 60 °C to + 180 °C temperature range
- TCR: 6180 ppm/°C (0 °C; + 100 °C) (see note <sup>(1)</sup>)
- Wide resistance range: 25 Ω to 2500 Ω, TFS-S  
25 Ω to 250 Ω, TFS-W
- Packaging available: W/A, SIL
- High stability ( $\frac{\Delta R}{R}$  and  $\frac{\Delta CT}{CT}$  < 0.2 % 1000 h at Pn at 150 °C)



**RoHS**  
COMPLIANT

### STANDARD ELECTRICAL SPECIFICATIONS

TEST	SPECIFICATIONS	CONDITIONS
<b>MATERIAL</b>	<b>NICKEL</b>	
<b>Resistance range</b>	25 Ω to 2500 Ω on TFS-S/25R to 100R on TFS W0805 25R to 250R on TFS-W 1206	
<b>Absolute TCR <sup>(1)</sup></b>	+ 6180 ppm/°C	0 °C; 100 °C
<b>Absolute tolerance</b>	± 2 %, ± 1 %	
<b>Tolerance on temperature</b>	up to 0, 33 °C	
<b>Operating temperature range</b>	- 55 °C to + 125 °C	
<b>Storage temperature range</b>	- 55 °C to + 155 °C	
<b>Stability</b>	$\frac{\Delta R}{R} < 0.2 \%$ ; $\frac{\Delta CT}{CT} < 0.2 \%$	1000 h at Pn at + 150 °C

#### Note:

<sup>(1)</sup> The ohmic value  $R_T$  at temperature T (°C) depends on  $R_0$  (ohmic value at 0 °C) according to the following equation:

$$R_T/R_0 = 1 + 5.485 \times 10^{-3} T + 6.65 \times 10^{-6} T^2 + 2.805 \times 10^{-11} T^4$$

**Example:** 0 °C < T < 100 °C

$$R_T/R_0 = 1.6180$$

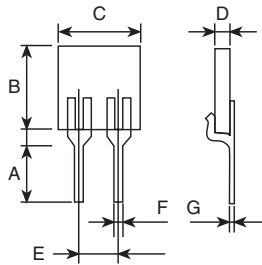
$$TCR = \pm 6180 \text{ ppm/}^\circ\text{C}$$

### MECHANICAL SPECIFICATIONS

Resistive element	Nickel, around 1.5 μm thick
Substrate material	99.6 % alumina
Leads (TFS-S)	Tin/silver plated on copper alloy
Terminals (TFS-W)	Tin silver over nickel

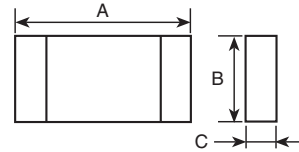
**DIMENSIONS**

TFS-S Single-In-Line



DIMENSION	INCHES	MILLIMETERS
A	0.200	3.17
B	0.200	5
C	0.200	5
D	0.025	0.63
E	0.100	2.54
F	0.020	0.50
G	0.010	0.25

TFS-W Chip for SMD

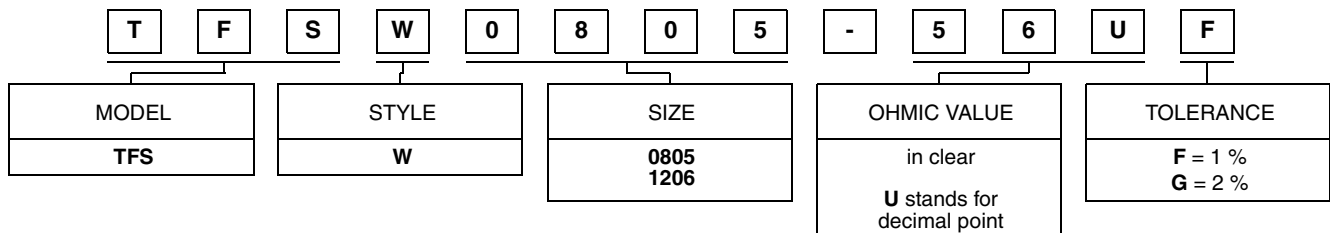
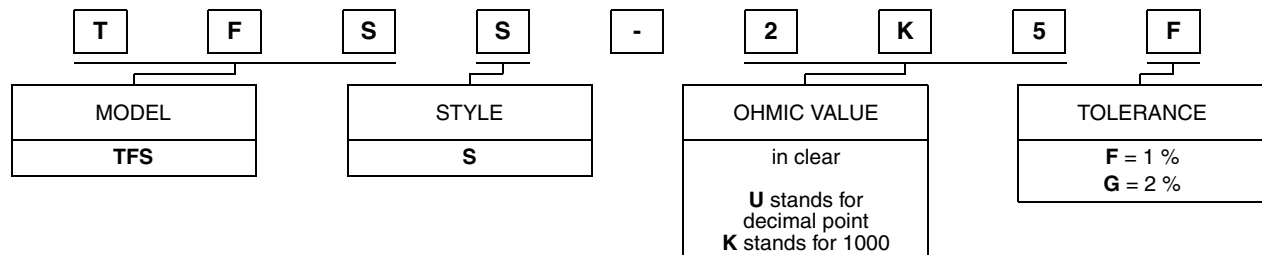


0705 DIMENSION	INCHES	MILLIMETERS
A	0.075	1.90
B	0.050	1.25
C	0.020	0.50

1206 DIMENSION	INCHES	MILLIMETERS
A	0.125	3.20
B	0.063	1.60
C	0.027	0.70

**PACKAGING**

Waffle pack or tape and reel for TFS-W  
Sticks or special packaging for TFS-S

**HOW TO ORDER**
**Wrap around**

**SIL**

**Historical Part Number:**

TFS W 0805 56U 1% e2  
TFS S 2K5 1% e2

## Electro-Pyrotechnic Initiator Chip Resistor



Electro-pyrotechnic initiator resistors, also known as bridge resistors, are resistive elements, which convert electrical energy into heat energy in a precise electro-thermal profile for the purpose of initiating a series of pyrotechnic events in a controlled energetic reaction. In automotive applications this effect is used to deploy automotive airbags and other safety devices. These same devices are also used in military applications for pilot ejection systems, explosive bolt disengagement of airborne missiles, chaff dispensers, artillery projectile activators, anti-tank mines, etc. Commercially, they are used in mining and de-constructions applications.

### FEATURES

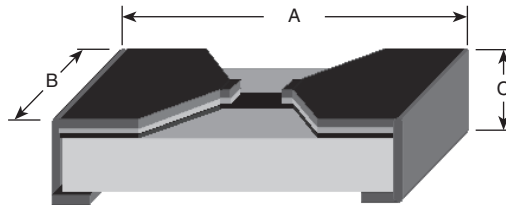
Vishay has developed a special thin film resistor chip specifically designed to provide pyrotechnic engineers with a lot of advantages



**RoHS\***  
COMPLIANT

- Firing energy down to 50  $\mu$ J
- Firing time down to 50  $\mu$ s
- Ohmic range: 2R to 10R
- Compatibility with various pyrotechnic composition even with no primer
- Joule effect ignition or flash ignition for very fast firing
- Easy set up by design of firing levels
- No fire/all fire ratio up to 70 %
- Very predictable, reproducible and reliable behaviour
- Size: 0603 preferred - other size available upon request

### DIMENSIONS in millimeters (inches)



CASE SIZE	DIMENSION		
	A	B	C
	MAX. TOL. + 0.152 (0.006) MIN. TOL. - 0.152 (0.006)	MAX. TOL. + 0.127 (0.005) MIN. TOL. - 0.127 (0.005)	MAX. TOL. + 0.127 (0.005) MIN. TOL. - 0.127 (0.005)
0603	1.52 (0.060)	0.75 (0.030)	0.5 (0.020)

### MECHANICAL SPECIFICATIONS

- Substrate: special alumina based substrate
- Resistive element: fine line patterned Tantalum nitride thin film layer
- Diffusion and conductive thin film layers
- Terminations: wraparound over nickel barrier

### TECHNOLOGY

This technology contributes to the stability of the heating element, the precise electro-thermal response profile and the ability to design a precise activation energy.

All these features are perfectly controlled on high production volumes.

\* Pb containing terminations are not RoHS compliant, exemptions may apply



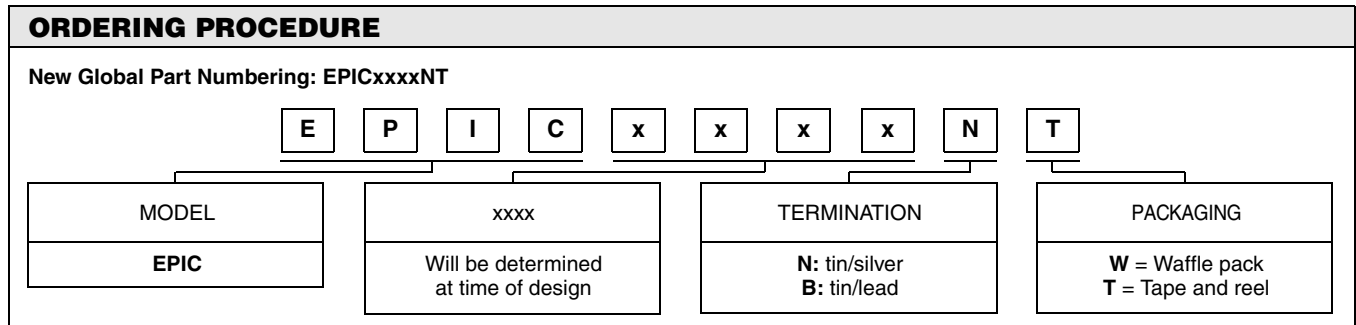
**EXAMPLE OF APPLICATION**

Chip: 0603  
R: 2R ± 0R2  
Energy: around 1.5 mJ  
Response time: 0.2 ms

**AIRBAGS INITIATORS**

Bruceton's tests  
2 customers: customer A and customer B have equipped squibs of their own with 3 variants (Variant 1, 2 and 3) . Bruceton's test results of Vishay heating elements are shown in Table 1

HEATING ELEMENT	CUSTOMER A		CUSTOMER B	
	NF (in mA)	AF (in mA)	NF (in mA)	AF (in mA)
Variant 1	546	766	538	776
Variant 2	571	839	577	859
Variant 3	619	891	612	875







## High Stability Resistor Chips

### **FEATURES**

- Thick film chip resistor
- ESA qualified
- ESCC4001/026
- 5 sizes qualified: 0603, 0805, 1206, 2010, 2512
- Qualified ohmic range: 1R to 10M

In progress, due to be released 01-Dec-07

## High Stability Resistor Chips

### FEATURES

- High precision thin film chip array
- ESA qualified
- ESCC4001/025
- 3 sizes qualified: PRA100, PRA135, PRA182
- Tolerance ratio down to 0.05 %
- Temperature coefficient ratio down to 3 ppm/°C
- 2 to 8 resistors
- Network with unlike ohmic values also qualified

In progress, due to be released 01-Dec-07





## Model Numbers

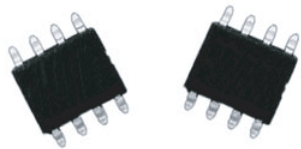
RMKMS (CNM) ..... 80

# Molded

Networks



## Molded, 50 Mil Pitch, Dual-In-Line Resistor Networks



Actual Size

The RMKM series of small outline surface mount style molded package can accommodate resistor network to your particular application requirements in compact circuit integration. The resistor element is a special nickel chromium film formulation on oxidized silicon.

Utilizing those networks will enable you to take advantage of parametric performances which will introduce in your circuitry high thermal and load life stability (0.05 % abs, 0.02 % ratio, 2000 h at + 70 °C at Pn) together with the added benefits of low noise and rapid rise time.

### FEATURES

- Tight TCR tracking down to 5 ppm/°C
- Monolithic reliability
- Low noise < - 35 dB

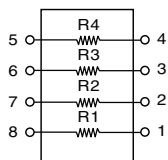


### TYPICAL PERFORMANCE

	ABS	TRACKING
TCR	10 ppm/°C	5 ppm/°C
	ABS	RATIO
TOL.	0.1 %	0.05 %

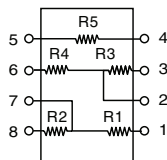
### SCHEMATIC

RMKM S408

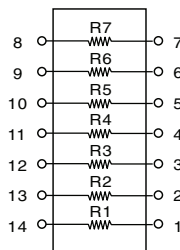


RMKM S508

Case S08

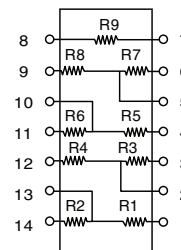


RMKM S714



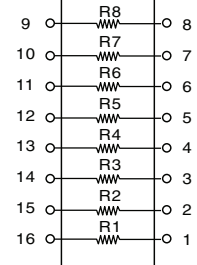
RMKM S914

Case S014



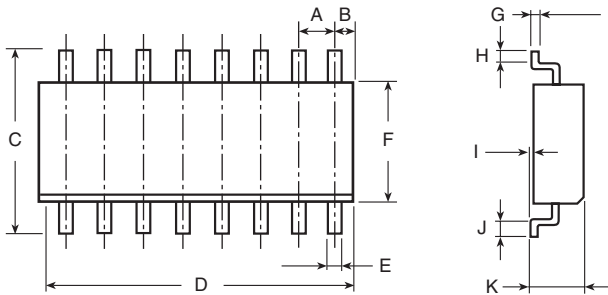
RMKM S816

Case S016



For other configurations, please consult factory.

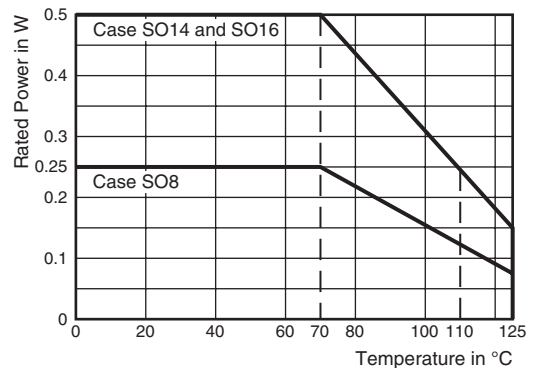
STANDARD ELECTRICAL SPECIFICATIONS			
TEST		SPECIFICATIONS	CONDITION
Sizes		S08, S014, S016	
Resistance range		500 Ω to 200K	
TCR:	Tracking	± 5 ppm/°C maximum	- 55 °C to + 125 °C
	Absolute	± 15 ppm/°C (- 55 °C to ± 125 °C); ± 10 ppm/°C (0 °C to + 70 °C)	
Tolerance:	Ratio	0.05 % to 0.5 % (0.02 upon request)	
	Absolute	± 0.1 % to ± 1 %	
Power rating:	Resistor	50 mW	
	Package	S08 = 250 mW, S014 = 500 mW, S016 = 500 mW	at + 70 °C
Stability	ΔR Absolute	0.05 %	2000 h at + 70 °C at P
	ΔR Ratio	0.02 %	2000 h at + 70 °C at P
Voltage coefficient		< 0.1 ppm/V	
Working voltage		50 V <sub>DC</sub> maximum	
Operating temperature range		- 55 °C to + 125 °C	
Storage temperature range		- 55 °C to + 155 °C	
Noise		- 35 dB (typical)	MIL-STD-202, Meth. 308
Thermal EMF		0.1 μV/°C	
High temp. storage Shelf life stability	Absolute	0.075 %	2000 h at + 125 °C
	Ratio	0.025 %	2000 h at + 125 °C

**DIMENSIONS AND IMPRINTING**

**Imprinting:**

VISHAY logo, series, ohmic value, tolerance, manufacturing date

DIMENSION	INCHES	MILLIMETERS
A	0.05	Pitch 1.27
B	0.025	0.63 maximum
C (S08)	0.232/0.244	5.9/6.2
C (S14)	0.232/0.244	5.9/6.2
C (S16)	0.248/0.260	6.3/6.6
D (S08)	0.187/0.195	4.75/4.95
D (S14)	0.337/0.344	8.55/8.75
D (S16)	0.386/0.394	9.8/10
E	0.014/0.018	0.35/0.45
F (S08)	0.154/0.157	3.9/4
F (S14)	0.154/0.157	3.9/4
F (S16)	0.154/0.157	3.9/4
G	0.007/0.010	0.185/0.265
H, J	0.015	0.40
I	0.004/0.007	0.1/0.2
K	0.070 maximum	1.75 maximum

MECHANICAL SPECIFICATIONS	
Mechanical protection	Epoxy molded assembly
Terminal leads	100 % tin
Resistive element	Passivated Nichrome
Unit weight: Case S08	0.070 g
Cases S014, S016	0.146 g

**DERATING CURVE**


MARKING				
TOLERANCE CODING				
A	B	D	F	X
0.1 %	0.1 %	0.5 %	1 %	0.1 %
0.05 %	0.1 %	0.1 %	0.5 %	0.02 % (on request only)

GLOBAL PART NUMBER INFORMATION					
New Global Part Numbering: <b>RMKMS40810KFDT30</b> (preferred part number format)					
<b>R</b>	<b>M</b>	<b>K</b>	<b>M</b>	<b>S</b>	<b>4 0 8 1 0 K F D T 3 0</b>
GLOBAL MODEL	VALUE	ABS. TOLERANCE	RATIO TOLERANCE	PACKAGING	OPTION
RMKMS408 RMKMS508 RMKMS816 RMKMS714 RMKMS914	Decimal: R or K	B = 0.1 % D = 0.5 % F = 1.0 %	B = 0.1 % W = 0.05 % P = 0.02 % L = 0.01 %	T = Tape blank = Tube	Leave blank if no option
Custom Design: CNM 1138					
CNM	1138				
GLOBAL MODEL	REFERENCE				
Historical Part Number example: <b>RMKMS 408 10K 1 % abs 0.5 % ratio T R0030</b> (will continue to be accepted)					
RMKMS 408	10K	1 % abs 0.5 % ratio	T	R0030	
HISTORICAL MODEL	VALUE	ABS. TOLERANCE AND RATIO TOLERANCE	PACKAGING	OPTION	
			T = Tape blank = Tube	Leave blank if no option	





# Single-In-Line

Resistors and Network

## Model Numbers

CNS 020, CNS 021 .....	84
CNS 471 .....	86
TAS (CNS) .....	88





## Conformal, Radial Discrete Resistor



### FEATURES

- Incorporates high stability thin film element (0.1 % at + 70 °C at Pn during 1000 h)



**RoHS**  
COMPLIANT

### TYPICAL PERFORMANCE

		ABS
TCR		5 ppm/°C
		ABS
TOL.		0.02 %

### SCHEMATIC



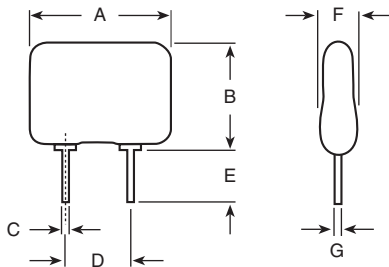
STANDARD ELECTRICAL SPECIFICATIONS			
TEST		SPECIFICATIONS	CONDITIONS
MATERIAL		PASSIVATED NICHROME	
Resistance range		100 Ω (minimum) to 10 MΩ (maximum)	
Absolute TCR:	Standard <sup>(1)</sup>	± 10 ppm/°C	- 40 °C to + 125 °C
	On request	± 5 ppm/°C	0 °C to + 70 °C
Tolerance:	Absolute	± 0.01 % to ± 1 %	
Power rating:		0.5 W	at + 70 °C
		0.3 W	at + 125 °C
Working voltage (maximum)		300 V	
Operating temperature range		- 55 °C to + 155 °C	

**Note:**

<sup>(1)</sup> 15 ppm/°C for  $R \geq 1.5M$

### DIMENSIONS AND IMPRINTING

CNS 020



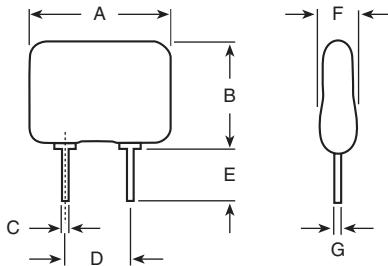
DIMENSION	INCHES	MILLIMETERS
A	0.318	8.10
B	0.260	6.62
C	0.020	0.51
D	0.200	5.08
E	0.120	3.17
F	0.100	2.54
G	0.010	0.25

In clear: model, Vishay logo and manufacturing code

On back: ohmic value (in Ω), tolerance (in %)

**DIMENSIONS AND IMPRINTING**

CNS 021



DIMENSION	INCHES	MILLIMETERS
A	0.318	8.10
B	0.260	6.62
C	0.020	0.51
D	0.150	3.81
E	0.120	3.17
F	0.100	2.54
G	0.010	0.25

In clear: model, Vishay logo and manufacturing code

 On back: ohmic value (in  $\Omega$ ), tolerance (in %)

ENVIRONMENTAL TEST				
TEST	REQUIREMENTS			CONDITIONS
	NFC 83220 CECC40300	MIL-PRF 55182E	DRIFTS (max.)	
Overload	$\pm 0.01\%$	$\pm 0.05\%$	0.01 %	2.5 Un/5 s U max. < 2 Un
Temperature cycling	$\pm 0.01\%$	$\pm 0.05\%$	0.01 %	- 55 °C/+ 155 °C 5 cycles CEI 63-2-14 Test No
Terminal strength	$\pm 0.01\%$	$\pm 0.02\%$	0.01 %	CEI 68-2-21 Test Ua (pulling), Ub (bending), Uc (twisting)
Resistance to solder heat	$\pm 0.01\%$	$\pm 0.02\%$	0.01 %	+ 260 °C/10 s, CEI 68-2-20A Test T6 (Met 1A)
Vibration	$\pm 0.01\%$	$\pm 0.02\%$	0.01 %	10 Hz to 500 Hz 10 g, 6 h Met B4; CEI 68-2-6 Test Fc
Climatic sequence	$\pm 0.05\%$ Insulation resistance > 10 <sup>2</sup> M $\Omega$	-	0.05 %	- 55 °C/+ 155 °C 6 cycles 95 % RH RH 85 mbar CEI68-1
Moisture	$\pm 0.05\%$ Insulation resistance > 10 <sup>2</sup> M $\Omega$	-	0.02 %	56 days 95 % RH + 40 °C CEI 68-2-3
High temperature storage	$\pm 0.05\%$	-	0.05 %	1000 h/+ 155 °C CEI 68-2-20A; Test B

MECHANICAL SPECIFICATIONS	
Resistive material	Nichrome
Substrate material	Alumina
Terminals	Tin/silver on Cu alloy
Protection	Conformal epoxy coating

GLOBAL PART NUMBER INFORMATION		
New Global Part Numbering: CNS020-301KF (preferred part number format)		
C	N	S
0	2	0
-	3	0
1	K	F
GLOBAL MODEL	VALUE	TOLERANCE
CNS 020 CNS 021	Decimal: R, K or M	L = $\pm 0.01\%$ C = $\pm 0.25\%$ P = $\pm 0.02\%$ D = $\pm 0.5\%$ W = $\pm 0.05\%$ F = $\pm 1.0\%$ B = $\pm 0.1\%$
Historical Part Number example: CNS 020 301K 1% (will continue to be accepted)		
CNS 020	301K	1%
HISTORICAL MODEL	VALUE	TOLERANCE

## Decade Divider, Single-In-Line Thin Film Resistor Networks (Standard)



Using these integrated thin film networks instead of discrete resistor sets, designers gain several advantages: smaller size, better overall tracking, greater reliability, and lower cost.

### FEATURES

- Low voltage coefficient < 0.02 ppm/V
- Low noise index < - 30 dB
- High stability 0.01 % on ratio (1000 h at Pn at + 70 °C)
- Standard



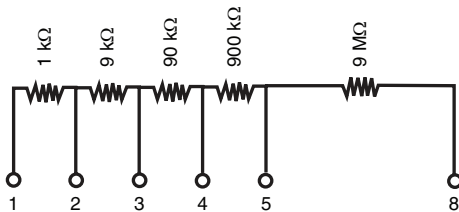
**RoHS**  
COMPLIANT

### TYPICAL PERFORMANCE

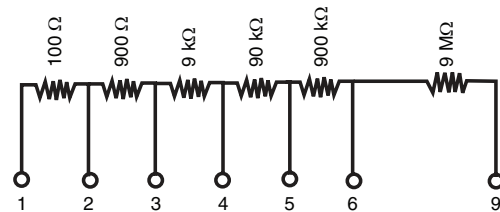
	ABS	TRACKING
TCR	< 25 ppm/°C	< 2.5 ppm/°C
	ABS	RATIO
TOL.	0.1 %	0.03 %

### SCHEMATIC

5 Decades



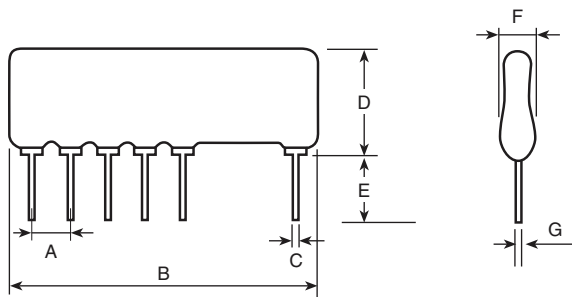
6 Decades



STANDARD ELECTRICAL SPECIFICATIONS			
TEST		SPECIFICATIONS	CONDITIONS
MATERIAL		PASSIVATED NICHROME	
Resistance range		100 Ω to 10 MΩ	
TCR	Tracking	< 2.5 ppm/°C	Except for 100R (5 ppm/°C)
	Absolute	< 25 ppm/°C	(0 °C to + 70 °C)
Tolerance	Ratio	A = ± 0.05 %, B = ± 0.1 %, C = ± 0.03 %	
	Absolute	± 0.1 %	(0 °C to + 70 °C)
Power rating	Resistor	0.1 W	
	Package	0.6 W	
Stability	ΔR Ratio	0.01 % typical	1000 h at + 70 °C at Pn
Voltage coefficient		< 0.02 ppm/V	
Working voltage		1200 V	
Operating temperature range		0 °C; + 70 °C	
Storage temperature range		- 55 °C to + 155 °C	
Noise		< - 30 dB typical	
Thermal EMF		0.1 μV/°C	
Shelf life stability (Ratio)		50 ppm	1 year

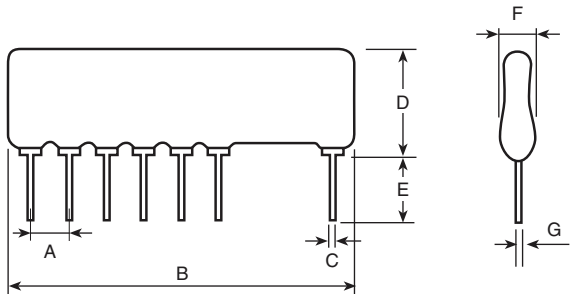
**DIMENSIONS**

## 5 Decades



DIMENSION	INCHES	MILLIMETERS
A	0.100	2.54
B	0.830	21.08
C	0.020	0.51
D	0.275	7 max.
E	0.125	3.17
F	0.100	2.54 max.
G	0.010	0.25

## 6 Decades



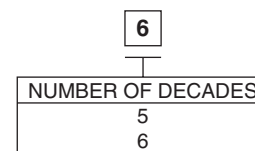
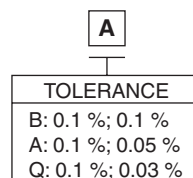
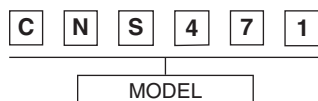
DIMENSION	INCHES	MILLIMETERS
A	0.100	2.54
B	0.830	21.08
C	0.020	0.51
D	0.275	7 max.
E	0.125	3.17
F	0.100	2.54 max.
G	0.010	0.25

**MECHANICAL SPECIFICATIONS**

Resistive material	Nichrome
Coating	Fluidized epoxy
Terminals	Tin/silver on copper alloy
Substrate material	Alumina
Marking resistance to solvents	Laser marking

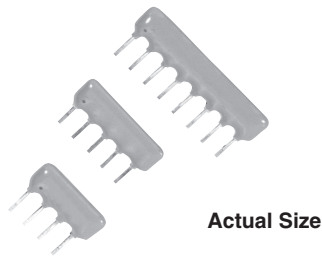
**GLOBAL PART NUMBER INFORMATION**

New Global Part Numbering: CNS471A6



Historical Part Number example: CNS 471 A 6 e2

## Conformal, Single-In-Line Resistor Networks



These networks are designed to be used in analog circuits in conjunction with operational amplifiers. In addition to the standard models, Vishay also offers semi-custom or custom networks.

### FEATURES

- Standard design - no NRE
- Low TCR (10 ppm/°C)
- Excellent TCR tracking (< 2 ppm/°C)
- Low noise (< - 35 dB)
- High stability (0.005 % on ratio, after 2000 h at Pn at + 70 °C)



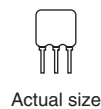
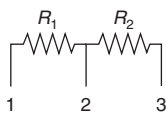
**RoHS**  
COMPLIANT

### TYPICAL PERFORMANCE

	ABS	TRACKING
TCR	10 ppm/°C	< 2 ppm/°C
	ABS	RATIO
TOL.	0.1 %	0.02 %

### SCHEMATIC

$$R_1 = R_2$$



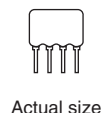
Actual size

### TWO EQUAL RESISTORS

#### ORDERING INFORMATION

$R_1 = 1\text{ k}\Omega$	TAS 209	50 k $\Omega$	TAS 214
2 k $\Omega$	TAS 210	100 k $\Omega$	TAS 215
5 k $\Omega$	TAS 211	200 k $\Omega$	TAS 216
10 k $\Omega$	TAS 212	500 k $\Omega$	TAS 217
20 k $\Omega$	TAS 213	1 M $\Omega$	TAS 218

$$R_1 = R_2$$



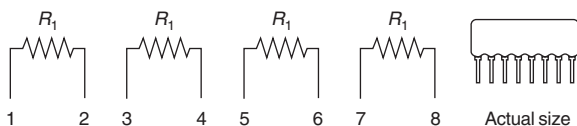
Actual size

### TWO EQUAL RESISTORS

#### ORDERING INFORMATION

$R_1 = 1\text{ k}\Omega$	TAS 365
10 k $\Omega$	TAS 363
100 k $\Omega$	TAS 348

$$R_1$$



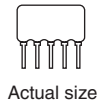
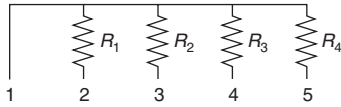
Actual size

### FOUR EQUAL RESISTORS

#### ORDERING INFORMATION

$R_1 = 1\text{ k}\Omega$	TAS 329
5 k $\Omega$	TAS 1002
10 k $\Omega$	TAS 158
100 k $\Omega$	TAS 288

$$R_1 = R_2 = R_3 = R_4$$



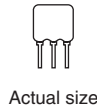
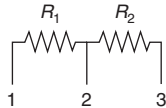
**FOUR EQUAL RESISTORS, ONE COMMON**

**ORDERING INFORMATION**

$R_1 = 10\text{ k}\Omega$	TAS 366
100 k $\Omega$	TAS 367

$$R_1 + R_2 = 10\text{ k}\Omega, 100\text{ k}\Omega, 1\text{ M}\Omega$$

$$\frac{R_1 + R_2}{R_2} = 10$$



**RATIO DIVIDER 10:1**

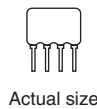
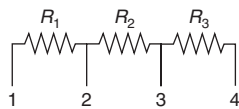
**ORDERING INFORMATION**

$R_1 + R_2 = 9\text{ k}\Omega + 1\text{ k}\Omega = 10\text{ k}\Omega$	TAS 280
90 k $\Omega + 10\text{ k}\Omega = 100\text{ k}\Omega$	TAS 193
900 k $\Omega + 100\text{ k}\Omega = 1\text{ M}\Omega$	TAS 281

$$R_1 + R_2 + R_3 = 10\text{ k}\Omega, 100\text{ k}\Omega$$

$$\frac{R_1 + R_2 + R_3}{R_3} = 100$$

$$\frac{R_1 + R_2 + R_3}{R_2 + R_3} = 10$$



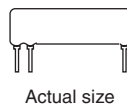
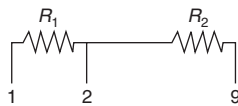
**RATIO DIVIDER 10:1, 100:1**

**ORDERING INFORMATION**

$R_1 + R_2 + R_3 = 100\text{ k}\Omega$	TAS 330
with $R_1 = 90\text{ k}\Omega$	
$R_2 = 9\text{ k}\Omega$	
$R_3 = 1\text{ k}\Omega$	

$$R_1 + R_2 = 10\text{ M}\Omega$$

$$\frac{R_1 + R_2}{R_1} = 100$$

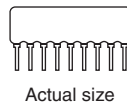
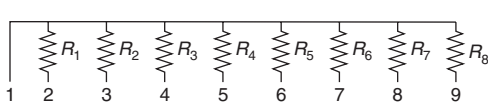


**RATIO DIVIDER 100:1**

**ORDERING INFORMATION**

$R_1 + R_2 = 10\text{ M}\Omega$	TAS 112
---------------------------------	---------

$$R_1 = R_2 = R_3 = R_4 = R_5 = R_6 = R_7 = R_8$$

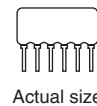
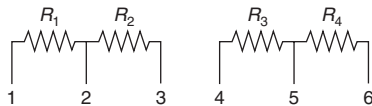


**FOUR EQUAL RESISTORS**

**ORDERING INFORMATION**

$R_1 = 10\text{ k}\Omega$	TAS 368
100 k $\Omega$	TAS 369

$$\frac{R_2}{R_1} = \frac{R_4}{R_3} = 10$$

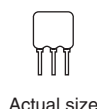
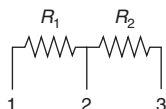


**DIVIDER NETWORK 10:1**

**ORDERING INFORMATION**

$R_1 = 10\text{ k}\Omega$	TAS 220
---------------------------	---------

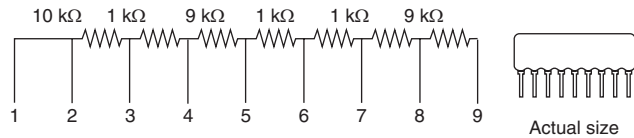
$$\frac{R_1}{R_2} = 10$$



**DIVIDER NETWORK 10:1**

**ORDERING INFORMATION**

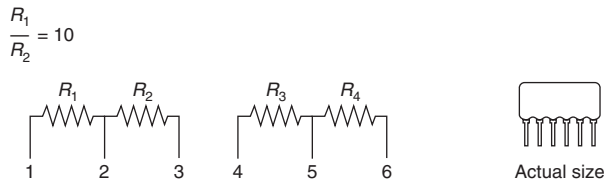
$R_1 = 100\text{ k}\Omega$	TAS 282
1 M $\Omega$	TAS 283



## EIGHT RESISTOR NETWORKS

### ORDERING INFORMATION

TAS 272



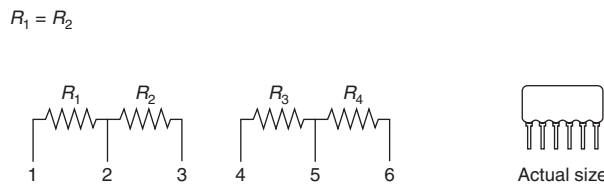
## DIVIDER NETWORK 10:1

### ORDERING INFORMATION

$R_1 = 10\text{ k}\Omega$  TAS 328

100 k $\Omega$  TAS 284

1 M $\Omega$  TAS 285



## DIVIDER NETWORK 1:1

### ORDERING INFORMATION

$R_1 = 5\text{ k}\Omega$  TAS 225

10 k $\Omega$  TAS 286

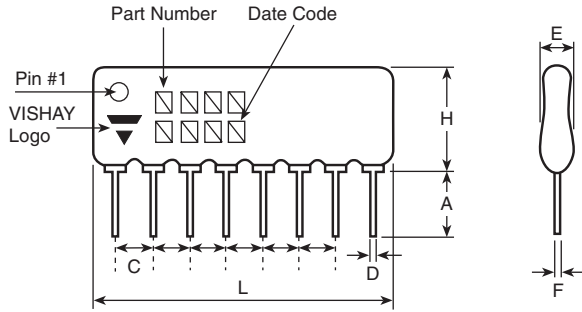
100 k $\Omega$  TAS 219

1 M $\Omega$  TAS 287

## STANDARD ELECTRICAL SPECIFICATIONS

TEST	SPECIFICATIONS	CONDITIONS
MATERIAL	PASSIVATED NICHROME	
TCR:	Tracking	< 2 ppm/°C
	Absolute	± 15 ppm/°C ± 10 ppm/°C
Tolerance:	Ratio	± 0.05 % (± 0.02 or ± 0.01 % on request)
	Absolute	± 0.1 %
Power rating:	Resistor	100 mW
	Package	Varies with size
Stability ( $\Delta R$ ratio)	0.005 %	2000 h at + 70 °C at Pn
Voltage coefficient	< 0.002 ppm/V	
Working voltage	100 V	
Operating temperature range	- 40 °C to + 125 °C	
Storage temperature range	- 55 °C to + 125 °C	
Noise	- 35 dB typical	
Thermal EMF	0.1 $\mu\text{V}/^\circ\text{C}$	
Shelf life stability	50 ppm maximum	1 year

**DIMENSIONS**



Marking: The pin 1, series and model, Vishay trademark, manufacturing date (year, week)

DIMENSION	INCHES	MILLIMETERS
A	0.124	3.17 minimum
C	0.100	2.54
D	0.020	0.51
H	0.260	6.62 maximum
E	0.100	2.54 maximum
F	0.010	0.25

PIN COUNT	3	4	5	6	7	8	9	10
L max. Inches	0.320	0.420	0.520	0.620	0.720	0.820	0.920	1.020
Millimeters	8.14	10.68	13.23	15.78	18.32	20.87	23.40	25.95

MECHANICAL SPECIFICATIONS	
Resistive element	Passivated Nichrome
Substrate material	Alumina
Body	Epoxy-conformal coating
Terminals	Tin/silver on Cu alloy
Marking resistance to solvents	Laser marking

**GLOBAL PART NUMBER INFORMATION**

New Global Part Numbering: TAS214BW (preferred part number format)

T	A	S	2	1	4	B	W
GLOBAL MODEL	REFERENCE	ABS. TOLERANCE	RATIO TOLERANCE				
TAS	(see list)	B = 0.1 %	W = 0.05 % P = 0.02 %				

Custom Network: CNS 1128

CNS	1128
GLOBAL MODEL	REFERENCE

Historical Part Number example: TAS 214 50K 0.1 % 0.05 % e2 (will continue to be accepted)

TAS	214	50K	0.1 %	0.05 %	e2
HISTORICAL MODEL	REFERENCE	OHMIC VALUE	ABS. TOLERANCE	RATIO TOLERANCE	RoHS







## Model Numbers

RMKD (CNP) ..... 94

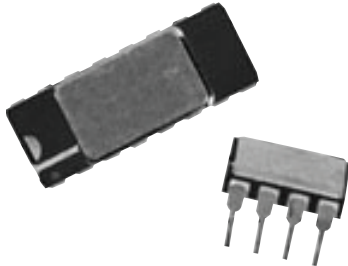
SLCC ..... 97

# Hermetic

## Networks



## Hermetic, Dual-In-Line Packaged Resistor Networks



Actual Size

The superstable RMKD nickel-chromium integrated networks are available in a range of standard designs which bring a completely new “state-of-the-art” to precision network performance criteria.

Circuit designers can now incorporate into their circuitry the ultimate in today’s performance characteristics as “standards”, without needing to call out specially engineered designs at premium prices.

### FEATURES

- High stability: < 300 ppm maximum, 2000 h at Pn at + 70 °C
- Hermetic cases: dual-in-line



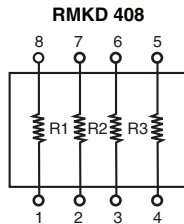
**RoHS**  
COMPLIANT

### TYPICAL PERFORMANCE

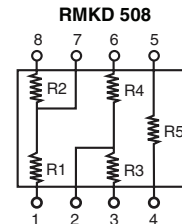
	ABS	TRACKING
TCR	10 ppm/°C	1 ppm/°C
	ABS	RATIO
TOL.	0.05 %	0.02 %

### SCHEMATIC

Standard Configuration, 8 Leads Hermetic DIL

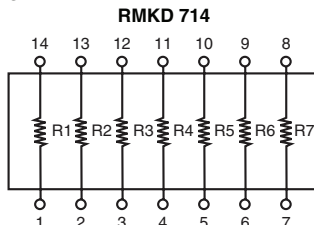


4 Equal and Independent Resistors

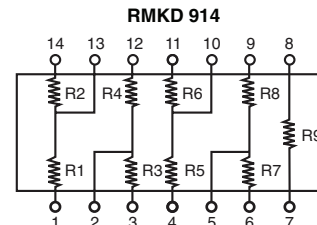


Dual Divider Feedback Network with Equal Value Resistors

Standard Configuration, 14 Leads Hermetic DIL

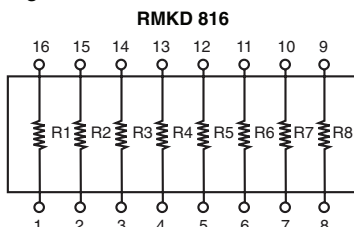


7 Equal and Independent Resistors



Quad Divider Feedback Network with Equal Value Resistors

Standard Configuration, 16 Leads Hermetic DIL

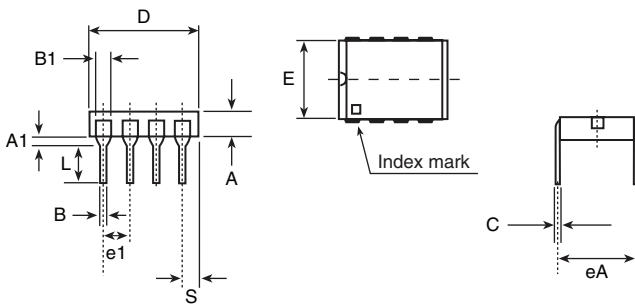


8 Equal and Independent Resistors

STANDARD ELECTRICAL SPECIFICATIONS							
TEST	SPECIFICATIONS			CONDITIONS			
CONFIGURATIONS	RMKD 408, RMKD 508, RMKD 714, RMKD 816, RMKD 914						
Resistance range	500 Ω < R < 200 kΩ						
TCR:	Tracking	± 1 ppm/°C typical/± 2 ppm/°C maximum		- 55 °C to + 125 °C			
	Absolute	± 5 ppm/°C typical		0 °C to + 70 °C			
		± 10 ppm/°C maximum		- 55 °C to + 125 °C			
Tolerance:	Absolute	± 0.10 %	± 0.05 %	± 0.05 %			
	Ratio	± 0.05 %	± 0.02 %	± 0.01 %			
Power rating:	Package	125 mW	250 mW	250 mW	250 mW	250 mW	at + 70 °C
Stability (ΔR ratio)	< 300 ppm maximum			2000 h at + 70 °C at Pn			
Working voltage	100 V <sub>CC</sub> on R						
Operating temperature range	- 55 °C to + 125 °C						
Storage temperature range	- 55 °C to + 155 °C						
Noise	- 35 dB typical			MIL-STD-202, Model 308			
Thermal EMF	< 0.1 μV/°C						

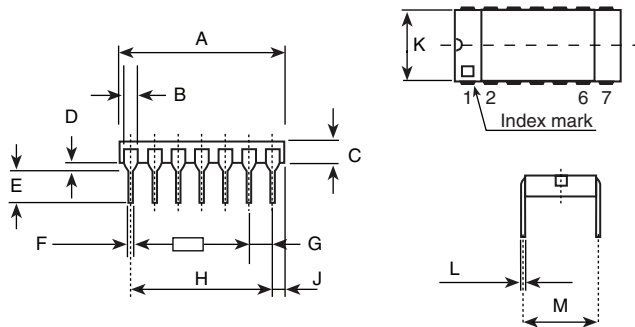
**DIMENSIONS**

RMKD 408 and RMKD 508



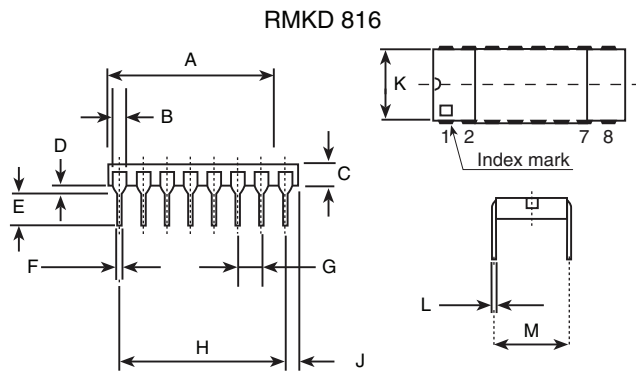
DIMENSION	INCHES	MILLIMETERS
D	0.401	10.20 ± 0.10
B1	0.046	1.19
A1	0.035	0.89 ± 0.25
A	0.086	2.20 ± 0.20
L	0.129 minimum	3.30 minimum
B	0.018	0.46 ± 0.05
e1	0.100	2.54 ± 0.10
S	0.050	1.27 ± 0.50
E	0.290	7.37 ± 0.20
C	0.009	0.25 ± 0.05
eA	0.300	7.62 ± 0.20

RMKD 714 and RMKD 914



DIMENSION	INCHES	MILLIMETERS
A	0.700	17.78 ± 0.20
B	0.046	1.19
C	0.086	2.20 ± 0.20
D	0.035	0.89 ± 0.25
E	0.129	3.30
F	0.018	0.46 ± 0.05
G	0.100	2.54 ± 0.10
H	0.600	15.24 ± 0.10
J	0.050	1.27 ± 0.50
K	0.290	7.37 ± 0.20
L	0.009	0.25 ± 0.05
M	0.300	7.62 ± 0.20

## DIMENSIONS



DIMENSION	INCHES	MILLIMETERS
A	0.799	20.30 ± 0.20
B	0.046	1.19
C	0.092	2.35 ± 0.20
D	0.035	0.89 ± 0.25
E	0.129	3.30
F	0.018	0.46 ± 0.05
G	0.100	2.54 ± 0.10
H	0.700	17.78 ± 0.10
J	0.050	1.27 ± 0.50
K	0.290	7.37 ± 0.20
L	0.009	0.25 ± 0.05
M	0.300	7.62 ± 0.20

## MECHANICAL SPECIFICATIONS

Resistive material	Nichrome
Passivation	Mineral passivation Si <sub>3</sub> N <sub>4</sub>
Terminals	Gold

## GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: RMKD408-100KBW0005 (preferred part number format)

**R** **M** **K** **D** **4** **0** **8** - **1** **0** **0** **K** **B** **W** **0** **0** **0** **5**

GLOBAL MODEL	VALUE	ABS. TOLERANCE	RATIO TOLERANCE	OPTION
RMKD408 RMKD508 RMKD816 RMKD714 RMKD914	Decimal: R, K or M	<b>B</b> = 0.1 % <b>W</b> = 0.05 %	<b>W</b> = 0.05 % <b>P</b> = 0.02 % <b>L</b> = 0.01 %	leave blank if no option

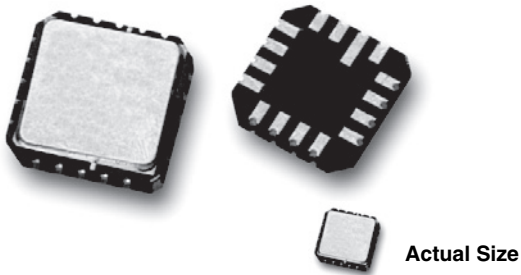
For custom specification:

CNP	1186
GLOBAL MODEL	REFERENCE

Historical Part Number Example: RMKD408 100K 0.1 % 0.05 % e4 (will continue to be accepted)

RMKD408	100K	0.1 %	0.05 %	e4
HISTORICAL MODEL	OHMIC VALUE	ABS. TOLERANCE	RATIO TOLERANCE	RoHS

## Hermetic, 50 Mil Pitch, Leadless Chip Resistor Networks



Capable of meeting the characteristics of MIL-PRF-83401 these networks are available in a wide range of resistance values: several standard configurations are presented with the SLCC series.

### FEATURES

- High stability ultrafilm (0.05 % at 1000 h at + 70 °C under Pn)
- Low noise < 35 dB
- Hermetic package



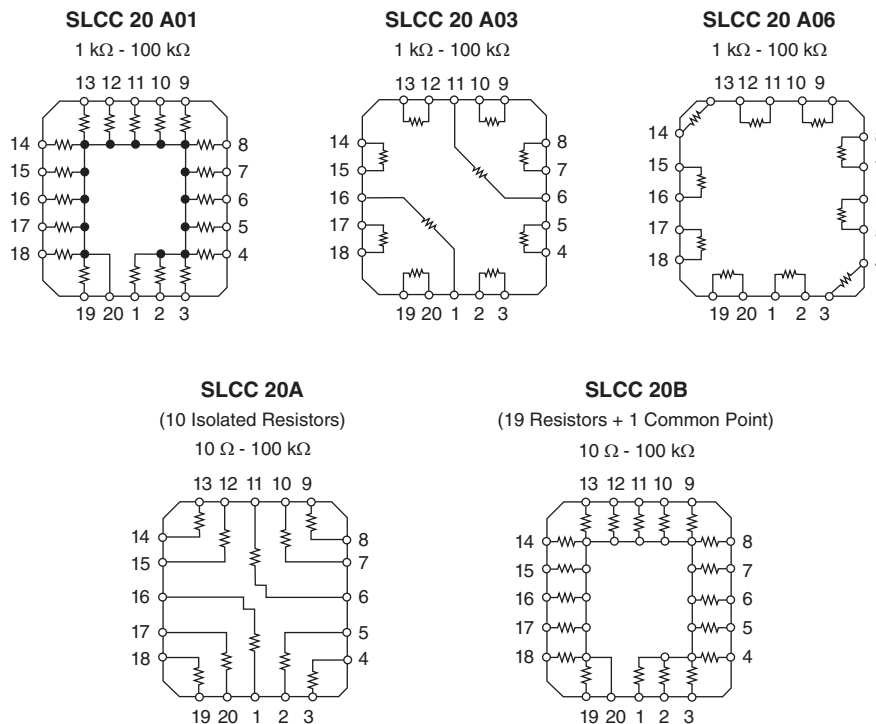
**RoHS**  
COMPLIANT

### TYPICAL PERFORMANCE

	ABS	TRACKING
TCR	25 ppm/°C	2 ppm/°C
	ABS	RATIO
TOL.	0.1 %	0.1 %

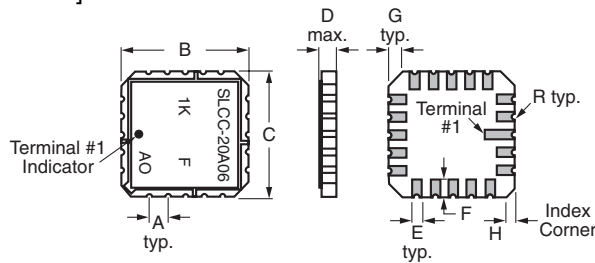
Resistance Range: Noted on schematics

### SCHEMATIC



STANDARD ELECTRICAL SPECIFICATIONS			
TEST	SPECIFICATIONS	CONDITIONS	
PIN NUMBER	20		
TCR:	Tracking	$\pm 2$ ppm/ $^{\circ}$ C (typical)/5 ppm/ $^{\circ}$ C maximum	- 55 $^{\circ}$ C to + 125 $^{\circ}$ C
	Absolute	$\pm 25$ ppm/ $^{\circ}$ C maximum	- 55 $^{\circ}$ C to + 125 $^{\circ}$ C
Tolerance:	Ratio	$\pm 0.1\%$ to 1.0% tighter specs on request	
	Absolute	$\pm 0.1\%$ to 5.0% tighter specs on request	
Power rating:	Resistor	50 mW	at + 70 $^{\circ}$ C
	Package	500 mW	at + 70 $^{\circ}$ C
Stability ( $\Delta R$ ratio)	0.05 %	1000 h at + 70 $^{\circ}$ C under Pn	
Voltage coefficient	< 0.1 ppm/V		
Working voltage	100 V <sub>DC</sub> on R		
Operating temperature range	- 55 $^{\circ}$ C to + 125 $^{\circ}$ C		
Storage temperature range	- 55 $^{\circ}$ C to + 150 $^{\circ}$ C		
Noise	- 35 dB typical		
Thermal EMF	0.1 $\mu$ V/ $^{\circ}$ C		
Shelf life stability	< 50 ppm	1 year at + 25 $^{\circ}$ C	

**DIMENSIONS** in millimeters [inches]



	A	B	C	D	E	F	G	H
20 Pin	1.27 [0.050]	8.89 [0.350]	8.89 [0.350]	1.96 [0.077]	0.635 [0.025]	1.27 [0.050]	1.02 [0.040]	0.508 [0.020]

**GLOBAL PART NUMBER INFORMATION**

New Global Part Numbering: SLCC20A01-10KF0005

S	L	C	C	2	0	A	0	1	-	1	0	K	F	0	0	0	5
GLOBAL MODEL				SCHEMATIC				VALUE			TOL.			OPTION			
SLCC20				A B A01 A03 A06				Decimal R, K or M			B (0.1 % 0.1 %) D (0.5 % 0.25 %) F (1.0 % 0.5 %) G (2.0 % 1.0 %) J (5.0 % 1.0 %)			leave blank if no option			

Historical Part Number example: SLCC 20 A01 10K F R0005 e4

SLCC 20	A01	10K	F	R0005	e4
GLOBAL MODEL	SCHEMATIC	VALUE	TOL.	OPTION	RoHs
				leave blank if no option	

## ONLINE INFORMATION

For product information and a current list of sales offices,  
representatives and distributors, visit our website:

[www.vishay.com](http://www.vishay.com)

### WORLDWIDE SALES CONTACTS

#### THE AMERICAS

##### UNITED STATES

VISHAY AMERICAS  
ONE GREENWICH PLACE  
SHELTON, CT 06484  
UNITED STATES  
PH: +1-402-563-6866  
FAX: +1-402-563-6296

##### ASIA

##### SINGAPORE

VISHAY INTERTECHNOLOGY  
ASIA PTE LTD.  
25 TAMPINES STREET 92  
KEPPEL BUILDING #02-00  
SINGAPORE 528877  
PH: +65-6788-6668  
FAX: +65-6788-0988

##### P.R. CHINA

VISHAY TRADING (SHANGHAI) CO., LTD.  
15D, SUN TONG INFOPORT PLAZA  
55 HUAI HAI WEST ROAD  
SHANGHAI 200030  
P.R. CHINA  
PH: +86-21-5258-5000  
FAX: +86-21-5258-7979

##### JAPAN

VISHAY JAPAN CO., LTD.  
MG IKENOHATA BLDG. 4F  
1-2-18, IKENOHATA  
TAITO-KU  
TOKYO 110-0008  
JAPAN  
PH: +81-3-5832-6210  
FAX: +81-3-5832-6260

#### EUROPE

##### GERMANY

VISHAY EUROPE SALES GMBH  
GEHEIMRAT-ROSENTHAL-STR. 100  
95100 SELB  
GERMANY  
PH: +49-9287-71-0  
FAX: +49-9287-70435

##### FRANCE

VISHAY S.A.  
199, BLVD DE LA MADELEINE  
06003 NICE, CEDEX 1  
FRANCE  
PH: +33-4-9337-2920  
FAX: +33-4-9337-2997

##### UNITED KINGDOM

VISHAY LTD.  
PALLION INDUSTRIAL ESTATE  
SUNDERLAND SR4 6SU  
UNITED KINGDOM  
PH: +44-191-514-4155  
FAX: +44-191-567-8262

One of the World's Largest

**Manufacturers**

of Discrete Semiconductors and Passive Components



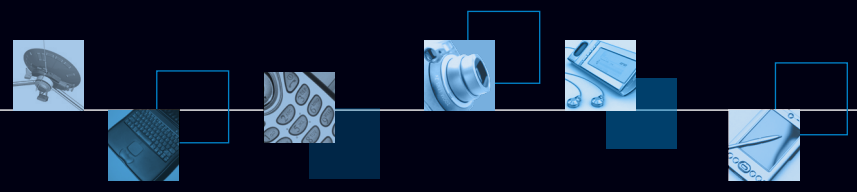


THIN FILM PRODUCTS

**World Headquarters**

Vishay Intertechnology, Inc.  
63 Lancaster Avenue  
Malvern, PA 19355-2143  
United States

One of the World's Largest  
**Manufacturers**  
of Discrete Semiconductors and Passive Components



DATA BOOK

Copyright © 2007 by Vishay Intertechnology, Inc.  
Registered Trademarks of Vishay Intertechnology, Inc.  
All rights reserved. Printed in Germany.  
Specifications subject to change without notice.

[www.vishay.com](http://www.vishay.com)



VSE-DB0096-0711