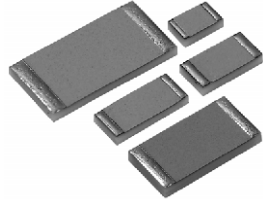




### Ultra High Precision Z-Foil Flip Chip Resistor with TCR of $\pm 0.05 \text{ ppm}/^\circ\text{C}$ , 35 % Space Saving versus Wraparound Design and PCR of $5 \text{ ppm}$ at Rated Power



Bottom View

Any value at tolerance available within resistance range

#### INTRODUCTION

One of the most important parameters influencing stability is the Temperature Coefficient of Resistance (TCR). Although the TCR of Bulk Metal® Foil resistors is considered extremely low, this characteristic has been further refined over the years.

The VFCP Series utilizes ultra precision Bulk Metal® Z-Foil.

The Z-Foil technology provides a significant reduction to the resistive element's sensitivity to ambient temperature variations (TCR) and to self heating when power is applied (power coefficient).

Along with the inherently low PCR and TCR, Z-Foil technology also provides remarkably improved load life stability, low noise and availability of tight tolerance.

The Flip Chip configuration provides a substantial PCB space saving of more than 35 % vs. a surface mount chip with wraparound terminations. The VFCP is available in any value within the specified resistance range.

Our Application Engineering Department is available to advise and make recommendations. For non-standard technical requirements and special applications, please contact us.

TABLE 1 - TOLERANCE AND TCR VS RESISTANCE VALUE		
RESISTANCE VALUE ( $\Omega$ )	TOLERANCE (%)	TYPICAL TCR AND MAX. SPREAD (- 55 °C to + 125 °C, + 25 °C Ref.)
250 to 150K	$\pm 0.01$	$\pm 0.2 \pm 1.6$
100 to < 250	$\pm 0.02$	$\pm 0.2 \pm 1.6$
50 to < 100	$\pm 0.05$	$\pm 0.2 \pm 1.8$
25 to < 50	$\pm 0.1$	$\pm 0.2 \pm 2.8$
10 to < 25	$\pm 0.25$	$\pm 0.2 \pm 2.8$

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

#### FEATURES

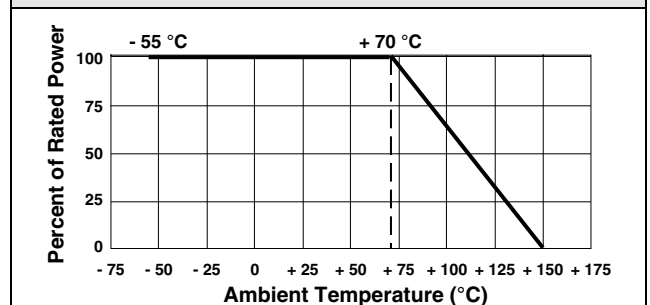
- Temperature Coefficient of Resistance (TCR):  $\pm 0.05 \text{ ppm}/^\circ\text{C}$  typical (0 °C to + 60 °C)  $\pm 0.2 \text{ ppm}/^\circ\text{C}$  typical (- 55 °C to + 125 °C, 25 °C Ref.)
- Tolerance: to  $\pm 0.01 \%$  (100 ppm)
- Power Coefficient "ΔR due to self heating" 5 ppm at Rated Power
- Load Life Stability (70 °C for 2000 hours):  $\pm 0.005 \%$  (50 ppm)
- Power Rating to: 600 mW at + 70 °C
- Electrostatic Discharge (ESD) above 25 000 V
- Resistance Range: 10 $\Omega$  to 150 k $\Omega$  (for lower and higher values, please contact us)
- Non Inductive, Non Capacitive Design
- Short time overload  $\leq 0.005 \%$  (50 ppm)
- Non hot spot design
- Rise time: 1ns without ringing
- Current Noise: - 40 dB
- Voltage Coefficient < 0.1 ppm/V
- Non Inductive: < 0.08  $\mu\text{H}$
- Terminal Finishes available: Lead (Pb)-free Tin/Lead Alloy
- Matched sets are available per request
- Any value available within resistance range (e.g. 1K2345)
- Prototype samples available from 48 hours. For more information, please contact [foil@vishay.com](mailto:foil@vishay.com)
- For better performances please contact us



#### APPLICATIONS

- Automatic Test Equipment (ATE)
- High Precision Instrumentation
- Laboratory, Industrial and Medical
- Audio
- EB Applications (electron beam scanning and recording equipment, electron microscopes)
- Military and Space
- Airborne
- Down Hole instrumentation
- Communication

FIGURE 1 - POWER DERATING CURVE



# VFCP Series (0805, 1206, 1506, 2010, 2512) (Z-Foil)



Vishay Foil Resistors Ultra High Precision Z-Foil Flip Chip Resistor with TCR of  $\pm 0.05 \text{ ppm}/^\circ\text{C}$ , 35 % Space Saving versus Wraparound Design and PCR of 5 ppm at Rated Power

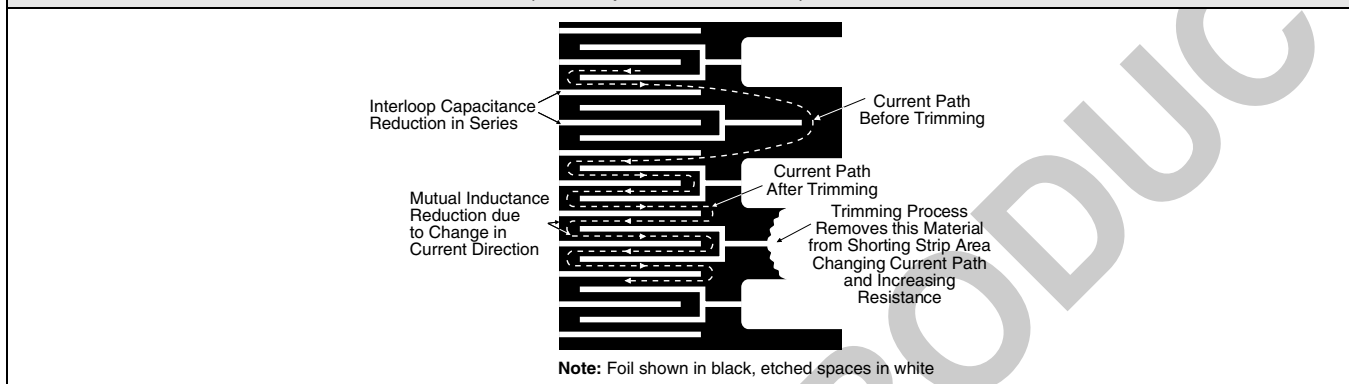
**TABLE 2 - DSCC SPECIFICATIONS** (Vishay resistors are listed on the following DSCC specifications)

MODEL	DSCC	MIL SPEC
VFCP1206	2009	MIL-PRF-55342

**Note**

• For VFCP0805, VFCP1506, VFCP2010 and VFCP2512 DSCC Drawings, please contact [foil@vishay.com](mailto:foil@vishay.com)

**FIGURE 2 - TRIMMING TO VALUES** (Conceptual Illustration)



**TABLE 3 - SPECIFICATIONS**

CHIP SIZE	RATED POWER (mW) at + 70 °C	MAXIMUM VOLTAGE RATING ( $\leq \sqrt{P \times R}$ )	RESISTANCE RANGE ( $\Omega$ )	MAXIMUM WEIGHT (mg)
0805	100 mW	34 V	10 to 12K	5.2
1206	250 mW	86 V	10 to 30K	10.3
1506	300 mW	109 V	10 to 40K	12
2010	400 mW	200 V	10 to 100K	25
2512	600 mW	220 V	10 to 150K	35

**TABLE 4 - LOAD LIFE STABILITY (+ 70 °C FOR 2000 HOURS)**

CHIP SIZE	MAXIMUM $\Delta R$ LIMITS
0805	$\pm 0.005 \%$ at 50 mW $\pm 0.01 \%$ at 100 mW
1206	$\pm 0.005 \%$ at 150 mW $\pm 0.01 \%$ at 250 mW
1506	$\pm 0.005 \%$ at 150 mW $\pm 0.01 \%$ at 300 mW
2010	$\pm 0.005 \%$ at 200mW $\pm 0.01 \%$ at 400 mW
2512	$\pm 0.005 \%$ at 500 mW $\pm 0.01 \%$ at 600 mW

**TABLE 5 - PERFORMANCES**

TEST OR CONDITION	MIL-PRF-55342 CHARACTERISTIC E $\Delta R$ LIMITS	TYPICAL $\Delta R$ LIMITS	MAXIMUM $\Delta R$ LIMITS <sup>1)</sup>
Thermal Shock	$\pm 0.1 \%$	$\pm 0.005 \%$ (50 ppm)	$\pm 0.01 \%$ (100 ppm)
Low Temperature Operation	$\pm 0.1 \%$	$\pm 0.005 \%$ (50 ppm)	$\pm 0.01 \%$ (100 ppm)
Short Time Overload	$\pm 0.1 \%$	$\pm 0.005 \%$ (50 ppm)	$\pm 0.01 \%$ (100 ppm)
High Temperature Exposure	$\pm 0.1 \%$	$\pm 0.01 \%$ (100 ppm)	$\pm 0.02 \%$ (200 ppm)
Resistance to Soldering Heat	$\pm 0.2 \%$	$\pm 0.005 \%$ (50 ppm)	$\pm 0.015 \%$ (150 ppm)
Moisture Resistance	$\pm 0.2 \%$	$\pm 0.005 \%$ (50 ppm)	$\pm 0.02 \%$ (200 ppm)
Load Life Stability + 70 °C for 2000 hours at Rated Power	$\pm 0.5 \%$	$\pm 0.005 \%$ (50 ppm)	$\pm 0.01 \%$ (100 ppm)

**Note**

1. As shown + 0.01 W to allow for measurement errors at low values.



# VFCP Series (0805, 1206, 1506, 2010, 2512) (Z-Foil)

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Vishay Foil Resistors

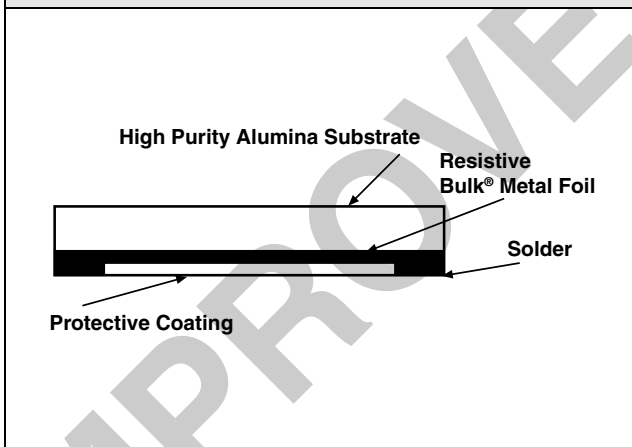
**TABLE 6 - DIMENSIONS AND LAND PATTERN** in inches (millimeters)

CHIP SIZE	BOTTOM VIEW (showing terminals for mounting)		LAND PATTERN				
	L	W	THICKNESS	D	Z <sup>1)</sup>	G <sup>1)</sup>	X <sup>1)</sup>
	$\pm 0.005$ (0.13)	$\pm 0.005$ (0.13)	MAXIMUM	$\pm 0.005$ (0.13)	MAXIMUM	MINIMUM	MAXIMUM
0805	0.079 (2.01)	0.049 (1.24)	0.025 (0.64)	0.010 (0.25)	0.078 (1.98)	0.053 (1.35)	0.049 (1.24)
1206	0.126 (3.20)	0.062 (1.57)	0.025 (0.64)	0.015 (0.38)	0.125 (3.18)	0.090 (2.29)	0.062 (1.57)
1506	0.150 (3.81)	0.062 (1.57)	0.025 (0.64)	0.012 (0.30)	0.150 (3.81)	0.120 (3.05)	0.062 (1.57)
2010	0.200 (5.08)	0.100 (2.54)	0.025 (0.64)	0.020 (0.51)	0.199 (5.05)	0.153 (3.89)	0.100 (2.54)
2512	0.250 (6.35)	0.126 (3.20)	0.025 (0.64)	0.024 (0.61)	0.250 (6.35)	0.196 (4.98)	0.126 (3.20)

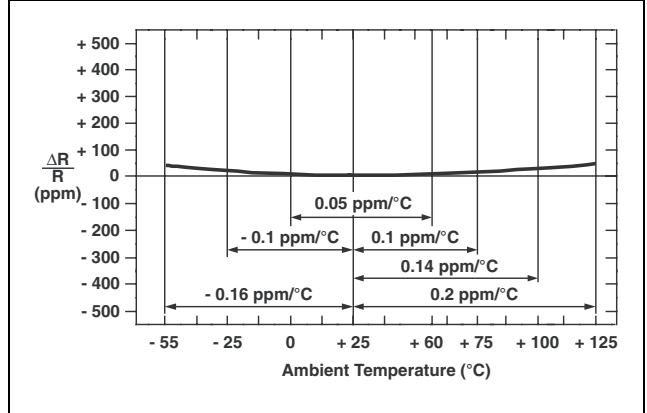
**Note**

1. Land Pattern Dimensions are per IPC-782

**FIGURE 3 - CHIP CONFIGURATION**



**FIGURE 4 - TYPICAL TCR CURVE Z-FOIL**  
(For more details, see Table 1)



**Note**

- The TCR values for  $< 100\Omega$  are influenced by the termination composition and result in deviation from this curve

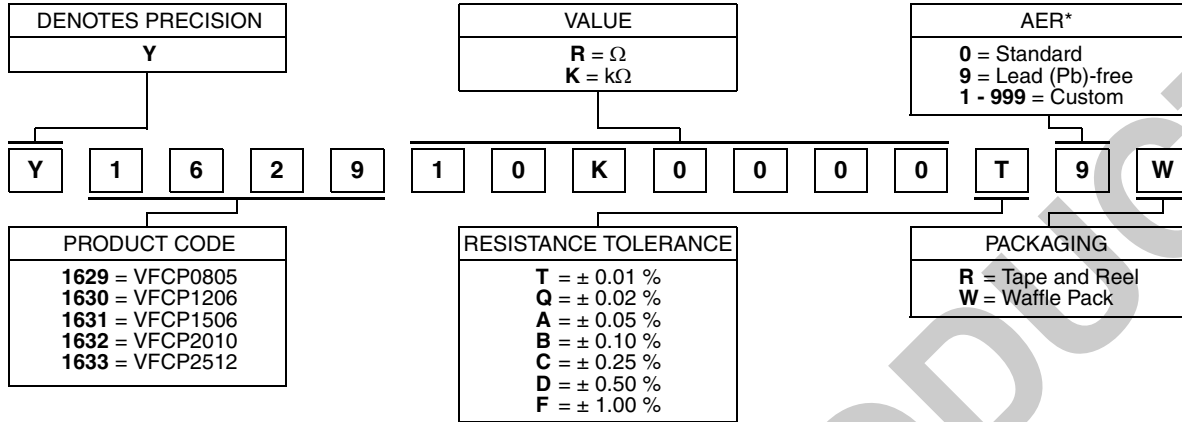
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**TABLE 7 - GLOBAL PART NUMBER INFORMATION**

NEW GLOBAL PART NUMBER: Y162910K0000T9W (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y1629 10K0000 T 9 W:

TYPE: VFCP0805  
 VALUE: 10.0  $k\Omega$   
 ABSOLUTE TOLERANCE:  $\pm 0.01 \%$   
 TERMINATION: Lead (Pb)-free  
 PACKAGING: Waffle Pack

HISTORICAL PART NUMBER: VFCP0805 10K000 TCR0.2 T S W (will continue to be used)

<b>VFCP0805</b>	<b>10K000</b>	<b>TCR0.2</b>	<b>T</b>	<b>S</b>	<b>W</b>
MODEL	OHMIC VALUE	TCR	RESISTANCE TOLERANCE	TERMINATION	PACKAGING
VFCP0805 VFCP1206 VFCP1506 VFCP2010 VFCP2512	10.0 $k\Omega$	Characteristic	T = $\pm 0.01 \%$ Q = $\pm 0.02 \%$ A = $\pm 0.05 \%$ B = $\pm 0.10 \%$ C = $\pm 0.25 \%$ D = $\pm 0.50 \%$ F = $\pm 1.00 \%$	S = Lead (Pb)-free B = Tin/Lead	T = Tape and Reel W = Waffle Pack

**Note**

\* For non-standard requests, please contact Application Engineering.



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