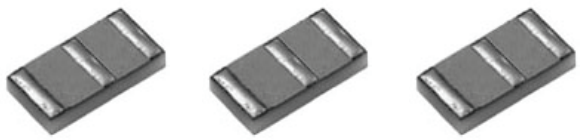
High Precision Bulk Metal® Foil Surface Mount Voltage Divider, TCR Tracking of < 0.5 ppm/°C, Tolerance Match of 0.01 % and Stability of ± 0.005 % (50 ppm)



Bottom View

INTRODUCTION

Bulk Metal® Z-Foil (BMZF) technology out-performs all other resistor technologies available today for applications that require ultra high precision and ultra high stability.

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

Model **VFCD1505** offers low TCR (both absolute and tracking), excellent load life stability, tight tolerance, excellent ratio stability, low thermal EMF and low current noise, all in one package. 0.05 ppm/°C absolute TCR removes errors due to temperature gradients.

The **VFCD1505** surface mount divider provides tight tolerance matching and TCR tracking between 2 resistors simultaneously etched on one piece of foil on a common substrate. The electrical specifications of this integrated construction offers improved performances and better real estate utilization over discrete resistors and matched pairs.

Our application engineering department is available to advise and make recommendations for non-standard technical requirements and special applications, please contact us.

FIGURE 1 - POWER DERATING CURVE

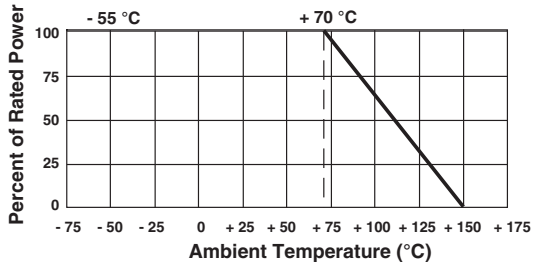
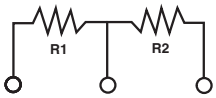


FIGURE 2 -SCHEMATIC



FEATURES

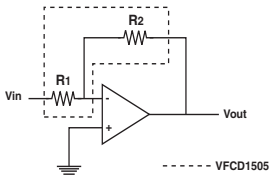
- Temperature coefficient of resistance (TCR): absolute: (table 1)
  ± 0.05 ppm/°C (typical 0 °C to + 60 °C)
  ± 0.2 ppm/°C (typical - 55 °C to + 125 °C, + 25 °C ref.)
  Tracking: (table 1)
  0.1 ppm/°C typical
- Resistance range: 1K to 10K
- Foil resistors are not restricted to standard values/ ratios, specific "as required" values/ratios may be supplied at no extra cost or delivery (e.g 2K234/5K456)
- Power coefficient tracking: "ΔR due to self heating" 5 ppm at rated power
- Short time overload: ± 0.005 %
- Tolerance: absolute and resistance ratio: to 0.01 %
- Load life stability (0.1 W at 70 °C, 2000 h)
  Absolute: 0.01 %
  Ratio: 0.005 %
- Electrostatic discharge (ESD) up to 25 000 V
- Power rating at 70 °C: entire package: 0.1 W, divided between the two resistors proportionally to their value
- Non-inductive, non-capacitive design
- Thermal EMF: 0.05 µV/°C typical
- Current noise: < - 40 dB
- Rise time: 1 ns effectively no ringing
- Non inductive: < 0.08 µH
- Voltage coefficient: < 0.1 ppm/V
- Non hot spot design
- Compliant to RoHS directive 2002/95/EC
- Terminal finish: lead (Pb)-free or tin/lead alloy
- For better performances please contact us
- Prototypes quantities available in just 5 working days or sooner. For more information, please contact foil@vishaypg.com

Pb-free Available

RoHS* COMPLIANT

APPLICATIONS

- Instrumentation amplifiers
- Bridge networks
- Differential amplifiers
- Ratio arms in bridge circuits
- Medical and test equipment
- Military
- Airborne etc.



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

TABLE 1 - RESISTANCE VALUES/RATIO AND TCR CHARACTERISTICS

POPULAR VALUES	VCODES	ABSOLUTE TCR (- 55 °C TO + 125 °C, + 25 °C REF.)		TCR TRACKING		TOLERANCE MATCHING
		TYPICAL	MAXIMUM	TYPICAL	MAXIMUM	
10K/10K	V0001	± 0.2 ppm/°C	± 1 ppm/°C	0.1 ppm/°C	0.5 ppm/°C	0.01 %
5K/5K	V0002					
1K/1K	V0004					
2K/2K	V0059					
5K/10K	V0005	± 0.2 ppm/°C	± 1 ppm/°C	0.4 ppm/°C	1.0 ppm/°C	0.01 %
2.5K/10K	V0060					
1K/9K	V0056	± 0.2 ppm/°C	± 1 ppm/°C	0.4 ppm/°C	1.0 ppm/°C	0.02 %
1K/10K	V0064					

Note

- Additional ratios are available. For the relevant VCODES for ordering, please contact application engineering using the footer below

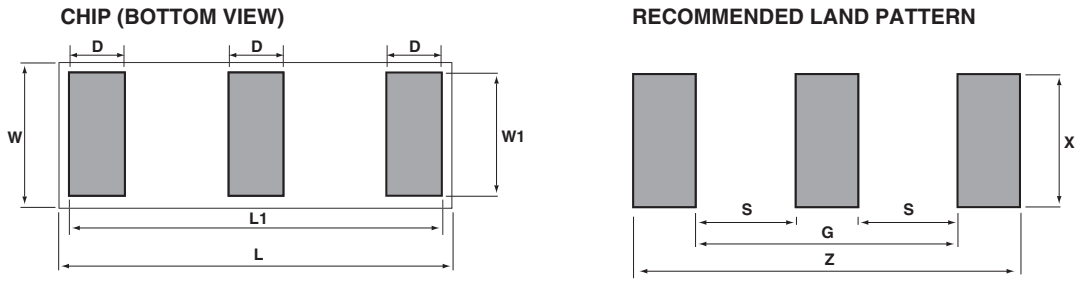
TABLE 2 - TYPICAL PERFORMANCE SPECIFICATIONS

TEST	MIL-PRF-55342H CHARACTERISTIC E ΔR LIMITS (1)	VFCD1505 ΔRATIO
Thermal shock	0.10 %	0.005 % (50 ppm)
Low temperature operation	0.10 %	0.005 % (50 ppm)
Short time overload	0.10 %	0.005 % (50 ppm)
High temperature exposure	0.10 %	0.01 % (100 ppm)
Resistance to soldering heat	0.20 %	0.01 % (100 ppm)
Moisture resistance	0.20 %	0.005 % (50 ppm)
Load life (ratio stability)	-	0.005 % (50 ppm)
Maximum working voltage for each element	22 V	
Weight	10 mg	
Packaging	Waffle pack standard, tape and reel available	

Note

(1) ΔR's plus additional 0.01 Ω for measurement error

FIGURE 3 - MODEL VFCD1505 DIMENSIONS AND LAND PATTERN in inches (millimeters)

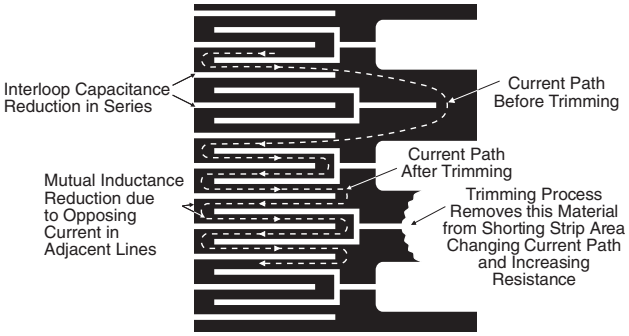


L ± 0.005 (0.13)	W ± 0.005 (0.13)	D ± 0.003 (0.08)	L1 ± 0.003 (0.08)	W1 ± 0.005 (0.13)	THICKNESS MAXIMUM	Z ± 0.003 (0.08)	G ± 0.003 (0.08)	S ± 0.003 (0.08)	X ± 0.003 (0.08)
0.150 (3.81)	0.050 (1.27)	0.015 (0.38)	0.144 (3.66)	0.043 (1.09)	0.025 (0.64)	0.147 (3.73)	0.111 (2.82)	0.046 (1.17)	0.046 (1.17)

Notes

- Avoid the use of cleaning agents which could attack epoxy resins, which form part of the resistor construction
- Vacuum pick up is recommended for handling
- Soldering iron is not applicable

FIGURE 4 - TRIMMING TO VALUES
(conceptual illustration)



Note: Foil shown in black, etched spaces in white

FIGURE 5 - TYPICAL RESISTANCE/ TEMPERATURE CURVE
(for more details see table 1)

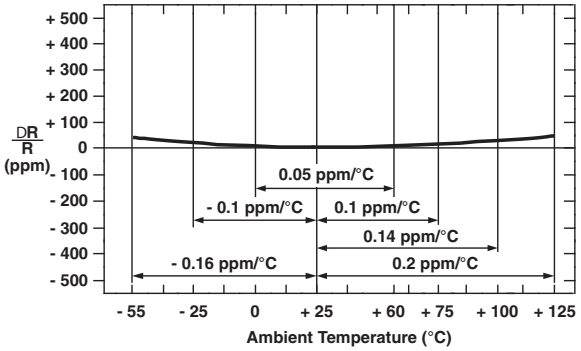


TABLE 3 - GLOBAL PART NUMBER INFORMATION [1]

NEW GLOBAL PART NUMBER: Y1685V0001QQ9R (preferred part number format)

DENOTES PRECISION	VCODE [2]	TOLERANCE MATCH	PACKAGING
Y	RESISTANCE VALUE CODE	**T** = 0.01 % **Q** = 0.02 % **A** = 0.05 %	**R** = tape and reel **W** = waffle pack

Y	1	6	8	5	V	0	0	0	1	Q	Q	9	R

PRODUCT CODE	ABSOLUTE TOLERANCE	CHARACTERISTICS
1685 = VFCD1505	**T** = ± 0.01 % **Q** = ± 0.02 % **A** = ± 0.05 % **B** = ± 0.1 % **C** = ± 0.25 % **D** = ± 0.5 % **F** = ± 1.0 %	**0** = standard product, tin/lead terminations **9** = standard product, lead (Pb)-free terminations **Other** = custom

FOR EXAMPLE: ABOVE GLOBAL ORDER Y1685 V0001 Q Q 9 R:

TYPE: VFCD1505
VALUES: 10K/10K
ABSOLUTE TOLERANCE: ± 0.02 %
TOLERANCE MATCH: 0.02 %
TERMINATION: lead (Pb)-free
PACKAGING: tape and reel

HISTORICAL PART NUMBER: VFCD1505 10K/10K TCR0.2 Q Q S T (will continue to be used)

VFCD1505	10K/10K	TCR0.2	Q	Q	S	T
MODEL	OHMIC VALUE	TCR CHARACTERISTIC	ABSOLUTE TOLERANCE	TOLERANCE MATCH	TERMINATION	PACKAGING
VFCD1505	R_1 = 10 kΩ R_2 = 10 kΩ		**T** = ± 0.01 % **Q** = ± 0.02 % **A** = ± 0.05 % **B** = ± 0.1 % **C** = ± 0.25 % **D** = ± 0.5 % **F** = ± 1.0 %	**T** = 0.01 % **Q** = 0.02 % **A** = 0.05 %	**S** = lead (Pb)-free **B** = tin/lead alloy	**T** = tape and reel **W** = waffle pack

Notes

(1) Application engineering release: for non-standard requests, please contact application engineering

(2) For examples of VCODES see table 1

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