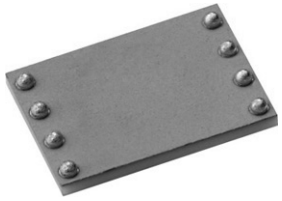
Ultra High Precision Z-Foil BGA Surface Mount Resistor 4R Network, Temperature Coefficient Tracking 0.1 ppm/°C, Load Life Ratio Stability to ± 0.01 % (100 ppm), ESD Immunity to 25 kV



INTRODUCTION

Bulk Metal® Z-foil technology out-performs all other resistor technologies available today for applications that require ultra-high precision and ultra-high stability. The Z-foil technology provides a significant reduction of the resistive element's sensitivity to ambient temperature variations (TCR) and to self heating when power is applied (power coefficient).

Model VFB2028N offers low TCR (both absolute and tracking), low PCR tracking, excellent load life stability, tight tolerance, excellent ratio stability, and low current noise, all in one package. 0.05 ppm/°C absolute TCR removes errors due to temperature gradients.

The VFB2028N ball grid array (BGA) surface mount 4-resistor network provides tight tolerance matching and TCR tracking between 4 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.

FEATURES

Pb-free Available

RoHS* COMPLIANT

- Temperature coefficient of resistance (TCR):
  Absolute: ± 0.05 ppm/°C typical (0 °C to + 60 °C)
  ± 0.2 ppm/°C typical (- 55 °C to + 125 °C, + 25 °C ref.)
  Tracking: 0.1 ppm/°C typical
- Power coefficient tracking "ΔR due to self heating": 5 ppm at rated power
- Power rating: 0.2 W per resistor at 70 °C
- Resistance tolerance match: 0.01 %
- Ratio stability: 0.01 % (0.2 W at 70 °C, 2000 h)
- Large variety of resistance ratios: 100 Ω to 30 kΩ
- Electrostatic discharge (ESD) up to 25 000 V
- Short time overload ≤ 0.01 % (100 ppm)
- Non inductive, non capacitive design
- Rise time: 1 ns effectively no ringing
- Thermal stabilization < 1 s
- Current noise: < - 40 dB
- Voltage coefficient: < 0.1 ppm/V
- Non inductive: < 0.08 µH
- Non hot spot design
- Terminal (solder ball) available: lead (Pb)-free
  tin/lead alloy
- Compliant to RoHS directive 2002/95/EC
- Maximum working voltage for each element: $(P \times R)^{1/2}$
- Weight: 74 mg
- For better performances please contact us

TABLE 1 - POPULAR RESISTANCE VALUES/RATIO AND TCR CHARACTERISTICS

POPULAR VALUES AVAILABLE (1) (R1/R2/R3/R4)	RESISTANCE VALUE CODE	TCR MAX. (MIL RANGE)		TOLERANCE	
		ABSOLUTE	TRACKING	ABSOLUTE	MATCH (R1/R2 and R3/R2)
10K/10K/10K/10K	V0008	2.0 ppm/°C	0.5 ppm/°C	0.02 %	0.01 %
15K/15K/15K/15K	V0355				
20K/20K/20K/20K	V0300				
25K/25K/25K/25K	V0311				
30K/30K/30K/30K	V0356				

Note

(1) For other values and ratios, please contact sales engineering department: foil@vishaypg.com

TABLE 2 - TYPICAL PERFORMANCE SPECIFICATIONS PER MIL-PRF-55342

TEST	ΔR	ΔRatio
Thermal shock, 5 x (- 65 °C to + 150 °C)	0.01 % (100 ppm)	0.01 % (100 ppm)
Low temperature operation, - 65 °C at $P_{nom.}$ 45 min	0.01 % (100 ppm)	0.005 % (50 ppm)
Short time overload, 6.25 x $P_{nom.}$ x 5 s	0.01 % (100 ppm)	0.01 % (100 ppm)
High temperature exposure, 100 h at + 150 °C	0.01 % (100 ppm)	0.01 % (100 ppm)
Resistance to soldering heat per MIL-PRF-55342	0.01 % (100 ppm)	0.01 % (100 ppm)
Moisture resistance MIL-STD-202, method 106 without load	0.05 % (500 ppm)	0.02 % (200 ppm)
Load life (ratio stability), + 70 °C for 2000 h	0.01 % (100 ppm)	0.01 % (100 ppm)

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

FIGURE 1 - CHIP CONFIGURATION

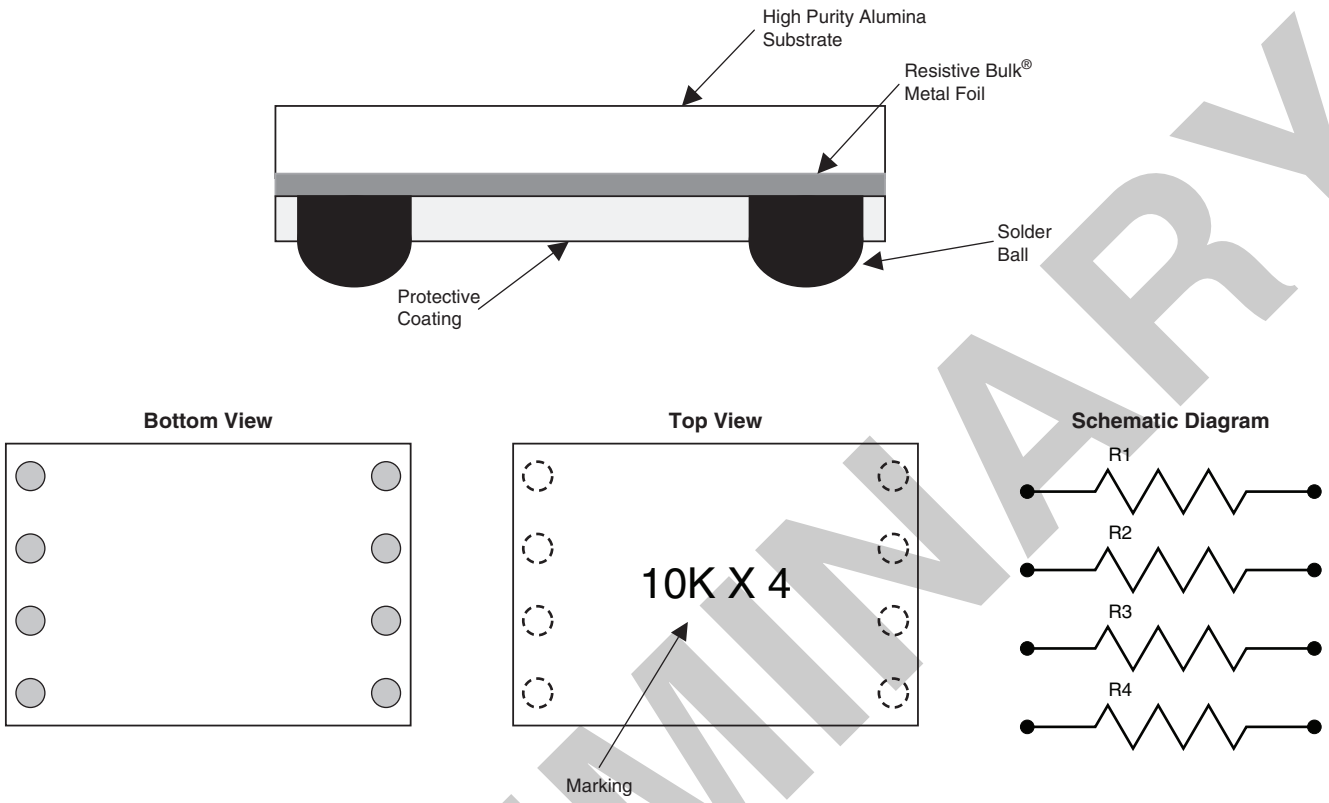
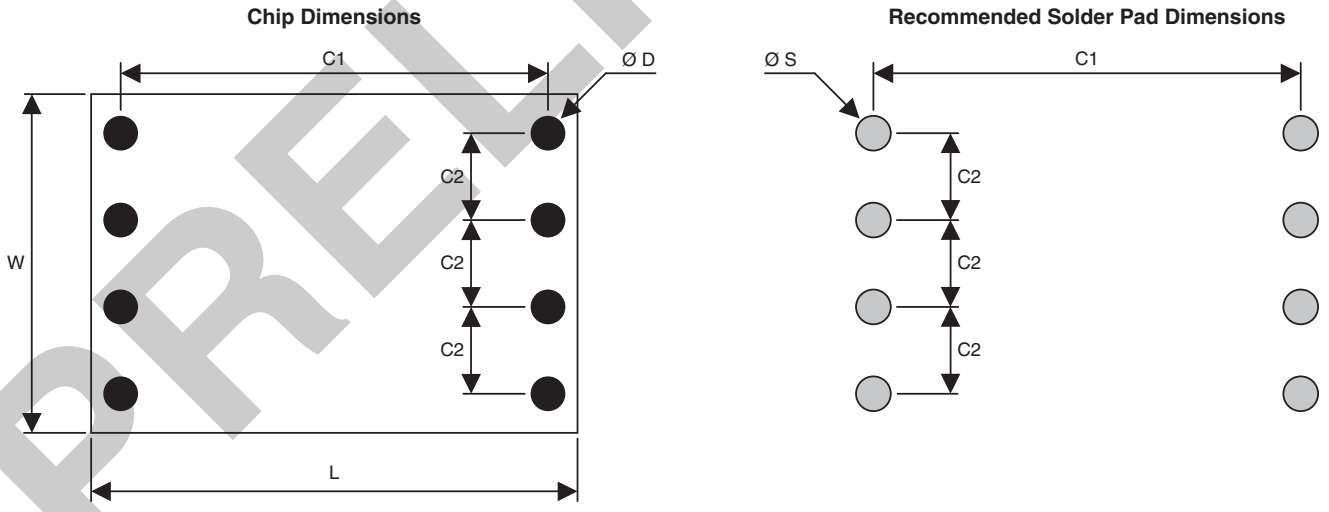
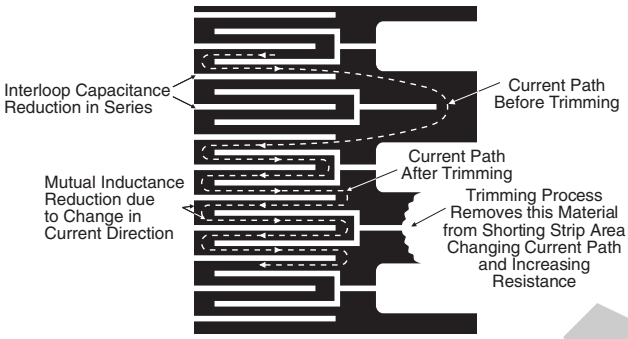


TABLE 3 - DIMENSIONS in Inches (Millimeters)



L	W	Ø D	C1	C2	Ø S	THICKNESS (with balls)
0.280 ± 0.005 (7.12 ± 0.13)	0.195 ± 0.005 (4.95 ± 0.13)	0.020 ± 0.002 (0.50 ± 0.05)	0.246 ± 0.002 (6.25 ± 0.05)	0.050 ± 0.002 (1.27 ± 0.05)	0.018 ± 0.002 (0.46 ± 0.05)	0.032 ± 0.003 (0.81 ± 0.08)

FIGURE 2 -TRIMMING TO VALUES (Conceptual Illustration)



Note: Foil shown in black, etched spaces in white

FIGURE 3 - DERATING CURVE

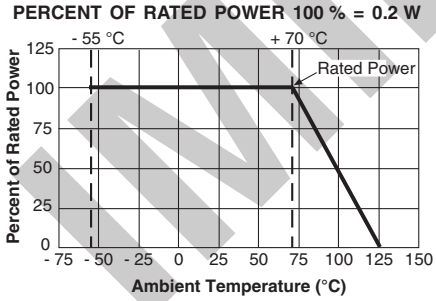


FIGURE 4 - TYPICAL TCR CURVE Z-FOIL

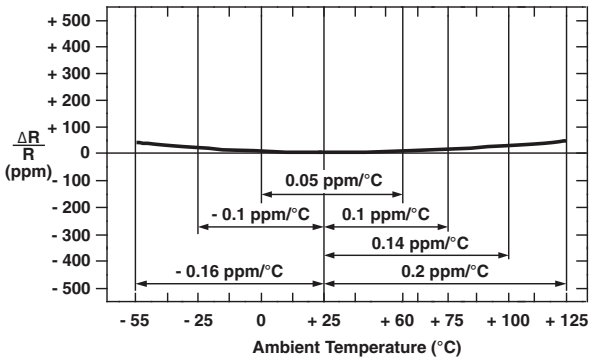


TABLE 4 - GLOBAL PART NUMBER INFORMATION (1)(3)

NEW GLOBAL PART NUMBER: Y1681V0355QT9W (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	1	V	0	3	5	5	Q	T	9	W

PRODUCT CODE	RESISTANCE TOLERANCE	CHARACTERISTICS
1681 = VFB2028N	**Q** = ± 0.02 % **A** = ± 0.05 % **B** = ± 0.10 % **C** = ± 0.25 %	**0** = standard **9** = lead (Pb)-free **1 to 999** = custom

FOR EXAMPLE: ABOVE GLOBAL ORDER Y1681 V0355 Q T 9 W:

TYPE: VFB2028N
VALUES: 15K/15K/15K/15K
ABSOLUTE TOLERANCE: ± 0.02 %
TOLERANCE MATCH: 0.01 %
TERMINATION: lead (Pb)-free
PACKAGING: waffle pack

HISTORICAL PART NUMBER: VFB2028N 15K/15K/15K/15K Q T S W (will continue to be used)

VFB2028N	15K/15K/15K/15K	Q	T	S	W
MODEL	RESISTANCE VALUE	ABSOLUTE TOLERANCE	TOLERANCE MATCH	TERMINATION	PACKAGING
	R_1 = 15 kΩ R_2 = 15 kΩ R_3 = 15 kΩ R_4 = 15 kΩ	**Q** = ± 0.02 % **A** = ± 0.05 % **B** = ± 0.10 % **C** = ± 0.25 %	**T** = 0.01 % **Q** = 0.02 % **A** = 0.05 %	**S** = lead (Pb)-free **B** = tin/lead	**T** = tape and reel **W** = waffle pack

Notes
(1) For non-standard requests, please contact application engineering.
(2) For list of value codes see table 1 (additional values are available on request).
(3) Can be mounted on SMN(Z) land pattern.

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