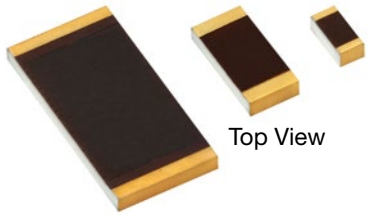
Ultra High-Precision Foil Wraparound Surface Mount Chip Resistor

with Gold Plated Terminals for High Temperature Applications up to +250°C

FEATURES

- Temperature coefficient of resistance (TCR): 2.5 ppm/°C max (–55°C to +200°C, +25°C ref.)
- Resistance range: 10 Ω to 125 kΩ (for higher and lower values, please contact us)
- Resistance tolerance: to ±0.01%
- **Working power[1]:**
  - **to 750 mW at +70°C**
  - **to 300 mW at +200°C**
- **Long-term stability: ±0.02% at +225 °C for 1000 h, no power**
- **Load-life stability: ±0.05% at 200°C for 2000 h, at working power**
- **High temperature exposure up to +250°C (unmounted), ±0.05%[2]**
- Bulk Metal Foil resistors are not restricted to standard values; we can supply specific “as required” values at no extra cost or delivery (e.g., 1K2345 vs. 1K)
- Thermal stabilization time <1 s (nominal value achieved within 10 ppm of steady state value)
- Electrostatic discharge (ESD) up to 25 kV
- Non-inductive, non-capacitive design
- Rise time: 1 ns effectively no ringing
- Current noise: 0.010 μV_{RMS}/V of applied voltage (<–40 dB)
- Voltage coefficient: 0.1 ppm/V
- Non-inductive: <0.08 µH
- Non hot spot design
- Terminal finish: soft gold plating
- For sample prototype quantities, please contact foil@vpgsensors.com.



Top View

1206
Bottom View

Pb-free Available

RoHS

INTRODUCTION

Vishay Foil Resistors (VFR) introduces an advanced line of Ultra Precision Bulk Metal® Z1 Foil Technology: wraparound surface mount chip resistors with gold-plated terminals for high temperature up to +250°C[1].

The FRSG series incorporates Z1 Foil Technology to extend its critical performance features to high-temperature environments, while maintaining the same low TCR. The gold-plated terminals support the use of popular mounting methods used in the industry, therefore, facilitating any design considerations required.

The FRSG 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 foil@vpgsensors.com.

Table 1—Tolerance and TCR vs. Resistance Value[1] (–55°C to +200°C, +25°C Ref.)

Resistance Value (Ω)	Tolerance (%)	Max TCR (ppm/°C)
250 to 125k	±0.01%	±2.5
100 to <250	±0.02%	
50 to <100	±0.05%	
25 to <50	±0.1%	
10 to <25	±0.25%	

Table 2—Specifications

Chip Size	Rated Power at +70°C (mW)	Working Power at +200°C (mW)	Resistance Range (Ω)
	FR4 PCB	Ceramic PCB	
0603	100	33	100 to 4k
0805	200	83	10 to 8k
1206	300	140	10 to 25k
1506	350	167	10 to 30k
2010	500	220	10 to 70k
2512	750	300	10 to 125k

Note

(1) Performances obtained with ceramic PCB.

(2) As shown +0.01 Ω to allow for measurement errors at low values.

Figure 1—Power Derating Curve

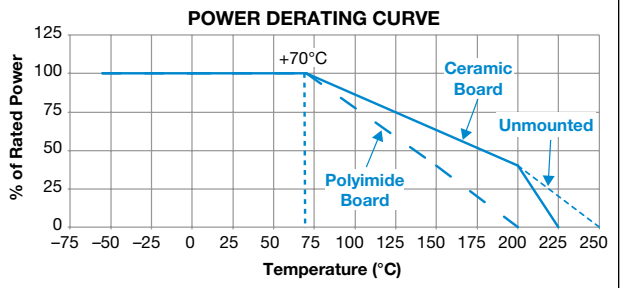
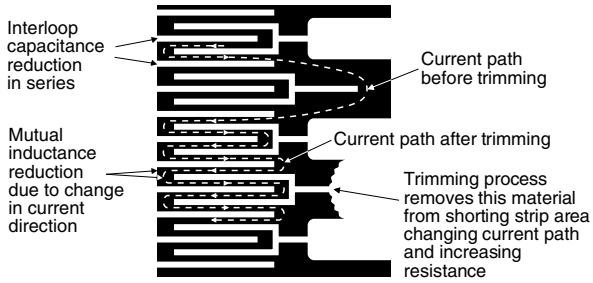


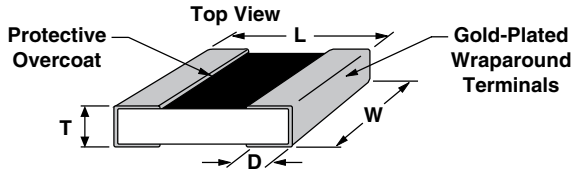
Figure 2—Trimming to Values
(conceptual illustration)

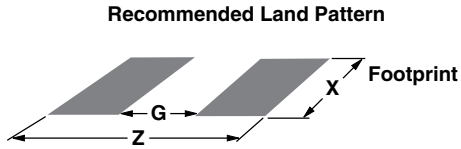


Foil shown in black, etched spaces in white

Note
To acquire a precision resistance value, the Bulk Metal® Foil chip is trimmed by selectively removing built-in "shorting bars." To increase the resistance in known increments, marked areas are cut, producing progressively smaller increases in resistance. This method reduces the effect of "hot spots" and improves the long-term stability of VFR resistors.

Table 3—Dimensions and Land Pattern in Inches (Millimeters)





Chip Size	L ±0.005 (0.13)	W ±0.005 (0.13)	Thickness Maximum	D ±0.005 (0.13)	Z [1]	G [1]	X [1]
0603	0.063 (1.60)	0.032 (0.81)	0.025 (0.64)	0.011 (0.28)	0.102 (2.59)	0.031 (0.78)	0.031(0.78)
0805	0.080 (2.03)	0.050 (1.27)		0.015 (0.38)	0.122 (3.10)	0.028 (0.71)	0.050 (1.27)
1206	0.126 (3.20)	0.062 (1.57)		0.020 (0.51)	0.175 (4.45)	0.059 (1.50)	0.071 (1.80)
1506	0.150 (3.81)	0.062 (1.57)		0.020 (0.51)	0.199 (5.05)	0.083 (2.11)	0.071 (1.80)
2010	0.198 (5.03)	0.097 (2.46)		0.025 (0.64)	0.247 (6.27)	0.115 (2.92)	0.103 (2.62)
2512	0.249 (6.32)	0.127 (3.23)		0.032 (0.81)	0.291 (7.39)	0.150 (3.81)	0.127 (3.23)

Note
[1] Land Pattern Dimensions are per IPC-7351A.

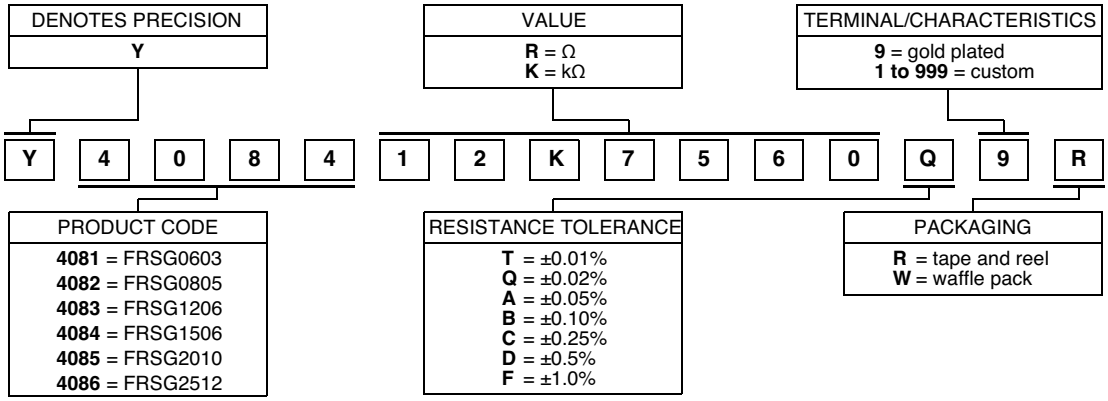
Table 4—Performances[1]

Test and Conditions		Typical Limit % (ppm)	Max Limit % (ppm)
Short time overload, 6.25 x P_{nom}		±0.005% (50)	±0.01% (100)
High temperature exposure, +225°C, no power	100 hrs 1,000 hrs	±0.01% (100)[2] ±0.02% (200)[2][3]	±0.02% (200)[2] ±0.05% (500)[2][3]
Low temperature operation, –65°C, 45 min at rated power		±0.005% (50)	±0.01% (100)
Resistance to soldering heat, per MIL-PRF-55342 (p.4.8.8.1)		±0.005% (50)	±0.01% (100)
Moisture resistance, per MIL-PRF-55342 (p. 4.8.9)		±0.005% (50)	±0.01% (100)
Humidity test, 85°C/85% RH, 1000 h		±0.005% (50)	±0.01% (100)
Stability under load, +200°C for 2000 h, derated power (see table 2), ceramic PCB		±0.05% (500)[2][3]	±0.1% (1,000)[2][3]
Load-life test, +70°C for 2000 h at rated power (see Table 2), ceramic PCB and FR4 PCB		±0.01% (100)	±0.02% (200)
Thermal shock, 5 x (–65°C to +200°C)		±0.01% (100)	±0.02% (200)

Notes
(1) As shown + 0.01 Ω to allow for measurement errors at low values.
(2) Performances obtained with ceramic PCB.
(3) For R ≥ 100 Ω. For other resistance values please contact Application Engineering.

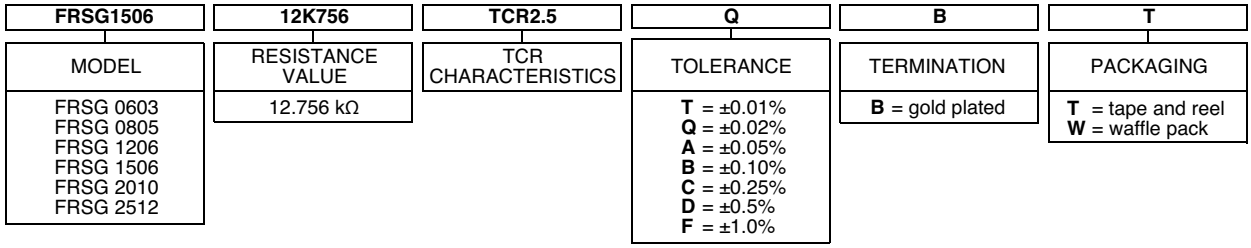
Figure 3—Global Part Number Information[1]

NEW GLOBAL PART NUMBER: Y408412K7560Q9R (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y4084 12K7560 Q 9 R:
TYPE: FRSG1506
VALUES: 12.7560 kΩ
ABSOLUTE TOLERANCE: 0.02%
TERMINATION: gold plated
PACKAGING: tape and reel

HISTORICAL PART NUMBER: FRSG1506 12K756 TCR2.5 Q B T (will continue to be used)



Note
(1) Customizations are available; contact application engineering at foil@vpgsensors.com.

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