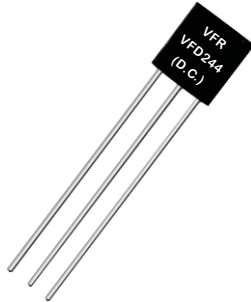
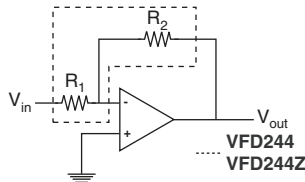


Bulk Metal® Foil Technology High Precision Voltage Divider Resistors with TCR Tracking to 0.5 ppm/°C and Tolerance Match to 0.005 % (50 ppm)



APPLICATIONS

- Instrumentation amplifiers
- Bridge networks
- Differential amplifiers
- Military
- Space
- Medical
- Automatic test equipment
- Down-hole (high temperature)



FEATURES

- Temperature coefficient of resistance (TCR) absolute: ± 2 ppm/°C typical (-55 °C to +125 °C, +25 °C ref.)
TCR tracking: 0.5 ppm/°C
- Tolerance: absolute and matching to 0.005 % (50 ppm)
- Resistance range: 1 Ω to 150 k Ω per resistive element
- Vishay Foil resistors are not restricted to standard values/ratios; specific “as requested” values/ratios can be supplied at no extra cost or delivery (e.g. 1K2345 vs. 1K)
- Power rating: up to 1 W at 70 °C, for the entire package, divided proportionally between the two values
- Load life ratio stability: < 0.005 % (50 ppm) 1 W at 70 °C for 2000 h
- Maximum working voltage: 350 V
- Electrostatic discharge (ESD) up to 25 000 V
- Non-inductive, non-capacitive design
- Rise time: 1 ns effectively no ringing
- Thermal stabilization time < 1 s (nominal value achieved within 10 ppm of steady state value)
- Current noise: 0.010 $\mu\text{V}_{\text{RMS}}/\text{V}$ of applied voltage (< -40 dB)
- Thermal EMF: 0.05 $\mu\text{V}/^\circ\text{C}$ typical
- Voltage coefficient: < 0.1 ppm/V
- Non-inductive: < 0.08 μH
- Non hot spot design
- Terminal finish: lead (Pb)-free or tin/lead alloy
- Compliant to RoHS directive 2002/95/EC
- Prototype quantities available in just 5 working days or sooner. For more information, please contact foil@vpgsensors.com
- For better performances see VFD244Z (Z-Foil) datasheet



RoHS*
COMPLIANT

TABLE 1 - RATED POWER PER ELEMENT

| RESISTANCE ELEMENT VALUE | MAXIMUM POWER RATING AT 70 °C PER ENTIRE PACKAGE | MAXIMUM POWER RATING AT 125 °C PER ENTIRE PACKAGE |
|----------------------------------|--|---|
| 1 Ω to < 100 k Ω | 1 W (not exceed 0.6 W per element) | 0.5 W (not exceed 0.3 W per element) |
| 100 k Ω to 150 k Ω | 0.6 W (not exceed 0.4 W per element) | 0.3 W (not exceed 0.2 W per element) |

TABLE 2 - MODEL VFD244 SPECIFICATIONS

| MODEL | RESISTANCE VALUES | ABSOLUTE TCR (-55 °C to +125 °C, +25 °C ref.) | TOLERANCE | | TCR TRACKING (MAX.) | |
|--------------------------|---------------------------------|---|---------------|------------|---------------------|------------------|
| | | TYPICAL AND MAX. SPREAD | ABSOLUTE | MATCH | SAME VALUES | DIFFERENT VALUES |
| VFD244 | 500 Ω to 150 k Ω | ± 2 ppm/°C ± 2.5 ppm/°C | ± 0.005 % | 0.005 % | 0.5 ppm/°C | 1.5 ppm/°C |
| | 100 Ω to 500 Ω | | ± 0.005 % | 0.01 % | 1.0 ppm/°C | 2.0 ppm/°C |
| | 50 Ω to 100 Ω | ± 2 ppm/°C ± 3.5 ppm/°C | ± 0.01 % | 0.02 % | 1.5 ppm/°C | 2.5 ppm/°C |
| | 25 Ω to 50 Ω | ± 2 ppm/°C ± 4.0 ppm/°C | ± 0.01 % | 0.02 % | 2.0 ppm/°C | 3.0 ppm/°C |
| | 10 Ω to 25 Ω | | ± 0.02 % | 0.04 % | 2.5 ppm/°C | 3.5 ppm/°C |
| | 5 Ω to 10 Ω | ± 2 ppm/°C ± 4.5 ppm/°C | ± 0.05 % | 0.05 % | 3.0 ppm/°C | 4.0 ppm/°C |
| | 2 Ω to 5 Ω | ± 2 ppm/°C ± 5.0 ppm/°C | ± 0.1 % | 0.1 % | 3.5 ppm/°C | 4.5 ppm/°C |
| 1 Ω to 2 Ω | ± 2 ppm/°C ± 6.0 ppm/°C | ± 0.5 % | 0.2 % | 4.0 ppm/°C | 5.0 ppm/°C | |

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

INTRODUCTION

Today, designers of analog circuits are demanding voltage dividers that approach the ideal in Performance ... stable, high speed, high accuracy components that will operate with assured, predictable reliability for years in a variety of environments. Vishay Foil Resistors (VFR) is meeting those demands with the VFD244 of unequalled performance. VFR also adds the dimensions of convenience and economy to resistors needs. Our long experience relieves the circuit designer of the complicated, costly and wasteful procedure of calculating the value of individual resistor components, ordering and then stabilizing, aging or matching these units, and literally assembling and testing his own resistor arrays.

The VFR approach to dividers is simple and straight forward, our solution consists of any combination of resistors, and the end result is what matters. As a consequence, the only data VFR requires is the overall electrical performance specifications, the environment operational, and the desired physical requirements.

These four fundamental factors determine how "ideal" a precision divider resistor will be:

1. Initial absolute resistance value or how closely the absolute resistance value can be achieved
2. How precisely the value of individual resistors can be controlled
3. How precisely the end of life tolerance is maintained under a wide range of operating conditions and stress factors (temperature, humidity, load, etc.)
4. Fast response without ringing and fast thermal stabilization - and the ability of the resistor to react to rapid switching without adversely affecting the circuit function. Until the development of Vishay Foil resistors, precise control of all four factors was virtually impossible. Vishay Foil resistors are designed and manufactured to eliminate the inter-parameter compromise inherent in all other types of resistors. All important characteristics: tolerance, long term stability, temperature coefficient, power coefficient, ESD, noise, capacitance and inductance – are optimized, approaching the theoretical ideal in total performance. Resistor technologies before the development of Bulk Metal® Foil resistors all compromised the theoretical ideal performance in one or more ways. For example, the winding of wire and the evaporation or the sputtering of extremely thin metal each produce metallurgical changes in the resistance materials and these noticeably deteriorate the electrical characteristics. Such changes are not predictable, and thus randomly alter performance parameters. The form factor of other units also introduces losses in high frequency performance, limits power dissipation and prohibits size reduction.

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

FIGURE 1 - TRIMMING TO VALUES (conceptual illustration)

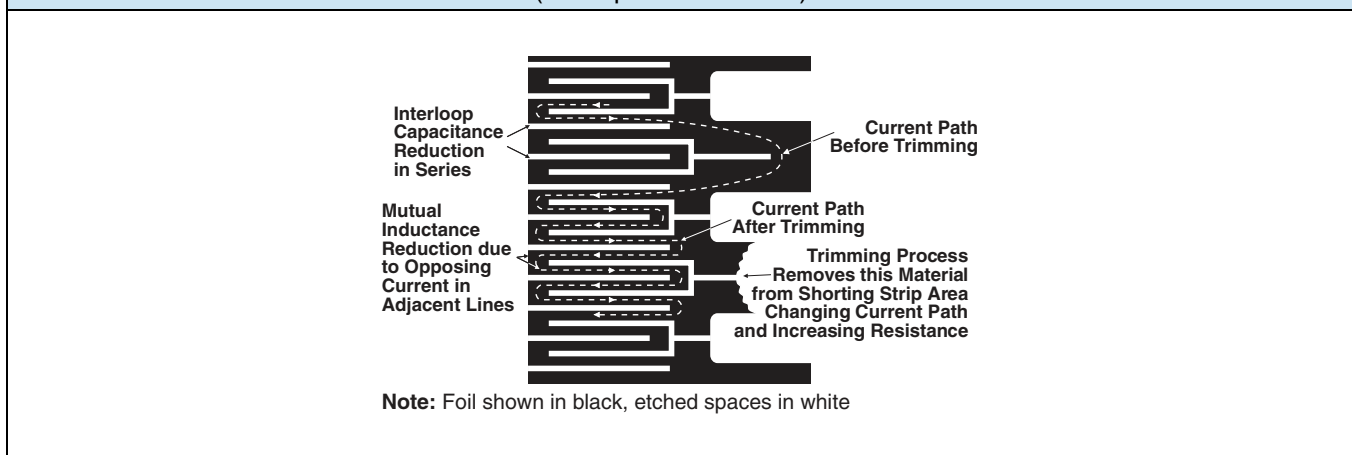
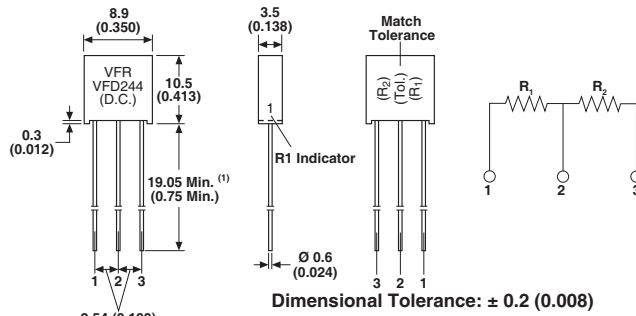


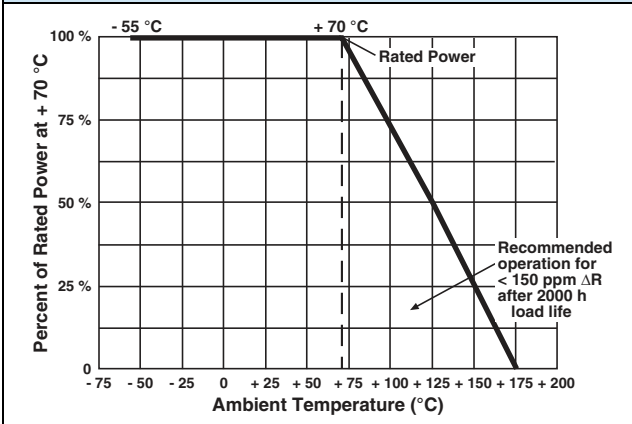
FIGURE 2 - STANDARD PRINTING AND DIMENSIONS in millimeters (inches)

Model VFD244 and Schematic (2)



- (1) Lead wires: #22 AWG solder coated copper
- (2) Each resistor contains 2 chips of two resistive elements

FIGURE 3 - POWER DERATING CURVE VFD244



Note

- Power is divided proportionally between the 2 values (see table 1)

FIGURE 4 - TYPICAL RESISTANCE/TEMPERATURE CURVE

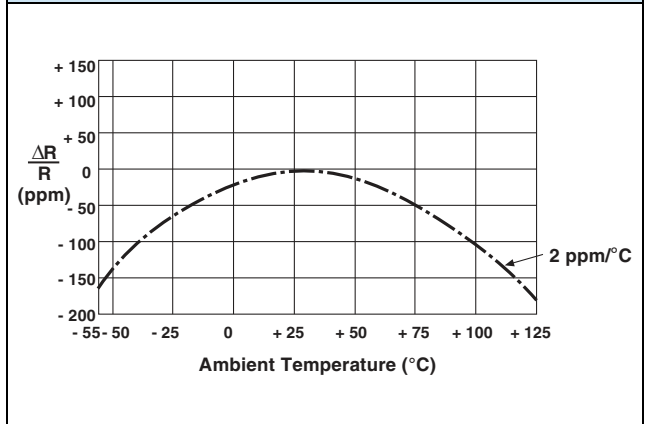
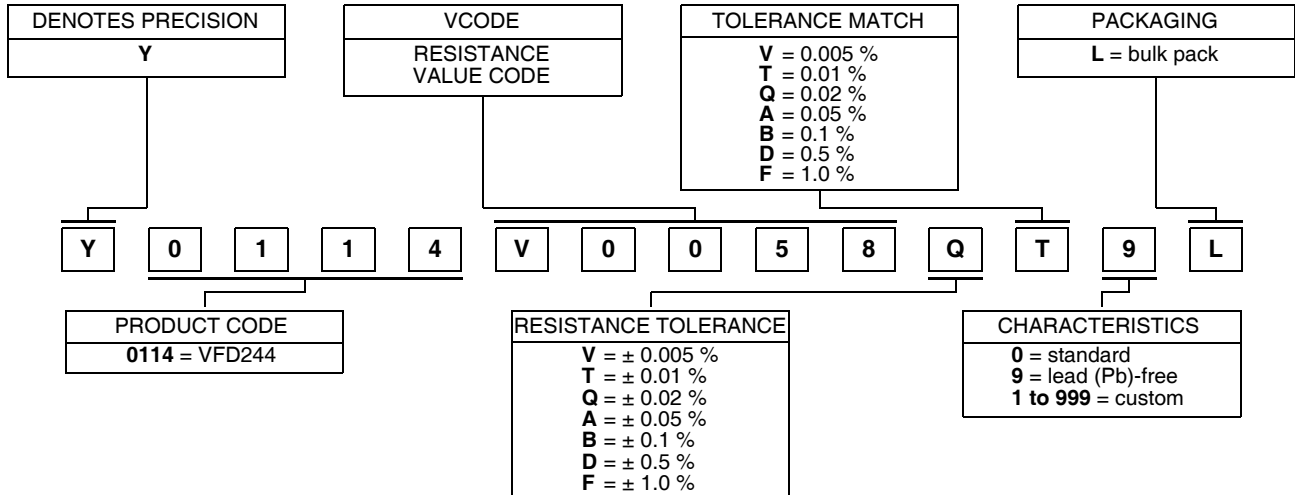


TABLE 3 - GLOBAL PART NUMBER INFORMATION (1)

NEW GLOBAL PART NUMBER: Y0114V0058QT9L (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y0114 V0058 Q T 9 L:

TYPE: VFD244
VALUES: 2K/20K
ABSOLUTE TOLERANCE: ± 0.02 %
TOLERANCE MATCH: 0.01 %
TERMINATION: lead (Pb)-free
PACKAGING: bulk pack

HISTORICAL PART NUMBER: VFD244T 2K/20K TCR2 Q T B (will continue to be used)

| | | | | | | |
|--------|---|---|--------------------|--|--|---------------|
| VFD244 | T | 2K/20K | TCR2 | Q | T | B |
| MODEL | TERMINATION | OHMIC VALUE | TCR CHARACTERISTIC | ABSOLUTE TOLERANCE | TOLERANCE MATCH | PACKAGING |
| VFD244 | T = lead (Pb)-free None = tin/lead alloy | R ₁ = 2 kΩ R ₂ = 20 kΩ | | V = ± 0.005 % T = ± 0.01 % Q = ± 0.02 % A = ± 0.05 % B = ± 0.1 % D = ± 0.5 % F = ± 1.0 % | V = 0.005 % T = 0.01 % Q = 0.02 % A = 0.05 % B = 0.1 % D = 0.5 % F = 1.0 % | B = bulk pack |

Note

(1) For non-standard requests, please contact application engineering



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