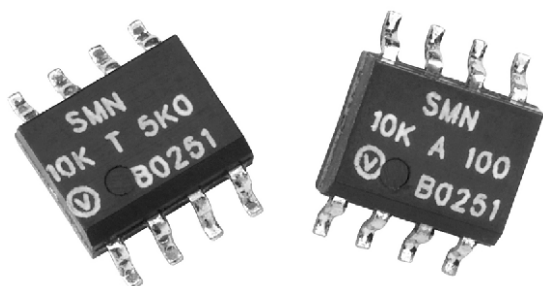


High Precision Surface Mount 4 Resistor Network Dual-In-Line Package with TCR Tracking $\leq 0.5 \text{ ppm}/^\circ\text{C}$, Tolerance Match of 0.01 % and Ratio Stability of 0.005 %



Any value and any ratio available within resistance range

INTRODUCTION

Bulk Metal[®] Foil (BMF) Technology outperforms all other resistor technologies available today for applications that require High Precision and High Stability.

This technology has been pioneered and developed by Vishay, and products based on this technology are the most suitable for a wide range of applications.

BMF technology allows us to produce Customer Orientated products designed to satisfy challenging and specific technical requirements.

Model SMN offers low TCR (absolute and tracking), excellent load life stability, tight tolerance (absolute and match), excellent ratio stability, low thermal EMF, low current noise and low voltage coefficient - **all in the same resistor.**

The SMN Surface Mount Network is made up of 4 independent BMF resistors in a small standard molded epoxy package with 50 MIL lead pitch (JEDEC MS-012 package).

The electrical specification of this integrated construction offers improved performance and better real estate utilization over discrete resistors and matched sets. The resistor may be used independently or as divider pairs.

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

TABLE 1 - RESISTANCE VALUES AND TOLERANCES

(Tighter performances are available)

| | |
|----------------------------------|--|
| RESISTANCE VALUES | 100 Ω - 10 k Ω per resistor |
| ABSOLUTE TOLERANCE EACH RESISTOR | $\pm 0.02 \%$, $\pm 0.05 \%$, $\pm 0.1 \%$ |
| RESISTANCE TOLERANCE MATCH | 0.01 %, 0.02 %, 0.05 % |

FEATURES

- Temperature Coefficient of Resistance (TCR) (- 55 $^\circ\text{C}$ to + 125 $^\circ\text{C}$, + 25 $^\circ\text{C}$ Ref):
Absolute: $\pm 2 \text{ ppm}/^\circ\text{C}$ typical (see table 2)
Tracking: 0.5 ppm/ $^\circ\text{C}$ typical (see table 2)
- Power Rating: at 70 $^\circ\text{C}$
Entire Package: 0.4 W
Each Resistor: 0.1 W
- Resistance Tolerance Match: 0.01 %
- Ratio Stability: 0.005 % (0.1 W at 70 $^\circ\text{C}$, 2000 hours)
- Large Variety of Resistance Ratios
- Electrostatic Discharge (ESD) above 25 000 Volts
- Short Time Overload $\leq 0.0025 \%$
- Non Inductive, Non Capacitive Design
- Rise Time: 1 ns without ringing
- Current Noise: < - 40 dB
- Thermal EMF: 0.05 $\mu\text{V}/^\circ\text{C}$
- Voltage Coefficient < 0.1 ppm/V
- Non Inductive: < 0.08 μH
- Non Hot Spot Design
- Terminal Finishes available: Lead (Pb)-free Tin/Lead Alloy
- For better performances please contact us
- Available with Z-Foil technology, please see SMNZ datasheet



RoHS+ COMPLIANT

APPLICATIONS

- Instrumentation Amplifiers
- Bridge Networks
- Differential Amplifiers
- Ratio Arms in Bridge Circuits
- Medical and Test Equipment
- Military
- Airborne etc.

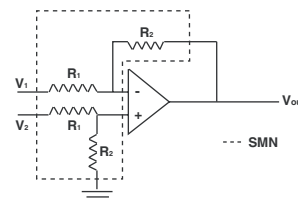
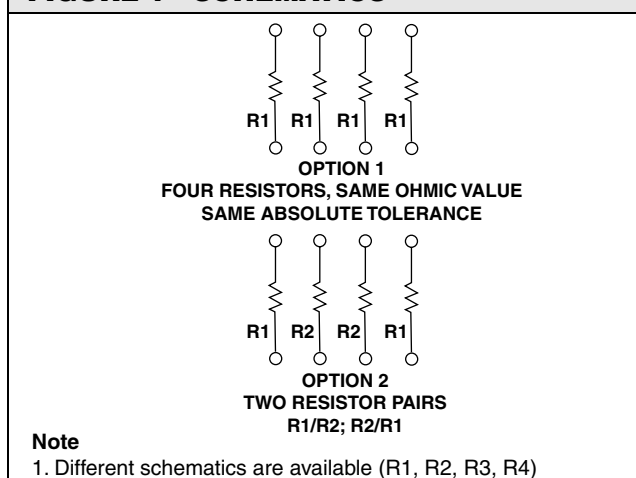
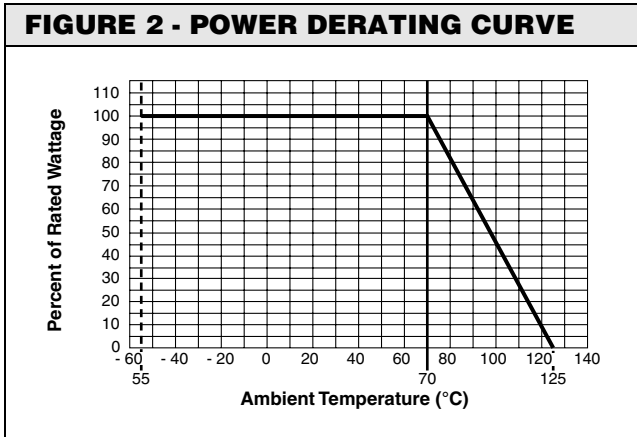


FIGURE 1 - SCHEMATICS¹⁾

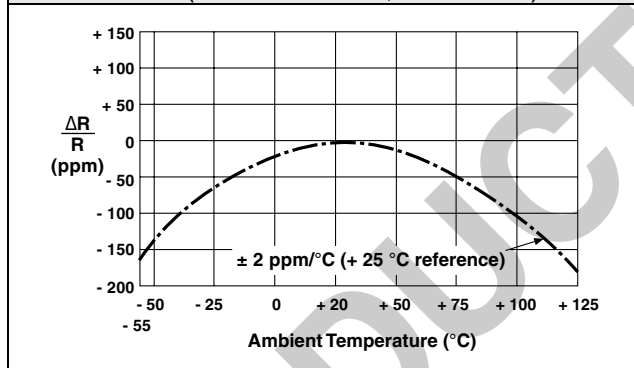
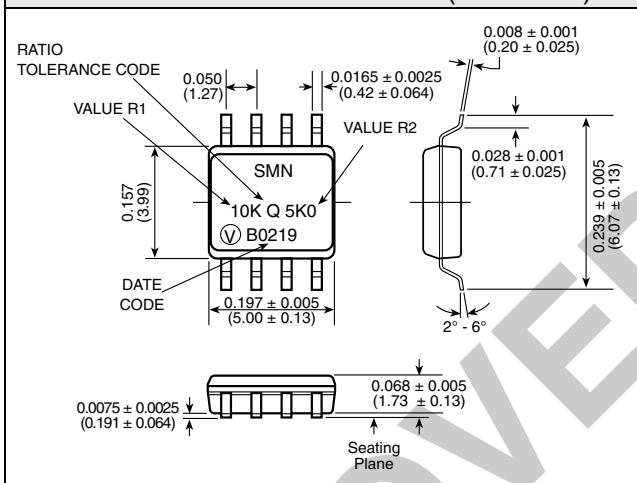


* Pb containing terminations are not RoHS compliant, exemptions may apply

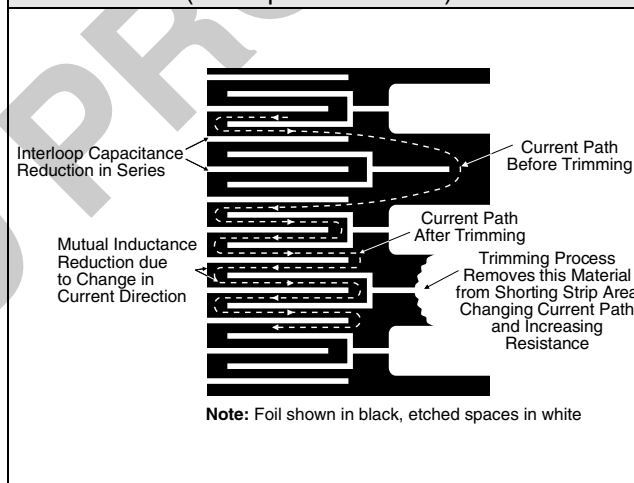
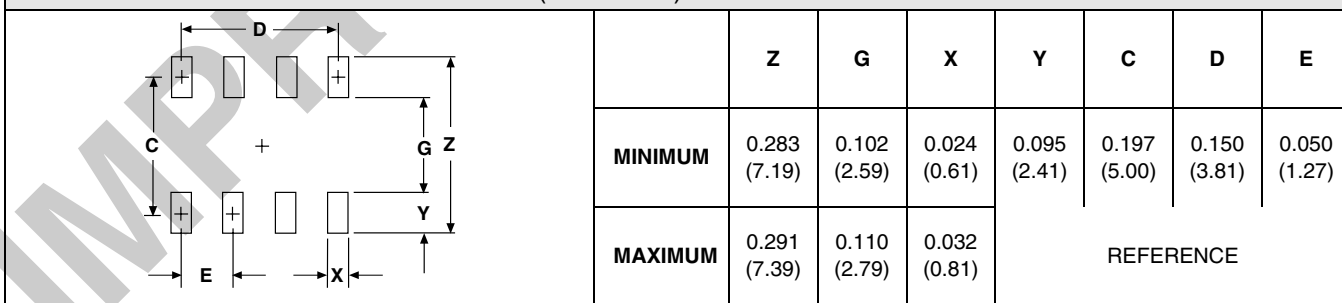
High Precision Surface Mount 4 Resistor Network Vishay Foil Resistors
 Dual-In-Line Package with TCR Tracking $\leq 0.5 \text{ ppm}/^\circ\text{C}$,
 Tolerance Match of 0.01% and Ratio Stability of 0.005%

FIGURE 2 - POWER DERATING CURVE

FIGURE 4 - TYPICAL TCR CURVE

(For more details, see table 2)


FIGURE 3 - DIMENSIONS AND IMPRINTING EXAMPLE in inches (millimeters)

FIGURE 5 - TRIMMING TO VALUES

(Conceptual Illustration)


FIGURE 6 - LAND PATTERN in inches (millimeters)


Vishay Foil Resistors High Precision Surface Mount 4 Resistor Network
Dual-In-Line Package with TCR Tracking $\leq 0.5 \text{ ppm}/^\circ\text{C}$,
Tolerance Match of 0.01% and Ratio Stability of 0.005%

TABLE 2 - PERFORMANCE SPECIFICATIONS (Per MIL-PRF 914 Test Methods)

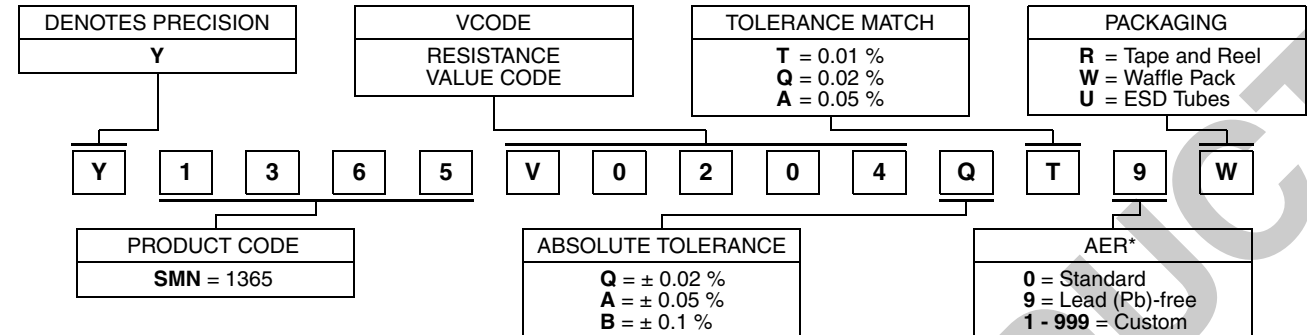
| SPECIFICATIONS | TYPICAL LIMITS |
|---|---|
| Power Rating at + 70 °C | Each resistor: 0.1 watts Entire package: 0.4 watts |
| Maximum Working Voltage (each resistor) | $(P \times R)^{1/2}$ |
| TCR - 55 °C to + 125 °C (25 °C reference) | Absolute (typical and max. spread): $\pm 2 \pm 3 \text{ ppm}/^\circ\text{C}$ Tracking (maximum): For $R1/R2 = 1$ 1.0 ppm/°C For $1 < R1/R2 \leq 10$ 2.0 ppm/°C For $10 < R1/R2 \leq 100$ 3.0 ppm/°C |
| Thermal Shock 25 x (- 65 °C to + 125 °C) | $\Delta R = 0.01 \%$ (100 ppm) $\Delta \text{Ratio} = 0.01 \%$ (100 ppm) |
| Thermal Shock 5 x (- 65 °C to + 125 °C) and Power Conditioning 1.5 rated power at 25 °C, 100 hours | $\Delta R = 0.02 \%$ (200 ppm) $\Delta \text{Ratio} = 0.015 \%$ (150 ppm) |
| DWV Atm. Pressure 200 V (A.C), 1 minute | Successfully passed |
| Insulation Resistance 100 V (D.C), 1 minute | $> 10^4 \text{ M}\Omega$ |
| Resistance to Soldering Heat | $\Delta R = 0.01 \%$ (100 ppm) $\Delta \text{Ratio} = 0.005 \%$ (50 ppm) |
| Moisture Resistance + 65 °C to - 10 °C; 90 % to 98 % RH; 0.1 x rated power; 240 hours | $\Delta R = 0.02 \%$ (200 ppm) $\Delta \text{Ratio} = 0.005 \%$ (50 ppm) |
| Shock (Specified Pulse) 100G | $\Delta R = 0.01 \%$ (100 ppm) $\Delta \text{Ratio} = 0.01 \%$ (100 ppm) |
| Vibration, High Frequency (10 Hz - 2000 Hz), 20G | $\Delta R = 0.005 \%$ (50 ppm) $\Delta \text{Ratio} = 0.005 \%$ (50 ppm) |
| High Temperature Exposure 100 hours at 125 °C | $\Delta R = 0.01 \%$ (100 ppm) $\Delta \text{Ratio} = 0.005 \%$ (50 ppm) |
| Low Temperature Storage 24 hours at - 65 °C | $\Delta R = 0.005 \%$ (50 ppm) $\Delta \text{Ratio} = 0.005 \%$ (50 ppm) |
| Load Life Stability at 70 °C; 0.1 watt per resistor, 2000 hours | $\Delta R = 0.005 \%$ (50 ppm) $\Delta \text{Ratio} = 0.005 \%$ (50 ppm) |
| Short Time Overload 6.25 x Rated Power; 5 seconds | $\Delta R = 0.005 \%$ (50 ppm) $\Delta \text{Ratio} = 0.0025 \%$ (25 ppm) |
| Weight | 0.08 g |



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TABLE 3 - GLOBAL PART NUMBER INFORMATION

NEW GLOBAL PART NUMBER: Y1365V0204QT9W (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y1365 V0204 Q T 9 W:

TYPE: SMN
 VALUES: 10K/500R
 ABSOLUTE TOLERANCE: $\pm 0.02 \%$
 TOLERANCE MATCH: 0.01%
 TERMINATION: Lead (Pb)-free
 PACKAGING: Waffle Pack

HISTORICAL PART NUMBER: SMN 10K/500R TCR2 Q T S W (will continue to be used)

| | | | | | | |
|-------|--|--------------|--|---|--|--|
| SMN | 10K/500R | TCR2 | Q | T | S | W |
| MODEL | RESISTANCE VALUE | ABSOLUTE TCR | ABSOLUTE TOLERANCE | TOLERANCE MATCH | TERMINATION | PACKAGING |
| SMN | $R_1 = 10 \text{ k}\Omega$ $R_2 = 500 \Omega$ | TCR2 | $Q = \pm 0.02 \%$ $A = \pm 0.05 \%$ $B = \pm 0.1 \%$ | $T = 0.01 \%$ $Q = 0.02 \%$ $A = 0.05 \%$ | $S = \text{Lead (Pb)-free}$ $B = \text{Tin/Lead}$ | $T = \text{Tape and Reel}$ $W = \text{Waffle Pack}$ $U = \text{ESD Tubes}$ |

Note

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

TABLE 4 - RESISTANCE VALUE CODE LIST FOR POPULAR RATIOS

| VCODES | R1/R2 RATIO | R1 | R2 | VCODES | R1/R2 RATIO | R1 | R2 |
|--------|-------------|------|------|--------|-------------|------|------|
| V0201 | 100 | 10K | 100R | V0189 | 2.5 | 1K | 400R |
| V0202 | 50 | 10K | 200R | V0185 | | 500R | 200R |
| V0197 | | 5K | 100R | V0207 | 2 | 10K | 5K |
| V0203 | 25 | 10K | 400R | V0175 | | 2K | 1K |
| V0198 | | 5K | 200R | V0190 | | 1K | 500R |
| V0204 | 20 | 10K | 500R | V0182 | | 400R | 200R |
| V0193 | | 2K | 100R | V0179 | 200R | 100R | |
| V0205 | 10 | 10K | 1K | V0186 | 1.25 | 500R | 400R |
| V0194 | | 2K | 200R | V0178 | 1 | 100R | 100R |
| V0187 | | 1K | 100R | V0180 | | 200R | 200R |
| V0200 | 5 | 5K | 1K | V0183 | | 400R | 400R |
| V0195 | | 2K | 400R | V0023 | | 500R | 500R |
| V0188 | | 1K | 200R | V0191 | | 1K | 1K |
| V0184 | | 500R | 100R | V0176 | | 2K | 2K |
| V0196 | 4 | 2K | 500R | V0019 | | 5K | 5K |
| V0181 | | 400R | 100R | V0008 | 10K | 10K | |

Note

- Other values available upon request.



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