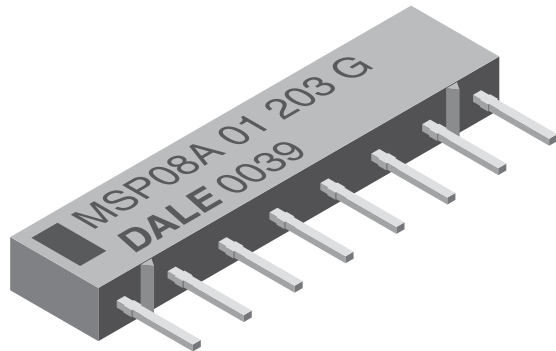


# Thick Film Resistor Networks, Single-In-Line, Molded SIP



## FEATURES

- Isolated, bussed, and dual terminator schematics available
- 0.195" (4.95 mm) "A" or 0.350" (8.89 mm) "C" maximum seated height
- Thick film resistive elements
- Low temperature coefficient (-55 °C to +125 °C) ± 100 ppm/°C
- Rugged, molded case construction
- Reduces total assembly costs
- Compatible with automatic insertion equipment and reduces PC board space
- Wide resistance range (10 Ω to 2.2 MΩ)
- Available in tube pack
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



RoHS\* Available

### Note

\* This datasheet provides information about parts that are RoHS-compliant and/or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information/tables in this datasheet for details.

| STANDARD ELECTRICAL SPECIFICATIONS |         |   |                    |                   |  |   |   |
|------------------------------------|---------|---|--------------------|-------------------|--|---|---|
| GLOBAL MODEL/ SCHEMATIC            | PROFILE | POWER RATING ELEMENT $P_{70^{\circ}\text{C}}$ W | RESISTANCE RANGE Ω | TOLERANCE (2) ± % | TEMPERATURE COEFFICIENT (-55 °C to +125 °C) ± ppm/°C | TCR TRACKING (1) (-55 °C to +125 °C) ± ppm/°C | MAXIMUM WORKING VOLTAGE (3) V <sub>DC</sub> |
| MSPxxx01                           | A       | 0.20  | 10 to 2.2M         | 1, 2, 5           | 100  | 50  | 100   |
| MSPxxx01                           | C       | 0.25  | 10 to 2.2M         | 1, 2, 5           | 100  | 50  | 100   |
| MSPxxx03                           | A       | 0.30  | 10 to 2.2M         | 1, 2, 5           | 100  | 50  | 100   |
| MSPxxx03                           | C       | 0.40  | 10 to 2.2M         | 1, 2, 5           | 100  | 50  | 100   |
| MSPxxx05                           | A       | 0.20  | 10 to 2.2M         | 1, 2, 5           | 100  | 150   | 100   |
| MSPxxx05                           | C       | 0.25  | 10 to 2.2M         | 1, 2, 5           | 100  | 150   | 100   |

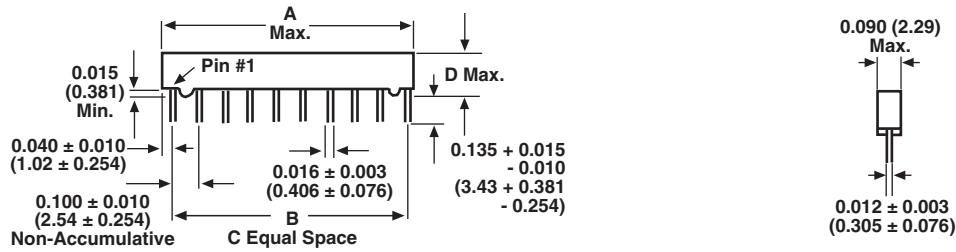
### Notes

- (1) Tighter tracking available
- (2) ± 2 % standard, ± 1 % and ± 5 % available
- (3) Continuous working voltage shall be  $\sqrt{P \times R}$  or maximum working voltage, whichever is less

| GLOBAL PART NUMBER INFORMATION  |  |  |   |  |  |   |  |   |   |   |   |   |   |   |  |  |  |
|---|--|--|---|--|--|---|--|---|---|---|---|---|---|---|--|--|--|
| <b>New Global Part Numbering: MSP06A031K00GDA (preferred part numbering format)</b>   |  |  |   |  |  |   |  |   |   |   |   |   |   |   |  |  |  |
| M   | S  | P  | 0   | 6  | A  | 0   | 3  | 1 | K | 0 | 0 | G | D | A |  |  |  |
| GLOBAL MODEL<br><b>MSP</b>  | PIN COUNT<br>06 = 6 pin<br>08 = 8 pin<br>09 = 9 pin<br>10 = 10 pin | PACKAGE HEIGHT<br>A = "A" profile<br>C = "C" profile | SCHEMATIC<br>01 = Bussed<br>03 = Isolated<br>00 = Special | RESISTANCE VALUE<br>R = Ω<br>K = kΩ<br>M = MΩ<br>10R0 = 10 Ω<br>33K0 = 33 kΩ<br>1M00 = 1 MΩ<br>0000 = 0 Ω Jumper | TOLERANCE CODE<br>F = ± 1 %<br>G = ± 2 %<br>J = ± 5 %<br>S = Special<br>Z = 0 Ω Jumper | PACKAGING<br>EJ = Lead (Pb)-free, tube<br>DA = Tin/lead, tube | SPECIAL<br>Blank = Standard (Dash Number) (Up to 3 digits) From 1 to 999 as applicable |   |   |   |   |   |   |   |  |  |  |
| <b>Historical Part Number Example: MSP06A03102G (will continue to be accepted)</b>    |  |  |   |  |  |   |  |   |   |   |   |   |   |   |  |  |  |
| MSP   | 06   | A  | 03  | 102  | G  | D03   |  |   |   |   |   |   |   |   |  |  |  |
| HISTORICAL MODEL  | PIN COUNT  | PACKAGE HEIGHT                                       | SCHEMATIC   | RESISTANCE VALUE   | TOLERANCE CODE   | PACKAGING   |  |   |   |   |   |   |   |   |  |  |  |
| <b>New Global Part Numbering: MSP08C05131AGDA (preferred part numbering format)</b>   |  |  |   |  |  |   |  |   |   |   |   |   |   |   |  |  |  |
| M   | S  | P  | 0   | 8  | C  | 0   | 5  | 1 | 3 | 1 | A | G | D | A |  |  |  |
| GLOBAL MODEL<br><b>MSP</b>  | PIN COUNT<br>06 = 6 pin<br>08 = 8 pin<br>09 = 9 pin<br>10 = 10 pin | PACKAGE HEIGHT<br>A = "A" profile<br>C = "C" profile | SCHEMATIC<br>05 = Dual terminator                         | RESISTANCE VALUE<br>3 digit impedance code, followed by alpha modifier (see Impedance Codes table)               | TOLERANCE CODE<br>F = ± 1 %<br>G = ± 2 %<br>J = ± 5 %                                  | PACKAGING<br>EJ = Lead (Pb)-free, tube<br>DA = Tin/lead, tube | SPECIAL<br>Blank = Standard (Dash Number) (Up to 3 digits) From 1 to 999 as applicable |   |   |   |   |   |   |   |  |  |  |
| <b>Historical Part Number Example: MSP08C05221331G (will continue to be accepted)</b> |  |  |   |  |  |   |  |   |   |   |   |   |   |   |  |  |  |
| MSP   | 08   | C  | 05  | 221  | 331  | G   | D03  |   |   |   |   |   |   |   |  |  |  |
| HISTORICAL MODEL  | PIN COUNT  | PACKAGE HEIGHT                                       | SCHEMATIC   | RESISTANCE VALUE 1   | RESISTANCE VALUE 2   | TOLERANCE CODE  | PACKAGING  |   |   |   |   |   |   |   |  |  |  |

### Note

- For additional information on packaging, refer to the Through-Hole Network Packaging document ([www.vishay.com/doc?31542](http://www.vishay.com/doc?31542)).

**DIMENSIONS** in inches (millimeters)


| GLOBAL MODEL | A (Max.)      | B             | C | D (Max.)                                       |
|--------------|---------------|---------------|---|--|
| MSP06        | 0.590 (14.99) | 0.500 (12.70) | 5 | MSPxxA = 0.195 (4.95)<br>MSPxxC = 0.350 (8.89) |
| MSP08        | 0.790 (20.07) | 0.700 (17.78) | 7 |  |
| MSP10        | 0.990 (25.15) | 0.900 (22.86) | 9 |  |
| MSP09        | 0.890 (22.61) | 0.800 (20.32) | 8 | 0.195 (4.95) only                              |

| TECHNICAL SPECIFICATIONS                             |           |                     |
|--|-----------|---------------------|
| PARAMETER  | UNIT      | MSP SERIES          |
| Package Power Rating<br>Maximum at +25 °C and +70 °C |           | See Derating Curves |
| Voltage Coefficient of Resistance                    | $V_{eff}$ | < 50 ppm typical    |
| Dielectric Strength                                  | $V_{AC}$  | 200                 |
| Isolation Resistance (03 Schematic)                  | $\Omega$  | > 100 M             |
| Operating Temperature Range                          | °C        | -55 to +125         |
| Storage Temperature Range                            | °C        | -55 to +150         |

| MECHANICAL SPECIFICATIONS      |  |
|--------------------------------|--|
| Marking Resistance to Solvents | Permanency testing per MIL-STD-202, Method 215   |
| Solderability                  | Per MIL-STD-202, Method 208E, RMA flux   |
| Body                           | Molded epoxy   |
| Terminals                      | Copper alloy, solder plated  |
| Weight                         | MSP06A = 0.4 g      MSP06C = 0.7 g<br>MSP08A = 0.5 g      MSP08C = 0.9 g<br>MSP09A = 0.55 g     MSP10C = 1.1 g<br>MSP10A = 0.6 g |

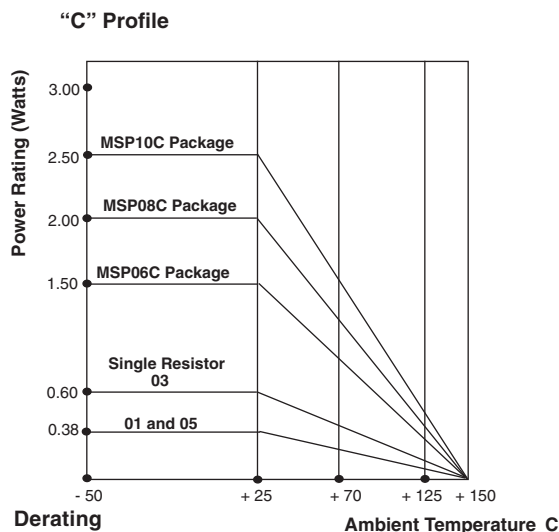
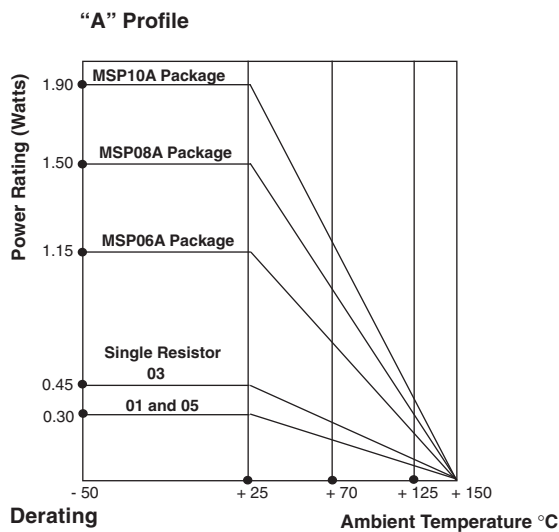
| IMPEDANCE CODES |                    |                    |      |                    |                    |
|-----------------|--------------------|--------------------|------|--------------------|--------------------|
| CODE            | R <sub>1</sub> (Ω) | R <sub>2</sub> (Ω) | CODE | R <sub>1</sub> (Ω) | R <sub>2</sub> (Ω) |
| 500B            | 82                 | 130                | 141A | 270                | 270                |
| 750B            | 120                | 200                | 181A | 330                | 390                |
| 800C            | 130                | 210                | 191A | 330                | 470                |
| 990A            | 160                | 260                | 221B | 330                | 680                |
| 101C            | 180                | 240                | 281B | 560                | 560                |
| 111C            | 180                | 270                | 381B | 560                | 1.2K               |
| 121B            | 180                | 390                | 501C | 620                | 2.7K               |
| 121C            | 220                | 270                | 102A | 1.5K               | 3.3K               |
| 131A            | 220                | 330                | 202B | 3K                 | 6.2K               |

**Note**

- For additional impedance codes, refer to the Dual Terminator Impedance Code Table document ([www.vishay.com/doc?31530](http://www.vishay.com/doc?31530)).

| CIRCUIT APPLICATIONS       |  |
|----------------------------|--|
| <p><b>01 Schematic</b></p> | <p>5, 7, 8 <sup>(1)</sup>, or 9 resistors with one pin common</p> <p>The MSPxxx01 circuit contains 5, 7, 8 <sup>(1)</sup>, or 9 nominally equal resistors, each connected between a common pin (pin no. 1) and a discrete PC board pin. Commonly used in the following applications:</p> <ul style="list-style-type: none"> <li>• “Wired OR” Pull-up</li> <li>• Power Gate Pull-up</li> <li>• TTL Input Pull-down</li> <li>• MOS/ROM Pull-up/Pull-down</li> <li>• Open Collector Pull-up</li> <li>• TTL Unused Gate Pull-up</li> </ul> <p><b>Note</b><br/> <sup>(1)</sup> Available in “A” Profile only</p> <p>Standard E-24 resistance values stocked. Consult factory.</p> |
| <p><b>03 Schematic</b></p> | <p>3, 4 or 5 isolated resistors</p> <p>The MSPxxx03 circuit contains 3, 4, or 5 resistors of nominally equal value in a compact package. Each resistor is connected to two discrete PC pins.</p> <p>Standard E-24 resistance values stocked. Consult factory.</p>  |
| <p><b>05 Schematic</b></p> | <p>Pulse squaring and TTL dual-line terminators</p> <p>The MSPxxx05 circuits contain 4, 6, 7 <sup>(2)</sup>, or 8 series pair of resistors. Each series pair is connected between two common lines. The junction of these resistor pairs is connected to the input terminals.</p> <p>The 05 circuits are designed for TTL dual-line termination and pulse squaring.</p> <p><b>Note</b><br/> <sup>(2)</sup> Available in “A” Profile only</p> <p>Many dual terminator resistance values stocked. Consult factory.</p>   |

**DERATING**





| "A" PROFILE +70 °C PACKAGE RATINGS |        |
|------------------------------------|--------|
| MSP10A                             | 1.25 W |
| MSP09A                             | 1.12 W |
| MSP08A                             | 1.00 W |
| MSP06A                             | 0.75 W |

| "C" PROFILE +70 °C PACKAGE RATINGS |        |
|------------------------------------|--------|
| MSP10C                             | 1.60 W |
| MSP08C                             | 1.30 W |
| MSP06C                             | 1.00 W |

**Note**

- Higher power ratings available. Contact factory.

| PERFORMANCE                     |   |                                |
|---------------------------------|---|--------------------------------|
| TEST                            | CONDITIONS  | MAX. ΔR<br>(TYPICAL TEST LOTS) |
| Power Conditioning              | 1.5 x rated power, applied 1.5 h "ON" and 0.5 h "OFF" for 100 h ± 4 h at +25 °C ambient temperature                   | ± 0.50 % ΔR                    |
| Thermal Shock                   | 5 cycles between -65 °C and +125 °C   | ± 0.50 % ΔR                    |
| Short Time Overload             | 2.5 x rated working voltage 5 s   | ± 0.25 % ΔR                    |
| Low Temperature Operation       | 45 min at full rated working voltage at -65 °C  | ± 0.25 % ΔR                    |
| Moisture Resistance             | 240 h with humidity ranging from 80 % RH to 98 % RH   | ± 0.50 % ΔR                    |
| Resistance to Soldering Heat    | Leads immersed in +260 °C solder to within 1/16" of device body for 10 s  | ± 0.25 % ΔR                    |
| Shock                           | Total of 18 shocks at 100 g's   | ± 0.25 % ΔR                    |
| Vibration                       | 12 h at maximum of 20 g's between 10 Hz and 2000 Hz   | ± 0.25 % ΔR                    |
| Load Life                       | 1000 h at +70 °C, rated power applied 1.5 h "ON", 0.5 h "OFF" for full 1000 h period. Derated according to the curve. | ± 1.00 % ΔR                    |
| Terminal Strength               | 4.5 pound pull for 30 s   | ± 0.25 % ΔR                    |
| Insulation Resistance           | 10 000 MΩ (minimum)   | -                              |
| Dielectric Withstanding Voltage | -   | -                              |



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