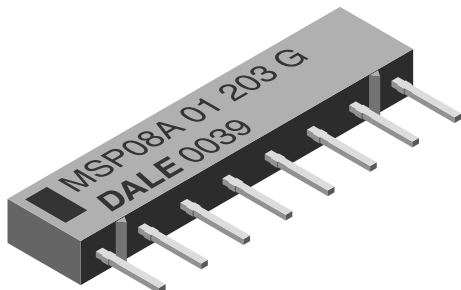


# Thick Film Resistor Networks

## Single-In-Line, Molded SIP; 01, 03, 05 Schematics

### 6, 8, 9 or 10 Pin "A" Profile and 6, 8 or 10 Pin "C" Profile



#### FEATURES

- 0.195" [4.95mm] "A" or 0.350" [8.89mm] "C" maximum seated height
- Highly stable thick film
- Low temperature coefficient (- 55°C to + 125°C)  $\pm 100\text{ppm}/^\circ\text{C}$
- Rugged, molded case construction
- Reduces total assembly costs
- Compatible with automatic insertion equipment and reduces PC board space
- Wide resistance range
- Available in tube pack or side-by-side pack

#### STANDARD ELECTRICAL SPECIFICATIONS

| MODEL/<br>SCHEMATIC | PROFILE | RESISTOR<br>POWER RATING<br>Max. @ 70°C*<br>W | RESISTANCE<br>RANGE<br>$\Omega$ | STANDARD<br>TOLERANCE<br>%          | TEMPERATURE<br>COEFFICIENT<br>(- 55°C to + 125°C)<br>ppm/°C | TCR<br>TRACKING*<br>(- 55°C to + 125°C)<br>ppm/°C | OPERATING<br>VOLTAGE<br>Max.<br>VDC |
|---------------------|---------|-----------------------------------------------|---------------------------------|-------------------------------------|-------------------------------------------------------------|---------------------------------------------------|-------------------------------------|
| MSP01               | A<br>C  | 0.20<br>0.25                                  | 10 - 2.2M                       | $\pm 2$ Standard<br>(1, 5)**        | $\pm 100$                                                   | $\pm 50\text{ppm}/^\circ\text{C}$                 | 100                                 |
| MSP03               | A<br>C  | 0.30<br>0.40                                  | 10 - 2.2M                       | $\pm 2$ Standard<br>(1, 5)**        | $\pm 100$                                                   | $\pm 50\text{ppm}/^\circ\text{C}$                 | 100                                 |
| MSP05               | A<br>C  | 0.20<br>0.25                                  | 10 - 2.2M                       | $\pm 2$ Standard<br>( $\pm 5\%$ )** | $\pm 100$                                                   | $\pm 150\text{ppm}/^\circ\text{C}$                | 100                                 |

\* Tighter tracking available

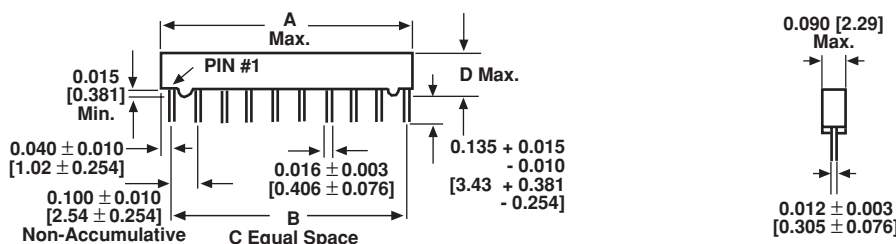
\*\* Tolerances in brackets available on request

#### TECHNICAL SPECIFICATIONS

| PARAMETER                                              | UNIT      | MSP SERIES          |
|--------------------------------------------------------|-----------|---------------------|
| Package Power Rating<br>(Maximum at + 25°C and + 70°C) |           | See Derating Curves |
| Voltage Coefficient of Resistance                      | $V_{eff}$ | < 50ppm typical     |
| Dielectric Strength                                    | VAC       | 200                 |
| Isolation Resistance (03 Schematic)                    | $\Omega$  | > 100M              |
| 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, tin-lead plated.                                                                                                                        |  |
| Weight:                         | MSP06A = 0.4 gram      MSP06C = 0.7 gram<br>MSP08A = 0.5 gram      MSP08C = 0.9 gram<br>MSP09A = .55 gram      MSP10C = 1.1 gram<br>MSP10A = 0.6 gram |  |

**DIMENSIONS** in inches [millimeters]

| 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                              |

**ORDERING INFORMATION****01 Schematic**

| MSP<br>MODEL | 08<br>NUMBER OF<br>PINS | A<br>PACKAGE CODE                                                                                                        | 01<br>SCHEMATIC | 101<br>RESISTANCE VALUE                                                                                       | G<br>TOLERANCE                               |
|--------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------|----------------------------------------------|
|              |                         | A = 0.195" [4.95mm] Height<br>0.100" [2.54mm] Lead Spacing<br>C = 0.350" [8.89mm] Height<br>0.100" [2.54mm] Lead Spacing |                 | First 2 digits (3 for "F" tolerance) are significant figures. Last digit specifies number of zeros to follow. | F = $\pm$ 1%<br>G = $\pm$ 2%<br>J = $\pm$ 5% |

**03 Schematic**

| MSP<br>MODEL | 06<br>NUMBER OF<br>PINS | A<br>PACKAGE CODE                                                                                                        | 03<br>SCHEMATIC | 102<br>RESISTANCE VALUE                                                                                       | G<br>TOLERANCE                               |
|--------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------|----------------------------------------------|
|              |                         | A = 0.195" [4.95mm] Height<br>0.100" [2.54mm] Lead Spacing<br>C = 0.350" [8.89mm] Height<br>0.100" [2.54mm] Lead Spacing |                 | First 2 digits (3 for "F" tolerance) are significant figures. Last digit specifies number of zeros to follow. | F = $\pm$ 1%<br>G = $\pm$ 2%<br>J = $\pm$ 5% |

**05 Schematic**

| MSP<br>MODEL | 06<br>NUMBER OF<br>PINS | A<br>PACKAGE CODE                                                                                                        | 05<br>SCHEMATIC | 221<br>RESISTANCE<br>VALUE R1                                                                 | 331<br>RESISTANCE<br>VALUE R2 | G<br>TOLERANCE               |
|--------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------------------------------------------------------------------------------|-------------------------------|------------------------------|
|              |                         | A = 0.195" [4.95mm] Height<br>0.100" [2.54mm] Lead Spacing<br>C = 0.350" [8.89mm] Height<br>0.100" [2.54mm] Lead Spacing |                 | First two digits are significant figures. Last digit specifies the number of zeros to follow. |                               | G = $\pm$ 2%<br>J = $\pm$ 5% |

**EXAMPLE:**

MSP08A-01-101G = A molded single-in-line thick film resistor network with 8 pins on 0.100" [2.54mm] centers, 0.195" [4.95mm] maximum seated height, 01 Schematic, resistance value of 100 ohm and a tolerance of  $\pm$  2%.

**EXAMPLE:**

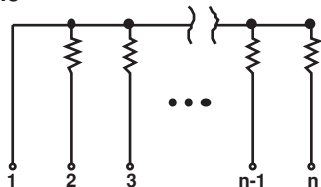
MSP06A-03-102G = A molded single-in-line thick film resistor network with 6 pins on 0.100" [2.54mm] centers, 0.195" [4.95mm] maximum seated height, 03 Schematic, resistance value of 1000 ohm and a tolerance of  $\pm$  2%.

**EXAMPLE:**

MSP06A-05-221/331G = A molded single-in-line thick film resistor network with 6 pins on 0.100" [2.54mm] centers, 0.195" [4.95mm] maximum seated height, 05 Schematic with resistances of R1 = 220 ohm and R2 = 330 ohm and a tolerance  $\pm$  2%.

## CIRCUIT APPLICATIONS

### 01 Schematic



5, 7, 8\* or 9 resistors with one pin common

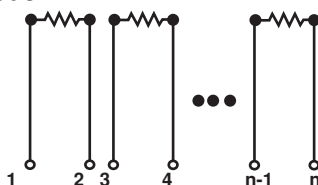
The MSPxxx-01 circuit contains 5, 7, 8\* or 9 nominally equal resistors, each connected between a common pin (Pin No. 1) and a discrete PC board pin. Commonly used in the following applications:

- "Wired OR" Pull-up
- Power Gate Pull-up
- TTL Input Pull-down
- MOS/ROM Pull-up/Pull-down
- Open Collector Pull-up
- TTL Unused Gate Pull-up

\* Available in "A" Profile only

Standard E-24 resistance values stocked. Consult factory.

### 03 Schematic

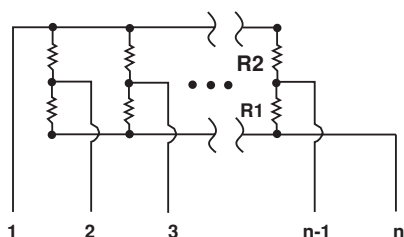


3, 4 or 5 isolated resistors

The MSPxxx-03 circuit contains 3, 4 or 5 resistors of nominally equal value in a compact package. Each resistor is connected to two discrete PC pins.

Standard E-24 resistance values stocked. Consult factory.

### 05 Schematic



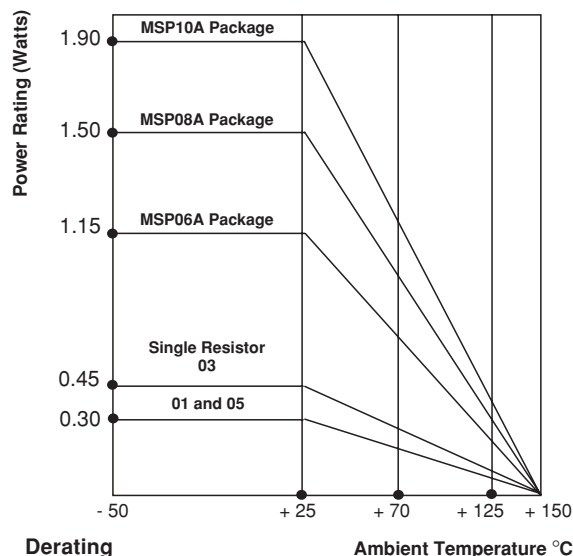
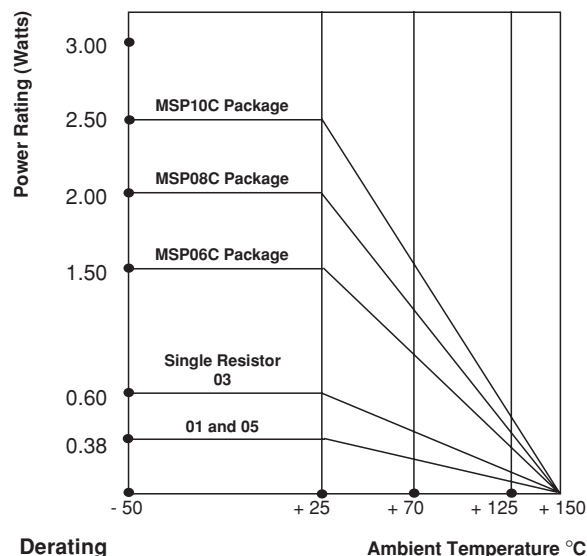
Pulse squaring and TTL dual-line terminators

The MSPxxx-05 circuits contain 4, 6, 7\* 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.

The 05 circuits are designed for TTL dual-line termination and pulse squaring.

\* Available in "A" Profile only

Many dual terminator resistance values stocked. Consult factory.

**"A" Profile****"C" Profile****"A" PROFILE + 70°C PACKAGE RATINGS**

|        |            |
|--------|------------|
| MSP10A | 1.25 watts |
| MSP09A | 1.12 watts |
| MSP08A | 1.00 watts |
| MSP06A | 0.75 watts |

**"C" PROFILE + 70°C PACKAGE RATINGS**

|        |            |
|--------|------------|
| MSP10C | 1.60 watts |
| MSP08C | 1.30 watts |
| MSP06C | 1.00 watts |

Higher power ratings available. Contact factory.

**PERFORMANCE**

| TEST                            | CONDITIONS                                                                                                                           | MAX. $\Delta R$ (Typical Test Lots) |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| Power Conditioning              | 1.5 x rated power, applied 1.5 hours "ON" and 0.5 hour "OFF" for 100 hours $\pm$ 4 hours at + 25°C ambient temperature               | $\pm$ 0.50% $\Delta R$              |
| Thermal Shock                   | 5 cycles between - 65°C and + 125°C                                                                                                  | $\pm$ 0.50% $\Delta R$              |
| Short Time Overload             | 2.5 x rated working voltage 5 seconds                                                                                                | $\pm$ 0.25% $\Delta R$              |
| Low Temperature Operation       | 45 minutes at full rated working voltage at - 65°C                                                                                   | $\pm$ 0.25% $\Delta R$              |
| Moisture Resistance             | 240 hours with humidity ranging from 80% RH to 98% RH                                                                                | $\pm$ 0.50% $\Delta R$              |
| Resistance to Soldering Heat    | Leads immersed in + 260°C solder to within 1/16" of device body for 10 seconds                                                       | $\pm$ 0.25% $\Delta R$              |
| Shock                           | Total of 18 shocks at 100 G's                                                                                                        | $\pm$ 0.25% $\Delta R$              |
| Vibration                       | 12 hours at maximum of 20 G's between 10 and 2,000 Hz                                                                                | $\pm$ 0.25% $\Delta R$              |
| Load Life                       | 1000 hours at + 70°C, rated power applied 1.5 hours "ON", 0.5 hour "OFF" for full 1,000 hour period. Derated according to the curve. | $\pm$ 1.00% $\Delta R$              |
| Terminal Strength               | 4.5 pound pull for 30 seconds                                                                                                        | $\pm$ 0.25% $\Delta R$              |
| Insulation Resistance           | 10,000 Megohm (minimum)                                                                                                              | —                                   |
| Dielectric Withstanding Voltage |                                                                                                                                      | —                                   |