

# Thick Film Resistor Networks, Military, MIL-PRF-83401 Qualified, Type RZ040 to RZ090, Single-In-Line, Molded SIP



## FEATURES

- Isolated, bussed and dual terminator schematics available
- MIL-PRF-83401 qualified
- 0.195" (4.95 mm) "A" and 0.350" (8.89 mm) "C" maximum seated heights
- Thick film resistive elements
- TCR available in "K" ( $\pm 100$  ppm/ $^{\circ}$ C) or "M" ( $\pm 300$  ppm/ $^{\circ}$ C) characteristic
- All device leads are hot-solder dipped
- Rugged molded case construction
- Compatible with automatic insertion equipment
- 100 % screen tested per group A, subgroup 1 of MIL-PRF-83401
- All devices are capable of passing the MIL-STD-202, method 210, condition D "Resistance to Soldering Heat" test
- Available in tube pack

## STANDARD ELECTRICAL SPECIFICATIONS

| VISHAY DALE MODEL/ PIN NO/ PROFILE | MIL STYLE | MIL SPEC. SHEET | SCHEMATIC | POWER RATING ELEMENT $P_{70^{\circ}\text{C}}$ W | POWER RATING PACKAGE $P_{70^{\circ}\text{C}}$ W | RESISTANCE RANGE $\Omega$ | TOLERANCE <sup>(1)</sup> $\pm$ % | TEMPERATURE COEFFICIENT <sup>(2)</sup> (-55 $^{\circ}$ C to +125 $^{\circ}$ C) $\pm$ ppm/ $^{\circ}$ C | WEIGHT g |
|------------------------------------|-----------|-----------------|-----------|-------------------------------------------------|-------------------------------------------------|---------------------------|----------------------------------|--------------------------------------------------------------------------------------------------------|----------|
| MSM06C                             | RZ040     | 04              | 01 (C)    | 0.20                                            | 1.00                                            | 10 to 1M                  | 1, 2, 5                          | 100, 300                                                                                               | 0.7      |
|                                    |           |                 | 03 (G)    | 0.20                                            | 0.60                                            | 10 to 1M                  | 1, 2, 5                          | 100, 300                                                                                               |          |
|                                    |           |                 | 05 (H)    | 0.11                                            | 0.88                                            | Consult factory           | 1, 2, 5                          | 100, 300                                                                                               |          |
| MSM08C                             | RZ050     | 05              | 01 (C)    | 0.20                                            | 1.40                                            | 10 to 1M                  | 1, 2, 5                          | 100, 300                                                                                               | 0.9      |
|                                    |           |                 | 03 (G)    | 0.20                                            | 0.80                                            | 10 to 1M                  | 1, 2, 5                          | 100, 300                                                                                               |          |
|                                    |           |                 | 05 (H)    | 0.11                                            | 1.32                                            | Consult factory           | 1, 2, 5                          | 100, 300                                                                                               |          |
| MSM10C                             | RZ060     | 06              | 01 (C)    | 0.20                                            | 1.80                                            | 10 to 1M                  | 1, 2, 5                          | 100, 300                                                                                               | 1.1      |
|                                    |           |                 | 03 (G)    | 0.20                                            | 1.00                                            | 10 to 1M                  | 1, 2, 5                          | 100, 300                                                                                               |          |
|                                    |           |                 | 05 (H)    | 0.11                                            | 1.80                                            | Consult factory           | 1, 2, 5                          | 100, 300                                                                                               |          |
| MSM06A                             | RZ070     | 07              | 01 (C)    | 0.12                                            | 0.60                                            | 10 to 1M                  | 1, 2, 5                          | 100, 300                                                                                               | 0.4      |
|                                    |           |                 | 03 (G)    | 0.12                                            | 0.36                                            | 10 to 1M                  | 1, 2, 5                          | 100, 300                                                                                               |          |
|                                    |           |                 | 05 (H)    | 0.07                                            | 0.60                                            | Consult factory           | 1, 2, 5                          | 100, 300                                                                                               |          |
| MSM08A                             | RZ080     | 08              | 01 (C)    | 0.12                                            | 0.84                                            | 10 to 1M                  | 1, 2, 5                          | 100, 300                                                                                               | 0.5      |
|                                    |           |                 | 03 (G)    | 0.12                                            | 0.48                                            | 10 to 1M                  | 1, 2, 5                          | 100, 300                                                                                               |          |
|                                    |           |                 | 05 (H)    | 0.07                                            | 0.84                                            | Consult factory           | 1, 2, 5                          | 100, 300                                                                                               |          |
| MSM10A                             | RZ090     | 09              | 01 (C)    | 0.12                                            | 1.08                                            | 10 to 1M                  | 1, 2, 5                          | 100, 300                                                                                               | 0.6      |
|                                    |           |                 | 03 (G)    | 0.12                                            | 0.60                                            | 10 to 1M                  | 1, 2, 5                          | 100, 300                                                                                               |          |
|                                    |           |                 | 05 (H)    | 0.07                                            | 1.08                                            | Consult factory           | 1, 2, 5                          | 100, 300                                                                                               |          |

### Notes

<sup>(1)</sup>  $\pm 2$  % standard,  $\pm 1$  % and  $\pm 5$  % available.

<sup>(2)</sup> K =  $\pm 100$  ppm/ $^{\circ}$ C; M =  $\pm 300$  ppm/ $^{\circ}$ C.



## GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: M8340107K1003GCD03 (preferred part numbering format)

| M         | 8                                                                                                                                                                | 3 | 4 | 0 | 1                          | 0 | 7 | K                                                                                                                         | 1 | 0 | 0                                               | 3 | G                          | C | D                                                                  | 0 | 3 |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|----------------------------|---|---|---------------------------------------------------------------------------------------------------------------------------|---|---|-------------------------------------------------|---|----------------------------|---|--------------------------------------------------------------------|---|---|
| MIL STYLE | SPEC SHEET                                                                                                                                                       |   |   |   | CHARACTERISTIC             |   |   | RESISTANCE VALUE                                                                                                          |   |   | TOLERANCE CODE                                  |   | SCHEMATIC                  |   | PACKAGING                                                          |   |   |
| M83401    | 04 = 6 pin, "C" profile<br>05 = 8 pin, "C" profile<br>06 = 10 pin, "C" profile<br>07 = 6 pin, "A" profile<br>08 = 8 pin, "A" profile<br>09 = 10 pin, "A" profile |   |   |   | K = 100 ppm<br>M = 300 ppm |   |   | 3 digit significant figure, followed by a multiplier<br>10R0 = 10 $\Omega$<br>3302 = 33 k $\Omega$<br>1004 = 1 M $\Omega$ |   |   | F = $\pm 1\%$<br>G = $\pm 2\%$<br>J = $\pm 5\%$ |   | C = Bussed<br>G = Isolated |   | D03 = Tin/lead, tube<br>DSL = Tin/lead, tube, single lot date code |   |   |

Historical Part Number example: M8340107K1003GC (will continue to be accepted)

| M83401    | 07         | K              | 1003             | G              | C         | D03       |
|-----------|------------|----------------|------------------|----------------|-----------|-----------|
| MIL STYLE | SPEC SHEET | CHARACTERISTIC | RESISTANCE VALUE | TOLERANCE CODE | SCHEMATIC | PACKAGING |

New Global Part Numbering: M8340104KA001GHD03 (preferred part numbering format)

| M         | 8                                                                                                                                                                | 3 | 4 | 0 | 1                          | 0 | 4 | K                                             | A | 0 | 0                                               | 1 | G                   | H | D                                                                  | 0 | 3 |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|----------------------------|---|---|-----------------------------------------------|---|---|-------------------------------------------------|---|---------------------|---|--------------------------------------------------------------------|---|---|
| MIL STYLE | SPEC SHEET                                                                                                                                                       |   |   |   | CHARACTERISTIC             |   |   | RESISTANCE VALUE                              |   |   | TOLERANCE CODE                                  |   | SCHEMATIC           |   | PACKAGING                                                          |   |   |
| M83401    | 04 = 6 pin, "C" profile<br>05 = 8 pin, "C" profile<br>06 = 10 pin, "C" profile<br>07 = 6 pin, "A" profile<br>08 = 8 pin, "A" profile<br>09 = 10 pin, "A" profile |   |   |   | K = 100 ppm<br>M = 300 ppm |   |   | Per std. MIL Spec (see Impedance Codes table) |   |   | F = $\pm 1\%$<br>G = $\pm 2\%$<br>J = $\pm 5\%$ |   | H = Dual terminator |   | D03 = Tin/lead, tube<br>DSL = Tin/lead, tube, single lot date code |   |   |

Historical Part Number example: M8340104KA001GH (will continue to be accepted)

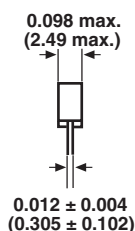
| M83401    | 04         | K              | A001             | G              | H         | D03       |
|-----------|------------|----------------|------------------|----------------|-----------|-----------|
| MIL STYLE | SPEC SHEET | CHARACTERISTIC | RESISTANCE VALUE | TOLERANCE CODE | SCHEMATIC | PACKAGING |

## Note

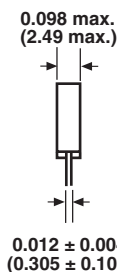
- For additional information on packaging, refer to the Through Hole Network Packaging document ([www.vishay.com/doc?31542](http://www.vishay.com/doc?31542)).

## DIMENSIONS in inches (millimeters)

## "A" Profile



## "C" Profile



| VISHAY DALE MODEL | A                                | B                | C |
|-------------------|----------------------------------|------------------|---|
| MSM06             | 0.583 ± 0.015<br>(14.81 ± 0.381) | 0.500<br>(12.70) | 5 |
| MSM08             | 0.783 ± 0.015<br>(19.89 ± 0.381) | 0.700<br>(17.78) | 7 |
| MSM10             | 0.983 ± 0.015<br>(24.97 ± 0.381) | 0.900<br>(22.86) | 9 |

**TECHNICAL SPECIFICATIONS**

| PARAMETER                         | UNIT             | MSM SERIES  |
|-----------------------------------|------------------|-------------|
| Maximum Operating Voltage         | V <sub>DC</sub>  | 50          |
| Voltage Coefficient of Resistance | V <sub>eff</sub> | < 50 ppm    |
| Dielectric Strength               | V <sub>AC</sub>  | 200 min.    |
| Insulation Resistance             | Ω                | 10 000M     |
| Operating Temperature Range       | °C               | -55 to +125 |
| Storage Temperature Range         | °C               | -55 to +150 |

**MECHANICAL SPECIFICATIONS**

|               |                                 |
|---------------|---------------------------------|
| Body          | Molded epoxy                    |
| Terminals     | Copper alloy, hot-solder dipped |
| Solderability | Per MIL-PRF-83401               |

**CAGE CODE: 91637 and 2799A (formerly SH903)****MILITARY IMPEDANCE CODES**

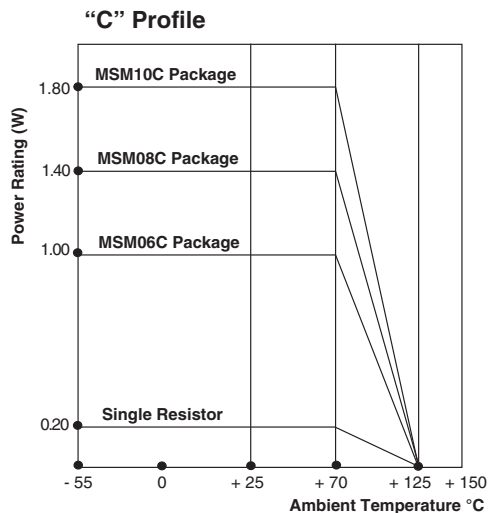
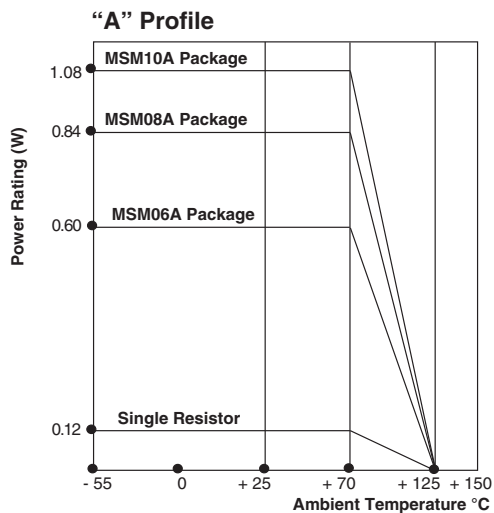
| CODE | R <sub>1</sub> (Ω) | R <sub>2</sub> (Ω) | CODE                | R <sub>1</sub> (Ω) | R <sub>2</sub> (Ω) |
|------|--------------------|--------------------|---------------------|--------------------|--------------------|
| A001 | 82                 | 130                | A011                | 330                | 680                |
| A002 | 120                | 200                | A012                | 1.5K               | 3.3K               |
| A003 | 130                | 210                | A013                | 3K                 | 6.2K               |
| A004 | 160                | 260                | A014                | 180                | 270                |
| A005 | 180                | 240                | A015                | 270                | 270                |
| A006 | 180                | 390                | A016                | 560                | 560                |
| A007 | 220                | 270                | A017                | 560                | 1.2K               |
| A008 | 220                | 330                | A018                | 620                | 2.7K               |
| A009 | 330                | 390                | A019 <sup>(1)</sup> | 150                | 1K                 |
| A010 | 330                | 470                | A020 <sup>(1)</sup> | 1K                 | 1K                 |

**Note**<sup>(1)</sup> Offered for the M83401/09 product only

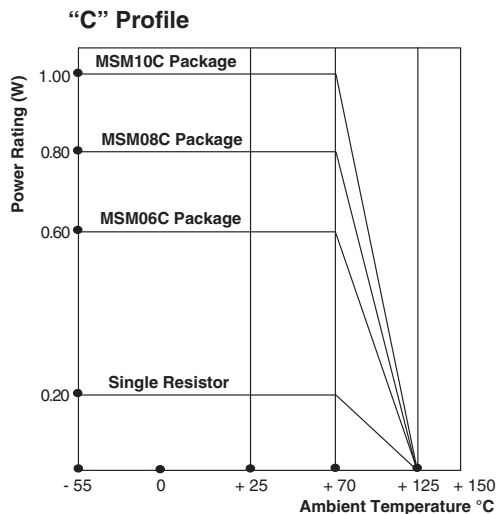
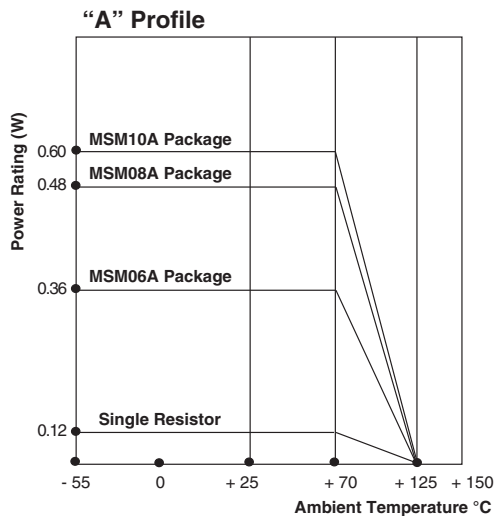


## DERATING

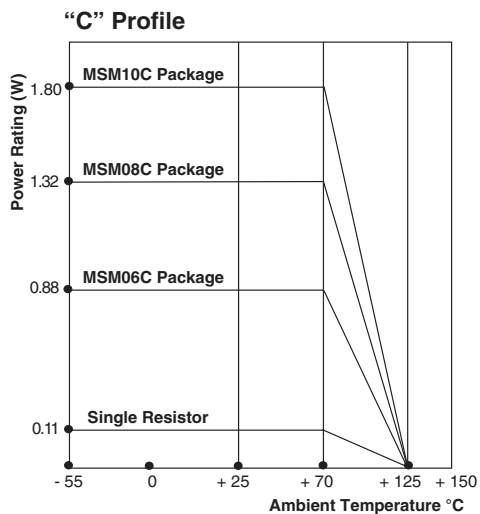
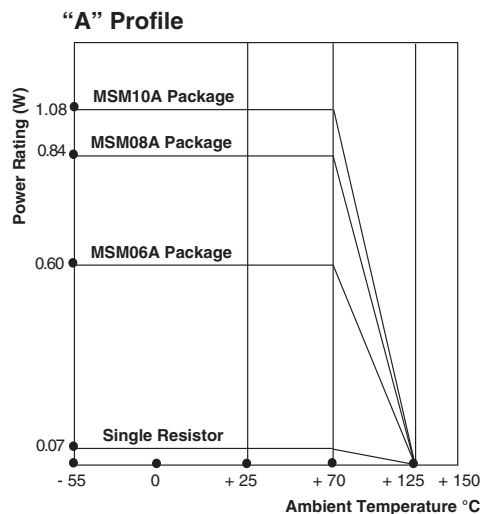
### 01 Schematic



### 03 Schematic



### 05 Schematic



**CIRCUIT APPLICATIONS**
**01 Schematic**


5, 7 or 9 resistors with one pin common

“A” Profile

MSM06A01 (M8340107xxxxxC)

MSM08A01 (M8340108xxxxxC)

MSM10A01 (M8340109xxxxxC)

“C” Profile

MSM06C01 (M8340104xxxxxC)

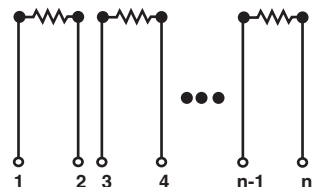
MSM08C01 (M8340105xxxxxC)

MSM10C01 (M8340106xxxxxC)

The MSM06A01, MSM08A01, MSM10A01, MSM06C01, MSM08C01, and MSM10C01 molded single-in-line resistor networks provide the user with a choice of 5, 7, or 9 nominally equal resistors, each connected to a common pin (Pin No. 1).

Commonly used in the following applications:

- “Wired OR” pull-up
- Power Gate pull-up
- MOS/ROM pull-up/pull-down
- Open collector pull-up
- TTL input pull-down
- TTL unused gate pull-up

**03 Schematic**


3, 4 or 5 isolated resistors

“A” Profile

MSM06A03 (M8340107xxxxxG)

MSM08A03 (M8340108xxxxxG)

MSM10A03 (M8340109xxxxxG)

“C” Profile

MSM06C03 (M8340104xxxxxG)

MSM08C03 (M8340105xxxxxG)

MSM10C03 (M8340106xxxxxG)

The MSM06A03, MSM08A03, MSM10A03, MSM06C03, MSM08C03, and MSM10C03 molded single-in-line resistor networks provide the user with a choice of 3, 4, or 5 nominally equal resistors. Each resistor is isolated from all others.

Commonly used in the following applications:

- “Wired OR” pull-up
- Power driven pull-up
- Power gate pull-up
- Line termination
- Long-line impedance balance
- LED current limiting
- ECL output pull-down
- TTL input pull-down

**05 Schematic**


4, 6 or 8 resistor pairs

“A” Profile

MSM06A05 (M8340107xxxxxH)

MSM08A05 (M8340108xxxxxH)

MSM10A05 (M8340109xxxxxH)

“C” Profile

MSM06C05 (M8340104xxxxxH)

MSM08C05 (M8340105xxxxxH)

MSM10C05 (M8340106xxxxxH)

The MSM06A05, MSM08A05, MSM10A05, MSM06C05, MSM08C05, and MSM10C05 molded single-in-line resistor networks provide the user with a choice of 4, 6, or 8 pair of  $R_1/R_2$  resistor values for pulse squaring and TTL dual-line terminating requirements.

**PERFORMANCE**

| TEST                            | CONDITIONS                                                                                              | MAX. $\Delta R$ (TYPICAL TEST LOTS)                                                      |
|---------------------------------|---------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Power Conditioning              | 1.5 x rated power, applied 1.5 h “ON” and 0.5 h “OFF” for 100 h $\pm$ 4 h 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 for 5 s                                                                     | $\pm$ 0.25 % $\Delta R$ (Characteristic K)<br>$\pm$ 0.50 % $\Delta R$ (Characteristic M) |
| Low Temperature Operation       | 45 min at full rated working voltage at -65 °C                                                          | $\pm$ 0.25 % $\Delta R$ (Characteristic K)<br>$\pm$ 0.50 % $\Delta R$ (Characteristic M) |
| Moisture Resistance             | 240 h 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 body for 10 s                                       | $\pm$ 0.25 % $\Delta R$                                                                  |
| Shock                           | Total of 18 shocks at 100 g's                                                                           | $\pm$ 0.25 % $\Delta R$                                                                  |
| Vibration                       | 12 h at maximum of 20 g's between 10 Hz and 2000 Hz                                                     | $\pm$ 0.25 % $\Delta R$                                                                  |
| Load Life                       | 1000 h at +70 °C, rated power applied<br>1.5 h “ON”, 0.5 h “OFF” for full 1000 h period                 | $\pm$ 0.50 % $\Delta R$ (Characteristic K)<br>$\pm$ 2.00 % $\Delta R$ (Characteristic M) |
| Terminal Strength               | 4 1/2 pound pull for 30 s                                                                               | $\pm$ 0.25 % $\Delta R$                                                                  |
| Insulation Resistance           | 10 000 M $\Omega$ (minimum)                                                                             | -                                                                                        |
| Dielectric Withstanding Voltage | No evidence of arcing or damage (200 V <sub>RMS</sub> for 1 min)                                        | -                                                                                        |



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