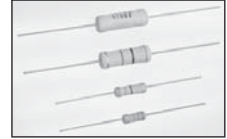


### FEATURES

- NON-FLAMMABLE RESIN INSULATION
- HIGH STABILITY AND RELIABILITY
- LOW NOISE
- LOW COST ALTERNATIVE TO CARBON COMPOSITION AND WIREWOUND APPLICATIONS
- NEW REDUCED SIZES
- EIA COLOR CODING AND ALPHA-NUMERICAL CODING AVAILABLE DEPENDING ON SIZE



**RoHS**  
**Compliant**  
includes all homogeneous materials

\*See Part Number System for Details

### STANDARD TYPES, RATINGS AND AVAILABILITY

| Type                           | NMO100       | NMO200        | NMO300        | NMO500       | NMO700       |
|--------------------------------|--------------|---------------|---------------|--------------|--------------|
| Power Rating at 70°C           | 1 Watt       | 2 Watts       | 3 Watts       | 5 Watts      | 7 Watts      |
| Max. Working Voltage at 70°C** | 350V         | 350V          | 500V          | 750V         | 850V         |
| Max. Overload Voltage at 70°C  | 600V         | 600V          | 800V          | 1000V        | 1500V        |
| Max. Pulse Voltage at 70°C     | 750V         | 750V          | 1500V         | 2000V        | 2000V        |
| Resistance Range               | ±5% (J) Tol. | 0.22Ω ~ 100KΩ | 0.22Ω ~ 100KΩ | 0.5Ω ~ 100KΩ | 5.1Ω ~ 200KΩ |
|                                | ±2% (G) Tol. | 10Ω ~ 100KΩ   | 10Ω ~ 100KΩ   | 10Ω ~ 100KΩ  | 10Ω ~ 100KΩ  |
| Resistance Value Availability  | E-24         | E-24          | E-24          | E-24         | E-24         |
| Axial Taping Availability      | Yes          | Yes           | No            | No           | No           |

### REDUCED SIZE, RATING AND AVAILABILITY

| Type                           | NMO100S      | NMO200S      | NMO300S      | NMO500S      | NMO700S     |
|--------------------------------|--------------|--------------|--------------|--------------|-------------|
| Power Rating at 70°C           | 1 Watt       | 2 Watts      | 3 Watts      | 5 Watts      | 7 Watts     |
| Max. Working Voltage at 70°C** | 350V         | 350V         | 350V         | 500V         | 750V        |
| Max. Overload Voltage at 70°C  | 600V         | 600V         | 600V         | 800V         | 1000V       |
| Max. Pulse Voltage at 70°C     | 750V         | 750V         | 750V         | 750V         | 1200V       |
| Resistance Range               | ±5% (J) Tol. | 0.22Ω ~ 50KΩ | 0.22Ω ~ 50KΩ | 0.5Ω ~ 100KΩ | 10Ω ~ 200KΩ |
|                                | ±2% (G) Tol. | 10Ω ~ 50KΩ   | 10Ω ~ 50KΩ   | 10Ω ~ 100KΩ  | 10Ω ~ 200KΩ |
| Resistance Value Availability  | E-24         | E-24         | E-24         | E-24         | E-24        |
| Axial Taping Availability      | Yes          | Yes          | No           | No           | No          |

\* Special Order \*\* Maximum allowable continuous voltage (Vdc or rms) for all resistors is the lower of the two values: "MAXIMUM WORKING VOLTAGE" as specified, or  $\sqrt{\text{Power rating (WATTS} \times \text{Resistance (OHMS))}}$

### CHARACTERISTICS

| Requirements                        | Performance                                                   | Test Method & Conditions   |              |
|-------------------------------------|---------------------------------------------------------------|----------------------------|--------------|
|                                     |                                                               | JIS C5202                  | MIL-R-22684B |
| Operating Temperature Range         | -55 ~ +200°C (Derated above 70°C as per derating curve below) |                            |              |
| Withstanding Voltage (Lead to Body) | See Maximum Working Voltage                                   |                            |              |
| Temperature Coefficient             | ±200ppm/°C                                                    | 5.2, t-to=80°C             | 4.6.11       |
| Short Time Overload                 | $\Delta R < \pm(0.5\% + 0.05\Omega)$                          | 5.5, Cond. A               | 4.6.5        |
| Temperature Cycling                 | $\Delta R < \pm(0.5\% + 0.05\Omega)$                          | 7.4, -55/+85°C             | 4.6.3        |
| Soldering Effect                    | $\Delta R < \pm(0.5\% + 0.05\Omega)$                          | 6.4, +350°C for 3 sec.     | 4.6.9        |
| Vibration                           | $\Delta R < \pm(0.5\% + 0.05\Omega)$                          | 6.3, Cond. A               | 4.6.14       |
| Moisture Resistance                 | $\Delta R < \pm 5\%$                                          | 7.9, +40°C 90~95%RH 100hrs | 4.6.10       |
| Load Life                           | $\Delta R < \pm 5\%$                                          | 7.10, +70°C 1000hrs.       | 4.6.12       |

### TYPICAL PERFORMANCE

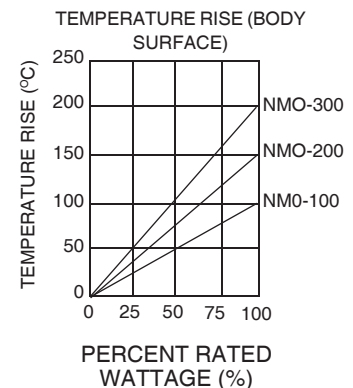
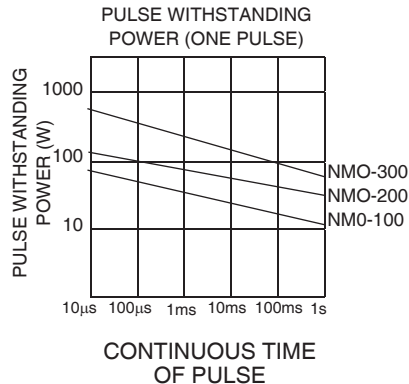
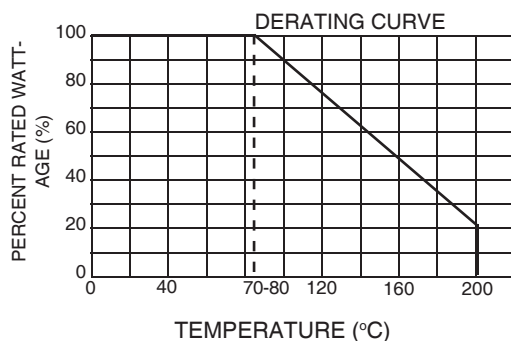


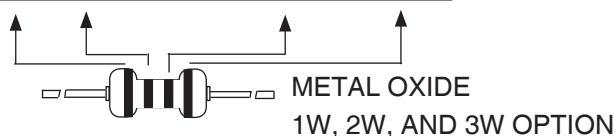
Figure 1: Schematic diagram of the experimental setup. The top part shows a cross-section of a cylindrical sample with diameter  $D$  and a central hole of diameter  $d$ . The bottom part shows a side view of the sample mounted on a horizontal support. The support has a central section of length  $L$  and two outer sections of length  $H$ . The support is labeled "Lead Material: 10% Pb, 90% Sb".

| Type   | Dimensions (mm)  |             |             |                   |
|--------|------------------|-------------|-------------|-------------------|
|        | D $\phi \pm 0.6$ | L $\pm 1.0$ | H $\pm 3.0$ | d $\phi \pm 0.05$ |
| NMO100 | 4.5              | 11          | 30          | 0.80              |
| NMO200 | 5.5              | 15          | 30          | 0.80              |
| NMO300 | 8.5              | 24          | 38          | 0.80              |
| NMO500 | 8.5              | 41          | 38          | 0.80              |
| NMO700 | 8.5              | 53          | 38          | 0.80              |

| Type    | Dimensions (mm)  |             |             |                   |
|---------|------------------|-------------|-------------|-------------------|
|         | D $\phi \pm 0.6$ | L $\pm 1.0$ | H $\pm 3.0$ | d $\phi \pm 0.05$ |
| NMO100S | 3.5              | 9.0         | 30          | 0.65              |
| NMO200S | 4.5              | 11          | 30          | 0.80              |
| NMO300S | 5.5              | 15          | 30          | 0.80              |
| NMO500S | 8.5              | 24          | 38          | 0.80              |
| NMO700S | 8.5              | 41          | 38          | 0.80              |

| Color  | Significant Figure |     |     | Multiplier | Tolerance  |
|--------|--------------------|-----|-----|------------|------------|
|        | 1st                | 2nd | 3rd |            |            |
| Black  | 0                  | 0   | 0   | 1          | -          |
| Brown  | 1                  | 1   | 1   | 10         | F (±1%)    |
| Red    | 2                  | 2   | 2   | 100        | G (±2%)    |
| Orange | 3                  | 3   | 3   | 1,000      | -          |
| Yellow | 4                  | 4   | 4   | 10,000     | -          |
| Green  | 5                  | 5   | 5   | 100,00     | D ±0.5%)   |
| Blue   | 6                  | 6   | 6   | 1,000,000  | C (±0.25%) |
| Violet | 7                  | 7   | 7   | 10,000,000 | B (±0.1%)  |
| Grey   | 8                  | 8   | 8   | -          | -          |
| White  | 9                  | 9   | 9   | -          | -          |
| Gold   | -                  | -   | -   | 0.1        | J (±5%)    |
| Silver | -                  | -   | -   | 0.01       | K (±10%)   |

|     |     |     |
|-----|-----|-----|
| 1.0 | 2.2 | 4.7 |
| 1.1 | 2.4 | 5.1 |
| 1.2 | 2.7 | 5.6 |
| 1.3 | 3.0 | 6.2 |
| 1.5 | 3.3 | 6.8 |
| 1.6 | 3.6 | 7.5 |
| 1.8 | 3.9 | 8.2 |
| 2.0 | 4.3 | 9.1 |



NMO 5W  
1KΩ

**NMO 100 S J 103 TR F**

RoHS compliant parts

TR = Tape and Reel  
B = Bulk

Resistance Code: First 2 digits are significant,  
3rd digit is multiplier, "R" indicates decimal on  
values below 10 OHMS

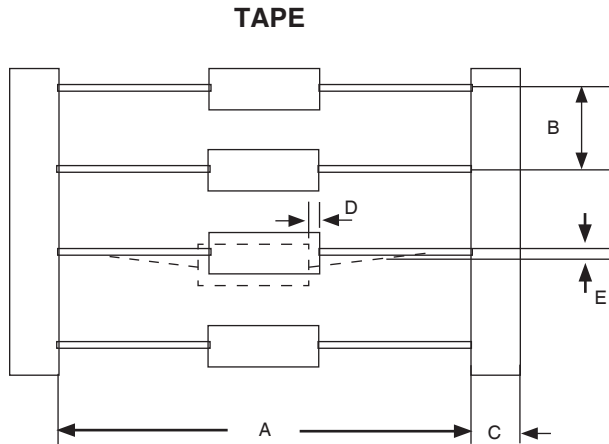
Tolerance Code:  
G =  $\pm 2\%$  (Opt.)  
J =  $\pm 5\%$  STD.

S = Reduced Size

Power Rating (Wattage Code)  
100 = 1WATT    500 = 5WATTS  
200 = 2WATTS    700 = 7 WATTS  
300 = 3WATTS

Series

# Resistor Taping Specifications & Mechanical Characteristics

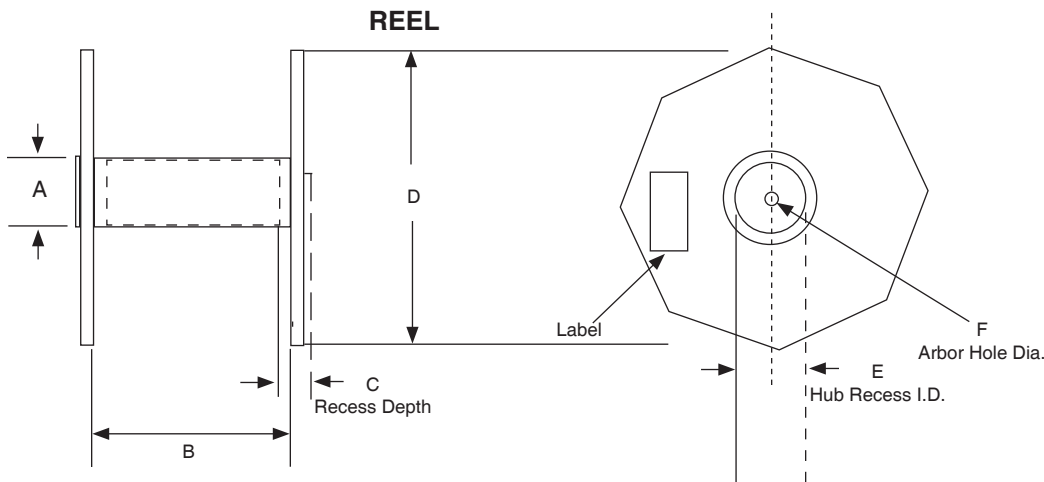


**TAPE DIMENSIONS (mm)**

| Power Rating (Wattage) | A          | B        | C       | D max. | E max. |
|------------------------|------------|----------|---------|--------|--------|
| 1/8W                   | 52 ± 1.0   | 5 ± 0.5  | 6 ± 0.3 | 0.6    | 1.2    |
| 1/4W                   | 52 ± 1.0   | 5 ± 0.5  | 6 ± 0.3 | 0.6    | 1.2    |
| 1/2W                   | 52 ± 1.0   | 5 ± 0.5  | 6 ± 0.3 | 0.6    | 1.2    |
| 1W                     | 52.4 ± 1.5 | 5 ± 0.6  | 6 ± 0.3 | 0.6    | 1.2    |
|                        | 63.5 ± 1.5 |          |         |        |        |
| 2W                     | 52.4 ± 1.5 | 5 ± 0.6  | 6 ± 0.3 | 0.6    | 1.2    |
|                        | 63.5 ± 1.5 | 10 ± 1.0 |         |        |        |
| 3W                     | 52.4 ± 1.5 | 5 ± 0.6  | 6 ± 0.3 | 0.6    | 1.2    |
|                        | 63.5 ± 1.5 | 10 ± 1.0 |         |        |        |

**REEL DIMENSIONS (mm)**

| Power Rating | A max. | B        | C ref. | D max. | E max. | F ± 1.0 |
|--------------|--------|----------|--------|--------|--------|---------|
| 1/8W ~ 2W    | 60     | 40 ~ 100 | 16     | 312    | 53     | 15      |
| 3W           |        | 70 ± 10  |        |        |        | 14.5    |



## MECHANICAL CHARACTERISTICS

### LEAD PULL TEST

The lead wire shall withstand steady pull of the following weight axially to the lead wire for the minimum period of 10 seconds without any breakage or damage:

| Nom. Lead Diameter | 0.4φmm  | 0.5φmm  | 0.6φmm | 0.7φmm  | 0.8φmm & over |
|--------------------|---------|---------|--------|---------|---------------|
| Steady Weight      | 1.0Kgs. | 1.0Kgs. | 1.5Kgs | 2.0Kgs. | 2.5Kgs.       |

### LEAD BEND TEST

The lead wire shall withstand minimum 4 bends of 90° rotation without any breakage or damage, when the resistor is placed in a vertical position and is applied with a weight of 0.5Kgs for 0.4 - 0.5mm or 1.1Kgs for 0.6mm and over lead wire.

### SOLDERABILITY

The lead wire is immersed into 10% methanol or isopropyl alcohol of rosin by weight for a period of  $2 \pm 0.5$  seconds. Then, it shall be dipped into molten solder melted at  $230 \pm 5^\circ\text{C}$  for a period of  $5 \pm 1$  seconds approximately 1.5mm from the body of the resistor. A new adhering coating of solder shall cover minimum 95% of the surface being dipped into solder.

### RESISTANCE TO CLEANING SOLVENTS

Color coating or marking shall remain legible after cleaning by solvents such as isopropyl alcohol, trichloroethylene, freon® TF/TAX, xylene etc., in form of liquid or gas.

