

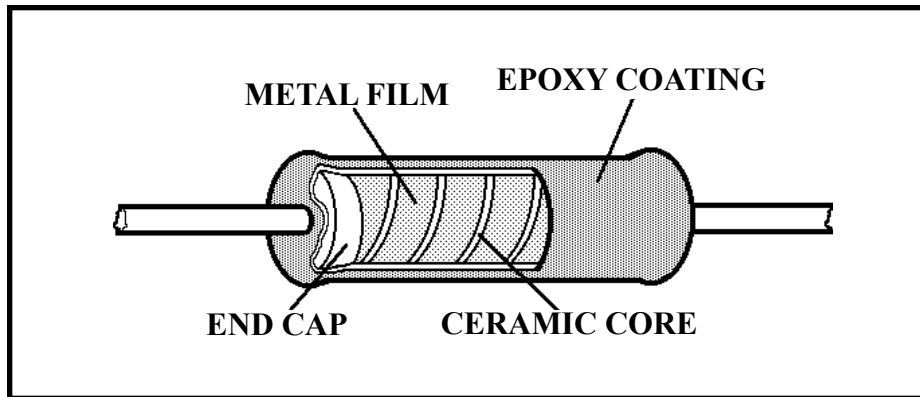


# CODECO CORPORATION OF VERMONT

## Series: LM

## Precision Metal Film Resistors

VPR's series LM is our standard epoxy coated metal film resistor. This part provides a low cost answer to resistor requirements with tight tolerances, special T.C. problems, low noise and high stability requirements. These parts have been designed not only to meet, but to surpass the specification of MIL-R-10509. The LM resistors feature a high vacuum deposition of a thin film of metal alloy on a ceramic substrate. They are then terminated with gold end bands to ensure the low noise properties. The lead wires are welded to the end caps for strength and reliability. Finally, they are finished with an exclusive epoxy coating. Special techniques and methods are used in every step of the process to ensure long lasting reliability. All LM series parts are RoHS compliant.



The LM series metal film resistors are available in a power range of 1/20 watt to 1 watt and all standard tolerances from  $\pm 1\%$  down to  $\pm 0.01\%$ . Available temperature coefficients range from  $\pm 100\text{PPM}/^\circ\text{C}$  down to  $\pm 2\text{PPM}/^\circ\text{C}$ . All LM series parts are now RoHS compliant. The leads are copper covered with 100% matte tin.

### MARKING:

Each resistor is marked either with alpha-numeric printing or with color banding. In each case, epoxy type inks are utilized to guarantee permanence of the marking even through all types of cleaning and degreasing procedures.

All leads are 1.5" long and are #22 AWG (.025") wire

VPR Type	MIL Type	Power at 125°C	Power at 70°C	Maximum Voltage	Length Inches	Diameter Inches	Resistance Range
LM2	RN50	1/10	1/3	200	.170±.020	.072±.010	1Ω to 2.37M
LM3	RN55	1/8	1/4	300	.280±.020	.100±.010	1Ω to 50M
LM4	RN60	1/4	1/2	500	.400±.020	.150±.010	1Ω to 10M
LM5	RN65	1/2	1	500	.600±.020	.200±.010	1Ω to 120K



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## Options:

- Power ratings: 1, 1/2, 1/4, 1/8 and 1/10 watts.
- Tolerances:  $\pm 1\%$ ,  $\pm 5\%$ ,  $\pm .25\%$ ,  $\pm 0.1\%$ ,  $\pm 0.05\%$ ,  $\pm 0.02\%$  and  $\pm 0.01\%$ .
- Temperature coefficients: 100, 50, 25, 10, 5 and 2PPM/ $^{\circ}\text{C}$ .
- Inductance: Special non-inductive films are available.
- Matching: Parts may be matched with respect to TC and tolerance.

## Design Features:

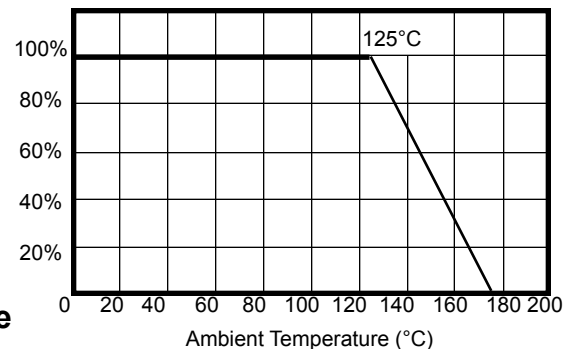
- TCs and tolerances approaching the lowest attainable using film techniques
- Excellent temperature and time stabilities, approaching those of wirewound resistors.
- Low voltage and power coefficients, approaching those of wirewounds of comparable size.
- Low noise: Approaching the lowest theoretically attainable, except with the most expensive and best wirewound designs. (Johnson noise)
- High initial accuracy and tracking: Tolerance matches of .01% and TC tracks of 2PPM/ $^{\circ}\text{C}$  are available.
- Very low reactance: low series L, low shunt C. Reactance error is generally less than tolerance up to 10MHz., for most resistance values.
- Recommended wave solder temperature is 260C at no more than 10 seconds.

## Performance Characteristics

As a guide to the performance that can be expected from the LM series resistors, the following chart indicates typical results of tests performed in accordance with MIL-R-10509.

<u>Test</u> (Max. Resistance Change)	<u>MIL Requirements</u>	<u>VPR Average</u>
Temperature cycling, -65 $^{\circ}\text{C}$ to +150 $^{\circ}\text{C}$	.25%	.05%
Low temperature operation	.25%	.02%
Short time overload	.25%	.02%
Terminal strength, 5 lb. load	.20%	.02%
Dielectric withstanding voltage	.25%	.01%
Resistance to soldering heat, +350 $^{\circ}\text{C}$	.10%	.01%
Moisture resistance	.50%	.05%
Life test (1,000 hours)	.50%	.02%
Shock, medium impact, 50G, 11 ms.	.25%	.01%
Vibration, High frequency 10-2,000 Hz.	.25%	.01%

**Percent of Load vs. Ambient Temp.**



**Surface Temp. Rise vs. Load**

