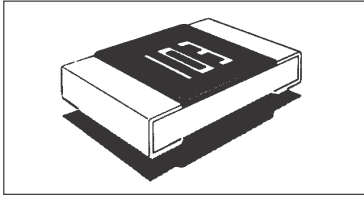


### Thick Film Chip Resistors - RM Series



“Fixed Chip Resistors” manufactured for more compact electronic components and automatic mounting system.

These Chip Resistors have electrical stability and mechanical stress due to used reliable metal glazed paste printed on Alumina substrate. Resistors will reduce your cost and save developmental time.

#### **FEATURES**

1. Very small, thin and light weight.
2. Both flow soldering and reflow soldering are applicable.
3. Owing to the reduced lead inductance, the high frequency characteristic is excellent.
4. Suitable size and packaging for surface mount assembly.

#### **PART NUMBERING**

(EX) 0805 5% 10ohm

<b>RM</b>	<b>10</b>	<b>J</b>	<b>100</b>	<b>CT</b>
1	2	3	4	5

**1. Code Designation:** Thick Film Chip Resistors

**2. Dimensions:** RM02 0.6x0.3mm; RM04 1.0x0.5mm;  
 RM06 1.6x.8mm; RM10 2.0x1.25mm;  
 RM12 3.2x1.6mm; RM14 3.2x2.65mm;  
 RM20 5.0x2.5mm; RM25 6.3x3.1mm

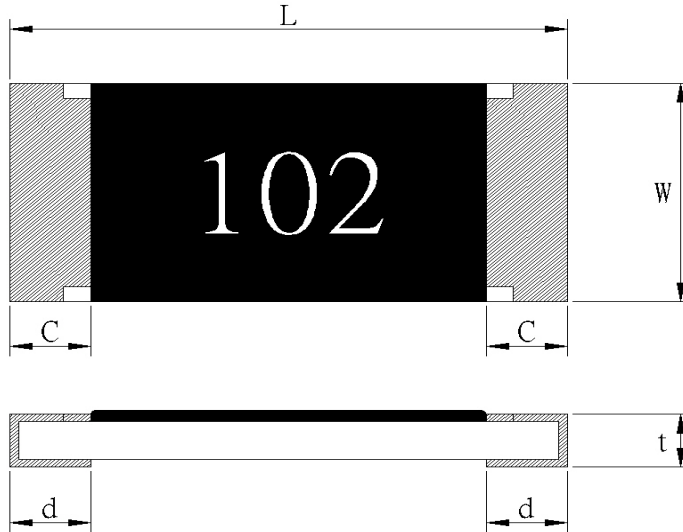
**3. Resistance Tolerance:** F: ±1%; J: ±5%

**4. Nominal Resistance:** 5% - 3 Digit  
 1st 2 significant 3rd  
 is multiplier (10x)  
 000 = jumper “0” ohm  
 1% - 4 digit  
 1st 3 significant  
 4th multiplier (10x)

**5. Packaging:** CT = Tape and reel\*

\*Note: Calchip has completed the Lead-Free transition. All parts shipped with or without the "custom designator" LF at the end of the part number will be Lead-Free. Lead-Free material will still continue to have an LF at the end of the Lot Code and a green RoHS symbol on the label. Please contact your sales associate if you require non-RoHS material.

**Dimensions:**



**UNIT: mm**

Type	L	W	C	d	t
RM02	0.6 ±0.03	0.3 ±0.03	0.1 ±0.05	0.15 ±0.05	0.25 ±0.05

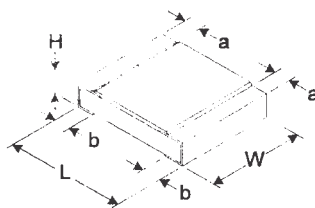
**Ratings & Characteristics :**

Type	Power Rating at 70°C	Rated Voltage	Max. Working Voltage	Max. Over- Load Voltage	T.C.R (PPM/°C)	Resistance Range(Ω)		
						F(±1%) E-96	G(±2%) E-24	J(±5%) E-24
RM02	1/20W	Refer 5.2	25V	50V	±200	10Ω-1MΩ	10Ω-1MΩ	10Ω-10MΩ
					+600 -200			1-9.1Ω

**0Ω THICK FILM CHIP RESISTORS**

Type	Rated Current	Max Overload Current	Resistance Range
RM02	0.5	1	50mΩ MAX

Operating Temp(°C): : -55°C ~ +125°C



### PERFORMANCE CHARACTERISTICS (Tested per MIL-STD-202 Oper. Temp. -55c ~ 125c)

Type	Package Size	Power Rating (Watts)	Maximum Working Voltage	Maximum Overload Voltage	Resistance Temperature Coefficient	Resistance Range	Tolerance	Current Rating of Jumper <sup>3</sup>
RM04	0402	1/16 @ 70°C	50V	100V	±500ppm/°C ±200ppm/°C ±200ppm/°C	.1Ω - 9.1Ω 10Ω - 10 M 10Ω - 1 M	±5% / 1% ±5% ±1%	1A max.
RM06	0603	1/10 @ 70°C	50V	100V	±400ppm/°C ±200ppm/°C ±200ppm/°C ±100ppm/°C	.1Ω - 9.1Ω 1 M - 10 M 10Ω - 10 M 10Ω - 1 M	±5% / 1% ±1% ±5% ±1%	1A max.
RM10	0805	1/8 @ 70°C	150V	300V	±400ppm/°C ±200ppm/°C ±200ppm/°C ±100ppm/°C	.1Ω - 9.1Ω 1 M - 10 M 10Ω - 20 M 10Ω - 1 M	±5% / 1% ±1% ±5% ±1%	2A max.
RM12	1206	1/4 @ 70°C	200V	400V	±400ppm/°C ±200ppm/°C ±200ppm/°C ±100ppm/°C	.1Ω - 9.1Ω 1 M - 10 M 10Ω - 20 M 10Ω - 1 M	±5% / 1% ±1% ±5% ±1%	2A max.
RM14	1210	1/3 @ 70°C	200V	400V	±400ppm/°C ±200ppm/°C ±200ppm/°C ±100ppm/°C	.1Ω - 9.1Ω 1 M - 10 M 10Ω - 10 M 10Ω - 1 M	±5% / 1% ±1% ±5% ±1%	3A max.
RM20	2010	1/2 @ 70°C	200V	400V	±400ppm/°C ±200ppm/°C ±100ppm/°C	.1Ω - 9.1Ω 10Ω - 10 M 10Ω - 1 M	±5% / 1% ±5% ±1%	3A max.
RM25	2512	1 @ 70°C	200V	400V	±400ppm/°C ±200ppm/°C ±100ppm/°C	.1Ω - 9.1Ω 10Ω - 10 M 10Ω - 1 M	±5% / 1% ±5% ±1%	3A max.

### DIMENSIONS

Inches (mm)

Type	Body Length (L)	Body Width (W)	Body Height (H)	Top Terminator (a)	Bottom Terminator (b)
RM04	0.39±.004/-0.002 (1.0±0.10/-0.05)	.020±.004/-0.002 (0.50±.10/-0.05)	.014±.002 (0.35±0.05)	.008±.004 (0.20±0.10)	.010±.008/-0.004 (0.25±0.20/-0.10)
RM06	.063±.004 (1.60±0.10)	.031±.006/-0.002 (0.80±0.15/-0.05)	.018±.004 (0.45±0.10)	.010±.004 (0.25±0.10)	.012±.008/-0.004 (0.30±0.20/-0.10)
RM10	.078±.008 (2.00±0.20)	.049±.008 (1.25±0.20)	.018±.004 (0.45±0.15)	.016±.008 (0.40±0.20)	.012±.008/-0.004 (0.30±0.20/-0.10)
RM12	.122±.004 (3.10±0.10)	.061±.004 (1.55±0.10)	.021±.004/-0.002 (0.55±0.10/-0.05)	.018±.008 (0.45±0.20)	.012±.008/-0.004 (0.30±0.20/-0.10)
RM14	.122±.004 (3.10±0.10)	.100±.004 (2.55±0.10)	.021±.004/-0.002 (0.55±0.10/-0.05)	.018±.008 (0.45±0.20)	.012±.008/-0.004 (0.30±0.20/-0.10)
RM20	.197±.008 (5.00±0.20)	.098±.008 (2.50±0.20)	.021±.004 (0.55±0.10)	.020±.008 (0.50±0.20)	.020±.008 (0.50±0.20)
RM25	.248±.008 (6.30±0.20)	.124±.008 (3.15±0.20)	.021±.004 (0.55±0.10)	.020±.008 (0.50±0.20)	.020±.008 (0.50±0.20)

#### NOTES

1. RM04 J & F are not marked
2. Zero Ohm (0.05 max.) jumper available in all sizes
3. EIA, E24 and E96 resistance ranges apply
4. Higher and lower values available. Consult Factory.

## Thick Film Chip Resistors

### MARKING



Resistance value in three digit designation system is marked on the glasscoat. Illustrated is a resistor of 15KΩ. Four digit resistance designation system is applied to RM12 and E-96 Series. For example, 1502 designated 15KΩ. (The last digit specifies the number of zeros.)

- For E-24 Series ( $\pm 5\%$ -J and  $\pm 10\%$ -K Tolerances)  
In 0603, 0805, 1206, 1210, 2010 and 2512 sizes:  
**3 DIGIT SYSTEM** - First two digits are significant and third digit is multiplier, "R" indicates decimal on values under 10 ohms.  
**Examples:** 100 = 10 ohms      102 = 1k ohms  
470 = 47 ohm      103 = 10k ohms  
101 = 100 ohms      104 = 100k ohms  
105 = 1 megohms

- For E-96 Series ( $\pm 1\%$ -F Tolerance)  
In 0805, 1206, and 1210 sizes:  
**4 DIGIT SYSTEM** - First three digits are significant and fourth digit is multiplier, "R" indicates decimal on values under 10 ohms.  
**Examples:** 10R0 = 10 ohms      1003 = 100k ohms  
1000 = 100 ohms      1004 = 1 megohms  
1001 = 1k ohms      1052 = 10.5k ohms  
1002 = 10k ohms      2213 = 221k ohms

- For E-96 Series ( $\pm 1\%$ -F Tolerance) in 0603 size  
**3 DIGIT SYSTEM** (Due to space restrictions)

E-24			E-96					
Value	Value	Code	Value	Code	Value	Code	Value	Code
100	100	01	102	02	105	03	107	04
110	110	05	113	06	115	07	118	08
120	121	09	124	10	127	11	130	12
130	133	13	137	14	140	15	143	16
150	147	17	150	18	154	19	158	20
160	162	21	165	22	169	23	174	24
180	178	25	182	26	187	27	191	28
200	196	29	200	30	205	31	210	32
220	215	33	221	34	226	35	232	36
240	237	37	243	38	249	39	255	40
270	261	41	267	42	274	43	280	44
300	287	45	294	46	301	47	309	48
330	316	49	324	50	332	51	340	52
360	348	53	357	54	365	55	374	56
390	383	57	392	58	402	59	412	60
430	422	61	432	62	442	63	453	64
470	464	65	475	66	487	67	499	68
510	511	69	523	70	536	71	549	72
560	562	73	576	74	590	75	604	76
620	619	77	634	78	649	79	665	80
680	681	81	698	82	715	83	732	84
750	750	85	768	86	787	87	806	88
820	825	89	845	90	866	91	887	92
910	909	93	931	94	953	95	976	96

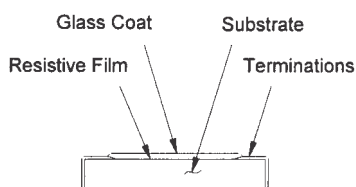
\*For 1%, a 3-digit alpha-numeric marking system is used as follows.

A	B	C	D	E	F	X
10 <sup>0</sup>	10 <sup>1</sup>	10 <sup>2</sup>	10 <sup>3</sup>	10 <sup>4</sup>	10 <sup>5</sup>	10 <sup>-1</sup>

### PERFORMANCE CHARACTERISTICS

ITEMS	SPECIFICATIONS, REQUIREMENT	TESTED PER EIA J-RC-2690A	TYPICAL	
Moisture Resistance, Thermal Shock	$\pm(1\%+0.05\Omega)$ , No Mechanical Damage	-55°C to +125°C, 5 cycles	Within $\pm 0.2\%$	
Low Temperature Exposure	$\pm(3\%+0.1\Omega)$ , No Mechanical Damage	-55°C, 1,000 Hours	Within $\pm 0.5\%$	
Load Life	<1 meg $\pm(3\%+0.1\Omega)$ , $\geq 1$ meg $\pm 5\%$	70°C, rated voltage, 1.5hr on/0.5hr off, 1,000 hrs	See Graph	
Load Life in Moisture	<1 meg $\pm(3\%+0.1\Omega)$ , $\geq 1$ meg $\pm 5\%$	40°C, 95% R.H., 1.5hr on/0.5hr off, 1,000 hrs	See Graph	
Vibration	$\pm(1\%+0.05\Omega)$ , No Mechanical Damage	10-55 Hz, 3 direction, each 2 hours	Within $\pm 0.1\%$	
Resistance to Soldering Heat	$\pm(1\%+0.05\Omega)$ , No Mechanical Damage	270°C, 10 seconds	See Graph	
Solderability	min. 95% coverage	230°C, 3 seconds, flux applied <sup>1</sup>	More than 97%	
Heat Resistance	Adhesion Curing	$\pm(1\%+0.05\Omega)$	+150°C, 10 minutes	Within $\pm 0.3\%$
	Dry Heat	$\pm(3\%+0.1\Omega)$ , No Mechanical Damage	-125°C, 1,000 hours	Within $\pm 0.5\%$
Terminal Strength	Pull	$\pm(1\%+0.05\Omega)$ , No Mechanical Damage	500G load, 30 seconds	Within $\pm 0.2\%$
	Board Bending	$\pm(1\%+0.05\Omega)$ , No Mechanical Damage	1/45mm bend, 10 seconds	Within $\pm 0.2\%$
Dielectric Withstanding Voltage	No Insulation Breakdown	500V, 1 minute	Above 900V	
Short Time Overload	$\pm(1\%+0.05\Omega)$ , No Evidence of Arc	2 1/2 times rated voltage, 5 seconds	Within $\pm 0.4\%$	
Insulation Resistance	1,000 meg minimum	500V, 1 minute	Above 10 <sup>6</sup> meg	
Voltage Coefficient	+0/-100ppm/V (above 1K $\pm$ )	Rated Voltage & 1/10 times rated voltage	Within -90ppm/V	

### MATERIALS



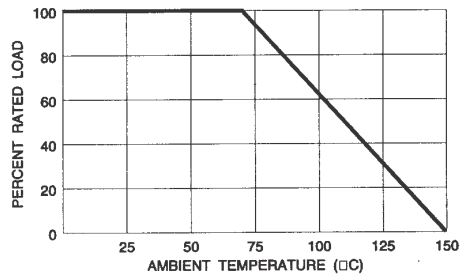
Feature	Material	Remarks (Reference Only)
Substrate	Alumina Porcelain	Purity 90% min.
Resistive Film	Ruthenium-Oxide Film	20 Microns Thick
Coating	Boro-Silicated Acid Lead Glass	20 Microns Thick
Terminations	100% matte Tin (Electrical Plated) over Nickel (Electrical Plated) over AG-PD (Silver Palladium[Glaze Printed])	3 Microns Thick 3 Microns Thick 8 Microns Thick

## Thick Film Chip Resistors

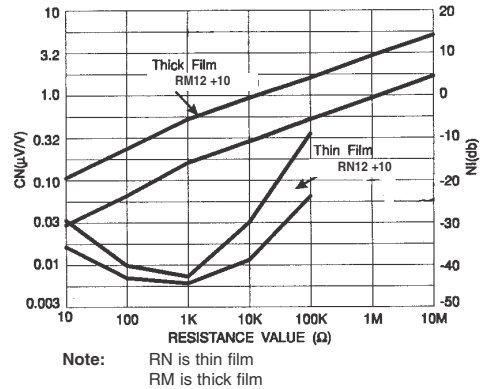


### PERFORMANCE CURVES

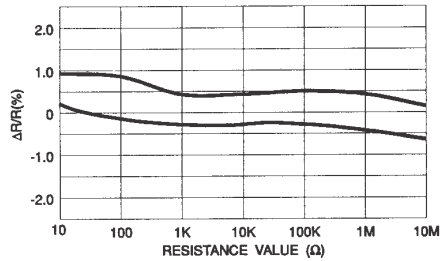
**Power - Temperature Derating**



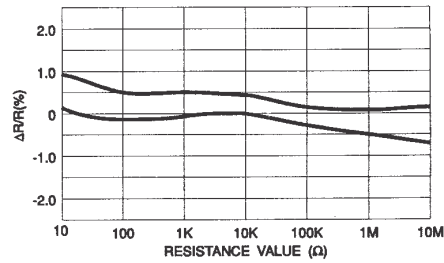
**Current Noise**



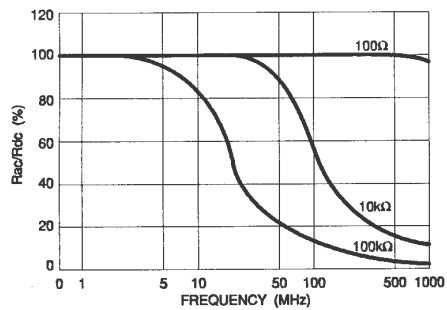
**Load Life in Moisture (1,000 hours)**



**Load Life (1,000 hours)**



**High Frequency Characteristics**



**Resistance to Soldering Heat**

