

## Metal Film Resistors, Axial, Industrial, Precision



### FEATURES

- Small size - conformal coated
- Flammability tested according to IEC/EN 60695-11-5
- Controlled temperature coefficient
- Excellent high frequency characteristics
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

STANDARD ELECTRICAL SPECIFICATIONS						
GLOBAL MODEL	HISTORICAL MODEL	MAXIMUM WORKING VOLTAGE <sup>(1)</sup> V	POWER RATING $P_{70^{\circ}\text{C}}$ W	RESISTANCE RANGE $\Omega$	TOLERANCE $\pm \%$	TEMPERATURE COEFFICIENT $\pm \text{ppm}/^{\circ}\text{C}$
CMF50	CMF-50	200	0.4	43 to 332K	0.1	25
				22 to 332K	0.25	
				10 to 475K	0.5, 1	
				43 to 332K	0.1	50
				22 to 332K	0.25	
				10 to 475K	0.5	
				1 to 10M	1, 2	
				0.22 to 10M	5	
				1 to 10M	1, 2	100, 150, 200
				0.22 to 10M	5	
CMF55	CMF-55	350	0.6	10 to 1M	0.1, 0.25, 0.5, 1	25
				10 to 1M	0.1, 0.25, 0.5	50
				1 to 10M	1	
				0.22 to 10M	2	
				0.22 to 22M	5	100, 150, 200
				1 to 10M	1	
				0.22 to 10M	2	
				0.22 to 22M	5	
				0.22 to 10M	2	
				0.22 to 22M	5	300
CMF60	CMF-60	500	1	43 to 1M	0.1	25
				22 to 1.5M	0.25	
				10 to 2.43M	0.5, 1	
				43 to 1M	0.1	50
				22 to 1.5M	0.25	
				10 to 2.43M	0.5	
				1 to 22M	1, 2	
				0.22 to 22M	5	
				1 to 22M	1, 2	100, 150, 200
				0.22 to 22M	5	
				1 to 22M	2	
				0.22 to 22M	5	300

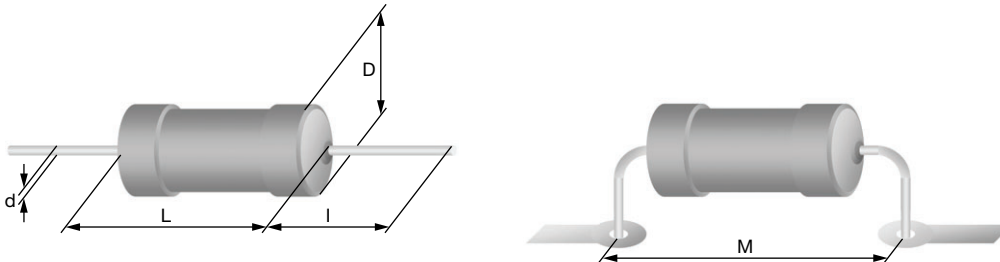
#### Note

<sup>(1)</sup> Continuous working voltage shall be  $\sqrt{P \times R}$  or maximum working voltage, whichever is less

GLOBAL PART NUMBER INFORMATION														
Global Part Numbering: CMF55301R00FKEA														
<b>C</b>	<b>M</b>	<b>F</b>	<b>5</b>	<b>5</b>	<b>3</b>	<b>0</b>	<b>1</b>	<b>R</b>	<b>0</b>	<b>0</b>	<b>F</b>	<b>K</b>	<b>E</b>	<b>A</b>
GLOBAL MODEL (See Standard Electrical Specifications table)			RESISTANCE VALUE <b>R</b> = $\Omega$ <b>K</b> = $k\Omega$ <b>M</b> = $M\Omega$ <b>R10000</b> = 0.1 $\Omega$ <b>680K00</b> = 680 $k\Omega$ <b>1M0000</b> = 1.0 $M\Omega$			TOLERANCE CODE <b>B</b> = $\pm 0.1\%$ <b>C</b> = $\pm 0.25\%$ <b>D</b> = $\pm 0.5\%$ <b>F</b> = $\pm 1\%$ <b>G</b> = $\pm 2\%$ <b>J</b> = $\pm 5\%$			TEMPERATURE COEFFICIENT <b>E</b> = 25 ppm <b>H</b> = 50 ppm <b>K</b> = 100 ppm <b>L</b> = 150 ppm <b>N</b> = 200 ppm <b>M</b> = 300 ppm			PACKAGING <b>EA</b> = lead (Pb)-free, T/R (full) <b>EB</b> = lead (Pb)-free, ammo pack (1000 pieces)		

**Note**

- For additional information on packaging, refer to the "Through-Hole Resistor Packaging" document ([www.vishay.com/doc?31544](http://www.vishay.com/doc?31544))

**DIMENSIONS** in millimeters


GLOBAL MODEL	$D_{max.}$	$L_{max.}$	$d_{nom.}$	$I_{min.}$	$M_{min.}$	MASS (mg)
CMF50	1.6	3.6	0.5	29	5	125
CMF55	2.5	6.5	0.6	28	10	220
CMF60	4.2	11.9	0.8	31	15	700

TECHNICAL SPECIFICATIONS					
PARAMETER	UNIT	CMF50	CMF55	CMF60	
Maximum Working Voltage	$V_{\equiv}$	$\leq 200$	$\leq 350$	$\leq 500$	
Insulation Voltage (1 Min)	$V_{eff}$	300	500	800	
Dielectric Strength	$V_{AC}$	300	450	750	
Insulation Resistance	$\Omega$	$\geq 1G$			
Operating Temperature Range	$^{\circ}C$	-55 to +155			
Terminal Strength (Pull Test)	lb	2	2	2	

TEMPERATURE COEFFICIENT CODES	
GLOBAL TC CODE	TEMPERATURE COEFFICIENT
E	25 ppm/ $^{\circ}C$
H	50 ppm/ $^{\circ}C$
K	100 ppm/ $^{\circ}C$
L	150 ppm/ $^{\circ}C$
N	200 ppm/ $^{\circ}C$
M	300 ppm/ $^{\circ}C$

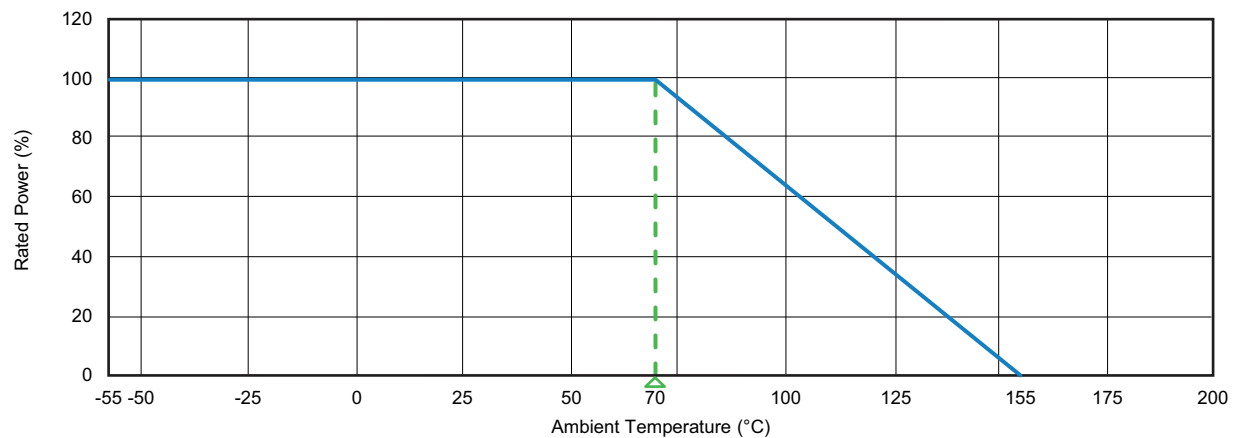


**LOAD LIFE SHIFT DUE TO POWER AND DERATING AT +70 °C**

The power rating for the CMF parts is tied to the derating temperature, the heat rise of the parts, and the  $\Delta R$  for the load life performance. When the tables/graphs below are used together they show that when the parts are run at their higher power ratings, the parts will run hotter, which has the potential of causing the resistance of the parts to shift more over the life of the part.

LOAD LIFE SHIFT VS. POWER RATING		
LOAD LIFE	MAXIMUM $\Delta R/R$ FOR 8000 h	
	$\pm 0.5\%$	$\pm 1.0\%$
APPLIED MAXIMUM FILM TEMPERATURE	125 °C	155 °C
MODEL	POWER RATING AT +70 °C	
CMF50	0.25 W	0.4 W
CMF55	0.4 W	0.6 W
CMF60	0.65 W	1 W

CMF resistors have an operating temperature range of -55 °C to +155 °C. They must be derated at high ambient temperatures according to the derating curve.



**DERATING**

**MATERIAL SPECIFICATIONS**

<b>Element</b>	Material and application process dependent on type, R-value, TCR, and tolerance	<b>Coating</b>	Polyurethane based lacquer, formulated for superior moisture protection. Flammability tested according to IEC/EN 60695-11-5
<b>Core</b>	Fire-cleaned high purity ceramic	<b>Solderability</b>	Continuous satisfactory coverage when tested in accordance with JSTD-002

**MARKING**

	CMF50	CMF55	CMF60
Line 1	*ohmic value*	CMF55	CMF60
Line 2	*tolerance*	*ohmic value*	
Line 3	-	*tolerance*TCR*	

Stamp text never contains spaces!  
Max. 7 characters per line.

OHMIC VALUE	
0.1	0R1
0.12	0R12
1	1R0
1.2	1R2
1.23	1R23
12	12R
12.3	12R3
123	123R
1000	1K0
1200	1K2
10 000	10K
1 000 000	1M0
1 200 000	1M2
123 456 000	123M456

Leading zero if < 1; at least two numeric digits (trailing zero if only one digit before the R, K, M)

TOLERANCE		TCR	
0.1	.1%	25	T9
0.25	.25%	50	T2
0.5	.5%	100	T1
1	1%	150	T0
2	2%	200	T00
5	5%	300	M

Without leading zeroes!



PERFORMANCE				
TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE ( $\Delta R_{max.}$ )		
		STABILITY CLASS 0.5	STABILITY CLASS 1	STABILITY CLASS 2
	Stability for product line:			
	CMF50	1 $\Omega$ to 332 $\Omega$	0.22 $\Omega$ to < 1 $\Omega$	> 332 $\Omega$
	CMF55	1 $\Omega$ to 1 M $\Omega$	0.22 $\Omega$ to < 1 $\Omega$	> 1 M $\Omega$
	CMF60	1 $\Omega$ to 2.43 M $\Omega$	0.22 $\Omega$ to < 1 $\Omega$	> 2.43 M $\Omega$
Short time overload	Room temperature $U = 2.5 \times \sqrt{P_{70} \times R}$ or $U = 2 \times U_{max.}$ ; 5 s	$\pm (0.1 \% R + 0.01 \Omega)$ no visible damage	$\pm (0.25 \% R + 0.05 \Omega)$ no visible damage	$\pm 0.5 \% R$ no visible damage
Shock	Shock duration: 6 ms Peak value: 100 gn Waveform: half-sine Number of shocks: 3 in both directions of the 3 axes ( $\Sigma 18$ )	$\pm (0.1 \% R + 0.01 \Omega)$ no visible damage	$\pm (0.25 \% R + 0.05 \Omega)$ no visible damage	$\pm 0.5 \% R$ no visible damage
Vibration	10 sweep cycles per direction; 10 Hz to 2000 Hz; 1.5 mm or 200 m/s <sup>2</sup>	$\pm (0.1 \% R + 0.01 \Omega)$ no visible damage	$\pm (0.25 \% R + 0.05 \Omega)$ no visible damage	$\pm 0.5 \% R$ no visible damage
Temperature cycling	30 min at -55 °C 30 min at 155 °C 5 cycles	$\pm (0.1 \% R + 0.01 \Omega)$	$\pm (0.25 \% R + 0.05 \Omega)$	$\pm 0.5 \% R$
	CMF50: 500 cycles CMF55: 200 cycles CMF60: 100 cycles	$\pm (0.5 \% R + 0.05 \Omega)$		
Load life	Varies based on power rating used; see "Load Life Shift Due To Power And Derating" table			
Dielectric withstanding voltage	$U_{RMS} = U_{ins}$ ; 60 s	No flashover or breakdown		
Effect of solder	Unmounted components; (260 $\pm$ 5) °C, (10 $\pm$ 1) s	$\pm (0.1 \% R + 0.01 \Omega)$ no visible damage	$\pm (0.25 \% R + 0.05 \Omega)$ no visible damage	$\pm 0.5 \% R$ no visible damage



## **Disclaimer**

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.