

### An Overview of Vishay Metal Film Resistors



#### KEY BENEFITS

- A wide range of power ratings (0.05 W to 3 W)
- A wide resistance range (0.1  $\Omega$  to 50 M $\Omega$ )
- Low- / high-temperature performance ( $-65\text{ }^{\circ}\text{C}$  to  $+230\text{ }^{\circ}\text{C}$ )
- Tight tolerance (down to  $\pm 0.01\%$ )
- Low temperature coefficient (down to  $\pm 2\text{ ppm}/^{\circ}\text{C}$ )
- Very low noise:  $-40\text{ dB}$

#### RESOURCES




- For available military products (MIL-PRF-39017, MIL-PRF-55182, MIL-PRF-22684, and MIL-R-10509), consult *Military Film Leaded Selector Guide* - [www.vishay.com/doc?49135](http://www.vishay.com/doc?49135)
- For more information about European Space Agency- (ESA) qualified products, consult *Military- and Space-Qualified Passive Components Selector Guide* - [www.vishay.com/doc?49605](http://www.vishay.com/doc?49605)
- For technical questions on Dale Metal Film products, contact [ff2aresistors@vishay.com](mailto:ff2aresistors@vishay.com)
- For technical questions on Draloric / BCcomponents Metal Film products, contact [leadedresistors@vishay.com](mailto:leadedresistors@vishay.com)





# METAL FILM RESISTORS

## Resistive Products

Through-Hole Metal Film Resistors							
Product	Model	Wattage Ratings	Resistance Range	TCR ppm/°C	Tolerance	Application	
 <p><b>CCF</b></p>	<a href="#">CCF07</a>	0.25 / 0.50	10 Ω to 1 MΩ 1.1 MΩ to 2 MΩ	± 100 ± 250	± 2 %, ± 5 % ± 5 %	<ul style="list-style-type: none"> <li>• Telephones</li> <li>• Base stations</li> <li>• Transmitters</li> <li>• TV / cable</li> <li>• Video</li> <li>• Amplifiers</li> <li>• Modems</li> <li>• Copy machines</li> <li>• Computer monitors</li> <li>• Avionics</li> <li>• Automotive</li> <li>• Heat pumps</li> <li>• Dishwashers</li> <li>• Audio</li> <li>• Medical</li> </ul>	
	<a href="#">CCF50</a>	0.33	10 Ω to 1 MΩ	± 100	± 1 %, ± 5 %		
	<a href="#">CCF55</a>	0.25 / 0.50	10 Ω to 3.01 MΩ	± 100	± 1 %		
	<a href="#">CCF60</a>	1.0	10 Ω to 1 MΩ	± 100	± 1 %		
	<a href="#">CCF02</a>	2.0	4.99 Ω to 1 MΩ	± 100	± 1 %, ± 5 %		
 <p><b>CMF Industrial / CMF Non-Magnetic</b></p>	<a href="#">CMF50</a> <a href="#">CMF50..143</a>	0.125 / 0.25	10 Ω to 22 MΩ 10 Ω to 2.5 MΩ 10 Ω to 2.5 MΩ 10 Ω to 2.5 MΩ	± 150, ± 200 ± 100 ± 50 ± 25	± 1 % to ± 5 % ± 1 % to ± 5 % ± 0.1 % to ± 5 % ± 0.1 % to ± 1 %		
	<a href="#">CMF55</a> <a href="#">CMF55..143</a>	0.25 / 0.5	0.1 Ω to 50 MΩ 0.5 Ω to 50 MΩ 0.5 Ω to 50 MΩ 1 Ω to 22 MΩ 10 Ω to 5 MΩ 10 Ω to 2.5 MΩ 10 Ω to 2.5 MΩ	± 200 ± 200 ± 150 ± 100 ± 50 ± 50 ± 25	± 2 %, ± 5 % ± 1 % ± 1 % to ± 5 % ± 1 % to ± 5 % ± 1 % to ± 5 % ± 0.1 % to ± 0.5 % ± 0.1 % to ± 1 %		
	<a href="#">CMF07</a> <a href="#">CMF07..143</a>	0.5	1 Ω to 5 MΩ 5 Ω to 5 MΩ	± 150, ± 200 ± 100	± 2 %, ± 5 % ± 2 %, ± 5 %		
	<a href="#">CMF60</a> <a href="#">CMF60..143</a>	0.5 / 1.0	0.1 Ω to 10 MΩ 0.5 Ω to 10 MΩ 0.5 Ω to 10 MΩ 1 Ω to 10 MΩ 10 Ω to 10 MΩ 10 Ω to 2.5 MΩ 10 Ω to 2.5 MΩ	± 200 ± 200 ± 150 ± 100 ± 50 ± 50 ± 25	± 2 %, ± 5 % ± 1 % ± 1 % to ± 5 % ± 1 % to ± 5 % ± 1 % to ± 5 % ± 0.1 % to ± 0.5 % ± 0.1 % to ± 1 %		
	<a href="#">CMF20</a> <a href="#">CMF20..143</a>	1.0	1 Ω to 10 MΩ 5 Ω to 10 MΩ	± 150, ± 200 ± 100	± 2 %, ± 5 % ± 2 %, ± 5 %		
	<a href="#">CMF65</a> <a href="#">CMF65..143</a>	1.0 / 1.5	0.1 Ω to 22 MΩ 0.5 Ω to 22 MΩ 0.5 Ω to 22 MΩ 1 Ω to 15 MΩ 10 Ω to 10 MΩ 10 Ω to 2.5 MΩ 10 Ω to 2.5 MΩ	± 200 ± 200 ± 150 ± 100 ± 50 ± 50 ± 25	± 2 %, ± 5 % ± 1 % ± 1 % to ± 5 % ± 1 % to ± 5 % ± 1 % to ± 5 % ± 0.1 % to ± 0.5 % ± 0.1 % to ± 1 %		
	<a href="#">CMF70</a> <a href="#">CMF70..143</a>	1.25 / 1.75	1 Ω to 22 MΩ 1 Ω to 15 MΩ 10 Ω to 10 MΩ 10 Ω to 2.5 MΩ 10 Ω to 2.5 MΩ	± 150, ± 200 ± 100 ± 50 ± 50 ± 25	± 1 % to ± 5 % ± 1 % to ± 5 % ± 1 % to ± 5 % ± 0.1 % to ± 0.5 % ± 0.1 % to ± 1 %		
	 <p><b>CMF Fusible</b></p>	<a href="#">CMF55..39</a>	0.25	4 Ω to 10 kΩ	± 100		± 1 %
<a href="#">CMF60..64</a>		0.50	4 Ω to 23 kΩ				
<a href="#">CMF70..5</a>		1.5	4 Ω to 30 kΩ				

# METAL FILM RESISTORS



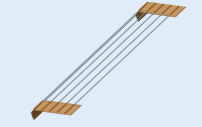

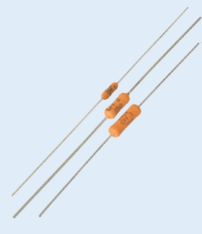
## Resistive Products

Through-Hole Metal Film Resistors						
Product	Model	Wattage Ratings	Resistance Range	TCR ppm/°C	Tolerance	Application
<b>CMF Flame Retardant</b> 	<a href="#">CMF65..146</a>	1.25 / 1.75 / 2.5	1 Ω to 15 MΩ	± 100	± 1 % to ± 5 %	<ul style="list-style-type: none"> <li>• Telecommunications</li> <li>• Power supplies</li> <li>• Instrumentation</li> <li>• Industrial</li> </ul>
	<a href="#">CMF70..146</a>	1.5 / 2.0 / 3.0	1 Ω to 15 MΩ			
<b>CMF Pulse Withstanding</b> 	<a href="#">CMF65..147</a>	1.25 / 1.75 / 2.5	1 Ω to 15 MΩ	± 100	± 1 % to ± 5 %	<ul style="list-style-type: none"> <li>• Telecommunications</li> <li>• Industrial</li> <li>• Pulse applications</li> </ul>
	<a href="#">CMF70..147</a>	1.5 / 2.0 / 3.0	1 Ω to 15 MΩ			
<b>GSR</b> 	<a href="#">GSR55</a>	0.10 / 0.125	10 Ω to 2.5 MΩ	± 15, ± 25, ± 50	± 0.05 % to ± 1 %	<ul style="list-style-type: none"> <li>• Harsh environments</li> <li>• Space</li> <li>• Avionics</li> </ul>
	<a href="#">GSR57</a>	0.125 / 0.25	10 Ω to 1.0 MΩ			
	<a href="#">GSR60</a>	0.125 / 0.25	10 Ω to 3.0 MΩ			
	<a href="#">GSR65</a>	0.25 / 0.50	10 Ω to 10.0 MΩ			
	<a href="#">GSR70</a>	0.50 / 0.75	10 Ω to 10.0 MΩ			
	<a href="#">GSR75</a>	1.0 / 2.0	10 Ω to 5.0 MΩ			
<b>MBx/SMA</b>  AEC-Q200	<a href="#">MBA/SMA 0204</a>	0.25 / 0.4 0.07 / 0.25	0.22 Ω to 10 MΩ 0.22 Ω to 332 KΩ	± 50, ± 25 ± 25, ± 15	± 5 %, ± 1 %, ± 0.5 % ± 0.25 %, ± 0.1 %	<ul style="list-style-type: none"> <li>• Automotive</li> <li>• Industrial</li> <li>• Telecommunications</li> <li>• Medical equipment</li> <li>• Test and measurement equipment</li> </ul>
	<a href="#">MBB/SMA 0207</a>	0.4 / 0.6 0.11 / 0.4	0.22 Ω to 22 MΩ 10 Ω to 1 MΩ	± 50, ± 25 ± 25, ± 15		
	<a href="#">MBE/SMA 0414</a>	0.65 / 1.0 0.17 / 0.65	0.22 Ω to 22 MΩ 22 Ω to 1.5 MΩ	± 50, ± 25 ± 25, ± 15		
<b>UXx</b> 	<a href="#">UXA 0204</a>	0.1	22 Ω to 221 KΩ	± 10, ± 5, ± 2	± 0.25 %, ± 0.1 % ± 0.05 %, ± 0.01 %	<ul style="list-style-type: none"> <li>• Precision test and measuring system</li> <li>• Design of calibration reference standards</li> </ul>
	<a href="#">UXB 0207</a>	0.25	10 Ω to 1 MΩ	± 10, ± 5, ± 2		
	<a href="#">UXE 0414</a>	0.5	22 Ω to 511 KΩ	± 10, ± 5		
<b>MPR24</b> 	<a href="#">MPR24</a>	0.125	4.99 Ω to 1 MΩ	± 25, ± 15	± 0.05 %, ± 0.02 %, ± 0.01 % ± 0.5 %, ± 0.25 %, ± 0.1 %	<ul style="list-style-type: none"> <li>• Test and measurement equipment</li> <li>• Telecommunications</li> </ul>
		0.25		± 10, ± 5		
<b>MRS</b> 	<a href="#">MRS16</a>	0.4	4.99 Ω to 1 MΩ	± 50	± 1 %	<ul style="list-style-type: none"> <li>• All general purpose applications</li> </ul>
	<a href="#">MRS25</a>	0.6	1 Ω to 10 MΩ			
<b>MBx/SMA VG06</b>  AEC-Q200	<a href="#">MBA/SMA 0204 VG06</a>	0.4	1 Ω to 5.11 MΩ	± 50, ± 15	± 1 %, ± 0.1 %	<ul style="list-style-type: none"> <li>• Military</li> <li>• Avionics</li> <li>• Space</li> </ul>
	<a href="#">MBB/SMA 0207 VG06</a>	0.6	1 Ω to 10 MΩ	± 50, ± 15	± 1 %, ± 0.1 %	
	<a href="#">MBE/SMA 0414 VG06</a>	1	1 Ω to 21.5 MΩ	± 50, ± 15	± 1 %, ± 0.1 %	
<b>MBA/SMA HF</b> 	<a href="#">MBA/SMA 0204 HF</a>	0.25 / 0.4	1.5 Ω to 470 Ω	± 50	± 2 %, ± 1 %	<ul style="list-style-type: none"> <li>• Telecommunications</li> <li>• Industrial electronics</li> </ul>



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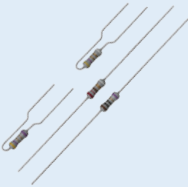
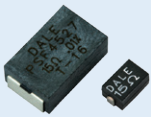
## Resistive Products

Through-Hole Metal Film Resistors						
Product	Model	Wattage Ratings	Resistance Range	TCR ppm/°C	Tolerance	Application
 FRJ	<a href="#">FRJ50</a>	N/A	0.010 Ω max	N/A	N/A	• Jumper
	<a href="#">PR02L</a>	2	2 KΩ to 70 KΩ	± 250	± 5 %	• Lamp ignition
	<a href="#">PR2.5L</a>	2.5				
	<a href="#">PR2.5LS</a>	2.5				
	<a href="#">DB1U</a>	N/A	0.006 Ω max	N/A	N/A	• Jumper
	<a href="#">DB2U / DB4U</a>		0.0045 Ω max 0.0025 Ω max			
	<a href="#">PTF51</a>	0.05	15 Ω to 100 kΩ	± 5, ± 10, ± 15	± 0.02 % to ± 1 %	• Precision test equipment • Instrumentation
	<a href="#">PTF56</a>	0.125	15 Ω to 500 kΩ		± 0.01 % to ± 1 %	
	<a href="#">PTF65</a>	0.25	15 Ω to 1 MΩ		± 0.05 % to ± 1 %	
	<a href="#">CPF1</a>	1.0	0.1 Ω to 150 kΩ	± 200	± 2 %, ± 5 %	• Small size, high power • Automotive • Industrial controls
			0.5 Ω to 150 kΩ	± 200	± 1 %	
			0.5 Ω to 150 kΩ	± 150	± 1 % to ± 5 %	
	<a href="#">CPF2</a>	2.0	1 Ω to 150 kΩ	± 100	± 0.5 % to ± 5 %	
			5 Ω to 150 kΩ	± 50	± 0.1 % to ± 5 %	
			5 Ω to 150 kΩ	± 25	± 0.1 % to ± 1 %	
	<a href="#">CPF3</a>	3.0	0.1 Ω to 150 kΩ	± 200	± 2 %, ± 5 %	
			1 Ω to 150 kΩ	± 200	± 1 %	
			1 Ω to 150 kΩ	± 150	± 1 % to ± 5 %	
			1 Ω to 150 kΩ	± 100	± 0.5 % to ± 5 %	
			8 Ω to 150 kΩ	± 50	± 0.1 % to ± 5 %	
			8 Ω to 150 kΩ	± 25	± 0.1 % to ± 1 %	



# METAL FILM RESISTORS

## Resistive Products

Through-Hole Metal Film Resistors						
Product	Model	Wattage Ratings	Resistance Range	TCR ppm/°C	Tolerance	Application
<b>SFR</b> 	<a href="#">SFR16S</a>	0.5	1 Ω to 3 MΩ 4.99 Ω to 3 MΩ	± 100, ± 250	± 5 %	• All general purpose applications
	<a href="#">SFR25</a>	0.4	0.22 Ω to 10 MΩ 1 Ω to 10 MΩ		± 1 %	
	<a href="#">SFR25H</a>	0.5	0.22 Ω to 10 MΩ 1 Ω to 10 MΩ		± 5 %	
					± 1 %	
					± 5 %	
					± 1 %	
<b>PR01/02/03</b> 	<a href="#">PR01</a>	0.6	0.22 Ω to 1 Ω	± 250	± 5 %, ± 1 %	• All general purpose power applications
		1.0	1 Ω to 1 MΩ			
	<a href="#">PR02</a>	1.2	0.33 Ω to 1 Ω			
		2	1 Ω to 1 MΩ			
	<a href="#">PR03</a>	1.6	0.68 Ω to 1 Ω			
		3	1 Ω to 1 MΩ			
<b>NFR25/25H</b> 	<a href="#">NFR25</a>	0.33	0.22 Ω to 15 KΩ	Refer to datasheet	± 5 %	• Audio • Video
	<a href="#">NFR25H</a>	0.5				
Surface-Mount Metal Film Resistor						
<b>PSF</b> 	<a href="#">PSF2012</a>	0.125	15 Ω to 100 kΩ	± 5, ± 10, ± 15, ± 25	± 0.01 % to ± 1 %	• Precision test equipment • Instrumentation
	<a href="#">PSF4527</a>	0.25	15 Ω to 500 kΩ	± 5, ± 10, ± 15, ± 25	± 0.01 % to ± 1 %	



# METAL FILM RESISTORS

## Resistive Products

### SEMICONDUCTORS

#### *MOSFETs Segment*

##### MOSFETs

- Low-Voltage TrenchFET® Power MOSFETs
- Medium-Voltage Power MOSFETs
- High-Voltage Planar MOSFETs
- High-Voltage Superjunction MOSFETs
- Automotive-Grade MOSFETs

##### ICs

- VRPower® DrMOS Integrated Power Stages
- Power Management and Power Control ICs
- Smart Load Switches
- Analog Switches and Multiplexers

#### *Diodes Segment*

##### Rectifiers

- Schottky Rectifiers
- Ultra-Fast Recovery Rectifiers
- Standard and Fast Recovery Rectifiers
- High-Power Rectifiers / Diodes
- Bridge Rectifiers

##### Small-Signal Diodes

- Schottky and Switching Diodes
- Zener Diodes
- RF PIN Diodes

##### Protection Diodes

- TVS Diodes or TRANSZORB® (unidirectional, bidirectional)
- ESD Protection Diodes (including arrays)

##### Thyristors / SCRs

- Phase-Control Thyristors
- Fast Thyristors

##### IGBTs

- Field Stop Trench
- Punch-Through Trench

##### Power Modules

- Input Modules (diodes and thyristors)
- Output and Switching Modules (contain MOSFETs, IGBTs, and diodes)
- Custom Modules

#### *Optoelectronic Components Segment*

##### Infrared Emitters and Detectors

##### Optical Sensors

- Proximity
- Ambient light
- Light Index (RGBW, UV, IR)
- Humidity
- Quadrant Sensors
- Transmissive
- Reflective

##### Infrared Remote Control Receivers

##### Optocouplers

- Phototransistor, Photodarlington
- Linear
- Phototriac
- High-Speed
- IGBT and MOSFET Driver

##### Solid-State Relays

##### LEDs and 7-Segment Displays

##### Infrared Data Transceiver Modules

##### Custom Products

### PASSIVE COMPONENTS

#### *Resistors and Inductors Segment*

##### Film Resistors

- Metal Film Resistors
- Thin Film Resistors
- Thick Film Resistors
- Power Thick Film Resistors
- Metal Oxide Film Resistors
- Carbon Film Resistors

##### Wirewound Resistors

- Vitreous, Cemented, and Housed Resistors
- Braking and Neutral Grounding Resistors
- Custom Load Banks

##### Power Metal Strip® Resistors

##### Battery Management Shunts

##### Crowbar and Steel Blade Resistors

##### Thermo Fuses

##### Chip Fuses

##### Pyrotechnic Initiators / Igniters

##### Variable Resistors

- Cermet Variable Resistors
- Wirewound Variable Resistors
- Conductive Plastic Variable Resistors
- Contactless Potentiometers
- Hall Effect Position Sensors
- Precision Magnetic Encoders

##### Networks / Arrays

##### Non-Linear Resistors

- NTC Thermistors
- PTC Thermistors
- Thin Film RTDs
- Varistors

##### Magnetics

- Inductors
- Wireless Charging Coils
- Planar Devices
- Transformers
- Custom Magnetics

##### Connectors

#### *Capacitors Segment*

##### Tantalum Capacitors

- Molded Chip Tantalum Capacitors
- Molded Chip Polymer Tantalum Capacitors
- Coated Chip Tantalum Capacitors
- Solid Through-Hole Tantalum Capacitors
- Wet Tantalum Capacitors

##### Ceramic Capacitors

- Multilayer Chip Capacitors
- Disc Capacitors
- Multilayer Chip RF Capacitors
- Chip Antennas
- Thin Film Capacitors

##### Film Capacitors

##### Power Capacitors

##### Heavy-Current Capacitors

##### Aluminum Electrolytic Capacitors

##### ENYCAP™ Energy Storage Capacitors