

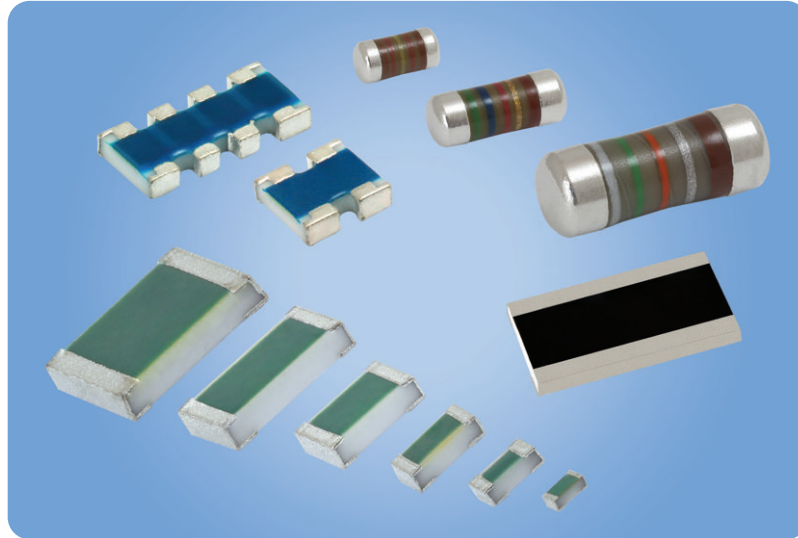


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# SMD RESISTORS

Vishay Draloric / Beyschlag

## Vishay Draloric / Beyschlag SMD Resistor Solutions for All Types of Applications



### KEY BENEFITS

- Broadest portfolio
- High performing products
- Standard, professional, precision, semi-precision, and ultra precision product ranges

### FEATURES

- Resistor solutions for application-specific requirements, such as:
  - High pulse load
  - High voltage
  - High power
  - High reliability
  - High frequency
  - Low ohmic ( $< 1 \Omega$ )
  - High ohmic ( $> 10 M\Omega$ )
  - Sulfur-resistant
  - Lead (Pb)-bearing
  - Voltage divider
  - Fully green

### RESOURCES

- For technical questions, please contact: [melf@vishay.com](mailto:melf@vishay.com), [thinfilmmchip@vishay.com](mailto:thinfilmmchip@vishay.com), [thickfilmmchip@vishay.com](mailto:thickfilmmchip@vishay.com), [thinfilmmarray@vishay.com](mailto:thinfilmmarray@vishay.com), [specialresistors@vishay.com](mailto:specialresistors@vishay.com)
- Please find your relevant sales contacts at: [www.vishay.com/doc?99914](http://www.vishay.com/doc?99914)



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## ACCURACY CLASSIFICATION

	Thin Film MELF (pages 5 to 7)	Thin Film Chip and Array (pages 7 to 9)	Thick Film Chip (pages 10 to 12)
<b>Standard</b> e.g. TCR 100 ppm/K $\pm$ 1 %			D/CRCW e3 RCA e3 RCL e3 RCC e3
<b>Semi-Precision</b> e.g. TCR 50 ppm/K $\pm$ 0.5 %			D/CRCW-P e3
<b>Professional</b> e.g. TCR 50 ppm/K $\pm$ 1 %	MM SMM	MC MC AT MCW AT NCW AT ACAS	
<b>Precision</b> e.g. TCR 25 ppm/K $\pm$ 0.1 %	MM SMM	MC MC AT MCW AT ACAS ACAS AT TNPW e3	
<b>Ultra Precision</b> e.g. TCR 5 ppm/K $\pm$ 0.05 %	UM	TNPU e3 MC AT ACAS ACAS AT	



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## RESISTOR SOLUTIONS FOR SPECIFIC APPLICATION REQUIREMENTS

	Thin Film MELF (pages 5 to 6)	Thin Film Chip (pages 7 to 9)	Thick Film Chip (pages 10 to 12)	Carbon Film MELF (page 6)
High Pulse Load	MM SMM	MC MC AT MCW AT	CRCW-HP e3 D/CRCW-IF e3 RCA-IF e3 RCA-HP e3 RCS e3	CM
High Power	MMA 0204 HT MM SMM	MC AT MCW AT NCW AT MC HP TNPW e3	CRCW-HP e3 RCL e3 RCC e3 RCS e3 RCA-HP e3 RCA-LS e3 RCA-AU e4	CM
High Voltage	MM HV MM HV AT	TNPV e3	RCV e3 RCV-AT e3	CMB 0207
Sulfur-Resistant	MM SMM	MC MC AT MCW AT NCW AT TNPW e3 MC HP	RCA e3 RCA-LS e3 RCA-IF e3 RCA-HP e3 RCA-AU e4	CM
High Reliability	MM VG03 SMM0204 EN803 E8 MS1 ESCC MS1 EN803 E8	MC VG01 TNPS		
High Frequency	MM HF			CMA 0204 HF
Low Ohmic 0.1 $\Omega$ to < 1 $\Omega$	MM SMM	NCW AT		
High Ohmic > 10 M $\Omega$	MMB 0207		D/CRCW-HR e3	



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## RESISTOR SOLUTIONS FOR SPECIFIC APPLICATION REQUIREMENTS

	Thin Film MELF (pages 5 to 6)	Thin Film Chip (pages 7 to 9)	Thick Film Chip (pages 10 to 12)	Carbon Film MELF (page 6)
Lead (Pb)-Bearing	MS1 ESCC MS1 EN803 E8	TNPS ESCC TNPW	D/CRCW D/CRCW-P D/CRCW-HR RCA	
Voltage Divider		ACAS ACAS AT		
Fully Green	MM SMM UM	TNPW e3	RCG e3	CM
AEC-Q200 Qualified	MM SMM MM HV AT MM HT	ACAS AT MC AT MCW AT MC HP NCW AT TNPW e3 TNPU e3 TNPV e3	D/CRCW e3 D/CRCW-P e3 D/CRCW-IF e3 RCA e3 RCL e3 RCA-HP e3 RCA-AU e4 RCA-LS e3 RCS e3 RCC e3 RCA-IF e3 RCV-AT e3 CRCW-HP e3	CM



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Thin Film MELF Resistors			
Series	Description	Features	Brand
<b>MMU, MMA, MMB Professional</b> 	<ul style="list-style-type: none"> <li>• <b>Professional MELF Resistors</b></li> <li>• Size: 0102 to 0207</li> <li>• Tolerance: <math>\pm 0.5\%</math> to <math>\pm 5\%</math></li> <li>• TCR: <math>\pm 25</math> ppm/K to <math>\pm 100</math> ppm/K</li> <li>• Resistance range: <math>0.1\ \Omega</math> to <math>15\ \text{M}\Omega</math>; <math>0\ \Omega</math></li> <li>• Power rating: <math>0.3\ \text{W}</math> to <math>1\ \text{W}</math></li> </ul>	<ul style="list-style-type: none"> <li>• Precise and stable thin film technology</li> <li>• High power rating</li> <li>• IECQ-CECC approval to EN 140401-803</li> <li>• AEC-Q200 qualified</li> </ul>	Beyschlag
<b>MMU, MMA, MMB Precision</b> 	<ul style="list-style-type: none"> <li>• <b>Precision MELF Resistors</b></li> <li>• Size: 0102 to 0207</li> <li>• Tolerance: <math>\pm 0.1\%</math> to <math>\pm 0.5\%</math></li> <li>• TCR: <math>\pm 15</math> ppm/K to <math>\pm 25</math> ppm/K</li> <li>• Resistance range: <math>10\ \Omega</math> to <math>10\ \text{M}\Omega</math></li> <li>• Power rating: <math>0.2\ \text{W}</math> to <math>0.4\ \text{W}</math></li> </ul>	<ul style="list-style-type: none"> <li>• Precise and stable thin film technology</li> <li>• IECQ-CECC approval to EN 140401-803</li> <li>• Advanced level of precision and stability</li> <li>• AEC-Q200 qualified</li> </ul>	Beyschlag
<b>SMM 0102, 0204, 0207</b> 	<ul style="list-style-type: none"> <li>• <b>Precision and Professional MELF Resistors</b></li> <li>• Size: 0102 to 0207</li> <li>• Tolerance: <math>\pm 0.1\%</math> to <math>\pm 5\%</math></li> <li>• TCR: <math>\pm 15</math> ppm/K to <math>\pm 100</math> ppm/K</li> <li>• Resistance range: <math>0.16\ \Omega</math> to <math>10\ \text{M}\Omega</math>; (OMM) <math>0\ \Omega</math></li> <li>• Power rating: <math>0.2\ \text{W}</math> to <math>1\ \text{W}</math></li> </ul>	<ul style="list-style-type: none"> <li>• Precise and stable thin film technology</li> <li>• High power rating</li> <li>• AEC-Q200 qualified</li> </ul>	Draloric
<b>UMA 0204, UMB 0207</b> 	<ul style="list-style-type: none"> <li>• <b>Ultra Precision MELF Resistors</b></li> <li>• Size: 0204; 0207</li> <li>• Tolerance: <math>\pm 0.02\%</math> to <math>\pm 0.25\%</math></li> <li>• TCR: <math>\pm 5</math> ppm/K to <math>\pm 15</math> ppm/K</li> <li>• Resistance range: <math>10\ \Omega</math> to <math>390\ \text{k}\Omega</math></li> <li>• Power rating: <math>0.25\ \text{W}</math> to <math>0.4\ \text{W}</math></li> </ul>	<ul style="list-style-type: none"> <li>• Superior overall stability</li> <li>• High precision thin film technology</li> <li>• IECQ-CECC approval to EN 140401-803</li> </ul>	Beyschlag
<b>SMM 0204... EN803 E0</b> 	<ul style="list-style-type: none"> <li>• <b>MINI-MELF Resistors (CECC Approved)</b></li> <li>• Size: 0204</li> <li>• Tolerance: <math>\pm 0.1\%</math> to <math>\pm 5\%</math></li> <li>• TCR: <math>\pm 15</math> ppm/K to <math>\pm 100</math> ppm/K</li> <li>• Resistance range: <math>1\ \Omega</math> to <math>2.21\ \text{M}\Omega</math>; (OMM) <math>0\ \Omega</math></li> <li>• Power rating: <math>0.25\ \text{W}</math></li> </ul>	<ul style="list-style-type: none"> <li>• High reliability product</li> <li>• AEC-Q200 qualified</li> <li>• IECQ-CECC approval to EN 140401-803</li> </ul>	Draloric
<b>SMM 0204... EN803 E8</b> 	<ul style="list-style-type: none"> <li>• <b>MINI-MELF Resistors With Established Reliability</b></li> <li>• Size: 0204</li> <li>• Tolerance: <math>\pm 0.1\%</math>; <math>\pm 1\%</math></li> <li>• TCR: <math>\pm 15</math> ppm/K; <math>\pm 50</math> ppm/K</li> <li>• Resistance range: <math>1\ \Omega</math> to <math>2.21\ \text{M}\Omega</math></li> <li>• Power rating: <math>0.25\ \text{W}</math></li> </ul>	<ul style="list-style-type: none"> <li>• IECQ-CECC approval to EN 140401-803 version E</li> <li>• Established reliability, failure rate level E8</li> <li>• Stable metal film on high quality ceramic</li> </ul>	Draloric
<b>MS1...EN803 E8</b> 	<ul style="list-style-type: none"> <li>• <b>Lead (Pb)-Bearing MINI-MELF Resistors With Established Reliability</b></li> <li>• Size: 0204</li> <li>• Tolerance: <math>\pm 0.1\%</math>; <math>\pm 1\%</math></li> <li>• TCR: <math>\pm 15</math> ppm/K; <math>\pm 50</math> ppm/K</li> <li>• Resistance range: <math>1\ \Omega</math> to <math>2.21\ \text{M}\Omega</math></li> <li>• Power rating: <math>0.25\ \text{W}</math></li> </ul>	<ul style="list-style-type: none"> <li>• IECQ-CECC approval to EN 140401-803 version E</li> <li>• Established reliability, failure rate level E8</li> <li>• Stable metal film on high quality ceramic</li> <li>• SnPb termination plating, Pb contents <math>&gt; 6\%</math></li> <li>• Meets Bellcore, MIL, and ESCC plating requirements</li> </ul>	Draloric



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Thin Film MELF Resistors			
Series	Description	Features	Brand
<a href="#">MS1...ESCC</a>  	<ul style="list-style-type: none"> <li>• <b>Hi-Rel Thin Film MINI-MELF Resistors</b></li> <li>• Size: 0204</li> <li>• Tolerance: <math>\pm 0.1\%</math> to <math>\pm 1\%</math></li> <li>• TCR: <math>\pm 15</math> ppm/K to <math>\pm 50</math> ppm/K</li> <li>• Resistance range: <math>2.21\ \Omega</math> to <math>5.11\ M\Omega</math></li> <li>• Power rating: 0.25 W</li> </ul>	<ul style="list-style-type: none"> <li>• High reliability product</li> <li>• ESA-approved to ESCC 4001/022</li> <li>• Advanced thin film technology</li> <li>• SnPb termination plating, minimum 6 % Pb</li> </ul>	Draloric
<a href="#">MMU 0102 HF,</a> <a href="#">MMA 0204 HF,</a> <a href="#">MMB 0207 HF</a> 	<ul style="list-style-type: none"> <li>• <b>High Frequency MELF Resistors</b></li> <li>• Size: 0102 to 0207</li> <li>• Tolerance: <math>\pm 1\%</math> to <math>\pm 2\%</math></li> <li>• TCR: <math>\pm 50</math> ppm/K</li> <li>• Resistance range: <math>1.5\ \Omega</math> to <math>475\ \Omega</math></li> <li>• Power rating: 0.3 W to 1.0 W</li> </ul>	<ul style="list-style-type: none"> <li>• Speciality product for RF applications</li> <li>• Low inductance, non-helical trimmed product</li> </ul>	Beyschlag
<a href="#">MMU 0102 VG03,</a> <a href="#">MMA 0204 VG03,</a> <a href="#">MMB 0207 VG03</a>  	<ul style="list-style-type: none"> <li>• <b>Precision and Professional MELF Resistors With Established Reliability</b></li> <li>• Size: 0102 to 0207</li> <li>• Tolerance: <math>\pm 0.1\%</math> to <math>\pm 1\%</math></li> <li>• TCR: <math>\pm 15</math> ppm/K to <math>\pm 50</math> ppm/K</li> <li>• Resistance range: <math>1\ \Omega</math> to <math>10\ M\Omega</math>; <math>0\ \Omega</math></li> <li>• Power rating: 0.2 W to 0.4 W</li> </ul>	<ul style="list-style-type: none"> <li>• IECQ-CECC approval to EN 140401-803, version E</li> <li>• Established reliability, failure rate level E6 (corresponds to MIL level P)</li> <li>• Precise and stable thin film technology</li> </ul>	Beyschlag
<a href="#">MMA 0204 HT</a>  	<ul style="list-style-type: none"> <li>• <b>Professional High Temperature MINI-MELF Resistor</b></li> <li>• Size: 0204</li> <li>• Tolerance: <math>\pm 0.5\%</math> to <math>\pm 1\%</math></li> <li>• TCR: <math>\pm 25</math> ppm/K to <math>\pm 50</math> ppm/K</li> <li>• Resistance range: <math>47\ \Omega</math> to <math>100\ k\Omega</math>; <math>0\ \Omega</math></li> <li>• Power rating: 0.5 W</li> </ul>	<ul style="list-style-type: none"> <li>• 175 °C specified operating temperature</li> <li>• AEC-Q200 qualified</li> <li>• Excellent stability <math>\leq 0.25\%</math> at 175 °C</li> </ul>	Beyschlag
<a href="#">MMA 0204 HV,</a> <a href="#">MMB 0207 HV</a> 	<ul style="list-style-type: none"> <li>• <b>Professional High Voltage Thin Film MELF Resistors</b></li> <li>• Size: 0204 and 0207</li> <li>• Tolerance: <math>\pm 1\%</math></li> <li>• TCR: <math>\pm 50</math> ppm/K</li> <li>• Resistance range: <math>340\ k\Omega</math> to <math>10\ M\Omega</math></li> <li>• Power rating: 0.4 W to 1.0 W</li> </ul>	<ul style="list-style-type: none"> <li>• High operating voltage <math>U_{max.} = 1000\ V</math></li> <li>• Advanced metal film technology</li> <li>• Matte Sn termination on Ni barrier layer</li> </ul>	Beyschlag
<a href="#">MM HV AT</a>  	<ul style="list-style-type: none"> <li>• <b>Precision Automotive High Voltage Thin Film MELF Resistors</b></li> <li>• Size: 0204 and 0207</li> <li>• Tolerance: <math>\pm 0.1\%</math> to <math>\pm 0.5\%</math></li> <li>• TCR: <math>\pm 25</math> ppm/K</li> <li>• Resistance range: <math>340\ k\Omega</math> to <math>10\ M\Omega</math></li> <li>• Power rating: 0.4 W to 1.0 W</li> </ul>	<ul style="list-style-type: none"> <li>• High operating voltage up to <math>U_{max.} = 1200\ V</math></li> <li>• AEC-Q200 qualified</li> <li>• Advanced metal film technology</li> </ul>	Beyschlag






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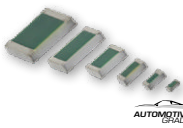
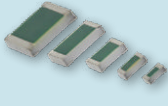

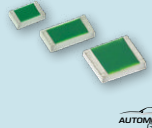
# SMD RESISTORS

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## Carbon Film MELF Resistors

Series	Description	Features	Brand
<a href="#">CMA 0204, CMB 0207</a> 	<ul style="list-style-type: none"> <li>• <b>High Pulse Load MELF Resistors</b></li> <li>• Size: 0204 and 0207</li> <li>• Tolerance: <math>\pm 1\%</math> to <math>\pm 5\%</math></li> <li>• TCR: see datasheet</li> <li>• Resistance range: 2.2 <math>\Omega</math> to 1.5 M<math>\Omega</math></li> <li>• Power rating: 0.4 W to 1 W</li> <li>• Up to 3 kW single pulse capability</li> </ul>	<ul style="list-style-type: none"> <li>• Special carbon film technology</li> <li>• Outstanding pulse load stability</li> <li>• High power rating</li> <li>• AEC-Q200 qualified</li> <li>• CMB: tested and certified according to EN IEC 62368-1: 2020, Annex G.10 (includes former requirements of IEC 60065, 14.2a)</li> </ul>	Beyschlag
<a href="#">CMA 0204 HF</a> 	<ul style="list-style-type: none"> <li>• <b>Pulse Load MELF Resistors for High Frequency Applications</b></li> <li>• Size: 0204</li> <li>• Tolerance: <math>\pm 2\%</math></li> <li>• TCR: -250 ppm/K</li> <li>• Resistance range: 47 <math>\Omega</math> to 300 <math>\Omega</math></li> <li>• Power rating: 0.4 W</li> </ul>	<ul style="list-style-type: none"> <li>• Specialty product for RF applications</li> <li>• ESD capability: 3 kV, human body model</li> <li>• Suitable for more than 10 GHz</li> </ul>	Beyschlag
<a href="#">CMA 0204 - Ethernet Termination</a> 	<ul style="list-style-type: none"> <li>• <b>Automotive Ethernet Common Mode Termination Carbon Film Mini-MELF Resistors</b></li> <li>• Size: 0204</li> <li>• Tolerance: <math>\pm 0.5\%</math> to <math>\pm 1\%</math></li> <li>• TCR: -250 ppm/K</li> <li>• Resistance range: 500 <math>\Omega</math>, 1 k<math>\Omega</math>, 2 k<math>\Omega</math></li> <li>• Power rating: 0.4 W</li> </ul>	<ul style="list-style-type: none"> <li>• Specialty product for automotive ethernet common mode termination</li> <li>• ESD capability: 8 kV contact, IEC 61000-4-2</li> <li>• Current noise ratio: <math>\leq 0.05\ \mu\text{V/V}</math></li> </ul>	Beyschlag

## Thin Film Chip Resistors

Series	Description	Features	Brand
<a href="#">TNPW e3</a> 	<ul style="list-style-type: none"> <li>• <b>High Stability Thin Film Flat Chip Resistors</b></li> <li>• Size: 0201 to 1210</li> <li>• Tolerance: <math>\pm 0.1\%</math> to <math>\pm 1\%</math></li> <li>• TCR: <math>\pm 10\ \text{ppm/K}</math> to <math>\pm 50\ \text{ppm/K}</math></li> <li>• Resistance range: 1 <math>\Omega</math> to 3.01 M<math>\Omega</math></li> <li>• Power rating: 0.075 W to 0.5 W</li> </ul>	<ul style="list-style-type: none"> <li>• Low temperature coefficient and tight tolerances</li> <li>• Superior moisture resistivity</li> <li>• Excellent overall stability at different environmental conditions</li> <li>• AEC-Q200 qualified</li> </ul>	Vishay
<a href="#">TNPW</a> 	<ul style="list-style-type: none"> <li>• <b>High Stability Precision Thin Film Chip Resistors</b></li> <li>• Size: 0402 to 1210</li> <li>• Tolerance: <math>\pm 0.1\%</math> to <math>\pm 1\%</math></li> <li>• TCR: <math>\pm 10\ \text{ppm/K}</math> to <math>\pm 50\ \text{ppm/K}</math></li> <li>• Resistance range: 10 <math>\Omega</math> to 3.01 M<math>\Omega</math></li> <li>• Power rating: 0.063 W to 0.33 W</li> </ul>	<ul style="list-style-type: none"> <li>• SnPb termination plating, minimum 6 % Pb</li> <li>• Excellent overall stability at different environmental conditions</li> <li>• Low temperature coefficient and tight tolerances</li> </ul>	Vishay
<a href="#">TNPU e3</a> 	<ul style="list-style-type: none"> <li>• <b>Ultra Precision Thin Film Chip Resistors</b></li> <li>• Size: 0402 to 1206</li> <li>• Tolerance: <math>\pm 0.02\%</math> to <math>\pm 0.1\%</math></li> <li>• TCR: <math>\pm 2\ \text{ppm/K}</math> to <math>\pm 10\ \text{ppm/K}</math></li> <li>• Resistance range: 24.9 <math>\Omega</math> to 511 k<math>\Omega</math></li> <li>• Power rating: 0.063 W to 0.25 W</li> </ul>	<ul style="list-style-type: none"> <li>• Low temperature coefficient and tight tolerances</li> <li>• Superior moisture resistivity</li> <li>• AEC-Q200 qualified</li> </ul>	Draloric
<a href="#">TNPV e3</a> 	<ul style="list-style-type: none"> <li>• <b>High Voltage Thin Film Flat Chip Resistors</b></li> <li>• Size: 0805 and 1210</li> <li>• Tolerance: <math>\pm 0.1\%</math> to <math>\pm 1\%</math></li> <li>• TCR: <math>\pm 10\ \text{ppm/K}</math> to <math>\pm 50\ \text{ppm/K}</math></li> <li>• Resistance range: 121 k<math>\Omega</math> to 3.01 M<math>\Omega</math></li> <li>• Power rating: 0.2 W to 0.33 W</li> </ul>	<ul style="list-style-type: none"> <li>• High operating voltage <math>U_{\text{max}}</math> up to 1000 V</li> <li>• Precision properties: TCR and tolerances down to <math>\pm 10\ \text{ppm/K}</math>; <math>\pm 0.1\%</math></li> <li>• Excellent overall stability at different environmental conditions</li> <li>• Superior moisture resistivity</li> <li>• AEC-Q200 qualified</li> </ul>	Draloric





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Thin Film Chip Resistors			
Series	Description	Features	Brand
<b>MC AT</b> 	<ul style="list-style-type: none"><li>• <b>High Stability Thin Film Flat Chip Resistors</b></li><li>• Size: 0402 to 1206</li><li>• Tolerance: <math>\pm 0.05\%</math> to <math>\pm 1\%</math></li><li>• TCR: <math>\pm 5</math> ppm/K to <math>\pm 50</math> ppm/K</li><li>• Resistance range: <math>1\ \Omega</math> to <math>10\ \text{M}\Omega</math>; <math>0\ \Omega</math></li><li>• Power rating: <math>0.13\ \text{W}</math> to <math>0.52\ \text{W}</math></li></ul>	<ul style="list-style-type: none"><li>• High temperature operation up to <math>175\ ^\circ\text{C}</math></li><li>• IECQ-CECC approval to EN 140401-801</li><li>• AEC-Q200 qualified</li><li>• Superior moisture resistivity</li></ul>	Beyschlag
<b>MC Professional</b> 	<ul style="list-style-type: none"><li>• <b>Professional Thin Film Chip Resistors</b></li><li>• Size: 0402 to 1206</li><li>• Tolerance: <math>\pm 0.5\%</math> to <math>\pm 1\%</math></li><li>• TCR: <math>\pm 25</math> ppm/K to <math>\pm 50</math> ppm/K</li><li>• Resistance range: <math>1\ \Omega</math> to <math>2\ \text{M}\Omega</math>; <math>0\ \Omega</math></li><li>• Power rating: <math>0.1\ \text{W}</math> to <math>0.4\ \text{W}</math></li></ul>	<ul style="list-style-type: none"><li>• Excellent overall stability: Class 0.5</li><li>• IECQ-CECC approval to EN 140401-801</li></ul>	Beyschlag
<b>MC Precision</b> 	<ul style="list-style-type: none"><li>• <b>Precision Thin Film Chip Resistors</b></li><li>• Size: 0402 to 1206</li><li>• Tolerance: <math>\pm 0.1\%</math> to <math>\pm 0.25\%</math></li><li>• TCR: <math>\pm 10</math> ppm/K to <math>\pm 25</math> ppm/K</li><li>• Resistance range: <math>39\ \Omega</math> to <math>2\ \text{M}\Omega</math></li><li>• Power rating: <math>0.063\ \text{W}</math> to <math>0.25\ \text{W}</math></li></ul>	<ul style="list-style-type: none"><li>• Superior overall stability: Class 0.1 and 0.25</li><li>• IECQ-CECC approval to EN 140401-801</li></ul>	Beyschlag
<b>MC HP</b> 	<ul style="list-style-type: none"><li>• <b>High Power Thin Film Chip Resistors</b></li><li>• Size: 0402 to 0805</li><li>• Tolerance: <math>\pm 0.1\%</math> to <math>\pm 1\%</math></li><li>• TCR: <math>\pm 25</math> ppm/K to <math>\pm 50</math> ppm/K</li><li>• Resistance range: <math>1\ \Omega</math> to <math>100\ \text{k}\Omega</math></li><li>• Power rating: <math>0.2\ \text{W}</math> to <math>0.4\ \text{W}</math></li></ul>	<ul style="list-style-type: none"><li>• Rated dissipation <math>P_{85}</math> up to <math>0.4\ \text{W}</math> for size 0805</li><li>• High temperature operation up to <math>175\ ^\circ\text{C}</math></li><li>• Superior temperature cycling robustness</li><li>• AEC-Q200 qualified</li></ul>	Beyschlag
<b>TNPR e3</b> 	<ul style="list-style-type: none"><li>• <b>Radio Frequency 20 GHz Thin Film Chip Resistors</b></li><li>• Size: 0201</li><li>• Tolerance: <math>\pm 0.5\%</math> to <math>\pm 1\%</math></li><li>• TCR: <math>\pm 25</math> ppm/K</li><li>• Resistance range: <math>50\ \Omega</math></li><li>• Power rating: <math>0.075\ \text{W}</math></li></ul>	<ul style="list-style-type: none"><li>• Specialty product for RF applications</li><li>• Operating frequency range: up to <math>20\ \text{GHz}</math></li></ul>	Draloric
<b>MCW AT Professional</b> 	<ul style="list-style-type: none"><li>• <b>Professional Wide Terminal Thin Film Chip Resistor</b></li><li>• Size: 0406, 0612</li><li>• Tolerance: <math>\pm 0.5\%</math> to <math>\pm 1\%</math></li><li>• TCR: <math>\pm 25</math> ppm/K to <math>\pm 50</math> ppm/K</li><li>• Resistance range: <math>1\ \Omega</math> to <math>100\ \text{k}\Omega</math></li><li>• Power rating: <math>0.3\ \text{W}</math> to <math>1.0\ \text{W}</math></li></ul>	<ul style="list-style-type: none"><li>• Rated dissipation <math>P_{85}</math> up to <math>1\ \text{W}</math></li><li>• Superior temperature cycling robustness</li><li>• High temperature operation up to <math>175\ ^\circ\text{C}</math></li><li>• AEC-Q200 qualified</li></ul>	Beyschlag
<b>MCW 0406 AT Precision</b> 	<ul style="list-style-type: none"><li>• <b>Precision Wide Terminal Thin Film Chip Resistor</b></li><li>• Size: 0406</li><li>• Tolerance: <math>\pm 0.1\%</math></li><li>• TCR: <math>\pm 15</math> ppm/K to <math>\pm 25</math> ppm/K</li><li>• Resistance range: <math>1\ \Omega</math> to <math>100\ \text{k}\Omega</math></li><li>• Power rating: <math>0.25\ \text{W}</math></li></ul>	<ul style="list-style-type: none"><li>• Advanced level of precision and stability</li><li>• Precision down to <math>1\ \Omega</math></li><li>• Superior temperature cycling robustness</li><li>• AEC-Q200 qualified</li></ul>	Beyschlag
<b>NCW 0406 AT, NCW 0612 AT</b> 	<ul style="list-style-type: none"><li>• <b>Low Ohmic Wide Terminal Thin Film Chip Resistors</b></li><li>• Size: 0406, 0612</li><li>• Tolerance: <math>\pm 1\%</math></li><li>• TCR: <math>\pm 50</math> ppm/K</li><li>• Resistance range: <math>0.1\ \Omega</math> to <math>0.91\ \Omega</math></li><li>• Power rating: <math>0.3\ \text{W}</math> to <math>1\ \text{W}</math></li></ul>	<ul style="list-style-type: none"><li>• Rated power dissipation <math>P_{85}</math> up to <math>1\ \text{W}</math></li><li>• Resistance range down to <math>0.1\ \Omega</math></li><li>• Superior temperature cycling robustness</li><li>• Superior moisture resistivity</li><li>• AEC-Q200 qualified</li></ul>	Beyschlag

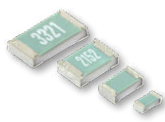

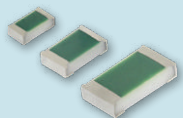



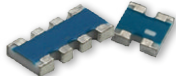





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# SMD RESISTORS

Vishay Draloric / Beyschlag

Thin Film Chip Resistors			
Series	Description	Features	Brand
<a href="#">MC VG01</a>  	<ul style="list-style-type: none"><li>• <b>Thin Film Chip Resistors With Established Reliability</b></li><li>• Size: 0402 to 1206</li><li>• Tolerance: <math>\pm 0.1\%</math>; <math>\pm 1\%</math></li><li>• TCR: <math>\pm 15</math> ppm/K; <math>\pm 50</math> ppm/K</li><li>• Resistance range: <math>1\ \Omega</math> to <math>1\ \text{M}\Omega</math>; <math>0\ \Omega</math></li><li>• Power rating: 0.063 W to 0.25 W</li></ul>	<ul style="list-style-type: none"><li>• Established reliability, failure rate level 6 (corresponds to MIL level P)</li><li>• Advanced level of precision and stability</li><li>• IECQ-CECC approval to EN 140401-801, Version E</li></ul>	Beyschlag
<a href="#">TNPS...ESCC</a>  	<ul style="list-style-type: none"><li>• <b>Hi-Rel Thin Film Chip Resistors</b></li><li>• Size: 0603 to 1206</li><li>• Tolerance: <math>\pm 0.1\%</math> to <math>\pm 1\%</math></li><li>• TCR: <math>\pm 15</math> ppm/K to <math>\pm 50</math> ppm/K</li><li>• Resistance range: <math>10\ \Omega</math> to <math>1\ \text{M}\Omega</math></li><li>• Power rating: 0.1 W to 0.25 W</li></ul>	<ul style="list-style-type: none"><li>• ESA approval to ESCC 4001/029</li><li>• Advanced level of precision and stability</li><li>• SnPb termination plating, minimum 6 % Pb</li></ul>	Draloric
<a href="#">ACAS 0612 Professional</a> 	<ul style="list-style-type: none"><li>• <b>Professional Thin Film Chip Resistor Array</b></li><li>• Size: 0612</li><li>• Tolerance: <math>\pm 0.5\%</math>; <math>\pm 1\%</math></li><li>• TCR: <math>\pm 25</math> ppm/K to <math>\pm 50</math> ppm/K</li><li>• Resistance range: <math>47\ \Omega</math> to <math>221\ \text{k}\Omega</math></li><li>• Power rating per element: 0.1 W</li></ul>	<ul style="list-style-type: none"><li>• Four insulated resistors on one substrate</li><li>• Two pairs or four equal resistor values</li><li>• Resistance ratio up to 10:1</li><li>• Professional applications with space constraints</li></ul>	Beyschlag
<a href="#">ACAS 0612 Precision</a> 	<ul style="list-style-type: none"><li>• <b>Precision Thin Film Chip Resistor Array</b></li><li>• Size: 0612</li><li>• Relative tolerance: down to <math>\pm 0.05\%</math></li><li>• Relative TCR: down to <math>\pm 5</math> ppm/K</li><li>• Resistance range: <math>47\ \Omega</math> to <math>221\ \text{k}\Omega</math></li><li>• Power rating per element: 0.1 W</li></ul>	<ul style="list-style-type: none"><li>• Four insulated resistors on one substrate</li><li>• Tight TCR tracking and tolerance matching</li><li>• Resistance ratio up to 5:1</li><li>• For all applications with matched resistors like voltage dividers or feedback circuits</li></ul>	Beyschlag
<a href="#">ACAS 0606 AT, ACAS 0612 AT</a>  	<ul style="list-style-type: none"><li>• <b>Precision Automotive Grade Thin Film Chip Resistor Array</b></li><li>• Size: 0606 and 0612</li><li>• Relative tolerance: down to <math>\pm 0.05\%</math></li><li>• Relative TCR: down to <math>\pm 5</math> ppm/K</li><li>• Resistance range: <math>47\ \Omega</math> to <math>150\ \text{k}\Omega</math></li><li>• Power rating per element: 0.125 W</li></ul>	<ul style="list-style-type: none"><li>• Superior moisture resistivity</li><li>• Two or four insulated resistors on one substrate</li><li>• Tight TCR tracking and tolerance matching</li><li>• Resistance ratio up to 100:1</li><li>• AEC-Q200 qualified</li><li>• Perfect for automotive and industrial applications with matched resistors like voltage dividers or feedback circuits</li></ul>	Beyschlag



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# SMD RESISTORS

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## Thick Film Chip Resistors

Series	Description	Features	Brand
<a href="#">D/CRCW e3</a> 	<ul style="list-style-type: none"><li>• <b>Standard Thick Film Chip Resistors</b></li><li>• Size: 0402 to 2512</li><li>• Resistance range: 1 <math>\Omega</math> to 10 M<math>\Omega</math></li><li>• Power rating: 0.063 W to 1 W</li><li>• Zero ohm jumper: available for all sizes</li></ul>	<ul style="list-style-type: none"><li>• AEC-Q200 qualified</li></ul>	Vishay
<a href="#">D/CRCW</a> 	<ul style="list-style-type: none"><li>• <b>Lead (Pb)-Bearing Thick Film Chip Resistors</b></li><li>• Size: 0402 to 2512</li><li>• Resistance range: 1 <math>\Omega</math> to 10 M<math>\Omega</math></li><li>• Power rating: 0.063 W to 1 W</li><li>• Zero ohm jumper: available for all sizes</li></ul>	<ul style="list-style-type: none"><li>• SnPb termination plating on Ni barrier, minimum 10 % Pb</li></ul>	Vishay
<a href="#">RCA e3</a> 	<ul style="list-style-type: none"><li>• <b>Automotive Grade, Sulfur-Resistant, Lead (Pb)-Free, Thick Film Chip Resistors</b></li><li>• Size: 0402 to 2512</li><li>• Resistance range: 1 <math>\Omega</math> to 10 M<math>\Omega</math></li><li>• Power rating: 0.063 W to 1 W</li><li>• Zero ohm jumper: available for all sizes</li></ul>	<ul style="list-style-type: none"><li>• Superior resistance against H<sub>2</sub>S atmosphere</li><li>• AEC-Q200 qualified</li></ul>	Draloric
<a href="#">RCA</a> 	<ul style="list-style-type: none"><li>• <b>Lead (Pb)-Bearing Automotive Grade, Sulfur-Resistant, Thick Film Chip Resistors</b></li><li>• Size: 0402 to 2512</li><li>• Resistance range: 1 <math>\Omega</math> to 10 M<math>\Omega</math></li><li>• Power rating: 0.063 W to 1 W</li><li>• Zero ohm jumper: available for all sizes</li></ul>	<ul style="list-style-type: none"><li>• Superior resistance against H<sub>2</sub>S atmosphere</li><li>• SnPb termination plating on Ni barrier, minimum 10 % Pb</li></ul>	Vishay
<a href="#">D/CRCW-P e3</a> 	<ul style="list-style-type: none"><li>• <b>Thick Film Semi-Precision Chip Resistor</b></li><li>• Size: 0402 to 1206</li><li>• Resistance range: 100 <math>\Omega</math> to 10 M<math>\Omega</math></li><li>• Power rating: 0.063 W to 0.25 W</li></ul>	<ul style="list-style-type: none"><li>• AEC-Q200 qualified</li><li>• Tight tolerances (<math>\pm 0.5</math> %)</li><li>• Low TCR (<math>\pm 50</math> ppm/K)</li></ul>	Vishay
<a href="#">D/CRCW-P</a> 	<ul style="list-style-type: none"><li>• <b>Lead (Pb)-Bearing Thick Film Semi-Precision Chip Resistors</b></li><li>• Size: 0402 to 1206</li><li>• Resistance range: 100 <math>\Omega</math> to 10 M<math>\Omega</math></li><li>• Power rating: 0.063 W to 0.25 W</li></ul>	<ul style="list-style-type: none"><li>• Tight tolerances (<math>\pm 0.5</math> %)</li><li>• Low TCR (<math>\pm 50</math> ppm/K)</li><li>• SnPb termination plating on Ni barrier, minimum 10 % Pb</li></ul>	Vishay
<a href="#">RCC e3</a> 	<ul style="list-style-type: none"><li>• <b>Medium Power Thick Film Chip Resistors</b></li><li>• Size: 0402 to 1206</li><li>• Resistance range: 1 <math>\Omega</math> to 10 M<math>\Omega</math></li><li>• Power rating: 0.125 W to 0.5 W</li><li>• Zero ohm jumper available</li></ul>	<ul style="list-style-type: none"><li>• Enhanced power rating up to 0.5 W</li><li>• Increased operating voltage</li><li>• AEC-Q200 qualified</li></ul>	Vishay
<a href="#">CRCW-HP e3</a> 	<ul style="list-style-type: none"><li>• <b>Pulse-Proof, High Power Thick Film Chip Resistors</b></li><li>• Size: 0402 to 2512</li><li>• Resistance range: 1 <math>\Omega</math> to 1 M<math>\Omega</math></li><li>• Power rating: 0.2 W to 1.5 W</li><li>• Tolerance: <math>\pm 0.5</math> %</li></ul>	<ul style="list-style-type: none"><li>• Excellent pulse load capability</li><li>• Enhanced power rating</li><li>• Double-sided printed resistor element</li><li>• AEC-Q200 qualified</li></ul>	Draloric





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## Thick Film Chip Resistors

Series	Description	Features	Brand
<a href="#">RCA-HP e3</a> 	<ul style="list-style-type: none"> <li>• <b>Sulfur-Resistant, Pulse-Proof, High Power Thick Film Chip Resistor</b></li> <li>• Size: 0402 to 2512</li> <li>• Resistance range: 1 <math>\Omega</math> to 1 M<math>\Omega</math></li> <li>• Power rating: 0.2 W to 1.5 W</li> </ul>	<ul style="list-style-type: none"> <li>• Superior resistance against H<sub>2</sub>S atmosphere</li> <li>• Excellent pulse load capability</li> <li>• Enhanced power rating</li> <li>• Double-sided resistor element</li> <li>• AEC-Q200 qualified</li> </ul>	Draloric
<a href="#">RCL e3</a> 	<ul style="list-style-type: none"> <li>• <b>Long Side Termination Thick Film Chip Resistors</b></li> <li>• Size: 0406 to 1225</li> <li>• Resistance range: 1 <math>\Omega</math> to 2.2 M<math>\Omega</math></li> <li>• Power rating: 0.25 W to 2 W</li> </ul>	<ul style="list-style-type: none"> <li>• Enhanced power rating</li> <li>• Long side terminations</li> <li>• Better performance in temperature cycles</li> <li>• AEC-Q200 qualified</li> </ul>	Draloric
<a href="#">RCA-LS e3</a> 	<ul style="list-style-type: none"> <li>• <b>Sulfur-Resistant, Long Side Termination Thick Film Chip Resistors</b></li> <li>• Size: 0406 to 1225</li> <li>• Resistance range: 1 <math>\Omega</math> to 2.2 M<math>\Omega</math></li> <li>• Power rating: 0.25 W to 2 W</li> </ul>	<ul style="list-style-type: none"> <li>• Superior resistance against H<sub>2</sub>S atmosphere</li> <li>• Enhanced power rating</li> <li>• Long side terminations</li> <li>• Better performance in temperature cycles</li> <li>• AEC-Q200 qualified</li> </ul>	Draloric
<a href="#">RCV-AT e3</a> 	<ul style="list-style-type: none"> <li>• <b>AEC-Q200 Qualified High Voltage Thick Film Chip Resistors</b></li> <li>• Size: 1206, 2010, 2512</li> <li>• Resistance range: 100 k<math>\Omega</math> to 100 M<math>\Omega</math></li> <li>• Power rating: 0.25 W to 1 W</li> </ul>	<ul style="list-style-type: none"> <li>• High operating voltage (up to 3000 V)</li> <li>• Low voltage coefficient of resistance (VCR): 25 ppm/V</li> <li>• AEC-Q200 qualified</li> </ul>	Draloric
<a href="#">RCV e3</a> 	<ul style="list-style-type: none"> <li>• <b>High Voltage Thick Film Chip Resistors</b></li> <li>• Size: 0805 to 2512</li> <li>• Resistance range: 100 k<math>\Omega</math> to 100 M<math>\Omega</math></li> <li>• Power rating: 0.125 W to 1 W</li> </ul>	<ul style="list-style-type: none"> <li>• High operating voltage (up to 3000 V)</li> <li>• Low voltage coefficient of resistance (VCR): 25 ppm/V</li> <li>• RCV2010 and RCV2512: IEC 62368-1 compliant, Ed. 3</li> <li>• RCV2010 and RCV2512: UL 1676 qualified</li> </ul>	Draloric
<a href="#">RCG e3</a> 	<ul style="list-style-type: none"> <li>• <b>Fully RoHS-Compliant, Green, Thick Film, Rectangular Chip Resistors</b></li> <li>• Size: 0402 to 1206</li> <li>• Resistance range: 1 <math>\Omega</math> to 10 M<math>\Omega</math></li> <li>• Power rating: 0.063 W to 0.25 W</li> </ul>	<ul style="list-style-type: none"> <li>• Green resistor – does not use RoHS exemptions</li> <li>• Stability: <math>\pm 1\%</math> for 1000 h at 70 °C, for <math>\pm 1\%</math> tolerance</li> </ul>	Draloric
<a href="#">D/CRCW-IF e3</a> 	<ul style="list-style-type: none"> <li>• <b>Thick Film, Rectangular, Pulse-Proof Chip Resistors</b></li> <li>• Size: 0402 to 2512</li> <li>• Resistance range: 1 <math>\Omega</math> to 100 k<math>\Omega</math></li> <li>• Power rating: 0.063 W to 1.0 W</li> </ul>	<ul style="list-style-type: none"> <li>• High pulse performance</li> <li>• AEC-Q200 qualified</li> </ul>	Vishay
<a href="#">RCA-IF e3</a> 	<ul style="list-style-type: none"> <li>• <b>Sulfur-Resistant, Pulse-Proof Thick Film Chip Resistors</b></li> <li>• Size: 0402 to 2512</li> <li>• Resistance range: 1 <math>\Omega</math> to 100 k<math>\Omega</math></li> <li>• Power rating: 0.063 W to 1.0 W</li> </ul>	<ul style="list-style-type: none"> <li>• Superior resistance against H<sub>2</sub>S atmosphere</li> <li>• High pulse performance</li> <li>• AEC-Q200 qualified</li> </ul>	Draloric
<a href="#">RCS e3</a> 	<ul style="list-style-type: none"> <li>• <b>Anti-Surge, High Power Thick Film Chip Resistors</b></li> <li>• Size: 0402 to 1206</li> <li>• Resistance range: 1 <math>\Omega</math> to 10 M<math>\Omega</math></li> <li>• Power rating: 0.2 W to 0.5 W</li> <li>• Zero ohm jumper available</li> </ul>	<ul style="list-style-type: none"> <li>• Excellent surge pulse capability</li> <li>• High power rating</li> <li>• AEC-Q200 qualified</li> </ul>	Vishay

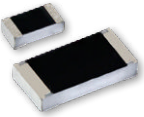
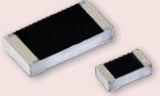




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# SMD RESISTORS

Vishay Draloric / Beyschlag

## Thick Film Chip Resistors

Series	Description	Features	Brand
<a href="#">D/CRCW-HR e3</a> 	<ul style="list-style-type: none"> <li>Thick Film, Rectangular, High Value Chip Resistors</li> <li>Size: 0603 to 1206</li> <li>Resistance range: 11 MΩ to 470 MΩ</li> <li>Power rating: 0.1 W to 0.25 W</li> </ul>	<ul style="list-style-type: none"> <li>High resistance values (up to 470 MΩ)</li> <li>Suitable for voltage dividers and hybrids</li> </ul>	Vishay
<a href="#">D/CRCW-HR</a> 	<ul style="list-style-type: none"> <li>Lead (Pb)-Bearing Thick Film, Rectangular High Value Chip Resistors</li> <li>Size: 0603 to 1206</li> <li>Resistance range: 11 MΩ to 470 MΩ</li> <li>Power rating: 0.1 W to 0.25 W</li> </ul>	<ul style="list-style-type: none"> <li>High resistance values (up to 470 MΩ)</li> <li>Suitable for voltage dividers and hybrids</li> <li>SnPb termination plating on Ni barrier, minimum 10 % Pb</li> </ul>	Vishay
<a href="#">CRCW0201 e3</a> 	<ul style="list-style-type: none"> <li>Commodity Thick Film Chip Resistors</li> <li>Size: 0201</li> <li>Resistance range: 1 Ω to 10 MΩ</li> <li>Power rating: 0.05 W</li> <li>Tolerance: ± 0.5 %</li> </ul>	<ul style="list-style-type: none"> <li>High volume product suitable for commercial applications</li> </ul>	Vishay
<a href="#">CRCW01005 e3</a> 	<ul style="list-style-type: none"> <li>Commodity Thick Film Chip Resistors</li> <li>Size: 01005</li> <li>Resistance range: 1 Ω to 1 MΩ</li> <li>Power rating: 0.031 W</li> <li>Tolerance: ± 1 %</li> </ul>	<ul style="list-style-type: none"> <li>High volume product suitable for commercial applications</li> <li>Very small standard size (0.4 mm x 0.2 mm)</li> </ul>	Vishay



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# SMD RESISTORS

Vishay Draloric / Beyschlag

## Vishay Intertechnology – A Global Industry Leader

Vishay Intertechnology components are used in virtually all types of electronic devices and equipment in the industrial, computing, automotive, consumer, telecommunications, military, aerospace, power supplies, and medical markets. Vishay has manufacturing plants in the Americas, Asia, Europe, and Israel, as well as sales offices worldwide. Vishay Intertechnology has a diverse portfolio of semiconductors and passive components, including diodes, MOSFETs (metal-oxide semiconductor field-effect transistors), optoelectronic products, selected integrated circuits (ICs), resistors, inductors, and capacitors. This enables it to provide “one-stop shop” service and offer many different parts for each customer design. Its innovations in technology, successful acquisition strategy, superior product quality, and “one-stop shop” service to customers have made the Company a global industry leader.

[www.vishay.com](http://www.vishay.com)

Two of the most important manufacturers of fixed film resistors are the Vishay Draloric and the Vishay Beyschlag brands.

### About Draloric

In 1900, in Germany, Mr. Philip Rosenthal, as a sideline to his established business of porcelain tableware, started to manufacture ceramics for electronic applications. Starting in 1910, these were also made in Selb, Germany. In 1936, this electronic ceramics activity was separated from Rosenthal AG and made part of a joint venture with AEG named Rosenthal Isolatoren GmbH, or “RIG.”

The RIG name lasted until 1974, when AEG took over all of RIG and renamed it “CRL” because of its portfolio of passive components. The name was changed again in 1974 to Draloric Electronic GmbH. With the acquisition of Draloric Electronic GmbH by the electronics division of Corning Glass Works in 1981, the name was changed to Corning-Draloric, which lasted until its acquisition by Vishay Intertechnology in 1987.

Vishay Draloric is a leading brand for MELF resistors and ceramic capacitor products. The Vishay Draloric product portfolio also includes thin film flat chip resistors, leaded film and wirewound resistors, and large ceramic power capacitors. As part of Vishay Intertechnology, Draloric Electronic has had production sites in Israel since 1989, and in the Czech Republic since 1991.

Draloric competitors Roederstein GmbH (resistors and capacitors), and Vitramon GmbH (capacitors only) were acquired by Vishay Intertechnology in 1993 and 1994, respectively, and merged with Draloric Electronic GmbH, which has its headquarters in Selb. Since then, the name Vishay Draloric has been used as a brand name for resistor products.

Visit us at:

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### About Beyschlag

A look back into the history of the company shows a solid business based on natural growth. From the moment the company was founded in 1931, the customer has always come first. At the time, Dr. Bernhard Beyschlag started producing rectifiers in Berlin, Germany, to meet the growing needs of the new radio industry. Soon, carbon film resistors were in production. The company spent periods in Hitzacker and Westerland on the Island of Sylt before finally relocating to Heide in 1974. From the early 1970s, Beyschlag belonged to Philips Components, until 1999, when Philips divested itself of its passive components business to allow the foundation of BCcomponents. In 2002, BCcomponents was bought by Vishay.

For more than 80 years, Beyschlag has stood for expertise in thin film technology, continuous innovation, excellence in service and logistics, and customer-oriented solutions.

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