100 & 200 Series

Bulk Ceramic Axial Lead Resistors

100 & 200 Series Axial Leaded Non-Inductive Bulk Ceramic Resistors provide excellent performance where high peak power or high-energy pulses must be handled in a small size. The advantage of the bulk construction is that it produces an inherently noninductive resistor; and it allows energy and power to be uniformly distributed through the entire ceramic resistor body — there is no film or wire to fail. We offer a full line of rugged, reliable ceramic resistors - including custom designs. Three distinctly different ceramic materials are available in each size to afford the designer with unique components to meet the most demanding requirements.

As alternatives to hard to find carbon composition resistors, composition resistors can be used as drop-in replacements for 1 and 2 watt sizes. Much larger sizes, up to 70 watts in a single component, are available for new or re-designs where an array of smaller resistors may have been previously required.



FEATURES

- · Non-inductive "bulk ceramic" resistor
- Uniform distribution of energy throughout resistor body
- Replacement of Carbon Composition Resistors
- Large peak energy in small size
- High power dissipation (Type SP)
- High voltage and energy absorption (Type AS)
- Through-hole or post mountable

MATERIAL TYPES

TYPE SP

Withstands high operating temperatures resulting in high power dissipation. Maximum continuous operating temperature is specified at 350°C. This type is suitable for use in oil without an oil-resistant coating.

TYPE AS

Best suited for high energy and voltage pulse applications. Maximum continuous operating temperature is specified at 230°C. The standard dielectric coating is recommended for use in air, and the oil-resistant coating is recommended

Appplications

- Soft Start/In-rush Limiters
- RC Snubber Circuits
- Spark-Gap Limiters
- Parasitic Suppression
- High Voltage Power Supplies

for use in oil.

- Pulse Waveform
- EMI/EFI Test Circuits
- RF Dummy Load Circuits
- Capacitor Dump Circuits

TYPE BA

Best suited for high energy and voltage pulse applications where the required resistance value is above the resistance values available in Type SP and Type AS resistors. Maximum continuous operating temperature is specified at 230°C. The standard dielectric coating is recommended for use in air, and the oil-resistant coating is recommended for use in oil.

Appplications

- DC Coupling and Filter Cap Discharge
- Voltage Balancing
- Pre-charge / Inrush Limit
- Voltage Divider
- Filter
- Snubber
- Crowbar
- Measuring
- EMI / EFI Test Circuits
- Test Loads

(continued)

100 & 200 Series

Bulk Ceramic Axial Lead Resistors

Series Res. range (n) Avg. power rating¹ (W) Rated peak energy² (J) Rated peak voltage² Rated peak current³ (A) Typ. body weight⁴ (g) 231 AS 25-6,350 1.5 75 1,500V 90 0.44 231 BA 6K-390K 1.2 35 1200V 350 0.44 233AS 6-1,800 2 170 1,100V 150 1.2 233BA 1.8K-150K 1.6 80 900V 90 1.2 233BA 1.8K-150K 1.6 80 900V 150 1.2 233BA 1.8K-150K 1.6 80 900V 150 1.9 234AS 12-5,000 3 275 2500V 150 1.9 234BA 4K-300K 2.4 140 2,000V 150 1.9 234BA 4K-300K 2.4 140 2,000V 190 1.9 250AS 4-1,200 2.5 260 1,500V 190 1.5 250AS <th></th> <th></th> <th></th> <th>S</th> <th>PECIFIC</th> <th>ATIONS</th> <th></th>				S	PECIFIC	ATIONS	
231SP 1-1,000 2.5 15 375V 350 0.44 231BA 6K-390K 1.2 35 1200V 12 233AS 6-1,800 2 170 1,100V 150 1.2 233SP 1-120 7 20 375V 550 1.2 233BA 1.8K-150K 1.6 80 900V 150 1.9 234SA 12-5,000 3 275 2500V 150 1.9 234SA 1-330 10 30 500V 550 1.9 234BA 4K-300K 2.4 140 2,000V 190 1.9 250SP 1-150 8.5 20 375V 700 1.5 250SP 1-150 8.5 20 375V 700 1.5 251AS 8-2,300 3.5 400 2,500V 190 3.0 251BA 2K-190K 3 200 2,000V 150 3.8	Series	•					
231SP 1-1,000 2.5 15 375V 350 0.44 231BA 6K-390K 1.2 35 1200V 12 233AS 6-1,800 2 170 1,100V 150 1.2 233SP 1-120 7 20 375V 550 1.2 233BA 1.8K-150K 1.6 80 900V 150 1.9 234SA 12-5,000 3 275 2500V 150 1.9 234SA 1-330 10 30 500V 550 1.9 234BA 4K-300K 2.4 140 2,000V 190 1.9 250SP 1-150 8.5 20 375V 700 1.5 250SP 1-150 8.5 20 375V 700 1.5 251AS 8-2,300 3.5 400 2,500V 190 3.0 251BA 2K-190K 3 200 2,000V 150 3.8	231AS	25-6,350	1.5		1,500V	90	0.44
233AS 6-1,800 2 170 1,100V 150 1.2 233BP 1-120 7 20 375V 550 1.2 233BA 1.8K-150K 1.6 80 900V 150 1.2 234AS 12-5,000 3 275 2500V 150 1.9 234BA 4K-300K 2.4 140 2,000V 190 1.9 250AS 4-1,200 2.5 260 1,500V 190 1.9 250SA 4-1,200 2.5 260 1,500V 190 1.9 250SA 14-130K 2 130 1,200V 150 1.5 250BA 1K-130K 2 130 1,200V 190 3.0 251AS 8-2,300 3.5 400 2,500V 190 3.0 251SP 1-330 12 30 500V 700 2.4 251BA 2K-190K 3 200 2,000V 150	231SP		2.5	15	375V	350	0.44
233SP 1-120 7 20 375V 550 1.2 234AS 1.25,000 3 275 2500V 150 1.9 234SP 1-330 10 30 500V 550 1.9 234BA 4K-300K 2.4 140 2,000V 190 1.9 250AS 4-1,200 2.5 260 1,500V 190 1.9 250SP 1-150 8.5 20 375V 700 1.5 250BA 1K-130K 2 130 1,200V 190 3.0 251SP 1-330 12 30 500V 700 2.4 251SP 1-330 12 30 500V 700 2.4 251BA 2K-190K 3 200 2,000V 150 3.8 102BA 9K-700K 4 300 2,400V 150 3.8 102BA 9K-700K 4 300 2,400V 190 6.0	231BA	6K-390K	1.2	35	1200V		
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234AS 12-5,000 3 275 2500V 150 1.9 234SP 1-330 10 30 500V 550 1.9 234BA 4K-300K 2.4 140 2,000V 190 1.9 250AS 4-1,200 2.5 260 1,500V 190 1.9 250BA 1K-130K 2 130 1,200V 1.5 250BA 1K-130K 2 130 1,200V 1.5 251AS 8-2,300 3.5 400 2,500V 190 3.0 251SP 1-330 12 30 500V 700 2.4 251BA 2K-190K 3 200 2,000V 150 3.8 102AS 30-9,000 5 600 3,000V 150 3.8 102BA 9K-700K 4 300 2,400V 250 3.8 102BA 9K-700K 4 300 2,400V 4.8 252BA 5K-450K 5	233SP	1-120	7	20	375V	550	1.2
234SP 1-330 10 30 500V 550 1.9 234BA 4K-300K 2.4 140 2,000V 190 1.9 250AS 4-1,200 2.5 260 1,500V 190 1.9 250SP 1-150 8.5 20 375V 700 1.5 250BA 1K-130K 2 130 1,200V 190 3.0 251AS 8-2,300 3.5 400 2,500V 190 3.0 251SP 1-330 12 30 500V 700 2.4 251BA 2K-190K 3 200 2,000V 150 3.8 102AS 30-9,000 5 600 3,000V 150 3.8 102BA 9K-700K 4 300 2,400V 252 3.8 102SP 1-460 18 75 1,000V 700 4.8 252BA 5K-450K 5 450 2,400V 2. </td <td>233BA</td> <td>1.8K-150K</td> <td>1.6</td> <td>80</td> <td>900V</td> <td></td> <td></td>	233BA	1.8K-150K	1.6	80	900V		
234BA 4K-300K 2.4 140 2,000V 250AS 4-1,200 2.5 260 1,500V 190 1.9 250SP 1-150 8.5 20 375V 700 1.5 250BA 1K-130K 2 130 1,200V 190 3.0 251AS 8-2,300 3.5 400 2,500V 190 3.0 251BA 2K-190K 3 200 2,000V 190 3.0 251BA 2K-190K 3 200 2,000V 150 3.8 102AS 30-9,000 5 600 3,000V 150 3.8 102BA 9K-700K 4 300 2,400V 2.0 3.8 102BA 9K-700K 4 300 2,400V 2.0 3.8 102BA 9K-700K 4 300 2,400V 190 6.0 252BA 5K-450K 5 450 2,400V 150 7.6 <t< td=""><td>234AS</td><td>12-5,000</td><td>3</td><td>275</td><td>2500V</td><td>150</td><td>1.9</td></t<>	234AS	12-5,000	3	275	2500V	150	1.9
250AS 4-1,200 2.5 260 1,500V 190 1.9 250SP 1-150 8.5 20 375V 700 1.5 250BA 1K-130K 2 130 1,200V 190 3.0 251AS 8-2,300 3.5 400 2,500V 190 3.0 251BA 2K-190K 3 200 2,000V 190 3.0 251BA 2K-190K 3 200 2,000V 150 3.8 102BA 9,000 5 600 3,000V 150 3.8 102BA 9K-700K 4 300 2,400V 250 3.8 102BA 9K-700K 4 300 2,400V 190 6.0 252AS 20-5,800 6 900 3,000V 190 6.0 252BA 5K-450K 5 450 2,400V 150 7.6 104AS 55-18,000 9 1,200 9,000V 150<	234SP	1-330	10	30	500V	550	1.9
250SP 1-150 8.5 20 375V 700 1.5 250BA 1K-130K 2 130 1,200V 3.0 251AS 8-2,300 3.5 400 2,500V 190 3.0 251SP 1-330 12 30 500V 700 2.4 251BA 2K-190K 3 200 2,000V 150 3.8 102AS 30-9,000 5 600 3,000V 150 3.8 102BA 9K-700K 4 300 2,400V 550 3.8 102BA 9K-700K 4 300 2,400V 190 6.0 252AS 20-5,800 6 900 3,000V 190 6.0 252BA 5K-450K 5 450 2,400V 150 7.6 104AS 55-18,000 9 1,200 9,000V 150 7.6 104AS 75-18,000 9 1,200 9,000V 150 7.6	234BA	4K-300K	2.4	140	2,000V		
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251AS 8-2,300 3.5 400 2,500V 190 3.0 251SP 1-330 12 30 500V 700 2.4 251BA 2K-190K 3 200 2,000V 2.4 102AS 30-9,000 5 600 3,000V 150 3.8 102SP 1-700 15 50 1,000V 550 3.8 102BA 9K-700K 4 300 2,400V 2.000V 190 6.0 252BA 9K-700K 4 300 2,400V 700 4.8 252BA 5K-450K 5 450 2,400V 700 4.8 252BA 5K-450K 5 450 2,400V 104AS 55-18,000 9 1,200 9,000V 150 7.6 104SP 2-1,500 25 95 3,600V 550 7.6 104BA 18K-1M 7 600 7,000V 190 12.0 254S	250SP	1-150	8.5	20	375V	700	1.5
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252SP 1-460 18 75 1,000V 700 4.8 252BA 5K-450K 5 450 2,400V 1040V	102BA	9K-700K	4	300	2,400V		
252BA 5K-450K 5 450 2,400V 104AS 55-18,000 9 1,200 9,000V 150 7.6 104SP 2-1,500 25 95 3,600V 550 7.6 104BA 18K-1M 7 600 7,000V 700V 12.0 254AS 36-12,000 11 1,800 9,000V 190 12.0 254SP 2-1,000 31 150 3,600V 700 9.6 254BA 12K-970K 9 900 7,000V 150 11.4 106SP 3-2,400 36 155 5,000V 550 11.4 106BA 30K-1M 10 1000 12,000V 190 18.0 256AS 60-20,000 16 2,900 15,000V 700 14.4 256BA 20K-1M 13 1500 12,000V 100 14.4 256BA 20K-1M 13 1500 25,000V 150 <t< td=""><td>252AS</td><td>20-5,800</td><td>6</td><td>900</td><td>3,000V</td><td>190</td><td>6.0</td></t<>	252AS	20-5,800	6	900	3,000V	190	6.0
104AS 55-18,000 9 1,200 9,000V 150 7.6 104SP 2-1,500 25 95 3,600V 550 7.6 104BA 18K-1M 7 600 7,000V 7000V 7.6 254AS 36-12,000 11 1,800 9,000V 190 12.0 254SP 2-1,000 31 150 3,600V 700 9.6 254BA 12K-970K 9 900 7,000V 700 9.6 254BA 12K-970K 9 900 7,000V 150 11.4 106SP 3-2,400 36 155 5,000V 550 11.4 106BA 30K-1M 10 1000 12,000V 190 18.0 256AS 60-20,000 16 2,900 15,000V 190 18.0 256SP 2-1,600 45 240 5,000V 700 14.4 256BA 20K-1M 13 1500 12,000V 109AS 150-48,000 20 3,000 25,000V 150 </td <td>252SP</td> <td>1-460</td> <td>18</td> <td>75</td> <td>1,000V</td> <td>700</td> <td>4.8</td>	252SP	1-460	18	75	1,000V	700	4.8
104SP 2-1,500 25 95 3,600V 550 7.6 104BA 18K-1M 7 600 7,000V 190 12.0 254AS 36-12,000 11 1,800 9,000V 190 12.0 254SP 2-1,000 31 150 3,600V 700 9.6 254BA 12K-970K 9 900 7,000V 150 11.4 106AS 90-30,000 13 1,900 15,000V 150 11.4 106SP 3-2,400 36 155 5,000V 550 11.4 106BA 30K-1M 10 1000 12,000V 256AS 60-20,000 16 2,900 15,000V 190 18.0 256SP 2-1,600 45 240 5,000V 700 14.4 256BA 20K-1M 13 1500 12,000V 109AS 150-48,000 20 3,000 25,000V 150 17.1 109BA 48K-1M 16 1500 20,000V 190 27.0	252BA	5K-450K	5	450	2,400V		
104BA 18K-1M 7 600 7,000V 254AS 36-12,000 11 1,800 9,000V 190 12.0 254SP 2-1,000 31 150 3,600V 700 9.6 254BA 12K-970K 9 900 7,000V 7000V 106AS 90-30,000 13 1,900 15,000V 150 11.4 106SP 3-2,400 36 155 5,000V 550 11.4 106BA 30K-1M 10 1000 12,000V 190 18.0 256AS 60-20,000 16 2,900 15,000V 190 18.0 256SP 2-1,600 45 240 5,000V 700 14.4 256BA 20K-1M 13 1500 12,000V 150 17.1 109AS 150-48,000 20 3,000 25,000V 150 17.1 109BA 48K-1M 16 1500 20,000V 190 27.0 259AS 100-32,000 25 4,600 25,000V 190	104AS	55-18,000	9	1,200	9,000V	150	7.6
254AS 36-12,000 11 1,800 9,000V 190 12.0 254SP 2-1,000 31 150 3,600V 700 9.6 254BA 12K-970K 9 900 7,000V 150 11.4 106AS 90-30,000 13 1,900 15,000V 150 11.4 106SP 3-2,400 36 155 5,000V 550 11.4 106BA 30K-1M 10 1000 12,000V 190 18.0 256AS 60-20,000 16 2,900 15,000V 190 18.0 256SP 2-1,600 45 240 5,000V 700 14.4 256BA 20K-1M 13 1500 12,000V 109AS 150-48,000 20 3,000 25,000V 150 17.1 109SP 4-3,800 55 250 8,800V 550 17.1 109BA 48K-1M 16 1500 20,000V 190 27.0 259SP 3-2,500 70 380 8,800V <	104SP	2-1,500	25	95	3,600V	550	7.6
254SP 2-1,000 31 150 3,600V 700 9.6 254BA 12K-970K 9 900 7,000V 150 11.4 106AS 90-30,000 13 1,900 15,000V 150 11.4 106SP 3-2,400 36 155 5,000V 550 11.4 106BA 30K-1M 10 1000 12,000V 190 18.0 256AS 60-20,000 16 2,900 15,000V 700 14.4 256BA 20K-1M 13 1500 12,000V 10 14.4 256BA 20K-1M 13 1500 12,000V 150 17.1 109AS 150-48,000 20 3,000 25,000V 150 17.1 109SP 4-3,800 55 250 8,800V 550 17.1 109BA 48K-1M 16 1500 20,000V 190 27.0 259SP 3-2,500 70 380 8,800V 700 21.6	104BA	18K-1M	7	600	7,000V		
254BA 12K-970K 9 900 7,000V 106AS 90-30,000 13 1,900 15,000V 150 11.4 106SP 3-2,400 36 155 5,000V 550 11.4 106BA 30K-1M 10 1000 12,000V 256AS 60-20,000 16 2,900 15,000V 190 18.0 256SP 2-1,600 45 240 5,000V 700 14.4 256BA 20K-1M 13 1500 12,000V 109AS 150-48,000 20 3,000 25,000V 150 17.1 109SP 4-3,800 55 250 8,800V 550 17.1 109BA 48K-1M 16 1500 20,000V 259AS 100-32,000 25 4,600 25,000V 190 27.0 259SP 3-2,500 70 380 8,800V 700 21.6	254AS	36-12,000	11	1,800	9,000V	190	12.0
106AS 90-30,000 13 1,900 15,000V 150 11.4 106SP 3-2,400 36 155 5,000V 550 11.4 106BA 30K-1M 10 1000 12,000V 256AS 60-20,000 16 2,900 15,000V 190 18.0 256SP 2-1,600 45 240 5,000V 700 14.4 256BA 20K-1M 13 1500 12,000V 109AS 150-48,000 20 3,000 25,000V 150 17.1 109SP 4-3,800 55 250 8,800V 550 17.1 109BA 48K-1M 16 1500 20,000V 259AS 100-32,000 25 4,600 25,000V 190 27.0 259SP 3-2,500 70 380 8,800V 700 21.6	254SP	2-1,000	31	150	3,600V	700	9.6
106SP 3-2,400 36 155 5,000V 550 11.4 106BA 30K-1M 10 1000 12,000V 1000 12,000V 1000 1000 12,000V 1000	254BA	12K-970K	9	900	7,000V		
106BA 30K-1M 10 1000 12,000V 256AS 60-20,000 16 2,900 15,000V 190 18.0 256SP 2-1,600 45 240 5,000V 700 14.4 256BA 20K-1M 13 1500 12,000V 109AS 150-48,000 20 3,000 25,000V 150 17.1 109SP 4-3,800 55 250 8,800V 550 17.1 109BA 48K-1M 16 1500 20,000V 259AS 100-32,000 25 4,600 25,000V 190 27.0 259SP 3-2,500 70 380 8,800V 700 21.6	106AS	90-30,000	13	1,900	15,000V	150	11.4
256AS 60-20,000 16 2,900 15,000V 190 18.0 256SP 2-1,600 45 240 5,000V 700 14.4 256BA 20K-1M 13 1500 12,000V 109AS 150-48,000 20 3,000 25,000V 150 17.1 109SP 4-3,800 55 250 8,800V 550 17.1 109BA 48K-1M 16 1500 20,000V 259AS 100-32,000 25 4,600 25,000V 190 27.0 259SP 3-2,500 70 380 8,800V 700 21.6	106SP	3-2,400	36	155	5,000V	550	11.4
256SP 2-1,600 45 240 5,000V 700 14.4 256BA 20K-1M 13 1500 12,000V 109AS 150-48,000 20 3,000 25,000V 150 17.1 109SP 4-3,800 55 250 8,800V 550 17.1 109BA 48K-1M 16 1500 20,000V 259AS 100-32,000 25 4,600 25,000V 190 27.0 259SP 3-2,500 70 380 8,800V 700 21.6	106BA	30K-1M	10	1000	12,000V		
256BA 20K-1M 13 1500 12,000V 109AS 150-48,000 20 3,000 25,000V 150 17.1 109SP 4-3,800 55 250 8,800V 550 17.1 109BA 48K-1M 16 1500 20,000V 259AS 100-32,000 25 4,600 25,000V 190 27.0 259SP 3-2,500 70 380 8,800V 700 21.6	256AS	60-20,000	16	2,900	15,000V	190	18.0
109AS 150-48,000 20 3,000 25,000V 150 17.1 109SP 4-3,800 55 250 8,800V 550 17.1 109BA 48K-1M 16 1500 20,000V 259AS 100-32,000 25 4,600 25,000V 190 27.0 259SP 3-2,500 70 380 8,800V 700 21.6	256SP	2-1,600	45	240	5,000V	700	14.4
109SP 4-3,800 55 250 8,800V 550 17.1 109BA 48K-1M 16 1500 20,000V 259AS 100-32,000 25 4,600 25,000V 190 27.0 259SP 3-2,500 70 380 8,800V 700 21.6	256BA	20K-1M	13	1500	12,000V		
109BA 48K-1M 16 1500 20,000V 259AS 100-32,000 25 4,600 25,000V 190 27.0 259SP 3-2,500 70 380 8,800V 700 21.6	109AS	150-48,000	20	3,000	25,000V	150	17.1
259AS 100-32,000 25 4,600 25,000V 190 27.0 259SP 3-2,500 70 380 8,800V 700 21.6	109SP	4-3,800	55	250	8,800V	550	17.1
259SP 3-2,500 70 380 8,800V 700 21.6	109BA	48K-1M	16	1500	20,000V		
259SP 3-2,500 70 380 8,800V 700 21.6	259AS	100-32,000	25	4,600	25,000V	190	27.0
	259SP	3-2,500			8,800V	700	21.6
	259BA	30K-1M	20	2300	20,000V		

- 1. @ 40°C Ambient. Derate linearly to 0 Watts at 230°C for Type AS and BA. Derate linearly to 0 Watts at 350 °C for Type SP.
- 2. Allowable peak energy/voltage will depend on the resistance value and pulse width. Energy ratings are based on pulse <10 milliseconds. Type SP rating can be substantially greater for longer pulses. Consult factory.
- 3. Peak Current Ratings presume energy approaching rated peak energy values. Allowable current can be higher for lower energy values. Consult factory.
- 4. Excludes caps/leads and coating.



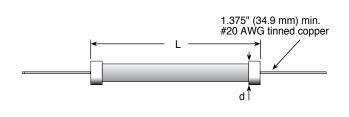
100 & 200 Series

Bulk Ceramic Axial Lead Resistors

	CI	HARACTERIS1	rics	
Characteristic	Test	Type SP	Type AS	
Operating Temp.		-55°C to +350°C*	-55°C to +230°C	
Resistance Temp. Coefficient		+0.2 to -0.08 %/°C	+0.0 to -0.08 %/°C	
Voltage Coefficient	Max. % per kilovolt per inch active length	-1.0%	-1.0%	Derating
Short Time Overload		±5%	±2%	100 40°
Load Life	Max. % change after 1,000 hours at rated power	±5%	±5%	SP 40
Thermal Shock Max. % change after 10 cycles -55°C to +125°C		±3%	±3%	% 20 AS & BA 230° 350°
Moisture Resistance	Max. % change when tested per MIL-STD-202, Method 103	±5%	±5%	0 100 200 300 400 Ambient Temperature (°C)
Density		2.2-2.4 gm/cc	2.2-2.6 gm/cc	
Specific Heat		0.24-0.26 cal/gm -°C	0.23-0.25 cal/gm -°C	
Thermal Conductivity		0.14-0.16 cal/(cm-°C-sec)	0.003-0.006 cal/(cm-°	C-sec)

^{*}When required, Type SP material can withstand short periods of use at red-heat conditions, i.e. up to 550°C to 600°C

DIMENSIONS



Size	Diam. d max. in. (mm)	Length L max. in. (mm)
231	0.2 (5.1)	0.75 (19.1)
233	0.31 (7.9)	0.75 (19.1)
234	0.31 (7.9)	1.125 (28.6)
250	0.44 (11.1)	0.75 (19.1)
251	0.44 (11.1)	1.125 (28.6)
102	0.31 (7.9)	2.125 (54.0)
252	0.44 (11.1)	2.125 (54.0)
104	0.31 (7.9)	4.125 (104.8)
254	0.44 (11.1)	4.125 (104.8)
106	0.31 (7.9)	6.125 (155.6)
256	0.44 (11.1)	6.125 (155.6)
109	0.31 (7.9)	9.125 (231.8)
259	0.44 (11.1)	9.125 (231.8)

ORDERING INFORMATION

102AS101KD

Coating/ Terminal option see chart

Type Coating/Terminal option

No Suffix = Standard Includes aluminum metalization under caps/leads.

AS, BA D = Standard; includes dielectric coating and aluminum metalization under caps/leads.

DS = Dielectric coating and silver metalization under caps/leads.

O = Oil resistant coating and silver metalization under caps/leads

M = Ceramic based coating and aluminum metalization under caps/leads

Packaging: Bulk in poly bags is standard. Tape & reel is also available.