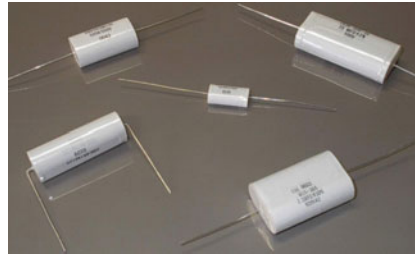


**Type 461M
Axial Lead
Pressed/Oval Profile
Metallized Polyester
Film Capacitors**



Specifications

Capacitance Range:

0.0047 to 100.0 μ F

Capacitance Tolerance:

\pm 5% and \pm 10%, standard
(other tolerances available upon request)

Voltage Rating:

63 to 1000 VDC
40 to 250 VAC*

Operating Temperature

Units may be operated at full rated
DC voltage from -55°C to +85°C.

DC Voltage de-rating above +85°C:

Units may be operated up to a
maximum of +125°C provided the
voltage is de-rated linearly to 50%
of rated voltage at +125°C.

Dissipation Factor:

1.0% Maximum @ 1 KHz, +25°C

Insulation Resistance:

At +25°C: 10,000 M Ω for C \leq 1.0 μ F
10,000 M Ω - μ F for C > 1.0 μ F
At +85°C: 1,000 M Ω for C \leq 1.0 μ F
1,000 M Ω - μ F for C > 1.0 μ F

Encapsulation:

Wrapped with flame retardant polyester
tape (meets UL510 specifications) and
potted with flame retardant epoxy (meets
UL94V-0 specifications).

Lead Wire:

Tinned Copper-Clad Steel for wire sizes:
0.020 (0.5) diameter (#24 AWG)
0.025 (0.6) diameter (#22 AWG)
0.032 (0.8) diameter (#20 AWG)
Tinned Copper for wire sizes:
0.040 (1.0) diameter (#18 AWG)

Dielectric/Construction:

Metallized Polyester film, single section
design. Non-Inductively wound.

* Please refer to the AC Voltage Application Notes provided on page 12. In addition, we encourage you to contact us for further details regarding your specific AC Voltage application.

In addition to the information provided here SBE also offers complete design and manufacturing of specific capacitance values, custom form factors, special lead terminations, etc.

Dimensions are in inches, millimeters are in parenthesis.

#SBE461M10/01



Introduction to SBE

Who Are We

SB Electronics, Inc. *Designs* and *Manufactures* the most reliable film capacitor products for use in today's demanding applications. SBE, a former Sprague Electric company, was founded in 1986 following a management buyout. We manufacture the ubiquitous Orange Drop[®] and 192P Pacer[®] film capacitor lines, both of which have reliably served the industry since 1959!

SBE's expanding product offerings also include a wide range of Metallized and Film/Foil capacitors in both Radial and Axial leaded styles. We also bolstered our axial leaded product portfolio by purchasing several lines from Industrial/Midwec in 1999. You can find additional details regarding our purchase of Industrial/Midwec on our web site at: www.SBElectronics.com

Why choose SBE?

Our focus is on film capacitor products. SBE has the experience, technical expertise and supporting staff to design and deliver the film capacitor you need, when you need it.

High voltage, tight tolerance, demanding peak currents, high frequency; whatever your application, SBE can help you specify the *right* part. Our products are designed for life and reliably manufactured to provide the best electrical performance for your application.

Located in the pristine Green Mountains of Vermont, SBE benefits from a traditional "Vermont work ethic", which is comprised of hard work, pride in craftsmanship, dedication and attention to detail. Put our team to the test!

Our Company Philosophy

SBE's Mission, Vision and Core Operating Values center around our critical success factors; which include comprehensive technical support, proven reliability, short manufacturing lead times, and dependable customer service that is second-to-none. SBE takes great pride in providing customer service that answers your questions completely and timely by friendly people that are pleasant to work with!

SBE, providing you with the ultimate in Performance, from Design to Delivery.

Orange Drop[®] and Pacer[®] are registered trademarks of SB Electronics, Inc.



General Specifications

The 461M series is designed and manufactured for use in many demanding applications. They are non-inductively wound using the most reliable metallized polyester film available today. A wide range of capacitance values, voltage ratings, lead terminations and sizes offer the designer an array of options to best meet the form, fit and function requirements specified.

With complete design and manufacturing operations located at our Barre, Vermont facility, SBE's staff can provide the expertise needed to support your application, be it with a standard product found here, or a tailor designed part specific for your requirement. Regardless, SBE designs and manufactures film capacitors to outlast the products they are installed in. If you are in need of any further technical specifications or require any application assistance we will be pleased to assist you.

Operating Temperature Range:

Standard operating temperature range is -55°C to $+85^{\circ}\text{C}$. Units may be operated at the full rated voltage within this temperature range.

The 461M series may be operated up to a maximum temperature of $+125^{\circ}\text{C}$, however the voltage must be linearly de-rated to 50% of the full rated voltage at $+125^{\circ}\text{C}$.

Dielectric Withstanding Voltage:

Units shall withstand a DC potential of 150% of rated voltage applied between terminals for not more than 2 minutes.

Lead Bend Test:

After 3 consecutive 180° bends. No damage.

Lead Pull Test:

5 pounds (2.3 Kg) for one minute on lead axis. No damage.

Humidity Testing:

Units subjected to 95% relative humidity for 250 hours with no voltage applied at $+40^{\circ}\text{C}$. After 4 hours of drying, minimum product of insulation resistance and capacitance shall be $5,000\ \text{M}\Omega\text{-}\mu\text{F}$, but need not exceed $5,000\ \text{M}\Omega$.

DC Voltage Life Test:

500 hours at $+85^{\circ}\text{C}$ at 125% of rated voltage. After test; capacitance shall not have changed by more than $\pm 10\%$ of initial value, insulation resistance shall not have decreased by more than 50% of initial value and dissipation factor shall not have increased to more than 1.25%. In addition, there shall be no open or short circuits, and no sign of visible damage.

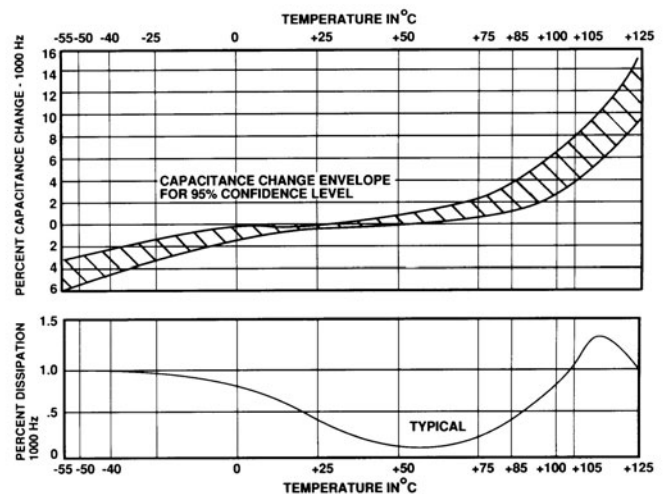
Dielectric Material/Construction:

The 461M series is manufactured using metallized polyester film as the dielectric. The capacitor element is non-inductively wound in a single section design.

Metallized polyester film utilizes a base film of polyester with a thin layer of aluminum vacuum deposited directly on the film as the electrode.

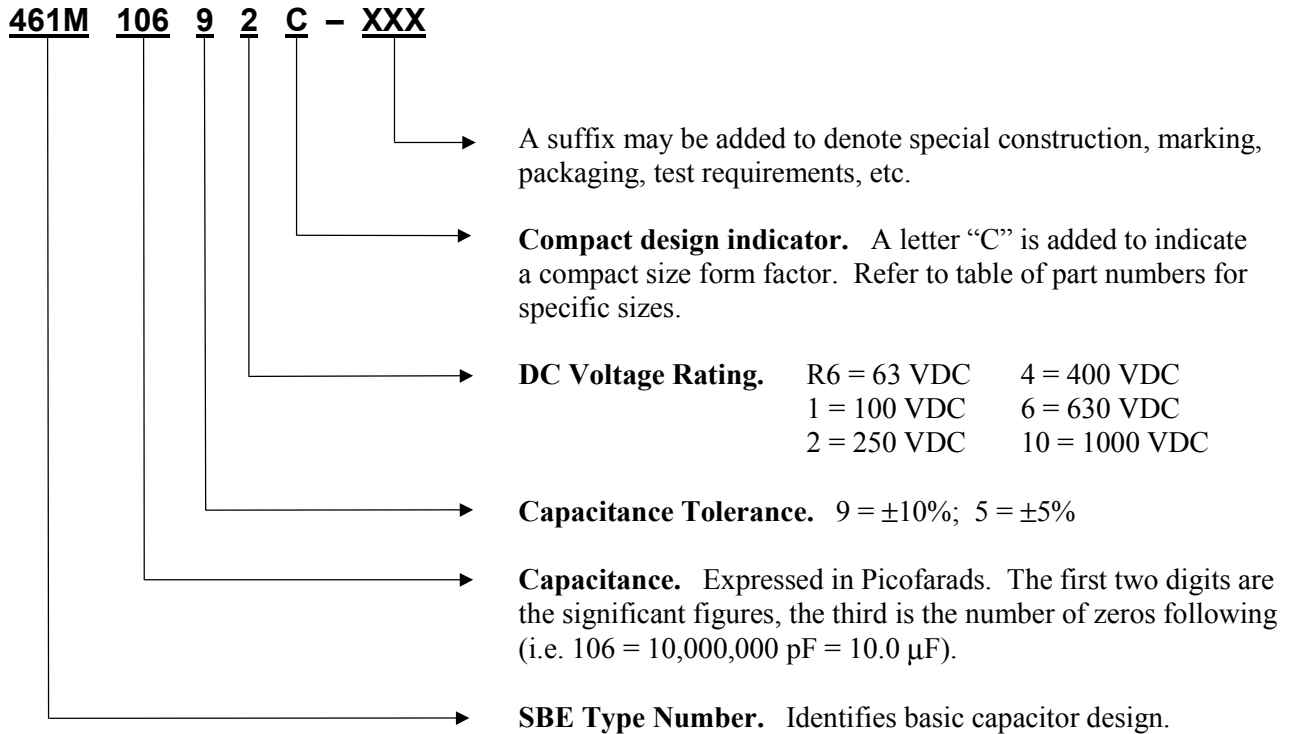
Metallized film exhibits a characteristic called "self-healing" or "self-clearing", which is the ability to remove a fault or short circuit in the dielectric film by vaporizing (from high current density) the metallization near the defect. The metallization is so thin that negligible film damage occurs during the clearing process. The vaporized metal oxidizes over time, aiding in the isolation of a fault area.

Typical Temperature Characteristics:





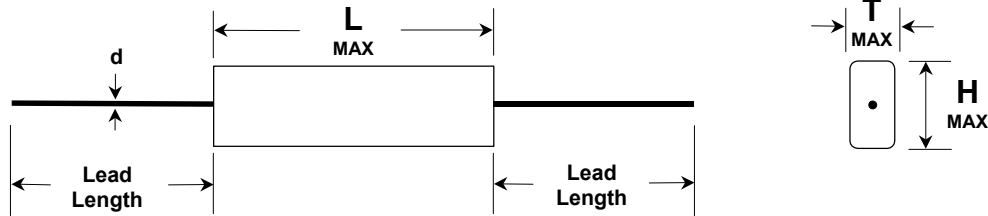
Ordering/Part Number Information



Standard Marking Format

Sample Marking on unit	Description	Tolerance codes per EIA standards
SBE 461M(C) 106K 250V 0142	SBE - SB Electronics Identification 461M - Type Number. 461MC indicates compact design. 250V - DC Voltage Rating 106K - Capacitance and Tolerance Code 0142 - Weekly Date Code (i.e. 42 nd week of 2001)	J ±5% K ±10%

Dimension Outline



Lead Length Table

L MAX dimension	Lead Length (Typical)
0.61 (15.5)	2.00 (50.8)
0.79 (20.1)	1.90 (48.3)
0.99 (25.1)	1.80 (45.7)
1.25 (31.8)	1.65 (41.9)
1.50 (38.1)	1.50 (38.1)
1.74 (44.2)	1.40 (35.6)
2.21 (56.1)	1.25 (31.8)

In all cases a MINIMUM lead length of 1.25 (31.8) will be met.

Lead Wire Size and Additional Termination Options

Standard lead wire sizes used in manufacturing range from 0.020 (0.5) diameter (#24 AWG) to 0.040 (1.0) diameter (#18 AWG). We can also provide a variety of other wire sizes and material (i.e. heavier gauges, insulated wire, tinned copper in smaller gauges, etc.). If the wire size or material listed on our standard items doesn't meet your requirements please contact us. We can accommodate your needs. We can also provide lug/tab terminations upon request. Please contact us with your specific requirements.



Type 461M Sizes and Ratings – 63 VDC/40 VAC

Cap (µF)	Base Part #	Standard Dimensions/Ratings ¹				dV/dt V/µsec	Compact Dimensions/Ratings ¹				dV/dt V/µsec	
		L MAX	T MAX	H MAX	Wire (d)		L MAX	T MAX	H MAX	Wire (d)		
0.22	461M2249R6	0.61 (15.5)	0.14 (3.6)	0.24 (6.1)	0.020 (0.5)	14						
0.25	461M2549R6	0.61 (15.5)	0.15 (3.8)	0.25 (6.4)	0.020 (0.5)	14						
0.27	461M2749R6	0.61 (15.5)	0.16 (4.1)	0.26 (6.6)	0.020 (0.5)	14						
0.33	461M3349R6	0.61 (15.5)	0.18 (4.6)	0.27 (6.9)	0.020 (0.5)	14						
0.39	461M3949R6	0.79 (20.1)	0.14 (3.6)	0.24 (6.1)	0.020 (0.5)	8	0.61 (15.5)	0.19 (4.8)	0.29 (7.4)	0.020 (0.5)	14	
0.43	461M4349R6	0.79 (20.1)	0.15 (3.8)	0.25 (6.4)	0.020 (0.5)	8	0.61 (15.5)	0.20 (5.1)	0.30 (7.6)	0.020 (0.5)	14	
0.47	461M4749R6	0.79 (20.1)	0.16 (4.1)	0.26 (6.6)	0.020 (0.5)	8	0.61 (15.5)	0.21 (5.3)	0.31 (7.9)	0.020 (0.5)	16	
0.5	461M5049R6	0.79 (20.1)	0.17 (4.3)	0.26 (6.6)	0.020 (0.5)	8	0.61 (15.5)	0.22 (5.6)	0.32 (8.1)	0.020 (0.5)	19	
0.56	461M5649R6	0.79 (20.1)	0.18 (4.6)	0.27 (6.9)	0.020 (0.5)	8	0.61 (15.5)	0.24 (6.1)	0.33 (8.4)	0.020 (0.5)	22	
0.6	461M6049R6	0.79 (20.1)	0.18 (4.6)	0.28 (7.1)	0.020 (0.5)	8	0.61 (15.5)	0.24 (6.1)	0.34 (8.6)	0.020 (0.5)	23	
0.68	461M6849R6	0.79 (20.1)	0.20 (5.1)	0.29 (7.4)	0.020 (0.5)	8	0.61 (15.5)	0.26 (6.6)	0.36 (9.1)	0.020 (0.5)	26	
0.75	461M7549R6	0.79 (20.1)	0.21 (5.3)	0.30 (7.6)	0.020 (0.5)	8	0.61 (15.5)	0.28 (7.1)	0.37 (9.4)	0.020 (0.5)	28	
0.82	461M8249R6	0.99 (25.1)	0.18 (4.6)	0.28 (7.1)	0.020 (0.5)	6	0.79 (20.1)	0.21 (5.3)	0.33 (8.4)	0.020 (0.5)	10	
0.9	461M9049R6	0.99 (25.1)	0.19 (4.8)	0.28 (7.1)	0.020 (0.5)	6	0.79 (20.1)	0.22 (5.6)	0.34 (8.6)	0.020 (0.5)	12	
1.0	461M1059R6	0.99 (25.1)	0.19 (4.8)	0.31 (7.9)	0.020 (0.5)	6	0.79 (20.1)	0.23 (5.8)	0.35 (8.9)	0.020 (0.5)	13	
1.2	461M1259R6	0.99 (25.1)	0.21 (5.3)	0.33 (8.4)	0.020 (0.5)	7	0.79 (20.1)	0.24 (6.1)	0.39 (9.9)	0.025 (0.6)	15	
1.5	461M1559R6	0.99 (25.1)	0.22 (5.6)	0.37 (9.4)	0.020 (0.5)	9	0.79 (20.1)	0.27 (6.9)	0.43 (10.9)	0.025 (0.6)	26	
1.8	461M1859R6	0.99 (25.1)	0.24 (6.1)	0.40 (10.2)	0.020 (0.5)	11	0.79 (20.1)	0.30 (7.6)	0.46 (11.7)	0.025 (0.6)	26	
2.0	461M2059R6	0.99 (25.1)	0.25 (6.4)	0.43 (10.9)	0.020 (0.5)	17	0.79 (20.1)	0.31 (7.9)	0.49 (12.4)	0.025 (0.6)	26	
2.2	461M2259R6	0.99 (25.1)	0.26 (6.6)	0.45 (11.4)	0.025 (0.6)	18	0.79 (20.1)	0.33 (8.4)	0.51 (13.0)	0.025 (0.6)	26	
2.5	461M2559R6	1.25 (31.8)	0.26 (6.6)	0.39 (9.9)	0.025 (0.6)	8	0.99 (25.1)	0.28 (7.1)	0.47 (11.9)	0.025 (0.6)	18	
2.7	461M2759R6	1.25 (31.8)	0.26 (6.6)	0.41 (10.4)	0.025 (0.6)	9	0.99 (25.1)	0.29 (7.4)	0.48 (12.2)	0.025 (0.6)	18	
3.0	461M3059R6	1.25 (31.8)	0.26 (6.6)	0.45 (11.4)	0.025 (0.6)	13	0.99 (25.1)	0.31 (7.9)	0.50 (12.7)	0.025 (0.6)	18	
3.3	461M3359R6	1.25 (31.8)	0.28 (7.1)	0.46 (11.7)	0.025 (0.6)	13	0.99 (25.1)	0.33 (8.4)	0.52 (13.2)	0.025 (0.6)	18	
3.6	461M3659R6	1.25 (31.8)	0.29 (7.4)	0.48 (12.2)	0.025 (0.6)	13	0.99 (25.1)	0.35 (8.9)	0.53 (13.5)	0.032 (0.8)	18	
3.9	461M3959R6	1.25 (31.8)	0.31 (7.9)	0.49 (12.4)	0.025 (0.6)	13	0.99 (25.1)	0.36 (9.1)	0.55 (14.0)	0.032 (0.8)	18	
4.7	461M4759R6	1.25 (31.8)	0.34 (8.6)	0.53 (13.5)	0.025 (0.6)	13	0.99 (25.1)	0.38 (9.7)	0.62 (15.7)	0.032 (0.8)	18	
5.0	461M5059R6	1.25 (31.8)	0.35 (8.9)	0.55 (14.0)	0.032 (0.8)	13	0.99 (25.1)	0.39 (9.9)	0.64 (16.3)	0.032 (0.8)	18	
5.6	461M5659R6	1.25 (31.8)	0.38 (9.7)	0.56 (14.2)	0.032 (0.8)	14	0.99 (25.1)	0.42 (10.7)	0.67 (17.0)	0.032 (0.8)	18	
6.0	461M6059R6	1.25 (31.8)	0.39 (9.9)	0.58 (14.7)	0.032 (0.8)	14	0.99 (25.1)	0.44 (11.2)	0.68 (17.3)	0.032 (0.8)	18	
6.8	461M6859R6	1.50 (38.1)	0.37 (9.4)	0.55 (14.0)	0.032 (0.8)	11	1.25 (31.8)	0.39 (9.9)	0.64 (16.3)	0.032 (0.8)	14	
7.0	461M7059R6	1.50 (38.1)	0.37 (9.4)	0.56 (14.2)	0.032 (0.8)	11	1.25 (31.8)	0.40 (10.2)	0.65 (16.5)	0.032 (0.8)	14	
7.5	461M7559R6	1.50 (38.1)	0.36 (9.1)	0.61 (15.5)	0.032 (0.8)	11	1.25 (31.8)	0.42 (10.7)	0.67 (17.0)	0.032 (0.8)	14	
8.0	461M8059R6	1.50 (38.1)	0.37 (9.4)	0.62 (15.7)	0.032 (0.8)	11	1.25 (31.8)	0.43 (10.9)	0.68 (17.3)	0.032 (0.8)	14	
9.0	461M9059R6	1.50 (38.1)	0.40 (10.2)	0.65 (16.5)	0.032 (0.8)	11	1.25 (31.8)	0.47 (11.9)	0.71 (18.0)	0.032 (0.8)	14	
10.0	461M1069R6	1.50 (38.1)	0.43 (10.9)	0.68 (17.3)	0.032 (0.8)	11	1.25 (31.8)	0.50 (12.7)	0.74 (18.8)	0.032 (0.8)	14	
12.0	461M1269R6	1.74 (44.2)	0.42 (10.7)	0.67 (17.0)	0.032 (0.8)	9	1.50 (38.1)	0.48 (12.2)	0.73 (18.5)	0.032 (0.8)	11	
15.0	461M1569R6	1.74 (44.2)	0.43 (10.9)	0.80 (20.3)	0.032 (0.8)	9	1.50 (38.1)	0.52 (13.2)	0.83 (21.1)	0.032 (0.8)	11	
18.0	461M1869R6	1.74 (44.2)	0.48 (12.2)	0.85 (21.6)	0.032 (0.8)	9	1.50 (38.1)	0.58 (14.7)	0.89 (22.6)	0.032 (0.8)	11	
20.0	461M2069R6	1.74 (44.2)	0.52 (13.2)	0.89 (22.6)	0.032 (0.8)	9	1.50 (38.1)	0.62 (15.7)	0.92 (23.4)	0.032 (0.8)	11	
25.0	461M2569R6	1.74 (44.2)	0.59 (15.0)	0.96 (24.4)	0.032 (0.8)	9	1.50 (38.1)	0.67 (17.0)	1.04 (26.4)	0.040 (1.0)	11	
30.0	461M3069R6	1.74 (44.2)	0.66 (16.8)	1.03 (26.2)	0.040 (1.0)	9	1.50 (38.1)	0.75 (19.1)	1.12 (28.4)	0.040 (1.0)	11	
35.0	461M3569R6	1.74 (44.2)	0.73 (18.5)	1.10 (27.9)	0.040 (1.0)	9	1.50 (38.1)	0.82 (20.8)	1.19 (30.2)	0.040 (1.0)	11	
40.0	461M4069R6	1.74 (44.2)	0.79 (20.1)	1.16 (29.5)	0.040 (1.0)	9	1.50 (38.1)	0.89 (22.6)	1.26 (32.0)	0.040 (1.0)	11	
45.0	461M4569R6	1.74 (44.2)	0.85 (21.6)	1.22 (31.0)	0.040 (1.0)	9	1.50 (38.1)	0.95 (24.1)	1.32 (33.5)	0.040 (1.0)	11	
50.0	461M5069R6	1.74 (44.2)	0.90 (22.9)	1.27 (32.3)	0.040 (1.0)	9	1.50 (38.1)	1.01 (25.7)	1.38 (35.1)	0.040 (1.0)	11	
55.0	461M5569R6	1.74 (44.2)	0.95 (24.1)	1.32 (33.5)	0.040 (1.0)	9	1.50 (38.1)	1.07 (27.2)	1.44 (36.6)	0.040 (1.0)	11	
60.0	461M6069R6	1.74 (44.2)	1.00 (25.4)	1.37 (34.8)	0.040 (1.0)	9	1.50 (38.1)	1.13 (28.7)	1.50 (38.1)	0.040 (1.0)	11	
65.0	461M6569R6	1.74 (44.2)	1.05 (26.7)	1.42 (36.1)	0.040 (1.0)	9	1.50 (38.1)	1.18 (30.0)	1.55 (39.4)	0.040 (1.0)	11	
70.0	461M7069R6	1.74 (44.2)	1.10 (27.9)	1.47 (37.3)	0.040 (1.0)	9	1.50 (38.1)	1.23 (31.2)	1.60 (40.6)	0.040 (1.0)	11	
75.0	461M7569R6	1.74 (44.2)	1.14 (29.0)	1.51 (38.4)	0.040 (1.0)	9	1.50 (38.1)	1.28 (32.5)	1.65 (41.9)	0.040 (1.0)	11	
80.0	461M8069R6	1.74 (44.2)	1.18 (30.0)	1.55 (39.4)	0.040 (1.0)	9	1.50 (38.1)	1.33 (33.8)	1.70 (43.2)	0.040 (1.0)	11	
85.0	461M8569R6	1.74 (44.2)	1.23 (31.2)	1.60 (40.6)	0.040 (1.0)	9	1.50 (38.1)	1.37 (34.8)	1.74 (44.2)	0.040 (1.0)	11	
90.0	461M9069R6	1.74 (44.2)	1.27 (32.3)	1.64 (41.7)	0.040 (1.0)	9						
95.0	461M9569R6	1.74 (44.2)	1.31 (33.3)	1.68 (42.7)	0.040 (1.0)	9						
100.0	461M1079R6	1.74 (44.2)	1.34 (34.0)	1.72 (43.7)	0.040 (1.0)	9						

¹ Please refer to Ordering/Part Number page for specific part numbering details.



Type 461M Sizes and Ratings – 100 VDC/63 VAC

Cap (µF)	Base Part #	Standard Dimensions/Ratings ¹				dV/dt V/µsec	Compact Dimensions/Ratings ¹				dV/dt V/µsec	
		L MAX	T MAX	H MAX	Wire (d)		L MAX	T MAX	H MAX	Wire (d)		
0.22	461M22491	0.61 (15.5)	0.16 (4.1)	0.26 (6.6)	0.020 (0.5)	16						
0.25	461M25491	0.61 (15.5)	0.18 (4.6)	0.27 (6.9)	0.020 (0.5)	16						
0.27	461M27491	0.61 (15.5)	0.18 (4.6)	0.28 (7.1)	0.020 (0.5)	16						
0.33	461M33491	0.79 (20.1)	0.15 (3.8)	0.25 (6.4)	0.020 (0.5)	9	0.61 (15.5)	0.20 (5.1)	0.30 (7.6)	0.020 (0.5)	16	
0.39	461M39491	0.79 (20.1)	0.17 (4.3)	0.27 (6.9)	0.020 (0.5)	9	0.61 (15.5)	0.22 (5.6)	0.32 (8.1)	0.020 (0.5)	21	
0.43	461M43491	0.79 (20.1)	0.18 (4.6)	0.28 (7.1)	0.020 (0.5)	9	0.61 (15.5)	0.24 (6.1)	0.34 (8.6)	0.020 (0.5)	24	
0.47	461M47491	0.79 (20.1)	0.19 (4.8)	0.29 (7.4)	0.020 (0.5)	9	0.61 (15.5)	0.25 (6.4)	0.35 (8.9)	0.020 (0.5)	27	
0.5	461M50491	0.79 (20.1)	0.19 (4.8)	0.29 (7.4)	0.020 (0.5)	9	0.61 (15.5)	0.26 (6.6)	0.35 (8.9)	0.020 (0.5)	28	
0.56	461M56491	0.79 (20.1)	0.20 (5.1)	0.30 (7.6)	0.020 (0.5)	9	0.61 (15.5)	0.27 (6.9)	0.37 (9.4)	0.020 (0.5)	31	
0.6	461M60491	0.79 (20.1)	0.20 (5.1)	0.32 (8.1)	0.020 (0.5)	10	0.61 (15.5)	0.28 (7.1)	0.38 (9.7)	0.020 (0.5)	32	
0.68	461M68491	0.79 (20.1)	0.22 (5.6)	0.34 (8.6)	0.020 (0.5)	13	0.61 (15.5)	0.29 (7.4)	0.41 (10.4)	0.020 (0.5)	34	
0.75	461M75491	0.99 (25.1)	0.18 (4.6)	0.31 (7.9)	0.020 (0.5)	6	0.79 (20.1)	0.23 (5.8)	0.35 (8.9)	0.020 (0.5)	15	
0.82	461M82491	0.99 (25.1)	0.19 (4.8)	0.32 (8.1)	0.020 (0.5)	6	0.79 (20.1)	0.24 (6.1)	0.36 (9.1)	0.020 (0.5)	16	
0.9	461M90491	0.99 (25.1)	0.20 (5.1)	0.33 (8.4)	0.020 (0.5)	8	0.79 (20.1)	0.25 (6.4)	0.38 (9.7)	0.020 (0.5)	17	
1.0	461M10591	0.99 (25.1)	0.22 (5.6)	0.34 (8.6)	0.020 (0.5)	9	0.79 (20.1)	0.25 (6.4)	0.41 (10.4)	0.020 (0.5)	18	
1.2	461M12591	0.99 (25.1)	0.24 (6.1)	0.36 (9.1)	0.020 (0.5)	11	0.79 (20.1)	0.28 (7.1)	0.44 (11.2)	0.025 (0.6)	29	
1.5	461M15591	0.99 (25.1)	0.26 (6.6)	0.41 (10.4)	0.025 (0.6)	13	0.79 (20.1)	0.32 (8.1)	0.47 (11.9)	0.025 (0.6)	29	
1.8	461M18591	0.99 (25.1)	0.29 (7.4)	0.44 (11.2)	0.025 (0.6)	20	0.79 (25.1)	0.34 (8.6)	0.52 (13.2)	0.025 (0.6)	30	
2.0	461M20591	1.25 (31.8)	0.26 (6.6)	0.41 (10.4)	0.025 (0.6)	15	0.99 (25.1)	0.29 (7.4)	0.47 (11.9)	0.025 (0.6)	20	
2.2	461M22591	1.25 (31.8)	0.26 (6.6)	0.44 (11.2)	0.025 (0.6)	15	0.99 (25.1)	0.31 (7.9)	0.49 (12.4)	0.025 (0.6)	20	
2.5	461M25591	1.25 (31.8)	0.28 (7.1)	0.46 (11.7)	0.025 (0.6)	15	0.99 (25.1)	0.33 (8.4)	0.52 (13.2)	0.025 (0.6)	20	
2.7	461M27591	1.25 (31.8)	0.29 (7.4)	0.48 (12.2)	0.025 (0.6)	15	0.99 (25.1)	0.27 (6.9)	0.53 (13.5)	0.025 (0.6)	20	
3.0	461M30591	1.25 (31.8)	0.31 (7.9)	0.49 (12.4)	0.025 (0.6)	15	0.99 (25.1)	0.36 (9.1)	0.55 (14.0)	0.032 (0.8)	20	
3.3	461M33591	1.25 (31.8)	0.33 (8.4)	0.51 (13.0)	0.025 (0.6)	15	0.99 (25.1)	0.39 (9.9)	0.57 (14.5)	0.032 (0.8)	21	
3.6	461M36591	1.25 (31.8)	0.34 (8.6)	0.53 (13.5)	0.025 (0.6)	15	0.99 (25.1)	0.41 (10.4)	0.59 (15.0)	0.032 (0.8)	21	
3.9	461M39591	1.25 (31.8)	0.33 (8.4)	0.58 (14.7)	0.025 (0.6)	15	0.99 (25.1)	0.40 (10.2)	0.64 (16.3)	0.032 (0.8)	21	
4.7	461M47591	1.50 (38.1)	0.32 (8.1)	0.57 (14.5)	0.025 (0.6)	12	1.25 (31.8)	0.37 (9.4)	0.62 (15.7)	0.032 (0.8)	15	
5.0	461M50591	1.50 (38.1)	0.33 (8.4)	0.58 (14.7)	0.025 (0.6)	12	1.25 (31.8)	0.39 (9.9)	0.63 (16.0)	0.032 (0.8)	15	
5.6	461M56591	1.50 (38.1)	0.36 (9.1)	0.60 (15.2)	0.032 (0.8)	12	1.25 (31.8)	0.41 (10.4)	0.66 (16.8)	0.032 (0.8)	15	
6.0	461M60591	1.50 (38.1)	0.37 (9.4)	0.62 (15.7)	0.032 (0.8)	12	1.25 (31.8)	0.43 (10.9)	0.68 (17.3)	0.032 (0.8)	15	
6.8	461M68591	1.50 (38.1)	0.40 (10.2)	0.65 (16.5)	0.032 (0.8)	12	1.25 (31.8)	0.46 (11.7)	0.71 (18.0)	0.032 (0.8)	15	
7.0	461M70591	1.50 (38.1)	0.41 (10.4)	0.66 (16.8)	0.032 (0.8)	12	1.25 (31.8)	0.47 (11.9)	0.72 (18.3)	0.032 (0.8)	15	
7.5	461M75591	1.50 (38.1)	0.43 (10.9)	0.67 (17.0)	0.032 (0.8)	12	1.25 (31.8)	0.49 (12.4)	0.74 (18.8)	0.032 (0.8)	15	
8.0	461M80591	1.50 (38.1)	0.44 (11.2)	0.69 (17.5)	0.032 (0.8)	12	1.25 (31.8)	0.48 (12.2)	0.79 (20.1)	0.032 (0.8)	16	
9.0	461M90591	1.50 (38.1)	0.48 (12.2)	0.72 (18.3)	0.032 (0.8)	12	1.25 (31.8)	0.52 (13.2)	0.83 (21.1)	0.032 (0.8)	16	
10.0	461M10691	1.74 (44.2)	0.42 (10.7)	0.73 (18.5)	0.032 (0.8)	10	1.50 (38.1)	0.48 (12.2)	0.79 (20.1)	0.032 (0.8)	12	
12.0	461M12691	2.21 (56.1)	0.39 (9.9)	0.70 (17.8)	0.032 (0.8)	7	1.50 (38.1)	0.53 (13.5)	0.84 (21.3)	0.032 (0.8)	12	
15.0	461M15691	2.21 (56.1)	0.42 (10.7)	0.80 (20.3)	0.032 (0.8)	7	1.50 (38.1)	0.61 (15.5)	0.92 (23.4)	0.032 (0.8)	12	
18.0	461M18691	2.21 (56.1)	0.47 (11.9)	0.85 (21.6)	0.032 (0.8)	7	1.50 (38.1)	0.65 (16.5)	1.02 (25.9)	0.040 (1.0)	12	
20.0	461M20691	2.21 (56.1)	0.51 (13.0)	0.88 (22.4)	0.032 (0.8)	7	1.50 (38.1)	0.69 (17.5)	1.06 (26.9)	0.040 (1.0)	12	
22.0	461M22691	2.21 (56.1)	0.54 (13.7)	0.91 (23.1)	0.032 (0.8)	7	1.74 (44.2)	0.65 (16.5)	1.02 (25.9)	0.040 (1.0)	10	
25.0	461M25691	2.21 (56.1)	0.58 (14.7)	0.95 (24.1)	0.032 (0.8)	7	1.74 (44.2)	0.70 (17.8)	1.07 (27.2)	0.040 (1.0)	10	
30.0	461M30691	2.21 (56.1)	0.65 (16.5)	1.02 (25.9)	0.040 (1.0)	7	1.74 (44.2)	0.79 (20.1)	1.16 (29.5)	0.040 (1.0)	10	
35.0	461M35691	2.21 (56.1)	0.72 (18.3)	1.09 (27.7)	0.040 (1.0)	7	1.74 (44.2)	0.86 (21.8)	1.23 (31.2)	0.040 (1.0)	10	
40.0	461M40691	2.21 (56.1)	0.78 (19.8)	1.15 (29.2)	0.040 (1.0)	7	1.74 (44.2)	0.93 (23.6)	1.30 (33.0)	0.040 (1.0)	10	
45.0	461M45691	2.21 (56.1)	0.83 (21.1)	1.20 (30.5)	0.040 (1.0)	7	1.74 (44.2)	1.00 (25.4)	1.37 (34.8)	0.040 (1.0)	10	
50.0	461M50691	2.21 (56.1)	0.89 (22.6)	1.26 (32.0)	0.040 (1.0)	7	1.74 (44.2)	1.06 (26.9)	1.43 (36.3)	0.040 (1.0)	10	
55.0	461M55691	2.21 (56.1)	0.94 (23.9)	1.31 (33.3)	0.040 (1.0)	7	1.74 (44.2)	1.12 (28.4)	1.49 (37.8)	0.040 (1.0)	10	
60.0	461M60691	2.21 (56.1)	0.99 (25.1)	1.36 (34.5)	0.040 (1.0)	7	1.74 (44.2)	1.18 (30.0)	1.55 (39.4)	0.040 (1.0)	10	
65.0	461M65691	2.21 (56.1)	1.03 (26.2)	1.40 (35.6)	0.040 (1.0)	7	1.74 (44.2)	1.23 (31.2)	1.60 (40.6)	0.040 (1.0)	10	
70.0	461M70691	2.21 (56.1)	1.08 (27.4)	1.45 (36.8)	0.040 (1.0)	7	1.74 (44.2)	1.29 (32.8)	1.66 (42.2)	0.040 (1.0)	10	
75.0	461M75691	2.21 (56.1)	1.12 (28.4)	1.49 (37.8)	0.040 (1.0)	7	1.74 (44.2)	1.34 (34.0)	1.71 (43.4)	0.040 (1.0)	10	
80.0	461M80691	2.21 (56.1)	1.16 (29.5)	1.54 (39.1)	0.040 (1.0)	7	1.74 (44.2)	1.39 (35.3)	1.76 (44.7)	0.040 (1.0)	10	
85.0	461M85691	2.21 (56.1)	1.21 (30.7)	1.58 (40.1)	0.040 (1.0)	7						
90.0	461M90691	2.21 (56.1)	1.24 (31.5)	1.62 (41.1)	0.040 (1.0)	7						
100.0	461M10791	2.21 (56.1)	1.32 (33.5)	1.69 (42.9)	0.040 (1.0)	7						

¹ Please refer to Ordering/Part Number page for specific part numbering details.



Type 461M Sizes and Ratings – 250 VDC/160 VAC

Cap (μ F)	Base Part #	Standard Dimensions/Ratings ¹				dV/dt V/ μ sec	Compact Dimensions/Ratings ¹				dV/dt V/ μ sec	
		L MAX	T MAX	H MAX	Wire (d)		L MAX	T MAX	H MAX	Wire (d)		
0.1	461M10492	0.61 (15.5)	0.16 (4.1)	0.26 (6.6)	0.020 (0.5)	22						
0.12	461M12492	0.61 (15.5)	0.17 (4.3)	0.27 (6.9)	0.020 (0.5)	22						
0.15	461M15492	0.79 (20.1)	0.15 (3.8)	0.25 (6.4)	0.020 (0.5)	13	0.61 (15.5)	0.20 (5.1)	0.30 (7.6)	0.020 (0.5)	22	
0.18	461M18492	0.79 (20.1)	0.16 (4.1)	0.26 (6.6)	0.020 (0.5)	13	0.61 (15.5)	0.22 (5.6)	0.32 (8.1)	0.020 (0.5)	28	
0.22	461M22492	0.79 (20.1)	0.18 (4.6)	0.28 (7.1)	0.020 (0.5)	13	0.61 (15.5)	0.24 (6.1)	0.34 (8.6)	0.020 (0.5)	36	
0.25	461M25492	0.79 (20.1)	0.18 (4.6)	0.31 (7.9)	0.020 (0.5)	13	0.61 (15.5)	0.26 (6.6)	0.36 (9.1)	0.020 (0.5)	41	
0.27	461M27492	0.79 (20.1)	0.19 (4.8)	0.32 (8.1)	0.020 (0.5)	13	0.61 (15.5)	0.27 (6.9)	0.37 (9.4)	0.020 (0.5)	44	
0.33	461M33492	0.99 (25.1)	0.17 (4.3)	0.30 (7.6)	0.020 (0.5)	9	0.79 (20.1)	0.21 (5.3)	0.34 (8.6)	0.020 (0.5)	18	
0.39	461M39492	0.99 (25.1)	0.19 (4.8)	0.32 (8.1)	0.020 (0.5)	9	0.79 (20.1)	0.24 (6.1)	0.36 (9.1)	0.020 (0.5)	22	
0.43	461M43492	0.99 (25.1)	0.20 (5.1)	0.33 (8.4)	0.020 (0.5)	10	0.79 (20.1)	0.25 (6.4)	0.37 (9.4)	0.020 (0.5)	24	
0.47	461M47492	0.99 (25.1)	0.21 (5.3)	0.34 (8.6)	0.020 (0.5)	12	0.79 (20.1)	0.25 (6.4)	0.40 (10.2)	0.020 (0.5)	26	
0.5	461M50492	0.99 (25.1)	0.22 (5.6)	0.34 (8.6)	0.020 (0.5)	13	0.79 (20.1)	0.26 (6.6)	0.41 (10.4)	0.025 (0.6)	27	
0.56	461M56492	0.99 (25.1)	0.23 (5.8)	0.36 (9.1)	0.020 (0.5)	15	0.79 (20.1)	0.27 (6.9)	0.43 (10.9)	0.025 (0.6)	41	
0.6	461M60492	0.99 (25.1)	0.24 (6.1)	0.37 (9.4)	0.020 (0.5)	16	0.79 (20.1)	0.28 (7.1)	0.44 (11.2)	0.025 (0.6)	42	
0.68	461M68492	0.99 (25.1)	0.26 (6.6)	0.38 (9.7)	0.025 (0.6)	18	0.79 (20.1)	0.30 (7.6)	0.46 (11.7)	0.025 (0.6)	42	
0.75	461M75492	0.99 (25.1)	0.27 (6.9)	0.40 (10.2)	0.025 (0.6)	19	0.79 (20.1)	0.32 (8.1)	0.48 (12.2)	0.025 (0.6)	42	
0.82	461M82492	1.25 (31.8)	0.26 (6.6)	0.36 (9.1)	0.025 (0.6)	12	0.99 (25.1)	0.27 (6.9)	0.43 (10.9)	0.025 (0.6)	28	
0.9	461M90492	1.25 (31.8)	0.26 (6.6)	0.38 (9.7)	0.025 (0.6)	13	0.99 (25.1)	0.29 (7.4)	0.44 (11.2)	0.025 (0.6)	29	
1.0	461M10592	1.25 (31.8)	0.27 (6.9)	0.40 (10.2)	0.025 (0.6)	14	0.99 (25.1)	0.31 (7.9)	0.46 (11.7)	0.025 (0.6)	29	
1.2	461M12592	1.25 (31.8)	0.30 (7.6)	0.43 (10.9)	0.025 (0.6)	21	0.99 (25.1)	0.33 (8.4)	0.51 (13.0)	0.025 (0.6)	29	
1.5	461M15592	1.25 (31.8)	0.31 (7.9)	0.50 (12.7)	0.025 (0.6)	22	0.99 (25.1)	0.37 (9.4)	0.56 (14.2)	0.032 (0.8)	29	
1.8	461M18592	1.25 (31.8)	0.35 (8.9)	0.53 (13.5)	0.025 (0.6)	22	0.99 (25.1)	0.38 (9.7)	0.63 (16.0)	0.032 (0.8)	29	
2.0	461M20592	1.50 (38.1)	0.32 (8.1)	0.51 (13.0)	0.025 (0.6)	17	1.25 (31.8)	0.34 (8.6)	0.59 (15.0)	0.025 (0.6)	22	
2.2	461M22592	1.50 (38.1)	0.34 (8.6)	0.53 (13.5)	0.025 (0.6)	17	1.25 (31.8)	0.36 (9.1)	0.61 (15.5)	0.032 (0.8)	22	
2.5	461M25592	1.50 (38.1)	0.37 (9.4)	0.55 (14.0)	0.032 (0.8)	17	1.25 (31.8)	0.39 (9.9)	0.64 (16.3)	0.032 (0.8)	22	
2.7	461M27592	1.50 (38.1)	0.35 (8.9)	0.60 (15.2)	0.032 (0.8)	17	1.25 (31.8)	0.41 (10.4)	0.66 (16.8)	0.032 (0.8)	22	
3.0	461M30592	1.50 (38.1)	0.38 (9.7)	0.62 (15.7)	0.032 (0.8)	17	1.25 (31.8)	0.44 (11.2)	0.68 (17.3)	0.032 (0.8)	22	
3.3	461M33592	1.50 (38.1)	0.40 (10.2)	0.65 (16.5)	0.032 (0.8)	17	1.25 (31.8)	0.46 (11.7)	0.71 (18.0)	0.032 (0.8)	22	
3.6	461M36592	1.50 (38.1)	0.42 (10.7)	0.67 (17.0)	0.032 (0.8)	17	1.25 (31.8)	0.49 (12.4)	0.73 (18.5)	0.032 (0.8)	22	
3.9	461M39592	1.50 (38.1)	0.44 (11.2)	0.69 (17.5)	0.032 (0.8)	17	1.25 (31.8)	0.51 (13.0)	0.76 (19.3)	0.032 (0.8)	22	
4.7	461M47592	1.74 (44.2)	0.44 (11.2)	0.69 (17.5)	0.032 (0.8)	14	1.50 (38.1)	0.49 (12.4)	0.74 (18.8)	0.032 (0.8)	17	
5.0	461M50592	1.74 (44.2)	0.46 (11.7)	0.70 (17.8)	0.032 (0.8)	14	1.50 (38.1)	0.48 (12.2)	0.79 (20.1)	0.032 (0.8)	17	
5.6	461M56592	1.74 (44.2)	0.49 (12.4)	0.74 (18.8)	0.032 (0.8)	14	1.50 (38.1)	0.52 (13.2)	0.83 (21.1)	0.032 (0.8)	17	
6.0	461M60592	1.74 (44.2)	0.51 (13.0)	0.76 (19.3)	0.032 (0.8)	14	1.50 (38.1)	0.54 (13.7)	0.85 (21.6)	0.032 (0.8)	17	
6.8	461M68592	1.74 (44.2)	0.55 (14.0)	0.79 (20.1)	0.032 (0.8)	14	1.50 (38.1)	0.58 (14.7)	0.89 (22.6)	0.032 (0.8)	17	
7.0	461M70592	1.74 (44.2)	0.56 (14.2)	0.80 (20.3)	0.032 (0.8)	14	1.50 (38.1)	0.59 (15.0)	0.90 (22.9)	0.032 (0.8)	17	
7.5	461M75592	1.74 (44.2)	0.58 (14.7)	0.83 (21.1)	0.032 (0.8)	14	1.50 (38.1)	0.62 (15.7)	0.93 (23.6)	0.032 (0.8)	17	
8.0	461M80592	1.74 (44.2)	0.60 (15.2)	0.85 (21.6)	0.032 (0.8)	14	1.50 (38.1)	0.64 (16.3)	0.95 (24.1)	0.040 (1.0)	17	
9.0	461M90592	1.74 (44.2)	0.61 (15.5)	0.92 (23.4)	0.032 (0.8)	14	1.50 (38.1)	0.69 (17.5)	1.00 (25.4)	0.040 (1.0)	17	
10.0	461M10692	2.21 (56.1)	0.54 (13.7)	0.85 (21.6)	0.032 (0.8)	10	1.74 (44.2)	0.65 (16.5)	0.96 (24.4)	0.040 (1.0)	14	
12.0	461M12692	2.21 (56.1)	0.60 (15.2)	0.91 (23.1)	0.032 (0.8)	11	1.74 (44.2)	0.69 (17.5)	1.07 (27.2)	0.040 (1.0)	14	
15.0	461M15692	2.21 (56.1)	0.69 (17.5)	1.00 (25.4)	0.040 (1.0)	11	1.74 (44.2)	0.79 (20.1)	1.17 (29.7)	0.040 (1.0)	14	
18.0	461M18692	2.21 (56.1)	0.74 (18.8)	1.11 (28.2)	0.040 (1.0)	11	1.74 (44.2)	0.88 (22.4)	1.26 (32.0)	0.040 (1.0)	14	
20.0	461M20692	2.21 (56.1)	0.79 (20.1)	1.16 (29.5)	0.040 (1.0)	11	1.74 (44.2)	0.94 (23.9)	1.31 (33.3)	0.040 (1.0)	14	
22.0	461M22692	2.21 (56.1)	0.83 (21.1)	1.20 (30.5)	0.040 (1.0)	11	1.74 (44.2)	1.00 (25.4)	1.37 (34.8)	0.040 (1.0)	14	
25.0	461M25692	2.21 (56.1)	0.90 (22.9)	1.27 (32.3)	0.040 (1.0)	11	1.74 (44.2)	1.07 (27.2)	1.44 (36.6)	0.040 (1.0)	14	
30.0	461M30692	2.21 (56.1)	1.00 (25.4)	1.37 (34.8)	0.040 (1.0)	11	1.74 (44.2)	1.19 (30.2)	1.56 (39.6)	0.040 (1.0)	14	
35.0	461M35692	2.21 (56.1)	1.09 (27.7)	1.46 (37.1)	0.040 (1.0)	11	1.74 (44.2)	1.30 (33.0)	1.67 (42.4)	0.040 (1.0)	14	
40.0	461M40692	2.21 (56.1)	1.18 (30.0)	1.55 (39.4)	0.040 (1.0)	11	1.74 (44.2)	1.40 (35.6)	1.77 (45.0)	0.040 (1.0)	14	
45.0	461M45692	2.21 (56.1)	1.26 (32.0)	1.63 (41.4)	0.040 (1.0)	11						
50.0	461M50692	2.21 (56.1)	1.34 (34.0)	1.71 (43.4)	0.040 (1.0)	11						
55.0	461M55692	2.21 (56.1)	1.41 (35.8)	1.78 (45.2)	0.040 (1.0)	11						

¹ Please refer to Ordering/Part Number page for specific part numbering details.



Type 461M Sizes and Ratings – 400 VDC/200 VAC

Cap (μ F)	Base Part #	Standard Dimensions/Ratings ¹				dV/dt V/ μ sec	Compact Dimensions/Ratings ¹				dV/dt V/ μ sec	
		L MAX	T MAX	H MAX	Wire (d)		L MAX	T MAX	H MAX	Wire (d)		
0.027	461M27394	0.61 (15.5)	0.14 (3.6)	0.24 (6.1)	0.020 (0.5)	42						
0.033	461M33394	0.61 (15.5)	0.16 (4.1)	0.26 (6.6)	0.020 (0.5)	42						
0.036	461M36394	0.61 (15.5)	0.17 (4.3)	0.27 (6.9)	0.020 (0.5)	42						
0.039	461M39394	0.61 (15.5)	0.17 (4.3)	0.27 (6.9)	0.020 (0.5)	42						
0.043	461M43394	0.61 (15.5)	0.18 (4.6)	0.28 (7.1)	0.020 (0.5)	42						
0.047	461M47394	0.61 (15.5)	0.19 (4.8)	0.29 (7.4)	0.020 (0.5)	42						
0.05	461M50394	0.61 (15.5)	0.20 (5.1)	0.30 (7.6)	0.020 (0.5)	42						
0.056	461M56394	0.79 (20.1)	0.15 (3.8)	0.25 (6.4)	0.020 (0.5)	23	0.61 (15.5)	0.21 (5.3)	0.31 (7.9)	0.020 (0.5)	49	
0.062	461M62394	0.79 (20.1)	0.16 (4.1)	0.26 (6.6)	0.020 (0.5)	23	0.61 (15.5)	0.22 (5.6)	0.32 (8.1)	0.020 (0.5)	57	
0.068	461M68394	0.79 (20.1)	0.17 (4.3)	0.27 (6.9)	0.020 (0.5)	23	0.61 (15.5)	0.23 (5.8)	0.33 (8.4)	0.020 (0.5)	65	
0.075	461M75394	0.79 (20.1)	0.18 (4.6)	0.28 (7.1)	0.020 (0.5)	23	0.61 (15.5)	0.25 (6.4)	0.35 (8.9)	0.020 (0.5)	72	
0.082	461M82394	0.79 (20.1)	0.19 (4.8)	0.29 (7.4)	0.020 (0.5)	23	0.61 (15.5)	0.26 (6.6)	0.36 (9.1)	0.020 (0.5)	78	
0.1	461M10494	0.99 (25.1)	0.16 (4.1)	0.28 (7.1)	0.020 (0.5)	16	0.79 (20.1)	0.20 (5.1)	0.32 (8.1)	0.020 (0.5)	25	
0.12	461M12494	0.99 (25.1)	0.17 (4.3)	0.30 (7.6)	0.020 (0.5)	16	0.79 (20.1)	0.22 (5.6)	0.34 (8.6)	0.020 (0.5)	34	
0.15	461M15494	0.99 (25.1)	0.20 (5.1)	0.32 (8.1)	0.020 (0.5)	16	0.79 (20.1)	0.25 (6.4)	0.37 (9.4)	0.020 (0.5)	42	
0.18	461M18494	0.99 (25.1)	0.22 (5.6)	0.34 (8.6)	0.020 (0.5)	22	0.79 (20.1)	0.26 (6.6)	0.41 (10.4)	0.025 (0.6)	48	
0.22	461M22494	0.99 (25.1)	0.24 (6.1)	0.37 (9.4)	0.020 (0.5)	28	0.79 (20.1)	0.29 (7.4)	0.45 (11.4)	0.025 (0.6)	73	
0.25	461M25494	0.99 (25.1)	0.23 (5.8)	0.42 (10.7)	0.020 (0.5)	30	0.79 (20.1)	0.31 (7.9)	0.47 (11.9)	0.025 (0.6)	74	
0.27	461M27494	1.25 (31.8)	0.20 (5.1)	0.39 (9.9)	0.020 (0.5)	18	0.99 (25.1)	0.26 (6.6)	0.41 (10.4)	0.025 (0.6)	32	
0.33	461M33494	1.25 (31.8)	0.23 (5.8)	0.42 (10.7)	0.020 (0.5)	21	0.99 (25.1)	0.28 (7.1)	0.46 (11.7)	0.025 (0.6)	49	
0.39	461M39494	1.25 (31.8)	0.25 (6.4)	0.44 (11.2)	0.020 (0.5)	35	0.99 (25.1)	0.30 (7.6)	0.49 (12.4)	0.025 (0.6)	49	
0.43	461M43494	1.25 (31.8)	0.27 (6.9)	0.45 (11.4)	0.025 (0.6)	36	0.99 (25.1)	0.32 (8.1)	0.51 (13.0)	0.025 (0.6)	49	
0.47	461M47494	1.50 (38.1)	0.26 (6.6)	0.42 (10.7)	0.025 (0.6)	18	0.99 (25.1)	0.34 (8.6)	0.53 (13.5)	0.025 (0.6)	50	
0.5	461M50494	1.50 (38.1)	0.26 (6.6)	0.44 (11.2)	0.025 (0.6)	27	0.99 (25.1)	0.35 (8.9)	0.54 (13.7)	0.032 (0.8)	50	
0.56	461M56494	1.50 (38.1)	0.27 (6.9)	0.46 (11.7)	0.025 (0.6)	28	0.99 (25.1)	0.38 (9.7)	0.56 (14.2)	0.032 (0.8)	50	
0.6	461M60494	1.50 (38.1)	0.28 (7.1)	0.47 (11.9)	0.025 (0.6)	28	0.99 (25.1)	0.39 (9.9)	0.58 (14.7)	0.032 (0.8)	50	
0.68	461M68494	1.74 (44.2)	0.27 (6.9)	0.46 (11.7)	0.025 (0.6)	22	1.25 (31.8)	0.35 (8.9)	0.54 (13.7)	0.032 (0.8)	36	
0.75	461M75494	1.74 (44.2)	0.29 (7.4)	0.47 (11.9)	0.025 (0.6)	23	1.25 (31.8)	0.37 (9.4)	0.56 (14.2)	0.032 (0.8)	37	
0.82	461M82494	1.74 (44.2)	0.30 (7.6)	0.49 (12.4)	0.025 (0.6)	23	1.25 (31.8)	0.36 (9.1)	0.61 (15.5)	0.032 (0.8)	37	
0.9	461M90494	1.74 (44.2)	0.32 (8.1)	0.51 (13.0)	0.025 (0.6)	23	1.25 (31.8)	0.38 (9.7)	0.63 (16.0)	0.032 (0.8)	37	
1.0	461M10594	1.74 (44.2)	0.34 (8.6)	0.52 (13.2)	0.025 (0.6)	23	1.25 (31.8)	0.41 (10.4)	0.66 (16.8)	0.032 (0.8)	37	
1.2	461M12594	1.74 (44.2)	0.38 (9.7)	0.56 (14.2)	0.032 (0.8)	23	1.25 (31.8)	0.46 (11.7)	0.70 (17.8)	0.032 (0.8)	37	
1.5	461M15594	1.74 (44.2)	0.40 (10.2)	0.65 (16.5)	0.032 (0.8)	23	1.25 (31.8)	0.49 (12.4)	0.80 (20.3)	0.032 (0.8)	37	
1.8	461M18594	1.74 (44.2)	0.44 (11.2)	0.69 (17.5)	0.032 (0.8)	23	1.25 (31.8)	0.55 (14.0)	0.86 (21.8)	0.032 (0.8)	37	
2.0	461M20594	1.74 (44.2)	0.47 (11.9)	0.72 (18.3)	0.032 (0.8)	23	1.50 (38.1)	0.50 (12.7)	0.81 (20.6)	0.032 (0.8)	29	
2.2	461M22594	1.74 (44.2)	0.50 (12.7)	0.75 (19.1)	0.032 (0.8)	23	1.50 (38.1)	0.53 (13.5)	0.84 (21.3)	0.032 (0.8)	29	
2.5	461M25594	1.74 (44.2)	0.51 (13.0)	0.82 (20.8)	0.032 (0.8)	23	1.50 (38.1)	0.58 (14.7)	0.88 (22.4)	0.032 (0.8)	29	
2.7	461M27594	1.74 (44.2)	0.53 (13.5)	0.84 (21.3)	0.032 (0.8)	24	1.50 (38.1)	0.60 (15.2)	0.91 (23.1)	0.032 (0.8)	29	
3.0	461M30594	2.21 (56.1)	0.44 (11.2)	0.81 (20.6)	0.032 (0.8)	17	1.74 (44.2)	0.54 (13.7)	0.91 (23.1)	0.032 (0.8)	24	
3.3	461M33594	2.21 (56.1)	0.47 (11.9)	0.84 (21.3)	0.032 (0.8)	17	1.74 (44.2)	0.57 (14.5)	0.94 (23.9)	0.032 (0.8)	24	
3.6	461M36594	2.21 (56.1)	0.50 (12.7)	0.87 (22.1)	0.032 (0.8)	17	1.74 (44.2)	0.60 (15.2)	0.97 (24.6)	0.032 (0.8)	24	
3.9	461M39594	2.21 (56.1)	0.52 (13.2)	0.89 (22.6)	0.032 (0.8)	17	1.74 (44.2)	0.63 (16.0)	1.00 (25.4)	0.040 (1.0)	24	
4.7	461M47594	2.21 (56.1)	0.59 (15.0)	0.96 (24.4)	0.032 (0.8)	17	1.74 (44.2)	0.71 (18.0)	1.08 (27.4)	0.040 (1.0)	24	
5.0	461M50594	2.21 (56.1)	0.61 (15.5)	0.98 (24.9)	0.032 (0.8)	17	1.74 (44.2)	0.74 (18.8)	1.11 (28.2)	0.040 (1.0)	24	
5.6	461M56594	2.21 (56.1)	0.65 (16.5)	1.02 (25.9)	0.040 (1.0)	17	1.74 (44.2)	0.79 (20.1)	1.16 (29.5)	0.040 (1.0)	24	
6.0	461M60594	2.21 (56.1)	0.68 (17.3)	1.05 (26.7)	0.040 (1.0)	17	1.74 (44.2)	0.82 (20.8)	1.19 (30.2)	0.040 (1.0)	24	
6.8	461M68594	2.21 (56.1)	0.73 (18.5)	1.10 (27.9)	0.040 (1.0)	17	1.74 (44.2)	0.88 (22.4)	1.26 (32.0)	0.040 (1.0)	24	
7.0	461M70594	2.21 (56.1)	0.75 (19.1)	1.12 (28.4)	0.040 (1.0)	17	1.74 (44.2)	0.90 (22.9)	1.27 (32.3)	0.040 (1.0)	24	
7.5	461M75594	2.21 (56.1)	0.78 (19.8)	1.15 (29.2)	0.040 (1.0)	17	1.74 (44.2)	0.94 (23.9)	1.31 (33.3)	0.040 (1.0)	24	
8.0	461M80594	2.21 (56.1)	0.81 (20.6)	1.18 (30.0)	0.040 (1.0)	17	1.74 (44.2)	0.97 (24.6)	1.34 (34.0)	0.040 (1.0)	24	
9.0	461M90594	2.21 (56.1)	0.87 (22.1)	1.24 (31.5)	0.040 (1.0)	17	1.74 (44.2)	1.04 (26.4)	1.41 (35.8)	0.040 (1.0)	24	
10.0	461M10694	2.21 (56.1)	0.92 (23.4)	1.29 (32.8)	0.040 (1.0)	17	1.74 (44.2)	1.11 (28.2)	1.48 (37.6)	0.040 (1.0)	24	
12.0	461M12694	2.21 (56.1)	1.03 (26.2)	1.40 (35.6)	0.040 (1.0)	17	1.74 (44.2)	1.23 (31.2)	1.60 (40.6)	0.040 (1.0)	24	
15.0	461M15694	2.21 (56.1)	1.17 (29.7)	1.54 (39.1)	0.040 (1.0)	17	1.74 (44.2)	1.39 (35.3)	1.77 (45.0)	0.040 (1.0)	24	
18.0	461M18694	2.21 (56.1)	1.29 (32.8)	1.66 (42.2)	0.040 (1.0)	17						
20.0	461M20694	2.21 (56.1)	1.37 (34.8)	1.74 (44.2)	0.040 (1.0)	17						

¹ Please refer to Ordering/Part Number page for specific part numbering details.



Type 461M Sizes and Ratings – 630 VDC/220 VAC

Cap (µF)	Base Part #	Standard Dimensions/Ratings ¹				dV/dt V/µsec	Compact Dimensions/Ratings ¹				dV/dt V/µsec	
		L MAX	T MAX	H MAX	Wire (d)		L MAX	T MAX	H MAX	Wire (d)		
0.01	461M10396	0.61 (15.5)	0.15 (3.8)	0.25 (6.4)	0.020 (0.5)	78						
0.012	461M12396	0.61 (15.5)	0.16 (4.1)	0.26 (6.6)	0.020 (0.5)	78						
0.015	461M15396	0.61 (15.5)	0.18 (4.6)	0.28 (7.1)	0.020 (0.5)	78						
0.018	461M18396	0.61 (15.5)	0.20 (5.1)	0.30 (7.6)	0.020 (0.5)	78						
0.022	461M22396	0.79 (20.1)	0.15 (3.8)	0.25 (6.4)	0.020 (0.5)	39	0.61 (15.5)	0.22 (5.6)	0.32 (8.1)	0.020 (0.5)	103	
0.027	461M27396	0.79 (20.1)	0.17 (4.3)	0.27 (6.9)	0.020 (0.5)	39	0.61 (15.5)	0.25 (6.4)	0.35 (8.9)	0.020 (0.5)	132	
0.033	461M33396	0.79 (20.1)	0.19 (4.8)	0.29 (7.4)	0.020 (0.5)	39	0.61 (15.5)	0.27 (6.9)	0.37 (9.4)	0.020 (0.5)	155	
0.036	461M36396	0.79 (20.1)	0.20 (5.1)	0.30 (7.6)	0.020 (0.5)	39	0.61 (15.5)	0.29 (7.4)	0.39 (9.9)	0.020 (0.5)	164	
0.039	461M39396	0.79 (20.1)	0.21 (5.3)	0.31 (7.9)	0.020 (0.5)	42	0.61 (15.5)	0.30 (7.6)	0.40 (10.2)	0.020 (0.5)	171	
0.043	461M43396	0.99 (25.1)	0.17 (4.3)	0.27 (6.9)	0.020 (0.5)	25	0.79 (20.1)	0.22 (5.6)	0.32 (8.1)	0.020 (0.5)	50	
0.047	461M47396	0.99 (25.1)	0.17 (4.3)	0.29 (7.4)	0.020 (0.5)	25	0.79 (20.1)	0.22 (5.6)	0.34 (8.6)	0.020 (0.5)	55	
0.05	461M50396	0.99 (25.1)	0.18 (4.6)	0.30 (7.6)	0.020 (0.5)	25	0.79 (20.1)	0.22 (5.6)	0.35 (8.9)	0.020 (0.5)	59	
0.056	461M56396	0.99 (25.1)	0.19 (4.8)	0.31 (7.9)	0.020 (0.5)	25	0.79 (20.1)	0.24 (6.1)	0.36 (9.1)	0.020 (0.5)	67	
0.062	461M62396	0.99 (25.1)	0.20 (5.1)	0.32 (8.1)	0.020 (0.5)	27	0.79 (20.1)	0.25 (6.4)	0.38 (9.7)	0.020 (0.5)	73	
0.068	461M68396	0.99 (25.1)	0.21 (5.3)	0.33 (8.4)	0.020 (0.5)	32	0.79 (20.1)	0.25 (6.4)	0.41 (10.4)	0.020 (0.5)	77	
0.075	461M75396	0.99 (25.1)	0.22 (5.6)	0.34 (8.6)	0.020 (0.5)	37	0.79 (20.1)	0.27 (6.9)	0.42 (10.7)	0.025 (0.6)	82	
0.082	461M82396	0.99 (25.1)	0.22 (5.6)	0.37 (9.4)	0.020 (0.5)	40	0.79 (20.1)	0.28 (7.1)	0.43 (10.9)	0.025 (0.6)	122	
0.1	461M10496	0.99 (25.1)	0.24 (6.1)	0.40 (10.2)	0.020 (0.5)	48	0.79 (20.1)	0.31 (7.9)	0.47 (11.9)	0.025 (0.6)	123	
0.12	461M12496	1.25 (31.8)	0.22 (5.6)	0.38 (9.7)	0.020 (0.5)	30	0.99 (25.1)	0.27 (6.9)	0.43 (10.9)	0.025 (0.6)	78	
0.15	461M15496	1.25 (31.8)	0.25 (6.4)	0.41 (10.4)	0.020 (0.5)	36	0.99 (25.1)	0.31 (7.9)	0.46 (11.7)	0.025 (0.6)	79	
0.18	461M18496	1.25 (31.8)	0.28 (7.1)	0.44 (11.2)	0.025 (0.6)	56	0.99 (25.1)	0.33 (8.4)	0.51 (13.0)	0.025 (0.6)	80	
0.22	461M22496	1.50 (38.1)	0.28 (7.1)	0.43 (10.9)	0.025 (0.6)	43	0.99 (25.1)	0.37 (9.4)	0.55 (14.0)	0.032 (0.8)	80	
0.25	461M25496	1.50 (38.1)	0.30 (7.6)	0.45 (11.4)	0.025 (0.6)	43	0.99 (25.1)	0.36 (9.1)	0.61 (15.5)	0.032 (0.8)	81	
0.27	461M27496	1.50 (38.1)	0.31 (7.9)	0.47 (11.9)	0.025 (0.6)	43	0.99 (25.1)	0.38 (9.7)	0.63 (16.0)	0.032 (0.8)	81	
0.33	461M33496	1.50 (38.1)	0.33 (8.4)	0.52 (13.2)	0.025 (0.6)	44	0.99 (25.1)	0.43 (10.9)	0.68 (17.3)	0.032 (0.8)	81	
0.39	461M39496	1.74 (44.2)	0.32 (8.1)	0.51 (13.0)	0.025 (0.6)	35	1.25 (31.8)	0.42 (10.7)	0.61 (15.5)	0.032 (0.8)	58	
0.43	461M43496	1.74 (44.2)	0.34 (8.6)	0.53 (13.5)	0.025 (0.6)	35	1.25 (31.8)	0.44 (11.2)	0.63 (16.0)	0.032 (0.8)	58	
0.47	461M47496	1.74 (44.2)	0.33 (8.4)	0.58 (14.7)	0.025 (0.6)	36	1.25 (31.8)	0.44 (11.2)	0.68 (17.3)	0.032 (0.8)	58	
0.5	461M50496	1.74 (44.2)	0.34 (8.6)	0.59 (15.0)	0.025 (0.6)	36	1.25 (31.8)	0.45 (11.4)	0.70 (17.8)	0.032 (0.8)	58	
0.56	461M56496	1.74 (44.2)	0.37 (9.4)	0.62 (15.7)	0.032 (0.8)	36	1.25 (31.8)	0.48 (12.2)	0.73 (18.5)	0.032 (0.8)	59	
0.6	461M60496	1.74 (44.2)	0.38 (9.7)	0.63 (16.0)	0.032 (0.8)	36	1.25 (31.8)	0.48 (12.2)	0.79 (20.1)	0.032 (0.8)	59	
0.68	461M68496	1.74 (44.2)	0.41 (10.4)	0.66 (16.8)	0.032 (0.8)	36	1.25 (31.8)	0.52 (13.2)	0.83 (21.1)	0.032 (0.8)	59	
0.75	461M75496	1.74 (44.2)	0.44 (11.2)	0.68 (17.3)	0.032 (0.8)	36	1.25 (31.8)	0.55 (14.0)	0.86 (21.8)	0.032 (0.8)	59	
0.82	461M82496	1.74 (44.2)	0.43 (10.9)	0.74 (18.8)	0.032 (0.8)	36	1.50 (38.1)	0.49 (12.4)	0.80 (20.3)	0.032 (0.8)	45	
0.9	461M90496	1.74 (44.2)	0.46 (11.7)	0.77 (19.6)	0.032 (0.8)	36	1.50 (38.1)	0.52 (13.2)	0.83 (21.1)	0.032 (0.8)	45	
1.0	461M10596	1.74 (44.2)	0.49 (12.4)	0.80 (20.3)	0.032 (0.8)	36	1.50 (38.1)	0.55 (14.0)	0.86 (21.8)	0.032 (0.8)	45	
1.2	461M12596	1.74 (44.2)	0.54 (13.7)	0.85 (21.6)	0.032 (0.8)	36	1.50 (38.1)	0.62 (15.7)	0.93 (23.6)	0.032 (0.8)	45	
1.5	461M15596	2.21 (56.1)	0.51 (13.0)	0.82 (20.8)	0.032 (0.8)	26	1.74 (44.2)	0.62 (15.7)	0.93 (23.6)	0.032 (0.8)	37	
1.8	461M18596	2.21 (56.1)	0.57 (14.5)	0.88 (22.4)	0.032 (0.8)	26	1.74 (44.2)	0.69 (17.5)	1.00 (25.4)	0.040 (1.0)	37	
2.0	461M20596	2.21 (56.1)	0.58 (14.7)	0.95 (24.1)	0.032 (0.8)	26	1.74 (44.2)	0.71 (18.0)	1.08 (27.4)	0.040 (1.0)	37	
2.2	461M22596	2.21 (56.1)	0.61 (15.5)	0.99 (25.1)	0.032 (0.8)	26	1.74 (44.2)	0.75 (19.1)	1.12 (28.4)	0.040 (1.0)	37	
2.5	461M25596	2.21 (56.1)	0.66 (16.8)	1.04 (26.4)	0.040 (1.0)	26	1.74 (44.2)	0.81 (20.6)	1.18 (30.0)	0.040 (1.0)	37	
2.7	461M27596	2.21 (56.1)	0.70 (17.8)	1.07 (27.2)	0.040 (1.0)	27	1.74 (44.2)	0.84 (21.3)	1.21 (30.7)	0.040 (1.0)	37	
3.0	461M30596	2.21 (56.1)	0.74 (18.8)	1.11 (28.2)	0.040 (1.0)	27	1.74 (44.2)	0.90 (22.9)	1.27 (32.3)	0.040 (1.0)	37	
3.3	461M33596	2.21 (56.1)	0.78 (19.8)	1.16 (29.5)	0.040 (1.0)	27	1.74 (44.2)	0.95 (24.1)	1.32 (33.5)	0.040 (1.0)	37	
3.6	461M36596	2.21 (56.1)	0.83 (21.1)	1.20 (30.5)	0.040 (1.0)	27	1.74 (44.2)	1.00 (25.4)	1.37 (34.8)	0.040 (1.0)	37	
3.9	461M39596	2.21 (56.1)	0.87 (22.1)	1.24 (31.5)	0.040 (1.0)	27	1.74 (44.2)	1.05 (26.7)	1.42 (36.1)	0.040 (1.0)	37	
4.7	461M47596	2.21 (56.1)	0.97 (24.6)	1.34 (34.0)	0.040 (1.0)	27	1.74 (44.2)	1.16 (29.5)	1.54 (39.1)	0.040 (1.0)	37	
5.0	461M50596	2.21 (56.1)	1.00 (25.4)	1.37 (34.8)	0.040 (1.0)	27	1.74 (44.2)	1.21 (30.7)	1.58 (40.1)	0.040 (1.0)	37	
5.6	461M56596	2.21 (56.1)	1.07 (27.2)	1.44 (36.6)	0.040 (1.0)	27	1.74 (44.2)	1.29 (32.8)	1.66 (42.2)	0.040 (1.0)	37	
6.0	461M60596	2.21 (56.1)	1.11 (28.2)	1.48 (37.6)	0.040 (1.0)	27	1.74 (44.2)	1.34 (34.0)	1.71 (43.4)	0.040 (1.0)	37	
6.8	461M68596	2.21 (56.1)	1.20 (30.5)	1.57 (39.9)	0.040 (1.0)	27						
7.0	461M70596	2.21 (56.1)	1.22 (31.0)	1.59 (40.4)	0.040 (1.0)	27						
7.5	461M75596	2.21 (56.1)	1.26 (32.0)	1.64 (41.7)	0.040 (1.0)	27						
8.0	461M80596	2.21 (56.1)	1.31 (33.3)	1.68 (42.7)	0.040 (1.0)	27						
9.0	461M90596	2.21 (56.1)	1.40 (35.6)	1.77 (45.0)	0.040 (1.0)	27						

¹ Please refer to Ordering/Part Number page for specific part numbering details.



Type 461M Sizes and Ratings – 1000 VDC/250 VAC

Cap (μ F)	Base Part #	Standard Dimensions/Ratings ¹				dV/dt V/ μ sec	Compact Dimensions/Ratings ¹				dV/dt V/ μ sec	
		L MAX	T MAX	H MAX	Wire (d)		L MAX	T MAX	H MAX	Wire (d)		
.0047	461M472910	0.61 (15.5)	0.14 (3.6)	0.24 (6.1)	0.020 (0.5)	125						
.0056	461M562910	0.61 (15.5)	0.16 (4.1)	0.25 (6.4)	0.020 (0.5)	125						
.0068	461M682910	0.61 (15.5)	0.17 (4.3)	0.27 (6.9)	0.020 (0.5)	125						
.0075	461M752910	0.61 (15.5)	0.18 (4.6)	0.28 (7.1)	0.020 (0.5)	125						
.0082	461M822910	0.61 (15.5)	0.19 (4.8)	0.29 (7.4)	0.020 (0.5)	125						
.0091	461M912910	0.61 (15.5)	0.20 (5.1)	0.30 (7.6)	0.020 (0.5)	125						
0.01	461M103910	0.79 (20.1)	0.14 (3.6)	0.24 (6.1)	0.020 (0.5)	55	0.61 (15.5)	0.21 (5.3)	0.31 (7.9)	0.020 (0.5)	142	
0.012	461M123910	0.79 (20.1)	0.15 (3.8)	0.25 (6.4)	0.020 (0.5)	55	0.61 (15.5)	0.23 (5.8)	0.33 (8.4)	0.020 (0.5)	187	
0.015	461M153910	0.79 (20.1)	0.17 (4.3)	0.27 (6.9)	0.020 (0.5)	55	0.61 (15.5)	0.26 (6.6)	0.36 (9.1)	0.020 (0.5)	233	
0.018	461M183910	0.99 (25.1)	0.14 (3.6)	0.24 (6.1)	0.020 (0.5)	34	0.79 (20.1)	0.19 (4.8)	0.28 (7.1)	0.020 (0.5)	55	
0.022	461M223910	0.99 (25.1)	0.16 (4.1)	0.26 (6.6)	0.020 (0.5)	34	0.79 (20.1)	0.20 (5.1)	0.32 (8.1)	0.020 (0.5)	55	
0.027	461M273910	0.99 (25.1)	0.18 (4.6)	0.28 (7.1)	0.020 (0.5)	34	0.79 (20.1)	0.22 (5.6)	0.34 (8.6)	0.020 (0.5)	78	
0.033	461M333910	0.99 (25.1)	0.19 (4.8)	0.31 (7.9)	0.020 (0.5)	34	0.79 (20.1)	0.24 (6.1)	0.37 (9.4)	0.020 (0.5)	97	
0.036	461M363910	0.99 (25.1)	0.20 (5.1)	0.32 (8.1)	0.020 (0.5)	34	0.79 (20.1)	0.24 (6.1)	0.40 (10.2)	0.020 (0.5)	102	
0.039	461M393910	0.99 (25.1)	0.20 (5.1)	0.33 (8.4)	0.020 (0.5)	40	0.79 (20.1)	0.25 (6.4)	0.41 (10.4)	0.020 (0.5)	109	
0.043	461M433910	0.99 (25.1)	0.22 (5.6)	0.34 (8.6)	0.020 (0.5)	47	0.79 (20.1)	0.27 (6.9)	0.42 (10.7)	0.025 (0.6)	115	
0.047	461M473910	0.99 (25.1)	0.23 (5.8)	0.35 (8.9)	0.020 (0.5)	52	0.79 (20.1)	0.28 (7.1)	0.43 (10.9)	0.025 (0.6)	171	
0.05	461M503910	0.99 (25.1)	0.23 (5.8)	0.36 (9.1)	0.020 (0.5)	56	0.79 (20.1)	0.29 (7.4)	0.44 (11.2)	0.025 (0.6)	172	
0.056	461M563910	0.99 (25.1)	0.25 (6.4)	0.37 (9.4)	0.020 (0.5)	62	0.79 (20.1)	0.31 (7.9)	0.46 (11.7)	0.025 (0.6)	173	
0.062	461M623910	0.99 (25.1)	0.25 (6.4)	0.40 (10.2)	0.020 (0.5)	66	0.79 (20.1)	0.33 (8.4)	0.48 (12.2)	0.025 (0.6)	174	
0.068	461M683910	1.25 (31.8)	0.21 (5.3)	0.37 (9.4)	0.020 (0.5)	36	0.99 (25.1)	0.26 (6.6)	0.42 (10.7)	0.025 (0.6)	70	
0.075	461M753910	1.25 (31.8)	0.23 (5.8)	0.38 (9.7)	0.020 (0.5)	40	0.99 (25.1)	0.28 (7.1)	0.43 (10.9)	0.025 (0.6)	105	
0.082	461M823910	1.25 (31.8)	0.24 (6.1)	0.39 (9.9)	0.020 (0.5)	44	0.99 (25.1)	0.29 (7.4)	0.45 (11.4)	0.025 (0.6)	106	
0.1	461M104910	1.25 (31.8)	0.25 (6.4)	0.44 (11.2)	0.020 (0.5)	73	0.99 (25.1)	0.31 (7.9)	0.50 (12.7)	0.025 (0.6)	107	
0.12	461M124910	1.25 (31.8)	0.28 (7.1)	0.47 (11.9)	0.025 (0.6)	74	0.99 (25.1)	0.35 (8.9)	0.53 (13.5)	0.025 (0.6)	108	
0.15	461M154910	1.25 (31.8)	0.29 (7.4)	0.54 (13.7)	0.025 (0.6)	75	0.99 (25.1)	0.37 (9.4)	0.61 (15.5)	0.032 (0.8)	108	
0.18	461M184910	1.25 (31.8)	0.33 (8.4)	0.58 (14.7)	0.025 (0.6)	76	0.99 (25.1)	0.41 (10.4)	0.66 (16.8)	0.032 (0.8)	109	
0.22	461M224910	1.50 (38.1)	0.32 (8.1)	0.57 (14.5)	0.025 (0.6)	57	1.25 (31.8)	0.37 (9.4)	0.62 (15.7)	0.032 (0.8)	76	
0.25	461M254910	1.50 (38.1)	0.32 (8.1)	0.63 (16.0)	0.025 (0.6)	57	1.25 (31.8)	0.38 (9.7)	0.69 (17.5)	0.032 (0.8)	77	
0.27	461M274910	1.50 (38.1)	0.34 (8.6)	0.65 (16.5)	0.025 (0.6)	57	1.25 (31.8)	0.40 (10.2)	0.71 (18.0)	0.032 (0.8)	77	
0.33	461M334910	1.50 (38.1)	0.38 (9.7)	0.69 (17.5)	0.032 (0.8)	58	1.25 (31.8)	0.45 (11.4)	0.76 (19.3)	0.032 (0.8)	77	
0.39	461M394910	1.50 (38.1)	0.42 (10.7)	0.73 (18.5)	0.032 (0.8)	58	1.25 (31.8)	0.50 (12.7)	0.81 (20.6)	0.032 (0.8)	77	
0.43	461M434910	1.50 (38.1)	0.45 (11.4)	0.76 (19.3)	0.032 (0.8)	58	1.25 (31.8)	0.53 (13.5)	0.84 (21.3)	0.032 (0.8)	77	
0.47	461M474910	1.50 (38.1)	0.47 (11.9)	0.78 (19.8)	0.032 (0.8)	58	1.25 (31.8)	0.56 (14.2)	0.87 (22.1)	0.032 (0.8)	78	
0.5	461M504910	1.74 (44.2)	0.43 (10.9)	0.74 (18.8)	0.032 (0.8)	47	1.50 (38.1)	0.49 (12.4)	0.80 (20.3)	0.032 (0.8)	58	
0.56	461M564910	1.74 (44.2)	0.46 (11.7)	0.77 (19.6)	0.032 (0.8)	47	1.50 (38.1)	0.52 (13.2)	0.83 (21.1)	0.032 (0.8)	58	
0.6	461M604910	1.74 (44.2)	0.48 (12.2)	0.79 (20.1)	0.032 (0.8)	47	1.50 (38.1)	0.55 (14.0)	0.85 (21.6)	0.032 (0.8)	59	
0.68	461M684910	1.74 (44.2)	0.52 (13.2)	0.82 (20.8)	0.032 (0.8)	47	1.50 (38.1)	0.59 (15.0)	0.90 (22.9)	0.032 (0.8)	59	
0.75	461M754910	1.74 (44.2)	0.55 (14.0)	0.86 (21.8)	0.032 (0.8)	47	1.50 (38.1)	0.62 (15.7)	0.93 (23.6)	0.032 (0.8)	59	
0.82	461M824910	1.74 (44.2)	0.58 (14.7)	0.89 (22.6)	0.032 (0.8)	47	1.50 (38.1)	0.66 (16.8)	0.97 (24.6)	0.040 (1.0)	59	
0.9	461M904910	1.74 (44.2)	0.61 (15.5)	0.92 (23.4)	0.032 (0.8)	47	1.50 (38.1)	0.69 (17.5)	1.00 (25.4)	0.040 (1.0)	59	
1.0	461M105910	1.74 (44.2)	0.62 (15.7)	0.99 (25.1)	0.032 (0.8)	47	1.50 (38.1)	0.74 (18.8)	1.05 (26.7)	0.040 (1.0)	59	
1.2	461M125910	2.21 (56.1)	0.56 (14.2)	0.94 (23.9)	0.032 (0.8)	34	1.74 (44.2)	0.69 (17.5)	1.06 (26.9)	0.040 (1.0)	47	
1.5	461M155910	2.21 (56.1)	0.65 (16.5)	1.02 (25.9)	0.040 (1.0)	34	1.74 (44.2)	0.79 (20.1)	1.16 (29.5)	0.040 (1.0)	47	
1.8	461M185910	2.21 (56.1)	0.72 (18.3)	1.09 (27.7)	0.040 (1.0)	34	1.74 (44.2)	0.88 (22.4)	1.25 (31.8)	0.040 (1.0)	47	
2.0	461M205910	2.21 (56.1)	0.77 (19.6)	1.14 (29.0)	0.040 (1.0)	34	1.74 (44.2)	0.94 (23.9)	1.31 (33.3)	0.040 (1.0)	47	
2.2	461M225910	2.21 (56.1)	0.81 (20.6)	1.19 (30.2)	0.040 (1.0)	34	1.74 (44.2)	0.99 (25.1)	1.36 (34.5)	0.040 (1.0)	47	
2.5	461M255910	2.21 (56.1)	0.88 (22.4)	1.25 (31.8)	0.040 (1.0)	34	1.74 (44.2)	1.07 (27.2)	1.44 (36.6)	0.040 (1.0)	47	
2.7	461M275910	2.21 (56.1)	0.92 (23.4)	1.29 (32.8)	0.040 (1.0)	34	1.74 (44.2)	1.11 (28.2)	1.48 (37.6)	0.040 (1.0)	48	
3.0	461M305910	2.21 (56.1)	0.98 (24.9)	1.35 (34.3)	0.040 (1.0)	34	1.74 (44.2)	1.18 (30.0)	1.55 (39.4)	0.040 (1.0)	48	
3.3	461M335910	2.21 (56.1)	1.03 (26.2)	1.40 (35.6)	0.040 (1.0)	34	1.74 (44.2)	1.25 (31.8)	1.62 (41.1)	0.040 (1.0)	48	
3.6	461M365910	2.21 (56.1)	1.09 (27.7)	1.46 (37.1)	0.040 (1.0)	34	1.74 (44.2)	1.31 (33.3)	1.68 (42.7)	0.040 (1.0)	48	
3.9	461M395910	2.21 (56.1)	1.14 (29.0)	1.51 (38.4)	0.040 (1.0)	34	1.74 (44.2)	1.37 (34.8)	1.74 (44.2)	0.040 (1.0)	48	
4.7	461M475910	2.21 (56.1)	1.26 (32.0)	1.64 (41.7)	0.040 (1.0)	34						
5.0	461M505910	2.21 (56.1)	1.31 (33.3)	1.68 (42.7)	0.040 (1.0)	34						

¹ Please refer to Ordering/Part Number page for specific part numbering details.



AC Voltage Application Notes

Many requests are received regarding the permissible AC voltage/frequency capability of metallized polyester film capacitors, because they are smaller and appear to have a temperature advantage when compared with metallized polypropylene capacitors of similar capacitance and voltage rating. It has also been asked why we do not publish these curves in our catalog as do some other capacitor suppliers. The information below will help to address this question. This information is not presented as a detailed analysis, but rather to highlight some of the issues that need to be considered when using metallized polyester film capacitors in AC applications.

There is no such thing as a "perfect" film capacitor dielectric. All have their unique "pros" and "cons". As an example, polypropylene film has many advantages: it behaves very uniformly and predictably over temperature and frequency allowing suggested operating limits to be calculated and plotted. It has very low dielectric losses. Its voltage withstand per unit thickness is the highest of all capacitor films. However, polypropylene has a maximum temperature limit of +105°C. It also has a low dielectric constant, which results in a larger physical size for a given capacitance and voltage rating when compared with most other film dielectrics. Therefore the reduced size and perceived temperature advantage of metallized polyester film capacitors are strong motivators to consider their use.

For metallized polypropylene film capacitors the increase in dissipation factor associated with increasing frequency is determined by the ohmic losses of the lead wires and the metallization alloy deposited on the film. The dielectric losses are very small and do not change. This behavior lends itself to spreadsheet analysis to create performance curves that conservatively represent real behavior in applications. Defining the capacitor application thermal environment enables scaling these performance curves as required.

Defining the voltage/frequency capability of polyester film capacitors is particularly more complicated because:

- **Polyester film dielectric losses are usually more than an order of magnitude higher than for polypropylene film, and**
- **Polyester film losses are a very strong function of frequency and temperature.**

These film losses are high enough to completely dominate ohmic losses in polyester capacitors. More important, the DF behavior with temperature and with frequency are transcendental functions that cannot be modeled easily with a spreadsheet.

If you refer to the general specifications page (page 3), you will find at the lower right a typical Dissipation Factor vs. Temperature graph for polyester film at 1KHz. Note that as you move above +50°C the DF starts to climb. For large enough AC voltages the increasing losses with temperature can result in thermal runaway. It can also be seen that for AC applications the +125°C internal hot spot temperature limit is extremely misleading. It is very difficult to use the temperature range between +85°C and +125°C for AC applications because the allowable AC voltage drops so fast with increasing temperature!

The DF vs. Temperature behavior changes drastically with frequency. Upon request we can provide graphs of DF vs. Temperature for several frequencies, and describe an iterative method for providing a "starting point" for polyester capacitor performance evaluation in an AC application. It will be left in the hands of the product design engineer to do the temperature rise tests under worst case electrical and thermal conditions to verify that a proposed polyester capacitor is indeed suitable for that specific application.

Since a very small ambient temperature change can result in a large increase in DF, the polyester capacitor behavior can be VERY sensitive to the application thermal environment. That environment can be so variable that in our opinion publishing generally applicable performance curves would be very misleading!

However we also realize that despite the information presented above there are many AC applications where polyester capacitors represent the best solution from a size, cost, and electrical performance perspective.

We hope you find this information useful in your design process, and we welcome technical discussions on the suitability of any type of film capacitor for your application.



Pulse Application Notes

The purpose of the information below is to highlight factors that should be understood and considered when evaluating metallized polyester film capacitors for pulse applications. We will start with some general information. First,

A "pulse application" will be defined as any application where very substantial and rapid voltage changes occur across the capacitor at a relatively low duty ratio.

It is also necessary to describe the construction (valid for other suppliers as well) of metallized film capacitors. To begin plain dielectric film is placed in a vacuum and a thin layer of metal alloy is deposited on it. The metallized film is wound into a cylinder so that a metallized edge extends on each end of the wound capacitor section. Both ends are then sprayed with small droplets of molten metal that adhere along, and make contact with, the metallization on the film. The wire lead is welded to this end spray. The end spray process does not result in a uniform connection to the metallization and there is some damage and connection loss at the edge of the film from the heat contained in the metal droplets.

During application the capacitor current must be shared by all the minute connection points of the metal end spray to the metallization of the film. Since the actual contacts between the metal end spray and the metallization are relatively few and tiny, and the contact is made to a very thin layer of metallization, the current density at each contact is enormous. If the peak current rises past a certain point the metallization vaporizes adjacent to the connections with the highest current density. Since these connection points are now gone, the remaining connection points must carry more current. After a finite number of pulses the capacitor becomes an open circuit.

Therefore when metallized film capacitors are used in pulse applications the overriding concern is the peak current during a voltage transition.

Because it is very difficult to measure fast current pulses directly, maximum pulse current is usually specified by dV/dt of voltage waveforms across the capacitor. $I = C * dV/dt$. There are several factors that determine pulse current capability. To begin with, as the diameter of a unit increases so do the number of connection points between the end spray and film metallization. Thus, for the same capacitance and voltage rating, a "short, fat" [rather than a "long, skinny"] capacitor will have better pulse current capability. The longer, thinner designs are also prone to more process damage explaining why in general very small diameter metallized capacitors have VERY low dV/dt ratings!

In addition, if a proposed capacitor application falls within the maximum dV/dt specified then the application must be checked to ensure the power dissipation [temperature rise] is within the allowable limit. For this purpose it is useful to consider each voltage transition as $\frac{1}{2}$ cycle of a cosine waveform. The period would be defined by "mentally fitting" the cosine wave to the actual rise/fall time. Determine the frequency by doubling the peak-to-peak time observed from the cosine approximation. Although appearing to be a loose method to use for analysis, it produces surprisingly useful results when compared to behavior in an application. This method of analysis is applicable to any kind of capacitor used for a pulse application. Contact us for the analysis details.

To avoid reliability issues in any application the total voltage transition between the most positive and negative peak [including ringing] over one waveform period should not exceed 2.828 times the rated AC voltage. In addition, the highest voltage peak across the capacitor should not exceed the DC voltage rating.

Also of interest is the fact that metallized polyester film capacitors have higher dV/dt ratings than comparable metallized polypropylene because the film does not sustain as much damage by the hot metal end spray or the heat generated at lead welding. For pulse applications with very low duty ratios and slow repetition rates they may be the best choice. However, because polyester dielectric loss is so high they are not suitable for large voltage swings at high repetition rate applications.

If our standard capacitor dV/dt ratings do not meet the needs of your application please contact us. There are several options available to substantially improve the allowable dV/dt .

SBE is very conscious of maintaining metallized film capacitor pulse capability. Every lot is sample checked at four times the rated dV/dt for 1000 pulses [Exceptions do exist]. We encourage you to contact us to further discuss your pulse application to assure you specify the *right* part!



Film Capacitor Terminology

SB Electronics designs and manufactures capacitors that can be expected to outlast the equipment in which they are installed while operating continuously at the catalog defined maximum limits. Our goal is to define application constraints as clearly as possible. *SB capacitors are designed for continuous operation within the specified ratings.*

Breakdown Voltage

The applied voltage at which a dielectric no longer behaves as an electrical insulator.

Capacitive Reactance (Xc)

Reactance is the loss free opposition to the flow for an alternating current, expressed in ohms. Current flow through this reactance does not dissipate heat as it would through a resistance of equal value.

Corona Discharge (Partial)

A small but locally intense electrical discharge that injects charge into the insulating film adjacent to edges of foil/metallization or a location where air is trapped between foil/metallization and the film. The discharge is caused by a voltage gradient large enough to ionize molecules in either the film or small air pockets. Each discharge does some small but cumulative damage to the film. Corona is an important consideration for AC and/or pulse applications where the cumulative damage can rapidly accrue and cause dielectric failure. For film/foil parts this will result in a short circuit. For capacitors employing metallized film the “clearing” around the dielectric failure sites results in progressive capacitance loss. (also refer to dV/dt)

Corona Inception Voltage (CIV)

The peak-to-peak voltage at which corona discharge begins, also known as the Corona Start Voltage [CSV]. It is traditionally expressed as the RMS value of a sine wave with the above peak-to-peak value. (Occasionally seen as Corona Offset Voltage, where it is expressed as a peak-to-peak value.)

DC Leakage Current

Undesired current flow through a capacitor resulting from an applied constant voltage. Film/foil capacitor leakage current is extremely low [Insulation resistance is typically greater than 1E6 Megohms for polypropylene film at room temperature].

DC Voltage Rating

Also known as DC working voltage [DCWV]. The maximum continuous voltage that the capacitor can withstand without expectation of failure during the life of an application. This voltage is reduced at the upper end of the temperature range for each dielectric type.

Dielectric Absorption

Quantifies the percent charge stored in a capacitor dielectric [rather than on the foil surfaces] which cannot be removed quickly. If the voltage across a charged capacitor is brought to zero for a short time, the capacitor will appear to “self recharge” slightly after the discharge circuit is opened. Dielectric absorption can be approximated by the ratio of the equilibrium value “self recharge” voltage to the voltage before discharge. This is an important parameter for “sample and hold” applications. Specific procedures exist to more precisely quantify dielectric absorption. We encourage you to contact us with your specific application requirements.

Dielectric Constant (relative permittivity)

The ratio of capacitance for a given dielectric to the capacitance of the same geometry with vacuum as the dielectric.

Dielectric Strength

The ratio of the breakdown voltage to the dielectric thickness. Refers to an average value. Usually expressed at room temperature. Dielectric strength falls at the upper temperature range for each dielectric, requiring a corresponding reduction in DC voltage rating.



Film Capacitor Terminology

Dissipation Factor (DF or Tangent Delta)

The ratio of the sum of all loss phenomena (dielectric and resistive) to capacitive reactance, usually expressed as a percent. It is also the ratio of the current in phase with the applied voltage to the reactive current. DF must be given at a specific frequency to be meaningful. DF is an industry standard for comparing capacitor quality. Lower DF indicates less power dissipated under otherwise identical conditions.

dV/dt (pulse rise time)

The maximum guaranteed repetitive rate of voltage change [slew rate] a capacitor can withstand without damage during the lifetime of an application, expressed in Volts/ μ sec or KV/ μ sec. dV/dt also expresses current pulse capability without requiring a nearly impossible pulse current measurement. Pulse current is only an issue for metallized capacitors where pulse currents above the rated value can destroy the connection to the metallization. With leads welded directly to extended foil, film/foil capacitor dV/dt is only limited by corona inception [AC voltage rating] and application circuit inductance. SBE dV/dt ratings are provided to assure capacitors are NEVER operated in corona to assure highest possible reliability in pulse applications. For special applications where the total number of discharges over a product lifetime is low and predictable, film/foil capacitors can be operated at a much higher dV/dt.

ESR (Equivalent Series Resistance)

A mathematical construct [expressed in ohms] that allows ALL capacitor losses at a single specific frequency to be expressed as a single series resistance. It allows capacitor heating to be easily calculated if DF and the sine wave RMS current is known. ESR can be used to compare capacitor quality if frequency and capacitance are the same. ESR CANNOT be used to determine losses for a non-sine arbitrary waveform current [even if the true RMS current is known] because arbitrary waveforms contain 2 or more harmonic frequencies. $ESR = DF * \text{Capacitive Reactance}$

Film/Foil Capacitor (Extended Foil Design)

Film and discrete foils are utilized rather than metallized film. This allows the leads to be welded directly to the extended foil. This method of lead attachment creates a highly reliable connection resulting in lowest possible DF/ESR. It also allows highly reliable operation at extremely high pulse currents.

Metallized Film Capacitor

Metallized film is used rather than film and separate metal foils. Electrical connection to the metallized film is made with a layer of molten metal droplets sprayed on each end of the capacitor, with lead wires welded to this "end spray". The connection of the metallized film to the end spray is not continuous; small metal particles contact the metallized layer at discrete locations. There is more resistance from this connection than for the foil/wire weld in a film/foil capacitor, resulting in higher DF and ESR. The current density at each contact point between the end spray and metallized film is high, and this connection is subject to deterioration and failure if pulse currents are excessive [results in lower dV/dt ratings]. Unlike a film/foil capacitor, dielectric breakdown does not result in capacitor failure (see "self healing") so metallized capacitors can be made with thinner film than required for film/foil. This, along with removal of the foil, allows smaller size for given capacitance and voltage ratings.

Self-healing

For capacitors made with metallized film, self-healing or "clearing" removes a fault or short circuit in the dielectric film by vaporizing [from high current density] the metallization near the defect. The metallization is so thin that negligible film damage is done during the clearing process. The vaporized metal oxidizes over time, aiding in the isolation of a fault area.

Skin Effect

The tendency for AC current to flow on the outside of conductors at high frequency. This is caused by the conductor resisting the rapid internal magnetic field changes created by the current. This phenomenon causes higher conduction losses than one would otherwise expect based on material and cross section area, and is a major contributor to the rise in capacitor DF at higher frequencies seen in even the best film/foil polypropylene dielectric capacitors.



SBE designs and manufactures a wide variety of Film Capacitors. Please contact us today for additional details!

Radial Lead Film Capacitors, Orange Drop®

POLYPROPYLENE – FILM/FOIL

Series	Capacitance	DC Voltage	AC Voltage	Features
715P	.001 to .47 μ F	100 to 2000	70 to 500	Tolerance to \pm 1%, excellent Polystyrene sub.
716P	.001 to 1.0 μ F	100 to 2000	70 to 500	Solid copper leads, high performance
716P High Volt.	.00022 to .033 μ F	1000 to 2000	450 to 500	Compact size, extremely low D.F.
715P/717P	.00047 to .015 μ F	1800 to 2000	800 to 1000	dV/dt to 104 KV/ μ sec, tolerances to \pm 1%
773P	.001 to .01 μ F	1600	700 to 750	Ideal for demanding ballast applications
778P/779P	.00047 to .033 μ F	630	400	Peak current over 450 Amps, low ESR

POLYPROPYLENE – METALLIZED

725M	.01 to 4.7 μ F	160 to 630	100 to 250	Compact size, low ESR/ESL
727M	.001 to 2.2 μ F	400 to 2000	300 to 600	AC applications
757M	.001 to .01 μ F	1600	700	High AC voltage for electronic ballast

POLYESTER – FILM/FOIL

225P	.001 to 1.0 μ F	100 to 600	70 to 200	Over 40 years of proven reliability
418P	.001 to 1.0 μ F	100 to 1000	70 to 200	High peak current, temp rating to +125°C

POLYESTER – METALLIZED

425M	.012 to 12.0 μ F	100 to 630	63 to 250	Compact size, various lead spacings
427M	.01 to 2.2 μ F	up to 1000	up to 480	AC applications

R-C NETWORKS

Series	Cap/Resistor	DC Voltage	AC Voltage	Features
288P	.1/.22/.47 μ F 47/100/470 Ohm	400	250	Metallized Polyester Film Cap. 1/2 watt carbon comp resistor
298P	.047/.1 μ F 47/100/470 Ohm	500	330	Polyester Film/Foil Cap. 1/2 watt carbon comp resistor

Axial Lead Film Capacitors

POLYPROPYLENE – METALLIZED

Series	Capacitance	DC Voltage	AC Voltage	Features
760M/761M	.01 to 65.0 μ F	160 to 630	100 to 250	High Power
762M/763M	.01 to 2.2 μ F	up to 2000	up to 600	AC applications

POLYPROPYLENE – FILM/FOIL

770P	.00047 to .68 μ F	100 to 600	70 to 200	Excellent capacitance stability
------	-----------------------	------------	-----------	---------------------------------

POLYESTER – METALLIZED

460M/461M	.0047 to 100.0 μ F	63 to 1000	40 to 250	Various sizes, wide range of cap values
462M/463M	.01 to 2.2 μ F	up to 1000	up to 480	AC applications

POLYESTER – FILM/FOIL

192P Pacer®	.0001 to .39 μ F	80 to 600	55 to 200	Small size, available on Tape & Reel
-------------	----------------------	-----------	-----------	--------------------------------------

Orange Drop® and Pacer® are registered trademarks of SB Electronics, Inc.