

ELECTRON PRODUCTS INC.

POLYSTYRENE AND FOIL CAPACITORS

ENGINEERING DATA SHEET

SERIES **X**

ENVIRONMENTAL DATA

APPLICATIONS

Series X Polystyrene capacitors have superior electrical properties. They are dry-section, non-polar, non-inductive wound capacitors with low Dissipation Factor, low Dielectric Absorption, high Insulation Resistance and a low Temperature Coefficient.

Series X Capacitors come in several styles: Oval Wrap & Fill; Round Wrap & Fill (C Style); Axial Epoxy Case (E Style); Radial Epoxy Case (2E Style); Rectangular Hermetically Sealed (G Style); Round Hermetically Sealed (L Style). They are available in several sizes including Regular as well as custom sizes to meet specific customer requirements.

Contact our Engineering Department for special sizes, configurations, capacitance values and AC applications with Anti-Corona construction at all frequencies. Custom metal enclosures are available. Custom designed Feed Through capacitors (Q Style) are also available for filter applications to specific requirements.

OPERATING TEMPERATURE RANGE

Range: -55°C to +85°C with voltage derating, 100% of listed voltage rating from -55°C to +65°C, derate linearly to 60% of the listed voltage rating at +85°C.

LIFE TEST

Series X capacitors shall be capable of withstanding a test of 250 hours at 85°C and 140% of the DC derated voltage. The voltage shall be applied to each capacitor through its individual current-limiting resistor as determined from the formula $R = 0.025/C$, where C is the nominal capacitance in farads and R is in ohms. The test procedures shall be in accordance with MIL-C-19978, except as noted herein. Not more than one failure in twelve shall be permitted. Any one of the following shall be considered a failure.

- a. A change in capacitance of more than 6% from its initial value.
- b. An increase in Dissipation Factor to a value greater than the initial acceptance limit.
- c. A decrease in Insulation Resistance to a value less than 60% of the acceptance limit for 25°C.
- d. A permanent short or open.

VIBRATION

Series X capacitors shall be capable of withstanding a vibration test in accordance with MIL-STD-202, Method 201. The following details and exceptions shall apply:

- a. **Mounting.** The capacitor body shall be rigidly mounted by the entire body length to the vibration test fixture. The leads shall be soldered to rigidly supported terminals and so spaced that the length of each lead from the capacitor is $1/2 \pm 1/8$ inch from the edge of the supporting terminal.
- b. **Measurement during Vibration.** During the last cycle in each direction, an electrical measurement shall be made to detect intermittent contacts or open or short circuiting.
- c. **Examination After Vibration.** Capacitors shall be visibly examined for evidence of mechanical damage.

MOISTURE RESISTANCE

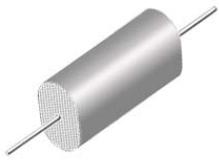
Series X capacitor Styles G and L (hermetically sealed in metal containers) shall be capable of withstanding the moisture resistance, humidity, and temperature and immersion cycling or MIL-C-19978. Styles E and 2E (epoxy encased) and Style wrap & fill capacitors are not intended for exposure to high humidity conditions over extended periods of time.

TERMINAL STRENGTH

Series X capacitors utilize tin-plated, copper-clad steel wire terminals which shall be capable of withstanding the following test without mechanical damage to the capacitor or terminals:

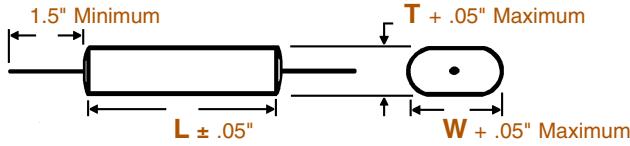
- a. **Pull Test.** The capacitor shall withstand a steady pull of 5 pounds axially to the leads for 1 minute.
- b. **Bend Test.** The wire lead terminals shall be bent at a point of 1/4 inch from the body of the capacitor, first 90 degrees in one direction, then back to the original position, and then 90 degrees in the opposite direction.

POLYSTYRENE AND FOIL WRAP AND FILL, OVAL AXIAL LEAD CAPACITORS



X
POLYSTYRENE & FOIL
WRAP & FILL, OVAL
REGULAR SERIES

DIMENSIONS See tables for specific **T**, **W**, **L** values.



WIRE SIZE (Length 1.5" Minimum)

BODY LENGTH (L)	WIRE SIZE	
	AWG No.	Diameter
≤ 0.71"	24	0.020"
> 0.71" ≤ 1.25"	22	0.025"
> 1.25"	20	0.032"

ORDERING DESCRIPTION

Capacitor, fixed: Polystyrene dielectric; extended foil construction; tin-plated copper-clad steel wire axial leads; encased in skin-tight plastic wrap with epoxy end fill.

APPLICATION NOTES

Wrap & Fill capacitors are not intended for exposure to high humidity conditions over extended periods of time. For stringent environmental conditions, Wrap & Fill capacitors should be used in encapsulated or hermetically sealed circuitry.

SELECTION AND ORDERING TABLES Select voltage rating, capacitance and tolerance, read Part Number to the right.

MFD	50VDC 40vAC			100VDC 70vAC			200VDC 120vAC			400VDC 160vAC		
RATING	T	W	L	PART #	T	W	L	PART #	T	W	L	PART #
	+ .05"	+ .05"	± .05"		+ .05"	+ .05"	± .05"		+ .05"	+ .05"	± .05"	
.001	.12	.20	.58	X.5-102E	.12	.20	.58	X1-102E	.12	.20	.58	X2-102E
.0012	.12	.20	.58	X.5-122E	.12	.20	.58	X1-122E	.12	.20	.58	X4-122E
.0015	.12	.20	.58	X.5-152E	.12	.20	.58	X1-152E	.12	.20	.58	X4-152E
.0018	.12	.20	.58	X.5-182E	.12	.20	.58	X1-182E	.12	.20	.58	X4-182E
.0022	.12	.20	.58	X.5-222E	.12	.20	.58	X1-222E	.12	.20	.58	X4-222E
.0027	.12	.20	.58	X.5-272E	.12	.20	.58	X1-272E	.12	.20	.58	X4-272E
.0033	.12	.20	.58	X.5-332E	.12	.20	.58	X1-332E	.14	.23	.58	X2-332E
.0039	.12	.20	.58	X.5-392E	.12	.20	.58	X1-392E	.16	.22	.58	X2-392E
.0047	.12	.20	.58	X.5-472E	.12	.20	.58	X1-472E	.18	.27	.58	X2-472E
.0056	.12	.20	.58	X.5-562E	.12	.20	.58	X1-562E	.19	.29	.58	X2-562E
.0068	.12	.20	.58	X.5-682E	.13	.21	.58	X1-682E	.14	.25	.71	X2-682E
.0082	.12	.20	.58	X.5-822E	.17	.25	.58	X1-822E	.16	.27	.71	X2-822E
.01	.12	.21	.58	X.5-103E	.18	.27	.58	X1-103E	.19	.29	.71	X2-103E
.012	.15	.23	.58	X.5-123E	.15	.24	.71	X1-123E	.21	.32	.71	X2-123E
.015	.17	.25	.58	X.5-153E	.16	.29	.71	X1-153E	.23	.35	.71	X2-153E
.018	.18	.27	.58	X.5-183E	.19	.32	.71	X1-183E	.21	.34	.84	X2-183E
.022	.15	.28	.71	X.5-223E	.20	.34	.71	X1-223E	.23	.37	.84	X2-223E
.027	.16	.29	.71	X.5-273E	.23	.36	.71	X1-273E	.23	.35	.98	X2-273E
.033	.19	.32	.71	X.5-333E	.25	.38	.71	X1-333E	.25	.38	.98	X2-333E
.039	.16	.28	.84	X.5-393E	.22	.34	.84	X1-393E	.27	.40	.98	X2-393E
.047	.17	.30	.84	X.5-473E	.24	.35	.84	X1-473E	.32	.45	.98	X2-473E
.056	.19	.31	.84	X.5-563E	.24	.34	.98	X1-563E	.34	.49	.98	X2-563E
.068	.22	.34	.84	X.5-683E	.25	.38	.98	X1-683E	.30	.44	1.25	X2-683E
.082	.24	.35	.84	X.5-823E	.28	.40	.98	X1-823E	.34	.47	1.25	X2-823E
.10	.27	.36	.84	X.5-104E	.31	.43	.98	X1-104E	.37	.50	1.25	X2-104E
.12	.30	.39	.84	X.5-124E	.29	.42	1.25	X1-124E	.41	.54	1.25	X2-124E
.15	.34	.46	.84	X.5-154E	.33	.44	1.25	X1-154E	.47	.59	1.25	X2-154E
.18	.35	.47	.98	X.5-184E	.36	.47	1.25	X1-184E	.45	.58	1.50	X2-184E
.22	.37	.54	.98	X.5-224E	.40	.51	1.25	X1-224E	.50	.64	1.50	X2-224E
.27	.42	.58	.98	X.5-274E	.46	.59	1.25	X1-274E	.48	.59	1.75	X2-274E
.33	.46	.61	.98	X.5-334E	.51	.64	1.25	X1-334E	.52	.64	1.75	X2-334E
.39	.38	.55	1.25	X.5-394E	.47	.59	1.50	X1-394E	.57	.70	1.75	X2-394E
.47	.43	.58	1.25	X.5-474E	.44	.57	1.75	X1-474E	.64	.76	1.75	X2-474E
.56	.47	.60	1.75	X.5-564E	.47	.60	1.75	X1-564E	.68	.82	1.75	X2-564E
.68	.56	.69	1.75	X.5-684E	.56	.69	1.75	X1-684E	.76	.88	1.75	X2-684E
.82	.62	.72	1.75	X.5-824E	.62	.72	1.75	X1-824E				
1.0	.70	.81	1.75	X.5-105E	.70	.81	1.75	X1-105E				
1.5	.70	.85	2.00	X.5-155E	.70	.85	2.00	X1-155E				

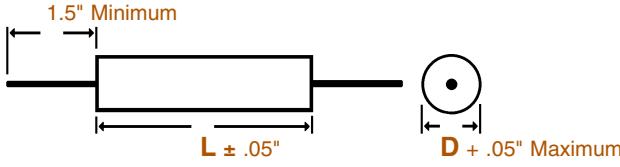
Note: Replace the last digit **E** with the desired tolerance code from the tolerance table. For an in-between value use the next larger value's dimensions. Custom sizes are readily available. All dimensions are in inches. All +.05" dimension tolerances are Maximum.

POLYSTYRENE AND FOIL WRAP AND FILL, ROUND AXIAL LEAD CAPACITORS



XC
POLYSTYRENE & FOIL
WRAP & FILL, ROUND
REGULAR SERIES

DIMENSIONS See tables for specific **D**, **L** values.



WIRE SIZE (Length 1.5" Minimum)

BODY LENGTH (L)	WIRE SIZE	
	AWG No.	Diameter
≤ 0.71"	24	0.020"
> 0.71" ≤ 1.25"	22	0.025"
> 1.25"	20	0.032"

ORDERING DESCRIPTION

Capacitor, fixed: Polystyrene dielectric; extended foil construction; tin-plated copper-clad steel wire axial leads; encased in skin-tight plastic wrap with epoxy end fill.

APPLICATION NOTES

Wrap & Fill capacitors are not intended for exposure to high humidity conditions over extended periods of time. For stringent environmental conditions, Wrap & Fill capacitors should be used in encapsulated or hermetically sealed circuitry.

SELECTION AND ORDERING TABLES Select voltage rating, capacitance and tolerance, read Part Number to the right.

MFD	50VDC 40vAC			100VDC 70vAC			200VDC 120vAC			400VDC 160vAC		
RATING	D	L	PART #	D	L	PART #	D	L	PART #	D	L	PART #
	+ .05"	± .05"		+ .05"	± .05"		+ .05"	± .05"		+ .05"	± .05"	
.001	.15	.58	XC.5-102E	.15	.58	XC1-102E	.15	.58	XC2-102E	.15	.58	XC4-102E
.0012	.15	.58	XC.5-122E	.15	.58	XC1-122E	.15	.58	XC2-122E	.15	.58	XC4-122E
.0015	.15	.58	XC.5-152E	.15	.58	XC1-152E	.15	.58	XC2-152E	.15	.58	XC4-152E
.0018	.15	.58	XC.5-182E	.15	.58	XC1-182E	.15	.58	XC2-182E	.17	.58	XC4-182E
.0022	.15	.58	XC.5-222E	.15	.58	XC1-222E	.16	.58	XC2-222E	.19	.58	XC4-222E
.0027	.15	.58	XC.5-272E	.15	.58	XC1-272E	.17	.58	XC2-272E	.21	.58	XC4-272E
.0033	.15	.58	XC.5-332E	.15	.58	XC1-332E	.18	.58	XC2-332E	.19	.71	XC4-332E
.0039	.15	.58	XC.5-392E	.15	.58	XC1-392E	.19	.58	XC2-392E	.20	.71	XC4-392E
.0047	.15	.58	XC.5-472E	.16	.58	XC1-472E	.21	.58	XC2-472E	.22	.71	XC4-472E
.0056	.16	.58	XC.5-562E	.17	.58	XC1-562E	.23	.58	XC2-562E	.24	.71	XC4-562E
.0068	.17	.58	XC.5-682E	.19	.58	XC1-682E	.20	.71	XC2-682E	.26	.71	XC4-682E
.0082	.18	.58	XC.5-822E	.20	.58	XC1-822E	.22	.71	XC2-822E	.28	.71	XC4-822E
.01	.19	.58	XC.5-103E	.22	.58	XC1-103E	.24	.71	XC2-103E	.30	.71	XC4-103E
.012	.21	.58	XC.5-123E	.20	.71	XC1-123E	.26	.71	XC2-123E	.30	.84	XC4-123E
.015	.23	.58	XC.5-153E	.22	.71	XC1-153E	.29	.71	XC2-153E	.33	.84	XC4-153E
.018	.25	.58	XC.5-183E	.24	.71	XC1-183E	.28	.84	XC2-183E	.33	.98	XC4-183E
.022	.22	.71	XC.5-223E	.26	.71	XC1-223E	.30	.84	XC2-223E	.35	.98	XC4-223E
.027	.24	.71	XC.5-273E	.28	.71	XC1-273E	.30	.98	XC2-273E	.38	.98	XC4-273E
.033	.26	.71	XC.5-333E	.31	.71	XC1-333E	.32	.98	XC2-333E	.41	.98	XC4-333E
.039	.25	.84	XC.5-393E	.30	.84	XC1-393E	.36	.98	XC2-393E	.39	1.25	XC4-393E
.047	.27	.84	XC.5-473E	.32	.84	XC1-473E	.39	.98	XC2-473E	.42	1.25	XC4-473E
.056	.29	.84	XC.5-563E	.31	.98	XC1-563E	.42	.98	XC2-563E	.45	1.25	XC4-563E
.068	.32	.84	XC.5-683E	.34	.98	XC1-683E	.40	1.25	XC2-683E	.49	1.25	XC4-683E
.082	.35	.84	XC.5-823E	.37	.98	XC1-823E	.43	1.25	XC2-823E	.54	1.25	XC4-823E
.10	.38	.84	XC.5-104E	.40	.98	XC1-104E	.47	1.25	XC2-104E	.52	1.50	XC4-104E
.12	.42	.84	XC.5-124E	.38	1.25	XC1-124E	.51	1.25	XC2-124E	.56	1.50	XC4-124E
.15	.47	.84	XC.5-154E	.42	1.25	XC1-154E	.56	1.25	XC2-154E	.56	1.75	XC4-154E
.18	.45	.98	XC.5-184E	.45	1.25	XC1-184E	.54	1.50	XC2-184E	.61	1.75	XC4-184E
.22	.49	.98	XC.5-224E	.49	1.25	XC1-224E	.59	1.50	XC2-224E	.67	1.75	XC4-224E
.27	.54	.98	XC.5-274E	.54	1.25	XC1-274E	.59	1.75	XC2-274E	.74	1.75	XC4-274E
.33	.59	.98	XC.5-334E	.59	1.25	XC1-334E	.64	1.75	XC2-334E	.74	1.75	XC4-334E
.39	.53	1.25	XC.5-394E	.53	1.50	XC1-394E	.69	1.75	XC2-394E	.81	1.75	XC4-394E
.47	.56	1.25	XC.5-474E	.53	1.75	XC1-474E	.76	1.75	XC2-474E			
.56	.49	1.75	XC.5-564E	.57	1.75	XC1-564E	.83	1.75	XC2-564E			
.68	.54	1.75	XC.5-684E	.62	1.75	XC1-684E	.90	1.75	XC2-684E			
.82	.58	1.75	XC.5-824E	.68	1.75	XC1-824E						
1.0	.64	1.75	XC.5-105E	.74	1.75	XC1-105E						
1.5	.71	2.00	XC.5-155E	.83	2.00	XC1-155E						

Note: Replace the last digit **E** with the desired tolerance code from the tolerance table. For an in-between value use the next larger value's dimensions. Custom sizes are readily available. All dimensions are in inches. All +.05" dimension tolerances are Maximum.

POLYSTYRENE AND FOIL CAPACITORS PARAMETRIC TREND CURVES AND ACCEPTANCE CRITERIA

SERIES X

CAPACITANCE

Reference MIL-STD-202, Method 305

Test Frequency: 1000 Hz

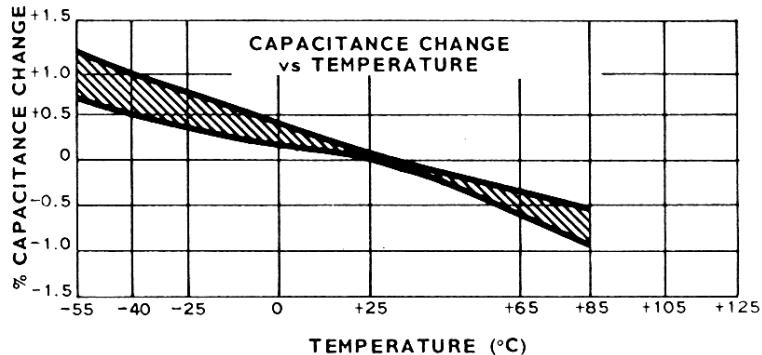
Temperature: +25°C

Capacitance Change Over Temperature.

Acceptance Limits:

-100 ppm/°C ± 50 ppm/°C

Capacitance Retrace: Within ±0.2%



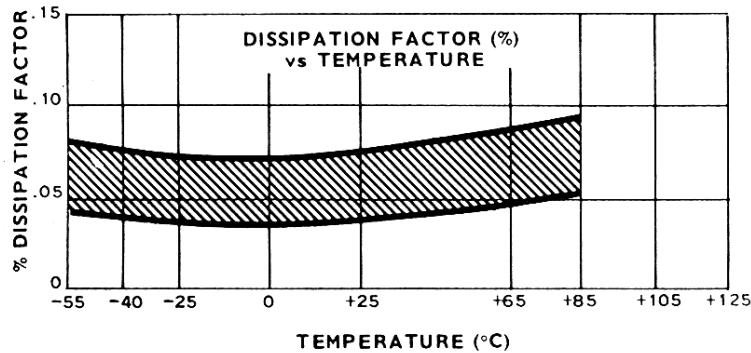
DISSIPATION FACTOR

Reference MIL-STD-202,
Method 306

Test Frequency: 1000 Hz

Temperature: +25°C

Acceptance Limit: 0.10% Maximum



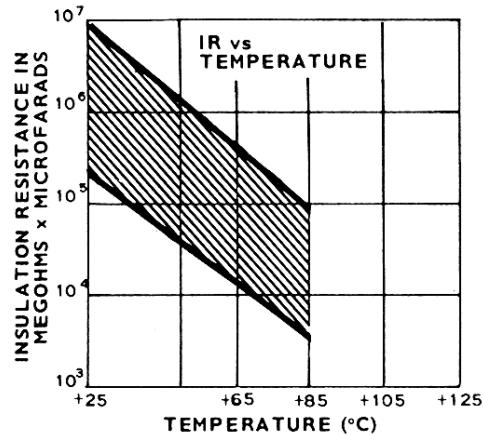
INSULATION RESISTANCE

Reference MIL-STD-202, Method 302

Electrification shall be at rated voltage or 500 VDC, whichever is less and for a time not greater than 2 minutes.

Acceptance Limits:

Test Temperature	Megs x μ f	Megohms
	Minimum	Need not exceed
@ +25°C	200,000	500,000
@ +65°C	10,000	100,000
@ +85°C	4,000	40,000



VOLTAGE RATING

100% of listed voltage rating from -55°C to +65°C, derate linearly to 60% of the listed voltage rating at +85°C.

VOLTAGE TEST

Reference MIL-STD-202, Method 301. Surge current is limited to 1 ampere maximum. Voltage applied for 1 minute (maximum) @ +25°C. Ground test is performed terminal to case (where the case is not a terminal) at 200% of the DC voltage rating. Dielectric strength test is performed terminal to terminal at 200% of the DC voltage rating.