METAL CASE HYPASS™ INTERFERENCE SUPPRESSION POLYESTER FILM CAPACITORS

FEATURES

- High frequency filtering
- No series resonance
- Low inductance to ground

MAJOR APPLICATIONS: EMI suppression.

PHYSICAL CHARACTERISTICS

TORQUE: Terminals shall withstand 10 inch pounds with no damage.

DIMENSIONS: See chart below, contact factory for additional sizes.

MARKING:
Dearborn trademark, type or catalog number, capacitance, and voltage.

ENVIRONMENTAL CHARACTERISTICS

DC LIFE TEST:
- 150% of rated DC voltage for 250 hours at +85°C.
- No open or short circuits.
- No visible damage: Max. Cap chg: ±5%
  Min. I.R. = 50% of initial limit
  Max. D.F. = 2.0%

THERMAL SHOCK AND IMMERSION CYCLING:
No visible damage: Max. Cap chg: ±5%
Min. I.R. = 50% of initial limit
Max. D.F. = 2.0%

ELECTRICAL SPECIFICATIONS

CAPACITANCE RANGE: 0.10 µF to 0.5 µF

DC VOLTAGE RATING: 50 VDC to 1,000 VDC

CAPACITANCE TOLERANCE: +20% - 10%, ±10%

OPERATING TEMPERATURE: -40°C to +85°C

DISSIPATION FACTOR: 1.0% maximum

VOLTAGE TEST: 200% of rated voltage for 1 minute

INSULATION RESISTANCE:
- At +25°C, 20,000 Megaohm-Microfarads, need not exceed 20,000 Megaohms
- At +85°C, 200 Megaohm-Microfarads, need not exceed 1,000 Megaohms

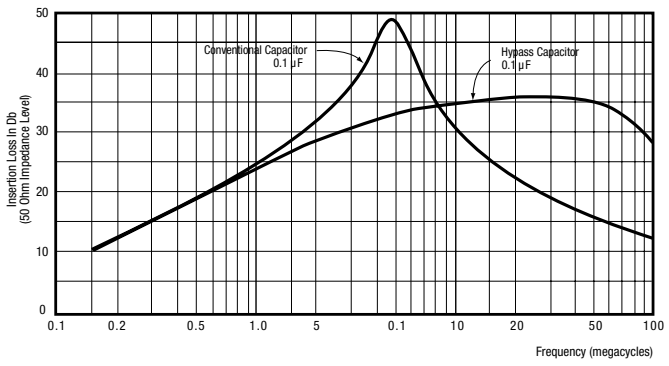
TYPICAL SIZES

Current µF in Amps		Bracket mounting Dimensions						
		D	L	W	M	R	Y	Fig.
50 WVDC								
0.50	40	1.000	1.813	1.000	0.875	1.188	0.250	1
0.50	60	1.000	1.813	1.000	0.875	1.188	0.250	1
200 WVDC								
0.25	20	0.750	1.813	0.750	0.656	0.875	0.201	1
0.50	20	1.000	1.813	1.000	0.875	1.188	0.250	1
400 WVDC								
0.10	20	0.688	1.813	0.750	0.641	0.781	0.201	1
600 WVDC								
0.10	20	0.688	1.813	0.750	0.641	0.781	0.201	1
0.25	20	1.000	1.813	1.000	0.875	1.188	0.250	1
0.50	20	1.000	2.250	1.000	0.875	1.188	0.250	1

Current µF in Amps		Bulkhead mounting Dimensions						
		D	L	W	M	R	Y	Fig.
200 WVDC								
0.25	20	0.750	1.813	0.875	1.125	1.438	0.156	2
400 WVDC								
0.10	20	0.688	1.813	0.875	1.062	1.375	0.156	2
600 WVDC								
0.10	20	0.688	1.813	0.875	1.062	1.375	0.156	2
0.50	100	1.125	3.125	1.500	1.750	2.312	0.201	3
1,000 WVDC								
0.20	100	1.125	3.125	1.500	1.750	2.312	0.201	3

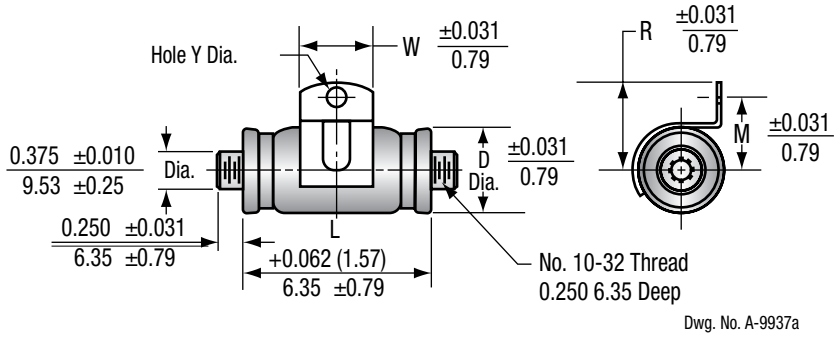
Note:
Hypass capacitors rated at 200 WVDC or 400 WDVC may be used on 130 volt, 60Hz circuits.
Capacitors rated at 600 and 1,000 WVDC may be used on 250 volt, 60Hz circuits.

INSERTION LOSS OF A HYPASS™ CAPACITOR VS. A CONVENTIONAL CAPACITOR



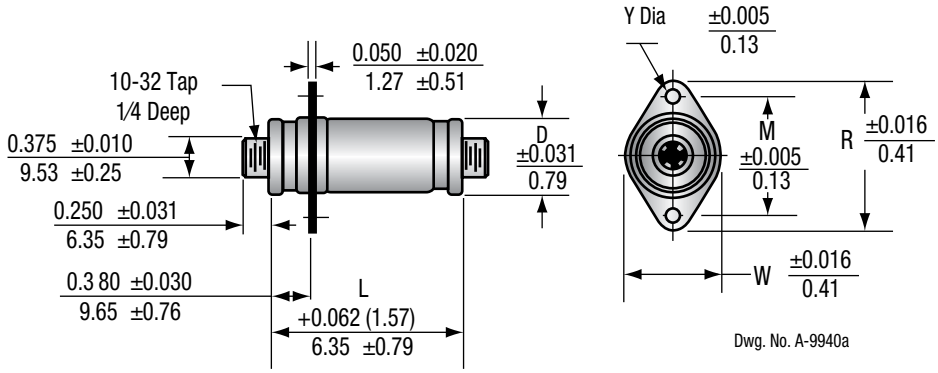
METAL CASE HYPASS™ INTERFERENCE SUPPRESSION POLYESTER FILM CAPACITORS

FIGURE 1



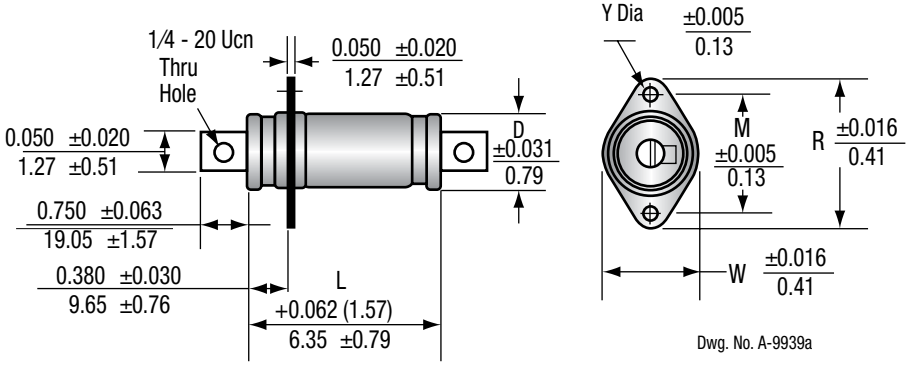
Dwg. No. A-9937a

FIGURE 2



Dwg. No. A-9940a

FIGURE 3

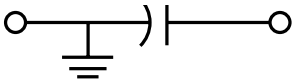


Dwg. No. A-9939a

Dimensions: Inches / Millimeters

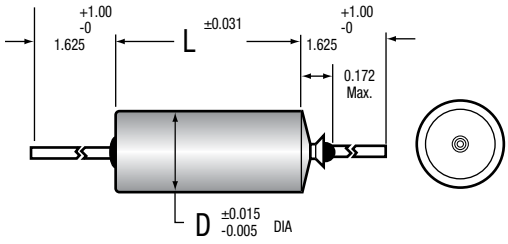
Terminal Hardware Available On Special Order.

SECTION GROUNDED TO CASE

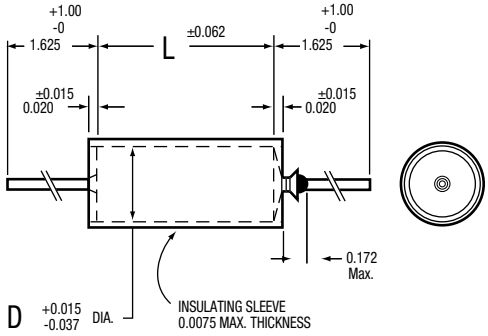


DIMENSIONS (in inches)

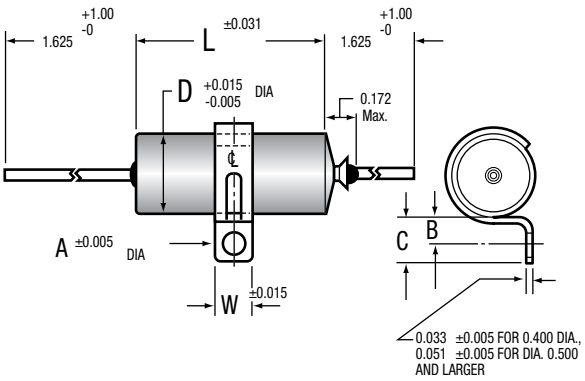
CASE STYLE 01



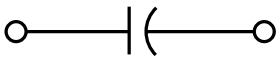
CASE STYLE 03



CASE STYLE 12

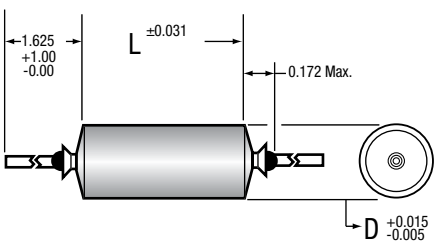


SECTION INSULATED FROM CASE

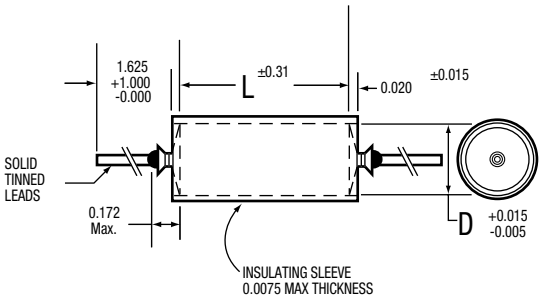


DIMENSIONS (in inches)

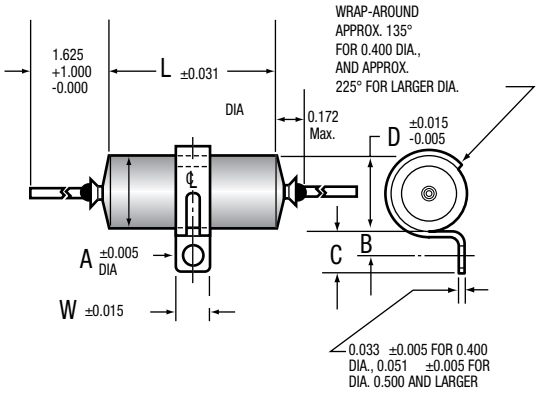
CASE STYLE 02



CASE STYLE 04



CASE STYLE 13



The length of grounded styles is 0.062" shorter than the length shown in tabulations in the catalog.

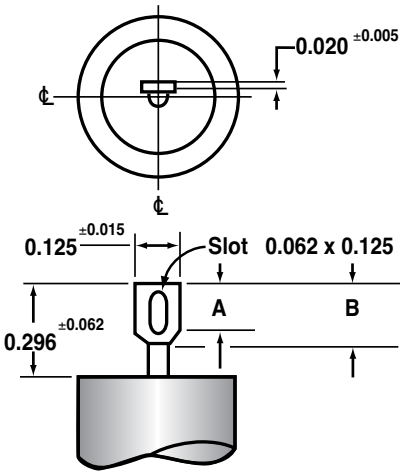
GUIDE TO ORDERING

BRACKET DIMENSIONS (Style 12 & 13 / in inches)

D	W	A	B	C
0.400	0.250	0.144	0.187±0.015	0.312±0.031
0.500	0.500	0.156	0.250±0.031	0.437±0.062
0.562	0.500	0.156	0.250±0.031	0.437±0.062
0.670	0.500	0.156	0.250±0.031	0.437±0.062
0.750	0.500	0.156	0.250±0.031	0.437±0.062
1.000	0.500	0.156	0.250±0.031	0.437±0.062

*Based on 1 in. = 25.4 mm

TYPICAL TAB TERMINAL DIMENSIONS



Dwg. No A-9525

A = 0.156 ± 0.015" (3.96 ± 0.38 mm)

B = 0.187 ± 0.015" (4.75 ± 0.38 mm)

Tab Terminal available only on case diameters equal to or greater than 0.400 inches.

T1 & T3 styles are supplied with one tab terminal on the insulated end and a ground lead on the opposite end.

ORDERING TABLES

METAL CASE

EXAMPLE:

218P 223 X9 100 S 02

CATALOG NUMBERING SYSTEM

Case style

Terminal: S = Wire leads T = Soldering tab*.

DC Voltage rating: Expressed in volts.
See standard ratings charts for voltage code.

Capacitance Tolerance: X0 = ±20%
X9 = ±10%
X5 = ±5%
X2 = ±2%

Capacitance: Expressed in picofarads, the first two digits are significant figures; the third is the number of zeros following. See standard ratings tables for capacitance code.

Dearborn type number: Identifies the basic capacitor.

* Soldering tabs are available only on case diameters equal to or greater then 0.400 inches.

WRAP AND FILL

EXAMPLE:

430P 183 X9 100 X F

CATALOG NUMBERING SYSTEM

"F" applies only to "ROHS" compliant parts.

Terminal: No suffix required unless specified on applicable specification sheet (Terminal style).

DC Voltage rating: Expressed in volts.
See standard ratings charts for voltage code.

Capacitance Tolerance: X0 = ±20%
X9 = ±10%
X5 = ±5%
X2 = ±2%

Capacitance: Expressed in picofarads, the first two digits are significant figures; the third is the number of zeros following. See standard ratings tables for capacitance code.

Dearborn type number: Identifies the basic capacitor.

PROPERTIES OF DIELECTRIC FILMS

POLYESTER (Polyethylene Terephtalate, P.E.T.)

Capacitors with smaller dimensions can be manufactured due to the high dielectric constant and excellent electrical performance of this film. Metalized polyester capacitors also have outstanding self-healing properties.

POLYPROPYLENE (P.P.)

This film features very low dielectric losses, low dielectric adsorption, high dielectric strength, very high insulating strength and a practically linear temperature coefficient in all temperature ranges.

All these properties make this film suitable for the manufacturing of power electronics capacitors.

However, the operating temperature is limited to 105°C.

POLYPHENYLENE SULFIDE (P.P.S.)

The properties of this film are as follows: very low dielectric losses, low temperature coefficient, high stability of the capacitance value, resistant to humidity and a high melting point. This material is suited for surface mounted precision capacitors (SMD). This film also has high temperature advantages and can be used for temperature up to 150°C.

PROPERTIES OF METALIZED FILM CAPACITORS

The metalized film consists of an extremely thin layer (some hundredths µm) of zinc or aluminum deposited by evaporation under vacuum on the dielectric. The nature, thickness and geometry of the metalized layer modify the properties of the capacitors, especially as far as permissible peak or effective current is concerned.

Metalized film capacitors are smaller than film-foil capacitors.

Self-healing is a fundamental property of these capacitors. When a dielectric breakdown occurs between the metal layers, due to a dielectric failure, an electrical arc causes local vapor deposition of the metallization which results in an insulating metallic oxide. Thus regenerated, the capacitor is once again operational.

The self-healing operation generally requires only a very small amount of energy (5 to 15 µJoules) and is performed in several µseconds (< 50). However, a minimum amount of energy is required below which self-healing operations are unpredictable. This energy is calculated in relation to the capacitance value and the load voltage: $E = 1 / 2\ CV^2$.

PROPERTIES OF FILM–FOIL CAPACITORS

Film Foil capacitors are especially recommended to meet high voltage or current and / or power stresses.

The thickness of the metal foil enables the reduction of the series resistance and improves the general performance of the capacitors. These improvements are made to the detriment of the volume of the capacitor which also loses its self-healing properties. Composite dielectrics combine films of different types with complementary specific characteristics.

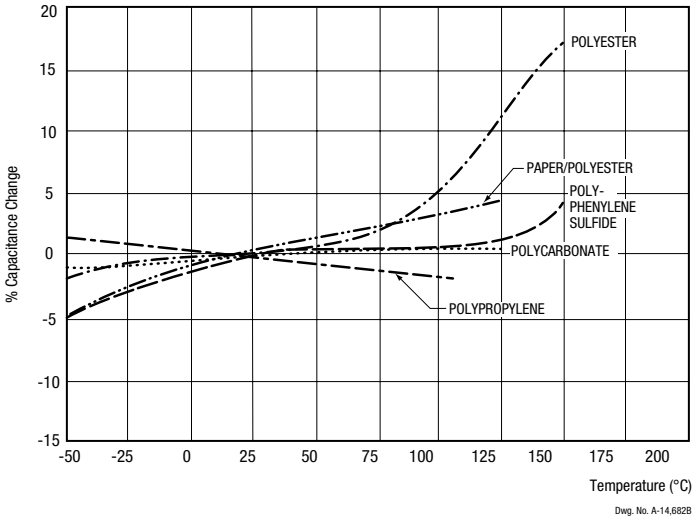
For high voltage and power electronics applications, these capacitors are usually impregnated with impregnating fluids or solid substances.

CAPACITOR PERFORMANCE VS. TEMPERATURE

The capacitors' performance versus temperature essentially depends upon the dielectric type.

The figure below shows ranges of operating temperatures.

% OF CAPACITANCE CHANGE VS. TEMPERATURE (°C)

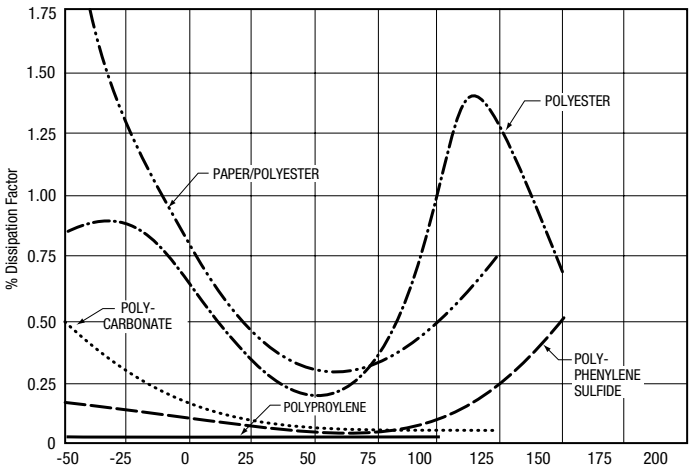


Dwg. No. A-14,682B

Important differences affect the laws governing the changes of the main electrical characteristics.

They are highlighted by the following curves:

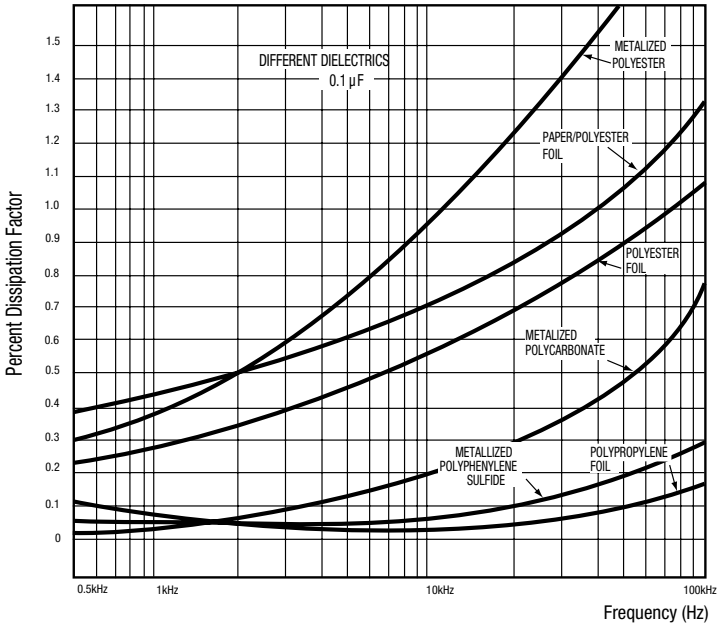
% OF DISSIPATION FACTOR (DF) VS. TEMPERATURE (°C)



Dwg. No. A-14,683C

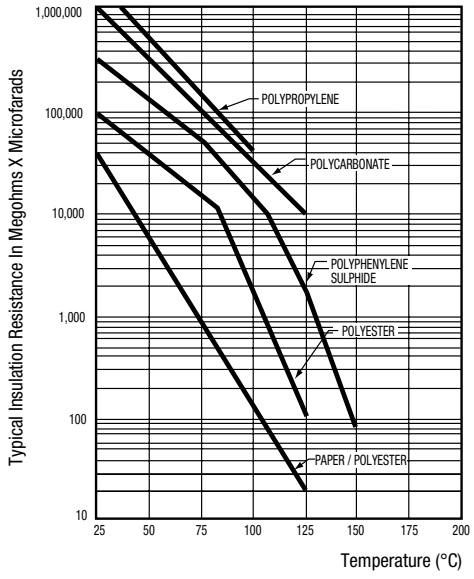
PROPERTIES OF DIELECTRIC FILMS

% OF DISSIPATION FACTOR (DF) VS. FREQUENCY (HZ)



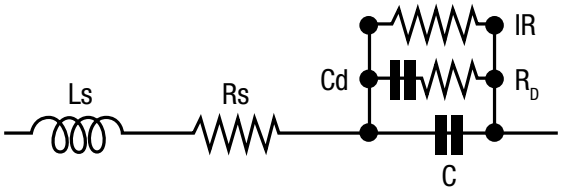
Dwg. No. A-14,684B

IR VS. TEMPERATURE (°C)



Dwg. No. A-14,687B

A REAL CAPACITOR MAY BE REPRESENTED BY THE FOLLOWING DIAGRAM:



Series Inductance	Ls
Resistance of metal foil & connections	Rs
Insulation Resistance	IR
Dielectric Absorption	Cd
Resistance equivalent to the dielectric losses	R_D
Capacitance	C

Resistive terms generate temperature rises when the capacitors carry AC current (I_{rms}). Depending upon the frequency range, they may be more or less preponderant.

THE EQUIVALENT SERIES RESISTANCE (ESR) IS THE SUM OF THE FOLLOWING TERMS:

$$ESR = Rs + DF / C\omega + 1 \ / \ IR\ C^2\ \omega^2$$

When the frequency increases, the term $1 / IRC^2\omega^2$ becomes rapidly insignificant.

For plastic dielectrics, losses remain constant within a wide range of frequencies and the affect of the term: $DF / C\omega$ decreases: $ESR = Rs + DF / C\omega$

The metal foil and the connections are designed to obtain a resistance value (Rs) as low as possible. This value is dependent on the capacitors' technology and geometry.

Inductance (Ls) also disturbs the equation of the capacitors at high frequencies.

IMPEDANCE (Z) IS STATED AS FOLLOWS:

$$Z = Rs^2 + (Ls\omega - 1 / C\omega)^2$$

When frequency increases, the affect of Ls will gradually cancel the capacitance component of the capacitors until it reaches the resonance frequency where:

$$Z = Rs \text{ and } LC\omega^2 = 1$$