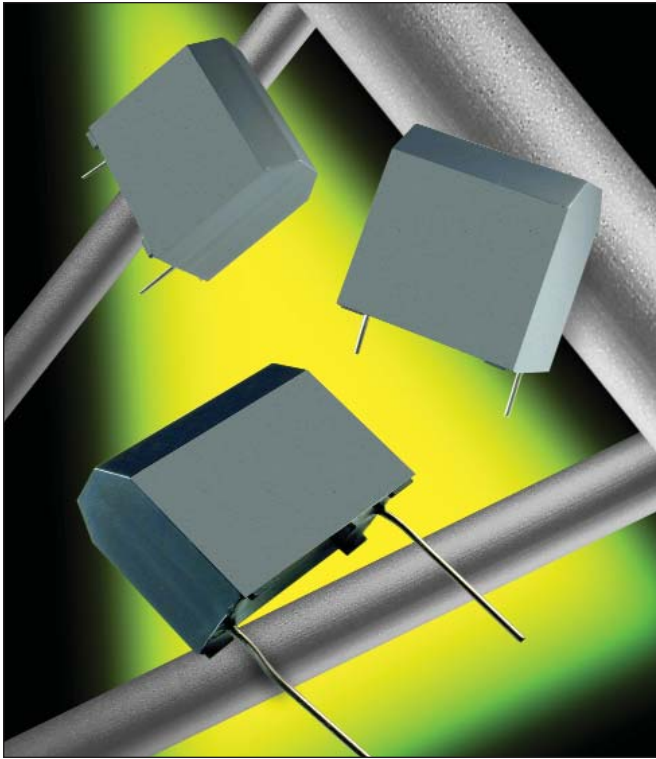


# Medium Power Film Capacitors



## FFB (RoHS Compliant)

DC FILTERING



### PACKAGING MATERIAL

Self-extinguishing plastic case (V0 = in accordance with UL 94) filled thermosetting resin.

Self-extinguishing thermosetting resin (V0 = in accordance with UL 94; I3F2 = in accordance with NF F 16-101).

### STANDARDS

- IEC 61071-1, IEC 61071-2: Power electronic capacitors
- IEC 60384-16: Fixed metallized polypropylene film dielectric DC capacitors
- IEC 60384-16-1: Fixed metallized polypropylene film dielectric DC capacitors  
Assessment level E
- IEC 60384-17: Fixed metallized polypropylene film dielectric AC and pulse capacitors
- IEC 60384-17-1: Fixed metallized polypropylene film dielectric AC and pulse capacitors  
Assessment level E
- IEC 60384-2: Fixed metallized polyester capacitors

The FFB series uses a non-impregnated metallized polypropylene or polyester dielectric with the controlled self-healing process, specially treated to have a very high dielectric strength in operating conditions up to 105°C.

The FFB has been designed for printed circuit board mounting. Furthermore, their performances allow to be a very interesting alternative to electrolytic technology because they can withstand much higher levels of surge voltage.

### APPLICATIONS

The FFB capacitor is particularly designed for DC filtering, low reactive power.

### HOT SPOT CALCULATION

See *Hot Spot Temperature*, page 3.

$\theta_{\text{hot spot}} = \theta_{\text{ambient}} + (P_d + P_t) \times R_{th}$   
with  $P_d$  (Dielectric losses) =  $Q \times \text{tg}\delta_0$   
 $Q \times \text{tg}\delta_0 \Rightarrow \left[ \frac{1}{2} \times C_n \times (V_{\text{peak to peak}})^2 \times f \right] \times \text{tg}\delta_0$   
 $\text{tg}\delta_0$  (tan delta)  
For polypropylene,  $\text{tg}\delta_0 = 2 \times 10^{-4}$  for frequencies up to 1MHz and is independent of temperatures.  
For polyester,  $\text{tg}\delta_0$  values are shown in graph 4 on page 3.

$$P_t \text{ (Thermal losses)} = R_s \times (I_{\text{rms}})^2$$

where  $C_n$  in Farad     $I_{\text{rms}}$  in Ampere     $f$  in Hertz  
 $V$  in Volt     $R_s$  in Ohm     $\theta$  in °C  
 $R_{th}$  in °C/W

### WORKING TEMPERATURE

(according to the power to be dissipated) -55°C to +105°C

### LIFETIME EXPECTANCY

One unique feature of this technology (as opposed to electrolytics) is how the capacitor reacts at the end of its lifetime. Unlike aluminum, electrolytics film capacitors do not have a catastrophic failure mode. Film capacitors simply experience a parametric loss of capacitance of about 2%, with no risk of short circuit.

Please note that this is theoretical, however, as the capacitor continues to be functional even after this 2% decrease.

# Medium Power Film Capacitors



FFB (RoHS Compliant)

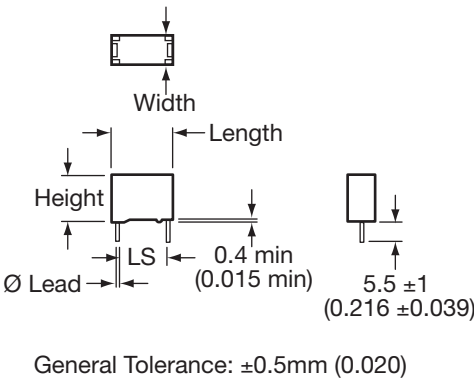
## HOW TO ORDER

| FFB    | 1                     | 4                                  | D                                                                                                            | 0336                                                              | K                      | --                                                                        |
|--------|-----------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|------------------------|---------------------------------------------------------------------------|
| Series | Case Size             | Dielectric                         | Voltage Code                                                                                                 | Capacitance Code                                                  | Capacitance Tolerances | Lead Styles                                                               |
|        | 1<br>2<br>3<br>4<br>5 | 4 = Polyester<br>6 = Polypropylene | D = 75Vdc<br>E = 100Vdc<br>H = 300Vdc<br>I = 400Vdc<br>J = 525Vdc<br>A = 720Vdc<br>C = 900Vdc<br>L = 1100Vdc | 0 = pF code<br>0336 = 33μF<br>0686 = 68μF<br>0117 = 110μF<br>etc. | K = ±10%               | -- = 2 Leaded<br>JC = 4 Leaded<br><br>Consult Factory for Special Options |

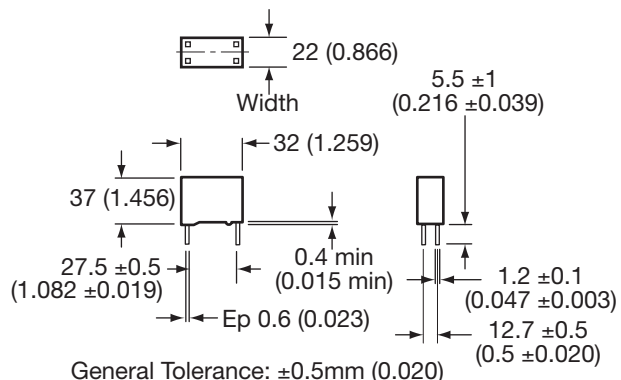
DC FILTERING

## GENERAL DESCRIPTION

### CASE STYLE: P0; 18; 19; 26; R68 2 LEADED STYLE



### CASE STYLE: R68 4 LEADED STYLE



## DIMENSIONS: millimeters (inches)

| Case Size | Case Style               | Length<br>mm ±0.40<br>(inches) | Width<br>mm ±0.40<br>(inches) | Height<br>mm ±0.30<br>(inches) | Dimensions<br>lead mm +10% -0.05<br>(inches) | LS<br>mm ±0.40<br>(inches) |
|-----------|--------------------------|--------------------------------|-------------------------------|--------------------------------|----------------------------------------------|----------------------------|
| 1         | P0                       | 31.1 (1.230)                   | 13.0 (0.510)                  | 22.4 (0.880)                   | Ø 0.80 (0.031)                               | 27.5 (1.083)               |
| 2         | 18                       | 31.1 (1.230)                   | 14.6 (0.580)                  | 25.7 (1.010)                   | Ø 0.80 (0.031)                               | 27.5 (1.083)               |
| 3         | 19                       | 31.1 (1.230)                   | 17.3 (0.680)                  | 29.8 (1.170)                   | Ø 0.80 (0.031)                               | 27.5 (1.083)               |
| 4         | 26                       | 31.1 (1.230)                   | 20.8 (0.820)                  | 31.3 (1.230)                   | Ø 1.00 (0.039)                               | 27.5 (1.083)               |
| 5         | R68<br>2 Leaded<br>Style | 32.0 (1.260)                   | 22.0 (0.870)                  | 37.0 (1.460)                   | Ø 1.00 (0.039)                               | 27.5 (1.083)               |
|           | R68<br>4 Leaded<br>Style | 32.0 (1.260)                   | 22.0 (0.870)                  | 37.0 (1.460)                   | 1.20 x 0.60<br>(0.047 x 0.023)               | 27.5 (1.083)               |



# Medium Power Film Capacitors



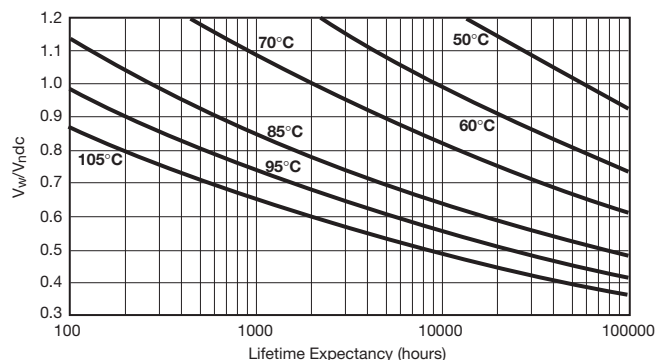
## FFB (RoHS Compliant) – Polyester Dielectric

### POLYESTER DIELECTRIC FOR LOW VOLTAGE DC FILTERING

#### ELECTRICAL CHARACTERISTICS – POLYESTER DIELECTRIC

|                                       |                                        |
|---------------------------------------|----------------------------------------|
| Climatic category                     | 55/105/56 (IEC 60068)                  |
| Test voltage between terminals @ 25°C | 1.5 x $V_{n\text{dc}}$                 |
| Capacitance range $C_n$               | 6.2 $\mu\text{F}$ to 110 $\mu\text{F}$ |
| Tolerance on $C_n$                    | $\pm 10\%$                             |
| Rated DC voltage $V_{n\text{dc}}$     | 75 to 400 V                            |
| Dielectric                            | polyester                              |
| Max Stray Inductance                  | 20nH                                   |

#### LIFETIME EXPECTANCY vs VOLTAGE AND HOT SPOT TEMPERATURE – POLYESTER DIELECTRIC



$V_w$  = Permanent working or operating DC voltage.

### RATINGS AND PART NUMBER REFERENCE – POLYESTER DIELECTRIC

| Part Number                                                                                         | Capacitance ( $\mu\text{F}$ ) | Case Style        | $I_{\text{rms}}$ max. (A) | $R_s$ (m $\Omega$ ) | $R_{\text{th}}$ ( $^{\circ}\text{C}/\text{W}$ ) | Typical Weight (g) |
|-----------------------------------------------------------------------------------------------------|-------------------------------|-------------------|---------------------------|---------------------|-------------------------------------------------|--------------------|
| <b><math>V_{n\text{dc}}</math> 75V <math>V_{\text{rms}}</math> max.: 45 volts Voltage Code: D</b>   |                               |                   |                           |                     |                                                 |                    |
| FFB14D0336K--                                                                                       | 33                            | PO                | 3                         | 3                   | 40.7                                            | 15                 |
| FFB24D0476K--                                                                                       | 47                            | 18                | 4.3                       | 2                   | 33.3                                            | 20                 |
| FFB34D0686K--                                                                                       | 68                            | 19                | 6.2                       | 1.7                 | 29.9                                            | 25                 |
| FFB44D0826K--                                                                                       | 82                            | 26                | 7.4                       | 1.6                 | 26.7                                            | 32                 |
| FFB54D0117K--                                                                                       | 110                           | R68 (2 terminals) | 10                        | 1.4                 | 22.9                                            | 40                 |
| FFB54D0117KJC                                                                                       | 110                           | R68 (4 terminals) | 10                        | 1.4                 | 22.9                                            | 40                 |
| <b><math>V_{n\text{dc}}</math> 100V <math>V_{\text{rms}}</math> max.: 60 volts Voltage Code: E</b>  |                               |                   |                           |                     |                                                 |                    |
| FFB14E0206K--                                                                                       | 20                            | PO                | 2.6                       | 3                   | 40.5                                            | 15                 |
| FFB24E0276K--                                                                                       | 27                            | 18                | 3.5                       | 2.5                 | 33.3                                            | 20                 |
| FFB34E0396K--                                                                                       | 39                            | 19                | 5                         | 2                   | 29.8                                            | 25                 |
| FFB44E0476K--                                                                                       | 47                            | 26                | 6                         | 1.7                 | 26.6                                            | 32                 |
| FFB54E0686K--                                                                                       | 68                            | R68 (2 terminals) | 9                         | 1.4                 | 22.8                                            | 40                 |
| FFB54E0686KJC                                                                                       | 68                            | R68 (4 terminals) | 9                         | 1.4                 | 22.8                                            | 40                 |
| <b><math>V_{n\text{dc}}</math> 300V <math>V_{\text{rms}}</math> max.: 90 volts Voltage Code: H</b>  |                               |                   |                           |                     |                                                 |                    |
| FFB14H0755K--                                                                                       | 7.5                           | PO                | 2.4                       | 16                  | 40.7                                            | 15                 |
| FFB24H0116K--                                                                                       | 11                            | 18                | 3.6                       | 11                  | 33.5                                            | 20                 |
| FFB34H0166K--                                                                                       | 16                            | 19                | 5.2                       | 8                   | 29.9                                            | 25                 |
| FFB44H0186K--                                                                                       | 18                            | 26                | 6                         | 7                   | 27.1                                            | 32                 |
| FFB54H0276K--                                                                                       | 27                            | R68 (2 terminals) | 9                         | 5                   | 22.9                                            | 40                 |
| FFB54H0276KJC                                                                                       | 27                            | R68 (4 terminals) | 9                         | 5                   | 22.9                                            | 40                 |
| <b><math>V_{n\text{dc}}</math> 400V <math>V_{\text{rms}}</math> max.: 105 volts Voltage Code: I</b> |                               |                   |                           |                     |                                                 |                    |
| FFB14I0625K--                                                                                       | 6.2                           | PO                | 2.5                       | 17                  | 40.5                                            | 15                 |
| FFB24I0755K--                                                                                       | 7.5                           | 18                | 3.1                       | 14                  | 33.5                                            | 20                 |
| FFB34I0126K--                                                                                       | 12                            | 19                | 5                         | 9                   | 29.9                                            | 25                 |
| FFB44I0156K--                                                                                       | 15                            | 26                | 6.2                       | 7                   | 26.4                                            | 32                 |
| FFB54I0206K--                                                                                       | 20                            | R68 (2 terminals) | 8.2                       | 5.5                 | 22.8                                            | 40                 |
| FFB54I0206KJC                                                                                       | 20                            | R68 (4 terminals) | 8.2                       | 5.5                 | 22.8                                            | 40                 |

# Medium Power Film Capacitors



## FFB (RoHS Compliant) – Polypropylene Dielectric

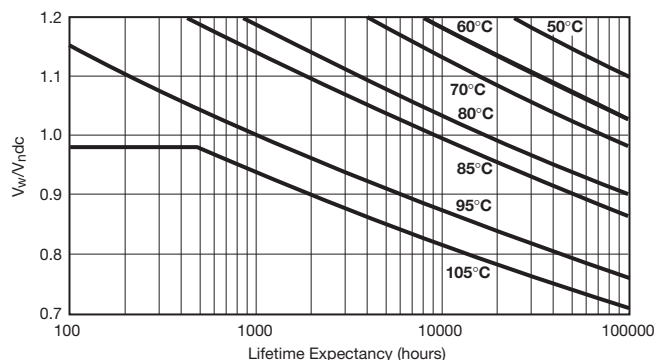
### POLYPROPYLENE DIELECTRIC FOR INDUSTRIAL DC FILTERING

These capacitors have been designed principally for high and medium power DC filtering applications.

### ELECTRICAL CHARACTERISTICS – POLYPROPYLENE DIELECTRIC

|                                       |                        |
|---------------------------------------|------------------------|
| Climatic category                     | 55/105/56 (IEC 60068)  |
| Test voltage between terminals @ 25°C | 1.5 x V <sub>ndc</sub> |
| Capacitance range C <sub>n</sub>      | 1.5μF to 13μF          |
| Tolerance on C <sub>n</sub>           | ±10%                   |
| Rated DC voltage V <sub>ndc</sub>     | 525 to 1100 V          |
| Dielectric                            | polypropylene          |

### LIFETIME EXPECTANCY vs VOLTAGE AND HOT SPOT TEMPERATURE – POLYPROPYLENE DIELECTRIC



V<sub>w</sub> = Working DC Voltage • V<sub>n</sub> = Rated DC Voltage

### RATINGS AND PART NUMBER REFERENCE – POLYPROPYLENE DIELECTRIC

| Part Number                                                       | Capacitance (μF) | Case Style        | I <sub>rms</sub> max. (A) | R <sub>s</sub> (mΩ) | R <sub>th</sub> (°C/W) | Typical Weight (g) |
|-------------------------------------------------------------------|------------------|-------------------|---------------------------|---------------------|------------------------|--------------------|
| <b>V<sub>ndc</sub> 525V Vrms max.: 105 volts Voltage Code: J</b>  |                  |                   |                           |                     |                        |                    |
| FFB16J0395K--                                                     | 3.9              | PO                | 5.1                       | 30                  | 45.7                   | 15                 |
| FFB26J0565K--                                                     | 5.6              | 18                | 7.4                       | 21                  | 36.4                   | 20                 |
| FFB36J0825K--                                                     | 8.2              | 19                | 10.9                      | 15                  | 32.6                   | 25                 |
| FFB46J0106K--                                                     | 10               | 26                | 12                        | 12                  | 29.8                   | 32                 |
| FFB56J0136K--                                                     | 13               | R68 (2 terminals) | 12                        | 9                   | 24.3                   | 40                 |
| FFB56J0136KJC                                                     | 13               | R68 (4 terminals) | 16.7                      | 9                   | 24.3                   | 40                 |
| <b>V<sub>ndc</sub> 720V Vrms max.: 120 volts Voltage Code: A</b>  |                  |                   |                           |                     |                        |                    |
| FFB16A0335K--                                                     | 3.3              | PO                | 5.0                       | 31                  | 45.0                   | 15                 |
| FFB26A0435K--                                                     | 4.3              | 18                | 6.5                       | 24                  | 36.2                   | 20                 |
| FFB36A0625K--                                                     | 6.2              | 19                | 9.4                       | 17                  | 32.7                   | 25                 |
| FFB46A0755K--                                                     | 7.5              | 26                | 11.4                      | 14                  | 29.9                   | 32                 |
| FFB56A0106K--                                                     | 10               | R68 (2 terminals) | 12                        | 11                  | 24.2                   | 40                 |
| FFB56A0106KJC                                                     | 10               | R68 (4 terminals) | 15.2                      | 11                  | 24.2                   | 40                 |
| <b>V<sub>ndc</sub> 900V Vrms max.: 150 volts Voltage Code: C</b>  |                  |                   |                           |                     |                        |                    |
| FFB16C0205K--                                                     | 2                | PO                | 3.6                       | 41                  | 45.7                   | 15                 |
| FFB26C0275K--                                                     | 2.7              | 18                | 4.9                       | 30                  | 36.6                   | 20                 |
| FFB36C0395K--                                                     | 3.9              | 19                | 7.2                       | 21                  | 32.9                   | 25                 |
| FFB46C0515K--                                                     | 5.1              | 26                | 9.3                       | 16                  | 29.7                   | 32                 |
| FFB56C0685K--                                                     | 6.8              | R68 (2 terminals) | 12                        | 12                  | 24.1                   | 40                 |
| FFB56C0685KJC                                                     | 6.8              | R68 (4 terminals) | 12.5                      | 12                  | 24.1                   | 40                 |
| <b>V<sub>ndc</sub> 1100V Vrms max.: 180 volts Voltage Code: L</b> |                  |                   |                           |                     |                        |                    |
| FFB16L0155K--                                                     | 1.5              | PO                | 3.3                       | 45                  | 45.2                   | 15                 |
| FFB26L0185K--                                                     | 1.8              | 18                | 3.9                       | 40                  | 36.5                   | 20                 |
| FFB36L0245K--                                                     | 2.4              | 19                | 5.3                       | 28                  | 33.4                   | 25                 |
| FFB46L0305K--                                                     | 3                | 26                | 6.6                       | 23                  | 30.2                   | 32                 |
| FFB56L0475K--                                                     | 4.7              | R68 (2 terminals) | 10.3                      | 15                  | 24.1                   | 40                 |
| FFB56L0475KJC                                                     | 4.7              | R68 (4 terminals) | 10.3                      | 15                  | 24.1                   | 40                 |

