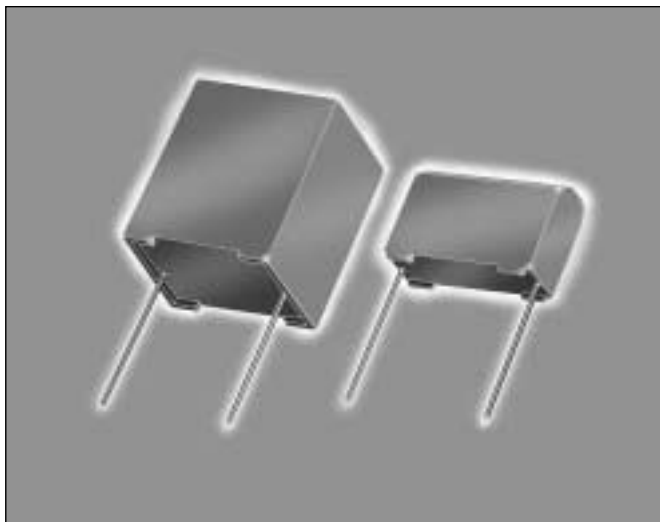


Medium Power Film Capacitors



FFB

DC FILTERING



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 100°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.

GENERAL CHARACTERISTICS

Climatic category 55/100/56 (IEC 68)

Test voltage between terminals @ 25°C
 $1.5 \times V_{r,dc}$

STANDARDS

- IEC 1071-1, IEC 1071-2: Power electronic capacitors
- IEC 60 384-16: Fixed metallized polypropylene film dielectric DC capacitors
- IEC 60 384-16-1: Fixed metallized polypropylene film dielectric DC capacitors Assessment level E
- IEC 60 384-17: Fixed metallized polypropylene film dielectric AC and pulse capacitors
- IEC 60 384-17-1: Fixed metallized polypropylene film dielectric AC and pulse capacitors Assessment level E

WORKING TEMPERATURE

(according to the power to be dissipated) -55°C to +100°C

LIFETIME EXPECTANCY

One unique feature of this technology (as opposed to electrolytics) is how the capacitor reacts at the end of its lifetime. Whereas, with an electrolytic, there is a strong risk of explosion of the case. However, with our line of film capacitors, the capacitor will simply experience at the end of life a loss of capacitance of about 5%, with no risk of explosion.

Please note that this is theoretical, however, as the capacitor continues to be functional even after this 5% decrease.

HOT SPOT TEMPERATURE CALCULATION

You can calculate the maximum operating (hot spot) temperature of this capacitor in the following manner:

The loss factor of the capacitor is made up of the sum of two components. The first represents electrical losses in the dielectric and the second component represents Joule effect in the connection and foils ($R_s \cdot C \cdot 2 \pi f$).

For all applications, the temperature in the hot spot capacitor must be lower than 100°C.

$$\theta_{\text{hot spot}} = \theta_{\text{ambient}} + [\text{tg} \delta_0 \cdot Q + R_s \cdot (I_{\text{rms}})^2] \cdot R_{\text{th}}$$

With:

Q : Reactive power in Var

R_s in Ohm

I_{rms} in Ampere

R_{th} : Rth ambient / hot spot in °C/W

$\text{tg} \delta_0 \cdot (10^{-4})$ is the tangent of loss angle (see $\tan \delta_0$ page 3)

PACKAGING

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

Self-extinguishing thermosetting resin (V0 = in accordance with UL 94; M2F1 = in accordance with NF F 16-101).

Medium Power Film Capacitors



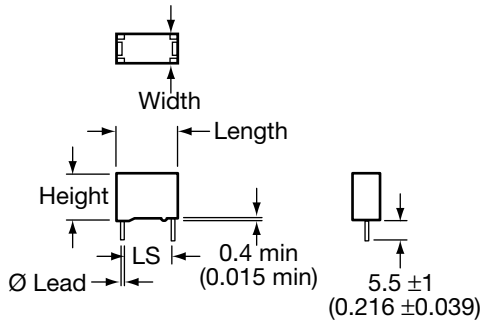
FFB

GENERAL DESCRIPTION

DC FILTERING

BOX KIND: P0; 18; 19; 26; R68

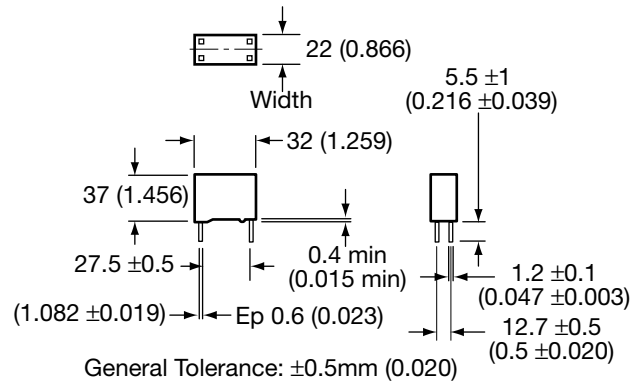
2 TERMINALS SOLUTION



General Tolerance: ±0.5mm (0.020)

BOX KIND: R68

4 TERMINALS SOLUTION



General Tolerance: ±0.5mm (0.020)

DIMENSIONS: millimeters (inches)

Box Kind	Length mm ±0.40 (inches)	Width mm ±0.40 (inches)	Height mm ±0.30 (inches)	Dimensions lead mm (inches)	LS mm ±0.40 (inches)
P0	31.1 (1.230)	13.0 (0.051)	22.4 (0.880)	Ø 0.80 (0.031)	27.5 (1.083)
18	31.1 (1.230)	14.6 (0.580)	25.7 (1.010)	Ø 0.80 (0.031)	27.5 (1.083)
19	31.1 (1.230)	17.3 (0.068)	29.8 (1.170)	Ø 0.80 (0.031)	27.5 (1.083)
26	31.1 (1.230)	20.8 (0.820)	31.3 (1.230)	Ø 1.00 (0.039)	27.5 (1.083)
R68 2 Terminals Solution	32.0 (1.260)	22.0 (0.870)	37.0 (1.460)	Ø 1.00 (0.039)	27.5 (1.083)
R68 4 Terminals Solution	32.0 (1.260)	22.0 (0.870)	37.0 (1.460)	1.20 x 0.60 (0.047 x 0.023)	27.5 (1.083)

DC FILTERING FOR LOW VOLTAGE

ELECTRICAL CHARACTERISTICS

Capacitance range C_n	6.2 μ F to 110 μ F
Tolerance on C_n	$\pm 10\%$
Rated DC voltage $V_{n,dc}$	75 to 400 V
Dielectric	polyester

HOT SPOT CALCULATION

$$\theta_{\text{hot spot}} = \theta_{\text{ambient}} + (P_d + P_t) \times R_{th}$$

with P_d (Dielectric losses) = $Q \times \text{tg}\delta_0$
 $Q \times \text{tg}\delta_0 \Rightarrow [\frac{1}{2} \times C_n \times (V_{\text{peak to peak}})^2 \times f] \times \text{tg}\delta_0$
(see $\text{tg}\delta_0$ for polyester dielectric page 3)

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

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

Medium Power Film Capacitors



FFB

DC FILTERING FOR LOW VOLTAGE

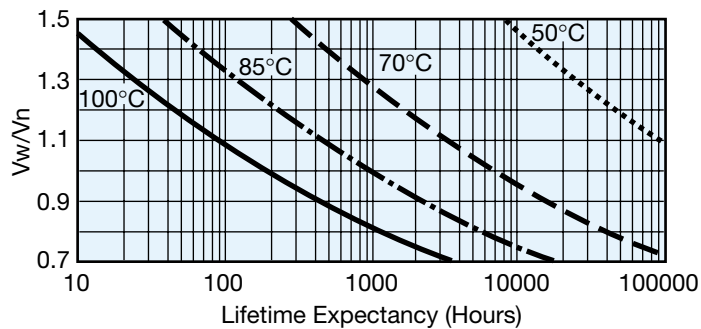
POLYESTER DIELECTRIC

TABLE OF VALUES

Capacitance (μF)	Box Kind	I _{rms} max. (A)	R _s (mΩ)	R _{th} (°C/W)	Part Number
V_{ndc} 75V Vrms max.: 45 volts					
33	PO	3	3	40.7	FFB14D0336K--
47	18	4.3	2	33.3	FFB24D0476K--
68	19	6.2	1.7	29.9	FFB34D0686K--
82	26	7.4	1.6	26.7	FFB44D0826K--
110	R68 (2 terminals)	10	1.4	22.9	FFB54D0117K--
110	R68 (4 terminals)	10	1.4	22.9	FFB54D0117KJC
V_{ndc} 100V Vrms max.: 60 volts					
20	PO	2.6	3	40.5	FFB14E0206K--
27	18	3.5	2.5	33.3	FFB24E0276K--
39	19	5	2	29.8	FFB34E0396K--
47	26	6	1.7	26.6	FFB44E0476K--
68	R68 (2 terminals)	9	1.4	22.8	FFB54E0686K--
68	R68 (4 terminals)	9	1.4	22.8	FFB54E0686KJC
V_{ndc} 300V Vrms max.: 90 volts					
7.5	PO	2.4	16	40.7	FFB14H0755K--
11	18	3.6	11	33.5	FFB24H0116K--
16	19	5.2	8	29.9	FFB34H0166K--
18	26	6	7	27.1	FFB44H0186K--
27	R68 (2 terminals)	9	5	22.9	FFB54H0276K--
27	R68 (4 terminals)	9	5	22.9	FFB54H0276KJC
V_{ndc} 400V Vrms max.: 105 volts					
6.2	PO	2.5	17	40.5	FFB14I0625K--
7.5	18	3.1	14	33.5	FFB24I0755K--
12	19	5	9	29.9	FFB34I0126K--
15	26	6.2	7	26.4	FFB44I0156K--
20	R68 (2 terminals)	8.2	5.5	22.8	FFB54I0206K--
20	R68 (4 terminals)	8.2	5.5	22.8	FFB54I0206KJC

DC FILTERING

LIFETIME EXPECTANCY vs V_w/V_n AND HOT SPOT TEMPERATURE



V_w = Working DC Voltage

V_n = Rated DC Voltage



DC FILTERING FOR INDUSTRIAL APPLICATION

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

ELECTRICAL CHARACTERISTICS

Capacitance range C_n	1.5 μ F to 13 μ F
Tolerance on C_n	$\pm 10\%$
Rated DC voltage $V_{n,dc}$	525 to 1100 V
Dielectric	polypropylene

TANGENT OF LOSS ANGLE ($TAN\delta_0$) FOR POLYPROPYLENE DIELECTRIC

Polypropylene has a constant dielectric loss factor of 2×10^{-4} irrespective of temperature and frequency (up to 1 MHz).

HOT SPOT TEMPERATURE CALCULATION

You can calculate the maximum operating (hot spot) temperature of this capacitor in the following manner:

The loss factor of the capacitor is made up of the sum of two components. The first represents electrical losses ($tg \delta_0 = 2 \times 10^{-4}$) and the second component represents Joule effect in the connection and foils, ($R_s.C.2 \pi f$).

For all applications, the temperature in the hot spot capacitor must be lower than 100°C. Heating calculation of hot spot capacitor:

$$\theta_{hot\ spot} = \theta_{ambient} + [tg\delta_0 \cdot Q + R_s \cdot (I_{rms})^2] \cdot R_{th}$$

With:

Q : Reactive power in Var

R_s in Ohm

I_{rms} in Ampere

R_{th} : Rth ambient / hot spot in °C/W

$tg \delta_0 \cdot (10^{-4})$ is the tangent of loss angle for polypropylene dielectric. Polypropylene has a constant dielectric losses factor of 2×10^{-4} irrespective of temperature and frequency (up to 1 MHz).

Medium Power Film Capacitors



FFB

DC FILTERING FOR INDUSTRIAL APPLICATION

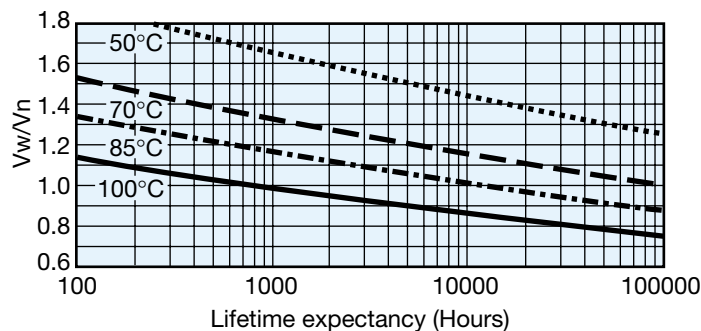
POLYPROPYLENE DIELECTRIC

TABLE OF VALUES

Capacitance (μF)	Box Kind	I _{rms} max. (A)	R _s (mΩ)	R _h (°C/W)	Part Number
V_ndc 525V Vrms max.: 105 volts					
3.9	PO	5.1	30	45.7	FFB16J0395K--
5.6	18	7.4	21	36.4	FFB26J0565K--
8.2	19	10.9	15	32.6	FFB36J0825K--
10	26	13.3	12	29.8	FFB46J0106K--
13	R68 (2 terminals)	16.7	9	24.3	FFB56J0136K--
13	R68 (4 terminals)	16.7	9	24.3	FFB56J0136KJC
V_ndc 720V Vrms max.: 120 volts					
3.3	PO	5.0	31	45.0	FFB16A0335K--
4.3	18	6.5	24	36.2	FFB26A0435K--
6.2	19	9.4	17	32.7	FFB36A0625K--
7.5	26	11.4	14	29.9	FFB46A0755K--
10	R68 (2 terminals)	15.2	11	24.2	FFB56A0106K--
10	R68 (4 terminals)	15.2	11	24.2	FFB56A0106KJC
V_ndc 900V Vrms max.: 150 volts					
2	PO	3.6	41	45.7	FFB16C0205K--
2.7	18	4.9	30	36.6	FFB26C0275K--
3.9	19	7.2	21	32.9	FFB36C0395K--
5.1	26	9.3	16	29.7	FFB46C0515K--
6.8	R68 (2 terminals)	12.5	12	24.1	FFB56C0685K--
6.8	R68 (4 terminals)	12.5	12	24.1	FFB56C0685KJC
V_ndc 1100V Vrms max.: 180 volts					
1.5	PO	3.3	45	45.2	FFB16L0155K--
1.8	18	3.9	40	36.5	FFB26L0185K--
2.4	19	5.3	28	33.4	FFB36L0245K--
3	26	6.6	23	30.2	FFB46L0305K--
4.7	R68 (2 terminals)	10.3	15	24.1	FFB56L0475K--
4.7	R68 (4 terminals)	10.3	15	24.1	FFB56L0475KJC

DC FILTERING

LIFETIME EXPECTANCY vs V_w/V_n AND HOT SPOT TEMPERATURE



V_w = Working DC Voltage

V_n = Rated DC Voltage