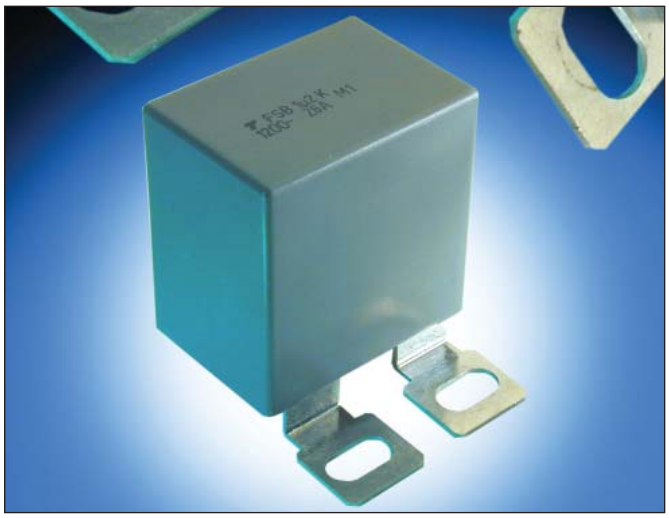
Medium Power Film Capacitors

FSB (RoHS Compliant)



GENERAL DESCRIPTION

Metallized polypropylene dielectric capacitor with controlled self-healing.

Reinforced metallization developed for high impulse currents.

APPLICATIONS

- IGBT protection
- IGBT clamping

PACKAGING MATERIAL

- Plastic case backfilled with thermosetting resin

PROTECTION

HOW TO ORDER

FSB	1	6	U	0154	J	– –
Series	**Case Size** 1 = PO Style 2 = 18 Style 3 = 19 Style 4 = 26 style 5 = R28 Style (2 terminal or 4 terminal)	**Dielectric** 6 = Polypropylene	**Voltage Code** B = 850Vdc U = 1200Vdc M = 1600Vdc N = 2000Vdc	**Capacitance Code** 0 + pF code 0154 = 0.15µF 0334 = 0.33µF 0255 = 2.5µF etc.	**Capacitance Tolerances** J = ± 5% K = ±10% (Case size 6 only)	**Terminal Code** – – = 2 Terminal JC = 4 Terminal (Case Size 5 option only)

ELECTRICAL CHARACTERISTICS

Capacitance Range C_n	0.10µF to 2.5µF
Tolerance on C_n	±5%: FSB1...5 ±10%: FSB6
Rated DC Voltage $V_n$dc	850 to 2000 V
Stray Inductance	≤ 25 nH
RMS Current	I_{rms} max. = up to 28A The currents shown in the tables are maximum. It is necessary to maintain operation within the maximum temperature of the dielectric 85°C. See “Hot spot temperature calculation”
Insulation Resistance	R_i x C ≥ 30,000 s
Impulse Current	$I^2.t$ max. = up to 1.69 A^2s Spikes or peak currents in the capacitors may cause a deterioration of the bonding between the metallization and the connections. These bonds are capable of withstanding only a limited amount of energy for each spike. The table shows the maximum energy permitted in the form ($I^2.t$), where I is in Amperes, and t is in seconds.

Note: The formula ($I^2.t$) replaces dv/dt which is less easy to use as it is not an expression of energy (I = C.dv/dt). This type of capacitor has been designed to withstand high ($I^2.t$) values.

Variation of Capacitance with Temperature	$\frac{\Delta C}{C}$ ≤ ±2% between -40 and +85°C
Climatic Category	40/085/56 (IEC 68)
Test Voltage Between Terminals @ 25°C	1.6 $V_n$dc during 10s
Withstanding Voltage Between Terminals and Case @ 25°C	@ 3 kVrms @ 50Hz during 1 min.

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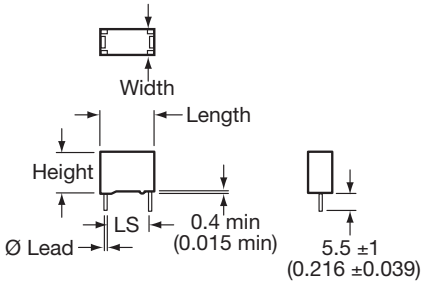
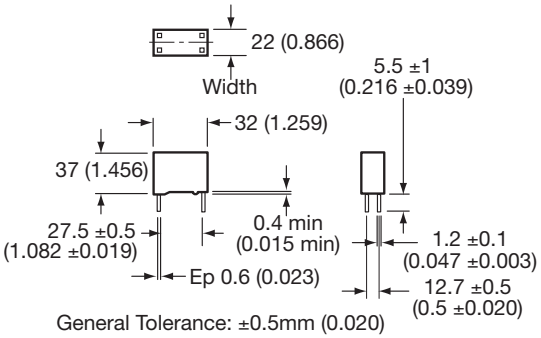
GENERAL DESCRIPTION

STYLE: P0; 18; 19; 26; R68
ALL CASE SIZES
2 TERMINALS VERSION



General Tolerance: ±0.5mm (0.020)

STYLE: R68
CASE SIZE 5 ONLY
4 TERMINALS VERSION



General Tolerance: ±0.5mm (0.020)

DIMENSIONS: millimeters (inches)

Case Size	Case Style	Length mm ±0.40 (inches)	Width mm ±0.40 (inches)	Height mm ±0.30 (inches)	Dimensions lead mm +10% -0.05 (inches)	LS mm ±0.40 (inches)
1	**P0**	31.1 (1.230)	13.0 (0.051)	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 (0.068)	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 2 Terminals Version**	32.5 (1.280)	22.0 (0.870)	37.0 (1.460)	Ø 1.00 (0.039)	27.5 (1.083)
	R68 4 Terminals Version	32.5 (1.280)	22.0 (0.870)	37.0 (1.460)	1.20 x 0.60 (0.047 x 0.023)	27.5 (1.083)

RATINGS AND PART NUMBER REFERENCE

Part Number	Capacitance (µF)	Case Style	(I²t) (A²s)	Irms (A)	Rs (mΩ)	Rth (hotspot/amb.)	Typical Weight (g)
$U_N$dc = 1200V Vpeak = 1600V Vrms = 560V Vs = 2000V (Voltage Code U)							
FSB16U0154J--	0.15	P0	0.05	3	14.3	45.9	15
FSB26U0274J--	0.27	18	0.15	7.6	8.4	36.8	20
FSB36U0394J--	0.39	19	0.31	11	6.2	32.2	25
FSB46U0474J--	0.47	26	0.41	12	5.6	29.4	32
FSB56U0684J--	0.68	R68 (2 terminals)	0.94	12	3.8	23.7	40
FSB56U0684JJC	0.68	R68 (4 terminals)	0.94	16.7	3.8	23.7	40
$U_N$dc = 1600V Vpeak = 2000V Vrms = 630V Vs = 2300V (Voltage Code M)							
FSB16M0134J--	0.13	P0	0.05	4.6	13.3	44.9	15
FSB26M0184J--	0.18	18	0.1	6.4	9.9	35.9	20
FSB36M0244J--	0.24	19	0.18	8.5	7.8	32.4	25
FSB46M0334J--	0.33	26	0.35	11.7	5.6	28.6	32
FSB56M0434J--	0.43	R68 (2 terminals)	0.59	12	4.6	23.8	40
FSB56M0434JJC	0.43	R68 (4 terminals)	0.59	15.2	4.6	23.8	40
$U_N$dc = 2000V Vpeak = 2400V Vrms = 700V Vs = 2600V (Voltage Code N)							
FSB16N0104J--	0.1	P0	0.05	4.2	14.3	44.6	15
FSB26N0134J--	0.13	18	0.08	5.5	11.3	35.7	20
FSB36N0184J--	0.18	19	0.15	7.6	8.5	32.1	25
FSB46N0224J--	0.22	26	0.22	9.3	6.8	29.1	32
FSB56N0304J--	0.3	R68 (2 terminals)	0.41	12	5.3	23.8	40
FSB56N0304JJC	0.3	R68 (4 terminals)	0.41	12.7	5.3	23.8	40

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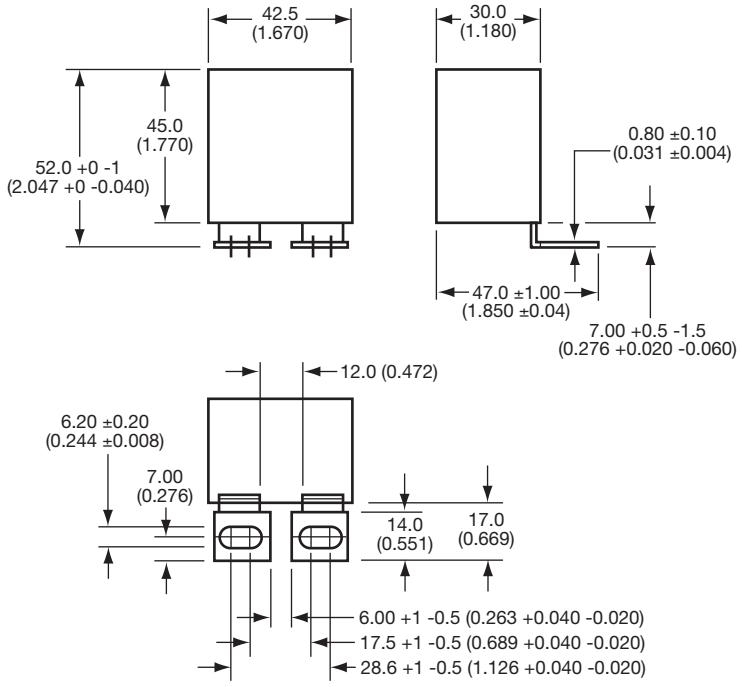
CASE SIZE 6

Plastic case resin filled

Dimensions: millimeters (inches)



GENERAL TOLERANCES: ±0.50mm (±0.020 inches)

RATINGS AND PART NUMBER REFERENCE

Part Number	Capacitance (µF)	(I²t) (A²s)	$I_{rms\ max.}$ (A)	R_s (mΩ)	R_{th} (°C/W)	Typical Weight (g)
FSB 850V $V_n$dc = 850V V_{peak} = 1200V V_{rms} = 450V V_S = 1500V (Voltage Code B)						
FSB66B0205K--	2	0.99	25	3.4	19.1	87
FSB66B0225K--	2.2	1.19	28	3.1	18.6	87
FSB66B0255K--	2.5	1.54	28	2.7	17.8	87
FSB 1200V $V_n$dc = 1200V V_{peak} = 1600V V_{rms} = 560V V_S = 2000V (Voltage Code U)						
FSB66U0105K--	1	1.47	25	3.6	17.2	87
FSB66U0125K--	1.2	1.69	26	3.4	17.5	87
FSB66U0155K--	1.5	1	26	3.4	17.5	87
FSB 2000V $V_n$dc = 2000V V_{peak} = 2400V V_{rms} = 700V V_S = 2600V (Voltage Code N)						
FSB66N0474K--	0.47	0.41	22	6.3	19.4	87
FSB66N0564K--	0.56	0.62	23	5.2	17.9	87
FSB66N0684K--	0.68	0.91	24	4.4	17.3	87

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PROTECTION

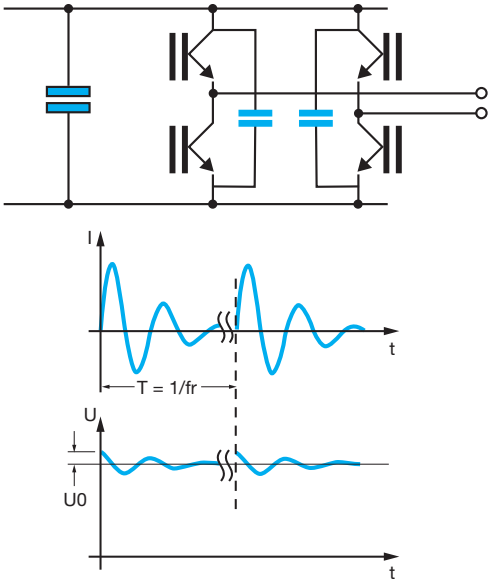
STANDARDS

IEC 61071-1, IEC 61071-2: Power electronic capacitors

TANGENT OF LOSS ANGLE (TANδ_0) FOR POLYPROPYLENE DIELECTRIC

Polypropylene has a constant dielectric loss factor of $2x10^{-4}$ irrespective of temperature and frequency (up to 1 MHz).

IGBT SNUBBER



With

L = stray inductance IGBT + capacitor

R = serial resistance IGBT + capacitor

HOT SPOT TEMPERATURE CALCULATION

See Hot Spot Temperature, page 3.

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

with P_d (Dielectric losses) = Q x $tg\delta_0$

$\Rightarrow [\frac{1}{2} \times C_n \times (V_{ripple\ peak\ to\ peak})^2 \times f] \times (2 \times 10^{-4})$

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

Rth : Rth ambient / hot spot in °C/W

where C_n in Farad, I_{rms} in Ampere, f in Hertz, V in Volt, R_s in Ohm, θ in °C

Due to the design of the capacitor and its technology, the thermal impedance between the terminations and the core of the capacitor is low, it is necessary to take care that the capacitor is never overheated by use of wrongly sized connections.

Do not use the capacitor as a heat sink.

Due to the complexity of the IGBT / capacitor thermal exchanges, we recommend that thermal measurements shall be made on the different components. We would be pleased to advise you on specific applications.

WORKING TEMPERATURE

(according to the power to be dissipated) -40°C to +85°C

MARKING

TPC logo

Capacitance and tolerance in clear

Nominal DC voltage in clear

RMS current in clear

Date of manufacture (IEC coding)

$$Ieff = \sqrt{\left[\frac{C\beta_0^2 \times U_0}{2j\beta}\right]^2 \times \frac{1}{T} \times \left[\frac{e^{-2\alpha \times T}}{\beta^2 + \alpha^2} \times [\beta \sin(2\beta \times T) - \alpha \times \cos(2\beta \times T)] + \frac{1}{\alpha} \times e^{-2\alpha \times T} + \frac{\alpha}{\beta^2 + \alpha^2} - \frac{1}{\alpha}\right]}$$

with $\beta 0 = \sqrt{\frac{1}{LC}}$; $\alpha = \frac{R}{2L}$; $\beta = \sqrt{\beta_0^2 - \alpha^2}$