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CAPACITORS FOR POWER ELECTRONICS

Power capacitors

Design

MKP capacitors uses polypropylene film as the dielectric, which excels in low dielectric loss. PP film is metalized with a thin layer of zinc-aluminium alloy. Two layers of metalized film are wound into cylindrical windings. Flat sides of windings are contacted with zinc layer ensuring connection to terminals.

Special structure of winding ensures feature called “self-healing”. In the event of voltage breakdown, the metal layer is evaporated around the breakdown channel in very short time. Thanks to evaporation, no conductive channel is created between both metal layers and capacitor remains in full functionality.

Case

Most of our capacitors - cylindrical DC Link capacitors, AC filters, some types of rectangular DC Link or impulse capacitors - are cased in aluminium can. Other bigger rectangular capacitors may be encapsulated in stainless steel can. Plastic housing is mainly used for snubber or impulse capacitors.

PU resin

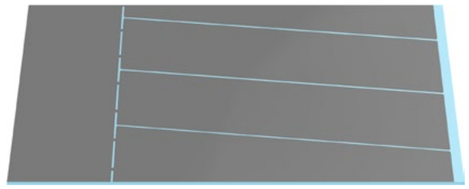
Winding elements are very vulnerable to humidity, oxygen and other environmental interferences. Therefore capacitors are filled with PU resin to protect winding elements from entering by air environmental interferences. As a result, is extension of lifetime of capacitor. On top of that resin also keeps winding elements mechanically safe and fixed against any vibrations.

Dry system

No impregnation is used for metalized polypropylene film.

Safety System

Segmented film



Segmented film offers one of the most important internal protective mechanism that ensures safe operation through the lifetime, ageing and during overload of the capacitor. Special segmented metallization feature fuse gates protect capacitor element from internal faults in case of improper self-healing caused by weak spots in PP film. Fuse gates are limiting current flowing into the weak spot and disconnects particular segment. Which protects winding element from destruction. Depending on rated voltage and type of foil, different segments are used. Capacitance decrease takes place when the capacitor is on the edge of its lifetime. Segmented film is used in DC applications.

Overpressure disconnector

There is an attenuated spot at internal wiring of the capacitor. When pressure starts to increase, case expands. Pressure is forced to push the lid, where terminals are placed. Expansion of the lid cause separation of connecting wires at attenuated spot and capacitor disconnects. Only AC filters capacitors use overpressure disconnector.

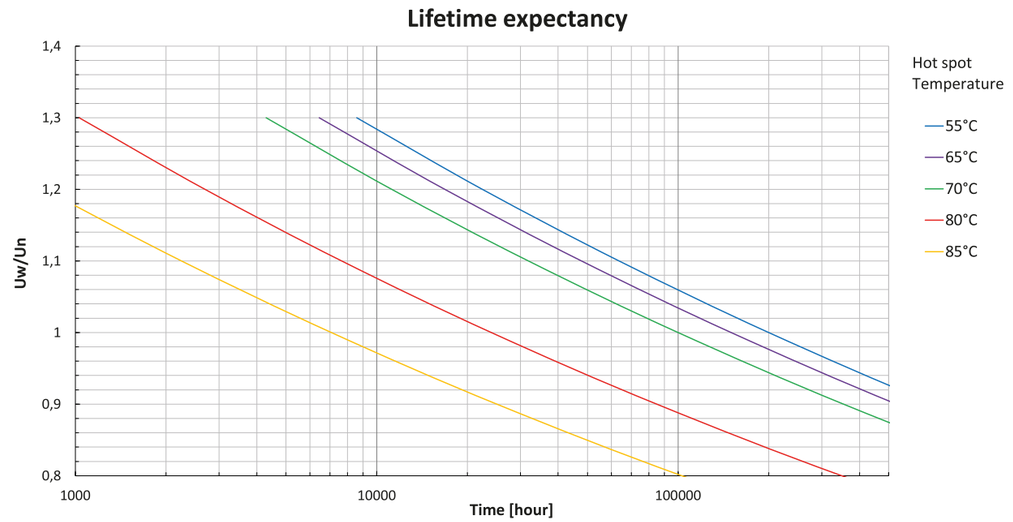
Pressure switch

Pressure switch might be used for capacitors with hermetical housing. When self-healing system fails, surge of temperature and pressure occurs and the capacitor might tear up. Overpressure sensor detects the surge of pressure and provides signal which shall be used for safety circuit and disconnection of capacitor. Sensor contains NC or NO switch. Switch is activated when overpressure reaches 0,3-0,5 bar. Switching voltage and current up to 250 V and 5 A.

Capacitors for Power Electronics

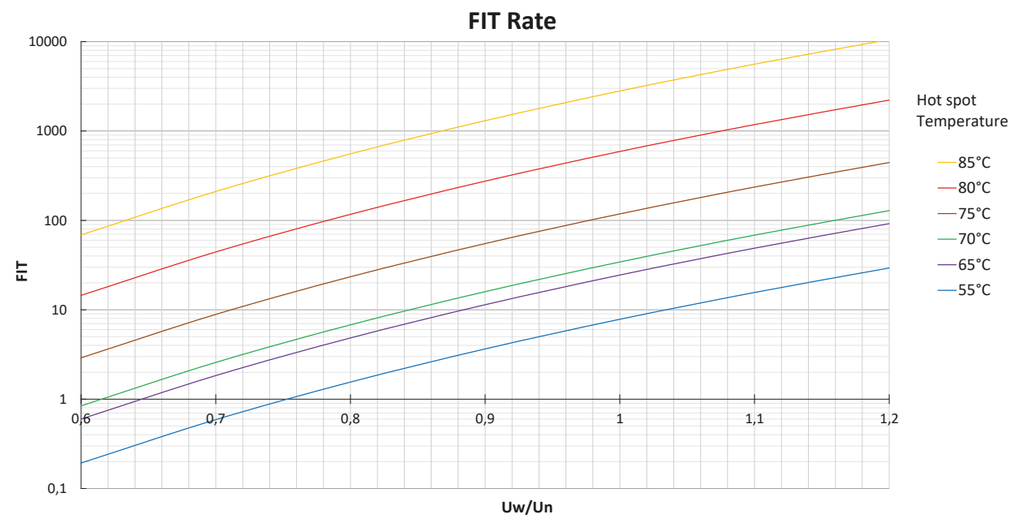
Lifetime

Capacitor lifetime depends strongly on hotspot temperature and working voltage. The higher the hotspot temperature and the voltage is, the lifetime decreases exponentially. Hotspot temperature is linked with current load of the capacitor. Lifetime expectancy, described in graph below, is calculated according to previous experiments, long-time experiences and theoretical predictions. Graph is theoretical curve and lifetime of different types of capacitors may vary. Standard designed lifetime is 100.000 hours at hot spot temperature 70°C.



FIT Rate

FIT (failures in time) represents probability of failure during operating procedure under specific conditions. In the other word, it provides information about what can we expect when capacitor is overloaded. It is statistic value calculated from long-time experiences and theoretical predictions. FIT rate depends mainly on working hot spot temperature and applied working voltage but of course also on capacitor design itself.



Capacitors for Power Electronics

Snubber Capacitors

General technical parameters

Rated voltage	700 V – 12 000 V DC
Rated capacitance	0,1 µF – 60 µF
Capacitance tolerance	±10 %
Voltage test between terminals	1,5 x U_N DC/10 s
Mounting position	Any
Case temperature	-40/85 °C
Storage temperature	-40/85 °C
Hot spot	max 85 °C
Lifetime expectancy	100 000 – 150 000 h
FIT	50
Case	Plastic - PA

Standard types

(other parameters on request)

U_{MAX} = 1000 V U_N = 800 V DC U_S = 1200 V U_{RMS} = 480 V

C_N (µF)	Type	I_{MAX} (A)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	Ø D (mm)	L (mm)	X (M)	Ø d (mm)	m (kg)	Drw. No.
9,0	PVDJP 50546-1/9	15	1,1	3,6	11,5	15	50	54	6	18	0,1	1
16,0	PVDJP 60546-1/16	22	2,0	2,1	10,8	15	60	54	6	18	0,2	1
30,0	PVDJP 75548-1/30	35	4,0	1,2	9,4	15	75	54	8	22	0,3	1
60,0	PVDJP 105548-1/60	60	8,0	0,6	5,7	15	105	54	8	22	0,8	1

U_{MAX} = 2000 V U_N = 1600 V DC U_S = 2400 V U_{RMS} = 840 V

C_N (µF)	Type	I_{MAX} (A)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	Ø D (mm)	L (mm)	X (M)	Ø d (mm)	m (kg)	Drw. No.
2,8	PVDJP 50546-2/2,8	20	1,5	3,2	11,5	15	50	54	6	18	0,1	1
4,8	PVDJP 60546-2/4,8	28	2,5	1,9	10,8	15	60	54	6	18	0,2	1
6,0	PVDJP 65546-2/6	32	3,2	1,5	10,5	15	65	54	6	18	0,2	1
8,0	PVDJP 75548-2/8	40	4,2	1,1	9,4	15	75	54	8	22	0,3	1
10,0	PVDJP 85548-2/10	45	5,2	0,9	7,9	15	85	54	8	22	0,4	1
18,0	PVDJP 105548-2/18	70	9,2	0,6	5,7	15	105	54	8	22	0,5	1

U_{MAX} = 3600 V U_N = 3000 V DC U_S = 4500 V U_{RMS} = 1200 V

C_N (µF)	Type	I_{MAX} (A)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	Ø D (mm)	L (mm)	X (M)	Ø d (mm)	m (kg)	Drw. No.
0,65	PVDJP 50606-3,6/0,65	8	0,7	6,8	11,3	15	50	60	6	18	0,2	1
1,1	PVDJP 60606-3,6/1,1	12	1,1	4,2	10,6	15	60	60	6	18	0,2	1
1,4	PVDJP 65606-3,6/1,4	15	1,4	3,3	10,2	15	65	60	6	18	0,2	1
2,0	PVDJP 75608-3,6/2	18	2,0	2,6	8,8	15	75	60	8	22	0,3	1
2,7	PVDJP 85608-3,6/2,7	24	2,7	1,9	7,4	15	85	60	8	22	0,5	1
4,0	PVDJP 105608-3,6/4	30	4,0	1,3	6,3	15	105	60	8	22	0,6	1

U_{MAX} = 4000 V U_N = 3200 V DC U_S = 4800 V U_{RMS} = 1800 V

C_N (µF)	Type	I_{MAX} (A)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	Ø D (mm)	L (mm)	X (M)	Ø d (mm)	m (kg)	Drw. No.
0,7	PVDJP 50686-4/0,7	20	1,7	4,1	11,2	15	50	68	6	18	0,2	1
1,2	PVDJP 60686-4/1,2	30	2,8	2,4	10,3	15	60	68	6	18	0,2	1
1,5	PVDJP 65686-4/1,5	35	3,6	1,9	9,8	15	65	68	6	18	0,2	1
2,0	PVDJP 75688-4/2	40	4,8	1,5	8,0	15	75	68	8	22	0,4	1
3,0	PVDJP 85688-4/3	55	7,2	1,1	6,7	15	85	68	8	22	0,5	1
4,5	PVDJP 105688-4/4,5	75	10,0	0,7	5,6	15	105	68	8	22	0,8	1

U_{MAX} = 5000 V U_N = 4000 V DC U_S = 6000 V U_{RMS} = 2100 V

C_N (µF)	Type	I_{MAX} (A)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	Ø D (mm)	L (mm)	X (M)	Ø d (mm)	m (kg)	Drw. No.
0,5	PVDJP 50686-5/0,5	15	1,4	4,8	11,2	15	50	68	6	18	0,2	1
0,8	PVDJP 60686-5/0,8	25	2,2	3,1	10,3	15	60	68	6	18	0,2	1
1,1	PVDJP 65686-5/1,1	30	3,1	2,2	9,8	15	65	68	6	18	0,3	1
1,5	PVDJP 75688-5/1,5	35	4,2	1,7	8,0	15	75	68	8	22	0,4	1
2,2	PVDJP 85688-5/2,2	50	6,1	1,2	6,7	15	85	68	8	22	0,5	1
3,3	PVDJP 105608-5/3,3	70	9,0	0,8	5,6	12	105	68	8	22	0,5	1

U_{MAX} = 6800 V U_N = 6000 V DC U_S = 8200 V U_{RMS} = 3200 V

C_N (µF)	Type	I_{MAX} (A)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	Ø D (mm)	L (mm)	X (M)	Ø d (mm)	m (kg)	Drw. No.
0,11	PVDJP 50686-6,8/0,11	10	0,7	9,9	11,2	15	50	68	6	18	0,3	1
0,20	PVDJP 60686-6,8/0,2	12	1,2	6,0	10,3	15	60	68	6	18	0,4	1
0,25	PVDJP 65686-6,8/0,25	15	1,5	5,0	9,8	15	65	68	6	18	0,4	1
0,35	PVDJP 75688-6,8/0,35	18	2,1	3,5	8,0	15	75	68	8	22	0,4	1
0,47	PVDJP 85688-6,8/0,47	22	2,8	2,6	6,7	15	85	68	8	22	0,5	1
0,68	PVDJP 105688-6,8/0,68	30	4,0	1,8	5,6	15	105	68	8	22	0,7	1

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Protection of SCR thyristors

U_{MAX} = 6800 V U_N = 5600 V DC U_S = 8400 V U_{RMS} = 3000 V

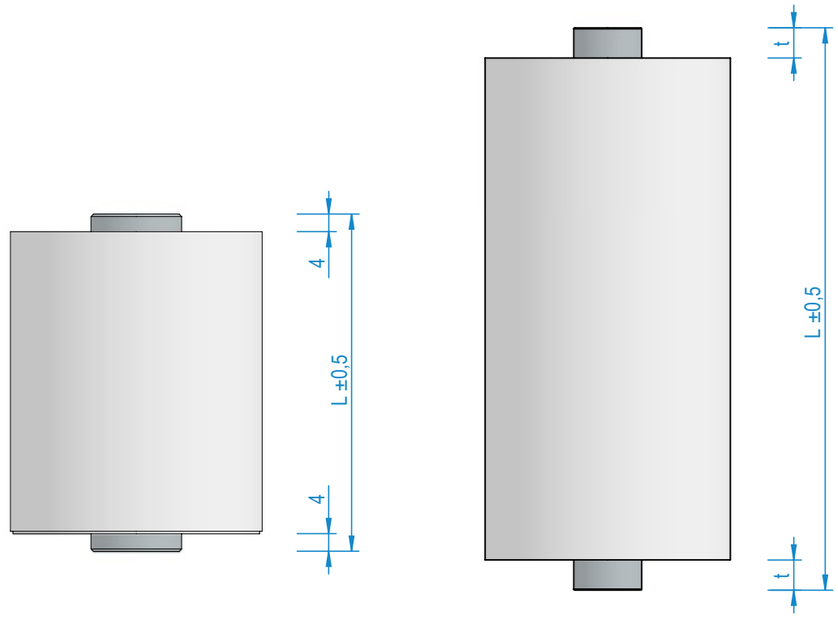
C_N (µF)	Type	I_{MAX} (A)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x L (mm)	t (mm)	m (kg)	Drw. No.
0,33	PVDJP 020-6,8/0,33	10	1,2	8,6	5,5	15	60 x 133	8	0,6	2
0,5	PVDJP 020-6,8/0,5	20	1,3	7,6	5,6	15	55 x 133	8	0,4	2
2,0	PVDJP 021-6,8/2	12	6,8	7,0	4,9	30	85 x 120	4	0,6	2

U_{MAX} = 8000 V U_N = 6400 V DC U_S = 9600 V U_{RMS} = 3200 V

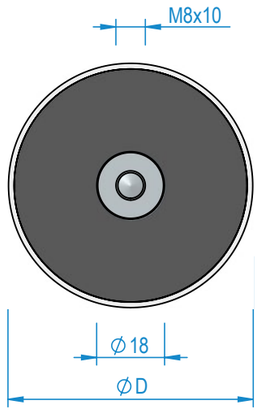
C_N (µF)	Type	I_{MAX} (A)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x L (mm)	t (mm)	m (kg)	Drw. No.
0,33	PVDJP 020-8/0,33	12	0,8	8,0	9,2	15	55 x 133	8	0,5	2
0,5	PVDJP 020-8/0,5	20	1,2	6,0	9,0	15	60 x 133	8	0,6	2
0,68	PVDJP 020-8/0,68	25	2,4	7,5	4,0	15	55 x 133	8	0,4	2
0,75	PVDJP 020-8/0,75	25	1,5	5,0	9,0	15	60 x 133	8	0,6	2
1,0	PVDJP 020-8/1	30	2,4	4,0	8,0	15	65 x 133	8	0,6	2

U_{MAX} = 10000 V U_N = 8000 V DC U_S = 12000 V U_{RMS} = 4000 V

C_N (µF)	Type	I_{MAX} (A)	I_S (kA)	R_S (mΩ)	R_{TH} (K/W)	L_S (nH)	D x L (mm)	t (mm)	m (kg)	Drw. No.
0,33	PVDJP 020-10/0,33	10	0,9	8,5	5,5	15	60 x 133	8	0,6	2
0,47	PVDJP 020-10/0,47	12	3,9	6,6	5,4	15	65 x 133	8	0,6	2
0,5	PVDJP 020-10/0,50	12	3,0	7,1	5,5	15	60 x 133	8	0,6	2
0,56	PVDJP 020-10/0,56	12	3,0	5,8	5,4	15	65 x 133	8	0,6	2
0,62	PVDJP 020-10/0,62	12	3,0	5,5	5,4	15	65 x 133	8	0,6	2



Drawing 1



Drawing 2