

FPX RANGE

Capacitor for Power Electronics

Preliminary data sheet



FPX

Applications

Protection of thyristors .
Protection of gate turn off thyristor (GTO) .
Clamping (Secondary snubber) .

Technology

Metallized polypropylene dielectric capacitor with controlled self healing .
Reinforced metallisation developed for high impulse currents .
Axial connections specially developed to reduce serial inductance and to provide rigid mechanical mounting .

Presentation

Cylindrical in plastic or epoxy case filled with thermosetting resin .
Outputs : threaded inserts M6 or M8 .

Electrical characteristics

Climatic category : 40/085/56 (IEC 68) .
Working Temperature : - 40 to + 85°C .
Hot spot temperature 85°C (must be calculated : see page up) .

Capacitance range : C = 0.5 μ F to 6 μ F .
Tolerance : \pm 5 % .

Nominal dc voltage : U_{ndc} = 1000 to 3000 V .
Peak voltage : U_{cr} = 1600 to 4000 V .
Allowable overvoltage : U_s = 2000 to 4600 V 10 s per day .

RMS current : I_{rms} max = 15 to 160 A .

Impulse current : I^2t max = up to 729 A²s .

Spikes or peak currents in the capacitors may cause a deterioration of the bonding between the metallisation and 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 amps, and t is in seconds .
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 .

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Stray inductance : 5 to 20 nH .

Variation of capacitance with temperature : $\frac{\Delta C}{C} \pm 2 \%$ between -40 and 85°C .

Test voltage between terminals : $U_s \times 10 \text{ s } 25^{\circ}\text{C}$.

Withstanding voltage between terminals and case : $> 4000 \text{ V}_{\text{rms}} 60 \text{ s } 50 \text{ Hz}$.

Standards

IEC 1071-1, IEC 1071-2 : Power electronic capacitors .

IEC 68 -1 : Environmental testing .

UL 94 : Fire requirements .

Hot spot temperature calculation

Hot spot = $\theta_{\text{connection}} + (P_d + P_c) \times R_{\text{th}}$.

with

P_d (Dielectric losses) = $Q \times \text{Tg}\delta 0 \text{ @ } [1/2 \times C \times (U_{\text{peak to peak}})^2 \times \text{Fr}] \times (2 \cdot 10^{-4})$.

P_c (Joule losses) = $R_s \times I_{\text{rms}}^2$.

- C in Farad .

- U in Volts .

- R_s in

NOTE

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.

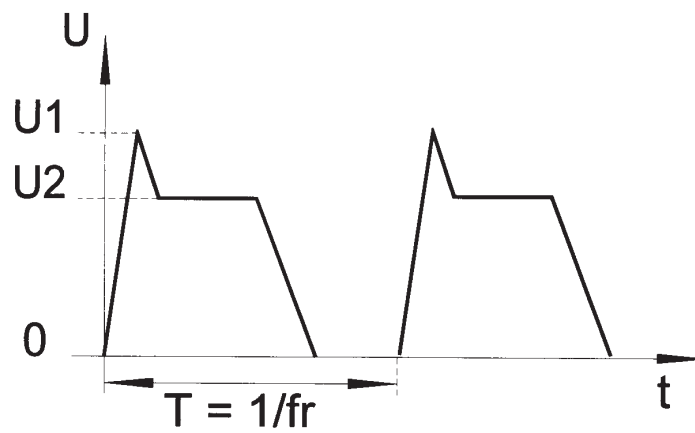
In the case where the series diode are screwed to the capacitor, cooling of the diode must be taken into account. Do not use the capacitor as a heat sink.

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

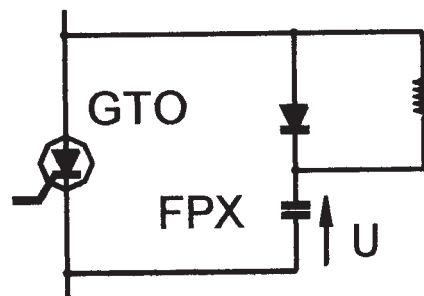
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Applications note

GTO protection



Choice of voltage : U_1 Upeak
 U_2 Undc

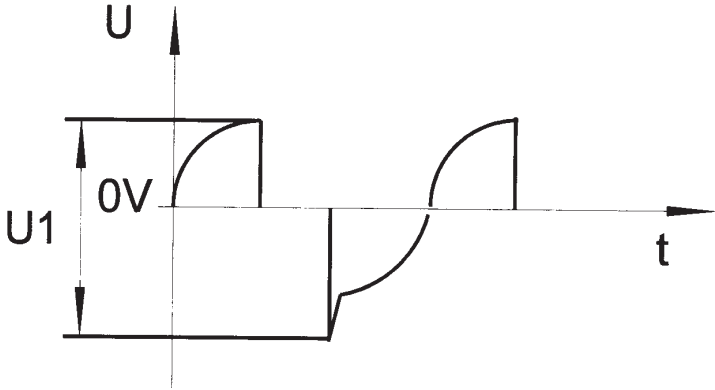


Nominal dc voltage (U_{dc}) and peak voltage (U_{peak}) are given in the tables.

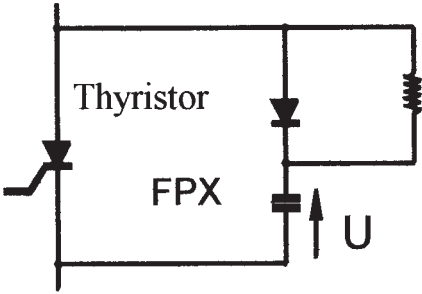
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Applications note

THYRISTOR protection



Choice of voltage : U_1 U_{peak}
note that U_1 is the voltage peak to peak and can be not symmetrical versus 0 V

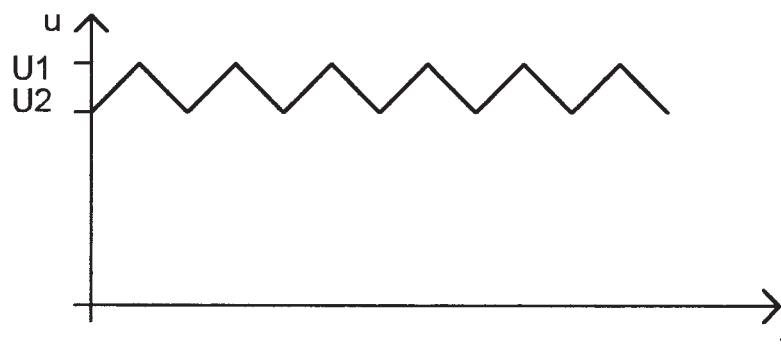


Peak voltage is given in the tables.

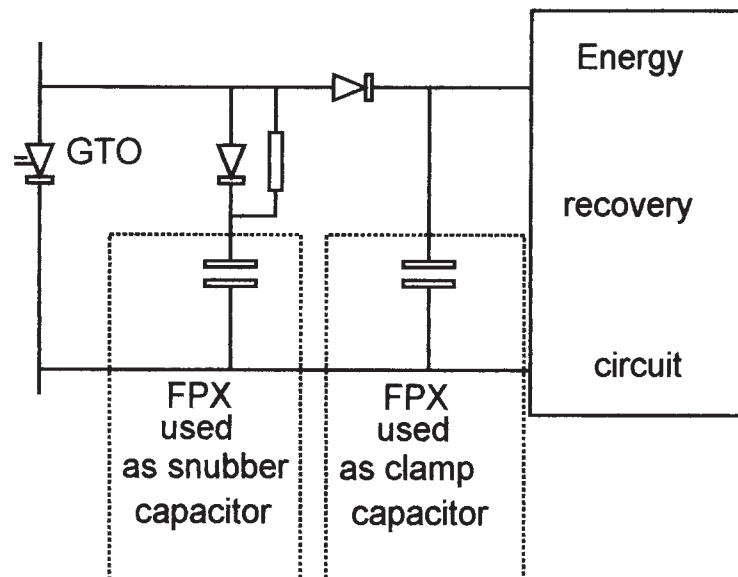
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Applications note

CLAMPING



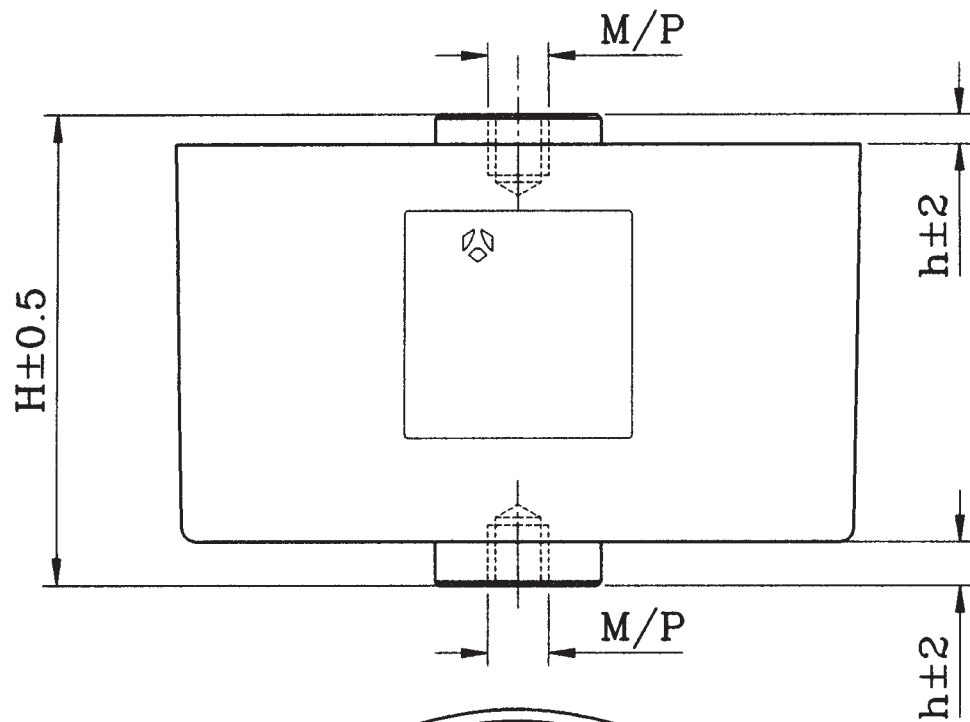
Choice of voltage : U1 Upeak
U2 Undc



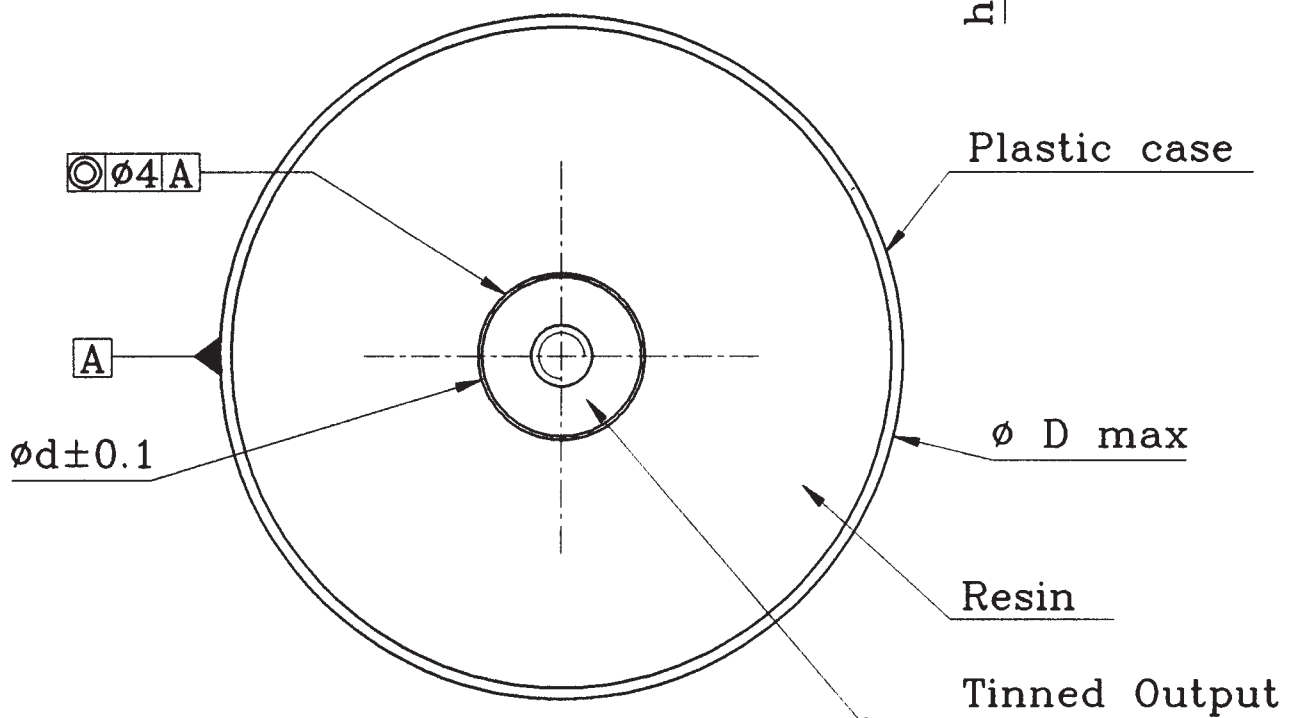
The nominal voltage (U_{ndc}) and peak voltage (U_{peak}) are given in the tables.

NOTE

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Max Torque: 10Nm (M8)
6Nm (M6)

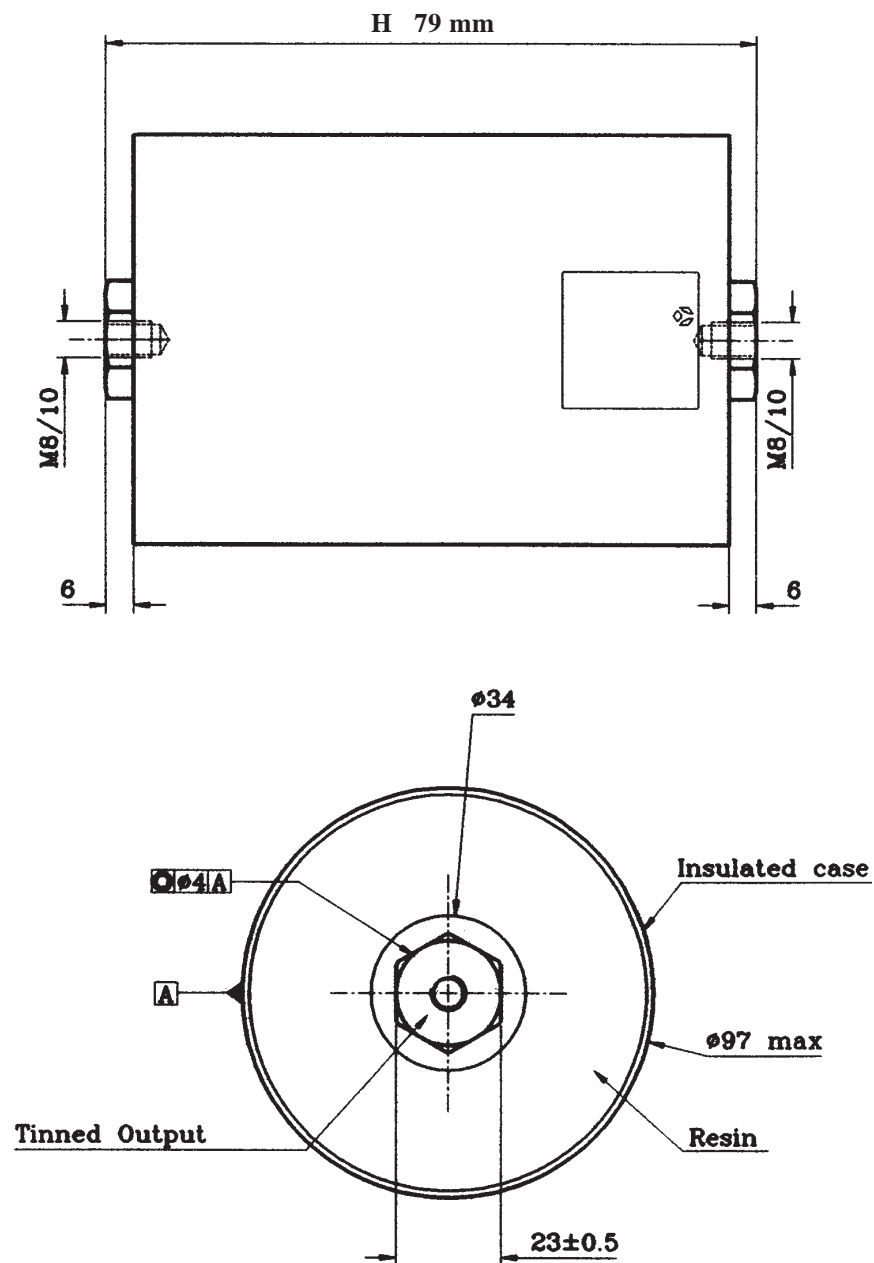


Dimensions in mm

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Max Torque : 10Nm

The positions of the connections of each side are not indexed



Dimensions in mm

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FPX 2000V Undc : 1000 V Upeak : 1600 V Urms : 560 V Us : 2000 V

Cn (μ F)	Dimensions (mm)					(I ² .t) max (A ² .s)	I _{rms} max (A)	Rs (mOhm)	R _{th} (°C/W)	Références
	Case type	H ± 0.5	h ± 2	D max	d ± 0.1					
1	Plastic case M6/6	52	5	40	18	2	15	2.4	14	FPX66N0105J--
2	Plastic case M8/8	52	5	60	22	8	30	1.2	6.1	FPX86N0205J--
3	Plastic case M8/8	52	5	72	22	18	45	0.9	4.5	FPX86N0305J--
3.5	Plastic case M8/8	52	5	72	22	25	50	0.85	4.5	FPX86N0355J--
4	Plastic case M8/8	52	5	82	22	32	60	0.75	3.5	FPX86N0405J--
5	Plastic case M8/8	52	5	82	22	50	70	0.65	2.5	FPX86N0505J--

FPX 2500V Undc : 1300 V Upeak : 2000 V Urms : 700 V Us : 2500 V

Cn (μ F)	Dimensions (mm)					(I ² .t) max (A ² .s)	I _{rms} max (A)	Rs (mOhm)	R _{th} (°C/W)	Références
	Case type	H ± 0.5	h ± 2	D max	d ± 0.1					
0.5	Plastic case M6/6	52	5	40	18	1	15	3	14	FPX66P0504J--
1	Plastic case M8/8	52	5	60	22	3	20	2.3	10.5	FPX86P0105J--
1.5	Plastic case M8/8	52	5	60	22	7	30	1.5	6.1	FPX86P0155J--
2	Plastic case M8/8	52	5	72	22	12.7	40	1.1	4.5	FPX86P0205J--
2.5	Plastic case M8/8	52	5	72	22	20	60	0.89	3.7	FPX86P0255J--
3	Plastic case M8/8	52	5	82	22	28	60	0.85	3.2	FPX86P0305J--
3.5	Plastic case M8/8	52	5	82	22	39	65	0.78	2.9	FPX86P0355J--

FPX 3500V Undc : 2000 V Upeak : 2400 V Urms : 850 V Us : 3500 V

Cn (μ F)	Dimensions (mm)					(I ² .t) max (A ² .s)	I _{rms} max (A)	Rs (mOhm)	R _{th} (°C/W)	Références
	Case type	H ± 0.5	h ± 2	D max	d ± 0.1					
2	Plastic case M8/8	62	5	72	22	23	41	1.24	6.1	FPX86X0205J--
3	Plastic case M8/8	62	5	92	22	50	62	0.92	3.9	FPX86X0305J--
3.5	Plastic case M8/8	62	5	92	22	70	72	0.83	3.4	FPX86X0355J--
4	Plastic case M8/8	62	5	92	22	85	80	0.78	3.1	FPX86X0405J--

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FPX 4500V Undc : 2500 V Upeak : 3200 V Urms : 1130 V Us : 4500 V

Cn (μ F)	Dimensions (mm)					(I ² .t) max (A ² .s)	I _{rms} max (A)	Rs (mOhm)	R _{th} (°C/W)	Références
	Case type	H ± 0.5	h ± 2	D max	d ± 0.1					
1	Plastic case M8/8	62	5	72	22	15	38	1.4	6.2	FPX86Z0105J--
2	Plastic case M8/8	62	5	92	22	70	75	0.85	3.1	FPX86Z0205J--

FPX 4600V Undc : 3000 V Upeak : 4000 V Urms : 1400 V Us : 4600 V

Cn (μ F)	Dimensions (mm)					(I ² .t) max (A ² .s)	I _{rms} max (A)	Rs (mOhm)	R _{th} (°C/W)	Références
	Case type	H * ± 0.5	h ± 2	D max	d ± 0.1					
0.68	Plastic case M8/8	62	5	72	22	14	35	1.59	6.2	FPX86Y0684J--
1.25	Plastic case M8/8	62	5	92	22	50	65	1	3.3	FPX86Y1254J--
1.5	Epoxy case M8/10	79	6	97	–	32	60	1.4	8.3	FPX86Y0155J--
1.7	Epoxy case M8/10	79	6	97	–	40	70	1.3	7.4	FPX86Y0175J--
2	Epoxy case M8/10	79	6	97	–	56	80	1.1	6.3	FPX86Y0205J--
2.5	Epoxy case M8/10	118	6	97	–	200	130	0.8	3.3	FPX86Y0255J--
2.7	Epoxy case M8/10	118	6	97	–	232	140	0.7	3.2	FPX86Y0275J--
3	Epoxy case M8/10	143	6	97	–	128	100	0.9	4.4	FPX86Y0305J--
3.5	Epoxy case M8/10	143	6	97	–	170	110	0.8	4.2	FPX86Y0355J--
4	Epoxy case M8/10	143	6	97	–	224	115	0.8	4.0	FPX86Y0405J--
4.5	Epoxy case M8/10	163	6	97	–	522	120	0.6	5.0	FPX86Y0455J--
5	Epoxy case M8/10	163	6	97	–	600	130	0.6	5.0	FPX86Y0505J--
6	Epoxy case M8/10	163	6	97	–	729	160	0.5	5.0	FPX86Y0605J--

* Tol : + 0 / – 3 mm for H 118 mm.

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