CAUTION FOR PROPER USE OF FILM CAPACITORS

Please consider the following information when selecting and using capacitors.
Specifications, materials and so on in the catalog may be subject to change without notice.
Data in the catalog is not guaranteed value, but typical value only.

■ORDERING INFORMATION

Please confirm and inform us of the following information when ordering capacitors.

1. Working voltage : AC or DC
2. Capacitance and capacitance tolerance
3. Operating temperature range
4. Special operating condition : waveform, effective value,crest value, frequency, pulse, etc.
5. Expected failure mode : Influence to other components, when the capacitor gets failure, or influence to the capacitor, when the other component or the circuit works irregularly.
6. Soldering condition
7. Operating environmental condition
8. Others

Ask for our technical specifications of the capacitor and confirm it to be suitable for the application before purchase and/or use.

■PROPER USE INFORMATION

1.RATED VOLTAGE

Rated voltage is the maximum peak voltage (sum of D.C. voltage and peak A.C. voltage which is no more than the value specified in the individual specification) which may be applied to a capacitor continuously at its rated temperature.
Rated voltage of capacitors for electronic equipment is usually DC voltage. (Unless otherwise specified)

1) When a D.C. rated capacitor is used in an A.C. circuit, the capacitor generates heat except for an across the line capacitor. We recommend using capacitors below the voltage shown in Table 1.

Table 1

DC Rated Voltage	AC Rated Voltage [Vrms(50, 60Hz)]									
	MPN	MPK	MPH	MPB	MPE	MMB	MMK	F2D	P2S	H2D
50V	–	–	–	–	–	–	–	30	–	30
100V	–	–	※	–	–	50	50	50	50	50
200V	–	–	–	–	–	–	–	100	–	–
250V	–	–	125	125	–	125	–	–	125	–
400V	–	–	–	–	–	200	–	–	–	–
450V	100	150	200	200	–	–	200	–	–	–
630V	150	200	250	250	–	250	250	–	–	–
800V	–	※	※	–	250	–	–	–	–	–
1250V	–	–	–	–	400	–	–	–	–	–
1600V	–	–	–	–	700	–	–	–	–	–

・AC rated voltage of Table 1 is not applicable to all kinds of capacitors. Please inquire us to details.
※For AC rated voltage of this item, please consult our sales offices.

2) Rated voltage derating by category temperature

Use of the capacitors at high temperature shortens the capacitor life due to thermal deterioration. When operating capacitors at high temperature, please derate the operating voltage in conformance with the graphs below. (Fig1～2)

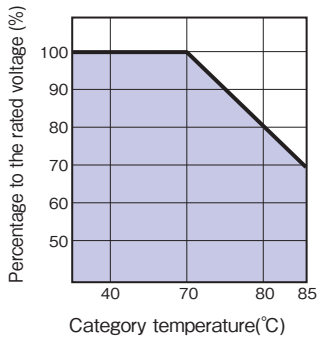

Fig 1
Application series
P2S

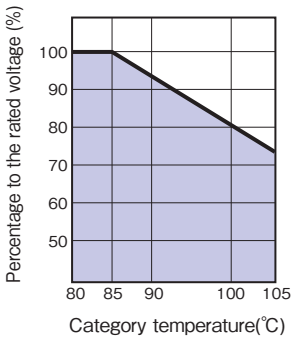

Fig 2
Application series
MPK, PCK, MMG, MMB, MMK, F2D

3) Rated voltage derating by high frequency

Using a capacitors at high frequency will shorten its life due to the generation of heat. When operating capacitors at high frequency, please reduce the operating voltage according to specification sheet.

4) Use in special wave form

If you want to use the capacitor with a special wave-form other than a sine wave, please inquire to us for details after identifying the wave-form with which the capacitor is required to be used, because the effective value varies with wave-form.

(NOTE) Where a DC bias is voltage included,the DC rated voltage minus the DC bias voltage becomes the permissible AC voltage, and this AC voltage shall be derated depending on the frequency.

2. PERMISSIBLE CURRENT

1) PERMISSIBLE CURRENT FOR FREQUENCY

When using capacitors with an alternating current, effective current should not exceed the value of permissible current for frequency shown in the graph of each series.(individual page)

2) Permissible peak current (pulse current)

When in use for non-sine current wave, effective current should not exceed the permissible value and also, peak current should not exceed the following permissible peak current value shown in each series in Table 2.

Table 2 (Ao-p)

(μF)	MPK			MPH					MPB			MPE			MMB				MMK		
	450Vdc	630Vdc	800Vdc	100Vdc	250Vdc	450Vdc	630Vdc	800Vdc	250Vdc	450Vdc	630Vdc	800Vdc	1250Vdc	1600Vdc	100VDC	250Vdc	400Vdc	630Vdc	100Vdc	450Vdc	630Vdc
0.001	–	–	–	–	–	–	–	–	–	–	–	6	6	6	–	–	–	–	–	–	–
0.0012	–	–	–	–	–	–	–	–	–	–	–	7	7	7	–	–	–	–	–	–	–
0.0015	–	–	–	–	–	–	–	–	–	–	–	9	9	9	–	–	–	–	–	–	–
0.0018	–	–	–	–	–	–	–	–	–	–	–	10	10	10	–	–	–	–	–	–	–
0.0022	–	–	–	–	–	–	–	–	–	–	–	9	9	13	–	–	–	–	–	–	–
0.0027	–	–	–	–	–	–	–	–	–	–	–	12	12	16	–	–	–	–	–	–	–
0.0033	–	–	–	–	–	–	–	–	–	–	–	14	14	19	–	–	–	–	–	–	–
0.0039	–	–	–	–	–	–	–	–	–	–	–	17	17	22	–	–	–	–	–	–	–
0.0047	–	–	–	–	–	–	–	–	–	–	–	20	20	27	–	–	–	–	–	–	–
0.0056	–	–	–	–	–	–	–	–	–	–	–	24	24	32	–	–	–	–	–	–	–
0.0068	–	–	–	–	–	–	–	–	–	–	–	29	29	39	–	–	–	–	–	–	–
0.0082	–	–	–	–	–	–	–	–	–	–	–	24	24	47	–	–	–	–	–	–	–
0.01	–	–	–	–	–	–	–	–	9	9	9	29	29	58	–	–	–	5	–	–	–
0.012	–	–	–	–	–	–	–	–	10	10	10	35	35	69	–	–	–	6	–	–	–
0.015	–	–	–	–	–	–	–	–	13	13	13	43	43	86	–	–	–	8	–	–	–
0.018	–	–	–	–	–	–	–	–	16	16	16	52	52	104	–	–	–	10	–	–	–
0.022	–	–	–	–	–	–	–	–	19	19	14	53	63	127	–	–	–	10	–	–	–
0.027	–	–	–	–	–	–	–	–	24	24	18	65	78	155	–	–	–	12	–	–	–
0.033	–	–	–	–	–	–	–	–	15	15	22	79	95	190	–	–	–	15	–	–	–
0.039	–	–	–	–	–	–	–	–	18	18	25	93	112	224	–	–	10	17	–	–	–
0.047	–	–	–	–	–	–	31	–	22	22	16	113	135	270	–	–	12	21	–	19	–
0.056	–	–	–	–	–	–	37	–	26	26	19	134	161	230	–	–	14	13	–	23	–
0.068	–	–	–	–	–	–	44	–	25	32	23	163	196	279	–	–	17	16	–	27	–
0.082	–	–	–	–	–	–	54	–	30	38	28	197	236	337	–	–	20	19	–	33	–
0.1	–	35	–	–	50	60	66	–	31	21	34	240	288	411	–	25	25	23	–	40	–
0.12	–	42	–	–	60	72	79	–	37	25	41	288	345	–	–	30	17	28	–	48	–
0.15	–	52	–	–	75	56	98	–	46	31	51	360	431	–	–	37	21	35	–	60	–
0.18	–	63	–	–	90	67	118	–	45	38	62	431	518	–	–	30	25	42	–	44	–
0.22	–	77	–	–	88	81	144	111	54	46	75	527	452	–	–	37	31	51	–	54	–
0.27	–	41	–	–	108	100	93	136	67	56	63	647	555	–	–	45	38	38	–	67	63
0.33	–	50	–	–	132	122	113	167	81	69	77	565	678	–	–	55	47	46	–	81	77
0.39	–	59	–	–	96	144	134	197	54	81	90	668	–	–	–	37	55	54	–	96	90
0.47	47	72	60	–	116	174	161	283	66	98	109	805	–	–	–	44	66	65	–	116	109
0.56	55	85	72	–	138	117	192	343	78	81	130	959	–	–	61	53	49	78	–	138	130
0.68	67	103	87	–	167	142	233	414	95	99	158	–	–	–	74	64	60	95	–	167	158
0.82	81	75	105	–	202	171	281	238	114	119	190	–	–	–	89	77	72	89	–	202	190
1	99	91	128	–	246	209	343	507	139	145	232	–	–	–	108	94	88	108	–	246	232
1.2	119	110	119	–	295	250	279	–	167	174	–	–	–	–	85	113	105	130	–	295	–
1.5	149	137	149	–	369	313	348	–	146	218	–	–	–	–	106	141	104	162	–	209	–
1.8	179	164	179	–	250	375	418	–	175	262	–	–	–	–	127	105	124	195	–	250	–
2.2	219	201	219	–	306	459	511	–	213	320	–	–	–	–	155	129	152	238	–	306	–
2.7	269	–	–	–	375	393	–	–	262	–	–	–	–	–	191	158	187	–	–	262	–
3.3	329	–	–	–	459	480	–	–	320	–	–	–	–	–	233	193	228	–	–	320	–
3.9	389	–	–	–	542	567	–	–	378	–	–	–	–	–	171	228	270	–	–	378	–
4.7	469	–	–	457	653	683	–	–	455	–	–	–	–	–	206	275	325	–	332	455	–
5.6	–	–	–	545	543	–	–	–	–	–	–	–	–	–	246	258	–	–	396	–	–
6.8	–	–	–	661	659	–	–	–	–	–	–	–	–	–	298	313	–	–	480	–	–
8.2	–	–	–	798	794	–	–	–	–	–	–	–	–	–	360	378	–	–	579	–	–
10	–	–	–	973	969	–	–	–	–	–	–	–	–	–	439	461	–	–	706	–	–
12	–	–	–	814	–	–	–	–	–	–	–	–	–	–	–	–	–	–	527	–	–
15	–	–	–	1017	–	–	–	–	–	–	–	–	–	–	–	–	–	–	659	–	–
18	–	–	–	1220	–	–	–	–	–	–	–	–	–	–	–	–	–	–	790	–	–
22	–	–	–	1492	–	–	–	–	–	–	–	–	–	–	–	–	–	–	966	–	–

In case operating current may exceed the above values, please consult us.

3.SELF HEAT RISE

Due to ripple current, A.C. voltage, and/or high frequency circuit, capacitors generate heat. Capacitors may degrade or damage themselves in case of excessive self heat rise.
We recommend self heat rise limits of Table 3.

Table 3

Type of capacitors	Self heat rise limits	Application Series
Polyester Film Capacitor	Within 10℃	F2D
Metallized Polyester Film Capacitor	Within 15℃	MMG, MMB, MMBA, MMK
Polypropylene Film Capacitor	Within 8℃	P2S
Metallized Polypropylene Film Capacitor	Within 8℃	MPN, MPK, MPKA
	Within 10℃	MPB, MPH, MPE
	Within 15℃	PCK
Polyphenylene Sulfide Film Capacitor	Within 15℃	H2D

4.CATEGORY TEMPERATURE

Atmospheric temperature range at which a capacitor may be used continuously.

1) Upper category temperature

The maximum ambient temperature at which a capacitor may be used continuously.
However, when the temperature of the capacitor goes up due to radiation or conduction from other heat sources, and/or A.C. components included in A.C. voltage or in D.C. voltage (ripple), the maximum temperature at the surface of the capacitor shall be considered as the upper category temperature.

2) Lower category temperature

The minimum ambient temperature at which a capacitor may be used continuously.

5.FOR CHARGE AND DISCHARGE

Rapid charge and discharge to capacitors under heavy condition may result in failure of capacitors. For this application, consult us in advance.

6.BUZZ

During AC operation, as the case may be, the capacitor may make buzzing noise due to mechanical vibration of the film caused the coulomb force which exists between electrodes opposite polarity. A louder buzz is made when applied voltage waveform has distortion, and/or higher frequency component, etc. Consult us if buzz made by the capacitor influence as the application.

7.USE IN CIRCUITS SUCH AS TIME-CONSTANTS

The characteristics of a capacitor vary with environmental conditions. Even in the general working state, its electrostatic capacity varies somewhat with the level of humidity in the air, and this change in electrostatic capacity varies with the dielectric used. Rubycon recommend to use P2S series when use in circuits require stable capacity such as time-constants.

8.USE IN HUMID ENVIRONMENT

When used for a long time in humid environment, the capacitor elements absorb moisture. As a result, the capacitor might break down. When used under the humid condition, please consult us.

9.SOLDERING OPERATION

When capacitors are sustained at high temperature in soldering operations, it invites short circuits or other failures due to deteriorations of the film so please observe the limitations specified in the graphs below.
Avoid reflow soldering the lead type.

※) Even under the conditions shown in fig 5, types P2S, may pose problems according to circuit board thickness and preheating conditions.
So, please pay attention to this point.

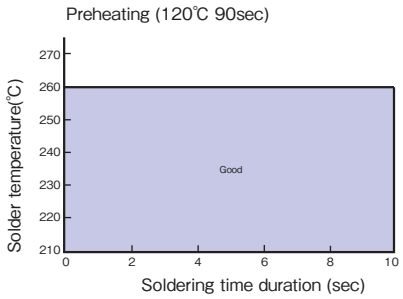

Fig 3

Application series
F2D, H2D, MMG, MMB,
MMBA, MMK

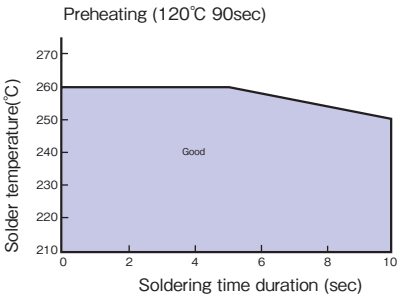

Fig 4

Application series
MPN, MPK, MPB, MPH,
MPE, MPKA, PCK

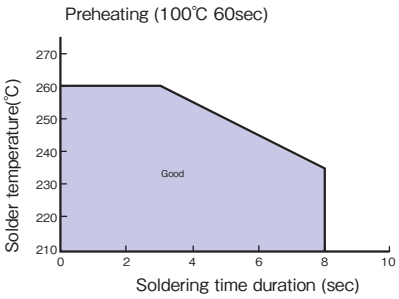

Fig 5

Application series
P2S

When using soldering iron, temperature of iron shall be 350℃, applied duration within 3sec as 1time.

10.CLEANING SOLVENTS

When a solvent is used for cleaning etc., inactive material such as alcohol, etc. should be used.
(For a more techical information, consult our engineering)

11.STORAGE CONDITION

A storage needs to be kept indoors at less than 30℃ and relative humidity of under 75% without any sudden temperature changes, direct sunlights and corrosive gas around.
Storage period in the above conditions is within one year
in principle.

12.DISPOSAL

In cace of rejecting capacitors, please seek for proffessionals who deal with the industrial wastes treatment.

13.OTHERS

- Quoted documents:Guideline of notabilia for fixed plastic film capacitors for use in electronic equipment (Technical Report of Japan Electronics and Information Technology Industries Association, JEITA RCR-2350C)
- For further particulars, please apply to our sales offices.