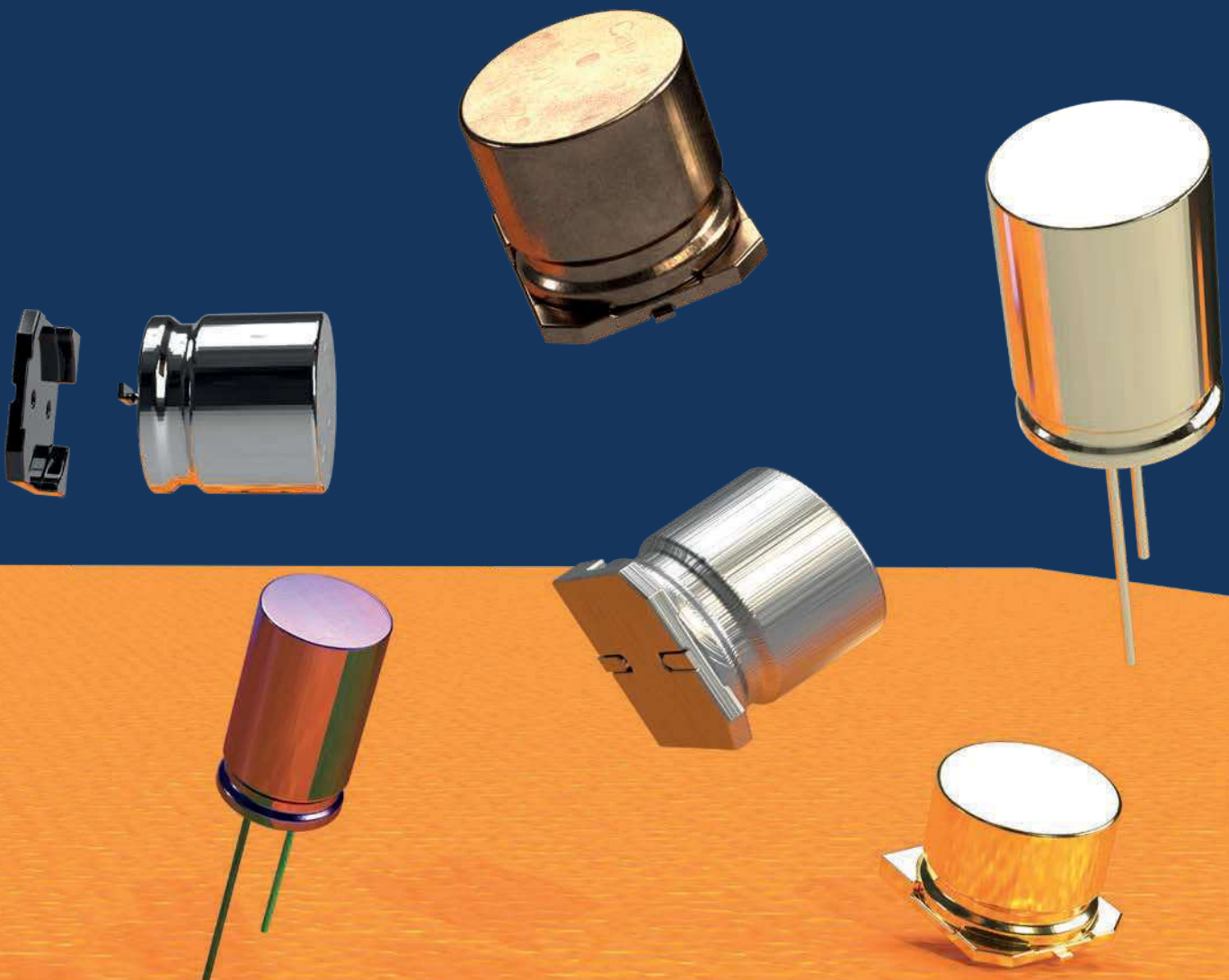


CAPXON

ELECTROLYTIC CAPACITORS

CONDUCTIVE POLYMER TYPES



2024

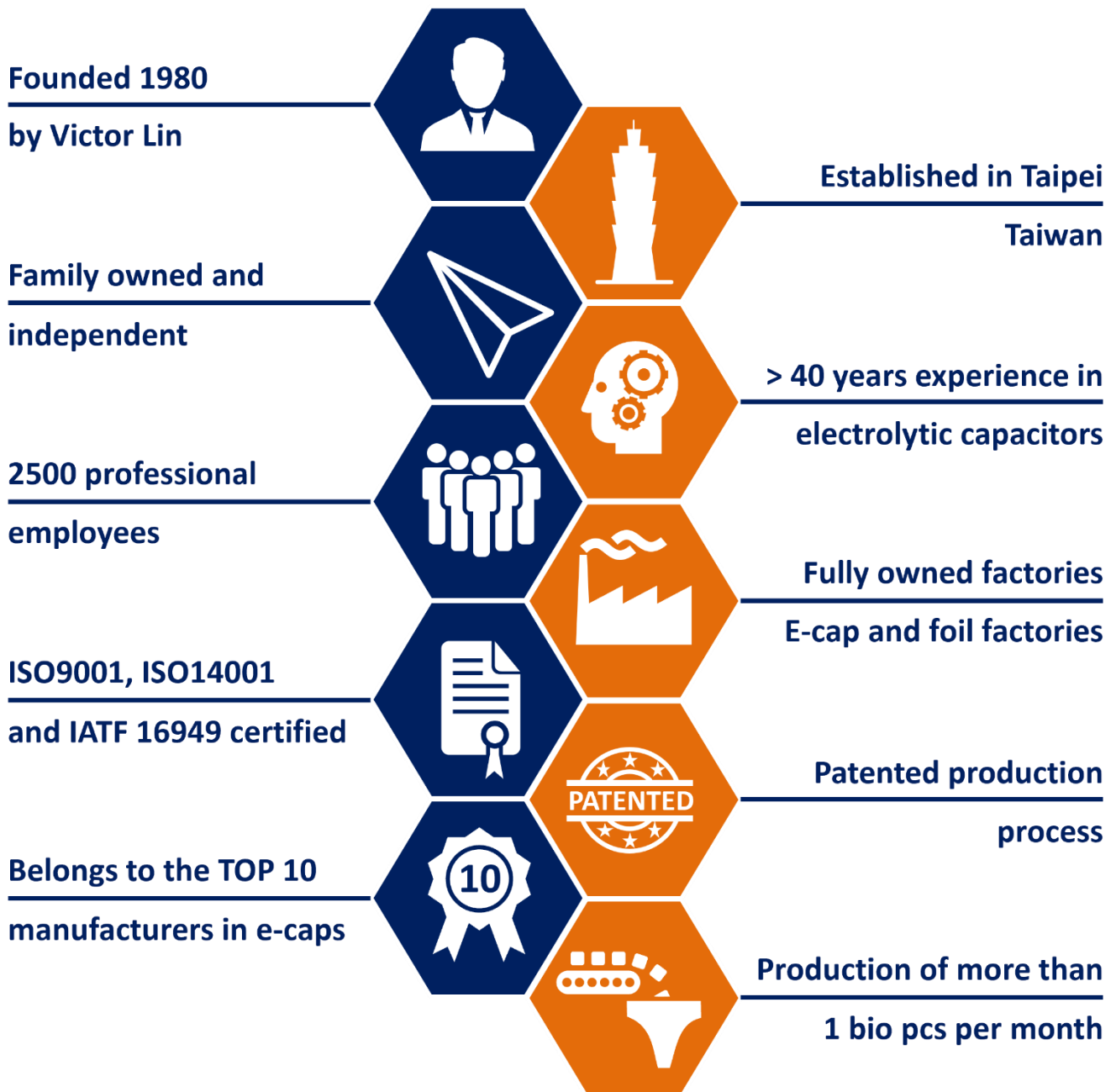
CONTENT

WORLD OF CAPXON		Page
	GENERAL INFORMATION	
	About us	4
	Overview Capacitor Technologies	5
	Technology Comparison	6
	FURTHER INFORMATION	
	Certification	7
	Smart Production	8
	Advanced Technology	9
	New Research	10
	Component Reliability Data	11
	Quality and Environmental Management	17
	AEC-Q200 and Automotive Requirements	20
	Lifetime Estimation ▪ Lifetime Compendium	21
	Technical Notes ▪ Technical Compendium	22
	Application Examples	23
	Technical Terms	26
	Notes	134
SOLID CONDUCTIVE POLYMER CAPACITORS		Page
	STACKED TYPE	
	Overview ▪ Selection Table	27
	Datasheets	28
	Product Code and Marking	109
	Dimensions and PAD Layout	109
	Taping and Packaging	110
	General Precautions and Guidelines	125
	Soldering Specifications	132
	SMD TYPE	
	Overview ▪ Selection Table	35
	Datasheets	36
	Product Code and Marking	112
	Taping and Packaging	113
	Dimensions and PAD Layout	116
	General Precautions and Guidelines	125
	Soldering Specifications	131

CONTENT

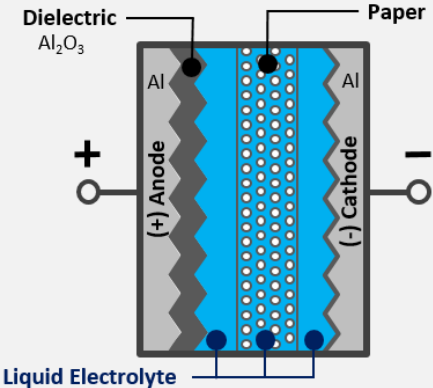
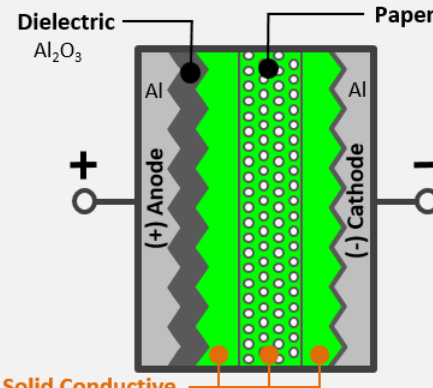
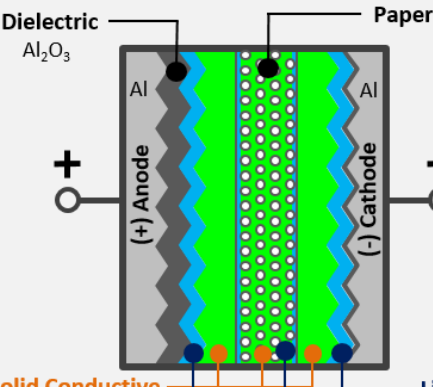
SOLID CONDUCTIVE POLYMER CAPACITORS		Page
	RADIAL TYPE	
	Overview ▪ Selection Table	63
	Datasheets	64
	Product Code and Marking	117
	Taping	118
	Packaging	121
	Available Lead Treatments	123
	General Precautions and Guidelines	125
	Soldering Specifications	133

10 FACTS ABOUT CAPXON



A WORLD OF ELECTROLYTIC CAPACITORS

CapXon's know-how in Electrolytic Capacitors covers technologies with aluminum foil. These are Aluminum Electrolytics, Solid Conductive Polymers and the combination known as Hybrid Conductive Polymers:

Aluminum Electrolytic	Description	Features
	Rated Voltage • V_R	4 VDC to 650 VDC
	Cathode Material	Liquid Electrolyte
	Self-healing of Dielectric	Yes
	Package	Widest range in all sizes
	Stability	Reduced performance at low temperature
	Lifetime	Limited life at high temperature
	Reliability	Automotive  AEC-Q200 qualified
Solid Conductive Polymer	Description	Features
	Rated Voltage • V_R	2.5 VDC to 100 VDC
	Cathode Material	Solid Conductive Polymer
	Self-Healing of Dielectric	No
	ESR	Ultra-low ESR at high frequency
	Stability	Stable for low and high temperature
	Lifetime	Very stable and long life - no dry out
	Reliability	Only internal standard qualification
Hybrid Conductive Polymer	Description	Features
	Rated Voltage • V_R	16 VDC to 400 VDC
	Cathode Material	Solid Conductive Polymer & Liquid Electrolyte
	Self-Healing of Dielectric	Yes
	ESR	Very low ESR at high frequency
	Stability	Even more stable than liquid type
	Leakage Current • I_{LEAK}	Lower leakage current than Solid Conductive Polymer Type
	Reliability	Automotive  AEC-Q200 qualified

COMPARISON OF ELECTROLYTIC CAPACITOR TECHNOLOGIES

Characteristics	Aluminum Electrolytic Capacitor	Solid Conductive Polymer Capacitor	Hybrid Conductive Polymer Capacitor
ESR at High Frequency	○ (120 ~ 1 000 mΩ)	++ (7 ~ 15 mΩ)	++ (20 ~ 30 mΩ)
Leakage Current ▪ I_{LEAK}	++ (0.01 * C_R * V_R)	○ (0.2 * C_R * V_R)	++ (0.01 * C_R * V_R)
Ripple Current ▪ I_R	○ (~ 600 mA)	++ (2 000 ~ 7 000 mA)	++ (2 000 ~ 3 000 mA)
Rated Voltage ▪ V_R	++ (~ 700 V)	○ (~ 100 V)	++ (~ 400 V)
Operating Temperature Characteristics	++ (-40 ~ + 125 °C)	++ (-55 ~ + 125 °C)	++ (-55 ~ + 150 °C)
Low Temperature Characteristics	○ (-40 ~ + 125 °C)	++ (-55 ~ + 125 °C)	++ (-55 ~ + 150 °C)
Lifetime	○ (105 °C / 3 000h)	++ (105 °C / 5 000h)	++ (105 °C / 10 000h)
Failure Mode	++ Open	○ Short	++ Open

++ ... best performance

+ ... well performance

○ ... basic performance

CERTIFICATION ACCORDING TO INTERNATIONAL STANDARDS

Quality, the environment, safety, and conservation of resources are the focus of our daily added value.

To meet the high requirements in the electronics industry, CapXon, as a global company, is certified according to the highest international standards. In this way, we ensure that all procedures and processes in our company are always structured and continuously optimized based on the valid and defined requirements.

CapXon is certified according to the following standards:



SMART PRODUCTION

Since 1980 CapXon focuses on research, development and manufacturing of Aluminum Electrolytic Capacitors and is a leading brand with its own capacitor production in Shenzhen and Shanxi as well as its own foil production in Yichang, Qinghai, Baotou and Shanxi. More than 40 years of experience give us a deep understanding of foil material, high performance electrolytes, advance lead wire technology, conductive polymer and electrochemical systems.

Precision equipment
ensures
the quality of key
components



Capacitor production for
all core technologies as
Aluminium Electrolytic,
Solid Conductive and
Hybrid Conductive Poly-
mer capacitors with
R&D and Quality head-
quarters in Shenzhen

Development of our
own production pro-
cess and machinery
with the highest
grade of automated
production equip-
ment and software



ADVANCED TECHNOLOGY

Only with the best production equipment and well-trained staff is it possible to maintain and expand the market position. Every year CapXon invests very large sums in machine, software and the education for our more than 2500 employees. To recognize deviation immediately during the production process, CapXon uses various precise inspection equipment.

All productions are qualified with strict specifications and every operation is monitored and measured at the machine



The products and the production meet the requirements of all industries even Medical or Automotive

Automated and full controlled manufacturing process



NEW RESEARCH

Highly roughened and formed anode foils are the heart of every Aluminum Electrolytic Capacitor. CapXon has been conducting intensive research and development for decades to bring low-voltage and high-voltage films into new spheres and at the same time to optimize processability and durability. The electrolytes and conductive polymers used on the cathode side are subject to a continuous improvement process, taking commercial and technical aspects into account.

Electrolyte and polymer development to achieve maximum product reliability and a long life



High grade etching foil, high grade forming foil through consistent further development to the limit of what is technically feasible

Well-equipped ISO/IEC 17025: 2005 accredited laboratories for research, analysis and testing



COMPONENT RELIABILITY DATA

In this section, the main parameters for predictive reliability and availability calculations are explained and in which way CapXon can provide you with such data.

FAILURE RATE λ

The failure rate λ describes the frequency which components possibly fail. The failure rate describes how many defects can be expected, if you run the application in operation for a certain time.

The failure rate can be calculated as following:

$$(1) \quad \lambda = \frac{n}{N \cdot t}$$

n ... Number of defect components

N ... Number of tested components

t ... Amount of operating hours

FAILURE CRITERIA

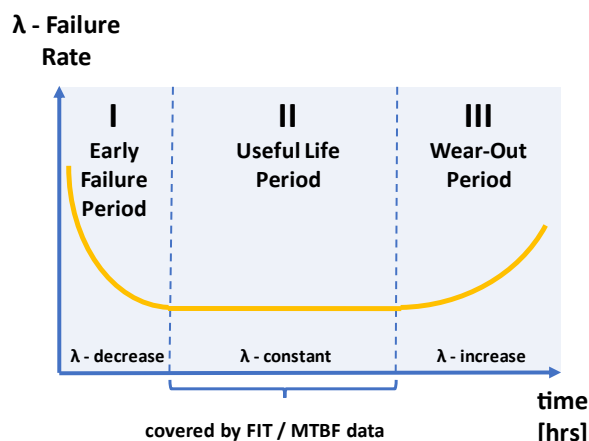
Capacitors will show certain wear-out phenomenon's by aging and so as times goes by the capacitors can possibly change their electrical performance.

As soon as the component is no longer fulfilling their electrical spec, stated features or with customer agreed parameters, the status of capacitor is seen as in failure mode or defect. This does not necessarily mean that the application will fail. An essential influence are the design and dimensioning by customer, which lead to major impact on possible failure modes and fail criteria for the application itself.

All given data by CapXon is just concerning the failure mode cases of the single component and is not representing the complexity of complete applications, assembled systems nor full electronic PCB boards.

BATHTUB CURVE

It's a widely used model within the reliability engineering to describe the expected failure rates over the whole application lifetime / product life cycle.



Bathtub curve

The Bathtub Curve states the failure rate behaviour within the three different product life cycle stages. These are the Early Failure Period, the Useful Life Period and the Wear Out Period.

With production control, monitoring and quality assurance, it is possible to reduce the early failures to a best possible minimum.

Failures within the Useful Life Period, which are described as FIT or MTBF value, are defined as events of coincidence and are not representing any systematic or epidemic failures.

FIT – FAILURES IN TIME

FIT - Failures In Time is the common way to describe the expected failure rate for electronics.

The FIT values describe certain failure rate within the useful life period and provides the basis for calculations, assumptions and extrapolation of reliability and availability to gather the understanding for expected failures / defects. These calculated figures are used to decide whether the component is a proper choice for the desired use case. Additionally, it need to be clarified whether redundancies are necessary and which redundancies are needed to fulfil the desired mission profile of an application.

The unit FIT defines the expected amount of failures per application hour.

$$(2) \quad 1 \text{ FIT} = \frac{10^{-9}}{h} = \frac{10^{-9} \text{ failures}}{\text{per operating hour}}$$

So as higher the stated FIT value is, as higher the statistical chance of defect is.

Please find the following example of a failure rate test determined by a useful life test:

- Number of failures $n = 2$
- Number of tested components $N = 10\,000$
- Operating hours $t = 20\,000\text{ h}$

$$(3) \quad \lambda = \frac{n}{N \cdot t} = \frac{2}{10\,000 \cdot 20\,000\text{h}} = 10\text{ FIT}$$

$$(4) \quad 10\text{ FIT} = \frac{10^{-8}}{h} = \frac{0.001\%}{1000h}$$

MTBF ▪ MEANTIME BETWEEN FAILURES

It's the predicted elapsed time between inherent failures of an electronic system during normal operation. The MTBF can be calculated as arithmetic mean / average time between failures of a system.

Assuming a constant failure rate, the MTBF can be easily calculated by reciprocal value of the Failure Rate λ :

$$(5) \quad MTBF = \frac{1}{\lambda}$$

MTBF is just a different way to describe the failure rate and can be easily converted to FIT and vice versa:

$$(6) \quad MTBF = \frac{10^9\text{h}}{FIT} = \frac{114\,000\text{ years}}{FIT}$$

$$(7) \quad FIT = \frac{10^9\text{h}}{MTBF} = \frac{114\,000\text{ years}}{MTBF}$$

The **MTBF** values are just covering the useful life period (flat middle section) of the bathtub curve. Because of this, a FIT or MTBF value can't be extrapolated to estimate the service lifetime for a component. FIT or MTBF values doesn't cover the higher failure rates of the wear-out period, where the expected failure rate would be higher due to occurring wear-out phenomenon's.

LIFETIME TESTS

Due to the fact that all electrolytic capacitors show aging behaviour and a possible drift of electrical parameters over usage time, lifetime tests are performed by manufacturers to describe the related reliability and performance of a certain capacitor. Different product series as well as the single product itself can provide very different lifetime performance. So, these test results are given to select the proper product in relation to the applied stress profile of application to gain the desired application performance within the whole product life cycle.

There are various names (e.g. Endurance, Load Life, Useful Life, Operational Life, Life Expectancy, Shelf Life, ...) and different lifetime tests that are existing within the industry. Please kindly check the specific test specification and given data for the capacitor before design-in.

Sadly, there is no standardized naming and test criteria existing, given by any international accepted standard committee for all the lifetime tests, which are applied to electrolytic capacitors. Customers need to compare competitor products carefully with each other to see if test specifications are similar or different.

Please see particular datasheets for the specific test results and criteria of an individual product of CapXon.

Again, please note that the criteria of failure are given by the test specification limits of the dedicated lifetime test and as soon as a component is not fulfilling these given limits, it is rated as a failure. So, failure does not necessarily mean defect or breakdown of application. It is just describing that the drift of electrical performance is bigger than the checked limits of the particular test. It doesn't matter whether the measured C value is lower as the allowed test limit or the component is in a failure mode of open circuit, both cases are treated the same as a failure. Design and dimensioning of application will arrange how much drift of electrical parameters can be accepted for the individual capacitor. For example, when the rate of capacitance change is becoming critical within the application is defined by customer design. The lifetime tests are in place to provide a common and industry-wide comparable performance index of the capacitors.

As manufacturer, we can state and check how fast a drift of capacitance and further parameters will happen. Dimensioning within application design will set how long an error-free operation is possible. A proper dimensioning can enlarge the acceptable drift and so the lifetime performance. But be aware, if it is not done properly or component is overstressed, it also can shorten the expected lifetime performance. Please be aware to check dimensioning and drift estimation to assure your product performance for the desired lifetime. For support with lifetime estimations and dimensioning, we are pleased to support you and feel free to get in touch with our technical support.

In the following section CapXon's lifetime tests, which are performed with our products, are described in detail.

ENDURANCE

The Endurance test of the product checks the performance of its electrical parameters, such as capacitance change, leakage current and dissipation factor on their behaviour over time at a predetermined test setup of electrical stress and ambient condition.

Depending on the product series, the Endurance test is performed according to one of the settings below:

Setting 1 - applying Endurance test:

- max. Temperature
- V_R - Rated Voltage

Setting 2 - applying Endurance test:

- max. Temperature
- V_R - Rated Voltage
- I_R - Rated Ripple

Setting 1 is in accordance to the IEC 60364-4 / JIS 51001-4 test criteria and Setting 2 is enlarging the electrical stress setup with additional appliance of I_R , to get a more representative result in comparison to possible real-life application stress.

The Endurance test is performed within product qualification at the stage of internal product validation and is repeated periodically for product requalification.

USEFUL LIFE

To get more representative understanding of lifetime performance for typical capacitor use, the useful life test represents such criteria.

The applied electrical stress is like the Endurance test - Setting 2. The test specification limits are wider as the endurance test specification, but as described the applied electrical stress stays similar. So, a larger acceptable drift of electrical parameters results in a larger expected lifetime. This represents the operational frame which is set by customer at dimensioning the capacitor specification for their application and the possible borders of an error-free operation.

Also, we state a FIT value related to the useful life test. These failure rate describes the deviation / possibility of occurrence of failures within the useful life period when the settings of useful life test are applied. This is related to the middle section of the bathtub curve the so-called useful life period (see above page 12 - Bathtub Curve of Product Reliability).

In the datasheet you will find the following phrase:

Failure Rate (during useful Life): 0.01%/1000h with a confidence level of 60%. As a result, this is like a 100 FIT:

$$\lambda = \frac{0.01\%}{1000h} = 100 \text{ FIT} = 100 \text{ failures} * 10^{-9}h$$

Example:

If you have 8000 components running in applications for 5000 hours with the test conditions applied like the useful life test, you can estimate the number of components that show a higher drift as given by the useful life test spec borders as follows:

- Number of components $N = 8000$
- Operating hours $t = 5000 \text{ h}$

$$\lambda = \frac{n}{N * t}$$

$$n = \lambda * N * t = \frac{0.01\%}{1000h} * 8000 * 5000h = 4$$

This means that when there are 8000 pcs in operation for 5000 hours at the maximum possible operating conditions (max. temp., V_R & I_R similar to useful life test criteria) an amount of 4 products (with a confidence level of 60%) can be expected to show a higher drift as given in the test spec.

SHELF LIFE

The shelf life test simulates the aging of the capacitor, if it is just stressed with ambient temperature without any electrical load. The shelf life is not defining the possible storage time of the capacitor but just to describe the aging situation before mounting / PCB assembly.

The Shelf Life test criteria shall be satisfied, if the capacitor was restored to 20°C and following a conditioning by voltage treatment in accordance with 4.1 of JIS 5101-4 was applied, before measuring the capacitor.

LIFETIME TEST EXAMPLES

Example 1 - Useful Life, Endurance (Setting 1) and Shelf life tests of SMD types – HV Series:

Lifetime Test	Test	2000 hours
Endurance 105°C (V _a applied)	ΔC/C	≤ ±30% of initial measured value
	tanδ	≤ 300% of initial specified value
	I _{Leak}	≤ the initial specified value
Shelf Life 105°C (None)	Test	1000 hours
	ΔC/C	≤ ±30% of initial measured value
	tanδ	≤ 300% of initial specified value
Resistance to Soldering Heat	I _{Leak}	≤ the initial specified value
	The capacitors shall be kept on a hot plate maintained at 250°C for 30 seconds. After removing from the hot plate and restored at room temperature, they meet the characteristic requirements listed below	
	ΔC/C	Within ±10% of initial value
	tanδ	Less than specified value
	I _{Leak}	Less than specified value

Example 2 - of Useful Life, Endurance (Setting 2) and Shelf life tests of Radial types – GF Series

Lifetime Test	Test	2000 hours	3000 hours	5000 hours
Endurance 105°C (V _a & I _a applied)		φ D 5 ~ 6.3 mm	φ D 8 mm	φ D ≥ 10 mm
	ΔC/C	≤ ±20% of initial measured value		
	tanδ	≤ 200% of initial specified value		
	I _{Leak}	≤ the initial specified value		
	I _{Leak}	≤ the initial specified value		
Shelf Life 105°C (None)	Test	1000 hours		
	ΔC/C	≤ ±20% of initial measured value		
	tanδ	≤ 200% of initial specified value		
	I _{Leak}	≤ the initial specified value		

Example 3 - of Useful Life, Endurance (Setting 2) and Shelf life tests of Snap In types – HU Series:

Lifetime Test	Test	V _a ≤ 100V	V _a > 100V
Useful Life 105°C (V _a & I _a applied)	Test	5000 hours	8000 hours
	ΔC/C	≤ ±30% of initial measured value	≤ ±20% of initial measured value
	tanδ	≤ 300% of initial specified value	≤ 200% of initial specified value
	I _{Leak}	≤ the initial specified value	≤ the initial specified value
Endurance 105°C (V _a applied)	Test	3000 hours	
	ΔC/C	≤ ±15% of initial measured value	≤ ±10% of initial measured value
	tanδ	≤ 130% of initial specified value	≤ 130% of initial specified value
	I _{Leak}	≤ the initial specified value	≤ the initial specified value
Shelf Life 105°C (None)	Test	1000 hours	
	ΔC/C	≤ ±15% of initial measured value	≤ ±10% of initial measured value
	tanδ	≤ 130% of initial specified value	≤ 130% of initial specified value
	I _{Leak}	≤ the initial specified value	≤ the initial specified value

Example 4 - Useful Life, Endurance (Setting 2) and Shelf life tests of Screw types – RK Series:

Lifetime Test	Test	4000 hours
Useful Life 105°C (V _a & I _a applied)	ΔC/C	≤ ±45% of initial measured value
	tanδ	≤ 300% of initial specified value
	I _{Leak}	≤ the initial specified value
	I _{Leak}	≤ the initial specified value
Endurance 105°C (V _a applied)	Test	2000 hours
	ΔC/C	≤ ±15% of initial measured value
	tanδ	≤ 130% of initial specified value
	I _{Leak}	≤ the initial specified value
Shelf Life 105°C (None)	Test	1000 hours
	ΔC/C	≤ ±15% of initial measured value
	tanδ	≤ 130% of initial specified value
	I _{Leak}	≤ the initial specified value

TELCORDIA SR-332

This industry-wide accepted standard provides data and tools for reliability predictions of components, devices or full hardware units of electronic equipment. Telcordia (for-

merly Bellcore). With the given figures and data, it is possible to assure system availability and to gather the desired system reliability.

FIT & MTBF DATA OF CAPXON PRODUCTS

CapXon provides FIT & MTBF values based on Telcordia SR332 standard for all components. From our perspective, it provides more reliable prediction because it is more specific and detailed than MIL-217 or Siemens SN 29500.

Please find the FIT values for CapXon components and application-based reliability prediction calculations on the following page.

The table of SMD / RADIAL / Snap-In is covering all Electrolytic Technologies – Liquid, Solid and Hybrid Electrolytic Capacitors in SMD & Radial.

The table of Screw capacitors is just concerning Liquid Aluminum Electrolytic Capacitors.

Mounting Type	SMD / Radial / Snap-In					
Electrical Stress	100%		75%		50%	
Operating Temp. [°C]	λ [FIT]	σ [FIT]	λ [FIT]	σ [FIT]	λ [FIT]	σ [FIT]
≤ 30	1,19	0,28	0,65	0,15	0,36	0,08
35	1,52	0,35	0,84	0,19	0,46	0,11
40	1,94	0,45	1,06	0,25	0,58	0,14
45	2,45	0,57	1,34	0,31	0,74	0,17
50	3,07	0,71	1,68	0,39	0,92	0,22
55	3,82	0,89	2,10	0,49	1,15	0,27
60	4,72	1,10	2,59	0,60	1,42	0,33
65	5,80	1,35	3,19	0,74	1,75	0,41
70	7,09	1,65	3,89	0,91	2,14	0,50
75	8,61	2,01	4,73	1,10	2,59	0,60
80	10,40	2,42	5,71	1,33	3,13	0,73
85	12,50	2,91	6,86	1,60	3,76	0,88
90	14,94	3,48	8,20	1,91	4,50	1,05
95	17,78	4,14	9,76	2,27	5,35	1,25
100	21,05	4,90	11,55	2,69	6,34	1,48
105	24,82	5,78	13,62	3,17	7,47	1,74
110	29,13	6,78	15,99	3,72	8,77	2,04
115	34,05	7,93	18,69	4,35	10,26	2,39
120	39,65	9,23	21,76	5,07	11,94	2,78
125	45,99	10,71	25,24	5,88	13,85	3,23
130	53,15	12,38	29,17	6,79	16,01	3,73
135	61,20	14,25	33,59	7,82	18,43	4,29
140	70,24	16,36	38,55	8,98	21,15	4,93
145	80,34	18,71	44,09	10,27	24,20	5,64
150	91,60	21,33	50,27	11,71	27,59	6,43

Table 1: FIT values for SMD, Radial, Snap-In

Remark: Above values are only valid within the max. specified temperature range of the particular component. All given FIT data is meant for lifetime predictions only and is not representing any warranty.

For particular products (e.g. screw capacitors) within the datasheet, further FIT or MTBF data is added and in such a case, this substitutes the general information stated above.

Mounting Type	Screw terminal					
Electrical Stress	100%		75%		50%	
Operating Temp. [°C]	λ [FIT]	σ [FIT]	λ [FIT]	σ [FIT]	λ [FIT]	σ [FIT]
≤ 30	34,20	24,43	18,77	13,40	10,30	7,36
35	43,85	31,32	24,06	17,19	13,21	9,43
40	55,78	39,84	30,61	21,87	16,80	12,00
45	70,42	50,30	38,65	27,61	21,21	15,15
50	88,27	63,05	48,44	34,60	26,59	18,99
55	109,88	78,48	60,30	43,07	33,09	23,64
60	135,88	97,06	74,57	53,27	40,93	29,23
65	166,99	119,28	91,65	65,46	50,30	35,93
70	203,99	145,71	111,95	79,97	61,44	43,89
75	247,76	176,97	135,97	97,12	74,62	53,30
80	299,26	213,76	164,24	117,31	90,14	64,38
85	359,57	256,84	197,34	140,96	108,30	77,36
90	429,86	307,04	235,91	168,51	129,47	92,48
95	511,39	365,28	280,66	200,47	154,03	110,02
100	605,57	432,55	332,34	237,39	182,39	130,28
105	713,89	509,92	391,79	279,85	215,02	153,59

Table 2: FIT values for Screw types

λ - Mean Component Failure Rate

σ - Standard Deviation of Component Failure Rate

CALCULATION OF FIT VALUE FOR APPLICATION CASE

By using the given Telcordia SR-332 figures and by the assumption that the failure rate follows a gamma distribution, the FIT value can be calculated with given mean λ and standard deviation σ (see section tables in section 8.8) and desired UCL - Upper Confidence Level as follows:

$$\text{shape } \kappa = \left(\frac{\lambda}{\sigma} \right)^2$$

$$\text{scale } \theta = \frac{\sigma^2}{\lambda}$$

The desired FIT value for the application case is the P% quantile of the gamma distribution and it can be calculated by the inverse cumulative gamma distribution with the shape κ and scale θ parameters as follows:

$$\lambda_{P\%UCL} = G^{-1}(P/100; \kappa; \theta)$$

If the shape κ parameter is >100 the FIT can also be calculated by using the P% quantile of the normal distribution, by inverse cumulative distribution of normal distribution with mean λ and standard deviation σ :

$$\lambda_{P\%UCL} = N^{-1}(P/100; \lambda; \sigma)$$

Customer need to define which UCL is desired for the reliability prediction for their application case (typical values for UCL are e.g. 60%, 90%, 95%, 99%).

CALCULATION EXAMPLE

Example 1:

GF Series – Radial type
Aluminum Electrolytic Capacitor

@ 70°C and 75% electrical stress
Upper Confidence Level (UCL) = 90%

Values according to table 1 at page 16:
 $\lambda = 3.89 \text{ FIT} / \sigma = 0.91 \text{ FIT}$

$$\text{shape } \kappa = \left(\frac{3.89}{0.91} \right)^2 = 18.27$$

$$\text{scale } \theta = \frac{0.91^2}{3.89} = 0.21$$

$$\lambda_{90\%UCL} = G^{-1}(90/100; 18.27; 0.21) = 5.02 \text{ FIT}$$

In Microsoft Excel you can solve this with the following formula:

International / American Excel Version:
=GAMMAINV(0.9, 18.27, 0.21)

European Excel Version:
=GAMMAINV(0.9; 18.27; 0.21)

Example 2:

RG Series - Screw type
Aluminum Electrolytic Capacitor

@ 60°C and 75% electrical stress
Upper Confidence Level (UCL) = 90%

Values according to table 2 at page 16:
 $\lambda = 74.57 \text{ FIT} / \sigma = 53.27 \text{ FIT}$

$$\text{shape } \kappa = \left(\frac{74.57}{53.27} \right)^2 = 2.01$$

$$\text{scale } \theta = \frac{0.91^2}{3.89} = 38.05 \text{ FIT}$$

$$\lambda_{90\%UCL} = G^{-1}(90/100; 2.01; 38.05) = 148.57 \text{ FIT}$$

In Microsoft Excel you can solve this with the following formula:

International / American Excel Version:
=GAMMAINV(0.9, 2.01, 38.05)

European Excel Version:
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QUALITY MANAGEMENT SYSTEM

We are committed and living the principle of **QUALITY FIRST - to offer highly satisfying products and service to the customer**. This global aim is shared by the CapXon quality and environmental management system and part of our business philosophy:

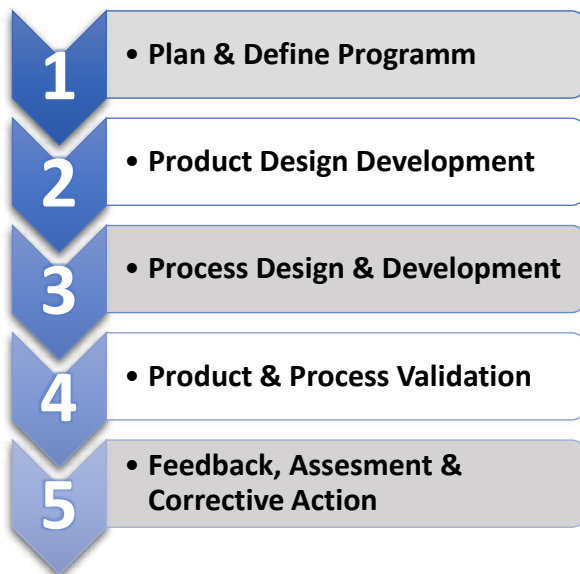
QUALITY MANAGEMENT SYSTEM CERTIFICATION

In accordance with our quality commitment, CapXon quality management is certified by **ISO 9001** and **IATF 16949**. The certification covers our production plants as well as our sales organization. This standard is applied throughout the company and is used to implement, monitor and to proceed the CapXon quality policy in all process steps.

PRODUCT AND PROCESS QUALITY

Our product and process development follows the sequence and phases of **APQP – Advance Product Quality Planning**:

5 Phases of APQP



Quality tools such quality tools, including **5S, PDCA, FMEA, (DFMEA & PFMEA), MSA, APQP, PPAP, SPC** and others, are in place to minimize risks, provide constant monitoring and ensure continuous improvements in conjunction with regular internal audits and QM reviews.

QUALITY ASSURANCE

For our sample checks, we refer to **AQL - Acceptable Quality Level** figures, which are based on a random sampling

plan in accordance with **MIL-STD-1916**. Referring to instructions of this standard, a delivered lot will be accepted with a probability of 90%, if the percentage of non-conformance does not exceed the stated AQL figure. As a general internal target, the percentage of non-conformance in deliveries from CapXon is significantly below the AQL figure. The acceptance value we apply to non-conform components is $c=0$.

INCOMING GOODS INSPECTION BY CUSTOMER

We recommend applying planned random sampling checks in accordance with MIL-STD-1916, is compliant with MIL STD 105 D and IEC 60410, for incoming goods inspection. The test methods, which shall be applied, are laid down in the relevant standards.

ENVIRONMENTAL MANAGEMENT

Environmental Policy

CapXon defines internally the following environmental protection principles:

- comply with the given law & regulations
- observe and act to reduce pollution
- produce cleanly
- reduce the consumption and save resources
- cut down usage of toxic substances
- make continuous improvements
- protect the environment

ENVIRONMENTAL MANAGEMENT SYSTEM CERTIFICATION

CapXon environmental management system is certified in accordance with ISO 14001 and is applied throughout the whole company as well as CapXon's environmental policy is implemented.

ENVIRONMENTAL HAZARDOUS SUBSTANCES FREE MANAGEMENT SYSTEM

To show our commitment to protect the environment and people, CapXon drives a sustainable effort to produce environment-friendly products.

IECQ QC 080000 HSPM - Hazardous Substance Process Management, which is based on the quality management system of ISO 9001.

The CapXon QC080000 based HSF management system is company-wide applied for implementing the CapXon environmental Hazardous Substances management and that CapXon products effectively in the management of hazardous substances.

ENERGY MANAGEMENT SYSTEM

CapXon establishes comprehensive energy use management in accordance with the requirements of ISO 50001 Energy Management System in order to meet the social responsibility of low carbon environmental protection and efficiency

CERTIFICATION IN ACCORDANCE TO ISO 14001, ISO 50001, QC 080000

The CapXon Group operates an environmental management system that conforms to the requirements of **ISO 14001** and is mandatory for all plants. The CapXon Group operates an Energy management system that conforms to the requirements of **ISO 50001** and is mandatory for all plants. The CapXon Group operates an environmental **Hazardous Substances Free management system** that conforms to the requirements of QC 080000 and is mandatory for all plants. The company certificate is posted on the CapXon internet: (www.capxongroup.com).

RoHS COMPLIANCE

The abbreviation **RoHS** is usually called **Restriction of Hazardous Substances**, the full term is the short term for the **Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment** and is referring to the EU directive 2011/65/EU. The RoHS 2 – 2011/65/Eu substituted the former RoHS 1- 2002/95/EC.

The aim of RoHS is to banish Hazardous Substances of electronic waste, which can harm the environment and others. Based on this regulation, we as component manufacturer, need to design, observe and control that such hazardous materials are fully avoided and reduced to the max. Moreover, it's possible to replace them by adequate non concerned materials within the given limitations .

For all by RoHS scoped materials (excluding exempt products) the maximum permitted concentrations are:

all concerned materials (except Cd)

- 0,1% / 1000ppm

Cadmium -Cd:

- 0,01% or 100ppm

These limitations for the restricted materials focus on each homogeneous material within the product. So, the limitations are concerning each individual / single substance or part, which can be separated mechanically (e.g. aluminum can, rubber sealant) and are not apply to the weight of the whole component itself.

Last update of RoHS was Directive (EU) 2015/863, which was published on 2015-03-31 and implemented by 2019-07-22. According to this directive, the following ten substances are restricted:

- **Pb** - Lead
- **Hg**- Mercury
- **Cd** - Cadmium
- **Cr⁺⁶** - Hexavalent chromium
- **PBB** - Polybrominated biphenyls
- **PBDE** - Polybrominated diphenyl ether
- **DEHP** - Bis (2-ethylhexyl) phthalate
- **BBP** - Butyl benzyl phthalate
- **DBP** - Dibutyl phthalate
- **DIBP** - Diisobutyl phthalate

By the update DEHP, BBP, DBP and DIBP were added to the list of hazardous substances.

Since 2011 RoHS compliance is mandatory to be able to get CE approval.

C-RoHS / CHINA RoHS COMPLIANCE

The common speech so called China RoHS means the conformance to **SJ/T 11363-2006** for electronical components and assemblies and is fully called **Administrative Measure on the Control of Pollution Caused by Electronic Information Products**.

In China RoHS, the following substances are banned because they are considered as environmentally hazardous:

- **Pb** - Lead
- **Hg**- Mercury
- **Cd** - Cadmium
- **Cr⁺⁶** - Hexavalent chromium
- **PBB** - Polybrominated biphenyls
- **PBDE** - Polybrominated diphenyl ether

Since December 2012, CapXon has provided China RoHS certification for our products and certifications.

SONY GP CERTIFICATION

Since Nov 2011, CapXon has been certified as Green Partner by SONY and we are running an environmental management system that continuously meet the requirements of the SONY Green Partner Program and we are working in

accordance with the Sony environmental quality assurance. The Certificate is listed by **SONY GP Certificate No.: FC012746**

REACH CERTIFICATION

REACH is the abbreviation for Registration, Evaluation, Authorization of Chemicals and by Regulation (EC) No 1907 /2006 it is

So each manufacturer or importer, who is shipping goods to the European Union, need to declare and be compliant according to REACH, if within the shipped goods a substance, which is listed out SVHC-List (Substances of Very High Concern) is included and overall a total mass of bigger a ton per year is imported.

CapXon is working in accordance with REACH requirements and certification is available for our products.

ROHS & REACH MARKING

Within our datasheets, we mark the RoHS and REACH compliance with our "RoHS & REACH compliant"- marking, please see marking below for reference:



HALOGEN FREE (HF)

The Halogen Free requirements are based on customer and environmental regulations on management and control requirements of halogens, such as the **European Directive 2002/95/EC, IEC 61249-2-21, Montreal Protocol on Substances that Deplete the Ozone Layer and Controls the Stockholm joint pledge about durable organic pollutant.**

Concerned by the halogen-free initiative are elements like:

- **Fluorine**
- **Chlorine**
- **Bromine**
- **Iodine**
- **Astatine**

In case of fire, these elements can release toxic fumes, which could harm humans and can also cause corrosion of metals.

CapXon is using halogen-free materials for all our electrolytic capacitors. Since 31st of Oct 2009 all products meet the halogen-free requirements.

BANNED AND ENVIRONMENTAL HAZARDOUS SUBSTANCES IN COMPONENTS

As a manufacturer of passive components, we develop our products focussing on sustainability. In order to guarantee a standardized procedure within CapXon, a mandatory avoidance list of Environmental Hazardous Substances with special interest is part of our environmental management system. The planning and development instructions include regulations and guidelines that aim to identify environmental aspects and to optimize products as well as processes with respect to material usage and environmental compliance to design them with sparing use of resources and to substitute hazardous substances as far as possible.

The environmental officer provides support in the assessment of the environmental impacts of our development projects and as part of our environmental management these aspects are checked and recorded in internal design reviews.

AEC-Q200 & AUTOMOTIVE REQUIREMENTS

To serve the high standards of automotive applications, CapXon provides AEC-Q200 versions for many of their product series.

If AEC-Q200 version is available, the product series or single component is marked with the following marking on the datasheet:



Marking of components with references in reliability testing to AEC-Q200

The AEC-Q200 versions are different in case of reliability testing, production monitoring and available material declaration. For details, please see the table below:

	Standard Version	AEC-Q200 Version
Reliability Testing		
Tests according to internal specification	✓	✓
Tests according to AEC-Q200 applied test range related to product	✗	✓
Production Monitoring		
Production & documentation in accordance with ISO 9001	✓	✓
Production & documentation in accordance with IATF 16949	✗	✓
Compliance and Declarations		
RoHS & REACH compliance	✓	✓
IMDS entry available (on request)	✗	✓
PPAP (on request)	✗	✓

Table 9: Differences between standard and AEC-Q200 components

AEC-Q200

The AEC-Q200 was issued as a global reliability test standard by the AEC - Automotive Electronics Council. The overall aim of this standard is to define the minimum stress test driven qualification requirements and references of test conditions for qualification of passive components.

AEC-Q200 qualified components are highly qualified products for critical surroundings and can withstand the harsh and challenging usage conditions of an automotive environment.

For Aluminum Electrolytic Capacitors, concerning all technologies of Liquid Aluminum Electrolytic, Solid and hybrid types, the AEC-Q200 claims a test plan of 27 different reliability tests (e.g.: Temperature Cycling, Vibration, Biased Humidity, Surge Voltage, ...) with a sample size of about 77 pcs. and a maximum test duration of particular test of about 1000 hours.

By AEC-Q200 at least the temperature range of -40°C to 105°C need to be tested and applicable for Aluminum Electrolytic Capacitors, if not, differently specified by datasheet.

In case of AEC-Q200 version, reliability testing is performed for the dedicated components in addition to CapXon's internal qualification setup as well as additional agreed requirements between CapXon and their customers.

PPAP

PPAP – Production Part Approval Process is a documentation to assure quality of supplier and their production process within the automotive supply chain.

The PPAP covers and ensure the following aspects:

- Manufacturability and meeting all given quality requirements
- Design records and specification requirements
- Manufacturing process can consistently meet all component requirements

For our AEC-Q200 components, we provide PPAP Level 3 on request, which is providing product samples as well as the complete supporting data.

IMDS

The IMDS – International Material Database System contains information about the used materials within the build-up of the component.

With IMDS, it is possible to monitor and control hazardous substances and prohibited substances down to the single component. IMDS is mainly used to fulfil various reporting requirements of automotive manufacturers.

For all our AEC-Q200 components and in case of an automotive use case, we provide IMDS entries on request. For further information, visit our website <http://www.capxongroup.com/en/> or contact CapXon directly.

LIFETIME ESTIMATION • LIFETIME COMPENDIUM

The accurate estimation of the lifetime of components is one of the elementary considerations of any electronic assembly. If electrolytic capacitors are not properly designed for the application environment and load, they will inevitably lead to a disproportionate change in their electrical performance or, in the worst case, failure of the capacitor. CapXon's lifetime compendium helps users to calculate and estimate the expected lifetime of **Aluminum Electrolytic Capacitors**.

The lifetime compendium is available to download from our website
http://www.capxongroup.com/files/Lifetime%20Compendium_EN.pdf



Content

CAPXON		CONTENT
CONTENT		
WORLD OF CAPXON	Page:	
GENERAL INFORMATION		
About us		3
Technical Terms		4
LIFETIME COMPENDIUM	Page:	
HOW CAN THE TERM "LIFETIME" AND THE END OF IT BE SUBJECT TO AN E-CAP?		5
LOW VOLTAGE E-CAPS (≤ 100V) WITH LIQUID ELECTROLYTE		6
HIGH VOLTAGE E-CAPS (≥ 160V) WITH LIQUID ELECTROLYTES		10
TOTAL LIFETIME EXPERIENCE WITH CHANGING RIPPLE CURRENT IN THE APPLICATION		11
CALCULATION EXAMPLE - OUTPUT FILTER CAP - IN A SWITCH MODE POWER SUPPLY		13
CALCULATION STEPS		14
DETERMINATION OF USEFUL LIFE BY GRAPHIC WAY - LIFETIME HOMOGRAPH -		16
APPLICATION EXAMPLES		17
SOLID CONDUCTIVE POLYMER CAPACITORS (SOLID TYPE E-CAPS)		21
HYBRID CONDUCTIVE POLYMER CAPACITORS		24
RULE OF THUMB FOR SIMPLE AND QUICK LIFETIME ESTIMATIONS		26
COMPONENT RELIABILITY DATA		27
FIT - FAILURES IN TIME		27
MTBF - MEANTIME BETWEEN FAILURES		28
LIFETIME TESTS		28
FIT & MTBF DATA OF CAPXON PRODUCTS		30
CALCULATION OF FIT VALUE FOR APPLICATION CASE		32
NOTES		33

Technical Background

CAPXON LIFETIME COMPENDIUM

sure of the component. To explain and calculate the additional heating, the relationship of the thermal resistance, i.e. the ability of electronic components to dissipate heat.

Like all electronic components, electrolytic capacitors are not ideal components, but have issues that give off in the form of heat under load. For all electronic components, the cooler the component, the longer the expected lifetime.

For e-caps the ohmic losses are grouped under the term "ESR" for Equivalent Series Resistance. These include the ohmic losses resulting from the terminals of the capacitor, the contact connections of the terminals, the contact resistance of the electrode contacting and the dielectric losses, also referred to as dissipation factor tan δ.

(2) $P_r = I_A^2 \cdot ESR$

WITH

P_r Internal power losses [W]

I_A Ripple current flowing in the capacitor [A-RMS]

ESR Equivalent series resistance [Ω]

(3) $P_T = \frac{\Delta T_A}{R_{\theta JA}} \cdot A \cdot \beta$

WITH

P_T Thermal power [W]

ΔT_A Core temperature rise (°C) by internal heating due to the application current

$R_{\theta JA}$ Thermal resistance of the electrolytic capacitor [°C/W]

β Radiation coefficient [W/(cm²·K)]

A Surface of the capacitor [cm²]

(4) $\Delta T_A = \frac{P_T}{\beta \cdot A}$

DETERMINATION OF THE CORE TEMPERATURE INCREASE ΔT_A

To calculate the lifetime, the determination of ΔT_A - core temperature rise due to the application current in the capacitor - is necessary.

This can be done in different ways

a.) Temperature measurement of core temperature T_c

By this very precise method, a thermocouple (usually a K sensor) is inserted into the capacitor, which is possible only during the production of the e-cap and determines the core temperature T_c over this. The ambient temperature T_A is measured secondarily.

b.) Temperature measurement of core temperature T_c

The integration of a temperature sensor is not that simple and only possible with electrolytic capacitors with connection.

Fig. 3: Thermal output of the e-cap via convection, radiation and dissipation

Fig. 4: Snap-in capacitor with integrated thermocouple for measuring the core temperature

Calculation base

CAPXON LIFETIME COMPENDIUM

For all CapXon high-performance series ≥ 200V, see table 9

(8) $I_A = I_{A0} \cdot K_{Temp} \cdot K_{Ripple} = I_{A0} \cdot 2^{\frac{T_{A0} - T_A}{10}} \cdot 2^{\frac{I_{A0} - I_A}{10}}$

WITH

K_{Temp} Ripple current influence

ΔT_A Core temperature increase (°C) by internal heating due to the rated ripple current

K_{Ripple} Core temperature increase (°C) by internal heating due to the rated ripple current

Table 9: Maximum permissible core temperature rise due to the permissible rated alternating current

Table 10: Influence of the application current and the application voltage on CapXon high-voltage series

Table 11: Influence of the application current and application voltage on CapXon high voltage series for use in lightning application

CapXon_Ver. 006 - 01/04/2024

Application example

CAPXON LIFETIME COMPENDIUM

CALCULATION EXAMPLE - OUTPUT FILTER CAP - IN A SWITCH MODE POWER SUPPLY

Fig. 1: Principal diagram for switching mode power supply with active PFC and galvanically isolated output

Output voltage: 24V

Power factor: 0.95

Operating cycles: 10 years = 87,600h

Operating cycles: 200,000 during the operating period of 10 years

Operation under different conditions according to the following table:

Operation in Mode 1	Operation in Mode 2	Stop / Standby
Duration time: 100 s	Duration time: 100 s	Duration time: 100 s
Ambient temperature T_A : 70°C	Ambient temperature T_A : 70°C	Ambient temperature T_A : 40°C

Frequency f (kHz)

Frequency f (kHz)	Rated current I (A)	Frequency f (kHz)	Rated current I (A)	Frequency f (kHz)	Rated current I (A)
100Hz	1.5A	300Hz	1.8A	100Hz	0.5A
300Hz	1.8A	100Hz	1.2A	300Hz	0.7A
100Hz	0.8A	100Hz	0.8A	100Hz	0.8A
300Hz	0.8A	300Hz	0.7A	300Hz	0.7A

Table 16: Requirement profile for the calculation example - switched-mode power supply

Selected Type: GFS63M035G250ETA

Rated capacitance Cx	Rated voltage Vx	Rated current Ix	Dimension Ø x L	Endurance
500µF	35V	3.6A at 100Hz/105°C	10mm x 25mm	5000h at 105°C

Table 17: Mean parameter GFS63M035G250ETA

Graphical estimation

CAPXON LIFETIME COMPENDIUM

The first step is to calculate the equivalent 220Hz values for the two application currents I_{A1} and I_{A2} as well as the resulting RMS value I_{Aeq} .

WITH

(15) $I_{Aeq} = \sqrt{I_{A1}^2 + I_{A2}^2 + \dots + I_{An}^2}$

The necessary ripple current correction factors are shown in table 14. Extract data sheet for series

Frequency [Hz]	50	100	200	500	1k	2.5k
Ripple current correction factor K_r	0.8	1	1.2	1.5	1.8	2.5

Table 20: Ripple current correction factor for the CapXon series

Equation: 220Hz current 1: $I_{Aeq1} = \frac{I_{A1}}{K_r} = 2.0A$

Equation: 220Hz current 2: $I_{Aeq2} = \frac{I_{A2}}{K_r} = 11.4A$

RMS value: $I_{Aeq,RMS} = \sqrt{I_{Aeq1}^2 + I_{Aeq2}^2} = \sqrt{2.0^2 + 11.4^2} = 11.6A$

In the second step, the ripple current ratio I_{Aeq} can be calculated with

Ripple current ratio: $\frac{I_{Aeq}}{I_{A0}} = \frac{11.6A}{2.0A} = 5.8$

Fig. 2: Homograph for the CapXon series with intersection point for the application example

The ripple current ratio and the ambient temperature of 60°C show the intersection of the graph in the homograph. The useful life is between the 50,000h and 100,000h curve, exactly at 60,000h and meets the minimum requirement of > 40,000h.

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TECHNICAL NOTES • TECHNICAL COMPENDIUM

Due to their compact design, **Aluminum Electrolytic Capacitors** are the most common high-capacitance storage and filter elements in electronics. Like all electronic components, they do not have an “ideal” electrical behavior, they have losses. Their properties are very dependent on temperature and frequency. Detailed knowledge of these components is an absolute must for all electronics developers, especially for power supplies and converters.

The CapXon Technical Compendium describes the basics, electrical parameters, production steps, provides suggestions for the selection of suitable capacitors and design rules for reliable and long-lasting operation.

The technical compendium is available to download from our website
http://www.capxongroup.com/files/Technical%20Compendium_EN.pdf



Basics

CAPXON TECHNICAL INFORMATION

1. BASICS

Aluminum Electrolytic Capacitors are by far the most important and common high-capacitance storage or filter capacitors in electronic devices.

The enormous importance of electrolytic capacitors is related to their properties:

- Extremely high CV (capacitance per volume) on the smallest volume
- High dielectric strength of even the thinnest layers (7 to 8 · 10⁶ V/cm)
- Relatively high dielectric constant ε (approx. 10)
- Etching ability of aluminum, which allows a surface enlargement of up to 200 times and thus a dramatic space reduction
- Very wide range of design and dimensions

1.1. BASIC STRUCTURE OF A CAPACITOR

When voltage U is applied between both conducting electrode plates, a certain amount of charge Q will be stored in the dielectric surface by a proportional relative voltage. The proportional constant C is designating the ability of the capacitor to store energy in electric field.

Fig. 1: Basic structure of a plate capacitor

The capacitance can be calculated using the amount of charge and the applied voltage

$$(1) \quad C = \frac{Q}{U}$$

Fig. 2: Sectional view of an aluminum electrolytic capacitor

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For further information please contact sales@capxon.org

11

11

Production steps

CAPXON TECHNICAL INFORMATION

2. PRODUCTION STEPS

To achieve the highest level of reliability for all our products, CapXon only uses 99.99% pure aluminum in its electrolytic capacitors. Foreign atoms on the surface in connection with the electrolyte would lead to corrosion.

Raw material Aluminum foil

Foil etching

Foil forming

Cutting

Contacting and winding

Impregnation

Assembling

Rubber sealing (uvul)

Sealing and marking

Aging

Finishing and packaging

Aluminum electrolytic capacitor

Fig. 3: Production steps - From foil to capacitor

The processing of the foil, the so-called etching process, the forming and the subsequent manufacturing of the electrolyte.

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11

11

Electrical parameters

CAPXON TECHNICAL INFORMATION

Apart from the ultra low ESR already explained, what are the main advantages of conductive polymer capacitors?

Technology	Solid Conductor (Polymer)	Hybrid Conductor (Silver Polymer)
Capacitance	0.37 - 3000µF	0.2 - 1500µF
Rated voltage	2.5V - 100VDC	16V - 400VDC
Max. temperature	105 - 125°C	105 - 150°C
Life	70000 hours	100000 hours

4.3. STABILITY OF ELECTRICAL PARAMETERS

If we compare the solid polymer or hybrid polymer technology with other capacitors designs, the advantages become clear.

The capacitance of ceramic capacitors reduces for high capacitance types with the applied voltage, what has to do with the following facts:

Ceramic materials like X7R, X7V, X7S or Z5U are ferroelectric materials and classified as class 2 ceramics. As higher the applied voltage so lower the permittivity ε, so lower the capacitance value. The capacitance measured at applied higher voltage may drop to 40% of the value measured with the standardized measurement voltage of 5 V or 20 V, what that means for the circuit in filters or memory applications need not be further elaborated here. This is the reason for harmonic distortions in audio applications.

Fig. 23: Change in capacitance as a function of the applied voltage for a Class 2 ceramic capacitor

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22

22

Capacitor selection

CAPXON TECHNICAL INFORMATION

6.2. HIGH FREQUENCY OUTPUT SMOOTHING

In the output stage on the secondary side, a rectification and smoothing circuit converts the AC voltage supplied by the transformer into the desired DC voltage. For example, 230VAC. The smoothing circuit can consist of a diode bridge, a capacitor and an inductor. See Fig. 27. The output current smooth ripple in the rectified voltage and, also ensure the stability during transient increase in the load current.

Fig. 27: Output smoothing capacitors in a flyback SMPS

When the MOSFET is not turned on, no current flows through the secondary diode and the output capacitors must supply the load with power. When the MOSFET is turned off, the diode conducts, supplies the load and charges the output capacitor.

Technology	Type	Temperature	105°C	125°C	150°C	175°C
Aluminum Electrolytic	SMC	AX	FX	FX	FX	FX
Hybrid	SMC	AX	FX	FX	FX	FX

6.3. BUFFERING

The block diagram in Figure 28 shows a microcontroller (µC) that is supplied via a linear voltage regulator, whose output voltage is 5V. In the application we assume a steadily made fluctuation with minimal power consumption and an operating mode of the µC as standby current (µA) and in operating current between 10mA and 100mA are necessary for the µC. The threshold value between standby and operating current is therefore 30mA, which leads to a sudden current requirement of the µC and to rise times of 100ns on the linear regulator.

Fig. 28: Simple µC power supply circuit

These rise times are too fast for the connected voltage regulator, so that the control loop does not yet react and there is a voltage drop at the input of the µC. The result would be an unstable operation of the µC, misinterpretation of binary values or, in the worst case, a system crash.

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For further information please contact sales@capxon.org

27

27

Design rules

CAPXON TECHNICAL INFORMATION

7. DESIGN RULES

7.1. ARRANGEMENT

Never arrange electrolytic capacitors near hot components such as transistors, transformers, power semiconductor etc. to avoid thermal heating of the liquid electrolyte.

7.3. CLEARANCE - OVERPRESSURE VENT

During operation, current flows through the capacitor and the electrolyte, which causes an increase in the internal pressure. If the internal pressure is too high, the overpressure vent opens and the gas escapes in a controlled manner. In order not to impair the functioning of the vent, a minimum distance to other components must be maintained above.

No conducting tracks, wires or other circuit parts may be arranged above the valve.

Fig. 30: Recommended distance for optimal cooling

If possible, leave the half diameter between the electrolytic capacitors for optimal cooling of the heat-sensitive components.

7.2. CONDUCTOR TRACKS

Make conductor tracks sufficiently thick. Especially at high or RMS currents the track can be very hot, if the proximity effect is large. Large widths at 25mm should help: provide 100µm, 200µm thickness or more.

Power	Track thickness
Very low	35µm
> 25W	200µm

Table 3: Recommended track thickness for high RMS current

Table 4: Recommended minimum clearance distance between capacitor and device case

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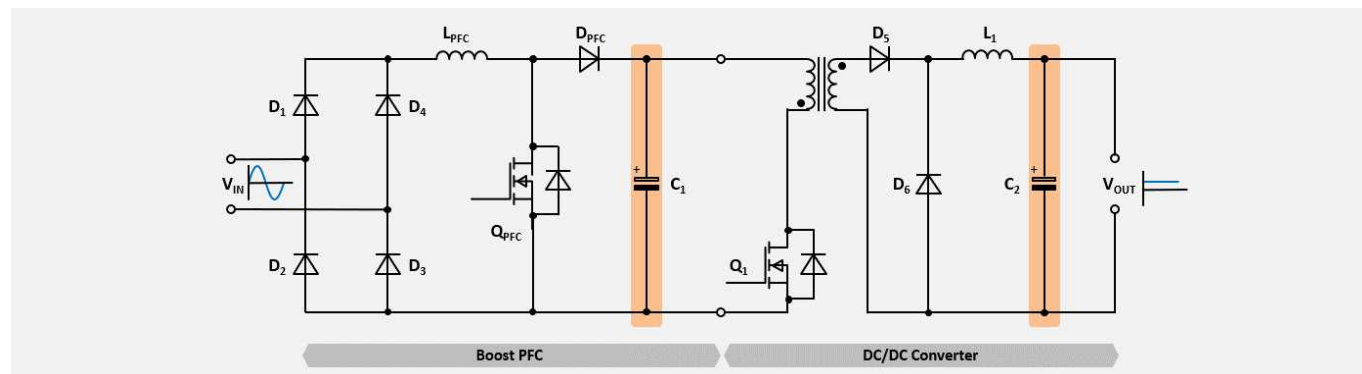
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31

31

SWITCH MODE POWER SUPPLY (SMPS)

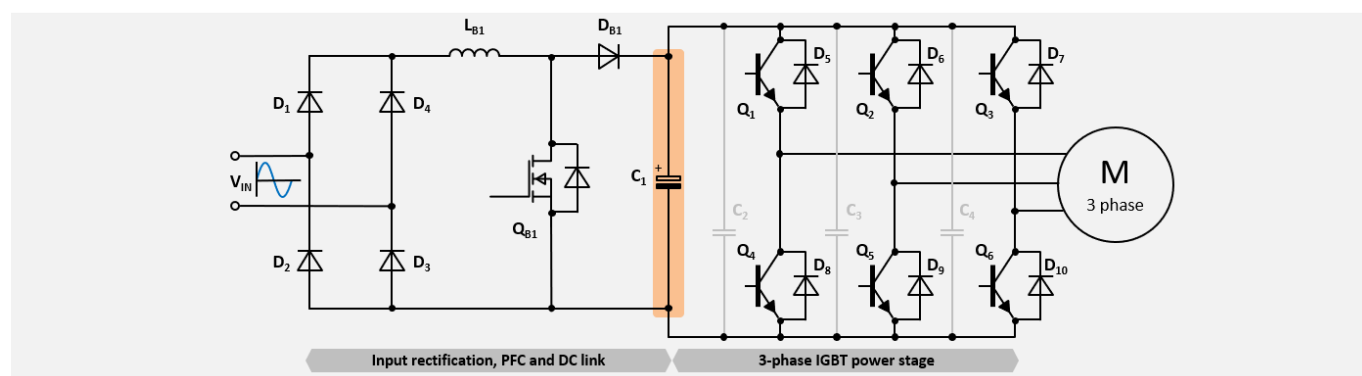
Example of a Switch Mode Power Supply with boost Power Factor Correction (PFC) and downstream DC/DC converter in Fly-back topology with recommended products.



Designation	Circuit	Purpose	Specification	Series	Part Number
C ₁	Boost PFC	Inductor ripple current filtering	100μF; 400V; 105°C; Radial; 2000h D18xL31.5mm; 0.53A@120Hz	KM	KM101M400K315A
C ₁	Boost PFC	Inductor ripple current filtering	470μF; 450V; 105°C; Snap-In ; 5000h D35xL45mm; 1.94A@120Hz	HP	HP471M450P450A
C ₂	DC/DC Converter	Output filtering	470μF; 25V; 105°C; SMD; 2000h D10xL10.5mm; 0.65A@100kHz	DV	DV471M025G105A
C ₂	DC/DC Converter	Output filtering	1000μF; 25V; 105°C; Radial; 10000h D13xL20mm; 1.91A@100kHz	FH	FH102M025I200A
C ₂	DC/DC Converter	Output filtering	82μF; 25V; 105°C; Radial; 2000h D8xL11.5mm; 4.1A@100kHz	PS	PS820M025F115A

INDUSTRIAL MOTOR DRIVE

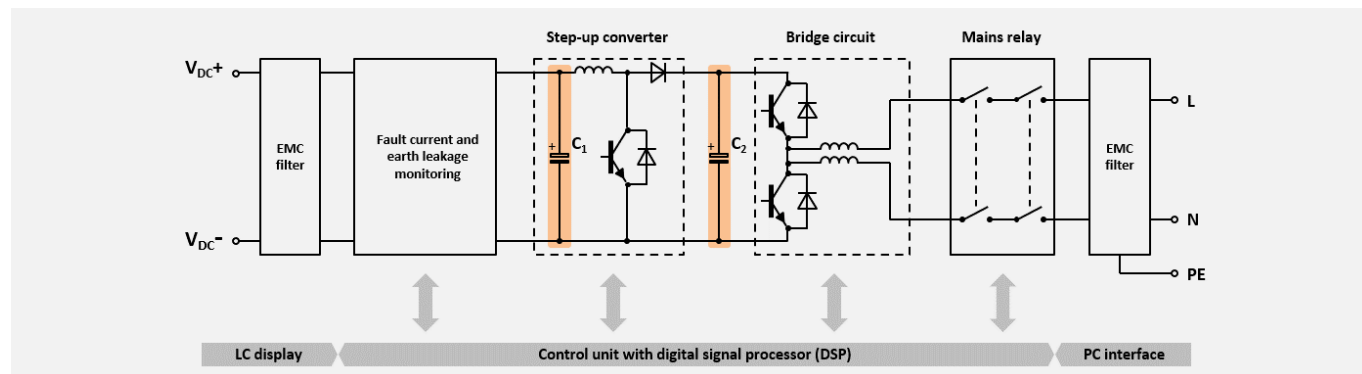
Example of a typical industrial motor drive for pumps, fans or compressors. The power circuit consist input rectifier, Power Factor Correction (PFC), DC link bank and 3-phase IGBT power stage. CapXon offers the full range of DC link solutions in electrolyte technology



Designation	Circuit	Purpose	Specification	Series	Part Number
C ₁	DC link bank	Energy storage and supply	560μF; 450V; 85°C; Snap-In; 7000h D30xL50mm; 3.17A@120Hz	UC	UC561M450O500A
C ₁	DC link bank	Energy storage and supply	470μF; 500V; 85°C; Snap-In; 10000h D35xL55mm; 2.99A@120Hz	UD	UD471M500P550A
C ₁	DC link bank	Energy storage and supply	680μF; 450V; 105°C; Snap-In; 8000h D35xL60mm; 2.94A@120Hz	UK	UK681M450P600A
C ₁	DC link bank	Energy storage and supply	680μF; 450V; 105°C; Snap-In; 10000h D35xL55mm; 3A@120Hz	UL	UL821M450Q550A

PHOTO VOLTAIC INVERTER

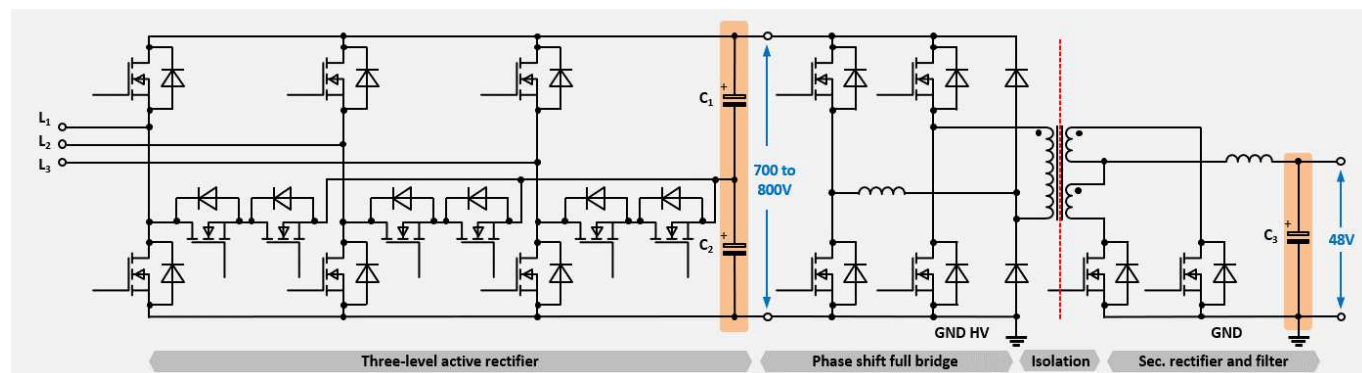
Block diagram of the power circuit of a photo voltaic inverter with EMC filter, monitoring circuit, step-up converter, bridge circuit, and mains relay with recommended products.



Designation	Circuit	Purpose	Specification	Series	Part Number
C ₁ , C ₂	Step-up + DC link	Energy storage and supply	680μF; 500V; 105°C; Snap-In; 5000h D40xL60mm; 3A@120Hz	UJ	UJ681M500Q600A
C ₁ , C ₂	Step-up + DC link	Energy storage and supply	5600μF; 450V; 105°C; Screw; 20000h D63.5xL165mm; 21.7@120Hz	RX	RX562M450SA65A
C ₁ , C ₂	Step-up + DC link	Energy storage and supply	470μF; 450V; 105°C; Snap-In; 10000h D30xL50mm; 1.97A@120Hz	UL	UL471M450O500A
C ₁ , C ₂	Step-up + DC link	Energy storage and supply	1000μF; 450V; 105°C; Screw; 8000h D51xL80mm; 4.6A@120Hz	RH	RH102M350R800A

3-PHASE HIGH VOLTAGE BATTERY CHARGER

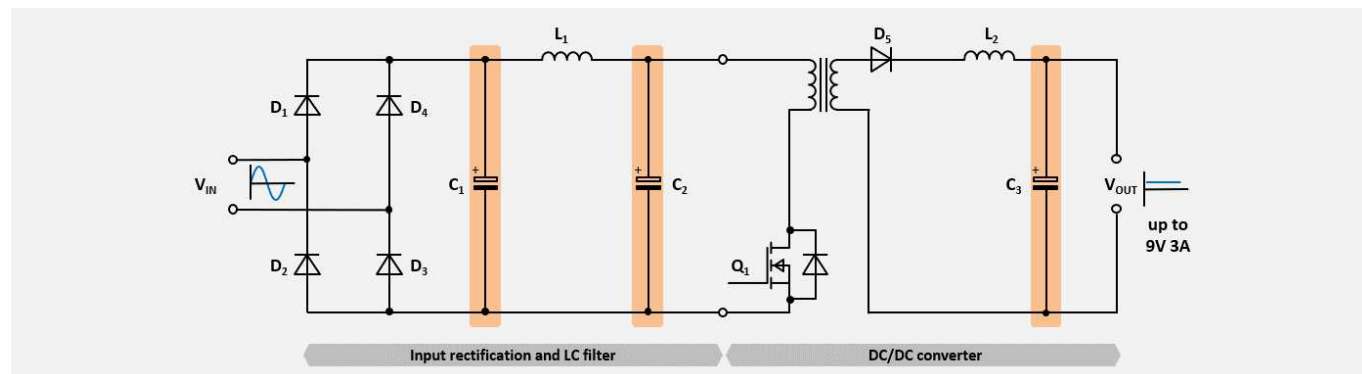
Principal circuit of a 3-phase high voltage battery charger for bidirectional applications such as electric vehicle charging (e-cars, fork-lift trucks, transport vehicles with recommend products for the active rectifier and output filter.



Designation	Circuit	Purpose	Specification	Series	Part Number
C ₁ , C ₂	Three-level active rectifier	Energy storage and supply	2200μF; 450V; 85°C; Snap-In; 7000h D45xL90mm; 8.5A@120Hz	UC	UC222M450V900A
C ₁ , C ₂	Three-level active rectifier	Energy storage and supply	1000μF; 500V; 105°C; Snap-In; 5000h D40xL80mm; 4.68A@120Hz	UJ	UJ102M500Q800A
C ₃	Output filter	Output buffering and ensure stability	56μF; 63V; 105°C; Radial; 10000h D10xL12.5mm; 2.4A@100kHz	AS	AS560M063G125PTA
C ₃	Output filter	Output buffering and ensure stability	150μF; 63V; 105°C; Radial; 2000h D10xL18mm; 3A@100kHz	PH	PH151M063G125PTA

27W PORTABLE POWER USB-C ADAPTER

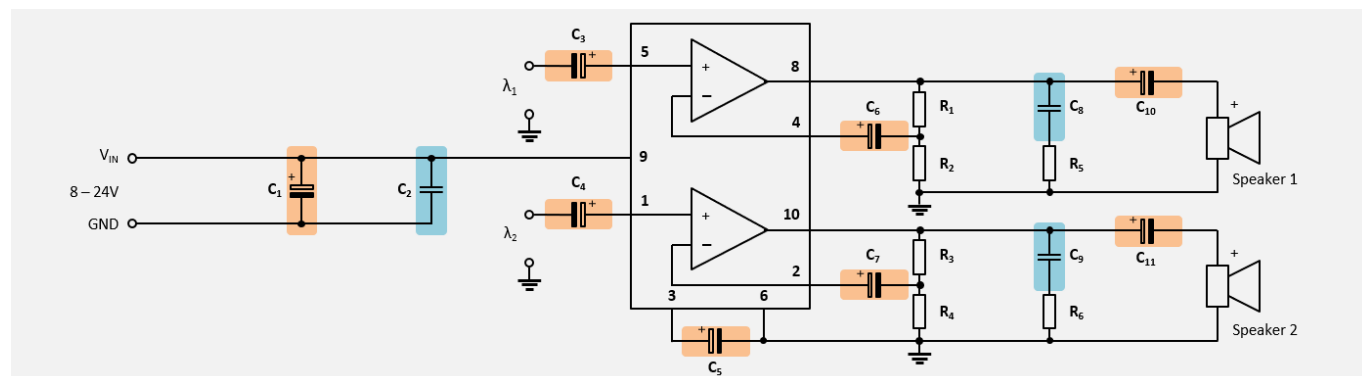
Example of a portable power adapter for USB-C laptops, smartphones and tablets with recommend products for the LC filter and to ensure stability (smoothing) during transient increase in the load voltage.



Designation	Circuit	Purpose	Specification	Series	Part Number
C ₁ , C ₂	LC filter	Input filtering	22μF; 400V; 105°C; Radial; 2000h D10xL25mm; 0.125A@120Hz	KM	KM220M400G250A
C ₁ , C ₂	LC filter	Input filtering	15μF; 400V; 105°C; Radial; 5000h D10xL20mm; 0.24A@120Hz	KF	KF150M400G200A
C ₃	DC/DC converter	Output filtering	470μF; 16V; 105°C; Radial; 2000h D5.5xL11mm; 2.69A@100kHz	PX	PX471M016C090P
C ₃	DC/DC converter	Output filtering	330μF; 12V; 105°C; Radial; 2000h D5xL9mm; 2.69A@100kHz	PX	PX331M012C090P

AUDIO SPEAKER

Example of an active audio speaker with treble and bass and the recommend products for the NF filter as well as the acoustic coupling.



Designation	Circuit	Purpose	Specification	Series	Part Number
C ₁ , C ₃ , C ₄ , C ₅ C ₆ , C ₇ , C ₁₀ , C ₁₁	Audio speaker	NF filter	470μF; 35V; 85°C; Radial; 2000h D10xL16mm; 0.63A@120Hz	RW	RW471M035G160A
C ₂ , C ₈ , C ₉	Audio speaker	Acoustic coupling	47μF; 35V; 85°C; Radial; 2000h D10xL12.5mm; 0.15A@120Hz	NR	NR470M035G125ETA

TECHNICAL TERMS

Item	Description	SI units
V_R	Rated voltage	V
V_S	Surge voltage	V
V_{Ripple_AC}	Ripple voltage	V
$V_{Reverse}$	Reverse voltage	V
V_A	Application voltage, operating voltage	A
I_R	Rated ripple current, rated alternating current	A
I_A	Application current, operating current	A
I_{A_Max}	Maximum application current, maximum operating current	A
I_{Leak}	Leakage current	A
T_{0_Max}	Upper category temperature	°C
T_{0_Min}	Lower category temperature	°C
T_A	Application temperature, operating temperature	°C
T_S	Capacitor surface temperature	°C
ΔT_0	Core temperature rise by internal heating due to rated ripple current	°C
ΔT_A	Core temperature rise by internal heating due to application ripple current	°C
C_R	Rated capacitance	F
ΔC	Capacitance tolerance	%
C/C_R	Capacitance drift	-
$\tan \delta$	Dissipation factor	-
Z	Impedance	Ω
ESR	Equivalent series resistance	Ω
ESL	Equivalent series inductance	H
X_C	Capacitive reactance	Ω
X_L	Inductive reactance	Ω
f	Frequency	Hz
ω	Angular frequency	Hz
λ	FIT = failure in time	-
K_f	Multiplier for ripple current vs. frequency	-
K_T	Multiplier for ripple current vs. temperature	-
K_0	Dielectric constant derating coefficient at high temperature	-
L_0	Specified lifetime at max. capacitor temperature, rated voltage (and rated ripple current)	h
L_A	Expected lifetime at application conditions	h

OVERVIEW ▪ SMD MULTILAYER POLYMER CAPACITORS (MLPC)



Features

HIGH TEMPERATURE

LOW ESR

LOW HEIGHT

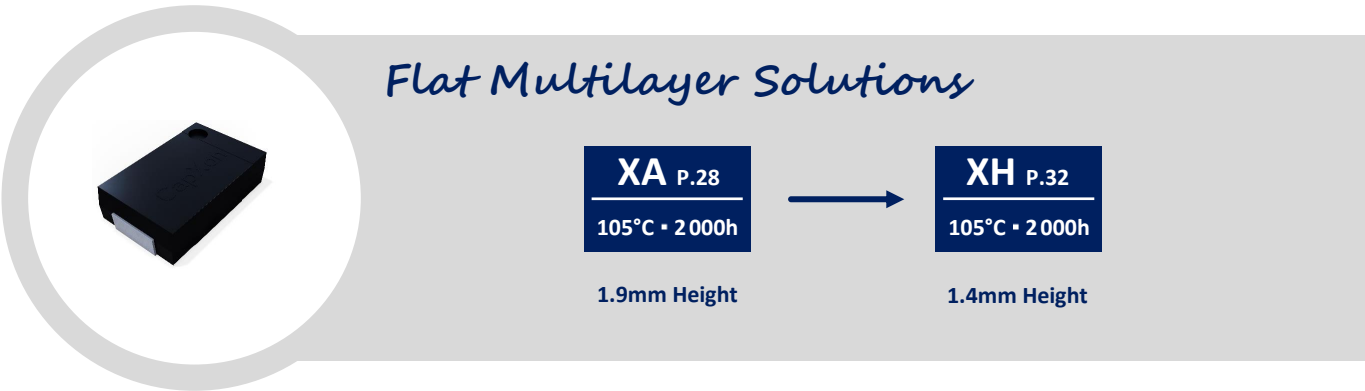
STANDARD

ULTRA LOW ESR

ULTRA LONG LIFE

Series		Page	High Temperature	Low ESR	Low Height	Standard	Ultra Low Height	Ultra Long Life	Temperature Range (°C)		Voltage Range (V)		Capacitance Range (μF)		Endurance (hours)
XA		28		•	•	•			-55	+105	2	25	10	470	2000
XH		32		•			•		-55	+105	2	25	22	330	2000

GROUP CHART



XA SERIES ■ FLAT, 1.9MM HEIGHT MULTILAYER TYPE

KEY FEATURES



- **MLPC - MULTILAYER CONDUCTIVE POLYMER** ■ SMD type
- Endurance: 105°C ■ 2 000 hours
- Ultra-low ESR and highest ripple current
- No voltage derating
- No dry-out effect guarantees extremely long life

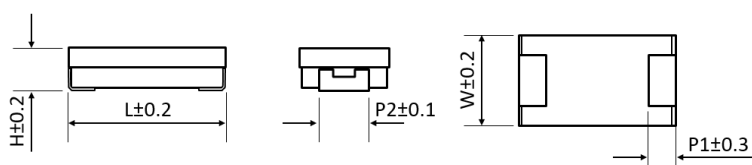


SPECIFICATIONS

Items		Performance Characteristics
Operating Temperature Range		-55 ~ +105°C
Rated Voltage Range	V_R	2 ~ 25V DC
Surge Voltage	V_S	$V_S = 1.25 \cdot V_R$ (2 ~ 16VDC); $V_S = 1.15 \cdot V_R$ (20 ~ 25VDC)
Capacitance Range	C_R	10 ~ 470μF
Cap. Tolerance	ΔC	±20% (120Hz ■ 20°C)
Leakage Current (20°C ■ V_R applied)	I_{LEAK}	$\leq 0.1 \cdot C_R \cdot V_R$ (μA) [≤ 6.3 VDC]; $\leq 0.3 \cdot C_R \cdot V_R$ (μA) [> 6.3 VDC] After 2 minutes
Dissipation Factor % (20°C ■ 120Hz)	$\tan\delta$	Not to exceed the values shown in standard ratings
Equivalent Series Resistance (20°C ■ 100kHz)	ESR	Not to exceed the values shown in standard ratings

Lifetime Test			
Endurance 105°C (V _R applied)	Test	2 000 hours	
	ΔC/C _R	Within ±20% of the initial value	
	tanδ	< 2 times of the initial limit	
	ESR	Less than 200% of the specified value	
	I _{Leak}	< 3 times of the initial limit	≤ 6.3 VDC
		Within the initial limit	> 6.3 VDC
Moisture Resistance stored at 60°C (RH 90 ~ 95%)	Test	500 hours	
	ΔC/C _R	Within +70 to -20% of the initial value	
	tanδ	< 2 times of the initial limit	
	ESR	Less than 200% of the specified value	
	I _{Leak}	< 3 times of the initial limit	≤ 6.3 VDC
		Within the initial limit	> 6.3 VDC

DIMENSIONS ■ All dimensions in mm



L	W	H	P1	P2
7.3	4.3	1.9	1.3	2.4

Recommended pad layout on page 109.

STANDARD RATINGS

Part number shows blister tape on plastic reel

V _R (V)	C _R (μF)	L (mm)	W (mm)	H (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	Max. I _R +45°C • 100kHz (mA rms)	CapXon Part Number
2	180	7.3	4.3	1.9	36	6	12	5600	XA181M0027019P120
							9	6300	XA181M0027019P090
	220				44		12	5600	XA221M0027019P120
							9	6300	XA221M0027019P090
	270				54		9	6300	XA271M0027019P090
							6	7500	XA271M0027019P060
	330				66		9	6300	XA331M0027019P090
							6	7500	XA331M0027019P060
	390				78		9	6300	XA391M0027019P090
							6	7500	XA391M0027019P060
2.5	470	7.3	4.3	1.9	94	6	9	6300	XA471M0027019P090
							6	7500	XA471M0027019P060
	150				38		12	5600	XA151M2R57019P120
							9	6300	XA151M2R57019P090
	180				45		12	5600	XA181M2R57019P120
							9	6300	XA181M2R57019P090
	220				55		9	6300	XA221M2R57019P090
							6	7500	XA221M2R57019P060
	270				68		9	6300	XA271M2R57019P090
							6	7500	XA271M2R57019P060
4	330	7.3	4.3	1.9	83	6	9	6300	XA331M2R57019P090
							6	7500	XA331M2R57019P060
	390				98		9	6300	XA391M2R57019P090
							6	7500	XA391M2R57019P060
	470				118		9	6300	XA471M2R57019P090
							6	7500	XA471M2R57019P060
	82				33		15	5100	XA820M0047019P150
							12	5600	XA820M0047019P120
	100				40		15	5100	XA101M0047019P150
							12	5600	XA101M0047019P120
4	120	7.3	4.3	1.9	48	6	12	5600	XA121M0047019P120
							9	6300	XA121M0047019P090
	150				60		12	5600	XA151M0047019P120
							9	6300	XA151M0047019P090
	180				72		12	5600	XA181M0047019P120
							9	6300	XA181M0047019P090

STANDARD RATINGS

Part number shows blister tape on plastic reel

V _R (V)	C _R (μF)	L (mm)	W (mm)	H (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C ▪ 120Hz (%)	Max. ESR +20°C ▪ 100kHz (mΩ)	Max. I _R +45°C ▪ 100kHz (mA rms)	CapXon Part Number
4	220	7.3	4.3	1.9	88	6	12	5600	XA221M0047019P120
							9	6300	XA221M0047019P090
6.3	68	7.3	4.3	1.9	43	6	15	5100	XA680M6R37019P150
	100				63		12	5600	XA680M6R37019P120
							15	5100	XA101M6R37019P150
							12	5600	XA101M6R37019P120
	120				76		12	5600	XA121M6R37019P120
	9						6300	XA121M6R37019P090	
	12						5600	XA151M6R37019P120	
	150				95		9	6300	XA151M6R37019P090
8	47	7.3	4.3	1.9	113	6	40	3200	XA470M0087019P400
	68				163		40	3200	XA680M0087019P400
	82				197		40	3200	XA820M0087019P400
	100				240		40	3200	XA101M0087019P400
	120				288		40	3200	XA121M0087019P400
	10				47		7.3	4.3	1.9
68		204	40	3200	XA680M0107019P400				
82		246	40	3200	XA680M0107019P400				
100		300	40	3200	XA101M0107019P400				
16		10	7.3	4.3	1.9	48			
	15	72				40	3200	XA150M0167019P400	
	22	105				40	3200	XA220M0167019P400	
	33	158				40	3200	XA330M0167019P400	
	47	225				40	3200	XA470M0167019P400	
	56	268				40	3200	XA560M0167019P400	
	68	326				40	3200	XA680M0167019P400	
	20	10				7.3	4.3	1.9	60
15		90	40	3200	XA150M0207019P400				
22		132	40	3200	XA220M0207019P400				
33		198	40	3200	XA330M0207019P400				
47		282	40	3200	XA470M0207019P400				
25		10	7.3	4.3	1.9				75
	15	113				40	3200	XA150M0257019P400	
	22	165				40	3200	XA220M0257019P400	
	33	248				40	3200	XA330M0257019P400	

MULTIPLIER K_I for RIPPLE CURRENT vs. SURFACE TEMPERATURE T_s

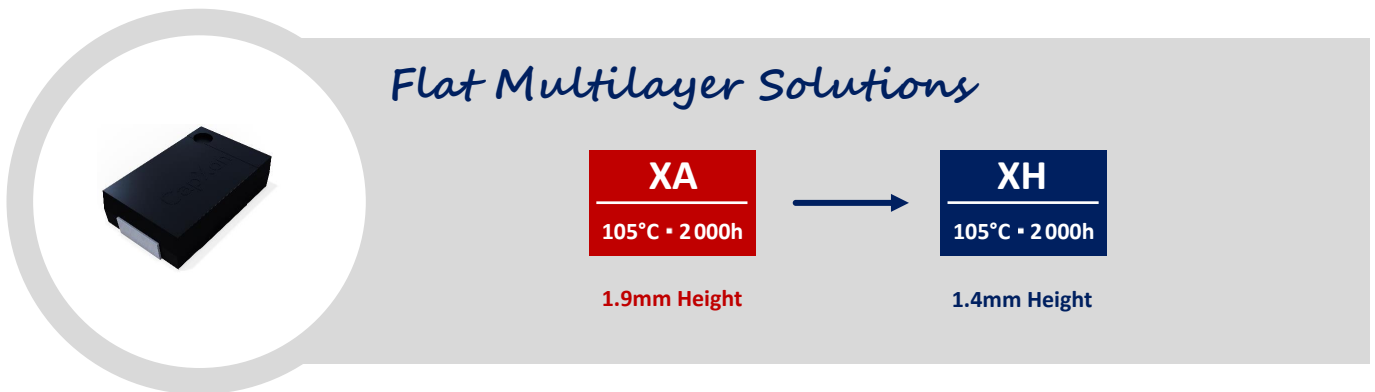
Temperature T_s		$T_s \leq 45^\circ\text{C}$	$45^\circ\text{C} \leq T_s < 85^\circ\text{C}$	$85^\circ\text{C} \leq T_s \leq 105^\circ\text{C}$
K_I	$V_R: 2V \sim 6.3V$	1	0.7	0.25
K_I	$V_R: 8V \sim 25V$	1	0.8	0.5

PRECAUTIONS, GUIDELINES AND PACKAGING INFORMATION

Unless otherwise agreed in individual specifications, all products are subject to our “General Precautions and Guidelines” as well as our “Packaging Information”. Please refer to the following links in the table.

			
General Precautions & Guidelines	Packaging Information	3D Models	Reliability Tests

GROUP CHART



DISCLAIMER

All product related data (e.g. specification, statements and general information) are subject to change without any notice. It is necessary that the customer observes all product related technical / application information and handling instructions.

CapXon products are designed and manufactured according to severe quality and safety standards. Under no circumstance, CapXon warrants that any CapXon product is suitable for the purposes intended for your application, even CapXon knows the application. It is customer's duty and obligation to check and make sure that CapXon products are suitable for the purposes intended and select the correct and proper CapXon product. Customers are requested to perform a sufficient validation and reliability evaluation to assure needed safety level and reliability performance by suitable designs and to apply proper safeguards (e.g. redundancies, protective circuits).

Particular operating conditions (ambient temperature, ripple current, voltage, thermal resistance, etc.) as well as storage, production or assembly may affect the performance and the lifetime of the capacitor. Please consult CapXon for lifetime estimation, failure mode considerations or worst-case scenarios according to the product technology, product tolerances / deviations or change of the characteristics of the capacitor due to shipment, storage, handling, production and usage.

For aerospace or military application, life-saving, life-sustaining, safety critical applications or any application where failure may cause severe personal injury or death, please consult us before design-in the capacitor in your application.

Except for the written expressed warranties, CapXon does not impliedly, by assumption or whatever else, warrant, undertake, promise any other warranty or guaranty for any CapXon product.

For further information, please visit our website www.capxongroup.com or contact CapXon directly.

XH SERIES ▪ ULTRA FLAT, 1.4MM HEIGHT MULTILAYER TYPE

KEY FEATURES



- **MLPC - MULTILAYER CONDUCTIVE POLYMER** ▪ SMD type
- Endurance: 105°C ▪ 2 000 hours
- Ultra-low ESR and highest ripple current
- No voltage derating
- No dry-out effect guarantees extremely long life

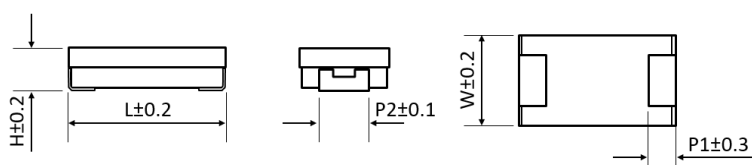


SPECIFICATIONS

Items		Performance Characteristics
Operating Temperature Range		-55 ~ +105°C
Rated Voltage Range	V_R	2 ~ 25V DC
Surge Voltage	V_S	$V_S = 1.25 \cdot V_R$ (2 ~ 16VDC); $V_S = 1.15 \cdot V_R$ (20 ~ 25VDC)
Capacitance Range	C_R	22 ~ 330μF
Cap. Tolerance	ΔC	±20% (120Hz ▪ 20°C)
Leakage Current (20°C ▪ V_R applied)	I_{LEAK}	$\leq 0.1 \cdot C_R \cdot V_R$ (μA) [≤ 6.3 VDC]; $\leq 0.3 \cdot C_R \cdot V_R$ (μA) [> 6.3 VDC] After 2 minutes
Dissipation Factor % (20°C ▪ 120Hz)	$\tan \delta$	Not to exceed the values shown in standard ratings
Equivalent Series Resistance (20°C ▪ 100kHz)	ESR	Not to exceed the values shown in standard ratings

Lifetime Test			
Endurance 105°C (V _R applied)	Test	2 000 hours	
	ΔC/C _R	Within ±20% of the initial value	
	tanδ	< 2 times of the initial limit	
	ESR	Less than 200% of the specified value	
	I _{Leak}	< 3 times of the initial limit	≤ 6.3 VDC
		Within the initial limit	> 6.3 VDC
Moisture Resistance stored at 60°C (RH 90 ~ 95%)	Test	500 hours	
	ΔC/C _R	Within +70 to -20% of the initial value	
	tanδ	< 2 times of the initial limit	
	ESR	Less than 200% of the specified value	
	I _{Leak}	< 3 times of the initial limit	≤ 6.3 VDC
		Within the initial limit	> 6.3 VDC

DIMENSIONS ▪ All dimensions in mm



L	W	H	P1	P2
7.3	4.3	1.4	1.3	2.4

Recommended pad layout on page 109.

STANDARD RATINGS

Part number shows blister tape on plastic reel

V _R (V)	C _R (μF)	L (mm)	W (mm)	H (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C ▪ 120Hz (%)	Max. ESR +20°C ▪ 100kHz (mΩ)	Max. I _R +45°C ▪ 100kHz (mA rms)	CapXon Part Number
2	330	7.3	4.3	1.4	66	6	9	6300	XH331M0027014P090
							6	7500	XH331M0027014P060
2.5	330	7.3	4.3	1.4	83	6	9	6300	XH331M2R57014P090
							6	7500	XH331M2R57014P060
6.3	68	7.3	4.3	1.4	43	6	15	5100	XH680M6R37014P150
							12	5600	XH680M6R37014P120
	100				63	6	15	5100	XH101M6R37014P150
							12	5600	XH101M6R37014P120
16	47	7.3	4.3	1.4	225	6	40	3200	XH470M0167014P400
25	22	7.3	4.3	1.4	165	6	40	3200	XH220M0257014P400

MULTIPLIER K_I for RIPPLE CURRENT vs. SURFACE TEMPERATURE T_S

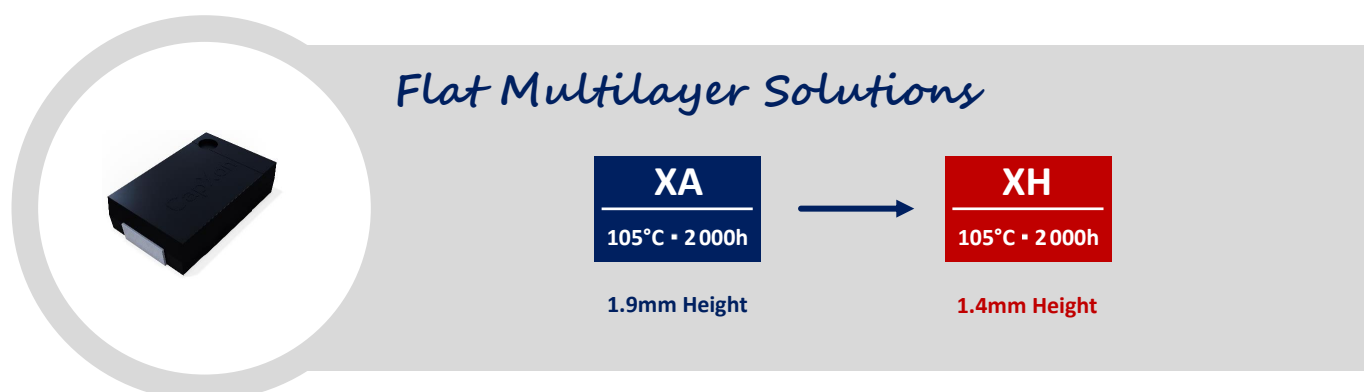
Temperature T_S		$T_S \leq 45^\circ\text{C}$	$45^\circ\text{C} \leq T_S < 85^\circ\text{C}$	$85^\circ\text{C} \leq T_S \leq 105^\circ\text{C}$
K_I	$V_R: 2V \sim 6.3V$	1	0.7	0.25
K_I	$V_R: 8V \sim 25V$	1	0.8	0.5

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General Precautions & Guidelines	Packaging Information	3D Models	Reliability Tests

GROUP CHART



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Particular operating conditions (ambient temperature, ripple current, voltage, thermal resistance, etc.) as well as storage, production or assembly may affect the performance and the lifetime of the capacitor. Please consult CapXon for lifetime estimation, failure mode considerations or worst-case scenarios according to the product technology, product tolerances / deviations or change of the characteristics of the capacitor due to shipment, storage, handling, production and usage.

For aerospace or military application, life-saving, life-sustaining, safety critical applications or any application where failure may cause severe personal injury or death, please consult us before design-in the capacitor in your application.

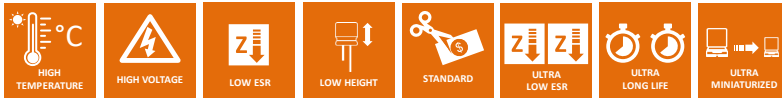
Except for the written expressed warranties, CapXon does not impliedly, by assumption or whatever else, warrant, undertake, promise any other warranty or guaranty for any CapXon product.

For further information, please visit our website www.capxongroup.com or contact CapXon directly.

OVERVIEW ▪ SMD CONDUCTIVE POLYMER CAPACITORS

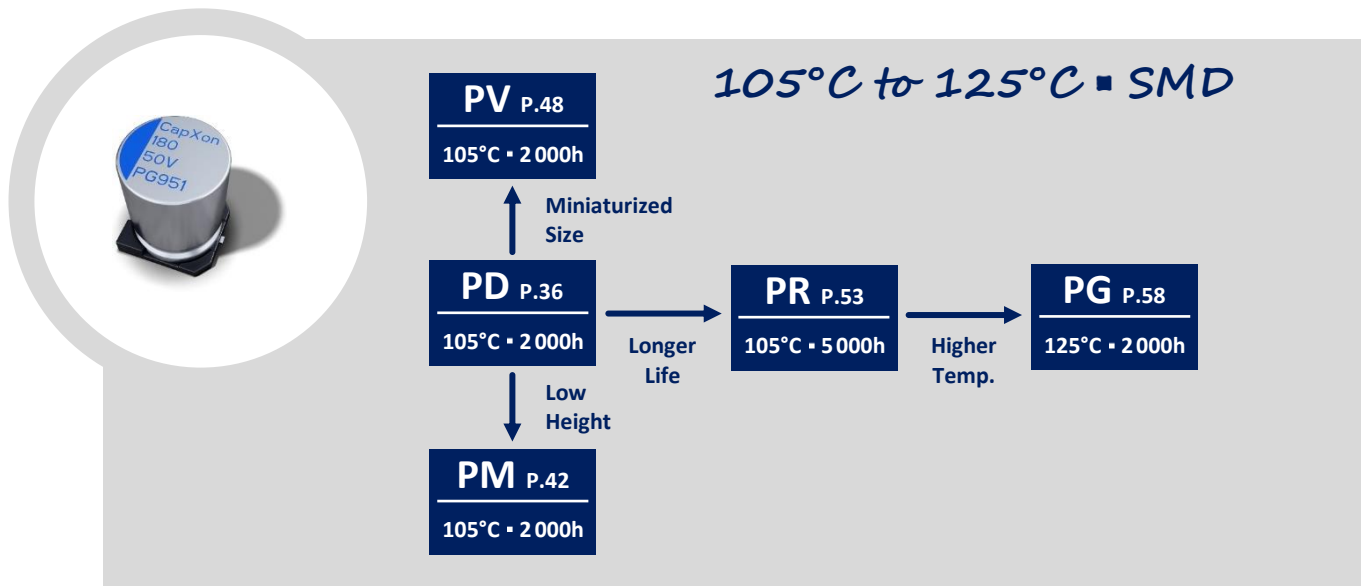


Features



Series	Page	High Temperature	High Voltage	Low ESR	Low Height	Standard	Ultra Long Life	Temperature Range (°C)		Voltage Range (V)		Capacitance Range (μF)		Endurance (hours)
PD	36		•	•		•	•	-55	+105	2.5	100	10	3300	2000
PM	42		•	•	•			-55	+105	2.5	100	4.7	560	2000
PV	48		•	•	•			-55	+105	2.5	100	6.8	2500	2000
PR	53			•				-55	+105	6.3	50	10	1500	5000
PG	58	•		•				-55	+125	6.3	50	10	1500	2000

GROUP CHART ▪ SMD CONDUCTIVE POLYMER CAPACITORS



PD SERIES • STANDARD TYPE

KEY FEATURES

- **SOLID CONDUCTIVE POLYMER** • SMD type
- Low ESR at high frequency range
- Endurance: 105°C • 2 000 hours
- Large permissible ripple current
- No dry-out effect guarantees extremely long life

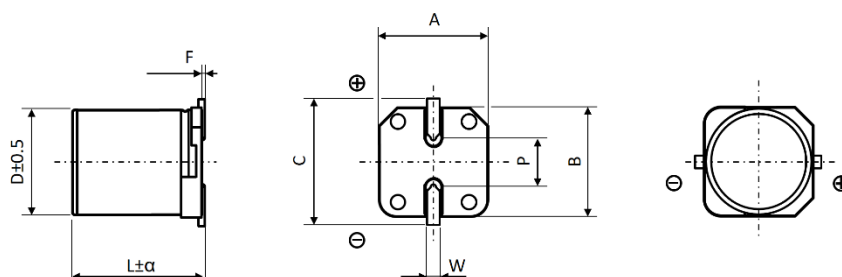


SPECIFICATIONS

Items		Performance Characteristics
Operating Temperature Range		-55 ~ +105°C
Rated Voltage Range	V_R	2.5 ~ 100V DC
Surge Voltage	V_S	($V_R \leq 20V$): $V_S = 1.15 \cdot V_R$ ($V_R \geq 25V$): $V_S = 1.10 \cdot V_R$
Capacitance Range	C_R	10 ~ 3300 μ F
Cap. Tolerance	ΔC	$\pm 20\%$ (120Hz • 20°C)
Leakage Current (20°C • V_R applied)	I_{LEAK}	Not to exceed the values shown in standard ratings After 2 minutes
Dissipation Factor % (20°C • 120Hz)	$\tan \delta$	Not to exceed the values shown in standard ratings
Equivalent Series Resistance (20°C • 100kHz)	ESR	Not to exceed the values shown in standard ratings

Lifetime Test		
Endurance 105°C (V_R applied)	Test	2 000 hours
	$\Delta C/C_R$	Within $\pm 20\%$ of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value
Moisture Resistance stored at 60°C (RH 90 ~ 95%)	Test	1 000 hours
	$\Delta C/C_R$	Within $\pm 20\%$ of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value

DIMENSIONS STANDARD PACKAGE • All dimensions in mm



Recommended pad layout on page 116.

DIMENSIONS STANDARD PACKAGE ▀ All dimensions in mm

ø D	L	α	A ± 0.2	B ± 0.2	C ± 0.2	F	P ± 0.2	W
8.0	11.7	0.3	8.3	8.3	9.0	0 to 0.3	3.1	0.7 to 1.1
10.0	12.4	0.3	10.3	10.3	11.0	0 to 0.3	4.5	0.7 to 1.1

STANDARD RATINGS

Part number shows blister tape on paper reel

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
2.5	560	8	11.7	280	8	9	5200	PD561M2R5F117PTR
	680	8	11.7	340	8	9	5200	PD681M2R5F117PTR
	820	8	11.7	410	8	9	5400	PD821M2R5F117PTR
	1000	8	11.7	500	8	9	5400	PD102M2R5F117PTR
	1500	8	11.7	750	8	9	5400	PD152M2R5F117PTR
	1500	10	12.4	750	8	9	5600	PD152M2R5G124PTR
	2500	10	12.4	1250	8	9	5600	PD252M2R5G124PTR
	2700	10	12.4	1350	10	9	5600	PD272M2R5G124PTR
	3300	10	12.4	1650	10	9	5600	PD332M2R5G124PTR
4	560	8	11.7	448	8	9	5200	PD561M004F117PTR
	680	8	11.7	544	8	9	5200	PD681M004F117PTR
	820	8	11.7	656	8	9	5200	PD821M004F117PTR
	1000	8	11.7	800	10	9	5200	PD102M004F117PTR
	1200	8	11.7	960	10	9	5200	PD122M004F117PTR
	1200	10	12.4	960	10	9	5600	PD122M004G124PTR
	1500	8	11.7	1200	10	9	5200	PD152M004F117PTR
	1500	10	12.4	1200	10	9	5600	PD152M004G124PTR
	1800	10	12.4	1440	10	9	5600	PD182M004G124PTR
	2200	10	12.4	1760	10	9	5600	PD222M004G124PTR
	2500	10	12.4	2000	10	9	5600	PD252M004G124PTR
	2700	10	12.4	2160	10	9	5600	PD272M004G124PTR
6.3	180	8	11.7	227	8	9	5200	PD181M6R3F117PTR
	270	8	11.7	340	8	9	5200	PD271M6R3F117PTR
	330	8	11.7	416	8	9	5200	PD331M6R3F117PTR
	390	8	11.7	491	8	9	5200	PD391M6R3F117PTR
	470	8	11.7	592	8	9	5200	PD471M6R3F117PTR
	560	8	11.7	706	8	9	5200	PD561M6R3F117PTR
	680	10	12.4	856	8	9	5500	PD681M6R3G124PTR
	820	8	11.7	1033	10	9	5200	PD821M6R3F117PTR
	820	10	12.4	1033	10	9	5500	PD821M6R3G124PTR
	1000	8	11.7	1260	10	9	5200	PD102M6R3F117PTR
	1000	10	12.4	1260	10	9	5500	PD102M6R3G124PTR
	1500	10	12.4	1890	10	9	5500	PD152M6R3G124PTR
	2000	10	12.4	2520	10	9	5500	PD202M6R3G124PTR
	2200	10	12.4	2772	10	9	5500	PD222M6R3G124PTR

STANDARD RATINGS

Part number shows blister tape on paper reel

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
10	180	8	11.7	360	8	9	5200	PD181M010F117PTR
	220	8	11.7	440	8	9	5200	PD221M010F117PTR
	270	8	11.7	540	8	9	5200	PD271M010F117PTR
	330	8	11.7	660	8	9	5200	PD331M010F117PTR
	390	8	11.7	780	8	9	5200	PD391M010F117PTR
	470	8	11.7	940	8	9	5200	PD471M010F117PTR
	470	10	12.4	940	8	9	5500	PD471M010G124PTR
	560	8	11.7	1120	8	9	5200	PD561M010F117PTR
	560	10	12.4	1120	8	9	5500	PD561M010G124PTR
	680	8	11.7	1360	10	9	5200	PD681M010F117PTR
	680	10	12.4	1360	10	9	5500	PD681M010G124PTR
	820	10	12.4	1640	10	9	5500	PD821M010G124PTR
	1000	10	12.4	2000	10	9	5500	PD102M010G124PTR
	1200	10	12.4	2400	10	9	5500	PD122M010G124PTR
	1500	10	12.4	3000	10	9	5500	PD152M010G124PTR
16	180	8	11.7	576	8	15	4700	PD181M016F117PTR
	220	8	11.7	704	8	15	4700	PD221M016F117PTR
	220	10	12.4	704	8	15	5100	PD221M016G124PTR
	270	8	11.7	864	8	15	4700	PD271M016F117PTR
	270	10	12.4	864	8	15	5100	PD271M016G124PTR
	330	8	11.7	1056	8	15	4700	PD331M016F117PTR
	330	10	12.4	1056	8	15	5100	PD331M016G124PTR
	390	8	11.7	1248	10	15	4700	PD391M016F117PTR
	470	10	12.4	1504	10	15	5100	PD471M016G124PTR
	560	8	11.7	1792	12	14	4950	PD561M016F117PTR
	680	10	12.4	2176	10	15	5100	PD681M016G124PTR
	820	10	12.4	2624	10	15	5100	PD821M016G124PTR
	1000	10	12.4	3200	12	14	5400	PD102M016G124PTR
20	39	8	11.7	156	8	20	4210	PD390M020F117PTR
	68	8	11.7	272	8	20	4210	PD680M020F117PTR
	82	8	11.7	328	8	20	4210	PD820M020F117PTR
	100	8	11.7	400	8	20	4210	PD101M020F117PTR
	100	10	12.4	400	8	20	4800	PD101M020G124PTR
	150	10	12.4	600	10	20	4800	PD151M020G124PTR
	180	10	12.4	720	10	20	4800	PD181M020G124PTR
	220	8	11.7	880	10	22	4000	PD221M020F117PTR
	220	10	12.4	880	10	20	4800	PD221M020G124PTR
	270	8	11.7	1080	10	22	4000	PD271M020F117PTR
	270	10	12.4	1080	10	20	4800	PD271M020G124PTR
	330	10	12.4	1320	10	20	4800	PD331M020G124PTR
	390	8	11.7	1560	12	14	4950	PD391M020F117PTR
	470	10	12.4	1880	12	20	4800	PD471M020G124PTR
	680	10	12.4	2720	12	16	5000	PD681M020G124PTR

STANDARD RATINGS

Part number shows blister tape on paper reel

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
25	33	8	11.7	165	8	25	3800	PD330M025F117PTR
	47	8	11.7	235	8	20	4210	PD470M025F117PTR
	56	10	12.4	280	8	28	3800	PD560M025G124PTR
	82	8	11.7	410	8	20	4210	PD820M025F117PTR
	100	8	11.7	500	10	20	4210	PD101M025F117PTR
	100	10	12.4	500	10	20	4800	PD101M025G124PTR
	180	8	11.7	900	10	25	3800	PD181M025F117PTR
	180	10	12.4	900	10	20	4800	PD181M025G124PTR
	220	8	11.7	1100	10	25	3800	PD221M025F117PTR
	220	10	12.4	1100	10	20	4800	PD221M025G124PTR
	270	10	12.4	1350	10	20	4800	PD271M025G124PTR
	330	8	11.7	1650	12	20	4210	PD331M025F117PTR
	330	10	12.4	1650	12	22	4200	PD331M025G124PTR
	390	10	12.4	1950	12	22	4200	PD391M025G124PTR
	470	10	12.4	2350	12	25	3800	PD471M025G124PTR
35	39	8	11.7	273	12	32	2700	PD390M035F117PTR
	68	8	11.7	476	12	28	3300	PD680M035F117PTR
	82	8	11.7	574	12	28	3300	PD820M035F117PTR
	100	10	12.4	700	12	25	3800	PD101M035G124PTR
	120	8	11.7	840	12	25	3800	PD121M035F117PTR
	150	8	11.7	840	12	25	3800	PD151M035F117PTR
	150	10	12.4	1050	12	25	3800	PD151M035G124PTR
	180	10	12.4	1260	12	22	4100	PD181M035G124PTR
	220	10	12.4	1540	12	22	4100	PD221M035G124PTR
	270	10	12.4	1890	12	20	4400	PD271M035G124PTR
50	330	10	12.4	2310	12	20	4400	PD331M035G124PTR
	10	8	11.7	100	12	40	1800	PD100M050F117PTR
	22	8	11.7	220	12	40	1800	PD220M050F117PTR
	33	8	11.7	300	12	35	2000	PD330M050F117PTR
	39	8	11.7	390	12	30	2300	PD390M050F117PTR
	47	8	11.7	470	12	30	2300	PD470M050F117PTR
	56	8	11.7	560	12	30	2500	PD560M050F117PTR
	56	10	12.4	560	12	25	3000	PD560M050G124PTR
	68	10	12.4	680	12	25	3000	PD680M050G124PTR
	100	10	12.4	1000	12	25	3000	PD101M050G124PTR
63	22	8	11.7	277	12	35	1800	PD220M063F117PTR
	27	8	11.7	340	12	35	2200	PD270M063F117PTR
	33	8	11.7	416	12	35	2200	PD330M063F117PTR
	33	10	12.4	416	12	30	2500	PD330M063G124PTR
	39	8	11.7	491	12	35	2200	PD390M063F117PTR
	47	10	12.4	592	12	30	2500	PD470M063G124PTR
	56	10	12.4	706	12	30	2500	PD560M063G124PTR
	68	10	12.4	857	12	30	2500	PD680M063G124PTR

STANDARD RATINGS

Part number shows blister tape on paper reel

V_R (V)	C_R (μF)	ϕD (mm)	L (mm)	I_{LEAK} (μA , 2min)	$\tan\delta$ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (m Ω)	I_R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
80	12	8	11.7	192	12	40	1800	PD120M080F117PTR
	22	10	12.4	352	12	38	2300	PD220M080G124PTR
	47	10	12.4	752	12	40	1800	PD470M080G124PTR
100	10	8	11.7	200	12	45	1700	PD100M100F117PTR
	18	10	12.4	360	12	40	2100	PD180M100G124PTR
	22	10	12.4	440	12	40	2100	PD220M100G124PTR

MULTIPLIER K_f for RIPPLE CURRENT vs. FREQUENCY

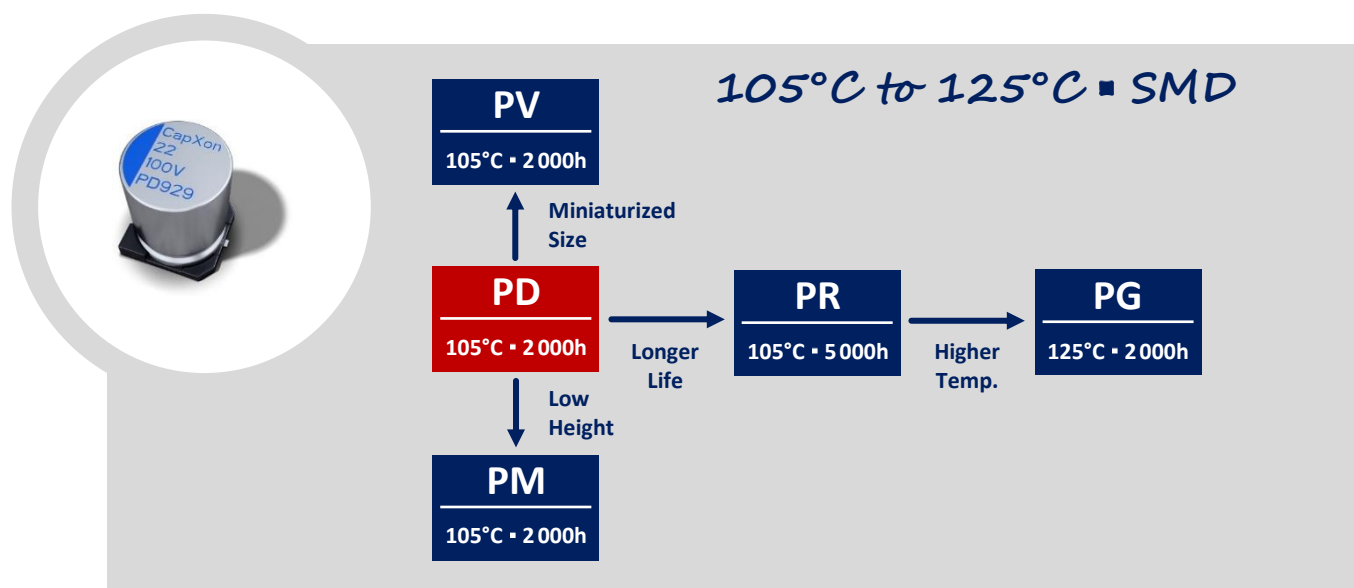
Frequency (Hz)	$120 \leq \text{Freq.} < 1k$	$1k \leq \text{Freq.} < 10k$	$10k \leq \text{Freq.} < 100k$	$100k \leq \text{Freq.} < 300k$
Coefficient K_f	0.05	0.3	0.7	1

PRECAUTIONS, GUIDELINES AND PACKAGING INFORMATION

Unless otherwise agreed in individual specifications, all products are subject to our “General Precautions and Guidelines” as well as our “Packaging Information”. Please refer to the following links in the table.

			
General Precautions & Guidelines	Packaging Information	3D Models	Reliability Tests

GROUP CHART



DISCLAIMER

All product related data (e.g. specification, statements and general information) are subject to change without any notice. It is necessary that the customer observes all product related technical / application information and handling instructions.

CapXon products are designed and manufactured according to severe quality and safety standards. Under no circumstance, CapXon warrants that any CapXon product is suitable for the purposes intended for your application, even CapXon knows the application. It is customer's duty and obligation to check and make sure that CapXon products are suitable for the purposes intended and select the correct and proper CapXon product. Customers are requested to perform a sufficient validation and reliability evaluation to assure needed safety level and reliability performance by suitable designs and to apply proper safeguards (e.g. redundancies, protective circuits).

Particular operating conditions (ambient temperature, ripple current, voltage, thermal resistance, etc.) as well as storage, production or assembly may affect the performance and the lifetime of the capacitor. Please consult CapXon for lifetime estimation, failure mode considerations or worst-case scenarios according to the product technology, product tolerances / deviations or change of the characteristics of the capacitor due to shipment, storage, handling, production and usage.

For aerospace or military application, life-saving, life-sustaining, safety critical applications or any application where failure may cause severe personal injury or death, please consult us before design-in the capacitor in your application.

Except for the written expressed warranties, CapXon does not impliedly, by assumption or whatever else, warrant, undertake, promise any other warranty or guaranty for any CapXon product.

For further information, please visit our website www.capxongroup.com or contact CapXon directly.

PM SERIES • LOW HEIGHT TYPE

KEY FEATURES



- **SOLID CONDUCTIVE POLYMER** • SMD type
- Low height for space critical applications
- Endurance: 105°C • 2 000 hours
- Large permissible ripple current
- No dry-out effect guarantees extremely long life

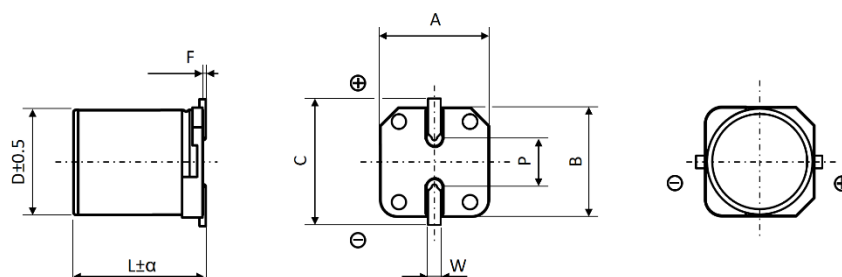


SPECIFICATIONS

Items		Performance Characteristics
Operating Temperature Range		-55 ~ +105°C
Rated Voltage Range	V_R	2.5 ~ 100V DC
Surge Voltage	V_S	($V_R \leq 20V$): $V_S = 1.15 \cdot V_R$ ($V_R \geq 25V$): $V_S = 1.10 \cdot V_R$
Capacitance Range	C_R	4.7 ~ 560μF
Cap. Tolerance	ΔC	±20% (120Hz • 20°C)
Leakage Current (20°C • V_R applied)	I_{LEAK}	Not to exceed the values shown in standard ratings After 2 minutes
Dissipation Factor % (20°C • 120Hz)	$\tan \delta$	Not to exceed the values shown in standard ratings
Equivalent Series Resistance (20°C • 100kHz)	ESR	Not to exceed the values shown in standard ratings

Lifetime Test		
Endurance 105°C (V_R applied)	Test	2 000 hours
	$\Delta C/C_R$	Within ±20% of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value
Moisture Resistance stored at 60°C (RH 90 ~ 95%)	Test	1 000 hours
	$\Delta C/C_R$	Within ±20% of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value

DIMENSIONS STANDARD PACKAGE • All dimensions in mm



Recommended pad layout on page 116.

DIMENSIONS STANDARD PACKAGE • All dimensions in mm

ø D	L	α	A ± 0.2	B ± 0.2	C ± 0.2	F	P ± 0.2	W
4.0	5.5	0.3	4.3	4.3	4.9	0 to 0.3	1.0	0.5 to 0.8
5.0	5.5	0.3	5.3	5.3	5.9	0 to 0.3	1.4	0.5 to 0.8
5.0	5.8	0.3	5.3	5.3	5.9	0 to 0.3	1.4	0.5 to 0.8
6.3	5.8	0.3	6.6	6.6	7.2	0 to 0.3	2.2	0.5 to 0.8
6.3	7.7	0.3	6.6	6.6	7.2	0 to 0.3	2.2	0.5 to 0.8

STANDARD RATINGS

Part number shows blister tape on paper reel

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C - 120Hz (%)	Max. ESR +20°C - 100kHz (mΩ)	I _R - Max. Ripple Current +105°C - 100kHz (mA rms)	CapXon Part Number
2.5	82	5	5.8	300	8	30	2100	PM820M2R5C058PTR
	100	6.3	5.8	300	8	22	2500	PM101M2R5E058PTR
	150	6.3	5.8	300	8	22	2500	PM151M2R5E058PTR
	180	5	5.8	300	8	25	2310	PM181M2R5C058PTR
	180	6.3	5.8	300	8	22	2500	PM181M2R5E058PTR
	220	5	5.8	300	8	25	2310	PM221M2R5C058PTR
	220	6.3	5.8	300	8	22	2800	PM221M2R5E058PTR
	270	5	5.8	300	8	22	2610	PM271M2R5C058PTR
	270	6.3	5.8	300	8	22	2800	PM271M2R5E058PTR
	330	6.3	5.8	300	8	15	3100	PM331M2R5E058PTRZ
	390	6.3	5.8	300	8	25	2610	PM391M2R5E058PTR
	390	6.3	5.8	300	8	15	3100	PM391M2R5E058PTRZ
	470	6.3	5.8	300	8	20	2800	PM471M2R5E058PTR
	470	6.3	7.7	300	8	15	3600	PM471M2R5E077PTR
	560	6.3	5.8	300	8	15	3100	PM561M2R5E058PTRZ
	560	6.3	7.7	300	8	15	3600	PM561M2R5E077PTR
4	47	5	5.8	300	8	25	2310	PM470M004C058PTR
	56	5	5.8	300	8	25	2310	PM560M004C058PTR
	68	5	5.8	300	8	25	2310	PM680M004C058PTR
	100	5	5.8	300	8	25	2310	PM101M004C058PTR
	100	6.3	5.8	300	8	22	2500	PM101M004E058PTR
	120	5	5.8	300	8	22	2500	PM121M004C058PTR
	120	6.3	5.8	300	8	22	2500	PM121M004E058PTR
	150	5	5.8	300	8	22	2500	PM151M004C058PTR
	150	6.3	5.8	300	8	22	2500	PM151M004E058PTR
	150	6.3	7.7	300	8	20	3100	PM151M004E077PTR
	180	6.3	5.8	300	8	22	2500	PM181M004E058PTR
	220	5	5.8	300	8	22	2610	PM221M004C058PTR
	220	6.3	5.8	300	8	22	2800	PM221M004E058PTR
	220	6.3	7.7	300	8	20	3100	PM221M004E077PTR
	270	6.3	5.8	300	8	22	2800	PM271M004E058PTR
	270	6.3	7.7	300	8	20	3100	PM271M004E077PTR
	330	6.3	5.8	300	8	20	2800	PM331M004E058PTR
	330	6.3	5.8	300	8	15	3100	PM331M004E058PTRZ
	330	6.3	7.7	300	8	15	3600	PM331M004E077PTR
	390	6.3	5.8	300	8	20	2800	PM391M004E058PTR
	390	6.3	7.7	300	8	15	3600	PM391M004E077PTR
	470	6.3	7.7	300	8	15	3600	PM471M004E077PTR

STANDARD RATINGS

Part number shows blister tape on paper reel

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
6.3	47	5	5.5	300	8	30	2000	PM470M6R3C055PTR
	56	5	5.5	300	8	30	2000	PM560M6R3C055PTR
	68	5	5.5	300	8	30	2000	PM680M6R3C055PTR
	68	6.3	5.8	300	8	22	2690	PM680M6R3E058PTR
	82	5	5.5	300	8	30	2000	PM820M6R3C055PTR
	82	6.3	5.8	300	8	22	2690	PM820M6R3E058PTR
	100	5	5.5	300	8	30	2000	PM101M6R3C055PTR
	100	5	5.8	300	8	25	2310	PM101M6R3C058PTR
	100	6.3	5.8	300	8	22	2800	PM101M6R3E058PTR
	120	5	5.8	300	8	25	2310	PM121M6R3C058PTR
	120	6.3	5.8	300	8	22	2800	PM121M6R3E058PTR
	150	5	5.8	300	8	22	2610	PM151M6R3C058PTR
	150	6.3	5.8	300	8	22	2800	PM151M6R3E058PTR
	150	6.3	7.7	300	8	20	3100	PM151M6R3E077PTR
	180	5	5.8	300	8	22	2610	PM181M6R3C058PTR
	180	6.3	5.8	300	8	22	2800	PM181M6R3E058PTR
	180	6.3	7.7	300	8	20	3100	PM181M6R3E077PTR
	220	6.3	5.8	300	8	20	3000	PM221M6R3E058PTR
	220	6.3	5.8	300	8	15	3100	PM221M6R3E058PTRZ
	220	6.3	7.7	300	8	15	3600	PM221M6R3E077PTR
	270	6.3	5.8	300	8	20	3000	PM271M6R3E058PTR
	270	6.3	7.7	300	8	15	3600	PM271M6R3E077PTR
	330	6.3	5.8	300	8	20	3100	PM331M6R3E058PTR
	330	6.3	7.7	300	8	15	3600	PM331M6R3E077PTR
	330	6.3	7.7	300	8	10	4200	PM331M6R3E077PTRZ
	390	6.3	7.7	300	8	15	3600	PM391M6R3E077PTR
10	4.7	4	5.5	300	8	120	980	PM4R7M010B055PTR
	6.8	4	5.5	300	8	120	980	PM6R8M010B055PTR
	10	4	5.5	300	8	80	1200	PM100M010B055PTR
	15	4	5.5	300	8	80	1200	PM150M010B055PTR
	22	4	5.5	300	8	80	1200	PM220M010B055PTR
	33	5	5.5	300	8	30	2000	PM330M010C055PTR
	33	6.3	5.8	300	8	30	2200	PM330M010E058PTR
	39	5	5.5	300	8	30	2000	PM390M010C055PTR
	39	6.3	5.8	300	8	30	2200	PM390M010E058PTR
	47	5	5.5	300	8	30	2000	PM470M010C055PTR
	47	6.3	5.8	300	8	30	2200	PM470M010E058PTR
	47	6.3	7.7	300	8	20	2800	PM470M010E077PTR
	56	5	5.5	300	8	30	2000	PM560M010C055PTR
	56	6.3	5.8	300	8	30	2200	PM560M010E058PTR
	56	6.3	7.7	300	8	20	2800	PM560M010E077PTR
	68	5	5.5	300	8	30	2000	PM680M010C055PTR
	68	6.3	5.8	300	8	30	2200	PM680M010E058PTR
	68	6.3	7.7	300	8	20	2800	PM680M010E077PTR
	82	5	5.5	300	8	30	2000	PM820M010C055PTR
	82	6.3	5.8	300	8	30	2200	PM820M010E058PTR

STANDARD RATINGS

Part number shows blister tape on paper reel

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
10	82	6.3	7.7	300	8	20	2800	PM820M010E077PTR
	100	5	5.5	300	8	30	2000	PM101M010C055PTR
	100	6.3	5.8	300	8	30	2200	PM101M010E058PTR
	100	6.3	7.7	300	8	20	2800	PM101M010E077PTR
	120	6.3	5.8	300	8	25	2610	PM121M010E058PTR
	150	6.3	5.8	300	8	25	2610	PM151M010E058PTR
	150	6.3	7.7	300	8	20	3100	PM151M010E077PTR
	180	6.3	5.8	300	8	25	2610	PM181M010E058PTR
	180	6.3	7.7	300	8	20	3100	PM181M010E077PTR
	220	6.3	5.8	300	8	25	2610	PM221M010E058PTR
	220	6.3	7.7	300	8	20	3100	PM221M010E077PTR
	270	6.3	7.7	300	8	20	3100	PM271M010E077PTR
	330	6.3	7.7	300	8	20	3100	PM331M010E077PTR
16	10	5	5.8	400	8	40	2000	PM100M016C058PTR
	10	6.3	5.8	400	8	35	2200	PM100M016E058PTR
	10	6.3	7.7	400	8	30	2610	PM100M016E077PTR
	15	5	5.8	400	8	40	2000	PM150M016C058PTR
	15	6.3	5.8	400	8	35	2200	PM150M016E058PTR
	15	6.3	7.7	400	8	30	2610	PM150M016E077PTR
	22	5	5.8	400	8	40	2000	PM220M016C058PTR
	22	6.3	5.8	400	8	35	2200	PM220M016E058PTR
	22	6.3	7.7	400	8	30	2610	PM220M016E077PTR
	33	5	5.8	400	8	40	2000	PM330M016C058PTR
	33	6.3	5.8	400	8	35	2200	PM330M016E058PTR
	33	6.3	7.7	400	8	30	2610	PM330M016E077PTR
	39	5	5.8	400	8	40	2000	PM390M016C058PTR
	39	6.3	5.8	400	8	35	2200	PM390M016E058PTR
	39	6.3	7.7	400	8	30	2610	PM390M016E077PTR
	47	5	5.8	400	8	40	2000	PM470M016C058PTR
	47	6.3	5.8	400	8	35	2200	PM470M016E058PTR
	47	6.3	7.7	400	8	30	2610	PM470M016E077PTR
	56	5	5.8	400	8	40	2000	PM560M016C058PTR
	56	6.3	5.8	400	8	35	2200	PM560M016E058PTR
	56	6.3	7.7	400	8	30	2610	PM560M016E077PTR
	68	6.3	5.8	400	8	35	2200	PM680M016E058PTR
	68	6.3	7.7	400	8	25	2690	PM680M016E077PTR
	82	6.3	5.8	400	8	35	2200	PM820M016E058PTR
	82	6.3	7.7	400	8	25	2690	PM820M016E077PTR
	100	6.3	5.8	400	8	30	2490	PM101M016E058PTR
	100	6.3	7.7	400	8	25	2690	PM101M016E077PTR
	150	6.3	7.7	400	8	25	2690	PM151M016E077PTR
	180	6.3	5.8	400	12	25	3200	PM181M016E058PTR

STANDARD RATINGS

Part number shows blister tape on paper reel

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
20	10	5	5.8	600	8	40	2000	PM100M020C058PTR
	10	6.3	5.8	600	8	40	2200	PM100M020E058PTR
	15	6.3	5.8	600	8	35	2200	PM150M020E058PTR
	22	6.3	5.8	600	8	35	2200	PM220M020E058PTR
	22	6.3	7.7	600	8	30	2670	PM220M020E077PTR
	27	6.3	5.8	600	8	35	2200	PM270M020E058PTR
	33	6.3	5.8	600	8	35	2200	PM330M020E058PTR
	33	6.3	7.7	600	8	30	2670	PM330M020E077PTR
	39	6.3	7.7	600	8	30	2670	PM390M020E077PTR
	47	6.3	5.8	600	8	35	2200	PM470M020E058PTR
	47	6.3	7.7	600	8	30	2670	PM470M020E077PTR
	56	6.3	5.8	600	8	35	2200	PM560M020E058PTR
	56	6.3	7.7	600	8	30	2670	PM560M020E077PTR
	120	6.3	5.8	600	12	25	3200	PM121M020E058PTR
25	6.8	6.3	5.8	600	8	40	2000	PM6R8M025E058PTR
	10	6.3	5.8	600	8	35	2200	PM100M025E058PTR
	10	6.3	7.7	600	8	35	2670	PM100M025E077PTR
	15	6.3	5.8	600	8	35	2200	PM150M025E058PTR
	15	6.3	7.7	600	8	30	2670	PM150M025E077PTR
	22	6.3	5.8	600	8	35	2200	PM220M025E058PTR
	22	6.3	7.7	600	8	30	2670	PM220M025E077PTR
	33	6.3	5.8	600	8	35	2200	PM330M025E058PTR
	33	6.3	7.7	600	8	30	2670	PM330M025E077PTR
	39	6.3	7.7	600	8	30	2670	PM390M025E077PTR
35	47	6.3	5.8	600	8	35	2200	PM470M025E058PTR
	18	6.3	5.8	600	12	64	900	PM180M035E058PTR
	22	6.3	5.8	600	12	50	1300	PM220M035E058PTR
	27	6.3	5.8	600	12	50	1530	PM270M035E058PTR
	47	6.3	7.7	600	12	50	1600	PM470M035E077PTR
50	56	6.3	7.7	600	12	35	2100	PM560M035E077PTR
	8,2	6.3	5.8	600	12	80	800	PM8R2M050E058PTR
	12	6.3	5.8	600	12	80	800	PM120M050E058PTR
63	15	6.3	5.8	600	12	80	800	PM150M050E058PTR
	5.6	6.3	5.8	600	12	100	700	PM5R6M063E058PTR
	8.2	6.3	5.8	600	12	100	700	PM8R2M063E058PTR
100	4.7	6.3	7.7	600	12	100	1060	PM4R7M100E077PTR

MULTIPLIER K_f for RIPPLE CURRENT vs. FREQUENCY

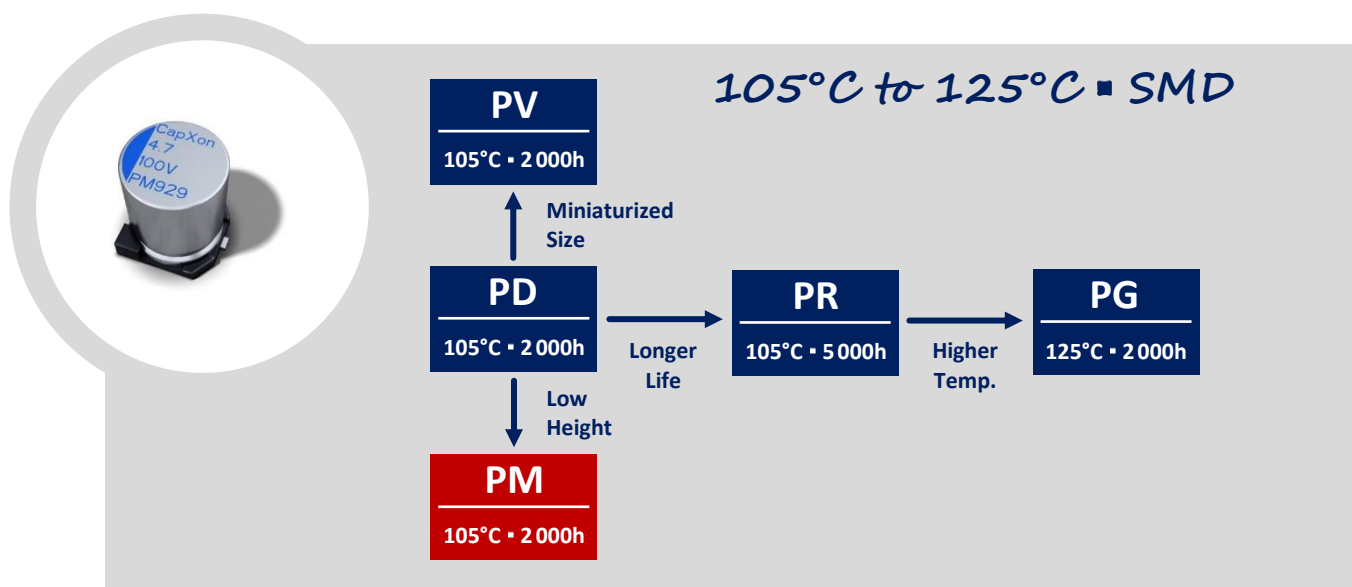
Frequency (Hz)	120 ≤ Freq. < 1k	1k ≤ Freq. < 10k	10k ≤ Freq. < 100k	100k ≤ Freq. < 300k
Coefficient K_f	0.05	0.3	0.7	1

PRECAUTIONS, GUIDELINES AND PACKAGING INFORMATION

Unless otherwise agreed in individual specifications, all products are subject to our “General Precautions and Guidelines” as well as our “Packaging Information”. Please refer to the following links in the table.

			
General Precautions & Guidelines	Packaging Information	3D Models	Reliability Tests

GROUP CHART



DISCLAIMER

All product related data (e.g. specification, statements and general information) are subject to change without any notice. It is necessary that the customer observes all product related technical / application information and handling instructions.

CapXon products are designed and manufactured according to severe quality and safety standards. Under no circumstance, CapXon warrants that any CapXon product is suitable for the purposes intended for your application, even CapXon knows the application. It is customer's duty and obligation to check and make sure that CapXon products are suitable for the purposes intended and select the correct and proper CapXon product. Customers are requested to perform a sufficient validation and reliability evaluation to assure needed safety level and reliability performance by suitable designs and to apply proper safeguards (e.g. redundancies, protective circuits).

Particular operating conditions (ambient temperature, ripple current, voltage, thermal resistance, etc.) as well as storage, production or assembly may affect the performance and the lifetime of the capacitor. Please consult CapXon for lifetime estimation, failure mode considerations or worst-case scenarios according to the product technology, product tolerances / deviations or change of the characteristics of the capacitor due to shipment, storage, handling, production and usage.

For aerospace or military application, life-saving, life-sustaining, safety critical applications or any application where failure may cause severe personal injury or death, please consult us before design-in the capacitor in your application.

Except for the written expressed warranties, CapXon does not impliedly, by assumption or whatever else, warrant, undertake, promise any other warranty or guaranty for any CapXon product.

For further information, please visit our website www.capxongroup.com or contact CapXon directly.

PV SERIES ▀ LOW PROFILE TYPE

KEY FEATURES



- **SOLID CONDUCTIVE POLYMER** ▀ SMD type
- Low profile and high capacitance for space critical applications
- Endurance: 105°C ▀ 2 000 hours
- Large permissible ripple current
- No dry-out effect guarantees extremely long life

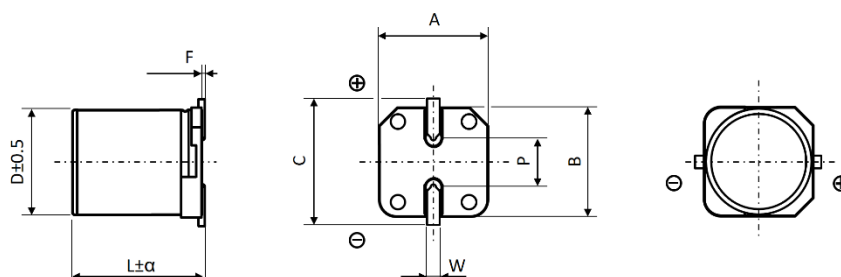


SPECIFICATIONS

Items		Performance Characteristics
Operating Temperature Range		-55 ~ +105°C
Rated Voltage Range	V_R	2.5 ~ 100V DC
Surge Voltage	V_S	($V_R \leq 20V$): $V_S = 1.15 \cdot V_R$ ($V_R \geq 25V$): $V_S = 1.10 \cdot V_R$
Capacitance Range	C_R	6.8 ~ 2500 μ F
Cap. Tolerance	ΔC	$\pm 20\%$ (120Hz ▀ 20°C)
Leakage Current (20°C ▀ V_R applied)	I_{LEAK}	Not to exceed the values shown in standard ratings After 2 minutes
Dissipation Factor % (20°C ▀ 120Hz)	$\tan \delta$	Not to exceed the values shown in standard ratings
Equivalent Series Resistance (20°C ▀ 100kHz)	ESR	Not to exceed the values shown in standard ratings

Lifetime Test		
Endurance 105°C (V_R applied)	Test	2 000 hours
	$\Delta C/C_R$	Within $\pm 20\%$ of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value
Moisture Resistance stored at 60°C (RH 90 ~ 95%)	Test	1 000 hours
	$\Delta C/C_R$	Within $\pm 20\%$ of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value

DIMENSIONS STANDARD PACKAGE ▀ All dimensions in mm



Recommended pad layout on page 116.

DIMENSIONS STANDARD PACKAGE • All dimensions in mm

ø D	L	α	A ± 0.2	B ± 0.2	C ± 0.2	F	P ± 0.2	W
8.0	7.7	0.3	8.3	8.3	9.0	0 to 0.3	3.1	0.7 to 1.1
8.0	8.7	0.3	8.3	8.3	9.0	0 to 0.3	3.1	0.7 to 1.1
8.0	10.5	0.3	8.3	8.3	9.0	0 to 0.3	3.1	0.7 to 1.1
10.0	8.7	0.3	10.3	10.3	11.0	0 to 0.3	4.5	0.7 to 1.1
10.0	10.5	0.3	10.3	10.3	11.0	0 to 0.3	4.5	0.7 to 1.1

STANDARD RATINGS

Part number shows blister tape on paper reel

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C - 120Hz (%)	Max. ESR +20°C - 100kHz (mΩ)	I _R - Max. Ripple Current +105°C - 100kHz (mA rms)	CapXon Part Number
2.5	560	8	7.7	280	8	20	3500	PV561M2R5F077PTR
	680	8	7.7	340	8	20	3500	PV681M2R5F077PTR
	820	8	7.7	410	8	20	3500	PV821M2R5F077PTR
	1000	8	8.7	500	8	11	4800	PV102M2R5F087PTR
	1200	10	8.7	600	8	20	3700	PV122M2R5G087PTR
	1500	10	8.7	750	10	20	3700	PV152M2R5G087PTR
	2200	10	10.5	1100	10	11	5500	PV222M2R5G105PTR
	2500	10	10.5	1250	10	11	5500	PV252M2R5G105PTR
4	330	8	7.7	264	8	20	3500	PV331M004F077PTR
	390	8	8.7	312	8	15	4200	PV391M004F087PTR
	470	8	8.7	376	8	15	4200	PV471M004F087PTR
	560	8	7.7	448	8	20	3500	PV561M004F077PTR
	560	8	8.7	448	8	11	4800	PV561M004F087PTR
	680	8	7.7	544	8	20	3500	PV681M004F077PTR
	680	8	8.7	544	8	11	4800	PV681M004F087PTR
	820	8	8.7	656	8	11	4800	PV821M004F087PTR
	820	10	10.5	656	8	11	5100	PV821M004G105PTR
	1000	8	10.5	800	10	11	5100	PV102M004F105PTR
	1200	10	10.5	960	10	11	5500	PV122M004G105PTR
	1500	10	10.5	1200	10	11	5500	PV152M004G105PTR
	2000	10	10.5	1600	10	11	5500	PV202M004G105PTR
	220	8	7.7	277	8	20	3500	PV221M6R3F077PTR
6.3	270	8	7.7	340	8	20	3500	PV271M6R3F077PTR
	330	8	7.7	416	8	20	3500	PV331M6R3F077PTR
	390	8	7.7	491	8	20	3500	PV391M6R3F077PTR
	470	8	7.7	592	8	20	3500	PV471M6R3F077PTR
	470	8	8.7	592	8	11	4800	PV471M6R3F087PTR
	680	8	8.7	856	10	11	4800	PV681M6R3F087PTR
	820	10	8.7	1033	10	20	3700	PV821M6R3G087PTR
	1000	10	8.7	1260	10	20	3700	PV102M6R3G087PTR
	1200	10	10.5	1512	10	11	5500	PV122M6R3G105PTR
	1500	10	10.5	1890	10	11	5500	PV152M6R3G105PTR

STANDARD RATINGS

Part number shows blister tape on paper reel

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
10	330	8	7.7	660	8	20	3500	PV331M010F077PTR
	390	8	7.7	780	8	20	3500	PV391M010F077PTR
	470	8	8.7	940	8	11	4800	PV471M010F087PTR
	560	10	8.7	1120	8	20	3700	PV561M010G087PTR
	560	10	10.5	1120	8	11	4800	PV561M010G105PTR
	680	10	8.7	1360	10	20	3700	PV681M010G087PTR
	680	10	10.5	1360	10	11	4800	PV681M010G105PTR
	820	10	10.5	1640	10	11	5100	PV821M010G105PTR
16	68	8	7.7	218	8	25	3300	PV680M016F077PTR
	150	8	7.7	480	8	25	3300	PV151M016F077PTR
	180	8	7.7	576	8	23	3500	PV181M016F077PTR
	180	8	8.7	576	8	16	4800	PV181M016F087PTR
	220	8	7.7	704	8	23	3500	PV221M016F077PTR
	220	8	8.7	704	8	16	4800	PV221M016F087PTR
	270	8	8.7	864	10	16	4800	PV271M016F087PTR
	270	10	10.5	864	10	16	5100	PV271M016G105PTR
	330	10	8.7	1056	10	23	3700	PV331M016G087PTR
	330	10	10.5	1056	10	16	5100	PV331M016G105PTR
	390	10	8.7	1248	10	23	3700	PV391M016G087PTR
	390	10	10.5	1248	10	16	5100	PV391M016G105PTR
	470	10	10.5	1504	10	16	5100	PV471M016G105PTR
20	27	8	8.7	400	10	25	3300	PV270M020F087PTR
	68	8	8.7	272	10	22	3500	PV680M020F087PTR
	82	8	8.7	328	10	22	3500	PV820M020F087PTR
	100	8	8.7	400	10	22	3500	PV101M020F087PTR
	120	10	8.7	480	10	30	2800	PV121M020G087PTR
	150	8	8.7	600	10	22	3500	PV151M020F087PTR
	150	10	8.7	600	10	27	3100	PV151M020G087PTR
	180	10	8.7	720	10	27	3100	PV181M020G087PTR
	180	10	10.5	720	10	22	3700	PV181M020G105PTR
	220	10	8.7	880	10	27	3100	PV221M020G087PTR
	220	10	10.5	880	10	22	3700	PV221M020G105PTR
	270	10	10.5	1080	10	22	3700	PV271M020G105PTR
	330	10	10.5	1320	10	22	3700	PV331M020G105PTR
25	47	10	8.7	400	10	30	2800	PV470M025G087PTR
	68	8	8.7	340	10	22	3500	PV680M025F087PTR
	82	8	8.7	410	10	22	3500	PV820M025F087PTR
	82	10	8.7	410	10	27	3100	PV820M025G087PTR
	100	8	8.7	500	10	22	3500	PV101M025F087PTR
	100	10	8.7	500	10	27	3100	PV101M025G087PTR
	120	8	8.7	600	10	22	3500	PV121M025F087PTR
	150	8	8.7	750	10	25	3300	PV151M025F087PTR
	180	10	10.5	900	10	22	3700	PV181M025G105PTR
	270	10	10.5	1350	10	25	3500	PV271M025G105PTR

STANDARD RATINGS

Part number shows blister tape on paper reel

V_R (V)	C_R (μF)	$\varnothing D$ (mm)	L (mm)	I_{LEAK} (μA , 2min)	$\tan\delta$ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (m Ω)	I_R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
35	56	8	7.7	392	12	40	2200	PV560M035F077PTR
	68	8	7.7	476	12	35	2400	PV680M035F077PTR
	82	8	8.7	574	12	35	2600	PV820M035F087PTR
	100	8	8.7	700	12	30	3000	PV101M035F087PTR
	100	10	10.5	700	12	30	3200	PV101M035G105PTR
	120	10	10.5	840	12	30	3200	PV121M035G105PTR
	150	10	10.5	1050	12	30	3200	PV151M035G105PTR
50	10	8	8.7	100	12	45	1500	PV100M050F087PTR
	33	8	8.7	330	12	40	1900	PV330M050F087PTR
	47	8	10.5	470	12	35	2200	PV470M050F105PTR
	47	10	10.5	470	12	35	2500	PV470M050G105PTR
	68	10	10.5	680	12	35	2600	PV680M050G105PTR
63	10	8	8.7	126	12	45	1500	PV100M063F087PTR
	22	8	8.7	277	12	40	1700	PV220M063F087PTR
	27	8	8.7	340	12	40	1900	PV270M063F087PTR
	33	8	8.7	416	12	40	1900	PV330M063F087PTR
	33	10	10.5	416	12	35	2200	PV330M063G105PTR
	47	10	10.5	592	12	35	2200	PV470M063G105PTR
80	10	8	8.7	160	12	45	1600	PV100M080F087PTR
	15	10	10.5	240	12	40	1900	PV150M080G105PTR
100	6.8	8	8.7	136	12	48	1500	PV6R8M100F087PTR
	12	10	10.5	240	12	45	1900	PV120M100G105PTR
	15	8	8.7	300	12	48	1500	PV150M100F087PTR

MULTIPLIER K_f FOR RIPPLE CURRENT VS. FREQUENCY

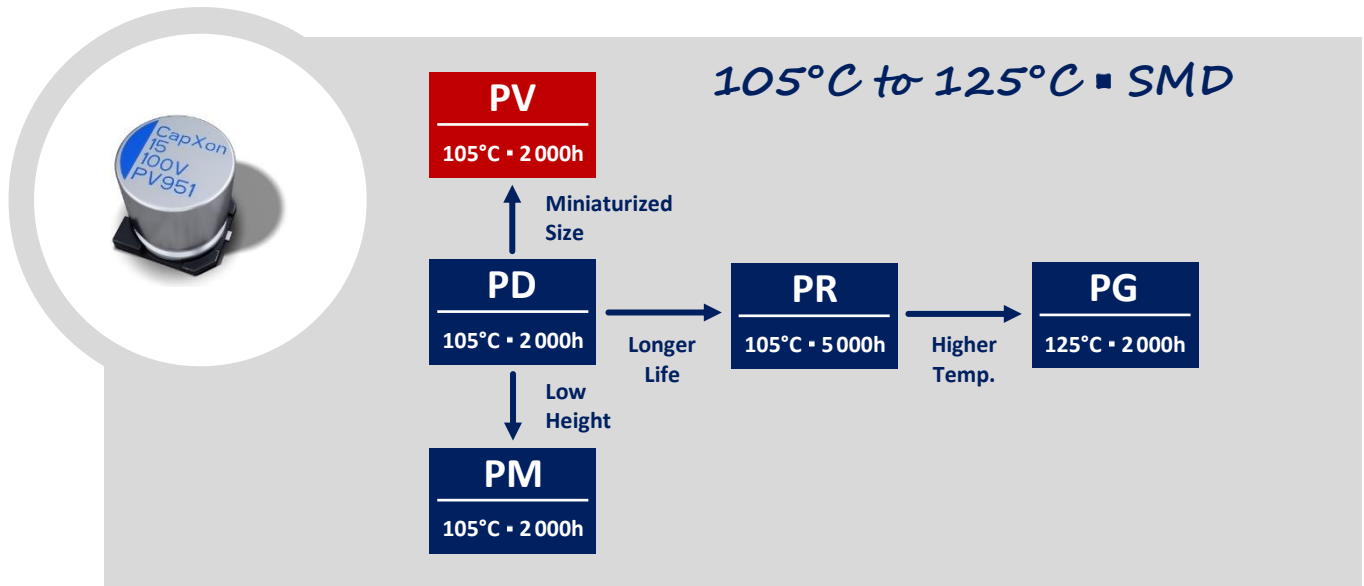
Frequency (Hz)	$120 \leq \text{Freq.} < 1k$	$1k \leq \text{Freq.} < 10k$	$10k \leq \text{Freq.} < 100k$	$100k \leq \text{Freq.} < 300k$
Coefficient K_f	0.05	0.3	0.7	1

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All product related data (e.g. specification, statements and general information) are subject to change without any notice. It is necessary that the customer observes all product related technical / application information and handling instructions.

CapXon products are designed and manufactured according to severe quality and safety standards. Under no circumstance, CapXon warrants that any CapXon product is suitable for the purposes intended for your application, even CapXon knows the application. It is customer's duty and obligation to check and make sure that CapXon products are suitable for the purposes intended and select the correct and proper CapXon product. Customers are requested to perform a sufficient validation and reliability evaluation to assure needed safety level and reliability performance by suitable designs and to apply proper safeguards (e.g. redundancies, protective circuits).

Particular operating conditions (ambient temperature, ripple current, voltage, thermal resistance, etc.) as well as storage, production or assembly may affect the performance and the lifetime of the capacitor. Please consult CapXon for lifetime estimation, failure mode considerations or worst-case scenarios according to the product technology, product tolerances / deviations or change of the characteristics of the capacitor due to shipment, storage, handling, production and usage.

For aerospace or military application, life-saving, life-sustaining, safety critical applications or any application where failure may cause severe personal injury or death, please consult us before design-in the capacitor in your application.

Except for the written expressed warranties, CapXon does not impliedly, by assumption or whatever else, warrant, undertake, promise any other warranty or guaranty for any CapXon product.

For further information, please visit our website www.capxongroup.com or contact CapXon directly.

PR SERIES ■ ULTRA LONG LIFE TYPE ■ 5 000 HOURS

KEY FEATURES



- **SOLID CONDUCTIVE POLYMER** ■ SMD type
- Ultra-low ESR at high frequency range
- Endurance: 105°C ■ 5 000 hours
- Large permissible ripple current
- No dry-out effect guarantees extremely long life

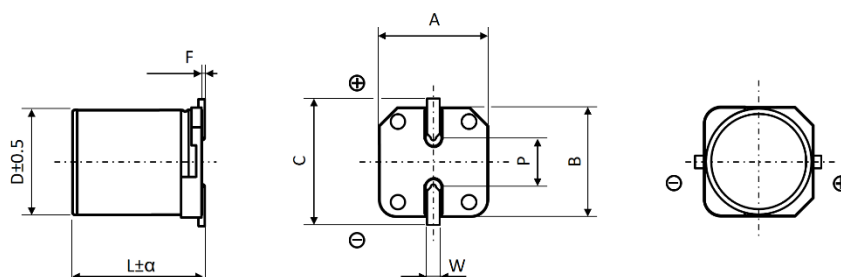


SPECIFICATIONS

Items		Performance Characteristics
Operating Temperature Range		-55 ~ +105°C
Rated Voltage Range	V_R	6.3 ~ 50V DC
Surge Voltage	V_S	($V_R \leq 20V$): $V_S = 1.15 \cdot V_R$ ($V_R \geq 25V$): $V_S = 1.10 \cdot V_R$
Capacitance Range	C_R	10 ~ 1500 μ F
Cap. Tolerance	ΔC	$\pm 20\%$ (120Hz ■ 20°C)
Leakage Current (20°C ■ V_R applied)	I_{LEAK}	Not to exceed the values shown in standard ratings After 2 minutes
Dissipation Factor % (20°C ■ 120Hz)	$\tan \delta$	Not to exceed the values shown in standard ratings
Equivalent Series Resistance (20°C ■ 100kHz)	ESR	Not to exceed the values shown in standard ratings

Lifetime Test		
Endurance 105°C (V_R applied)	Test	5 000 hours
	$\Delta C/C_R$	Within $\pm 20\%$ of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value
Moisture Resistance stored at 60°C (RH 90 ~ 95%)	Test	1 000 hours
	$\Delta C/C_R$	Within $\pm 20\%$ of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value

DIMENSIONS STANDARD PACKAGE ■ All dimensions in mm



Recommended pad layout on page 116.

DIMENSIONS STANDARD PACKAGE • All dimensions in mm

ø D	L	α	A ± 0.2	B ± 0.2	C ± 0.2	F	P ± 0.2	W
6.3	5.8	0.3	6.6	6.6	7.2	0 to 0.3	2.2	0.5 to 0.8
6.3	7.7	0.3	6.6	6.6	7.2	0 to 0.3	2.2	0.5 to 0.8
8.0	7.7	0.3	8.3	8.3	9.0	0 to 0.3	3.1	0.7 to 1.1
8.0	8.7	0.3	8.3	8.3	9.0	0 to 0.3	3.1	0.7 to 1.1
8.0	10.5	0.3	8.3	8.3	9.0	0 to 0.3	3.1	0.7 to 1.1
8.0	11.7	0.3	8.3	8.3	9.0	0 to 0.3	3.1	0.7 to 1.1
10.0	10.5	0.3	10.3	10.3	11.0	0 to 0.3	4.5	0.7 to 1.1
10.0	12.4	0.3	10.3	10.3	11.0	0 to 0.3	4.5	0.7 to 1.1

STANDARD RATINGS

Part number shows blister tape on paper reel

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
6.3	100	6.3	5.8	300	8	32	2300	PR101M6R3E058PTR
	220	6.3	5.8	300	8	32	2300	PR221M6R3E058PTR
	220	6.3	5.8	300	8	20	2800	PR221M6R3E058PTRZ
	270	6.3	7.7	340	8	22	3000	PR271M6R3E077PTR
	470	8	7.7	592	8	22	3700	PR471M6R3F077PTR
	820	8	11.7	1033	8	12	5000	PR821M6R3F117PTR
	1000	10	10.5	1260	8	15	4700	PR102M6R3G105PTR
	1500	10	12.4	1890	8	12	5300	PR152M6R3G124PTR
10	56	6.3	5.8	300	8	32	2300	PR560M010E058PTR
	120	6.3	7.7	300	8	22	2900	PR121M010E077PTR
	150	6.3	7.7	300	8	22	2900	PR151M010E077PTR
	180	6.3	7.7	360	8	22	2900	PR181M010E077PTR
	270	8	7.7	540	8	22	3200	PR271M010F077PTR
	330	10	8.7	660	8	22	3700	PR331M010G087PTR
	470	8	11.7	940	8	12	4500	PR471M010F117PTR
	560	10	10.5	1120	8	15	4200	PR561M010G105PTR
	820	10	12.4	1640	8	12	4800	PR821M010G124PTR
	1000	10	12.4	2000	8	12	4800	PR102M010G124PTR
16	47	6.3	5.8	400	10	48	1700	PR470M016E058PTR
	82	6.3	7.7	400	10	28	2400	PR820M016E077PTR
	100	6.3	7.7	400	10	28	2400	PR101M016E077PTR
	120	6.3	7.7	400	12	28	2400	PR121M016E077PTR
	120	8	7.7	400	12	28	3000	PR121M016F077PTR
	150	8	8.7	480	12	26	3100	PR151M016F087PTR
	150	10	8.7	480	12	33	3100	PR151M016G087PTR
	180	8	11.7	576	12	18	4200	PR181M016F117PTR
	180	10	8.7	576	12	33	3100	PR181M016G087PTR
	220	8	11.7	704	12	18	4200	PR221M016F117PTR
	270	10	10.5	864	12	23	3800	PR271M016G105PTR
	330	10	10.5	1056	12	23	3800	PR331M016G105PTR
	390	10	12.4	1248	12	18	4500	PR391M016G124PTR
	560	10	12.4	1792	12	18	4500	PR561M016G124PTR
	680	10	12.4	2176	12	18	4500	PR681M016G124PTR

STANDARD RATINGS

Part number shows blister tape on paper reel

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
20	22	6.3	5.8	600	10	48	1700	PR220M020E058PTR
	33	6.3	5.8	600	10	48	1700	PR330M020E058PTR
	47	6.3	7.7	600	10	33	2300	PR470M020E077PTR
	56	6.3	7.7	600	10	33	2300	PR560M020E077PTR
	68	6.3	7.7	600	10	33	2300	PR680M020E077PTR
	82	8	7.7	600	12	33	2900	PR820M020F077PTR
	120	8	7.7	600	12	33	2900	PR121M020F077PTR
	150	8	11.7	600	12	23	4000	PR151M020F117PTR
	180	8	11.7	720	12	23	4000	PR181M020F117PTR
	180	10	10.5	720	12	25	3650	PR181M020G105PTR
	220	10	10.5	880	12	25	3650	PR221M020G105PTR
	330	10	12.4	1320	12	23	4200	PR331M020G124PTR
25	10	6.3	5.8	600	10	58	1600	PR100M025E058PTR
	22	6.3	5.8	600	10	58	1600	PR220M025E058PTR
	39	6.3	7.7	600	10	33	2300	PR390M025E077PTR
	47	6.3	7.7	600	10	33	2300	PR470M025E077PTR
	47	8	11.7	600	12	23	3700	PR470M025F117PTR
	56	8	7.7	600	12	33	2900	PR560M025F077PTR
	68	8	7.7	600	12	33	2900	PR680M025F077PTR
	68	8	11.7	600	12	23	4000	PR680M025F117PTR
	82	8	8.7	600	12	27	3200	PR820M025F087PTR
	82	8	11.7	600	12	23	4000	PR820M025F117PTR
	82	10	8.7	600	12	33	2900	PR820M025G087PTR
	100	6.3	7.7	600	12	40	2000	PR101M025E077PTR
	100	8	8.7	600	12	27	3200	PR101M025F087PTR
	120	8	11.7	600	12	23	4000	PR121M025F117PTR
	120	10	10.5	600	12	25	3650	PR121M025G105PTR
	150	10	12.4	750	12	23	4200	PR151M025G124PTR
	180	10	12.4	900	12	23	4200	PR181M025G124PTR
	220	8	11.7	1100	12	23	4000	PR221M025F117PTR
	220	10	12.4	1100	12	23	4200	PR221M025G124PTR
35	10	6.3	5.8	600	12	75	980	PR100M035E058PTR
	18	6.3	7.7	600	12	60	1400	PR180M035E077PTR
	22	8	11.7	600	12	35	2300	PR220M035F117PTR
	27	6.3	7.7	600	12	60	1400	PR270M035E077PTR
	33	8	11.7	600	12	35	2300	PR330M035F117PTR
	39	8	8.7	600	12	40	1800	PR390M035F087PTR
	56	8	11.7	600	12	35	2300	PR560M035F117PTR
	68	10	10.5	600	12	32	2500	PR680M035G105PTR
	100	10	10.5	700	12	32	2500	PR101M035G105PTR
	100	10	12.4	700	12	30	3100	PR101M035G124PTR
	150	10	10.5	700	12	32	2500	PR151M035G105PTR
	150	10	12.4	700	12	30	3100	PR151M035G124PTR

STANDARD RATINGS

Part number shows blister tape on paper reel

V_R (V)	C_R (μF)	$\varnothing D$ (mm)	L (mm)	I_{LEAK} (μA , 2min)	$\tan\delta$ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (m Ω)	I_R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
50	10	8	7.7	100	12	75	1400	PR100M050F077PTR
	12	6.3	7.7	120	12	75	1400	PR120M050E077PTR
	22	8	8.7	220	12	50	1800	PR220M050F087PTR
	22	8	11.7	220	12	40	2400	PR220M050F117PTR
	22	10	8.7	220	12	55	1800	PR220M050G087PTR
	27	8	11.7	270	12	40	2400	PR270M050F117PTR
	33	10	10.5	330	12	42	2200	PR330M050G105PTR
	33	10	12.4	330	12	30	3000	PR330M050G124PTR
	47	10	12.4	470	12	30	3000	PR470M050G124PTR
	56	10	12.4	560	12	30	3000	PR560M050G124PTR
	68	10	12.4	680	12	30	3000	PR680M050G124PTR
	100	10	12.4	1000	12	26	3650	PR101M050G124PTR

MULTIPLIER K_f for RIPPLE CURRENT vs. FREQUENCY

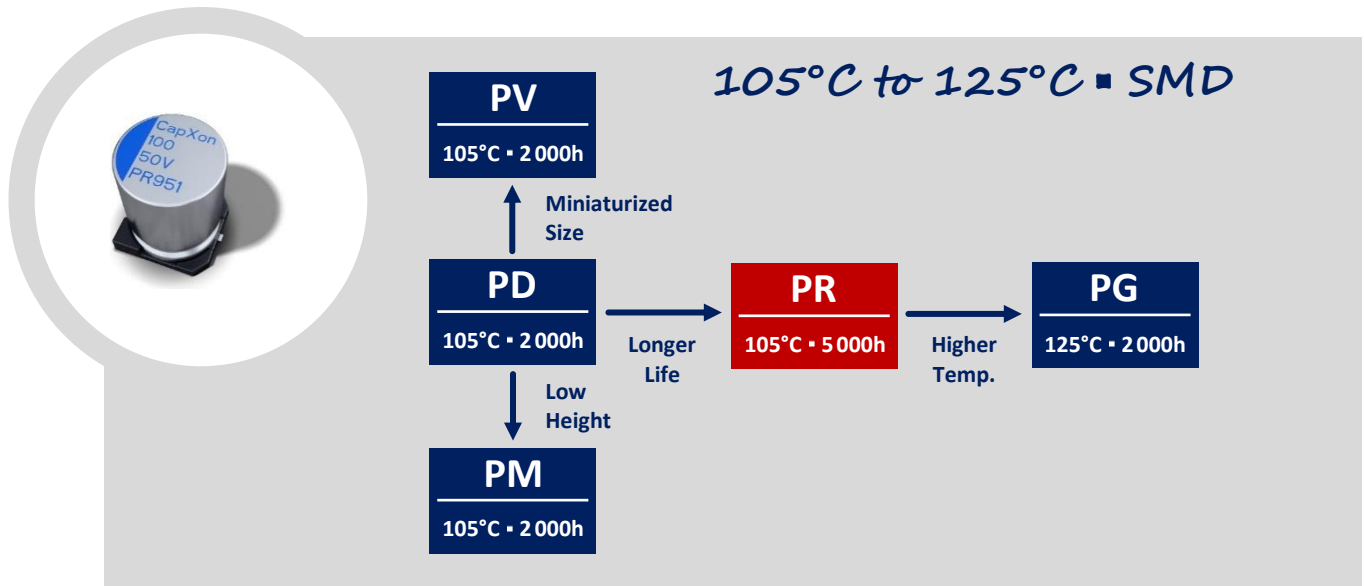
Frequency (Hz)	120 ≤ Freq. < 1k	1k ≤ Freq. < 10k	10k ≤ Freq. < 100k	100k ≤ Freq. < 300k
Coefficient K_f	0.05	0.3	0.7	1

PRECAUTIONS, GUIDELINES AND PACKAGING INFORMATION

Unless otherwise agreed in individual specifications, all products are subject to our “General Precautions and Guidelines” as well as our “Packaging Information”. Please refer to the following links in the table.

General Precautions & Guidelines	Packaging Information	3D Models	Reliability Tests

GROUP CHART



DISCLAIMER

All product related data (e.g. specification, statements and general information) are subject to change without any notice. It is necessary that the customer observes all product related technical / application information and handling instructions.

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Particular operating conditions (ambient temperature, ripple current, voltage, thermal resistance, etc.) as well as storage, production or assembly may affect the performance and the lifetime of the capacitor. Please consult CapXon for lifetime estimation, failure mode considerations or worst-case scenarios according to the product technology, product tolerances / deviations or change of the characteristics of the capacitor due to shipment, storage, handling, production and usage.

For aerospace or military application, life-saving, life-sustaining, safety critical applications or any application where failure may cause severe personal injury or death, please consult us before design-in the capacitor in your application.

Except for the written expressed warranties, CapXon does not impliedly, by assumption or whatever else, warrant, undertake, promise any other warranty or guaranty for any CapXon product.

For further information, please visit our website www.capxongroup.com or contact CapXon directly.

PG SERIES ■ HIGH TEMPERATURE 125°C TYPE

KEY FEATURES



- **SOLID CONDUCTIVE POLYMER** ■ SMD type
- Especially for high temperature environments
- Endurance: 125°C ■ 2 000 hours
- Large permissible ripple current
- No dry-out effect guarantees extremely long life

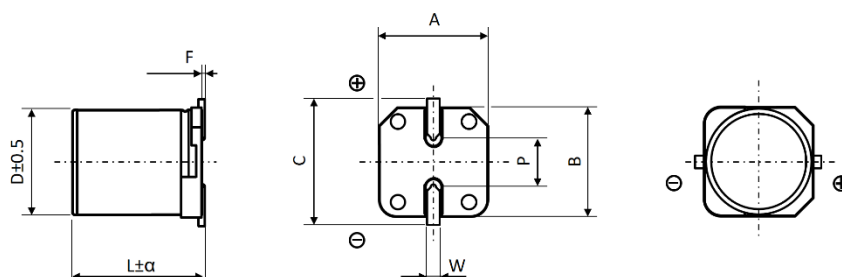


SPECIFICATIONS

Items		Performance Characteristics
Operating Temperature Range		-55 ~ +125°C
Rated Voltage Range	V_R	6.3 ~ 50V DC
Surge Voltage	V_S	($V_R \leq 20V$): $V_S = 1.15 \cdot V_R$ ($V_R \geq 25V$): $V_S = 1.10 \cdot V_R$
Capacitance Range	C_R	10 ~ 1500 μ F
Cap. Tolerance	ΔC	$\pm 20\%$ (120Hz ■ 20°C)
Leakage Current (20°C ■ V_R applied)	I_{LEAK}	Not to exceed the values shown in standard ratings After 2 minutes
Dissipation Factor % (20°C ■ 120Hz)	$\tan \delta$	Not to exceed the values shown in standard ratings
Equivalent Series Resistance (20°C ■ 100kHz)	ESR	Not to exceed the values shown in standard ratings

Lifetime Test		
Endurance 125°C (V_R applied)	Test	2 000 hours
	$\Delta C/C_R$	Within $\pm 20\%$ of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value
Moisture Resistance stored at 60°C (RH 90 ~ 95%)	Test	1 000 hours
	$\Delta C/C_R$	Within $\pm 20\%$ of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value

DIMENSIONS STANDARD PACKAGE ■ All dimensions in mm



Recommended pad layout on page 116.

DIMENSIONS STANDARD PACKAGE ▪ All dimensions in mm

ø D	L	α	A ± 0.2	B ± 0.2	C ± 0.2	F	P ± 0.2	W
6.3	5.8	0.3	6.6	6.6	7.2	0 to 0.3	2.2	0.5 to 0.8
6.3	7.7	0.3	6.6	6.6	7.2	0 to 0.3	2.2	0.5 to 0.8
8.0	7.7	0.3	8.3	8.3	9.0	0 to 0.3	3.1	0.7 to 1.1
8.0	8.7	0.3	8.3	8.3	9.0	0 to 0.3	3.1	0.7 to 1.1
8.0	11.7	0.3	8.3	8.3	9.0	0 to 0.3	3.1	0.7 to 1.1
10.0	8.7	0.3	10.3	10.3	11.0	0 to 0.3	4.5	0.7 to 1.1
10.0	10.5	0.3	10.3	10.3	11.0	0 to 0.3	4.5	0.7 to 1.1
10.0	12.4	0.3	10.3	10.3	11.0	0 to 0.3	4.5	0.7 to 1.1

STANDARD RATINGS

Part number shows blister tape on paper reel

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Cur- rent +105°C • 100kHz (mA rms)	I _R • Max. Ripple Cur- rent +125°C • 100kHz (mA rms)	CapXon Part Number
6.3	100	6.3	5.8	300	8	35	2200	695	PG101M6R3E058PTR
	270	6.3	7.7	340	8	25	2800	885	PG271M6R3E077PTR
	470	8	7.7	592	8	25	3500	1100	PG471M6R3F077PTR
	820	8	11.7	1033	8	15	4700	1490	PG821M6R3F117PTR
	1000	10	10.5	1260	8	18	4400	1390	PG102M6R3G105PTR
	1500	10	12.4	1890	8	15	5100	1610	PG152M6R3G124PTR
10	56	6.3	5.8	300	8	35	2200	695	PG560M010E058PTR
	120	6.3	7.7	300	8	25	2800	885	PG121M010E077PTR
	150	6.3	7.7	300	8	25	2800	885	PG151M010E077PTR
	180	6.3	7.7	360	8	25	2800	885	PG181M010E077PTR
	270	8	7.7	540	8	25	3000	950	PG271M010F077PTR
	330	10	8.7	660	8	25	3500	1100	PG331M010G087PTR
	470	8	11.7	940	8	15	4200	1330	PG471M010F117PTR
	560	10	10.5	1120	8	18	4000	1265	PG561M010G105PTR
	820	10	12.4	1640	8	15	4500	1420	PG821M010G124PTR
16	47	6.3	5.8	400	10	50	1600	505	PG470M016E058PTR
	82	6.3	7.7	400	10	30	2200	695	PG820M016E077PTR
	100	6.3	7.7	400	10	30	2200	695	PG101M016E077PTR
	120	8	7.7	400	12	30	2800	885	PG121M016F077PTR
	150	8	8.7	480	12	28	3000	950	PG151M016F087PTR
	150	10	8.7	480	12	35	3000	930	PG151M016G087PTR
	180	8	11.7	576	12	20	3800	1200	PG181M016F117PTR
	180	10	8.7	576	12	35	3000	930	PG181M016G087PTR
	220	8	11.7	704	12	20	3800	1200	PG221M016F117PTR
	270	10	10.5	864	12	25	3500	1105	PG271M016G105PTR
	330	10	10.5	1056	12	25	3500	1105	PG331M016G105PTR
	390	10	12.4	1248	12	20	4000	1265	PG391M016G124PTR
	560	10	12.4	1792	12	20	4000	1265	PG561M016G124PTR

STANDARD RATINGS

Part number shows blister tape on paper reel

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Cur- rent +105°C • 100kHz (mA rms)	I _R • Max. Ripple Cur- rent +125°C • 100kHz (mA rms)	CapXon Part Number
20	22	6.3	5.8	600	10	50	1600	505	PG220M020E058PTR
	33	6.3	5.8	600	10	50	1600	505	PG330M020E058PTR
	47	6.3	7.7	600	10	35	2200	695	PG470M020E077PTR
	56	6.3	7.7	600	10	35	2200	695	PG560M020E077PTR
	68	6.3	7.7	600	10	35	2200	695	PG680M020E077PTR
	82	8	7.7	600	12	35	2800	885	PG820M020F077PTR
	120	8	7.7	600	12	35	2800	885	PG121M020F077PTR
	150	8	11.7	600	12	25	3800	1200	PG151M020F117PTR
	180	8	11.7	720	12	25	3800	1200	PG181M020F117PTR
	180	10	10.5	720	12	27	3500	1105	PG181M020G105PTR
	220	10	10.5	880	12	27	3500	1105	PG221M020G105PTR
	330	10	12.4	1320	12	25	4000	1265	PG331M020G124PTR
25	10	6.3	5.8	600	10	60	1500	474	PG100M025E058PTR
	22	6.3	5.8	600	10	60	1500	474	PG220M025E058PTR
	39	6.3	7.7	600	10	35	2200	695	PG390M025E077PTR
	47	6.3	7.7	600	10	35	2200	695	PG470M025E077PTR
	47	8	11.7	600	12	25	3500	1100	PG470M025F117PTR
	56	8	7.7	600	12	35	2800	885	PG560M025F077PTR
	68	8	7.7	600	12	35	2800	885	PG680M025F077PTR
	68	8	11.7	600	12	25	3800	1200	PG680M025F117PTR
	82	8	8.7	600	12	30	3000	950	PG820M025F087PTR
	82	8	11.7	600	12	25	3800	1200	PG820M025F117PTR
	82	10	8.7	600	12	35	2800	885	PG820M025G087PTR
	100	8	11.7	600	12	25	3800	1200	PG101M025F117PTR
	120	8	11.7	600	12	25	3800	1200	PG121M025F117PTR
	120	10	10.5	600	12	27	3500	1105	PG121M025G105PTR
	150	10	12.4	750	12	25	4000	1265	PG151M025G124PTR
	180	10	12.4	900	12	25	4000	1265	PG181M025G124PTR
35	10	6.3	5.8	600	12	75	980	310	PG100M035E058PTR
	18	6.3	7.7	600	12	60	1400	450	PG180M035E077PTR
	22	8	11.7	600	12	35	2300	730	PG220M035F117PTR
	27	6.3	7.7	600	12	60	1400	450	PG270M035E077PTR
	33	8	11.7	600	12	35	2300	730	PG330M035F117PTR
	39	8	8.7	600	12	40	1800	570	PG390M035F087PTR
	56	8	11.7	600	12	35	2300	730	PG560M035F117PTR
	68	10	10.5	600	12	32	2500	800	PG680M035G105PTR
	100	10	10.5	700	12	32	2500	800	PG101M035G105PTR
	100	10	12.4	700	12	30	3100	980	PG101M035G124PTR
	150	8	11.7	1050	12	25	4800	1650	PG151M035F117PTR
	180	10	10.5	1260	12	30	4400	1390	PG181M035G105PTR

STANDARD RATINGS

Part number shows blister tape on paper reel

V_R (V)	C_R (μF)	$\varnothing D$ (mm)	L (mm)	I_{LEAK} (μA , 2min)	$\tan \delta$ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (m Ω)	I_R • Max. Ripple Cur- rent +105°C • 100kHz (mA rms)	I_R • Max. Ripple Cur- rent +125°C • 100kHz (mA rms)	CapXon Part Number
50	10	8	7.7	100	12	75	1400	450	PG100M050F077PTR
	12	6.3	7.7	120	12	75	1400	450	PG120M050E077PTR
	22	8	8.7	220	12	50	1800	570	PG220M050F087PTR
	22	8	11.7	220	12	40	2400	760	PG220M050F117PTR
	22	10	8.7	220	12	55	1800	570	PG220M050G087PTR
	27	8	11.7	270	12	40	2400	760	PG270M050F117PTR
	33	10	10.5	330	12	42	2200	700	PG330M050G105PTR
	33	10	12.4	330	12	30	2800	885	PG330M050G124PTR
	47	10	12.4	470	12	30	2800	885	PG470M050G124PTR
	100	10	12.4	1000	12	30	2800	885	PG101M050G124PTR
	180	10	12.4	1800	12	24	3000	950	PG181M050G124PTR

MULTIPLIER K_f for RIPPLE CURRENT vs. FREQUENCY

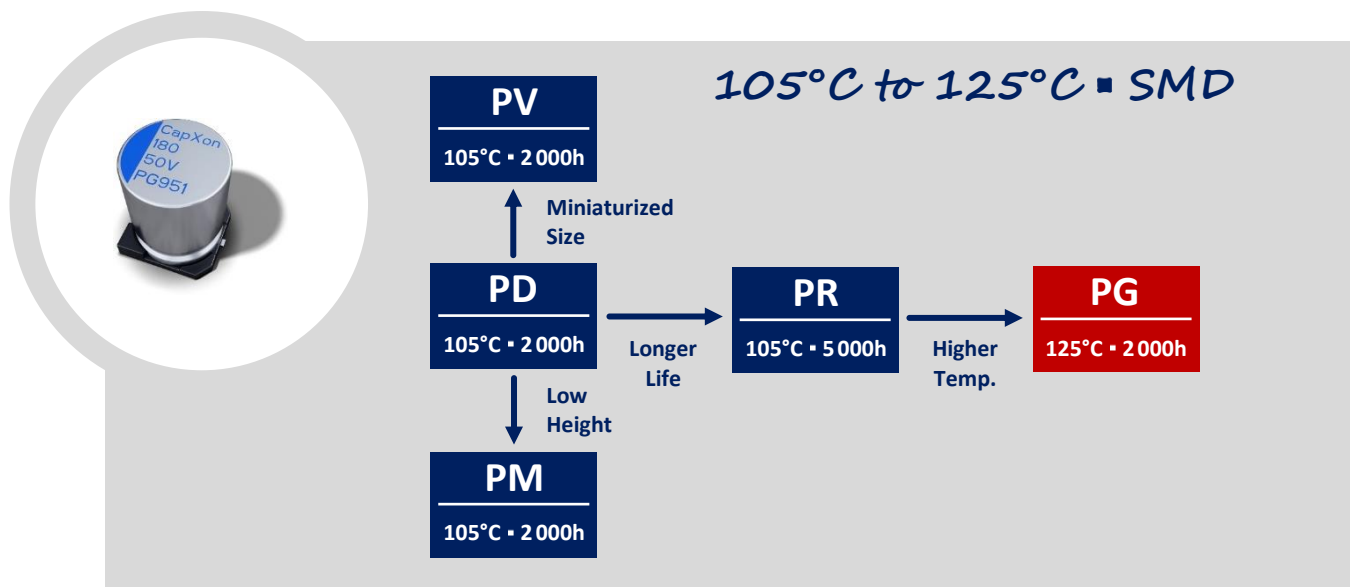
Frequency (Hz)	120 ≤ Freq. < 1k	1k ≤ Freq. < 10k	10k ≤ Freq. < 100k	100k ≤ Freq. < 300k
Coefficient K_f	0.05	0.3	0.7	1

PRECAUTIONS, GUIDELINES AND PACKAGING INFORMATION

Unless otherwise agreed in individual specifications, all products are subject to our “General Precautions and Guidelines” as well as our “Packaging Information”. Please refer to the following links in the table.

General Precautions & Guidelines	Packaging Information	3D Models	Reliability Tests

GROUP CHART



DISCLAIMER

All product related data (e.g. specification, statements and general information) are subject to change without any notice. It is necessary that the customer observes all product related technical / application information and handling instructions.

CapXon products are designed and manufactured according to severe quality and safety standards. Under no circumstance, CapXon warrants that any CapXon product is suitable for the purposes intended for your application, even CapXon knows the application. It is customer's duty and obligation to check and make sure that CapXon products are suitable for the purposes intended and select the correct and proper CapXon product. Customers are requested to perform a sufficient validation and reliability evaluation to assure needed safety level and reliability performance by suitable designs and to apply proper safeguards (e.g. redundancies, protective circuits).

Particular operating conditions (ambient temperature, ripple current, voltage, thermal resistance, etc.) as well as storage, production or assembly may affect the performance and the lifetime of the capacitor. Please consult CapXon for lifetime estimation, failure mode considerations or worst-case scenarios according to the product technology, product tolerances / deviations or change of the characteristics of the capacitor due to shipment, storage, handling, production and usage.

For aerospace or military application, life-saving, life-sustaining, safety critical applications or any application where failure may cause severe personal injury or death, please consult us before design-in the capacitor in your application.

Except for the written expressed warranties, CapXon does not impliedly, by assumption or whatever else, warrant, undertake, promise any other warranty or guaranty for any CapXon product.

For further information, please visit our website www.capxongroup.com or contact CapXon directly.

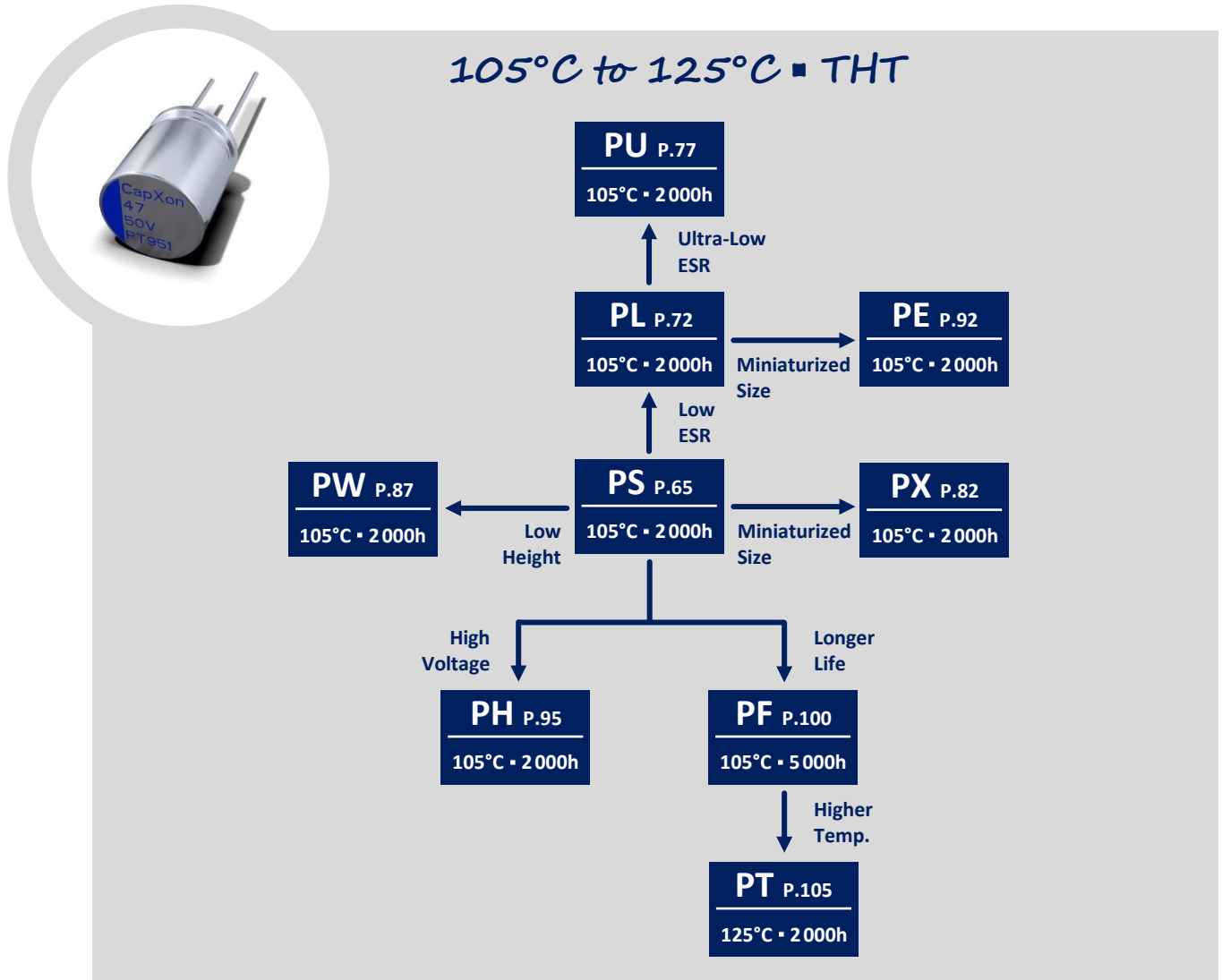
OVERVIEW ▪ RADIAL CONDUCTIVE POLYMER CAPACITORS

Features



Series	Page	High Temperature	High Voltage	Low ESR	Low Height	Standard	Ultra Low ESR	Ultra Long Life	Ultra Miniaturized	Temperature Range (°C)		Voltage Range (V)		Capacitance Range (μF)		Endurance (hours)
PS	65			•		•				-55	+105	2.5	25	39	3500	2000
PL	72			•						-55	+105	2.5	16	180	3500	2000
PU	77						•			-55	+105	2.5	10	180	3900	2000
PX	82			•	•					-55	+105	2.5	25	6.8	820	2000
PW	87			•	•					-55	+105	2.5	25	39	2500	2000
PE	92			•					•	-55	+105	2.5	16	270	1200	2000
PH	95		•	•						-55	+105	35	100	6.8	330	2000
PF	100			•				•		-55	+105	2.5	35	10	2700	5000
PT	105	•		•						-55	+125	2.5	50	22	2700	2000

GROUP CHART • RADIAL CONDUCTIVE POLYMER CAPACITORS



PS SERIES ■ STANDARD TYPE

KEY FEATURES

- **SOLID CONDUCTIVE POLYMER** ■ THT type
- Low ESR at high frequency range
- Endurance: 105°C ■ 2 000 hours
- Large permissible ripple current
- No dry-out effect guarantees extremely long life

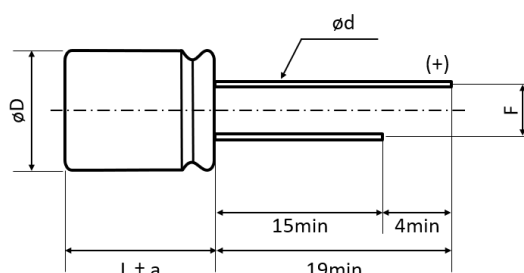


SPECIFICATIONS

Items		Performance Characteristics
Operating Temperature Range		-55 ~ +105°C
Rated Voltage Range	V_R	2.5 ~ 25V DC
Surge Voltage	V_S	($V_R \leq 20V$): $V_S = 1.15 \cdot V_R$ ($V_R \geq 25V$): $V_S = 1.10 \cdot V_R$
Capacitance Range	C_R	39 ~ 3500μF
Cap. Tolerance	ΔC	±20% (120Hz ■ 20°C)
Leakage Current (20°C ■ V_R applied)	I_{LEAK}	Not to exceed the values shown in standard ratings After 2 minutes
Dissipation Factor % (20°C ■ 120Hz)	$\tan \delta$	Not to exceed the values shown in standard ratings
Equivalent Series Resistance (20°C ■ 100kHz)	ESR	Not to exceed the values shown in standard ratings

Lifetime Test		
Endurance 105°C (V_R applied)	Test	2 000 hours
	$\Delta C/C_R$	Within ±20% of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value
Moisture Resistance stored at 60°C (RH 90 ~ 95%)	Test	1 000 hours
	$\Delta C/C_R$	Within ±20% of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value

DIMENSIONS ■ All dimensions in mm



ø D	L	øD+0.5max	a	F±0.5	ød±0.05
8	8	8	1	3.5	0.6
8	11.5	8	1.5	3.5	0.6
10	12.5	10	1.5	5.0	0.6

STANDARD RATINGS

Part number shows tape version with straight leads

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
2.5	560	8	8	280	8	12	5100	PS561M2R5F080PTD
	560	8	11.5	280	8	12	5100	PS561M2R5F115PTD
	680	8	8	340	8	12	5200	PS681M2R5F080PTD
	680	8	11.5	340	8	12	5200	PS681M2R5F115PTD
	820	8	8	410	8	12	5200	PS821M2R5F080PTD
	820	8	11.5	410	8	12	5200	PS821M2R5F115PTD
	1000	8	8	500	8	12	5500	PS102M2R5F080PTD
	1000	8	11.5	500	8	12	5500	PS102M2R5F115PTD
	1200	8	8	600	8	12	5500	PS122M2R5F080PTD
	1200	8	11.5	600	8	12	5500	PS122M2R5F115PTD
	1500	8	8	750	8	12	5500	PS152M2R5F080PTD
	1500	8	11.5	750	8	12	5500	PS152M2R5F115PTD
	2000	8	11.5	1000	8	12	5900	PS202M2R5F115PTD
	2000	10	12.5	1000	8	12	5900	PS202M2R5G125PTA
	2200	10	12.5	1100	8	12	5900	PS222M2R5G125PTA
	2500	10	12.5	1250	8	12	5900	PS252M2R5G125PTA
	2700	10	12.5	1350	8	12	5900	PS272M2R5G125PTA
	3000	10	12.5	1500	8	12	5900	PS302M2R5G125PTA
	3300	10	12.5	1650	8	12	5900	PS332M2R5G125PTA
	3500	10	12.5	1750	10	12	5900	PS352M2R5G125PTA
4	560	8	8	448	8	12	5100	PS561M004F080PTD
	560	8	11.5	448	8	12	5200	PS561M004F115PTD
	680	8	8	544	8	12	5100	PS681M004F080PTD
	680	8	11.5	544	8	12	5200	PS681M004F115PTD
	820	8	8	656	8	12	5100	PS821M004F080PTD
	820	8	11.5	656	8	12	5200	PS821M004F115PTD
	820	10	12.5	656	8	12	5900	PS821M004G125PTA
	1000	8	8	800	10	12	5100	PS102M004F080PTD
	1000	8	11.5	800	10	12	5500	PS102M004F115PTD
	1000	10	12.5	800	10	12	5900	PS102M004G125PTA
	1200	8	11.5	960	10	12	5500	PS122M004F115PTD
	1200	10	12.5	960	10	12	5900	PS122M004G125PTA
	1500	8	11.5	600	10	12	5500	PS152M004F115PTD
	1500	10	12.5	600	10	12	5900	PS152M004G125PTA
	2000	10	12.5	800	10	12	5900	PS202M004G125PTA
	2200	10	12.5	880	10	12	5900	PS222M004G125PTA
	2500	10	12.5	1000	10	12	5900	PS252M004G125PTA
6.3	180	8	8	227	7	21	5100	PS181M6R3F080PTD
	180	8	11.5	227	7	21	5100	PS181M6R3F115PTD
	220	8	8	277	7	21	5100	PS221M6R3F080PTD
	220	8	11.5	277	7	21	5100	PS221M6R3F115PTD
	270	8	8	340	7	21	5100	PS271M6R3F080PTD
	270	8	11.5	340	7	21	5100	PS271M6R3F115PTD
	330	8	8	416	7	15	5100	PS331M6R3F080PTD

See "PACKAGING INFORMATION" for pin treatment options.

STANDARD RATINGS

Part number shows tape version with straight leads

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
6.3	330	8	11.5	416	7	15	5500	PS331M6R3F115PTD
	390	8	8	491	8	15	5100	PS391M6R3F080PTD
	390	8	11.5	491	8	15	5500	PS391M6R3F115PTD
	470	8	8	592	8	12	5100	PS471M6R3F080PTD
	470	8	11.5	592	8	12	5500	PS471M6R3F115PTD
	560	8	8	706	8	12	5100	PS561M6R3F080PTD
	560	8	11.5	706	8	12	5500	PS561M6R3F115PTD
	680	8	8	428	8	10	5100	PS681M6R3F080PTD
	680	8	11.5	428	8	12	5500	PS681M6R3F115PTD
	680	10	12.5	428	8	12	5900	PS681M6R3G125PTA
	820	8	8	517	10	12	5100	PS821M6R3F080PTD
	820	8	11.5	517	10	12	5500	PS821M6R3F115PTD
	820	10	12.5	517	10	12	5900	PS821M6R3G125PTA
	1000	8	8	630	10	12	5100	PS102M6R3F080PTD
	1000	8	11.5	630	10	12	5500	PS102M6R3F115PTD
	1000	10	12.5	630	10	12	5900	PS102M6R3G125PTA
	1200	8	11.5	756	10	12	5500	PS122M6R3F115PTD
	1200	10	12.5	756	10	12	5900	PS122M6R3G125PTA
	1500	8	11.5	945	10	12	5500	PS152M6R3F115PTD
	1500	10	12.5	945	10	12	5900	PS152M6R3G125PTA
	2000	10	12.5	1260	10	12	5900	PS202M6R3G125PTA
	2200	10	12.5	1386	10	12	5900	PS222M6R3G125PTA
	2500	10	12.5	1575	10	12	5900	PS252M6R3G125PTA
10	180	8	8	180	8	15	5100	PS181M010F080PTD
	180	8	11.5	180	8	15	5500	PS181M010F115PTD
	220	8	8	220	8	15	5100	PS221M010F080PTD
	220	8	11.5	220	8	15	5500	PS221M010F115PTD
	270	8	8	270	8	15	5100	PS271M010F080PTD
	270	8	11.5	270	8	15	5500	PS271M010F115PTD
	330	8	8	330	8	12	5100	PS331M010F080PTD
	330	8	11.5	330	8	12	5500	PS331M010F115PTD
	390	8	8	390	8	12	5100	PS391M010F080PTD
	390	8	11.5	390	8	12	5500	PS391M010F115PTD
	470	8	8	470	8	12	5500	PS471M010F080PTD
	470	8	11.5	470	8	12	5500	PS471M010F115PTD
	560	8	8	560	8	12	5500	PS561M010F080PTD
	560	8	11.5	560	8	12	5500	PS561M010F115PTD
	680	8	8	680	10	12	5500	PS681M010F080PTD
	680	8	11.5	680	10	12	5900	PS681M010F115PTD
	680	10	12.5	680	10	12	5900	PS681M010G125PTA
	820	8	11.5	820	10	12	5900	PS821M010F115PTD
	820	10	12.5	820	10	12	5900	PS821M010G125PTA
	1000	8	11.5	1000	10	12	5900	PS102M010F115PTD
	1000	10	12.5	1000	10	12	5900	PS102M010G125PTA

See "PACKAGING INFORMATION" for pin treatment options.

STANDARD RATINGS

Part number shows tape version with straight leads

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
10	1200	10	12.5	1200	10	12	5900	PS122M010G125PTA
	1500	10	12.5	1500	10	12	5900	PS152M010G125PTA
16	100	8	11.5	160	8	12	4800	PS101M016F115PTD
	150	8	8	240	8	12	4500	PS151M016F080PTD
	180	8	8	288	8	15	4500	PS181M016F080PTD
	180	8	11.5	288	8	15	4800	PS181M016F115PTD
	220	8	8	352	8	15	4500	PS221M016F080PTD
	220	8	11.5	352	8	15	5000	PS221M016F115PTD
	270	8	8	432	8	12	4500	PS271M016F080PTD
	270	8	11.5	432	8	15	5000	PS271M016F115PTD
	270	10	12.5	432	8	12	5500	PS271M016G125PTA
	330	8	8	528	8	12	4500	PS331M016F080PTD
	330	8	11.5	528	8	12	5000	PS331M016F115PTD
	330	10	12.5	528	8	12	5500	PS331M016G125PTA
	390	8	8	624	8	12	4500	PS391M016F080PTD
	390	8	11.5	624	8	12	5000	PS391M016F115PTD
	390	10	12.5	624	8	12	5500	PS391M016G125PTA
	470	8	8	752	10	16	4500	PS471M016F080PTD
	470	8	11.5	752	10	12	5000	PS471M016F115PTD
	470	10	12.5	752	10	12	5500	PS471M016G125PTA
	560	8	8	896	12	16	4500	PS561M016F080PTD
	560	8	11.5	896	10	12	5000	PS561M016F115PTD
	560	10	12.5	896	10	12	5500	PS561M016G125PTA
	680	8	11.5	1088	12	14	5000	PS681M016F115PTD
	680	10	12.5	1088	10	12	5500	PS681M016G125PTA
	820	10	12.5	1312	10	12	5500	PS821M016G125PTA
	1000	10	12.5	1600	10	12	5500	PS102M016G125PTA
	1200	10	12.5	1920	12	12	5500	PS122M016G125PTA
20	39	8	8	156	8	25	3500	PS390M020F080PTD
	39	8	11.5	156	8	20	3800	PS390M020F115PTD
	47	8	8	188	8	25	3500	PS470M020F080PTD
	47	8	11.5	188	8	20	3800	PS470M020F115PTD
	68	8	8	272	8	25	3500	PS680M020F080PTD
	68	8	11.5	272	8	20	4100	PS680M020F115PTD
	82	8	8	328	8	20	3800	PS820M020F080PTD
	82	8	11.5	328	8	20	4100	PS820M020F115PTD
	100	8	8	400	8	18	3900	PS101M020F080PTD
	100	8	11.5	400	8	18	4200	PS101M020F115PTD
	100	10	12.5	400	8	18	4500	PS101M020G125PTA
	150	8	8	600	8	18	3900	PS151M020F080PTD
	150	8	11.5	600	8	18	4200	PS151M020F115PTD
	150	10	12.5	600	8	18	4500	PS151M020G125PTA
	180	8	8	720	8	18	3900	PS181M020F080PTD
	180	8	11.5	720	8	18	4200	PS181M020F115PTD

See “PACKAGING INFORMATION” for pin treatment options.

STANDARD RATINGS

Part number shows tape version with straight leads

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
20	180	10	12.5	720	8	18	4500	PS181M020G125PTA
	220	8	8	880	8	18	3900	PS221M020F080PTD
	220	8	11.5	880	8	18	4200	PS221M020F115PTD
	220	10	12.5	880	8	18	4500	PS221M020G125PTA
	270	8	11.5	1080	8	15	4500	PS271M020F115PTD
	270	10	12.5	1080	8	15	4900	PS271M020G125PTA
	330	8	11.5	1320	8	15	4500	PS331M020F115PTD
	330	10	12.5	1320	8	15	4900	PS331M020G125PTA
	390	8	11.5	1560	8	15	4500	PS391M020F115PTD
	390	10	12.5	1560	8	15	4900	PS391M020G125PTA
	470	10	12.5	1880	8	15	4900	PS471M020G125PTA
	560	10	12.5	2240	10	20	4500	PS561M020G125PTA
	680	10	12.5	2720	10	20	4500	PS681M020G125PTA
	820	10	12.5	3280	12	20	4500	PS821M020G125PTA
	1000	10	12.5	2000	12	20	4500	PS102M020G125PTA
25	39	8	8	195	8	25	3500	PS390M025F080PTD
	39	8	11.5	195	8	20	3800	PS390M025F115PTD
	47	8	8	235	8	25	3500	PS470M025F080PTD
	47	8	11.5	235	8	20	3800	PS470M025F115PTD
	68	8	8	340	8	25	3500	PS680M025F080PTD
	68	8	11.5	340	8	20	4100	PS680M025F115PTD
	82	8	8	410	8	20	3800	PS820M025F080PTD
	82	8	11.5	410	8	20	4100	PS820M025F115PTD
	100	8	8	500	8	20	3900	PS101M025F080PTD
	100	8	11.5	500	8	20	4200	PS101M025F115PTD
	100	10	12.5	500	8	20	4500	PS101M025G125PTA
	150	8	8	750	8	20	3900	PS151M025F080PTD
	150	8	11.5	750	8	20	4200	PS151M025F115PTD
	150	10	12.5	750	8	20	4500	PS151M025G125PTA
	180	8	8	900	8	20	3900	PS181M025F080PTD
	180	8	11.5	900	8	20	4200	PS181M025F115PTD
	180	10	12.5	900	8	20	4500	PS181M025G125PTA
	220	8	8	1100	8	20	3900	PS221M025F080PTD
	220	8	11.5	1100	8	20	4200	PS221M025F115PTD
	220	10	12.5	1100	8	20	4500	PS221M025G125PTA
	270	8	11.5	1350	8	18	4400	PS271M025F115PTD
	270	10	12.5	1350	8	18	4800	PS271M025G125PTA
	330	8	11.5	1650	8	18	4400	PS331M025F115PTD
	330	10	12.5	1650	8	18	4800	PS331M025G125PTA
	390	10	12.5	1950	8	20	4500	PS391M025G125PTA
	470	10	12.5	2350	8	20	4500	PS471M025G125PTA
	560	10	12.5	2800	10	20	4500	PS561M025G125PTA
	680	10	12.5	3400	12	20	4500	PS681M025G125PTA
	820	10	12.5	2050	12	20	4500	PS821M025G125PTA

See “PACKAGING INFORMATION” for pin treatment options.

MULTIPLIER K_f for RIPPLE CURRENT vs. FREQUENCY

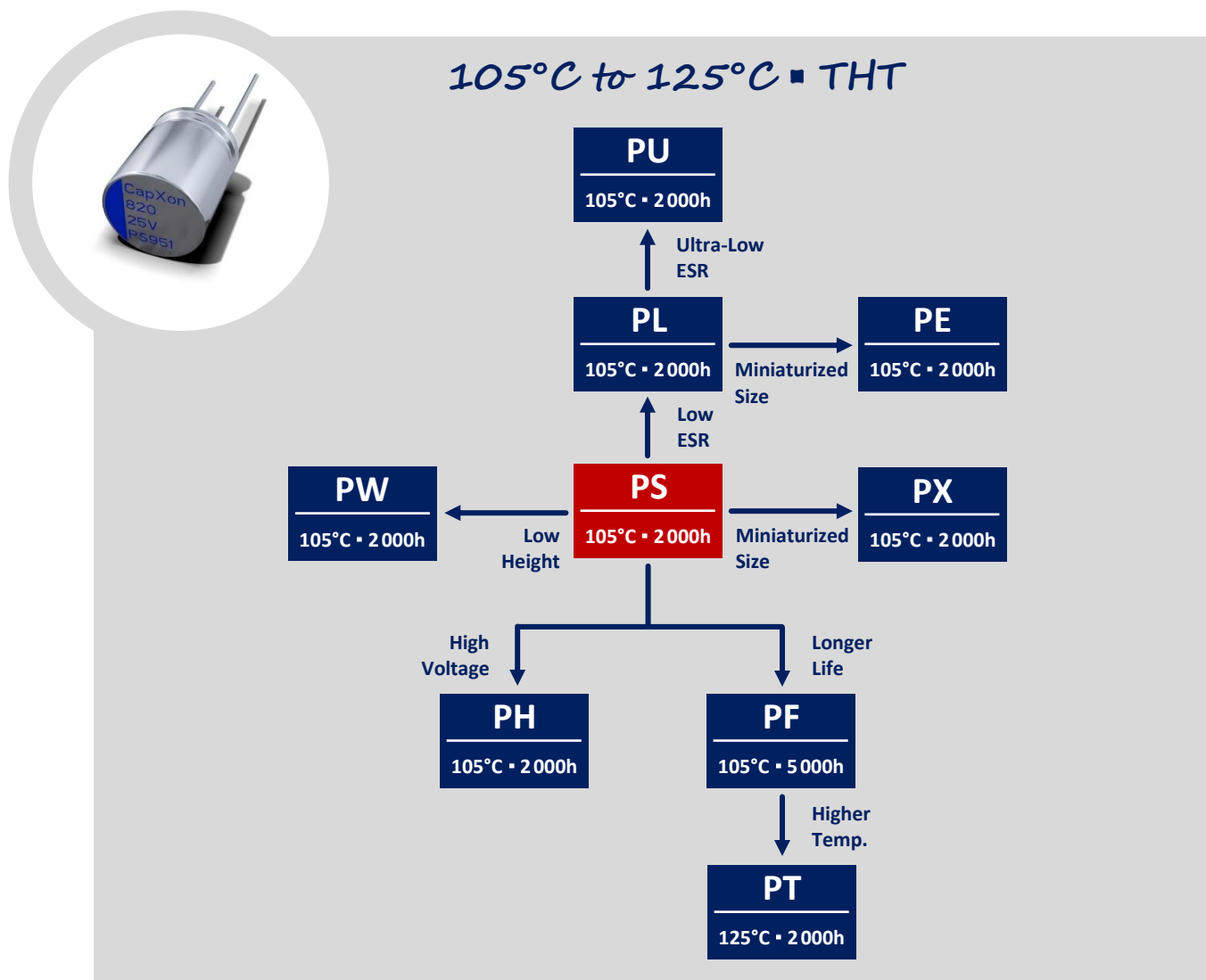
Frequency (Hz)	$120 \leq \text{Freq.} < 1k$	$1k \leq \text{Freq.} < 10k$	$10k \leq \text{Freq.} < 100k$	$100k \leq \text{Freq.} < 300k$
Coefficient K_f	0.05	0.3	0.7	1

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CapXon products are designed and manufactured according to severe quality and safety standards. Under no circumstance, CapXon warrants that any CapXon product is suitable for the purposes intended for your application, even CapXon knows the application. It is customer's duty and obligation to check and make sure that CapXon products are suitable for the purposes intended and select the correct and proper CapXon product. Customers are requested to perform a sufficient validation and reliability evaluation to assure needed safety level and reliability performance by suitable designs and to apply proper safeguards (e.g. redundancies, protective circuits).

Particular operating conditions (ambient temperature, ripple current, voltage, thermal resistance, etc.) as well as storage, production or assembly may affect the performance and the lifetime of the capacitor. Please consult CapXon for lifetime estimation, failure mode considerations or worst-case scenarios according to the product technology, product tolerances / deviations or change of the characteristics of the capacitor due to shipment, storage, handling, production and usage.

For aerospace or military application, life-saving, life-sustaining, safety critical applications or any application where failure may cause severe personal injury or death, please consult us before design-in the capacitor in your application.

Except for the written expressed warranties, CapXon does not impliedly, by assumption or whatever else, warrant, undertake, promise any other warranty or guaranty for any CapXon product.

For further information, please visit our website www.capxongroup.com or contact CapXon directly.

PL SERIES • ULTRA LOW ESR $\leq 9\text{m}\Omega$

KEY FEATURES



- **SOLID CONDUCTIVE POLYMER** • THT type
- Ultra-low ESR at high frequency range
- Endurance: 105°C • 2 000 hours
- Very large permissible ripple current
- No dry-out effect guarantees extremely long life

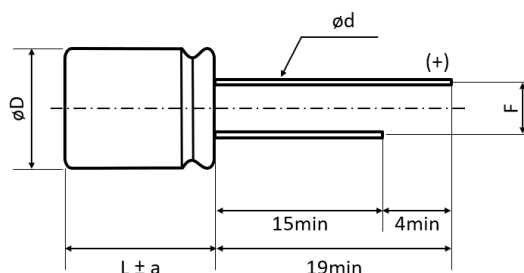


SPECIFICATIONS

Items		Performance Characteristics
Operating Temperature Range		-55 ~ +105°C
Rated Voltage Range	V_R	2.5 ~ 16V DC
Surge Voltage	V_S	$V_S = 1.15 \cdot V_R$
Capacitance Range	C_R	180 ~ 3500 μF
Cap. Tolerance	ΔC	$\pm 20\%$ (120Hz • 20°C)
Leakage Current (20°C • V_R applied)	I_{LEAK}	Not to exceed the values shown in standard ratings After 2 minutes
Dissipation Factor % (20°C • 120Hz)	$\tan\delta$	Not to exceed the values shown in standard ratings
Equivalent Series Resistance (20°C • 100kHz)	ESR	Not to exceed the values shown in standard ratings

Lifetime Test		
Endurance 105°C (V_R applied)	Test	2 000 hours
	$\Delta C/C_R$	Within $\pm 20\%$ of the initial value
	$\tan\delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value
Moisture Resistance stored at 60°C (RH 90 ~ 95%)	Test	1 000 hours
	$\Delta C/C_R$	Within $\pm 20\%$ of the initial value
	$\tan\delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value

DIMENSIONS • All dimensions in mm



ϕD	L	$\phi D+0.5\text{max}$	a	F ± 0.5	$\phi d \pm 0.05$
8	8	8	1	3.5	0.6
8	11.5	8	1.5	3.5	0.6
10	12.5	10	1.5	5.0	0.6

STANDARD RATINGS

Part number shows tape version with straight leads

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
2.5	560	8	8	280	8	9	6100	PL561M2R5F080PTD
	560	8	11.5	280	8	9	6100	PL561M2R5F115PTD
	680	8	8	340	8	9	6100	PL681M2R5F080PTD
	680	8	11.5	340	8	9	6100	PL681M2R5F115PTD
	820	8	8	410	8	9	6100	PL821M2R5F080PTD
	820	8	11.5	410	8	9	6100	PL821M2R5F115PTD
	1000	8	8	500	8	9	6100	PL102M2R5F080PTD
	1000	8	11.5	500	8	9	6100	PL102M2R5F115PTD
	1200	8	8	600	8	9	6100	PL122M2R5F080PTD
	1200	8	11.5	600	8	9	6100	PL122M2R5F115PTD
	1500	8	8	750	8	9	6100	PL152M2R5F080PTD
	1500	8	11.5	750	8	9	6100	PL152M2R5F115PTD
	1800	8	8	900	8	9	6100	PL182M2R5F080PTD
	2000	8	11.5	1000	8	9	6100	PL202M2R5F115PTD
	2000	10	12.5	1000	8	9	6640	PL202M2R5G125PTA
	2500	10	12.5	1250	8	9	6640	PL252M2R5G125PTA
	2700	10	12.5	1350	8	9	6640	PL272M2R5G125PTA
	3000	10	12.5	1500	8	9	6640	PL302M2R5G125PTA
	3300	10	12.5	1650	8	9	6640	PL332M2R5G125PTA
	3500	10	12.5	1750	8	9	6640	PL352M2R5G125PTA
4	560	8	8	224	8	9	6100	PL561M004F080PTD
	560	8	11.5	224	8	9	6100	PL561M004F115PTD
	680	8	8	272	8	9	6100	PL681M004F080PTD
	680	8	11.5	272	8	9	6100	PL681M004F115PTD
	820	8	8	328	8	9	6100	PL821M004F080PTD
	820	8	11.5	328	8	9	6100	PL821M004F115PTD
	820	10	12.5	328	8	9	6100	PL821M004G125PTA
	1000	8	8	800	8	9	6100	PL102M004F080PTD
	1000	8	11.5	800	8	9	6100	PL102M004F115PTD
	1200	8	8	960	8	9	6100	PL122M004F080PTD
	1200	8	11.5	960	8	9	6100	PL122M004F115PTD
	1200	10	12.5	960	8	9	6640	PL122M004G125PTA
	1500	8	11.5	1200	8	9	6100	PL152M004F115PTD
	1500	10	12.5	1200	8	9	6100	PL152M004G125PTA
	1800	8	11.5	1440	8	9	6500	PL182M004F115PTD
	2000	10	12.5	1600	8	9	6640	PL202M004G125PTA
	2500	10	12.5	1500	8	9	6640	PL252M004G125PTA
6.3	180	8	8	227	7	9	6100	PL181M6R3F080PTD
	180	8	11.5	227	7	9	6100	PL181M6R3F115PTD
	220	8	8	277	7	9	6100	PL221M6R3F080PTD
	220	8	11.5	277	7	9	6100	PL221M6R3F115PTD
	270	8	8	340	7	9	6100	PL271M6R3F080PTD
	270	8	11.5	340	7	9	6100	PL271M6R3F115PTD
	330	8	8	416	7	9	6100	PL331M6R3F080PTD
	330	8	11.5	416	7	9	6100	PL331M6R3F115PTD

See “PACKAGING INFORMATION” for pin treatment options.

STANDARD RATINGS

Part number shows tape version with straight leads

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
6.3	390	8	8	491	8	9	6100	PL391M6R3F080PTD
	390	8	11.5	491	8	9	6100	PL391M6R3F115PTD
	470	8	8	592	8	9	6100	PL471M6R3F080PTD
	470	8	11.5	592	8	9	6100	PL471M6R3F115PTD
	560	8	8	706	8	9	6100	PL561M6R3F080PTD
	560	8	11.5	706	8	9	6100	PL561M6R3F115PTD
	680	8	8	428	8	9	6100	PL681M6R3F080PTD
	680	8	11.5	428	8	9	6100	PL681M6R3F115PTD
	820	8	8	517	10	9	6100	PL821M6R3F080PTD
	820	8	11.5	517	10	9	6100	PL821M6R3F115PTD
	1000	8	8	630	10	9	6100	PL102M6R3F080PTD
	1000	8	11.5	630	10	9	6100	PL102M6R3F115PTD
	1000	10	12.5	630	10	9	6640	PL102M6R3G125PTA
	1200	8	8	756	10	9	6100	PL122M6R3F080PTD
	1200	8	11.5	756	10	9	6100	PL122M6R3F115PTD
	1200	10	12.5	756	10	9	6640	PL122M6R3G125PTA
	1500	8	11.5	945	10	9	6100	PL152M6R3F115PTD
	1500	10	12.5	945	10	9	6640	PL152M6R3G125PTA
	2000	10	12.5	1260	10	9	6640	PL202M6R3G125PTA
	2200	10	12.5	1336	10	9	6640	PL222M6R3G125PTA
	2500	10	12.5	1575	10	9	6640	PL252M6R3G125PTA
10	180	8	8	360	7	9	6100	PL181M010F080PTD
	180	8	11.5	360	7	9	6100	PL181M010F115PTD
	220	8	8	440	8	9	6100	PL221M010F080PTD
	220	8	11.5	440	8	9	6100	PL221M010F115PTD
	270	8	8	540	8	9	6100	PL271M010F080PTD
	270	8	11.5	540	8	9	6100	PL271M010F115PTD
	330	8	8	660	8	9	6100	PL331M010F080PTD
	330	8	11.5	660	8	9	6100	PL331M010F115PTD
	390	8	8	780	8	9	6100	PL391M010F080PTD
	390	8	11.5	780	8	9	6100	PL391M010F115PTD
	470	8	8	940	8	9	6100	PL471M010F080PTD
	470	8	11.5	940	8	9	6100	PL471M010F115PTD
	560	8	8	560	10	9	6100	PL561M010F080PTD
	560	8	11.5	560	10	9	6100	PL561M010F115PTD
	680	8	8	680	10	9	5600	PL681M010F080PTD
	680	8	11.5	680	10	9	5600	PL681M010F115PTD
	680	10	12.5	680	10	9	6100	PL681M010G125PTA
	820	8	11.5	820	10	9	5600	PL821M010F115PTD
	820	10	12.5	820	10	9	6100	PL821M010G125PTA
	1000	8	11.5	1000	10	9	5600	PL102M010F115PTD
	1000	10	12.5	1000	10	9	6100	PL102M010G125PTA
	1200	10	12.5	1200	10	9	6100	PL122M010G125PTA
	1500	10	12.5	1500	10	9	6100	PL152M010G125PTA

See “PACKAGING INFORMATION” for pin treatment options.

STANDARD RATINGS

Part number shows tape version with straight leads

V_R (V)	C_R (μF)	$\varnothing D$ (mm)	L (mm)	I_{LEAK} (μA , 2min)	$\tan\delta$ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (m Ω)	I_R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
16	180	8	11.5	576	8	9	5600	PL181M016F115PTD
	220	8	11.5	704	8	9	5600	PL221M016F115PTD
	270	8	8	864	8	9	5600	PL271M016F080PTD
	270	8	11.5	864	8	9	5600	PL271M016F115PTD
	330	8	8	528	8	9	5600	PL331M016F080PTD
	330	8	11.5	528	8	9	5600	PL331M016F115PTD
	330	10	12.5	528	8	9	6100	PL331M016G125PTA
	390	8	11.5	624	8	9	5600	PL391M016F115PTD
	390	10	12.5	624	8	9	6100	PL391M016G125PTA
	470	8	11.5	752	10	9	5600	PL471M016F115PTD
	470	10	12.5	752	10	9	6100	PL471M016G125PTA
	560	8	11.5	896	10	9	5600	PL561M016F115PTD
	560	10	12.5	896	10	9	6100	PL561M016G125PTA
	680	10	12.5	1000	10	9	6100	PL681M016G125PTA
	820	10	12.5	1280	10	9	6100	PL821M016G125PTA
	1000	10	12.5	1600	10	9	6100	PL102M016G125PTA

See "PACKAGING INFORMATION" for pin treatment options.

MULTIPLIER K_f for RIPPLE CURRENT vs. FREQUENCY

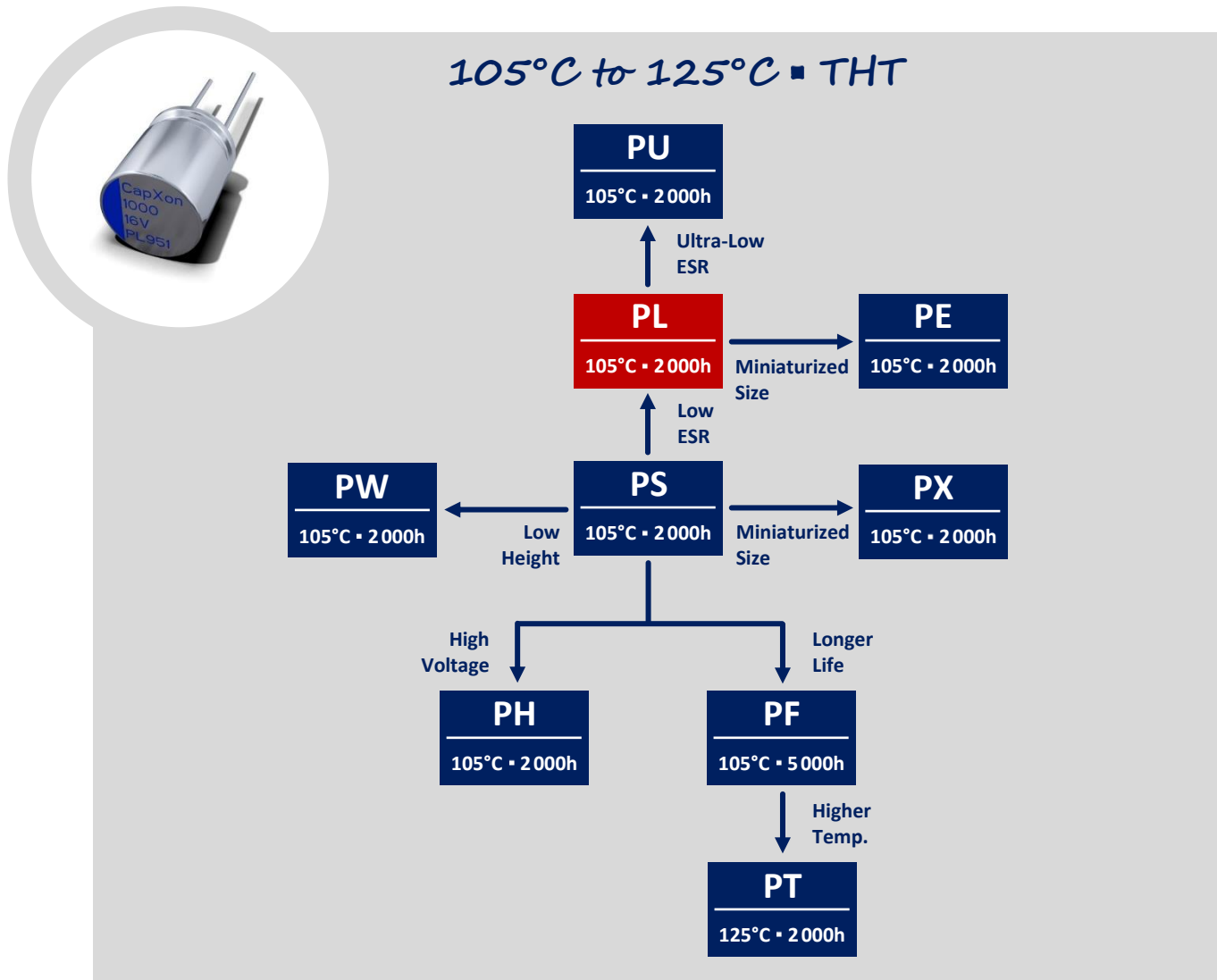
Frequency (Hz)	$120 \leq \text{Freq.} < 1k$	$1k \leq \text{Freq.} < 10k$	$10k \leq \text{Freq.} < 100k$	$100k \leq \text{Freq.} < 300k$
Coefficient K_f	0.05	0.3	0.7	1

PRECAUTIONS, GUIDELINES AND PACKAGING INFORMATION

Unless otherwise agreed in individual specifications, all products are subject to our "General Precautions and Guidelines" as well as our "Packaging Information". Please refer to the following links in the table.

General Precautions & Guidelines	Packaging Information	3D Models	Reliability Tests

GROUP CHART



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Particular operating conditions (ambient temperature, ripple current, voltage, thermal resistance, etc.) as well as storage, production or assembly may affect the performance and the lifetime of the capacitor. Please consult CapXon for lifetime estimation, failure mode considerations or worst-case scenarios according to the product technology, product tolerances / deviations or change of the characteristics of the capacitor due to shipment, storage, handling, production and usage.

For aerospace or military application, life-saving, life-sustaining, safety critical applications or any application where failure may cause severe personal injury or death, please consult us before design-in the capacitor in your application.

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For further information, please visit our website www.capxongroup.com or contact CapXon directly.

PU SERIES • ULTRA LOW ESR $\leq 7\text{m}\Omega$

KEY FEATURES



- **SOLID CONDUCTIVE POLYMER** • THT type
- Ultra-low ESR at high frequency range
- Endurance: 105°C • 2 000 hours
- Very large permissible ripple current
- No dry-out effect guarantees extremely long life

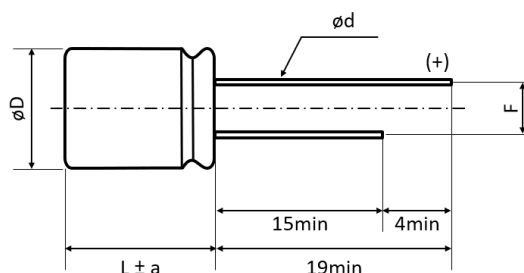


SPECIFICATIONS

Items		Performance Characteristics
Operating Temperature Range		-55 ~ +105°C
Rated Voltage Range	V_R	2.5 ~ 10V DC
Surge Voltage	V_S	$V_S = 1.15 \cdot V_R$
Capacitance Range	C_R	180 ~ 3900 μF
Cap. Tolerance	ΔC	$\pm 20\%$ (120Hz • 20°C)
Leakage Current (20°C • V_R applied)	I_{LEAK}	Not to exceed the values shown in standard ratings After 2 minutes
Dissipation Factor % (20°C • 120Hz)	$\tan\delta$	Not to exceed the values shown in standard ratings
Equivalent Series Resistance (20°C • 100kHz)	ESR	Not to exceed the values shown in standard ratings

Lifetime Test		
Endurance 105°C (V_R applied)	Test	2 000 hours
	$\Delta C/C_R$	Within $\pm 20\%$ of the initial value
	$\tan\delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value
Moisture Resistance stored at 60°C (RH 90 ~ 95%)	Test	1 000 hours
	$\Delta C/C_R$	Within $\pm 20\%$ of the initial value
	$\tan\delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value

DIMENSIONS • All dimensions in mm



ϕD	L	$\phi D+0.5\text{max}$	a	F ± 0.5	$\phi d \pm 0.05$
8	8	8	1	3.5	0.6
8	11.5	8	1.5	3.5	0.6
10	12.5	10	1.5	5.0	0.6

STANDARD RATINGS

Part number shows tape version with straight leads

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
2.5	560	8	8	280	8	7	6100	PU561M2R5F080PTD
	560	8	11.5	280	8	7	6100	PU561M2R5F115PTD
	680	8	8	340	8	7	6100	PU681M2R5F080PTD
	680	8	11.5	340	8	7	6100	PU681M2R5F115PTD
	820	8	8	410	8	7	6100	PU821M2R5F080PTD
	820	8	11.5	410	8	7	6100	PU821M2R5F115PTD
	1000	8	8	500	8	7	6100	PU102M2R5F080PTD
	1000	8	11.5	500	8	7	6100	PU102M2R5F115PTD
	1200	8	8	600	12	7	6100	PU122M2R5F080PTD
	1200	8	11.5	600	8	7	6100	PU122M2R5F115PTD
	1500	8	8	750	12	7	6100	PU152M2R5F080PTD
	1500	8	11.5	750	8	7	6100	PU152M2R5F115PTD
	1500	10	12.5	750	8	7	6100	PU152M2R5G125PTA
	2000	8	11.5	1000	8	7	6100	PU202M2R5F115PTD
	2000	10	12.5	1000	8	7	6100	PU202M2R5G125PTA
	2200	8	11.5	1100	8	7	6700	PU222M2R5F115PTD
	2500	10	12.5	1250	8	7	7100	PU252M2R5G125PTA
	2700	10	12.5	1350	8	7	7100	PU272M2R5G125PTA
	3000	10	12.5	1500	8	7	7100	PU302M2R5G125PTA
	3300	10	12.5	1650	8	7	7100	PU332M2R5G125PTA
	3500	10	12.5	1750	8	7	7100	PU352M2R5G125PTA
	3900	10	12.5	1950	8	7	7100	PU392M2R5G125PTA
4	560	8	8	224	8	7	6100	PU561M004F080PTD
	560	8	11.5	224	8	7	6100	PU561M004F115PTD
	680	8	8	272	8	7	6100	PU681M004F080PTD
	680	8	11.5	272	8	7	6100	PU681M004F115PTD
	820	8	8	328	8	7	6100	PU821M004F080PTD
	820	8	11.5	328	8	7	6100	PU821M004F115PTD
	820	10	12.5	328	8	7	6600	PU821M004G125PTA
	1000	8	8	800	8	7	6100	PU102M004F080PTD
	1000	8	11.5	800	8	7	6100	PU102M004F115PTD
	1000	10	12.5	800	8	7	6600	PU102M004G125PTA
	1200	8	11.5	960	8	7	6100	PU122M004F115PTD
	1200	10	12.5	960	8	7	6600	PU122M004G125PTA
	1500	8	11.5	1200	10	7	6100	PU152M004F115PTD
	1500	10	12.5	1200	10	7	6600	PU152M004G125PTA
	1800	10	12.5	1440	10	7	6600	PU182M004G125PTA
	2000	10	12.5	1600	10	7	6600	PU202M004G125PTA
	2200	10	12.5	1760	10	7	6600	PU222M004G125PTA
	2500	10	12.5	2000	10	7	6600	PU252M004G125PTA
	2700	10	12.5	2160	10	7	6900	PU272M004G125PTA
	180	8	8	113	10	7	6100	PU181M6R3F080PTD
6.3	180	8	11.5	113	10	7	6100	PU181M6R3F115PTD
	220	8	8	139	10	7	6100	PU221M6R3F080PTD

See “PACKAGING INFORMATION” for pin treatment options.

STANDARD RATINGS

Part number shows tape version with straight leads

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
6.3	220	8	11.5	139	10	7	6100	PU221M6R3F115PTD
	270	8	8	170	10	7	6100	PU271M6R3F080PTD
	270	8	11.5	170	10	7	6100	PU271M6R3F115PTD
	330	8	8	208	10	7	6100	PU331M6R3F080PTD
	330	8	11.5	208	10	7	6100	PU331M6R3F115PTD
	390	8	8	246	10	7	6100	PU391M6R3F080PTD
	390	8	11.5	246	10	7	6100	PU391M6R3F115PTD
	470	8	8	296	10	7	6100	PU471M6R3F080PTD
	470	8	11.5	296	10	7	6100	PU471M6R3F115PTD
	560	8	8	352	8	7	6100	PU561M6R3F080PTD
	560	8	11.5	352	8	7	6100	PU561M6R3F115PTD
	680	8	8	428	8	7	6100	PU681M6R3F080PTD
	680	8	11.5	428	8	7	6600	PU681M6R3F115PTD
	680	10	12.5	428	8	7	6600	PU681M6R3G125PTA
	820	8	8	517	10	7	6100	PU821M6R3F080PTD
	820	8	11.5	517	10	7	6600	PU821M6R3F115PTD
	820	10	12.5	517	10	7	6600	PU821M6R3G125PTA
	1000	8	8	630	10	7	6200	PU102M6R3F080PTD
	1000	8	11.5	630	10	7	7100	PU102M6R3F115PTD
	1000	10	12.5	630	10	7	7100	PU102M6R3G125PTA
	1200	8	11.5	756	10	7	7100	PU122M6R3F115PTD
	1200	10	12.5	756	10	7	7100	PU122M6R3G125PTA
	1500	10	12.5	945	10	7	7100	PU152M6R3G125PTA
	1800	10	12.5	1134	10	7	7100	PU182M6R3G125PTA
	2000	10	12.5	1260	10	7	7100	PU202M6R3G125PTA
	2500	10	12.5	1575	10	7	7100	PU252M6R3G125PTA
10	180	8	11.5	180	8	7	6600	PU181M010F115PTD
	220	8	11.5	220	8	7	6600	PU221M010F115PTD
	270	8	11.5	270	8	7	6600	PU271M010F115PTD
	330	8	11.5	330	8	7	6600	PU331M010F115PTD
	390	8	11.5	390	8	7	6600	PU391M010F115PTD
	470	8	11.5	470	8	7	6600	PU471M010F115PTD
	470	10	12.5	470	8	7	6600	PU471M010G125PTA
	560	8	11.5	560	8	7	6600	PU561M010F115PTD
	560	10	12.5	560	8	7	6600	PU561M010G125PTA
	680	8	11.5	680	10	7	6600	PU681M010F115PTD
	680	10	12.5	680	10	7	6600	PU681M010G125PTA
	820	8	11.5	820	10	7	7100	PU821M010F115PTD
	820	10	12.5	820	10	7	7100	PU821M010G125PTA
	1000	10	12.5	1000	10	7	7100	PU102M010G125PTA
	1200	10	12.5	1200	10	7	7100	PU122M010G125PTA
	1500	10	12.5	1500	10	7	7100	PU152M010G125PTA

See "PACKAGING INFORMATION" for pin treatment options.

MULTIPLIER K_f for RIPPLE CURRENT vs. FREQUENCY

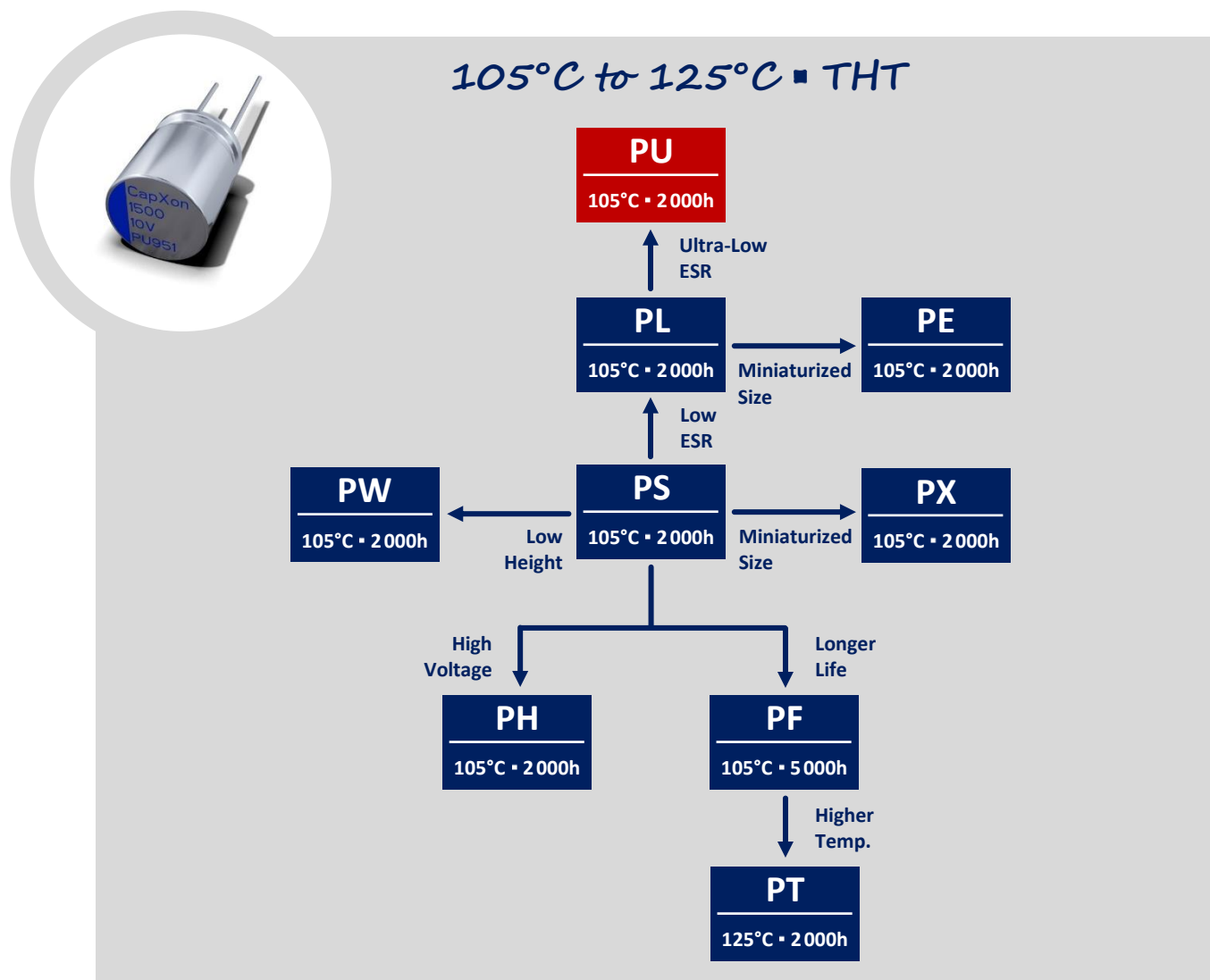
Frequency (Hz)	$120 \leq \text{Freq.} < 1k$	$1k \leq \text{Freq.} < 10k$	$10k \leq \text{Freq.} < 100k$	$100k \leq \text{Freq.} < 300k$
Coefficient K_f	0.05	0.3	0.7	1

PRECAUTIONS, GUIDELINES AND PACKAGING INFORMATION

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General Precautions & Guidelines	Packaging Information	3D Models	Reliability Tests

GROUP CHART



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Particular operating conditions (ambient temperature, ripple current, voltage, thermal resistance, etc.) as well as storage, production or assembly may affect the performance and the lifetime of the capacitor. Please consult CapXon for lifetime estimation, failure mode considerations or worst-case scenarios according to the product technology, product tolerances / deviations or change of the characteristics of the capacitor due to shipment, storage, handling, production and usage.

For aerospace or military application, life-saving, life-sustaining, safety critical applications or any application where failure may cause severe personal injury or death, please consult us before design-in the capacitor in your application.

Except for the written expressed warranties, CapXon does not impliedly, by assumption or whatever else, warrant, undertake, promise any other warranty or guaranty for any CapXon product.

For further information, please visit our website www.capxongroup.com or contact CapXon directly.

PX SERIES ■ LOW PROFILE TYPE

KEY FEATURES



- **SOLID CONDUCTIVE POLYMER** • THT type
- Low profile for space critical applications
- Endurance: 105°C • 2 000 hours
- Large permissible ripple current
- No dry-out effect guarantees extremely long life

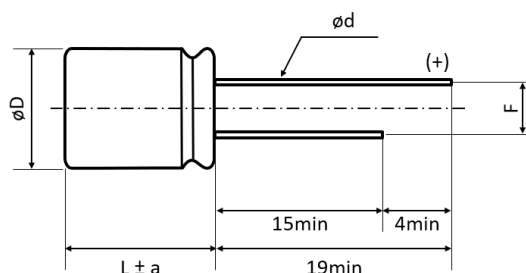


SPECIFICATIONS

Items		Performance Characteristics
Operating Temperature Range		-55 ~ +105°C
Rated Voltage Range	V_R	2.5 ~ 25V DC
Surge Voltage	V_S	($V_R \leq 20V$): $V_S = 1.15 \cdot V_R$ ($V_R \geq 25V$): $V_S = 1.10 \cdot V_R$
Capacitance Range	C_R	6.8 ~ 820µF
Cap. Tolerance	ΔC	±20% (120Hz • 20°C)
Leakage Current (20°C • V_R applied)	I_{LEAK}	Not to exceed the values shown in standard ratings After 2 minutes
Dissipation Factor % (20°C • 120Hz)	$\tan \delta$	Not to exceed the values shown in standard ratings
Equivalent Series Resistance (20°C • 100kHz)	ESR	Not to exceed the values shown in standard ratings

Lifetime Test		
Endurance 105°C (V_R applied)	Test	2 000 hours
	$\Delta C/C_R$	Within ±20% of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value
Moisture Resistance stored at 60°C (RH 90 ~ 95%)	Test	1 000 hours
	$\Delta C/C_R$	Within ±20% of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value

DIMENSIONS ■ All dimensions in mm



ø D	L	øD+0.5max	a	F±0.5	ød±0.05
4	5 and 7	4	1	1.5	0.45
4	10	5	1	1.5	0.5
5	5 and 7	5	1	2	0.45
5	8 and 9	5	1	2	0.5
5	11	5	1	2	0.6
6.3	5.2 and 7	6.3	1	2.5	0.45
6.3	9	6.3	1	2.5	0.5
6.3	11	6.3	1	2.5	0.6

STANDARD RATINGS

Part number shows tape version with straight leads

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
2.5	100	4	5	300	8	30	1670	PX101M2R5B050PTF
	150	5	5	300	8	30	1970	PX151M2R5C050PTB
	150	6.3	5.2	300	8	30	2200	PX151M2R5E052PTC
	180	5	5	300	8	30	1970	PX181M2R5C050PTB
	220	5	5	300	8	30	2200	PX221M2R5C050PTB
	330	6.3	5.2	300	8	25	2610	PX331M2R5E052PTC
	390	6.3	5.2	300	8	20	2690	PX391M2R5E052PTC
	390	6.3	7	300	8	15	3100	PX391M2R5E070PTC
	470	6.3	5.2	300	8	20	2690	PX471M2R5E052PTC
	470	6.3	7	300	8	15	3100	PX471M2R5E070PTC
	560	5	9	300	8	15	3100	PX561M2R5C090PTB
	560	6.3	7	300	8	15	3100	PX561M2R5E070PTC
	680	6.3	11	300	8	15	3500	PX681M2R5E110PTC
	100	5	5	300	8	30	1970	PX101M004C050PTB
4	100	6.3	5.2	300	8	30	2200	PX101M004E052PTC
	150	6.3	7	300	8	25	2670	PX151M004E070PTC
	220	6.3	7	300	8	20	2690	PX221M004E070PTC
	270	6.3	5.2	300	8	25	2610	PX271M004E052PTC
	270	6.3	9	300	8	15	3300	PX271M004E090PTC
	330	6.3	5.2	300	8	20	2690	PX331M004E052PTC
	330	6.3	7	300	8	15	3100	PX331M004E070PTC
	390	6.3	9	300	8	15	3300	PX391M004E090PTC
	470	6.3	7	300	8	15	3100	PX471M004E070PTC
	560	6.3	11	300	8	15	3500	PX561M004E110PTC
6.3	82	6.3	5.2	300	8	30	2200	PX820M6R3E052PTC
	100	6.3	5.2	300	8	25	2390	PX101M6R3E052PTC
	100	6.3	7	300	8	20	2690	PX101M6R3E070PTC
	150	4	7	300	8	35	1900	PX151M6R3B070PTF
	220	5	7	300	8	20	2450	PX221M6R3C070PTB
	220	5	8	300	8	15	2690	PX221M6R3C080PTB
	220	6.3	5.2	300	8	20	2690	PX221M6R3E052PTC
	220	6.3	7	300	8	15	3100	PX221M6R3E070PTC
	220	6.3	9	300	8	15	3300	PX221M6R3E090PTC
	270	5	7	300	8	20	2450	PX271M6R3C070PTB
	270	5	8	300	8	15	2690	PX271M6R3C080PTB
	330	5	8	300	8	15	2690	PX331M6R3C080PTB
	330	5	9	300	8	15	3100	PX331M6R3C090PTB
	330	6.3	5.2	300	8	20	2690	PX331M6R3E052PTC
	330	6.3	9	300	8	15	3300	PX331M6R3E090PTC
	390	5	9	300	8	15	3100	PX391M6R3C090PTB
	390	6.3	11	300	8	15	3500	PX391M6R3E110PTC
	470	6.3	7	300	8	15	3100	PX471M6R3E070PTC
	680	6.3	9	300	8	15	3300	PX681M6R3E090PTC
	680	6.3	11	300	8	15	3500	PX681M6R3E110PTC
	820	6.3	11	300	8	15	3500	PX821M6R3E110PTC

See "PACKAGING INFORMATION" for pin treatment options.

STANDARD RATINGS

Part number shows tape version with straight leads

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
10	10	4	5	300	8	80	1200	PX100M010B050PTF
	22	4	5	300	8	80	1200	PX220M010B050PTF
	33	5	5	300	8	45	1670	PX330M010C050PTB
	33	6.3	5.2	300	8	30	2200	PX330M010E052PTC
	33	6.3	7	300	8	25	2410	PX330M010E070PTC
	39	5	5	300	8	45	1670	PX390M010C050PTB
	47	6.3	5.2	300	8	30	2200	PX470M010E052PTC
	47	6.3	7	300	8	20	2690	PX470M010E070PTC
	47	6.3	9	300	8	18	3100	PX470M010E090PTC
	56	6.3	5.2	300	8	30	2200	PX560M010E052PTC
	68	6.3	9	300	8	18	3100	PX680M010E090PTC
	82	6.3	5.2	300	8	30	2200	PX820M010E052PTC
	100	6.3	5.2	300	8	30	2200	PX101M010E052PTC
	100	6.3	9	300	8	18	3100	PX101M010E090PTC
	150	5	7	300	8	25	2100	PX151M010C070PTB
	150	6.3	5.2	300	8	25	2200	PX151M010E052PTC
	150	6.3	9	300	8	18	3100	PX151M010E090PTC
	180	5	11	300	8	20	2690	PX181M010C110PTB
	220	5	11	300	8	20	2690	PX221M010C110PTB
	220	6.3	9	300	8	15	3300	PX221M010E090PTC
	270	5	11	300	8	20	2690	PX271M010C110PTB
	270	6.3	7	300	8	20	3100	PX271M010E070PTC
	270	6.3	11	300	8	15	3500	PX271M010E110PTC
	330	6.3	9	300	8	15	3300	PX331M010E090PTC
	470	6.3	9	300	8	15	3300	PX471M010E090PTC
	470	6.3	11	300	8	15	3500	PX471M010E110PTC
16	10	6.3	5.2	300	8	30	2200	PX100M016E052PTC
	22	6.3	5.2	300	8	30	2200	PX220M016E052PTC
	22	6.3	7	300	8	25	2610	PX220M016E070PTC
	33	6.3	5.2	300	8	30	2200	PX330M016E052PTC
	33	6.3	7	300	8	25	2610	PX330M016E070PTC
	39	6.3	5.2	300	8	30	2200	PX390M016E052PTC
	47	6.3	5.2	300	8	30	2200	PX470M016E052PTC
	47	6.3	7	300	8	25	2610	PX470M016E070PTC
	82	6.3	7	300	8	20	2690	PX820M016E070PTC
	100	5	11	300	8	20	2690	PX101M016C110PTB
	100	6.3	5.2	300	8	30	2200	PX101M016E052PTC
	100	6.3	9	300	8	20	2900	PX101M016E090PTC
	100	6.3	11	300	8	15	3500	PX101M016E110PTC
	150	6.3	7	300	8	20	2690	PX151M016E070PTC
	180	6.3	9	300	8	20	3100	PX181M016E090PTC
	220	6.3	9	300	8	20	3100	PX221M016E090PTC
	220	6.3	11	300	8	15	3500	PX221M016E110PTC
	270	6.3	11	300	8	15	3500	PX271M016E110PTC
	330	6.3	9	300	8	15	3100	PX331M016E090PTC

See “PACKAGING INFORMATION” for pin treatment options.

STANDARD RATINGS

Part number shows tape version with straight leads

V_R (V)	C_R (μF)	ϕD (mm)	L (mm)	I_{LEAK} (μA , 2min)	$\tan\delta$ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (m Ω)	I_R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
20	10	6.3	5.2	300	8	30	2200	PX100M020E052PTC
	15	6.3	7	300	8	25	2670	PX150M020E070PTC
	22	6.3	5.2	300	8	30	2200	PX220M020E052PTC
	22	6.3	7	300	8	25	2670	PX220M020E070PTC
	33	6.3	7	300	8	25	2670	PX330M020E070PTC
	33	6.3	9	300	8	20	2900	PX330M020E090PTC
	47	6.3	7	300	8	25	2670	PX470M020E070PTC
	56	6.3	9	300	8	20	2900	PX560M020E090PTC
	68	6.3	9	300	8	20	2900	PX680M020E090PTC
	68	6.3	11	300	8	20	2900	PX680M020E110PTC
25	82	6.3	11	300	8	20	2900	PX820M020E110PTC
	6.8	6.3	5.2	300	8	40	1800	PX6R8M025E052PTC
	10	6.3	5.2	300	8	30	2200	PX100M025E052PTC
	10	6.3	7	300	8	25	2670	PX100M025E070PTC
	15	6.3	5.2	300	8	30	2200	PX150M025E052PTC
	15	6.3	7	300	8	25	2670	PX150M025E070PTC
	22	6.3	7	300	8	25	2670	PX220M025E070PTC
	27	6.3	9	300	8	25	2670	PX270M025E090PTC
	33	6.3	7	300	8	25	2670	PX330M025E070PTC
	33	6.3	5.2	300	8	30	2200	PX330M025E052PTC
	39	6.3	7	300	8	25	2670	PX390M025E070PTC
	47	6.3	9	300	8	25	2670	PX470M025E090PTC
	56	6.3	11	300	8	20	2900	PX560M025E110PTC
	68	6.3	11	300	8	20	2900	PX680M025E110PTC

See “PACKAGING INFORMATION” for pin treatment options.

MULTIPLIER K_f for RIPPLE CURRENT vs. FREQUENCY

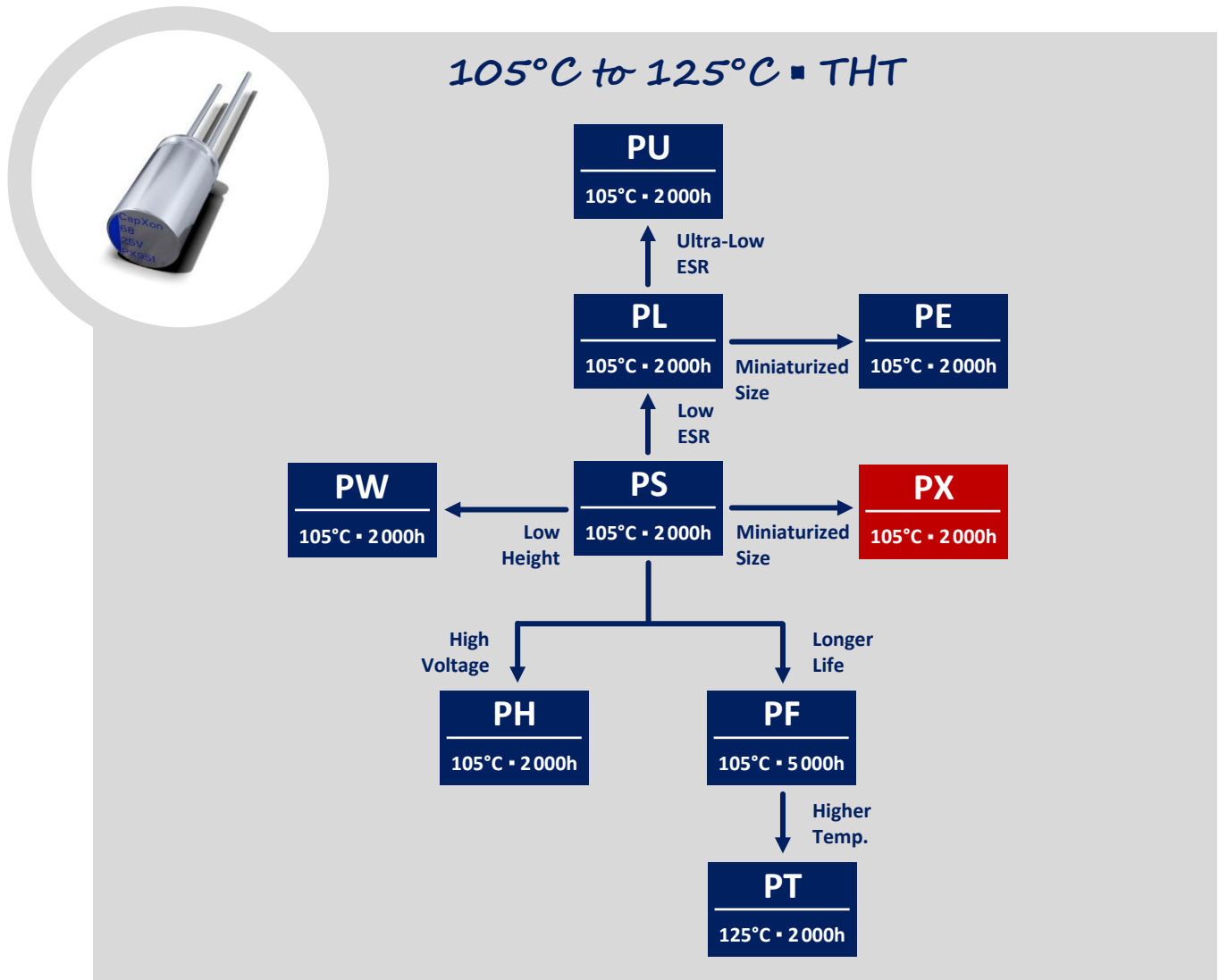
Frequency (Hz)	$120 \leq \text{Freq.} < 1k$	$1k \leq \text{Freq.} < 10k$	$10k \leq \text{Freq.} < 100k$	$100k \leq \text{Freq.} < 300k$
Coefficient K_f	0.05	0.3	0.7	1

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GROUP CHART



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For aerospace or military application, life-saving, life-sustaining, safety critical applications or any application where failure may cause severe personal injury or death, please consult us before design-in the capacitor in your application.

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For further information, please visit our website www.capxongroup.com or contact CapXon directly.

PW SERIES • LOW HEIGHT TYPE

KEY FEATURES



- **SOLID CONDUCTIVE POLYMER** • THT type
- Low height for space critical applications
- Endurance: 105°C • 2 000 hours
- Large permissible ripple current
- No dry-out effect guarantees extremely long life

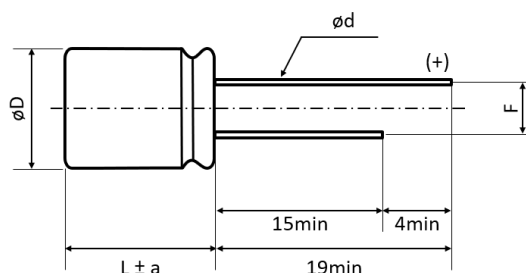


SPECIFICATIONS

Items		Performance Characteristics
Operating Temperature Range		-55 ~ +105°C
Rated Voltage Range	V_R	2.5 ~ 25V DC
Surge Voltage	V_S	($V_R \leq 20V$): $V_S = 1.15 \cdot V_R$ ($V_R \geq 25V$): $V_S = 1.10 \cdot V_R$
Capacitance Range	C_R	39 ~ 2500 μ F
Cap. Tolerance	ΔC	$\pm 20\%$ (120Hz • 20°C)
Leakage Current (20°C • V_R applied)	I_{LEAK}	Not to exceed the values shown in standard ratings After 2 minutes
Dissipation Factor % (20°C • 120Hz)	$\tan \delta$	Not to exceed the values shown in standard ratings
Equivalent Series Resistance (20°C • 100kHz)	ESR	Not to exceed the values shown in standard ratings

Lifetime Test		
Endurance 105°C (V_R applied)	Test	2 000 hours
	$\Delta C/C_R$	Within $\pm 20\%$ of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value
Moisture Resistance stored at 60°C (RH 90 ~ 95%)	Test	1 000 hours
	$\Delta C/C_R$	Within $\pm 20\%$ of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value

DIMENSIONS • All dimensions in mm



ϕD	L	$\phi D+0.5\max$	a	F ± 0.5	$\phi d \pm 0.05$
8	7	8	1	3.5	0.6
10	7	10	1.5	5	0.6
10	10	10	1.5	5	0.6

STANDARD RATINGS

Part number shows tape version with straight leads

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
2.5	820	8	7	410	8	20	3700	PW821M2R5F070PTD
	1000	8	7	500	8	20	3700	PW102M2R5F070PTD
	1200	10	7	600	8	15	4200	PW122M2R5G070PTA
	1500	10	7	750	10	15	4200	PW152M2R5G070PTA
	1800	10	7	900	10	15	4200	PW182M2R5G070PTA
	1800	10	10	900	10	12	4500	PW182M2R5G100PTA
	2000	10	7	1000	10	15	4200	PW202M2R5G070PTA
	2000	10	10	1000	10	12	4500	PW202M2R5G100PTA
	2500	10	10	1250	10	12	4500	PW252M2R5G100PTA
4	560	8	7	448	8	20	3700	PW561M004F070PTD
	680	8	7	544	8	20	3700	PW681M004F070PTD
	820	8	7	656	8	20	3700	PW821M004F070PTD
	820	10	7	656	8	15	4200	PW821M004G070PTA
	1000	10	7	800	10	15	4200	PW102M004G070PTA
	1200	10	7	960	10	15	4200	PW122M004G070PTA
	1200	10	10	960	10	12	4500	PW122M004G100PTA
	1500	10	7	1200	10	15	4200	PW152M004G070PTA
	1500	10	10	1200	10	12	4500	PW152M004G100PTA
6.3	1800	10	10	1440	10	12	4500	PW182M004G100PTA
	470	8	7	592	8	20	3700	PW471M6R3F070PTD
	560	8	7	706	8	20	3700	PW561M6R3F070PTD
	680	8	7	857	8	20	3700	PW681M6R3F070PTD
	820	8	7	1033	10	20	3700	PW821M6R3F070PTD
	820	10	7	1033	10	15	4200	PW821M6R3G070PTA
	1000	10	7	1260	10	15	4200	PW102M6R3G070PTA
	1000	10	10	1260	10	12	4500	PW102M6R3G100PTA
	1200	10	7	1512	10	15	4200	PW122M6R3G070PTA
10	1200	10	10	1512	10	12	4500	PW122M6R3G100PTA
	1500	10	10	1890	10	12	4500	PW152M6R3G100PTA
	330	8	7	660	8	20	3700	PW331M010F070PTD
	390	8	7	780	8	20	3700	PW391M010F070PTD
	470	8	7	940	8	20	3700	PW471M010F070PTD
	470	10	7	940	8	15	4200	PW471M010G070PTA
	560	10	7	1120	8	15	4200	PW561M010G070PTA
	560	10	10	1120	8	12	4500	PW561M010G100PTA
	680	10	7	1360	10	15	4200	PW681M010G070PTA
16	680	10	10	1360	10	12	4500	PW681M010G100PTA
	820	10	7	1640	10	15	4200	PW821M010G070PTA
	820	10	10	1640	10	12	4500	PW821M010G100PTA
	1000	10	10	2000	10	12	4500	PW102M010G100PTA
	180	8	7	576	8	20	3300	PW181M016F070PTD
	220	8	7	704	8	20	3300	PW221M016F070PTD
	270	8	7	864	8	20	3300	PW271M016F070PTD
	270	10	7	864	8	20	3700	PW271M016G070PTA

See "PACKAGING INFORMATION" for pin treatment options.

STANDARD RATINGS

Part number shows tape version with straight leads

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
16	330	8	7	1056	10	20	3300	PW331M016F070PTD
	330	10	7	1056	10	20	3700	PW331M016G070PTA
	330	10	10	1056	10	15	4200	PW331M016G100PTA
	390	10	7	1248	10	20	3700	PW391M016G070PTA
	390	10	10	1248	10	20	4200	PW391M016G100PTA
	470	10	7	1504	10	20	3700	PW471M016G070PTA
	470	10	10	1504	10	15	4200	PW471M016G100PTA
	560	10	10	1792	10	15	4200	PW561M016G100PTA
20	56	8	7	224	8	25	3000	PW560M020F070PTD
	68	8	7	272	8	25	3000	PW680M020F070PTD
	82	8	7	328	8	25	3000	PW820M020F070PTD
	82	10	7	328	8	25	3400	PW820M020G070PTA
	100	8	7	400	8	25	3000	PW101M020F070PTD
	100	10	7	400	8	25	3400	PW101M020G070PTA
	100	10	10	400	8	20	3800	PW101M020G100PTA
	150	8	7	600	8	25	3000	PW151M020F070PTD
	150	10	7	600	8	25	3400	PW151M020G070PTA
	150	10	10	600	8	20	3800	PW151M020G100PTA
	180	8	7	720	8	25	3000	PW181M020F070PTD
	180	10	7	720	8	25	3400	PW181M020G070PTA
	180	10	10	720	8	20	3800	PW181M020G100PTA
	220	10	7	880	10	25	3400	PW221M020G070PTA
	220	10	10	880	10	20	3800	PW221M020G100PTA
	270	10	7	1080	10	25	3400	PW271M020G070PTA
	270	10	10	1080	10	20	3800	PW271M020G100PTA
	330	10	10	1320	10	20	3800	PW331M020G100PTA
25	39	8	7	195	8	25	3000	PW390M025F070PTD
	47	8	7	235	8	25	3000	PW470M025F070PTD
	56	8	7	280	8	25	3000	PW560M025F070PTD
	68	8	7	340	8	25	3000	PW680M025F070PTD
	68	10	7	340	8	25	3400	PW680M025G070PTA
	82	8	7	410	8	25	3000	PW820M025F070PTD
	82	10	7	410	8	25	3400	PW820M025G070PTA
	82	10	10	410	8	20	3800	PW820M025G100PTA
	100	10	7	500	10	25	3400	PW101M025G070PTA
	100	10	10	500	10	20	3800	PW101M025G100PTA
	120	10	7	600	10	25	3400	PW121M025G070PTA
	120	10	10	600	10	20	3800	PW121M025G100PTA
	150	10	7	750	10	25	3400	PW151M025G070PTA
	150	10	10	750	10	20	3800	PW151M025G100PTA
	180	10	10	900	10	20	3800	PW181M025G100PTA

See "PACKAGING INFORMATION" for pin treatment options.

MULTIPLIER K_f for RIPPLE CURRENT vs. FREQUENCY

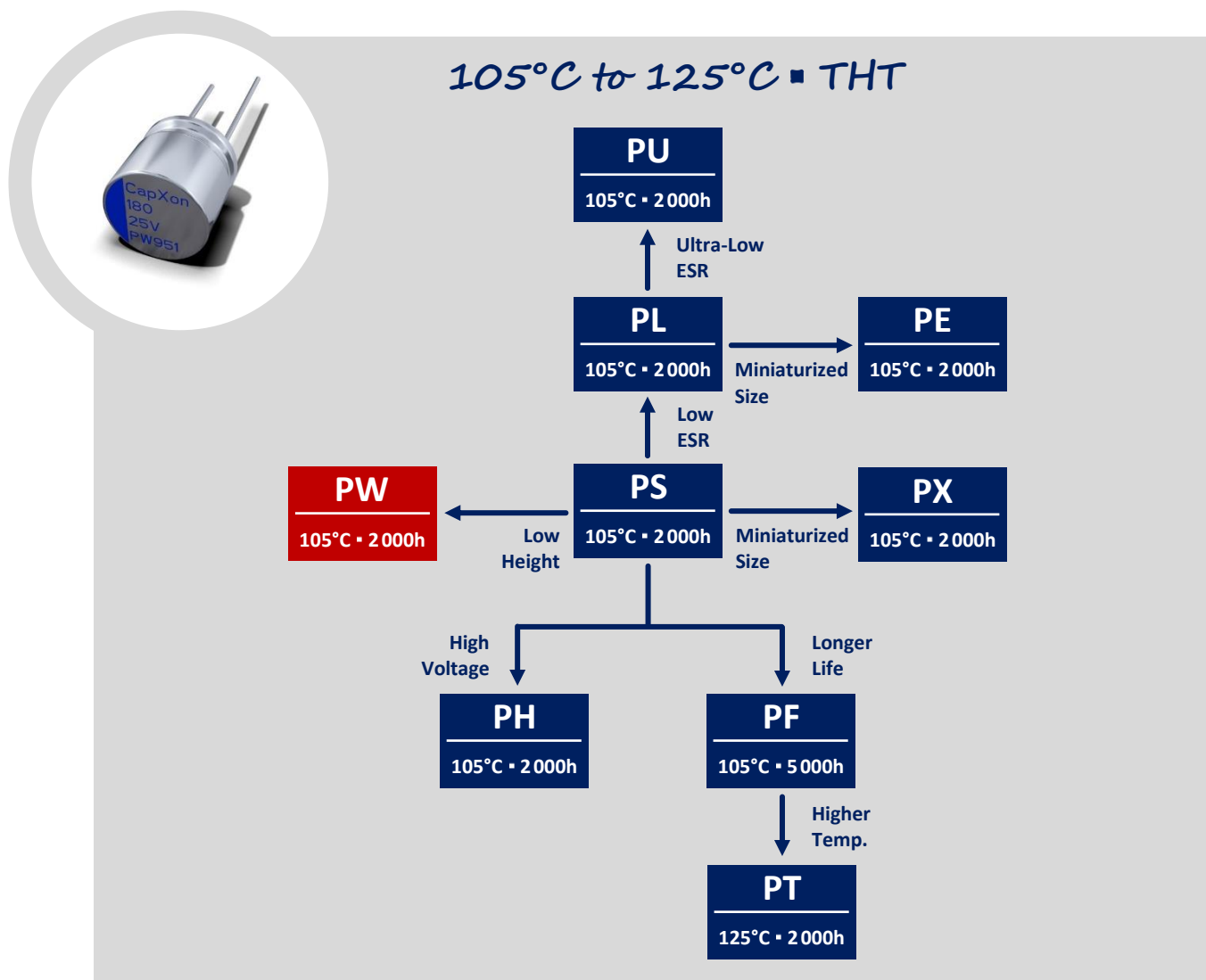
Frequency (Hz)	$120 \leq \text{Freq.} < 1k$	$1k \leq \text{Freq.} < 10k$	$10k \leq \text{Freq.} < 100k$	$100k \leq \text{Freq.} < 300k$
Coefficient K_f	0.05	0.3	0.7	1

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General Precautions & Guidelines	Packaging Information	3D Models	Reliability Tests

GROUP CHART



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PE SERIES • ULTRA MINIATURIZED TYPE

KEY FEATURES



- **SOLID CONDUCTIVE POLYMER • THT type**
- Ultra-miniaturized type for space critical applications
- Endurance: 105°C • 2 000 hours
- Large permissible ripple current
- No dry-out effect guarantees extremely long life

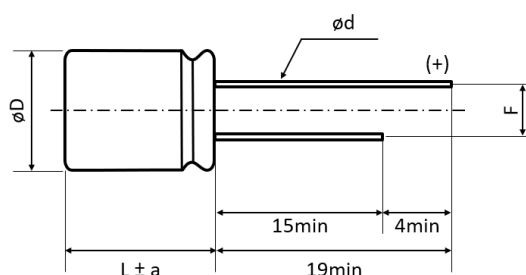


SPECIFICATIONS

Items		Performance Characteristics
Operating Temperature Range		-55 ~ +105°C
Rated Voltage Range	V_R	2.5 ~ 16 V DC
Surge Voltage	V_S	$V_S = 1.15 \cdot V_R$
Capacitance Range	C_R	270 ~ 1200μF
Cap. Tolerance	ΔC	±20% (120Hz • 20°C)
Leakage Current (20°C • V_R applied)	I_{LEAK}	Not to exceed the values shown in standard ratings After 2 minutes
Dissipation Factor % (20°C • 120Hz)	$\tan \delta$	Not to exceed the values shown in standard ratings
Equivalent Series Resistance (20°C • 100kHz)	ESR	Not to exceed the values shown in standard ratings

Lifetime Test		
Endurance 105°C (V_R applied)	Test	2 000 hours
	$\Delta C/C_R$	Within ±20% of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value
Moisture Resistance stored at 60°C (RH 90 ~ 95%)	Test	1 000 hours
	$\Delta C/C_R$	Within ±20% of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value

DIMENSIONS • All dimensions in mm



ø D	L	øD+0.5max	a	F±0.5	ød±0.05
6.3	8	6.3	1	2.5	0.6

STANDARD RATINGS

Part number shows tape version with straight leads

V_R (V)	C_R (μF)	ϕD (mm)	L (mm)	I_{LEAK} (μA , 2min)	$\tan\delta$ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (m Ω)	I_R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
2.5	560	6.3	8	280	8	7	5600	PE561M2R5E080PTC
	820	6.3	8	410	8	7	5600	PE821M2R5E080PTC
	1200	6.3	8	600	10	7	5600	PE122M2R5E080PTC
4	560	6.3	8	448	8	7	5600	PE561M004E080PTC
6.3	330	6.3	8	415	10	8	5000	PE331M6R3E080PTC
	470	6.3	8	592	8	7	5600	PE471M6R3E080PTC
	560	6.3	8	706	8	7	5600	PE561M6R3E080PTC
	680	6.3	8	857	8	7	5600	PE681M6R3E080PTC
16	270	6.3	8	864	8	15	4500	PE271M016E080PTC

See “PACKAGING INFORMATION” for pin treatment options.

MULTIPLIER K_f for RIPPLE CURRENT vs. FREQUENCY

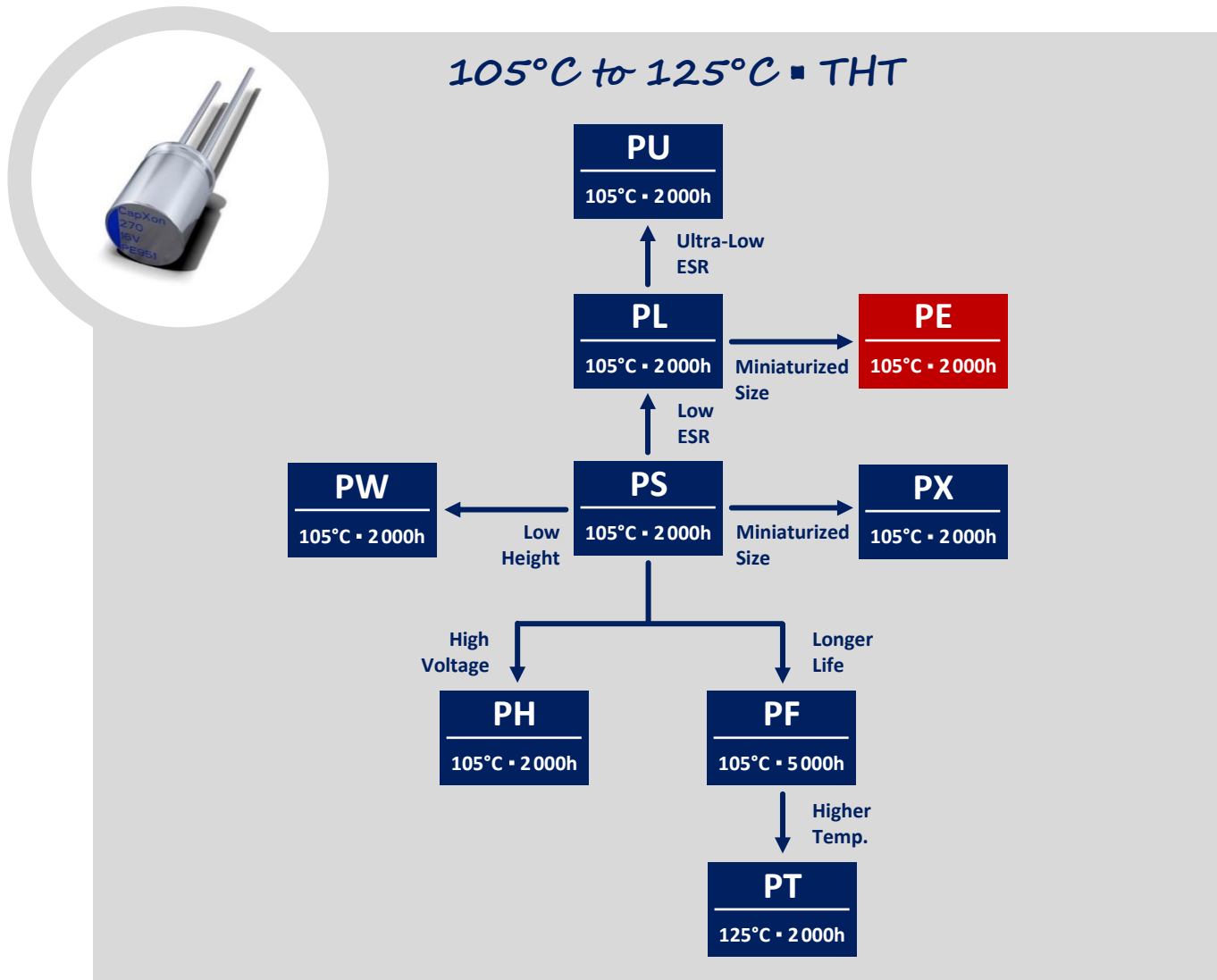
Frequency (Hz)	120 ≤ Freq. < 1k	1k ≤ Freq. < 10k	10k ≤ Freq. < 100k	100k ≤ Freq. < 300k
Coefficient K_f	0.05	0.3	0.7	1

PRECAUTIONS, GUIDELINES AND PACKAGING INFORMATION

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General Precautions & Guidelines	Packaging Information	3D Models	Reliability Tests

GROUP CHART



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PH SERIES ■ HIGH VOLTAGE & HIGH RELIABILITY

KEY FEATURES



- **SOLID CONDUCTIVE POLYMER** • THT type
- Very high ripple current in smallest dimension
- Endurance: 105°C • 2 000 hours
- Low ESR at high frequency range
- No dry-out effect guarantees extremely long life

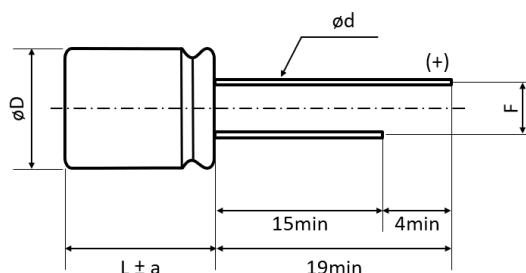


SPECIFICATIONS

Items		Performance Characteristics
Operating Temperature Range		-55 ~ +105°C
Rated Voltage Range	V_R	35 ~ 100V DC
Surge Voltage	V_S	$V_S = 1.10 \cdot V_R$
Capacitance Range	C_R	6.8 ~ 330μF
Cap. Tolerance	ΔC	±20% (120Hz • 20°C)
Leakage Current (20°C • V_R applied)	I_{LEAK}	Not to exceed the values shown in standard ratings After 2 minutes
Dissipation Factor % (20°C • 120Hz)	$\tan \delta$	Not to exceed the values shown in standard ratings
Equivalent Series Resistance (20°C • 100kHz)	ESR	Not to exceed the values shown in standard ratings

Lifetime Test		
Endurance 105°C (V_R applied)	Test	2 000 hours
	$\Delta C/C_R$	Within ±20% of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value
Moisture Resistance stored at 60°C (RH 90 ~ 95%)	Test	1 000 hours
	$\Delta C/C_R$	Within ±20% of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value

DIMENSIONS ■ All dimensions in mm



ϕD	L	$\phi D + 0.5\text{max}$	a	F±0.5	$\phi d \pm 0.05$
6.3	8	6.3	1	2.5	0.5
8	8	8	1	3.5	0.6
8	9	8	1.5	3.5	0.6
8	11.5	8	1.5	3.5	0.6
10	10	10	1.5	5	0.6
10	12.5	10	1.5	5	0.6

STANDARD RATINGS

Part number shows tape version with straight leads

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
35	10	6.3	8	175	12	40	2100	PH100M035E080PTC
	10	8	8	175	12	35	2300	PH100M035F080PTD
	22	6.3	8	154	12	40	2100	PH220M035E080PTC
	22	8	11.5	154	12	30	2890	PH220M035F115PTD
	33	8	8	231	12	30	2500	PH330M035F080PTD
	33	8	11.5	231	12	25	3100	PH330M035F115PTD
	39	8	11.5	273	12	25	3100	PH390M035F115PTD
	47	8	8	329	12	30	2700	PH470M035F080PTD
	47	8	11.5	329	12	20	3600	PH470M035F115PTD
	47	10	12.5	329	12	20	3800	PH470M035G125PTA
	56	8	8	392	12	30	2700	PH560M035F080PTD
	56	8	11.5	392	12	20	3600	PH560M035F115PTD
	68	8	8	476	12	30	2700	PH680M035F080PTD
	68	8	11.5	476	12	20	3600	PH680M035F115PTD
	68	10	12.5	476	12	20	4000	PH680M035G125PTA
	82	8	11.5	574	12	20	3600	PH820M035F115PTD
	100	8	8	700	12	25	2800	PH101M035F080PTD
	100	8	11.5	700	12	20	3600	PH101M035F115PTD
	100	10	10	700	12	25	3000	PH101M035G100PTA
	100	10	12.5	700	12	20	4000	PH101M035G125PTA
	120	10	12.5	840	12	20	4400	PH121M035G125PTA
	150	10	12.5	1050	12	15	4400	PH151M035G125PTA
	180	10	12.5	1260	12	20	4000	PH181M035G125PTA
	220	10	12.5	1540	12	20	4000	PH221M035G125PTA
	270	10	12.5	1890	12	20	4000	PH271M035G125PTA
	330	10	12.5	2310	12	18	4400	PH331M035G125PTA
50	10	8	8	100	12	45	2100	PH100M050F080PTD
	12	6.3	8	120	12	50	1800	PH120M050E080PTC
	22	8	8	220	12	45	2300	PH220M050F080PTD
	27	8	11.5	390	12	32	2700	PH270M050F115PTD
	33	8	8	330	12	45	2300	PH330M050F080PTD
	33	8	11.5	330	12	32	2700	PH330M050F115PTD
	33	10	12.5	330	12	30	3000	PH330M050G125PTA
	39	8	11.5	390	12	32	2700	PH390M050F115PTD
	39	10	12.5	390	12	30	3000	PH390M050G125PTA
	47	8	11.5	470	12	30	2800	PH470M050F115PTD
	47	10	12.5	470	12	25	3400	PH470M050G125PTA
	56	8	11.5	560	12	30	2800	PH560M050F115PTD
	56	10	10	560	12	30	2800	PH560M050G100PTA
	56	10	12.5	560	12	25	3400	PH560M050G125PTA
	68	8	9	680	12	40	2400	PH680M050F090PTD
	68	8	11.5	680	12	30	2800	PH680M050F115PTD
	68	10	12.5	680	12	25	3400	PH680M050G125PTA
	82	10	12.5	820	12	25	3400	PH820M050G125PTA

See “PACKAGING INFORMATION” for pin treatment options.

STANDARD RATINGS

Part number shows tape version with straight leads

V_R (V)	C_R (μF)	$\varnothing D$ (mm)	L (mm)	I_{LEAK} (μA , 2min)	$\tan\delta$ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (m Ω)	I_R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
50	100	10	12.5	1000	12	25	3400	PH101M050G125PTA
	120	10	12.5	1200	12	25	3400	PH121M050G125PTA
63	10	8	8	126	12	45	1900	PH100M063F080PTD
	10	8	11.5	126	12	45	2100	PH100M063F115PTD
	22	8	8	277,2	12	45	2100	PH220M063F080PTD
	27	8	11.5	340	12	35	2300	PH270M063F115PTD
	33	8	11.5	415,8	12	35	2500	PH330M063F115PTD
	33	10	10	416	12	35	2700	PH330M063G100PTA
	39	8	11.5	491,4	12	35	2500	PH390M063F115PTD
	39	10	12.5	491,4	12	32	2900	PH390M063G125PTA
	47	8	11.5	592,2	12	35	2500	PH470M063F115PTD
	47	10	12.5	592,2	12	30	3000	PH470M063G125PTA
	56	10	12.5	705,6	12	30	3000	PH560M063G125PTA
	68	10	12.5	856,8	12	30	3000	PH680M063G125PTA
	82	10	12.5	1033,2	12	30	3000	PH820M063G125PTA
	150	10	12.5	1890	12	30	3000	PH151M063G125PTA
80	10	8	8	160	12	45	1900	PH100M080F080PTD
	12	8	11.5	192	12	38	2100	PH120M080F115PTD
	22	10	12.5	352	12	35	2800	PH220M080G125PTA
	27	10	12.5	432	12	35	2800	PH270M080G125PTA
	33	8	11.5	528	12	38	2100	PH330M080F115PTD
	33	10	12.5	528	12	35	2800	PH330M080G125PTA
100	6.8	8	8	136	12	45	1800	PH6R8M100F080PTD
	8.2	8	11.5	164	12	45	1800	PH8R2M100F115PTD
	10	8	11.5	200	12	42	2100	PH100M100F115PTD
	12	8	11.5	240	12	42	2100	PH120M100F115PTD
	12	10	12.5	240	12	40	2300	PH120M100G125PTA
	15	8	11.5	300	12	42	2100	PH150M100F115PTD
	18	10	12.5	360	12	35	2500	PH180M100G125PTA
	22	10	12.5	440	12	35	2800	PH220M100G125PTA
	27	10	12.5	540	12	35	2800	PH270M100G125PTA
	33	10	12.5	660	12	35	2800	PH330M100G125PTA

See "PACKAGING INFORMATION" for pin treatment options.

MULTIPLIER K_f for RIPPLE CURRENT vs. FREQUENCY

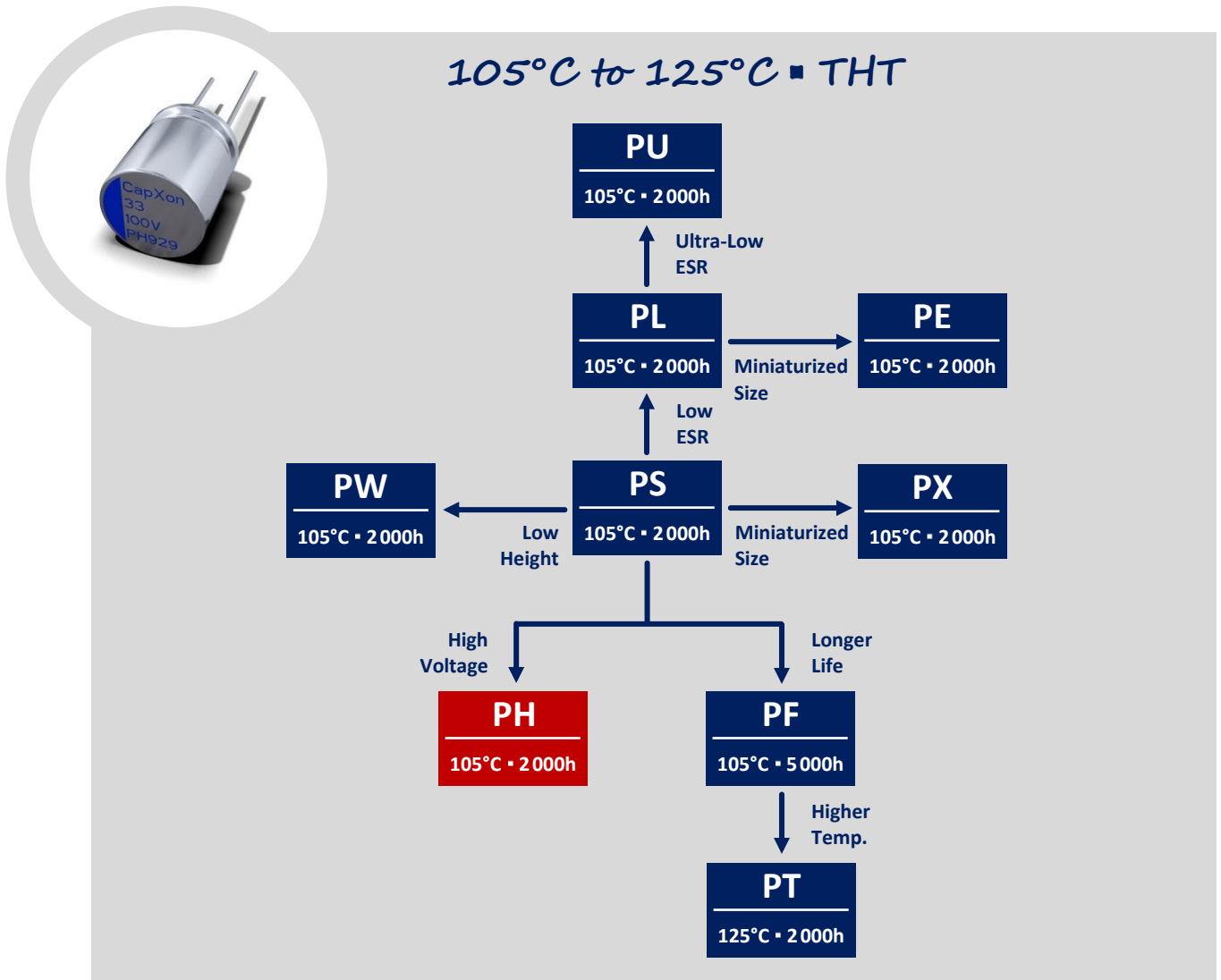
Frequency (Hz)	$120 \leq \text{Freq.} < 1k$	$1k \leq \text{Freq.} < 10k$	$10k \leq \text{Freq.} < 100k$	$100k \leq \text{Freq.} < 300k$
Coefficient K_f	0.05	0.3	0.7	1

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PF SERIES ▀ ULTRA LONG LIFE TYPE ▀ 5 000 hours

KEY FEATURES



- **SOLID CONDUCTIVE POLYMER** ▀ THT type
- Ultra-low ESR at high frequency range
- Endurance: 105°C ▀ 5 000 hours
- Very large permissible ripple current
- No dry-out effect guarantees extremely long life

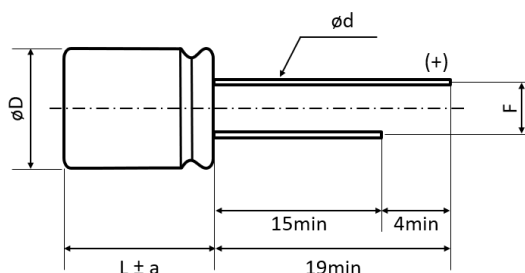


SPECIFICATIONS

Items		Performance Characteristics
Operating Temperature Range		-55 ~ +105°C
Rated Voltage Range	V_R	2.5 ~ 35V DC
Surge Voltage	V_S	($V_R \leq 20V$): $V_S = 1.15 \cdot V_R$ ($V_R \geq 25V$): $V_S = 1.10 \cdot V_R$
Capacitance Range	C_R	10 ~ 2700 μ F
Cap. Tolerance	ΔC	$\pm 20\%$ (120Hz ▀ 20°C)
Leakage Current (20°C ▀ V_R applied)	I_{LEAK}	Not to exceed the values shown in standard ratings After 2 minutes
Dissipation Factor % (20°C ▀ 120Hz)	$\tan \delta$	Not to exceed the values shown in standard ratings
Equivalent Series Resistance (20°C ▀ 100kHz)	ESR	Not to exceed the values shown in standard ratings

Lifetime Test		
Endurance 105°C (V_R applied)	Test	5 000 hours
	$\Delta C/C_R$	Within $\pm 20\%$ of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value
Moisture Resistance stored at 60°C (RH 90 ~ 95%)	Test	1 000 hours
	$\Delta C/C_R$	Within $\pm 20\%$ of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value

DIMENSIONS ▀ All dimensions in mm



ϕD	L	$\phi D+0.5\max$	a	F ± 0.5	$\phi d \pm 0.05$
4	5	4	1	1.5	0.45
5	8 and 9	5	1	2	0.5
6.3	5.2	6.3	1	2.5	0.45
6.3	8	6.3	1	2.5	0.5
6.3	11	6.3	1	2.5	0.6
8	7 and 8	8	1	3.5	0.6
8	11.5	8	1.5	3.5	0.6
10	12.5	10	1.5	5	0.6

STANDARD RATINGS

Part number shows tape version with straight leads

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
2.5	100	5	8	300	8	9	4180	PF101M2R5C080PTB
	220	5	8	300	8	9	4180	PF221M2R5C080PTB
	300	5	9	300	8	9	4180	PF301M2R5C090PTB
	330	5	8	300	8	9	4180	PF331M2R5C080PTB
	330	6.3	8	300	8	9	5600	PF331M2R5E080PTC
	390	6.3	5.2	300	8	15	3100	PF391M2R5E052PTC
	470	5	8	300	8	9	4180	PF471M2R5C080PTB
	470	6.3	8	300	8	9	5600	PF471M2R5E080PTC
	560	5	8	300	8	9	4180	PF561M2R5C080PTB
	560	6.3	5.2	300	8	15	3100	PF561M2R5E052PTC
	560	6.3	8	300	8	9	5600	PF561M2R5E080PTC
	560	8	8	300	8	9	6100	PF561M2R5F080PTD
	820	6.3	8	410	8	9	5600	PF821M2R5E080PTC
	820	8	7	410	8	10	5000	PF821M2R5F070PTD
	820	8	8	410	8	9	6100	PF821M2R5F080PTD
	1000	8	8	500	8	9	6100	PF102M2R5F080PTD
	1500	8	11.5	750	8	9	6100	PF152M2R5F115PTD
	2000	10	12.5	1000	8	9	6640	PF202M2R5G125PTA
	2700	10	12.5	1350	8	9	6640	PF272M2R5G125PTA
4	270	6.3	8	300	8	9	5000	PF271M004E080PTC
	330	5	8	300	8	9	4050	PF331M004C080PTB
	390	6.3	8	312	8	9	5000	PF391M004E080PTC
	560	6.3	8	448	8	9	5600	PF561M004E080PTC
	560	8	7	448	8	15	3900	PF561M004F070PTD
	680	8	8	542	8	9	6100	PF681M004F080PTD
	820	8	8	656	8	9	6100	PF821M004F080PTD
	1000	8	11.5	800	8	9	6100	PF102M004F115PTD
	1200	10	12.5	960	8	9	6640	PF122M004G125PTA
	1500	10	12.5	1200	8	9	6640	PF152M004G125PTA
6.3	2000	10	12.5	1600	8	9	6640	PF202M004G125PTA
	220	6.3	5.2	300	8	18	2980	PF221M6R3E052PTC
	220	6.3	8	300	8	10	4500	PF221M6R3E080PTC
	270	5	8	340	8	10	3700	PF271M6R3C080PTB
	330	5	8	416	8	10	3700	PF331M6R3C080PTB
	330	6.3	8	416	8	9	5000	PF331M6R3E080PTC
	390	8	8	491	8	9	6100	PF391M6R3F080PTD
	390	8	7	491	8	15	3900	PF391M6R3F070PTD
	470	6.3	8	592	8	9	5100	PF471M6R3E080PTC
	470	8	8	592	8	9	6100	PF471M6R3F080PTD
	560	6.3	8	706	8	9	5100	PF561M6R3E080PTC
	560	8	8	706	8	9	6100	PF561M6R3F080PTD
	680	8	8	428	8	9	6100	PF681M6R3F080PTD
	820	8	8	517	10	9	6100	PF821M6R3F080PTD
	820	10	12.5	517	10	9	6640	PF821M6R3G125PTA

See "PACKAGING INFORMATION" for pin treatment options.

STANDARD RATINGS

Part number shows tape version with straight leads

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
6.3	1000	8	11.5	630	10	9	6100	PF102M6R3F115PTD
	1200	8	11.5	756	10	9	6100	PF122M6R3F115PTD
	1500	10	12.5	945	10	9	6640	PF152M6R3G125PTA
	2000	10	12.5	1260	10	9	6640	PF202M6R3G125PTA
10	10	4	5	300	8	100	700	PF100M010B050PTF
	68	6.3	8	300	8	10	4500	PF680M010E080PTC
	100	6.3	8	300	8	10	4500	PF101M010E080PTC
	150	6.3	8	300	8	10	4500	PF151M010E080PTC
	270	8	7	270	8	22	3300	PF271M010F070PTD
	270	8	11.5	270	8	9	5600	PF271M010F115PTD
	330	8	11.5	330	8	9	5600	PF331M010F115PTD
	390	8	8	390	8	9	6100	PF391M010F080PTD
	470	8	8	470	8	9	6100	PF471M010F080PTD
	470	10	12.5	470	8	9	6100	PF471M010G125PTA
	560	8	8	560	10	9	6100	PF561M010F080PTD
	560	10	12.5	560	10	9	6100	PF561M010G125PTA
	680	8	11.5	680	10	9	6100	PF681M010F115PTD
	820	10	12.5	820	10	9	6640	PF821M010G125PTA
	1000	10	12.5	1000	10	9	6640	PF102M010G125PTA
16	100	6.3	5.2	300	8	24	2490	PF101M016E052PTC
	100	6.3	8	300	8	15	3500	PF101M016E080PTC
	100	6.3	11	300	8	12	4800	PF101M016E110PTC
	150	6.3	5.2	300	8	24	3200	PF151M016E052PTC
	150	8	7	300	8	22	3300	PF151M016F070PTD
	180	6.3	11	288	8	12	5600	PF181M016E110PTC
	180	8	8	288	8	10	5100	PF181M016F080PTD
	180	10	12.5	288	8	10	5600	PF181M016G125PTA
	220	8	8	352	8	10	5100	PF221M016F080PTD
	220	8	7	352	8	22	3300	PF221M016F070PTD
	270	8	8	432	8	10	5100	PF271M016F080PTD
	270	8	7	432	8	22	3300	PF271M016F070PTD
	270	10	12.5	432	8	10	5600	PF271M016G125PTA
	330	8	8	528	10	10	4700	PF331M016F080PTD
	330	8	11.5	528	8	10	5600	PF331M016F115PTD
	390	10	12.5	624	8	10	6100	PF391M016G125PTA
	470	8	11.5	752	10	10	5400	PF471M016F115PTD
	470	10	12.5	752	10	10	6100	PF471M016G125PTA
	560	8	11.5	896	10	10	6100	PF561M016F115PTD
	560	10	12.5	896	10	10	6100	PF561M016G125PTA
	1000	10	12.5	1600	10	12	5400	PF102M016G125PTA

See "PACKAGING INFORMATION" for pin treatment options.

STANDARD RATINGS

Part number shows tape version with straight leads

V_R (V)	C_R (μ F)	ϕ D (mm)	L (mm)	I_{LEAK} (μ A, 2min)	$\tan\delta$ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (m Ω)	I_R • Max. Ripple Current +105°C • 100kHz (mA rms)	CapXon Part Number
20	120	6.3	5.2	480	12	25	3200	PF121M020E052PTC
	150	10	12.5	600	12	14	5000	PF151M020G125PTA
	180	8	7	720	12	25	3200	PF181M020F070PTD
	330	10	12.5	1320	12	14	5000	PF331M020G125PTA
	390	8	11.5	1560	12	14	4950	PF391M020F115PTD
	560	10	12.5	2240	12	12	5400	PF561M020G125PTA
	680	10	12.5	2720	12	12	5400	PF681M020G125PTA
25	56	6.3	5.2	280	12	30	2800	PF560M025E052PTC
	68	8	11.5	340	12	20	4100	PF680M025F115PTD
	82	6.3	8	410	12	28	2780	PF820M025E080PTC
	82	8	7	410	12	28	3000	PF820M025F070PTD
	100	8	11.5	500	12	20	4100	PF101M025F115PTD
	100	10	12.5	500	12	18	4650	PF101M025G125PTA
	180	8	8	900	12	18	3770	PF181M025F080PTD
	180	8	11.5	900	12	18	4200	PF181M025F115PTD
	220	8	11.5	1100	12	18	4200	PF221M025F115PTD
	270	10	12.5	1350	12	18	4650	PF271M025G125PTA
	330	10	12.5	1650	12	14	5000	PF331M025G125PTA
	390	10	12.5	1950	12	14	5000	PF391M025G125PTA
35	22	6.3	5.2	300	12	35	2600	PF220M035E052PTC
	33	10	12.5	231	12	25	3100	PF330M035G125PTA
	39	8	7	273	12	32	2800	PF390M035F070PTD
	68	8	11.5	476	12	20	3600	PF680M035F115PTD
	82	8	11.5	574	12	20	3600	PF820M035F115PTD
	120	10	12.5	840	12	18	4000	PF121M035G125PTA
	150	10	12.5	1050	12	18	4000	PF151M035G125PTA

See "PACKAGING INFORMATION" to formed products.

MULTIPLIER K_f for RIPPLE CURRENT vs. FREQUENCY

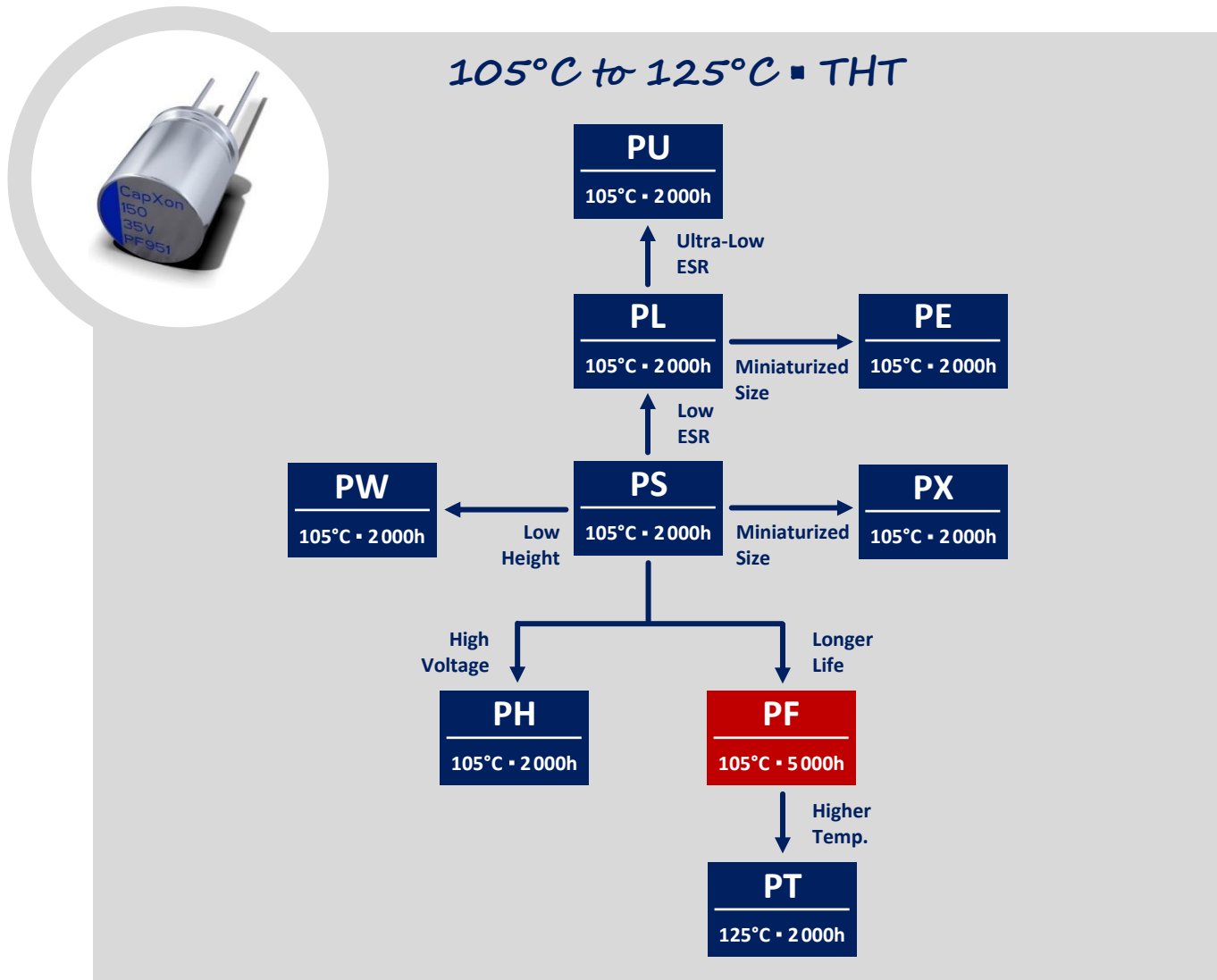
Frequency (Hz)	$120 \leq \text{Freq.} < 1k$	$1k \leq \text{Freq.} < 10k$	$10k \leq \text{Freq.} < 100k$	$100k \leq \text{Freq.} < 300k$
Coefficient K_f	0.05	0.3	0.7	1

PRECAUTIONS, GUIDELINES AND PACKAGING INFORMATION

Unless otherwise agreed in individual specifications, all products are subject to our "General Precautions and Guidelines" as well as our "Packaging Information". Please refer to the following links in the table.

General Precautions & Guidelines	Packaging Information	3D Models	Reliability Tests

GROUP CHART



DISCLAIMER

All product related data (e.g. specification, statements and general information) are subject to change without any notice. It is necessary that the customer observes all product related technical / application information and handling instructions.

CapXon products are designed and manufactured according to severe quality and safety standards. Under no circumstance, CapXon warrants that any CapXon product is suitable for the purposes intended for your application, even CapXon knows the application. It is customer's duty and obligation to check and make sure that CapXon products are suitable for the purposes intended and select the correct and proper CapXon product. Customers are requested to perform a sufficient validation and reliability evaluation to assure needed safety level and reliability performance by suitable designs and to apply proper safeguards (e.g. redundancies, protective circuits).

Particular operating conditions (ambient temperature, ripple current, voltage, thermal resistance, etc.) as well as storage, production or assembly may affect the performance and the lifetime of the capacitor. Please consult CapXon for lifetime estimation, failure mode considerations or worst-case scenarios according to the product technology, product tolerances / deviations or change of the characteristics of the capacitor due to shipment, storage, handling, production and usage.

For aerospace or military application, life-saving, life-sustaining, safety critical applications or any application where failure may cause severe personal injury or death, please consult us before design-in the capacitor in your application.

Except for the written expressed warranties, CapXon does not impliedly, by assumption or whatever else, warrant, undertake, promise any other warranty or guaranty for any CapXon product.

For further information, please visit our website www.capxongroup.com or contact CapXon directly.

PT SERIES ■ HIGH TEMPERATURE 125°C TYPE

KEY FEATURES



- **SOLID CONDUCTIVE POLYMER** ■ THT type
- Especially for high temperature environments
- Endurance: 125°C ■ 2 000 hours
- Very large permissible ripple current
- No dry-out effect guarantees extremely long life

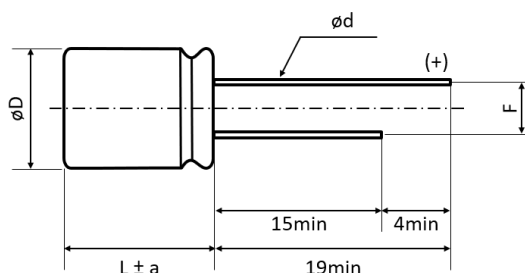


SPECIFICATIONS

Items		Performance Characteristics
Operating Temperature Range		-55 ~ +125°C
Rated Voltage Range	V_R	2.5 ~ 50V DC
Surge Voltage	V_S	($V_R \leq 20V$): $V_S = 1.15 \cdot V_R$ ($V_R \geq 25V$): $V_S = 1.10 \cdot V_R$
Capacitance Range	C_R	22 ~ 2700 μ F
Cap. Tolerance	ΔC	$\pm 20\%$ (120Hz ■ 20°C)
Leakage Current (20°C ■ V_R applied)	I_{LEAK}	Not to exceed the values shown in standard ratings After 2 minutes
Dissipation Factor % (20°C ■ 120Hz)	$\tan \delta$	Not to exceed the values shown in standard ratings
Equivalent Series Resistance (20°C ■ 100kHz)	ESR	Not to exceed the values shown in standard ratings

Lifetime Test		
Endurance 125°C (V_R applied)	Test	2 000 hours
	$\Delta C/C_R$	Within $\pm 20\%$ of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value
Moisture Resistance stored at 60°C (RH 90 ~ 95%)	Test	1 000 hours
	$\Delta C/C_R$	Within $\pm 20\%$ of the initial value
	$\tan \delta$	Not to exceed 150% of the value specified
	ESR	Not to exceed 150% of the value specified
	I_{Leak}	Less than the specified value

DIMENSIONS ■ All dimensions in mm



ϕD	L	$\phi D+0.5\max$	a	F ± 0.5	$\phi d \pm 0.05$
6.3	5.2	6.3	1	2.5	0.45
6.3	11	6.3	1	2.5	0.6
8	7	8	1	3.5	0.6
8	8	8	1	3.5	0.6
8	11.5	8	1.5	3.5	0.6
10	8	10	1.5	5	0.6
10	10	10	1.5	5	0.6
10	12.5	10	1.5	5	0.6

STANDARD RATINGS

Part number shows tape version with straight leads

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Cur- rent+105°C • 100kHz (mA rms)	I _R • Max. Ripple Cur- rent+125°C • 100kHz (mA rms)	CapXon Part Number
2.5	820	8	8	410	8	9	5500	1741	PT821M2R5F080PTD
	1000	8	11.5	500	8	9	6100	1929	PT102M2R5F115PTD
	1500	8	11.5	750	8	9	6100	1929	PT152M2R5F115PTD
	2000	10	12.5	1000	8	9	6640	2100	PT202M2R5G125PTA
	2700	10	12.5	1350	8	9	6640	2100	PT272M2R5G125PTA
4	150	6.3	5.2	300	8	40	1810	572	PT151M004E052PTC
	330	8	7	264	8	30	3000	949	PT331M004F070PTD
	560	8	8	224	8	9	5500	1741	PT561M004F080PTD
	560	8	11.5	224	8	9	6100	1929	PT561M004F115PTD
	680	10	8	544	8	25	3700	1170	PT681M004G080PTA
	820	8	8	328	8	9	5500	1741	PT821M004F080PTD
	1200	8	11.5	960	8	9	6100	1929	PT122M004F115PTD
	1500	10	12.5	1200	8	9	6640	2100	PT152M004G125PTA
	2500	10	12.5	2000	8	9	6640	2100	PT252M004G125PTA
6.3	82	6.3	5.2	258	8	40	1800	569	PT820M6R3E052PTC
	150	8	7	473	8	30	3000	949	PT151M6R3F070PTD
	330	10	8	416	8	25	3700	1170	PT331M6R3G080PTA
	390	8	8	491	8	9	5500	1741	PT391M6R3F080PTD
	470	8	11.5	592	8	9	6100	1929	PT471M6R3F115PTD
	680	8	8	428	8	9	5500	1741	PT681M6R3F080PTD
	680	10	12.5	428	8	9	6100	1929	PT681M6R3G125PTA
	820	10	12.5	517	10	9	6100	1929	PT821M6R3G125PTA
	1000	8	11.5	630	10	9	6100	1929	PT102M6R3F115PTD
	1500	10	12.5	945	10	9	6640	2100	PT152M6R3G125PTA
10	56	6.3	5.2	280	8	40	1800	569	PT560M010E052PTC
	120	8	7	240	8	30	3000	949	PT121M010F070PTD
	220	8	11.5	220	8	9	6100	1929	PT221M010F115PTD
	270	10	8	270	8	25	3700	1170	PT271M010G080PTA
	330	8	11.5	330	8	9	6100	1929	PT331M010F115PTD
	560	10	12.5	560	10	9	6100	1929	PT561M010G125PTA
	680	8	11.5	680	10	9	6100	1929	PT681M010F115PTD
	1000	10	12.5	1000	10	9	6640	2100	PT102M010G125PTA
	39	6.3	5.2	312	8	40	1800	569	PT390M016E052PTC
16	82	8	7	300	8	30	2700	854	PT820M016F070PTD
	100	6.3	11	160	8	12	4800	1518	PT101M016E110PTC
	150	8	8	240	8	18	3600	1140	PT151M016F080PTD
	150	10	8	240	8	25	3300	1044	PT151M016G080PTA
	180	8	11.5	288	8	10	5600	1771	PT181M016F115PTD
	220	8	11.5	352	8	10	5600	1771	PT221M016F115PTD
	270	8	11.5	432	8	10	5600	1771	PT271M016F115PTD
	330	8	11.5	528	8	10	5600	1771	PT331M016F115PTD
	470	10	12.5	752	10	10	6100	1929	PT471M016G125PTA
	560	10	12.5	896	10	10	6100	1929	PT561M016G125PTA

See "PACKAGING INFORMATION" for pin treatment options.

STANDARD RATINGS

Part number shows tape version with straight leads

V _R (V)	C _R (μF)	ø D (mm)	L (mm)	I _{LEAK} (μA, 2min)	tanδ +20°C • 120Hz (%)	Max. ESR +20°C • 100kHz (mΩ)	I _R • Max. Ripple Cur- rent+105°C • 100kHz (mA rms)	I _R • Max. Ripple Cur- rent+125°C • 100kHz (mA rms)	CapXon Part Number
20	22	6.3	5.2	220	12	60	1450	458	PT220M020E052PTC
	47	8	7	300	12	30	2700	854	PT470M020F070PTD
	68	10	8	272	12	30	3000	949	PT680M020G080PTA
	100	8	11.5	400	12	22	3900	1234	PT101M020F115PTD
	120	8	8	480	12	25	3100	981	PT121M020F080PTD
	150	8	11.5	600	12	22	3900	1234	PT151M020F115PTD
	150	10	12.5	600	12	20	4500	1424	PT151M020G125PTA
	270	10	12.5	1080	12	20	4900	1550	PT271M020G125PTA
25	68	8	11.5	340	12	24	3500	1108	PT680M025F115PTD
	82	8	8	410	12	25	3100	981	PT820M025F080PTD
	100	10	12.5	500	12	20	4500	1424	PT101M025G125PTA
	120	8	11.5	600	12	22	3900	1234	PT121M025F115PTD
	180	10	12.5	900	12	20	4500	1424	PT181M025G125PTA
35	39	8	8	273	12	32	2600	823	PT390M035F080PTD
	56	8	11.5	392	12	25	3200	1013	PT560M035F115PTD
	100	10	12.5	700	12	22	4000	1266	PT101M035G125PTA
50	22	8	8	220	12	35	2500	790	PT220M050F080PTD
	27	8	11.5	270	12	32	2700	854	PT270M050F115PTD
	33	10	10	330	12	30	3476	1100	PT330M050G100PTA
	47	10	12.5	470	12	25	4100	1297	PT470M050G125PTA

See “PACKAGING INFORMATION” for pin treatment options.

MULTIPLIER K_f for RIPPLE CURRENT vs. FREQUENCY

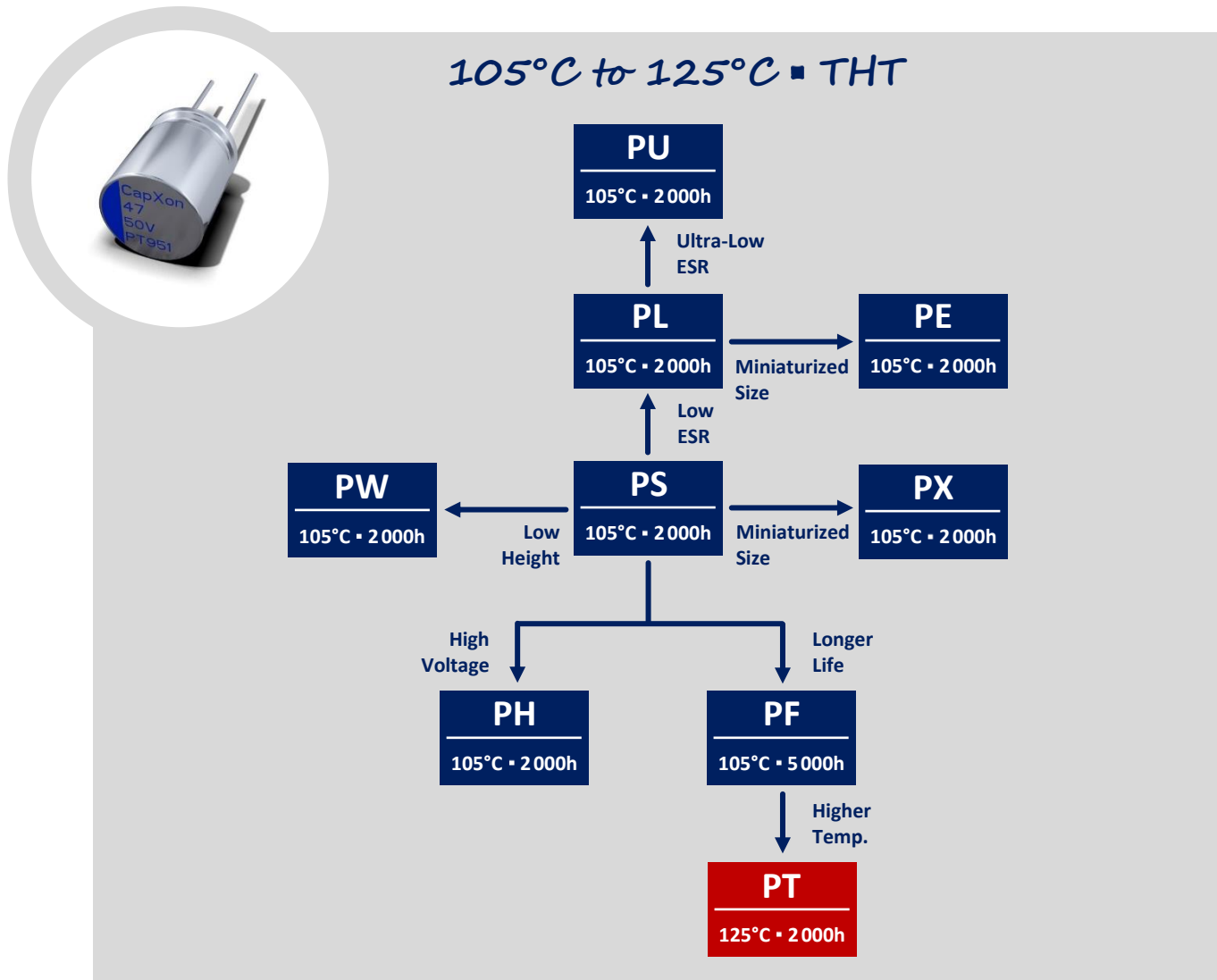
Frequency (Hz)	120 ≤ Freq. < 1k	1k ≤ Freq. < 10k	10k ≤ Freq. < 100k	100k ≤ Freq. < 300k
Coefficient K_f	0.05	0.3	0.7	1

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GROUP CHART



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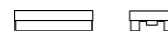
Particular operating conditions (ambient temperature, ripple current, voltage, thermal resistance, etc.) as well as storage, production or assembly may affect the performance and the lifetime of the capacitor. Please consult CapXon for lifetime estimation, failure mode considerations or worst-case scenarios according to the product technology, product tolerances / deviations or change of the characteristics of the capacitor due to shipment, storage, handling, production and usage.

For aerospace or military application, life-saving, life-sustaining, safety critical applications or any application where failure may cause severe personal injury or death, please consult us before design-in the capacitor in your application.

Except for the written expressed warranties, CapXon does not impliedly, by assumption or whatever else, warrant, undertake, promise any other warranty or guaranty for any CapXon product.

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PRODUCT CODE • SMD MLPC - MULTILAYER POLYMER CAPACITORS



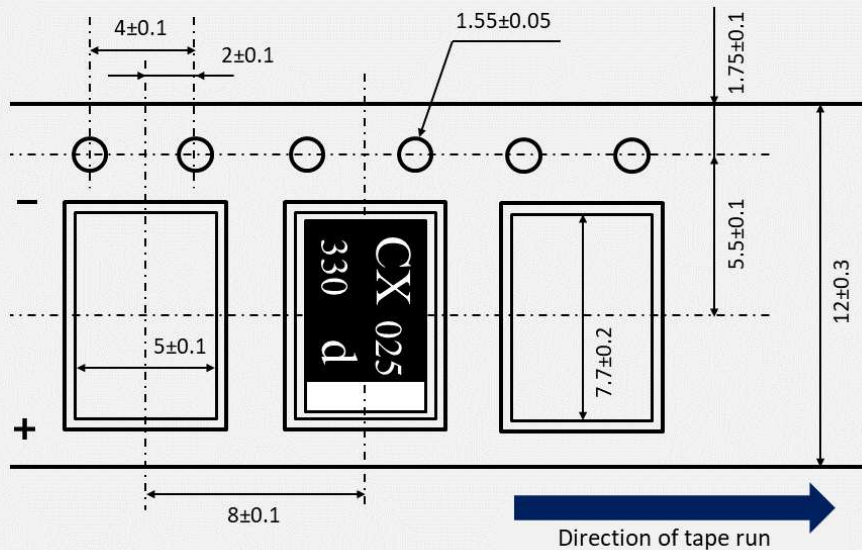
SMD type example:

XA series • 100μF • 6.3V • ±20% • L x W 7.3 x 4.3mm • H 1.9mm • 15mΩ • Tape & Reel

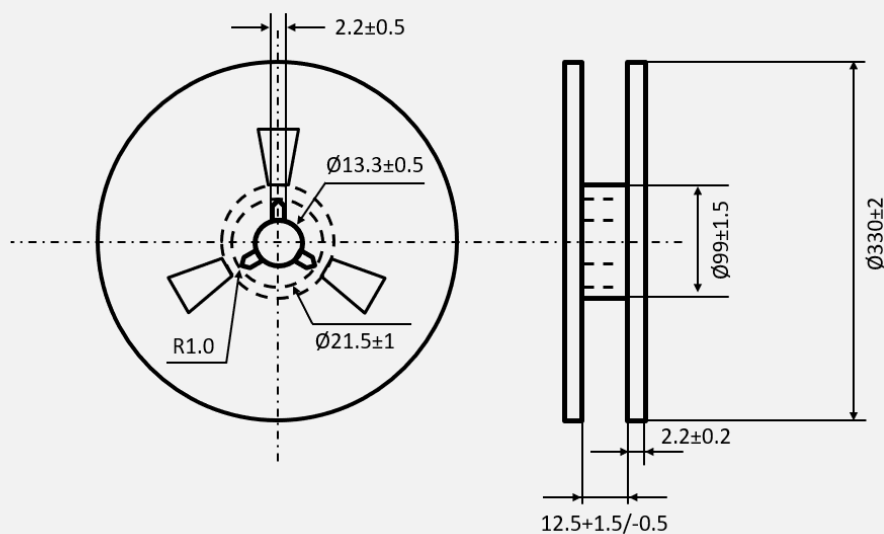
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
X	A	1	0	1	M	6	R	3	7	0	1	9	P	1	5	0	-	-	-	
Series		Capacitance				Voltage			Case L x W (mm)	Height (mm)			Type code	ESR (mΩ)			Special requirement			
Code	H (mm)	Code				Code	Volt		Code	L x W	Code	H	Code	Type	Code	ESR				
XA	1.9	010				002	2		014	1.4	P	Polymer	045	4.5						
XH	1.4	4R7				2R5	2.5		019	1.9										
		100				004	4													
		101				6R3	6.3													
		102				008	8													
		152				010	10													
						016	16													
						025	25													

TAPING • SMD MLPC - MULTILAYER POLYMER CAPACITORS • REEL PACK

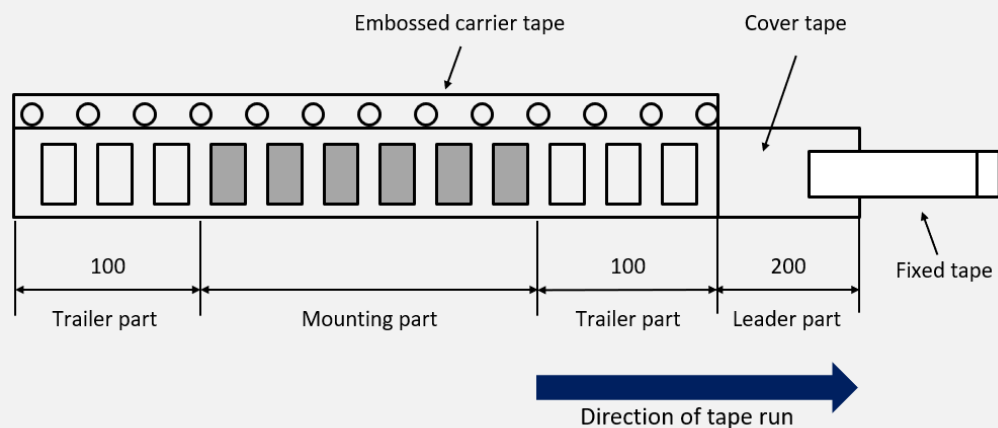
MLPC tape (unit: mm)



Reel (unit: mm)

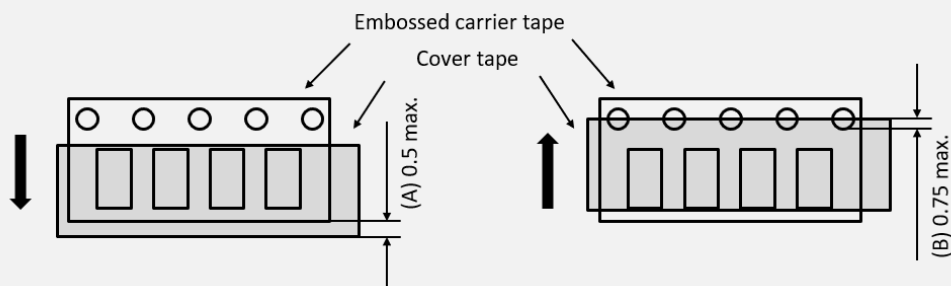


Cover tape (unit: mm)



TAPING - SMD MLPC - MULTILAYER POLYMER CAPACITORS - REEL PACK

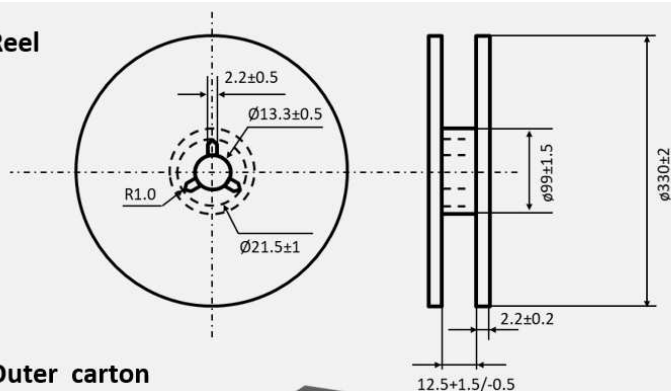
Cover tape



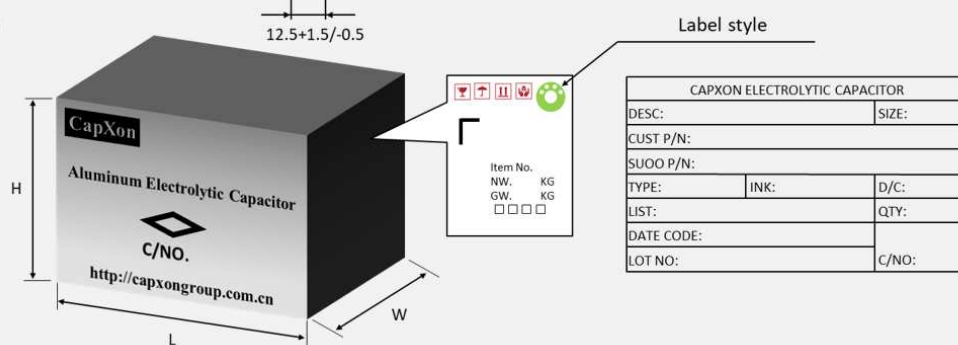
The cover tape covered the sprocket holes shall not exceed the limit as following:

- Deviation between carrier tape and seal tape shall be less than 0.5mm.
- Seal tape covered on the feeding holes shall be less than 0.75mm.

Reel



Outer carton



Series	Reel quantity (pcs)	Outer box quantity (pcs)	Outer box size L x W x H (mm)	Country of origin	Tariff number
XA	3500	17500	395 x 395 x 130	China	85322200
XH	3500	17500	395 x 395 x 130	China	85322200

PRODUCT CODE • SMD CONDUCTIVE POLYMER CAPACITORS



SMD type example:

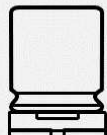
PV series • 150µF • 16V • ±20% • Ø 8mm • H 7.7mm • Tape & Reel

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
P	V	1	5	1	M	0	1	6	F	0	7	7	P	T	R	-	-	-	-
Series	Capacitance	Capacitance tolerance	Voltage	Case Ø (mm)	Height (mm)	Type code	Taping	Special requirement											
Code	µF	Code	Volt	Code	H	Code	Code	Code											
010	1	M	2R5	B	055	P	TR	U											
4R7	4.7		004	C	058														
100	10		6R3	E	077														
101	100		010	F	087														
102	1000		016	G	105														
152	1500		020		117														
			025		124														
			035																
			050																
			063																
			080																
			100																

See datasheet for reference

MARKING • SMD CONDUCTIVE POLYMER CAPACITORS

Solid Conductive Polymer Capacitor • SMD type



CapXon: Manufacturer trademark
 150: Nominal capacitance (µF)
 16V: Rated voltage (V)
 (-) polarity (Cathode indicate)

PV: PV Series
 015: Production datacode year/week
 (ex. 2020/15th week)

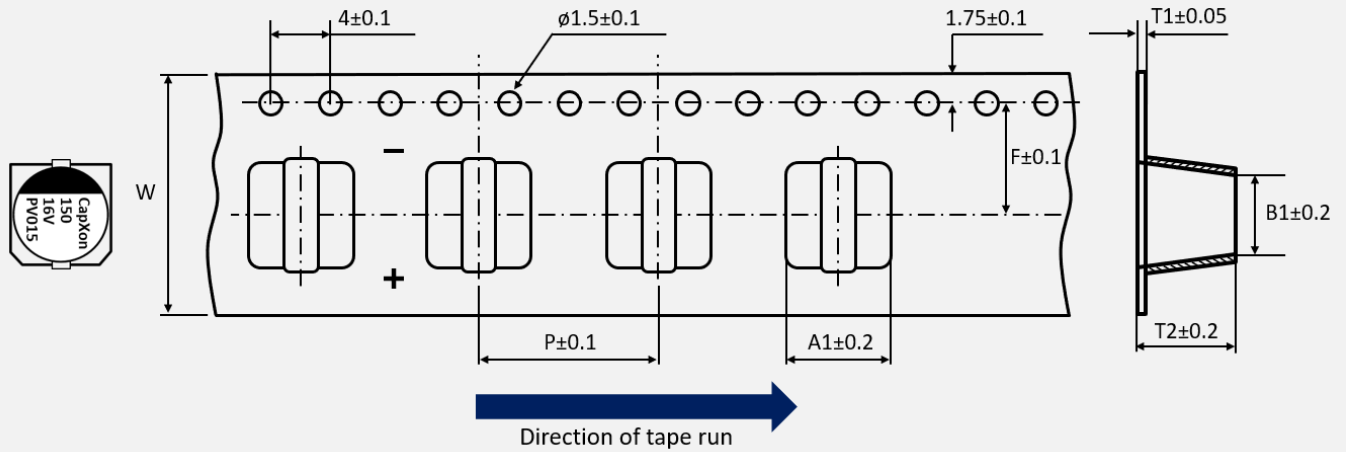
Top view



0 15
 → Production week
 → Last digit of the year

TAPING • SMD CONDUCTIVE POLYMER CAPACITORS • REEL PACK

SMD taping • ϕD 4mm to 10mm

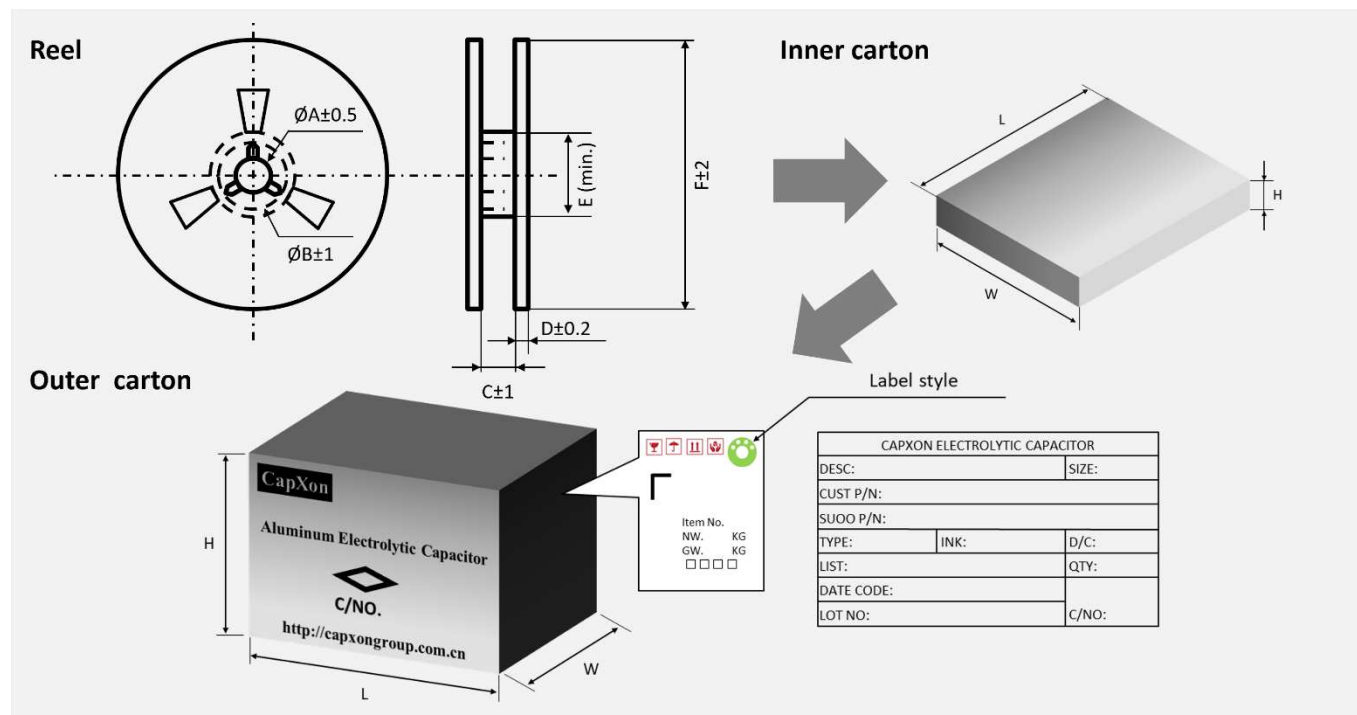


All dimensions in mm

ϕD	4 x 5.5	5 x 5.5	5 x 5.8	6.3 x 5.8	6.3 x 7.7	8 x 7.7
W	12	12	12	16	16	16
P	8	12	12	12	12	12
F	5.5	5.5	5.5	7.5	7.5	7.5
A1	4.7	5.7	5.7	7	7	8.7
B1	4.7	5.7	5.7	7	7	8.7
T1	0.4	0.4	0.4	0.4	0.4	0.4
T2	5.7	5.7	6.1	6.2	8.1	8.2

ϕD	8 x 8.7	8 x 10.5	8 x 11.7	10 x 8.7	10 x 10.5	10 x 12.4
W	24	24	24	24	24	24
P	16	16	16	16	16	16
F	11.5	11.5	11.5	11.5	11.5	11.5
A1	8.7	8.7	8.7	10.7	10.7	10.7
B1	8.7	8.7	8.7	10.7	10.7	10.7
T1	0.4	0.4	0.5	0.4	0.5	0.4
T2	11	11	13	11	11	12.9

TAPING • SMD CONDUCTIVE POLYMER CAPACITORS • REEL PACK • PAPER REEL



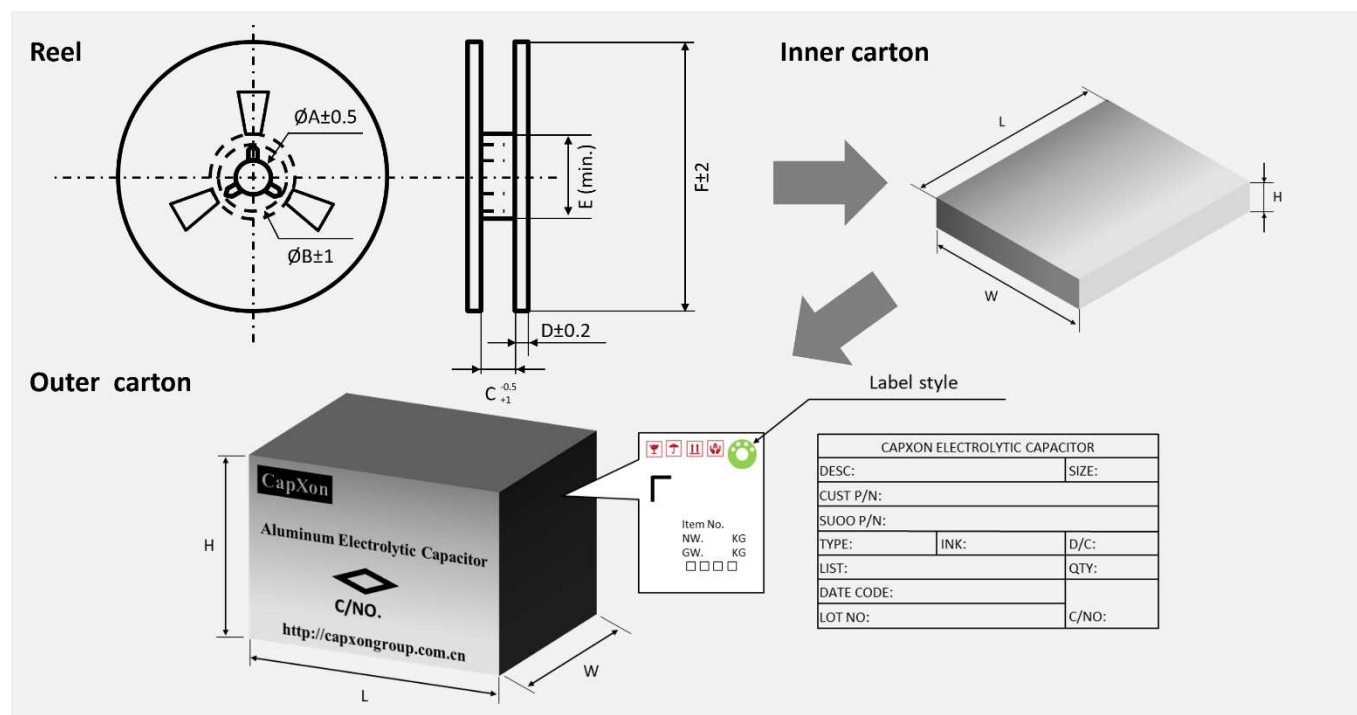
Ø D (mm)	L (mm)	Reel quantity (pcs)	Inner box quantity (pcs)	Inner box size L x W x H (mm)	Outer box quantity (pcs)	Outer box size L x W x H (mm)	Country of origin	Tariff number
4	5.5	2000	10000	400 x 390 x 106	30000	425 x 412 x 340	China	85322200
5	5.5	1000	5000	400 x 390 x 106	15000	425 x 412 x 340	China	85322200
	5.8	1000	5000	400 x 390 x 106	15000	425 x 412 x 340	China	85322200
6.3	5.8	1000	4000	400 x 390 x 106	12000	425 x 412 x 340	China	85322200
	7.7	900	3600	400 x 390 x 106	10800	425 x 412 x 340	China	85322200
8	7.7	700	2800	400 x 390 x 106	8400	425 x 412 x 340	China	85322200
	8.7	500	1500	400 x 390 x 106	4500	425 x 412 x 340	China	85322200
	10.5	500	1500	400 x 390 x 106	4500	425 x 412 x 340	China	85322200
10	11.7	400	1200	400 x 390 x 106	3600	425 x 412 x 340	China	85322200
	8.7	500	1500	400 x 390 x 106	4500	425 x 412 x 340	China	85322200
	10.5	500	1500	400 x 390 x 106	4500	425 x 412 x 340	China	85322200
	12.4	400	1200	400 x 390 x 106	3600	425 x 412 x 340	China	85322200

All reel dimensions in mm

Ø D	4	5	5	6.3	6.3	8	8	8	8	10	10	10
L	5.5	5.5	5.8	5.8	7.7	7.7	8.7	10.5	11.7	8.7	10.5	12.4
A	15	15	15	15	15	15	15	15	15	15	15	15
B	21	21	21	21	21	21	21	21	21	21	21	21
C	14	14	14	18	18	18	26	26	26	26	26	26
D	3	3	3	3	3	3	3	3	3	3	3	3
E	80	80	80	80	80	80	80	80	80	80	80	80
F	380	380	380	380	380	380	380	380	380	380	380	380

Remark: Standard = Paper reel

TAPING • SMD CONDUCTIVE POLYMER CAPACITORS • REEL PACK • PLASTIC REEL



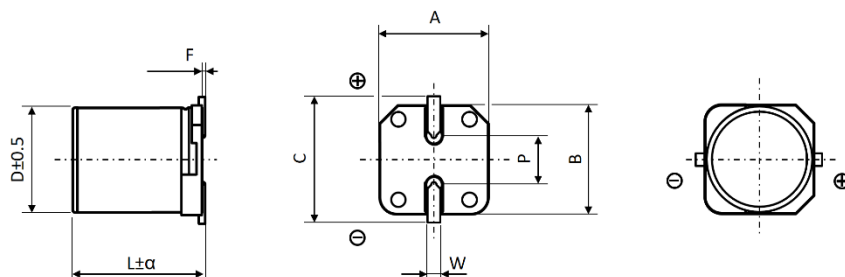
Ø D (mm)	L (mm)	Reel quantity (pcs)	Inner box quantity (pcs)	Inner box size L x W x H (mm)	Outer box quantity (pcs)	Outer box size L x W x H (mm)	Country of origin	Tariff number
4	5.5	2000	10000	400 x 390 x 106	30000	425 x 412 x 340	China	85322200
5	5.5	1000	5000	400 x 390 x 106	15000	425 x 412 x 340	China	85322200
	5.8	1000	5000	400 x 390 x 106	15000	425 x 412 x 340	China	85322200
6.3	5.8	1000	4000	400 x 390 x 106	12000	425 x 412 x 340	China	85322200
	7.7	900	3600	400 x 390 x 106	10800	425 x 412 x 340	China	85322200
8	7.7	700	2800	400 x 390 x 106	8400	425 x 412 x 340	China	85322200
	8.7	500	1500	400 x 390 x 106	4500	425 x 412 x 340	China	85322200
	10.5	500	1500	400 x 390 x 106	4500	425 x 412 x 340	China	85322200
	11.7	400	1200	400 x 390 x 106	3600	425 x 412 x 340	China	85322200
10	8.7	500	1500	400 x 390 x 106	4500	425 x 412 x 340	China	85322200
	10.5	500	1500	400 x 390 x 106	4500	425 x 412 x 340	China	85322200
	12.4	400	1200	400 x 390 x 106	3600	425 x 412 x 340	China	85322200

All reel dimensions in mm

Ø D	4	5	5	6.3	6.3	8	8	8	8	10	10	10
L	5.5	5.5	5.8	5.8	7.7	7.7	8.7	10.5	11.7	8.7	10.5	12.4
A	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2
B	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5
C	13	13	13	17	17	25	25	25	25	25	25	25
D	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
E	100	100	100	100	100	100	100	100	100	100	100	100
F	380	380	380	380	380	380	380	380	380	380	380	380

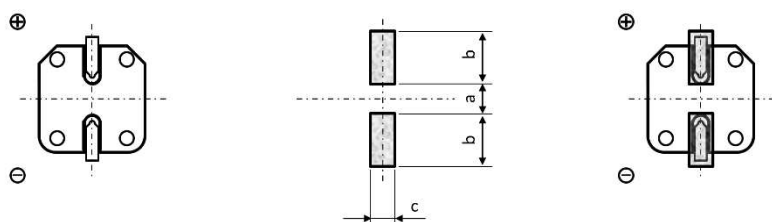
Remark: Plastic reel = Add code "U" at the end of the part number

DIMENSIONS STANDARD PACKAGE ▪ All dimensions in mm



ϕD	L	α	$A \pm 0.2$	$B \pm 0.2$	$C \pm 0.2$	F	$P \pm 0.2$	W
4.0	5.5	0.3	4.3	4.3	4.9	0 to 0.3	1.0	0.5 to 0.8
5.0	5.5	0.3	5.3	5.3	5.9	0 to 0.3	1.4	0.5 to 0.8
5.0	5.8	0.3	5.3	5.3	5.9	0 to 0.3	1.4	0.5 to 0.8
6.3	5.8	0.3	6.6	6.6	7.2	0 to 0.3	2.2	0.5 to 0.8
6.3	7.7	0.3	6.6	6.6	7.2	0 to 0.3	2.2	0.5 to 0.8
8.0	7.7	0.3	8.3	8.3	9.0	0 to 0.3	3.1	0.7 to 1.1
8.0	8.7	0.3	8.3	8.3	9.0	0 to 0.3	3.1	0.7 to 1.1
8.0	10.5	0.3	8.3	8.3	9.0	0 to 0.3	3.1	0.7 to 1.1
8.0	11.7	0.3	8.3	8.3	9.0	0 to 0.3	3.1	0.7 to 1.1
10.0	8.7	0.3	10.3	10.3	11.0	0 to 0.3	4.5	0.7 to 1.1
10.0	10.5	0.3	10.3	10.3	11.0	0 to 0.3	4.5	0.7 to 1.1
10.0	12.4	0.3	10.3	10.3	11.0	0 to 0.3	4.5	0.7 to 1.1

PAD LAYOUT STANDARD PACKAGE ▪ All dimensions in mm



Bottom view

Recommended land patterns

Capacitor mounted on pads

ϕD	L	a	b	c
4.0	5.5	1.0	2.6	1.6
5.0	5.5	1.4	3.0	1.6
5.0	5.8	1.4	3.0	1.6
6.3	5.8	2.1	3.5	1.6
6.3	7.7	2.1	3.5	1.6
8.0	7.7	2.8	4.2	1.9
8.0	8.7	2.8	4.2	1.9
8.0	10.5	2.8	4.2	1.9
8.0	11.7	2.8	4.2	1.9
10.0	8.7	4.3	4.4	1.9
10.0	10.5	4.3	4.4	1.9
10.0	12.4	4.3	4.4	1.9

PRODUCT CODE • RADIAL CONDUCTIVE POLYMER CAPACITORS

THT type example:

PH series • 330µF • 35V • ±20% • Ø 10mm • L 12.5mm • P 5mm • Tape Ammo

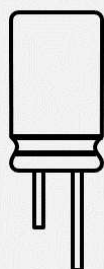


1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
P H		3 3 1			M	0 3 5			G	1 2 5			P	T A		- - - -				
Series		Capacitance			Capacitance tolerance	Voltage			Case Ø (mm)	Height (mm)			Type code	Taping / lead treatment *		Special requirement				
Code	µF				Code	%	Code	Volt	Code	ØD	Code	H	Code	Type	Code	Pitch (mm)				
010	1				M	±20	2R5	2.5	B	4	080	8	P	Polymer	TB	2				
4R7	4.7						004	4	C	5	090	9			TC	2.5				
100	10						6R3	6.3	E	6.3	100	10			TD	3.5				
101	100						010	10	F	8	115	11.5			TA	5				
102	1000						016	16	G	10	125	12.5								
152	1500						020	20			180	18								
							025	25												
							035	35												
							050	50												
							063	63												
							080	80												
							100	100												

* See chapter taping or lead treatment for further information
Please consult CapXon for further assistance

MARKING • RADIAL CONDUCTIVE POLYMER CAPACITORS

Solid Conductive Polymer Capacitor • Radial type



CapXon: Manufacturer trademark
330: Nominal capacitance (µF)
35V: Rated voltage (V) • Standard type
- polarity (Cathode indicate)

PH: PH Series
007: Production datacode year/week
(ex. 2020/7th week)

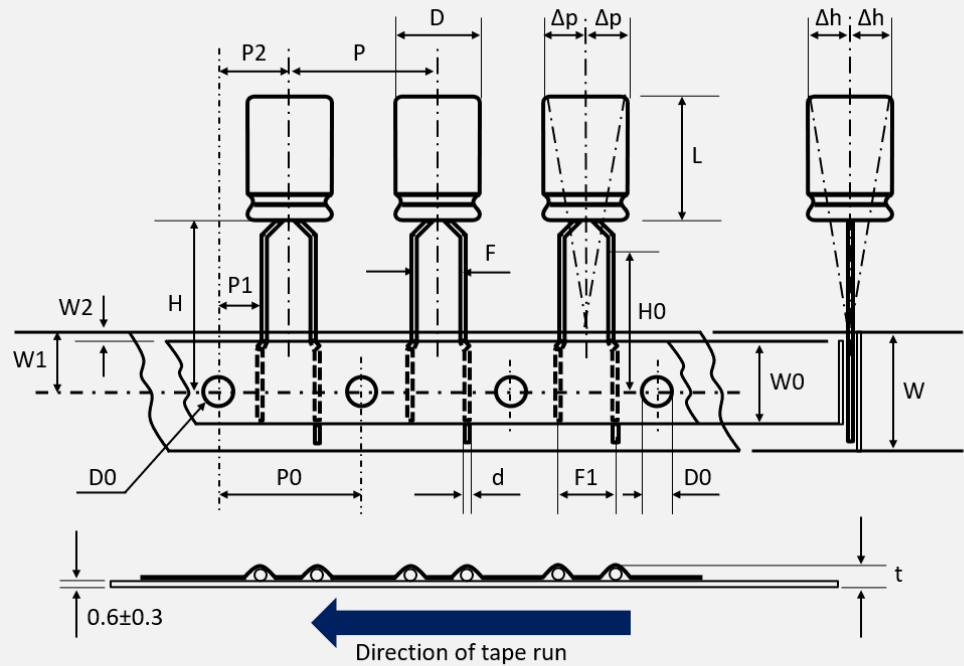
Top view



0 07
└─┬─┘
└─┘
Production week
Last digit of the year

TAPING • RADIAL CONDUCTIVE POLYMER CAPACITORS • AMMO PACK

Taping • $\varnothing D$ 4mm



Example

P	X	1 0 1	M	2 R 5	B	0 5 0	P	T B	- - - -
Series	Capacitance	Tolerance	Voltage	$\varnothing D$ (mm)	Height (mm)	Type code	Lead treatment	Special requirement	

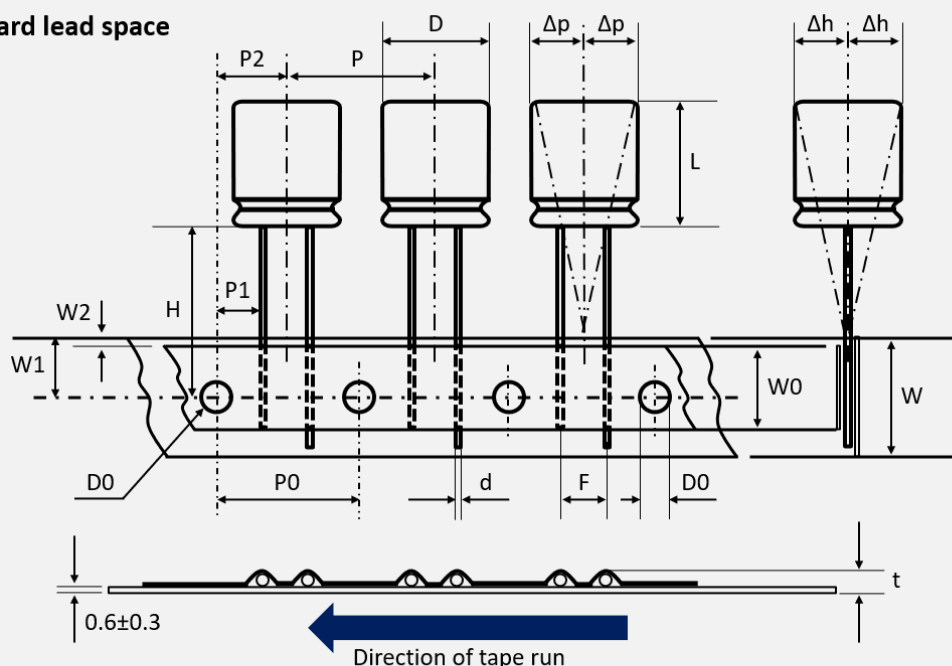
All dimensions in mm

	D	L	d	P	P0	P1	P2	F	F1	W	W0	W1	W2	H	D0	Δh	Δp	t	Code
Tol	± 0.5	-	± 0.05	± 1.0	± 0.2	± 0.7	± 1.3	+0.4 -0.2	± 0.5	± 0.5	± 0.5	± 0.5	Max	+0.75 -0.5	± 0.2	Max	Max	Max	
Item	4	$\frac{5 (\pm 1)}{7 (\pm 1)}$	0.45	12.7	12.7	5.1	6.35	2	3.5	18	11	9	2	18.5	4	1	1	1.5	TB

The negative lead (cathode) is in the front, i.e. in the direction of tape run.

TAPING • RADIAL CONDUCTIVE POLYMER CAPACITORS • AMMO PACK

Taping • $\varnothing D \geq 5\text{mm}$ • standard lead space



Example

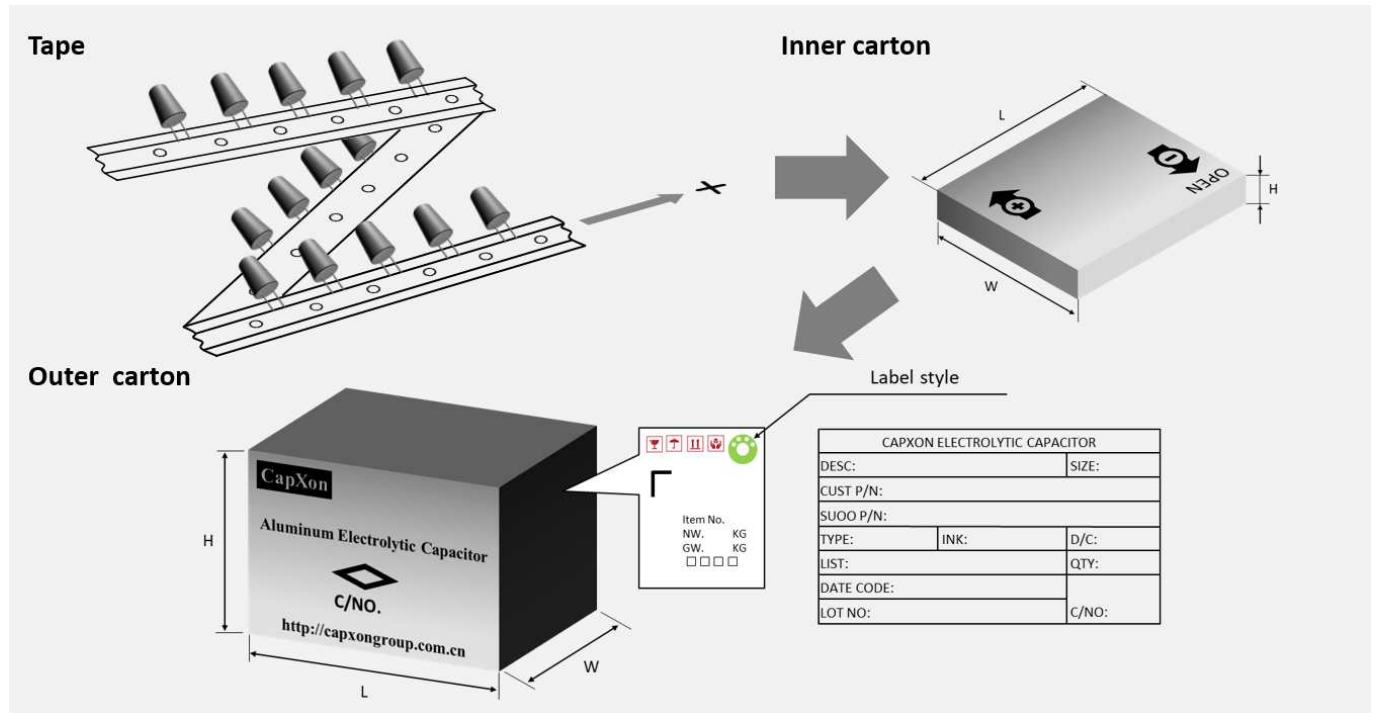
P	H	3 3 1	M	0 3 5	G	1 2 5	P	T A	- - - -
Series	Capacitance	Tolerance	Voltage	$\varnothing D$ (mm)	Height (mm)	Type code	Lead treatment	Special requirement	

All dimensions in mm

	D	L	d	P	P0	P1	P2	F	W	W0	W1	W2	H	D0	Δh	Δp	t	Code
Tol	±0.5	-	±0.05	±1.0	±0.2	±0.7	±1.3	+0.4 -0.2	±0.5	±0.5	±0.5	Max	+0.75 -0.5	±0.2	Max	Max	Max	
Item	5	5 (±1)	0.45	12.7	12.7	5.35	6.35	2	18	11	9	2	18.5	4	1	1	1.5	TB
		7 (±1)																
		8 (±1)	0.5															
		9 (±1)																
		11 (±1)																
	6.3	5.2 (±1)	0.45	12.7	12.7	5.1	6.35	2.5	18	11	9	2	18.5	4	1	1	1.5	TC
		7 (±1)																
		8 (±1)	0.6															
		9 (±1)																
		11 (±1)																
	8	7 (±1)	0.6	12.7	12.7	4.6	6.35	3.5	18	11	9	2	18.5	4	1	1	1.5	TD
		8 (±1)																
		9 (±1.5)																
		11.5 (±1.5)																
	10	7 (±1.5)	0.6	12.7	12.7	3.85	6.35	5	18	11	9	2	18.5	4	1	1	1.5	TA
		8 (±1.5)																
10 (±1.5)																		
12.5 (±1.5)																		

The negative lead (cathode) is in the front, i.e. in the direction of tape run.

TAPING • RADIAL CONDUCTIVE POLYMER CAPACITORS • AMMO PACK



Ø D (mm)	Length L (mm)	Inner box quantity (pcs)	Inner box size L x W x H (mm)	Outer box quantity (pcs)	Outer box size L x W x H (mm)	Country of origin	Tariff number
4	5 to 7	2500	331 x 227 x 51	25000	474 x 343 x 285	China	85322200
5	5 to 11	2000	331 x 227 x 51	20000	474 x 343 x 285	China	85322200
6.3	5.2 to 11	1500	331 x 227 x 51	15000	474 x 343 x 285	China	85322200
8	7 to 11.5	800	331 x 227 x 51	8000	474 x 343 x 285	China	85322200
10	7 to 12.5	600	331 x 227 x 51	6000	474 x 343 x 285	China	85322200

PACKAGING ▪ RADIAL CONDUCTIVE POLYMER CAPACITORS STRAIGHT LEADS ▪ BULK PACK



Ø D (mm)	Length L (mm)	Inner bag / Inner row (pcs)	Inner box quantity (pcs)	Inner box size L x W x H (mm)	Outer box quantity (pcs)	Outer box size L x W x H (mm)	Country of origin	Tariff number
4	5	1000/bag	1000	295 x 181 x 222	12000	295 x 181 x 222	China	85322200
	7	1000/bag	1000	295 x 181 x 222	12000	295 x 181 x 222	China	85322200
5	5	1000/bag	1000	295 x 181 x 222	12000	295 x 181 x 222	China	85322200
	7	800/bag	800	295 x 181 x 222	9600	295 x 181 x 222	China	85322200
	8	800/bag	800	295 x 181 x 222	9600	295 x 181 x 222	China	85322200
	9	700/bag	700	295 x 181 x 222	8400	295 x 181 x 222	China	85322200
	11	600/bag	600	295 x 181 x 222	7200	295 x 181 x 222	China	85322200
6.3	5.2	800/bag	800	295 x 181 x 222	9600	295 x 181 x 222	China	85322200
	6	800/bag	800	295 x 181 x 222	9600	295 x 181 x 222	China	85322200
	7	800/bag	800	295 x 181 x 222	9600	295 x 181 x 222	China	85322200
	8	600/bag	600	295 x 181 x 222	7200	295 x 181 x 222	China	85322200
	9	600/bag	600	295 x 181 x 222	7200	295 x 181 x 222	China	85322200
	11	500/bag	500	295 x 181 x 222	6000	295 x 181 x 222	China	85322200
8	7	500/bag	500	295 x 181 x 222	6000	295 x 181 x 222	China	85322200
	8	500/bag	500	295 x 181 x 222	6000	295 x 181 x 222	China	85322200
	9	450/bag	450	295 x 181 x 222	5400	295 x 181 x 222	China	85322200
	11.5	300/bag	300	295 x 181 x 222	3600	295 x 181 x 222	China	85322200
10	7	300/bag	300	295 x 181 x 222	3600	295 x 181 x 222	China	85322200
	8	300/bag	300	295 x 181 x 222	3600	295 x 181 x 222	China	85322200
	10	300/bag	300	295 x 181 x 222	3600	295 x 181 x 222	China	85322200
	12.5	200/bag	200	295 x 181 x 222	2400	295 x 181 x 222	China	85322200

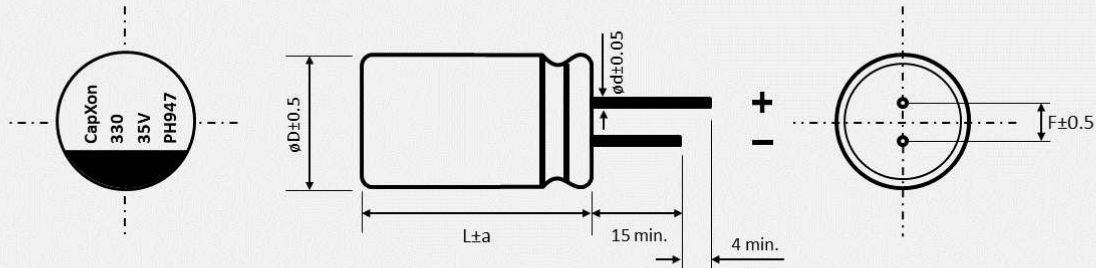
PACKAGING ▪ RADIAL CONDUCTIVE POLYMER CAPACITORS
CUTTED LEADS ▪ BULK PACK



Ø D (mm)	Length L (mm)	Inner bag / Inner row (pcs)	Inner box quantity (pcs)	Cutting height (mm)	Outer box quantity (pcs)	Outer carton quantity (pcs)	Country of origin	Tariff number
4	5	1500/bag	1500/box	≤ 7	18000	18000	China	85322200
	7	1500/bag	1500/box	≤ 7	18000	18000	China	85322200
5	5	1500/bag	1500/box	≤ 7	18000	18000	China	85322200
	7	1500/bag	1500/box	≤ 7	18000	18000	China	85322200
	8	1000/bag	1000/box	≤ 7	12000	12000	China	85322200
	9	1000/bag	1000/box	≤ 7	12000	12000	China	85322200
	11	1000/bag	1000/box	≤ 7	12000	12000	China	85322200
6.3	5.2	1200/bag	1200/box	≤ 7	14400	14400	China	85322200
	7	1000/bag	1000/box	≤ 7	12000	12000	China	85322200
	8	800/bag	800/box	≤ 7	9600	9600	China	85322200
	9	800/bag	800/box	≤ 7	9600	9600	China	85322200
	11	800/bag	800/box	≤ 7	9600	9600	China	85322200
8	7	700/bag	700/box	≤ 7	8400	8400	China	85322200
	8	600/bag	600/box	≤ 7	7200	7200	China	85322200
	9	600/bag	600/box	≤ 7	7200	7200	China	85322200
	11.5	500/bag	500/box	≤ 7	6000	6000	China	85322200
10	7	500/bag	500/box	≤ 7	6000	6000	China	85322200
	8	500/bag	500/box	≤ 7	6000	6000	China	85322200
	10	400/bag	400/box	≤ 7	4800	4800	China	85322200
	12.5	300/bag	300/box	≤ 7	3600	3600	China	85322200

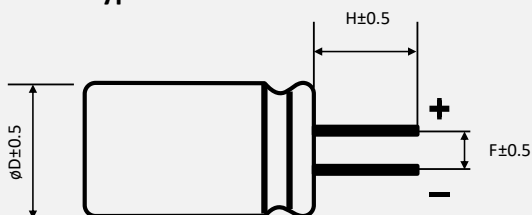
AVAILABLE LEAD TREATMENTS • RADIAL CONDUCTIVE POLYMER CAPACITORS

Radial type • standard lead spacing (all dimensions in mm)



$\varnothing D$ (mm)	L (mm)	a (mm)	F (mm)	$\varnothing d$ (mm)
4	5	1	1.5	0.45
5	7	1	2	0.45
	8			0.5
	9			0.6
	11			0.6
6.3	5.2	1	2.5	0.45
	7			0.45
	8			0.6
	9			0.6
8	11	1.5	3.5	0.6
	7			0.6
	8			0.6
	9			0.6
10	11.5			0.6
	7	1.5	5	0.6
	8			0.6
	10			0.6
	12.5			0.6

Radial type • **CA** version • cutted leads • standard lead spacing



Example

Length „H“ customized. See product code table
customized lead length for further reference.

$\varnothing D$ (mm)	4	5	6.3	8	10
F (mm)	1.5	2	2.5	3.5	5

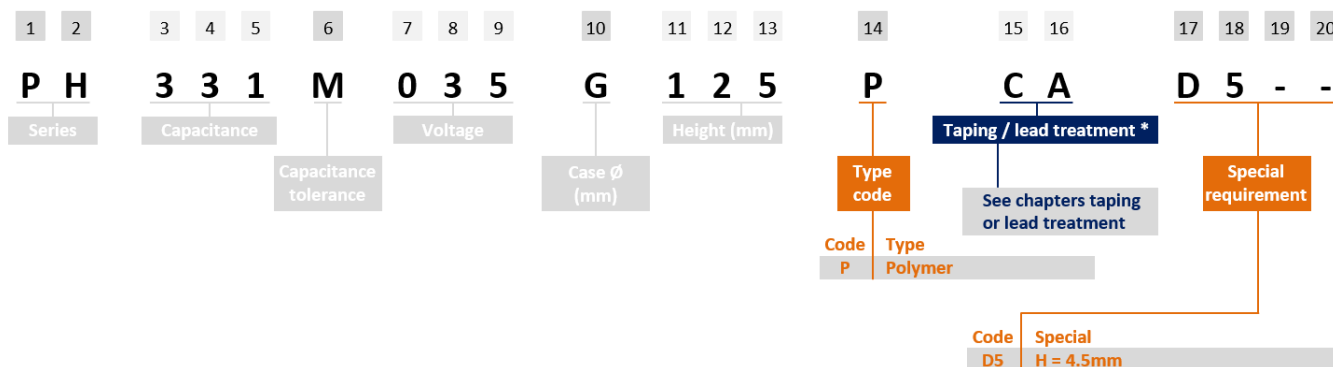
P	H	3 3 1	M	0 3 5	G	1 2 5	P	C A	-	-	-
Series	Capacitance	Tolerance	Voltage	$\varnothing D$ (mm)	Height (mm)	Type code	Lead treatment	Special requirement			



PRODUCT CODE TABLE • CUSTOMIZED LEAD LENGTH

THT type example:

PH series ▪ 330μF ▪ 35V ▪ ±20% ▪ Ø 10mm ▪ L 12.5mm ▪ CA version, cutted leads ▪ P 5mm ▪ H 4.5mm



The 17th digit is according basic ordering of the Latin alphabet and shows the measure "H" in front of the decimal separator. The 18th digit follows the numbering from 0 to 9 and shows the measure "H" after the decimal separator.

Product code 17 th digit	H (mm)
A	1
B	2
C	3
D	4
E	5
F	6
G	7

Product code 18 th digit	H (mm)
0	0.0
1	0.1
2	0.2
3	0.3
4	0.4
5	0.5
6	0.6
7	0.7
8	0.8
9	0.9

Example H (mm)	Product code
4.0	D0
4.5	D5
5.2	E2
6.0	F0

GENERAL PRECAUTIONS & GUIDELINES

1. GENERAL PRECAUTIONS & GUIDELINES 126

1.1. GENERAL - ALL TYPES - 126

1.1.1. POLARITY 126

1.1.2. OVERVOLTAGE 126

1.1.3. OPERATING TEMPERATURE 126

1.1.4. RIPPLE CURRENT 126

1.1.5. CHARGE AND DISCHARGING 126

1.1.6. SOLDERING CONDITIONS 126

1.1.7. MSL – MOISTURE SENSITIVE LEVEL (ONLY FOR SMD TYPES) 126

1.1.8. RESISTANCE TO CHEMICALS AND SOLVENTS FOR WASHING, GLUING, FILLING AND COATING 126

1.1.9. CLEANING AND WASHING 127

1.1.10. GLUING, FILLING OR COATING 127

1.1.11. OPERATION AND ENVIRONMENT 127

1.1.12. MECHANICAL STRESS 128

1.1.13. STORAGE 128

1.1.14. DISPOSAL 128

1.2. ALUMINUM ELECTROLYTIC & HYBRID CONDUCTIVE POLYMER CAPACITORS - ALL MOUNTING STYLES - 128

1.2.1. VENT & VENT OPERATION AT EMERGENCY 128

1.2.2. SLEEVE MATERIAL (NOT FOR SMD) 129

1.3. ALUMINUM ELECTROLYTIC - RADIAL TYPE - 129

1.3.1. PIN CUTTING & BENDING 129

1.3.2. SOLDERING 129

1.4. ALUMINUM ELECTROLYTIC CAPACITORS - SCREW TYPE - 129

1.4.1. MAINTENANCE 129

1.4.2. MOUNTING & INSTALLATION 129

1.4.3. MOUNTING DIRECTION OF SCREW TYPE CAPACITORS 129

1.4.4. HORIZONTAL MOUNTING 130

1.5. SOLID CONDUCTIVE POLYMER CAPACITORS 130

1.5.1. APPLICATION RESTRICTIONS 130

1.5.2. SUDDEN CHARGE AND DISCHARGE 130

2. SOLDERING INSTRUCTIONS 131

2.1. REFLOW SOLDERING ▪ SMD – SOLID CONDUCTIVE POLYMER CAPACITORS 131

2.2. REFLOW SOLDERING ▪ SMD MLPC – SOLID POLYMER CONDUCTIVE CAPACITORS 132

2.3. WAVE SOLDERING ▪ ALL RADIAL & SNAP-IN CAPACITORS 133

1. GENERAL PRECAUTIONS & GUIDELINES

In the following Precautions and Guidelines, CapXon provides instructions and requirements to assure a proper handling and desired performance of capacitors. Firstly, all general information is given, which applies to all technologies. The following chapters provides additional instructions specifically about technology and mounting style, which completes the full set of instructions.

1.1. GENERAL - ALL TYPES -

1.1.1. POLARITY

All conventional Electrolytic Capacitors have a polarity due to the internal construction. This polarity is marked on the component by printing on the top of component or on the sleeve of Aluminum Electrolytic Capacitors, including Radial, Snap-In and Screw types.

Any reverse voltage can cause short circuit breakdown of capacitor or leakage of electrolyte. Electrolytic Capacitors isn't designed for AC-voltage supply and only meant for DC-voltage applications.

For an application where polarity in circuit can be reversed or unknown, specific bi-polar aluminium electrolytic capacitors shall be used. We offer such components within our product range.

1.1.2. OVERVOLTAGE

Overvoltage can damage the capacitor and can cause a drastic increase in leakage current, which possibly shortens the lifetime of the capacitor. In a worst case, short circuit failure mode can happen. As a result, do not apply any continuous or temporary overvoltage.

The applied operating voltage, which is applied to the capacitor, should not exceed the rated voltage of the capacitor.

1.1.3. OPERATING TEMPERATURE

Only operate the capacitor within the limits of allowed temperature range, which is specified by datasheet. Be aware that the sum of thermal stress by ambient condition plus electrical stress is the main driving factor for aging. As the thermal stress level gets higher, the expected capacitor lifetime would be lower.

A drop in applied temperature, ambient condition or cooling within application can enlarge the expected lifetime of

the capacitor. For details, please see further documentation of lifetime estimation.

1.1.4. RIPPLE CURRENT

The applied ripple current shall not exceed the stated max. ripple current I_R on the datasheet at the specific frequency.

When capacitors are overstressed by ripple, it can generate massive heat inside the capacitor, which can result in deterioration, vent operation or capacitor breakage.

1.1.5. CHARGE AND DISCHARGING

Frequent and quick charge / discharge generates heat inside the capacitor and can cause possible increase of leakage current, reduction of the expected lifetime, decrease of capacitance, vent operation or breakage.

For such applications please see design rules or consult our technical support for assistance.

1.1.6. SOLDERING CONDITIONS

For recommended reflow solder profile, please see additional information at Section 2. Soldering Instructions.

Soldering by vapor phase for SMD types or any hand soldering are not recommended. No permission is released by CapXon side either. In case of such a usage, customer need to validate solder result and applied component stress within their own manufacturing process.

1.1.7. MSL – MOISTURE SENSITIVE LEVEL (ONLY FOR SMD TYPES)

Our standard SMD components are rated according to JEDEC J-STD020 with MSL1. Construction of this part does not include hygroscopic critical materials and are not prone to delamination or popcorn effects. Only SMD MLPC types of the Solid Conductive Polymer components have MSL3. Moreover, only this type requires additional actions or specific handling in factory floor by customer such as handling or storing the goods after opening the package in accordance to JEDEC J-STD020.

1.1.8. RESISTANCE TO CHEMICALS AND SOLVENTS FOR WASHING, GLUING, FILLING AND COATING

Due to the wide variety of suppliers and different chemical formulas of washing, gluing, filling and coating materials, the individually used material and appliance process need to be validated by customer itself. It is not possible to provide any global material usage approval from our side.

CapXon can provide additional information, including combination of chemicals which could be critical to the component behavior and can support measurements of component performance after appliance of washing, gluing, filling or coating materials. For specific support, please kindly contact our technical support for further advices.

1.1.9. CLEANING AND WASHING

Do not wash the assembled capacitors with the following cleaning agents:

- **Xylene**
 - can cause deterioration of the rubber seal material
- **Halogenated solvents**
 - can cause corrosion and electrical failure modes
- **Petroleum based solvents**
 - can cause degeneration of the rubber seal material
- **Alkali based solvents**
 - can cause corrosion and dissolving of aluminum can
- **Acetone**
 - component marking possibly dissolve

After finishing cleaning and washing, the below points need to be verified by customer:

Dry all solvents properly from PCB as well as capacitor surface sufficiently and apply air blower or air knife, with temperatures within the temperature range of the product specification, if needed.

Monitor pH value, conductivity, specific gravity and water content of cleaning solvents to be sure of possible contaminations and pollution. Contaminations can negatively affect the performance of the capacitor.

1.1.10. GLUING, FILLING OR COATING

It is not allowed to use any gluing (adhesives), filling or coating materials, which contains halogenated solvents. Halogen ions are critical, because they can diffuse or creep in the capacitor through rubber sealing and can possibly damage the internal capacitor element /structure result in serious failure modes for the capacitor.

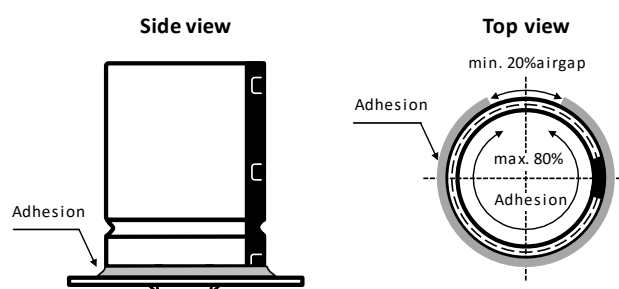
Additionally, please pay attention to the following points:

- Make sure that the surface of capacitor and the area between component bottom / rubber sealant is dry and clean before appliance of gluing, filling or coating material. It is important to avoid any contamination with chemical residues (e.g. flux residues, cleaning).
- Please follow and meet the stated gluing, coating, filling, heating and curing instructions from manufacturer or supplier of such materials. Be aware of possi-

ble shrinkage of such materials. Verify that the hardening was properly done and that no solvents / agents do remain.

- There should be no excessive heat nor mechanical pressure /stress at any stages from the production on customer side. Be aware of the possible material shrinkage of used material. High material shrinkage which leads to damage on capacitor is not CapXon's responsibility.
- The used materials of gluing, coating or filling can possibly react with the marking of component and this can change optical appearance such as the appearance and legibility.
- If the rubber seal surface is fully covered by gluing, filling or coating material, it is no longer possible to have a natural diffusion of gas between the inside of the capacitor and the ambient. So, to avoid such situation, it's strongly recommended to block maximum 80% of the sealed section on the bottom side of the capacitor.

Please find the example below of how gluing could be applied on Radial and Snap-In types.



Gluing reference example of a Snap-In capacitor

1.1.11. OPERATION AND ENVIRONMENT

As long as the application is powered, in operation and cap is not discharged, the user is never permitted to touch the electric terminals of the capacitor directly or to bridge the terminals by hand or any other conductive liquid or solid material. Otherwise, a short circuit of terminals can happen and a hard discharge can damage capacitor / application as well as it can harm the operator.

Within operation, please avoid the following environmental conditions to assure proper capacitor operation:

- high vibration, shocks or mechanical stress. For tested and allowed conditions, please see available references or contact us for details
- avoid direct sunlight, ozone and any kind of radiation or ultraviolet rays
- corrosive or toxic gases (e.g. ammonium, chlorine)

and compounds, bromine and compounds, hydrogen sulfide, sulfuric acid)

- ambient with high amount of damp condensation, water or types of oil

1.1.12. MECHANICAL STRESS

Best possible, avoid mechanical stress for the capacitor and do not apply any excessive mechanical stress to the lead wire pins or terminal.

After mounting, do not lift nor carry the PCB assembly by just grabbing the capacitor to pick up the board.

1.1.13. STORAGE

In case of long-term storage without applying voltage to the capacitor, leakage current tends to increase.

By applying the rated voltage before usage, the dielectric layer of aluminium oxide and leakage current can be stabilized.

If the capacitor is for more than 12 months, it is recommended to apply the DC rated voltage V_R for 30 minutes through 1k Ω protective series resistor.

The storage conditions for storage on customer side should be monitored and controlled to a temperature of 5°C up to 35°C and less than 75% rel. humidity.

1.1.14. DISPOSAL

Please follow your local governmental and organizational restrictions for disposal and if needed, contact your local responsible for correct handling.

In case of incineration, punch holes in the aluminum can in advanced to avoid explosion of capacitor and then burn with at least 800°C, otherwise it can result toxic gas.

1.2. ALUMINUM ELECTROLYTIC & HYBRID CONDUCTIVE POLYMER CAPACITORS - ALL MOUNTING STYLES -

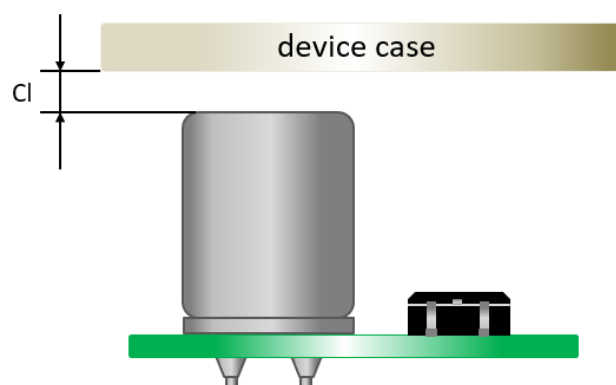
1.2.1. VENT & VENT OPERATION AT EMERGENCY

As a safety feature, most our regular electrolytic capacitors have a so-called vent, which is a pre-determined breaking point. In case of overstressed component, it can lead to internal gassing and due to this an internal overpressure will

result in vent operation. So, the vent will open to release such pressure and gas can become visible. If user detects vent operation or gassing out of the capacitor when operating, disconnect the application immediately from power supply to turn it off directly. If it can't be turned off, the capacitor or the conductive liquid / gas of electrolyte can result in short-circuits, which can dramatically damage the application.

Please notice to avoid being near with body or face above or in direction of capacitors vent when powered. When the running application is overstressed, gas leakage by vent is possible. By this gas with temperatures higher than 100°C can occur and can hurt human body and face. In such an event, if contact with skin, wash it immediately with plenty of water and soap. If contact with eyes, rinse immediately (e.g. eye shower) with plenty of water. If gas is inhaled, gargle right away with plenty of water. For all three cases, please consult a doctor for medical advices.

For proper operation of vent, consider space between the vent and covering surfaces (e.g. housing) as stated at the table below, it is strongly recommended for your mechanical construction / build-up of your product:



Minimum distance to be observed for the safe operation of the capacitor

Case diameter $\varnothing$	Clearance distance CI
6.3mm to 16mm	Min. 2mm
18mm to 35mm	Min. 3mm
≥ 40 mm	Min. 5mm

Recommended minimum clearance distance between topside capacitor and device case

If such a space is not provided, the vent will not operate completely or even cannot open in case of overpressure.

Case sizes which are smaller than 6.3mm in diameter have no vent on top, for these no space need to be considered.

1.2.2. SLEEVE MATERIAL (NOT FOR SMD)

The standard sleeve material for the majority of our Radial, Snap-In and Screw mounting capacitors is PET and for some series PVC is used as sleeve material. When sleeve is exposed to xylene, toluene or similar and afterwards exposed to high heat, the sleeve may be cracked or damaged.

The sleeve is not used as insulating material or layer and does not insulate capacitor to surroundings. For needed insulation, further actions need to be considered by customer and please follow our recommended design rules.

Sleeves are applied for all Aluminum Electrolytic Capacitors with Radial, Snap-In or Screw mounting and if desired for further customized solutions.

1.3. ALUMINUM ELECTROLYTIC - RADIAL TYPE -

1.3.1. PIN CUTTING & BENDING

Please take absolute care when cutting or bending pins, that the pin is fixed mechanically in direction of rubber sealant. It is necessary that the mechanical force while cutting and bending, which results in pulling or pressing force on pin, does not stress the inner construction of capacitor element or to damage the rubber sealant. Excessive pulling or pressing force on the pin with missing fixation can result in damage of internal pin to capacitor element connection and also the sealing can be weakened. So, please take care to assure appropriate cutting and bending. Do not pre-damage the capacitors and shorten their lifetime performance by incorrect handling.

1.3.2. SOLDERING

For recommended wave solder profile, please see additional solder instruction at section 2.5.

Improper soldering conditions may shrink or break the sleeve. Additionally, excessive heat can damage the internal capacitor element as terminals and lead wires conduct heat into the capacitor.

1.4. ALUMINUM ELECTROLYTIC CAPACITORS - SCREW TYPE -

1.4.1. MAINTENANCE

A regular inspection is recommended when screw capacitors are used at industrial applications. Before inspection, make sure to turn off the power, discharge screw capacitors carefully and do not apply mechanical force or pressure to the terminal to avoid damage. Inspection items are as stated below:

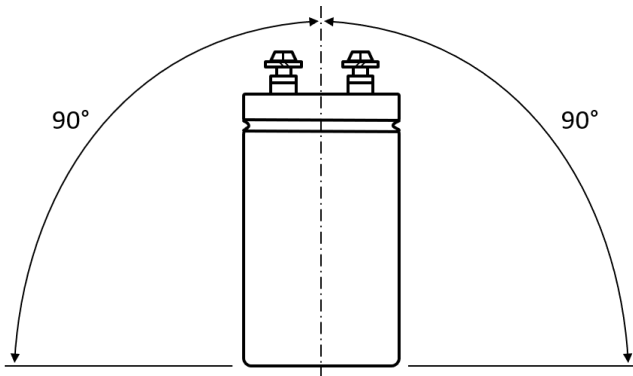
- Check on outer damage, deformation and electrolyte leakage
- Check electrical performance: leakage current, capacitance, DF value and other product specifications. If there is any abnormality detected, make sure a capacitor replacement will be done and handled properly

1.4.2. MOUNTING & INSTALLATION

Make sure capacitors rated capacitance, rated voltage and polarity is according to spec before installation. Please confirm that capacitors and circuit board terminal pitch is consistent to each other before installation. It may cause stress to internal capacitor element through the terminal. If the pitch is different, mounting was done nevertheless and strong mechanical stress was applied. In such case, this can cause short-circuit and other failure modes. Machine automated force and lead torque strength must be controlled properly when mounting happens with automated machine.

1.4.3. MOUNTING DIRECTION OF SCREW TYPE CAPACITORS

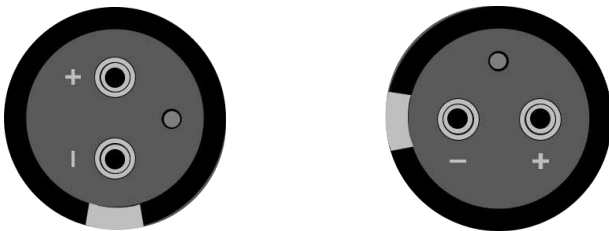
To avoid screw capacitor breakage / explosion, it is not allowed to be mounted with the safety vent downwards to ground, because vent can't function properly when mounted with vent to bottom side and existing gas pressure cannot release properly. Recommended mounting method is shown as figure below, to avoid any safety vent downwards installation. So, capacitor should be mounted with screw terminals up as shown below:



Recommended mounting direction

1.4.4. HORIZONTAL MOUNTING

For horizontal mounting following mounting is strongly recommended. Anode terminal in upper position with safety vent in horizontal position as figure below on left side or safety vent in upper position with anode and cathode terminal in horizontal as figure below on right side.



Recommended mounting position, also in accordance to EIAJ RCR-2367C

It may not damage capacitors directly, but an electrolyte leakage may happen, if installed by other mounting method in horizontal direction.

1.5. SOLID CONDUCTIVE POLYMER CAPACITORS

1.5.1. APPLICATION RESTRICTIONS

The leakage current of Solid Conductive Polymer Capacitors may vary which depends on thermal stress.

Please don't use Solid Conductive Polymer Capacitors in the following types of applications / circuits:

- High-impedance circuits - which are meant to sustain voltages
- Coupling circuits

- Time constant circuits - in addition to the leakage current fluctuation, capacitance may also fluctuate, which depends on operational temperature and humidity. The fluctuation of the capacitance may cause problems, if it is used as a time constant capacitor, which is extremely sensitive to the fluctuation of the capacitance. So, do not use it as a time constant capacitor.
- Other circuits - which are significantly affected by leakage current. If you want to use 2 or more capacitors in a series connection, please contact us before usage.

1.5.2. SUDDEN CHARGE AND DISCHARGE

Do not use the capacitor in circuits when capacitor is repetitively charged and discharged rapidly. If repetitively and rapid charging and discharging stresses the capacitor, it can result in reduction of capacitance or may cause further damage due to internal heating. The usage of a protective circuit is recommended to ensure reliability, when rush currents exceeds 10 times of capacitors allowed max. ripple current I_R , but never more than max. 10A. When measuring the leakage current, a protective resistor (1 k Ω) must be inserted to the circuit during the charge and discharge.

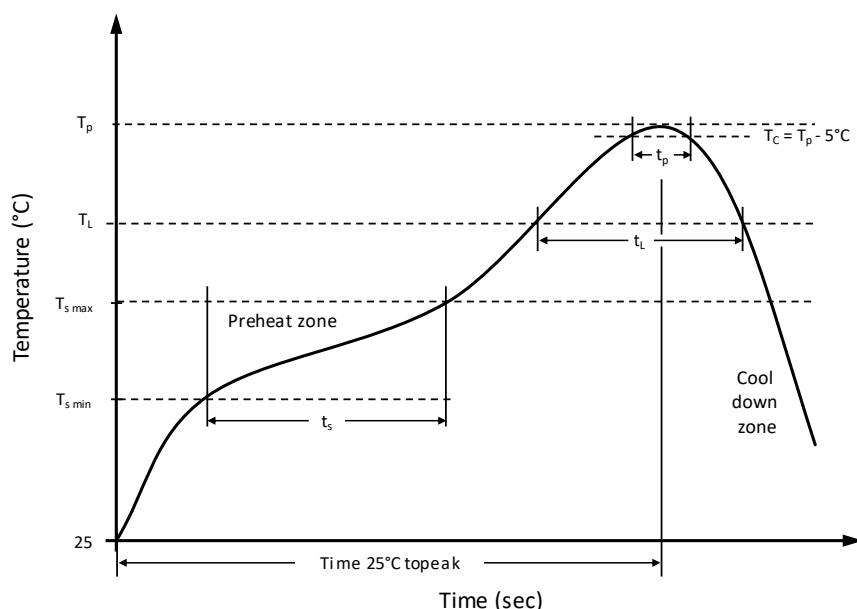
2. SOLDERING INSTRUCTIONS

In the following sections CapXon's leadfree solder profiles are stated in detail.



2.1. REFLOW SOLDERING • SMD – SOLID CONDUCTIVE POLYMER CAPACITORS

Recommended reflow soldering conditions



Classification of reflow soldering profile

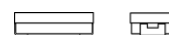
Profile Features		Value
Preheat temperature min.	$T_{s\ min}$	150 °C
Preheat temperature max.	$T_{s\ max}$	180 °C
Preheat time t_s from $T_{s\ min}$ to $T_{s\ max}$	t_s	120 seconds
Ramp-up rate (T_L to T_p)		max. 3 °C/second
Liquidous temperature	T_L	217 °C
Time t_L maintained above T_L	t_L	60 ~ 150 seconds
Peak package body temperature	T_p	See reference table below for proper Rated Voltage V_R
Timeframe of within 5°C below (T_c) and up to max actual peak body temperature (T_p)	t_p	max. 20 seconds
Ramp-down rate (T_L to T_p)		max. 6 °C/second
Time 25°C to peak temperature		max. 8 minutes

* Limitations of ramp rates to JEDEC-J-STD020E

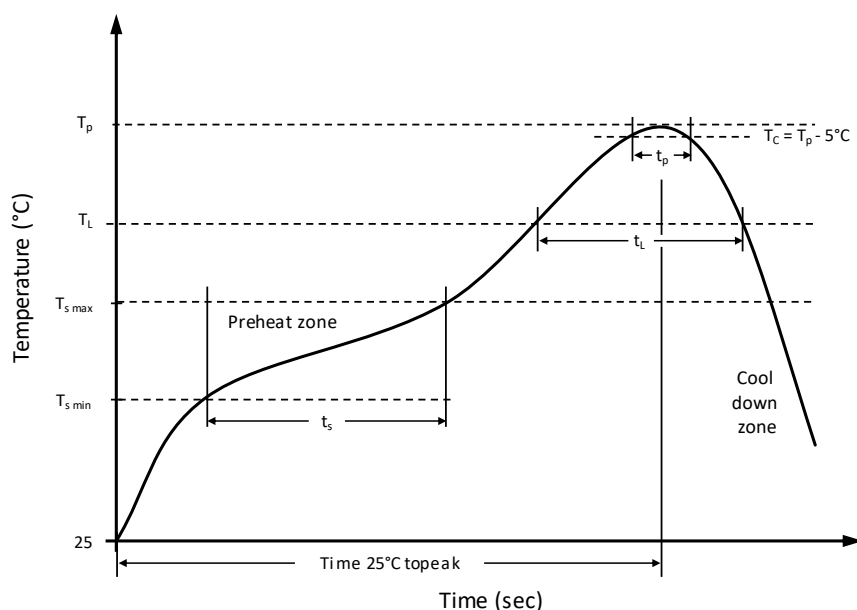
Package classification reflow temperature for SMD – Solid Conductive Polymer Capacitors

V_R • Rated Voltage (V)	Time above 200°C	Time above 230°C	T_p Peak Temperature	Allowed Reflow Runs
2.5 up to 10	90 sec. max.	60 sec. max.	260 °C	only once
			250 °C	max. twice
16 up to 25	90 sec. max.	60 sec. max.	250 °C	only once
	80 sec. max.	50 sec. max.	240 °C	max. twice
35 up to 100	70 sec. max.	30 sec. max.	240 °C	only once

2.2. REFLOW SOLDERING • SMD MLPC – SOLID POLYMER CONDUCTIVE CAPACITORS



Recommended reflow soldering conditions



Classification of reflow soldering profile

Profile Features		Value
Preheat temperature min.	$T_{s \min}$	150 °C
Preheat temperature max.	$T_{s \max}$	200 °C
Preheat time t_s from $T_{s \min}$ to $T_{s \max}$	t_s	120 seconds
Ramp-up rate (T_L to T_p)		max. 3°C/second
Liquidous temperature	T_L	217 °C
Time t_L maintained above T_L	t_L	60 ~ 150 seconds
Peak package body temperature	T_p	See reference table below for proper Rated Voltage V_R
Timeframe of within 5°C below and up to max actual peak body temperature	t_p	max. 30 seconds
Ramp-down rate (T_L to T_p)		max. 6°C/second
Time 25°C to peak temperature		max. 8 minutes

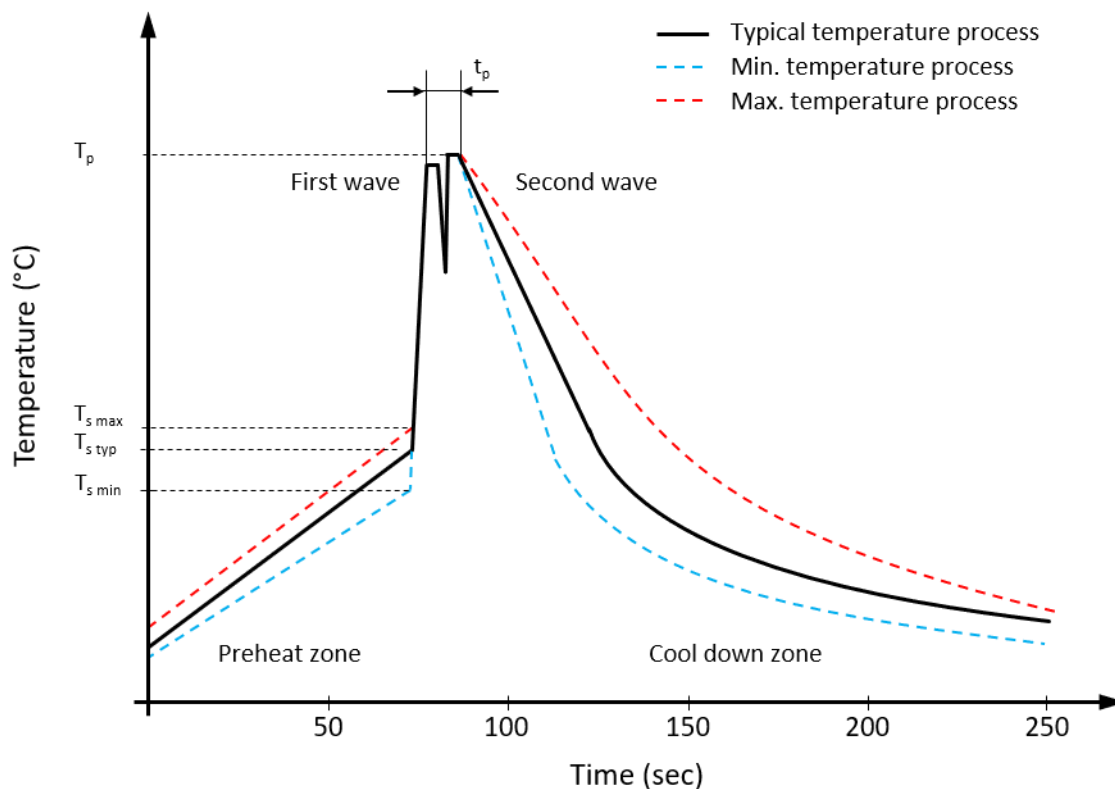
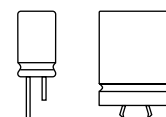
* Limitations of ramp rates to JEDEC-J-STD020E

Package classification reflow temperature for SMD MLPC – Solid Conductive Polymer Capacitors

V_R • Rated Voltage (V)	Time above 200°C	Time above 230°C	T_p • Peak Temperature	Allowed Reflow Runs
2.5 up to 25	90 sec. max.	40 sec. max.	260°C max. 10sec.	max. twice
			250°C max. 10sec.	max. three times

2.3. WAVE SOLDERING • ALL RADIAL & SNAP-IN CAPACITORS

Recommended wave soldering conditions



Classification wave soldering profile • Refer to EN 61760-1: 2006

Profile Features		Value • Pb-free Assembly	Value • Sn-Pb Assembly
Preheat temperature min.	$T_{s \text{ min}}$	100 °C	100 °C
Preheat temperature typical	$T_{s \text{ typ}}$	120 °C	120 °C
Preheat temperature max.	$T_{s \text{ max}}$	130 °C	130 °C
Preheat time t_s from $T_{s \text{ min}}$ to $T_{s \text{ max}}$	t_s	70 seconds	70 seconds
Peak temperature	T_p	245 °C ~ 260 °C	235 °C ~ 260 °C
Time of actual peak temperature	t_p	Max. 10 seconds Max. 5 second each wave	Max. 10 seconds Max. 5 second each wave
Ramp-down rate min.		~ 2 °C/second	~ 2 °C/second
Ramp-down rate typical		~ 3.5 °C/second	~ 3.5 °C/second
Ramp-down rate max.		~ 5 °C/second	~ 5 °C/second
Time 25°C to 25°C		4 minutes	4 minutes

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IATF 16949

AEC-Q200

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