Company introduction

ADSO Capacitor Co., Ltd is a set of capacitor research and development, production and sales in one of the specialized companies, aims to provide application solutions, excellent quality for power electronics industry products and high quality service.

ADSO Capacitor Co., Ltd has been specializing in metal film capacitors R & D and production , the company introduced the international advanced capacitor automated production equipment and high-precision testing instruments, built a set of complete infrastructure materials R & D, production, assembly, single module analysis, development of detection devices is equal to one, based on mature technology, the latest scientific research results, the use of advanced production technology and reasonable, standardized management and high quality efficient staff, forming a large-scale production capacity of strong product research, development and quality.

ADSO Capacitor Co., Ltd through a wide range of technical exchanges**,** actively participate in national and regional projects, relying on independent innovation**,** expert restart**,** the combination and the introduction of overseas advanced technology and other business model, the formation of a strong technical force, a high degree of specialization, strong ability in R & D, multidisciplinary "T" the team, also owns a number of invention and utility model patents, and in the famous expert driven, and cultivate a large number of high quality hard, technology professionals. Company's products are widely used in power electronic equipment electrical control system, the national grid power compensation circuit transformation system, motor variable frequency speed control system, the wind turbine controller system, photovoltaic inverter system railway system, transmission lines, new energy vehicles, energy saving and environmental protection equipment etc..

ADSO Capacitor Co., Ltd products quality, competitive price, short delivery cycle, and thoughtful service and industry reputation, mainly to provide OEM and ODM services well-known capacitor brand at home and abroad, the products are exported to all over the world. **ADSO** is ADSO Capacitor Co., Ltd under the independent brand, in Beijing, Shanghai, Nanjing, Wuhan, Xi'an and other offices or branches, and exported to the Americas, Europe, Australia, Asia and other developed countries and regions, initially set up a "in the Pearl River Delta as the basis, for the whole country, fan out from point to area global radiation", solid sales network. All the staff are trying to put the ADSO into a broad influence on the well-known brands.

ADSO Capacitor Co., Ltd to "market-oriented, quality of life, service demand development, the pursuit of" business philosophy, to "maximize meet customer demand" as the fundamental purpose, to professional service as the means, in order to promote the technical progress of the industry as our own duty, always pay attention to high quality product R & D and manufacturing of refine on, the pursuit of maximum the continuous progress and innovation, dedication to provide the best quality products and the most professional service for you.

Overview:

The DLB Series is a polypropylene metallized film with solvent resistant plastic case filled with resin sealing. (UL 94 V-0)

Application:

The DLB series is designed for DC-link applications. For compact design of: Frequency converters. Industrial and high-end power supplies.Solar inverters.

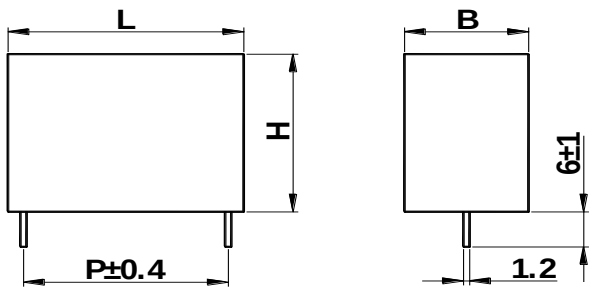
Benefits:

High capacitance density, compact.
Excellent self-healing properties.
Overvoltage capability.
Low losses with high current capability.
High reliability.Long useful life.RoHS-compatible.

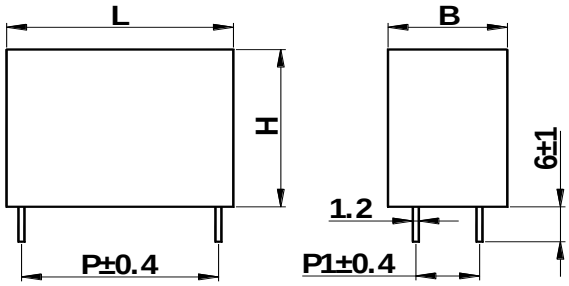
Construction:

Dielectric: Polypropylene (PP) film.
Protection: Solvent resistant plastic case with resin sealing. (UL 94 V-0)
Terminals: Parallel wire leads, lead-free tinned.
2-pin and 4-pin versions.
Standard lead lengths: 6 ±1 mm.
Special lead lengths are available on request.

DESIGNS:



2-pin version
Designs P2



4-pin version
Designs P4

Electrical data

Reference standards	IEC 61071 , IEC 60068 , RoHS compliance
Rated capacitance (C_N)	4.5μF ... 90μF
Rated voltage (U_{NDC})	800V ... 1300V
Standard capacitance tolerance	K: ±10%
Dissipation factor tan δ (100Hz@20℃)	$\leq 10 \times 10^{-4}$
Test voltage between terminals	U_{TT} 1.5 U_{NDC} , 10s
Test voltage between terminals and case	U_{TC} 3000 VAC, 10s
Insulation Resistance	Ri x C ≥ 10,000s at 100 VDC/1min at +25°C
Operating temperature range (case)	–40 ℃ ... +105 ℃
Max. permissible ambient temperature	+85 ℃, operation at rated power, rated current and natural cooling
Storage temperature Θstg	–40 ℃ ... +105 ℃
Climatic category	40/85/56
Damp heat test- Test conditions	Temperature : +40 ℃; Relative humidity : 93% ±2%； Test duration : 56 days
Damp heat test - Performances	Capacitance change : ≤ ±5%; tgδ change: ≤50% of nominal value at 1 kHz； Insulation resistance: ≤50% of limit value
Expected lifetime	100 000 h at U_{NDC} @ Θhs 70 ℃
Fit rate	50 (100 000 h at U_{NDC} @ at Θhs 70 ℃)
Resistance to soldering heat-Test conditions:	Solder bath temperature= +260±5 ℃ dipping time (with heat screen) ≤4s
Resistance to soldering heat- Performances	Capacitance change: ≤ ±1%;tgδ change : ≤0.0010 at 1kHz;Visual inspection No visible damage;

U_{NDC} 800V @ Θhs 70°C 700V @ Θhs 85°C

Ordering code	Cn (μF)	DIMENSIONS (mm)					Imax 10kHz@60° (A)	Imax 20kHz@60° (A)	Rs (mΩ)
		L	B	H	P	P1			
DLB-800-10-P20	10	42	17	28	37.5	-	8	8	11.2
DLB-800-18-P20	18	42	20	39	37.5	-	10	10	6.5
DLB-800-24-P20	24	42	28	37	37.5	-	11	11	5.0
DLB-800-24-P40	24	42	28	37	37.5	10.2	13	12	4.8
DLB-800-33-P20	33	42	30	45	37.5	-	14	13	3.7
DLB-800-33-P40	33	42	30	45	37.5	20.3	15	14	3.5
DLB-800-50-P20	50	57	30	45	52.5	-	14	13	4.7
DLB-800-50-P40	50	57	30	45	52.5	20.3	15	14	4.5
DLB-800-65-P20	65	57	35	50	52.5	-	14	14	3.7
DLB-800-65-P40	65	57	35	50	52.5	20.3	18	16	3.5
DLB-800-90-P20	90	57	42	56	52.5	-	14	14	2.8
DLB-800-90-P40	90	57	42	56	52.5	20.3	20	18	2.6

U_{NDC} 900V @ Θhs 70°C 800V @ Θhs 85°C

Ordering code	Cn (μF)	DIMENSIONS (mm)					Imax 10kHz@60° (A)	Imax 20kHz@60° (A)	Rs (mΩ)
		L	B	H	P	P1			
DLB-900-8.0-P20	8	42	17	28	37.5	-	7	7	12.7
DLB-900-15-P20	15	42	20	39	37.5	-	9	9	7.0
DLB-900-21-P20	21	42	28	37	37.5	-	11	10	5.1
DLB-900-21-P40	21	42	28	37	37.5	10.2	12	11	4.9
DLB-900-28-P20	28	42	30	45	37.5	-	14	13	3.9
DLB-900-28-P40	28	42	30	45	37.5	20.3	15	14	3.7
DLB-900-42-P20	42	57	30	45	52.5	-	14	13	5.1
DLB-900-42-P40	42	57	30	45	52.5	20.3	15	14	4.9
DLB-900-55-P20	55	57	35	50	52.5	-	14	14	4.0
DLB-900-55-P40	55	57	35	50	52.5	20.3	18	16	3.8
DLB-900-72-P20	72	57	42	56	52.5	-	14	14	3.1
DLB-900-72-P40	72	57	42	56	52.5	20.3	20	18	2.9

DLB Series

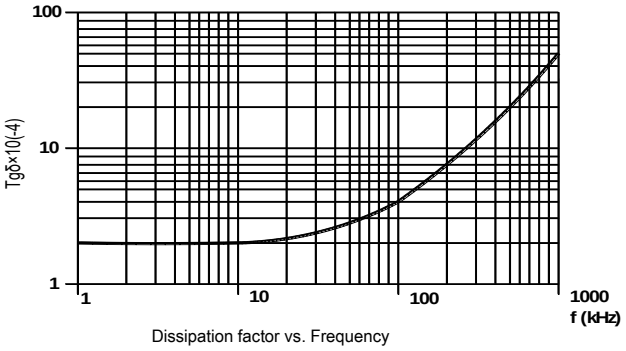
U_{NDC} 1100V @ Θhs 70°C　　900V @ Θhs 85°C

Ordering code	Cn (μF)	DIMENSIONS (mm)					Imax 10kHz@60 ° (A)	Imax 20kHz@60 ° (A)	Rs (mΩ)
		L	B	H	P	P1			
DLB-1100-6.5-P20	6.5	42	17	28	37.5	-	7	7	13.4
DLB-1100-11-P20	11	42	20	39	37.5	-	9	9	8.2
DLB-1100-15-P20	15	42	28	37	37.5	-	12	11	6.1
DLB-1100-15-P40	15	42	28	37	37.5	10.2	13	12	5.9
DLB-1100-20-P20	20	42	30	45	37.5	-	14	13	4.7
DLB-1100-20-P40	20	42	30	45	37.5	20.3	15	14	4.5
DLB-1100-30-P20	30	57	30	45	52.5	-	14	13	6.0
DLB-1100-30-P40	30	57	30	45	52.5	20.3	15	14	5.8
DLB-1100-42-P20	42	57	35	50	52.5	-	14	14	4.4
DLB-1100-42-P40	42	57	35	50	52.5	20.3	18	17	4.2
DLB-1100-55-P20	55	57	42	56	52.5	-	14	14	3.5
DLB-1100-55-P40	55	57	42	56	52.5	20.3	20	19	3.3

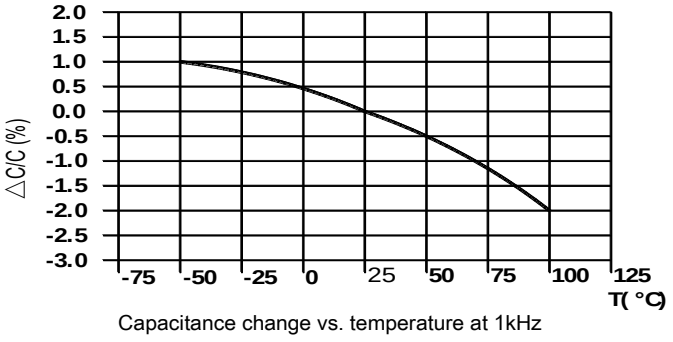
U_{NDC} 1300V @ Θhs 70°C　　1100V @ Θhs 85°C

Ordering code	Cn (μF)	DIMENSIONS (mm)					Imax 10kHz@60 ° (A)	Imax 20kHz@60 ° (A)	Rs (mΩ)
		L	B	H	P	P1			
DLB-1300-4.5-P20	4.5	42	17	28	37.5	-	6	6	16.1
DLB-1300-8.0-P20	8	42	20	39	37.5	-	8	8	9.3
DLB-1300-11-P20	11	42	28	37	37.5	-	10	9	6.9
DLB-1300-11-P40	11	42	28	37	37.5	10.2	12	11	6.7
DLB-1300-15-P20	15	42	30	45	37.5	-	12	11	5.2
DLB-1300-15-P40	15	42	30	45	37.5	20.3	13	12	5.0
DLB-1300-22-P20	22	57	30	45	52.5	-	12	11	6.8
DLB-1300-22-P40	22	57	30	45	52.5	20.3	14	13	6.6
DLB-1300-28-P20	28	57	35	50	52.5	-	14	13	5.5
DLB-1300-28-P40	28	57	35	50	52.5	20.3	16	14	5.3
DLB-1300-37-P20	37	57	42	56	52.5	-	14	14	4.2
DLB-1300-37-P40	37	57	42	56	52.5	20.3	18	16	4.0

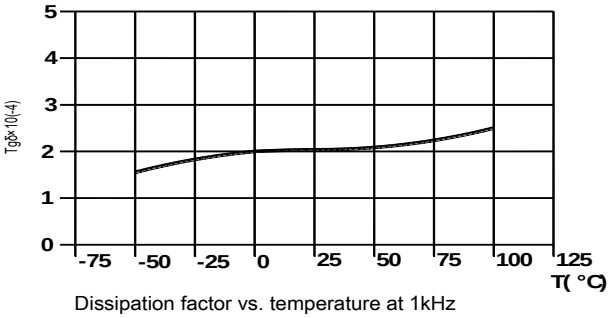
Typical polypropylene dielectric characteristics



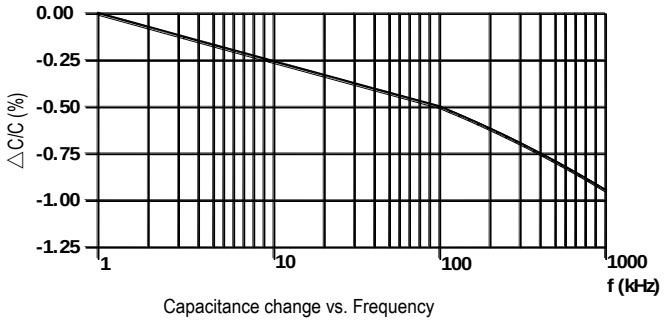
Dissipation factor vs. Frequency



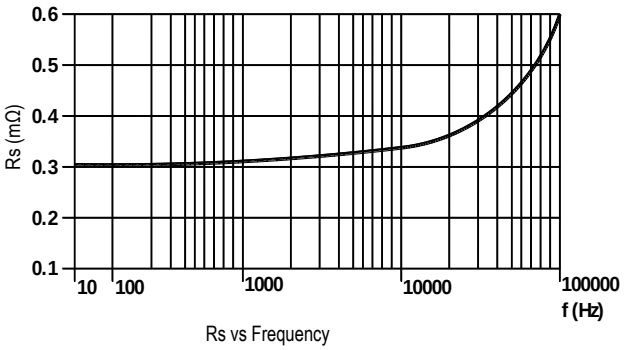
Capacitance change vs. temperature at 1kHz



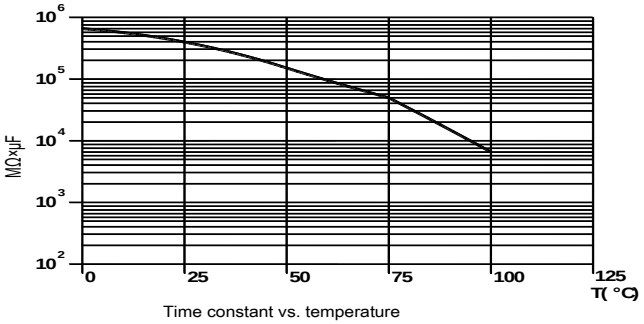
Dissipation factor vs. temperature at 1kHz



Capacitance change vs. Frequency



Rs vs Frequency



Time constant vs. temperature

General Remarks

Rated capacitance C_N

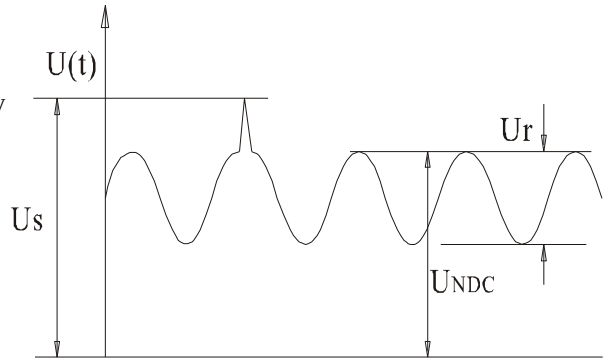
Capacitance value rated at 20 ℃ / 50 Hz.

Rated AC voltage U_N

Maximum operating peak recurrent voltage of either polarity of a reversing type waveform for which the capacitor has been designed.

Rated DC voltage U_{NDC}

Maximum operating peak voltage of either polarity but of a non-reversing type waveform,for which the capacitor has been designed,for continuous operation.



Ripple voltage Ur

Maximum value of the peak-to-peak alternating component of the unidirectional voltage. This value is stated only for DC-capacitors. The peak-to-peak value of AC- and AC/DC-types is always $2 \times U_{NAC}$.

Non-recurrent surge voltage Us

Peak voltage induced by a switching or any other disturbance of the system which is allowed for a limited number of times and duration.

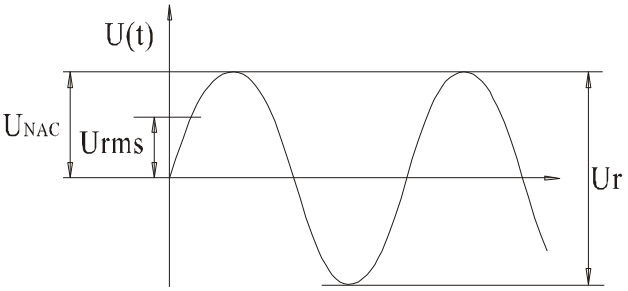
- Maximum duration: 50 ms / pulse. Maximum number of occurrences: 1000 (during load).

Insulation voltage Ui

Rms rated value of the insulation voltage of capacitive elements and terminals to case or earth.

rms voltage Urms

Root mean square of max. permissible value of sinusoidal AC voltage in continuous operation. In power electronics, the RMS voltage is usually not the rated voltage value of the capacitor.



Maximum current Imax

Maximum rms current for continuous operation.

Maximum rate of voltage rise (du/dt)max

Maximum permissible repetitive rate of voltage rise of the operational voltage.

Maximum peak current $\hat{I}$

Maximum permissible repetitive current amplitude during continuous operation.

Maximum peak current ($\hat{I}$) and maximum rate of voltage rise (du/dt)max on a capacitor are related as follows:

$$\hat{I} = C \times (du/dt)max$$

Maximum non-repetitive rate of voltage rise (du/dt)s

Peak rate of voltage rise that may occur non-repetitively and briefly in the event of a fault.

Maximum surge current $\hat{I}s$

Admissible peak current induced by a switching or any other disturbance of the system which is allowed for a limited number of times (1000 times) and duration (50 ms / pulse).

$$\hat{I}s = C \times (du/dt)s$$

Ambient temperature Θ_A

Temperature of the surrounding air, measured at 10 cm distance and 2/3 of the case height of the capacitor.

Lowest operating temperature Θmin

Lowest permitted ambient temperature at which a capacitor may be energized.

Maximum operating temperature Θmax

Highest permitted capacitor temperature during operation, i.e. temperature at the hottest point of the case. It is, however, not sufficient to monitor the surface temperature. Life-span and safe operation crucially depend on the observance of the hotspot temperature.

Hot-spot temperatureΘhs

Temperature zone inside of the capacitor at hottest spot. It has to be noted that,depending on the thermal power dissipation generated inside the capacitor,there is always a temperature difference between hotspot and surface. As the hotspot is usually not accessible for measurement, Θhs must be calculated based on the data stated in the catalogue or data sheet:

$$\Theta hs = \Theta_A + Irms^2 x\ ESR\ x\ Rth$$

Important: No thermal dissipation losses are admissible when operating a capacitor at an ambient temperature equal to the upper category temperature,i.e. Irms and Q shall be zero (operation at pure DC voltage) !

Dielectric dissipation factor tanδ0

Constant dissipation factor of the dielectric material for all capacitors at their rated frequency.The typical loss factor of pp film is $\tan\delta 0 = 2 \times 10^{-4}$.

Dissipation factor tanδ

Loss factor of the capacitor at sinusoidal ac voltage and applied frequency.It is calculated as follows:

$$\tan\delta\ (f) = \tan\delta 0 + Rs\ x\ 2\pi f\ x\ C_N$$

Series resistance Rs

The sum of all ohmic resistances occurring inside the capacitor.

Equivalent Series Resistance ESR

Represents the sum of all loss resistances occurring in the capacitor. It depends on frequency and is essential for the calculation of the capacitor's total power losses.

$$ESR = Rs + \tan\delta 0\ /(2\pi f\ x\ C_N)$$

Thermal resistance Rth

The thermal resistance indicates by how many degrees the capacitor temperature at the hot spot rises in relation to the dissipation losses.

Maximum power loss Pmax

Maximum permissible power dissipation for the capacitor's operation.

$$Pmax = (\Theta hs - \Theta_A)/Rth$$

Self inductance Ls

The sum of all inductive elements which are contained in a capacitor.

Resonance frequency Fr

The lowest frequency at which the impedance of the capacitor becomes minimum.

$$Fr = 1/(2\pi\sqrt{Ls\ x\ C_N})$$

Rated energy contents WN

Energy stored in the capacitor when charged at rated voltage.

$$W_N = 1/2 C_N \times U_N^2$$

Clearance in air L

The shortest distance between conducting parts of the terminals or between terminals and case. In this catalogue, we state only the shorter.

Creepage distance K

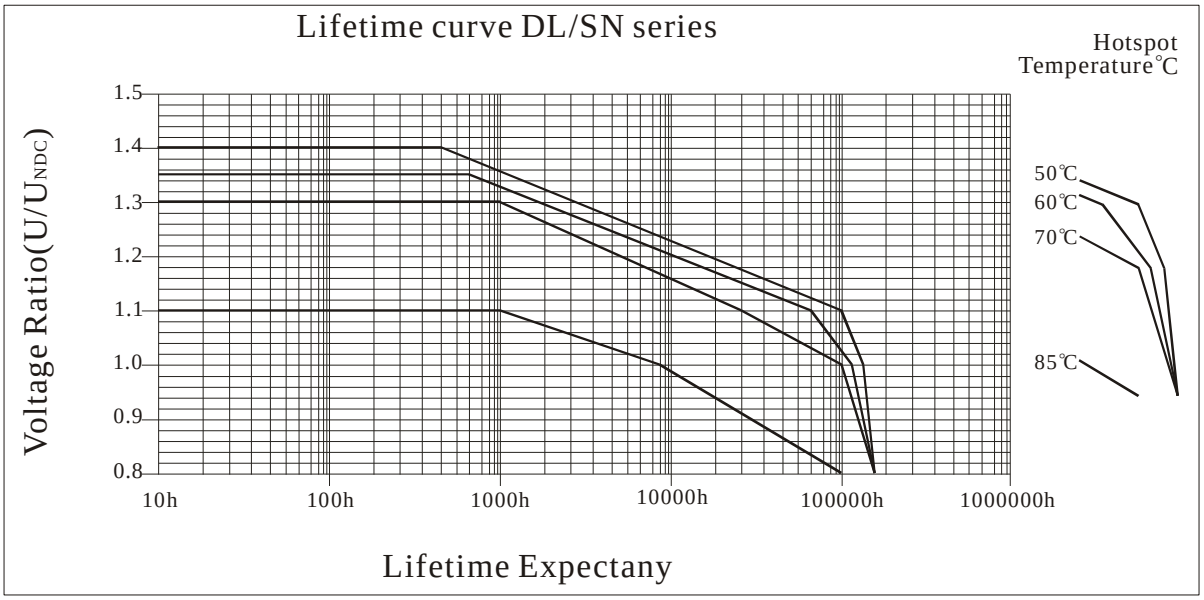
The shortest distance along an insulated surface between conducting parts of the terminals or between terminals and case. In this catalogue, again we state only the shorter.

DC Capacitor Expected life and Failure rate

DC capacitor Lifetime statements vs. Failure rate

In the lifetime expectancy graphic, statements for more than 200,000 hrs are cut off as they are technically unreasonable. For higher hotspot temperatures, no statements are made regarding operation at overvoltage: the simultaneous operation at limit values results in unpredictable conditions. Here, the statement of a FIT rate - that reflects the growing risk at such extreme conditions - would be of far better use.

DC capacitor Lifetime Expectancy Graphs



DC capacitor FIT rates (Failures In Time):

By reflecting the probability (in other words: risk) of failures during the operating period under selected operating conditions, it provides information on what effects to expect when de-rating (or over-loading) a capacitor. The failure probability of a component is a statistical value which is described by a log-normal distribution:

$$N = No \times e^{-\lambda t}$$

N = number of functional components after period t

No = total number of components at time t = 0

λ = failure rate

λ is the failure rate, which alternatively is also stated as the so-called FIT-rate (FIT = Failures In Time = $\lambda \times 10^9$). Service cycles may be calculated based on the so-called MTBF value (mean time between failures): MTBF = 1/λ. The failure rate is very closely linked with the operating temperature and the operating voltage applied to the capacitor. As standard, our FIT rates are related to a realistic (from a technical and statistical point of view) operating interval of t=100,000 hours, assuming a capacitor hotspot temperature of 70°C. Hotspot is the only reliable criterion in relation to the capacitor's temperature stress. The outside temperatures may be comparably low, however with high electrical stress the temperature rise in the capacitor may be substantial due to the power dissipation losses produced inside. This could result in the same temperature stress as a generally high ambient temperature.

DC Capacitor Expected life and Failure rate

The simultaneous operation of capacitors at highest permissible voltage and operating temperature should be avoided; otherwise, failure rates may increase beyond reasonable technical reliability.

In fact, a FIT rate of 50 would mean, for example: "If 10,000 capacitors are operated simultaneously for 100,000 hours at rated voltage and with a hotspot temperature of no more than 70 ℃, then out of this batch no more than 50 pcs may fail during the entire period." Any period during which the hotspot temperature is lower than 70 ℃, or the voltage is less than rated voltage, will contribute to a reduction of the 50 FIT.

After the reference interval, the capacitors will continue operating; however the probability of failures may change. It shall be noted that the statements on FIT rates are based mainly on long-year empirical experience; at **ADSO**, we are conducting numerous and regular reliability tests to verify and back up our empirical knowledge. However dedicated studies designed to prove FIT rates would require the test of thousands of capacitors, over hundreds of thousands of hours, which is technically and commercially impossible. Even the use of statistical methods and accelerated ageing factors encounters physical and chemical limits.

Hence lifetime formulas such as

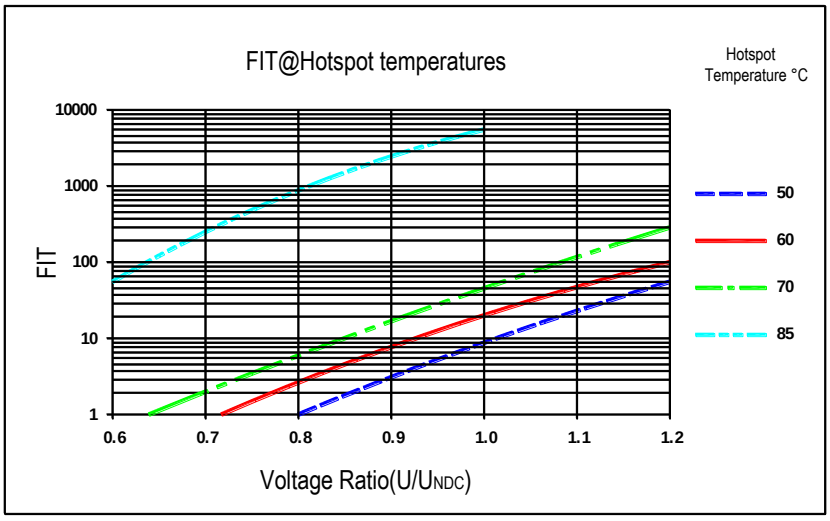
Lifetime (U) = L_N x (Urated/Uworking)^8 and Lifetime (Θ) = L_N x $2^{(\Theta rated-\Theta working)/7}$

should not be used to calculate absolute figures of expected lifetime. These rules and formulas are mainly designed to give an approximate feeling for the importance of voltage and temperature.

All standard items of **ADSO** are designed and dimensioned to comply with their FIT rate as stated in the catalogue or special data sheet. FIT rate statements related to longer reference intervals can be made on request. Further, capacitor designs can be adapted on request to achieve lower FIT at the intended operating conditions.

Based on our current state of knowledge derived from test data and experience, we quote the following FIT rates for our standard products at the a.m. conditions:

DC capacitor FIT rates Quota Graphs



General Safety Advices

Cautions and warnings

_ In case of dents of more than 1 mm depth or any other mechanical damage, capacitors must not be used at all.
_ Check tightness of the connections/terminals periodically.
_ The energy stored in capacitors may be lethal. To prevent any chance of shock, discharge and short-circuit the capacitor before handling.
_ Failure to follow cautions may result, worst case, in premature failures, bursting and fire.
_ **ADSO** is not responsible for any kind of possible damages to persons or things due to improper installation and application of capacitors for power electronics.

Safety

_ Electrical or mechanical misapplication of capacitors may be hazardous. Personal injury or property damage may result from bursting of the capacitor or from expulsion of oil or melted material due to mechanical disruption of the capacitor.
_ Ensure good, effective grounding for capacitor enclosures.
_ Observe appropriate safety precautions during operation (self-recharging phenomena and the high energy contained in capacitors).
_ Handle capacitors carefully, because they may still be charged even after disconnection.
_ The terminals of capacitors, connected bus bars and cables as well as other devices may also be energized.
_ Follow good engineering practice.

Thermal load

After installation of the capacitor it is necessary to verify that maximum hot-spot temperature is not exceeded at extreme service conditions.

Mechanical protection

The capacitor has to be installed in a way that mechanical damages and dents in the aluminum can are avoided.

Storage and operating conditions

Do not use or store capacitors in corrosive atmosphere, especially where chloride gas, sulfide gas,acid, alkali, salt or the like are present. In dusty environments regular maintenance and cleaning especially of the terminals is required to avoid conductive path between phases and/or phases and ground.The maximum storage temperature is 85 ℃.

Service life expectancy

Electrical components do not have an unlimited service life expectancy; this applies to self-healing capacitors, too. The maximum service life expectancy may vary depending on the application the capacitor is used in.

The following applies to all products named in this publication:

1. Some parts of this publication contain statements about the suitability of our products for certain areas of application. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application. As a rule, ADSO is either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether an ADSO product with the properties described in the product specification is suitable for use in a particular customer application.
2. We also point out that in individual cases, a malfunction of passive electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified. In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of a passive electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of a passive electronic component.
3. The warnings, cautions and product-specific notes must be observed.
4. In order to satisfy certain technical requirements, some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as “hazardous”). Useful information on this will be found in our Material Data Sheets on the Internet. Should you have any more detailed questions, please contact our sales offices.
5. We constantly strive to improve our products. Consequently, the products described in this publication may change from time to time. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order. We also reserve the right to discontinue production and delivery of products. Consequently, we cannot guarantee that all products named in this publication will always be available.