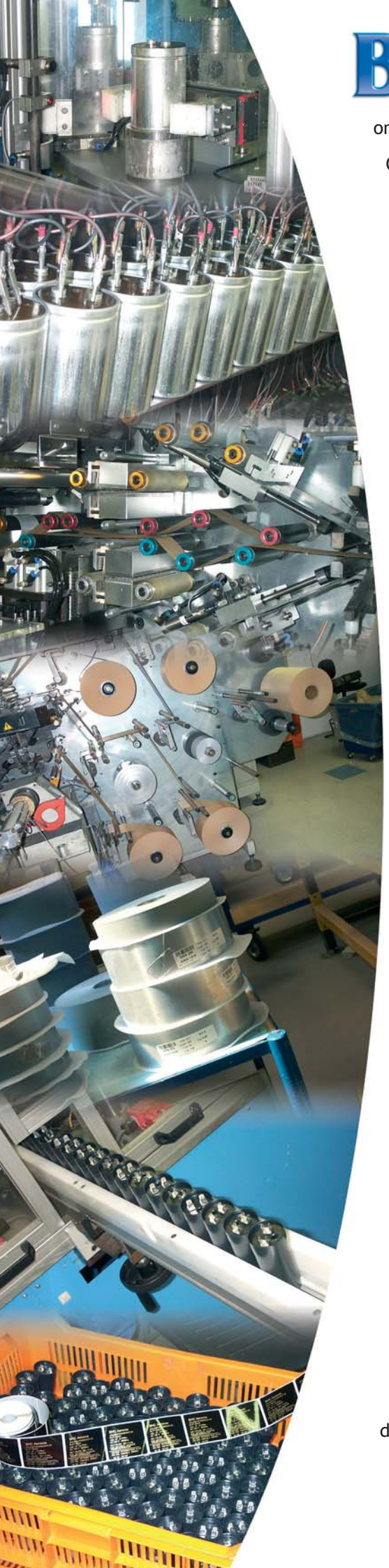
BHC COMPONENTS

part of the EVOX RIFA GROUP

Aluminium Electrolytic Capacitors



BHC COMPONENTS, now part of the Evox Rifa Group, is one of Europe's leading manufacturers of Large Can Aluminium Capacitors. The Evox Rifa Group is a major global capacitor manufacturer, offering a wide range of technologies and styles from production facilities in Sweden, UK, Finland, China and Singapore.

The ISO9001:2000 approved BHC production plant at Weymouth in the South of England has been successfully manufacturing Aluminium Electrolytic Capacitors for the most demanding applications since 1968.

BHC prides itself on its ability to provide a flexible design service for unique customer requirements. The company has a history of working alongside design teams, providing the exact solution to a particular problem, and unrivalled support in the subsequent application. BHC recognises that its success depends on the future of its customers and sees itself not only as a supplier of technologically superior products but as a partner, mutually striving with our customers for competitive advantage.

The product development and customer service provided by BHC is backed by a totally integrated, real time information system that plays an important role in quality, design, and in all phases of production from planning to control.

The control offered by the use of information systems over the manufacturing process is only a part of the quality system that pervades at every level. Quality is the responsibility of every member of our team with the emphasis placed on "right first time" and "continuous improvement". Quality is the link that bonds us to our customers. We are committed to not only satisfy customers' current needs, but to improve and develop products in anticipation of their future requirements.

In formal recognition of this BHC has achieved approval to BS EN ISO9001:2000.

Manufacturing competitively priced products of the highest quality is the cornerstone of our success. If you wish to share in that success then contact us and see for yourself how we can provide a solution to satisfy your needs without having to make do with the closest standard available.

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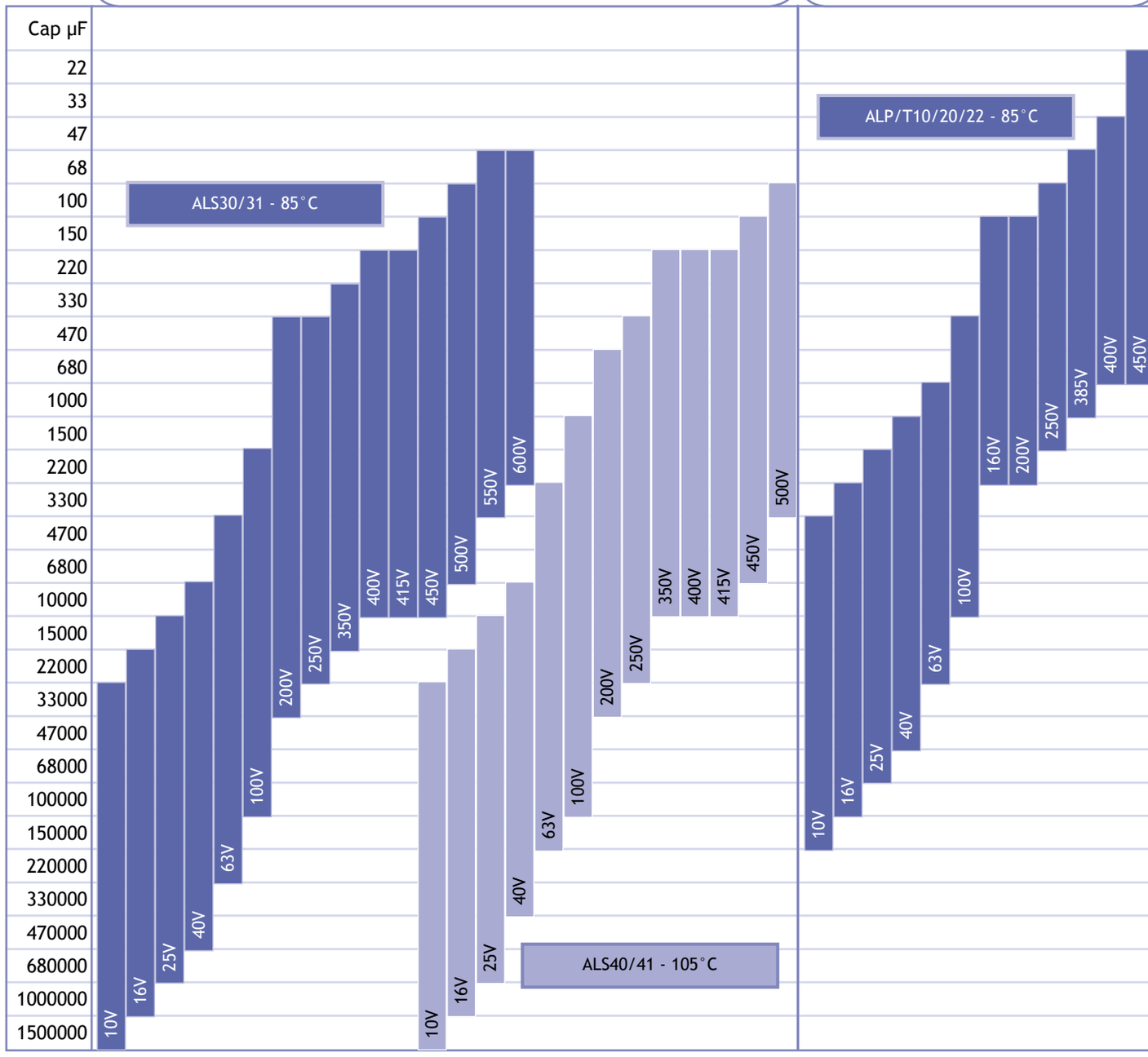
BHC Aluminium Electrolytic Capacitors

Aluminium Electrolytic Capacitors

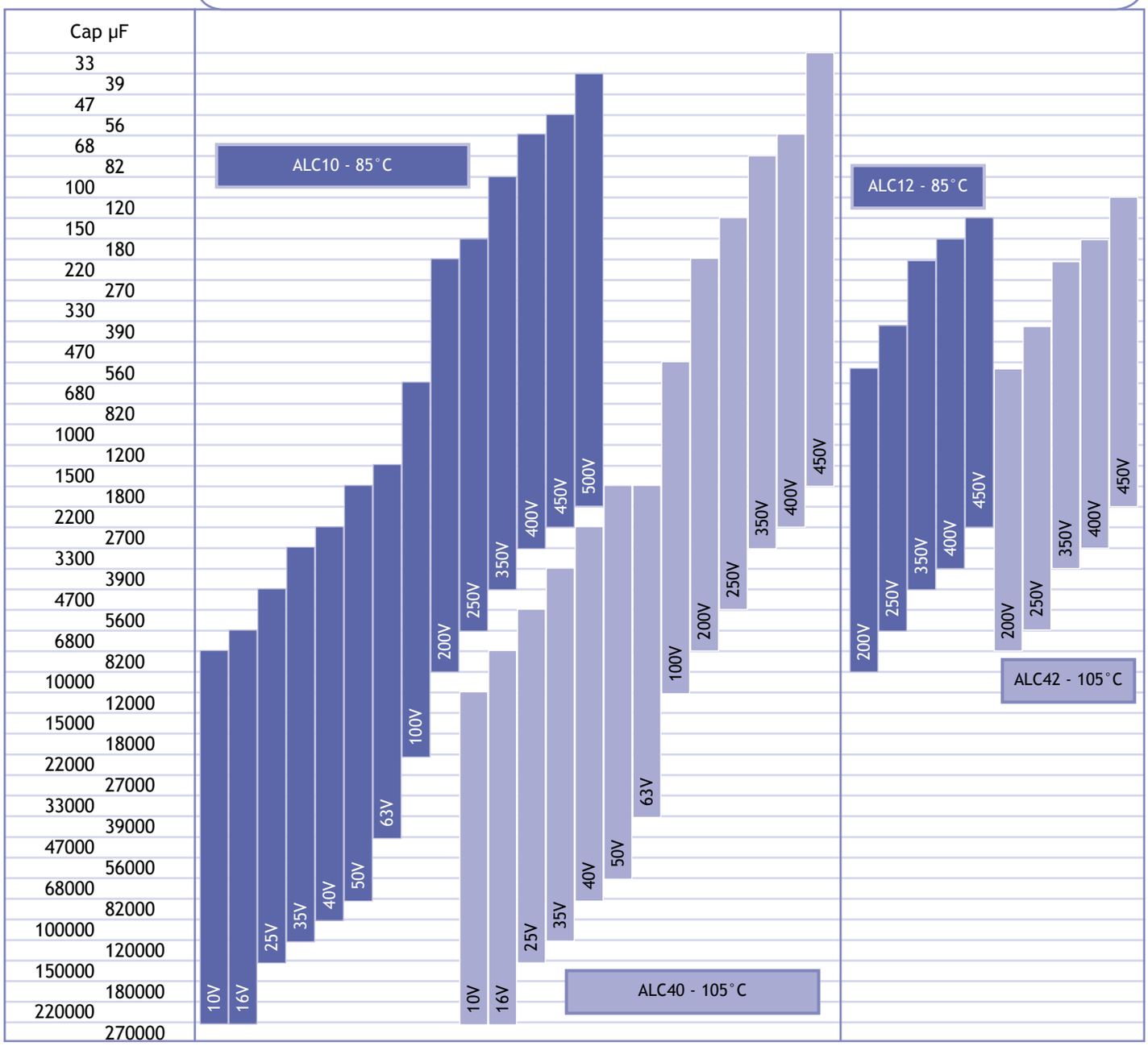
SCREW TERMINAL - ALS SERIES

SOLDER PIN/TAG-ALP/T SERIES



Reference Guide

PCB SNAP-IN - ALC SERIES



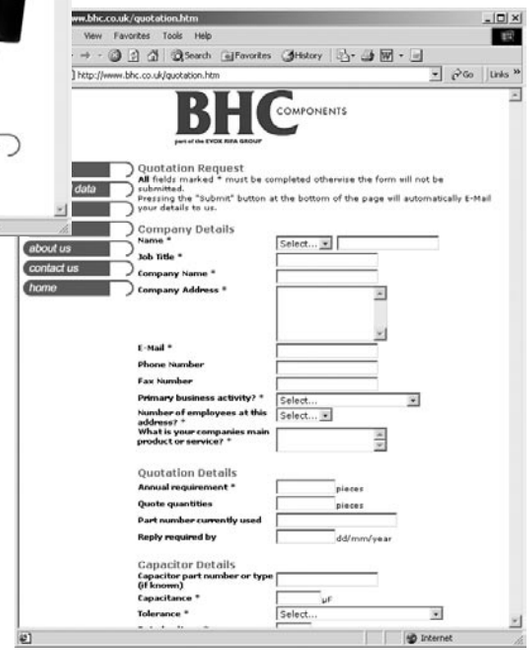
Aluminium Electrolytic Capacitors

BHC web site - http://www.bhc.co.uk

The web site has been designed and hosted to be content rich, easy to navigate, and fast to access. The presentation of the site has been kept simple in order to avoid large page sizes that take too long to download. The design of the site is aimed at the requirements of system design engineers and purchasing personnel and attempts to answer most of the frequently asked questions that we encounter.

The site content includes static pages and dynamically generated pages linked to a JAVA database. The static pages cover generic information that will not require updating on a regular basis, whereas, the dynamic pages relate to data that may change on a more frequent basis.

The site content is subject to continual change as we try to best serve the needs of our new and existing customers. We welcome any feedback or constructive comments on ways we can improve the site, or any new content or functionality that you feel should be available online.



Some of the main features and content of the new web site will include;

- product selector - *dynamic*
- specification sheet report generator – *dynamic*
- life expectancy calculator – *dynamic*
- capacitor construction theory – *static*
- electrical characteristics – *static*
- application and operation (e.g. mounting, protection, balancing resistors, etc...) – *static*
- cleaning solutions - *static*
- product safety - *static*
- component weights - *static*
- product approvals - *static*
- company information – *static*
- download area for literature – *static*
- form requests (quotation, product literature)

Optimised Design Service

Approximately 70% of BHC sales comprise application specific capacitor designs supplied to medium and large OEM (original equipment manufacturers) customers. These designs are neither found in the product catalogue, nor on the website, but have been optimised through close consultation with system designers.

There are a number of design changes that can be made to a standard product that can result in one or more of the following characteristics being achieved;

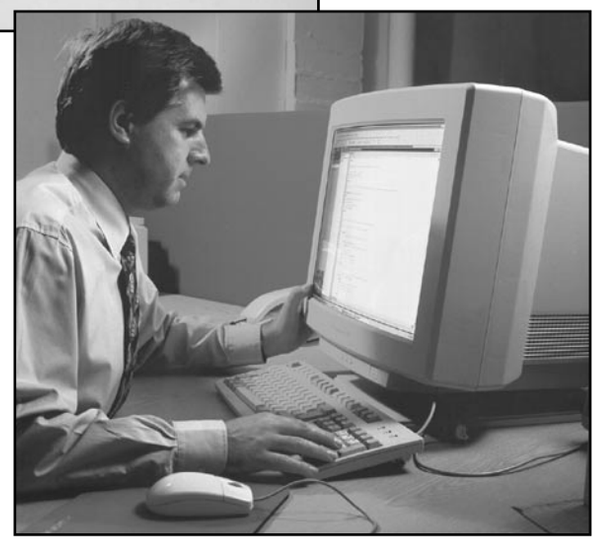
- lower cost
- increased CV in the same can size, or reduced can size for the same CV
- lower ESR resulting in higher ripple current rating
- special print requirements

All standard and custom designs are typically verified by generic in-house endurance testing, surge voltage testing (according to customers requirements), mechanical testing for shock and vibration.

ECAD Design and Simulation Software

BHC has developed a proprietary CAD package called “ECAD”. The principle functions of ECAD include;

- interface to company AS400 business system (i.e. bill of materials for procurement)
- creation of manufacturing instructions
- issue / revision control
- real time costing
- design creation
- life expectancy simulation (with website extension)
- product selector (with website extension)
- specification sheet creation
- design archiving



Using this system BHC application and design engineers are able to offer a rapid response to technical queries relating to existing designs or proposals for new applications. For further information on how this service can benefit your application contact the Technical Sales department at BHC or Email you enquiry to bhcsales@bhc.co.uk marked for the attention of Technical Sales.

Aluminium Electrolytic Capacitors

Capacitor Construction

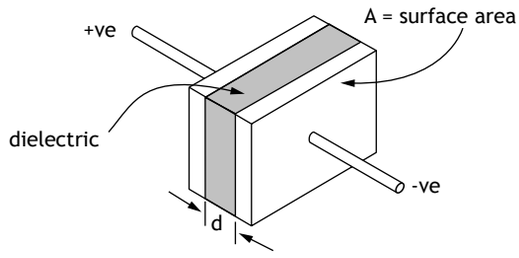
Basic Construction of a Capacitor

The basic principle of the capacitor is to store electrical charge (Q in coulombs). The potential charge it can hold is determined by the capacitance (C in Farads) and voltage (V in volts) and is defined as:-

$$Q = C \cdot V$$

The unit of capacitance, the Farad, is the capacitance of the capacitor between the plates across which there appears a potential difference of 1 volt when it is charged by 1 coulomb of electricity. The value of capacitance in a basic capacitor is proportional to the area of the plates and inversely proportional to the distance between them. Not only does this distance between the plates have an effect on capacitance but also the material that occupies the space, known as the dielectric.

If the space were to be occupied by a perfect vacuum then



the capacitance can be determined by:

$$C = \epsilon_0 \cdot \frac{A}{d}$$

A = surface area of the plates in m^2
d = distance between the plates (or dielectric thickness) in m
ϵ_0 = permittivity of free space - 8.85 x 10^{-12} F/m

In practice this space is occupied by a dielectric which has a relative permittivity to that of the vacuum as follows:

MATERIAL	RELATIVE PERMITTIVITY
Vacuum	1.0
Air	1.0006
Paper (dry)	2 - 2.5
Polythene	2 - 2.5
Insulating oil	3 - 4
Bakelite	4.5 - 5.5
Glass	5 - 10

Therefore capacitance is determined by:

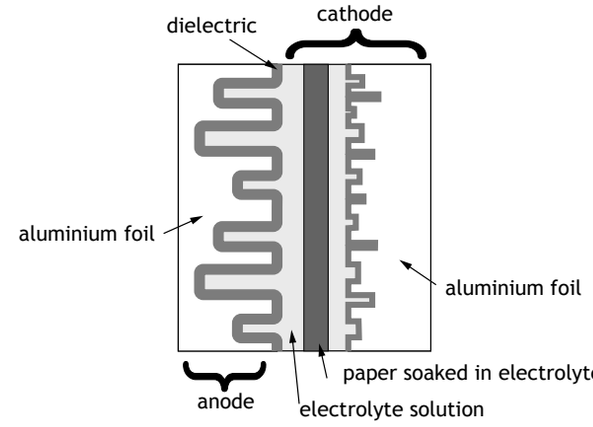
$$C = \epsilon_0 \cdot \epsilon_r \cdot \frac{A}{d}$$

ϵ_r = relative permittivity of the dielectric

Aluminium Electrolytic Capacitors

The aluminium electrolytic capacitor consists basically of two foils interleaved with an absorbent paper wound tightly into a cylinder. The main advantage of this type of capacitor is the high capacitance per unit volume due to its internal construction which consists of a very thin dielectric layer and large effective surface area.

The positive plate, or anode, is made from aluminium foil which is etched to increase the surface area. The dielectric is aluminium oxide, which is formed electrolytically onto the surface of the foil. This formed oxide layer is very thin, being proportional in thickness to the forming voltage and possesses a semiconductor characteristic. The oxide thickness for a 25 volt working capacitor is in the order of 0.045 microns.

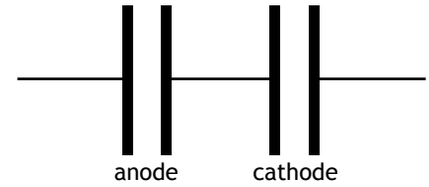


The negative plate, or cathode, is provided by an electrolyte solution for two reasons:

- allows good contact with the anode by permeating all the etched structure.
- repairs any flaws in the oxide layer when the capacitor is polarised.

The second foil, usually called the cathode foil, contacts with the electrolyte reducing the series resistance. This foil has a thin stabilized oxide film, and therefore will also possess a very high capacitance. Like the anode foil the cathode is also etched to increase the surface area. This is necessary in order to eliminate the effect on the overall capacitance by the presence of the cathode foil.

equivalent circuit



$$\frac{1}{C_{total}} = \frac{1}{C_{anode}} + \frac{1}{C_{cathode}}$$

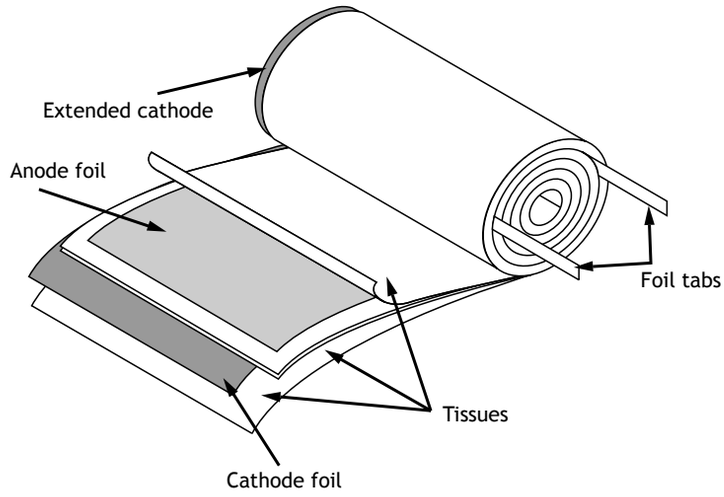
Manufacturing Process

The manufacturing process begins with the anode foil being electrochemically etched to increase the surface area and then 'formed' to produce the aluminium oxide layer.

Both the anode and cathode foils are then interleaved with absorbent paper and wound into a cylinder. During the winding process aluminium tabs are attached to each foil to provide the electrical contact.

The deck, complete with terminals, is attached to the tabs and then folded down to rest on top of the winding.

The complete winding is impregnated with electrolyte before being housed in a suitable container, usually an aluminium can, and sealed. Throughout the process all materials inside the housing must be maintained at the highest purity and be compatible with the electrolyte.



Before being sleeved and packed each capacitor is aged and tested. The purpose of ageing is to repair any damage in the oxide layer and thus reduce the leakage current to a very low level. Ageing is normally carried out at the rated temperature of the capacitor and is accomplished by applying voltage to the device whilst carefully controlling the supply current. The process may take several hours to complete. Damage to the oxide layer can occur due to variety of reasons:

- slitting of the anode foil after forming
- attaching the tabs to the anode foil
- minor mechanical damage caused during winding

After completion of the production process a sample from each batch is taken by the quality department. This sample size is controlled by the use of recognised sampling tables defined in BS 6001.

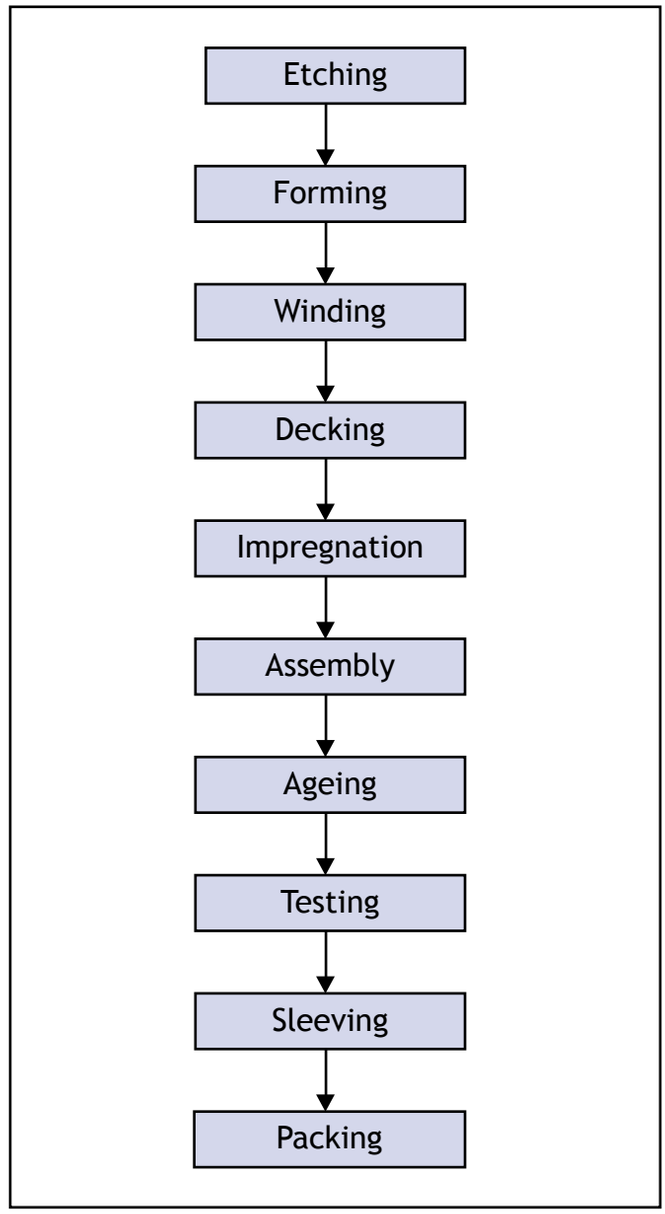
The following tests are applied and may be varied at the request of the customer. In this case the batch, or special procedure, will determine the course of action:

Electrical:

- Leakage current
- Capacitance
- ESR
- Impedance
- Tan Delta

Mechanical/Visual:

- Overall dimensions
- Torque test of mounting stud
- Print detail
- Box labels
- Packaging, including packed quantity



Aluminium Electrolytic Capacitors

Electrical Characteristics

Rated Capacitance (C_R)
This is the designed value of capacitance, usually specified in micro-Farads (μF), when measured with an a.c. voltage <0.5V at 100Hz and 20˚C, with no bias voltage applied. The value of capacitance decreases with frequency and increases with temperature, the magnitude of variation being dependent on the capacitor type.

Capacitance Tolerance
Due to material and manufacturing process variability a tolerance is specified for the rated capacitance. For a typical batch of capacitors the distribution of capacitance values is generally within ±5% of a nominal value.

Rated Voltage (U_R)
The rated voltage is the value of voltage that may be applied continuously, within the operating temperature range of the capacitor. Generally the rated voltage and category voltage have the same value.

Surge Voltage
Unless otherwise stated in the data sheets capacitors shall withstand 1000 cycles at upper category temperature as described below:

Charge to surge voltage and hold for 30 seconds followed by a no load period of 5.5 minutes with the capacitor disconnected and allowed to discharge internally. The power supply used shall be capable of delivering ≥5 A at the test voltage.

Short duration surge voltage - certain product ranges are able to withstand a higher surge voltage but for a shorter period of time. Where applicable these capacitors shall withstand 100 surges at 20˚C as described below:

Charge capacitor to rated voltage then charge up to short duration surge voltage for a period of ≤500 mS then discharge completely, followed by a no load period of 5 minutes. Figures for this test, where applicable, are shown under the range data sheets.

Transient Surge Voltage
High voltage capacitors (250V – 500V) manufactured by BHC are capable of withstanding very high transient surge voltages for short duration. For example, the 400V capacitors from the ALC10 series have been successfully tested to 600V for 500ms as an isolated condition, i.e. once per day. Ultimately the performance of the capacitors under this type of condition is dependent on four criteria:

- value of the voltage;
- duration;
- temperature;
- repetition rate

Given this information BHC can advise on the suitability of a given capacitor for the application.

Dissipation Factor
The dissipation factor or tangent of the loss angle (tan δ) is a measure of the deviation from that of an ideal capacitor, and is related to the capacitance and e.s.r. values as follows:-

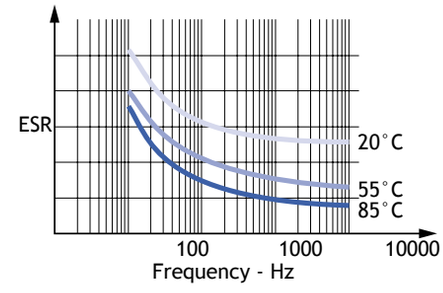
$$\text{Tan } \delta = 2.\pi.f.C.esr$$

Where capacitance (C) and e.s.r. are at frequency f.

Voltage Proof
Values are quoted for each range in the data sheets. These values are applicable to insulating sleeves and end discs in good condition with no scuffs or scratches. Damage caused by improper handling may reduce these values.
The test involves applying a high d.c. voltage, e.g. 2500V, across the insulating sleeve of the capacitor for a period of 1 minute. During this test period there should be no sign of breakdown or flashover.

Leakage Current
This is the residual current which continues to flow when the capacitor has been charged up to a set voltage. At this voltage its magnitude is determined by the thickness (forming voltage) and degree of perfection of the dielectric oxide and foil surface area. The value of leakage current will continue to fall, whilst voltage is applied, until a very low steady state value is reached. Its value will increase both with voltage and temperature. The longer capacitors are stored with no applied voltage, the higher the initial leakage current. More details are given under shelf life.

Equivalent Series Resistance
The equivalent series resistance (e.s.r.) is made up of several resistive components within the capacitor, including electrolyte, tissue separators, foils etc. The method of construction also plays an important role. For example, the e.s.r. can be significantly reduced in some cases by making multiple connections to the anode and cathode foils. The e.s.r. is both temperature and frequency dependent, increasing either will cause a reduction in e.s.r., as exemplified by the graph below:



Impedance (Z)
The impedance is governed by the capacitance (C), e.s.r. and inductance (L) of the capacitor and is given by the formula:

$$Z = \sqrt{esr^2 + (X_L - X_C)^2}$$

Where $X_L = 2.\pi.f.L$ and $X_C = \dfrac{1}{(2.\pi.f.C.)}$

The impedance is dominated by the capacitive reactance (X_C) at low frequencies and by the inductive reactance (X_L) at high frequencies. Series resonance occurs when $X_L = X_C$ at which point Z = e.s.r.

The impedance is clearly frequency dependent and is temperature dependent due to the capacitance and e.s.r. terms.

Inductance

Some inductance is present in all wound aluminium electrolytic capacitors as a result of the construction of the winding and the tabbing. The value is usually not more than a few tens of nano-henrys and is more or less constant with changes in temperature and frequency.

Ripple Current (I_R)

Ripple current, caused by the application of an alternating voltage waveform, will generate heat inside the capacitor. The power loss is given by:

$P = I_r^2.esr$ (Watts)

Where:
P = Power loss
I_r = Ripple Current (Amps)

The maximum power a capacitor can handle is dependent upon the style and surface area of the can, the thermal dissipation factor, and the permissible core temperature rise within the capacitor. Thus for a given capacitor a maximum continuous ripple current rating can be established. Capacitors have a maximum designed core temperature which is higher than the specified maximum ambient operating temperature for the component. At lower ambient temperatures higher ripple currents can be applied provided the maximum core temperature is not exceeded. Factors are given in the data sheets. Increased ripple currents are also possible at higher frequencies, since the e.s.r. is lower. Heat-sinking and forced air cooling will both aid heat transfer and thus allow higher ripple currents.

Note, some additional heat is generated by the leakage current, but this is normally much less than that generated by the ripple current and so can be ignored.
Since the ripple current raises the temperature of the capacitor, it has a significant effect on the operational life of the component. Further details are given under life-expectancy.

Temperature Range

The maximum operating temperature or upper category temperature is the maximum temperature at which the capacitor is designed to operate continuously. Choice of foils, electrolyte and encapsulation materials ultimately determine this figure.
The lower category temperature is the lowest temperature at which the capacitor is designed to operate continuously. The electrolyte resistivity and viscosity both increase at low temperatures causing loss of capacitance and increased e.s.r.

Climatic Category

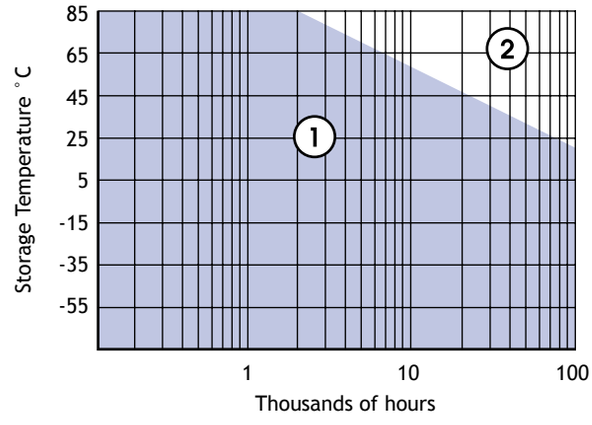
The Climatic Category, in accordance with IEC 68-1, is based upon three groups of digits which decode as follows:

Where:
LCT = Lower category temperature °C (e.g. 40 = -40°C)
UCT = Upper category temperature °C (e.g. 85 = +85°C)
DH = Damp heat test days (IEC 68)

Shelf Life

The capacitance, ESR and impedance of a capacitor will not change significantly after extended storage periods, however the leakage current will very slowly increase. BHC products are particularly stable and allow a shelf life in excess of ten years at room temperature.

The shelf life is shown in the figure below. Within region 1 the leakage current should remain within its specified limit when measured. In region 2 the leakage current may initially exceed the specified limit and if the measured value is higher than twice the specified limit then re-ageing is recommended.



Re-age Procedure

Apply the rated voltage to the capacitor at room temperature for a period of one hour, or until the leakage current has fallen to a steady value below the specified limit. During re-ageing a maximum charging current of twice the specified leakage current or 5mA (whichever is greater) is suggested.

Aluminium Electrolytic Capacitors

Change in Electrical Characteristics

Various electrical parameters will alter with frequency, temperature and voltage as shown:

	Temperature increase	Frequency increase	Voltage increase	Time under voltage
Capacitance	↕	↕	-	-
ESR	↕	↕	-	-
Impedance (below resonance)	↕	↕	-	-
Impedance (above resonance)	↕	↕	-	-
DC leakage	↕	-	↕	↕

APPLICATION AND OPERATION

Aluminium electrolytic capacitors are used in a wide variety of applications including; power supplies, inverters for variable speed drives and uninterruptible power supplies, energy discharge (for medical and photoflash applications) and motor starting. Their advantages over other capacitors are:

- high capacitance per unit volume
- high ripple current capability

For optimum performance of this type of capacitor the following points should be considered:

Parallel and Series Operation

Special considerations arise when electrolytic capacitors are used in series or parallel banks.

In series operation, matching of capacitance values may be necessary to avoid imbalance during charging and discharging mode. Steps must be taken to ensure adequate d.c. voltage distribution while biased, either by providing shunt resistors to compensate for inequalities in capacitor d.c. leakage currents, or some other means.

There are two major configurations to consider when constructing a series/parallel bank of capacitors - individual balancing resistors and common centre connection.

Individual balancing resistors afford greater protection for the capacitors if one becomes short circuit but is more complex to construct and expensive. Common centre connections give improved balancing during steady state and transient conditions but offer the possibility of exposing one half of the bank to full voltage should one capacitor short circuit.

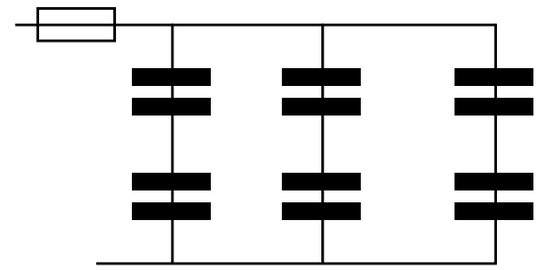
Full details on the selection and use of shunt resistors can be found in a technical article, TD001, in "Aluminium Electrolytic Capacitors - Application Notes", available from BHC.

In parallel operation, particularly large, high voltage banks, the possibility of capacitors discharging into each other may entail special precautions in certain applications.

Series/Parallel Bank Protection

There are three major configurations to consider in protecting a series/parallel bank of capacitors. The advantages and disadvantages of each are outlined below but the final choice must be made by the equipment designer.

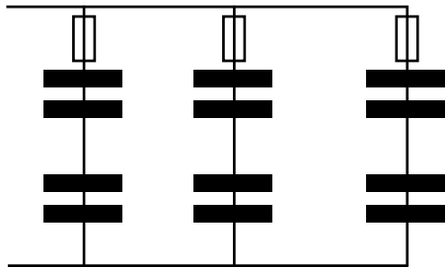
OPTION 1 - Fusing for whole bank



Advantages
- Simple construction
- Inexpensive

Disadvantages
- Only offers basic protection
- Cannot protect against internal discharges within bank

OPTION 2 - Individual capacitor fuses



Advantages
- Removes faulty capacitor from circuit

Disadvantages
- Expensive
- Complex assembly (busbars and fuses)

OPTION 3 - Electronic monitoring

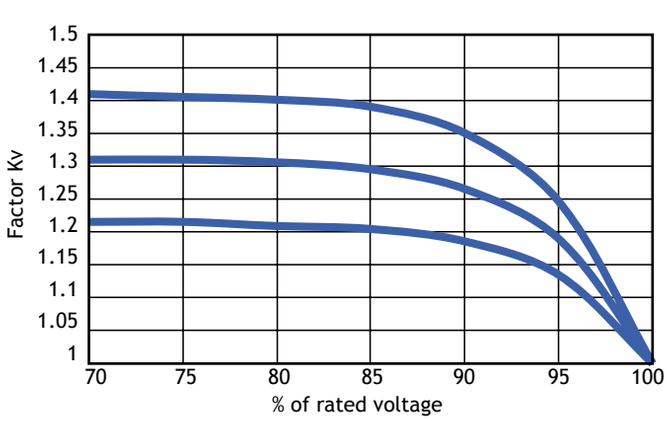
Advantages
- May prevent serious failure by early shut down of equipment
- Optional bank discharge mechanism to prevent capacitors dumping charge into failed capacitor

Disadvantages
- Must be designed into control circuitry
- Complex and expensive

Voltage Deration

If capacitors are operated at a voltage below their rated value then the reduced stress and lower leakage current will give an improvement in the life expectancy.

Since leakage current increases with temperature the benefit of a reduced operating voltage is more pronounced at higher temperatures. The graph below shows the voltage deration factor (Kv) for products with a rated temperature of 85°C and core temperatures (Tc) of 45°C, 65°C and 85°C.



The life expectancy of a capacitor at full rated voltage is multiplied by the voltage deration factor to obtain the new life expectancy at the lower operating voltage:

$$Le_{(Vop)} = Le_{(Vr)} \times Kv$$

$Le_{(Vop)}$ - Life expectancy at operating voltage
$Le_{(Vr)}$ - Life expectancy at rated voltage
Kv - Voltage deration factor

Polarity and Reversed Voltage

Aluminium Electrolytic capacitors manufactured for use in d.c. applications contain an anode foil and a cathode foil. As such they are polarised devices and must be connected with the +ve to the anode foil and the -ve to the cathode foil. If this were to be reversed then the electrolytic process that took place in forming the oxide layer on the anode would be recreated in trying to form an oxide layer on the cathode. In forming the cathode foil in this way heat would be generated and gas given off within the capacitor usually leading to catastrophic failure.

The cathode foil already possesses a thin stabilised oxide layer, this thin oxide layer is equivalent to a forming voltage of approximately 2V. As a result, the capacitor can withstand a voltage reversal of up to 2V for short periods. Above this voltage the formation process will commence.

Aluminium electrolytic capacitors can also be manufactured for use in intermittent a.c. applications by using two anode foils in place of one anode and one cathode.

Case Polarity - due to the presence of electrolyte in the capacitor the aluminium can, stud mounting and any dummy pins will essentially be at the same potential as the negative terminal. BHC therefore recommend that they are either:
- left unconnected
- connected to the same potential as the negative terminal
- insulated

Mounting

All aluminium electrolytic capacitors incorporate a safety vent, in order to relieve build up of internal pressure due to over stress or catastrophic failure. For the smaller ranges, such as snap-in or solder pin types, this takes the form of a weakened area in the side or base of the can. For the larger, screw terminal types the vent is incorporated in the deck.

In all cases consideration must be given, when mounting the capacitor, to the operation of the vent under failure conditions. It is recommended that capacitors are always mounted with the safety vent uppermost, or in the upper part of the device. Should the vent operate the least amount of electrolyte will then be expelled.

It is worth noting that screw terminal capacitors may be mounted in **any** position so long as the vent can operate. The operational and parametric performance is totally unaffected by the physical orientation but should the vent operate with the capacitor mounted upside down then a few drops of electrolyte may be expelled.

Mounting continued overleaf....

Aluminium Electrolytic Capacitors

Mounting continued....

Board mounting types are designed to be mounted by their terminals alone. Larger types may have dummy pins for extra rigidity. Screw terminal and tag ended types may be fixed with a base stud or suitable mounting clamp.

Adequate space should be allowed between components for cooling air to circulate, particularly when high ripple currents are being applied.

Altitude and Low Air Pressure

All capacitors manufactured by BHC are hermetically sealed and should therefore suffer no electrolyte seepage even under vacuum conditions. Additionally the electrical parameters of capacitance, esr, impedance and leakage current will be unaffected.

If a capacitor is operated at altitude, however, the life will be affected slightly for two reasons. Convected heat loss will be reduced as the air density falls resulting in the capacitor running hotter with a consequent reduction in life.

As the air pressure drops the differential between the internal case pressure and external pressure increases. A complete vacuum would cause the internal pressure to rise by 15 psi (approx.). If maintained this would lead to increased electrolyte vapour loss and give a slight reduction in life expectancy.

Alcohols

Component cleaning using solvents such as isopropanol, methanol, ethanol, and propanol would not normally have any detrimental effects and therefore do not require any special precautions.

Aqueous cleaning methods

Aqueous cleaning methods in conjunction with saponification may be used. However, it is recommended that immediate drying of the component in hot air at approximately 85°C for at least 5 minutes is carried out.

Water can become entrapped beneath the sleeve and unlike the solvents used above may not be adequately dispelled by evaporation at room temperature. Trapped water can cause the hydration and discolouration of the surface of the aluminium can, however this is in no way detrimental to the functioning of the capacitor.

Halogenated Hydrocarbons

Halogenated Hydrocarbons contain CFC's and as such are ozone depleting chemicals (ODC's). It is not recommended that they are used as cleaning solvents. In addition these solvents can be injurious to electrolytic capacitors by absorption into the rubber seals followed by subsequent diffusion into the case, and attack of the winding, leading to premature failure.

LIFE EXPECTANCY

The life expectancy represents the typical period of time until the end of life is reached, which in this case is characterised as follows:

CATASTROPHIC FAILURE

- open or short circuit

MECHANICAL FAILURE

- operation of safety vent, split sleeving, etc

PARAMETRIC FAILURE

- capacitance change > ± 10%
- esr > 2 x initial value
- impedance > 3 x initial value
- leakage current > specified limit

Some circuits may be able to tolerate larger parametric variations than shown above, in which case the life of the component will be extended beyond the figures quoted.

The life expectancy data is statistically derived from extensive endurance testing of standard production components and data gathered from components in the field. It does not guarantee the performance and BHC Components cannot assume responsibility for it's use.

Reducing the stress level on the capacitor (i.e. lower voltage/current/temperature) will increase the life expectancy, as will improved cooling.

BHC will calculate the life expectancy of a capacitor under other sets of conditions provided as much as possible of the following data is supplied:

Operating voltage - this should be taken as the sum of the nominal d.c. voltage and the peak of the a.c. ripple voltage.

Ripple current - the rms values should be given at each frequency.

Air temperature - the temperature of the air surrounding or flowing over the capacitors

Thermal aspects - type of cooling, i.e. natural convection or rate of forced air flow (m/s). Thermal resistance of heat sink or chassis.

End of life criteria - any special end of life conditions if different from those stated above.

Life Expectancy and Thermal Characteristics

A key aspect of the life expectancy calculation is the core temperature of the capacitor. It is essential to determine this operating core temperature either by calculation or by measurement.

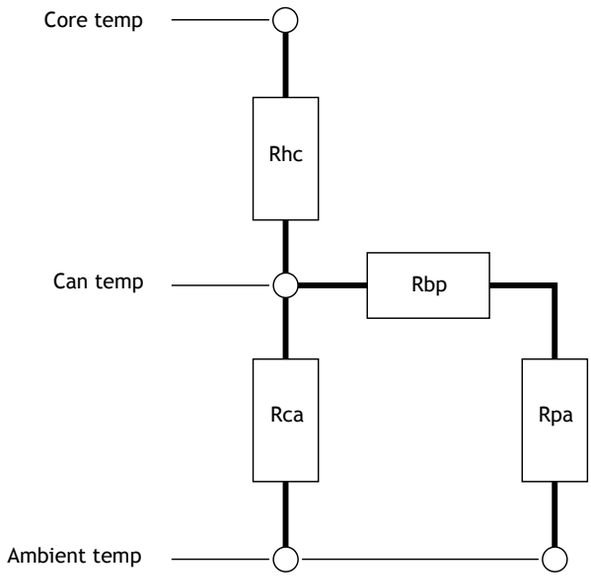
Heat is generated inside the capacitor by the effect of ripple current which raises the core or hot-spot temperature above that of the ambient air. Heat is also generated by the leakage current, however this is normally small enough to be ignored.

Other circuit components in close proximity will also contribute to the heating of the capacitor. As will any mechanical connections to the capacitor, such as the

continued on next page....

mounting method, which is at a higher temperature than the ambient air. Under steady state conditions, when thermal equilibrium has been reached, the heat generated will be exactly balanced by the heat loss.

If we consider only the loss of heat generated within the capacitor, and ignore heat absorbed from surrounding components and through the mounting arrangement, we arrive at the simplified thermal equivalent circuit shown below.



Thermal resistance factors:

Rhc = Hot-spot to can

Rca = Can to ambient air

Rbp = Can base to mounting plate

Rpa = Mounting plate to ambient air

Total thermal resistance from hot-spot to ambient air is given by:

Rha = Rhc + 1/(1/Rca + 1/(Rbp + Rpa))
measured in °C/W

In each case the thermal resistance factors shown are effectively a lumped combination of conduction, convection and radiation.
The method of construction, standard or extended cathode, will determine the Rhc value. The values of Rca and Rpa will vary according to the level of airflow, if any. The value of Rbp will depend upon the characteristics of the material placed between the aluminium base of the can and the mounting plate (i.e. insulating end discs and/or thermal pads) and also on the pressure holding the capacitor against the mounting plate.

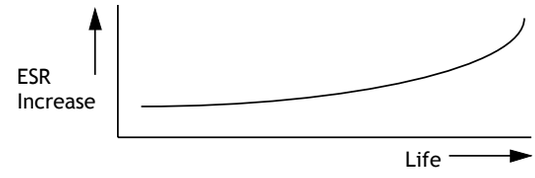
BHC have carried out extensive testing to establish the thermal resistance of the hot-spot to ambient, Rha, for each case size across each range. From this data, life expectancy can be calculated for both standard and special designs under most operating conditions.

A full technical article, TD003, is included in "Aluminium Electrolytic Capacitors - Application Notes", available from BHC, which explains life expectancy and thermal characteristics in more detail. Included in the article is an explanation of how to calculate life expectancy by the end user.

Life Expectancy and Rated Ripple Current

When ripple current is applied to a capacitor the most important parameter in relation to the life expectancy is the esr. The value of esr will slowly increase throughout the life of the capacitor, leading to a gradual increase in power loss and hence core temperature rise.

Long term endurance testing, with voltage and ripple current applied, has established the characteristic parameter changes which are displayed by each product family. The typical esr characteristic is shown below:



Careful study of these curves has enabled the development of a mathematical model to simulate the changes in esr which occur under various test conditions and level of stress.

The results of these mathematical models is included in a full technical article, TD004, in "Aluminium Electrolytic Capacitors - Application Notes", available from BHC. The article includes graphs for most products which allow life expectancy to be extrapolated, based on rated ripple current and ambient air temperature.

Aluminium Electrolytic Capacitors

Product Safety

THESE NOTES SHOULD BE READ IN CONJUNCTION WITH THE PRODUCT DATA SHEET. FAILURE TO OBSERVE THE RATINGS AND THE INFORMATION ON THIS SHEET MAY RESULT IN A SAFETY HAZARD.

WARNING

When potentially lethal voltages e.g. 30V a.c. (r.m.s) or 60V d.c. are applied to the terminals of this product, the use of a hazard warning label is recommended. In the case of motor start capacitors they meet the requirements of British Standard Specifications BS.5267:1976 and reference should be made to Appendix C - Guide for installation and operation.

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1. MATERIAL CONTENT

Electrolyte

Aluminium electrolytic capacitors contain liquids (electrolytes) which can be hazardous. The electrolytes are conducting solutions of organic and/or boric acid, neutralised with amines or ammonia, in a variety of solvents.

The major solvents are butyrolactone and ethylene glycol. Co-solvents e.g. N-methyl pyrolidone may be present.

Inorganic or organo-phosphates are present in low concentration.

The physical, chemical and toxicological properties of the electrolytes are largely determined by the solvents, as summarised below:

Physical Properties

1. Low viscosity - typically 5 - 50 cp at 25°C
2. Combustible - Flash points 95 - 120°C
3. Low vapour pressure - < 20mm Hg at 25°C

Chemical properties

1. Non-corrosive.
2. Can be aggressive to many plastics, lacquers and resins.
3. Totally soluble in hot water.

Toxicology

The electrolytes are moderately toxic, with LD50 values in the range 1.5 - 2g/Kg.

Skin exposure can cause drying and de-fatting. Severe irritation may be caused to the mucous membranes, particularly the eyes, where conjunctivitis may result.

Safety Precautions

In the event of electrolyte escape, wash the affected area with hot water. Use rubber gloves to avoid skin contact. Any contact with the eyes should be liberally irrigated with water, and medical advice sought.

Note - the electrolyte systems do not contain materials currently listed as carcinogenic, mutagenic or teratogenic, e.g. polychlorinated biphenyls (PCB's), dimethylformamide (DMF) or dimethylacetamide (DMA).

The capacitor case may be aluminium, polycarbonate or Noryl. Aluminium cans are usually sleeved with PVC or polyolefin.

Other Materials

The end seal (cover) may be nylon, phenolic or polybutylteraphthallate (PBT) or an EPR rubber/phenolic laminate.

Sealing rings and pressure vents are EPR or silicone rubber.

2. PHYSICAL FORM

These capacitors are cylindrical, with axial, radial or screw terminations.

3. INTRINSIC PROPERTIES

Operating

D.C. capacitors are polar devices, and will operate safely only if correctly connected. Reversing the connections will result in high leakage currents which could subsequently cause short circuit failure, rupture of the safety vent and possibly explosion and fire.

Correctly polarised operation may result in the above failure modes if:

- the surge voltage is exceeded.
- the ambient temperature is too high.
- excessive ripple currents are applied.

A.C. typres are non-polar. Catastrophic failure may be caused by:

- Abnormal duty cycles.
- Voltage in excess of rated value.
- Ambient temperature too high.

Non Operating

Aluminium electrolytic capactiors contain liquids which can leak out (see material content).

Damage to the encapsulation may cause leakage of the electrolyte. Excessive torque or soldering heat may affect the performance of the capacitor or damage the sealing.

Electric shock may result if capacitors are not discharged.

4. FLAMMABILITY

Most plastics and elastomers are combustible, i.e. will ignite if an ignition source is applied under suitable conditions of temperature and oxygen level. For most published data the UL94 Horizontal or Vertical Burning System has been applied. Although useful for comparative values, this test is not practicable, as the ignition characteristics are strongly influenced by the material dimensions, and other materials with which they may be in intimate contact.

BHC has completed a series of flammability tests based on a Needle Flame Test as specified in IEC 695-2-2. Full details of the tests undertaken on both the external components, and internal wind elements, can be found in a full technical article, TD005, "Flammability Characteristics" contained within BHC "Aluminium Electrolytic Capacitors – Application Notes".

5. DISPOSAL

Aluminium Electrolytic Capacitors are consignable waste under the Special Waste Regulations 1996 (Statutory Instrument 1996 Nº 972), which complies with the EC Hazardous Waste Directive - Directive 91/689/EEC. The electrolyte should therefore be treated as a hazardous waste and advice should be sought from the local office of the Environmental Agency regarding its disposal. In the United Kingdom there are two possible methods of disposal; high temperature incineration and land fill, from which the user should seek the best practicable environmental option.

Due to the construction of an aluminium electrolytic capacitor high temperature incineration may cause the component to explode due to build-up of internal gas pressure. In addition, incineration may also cause emission of noxious fumes. If it is decided that this is the best practicable option then it must be carried out under controlled conditions and at a minimum temperature of 1200°C. It should also be confirmed that the incinerator is authorised under parts A or B of the Environmental Protection Act.

The alternative is to dispose of them in an engineered lined land fill site that is licensed to take the materials identified on this safety sheet. It should be stressed that these capacitors are not to be disposed of in a land fill site set aside for domestic waste.

BHC strongly recommend that if there are any doubts regarding the disposal of aluminium capacitors that advice be sought from the local regulating authority.

In addition BHC would like to request that users of aluminium electrolytic capacitors respect the needs of the environment and wherever possible recover as much of the materials as possible, i.e. aluminium.

6. UNSAFE USE

Most failures are of a passive nature and do not represent a safety hazard. A hazard may, however, arise if this failure causes a dangerous malfunction of the equipment in which the capacitor is employed. Circuits should be designed to fail safe under the normal modes of failure.

The usual failure mode is an increase in leakage current or short circuit. Other possible modes are decrease of capacitance, increase in dissipation factor (and impedance) or an open circuit.

Capacitors should be used in a well ventilated enclosure or cabinet.

7. MOUNTING

Care should be taken when mounting by clamp, that any safety vent in the can is not covered.

8. DIELECTRIC ABSORPTION

A phenomenon known as dielectric absorption can cause aluminium electrolytic capacitors to re-charge themselves. The phenomenon is well known but impossible to predict with any great accuracy and so potentially any electrolytic product could be affected. Thus, a capacitor, which has been charged and then completely discharged, will appear to re-charge itself, if left open circuit and this will manifest itself as a small voltage across the terminals of the capacitor. Generally the voltages seen are less than 20 Vdc, however higher voltages have on occasion been reported.

In order to avoid any problems caused by this voltage BHC recommends that capacitors be discharged before connecting to the terminals.

Aluminium Electrolytic Capacitors

Quality Assurance System

BHC recognises that quality is not just a functional part of the manufacturing process, necessary to maintain order and control, it is a philosophy that pervades the whole organisation at every level. Quality is the responsibility of every member of the BHC team where the emphasis is placed on “right first time” and “continuous improvement”. For BHC total quality forms the bond with its customers. It no longer serves to solely satisfy their current needs but creates the environment for development and improvement in order to anticipate and satisfy future requirements.

FM 11885

In formal recognition of this BHC has achieved the following approvals for its quality systems:

In March 1991 the site was also approved to BS 5750 part 1 which has now been harmonised in the European community as EN 9001. This standard is the most comprehensive of the series and is the “Model for quality assurance in design, development, production, installation and servicing”. It is also known as BS EN ISO9001:2000. Additionally certain ranges in the motor start capacitors are approved to VDE 560.

560 PART 8

The benefits of the total quality philosophy and systems that BHC have adopted are evident in the service it provides. One of the key concepts underpinning operations management is optimum batch size which strikes the perfect balance between manufacturing throughput efficiency and traceability. The customer benefits from this with the availability of the most cost competitive order quantities and price, combined with maximum flexibility in tailoring the product to their needs, and enhanced traceability for individual capacitors.

Customer Return Analysis

One feature of the quality system concerns the investigation of field failures. Components returned from the field for technical reasons will be subjected to a rigorous investigation and, unless otherwise specified, a written report will be provided. The data collected from this exercise is collated in a database and reviewed by senior management resulting in corrective actions where necessary.

Reliability and Failure Rates

The reliability of a component can be defined as the probability that it will perform satisfactorily under a given set of conditions for a given length of time. In order to calculate the reliability for a component the failure rate will need to be used.

Failure rates for BHC components have been established as a result of many years of routine endurance testing. Most of these tests are carried out at rated temperature with full rated voltage and ripple current applied. Extensive analysis of this data has enabled failure rates to be established for most product ranges with a 60% confidence level.

Full details of the reliability and failure rates is included in a technical article, TD002, in “Aluminium Electrolytic Capacitors - Application Notes”, available from BHC.

Screw Terminal Capacitors

ALS30/40 series

Listed here are only samples of the range of Screw Terminal Capacitors we can produce.

Electrical characteristics and case size are just two parameters that can be optimised by our design engineers to achieve the exact product you require. Please contact our sales office for more details.

ALS30/31 Series

The ALS30/31 series of screw terminal capacitors cover a wide range of case sizes and voltage ratings featuring high ripple currents and long life performance. They are ideally suited for industrial and commercial applications demanding high reliability and long life expectancy such as frequency converters, UPS systems and switch mode power supplies.

ALS40/41 Series

The ALS40/41 series of screw terminal capacitors feature the same high ripple currents and long life characteristics as the ALS30/31 series but can operate at higher temperatures. They are similarly suited for high reliability and long life applications such as frequency converters, UPS systems and switch mode power supplies, but the extended temperature range allows increased ripple currents at lower temperatures.

	ALS30/31	ALS40/41
Capacitance Range	68µF to 1,500,000µF	100µF to 1,500,000µF
Capacitance Tolerance	±20%	±20%
Voltage Range	10V to 600V d.c.	10V to 500V d.c.
Temperature range	-40°C to +85°C	-40°C to +105°C
Case sizes	36 x 52mm to 90 x 220mm	36 x 52mm to 90 x 220mm

CASE DIMENSIONS AND TERMINAL STYLES

Terminations

Aluminium inserts with M5 threads as standard, max. torque 2NM. Optional M6 threaded inserts have a max. torque 4NM. Max. torque for stud mounting M8:4NM and M12:8NM

Terminal options

(preferred options shown in bold)

Term. Style	Thread	Height T - mm ±0.5	Dia. - DT mm ±0.5	Thread depth TD - mm minimum	Drawing
A [1]	**M5**	**5.5**	**13**	**10**	**Fig.2**
A [2]	**M5**	**7.14**	**8**	**10**	**Fig.1**
B	M5	7.14	13	10	Fig.1
C	M6	5.5	13	10	Fig.1
F	M5	2.36	8	5.5	Fig.1
G	M6	6.35	17	11.8	Fig.1
J	M6	3.17	17	8.8	Fig.1
M	M5	7.14	8	10	Fig.1
R [3]	M5	5.5	15	10	Fig. 2

Notes: [1] Terminal post with flats.
Can diameters 51, 66, 77, 90mm.
Dimension Z is 10mm.

[2] Can diameter 36mm only.

[3] Terminal post with flats.
Dimension Z is 13mm.

Mounting

Any position but refer to the earlier section 'Application & Operation'. Details of mounting clips and stud mounting kits can be found near the back of the catalogue.

Stud Mounting - ALS31/41

Case Polarity - due to the presence of electrolyte in the capacitor the aluminium can and stud mounting will essentially be at the same potential as the negative terminal. BHC therefore recommends that the stud and can are insulated (see accessories for insulating nuts).

Fig. 1 - Terminal Styles A[2], B, C, F, G, J, M

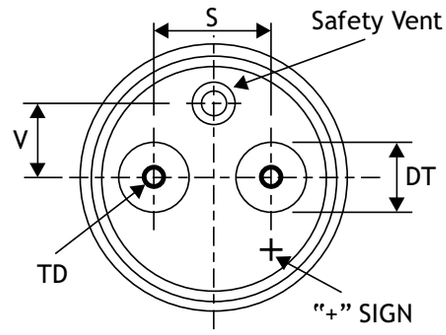
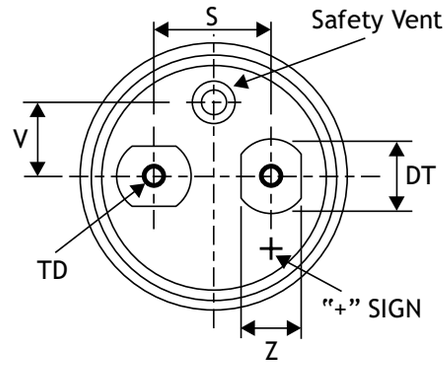
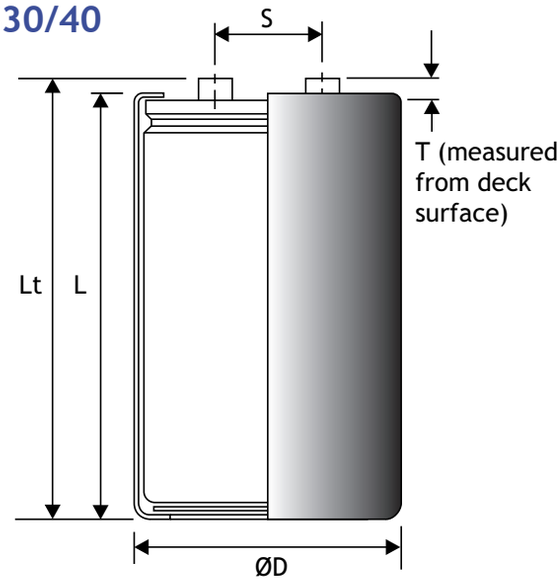


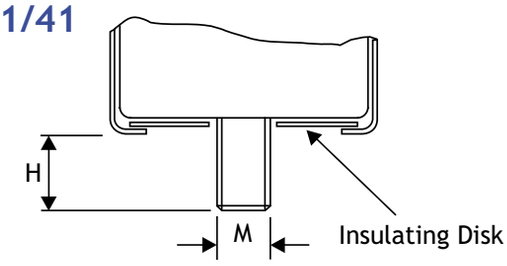
Fig. 2 - Terminal Style A[1], R



ALS30/40



ALS31/41



ALS30/40
case sizes & technical data

DIMENSIONS (sleeved) mm

CASE	D	L	Lt*	S	T	V	M	H	MOUNTING	WEIGHT grams	Terminal Style								
CODE	±1	±2	±1	±0.5	±0.5	mm	THREAD	±1	CLIP	nom.	A[1]	A[2]	B	C	F	G	J	M	R
DA	36	52	58.5	12.8	7.14	8	M8	12	V3/H2/UTE2736	75		•			•			•	
DB	36	62	67.5	12.8	7.14	8	M8	12	V3/H2/UTE2736	90		•			•			•	
DE	36	82	87.5	12.8	7.14	8	M8	12	V3/H2/UTE2736	115		•			•			•	
DF	36	105	111.5	12.8	7.14	8	M8	12	V3/H2/UTE2736	140		•			•			•	
KE	51	82	86.5	22.2	5.5	13.7	M12	16	V4/UTE2737	220	•		•		•			•	•
KF	51	105	110.5	22.2	5.5	13.7	M12	16	V4/UTE2737	300	•		•		•			•	•
MF	66	105	110.5	28.5	5.5	15.8	M12	16	V10/UTE2738	505	•		•	•					•
ND	77	75	79.5	31.8	5.5	19	M12	16	V11	495	•		•	•		•	•	•	•
NF	77	105	110.5	31.8	5.5	19	M12	16	V11	690	•		•	•		•	•	•	•
NP	77	146	150.5	31.8	5.5	19	M12	16	V11	960	•		•	•		•	•	•	•
NT	77	220	224.5	31.8	5.5	19	M12	16	V11	1450	•		•	•		•	•	•	•
QC	90	67	71.5	31.8	5.5	25	M12	16	V90	615	•		•	•			•		
QD	90	75	79.5	31.8	5.5	25	M12	16	V90	690	•		•	•			•		
QH	90	98	103.5	31.8	5.5	25	M12	16	V90	900	•		•	•			•		
QP	90	146	149.5	31.8	5.5	25	M12	16	V90	1345	•		•	•			•		
QT	90	220	223.5	31.8	5.5	25	M12	16	V90	2000	•		•	•			•		

* Dimensions Lt will change dependant on terminal style.

TECHNICAL DATA

Related documents
IEC 384-4

Temperature range
ALS30/31
Storage -55°C to +85°C
Operating -40°C to +85°C
Environmental classification 40/085/56

ALS40/41
Storage -55°C to +105°C
Operating -40°C to +105°C
Environmental classification 40/105/56

Surge voltage
1000 surges (30 seconds) at 85°C (ALS30/31) and 105°C (ALS40/41) with surge voltage applied. See electrical characteristics for more details.

SHORT DURATION SURGE VOLTAGE (<500 mS)

RATED VOLTAGE	SURGE VOLTAGE
200	350
250	400
350	500
400	520
415	530
450	550
500	600

Charge/discharge
10^6 cycles at 25°C and rated voltage. One cycle per second with a time constant of 0.1.

D.C. leakage current
After application of rated d.c. voltage for 5 minutes at 20°C, the d.c. leakage current shall not exceed 0.006 $C_r U_r$ (0.003 $C_r U_r$ for ALS40) or 6mA whichever is the smaller. Where C_r is the rated capacitance in µF and U_r is the rated d.c. voltage.

Vibration
10Hz to 55Hz at 0.75mm or 10g for 3x2hrs duration. Except 220mm long cans 10-55hz at 0.35mm or 5g for 3x0.5hrs duration.

Insulation resistance
≥ 100MΩ at 100V d.c., across insulating sleeve.

Voltage proof
≥ 2500V d.c., across insulating sleeve.

Capacitor marking
The capacitors are marked with items 1 to 6 from the following list as a minimum, and as much of the remaining information as is practical.

1. Rated capacitance in µF
2. Rated voltage d.c.
3. Polarity of terminations
4. Tolerance on rated capacitance
5. Date code/Batch number
6. BHC part number
7. Environmental classification

Technical data continued overleaf....

Ripple current

The following values are approximate only, to give an indication of the effects of frequency and temperature on ripple current. More accurate data can be obtained by referring to the Application Notes available from BHC.

FREQUENCY CORRECTION

Capacitors shall withstand the rated r.m.s. ripple current as given in the table at upper category temperature in circulating air. For frequencies other than those shown the following formula should be used:

$$\text{Ripple current} = \sqrt{\frac{F \times A^2 \times B^2}{100 \times (B^2 - A^2) + (F \times A^2)}}$$

A = 100Hz ripple current
B = 10kHz ripple current
F = Required frequency (Hz)

TEMPERATURE CORRECTION – ALS30/31

For ambient temperature other than 85°C the following multipliers should be applied to the 85°C ripple current.

AMBIENT TEMPERATURE	FACTOR
50°C	2.1
60°C	1.9
70°C	1.7
85°C	1.0

TEMPERATURE CORRECTION – ALS40/41

For ambient temperature other than 105°C the following multipliers should be applied to the 105°C ripple current.

AMBIENT TEMPERATURE	FACTOR
50°C	2.5
60°C	2.4
70°C	2.2
85°C	1.8
105°C	1.0

N.B. The sum of the d.c. and a.c. voltage components should not exceed the d.c. voltage rating.

Life expectancy

At rated temperature with rated voltage and ripple current applied.

Can Diameter	Range	Life Expectancy (hours)
36	ALS30/31	11000
	ALS40/41	6000
51	ALS30/31	18000
	ALS40/41	7000
66	ALS30/31	19000
	ALS40/41	8000
77, 90	ALS30/31	20000
	ALS40/41	9000

ALS30/31

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 85°C 100 Hz	Ripple current (A) at 85°C 10 KHz	Type number
10V d.c. (11.5V surge)	33000	36x52	20	18	8.4	8.9	ALS3 - - 333DA010
	47000	36x62	15	14	10.2	10.7	ALS3 - - 473DB010
	68000	36x82	10	9	13.6	14.3	ALS3 - - 683DE010
	100000	36x105	8	8	17.1	17.9	ALS3 - - 104DF010
	150000	51x82	8	7	16.0	18.0	ALS3 - - 154KE010
	220000	51x105	7	6	20.6	22.0	ALS3 - - 224KF010
	330000	77x75	10	10	18.4	18.5	ALS3 - - 334ND010
	330000	66x105	6	5	24.4	26.0	ALS3 - - 334MF010
	330000	90x67	8	8	22.6	23.1	ALS3 - - 334QC010
	470000	90x75	11	11	19.4	19.5	ALS3 - - 474QD010
	470000	77x105	5	5	30.8	32.8	ALS3 - - 474NF010
	680000	90x98	7	6	27.9	28.0	ALS3 - - 684QH010
	680000	77x146	5	4	32.3	32.7	ALS3 - - 684NP010
	1000000	90x146	4	4	45.3	45.6	ALS3 - - 105QP010
	1000000	77x220	4	4	44.7	45.3	ALS3 - - 105NT010
	1500000	90x220	4	4	53.8	54.3	ALS3 - - 155QT010

Mounting Style 0 or 1 **
Termination Style A,B,C,F,G,J,M or R

Ordering information

For full ordering details see pages 54 & 55.

ALS30/31

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 85°C 100 Hz	Ripple current (A) at 85°C 10 KHz	Type number
16V d.c. (18.4V surge)	22000	36x52	22	18	8.3	8.8	ALS3 - - 223DA016
	33000	36x62	17	14	10.1	10.6	ALS3 - - 333DB016
	47000	36x82	11	10	13.4	14.1	ALS3 - - 473DE016
	68000	36x105	9	8	16.9	17.7	ALS3 - - 683DF016
	100000	51x82	10	9	16.0	16.9	ALS3 - - 104KE016
	150000	51x105	8	7	20.0	20.9	ALS3 - - 154KF016
	220000	77x75	10	10	18.5	18.6	ALS3 - - 224ND016
	220000	66x105	6	5	29.3	29.7	ALS3 - - 224MF016
	330000	90x67	8	8	22.6	23.1	ALS3 - - 334QC016
	330000	90x75	11	11	19.1	19.2	ALS3 - - 334QD016
	330000	77x105	5	5	28.6	30.8	ALS3 - - 334NF016
	470000	90x98	7	7	27.6	27.8	ALS3 - - 474QH016
	470000	77x146	5	5	38.9	39.6	ALS3 - - 474NP016
	680000	90x146	4	4	45.3	45.5	ALS3 - - 684QP016
	680000	77x220	4	4	46.7	47.6	ALS3 - - 684NT016
	1000000	90x220	4	3	56.4	57.3	ALS3 - - 105QT016
25V d.c. (28.5V surge)	15000	36x52	24	20	8.2	8.7	ALS3 - - 153DA025
	22000	36x62	17	15	9.9	10.4	ALS3 - - 223DB025
	33000	36x82	11	10	13.2	13.9	ALS3 - - 333DE025
	47000	36x105	9	7	16.6	17.4	ALS3 - - 473DF025
	68000	51x82	11	10	15.6	16.9	ALS3 - - 683KE025
	100000	51x105	9	8	19.6	20.6	ALS3 - - 104KF025
	150000	77x75	11	11	17.9	18.1	ALS3 - - 154ND025
	150000	66x105	6	6	28.4	28.9	ALS3 - - 154MF025
	220000	90x67	9	8	21.9	22.6	ALS3 - - 224QC025
	220000	90x75	12	12	18.7	18.8	ALS3 - - 224QD025
	220000	77x105	6	6	28.1	30.8	ALS3 - - 224NF025
	330000	90x98	8	8	26.4	26.5	ALS3 - - 334QH025
	330000	77x146	5	5	37.3	39.6	ALS3 - - 334NP025
	470000	90x146	4	4	43.6	43.9	ALS3 - - 474QP025
	470000	77x220	4	4	45.8	47.0	ALS3 - - 474NT025
	680000	90x220	4	4	55.4	56.7	ALS3 - - 684QT025
40V d.c. (46V surge)	10000	36x52	23	20	7.9	8.4	ALS3 - - 103DA040
	15000	36x62	17	14	9.5	10.0	ALS3 - - 153DB040
	22000	36x82	11	10	12.7	13.3	ALS3 - - 223DE040
	33000	51x82	12	11	14.2	16.7	ALS3 - - 333KE040
	47000	51x82	12	11	14.2	16.7	ALS3 - - 473KE040
	68000	51x105	10	9	18.0	20.6	ALS3 - - 683KF040
	100000	77x75	13	12	16.4	16.5	ALS3 - - 104ND040
	100000	66x105	7	6	26.3	26.6	ALS3 - - 104MF040
	100000	90x67	8	7	23.0	24.8	ALS3 - - 104QC040
	100000	90x75	10	10	20.3	20.4	ALS3 - - 104QD040
	150000	77x105	8	8	26.8	30.2	ALS3 - - 154NF040
	150000	90x98	7	7	28.6	28.9	ALS3 - - 154QH040
	220000	77x146	6	5	35.4	39.6	ALS3 - - 224NP040
	220000	90x146	4	4	46.5	47.0	ALS3 - - 224QP040
	330000	77x220	4	4	45.0	46.5	ALS3 - - 334NT040
	470000	90x220	4	4	52.3	53.4	ALS3 - - 474QT040
63V d.c. (72.5V surge)	4700	36x52	36	28	6.7	7.4	ALS3 - - 472DA063
	6800	36x62	26	20	8.2	9.0	ALS3 - - 682DB063
	10000	36x82	17	14	10.8	11.9	ALS3 - - 103DE063
	15000	36x105	15	8	10.9	14.4	ALS3 - - 153DF063
	15000	51x82	12	11	13.9	14.4	ALS3 - - 153KE063
	22000	51x82	12	11	13.9	14.4	ALS3 - - 223KE063
	33000	51x105	10	9	17.4	18.0	ALS3 - - 333KF063
	47000	77x75	13	13	16.6	16.8	ALS3 - - 473ND063
	47000	66x105	8	7	26.7	26.5	ALS3 - - 473MF063
	47000	90x75	11	10	20.3	20.7	ALS3 - - 473QD063
	68000	90x67	10	9	20.9	22.4	ALS3 - - 683QC063
	68000	77x105	8	8	24.7	26.4	ALS3 - - 683NF063
	68000	90x98	8	7	28.9	29.6	ALS3 - - 683QH063
	100000	77x146	6	6	34.8	35.4	ALS3 - - 104NP063
	150000	90x146	5	5	40.2	40.7	ALS3 - - 154QP063
	150000	77x220	4	4	43.3	45.1	ALS3 - - 154NT063
	220000	90x220	4	4	52.4	54.3	ALS3 - - 224QT063

Ordering information

For full ordering details see pages 54 & 55.

Mounting Style 0 or 1 **
Termination Style A,B,C,F,G,J,M or R

BHC COMPONENTS
part of the EVOX RIFA GROUP

Screw Terminal Capacitors

ALS30/31

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 85°C 100 Hz	Ripple current (A) at 85°C 10 KHz	Type number
100V d.c. (115V surge)	2200	36x52	69	55	4.9	5.4	ALS3 - - 222DA100
	3300	36x62	49	39	6.0	6.6	ALS3 - - 332DB100
	4700	36x82	33	27	7.9	8.8	ALS3 - - 472DE100
	6800	36x105	23	19	10.0	11.1	ALS3 - - 682DF100
	10000	51x82	28	24	10.1	10.5	ALS3 - - 103KE100
	15000	51x105	20	18	12.6	13.1	ALS3 - - 153KF100
	22000	77x75	25	24	12.0	12.2	ALS3 - - 223ND100
	22000	66x105	13	12	18.4	19.1	ALS3 - - 223MF100
	22000	90x67	15	13	18.9	20.9	ALS3 - - 223QC100
	22000	90x75	21	20	14.7	15.0	ALS3 - - 223QD100
	33000	77x105	15	14	17.6	19.0	ALS3 - - 333NF100
	33000	90x98	13	12	20.8	21.2	ALS3 - - 333QH100
	47000	77x146	10	9	25.2	25.7	ALS3 - - 473NP100
	68000	90x146	9	8	29.4	29.8	ALS3 - - 683QP100
	68000	77x220	7	6	40.6	41.5	ALS3 - - 683NT100
	100000	90x220	6	5	30.8	33.3	ALS3 - - 104QT100
200V d.c. (230V surge)	470	36x52	286	227	2.6	4.3	ALS3 - - 471DA200
	680	36x62	199	158	3.9	5.4	ALS3 - - 681DB200
	1000	36x82	135	107	5.1	7.1	ALS3 - - 102DE200
	1500	36x105	90	72	5.6	9.1	ALS3 - - 152DF200
	2200	51x82	73	60	8.2	9.7	ALS3 - - 222KE200
	3300	51x105	48	40	9.2	13.1	ALS3 - - 332KF200
	4700	77x75	48	42	10.6	11.5	ALS3 - - 472ND200
	4700	66x105	33	27	13.0	19.1	ALS3 - - 472MF200
	6800	66x105	27	23	15.7	17.7	ALS3 - - 682MF200
	6800	90x67	38	29	13.7	18.5	ALS3 - - 682QC200
	6800	90x75	35	31	13.3	14.3	ALS3 - - 682QD200
	10000	77x105	28	25	14.9	15.9	ALS3 - - 103NF200
	10000	90x98	23	20	18.8	20.3	ALS3 - - 103QH200
	15000	77x146	18	16	21.4	22.7	ALS3 - - 153NP200
	22000	90x146	13	12	26.7	28.0	ALS3 - - 223QP200
	22000	77x220	11	9	36.1	38.7	ALS3 - - 223NT200
	33000	90x220	10	9	42.2	44.8	ALS3 - - 333QT200
250V d.c. (287V surge)	470	36x52	247	187	3.0	4.5	ALS3 - - 471DA250
	680	36x62	172	131	3.8	5.6	ALS3 - - 681DB250
	1000	36x82	117	89	5.0	7.4	ALS3 - - 102DE250
	1500	51x82	86	67	6.2	9.8	ALS3 - - 152KE250
	2200	51x82	69	55	7.7	9.1	ALS3 - - 222KE250
	3300	51x105	45	36	10.4	12.4	ALS3 - - 332KF250
	3300	77x75	52	43	10.4	11.9	ALS3 - - 332ND250
	4700	66x105	31	24	15.0	18.2	ALS3 - - 472MF250
	4700	90x75	38	32	13.2	14.9	ALS3 - - 472QD250
	6800	90x67	35	27	13.5	17.7	ALS3 - - 682QC250
	6800	77x105	29	25	15.0	16.5	ALS3 - - 682NF250
	10000	90x98	24	21	17.1	18.4	ALS3 - - 103QH250
	10000	77x146	19	16	21.6	24.0	ALS3 - - 103NP250
	15000	90x146	14	12	27.0	29.5	ALS3 - - 153QP250
	15000	77x220	12	10	32.4	36.5	ALS3 - - 153NT250
	22000	77x220	9	7	36.3	45.8	ALS3 - - 223NT250
	22000	90x220	12	10	42.3	47.4	ALS3 - - 223QT250

Mounting Style 0 or 1 **
Termination Style A,B,C,F,G,J,M or R

Ordering information

For full ordering details see pages 54 & 55.

ALS30/31

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 85°C 100 Hz	Ripple current (A) at 85°C 10 KHz	Type number
350V d.c. (385V surge)	330	36x52	325	226	2.4	5.0	ALS3 - - 331DA350
	470	36x82	223	154	3.4	7.2	ALS3 - - 471DE350
	680	36x105	154	107	4.4	9.0	ALS3 - - 681DF350
	1000	51x82	116	82	6.1	10.6	ALS3 - - 102KE350
	1500	51x105	77	55	8.2	13.5	ALS3 - - 152KF350
	2200	51x105	66	48	8.7	14.1	ALS3 - - 222KF350
	2200	77x75	66	50	9.1	15.6	ALS3 - - 222ND350
	2200	66x105	52	37	11.9	19.3	ALS3 - - 222MF350
	3300	66x105	39	29	12.8	20.3	ALS3 - - 332MF350
	3300	90x67	49	34	11.8	18.0	ALS3 - - 332QC350
	3300	90x75	47	36	12.5	19.8	ALS3 - - 332QD350
	4700	77x105	35	27	14.7	21.7	ALS3 - - 472NF350
	4700	90x98	31	24	16.3	26.6	ALS3 - - 472QH350
	6800	77x146	23	18	19.3	26.0	ALS3 - - 682NP350
	6800	90x146	20	15	24.9	34.4	ALS3 - - 682QP350
	10000	77x220	15	11	31.7	39.3	ALS3 - - 103NT350
	15000	90x220	15	12	38.2	46.4	ALS3 - - 153QT350
400V d.c. (440V surge)	220	36x52	570	387	2.1	4.4	ALS3 - - 221DA400
	330	36x62	382	260	2.7	5.5	ALS3 - - 331DB400
	470	36x82	267	182	3.5	7.1	ALS3 - - 471DE400
	680	36x105	185	126	4.4	8.8	ALS3 - - 681DF400
	1000	51x82	139	98	5.8	10.3	ALS3 - - 102KE400
	1500	51x105	92	65	7.8	13.1	ALS3 - - 152KF400
	1500	77x75	97	70	8.3	14.7	ALS3 - - 152ND400
	2200	51x105	78	56	8.4	13.5	ALS3 - - 222KF400
	2200	66x105	62	44	11.2	18.8	ALS3 - - 222MF400
	2200	90x75	69	50	10.7	18.9	ALS3 - - 222QD400
	3300	90x67	53	38	11.7	17.1	ALS3 - - 332QC400
	3300	77x105	49	36	13.4	21.3	ALS3 - - 332NF400
	3300	90x98	45	32	14.9	25.3	ALS3 - - 332QH400
	4700	77x105	38	26	14.6	20.9	ALS3 - - 472NF400
	4700	90x98	36	26	17.1	25.4	ALS3 - - 472QH400
	4700	77x146	33	24	18.0	26.0	ALS3 - - 472NP400
	6800	77x146	27	20	19.5	26.9	ALS3 - - 682NP400
	6800	90x146	24	17	23.2	32.9	ALS3 - - 682QP400
	6800	77x220	22	15	29.0	40.7	ALS3 - - 682NT400
	10000	90x220	17	12	35.7	49.4	ALS3 - - 103QT400
415V d.c. (456V surge)	220	36x52	555	368	2.1	4.4	ALS3 - - 221DA415
	330	36x62	372	247	2.7	5.6	ALS3 - - 331DB415
	470	36x82	261	173	3.5	7.2	ALS3 - - 471DE415
	680	36x105	180	120	4.5	9.0	ALS3 - - 681DF415
	1000	51x82	136	94	5.7	10.4	ALS3 - - 102KE415
	1500	51x105	90	62	7.6	13.1	ALS3 - - 152KF415
	1500	77x75	96	68	8.1	14.7	ALS3 - - 152ND415
	2200	66x105	61	42	11.0	18.9	ALS3 - - 222MF415
	2200	90x67	71	49	10.5	17.5	ALS3 - - 222QC415
	2200	90x75	68	49	11.1	18.9	ALS3 - - 222QD415
	3300	77x105	48	36	13.4	21.3	ALS3 - - 332NF415
	3300	90x98	45	32	14.6	25.3	ALS3 - - 332QH415
	4700	77x146	33	24	17.6	25.9	ALS3 - - 472NP415
	6800	90x146	23	17	22.7	32.8	ALS3 - - 682QP415
	6800	77x220	21	15	28.5	40.1	ALS3 - - 682NT415
	10000	90x220	17	12	35.2	48.7	ALS3 - - 103QT415

** *Mounting Style* 0 or 1
Termination Style A,B,C,F,G,J,M or R

Ordering information

For full ordering details see pages 54 & 55.

Screw Terminal Capacitors

ALS30/31

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 85°C 100 Hz	Ripple current (A) at 85°C 10 KHz	Type number
450V d.c. (495V surge)	150	36x52	735	485	1.8	4.1	ALS3 - - 151DA450
	220	36x62	502	332	2.4	5.1	ALS3 - - 221DB450
	330	36x82	335	221	3.1	6.7	ALS3 - - 331DE450
	470	36x105	235	155	4.0	8.4	ALS3 - - 471DF450
	680	51x82	175	117	4.9	9.9	ALS3 - - 681KE450
	1000	51x105	118	79	6.5	12.6	ALS3 - - 102KF450
	1500	77x75	95	65	8.7	14.9	ALS3 - - 152ND450
	1500	66x105	81	52	9.5	17.4	ALS3 - - 152MF450
	2200	90x67	74	46	9.6	15.4	ALS3 - - 222QC450
	2200	90x75	67	47	11.5	19.0	ALS3 - - 222QD450
	2200	66x105	67	47	11.1	19.3	ALS3 - - 222MF450
	2200	77x105	59	41	12.2	21.1	ALS3 - - 222NF450
	3300	90x75	53	33	12.6	17.9	ALS3 - - 332QD450
	3300	77x105	40	30	13.8	21.2	ALS3 - - 332NF450
	3300	90x98	44	30	15.6	25.5	ALS3 - - 332QH450
	3300	77x146	39	27	16.1	25.1	ALS3 - - 332NP450
	4700	77x146	36	26	17.1	25.2	ALS3 - - 472NP450
	4700	90x146	29	19	21.0	31.8	ALS3 - - 472QP450
	6800	77x220	21	14	27.4	38.8	ALS3 - - 682NT450
	10000	90x220	18	13	33.4	46.5	ALS3 - - 103QT450
500V d.c. (550V surge)	100	36x52	1231	847	1.6	2.9	ALS3 - - 101DA500
	150	36x62	823	566	2.0	3.7	ALS3 - - 151DB500
	220	36x82	560	386	2.7	4.8	ALS3 - - 221DE500
	330	36x82	450	350	3.2	5.7	ALS3 - - 331DE500
	330	36x105	374	258	3.5	6.2	ALS3 - - 331DF500
	470	51x82	276	194	4.4	7.5	ALS3 - - 471KE500
	680	51x105	190	133	5.7	9.6	ALS3 - - 681KF500
	1000	77x75	173	109	7.6	12.2	ALS3 - - 102ND500
	1000	66x105	137	96	8.1	13.8	ALS3 - - 102MF500
	1500	77x105	91	65	10.6	17.0	ALS3 - - 152NF500
	1500	90x67	110	87	9.5	14.3	ALS3 - - 152QC500
	1500	90x75	119	76	10.1	15.9	ALS3 - - 152QD500
	2200	90x98	80	50	13.7	21.1	ALS3 - - 222QH500
	2200	77x146	62	44	14.3	21.8	ALS3 - - 222NP500
	3300	77x146	54	39	15.3	22.6	ALS3 - - 332NP500
	3300	90x146	51	32	19.0	28.3	ALS3 - - 332QP500
	4700	77x220	37	24	24.3	33.3	ALS3 - - 472NT500
	6800	90x220	27	22	26.5	41.3	ALS3 - - 682QT500
550V d.c. (605V surge)	68	36x52	2178	1665	0.9	1.3	ALS3 - - 680DA550
	150	36x82	988	757	1.4	2.3	ALS3 - - 151DE550
	220	36x105	674	500	2.0	2.9	ALS3 - - 221DF550
	330	51x82	458	330	3.0	3.4	ALS3 - - 331KE550
	470	51x105	321	248	3.9	4.4	ALS3 - - 471KF550
	680	77x75	230	173	4.5	6.0	ALS3 - - 681ND550
	680	66x105	221	170	5.4	6.3	ALS3 - - 681MF550
	1000	66x105	154	120	5.8	7.5	ALS3 - - 102MF550
	1200	77x105	130	99	7.7	9.0	ALS3 - - 122NF550
	1500	77x146	103	80	9.0	11.4	ALS3 - - 152NP550
	1800	77x146	87	68	11.0	12.2	ALS3 - - 182NP550
	2200	77x220	70	55	13.9	17.3	ALS3 - - 222NT550
	3300	77x220	48	40	16.5	20.2	ALS3 - - 332NT550
600V d.c. (640V surge)	68	36x52	2772	1662	0.7	1.3	ALS3 - - 680DA600
	100	36x62	1886	1131	0.9	1.6	ALS3 - - 101DB600
	150	36x82	1257	754	1.3	2.1	ALS3 - - 151DE600
	220	36x105	858	514	1.6	2.8	ALS3 - - 221DF600
	220	51x82	862	519	2.1	3.5	ALS3 - - 221KE600
	470	51x105	407	246	3.3	5.5	ALS3 - - 471KF600
	680	66x105	281	170	4.7	7.8	ALS3 - - 681MF600
	680	77x75	290	179	4.4	7.0	ALS3 - - 681ND600
	1000	77x105	194	119	6.2	10.0	ALS3 - - 102NF600
	1500	77x146	130	79	8.7	14.0	ALS3 - - 152NP600
	2200	77x220	88	53	13.5	18.3	ALS3 - - 222NT600

Mounting Style 0 or 1 **
Termination Style A,B,C,F,G,J,M or R

Ordering information

For full ordering details see pages 54 & 55.

ALS40/41

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 105°C 100 Hz	Ripple current (A) at 105°C 10 KHz	Type number
10V d.c. (11.5V surge)	33000	36x52	22	19	7.1	7.5	ALS4 - - 333DA010
	47000	36x62	16	14	8.6	9.0	ALS4 - - 473DB010
	68000	36x82	11	10	11.5	12.0	ALS4 - - 683DE010
	100000	36x105	8	7	14.5	15.1	ALS4 - - 104DF010
	150000	51x82	12	11	12.3	12.4	ALS4 - - 154KE010
	220000	51x105	8	8	16.8	17.0	ALS4 - - 224KF010
	330000	77x75	13	12	14.1	14.1	ALS4 - - 334ND010
	330000	66x105	6	6	24.4	24.7	ALS4 - - 334MF010
	330000	90x67	8	8	19.2	19.7	ALS4 - - 334QC010
	470000	90x75	11	11	16.4	16.5	ALS4 - - 474QD010
	470000	77x105	7	7	23.1	23.2	ALS4 - - 474NF010
	680000	90x98	7	7	23.5	23.6	ALS4 - - 684QH010
	680000	77x146	5	5	27.4	27.8	ALS4 - - 684NP010
	1000000	90x146	4	4	38.3	38.5	ALS4 - - 105QP010
	1000000	77x220	4	4	37.8	38.3	ALS4 - - 105NT010
	1500000	90x220	4	4	45.5	46.0	ALS4 - - 155QT010
16V d.c. (18.4V surge)	22000	36x52	24	20	7.0	7.4	ALS4 - - 223DA016
	33000	36x62	17	14	8.5	8.9	ALS4 - - 333DB016
	47000	36x82	11	10	11.3	11.9	ALS4 - - 473DE016
	68000	36x105	9	8	14.3	15.0	ALS4 - - 683DF016
	100000	51x82	12	11	12.3	12.5	ALS4 - - 104KE016
	150000	51x105	8	8	16.7	17.0	ALS4 - - 154KF016
	220000	77x75	12	12	14.2	14.3	ALS4 - - 224ND016
	220000	66x105	6	6	24.5	24.8	ALS4 - - 224MF016
	330000	90x67	8	8	19.2	19.7	ALS4 - - 334QC016
	330000	90x75	11	11	16.2	16.2	ALS4 - - 334QD016
	330000	77x105	7	7	22.7	22.9	ALS4 - - 334NF016
	470000	90x98	8	7	23.4	23.5	ALS4 - - 474QH016
	470000	77x146	5	5	32.3	32.6	ALS4 - - 474NP016
	680000	90x146	4	4	38.3	38.5	ALS4 - - 684QP016
	680000	77x220	4	4	39.6	40.4	ALS4 - - 684NT016
	1000000	90x220	4	3	47.8	48.6	ALS4 - - 105QT016
25V d.c. (28.5V surge)	15000	36x52	24	20	6.9	7.3	ALS4 - - 153DA025
	22000	36x62	17	15	8.4	8.8	ALS4 - - 223DB025
	33000	36x82	11	10	11.1	11.7	ALS4 - - 333DE025
	47000	36x105	9	8	14.0	14.7	ALS4 - - 473DF025
	68000	51x82	13	12	12.0	12.2	ALS4 - - 683KE025
	100000	51x105	9	8	16.4	16.7	ALS4 - - 104KF025
	150000	77x75	13	13	13.7	13.8	ALS4 - - 154ND025
	150000	66x105	6	6	23.8	24.1	ALS4 - - 154MF025
	150000	90x75	10	10	18.7	18.8	ALS4 - - 154QD025
	220000	90x67	9	8	18.6	19.2	ALS4 - - 224QC025
	220000	77x105	8	7	22.3	22.4	ALS4 - - 224NF025
	330000	90x98	8	8	22.3	22.4	ALS4 - - 334QH025
	330000	77x146	5	5	31.0	31.1	ALS4 - - 334NP025
	470000	90x146	4	4	36.9	37.1	ALS4 - - 474QP025
	470000	77x220	4	4	38.9	39.8	ALS4 - - 474NT025
	680000	90x220	4	3	47.0	48.1	ALS4 - - 684QT025
40V d.c. (46V surge)	10000	36x52	23	19	6.6	6.9	ALS4 - - 103DA040
	10000	36x62	19	16	8.1	8.7	ALS4 - - 103DB040
	15000	36x82	13	10	10.8	11.6	ALS4 - - 153DE040
	22000	36x105	10	8	13.6	14.5	ALS4 - - 223DF040
	33000	51x82	13	12	11.7	12.0	ALS4 - - 333KE040
	47000	51x105	9	8	16.2	16.6	ALS4 - - 473KF040
	68000	77x75	13	13	13.9	14.0	ALS4 - - 683ND040
	100000	66x105	7	7	20.6	20.8	ALS4 - - 104MF040
	100000	90x67	10	9	17.7	18.5	ALS4 - - 104QC040
	100000	90x75	12	11	16.0	16.1	ALS4 - - 104QD040
	100000	77x105	7	7	22.4	22.7	ALS4 - - 104NF040
	150000	90x98	8	8	22.6	22.8	ALS4 - - 154QH040
	150000	77x146	5	5	31.3	31.6	ALS4 - - 154NP040
	220000	90x146	4	4	36.8	37.1	ALS4 - - 224QP040
	220000	77x220	4	4	37.7	39.2	ALS4 - - 224NT040
	330000	90x220	4	4	45.6	47.0	ALS4 - - 334QT040

Mounting Style 0 or 1 **
Termination Style A,B,C,F,G,J,M or R

Ordering information

For full ordering details see pages 54 & 55.

Screw Terminal Capacitors

ALS40/41

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 105°C 100 Hz	Ripple current (A) at 105°C 10 KHz	Type number
63V d.c. (72.5V surge)	3300	36x52	38	30	5.5	6.2	ALS4 - - 332DA063
	4700	36x62	27	22	6.7	7.5	ALS4 - - 472DB063
	6800	36x82	19	15	8.9	10.0	ALS4 - - 682DE063
	10000	36x105	13	10	11.2	12.6	ALS4 - - 103DF063
	15000	51x82	16	15	10.7	11.2	ALS4 - - 153KE063
	22000	51x105	11	10	14.7	15.3	ALS4 - - 223KF063
	22000	77x75	14	12	14.6	15.1	ALS4 - - 223ND063
	33000	66x105	8	7	21.3	22.2	ALS4 - - 333MF063
	33000	90x67	10	8	18.1	20.1	ALS4 - - 333QC063
	33000	90x75	11	11	17.1	17.5	ALS4 - - 333QD063
	47000	77x105	9	8	20.7	21.1	ALS4 - - 473NF063
	47000	90x98	8	7	24.4	25.1	ALS4 - - 473QH063
	68000	77x146	6	6	29.1	29.8	ALS4 - - 683NP063
	100000	90x146	5	5	34.5	35.2	ALS4 - - 104QP063
	100000	77x220	4	4	36.7	38.8	ALS4 - - 104NT063
	150000	90x220	4	4	44.4	46.5	ALS4 - - 154QT063
100V d.c. (115V surge)	1500	36x52	79	62	3.9	4.5	ALS4 - - 152DA100
	2200	36x62	56	44	4.8	5.5	ALS4 - - 222DB100
	3300	36x82	37	29	6.4	7.4	ALS4 - - 332DE100
	4700	36x105	26	21	8.1	9.3	ALS4 - - 472DF100
	6800	51x82	32	28	8.0	8.4	ALS4 - - 682KE100
	10000	51x105	21	18	10.9	11.5	ALS4 - - 103KF100
	15000	77x75	28	26	9.7	9.9	ALS4 - - 153ND100
	15000	66x105	14	12	15.8	16.7	ALS4 - - 153MF100
	15000	90x75	20	18	12.9	13.4	ALS4 - - 153QD100
	22000	90x67	17	16	14.3	15.2	ALS4 - - 223QC100
	22000	77x105	15	13	15.5	16.0	ALS4 - - 223NF100
	22000	90x98	13	11	18.4	19.0	ALS4 - - 223QH100
	33000	77x146	10	10	21.6	22.2	ALS4 - - 333NP100
	47000	90x146	9	8	25.9	26.5	ALS4 - - 473QP100
	47000	77x220	7	6	35.4	36.6	ALS4 - - 473NT100
	100000	90x220	6	6	37.2	37.9	ALS4 - - 104QT100
200V d.c. (230V surge)	680	36x52	195	154	2.9	4.0	ALS4 - - 681DA200
	680	36x62	188	147	3.3	4.6	ALS4 - - 681DB200
	1000	36x82	128	100	4.3	6.1	ALS4 - - 102DE200
	1500	36x105	86	67	5.6	7.8	ALS4 - - 152DF200
	2200	51x82	71	58	6.8	8.0	ALS4 - - 222KE200
	3300	51x105	47	38	9.1	10.9	ALS4 - - 332KF200
	4700	77x75	48	42	8.7	9.4	ALS4 - - 472ND200
	6800	66x105	27	23	12.9	14.5	ALS4 - - 682MF200
	6800	90x67	37	28	11.8	15.9	ALS4 - - 682QC200
	6800	90x75	36	32	10.9	11.7	ALS4 - - 682QD200
	6800	77x105	29	25	13.4	14.8	ALS4 - - 682NF200
	10000	90x98	23	20	15.4	16.6	ALS4 - - 103QH200
	10000	77x146	19	16	19.3	21.5	ALS4 - - 103NP200
	15000	90x146	14	12	24.2	26.5	ALS4 - - 153QP200
	22000	77x220	11	10	29.5	31.6	ALS4 - - 223NT200
	33000	90x220	10	8	34.3	36.4	ALS4 - - 333QT200
250V d.c. (287V surge)	470	36x52	235	174	2.5	3.9	ALS4 - - 471DA250
	680	36x62	164	122	3.2	4.8	ALS4 - - 681DB250
	1000	36x82	111	83	4.2	6.3	ALS4 - - 102DE250
	1000	36x105	108	79	4.7	7.5	ALS4 - - 102DF250
	1500	51x82	83	64	6.2	8.2	ALS4 - - 152KE250
	2200	51x105	56	42	8.3	11.1	ALS4 - - 222KF250
	3300	77x75	52	42	8.5	9.7	ALS4 - - 332ND250
	4700	66x105	30	24	12.3	15.0	ALS4 - - 472MF250
	4700	90x67	42	30	10.9	16.3	ALS4 - - 472QC250
	4700	90x75	38	32	10.7	12.1	ALS4 - - 472QD250
	6800	77x105	30	25	12.1	13.4	ALS4 - - 682NF250
	6800	90x98	25	20	15.1	17.3	ALS4 - - 682QH250
	10000	77x146	19	16	17.5	19.5	ALS4 - - 103NP250
	15000	90x146	14	12	21.9	23.9	ALS4 - - 153QP250
	15000	77x220	12	10	29.2	33.0	ALS4 - - 153NT250
	22000	90x220	11	9	34.1	38.2	ALS4 - - 223QT250

Ordering information

For full ordering details see pages 54 & 55.

Mounting Style 0 or 1 **

Termination Style A,B,C,F,G,J,M or R

ALS40/41

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 105°C 100 Hz	Ripple current (A) at 105°C 10 KHz	Type number
350V d.c. (385V surge)	220	36x52	457	303	1.8	4.5	ALS4 - - 221DA350
	330	36x62	307	204	2.4	5.7	ALS4 - - 331DB350
	470	36x82	215	143	3.0	7.2	ALS4 - - 471DE350
	680	36x105	149	99	3.9	8.9	ALS4 - - 681DF350
	1000	51x82	113	78	5.0	10.0	ALS4 - - 102KE350
	1500	51x105	75	52	6.8	12.5	ALS4 - - 152KF350
	2200	77x75	66	49	8.3	13.7	ALS4 - - 222ND350
	2200	66x105	51	35	9.8	17.9	ALS4 - - 222MF350
	2200	90x67	74	52	9.1	16.4	ALS4 - - 222QC350
	2200	90x75	56	40	9.4	17.8	ALS4 - - 222QD350
	3300	77x105	41	30	11.7	19.7	ALS4 - - 332NF350
	4700	90x98	31	23	14.6	23.2	ALS4 - - 472QH350
	4700	77x146	27	20	15.7	23.6	ALS4 - - 472NP350
	6800	90x146	19	14	20.3	29.7	ALS4 - - 682QP350
	6800	77x220	23	17	25.4	35.7	ALS4 - - 682NT350
	10000	90x220	21	16	31.0	42.7	ALS4 - - 103QT350
400V d.c. (440V surge)	220	36x52	542	349	2.0	4.9	ALS4 - - 221DA400
	220	36x62	537	344	2.1	5.4	ALS4 - - 221DB400
	470	36x82	254	164	3.2	7.8	ALS4 - - 471DE400
	470	36x105	251	161	3.5	8.5	ALS4 - - 471DF400
	680	51x82	183	121	4.2	9.8	ALS4 - - 681KE400
	1000	51x105	124	81	5.6	12.3	ALS4 - - 102KF400
	1500	77x75	93	64	7.6	13.9	ALS4 - - 152ND400
	2200	66x105	60	41	9.7	18.1	ALS4 - - 222MF400
	2200	90x67	63	44	9.4	15.9	ALS4 - - 222QC400
	2200	90x75	67	47	10.0	17.5	ALS4 - - 222QD400
	2200	77x105	62	42	10.6	19.8	ALS4 - - 222NF400
	3300	90x98	44	31	13.6	23.4	ALS4 - - 332QH400
	4700	77x146	33	23	15.4	22.6	ALS4 - - 472NP400
	6800	90x146	23	17	20.0	28.3	ALS4 - - 682QP400
	6800	77x220	21	15	23.5	33.3	ALS4 - - 682NT400
	10000	90x220	18	14	29.0	40.3	ALS4 - - 103QT400
415V d.c. (456V surge)	220	36x52	530	331	2.0	5.0	ALS4 - - 221DA415
	220	36x62	524	325	2.1	5.4	ALS4 - - 221DB415
	330	36x82	349	217	2.8	7.1	ALS4 - - 331DE415
	470	36x105	245	152	3.5	8.7	ALS4 - - 471DF415
	680	51x82	180	115	4.4	9.9	ALS4 - - 681KE415
	1000	51x105	122	77	5.8	12.3	ALS4 - - 102KF415
	1500	77x75	95	65	7.6	13.8	ALS4 - - 152ND415
	2200	66x105	60	39	9.7	18.1	ALS4 - - 222MF415
	2200	90x67	61	43	9.4	15.8	ALS4 - - 222QC415
	2200	90x75	67	47	10.0	17.3	ALS4 - - 222QD415
	2200	77x105	61	41	10.7	19.7	ALS4 - - 222NF415
	3300	90x98	44	30	13.6	23.3	ALS4 - - 332QH415
	3300	77x146	40	27	14.2	23.6	ALS4 - - 332NP415
	4700	90x146	29	19	18.5	29.8	ALS4 - - 472QP415
	6800	77x220	21	14	23.0	32.5	ALS4 - - 682NT415
	10000	90x220	18	14	28.3	39.3	ALS4 - - 103QT415
450V d.c. (495V surge)	150	36x52	721	360	1.8	4.5	ALS4 - - 151DA450
	150	36x62	715	356	1.9	4.8	ALS4 - - 151DB450
	220	36x82	487	242	2.5	6.2	ALS4 - - 221DE450
	330	36x105	325	162	3.2	7.9	ALS4 - - 331DF450
	470	51x82	239	123	4.1	9.0	ALS4 - - 471KE450
	680	51x105	164	84	5.3	11.3	ALS4 - - 681KF450
	1000	77x75	125	69	7.0	13.2	ALS4 - - 102ND450
	1500	66x105	79	42	8.9	17.1	ALS4 - - 152MF450
	1500	90x67	78	57	8.7	15.3	ALS4 - - 152QC450
	1500	90x75	87	49	9.3	16.7	ALS4 - - 152QD450
	1500	77x105	80	43	9.8	18.7	ALS4 - - 152NF450
	2200	90x98	58	32	12.5	22.5	ALS4 - - 222QH450
	2200	77x146	54	29	13.1	22.9	ALS4 - - 222NP450
	3300	77x146	38	27	14.6	22.0	ALS4 - - 332NP450
	3300	90x146	37	20	17.4	28.9	ALS4 - - 332QP450
	4700	77x220	27	15	21.9	32.0	ALS4 - - 472NT450
	6800	90x220	19	15	23.5	39.2	ALS4 - - 682QT450

Ordering information

For full ordering details see pages 54 & 55.

Mounting Style 0 or 1 **

Termination Style A,B,C,F,G,J,M or R

BHC COMPONENTS
part of the EVOX RIFA GROUP

Screw Terminal Capacitors

ALS40/41

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 105°C 100 Hz	Ripple current (A) at 105°C 10 KHz	Type number
500V d.c. (550V surge)	100	36x52	1499	1135	0.9	1.4	ALS4 - - 101DA500
	150	36x62	1002	758	1.1	1.8	ALS4 - - 151DB500
	220	36x82	683	500	1.5	2.4	ALS4 - - 221DE500
	330	36x105	456	347	1.9	3.1	ALS4 - - 331DF500
	470	51x82	332	240	2.9	4.0	ALS4 - - 471KE500
	680	51x105	228	170	3.8	5.1	ALS4 - - 681KF500
	680	77x75	234	173	4.2	5.8	ALS4 - - 681ND500
	680	90x67	242	201	4.9	6.3	ALS4 - - 681QC500
	1000	66x105	155	117	5.5	7.4	ALS4 - - 102MF500
	1000	90x75	161	119	5.6	7.8	ALS4 - - 102QD500
	1500	77x105	110	81	6.9	9.5	ALS4 - - 152NF500
	1500	90x98	107	79	7.8	10.6	ALS4 - - 152QH500
	2200	77x146	74	57	9.7	12.7	ALS4 - - 222NP500
	3300	90x146	51	40	13.0	16.8	ALS4 - - 332QP500
	3300	77x220	49	39	15.4	19.4	ALS4 - - 332NT500

Mounting Style 0 or 1 **

Termination Style A,B,C,F,G,J,M or R

Ordering information

For full ordering details see pages 54 & 55.

PCB Snap-In Capacitors

ALC10/40 series

Listed here are only samples of the range of PCB mounting Snap-In Capacitors we can produce.

Electrical characteristics and case size are just two parameters that can be optimised by our design engineers to achieve the exact product you require. Please contact our sales office for more details.

ALC10 Series

The ALC10 series of snap-in capacitors cover a wide range of case sizes and voltage ratings featuring high ripple currents and long life performance. They are ideally suited for industrial and commercial applications demanding high reliability and long life expectancy such as frequency converters, UPS systems and switch mode power supplies.

ALC40 Series

The ALC40 series of snap-in capacitors feature the same high ripple currents and long life characteristics as the ALC10 series but can operate at higher temperatures. They are similarly suited for high reliability and long life applications such as frequency converters, UPS systems and switch mode power supplies, but the extended temperature range allows increased ripple currents at lower temperatures.

ALC12/42

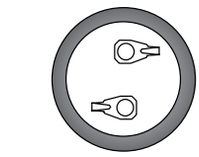
The ALC12 (85°C) and ALC42 (105°C) are high CV, snap-in, versions of the ALC10 and ALC40 ranges. Both series are designed for applications where high reliability and compact sizes are important such as switch mode power supplies and frequency converters. An overview of both series can be found on pages 43 to 46.

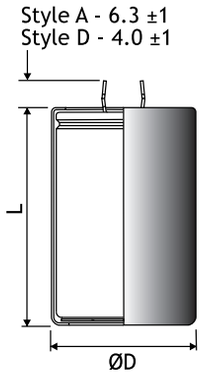
	ALC10	ALC40
Capacitance Range	39µF to 220,000µF	33µF to 220,000µF
Capacitance Tolerance	±20%	±20%
Voltage Range	10V to 500V d.c.	10V to 450V d.c.
Temperature range	-40°C to +85°C	-40°C to +105°C
Case sizes	22 x 30mm to 50 x 105mm	22 x 30mm to 50 x 105mm

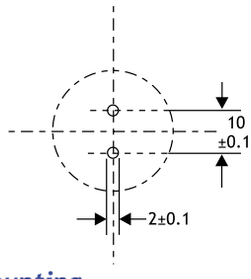
PCB Snap-In Capacitors

ALC10/40 case sizes

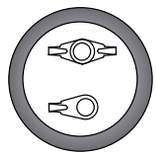
STYLE A/D
2 Pin

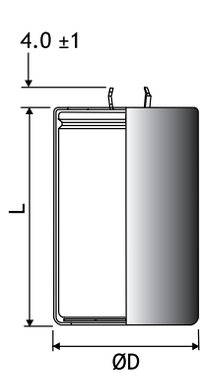


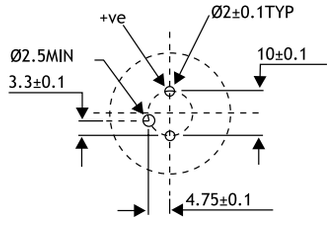




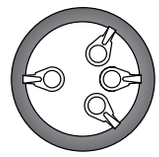
STYLE F
3 Pin

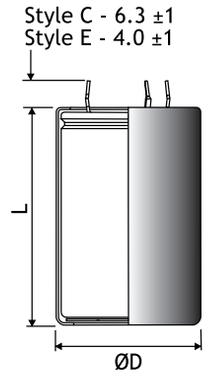




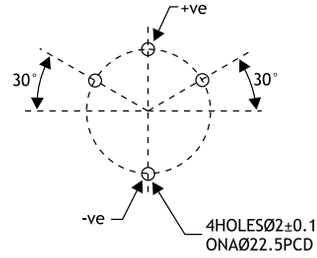


STYLE C/E
4 Pin

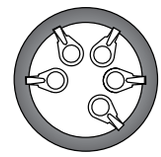


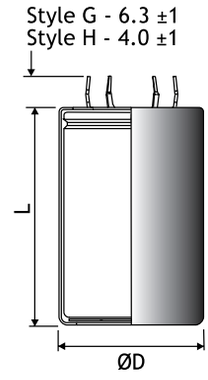


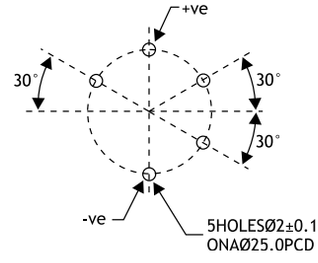
Negative denoted by line on sleeve



STYLE G/H
5 Pin







Mounting

These capacitors are designed to be mounted by their terminations alone, and may be used in any position.
Dummy pins must be isolated on 4 and 5 pin styles.

CASE CODE (COMPONENT WEIGHT grams - nom.)

DIA. mm	LENGTH mm ±2								
-0+1	30	35	40	45	50	55	60	80	105
22	AB (25)	AC (26)	AD (30)						
25	BB (28)	BC (30)	BD (35)						
30	CB (35)	CC (40)	CD (45)	CE (50)	CF (55)				
35	DB (42)	DC (50)	DD (55)	DE (65)	DF (70)	DG (75)	DH (80)	DL (105)	
40	EB (49)	EC (57)	ED (65)	EE (80)	EF (82)	EG (95)	EH (98)	EL (131)	EP (170)
45	FB (62)	FC (72)	FD (82)	FE (92)	FF (103)	FG (113)	FH (123)	FL (164)	FP (215)
50	KB (75)	KC (88)	KD (100)	KE (113)	KF (126)	KG (138)	KH (151)	KL (201)	KP (264)

Other sizes available upon request

TERMINAL STYLE

DESCRIPTION	2 pin standard	2 pin short	3 pin short	4 pin standard	4 pin short	5 pin standard	5 pin short
PIN LENGTH	6.3±1	4.0±1	4.0±1	6.3±1	4.0±1	6.3±1	4.0±1
CODE	A	D	F	C	E	G	H
DIA. mm -0+1							
22	●						
25	●	●	●				
30	●	●	●				
35	●	●	●	●	●		
40	●	●		●	●	●	●
45				●	●	●	●
50				●	●	●	●

TECHNICAL DATA

Related documents
IEC 384-4

Temperature range
ALC10: Storage -55°C to +85°C
Operating -40°C to +85°C
Environmental classification 40/085/56

ALC40: Storage -55°C to +105°C
Operating -40°C to +105°C
Environmental classification 40/105/56

Surge voltage
1000 surges (30 seconds) at 85°C (ALC10) and 105°C (ALC40) with surge voltage applied. See electrical characteristics for more details.

Charge/discharge
10^6 cycles at 25°C and rated voltage. One cycle per second with a time constant of 0.1.

D.C. leakage current
After application of rated d.c. voltage for 5 minutes at 20°C, the d.c. leakage current shall not exceed
$(0.006\ C_r\ U_r)$ µA. Where C_r is the rated capacitance in µF and U_r is the rated d.c. voltage.

Vibration
10Hz to 500Hz at 0.75mm or 10g for 3x2hrs duration.
10Hz to 55Hz at 0.35mm or 5g for 3x0.5hrs duration (45/50mm diameter cans).

Insulation resistance
≥ 100MΩ at 100V d.c., across insulating sleeve.

Voltage proof
≥ 2500V d.c., across insulating sleeve.

Ripple current
The following values are approximate only, to give an indication of the effects of frequency and temperature on ripple current. More accurate data can be obtained by referring to the Application Notes available from BHC.

FREQUENCY CORRECTION - ALC10/40
Capacitors shall withstand the rated r.m.s. ripple current as given in the tables at upper category temperature in circulating air. For frequencies other than those shown the following formula should be used:

$$\text{Ripple current} = \sqrt{\frac{F \times A^2 \times B^2}{100 \times (B^2 - A^2) + (F \times A^2)}}$$

A = 100Hz ripple current
B = 10kHz ripple current
F = Required frequency (Hz)

TEMPERATURE CORRECTION - ALC10
For ambient temperatures other than 85°C the following correction factors should be employed.

AMBIENT TEMPERATURE	FACTOR
30°C	2.5
50°C	2.1
70°C	1.6
85°C	1.0

TEMPERATURE CORRECTION - ALC40
For ambient temperatures other than 105°C the following correction factors should be employed.

AMBIENT TEMPERATURE	FACTOR
50°C	2.5
60°C	2.4
70°C	2.2
85°C	1.8
105°C	1.0

N.B. The sum of the d.c. and a.c. voltage components should not exceed the d.c. voltage rating.

Life expectancy
At rated temperature with rated voltage and ripple current applied.

CAN DIAMETER (mm)	RANGE	LIFE EXPECTANCY (hours)
22	ALC10	8000
22	ALC40	4000
25	ALC10	10000
25	ALC40	6000
30	ALC10	13000
30	ALC40	7000
35	ALC10	15000
35	ALC40	8000
40, 45, 50	ALC10	18000
40, 45, 50	ALC40	9000

Capacitor marking
The capacitors are marked with items 1 to 6 from the following list as a minimum, and as much of the remaining information as is practical.

1. Rated capacitance in µF
2. Rated voltage d.c.
3. Polarity of terminations
4. Tolerance on rated capacitance
5. Date code/Batch number
6. BHC part number
7. Environmental classification

PCB Snap-In Capacitors

ALC10

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 85°C 100 Hz	Ripple current (A) at 85°C 10 KHz	Type number
10V d.c. (11.5V surge)	8200	22x30	151	136	1.95	2.02	ALC10A822AB010
	12000	25x30	119	107	2.39	2.48	ALC10A123BB010
	12000	22x40	103	93	2.63	2.72	ALC10A123AD010
	15000	25x35	94	85	2.84	2.94	ALC10A153BC010
	18000	30x30	102	92	2.91	3.01	ALC10A183CB010
	18000	25x40	80	72	3.23	3.34	ALC10A183BD010
	22000	30x35	80	72	3.46	3.58	ALC10A223CC010
	27000	30x40	69	62	3.91	4.05	ALC10A273CD010
	33000	35x35	74	67	3.98	4.12	ALC10A333DC010
	39000	30x50	52	47	4.89	5.06	ALC10A393CF010
	39000	35x40	64	58	4.48	4.64	ALC10A393DD010
	47000	35x50	49	44	5.55	5.75	ALC10A473DF010
	56000	40x30	65	59	4.91	5.08	ALC10A563EB010
	68000	40x40	52	47	6.78	7.02	ALC10A683ED010
	82000	40x45	43	39	7.72	7.99	ALC10A823EE010
	100000	40x50	36	32	8.79	9.10	ALC10A104EF010
	120000	40x55	32	29	9.11	9.43	ALC10A124EG010
	150000	40x60	27	24	10.04	10.40	ALC10A154EH010
	180000	40x80	20	18	13.14	13.61	ALC10A184EL010
	220000	40x105	17	16	13.64	14.05	ALC10A224EP010
16V d.c. (18.5V surge)	6800	22x30	139	122	2.03	2.11	ALC10A682AB016
	8200	25x30	128	113	2.30	2.40	ALC10A822BB016
	10000	22x40	94	83	2.76	2.87	ALC10A103AD016
	10000	25x35	101	89	2.74	2.85	ALC10A103BC016
	12000	30x30	115	101	2.74	2.85	ALC10A123CB016
	12000	25x40	87	77	3.10	3.23	ALC10A123BD016
	18000	30x35	87	77	3.32	3.46	ALC10A183CC016
	22000	30x40	75	66	3.75	3.91	ALC10A223CD016
	22000	35x35	86	76	3.69	3.84	ALC10A223DC016
	27000	30x50	59	52	4.59	4.78	ALC10A273CF016
	27000	35x40	74	65	4.17	4.34	ALC10A273DD016
	33000	40x30	76	68	5.06	5.17	ALC10A333EB016
	39000	35x50	55	48	5.23	5.45	ALC10A393DF016
	39000	40x35	66	60	5.63	5.74	ALC10A393EC016
	47000	40x40	53	48	6.68	6.83	ALC10A473ED016
	56000	40x45	44	40	7.67	7.84	ALC10A563EE016
	68000	40x50	37	33	8.74	8.93	ALC10A683EF016
	82000	40x55	33	29	9.05	9.22	ALC10A823EG016
	100000	40x60	27	25	10.05	10.23	ALC10A104EH016
	120000	40x80	20	18	13.13	13.43	ALC10A124EL016
	220000	40x105	17	16	13.64	14.05	ALC10A224EP016
25V d.c. (28.5V surge)	4700	22x30	139	118	2.03	2.14	ALC10A472AB025
	5600	25x30	129	110	2.29	2.41	ALC10A562BB025
	6800	22x40	95	81	2.74	2.89	ALC10A682AD025
	8200	25x35	95	81	2.82	2.97	ALC10A822BC025
	10000	30x30	113	96	2.76	2.91	ALC10A103CB025
	10000	25x40	81	69	3.21	3.38	ALC10A103BD025
	12000	30x35	88	75	3.30	3.48	ALC10A123CC025
	15000	30x40	75	64	3.75	3.95	ALC10A153CD025
	18000	35x35	85	72	3.71	3.91	ALC10A183DC025
	18000	30x50	59	50	4.59	4.84	ALC10A183CF025
	22000	35x40	74	63	4.17	4.40	ALC10A223DD025
	27000	35x50	55	47	5.23	5.51	ALC10A273DF025
	27000	40x30	84	76	4.10	4.15	ALC10A273EB025
	39000	40x40	59	54	5.65	5.73	ALC10A393ED025
	47000	40x45	49	44	6.44	6.53	ALC10A473EE025
	56000	40x50	40	37	7.42	7.52	ALC10A563EF025
	68000	40x55	37	34	7.56	7.64	ALC10A683EG025
	100000	40x80	22	20	11.20	11.36	ALC10A104EL025
	120000	40x105	18	17	12.96	13.53	ALC10A124EP025

Ordering information

For details of ordering see pages 54 & 55.

ALC10

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 85°C 100 Hz	Ripple current (A) at 85°C 10 KHz	Type number
35V d.c. (40V surge)	3300	22x30	145	120	2.00	2.14	ALC10A332AB035
	4700	25x30	127	107	2.31	2.47	ALC10A472BB035
	5600	22x40	98	82	2.70	2.88	ALC10A562AD035
	6800	25x35	97	81	2.80	2.99	ALC10A682BC035
	8200	30x30	114	95	2.75	2.94	ALC10A822CB035
	8200	25x40	83	70	3.17	3.39	ALC10A822BD035
	10000	30x35	89	75	3.28	3.50	ALC10A103CC035
	12000	30x40	76	64	3.73	3.99	ALC10A123CD035
	15000	35x35	86	72	3.70	3.95	ALC10A153DC035
	15000	30x50	59	49	4.59	4.90	ALC10A153CF035
	15000	40x30	87	78	4.24	4.31	ALC10A153EB035
	18000	35x40	75	63	4.16	4.44	ALC10A183DD035
	18000	40x35	77	70	4.66	4.73	ALC10A183EC035
	22000	35x50	55	46	5.23	5.59	ALC10A223DF035
	22000	40x40	61	55	5.56	5.65	ALC10A223ED035
	27000	40x45	51	46	6.30	6.40	ALC10A273EE035
	33000	40x50	42	38	7.16	7.27	ALC10A333EF035
	39000	40x60	33	30	8.75	8.91	ALC10A393EH035
	56000	40x80	23	21	10.94	11.14	ALC10A563EL035
	100000	40x105	17	16	12.67	13.34	ALC10A104EP035
40V d.c. (46V surge)	2700	22x30	148	121	1.97	2.14	ALC10A272AB040
	3900	25x30	125	103	2.33	2.53	ALC10A392BB040
	3900	22x40	101	83	2.66	2.89	ALC10A392AD040
	4700	25x35	99	81	2.77	3.01	ALC10A472BC040
	5600	30x30	115	94	2.74	2.98	ALC10A562CB040
	5600	25x40	85	70	3.14	3.42	ALC10A562BD040
	6800	30x35	90	74	3.26	3.55	ALC10A682CC040
	8200	30x40	77	63	3.70	4.03	ALC10A822CD040
	10000	35x35	86	71	3.69	4.01	ALC10A103DC040
	12000	30x50	59	48	4.59	4.99	ALC10A123CF040
	12000	35x40	75	62	4.14	4.50	ALC10A123DD040
	15000	40x30	89	79	4.42	4.51	ALC10A153EB040
	18000	35x50	55	45	5.23	5.69	ALC10A183DF040
	18000	40x35	78	70	4.88	4.97	ALC10A183EC040
	22000	40x40	62	56	5.81	5.92	ALC10A223ED040
	27000	40x50	43	38	7.23	7.36	ALC10A273EF040
	33000	40x60	33	30	8.74	8.91	ALC10A333EH040
	47000	40x80	23	21	10.96	11.17	ALC10A473EL040
	82000	40x105	18	17	12.63	13.44	ALC10A823EP040
50V d.c. (57V surge)	1800	22x30	175	140	1.85	2.07	ALC10A182AB050
	2700	25x30	137	110	2.23	2.49	ALC10A272BB050
	2700	22x40	125	100	2.43	2.72	ALC10A272AD050
	3300	25x35	114	91	2.60	2.91	ALC10A332BC050
	3900	30x30	113	91	2.75	3.07	ALC10A392CB050
	3900	25x40	99	80	2.94	3.29	ALC10A392BD050
	5600	30x35	91	73	3.25	3.63	ALC10A562CC050
	6800	30x40	80	65	3.63	4.06	ALC10A682CD050
	8200	35x35	81	65	3.82	4.27	ALC10A822DC050
	8200	30x50	68	54	4.33	4.84	ALC10A822CF050
	10000	35x40	73	59	4.23	4.73	ALC10A103DD050
	10000	40x30	81	72	4.15	4.24	ALC10A103EB050
	12000	35x50	60	48	5.05	5.65	ALC10A123DF050
	12000	40x40	65	57	5.75	5.89	ALC10A123ED050
	15000	40x45	53	47	6.48	6.64	ALC10A153EE050
	18000	40x50	44	39	7.41	7.59	ALC10A183EF050
	22000	40x55	40	36	7.60	7.75	ALC10A223EG050
	27000	40x60	33	30	8.41	8.56	ALC10A273EH050
	39000	40x80	23	21	10.49	10.68	ALC10A393EL050
	68000	40x105	18	16	12.42	13.30	ALC10A683EP050

Ordering information

For details of ordering see pages 54 & 55.

PCB Snap-In Capacitors

ALC10

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 85°C 100 Hz	Ripple current (A) at 85°C 10 KHz	Type number
63V d.c. (72.5V surge)	1500	22x30	199	157	1.70	1.89	ALC10A152AB063
	2200	25x30	149	118	2.13	2.37	ALC10A222BB063
	2200	22x40	149	118	2.19	2.44	ALC10A222AD063
	2700	25x35	128	101	2.43	2.70	ALC10A272BC063
	3300	30x30	112	88	2.77	3.08	ALC10A332CB063
	3300	25x40	112	88	2.73	3.04	ALC10A332BD063
	4700	30x35	91	72	3.24	3.61	ALC10A472CC063
	5600	30x40	83	66	3.56	3.96	ALC10A562CD063
	6800	35x35	75	59	3.95	4.40	ALC10A682DC063
	6800	30x50	75	59	4.07	4.53	ALC10A682CF063
	8200	35x40	69	55	4.31	4.80	ALC10A822DD063
	8200	40x30	82	72	3.95	4.03	ALC10A822EB063
	10000	35x50	64	51	4.85	5.40	ALC10A103DF063
	10000	40x35	80	72	4.58	4.67	ALC10A103EC063
	12000	40x40	64	57	5.42	5.55	ALC10A123ED063
	15000	40x50	44	39	7.02	7.18	ALC10A153EF063
	18000	40x60	35	31	8.54	8.75	ALC10A183EH063
	27000	40x80	24	21	10.53	10.78	ALC10A273EL063
	39000	40x105	19	17	12.23	13.51	ALC10A393EP063
100V d.c. (115V surge)	680	22x30	355	266	1.27	1.55	ALC10A681AB100
	1000	25x30	243	182	1.67	2.04	ALC10A102BB100
	1200	22x40	203	152	1.88	2.30	ALC10A122AD100
	1200	25x35	203	152	1.93	2.36	ALC10A122BC100
	1500	30x40	163	122	2.30	2.81	ALC10A152CB100
	1500	25x40	163	122	2.27	2.78	ALC10A152BD100
	1800	30x35	137	103	2.64	3.23	ALC10A182CC100
	2200	30x40	113	85	3.05	3.73	ALC10A222CD100
	2700	35x35	92	69	3.57	4.37	ALC10A272DC100
	2700	40x30	121	104	3.72	3.88	ALC10A272EB100
	3300	30x50	76	57	4.05	4.95	ALC10A332CF100
	3300	35x40	76	57	4.11	5.03	ALC10A332DD100
	3300	40x35	106	92	4.09	4.24	ALC10A332EC100
	3900	40x40	85	74	4.88	5.08	ALC10A392ED100
	4700	35x50	55	41	5.23	6.40	ALC10A472DF100
	4700	40x45	70	61	5.60	5.83	ALC10A472EE100
	5600	40x50	59	51	6.41	6.68	ALC10A562EF100
	6800	40x55	53	46	6.61	6.84	ALC10A682EG100
	8200	40x60	44	39	7.36	7.61	ALC10A822EH100
	12000	40x80	31	27	9.14	9.45	ALC10A123EL100
	18000	40x105	19	17	11.34	12.61	ALC10A183EP100
200V d.c. (230V surge)	220	22x30	727	509	0.89	1.23	ALC10A221AB200
	330	25x30	486	340	1.18	1.63	ALC10A331BB200
	330	22x40	486	340	1.21	1.67	ALC10A331AD200
	390	25x35	412	288	1.36	1.87	ALC10A391BC200
	470	30x30	343	240	1.58	2.18	ALC10A471CB200
	470	25x40	343	240	1.56	2.15	ALC10A471BD200
	560	30x35	288	202	1.82	2.51	ALC10A561CC200
	680	30x40	238	167	2.10	2.89	ALC10A681CD200
	820	35x35	198	139	2.43	3.35	ALC10A821DC200
	820	40x30	178	142	3.06	3.63	ALC10A821EB200
	1000	30x50	163	114	2.76	3.80	ALC10A102CF200
	1000	35x40	163	114	2.81	3.87	ALC10A102DD200
	1000	40x35	153	124	3.43	3.99	ALC10A102EC200
	1200	35x50	135	82	3.06	4.01	ALC10A122DF200
	1200	40x40	124	99	4.02	4.69	ALC10A122ED200
	1500	35x50	110	77	3.70	5.10	ALC10A152DF200
	1500	40x45	101	81	4.61	5.38	ALC10A152EE200
	1800	40x50	84	68	5.27	6.15	ALC10A182EF200
	2200	40x60	67	53	6.29	7.43	ALC10A222EH200
	3300	40x80	46	37	7.83	9.17	ALC10A332EL200
	4700	40x105	45	32	8.08	11.73	ALC10A472EP200
	5600	45x105	42	29	8.51	12.16	ALC10G562FP200
	8200	50x105	33	25	9.17	11.76	ALC10G822KP200

Ordering information

For details of ordering see pages 54 & 55.

ALC10

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 85°C 100 Hz	Ripple current (A) at 85°C 10 KHz	Type number
250V d.c. (287V surge)	180	22x30	888	577	0.80	1.17	ALC10A181AB250
	220	25x30	727	473	0.97	1.41	ALC10A221BB250
	270	22x40	593	385	1.10	1.60	ALC10A271AD250
	270	25x35	593	385	1.13	1.65	ALC10A271BC250
	330	30x30	486	316	1.33	1.94	ALC10A331CB250
	330	25x35	490	320	1.34	1.95	ALC10A331BC250
	330	25x40	486	316	1.31	1.91	ALC10A331BD250
	470	30x35	343	223	1.67	2.43	ALC10A471CC250
	560	30x40	288	187	1.91	2.78	ALC10A561CD250
	680	35x35	238	155	2.22	3.23	ALC10A681DC250
	680	30x50	238	155	2.29	3.34	ALC10A681CF250
	680	40x30	187	144	2.79	3.56	ALC10A681EB250
	820	35x40	198	129	2.55	3.72	ALC10A821DD250
	820	40x40	153	116	3.80	4.91	ALC10A821ED250
	1000	35x50	163	106	3.26	4.75	ALC10A102DF250
	1000	40x45	126	96	4.33	5.58	ALC10A102EE250
	1200	35x60	140	100	3.76	5.48	ALC10A122DH250
	1200	40x50	104	80	4.94	6.37	ALC10A122EF250
	1500	40x55	89	69	5.29	6.58	ALC10A152EG250
	1800	35x80	100	82	4.60	6.69	ALC10A182DL250
	1800	40x60	74	58	5.92	7.34	ALC10A182EH250
	2200	40x80	57	43	7.33	9.49	ALC10A222EL250
	3900	40x105	46	32	7.78	11.71	ALC10A392EP250
	4700	45X105	42	29	8.22	12.11	ALC10G472FP250
	5600	50x105	38	27	8.63	12.03	ALC10G562KP250
350V d.c. (385V surge)	100	22x30	1359	876	0.69	1.49	ALC10A101AB350
	120	25x30	1139	736	0.83	1.75	ALC10A121BB350
	150	22x40	908	585	0.95	2.03	ALC10A151AD350
	150	25x35	912	589	0.99	2.07	ALC10A151BC350
	180	25x40	761	492	1.13	2.37	ALC10A181BD350
	180	30x30	776	506	1.11	2.19	ALC10A181CB350
	270	30x35	527	346	1.41	2.65	ALC10A271CC350
	330	30x40	432	284	1.65	3.07	ALC10A331CD350
	330	40x30	424	277	2.02	3.97	ALC10A331EB350
	390	30x50	364	238	1.92	3.65	ALC10A391CF350
	390	35x35	386	259	1.82	3.07	ALC10A391DC350
	390	40x35	361	236	2.33	4.50	ALC10A391EC350
	470	35x40	321	216	2.07	3.47	ALC10A471DD350
	470	40x40	299	195	2.69	5.22	ALC10A471ED350
	560	35x50	268	180	2.80	4.80	ALC10A561DF350
	560	40x45	251	164	3.04	5.88	ALC10A561EE350
	680	40x50	207	136	3.46	6.65	ALC10A681EF350
	820	35x60	190	130	3.40	5.50	ALC10A821DH350
	820	40x55	174	114	3.84	7.16	ALC10A821EG350
	820	40x60	172	112	3.99	7.67	ALC10A821EH350
	1000	35x80	154	104	3.90	6.40	ALC10A102DL350
	1200	40x80	119	78	4.95	9.20	ALC10A122EL350
	1800	40x105	81	54	6.14	10.73	ALC10A182EP350
	2700	45x105	63	42	7.00	11.44	ALC10G272FP350
	3300	50x105	54	36	7.54	11.57	ALC10G332KP350

Ordering information

For details of ordering see pages 54 & 55.

PCB Snap-In Capacitors

ALC10

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 85°C 100 Hz	Ripple current (A) at 85°C 10 KHz	Type number
400V d.c. (440V surge)	68	22x30	2042	1370	0.59	1.25	ALC10A680AB400
	100	25x30	1400	943	0.77	1.60	ALC10A101BB400
	100	22x40	1389	933	0.80	1.69	ALC10A101AD400
	120	25x35	1166	785	0.90	1.87	ALC10A121BC400
	150	30x30	950	645	1.04	2.03	ALC10A151CB400
	150	25x40	935	630	1.06	2.18	ALC10A151BD400
	180	30x35	791	536	1.20	2.36	ALC10A181CC400
	220	30x35	650	400	1.31	2.47	ALC10A221CC400
	220	30x40	648	440	1.41	2.74	ALC10A221CD400
	270	35x35	547	376	1.61	2.88	ALC10A271DC400
	270	40x30	441	284	1.85	3.67	ALC10A271EB400
	330	35x35	461	320	1.73	2.92	ALC10A331DC400
	330	30x50	438	299	1.82	3.42	ALC10A331CF400
	330	35x40	449	309	1.84	3.27	ALC10A331DD400
	330	40x35	378	252	2.29	4.21	ALC10A331EC400
	390	35x50	377	226	2.19	3.96	ALC10A391DF400
	390	40x40	312	203	2.62	4.86	ALC10A391ED400
	470	35x50	321	223	2.62	4.41	ALC10A471DF400
	470	40x40	230	156	2.74	5.21	ALC10A471ED400
	470	40x45	258	168	3.00	5.49	ALC10A471EE400
	560	35x50	278	180	2.57	4.04	ALC10A561DF400
	560	35x60	264	184	3.01	5.11	ALC10A561DH400
	560	40x50	216	141	3.41	6.19	ALC10A561EF400
	680	35x60	232	142	2.90	4.73	ALC10A681DH400
	680	40x60	177	114	3.99	7.14	ALC10A681EH400
	820	35x80	181	127	3.70	6.09	ALC10A821DL400
	1000	35x80	112	77	3.98	6.32	ALC10A102DL400
	1000	40x80	120	78	5.00	8.82	ALC10A102EL400
	1500	40x105	99	68	5.79	10.16	ALC10A152EP400
	2200	45x105	77	53	6.56	10.90	ALC10G222FP400
	2700	50x105	66	45	7.11	11.13	ALC10G272KP400
450V d.c. (495V surge)	56	22x30	2067	1372	0.57	1.27	ALC10A560AB450
	68	25x30	1708	1135	0.69	1.50	ALC10A680BB450
	82	22x40	1413	938	0.77	1.71	ALC10A820AD450
	100	25x35	1167	777	0.88	1.90	ALC10A101BC450
	120	30x30	989	663	1.00	2.03	ALC10A121CB450
	120	25x40	973	648	1.01	2.18	ALC10A121BD450
	150	25x40	785	524	1.12	2.35	ALC10A151BD450
	150	30x30	805	543	1.10	2.12	ALC10A151CB450
	150	30x35	792	531	1.17	2.38	ALC10A151CC450
	180	30x40	661	443	1.36	2.76	ALC10A181CD450
	220	35x35	559	379	1.56	2.89	ALC10A221DC450
	220	30x50	540	362	1.61	3.27	ALC10A221CF450
	220	40x30	517	311	1.77	3.68	ALC10A221EB450
	270	30x50	446	301	1.76	3.43	ALC10A271CF450
	270	35x35	470	322	1.68	2.91	ALC10A271DC450
	270	35x40	458	311	1.78	3.27	ALC10A271DD450
	270	40x35	427	259	2.07	4.22	ALC10A271EC450
	330	30x50	373	253	1.91	3.54	ALC10A331CF450
	330	35x50	373	253	2.41	4.38	ALC10A331DF450
	330	40x40	348	210	2.47	4.91	ALC10A331ED450
	390	35x50	240	166	2.60	4.41	ALC10A391DF450
	390	40x45	293	177	2.70	5.53	ALC10A391EE450
	470	35x50	252	155	2.43	4.03	ALC10A471DF450
	470	35x60	270	185	2.95	5.12	ALC10A471DH450
	470	40x50	243	147	3.08	6.25	ALC10A471EF450
	560	40x60	202	121	3.56	7.04	ALC10A561EH450
	680	35x80	190	131	3.61	6.09	ALC10A681DL450
	820	40x80	138	83	4.47	8.78	ALC10A821EL450
	1000	40x80	114	75	4.95	9.32	ALC10A102EL450
	1200	40x105	103	70	5.57	10.15	ALC10A122EP450
	1800	45x105	82	55	6.27	10.87	ALC10G182FP450
	2200	50x105	70	47	6.81	11.12	ALC10G222KP450

Ordering information

For details of ordering see pages 54 & 55.

ALC10

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 85°C 100 Hz	Ripple current (A) at 85°C 10 KHz	Type number
500V d.c. (550V surge)	39	22x30	3150	2339	0.57	1.13	ALC10A390AB500
	56	25x30	2207	1642	0.74	1.44	ALC10A560BB500
	68	22x40	1811	1345	0.84	1.65	ALC10A680AD500
	68	25x35	1816	1351	0.87	1.70	ALC10A680BC500
	82	25x40	1507	1120	1.00	1.95	ALC10A820BD500
	82	30x30	1527	1140	0.99	1.84	ALC10A820CB500
	100	30x30	1000	765	1.08	1.94	ALC10A101CB500
	100	30x35	1220	840	1.15	2.16	ALC10A101CC500
	120	30x35	1052	786	1.25	2.28	ALC10A121CC500
	150	30x40	843	631	1.48	2.67	ALC10A151CD500
	180	30x50	699	522	1.78	3.27	ALC10A181CF500
	180	35x35	728	549	1.70	2.84	ALC10A181DC500
	180	40x30	699	522	1.76	3.22	ALC10A181EB500
	220	35x40	596	450	1.96	3.26	ALC10A221DD500
	220	40x35	571	426	2.07	3.82	ALC10A221EC500
	270	35x50	481	362	2.34	3.97	ALC10A271DF500
	270	40x40	466	348	2.41	4.42	ALC10A271ED500
	330	40x45	382	286	2.74	5.00	ALC10A331EE500
	390	35x60	340	258	2.87	4.67	ALC10A391DH500
	390	40x50	324	242	3.09	5.59	ALC10A391EF500
	470	40x60	269	201	3.56	6.43	ALC10A471EH500
	560	35x80	240	182	3.50	5.57	ALC10A561DL500
	680	40x80	187	140	4.40	7.77	ALC10A681EL500
	1000	40x105	130	98	5.43	9.18	ALC10A102EP500
	1500	45x105	110	82	5.97	9.76	ALC10G152FP500
	1800	50x105	94	70	6.45	10.09	ALC10G182KP500

Ordering information

For details of ordering see pages 54 & 55.

PCB Snap-In Capacitors

ALC40

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 105°C 100 Hz	Ripple current (A) at 105°C 10 KHz	Type number
10V d.c. (11.5V surge)	12000	22x30	233	201	1.95	2.05	ALC40A123AB010
	15000	22x40	181	155	2.60	2.74	ALC40A153AD010
	18000	22x40	154	133	2.70	2.84	ALC40A183AD010
	18000	25x30	172	150	2.19	2.29	ALC40A183BB010
	22000	25x35	139	121	2.59	2.71	ALC40A223BC010
	27000	25x40	114	99	3.04	3.18	ALC40A273BD010
	27000	30x30	138	123	2.45	2.55	ALC40A273CB010
	33000	30x35	111	98	2.97	3.09	ALC40A333CC010
	39000	30x40	92	82	3.40	3.54	ALC40A393CD010
	47000	35x35	98	89	3.26	3.39	ALC40A473DC010
	56000	30x50	66	58	4.41	4.59	ALC40A563CF010
	56000	35x40	81	74	3.74	3.90	ALC40A563DD010
	56000	40x30	65	59	4.91	5.00	ALC40A563EB010
	68000	35x50	61	55	4.85	5.03	ALC40A683DF010
	68000	40x40	52	47	6.78	6.91	ALC40A683ED010
	82000	35x50	58	53	4.85	5.05	ALC40A823DF010
	82000	40x45	43	39	7.72	7.87	ALC40A823EE010
	100000	40x50	36	32	8.79	8.95	ALC40A104EF010
	120000	40x55	32	29	9.11	9.25	ALC40A124EG010
	150000	40x60	27	24	10.04	10.19	ALC40A154EH010
	180000	40x80	19	18	13.18	13.48	ALC40A184EL010
	220000	40x105	17	16	14.15	14.61	ALC40A224EP010
16V d.c. (18.5V surge)	8200	22x30	228	195	1.83	1.94	ALC40A822AB016
	10000	22x40	177	151	2.47	2.63	ALC40A103AD016
	12000	22x40	154	131	2.53	2.69	ALC40A123AD016
	12000	25x30	179	156	2.01	2.12	ALC40A123BB016
	15000	25x35	142	124	2.39	2.51	ALC40A153BC016
	18000	25x40	118	103	2.80	2.95	ALC40A183BD016
	18000	30x30	153	136	2.23	2.34	ALC40A183CB016
	22000	30x35	122	108	2.70	2.84	ALC40A223CC016
	27000	30x40	100	89	3.10	3.26	ALC40A273CD016
	33000	30x50	75	67	4.02	4.22	ALC40A333CF016
	33000	35x35	113	102	2.97	3.12	ALC40A333DC016
	33000	40x30	76	68	5.06	5.17	ALC40A333EB016
	39000	35x40	94	85	3.41	3.58	ALC40A393DD016
	39000	40x35	66	60	5.63	5.74	ALC40A393EC016
	47000	35x50	69	62	4.41	4.63	ALC40A473DF016
	47000	40x40	53	48	6.68	6.83	ALC40A473ED016
	56000	35x50	68	61	4.41	4.63	ALC40A563DF016
	56000	40x45	44	40	7.67	7.84	ALC40A563EE016
	68000	40x50	37	33	8.74	8.93	ALC40A683EF016
	82000	40x55	33	29	9.05	9.22	ALC40A823EG016
	100000	40x60	27	25	10.05	10.23	ALC40A104EH016
	120000	40x80	20	18	13.13	13.43	ALC40A124EL016
	220000	40x105	17	16	14.15	14.61	ALC40A224EP016
25V d.c. (28.5V surge)	5600	22x30	233	196	1.80	1.94	ALC40A562AB025
	6800	22x40	182	151	2.42	2.63	ALC40A682AD025
	8200	22x40	157	132	2.48	2.68	ALC40A822AD025
	8200	25x30	183	157	1.97	2.11	ALC40A822BB025
	10000	25x35	148	126	2.33	2.50	ALC40A103BC025
	12000	25x40	123	105	2.74	2.93	ALC40A123BD025
	12000	30x30	157	138	2.18	2.33	ALC40A123CB025
	15000	30x35	125	109	2.65	2.83	ALC40A153CC025
	18000	30x40	103	91	3.04	3.24	ALC40A183CD025
	22000	35x35	116	104	2.91	3.10	ALC40A223DC025
	27000	30x50	73	64	3.94	4.21	ALC40A273CF025
	27000	35x40	96	86	3.34	3.56	ALC40A273DD025
	27000	40x30	75	69	4.03	4.09	ALC40A273EB025
	33000	35x50	70	63	4.32	4.61	ALC40A333DF025
	33000	40x35	66	62	4.83	4.90	ALC40A333EC025
	39000	35x50	69	62	4.32	4.61	ALC40A393DF025
	39000	40x40	53	49	5.57	5.65	ALC40A393ED025
	47000	40x50	41	37	7.30	7.40	ALC40A473EF025
	56000	40x55	38	35	7.51	7.61	ALC40A563EG025
	82000	40x80	22	20	11.06	11.24	ALC40A823EL025
	120000	40x105	18	17	13.41	14.05	ALC40A124EP025

Ordering information

For details of ordering see pages 54 & 55.

ALC40

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 105°C 100 Hz	Ripple current (A) at 105°C 10 KHz	Type number
35V d.c. (40V surge)	3900	22x30	239	196	1.75	1.93	ALC40A392AB035
	4700	22x40	187	152	2.35	2.63	ALC40A472AD035
	5600	22x40	163	133	2.41	2.67	ALC40A562AD035
	5600	25x30	190	159	1.93	2.10	ALC40A562BB035
	6800	25x35	153	128	2.27	2.49	ALC40A682BC035
	8200	25x40	127	106	2.67	2.92	ALC40A822BD035
	8200	30x30	162	140	2.13	2.32	ALC40A822CB035
	10000	30x35	130	112	2.59	2.82	ALC40A103CC035
	12000	30x40	107	92	2.96	3.23	ALC40A123CD035
	15000	35x35	120	105	2.84	3.09	ALC40A153DC035
	15000	40x30	87	78	4.24	4.31	ALC40A153EB035
	18000	30x50	76	66	3.85	4.19	ALC40A183CF035
	18000	35x40	99	87	3.25	3.55	ALC40A183DD035
	18000	40x35	77	70	4.66	4.73	ALC40A183EC035
	22000	35x50	73	64	4.22	4.59	ALC40A223DF035
	22000	40x40	61	55	5.49	5.58	ALC40A223ED035
	27000	35x50	71	63	4.22	4.59	ALC40A273DF035
	27000	40x45	51	46	6.30	6.40	ALC40A273EE035
	33000	40x50	42	38	7.16	7.27	ALC40A333EF035
	39000	40x60	33	30	8.75	8.91	ALC40A393EH035
	56000	40x80	23	21	10.94	11.14	ALC40A563EL035
	100000	40x105	17	16	13.04	13.77	ALC40A104EP035
40V d.c. (46V surge)	2700	22x30	259	207	1.69	1.92	ALC40A272AB040
	3300	22x40	202	160	2.26	2.60	ALC40A332AD040
	3900	25x30	202	166	1.87	2.09	ALC40A392BB040
	4700	22x40	154	124	2.38	2.69	ALC40A472AD040
	5600	25x35	149	124	2.23	2.49	ALC40A562BC040
	5600	30x30	171	144	2.08	2.31	ALC40A562CB040
	6800	25x40	123	102	2.61	2.92	ALC40A682BD040
	6800	30x35	145	120	2.55	2.84	ALC40A682CC040
	8200	30x35	129	110	2.53	2.81	ALC40A822CC040
	10000	30x40	107	91	2.90	3.22	ALC40A103CD040
	12000	30x50	80	68	3.75	4.18	ALC40A123CF040
	12000	35x35	121	106	2.77	3.08	ALC40A123DC040
	12000	40x30	88	79	4.13	4.22	ALC40A123EB040
	15000	35x40	100	87	3.18	3.53	ALC40A153DD040
	15000	40x40	63	56	5.66	5.78	ALC40A153ED040
	18000	35x50	73	64	4.12	4.58	ALC40A183DF040
	18000	40x45	53	47	6.46	6.60	ALC40A183EE040
	22000	40x50	43	39	7.34	7.50	ALC40A223EF040
	27000	40x55	39	35	7.50	7.63	ALC40A273EG040
	47000	40x80	23	21	10.42	10.59	ALC40A473EL040
	68000	40x105	17	16	12.71	13.47	ALC40A683EP040
50V d.c. (57.5V surge)	1800	22x30	282	218	1.60	1.90	ALC40A182AB050
	2200	22x40	222	170	2.13	2.57	ALC40A222AD050
	2700	22x40	187	145	2.22	2.64	ALC40A272AD050
	2700	25x30	213	169	1.80	2.09	ALC40A272BB050
	3300	25x35	172	136	2.13	2.47	ALC40A332BC050
	3900	25x35	156	126	2.15	2.48	ALC40A392BC050
	3900	30x30	178	147	2.01	2.31	ALC40A392CB050
	4700	25x40	129	104	2.52	2.90	ALC40A472BD050
	5600	30x35	135	112	2.44	2.80	ALC40A562CC050
	6800	30x40	112	93	2.80	3.21	ALC40A682CD050
	8200	30x50	84	69	3.63	4.16	ALC40A822CF050
	8200	35x35	126	107	2.68	3.07	ALC40A822DC050
	8200	40x30	91	80	4.15	4.26	ALC40A822EB050
	10000	30x50	104	88	3.40	4.04	ALC40A103CF050
	10000	35x40	104	88	3.08	3.52	ALC40A103DD050
	12000	35x50	77	65	3.98	4.56	ALC40A123DF050
	12000	40x40	64	57	5.42	5.53	ALC40A123ED050
	15000	35x50	57	44	4.73	5.42	ALC40A153DF050
	15000	40x45	53	47	6.11	6.23	ALC40A153EE050
	18000	40x50	44	39	6.98	7.12	ALC40A183EF050
	22000	40x60	34	30	8.45	8.63	ALC40A223EH050
	33000	40x80	24	21	10.41	10.62	ALC40A333EL050
	56000	40x105	18	16	12.64	13.72	ALC40A563EP050

Ordering information

For details of ordering see pages 54 & 55.

PCB Snap-In Capacitors

ALC40

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 105°C 100 Hz	Ripple current (A) at 105°C 10 KHz	Type number
63V d.c. (72V surge)	1800	22x30	256	200	1.55	1.83	ALC40A182AB063
	2200	25x30	227	180	1.69	1.98	ALC40A222BB063
	2700	22x40	170	132	2.15	2.55	ALC40A272AD063
	3300	25x35	165	133	2.01	2.35	ALC40A332BC063
	3900	25x40	138	111	2.36	2.75	ALC40A392BD063
	3900	30x30	185	154	1.88	2.18	ALC40A392CB063
	4700	30x35	148	123	2.28	2.65	ALC40A472CC063
	5600	30x40	122	102	2.61	3.03	ALC40A562CD063
	5600	40x30	102	90	3.82	3.91	ALC40A562EB063
	6800	30x50	92	75	3.39	3.93	ALC40A682CF063
	6800	35x35	141	119	2.50	2.90	ALC40A682DC063
	6800	40x35	91	81	4.18	4.26	ALC40A682EC063
	8200	30x50	48	35	3.33	3.98	ALC40A822CF063
	8200	35x40	116	99	2.87	3.33	ALC40A822DD063
	8200	40x40	72	64	5.01	5.12	ALC40A822ED063
	10000	35x50	85	72	3.71	4.31	ALC40A103DF063
	10000	40x45	60	53	5.69	5.81	ALC40A103EE063
	12000	40x50	50	44	6.50	6.64	ALC40A123EF063
	15000	40x60	39	34	7.81	7.99	ALC40A153EH063
	22000	40x80	27	24	9.70	9.92	ALC40A223EL063
	33000	40x105	18	17	12.01	13.01	ALC40A333EP063
100V d.c. (115V surge)	560	22x30	383	276	1.22	1.67	ALC40A561AB100
	680	22x40	302	214	1.60	2.26	ALC40A681AD100
	820	22x40	259	186	1.68	2.31	ALC40A821AD100
	820	25x30	294	220	1.39	1.82	ALC40A821BB100
	1000	25x35	238	177	1.65	2.16	ALC40A102BC100
	1200	25x40	198	147	1.93	2.53	ALC40A122BD100
	1200	30x30	245	191	1.57	2.01	ALC40A122CB100
	1500	30x35	195	151	1.90	2.44	ALC40A152CC100
	1800	30x40	162	125	2.18	2.80	ALC40A182CD100
	2200	30x50	123	94	2.82	3.63	ALC40A222CF100
	2200	35x35	177	142	2.10	2.67	ALC40A222DC100
	2200	40x30	128	110	3.58	3.80	ALC40A222EB100
	2700	35x40	146	118	2.41	3.07	ALC40A272DD100
	2700	40x40	95	80	4.92	5.24	ALC40A272ED100
	3300	35x50	108	86	3.12	3.97	ALC40A332DF100
	3300	40x45	78	66	5.59	5.95	ALC40A332EE100
	3900	40x50	65	55	6.41	6.83	ALC40A392EF100
	4700	40x55	58	50	6.67	7.04	ALC40A472EG100
	5600	40x60	49	42	7.46	7.87	ALC40A562EH100
	8200	40x80	34	29	9.28	9.78	ALC40A822EL100
	10000	40x105	24	21	11.33	13.12	ALC40A103EP100
200V d.c. (230V surge)	220	22x30	644	442	0.88	1.41	ALC40A221AB200
	270	25x30	542	377	1.01	1.56	ALC40A271BB200
	330	22x40	428	294	1.21	1.95	ALC40A331AD200
	390	25x35	386	271	1.24	1.86	ALC40A391BC200
	470	25x40	320	224	1.45	2.19	ALC40A471BD200
	470	30x30	369	270	1.24	1.76	ALC40A471CB200
	560	30x35	301	219	1.50	2.13	ALC40A561CC200
	680	30x40	249	181	1.72	2.44	ALC40A681CD200
	680	40x30	202	158	2.97	3.67	ALC40A681EB200
	820	30x50	196	140	2.18	3.16	ALC40A821CF200
	820	35x35	252	191	1.70	2.34	ALC40A821DC200
	820	40x35	173	137	3.35	4.06	ALC40A821EC200
	1000	35x40	208	158	1.95	2.69	ALC40A102DD200
	1000	40x40	140	110	3.92	4.80	ALC40A102ED200
	1200	35x50	159	119	2.50	3.48	ALC40A122DF200
	1200	40x45	116	91	4.50	5.50	ALC40A122EE200
	1500	40x50	94	74	5.13	6.23	ALC40A152EF200
	1800	40x60	76	60	6.10	7.53	ALC40A182EH200
	2700	40x80	52	41	7.62	9.32	ALC40A272EL200
	3900	40x105	49	34	7.90	12.31	ALC40A392EP200
	5600	45x105	40	28	8.68	12.54	ALC40G562FP200
	6800	50x105	36	26	9.08	12.29	ALC40G682KP200

Ordering information

For details of ordering see pages 54 & 55.

ALC40

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 105°C 100 Hz	Ripple current (A) at 105°C 10 KHz	Type number
250V d.c. (287V surge)	150	22x30	823	552	0.76	1.32	ALC40A151AB250
	180	22x40	674	448	0.96	1.73	ALC40A181AD250
	220	22x40	559	374	1.04	1.82	ALC40A221AD250
	220	25x30	592	405	0.93	1.50	ALC40A221BB250
	270	25x35	480	327	1.10	1.77	ALC40A271BC250
	330	25x40	393	268	1.29	2.08	ALC40A331BD250
	330	30x30	441	312	1.13	1.69	ALC40A331CB250
	390	30x35	364	256	1.36	2.04	ALC40A391CC250
	470	30x40	302	212	1.56	2.34	ALC40A471CD250
	470	40x30	258	193	2.59	3.49	ALC40A471EB250
	560	30x50	243	168	1.96	3.02	ALC40A561CF250
	560	35x35	297	217	1.57	2.25	ALC40A561DC250
	560	40x35	221	166	3.05	4.16	ALC40A561EC250
	680	35x40	245	179	1.80	2.59	ALC40A681DD250
	680	40x40	180	134	3.49	4.76	ALC40A681ED250
	820	35x50	190	137	3.12	4.66	ALC40A821DF250
	820	40x45	149	111	4.01	5.46	ALC40A821EE250
	1000	35x60	164	125	3.61	5.78	ALC40A102DH250
	1000	40x50	123	92	4.58	6.22	ALC40A102EF250
	1200	40x55	106	80	4.93	6.51	ALC40A122EG250
	1500	35x80	112	90	4.43	6.88	ALC40A152DL250
	1800	40x80	67	50	6.77	9.27	ALC40A182EL250
	2700	40x105	62	42	7.05	12.03	ALC40A272EP250
	3900	45x105	50	33	7.90	12.43	ALC40G392FP250
	4700	50x105	44	30	8.36	12.30	ALC40G472KP250
350V d.c. (385V surge)	82	22x30	1233	789	0.67	1.69	ALC40A820AB350
	100	22x40	1002	638	0.83	2.12	ALC40A101AD350
	120	22x40	841	537	0.91	2.27	ALC40A121AD350
	120	25x30	868	562	0.88	2.07	ALC40A121BB350
	150	25x35	694	449	1.04	2.46	ALC40A151BC350
	180	25x40	578	374	1.20	2.81	ALC40A181BD350
	180	30x30	618	410	1.17	2.46	ALC40A181CB350
	220	30x35	502	332	1.36	2.88	ALC40A221CC350
	270	30x40	410	272	1.59	3.33	ALC40A271CD350
	270	40x30	448	291	1.97	4.36	ALC40A271EB350
	330	35x35	378	260	1.79	3.24	ALC40A331DC350
	390	30x50	287	191	2.02	4.02	ALC40A391CF350
	390	35x40	317	218	2.02	3.67	ALC40A391DD350
	390	40x40	312	203	2.64	5.73	ALC40A391ED350
	470	35x50	251	170	2.72	4.90	ALC40A471DF350
	470	40x45	258	168	3.00	6.46	ALC40A471EE350
	560	35x50	224	155	2.57	4.44	ALC40A561DF350
	560	35x60	224	155	3.11	5.70	ALC40A561DH350
	560	40x50	216	141	3.41	7.27	ALC40A561EF350
	680	40x60	177	114	3.99	8.39	ALC40A681EH350
	820	35x80	150	102	3.82	6.72	ALC40A821DL350
	1000	40x80	120	78	5.00	9.98	ALC40A102EL350
	1500	40x105	99	68	6.00	11.47	ALC40A152EP350
	2200	45x105	77	53	6.79	12.06	ALC40G222FP350
	2700	50x105	66	45	7.34	12.08	ALC40G272KP350

Ordering information

For details of ordering see pages 54 & 55.

PCB Snap-In Capacitors

ALC40

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 105°C 100 Hz	Ripple current (A) at 105°C 10 KHz	Type number
400V d.c. (440V surge)	68	22x30	1717	1123	0.65	1.71	ALC40A680AB400
	82	22x40	1415	923	0.80	2.14	ALC40A820AD400
	100	22x40	1166	762	0.88	2.30	ALC40A101AD400
	100	25x30	1193	788	0.85	2.09	ALC40A101BB400
	120	25x35	991	653	1.00	2.45	ALC40A121BC400
	150	25x40	794	524	1.17	2.83	ALC40A151BD400
	150	30x30	835	562	1.14	2.46	ALC40A151CB400
	180	30x35	690	463	1.31	2.88	ALC40A181CC400
	220	30x40	565	379	1.54	3.33	ALC40A221CD400
	220	40x30	521	320	1.88	4.36	ALC40A221EB400
	270	35x35	470	322	1.73	3.23	ALC40A271DC400
	270	40x35	430	266	2.21	4.95	ALC40A271EC400
	330	30x50	383	258	1.98	4.02	ALC40A331CF400
	330	35x40	386	266	1.98	3.64	ALC40A331DD400
	330	40x40	350	216	2.56	5.76	ALC40A331ED400
	390	35x50	323	221	2.64	4.66	ALC40A391DF400
	390	40x45	295	182	2.88	6.48	ALC40A391EE400
	470	35x50	277	192	2.51	4.40	ALC40A471DF400
	470	35x60	270	185	3.04	5.78	ALC40A471DH400
	470	40x50	245	151	3.28	7.30	ALC40A471EF400
	560	40x55	209	130	3.62	7.78	ALC40A561EG400
	680	35x80	200	131	3.72	6.69	ALC40A681DL400
	680	40x60	173	107	4.08	8.58	ALC40A681EH400
	1000	40x80	118	73	4.85	10.16	ALC40A102EL400
	1200	40x105	103	70	5.76	11.46	ALC40A122EP400
	1800	45x105	82	55	6.48	12.04	ALC40G182FP400
	2200	50x105	70	47	7.02	12.08	ALC40G222KP400
450V d.c. (495V surge)	33	22x30	2851	1971	0.51	1.38	ALC40A330AB450
	47	22x40	2002	1385	0.67	1.84	ALC40A470AD450
	47	25x30	2011	1392	0.66	1.74	ALC40A470BB450
	56	25x35	1687	1168	0.76	2.03	ALC40A560BC450
	68	25x40	1391	963	0.88	2.34	ALC40A680BD450
	68	30x30	1403	974	0.87	2.19	ALC40A680CB450
	82	30x35	1163	807	1.01	2.54	ALC40A820CC450
	100	30x40	955	663	1.18	2.95	ALC40A101CD450
	120	35x35	810	565	1.36	3.11	ALC40A121DC450
	150	30x50	642	446	1.54	3.67	ALC40A151CF450
	150	35x40	651	454	1.57	3.53	ALC40A151DD450
	150	40x30	642	447	1.73	4.14	ALC40A151EB450
	180	35x50	541	377	1.88	4.27	ALC40A181DF450
	180	40x35	538	374	2.01	4.70	ALC40A181EC450
	220	35x50	449	315	2.28	4.71	ALC40A221DF450
	220	40x40	440	306	2.34	5.47	ALC40A221ED450
	270	40x50	356	248	2.80	6.74	ALC40A271EF450
	330	35x60	285	198	2.91	5.53	ALC40A331DH450
	330	40x55	293	204	3.14	7.29	ALC40A331EG450
	390	40x60	249	174	3.50	8.04	ALC40A391EH450
	470	35x80	203	138	3.51	6.68	ALC40A471DL450
	560	40x80	175	122	4.32	9.57	ALC40A561EL450
	820	40x105	121	85	5.34	11.05	ALC40A821EP450
	1200	45x105	105	71	5.84	11.64	ALC40G122FP450
	1500	50x105	86	59	6.44	11.85	ALC40G152KP450

Ordering information

For details of ordering see pages 54 & 55.

PCB Snap-In Capacitors

ALC12/42 series

A high CV range of snap-in capacitors.

Both series are designed for applications where high reliability and compact case sizes are important, such as switch mode power supplies and frequency converters.

	ALC12	ALC42
Capacitance Range	150µF to 8,200µF	120µF to 6,800µF
Capacitance Tolerance	±20%	±20%
Voltage Range	200V to 450V d.c.	200V to 450V d.c.
Temperature range	-40˚C to +85˚C	-40˚C to +105˚C
Case sizes	30 x 30mm to 50 x 105mm	30 x 30mm to 50 x 105mm

Case Sizes 22, 25mm diameter available upon request.
For case size and terminal style details see page 30.

TECHNICAL DATA

Related documents
IEC 384-4

Temperature range
ALC12
Storage -55˚C to +85˚C
Operating -40˚C to +85˚C
Environmental classification 40/085/56

ALC42
Storage -55˚C to +105˚C
Operating -40˚C to +105˚C
Environmental classification 40/105/56

Surge voltage
1000 surges (30 seconds) at 85˚C (ALC12) and 105˚C (ALC42) with surge voltage applied. See electrical characteristics for more details.

Charge/discharge
10^6 cycles at 25˚C and rated voltage. One cycle per second with a time constant of 0.1.

D.C. leakage current
After application of rated d.c. voltage for 5 minutes at 20˚C, the d.c. leakage current shall not exceed
$(0.006\ C_r\ U_r)$ µA. Where C_r is the rated capacitance in µF and U_r is the rated d.c. voltage.

Vibration
10Hz to 500Hz at 0.75mm or 10g for 3x2hrs duration.
10Hz to 55Hz at 0.35mm or 5g for 3x0.5hrs duration (45/50mm dia. cans).

Insulation resistance
≥ 100MΩ at 100V d.c., across insulating sleeve.

Voltage proof
≥ 2500V d.c., across insulating sleeve.

Life expectancy
2000 hours at rated temperature with rated voltage and ripple current applied.

Capacitor marking
The capacitors are marked with items 1 to 6 from the following list as a minimum, and as much of the remaining information as is practical.

1. Rated capacitance in µF
2. Rated voltage d.c.
3. Polarity of terminations
4. Tolerance on rated capacitance
5. Date code/Batch number
6. BHC part number
7. Environmental classification

PCB Snap-In Capacitors

ALC12

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 85°C 100 Hz	Ripple current (A) at 85°C 10 KHz	Type number
200V d.c. (230V surge)	560	30x30	342	224	1.75	2.81	ALC12A561CB200
	680	30x35	278	181	2.06	3.36	ALC12A681CC200
	1000	30x40	201	135	2.52	3.81	ALC12A102CD200
	1000	35x35	218	151	2.58	3.63	ALC12A102DC200
	1200	30x50	162	107	3.09	4.86	ALC12A122CF200
	1200	35x40	181	125	2.96	4.18	ALC12A122DD200
	1200	40x30	243	186	2.26	2.75	ALC12A122EB200
	1500	40x35	190	145	2.73	3.35	ALC12A152EC200
	1800	35x50	128	91	3.70	5.01	ALC12A182DF200
	1800	40x40	156	119	3.17	3.90	ALC12A182ED200
	2200	35x60	107	76	4.21	5.65	ALC12A222DH200
	2200	40x45	132	101	3.54	4.32	ALC12A222EE200
	2700	35x80	93	68	4.99	6.90	ALC12A272DL200
	2700	40x55	104	79	4.27	5.26	ALC12A272EG200
	3300	40x60	96	75	4.48	5.33	ALC12A332EH200
	3900	40x80	78	60	5.55	6.90	ALC12A392EL200
	5600	40x105	43	31	8.39	12.08	ALC12A562EP200
	6800	45x105	38	28	8.85	12.05	ALC12G682FP200
	8200	50x105	34	26	9.21	11.90	ALC12G822KP200
250V d.c. (287V surge)	390	30x30	456	299	1.56	2.66	ALC12A391CB250
	470	30x35	375	244	1.82	3.17	ALC12A471CC250
	560	30x40	314	204	2.12	3.69	ALC12A561CD250
	680	35x35	285	194	2.34	3.56	ALC12A681DC250
	680	40x30	316	225	2.12	2.94	ALC12A681EB250
	820	30x50	219	144	2.75	4.62	ALC12A821CF250
	820	35x40	236	160	2.69	4.09	ALC12A821DD250
	1000	40x35	232	170	2.58	3.41	ALC12A102EC250
	1200	35x50	167	115	3.38	4.96	ALC12A122DF250
	1200	40x40	192	140	2.99	3.96	ALC12A122ED250
	1500	35x60	136	95	3.87	5.58	ALC12A152DH250
	1500	40x45	160	118	3.36	4.35	ALC12A152EE250
	1800	40x55	128	93	4.02	5.32	ALC12A182EG250
	2200	35x80	94	66	4.79	6.81	ALC12A222DL250
	2200	40x60	115	86	4.28	5.43	ALC12A222EH250
	2700	40x80	85	61	5.28	7.01	ALC12A272EL250
	3900	40x105	48	32	7.72	12.08	ALC12A392EP250
	4700	45x105	42	29	8.22	12.11	ALC12G472FP250
	5600	50x105	38	27	8.63	12.03	ALC12G562KP250
350V d.c. (385V surge)	220	30x30	643	397	1.30	2.55	ALC12A221CB350
	270	30x35	522	321	1.52	3.01	ALC12A271CC350
	390	30x40	370	231	1.90	3.55	ALC12A391CD350
	390	35x35	384	243	2.02	3.51	ALC12A391DC350
	470	30x50	304	188	2.31	4.42	ALC12A471CF350
	470	40x30	368	249	1.95	2.85	ALC12A471EB350
	560	35x40	279	181	2.44	3.97	ALC12A561DD350
	560	40x35	299	199	2.32	3.50	ALC12A561EC350
	680	35x50	225	144	2.92	4.93	ALC12A681DF350
	680	40x40	246	164	2.68	4.04	ALC12A681ED350
	820	40x45	207	139	3.02	4.50	ALC12A821EE350
	1000	35x60	163	107	3.51	5.45	ALC12A102DH350
	1000	40x50	175	118	3.39	4.92	ALC12A102EF350
	1200	40x60	146	99	3.89	5.62	ALC12A122EH350
	1500	35x80	111	73	4.37	6.64	ALC12A152DL350
	1800	40x80	100	68	4.85	6.89	ALC12A182EL350
	2200	40x105	81	55	5.61	7.99	ALC12A222EP350
	3300	45x105	49	32	7.53	11.79	ALC12G332FP350
	3900	50x105	44	29	7.95	11.73	ALC12G392KP350
400V d.c. (440V surge)	180	30x30	794	509	1.21	2.38	ALC12A181CB400
	220	30x35	648	414	1.42	2.82	ALC12A221CC400
	270	30x40	529	339	1.66	3.28	ALC12A271CD400
	330	35x35	457	299	1.91	3.35	ALC12A331DC400
	330	40x30	485	326	1.79	2.86	ALC12A331EB400
	390	30x50	370	238	2.16	4.17	ALC12A391CF400
	390	35x40	385	252	2.18	3.85	ALC12A391DD400

Ordering information

For details of ordering see pages 54 & 55.

ALC12

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 85°C 100 Hz	Ripple current (A) at 85°C 10 KHz	Type number
400V d.c. (440V surge)	470	40x35	352	240	2.21	3.38	ALC12A471EC400
	560	35x50	270	178	2.75	4.72	ALC12A561DF400
	560	40x40	295	200	2.54	3.92	ALC12A561ED400
	680	35x60	226	149	3.14	5.34	ALC12A681DH400
	680	40x45	245	168	2.87	4.37	ALC12A681EE400
	820	40x50	207	143	3.22	4.80	ALC12A821EF400
	1000	35x80	155	102	3.90	6.52	ALC12A102DL400
	1000	40x60	172	119	3.71	5.46	ALC12A102EH400
	1500	40x80	115	80	4.64	6.71	ALC12A152EL400
	1800	40x105	82	53	6.11	11.06	ALC12A182EP400
	2700	45x105	59	39	7.11	11.40	ALC12G272FP400
	3300	50x105	51	35	7.60	11.38	ALC12G332KP400
450V d.c. (495V surge)	150	30x30	861	548	1.15	2.34	ALC12A151CB450
	220	30x35	596	382	1.45	2.83	ALC12A221CC450
	270	30x40	486	312	1.70	3.30	ALC12A271CD450
	270	35x35	500	324	1.82	3.30	ALC12A271DC450
	330	30x50	395	252	2.08	4.10	ALC12A331CF450
	330	35x40	410	266	2.10	3.79	ALC12A331DD450
	330	40x30	460	313	1.79	2.74	ALC12A331EB450
	390	40x35	379	255	2.13	3.35	ALC12A391EC450
	470	35x50	292	190	2.64	4.66	ALC12A471DF450
	470	40x40	314	211	2.45	3.88	ALC12A471ED450
	560	40x45	265	178	2.76	4.34	ALC12A561EE450
	680	35x60	206	136	3.23	5.22	ALC12A681DH450
	680	40x50	220	150	3.10	4.76	ALC12A681EF450
	820	35x80	182	123	3.69	6.26	ALC12A821DL450
	820	40x60	180	120	3.62	5.44	ALC12A821EH450
	1000	40x80	156	107	4.21	6.69	ALC12A102EL450
	1500	40x105	96	63	5.77	10.51	ALC12A152EP450
	1800	45x105	82	55	6.27	10.87	ALC12G182FP450
	2200	50x105	70	47	6.81	11.12	ALC12G222KP450

ALC42

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 105°C 100 Hz	Ripple current (A) at 105°C 10 KHz	Type number
200V d.c. (230V surge)	560	30x30	328	213	1.78	2.88	ALC42A561CB200
	680	30x35	266	171	2.09	3.46	ALC42A681CC200
	820	30x40	220	142	2.44	4.04	ALC42A821CD200
	1000	35x35	213	148	2.58	3.61	ALC42A102DC200
	1000	40x30	252	186	2.26	2.87	ALC42A102EB200
	1200	30x50	156	102	3.14	4.98	ALC42A122CF200
	1200	35x40	176	122	2.97	4.17	ALC42A122DD200
	1200	40x35	199	145	2.73	3.55	ALC42A122EC200
	1500	35x50	137	93	3.64	5.24	ALC42A152DF200
	1500	40x40	163	119	3.15	4.07	ALC42A152ED200
	1800	40x45	138	101	3.54	4.53	ALC42A182EE200
	2200	35x60	105	75	4.21	5.60	ALC42A222DH200
	2200	40x50	119	89	3.92	4.91	ALC42A222EF200
	2200	40x55	109	79	4.24	5.52	ALC42A222EG200
	2700	35x80	89	65	5.06	7.01	ALC42A272DL200
	2700	40x60	99	74	4.49	5.57	ALC42A272EH200
	3300	40x80	81	61	5.52	7.16	ALC42A332EL200
	4700	40x105	46	32	8.22	12.69	ALC42A472EP200
	5600	45x105	41	29	8.68	12.61	ALC42G562FP200
	6800	50x105	36	26	9.09	12.39	ALC42G682KP200
250V d.c. (287V surge)	390	30x30	442	285	1.59	2.81	ALC42A391CB250
	470	30x35	362	232	1.86	3.36	ALC42A471CC250
	560	30x40	303	194	2.16	3.92	ALC42A561CD250
	680	35x35	278	187	2.36	3.64	ALC42A681DC250
	680	40x30	313	221	2.12	2.95	ALC42A681EB250
	820	30x50	212	137	2.80	4.87	ALC42A821CF250
	820	35x40	230	155	2.72	4.19	ALC42A821DD250
	820	40x35	251	175	2.55	3.62	ALC42A821EC250
	1000	40x40	206	144	2.95	4.18	ALC42A102ED250
	1200	35x50	160	110	3.40	5.04	ALC42A122DF250

Ordering information

For details of ordering see pages 54 & 55.

PCB Snap-In Capacitors

Rated voltage d.c.	Cap (µF)	Case Size (mm)	ESR (mΩ) at 20°C 100Hz (max)	Impedance (mΩ) at 20°C 10 KHz (max)	Ripple current (A) at 105°C 100 Hz	Ripple current (A) at 105°C 10 KHz	Type number
250V d.c. (287V surge)	1200	40x45	174	122	3.31	4.65	ALC42A122EE250
	1500	35x60	134	92	3.90	5.66	ALC42A152DH250
	1500	40x50	146	104	3.70	5.02	ALC42A152EF250
	1800	35x80	105	70	4.64	7.19	ALC42A182DL250
	1800	40x55	127	92	4.01	5.31	ALC42A182EG250
	2700	40x80	84	60	5.28	7.02	ALC42A272EL250
	3300	40x105	53	34	7.47	12.71	ALC42A332EP250
	4700	45x105	41	28	8.32	12.45	ALC42G472FP250
	5600	50x105	37	26	8.70	12.21	ALC42G562KP250
350V d.c. (385V surge)	220	30x30	704	461	1.34	2.74	ALC42A221CB350
	270	30x35	571	373	1.57	3.26	ALC42A271CC350
	330	30x40	468	306	1.84	3.80	ALC42A331CD350
	390	35x35	420	282	2.06	3.65	ALC42A391DC350
	390	40x30	451	311	1.91	3.01	ALC42A391EB350
	470	30x50	332	218	2.37	4.75	ALC42A471CF350
	470	35x40	349	234	2.37	4.20	ALC42A471DD350
	560	40x35	328	230	2.34	3.51	ALC42A561EC350
	680	35x50	246	166	2.98	5.09	ALC42A681DF350
	680	40x40	270	189	2.71	4.06	ALC42A681ED350
	820	35x60	204	140	3.40	5.75	ALC42A821DH350
	820	40x50	216	149	3.31	5.19	ALC42A821EF350
	1000	40x55	182	127	3.63	5.48	ALC42A102EG350
	1200	35x80	140	96	4.21	7.01	ALC42A122DL350
	1200	40x60	160	114	3.83	5.62	ALC42A122EH350
	1500	40x80	120	84	4.76	7.20	ALC42A152EL350
	2200	40x105	72	48	6.71	12.34	ALC42A222EP350
	2700	45x105	62	41	7.26	12.35	ALC42G272FP350
	3300	50x105	53	36	7.77	12.21	ALC42G332KP350
400V d.c. (440V surge)	180	30x30	733	467	1.28	2.73	ALC42A181CB400
	220	30x35	587	375	1.49	3.25	ALC42A221CC400
	270	30x40	488	310	1.75	3.79	ALC42A271CD400
	330	35x35	426	280	1.99	3.61	ALC42A331DC400
	330	40x30	458	308	1.84	2.96	ALC42A331EB400
	390	30x50	342	218	2.28	4.74	ALC42A391CF400
	390	35x40	360	235	2.21	4.17	ALC42A391DD400
	390	40x35	377	251	2.18	3.65	ALC42A391EC400
	470	40x40	313	208	2.52	4.22	ALC42A471ED400
	560	35x50	250	164	2.88	5.06	ALC42A561DF400
	560	40x45	264	176	2.84	4.71	ALC42A561EE400
	680	35x60	211	139	3.27	5.72	ALC42A681DH400
	680	40x50	222	149	3.19	5.14	ALC42A681EF400
	820	40x55	189	128	3.50	5.45	ALC42A821EG400
	1000	35x80	145	96	4.06	6.96	ALC42A102DL400
	1200	40x80	128	86	4.56	7.20	ALC42A122EL400
	1800	40x105	76	49	6.41	12.32	ALC42A182EP400
	2200	45x105	65	42	6.96	12.32	ALC42G222FP400
	2700	50x105	55	37	7.48	12.17	ALC42G272KP400
450V d.c. (495V surge)	120	30x30	918	580	1.13	2.69	ALC42A121CB450
	180	30x35	622	396	1.40	3.20	ALC42A181CC450
	220	30x40	510	324	1.69	3.73	ALC42A221CD450
	220	35x35	525	335	1.80	3.66	ALC42A221DC450
	270	30x50	412	262	2.06	4.67	ALC42A271CF450
	270	35x40	428	275	2.08	4.19	ALC42A271DD450
	270	40x30	476	320	1.78	2.90	ALC42A271EB450
	330	40x35	385	257	2.13	3.54	ALC42A331EC450
	390	40x40	323	215	2.44	4.12	ALC42A391ED450
	470	35x50	260	171	2.78	4.94	ALC42A471DF450
	470	40x45	270	180	2.70	4.59	ALC42A471EE450
	560	40x50	230	154	3.02	5.03	ALC42A561EF450
	680	35x80	187	125	3.69	6.88	ALC42A681DL450
	680	40x60	191	128	3.55	5.73	ALC42A681EH450
	820	40x80	161	109	4.20	7.21	ALC42A821EL450
	1200	40x105	102	66	5.70	11.82	ALC42A122EP450
	1500	45x105	84	55	6.29	12.03	ALC42G152FP450
	1800	50x105	72	48	6.79	12.07	ALC42G182KP450

Ordering information

For details of ordering see pages 54 & 55.

Solder Pin & Tag Capacitors

ALP/T 10/20/22 series

Listed here are only samples of the range of Solder Pin and Tag Capacitors we can produce.

It should be pointed out that the ALP, solder pin, ranges are an older design and as such should not be considered for any new applications. Details are incorporated here, primarily, for maintenance/ replacement purposes.

ALP/T 10, 20 and 22 Series

A range of 85°C capacitors designed to meet the demands of inverters, switch mode power supplies and energy storage circuits. It should be noted that for any new applications requiring board mounting terminations, ALP, the ALC ranges of snap-in capacitors produced by BHC should be considered. The ALP/T10 is the older "General Purpose" range whereas the ALP/T20 is the "Long Life" equivalent. ALP/T22 is a higher CV version of ALP/T20 with the same long life characteristics.

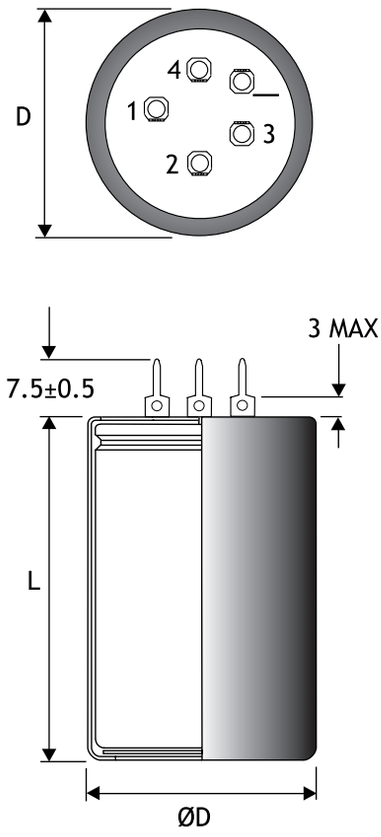
	ALP/T10	ALP/T20	ALP/T22
Capacitance Range	100µF to 68,000µF	22µF to 68,000µF	47µF to 150,000µF
Capacitance Tolerance	-10% +30%	-10% +30% (200V ±20%)	±20%
Voltage Range	10V to 385V d.c.	10V to 450V d.c.	10V to 450V d.c.
Temperature range	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C
Case sizes	22 x 35 to 40 x 105	22 x 35 to 40 x 105	22 x 35 to 40 x 105

Solder Pin & Tag Capacitors

ALP/T 10/20/22 case sizes

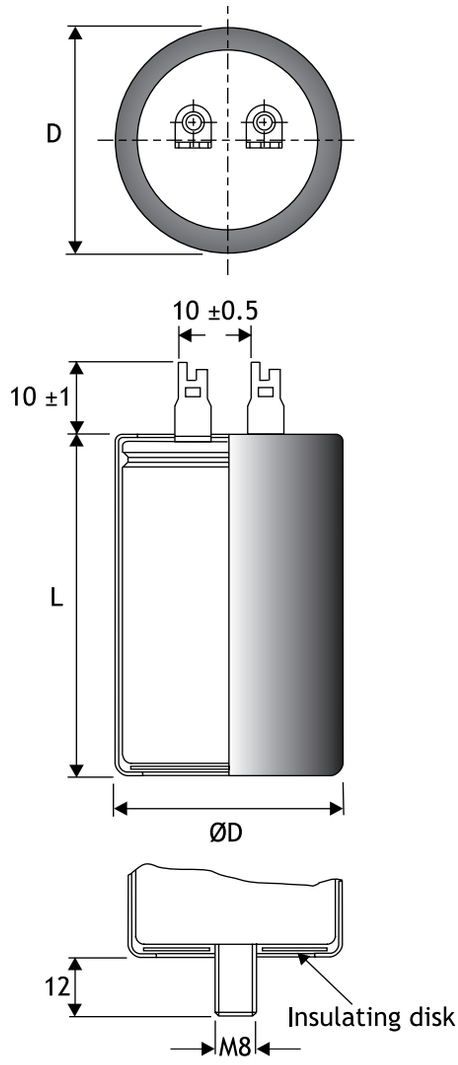
ALP *Pin style*

Designed for PCB mounting to DIN 41238.



ALT *Tag style*

Designed for flying lead connection.



DIMENSIONS (sleeved) mm

CASE CODE	D ±1	L ±2	MOUNTING CLIP FOR ALT STYLE	WEIGHT grams nom.
AA	25	35	V2/H1	30
AB	25	45	V2/H1	39
BB	30	45	-	50
CB	35	45	V3/H2	65
CD	35	55	V3/H2	75
DB	40	45	V9	80
DD	40	55	V9	95
DE	40	75	V9	125
DF	40	105	V9	170

For details of mounting clips and stud mounting kits see pages 52 & 53.

ALT11\21\23

Stud Mounting

Max torque: stud M8:4NM

Capacitor marking

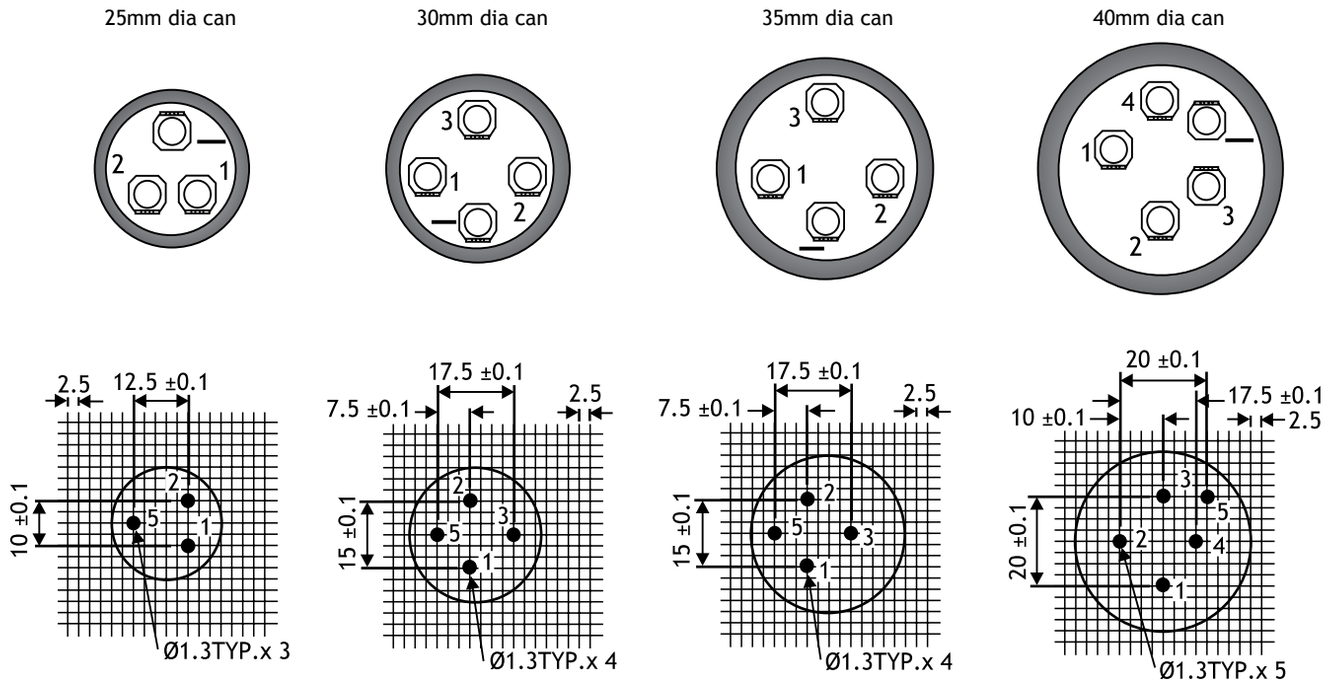
The capacitors are marked with items 1 to 6 from the following list as a minimum, and as much of the remaining information as is practical.

1. Rated capacitance in µF
2. Rated voltage d.c.
3. Polarity of terminations
4. Tolerance on rated capacitance
5. Date code/Batch number
6. BHC part number
7. Environmental classification

Ordering information

For details of ordering see pages 54 & 55.

ALP *Pin and mounting configurations*



Printed circuit board hole positions, viewed from component side.

Connections: Hole 1 represents +ve, Hole 5 represents -ve. Terminals 2,3 and 4 may be at negative terminal potential due to the presence of electrolyte. They are intended for mechanical connections only. It is recommended that they are soldered to the printed circuit board. Additional dummy pins are provided for stability. Note that the case and dummy pins may be at negative terminal potential.

TECHNICAL DATA

Related documents

IEC 384-4

DIN 41238

BS CECC 30301-033 (ALP/T20 Only)

Temperature range

Storage -55°C to +85°C
Operating -40°C to +85°C
Environmental classification 40/085/56

Surge voltage

1000 surges (30 seconds) at 85°C with surge voltage applied. See electrical characteristics for more details.

Charge/discharge

10^6 cycles at 25°C and rated voltage. One cycle per second with a time constant of 0.1.

D.C. leakage current

After application of rated d.c. voltage for 5 minutes at 20°C, the d.c. leakage current shall not exceed
(0.006 C_r U_r) µA. Where C_r is the rated capacitance in µF and U_r is the rated d.c. voltage.

Vibration

10Hz to 500Hz at 0.75mm or 10g for 3x2hrs duration.

Insulation resistance

≥ 100MΩ at 100V d.c., across insulating sleeve.

Voltage proof

≥ 2500V d.c., across insulating sleeve.

Life expectancy

At rated temperature with rated voltage and ripple current applied.

CAN DIAMETER (mm)	RANGE	LIFE EXPECTANCY (hours)
25	ALP/T10	5000
	ALP/T20 & 22	12000
30	ALP/T10	5000
	ALP/T20 & 22	15000
35	ALP/T10	5000
	ALP/T20 & 22	18000
40	ALP/T10	5000
	ALP/T20 & 22	26000

Solder Pin & Tag Capacitors

ALP/T 10/20/22

ALP/T CAP AND VOLTAGE MATRIX

Cap µF	Rated Voltage D.C. (Surge Voltage in Brackets)											
	10 (11.5)	16 (18.5)	25 (28.5)	40 (46)	63 (72.5)	100 (115)	160 (184)	200 (230)	250 (287)	385 (425)	400 (440)	450 (495)
22												ALP/T20
33												ALP/T20
47											ALP/T20	ALP/T20 ALP/T22
68										ALP/T22	ALP/T20	ALP/T20 ALP/T22
100									ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T22	ALP/T20	ALP/T20 ALP/T22
150							ALP/T10	ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T22	ALP/T20	ALP/T20 ALP/T22
220							ALP/T10	ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T22	ALP/T20	ALP/T20 ALP/T22
330							ALP/T10	ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T22	ALP/T20	ALP/T20 ALP/T22
470						ALP/T10 ALP/T20	ALP/T10	ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T22	ALP/T20	ALP/T20 ALP/T22
680						ALP/T10 ALP/T20 ALP/T22	ALP/T10	ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T22	ALP/T20	ALP/T22
1000					ALP/T10 ALP/T20	ALP/T10 ALP/T20 ALP/T22	ALP/T10	ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T22		
1500				ALP/T10 ALP/T20	ALP/T10 ALP/T20	ALP/T10 ALP/T20 ALP/T22	ALP/T10	ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22			
2200			ALP/T10 ALP/T20	ALP/T10 ALP/T20	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10	ALP/T20 ALP/T22				
3300		ALP/T10 ALP/T20	ALP/T10 ALP/T20	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22						
4700	ALP/T10 ALP/T20	ALP/T10 ALP/T20	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22						
6800	ALP/T10 ALP/T20	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22						
10000	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T22						
15000	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22							
22000	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T22							
33000	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T22								
47000	ALP/T10 ALP/T20 ALP/T22	ALP/T10 ALP/T20 ALP/T22	ALP/T22	ALP/T22								
68000	ALP/T10 ALP/T20 ALP/T22	ALP/T22	ALP/T22									
100000	ALP/T22	ALP/T22										
150000	ALP/T22											

For technical data covering case size, ESR, impedance and ripple current rating, on any of the above designs, contact BHC Components technical sales.

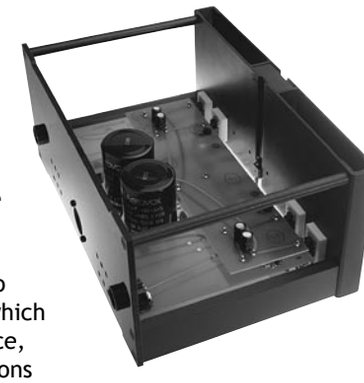
Audio Applications

SLIT FOIL CAPACITORS

Modern electrolytic capacitors are designed for use in power supplies so most aspects of their design have been optimised for this application. Some of the advances in design may not be beneficial in audio applications where the requirements of the capacitors are very different.

BHC, in collaboration with an audio research company, DNM Design, have produced the Slit Foil Capacitor specifically for audio applications. This is a patented design which eliminates circulating currents in the aluminium foils. This spurious current flow on the capacitor plates is known to occur, but is not apparent in most applications.

Voltage range	25V to 100V d.c.
Temperature range	-40˚C to +85˚C



Slit foil capacitor research has also indicated that improvements in the general construction of the capacitors give better results in audio where the fidelity of the waveshape is very important. Great attention has been paid to the construction details which can affect the performance, i.e. foil type, its connections and the mechanical construction. BHC manufacture a range of capacitors for this type of application in screw terminal, solder tag or board mounting configurations.

Details of capacitance and case sizes available in the Slit Foil Capacitors range are available from our sales office.

T-NETWORK

A new generation of audio capacitors is now available from BHC – T-Network Capacitor (TNC). The TNC has been designed specifically for audio applications by DNM design and is being manufactured in the UK by BHC.

In a normal capacitor unwanted resistance and inductance force the input and output together electrically, making its unwanted characteristics very critical for performance - figure 1.

The new T-Network capacitor (TNC) behaves differently because the input must flow along the capacitor plate to reach the output. The signal is forced into pure capacitance with most of the unwanted resistance and inductance appearing on each side of the bulk capacitance. The residual defects, therefore, tend to assist capacitance filtering in the T-Network design - figure 2.

The TNC is designed for the most demanding filtering situations and it will redefine performance standards in many non-audio applications. For use in audio amplifiers, the TNC incorporates current slit foil technology to produce the ultimate audio capacitor. These capacitors give excellent results against standard components on a direct replacement. However, TNC high frequency performance is so enhanced that the H.F. compensation of test amplifiers may need resetting for best results.

Figure 1: Conventional capacitor

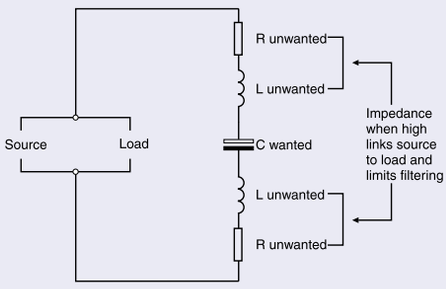
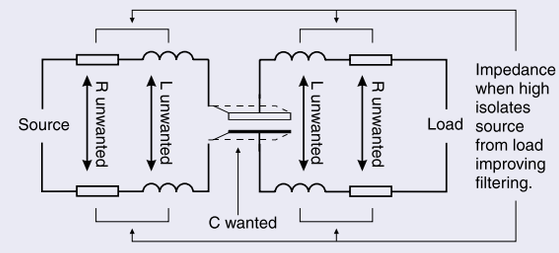


Figure 2: T-Network capacitor



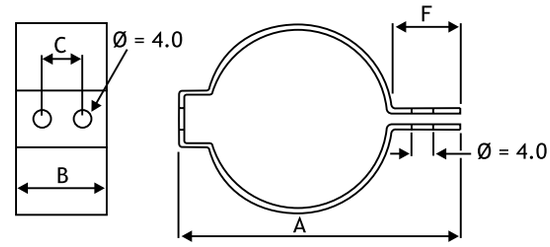
Cap µF	Cap Tolerance	Rated Voltage VDC	Part Number	Case Size (D x L) mm
10,000	-10% +30%	50	ALN20S1053DD	40 x 55
10,000	±20%	63	ALN20S1067DD	40 x 55

Accessories
Mounting Clips

DIMENSIONS mm **MATERIAL** Zinc plated steel

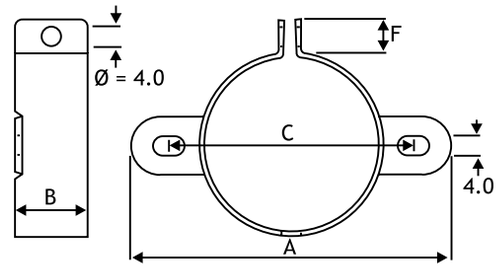
Horizontal Mounting

TYPE	CAN DIA	A	B	C	F
H1	25.0	40.0	22.3	12.8	10.0
H2	35.0	52.0	22.3	12.8	10.0

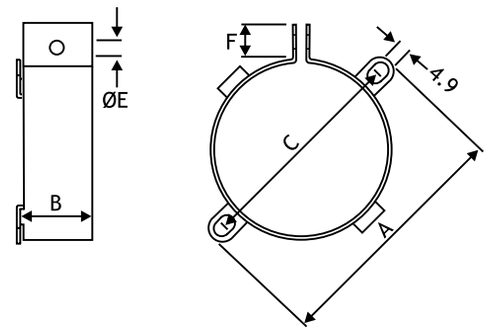


Vertical Mounting

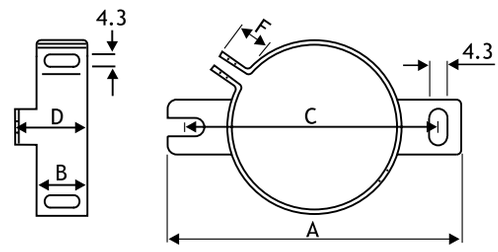
TYPE	CAN DIA	A	B	C	F
V2	25.0	49.0	19.0	37.0	10.0
V3	35.0	58.0	19.0	45.0	9.0
V9	40.0	65.0	19.0	52.4	9.5



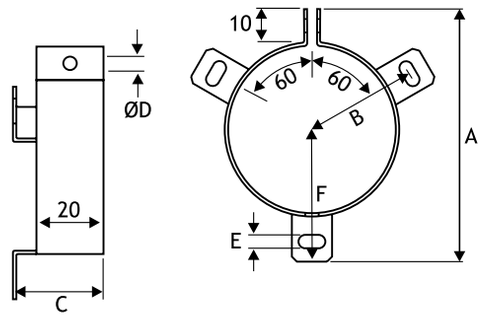
TYPE	CAN DIA	A	B	C	E	F
V4	51.0	75.0	25.4	64.0	5.0	10.0
V6	45.0	69.5	17.4	58.0	4.0	10.0
V8	63.5	88.9	25.4	77.5	5.0	9.5



TYPE	CAN DIA	A	B	C	D	F
UTE2736	35.0	63.0	12.2	54.0	17.2	9.0



TYPE	CAN DIA	A	B	C	D	E	F
V10	65.0	90.0	40.0	30.0	5.0	4.5	-
V11	76.0	103.0	45.5	30.0	5.0	4.5	-
V90	90.0	116.0	53.5	30.0	5.0	4.5	-
UTE2737	50.0	75.5	33.5	27.0	4.3	4.3	39.5
UTE2738	65.0	88.5	39.0	27.0	4.3	4.3	45.0
UTE2739	72.0	97.0	44.0	28.0	4.3	4.3	50.0



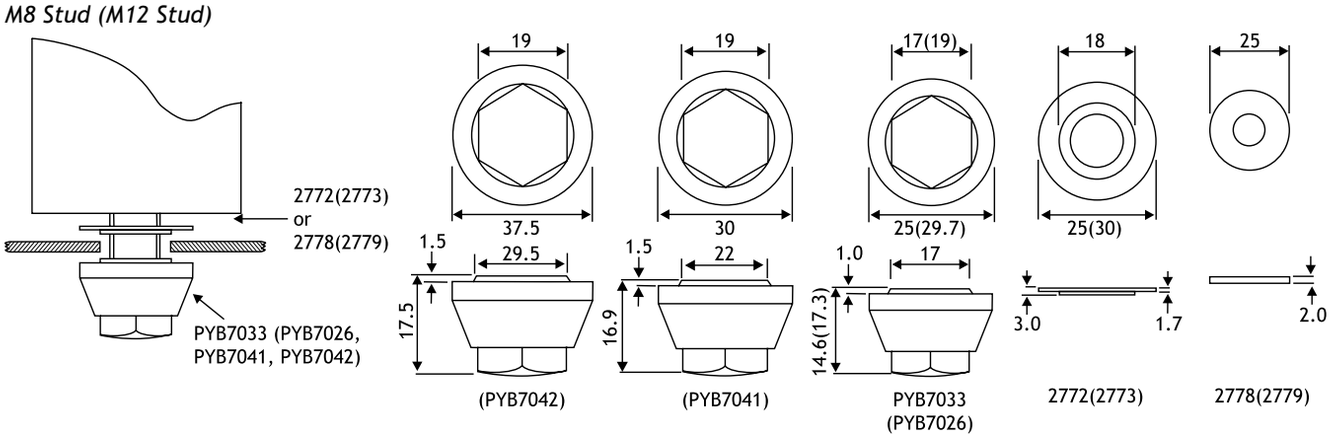
Note

When using mounting clamps care should be taken not to obscure any safety vent in the can.

Accessories
Stud Mounting Kits

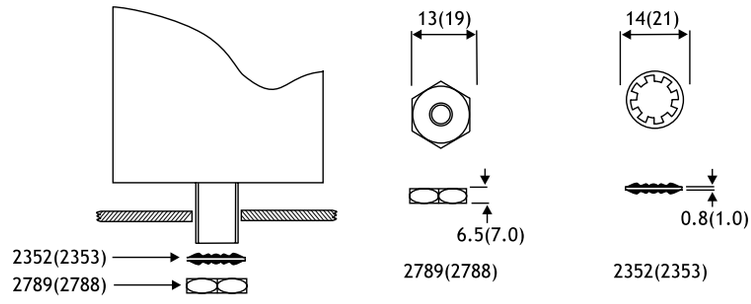
INSULATED VERSION

M8 Stud (M12 Stud)



NON-INSULATED VERSION

M8 Stud (M12 Stud)



Dimensions mm. All the above accessories may be ordered individually using the part number shown, or as kits using the kit part numbers shown below.

Kit Contents and Ordering Information

STANDARD KITS

		Kit order number			
Part code	Description	2740	2741	2782	2785
2352	Steel washer M8	-	-	●	-
2353	Steel washer M12	-	-	-	●
2772	Stepped poly washer M8	●	-	-	-
2773	Stepped poly washer M12	-	●	-	-
2778	Plain poly washer M8	●	-	-	-
2779	Plain poly washer M12	-	●	-	-
2788	Steel nut M12	-	-	-	●
2789	Steel nut M8	-	-	●	-
PYB7033	Nylon nut M8	●	-	-	-
PYB7026	Nylon nut M12	-	●	-	-
Kit description		Insulated M8	Insulated M12	Non-insulated M8	Non-insulated M12

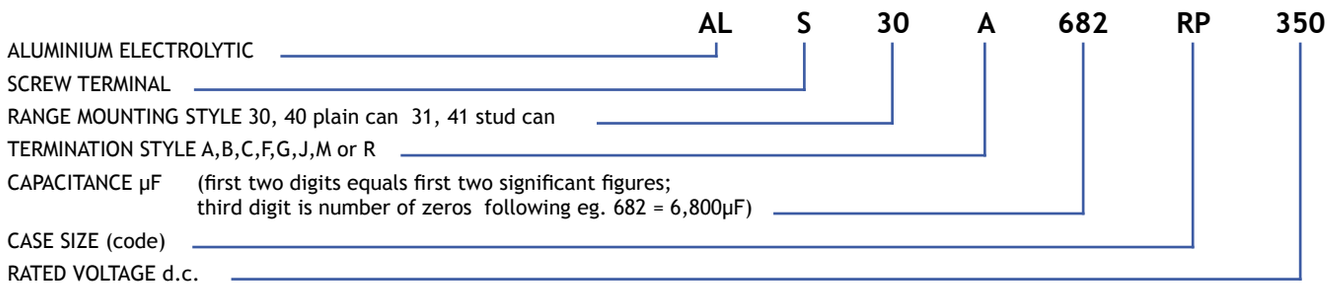
SPECIAL KITS

		Kit order number						
Part code	Description	2684	2685	2690	2691	2692	2693	2695
2352	Steel washer M8	-	-	-	-	●	-	-
2353	Steel washer M12	-	-	●	-	-	●	-
2772	Stepped poly washer M8	●	-	-	●	●	-	-
2773	Stepped poly washer M12	-	●	●	-	-	●	●
2778	Plain poly washer M8	-	-	-	●	●	-	-
2779	Plain poly washer M12	-	-	-	-	-	●	●
2788	Steel nut M12	-	●	●	-	-	●	●
2789	Steel nut M8	●	-	-	●	●	-	-
PYB7041	Nylon nut M12	-	-	-	-	-	-	-
PYB7042	Nylon nut M12	-	-	-	-	-	-	-

Ordering information

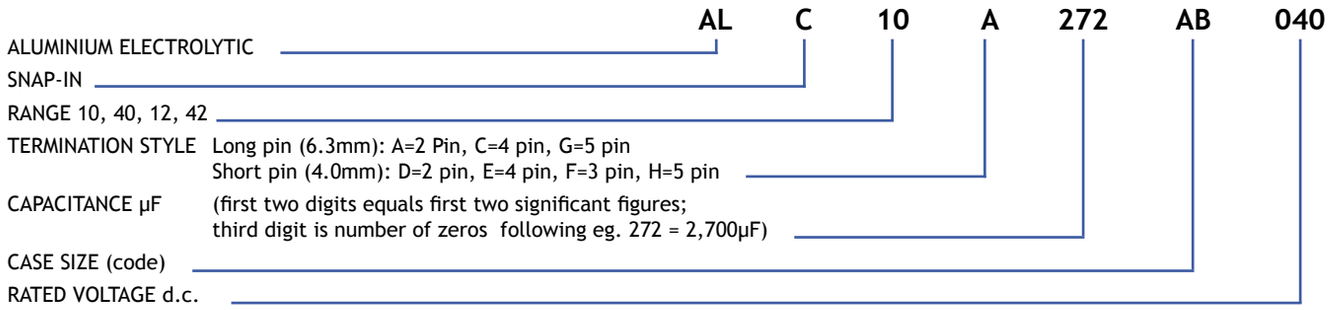
SCREW TERMINAL CAPACITORS

ALS30/31, ALS40/41



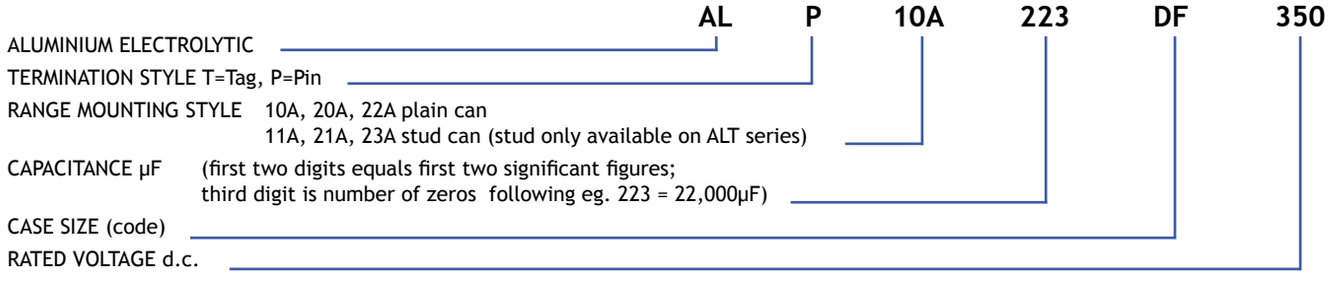
SNAP-IN CAPACITORS

ALC10, ALC40
ALC12, ALC42



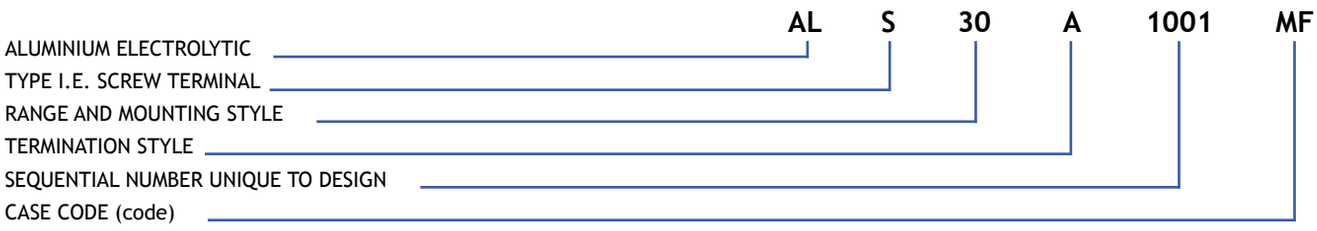
PCB & SOLDER TAG CAPACITORS

ALP10/20/22, ALT10/11/20/21/22/23



SPECIAL PART NUMBERS

Used when the design is different in any way from the data listed for a standard item. This can include anything from special electrical parameters to special print detail.



SAMPLE PART NUMBERS

The sample part number is used when a design has been raised as a feasibility, with or without samples being made. A full part number is issued, either as a standard or special design, once the item goes to full production.

CERTIFICATE OF REGISTRATION

Quality Management System

BHC Components Limited

20 Cumberland Drive
Granby Industrial Estate
Weymouth
Dorset
United Kingdom
DT4 9TE

Operate a Quality Management System
which complies with the requirements of
BS EN ISO 9001:2000
for the activities detailed in the scope of
registration.

Certificate No: **FM 11885**

Signed on behalf of BSI

Originally registered: **12 Mar 1991**

UKAS QUALITY MANAGEMENT 003

This is not a legal document and cannot be used as such. This certificate does not expire.
To check its validity telephone +44 (0)20 8996 9001 or visit www.bsi-global.com/BusinessPartners
Further clarifications regarding the scope of this certificate and the applicability of ISO 9001:2000 requirements may be obtained by consulting the organization. The British Standards Institution is incorporated by Royal Charter.
Group Headquarters: 389 Chiswick High Road, London W4 4AL, UK.

BSI Management Systems

MCA402/55/UE 15A/0132/UK/DP

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