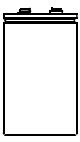
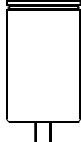


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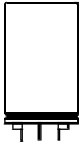
REFERENCE DATA

CAPACITOR TYPE	CAPACITANCE μ F	VOLTAGE V	TEMP. RANGE	PAGE
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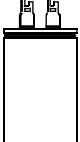
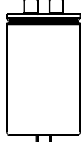
Screw Terminal

ALS20		ALS21		68 to 330,000	6.3 to 450	-55°C to +85°C	15-20
ALS29		ALS27		68 to 470,000	6.3 to 450	-55°C to +85°C	21-24
ALS30		ALS31		68 to 1,000,000	10 to 600	-40°C to +85°C	25-30
ALS40		ALS41		100 to 1,000,000	10 to 500	-40°C to +105°C	31-36
ALS60		ALS61		1000 to 150,000	16 to 100	-55°C to +125°C	37-39

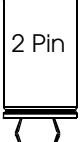

PCB Pin

ALP10		100 to 68,000	10 to 385	-40°C to +85°C	40-43
ALP20		22 to 68,000	10 to 450	-40°C to +85°C	44-47
ALP22		47 to 150,000	10 to 450	-40°C to +85°C	48-51



Solder Tag

ALT10		ALT11		100 to 68,000	10 to 385	-40°C to +85°C	40-43
ALT20		ALT21		22 to 68,000	10 to 450	-40°C to +85°C	44-47
ALT22		ALT23		47 to 150,000	10 to 450	-40°C to +85°C	48-51

PCB Snap-in

ALC10		4 Pin		56 to 47,000	10 to 450	-40°C to +85°C	52-56
ALC40		69 to 82,000		10 to 450	-40°C to +105°C	57-62	
		ALC10		330 to 1800	250 to 450	-40°C to +85°C	52-56
		ALC40		220 to 1500	250 to 450	-40°C to +105°C	57-62

Motor Start

MS			25 to 400	120 to 260 RMS	-20°C to +60°C	64-67
MD			25 to 200	120/150 to 260/325 RMS	-20°C to +60°C	64-67

Special Applications

Energy Discharge	PF	500 to 3,300	360 to 500	-20°C to +70°C	63
Audio	ALS/C/P/T	1,100 to 22,000	25 to 100	-40°C to +85°C	71
Custom Designs	All ranges	-	-	-	71
Maintenance Types	ALS10/11	-	-	-	71
	KA/KB, ALC20/50, MS styles S & C	-	-	-	71

TECHNICAL DATA

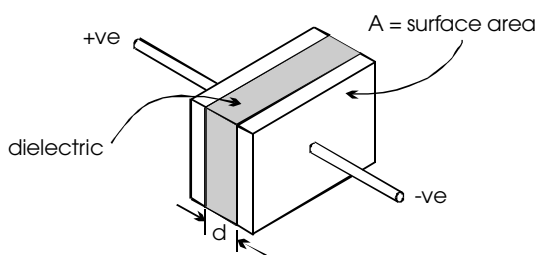
Capacitor Construction

Basic Construction

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 m²

d = distance between the plates (or dielectric thickness) in m

ϵ_0 = permittivity of free space - 8.85×10^{-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:

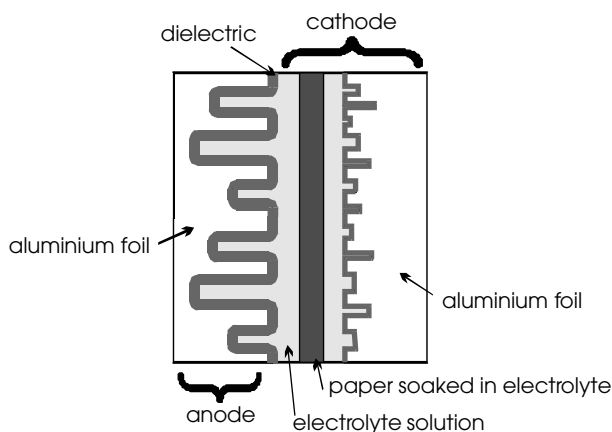
$$C = \epsilon_0 \cdot \epsilon_r \cdot \frac{A}{d}$$

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

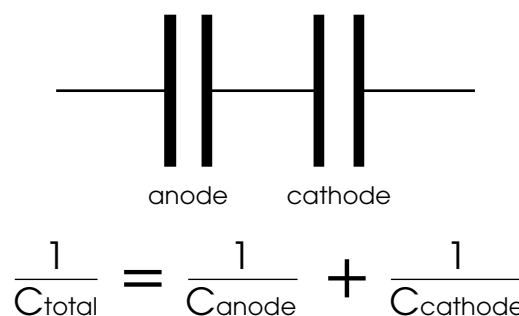


The negative plate, or cathode, is provided by an electrolyte solution for two reasons:

- 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

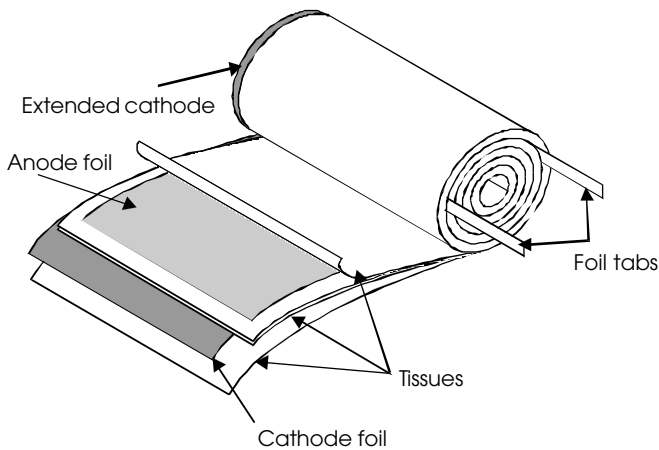


TECHNICAL DATA

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. For the majority of capacitors produced by BHC Aerovox this is carried out in house and is a major part of the manufacturing process.

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.

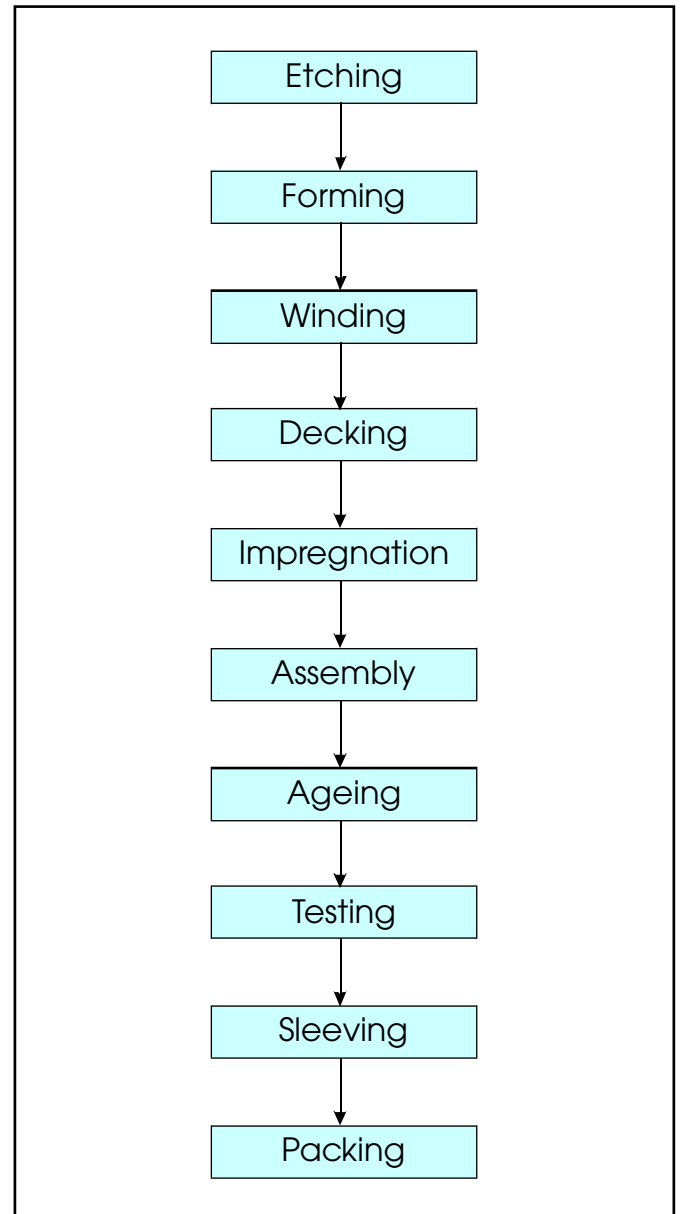
The following tests are applied and may be varied at the request of the customer. In this case the batch, or special procedure, will determine the course of action:

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



TECHNICAL DATA

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 $<0.5\text{V}$ 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 $\pm 5\%$ 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 $\geq 5\text{A}$ 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 $\leq 500\text{ms}$ 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.

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.

Dissipation Factor

The dissipation factor or tangent of the loss angle ($\tan \delta$) 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:-

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

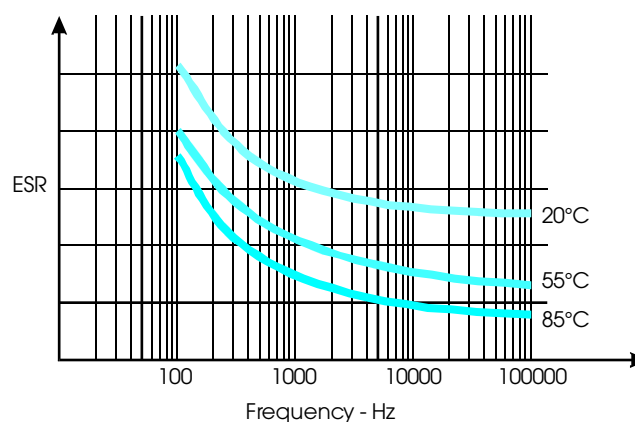
Where capacitance (C) and e.s.r. are at frequency f.

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:

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

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

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 $Z = \text{e.s.r.}$

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

TECHNICAL DATA

Electrical Characteristics

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:

$$P = I_r^2 \cdot \text{esr} \text{ (Watts)}$$

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.

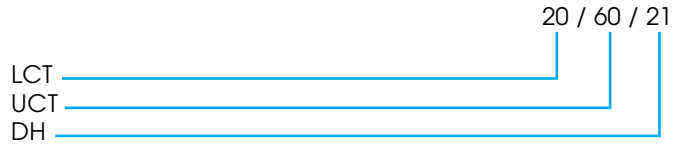
Temperature Range

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. 20 = -20°C)

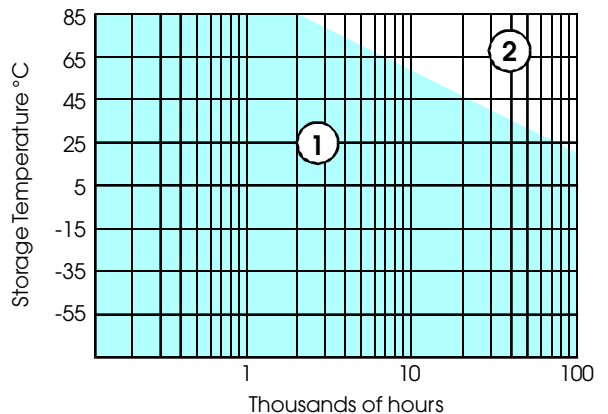
UCT = Upper category temperature °C (e.g. 60 = +60°C)

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 Aerovox 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.

TECHNICAL DATA

Electrical Characteristics, Application & Operation

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.

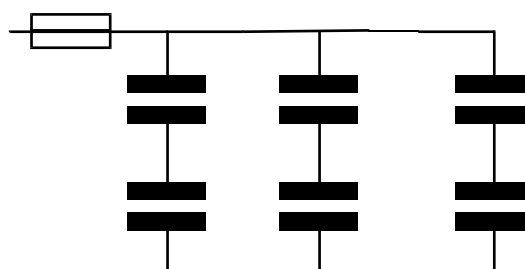
Full details on the selection and use of shunt resistors can be found in a technical article, TD001, in "Aluminium Electrolytic Capacitors - Application Notes", available from BHC Aerovox.

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



TECHNICAL DATA

Application & Operation

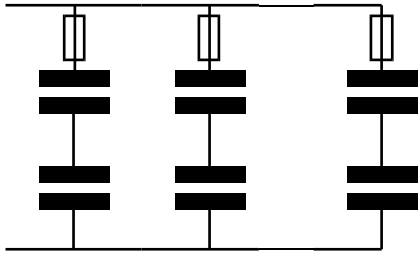
Advantages

- 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

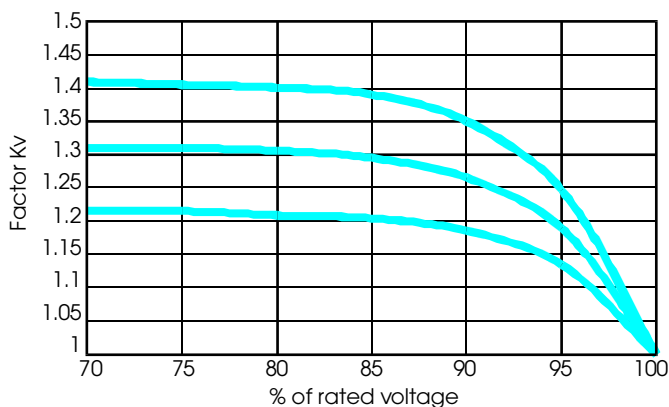
Disadvantages

- 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 Aerovox 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.

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 Aerovox 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.

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 $> \pm 10\%$
- esr $> 2 \times$ initial value
- impedance $> 3 \times$ 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 Aerovox 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 Aerovox 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.

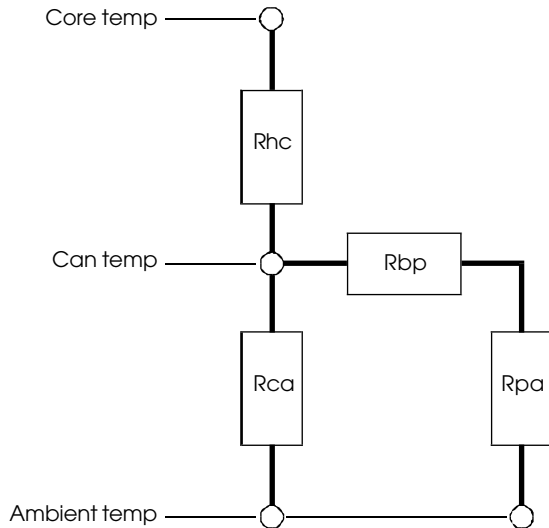
Heat is generated inside the capacitor by the effect of ripple current which raises the core or hot-spot temperature above that of the ambient air. Heat is also generated by the leakage current, however this is normally small enough to be ignored.

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 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.

TECHNICAL DATA

Life Expectancy

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:

R_{hc} = Hot-spot to can

R_{ca} = Can to ambient air

R_{bp} = Can base to mounting plate

R_{pa} = Mounting plate to ambient air

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

$$R_{ha} = R_{hc} + 1 / (1/R_{ca} + 1/R_{bp} + R_{pa})$$

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 R_{hc} value. The values of R_{ca} and R_{pa} will vary according to the level of airflow, if any. The value of R_{bp} 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.

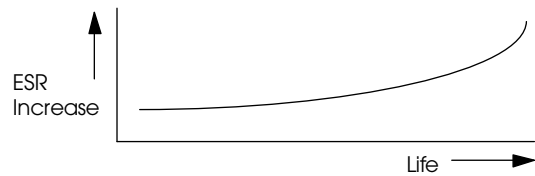
BHC Aerovox have carried out extensive testing to establish the thermal resistance of the hot-spot to ambient, R_{ha}, for each case size across each range. From this data, life expectancy can be calculated for both standard and special designs under most operating conditions.

A full technical article, TD003, is included in "Aluminium Electrolytic Capacitors - Application Notes", available from BHC Aerovox, 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 Aerovox. The article includes graphs for most products which allow life expectancy to be extrapolated, based on rated ripple current and ambient air temperature.

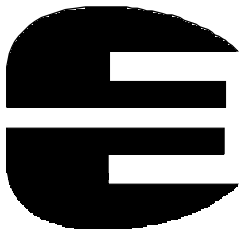
TECHNICAL DATA

Quality Assurance System

BHC Aerovox 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 Aerovox team where the emphasis is placed on "right first time" and "continuous improvement". For BHC Aerovox 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.

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

The site was originally approved in late 1981 to the CECC quality system and has held the approval ever since. The approval is based upon the requirements of CECC 00 100 and CECC 00 114 part 1.



M/108/CECC/UK

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 ISO 9001. Additionally certain ranges in the motor start capacitors are approved to VDE 560.

The benefits of the total quality philosophy and systems that BHC Aerovox have adopted are evident in the service it provides. One of the key



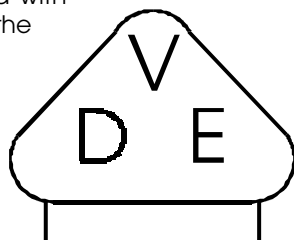
FM 11885

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.



0019/M/IECQ/UK



560 PART 8
560 PART 22

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 Aerovox 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 Aerovox.

TECHNICAL DATA

Cleansing Solutions, Solvents & Component Weights

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.

COMPONENT WEIGHTS

The following weights in grams are approximate for standard items.

Screw terminal types

Diameter mm	Length mm								
	52	62	75	82	98	105	115	146	220
36	75	90	105	115		140	155		
51		165	200	220		300	330		
66						505	555		
73							680		
77			495		645	690	760	960	1450
91			690		900			1345	

Solder pin, tag and snap in types

Diameter mm	Length mm									
	30	35	40	45	50	55	60	75	80	105
22	25	26	30							
25	28	30	35	35						
30	35	40	45	50	55					
35		50	55	65	70	75	80		105	
40				80		95		125		170

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.

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 pyrrolidone 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. types 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 capacitors 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. The statement below is based on results obtained by using a Needle - Flame Test, as specified in IEC 695-2-2. The materials were tested in situ on finished, standard capacitors. The flame was applied at positions and angles which gave maximum ignition capability.

All of the d.c. aluminium electrolytic capacitors supplied by BHC Aerovox have been subjected to the IEC 695-2-2 test with a flame application time of 120 seconds resulting in no ignition. The only exception to this being the ALP10 ranges, whereby the standoff portions on the decks ignited and then self-extinguished within 5 seconds of flame removal.

Full details of the flammability tests undertaken on both the external components and the internal wind elements are available from BHC Aerovox.

5. DISPOSAL

Aluminium Electrolytic Capacitors are consignable waste under the Special Waste Regulations 1996 (Statutory Instrument 1996 N° 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 Aerovox 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 Aerovox 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.

ALS20/21 SERIES

Screw Terminals - Plain and Stud Mountings

This range of professional grade components offers high levels of reliability and performance with outstanding high frequency characteristics. Their low levels of e.s.r. and impedance are ideally suited to high efficiency power supply and inverter applications.

Capacitance range 68 μ F to 330,000 μ F

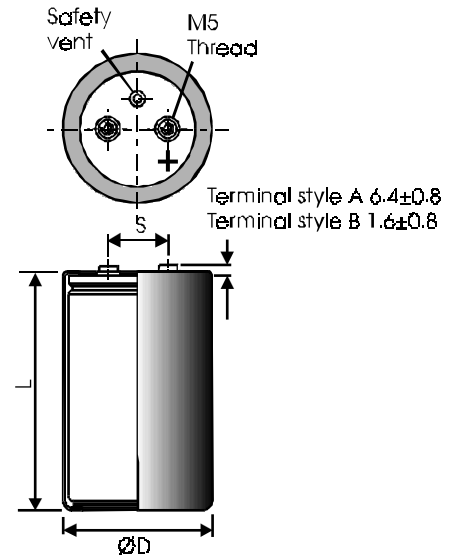
Capacitance tolerance -10% +50%

Voltage range 6.3V to 450V d.c.

Temperature range -55°C to +85°C

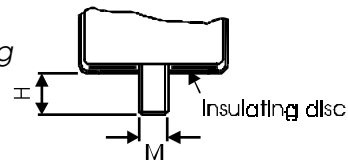
Case sizes 35 x 52mm to 76 x 140mm

ALS20



ALS21

Stud Mounting



DIMENSIONS (sleeved) mm

CASE CODE	D +2-1	L ±2	S ±0.5	M THREAD	H ±1	MOUNTING CLIP
DA	35	52	12.7	M8	12	V3/H2/UTE2736
DB	35	62	12.7	M8	12	V3/H2/UTE2736
DD	35	75	12.7	M8	12	V3/H2/UTE2736
DF	35	105	12.7	M8	12	V3/H2/UTE2736
KB	50	62	22.2	M12	16	V4/UTE2737
KD	50	75	22.2	M12	16	V4/UTE2737
KF	50	105	22.2	M12	16	V4/UTE2737
KJ	50	115	22.2	M12	16	V4/UTE2737
MF	65	105	28.5	M12	16	V10/UTE2738
MJ	65	115	28.5	M12	16	V10/UTE2738
NF	76	105	31.7	M12	16	V11
NJ	76	115	31.7	M12	16	V11
NN	76	140 (±3)	31.7	M12	16	V11

Terminations

Aluminium inserts with M5 threads as standard, max torque 2NM. Max torque for stud M8:4NM/M12:8NM.

ALS20/21 SERIES

Screw Terminals - Plain and Stud Mountings

TECHNICAL DATA

Related documents

CECC 30301-026
DIN 41240 & 41248
IEC 384-4

Temperature range

Storage -65°C to +85°C
Operating -55°C to +85°C
Environmental classification 55/085/56

Surge voltage

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

Charge/discharge

10⁶ 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 $(0.003 C_R U_R + 4) \mu\text{A}$ 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.

Insulation resistance

> 100M Ω at 100V d.c., across insulating sleeve.

Voltage proof

$\geq 2500\text{V}$ d.c., across insulating sleeve.
See technical data.

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 Aerovox.

FREQUENCY CORRECTION

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

For ambient temperature 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

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)	LIFE EXPECTANCY (hours)
35	10000
50	23000
65	27000
76	28000

Mounting

Any position but refer to mounting section on page 9. For details of mounting clips and stud mounting kits see page 68/69.

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 code
6. BHC part number
7. Environmental classification

Ordering information

For details of ordering see page 70.

ALS20/21 SERIES

Screw Terminals - Plain and Stud Mountings

Rated voltage	Cap μ F	Case Size	ESR $m\Omega$ at 20°C		Impedance $m\Omega$ at 20 °C, 10 KHz	Ripple current A at 85°C		Type number (Excluding style ref)
			100Hz	10KHz		100 Hz	10 KHz	
6.3V d.c. (7.2V surge)	10000	35x52	34.0	33.0	34.0	5.9	6.4	ALS2--103DA6R3
	15000	35x52	33.0	32.0	32.0	6.1	6.6	ALS2--153DA6R3
	22000	35x62	26.0	22.0	22.0	7.5	8.1	ALS2--223DB6R3
	33000	35x75	16.0	14.0	14.0	9.4	10.1	ALS2--333DD6R3
	47000	35x105	12.0	14.0	10.0	14.0	15.1	ALS2--473DF6R3
	47000	50x62	13.0	12.0	12.0	12.1	13.0	ALS2--473KB6R3
	68000	50x75	11.0	9.5	9.5	14.7	16.0	ALS2--683KD6R3
	100000	50x105	8.0	7.5	8.0	21.5	23.3	ALS2--104KF6R3
	100000	50x115	8.0	7.0	7.0	23.7	25.8	ALS2--104KJ6R3
	150000	65x105	7.5	7.0	7.0	25.4	27.4	ALS2--154MF6R3
	150000	65x115	7.5	7.0	7.0	27.6	30.1	ALS2--154MJ6R3
	220000	65x105	8.0	7.5	7.5	25.4	27.4	ALS2--224MF6R3
	220000	76x115	7.5	7.5	7.0	30.3	33.1	ALS2--224NJ6R3
	330000	76x140	7.5	6.5	6.5	37.0	40.0	ALS2--334NN6R3
10V d.c. (11.5V surge)	6800	35x52	38.0	31.0	32	5.7	6.3	ALS2--682DA010
	10000	35x52	34.0	26.5	27	6.0	6.5	ALS2--103DA010
	15000	35x62	24.0	19.0	20	7.4	8.1	ALS2--153DB010
	22000	35x75	20.0	17.5	18	9.3	10.0	ALS2--223DD010
	33000	35x105	15.0	12.0	13	13.8	15.0	ALS2--333DF010
	33000	50x62	15.0	12.0	13	12.0	12.9	ALS2--333KB010
	47000	50x75	11.0	10.0	10	14.6	15.8	ALS2--473KD010
	68000	50x105	9.0	8.0	8	21.2	22.8	ALS2--683KF010
	68000	50x115	8.5	7.5	8	23.2	25.2	ALS2--683KJ010
	100000	50x105	8.5	7.5	8	21.2	23.3	ALS2--104KF010
	100000	65x115	8.0	7.0	8	27.6	29.4	ALS2--104MJ010
	150000	65x105	8.0	8.0	8	25.4	27.4	ALS2--154MF010
	150000	76x115	9.0	8.0	9	30.3	32.3	ALS2--154NJ010
	220000	76x140	7.5	6.5	7	36.7	39.9	ALS2--224NN010
16V d.c. (18.4V surge)	4700	35x52	43.0	34.0	34	5.3	5.9	ALS2--472DA016
	6800	35x52	43.0	32.0	34	5.5	6.0	ALS2--682DA016
	10000	35x62	30.0	22.5	25	6.8	7.4	ALS2--103DB016
	15000	35x75	19.0	14.0	15	8.4	9.2	ALS2--153DD016
	22000	35x105	14.0	10.0	11	12.5	13.7	ALS2--223DF016
	22000	50x62	15.0	12.0	12	10.9	11.9	ALS2--223KB016
	33000	50x75	12.0	9.5	10	13.4	14.6	ALS2--333KD016
	47000	50x105	9.0	7.2	8	19.3	21.2	ALS2--473KF016
	47000	50x115	9.0	7.0	8	21.3	23.2	ALS2--473KJ016
	68000	65x105	8.0	7.0	8	22.7	24.9	ALS2--683MF016
	68000	65x115	8.0	7.0	8	24.8	27.0	ALS2--683MJ016
	100000	76x105	8.5	7.5	8	25.1	27.5	ALS2--104NF016
	100000	76x115	8.0	7.0	8	27.7	29.7	ALS2--104NJ016
	150000	76x140	7.5	6.5	7	33.5	35.9	ALS2--154NN016
25V d.c. (28.5V surge)	3300	35x52	47.0	34.0	40	5.1	5.8	ALS2--332DA025
	4700	35x52	46.0	32.0	35	5.3	5.9	ALS2--472DA025
	6800	35x62	32.0	22.5	25	6.6	7.3	ALS2--682DB025
	10000	35x75	21.0	14.5	15	8.2	9.1	ALS2--103DD025
	15000	35x105	15.0	10.5	12	12.3	13.5	ALS2--153DF025
	15000	50x62	17.0	12.0	12	10.7	11.8	ALS2--153KB025
	22000	50x75	13.0	9.5	11	13.0	14.4	ALS2--223KD025
	33000	50x105	10.0	7.5	8	19.0	20.8	ALS2--333KF025
	33000	50x115	9.0	7.0	8	20.9	23.2	ALS2--333KJ025
	47000	65x105	8.5	7.0	8	22.4	24.5	ALS2--473MF025
	47000	65x115	8.5	7.0	8	24.4	27.0	ALS2--473MJ025
	68000	76x105	8.5	7.5	8	24.7	27.1	ALS2--683NF025
	68000	76x115	8.0	7.0	8	26.8	29.7	ALS2--683NJ025
	100000	76x140	7.5	6.0	7	32.9	35.9	ALS2--104NN025

Note: Values of E.S.R. and Impedance quoted above are maximum

ALS20/21 SERIES

Screw Terminals - Plain and Stud Mountings

Rated voltage	Cap μ F	Case Size	ESR $m\Omega$ at 20°C		Impedance $m\Omega$ at 20 °C, 10 KHz	Ripple current A at 85°C		Type number (Excluding style ref)
			100Hz	10KHz		100 Hz	10 KHz	
40V d.c. (46V surge)	2200	35x52	55.0	38.0	40	4.9	5.7	ALS2--222DA040
	3300	35x52	48.0	31.0	32	5.2	5.9	ALS2--332DA040
	4700	35x62	31.0	19.5	20	6.4	7.3	ALS2--472DB040
	6800	35x75	26.0	15.5	17	8.0	9.0	ALS2--682DD040
	10000	35x105	16.0	11.0	12	11.9	13.4	ALS2--103DF040
	10000	50x62	18.0	12.5	13	10.3	11.6	ALS2--103KB040
	15000	50x75	15.0	10.0	11	12.6	14.1	ALS2--153KD040
	22000	50x105	11.0	7.5	9	18.3	20.8	ALS2--223KF040
	22000	50x115	10.0	7.0	8	20.0	22.8	ALS2--223KJ040
	33000	65x105	9.5	7.5	8	21.8	24.5	ALS2--333MF040
	33000	65x115	9.0	7.5	8	23.6	26.5	ALS2--333MJ040
	47000	76x105	10.0	9.0	9	24.1	27.1	ALS2--473NF040
	47000	76x115	9.5	8.0	9	26.0	29.2	ALS2--473NJ040
	68000	76x140	9.0	7.0	8	31.6	35.9	ALS2--683NN040
63V d.c. (72V surge)	1500	35x52	76	40.0	50	4.7	5.7	ALS2--152DA063
	2200	35x52	74	42.0	45	4.8	5.8	ALS2--222DA063
	3300	35x62	42	19.5	20	6.0	7.1	ALS2--332DB063
	3300	35x75	32	15.5	16	7.5	8.8	ALS2--332DD063
	4700	35x75	32	15.5	16	7.5	8.9	ALS2--472DD063
	4700	35x105	22	11.0	12	10.9	13.1	ALS2--472DF063
	6800	50x62	23	12.5	13	9.6	11.4	ALS2--682KB063
	6800	50x75	18	10.0	11	11.6	13.9	ALS2--682KD063
	10000	50x105	13	7.5	9	16.8	20.2	ALS2--103KF063
	15000	50x115	12	7.5	8	19.0	22.4	ALS2--153KJ063
	15000	65x105	12	7.5	8	20.2	24.1	ALS2--153MF063
	22000	65x115	11	8.0	9	22.1	26.1	ALS2--223MJ063
	22000	76x105	11	8.5	9	22.4	26.6	ALS2--223NF063
	33000	76x105	11	9.0	10	22.4	26.6	ALS2--333NF063
	33000	76x115	9	8.5	9	24.3	28.7	ALS2--333NJ063
	33000	76x140	11	7.0	8	29.5	35.0	ALS2--333NN063
47000	76x140	9	7.5	8	29.5	35.0	ALS2--473NN063	
100V d.c. (115V surge)	680	35x52	168	78.0	90	3.2	4.3	ALS2--681DA100
	1000	35x52	163	76.0	80	3.5	4.5	ALS2--102DA100
	1500	35x62	107	49.0	50	4.5	5.6	ALS2--152DB100
	1500	35x75	103	45.0	50	5.2	6.8	ALS2--152DD100
	2200	35x75	75	36.0	40	5.6	7.0	ALS2--222DD100
	2200	35x105	71	32.0	35	7.6	10.0	ALS2--222DF100
	3300	50x62	51	25.0	28	7.2	9.0	ALS2--332KB100
	3300	50x75	49	23.0	23	8.4	10.9	ALS2--332KD100
	4700	50x75	37	19.0	20	8.9	11.0	ALS2--472KD100
	4700	50x105	27	14.0	15	11.9	15.5	ALS2--472KF100
	6800	50x115	26	13.5	14	13.8	17.6	ALS2--682KJ100
	6800	65x105	21	12.0	13	15.0	18.8	ALS2--682MF100
	10000	65x105	21	12.0	12	15.5	19.0	ALS2--103MF100
	10000	65x115	20	11.5	12	16.8	20.8	ALS2--103MJ100
	15000	76x105	17	11.5	12	17.2	21.0	ALS2--153NF100
	15000	76x115	17	11.0	11	18.7	22.9	ALS2--153NJ100
15000	76x140	13	9.0	10	22.6	27.8	ALS2--153NN100	
22000	76x140	13	9.0	9	22.8	27.8	ALS2--223NN100	

Note: Values of E.S.R. and Impedance quoted above are maximum

ALS20/21 SERIES

Screw Terminals - Plain and Stud Mountings

Rated voltage	Cap μ F	Case Size	ESR $m\Omega$ at 20°C		Impedance $m\Omega$ at 20 °C, 10 KHz	Ripple current A at 85°C		Type number (Excluding style ref)
			100Hz	10KHz		100 Hz	10 KHz	
160V d.c. (184V surge)	330	35x52	259	95	100	2.7	3.5	ALS2--331DA160
	470	35x52	231	72	80	3.0	3.7	ALS2--471DA160
	680	35x62	158	48	50	3.7	4.6	ALS2--681DB160
	680	35x75	152	42	45	4.4	6.1	ALS2--681DD160
	1000	35x75	132	57	58	4.7	5.7	ALS2--102DD160
	1000	35x105	105	29	32	6.3	8.4	ALS2--102DF160
	1500	50x62	74	24	25	6.1	8.3	ALS2--152KB160
	1500	50x75	71	21	22	7.0	10.0	ALS2--152KD160
	2200	50x75	63	28	28	7.5	9.1	ALS2--222KD160
	2200	50x105	49	15	17	10.0	12.8	ALS2--222KF160
	3300	50x115	36	13	14	11.7	14.7	ALS2--332KJ160
	3300	65x105	27	12	13	12.6	15.4	ALS2--332MF160
	4700	65x115	27	11	12	14.1	17.0	ALS2--472MJ160
	4700	76x105	28	12	13	14.3	17.1	ALS2--472NF160
	6800	76x105	23	12	13	14.5	17.2	ALS2--682NF160
	6800	76x115	22	11	12	15.7	18.7	ALS2--682NJ160
	6800	76x140	20	9	10	19.0	22.8	ALS2--682NN160
	10000	76x140	17	10	10	19.1	22.8	ALS2--103NN160
200V d.c. (230V surge)	220	35x52	530	180	185	2.2	2.9	ALS2--221DA200
	330	35x62	356	121	125	2.8	3.7	ALS2--331DB200
	470	35x75	246	82	85	3.6	4.8	ALS2--471DD200
	680	50x62	115	41	45	4.6	7.1	ALS2--681KB200
	680	50x75	113	48	42	5.0	8.2	ALS2--681KD200
	1000	50x75	117	40	41	5.7	8.1	ALS2--102KD200
	1500	50x105	79	28	30	8.1	10.7	ALS2--152KF200
	1500	50x115	54	20	22	8.6	12.8	ALS2--152KJ200
	2200	65x105	40	17	18	10.7	14.3	ALS2--222MF200
	2200	65x115	39	16	17	11.3	14.5	ALS2--222MJ200
	3300	65x105	40	17	17	11.4	14.3	ALS2--332MF200
	3300	76x105	40	17	17	12.6	15.6	ALS2--332NF200
	3300	76x115	30	14	15	13.5	16.7	ALS2--332NJ200
	4700	76x105	32	15	16	12.9	15.5	ALS2--472NF200
	4700	76x140	29	13	14	16.7	23.6	ALS2--472NN200
6800	76x140	23	12	12	17.0	20.4	ALS2--682NN200	
250V d.c. (287V surge)	150	35x52	870	337	400	1.7	2.2	ALS2--151DA250
	220	35x52	680	271	280	1.9	2.6	ALS2--221DA250
	330	35x62	405	181	200	2.5	3.3	ALS2--331DB250
	470	35x75	237	80	85	3.2	4.7	ALS2--471DD250
	680	50x62	195	86	90	4.1	5.3	ALS2--681KB250
	680	50x75	194	84	86	4.5	6.0	ALS2--681KD250
	1000	50x75	140	83	85	5.1	6.6	ALS2--102KD250
	1500	50x105	90	41	45	7.3	9.4	ALS2--152KF250
	1500	50x115	90	41	45	7.6	10.1	ALS2--152KJ250
	2200	65x105	64	30	32	9.5	12.0	ALS2--222MF250
	2200	65x115	64	30	32	10.1	12.8	ALS2--222MJ250
	3300	65x105	40	17	18	10.2	13.6	ALS2--332MF250
	3300	76x105	46	24	24	11.3	13.6	ALS2--332NF250
	3300	76x115	46	23	24	12.1	14.7	ALS2--332NJ250
	4700	76x105	33	16	17	11.5	14.1	ALS2--472NF250
4700	76x140	32	17	18	14.9	18.0	ALS2--472NN250	
6800	76x140	23	12	13	15.3	18.3	ALS2--682NN250	

Note: Values of E.S.R. and Impedance quoted above are maximum

ALS20/21 SERIES

Screw Terminals - Plain and Stud Mountings

Rated voltage	Cap μ F	Case Size	ESR m Ω at 20°C		Impedance m Ω at 20 °C, 10 KHz	Ripple current A at 85°C		Type number (Excluding style ref)
			100Hz	10KHz		100 Hz	10 KHz	
315V d.c. (362V surge)	150	35x52	770	229	310	1.5	2.2	ALS2--151DA315
	220	35x62	545	204	210	2.0	2.8	ALS2--221DB315
	220	35x75	520	198	200	2.2	3.2	ALS2--221DD315
	330	35x75	361	134	140	2.6	3.8	ALS2--331DD315
	330	35x105	350	130	135	3.1	4.6	ALS2--331DF315
	470	50x62	254	95	100	3.3	5.1	ALS2--471KB315
	470	50x75	252	93	100	3.5	5.7	ALS2--471KD315
	680	50x75	177	67	70	4.1	6.5	ALS2--681KD315
	680	50x105	175	65	68	4.9	6.7	ALS2--681KF315
	1000	50x105	120	46	50	5.7	8.5	ALS2--102KF315
	1000	50x115	120	46	50	6.0	9.5	ALS2--102KJ315
	1500	65x105	83	33	35	7.8	11.7	ALS2--152MF315
	1500	65x115	83	33	35	8.2	12.3	ALS2--152MJ315
	2200	76x105	60	26	27	9.6	13.5	ALS2--222NF315
	2200	76x115	59	25	27	10.2	14.3	ALS2--222NJ315
3300	76x140	41	18	19	12.8	17.6	ALS2--332NN315	
350V d.c. (385V surge)	100	35x52	1089	368	400	1.2	2.0	ALS2--101DA350
	150	35x52	710	247	300	1.5	2.4	ALS2--151DA350
	220	35x62	502	174	200	1.9	3.0	ALS2--221DB350
	220	35x75	480	167	200	2.1	3.5	ALS2--221DD350
	330	35x75	291	74	125	2.5	4.9	ALS2--331DD350
	330	35x105	320	112	120	3.0	4.9	ALS2--331DF350
	470	50x62	235	82	85	3.1	5.4	ALS2--471KB350
	470	50x75	158	56	60	3.4	7.0	ALS2--471KD350
	680	50x75	160	58	60	4.0	6.9	ALS2--681KD350
	680	50x105	110	39	40	4.7	9.1	ALS2--681KF350
	1000	50x105	110	40	41	5.5	9.0	ALS2--102KF350
	1000	50x115	110	40	41	5.8	10.0	ALS2--102KJ350
	1500	65x105	77	29	30	7.5	12.2	ALS2--152MF350
	1500	65x115	76	29	30	7.9	12.9	ALS2--152MJ350
	2200	76x105	55	23	24	9.1	14.1	ALS2--222NF350
2200	76x115	55	22	24	9.7	15.0	ALS2--222NJ350	
3300	76x140	38	16	18	12.1	18.2	ALS2--332NN350	
400V d.c. (440V surge)	100	35x52	1750	1199	1200	1.1	1.5	ALS2--101DA400
	150	35x62	1313	797	800	1.5	2.0	ALS2--151DB400
	220	35x75	896	543	550	1.9	2.6	ALS2--221DD400
	330	50x62	600	364	370	2.4	3.3	ALS2--331KB400
	470	50x75	380	256	260	3.1	4.3	ALS2--471KD400
	680	50x115	260	178	180	4.4	6.1	ALS2--681KJ400
	1000	65x115	130	81	90	6.1	9.8	ALS2--102MJ400
	1500	76x105	120	85	90	7.5	10.1	ALS2--152NF400
	1500	76x115	90	57	60	7.8	11.9	ALS2--152NJ400
	2200	76x105	96	61	62	8.3	11.1	ALS2--222NF400
	2200	76x140	94	59	60	10.0	13.5	ALS2--222NN400
	3300	76x140	65	42	43	11.1	14.8	ALS2--332NN400
450V d.c. (495V surge)	68	35x52	1856	1018	1100	0.8	1.5	ALS2--680DA450
	100	35x52	1915	1050	1100	1.0	1.5	ALS2--101DA450
	150	35x75	1100	694	800	1.4	2.1	ALS2--151DD450
	220	35x105	572	314	350	2.0	3.7	ALS2--221DF450
	330	50x75	382	211	230	2.4	4.6	ALS2--331KD450
	470	50x105	269	149	160	3.3	6.1	ALS2--471KF450
	680	50x115	260	152	160	4.0	6.6	ALS2--681KJ450
	1000	65x105	180	109	115	5.3	8.4	ALS2--102MF450
1500	76x105	120	75	80	6.8	10.5	ALS2--152NF450	
2200	76x140	80	52	55	9.1	13.9	ALS2--222NN450	

Note: Values of E.S.R. and Impedance quoted above are maximum

ALS27/29 SERIES

Screw Terminals - Plain and Stud Mountings

This range of professional grade components offers high levels of reliability and performance with outstanding high frequency characteristics. Their low levels of e.s.r. and impedance are ideally suited to high efficiency power supply and inverter applications. Physical dimensions meet the requirements of CO37/39.

Capacitance range 68 μ F to 470,000 μ F

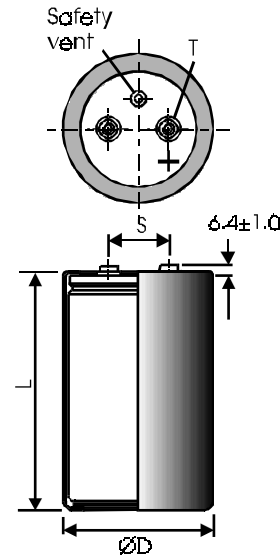
Capacitance tolerance -10% +50%

Voltage range 6.3V to 450V d.c.

Temperature range -55°C to +85°C

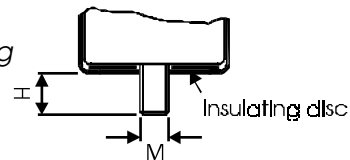
Case sizes 36 x 49mm to 77 x 146mm

ALS29



ALS27

Stud Mounting



DIMENSIONS (sleeved) mm

CASE CODE	D ±1	L ±2	S ±0.5	M THREAD	H ±1	T THREAD	MOUNTING CLIP
DY	36	49	12.7	M8	12	M4	2736
DB	36	62	12.7	M8	12	M4	2736
DE	36	82	12.7	M8	12	M4	2736
KB	51	62	22.2	M12	16	M5	2737
KE	51	82	22.2	M12	16	M5	2737
KJ	51	115	22.2	M12	16	M5	2737
MJ	66	115	28.5	M12	16	M5	2738
PJ	73	115	31.7	M12	16	M5	2739
NP	77	146	31.7	M12	16	M5	V11

Terminations

Aluminium inserts with M4 or M5 threads, in accordance with NFC-UTE 83-110, max torque 2NM. Max torque for stud M8:4NM/M12:8NM.

ALS27/29 SERIES

Screw Terminals - Plain and Stud Mountings

TECHNICAL DATA

Related documents

CECC 30301-016/-017
NFC-UTE 83-110 Type 1
IEC 384-4

Temperature range

Storage -65°C to +85°C
Operating -55°C to +85°C
Environmental classification 55/085/56

Surge voltage

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

Charge/discharge

10⁶ 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 $(0.003 C_R U_R + 4) \mu A$ 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.

Insulation resistance

$\geq 100M\Omega$ at 100V d.c., across insulating sleeve.

Voltage proof

$\geq 2500V$ d.c., across insulating sleeve. See technical data.

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 Aerovox.

FREQUENCY CORRECTION

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

For ambient temperature 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

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)	LIFE EXPECTANCY (hours)
36	10000
51	23000
66	27000
73,77	28000

Mounting

Any position but refer to mounting section on page 9. For details of mounting clips and stud mounting kits see page 68/69.

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 code
6. BHC part number
7. Environmental classification

Ordering information

For details of ordering see page 70.

ALS27/29 SERIES

Screw Terminals - Plain and Stud Mountings

Rated voltage	Cap μF	Case Size	ESR $\text{m}\Omega$ at 20°C 100Hz	Impedance $\text{m}\Omega$ at 20 °C, 10 KHz	Ripple current A at 85°C		Type number (Excluding style ref)
					100 Hz	10 KHz	
6.3V d.c. (7.2V surge)	15000	36x49	33.0	32.0	5.9	6.4	ALS2-A153DY6R3
	22000	36x62	26.0	22.0	7.5	8.1	ALS2-A223DB6R3
	33000	36x82	16.0	14.0	9.4	10.1	ALS2-A333DE6R3
	47000	51x62	13.0	12.0	12.1	13.0	ALS2-A473KB6R3
	68000	51x82	11.0	9.5	14.7	16.0	ALS2-A683KE6R3
	100000	51x115	8.0	7.0	23.7	25.8	ALS2-A104KJ6R3
	150000	66x115	7.5	7.0	27.6	30.1	ALS2-A154MJ6R3
	220000	73x115	7.5	7.5	29.0	31.0	ALS2-A224PJ6R3
470000	77x146	7.5	6.5	37.0	40.0	ALS2-A474NP6R3	
10V d.c. (11.5V surge)	10000	36x49	34.0	27.0	6.0	6.5	ALS2-A103DY010
	15000	36x62	24.0	19.0	7.4	8.1	ALS2-A153DB010
	22000	36x82	20.0	18.0	9.3	10.0	ALS2-A223KE010
	33000	51x62	15.0	13.0	12.0	12.9	ALS2-A333KB010
	47000	51x82	11.0	10.0	14.6	15.8	ALS2-A473KE010
	68000	51x115	8.5	7.5	23.2	25.2	ALS2-A683KJ010
	100000	66x115	8.0	8.0	27.6	29.4	ALS2-A104MJ010
	150000	73x115	8.0	9.0	28.0	30.5	ALS2-A154PJ010
330000	77x146	7.5	6.5	36.7	39.9	ALS2-A334NP010	
16V d.c. (18.4V surge)	6800	36x49	43	34	5.3	5.9	ALS2-A682DY016
	10000	36x62	30.0	23.0	6.8	7.4	ALS2-A103DB016
	15000	36x82	19.0	14.0	8.4	9.2	ALS2-A153DE016
	22000	51x62	15.0	12.0	10.9	11.9	ALS2-A223KB016
	33000	51x82	12.0	9.5	13.4	14.6	ALS2-A333KE016
	47000	51x115	9.0	8.0	21.3	23.2	ALS2-A473KJ016
	68000	66x115	8.0	8.0	24.8	27.0	ALS2-A683MJ016
	100000	73x115	8.0	8.0	26.0	28.1	ALS2-A104PJ016
220000	77x146	7.5	6.5	33.5	35.9	ALS2-A224NP016	
25V d.c. (28.5V surge)	4700	36x49	46.0	35.0	5.3	5.9	ALS2-A472DY025
	6800	36x62	32.0	25.0	6.6	7.3	ALS2-A682DB025
	10000	36x82	21.0	15.0	8.2	9.1	ALS2-A103DE025
	15000	51x62	17.0	12.0	10.7	11.8	ALS2-A153KB025
	22000	51x82	13.0	9.5	13.0	14.4	ALS2-A223KE025
	33000	51x115	9.0	7.0	20.9	23.2	ALS2-A333KJ025
	47000	66x115	8.5	8.0	24.4	27.0	ALS2-A473MJ025
	68000	73x115	8.0	8.0	26.1	28.1	ALS2-A683PJ025
150000	77x146	7.5	6.0	33.0	36.0	ALS2-A154NP025	
40V d.c. (46V surge)	3300	36x49	48.0	32.0	5.2	5.9	ALS2-A332DY040
	4700	36x62	31.0	20.0	6.4	7.3	ALS2-A472DB040
	6800	36x82	26.0	17.0	8.0	9.0	ALS2-A682DE040
	10000	51x62	18.0	12.5	10.3	11.6	ALS2-A103KB040
	15000	51x82	15.0	11.0	12.6	14.1	ALS2-A153KE040
	22000	51x115	10.0	8.0	20.0	22.8	ALS2-A223KJ040
	33000	66x115	9.0	8.0	23.6	26.5	ALS2-A333MJ040
	47000	73x115	9.5	9.0	25.0	27.5	ALS2-A473PJ040
100000	77x146	9.0	7.0	31.6	35.9	ALS2-A104NP040	
63V d.c. (72V surge)	2200	36x49	74.0	45.0	4.8	5.8	ALS2-A222DY063
	3300	36x62	42.0	20.0	6.0	7.1	ALS2-A332DB063
	4700	36x82	32.0	16.0	7.5	8.9	ALS2-A472DE063
	6800	51x62	23.0	13.0	9.6	11.4	ALS2-A682KB063
	10000	51x82	13.0	9.0	16.8	20.2	ALS2-A103KE063
	15000	51x115	12.0	8.0	19.0	22.4	ALS2-A153KJ063
	22000	66x115	11.0	9.0	22.1	26.1	ALS2-A223MJ063
	33000	73x115	9.0	9.0	22.3	26.5	ALS2-A333PJ063
47000	77x146	9.0	8.0	29.5	35.0	ALS2-A473NP063	

Note: Values of E.S.R. and Impedance quoted above are maximum

ALS27/29 SERIES

Screw Terminals - Plain and Stud Mountings

Rated voltage	Cap μ F	Case Size	ESR $m\Omega$ at 20°C 100Hz	Impedance $m\Omega$ at 20 °C, 10 KHz	Ripple current A at 85°C 100 Hz	Ripple current A at 85°C 10 KHz	Type number (Excluding style ref)
100V d.c. (115V surge)	1000	36x49	112.0	80.0	3.5	4.5	ALS2-A102DY100
	1500	36x62	57.0	50.0	4.5	5.6	ALS2-A152DB100
	2200	36x82	48.0	40.0	5.6	7.0	ALS2-A222DE100
	3300	51x62	51.0	28.0	7.2	9.0	ALS2-A332KB100
	4700	51x82	37.0	20.0	8.9	11.0	ALS2-A472KE100
	6800	51x115	26.0	14.0	13.8	17.6	ALS2-A682KJ100
	10000	66x115	20.0	12.0	16.8	20.8	ALS2-A103MJ100
	15000	73x115	17.0	11.0	18.4	22.0	ALS2-A153PJ100
	22000	77x146	13.0	9.0	22.8	27.8	ALS2-A223NP100
160V d.c. (184V surge)	470	36x49	230.0	80.0	3.0	3.7	ALS2-A471DY160
	680	36x62	160.0	50.0	3.7	4.6	ALS2-A681DB160
	1000	36x82	130.0	58.0	4.7	5.7	ALS2-A102DE160
	1500	51x62	74.0	25.0	6.1	8.3	ALS2-A152KB160
	2200	51x82	50.0	17.0	10.0	12.8	ALS2-A222KE160
	3300	51x115	36.0	14.0	11.7	14.7	ALS2-A332KJ160
	4700	66x115	27.0	12.0	14.1	17.0	ALS2-A472MJ160
	6800	73x115	22.0	12.0	15.2	18.1	ALS2-A682PJ160
	10000	77x146	17.0	10.0	19.1	22.8	ALS2-A103NP160
250V d.c. (287V surge)	220	36x49	680.0	270.0	1.9	2.6	ALS2-A221DY250
	330	36x62	405.0	200.0	2.5	3.3	ALS2-A331DB250
	470	36x82	240.0	85.0	3.2	4.7	ALS2-A471DE250
	680	51x62	195.0	90.0	4.1	5.3	ALS2-A681KB250
	1000	51x82	140.0	85.0	5.1	6.6	ALS2-A102KE250
	1500	51x115	90.0	45.0	7.6	10.0	ALS2-A152KJ250
	2200	66x115	64.0	32.0	10.1	12.8	ALS2-A222MJ250
	3300	73x115	45.0	24.0	11.3	13.8	ALS2-A332PJ250
	4700	77x146	32.0	18.0	14.9	18.0	ALS2-A472NP250
350V d.c. (385 V surge)	150	36x49	710.0	360.0	1.5	2.4	ALS2-A151DY350
	220	36x62	500.0	300.0	1.9	3.0	ALS2-A221DB350
	330	36x82	290.0	120.0	2.5	4.9	ALS2-A331DE350
	470	51x62	235.0	128.0	3.1	5.4	ALS2-A471KB350
	680	51x82	160.0	90.0	4.0	6.9	ALS2-A681KE350
	1000	51x115	110.0	60.0	5.8	10.0	ALS2-A102KJ350
	1500	66x115	76.0	45.0	7.9	12.9	ALS2-A152MJ350
	2200	73x115	55.0	36.0	9.1	14.3	ALS2-A222PJ350
	3300	77x146	38.0	26.0	12.1	18.2	ALS2-A332NP350
400V d.c. (440V surge)	100	36x49	1500.0	1100.0	1.1	1.5	ALS2-A101DY400
	150	36x62	1320.0	760.0	1.5	2.0	ALS2-A151DB400
	220	36x82	900.0	520.0	1.9	2.6	ALS2-A221DE400
	330	51x62	600.0	380.0	2.4	3.3	ALS2-A331KB400
	470	51x82	360.0	260.0	3.1	4.3	ALS2-A471KE400
	680	51x115	255.0	180.0	4.4	6.1	ALS2-A681KJ400
	1000	66x115	130.0	120.0	6.1	9.8	ALS2-A102MJ400
	1500	73x115	90.0	90.0	8.3	11.3	ALS2-A152PJ400
	2200	77x146	94.0	60.0	10.0	13.5	ALS2-A222NP400
450V d.c. (495V surge)	68	36x49	1860.0	1650.0	0.8	1.5	ALS2-A680DY450
	100	36x62	1300.0	1350.0	1.1	1.8	ALS2-A101DB450
	150	36x82	1100.0	1200.0	1.4	2.1	ALS2-A151DE450
	220	51x62	570.0	525.0	2.0	3.7	ALS2-A221KB450
	330	51x82	380.0	345.0	2.4	4.6	ALS2-A331KE450
	470	51x115	270.0	240.0	3.3	6.3	ALS2-A471KJ450
	680	51x115	260.0	150.0	4.0	6.6	ALS2-A681KJ450
	1000	66x115	180.0	173.0	5.3	8.4	ALS2-A102MJ450
	1500	73x115	120.0	120.0	6.8	10.5	ALS2-A152PJ450
	2200	77x146	80.0	83.0	9.1	13.9	ALS2-A222NP450

Note: Values of E.S.R. and Impedance quoted above are maximum

ALS30/31 SERIES

Screw Terminals - Plain and Stud Mountings

This range offers high CV per unit volume coupled with high ripple currents and long life performance. They are also capable of handling high peak voltages and currents.

Capacitance range 68 μ F to 1,000,000 μ F

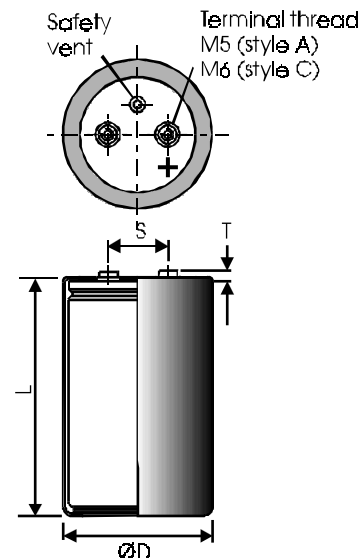
Capacitance tolerance \pm 20%

Voltage range 10V to 600V d.c.

Temperature range -40°C to +85°C

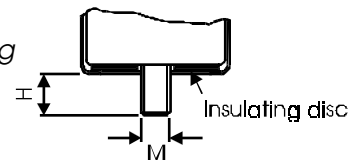
Case sizes 36 x 52mm to 91 x 146mm

ALS30



ALS31

Stud Mounting



DIMENSIONS (sleeved) mm

CASE CODE	D \pm 1	L \pm 2	S \pm 0.5	T \pm 0.8	M THREAD	H \pm 1	MOUNTING CLIP
DA	36	52	12.7	6.4	M8	12	V3/H2/UTE2736
DB	36	62	12.7	6.4	M8	12	V3/H2/UTE2736
DE	36	82	12.7	6.4	M8	12	V3/H2/UTE2736
DF	36	105	12.7	6.4	M8	12	V3/H2/UTE2736
KE	51	82	22.2	5.0	M12	16	V4/UTE2737
KF	51	105	22.2	5.0	M12	16	V4/UTE2737
MF	66	105	28.5	5.0	M12	16	V10/UTE2738
ND	77	75	31.7	5.0	M12	16	V11
NF	77	105	31.7	5.0	M12	16	V11
NP	77	146	31.7	5.0	M12	16	V11
NT	77	220	31.7	5.0	M12	16	V11
RD	91	75	31.7	5.0	M12	16	V90
RH	91	98	31.7	5.0	M12	16	V90
RP	91	146	31.7	5.0	M12	16	V90

Terminations

Aluminium inserts with M5 threads as standard, max torque 2NM. Optional M6 threaded inserts available on 77 & 91mm dia products, max torque 4NM. Max torque for stud M8:4NM/M12:8NM.

ALS30/31 SERIES

Screw Terminals - Plain and Stud Mountings

TECHNICAL DATA

Related documents

IEC 384-4

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.

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

10⁶ 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 or 10mA 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.

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 Aerovox.

FREQUENCY CORRECTION

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

For ambient temperatures 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

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)	LIFE EXPECTANCY (hours)
36	11000
51	18000
66	19000
77,91	20000

Mounting

Any position but refer to mounting section on page 9. For details of mounting clips and stud mounting kits see page 68/69.

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 code
6. BHC part number
7. Environmental classification

Ordering information

For details of ordering see page 70.

ALS30/31 SERIES

Screw Terminals - Plain and Stud Mountings

Rated voltage	Cap μ F	Case Size	ESR m Ω at 20°C 100Hz	Impedance m Ω at 20 °C,10 KHz	Ripple current A at 85°C 100 Hz	10 KHz	Type number (Excluding style ref)
10V d.c. (11.5V surge)	33000	36x52	20	18	8.4	8.87	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
	470000	91x75	11	11	19.4	19.5	ALS3--474RD010
	470000	77x105	5	5	30.8	32.8	ALS3--474NF010
	680000	91x98	7	6	27.9	28.0	ALS3--684RH010
	680000	77x146	5	4	39.6	41.7	ALS3--684NP010
	1000000	91x146	4	4	45.3	45.6	ALS3--105RP010
1000000	77x220	4	4	62.8	63.3	ALS3--105NT010	
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	91x75	11	11	19.1	19.2	ALS3--334RD016
	330000	77x105	5	5	28.6	30.8	ALS3--334NF016
	470000	91x98	7	7	27.6	27.8	ALS3--474RH016
	470000	77x146	5	5	38.9	39.6	ALS3--474NP016
	680000	91x146	4	4	45.3	45.5	ALS3--684RP016
680000	77x220	4	4	62.3	63.2	ALS3--684NT016	
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	91x75	12	12	18.7	18.8	ALS3--224RD025
	220000	77x105	6	6	28.1	30.8	ALS3--224NF025
	330000	91x98	8	8	26.4	26.5	ALS3--334RH025
	330000	77x146	5	5	37.3	39.6	ALS3--334NP025
	470000	91x146	4	4	43.6	43.9	ALS3--474RP025
470000	77x220	4	4	60.5	61.1	ALS3--474NT025	
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	91x75	10	10	20.3	20.4	ALS3--104RD040
	150000	77x105	8	8	26.8	30.2	ALS3--154NF040
	150000	91x98	7	7	28.6	28.9	ALS3--154RH040
	220000	77x146	6	5	35.4	39.6	ALS3--224NP040
	220000	91x146	4	4	46.5	47.0	ALS3--224RP040
330000	77x220	4	4	54.4	54.8	ALS3--334NT040	

Note: Values of E.S.R. and Impedance quoted above are maximum

ALS30/31 SERIES

Screw Terminals - Plain and Stud Mountings

Rated voltage	Cap μ F	Case Size	ESR $m\Omega$ at 20°C 100Hz	Impedance $m\Omega$ at 20 °C, 10 KHz	Ripple current A at 85°C 100 Hz	Ripple current A at 85°C 10 KHz	Type number (Excluding style ref)
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	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	91x75	11	10	20.3	20.7	ALS3--473RD063
	68000	77x105	8	8	24.7	26.4	ALS3--683NF063
	68000	91x98	8	7	28.9	29.6	ALS3--683RH063
	100000	77x146	6	6	34.8	35.4	ALS3--104NP063
	150000	91x146	5	5	40.2	40.7	ALS3--154RP063
	150000	77x220	4	4	55.2	56.3	ALS3--154NT063
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	91x75	21	20	14.7	15.0	ALS3--223RD100
	33000	77x105	15	14	17.6	19.0	ALS3--333NF100
	33000	91x98	13	12	20.8	21.2	ALS3--333RH100
	47000	77x146	10	9	25.2	25.7	ALS3--473NP100
	68000	91x146	9	8	29.4	29.8	ALS3--683RP100
	68000	77x220	7	6	40.6	41.5	ALS3--683NT100
200V d.c. (230V surge)	470	36x52	286	227	3.1	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	6.7	9.1	ALS3--152DF200
	2200	51x82	73	60	8.2	9.7	ALS3--222KE200
	3300	51x105	48	40	11.0	13.1	ALS3--332KF200
	4700	77x75	48	42	10.6	11.5	ALS3--472ND200
	4700	66x105	33	27	15.9	19.1	ALS3--472MF200
	6800	66x105	27	23	15.7	17.7	ALS3--682MF200
	6800	91x75	35	31	13.3	14.3	ALS3--682RD200
	10000	77x105	28	25	14.9	15.9	ALS3--103NF200
	10000	91x98	23	20	18.8	20.3	ALS3--103RH200
	15000	77x146	18	16	21.4	22.7	ALS3--153NP200
	22000	91x146	13	12	26.7	28.0	ALS3--223RP200
22000	77x220	11	9	36.1	38.7	ALS3--223NT200	
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	7.5	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	91x75	38	32	13.2	14.9	ALS3--472RD250
	6800	77x105	29	25	15.0	16.5	ALS3--682NF250
	10000	91x98	24	21	17.1	18.4	ALS3--103RH250
	10000	77x146	19	16	21.6	24.0	ALS3--103NP250
	15000	91x146	14	12	27.0	29.5	ALS3--153RP250
	15000	77x220	12	10	32.4	36.5	ALS3--153NT250

Note: Values of E.S.R. and Impedance quoted above are maximum

ALS30/31 SERIES

Screw Terminals - Plain and Stud Mountings

Rated voltage	Cap μ F	Case Size	ESR m Ω at 20°C 100Hz	Impedance m Ω at 20 °C, 10 KHz	Ripple current A at 85°C 100 Hz	10 KHz	Type number (Excluding style ref)
350V d.c. (385V surge)	330	36x52	325	226	2.4	4.2	ALS3--331DA350
	470	36x82	223	154	3.4	6.2	ALS3--471DE350
	680	36x105	154	107	4.4	8.0	ALS3--681DF350
	1000	51x82	116	82	6.1	9.3	ALS3--102KE350
	1500	51x105	77	55	8.2	12.5	ALS3--152KF350
	2200	77x75	66	50	9.1	11.5	ALS3--222ND350
	2200	66x105	52	37	11.9	18.2	ALS3--222MF350
	3300	66x105	39	29	12.8	17.2	ALS3--332MF350
	3300	91x75	47	36	11.7	14.2	ALS3--332RD350
	4700	77x105	35	27	13.4	15.8	ALS3--472NF350
	4700	91x98	31	24	16.3	20.3	ALS3--472RH350
	6800	77x146	23	18	19.3	23.2	ALS3--682NP350
	6800	91x146	20	15	24.9	32.5	ALS3--682RP350
	10000	77x220	15	11	31.7	39.3	ALS3--103NT350
400V d.c. (440V surge)	220	36x52	570	387	1.9	3.8	ALS3--221DA400
	330	36x62	382	260	2.5	4.7	ALS3--331DB400
	470	36x82	267	182	3.2	6.2	ALS3--471DE400
	680	36x105	185	126	4.1	7.9	ALS3--681DF400
	1000	51x82	139	98	5.8	8.9	ALS3--102KE400
	1500	51x105	92	65	7.8	12.0	ALS3--152KF400
	1500	77x75	97	70	8.3	11.9	ALS3--152ND400
	2200	66x105	62	44	11.2	17.4	ALS3--222MF400
	2200	91x75	69	50	10.7	14.9	ALS3--222RD400
	3300	77x105	49	36	12.7	16.5	ALS3--332NF400
	3300	91x98	45	32	14.9	20.9	ALS3--332RH400
	4700	77x146	33	24	18.0	24.2	ALS3--472NP400
	6800	91x146	24	17	23.2	30.3	ALS3--682RP400
	6800	77x220	22	15	29.0	40.7	ALS3--682NT400
415V d.c. (456V surge)	220	36x52	555	368	1.9	3.8	ALS3--221DA415
	330	36x62	372	247	2.4	4.8	ALS3--331DB415
	470	36x82	261	173	3.2	6.3	ALS3--471DE415
	680	36x105	180	120	4.1	8.0	ALS3--681DF415
	1000	51x82	136	94	5.7	8.8	ALS3--102KE415
	1500	51x105	90	62	7.6	11.9	ALS3--152KF415
	1500	77x75	96	68	8.1	11.7	ALS3--152ND415
	2200	66x105	61	42	11.0	17.2	ALS3--222MF415
	2200	91x75	68	49	10.5	14.6	ALS3--222RD415
	3300	77x105	48	36	12.4	16.2	ALS3--332NF415
	3300	91x98	45	32	14.6	20.5	ALS3--332RH415
	4700	77x146	33	24	17.6	23.7	ALS3--472NP415
	6800	91x146	23	17	22.7	29.7	ALS3--682RP415
	6800	77x220	21	15	28.5	40.1	ALS3--682NT415
450V d.c. (495V surge)	150	36x52	735	485	1.6	3.5	ALS3--151DA450
	220	36x62	502	332	2.0	4.4	ALS3--221DB450
	330	36x82	335	221	2.6	5.8	ALS3--331DE450
	470	36x105	235	155	3.4	7.4	ALS3--471DF450
	680	51x82	175	117	4.9	8.9	ALS3--681KE450
	1000	51x105	118	79	6.5	12.0	ALS3--102KF450
	1500	77x75	95	65	7.8	11.3	ALS3--152ND450
	1500	66x105	81	52	9.5	17.4	ALS3--152MF450
	2200	91x75	67	47	10.1	14.1	ALS3--222RD450
	2200	77x105	59	41	11.4	17.5	ALS3--222NF450
	3300	91x98	44	30	14.1	19.9	ALS3--332RH450
	3300	77x146	39	27	16.1	25.1	ALS3--332NP450
	4700	91x146	29	19	21.0	31.8	ALS3--472RP450
	6800	77x220	21	14	27.4	38.8	ALS3--682NT450

Note: Values of E.S.R. and Impedance quoted above are maximum

ALS30/31 SERIES

Screw Terminals - Plain and Stud Mountings

Rated voltage	Cap μ F	Case Size	ESR $m\Omega$ at 20°C 100Hz	Impedance $m\Omega$ at 20 °C, 10 KHz	Ripple current A at 85°C 100 Hz	Ripple current A at 85°C 10 KHz	Type number (Excluding style ref)
500V d.c. (550V surge)	100	36x52	1231	847	1.1	2.3	ALS3--101DA500
	150	36x62	823	566	1.4	2.9	ALS3--151DB500
	220	36x82	560	386	1.8	3.9	ALS3--221DE500
	330	36x105	374	258	2.4	5.0	ALS3--331DF500
	470	51x82	276	194	3.5	6.7	ALS3--471KE500
	680	51x105	190	133	4.6	9.0	ALS3--681KF500
	1000	77x75	173	109	5.9	9.7	ALS3--102ND500
	1000	66x105	137	96	6.7	13.0	ALS3--102MF500
	1500	91x75	91	65	8.5	14.4	ALS3--152NF500
	1500	77x105	119	76	7.8	12.2	ALS3--152RD500
	2200	91x98	80	50	10.7	17.1	ALS3--222RH500
	2200	77x146	62	44	11.9	20.6	ALS3--222NP500
	3300	91x146	51	32	15.8	26.4	ALS3--332RP500
	4700	77x220	37	24	21.0	33.3	ALS3--472NT500
550V d.c. (605V surge)	68	36x52	2178	1176	0.9	1.3	ALS3--680DA550
	150	36x82	988	534	1.4	2.3	ALS3--151DE550
	220	36x105	674	364	2.0	2.9	ALS3--221DF550
	330	51x82	458	251	3.0	4.4	ALS3--331KE550
	470	51x105	321	175	3.9	5.8	ALS3--471KF550
	680	77x75	230	129	4.5	7.3	ALS3--681ND550
	680	66x105	221	121	5.4	8.3	ALS3--681MF550
	1000	66x105	154	86	5.8	9.6	ALS3--102MF550
	1200	77x105	130	73	7.7	11.1	ALS3--122NF550
	1500	77x146	103	57	9.0	14.8	ALS3--152NP550
	1800	77x146	87	49	11.0	15.6	ALS3--182NP550
	2200	77x220	70	39	13.9	23.1	ALS3--222NT550
	3300	77x220	48	27	16.5	25.8	ALS3--332NT550
	600V d.c. (640V surge)	68	36x52	2772	1662	0.7	1.3
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	21.9	ALS3--222NT600

Note: Values of E.S.R. and Impedance quoted above are maximum

ALS40/41 SERIES

Screw Terminals - Plain and Stud Mountings

This range offers high CV per unit volume coupled with high ripple currents and long life performance at 105°C. They are also capable of handling high peak voltages and currents.

Capacitance range 100µF to 1,000,000µF

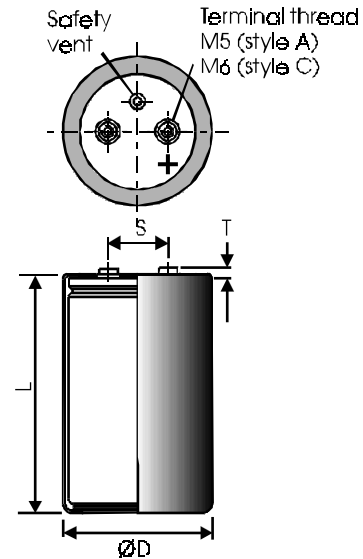
Capacitance tolerance ±20%

Voltage range 10V to 500V d.c.

Temperature range -40°C to +105°C

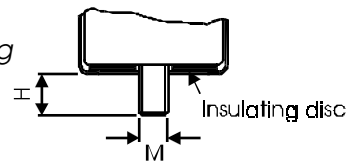
Case sizes 36 x 52mm to 91 x 146mm

ALS40



ALS41

Stud Mounting



DIMENSIONS (sleeved) mm

CASE CODE	D ±1	L ±2	S ±0.5	T ±0.8	M THREAD	H ±1	MOUNTING CLIP
DA	36	52	12.7	6.4	M8	12	V3/H2/UTE2736
DB	36	62	12.7	6.4	M8	12	V3/H2/UTE2736
DE	36	82	12.7	6.4	M8	12	V3/H2/UTE2736
DF	36	105	12.7	6.4	M8	12	V3/H2/UTE2736
KE	51	82	22.2	5.0	M12	16	V4/UTE2737
KF	51	105	22.2	5.0	M12	16	V4/UTE2737
MF	66	105	28.5	5.0	M12	16	V10/UTE2738
ND	77	75	31.7	5.0	M12	16	V11
NF	77	105	31.7	5.0	M12	16	V11
NP	77	146	31.7	5.0	M12	16	V11
NT	77	220	31.7	5.0	M12	16	V11
RD	91	75	31.7	5.0	M12	16	V90
RH	91	98	31.7	5.0	M12	16	V90
RP	91	146	31.7	5.0	M12	16	V90

Terminations

Aluminium inserts with M5 threads as standard, max torque 2NM. Optional M6 threaded inserts available on 77 & 91mm dia products, max torque 4NM. Max torque for stud M8:4NM/M12:8NM.

ALS40/41 SERIES

Screw Terminals - Plain and Stud Mountings

TECHNICAL DATA

Related documents

IEC 384-4

Temperature range

Storage -55°C to +105°C

Operating -40°C to +105°C

Environmental classification 40/105/56

Surge voltage

1000 surges (30 seconds) at 105°C with surge voltage applied. See electrical characteristics.

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

10⁶ 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 0.003 C_R U_R or 10mA 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.

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 Aerovox.

FREQUENCY CORRECTION

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

For ambient temperatures 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 (mm)	LIFE EXPECTANCY (hours)
36	6000
51	7000
66	8000
77,91	9000

Mounting

Any position but refer to mounting section on page 9. For details of mounting clips and stud mounting kits see page 68/69.

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 code
6. BHC part number
7. Environmental classification

Ordering information

For details of ordering see page 70.

ALS40/41 SERIES

Screw Terminals - Plain and Stud Mountings

Rated voltage	Cap μ F	Case Size	ESR $m\Omega$ at 20°C 100Hz	Impedance $m\Omega$ at 20 °C,10 KHz	Ripple current A at 105°C 100 Hz	Ripple current A at 105°C 10 KHz	Type number (Excluding style ref)
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
	470000	91x75	11	11	16.4	16.5	ALS4--474RD010
	470000	77x105	7	7	23.1	23.2	ALS4--474NF010
	680000	91x98	7	7	23.5	23.6	ALS4--684RH010
	680000	77x146	5	5	32.6	32.8	ALS4--684NP010
	1000000	91x146	4	4	38.3	38.5	ALS4--105RP010
1000000	77x220	4	4	53.1	53.5	ALS4--105NT010	
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	91x75	11	11	16.2	16.2	ALS4--334RD016
	330000	77x105	7	7	22.7	22.9	ALS4--334NF016
	470000	91x98	8	7	23.4	23.5	ALS4--474RH016
	470000	77x146	5	5	32.3	32.6	ALS4--474NP016
	680000	91x146	4	4	38.3	38.5	ALS4--684RP016
680000	77x220	4	4	53.0	53.4	ALS4--684NT016	
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	91x75	10	10	18.7	18.8	ALS4--154RD025
	220000	77x105	8	7	22.3	22.4	ALS4--224NF025
	330000	91x98	8	8	22.3	22.4	ALS4--334RH025
	330000	77x146	5	5	31.0	31.1	ALS4--334NP025
	470000	91x146	4	4	36.9	37.1	ALS4--474RP025
470000	77x220	4	4	51.2	51.6	ALS4--474NT025	
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	91x75	12	11	16.0	16.1	ALS4--104RD040
	100000	77x105	7	7	22.4	22.7	ALS4--104NF040
	150000	91x98	8	8	22.6	22.8	ALS4--154RH040
	150000	77x146	5	5	31.3	31.6	ALS4--154NP040
	220000	91x146	4	4	36.8	37.1	ALS4--224RP040
220000	77x220	4	4	50.9	51.6	ALS4--224NT040	

Note: Values of E.S.R. and Impedance quoted above are maximum

ALS40/41 SERIES

Screw Terminals - Plain and Stud Mountings

Rated voltage	Cap μ F	Case Size	ESR $m\Omega$ at 20°C 100Hz	Impedance $m\Omega$ at 20 °C, 10 KHz	Ripple current A at 105°C 100 Hz	Ripple current A at 105°C 10 KHz	Type number (Excluding style ref)
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	91x75	11	11	17.1	17.5	ALS4--333RD063
	47000	77x105	9	8	20.7	21.1	ALS4--473NF063
	47000	91x98	8	7	24.4	25.1	ALS4--473RH063
	68000	77x146	6	6	29.1	29.8	ALS4--683NP063
	100000	91x146	5	5	34.5	35.2	ALS4--104RP063
	100000	77x220	4	4	47.3	48.5	ALS4--104NT063
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	91x75	20	18	12.9	13.4	ALS4--153RD100
	22000	77x105	15	13	15.5	16.0	ALS4--223NF100
	22000	91x98	13	11	18.4	19.0	ALS4--223RH100
	33000	77x146	10	10	21.6	22.2	ALS4--333NP100
	47000	91x146	9	8	25.9	26.5	ALS4--473RP100
	47000	77x220	7	6	35.4	36.6	ALS4--473NT100
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	91x75	36	32	10.9	11.7	ALS4--682RD200
	6800	77x105	29	25	13.4	14.8	ALS4--682NF200
	10000	91x98	23	20	15.4	16.6	ALS4--103RH200
	10000	77x146	19	16	19.3	21.5	ALS4--103NP200
	15000	91x146	14	12	24.2	26.5	ALS4--153RP200
	22000	77x220	11	10	29.5	31.6	ALS4--223NT200
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	91x98	38	32	10.7	12.1	ALS4--472RD250
	6800	77x105	30	25	12.1	13.4	ALS4--682NF250
	6800	91x98	25	20	15.1	17.3	ALS4--682RH250
	10000	77x146	19	16	17.5	19.5	ALS4--103NP250
	15000	91x146	14	12	21.9	23.9	ALS4--153RP250
	15000	77x220	12	10	29.2	33.0	ALS4--153NT250

Note: Values of E.S.R. and Impedance quoted above are maximum

ALS40/41 SERIES

Screw Terminals - Plain and Stud Mountings

Rated voltage	Cap μ F	Case Size	ESR m Ω at 20°C 100Hz	Impedance m Ω at 20 °C, 10 KHz	Ripple current A at 105°C 100 Hz	Ripple current A at 105°C 10 KHz	Type number (Excluding style ref)
350V d.c. (385V surge)	220	36x52	457	303	1.7	3.3	ALS4--221DA350
	330	36x62	307	204	2.2	4.1	ALS4--331DB350
	470	36x82	215	143	2.8	5.4	ALS4--471DE350
	680	36x105	149	99	3.6	6.9	ALS4--681DF350
	1000	51x82	113	78	5.0	7.8	ALS4--102KE350
	1500	51x105	75	52	6.8	10.5	ALS4--152KF350
	2200	77x75	66	49	7.4	9.4	ALS4--222ND350
	2200	66x105	51	35	9.8	15.2	ALS4--222MF350
	2200	91x75	56	40	9.4	13.0	ALS4--222RD350
	3300	77x105	41	30	11.1	14.5	ALS4--332NF350
	4700	91x98	31	23	13.3	16.6	ALS4--472RH350
	4700	77x146	27	20	15.7	21.2	ALS4--472NP350
	6800	91x146	19	14	20.3	26.6	ALS4--682RP350
	6800	77x220	18	12	25.4	35.7	ALS4--682NT350
400V d.c. (440V surge)	220	36x52	542	349	1.6	3.3	ALS4--221DA400
	220	36x62	537	344	1.7	3.7	ALS4--221DB400
	470	36x82	254	164	2.7	5.4	ALS4--471DE400
	470	36x105	251	161	2.9	6.2	ALS4--471DF400
	680	51x82	183	121	4.2	7.5	ALS4--681KE400
	1000	51x105	124	81	5.6	10.2	ALS4--102KF400
	1500	77x75	93	64	6.9	10.2	ALS4--152ND400
	2200	66x105	60	41	9.1	14.4	ALS4--222MF400
	2200	91x75	67	47	8.7	12.1	ALS4--222RD400
	2200	77x105	62	42	9.8	14.9	ALS4--222NF400
	3300	91x98	44	31	12.1	17.0	ALS4--332RH400
	4700	77x146	33	23	14.5	19.6	ALS4--472NP400
	6800	91x146	23	17	18.7	24.5	ALS4--682RP400
	6800	77x220	21	15	23.5	33.3	ALS4--682NT400
415V d.c. (456V surge)	220	36x52	530	331	1.6	3.3	ALS4--221DA415
	220	36x62	524	325	1.7	3.7	ALS4--221DB415
	330	36x82	349	217	2.2	5.0	ALS4--331DE415
	470	36x105	245	152	2.8	6.3	ALS4--471DF415
	680	51x82	180	115	4.1	7.5	ALS4--681KE415
	1000	51x105	122	77	5.5	10.2	ALS4--102KF415
	1500	77x75	95	65	6.6	9.5	ALS4--152ND415
	2200	66x105	60	39	8.9	14.2	ALS4--222MF415
	2200	91x75	67	47	8.5	11.9	ALS4--222RD415
	2200	77x105	61	41	9.5	14.7	ALS4--222NF415
	3300	91x98	44	30	11.8	16.7	ALS4--332RH415
	3300	77x146	40	27	13.5	21.1	ALS4--332NP415
	4700	91x146	29	19	17.6	26.7	ALS4--472RP415
	6800	77x220	21	14	23.0	32.5	ALS4--682NT415
450V d.c. (495V surge)	150	36x52	721	360	1.2	3.3	ALS4--151DA450
	150	36x62	715	356	1.2	3.7	ALS4--151DB450
	220	36x82	487	242	1.6	4.8	ALS4--221DE450
	330	36x105	325	162	2.1	6.3	ALS4--331DF450
	470	51x82	239	123	3.2	7.4	ALS4--471KE450
	680	51x105	164	84	4.2	10.0	ALS4--681KF450
	1000	77x75	125	69	5.3	9.4	ALS4--102ND450
	1500	66x105	79	42	7.0	14.0	ALS4--152MF450
	1500	91x75	87	49	7.0	11.7	ALS4--152RD450
	1500	77x105	80	43	7.6	14.5	ALS4--152NF450
	2200	91x98	58	32	9.6	16.6	ALS4--222RH450
	2200	77x146	54	29	10.7	20.9	ALS4--222NP450
	3300	91x146	37	20	14.2	26.1	ALS4--332RP450
	4700	77x220	27	15	18.8	32.0	ALS4--472NT450

Note: Values of E.S.R. and Impedance quoted above are maximum

ALS40/41 SERIES

Screw Terminals - Plain and Stud Mountings

Rated voltage	Cap μ F	Case Size	ESR $m\Omega$ at 20°C 100Hz	Impedance $m\Omega$ at 20 °C, 10 KHz	Ripple current A at 105°C 100 Hz	Ripple current A at 105°C 10 KHz	Type number (Excluding style ref)
500V d.c. (550V surge)	100	36x52	1499	829	0.9	2.0	ALS4--101DA500
	150	36x62	1002	555	1.1	2.6	ALS4--151DB500
	220	36x82	683	378	1.5	3.4	ALS4--221DE500
	330	36x105	456	252	1.9	4.4	ALS4--331DF500
	470	51x82	332	189	2.9	5.8	ALS4--471KE500
	680	51x105	228	129	3.8	7.8	ALS4--681KF500
	680	77x75	234	134	4.2	8.1	ALS4--681ND500
	1000	66x105	155	88	5.5	11.2	ALS4--102MF500
	1000	91x75	161	93	5.6	10.5	ALS4--102RD500
	1500	77x105	110	65	6.9	12.1	ALS4--152NF500
	1500	91x98	107	62	7.8	14.5	ALS4--152RH500
	2200	77x146	74	43	9.7	17.3	ALS4--222NP500
	3300	91x146	51	30	13.0	22.1	ALS4--332RP500
	3300	77x220	49	28	15.4	28.4	ALS4--332NT500

Note: Values of E.S.R. and Impedance quoted above are maximum

ALS60/61 SERIES

Screw Terminals - Plain and Stud Mountings

This range offers high temperature operation with high ripple currents and long life performance

Capacitance range 1000 μ F to 150,000 μ F

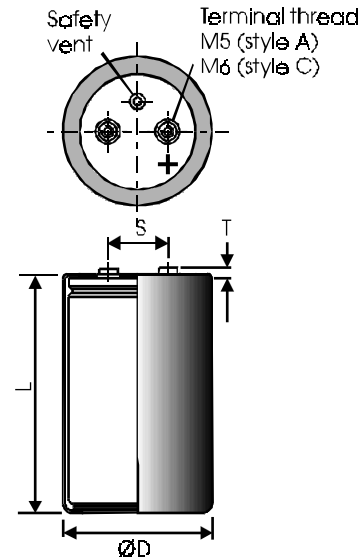
Capacitance tolerance \pm 20%

Voltage range 16V to 100V d.c.

Temperature range -55°C to +125°C

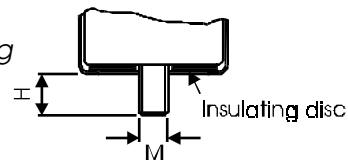
Case sizes 36 x 52mm to 77 x 146mm

ALS60



ALS61

Stud Mounting



DIMENSIONS (sleeved) mm

CASE CODE	D +2-1	L \pm 2	S \pm 0.5	T \pm 0.8	M THREAD	H \pm 1	MOUNTING CLIP
DA	36	52	12.7	6.4	M8	12	V3/H2/UTE2736
DB	36	62	12.7	6.4	M8	12	V3/H2/UTE2736
DE	36	82	12.7	6.4	M8	12	V3/H2/UTE2736
DF	36	105	12.7	6.4	M8	12	V3/H2/UTE2736
KE	51	82	22.2	5.0	M12	16	V4/UTE2737
KF	51	105	22.2	5.0	M12	16	V4/UTE2737
MF	66	105	28.5	5.0	M12	16	V10/UTE2738
NF	77	105	31.7	5.0	M12	16	V11
NP	77	146	31.7	5.0	M12	16	V11

Terminations

Aluminium inserts with M5 threads as standard, max torque 2NM. Optional M6 threaded inserts available on 77mm dia products, max torque 4NM. Max torque for stud M8:4NM/M12:8NM.

ALS60/61 SERIES

Screw Terminals - Plain and Stud Mountings

TECHNICAL DATA

Related documents

IEC 384-4

Temperature range

Storage -65°C to +125°C
Operating -55°C to +125°C
Environmental classification 55/125/56

Surge voltage

1000 surges (30 seconds) at 125°C with surge voltage applied. See electrical characteristics.

Charge/discharge

10⁶ 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 0.003 C_R U_R or 10mA 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.

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 Aerovox.

FREQUENCY CORRECTION

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

For ambient temperatures other than 125°C the following multipliers should be applied to the 125°C ripple current.

AMBIENT TEMPERATURE	FACTOR
50°C	2.9
60°C	2.7
70°C	2.5
85°C	2.2
105°C	1.7
125°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)	LIFE EXPECTANCY (hours)
36	6000
51	7000
66	7000
77	8000

Mounting

Any position but refer to mounting section on page 9. For details of mounting clips and stud mounting kits see page 68/69.

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 code
6. BHC part number
7. Environmental classification

Ordering information

For details of ordering see page 70.

ALS60/61 SERIES

Screw Terminals - Plain and Stud Mountings

Rated voltage	Cap μF	Case Size	ESR $\text{m}\Omega$ at 20°C 100Hz	Impedance $\text{m}\Omega$ at 20 °C, 10 KHz	Ripple current A at 125°C 100 Hz	Ripple current A at 125°C 10 KHz	Type number (Excluding style ref)
16V d.c. (18.4V surge)	10000	36x52	32	20	4.8	5.1	ALS6--103DA016
	15000	36x82	24	16	7.1	7.7	ALS6--153DE016
	22000	36x105	16	14	9.1	9.9	ALS6--223DF016
	33000	51x82	14	12	10.7	11.1	ALS6--333KE016
	47000	51x105	10	8	14.4	15.1	ALS6--473KF016
	68000	66x105	7	6	20.9	21.9	ALS6--683MF016
	100000	77x105	6	6	22.2	22.8	ALS6--104NF016
	150000	77x146	4	4	31.0	31.8	ALS6--154NP016
25V d.c. (28.5V surge)	4700	36x52	46	38	4.4	4.8	ALS6--472DA025
	10000	36x82	22	18	7.3	8.0	ALS6--103DE025
	15000	36x105	15	12	9.4	10.2	ALS6--153DF025
	22000	51x82	14	12	10.3	10.7	ALS6--223KE025
	33000	51x105	10	9	13.9	14.5	ALS6--333KF025
	47000	66x105	7	6	20.3	21.2	ALS6--473MF025
	68000	77x105	7	6	20.9	21.5	ALS6--683NF025
	100000	77x146	5	4	29.3	30.1	ALS6--104NP025
40V d.c. (46V surge)	4700	36x82	26	21	6.7	7.6	ALS6--472DE040
	10000	36x105	13	11	9.4	10.4	ALS6--103DF040
	15000	51x82	14	12	9.7	10.1	ALS6--153KE040
	22000	51x105	10	9	13.0	13.6	ALS6--223KF040
	33000	66x105	7	6	18.9	19.7	ALS6--333MF040
	47000	77x105	7	6	18.9	19.3	ALS6--473NF040
	68000	77x146	5	5	26.6	27.3	ALS6--683NP040
	63V d.c. (72.5V surge)	2200	36x52	47	37	3.9	4.5
3300		36x82	32	25	5.6	6.6	ALS6--332DE063
4700		36x105	22	18	7.1	8.4	ALS6--472DF063
6800		51x82	20	17	8.6	10.0	ALS6--682KE063
10000		51x105	13	11	11.6	12.7	ALS6--103KF063
15000		66x105	10	8	16.7	18.4	ALS6--153MF063
22000		77x105	9	8	17.9	19.0	ALS6--223NF063
33000		77x146	6	5	25.0	26.5	ALS6--333NP063
100V d.c. (115V surge)	1000	36x52	106	86	2.9	3.6	ALS6--102DA100
	2200	36x82	51	41	4.8	5.8	ALS6--222DE100
	3300	51x82	48	41	6.2	6.9	ALS6--332KE100
	4700	51x105	32	27	8.4	9.5	ALS6--472KF100
	6800	66x105	21	18	12.2	13.9	ALS6--682MF100
	10000	77x105	21	18	12.6	13.5	ALS6--103NF100
	15000	77x146	14	13	17.6	18.8	ALS6--153NP100

Note: Values of E.S.R. and Impedance quoted above are maximum

ALP/T10 SERIES

Board Mounting or Solder Tag Terminations

This range of capacitors is designed to meet the requirements of inverters, switch mode power supplies, welding applications and many other industrial and professional uses.

Capacitance range 100 μ F to 68,000 μ F

Capacitance tolerance -10% +30%

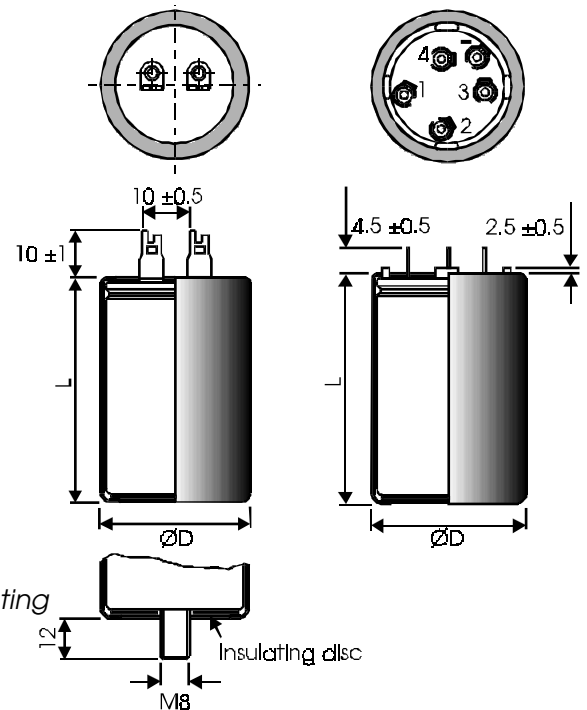
Voltage range 10V to 385V d.c.

Temperature range -40°C to +85°C

Case sizes 25 x 35mm to 40 x 105mm

ALT Tag style

ALP Pin style

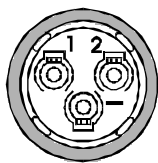


ALT11

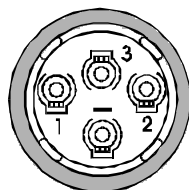
Stud
Mounting

ALP Pin configurations

25mm dia can

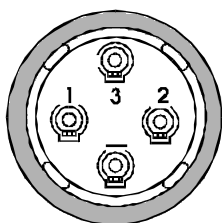


30mm dia can

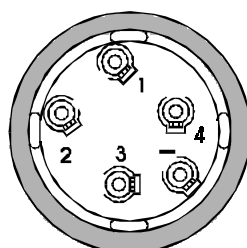


Hole 1 represents +ve

35mm dia can



40mm dia can



DIMENSIONS (sleeved) mm

CASE CODE	D ± 1	L ± 2	MOUNTING CLIP FOR ALT STYLE
AA	25	35	V2/H1
AB	25	45	V2/H1
BB	30	45	-
CB	35	45	V3/H2
CD	35	55	V3/H2
DB	40	45	V9
DD	40	55	V9
DE	40	75	V9
DF	40	105	V9

Max torque: stud M8:4NM

Terminations and Mounting

ALT styles are designed for flying lead connection. ALP styles are designed for printed circuit board mounting to DIN 41238. For details see page 43.

For details of mounting clips and stud mounting kits see page 68/69.

Board Mounting or Solder Tag Terminations

TECHNICAL DATA

Related documents

DIN 41238
DIN 41496-7
IEC 384-4

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.

Charge/discharge

10⁶ 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 $(0.006 C_r U_r + 4) \mu A$. 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

$\geq 100M\Omega$ at 100V d.c., across insulating sleeve.

Voltage proof

$\geq 2500V$ 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 Aerovox.

FREQUENCY CORRECTION

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 multipliers should be applied to the 100Hz ripple current.

RATED VOLTAGE d.c.	FREQUENCY (Hz)				
	50	100	500	1k	$\geq 10k$
0 - 25	0.89	1.0	1.05	1.06	1.07
40 - 160	0.81	1.0	1.28	1.33	1.39
200 - 450	0.75	1.0	1.54	1.70	1.89

TEMPERATURE CORRECTION

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

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)	LIFE EXPECTANCY (hours)
25	5000
30	5000
35	5000
40	5000

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 code
6. BHC part number
7. Environmental classification

Ordering information

For details of ordering see page 70.

ALP/T10 SERIES

Board Mounting or Solder Tag Terminations

Rated voltage	Cap μ F	Case Size	ESR $m\Omega$ at 20°C 100Hz	Impedance $m\Omega$ at 20 °C, 10 KHz	Ripple current A at 85°C 100 Hz	Type number (Excluding style ref)
10V d.c. (11.5V surge)	4700	25x35	94	80	1.90	AL-10A472AA010
	6800	25x45	68	58	2.40	AL-10A682AB010
	10000	30x45	52	45	3.10	AL-10A103BB010
	15000	35x45	42	38	3.90	AL-10A153CB010
	22000	35x55	33	30	4.70	AL-10A223CD010
	22000	40x45	38	35	4.40	AL-10A223DB010
	33000	40x55	31	29	5.30	AL-10A333DD010
	47000	40x75	24	22	6.80	AL-10A473DE010
68000	40x105	19	18	8.70	AL-10A683DF010	
16V d.c. (18.5V surge)	3300	25x35	100	81	1.80	AL-10A332AA016
	4700	25x45	72	59	2.40	AL-10A472AB016
	6800	30x45	57	47	3.00	AL-10A682BB016
	10000	35x45	47	41	3.60	AL-10A103CB016
	15000	35x55	37	32	4.40	AL-10A153CD016
	15000	40x45	43	38	4.20	AL-10A153DB016
	22000	40x55	35	32	5.00	AL-10A223DD016
	33000	40x75	26	24	6.50	AL-10A333DE016
47000	40x105	20	19	8.50	AL-10A473DF016	
25V d.c. (28.5V surge)	2200	25x35	104	81	1.80	AL-10A222AA025
	3300	25x45	72	57	2.40	AL-10A332AB025
	4700	30x45	57	47	3.00	AL-10A472BB025
	6800	35x45	48	40	3.60	AL-10A682CB025
	10000	35x55	37	32	4.40	AL-10A103CD025
	10000	40x45	43	38	4.20	AL-10A103DB025
	15000	40x55	35	32	5.00	AL-10A153DD025
	22000	40x75	27	24	6.40	AL-10A223DE025
33000	40x105	21	19	8.30	AL-10A333DF025	
40V d.c. (46V surge)	1500	25x35	140	98	1.70	AL-10A152AA040
	2200	25x45	79	56	2.30	AL-10A222AB040
	3300	30x45	60	45	2.90	AL-10A332BB040
	4700	35x45	50	40	3.50	AL-10A472CB040
	6800	35x55	40	32	4.30	AL-10A682CD040
	6800	40x45	46	39	4.00	AL-10A682DB040
	10000	40x55	37	32	4.80	AL-10A103DD040
	15000	40x75	28	25	6.20	AL-10A153DE040
22000	40x105	22	19	8.10	AL-10A223DF040	
63V d.c. (72.5V surge)	1000	25x35	137	87	1.50	AL-10A102AA063
	1500	25x45	95	61	2.10	AL-10A152AB063
	2200	30x45	72	50	2.70	AL-10A222BB063
	3300	35x45	59	43	3.20	AL-10A332CB063
	4700	35x55	46	35	4.00	AL-10A472CD063
	4700	40x45	54	43	3.70	AL-10A472DB063
	6800	40x55	43	36	4.50	AL-10A682DD063
	10000	40x75	32	27	5.80	AL-10A103DE063
15000	40x105	24	21	7.80	AL-10A153DF063	
100V d.c. (115V surge)	470	25x35	285	179	1.10	AL-10A471AA100
	680	25x45	199	126	1.40	AL-10A681AB100
	1000	30x45	145	95	1.90	AL-10A102BB100
	1500	35x45	110	77	2.40	AL-10A152CB100
	2200	35x55	82	58	3.00	AL-10A222CD100
	2200	40x45	93	70	2.80	AL-10A222DB100
	3300	40x55	71	55	3.50	AL-10A332DD100
	4700	40x75	51	40	4.60	AL-10A472DE100
6800	40x105	37	29	6.20	AL-10A682DF100	

Note: Values of E.S.R. and Impedance quoted above are maximum

ALP/T10 SERIES

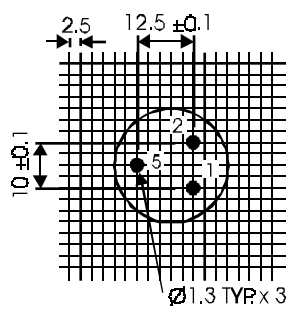
Board Mounting or Solder Tag Terminations

Rated voltage	Cap μF	Case Size	ESR $\text{m}\Omega$ at 20°C 100Hz	Impedance $\text{m}\Omega$ at 20 °C, 10 KHz	Ripple current A at 85°C 100 Hz	Type number (Excluding style ref)
160V d.c. (184V surge)	150	25x35	616	317	0.75	AL-10A151AA160
	220	25x45	422	218	0.99	AL-10A221AB160
	330	30x45	292	156	1.30	AL-10A331BB160
	470	35x45	217	120	1.70	AL-10A471CB160
	680	35x55	155	88	2.10	AL-10A681CD160
	680	40x45	166	99	2.10	AL-10A681DB160
	1000	40x55	120	75	2.70	AL-10A102DD160
	1500	40x75	83	53	3.60	AL-10A152DE160
2200	40x105	59	38	4.90	AL-10A222DF160	
250V d.c. (287V surge)	100	25x35	1104	650	0.56	AL-10A101AA250
	150	25x45	739	436	0.75	AL-10A151AB250
	220	30x45	514	307	1.00	AL-10A221BB250
	330	35x45	357	218	1.30	AL-10A331CB250
	470	35x55	256	159	1.70	AL-10A471CD250
	470	40x45	268	170	1.60	AL-10A471DB250
	680	40x55	192	125	2.10	AL-10A681DD250
	1000	40x75	133	87	2.80	AL-10A102DE250
1500	40x105	91	61	4.00	AL-10A152DF250	
385V d.c. (425V surge)	100	25x35	856	650	0.60	AL-10A101AA385
	150	30x45	573	260	0.95	AL-10A151BB385
	220	35x55	397	200	1.30	AL-10A221CD385
	330	40x45	294	158	1.60	AL-10A331DB385
	470	40x55	213	117	2.00	AL-10A471DD385
	680	40x75	149	82	2.70	AL-10A681DE385
	1000	40x105	103	58	3.70	AL-10A102DF385

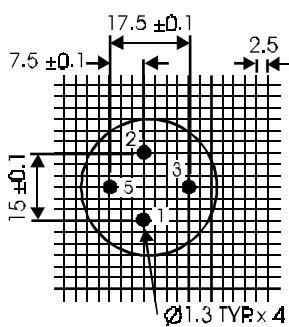
Note: Values of E.S.R. and Impedance quoted above are maximum

ALP Mounting (DIN 41238)

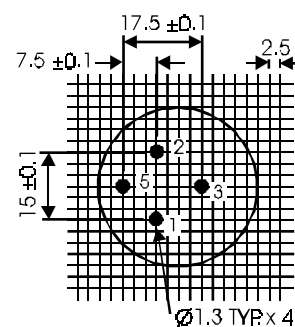
25mm dia can



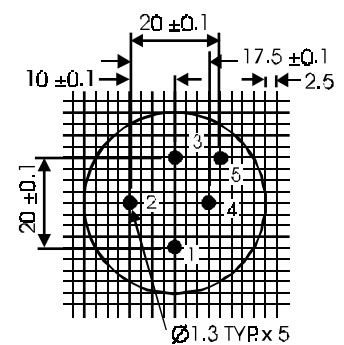
30mm dia can



35mm dia can



40mm dia can



Additional dummy pins are provided for stability. Note that the case and dummy pins may be at negative terminal potential.

(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.

ALP/T20 SERIES

Board Mounting or Solder Tag Terminations

This range of Long Life grade capacitors, complements the larger ALS20/21 screw terminal range. It features low e.s.r., high ripple current ratings and outstandingly good high frequency impedance.

Capacitance range 22µF to 68,000µF

Capacitance tolerance -10% +30%, ±20% (200V only)

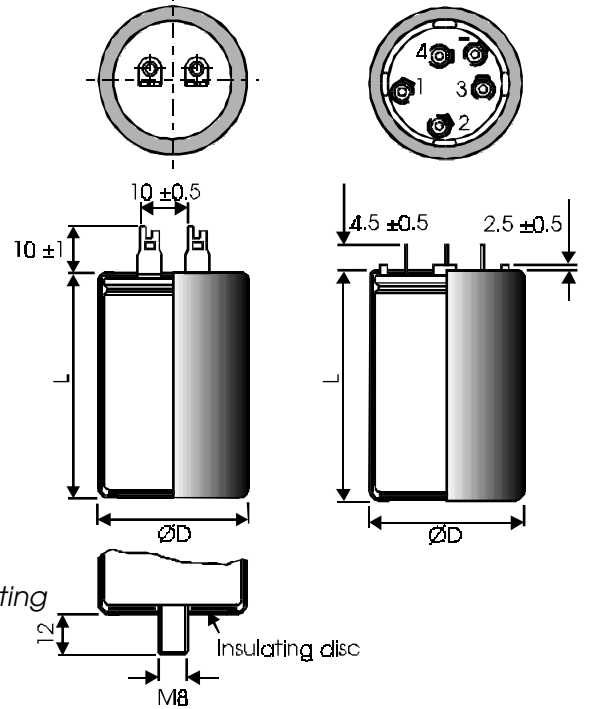
Voltage range 10V to 450V d.c.

Temperature range -40°C to +85°C

Case sizes 25 x 35mm to 40 x 105mm

ALT Tag style

ALP Pin style

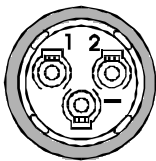


ALT21

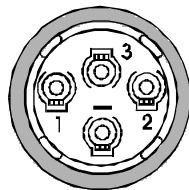
Stud Mounting

ALP Pin configurations

25mm dia can

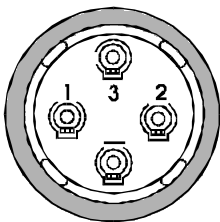


30mm dia can

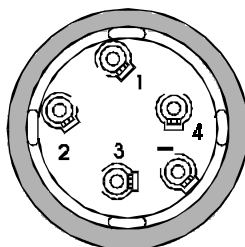


Hole 1 represents +ve

35mm dia can



40mm dia can



DIMENSIONS (sleeved) mm

CASE CODE	D ±1	L ±2	MOUNTING CLIP FOR ALT STYLE
AA	25	35	V2/H1
AB	25	45	V2/H1
BB	30	45	-
CB	35	45	V3/H2
CD	35	55	V3/H2
DB	40	45	V9
DD	40	55	V9
DE	40	75	V9
DF	40	105	V9

Max torque: stud M8:4NM

Terminations and Mounting

ALT styles are designed for flying lead connection.

ALP styles are designed for printed circuit board mounting to DIN 41238. For details see page 47.

For details of mounting clips and stud mounting kits see page 68/69.

ALP/T20 SERIES

Board Mounting or Solder Tag Terminations

TECHNICAL DATA

Related documents

BS CECC 30301-033
DIN 41240 & 41238 & 41496-7
IEC 384-4

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.

Charge/discharge

10⁶ 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 $(0.006 C_R U_R + 4) \mu\text{A}$. 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

$\geq 100\text{M}\Omega$ at 100V d.c., across insulating sleeve.

Voltage proof

$\geq 2500\text{V}$ 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 Aerovox.

FREQUENCY CORRECTION

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 multipliers should be applied to the 100Hz ripple current.

RATED VOLTAGE d.c.	FREQUENCY (Hz)				
	50	100	500	1k	$\geq 10\text{k}$
0 - 25	0.89	1.0	1.05	1.06	1.07
40 - 160	0.81	1.0	1.28	1.33	1.39
200 - 450	0.75	1.0	1.54	1.70	1.89

TEMPERATURE CORRECTION

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

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)	LIFE EXPECTANCY (hours)
25	12000
30	15000
35	18000
40	26000

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 code
6. BHC part number
7. Environmental classification

Ordering information

For details of ordering see page 70.

ALP/T20 SERIES

Board Mounting or Solder Tag Terminations

Rated voltage	Cap μF	Case Size	ESR $\text{m}\Omega$ at 20°C 100Hz	Impedance $\text{m}\Omega$ at 20 °C, 10 KHz	Ripple current A at 85°C 100 Hz	Type number (Excluding style ref)
10V d.c. (11.5V surge)	4700	25x35	74	50	2.6	AL-20A472AA010
	6800	25x45	51	37	3.4	AL-20A682AB010
	10000	30x45	39	29	4.3	AL-20A103BB010
	15000	35x45	35	26	5.0	AL-20A153CB010
	22000	35x55	27	21	6.2	AL-20A223CD010
	22000	40x45	36	27	5.4	AL-20A223DB010
	33000	40x55	29	22	6.5	AL-20A333DD010
	47000	40x75	20	17	8.8	AL-20A473DE010
68000	40x105	15	14	11.6	AL-20A683DF010	
16V d.c. (18.5V surge)	3300	25x35	75	50	2.5	AL-20A332AA016
	4700	25x45	52	37	3.4	AL-20A472AB016
	6800	30x45	40	30	4.3	AL-20A682BB016
	10000	35x45	36	27	4.9	AL-20A103CB016
	15000	35x55	28	21	6.0	AL-20A153CD016
	15000	40x45	36	27	5.4	AL-20A153DB016
	22000	40x55	29	22	6.5	AL-20A223DD016
	33000	40x75	20	17	8.8	AL-20A333DE016
47000	40x105	15	14	11.6	AL-20A473DF016	
25V d.c. (28.5V surge)	2200	25x35	78	52	2.5	AL-20A222AA025
	3300	25x45	53	38	3.3	AL-20A332AB025
	4700	30x45	42	31	4.2	AL-20A472BB025
	6800	35x45	37	28	4.9	AL-20A682CB025
	10000	35x55	28	21	6.0	AL-20A103CD025
	10000	40x45	36	27	5.4	AL-20A103DB025
	15000	40x55	29	22	6.5	AL-20A153DD025
	22000	40x75	20	17	8.8	AL-20A223DE025
33000	40x105	15	14	11.6	AL-20A333DF025	
40V d.c. (46V surge)	1500	25x35	112	68	2.0	AL-20A152AA040
	2200	25x45	76	51	2.8	AL-20A222AB040
	3300	30x45	57	41	3.6	AL-20A332BB040
	4700	35x45	48	35	4.3	AL-20A472CB040
	6800	35x55	36	27	5.4	AL-20A682CD040
	6800	40x45	45	33	4.8	AL-20A682DB040
	10000	40x55	35	27	5.9	AL-20A103DD040
	15000	40x75	25	20	7.8	AL-20A153DE040
22000	40x105	18	16	10.6	AL-20A223DF040	
63V d.c. (72.5V surge)	1000	25x35	122	74	2.0	AL-20A102AA063
	1500	25x45	83	54	2.7	AL-20A152AB063
	2200	30x45	57	41	3.5	AL-20A222BB063
	3300	35x45	48	35	4.3	AL-20A332CB063
	4700	35x55	36	27	5.4	AL-20A472CD063
	4700	40x45	45	33	4.8	AL-20A472DB063
	6800	40x55	35	27	5.9	AL-20A682DD063
	10000	40x75	25	20	7.8	AL-20A103DE063
15000	40x105	19	16	10.3	AL-20A153DF063	
100V d.c. (115V surge)	470	25x35	342	300	1.2	AL-20A471AA100
	680	25x45	229	210	1.7	AL-20A681AB100
	1000	30x45	160	150	2.2	AL-20A102BB100
	1500	35x45	117	120	2.8	AL-20A152CB100
	2200	35x55	84	90	3.5	AL-20A222CD100
	2200	40x45	96	110	3.3	AL-20A222DB100
	3300	40x55	70	75	4.1	AL-20A332DD100
	4700	40x75	49	55	5.6	AL-20A472DE100
6800	40x105	34	40	7.7	AL-20A682DF100	

Note: Values of E.S.R. and Impedance quoted above are maximum

ALP/T20 SERIES

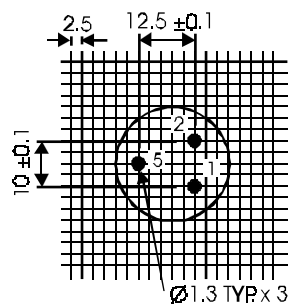
Board Mounting or Solder Tag Terminations

Rated voltage	Cap μF	Case Size	ESR $\text{m}\Omega$ at 20°C 100Hz	Impedance $\text{m}\Omega$ at 20 °C, 10 KHz	Ripple current A at 85°C 100 Hz	Type number (Excluding style ref)
200V d.c. (230V surge)	150	25x35	1000	770	0.75	AL-20A151AA200
	220	25x45	680	525	1.00	AL-20A221AB200
	330	30x45	460	360	1.29	AL-20A331BB200
	470	35x45	320	250	1.67	AL-20A471CB200
	680	35x55	220	170	2.22	AL-20A681CD200
	680	40x45	220	170	2.25	AL-20A681DB200
	1000	40x55	130	115	3.00	AL-20A102DD200
	1500	40x75	90	85	4.15	AL-20A152DE200
	2200	40x105	60	60	5.88	AL-20A222DF200
250V d.c. (287V surge)	100	25x35	1800	1300	0.60	AL-20A101AA250
	150	25x45	1100	850	0.80	AL-20A151AB250
	220	30x45	750	550	1.00	AL-20A221BB250
	330	35x45	500	400	1.40	AL-20A331CB250
	470	35x55	360	290	1.80	AL-20A471CD250
	470	40x45	420	350	1.80	AL-20A471DB250
	680	40x55	250	190	2.30	AL-20A681DD250
	1000	40x75	170	140	3.00	AL-20A102DE250
	1500	40x105	130	120	3.90	AL-20A152DF250
400V d.c. (440V surge)	47	25x35	2800	2200	0.40	AL-20A470AA400
	68	25x45	1700	1350	0.60	AL-20A680AB400
	100	30x45	1100	850	0.80	AL-20A101BB400
	150	35x45	725	525	1.10	AL-20A151CB400
	220	35x55	500	350	1.40	AL-20A221CD400
	220	40x45	600	420	1.30	AL-20A221DB400
	330	40x55	340	230	1.90	AL-20A331DD400
	470	40x75	240	160	2.80	AL-20A471DE400
	680	40x105	230	160	3.00	AL-20A681DF400
450V d.c. (495V surge)	22	25x35	7000	5000	0.26	AL-20A220AA450
	33	25x35	5000	3600	0.31	AL-20A330AA450
	47	25x35	3500	2800	0.37	AL-20A470AA450
	68	25x45	3000	2000	0.50	AL-20A680AB450
	100	30x45	2000	1500	0.65	AL-20A101BB450
	150	35x55	1500	950	0.83	AL-20A151CD450
	220	40x55	900	650	1.16	AL-20A221DD450
	330	40x75	550	420	1.67	AL-20A331DE450
	470	40x105	500	300	2.10	AL-20A471DF450

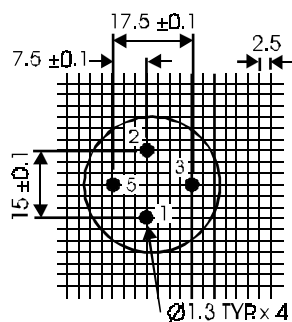
Note: Values of E.S.R. and Impedance quoted above are maximum

ALP Mounting (DIN 41238)

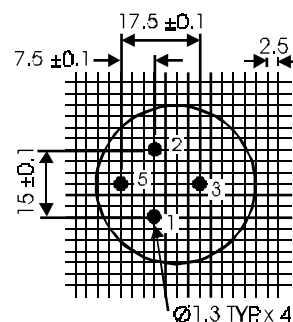
25mm dia can



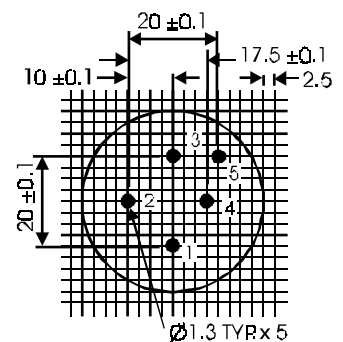
30mm dia can



35mm dia can



40mm dia can



Additional dummy pins are provided for stability. Note that the case and dummy pins may be at negative terminal potential.

(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.

ALP/T22 SERIES

Board Mounting or Solder Tag Terminations

This range of Long Life grade capacitors features a very high CV per unit volume with low e.s.r. and impedance values and high ripple currents. They are ideally suited for use in industrial and commercial applications such as switch mode power supplies and energy storage circuits.

Capacitance range 47 μ F to 150,000 μ F

Capacitance tolerance $\pm 20\%$

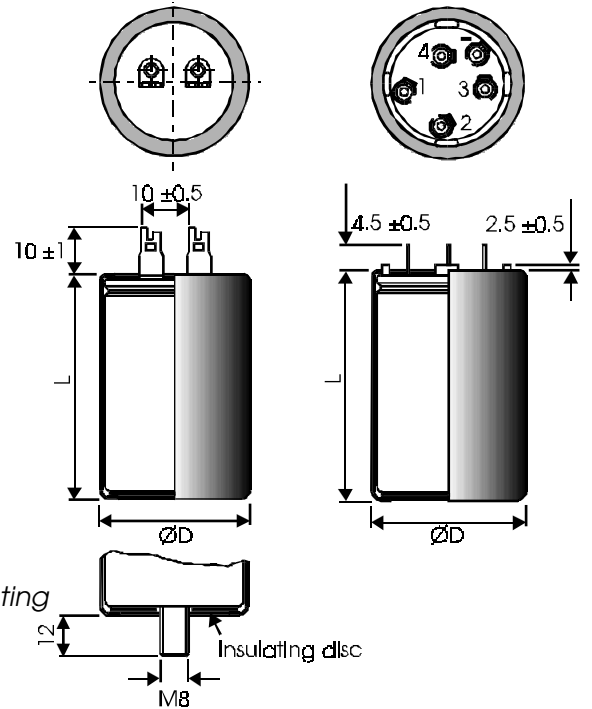
Voltage range 10V to 450V d.c.

Temperature range -40°C to +85°C

Case sizes 25 x 35mm to 40 x 105mm

ALT Tag style

ALP Pin style

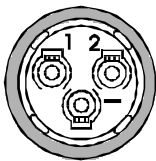


ALT23

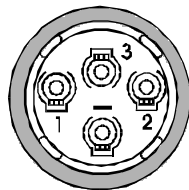
Stud Mounting

ALP Pin configurations

25mm dia can

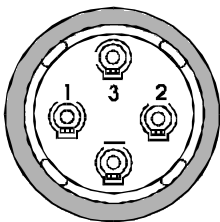


30mm dia can

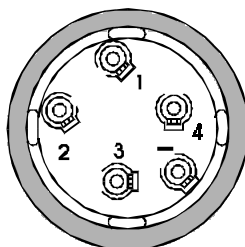


Hole 1 represents +ve

35mm dia can



40mm dia can



DIMENSIONS (sleeved) mm

CASE CODE	D ± 1	L ± 2	MOUNTING CLIP FOR ALT STYLE
AA	25	35	V2/H1
AB	25	45	V2/H1
BB	30	45	-
CB	35	45	V3/H2
CD	35	55	V3/H2
DB	40	45	V9
DD	40	55	V9
DE	40	75	V9
DF	40	105	V9

Max torque: stud M8:4NM

Terminations and Mounting

ALT styles are designed for flying lead connection.

ALP styles are designed for printed circuit board mounting to DIN 41238. For details see page 51.

For details of mounting clips and stud mounting kits see page 68/69.

ALP/T22 SERIES

Board Mounting or Solder Tag Terminations

TECHNICAL DATA

Related documents

DIN 41240 & 41238 & 414916-7
IEC 384-4

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.

Charge/discharge

10⁶ 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 $(0.006 C_R U_R + 4) \mu\text{A}$. 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

$\geq 100\text{M}\Omega$ at 100V d.c., across insulating sleeve.

Voltage proof

$\geq 2500\text{V}$ 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 Aerovox.

FREQUENCY CORRECTION

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 multipliers should be applied to the 100Hz ripple current.

RATED VOLTAGE d.c.	FREQUENCY (Hz)				
	50	100	500	1k	$\geq 10\text{k}$
0 - 25	0.89	1.0	1.05	1.06	1.07
40 - 160	0.81	1.0	1.28	1.33	1.39
200 - 450	0.75	1.0	1.54	1.70	1.89

TEMPERATURE CORRECTION

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

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)	LIFE EXPECTANCY (hours)
25	12000
30	15000
35	18000
40	26000

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 code
6. BHC part number
7. Environmental classification

Ordering information

For details of ordering see page 70.

ALP/T22 SERIES

Board Mounting or Solder Tag Terminations

	Rated voltage	Cap μ F	Case Size	ESR $m\Omega$ at 20°C 100Hz	Impedance $m\Omega$ at 20 °C, 10 KHz	Ripple current A at 85°C 100 Hz	Type number (Excluding style ref)
10V d.c. (11.5V surge)	10000	25x35	75	67	2.54	AL-22A103AA010	
	15000	25x45	51	45	3.39	AL-22A153AB010	
	22000	30x45	43	39	4.13	AL-22A223BB010	
	33000	35x45	40	37	4.73	AL-22A333CB010	
	47000	35x55	31	29	5.78	AL-22A473CD010	
	47000	40x45	39	36	5.22	AL-22A473DB010	
	68000	40x55	30	28	6.39	AL-22A683DD010	
	100000	40x75	22	20	8.39	AL-22A104DE010	
150000	40x105	15	14	11.67	AL-22A154DF010		
16V d.c. (18.5V surge)	6800	25x35	79	69	2.48	AL-22A682AA016	
	10000	25x45	54	48	3.30	AL-22A103AB016	
	15000	30x45	45	40	4.04	AL-22A153BB016	
	22000	35x45	41	37	4.67	AL-22A223CB016	
	33000	35x55	32	29	5.69	AL-22A333CD016	
	33000	40x45	40	37	5.15	AL-22A333DB016	
	47000	40x55	31	29	6.29	AL-22A473DD016	
	68000	40x75	22	21	8.39	AL-22A683DE016	
100000	40x105	16	15	11.30	AL-22A104DF016		
25V d.c. (28.5V surge)	4700	25x35	82	73	2.43	AL-22A472AA025	
	6800	25x45	57	50	3.21	AL-22A682AB025	
	10000	30x45	50	45	3.83	AL-22A103BB025	
	15000	35x45	48	44	4.31	AL-22A153CB025	
	22000	35x55	37	34	5.29	AL-22A223CD025	
	22000	40x45	48	44	4.70	AL-22A223DB025	
	33000	40x55	37	34	5.75	AL-22A333DD025	
	47000	40x75	26	24	7.73	AL-22A473DE025	
68000	40x105	18	17	10.65	AL-22A683DF025		
40V d.c. (46V surge)	3300	25x35	82	72	2.43	AL-22A332AA040	
	4700	25x45	57	50	3.21	AL-22A472AB040	
	6800	30x45	52	46	3.76	AL-22A682BB040	
	10000	35x45	50	45	4.23	AL-22A103CB040	
	15000	35x55	39	36	5.15	AL-22A153CD040	
	15000	40x45	50	45	4.61	AL-22A153DB040	
	22000	40x55	39	36	5.60	AL-22A223DD040	
	33000	40x75	27	25	7.58	AL-22A333DE040	
47000	40x105	19	17	10.37	AL-22A473DF040		
63V d.c. (72.5V surge)	2200	25x35	87	75	2.36	AL-22A222AA063	
	3300	25x45	58	51	3.18	AL-22A332AB063	
	4700	30x45	55	49	3.65	AL-22A472BB063	
	6800	35x45	54	49	4.07	AL-22A682CB063	
	10000	35x55	42	38	4.97	AL-22A103CD063	
	10000	40x45	54	48	4.43	AL-22A103DB063	
	10000	40x55	42	38	5.40	AL-22A103DD063	
	15000	40x75	30	27	7.19	AL-22A153DE063	
22000	40x105	20	18	10.11	AL-22A223DF063		
100V d.c. (115V surge)	680	25x35	225	185	1.47	AL-22A681AA100	
	1000	25x45	153	126	1.96	AL-22A102AB100	
	1500	30x45	116	98	2.52	AL-22A152BB100	
	2200	35x45	97	84	3.03	AL-22A222CB100	
	3300	35x55	72	63	3.79	AL-22A332CD100	
	3300	40x45	89	79	3.45	AL-22A332DB100	
	4700	40x55	68	61	4.24	AL-22A472DD100	
	6800	40x75	47	42	5.75	AL-22A682DE100	
10000	40x105	32	28	7.99	AL-22A103DF100		

Note: Values of E.S.R. and Impedance quoted above are maximum

ALP/T22 SERIES

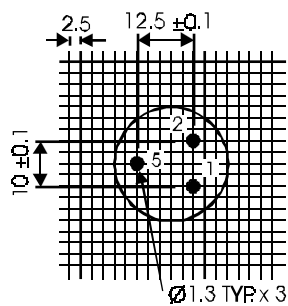
Board Mounting or Solder Tag Terminations

Rated voltage	Cap μF	Case Size	ESR $\text{m}\Omega$ at 20°C 100Hz	Impedance $\text{m}\Omega$ at 20 °C, 10 KHz	Ripple current A at 85°C 100 Hz	Type number (Excluding style ref)
200V d.c. (230 surge)	150	25x35	424	321	1.07	AL-22A151AA200
	220	25x45	289	219	1.43	AL-22A221AB200
	330	30x45	208	161	1.88	AL-22A331BB200
	470	35x45	165	132	2.84	AL-22A471CB200
	680	35x55	121	97	3.58	AL-22A681CD200
	680	40x45	140	116	3.34	AL-22A681DB200
	1000	40x55	104	87	4.19	AL-22A102DD200
	1500	40x75	71	59	5.71	AL-22A152DE200
2200	40x105	48	40	7.95	AL-22A222DF200	
250V d.c. (287V surge)	100	25x35	859	661	0.75	AL-22A101AA250
	150	25x45	573	441	1.01	AL-22A151AB250
	220	30x45	405	315	1.35	AL-22A221BB250
	330	35x45	290	230	2.14	AL-22A331CB250
	470	35x55	209	167	2.72	AL-22A471CD250
	470	40x45	229	186	2.62	AL-22A471DB250
	680	40x55	166	137	3.32	AL-22A681DD250
	1000	40x75	113	93	4.53	AL-22A102DE250
1500	40x105	76	62	6.32	AL-22A152DF250	
385V d.c. (425V surge)	68	25x35	1914	1417	0.50	AL-22A680AA385
	100	25x45	1301	964	0.67	AL-22A101AB385
	150	30x45	884	659	0.91	AL-22A151BB385
	220	35x45	625	471	1.46	AL-22A221CB385
	330	35x55	426	324	1.90	AL-22A331CD385
	330	40x45	450	347	1.88	AL-22A331DB385
	470	40x55	324	252	2.37	AL-22A471DD385
	680	40x75	223	173	3.22	AL-22A681DE385
1000	40x105	151	117	4.49	AL-22A102DF385	
450V d.c. (495V surge)	47	25x35	4180	3020	0.34	ALP22A470AA450
	68	25x45	2890	2085	0.45	ALP22A680AB450
	100	30x45	1980	1430	0.61	ALP22A101BB450
	150	35x45	1330	970	1.00	ALP22A151CB450
	220	35x55	910	665	1.31	ALP22A221CD450
	220	40x45	940	686	1.31	ALP22A221DB450
	330	40x55	630	466	1.70	ALP22A331DD450
	470	40x75	440	322	2.29	ALP22A471DE450
680	40x105	300	222	3.18	ALP22A681DF450	

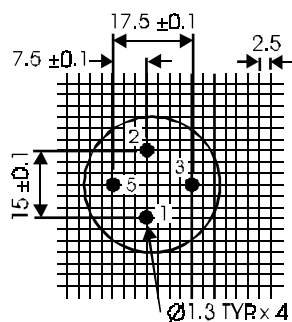
Note: Values of E.S.R. and Impedance quoted above are maximum

ALP Mounting (DIN 41238)

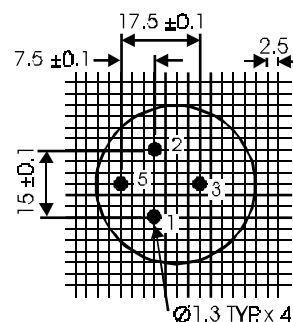
25mm dia can



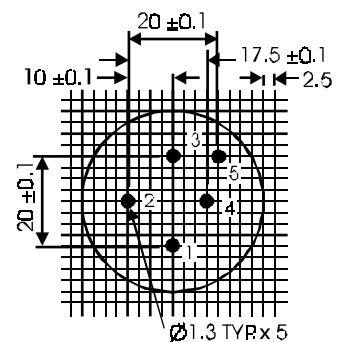
30mm dia can



35mm dia can



40mm dia can



Additional dummy pins are provided for stability. Note that the case and dummy pins may be at negative terminal potential.

(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.

ALC10 SERIES

Board Mounting - Snap-in Terminations

This range of small size capacitors features very high CV per unit volume with low e.s.r. & impedance values and high ripple currents. They are ideally suited for use in industrial and commercial applications such as switch mode power supplies and energy storage circuits.

Capacitance range 56 μ F to 47,000 μ F

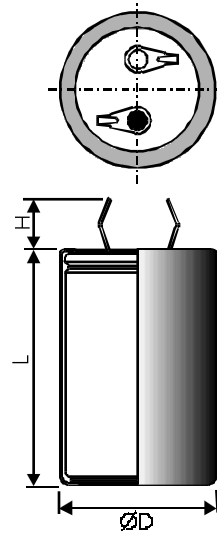
Capacitance tolerance $\pm 20\%$

Voltage range 10V to 450V d.c.

Temperature range -40°C to +85°C

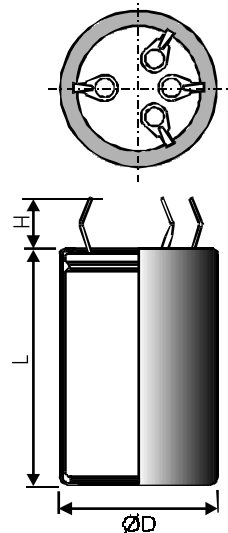
Case sizes 22 x 30mm to 35 x 80mm

ALC10 STYLE A



ALC10 STYLE C

35mm Ø only



Negative denoted by line on sleeve

DIMENSIONS (sleeved) mm

CASE CODE	D	L	H
AB	22	30	6.3
BB	25	30	6.3
AD	22	40	6.3
BC	25	35	6.3
CB	30	30	6.3
BD	25	40	6.3
CC	30	35	6.3
CD	30	40	6.3
DC	35	35	6.3
CF	30	50	6.3
DD	35	40	6.3
DF	35	50	6.3
DH	35	60	6.3
DL	35	80	6.3

ALC10 SERIES

Board Mounting - Snap-in Terminations

TECHNICAL DATA

Related documents

DIN 41240

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.

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 $(0.006 C_R U_R + 4) \mu\text{A}$. 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

$\geq 100\text{M}\Omega$ at 100V d.c., across insulating sleeve.

Voltage proof

$\geq 2500\text{V}$ 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 Aerovox.

FREQUENCY CORRECTION

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 multipliers should be applied to the 100Hz ripple current.

RATED VOLTAGE d.c.	FREQUENCY (Hz)				
	50	100	500	1k	$\geq 10\text{k}$
0 - 35	0.89	1.0	1.05	1.06	1.07
40 - 160	0.81	1.0	1.28	1.33	1.39
200 - 450	0.75	1.0	1.54	1.70	1.89

TEMPERATURE CORRECTION

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

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

Life expectancy

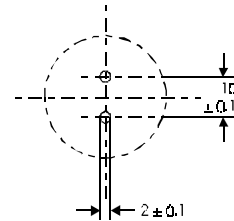
At rated temperature with rated voltage and ripple current applied.

CAN DIAMETER (mm)	LIFE EXPECTANCY (hours)
22	8000
25	10000
30	13000
35	15000

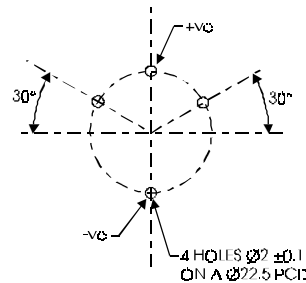
Mounting

These capacitors are designed to be mounted by their terminations alone, and may be used in any position.

2 PIN



4 PIN (35MM Ø ONLY)



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 code
6. BHC part number
7. Environmental classification

Ordering information

For details of ordering see page 70.

ALC10 SERIES

Board Mounting - Snap-in Terminations

Rated voltage	Cap μ F	Case Size	ESR $m\Omega$ at 20°C 100Hz	Impedance $m\Omega$ at 20 °C, 10 KHz	Ripple current A at 85°C 100 Hz	Type number
10V d.c. (11.5V surge)	8,200	22x30	151	136	1.95	ALC10A822AB010
	12,000	25x30	119	107	2.39	ALC10A123BB010
	12,000	22x40	103	93	2.63	ALC10A123AD010
	15,000	25x35	94	85	2.84	ALC10A153BC010
	18,000	30x30	102	92	2.91	ALC10A183CB010
	18,000	25x40	80	72	3.23	ALC10A183BD010
	22,000	30x35	80	72	3.46	ALC10A223CC010
	27,000	30x40	69	62	3.91	ALC10A273CD010
	33,000	35x35	74	67	3.98	ALC10A333DC010
	39,000	30x50	52	47	4.89	ALC10A393CF010
	39,000	35x40	64	58	4.48	ALC10A393DD010
47,000	35x50	49	44	5.55	ALC10A473DF010	
16V d.c. (18.5V surge)	6,800	22x30	139	122	2.03	ALC10A682AB016
	8,200	25x30	128	113	2.30	ALC10A822BB016
	10,000	22x40	94	83	2.76	ALC10A103AD016
	10,000	25x35	101	89	2.74	ALC10A103BC016
	12,000	30x30	115	101	2.74	ALC10A123CB016
	12,000	25x40	87	77	3.10	ALC10A123BD016
	18,000	30x35	87	77	3.32	ALC10A183CC016
	22,000	30x40	75	66	3.75	ALC10A223CD016
	22,000	35x35	86	76	3.69	ALC10A223DC016
	27,000	30x50	59	52	4.59	ALC10A273CF016
	27,000	35x40	74	65	4.17	ALC10A273DD016
39,000	35x50	55	48	5.23	ALC10A393DF016	
25V d.c. (28.5V surge)	4700	22x30	139	118	2.03	ALC10A472AB025
	5600	25x30	129	110	2.29	ALC10A562BB025
	6800	22x40	95	81	2.74	ALC10A682AD025
	8200	25x35	95	81	2.82	ALC10A822BC025
	10000	30x30	113	96	2.76	ALC10A103CB025
	10000	25x40	81	69	3.21	ALC10A103BD025
	12000	30x35	88	75	3.30	ALC10A123CC025
	15000	30x40	75	64	3.75	ALC10A153CD025
	18000	35x35	85	72	3.71	ALC10A183DC025
	18000	30x50	59	50	4.59	ALC10A183CF025
	22000	35x40	74	63	4.17	ALC10A223DD025
27000	35x50	55	47	5.23	ALC10A273DF025	
35V d.c. (40V surge)	3300	22x30	145	120	2.00	ALC10A332AB035
	4700	25x30	127	107	2.31	ALC10A472BB035
	5600	22x40	98	82	2.70	ALC10A562AD035
	6800	25x35	97	81	2.80	ALC10A682BC035
	8200	30x30	114	95	2.75	ALC10A822CB035
	8200	25x40	83	70	3.17	ALC10A822BD035
	10000	30x35	89	75	3.28	ALC10A103CC035
	12000	30x40	76	64	3.73	ALC10A123CD035
	15000	35x35	86	72	3.70	ALC10A153DC035
	15000	30x50	59	49	4.59	ALC10A153CF035
	18000	35x40	75	63	4.16	ALC10A183DD035
22000	35x50	55	46	5.23	ALC10A223DF035	

Note: Values of E.S.R. and Impedance quoted above are maximum

ALC10 SERIES

Board Mounting - Snap-in Terminations

Rated voltage	Cap μ F	Case Size	ESR m Ω at 20°C 100Hz	Impedance m Ω at 20 °C, 10 KHz	Ripple current A at 85°C 100 Hz	Type number
40V d.c. (46V surge)	2700	22x30	148	121	1.97	ALC10A272AB040
	3900	25x30	125	103	2.33	ALC10A392BB040
	3900	22x40	101	83	2.66	ALC10A392AD040
	4700	25x35	99	81	2.77	ALC10A472BC040
	5600	30x30	115	94	2.74	ALC10A562CB040
	5600	25x40	85	70	3.14	ALC10A562BD040
	6800	30x35	90	74	3.26	ALC10A682CC040
	8200	30x40	77	63	3.70	ALC10A822CD040
	10000	35x35	86	71	3.69	ALC10A103DC040
	12000	30x50	59	48	4.59	ALC10A123CF040
	12000	35x40	75	62	4.14	ALC10A123DD040
	18000	35x50	55	45	5.23	ALC10A183DF040
50V d.c. (57V surge)	1800	22x30	175	140	1.85	ALC10A182AB050
	2700	25x30	137	110	2.23	ALC10A272BB050
	2700	22x40	125	100	2.43	ALC10A272AD050
	3300	25x35	114	91	2.60	ALC10A332BC050
	3900	30x30	113	91	2.75	ALC10A392CB050
	3900	25x40	99	80	2.94	ALC10A392BD050
	5600	30x35	91	73	3.25	ALC10A562CC050
	6800	30x40	80	65	3.63	ALC10A682CD050
	8200	35x35	81	65	3.82	ALC10A822DC050
	8200	30x50	68	54	4.33	ALC10A822CF050
	10000	35x40	73	59	4.23	ALC10A103DD050
	12000	35x50	60	48	5.05	ALC10A123DF050
63V d.c. (72.5V surge)	1500	22x30	199	157	1.70	ALC10A152AB063
	2200	25x30	149	118	2.13	ALC10A222BB063
	2200	22x40	149	118	2.19	ALC10A222AD063
	2700	25x35	128	101	2.43	ALC10A272BC063
	3300	30x30	112	88	2.77	ALC10A332CB063
	3300	25x40	112	88	2.73	ALC10A332BD063
	4700	30x35	91	72	3.24	ALC10A472CC063
	5600	30x40	83	66	3.56	ALC10A562CD063
	6800	35x35	75	59	3.95	ALC10A682DC063
	6800	30x50	75	59	4.07	ALC10A682CF063
	8200	35x40	69	55	4.31	ALC10A822DD063
	10000	35x50	64	51	4.85	ALC10A103DF063
100V d.c. (115V surge)	680	22x30	355	266	1.27	ALC10A681AB100
	1000	25x30	243	182	1.67	ALC10A102BB100
	1200	22x40	203	152	1.88	ALC10A122AD100
	1200	25x35	203	152	1.93	ALC10A122BC100
	1500	30x40	163	122	2.30	ALC10A152CB100
	1500	25x40	163	122	2.27	ALC10A152BD100
	1800	30x35	137	103	2.64	ALC10A182CC100
	2200	30x40	113	85	3.05	ALC10A222CD100
	2700	35x35	92	69	3.57	ALC10A272DC100
	3300	30x50	76	57	4.05	ALC10A332CF100
	3300	35x40	76	57	4.11	ALC10A332DD100
	4700	35x50	55	41	5.23	ALC10A472DF100

Note: Values of E.S.R. and Impedance quoted above are maximum

ALC10 SERIES

Board Mounting - Snap-in Terminations

Rated voltage	Cap μ F	Case Size	ESR $m\Omega$ at 20°C 100Hz	Impedance $m\Omega$ at 20 °C, 10 KHz	Ripple current A at 85°C 100 Hz	Type number
200V d.c. (230V surge)	220	22x30	727	509	0.89	ALC10A221AB200
	330	25x30	486	340	1.18	ALC10A331BB200
	330	22x40	486	340	1.21	ALC10A331AD200
	390	25x35	412	288	1.36	ALC10A391BC200
	470	30x30	343	240	1.58	ALC10A471CB200
	470	25x40	343	240	1.56	ALC10A471BD200
	560	30x35	288	202	1.82	ALC10A561CC200
	680	30x40	238	167	2.10	ALC10A681CD200
	820	35x35	198	139	2.43	ALC10A821DC200
	1000	30x50	163	114	2.76	ALC10A102CF200
	1000	35x40	163	114	2.81	ALC10A102DD200
1500	35x50	110	77	3.70	ALC10A152DF200	
250V d.c. (287V surge)	180	22x30	888	577	0.80	ALC10A181AB250
	220	25x30	727	473	0.97	ALC10A221BB250
	270	22x40	593	385	1.10	ALC10A271AD250
	270	25x35	593	385	1.13	ALC10A271BC250
	330	30x30	486	316	1.33	ALC10A331CB250
	330	25x40	486	316	1.31	ALC10A331BD250
	470	30x35	343	223	1.67	ALC10A471CC250
	560	30x40	288	187	1.91	ALC10A561CD250
	680	35x35	238	155	2.22	ALC10A681DC250
	680	30x50	238	155	2.29	ALC10A681CF250
	820	35x40	198	129	2.55	ALC10A821DD250
	1000	35x50	163	106	3.04	ALC10A102DF250
	1000	35x50	163	106	4.11	ALC10C102DF250
1200	35x60	140	100	5.07	ALC10C122DH250	
1800	35x80	100	82	6.42	ALC10C182DL250	
400V d.c. (440V surge)	68	22x30	2345	1524	0.50	ALC10A680AB400
	100	25x30	1596	1037	0.65	ALC10A101BB400
	100	22x40	1596	1037	0.67	ALC10A101AD400
	120	25x35	1330	864	0.75	ALC10A121BC400
	150	30x30	1065	692	0.90	ALC10A151CB400
	150	25x40	1065	692	0.89	ALC10A151BD400
	180	30x35	888	577	1.04	ALC10A181CC400
	220	30x40	727	473	1.20	ALC10A221CD400
	270	35x35	593	385	1.41	ALC10A271DC400
	330	30x50	486	316	1.60	ALC10A331CF400
	330	35x40	486	316	1.63	ALC10A331DD400
	470	35x50	343	223	2.10	ALC10A471DF400
	470	35x50	343	223	3.36	ALC10C471DF400
	560	35x60	264	184	4.05	ALC10C561DH400
	820	35x80	181	127	5.18	ALC10C821DL400
450V d.c. (495V surge)	56	22x30	4267	2774	0.37	ALC10A560AB450
	68	25x30	3515	2285	0.44	ALC10A680BB450
	82	22x40	2915	1895	0.50	ALC10A820AD450
	100	25x35	2391	1554	0.56	ALC10A101BC450
	120	30x30	1993	1295	0.66	ALC10A121CB450
	120	25x40	1993	1295	0.65	ALC10A121BD450
	150	30x35	1596	1037	0.77	ALC10A151CC450
	180	30x40	1330	864	0.89	ALC10A181CD450
	220	35x35	1089	708	1.04	ALC10A221DC450
	220	30x50	1089	708	1.07	ALC10A221CF450
	270	35x40	888	577	1.20	ALC10A271DD450
	330	35x50	727	473	1.44	ALC10A331DF450
	330	35x50	400	258	2.99	ALC10C331DF450
	470	35x60	290	190	3.73	ALC10C471DH450
	680	35x80	200	131	4.75	ALC10C681DL450

Note: Values of E.S.R. and Impedance quoted above are maximum

ALC40 SERIES

Board Mounting - Snap-in Terminations

This range of small size Long Life capacitors has snap-in terminals for PCB mounting. It offers high CV per unit volume coupled with high ripple currents and long life performance. The extended temperature range allows increased ripple currents when operated at lower temperatures.

Capacitance range 33 μ F to 82,000 μ F

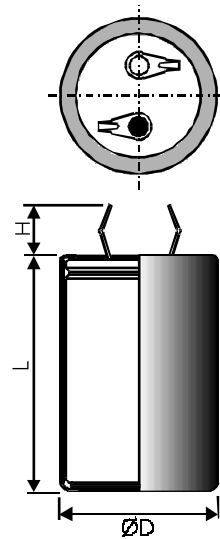
Capacitance tolerance $\pm 20\%$

Voltage range 10V to 450V d.c.

Temperature range -40°C to +105°C

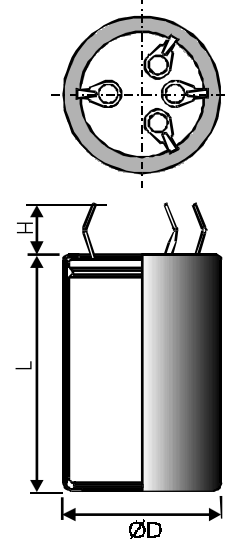
Case sizes 22 x 30mm to 35 x 80mm

ALC40 STYLE A



ALC40 STYLE C

35mm \varnothing only



Negative denoted by line on sleeve

DIMENSIONS (sleeved) mm

CASE CODE	D -0 +1	L ± 2	H ± 1
AB	22	30	6.3
BB	25	30	6.3
AD	22	40	6.3
BC	25	35	6.3
CB	30	30	6.3
BD	25	40	6.3
CC	30	35	6.3
CD	30	40	6.3
DC	35	35	6.3
CF	30	50	6.3
DD	35	40	6.3
DF	35	50	6.3
DF	35	50	6.3
DH	35	60	6.3
DL	35	80	6.3

ALC40 SERIES

Board Mounting - Snap-in Terminations

TECHNICAL DATA

Related documents

IEC 384-4

Temperature range

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

Surge voltage

1000 surges (30 seconds) at 105°C with surge voltage applied. See electrical characteristics.

Charge/discharge

10⁶ 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 $(0.006 C_R U_R + 4) \mu\text{A}$. 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

$\geq 100\text{M}\Omega$ at 100V d.c., across insulating sleeve.

Voltage proof

$\geq 2500\text{V}$ 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 Aerovox.

FREQUENCY CORRECTION

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:

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

A = 100Hz ripple current

B = 10kHz ripple current

F = Required frequency (Hz)

TEMPERATURE CORRECTION

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

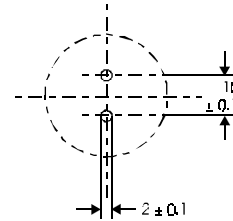
At rated temperature with rated voltage and ripple current applied.

CAN DIAMETER (mm)	LIFE EXPECTANCY (hours)
22	4000
25	6000
30	7000
35	8000

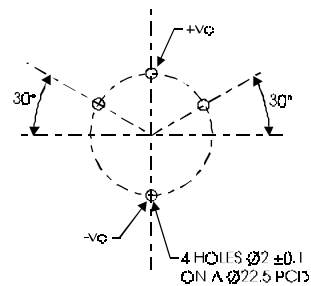
Mounting

These capacitors are designed to be mounted by their terminations alone, and may be used in any position.

2 PIN



4 PIN (35MM Ø ONLY)



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 code
6. BHC part number
7. Environmental classification

Ordering information

For details of ordering see page 70.

ALC40 SERIES

Board Mounting - Snap-in Terminations

Rated voltage	Cap μ F	Case Size	ESR $m\Omega$ at 20°C 100Hz	Impedance $m\Omega$ at 20 °C, 10 KHz	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
	68000	35x50	61	55	4.85	5.03	ALC40A683DF010
	82000	35x50	58	53	4.85	5.05	ALC40A823DF010
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
	39000	35x40	94	85	3.41	3.58	ALC40A393DD016
47000	35x50	69	62	4.41	4.63	ALC40A473DF016	
56000	35x50	68	61	4.41	4.63	ALC40A563DF016	
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
	33000	35x50	70	63	4.32	4.61	ALC40A333DF025
	39000	35x50	69	62	4.32	4.61	ALC40A393DF025
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
	18000	30x50	76	66	3.85	4.19	ALC40A183CF035
	18000	35x40	99	87	3.25	3.55	ALC40A183DD035
	22000	35x50	73	64	4.22	4.59	ALC40A223DF035
	27000	35x50	71	63	4.22	4.59	ALC40A273DF035

Note: Values of E.S.R. and Impedance quoted above are maximum

ALC40 SERIES

Board Mounting - Snap-in Terminations

Rated voltage	Cap μ F	Case Size	ESR $m\Omega$ at 20°C 100Hz	Impedance $m\Omega$ at 20 °C, 10 KHz	Ripple current A at 105°C 100 Hz	Ripple current A at 105°C 10 KHz	Type number
40V d.c. (46V surge)	2700	22x30	259	207	1.69	1.92	ALC40A272AB040
	3300	22x40	202	160	2.26	2.60	ALC40A332AD040
	3900	25x40	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
	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
	15000	35x40	100	87	3.18	3.53	ALC40A153DD040
18000	35x50	73	64	4.12	4.58	ALC40A183DF040	
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
10000	35x40	104	88	3.08	3.52	ALC40A103DD050	
12000	35x50	77	65	3.98	4.56	ALC40A123DF050	
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
	6800	30x50	92	75	3.39	3.93	ALC40A682CF063
	6800	35x35	141	119	2.50	2.90	ALC40A682DC063
	8200	35x40	116	99	2.87	3.33	ALC40A822DD063
	10000	35x50	85	72	3.71	4.31	ALC40A103DF063
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
	2700	35x40	146	118	2.41	3.07	ALC40A272DD100
3300	35x50	108	86	3.12	3.97	ALC40A332DF100	

Note: Values of E.S.R. and Impedance quoted above are maximum

ALC40 SERIES

Board Mounting - Snap-in Terminations

Rated voltage	Cap μ F	Case Size	ESR $m\Omega$ at 20°C 100Hz	Impedance $m\Omega$ at 20 °C, 10 KHz	Ripple current A at 105°C 100 Hz	Ripple current A at 105°C 10 KHz	Type number
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
	820	30x50	196	140	2.18	3.16	ALC40A821CF200
	820	35x35	252	191	1.70	2.34	ALC40A821DC200
	1000	35x40	208	158	1.95	2.69	ALC40A102DD200
	1200	35x50	159	119	2.50	3.48	ALC40A122DF200
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
	560	30x50	243	168	1.96	3.02	ALC40A561CF250
	560	35x35	297	217	1.57	2.25	ALC40A561DC250
	680	35x40	245	179	1.80	2.59	ALC40A681DD250
	820	35x50	190	137	2.29	3.34	ALC40A821DF250
	820	35x50	190	137	3.97	4.66	ALC40C821DF250
	1000	35x60	164	125	4.86	5.78	ALC40C102DH250
1500	35x80	112	90	6.18	7.27	ALC40C152DL250	
350V d.c. (385V surge)	82	22x30	1233	789	0.60	1.18	ALC40A820AB350
	100	22x40	1002	638	0.75	1.53	ALC40A101AD350
	120	22x40	841	537	0.81	1.62	ALC40A121AD350
	120	25x30	868	562	0.75	1.39	ALC40A121BB350
	150	25x35	694	449	0.89	1.64	ALC40A151BC350
	180	25x40	578	374	1.04	1.92	ALC40A181BD350
	180	30x30	618	410	0.95	1.60	ALC40A181CB350
	220	30x35	502	332	1.14	1.94	ALC40A221CC350
	270	30x40	410	272	1.31	2.22	ALC40A271CD350
	330	35x35	378	260	1.38	2.16	ALC40A331DC350
	390	30x50	287	191	1.73	2.89	ALC40A391CF350
	390	35x40	317	218	1.57	2.48	ALC40A391DD350
	470	35x50	251	170	1.98	3.19	ALC40A471DF350
	560	35x50	224	155	2.05	3.20	ALC40A561DF350
	470	35x50	251	170	3.38	4.72	ALC40C471DF350
	560	35x60	224	155	4.09	5.88	ALC40C561DH350
	820	35x80	150	102	5.22	7.47	ALC40C821DL350

Note: Values of E.S.R. and Impedance quoted above are maximum

ALC40 SERIES

Board Mounting - Snap-in Terminations

Rated voltage	Cap μ F	Case Size	ESR $m\Omega$ at 20°C 100Hz	Impedance $m\Omega$ at 20 °C, 10 KHz	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	0.54	1.04	ALC40A680AB400
	82	22x40	1415	923	0.67	1.33	ALC40A820AD400
	100	22x40	1166	762	0.73	1.43	ALC40A101AD400
	100	25x30	1193	788	0.68	1.25	ALC40A101BB400
	120	25x35	991	653	0.79	1.46	ALC40A121BC400
	150	25x40	794	524	0.94	1.73	ALC40A151BD400
	150	30x30	835	562	0.87	1.47	ALC40A151CB400
	180	30x35	690	463	1.04	1.77	ALC40A181CC400
	220	30x40	565	379	1.19	2.03	ALC40A221CD400
	270	35x35	503	348	1.27	1.99	ALC40A271DC400
	330	30x50	383	258	1.59	2.66	ALC40A331CF400
	330	35x40	413	286	1.47	2.29	ALC40A331DD400
	390	35x50	335	229	1.83	2.94	ALC40A391DF400
	470	35x50	293	203	1.91	2.97	ALC40A471DF400
	390	35x50	335	229	3.09	4.66	ALC40C391DF400
	470	35x60	293	203	3.73	5.78	ALC40C471DH400
	680	35x80	200	131	4.75	7.36	ALC40C681DL400
450V d.c. (495V surge)	33	22x30	4211	2897	0.43	1.07	ALC40A330AB450
	47	22x40	2955	2032	0.54	1.37	ALC40A470AD450
	47	25x30	2977	2055	0.58	1.46	ALC40A470BB450
	56	25x35	2494	1720	0.55	1.26	ALC40A560BC450
	68	25x40	2055	1417	0.64	1.48	ALC40A680BD450
	68	30x30	2092	1453	0.75	1.74	ALC40A680CB450
	82	30x35	1730	1200	0.70	1.46	ALC40A820CC450
	100	30x40	1419	984	0.84	1.77	ALC40A101CD450
	120	35x35	1220	856	0.96	2.03	ALC40A121DC450
	150	30x50	951	661	1.20	2.60	ALC40A151CF450
	150	35x40	980	689	1.05	1.98	ALC40A151DD450
	180	35x50	804	562	1.21	2.27	ALC40A181DF450
	220	35x50	673	474	1.51	2.94	ALC40A221DF450
	220	35x50	550	278	2.28	4.71	ALC40C221DF450
	330	35x60	382	198	2.91	5.53	ALC40C331DH450
470	35x80	268	138	3.70	7.08	ALC40C471DL450	

Note: Values of E.S.R. and Impedance quoted above are maximum

PF SERIES

Energy Discharge Capacitors

A range of aluminium electrolytic capacitors designed for rapid energy charge/discharge applications where low resistance and leakage currents are critical. These capacitors are specifically designed for each application and employ double anode techniques, with robust internal construction, which allows the maximum CV per unit volume to be achieved. Additionally single anode construction is employed for heavy duty applications, i.e. high repetition rates, and where CV per unit volume is not so critical. Other features of this range include minimal capacitance losses after thousands of discharges and good storage characteristics. Historically this range has found applications in; portable and studio photographic flash equipment, lasers, stroboscopes, magnetisation of permanent magnets, medical and research equipment.

TECHNICAL DATA

Climatic category

20/70/21

Container form

Cylindrical aluminium can fitted with an insulating base disc and heat shrink PVC sleeve.

Terminations

Available as either upright or low profile roll solder tag, solder pin or screw terminal.

Mounting

Plain or stud mounted cans. Insulated or non-insulated stud mounting kit available.

D.C. leakage current

This is measured at 20°C and full rated d.c. voltage. After 5 minutes, the leakage current shall not exceed the following:

$$I_L (\mu A) = (0.003 \times C_R \times U_R)$$

Where:

C_R = Rated capacitance μF

U_R = Rated d.c. voltage

TYPICAL DATA

Capacitance range 500 μF to 3,300 μF

Voltage range 360V to 500V d.c.

Surge voltage 1.1x rated voltage

Capacitance tolerance -10% +30%

Temperature range -20°C to +70°C

CUSTOM DESIGN

Energy discharge capacitors are designed to meet specific customer requirements. In order to obtain a feasibility complete the form at the back of the catalogue and fax to BHC Aerovox.

Rated voltage (d.c.)

The voltages specified are the maximum for continuous application, within the operating temperature of the capacitor, and should not be exceeded. Typically capacitors are powered at 85% of rated voltage, this has the effect of increasing the capacitor's life expectancy.

Surge voltage (d.c.)

The voltages specified are the maximum for intermittent application and are designed to cater for surges in the supply voltages, these should not exceed the surge voltage ratings.

Life expectancy

50,000 discharges in a flash tube, one every 3 seconds at 40°C.

Typical uses

- 4 discharges per minute continuously
- 1 discharge every 2½ seconds for 100 flashes, then 3 minutes rest period.
- 1 discharge every 2½ seconds for 300 flashes, then 4 hour rest period.

MS/MD SERIES

Motor Starting Capacitors

A range of aluminium electrolytic capacitors, specifically designed for a.c. operation which help to start the motor by providing a leading current to the auxiliary winding. The capacitor is not permanently connected to the winding of the motor and is switched off after starting, usually automatically. Capacitors for this application are designed for intermittent duty only, and must be capable of withstanding the a.c. voltage applied to the motor during starting. This range of capacitors is housed in a moulded case and carry approvals to VDE 560-8 and comply with the requirements of BS 5267 and IEC 252. The MS series is rated at a single voltage whereas the MD has a dual voltage rating.

Capacitance range 20 μ F to 400 μ F
(approved) - other values available

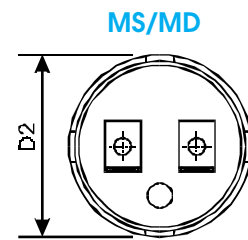
Capacitance tolerance .. $\pm 10\%$ or $-0 +25\%$

Rated voltage MS - 120, 220 and 260 V a.c.
MD - 120/150, 220/280 and 260/330 V a.c.

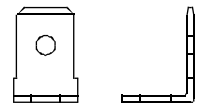
Surge voltage 1.25 x rated voltage

Climatic category 20/60/21

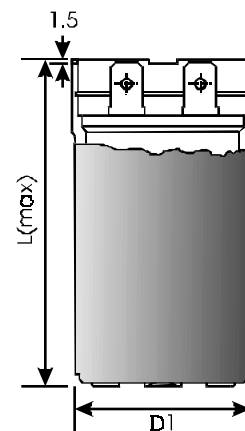
Temperature range -20°C to $+60^{\circ}\text{C}$



Terminations



Single amp, 6.3 faston tags fitted as standard, as shown above, double amp tags are also available.



DIMENSIONS (sleeved) mm

CASE CODE	D1	D2	L MAX	END CAP
AA	± 0.5 38	± 0.5 39	75	1981
AB	38	39	90	1981
AC	38	39	116	1981
BB	46	49	90	1980
BC	46	49	116	1980

APPROVAL CERTIFICATE DETAILS

Voltage		VDE Approval No
MS	MD	MS and MD
120	-	89732
220	220/280	79124
260	260/330	79125

Accessories

The following accessories are also available:-
Cables, Discharge Resistors, End Caps, Clamps, Stud Mountings.

MS/MD SERIES

Motor Starting Capacitors

TECHNICAL DATA

Capacitance

Motor start capacitors are tested as recommended in BS5267 - 'Capacitance shall be determined by measuring the current through the capacitor at the rated voltage and rated frequency of the capacitor.' The current should be read within 3 seconds after energising.'

$$\text{Capacitance } \mu\text{F at 50Hz} = \frac{3180 \times I}{V}$$

Where: I = current in amperes
V = applied voltage in volts

Voltage rating (a.c.)

Due to the presence of the auxiliary start winding, the voltage appearing on the motor start capacitor is usually higher than that of the motor or line voltage. The voltage generally rises with the speed of the motor and varies with the motor load during start-up. Unloaded conditions can give voltages of 15% more than that of loaded.

It is essential that the capacitor is disconnected before the voltage exceeds its maximum voltage rating.

Rated voltage r.m.s.	Maximum cut-off voltage r.m.s.
120	150
220	275
260	325
280	350
330	413

Dual Voltage Rating

The MD range of BHC Aerovox capacitors is designed with a dual voltage rating. The lower voltage rating relates to a duty cycle of 1.67% and the upper voltage rating relates to a duty cycle of 0.55%.

Power Factor

The tangent of the loss angle for motor start capacitors shall not exceed 0.1 and shall be calculated as follows:

$$\tan \delta = \frac{W}{V \times I} = \frac{\text{true watts}}{\text{apparent watts}}$$

Duty cycle

The standard rating is 1.67% or 1/60th full time and corresponds to a maximum duty of 20 starts, each of three seconds duration per hour. It is expressed following BS5267: 1967 and IEC publication 252: 1975, as 3/1.67 (a 3 minute cycle with 1.67% duration during which the capacitor may be energised). If the same capacitor is to be used for a duty cycle of 60 starts per hour the cycle duration will be 1 minute. The operation time per cycle will then have to be reduced to 1.67% of 1 minute (ie 1 second). Alternative duty cycles are available on request. Most popular are 0.55% and 1%.

Presence of a run capacitor

When the motor is fitted with both starting and run capacitors, consideration should be given to fitting of the appropriate discharge resistor to the starting capacitor. This is to protect the run capacitor from damage through discharge of the starting capacitor.

Container form

Cylindrical mouldings, meeting creepage and clearance distances, according to IEC 335-1 and flammability ratings according to UL94-V2 and V0.

Discharge resistors

A discharge resistor may be fitted to a motor start capacitor to prevent electrical overstress of the capacitor and or for safety reasons. In accordance with BS5267 and IEC 252, the resistor value should be such that it reduces the voltage on the capacitor, from the line voltage to less than 50V within 60 secs.

The resistor value may be approximated as follows:

$$R \text{ (K } \Omega) \text{ max} = \frac{T}{\text{Rated capacitance } \mu\text{F}}$$

Rated V d.c.	T
120	50,000
220	32,000
260	30,000
280	28,000
330	26,000

STANDARD RESISTOR VALUES

VALUE - OHMS	WATTAGE
5.6K	2W
15K	2W
33K	0.5W
56K	1W
82K	2W
100K	1W

Shelf life

Capacitors may be stored for periods up to 2 years without detriment, but after longer periods it is a safe guard to test them before putting into service. In service the oxide film, which is the dielectric of the capacitor, is maintained in good condition because any imperfections permit a current to pass and the resulting electrolysis forms a new oxide layer. Deterioration of the film takes place if the capacitor is stored for long periods and it is preferable for the 'reforming' of the film to be brought about before the capacitor is subject to its full duty. If a motor start capacitor is already connected to the motor the reforming can be achieved by freeing the motor from its load and switching on several times.

Capacitor Marking

The capacitors are marked with all the items from the following list as a minimum:

1. Rated capacitance in μF
2. Rated voltage a.c.
3. Duty cycle
4. Frequency
5. Temperature range
6. Date code
7. BHC Aerovox part number
8. Climatic category
9. Approvals

MS/MD SERIES

Motor Starting Capacitors

	Cap µF	Case Size D1 x L	Type number	
			Tolerance -0 +25%	Tolerance ±10%
120V r.m.s. Rated voltage (150V surge) Duty cycle 1.67%	25	38 x 75	025MS12AAMA0STD	025MS12AAMK0STD
	30	38 x 75	030MS12AAMA0STD	030MS12AAMK0STD
	35	38 x 75	035MS12AAMA0STD	035MS12AAMK0STD
	40	38 x 75	040MS12AAMA0STD	040MS12AAMK0STD
	50	38 x 75	050MS12AAMA0STD	050MS12AAMK0STD
	60	38 x 75	060MS12AAMA0STD	060MS12AAMK0STD
	80	38 x 75	080MS12AAMA0STD	080MS12AAMK0STD
	100	38 x 75	100MS12AAMA0STD	100MS12AAMK0STD
	120	38 x 75	120MS12AAMA0STD	120MS12AAMK0STD
	125	38 x 75	125MS12AAMA0STD	125MS12AAMK0STD
	150	38 x 75	150MS12AAMA0STD	150MS12AAMK0STD
	160	38 x 75	160MS12AAMA0STD	160MS12AAMK0STD
	180	38 x 90	180MS12ABMA0STD	180MS12ABMK0STD
	200	38 x 90	200MS12ABMA0STD	200MS12ABMK0STD
	230	38 x 90	230MS12ABMA0STD	230MS12ABMK0STD
	250	38 x 90	250MS12ABMA0STD	250MS12ABMK0STD
	300	38 x 90	300MS12ABMA0STD	300MS12ABMK0STD
	310	38 x 116	310MS12ACMA0STD	310MS12ACMK0STD
	315	38 x 116	315MS12ACMA0STD	315MS12ACMK0STD
	350	38 x 116	350MS12ACMA0STD	350MS12ACMK0STD
400	38 x 116	400MS12ACMA0STD	400MS12ACMK0STD	
220V r.m.s. Rated voltage (275V surge) Duty cycle 1.67%	30	38 x 75	030MS22AAMA0STD	030MS22AAMK0STD
	40	38 x 75	040MS22AAMA0STD	040MS22AAMK0STD
	40	38 x 90	040MS22ABMA0STD	040MS22ABMK0STD
	50	38 x 75	050MS22AAMA0STD	050MS22AAMK0STD
	50	38 x 90	050MS22ABMA0STD	050MS22ABMK0STD
	60	38 x 75	060MS22AAMA0STD	060MS22AAMK0STD
	60	38 x 90	060MS22ABMA0STD	060MS22ABMK0STD
	70	38 x 90	070MS22ABMA0STD	070MS22ABMK0STD
	80	38 x 90	080MS22ABMA0STD	080MS22ABMK0STD
	100	38 x 116	100MS22ACMA0STD	100MS22ACMK0STD
	125	38 x 116	125MS22ACMA0STD	125MS22ACMK0STD
	260V r.m.s. Rated voltage (325V surge) Duty cycle 1.67%	25	38 x 75	025MS26AAMA0STD
30		38 x 75	030MS26AAMA0STD	030MS26AAMK0STD
35		38 x 75	035MS26AAMA0STD	035MS26AAMK0STD
40		38 x 75	040MS26AAMA0STD	040MS26AAMK0STD
40		38 x 90	040MS26ABMA0STD	040MS26ABMK0STD
50		38 x 75	050MS26AAMA0STD	050MS26AAMK0STD
50		38 x 90	050MS26ABMA0STD	050MS26ABMK0STD
60		38 x 75	060MS26AAMA0STD	060MS26AAMK0STD
60		38 x 90	060MS26ABMA0STD	060MS26ABMK0STD
70		38 x 90	070MS26ABMA0STD	070MS26ABMK0STD
70		38 x 116	070MS26ACMA0STD	070MS26ACMK0STD
80		38 x 90	080MS26ABMA0STD	080MS26ABMK0STD
80		38 x 116	080MS26ACMA0STD	080MS26ACMK0STD
90		38 x 90	090MS26ABMA0STD	090MS26ABMK0STD
90		38 x 116	090MS26ACMA0STD	090MS26ACMK0STD
100		38 x 90	100MS26ABMA0STD	100MS26ABMK0STD
100		38 x 116	100MS26ACMA0STD	100MS26ACMK0STD
100		46 x 90	100MS26BBMA0STD	100MS26BBMK0STD
125		38 x 116	125MS26ACMA0STD	125MS26ACMK0STD
125		46 x 90	125MS26BBMA0STD	125MS26BBMK0STD
125		46 x 116	125MS26BCMA0STD	125MS26BCMK0STD
150		46 x 90	150MS26BBMA0STD	150MS26BBMK0STD
150	46 x 116	150MS26BCMA0STD	150MS26BCMK0STD	
200	46 x 116	200MS26BCMA0STD	200MS26BCMK0STD	

All items above are VDE approved

MS/MD SERIES

Motor Starting Capacitors

	Cap µF	Case Size D1 x L	Type number	
			Tolerance -0 +25%	Tolerance ±10%
120V r.m.s. Rated voltage (150V surge)	25	38 x 75	025MD12AAMA0STD	025MD12AAMK0STD
	30	38 x 75	030MD12AAMA0STD	030MD12AAMK0STD
Duty cycle 1.67%	35	38 x 75	035MD12AAMA0STD	035MD12AAMK0STD
	40	38 x 75	040MD12AAMA0STD	040MD12AAMK0STD
150V r.m.s. Rated voltage (188V surge)	50	38 x 75	050MD12AAMA0STD	050MD12AAMK0STD
	60	38 x 75	060MD12AAMA0STD	060MD12AAMK0STD
Duty cycle 0.55%	80	38 x 75	080MD12AAMA0STD	080MD12AAMK0STD
	100	38 x 75	100MD12AAMA0STD	100MD12AAMK0STD
	120	38 x 75	120MD12AAMA0STD	120MD12AAMK0STD
	125	38 x 75	125MD12AAMA0STD	125MD12AAMK0STD
	150	38 x 75	150MD12AAMA0STD	150MD12AAMK0STD
	160	38 x 75	160MD12AAMA0STD	160MD12AAMK0STD
	180	38 x 90	180MD12ABMA0STD	180MD12ABMK0STD
	200	38 x 90	200MD12ABMA0STD	200MD12ABMK0STD
	230	38 x 90	230MD12ABMA0STD	230MD12ABMK0STD
	250	38 x 90	250MD12ABMA0STD	250MD12ABMK0STD
	300	38 x 90	300MD12ABMA0STD	300MD12ABMK0STD
	310	38 x 116	310MD12ACMA0STD	310MD12ACMK0STD
	315	38 x 116	315MD12ACMA0STD	315MD12ACMK0STD
	350	38 x 116	350MD12ACMA0STD	350MD12ACMK0STD
	400	38 x 116	400MD12ACMA0STD	400MD12ACMK0STD
220V r.m.s. Rated voltage (275V surge)	30	38 x 75	030MD22AAMA0STD	030MD22AAMK0STD
	40	38 x 75	040MD22AAMA0STD	040MD22AAMK0STD
Duty cycle 1.67%	40	38 x 90	040MD22ABMA0STD	040MD22ABMK0STD
	50	38 x 75	050MD22AAMA0STD	050MD22AAMK0STD
280V r.m.s. Rated voltage (350V surge)	50	38 x 90	050MD22ABMA0STD	050MD22ABMK0STD
	60	38 x 75	060MD22AAMA0STD	060MD22AAMK0STD
Duty cycle 0.55%	60	38 x 90	060MD22ABMA0STD	060MD22ABMK0STD
	70	38 x 90	070MD22ABMA0STD	070MD22ABMK0STD
	80	38 x 90	080MD22ABMA0STD	080MD22ABMK0STD
	100	38 x 116	100MD22ACMA0STD	100MD22ACMK0STD
	125	38 x 116	125MD22ACMA0STD	125MD22ACMK0STD
260V r.m.s. Rated voltage (325V surge)	25	38 x 75	025MD26AAMA0STD	025MD26AAMK0STD
	30	38 x 75	030MD26AAMA0STD	030MD26AAMK0STD
Duty cycle 1.67%	35	38 x 75	035MD26AAMA0STD	035MD26AAMK0STD
	40	38 x 75	040MD26AAMA0STD	040MD26AAMK0STD
330V r.m.s. Rated voltage (413V surge)	40	38 x 90	040MD26ABMA0STD	040MD26ABMK0STD
	50	38 x 75	050MD26AAMA0STD	050MD26AAMK0STD
Duty cycle 0.55%	50	38 x 90	050MD26ABMA0STD	050MD26ABMK0STD
	60	38 x 75	060MD26AAMA0STD	060MD26AAMK0STD
	60	38 x 90	060MD26ABMA0STD	060MD26ABMK0STD
	70	38 x 90	070MD26ABMA0STD	070MD26ABMK0STD
	70	38 x 116	070MD26ACMA0STD	070MD26ACMK0STD
	80	38 x 90	080MD26ABMA0STD	080MD26ABMK0STD
	80	38 x 116	080MD26ACMA0STD	080MD26ACMK0STD
	90	38 x 90	090MD26ABMA0STD	090MD26ABMK0STD
	90	38 x 116	090MD26ACMA0STD	090MD26ACMK0STD
	100	38 x 90	100MD26ABMA0STD	100MD26ABMK0STD
	100	38 x 116	100MD26ACMA0STD	100MD26ACMK0STD
	100	46 x 90	100MD26BBMA0STD	100MD26BBMK0STD
	125	38 x 116	125MD26ACMA0STD	125MD26ACMK0STD
	125	46 x 90	125MD26BBMA0STD	125MD26BBMK0STD
	125	46 x 116	125MD26BCMA0STD	125MD26BCMK0STD
	150	46 x 90	150MD26BBMA0STD	150MD26BBMK0STD
	150	46 x 116	150MD26BCMA0STD	150MD26BCMK0STD
	200	46 x 116	200MD26BCMA0STD	200MD26BCMK0STD

The items highlighted in bold are VDE approved

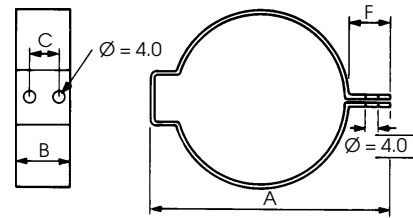
ACCESSORIES

Mounting Clips

DIMENSIONS mm

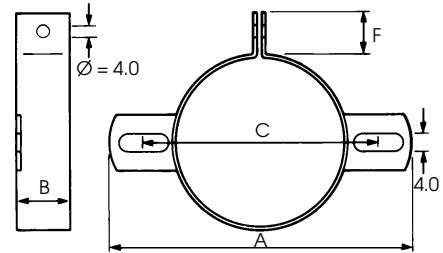
Horizontal Mounting

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

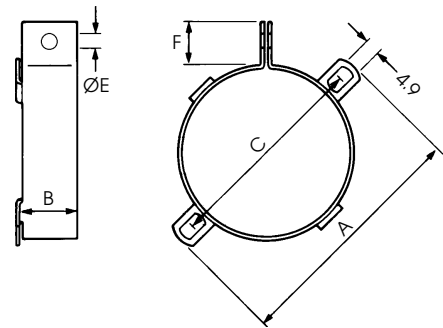


Vertical Mounting

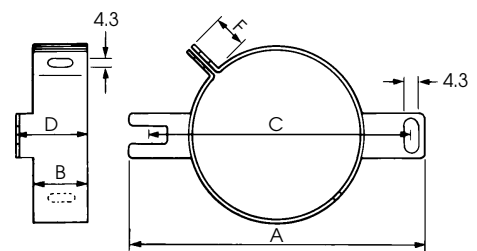
TYPE	CAN DIA	A	B	C	F
V2	25.0	49.0	19.0	37.0	10.0
V3	35.0	58.0	19.0	45.0	9.0
V9	40.0	65.0	19.0	52.4	9.5



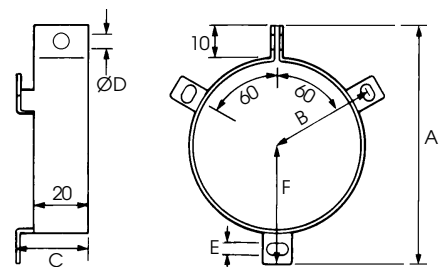
TYPE	CAN DIA	A	B	C	E	F
V4	51.0	75.0	25.4	64.0	5.0	10.0
V6	45.0	69.5	17.4	58.0	4.0	10.0
V8	63.5	88.9	25.4	77.5	5.0	9.5



TYPE	CAN DIA	A	B	C	E	F
UTE2736	35.0	63.0	12.2	54.0	17.2	10.0



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



Material

Zinc plated steel

Note

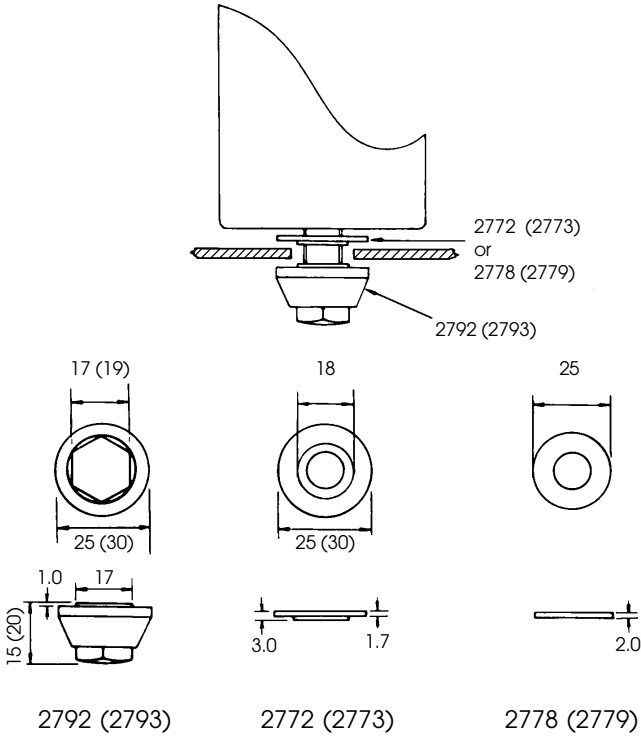
When using mounting clamps care should be taken not to obscure any safety vent in the can.

ACCESSORIES

Stud Mounting Kits

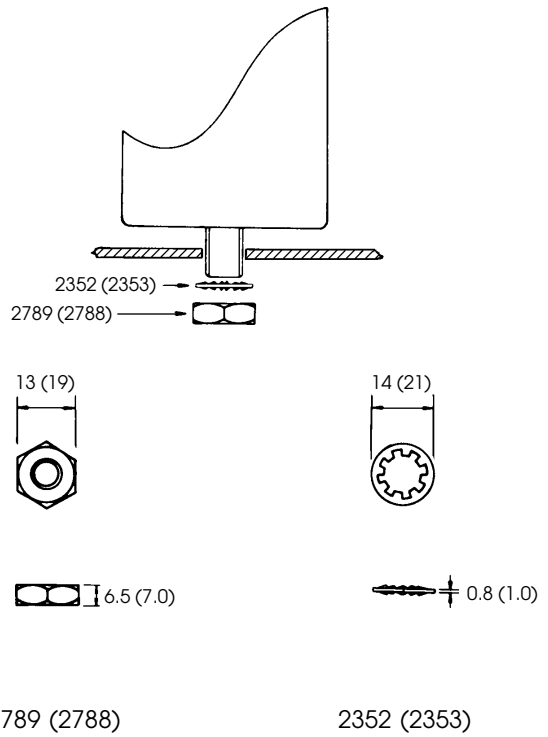
INSULATED VERSION

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

Part code	Description	Kit order number			
		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	-	-	●	-
2792	Nylon nut M8	●	-	-	-
2793	Nylon nut M12	-	●	-	-
Kit description		Insulated M8	Insulated M12	Non-insulated M8	Non-insulated M12

SPECIAL KITS

Part code	Description	Kit order number						
		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	●	-	-	●	●	-	-

ORDERING

SCREW TERMINAL CAPACITORS

ALS20/21, ALS27/29, **AL S 30 A 682 RP 350**
 ALS30/31, ALS40/41,
 ALS60/61

ALUMINIUM ELECTROLYTIC
 SCREW TERMINAL
 RANGE MOUNTING STYLE
 20, 29, 30, 40, 60 plain can
 21, 27, 31, 41, 61 stud can
 TERMINATION STYLE
 A, B or C
 CAPACITANCE μF
 (first two digits equals
 first two significant figures;
 third digit is no. of zeros
 following eg. 223 = 22,000 μF)
 CASE SIZE (code)
 RATED VOLTAGE d.c.

PCB MOUNTING AND SOLDER TAG CAPACITORS

ALP10, ALP20, ALP22, **AL P 10A 223 DF 040**
 ALT10/11, ALT20/21,
 ALT22/23

ALUMINIUM ELECTROLYTIC
 TERMINATION STYLE
 T = Tag, P = Pin
 RANGE MOUNTING STYLE
 10A, 20A, 22A plain can
 11A, 21A, 23A stud can
 Stud only available on ALT series
 CAPACITANCE μF
 (first two digits equals
 first two significant figures;
 third digit is no. of zeros
 following eg. 223 = 22,000 μF)
 CASE SIZE (code)
 RATED VOLTAGE d.c.

SNAP-IN CAPACITORS

ALC10, ALC40 SERIES **AL C 10 A 272 AB 040**

ALUMINIUM ELECTROLYTIC
 SNAP IN
 RANGE 10, 40
 TERMINATION STYLE
 A = 2 Pin, C = 4 Pin
 CAPACITANCE μF
 (first two digits equals
 first two significant figures;
 third digit is no. of zeros
 following eg. 272 = 2,700 μF)
 CASE SIZE (code)
 RATED VOLTAGE d.c.

MOTOR START CAPACITORS

MS SERIES **080 MS 22 AB M A 0 STD**
 MD SERIES

CAPACITANCE 080 = 80 μF
 TYPE
 MS = Motor start single rating
 MD = Motor start dual rating
 VOLTAGE
 22 = 220V RMS (rated)
 CASE SIZE (code)
 MANUFACTURING STYLE
 M = moulded case
 CAPACITANCE TOLERANCE
 A = -0% +25% K = $\pm 10\%$
 TERMINAL CODE
 0 = single amp tag (standard)
 1 = double amp tag, 2 = special variant
 VARIANTS
 STD = standard design, all other codes used
 to identify customer and/or special requirements

SPECIAL PART NUMBERS

AL S 30 A 1001 MF

ALUMINIUM ELECTROLYTIC
 TYPE, I.E. SCREW TERMINAL
 RANGE AND MOUNTING STYLE
 TERMINATION STYLE
 SEQUENTIAL NUMBER UNIQUE TO DESIGN
 CASE CODE

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

NS 4 B / 123

"NON-STANDARD"
 RANGE
 STYLE
 SEQUENTIAL NUMBER UNIQUE TO DESIGN

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.

SPECIAL APPLICATIONS

CUSTOM DESIGNS

BHC Aerovox prides itself on its ability to provide special designs unique to an individual customer's requirements. The company has a history of working alongside design teams to provide the exact solution to a particular problem. It has been made possible because of our in house foil forming capability with continuous developments in electrolyte technology and small batch manufacturing methods. This has enabled BHC Aerovox to adopt a more flexible

approach to the products it produces. This flexible approach allows variants on the standard ranges for case sizes, voltage ranges, capacitance values, temperature ranges, ripple currents, life expectancy, and most of the other electrical parameters. To obtain a feasibility of a capacitor for a special application, the form at the back of the catalogue should be completed, with as much information as possible, and faxed to BHC Aerovox.

AUDIO APPLICATIONS

BHC Aerovox, in collaboration with an audio research company DNM design, have produced the Slit Foil Capacitor specially 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. 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 Aerovox manufacture a range of capacitors for this type of application in screw terminal, solder tag or board mounting.

Capacitance range 1,100 μ F to 22,000 μ F

Capacitance tolerance \pm 20%

Voltage range 25V to 100V d.c.

Temperature range -40°C to +85°C

Typical examples of our range are

CAPACITANCE μ F	RATED VOLTAGE	STYLES*	DIMENSIONS (D x L) mm
8,200	50	ALC	35 x 50
10,000	50	ALP	40 x 55
15,000	50	ALP	40 x 65
1,100	63	ALP	30 x 45
4,700	63	ALT	35 x 55
10,000	63	ALC	35 x 75
22,000	63	ALT	40 x 105
15,000	80	ALS	63 x 83

* See individual product pages for detailed information

MAINTENANCE REPLACEMENT PURPOSES

Older ranges of BHC Aerovox capacitors that are no longer contained in this catalogue may still be available for maintenance or replacement purposes. It should be stressed, however, that for new applications, where the capacitor is being designed in, only the ranges included in this catalogue should be used to guarantee availability.

Older ranges available:

Screw Terminal ALS10/11 series

Pin/Tag KA/KB series

Snap in ALC20 and ALC50 series

Motor start Styles S & C

FAX MESSAGE

To:	Sales Department	From:	
Company:	BHC Aerovox Ltd	Company:	
Fax:	01305 760670	Department	
Date:		Phone:	
Pages:		Fax:	

SPECIAL DESIGN REQUEST

Customer Details				
Contact Name	Reply Req'd by			
Ext. Number	Potential (pcs/year)			
Specification	Currently using			
Product Details	Item 1	Item 2	Item 3	Item 4
Type				
Capacitance				
Tolerance				
Voltage				
Can Size				
Plain or Stud can				
Terminals				
Temp.range				
Additional Notes				
Operating conditions, i.e. ripple current, temperature				
Required Life				