

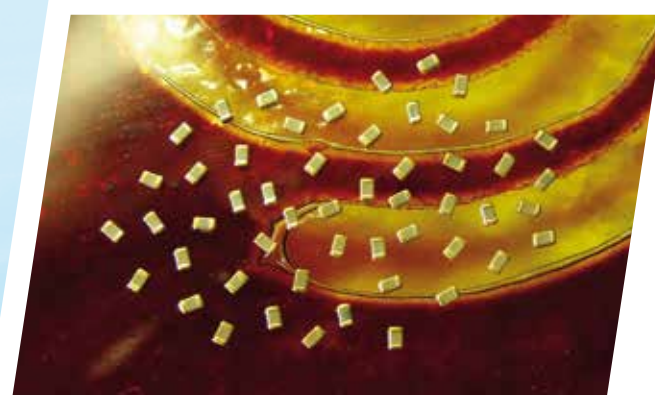
# Heritage - Success Story.

## Our Heritage

Today, we draw on the experience and expertise gained on numerous platforms to remain a leading supplier of multilayer ceramic capacitors (MLCC) and assemblies for military and commercial space programs, utilizing state-of-the-art design, manufacturing and control systems to meet and exceed customer requirements for reliability, performance and value.

## Knowles space grade platforms

- Alphasat
- Astra
- Cosmo NG
- Curiosity (Mars Rover MSL)
- Eumetsat
- Fermi Gamma Ray Space Telescope (formerly GLAST) Space Observatory
- Galileo
- GEO 4
- Globalstar
- GPS III
- Hispasat
- Hotbird
- Intelsat
- Iridium
- Iridium Next
- Juno
- Mars Science Lab
- MeTop
- MSL CHEMIN
- Rover
- Sentinel
- SES
- Sinosat
- Taurus II and Castor 30 Rocket Programs
- Vinasat



www.knowlescapers.com



DLI•JohansonMFG•Novacap•Syfer•Voltronics

Knowles Capacitors designs, manufactures and sells special electronic components. Our products are used in military, space, telecom infrastructure, medical and industrial applications where function and reliability are crucial.



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# Space Heritage Products



# Knowles Space A



Knowles manufactures quality multilayer ceramic components supplied to a worldwide customer base.

Customers utilise Knowles' components in all types of applications including: telecoms, industrial, automotive, military, aerospace, space and medical.

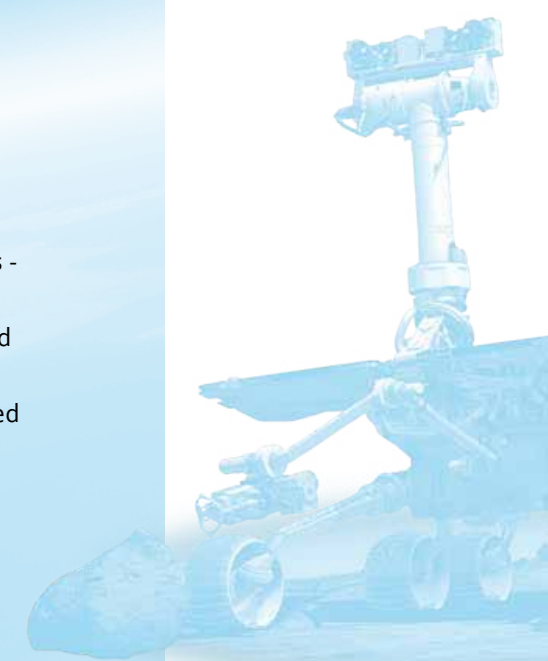
Different applications require corresponding reliability grade components. Knowles' state-of-the-art manufacturing and test equipment in the Suzhou facility is supported by an integrated management system approved to ISO 9001.



## Knowles reliability grade components

- IECQ-CECC ranges
- High Reliability Chip
- DSCC Approved Capacitor Assemblies
- SO2A Space ranges
- High Temperature Capacitors - HiT range
- High Reliability Radial Leaded Capacitors
- DSCC Approved Radial Leaded Capacitors
- EMI filters for High Rel applications

**FlexiCap** Flexible epoxy polymer termination material available.





# IECQ-CECC ranges

## Specialty High Rel. and approved parts

A range of specialist, high reliability, multilayer ceramic capacitors for use in critical or high reliability environments. All fully tested / approved and available with a range of suitable termination options, including tin/lead plating and Knowles FlexiCap™.

Ranges include:

1. Range tested and approved in accordance with IECQ-CECC QC32100.
2. Range qualified to the requirements of Knowles detail specification S02A-0100 (based on ESCC 3009).

COG/NP0 and X7R - 16V to 1kV



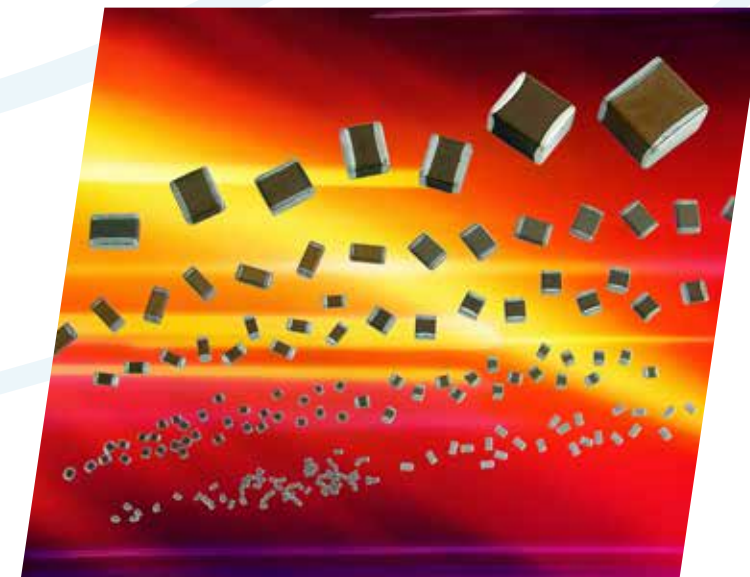
# High Reliability Chip Capacitors

A range of MLC chip capacitors in Ultra stable EIA Class I and II dielectrics with special testing for long term reliability. They are designed for optimum reliability, burned in at elevated voltage and temperature and 100% physically and electrically inspected to ascertain conformance to strict performance criteria. Units may be tested in accordance with MIL-PRF-55681, MIL-PRF-123, MIL-PRF-49467 or customer SCD.

Designed for surface mount application with nickel barrier terminations making them suitable for solder wave and reflow solder board attachment as well as vapor phase attachment for part sizes 2225 or smaller. Silver-palladium terminations are also available for hybrid use with conductive epoxy.

COG/NP0 chips are used in precision circuitry requiring Class I stability and exhibit linear temperature coefficient, low loss and stable electrical properties with time, voltage and frequency. Class II X7R chips are used as decoupling, by-pass, filtering and transient voltage suppression elements and exhibit +/-15% temperature coefficient and predictable variation of electrical properties with time, temperature and voltage.

COG/NP0 and X7R - 16Vdc to 10kVdc



# DSCC Approved Capacitor Assemblies

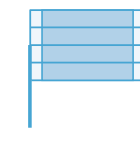


A range of switch mode leaded capacitor assemblies in three approved DSCC 87106 case codes sizes.

50V to 500V - N & J style leads



Lead Style N



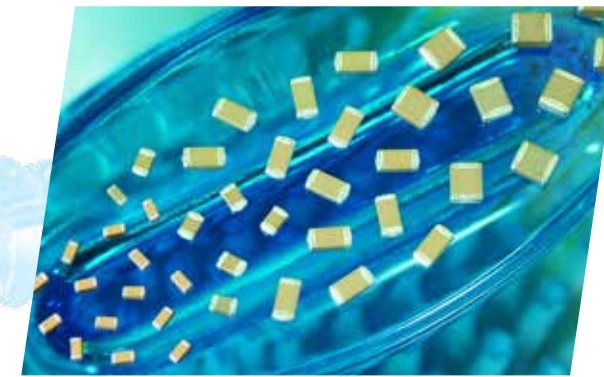
Lead Style J



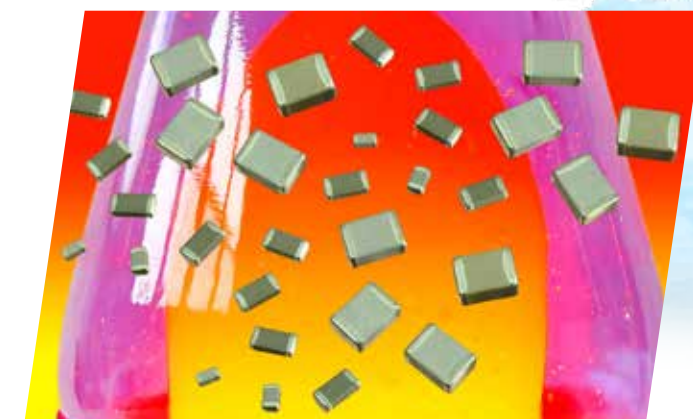
# S02A Space ranges

Knowles manufactures a range of COG/NP0 and X7R dielectric MLCCs which conform to Knowles Space specification S02A 0100 (based on ESCC 3009).

COG/NP0 and X7R - 16V to 500V



# High Temperature Capacitors - HiT range



The HiT range of multilayer ceramic capacitors is suitable for a variety of high temperature applications up to 200°C including: oil exploration, geothermal, military, automotive under-hood and avionics.

This range is manufactured to exacting standards using our unique screen printing process. This provides a high quality component suitable for demanding applications.

High Temperature 200°C  
COG/NP0 and X7R - 16V to 630V



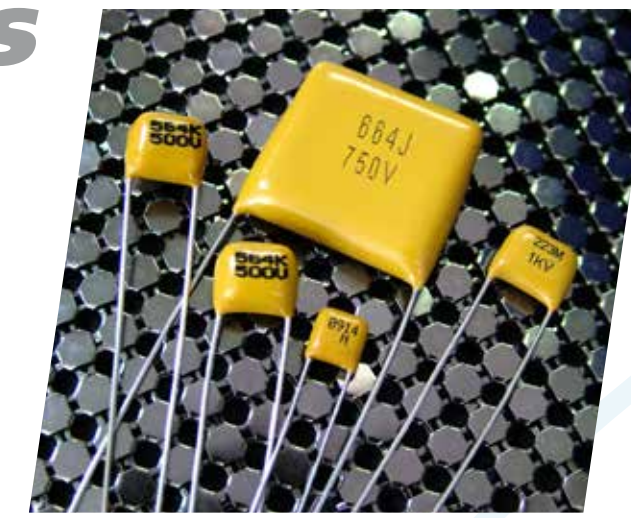
# High Reliability & DSCC Approved Radial Leaded Caps

Radial Leaded Capacitors available in COG/NP0 and X7R characteristics with special testing for long term reliability. In addition a range of High Voltage leaded capacitors are also available in ten DSCC approved specifications (Novacap Vendor CAGE code is 65238).

The conformal coating and lead mounting style provide a rugged configuration for optimum performance. Units may be tested to MIL-PRF-49467 and/or MIL-PRF-39014 and find application for High Reliability use such as power supplies, voltage multiplier circuits, aerospace, airborne and military use for radar.

They are also offered without the conformal coating for less harsh environmental applications and as RoHS compliant parts upon request.

COG/NP0 and X7R - 1kV to 10kV



# High-Rel EMI Filters



Knowles is experienced at providing products for the most demanding applications including ESA and NASA Space projects.

Knowles product qualifications include AEC-Q200 and space grade planar arrays and filters.

Special finishes (eg. Sn/Pb) are available for exempt applications such as military and space. Please contact our Sales Office for further details.

Surface Mount Filters are available as C filters (E01, E07), Pi filter (SBSPPP) and X2Y Integrated Passive Components (E03) and are available with Knowles FlexiCap™ flexible epoxy polymer termination material.

The following are qualified to AEC-Q200:

- Surface Mount 'C' Filter (E01 and E07 ranges)
- X2Y Integrated Passive Component (E03 range)

A range of resin Sealed Ceramic based Panel Mount Filters designed and manufactured to meet or exceed the requirements of MIL C 15733 and MIL C 28861 are available. The test methods are in accordance with MIL STD 220 and MIL STD 202 and covers:

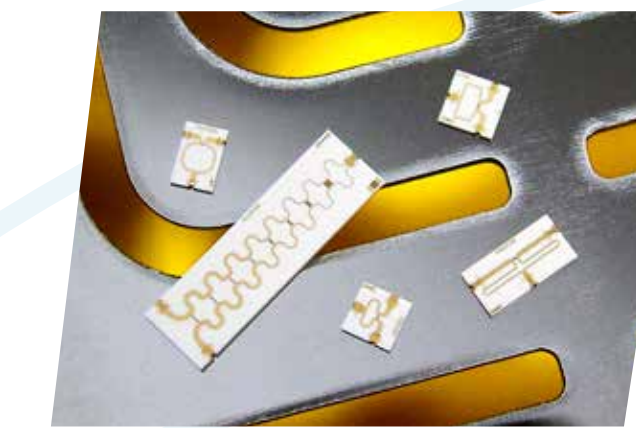
Insertion loss, Solderability, Bump and vibration, Temperature cycling, Humidity and Temperature rise under dc load.

Special test requirements can be accommodated e.g. 100% burn-in.

SM EMI Filters - Panel Mount Filters - Discoidals - Panar Arrays - Special Filters



# Thin Film Technology and Single Layer Caps



Over 10 years of designing custom solutions for very demanding defense and telecom applications has allowed DLI to create a catalog offering of Filters, Power Dividers and other passive devices such as Directional Couplers.

In addition, we continue to support custom requests and offer many other solutions such as Cavity Filters, Diplexers and Gain Equalizers.

## Products

- SM Bandpass Filters
- Lowpass Filters
- Highpass Filters
- Power Dividers
- Couplers
- Cavity Filters
- Diplexers
- Gain Equalizers



## Benefits/Advantages

- Temperature Stable (-55 to +125°C)
- EAR99
- Surface Mount Assembly up to 42 GHz
- Lower Cost of Manufacturing Assembly
- Power Handling (up to 40 Watts)
- High Repeatability – Precision Thin Film Fabrication



## Typical Applications

- Microwave Radar
- Test Equipment
- Switch Filter Banks
- Satellite and Radio Communications
- Synthesizer and filter banks
- 5G Base Stations

2 GHz to 42.5 GHz Frequency Ranges

