

High Capacitance MLCCs

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About Yageo



Founded in 1977, the Yageo Corporation has become a world-class provider of passive component services with capabilities on a global scale, including production and sales facilities in Asia, Europe and the Americas. The corporation provides one-stop-shopping, offering its complete product portfolio of resistors, capacitors and wireless components in both commodity and specialty versions to meet the diverse requirements of customers.

Yageo currently ranks as the world No.1 in chip-resistors, No. 3 in MLCCs and No. 4 in ferrite products, with a strong global presence: 21 sales offices in 15 countries, 9 production sites, 8 JIT logistic hubs, and 2 R&D centers worldwide.

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Functionality

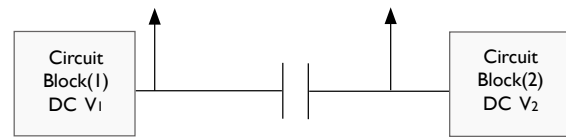
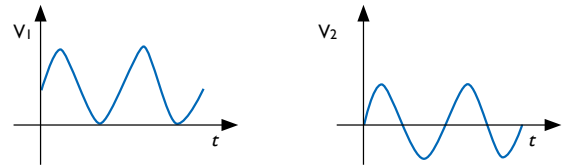
Electrical signals contain various noise components such as EMI or equipment-generated noise. This noise can cause many problems such as crosstalk, false-triggering, or incorrect logic levels. High capacitance MLCCs can be used to reduce these noise signals and provide a more stable operating system.

High-cap MLCCs have the following functions:

1. **Bypassing:** Used in filtering circuits, MLCCs having low capacitance change vs. frequency work to reduce unwanted signals (high-frequency noise) of the supply voltage to ICs, transistors, or other devices.
2. **Decoupling:** In addition to noise reduction, the MLCC works to keep voltage levels independent of each other with the proper capacitor (low-pass) filtering the supply line. The capacitance should be large enough to absorb any load shift of a device.
3. **Smoothing:** When AC signals are changed to DC signals, if the voltage waveform contains too much ripple, a capacitor is used to smooth (absorb) this voltage before it is sent to other circuits. The capacitance should be large enough to absorb the ripple current.

Signal Coupling

Because capacitors pass AC but block DC signals (when charged up to the applied DC voltage), they are often used to separate the AC and DC components of a signal. It is widely used for separating and joining two circuit blocks.

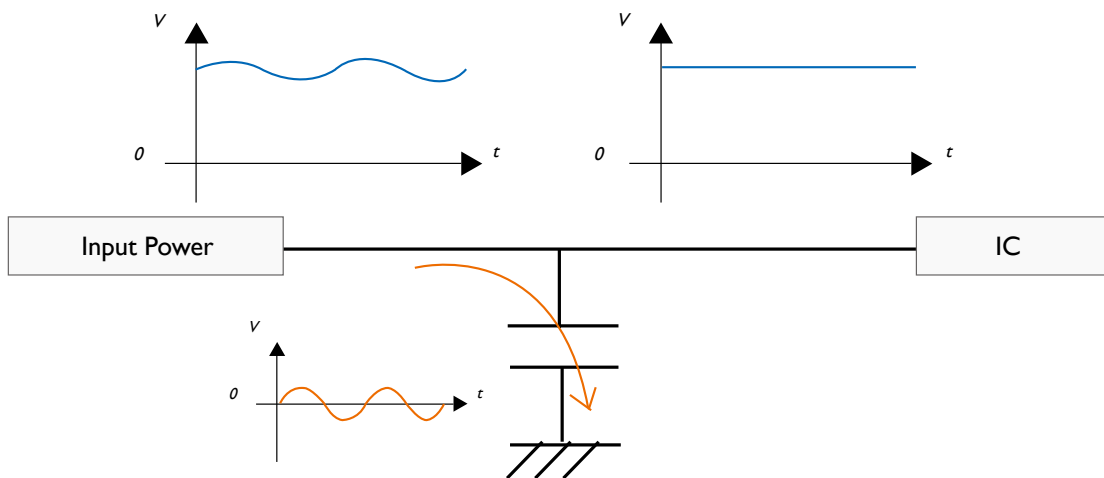


Coupling capacitor separates DC voltages of circuit blocks but couples AC signal.

Decoupling (Bypass)

A decoupling capacitor is a capacitor used to decouple one part of a circuit from another. Noise caused by other circuit elements is shunted through the capacitor, reducing the effect they have on the rest of the circuit. It is most commonly used between the power supply and ground.

An alternative name is bypass capacitor as it is used to bypass the power supply or other high impedance component of a circuit.



Product Selection Tables

X7R Product Range

| Size(inch)Cap | 0402 | 0603 | 0805 | 1206 | 1210 | 1812 | 2220 |
|---------------|------|------|------|------|------|------|------|
| 1uF | 6.3V | 50V | 50V | 100V | 100V | 100V | 50V |
| 2.2uF | --- | 16V | 25V | 50V | 100V | --- | --- |
| 4.7uF | --- | 6.3V | 25V | 50V | 50V | --- | --- |
| 10uF | --- | --- | 16V | 25V | 50V | --- | --- |
| 22uF | --- | --- | --- | 16V | 25V | --- | --- |
| 47uF | --- | --- | --- | --- | 16V | --- | --- |
| 100uF | --- | --- | --- | --- | --- | --- | --- |

X5R Product Range

| Size(inch)Cap | 0201 | 0402 | 0603 | 0805 | 1206 | 1210 |
|---------------|------|------|------|------|------|------|
| 1uF | 10V | 25V | 50V | 50V | 50V | 50V |
| 2.2uF | 6.3V | 25V | 50V | 50V | 50V | 50V |
| 4.7uF | --- | 16V | 25V | 50V | 50V | 50V |
| 10uF | --- | 10V | 25V | 50V | 50V | 50V |
| 22uF | --- | 6.3V | 16V | 10V | 25V | 25V |
| 47uF | --- | --- | 4V | 10V | 16V | 16V |
| 100uF | --- | --- | --- | 6.3V | 6.3V | 16V |
| 220uF | --- | --- | --- | --- | --- | 6.3V |

Y5V Product Range

| Size(inch)Cap | 0402 | 0603 | 0805 | 1206 | 1210 |
|---------------|------|------|------|------|------|
| 1uF | 10V | 25V | 50V | 50V | --- |
| 2.2uF | --- | 16V | 25V | 50V | --- |
| 4.7uF | --- | 10V | 16V | 16V | --- |
| 10uF | --- | --- | 16V | 25V | 50V |
| 22uF | --- | --- | 10V | 16V | 16V |
| 47uF | --- | --- | --- | --- | --- |
| 100uF | --- | --- | --- | --- | --- |

Cross Reference

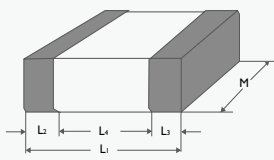
| Size | Yageo | Murata | SEMCO | TDK | TaiyoYuden |
|------|--------|--------|-------|-------|------------|
| 0201 | CC0201 | GRM03 | SL03 | C0603 | MK063 |
| 0402 | CC0402 | GRM15 | SL05 | C1005 | MK105 |
| 0603 | CC0603 | GRM18 | SL10 | C1608 | MK107 |
| 0805 | CC0805 | GRM21 | SL21 | C2012 | MK212 |
| 1206 | CC1206 | GRM31 | SL31 | C3216 | MK316 |
| 1210 | CC1210 | GRM32 | SL32 | C3225 | MK325 |
| 1812 | CC1812 | GRM43 | SL43 | C4532 | --- |

Product Portfolio

Electrical Characteristics

| Type | TC | Operating Temp range | Capacitance range | Voltage range | Tolerance |
|--------|-----|----------------------|-------------------|---------------|-------------|
| CC0201 | X5R | -55°C to 85°C | 1uF ~ 2.2uF | 6.3V ~ 10V | ±20% |
| CC0402 | X5R | -55°C to 85°C | 1uF ~ 22uF | 6.3V ~ 25V | ±10%, ±20% |
| | X7R | -55°C to 125°C | 1uF | 6.3V | ±10% |
| | Y5V | -30°C to 85°C | 1uF | 6.3V ~ 10V | +80% ~ -20% |
| CC0603 | X5R | -55°C to 85°C | 1uF ~ 47uF | 6.3V ~ 50V | ±10%, ±20% |
| | X7R | -55°C to 125°C | 1uF ~ 4.7uF | 6.3V ~ 50V | ±10% |
| | Y5V | -30°C to 85°C | 1uF ~ 4.7uF | 10V ~ 16V | +80% ~ -20% |
| CC0805 | X5R | -55°C to 85°C | 1uF ~ 100uF | 6.3V ~ 50V | ±10%, ±20% |
| | Y5V | -30°C to 85°C | 1uF ~ 22uF | 6.3V ~ 50V | +80% ~ -20% |
| | X7R | -55°C to 125°C | 1uF ~ 10uF | 6.3V ~ 50V | ±10% |
| CC1206 | X5R | -55°C to 85°C | 1uF ~ 100uF | 6.3V ~ 50V | ±10%, ±20% |
| | X7R | -55°C to 125°C | 1uF ~ 22uF | 6.3V ~ 100V | ±10% |
| | Y5V | -30°C to 85°C | 1uF ~ 22uF | 10V ~ 50V | +80% ~ -20% |
| CC1210 | X5R | -55°C to 85°C | 1uF ~ 220uF | 6.3V ~ 50V | ±10%, ±20% |
| | X7R | -55°C to 125°C | 1uF ~ 47uF | 6.3V ~ 100V | ±10% |
| | Y5V | -30°C to 85°C | 10uF ~ 22uF | 6.3V ~ 25V | +80% ~ -20% |
| CC1812 | X7R | -55°C to 125°C | 1uF | 50V | ±10% |
| CC2220 | X7R | -55°C to 125°C | 1uF | 50V | ±10% |

Dimensions

|  | Inch-based | Metric | L1 (mm) | W (mm) | L2 / L3 (mm) | | L4 (mm) |
|---|------------|--------|-----------|------------|--------------|------|---------|
| | | | | | min. | max. | min. |
| | | | | | | | |
| | 0201 | 0603M | 0.6 ±0.03 | 0.3 ±0.03 | 0.1 | 0.2 | 0.2 |
| | 0402 | 1005M | 1.0 ±0.05 | 0.5 ±0.05 | 0.15 | 0.3 | 0.4 |
| | 0603 | 1608M | 1.6 ±0.10 | 0.8 ±0.10 | 0.2 | 0.6 | 0.4 |
| | 0805 | 2012M | 2.0 ±0.10 | 1.25 ±0.10 | 0.25 | 0.75 | 0.55 |
| | 1206 | 3216M | 3.2 ±0.15 | 1.6 ±0.15 | 0.25 | 0.75 | 1.4 |
| | 1210 | 3225M | 3.2 ±0.20 | 2.5 ±0.20 | 0.25 | 0.75 | 1.4 |
| | 1812 | 4532M | 4.5 ±0.20 | 3.2 ±0.20 | 0.25 | 0.75 | 2.2 |
| | 2220 | 5750M | 5.7 ±0.40 | 5.0 ±0.30 | 0.25 | 0.75 | 3.4 |

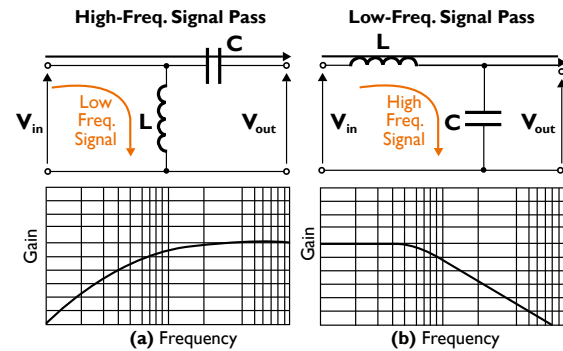
Note : Actual product specifications, please refer to datasheet



Noise Filter and Snubbers

When an inductive circuit is opened, the current through the inductance collapses quickly, creating a large voltage across the open circuit of the switch or relay. A snubber capacitor across the newly opened circuit creates a path for this impulse to bypass the contact points, thereby preserving their life; these are commonly found in contact breaker ignition systems.

Similarly, in smaller scale circuits, the spark may not be enough to damage the switch but will still radiate undesirable radio frequency interference (RFI), which a filter capacitor absorbs. Snubber capacitors are usually employed with a low-value resistor in series, to dissipate energy and minimize RFI. Such resistor-capacitor combinations are available in a single package.



Filtering functions of capacitor coupled with inductor
(a) High Pass Filter (b) Low Pass Filter

Applications

Consumer, industrial and communications applications, which often have very different mounting and soldering processes, and different substrates, are exposed to a wide range of application conditions. It is therefore necessary to relate their characteristics to typical applications and to consider the application limitations. Surface-mount technology is at a dynamic stage of development in its search for new components, quest for further miniaturization, improved processing, and so on.



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Power Management



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- Peripherals

Computers & Peripherals



- Infrastructure
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- Electrical grids
- Solar & wind energy

Alternative Energy

Introduction

High Performance and High Reliability

The four cornerstones of technology required to manufacture high performance and high reliability high-cap MLCCs are: material technology, thin-film processing technology, production technology and base metal technology.

Being vertically-integrated from material processing to production technology, Yageo is able to manufacture high-performance and high-reliability, high-cap MLCCs, controlling the production process from beginning to end.

Thanks to unique material technology, Yageo offers many types of Multi-Layer Ceramic Capacitors (MLCCs), including commodity, high-capacitance, high voltage, soft termination, and high frequency.

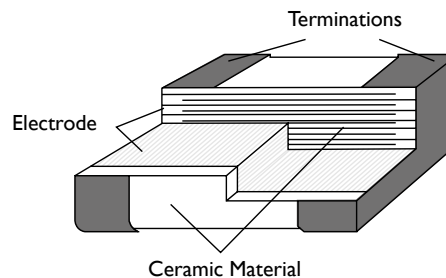
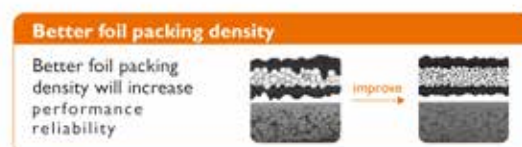
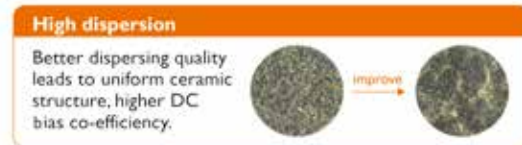
The dielectric material of Yageo's CC series ranges through NP0, X5R, X7R and Y5V, with standard EIA chip sizes available, a wide-range of capacitances for various circuit needs, rugged terminations (lead-free), and the capability to be used in both reflow and wave soldering systems.

Yageo MLCCs provide outstanding performance, reliability and cost advantages for circuit designers. The capacitors are for both paper- and plastic- embossed, tape-and-reel packaging for automatic SMD placement. High capacitance MLCCs are high-end products in terms of capacitance to accommodate trends in the electronic industry towards convergence, multi-functionality, and miniaturization.

In this subcategory, we cover 1 μ F - 220 μ F, depending on the case size. The available capacitance range is expanding year by year, and is particularly focused on the smaller MLCCs, with continuous R&D of the core technologies for thinner layers.

Main Features of Yageo's High Capacitance MLCCs

- Materials: X5R, X7R and Y5V
- Wide selection of sizes: from 0201 to 2220
- Capacitance range from 1 μ F to 220 μ F
- Working voltage rated from 6.3V - 100V
- Highly-reliable tolerance and high-speed automatic chip placement on PCBs
- Highly-resistant termination metal
- Tape & reel for surface mount assembly



Surface mount multilayer ceramic capacitor construction

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