

Analysis for the Lowest Cost 0603 0.1uF X7R 50V Capacitor

Executive Summary

The analysis of the 0603 0.1uF X7R 50V Multilayer Ceramic Capacitor (MLCC) market reveals distinct cost-effective sourcing opportunities, heavily influenced by procurement volume and distributor specialization. For large-scale procurement, specifically quantities exceeding 60,000 units, Samsung Electro-Mechanics' CL10B104KB8NNNC and KYOCERA AVX's 06035C104K4T2A, predominantly available through Future Electronics, present the most competitive unit costs, reaching as low as \$0.0031 and \$0.0084, respectively.¹ Furthermore, TDK's C1608X7R1H104K080AA demonstrates exceptionally low pricing, potentially as low as \$0.001 to \$0.003 per unit for very high quantities, though these offers often originate from non-traditional distributors and necessitate rigorous quality verification.² Conversely, for smaller to medium quantities, typically ranging from 1 to 1,000 units, the unit prices from major authorized distributors such as Digi-Key and Mouser are considerably higher, fluctuating between \$0.013 and \$0.10 per unit.³

The market for MLCCs is characterized by robust growth, propelled by the increasing demand for miniaturized components in consumer electronics, the expansion of 5G infrastructure, the proliferation of Internet of Things (IoT) devices, and the rapid electrification within the automotive sector.⁶ The 0603 case size, X7R dielectric, and low-voltage (up to 50V) segments collectively hold a dominant position within the MLCC market, indicating both high demand and mature production capabilities for the specified capacitor.⁸ Despite this market expansion, the MLCC supply chain continues to navigate challenges, including volatility in raw material prices, geopolitical influences such as U.S. export controls on semiconductor technologies that can create ripple effects, and broader logistical disruptions. These factors underscore the necessity for proactive risk mitigation strategies in procurement.¹¹

To optimize procurement, it is recommended that organizations target high-volume purchases from authorized distributors like Future Electronics for Samsung

Electro-Mechanics and KYOCERA AVX components. While exploring non-traditional channels for TDK parts at extremely high volumes might yield lower prices, it is imperative to conduct thorough due diligence on quality and authenticity. A critical aspect of cost-effectiveness involves carefully evaluating lead times and immediate stock availability, as the true "lowest cost" must account for potential delays. Implementing robust supply chain resilience strategies, including diversifying suppliers across different manufacturers and distributors, and maintaining strategic inventory buffers, is crucial to mitigate the impact of unforeseen disruptions. Furthermore, factoring in shipping costs and potential tariffs, particularly for international orders or smaller quantities, is essential, as these can significantly impact the total cost of acquisition.

1. Introduction to MLCCs and Analysis Scope

Multilayer Ceramic Capacitors (MLCCs) represent a cornerstone of modern electronic design, functioning as indispensable passive components that perform critical roles such as energy storage, voltage suppression, and signal filtering within diverse electronic circuits.¹⁶ The specific component under examination in this analysis, the 0603 0.1uF X7R 50V capacitor, embodies a set of parameters that define its widespread applicability and market dynamics.

The "0603" designation refers to the capacitor's standard case size in imperial units, measuring 0.06 inches by 0.03 inches. This corresponds to the 1608 metric standard (1.6mm x 0.8mm) and signifies a compact surface-mount technology (SMT) package. The small footprint of this package is a critical attribute for modern electronic designs, where miniaturization is a continuous imperative.³ The "0.1uF" (or 100nF) capacitance value is exceptionally common, making it a workhorse component for applications like decoupling power lines, bypassing unwanted signals, and general filtering in both digital and analog circuits.³ Its ubiquitous use contributes significantly to its high availability and competitive pricing.

The "X7R" dielectric material classification indicates a ferroelectric ceramic known for its temperature stability. X7R capacitors are engineered to exhibit a capacitance change of no more than $\pm 15\%$ across a broad operating temperature range, from -55°C to $+125^{\circ}\text{C}$.³ This characteristic makes them highly suitable for a wide array of general-purpose applications where temperature fluctuations are anticipated, but the

extreme stability offered by other dielectric types (e.g., COG/NPO) is not strictly necessary.²⁰ Finally, the "50V" rating specifies the maximum DC voltage that can be continuously applied to the capacitor without risking damage or performance degradation.³ This voltage falls within the "low voltage" range (defined as up to 75V), a segment that accounts for a substantial 70% of total MLCC production and 32% of the overall market share. This high production volume within the low-voltage category directly translates into more competitive pricing for 50V components.⁸

Given these specifications, the 0603 0.1uF X7R 50V capacitor is widely employed across numerous sectors. In consumer electronics, it is vital for compact, battery-powered devices such as smartphones, tablets, and laptops, where both small size and reliable performance are paramount.⁶ Within automotive electronics, its reliability and temperature resilience make it suitable for advanced driver-assistance systems (ADAS), infotainment systems, and engine control units (ECUs).⁶ The component is also critical for Internet of Things (IoT) devices, including smart home devices and industrial sensors, which demand compact and efficient solutions.⁷ Furthermore, it finds extensive use in industrial automation, where stable and efficient power delivery is essential for various equipment and machinery.⁷

The primary objective of this analysis is to meticulously examine the available market data to pinpoint the most cost-effective sourcing options for the specified MLCC. This involves a granular comparison of unit pricing across a spectrum of quantities from various authorized distributors and, where data permits, directly from manufacturers. Beyond a simple price comparison, the analysis integrates critical factors such as current stock availability, projected lead times, the established reputation for quality and reliability of key manufacturers, and the influence of shipping costs and broader supply chain dynamics. This comprehensive approach aims to equip procurement professionals with actionable intelligence that transcends the superficial unit price, enabling informed decisions that judiciously balance cost-effectiveness with supply chain reliability and component quality to achieve an optimal total cost of ownership.

The request for a 0603 0.1uF X7R 50V capacitor concerns a highly commoditized and universally adopted electronic component. This inherent "standard" nature profoundly shapes its market dynamics. The pervasive availability of these specifications across all major distributors and component aggregators underscores its commonality.¹ This high demand for a standardized product naturally attracts numerous manufacturers and distributors, fostering a highly competitive market environment. In such a landscape, suppliers are compelled to offer aggressive pricing, particularly for higher volumes, to secure and expand their market share. Consequently, the challenge for procurement shifts from merely finding the part to systematically identifying the

absolute lowest cost while simultaneously ensuring supply reliability and acceptable quality. This commoditization often results in a buyer's market for this specific component, where price differentiation becomes a critical factor for competitive advantage.

While the user's primary focus is explicitly on "lowest cost," for a component as ubiquitous as the 0603 0.1uF X7R 50V capacitor, subtle variations in manufacturer quality, consistency, and reliability can have significant long-term implications. For instance, KEMET explicitly notes that the X7R dielectric, while stable, inherently exhibits an aging rate, which describes a decrease in capacitance over time (approximately 1.0% per decade of hours).²⁰ KEMET designs its capacitors to account for this aging, ensuring they remain within specified capacitance tolerance at 1000 hours.²⁰ Other manufacturers also emphasize their robust quality processes.²⁶ Even within a standardized specification like X7R, manufacturers employ different material selections, design rules, and process controls.²⁰ These differences can lead to variations in actual long-term performance, including the rate of capacitance aging or susceptibility to failure modes such as flex cracks.³² A procurement strategy that focuses solely on the lowest unit price, without adequately considering manufacturer reputation and quality control, risks incurring higher downstream costs. These "hidden" costs can manifest as increased warranty claims, product recalls, field failures, or the need for costly rework. For design engineers and product managers, ensuring the long-term reliability of their end product often justifies a slightly higher unit cost for components sourced from manufacturers with a proven track record of quality and robust testing.²⁰ Therefore, this report integrates a discussion of manufacturer quality as a crucial aspect of overall cost-effectiveness.

2. Global MLCC Market Landscape (2024-2025)

The global Multilayer Ceramic Capacitor (MLCC) market is poised for substantial expansion over the coming decade, reflecting its foundational role in the rapidly evolving electronics industry. Projections from various research firms consistently indicate robust growth. One report forecasts an increase from USD 12.87 billion in 2025 to USD 20.99 billion by 2034, demonstrating a Compound Annual Growth Rate (CAGR) of 5.59%.⁶ Another analysis estimates the market at USD 18.77 billion in 2025, anticipating a more aggressive CAGR of 10.8% from 2025 to 2033.⁷ An even more optimistic outlook projects the industry size at USD 20 billion in 2025, escalating to

USD 104.6 billion by 2037 with a CAGR of 14.4%.⁹ These consistently positive, albeit varying, outlooks underscore the dynamic nature and strong growth expectations within the MLCC industry.

This significant market expansion is primarily propelled by several overarching technological and industrial trends. The relentless push for miniaturization in electronic devices drives a continuous demand for compact, high-performance MLCCs, essential for creating smaller, lighter, and more powerful products.⁶ The global rollout of 5G infrastructure and the increasing adoption of Internet of Things (IoT) devices further necessitate large volumes of MLCCs capable of handling high frequencies and supporting complex circuitry in connected ecosystems.⁶ A major catalyst for growth is the rapid electrification of the automotive sector, encompassing electric vehicles (EVs), hybrid electric vehicles (HEVs), and advanced driver-assistance systems (ADAS). Modern vehicles can integrate over 10,000 MLCCs, which are crucial for managing electrical systems, energy storage, and motor control.⁶ Furthermore, the increasing integration of electronics in industrial machinery and the demand for high-frequency MLCCs in advanced computing applications like AI servers and data centers also contribute substantially to market growth.⁷

Geographically, the Asia Pacific region consistently maintains the largest share of the global MLCC market, capturing over 37.4% in 2024 and generating USD 5.53 billion in revenue.⁸ This leadership is primarily attributed to the region's robust electronics manufacturing sector, with countries like China and Japan serving as key driving forces in both production and adoption.⁸ Europe is also anticipated to experience significant growth, with MLCC companies in the region actively developing new types of ceramic capacitors to meet diverse customer needs.⁶

The X7R dielectric MLCCs hold a commanding position in the market, contributing 48% to the overall market share.⁸ This highlights the widespread applicability and reliability of X7R for general-purpose electronic applications, making it a highly sought-after and well-supplied dielectric type. Concurrently, the low voltage range (up to 50V) segment leads the MLCC market with a 32% share, accounting for a substantial 70% of total MLCC production.⁸ This directly aligns with the user's query for a 50V capacitor, indicating that this specific voltage rating benefits from high production volumes and, consequently, competitive pricing. The ongoing trend towards miniaturization also remains a significant market driver. MLCCs smaller than 0603 inches, such as 0402 and 0201, collectively account for 45% of the market volume.⁸ While the current request specifies the 0603 size, the continuous push towards smaller form factors implies that manufacturers are constantly refining their production processes and material science. This innovation in smaller sizes can

indirectly benefit the production efficiency and cost-effectiveness of slightly larger, more mature sizes like 0603, as manufacturing techniques and material advancements often disseminate across product lines.

The MLCC market is dominated by several key global manufacturers renowned for their technological capabilities and extensive production scale. These include Samsung Electro-Mechanics, a recognized global market leader known for its high technological capability in producing high-capacity, ultra-small, and high-reliability MLCCs.²¹ TDK, a world leader in electronic solutions, is particularly recognized for its high-capacitance MLCCs for automotive and commercial applications, driven by its mastery of material science.²⁷ Yageo stands as a world-leading provider of passive components with a broad product portfolio.²⁸ KEMET is known for its high-reliability ceramic products, stringent quality control, and proactive measures to address issues such as tin whisker growth.²⁰ KYOCERA AVX supplies quality MLCCs with a strong focus on miniaturization and high functionality, adhering to stringent quality standards.²⁹ Lastly, Taiyo Yuden pursues a "super high-end product strategy" in MLCCs, leveraging advanced precision printing, multi-layering, and materials technologies to produce ultra-small, ultra-high-capacitance, and high-reliability components.³⁰ These manufacturers are consistently cited as innovators and market leaders, driving advancements in MLCC technology and ensuring a robust supply to the global market.⁷

The MLCC market is experiencing significant growth, driven by high-demand applications like automotive and 5G.⁶ While an expanding market might intuitively suggest rising prices, for a highly commoditized part like the 0603 0.1uF X7R 50V capacitor, this growth, coupled with the presence of numerous large-scale manufacturers, can lead to sustained or even intensified pricing pressure.²⁰ High overall market growth incentivizes manufacturers to expand production capacity and optimize processes to capture larger market share. For commoditized products, this often translates into fierce competition on price, especially for large volume orders. Therefore, while the total market value for MLCCs is increasing, the unit price for widely available, standard components like the 0603 0.1uF X7R 50V might not necessarily rise proportionally. Instead, manufacturers may engage in aggressive pricing strategies at high volumes to maintain or grow their market position, potentially leading to stable or even slightly declining unit costs for large orders. This dynamic highlights why a detailed cost analysis remains critical even in a growing market.

Furthermore, Asia-Pacific's overwhelming dominance in both MLCC production and consumption signifies its indispensable role in the global supply chain for these

components.⁶ A majority of the top 50 authorized distributors are also headquartered in Asia.³⁹ This concentration, while indicative of manufacturing prowess, also presents a significant single point of failure risk. A disproportionately large share of global MLCC manufacturing capacity, raw material sourcing, and distribution networks are concentrated within this region. Consequently, any significant disruption originating in Asia – be it geopolitical tensions (such as U.S. export controls on semiconductor technologies, which can have ripple effects on the broader electronics supply chain)¹³, natural disasters, trade policy shifts¹⁵, or economic downturns – could severely impact the global supply of MLCCs. This concentration risk makes supply chain diversification and strategic inventory management for components sourced from this region not merely a best practice, but a critical strategic imperative for global electronics manufacturers. The "lowest cost" from a single, high-volume Asian source might, therefore, carry an elevated, unquantified risk of supply interruption.

3. Key Electronic Component Distributors Overview

The electronic component distribution landscape is characterized by several major players who serve as crucial intermediaries, connecting manufacturers with end-users. These distributors offer vast inventories, essential logistical support, and valuable technical services. The ECIA's Top 50 Authorized Distributors report underscores the sheer scale of these operations, with total worldwide revenue reaching an impressive \$194.6 billion in 2022.³⁹

Leading global distributors include:

- **Arrow Electronics, Inc.:** A top-tier global distributor with a substantial market share and a comprehensive range of electronic components.³⁹ For the KEMET C0603C104K5RACTU, Arrow offers competitive pricing at \$0.0092 per unit for quantities of 12,000, supported by a significant stock of 2,204,000 units and a rapid lead time of 22 hours.²² They also list the KYOCERA AVX 06035C104K4T2A at \$0.0091 for 100,000 units.⁴⁰
- **Avnet:** Another prominent global distributor with significant revenue and market presence.³⁹ For the KEMET C0603C104K5RACTU, Avnet presents one of the lowest prices at \$0.00819 per unit for 8,000 units, though the provided data indicated this part was "out of stock," suggesting potential fluctuations in immediate supply.²²
- **Digi-Key:** Renowned as a leading online catalog distributor, Digi-Key is

recognized for its extensive in-stock inventory, broad product selection, and often very quick shipping times.³⁹ For the YAGEO CC0603MRX7R9BB104, Digi-Key offers progressive price breaks, reaching \$0.00936 per unit for 20,000 units, with over 3,400 units immediately in stock.³ For the Taiyo Yuden UMK107B7104KAHT, they report over 46,000 units in stock at \$0.02503 for 1,000 units.¹⁹ Digi-Key frequently boasts lead times as short as 39 minutes for in-stock items.²²

- **Future Electronics:** A major global distributor with substantial revenue.³⁹ Future Electronics distinguishes itself by offering some of the lowest unit prices for very high volumes. For instance, the Samsung Electro-Mechanics CL10B104KB8NNNC is available for as low as \$0.0031 per unit for 300,000 units, and the KYOCERA AVX 06035C104K4T2A for as low as \$0.0084 per unit for 60,000 units. Both are listed with tens of millions of units in "Global Stock: Ready to Ship!".¹
- **Mouser Electronics:** Ranked highly among authorized distributors, Mouser is often cited for competitive pricing and the potential for shipping upgrades (e.g., from UPS ground to 2nd day for large orders).³⁹ For the Taiyo Yuden MAJCU168BB7104KTEA01, Mouser offers prices as low as \$0.013 per unit for 45,000 units, with significant stock and quantities on order.⁴ For the TDK C1608X7R1H104K080AA, they list 1.5 million units in stock at \$0.015 for 8,000 units.²
- **Newark/element14:** These distributors, part of the same group, have historically faced criticism for high shipping costs for small orders. However, they have reportedly improved their shipping policies, now offering options via USPS, FedEx, or UPS ground starting around \$5, depending on weight.⁴¹ They offer competitive pricing for the KEMET C0603C104K5RACTU at \$0.013 for 4,000 units²² and the TDK C1608X7R1H104K080AA at \$0.014-\$0.016 for 4,000-8,000 units.²
- **TTI:** A major global distributor.³⁹ TTI shows pricing for the KEMET C0603C104K5RACTU at \$0.0153 for 8,000 units, but with a notable "Factory Lead Time: 14 Weeks," indicating a reliance on manufacturer production schedules rather than immediate stock.²²
- **RS Group:** A global distributor with a strong market presence.³⁹ For the KEMET C0603C104K5RACTU, RS lists a price of \$0.009 for 4,000 units, though this specific quantity was out of stock in the provided information.²²

Component search aggregators, such as OEMsTrade⁴³, oemsecrets.com⁴⁴, Octopart¹⁷, and FindChips¹⁶, play an indispensable role in modern electronic component procurement. These platforms streamline the sourcing process by offering centralized search capabilities, allowing users to quickly find parts by partial or full part numbers across a vast network of verified suppliers and over 140 distributors.⁴³ They provide

real-time pricing and availability data, enabling direct comparison of unit costs, stock levels, and sometimes lead times from multiple sources simultaneously.⁴³ Additionally, some offer tools to estimate costs in various currencies.⁴³ The utility of these platforms significantly reduces the manual effort and time required for procurement specialists to identify the most cost-effective sourcing options, particularly in a fragmented market with numerous distributors and constantly fluctuating prices and stock levels. They empower buyers to make more informed and efficient purchasing decisions.

The detailed pricing data reveals that different major distributors possess distinct competitive advantages, often tied to their operational models and relationships with manufacturers. Future Electronics, for example, consistently offers the lowest per-unit costs for ultra-high volumes, such as Samsung MLCCs at \$0.0031 for 300,000 units.¹ This suggests a business model optimized for large-scale OEM supply, likely leveraging direct, high-volume supply agreements with manufacturers. In contrast, distributors like Digi-Key and Mouser, while competitive at medium to large orders, may not achieve the absolute lowest prices of Future Electronics for the largest quantities. However, they often compensate with extensive in-stock availability and faster shipping for a broader range of order sizes.³ This difference in approach implies that procurement strategies must be highly quantity-dependent. For mass production, direct engagement with distributors specializing in ultra-high volume supply is paramount. For prototyping, research and development, or smaller production runs, the convenience, immediate availability, and potentially better shipping terms from broad-line distributors, even with a slightly higher per-unit cost, might offer greater overall value. This necessitates a flexible and adaptive sourcing approach tailored to specific project needs and volumes.

The proliferation of numerous distributors, each with varying stock levels, lead times, and quantity-dependent pricing, highlights the inherent fragmentation and dynamism of the electronic component distribution market. The widespread utility of platforms like Octopart and FindChips is not merely a convenience but a testament to the complexity of efficient sourcing.¹⁶ Manually navigating and cross-referencing pricing and availability data across dozens of individual distributor websites for every component would be an incredibly time-consuming, inefficient, and error-prone process. Component aggregators provide a critical market function by centralizing and standardizing this disparate information. By enabling rapid, comprehensive price and availability comparisons, they significantly enhance procurement efficiency, reduce search costs, and empower buyers to quickly identify the most competitive offers available at any given moment. This ultimately contributes to overall cost

savings by streamlining the decision-making process and facilitating access to the best available terms.

4. Comparative Pricing Analysis: 0603 0.1uF X7R 50V Capacitors

The pricing for 0603 0.1uF X7R 50V capacitors is highly dependent on the quantity purchased, reflecting significant economies of scale in both manufacturing and distribution. The following breakdown details unit pricing across various authorized distributors and manufacturers, emphasizing the impact of quantity breaks.

YAGEO (e.g., CC0603MRX7R9BB104, CS0603KRX7R9BB104)

- **Digi-Key (CC0603MRX7R9BB104):**
 - 1 unit: \$0.10000 ³
 - 10 units: \$0.03800 ³
 - 100 units: \$0.02180 ³
 - 1,000 units: \$0.01378 ³
 - 4,000 units: \$0.01098 ³
 - 8,000 units: \$0.00994 ³
 - 12,000 units: \$0.00942 ³
 - 20,000 units: \$0.00936 ³
- **Octopart (Yageo Group CS0603KRX7R9BB104):**
 - Price @ 1,000 units: \$0.027 ¹⁷

TAIYO YUDEN (e.g., MAJCU168BB7104KTEA01, UMK107B7104KAHT)

- **Mouser (MAJCU168BB7104KTEA01 - 50V 0.1uF X7R 10% AECQ2):**
 - 1 unit (Cut Tape): \$0.10 ⁴
 - 10 units (Cut Tape): \$0.055 ⁴
 - 100 units (Cut Tape): \$0.033 ⁴
 - 500 units (Cut Tape): \$0.026 ⁴

- 1,000 units (Reel): \$0.024 ⁴
- 3,000 units (Reel): \$0.02 ⁴
- 9,000 units (Reel): \$0.016 ⁴
- 45,000 units (Reel): \$0.013 ⁴
- **Digi-Key (UMK107B7104KAHT):**
 - 1 unit: \$0.11000 ¹⁹
 - 10 units: \$0.06300 ¹⁹
 - 100 units: \$0.03800 ¹⁹
 - 1,000 units: \$0.02503 ¹⁹

KEMET (C0603C104K5RACTU)

- **Mouser Electronics:**
 - 1 unit: \$0.100 ²²
 - 10 units: \$0.015 ²²
- **Arrow Electronics:**
 - 8,000 units: \$0.0096 ²²
 - 12,000 units: \$0.0092 ²²
- **RS:**
 - 4 units: \$0.018 ²²
 - 4,000 units: \$0.009 (out of stock) ²²
- **Newark:**
 - 1 unit: \$0.103 ²²
 - 25 units: \$0.027 ²²
 - 4,000 units: \$0.013 ²²
 - 8,000 units: \$0.013 ²²
- **Digi-Key:**
 - 1 unit: \$0.0800 ²²
 - 10 units: \$0.0130 ²²
 - 4,000 units: \$0.0104 ²²
 - 8,000 units: \$0.0096 ²²
- **TTI:**
 - 4,000 units: \$0.0156 ²²
 - 8,000 units: \$0.0153 ²²
- **Avnet:**
 - 4,000 units: \$0.00833 (out of stock) ²²

- 8,000 units: \$0.00819 (out of stock) ²²

KYOCERA AVX (06035C104K4T2A)

- **Future Electronics:**

- 4,000 units: \$0.0093 ¹
- 12,000 units: \$0.009 ¹
- 16,000 units: \$0.0089 ¹
- 40,000 units: \$0.0087 ¹
- 60,000 units: \$0.0084 (as low as) ¹

- **Arrow Electronics:**

- 100,000 units: \$0.0091 ⁴⁰

Samsung Electro-Mechanics (CL10B104KB8NNNC)

- **Future Electronics:**

- 4,000 units: \$0.0036 ¹
- 16,000 units: \$0.0035 ¹
- 60,000 units: \$0.0034 ¹
- 120,000 units: \$0.0033 ¹
- 300,000 units: \$0.0031 (as low as) ¹

TDK (C1608X7R1H104K080AA)

- **Newark:**

- 4,000 units: \$0.016 ²
- 8,000 units: \$0.015 ²

- **Mouser:**

- 1 unit: \$0.10 ²
- 10 units: \$0.054 ²
- 100 units: \$0.033 ²
- 500 units: \$0.026 ²

- 1,000 units: \$0.022²
- 4,000 units: \$0.017²
- 8,000 units: \$0.015²
- **Shenzhen Dasevic Electronic Limited:**
 - 10 units: \$0.003²
 - 29,415 units: \$0.002²
 - 62,500 units: \$0.001²
 - 93,750 units: \$0.001²
 - 133,335 units: \$0.001²
- **ODG (Origin Data Global):**
 - 8,824 units: \$0.005²
 - 18,750 units: \$0.004²
 - 30,000 units: \$0.004²
 - 42,858 units: \$0.004²
 - 57,693 units: \$0.004²
- **IC Components Limited:**
 - 1 unit: \$0.003²
 - 100 units: \$0.003²
 - 1,000 units: \$0.003²
- **YIC International Co., Limited:**
 - 1 unit: \$0.003²
 - 10 units: \$0.003²
 - 100 units: \$0.003²
 - 1,000 units: \$0.003²
 - 10,000 units: \$0.003²

Murata (GRM188R71H104JA93D)

- **Octopart:**
 - Price @ 1,000 units: \$0.015¹⁸

Analysis of Lowest Cost Options by Quantity

For **very high volumes (e.g., 300,000 units)**, Samsung Electro-Mechanics'

CL10B104KB8NNNC, available through Future Electronics, stands out with a unit price as low as \$0.0031.¹ This represents the most aggressive pricing among major authorized distributors for the specified capacitor. For quantities of 60,000 units, the KYOCERA AVX 06035C104K4T2A from Future Electronics also offers a competitive price of \$0.0084.¹

When considering **extremely high volumes (e.g., 60,000+ units)**, particularly from non-traditional or smaller distributors, TDK's C1608X7R1H104K080AA shows prices as low as \$0.001 per unit from Shenzhen Dasenic Electronic Limited.² Similarly, IC Components Limited and YIC International Co., Limited offer this TDK part at \$0.003 per unit even for smaller quantities like 1 unit.² While these prices are exceptionally low, it is crucial to exercise caution and conduct thorough due diligence regarding the authenticity, quality, and reliability of components sourced from such channels.

For **medium to large quantities (e.g., 4,000 to 20,000 units)** from major authorized distributors, prices generally range from \$0.00819 to \$0.017 per unit. Avnet and Arrow Electronics offer KEMET C0603C104K5RACTU at around \$0.00819 - \$0.0096 for 8,000-12,000 units, though Avnet's stock status was "out of stock".²² Digi-Key provides YAGEO CC0603MRX7R9BB104 at \$0.00936 for 20,000 units.³ Mouser offers Taiyo Yuden MAJCU168BB7104KTEA01 at \$0.016 for 9,000 units.⁴

For **smaller quantities (e.g., 1 to 1,000 units)**, the unit prices are significantly higher across all major distributors, typically ranging from \$0.013 to \$0.11 per unit.² This reflects the higher overhead associated with processing smaller orders and the absence of volume discounts.

Lead Times and Stock Availability

Immediate stock availability varies considerably among distributors. Digi-Key generally maintains extensive in-stock quantities for various manufacturers, often with very short lead times (e.g., 39 minutes for KEMET C0603C104K5RACTU).²² Future Electronics also reports large "Global Stock: Ready to Ship!" for Samsung and KYOCERA AVX parts, indicating immediate availability for substantial quantities.¹ Mouser shows significant stock for Taiyo Yuden and TDK parts, with some quantities "on order" with expected ship dates extending into 2025 or 2026, and factory lead times up to 31 weeks for certain Taiyo Yuden parts.⁴ TTI, while offering competitive pricing for KEMET, notes a "Factory Lead Time: 14 Weeks," indicating that their supply

relies on manufacturer production rather than immediate inventory.²² Avnet and RS also show instances of being "out of stock" for certain quantities, despite competitive pricing.²² This highlights the dynamic nature of component availability, where current stock levels and lead times can fluctuate rapidly.

Shipping Costs and Policies

Shipping costs and policies are a crucial, yet often overlooked, component of the total cost of acquisition. Major distributors like Digi-Key and Mouser are known for relatively competitive shipping, with Mouser sometimes upgrading shipping from UPS ground to 2nd day for large orders.⁴¹ Newark, which historically faced criticism for high shipping costs, has reportedly improved its policies, now offering options via USPS, FedEx, or UPS ground starting around \$5, depending on weight.⁴¹ Other distributors, such as Chicago Electronic Distributors, ship orders placed by 2:30 pm Eastern Time Monday to Friday typically the same day, with prices shown in the cart shipping estimator.⁴⁵ Component Distributors Inc. (CDI) ships within the continental US and US territories, and can use customer-supplied UPS/FedEx accounts, with all duties, taxes, and fees being the customer's responsibility.⁴⁶ For international orders, factors such as weight, destination, chosen carrier, and potential tariffs can significantly influence the total landed cost.¹² It is essential for procurement teams to factor these costs into their total cost analysis, as a seemingly low unit price can be offset by high shipping fees, especially for smaller quantities or expedited delivery.

5. Supply Chain Dynamics and Market Trends

The Multilayer Ceramic Capacitor (MLCC) market is experiencing a period of significant growth, primarily driven by the relentless demand for miniaturization in electronic devices, the rapid deployment of 5G infrastructure, and the increasing electrification of the automotive industry.⁶ This surge in demand is creating both opportunities and challenges within the MLCC supply chain.

Despite the robust market expansion, the MLCC supply chain continues to navigate several complexities. One prominent challenge is the volatility in raw material prices,

particularly for ceramic powders and precious metals such as silver and palladium, which are critical components in MLCC manufacturing.⁷ Fluctuations in these material costs can directly impact production expenses and, consequently, the final pricing of capacitors. Geopolitical factors also play a substantial role; for example, U.S. export controls on advanced semiconductor technologies, while not directly targeting MLCCs, can create ripple effects across the broader electronics supply chain, leading to component unavailability, compliance issues, and delayed manufacturing for customers.¹³ General supply chain disruptions, stemming from global conflicts, natural disasters, or rising energy costs, further complicate the landscape, affecting production timelines and overall availability.¹¹ To mitigate these risks, companies are advised to hold more inventory as a buffer against delays and to diversify their product sources to build more resilient supply chains.¹² However, a delicate balance must be struck to avoid overstocking, which can lead to increased storage costs and financial strain, especially for high-ticket items.¹²

Looking ahead, the MLCC market is projected to continue its strong growth trajectory.⁶ The ongoing demand for miniaturized, high-performance electronics in consumer, automotive, and industrial sectors will sustain the need for MLCCs. For standard, high-volume components like the 0603 0.1uF X7R 50V capacitor, this sustained demand, coupled with the presence of numerous large-scale manufacturers and their efforts to expand production capacity, could lead to continued price competition. Manufacturers are actively investing in research and development to innovate new materials, enhance capacitance values, and ensure reliability across various operating conditions.¹⁵ New product developments by major manufacturers, such as Murata's MLCCs for 5G infrastructure, TDK's high-performance automotive capacitors, KEMET's optimized components for IoT devices, and Yageo's advanced solutions for renewable energy systems, indicate a continuous push for technological advancement that will shape the market.¹⁴ These innovations, while often targeting new applications or higher performance tiers, can also contribute to improved manufacturing processes and cost efficiencies for more mature product lines. Maintaining supply chain resilience through diversification and strategic inventory management will remain critical for navigating potential future disruptions and ensuring consistent component availability.

6. Manufacturer Quality and Reliability Considerations

In the procurement of electronic components, particularly for critical applications, the quality and reliability of Multilayer Ceramic Capacitors (MLCCs) are paramount. Beyond initial unit cost, the long-term performance and durability of these components directly impact the overall total cost of ownership, influencing product lifespan, warranty claims, and potential rework expenses. Manufacturers adhere to various quality standards and certifications to ensure component integrity.

A key standard for MLCCs, particularly in the automotive sector, is **AEC-Q200**. This Automotive Electronics Council qualification ensures that passive components meet stringent reliability requirements for harsh automotive environments.²⁷ Many manufacturers, such as TDK, explicitly state that their automotive-grade MLCCs are qualified based on AEC-Q200 standards, signifying their robustness for demanding applications.²⁷

RoHS compliance (Restriction of Hazardous Substances) is another crucial standard, indicating that components do not contain specified hazardous materials, which is vital for environmental regulations and global market access.¹⁶ Furthermore, manufacturers often hold

ISO certifications, such as ISO9001:2015 for quality management systems and IATF 16949:2016 specifically for automotive quality management systems, as seen with KYOCERA AVX's Kagoshima Kokubu Plant.²⁹ These certifications provide assurance of consistent manufacturing processes and a commitment to quality.

Manufacturer-specific quality reputations further differentiate offerings:

- **Samsung Electro-Mechanics:** Positioned as a global market leader, Samsung Electro-Mechanics is known for its high technological capability in producing high-capacity, ultra-small, and high-reliability MLCCs. The company emphasizes rigorous quality control processes, with each component undergoing thorough testing to meet high standards of performance and reliability.²¹ Their focus on advanced material and layering technologies enables them to stack up to 600 layers in high-capacity MLCCs, crucial for miniaturization and performance.²⁶
- **TDK:** A world leader in electronic solutions, TDK's MLCCs are designed for high reliability and are qualified based on AEC-Q200 standards, particularly for automotive applications. Their advancements in material selection and product design enable industry-leading capacitance in compact sizes, contributing to component count reduction and miniaturization while maintaining high reliability.²⁷
- **Yageo:** As a world-leading provider of passive components, Yageo emphasizes its commitment to quality through publicly available quality reports and certificates.²⁸ Their extensive product portfolio covers various MLCC types, indicating broad

manufacturing capabilities.

- **KEMET:** KEMET has a long-standing reputation as a leader in high-reliability ceramic products. They produce monolithic ceramic capacitors under tightly-controlled manufacturing procedures, with careful material selection, conservative design rules, and scrupulous inspection processes.²⁰ KEMET also actively addresses concerns like tin whisker growth in MLCCs by employing a matte tin finish, a nickel underlayer, and specific plating and annealing processes to mitigate this risk.³²
- **KYOCERA AVX:** This manufacturer supplies quality multilayer ceramic capacitors made with high-purity ceramics, focusing on miniaturization, higher capacitance, and enhanced functionality for diverse applications.²⁹ They design and manufacture products to stringent quality and safety standards, advising customers to employ suitable safeguards for high-reliability or safety-critical applications.³⁸
- **Taiyo Yuden:** Taiyo Yuden pursues a "super high-end product strategy" for its MLCCs, leveraging advanced precision printing, multi-layering, and materials technologies. Their consistent in-house production system, from materials development to manufacturing, allows them to maintain a competitive edge and produce ultra-small, ultra-high-capacitance, and high-reliability products.³⁰ They possess advanced capabilities in synthesizing optimal dielectric materials and controlling ultrafine particles, which are critical for achieving high-quality MLCCs.³¹

The implications of quality on total cost of ownership are significant. While a component with a lower initial unit price might seem attractive, it can lead to higher long-term costs if its quality is compromised. Hidden costs can arise from increased rates of component failures, leading to costly product rework, higher warranty claims, or even product recalls. For instance, the inherent aging rate of X7R dielectrics, as noted by KEMET, means that even within a standard specification, variations in manufacturing quality can affect how consistently a capacitor maintains its specified capacitance over time.²⁰ Components from manufacturers with less rigorous quality control might experience faster degradation or be more susceptible to physical damage like flex cracks, which could lead to premature failures in the end product.³² Therefore, procurement decisions should balance the initial unit price with the manufacturer's reputation for consistent quality, reliability, and adherence to industry standards, ensuring that the chosen component contributes positively to the overall performance and longevity of the final electronic device.

7. Conclusions and Recommendations

The analysis of the lowest cost 0603 0.1uF X7R 50V capacitor reveals a nuanced landscape where cost-effectiveness is deeply intertwined with procurement volume, distributor specialization, and a careful consideration of supply chain dynamics and component quality.

For organizations seeking the absolute lowest unit cost, particularly for **ultra-high volumes (e.g., 300,000 units or more)**, Future Electronics emerges as a primary contender, offering Samsung Electro-Mechanics CL10B104KB8NNNC at an exceptionally low \$0.0031 per unit. Similarly, KYOCERA AVX 06035C104K4T2A from Future Electronics is competitive at \$0.0084 for 60,000 units.¹ For even more aggressive pricing, particularly for TDK's C1608X7R1H104K080AA, certain non-traditional distributors may quote prices as low as \$0.001-\$0.003 per unit for very high quantities.² However, for

smaller to medium quantities (1 to 1,000 units), prices from major authorized distributors like Digi-Key and Mouser are significantly higher, ranging from \$0.013 to \$0.10 per unit.³

The MLCC market is experiencing robust growth driven by miniaturization, 5G, IoT, and automotive electrification, with the 0603, X7R, and 50V segments being particularly dominant.⁶ This strong demand, coupled with a competitive landscape of major manufacturers, can lead to aggressive pricing strategies for commoditized parts, potentially stabilizing or even lowering unit costs for large orders. However, the supply chain remains susceptible to raw material price volatility and geopolitical impacts, especially given the concentration of MLCC production in Asia-Pacific.¹¹

Actionable Recommendations for Procurement:

1. Strategic Sourcing by Volume:

- For **mass production and very high-volume requirements**, prioritize engagement with distributors like Future Electronics, which demonstrate the capacity and pricing structure for large-scale OEM supply. Explore direct manufacturer relationships for the most competitive pricing at these volumes.
- For **prototyping, R&D, or smaller production runs**, leverage broad-line distributors such as Digi-Key and Mouser. While their unit prices may be higher, their extensive in-stock availability and faster shipping for a wider range of order sizes can provide greater overall value by reducing lead times

and facilitating rapid development.

2. **Due Diligence on Non-Traditional Sources:**

- When encountering extremely low prices from less-known or non-traditional distributors, particularly for high volumes, it is imperative to conduct stringent due diligence. This includes verifying the authenticity of the components, assessing the distributor's reputation, and potentially implementing additional incoming quality inspection procedures to mitigate risks associated with counterfeit or substandard parts. The potential for hidden costs from poor quality (e.g., failures, rework, warranty claims) can quickly outweigh initial unit price savings.

3. **Enhance Supply Chain Resilience:**

- Implement a strategy of **supplier diversification** across multiple authorized distributors and, if feasible, different manufacturers. This reduces reliance on a single source and provides alternatives in the event of supply chain disruptions.
- Maintain **strategic inventory buffers** for critical components like the 0603 0.1uF X7R 50V capacitor. While this incurs holding costs, it provides a crucial safeguard against unforeseen delays, raw material fluctuations, or geopolitical events that could impact supply.

4. **Prioritize Total Cost of Ownership:**

- Procurement decisions should extend beyond the mere unit price. Calculate the **total landed cost**, which includes shipping fees, potential tariffs, and any additional costs associated with expedited delivery.
- Integrate **manufacturer quality and reliability** into the evaluation process. Components from reputable manufacturers with established quality control processes (e.g., AEC-Q200, ISO certifications, and specific measures against issues like tin whiskers) may have a slightly higher upfront cost but can significantly reduce long-term expenses related to product failures, rework, and warranty claims.

5. **Leverage Component Search Aggregators:**

- Continuously utilize platforms like Octopart and FindChips. These aggregators provide real-time, consolidated pricing and availability data from numerous distributors, streamlining the price discovery process and enabling procurement teams to quickly identify the most competitive offers available at any given moment. This continuous monitoring is essential in a dynamic market with fluctuating stock levels and lead times.

By adopting these recommendations, organizations can effectively navigate the complexities of the MLCC market, ensuring the procurement of 0603 0.1uF X7R 50V

capacitors at the most cost-effective rates while maintaining supply chain stability and product quality.

Works cited

1. Buy Ceramic Capacitors Products Online | Future Electronics, accessed July 15, 2025,
<https://www.futureelectronics.com/c/passives/capacitors--ceramic-capacitors/products?q=%3Arelevance&text=&pageSize=50>
2. C1608X7R1H104K Price & Stock | DigiPart, accessed July 15, 2025,
<https://www.digipart.com/part/C1608X7R1H104K>
3. CC0603MRX7R9BB104 YAGEO | Capacitors | DigiKey, accessed July 15, 2025,
<https://www.digikey.com/en/products/detail/yageo/CC0603MRX7R9BB104/5883825>
4. 0.1 uF 0603 Multilayer Ceramic Capacitors MLCC - SMD/SMT - Mouser Electronics, accessed July 15, 2025,
<https://www.mouser.com/c/passive-components/capacitors/ceramic-capacitors/mlccs-multilayer-ceramic-capacitors/multilayer-ceramic-capacitors-mlcc-smd-smt/?capacitance=0.1%20uF&case%20code%20-%20in=0603>
5. 0.1 uF 0603 X7R Multilayer Ceramic Capacitors MLCC - SMD/SMT ..., accessed July 15, 2025,
<https://www.mouser.com/c/passive-components/capacitors/ceramic-capacitors/mlccs-multilayer-ceramic-capacitors/multilayer-ceramic-capacitors-mlcc-smd-smt/?capacitance=0.1%20uF&case%20code%20-%20in=0603&dielectric=X7R>
6. Multi-Layer Ceramic Capacitor Market Size to Reach USD 20.99 Bn by 2034, accessed July 15, 2025,
<https://www.precedenceresearch.com/multi-layer-ceramic-capacitor-market>
7. Multilayer Ceramic Capacitors (MLCCs) 2025 Trends and Forecasts 2033: Analyzing Growth Opportunities - Data Insights Market, accessed July 15, 2025,
<https://www.datainsightsmarket.com/reports/multilayer-ceramic-capacitors-mlccs-902458>
8. Multi-Layer Ceramic Capacitor (MLCC) Market | CAGR at 9.30%, accessed July 15, 2025, <https://market.us/report/multi-layer-ceramic-capacitor-mlcc-market/>
9. Multilayer Ceramic Capacitor Market Size, Growth Report 2037, accessed July 15, 2025,
<https://www.researchnester.com/reports/multilayer-ceramic-capacitor-mlcc-market/5199>
10. United States MLCC Market Report and Forecast 2025-2034 - MarketResearch.com, accessed July 15, 2025,
<https://www.marketresearch.com/Expert-Market-Research-v4220/United-States-MLCC-Forecast-41482773/>
11. Multilayer Ceramic Capacitor (MLCC) Market[2025-2034] - Exactitude Consultancy, accessed July 15, 2025,
<https://exactitudeconsultancy.com/reports/37499/multilayer-ceramic-capacitor-mlcc-market>

12. 7 Supply Chain Issues: How To Overcome Them in 2024 (2025) - Shopify, accessed July 15, 2025, <https://www.shopify.com/blog/supply-chain-issues>
13. Semiconductor Industry News - January 2025 Update - Sourcingengine, accessed July 15, 2025, <https://www.sourcingengine.com/blog/semiconductor-industry-news>
14. Ceramic Capacitor Market Size & Growth [2025-2033], accessed July 15, 2025, <https://www.globalgrowthinsights.com/market-reports/ceramic-capacitor-market-109875>
15. Ceramic Electric Capacitor Market Size 2025-2034, Industry Growth Report, accessed July 15, 2025, <https://www.gminsights.com/industry-analysis/ceramic-electric-capacitor-market>
16. C0603C104K5RAL details by KEMET Corporation - Findchips, accessed July 15, 2025, <https://www.findchips.com/detail/C0603C104K5RAL/KEMET-Corporation>
17. CS0603KRX7R9BB104 Yageo Group - Ceramic Capacitors ..., accessed July 15, 2025, <https://octopart.com/cs0603krx7r9bb104-yageo+group-74602106>
18. GRM188R71H104JA93D Murata - Ceramic Capacitors - Distributors, Price Comparison, and Datasheets | Octopart component search, accessed July 15, 2025, <https://octopart.com/grm188r71h104ja93d-murata-10322523>
19. UMK107B7104KAHT Taiyo Yuden | Capacitors - DigiKey, accessed July 15, 2025, <https://www.digikey.com/en/products/detail/taiyo-yuden/UMK107B7104KAHT/4157348>
20. ceramic high reliability capacitors - KEMET, accessed July 15, 2025, <https://content.kemet.com/datasheets/F3054.pdf>
21. Unleashing Power: Samsung Electro-Mechanics CL01Y105MR5NLNC Capacitor Review, accessed July 15, 2025, <https://www.eecart.com/about-product/detail/unleashing-power-samsung-electro-mechanics-cl01y105mr5nlnc-capacitor-review>
22. C0603C104K5RACTU - KEMET - TrustedParts.com, accessed July 15, 2025, <https://www.trustedparts.com/en/part/kemet/C0603C104K5RACTU>
23. CL10B104KB8NNNB details by Samsung Electro-Mechanics - Findchips, accessed July 15, 2025, <https://www.findchips.com/detail/CL10B104KB8NNNB/Samsung-Electro--Mechanics>
24. 0603 X7R Multilayer Ceramic Capacitors MLCC - SMD/SMT - Mouser Electronics, accessed July 15, 2025, <https://www.mouser.com/c/passive-components/capacitors/ceramic-capacitors/mlccs-multilayer-ceramic-capacitors/multilayer-ceramic-capacitors-mlcc-smd-smt/?case%20code%20-%20in=0603&dielectric=X7R>
25. UMJ107BB7104KA8T TAIYO YUDEN - Mouser Electronics, accessed July 15, 2025, <https://www.mouser.com/ProductDetail/TAIYO-YUDEN/UMJ107BB7104KA8T?qs=DPoM0jnrROXNxGAgma09gw%3D%3D>
26. MLCC | Samsung Electro-Mechanics, accessed July 15, 2025, <https://www.samsungsem.com/global/product/passive-component/mlcc.do>
27. Multilayer Ceramic Capacitors: TDK offers MLCCs with the industry's ..., accessed July 15, 2025, https://www.tdk.com/en/news_center/press/20250414_01.html

28. Quality Reports - World-leading provider of passive components ..., accessed July 15, 2025, https://www.yageo.com/en/SiteMap/Index/quality_reports
29. Multilayer Ceramic Chip Capacitors (MLCC) | Capacitors | Products ..., accessed July 15, 2025, <https://ele.kyocera.com/en/product/capacitor/mlcc/>
30. Pioneering the Future of Ultra-small, High-capacitance, High-voltage-resistant MLCCs, accessed July 15, 2025, <https://www.yuden.co.jp/en/ir/2015ar/feature/>
31. Feature | Annual Report 2020 | TAIYO YUDEN CO., LTD., accessed July 15, 2025, <https://www.yuden.co.jp/en/ir/2020ar/feature/>
32. Ceramic Capacitor FAQ and Application Guide - KEMET, accessed July 15, 2025, <https://www.kemet.com/en/us/capacitors/ceramic/ceramics-faq.html>
33. Cracking Problems in Low-Voltage Chip Ceramic Capacitors - NASA Technical Reports Server (NTRS), accessed July 15, 2025, <https://ntrs.nasa.gov/api/citations/20190001592/downloads/20190001592.pdf>
34. Multilayer Ceramic Capacitor Market Report 2025 - Research and Markets, accessed July 15, 2025, <https://www.researchandmarkets.com/reports/5783043/multilayer-ceramic-capacitor-market-report>
35. MLCC - Market Share Analysis, Industry Trends & Statistics, Growth Forecasts (2024 - 2029), accessed July 15, 2025, <https://www.giiresearch.com/report/moi1687923-mlcc-market-share-analysis-industry-trends.html>
36. Multilayer Ceramic Capacitors: TDK offers MLCCs with the industry's highest capacitance at 100 V for commercial applications in the 1608 case size, accessed July 15, 2025, https://www.tdk.com/en/news_center/press/20250626_01.html
37. Quality Reports - World-leading provider of passive components - YAGEO, accessed July 15, 2025, https://www.yageo.com/en/Download/Index/quality_reports
38. Advanced Ceramic Capacitors - kyocera avx, accessed July 15, 2025, <https://catalogs.kyocera-avx.com/AdvancedCeramicCapacitors.pdf>
39. ECIA's TOP 50 Authorized Global Distributors Report 2023 - Electronic Components Industry Association, accessed July 15, 2025, <https://ecia.memberclicks.net/assets/docs/Stats/Final%20ECIA%20Worldwide%20Top%2050%20Authorized%20Distributors%20Report%202022.pdf>
40. 060- Price, Reseller, Stock - Alldatasheet, accessed July 15, 2025, <https://www.alldatasheetit.com/distributor/view.jsp?Searchword=060->
41. Finding Parts - Distributors - Ladyada.net, accessed July 15, 2025, <https://www.ladyada.net/library/procure/partsdistributors.html>
42. Mouser Electronics: Electronic Components Distributor, accessed July 15, 2025, <https://www.mouser.com/>
43. OEMsTrade Electronic Part Inventory Search, accessed July 15, 2025, <https://www.oemstrade.com/>
44. oemsecrets.com: Search Electronic Components - Compare Prices & Inventory, accessed July 15, 2025, <https://www.oemsecrets.com/>
45. Shipping Policy - Chicago Electronic Distributors, accessed July 15, 2025, <https://chicagodist.com/pages/shipping-policy>

46. Component Distributors Inc., CDI, accessed July 15, 2025,
<https://www.cdiweb.com/shipping-policy/44>