Analysis of Lowest Cost 0603 10k Ohm 1% 1/10 W Resistor

1. Executive Summary

This report provides a comprehensive analysis to identify the lowest per-unit cost for a surface-mount device (SMD) resistor with specific parameters: 0603 package, 10k Ohm resistance, 1% tolerance, and a 1/10 Watt power rating. The investigation reveals that the absolute lowest per-unit cost is contingent upon the procurement volume, demonstrating a significant price disparity between bulk industrial purchases and smaller quantity acquisitions.

The most cost-effective option identified for high-volume procurement is the Royalohm CQ03WAF1002T5E, available from Mouser for an unparalleled $0.001 per unit.[1] This price, however, is strictly tied to a minimum order quantity (MOQ) of 5,000 units, highlighting that the concept of "lowest cost" is highly dependent on the scale of acquisition. For smaller quantities, typically sought by hobbyists or for prototyping, the per-unit cost is considerably higher, ranging from approximately $0.04 to $0.28 per unit from reputable distributors such as Mouser and DigiKey.[1] This report emphasizes that purchasers must carefully consider their project's scale and precise technical requirements when making component sourcing decisions.

2. Introduction to Resistor Specifications

Understanding the precise nature of the component sought is fundamental to accurate procurement. The requested resistor is defined by four key specifications: package size, resistance value, tolerance, and power rating.

The **0603 package** refers to a standard size for surface-mount device (SMD) resistors. Its dimensions are approximately 1.6mm in length by 0.8mm in width.[1] This

compact form factor is widely adopted in modern electronics due to its efficiency in dense circuit board designs, where minimizing space is a critical consideration.

A **10k Ohm (10,000 Ohms)** resistance value specifies the component's nominal electrical opposition to current flow within a circuit. This is a highly common resistance value, broadly utilized across a vast array of electronic applications, from basic signal conditioning to more complex voltage division networks.

The **1% tolerance** is a crucial precision specification. It indicates that the actual resistance value of the component will fall within ±1% of the nominal 10k Ohm. For this specific resistor, it means the operational resistance will be between 9,900 Ohms and 10,100 Ohms. This level of accuracy is typically mandated for sensitive analog circuits, precision voltage dividers, or any application where a highly exact resistance value is paramount for the circuit's intended performance and stability. The strict adherence to this tolerance significantly narrows the field of suitable components, as many general-purpose resistors offer a wider 5% tolerance.[5] While 5% tolerance parts might appear cheaper, they fundamentally do not meet the specified precision requirement, which could lead to functional issues in applications demanding higher accuracy.

Finally, the **1/10 Watt (0.1W) power rating** defines the maximum amount of electrical power the resistor can safely dissipate as heat without incurring damage or experiencing significant alterations to its electrical characteristics.[1] This rating is typical for small signal applications and low-power circuits, ensuring the component's longevity and reliable operation within its thermal limits. The combination of these specific parameters—0603, 10k Ohm, 1%, and 1/10W—describes a highly standard and frequently used component in the electronics industry. The extensive availability of products meeting these criteria across major distributor platforms, such as Mouser (listing 92-149 products) and DigiKey (listing numerous relevant parts) [1], is a direct result of this standardization. This widespread market availability and robust competition among manufacturers and distributors generally contribute to more competitive pricing, particularly for bulk orders.

3. Comparative Analysis of Lowest-Cost Options

The search for the lowest-cost resistor meeting the 0603 package, 10k Ohm, 1% tolerance, and 1/10 Watt power rating reveals a clear distinction in pricing based on

procurement volume and supplier type.

Royalohm CQ03WAF1002T5E (Mouser)

This component represents the absolute lowest per-unit cost identified in the research.

- **Price:** $0.001 per unit when purchased in quantities of 5,000 units.[1]
- **Minimum Order Quantity (MOQ):** 5,000 units, available exclusively in Reel packaging, which is standard for automated assembly processes.[2]
- **Availability:** High stock levels, with 70,000 units currently available and an additional 165,000 units projected to be in stock by August 15, 2025, indicating a stable supply chain.[2]
- **Key Features:** Notably, this part is designated as "Automotive Grade" and features "Anti-Sulfur Resistors," along with AEC-Q200 qualification.[2] These attributes signify a higher standard of reliability and robustness, making it suitable for demanding environments, offering exceptional value for high-volume industrial buyers.

Vishay CRCW060310K0FKEI (Mouser, DigiKey, Arrow, Newark)

A widely available and highly competitive option from a prominent manufacturer, Vishay.

- Mouser Pricing [2]:
  - 1 unit: $0.15
  - 10 units: $0.075
  - 100 units: $0.043
  - 500 units: $0.029
  - 1,000 units: $0.026
  - 5,000 units: $0.020
  - 10,000 units: $0.018
  - 50,000 units: $0.015
- DigiKey Pricing [3]:
  €0.09000 (approximately $0.097 USD, subject to exchange rates).

- **Availability:** Very high stock across multiple major distributors, including 88,929 units at Mouser, 15,550,000 at Arrow, and 12,800,000 at Newark.[2] The granular pricing tiers offered by distributors like Mouser are particularly beneficial for procurement specialists. This detailed breakdown allows for precise identification of the most cost-effective quantity for a specific project volume, enabling strategic purchasing decisions that balance immediate needs with potential future requirements to achieve optimal cost savings.

KOA Speer RK73G1JRTTD1002F (Mouser)

Another strong contender, especially for larger quantities, offering robust specifications.

- Mouser Pricing [1]:
  - 1 unit: $0.28
  - 10 units: $0.148
  - 100 units: $0.088
  - 500 units: $0.062
  - 1,000 units: $0.057
  - 5,000 units: $0.046
  - 10,000 units: $0.040
- **Availability:** 7,727 units in stock at Mouser, with an additional 5,000 expected by July 17, 2025.[2]
- **Key Features:** Also boasts Automotive Grade, Anti-Sulfur Resistors, and AEC-Q200 qualification.[1]

Other 1% Tolerance Options (Mouser)

Several other manufacturers offer competitive pricing for single units or small quantities:

- YAGEO RC0603FR-0710KA: $0.10 for 1 unit (18,101 in stock).[1]
- TE Connectivity / Holsworthy CRG0603F10K/10: $0.10 for 1 unit (560,151 in stock).[1]
- Bourns CR0603-FX-1002ELF: $0.10 for 1 unit (1,354,310 in stock).[1]

Hobbyist/Small Quantity Options (with caveats)

For very small quantities, some specialized retailers cater to hobbyists, though with important distinctions regarding specifications. The significant price differential observed for small quantities, when compared to bulk purchases from major distributors, is primarily attributable to the fixed overhead costs associated with processing, packaging, and shipping individual or small batches of components. These costs are amortized over thousands of units for large distributors, resulting in a negligible per-unit impact, whereas for smaller shops, these overheads represent a much larger proportion of the per-unit cost. This means small-scale buyers inherently pay a premium for the convenience of low-volume purchasing.

- **TinyOSShop Resistor 10k Ohm -0603 SMD:** Priced at $1.00 for a strip of 50 units ($0.02/unit), with discounts for larger strips (e.g., $0.75 for 20+ strips).[8] A critical point to note is that the provided information for this specific 10k Ohm part does not explicitly state the tolerance (1% or 5%). Purchasers must verify this crucial parameter directly with the vendor if considering this option, as a 5% tolerance would not meet the specified requirement.
- **Soldered.com Resistor 0603 10k ohm:** Listed at $0.02 per unit for 10 items.[5] However, a critical warning applies: this part explicitly states "Tolerance: 5%".[5] Therefore, it does not meet the 1% tolerance requirement of the user's query and should only be considered if the application can tolerate a 5% deviation. This highlights a crucial procurement trap: a seemingly lower price can be misleading if the component does not meet all required technical specifications.

The following table provides a detailed comparative analysis of the various options, illustrating how price per unit varies significantly with the quantity purchased.

Table 1: Comparative Pricing for 0603 10k Ohm 1% 1/10W Resistors by Quantity

Manufacturer	Part Number	Distributor	Price/Unit (1 pc)	Price/Unit (10 pc	Price/Unit (50 pc	Price/Unit (100 pc	Price/Unit (500 pc	Price/Unit (1,000	Price/Unit (5,000	Price/Unit (10,00	MOQ	Current Stock (a	Key Features	Source

				)	)	)	)	pc)	pc)	0 pc)		ppro x.)		
Royaloh m	CQ03WAF1002T5E	Mouser	N/A	N/A	N/A	N/A	N/A	N/A	$0.001	$0.001	5,000	70,000	Automotive Grade, Anti-Sulfur, AEC-Q200	[2]
Visha y	CRCW060310K0FKEI	Mouser	$0.15	$0.075	$0.029*	$0.043	$0.029	$0.026	$0.020	$0.018	1	88,929	General Purpose	[2]
Visha y Dale	CRCW060310K0FKEA	DigiKey	~$0.097 (€0.09)	~$0.097 (€0.09)	~$0.097 (€0.09)	~$0.097 (€0.09)	N/A	N/A	N/A	N/A	1	N/A	General Purpose	[3]
KOA Speer	RK73G1JRTT	Mouser	$0.28	$0.148	$0.062*	$0.088	$0.062	$0.057	$0.046	$0.040	1	7,727	Automotive	[2]

	D1002F												Grade, Anti-Sulfur, AEC-Q200	
YAGEO	RC0603FR-0710KA	Mouser	$0.10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	18,101	General Purpose	[1]
TE Conn.	CRG0603F10K/10	Mouser	$0.10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	560,151	General Purpose	[1]
Bourns	CR0603-FX-1002ELF	Mouser	$0.10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	1,354,310	General Purpose	[1]
TinyOSShop	Resistor 10k Oh	TinyOSShop	N/A	N/A	$0.02	$0.015*	N/A	N/A	N/A	N/A	50	989	SMD (strip of	[8]

	m												50), Tolerance not specified	
Soldered.com	Resistor 0603 10k	Soldered.com	N/A	$0.02	N/A	N/A	N/A	N/A	N/A	N/A	10	10	**5% Tolerance**, 2-year Warranty	[5]

Note: Prices for 50 and 100 pieces for Vishay and KOA Speer are interpolated from available data points. TinyOSShop prices are per unit when purchased in strips of 50 or 20+ strips respectively.

4. Deep Dive: The Absolute Lowest Cost Resistor

The Royalohm CQ03WAF1002T5E stands out as the component offering the lowest per-unit cost for the specified 0603, 10k Ohm, 1%, 1/10W resistor. This section provides a comprehensive overview of its specifications and procurement specifics.

Part Identification and Sourcing

The component is precisely identified as the Royalohm CQ03WAF1002T5E, a Thick Film Resistor - SMD, RMC CQ03 (0603) 1/10W 1% T/R-5000.[1] It is primarily sourced through Mouser, a major authorized electronic component distributor.[1]

Pricing Structure and Minimum Order Quantity

The per-unit price for this resistor is an exceptionally low **$0.001**.[2] This aggressive pricing is exclusively available when purchasing in high volumes, specifically in quantities of 5,000 units. The minimum order quantity (MOQ) is 5,000 units, and purchases must be made in multiples of this amount. The components are supplied in Reel packaging, which is the industry standard for high-volume automated pick-and-place manufacturing lines.[2] This pricing model clearly illustrates that significant cost reductions are achieved through economies of scale, where the fixed costs of handling and processing are spread across a large number of units.

Availability

As of the latest data, 70,000 units of the Royalohm CQ03WAF1002T5E are currently in stock at Mouser.[2] Furthermore, an additional 165,000 units are expected to be in stock by August 15, 2025.[2] This level of current inventory and predictable future supply is highly beneficial for procurement and production planning. It signifies not just immediate availability but also a robust and predictable supply chain, allowing manufacturers to forecast accurately and mitigate the risk of production delays due to component shortages. This goes beyond mere price; it speaks to the strategic advantage of sourcing from distributors with strong inventory management and clear supply pipelines.

Full Specifications

The Royalohm CQ03WAF1002T5E meets all the specified parameters, along with additional features indicating high reliability:

- **Resistance:** 10 kOhms [2]
- **Power Rating:** 100 mW (1/10 W) [2]
- **Tolerance:** 1 % [2]
- **Temperature Coefficient:** 100 PPM / C [2]
- **Minimum Operating Temperature:** -55 C [2]
- **Maximum Operating Temperature:** +155 C [2]
- **Voltage Rating:** 75 V [2]
- **Case Code - in:** 0603 [2]
- **Case Code - mm:** 1608 [2]
- **Physical Dimensions:** Length: 1.6 mm (0.063 in), Width: 0.8 mm (0.031 in), Height: 0.45 mm (0.018 in) [2]
- **Application:** Automotive Grade [2]
- **Features:** Anti-Sulfur Resistors [2]
- **Qualification:** AEC-Q200 [2]

The designation as "Automotive Grade" and the inclusion of "Anti-Sulfur Resistors" with "AEC-Q200 qualification" are significant. These are not typical features for generic, low-cost resistors; they denote a higher standard of reliability, robustness, and suitability for demanding operational environments. For high-volume industrial buyers, this component offers exceptional value, providing enhanced quality and reliability at a remarkably low per-unit cost.

Implications for Procurement

While the $0.001 price point is exceptionally attractive, the 5,000-unit MOQ makes this option primarily suitable for industrial-scale production, large-batch manufacturing, or projects with substantial component requirements. It is generally impractical for hobbyists or small-scale prototyping due to the high initial investment in quantity. For these smaller-scale needs, alternative sourcing strategies must be considered, as detailed in the following section.

5. Alternative Sourcing and Pricing Considerations

For users who cannot meet the high minimum order quantity of the absolute lowest-cost component, viable alternatives exist, primarily from major distributors, albeit at a higher per-unit price. The optimal procurement strategy is inherently project-dependent, necessitating a careful balance between price, quantity, and strict adherence to specifications.

For Small to Medium Quantities (1 to 1,000 units) – Meeting 1% Tolerance

Major authorized distributors remain the most reliable source for components that strictly adhere to the 1% tolerance requirement.

- **Mouser's Tiered Pricing:** Mouser offers competitive pricing for smaller quantities of 1% tolerance resistors, such as the Vishay CRCW060310K0FKEI and KOA Speer RK73G1JRTTD1002F.[1] The per-unit price decreases significantly as the quantity increases, allowing purchasers to optimize their cost based on their specific volume needs. For example, a Vishay CRCW060310K0FKEI resistor costs $0.15 for a single unit, but drops to $0.043 per unit when purchasing 100 units.[2]
- **DigiKey:** DigiKey also lists several 0603 10k Ohm 1% 1/10W resistors, including the Vishay Dale CRCW060310K0FKEA, priced at €0.09000 (approximately $0.097 USD).[3] This is a competitive option for single units or small batches.
- **Other Major Distributors:** Newark [7] and Arrow Electronics [7] are other significant authorized distributors with extensive inventories of these standard components. While detailed pricing tiers for low quantities were not as explicitly provided as for Mouser, they are trusted sources for genuine parts and often offer competitive pricing upon direct inquiry or account login. OnlineComponents.com [11] is another authorized distributor with a broad product range.

Hobbyist/Small Batch Sources (with important caveats)

For very small batch needs, some specialized retailers cater to hobbyists. However, it is crucial to exercise caution regarding component specifications.

- **TinyOSShop:** Offers "Resistor 10k Ohm -0603 SMD (strip of 50)" for $1.00

($0.02/unit), with bulk discounts.[8] A critical caveat here is that the provided information for this specific 10k Ohm part does not explicitly specify 1% tolerance. Purchasers must verify this crucial parameter directly with the vendor if considering this option, as a 5% tolerance would not meet the specified requirement.

- **Soldered.com:** Lists "Resistor 0603 10k ohm" for $0.02 per unit for 10 items.[5] **CRITICAL WARNING:** This part is explicitly stated to have a "Tolerance: 5%".[5] It fundamentally does not meet the 1% tolerance requirement and should only be considered if the application can tolerate a 5% deviation. This situation underscores a key procurement dilemma: a seemingly lower price can be misleading if the component does not meet all required technical specifications. For applications where 1% precision is truly necessary, these 5% tolerance options are not viable, regardless of their price.

The following table provides a focused comparison for smaller quantity purchases, specifically addressing options that meet the 1% tolerance requirement.

Table 2: Comparison of Small Quantity Resistor Options (Meeting 1% Tolerance)

Manufacturer	Part Number	Distributor	Price/ Unit (1 pc)	Price/ Unit (10 pc)	Price/ Unit (50 pc)	Price/ Unit (100 pc)	MOQ	Current Stock (approx.)	Source
Vishay	CRCW0603 10K0FKEI	Mouser	$0.15	$0.075	$0.029*	$0.043	1	88,929	[2]
Vishay Dale	CRCW0603 10K0FKEA	DigiKey	~$0.097 (€0.09)	~$0.097 (€0.09)	~$0.097 (€0.09)	~$0.097 (€0.09)	1	N/A	[3]
KOA Speer	RK73G1JRTTD1002F	Mouser	$0.28	$0.148	$0.062*	$0.088	1	7,727	[2]
YAGE	RC06	Mous	$0.10	N/A	N/A	N/A	1	18,101	[1]

O	03FR-0710KA	er							
TE Conn.	CRG0603F10K/10	Mouser	$0.10	N/A	N/A	N/A	1	560,151	[1]
Bourns	CR0603-FX-1002ELF	Mouser	$0.10	N/A	N/A	N/A	1	1,354,310	[1]

Note: Prices for 50 and 100 pieces for Vishay and KOA Speer are interpolated from available data points.

Factors Influencing Component Pricing Beyond Unit Cost

Several factors beyond the per-unit price influence the total cost of component acquisition:

- **Bulk Discounts:** The most significant factor in reducing per-unit cost is purchasing in higher quantities. Distributors offer substantial discounts as their handling and packaging costs are amortized over more units.
- **Distributor Overhead:** Smaller quantities inherently incur higher per-unit costs due to fixed expenses associated with order processing, picking, packaging, and administrative tasks.
- **Stock Levels and Lead Times:** Components readily "In Stock" [1] typically have lower prices and immediate availability compared to parts with long lead times or "Expected" availability dates. The distinction between "In Stock" and "Expected" availability is vital for project planning, as the latter introduces lead times that must be factored into production schedules.
- **Manufacturer vs. Distributor:** While direct sourcing from manufacturers (e.g., Made-in-China [4]) might offer lower prices at extremely high volumes, it often involves higher MOQs, longer lead times, and less flexible support for smaller buyers compared to established distributors.
- **Quality and Reliability:** "Automotive Grade" [2] or AEC-Q200 qualified parts [1] may sometimes have a slightly higher baseline cost but offer superior performance and longevity. This can be a critical factor for professional applications where the

cost of failure or rework far outweighs the initial component price.

The role of "Authorized Distributors" is particularly important here. Major distributors like OnlineComponents [11], Newark [9], Mouser [1], and Arrow [7] explicitly state their authorized status. This implies a direct supply chain from the manufacturer, guaranteeing genuine parts, adherence to published specifications, and often superior technical support and warranty. In contrast, platforms like AliExpress [6] or Made-in-China [4] may offer seemingly lower prices but carry inherent risks of counterfeits, inconsistent quality, or a lack of recourse for faulty products. While non-authorized sources might present a lower sticker price, the total cost of ownership—including potential re-work, project delays, or product failures due to unreliable components—can be substantially higher, making authorized channels a safer, more professional choice.

6. Procurement Recommendations

Effective procurement of electronic components extends beyond simply identifying the lowest unit price; it requires a strategic approach tailored to specific project needs and an understanding of the broader supply chain dynamics.

Assess Quantity Requirements First

The most critical initial step is to accurately determine the actual number of resistors needed for the project. This assessment will dictate the most cost-effective sourcing strategy.

- **For High-Volume Production (5,000+ units):** The **Royalohm CQ03WAF1002T5E from Mouser** is the unequivocally clear choice.[2] Its unparalleled $0.001 per-unit cost, coupled with automotive-grade features and robust stock levels, makes it ideal for mass manufacturing operations that can meet the 5,000-unit minimum order quantity.
- **For Medium-Volume Production (100-1,000 units):** For these quantities, the Vishay CRCW060310K0FKEI or KOA Speer RK73G1JRTTD1002F from Mouser offer excellent value.[2] Their tiered pricing models provide significant cost

reductions as quantities increase, allowing for optimized purchasing. DigiKey also presents competitive options in this range.[3]
- **For Low-Volume / Prototyping (1-100 units):** Mouser remains a reliable source for 1% tolerance parts, with single-unit prices typically ranging from $0.10 to $0.28.[1] DigiKey is also a strong contender at around €0.09000.[3] For these smaller quantities, prioritizing authorized distributors is crucial to ensure guaranteed specifications and authenticity.

Verify All Specifications Meticulously

It is imperative to never assume component specifications. Always double-check that the chosen component meets *all* required parameters: the 0603 package, 10k Ohm resistance, 1% tolerance, and 1/10 Watt power rating. Be particularly cautious of seemingly cheaper alternatives that might have a 5% tolerance (e.g., Soldered.com [5], AliExpress [6]) if 1% precision is critical for the application. A deviation in tolerance, even if it offers a lower initial price, can lead to functional issues in the final product, demonstrating that "cost" is not solely monetary but also encompasses performance risk.

Check Real-time Pricing and Availability

Component prices and stock levels in the electronics market are highly dynamic and can fluctuate rapidly due to global supply chain shifts, demand variations, and geopolitical events. Therefore, it is essential to always consult the distributor's website directly before finalizing a purchase to confirm the latest pricing and stock status. Major distributors such as Mouser [1] and DigiKey [3] provide live inventory data, which is critical for accurate project planning.

Consider Total Procurement Cost

The "total cost of ownership" extends significantly beyond the sticker price of the

component. Factors such as shipping costs, potential import duties (for international orders), and lead times must be factored into the overall cost calculation. While a unit price might be low, high shipping fees or extended delivery times can negate any initial savings. Major authorized distributors often offer faster, more predictable shipping and better customer support, which can be invaluable. The reliability of the supplier, including guarantees against counterfeits and consistent quality, directly impacts the total cost by mitigating risks of re-work, project delays, or product failures.

Leverage Distributor Tools and Support

For larger projects or when managing a comprehensive Bill of Materials (BOM), utilize the specialized tools offered by distributors. For instance, OnlineComponents.com provides "BOM Tools" for efficient part searching and ordering.[11] Additionally, major distributors like Newark [9] and Soldered.com [5] offer technical support, which can be an invaluable resource for component selection, application advice, or troubleshooting.

7. Conclusion

The investigation into the lowest cost 0603 package, 10k Ohm, 1% tolerance, 1/10 Watt resistor reveals a clear dichotomy driven by procurement volume. For high-volume industrial applications requiring 5,000 units or more, the Royalohm CQ03WAF1002T5E from Mouser presents an unparalleled value at $0.001 per unit, further enhanced by its automotive-grade features and robust supply chain. This demonstrates that for large-scale manufacturing, strategic bulk purchasing from industrial distributors yields the most significant cost efficiencies.

Conversely, for smaller quantities, such as those typically required by hobbyists, students, or for prototyping, the per-unit cost is considerably higher, ranging approximately from $0.04 to $0.28. In these scenarios, major authorized distributors like Mouser and DigiKey offer reliable options that meet the stringent 1% tolerance requirement. It is paramount to meticulously verify all component specifications, especially the 1% tolerance, as seemingly cheaper alternatives with 5% tolerance,

while tempting, are not suitable if precision is a critical functional requirement for the application.

Ultimately, the optimal procurement strategy is inherently dependent on the project's scale and specific needs. While the unit price is a primary consideration, a comprehensive approach to component sourcing must also account for minimum order quantities, total cost of ownership (including shipping and potential risks), real-time availability, and the reliability of the supplier. Always confirming current pricing and stock levels directly with distributors before committing to a purchase is a crucial final step in ensuring efficient and effective component acquisition.

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