

Thick Film Resistor Market - Forecast from 2026 to 2031

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Abstracts

Thick Film Resistor Market, with a 4.66% CAGR, is anticipated to reach USD 866.111 million in 2031 from USD 659.157 million in 2025.

Thick film resistors are passive components fabricated by screen-printing ruthenium-oxide-based pastes onto ceramic (typically 96 % alumina) substrates, followed by high-temperature firing at 800–850 °C. Resistive values range from 0.1 Ω to >100 G Ω , with standard tolerances of $\pm 1\%$ to $\pm 5\%$ and TCRs of ± 50 to ± 200 ppm/°C. The technology excels in high-volume, cost-sensitive applications requiring good stability, pulse withstand, and moderate precision compared with thin-film or foil alternatives.

Market expansion remains tightly coupled to three secular trends. First, the proliferation of powertrain electrification and advanced driver-assistance systems (ADAS) has dramatically increased resistor count per vehicle. Thick film devices are the dominant choice for low-ohmic current-sensing shunts (10 m Ω –1 Ω) in battery management systems (BMS), on-board chargers (OBC), DC-DC converters, and motor inverters due to their low inductance, high surge capability, and excellent thermal coefficient of resistance (TCR) tracking in four-terminal Kelvin configurations.

Second, Industry 4.0 and smart-manufacturing initiatives are driving deployment of distributed sensor nodes, motor drives, and robotic actuators that require robust, compact passives capable of operating in elevated ambient temperatures and high-vibration environments. Thick film resistors, particularly AEC-Q200-qualified automotive-grade series, satisfy these demands at a fraction of the cost of thin-film equivalents.

Third, continued miniaturization across consumer, industrial, and medical segments favors higher-density chip sizes (01005 to 2512 and larger power arrays). Advances in

paste chemistry and finer-line screen capability now enable 0402 and 0603 packages with power ratings up to 0.5 W and pulse handling exceeding 100 W in short-duration loads, making thick film increasingly competitive even in space-constrained designs traditionally reserved for thin film.

Within functional segments, thick film shunt resistors are experiencing the strongest growth trajectory. Modern low-ohmic shunts ($\approx 1\text{ m}\Omega$) leverage copper-terminated designs and proprietary low-TCR pastes to achieve $\pm 0.5\%$ tolerance and $\pm 15\text{ ppm}/^\circ\text{C}$ stability while handling continuous currents $>100\text{ A}$ and short-term peaks $>500\text{ A}$. These specifications are now mandatory for accurate state-of-charge (SoC) and state-of-health (SoH) estimation in xEV battery packs and for closed-loop current control in 800 V architectures.

North America retains a commanding share of global consumption, driven by concentration of Tier-1 automotive, defense, and renewable-energy OEMs that specify components with extended temperature range ($-55\text{ }^\circ\text{C}$ to $+175\text{ }^\circ\text{C}$), high-reliability screening (MIL-PRF-55342 equivalent), and domestic or near-shore supply chains. The region's leadership in wide-bandgap power electronics (SiC and GaN traction inverters) further amplifies demand for ultra-low-inductance, four-terminal shunts capable of precise high-frequency current measurement. Growth is reinforced by the rapid scale-up of North American battery gigafactory capacity and the resurgence of defense electronics spending, both of which prioritize components with proven long-term reliability and resistance drift

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