TCB60405-104V：Pin-to-Pin Drop-in Alternative for VAC T60405-R6131-X204 Nanocrystalline Common-Mode Choke



VAC T60405-R6131-X204 is a widely-adopted vertical through-hole nanocrystalline common-mode choke for industrial power-input EMI filtering. Nevertheless, global OEMs and contract manufacturers are continuously confronted with supply-chain risks: long-lead-time European manufacturing, allocation constraints, price volatility, and limited multi-sourcing options for critical power-supply BOM items. This paper introduces TCB60405-104V, Yetcoil's fully-validated pin-to-pin drop-in replacement. It matches the original' s electrical-magnetic performance, mechanical footprint, thermal operating window and assembly compatibility, enabling customers to realize BOM dual-sourcing or direct cross-reference without PCB modification or EMC-loop re-qualification.

1. Market Background of VAC T60405-R6131-X204

The T60405-R6131-X204 from Vacuumschmelze (VAC) is a classic 2-line nanocrystalline common-mode choke, rated for 2×4.5A continuous current, widely deployed in industrial switching power supplies, AC-DC converters, cabinet power-filter units, and general-purpose EMC-compliant power-input stages.

Its core advantages stem from high-permeability nanocrystalline Vitroperm core: outstanding low-frequency common-mode impedance, stable inductance over temperature, and compact vertical through-hole form-factor. The key electrical parameters are:

- Inductance: 10.8mH @10kHz, 2.5mH @100kHz
- Impedance |Z|:720Ω @10kHz, 2320Ω @100kHz
- Rated current: 4.5A per winding
- Operating ambient temperature:-40° C ~ +70° C (VAC datasheet)

Despite its proven field performance, hardware designers and procurement teams face three persistent pain-points:

1. Sole-source risk: Manufactured exclusively in Europe, subject to factory capacity allocation, ocean-transit lead-time fluctuation, and customs-clearance variability. Many projects suffer production bottlenecks when original-channel stock is exhausted.
2. High total-cost-of-ownership: Original component unit price plus international freight and tariff costs increase BOM expenditure for mid-to-high-volume production.
3. High switching cost for alternative solutions: Most general-market substitutes require PCB footprint rework, winding-polarity re-check, and full-re-validation of

EMC test reports, which brings heavy engineering overhead and delays product release cycles.

For many industrial-equipment manufacturers, the ideal solution is a form-fit-function (FFF) drop-in second-source: same mechanical outline, identical pin assignment, matched impedance-frequency curve, equivalent thermal-reliability performance, no hardware or firmware redesign required. That is exactly the development objective of our TCB60405-104V.



2. TCB60405-104V Technical Overview: Full-Performance Equivalent
TCB60405-104V is a vertical through-hole common-mode choke independently developed by Yetcoil, designed as direct mechanical & electrical cross-reference for VAC T60405-R6131-X204.

2.1 Core Material & Construction
Adopts high-permeability iron-based nanocrystalline core material, consistent with the original material-system design philosophy. The bobbin and housing comply with UL94V-0 flammability grade. Operating temperature range expands to -40° C ~ +125° C, offering extra thermal margin for high-ambient-temperature cabinet-installation scenarios. RoHS compliant.

2.2 Mechanical & Pin-to-Pin Compatibility
All critical mechanical dimensions are aligned with VAC T60405-R6131-X204:
- Max. overall height:22.0㎜
- Max. outer diameter:25.0㎜
- Typical body width:12.0㎜
- Pin layout, pin spacing (15.2㎜×7.6㎜)

Key benefit: Direct drop-in replacement. Existing PCB Gerber files, stencil, assembly jig, wave-soldering process do not need any modification. No mechanical re-qualification work required. Custom part marking service is available upon customer request.

The impedance-vs-frequency curve and insertion-loss curve of TCB60405-104V overlap closely with the reference device, covering 0.1kHz-hundreds MHz wide-band CM noise-suppression capability. It can reproduce the original EMC-filter performance in your existing power-input circuit, without re-tuning filter-stage component values.

3. Application Scope
TCB60405-104V targets same application scenarios as T60405-R6131-X204:
- Industrial AC-DC power supply input-filter stage
- Cabinet-type power-unit EMC filter
- Laboratory-equipment power-input port
- Non-safety-relevant power-conversion equipment, general-purpose EMI suppression