RF Components, Dielectric, and Magnetic Materials
Technical Ceramics
Skyworks Solutions, through Trans-Tech, its industry-leading ceramic products division, designs and manufactures a complete line of RF and microwave components for commercial markets. With over 50 years of experience, we offer a complete line of high quality, low-cost, ceramic-based components for a number of RF and microwave markets including wireless communications, infrastructure, military, cable television, broadband access, circuit miniaturization, technical powder, and ingots. Our tightly controlled processes, from raw materials to forming, firing, finishing, assembly and test, produce the highest quality and the most consistently reproducible components available today for both low and high volume requirements. Our product portfolio includes dielectric resonators and coaxial transmission line elements for DRO and VCO applications, ceramic bandpass filters, ferrite, and garnet material for circulators/isolators.

RF Components
Trans-Tech, Inc. manufactures a wide range of ceramic-based RF components including band pass filters, coaxial resonators, inductors, and filters. All of our components are made in-house utilizing proprietary powder formulations and ceramic processing techniques. Our tightly-controlled processes from raw materials, firing, metallization, finishing, and automated assembly and test, produce the highest quality and most consistently reproducible products available today. Rapid turnaround from design to prototype is achieved utilizing our engineering expertise.

Band Pass Filters
Trans-Tech Inc. is a world-class supplier of high performance ceramic band pass filters. Specializing in band pass, notch, and diplexing applications, Trans-Tech can cover a frequency range from 300 MHz to 6000 MHz with surface mount or connectorized devices. Utilizing state-of-the-art assembly automation, Trans-Tech provides cost-effective solutions meeting high performance specifications.

Trans-Tech’s surface mount PCB configured filters are designed to comply with “Green” manufacturing initiatives eliminating heavy metal elements. This configuration is designed to comply with pending European Union regulations (RoHS) regarding the elimination of lead and hazardous substances in electronic assemblies.

Our application engineers employ the latest in simulation and circuit analysis software, with accurately-defined design rules, to provide rapid turnaround on new filter designs. With our experience and design aids, Trans-Tech can provide the necessary support for your application from prototype through production. In addition to the personal attention, Trans-Tech offers a computer-aided design tool, CRaFT, to assist engineers designing basic filters. Please refer to the latest version of the CRaFT document from our Web site.

The strength of Trans-Tech’s designs begins with our ability to produce our own coaxial resonators from proprietary ceramic formulations. These resonators provide a high Q element that allows us to maintain our low filter insertion loss values. With numerous design package styles, Trans-Tech offers short leadtimes on both prototype and volume applications.
Coaxial Inductors
Trans-Tech’s coaxial inductors are most frequently used in the resonant circuit of voltage-controlled oscillators (VCOs), where a varactor provides the tuning capability. The designer is usually confronted with trade-offs between high Q for best phase noise and component size vs. circuit board real estate. An algorithm for selecting the correct Trans-Tech part is available on our Web site. In addition, Trans-Tech’s COAX program can provide valuable assistance for determining the correct Trans-Tech part. Application notes and references give example circuits, basic principles, and helpful hints.

While there is no physical distinction between a coaxial resonator and a coaxial inductor, the selection of an inductor for a VCO begins by first knowing (from analysis or experiment) the equivalent inductance that the active circuit, including the varactor, must see. In general, the VCO active circuit loads the ‘resonator’, lowering the resonator’s self-resonant frequency (SRF). The situation is analogous to externally capacitively loading a discrete parallel resonant L-C circuit.

Coaxial Resonators
Trans-Tech offers ceramic coaxial line elements in seven sizes and four dielectric constants to span applications from 300 MHz to 6.8 GHz. Metallized ceramics provide an attractive alternative, since the wireless communication market now forces a continuous trade-off between performance and miniaturization.

Trans-Tech’s ceramic solution offers advantages of high Q, reduced size, better shielding, and temperature performance superior to that obtainable from conventional L-C circuits or microstrip construction.

Two types of coaxial resonators are offered by Trans-Tech, a quarter-wave short (1/4) and a half-wave open (1/2). The quarter-wave has thick-film silver applied to one end. The half-wave has both ends un-metallized.
Dielectric Materials

Dielectric microwave materials are commonly assigned a loss tangent to permit an estimate of signal losses. But ceramic dielectric resonators (DRs) operate at a specific frequency, in a specified geometry, which allows direct measurement and specification of $Q_u$, the unloaded quality factor. $Q_u$ is a fundamental resonator parameter which is particularly appropriate (and more useful than loss tangent) for filter and oscillator applications.

Ceramics do not age perceptibly. Any change in the resonant frequency of a DR over time can be attributed to change in the measurement cavity or measurement technique. Ceramics don’t absorb moisture noticeably, but moisture condensation on the surface of the DR can affect $Q_u$. The $Q_u$ will recover when the moisture is driven off, for example, by self-heating of the DR in a transmitter filter.

The $Q_u$ of ceramic resonators can be degraded by finger oils, pencil marking, tape, and a host of other contaminants. Cleanliness is important.

Ceramics chip easily when they contact hard surfaces. Most tiny chips will not affect the electrical performance. Neither is surface roughness particularly important: there are no currents in a ceramic dielectric resonator, only stored energy in the form of fields.

Ceramics conduct heat much slower than metals. A large enough temperature gradient through a ceramic part can cause failure due to differential expansion: we call this thermal shock. Sudden application of heat on one side of a thick ceramic part invites fracture.

Adhesives used to mount DRs must be chosen carefully. Adhesives will always degrade a DR’s $Q_u$, but Trans-Tech has developed bonding systems to minimize $Q_u$ loss while guaranteeing bond strength. Refer to the Trans-Tech application note, Adhesives for Dielectric Resonators, document number 202824.

Basic Dielectric Materials

Bulk Microwave Dielectrics

Trans-Tech offers a broad range of ceramic materials which are not characterized for resonator applications, but for bulk, miscellaneous shapes, or substrates. Contact the factory for custom sizes and shapes.

Microwave Magnetic and Dielectric Materials for Ferrite Devices

Features
- Wide variety of materials
- Wide range of shapes and sizes, including ferrite/dielectric assemblies
- High quality and reproducibility
- Metallization on all ferrite only parts using thick film silver

Benefits
- Performance tailored for frequency and power level
- Reduced insertion loss
- Reduced intermodulation distortion (IMD)

Introduction

Trans-Tech offers a wide range of materials, shapes and sizes that can be selected to optimize customers’ specifications. Because we design and manufacture from raw materials to finished parts, we can ensure the quality and reproducibility of our products in small to very high volume applications.

Intended Applications

For below resonance applications, our ferrite garnets and spinels offer a wide range of 4pims for a wide range of frequencies, and special garnets for power handling or very wide temperature ranges by substitution of holmium or gadolinium respectively, covering a range from about 1 GHz to 40 GHz.

For above resonance applications, our garnets are available with narrow linewidths and a wide range of magnetization, covering the range of 200 MHz to 3 GHz approximately.

General Characteristics
- Magnetic and dielectric losses are the subject of continuous improvement, and we offer the lowest possible values for any given composition.
- Our manufacturing processing and microstructure has been optimized to give the lowest possible intermodulation contribution from the ferrite material.
- We offer a range of dielectric materials for ferrite/dielectric composite assemblies, the most useful lying in the range 16 to 50 dielectric constant. Other special dielectrics are available. Applications include dielectric impedance transformers and tuning pieces.
- Our precision machining allows very tight tolerancing for precise device assembly.