Dominant provider of **precision-engineered**, **high performance** RF, microwave, mmW and microelectronic solutions for **high reliability** and **mission critical** applications in the global defense, commercial and space markets.
API’S RF, MICROWAVE & MICROELECTRONICS

• 13 locations worldwide dedicated to the design, development and manufacture of one of the world’s largest selections of RF/microwave components and subsystems
• 70+ years of extensive and diverse program experience
• Preferred Supplier status at many major primes
• Engineering accounts for 14% of the team’s overall composition
• Dedication to quality; AS9100 and ISO 9001 certified
FILTER PRODUCTS

Integrated Microwave Assemblies

- IMAs
  - Digital Frequency Discriminators
  - Upconverters/Downconverters
  - Amplified Preselectors
  - Frequency Activity Detectors
  - Frequency Multipliers

Switched Filter Banks

- High Isolation (>80 dB)
- Fast Switching Speeds (<25 ns)
- High Power (100 watts+)
- In-house Filter & Switch Design
- Multiple Control Interfaces (LVTTL, RS-232, USB)

Filter Optimization

- Cavity
- Lumped Element
- Ceramic
- SAW
- Suspended Substrate
FILTER PRODUCTS

High Performance, Fully Customizable Multi-Channel Filter Assemblies
- Bandpass, Lowpass, Highpass, Bandreject
- Duplexers/Diplexers, Triplexers, Multiplexers
- Dielectrically Loaded Cavity Filters, Duplexers & Multiplexers
- Low Cost Ceramic
- Cavity / Combline, TEM
- Lumped Element
- Suspended Substrate
- SAW
- Waveguide

Wireless Assemblies & Sub-Systems
- Multiplexers
- PIN Diode Switch Filters
- Filtered GPS LNAs
- Integrated Switch Filter Banks
- High Power Amplifier + Filter Assemblies

Co-Site Interference Mitigation Filters
Broad Filter Capability Supporting Optimization of Program Performance, Size and Cost Requirements

- Lumped Element Filters
- Cavity /Combline/Interdigital Filters
- Tubular Filters
- Waveguide Filters
- Ceramic
- Suspended Substrate Stripline
- Surface Acoustic Wave (SAW)
- Diplexers & Multiplexers
FILTER MANUFACTURING CAPABILITIES

Prototype/Production Centers
- Prototype Machining
- CMM (Coordinate Measurement Machine)
- Laser Welding

Fabrication & Assembly
- J-STD-001, Class 3 Soldering
- SMT/Pick n Place
- Miniature Assembly

Electrical & Environmental Testing
- Automated Test & Data Recording
- Extensive Burn-in and Thermal Cycling Capabilities
- Shock & Vibration Testing

MICROWAVE FILTERS
FILTER PRODUCTS
Our customers are able to weigh the benefits of...

• Size vs. Loss
• Rejection vs. Size
• Selectivity vs. Group Delay

...and select the perfect filter to optimize system performance and value.
API’s bandpass filters are available with nearly every topology including:

- SAW
- Cavity
- Lumped Element
- Tubular
- Suspended Substrate
- Ceramic
- Waveguide
API’s lowpass are available with the following topologies:

- Lumped Element
- Tubular
- Suspended Substrate

Our expert engineers can utilize multiple topologies in a single design!
API’s highpass filters are available with the following topologies:

- Lumped Element
- Suspended Substrate
API’s notch filters are available with the following topologies:

- Cavity
- Lumped Element
- Suspended Substrate
- Ceramic
- Waveguide
Suspended Substrate is the ideal topology for broadband contiguous multiplexers. We also provide multiplexers utilizing lumped component and cavity based structures.
FILTER TOPOLOGIES
Features

- 300 kHz to 10 GHz
- Smallest and lightest
- Versatile topologies and transfer functions
- Ideal for moderate to very wide bandwidths
- Connectorized or surface mount
- Easily multiplexed
- Temperature stable options
- RoHS Compliance
Our custom package concepts provide additional shielding for better ultimate rejection.

We use creative layouts which offer reduced package sizes when needed.
Features
- 400 MHz to 40 GHz
- Low insertion loss
- High selectivity Chebyshev and pole-placed
- Temperature stable options
- High power handling capability
- 0.1 to +60% bandwidth
- Low profile designs available
- Drop-in designs to 20 GHz
- Low intermodulation products
High Performance Cavity Filters

- Unique low dielectric constant stabilizing structure to reduce overall sensitivity to shock and vibration
- Bimetallic resonators for superior temperature stabilization
- Innovative cross coupling techniques to achieve optimal rejection characteristics
- Reduce overall size and increase peak power handling with unique resonator designs
- Select designs are laser welded for added environmental protection and reliability

CAVITY TOPOLOGIES
Features

- Frequency range - 400 MHz to 6 GHz
- Bandwidths - 1 to 10%
- 2 to 6+ sections, custom packages available
- Low cost, small size
- Good insertion loss relative to size
- Surface mount
- Open frame or sealed for hi-rel
- Typical applications are:
  - GPS
  - ISM
  - WLAN
  - IFF
  - ManPack
Gold plating on surface mount packages offers better solderability & corrosion resistance

Temperature Stabilizing Elastomers for:
- Harsh Temperature Environments
- Demanding Shock & Vibration Specifications

Capacitive coupling arrays offer:
- Design Flexibility
- Superior Performance
- Enhanced Reliability
- Enhanced Repeatability
**Features**

- 2 to 40 GHz
- Ideal for broadband multiplexing
- Chebyshev and elliptic response
- Well suited for high shock and vibration applications
- Highly repeatable (ideal for matched filters)
- Broadband receivers
- Easily integrated with other components
We also offer immersion silver plating for very low loss designs
Suspended Substrate Quadraplexer

NF23BA72 ProtoData

Transmission Response

Frequency (GHz)

DB(|S(2,1)|)
CH1_at_Plus25

DB(|S(2,1)|)
CH2_at_Plus25

DB(|S(2,1)|)
CH3_at_Plus25

DB(|S(2,1)|)
CH4_at_Plus25
SURFACE ACOUSTIC WAVE (SAW)

Features
- Frequencies from 20 MHz to 2600 MHz
- Fractional Bandwidths 0.04 to 60%
- Hermetically Sealed

Available Options
- Low Loss Performance (< 2 dB)
- Shape Factors Below 1.10:1
- Customized Designs for Specific Applications
Features
- 30 MHz to 5 GHz
- Broad Stopbands
- Ideal for Harmonic Rejection
- Moderate Bandwidths (2 to 50%)
- Chebyshev Transfer Functions
- High Power Handling Capability
Utilizing Precision Centerless Ground Stock

High Power Tubular Designs to 5000 watts
Low Loss and High Ultimate Rejection
Consistent Unit to Unit Performance
Utilizing Precision Centerless Ground Stock
Lowpass or Bandpass Configuration
High Shock Rugged Mounting Configurations Available
Features
2 to 40 GHz
Bandwidths 0.1 to 10%
Extremely Low Insertion Loss
High Power Handling
RX/TX Waveguide Diplexers in Custom Configurations

Waveguide Flanges are Standard

SMA, TNC or Type-N Connectors Available

Integral Heat Sinks
RAPID FILTER CENTERS
API offers Lumped Element rapid cell filters with the following options:

- Bandpass, Lowpass, Highpass or Band Reject (Notch)
- SMA Connectors, Surface Mount or PC Pin Options
- 1 MHz to 3 GHz

Rapid filter solutions are for moderate complexity, standard design options only. Filters within these restraints (for selected applications) can be delivered in as little as 2-4 weeks. Please contact the factory for details and to find out if your requirements fall within these guidelines.
API offers Cavity rapid cell filters with the following options:

- Bandpass
- SMA Connectors
- 800 MHz to 20 GHz

Rapid filter solutions are for moderate complexity, standard design options only. Filters within these restraints (for selected applications) can be delivered in as little as 2-4 weeks. Please contact the factory for details and to find out if your requirements fall within these guidelines.
API offers Ceramic rapid cell filters with the following options:

- Bandpass
- Surface Mount
- 400 MHz – 2,500 MHz

Rapid filter solutions are for moderate complexity, standard design options only. Filters within these restraints (for selected applications) can be delivered in as little as 2-4 weeks. Please contact the factory for details and to find out if your requirements fall within these guidelines.
QUALITY AND RELIABILITY
Our employees:

- Are encouraged to suggest product improvements
- Have the skills and tools to identify the slightest imperfections
- Continually strive to exceed the goals placed before them
- Know that our success is directly related to the satisfaction of our customers

- All Manufacturing Facilities Certified to ISO 9001:2008
- Six Certified AS9100 Facilities (more facilities to be certified soon!)
During the design & development process, our engineers incorporate preventative design best practices such as:

- Spring-loaded, self-locking tuning bushings and rotors reducing the risk of metallic slivers which can lead to premature failure in cavity designs.

- Annealing of all inductors to remove any metal stress memory for consistent and reliable inductor performance.

- Designs incorporating smooth angles and edges for superior plating adhesion and higher operating power.
Quality Planning
As part of our Quality Management System (QMS) planning we utilize state of the art quality tools including APQP (Advanced Product Quality Planning), Control Plans and FMEA (failure modes effects analysis) that result in robust product realization strategies with the result of proactively engineering out potential quality problems.

Process Monitoring
We monitor established control points of product realization with proprietary data logging technology which allows for regular and critical assessment of performance against QMS objectives and product capability expectations.
ENGINEERING CAPABILITIES

State-of-the-Art Engineering
Using state-of-the-art software and simulation tools, our experienced engineering team is able to quickly take a requirement from concept to production.

3D modeling is used to ensure component compatibility and assess tolerance stack-ups.

Tools and software our Engineers routinely use:
• Ansoft HFSS
• Microwave Office
• Agilent ADS Design Suite
• SolidWorks
• Labview
• Agilent Genesys
• AutoCAD
• Cadence Allegro
• Ansoft Designer
• Sonnet EM Simulator

Partnering with our Customers
Using Genesys and CAD models allows us to integrate the Filter into our customer’s system level assembly to ensure proper fit and overall integrity.
POINTS OF CONTACT

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