COMPANY SNAPSHOT

• Dominant technology provider of RF/microwave, microelectronics, and security products for critical and high-reliability applications

• Deliver high performance, innovative products and services for critical space, defense, aerospace and commercial applications

• 50% Defense / 50% Commercial

• Publicly traded (NASDAQ: ATNY)

• 2,000+ Employees

• Annual revenues of over $325 million

• Company behind some of the most well-known product brands in the industry
ADDING CAPABILITIES EVERY DAY

1981: Founded

June 2011: NASDAQ Listed

Key Acquisitions:

2007
- Data Bus Products
- Analog Mixed Signal Products
- Components

Key Acquisitions:

2009-2010
- TEMPEST & Emanation Security, Encryption & Ruggedized Systems
- 1553 Data Bus
- Sys & Subsys Solutions
- Build-to-Print Services

Key Acquisitions:

2011
- Integrated & Multi-Function RF Assemblies
- Microwave Filters
- Oscillators
- Power Management
- Sensors
- Hybrids
- Active/Passive Components
- EMI Filters
- Class K (Space)
- Secure Communications
- EMS

Key Acquisitions:

2012-Present
- Radar Subsystem Solutions
- RF Systems
- RF/Microwave Modules
- Integrated & Multi-function RF Assemblies
- RF Silicon & RF Components
- Power Amplifiers
- Microelectronics
- Custom Magnetics
- Specialty Connectors
- Rugged Power Rectifiers
- Power Distribution Units
- Secure Mobility Solutions

New/Expanded Products & Capabilities
• Domestic & International Footprint

• Trusted facilities & personnel
  - 12 Trusted facilities (US, UK, and Canada)
  *High barriers to entry*

• Certified facilities, including:
  - MIL-PRF-38534 (Class H and K)
  - AS9100 Rev C
  - ISO 13485:2003
  - ISO 9001:2008 (All manufacturing facilities)

• International manufacturing locations are API companies and not subcontractors; same equipment and processes as U.S. facilities

• Global Sales Presence
API Technologies has outfitted a 45,000 ft² facility to support the combined manufacturing and engineering operations of our Worcester and Marlborough facilities. Located in Marlborough Massachusetts Technology Park, the facility is AS9100 registered and fully certified to MIL-PRF-38534 Class H and Class K standards.

API is a designer and manufacturer of RF/microwave and hybrid components, microwave, MMW, and microelectronic assemblies for defense, space systems, satellite, high-rel commercial, communications, avionics and ruggedized industrial applications.

**API Benefits**
- 30,000 square feet of Class 100,000 Clean Room
- Prototypes, Production and Qualification
- Reduce Size/Lower Weight
- Improve Performance and Reliability
- Full Temperature Testing
- Environmental Stress Screening
- MIL-PRF-38534 Class H / K
COMPLETE SOLUTION PROVIDER

Technologies
- Mixed Signal & Power
- RF, Microwave & MMW
- Optoelectronics
- Space
- Thin Film / SAW Wafer
- Power Conversion / Regulation

Markets
- Defense (MIL-PRF-38534 Class H)
- Space (MIL-PRF-38534 Class K)
- Avionics
- Hi-Rel Commercial
- Ruggedized Industrial
- Secure Communications

Capabilities
- Advanced Engineering
- High Density Manufacturing
- DC-50 GHz
- High Reliability
- Class K Certified Facility
- Thin Film / SAW Wafer Fab
CERTIFICATIONS & QUALIFICATIONS

- Manufacturing Facilities Certified to ISO 9001:2008
- EN/JISQ/AS9100:2009 certified
- 6 Certified AS9100 Facilities
- ANSI 20.20 Compliant Facilities
- Department of State ITAR Compliant
- Cleared Facilities & Personnel
- Six Sigma Greenbelts
- Certified Facilities to MIL-PRF-38534 (Class H and K)
  - Certified and Qualified by the Defense Logistics Agency
- QPL MIL-PRF-15733 & MIL-PRF-28861 (Selected Products)
- Solder/Assembly J-STD-001 Class 3 and IPC-A-610
- NEBS Approved (Selected Products)
- RoHS Compliant (Selected Products)
State-of-the-Art Engineering

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

- Ansoft HFSS
- Ansoft Designer
- Microwave Office
- Agilent ADS Design Suite
- SolidWorks
- Labview
- Agilent Genesys
- AutoCAD
- Cadence Allegro
- Sonnet EM Simulator
- PSpice
- PCad
- Or Cad
- Finite Element Analysis for Thermals
MANUFACTURING

Capabilities

- Auto Dispensing
- Auto Die Attach
- Auto Flip Chip/BGA
- 0.7 – 2 mil Gold Wirebonding
- 1 – 20 mil Aluminum Wirebonding
- Stenciling/Screen Printing
- SMT/Pick n Place
- Solder Reflow
- Aqueous Cleaning
- Hermetic Sealing
- Vacuum Seal
- Encapsulation
Capabilities

- VLSI Tests
- Mixed Signal Test Stations
- MMW LabView Test & Chamber
- Custom ATE Stations
- High Power Testers
- RF Test Benches
- Testing to 50 GHz
- -55°C to +125°C Electrical Test
Capabilities

- Laser Cutting
- Metal Deposition
- Photo Lithography
- Auto Step Reticle Stepper
- Precision Photo Resist
- Automated Developer Application
- Ion Etching
- Pack
- Auto Probe & Trim
- Auto Wafer Dicing
- Active or Passive Laser Trim
VERIFICATION & SCREENING

Capabilities

- Wirebond Pull & Ball Shear Tester
- Die Shear Test
- Pressurizing Helium Chamber
- Temp Cycling
- Fine/Gross Leak Test
- Real Time X-Ray
- Burn-In (Dynamic & Static)
- Centrifuge
- PIND Test
- Thermal Shock
CUSTOMERS

Honeywell

Raytheon

BAE Systems

L3 Communications

Orbital

Thales

GE Aviation

Hamilton Sundstrand

EADS

Ball

Rockwell Collins

Northrop Grumman

Lockheed Martin

Boeing
RF, Microwave & MMW
Q Band Power MMIC Amplifier

- Power MMIC
- Micro Strip to Waveguide Launches
- Proprietary MMIC Attach
- Thin Film Bias Boards

S Band SiC/GaN MMIC Amplifier

- High power RF amplifier using SOA III-V compound semiconductor and high dielectric barium titanate thin film
- Custom Package with Hermetic Feedthroughs
- Laser Sealed
QFN (Quad Flat No-lead) “Air Cavity” Package

- Proprietary Void Free Solder Die Attach
- MIL Temp Cycle Range
- Micro Strips
- Chip Caps
- Matched CTE
- Static Burn-in

High Power Radar (X Band) Amplifier

- Microstrip to Waveguide Launches
- Proprietary MMIC Attach
- On-board Power Supply
**STANDARD PRODUCTS**

**16-way Power Amplifier**
- Vertical Integration
- Proprietary Die Attach
- Full Test of MMIC and Combiner Level
- Thin Film
- Wirebond

**Mixed SMT & Chip on Board (COB)**
- Complex High Frequency Multi-Layer Board
- Surface Mount, Thru-hole Bare Die and Wire/Ribbon Bonding Used
- Full Functional Testing
**PIN Diode Drivers**

- MIL-STD-883 Level B Screening
- Inverting and Non-inverting Modes
- Positive and Negative Output Currents
- −55°C to +125°C Operating Temp

**1090 MHz SAW Oscillator Build-to-Print**

- MIL-PRF-38534 Class H Assembly
- Complete Microwave Testing Capability
- API SAW Wafer Fab
- Engineering Support for Process Design Testing
SAW Controlled Voltage Oscillators

- Exceptionally Low Phase Noise (Less Than -124 dBC/Hz at 1 kHz Offset)
- Linear Tuning
- Available From 100 MHz to 2 GHz Fundamental
- Frequency Multiply Option for Higher Frequencies
- Suitable for Applications with High Vibration Environments
A/D & D/A Converters
- 6 – 20 Bit Resolution
- CMOS and TTL Compatible Formats
- High Stability Over Wide Temp Ranges
- Laser-Trimmed for High Linearity
- High Resolution & High Speed
- Small Packages
- Operate Over Extended Temperatures

Voltage References
- Initial Accuracy to Better than 2.5 mV
- Temperature Coefficient to Better than 3 ppm/C
- Short Circuit Protected
- Standard 14 pin Dual-In-Line Package
- Fully compliant MIL-STD-883
Wideband Receiver MCM

- Avionics Application
- 14 Channels of 7-bit, 50 MSPS ADC
- Large ASIC, 0.52 inch per side, 424 Bond Pads
- Custom Package, 7 Layer HTCC, 2.3 x 1.5 Inch
- 274 Leads, 25 mil Pitch
- 212 Chips

Hybrid Phase Shifter Driver

- Initial Accuracy to Better than 2.5 mV
- Temperature Coefficient to Better than 3 ppm/C
- Short Circuit Protected
- Standard 14 Pin Dual-In-Line Package
Custom ASIC Monolithic Packaging

- Chip and Wire QCFP
- 1 mil Gold Wire
- Mil-STD-883 Compliant
- Custom CMOS Chip Set
- Identification Friend or Foe for Airborne Application

Solid State Opto-Isolated Relay

- 1 Amp Solid State Relay
- Opto Isolated
- Proprietary Die Attach
- Custom Cut Substrate
Optoelectronics/LED Illumination
Laser Rangefinder Receiver

- TO-8 Header with Sapphire Window
- Multi-Stacked Substrates

Custom Packaging for Fiber Optical Networking

- Custom Package Chip and Wire
- Tunable Receiver for Wavelength Monitoring
- Internal Thermo-electric Cooling
VCSEL Encoder
- Chip on Board Using FR4
- Custom Encoder Using Laser Emitting Chip
- Custom ASIC and Decoder

Silicon Carbide LED
- Enhanced Thermal Conductivity
- Custom Package
- Proprietary Die Attach
- Silicon Carbide
- 1 mil Wire
STANDARD PRODUCTS

Build to Print Silicon Carbide LED Illumination

- Superior Thermal Dissipation
- Chip and Wire
- Thin Film Aluminum Nitride Substrate
- Silicon Carbide LEDs
Microelectronics in Space
SPACE ASSEMBLY CAPABILITIES

- Surface Mount Assembly
- Void Free Solder Die Attach
- Epoxy Die Attach
- Auto Die Attach
- Flip Chip
- 0.7 - 2 mil Gold Wire Bonding
- 1 - 20 mil Alum Wire Bonding
- Manual Ribbon Bonding
- Testing to 50 GHz
- Active or Passive Laser Trim
- Hermetic Construction
- -55 °C to +125 °C Electrical Test
- Burn-in Capability (Dynamic & Static)
- In-house Thin Film & SAW Capabilities
- Multiple Substrate Construction: Thick & Thin Film
- Environmental Stress Screening (ESS)
**SPACE QUALIFIED PRODUCTS OVERVIEW**

**Space-Qualified Components**

- DC/DC
- Power Dividers
- Couplers
- Attenuators
- Switches
- Mixers
- Amplifiers
- Limiters
- VCO
- Filters

**RF2M Microwave Offers**

- 30+ Year Space Heritage
- Focused Space Product Team
- Technology Breadth
- GaAs, Si & GaN Devices
Development Plan

- PDR (Preliminary Design Review)
- Build and Evaluate EMU Units
- CDR (Critical Design Review)
- Process Identification Document (Baselined)
- MRR (Manufacturing Readiness Review)
- Elements/Devices Screened
  - Active Devices – Class K LAT (Lot Acceptance Test) per MIL-PRF-38534
  - Active Devices are Procured as Rad-hard or Tested for Tolerance
  - Passives Class K LAT (Where Applicable)
  - Package Evaluation per MIL-PRF-38534
- 100% Pre-cap and Final Inspection
- 100% Burn-in (320 hours) with 2% PDA
- API will Perform Groups A, B, C and D Conformance Testing and Periodic Inspection per MIL-PRF-38534
CERTIFICATIONS AND QUALIFICATIONS

• MIL-PRF-38534 General Specification for Hybrid Microcircuits
  • Facility and Manufacturing Process Certified and Qualified by DSCC for Class “H” and “K” Devices

• AS 9100, Quality Management System

• IPC 610 Certified Operator
Deep Space Launch
- Galileo
- Cassini
- USERS (2 sats)
- Selene & Okina
- Mars Phoenix
- Lunar Reconnaissance Orbiter

Launch & Reentry
- Vehicles
- Taurus
- Minuteman
- H-II

Scientific Missions
- SAOCOM
- Hershel Plank
- AMS-02
- Aquarius (SAC-D)
- Lisa Pathfinder
- Juno

Communications
- GPS-2F
- Prima
- O3B
- Inmarsat
- Intelsat
- Sirius Radio
- Direct TV
- Optus 10
- Amazonas 3
- Grail (2 sats)
- EnMap
- Vegetation
- Cassini
- Meteosat

- Thor 7
- MUOS
- Hot Bird
- MARECS
- Olympus
- SkyNet
- Eutelsat
- Koreasat
- OCO
- LCROSS
- Mars Science Lab
- ISS Kibo EF
Isolated DC-DC (Triple)

+28V Bus

-12V

+12V

+5V

Linear Regulators

- AP117A (+1.5V, FPGA)
- AP8601-2.5 (+2.5V, ASIC)
- AP8601-ADJ (+3.3V to +2.5V, 5A, Logic)

Switching Regulators

- AP8565-2A (+1.5V, FPGA)
- AP8565-6A (+2.5V, ASIC)
- AP127-ADJ (+ADJ, -ADJ, Log-Amp)
Rad Hard Power References

- Fixed and Adjustable Devices Available
- Up to 1.5 Amp Output Current
- Stabilities as low as +/-25 mV over the full Temp Range
- Standard TO-257 Package Outline

Rad Hard Linear Regulator

- Ultra Low Drop Out Voltage
- Outputs up to 5 Amps
- Voltage range up to 5 Volts
- Standard MO-078 Package
Rad Hard POL Regulator

- >90% Efficient @ 5 V input
- Ultra Stable across Temperature and Aging
- 2 Amps Output Current (6 Amp coming soon)
- Standard MO-078 Package Outline

Rad Hard Solid State Relay

- First Normally Closed SSR on the Market
- 10 Amp Capability
- Singles and Duals Available
- Standard SSR Package Outline
Thin Film/SAW Wafer Fab
Whether drilling on Alumina, Aluminum Nitride, BeO, Silica or Quartz, using our advanced laser drilling method ensures enhanced mounting convenience without the need for awkward bonding techniques.

**Specific Core Competencies Include:**

- Tolerances to ± 0.00005" (1.27μm)
- Resistor Tolerance to 0.1% Absolute, 0.01% Matching
- Metalized Vias and Wraparounds
- Gold Filled Vias
- Copper Filled Vias
- Polyimide, Silox and Silicon Nitride Dielectrics
- Dielectric Bridges
- Gold/Tin Selective Deposition
- Fine Lines and Spaces 0.0004"/0.0004" (10μm)
NICHROME/TANTALUM NITRIDE RESISTORS

Metal schemes including Gold, Copper, Nickel, Nichrome and Tantalum Nitride lines/spaces to ± 0.00050".

Gold plated or metallized vias for improved ground plane connection or heat dissipation.

BeO, Alumina, Aluminum Nitride, Silicon and Ferrites are just some of the substrate materials available.

Few companies have the capability to provide edge and via wrap-around services as we do. Selective 360° deposition allows for Gold to be deposited with a thickness of 100-400 micro inches.
API knows that critical attention to artwork dimensions and tolerances is of paramount importance during a design packet transfer. To assist with this critical step in the design process, we provide an illustration as seen here, which includes suggested values and tolerances that should be followed in order to facilitate a complete and comprehensive design packet.
MICROELECTRONICS - POINTS OF CONTACT

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