

# Space Products



Teledyne Microwave Solutions (TMS) provides the domestic and international space communities with the broadest range of **mission-proven** space components, integrations, and services. Supporting military, commercial, and scientific space applications, TMS delivers qualified solutions which fully meet the **reliability and performance** demands of space.

With more than 25 years experience as a worldwide leader in design, development, and manufacture of space qualified RF & microwave components and integrated assemblies, TMS is the trusted choice for space grade amplifiers, filters, frequency mixers, VCOs, detectors, LNAs, up/down converters, receivers and transmitters.



**TELEDYNE MICROWAVE SOLUTIONS**  
Everywhere you look™



# The TMS Space Advantage

TMS meshes experience, top level engineering, and proven components to master the most demanding applications.

## Heritage

- More than 25 years Space Experience
- Mission-Proven Hybrid Technology
- Domestic and International Programs
- UHF to Ka Band Products

## Full In-Place Proposal Team

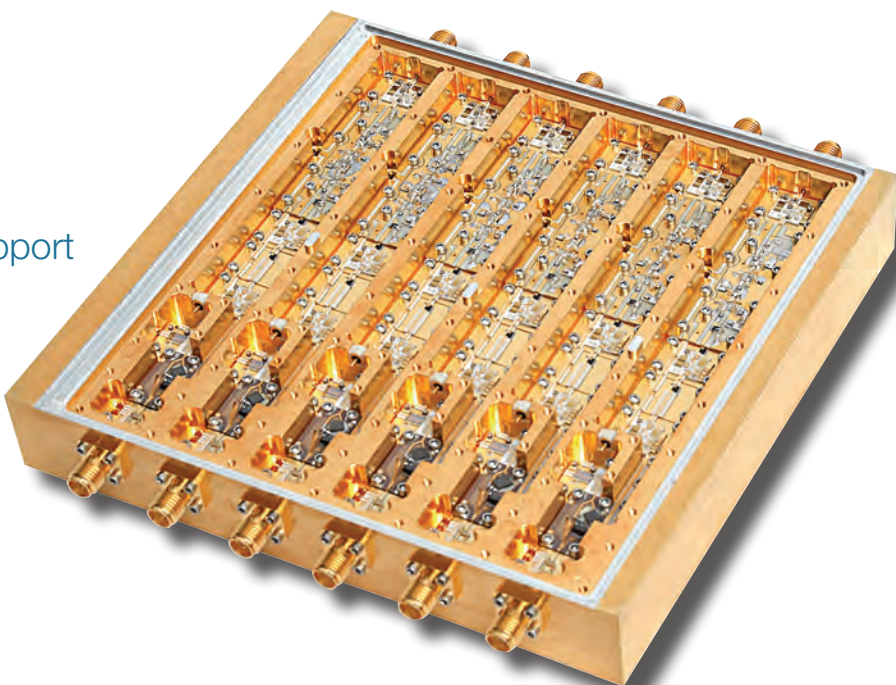
- Experienced
- Technical / Financial / Contracts

## Engineering Leadership and Support

- RF & Microwave / Mechanical / Thermal / Reliability
- Proposals / Technical Reviews

## Fully Integrated Product Team

- Program Management Team
- Authority / Resources / Experience



# TMS Space Heritage

## Over 25 Years of Continuous Success in Space

TMS has a long and successful heritage providing space products. A trusted partner to our customers, TMS understands the challenges and the solutions. TMS continues to be the supplier of choice for space-grade products for commercial, scientific and military space requirements.

### Programs

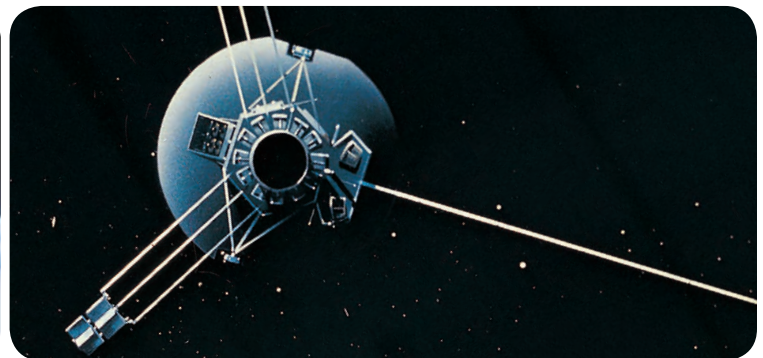
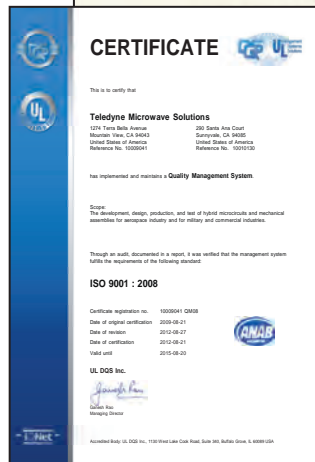
- MILSTAR
- ACeS
- GPS
- EOS
- SBIRS
- TDRS
- INMARSAT
- SKYNET
- MUOS
- MEOSAR
- GOES-R
- AEHF
- LANDSAT

### Customers

- Boeing Satellite
- Northrop Space Systems
- Lockheed
- Raytheon
- General Dynamics
- Harris Corporation
- Honeywell
- L-3
- Com Dev Canada and UK
- MDA Canada
- Astrium UK
- NT Space Japan
- ISRO India
- Thales Alenia Italy
- NIIR Russia

### Quality Certifications

- MIL-PRF-38534, Classes H & K (TRB Option)
- ISO 9001
- AS9100





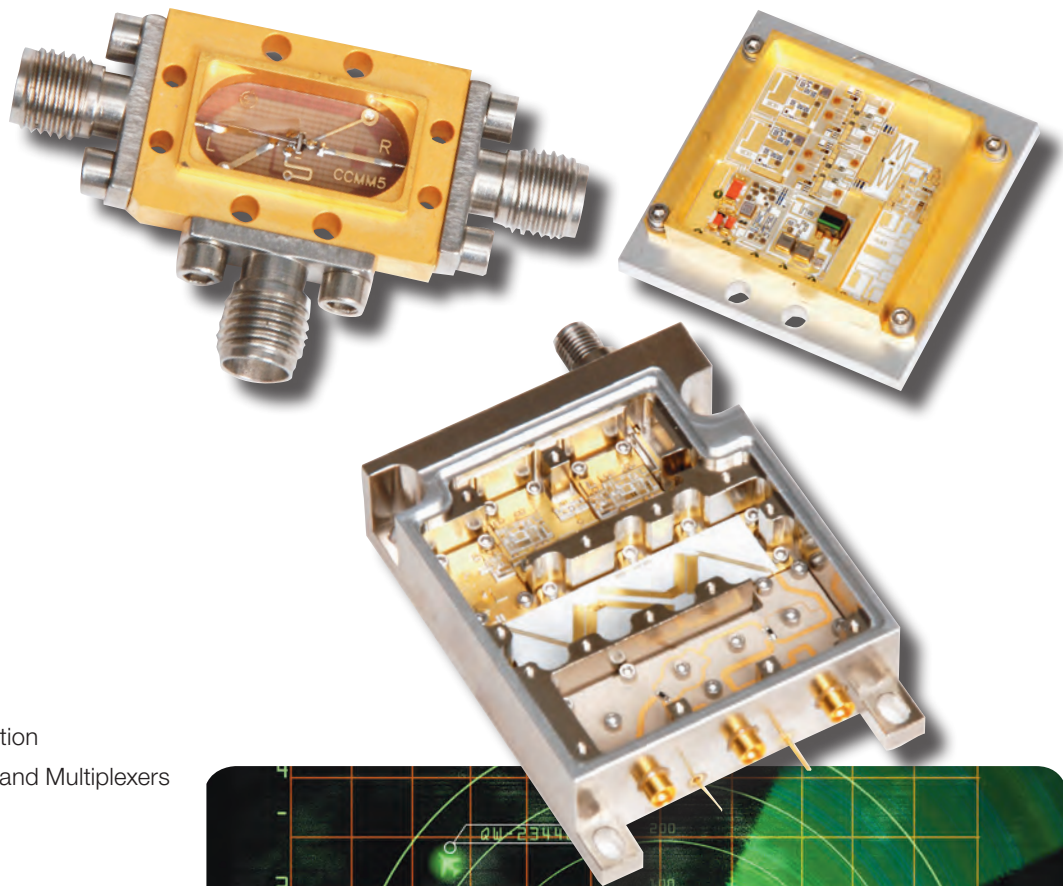
# TMS Space Products

## A full range of RF & Microwave space qualified components and integrations

The ease, speed and assurance of specifying MIL-PRF-38534 QML-certified space-level components. Designers can choose from the broadest selection of space qualified hardware in the industry. TMS's experienced staff and space expertise are trusted by design engineers to provide mission-compliant space grade solutions.

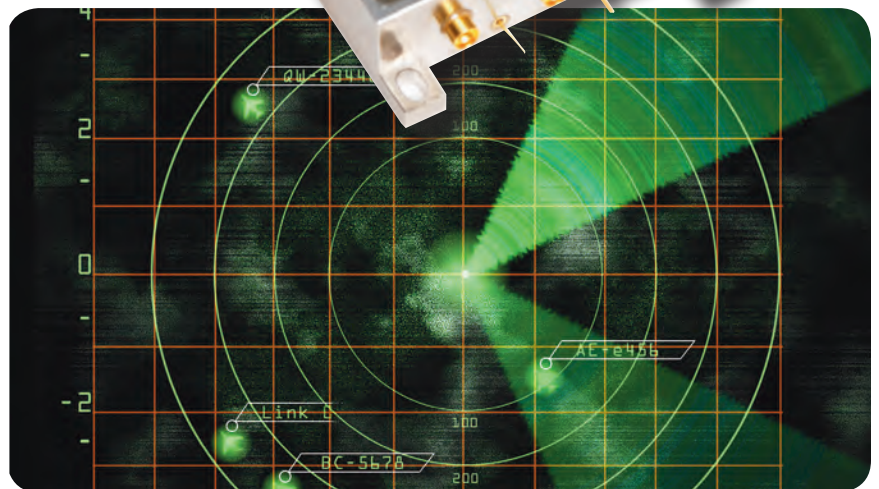
### RF and Microwave Components

- Amplifiers
- Analog/Threshold Detectors
- VCOs
- Microwave Mixers
- Detectors
- Frequency Doublers
- Power Dividers
- Switches
- IQ Networks Narrowband
- IQ Modulators
- IQ Demodulators
- Limiting Amps
- Limiters



### Integrated Assemblies

- LNAs
  - With/Without Integrated Filters
  - LNA / Down-Converter Integration
- Medium and High Power Filters and Multiplexers
- Up and Down Converters
- Receivers
- Transmitters
- SSPAs
- High Power 5 to 50 Watts
- DC/DC Power Supply
- Digital Control
- SSPA / Up-Converter Integration



# TMS Space Products

## Linear SSPA Products and LNAs

TMS space products include high frequency Ku and Ka Band products, such as LNAs and SSPAs.

### Space Grade Ku-band 20W SSPA

- 20 dB Step Attenuator (D/A driving VVA)
- RF Output Detector
- Digital Interface for:
  - Power Control, Blanking, Battle Short, ALC, Standby Mode, RF Power Monitor, Temperature Monitor, Over Temperature Protection
  - RADHARD FPGA
- RADHARD +28 Volt DC-DC Converter
- Output Filter (High Q Mechanical)



### Space Grade Dual Ka-Band LNA

- 28.0-29.31GHz and 29.5-30.81GHz LNA (in 2 separate bands)
- 2.3dB Noise Figure
- Dual redundant channels
- WR-28 Waveguide input and output





# TMS Space Filters

## Broad-Based Capabilities in Filters and Filter-Based Integrated Assemblies

TMS has earned its reputation as the complete filter technology company, providing performance proven solutions for the demanding environment of space. TMS uses a dedicated program management team and documented process and manufacturing controls. TMS's RF and mechanical design guidelines and regulations were developed specifically to meet the performance, quality, reliability, and thermal requirements of space applications.

### Lumped Element Filters

- Frequency Ranges: LC – DC to 20 GHz
- Typical Bandwidth: <1% to multiple octaves

### Compline & Cavity Filters

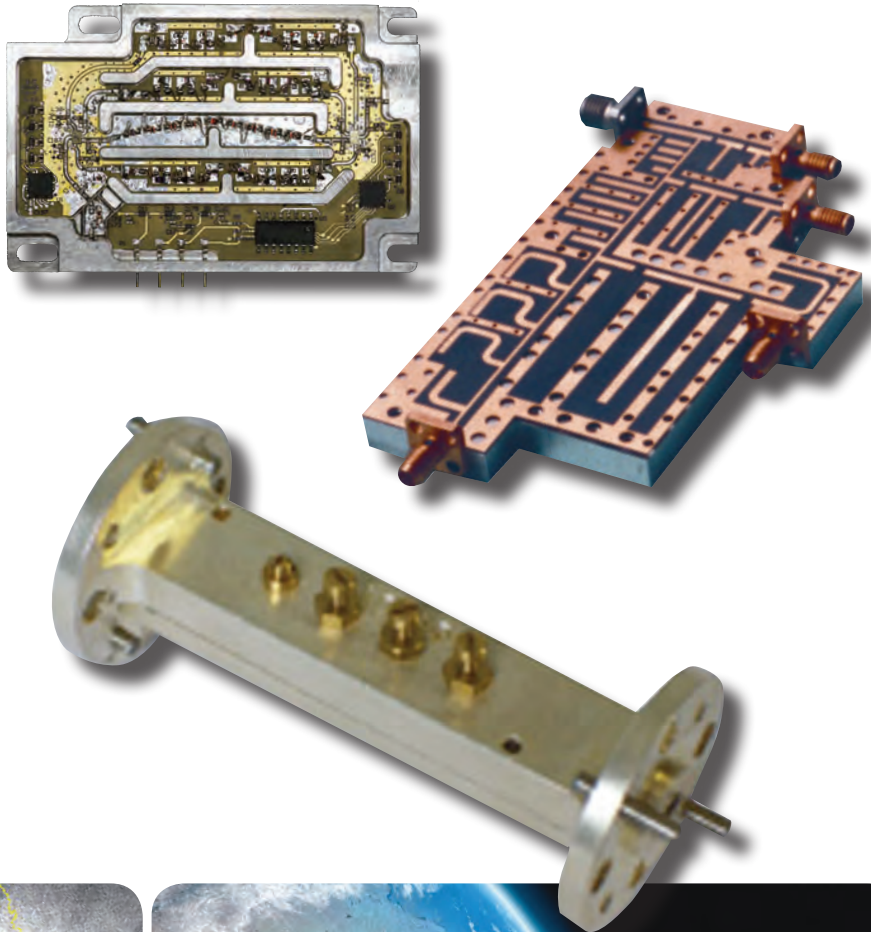
- 100MHz to 40GHz  
(rejections beyond 40GHz by design)
- Typical Bandwidth: <1% to multiple octaves

### Suspended Substrate Stripline Filters

- Frequency Range: 1 GHz to 20 GHz
- Typical Bandwidth 25 – 100%

### Waveguide Filters

- Frequency Ranges: LC – DC to 40 GHz
- Typical Bandwidth 0.1 to 10%
- High Power
- High Rejection with Cross Coupling and High Number of resonators



# TMS Value Add Services

## TMS is the Industry Leader in providing Customer-Defined Value Add Services

TMS offers a complete portfolio of manufacturing, screening, and testing services, including chip-and-wire assembly of products ranging from single die to complex hybrids. Customers can specify any combination of RF/DC testing and environmental screening. TMS performs Lot Acceptance testing on packaged devices or bare-die including diodes, transistors, MMICs, with test capabilities to 40 GHz. Additional services include device sorting, labeling, lead forming and tinning, and tape-and-reel packaging.



### Environmental Screening

- MIL-PRF-19500
- MIL-PRF-38534
- MIL-PRF-38535
- MIL-STD-883
- MIL-STD-750

### Element Evaluations

- FETS
- Transistors
- Diodes
- Capacitors
- Substrates

### Lot Acceptance Testing

- Die
- Packaged Devices
- Transistors
- Diodes
- MMICs

### Full DC and RF Testing

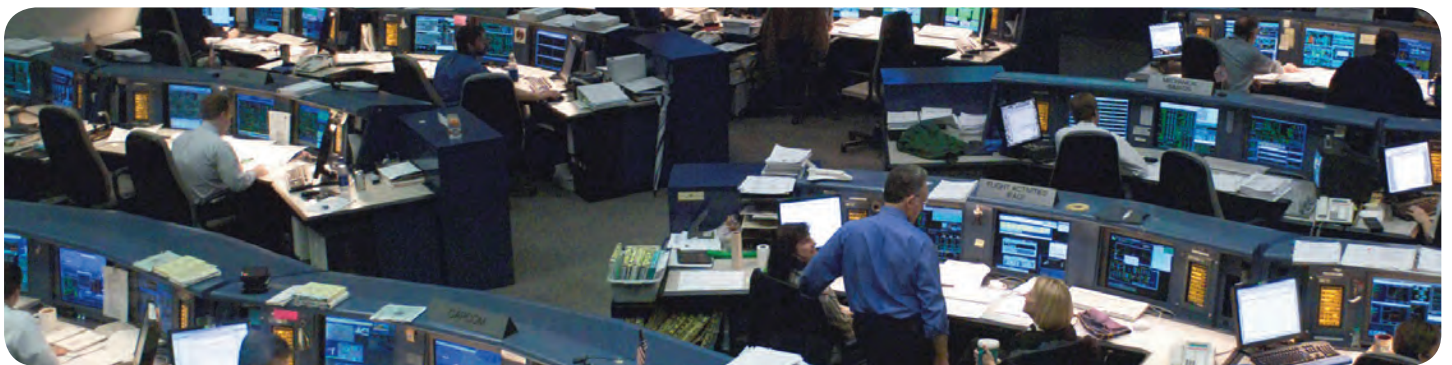
- RF Testing 100 KHz to 40 GHz
- RF Power Test
- CW to 200 Watts

### ESD Testing Services

- Human Body Model (HBM)
- Machine Model (MM)
- Testing per ESDA, JEDEC and MIL-STD-883, Method 3015

### Screening Services

- Internal Visual
- Stabilization Bake
- Temperature Cycle
- Constant Acceleration
- PIND (Particle Impact Noise Detection)
- HTRB (High Temperature Reverse Burn-in)
- Burn-in / Life Test
- Electrical Parameter Testing
- Seal (Fine / Gross)

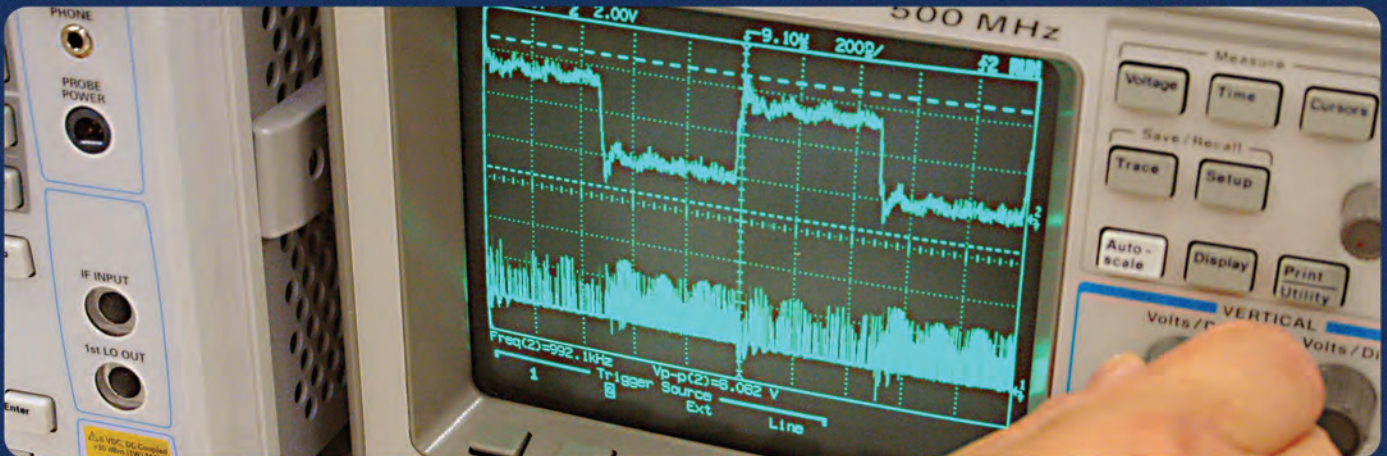






# TELEDYNE MICROWAVE SOLUTIONS

Everywhere you look™



**Teledyne Microwave Solutions** unites the strengths of seven pacesetter companies into one global leader ... the leader for everything microwave.

Teledyne Microwave • Teledyne TWT Products (MEC) • Teledyne Defence Ltd. • Teledyne Labtech  
Teledyne Cougar • Teledyne Paradise Datacom • Teledyne Filter Products

By joining as TMS, these companies bring you **a unified sales and customer service portal** to a powerful, collaborative, vertically integrated provider.

[teledynemicrowave.com](http://teledynemicrowave.com)

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Information subject to change without notice.