

# 2010 RF & MICROWAVE PRODUCT OVERVIEW



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[www.nardamicrowave.com](http://www.nardamicrowave.com)



As a business unit of L-3 Communications, Narda Microwave-East has served the military and commercial communication markets with outstanding products bearing the world-renowned Narda name for nearly 60 years. With a 150,000 square-foot plant and our dedicated team of sales, design and production professionals, Narda is ready to develop, design and deliver high-performance products to address your needs.

With the development and manufacture of state-of-the-art RF and microwave components, **Integrated Microwave Assemblies**, and subsystems, Narda has positioned itself and maintains its position as a technology leader by offering advanced products in the frequency range of DC to 100 GHz for both commercial and military applications. We maintain the world’s largest inventory of RF and microwave components for rapid delivery of our products to our customer base. Products manufactured at our production facilities include IMAs, couplers, power dividers, attenuators, RF switches and power monitors that are suitable for a myriad of RF applications. The Narda brand also includes a full line of RF safety products that characterize emission levels for RF workers and the general public.



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This booklet presents an overview of Narda’s RF & Microwave products. Details and specifications can be found at [www.nardamicrowave.com](http://www.nardamicrowave.com) or in the latest printed catalog...the most comprehensive in the industry.

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**Off-The-Shelf Catalog Products**  
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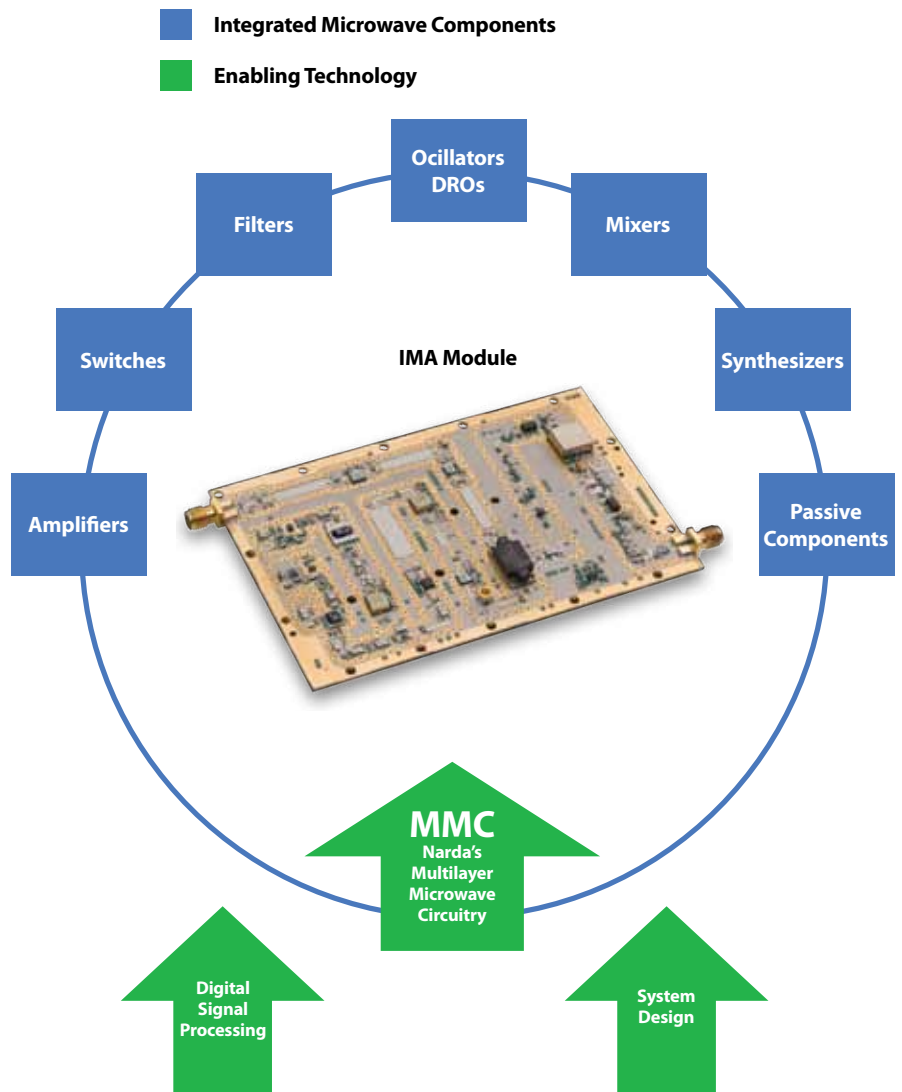
# INTEGRATED MICROWAVE ASSEMBLY (IMA) TECHNOLOGY



**Narda has been a pioneer** in the design and manufacture of **Integrated Microwave Assemblies (IMAs)** for more than 30 years. The first IMAs manufactured by Narda, referred to as **Classic MICs**, were realized by combining several alumina-on-carrier circuits within a single machined aluminum housing, thus creating a multi-function assembly. Many of these MICs are still in service and in production today.

In the last few years, Narda has significantly advanced the state of the art for IMA products by replacing the classic MIC approaches with its new **MMC (Multilayer Microwave Circuitry)** technology. MMC uses multilayered printed circuit boards to interconnect microwave devices (MIC, SMT, or MMIC configurations) with bias, control and digital signal processing components. These complex **IMAs** are constructed using a single multilayer board with the microwave circuitry on the top side and the control circuitry, conditioning, microprocessor, FPGAs and DSP circuits on the bottom. Connections from top to bottom are made with VIA holes, as appropriate.

Narda's **MMC** technology allows the creation of more complex, high performance IMA modules with tightly controlled I/O locations and unusually small form factors facilitating integration into complex next level assemblies. The **MMC** capability coupled with DSP technology, microwave component design competency and complex circuit design experience yields the ultimate in device realization.



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# INTEGRATED MICROWAVE ASSEMBLY (IMA) TECHNOLOGY



Narda's new **Ultimate MIC™ Modules** and **Ultimate SMT™ Modules** are examples of products that employ the MMC technology. The **Ultimate MIC™** approach is utilized when the majority of the electrical components are bare dies/chips, while the **Ultimate SMT™** technology is employed when there is a prevalence of surface mount devices. Both module types benefit from the ability to combine traditional MIC chip and wire hybrid technology with high volume, low cost, surface mount assembly techniques, thereby enabling our products to achieve integration levels unrivaled by conventional techniques. The results are small, low cost, high performing subsystems that combine microwave, digital signal processing, bias and control circuits interconnected with multi-layer signal routing designed to provide high levels of isolation.



**Ultimate MIC™**



**Ultimate SMT™**

Today, Narda produces IMA products that operate in the 500 MHz to 50 GHz frequency range. These products are supercomponents and subsystems which integrate two or more microwave components into a functional assembly. Typical products are:

- DROs / Phased-Locked DROs
- Frequency Synthesizers
- Arbitrary Waveform Generators
- Special Amplifiers
- SATCOM Up / Down Converter Modules
- LNAs and SSPAs
- PIN Switch Assemblies
- Switched Filter Banks
- Complex Frequency Sources
- Transceivers
- Up/Down Converters

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# INTEGRATED MICROWAVE ASSEMBLY (IMA) TECHNOLOGY



## IMA Modules

Simple IMA modules integrate two or more microwave components into a functional assembly using conventional MIC technology. Figure 1 shows an example of a simple IMA module. Complex IMAs use MMC technology to create a much higher level of integration. Figure 2 is a photo of a complete Ka Band BUC manufactured with this technology. Both the top and bottom side of the multi-layer board are shown. The board is housed in a proprietary metal housing which uses form-in-place gaskets to achieve extremely high isolation.

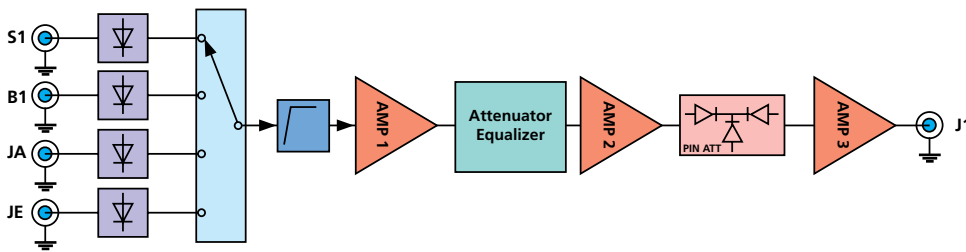


Figure 1: Simple IMA Module

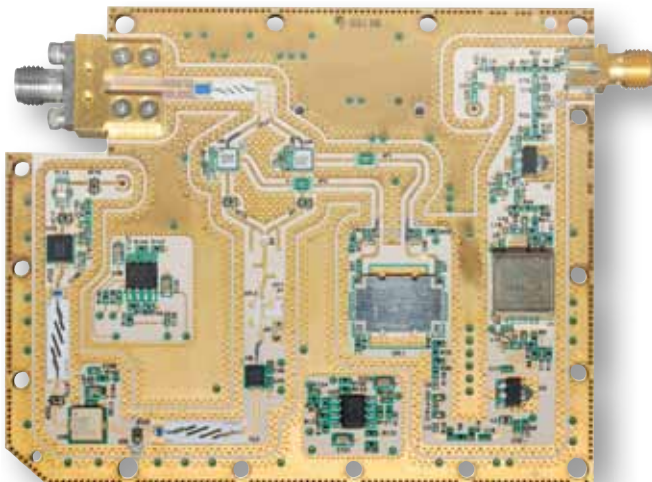


Figure 2: Complex Ka Band IMA Using MMC Technology

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# INTEGRATED MICROWAVE ASSEMBLY (IMA) TECHNOLOGY



## IMA CMS - Compact Microwave Subsystems

Narda's CMS products are higher level multifunctional assemblies often performing a complete subsystem task. These products incorporate combinations of IMA modules with related processing, power conditioning, cooling and the mechanical enclosure. Figure 3 shows an example of a complete Ku Band transceiver using IMA modules manufactured with Narda's MMC technology.

The production of reliable and high performing IMA modules and subsystems requires considerable resources and effort with the right combination of process, tools and talent. Narda, with over 55 years in the RF and microwave experience, has these resources, and can offer IMAs manufactured in state-of-the-art facilities that continually provide the standards of reliability and performance that exemplify the Narda name. Narda looks forward to serving your IMA needs as they arise. Please contact your local Narda Sales professional for additional information.

## IMA CMS Compact Microwave Subsystem

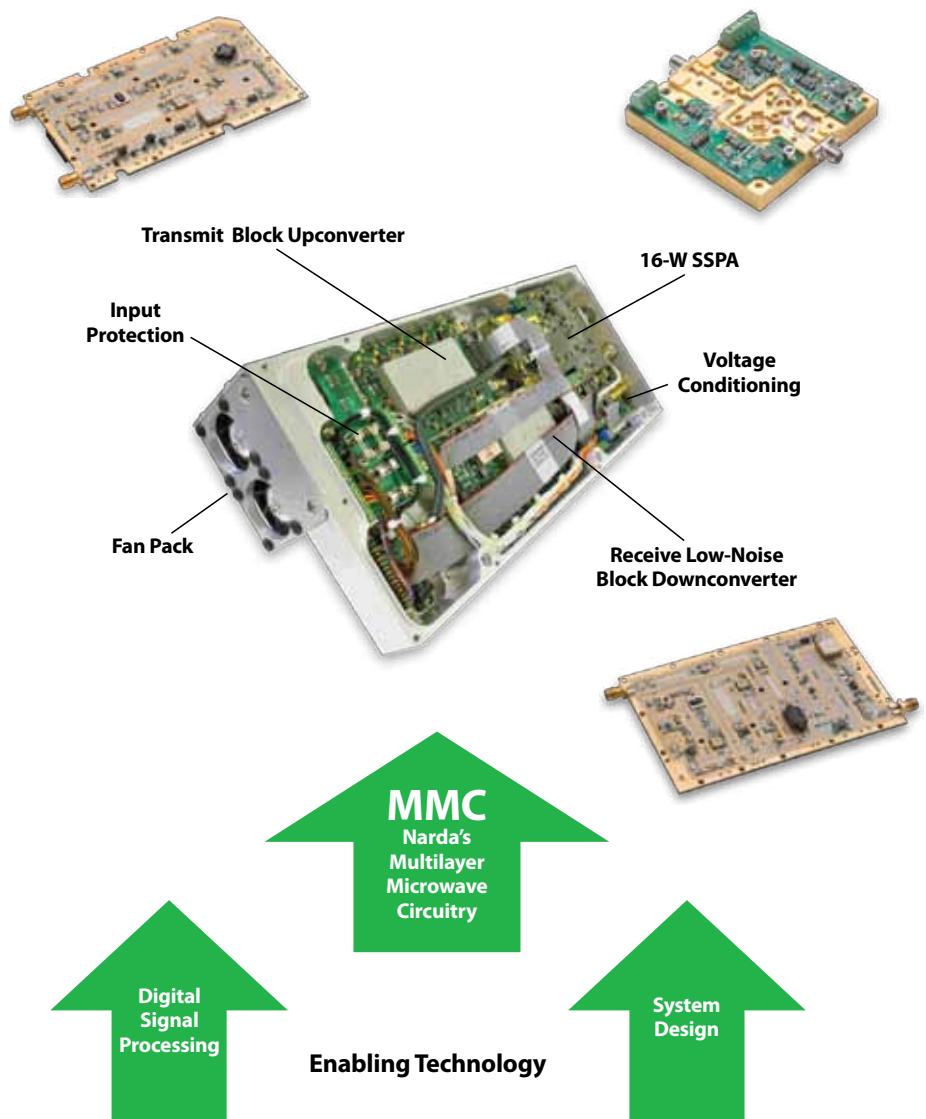


Figure 3 – Complex Microwave Subsystem Using IMA modules.

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## COUPLERS

- Millimeter Wave Ultra-Broadband Couplers
  - Models covering 18 to 40 GHz, 1 to 40 GHz and 1 to 60 GHz
- Miniature SMA Couplers
  - .5 to 26.5 GHz, octave, multi-octave and maximally flat models
- Type N Broadband Directional Couplers
  - .25 to 12.4 GHz, octave, multi-octave and maximally flat models
- Type N Dual Directional Reflectometer Couplers
  - Multi-octave bands from .05 to 8 GHz
  - High power, high directivity

## Off-the-Shelf Catalog Products



- High Power Directional Couplers
  - Covering 2 to 8 GHz, 2 to 18 GHz, 6 to 18 GHz bands
  - Power levels to 1000 W CW
- Economical Couplers for Cellular and PCS Applications

## POWER DIVIDERS & HYBRIDS

- Wireless Band Power Dividers/Combiners
  - 800 to 2500 MHz, 2-way to 16-way modules
- SMA 3-Way Power Dividers
- SMA 2-Way and 4-Way Power Dividers
  - Octave, multi-octave units in .5 to 26.5 GHz bandwidths
- Multi-Octave Type N Power Dividers
  - 2 to 8 GHz, 6 to 8 GHz and 2 to 18 GHz bandwidths
- Ultra-Broadband SMA Power Dividers
  - .5 to 6 GHz, .5 to 18 GHz bandwidths, 2, 4, 8-way



- SMA and Type N Multi-Octave 90 and 180 Hybrids
- Specialized Devices for High Power Dividing and Combining Operations

## TERMINATIONS

- Millimeter Wave Fixed Terminations
  - Frequency range: DC to 50 GHz
  - Connector 2.9 mm
- SMA Coaxial Fixed Terminations
  - Frequency range: DC to 26.5 GHz
  - Power: up to 10 W average
- Type N Coaxial Fixed Terminations
  - Frequency range: DC to 18 GHz
  - Power: up to 500 W average



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# ATTENUATORS

- Type N Fixed Coaxial Attenuators
  - Frequency range: DC to 18 GHz
  - Power: 2 or 5 W (average)
  - Choice of attenuation values up to 50 dB
- Miniature Fixed Attenuators
  - Frequency range: DC to 40 GHz
  - SMA and 2.9 mm connectors
  - Attenuation: up to 60 dB
- Type N High & Medium Power Attenuators
  - Frequency range: DC to 18 GHz
  - Attenuation: up to 30 dB
  - Power: up to 150 W average
- Thumbwheel & Panel Mount Step Attenuators
  - Frequency range: DC to 18 GHz
  - Type N or SMA female connectors
  - Attenuation: up to 69 dB
  - 1 dB or 10 dB Increments
- Low Cost Step Attenuators
  - Frequency range: DC to 2.5 GHz
  - Attenuation: 0 to 10 dB 1 dB steps, 0 to 50 dB 1 dB steps, 0 to 70 dB 10 dB steps

# Off-the-Shelf Catalog Products



- Variable Attenuators
  - Frequency range: 4 to 26 GHz
  - Connectors: SMA or Type N
  - Attenuation: up to 35 dB

# ADDITIONAL PASSIVE COMPONENTS



Circulators & Isolators



Detectors

Phase Shifters



DC Blocks



Adaptors



Standard Gain Horns



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## PIN SWITCHES

- PIN Switches
  - 0.5 to 18 GHz
  - SPST to SP6T, transfer
  - Reflective and absorptive
  - Integral drivers
- High-Speed Switched Bit Attenuators
- Switched Filter Banks
- Custom Switches
  - Up to 26.5 GHz
  - SPST to SP25T
  - High power switches
  - Full military specifications
  - Mil Std 883 screened



## PIN LIMITERS

- Narrowband and Wideband Versions
- Frequencies Up to 18 GHz
- Up to 600W of Pulsed Power
- Fast Recovery Time
- Small Size
- Available as a Stand Alone Part or in an Integrated Assembly



## MECHANICAL SWITCHES

- SEM Series – Stocked Electro Mechanical Switches
  - DC to 18 GHz
  - SPST to SP6T, transfer
  - Reflective and absorptive
  - Integral drivers
- Standard Custom Switches
  - DC to 26.5 GHz
  - SP2T to SP12T, transfer
  - Wide range of options



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# CUSTOM ENGINEERED COMPONENTS & NETWORKS

In addition to providing off-the-shelf catalog products, Narda has been supporting customers for decades with custom-engineered solutions. The most mutually beneficial solution (for the customer and Narda alike) is the selection of a catalog product; however, we continue to support our customers when special models are required. Product specifications that involve a reasonable first-order quantity and follow-up potential are welcomed.



Switched Filter Bank



Dual Hybrid Network



125 Watt  
5-Way  
Power Divider



Custom  
Butler Matrix



200 Watt  
Combiner

High Power  
Sampling Coupler



20 MHz - 18 GHz  
Power Sensor



## ENVIRONMENTAL PERFORMANCE

Environmental specifications for Stripline Directional Couplers, Attenuators, and Power Dividers as applicable.

Parameter	Specification
Operating Temperature	-54 to +105°C
Storage Temperature	-55 to +125°C
Humidity	Per MIL-STD-202F, method 103B, condition B (96 hours at 95% R.H.)
Shock	Per MIL-STD-202F, method 213B, condition J (30G, 11 msec)
Altitude	Per MIL-STD-202F, method 105G, condition B (50,000 feet)
Vibration	Per MIL-STD-202F, method 204D, condition B (.06" double amplitude or 15G, whichever is less)
Thermal Shock	Per MIL-STD-202F, method 107D, condition A (5 cycles)

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# RF SAFETY PRODUCTS & SERVICES

## 40+ Years of Being FIRST In RF Safety Products & Services

RF Safety is a serious business. We know...because we invented it! That's why we've devoted more than four decades to product development, safety education and customer service. No one else can make that claim. And our product performance has been independently verified by standards organizations across the globe. That's no small feat. If monitoring RF energy is an important part of your process, use the best equipment available from the company that invented RF Safety. For more information and detailed product specifications, please visit [www.narda-sts.us](http://www.narda-sts.us).

## RF Safety Program Guide

The topic of RF safety is important to every organization that either uses RF and microwave energy to deliver an end product such as a wireless service or employs it to perform an industrial function such as packaging, cooking, and drying of materials or products. Maintaining a safe environment for employees as well as the general public is not simply a good idea – it's the law, and it is being enforced more rigorously every year. An RF safety program is the key to establishing and maintaining an environment that offers personal protection and is legally defensible.

## RF Microwave Training

Comprehensive occupational safety training programs focus on the basic principles of RF safety, compliance with Major standards, and setting up an RF safety program. Safety engineers and officers, Health and Safety managers, providers of measurement services, engineering planning consultants, maintenance and service personnel, persons responsible in engineering control associations and trade supervisory authorities are all encouraged to partake in such training.



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435 Moreland Road, Hauppauge, NY 11788  
Tel: 631.231.1700 • Fax: 631.231.1711  
e-mail: [nardaeast@L-3com.com](mailto:nardaeast@L-3com.com)  
[www.nardamicrowave.com](http://www.nardamicrowave.com)