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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 or in the latest printed catalog...the most comprehensive in the industry.

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NARDA OVERVIEW



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 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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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 proprietary MMC (Multi-layer Microwave Circuitry) technology.

Features of IMA modules using Narda's MMC multi-layer printed circuit board technology are:

- A single multi-layer board construction integrates the RF/Microwave functions along with supporting bias, control, and DSP needs facilitating an unmatched level of integration.
- The incorporation of a microcontroller into an IMA module provides “smarts” that reduce setup and tune time, offer greater precision, and make adaptive adjustments for system and environmental variations.
- Configurable FPGA logic blocks integrated into the IMAs can be programmed and reprogrammed to perform many DSP functions, from simple filtering to complex signal processing.
- By utilizing the capabilities of both our Ultimate MIC™ and Ultimate SMT™ technologies, high performance IMA products are realized which are densely packed, low in power consumption, light weight, and meet SWaP guidelines.
- Products are produced in frequency ranges from DC to 60 GHz.

Markets Served

- EW, MILSATCOM, radar, missiles, UAVs and OEM instruments.

Dedicated IMA Facilities

Narda has three state-of-the-art facilities dedicated to IMA products; the 150,000 sq. ft. plant in Hauppauge NY (design, development and production), another 20,000 sq. ft. plant in Heredia Costa Rica (production) and the 8,000 sq. ft. design center in San Diego (design and development). Narda maintains two Class 100,000 clean rooms.



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INTEGRATED MICROWAVE ASSEMBLY (IMA) TECHNOLOGY

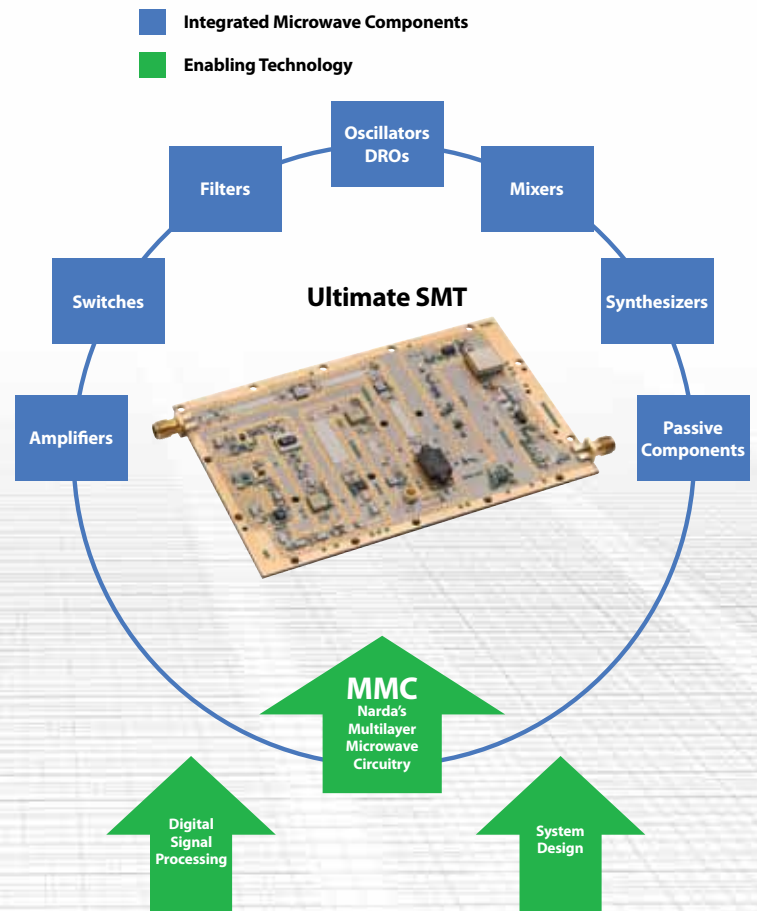


Applications

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

Narda's MMC Technology

MMC uses multi-layered printed circuit boards to interconnect microwave devices (MIC, SMT, or MMC configurations) with bias, control and digital signal processing components. These complex **IMAs** are constructed using a single multi-layer 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.



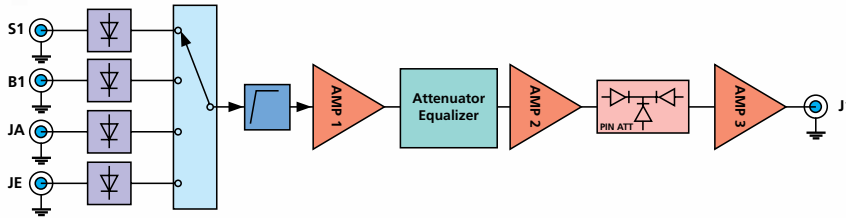
Narda's new MMC technology is currently manifested in two type of designs: Ultimate MIC modules and Ultimate SMT modules. The Ultimate MIC approach is utilized when the majority of the electrical components are bare dies/chips, while the Ultimate SMT technology is employed when there is a prevalence 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. This enables Narda's 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.

INTEGRATED MICROWAVE ASSEMBLY (IMA) TECHNOLOGY

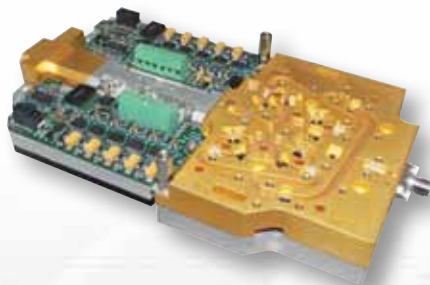


IMA Products Offered: Narda produces three types of IMA products.

Simple IMA modules integrate two or more microwave components into a functional assembly using conventional MIC technology.

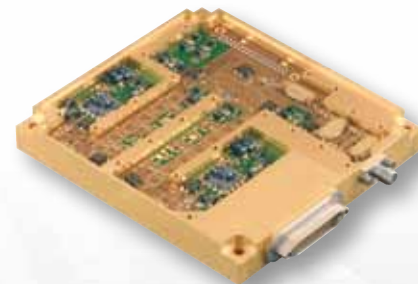


Complex IMA Modules use MMC technology to create a much higher level of integration. These modules typically use the Ultimate MIC or Ultimate SMT topology.



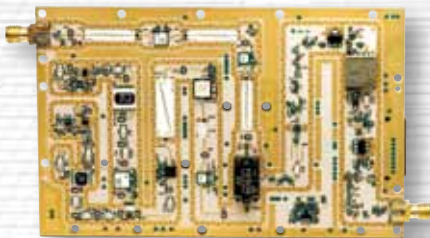
Ka Band SSPA

Smart IMA using a microcontroller to provide maximum power output with minimum DC drive over temperature and system variations.



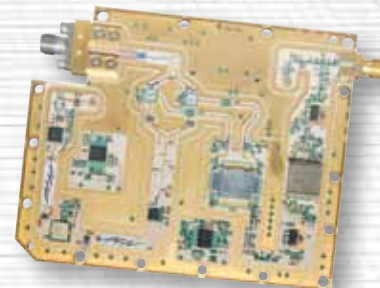
FPGA Programmable Source

This Ultimate MIC incorporates embedded FPGA configurable logic blocks to provide arbitrary waveform modulation of microwave signals.



Ku Band BUC

This IMA uses Ultimate SMT technology to provide a high performance, compact and efficient Ku band SATCOM block upconverter.



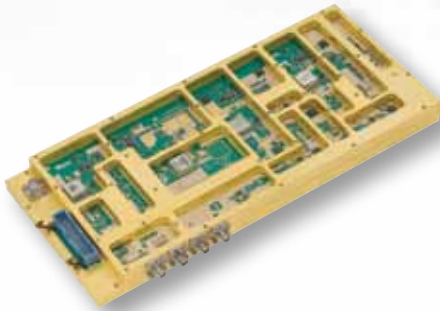
Ka Band BUC

This IMA uses Ultimate SMT technology to provide a high performance, compact and efficient Ka band SATCOM block upconverter.

INTEGRATED MICROWAVE ASSEMBLY (IMA) TECHNOLOGY

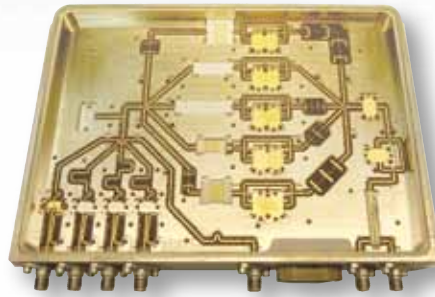


Complex IMAs (continued)



X Band DDS Synthesizer

Ultimate MIC X Band synthesizer provides stable signals with precision resolution.



EW Antenna Interface

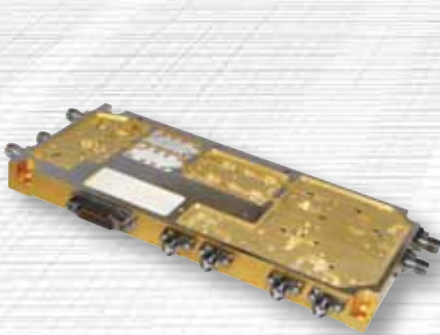
Complex IMA routing single input to multiple outputs with variable gain, preselection filtering and high power limiting in each path.



Switched Filter Bank

IMA utilizing high rejection PIN switched to select sharp cutoff channel filters.

Compact Microwave Subsystems (CMS) use IMA modules and support devices to build complete functional subsystems.



EW Receiver

Compact assembly of MMC (multilayer microwave circuitry) modules containing input and output switching networks, RF filters, and dual amplifier chains in a very small package.



RF Distribution Network

Complex distribution network integrating two multiplexers with input and output switching networks.



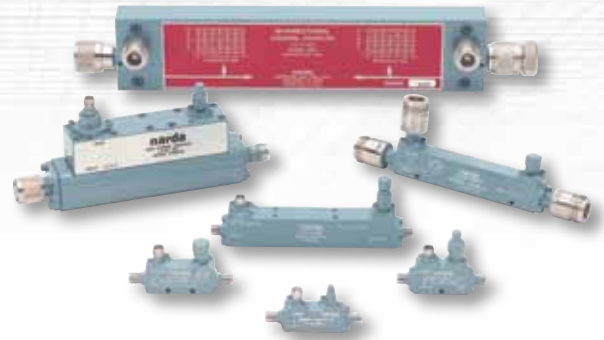
SATCOM Transceiver

Self contained transceiver for X, Ku or Ka band applications. High performance, low DC power and light weight.

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




Adapters



Standard Gain Horns



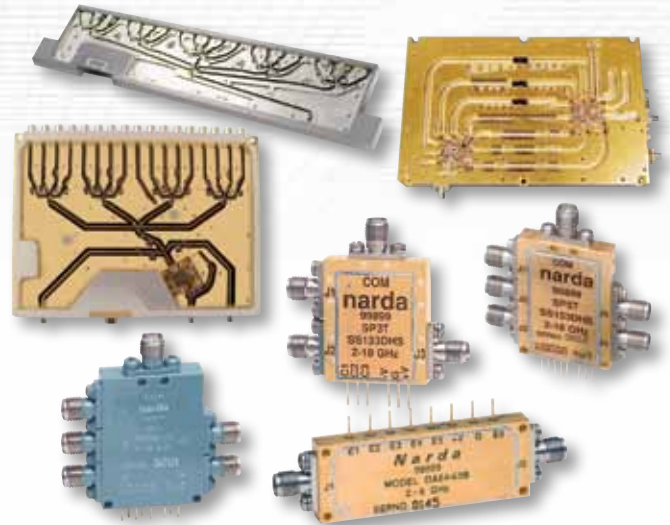
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PIN SWITCHES

- 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

Off-the-Shelf Catalog Products



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



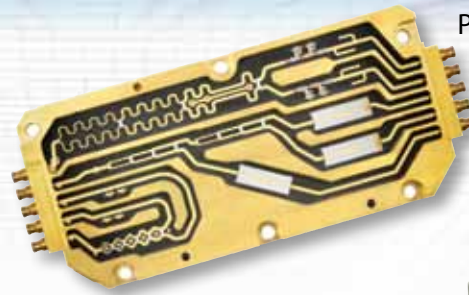
MECHANICAL SWITCHES

- 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



CUSTOM ENGINEERED COMPONENTS & NETWORKS

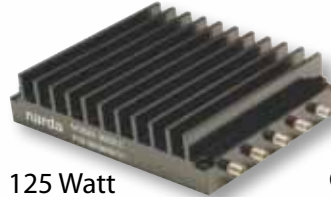
In addition to providing off-the-shelf catalog products, Narda has been supporting customers for decades with custom-engineered solutions. The most mutually beneficial solution (for the customer and Narda alike) is the selection of a catalog product; however, we continue to support our customers when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



Passive Distribution Network



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)

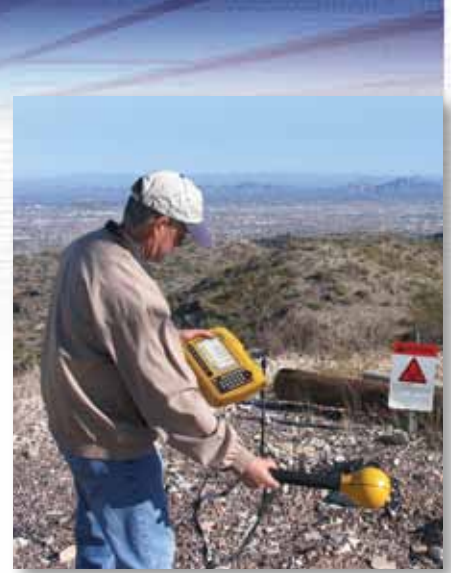
NARDA SAFETY TEST SOLUTIONS

Introduction

Narda Safety Test Solutions is recognized as the world leader in non-ionizing radiation safety equipment. The company holds more than 95% of the patents in the industry. Products are now available to accurately measure electromagnetic fields from a few Hertz to over 100 GHz, as well as, static magnetic fields. RF personal monitors cover 100 kHz to 100 GHz and area monitors detect energy from 50 Hz to 100 GHz.

The company prides itself in offering superior customer support in the following areas:

- Equipment and application consultation by our worldwide sales network
- Repair and calibration service
- Expert advice on standards and recent developments
- RF safety training and measurement services



Low Frequency-DC Static Fields (0 Hz) To 400 kHz

THM1176



EHP-50D



ELT-400



EFA-200 & EFA-300



Mobile Stray Voltage Detection System
8950-10



RF and MICROWAVE - 100 kHz to 100 GHz

Narrowband Meters

EHP-200



SRM-3006



Broadband Meters

NIM-511/513



NBM 520 & 550



Personal Monitors

RadMan



Nardalert S3



Area Monitors

SMARTS II



2600 System



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