MINI-CIRCUITS
NEW
MMIC
PRODUCTS

Excellence in Performance

Peace of Mind

Lifetime Product Supply
Commitment to Excellence in Quality
Easy to Do Business with

Mini-Circuits®
ISO 9001 ISO 14001 AS 9100 *CERTIFIED*

www.minicircuits.com

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INTRODUCTION

Mini-Circuits offers one of the industry's broadest selections of MMIC products up to 40.0 GHz.

Mini-Circuits MMIC in-house design center utilize GaAs semiconductor materials and PHEMT, HBT, IPD process technologies, our designs offer a very wide variety of performance characteristics to meet your needs including low noise, flat gain, ultra wideband, digital variable gain and more.

This MMIC new product lines overview guide provides you with a complete overview of our MMIC design capabilities and also a highlight of Mini-Circuits excellent MMIC products. As one of the few suppliers in the industry who own and manage their own packaging facilities, Mini-Circuits is able to provide the highest quality, most consistent, and most reliable products to our customers.

From here, we invite you to visit minicircuits.com and use ***Yoni2***®, our patented search engine that lets you search our entire engineering database by performance criteria to find the models that meet your requirements. You'll also find complete specs for individual models, free samples of selected products, high accuracy simulation models, and everything you need to make an informed decision about the right MMIC products for your needs. We're always here to support you. Get in touch with our applications team to discuss any questions or special requirements you might have. We thank you for your interest in Mini-Circuits MMIC products.

APPLICATION

- Point to Point Radio
- SATCOM
- Cellular
- Portable Wireless
- PCS
- LTE
- WiMAX
- GPS
- Wireless Base Station Systems
- UHF / VHF
- CATV
- Multi-Band Receivers
- Test & Measurement
- Instrumentation
- Military EW
- Avionics Systems
- Radar
- Isolation Amplifiers
- Balanced Amplifier
- Optical Networks

and More!

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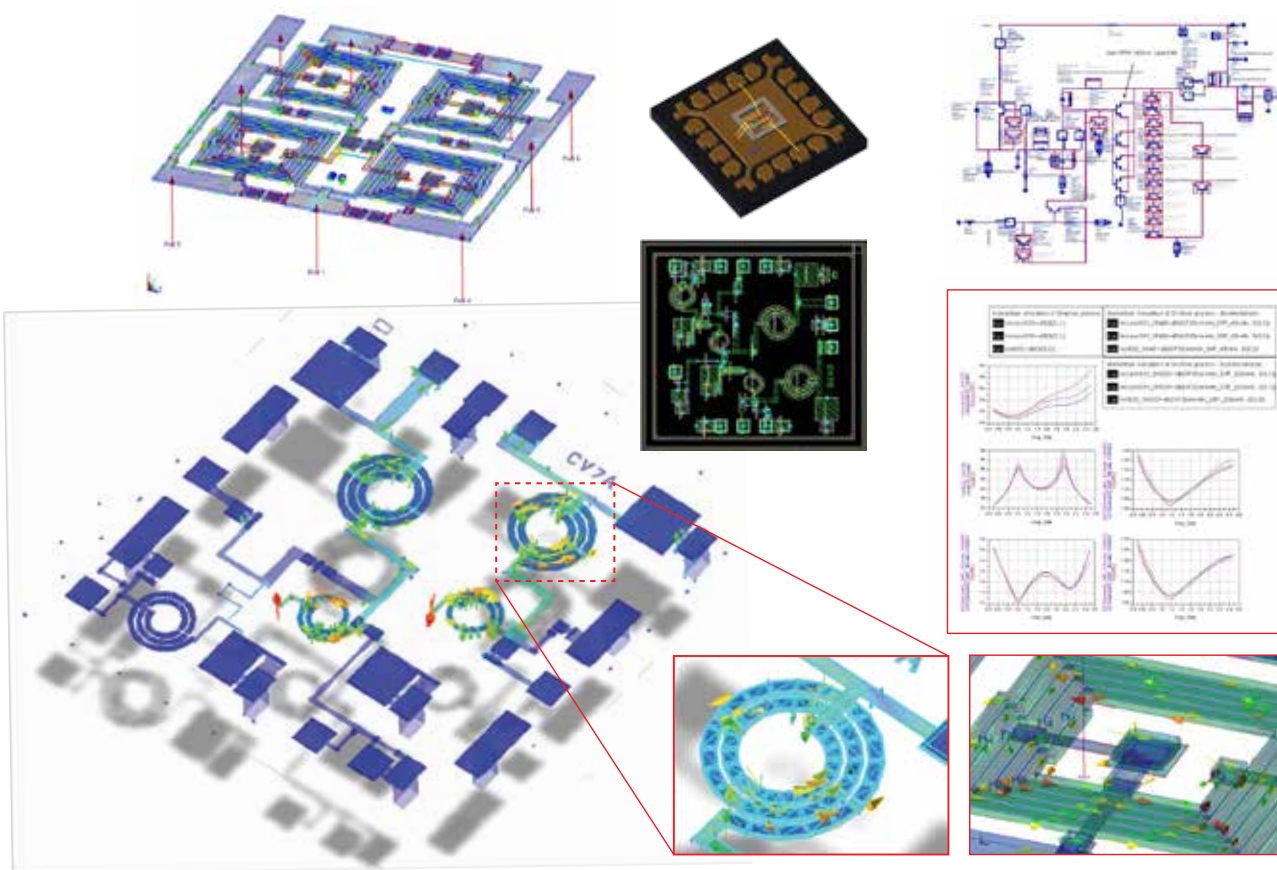
MINI-CIRCUITS MMIC TECHNOLOGIES

As a global leader of RF, IF and microwave components, Mini-Circuits offers MMIC products to satisfy today's and future high performance demands.

Mini-Circuits always expands boundaries of our design capabilities and continuously develop advanced MMIC technologies. We also invest heavily in advanced design tools and state of the art RF test and measurement systems.

State of The Art MMIC Design

To achieve high success rate at the first design cycle, Mini-Circuits MMIC design center utilizes advanced design tools in circuit simulation, harmonic balance simulation, full wave 3D EM simulation, thermal simulation and layout design.

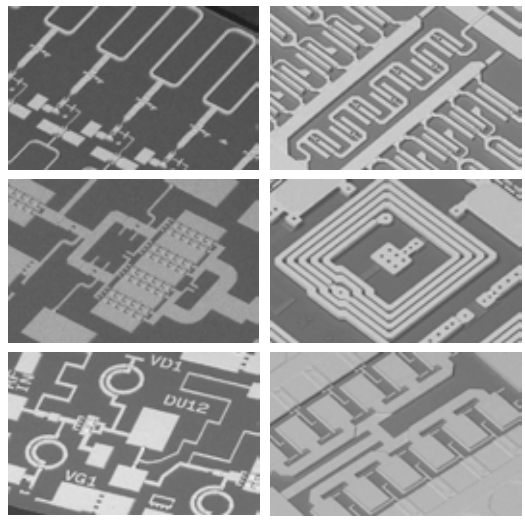


Semiconductor Materials and Processes

Why GaAs?

- High electron mobility enables high frequencies and fast switching performance
- Intrinsic GaAs is semi-insulating, making it an ideal substrate for stripline and high Q passives
- Large Band Gap 1.4eV enables higher power operation
- Radiation hardness means GaAs is well accepted for both space and military applications
- Commercially available in 6" wafer, making it suitable for mass production
- GaAs is widely accepted as the superior technology for the production of high frequency, high power and low noise products

GaAs Material Properties	
Electron Mobility (cm^2/Vs)	5,500 – 7,000
Peak Drift Velocity ($10^7 cm/s$)	1.6 – 2.3
Band Gap (eV)	1.4
Frequency Range (GHz)	>75
Gain	High
Noise Figure	Good
Production Maturity	6" Wafer



GaAs pHEMT	GaAs InGap HBT	GaAs IPD
0.5/0.25/0.15 µm E-mode and D-mode	2µm / 1µm	2µm
Products: • Low Noise Amplifiers • High Linearity Gain Block • Distributed Amplifiers • mmWave Power Amplifiers	**Products:** • High Linearity Gain Block • Power Amplifiers <6GHz	**Products:** • Filters • Diplexers • Baluns • Power splitters • Combiners • Couplers • Transformers
Features: • High transition frequency (Ft) • Low noise up to mmWave • E-mode (single supply) • High linearity • High power density • Great power and efficiency • Low standby current • May operate as low as 1.2V	**Features:** • High current gain • High power density • High linearity and efficiency (PAE) • Single supply • Consistent product performance • Proven technology for gain block and medium power amplifiers	**Features:** • Eliminate microphonics phenomenon • High current handling • High power dissipation • Excellent thermal dissipation • High reliability and repeatability

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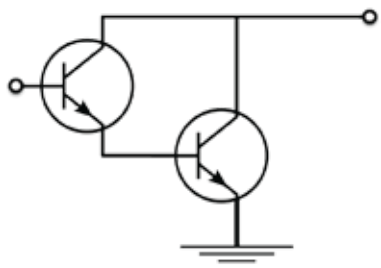
Circuit Architectures

Mini-Circuits MMIC designs employ a range of different circuit topologies to give our customers a wide variety of choice to meet their system requirements.

Whether the goal is to achieve wideband performance, high dynamic range, ultra low noise or other critical performance characteristics, the right circuit architecture allows our design engineers to strike the ideal balance of parameters for your needs.

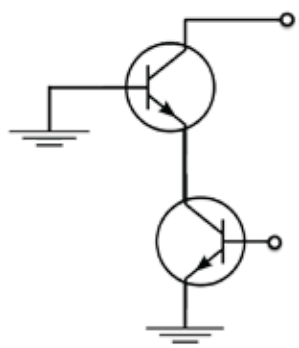
Darlington



Features:
- High current gain (β)
- Superior IP3 bandwidth
- Flat gain
- Great impedance match

Applications:
- IF gain block
- Multi purpose driver amplifiers

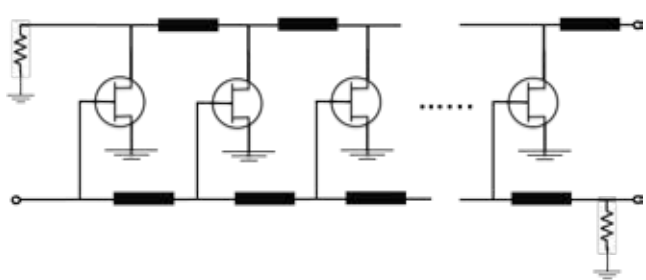
Cascode



Features:
- Improves input-output isolation
- Reduces the Miller effect
- Wide bandwidth
- High gain
- High output impedance
- High supply voltage
- High IP3

Applications:
- Low noise amplifier

Distributed



Features:
- Broadband performance
- Good impedance match
- Flat gain
- Excellent isolation

Applications:
- Radars
- Point to point radio
- Test instruments

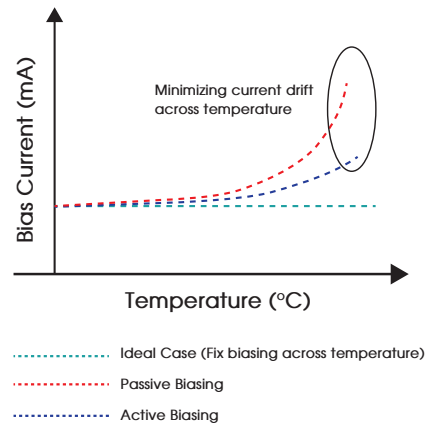
Design-in-chip Quality & Reliability

Active Biasing

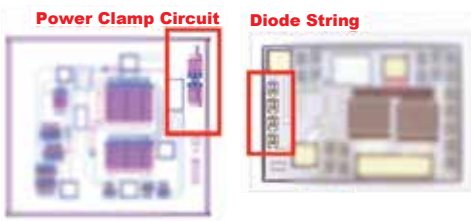
As changes in temperature can cause changes in amplifier characteristics, temperature stability is mandatory to maintain the performance of the amplifier.

Mini-Circuits MMIC amplifier designs utilize an active biasing circuit consisting of components that have the same temperature characteristics as the amplifier to improve temperature stability.

RF signals are isolated from the active biasing circuit, preventing degradation in RF performance.

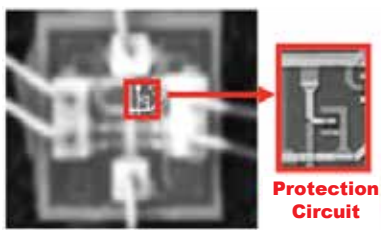


Protection Circuitry



ESD Protection Circuit

Designed-in ESD protection circuitry provides an alternate low resistance path for ESD, reducing current flow to critical circuits, and improving ESD survivability and product reliability.

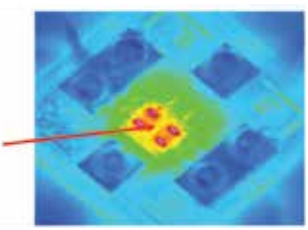


Transient Current Protection Circuit

Voltage spikes may cause permanent damage to MMIC amplifiers. Built-in transient current protection circuitry prevents damage caused by voltage spikes without degrading the amplifier's RF performance.

Junction Temperature Monitoring

We also measure and monitor MMIC amplifier junction temperature using embedded temperature sensing diodes near the transistor junction on every design and every production wafer to ensure we provide the highest quality and reliability in our amplifiers.



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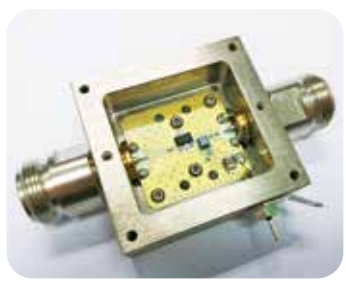
Evaluation Board Design

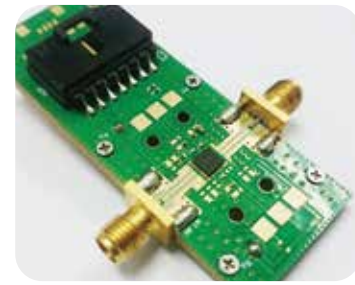
Mini-Circuits designs and manufactures evaluation board for all MMIC products.

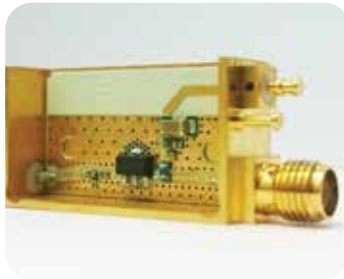
These evaluation boards are able to help customers to reduce their design effort. All required components such as bypass capacitors, DC blocks, biasing resistors and RF chokes are assembled on board.

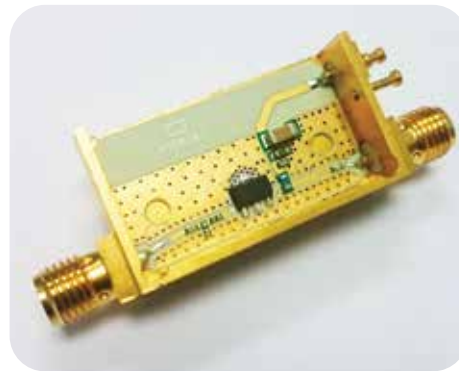
Heat dissipation issues are taken care of by proper heat sinking with a brass case. Mini-Circuits also include Voltage Control Module (VCM) on the evaluation boards for products that require voltage sequencing and DC control.

This module enables plug-and-play operation without the need for external voltage sequencing circuits.









NEW MMIC PRODUCTS

- Low Noise Amplifiers
- Wideband Microwave Amplifiers
- High Dynamic Range Amplifiers
- Digital Variable Gain Amplifiers
- Wideband Power Splitters / Combiners
- Wideband Frequency Mixers
- Frequency Multipliers

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Low Noise Amplifiers

Ranging from 40 to 8000 MHz, Mini-Circuits low noise MMIC amplifier model families provide noise figures as low as 0.38dB, making them ideal for sensitive receiver applications.

Our selection provides various combinations of gain, P1dB, IP3, power consumption and size to meet a wide range of system requirements.

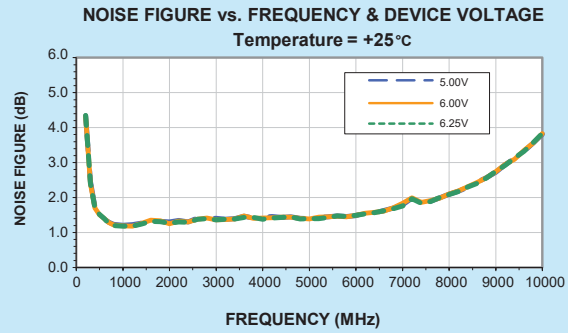
For wideband operation 500 to 8000MHz, Mini-Circuits' new model **PMA3-83LN+** has the unique combination of low noise, high IP3, and flat gain over a wideband making it ideal for sensitive, high-dynamic-range receiver applications. This design operates on a single 5V or 6V supply, is well matched for 50Ω and comes in a tiny, low profile package (3 x 3 x 0.89mm), accommodating dense circuit board layouts.

Mini-Circuits low noise amplifiers are also available with bypass features, such as **TSS-53LNB+**, TSS-53LNB+ features an internal switchable bypass circuit to protect the LNA in the presence of high power signals, minimize noise distortion and extend the usable dynamic range to up +48dBm in bypass mode.

Model Number	Frequency Range (MHz)	Gain (dB)	P1dB (dBm)	Noise Figure (dB)	IP3 (dBm)	DC Bias
PMA3-83LN+	500 to 8000	22.1	20.7	1.3	35.2	5V, 60mA/6V, 77mA
TSS-53LNB+	500 to 5000	21.7	20.6	1.4	33.9	5V, 82mA
PMA-545+	50 to 6000	14.2	20.3	0.8	36.4	3V, 80mA
PMA-545G1+	400 to 2200	31.3	22.2	1.0	33.6	5V, 158mA
PMA2-33LN+	400 to 3000	19.1	17.2	0.4	34.5	3V, 56mA
PMA2-43LN+	1100 to 4000	19.9	19.9	0.5	32.9	5V, 51mA
PMA2-162LN+	700 to 1600	22.7	20.0	0.5	30.0	4V, 55mA
PMA2-252LN+	1500 to 2500	17.6	17.8	0.8	30.0	4V, 57mA
PMA4-33GLN+	700 to 3000	38.9	22.6	0.5	40.4	5V, 152mA
PGA-103+	50 to 4000	11.0	22.5	0.9	44.6	3V, 60mA/5V, 97mA
PGA-105+	40 to 2600	15.1	20.5	1.9	39.3	5V, 63mA
PSA-545+	50 to 4000	14.9	20.2	1.0	36.2	3V, 80mA
PSA-5451+	50 to 4000	14.0	16.2	1.0	30.2	3V, 30mA
PSA-5453+	50 to 4000	14.7	19.4	1.0	36.8	3V, 60mA
PSA-5454+	50 to 4000	13.6	14.0	1.1	26.3	5V, 20mA
PSA-5455+	50 to 4000	14.4	18.5	1.0	32.2	5V, 40mA
PSA4-5043+	50 to 4000	18.4	18.8	0.8	33.5	3V, 33mA/5V, 58mA
SAV-541+	45 to 6000	17.6	19.2	0.5	33.1	3V, 60mA
SAV-551+	45 to 6000	15.9	17.5	0.5	24.3	3V, 15mA
SAV-581+	45 to 6000	17.0	19.0	0.5	30.6	3V, 30mA
TAV-541+	45 to 6000	17.9	19.1	0.5	33.6	3V, 60mA
TAV-551+	45 to 6000	16.3	17.5	0.5	23.5	3V, 15mA
TAV-581+	45 to 6000	17.3	18.3	0.5	30.3	3V, 30mA

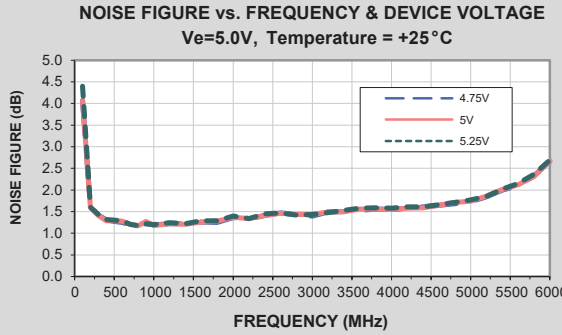
PMA3-83LN+
(0.5-8GHz)

- Low Noise figure, 1.3 dB at 2 GHz
- High IP3, + 35 dBm typ. at 2 GHz
- High Pout, P1dB + 20.7 dBm typ. at 2 GHz
- Excellent Gain flatness, ±0.9 dB over 0.5 to 7 GHz



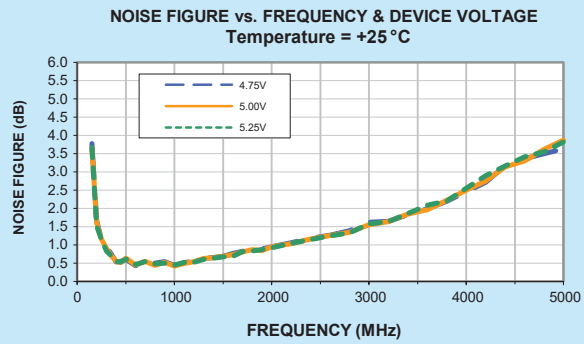
TSS-53LNB+
(0.5-5GHz)

- Integrated Bypass Switch
- Noise Figure: as low as 1.2 dB
- ± 0.7 dB flatness over 700 to 2100 MHz
- P1dB + 21 dBm typ.
- IP3, + 34 dBm in thru mode
- IP3, + 48 dBm in bypass mode
- Gain 21.7 dB typ. at 2 GHz



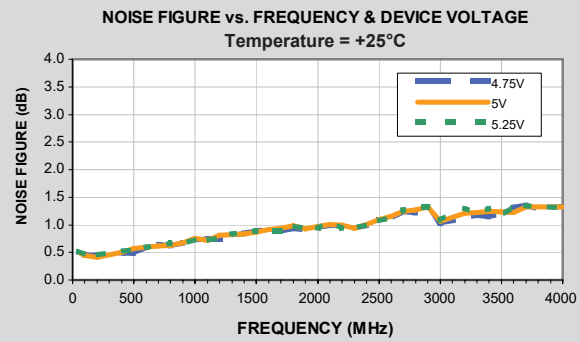
PMA4-33GLN+
(0.7-3GHz)

- Low Noise Figure, 0.54 dB at 900 MHz
- High IP3, + 40 dBm typ. at 900 MHz
- High Pout, P1dB + 22.6 dBm typ. at 900 MHz
- High Gain, 39 dB at 900 MHz



PGA-103+
(0.05-4GHz)

- 5V/3V operation
- High IP3, + 45 dBm typ. at 2 GHz, Vd=5V
- Low Noise Figure, 0.6 at 1 GHz; 0.9 dB at 2 GHz
- Gain, 11.0 dB typ. at 2 GHz
- P1dB + 22.5 dBm typ. at 2 GHz at Vd=5V



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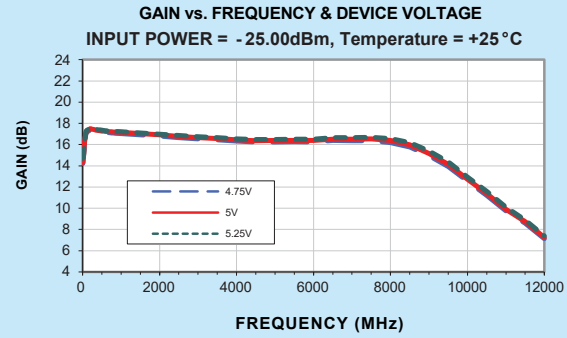
Wideband Microwave Amplifiers

Covering applications from DC to 26.5GHz, our selection of wideband fixed voltage MMIC amplifiers cover an extremely wide range of applications. With a variety of models offering different performance features including flat gain, high linearity, and output power up to 1/2watt, chances are, we have a model that meets your requirements.

Model Number	Frequency Range (MHz)	Gain (dB)	P1dB (dBm)	Noise Figure (dB)	IP3 (dBm)	DC Bias
GVA-123+	10 to 12000	16.9	16.2	4.0	30.0	5V, 52mA
AVA-24A+	5000 to 20000	11.8	18.4	5.7	25.0	5V, 120mA
AVA-183A+	5000 to 18000	14.0	19.0	5.0	26.0	5V, 131mA
AVM-273HPK+	13000 to 26500	14.0	26.9	8.4	32.1	6V, 559mA

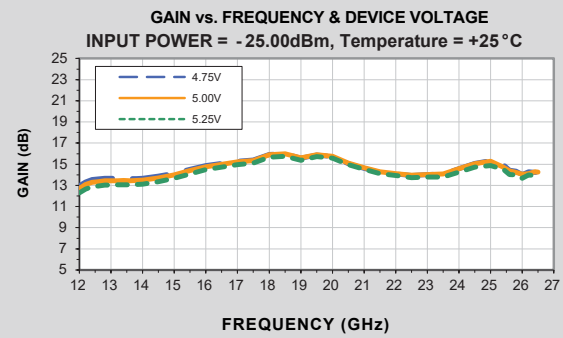
GVA-123+
(10-12000MHz)

- Broadband without external matching components
- Excellent Gain Flatness, ±0.7 dB, 0.05-8 GHz
- Gain, 16.9 dB typ. at 2 GHz
- Excellent return loss, 20 dB typ., 2 GHz



AVM-273HPK+
(13-26.5GHz)

- Wideband 13 to 26.5 GHz
- Output power up to +27 dBm
- Excellent directivity, 43 dB typ. @ 20 GHz
- Unconditionally stable
- Excellent gain flatness, ±1 dB
- Sequencing and DC Control module included



High Dynamic Range Amplifiers

Mini-Circuits' high dynamic range amplifiers deliver industry-leading dynamic range with OIP3 performance as high as +48dBm. This translates into extremely linear performance in multi-carrier and complex signal environments. Supporting both 50 and 75 ohm systems with a range of supply voltages, these models provide outstanding combinations of intercept point and power consumption for low cost compared to similar products on the market.

HXG-series amplifiers provide the unique combination of very high IP3 and very low noise performance, making them usable as output stage amplifiers and also in receiver front end circuitry. Mini-Circuits System in Packages® (MSiP) technology integrates the matching network with the amplifier in a single, tiny ceramic package, eliminating the need for external matching components.

For specific bandwidth applications, Mini-Circuits offers GVA-91+ and GVA-92+ with high Power Added Efficiency(up to 50%) and deliver high output power (up to +29.5dBm), with low DC power consumption.

Model Number	Frequency Range (MHz)	Gain (dB)	P1dB (dBm)	Noise Figure (dB)	IP3 (dBm)	DC Bias
LHA-1+	50 to 6000	14.1	22.7	2.1	40.0	5V, 146mA
PHA-1+	50 to 6000	13.5	22.4	2.2	42.0	5V, 146mA
PHA-1H+	50 to 6000	13.8	22.6	2.2	41.0	5V, 132mA
PHA-101+	50 to 1500	15.2	26.0	4.0	47.0	9V,186mA
PGA-122-75+	5 to 1500	15.6	24.3	2.9	43.0	9V, 115mA
HXG-122+	500 to 1200	15.3	23.0	2.2	46.0	5V,144mA
HXG-242+	700 to 2400	15.0	22.8	2.3	46.5	5V,144mA
GVA-91+	869 to 2170	20.4	28.8	6.4	40.0	5V, 147mA
GVA-92+	869 to 2170	21.2	24.1	6.0	42.0	5V, 99mA

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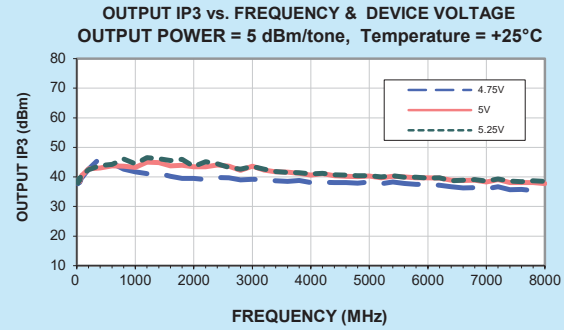
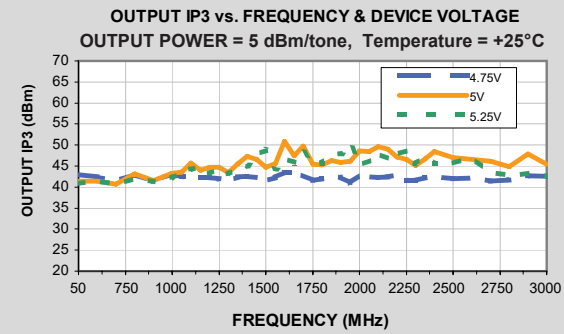
PHA-1H+
(50-6000MHz)

- High IP3, + 40.4 dBm typ. at 2.4 GHz
- Gain, 13.8 dB typ. at 2 GHz
- High Pout, P1dB + 22 dBm typ. at 2 GHz
- Low noise figure, 2.2 dB @2 GHz
- No external matching components required



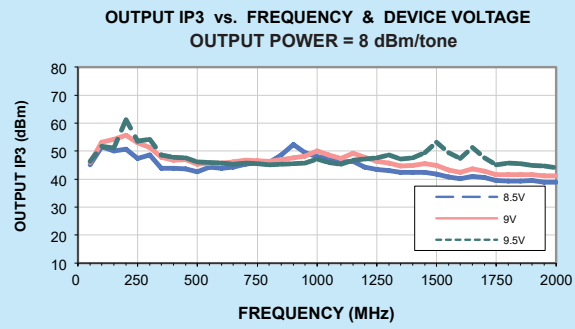
HXG-242+
(700-2400MHz)

- Ultra High IP3, +46 dBm typ. at 1.5 GHz
- Gain, 14.3 dB typ. at 2 GHz
- High Pout, P1dB +23 dBm typ.
- Low noise figure, 2.4 dB
- Internally matched for optimized IP3 performance
- No external matching components required



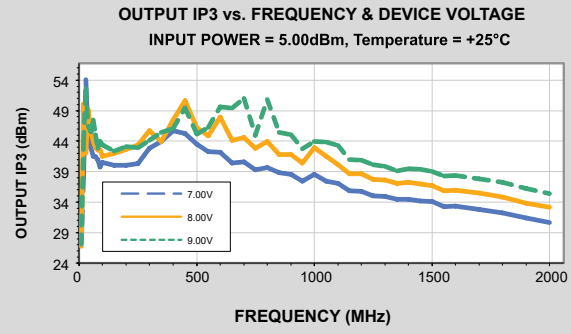
PHA-101+
(50-1500MHz)

- High IP3, + 47dBm typ at 0.9GHz
- Gain, 15.2dB typ at 0.9GHz
- High Pout, P1dB + 26dBm typ at 0.9GHz
- Low Noise figure, 4.0dB at 0.9GHz
- No external matching components required



PGA-122-75+
(5 – 1500MHz)

- 75 ohm operation
- High IP3, +43 dBm typ. at 0.5 GHz
- Gain, 15.6 dB typ. at 0.5 GHz
- High Pout, P1dB +24.3 dBm typ. at 0.5 GHz
- Low Noise Figure, 2.9 dB at 0.5 GHz



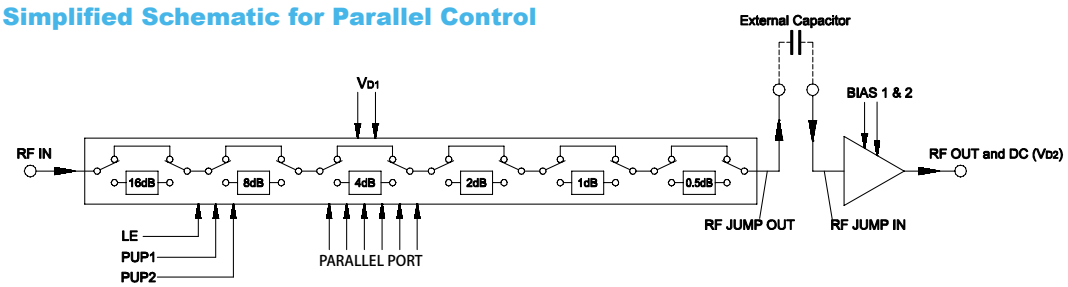
Digital Variable Gain Amplifiers

Mini-Circuits' DVGA-series of digitally controlled variable gain amplifiers integrate an amplifier with a digital step attenuator in a single, 5 x 5 mm package. They provide gain as high as 30 dB and 31.5 dB gain control in 0.5 dB steps using 6-bit serial or parallel control interfaces. The step attenuators used in DVGA amplifiers are produced using a unique combination CMOS process on silicon, offering the performance of GaAs with the advantages of conventional CMOS devices. They are immune to latch-up and provide ±0.1dB attenuation accuracy enabling very precise gain control.

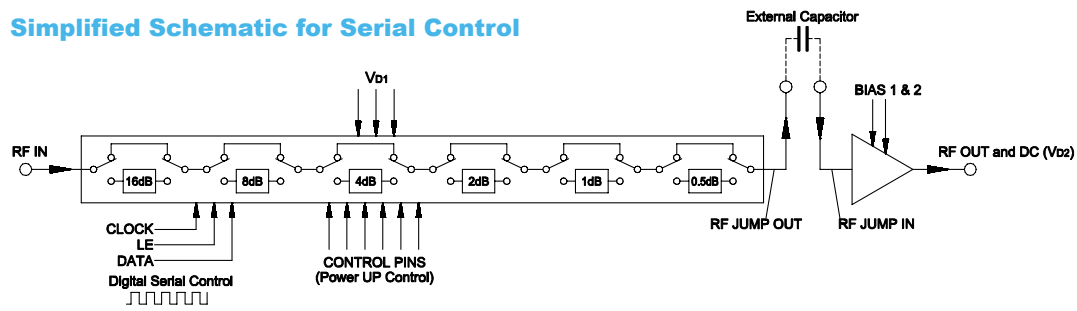
DVGA-series are packaged in MCLP which has an excellent thermal pad, provides repeatable transitions and low inductance.

Model Number	Frequency Range (MHz)	Gain (dB) 0 dB Step	Attenuation Total (dB)	Attenuation on Step (dB)	Number of Bits	Control Interface	OIP3 (dBm)	P1dB (dBm)	Noise Figure (dB)	DC Bias
DVGA1-242+	450 to 2400	29.5	31.5	0.5	6	Serial	35.7	23.2	3.1	3V/5V, 159mA
DVGA1-242PP+	450 to 2400	29.5	31.5	0.5	6	Parallel	35.7	23.2	3.1	3V/5V, 159mA
DVGA2-33+	50 to 3000	19.2	31.5	0.5	6	Serial	29.6	16.3	5.4	3V/5V, 71mA
DVGA2-33pp+	50 to 3000	19.2	31.5	0.5	6	Parallel	29.6	16.3	5.4	3V/5V, 71mA

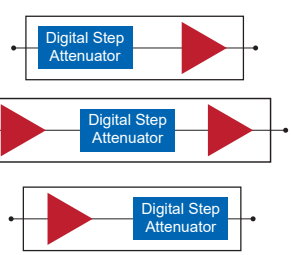
Simplified Schematic for Parallel Control



Simplified Schematic for Serial Control



Multiple Configurations Available



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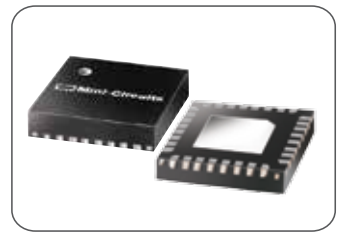
Wideband Power Splitters / Combiners

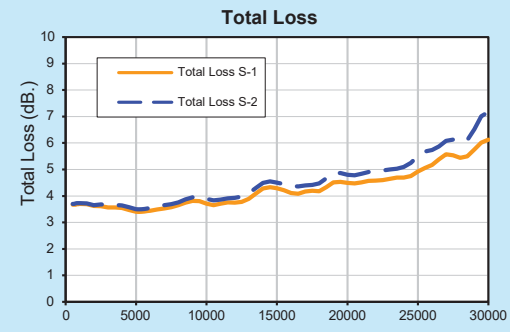
Mini-Circuits' new MMIC power splitters/combiners have the widest bandwidth in the industry in a single model. These power splitters/combiners cover the 1.8GHz to 26.5GHz frequency range, provide high performance and high power handling up to 2.5W.

Model Number	Frequency Range (MHz)	Isolation (dB)	Insertion Loss (Above 3dB)	Phase Unbalance (degrees)	Amplitude Unbalance (dB)
EP2C+	1800 to 12500	16	1.1	6.0	0.2
EP2K+	5000 to 20000	20	2.1	4.2	0.1
EP2K1+	2000 to 26500	20	2.4	5.4	0.3
EP2W1+	500 to 9500	20	3.1	3.0	0.6

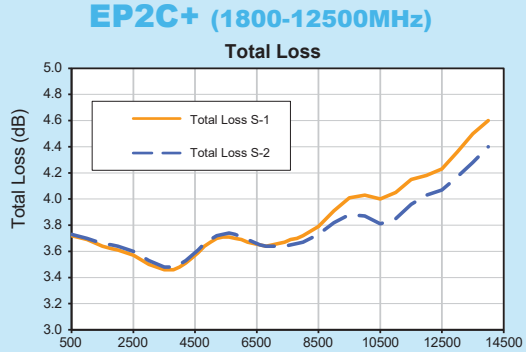


EP2K+ (5000-20000MHz)

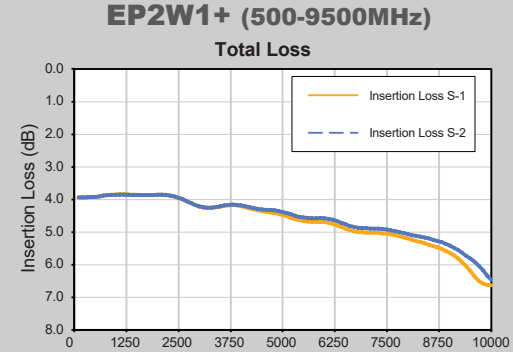
EP2K1+ (2000-26500MHz)



EP2C+ (1800-12500MHz)



EP2W1+ (500-9500MHz)



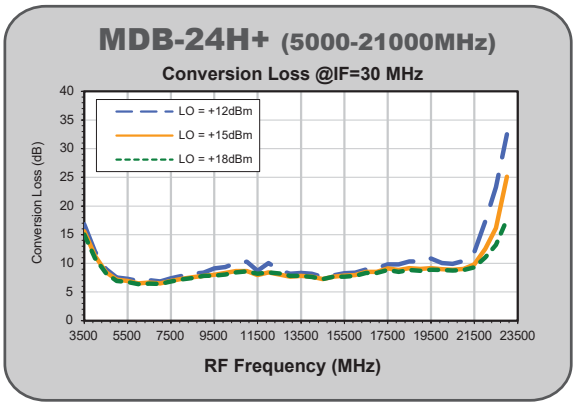
Wideband Frequency Mixers

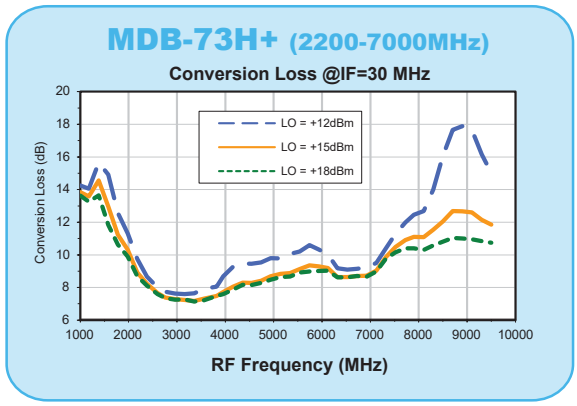
Mini-Circuits' new wideband double balanced MMIC frequency mixers provide excellent repeatability and consistent performance over a wide frequency range. Ultra-wideband coverage in a single device make these mixer suitable for wideband systems such as defense communications and radar, as well as a wide variety of narrowband applications from WiFi through Ku band and more. Requiring no DC power, these tiny MMIC mixers measure only 4 x 4 x 1mm, making them especially useful in dense PCB layouts.

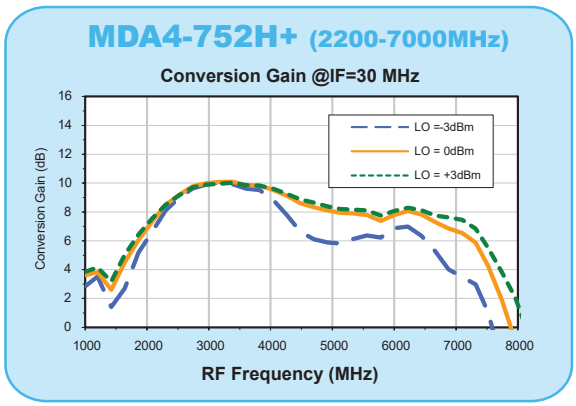
Model Number	RF In @ 1dB (dBm)	RF/LO Frequency Range (MHz)	IF Frequency Range (MHz)	Conversion Loss (dB)	LO-RF Isolation (dB)	LO-IF Isolation (dB)	IP3 @ Center Band (dBm)
MDB-24H+	10	5000 to 21500	DC to 5000	7.9	35	44	23
MDB-73H+	10	2200 to 7000	DC to 1600	8.2	39	46	24

Mini-Circuits also offer MDA4-752H+ as a multi-chip device incorporating a wideband mixer, an LO amplifier and an IF amplifier die in a single tiny 4X4mm MCLP package. It has flat conversion gain over a broad frequency range and has high IP3. In addition, the MDA4-752H+ has good input and output return loss over a broad frequency range without the need for external matching components.

Model Number	LO Level (dBm)	RF In @ 1dB Compression (MHz)	RF/LO Frequency Range (MHz)	IF Frequency Range (MHz)	Conversion Gain (dB)	LO-RF Isolation (dB)	LO-IF Isolation (dB)	Output IP3 (dBm)	DC Bias
MDA4-752H+	0	9	2200 to 7000	30 to 1600	9.1	31	61	24	5V, 141mA







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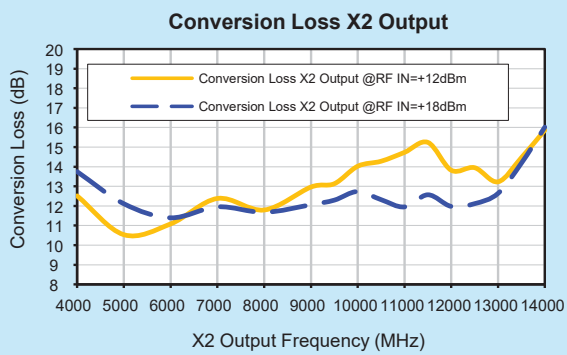
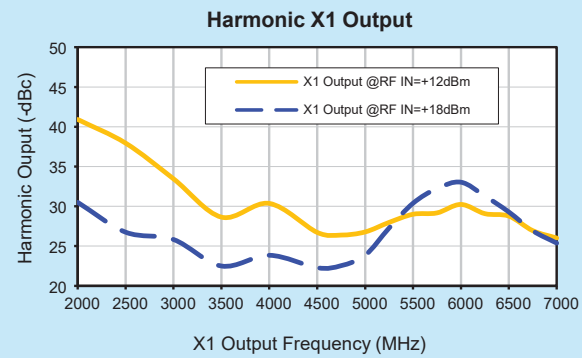
Frequency Multipliers

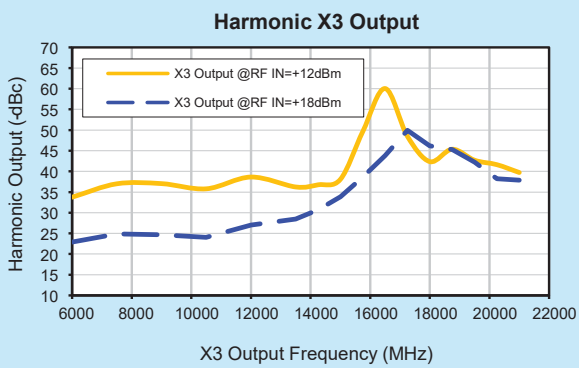
Mini-Circuits' CY2-143+ is an ultra-wideband MMIC frequency doubler, converting input frequencies from 2 to 7 GHz into output frequencies from 4 to 14 GHz. Its wide output range makes this model suitable for broadband systems as well as a wide variety of narrowband applications. Utilizing GaAs HBT technology, the multiplier comes housed in a tiny 4 x 4 x 1mm MCLP package and offers excellent repeatability, low inductance, good thermal efficiency, and low cost.

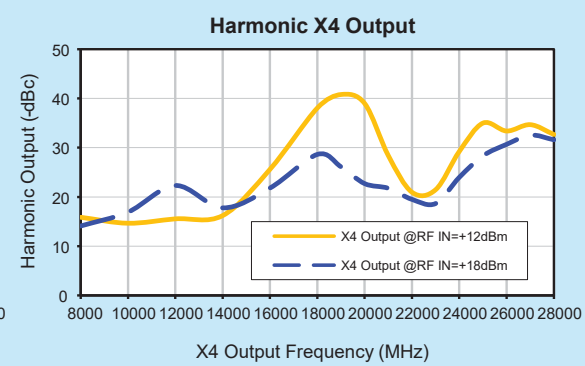
CY2-143H+ (5000-21000MHz)

- Ultra-wideband, output from 4 to 14 GHz
- Wide input power range, +12 to +18 dBm
- Low conversion loss, 12 dB
- Good fundamental and harmonic suppression: F1, 30 dBc; F3, 32 dBc
- Tiny size, 4 x 4 x 1mm
- Low cost





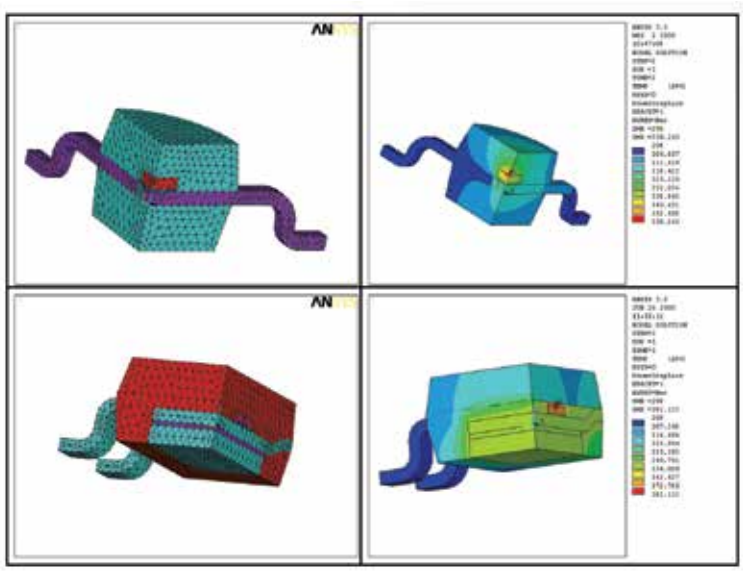




QUALITY MANUFACTURING PROCESS & CONTROL

Mini-Circuits is committed to building products which meet or exceed customer's expectations. Mini-Circuits produce products using the highest quality and reliability standards.

Advanced Packaging Technology

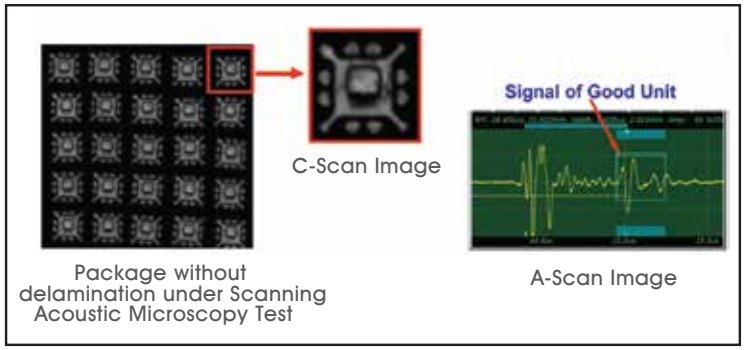


Thermal Management

At Mini Circuits, we know temperature has a direct impact on the operating performance and reliability of MMIC products. During material selection, we use mold compound, lead frame materials and package designs with excellent heat dissipation properties that improve product performance and long-term reliability.

Thermal Conductivity (W/m° K)

Material	Mini-Circuits	Competitors
Mold Compound	1.5	0.88
Conductive Epoxy	45	2.5



Moisture Sensitivity Level 1

Our proprietary package design meets MSL Level 1 standards and eliminates the risk of package delamination, ensuring long term product reliability under all operating and assembly conditions.

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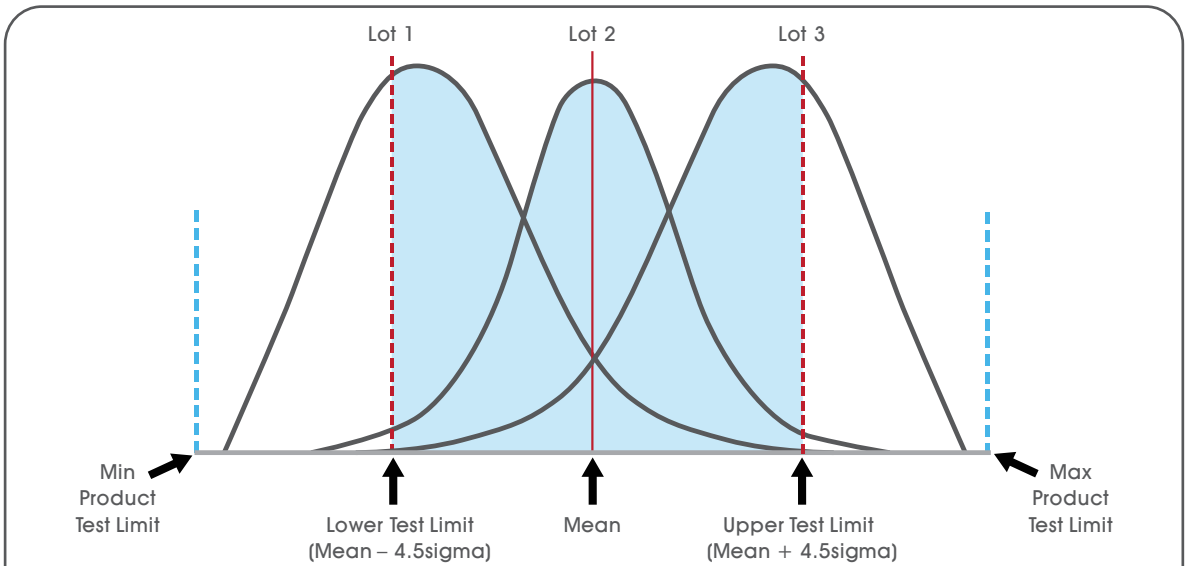
Comprehensive Test & Characterization

Mini-Circuits uses state-of-the art RF measurement equipment to characterize and qualify our MMIC product designs. Characterization and qualification testing such as S-parameter testing, power testing, noise figure testing, IP3 testing, and load and source pull testing allow our designers to validate every product design's performance and provide comprehensive performance analysis for each model.

- S-Parameter Test
- Power Test
- Noise Figure Test
- IP3 Test
- Load / Source Pull Test

Dynamic Test Specification

In pursuit of our goal to exceed our customer's expectations, we test our products to statistically generated 4.5 sigma limits instead of the specification limits. As a result, the products that are shipped to our customers are very consistent in performance with tight distribution.



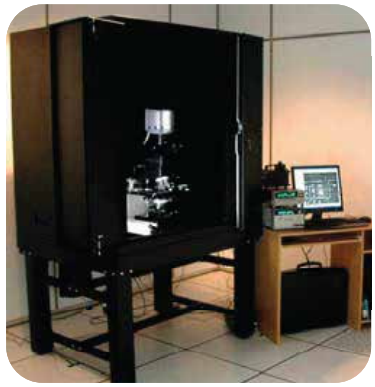
Only products performance from the shaded area in distribution chart will be shipped to customers.

Stringent Qualification

Our MMIC products undergo extensive and stringent qualification testing to ensure every unit delivers the quality you expect and reliability you can count on.

Test	Standard
High Temperature Operating Life Test (HTOL)	JEDEC Standard, JESD22A-108
Moisture Sensitivity Test (Level 1)	JEDEC Standard, J-STD-020
Temperature Cycle Test	MIL-STD-883, Method 1010
Autoclave Test	JEDEC Standard, JESD22-A102
High Temperature Storage Test	JEDEC Standard, JESD22-A103
Scanning Acoustic Microscope Test	JEDEC Standard, J-STD-020C
Humidity Test	MIL-STD-202F, Method 103B
Solderability Test	JEDEC Standard,JESD22-B102
Lead Integrity Test	MIL-STD-883, Method 2004
Whisker Growth Test	JEDEC Standard, JESD22-A121
ESD Sensitivity Test	ANSI/ESD-STM5.1-2007 (HBM)



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COMPANION PRODUCTS & OTHER RESOURCES

Companion Products

90° Hybrids

- 5 to 8000 MHz
- Power handling up to 15W
- Low phase and amplitude unbalance
- LTCC packages as small as 0805

Baluns

- 4 kHz to 18 GHz
- LTCC packages as small as 0805
- Insertion loss as low as 0.5 dB
- Low phase* and amplitude unbalance

  **relative to 180°*

Bias Tees

- 0.1 to 10000 MHz
- Isolation up to 44 dB
- Insertion loss as low as 0.35 dB
- VSWR as low as 1.05:1

Limiters

- 0.2 to 8200 MHz
- Input powers from +5 to +37 dBm
- Response time as fast as 2ns
- Hi-rel ceramic packages available

LTCC Filters

- DC to 18.3 GHz
- Low pass, high pass, band pass, and diplexers
- Sharp rejection
- Ceramic packages as small as 0603

Extensive Application Notes

As part of our commitment to providing you with best in class product information and application support, our online library of application notes contains over 40 articles with detailed technical information regarding uses of many of our MMIC products in different systems and operating environments.

Go to:

www.minicircuits.com/applications/application_notes.html

You can also request an application note specifically for the work you're doing by reaching out to us at ***apps@minicircuits.com***. We're here to support you!

Advanced Simulation Models

Mini-Circuits has always provided customers with free S-Parameters for all models to support performance modeling and simulation over linear power domains. To allow designers to accurately model the complete linear and non-linear performance of their designs, Mini-Circuits now provides free **X-Parameters®** for three of our most popular MMIC amplifiers: PHA-1+, GVA-62+, and GVA-63+.

Made possible through our partnership with modeling and measurement specialists, Modelithics, this advanced capability is ideal for use in systems with complex waveforms like LTE, OFDM and QAM, as well as for prediction of power compression, non-linear distortion, and other behaviors elusive to conventional simulations.

Made possible through our partnership with modeling and measurement specialists, Modelitics, these X-parameters models enable faster, more comprehensive feasibility assessments and more rapid transition from prototype simulations to working designs. For more information…

Go to:

http://www.minicircuits.com/products/x_parameters.shtml

FREE X-Parameters-Based
Non-Linear Simulation Models for ADS

Modelithics®

http://www.modelithics.com/mvp/Mini-Circuits.asp

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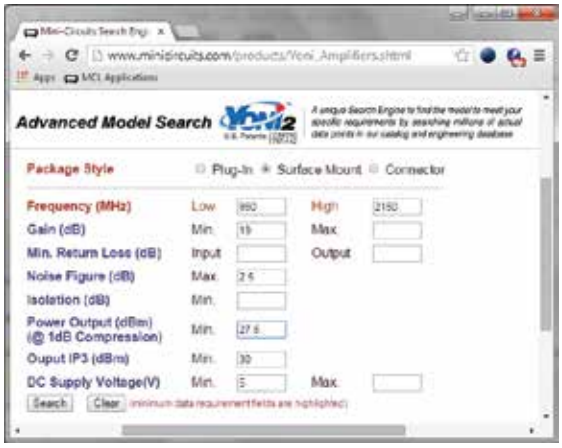
MINI-CIRCUITS NEW MMIC PRODUCTS

Yoni2®
U.S. Patents
7739260, 7761442

Find the Right Model for Your Needs in Seconds!

Why waste time searching for a needle in a haystack? Instead of combing through tables and datasheets of hundreds of possible MMIC options for the one that fits your requirements, visit minicircuits.com and use ***Yoni2***®, our patented RF product search engine. ***Yoni2***® searches thousands of actual test data points from our entire database of catalog models and non-catalog engineering designs for the amplifiers that meet or exceed your criteria. Just visit the ***Yoni2***® page. Within seconds, ***Yoni2***® will present a list of components what match your criteria based on how they actually perform across your specific frequency band!



Go to:

www.minicircuits.com/products/Yoni.shtml

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