



# Your Trusted Partner

DC to mmWave

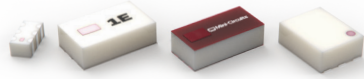


## **The Industry's Widest Selection in Stock for Same-Day Shipping**

- 27 Product Lines
- 10,000+ Active Models
- Designed, Built & Tested in House
- 20,000 Customers Worldwide
- 50+ Years Strong

# Components for the Entire Signal Chain

Every Block Covered from DC to mmWave



DC TO 50 GHz

## LTCC Passives

World-Leading Design

LTCC devices are fabricated with capacitors, inductors and distributed structures embedded in multi-layered ceramic substrate and sintered into a single monolithic component. Our design team has the most advanced knowledge of LTCC technology in the industry building on 20+ years of R&D and multiple active patents.

- World's broadest portfolio
- 750+ in-stock models
- Custom designs
- Packages as small as 0202

### Product lines:

Couplers, filters, power splitters, thru-lines, transformers/baluns



DC TO 65 GHz

## MMICs

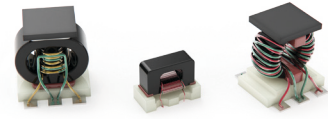
Designed & Packaged in House

MMICs are integrated circuits fabricated from semiconductor substrates, sold in surface-mount packages or as bare die for chip-and-wire assembly. Mini-Circuits MMICs utilize pHEMT, HBT and IPD fabrication processes on gallium arsenide (GaAs), designed and packaged in our own facilities.

- 700+ models in stock and growing
- Industry-leading quality
- All models available in SMT and bare die format

### Product lines:

Amplifiers, attenuators, bias tees, couplers, equalizers, reflectionless filters, mixers, multipliers, power splitters, switches, transformers/baluns



DC TO 20 GHz

## Core & Wire

50+ Years of Quality

Core and wire designs consist of twisted, wire-coupled structures wound around toroidal ferrite cores utilizing inductive coupling between conductors to achieve a desired function. Mini-Circuits performs all wire twisting, winding and welding in house with tight process control to ensure the highest quality and repeatability.

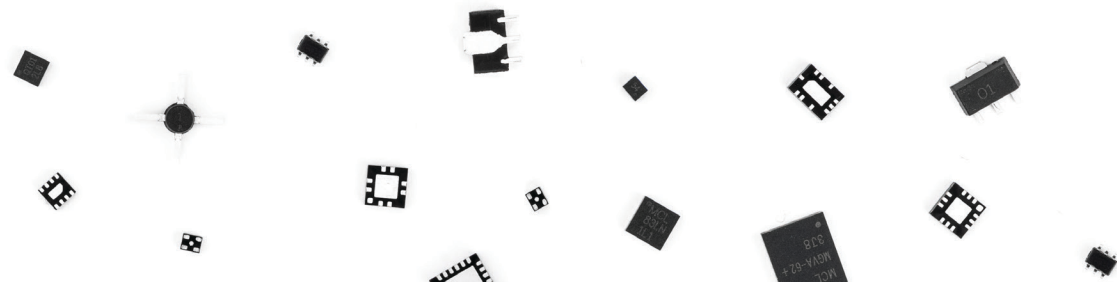
- Thousands of models
- Outstanding repeatability
- Footprints as small as 0.15 x 0.15"
- TopHat® feature for more accurate pick-and-place

### Product lines:

Couplers, filters, power splitters, transformers/baluns

DC TO 65 GHz

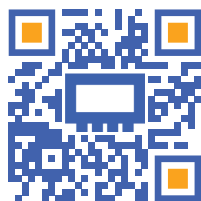
# MMIC Products



New and Coming Soon

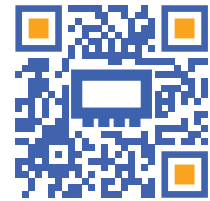
	Part No.	Freq. Range (GHz)	Description	Package Style
<b>Amplifiers</b>	AVA-183MP+	0.05 to 18	High Dynamic Range P1dB +24 dBm, NF 1.8 dB, Gain 16 dB, OIP3 +31 dBm	4x4 mm 20-Lead QFN
	AVA-5R183+	0.5 to 18	High Dynamic Range P1dB +17 dBm, NF 3.4 dB, Gain 14 dB, OIP3 +28 dBm	4x4 mm 20-Lead QFN
	PMA3-15453+	15 to 45	NF 3.2 dB, P1dB +17 dBm, OIP3 +25 dBm, Gain 16 dB, Single +5V Supply	3x3 mm 12-Lead QFN
	AVA-2183+	2 to 20	P1dB +19 dBm, OIP3 +25 dBm, Flat Gain 16 ± 1 dB	4x4 mm 20-Lead QFN
	AVA-0233LN+	2 to 30	Gain Control 30 dB, NF 2.4 dB, Flat Gain 16 ± 1 dB	5x5 mm 32-Lead QFN
	PMA3-24323LN+	24 to 32	NF 3.1 dB, P1dB +17 dBm, OIP3 +25 dBm, Gain 16 dB, Single +5V Supply	3x3 mm 12-Lead QFN
<b>Balun</b>	MTX2-133+	1.5 to 13	1:2 Balun, IL (above 3dB theoretical) 2.3 dB, Amplitude Unbalance 0.2 dB, Phase Unbalance 1 Degree	3x4 mm 12-Lead QFN
<b>Balun</b>	MTX2-183+	2 to 18	1:2 Balun, IL (above 3 dB theoretical) 2.3 dB , Amplitude Unbalance 0.2 dB, Phase Unbalance 2 Degrees	3x4 mm 12-Lead QFN
<b>Coupler</b>	EDC14-553-D+	22 to 55	Coupling 14 ± 1 dB, Low IL 0.8 dB, DC Passing	Bare Die
<b>Mixer</b>	SMIQ-6243H+	6 to 24	IQ Mixer, Conversion Loss 9 dB, L to R isolation 42 dB, Image Rejection 30 dB	4x4 mm 24-Lead QFN
<b>Multiplier</b>	CY3-453+	20 to 45	X3, Conversion Loss 20 dB, Harmonic Rejection > 30 dBc	4x4 mm 24-Lead QFN
<b>Variable Gain Amplifier</b>	PVGA-123+	0.4 to 12	Adjustable Gain Range 16 dB, OIP3 +30 dBm, Single +6V Supply	3x3 mm 12-Lead QFN
<b>Multiplier</b>	CY3-723-D+	40 to 72	X3, Conversion Loss 19 dB, Harmonic Rejection > 30 dBc	Bare Die
<b>Power Amplifier</b>	PMA5-83-2W+	DC to 8	$P_{SAT}$ +33 dBm, OIP3 +44 dBm, Gain 11.5 ± 1 dB	5x5 mm 32-Lead QFN

BROWSE OUR FULL SELECTION

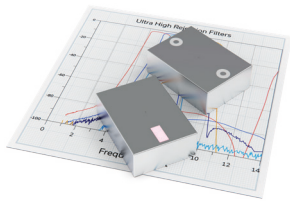


# LTCC Filter Innovations

LEARN MORE

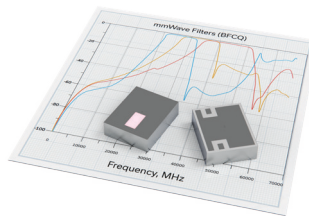


The Industry's Widest Selection



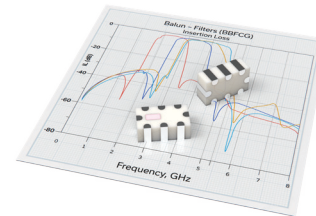
## Ultra-High Rejection

- Rejection floor down to 100+ dB
- Excellent selectivity
- Built-in shielding
- 1812 package style
- Patent pending



## mmWave Passbands

- Passbands to 50+ GHz
- The industry's widest selection of LTCC filters optimized for 5G FR2 bands
- Growing selection of models for Ku- and Ka-band Satcom downlink
- 1812 & 1008 package styles



## Integrated Balun-Bandpass Filters

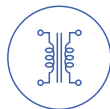
- Combine balun transformer and bandpass filter in a single device
- Saves space and simplifies board layouts in ADCs, DACs and other circuits
- 1210, 1008 & 0805 package styles



## Dual / Differential Filters

DC to 1900 MHz

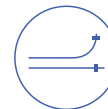
- Two filters in a single, tiny LTCC monolith
- Ideal for saving space in balanced or differential circuits
- 0805 & 1206 package styles



## Baluns

0.2 to 18 GHz

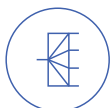
- Impedance ratio from 1 to 4
- Excellent power handling, up to 3W
- Variety of package styles as small as 0402



## Couplers

360 to 7200 MHz

- Coupling from 6 to 30 dB
- Directional and bi-directional models
- Variety of package styles as small as 0603



## Splitters

600 to 6500 MHz

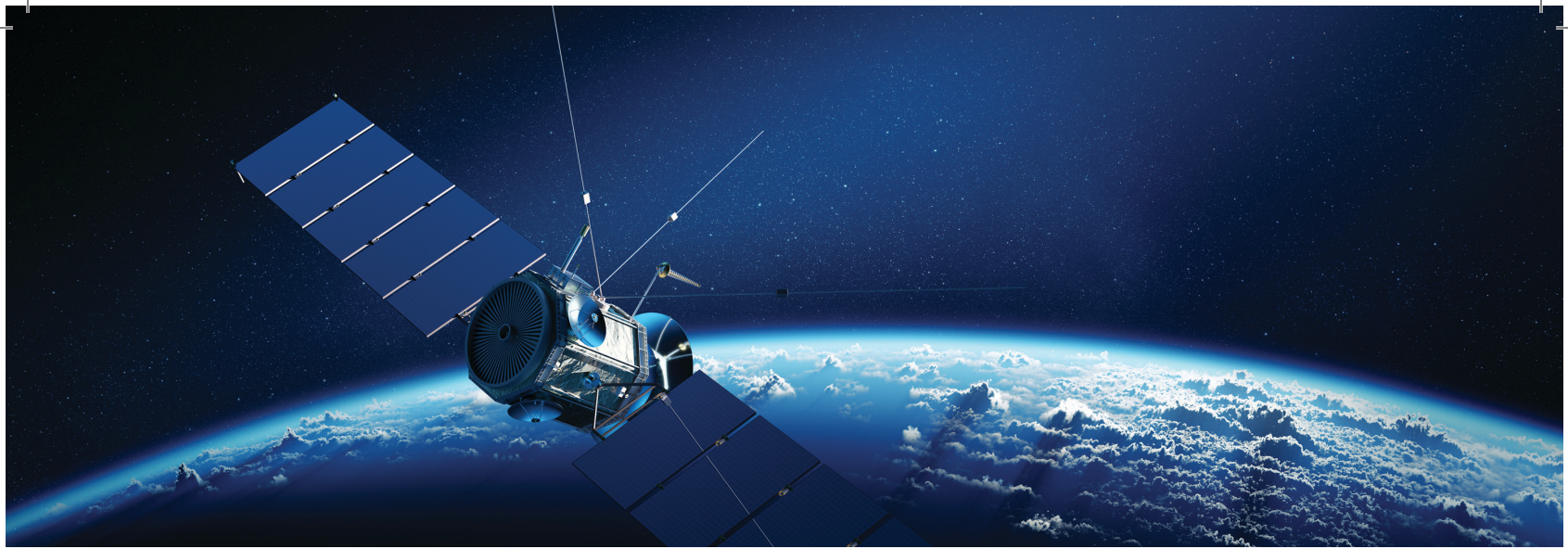
- 2-, 3- and 4-way designs
- Power handling up to 20W
- Variety of package styles as small as 0805



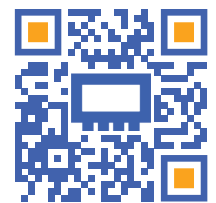
## Thru-Lines

DC to 30 GHz

- Placeholders for LTCC filters anywhere on your board layout
- Variety of footprint sizes: 0603, 0805, 1206 & 1812
- Power handling up to 30W
- Low insertion loss & excellent return loss



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## 30+ years Supporting Your Hi-Rel & Launch Prep Requirements

### Mil-Spec Qualification

- Qualification for the toughest operating environments
- Broad selection off-the-shelf + custom designs
- MMICs in ceramic, plastic and bare die formats

### Standard Capabilities:

Burn-in, thermal shock, vibration, destructive physical analysis\*, mechanical shock, hermeticity and HAST

### Space Upscreening

- Mil-Spec or equivalent qualifications
- 30+ years of space-level screening
- In-stock and custom components
- EEE-INST-002 compliant workflows

### Standard Capabilities:

Burn-in, thermal shock, vibration\*, radiographic inspection\*, destructive physical analysis (DPA)\*, mechanical shock, hermeticity, outgassing requirements, residual gas analysis, and hydrogen poisoning susceptibility with accompanying acceptance test procedure (ATP)

In addition to our technology-specific, standard capabilities, Mini-Circuits' applications support team can develop custom solutions for nearly any project.

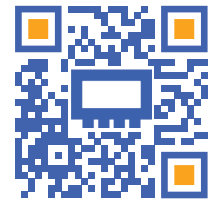
*\*While Mini-Circuits performs most of its testing and upscreening in-house, we use specialist partners for a limited selection of tests.*

# RF / Microwave Test Solutions & Components

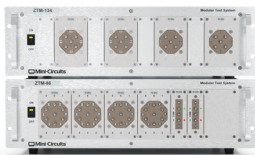
Get More Out of Your Test Setup

- Improve test efficiency and throughput without breaking the bank
- Expand and reconfigure as your needs change
- Wide variety of components in stock from DC to 100+ GHz
- The industry's fastest turnaround times

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## Rack Mount Systems & Benchtop Modules



### Modular Test Systems

Attenuation & Switching



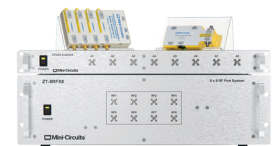
### Mechanical Switch Systems

Signal Routing to 50 GHz



### Solid State Switch Systems

Fast Switching, High Isolation



### Programmable Attenuators

9 kHz to 67 GHz, up to 120 dB



### Mesh Network Test Systems

Simultaneously Interconnect  
3 to n Devices or Test Modules



### NxM Switch Matrices

Blocking, Non-Blocking  
& Full Fanout



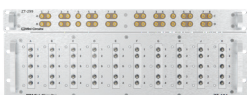
### High Power Test Systems

Up to 100W



### Instrumentation Amplifiers

Precision Amplifier Systems



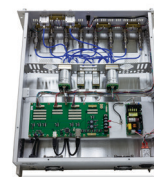
### Panel Mounted Structures

Adapters, Attenuators,  
Splitters & More



### Signal Distribution Systems

Multiple Channel  
Test Configuration



### Custom Test Systems

Our wealth and variety of components in stock allows us to take a building-block approach to developing custom equipment for your unique needs with exceptionally fast turnaround.

## Test Instrumentation



### Vector Network Analyzer

A High-Quality, Affordable  
2-Port 6 GHz VNA



### Signal Generators

1 MHz to 30 GHz,  
-70 to +23 dBm



### Power Sensors

CW, RMS, Peak & Average  
up to 40 GHz



### Frequency Counter / Power Sensor

Synchronized Frequency &  
Power Measurement from  
a Single Device

## Interconnect and Calibration



### Adapters

Coax and Waveguide



### Cables

Test Leads and System Cables



### Gauges

Ensure Connector Integrity



### VNA Calibration Kits

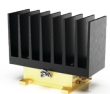
N-type, SMA-type



### Wrenches

N, SMA, 1.85 mm, 2.4 mm,  
2.92 mm, 3.5 mm

## Lab Components



Amplifiers  
DC to 95 GHz



Attenuators  
DC to 65 GHz



Bias Tees  
0.1 MHz to 54 GHz



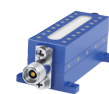
Couplers  
0.005 MHz to 65 GHz



DC Blocks  
0.1 MHz to 65 GHz



Equalizers  
DC to 40 GHz



Filters  
DC to 86 GHz



Hybrids, 90° & 180°  
0.01 to 4200 MHz



Impedance  
Matching Pads  
DC to 3000 MHz



Limiters  
0.2 to 8200 MHz



Mixers  
0.0005 MHz to 65 GHz



Modulators &  
Demodulators  
1 to 200 MHz



Multipliers  
0.05 MHz to 20 GHz



Phase Detectors  
1 to 100 MHz



Phase Shifters  
250 to 430 MHz



Power Detectors  
10 MHz to 43.5 GHz



Power Splitter  
& Combiners  
DC to 67 GHz



Switches  
DC to 67 GHz



Terminations  
DC to 65 GHz

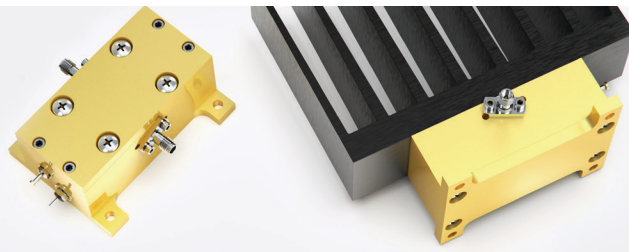


Transformers  
& Baluns  
DC to 2500 MHz

DC TO 95 GHz

# High-Frequency Products

For mmWave Test Applications

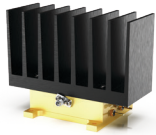


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## E-Band Amplifiers

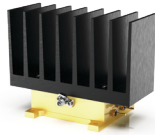
### ZVA-50953G+



#### E-Band Medium Power Amplifier

- 50 to 95 GHz
- +21 dBm  $P_{OUT}$  at Saturation
- 28 dB gain
- $\pm 2.0$  dB gain flatness
- Single supply voltage, +10 to +15V

### ZVA-71863HP+



#### E-Band Medium Power Amplifier

- 71 to 86 GHz
- +24 dBm  $P_{OUT}$  at Saturation
- 38 dB gain
- $\pm 1.5$  dB gain flatness
- Single supply voltage, +10 to +15V

### ZVA-71863LNX+

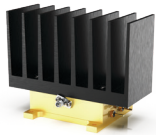


#### E-Band Low Noise Amplifier

- 71 to 86 GHz
- 4.5 dB noise figure
- 37 dB gain
- +13.8 dBm  $P_{1dB}$ , +18 dBm  $P_{SAT}$
- Single-supply voltage, +10 to +15V

## K – V-Band Amplifiers

### ZVA-35703+



#### Medium Power Amplifier

- 35 to 71 GHz
- +21 dBm  $P_{SAT}$
- 17.5 dB gain
- $\pm 1.5$  dB gain flatness
- Single supply voltage, +10 to +15V

### ZVA-543HP+



#### Medium Power Amplifier

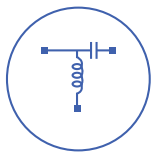
- 18 to 54 GHz
- +29 dBm  $P_{SAT}$
- High gain, 31 dB
- $\pm 2.0$  dB gain flatness
- Single supply voltage, +10 to +15V

### ZVA-0.5W303G+



#### Medium Power Amplifier

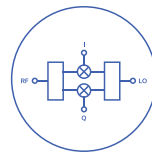
- 10 MHz to 30 GHz
- 0.5W  $P_{OUT}$  at Saturation
- $\pm 1.5$  dB gain flatness
- 4.2 dB noise figure
- Single +12V bias voltage



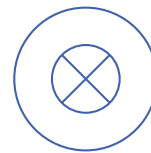
BIAS TEES



DIGITAL STEP ATTENUATORS



I/Q MIXERS



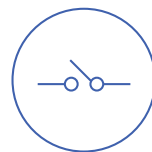
MIXERS



MULTIPLIERS



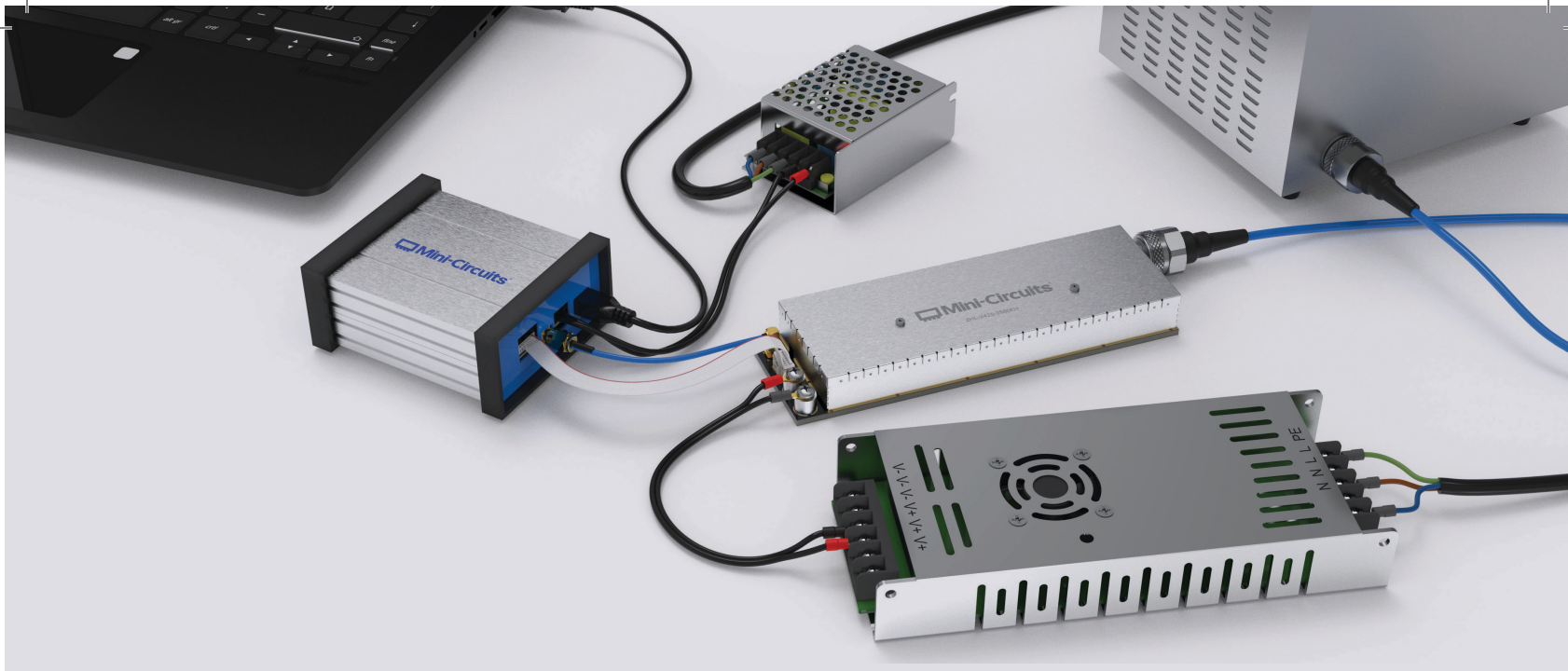
POWER DETECTORS



SWITCHES

& MORE





2.4 TO 2.5 GHz | 300W to 1kW

# ISM RF & MW Energy Solutions

Solid-State Power Amplifier & Signal Controller

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## User-Friendly Building Blocks

Mini-Circuits offers the flexibility to build the solution that fits your application requirements in the way that makes the most sense for you.

### Signal Generator/Controller

ISC-2425-25+



- Output power from -30 to +25 dBm in 0.1 dB steps
- Frequency selection with 1 kHz steps from 2400 to 2500 MHz
- Closed loop and feed forward RF power control modes
- Standalone or multi-channel operation (in either coherent or incoherent modes)
- User-friendly GUI and full API included

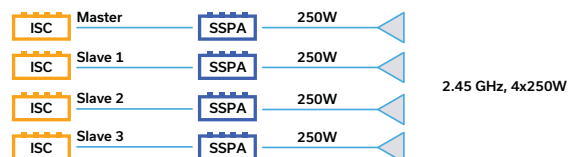
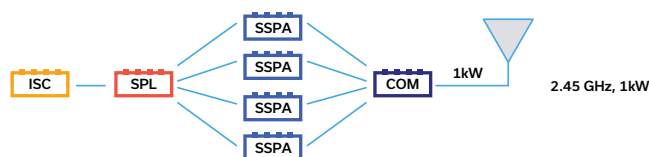
### 300W SSPA

ZHL-2425-250X+

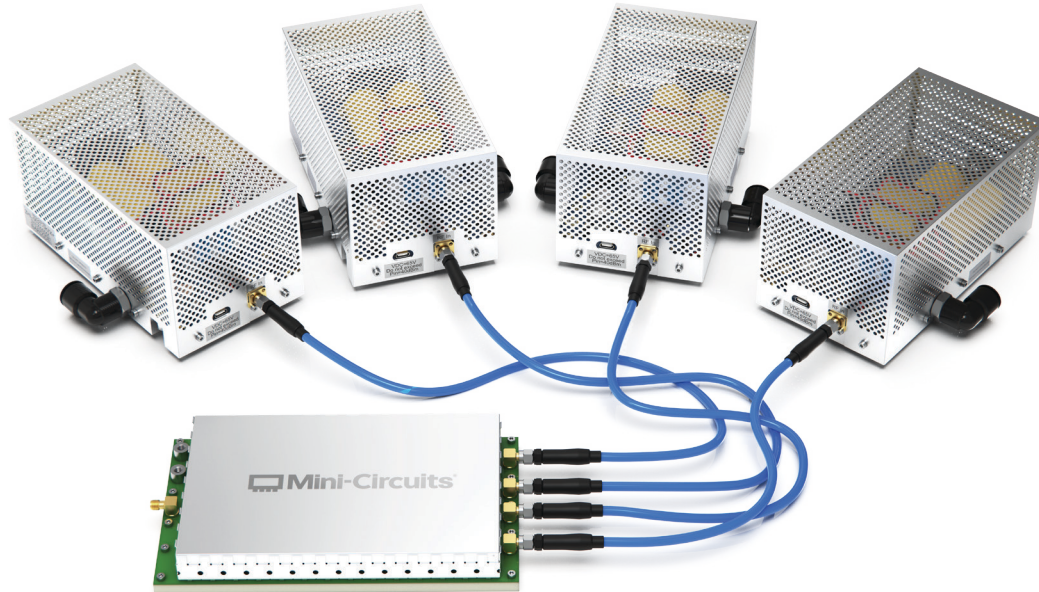


- 300W saturated output power typ.
- Supports CW & pulsed signals
- 42 dB gain
- 60% efficiency
- Built-in monitoring and protection for temperature, current forward and reflected power
- User friendly I<sup>2</sup>C control interface

### Example Configurations:



Fully Integrated 1kW Rack Mount Solution  
Coming Soon!



## ISM RF & MW ENERGY

# 27 MHz SSPA

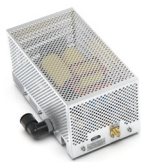
Driver & Amplifier Pair from 1.7 to 6 kW

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### 1.7kW Power Amplifier

RFE-24M30M1K7X+



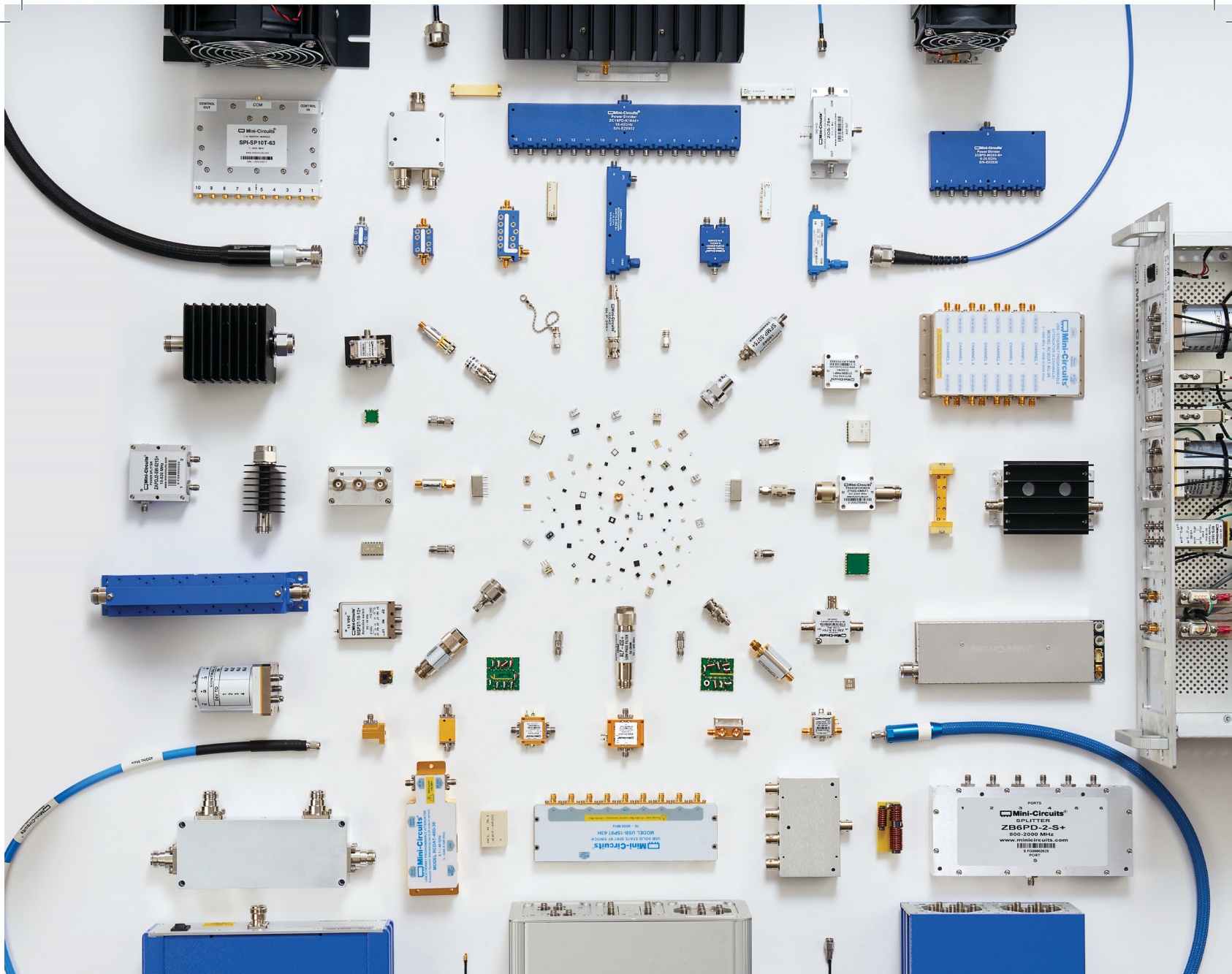
- 1.7kW output power
- CW & pulsed signals
- 26 dB gain
- 80% efficiency
- Built-in temperature & current monitoring
- Built-in emergency switch off
- Water cooled

### 4-Channel Driver

RFE-24M30M075X+



- One input, four 19W outputs
- CW & pulsed signals
- 16 dB gain at P3dB
- 55% efficiency
- Integrated harmonic suppression
- Built-in temperature & current monitoring
- Built-in emergency switch off



# Contact

## Mini-Circuits

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## SALES

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## APPLICATIONS

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