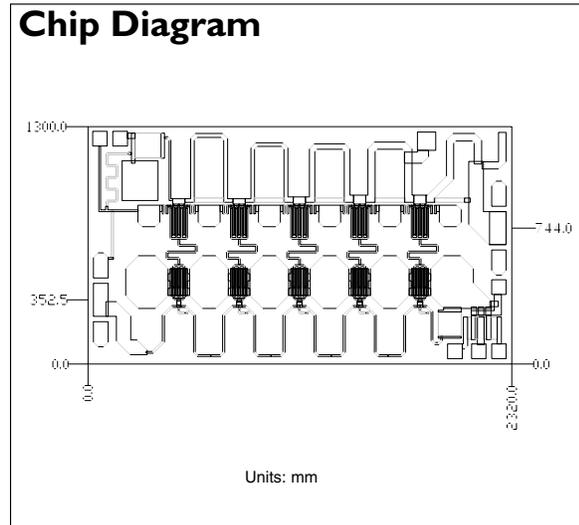


# 2.0-20.0 GHz GaAs MMIC 1W Power Amplifier

## Features

- ✕ Small Size: 2.32x1.30x0.076mm
- ✕ Integrated On-Chip DC Blocking
- ✕ Single Bias Operation
- ✕ Directly Cascadable - Fully Matched
- ✕ Unconditionally Stable
- ✕ P1dB: 29 dBm, Typ. @ 18 GHz
- ✕ Linear Gain: 9.5 dB, Typ. @ 18 GHz
- ✕ pHEMT Technology
- ✕ Silicon Nitride Passivation

## Chip Diagram



## Specifications (TA= 25°C, Vdd = 12V)<sup>1</sup>

Parameters	Units	Min	Typ	Max
Frequency Range	GHz	2.0		20.0
Linear Gain	dB	8.5		12.5
Gain Flatness	±dB			1.5
Power Output: 2-18 GHz (@ 1 dB Gain Compression)	dBm	28.5		
Power Output: 2-20 GHz (@ 1 dB Gain Compression)	dBm	26.5		
P1dB Variation (over operating frequency)	dBm			5.0
Saturated Output Power: 2-18 GHz	dBm	29.5		
Saturated Output Power: 2-20 GHz	dBm	27.5		
Input Return Loss	dB			-10.0
Output Return Loss	dB			-10.0
Current	mA	650	690	730
Thermal Resistance	°C/W			15.7
Stability <sup>2</sup>	Unconditionally Stable			

Notes: 1. Tested on Celeritek Connectorized evaluation board (standard assembly condition detailed on page 4).  
2. Stability factor measured on-wafer.

## Absolute Maximum Ratings<sup>1</sup>

Parameter	Rating
Drain Voltage	9.0V (min.) / 13.0V (max.)
Drain Current	750 mA
Continuous Power Dissipation	9.5 W
Input Power	20 dBm
Storage Temperature	-50°C to +150°C
Channel Temperature	175°C
Operating Backside Temperature	-40°C to (See note 2)

Notes: 1. Operation outside these limits can cause permanent damage.  
2. Calculation maximum operating temperature:  
 $T_{max} = 175 - (P_{dis} [W] \times 15.7) [^{\circ}C]$ .

## Die Attach and Bonding Procedures

**Die Attach:** Eutectic die attach is recommended. For eutectic die attach: Preform: AuSn (80% Au, 20% Sn); Stage Temperature: 290°C, ±5°C; Handling Tool: Tweezers; Time: 1 min or less.

**Wire Bonding:** Wire Size: 0.7 to 1.0 mil in diameter (pre-stressed); Thermocompression bonding is preferred over thermosonic bonding. For thermocompression bonding: Stage Temperature: 250°C; Bond Tip Temperature: 150°C; Bonding Tip Pressure: 18 to 40 gms depending on size of wire.

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October 2006 - Rev I3-Oct-06

**CMM0016**

## Typical On-Wafer Scattering Parameters

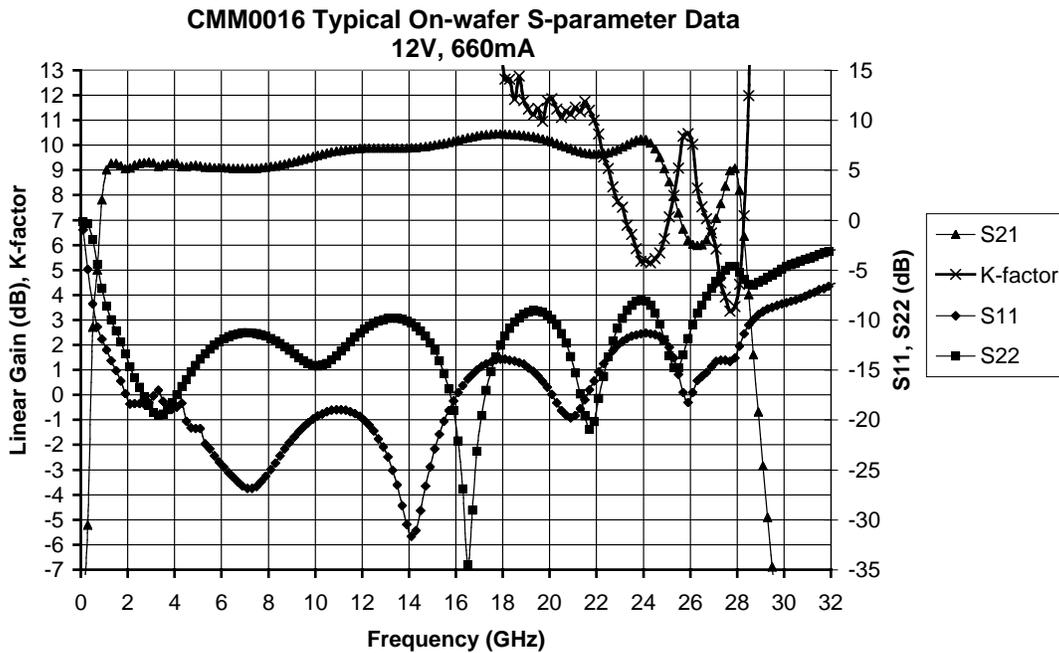
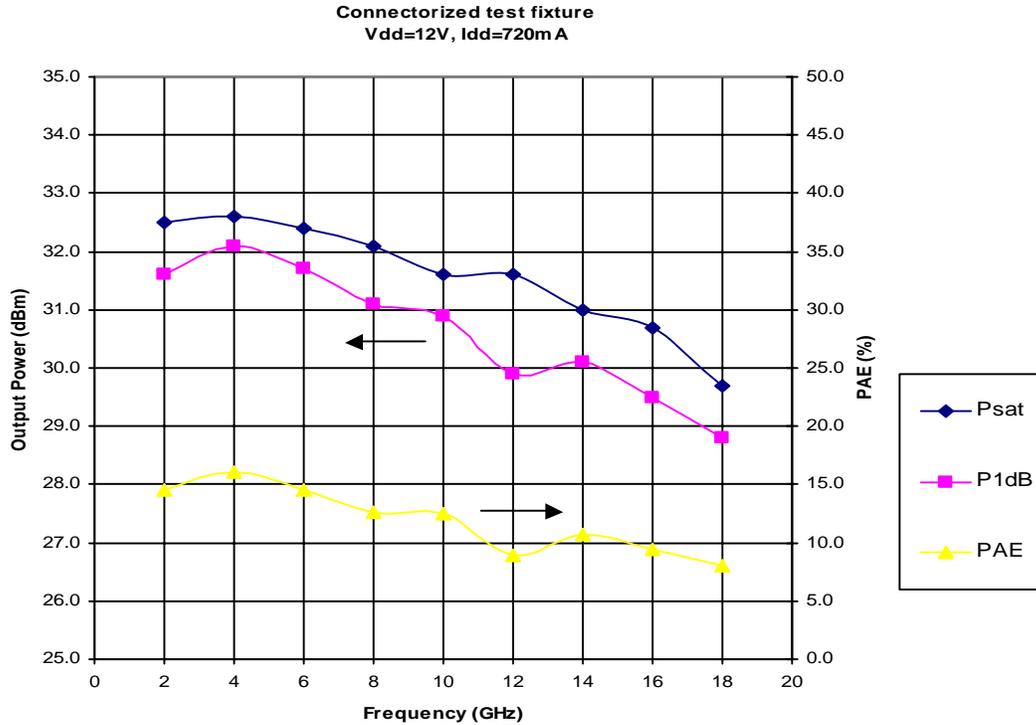
(Vd = +12V, Idd = 700 mA, T = 25°C, device in a 50 ohm system)

Frequency (MHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	(Mag)	(Ang)	(Mag)	(Ang)	(Mag)	(Ang)	(Mag)	(Ang)
0.1	0.895	-27.46	0.374	-118.79	0.001	179.07	0.982	-30.49
1.1	0.224	-94.72	2.819	-167.62	0.001	10.30	0.371	172.50
2.1	0.120	-115.66	2.845	137.27	0.001	161.31	0.184	155.95
3.1	0.132	-120.35	2.912	98.39	0.001	-24.81	0.109	176.74
4.1	0.116	-142.53	2.906	64.29	0.001	99.46	0.134	-148.11
5.1	0.090	-159.80	2.870	31.44	0.000	-18.80	0.201	-144.37
6.1	0.058	-155.91	2.848	-0.20	0.000	-15.21	0.254	-152.76
7.1	0.045	-135.98	2.839	-31.59	0.001	-9.90	0.273	-163.80
8.1	0.056	-111.34	2.863	-62.57	0.001	-17.50	0.256	-173.33
9.1	0.082	-107.92	2.929	-94.08	0.001	-40.23	0.214	-176.04
10.1	0.105	-116.81	3.014	-126.53	0.002	-66.05	0.186	-165.38
11.1	0.112	-130.45	3.087	-160.15	0.003	-95.26	0.221	-153.79
12.1	0.100	-145.03	3.119	165.56	0.003	-127.63	0.285	-157.63
13.1	0.065	-154.88	3.119	131.34	0.004	-150.95	0.321	-171.26
14.1	0.026	-114.03	3.123	97.11	0.005	-177.36	0.305	170.18
15.1	0.072	-60.29	3.163	62.54	0.006	157.71	0.223	149.10
16.1	0.137	-72.11	3.237	26.78	0.007	130.91	0.078	131.73
17.1	0.185	-90.65	3.312	-10.92	0.009	105.19	0.105	-99.62
18.1	0.202	-109.59	3.326	-50.17	0.011	69.44	0.264	-123.96
19.1	0.182	-125.30	3.296	-90.24	0.011	34.20	0.348	-155.20
20.1	0.134	-132.98	3.213	-131.48	0.012	4.93	0.319	168.29
21.1	0.105	-107.03	3.088	-172.66	0.014	-33.95	0.172	115.92
22.1	0.174	-94.92	3.039	145.86	0.015	-73.77	0.128	-27.54
23.1	0.247	-110.42	3.136	101.21	0.018	-111.05	0.322	-99.37
24.1	0.272	-132.47	3.242	47.32	0.023	-158.10	0.393	-159.52
25.1	0.231	-160.25	2.672	-12.38	0.024	149.27	0.210	107.34
26.1	0.137	-141.31	2.001	-56.79	0.022	119.19	0.301	-40.67
27.1	0.196	-146.43	2.259	-104.68	0.028	69.82	0.492	-112.02
28.1	0.234	-150.80	2.569	153.51	0.030	-17.00	0.547	109.01
29.1	0.349	170.45	0.720	68.96	0.006	-100.97	0.501	-21.16
30.1	0.386	130.23	0.247	26.46	0.002	-28.35	0.584	-59.24
31.1	0.428	92.93	0.104	-5.39	0.003	21.66	0.646	-78.61
32.1	0.480	60.25	0.042	-28.72	0.003	-5.04	0.707	-91.05
33.1	0.539	34.23	0.023	-53.32	0.001	11.16	0.755	-101.84
34.1	0.597	12.71	0.014	-63.64	0.005	-1.35	0.789	-111.75
35.1	0.658	-4.54	0.013	-90.12	0.010	-44.00	0.789	-123.00
36.1	0.706	-19.16	0.007	-169.84	0.008	-171.43	0.763	-120.14
37.1	0.751	-31.72	0.004	138.88	0.002	177.92	0.840	-127.28
38.1	0.790	-42.32	0.001	141.98	0.002	68.47	0.867	-134.25
39.1	0.826	-52.12	0.003	125.45	0.003	-55.70	0.888	-140.59
40.1	0.856	-60.30	0.001	-30.91	0.002	-147.28	0.896	-146.39

**S-Parameter Data Files are available online at: [www.mimixbroadband.com](http://www.mimixbroadband.com)**

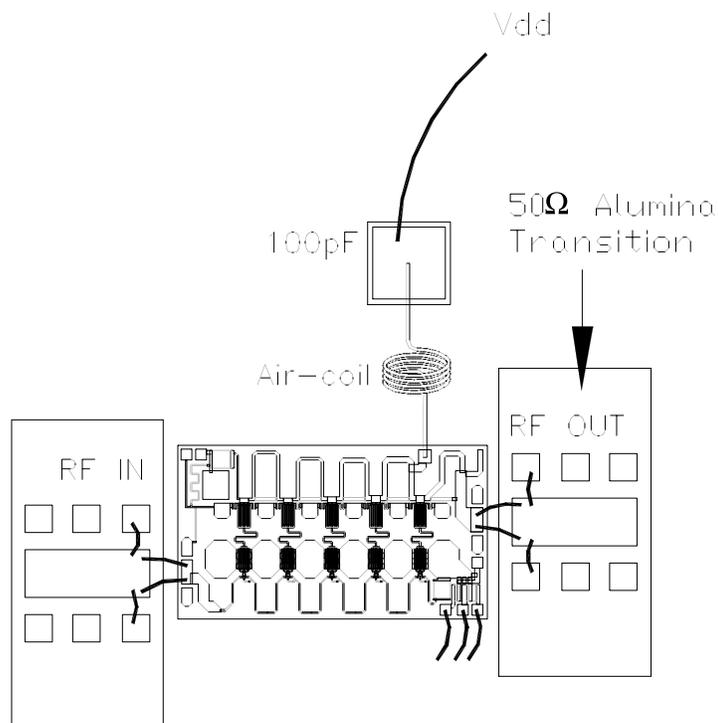
# 2.0-20.0 GHz GaAs MMIC 1W Power Amplifier

## Amplifier Measurements



# 2.0-20.0 GHz GaAs MMIC 1W Power Amplifier

## Assembly Example



Note:

1. Eutectic attach on at least 30mil thick CuW or CuMo carrier is recommend.
2. For evaluation, a 1.4mil wire diameter lithium gold air coil has been used .

# 2.0-20.0 GHz GaAs MMIC 1W Power Amplifier

## Handling and Assembly Information

**CAUTION!** - Mimix Broadband MMIC Products contain gallium arsenide (GaAs) which can be hazardous to the human body and the environment. For safety, observe the following procedures:

- Do not ingest.
- Do not alter the form of this product into a gas, powder, or liquid through burning, crushing, or chemical processing as these by-products are dangerous to the human body if inhaled, ingested, or swallowed.
- Observe government laws and company regulations when discarding this product. This product must be discarded in accordance with methods specified by applicable hazardous waste procedures.

**Life Support Policy** - Mimix Broadband's products are not authorized for use as critical components in life support devices or systems without the express written approval of the President and General Counsel of Mimix Broadband. As used herein: (1) Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user. (2) A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

**ESD** - Gallium Arsenide (GaAs) devices are susceptible to electrostatic and mechanical damage. Die are supplied in antistatic containers, which should be opened in cleanroom conditions at an appropriately grounded anti-static workstation. Devices need careful handling using correctly designed collets, vacuum pickups or, with care, sharp tweezers.

**Die Attachment** - GaAs Products from Mimix Broadband are 0.100 mm (0.004") thick and have vias through to the backside to enable grounding to the circuit. Microstrip substrates should be brought as close to the die as possible. The mounting surface should be clean and flat. If using conductive epoxy, recommended epoxies are Tanaka TS3332LD, Die Mat DM6030HK or DM6030HK-Pt cured in a nitrogen atmosphere per manufacturer's cure schedule. Apply epoxy sparingly to avoid getting any on to the top surface of the die. An epoxy fillet should be visible around the total die periphery. For additional information please see the Mimix "Epoxy Specifications for Bare Die" application note. If eutectic mounting is used, then a fluxless gold-tin (AuSn) preform, approximately 0.001" thick, placed between the die and the attachment surface should be used. A die bonder that utilizes a heated collet and provides scrubbing action to ensure total wetting to prevent void formation in a nitrogen atmosphere is recommended. The gold-tin eutectic (80% Au 20% Sn) has a melting point of approximately 280° C (Note: Gold Germanium should be avoided). The workstation temperature should be 310° C +/- 10° C. Exposure to these extreme temperatures should be kept to minimum. The collet should be heated, and the die pre-heated to avoid excessive thermal shock. Avoidance of air bridges and force impact are critical during placement.

**Wire Bonding** - Windows in the surface passivation above the bond pads are provided to allow wire bonding to the die's gold bond pads. The recommended wire bonding procedure uses 0.076 mm x 0.013 mm (0.003" x 0.0005") 99.99% pure gold ribbon with 0.5-2% elongation to minimize RF port bond inductance. Gold 0.025 mm (0.001") diameter wedge or ball bonds are acceptable for DC Bias connections. Aluminum wire should be avoided. Thermo-compression bonding is recommended though thermosonic bonding may be used providing the ultrasonic content of the bond is minimized. Bond force, time and ultrasonics are all critical parameters. Bonds should be made from the bond pads on the die to the package or substrate. All bonds should be as short as possible.

## Ordering Information

The CMM0016-BD is available in bare die and is shipped in Gel Pak.

**Part Number for Ordering**  
CMM0016-BD

**Package**  
Bare Die