

## **CMM0016-BD**

2.0 to 20.0 GHz  
GaAs MMIC 1W Power Amplifier

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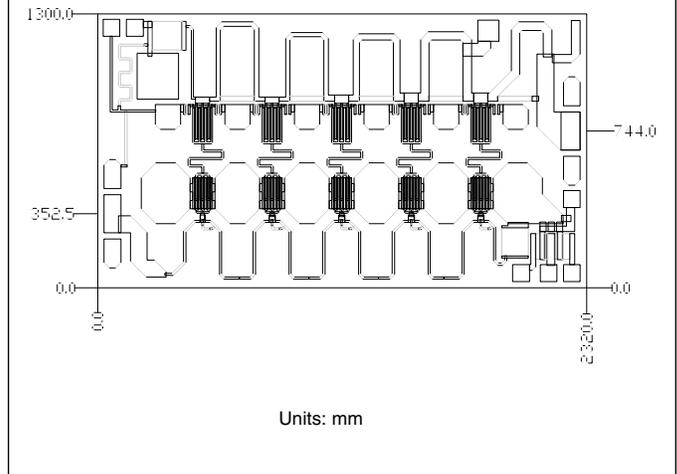
**Advanced Product Information  
August 2004**

(1 of 4)

### Features

- ❑ Small Size: 2.32 x 1.30 x 0.076 mm
- ❑ 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:  
 $T_{max} = 175 - (P_{dis} [W] \times 15.7) [°C]$ .

### 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.

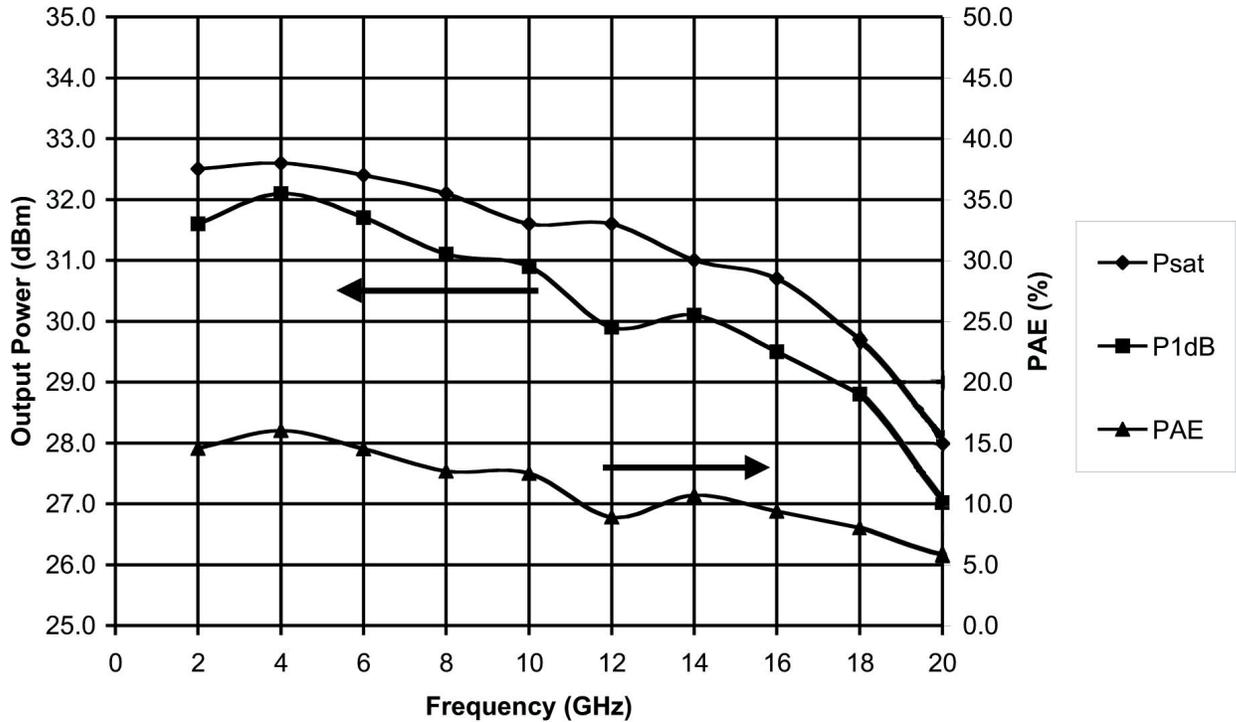
**Typical On-Wafer Scattering Parameters** ( $V_d = +12V$ ,  $I_{dd} = 700$  mA,  $T = 25^\circ C$ , device in a 50 ohm system)

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

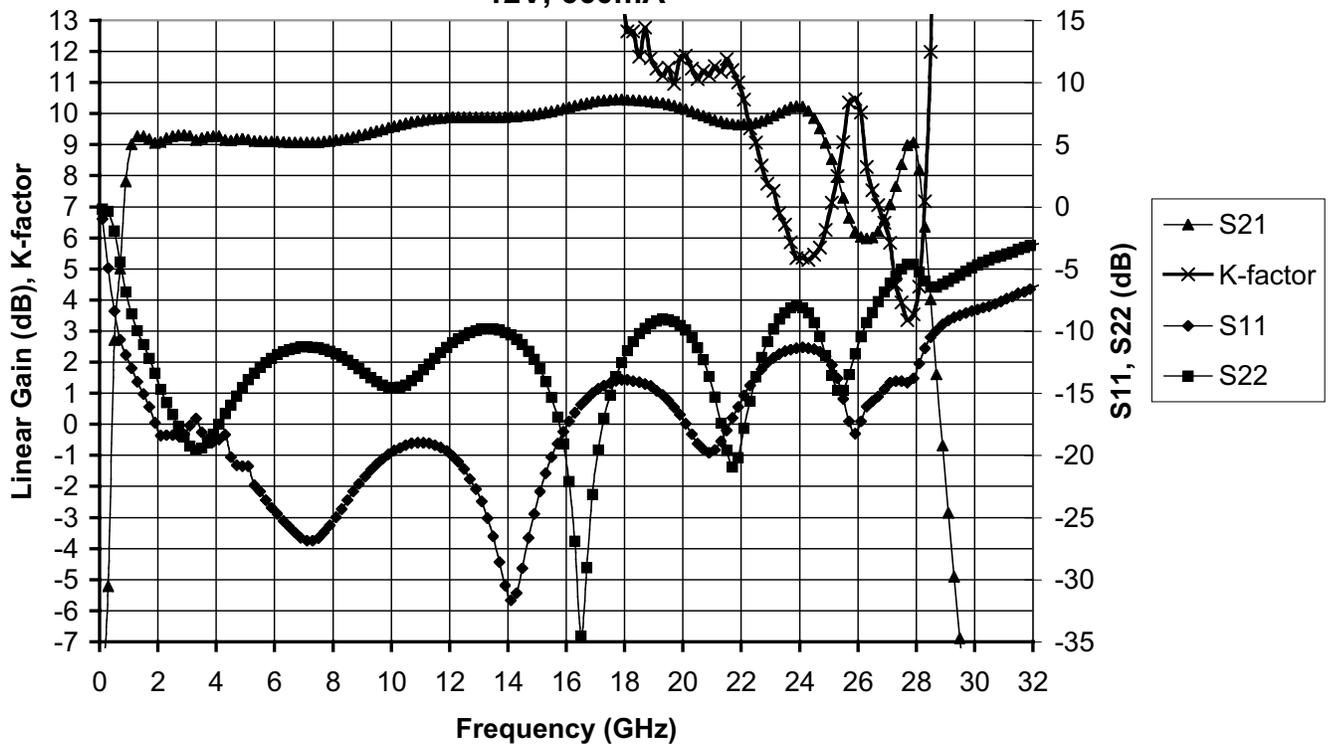
S-Parameter Data Files are available on-line at: [www.celeritek.com](http://www.celeritek.com)



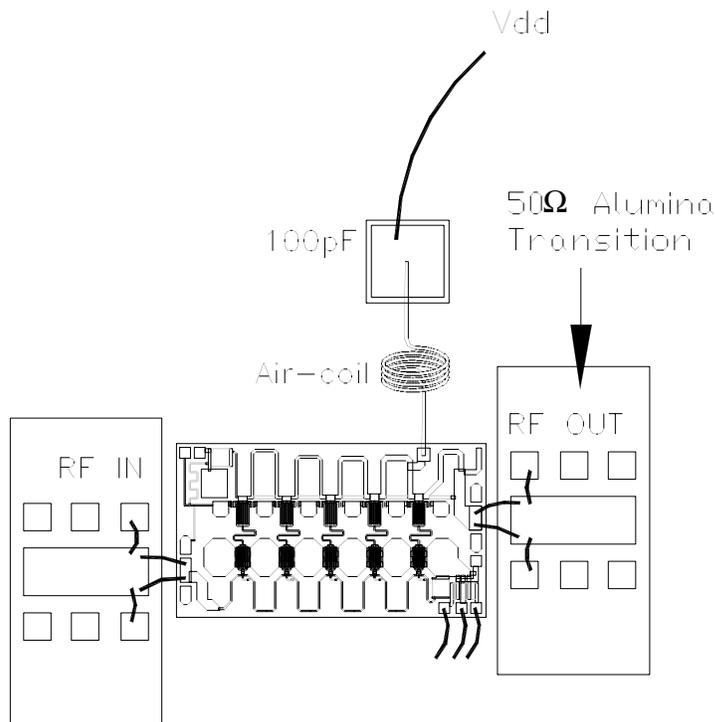
**CMM0016-BD Typical Measured Data**  
(connectorized test fixture)  
Vdd=12V, Idd=700mA



**CMM0016 Typical On-wafer S-parameter Data**  
12V, 660mA



### 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 .

### 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**

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