



2.0 to 18.0 GHz GaAs MMIC 1W Power Amplifier

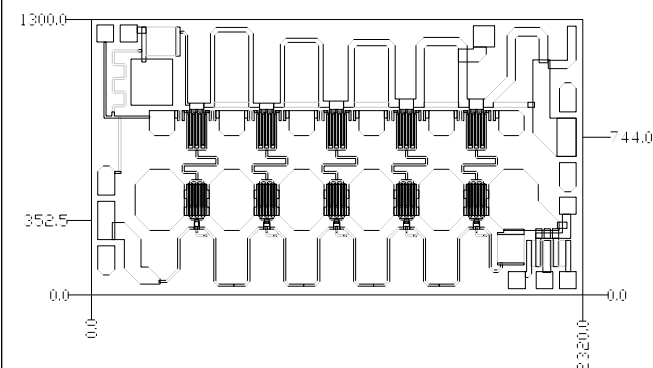
Advanced Product Information
June 2004

(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
- ❑ P1dB: 30 dBm, Typ. @ 18 GHz
- ❑ Linear Gain: 9.5 dB, Typ. @ 18 GHz
- ❑ pHEMT Technology
- ❑ Silicon Nitride Passivation

Chip Diagram



Units: mm

Specifications (TA = 25°C, Vdd = 12V) ¹

Parameters	Units	Min	Typ	Max
Frequency Range	GHz	2.0		18.0
Linear Gain	dB	8.5		12.5
Gain Variation (over operating frequency)	±dB			2.5
P1dB Variation (over operating frequency)	dBm			3.5
Power Output (@1 dB Gain Compression)	dBm	28.5		32.0
Saturated Output Power	dBm	29.5		33.0
Third Order Intercept Point (@ 10 GHz)	dBm		40	
Noise Figure (@10 GHz)	dB		5.5	
Input Reflection Coefficient	dB			-10.0
Output Reflection Coefficient	dB			-10.0
Current	mA	650	700	750
Thermal Resistance	°C/W			7.5
Stability ²	Unconditionally Stable			

Notes: 1. Tested on Celeritek connectorized evaluation board.

Absolute Maximum Ratings ¹

Parameter	Rating
Drain Voltage	9V (min.) / 13V (max.)
Drain Current	800 mA
Continuous Power Dissipation	9.2 W
Input Power	20 dBm
Storage Temperature	-50°C to +150°C
Channel Temperature	150°C
Operating Backside Temperature ²	-40°C

Notes: 1. Operation outside these limits can cause permanent damage.

2. Calculation maximum operating temperature:

$$T_{max} = 150 - (P_{dis} [W] \times 7.5) [^{\circ}C]$$

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.

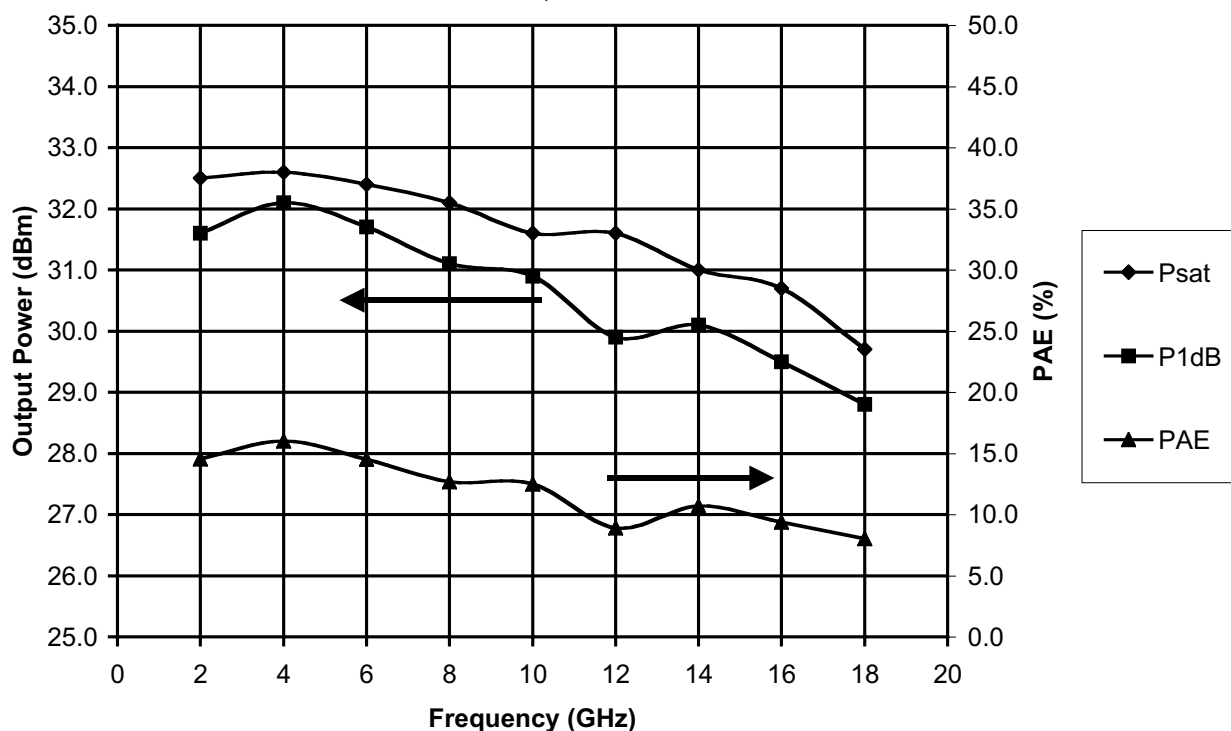
Typical On-Wafer Scattering Parameters (Vd = +12V, Icc = 750 mA, T = 23°C, device in a 50 ohm system)

Frequency (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	(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

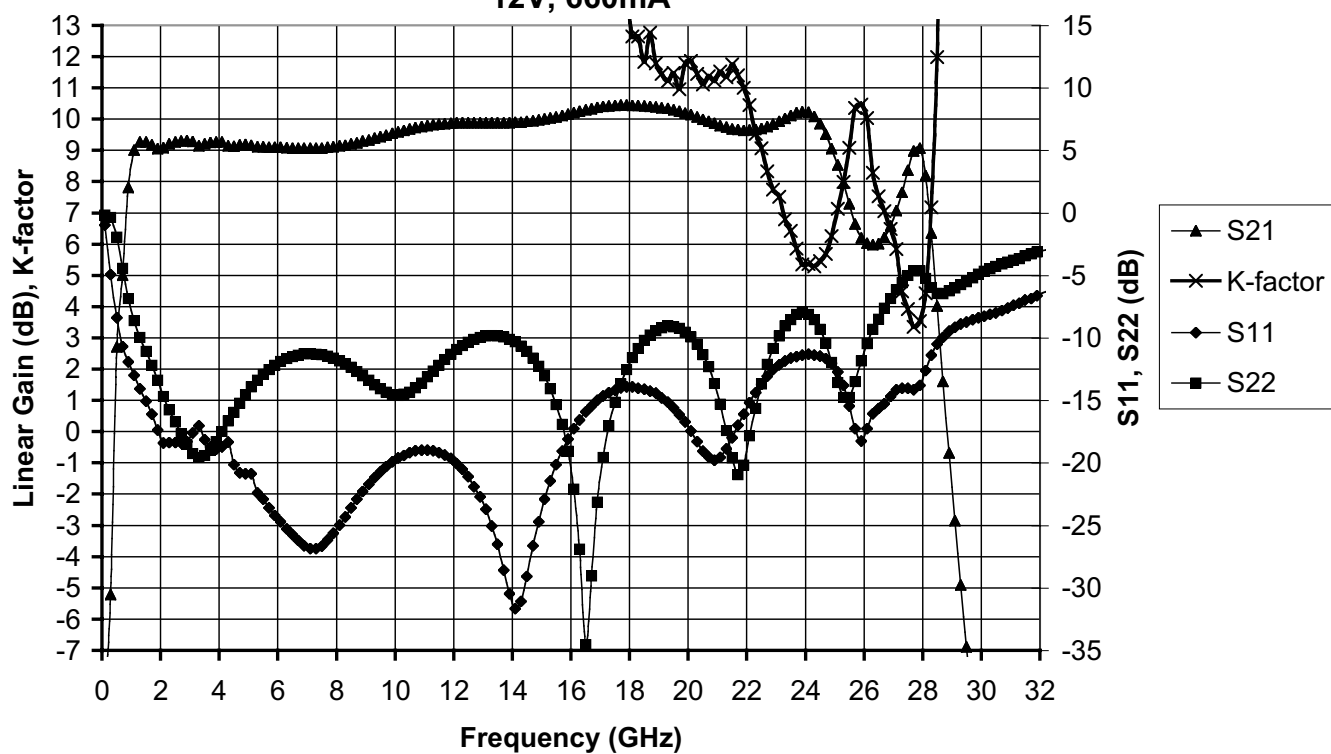
S-Parameter Data Files are available on-line at: www.celeritek.com



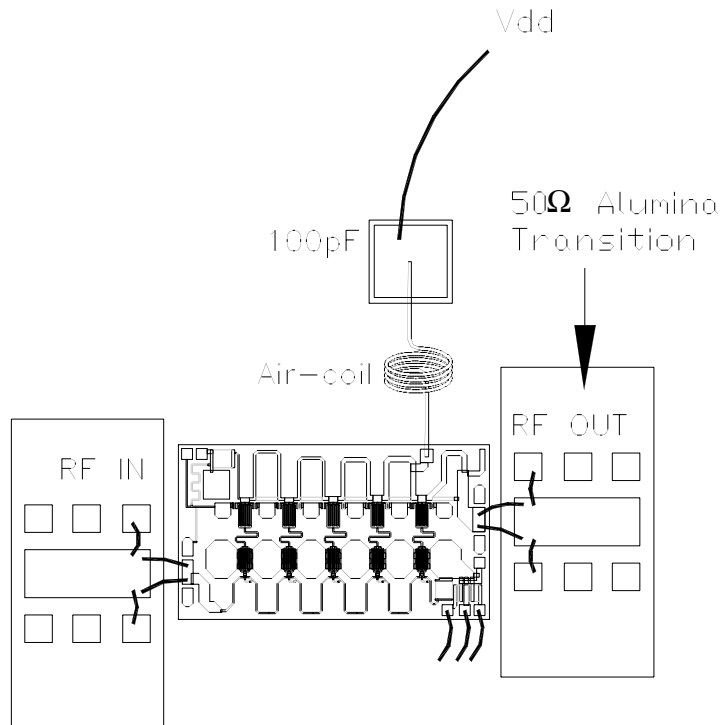
CMM0016-BD Typical Measured Data
(connectorized test fixture)
Vdd=12V, Idd=720mA



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



Assembly Example



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

Celeritek reserves the right to make changes without further notice to any products herein. Celeritek makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Celeritek assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Celeritek does not convey any license under its patent rights nor the rights of others. Celeritek products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Celeritek product could create a situation where personal injury or death may occur. Should Buyer purchase or use Celeritek products for any such unintended or unauthorized application, Buyer shall indemnify and hold Celeritek and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Celeritek was negligent regarding the design or manufacture of the part. Celeritek is a registered trademark of Celeritek, Inc. Celeritek, Inc. is an Equal Opportunity/Affirmative Action Employer.