

Broadband Power GaAs MESFET Chips

- ❑ **P_{1dB} Power:**
 - CF003-01: +22 dBm
 - CF005-01: +25 dBm
 - CF010-01: +28 dBm
- ❑ **High Gain (@ 12 GHz):**
 - CF003-01: 9.0 dB
 - CF005-01: 8.5 dB
 - CF010-01: 8.0 dB
- ❑ **Broadband: Usable to 18 GHz**
- ❑ **Wafer Qualification Procedure**
- ❑ **Customer Wafer Selection Available**

Celeritek Broadband Power Chips

Celeritek Medium Power Chips are GaAs MESFETs which include the CF003-01, CF005-01 and CF010-01 models. They are 600 μm , 1200 μm and 2400 μm gate width, respectively. All have sub-half-micron gate lengths, Celeritek's proprietary Silicon Nitride passivation, and are fabricated on ion implanted wafers.

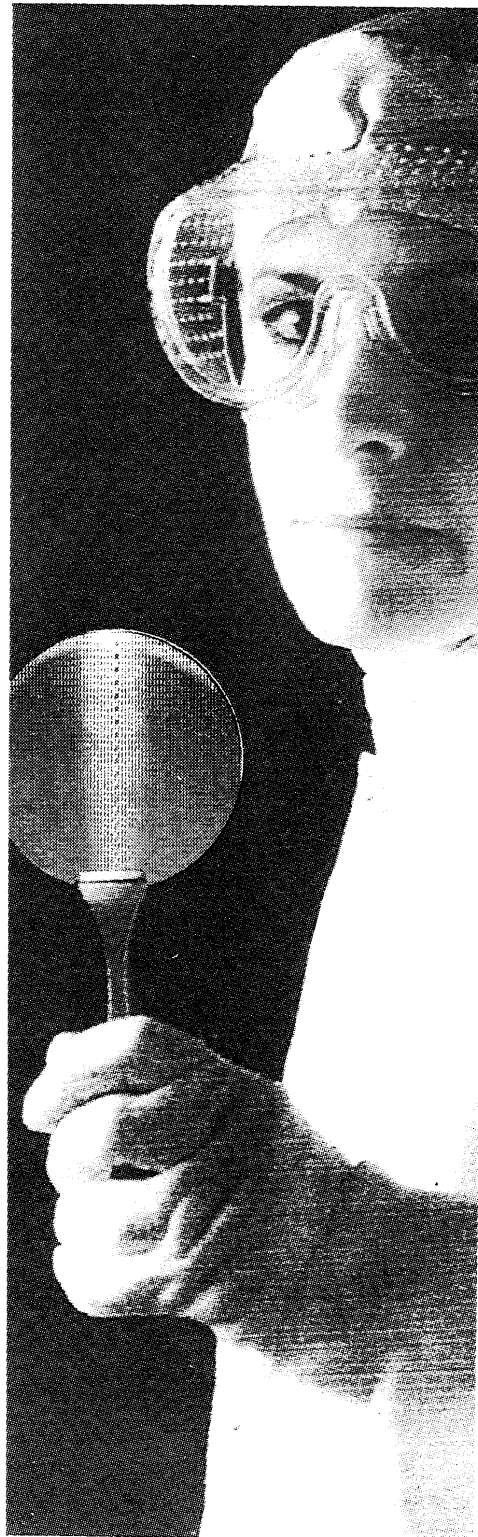
Celeritek's Wafer Qualification Procedure for these devices consists of DC, RF and reliability testing of both individual die and generic 6 to 18 GHz amplifier modules.

Celeritek's broadband power chips make up a family of GaAs FET devices which have high broadband gain and provide up to 1 watt in balanced 6 to 18 GHz amplifier circuits. These devices are also suitable for high power oscillators. In narrow band applications they offer superior associated gain.

These devices are available in chip form and are suitable for airborne, shipboard and ground-based equipment. Screening includes MIL-STD-750 Class B, Class S and commercial screening. These devices are also available in packaged form. Please consult the Packaged Power GaAs FET data sheets or contact the factory for further information.

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Broadband Power GaAs MESFET Chips

Broadband Power GaAs Chips

Specifications (T _A = 25°C)				CF003-01			CF005-01			CF010-01			
Active Layer				Ion Implanted			Ion Implanted			Ion Implanted			
Symbol	Parameters and Conditions	Frequency (GHz)	Units	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
G _L	Linear Power Gain	12.0	dB	8.0	9.0		7.5	8.5		7.0	8.0		
	V _{DS} = 6.0 V, I _{DS} = 80 mA												
	V _{DS} = 6.0 V, I _{DS} = 160 mA												
P _{1dB}	Power Output @ 1 dB GC	12.0	dBm	21.5	22.0		24.0	25.0		27.0	28.0		
	V _{DS} = 6.0 V, I _{DS} = 80 mA												
	V _{DS} = 6.0 V, I _{DS} = 160 mA												
g _m	Transconductance		mS	120			240			480			
	V _{DS} = 3.0 V, V _{GS} = 0 V												
	I _{DSS}												
I _{DSS}	Drain Current		mA	120	180	240	220	350	440	440	700	880	
	V _{DS} = 3.0 V, V _{GS} = 0 V												
V _p	Pinchoff Voltage		Volts	-0.7	-1.3	-2.5	-0.7	-1.3	-2.5	-0.7	-1.3	-2.5	
BV _{GD}	Breakdown Voltage, Gate-Drain		Volts	-5.5	-8.0		-5.5	-8.0		-5.5	-8.0		
													I _{GD} = 100 μA
													I _{GD} = 200 μA
R _{th}	Thermal Resistance		°C/W	80			50			25			
													I _{GD} = 400 μA

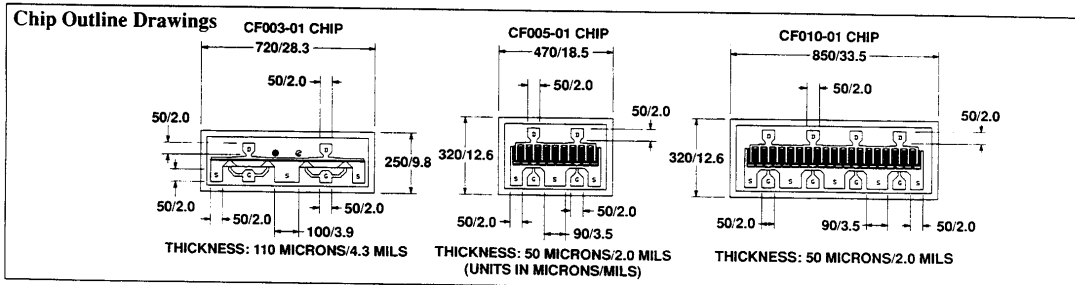
Absolute Maximum Ratings

Parameter	Symbol	Ratings
Drain-Source Voltage	V _{DS}	8V
Gate-Source Voltage	V _{GS}	-5V
Drain Current	I _{DS}	I _{DSS}
Continuous Dissipation		
CF003-01	P _T	1.6 W
CF005-01	P _T	3.0 W
CF010-01	P _T	6.0 W
Channel Temperature	T _{CH}	175°C
Storage Temperature	T _{STG}	-65°C to +175°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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Broadband Power GaAs MESFET Chips

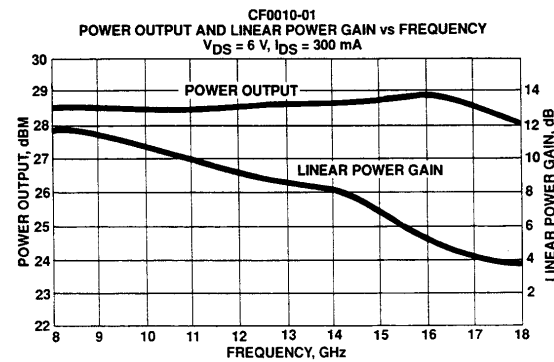
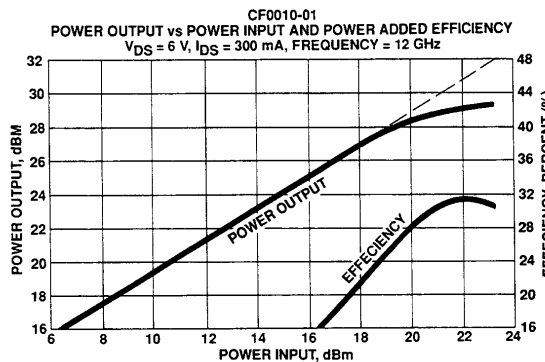
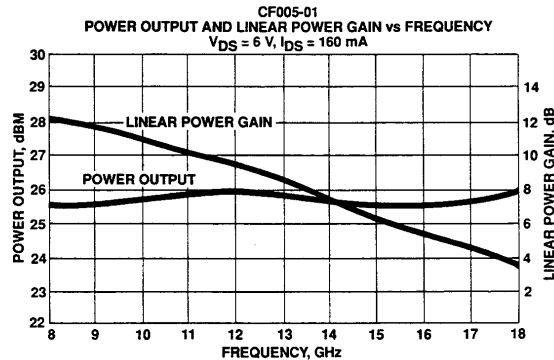
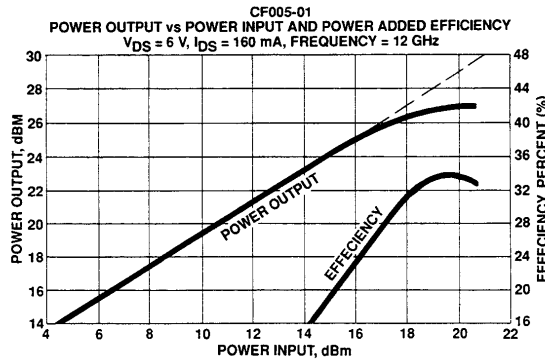
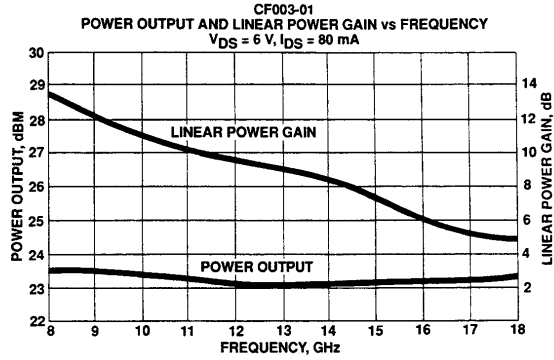
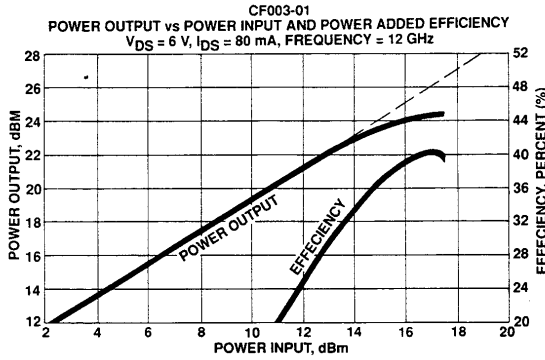


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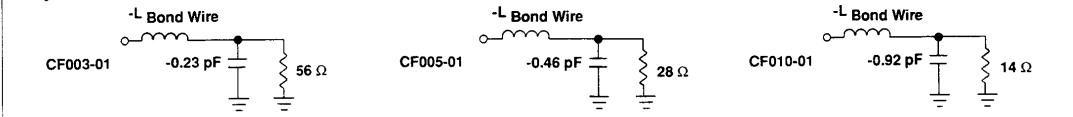
CF010 Series

Broadband Power GaAs Chips

Typical Performance ($T_A = 25^\circ\text{C}$)



Output Power Match Models



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Broadband Power GaAs MESFET Chips



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CF010 Series

Broadband Power GaAs Chips

Typical Scattering Parameters, Common Source (S-Parameters Include Bonding Wire Parasitics)

CF003-01 at Power Bias

$V_{DS} = 6\text{ V}, I_{DS} = 80\text{ mA}$

Frequency (GHz)	S_{11}		S_{21}		S_{12}		S_{22}		K	MSG (dB)		
	(Mag)	(Ang)	(dB)	(Mag)	(Ang)	(dB)	(Mag)	(Ang)				
2.0	0.91	-62	16.7	6.86	138	-28.6	0.04	59	0.23	-37	0.38	22.7
4.0	0.83	-108	14.1	5.10	107	-25.1	0.06	41	0.18	-74	0.53	19.6
6.0	0.80	-132	11.8	3.88	88	-24.0	0.06	33	0.17	-90	0.71	17.9
8.0	0.79	-155	9.6	3.01	71	-23.7	0.07	26	0.19	-120	0.88	16.6
10.0	0.78	-172	7.6	2.39	57	-24.1	0.06	24	0.23	-134	1.15	15.8
12.0	0.80	177	6.2	2.03	45	-23.3	0.07	21	0.27	-147	1.10	14.7
14.0	0.80	166	5.0	1.78	33	-23.2	0.07	17	0.31	-156	1.20	14.1
16.0	0.79	150	4.1	1.61	20	-22.1	0.08	14	0.33	-163	1.20	13.1
18.0	0.80	135	3.5	1.49	5	-21.3	0.09	9	0.32	-179	1.18	12.4

CF005-01 at Power Bias

$V_{DS} = 6\text{ V}, I_{DS} = 160\text{ mA}$

Frequency (GHz)	S_{11}		S_{21}		S_{12}		S_{22}		K	MSG (dB)		
	(Mag)	(Ang)	(dB)	(Mag)	(Ang)	(dB)	(Mag)	(Ang)				
2.0	0.78	-109	16.1	6.35	121	-27.2	0.04	30	0.35	-177	0.69	21.6
4.0	0.82	-153	11.7	3.85	90	-25.4	0.05	23	0.42	-177	0.74	18.6
6.0	0.83	-174	8.5	2.67	72	-24.8	0.06	19	0.45	-172	0.88	16.7
8.0	0.84	177	6.2	2.03	59	-24.5	0.06	20	0.47	-170	1.02	15.3
10.0	0.85	171	4.2	1.62	49	-24.5	0.06	21	0.47	-167	1.20	14.3
12.0	0.86	165	2.8	1.38	39	-23.5	0.07	18	0.49	-164	1.14	13.2
14.0	0.86	160	1.7	1.22	29	-23.2	0.07	19	0.51	-162	1.16	12.4
16.0	0.86	154	0.5	1.06	20	-22.5	0.08	15	0.53	-160	1.14	11.5
18.0	0.87	143	-0.9	0.91	9	-22.7	0.07	13	0.57	-156	1.18	10.9

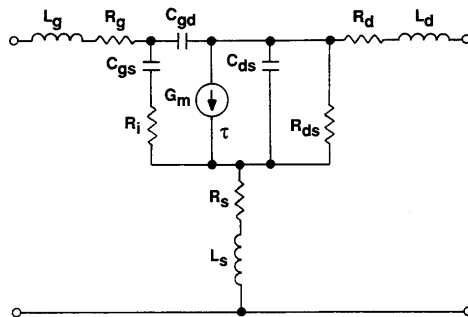
CF010-01 at Power Bias

$V_{DS} = 6\text{ V}, I_{DS} = 300\text{ mA}$

Frequency (GHz)	S_{11}		S_{21}		S_{12}		S_{22}		K	MSG (dB)		
	(Mag)	(Ang)	(dB)	(Mag)	(Ang)	(dB)	(Mag)	(Ang)				
2.0	0.89	-146	14.1	5.09	100	-30.4	0.03	29	0.62	180	0.54	22.3
4.0	0.90	-173	8.4	2.64	78	-29.1	0.04	29	0.66	176	0.76	18.8
6.0	0.90	175	5.0	1.77	65	-28.2	0.04	31	0.67	174	0.94	16.6
8.0	0.91	170	2.6	1.34	56	-27.4	0.04	36	0.68	174	1.08	15.0
10.0	0.91	166	0.6	1.07	49	-27.4	0.04	40	0.67	174	1.26	14.0
12.0	0.91	163	-0.9	0.90	41	-26.0	0.05	37	0.69	174	1.15	12.6
14.0	0.92	161	-2.1	0.78	35	-25.5	0.05	41	0.70	175	1.10	11.7
16.0	0.91	158	-3.3	0.68	28	-24.9	0.06	36	0.72	175	1.05	10.8
18.0	0.92	149	-4.6	0.59	19	-24.8	0.06	33	0.74	173	1.04	10.1

Device Model

Parameters	CF003-01 $V_{DS} = 6\text{ V}, I_{DS} = 80\text{ mA}$	CF005-01 $V_{DS} = 6\text{ V}, I_{DS} = 160\text{ mA}$	CF010-01 $V_{DS} = 6\text{ V}, I_{DS} = 300\text{ mA}$	Units
L_g	0.21	0.19	0.15	nH
R_g	0.50	0.25	0.12	Ω
C_{gs}	0.71	1.13	2.58	pF
R_i	1.40	0.65	0.42	Ω
C_{gd}	0.053	0.120	0.210	pF
G_m	134	254	578	mS
τ	2.8	3.0	2.8	ps
C_{ds}	0.16	0.26	0.50	pF
R_{ds}	87	36	20	Ω
R_d	0.67	0.33	0.17	Ω
L_d	0.21	0.19	0.10	nH
R_s	0.53	0.33	0.26	Ω
L_s	0.040	0.030	0.018	nH



Wafer Qualification Procedure

100% DC Test
100% Visual Insp.

Sample Chip Performance Test
Power, S-Parameters, IP3, Power Blast

Sample Circuit Performance Tests
6-18 GHz Module
Power, Gain, VSWR

Reliability Assessment
Power Blast & Burn-In

80% of tested samples must meet specifications for wafer acceptance.

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Specifications subject to change.



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