CFK0301

High Dynamic Range
Dual, Low-Noise GaAs FET

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Product Specifications
April 1998

(1 of 4)

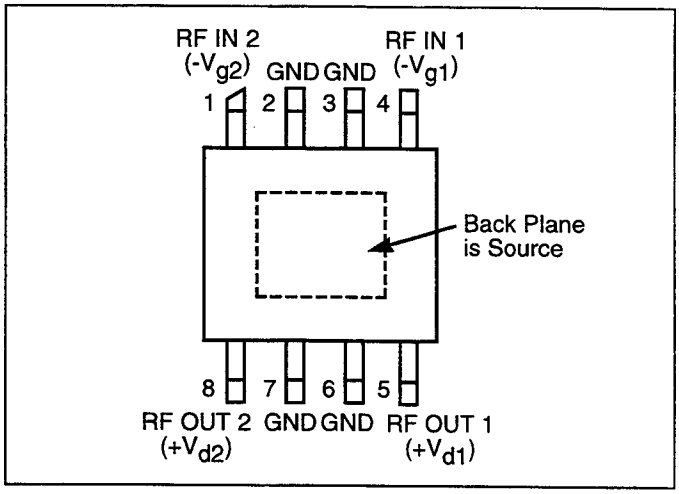
High Dynamic Range Dual, Low-Noise GaAs FET

Features

- ❑ **Dual 600 µm GaAs FETs in a Single Package**
- ❑ **Guaranteed Low-Noise Figure: 0.8 to 2.0 GHz**
- ❑ **Excellent Gain and Phase Matching**
- ❑ **High Intercept Point**
- ❑ **Easily Matched for Low Noise Figure**
- ❑ **Surface Mount SO-8 Package**

Applications

- ❑ **Cellular Base Stations**
- ❑ **PCS Base Stations**
- ❑ **Industrial Data Networks**



Description

Celeritek's CFK0301 contains two independent GaAs FETs in one surface-mount package. Each device is an 600 µm gate width and 1/4 µm gate length MESFET and provide low-noise figure and high intercept point. As the two GaAs FET die are selected from adjacent areas of the processed wafer, they are matched in gain and phase.

The CFK0301 is suitable as balanced front-end FETs of a low-noise amplifier of base stations for PCS, Japanese PHS, AMPS, GSM and other communications systems.

The CFK0301 is packaged in a SO-8 package which is surface-mountable and available in tape and reel.

Electrical Specifications of a single GaAs FET (TA = 25°C, 2 GHz)

RF Characteristics (Celeritek 1.9 GHz test fixture [1])		900 MHz			1.9 GHz			
Parameters	**Conditions**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Units**
V_d = 4V, I_d = 30 mA								
Noise Figure			0.6			0.75	0.85	dB
Associated Gain	@ Noise Figure		22		15.5	16.5		dB
P_{out}	P_{-1}		17.5		17.5	18.5		dBm
IP_3	+5 dBm P_{OUT}/Tone		27		27	28		dBm
I_d	@ P_{-1} per FET		43			42		mA
V_d = 4V, I_d = 70 mA								
Noise Figure			0.6			0.8		dB
Associated Gain	@ Noise Figure		23.5			17.5		dB
P_{out}	P_{-1}		19.5			19		dBm
IP_3	+5 dBm P_{OUT}/Tone		31			28		dBm
I_d	@ P_{-1} per FET		72			71		mA
DC Characteristics								
Transconductance	V_{ds} = 2 V, V_{gs} = 0 V	70	140					mmho
Saturated Drain Current	V_{ds} = 2 V, V_{gs} = 0 V	120	150	180				mA
Pinchoff Voltages	V_{ds} = 2 V, I_{ds} = 1 mA	-2.5	-1.3	-0.5				V
Thermal Resistance [2]	@ T_{case} = 150°C liquid crystal test		42					°C/W

Notes: 1. Input matched for low noise.
2. For both FETs.

Typical Noise Parameters (V_{ds} = 4 V, I_{ds} = 30 mA)

Frequency (GHz)	F_{min} (dB)	Gamma Opt Mag	Gamma Opt Ang	RN/50
0.6	0.3	0.9169	30	0.20
0.8	0.3	0.8840	33	0.19
1.0	0.4	0.8490	36	0.17
1.2	0.5	0.8390	40	0.18
1.4	0.5	0.7753	44	0.18
1.6	0.5	0.7419	47	0.17
1.8	0.6	0.7257	50	0.16
2.0	0.6	0.7120	53	0.16

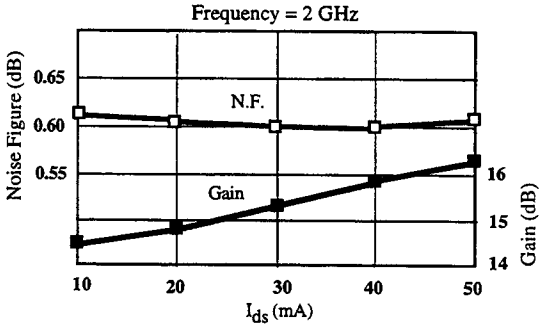
Absolute Maximum Ratings

Parameter	Symbol	Rating
Drain-Source Voltage	V_{ds} 1, 2	+6V
Gate-Source Voltage	V_{gs} 1, 2	-4V
Drain Current of Each Device	I_{ds}	Idss
Continuous Dissipation	Pt	1.5 W
Channel Temperature	Tch	175°C
Storage Temperature	Tstg	-65°C to +150°C

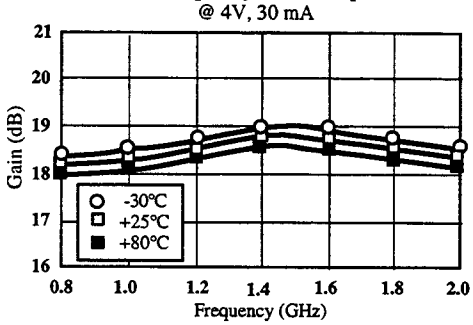
Typical Performance

(In Celeritek PB-CFK0301-P3-00 Evaluation Board)

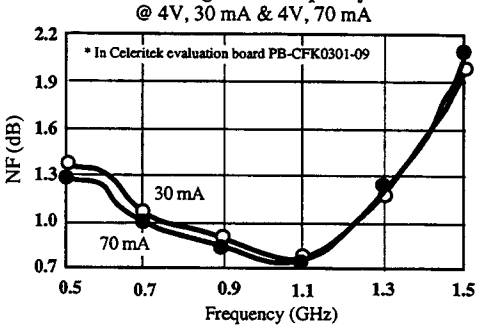
Noise Figure & Gain vs I_{ds}
Frequency = 2 GHz



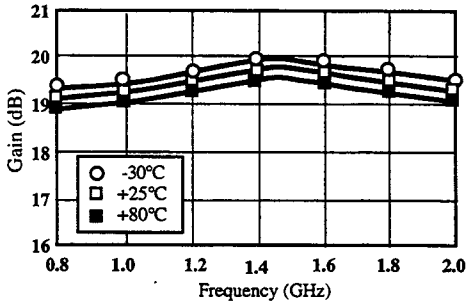
Gain vs Frequency Over Temperature
@ 4V, 30 mA



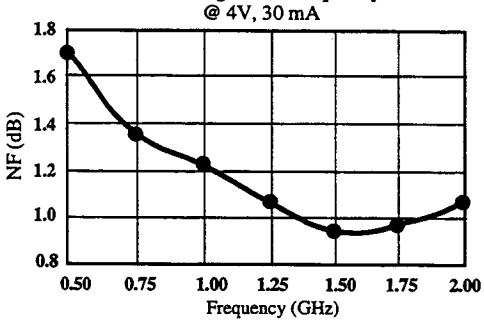
Noise Figure vs Frequency*
@ 4V, 30 mA & 4V, 70 mA



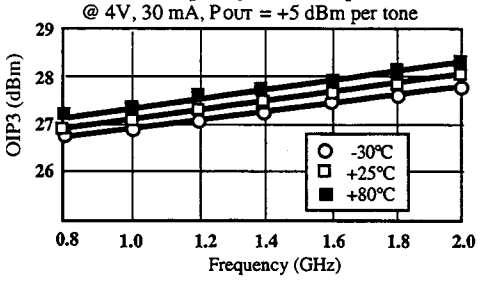
Gain vs Frequency Over Temperature
@ 4V, 70 mA



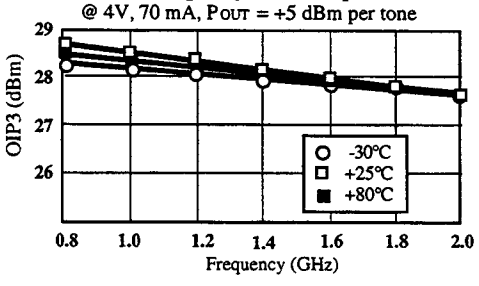
Noise Figure vs Frequency
@ 4V, 30 mA



OIP3 vs Frequency Over Temperature
@ 4V, 30 mA, Pout = +5 dBm per tone



OIP3 vs Frequency Over Temperature
@ 4V, 70 mA, Pout = +5 dBm per tone



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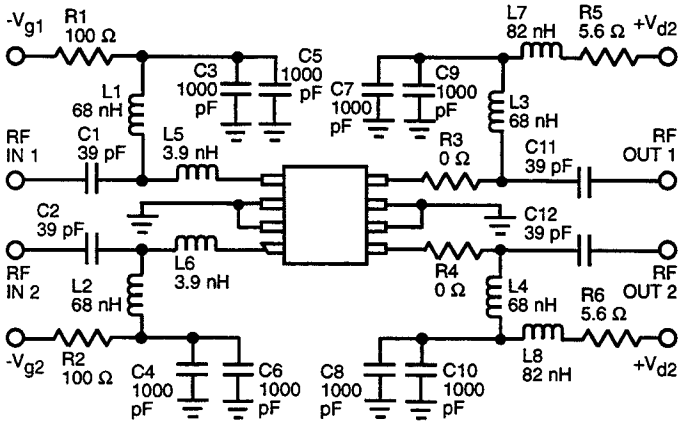
Typical Scattering Parameters (TA = 25°C, V_{DS} = 4 V, I_{DS} = 30 mA) Information is available on disk.

Frequency (GHz)	S_{11} Mag	S_{11} Ang	S_{21} Mag (dB)	S_{21} Ang	S_{12} MAG (dB)	S_{12} ANG	S_{22} MAG	S_{22} ANG
0.5	0.99	-27.9	17.37	157.0	0.01	69.3	0.37	-22.3
0.7	0.98	-39.3	17.24	147.9	0.02	61.6	0.37	-31.4
0.8	0.98	-44.9	17.15	143.3	0.02	58.9	0.37	-36.1
0.9	0.97	-50.4	17.00	138.6	0.03	54.1	0.37	-40.4
1.0	0.97	-55.8	16.91	134.3	0.03	50.5	0.37	-44.7
1.3	0.96	-71.4	16.54	121.5	0.03	39.2	0.36	-57.6
1.5	0.95	-81.1	16.25	113.2	0.04	32.0	0.36	-65.7
1.8	0.93	-94.3	15.80	101.5	0.04	22.6	0.35	-76.8
1.9	0.92	-98.4	15.66	97.9	0.05	19.1	0.34	-80.5
2.0	0.91	-102.2	15.52	94.4	0.05	14.8	0.33	-83.4
2.5	0.87	-122.0	15.06	77.3	0.06	1.6	0.32	-99.7
3.0	0.86	-145.0	14.71	58.5	0.06	-13.1	0.31	-117.4
3.5	0.84	-131.9	14.03	40.4	0.07	-27.9	0.31	-129.4
4.0	0.85	68.8	13.07	24.8	0.07	-39.8	0.29	-136.6

Typical Scattering Parameters (TA = 25°C, V_{DS} = 4 V, I_{DS} = 70 mA) Information is available on disk.

Frequency (GHz)	S_{11} Mag	S_{11} Ang	S_{21} Mag (dB)	S_{21} Ang	S_{12} MAG (dB)	S_{12} ANG	S_{22} MAG	S_{22} ANG
0.5	0.99	-29.9	19.10	156.0	0.01	68.8	0.34	-22.2
0.7	0.98	-42.0	18.94	146.4	0.02	62.0	0.34	-31.3
0.8	0.98	-48.0	18.83	141.0	0.02	58.8	0.34	-36.1
0.9	0.97	-53.9	18.65	136.7	0.02	-54.3	0.33	-40.5
1.0	0.97	-59.5	18.54	132.3	0.02	50.3	0.33	-44.6
1.3	0.95	-75.9	18.13	119.2	0.03	39.4	0.33	-57.3
1.5	0.94	-85.9	17.78	110.7	0.03	32.1	0.32	-65.2
1.8	0.92	-99.7	17.28	98.9	0.03	22.8	0.31	-75.9
1.9	0.91	-104.0	17.13	95.1	0.04	20.0	0.31	-79.6
2.0	0.90	-107.8	16.95	91.7	0.04	15.0	0.30	-82.0
2.5	0.86	-128.4	16.42	74.1	0.04	2.7	0.28	-97.8
3.0	0.85	-152.1	15.96	55.3	0.05	-11.3	0.27	-114.7
3.5	0.82	-67.2	15.20	37.2	0.05	-25.0	0.28	-125.6
4.0	0.83	134.1	14.19	21.8	0.05	-36.0	0.26	-131.3

Test Circuit - 900 MHz

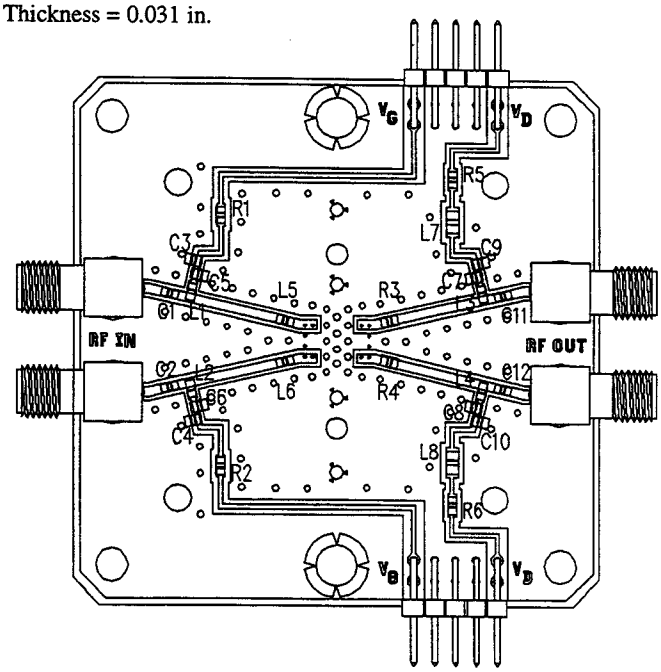


Evaluation Board Parts List

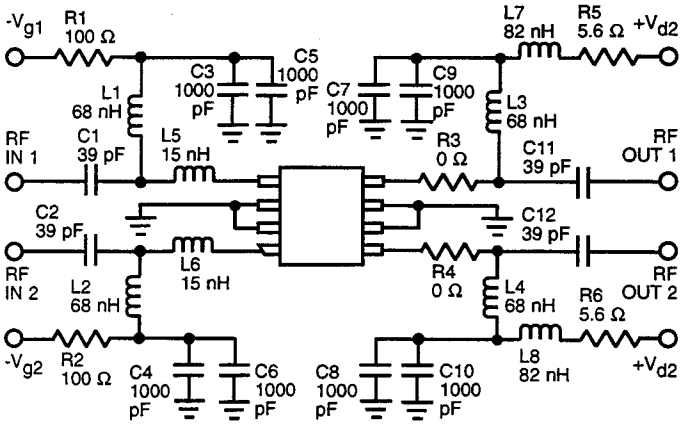
Item	Reference Designator	Description	Quantity
1	C1, C2, C11, C12	Capacitor, 39 pF	4
2	C3, C4, C5, C6, C7, C8, C9, C10	Capacitor, 1000 pF	8
3	R5, R6	Resistor, 5.6 Ω, 5%	2
4	R1, R2	Resistor, 100 Ω, 5%	2
5	L1, L2, L3, L4	Inductor, 68 nH	4
6	L5, L6	Inductor, 3.9 nH	2
7	L7, L8	Inductor, 82 nH	2
8	R3, R4	Resistor, 0 Ω	2

PB-CFK0301-P1-00 Evaluation Board

Evaluation Board Substrate:
ER = 4.65
Thickness = 0.031 in.

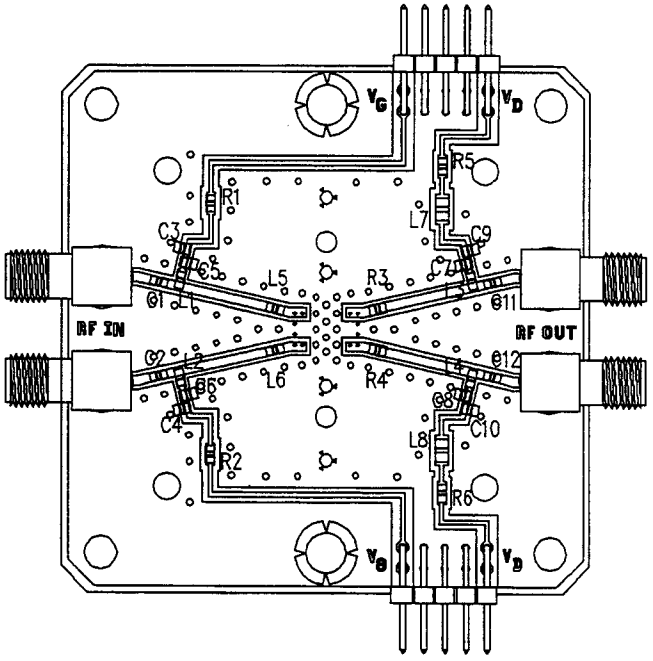


Test Circuit - 1.9 GHz



PB-CFK0301-P3-00 Evaluation Board

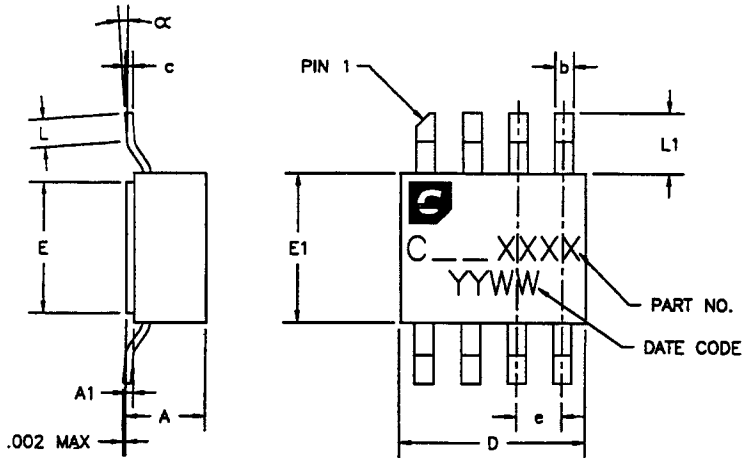
Evaluation Board Substrate:
ER = 4.65
Thickness = 0.031 in.



Evaluation Board Parts List

Item	Reference Designator	Description	Quantity
1	C1, C2, C11, C12	Capacitor, 39 pF	4
2	C3, C4, C5, C6, C7, C8, C9, C10	Capacitor, 1000 pF	8
3	R5, R6	Resistor, 5.6 Ω, 5%	2
4	R1, R2	Resistor, 100 Ω, 5%	2
5	L1, L2, L3, L4	Inductor, 68 nH	4
6	L5, L6	Inductor, 15 nH	2
7	L7, L8	Inductor, 82 nH	2
8	R3, R4	Resistor, 0 Ω	2

SO-8 Power Package Physical Dimensions



DIMENSION	MINIMUM	NOMINAL	MAXIMUM
A		.086[.0034]	.100[.0039]
A1	.005[.0002]	.008[.0003]	.011[.0004]
b	.017[.0007]	.020[.0008]	.023[.0009]
c	.007[.0003]	.008[.0003]	.009[.0004]
D	.195[.0077]	.200[.0079]	.205[.0081]
E	.135[.0053]	.140[.0055]	.145[.0057]
E1	.155[.0061]	.160[.0063]	.165[.0065]
e		.050[.0020]	
L	.020[.0009]		.040[.0016]
L1	.055[.0022]	.065[.0026]	.075[.0030]
α	0°		8°

DIMENSIONS IN INCHES

Ordering Information

The CFK0301GaAs FET is available in tape and reel. An evaluation board is also available. Ordering part numbers are listed.

Part Number for Ordering	Function	Package
CFK0301-AK-0000	**Dual, Low-Noise high dynamic range FET**	**SO-8 package**
CFK0301-AK-000T	**900 MHz, Dual, Low-Noise high dynamic range FET**	**SO-8 package in tape and reel**
PB-CFK0301-P1-000	**900 MHz, Evaluation Board**	
PB-CFK0301-P3-000	**1.9 GHz, Evaluation Board**	

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