High Dynamic Range Low Noise GaAs FET

August 2006 - Rev 03-Aug-06

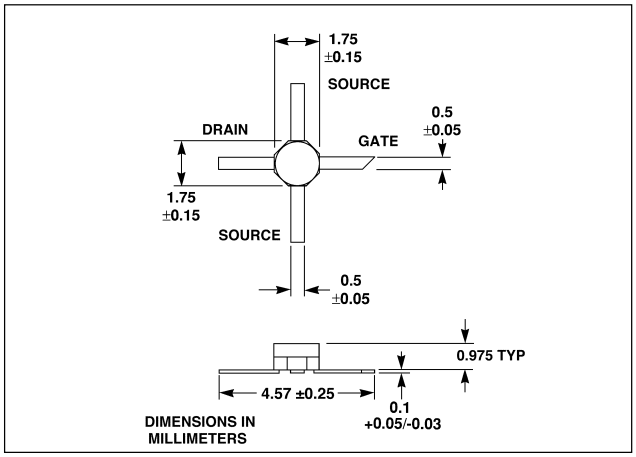
CFB0301

Features

- ❑ Low-Noise Figure from 0.8 to 2.0 GHz
- ❑ High Gain
- ❑ High Intercept Point
- ❑ Highly Stable
- ❑ Easily Matched to 50Ω
- ❑ 70 mil Package

Applications

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



Description

Celeritek's CFB0301 is a high performance GaAs MESFET with 600 µm gate width and 0.25 µm gate length. The low noise figure and high intercept point of this device makes it well suited for use as the low-noise amplifier of the base station receiver in PCS, Japanese PHS, AMPS, GSM and other communications systems. The CFB0301 is in an industry-standard 70 mil package. It is surface mountable and available in tape and reel.

Electrical Specifications (TA = 25°C, 2 GHz)

Parameters	Conditions	Min	Typ	Standard Deviation [4]	Max	Units
V_d = 2V, I_d = 25 mA						
Noise Figure [2]			0.6			dB
Associated Gain [2]	@ Noise Figure		16			dB
P_{out} [1, 3]	P_{-1}		15.0			dBm
IP_3 [3]	+5 dBm P_{OUT}/Tone		24			dBm
I_d [3]	@ P_{-1}		35			mA
V_d = 4V, I_d = 30 mA						
Noise Figure [2]			0.7			dB
Associated Gain [2]	@ Noise Figure		17			dB
P_{out} [1, 3]	P_{-1}		20.5			dBm
IP_3 [3]	+5 dBm P_{OUT}/Tone		30			dBm
I_d [3]	@ P_{-1}		56			mA
V_d = 4V, I_d = 70 mA						
Noise Figure [2]			0.8	0.08	0.9	dB
Associated Gain [2]	@ Noise Figure	16	17	0.4		dB
P_{out} [1, 3]	P_{-1}	20	21	0.4		dBm
IP_3 [3]	+5 dBm P_{OUT}/Tone	32	34	0.9		dBm
I_d [3]	@ P_{-1}		77			mA
Transconductance	V_{ds} = 2 V, V_{gs} = 0 V	70	140			mho
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	@ T_{case} = 150°C liquid crystal test		200			°C/W

Notes: 1. @ T_{case} = 25°C. Derate 5 mW/°C for T_{case} >25°C.
2. Input matched for low noise.
3. Matched for power transfer.
4. Standard deviation based on 10 wafers randomly selected and is provided as an estimate of the distribution only.

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

Frequency (GHz)	F_{min} [1] (dB)	Gamma Opt Mag	Gamma Opt Ang	Rn/50
0.8	0.4	0.6	27	0.19
1.0	0.4	0.6	29	0.17
1.2	0.4	0.6	32	0.18
1.4	0.4	0.6	35	0.18
1.6	0.4	0.5	38	0.17
1.8	0.4	0.5	41	0.16
2.0	0.5	0.5	45	0.15
2.2	0.5	0.5	49	0.15
2.4	0.5	0.5	54	0.14
2.6	0.5	0.5	60	0.13

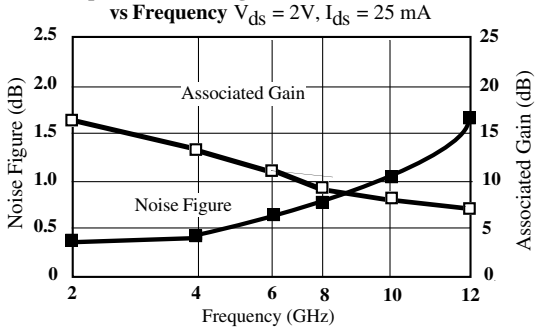
Note: 1. Fmin values reflect the circuit losses in the test fixture when matched to optimum noise figure.

Absolute Maximum Ratings

Parameter	Symbol	Rating
Drain-Source Voltage	V_{ds}	+8V
Gate-Source Voltage	V_{gs}	-5V
Drain Current	I_{ds}	Idss
Continuous Dissipation[1]	Pt	750 mW
Channel Temperature	Tch	175°C
Storage Temperature	Tstg	-65°C to +150°C

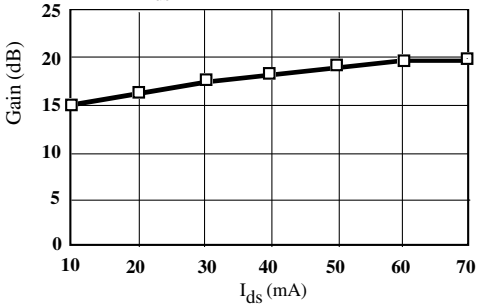
Typical Performance

Optimum Noise Figure and Associated Gain vs Frequency V_{ds} = 2V, I_{ds} = 25 mA



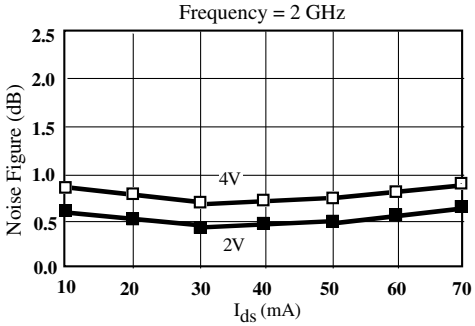
Associated Gain vs I_{ds}

V_{ds} = 2V, Frequency = 2 GHz



Optimum Noise Figure vs I_{ds} & V_{ds}

Frequency = 2 GHz



Typical Scattering Parameters (TA = 25°C, V_{DS} = 2 V, I_{DS} = 25 mA)

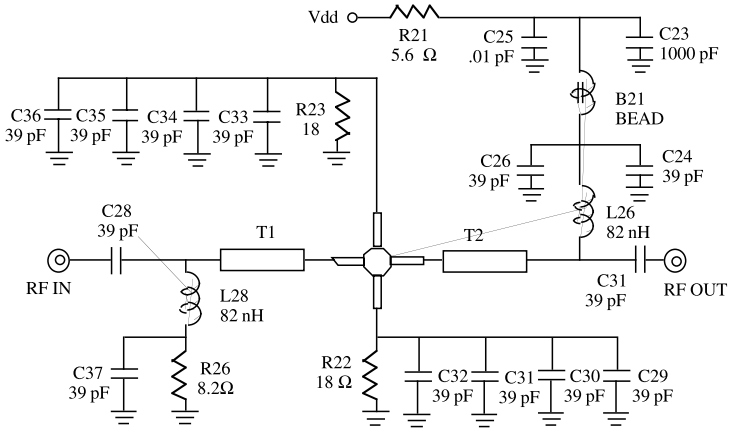
Frequency (GHz)	S_{11} Mag	S_{11} Ang	S_{21} Mag (dB)	S_{21} Ang	S_{12} MAG (dB)	S_{12} ANG	S_{22} MAG	S_{22} ANG
0.5	0.98	-20	7.17	161	0.02	78	0.42	-11
1.0	0.94	-40	6.90	148	0.03	70	0.41	-24
2.0	0.85	-76	6.00	119	0.05	52	0.36	-46
3.0	0.76	-108	5.00	95	0.07	38	0.32	-65
4.0	0.70	-130	4.30	75	0.08	30	0.30	-75
5.0	0.64	-150	3.83	55	0.09	20	0.27	-85

Test Circuit

Evaluation Board Schematic

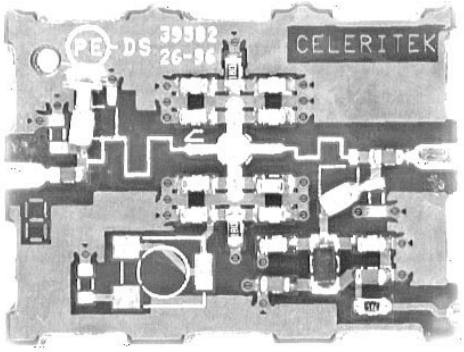
Evaluation Board Substrate:
- ER = 4.65
- Thickness = 0.036

Transmission Lines (Dimensions in mm.):
- T1: 0.203 (W) x 11.55 (L)
- T2: 0.203 (W) x 5.05 (L)



PB-CFB0301 Evaluation Board

(SMA Connectors not shown)



Evaluation Board Parts List

Item	Reference Designator	Description	Quantity	Manufacturer	Part Number
1	B21	Chip ferrite bead 0805	1	World Products	HB-1H2012-260JT
2	C23	Capacitor, 1000pF, 0603	1	Rohm	MCH185A102JK
3	C21, C24, C26, C28-C37	Capacitor, 39pF, 0603	13	Rohm	MCH185A039JK
4	C25	Capacitor, 0.01µF, 0603	1	Rohm	MCH185A103JK
5	L26, L28	Inductor, 82nH, INDA5T-3	2	Toko	LL2012-F8NK
6	R21	Resistor, 5.6 Ohm, 0603	1	Dale	RCWP575 560
7	R22, R23	Resistor, 18 Ohm, 0603	2	Dale	RCWP575 181
8	R26	Resistor, 8.2 Ohm, 0603	1	Dale	RCWP575 820

Ordering Information

The CFB0301GaAs FET is available in tape and reel. An evaluation board is also available. Ordering part numbers are listed.

Part Number for Ordering	Function	Package
CFB0301	**Low-Noise high dynamic range FET**	**70 mil package**
CFB0301-000T	**Low-Noise high dynamic range FET**	**70 mil package in tape and reel**
PB-CFB0301	**Evaluation Board**	