

High Dynamic Range Low Noise GaAs FET

Features

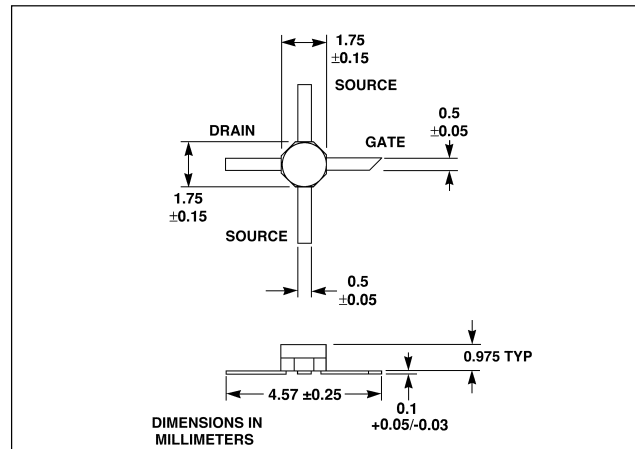
- ❑ Low-Noise Figure from 0.8 to 2.0 GHz
- ❑ High Gain
- ❑ High Intercept Point
- ❑ Highly Stable
- ❑ Easily Matched to 50Ω
- ❑ 70 mil Package

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. Trademarks are the property of their respected owners.

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

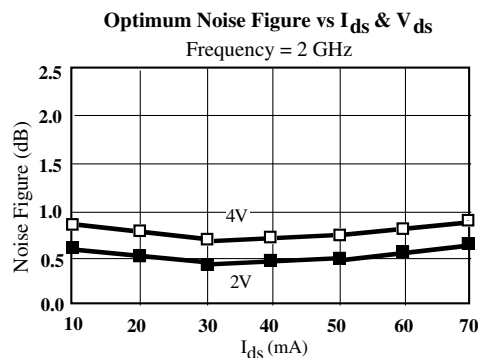
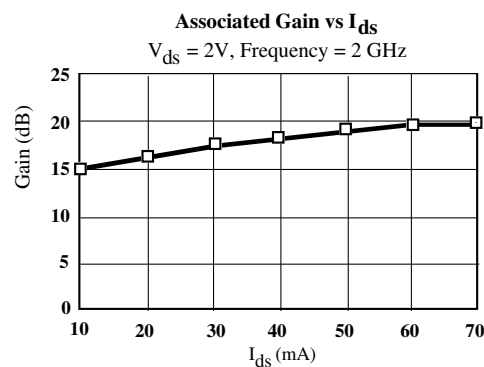
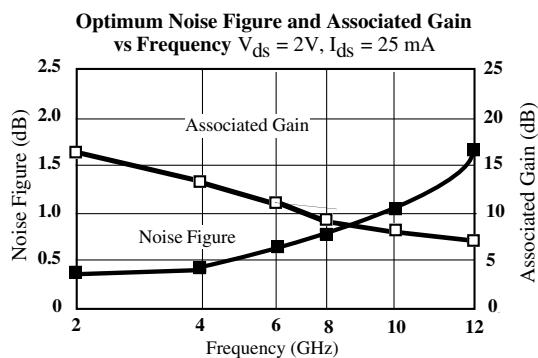
| Frequency (GHz) | F_{min}^1 (dB) | Gamma Opt | | Rn/50 |
|-----------------|------------------|-----------|-----|-------|
| | | Mag | Ang | |
| 0.8 | 0.4 | 0.6 | 27 | 0.19 |
| 1.0 | 0.4 | 0.6 | 29 | 0.17 |
| 1.2 | 0.4 | 0.6 | 32 | 0.18 |
| 1.4 | 0.4 | 0.6 | 35 | 0.18 |
| 1.6 | 0.4 | 0.5 | 38 | 0.17 |
| 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. F_{min} 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} | I_{dss} |
| Continuous Dissipation ¹ | Pt | 750 mW |
| Channel Temperature | Tch | 175°C |
| Storage Temperature | Tstg | -65°C to +150°C |

Typical Performance



Typical Scattering Parameters ($T_A = 25^\circ\text{C}$, $V_{DS} = 2\text{ V}$, $I_{DS} = 25\text{ mA}$)

| Frequency (GHz) | S_{11} | | S_{21} | | S_{12} | | S_{22} | |
|-----------------|----------|------|----------|-----|----------|-----|----------|-----|
| | Mag | Ang | Mag (dB) | Ang | MAG (dB) | ANG | MAG | 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 |

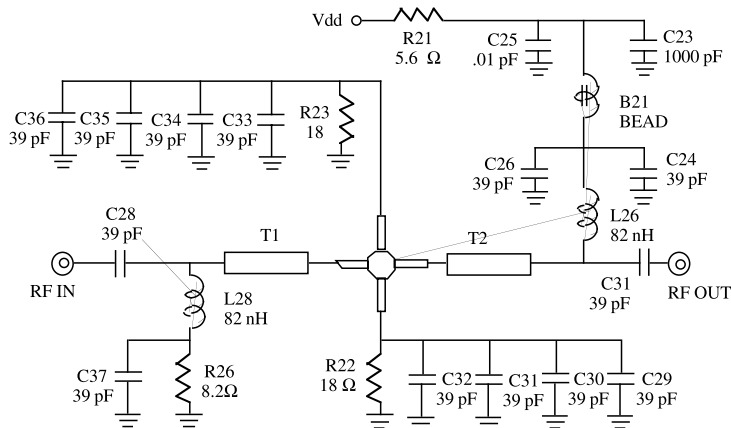
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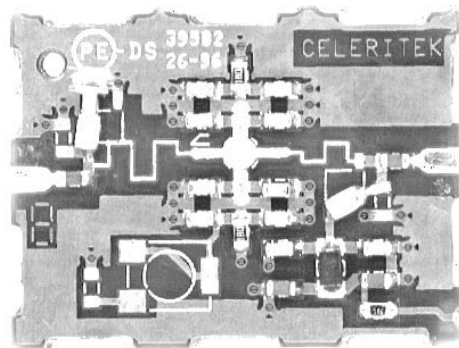
CFB0301

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

CFB0301

CFB0301-000T

PB-CFB0301

Function

Low-Noise high dynamic range FET

Low-Noise high dynamic range FET

Evaluation Board

Package

70 mil package

70 mil package in tape and reel