

Product Specifications June 2002

(1 of 3)

High Dynamic Range Low-Noise GaAs FET

Features

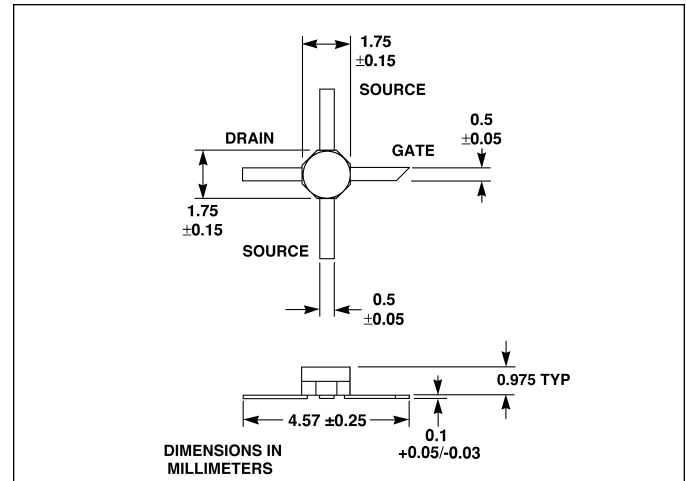
- ❑ Low-Noise Figure from 0.8 to 2.0 GHz
- ❑ High Gain
- ❑ High Intercept Point
- ❑ Highly Stable
- ❑ Easily Matched to 50Ω
- ❑ 70 mil Package

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.

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

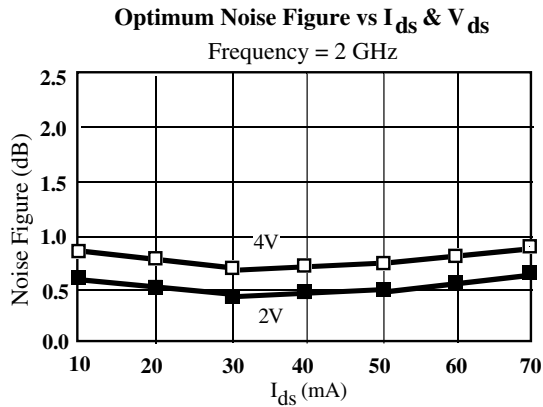
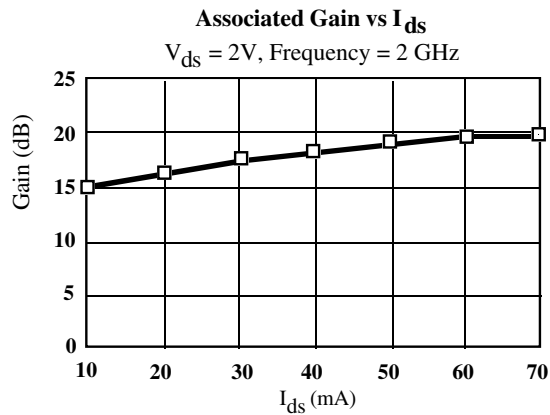
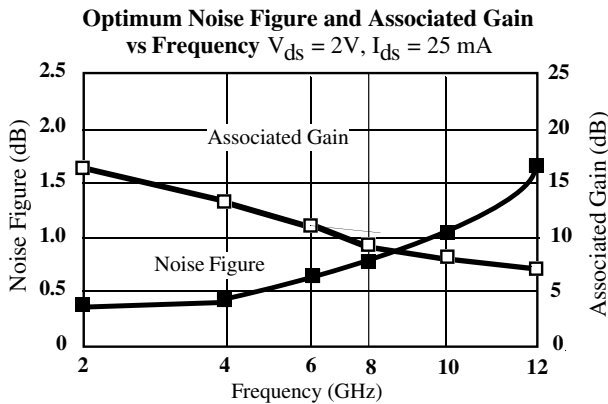
| Frequency (GHz) | F_{min}^1 (dB) | Gamma Opt | | Rn/50 |
|-----------------|------------------|-----------|-----|-------|
| | | Mag | Ang | |
| 0.8 | 0.4 | 0.6 | 27 | 0.19 |
| 1.0 | 0.4 | 0.6 | 29 | 0.17 |
| 1.2 | 0.4 | 0.6 | 32 | 0.18 |
| 1.4 | 0.4 | 0.6 | 35 | 0.18 |
| 1.6 | 0.4 | 0.5 | 38 | 0.17 |
| 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 |



Product Specifications - June 2002

(3 of 3)

Test Circuit Evaluation Board Schematic

Evaluation Board Substrate:

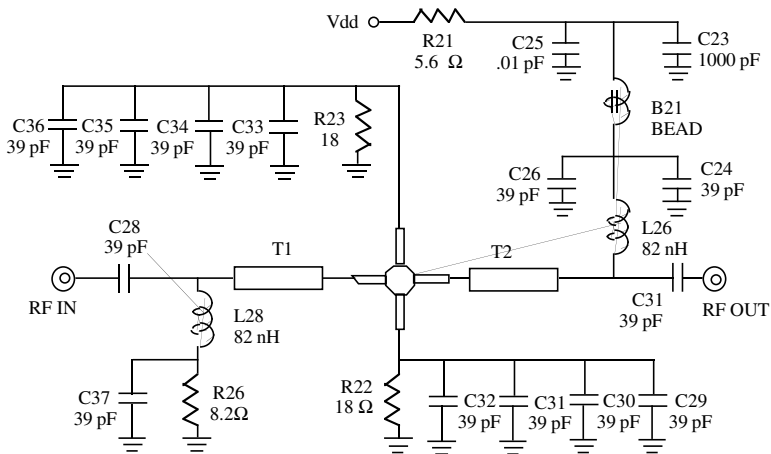
ER = 4.65

Thickness = 0.036

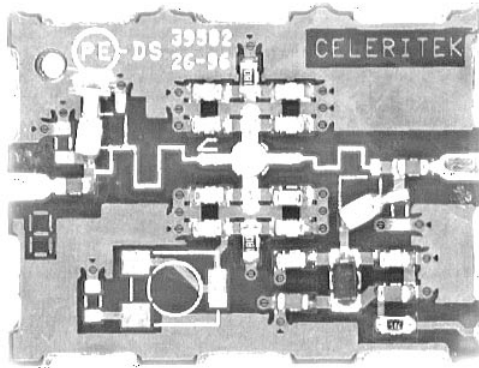
Transmission Lines (Dimensions in mm.):

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

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.