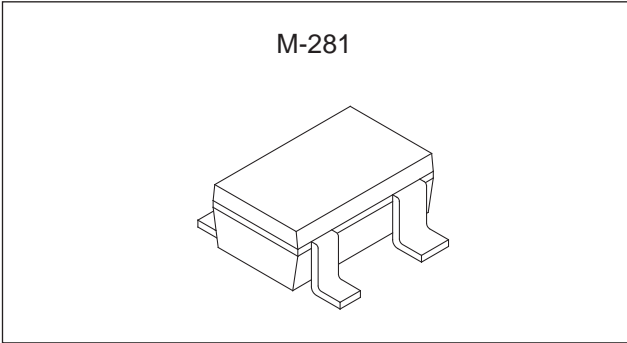


GaAs N-channel Dual-Gate MES FET

Description

The SGM2016AN is an N-channel dual-gate GaAs MES FET for UHF-band low-noise amplification. This FET is suitable for a wide range of applications including UHF TV tuners, cellular/cordless phone, and DBS IF amplifiers.



Features

- Ultra-small package
- Low voltage operation
- Low noise NF = 1.2dB (typ.) at 900MHz
- High gain Ga = 21dB (typ.) at 900MHz
- High stability
- Built-in gate protection diode

Application

UHF-band high-frequency amplifier, mixer, and oscillator

Structure

GaAs, N-channel, dual-gate metal semiconductor field-effect transistor

Absolute Maximum Ratings (Ta = 25°C)

| | | | |
|-------------------------------|-----------|-------------|----|
| • Drain to source voltage | V_{DSX} | 12 | V |
| • Gate 1 to source voltage | V_{G1S} | -5 | V |
| • Gate 2 to source voltage | V_{G2S} | -5 | V |
| • Drain current | I_D | 55 | mA |
| • Allowable power dissipation | P_D | 100 | mW |
| • Channel temperature | T_{ch} | 125 | °C |
| • Storage temperature | T_{stg} | -55 to +150 | °C |

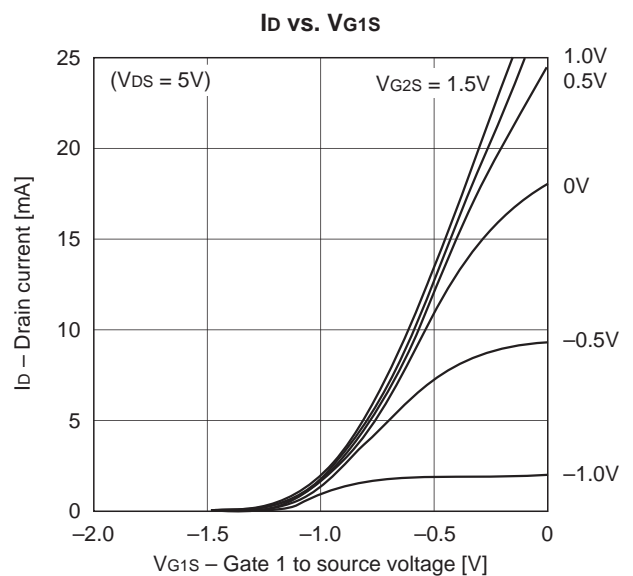
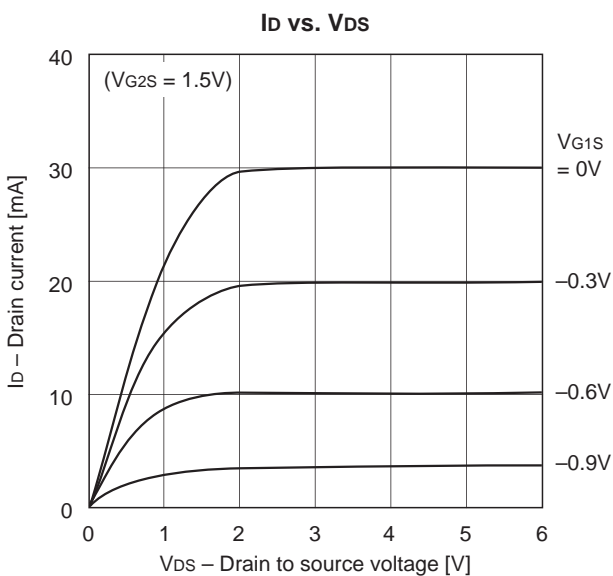
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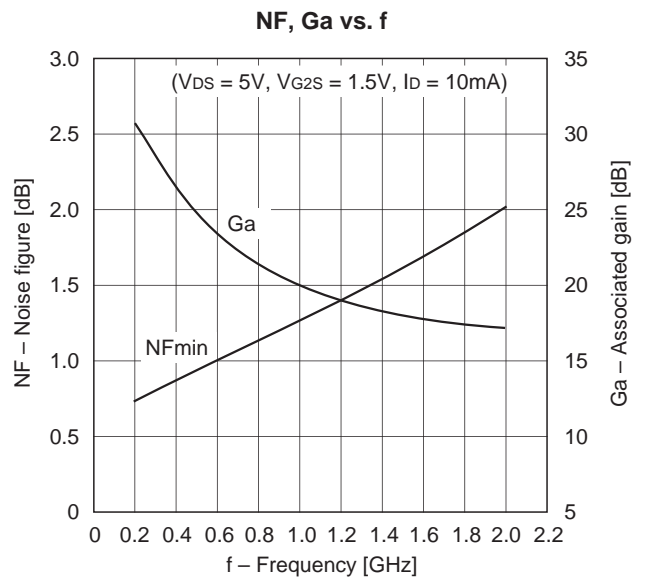
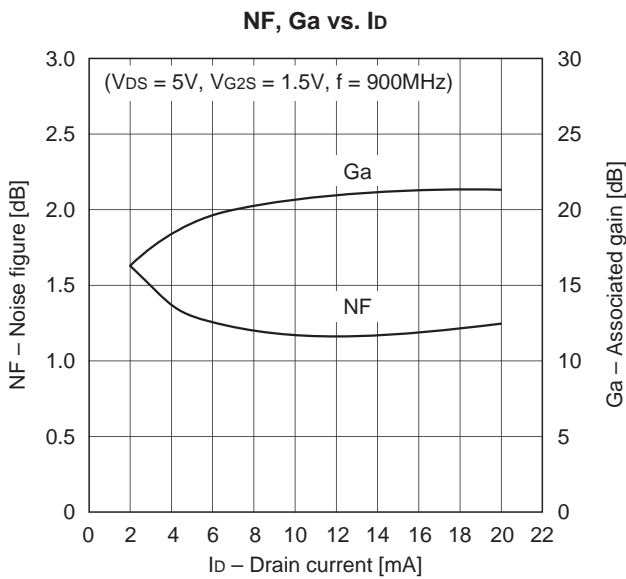
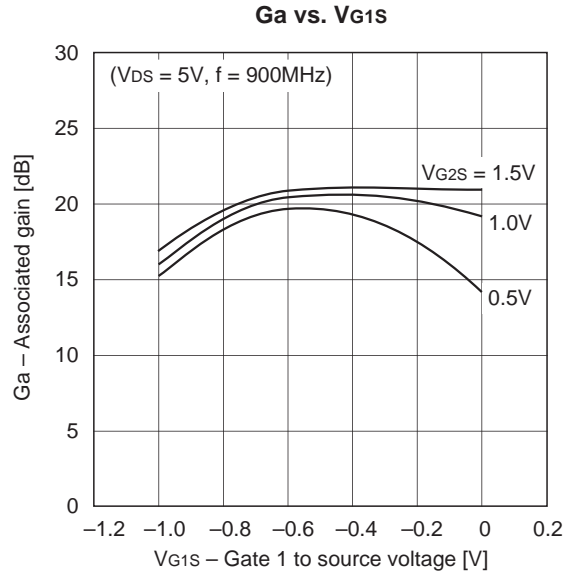
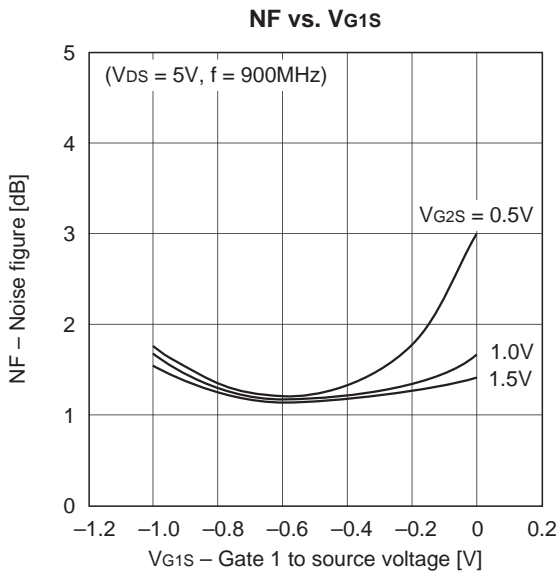
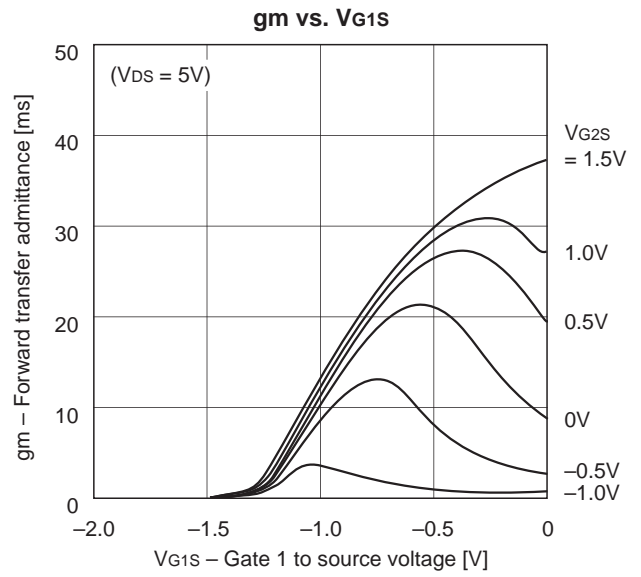
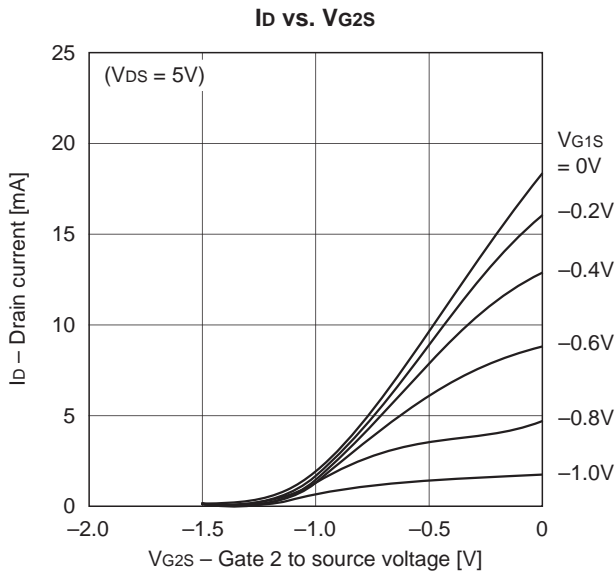
Electrical Characteristics

(Ta = 25°C)

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|----------------------------------|-----------------|---|------|------|------|---------|
| Drain cut-off current | I_{DSX} | $V_{DS} = 12V$ $V_{G1S} = -4V$ $V_{G2S} = 0V$ | | | 50 | μA |
| Gate 1 to source current | I_{G1SS} | $V_{G1S} = -4.5V$ $V_{G2S} = 0V$ $V_{DS} = 0V$ | | | -8 | μA |
| Gate 2 to source current | I_{G2SS} | $V_{G2S} = -4.5V$ $V_{G1S} = 0V$ $V_{DS} = 0V$ | | | -8 | μA |
| Drain saturation current | I_{DSS} | $V_{DS} = 5V$ $V_{G1S} = 0V$ $V_{G2S} = 0V$ | 10 | | 35 | mA |
| Gate 1 to source cut-off voltage | $V_{G1S} (OFF)$ | $V_{DS} = 5V$ $I_D = 100\mu A$ $V_{G2S} = 0V$ | | | -2.5 | V |
| Gate 2 to source cut-off voltage | $V_{G2S} (OFF)$ | $V_{DS} = 5V$ $I_D = 100\mu A$ $V_{G1S} = 0V$ | | | -2.5 | V |
| Forward transfer admittance | gm | $V_{DS} = 5V$ $I_D = 10mA$ $V_{G2S} = 1.5V$ $f = 1kHz$ | 20 | 30 | | ms |
| Input capacitance | C_{iss} | $V_{DS} = 5V$ $I_D = 10mA$ $V_{G2S} = 1.5V$ | | 0.9 | 2.0 | pF |
| Feedback capacitance | C_{rss} | $f = 1MHz$ | | 25 | 40 | fF |
| Noise figure | NF | $V_{DS} = 5V$ $I_D = 10mA$ $V_{G2S} = 1.5V$ | | 1.2 | 2.0 | dB |
| NF associated gain | Ga | $f = 900MHz$ | 17 | 21 | | dB |

Typical Characteristics (Ta = 25°C)





S-parameter vs. Frequency Characteristics ($V_{DS} = 5V$, $V_{G2S} = 1.5V$, $I_D = 10mA$)

($Z_0 = 50\Omega$)

| f (MHz) | S11 | | S21 | | S12 | | S22 | |
|------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 100 | 0.999 | -3.8 | 2.521 | 174.2 | 0.002 | 95.0 | 0.969 | -1.3 |
| 200 | 0.994 | -7.9 | 2.515 | 168.1 | 0.003 | 87.9 | 0.966 | -3.0 |
| 300 | 0.981 | -11.8 | 2.499 | 162.3 | 0.005 | 83.6 | 0.964 | -4.2 |
| 400 | 0.969 | -16.0 | 2.480 | 156.3 | 0.006 | 77.7 | 0.961 | -6.1 |
| 500 | 0.952 | -20.0 | 2.451 | 150.6 | 0.007 | 82.1 | 0.957 | -7.2 |
| 600 | 0.935 | -24.1 | 2.420 | 144.8 | 0.009 | 76.3 | 0.955 | -8.8 |
| 700 | 0.917 | -27.8 | 2.391 | 139.4 | 0.009 | 76.8 | 0.955 | -9.9 |
| 800 | 0.896 | -31.3 | 2.362 | 133.9 | 0.010 | 78.7 | 0.954 | -11.5 |
| 900 | 0.877 | -34.7 | 2.331 | 128.5 | 0.011 | 74.4 | 0.954 | -12.8 |
| 1000 | 0.850 | -38.0 | 2.294 | 122.9 | 0.012 | 82.6 | 0.953 | -14.4 |
| 1100 | 0.822 | -40.9 | 2.254 | 117.7 | 0.012 | 79.3 | 0.952 | -15.6 |
| 1200 | 0.797 | -44.0 | 2.216 | 112.4 | 0.012 | 72.4 | 0.949 | -17.2 |
| 1300 | 0.769 | -46.8 | 2.182 | 107.3 | 0.013 | 79.0 | 0.947 | -18.2 |
| 1400 | 0.744 | -49.7 | 2.153 | 102.1 | 0.013 | 81.5 | 0.946 | -20.0 |
| 1500 | 0.717 | -52.4 | 2.118 | 96.9 | 0.013 | 80.3 | 0.945 | -21.3 |
| 1600 | 0.692 | -54.9 | 2.076 | 91.8 | 0.013 | 83.7 | 0.945 | -22.9 |
| 1700 | 0.668 | -57.5 | 2.038 | 86.6 | 0.013 | 90.1 | 0.945 | -24.1 |
| 1800 | 0.641 | -59.6 | 2.005 | 81.4 | 0.013 | 98.4 | 0.945 | -25.8 |
| 1900 | 0.617 | -61.6 | 1.963 | 76.4 | 0.013 | 109.0 | 0.945 | -27.3 |
| 2000 | 0.589 | -63.4 | 1.929 | 71.5 | 0.013 | 113.0 | 0.945 | -28.7 |

Noise Figure Characteristics ($V_{DS} = 5V$, $V_{G2S} = 1.5V$, $I_D = 10mA$)

| f (MHz) | NFmin (dB) | Gamma Optimum | | Rn (Ω) |
|------------|---------------|---------------|------|--------------------|
| | | ANG | MAG | |
| 200 | 0.73 | 0.94 | 7.5 | 40.0 |
| 300 | 0.79 | 0.90 | 10.8 | 39.5 |
| 400 | 0.85 | 0.87 | 13.9 | 39.0 |
| 500 | 0.92 | 0.84 | 16.8 | 38.5 |
| 600 | 0.99 | 0.81 | 19.5 | 37.9 |
| 700 | 1.05 | 0.78 | 22.0 | 37.4 |
| 800 | 1.11 | 0.75 | 24.5 | 36.8 |
| 900 | 1.18 | 0.72 | 26.8 | 36.1 |
| 1000 | 1.25 | 0.70 | 29.1 | 35.5 |
| 1100 | 1.32 | 0.67 | 31.4 | 34.8 |
| 1200 | 1.39 | 0.65 | 33.8 | 34.1 |
| 1300 | 1.46 | 0.63 | 36.1 | 33.4 |
| 1400 | 1.53 | 0.60 | 38.6 | 32.6 |
| 1500 | 1.61 | 0.58 | 41.2 | 31.9 |
| 1600 | 1.68 | 0.56 | 43.9 | 31.0 |
| 1700 | 1.76 | 0.54 | 46.8 | 30.2 |
| 1800 | 1.84 | 0.52 | 50.0 | 29.3 |
| 1900 | 1.92 | 0.50 | 53.4 | 28.5 |
| 2000 | 2.00 | 0.48 | 57.0 | 27.5 |

