

GaAs N-channel Dual Gate MES FET**Description**

The 3SK165A 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 cellular, cordless phone.

Features

- Low voltage operation
- Low noise: $NF = 1.2\text{dB}$ (typ.) at 800MHz
- High gain: $G_a = 20\text{dB}$ (typ) at 800MHz
- High stability

Application

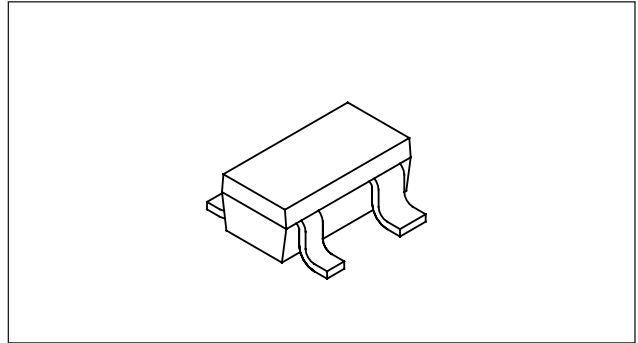
UHF band amplifier, mixer and oscillator

Structure

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

Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

| | | | |
|-------------------------------|-----------|-------------|------------------|
| • Drain to source voltage | V_{DSX} | 8 | V |
| • Gate 1 to source voltage | V_{G1S} | -6 | V |
| • Gate 2 to source voltage | V_{G2S} | -6 | V |
| • Drain current | I_D | 80 | mA |
| • Allowable power dissipation | P_D | 150 | mW |
| • Channel temperature | T_{ch} | 150 | $^\circ\text{C}$ |
| • Storage temperature | T_{stg} | -55 to +150 | $^\circ\text{C}$ |



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Electrical Characteristics

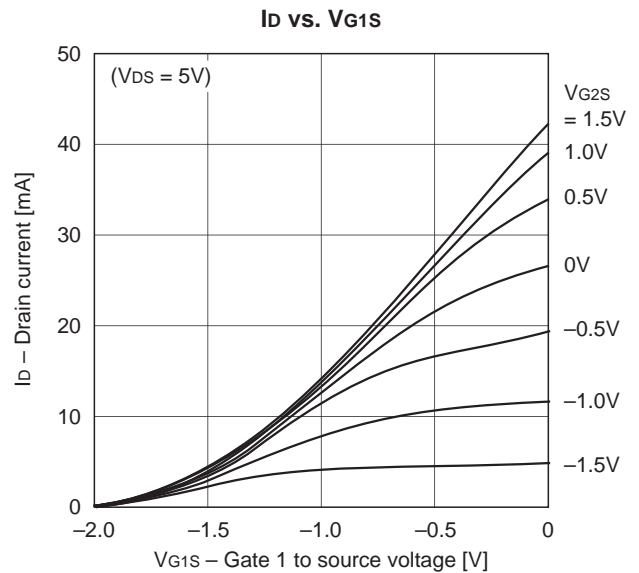
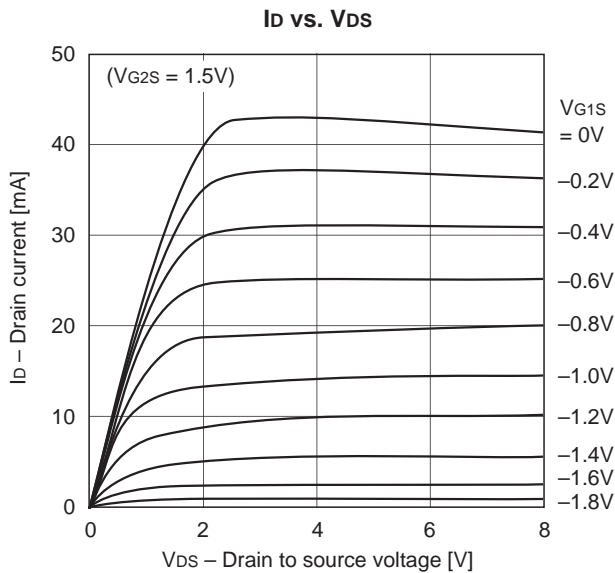
(Ta = 25°C)

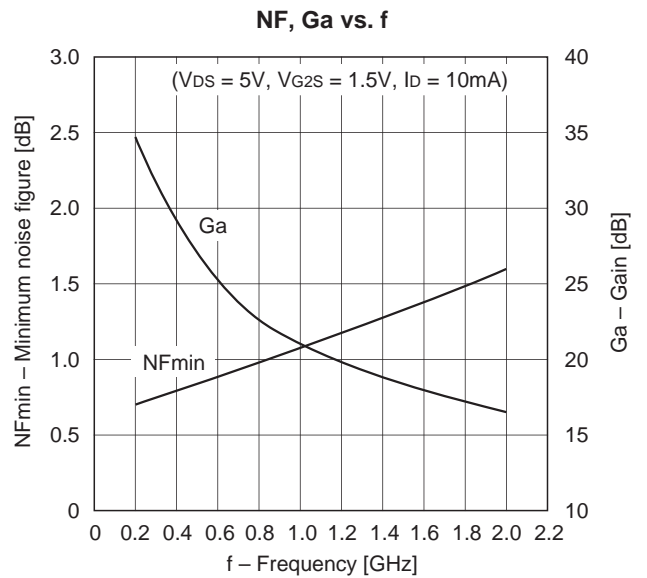
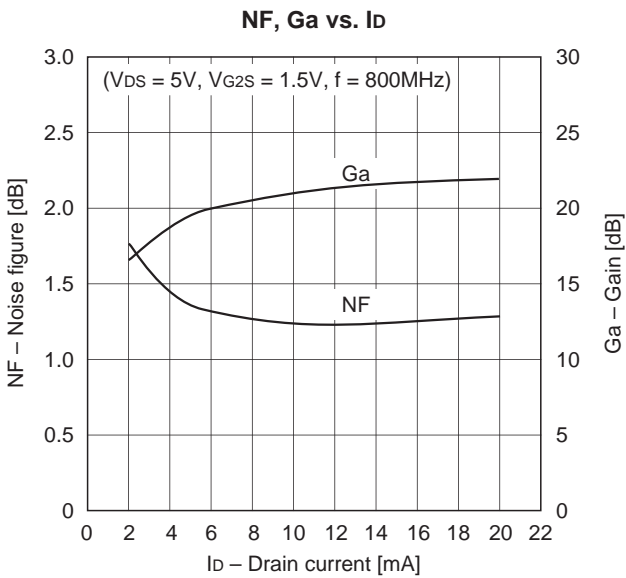
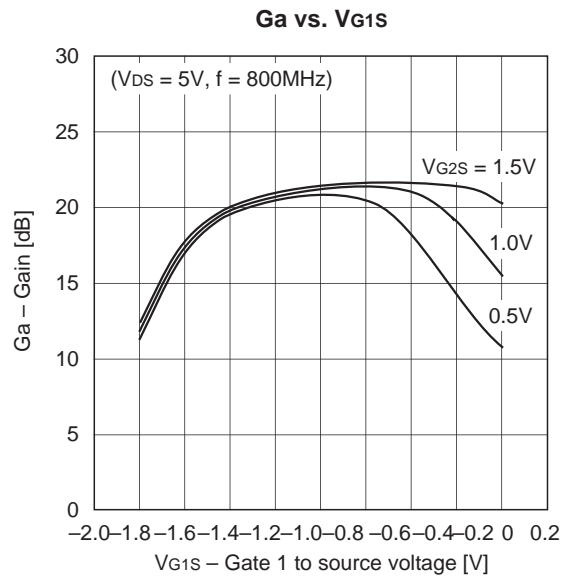
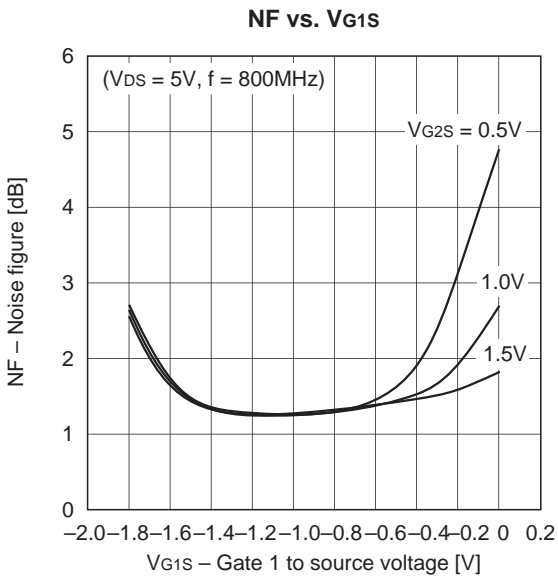
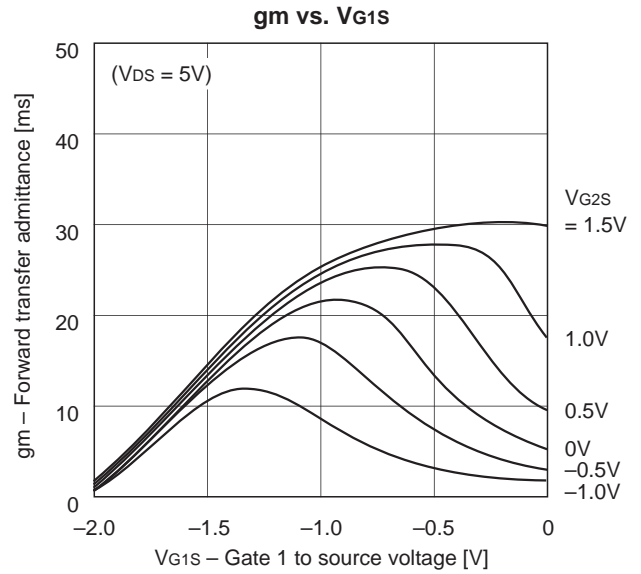
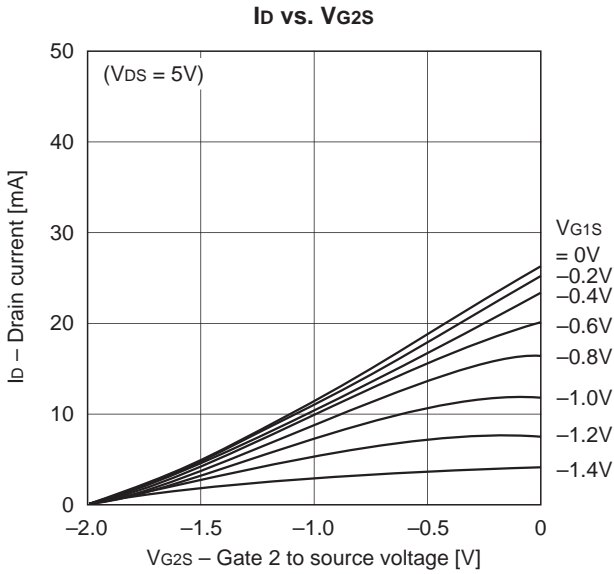
| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|----------------------------------|------------------------|--|------|------|------|------|
| Drain cut-off current | I _{DSX} | V _{DS} = 8V V _{G1S} = -4V V _{G2S} = 0V | | | 100 | μA |
| Gate 1 to source current | I _{G1SS} | V _{G1S} = -4V V _{G2S} = 0V V _{DS} = 0V | | | -20 | μA |
| Gate 2 to source current | I _{G2SS} | V _{G2S} = -4V V _{G1S} = 0V V _{DS} = 0V | | | -20 | μA |
| Drain saturation current | I _{DSS} | V _{DS} = 5V V _{G1S} = 0V V _{G2S} = 0V | 20 | | 55 | mA |
| Gate 1 to source cut-off voltage | V _{G1S (OFF)} | V _{DS} = 5V I _D = 100μA V _{G2S} = 0V | -1 | | -4 | V |
| Gate 2 to source cut-off voltage | V _{G2S (OFF)} | V _{DS} = 5V I _D = 100μA V _{G1S} = 0V | -1 | | -4 | V |
| Forward transfer admittance | gm | V _{DS} = 5V I _D = 10mA V _{G2S} = 1.5V f = 1kHz | 15 | 22 | | ms |
| Input capacitance | C _{iss} | V _{DS} = 5V I _D = 10mA V _{G2S} = 1.5V f = 1MHz | | 0.5 | 1.0 | pF |
| Feedback capacitance | C _{rss} | | | 7.5 | 25 | fF |
| Noise figure | NF | V _{DS} = 5V I _D = 10mA V _{G2S} = 1.5V f = 800MHz | | 1.2 | 2.5 | dB |
| Associated gain | G _a | | 16 | 20 | | dB |

* I_{DSS} classification

| Product name classification | I _{DSS} RANK |
|-----------------------------|-----------------------|
| 3SK165A-0 | 20 to 55mA |
| 3SK165A-1 | 20 to 35mA |

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 | -1.8 | 2.110 | 176.7 | 0.001 | 73.3 | 0.970 | -0.7 |
| 200 | 0.998 | -3.7 | 2.105 | 173.0 | 0.002 | 91.6 | 0.968 | -1.6 |
| 300 | 0.991 | -5.7 | 2.097 | 169.7 | 0.004 | 80.5 | 0.965 | -2.4 |
| 400 | 0.984 | -7.8 | 2.094 | 166.4 | 0.004 | 85.0 | 0.963 | -3.2 |
| 500 | 0.980 | -10.0 | 2.083 | 162.7 | 0.005 | 84.9 | 0.961 | -4.2 |
| 600 | 0.970 | -12.2 | 2.070 | 159.5 | 0.006 | 84.7 | 0.958 | -4.9 |
| 700 | 0.964 | -14.1 | 2.058 | 156.1 | 0.007 | 83.2 | 0.958 | -5.8 |
| 800 | 0.956 | -16.1 | 2.048 | 152.8 | 0.007 | 82.5 | 0.958 | -6.7 |
| 900 | 0.949 | -17.9 | 2.039 | 149.4 | 0.008 | 82.0 | 0.958 | -7.3 |
| 1000 | 0.938 | -19.7 | 2.021 | 146.0 | 0.008 | 78.1 | 0.958 | -8.3 |
| 1100 | 0.927 | -21.3 | 2.008 | 142.8 | 0.009 | 84.4 | 0.954 | -9.0 |
| 1200 | 0.911 | -22.8 | 1.990 | 139.6 | 0.010 | 76.7 | 0.953 | -9.6 |
| 1300 | 0.898 | -24.4 | 1.973 | 136.3 | 0.011 | 77.8 | 0.950 | -10.5 |
| 1400 | 0.882 | -25.8 | 1.954 | 133.3 | 0.011 | 80.9 | 0.949 | -11.2 |
| 1500 | 0.868 | -27.4 | 1.941 | 130.0 | 0.011 | 80.0 | 0.947 | -12.1 |
| 1600 | 0.856 | -29.0 | 1.928 | 126.8 | 0.011 | 80.5 | 0.947 | -12.9 |
| 1700 | 0.838 | -30.2 | 1.901 | 123.7 | 0.012 | 74.3 | 0.946 | -13.9 |
| 1800 | 0.824 | -31.5 | 1.888 | 120.6 | 0.012 | 79.2 | 0.945 | -14.5 |
| 1900 | 0.809 | -32.9 | 1.865 | 117.3 | 0.013 | 80.6 | 0.942 | -15.3 |
| 2000 | 0.792 | -34.1 | 1.846 | 114.1 | 0.013 | 79.5 | 0.941 | -15.9 |

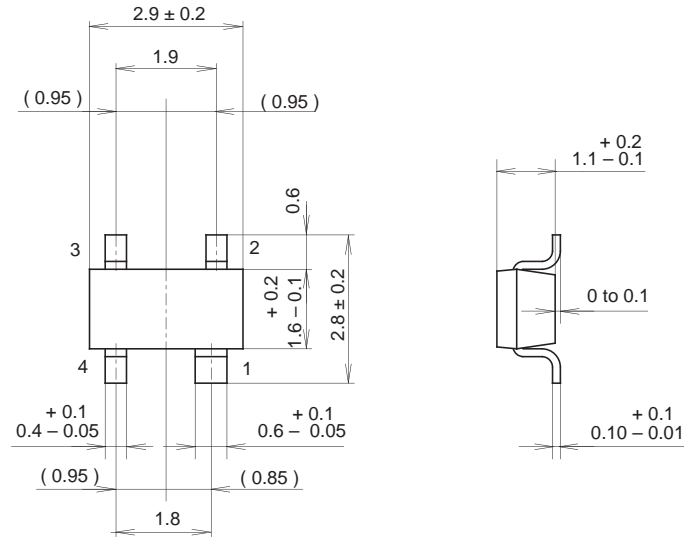
Noise Figure Characteristics ($V_{DS} = 5V$, $V_{G2S} = 1.5V$, $I_D = 10mA$)

| f (MHz) | NFmin (dB) | Gamma Optimum | | Rn (Ω) |
|------------|---------------|---------------|------|--------------------|
| | | ANG | MAG | |
| 200 | 0.72 | 0.97 | 4.4 | 63.7 |
| 300 | 0.75 | 0.95 | 6.4 | 63.0 |
| 400 | 0.81 | 0.93 | 8.2 | 62.2 |
| 500 | 0.84 | 0.91 | 9.9 | 61.5 |
| 600 | 0.90 | 0.88 | 11.4 | 60.7 |
| 700 | 0.94 | 0.86 | 12.8 | 59.9 |
| 800 | 0.98 | 0.84 | 14.2 | 59.1 |
| 900 | 1.02 | 0.83 | 15.5 | 58.4 |
| 1000 | 1.07 | 0.81 | 16.7 | 57.6 |
| 1100 | 1.13 | 0.80 | 17.9 | 56.8 |
| 1200 | 1.17 | 0.79 | 19.1 | 56.0 |
| 1300 | 1.22 | 0.78 | 20.3 | 55.2 |
| 1400 | 1.26 | 0.78 | 21.5 | 54.3 |
| 1500 | 1.31 | 0.77 | 22.8 | 53.5 |
| 1600 | 1.38 | 0.77 | 24.2 | 52.7 |
| 1700 | 1.42 | 0.77 | 25.6 | 51.9 |
| 1800 | 1.48 | 0.76 | 27.1 | 51.0 |
| 1900 | 1.52 | 0.76 | 28.8 | 50.2 |
| 2000 | 1.57 | 0.75 | 30.6 | 49.3 |

Package Outline

Unit: mm

M-254



- 1. Source
- 2. Gate1
- 3. Gate2
- 4. Drain

| | |
|------------|-------|
| SONY CODE | M-254 |
| EIAJ CODE | _____ |
| JEDEC CODE | _____ |

| | |
|--------------|-------|
| PACKAGE MASS | 0.01g |
|--------------|-------|