

GaAs N-channel Dual-Gate MES FET

Description:

The 3SK147 is a GaAs N-channel Dual-Gate MES FET for low noise UHF amplifiers and mixers. Low noise, high gain characteristics and low operating voltage are accomplished by optimum mask pattern design. Simplified high frequency circuits adjustments are made possible by the miniaturized plastic molded package which contributes to reduce parasitic elements of the device.

Features:

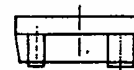
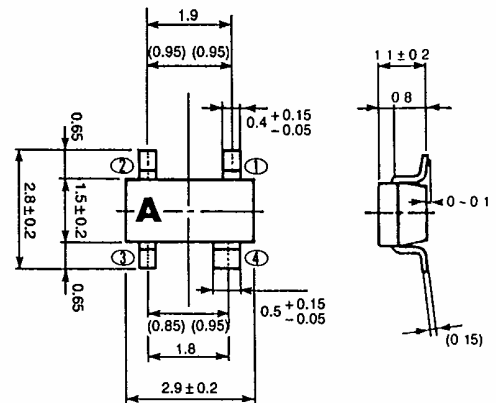
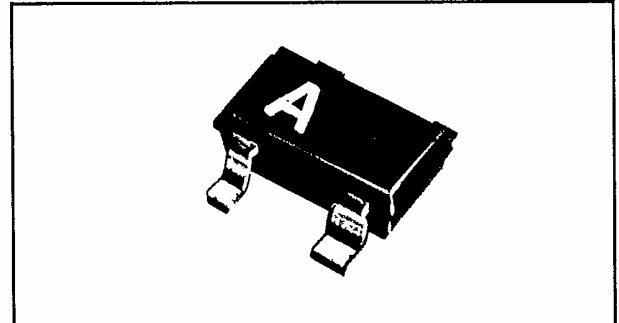
- Low Operating Voltage
- Low NF: NF = 1.2 dB (typ.) at 800MHz
- High PG: PG = 22 dB (typ.) at 800 MHz
- High Stability
- Protection Diode Included

Applications:

- UHF T.V. Tuner, amplifier, mixer, oscillator.

Absolute Maximum Ratings: (Ta = 25°C)

- Drain to Source Voltage: Vdsx 12 V
- Gate 1 to Source Voltage: Vg1s -5 V
- Gate 2 to Source Voltage: Vg2s -5 V
- Drain Current: Id 55 mA
- Power Dissipation: Pch 150 mW
- Channel Temperature: Tch +150 °C
- Storage Temperature: Tstg -55 ~ +150 °C



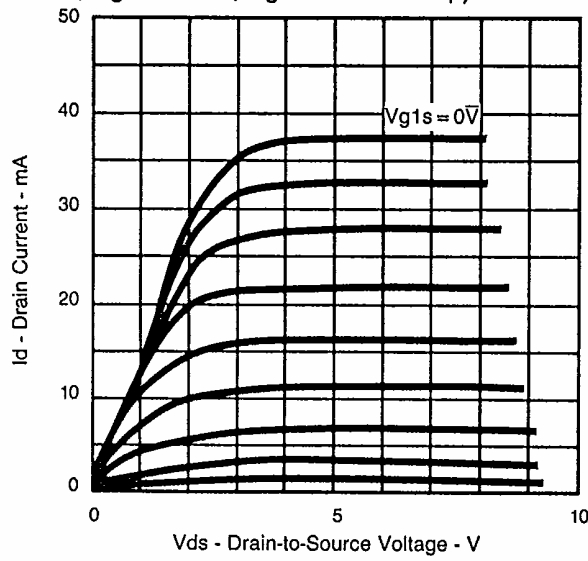
1 = gate 1
 2 = gate 2
 3 = drain
 4 = source
 unit:mm

Electrical Characteristics: (Ta = 25°C)

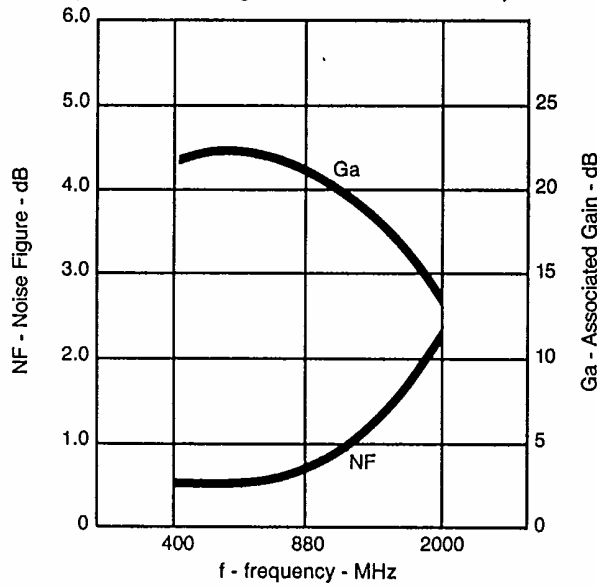
| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|--------------------------|--------|--|------|------|------|------|
| Drain to Source Voltage | Vdsx | Id = 20μA Vg1s = 0V Vg2s = -4V | 11 | | | V |
| Gate 1 Cutoff Current | Ig1ss | Vg1s = -4.5V Vg2s = 0V Vds = 0V | -8 | | | μA |
| Gate 2 Cutoff Current | Ig2ss | Vg2s = -4.5V Vg1s = 0V Vds = 0V | -8 | | | μA |
| Drain Saturation Current | Idss | Vds = 5V Vg1s = 0V Vg2s = 0V | 10 | | 50 | mA |
| Gate 1 Pinchoff Voltage | Vp1 | Vds = 5V Id = 100μA Vg2s = 0V | -2.5 | | | V |
| Gate 2 Pinchoff Voltage | Vp2 | Vds = 5V Id = 100μA Vg1s = 0V | -2.5 | | | V |
| Transconductance | gm | Vds = 5V Id = 10mA Vg2s = 1.5V f = 1KHz | 20 | 26 | | mS |
| Input Capacitance | Ciss | Vds = 5V Id = 10mA Vg2s = 1.5V f = 1MHz | | 1.1 | 3 | PF |
| Feedback Capacitance | Crss | | | 28 | 40 | fF |
| Power Gain | PG | Vds = 5V Id = 10mA Vg2s = 1.5V f = 800MHz | 18 | 22 | | dB |
| Noise Figure | NF | | | 1.2 | 2.0 | dB |

The specifications are subject to change without notice.

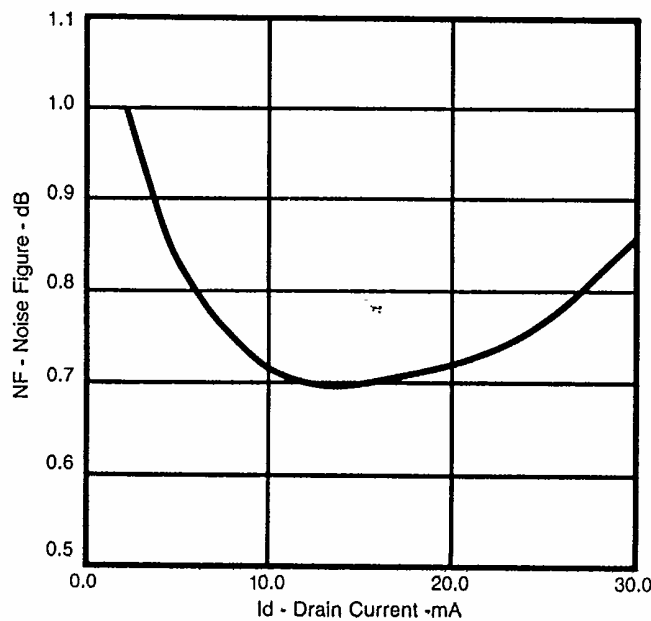
Output Characteristics: ($T_a = 25^\circ\text{C}$, $V_{g2s} = 1.5\text{V}$, $V_{g1s} = -0.2\text{Vstep}$)



NF, Ga Frequency Dependence: ($V_{ds} = 5.0\text{V}$, $V_{g2s} = 1.5\text{V}$, $I_{ds} = 10\text{mA}$)

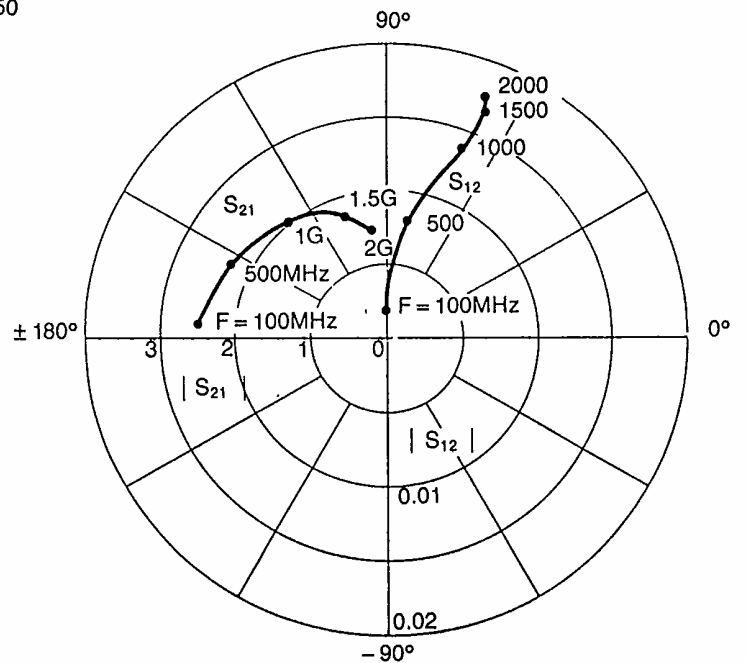
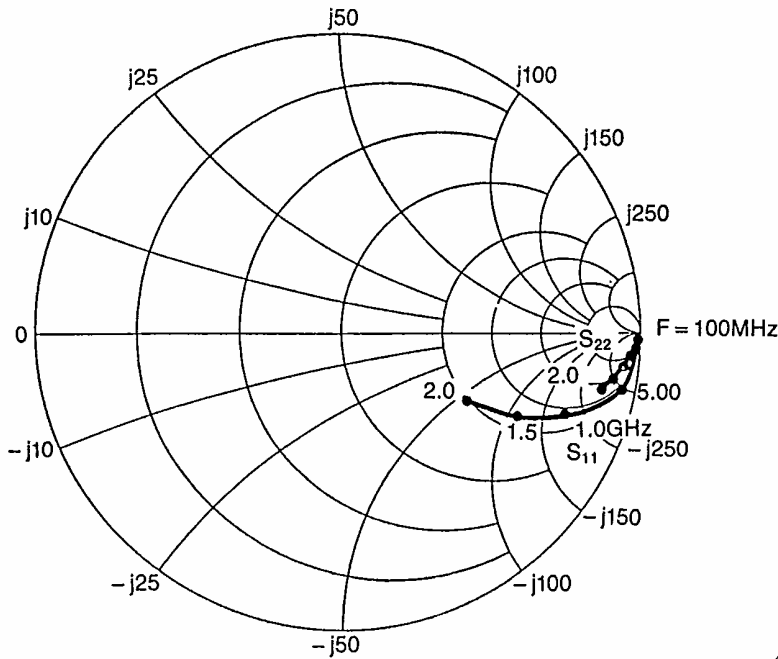


NF- I_d Characteristics: ($V_{ds} = 5.0\text{V}$, $V_{g2s} = 1.5\text{V}$, Frequency at 450MHz)



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S-Parameters vs. Frequency Characteristics: ($V_{ds} = 5V, V_{g2s} = 1.5V, I_d = 10mA$)

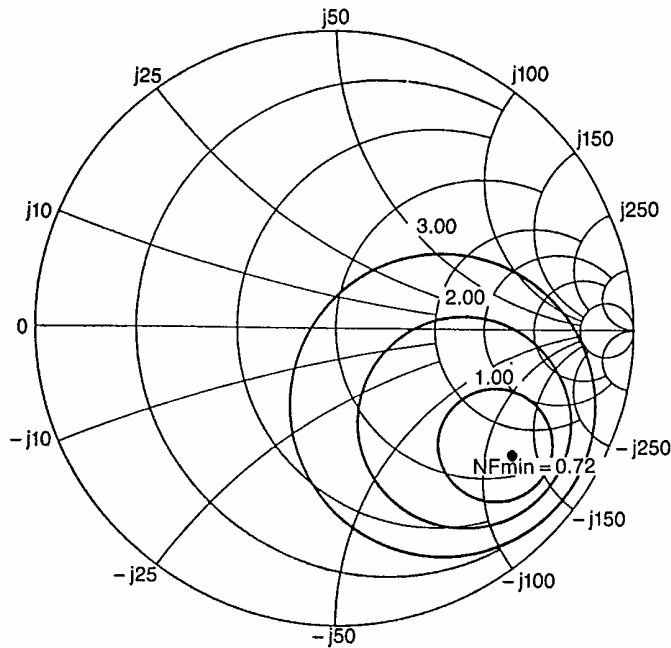


S-Parameter Data of FET 3SK147 (50.0 Ohm reference)

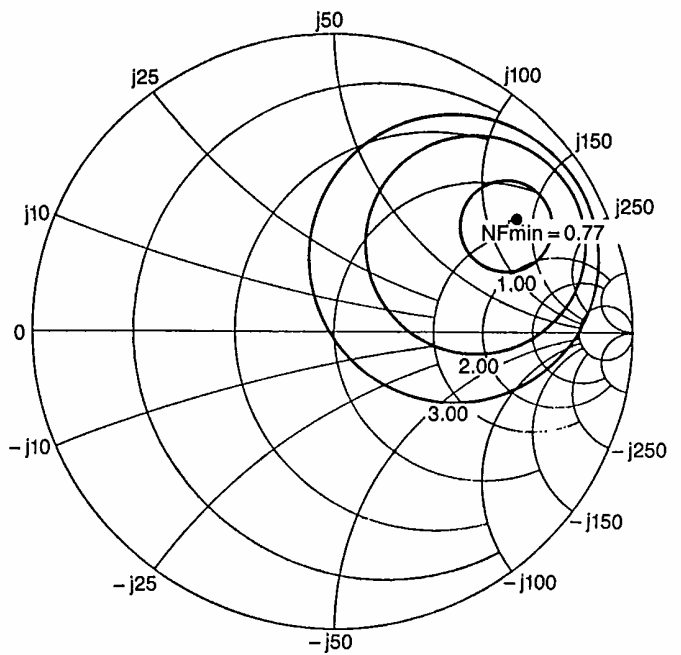
| Frequency MHz | S11 | | S21 | | S12 | | S22 | |
|------------------|------|--------|-------|--------|--------|-------|------|--------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 100 | .996 | -4.29 | 2.463 | 174.58 | 0.0017 | 90.33 | .969 | -1.24 |
| 200 | .991 | -8.41 | 2.429 | 167.53 | 0.0032 | 82.30 | .970 | -2.71 |
| 300 | .992 | -12.08 | 2.423 | 161.43 | 0.0042 | 85.75 | .981 | -5.05 |
| 400 | .967 | -16.21 | 2.415 | 160.18 | 0.0072 | 85.39 | .962 | -5.36 |
| 500 | .944 | -19.67 | 2.288 | 154.96 | 0.0080 | 79.42 | .961 | -6.27 |
| 600 | .920 | -23.29 | 2.275 | 147.32 | 0.0097 | 77.89 | .964 | -7.75 |
| 700 | .892 | -26.72 | 2.233 | 144.80 | 0.0111 | 74.26 | .954 | -8.54 |
| 800 | .865 | -29.98 | 2.128 | 140.64 | 0.0117 | 75.69 | .952 | -10.22 |
| 900 | .836 | -32.83 | 2.018 | 133.59 | 0.0125 | 71.74 | .940 | -10.92 |
| 1000 | .807 | -35.39 | 2.079 | 128.17 | 0.0139 | 68.31 | .940 | -12.55 |
| 1200 | .736 | -40.18 | 1.874 | 123.16 | 0.0162 | 69.28 | .932 | -15.15 |
| 1400 | .672 | -44.73 | 1.845 | 114.38 | 0.0174 | 64.55 | .919 | -17.33 |
| 1600 | .615 | -48.21 | 1.676 | 108.69 | 0.0173 | 68.24 | .915 | -18.83 |
| 1800 | .547 | -50.41 | 1.655 | 102.68 | 0.0179 | 66.81 | .908 | -19.93 |
| 2000 | .471 | -53.14 | 1.435 | 95.70 | 0.0178 | 68.29 | .892 | -21.04 |

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Noise Figure Characteristics: (Vds = 5.0V, Vg2s = 1.5V, Ids = 10mA)
 at 450MHz at 880MHz

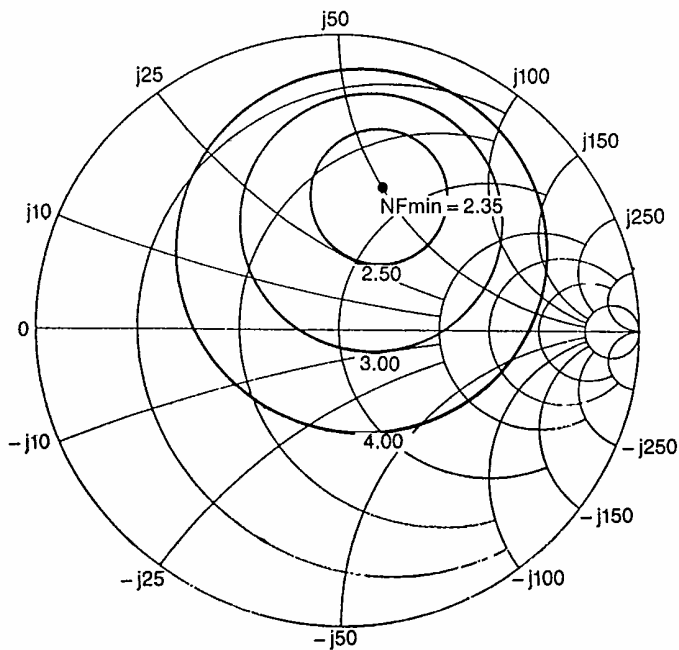


Vds = 5.0V
 Vg2s = 1.5V
 Ids = 10mA
 Frequency 450 MHz
 NF min 0.72 dB
 Ga 20.57 dB
 Gamma (S); Mag 0.730 Ang -35.46°
 Gamma (L); Mag 0.833 Ang -46.85°



Vds = 5.0V
 Vg2s = 1.5V
 Ids = 10mA
 Frequency 880 MHz
 NF min 0.77 dB
 Ga 20.57 dB
 Gamma (S); Mag 0.725 Ang 32.68°

at 2000MHz



| Frequency (MHz) | Ga (dB) | NF (dB) | Gamma- S | | Gamma- L | |
|-----------------|---------|---------|----------|---------|----------|---------|
| | | | (Mag.) | (Ang.) | (Mag.) | (Ang.) |
| 400 | 21.69 | 0.60 | 0.747 | -78.04° | 0.912 | -76.72° |
| 450 | 20.57 | 0.72 | 0.730 | -35.46° | 0.833 | -46.85° |
| 500 | 22.03 | 0.71 | 0.813 | 4.63° | 0.560 | -5.95° |
| 880 | 20.75 | 0.77 | 0.725 | 32.68° | | |
| 2000 | 13.38 | 2.35 | 0.510 | 73.32° | | |

Vds = 5.0V
 Vg2s = 1.5V
 Ids = 10mA
 Frequency 2000 MHz
 NF min 2.35 dB
 Ga 13.38 dB
 Gamma (S); Mag 0.510 Ang 73.32°