
3SK296

Silicon N-Channel Dual Gate MOS FET

HITACHI

ADE-208-388
1st. Edition

Application

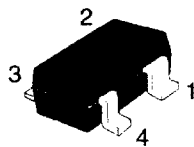
UHF RF amplifier

Features

- Low noise figure.
NF = 2.0 dB Typ. at $f = 900$ MHz
- Capable of low voltage operation

Outline

CMPAK-4



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

Absolute Maximum Ratings (Ta = 25°C)

| Item | Symbol | Ratings | Unit |
|---------------------------|-----------|-------------|------|
| Drain to source voltage | V_{DS} | 12 | V |
| Gate 1 to source voltage | V_{G1S} | ± 8 | V |
| Gate 2 to source voltage | V_{G2S} | ± 8 | V |
| Drain current | I_D | 25 | mA |
| Channel power dissipation | Pch | 100 | mW |
| Channel temperature | Tch | 150 | °C |
| Storage temperature | Tstg | -55 to +150 | °C |

Attention: This device is very sensitive to electro static discharge.

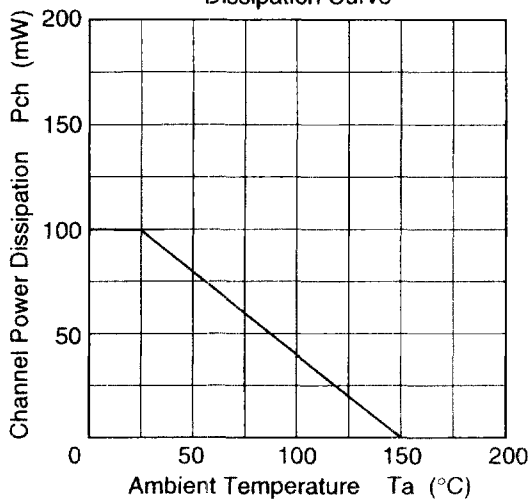
It is recommended to adopt appropriate cautions when handling this transistor.

Electrical Characteristics (Ta = 25°C)

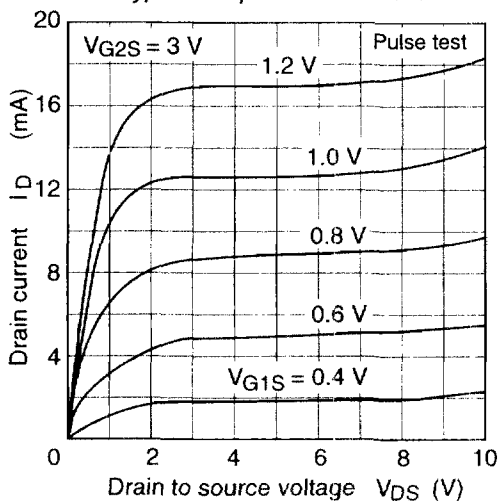
| Item | Symbol | Min | Typ | Max | Unit | Test conditions |
|------------------------------------|----------------|---------|------|-----------|------|---|
| Drain to source breakdown voltage | $V_{(BR)DSX}$ | 12 | — | — | V | $I_D = 200 \mu A$, $V_{G1S} = -3 V$, $V_{G2S} = -3 V$ |
| Gate 1 to source breakdown voltage | $V_{(BR)G1SS}$ | ± 8 | — | — | V | $I_{G1} = \pm 10 \mu A$, $V_{G2S} = V_{DS} = 0$ |
| Gate 2 to source breakdown voltage | $V_{(BR)G2SS}$ | ± 8 | — | — | V | $I_{G2} = \pm 10 \mu A$, $V_{G1S} = V_{DS} = 0$ |
| Gate 1 cutoff current | I_{G1SS} | — | — | ± 100 | nA | $V_{G1S} = \pm 6 V$, $V_{G2S} = V_{DS} = 0$ |
| Gate 2 cutoff current | I_{G2SS} | — | — | ± 100 | nA | $V_{G2S} = \pm 6 V$, $V_{G1S} = V_{DS} = 0$ |
| Drain current | $I_{DS(on)}$ | 0.5 | — | 10 | mA | $V_{DS} = 6 V$, $V_{G1S} = 0.5 V$, $V_{G2S} = 3 V$ |
| Gate 1 to source cutoff voltage | $V_{G1S(off)}$ | -0.5 | — | +0.5 | V | $V_{DS} = 10 V$, $V_{G2S} = 3 V$, $I_D = 100 \mu A$ |
| Gate 2 to source cutoff voltage | $V_{G2S(off)}$ | 0 | — | +1.0 | V | $V_{DS} = 10 V$, $V_{G1S} = 3 V$, $I_D = 100 \mu A$ |
| Forward transfer admittance | $ y_{fs} $ | 16 | 20.8 | — | mS | $V_{DS} = 6 V$, $V_{G2S} = 3 V$, $I_D = 10 mA$, $f = 1 kHz$ |
| Input capacitance | C_{iss} | 1.2 | 1.5 | 2.2 | pF | $V_{DS} = 6 V$, $V_{G2S} = 3 V$, $I_D = 10 mA$, $f = 1 MHz$ |
| Output capacitance | C_{oss} | 0.6 | 0.9 | 1.2 | pF | |
| Reverse transfer capacitance | C_{rss} | — | 0.01 | 0.03 | pF | |
| Power gain | PG | 16 | 19.5 | — | dB | $V_{DS} = 4 V$, $V_{G2S} = 3 V$, $I_D = 10 mA$, $f = 900 MHz$ |
| Noise figure | NF | — | 2.0 | 3 | dB | |

Note: Marking is "ZQ—"

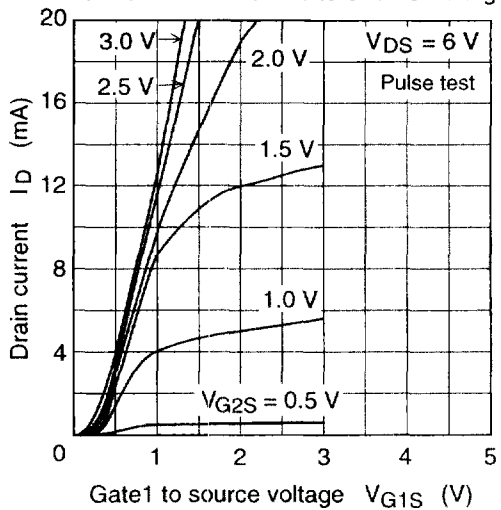
Maximum Channel Power Dissipation Curve



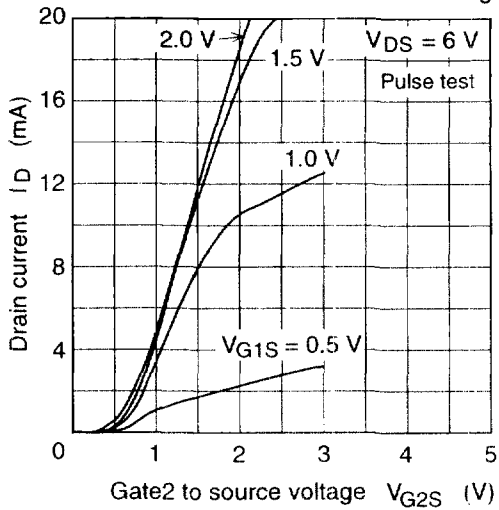
Typical Output Characteristics

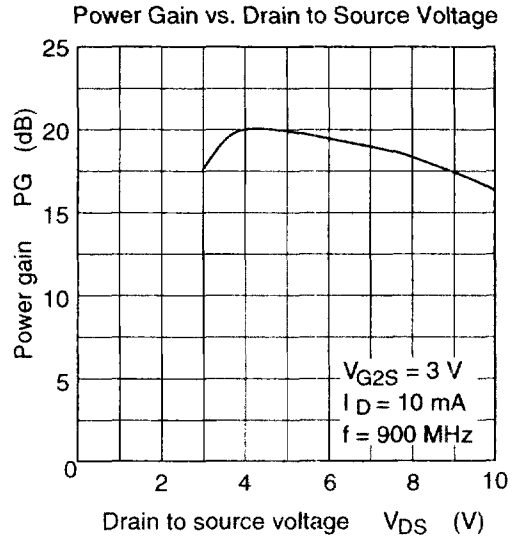
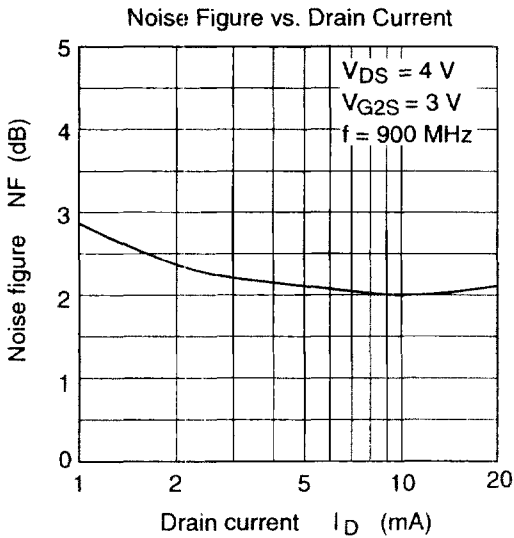
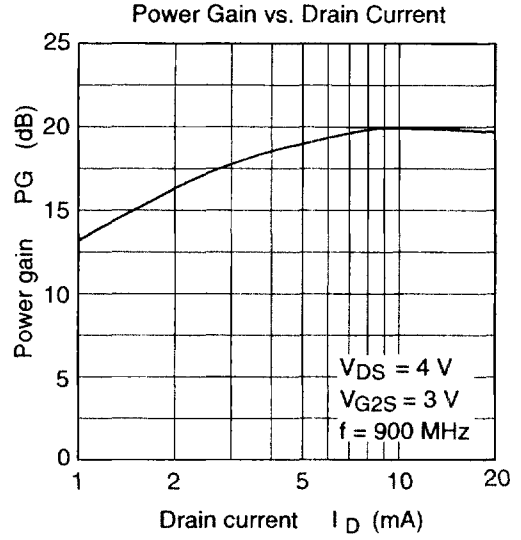
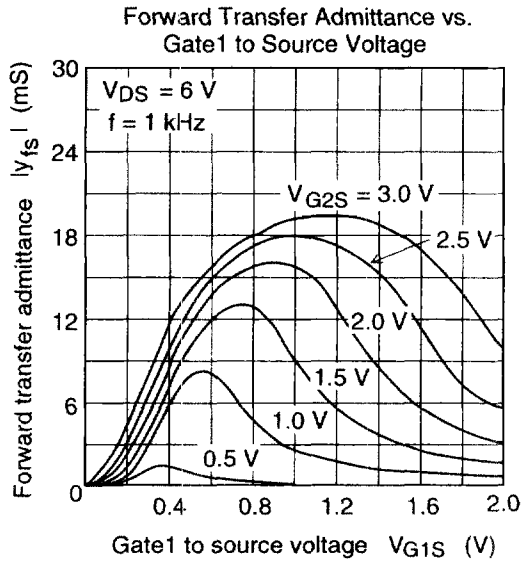


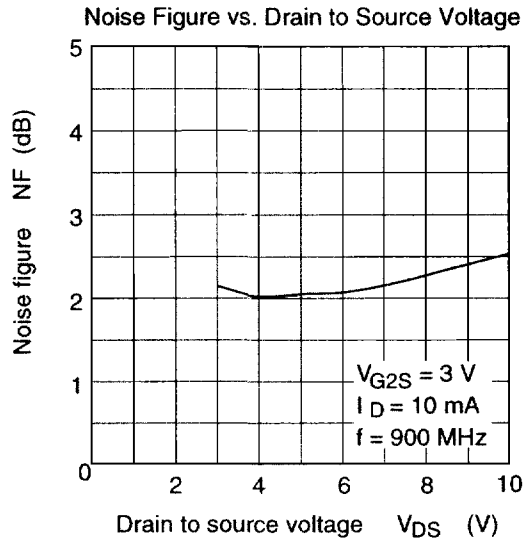
Drain Current vs. Gate1 to Source Voltage



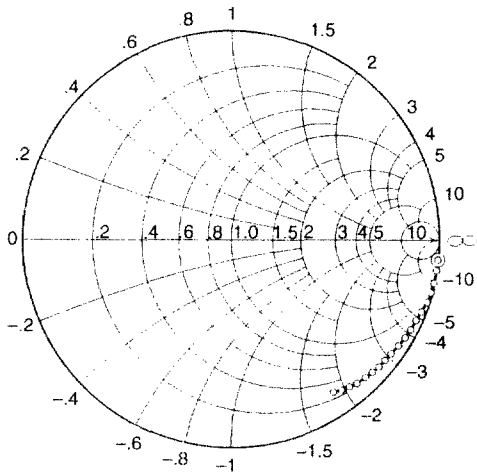
Drain Current vs. Gate2 to Source Voltage







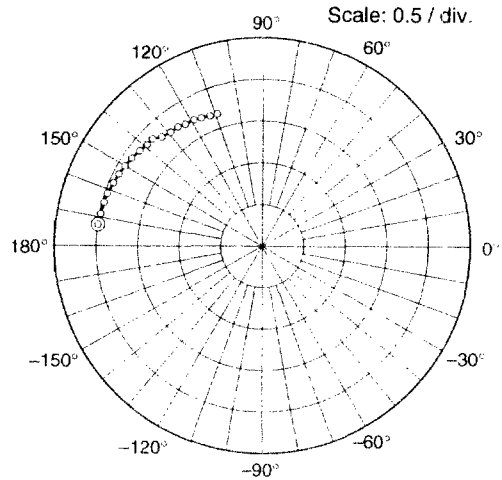
S11 Parameter vs. Frequency



Condition: $V_{DS} = 4\text{ V}$, $V_{GS} = 3\text{ V}$
 $I_D = 10\text{ mA}$, $Z_o = 50\ \Omega$
 100 to 1000 MHz (50 MHz step)



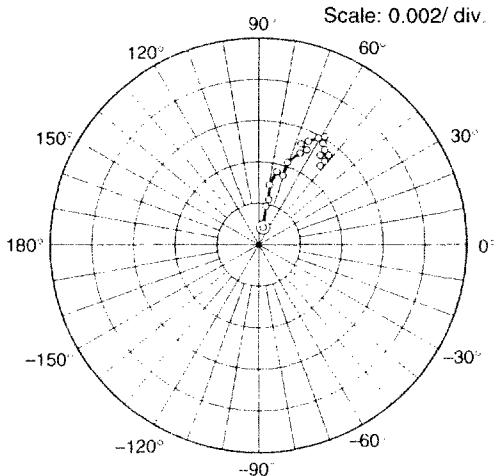
S21 Parameter vs. Frequency



Condition: $V_{DS} = 4\text{ V}$, $V_{GS} = 3\text{ V}$
 $I_D = 10\text{ mA}$, $Z_o = 50\ \Omega$
 100 to 1000 MHz (50 MHz step)



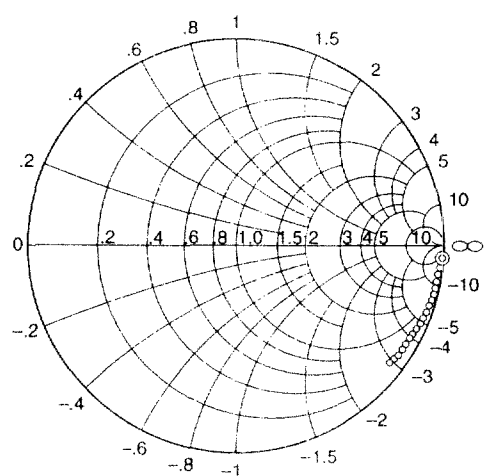
S12 Parameter vs. Frequency



Condition: $V_{DS} = 4\text{ V}$, $V_{GS} = 3\text{ V}$
 $I_D = 10\text{ mA}$, $Z_o = 50\ \Omega$
 100 to 1000 MHz (50 MHz step)



S22 Parameter vs. Frequency



Condition: $V_{DS} = 4\text{ V}$, $V_{GS} = 3\text{ V}$
 $I_D = 10\text{ mA}$, $Z_o = 50\ \Omega$
 100 to 1000 MHz (50 MHz step)



S Parameter ($V_{DS} = 4 \text{ V}$, $V_{GS} = 3 \text{ V}$, $I_D = 10 \text{ mA}$, $Z_0 = 50 \Omega$)

| Freq. (MHz) | S11 | | S21 | | S12 | | S22 | |
|----------------|-------|-------|------|-------|---------|------|-------|-------|
| | MAG. | ANG. | MAG. | ANG. | MAG. | ANG. | MAG. | ANG. |
| 100 | 0.999 | -6.1 | 1.98 | 172.2 | 0.00094 | 79.2 | 0.989 | -4.2 |
| 150 | 0.998 | -9.1 | 1.97 | 168.4 | 0.00189 | 80.4 | 0.987 | -6.1 |
| 200 | 0.992 | -11.9 | 1.96 | 165.0 | 0.00230 | 79.5 | 0.986 | -7.9 |
| 250 | 0.988 | -14.8 | 1.96 | 161.0 | 0.00286 | 79.9 | 0.984 | -9.8 |
| 300 | 0.985 | -17.9 | 1.94 | 157.1 | 0.00364 | 75.2 | 0.981 | -11.5 |
| 350 | 0.976 | -20.6 | 1.92 | 153.7 | 0.00353 | 71.8 | 0.978 | -13.4 |
| 400 | 0.971 | -23.2 | 1.91 | 149.9 | 0.00419 | 70.7 | 0.975 | -15.2 |
| 450 | 0.964 | -26.3 | 1.88 | 146.8 | 0.00495 | 65.5 | 0.972 | -17.2 |
| 500 | 0.961 | -29.1 | 1.87 | 142.8 | 0.00509 | 62.7 | 0.968 | -19.1 |
| 550 | 0.951 | -32.2 | 1.86 | 139.4 | 0.00530 | 66.6 | 0.963 | -20.8 |
| 600 | 0.949 | -35.0 | 1.86 | 136.1 | 0.00550 | 63.8 | 0.960 | -22.8 |
| 650 | 0.935 | -37.6 | 1.81 | 132.9 | 0.00601 | 58.2 | 0.956 | -24.5 |
| 700 | 0.933 | -40.5 | 1.78 | 129.4 | 0.00582 | 60.6 | 0.950 | -26.3 |
| 750 | 0.923 | -42.9 | 1.77 | 125.7 | 0.00572 | 58.5 | 0.945 | -28.0 |
| 800 | 0.916 | -45.8 | 1.75 | 122.6 | 0.00553 | 56.3 | 0.941 | -29.9 |
| 850 | 0.908 | -49.0 | 1.72 | 119.1 | 0.00514 | 56.3 | 0.936 | -31.7 |
| 900 | 0.900 | -51.2 | 1.70 | 115.8 | 0.00543 | 52.9 | 0.930 | -33.4 |
| 950 | 0.890 | -54.0 | 1.67 | 112.6 | 0.00506 | 52.4 | 0.924 | -35.2 |
| 1000 | 0.876 | -56.4 | 1.65 | 109.3 | 0.00469 | 51.9 | 0.919 | -37.0 |