

# 2N3954-2N3958 Monolithic Dual N-Channel JFET

## GENERAL DESCRIPTION

Matched FET pairs for differential amplifiers. This family of general purpose FETs is characterized for low and medium frequency differential amplifiers requiring low offset voltage, drift, noise, and capacitance.

## FEATURES

- Offset Voltage  $< 5 \text{ mV}$  • Drift  $< 5 \mu\text{V}/^\circ\text{C}$
- Low Capacitance —  $C_{iss} = 4 \text{ pF Max}$
- Spot Noise Figure =  $0.5 \text{ dB Max}$
- Superior Tracking Ability
- Low Output Conductance —  $g_{os} = 35 \mu\text{mho Max}$

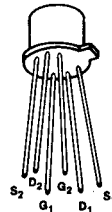
## ABSOLUTE MAXIMUM RATINGS

@  $25^\circ\text{C}$  (unless otherwise noted)

|                                                         |                                             |
|---------------------------------------------------------|---------------------------------------------|
| Any Case-To-Lead Voltage                                | $\pm 100 \text{ V}$                         |
| Gate-Drain or Gate-Source Voltage                       | $-50 \text{ V}$                             |
| Gate-To-Gate Voltage                                    | $\pm 100 \text{ V}$                         |
| Gate Current                                            | $50 \text{ mA}$                             |
| Total Device Dissipation $85^\circ\text{C}$ (Each Side) | $250 \text{ mW}$                            |
| Case Temperature (Both Sides)                           | $500 \text{ mW}$                            |
| Power Derating (Each Side)                              | $2.86 \text{ mW}/^\circ\text{C}$            |
| (Both Sides)                                            | $4.3 \text{ mW}/^\circ\text{C}$             |
| Storage Temperature Range                               | $-65^\circ\text{C}$ to $+125^\circ\text{C}$ |
| Lead Temperature                                        | $300^\circ\text{C}$                         |
| (1/16" from case for 10 seconds)                        |                                             |

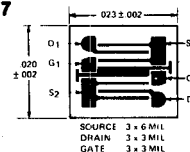
## PIN CONFIGURATION

TO-71



## CHIP TOPOGRAPHY

6017



## ORDERING INFORMATION

| TO-71   | WAFER     | DICE      |
|---------|-----------|-----------|
| 2N3954  | 2N3954/W  | 2N3954/D  |
| 2N3954A | 2N3954A/W | 2N3954A/D |
| 2N3955  | 2N3955/W  | 2N3955/D  |
| 2N3955A | 2N3955A/W | 2N3955A/D |
| 2N3956  | 2N3956/W  | 2N3956/D  |
| 2N3957  | 2N3957/W  | 2N3957/D  |
| 2N3958  | 2N3958/W  | 2N3958/D  |

## ELECTRICAL CHARACTERISTICS ( $25^\circ\text{C}$ unless otherwise noted)

| PARAMETER                                                                           | 2N3954 |      | 2N3954A |      | 2N3955 |      | 2N3955A |      | 2N3956 |      | 2N3957 |      | 2N3958 |      | UNIT            | TEST CONDITIONS                                                                                     |
|-------------------------------------------------------------------------------------|--------|------|---------|------|--------|------|---------|------|--------|------|--------|------|--------|------|-----------------|-----------------------------------------------------------------------------------------------------|
|                                                                                     | MIN    | MAX  | MIN     | MAX  | MIN    | MAX  | MIN     | MAX  | MIN    | MAX  | MIN    | MAX  | MIN    | MAX  |                 |                                                                                                     |
| $I_{GSS}$ Gate Reverse Current                                                      | -100   |      | -100    |      | -100   |      | -100    |      | -100   |      | -100   |      | -100   |      | pA              | $V_{GS} = -30 \text{ V}$ ,<br>$V_{DS} = 0$ , $T_A = 125^\circ\text{C}$                              |
|                                                                                     |        | -500 |         | -500 |        | -500 |         | -500 |        | -500 |        | -500 |        | -500 | nA              |                                                                                                     |
| $BV_{GSS}$ Gate-Source Breakdown Voltage                                            | -50    |      | -50     |      | -50    |      | -50     |      | -50    |      | -50    |      | -50    |      | V               | $V_{DS} = 0$ ,<br>$I_G = 1 \mu\text{A}$                                                             |
| $V_{GS(off)}$ Gate-Source Cutoff Voltage                                            | -1.0   | -4.5 | -1.0    | -4.5 | -1.0   | -4.5 | -1.0    | -4.5 | -1.0   | -4.5 | -1.0   | -4.5 | -1.0   | -4.5 | V               | $V_{DS} = 20 \text{ V}$ ,<br>$I_D = 1 \text{ nA}$                                                   |
| $V_{GS(1)}$ Gate-Source Forward Voltage                                             |        | 2.0  |         | 2.0  |        | 2.0  |         | 2.0  |        | 2.0  |        | 2.0  |        | 2.0  | V               | $V_{DS} = 0$ ,<br>$I_G = 1 \text{ mA}$                                                              |
| $V_{GS}$ Gate-Source Voltage                                                        | -4.2   |      | -4.2    |      | -4.2   |      | -4.2    |      | -4.2   |      | -4.2   |      | -4.2   |      | V               | $V_{DS} = 20 \text{ V}$ ,<br>$I_D = 50 \mu\text{A}$                                                 |
|                                                                                     | -0.5   | -4.0 | -0.5    | -4.0 | -0.5   | -4.0 | -0.4    | -4.0 | -0.5   | -4.0 | -0.5   | -4.0 | -0.5   | -4.0 | V               | $I_D = 200 \mu\text{A}$                                                                             |
| $I_G$ Gate Operating Current                                                        | -50    |      | -50     |      | -50    |      | -50     |      | -50    |      | -50    |      | -50    |      | pA              | $V_{DS} = 20 \text{ V}$ ,<br>$I_D = 200 \mu\text{A}$                                                |
|                                                                                     |        | -250 |         | -250 |        | -250 |         | -250 |        | -250 |        | -250 |        | -250 | nA              | $T_A = 125^\circ\text{C}$                                                                           |
| $I_{DSS}$ Saturation Drain Current                                                  | 0.5    | 5.0  | 0.5     | 5.0  | 0.5    | 5.0  | 0.5     | 5.0  | 0.5    | 5.0  | 0.5    | 5.0  | 0.5    | 5.0  | mA              | $V_{DS} = 20 \text{ V}$ ,<br>$V_{GS} = 0$                                                           |
| $g_{fs}$ Common-Source Forward Transconductance                                     | 1000   | 3000 | 1000    | 3000 | 1000   | 3000 | 1000    | 3000 | 1000   | 3000 | 1000   | 3000 | 1000   | 3000 | $\mu\text{mho}$ | $f = 1 \text{ kHz}$                                                                                 |
|                                                                                     |        | 1000 |         | 1000 |        | 1000 |         | 1000 |        | 1000 |        | 1000 |        | 1000 |                 | $f = 200 \text{ MHz}$                                                                               |
| $g_{os}$ Common-Source Output Conductance                                           |        | 35   |         | 35   |        | 35   |         | 35   |        | 35   |        | 35   |        | 35   | $\mu\text{mho}$ | $V_{DS} = 20 \text{ V}$ ,<br>$V_{GS} = 0$                                                           |
| $C_{iss}$ Common-Source Input Capacitance                                           |        | 4.0  |         | 4.0  |        | 4.0  |         | 4.0  |        | 4.0  |        | 4.0  |        | 4.0  | pF              | $f = 1 \text{ MHz}$                                                                                 |
| $C_{rss}$ Common Source Reverse Transfer Capacitance                                |        | 1.2  |         | 1.2  |        | 1.2  |         | 1.2  |        | 1.2  |        | 1.2  |        | 1.2  | pF              | $V_{DG} = 10 \text{ V}$ ,<br>$I_S = 0$                                                              |
| $C_{dgo}$ Drain-Gate Capacitance                                                    |        | 1.5  |         | 1.5  |        | 1.5  |         | 1.5  |        | 1.5  |        | 1.5  |        | 1.5  | pF              |                                                                                                     |
| NF Common Source Spot Noise Figure                                                  |        | 0.5  |         | 0.5  |        | 0.5  |         | 0.5  |        | 0.5  |        | 0.5  |        | 0.5  | dB              | $V_{DS} = 20 \text{ V}$ ,<br>$V_{GS} = 0$ ,<br>$R_G = 10 \text{ M}\Omega$ ,<br>$f = 100 \text{ Hz}$ |
| $ I_{G1} - I_{G2} $ Differential Gate Current                                       |        | 10   |         | 10   |        | 10   |         | 10   |        | 10   |        | 10   |        | 10   | nA              | $V_{DS} = 20 \text{ V}$ ,<br>$I_D = 200 \mu\text{A}$ ,<br>$T = 125^\circ\text{C}$                   |
| $I_{DSS1}/I_{DSS2}$ Drain Saturation Current Ratio                                  | 0.95   | 1.0  | 0.95    | 1.0  | 0.95   | 1.0  | 0.95    | 1.0  | 0.95   | 1.0  | 0.90   | 1.0  | 0.85   | 1.0  |                 | $V_{DS} = 20 \text{ V}$ ,<br>$V_{GS} = 0$                                                           |
| $ V_{GS1} - V_{GS2} $ Differential Gate-Source Voltage                              |        | 5.0  |         | 5.0  |        | 10.0 |         | 5.0  |        | 15   |        | 20   |        | 25   | mV              | $V_{DS} = 20 \text{ V}$ ,<br>$I_D = 200 \mu\text{A}$                                                |
| $\Delta V_{GS1} - V_{GS2}$ Gate-Source Differential Voltage Change with Temperature |        | 0.8  |         | 0.4  |        | 2.0  |         | 1.2  |        | 4.0  |        | 6.0  |        | 8.0  | mV              | $T = 25^\circ\text{C}$ to $-55^\circ\text{C}$                                                       |
|                                                                                     |        | 1.0  |         | 0.5  |        | 2.5  |         | 1.5  |        | 5.0  |        | 7.5  |        | 10.0 | mV              | $T = 25^\circ\text{C}$ to $125^\circ\text{C}$                                                       |
| $g_{fs1}/g_{fs2}$ Transconductance Ratio                                            | 0.97   | 1.0  | 0.97    | 1.0  | 0.97   | 1.0  | 0.95    | 1.0  | 0.95   | 1.0  | 0.90   | 1.0  | 0.85   | 1.0  |                 | $f = 1 \text{ kHz}$                                                                                 |