

# IT500-IT505

## Monolithic Dual Cascoded N-Channel JFET General Purpose Amplifier

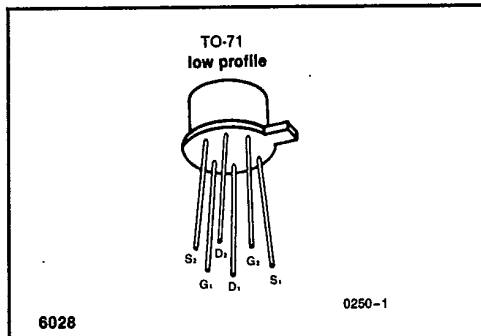


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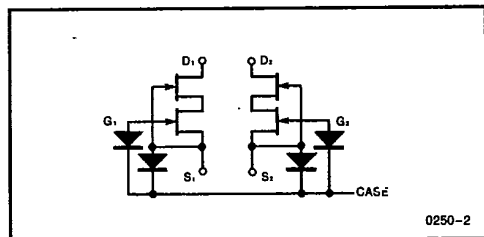
### GENERAL DESCRIPTION

A low noise, low leakage FET that employs a cascode structure to accomplish very low  $I_G$  at high voltage levels, while giving high transconductance and very high common, mode rejection ratio.

### PIN CONFIGURATION



### SCHEMATIC DIAGRAM



### FEATURES

- $C_{MRR} > 120\text{dB}$
- $I_G < 5\text{pA}$  @  $50\text{V}_{DG}$
- $C_{rss} < 0.5\text{pF}$
- $g_{os} > .025\mu\text{s}$

### ABSOLUTE MAXIMUM RATINGS

( $T_A = 25^\circ\text{C}$  unless otherwise specified)

|                                               |                                             |
|-----------------------------------------------|---------------------------------------------|
| Drain-Source and Drain-Gate Voltages (Note 1) | 60V                                         |
| Drain Current (Note 1)                        | 50mA                                        |
| Gate-Gate Voltage                             | $\pm 60\text{V}$                            |
| Storage Temperature                           | $-65^\circ\text{C}$ to $+200^\circ\text{C}$ |
| Operating Temperature                         | $-55^\circ\text{C}$ to $+150^\circ\text{C}$ |
| Lead Temperature (Soldering, 10sec)           | $+300^\circ\text{C}$                        |

|                                 | One Side                | Both Sides              |
|---------------------------------|-------------------------|-------------------------|
| Power Dissipation (Note 3)      | 250mW                   | 500mW                   |
| Derate above $25^\circ\text{C}$ | 3.8mW/ $^\circ\text{C}$ | 7.7mW/ $^\circ\text{C}$ |

NOTE 1. Per transistor.

NOTE 2. Due to the non-symmetrical structure of these devices, the drain and source ARE NOT interchangeable.

NOTE 3. @  $85^\circ\text{C}$  free air temp.

NOTE: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

### ORDERING INFORMATION

| TO-71 |
|-------|
| IT500 |
| IT501 |
| IT502 |
| IT503 |
| IT504 |
| IT505 |

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NOTE: All typical values have been characterized but are not tested.

**IT500-IT505****INTERSIL****IT500-IT505****ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise specified)

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| Symbol        | Characteristics                                        | Test Conditions                                                            | Limits            |       | Units                          |
|---------------|--------------------------------------------------------|----------------------------------------------------------------------------|-------------------|-------|--------------------------------|
|               |                                                        |                                                                            | Min               | Max   |                                |
| $I_{GSS}$     | Gate Reverse Current                                   | $V_{GS} = -20\text{V}$ , $V_{DS} = 0$ , $T_A = 125^\circ\text{C}$          |                   | -100  | pA                             |
|               |                                                        |                                                                            |                   | -5    | nA                             |
| $BV_{GSS}$    | Gate-Source Breakdown Voltage                          | $I_G = -1\mu\text{A}$ , $V_{DS} = 0$                                       | -50               |       |                                |
| $V_{GS(off)}$ | Gate-Source Cutoff Voltage                             | $V_{DS} = 20\text{V}$ , $I_D = 1\text{nA}$                                 | -0.7              | -4    | V                              |
| $V_{GS}$      | Gate-Source Voltage                                    |                                                                            | -0.2              | -3.8  |                                |
| $I_G$         | Gate Operating Current                                 | $V_{DG} = 35\text{V}$ , $I_D = 200\mu\text{A}$ , $T_A = 125^\circ\text{C}$ |                   | -5    | pA                             |
|               |                                                        |                                                                            |                   | -5    | nA                             |
| $I_{DSS}$     | Saturation Drain Current (Note 1)                      | $V_{DS} = 20\text{V}$ , $V_{GS} = 0$                                       | 0.7               | 7     | mA                             |
| $g_{fs}$      | Common-Source Forward Transconductance (Note 1)        | $V_{DS} = 20\text{V}$ , $V_{GS} = 0$                                       | 1000              | 4000  | $\mu\text{s}$                  |
| $g_{fs}$      | Common-Source Forward Transconductance (Note 1)        | $V_{DG} = 20\text{V}$ , $I_D = 200\mu\text{A}$                             | 500               | 1600  |                                |
| $g_{os}$      | Common-Source Output Conductance                       | $V_{DS} = 20\text{V}$ , $V_{GS} = 0$                                       |                   | 1     |                                |
| $g_{os}$      | Common-Source Output Conductance                       | $V_{DS} = 20\text{V}$ , $I_D = 200\mu\text{A}$                             |                   | 0.025 |                                |
| $C_{g1g2}$    | Gate to Gate Capacitance (Note 4)                      | $V_{G1} = V_{G2} = 10\text{V}$                                             |                   | 3.5   | pF                             |
| $C_{iss}$     | Common-Source Input Capacitance (Note 4)               | $V_{DS} = 20\text{V}$ , $V_{GS} = 0$                                       | $f = 1\text{MHz}$ | 7     | pF                             |
| $C_{rss}$     | Common-Source Reverse Transfer Capacitance (Note 3, 4) |                                                                            |                   | 0.5   |                                |
| NF            | Spot Noise Figure (Note 4)                             |                                                                            |                   | 0.5   | dB                             |
| $\bar{e}_n$   | Equivalent Input Noise Voltage (Note 4)                |                                                                            |                   | 50    | $\mu\text{V}/\sqrt{\text{Hz}}$ |
|               |                                                        |                                                                            | $f = 1\text{kHz}$ | 15    |                                |

| Symbol                   | Characteristics                         | Test Conditions                                                               | IT500 |     | IT501 |     | IT502 |     | IT503 |     | IT504 |     | IT505 |     | Units |
|--------------------------|-----------------------------------------|-------------------------------------------------------------------------------|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|
|                          |                                         |                                                                               | Min   | Max | Min   | Max | Min   | Max | Min   | Max | Min   | Max | Min   | Max |       |
| $I_{G1-I_{G2}}$          | Differential Gate Current               | $V_{DG} = 20\text{V}$ ,<br>$I_D = 200\mu\text{A}$ , $T_A = 125^\circ\text{C}$ |       | 5   |       | 5   |       | 5   |       | 5   |       | 10  |       | 15  | nA    |
| $I_{DSS1}$<br>$I_{DSS2}$ | Saturation Drain Current Ratio (Note 1) | $V_{DS} = 20\text{V}$ , $V_{GS} = 0\text{V}$                                  | 0.95  | 1   | 0.95  | 1   | 0.95  | 1   | 0.95  | 1   | 0.9   | 1   | 0.85  | 1   |       |
| $g_{fs1}/g_{fs2}$        | Transconductance Ratio (Note 1)         | $f = 1\text{kHz}$                                                             | 0.97  | 1   | 0.97  | 1   | 0.95  | 1   | 0.95  | 1   | 0.90  | 1   | 0.85  | 1   |       |

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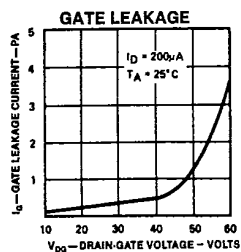
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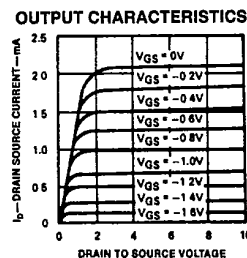
**ELECTRICAL CHARACTERISTICS** (Continued) ( $T_A = 25^\circ\text{C}$  unless otherwise specified)

| Symbol                   | Characteristics                      | Test Conditions                                       | IT500 |     | IT501 |     | IT502 |     | IT503 |     | IT504 |     | IT505 |     | Units                        |
|--------------------------|--------------------------------------|-------------------------------------------------------|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|------------------------------|
|                          |                                      |                                                       | Min   | Max | Min   | Max | Min   | Max | Min   | Max | Min   | Max | Min   | Max |                              |
| $V_{GS1}-V_{GS2}$        | Differential Gate-Source Voltage     | $V_{DG} = 20\text{V}$<br>$I_D = 200\mu\text{A}$       |       | 5   |       | 5   |       | 10  |       | 15  |       | 25  |       | 50  | mV                           |
| $\Delta V_{GS1}-V_{GS2}$ | Gate-Source Differential Voltage     | $V_{DG} = 20\text{V}$<br>$I_D = 200\mu\text{A}$       |       |     |       |     |       |     |       |     |       |     |       |     | $\mu\text{V}/^\circ\text{C}$ |
| $\Delta T$               | Change with Temp. (Note 2, 4)        |                                                       |       |     |       |     |       |     |       |     |       |     |       |     |                              |
|                          |                                      |                                                       |       |     |       |     |       |     |       |     |       |     |       |     |                              |
| $C_{MRR}$ (Note 5)       | Common Mode Rejection Ratio (Note 4) | $\Delta V_{DD} = 10\text{V}$ , $I_D = 200\mu\text{A}$ | 120   |     | 120   |     | 120   |     | 120   |     | 120   |     | 120   |     | dB                           |

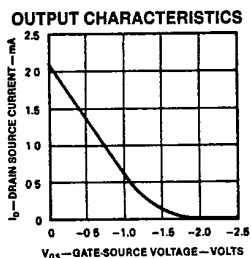
NOTES: 1. Pulse test required, pulsewidth = 300 $\mu\text{s}$ , duty cycle  $\leq 3\%$ .  
 2. Measured at end points,  $T_A$  and  $T_B$ .  
 3. With case guarded  $C_{RSS}$  is typically  $< 0.15\text{pF}$ .  
 4. For design reference only, not 100% tested.  
 5.  $C_{MRR} = 20 \log_{10} \Delta V_{DD} / \Delta [V_{GS1} - V_{GS2}]$ ,  $\Delta V_{DD} = 10 / -20\text{V}$

**TYPICAL PERFORMANCE CHARACTERISTICS**

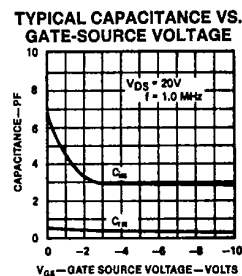
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