*Product Overview*

# *Pairing High-Speed JFET Amplifiers With Hi-Z DAQ Systems*

Wide-bandwidth data-acquisition (DAQ) systems (for example, oscilloscopes and active probes) use an analog front end (AFE) signal chain to capture high-frequency signals and fast-transient pulses. The input amplifier is the first stage in the signal chain of a wide-bandwidth DAQ system. The high input impedance (high-Z) and low bias current inputs of a JFET-input amplifier allow the measurement of small signals and help set the noise floor of the entire signal chain. JFET amplifiers are used as either unity-gain buffers (Figure 1) or in noninverting gain configurations (Figure 2) between the analog input signal and the analog-to-digital converter (ADC).

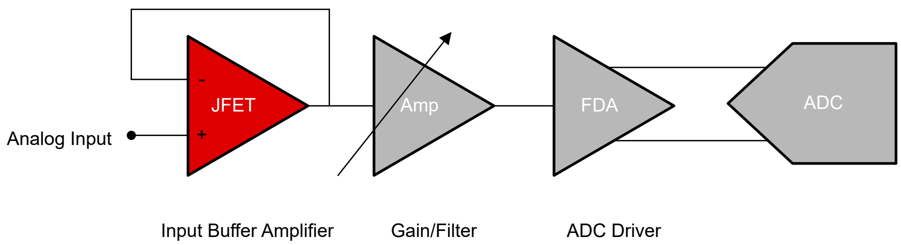


**Figure 1. Input JFET Amplifier in a Buffer Configuration in a Generic DAQ Front End**

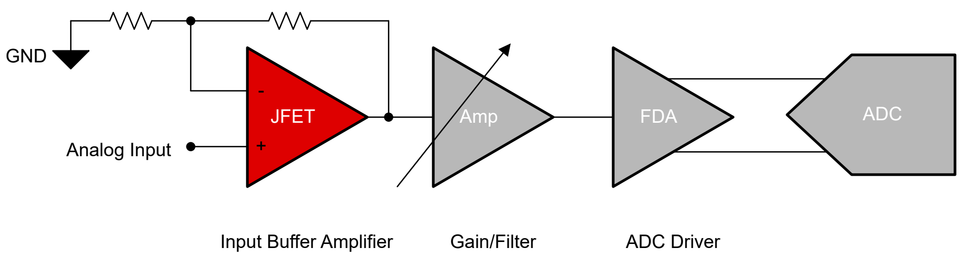


**Figure 2. Input JFET Amplifier in a Gain Configuration in a Generic DAQ Front End**

## Design Considerations

- Large signal bandwidth to measure a wide-frequency range of signals
- High-input impedance to prevent the loading of the measured signals
- Low noise to detect low-magnitude signals
- DC accuracy and precision for precise measurements
- Low bias current to minimize offset
- Output voltage swing to provide compatibility with subsequent stages
- Power consumption for battery-operated or thermal-sensitive systems
- Gain configuration or unity gain
- Learn about amplifier parameters with *TI precision lab video*
- Ask a question on our *TI E2E*™ forums
- Table 1 and Table 2 list the device selections

**Table 1. Recommended < 12V Parts**

| Parameter | BUF802 | OPA818 | OPA859 | OPA817 | OPA814 |
|---|---|---|---|---|---|
| $V_S$ MIN to MAX (V) | 9 to 13 | 6 to 13 | 3.3 to 5.25 | 6 to 12.6 | 6 to 12.6 |
| Large Signal Bandwidth ($2V_{PP}$) (MHz) | 1600 | 400 | 400 | 250 | 200 |
| Slew rate (V/µs) | 7000 | 1400 | 1150 | 100 | 700 |
| Input impedance (GΩ) | 50 | 500 | 1 | 60 | 60 |
| Noise (nV/√Hz) | 2.3 | 2.2 | 3.3 | 4.5 | 5.3 |
| Maximum Drift (µV/°C) | 1330(1) | 20 | N/A | 3.5 | 3.5 |
| Fixed Gain (V/V) | Yes | No | No | No | No |
| Maximum Bias Current (pA) | 25 | 25 | 5 | 20 | 20 |
| Output Voltage Swing (V) | $V_{S+}$ – 1.9, $V_{S-}$ + 3.4 | $V_{S+}$ – 0.5, $V_{S-}$ + 0.5 | $V_{S+}$ – 0.9, $V_{S-}$ + 2.2 | ±3.9 | ±3.9 |
| $I_Q$ (TYP) (mA) | 34 | 27.7 | 20.5 | 23.5 | 16 |
| Smallest Package Size (mm) | VQFN 3 × 3 | WSON 3 × 3 | WSON 3 × 3 | WSON 3 × 3 | SOT-23 2.9 × 2.8 |

(1) BUF802 package size and drift represent values for the standalone device not in a composite configuration.

**Table 2. Recommended > 24V Parts**

| Parameter | THS4631 | OPA810 |
|---|---|---|
| $V_S$ Min to Max (V) | 10 to 32 | 4.75 to 24 |
| Large Signal BW ($2V_{PP}$) (MHz) | 230 | 70 |
| Slew rate (V/µs) | 1000 | 200 |
| Input impedance (GΩ) | 10 | 12 |
| Noise (nV/√Hz) | 7 | 6.3 |
| Maximum Drift (µV/°C) | 10 | 10 |
| Fixed Gain (V/V) | No | No |
| Max Bias Current (pA) | 100 | 20 |
| Output Voltage Swing (V) | ±13.5 | $V_{S+}$ – 0.11, $V_{S-}$ + 0.08 |
| $I_Q$ (typ) (mA) | 11.5 | 3.7 |
| Smallest Package Size (mm) | HVSSOP 3 × 4.9 | SC70 2 × 1.25 |

For more devices, browse through the *online parametric tool* where you can sort by desired supply voltage, channel count, noise, and other features.

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