Micropower, High-Precision, RRIO Operational Amplifier for Automotive Sensors, Pumps, and Signal Conditioning

The AS333Q is an automotive-compliant, high-precision, operational amplifier (op amp). The device has an ultra-low input offset voltage (8μV), and near zero-drift over time and temperature for high-accuracy signal conditioning in automotive electronic control units (ECU).

This RRIO (rail-to-rail input and output) op amp uses chopper stabilization to minimize input offset voltage, reduce 1/f noise, and decrease input crossover-distortion present in most rail-to-rail input op amps. Its common-mode range is extended to 100mV beyond the supply rail and provides near zero-drift over time and temperature. The device is fully specified to operate from 1.8V to 5.5V single power supply.

The AS333Q features a good speed/power consumption ratio, offering 350kHz gain bandwidth while consuming only 17μA quiescent current. With a low input offset voltage of 8μV and a near zero-drift of 0.02μV/°C, combined with its 50mV from the rails output swing, this device is ideal for applications that require high precision and low power consumption.

The automotive-compliant AS333Q is AEC-Q100 grade 1 qualified, supporting a -40°C to +125°C ambient temperature range, and is available in the industry-standard SOT25 package. Its wide temperature range and high ESD capability facilitate its use in harsh automotive applications.

The DIODES Advantage

- **This micropower, zero-drift op amp is suitable for automotive, high-precision, current-consumption-sensitive applications.**
  - **Low 8μV Input Offset Voltage with Zero Drift Without Rail-Rail Input Crossover Disturbance**
    - Maintains accuracy across the input range, offering high-precision signal conditioning
  - **High Input Impedance With Tiny 70pA Input Bias Currents**
    - Enables interfacing with high-resistance sources without degradation of DC precision
  - **Micropower 17μA Quiescent Current**
    - Supports signal-conditioning applications that need to remain live even when the IC engine is not running
  - **350kHz Gain-Bandwidth Product with Low 1.1μV Input Noise Voltage**
    - Provides accurate signal conditioning from DC up to hundreds of kHz
  - **Robust ESD Capability (HBM: 4kV)**
    - Improves system reliability

Applications

- Automotive DC low-frequency signal conditioning in:
  - Vehicle sensor signal conditioning
  - Current sensing
  - Vehicle sensors
  - Filters
  - Vehicle pumps
New Product Announcement

**AS333Q**

**Typical Application**

Pressure Sensor

![Schematic diagram of a bridge excitation voltage V_DD connected to a voltage divider R1 and R2, with V_SENSE and V_DD/2 as inputs to an amplifier.]

Amplifier 1

Amplifier 2

V_OUT = V_SENSE * \left(1 + \frac{R_1}{R_2}\right) + \frac{V_DD}{2}

Analog Sensor

Pressure / Air / Flow / Smoke / Temperature / CO / CO2 etc

**Precision Micropower Automotive-Compliant Op Amps**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>RRIO</th>
<th>Supply Voltage</th>
<th>V_CM</th>
<th>V_OS</th>
<th>I_B</th>
<th>Channels</th>
<th>Supply Current</th>
<th>V_OUT</th>
<th>GBW</th>
<th>Low-Frequency Input Voltage Noise</th>
<th>Ambient Temperature Range</th>
<th>Package</th>
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<tbody>
<tr>
<td>AS333Q</td>
<td>Yes</td>
<td>1.8 to 5.5</td>
<td>V_CC ±0.1</td>
<td>8</td>
<td>0.2</td>
<td>1</td>
<td>17</td>
<td>V_CC ±0.05</td>
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<td>1.1</td>
<td>-40 to +125</td>
<td>SOT25</td>
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<tr>
<td>AS2333Q</td>
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<td>1.8 to 5.5</td>
<td>V_CC ±0.1</td>
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<td>24</td>
<td>V_CC ±0.05</td>
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<td>1.1</td>
<td>-40 to +125</td>
<td>SO-8</td>
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**Ordering Information**

<table>
<thead>
<tr>
<th>Orderable Part Number</th>
<th>Compliance (Only Automotive Supports PPAP)</th>
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<th>Moisture Sensitivity</th>
<th>Packing</th>
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<td>AS333QW5-7</td>
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<td>SOT25</td>
<td>MSL-1</td>
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