Figure 1. Physical Photos of AT8031

FEATURES

- Gain Bandwidth: 15kHz
- Rail to Rail Input and Output
- Input Offset Voltage: ±0.8mV (TYP)
- Input Offset Drift: ±2.3μV/°C
- Slew Rate: 7.5V/ms
- Low Noise: 2.4μV_{P-P} (0.1Hz to 10Hz)
- Input Voltage Range: −0.1V to +5.6V @Vs = 5.5V
- Supply Voltage Range: 1.4V to 5.5V
- Extended Temperature: −40°C to +125°C
- Micro Size Packages: SOT23-5

APPLICATIONS

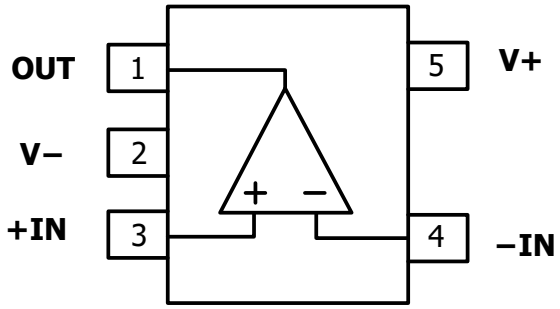
- Sensors
- Photodiode Amplification
- Wearable Products
- Temperature Measurement
- Battery Powered Instruments
- Medical Instruments
- Temperature Measurements

DESCRIPTION

The AT8031 features low-voltage operation, rail-to-rail input and output capabilities, and an outstanding speed-to-power consumption ratio. It provides excellent bandwidth (15kHz) and a slew rate of 7.5V/ms. This operational amplifier is unity gain stable and also has an ultra-low input bias current.

This device is well-suited for sensor interfaces, active filters, and portable applications. The operational amplifier AT8031 is specified for the full temperature range of −40°C to +125°C under single or dual power supplies ranging from 1.4V to 5.5V.

PIN CONFIGURATIONS



SOT23-5

PIN DESCRIPTION

Table 1: Pin Function

Pin #	Symbol	Description
1	OUT	Analog Output
3	+IN	Noninverting Input
4	−IN	Inverting Input
5	V+	Positive Power Supply
2	V−	Negative Power Supply

SPECIFICATIONS

Table 2. Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted) (1)

Parameter	Rating
Supply Voltage, V+ to V−	7.0V
Input Terminals, Voltage (2)	(V−) −0.5 to (V+) + 0.5V
Output Terminals, Voltage (3)	(V−) −0.5 to (V+) + 0.5V
Input Terminals, Current (2)	±10mA
Output Terminals, Current (3)	±50mA
Output Short-circuit (4)	Continuous
Storage Temperature	−65°C to +150°C
Operating Temperature	−40°C to +125°C
Junction Temperature	−40°C to +150°C
ESD Susceptibility	
Human-body model (HBM)	±8000V
Charge device model (CDM)	±500V
Machine Model (MM)	±300V

(1). Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those specified is not implied.

(2). Input terminals are diode-clamped to the power supply rails. Input signals that can swing more than 0.5V beyond the supply rails should be current-limited to 10mA or less.

(3). Output terminals are diode-clamped to the power-supply rails. Output signals that can swing more than 0.5V beyond the supply rails should be current-limited to ±55mA or less.

(4). Short-circuit to ground, one amplifier per package.

ESD CAUTION

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

THERMAL CHARACTERISTICS

Table 3.

Package Type	SOT23-5	Unit
$R_{\theta JA}$ Junction-to-ambient thermal resistance	237.8	°C/W
$R_{\theta JC}$ (top) Junction-to-case (top) thermal resistance	126.8	°C/W
$R_{\theta JB}$ Junction-to-board thermal resistance	85.9	°C/W
ψ_{JT} Junction-to-top characterization parameter	10.9	°C/W
ψ_{JB} Junction-to-board characterization parameter	84.9	°C/W

ELECTRICAL CHARACTERISTICS

(At T_A = +25°C, V_S =5V, R_L = 1MΩ connected to $V_S/2$, and V_{OUT} = $V_S/2$, unless otherwise noted.)

Table 4.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
POWER SUPPLY						
Operating Voltage Range	V_S		1.4		5.5	V
Quiescent Current/Amplifier	I_Q	V_O = 0 T_A = −40°C to +125°C		800	1500	nA
Power Supply Rejection Ratio	PSRR	V_S = 2.5V to 5.5V, V_{CM} = (V−)+0.5V	62	70		dB
INPUT						
Input Offset Voltage	V_{OS}	V_{CM} = $V_S/2$	−4	±0.8	4	mV
Input Offset Voltage Average Drift	V_{OS}/T_C	V_{CM} = $V_S/2$ T_A = −40°C to +125°C		±2.3		μV/°C
Input Bias Current	I_B	V_{CM} = $V_S/2$ T_A = −40°C to +125°C	−10	±1	10	pA
Input Offset Current	I_{OS}	T_A = −40°C to +125°C	−10	±1	10	pA
Common-Mode Voltage Range	V_{CM}	V_s = 5.5V	−0.1		5.6	V
Common-Mode Rejection Ratio	CMRR	V_s = 5.5V, V_{CM} = −0.1 to 4V	73	90		dB
		V_s = 5.5V, V_{CM} = −0.1 to 5.6V	60	83		dB
OUTPUT						
Open-Loop Voltage Gain	A_{OL}	V_s = 1.4V, R_L = 50kΩ, V_O = V_s − 0.1V	85	102		dB
		V_s = 5.0V, R_L = 50kΩ, V_O = V_s − 0.1V	92	106		dB
Output Swing from Rail		R_L = 50kΩ		5		mV
Output Short-Circuit Current	I_{SC}	T_A = −40°C to +125°C		30		mA
DYNAMIC PERFORMANCE						
Slew Rate	SR			7.5		V/ms
Gain Bandwidth Product	GBP			15		kHz
Phase Margin	PM			60		°
NOISE PERFORMANCE						
Voltage Noise	e_n p-p	f = 0.01Hz to 10Hz		2.4		μVp-p
Voltage Noise Density	e_n	f = 1kHz		160		nV/√Hz

TYPICAL CHARACTERISTICS

At T_A = +25°C, Vs = 5V, R_{LOAD} = 1MΩ connected to $V_S/2$, C_L=60pF, V_{CM} = $V_S/2$, unless otherwise noted.

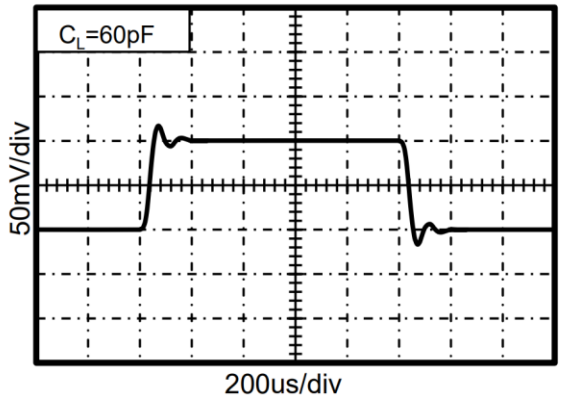


Figure 2. Small-Signal Step Response

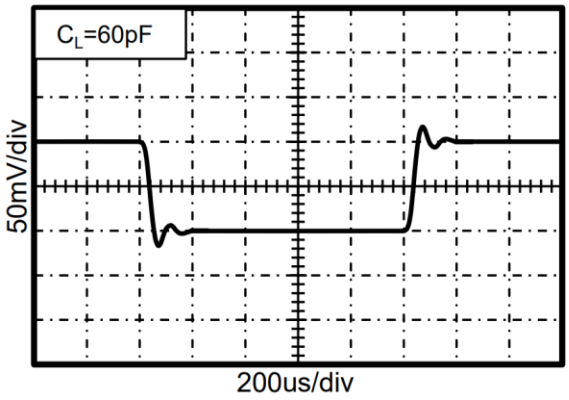


Figure 3. Small-Signal Step Response

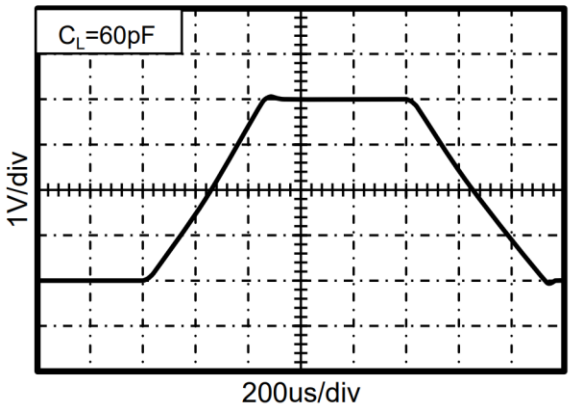


Figure 4. Large-Signal Step Response

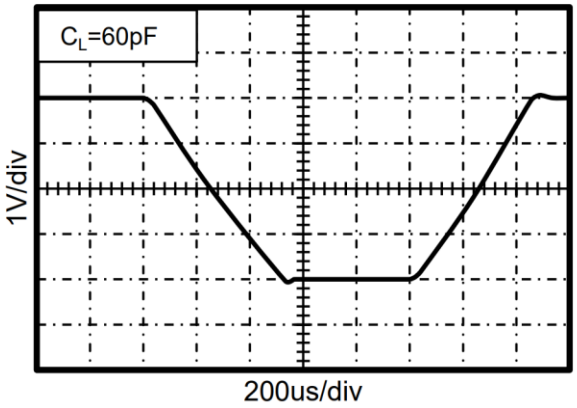


Figure 5. Large-Signal Step Response

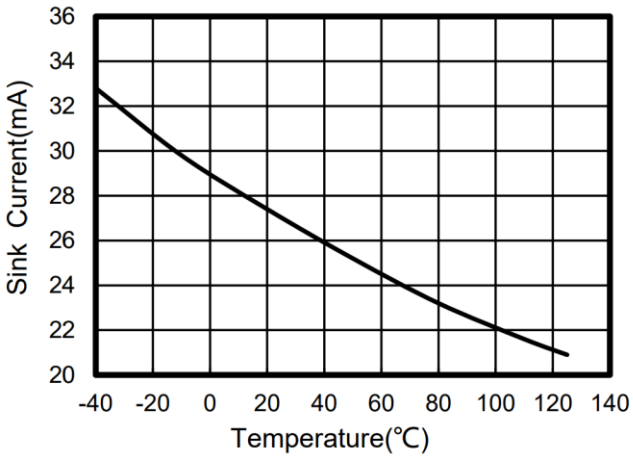


Figure 6. Sink Current vs Temperature

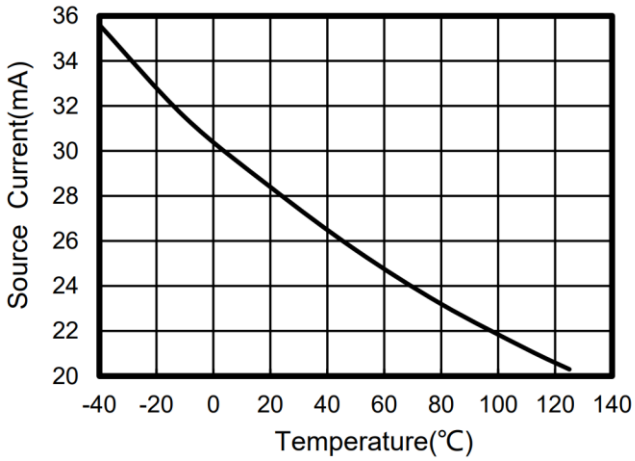
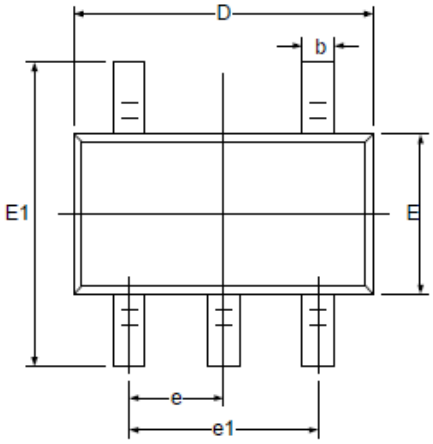
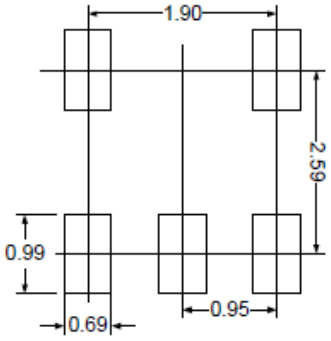


Figure 7. Source Current vs Temperature

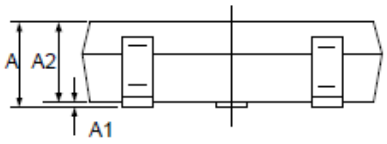
OUTLINE DIMENSIONS

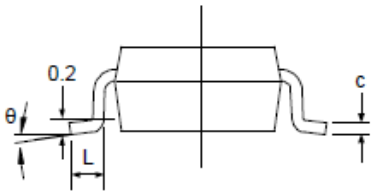
SOT23-5





RECOMMENDED LAND PATTERN (Unit: mm)





Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

ORDERING INFORMATION

Part Number	Buy Now
AT8031	

NOTICE

1. It is important to carefully read and follow the warnings, cautions, and product-specific notes provided with electronic components. These instructions are designed to ensure the safe and proper use of the component and to prevent damage to the component or surrounding equipment. Failure to follow these instructions could result in malfunction or failure of the component, damage to surrounding equipment, or even injury or harm to individuals. Always take the necessary precautions and seek professional assistance if unsure about proper use or handling of electronic components.
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