

# Comlinear® CLC1009, CLC1019, CLC2009

## 0.2mA, Low Cost, 2.5 to 5.5V, 35MHz Rail-to-Rail Amplifiers



### FEATURES

- 505µA supply current
- 75MHz bandwidth
- Power down to 33µA (CLC1019)
- Input voltage range with 5V supply: -0.3V to 3.8V
- Output voltage range with 5V supply: 0.07V to 4.86V
- 50V/µs slew rate
- 12nV/√Hz input voltage noise
- 15mA linear output current
- Fully specified at 2.7V and 5V supplies
- Replaces AD8031 in  $V_S \leq 5$  applications
- CLC2009: Pb-free MSOP-8, SOIC-8

### APPLICATIONS

- Portable/battery-powered applications
- Mobile communications, cell phones
- ADC buffer or Active filter
- Portable test instruments
- Signal conditioning
- Portable medical instrumentation

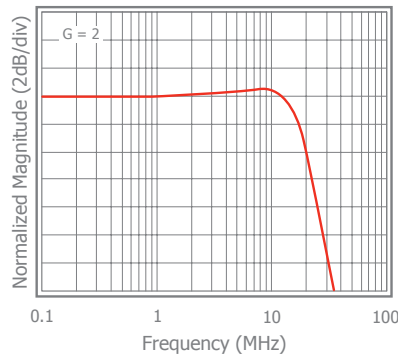
### General Description

The COMLINEAR CLC1009 (single), CLC1019 (single with disable), and CLC2009 (dual) are ultra-low power, low cost, voltage feedback amplifiers. These amplifiers use only 208µA of supply current and are designed to operate from a supply range of 2.5V to 5.5V ( $\pm 1.25$  to  $\pm 2.75$ ). The input voltage range extends 300mV below the negative rail and 1.2V below the positive rail.

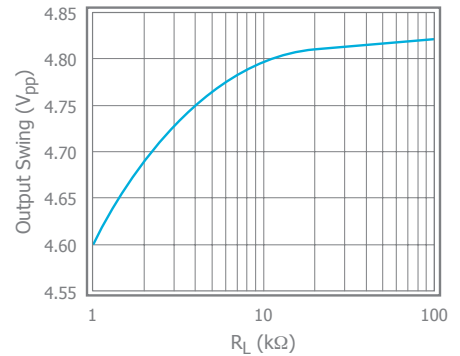
The CLC1009, CLC1019, and CLC2009 offer high bipolar performance at a low CMOS price. They offer superior dynamic performance with a 35MHz small signal bandwidth and 27V/µs slew rate. The combination of lowpower, high bandwidth, and rail-to-rail performance make the CLC1009, CLC1019, and CLC2009 well suited for battery-powered communication/ computing systems.

### Typical Performance Examples

Frequency Response



Output Swing vs.  $R_L$



### Ordering Information

Part Number	Package	Pb-Free	RoHS Compliant	Operating Temperature Range	Packaging Method
<b>CLC1009IST5X*</b>	SOT23-5	Yes	Yes	-40°C to +85°C	Reel
CLC1009ISO8X	SOIC-8	Yes	Yes	-40°C to +85°C	Reel
<b>CLC1019IST6X*</b>	SOT23-6	Yes	Yes	-40°C to +85°C	Reel
CLC1019ISO8X	SOIC-8	Yes	Yes	-40°C to +85°C	Reel
<b>CLC2009IMP8X*</b>	MSOP-8	Yes	Yes	-40°C to +85°C	Reel
CLC2009ISO8X	SOIC-8	Yes	Yes	-40°C to +85°C	Reel

Moisture sensitivity level for all parts is MSL-1. \*Advance Information, contact CADEKA for availability.

## Electrical Characteristics

$T_A = 25^\circ\text{C}$ ,  $V_S = +5\text{V}$ ,  $R_f = R_g = 2.5\text{k}\Omega$ ,  $R_L = 2\text{k}\Omega$  to  $V_S/2$ ,  $G = 2$ ; unless otherwise noted.

Parameter	Conditions	Min	Typ	Max	Units
Frequency Domain Response					
-3dB Bandwidth	$G = +1$ , $V_{OUT} = 0.05V_{pp}$ , $R_f = 0$		35		MHz
-3dB Bandwidth	$G = +2$ , $V_{OUT} < 0.2V_{pp}$		18		MHz
Large Signal Bandwidth	$G = +2$ , $V_{OUT} = 2V_{pp}$		8		MHz
Gain Bandwidth Product	$G = +11$ , $V_{OUT} = 0.2V_{pp}$		20		MHz
Time Domain Response					
Rise and Fall Time	$V_{OUT} = 0.2\text{V}$ step; (10% to 90%)		13		ns
Settling Time to 0.1%	$V_{OUT} = 1\text{V}$ step		140		ns
Overshoot	$V_{OUT} = 1\text{V}$ step		1		%
Slew Rate	$2\text{V}$ step, $G = -1$		27		V/ $\mu\text{s}$
Distortion/Noise Response					
2nd Harmonic Distortion	$V_{OUT} = 2V_{pp}$ , 100kHz		-78		dBc
3rd Harmonic Distortion	$V_{OUT} = 2V_{pp}$ , 100kHz		-66		dBc
THD	$V_{OUT} = 2V_{pp}$ , 100kHz		65		dB
Input Voltage Noise	> 10kHz		21		nV/ $\sqrt{\text{Hz}}$
DC Performance					
Input Offset Voltage <sup>(1)</sup>		-5	-1.5	5	mV
Average Drift			20		$\mu\text{V}/^\circ\text{C}$
Input Offset Current <sup>(1)</sup>		-1.3	0.37	1.3	$\mu\text{A}$
Input Bias Current <sup>(1)</sup>			1		nA/ $^\circ\text{C}$
Average Drift			7	130	nA
Power Supply Rejection Ratio <sup>(1)</sup>	DC	56	60		dB
Open-Loop Gain <sup>(1)</sup>	$V_{OUT} = V_S/2$	56	62		dB
Supply Current <sup>(1)</sup>	per channel		208	260	$\mu\text{A}$
Disable Characteristics					
Turn On Time			0.7		$\mu\text{s}$
Turn Off Time			4.5		$\mu\text{s}$
Off Isolation			72		dB
Disable Supply Current <sup>(1)</sup>			35		$\mu\text{A}$
Input Characteristics					
Input Resistance	Non-Inverting		>10		M $\Omega$
Input Capacitance			1.2		pF
Common Mode Input Range			-0.3 to 3.8		V
Common Mode Rejection Ratio <sup>(1)</sup>	DC, $V_{CM} = 0\text{V}$ to $V_S - 1.5$	65	95		dB
Output Characteristics					
Output Voltage Swing	$R_L = 2\text{k}\Omega$ to $V_S/2$ <sup>(1)</sup>	0.2 to 4.7	0.1 to 4.8		V
	$R_L = 10\text{k}\Omega$ to $V_S/2$		0.08 to 4.88		V
Output Current			$\pm 8.5$		mA
Short-Circuit Output Current	$V_{OUT} = V_S/2$		$\pm 13$		mA

## NOTES:

1) 100% tested at  $25^\circ\text{C}$

Refer to the data sheet for complete product specifications

For additional information regarding our products, please visit CADEKA at: [cadeka.com](http://cadeka.com)

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## Available Package

## CLC2009 SOIC-8

