



## ULV4347

Preliminary

CMOS IC

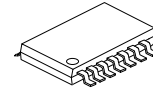
### MICROPOWER, RAIL-TO-RAIL OPERATIONAL AMPLIFIERS

#### DESCRIPTION

The UTC **ULV4347** is a microPower, low-cost operational amplifier available in micropackages. The UTC **ULV4347** (quad) is available in the TSSOP-14.

The small size and low power consumption (34µA per channel maximum) of the UTC **ULV4347** make it ideal for portable and battery-powered applications. The input range of the UTC **ULV4347** extends 200mV beyond the rails, and the output range is within 5mV of the rails.

The UTC **ULV4347** can be operated with a single or dual power supply from 2.5V to 5.5V.



TSSOP-14

#### FEATURES

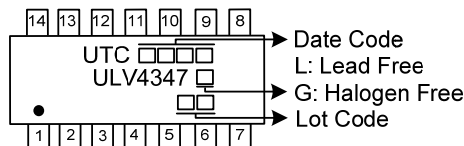
- \* Supply Voltage:2.5~5.5V
- \* Supply Current/Amplifier:34 µA (Max)
- \* Input Offset Voltage:8mV (Max)
- \* Rail-to-Rail Input and Output
- \* Slew Rate: 0.2V/µs (Typ.)

#### ORDERING INFORMATION

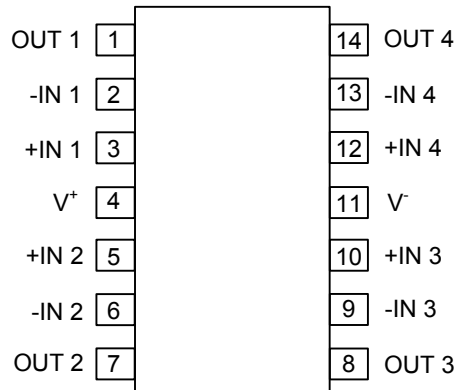
Ordering Number		Package	Packing
Lead Free	Halogen Free		
ULV4347L-P14-R	ULV4347G-P14-R	TSSOP-14	Tape Reel

<p>ULV4347G-P14-R</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) R: Tape Reel (2) P14: TSSOP-14 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
---	---

#### MARKING



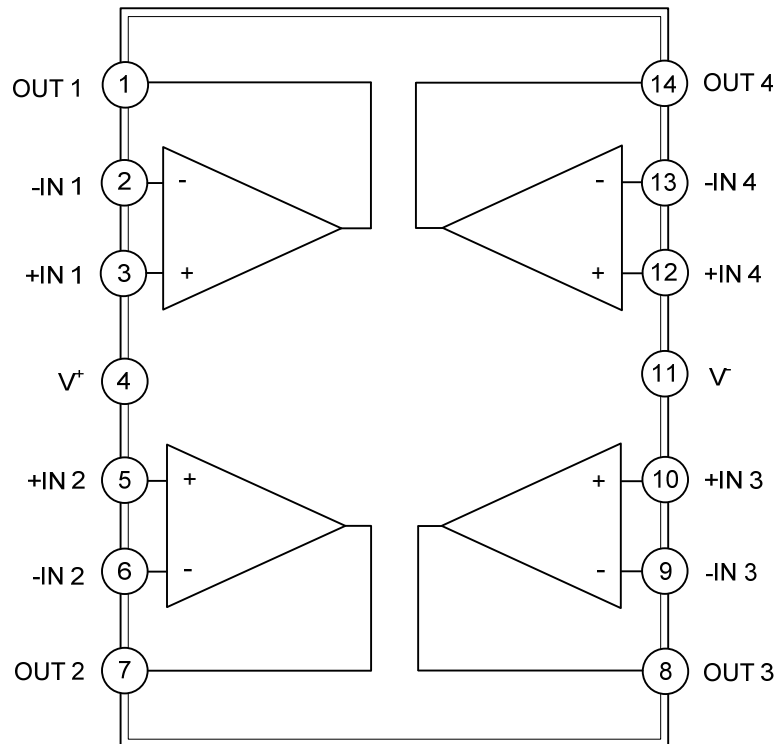
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	OUT 1	Output of 1 AMP
2	-IN 1	Inverting input of 1 AMP
3	+IN 1	Non-inverting input of 1 AMP
4	V <sup>+</sup>	Positive power supply
5	+IN 2	Non-inverting input of 2 AMP
6	-IN 2	Inverting input of 2 AMP
7	OUT 2	Output of 2 AMP
8	OUT 3	Output of 3 AMP
9	-IN 3	Inverting input of 3 AMP
10	+IN 3	Non-inverting input of 3 AMP
11	V <sup>-</sup>	Negative power supply
12	+IN 4	Non-inverting input of 4 AMP
13	-IN 4	Inverting input of 4 AMP
14	OUT 4	Output of 4 AMP

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V^+ - V^-$	7	V
Voltage at Input or Output Pin		$V^- - 0.5 \sim V^+ + 0.5$	V
Current at Input Pin	$I_i$	10	mA
Output Short-Circuit (Note 2)		Continuous	
Junction Temperature	$T_J$	+150	°C
Storage Temperature	$T_{STG}$	-65 ~ +150	°C

- Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation 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. Short-circuit to ground, one amplifier per package.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	110	°C/W

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V^+ - V^-$	2.5 ~ 5.5	V
Operating Free-Air Temperature	$T_{OPR}$	-40 ~ +125	°C

■ ELECTRICAL CHARACTERISTICS

( $T_A = 25^\circ\text{C}$ ,  $V^+ = 2.5 \sim 5.5\text{V}$ ,  $V^- = 0\text{V}$ ,  $V_{IC} = V^+ / 2$  V, and  $R_L = 100\text{k}\Omega$ , unless otherwise noted)

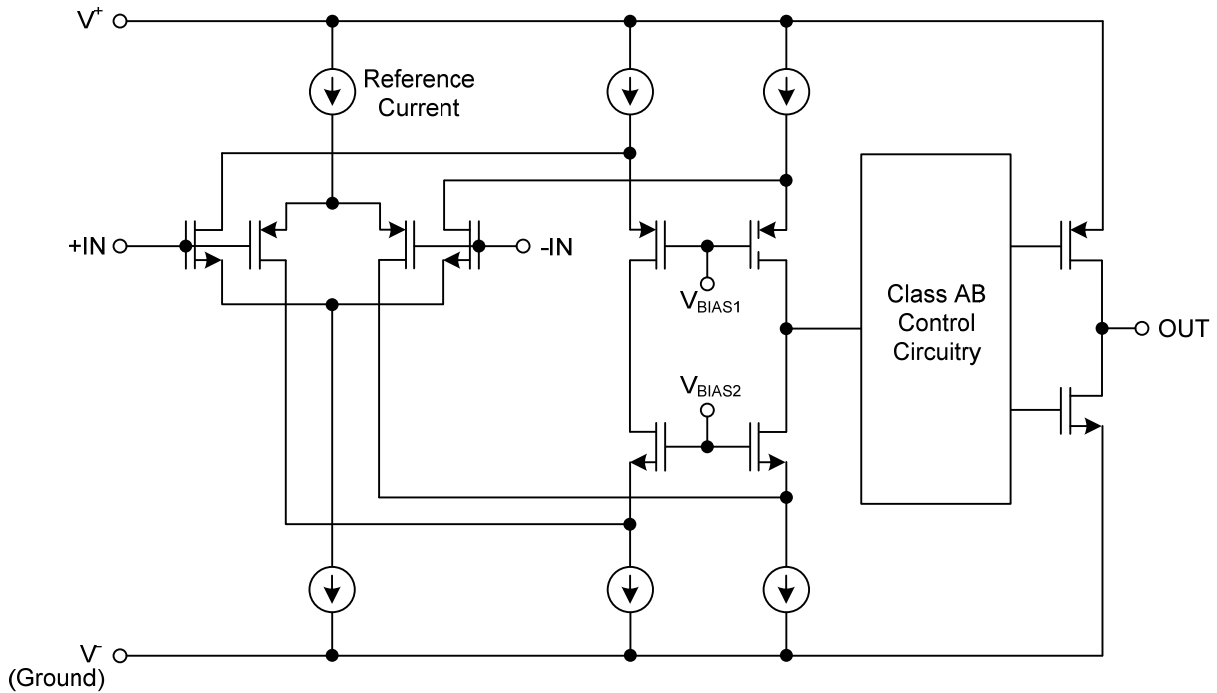
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Current/Amplifier	$I_Q$	$I_O = 0$		20	34	$\mu\text{A}$
Power Supply Rejection Ratio	PSRR	$V^+ = 2.5\text{V} \sim 5.5\text{V}$ , $V_{IC} < V^+ - 1.7\text{V}$	56	80		dB
Input Offset Voltage	$V_{OS}$	$V^+ = 5.5\text{V}$ , $V_{IC} = V^- + 0.8\text{V}$		2	8	mV
Input Offset Voltage Drift	$\Delta V_{OS} / \Delta T$			10		$\mu\text{V}/^\circ\text{C}$
Input Bias Current	$I_B$			$\pm 1$		pA
Input Offset Current	$I_{OS}$			$\pm 1$		pA
Common-Mode Voltage Range	$V_{CM}$		$V^- - 0.2$		$V^+ + 0.2$	V
Common-Mode Rejection Ratio	CMRR	$V^+ = 5.5\text{V}$ , $V^- - 0.2\text{V} < V_{IC} < V^+ - 1.7\text{V}$	68	80		dB
		$V^+ = 5.5\text{V}$ , $V^- - 0.2\text{V} < V_{IC} < (V^+) + 0.2\text{V}$	52	70		dB
Channel Separation, DC				0.3		$\mu\text{V}/\text{V}$
		$f = 1\text{kHz}$		128		dB

■ ELECTRICAL CHARACTERISTICS (Cont.)

( $T_A = 25^\circ\text{C}$ ,  $V^+ = 2.5 \sim 5.5\text{V}$ ,  $V^- = 0\text{V}$ ,  $V_{IC} = V^+/2$  V, and  $R_L = 100\text{k}\Omega$ , unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
Large Signal Voltage Gain	$A_v$	$V^+ = 5.5\text{V}$ , $R_L = 100\text{k}\Omega$ , $0.015\text{V} < V_O < 5.485\text{V}$	60	105		dB	
		$V^+ = 5.5\text{V}$ , $R_L = 5\text{k}\Omega$ , $0.125\text{V} < V_O < 5.375\text{V}$	60	105		dB	
Output Voltage	$V_O$	$R_L = 100\text{k}\Omega$	$V_{OH}$	$V^+ - 0.015$	$V^+ - 0.005$		V
			$V_{OL}$		0.005	0.015	V
		$R_L = 5\text{k}\Omega$	$V_{OH}$	$V^+ - 0.125$	$V^+ - 0.09$		V
			$V_{OL}$		0.09	0.125	V
Short-Circuit Current	$I_{SC}$			$\pm 11$		mA	
Slew Rate	SR	$G = +1$ , $C_L = 100\text{pF}$		0.2		V/ $\mu\text{s}$	
Gain-Bandwidth Product	GBW	$C_L = 100\text{pF}$		580		kHz	
Settling Time	$t_s$	0.1%, $V_S = 5\text{V}$ , 2V Step, $G = +1$		21		$\mu\text{s}$	
		0.01%, $V_S = 5\text{V}$ , 2V Step, $G = +1$		27		$\mu\text{s}$	
Overload Recovery Time		$V_{IN} \times \text{Gain} = V_S$		23		$\mu\text{s}$	
Input Voltage Noise		$f = 0.1\text{Hz} \sim 10\text{Hz}$		14		$\mu\text{V}_{P-P}$	
Input Voltage Noise Density	$e_n$	$f = 1\text{kHz}$		60		$\frac{\text{nV}}{\sqrt{\text{Hz}}}$	
Input Current Noise Density	$i_n$	$f = 1\text{kHz}$		0.7		$\frac{\text{fA}}{\sqrt{\text{Hz}}}$	

■ SIMPLIFIED SCHEMATIC



■ TYPICAL APPLICATION CIRCUIT

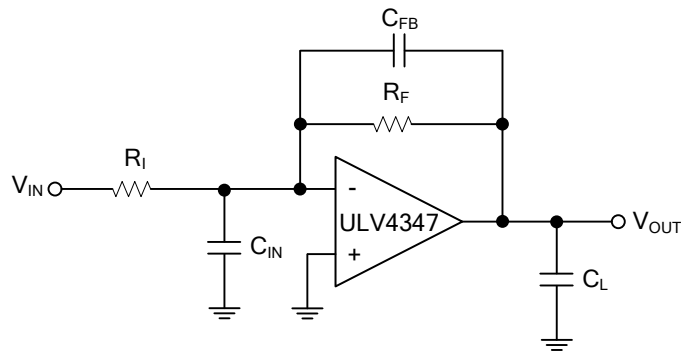


Figure 1. Adding a Feedback Capacitor In the Unity-Gain Inverter Configuration Improves Capacitive Load.

UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. UTC reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.