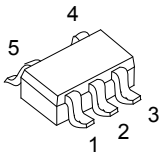
ULV377

CMOS IC

SINGLE CMOS OPERATIONAL AMPLIFIERS



SOT-25

■ DESCRIPTION

The UTC **ULV377** family of operational amplifiers are wide-bandwidth CMOS amplifiers that provide very low noise, low input bias current, and low offset voltage while operating on a low quiescent current of 680μA(typ). In addition, this device has a reasonably wide supply range with excellent PSRR, making it attractive for applications that run directly from batteries without regulation.

■ FEATURES

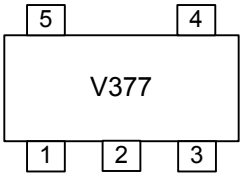
* Supply Voltage: 2.2 ~ 5.5V
* Supply Current/Amplifier: 1.05mA (Max.)
* Input Offset Voltage: 1mV (Max.)
* Rail-to-Rail Input and Output
* Slew Rate: 3.1V/μs (Typ.)

■ ORDERING INFORMATION

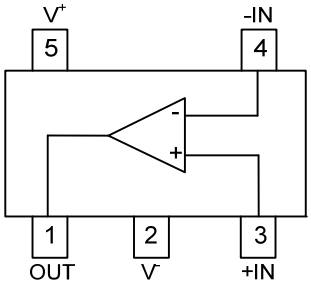
Ordering Number		Package	Packing
Lead Free	Halogen Free		
ULV377L-AF5-R	ULV377G-AF5-R	SOT-25	Tape Reel

ULV377G-AF5-R (1)Packing Type (2)Package Type (3)Green Package	(1) R: Tape Reel (2) AF5: SOT-25 (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



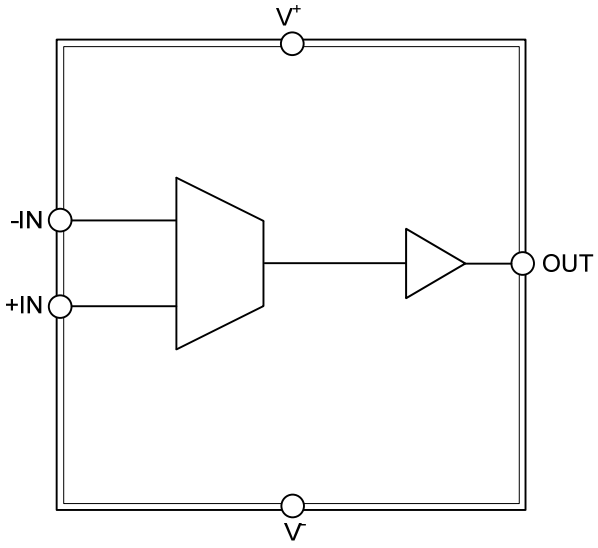
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	OUT	Output
2	V^-	Negative power supply
3	+IN	Non-inverting Input
4	-IN	Inverting Input
5	V^+	Positive power supply

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

over operating free-air temperature range (unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage, (V^+ - V^-)		7	V
Differential Input Voltage	V_{ID}	Supply Voltage	V
Signal input Current pin (Note 1)		±10	mA
Output Short-Circuit Current (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.

■ RECOMMENDED OPERATING CONDITIONS

over operating free-air temperature range (unless otherwise specified)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Supply Voltage	V^+ - V^-	2.2 (±1.1)		5.5 (±2.75)	V
Operating Free-Air Temperature	T_{OPR}	-40		+125	°C

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	230	°C/W

■ ELECTRICAL CHARACTERISTICS

(T_A =25°C, V^+ =5V, R_L=10kΩ, V_{CM} = V^+/2, and V_{OUT}= V^+ /2, unless otherwise specified.

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Supply Current/Amplifier	I_Q	I_O = 0, V_S =5.5V			0.68	1.05	mA
Power Supply Rejection Ratio	PSRR	V_S=2.2V ~ 5.5V, V_{CM} < (V^+) - 1.3V		87	110		dB
Input Offset Voltage	V_{OS}				0.5	1	mV
Input Offset Voltage Drift	$\Delta V_{OS}/\Delta T$				12		μV/°C
Input Bias Current	I_B				1		pA
Input Offset Current	I_{OS}				1		pA
Common-Mode Voltage Range	V_{CM}			V^- - 0.1		V^++0.1	V
Common-Mode Rejection Ratio	CMRR	V^- < V_{IC} < V^+ -1.3 V		70	100		dB
Large Signal Voltage Gain	A_V	V_O=±10V, R_L=2kΩ		87	110		dB
Output Voltage	V_O	R_L=10kΩ	V_{OH}	V^+-0.12	V^+-0.03		V
			V_{OL}		0.001	0.12	V
		R_L=2kΩ	V_{OH}	V^+-0.15	V^+-0.5		
			V_{OL}		0.001	0.14	
Short-Circuit Current	I_{SC}	Sourcing			50		
		Sinking			37		
Slew Rate	SR				3.1		V/μs
Gain-Bandwidth Product	GBW				5.5		MHz
Input-Referred Voltage Noise	e_n	f = 1kHz			18		nV/$\sqrt{Hz}$
Input-Referred Current Noise	i_n	f = 1kHz			0.01		pA/$\sqrt{Hz}$

■ APPLICATION INFORMATION

1. Basic Amplifier Configurations

The UTC **ULV377** family is unity-gain stable. It does not exhibit output phase inversion when the input is overdriven. A typical single-supply connection is shown in Figure 1. The UTC **ULV377** is configured as a basic inverting amplifier with a gain of -10V/V. This single-supply connection has an output centered on the common-mode voltage, V_{CM}. For the circuit shown, this voltage is 2.5V, but may be any value within the common-mode input voltage range.

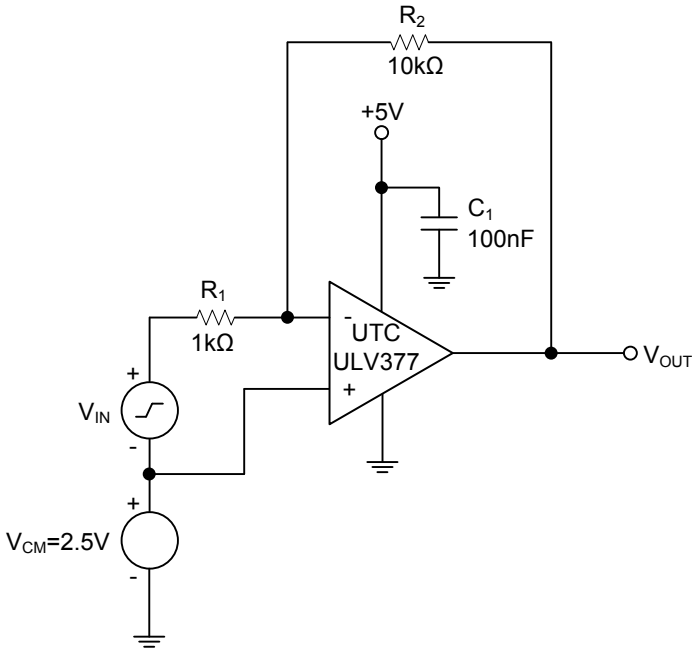


Figure 1. Basic Single-Supply Connection

■ APPLICATION INFORMATION (Cont.)

2. Active Filtering

The UTC **ULV377** is well-suited for filter applications requiring a wide bandwidth, fast slew rate, low-noise, single-supply operational amplifier. Figure 2 shows a 50-kHz, 2nd-order, low-pass filter. The components have been selected to provide a maximally-flat Butterworth response. Beyond the cutoff frequency, roll-off is -40dB/decade. The Butterworth response is ideal for applications requiring predictable gain characteristics such as the anti-aliasing filter used ahead of an analog-to-digital converter (ADC).

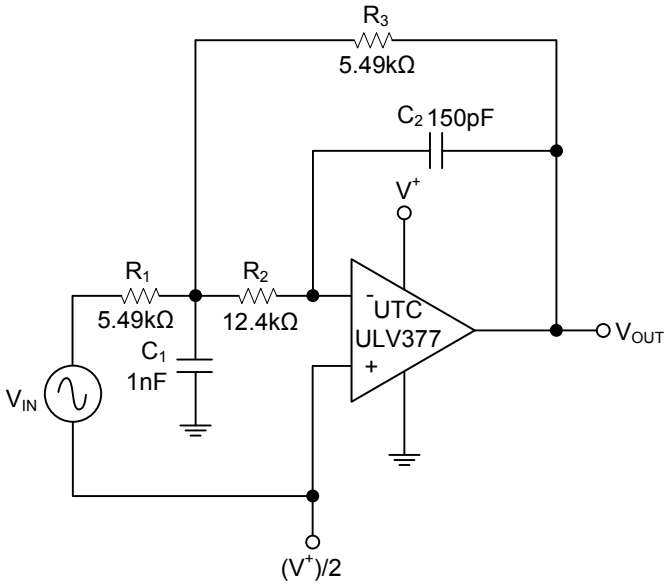


Figure 2. Second-Order, Butterworth, 50-kHz, Low-Pass Filter

■ TYPICAL APPLICATION CIRCUIT

Low-pass filters are commonly employed in signal processing applications to reduce noise and prevent aliasing. The UTC **ULV377** is ideally suited to construct high-speed, high-precision active filters. Figure 3 shows a second-order, low-pass filter commonly encountered in signal processing applications.

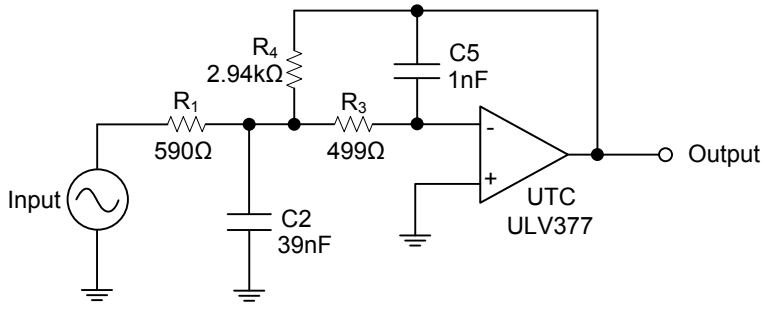
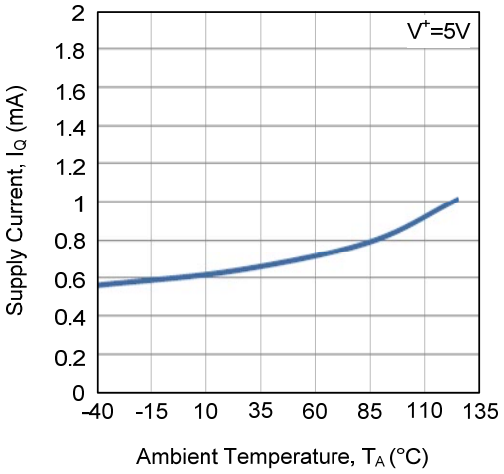


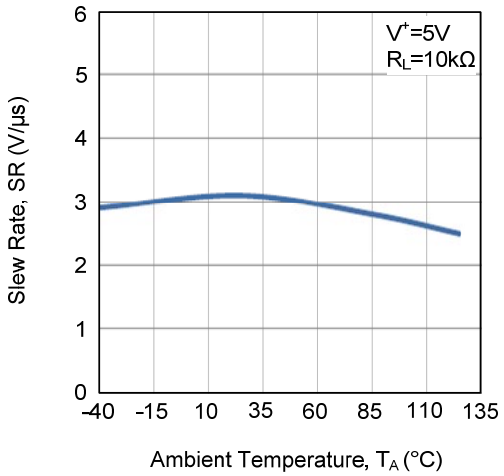
Figure 3. Typical Application Schematic

■ TYPICAL CHARACTERISTICS

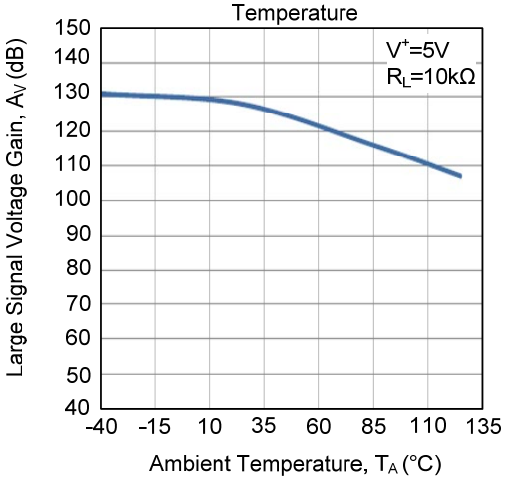
Supply Current vs. Temperature



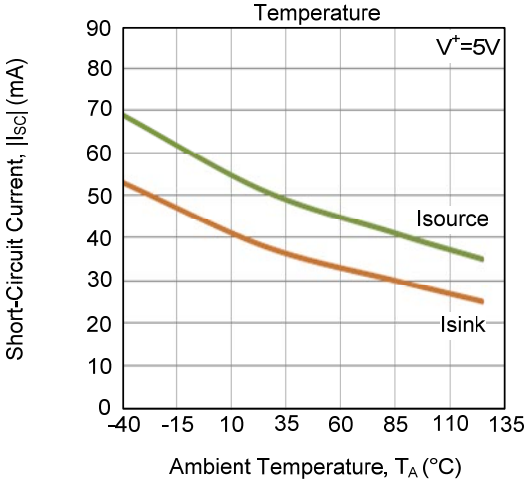
Slew Rate vs. Temperature



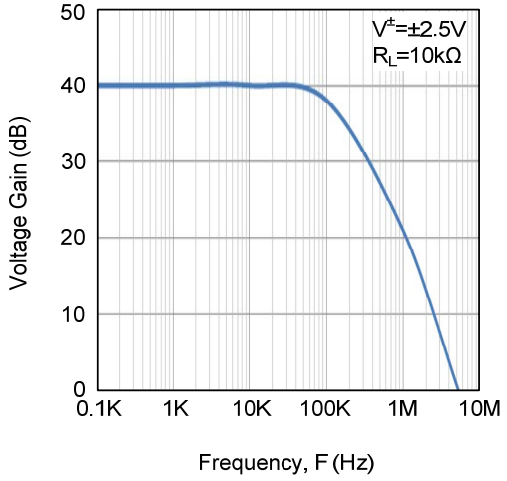
Large Signal Voltage Gain vs. Temperature



Output Short Circuit Current vs. Temperature



Voltage Gain vs. Frequency



Phase Shift vs. Frequency