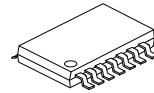


**ULV4333****CMOS IC****MICRO-POWER , ZERO-DRIFT,
RAIL-TO-RAIL INPUT/OUTPUT
CMOS QUAD OPERATIONAL
AMPLIFIERS****■ DESCRIPTION**

The UTC **ULV4333** CMOS quad operational amplifiers provide very low offset voltage and zero-drift over time and temperature.

The miniature, high precision, low quiescent current amplifiers offer high-impedance inputs that have a wide input common mode range of 100mV beyond the rails and rail-to-rail output that swings within 35mV of the rails. Single or dual supplies as low as 1.8V ($\pm 0.9V$) and up to 5.5V ($\pm 2.75V$) may be used. They are optimized for low voltage, single or dual supply operation.

The UTC **ULV4333** offers excellent CMRR without the crossover associated with traditional complementary input stages. This design results in superior performance for driving analog-to-digital converters (ADCs) without degradation of differential linearity.

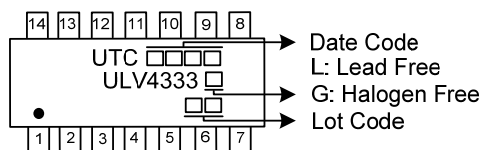
**TSSOP-14****■ FEATURES**

- * Supply Voltage: 1.8V ~ 5.5V
- * Supply Current: 105 μ A / amplifier (Typ.)
- * Input Offset Voltage: 25 μ V (Max.)
- * Rail-to-Rail Input/Output
- * Slew Rate: 0.25V/ μ s (Typ.)

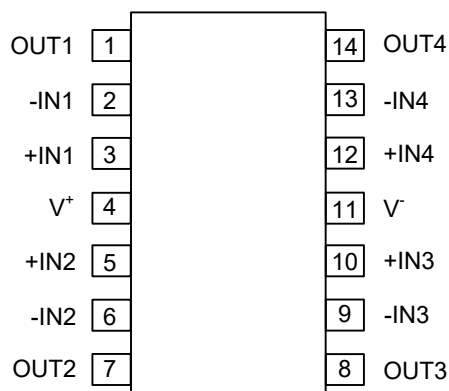
■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
ULV4333L-P14-R	ULV4333G-P14-R	TSSOP-14	Tape Reel

ULV4333G-P14-R (1) Packing Type (2) Package Type (3) Green Package	(1) R: Tape Reel (2) P14: TSSOP-14 (3) G: Halogen Free and Lead Free, L: Lead Free
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■ MARKING

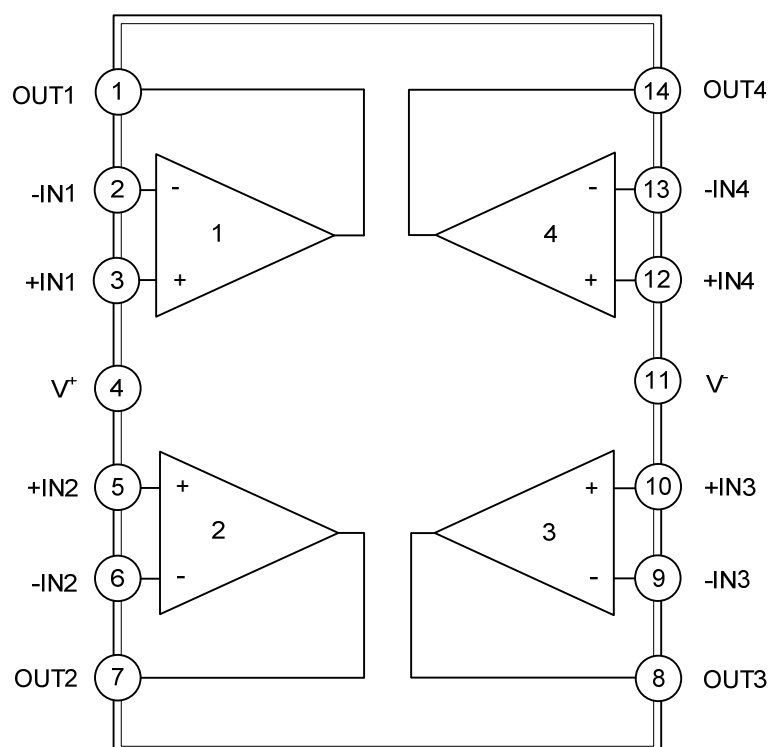
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	OUT1	Output of 1 AMP
2	-IN1	Inverting input of 1 AMP
3	+IN1	Non-inverting input of 1 AMP
4	V ⁺	Positive power supply
5	+IN2	Non-inverting input of 2 AMP
6	-IN2	Inverting input of 2 AMP
7	OUT2	Output of 2 AMP
8	OUT3	Output of 3 AMP
9	-IN3	Inverting input of 3 AMP
10	+IN3	Non-inverting input of 3 AMP
11	V ⁻	Negative power supply
12	+IN4	Non-inverting input of 4 AMP
13	-IN4	Inverting input of 4 AMP
14	OUT4	Output of 4 AMP

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V ⁺ - V ⁻	6.0	V
Input Voltage	V _{IN}	V ⁻ - 0.3 ~ V ⁺ + 0.3	V
Junction Temperature	T _J	+150	°C
Storage Temperature	T _{STG}	-65 ~ +150	°C

Note: 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.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V ⁺ - V ⁻	1.8 ~ 5.5	V
Operating Free-Air Temperature	T _{OPR}	-40 ~ +125	°C

■ ELECTRICAL CHARACTERISTICS

(T_A=25°C, V⁺=1.8~5.5V, R_L=10kΩ connected to V⁺/2, and V_{CM} = V⁺/2, V_{OUT} = V⁺/2, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Current/Amplifier	I _Q	I _{OUT} =0		105	148	μA
Power Supply Rejection Ratio	PSRR	V ⁺ =1.8V ~ 5.5V	93	120		dB
Input Offset Voltage	V _{OS}			14	25	μV
Input Bias Current	I _B			130		pA
Input Offset Current	I _{OS}			140		pA
Common-Mode Voltage Range	V _{CM}		V ⁻ -0.1		V ⁺ -0.1	V
Common-Mode Rejection Ratio	CMRR	V _{IC} =0V ~ 5V	89	110		dB
Output Voltage Swing from Rail	V _O	R _L =10kΩ		24	35	mV
Large Signal Voltage Gain	A _V	R _L =10kΩ	95	120		dB
Short-Circuit Current	I _{SC}	Sourcing, V _O = V ⁺		-32		mA
		Sinking, V _O = V ⁻		38		mA
Slew Rate	SR	G _V =1		0.25		V/μs
Gain-Bandwidth Product	GBW	C _L =100pF		350		KHz
Input-Referred Voltage Noise	e _n	f =0.1kHz~10Hz		2		nV/ √Hz

Note: Specified by design and characterization. Amplifiers are 100% production screened at 25°C to reduce defective units.

■ TYPICAL APPLICATION CIRCUIT

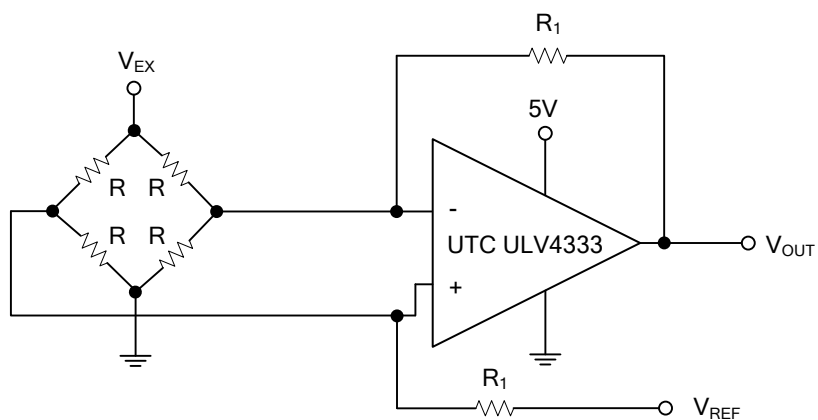


Figure 1. Single Op Amp Bridge Amplifier

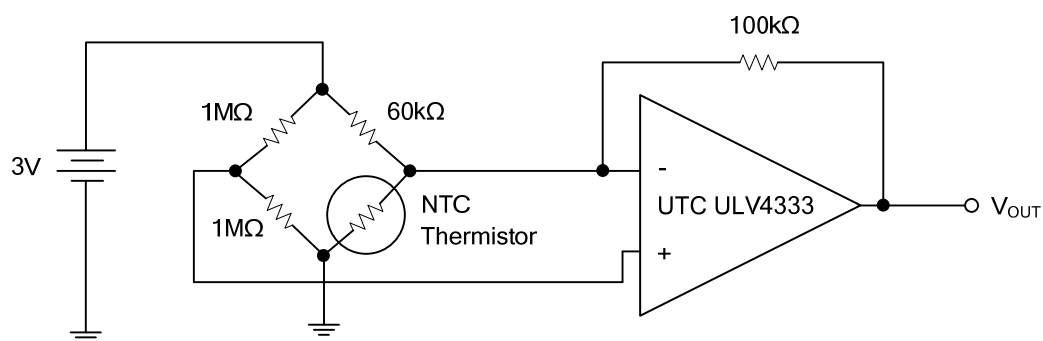
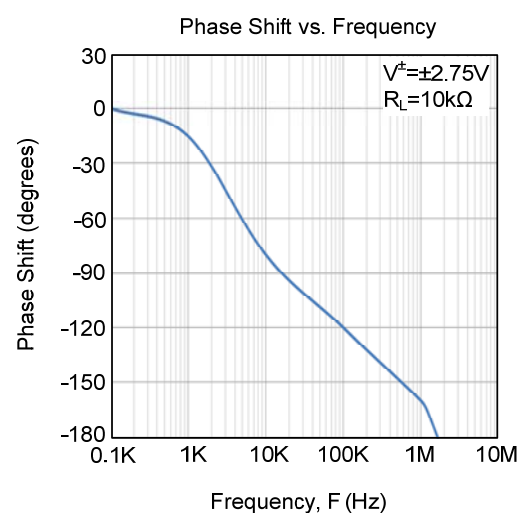
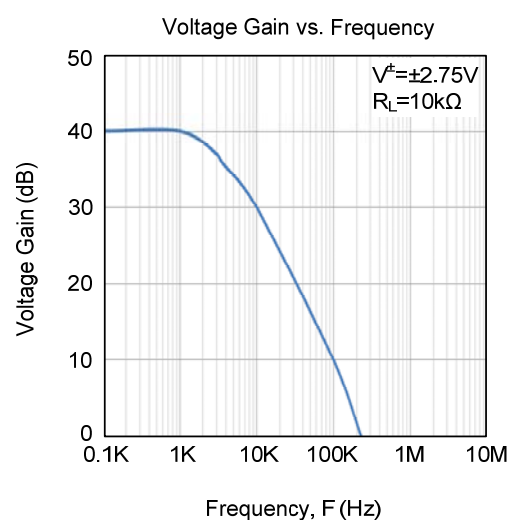
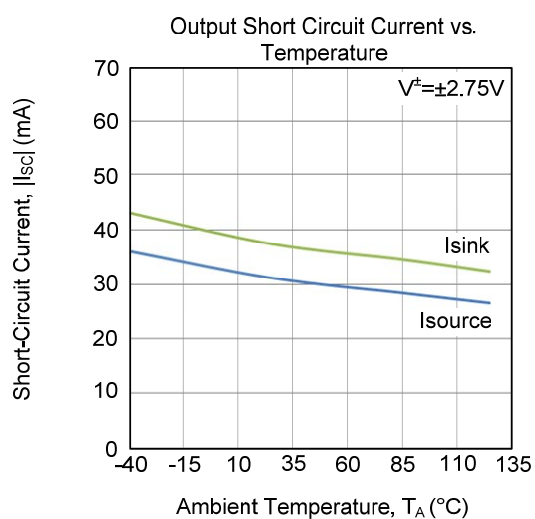
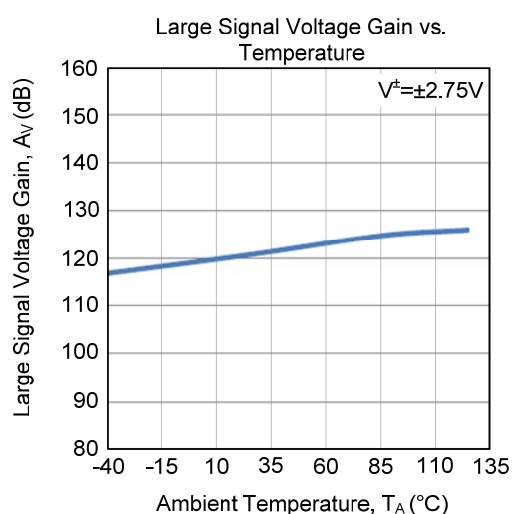
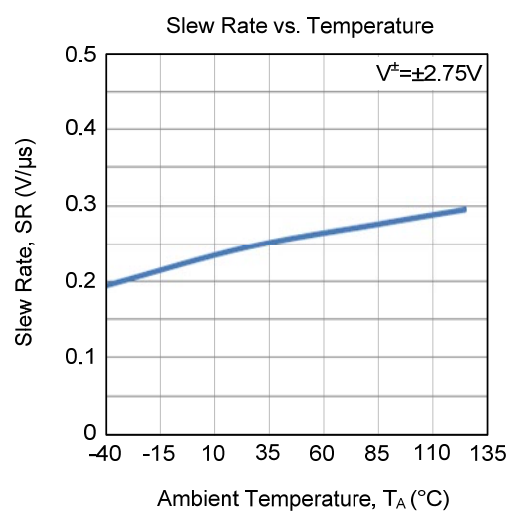
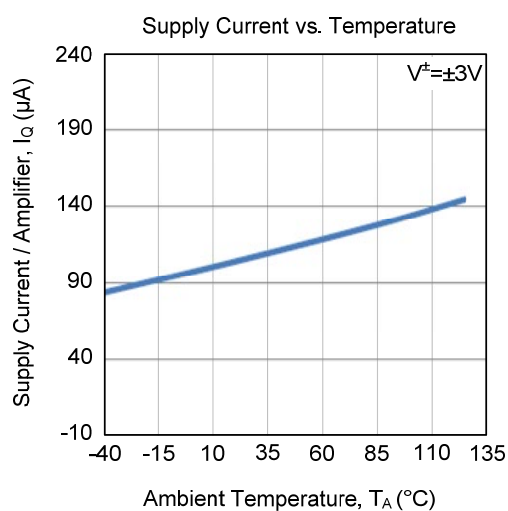


Figure 2. Thermistor Measurement

TYPICAL CHARACTERISTICS



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