

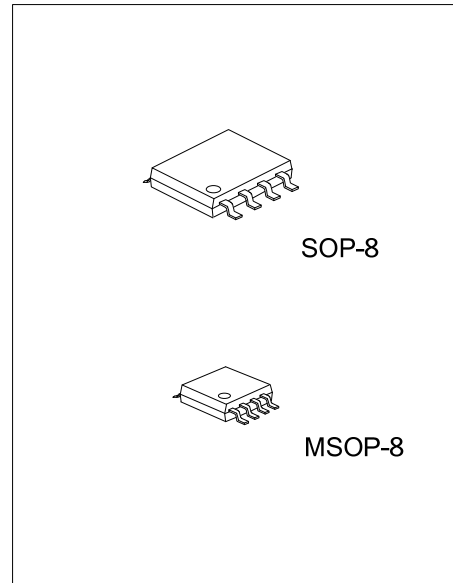


## ULV2333

Preliminary

CMOS IC

### MICRO-POWER, ZERO-DRIFT, RAIL-TO-RAIL INPUT/OUTPUT CMOS DUAL OPERATIONAL AMPLIFIERS



#### DESCRIPTION

The UTC **ULV2333** CMOS dual 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 **ULV2333** 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.

#### FEATURES

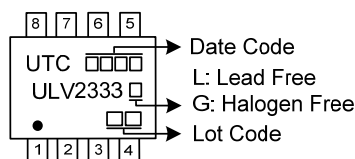
- \* Supply Voltage Range: 1.8V ~ 5.5V
- \* Supply Current: 80 $\mu$ A/Amplifier (Typ.)
- \* Low Offset Voltage: 25 $\mu$ V (Max.)
- \* Rail-to-Rail Input / Output
- \* Slew Rate: 0.25V/ $\mu$ s (Typ.)

#### ORDERING INFORMATION

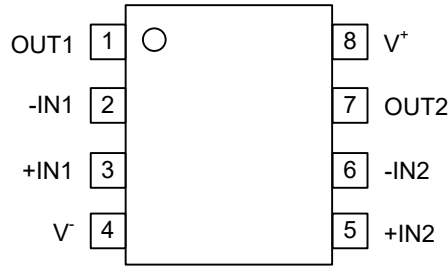
Ordering Number		Package	Packing
Lead Free	Halogen Free		
ULV2333L-S08-R	ULV2333G-S08-R	SOP-8	Tape Reel
ULV2333L-SM1-R	ULV2333G-SM1-R	MSOP-8	Tape Reel

<p>ULV2333G-S08-R</p> <ul style="list-style-type: none"> <li>(1) Packing Type</li> <li>(2) Package Type</li> <li>(3) Green Package</li> </ul>	<ul style="list-style-type: none"> <li>(1) R: Tape Reel</li> <li>(2) S08: SOP-8, SM1: MSOP-8</li> <li>(3) G: Halogen Free and Lead Free, L: Lead Free</li> </ul>
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#### MARKING



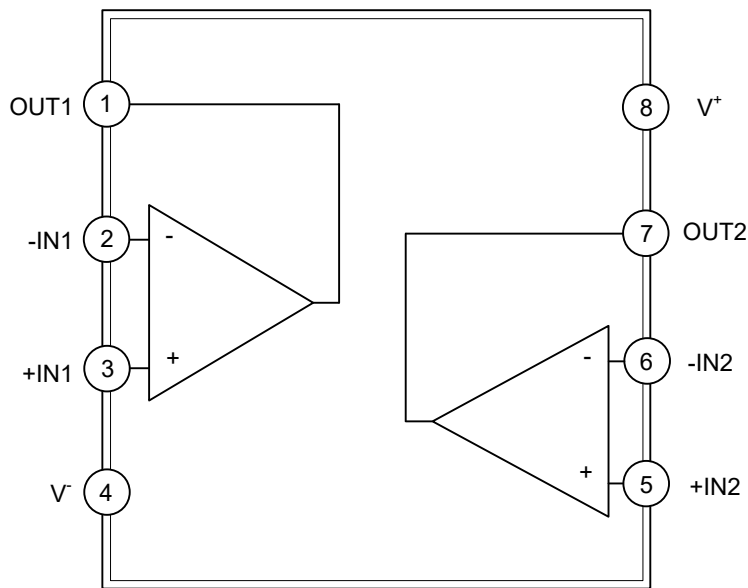
■ PIN CONFIGURATION



■ 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 <sup>-</sup>	Negative power supply
5	-IN2	Inverting input of 2 AMP
6	+IN2	Non-inverting input of 2 AMP
7	OUT2	Output of 2 AMP
8	V <sup>+</sup>	Positive power supply

■ BLOCK DIAGRAM



### ■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V^+ - V^-$	6.0	V
Input Voltage	$V_{IN}$	$V^- - 0.3 \sim V^+ + 0.3$	V
Junction Temperature	$T_J$	+150	°C
Storage Temperature Range	$T_{STG}$	-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	RATINGS	UNIT
Supply Voltage	$V^+ - V^-$	1.8 ~ 5.5	V
Operating Free-Air Temperature	$T_{OPR}$	-40 ~ +125	°C

### ■ ELECTRICAL CHARACTERISTICS

( $V^+=1.8\sim 5.5V$ ,  $R_L=10k\Omega$  connected to  $V^+/2$ , and  $V_{CM} = V^+/2$ ,  $V_{OUT} = V^+/2$ ,  $T_A=25^\circ C$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Current/Amplifier	$I_Q$	$I_{OUT}=0$		80	148	$\mu A$
Power Supply Rejection Ratio	PSRR	$V^+=1.8V \sim 5.5V$	93	120		dB
Input Offset Voltage	$V_{OS}$			14	25	$\mu V$
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	$V_{IC}=0V \sim 5V$	89	110		dB
Output Voltage Swing from Rail	$V_o$	$R_L=10k\Omega$		24	35	mV
Large Signal Voltage Gain	$A_V$	$R_L=10k\Omega$	95	121		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		$V/\mu s$
Gain-Bandwidth Product	GBW	$C_L=100pF$		350		KHz
Input-Referred Voltage Noise	$e_n$	$f=0.1kHz\sim 10Hz$		2		$nV/\sqrt{Hz}$

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

■ TYPICAL APPLICATION CIRCUIT

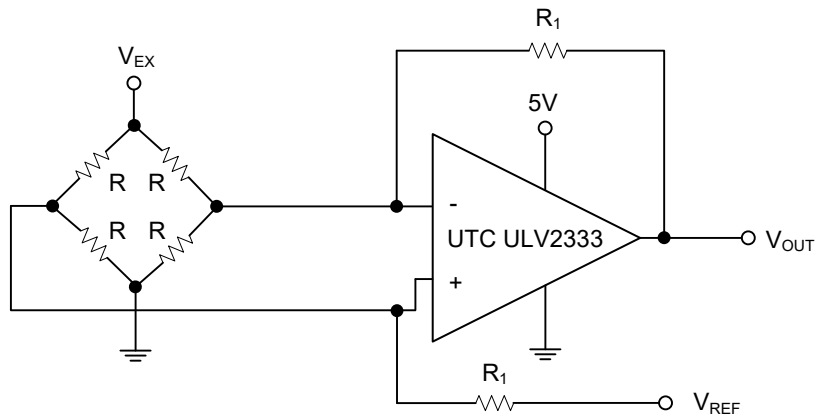


Figure 1. Bridge Amplifier Configuration

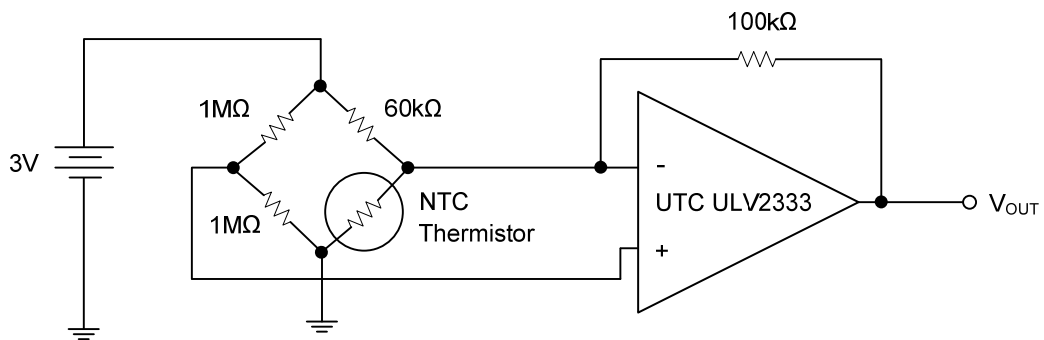


Figure 2. Thermistor Measurement

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