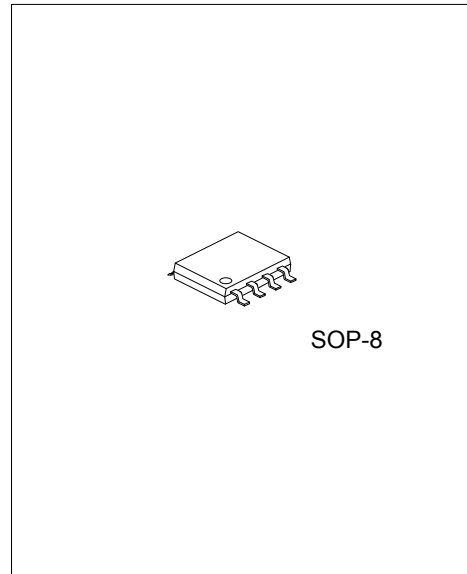




ULV333

CMOS IC

MICRO-POWER CMOS ZERO-DRIFT OPERATIONAL AMPLIFIERS



DESCRIPTION

The dual UTC **ULV333** CMOS 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 **ULV333** 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

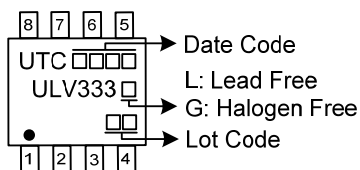
- * Supply Voltage Range: 1.8V~5.5V
- * Rail-to-Rail Input and Output
- * Low Offset Voltage: 25 μ V (Max.)
- * Quiescent Current: 120 μ A/Amplifier (Typ.)
- * Single or Dual Supply Operation
- * Integrated RFI Filter

ORDERING INFORMATION

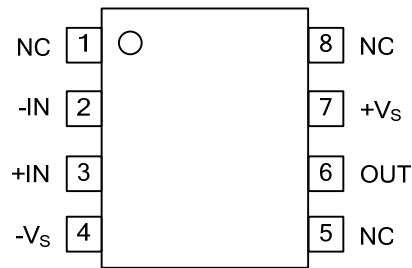
Ordering Number		Package	Packing
Lead Free	Halogen Free		
ULV333L-S08-R	ULV333G-S08-R	SOP-8	Tape Reel

<p>ULV333G-S08-R</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) R: Tape Reel (2) S08: SOP-8 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING



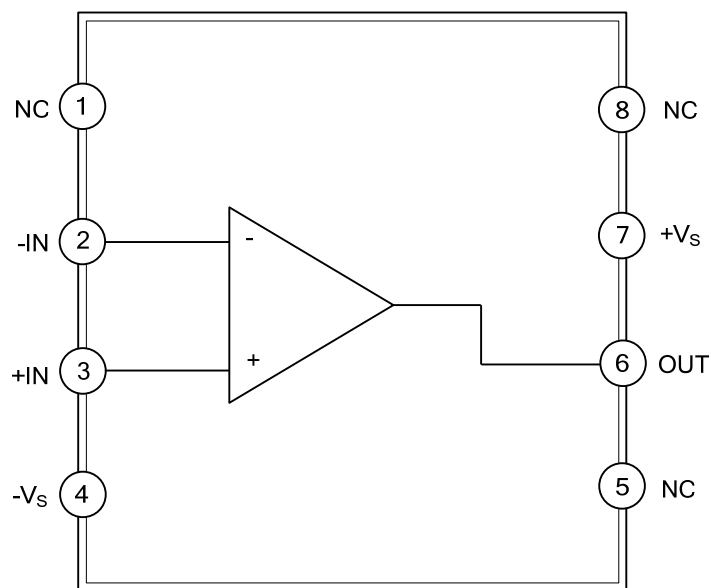
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1, 5, 8	NC	No connection
2	-IN	Inverting Input
3	+IN	Non-inverting Input
4	-Vs	Negative Power Supply
6	OUT	Output
7	+Vs	Positive Power Supply

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{CC}	6	V
Input Common Mode Voltage Range	V_{ICM}	$(-V_S) - 0.3 \sim (+V_S) + 0.3$	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
Specified Voltage Range	V_{CC}	1.8 ~ 5.5	V
Operating Temperature Range	T_A	-40 ~ +125	°C

■ ELECTRICAL CHARACTERISTICS

(At $T_A = +25^\circ\text{C}$, $V_S = 1.8\text{V} \sim 5.5\text{V}$, $V_{CM} = V_S/2$, $V_{OUT} = V_S/2$ and $R_L = 10\text{k}\Omega$, Full = $-40^\circ\text{C} \sim +125^\circ\text{C}$, unless otherwise noted.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
POWER SUPPLY							
Power Supply Rejection Ratio	PSRR	$V_S = 1.8\text{V} \sim 5.5\text{V}$	$T_A = 25^\circ\text{C}$	93	110	dB	
			Full Range	90		dB	
Quiescent Current	I_Q	$I_{OUT} = 0$	$T_A = 25^\circ\text{C}$		120	178	μA
			Full Range			212	μA
INPUT CHARACTERISTICS							
Input Offset Voltage	V_{OS}	$V_S = 5\text{V}$	$T_A = 25^\circ\text{C}$		14	25	μV
Input Offset Voltage Drift	$\Delta V_{OS}/\Delta T_A$	$T_A = -40^\circ\text{C} \sim +125^\circ\text{C}$		0.08		$\mu\text{V}/^\circ\text{C}$	
Input Bias Current	I_B			130		pA	
Common Mode Voltage Range	V_{CM}			$(-V_S) - 0.1$	$(+V_S) + 0.1$	V	
Common-Mode Rejection Ratio	CMRR	$(-V_S) - 0.1\text{V} < V_{CM} < (+V_S) + 0.1\text{V}$	$T_A = 25^\circ\text{C}$	89	100	dB	
			Full Range	85		dB	
Large Signal Voltage Gain	A_V	$(-V_S) + 0.1\text{V} < V_{OUT} < (+V_S) - 0.1\text{V}$, $R_L = 10\text{k}\Omega$	$T_A = 25^\circ\text{C}$	95	121	dB	
			Full Range	94		dB	
INPUT IMPEDANCE							
Differential		$T_A = +25^\circ\text{C}$		10^9		Ω	
Common Mode		$T_A = +25^\circ\text{C}$		10^9		Ω	
OUTPUT CHARACTERISTICS							
Output Voltage Swing from Rail		$R_L = 10\text{k}\Omega$	$T_A = 25^\circ\text{C}$	24	35	mV	
			Full Range			37	mV
Output Short-Circuit Current	I_{SC}	$V_S = 1.8\text{V}$		4		mA	
		$V_S = 5\text{V}$		40		mA	
Open-Loop Output Impedance		$f = 350\text{kHz}$, $I_{OUT} = 0$		1		k Ω	
DYNAMIC PERFORMANCE							
Slew Rate	SR	$G = +1$		0.25		V/ μs	
Gain-Bandwidth Product	GBW	$C_L = 100\text{pF}$		350		kHz	
Turn-On Time		$V_S = 5\text{V}$		200		μs	
NOISE							
Input Voltage Noise		$f = 0.1\text{Hz} \sim 10\text{Hz}$		2		μV_{P-P}	

■ TYPICAL APPLICATION CIRCUIT

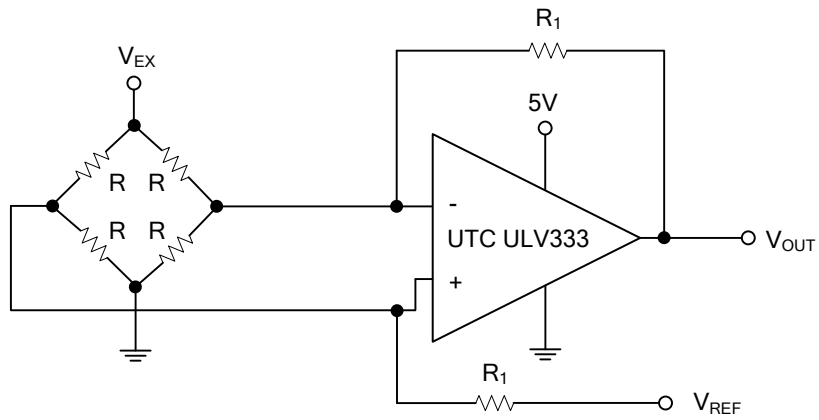


Figure 1. Bridge Amplifier Configuration

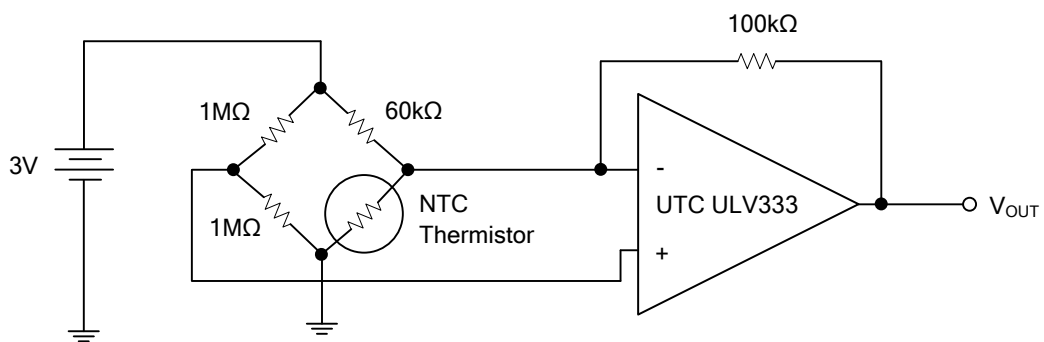


Figure 2. Thermistor Measurement

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