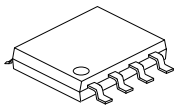
1.5V, 0.23μA/CH, ULTRALOW POWER, RAIL-TO-RAIL INPUT/OUTPUT DUAL CMOS OPERATIONAL AMPLIFIER



SOP-8

■ DESCRIPTION

The UTC **ULV7002** is dual ultralow power operational amplifiers designed to extend battery life and performance for portable applications. The operating voltage range of 1.5V to 5.5V and supply current of 0.23μA/ch (dual) typical, with stable over temperature and input voltage change make them deal for micropower oxygen sensors, gas sensors and remote sensor applications.

In addition to the ultralow power and low operating voltage, rail-to-rail input and output, input offset voltage of 3.0mV, input bias current of 1pA typical and ability to drive 470pF loads, make the UTC **ULV7002** series ideal when requiring excellent performance in battery powered applications.

■ FEATURES

* Supply Current: 0.23μA/ch typ.
* Operating Voltage: 1.5V~5.5V
* Input Offset Voltage: 3.0mV max.
* Input Bias Current: 1pA typ.
* Rail-to-Rail Input/Output
* CMOS Technology

■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
ULV7002L-S08-R	ULV7002G-S08-R	SOP-8	Tape Reel

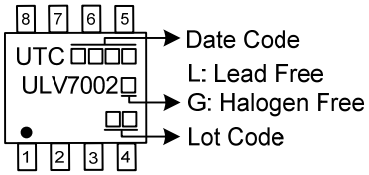
ULV7002G-S08-R

(1)Packing Type — (1) R: Tape Reel

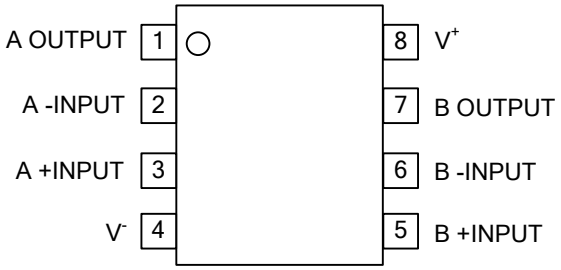
(2)Package Type — (2) S08: SOP-8

(3)Green Package — (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



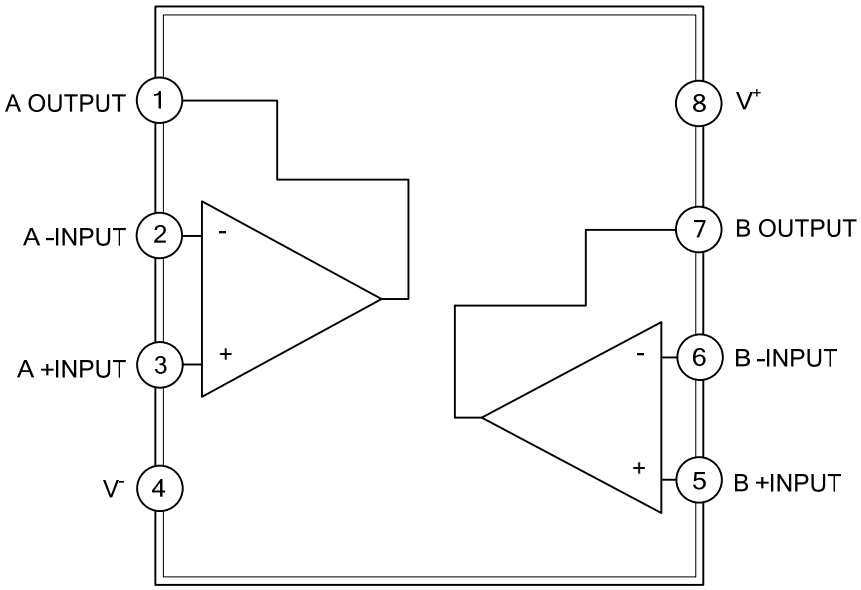
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	A OUTPUT	Output pin of A AMP
2	A -INPUT	Invert input pin of A AMP
3	A +INPUT	Non-invert input of A AMP
4	V^-	Negative (lowest) power supply
5	B +INPUT	Non-invert input of B AMP
6	B -INPUT	Invert input pin of B AMP
7	B OUTPUT	Output pin of B AMP
8	V^+	Positive (highest) power supply

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V^+ - V^-$	7	V
Differential Input Voltage (Note 1)	V_{ID}	±7 (Note 2)	V
Input Voltage	V_{IN}	$V^- - 0.3 \sim V^+ + 0.3$	V
Power Dissipation (Note 3)	P_D	500	mW
Operating Temperature Range	T_{OPR}	-40 ~ +105	°C
Storage Temperature Range	T_{STG}	-55 ~ +125	°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. Differential voltage is the voltage difference between +INPUT and -INPUT.
3. For supply voltage less than +7V, the absolute maximum rating is equal to the supply voltage.
4. Power dissipation is the power that can be consumed by the IC at T_A=25°C, and is the typical measured value based on JEDEC condition. When using the IC over T_A=25°C subtract the value [mW/°C]=P_D/ (T_{STG}(Max.)-25) per temperature.
2-layer: EIA/JEDEC STANDARD Test board (76.2x114.3x1.6mm, 2layers, FR-4) mounting.

■ RECOMMENDED OPERATING CONDITION (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	$V^+ - V^-$		1.5		5.5	V

■ ELECTRICAL CHARACTERISTICS

(V^+=5V, V^-=0V, V_{CM}=2.5V, R_L=100kΩ to 2.5V, T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
DC CHARACTERISTICS						
Supply Current (All Channel)	I_Q	No Signal		0.46	0.76	μA
Input Offset Voltage	V_{IO}	V_{CM}=0V		0.5	3.0	mV
Input Bias Current	I_B			1		pA
Input Offset Current	I_{IO}			1		pA
Voltage Gain	A_V	V_{OUT}=0.5V~4.5V	70	100		dB
Common-Mode Rejection Ratio	CMR	V_{CM}=0V~5V	60	80		dB
Supply Voltage Rejection Ratio	SVR	V^+=1.5V~5.5V, V_{CM}=0V	55	90		dB
Maximum Output Voltage	V_{OH}	R_L=100kΩ to 2.5V	4.9	4.95		V
	V_{OL}	R_L=100kΩ to 2.5V		0.05	0.1	V
Common-Mode Input Voltage Range	V_{ICM}	CMR≥60dB	0		5	V
AC CHARACTERISTICS						
Slew Rate	SR	G_V=0dB, C_L=20pF, V_{IN}=1Vpp		1		V/ms
Unity-Gain Frequency	f_T	G_V=20dB, C_L=20pF		1.1		kHz
Phase Margin	Φ_M	C_L=20pF		60		deg
Gain Margin	G_M	C_L=20pF		30		dB
Equivalent Input Noise Voltage	V_{NI}	f=100Hz		700		nV/√Hz

■ ELECTRICAL CHARACTERISTICS

(V^+=1.8V, V^-=0V, V_{CM}=0.9V, R_L=100kΩ to 0.9V, T_A=25°C unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
DC CHARACTERISTICS						
Supply Current (All Channel)	I_Q	No Signal		0.42	0.72	μA
Input Offset Voltage	V_{IO}	V_{CM}=0V		0.5	3.0	mV
Input Bias Current	I_B			1		pA
Input Offset Current	I_{IO}			1		pA
Voltage Gain	A_V	V_{OUT}=0.5V~1.3V	70	100		dB
Common-Mode Rejection Ratio	CMR	V_{CM}=0V~1.8V	55	80		dB
Supply Voltage Rejection Ratio	SVR	V^+=1.5V~5.5V, V_{CM}=0V	55	90		dB
Maximum Output Voltage	V_{OH}	R_L=100kΩ to 0.9V	1.7	1.75		V
	V_{OL}	R_L=100kΩ to 0.9V		0.05	0.1	V
Common-Mode Input Voltage Range	V_{ICM}	CMR≥55dB	0		1.8	V
AC CHARACTERISTICS						
Slew Rate	SR	G_V=0dB, C_L=20pF, V_{IN}=1Vpp		0.9		V/ms
Unity-Gain Frequency	f_T	G_V=20dB, C_L=20pF		1		kHz
Phase Margin	Φ_M	C_L=20pF		60		deg
Gain Margin	G_M	C_L=20pF		30		dB
Equivalent Input Noise Voltage	V_{NI}	f=100Hz		800		nV/√Hz

■ TYPICAL APPLICATION CIRCUIT