

**ULV7002****CMOS IC****ULTRALOW POWER,
RAIL-TO-RAIL INPUT/OUTPUT
DUAL CMOS OPERATIONAL
AMPLIFIER****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 0.15 μ A/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 4.0mV, make the UTC **ULV7002** series ideal when requiring excellent performance in battery powered applications.

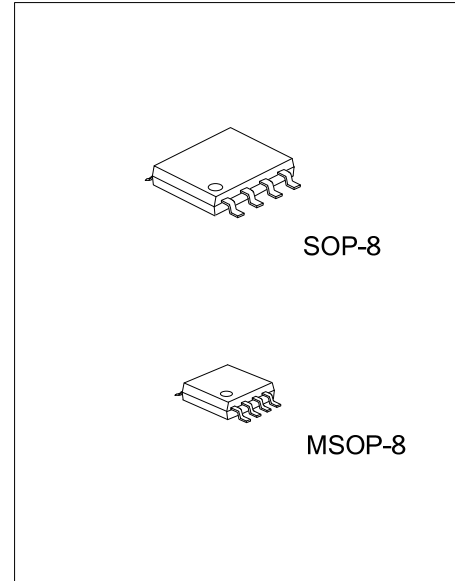
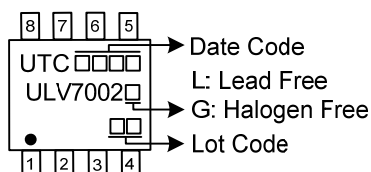
FEATURES

- * Supply Voltage: 1.5~5.5V
- * Supply Current/Amplifier: 0.15 μ A/ch typ
- * Input Offset Voltage: 4.0mV (Max)
- * Rail-to-Rail Input/Output
- * Slew Rate: 1.3V/ms (Typ.)

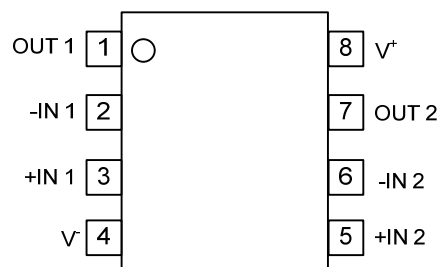
ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
ULV7002L-S08-R	ULV7002G-S08-R	SOP-8	Tape Reel
ULV7002L-SM1-R	ULV7002G-SM1-R	MSOP-8	Tape Reel

ULV7002G-S08-R (1) Packing Type (2) Package Type (3) Green Package	(1) R: Tape Reel (2) S08: SOP-8, SM1: MSOP-8 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING

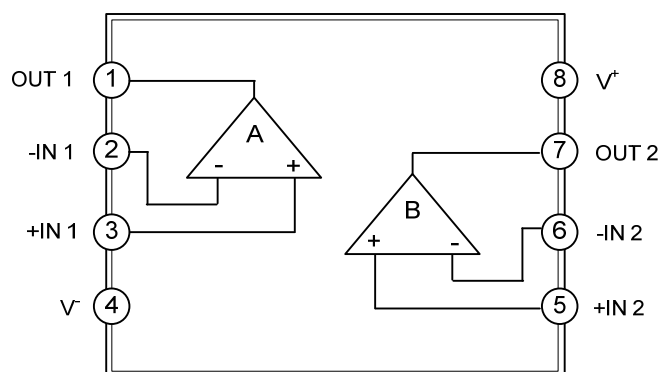
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	OUT 1	Output of 1 AMP
2	-IN 1	Inverting input of 1 AMP
3	+IN 1	Non-inverting input of 1 AMP
4	V ⁻	Negative power supply
5	+IN 2	Non-inverting input of 2 AMP
6	-IN 2	Inverting input of 2 AMP
7	OUT 2	Output of 2 AMP
8	V ⁺	Positive 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
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 $T_A=25^\circ\text{C}$, and is the typical measured value based on JEDEC condition. When using the IC over $T_A=25^\circ\text{C}$ subtract the value
 $[\text{mW}/^\circ\text{C}] = P_D / (T_{STG}(\text{Max.}) - 25)$ per temperature.

2-layer: EIA/JEDEC STANDARD Test board (76.2x114.3x1.6mm, 2layers, FR-4) mounting.

■ RECOMMENDED OPERATING CONDITION ($T_A=25^\circ\text{C}$, unless otherwise specified)

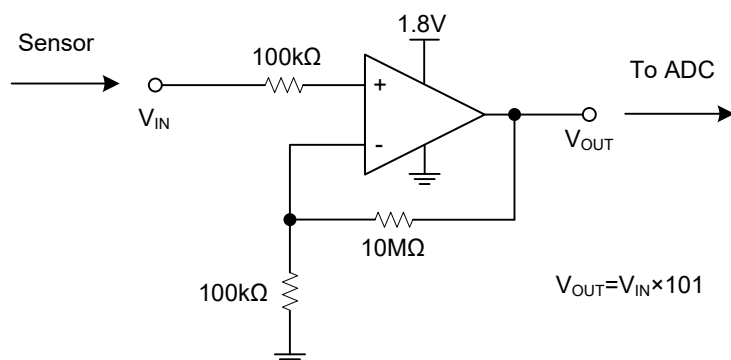
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	$V^+ - V^-$		1.5		5.5	V
Operating Temperature Range	T_{OPR}		-40		+125	°C

■ ELECTRICAL CHARACTERISTICS

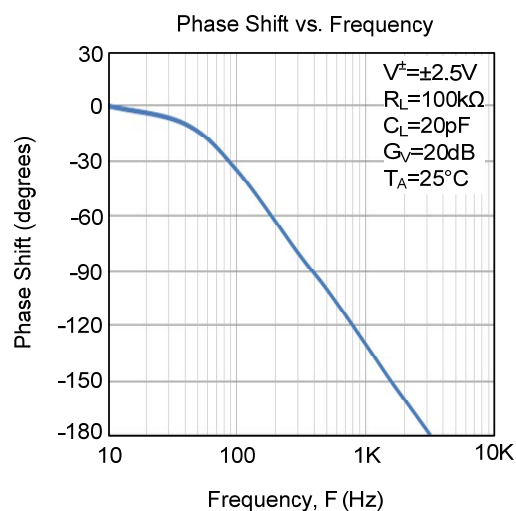
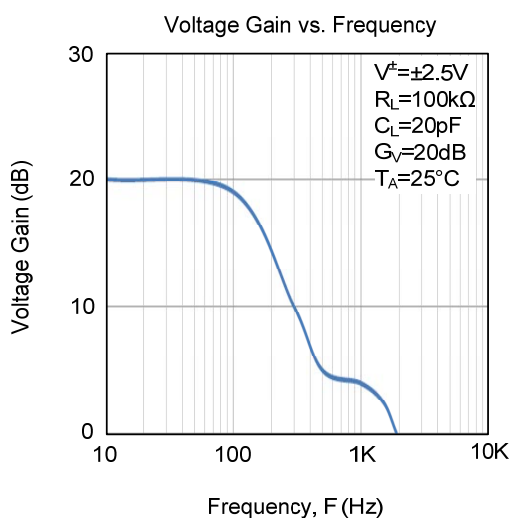
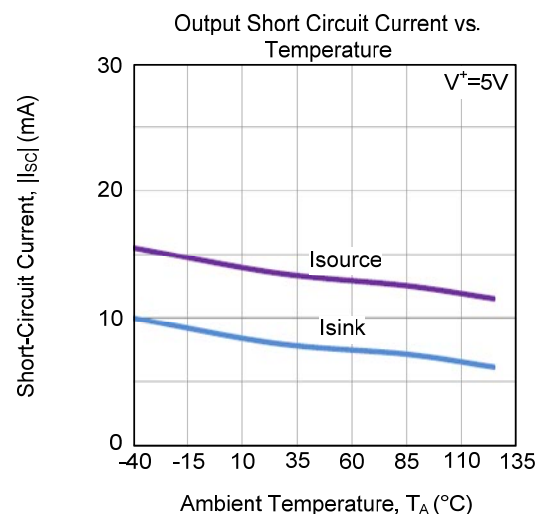
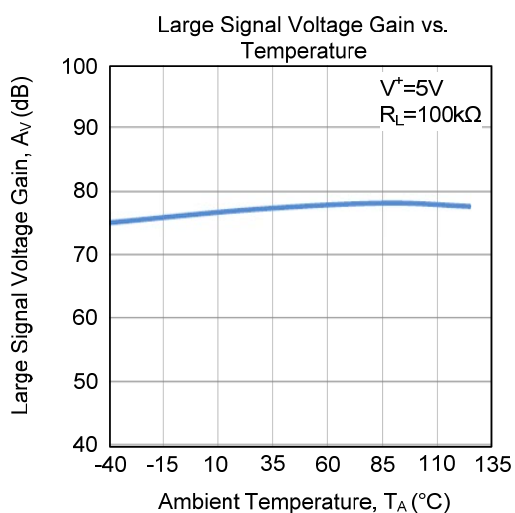
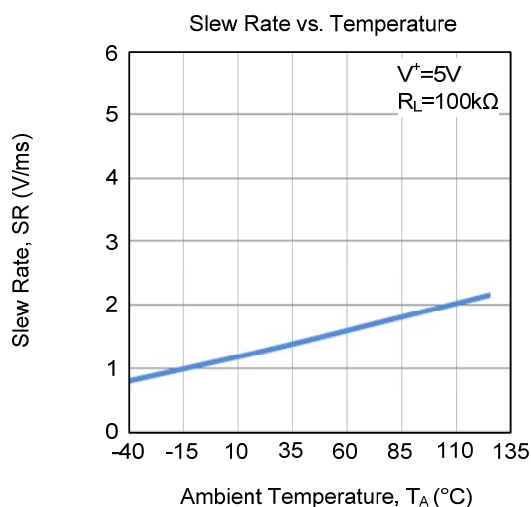
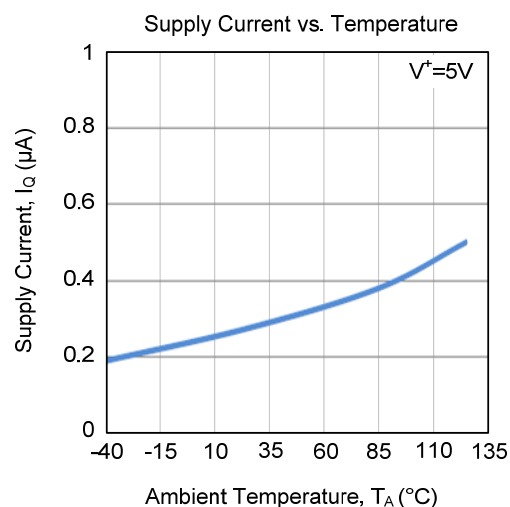
($V^+=1.8\sim 5\text{V}$, $V^-=0\text{V}$, $V_{CM}=V^+/2$ V, $R_L=100\text{k}\Omega$ to $V^+/2\text{V}$, $T_A=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Current/Amplifier	I_Q			0.3	0.66	μA
Power Supply Rejection Ratio	PSRR	$1.5\text{V} \leq V^+ \leq 5.5\text{V}$, $V_{CM}=0\text{V}$	55	75		dB
Input Offset Voltage	V_{OS}	$V_{CM}=0\text{V}$		0.8	4.0	mV
Input Bias Current	I_B			1		pA
Input Offset Current	I_{OS}			1		pA
Common-Mode Voltage Range	V_{CM}		0		V^+	V
Common Mode Rejection Ratio	CMRR	$0\text{V} \leq V_{CM} \leq V^+$	55	80		dB
Large Signal Voltage Gain	A_v	$R_L=100\text{k}\Omega$, $V_O=0.5\text{V} \sim V^+-0.5\text{V}$	70	78		dB
Output Voltage	V_O	$R_L=100\text{k}\Omega$ to V^+	V_{OH}	$V^+-0.2$	$V^+-0.05$	V
			V_{OL}	0.1	0.2	V
Slew Rate	SR	$G_v=0\text{dB}$, $C_L=20\text{pF}$, $V_{IN}=1\text{Vpp}$		1.3		V/ms
Gain-Bandwidth Product	GBW			1.8		kHz
Phase Margin	Φ_M			55		Deg.
Gain Margin	G_M			7		dB
Input-Referred Voltage Noise	e_n	$f=100\text{Hz}$		800		$\text{nV}/\sqrt{\text{Hz}}$

■ TYPICAL APPLICATION CIRCUIT



TYPICAL CHARACTERISTICS



UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. UTC reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.