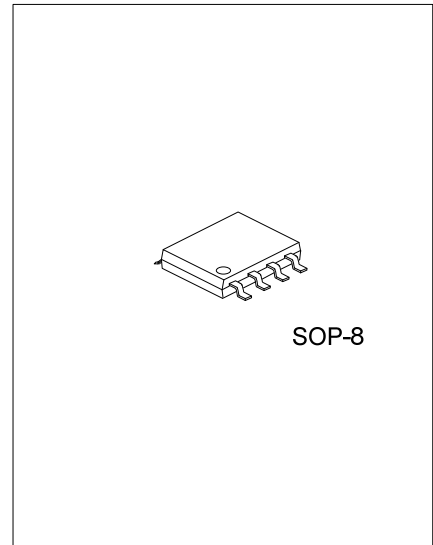




## ULV8539

CMOS IC

### MICRO-POWER, ZERO-DRIFT DUAL OPERATIONAL AMPLIFIERS



#### DESCRIPTION

The UTC **ULV8539** is very high precision amplifiers featuring extremely low offset voltage, and low power consumption. The supply current is less than 210µA maximum per amplifier at 5.0V. Operation is fully specified from 2.7V to 5.0V single supply ( $\pm 1.35V$  to  $\pm 2.5V$  dual supply).

The UTC **ULV8539** operates at very low power making these amplifiers ideal for battery-powered devices and portable equipment.

#### FEATURES

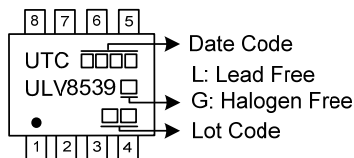
- \* Single-supply operation: 2.7V~5.5V
- \* Low supply current: 185µA
- \* Low offset voltage: 14µV maximum

#### ORDERING INFORMATION

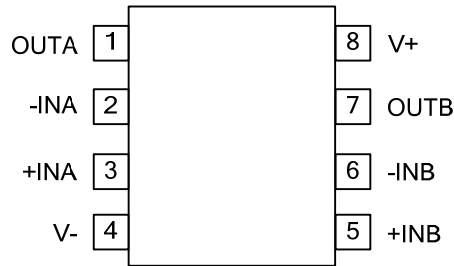
Ordering Number		Package	Packing
Lead Free	Halogen Free		
ULV8539L-S08-R	ULV8539G-S08-R	SOP-8	Tape Reel

<p>ULV8539G-S08-R</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) R: Tape Reel</p> <p>(2) S08: SOP-8</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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#### MARKING



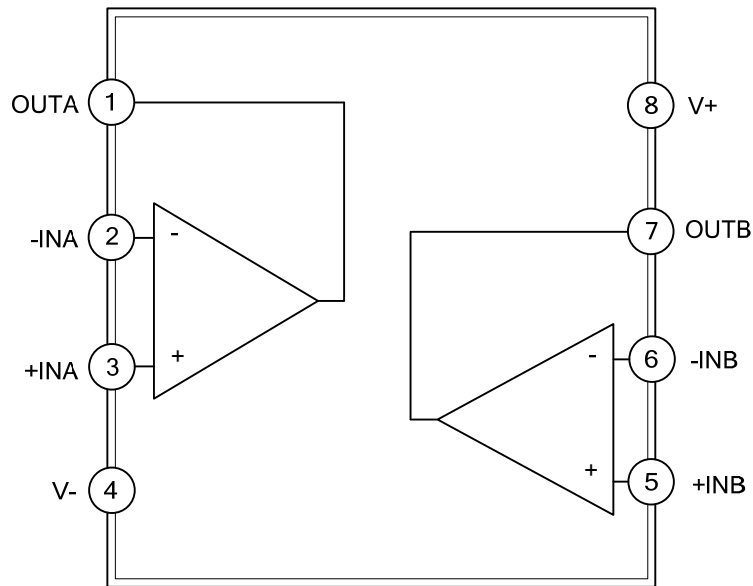
■ PIN CONFIGURATION



■ PIN DESCRIPTION

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

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING (T<sub>A</sub>=25°C, unless otherwise specified.)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V+ to V-	6	V
Input Voltage	V <sub>IN</sub>	V <sub>SS</sub> - 0.3 ~ V <sub>DD</sub> + 0.3	V
Differential Input Voltage	V <sub>ID</sub>	±6	V
Junction Temperature Range	T <sub>J</sub>	-65 ~ +150	°C
Operating Temperature Rang	T <sub>OPR</sub>	-40 ~ +125	°C
Storage Temperature Range	T <sub>STG</sub>	-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.

■ THERMAL RESISTANCE

PARAMETER	SYMBOL	RATINGS	UNIT
Junction-to-Ambient	θ <sub>JA</sub>	158	°C/W

■ ELECTRICAL CHARACTERISTICS

(V<sub>S</sub>=5.0V, V<sub>CM</sub>=2.5V, V<sub>O</sub>=2.5V, T<sub>A</sub>=25°C, unless otherwise specified.)

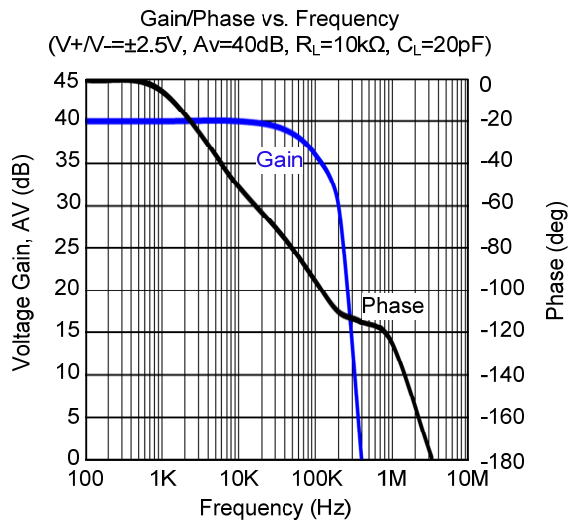
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>POWER SUPPLY</b>						
Supply Current/Amplifier	I <sub>Q</sub>	I <sub>O</sub> =0		185	230	μA
Power Supply Rejection Ratio	PSRR	V <sub>S</sub> =2.7V~5.0V	88	110		dB
<b>INPUT CHARACTERISTICS</b>						
Input Offset Voltage	V <sub>OS</sub>			5	15	μV
Input Bias Current	I <sub>B</sub>			20		pA
Input Offset Current	I <sub>OS</sub>			30		pA
Input Voltage Range			0		5	V
Common-Mode Rejection Ratio	CMRR	V <sub>CM</sub> =0V~5V	88	120		dB
Large Signal Voltage Gain	A <sub>V</sub>	R <sub>L</sub> =10kΩ, V <sub>O</sub> =0.1V~4.9V	88	115		dB
<b>OUTPUT CHARACTERISTICS</b>						
Output Voltage High	V <sub>OH</sub>	R <sub>L</sub> =100kΩ to Ground	4.98	4.994		V
		R <sub>L</sub> =10kΩ to Ground	4.95	4.97		V
Output Voltage Low	V <sub>OL</sub>	R <sub>L</sub> =100kΩ to V+		5	7	mV
		R <sub>L</sub> =10kΩ to V+		20	25	mV
Short-Circuit Current	I <sub>SC</sub>			±25		mA
<b>DYNAMIC PERFORMANCE</b>						
Slew Rate	SR	R <sub>L</sub> =10kΩ		0.4		V/μs
Gain Bandwidth Product	GBW			400		kHz
Settling Time 0.01%	t <sub>s</sub>	G = ±1, 2V step, C <sub>L</sub> = 20pF, R <sub>L</sub> =1kΩ		11		μs
Phase Margin	∅ <sub>M</sub>	R <sub>L</sub> =10kΩ, R <sub>L</sub> =100kΩ, C <sub>L</sub> =20pF		60		Degrees
Overload Recovery Time				0.05		ms
<b>NOISE PERFORMANCE</b>						
Voltage Noise	e <sub>n p-p</sub>	f=0.1Hz~10Hz		1.3		μV p-p
Voltage Noise Density	e <sub>n</sub>	f=1kHz		55		nV/√Hz

## ■ ELECTRICAL CHARACTERISTICS

( $V_S=2.7V$ ,  $V_{CM}=1.35V$ ,  $V_O=1.35V$ ,  $T_A=25^\circ C$ , unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>POWER SUPPLY</b>						
Supply Current/Amplifier	$I_Q$	$I_O=0$			230	$\mu A$
Power Supply Rejection Ratio	PSRR	$V_S=2.7V\sim 5.5V$	88	110		dB
<b>INPUT CHARACTERISTICS</b>						
Input Offset Voltage	$V_{OS}$			5	16	$\mu V$
Input Bias Current	$I_B$			20		pA
Input Offset Current	$I_{OS}$			30		pA
Input Voltage Range			0		2.7	V
Common-Mode Rejection Ratio	CMRR	$V_{CM}=0V\sim 2.7V$	83	110		dB
Large Signal Voltage Gain	$A_{VO}$	$R_L=10k\Omega$ , $V_O=0.1V\sim 2.6V$	83	105		dB
<b>OUTPUT CHARACTERISTICS</b>						
Output Voltage High	$V_{OH}$	$R_L=100k\Omega$ to Ground	2.68	2.693		V
		$R_L=10k\Omega$ to Ground	2.66	2.68		V
Output Voltage Low	$V_{OL}$	$R_L=100k\Omega$ to V+		5	7	mV
		$R_L=10k\Omega$ to V+		14	20	mV
Short-Circuit Current	$I_{SC}$			$\pm 8$		mA
<b>DYNAMIC PERFORMANCE</b>						
Slew Rate	SR	$R_L=10k\Omega$		0.35		V/ $\mu s$
Gain Bandwidth Product	GBW			400		kHz
Settling Time 0.01%	$t_s$	$G=\pm 1$ , 1V step, $C_L=20pF$ , $R_L=\infty$		8		$\mu s$
Phase Margin	$\phi_M$	$R_L=10k\Omega$ , $R_L=100k\Omega$ , $C_L=20pF$		60		Degrees
Overload Recovery Time				0.05		ms
<b>NOISE PERFORMANCE</b>						
Voltage Noise	$e_{n,p-p}$	$f=0.1Hz\sim 10Hz$		2.2		$\mu V$ p-p
Voltage Noise Density	$e_n$	$f=1kHz$		58		nV/ $\sqrt{Hz}$

■ TYPICAL CHARACTERISTICS



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