



# ULV8541

CMOS IC

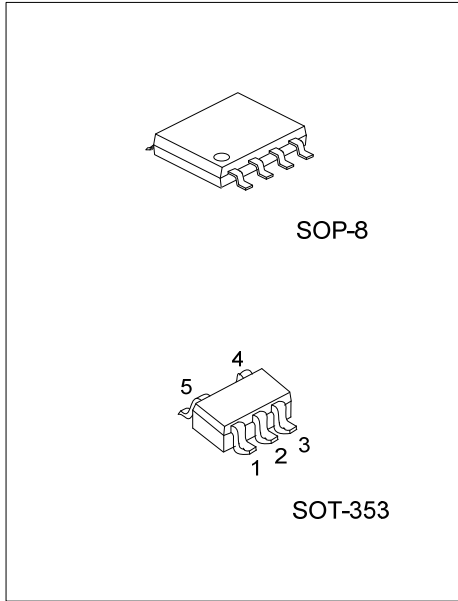
## CMOS RAIL-TO-RAIL GENERAL-PURPOSE AMPLIFIERS

### DESCRIPTION

The UTC **ULV8541** is single rail to-rail input and output, single-supply amplifier featuring very low supply current and 1MHz bandwidth. It is guaranteed to operate from a 2.7V single supply as well as a 5V supply.

Very low input bias currents enable the UTC **ULV8541** to be used for integrators, photodiode amplifiers, piezoelectric sensors, and other applications with high source impedance. The supply current is only 75µA, ideal for battery operation.

Rail-to-rail input and output are useful to designers buffering ASIC in single-supply system. The UTC **ULV8541** is optimized to maintain high gain at lower supply voltage, making it useful for active filter and gain stage.



### FEATURES

- \* Single-supply operation: 2.7V to 5.5V
- \* Low supply current: 75µA
- \* Wide bandwidth: 1MHz
- \* Rail-to-rail input and output

### ORDERING INFORMATION

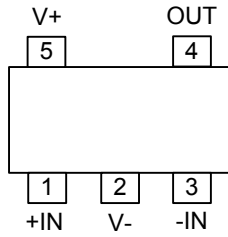
Ordering Number		Package	Packing
Lead Free	Halogen Free		
ULV8541L-AL5-R	ULV8541G-AL5-R	SOT-353	Tape Reel
ULV8541L-S08-R	ULV8541G-S08-R	SOP-8	Tape Reel

<p>ULV8541G-AL5-R</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) R: Tape Reel (2) AL5: SOT-353, S08: SOP-8 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
---	--

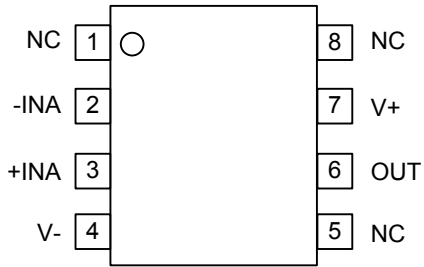
### MARKING

SOT-353	SOP-8
<p>8541</p>	<p>UTC □□□□ ULV8541□ ● □□</p> <p>→ Date Code → L: Lead Free → G: Halogen Free → Lot Code</p>

■ PIN CONFIGURATION



SOT-353

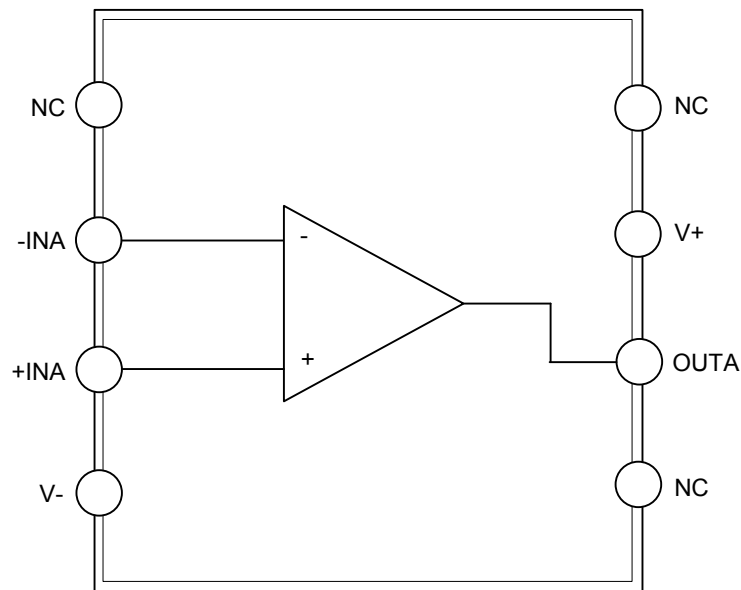


SOP-8

■ PIN DESCRIPTION

PIN NO.		PIN NAME	DESCRIPTION
SOT-353	SOP-8		
-	1, 5, 8	NC	No connect
3	2	-INA	Inverting input pin of A AMP
1	3	+INA	Non-inverting input of A AMP
2	4	V-	Negative power supply
4	6	OUT	Output pin of A AMP
5	7	V+	Positive power supply

■ BLOCK DIAGRAM



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

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V <sub>CC</sub>	6	V
Input Voltage	V <sub>IN</sub>	GND ~ V <sub>S</sub>	V
Differential Input Voltage	V <sub>ID</sub>	±6.0	V
Junction Temperature	T <sub>J</sub>	-65 ~ +150	°C
Operating Temperature Range	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.

■ ELECTRICAL CHARACTERISTICS (V<sub>S</sub>=5.0V, V<sub>CM</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>	V <sub>O</sub> =0V		75	120	μA
		-40°C ≤ T <sub>A</sub> ≤ +125°C			140	μA
Power Supply Rejection Ratio	PSRR	V <sub>S</sub> =+2.7V~5V	65	80		dB
		-40°C ≤ T <sub>A</sub> ≤ +125°C	60			dB
<b>INPUT CHARACTERISTICS</b>						
Input Offset Voltage	V <sub>OS</sub>			1	6	mV
		-40°C ≤ T <sub>A</sub> ≤ +125°C			7	mV
Input Offset Voltage Drift	ΔV <sub>OS</sub> /ΔT	-40°C ≤ T <sub>A</sub> ≤ +125°C		4		μV/°C
Input Bias Current	I <sub>B</sub>			50		pA
		-40°C ≤ T <sub>A</sub> ≤ +125°C		500		pA
Input Bias Current Drift	ΔI <sub>B</sub> /ΔT	-40°C ≤ T <sub>A</sub> ≤ +125°C		2500		fA/°C
Input Offset Current	I <sub>OS</sub>			25		pA
		-40°C ≤ T <sub>A</sub> ≤ +125°C		50		pA
Input Offset Current Drift	ΔI <sub>OS</sub> /ΔT	-40°C ≤ T <sub>A</sub> ≤ +125°C		30		fA/°C
Input Voltage Range			0		5	V
Common-Mode Rejection Ratio	CMRR	V <sub>CM</sub> =0V~5V	40	62		dB
		-40°C ≤ T <sub>A</sub> ≤ +125°C	38			dB
Large Signal Voltage Gain	A <sub>V</sub>	R <sub>L</sub> =100KΩ, V <sub>O</sub> =0.5V~2.2V	77	92		dB
		-40°C ≤ T <sub>A</sub> ≤ +125°C	72	88		dB
<b>OUTPUT CHARACTERISTICS</b>						
Output Voltage High	V <sub>OH</sub>	I <sub>L</sub> =1mA	4.9	4.965		V
		-40°C ≤ T <sub>A</sub> ≤ +125°C	4.875			V
Output Voltage Low	V <sub>OL</sub>	I <sub>L</sub> =1mA		25	100	mV
		-40°C ≤ T <sub>A</sub> ≤ +125°C			125	mV
Output Current	I <sub>OUT</sub>	V <sub>OUT</sub> = V <sub>S</sub> - 1V		30		mA
	I <sub>SC</sub>			±60		mA
Closed-Loop Output Impedance	Z <sub>OUT</sub>	f = 200kHz, A <sub>V</sub> = 1		45		Ω
<b>DYNAMIC PERFORMANCE</b>						
Slew Rate	SR	R <sub>L</sub> =100kΩ, C <sub>L</sub> =200pF		0.92		V/μs
Gain-Bandwidth Product	GBW			950		kHz
Full Power Bandwidth	BWP	1% distortion		65		kHz
Settling Time	t <sub>S</sub>	To 0.1% (1V step)		6		μs
Phase Margin	Φ <sub>M</sub>			70		Degrees
<b>NOISE PERFORMANCE</b>						
Voltage Noise Density	e <sub>N</sub>	f=1kHz		45		nV/√Hz
		f=10kHz		40		nV/√Hz
Current Noise Density	i <sub>N</sub>			<0.1		pA/√Hz

■ ELECTRICAL CHARACTERISTICS ( $V_S=3.0V$ ,  $V_{CM}=1.5V$ ,  $T_A=25^\circ C$ , unless otherwise specified)

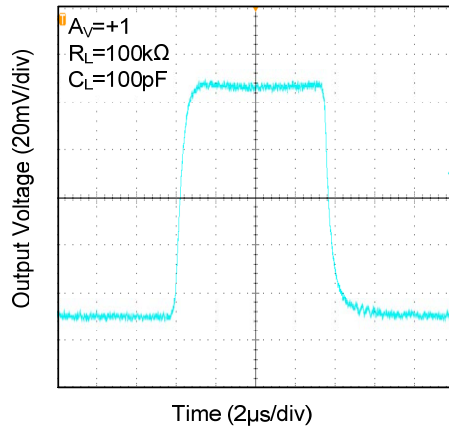
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>POWER SUPPLY</b>						
Supply Current / Amplifier	$I_Q$	$V_O=0V$		60	110	$\mu A$
		$-40^\circ C \leq T_A \leq +125^\circ C$			130	$\mu A$
Power Supply Rejection Ratio	PSRR	$V_S=+2.7V \sim 5V$	65	80		dB
		$-40^\circ C \leq T_A \leq +125^\circ C$	60			dB
<b>INPUT CHARACTERISTICS</b>						
Input Offset Voltage	$V_{OS}$			1	6	mV
		$-40^\circ C \leq T_A \leq +125^\circ C$			7	mV
Input Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	$-40^\circ C \leq T_A \leq +125^\circ C$		4		$\mu V/^\circ C$
Input Bias Current	$I_B$			50		pA
		$-40^\circ C \leq T_A \leq +125^\circ C$		500		pA
Input Bias Current Drift	$\Delta I_B/\Delta T$	$-40^\circ C \leq T_A \leq +125^\circ C$		2500		$fA/^\circ C$
Input Offset Current	$I_{OS}$			25		pA
		$-40^\circ C \leq T_A \leq +125^\circ C$		50		pA
Input Offset Current Drift	$\Delta I_{OS}/\Delta T$	$-40^\circ C \leq T_A \leq +125^\circ C$		30		$fA/^\circ C$
Input Voltage Range			0		3	V
Common-Mode Rejection Ratio	CMRR	$V_{CM}=0V \sim 3V$	40	57		dB
		$-40^\circ C \leq T_A \leq +125^\circ C$	38			dB
Large Signal Voltage Gain	$A_V$	$R_L=100K\Omega$ , $V_O=0.5V \sim 2.2V$	75	90		dB
		$-40^\circ C \leq T_A \leq +125^\circ C$	70	85		dB
<b>OUTPUT CHARACTERISTICS</b>						
Output Voltage High	$V_{OH}$	$I_L=1mA$	2.875	2.955		V
		$-40^\circ C \leq T_A \leq +125^\circ C$	2.850			V
Output Voltage Low	$V_{OL}$	$I_L=1mA$		32	100	mV
		$-40^\circ C \leq T_A \leq +125^\circ C$			125	mV
Output Current	$I_{OUT}$	$V_{OUT} = V_S - 1V$		18		mA
	$I_{SC}$			$\pm 25$		mA
Closed-Loop Output Impedance	$Z_{OUT}$	$f = 200kHz$ , $A_V = 1$		50		$\Omega$
<b>DYNAMIC PERFORMANCE</b>						
Slew Rate	SR	$R_L=100k\Omega$		0.8		$V/\mu s$
Gain-Bandwidth Product	GBW			860		kHz
Settling Time	$t_S$	To 0.01% (1V step)		5		$\mu s$
Phase Margin	$\Phi_M$			67		Degrees
<b>NOISE PERFORMANCE</b>						
Voltage Noise Density	$e_N$	$f=1kHz$		45		$nV/\sqrt{Hz}$
		$f=10kHz$		40		$nV/\sqrt{Hz}$
Current Noise Density	$i_N$			<0.1		$pA/\sqrt{Hz}$

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

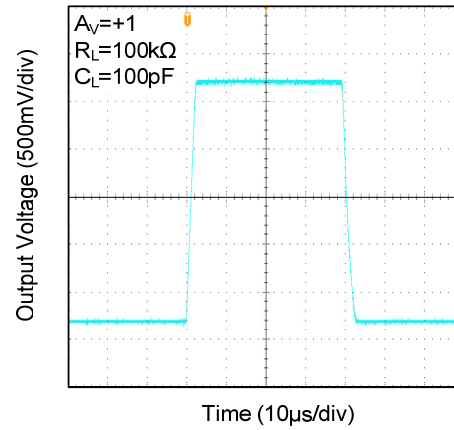
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>POWER SUPPLY</b>						
Supply Current / Amplifier	$I_Q$	$V_O=0V$		50	100	$\mu A$
		$-40^\circ C \leq T_A \leq +125^\circ C$			120	$\mu A$
Power Supply Rejection Ratio	PSRR	$V_S=+2.7V \sim 5V$	65	80		dB
		$-40^\circ C \leq T_A \leq +125^\circ C$	60			dB
<b>INPUT CHARACTERISTICS</b>						
Input Offset Voltage	$V_{OS}$			1	6	mV
		$-40^\circ C \leq T_A \leq +125^\circ C$			7	mV
Input Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	$-40^\circ C \leq T_A \leq +125^\circ C$		5		$\mu V/^\circ C$
Input Bias Current	$I_B$			50		pA
		$-40^\circ C \leq T_A \leq +125^\circ C$		500		pA
Input Bias Current Drift	$\Delta I_B/\Delta T$	$-40^\circ C \leq T_A \leq +125^\circ C$		2500		$fA/^\circ C$
Input Offset Current	$I_{OS}$			25		pA
		$-40^\circ C \leq T_A \leq +125^\circ C$		400		pA
Input Offset Current Drift	$\Delta I_{OS}/\Delta T$	$-40^\circ C \leq T_A \leq +125^\circ C$		30		$fA/^\circ C$
Input Voltage Range			0		2.7	V
Common-Mode Rejection Ratio	CMRR	$V_{CM}=0V \sim 2.7V$	40	55		dB
		$-40^\circ C \leq T_A \leq +125^\circ C$	38			dB
Large Signal Voltage Gain	$A_V$	$R_L=100K\Omega$ , $V_O=0.5V \sim 2.2V$	75	90		dB
		$-40^\circ C \leq T_A \leq +125^\circ C$	70	85		dB
<b>OUTPUT CHARACTERISTICS</b>						
Output Voltage High	$V_{OH}$	$I_L=1mA$	2.575	2.65		V
		$-40^\circ C \leq T_A \leq +125^\circ C$	2.550			V
Output Voltage Low	$V_{OL}$	$I_L=1mA$		35	100	mV
		$-40^\circ C \leq T_A \leq +125^\circ C$			125	mV
Output Current	$I_{OUT}$	$V_{OUT} = V_S - 1V$		15		mA
	$I_{SC}$			$\pm 20$		mA
Closed-Loop Output Impedance	$Z_{OUT}$	$f = 200kHz$ , $A_V = 1$		50		$\Omega$
<b>DYNAMIC PERFORMANCE</b>						
Slew Rate	SR	$R_L=100K\Omega$		0.75		$V/\mu s$
Gain-Bandwidth Product	GBW			850		kHz
Settling Time	$t_S$	To 0.1% (1V step)		5		$\mu s$
Phase Margin	$\Phi_M$			66		Degrees
<b>NOISE PERFORMANCE</b>						
Voltage Noise Density	$e_N$	$f=1kHz$		45		$nV/\sqrt{Hz}$
		$f=10kHz$		40		$nV/\sqrt{Hz}$
Current Noise Density	$i_N$			<0.1		$pA/\sqrt{Hz}$

■ TYPICAL CHARACTERISTICS

Small-Signal Step Response



Large-Signal Step Response



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.