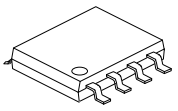
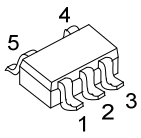
ULV8541

CMOS IC

CMOS RAIL-TO-RAIL GENERAL-PURPOSE AMPLIFIERS



SOP-8



SOT-353

■ 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.

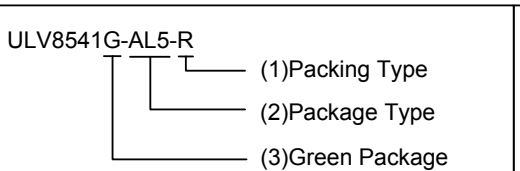
Rail-to-rail input and output are useful to designers buffering ASIC in single-supply system. The UTC **ULV8541** is optimized to maintain high gain at lower supply voltage, making it useful for active filter and gain stage.

■ 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

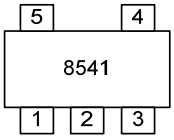
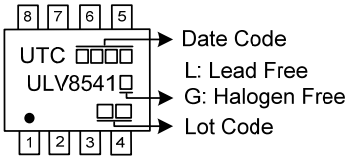


(1) R: Tape Reel

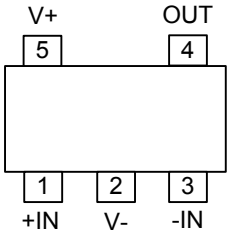
(2) AL5: SOT-353, S08: SOP-8

(3) G: Halogen Free and Lead Free, L: Lead Free

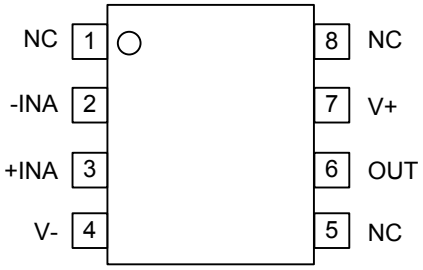
■ MARKING

SOT-353	SOP-8
	

■ PIN CONFIGURATION



SOT-353

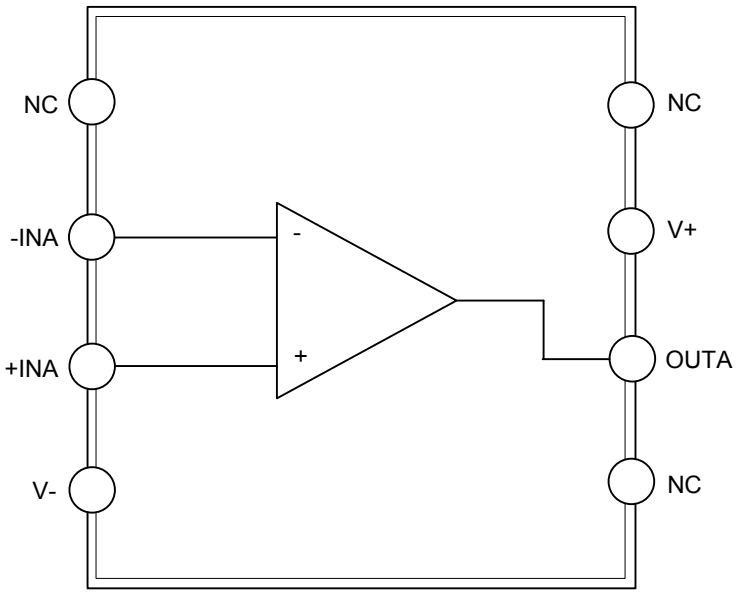


SOP-8

■ 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_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{CC}	6	V
Input Voltage	V_{IN}	GND ~ V_S	V
Differential Input Voltage	V_{ID}	±6.0	V
Junction Temperature	T_J	-65 ~ +150	°C
Operating Temperature Range	T_{OPR}	-40 ~ +125	°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.

■ ELECTRICAL CHARACTERISTICS (V_S=5.0V, V_{CM}=2.5V, T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
POWER SUPPLY						
Supply Current / Amplifier	I_Q	V_O=0V		75	120	μA
		-40°C ≤ T_A ≤ +125°C			140	μA
Power Supply Rejection Ratio	PSRR	V_S=+2.7V~5V	65	80		dB
		-40°C ≤ T_A ≤ +125°C	60			dB
INPUT CHARACTERISTICS						
Input Offset Voltage	V_{OS}			1	6	mV
		-40°C ≤ T_A ≤ +125°C			7	mV
Input Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	-40°C ≤ T_A ≤ +125°C		4		μV/°C
Input Bias Current	I_B			50		pA
		-40°C ≤ T_A ≤ +125°C		500		pA
Input Bias Current Drift	$\Delta I_B/\Delta T$	-40°C ≤ T_A ≤ +125°C		2500		fA/°C
Input Offset Current	I_{OS}			25		pA
		-40°C ≤ T_A ≤ +125°C		50		pA
Input Offset Current Drift	$\Delta I_{OS}/\Delta T$	-40°C ≤ T_A ≤ +125°C		30		fA/°C
Input Voltage Range			0		5	V
Common-Mode Rejection Ratio	CMRR	V_{CM}=0V~5V	40	62		dB
		-40°C ≤ T_A ≤ +125°C	38			dB
Large Signal Voltage Gain	A_V	R_L=100KΩ, Vo=0.5V~2.2V	77	92		dB
		-40°C ≤ T_A ≤ +125°C	72	88		dB
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	I_L=1mA	4.9	4.965		V
		-40°C ≤ T_A ≤ +125°C	4.875			V
Output Voltage Low	V_{OL}	I_L=1mA		25	100	mV
		-40°C ≤ T_A ≤ +125°C			125	mV
Output Current	I_{OUT}	V_{OUT} = V_S -1V		30		mA
	I_{SC}			±60		mA
Closed-Loop Output Impedance	Z_{OUT}	f = 200kHz, A_V = 1		45		Ω
DYNAMIC PERFORMANCE						
Slew Rate	SR	R_L=100kΩ, C_L=200pF		0.92		V/μs
Gain-Bandwidth Product	GBW			950		kHz
Full Power Bandwidth	BWP	1% distortion		65		kHz
Settling Time	t_S	To 0.1% (1V step)		6		μs
Phase Margin	Φ_M			70		Degrees
NOISE PERFORMANCE						
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=3.0V, V_{CM}=1.5V, T_A=25°C, unless otherwise specified)

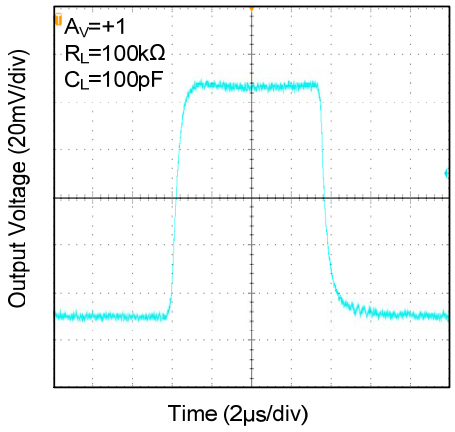
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
POWER SUPPLY						
Supply Current / Amplifier	I_Q	V_O=0V		60	110	μA
		-40°C ≤ T_A ≤ +125°C			130	μA
Power Supply Rejection Ratio	PSRR	V_S=+2.7V~5V	65	80		dB
		-40°C ≤ T_A ≤ +125°C	60			dB
INPUT CHARACTERISTICS						
Input Offset Voltage	V_{OS}			1	6	mV
		-40°C ≤ T_A ≤ +125°C			7	mV
Input Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	-40°C ≤ T_A ≤ +125°C		4		μV/°C
Input Bias Current	I_B			50		pA
		-40°C ≤ T_A ≤ +125°C		500		pA
Input Bias Current Drift	$\Delta I_B/\Delta T$	-40°C ≤ T_A ≤ +125°C		2500		fA/°C
Input Offset Current	I_{OS}			25		pA
		-40°C ≤ T_A ≤ +125°C		50		pA
Input Offset Current Drift	$\Delta I_{OS}/\Delta T$	-40°C ≤ T_A ≤ +125°C		30		fA/°C
Input Voltage Range			0		3	V
Common-Mode Rejection Ratio	CMRR	V_{CM}=0V~3V	40	57		dB
		-40°C ≤ T_A ≤ +125°C	38			dB
Large Signal Voltage Gain	A_V	R_L=100KΩ, Vo=0.5V~2.2V	75	90		dB
		-40°C ≤ T_A ≤ +125°C	70	85		dB
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	I_L=1mA	2.875	2.955		V
		-40°C ≤ T_A ≤ +125°C	2.850			V
Output Voltage Low	V_{OL}	I_L=1mA		32	100	mV
		-40°C ≤ T_A ≤ +125°C			125	mV
Output Current	I_{OUT}	V_{OUT} = V_S -1V		18		mA
	I_{SC}			±25		mA
Closed-Loop Output Impedance	Z_{OUT}	f = 200kHz, A_V = 1		50		Ω
DYNAMIC PERFORMANCE						
Slew Rate	SR	R_L=100kΩ		0.8		V/μs
Gain-Bandwidth Product	GBW			860		kHz
Settling Time	t_S	To 0.01% (1V step)		5		μs
Phase Margin	Φ_M			67		Degrees
NOISE PERFORMANCE						
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°C, unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
POWER SUPPLY						
Supply Current / Amplifier	I_Q	V_O=0V		50	100	μA
		-40°C ≤ T_A ≤ +125°C			120	μA
Power Supply Rejection Ratio	PSRR	V_S=+2.7V~5V	65	80		dB
		-40°C ≤ T_A ≤ +125°C	60			dB
INPUT CHARACTERISTICS						
Input Offset Voltage	V_{OS}			1	6	mV
		-40°C ≤ T_A ≤ +125°C			7	mV
Input Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	-40°C ≤ T_A ≤ +125°C		5		μV/°C
Input Bias Current	I_B			50		pA
		-40°C ≤ T_A ≤ +125°C		500		pA
Input Bias Current Drift	$\Delta I_B/\Delta T$	-40°C ≤ T_A ≤ +125°C		2500		fA/°C
Input Offset Current	I_{OS}			25		pA
		-40°C ≤ T_A ≤ +125°C		400		pA
Input Offset Current Drift	$\Delta I_{OS}/\Delta T$	-40°C ≤ T_A ≤ +125°C		30		fA/°C
Input Voltage Range			0		2.7	V
Common-Mode Rejection Ratio	CMRR	V_{CM}=0V~2.7V	40	55		dB
		-40°C ≤ T_A ≤ +125°C	38			dB
Large Signal Voltage Gain	A_V	R_L=100KΩ, Vo=0.5V~2.2V	75	90		dB
		-40°C ≤ T_A ≤ +125°C	70	85		dB
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	I_L=1mA	2.575	2.65		V
		-40°C ≤ T_A ≤ +125°C	2.550			V
Output Voltage Low	V_{OL}	I_L=1mA		35	100	mV
		-40°C ≤ T_A ≤ +125°C			125	mV
Output Current	I_{OUT}	V_{OUT} = V_S -1V		15		mA
	I_{SC}			±20		mA
Closed-Loop Output Impedance	Z_{OUT}	f = 200kHz, A_V = 1		50		Ω
DYNAMIC PERFORMANCE						
Slew Rate	SR	R_L=100KΩ		0.75		V/μs
Gain-Bandwidth Product	GBW			850		kHz
Settling Time	t_S	To 0.1% (1V step)		5		μs
Phase Margin	Φ_M			66		Degrees
NOISE PERFORMANCE						
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