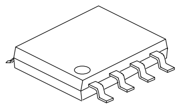
400µA, 0.71MHz RAIL-TO-RAIL OPERATIONAL AMPLIFIERS



SOP-8

■ DESCRIPTION

The UTC **ULV2262** is a dual low voltage operational amplifier. Both devices exhibit rail-to-rail output performance for increased dynamic range in single or split supply applications. It has low supply current for battery- powered applications, while still having adequate ac performance for applications that demand it. This family is fully characterized at 3V and 5V and is optimized for low-voltage applications.

The UTC **ULV2262**, exhibiting high input impedance and low noise, is excellent for small-signal conditioning for high-impedance sources, such as piezoelectric transducers. Because of the micro-power dissipation levels combined with 3V. operation, these devices work well in hand-held monitoring and remote-sensing applications.

■ FEATURES

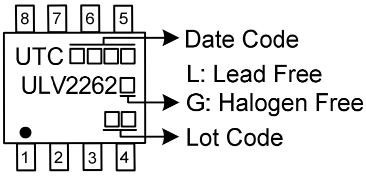
* Output Swing Includes Both Supply Rails
* Low Noise: 12nV/√Hz (Typ.) at f =1kHz
* Fully Specified for Both Single-Supply and Split-Supply Operation
* Low Power: 550µA (Max.)
* Common-Mode Input Voltage Range Includes Negative Rail
* Wide Supply Voltage Range: 2.7V~ 6.5V

■ ORDERING INFORMATION

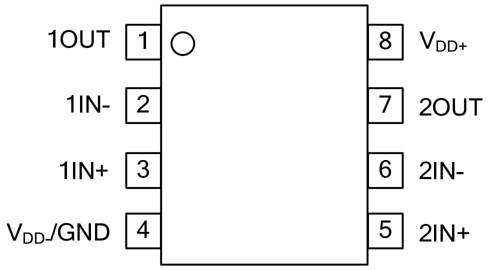
Ordering Number		Package	Packing
Lead Free	Halogen Free		
ULV2262L-S08-R	ULV2262G-S08-R	SOP-8	Tape Reel

ULV2262G-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



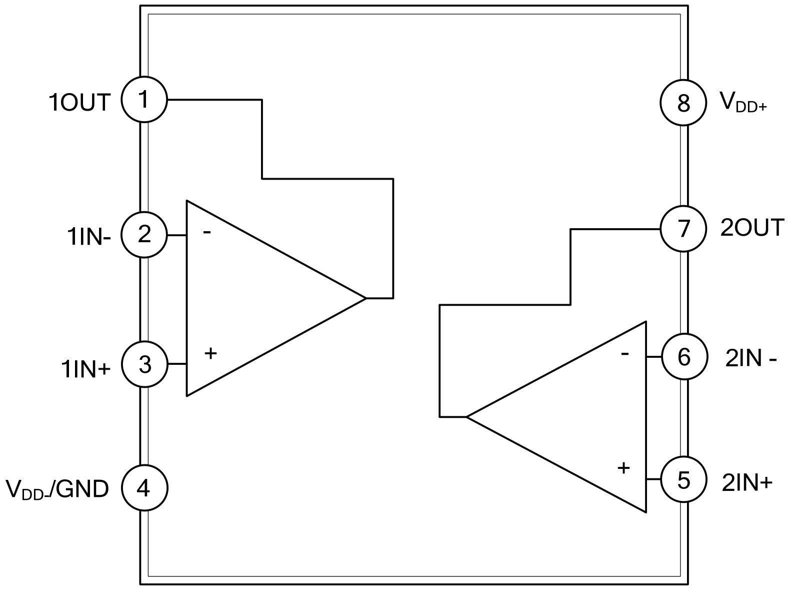
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	1OUT	Output pin of 1 AMP
2	1IN -	Invert input pin of 1 AMP
3	1IN +	Non-invert input of 1 AMP
4	V_{DD-}/GND	Ground
5	2IN+	Non-invert input of 2 AMP
6	2IN -	Invert input pin of 2 AMP
7	2OUT	Output pin of 2 AMP
8	V_{DD+}	Power supply

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

(over operating free-air temperature range unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage (Note 2)	V_{DD}	8	V
Differential Input Voltage (Note 3)	V_{ID}	$\pm V_{DD}$	
Input Voltage Range (Any Input) (Note 2)	V_I	V_{DD-} - 0.3 ~ V_{DD+}	V
Input Current (Each Input)	I_I	±5	mA
Output Current	I_O	±50	mA
Total Current into V_{DD+}		±50	mA
Total Current out of V_{DD-}		±50	mA
Duration of Short-Circuit Current (at or Below) 25°C (Note 4)		unlimited	
Continuous Total Power Dissipation (T_A≤25°C)	P_D	675	W
Storage Temperature Range	T_{STG}	-65 ~ +150	°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. All voltage values, except differential voltages, are with respect to V_{DD-}.
3. Differential voltages are at the noninverting input with respect to the inverting input. Excessive current flows when input is brought below V_{DD-} - 0.3V.
4. The output may be shorted to either supply. Temperature and/or supply voltages must be limited to ensure that the maximum dissipation rating is not exceeded.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Supply Voltage (Note)	$V_{DD\pm}$	2.7		6.5	V
Input Voltage Range	V_I	V_{DD-}		V_{DD+} -1.3	V
Common-Mode Input Voltage	V_{IC}	V_{DD-}		V_{DD+} -1.3	V
Operating Free-Air Temperature	T_A	-40		+125	°C

Note: All voltage values, except differential voltages, are with respect to V_{DD-}.

■ ELECTRICAL CHARACTERISTICS (T_A=25°C, V_{DD}=3V, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	V_{IO}	$V_{DD\pm}$ =±1.5V, V_{IC}=0, V_O=0, R_S=50Ω		300	950	μV
Temperature Coefficient Of Input Offset Voltage (T_A=25°C ~+85°C)	αV_{IO}			2		μV/°C
Input Offset Current	I_{IO}			0.5		pA
Input Bias Current	I_{IB}			1		pA
Common-Mode Input Voltage Range	V_{ICR}	R_S=50Ω, $\lvert V_{IO} \rvert$ ≤5mV	0~2	-0.3~2.2		V
High-Level Output Voltage	V_{OH}	I_{OH}=-20μA		2.99		V
		I_{OH}=-100μA	2.85			V
		I_{OH}=-400μA	2.7			V
Level-High Output Voltage	V_{OL}	V_{IC}=1.5V, I_{OL}=50μA		10		mV
		V_{IC}=1.5V, I_{OL}=500μA		100		mV
		V_{IC}=1.5V, I_{OL}=1mA		200		mV
Large Signal Differential Voltage Amplification	A_{VD}	V_{IC}=1.5V, V_O=1V~2V, R_L=50kΩ (Note)		100		V/mV
		V_{IC}=1.5V, V_O=1V~2V, R_L=1MΩ (Note)		100		V/mV
Differential Input Resistance	$r_{i(d)}$			10^{12}		Ω
Common-Mode Input Resistance	$r_{i(c)}$			10^{12}		Ω
Closed-Loop Output Impedance	z_O	f =100kHz, A_V=10		270		Ω
Common Mode Rejection Ratio	CMRR	V_{IC}=0~1.7V, R_S=50Ω, V_O=1.5V	65	75		dB
Supply Voltage Rejection Ratio ($\Delta V_{DD}/\Delta V_{IO}$)	k_{SVR}	V_{DD}= 2.7V~8V, V_{IC}=V_{DD}/2, No Load	80	95		dB
Supply Current	I_{DD}	V_O=1.5V, No Load		400	550	μA

Note: Referenced to 1.5V.

■ OPERATING CHARACTERISTICS (T_A=25°C, V_{DD}=3V, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Slew Rate at Unity Gain	SR	V_O=1.1V~1.9V, R_L=50kΩ, C_L=100pF (Note)	0.35	0.8		V/μs
Equivalent Input Noise Voltage	V_N	f=10Hz		43		nV/√Hz
		f=1kHz		12		nV/√Hz
Peak-to-Peak Equivalent Input Noise Voltage	$V_{N(PP)}$	f=0.1Hz~1Hz		0.6		μV
		f=0.1Hz~10Hz		1		μV
Equivalent Input Noise Current	I_N			0.6		fA/√Hz
Total Harmonic Distortion Plus Noise	THD+N	V_O=0.5V~2.5V, f=20kHz, R_L=50kΩ (Note), A_V =1		0.03%		
		V_O=0.5V~2.5V, f=20kHz, R_L=50kΩ (Note), A_V =10		0.05%		
Gain-Bandwidth Product	G_{BW}	f =1kHz, R_L=50kΩ, C_L=100pF (Note)		0.67		MHz
Maximum Output Swing Bandwidth	B_{OM}	$V_{O(PP)}$=1V, A_V= 1, R_L=50kΩ, C_L=100pF (Note)		395		kHz
Settling Time	t_S	A_V =-1, Step =1V ~2V, R_L=50kΩ, C_L=100pF (Note), 0 1%		5.6		μs
		A_V =-1, Step =1V ~2V, R_L=50kΩ, C_L=100pF (Note), 0.01%		12.5		μs
Phase Margin at Unity Gain	φ_m	R_L=50kΩ, C_L=100pF (Note)		55°		
Gain Margin				11		dB

Note: Referenced to 1.5V.

■ ELECTRICAL CHARACTERISTICS (T_A=25°C, V_{DD}=5V, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	V_{IO}	$V_{DD\pm}$ =±2.5V, V_{IC}=0, V_O=0, R_S=50Ω		300	950	μV
Temperature Coefficient Of Input Offset Voltage (T_A=25°C ~+85°C)	αVIO			2		μV/°C
Input Offset Current	I_{IO}			0.5		pA
Input Bias Current	I_{IB}			1		pA
Common-Mode Input Voltage Range	V_{ICR}	R_S=50Ω, $\|V_{IO}\|$ ≤5mV	0~4	-0.3~4.2		V
High- Level Output Voltage	V_{OH}	I_{OH}=-20μA		4.99		V
		I_{OH}=-100μA	4.85	4.94		V
		I_{OH}=-400μA	4.7	4.85		V
Level - High Output Voltage	V_{OL}	V_{IC}=2.5V, I_{OL}=50μA		0.01		V
		V_{IC}=2.5V, I_{OL}=500μA		0.09	0.15	V
		V_{IC}=2.5V, I_{OL}=1mA		0.2	0.3	V
Large Signal Differential Voltage Amplification	A_{VD}	V_{IC}=2.5V, V_O=1V~4V, R_L=50kΩ (Note)		170		V/mV
		V_{IC}=2.5V, V_O=1V~4V, R_L=1MΩ (Note)		550		V/mV
Differential Input Resistance	$r_{i(d)}$			10^{12}		Ω
Common-Mode Input Resistance	$r_{i(c)}$			10^{12}		Ω
Closed-Loop Output Impedance	z_O	f =100kHz, A_V=10		240		Ω
Common Mode Rejection Ratio	CMRR	V_{IC}=0~2.7V, R_S=50Ω, V_O=2.5V	65	83		dB
Supply Voltage Rejection Ratio ($\Delta V_{DD}/\Delta V_{IO}$)	k_{SVR}	V_{DD}= 4.4V~8V, V_{IC}=V_{DD}/2, No Load	80	95		dB
Supply Current	I_{DD}	V_O=2.5V, No Load		400	550	μA

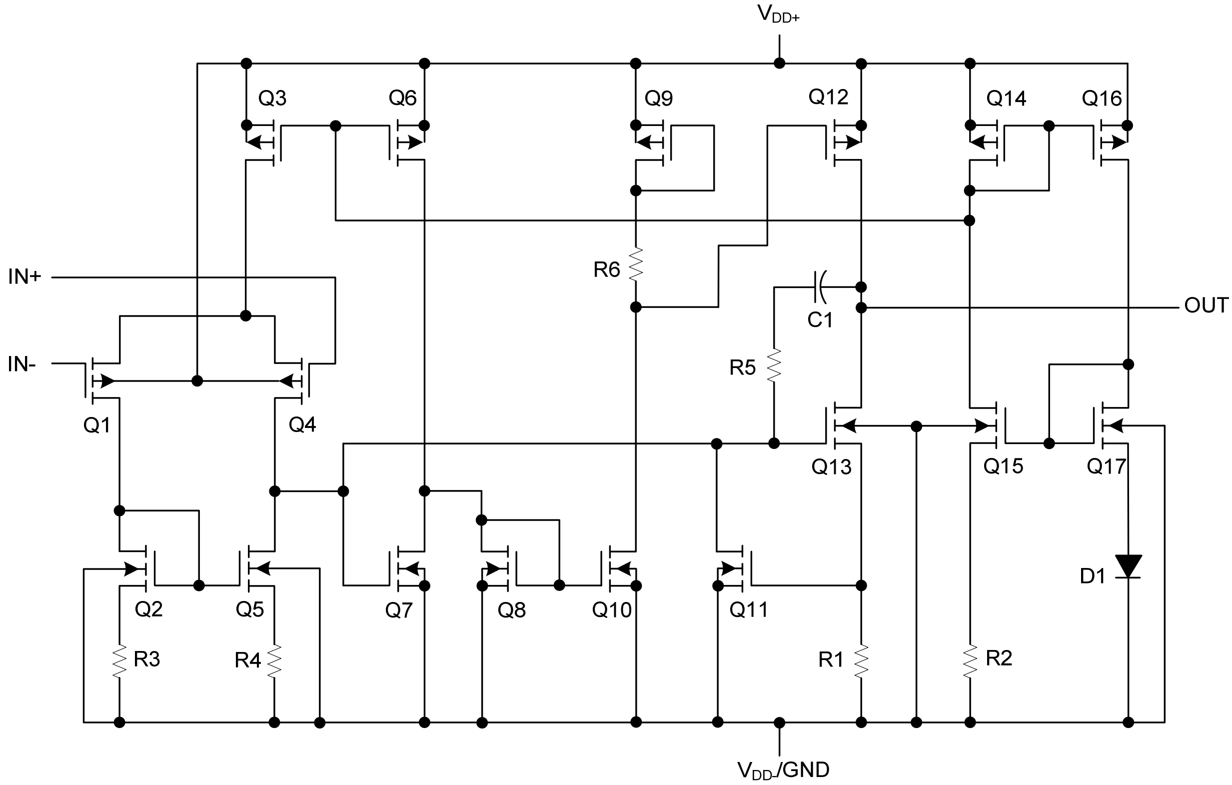
Note: Referenced to 2.5V.

■ OPERATING CHARACTERISTICS (T_A=25°C, V_{DD}=5V, unless otherwise specified)

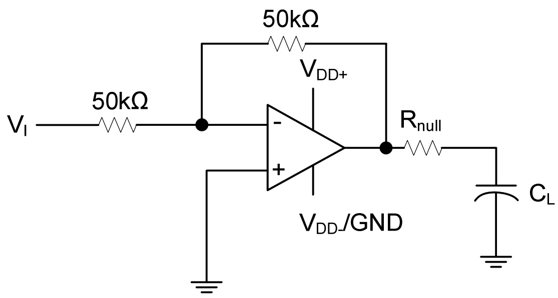
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Slew Rate at Unity Gain	SR	V_O=1.5V~3.5V, R_L=50kΩ, C_L=100pF (Note)	0.35	0.8		V/μs
Equivalent Input Noise Voltage	V_N	f=10Hz		40		nV/√Hz
		f=1kHz		12		nV/√Hz
Peak-to-Peak Equivalent Input Noise Voltage	$V_{N(PP)}$	f=0.1Hz~1Hz		0.7		μV
		f=0.1Hz~10Hz		1.3		μV
Equivalent Input Noise Current	I_N			0.6		fA/√Hz
Total Harmonic Distortion Plus Noise	THD+N	V_O=0.5V~2.5V, f=20kHz, R_L=50kΩ (Note), A_V =1		0.017%		
		V_O=0.5V~2.5V, f=20kHz, R_L=50kΩ (Note), A_V =10		0.03%		
Gain-Bandwidth Product	G_{BW}	f =50kHz, R_L=50kΩ, C_L=100pF (Note)		0.71		MHz
Maximum Output Swing Bandwidth	B_{OM}	$V_{O(PP)}$=2V, A_V= 1, R_L=50kΩ, C_L=100pF (Note)		185		kHz
Settling Time	t_S	A_V =-1, Step =0.5V ~2.5V, R_L=50kΩ, C_L=100pF (Note), 0.1%		6.4		μs
		A_V =-1, Step =0.5V ~2.5V, R_L=50kΩ, C_L=100pF (Note), 0.01%		14.1		μs
Phase Margin at Unity Gain	φ_m	R_L=50kΩ, C_L=100pF (Note)		56°		
Gain Margin				11		dB

Note: Referenced to 2.5V.

■ EQUIVALENT SCHEMATIC (each amplifier)



■ TYPICAL APPLICATION CIRCUIT



Series-Resistance Circuit