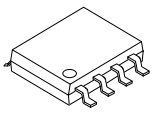
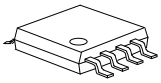
FAMILY OF 2.7V HIGH-SLEW-RATE RAIL-TO-RAIL OUTPUT OPERATIONAL AMPLIFIERS



SOP-8



TSSOP-8

■ DESCRIPTION

The UTC **ULV2772** is CMOS operational amplifier with rail-to-rail output swing, high output drive, and excellent dc-precision. For providing high slew rate and high bandwidth, the device only consumes 1mA of supply current per channel. This ac-performance is much higher than current competitive CMOS amplifiers. Because of its rail-to-rail output swing and high output drive, the UTC **ULV2772** is a good choice for driving the analog input or reference of analog-to-digital converters. And because of its low distortion while driving a 600Ω load, the device also can be used in telecom systems.

The UTC **ULV2772** is also specified across an extended temperature range (−40°C~125°C), making it useful for automotive systems.

The UTC **ULV2772** is characterized at 2.7V and 5V and can operate from a 2.5V to 5.5V single supply voltage. The single-supply operation and low power consumption means the device is a good solution for por table applications.

■ FEATURES

* Qualified for Automotive or Portable Applications
* Supply Voltage Range from 2.5V ~ 5.5V
* Rail-to-Rail Output
* Low Distortion Driving 600Ω: 0.005% THD+N
* Low Supply Current (Per Channel): 1mA
* 17nV/√Hz Input Noise Voltage
* Characterized From T_A=−40°C~125°C

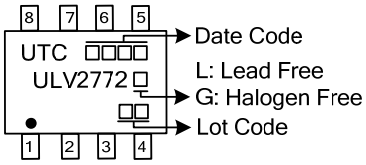
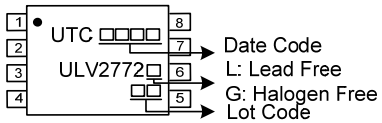
■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
ULV2772L-S08-R	ULV2772G-S08-R	SOP-8	Tape Reel
ULV2772L-P08-R	ULV2772G-P08-R	TSSOP-8	Tape Reel

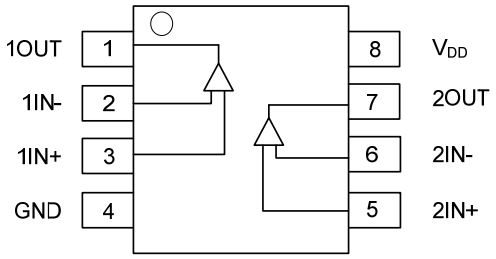
ULV2772G-S08-R

(1)Packing Type	(1) R: Tape Reel
(2)Package Type	(2) S08: SOP-8, P08: TSSOP-8
(3)Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

SOP-8	TSSOP-8
	

■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	1OUT	Output of the left channel
2	1IN-	Negative input of the left channel
3	1IN+	Positive input of the left channel
4	GND	Ground
5	2IN+	Positive input of the right channel
6	2IN-	Negative input of the right channel
7	2OUT	Output of the right channel
8	V_{DD}	Supply voltage

■ ABSOLUTE MAXIMUM RATING

PARAMETER		SYMBOL	RATINGS	UNIT
Supply Voltage (Note 2)		V_{DD}	7	V
Differential Input Voltage (Note 3)		V_{ID}	$\pm V_{DD}$	
Input Voltage Range (Any Input, Note 2)		V_I	-0.3 ~ V_{DD}	V
Input Current (Any Input)		I_I	±4	mA
Output Current		I_O	±50	mA
Total Current Into V_{DD+}			±50	mA
Total Current Out Of GND			±50	mA
Duration Of Short-Circuit Current (At or Below) 25°C (Note 4)			Unlimited	
Power Dissipation	SOP-8	P_D	600	mW
	TSSOP-8		550	mW
Operating Free-Air Temperature Range		T_A	-40 ~ +125	°C
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 GND.
3. Differential voltages are at the noninverting input with respect to the inverting input. Excessive current flows when input is brought below GND -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	RATINGS	UNIT
Supply Voltage	V_{DD}	2.5 ~ 6	V
Input Voltage Range	V_I	GND ~ V_{DD+}-1.3	V
Common-mode Input Voltage	V_{IC}	GND ~ V_{DD+}-1.3	V
Operating Free-Air Temperature	T_A	-40 ~ +125	°C

■ ELECTRICAL CHARACTERISTICS AT SPECIFIED FREE-AIR TEMPERATURE

V_{DD}=2.7V (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	T_A (Note 1)	MIN	TYP	MAX	UNIT
Input Offset Voltage	V_{IO}	V_{DD}=±1.35V, V_{IC}=0, V_O=0, R_S=50Ω	25°C		0.44	2.5	mV
			Full range		0.47	2.7	
Temperature Coefficient Of Input Offset Voltage	α_{VIO}		25°C~125°C		2		μV/°C
Input Offset Current	I_{IO}		25°C		1	60	pA
			Full range		2	125	
Input Bias Current	I_{IB}		25°C		2	60	pA
			Full range		6	350	
Common-mode Input Voltage Range	V_{ICR}	CMRR>60dB, R_S=50Ω	25°C	0	-0.3		V
				1.4	1.7		
			Full range	0	-0.3		
				1.4	1.7		
High-level Output Voltage	V_{OH}	I_{OH}=-0.675mA	25°C		2.6		V
			Full range	2.45			
		I_{OH}=-2.2mA	25°C		2.4		
			Full range	2.1			
Low-level Output Voltage	V_{OL}	V_{IC}=1.35V, I_{OL}=0.675mA	25°C		0.1		V
			Full range			0.2	
		V_{IC}=1.35V, I_{OL}=2.2mA	25°C		0.21		
			Full range			0.6	
Large-signal Differential Voltage Amplification	A_{VD}	V_{IC}=1.35V, R_L=10kΩ, V_O=0.6V~2.1V (Note 2)	25°C	20	380		V/mV
			Full range	13			
Differential Input Resistance	$R_{I(D)}$		25°C		10^{12}		Ω
Common-mode Input Capacitance	$C_{I(C)}$	f=10kHz	25°C		8		pF
Closed-loop Output Impedance	Z_O	f=100kHz, A_V=10	25°C		25		Ω
Common-mode Rejection Ratio	CMRR	V_{IC}=V_{ICR} (min), V_O=1.5V, R_S=50Ω	25°C	60	84		dB
			Full range	60	82		
Supply Voltage Rejection Ratio ($\Delta V_{DD}/\Delta V_{IO}$)	K_{SVR}	V_{DD}=2.7V~5V, V_{IC}=V_{DD}/2, No load	25°C	70	89		dB
			Full range	70	84		
Supply Current (Per Channel)	I_{DD}	V_O=1.5V, No load	25°C		1	2	mA
			Full range			2	

Notes: 1. Full range is −40°C~125°C for Q level part.
2. Referenced to 1.35 V

■ OPERATING CHARACTERISTICS AT SPECIFIED FREE-AIR TEMPERATURE

V_{DD}=2.7V (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A (Note 1)	MIN	TYP	MAX	UNIT
Slew Rate At Unity Gain	SR	$V_{O(PP)}$=0.8V, C_L=100pF, R_L=10kΩ		25°C	5	9		V/μs
				Full range	4.7	6		
Equivalent Input Noise Voltage	V_N	f=1kHz		25°C		21		nV/√Hz
		f=10kHz		25°C		17		
Peak-to-peak Equivalent Input Noise Voltage	$V_{N(PP)}$	f=0.1Hz~1Hz		25°C		0.33		μV
		f=0.1Hz~10Hz		25°C		0.86		μV
Equivalent Input Noise Current	I_N	f=100Hz		25°C		0.6		fA/√Hz
Total Harmonic Distortion Plus Noise	THD+N	R_L=600Ω, f=1kHz	A_V=1	25°C		0.0085		%
			A_V=10			0.025		
			A_V=100			0.12		
Gain-bandwidth Product		f=10kHz, R_L=600Ω, C_L=100pF		25°C		4.8		MHz
Settling Time	T_S	A_V=-1, Step=0.85V~1.85V, R_L=600Ω, C_L=100pF	0.1%	25°C		0.186		μs
			0.01%	25°C		3.92		
Phase Margin At Unity Gain	φ_m	R_L=600Ω, C_L=100pF		25°C		46		Deg
Gain Margin				25°C		12		dB

Note: Full range is -40°C ~ +125°C for Q level part.

■ ELECTRICAL CHARACTERISTICS AT SPECIFIED FREE-AIR TEMPERATURE

V_{DD}=5V (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	T_A (Note 1)	MIN	TYP	MAX	UNIT
Input Offset Voltage	V_{IO}	V_{DD}=±2.5V, V_{IC}=0, V_O=0, R_S=50Ω	25°C		0.36	2.5	mV
			Full range		0.4	2.7	
Temperature Coefficient Of Input Offset Voltage	α_{VIO}		25°C~125°C		2		μV/°C
Input Offset Current	I_{IO}		25°C		1	60	pA
			Full range		2	125	
Input Bias Current	I_{IB}		25°C		2	60	pA
			Full range		6	350	
Common-mode Input Voltage Range	V_{ICR}	CMRR>60dB, R_S=50Ω	25°C	0	-0.3		V
				3.7	3.8		
			Full range	0	-0.3		
				3.7	3.8		
High-level Output Voltage	V_{OH}	I_{OH}=-1.3mA	25°C		4.9		V
			Full range	4.8			
		I_{OH}=-4.2mA	25°C		4.7		
			Full range	4.4			
Low-level Output Voltage	V_{OL}	V_{IC}=2.5V, I_{OL}=1.3mA	25°C		0.1		V
			Full range			0.2	
		V_{IC}=2.5V, I_{OL}=4.2mA	25°C		0.21		
			Full range			0.6	
Large-signal Differential Voltage Amplification	A_{VD}	V_{IC}=1.35V, R_L=10kΩ, V_O=0.6V~2.1V (Note 2)	25°C	20	450		V/mV
			Full range	13			
Differential Input Resistance	$R_{I(D)}$		25°C		10^{12}		Ω
Common-mode Input Capacitance	$C_{I(C)}$	f=10kHz	25°C		8		pF
Closed-loop Output Impedance	Z_O	f=100kHz, A_V=10	25°C		20		Ω
Common-mode Rejection Ratio	CMRR	V_{IC}=V_{ICR} (min), V_O=3.7V, R_S=50Ω	25°C	60	96		dB
			Full range	60	93		
Supply Voltage Rejection Ratio ($\Delta V_{DD}/\Delta V_{IO}$)	K_{SVR}	V_{DD}=2.7V~5V, V_{IC}=V_{DD}/2, No load	25°C	70	89		dB
			Full range	70	84		
Supply Current (Per Channel)	I_{DD}	V_O=1.5V, No load	25°C		1	2	mA
			Full range			2	

Notes: 1. Full range is −40°C~125°C for Q level part.
2. Referenced to 2.5 V

■ OPERATING CHARACTERISTICS AT SPECIFIED FREE-AIR TEMPERATURE

V_{DD}=5V (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A (Note 1)	MIN	TYP	MAX	UNIT
Slew Rate At Unity Gain	SR	$V_{O\ (PP)}$=1.5V, C_L=100pF, R_L=10kΩ		25°C	5	10.5		V/μs
				Full range	4.7	6		
Equivalent Input Noise Voltage	V_N	f=1kHz		25°C		17		nV/√Hz
		f=10kHz		25°C		12		
Peak-to-peak Equivalent Input Noise Voltage	$V_{N\ (PP)}$	f=0.1Hz~1Hz		25°C		0.33		μV
		f=0.1Hz~10Hz		25°C		0.86		μV
Equivalent Input Noise Current	I_N	f=100Hz		25°C		0.6		fA/√Hz
Total Harmonic Distortion Plus Noise	THD+N	R_L=600Ω, f=1kHz	A_V=1	25°C		0.005		%
			A_V=10			0.016		
			A_V=100			0.095		
Gain-bandwidth Product		f=10kHz, R_L=600Ω, C_L=100pF		25°C		5.1		MHz
Settling Time	T_S	A_V=-1, Step=1.5V~3.5V, R_L=600Ω, C_L=100pF	0.1%	25°C		0.134		μs
			0.01%	25°C		1.97		
Phase Margin At Unity Gain	φ_m	R_L=600Ω, C_L=100pF		25°C		46		Deg
Gain Margin				25°C		12		dB

Note: Full range is -40°C ~ +125°C for Q level part.

■ TYPICAL APPLICATION CIRCUIT