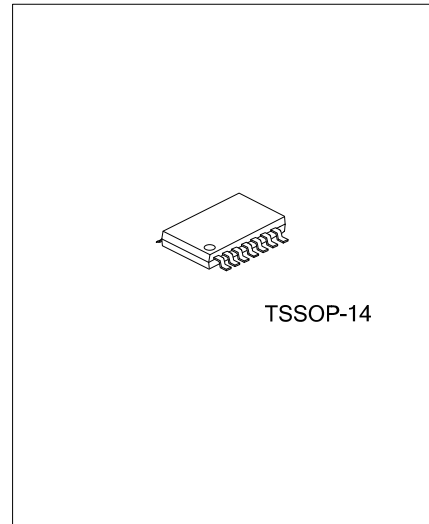




Low-POWER RAIL-TO-RAIL I/O CMOS QUAD OPERATIONAL AMPLIFIER



DESCRIPTION

The UTC **ULV724** (quad) is a low cost rail to rail input and output quad OP AMP. The UTC **ULV724** is low noise, low voltage, and low power supply current, that can be designed into a wide range of applications. The UTC **ULV724** is designed to provide optimal performance in low voltage and low noise systems. It provides rail-to-rail output swing into heavy loads.

Low quiescent current 1.3mA per channel at 5V can supply 11MHz bandwidth and 8.5V/μs slew rate. The UTC **ULV724** suits for Sensors, Active Filters, Audio, A/D Converters, Test Equipment, Communications, Battery-Powered Instrumentation and photodiode amplifiers, Cellular and Cordless Phones, Laptops and PDAs.

The quad version UTC **ULV724** is specified over the extended industrial temperature range (-40°C~+125°C). The operating supply range is from 2.1V to 5.5V.

FEATURES

- * Supply Voltage Range: 2.1V~5.5V
- * Input Voltage Range =- 0.1V~+5.6V with V_S=5.5V
- * Low Supply Current: 1.3mA/Amplifier
- * Low offset voltage : 1.5mV Typical
- * Rail-to-Rail Input and Output
- * High Gain Bandwidth Product: 11MHz
- * High Slew Rate: 8.5V/μs

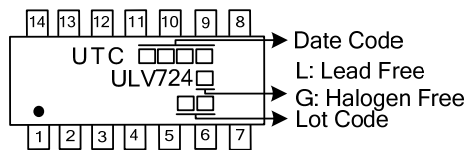
ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
ULV724L-P14-R	ULV724G-P14-R	TSSOP-14	Tape Reel

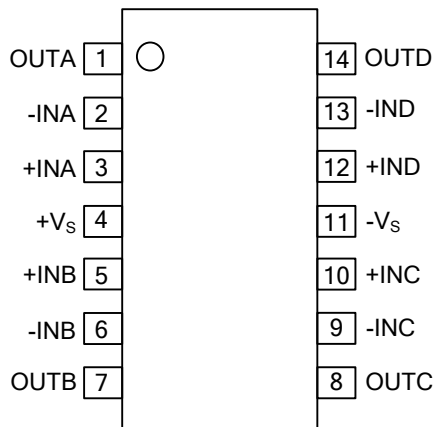
Note: xx: Output Voltage, refer to Marking Information.

<p>ULV724G-P14-R</p> <ul style="list-style-type: none"> (1)Packing Type (2)Package Type (3)Green Package 	<ul style="list-style-type: none"> (1) R: Tape Reel (2) P14: TSSOP-14 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING



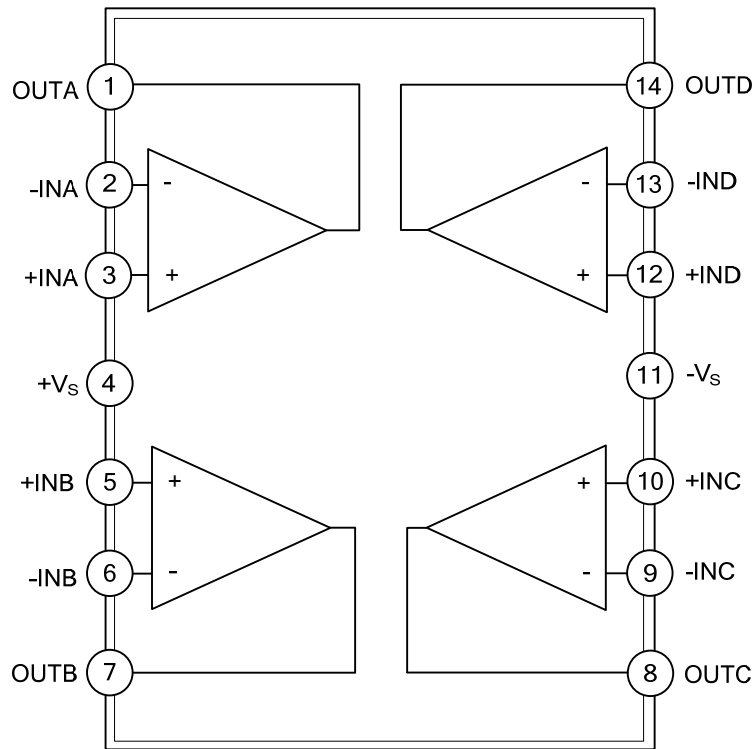
PIN CONFIGURATION



PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	OUTA	Output of A AMP
2	-INA	Invert input of A AMP
3	+INA	Non-invert input of A AMP
4	+Vs	Positive supply
5	+INB	Non-invert input of B AMP
6	-INB	Invert input of B AMP
7	OUTB	Output of B AMP
8	OUTC	Output of C AMP
9	-INC	Invert input of C AMP
10	+INC	Non-invert input of C AMP
11	-Vs	Negative supply
12	+IND	Non-invert input of D AMP
13	-IND	Invert input of D AMP
14	OUTD	Output of D AMP

■ BLOCK DIAGRAM



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■ ABSOLUTE MAXIMUM RATING (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage, +V _S to -V _S	V _S	7	V
Input Common Mode Voltage Range	V _{CM}	(-V _S)-0.3 ~ (+V _S)+0.3	V
Junction Temperature	T _J	+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

(T_A=25°C, V_S=+5V, V_{CM}=V_S/2, R_L=600Ω, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
INPUT CHARACTERISTICS						
Input Offset Voltage	V _{OS}			1.5	4	mV
Input Bias Current	I _B			1		pA
Input Offset Current	I _{OS}			1		pA
Common-Mode Voltage Range	V _{CM}	V _S =5.5V		-0.1~+ 5.6		V
Common-Mode Rejection Ratio	CMRR	V _S =5.5V, V _{CM} =-0.1V~4V	67	83		dB
		V _S =5.5V, V _{CM} =-0.1V~5.6V	60	75		dB
Open-Loop Voltage Gain	A _{OL}	R _L =600Ω, V _o =0.15V~4.85V	82	89		dB
		R _L =10kΩ, V _o =0.05V~4.95V	96	102		dB
Input Offset Voltage Drift	ΔV _{OS} /ΔT			2.1		μV/°C
OUTPUT CHARACTERISTICS						
Output Voltage Swing from Rail	V _O	R _L =600Ω		0.076		V
		R _L =10kΩ		0.006		V
Output Current	I _{OUT}		52	67		mA
Closed-Loop Output Impedance		f=1MHz, G=1		8.5		Ω
POWER SUPPLY						
Operating Voltage Range			2.1		5.5	V
Power Supply Rejection Ratio	PSRR	V _S =+2.1V~+5.5V V _{CM} =(-V _S)+0.5V	68	82		dB
Quiescent Current / Amplifier	I _Q	I _{OUT} =0		1.3	1.6	mA
DYNAMIC PERFORMANCE						
Gain-Bandwidth Product	GBP			11		MHz
Phase Margin	φ _o			62		°
Full Power Bandwidth	BW _P	<1% Distortion		400		kHz
Slew Rate	SR	G=1, 2V Output Step		8.5		V/μs
Settling Time to 0.1%	t _S	G=1, 2V Output Step		0.21		μs
Overload Recovery Time	t _{OR}	V _{IN} × Gain = V _S		0.6		μs
NOISE PERFORMANCE						
Voltage Noise Density	e _N	f=1kHz		12.5		nV/√Hz
		f=10kHz		8.5		nV/√Hz

■ TYPICAL APPLICATION CIRCUIT

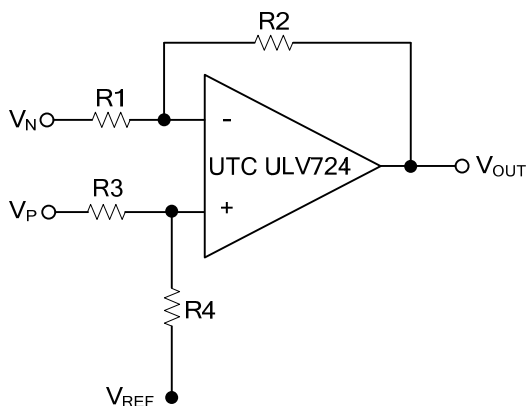


Figure 1. Differential Amplifier

Figure 1 is the differential amplifier. If the resistors ratios are equal ($R4/R3=R2/R1$), then $V_{OUT}=(V_P-V_N) \times R2/R1 + V_{REF}$.

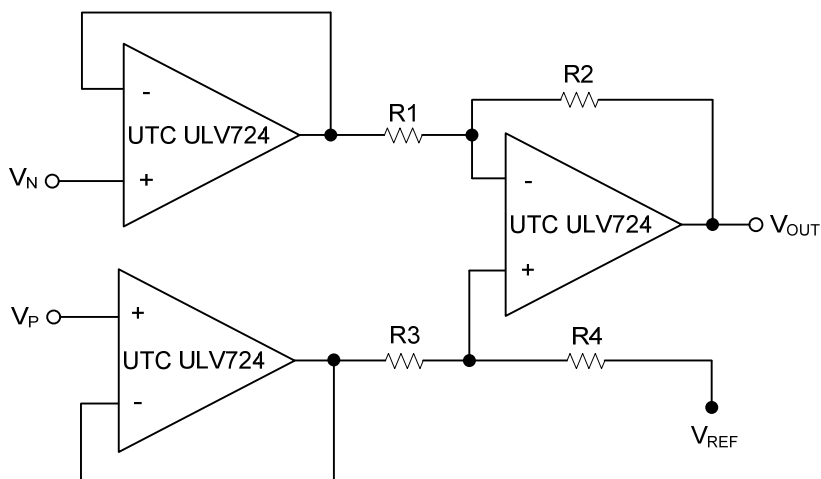


Figure 2. Instrumentation Amplifier

The circuit in Figure 2 performs the same function as that in Figure 1 but with the high input impedance.

■ TYPICAL APPLICATION CIRCUIT (Cont.)

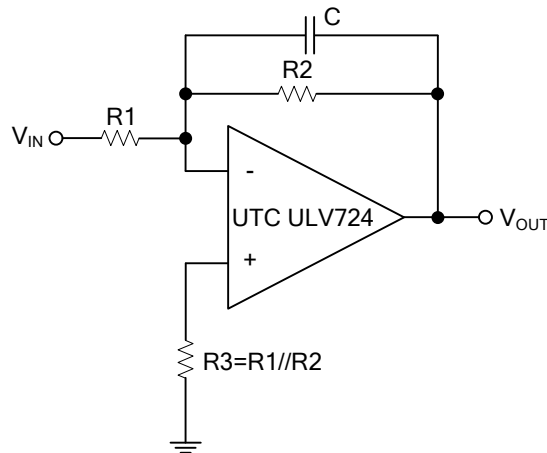


Figure 3. Low Pass Active Filter

Figure 3 is the low pass filter. It's DC gain is $-R2/R1$ and the -3dB corner frequency is $1/2\pi R2C$.

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