

**UTC** UNISONIC TECHNOLOGIES CO., LTD

# **ULV724**

Preliminary

# LOW-POWER RAIL-TO-RAIL I/O **CMOS QUAD OPERATIONAL** AMPLIFIER

### DESCRIPTION

The UTC ULV724 (guad) 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.

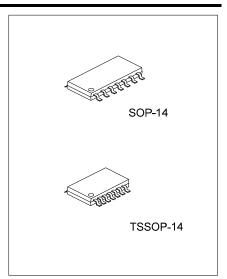
#### **FEATURES**

- \* Supply Voltage Range: 2.1V~5.5V
- \* Input Voltage Range =- 0.1V~+5.6V with V<sub>S</sub>=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

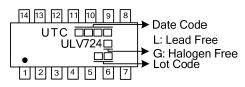
#### **ORDERING INFORMATION**

Ordering Number		Deekees	Decking	
Lead Free	Halogen Free	Package	Packing	
ULV724L-S14-R	ULV724G-S14-R	SOP-14	Tape Reel	
ULV724L-P14-R	ULV724G-P14-R	TSSOP-14	Tape Reel	

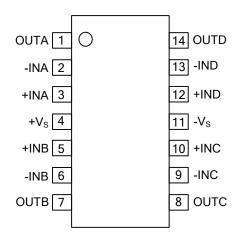
ULV724 <u>G</u> - <u>S14-</u> <u>P</u>	
(1)Packing Type (2)Package Type (3)Green Package	<ul><li>(1) R: Tape Reel</li><li>(2) S14: SOP-14, P14: TSSOP-14</li><li>(3) G: Halogen Free and Lead Free, L: Lead Free</li></ul>



# MARKING



## ■ PIN CONFIGURATION

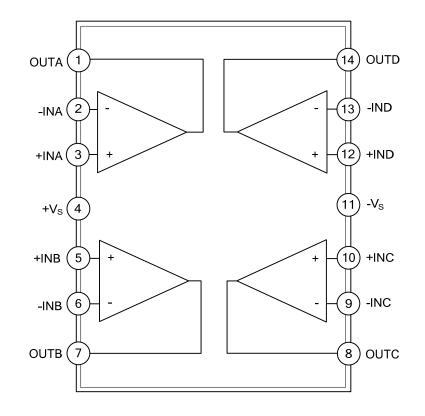


### PIN DESCRIPTION

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





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

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage, +V <sub>S</sub> to -V <sub>S</sub>	Vs	7	V
Input Common Mode Voltage Range	V <sub>CM</sub>	(-V <sub>S</sub> )-0.3 ~ (+V <sub>S</sub> )+0.3	V
Junction Temperature	TJ	+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

 $(T_A=25^{\circ}C, V_S=+5V, V_{CM}=V_S/2, R_L=600\Omega, unless otherwise specified)$ 

(	,,					
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
INPUT CHARACTERISTICS						
Input Offset Voltage	Vos			1.5	4.0	mV
Input Bias Current	IB			1.0		pА
Input Offset Current	los			1.0		pА
Common-Mode Voltage Range	V <sub>CM</sub>	V <sub>S</sub> =5.5V		-0.1~+ 5.6		V
Common-Mode Rejection Ratio	CMRR	V <sub>S</sub> =5.5V, V <sub>CM</sub> =-0.1V~4V	67	83		dB
		V <sub>S</sub> =5.5V, V <sub>CM</sub> =-0.1V~5.6V	60	75		dB
Open-Loop Voltage Gain	A <sub>OL</sub>	R <sub>L</sub> =600Ω, Vo=0.15V~4.85V	82	89		dB
		R <sub>L</sub> =10kΩ, Vo=0.05V~4.95V	96	102		dB
Input Offset Voltage Drift	$\Delta V_{OS} / \Delta_T$			2.1		µV/°C
OUTPUT CHARACTERISTICS						
		R∟=600Ω		0.076		V
Output Voltage Swing from Rail	Vo	R <sub>L</sub> =10kΩ		0.006		V
Output Current	IOUT		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	Vs=+2.1V~+5.5V V <sub>CM</sub> =(-V <sub>S</sub> )+0.5V	68	82		dB
Quiescent Current / Amplifier	Ι <sub>Q</sub>	I <sub>OUT</sub> =0		1.3	1.6	mA
DYNAMIC PERFORMANCE						
Gain-Bandwidth Product	GBP			11		MHz
Phase Margin	φο			62		0
Full Power Bandwidth	BW <sub>P</sub>	<1% Distortion		400		kHz
Slew Rate	SR	G=1, 2V Output Step		8.5		V/µs
Settling Time to 0.1%	ts	G=1, 2V Output Step		0.21		μs
Overload Recovery Time	t <sub>OR</sub>	V <sub>IN</sub> ×Gain=V <sub>S</sub>		0.6		μs
NOISE PERFORMANCE						
Voltage Noise Density	e <sub>N</sub>	f=1kHz		12.5		nV/√Hz
		f=10kHz		8.5		nV/√Hz



## TYPICAL APPLICATION CIRCUIT

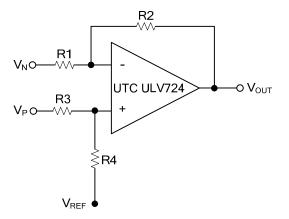


Figure 1. Differential Amplifier

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

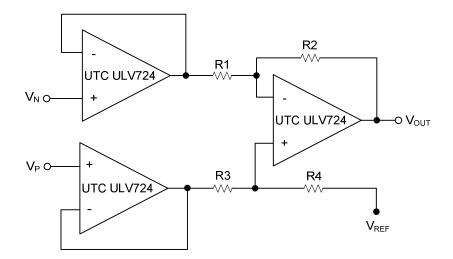


Figure 2. Instrumentation Amplifier

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



# **TYPICAL APPLICATION CIRCUIT (Cont.)**

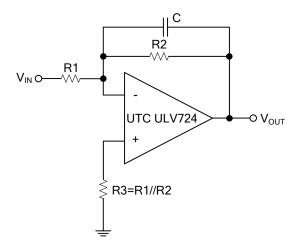


Figure 3. Low Pass Active Filter

Figure 3 is the low pass filter. It's DC gain is -R2/R1 and the -3dB corner frequency is  $1/2\pi R_2 C$ .

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