



ULV6004

CMOS IC

MICRO-POWER QUAD OPERATIONAL AMPLIFIERS

DESCRIPTION

The UTC **ULV6004** of operational amplifiers (op amps) with operational voltage (2.1V, min.) is specifically designed for general-purpose applications.. This amplifier will draw 110µA (typ.) quiescent current when the single supply voltage is as low as 2.1V. It also has a power supply range of 2.1V to 5.5V. Additionally, the UTC **ULV6004** supports rail-to-rail input and output swing, with a common mode input voltage range of $V^+ + 300mV$ to $V^- - 300mV$.

FEATURES

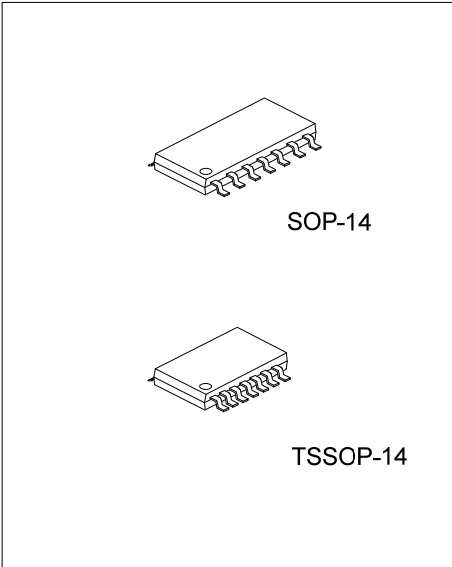
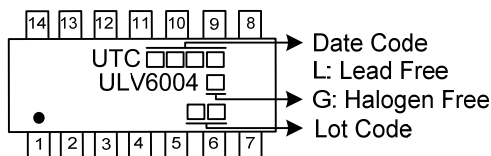
- * Supply Voltage: 2.1~5.5V
- * Supply Current/Amplifier: 170µA (Max.)
- * Input Offset Voltage: 4.5mV (Max.)
- * Rail-to-Rail Input and Output
- * Slew Rate: 1.1V/µs (Typ.)

ORDERING INFORMATION

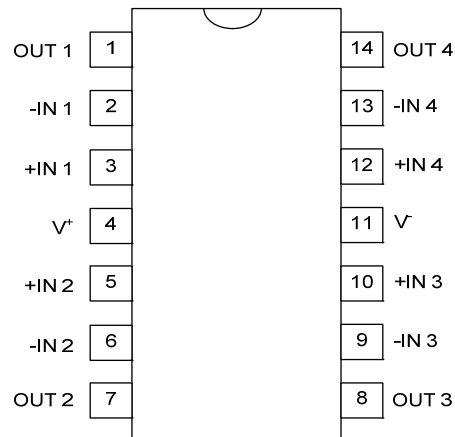
Ordering Number		Package	Packing
Lead Free	Halogen Free		
ULV6004L-S14-R	ULV6004G-S14-R	SOP-14	Tape Reel
ULV6004L-P14-R	ULV6004G-P14-R	TSSOP-14	Tape Reel

<p>ULV6004G-S14-R</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) R: Tape Reel (2) S14: SOP-14, P14: TSSOP-14 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING



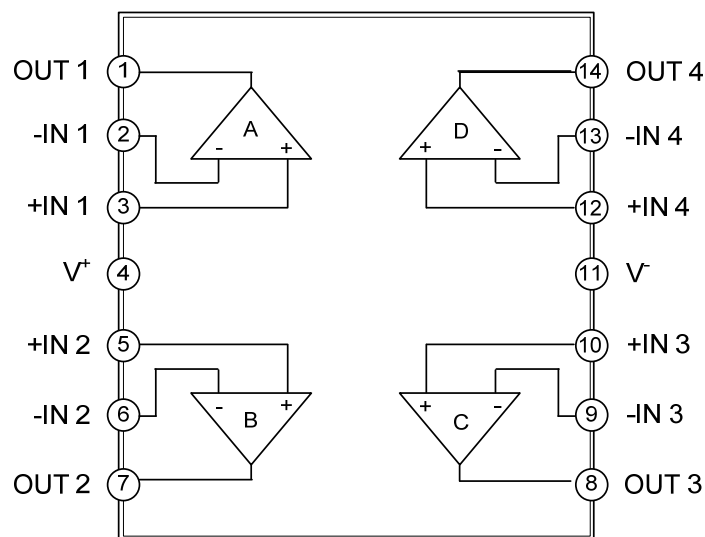
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	OUT 1	Output of 1 AMP
2	-IN 1	Inverting input of 1 AMP
3	+IN 1	Non-inverting input of 1 AMP
4	V ⁺	Positive power supply
5	+IN 2	Non-inverting input of 2 AMP
6	-IN 2	Inverting input of 2 AMP
7	OUT 2	Output of 2 AMP
8	OUT 3	Output of 3 AMP
9	-IN 3	Inverting input of 3 AMP
10	+IN 3	Non-inverting input of 3 AMP
11	V ⁻	Negative power supply
12	+IN 4	Non-inverting input of 4 AMP
13	-IN 4	Inverting input of 4 AMP
14	OUT 4	Output of 4 AMP

■ BLOCK DIAGRAM



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

PARAMETER	SYMBOL	RATINGS	UNIT
Power Supply	V ⁺ - V ⁻	7.0	V
All Inputs and Outputs		V ⁺ -0.3 ~ V ⁻ 0.3	V
Differential Input Voltage	V _{ID}	Supply Voltage	V
Current at Input Pins	I _{IN}	±2	mA
Current at Output and Supply Pins		±30	mA
Junction Temperature	T _J	+150	°C
Storage Temperature	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.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	SOP-14	125	°C/W
	TSSOP-14	175	°C/W

■ RECOMMENDED OPERATING CONDITIONS

(V⁺=2.1V~5.5V, and V⁻=0V, T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V ⁺ - V ⁻	2.1 ~ 5.5	V
Operating Free-Air Temperature	T _{OPR}	-40 ~ +125	°C

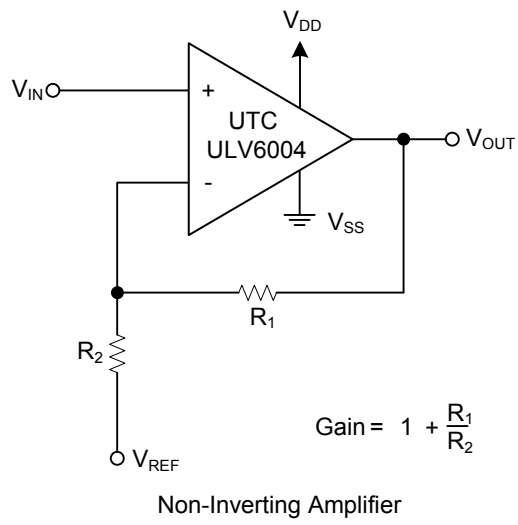
Note: The industrial temperature devices operate over this extended temperature range, but with reduced performance. In any case, the internal Junction Temperature (T_J) must not exceed the Absolute Maximum specification of +150°C.

■ DC ELECTRICAL CHARACTERISTICS

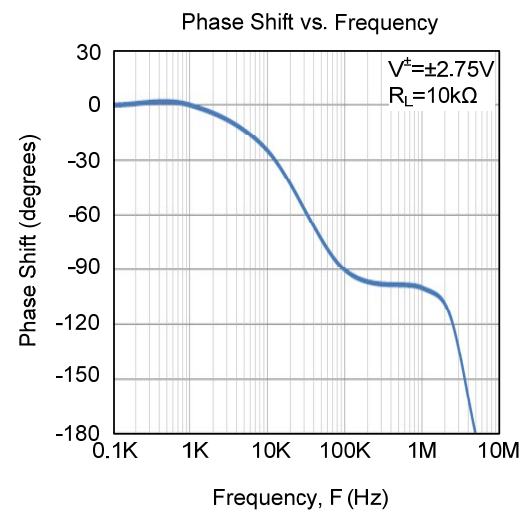
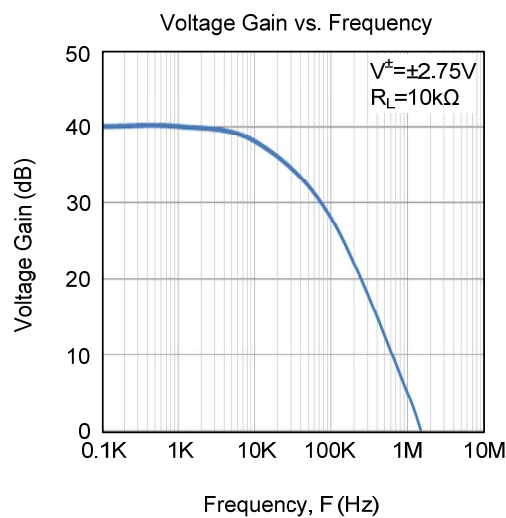
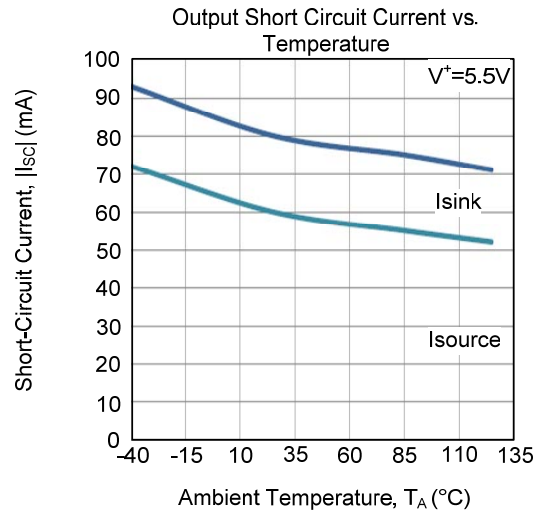
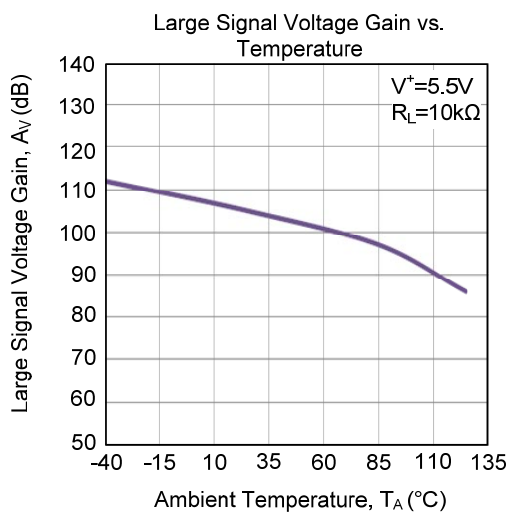
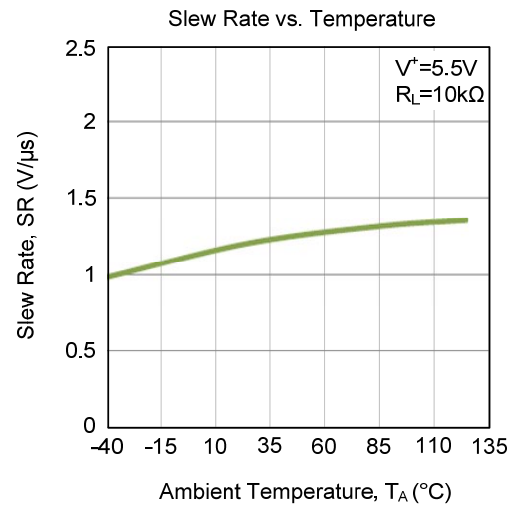
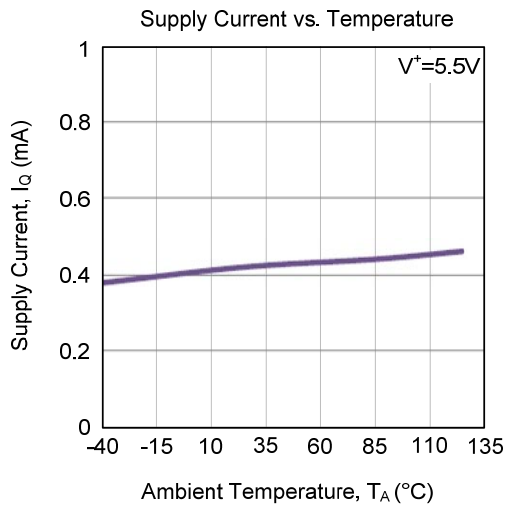
(T_A=25°C, V⁺=2.1V~5.5V, V⁻=0V, V_{CM}=V⁺/2, R_L=10kΩ, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Current/Amplifier	I _Q	I _O =0, V _{DD} =5.5V, V _{CM} =5V		110	170	uA
Power Supply Rejection Ratio	PSRR	V _{CM} =0V		85		dB
Input Offset Voltage	V _{OS}	V _O =0V		1	4.5	mV
Input Bias Current	I _B	V _O =0V		2		pA
Input Offset Current	I _{OS}	V _O =0V		2		pA
Common-Mode Voltage Range	V _{CM}		V ⁻ -0.3		V ⁺ +0.3	V
Common-Mode Rejection Ratio	CMRR	V ⁻ -0.3 < V _{CM} < V ⁺ +0.3V	60	107		dB
Large Signal Voltage Gain	A _V	R _L = 10kΩ, V _O =0.3~V ⁺ -0.3V	88	105		dB
Output Voltage	V _O	R _L = 10kΩ	V _{OH}	V ⁺ -0.09	V ⁺ -0.03	V
			V _{OL}		0.005	0.09
Short-Circuit Current	I _{SC}	Sourcing		80		mA
		Sinking		60		mA
Slew Rate	SR			1.1		V/μs
Gain-Bandwidth Product	GBW			1.5		MHz
Input-Referred Voltage Noise	e _n	f = 1kHz		30		nV/√Hz
Input-Referred Current Noise	i _n	f = 1kHz		1		fA/√Hz

■ TYPICAL APPLICATION CIRCUIT



■ TYPICAL CHARACTERISTICS



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