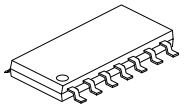
LOW POWER 10 MHZ RAIL-TO-RAIL I/O QUAD OPERATIONAL AMPLIFIERS



SOP-14

■ DESCRIPTION

The UTC **L6134** provides new levels of speed vs power performance in applications where low voltage supplies or power limitations previously made compromise necessary. With only 350μA/amp supply current, the 10MHz gain-bandwidth of this device supports new portable applications where higher power devices unacceptably drain battery life.

The UTC **L6134** can be driven by voltages that exceed both power supply rails, thus eliminating concerns over exceeding the common-mode voltage range. The rail-to-rail output swing capability provides the maximum possible dynamic range at the output. This is particularly important when operating on low supply voltages. The UTC **L6134** can also drive large capacitive loads without oscillating.

Operating on supplies from 2.7V to over 24V, the UTC **L6134** is excellent for a very wide range of applications, from battery operated systems with large bandwidth requirements to high speed instrumentation.

■ FEATURES

* (For 5V Supply, Typ. Unless Noted)
* Rail-to-rail Input : -0.25V ~ 5.25V
* Rail-to-Rail Output : 0.01V ~ 4.99V
* High Gain-Bandwidth, 10MHz at 20kHz
* Slew Rate 12V/μs
* Low Supply Current 350μA/Amplifier
* Wide Supply Range: 2.7V ~ 24V
* Gain 100dB with R_L=10k

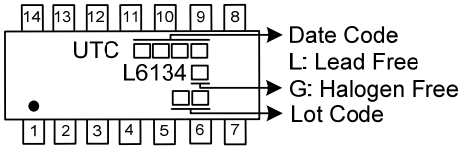
■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
L6134L-S14-R	L6134G-S14-R	SOP-14	Tape Reel

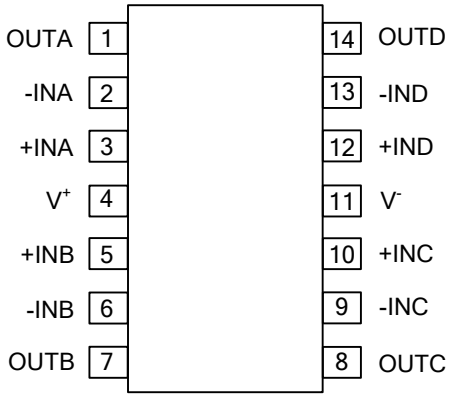
L6134G-S14-R
- (1)Packing Type
- (2)Package Type
- (3)Green Package

(1) R: Tape Reel
(2) S14: SOP-14
(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



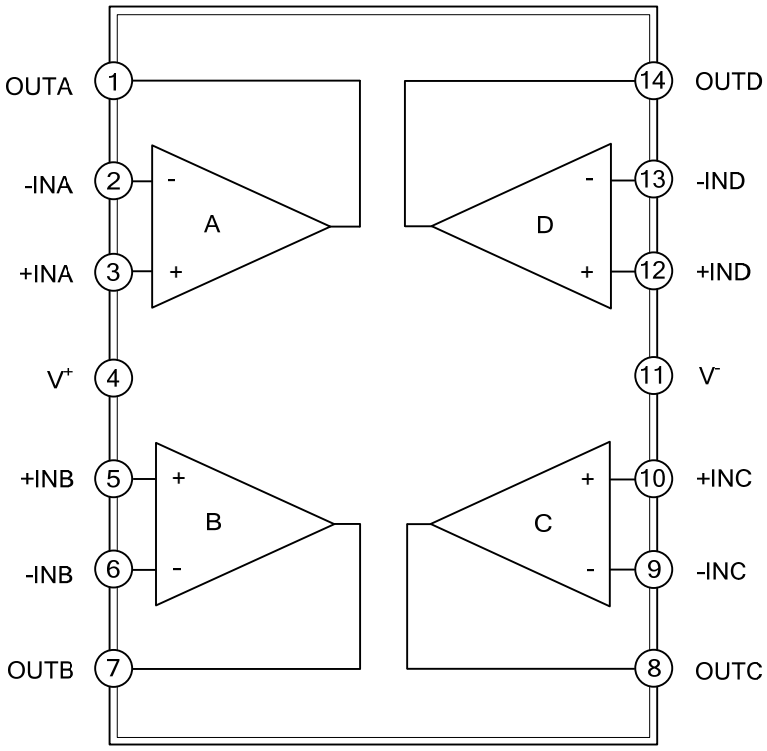
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	I/O	DESCRIPTION
1	OUTA	O	Analog Output pin of A AMP
2	-INA	I	Inverting Input pin of A AMP
3	+INA	I	Non-inverting Input of A AMP
4	V^+	I	Positive Power Supply
5	+INB	I	Non-inverting Input of B AMP
6	-INB	I	Inverting Input pin of B AMP
7	OUTB	O	Analog Output pin of B AMP
8	OUTC	O	Analog Output pin of C AMP
9	-INC	I	Inverting Input pin of C AMP
10	+INC	I	Non-inverting Input of C AMP
11	V^-	I	Negative Power Supply
12	+IND	I	Non-inverting Input of D AMP
13	-IND	I	Inverting Input pin of D AMP
14	OUTD	O	Analog Output pin of D AMP

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS (Note 1)

PARAMETER	SYMBOL	RATINGS	UNIT
Differential Input Voltage		±15	V
Voltage at Input/Output Pin		(V^+) + 0.3, (V^-) - 0.3	V
Supply Voltage $(V^+ - V^-)$		35	V
Current at Input Pin		±10	mA
Current at Output Pin (Note 2)		±25	mA
Current at Power Supply Pin		50	mA
Junction Temperature	T_J	+150	°C
Storage Temperature	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. Applies to both single-supply and split-supply operation. Continuous short circuit operation at elevated ambient temperature can result in exceeding the maximum allowed junction temperature of 150°C.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V^+		2.7		24	V
Temperature Range	T_A		-40		+85	°C

■ 5V DC ELECTRICAL CHARACTERISTICS (Note 1)

(V^+ =5.0V, V^- =0V, V_{CM}=V_O=V^+/2 and R_L > 1MΩ to V^+/2, T_C=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 3)	TYP (Note 2)	MAX (Note 3)	UNIT
Input Offset Voltage	V_{OS}	T_A =25°C		4.0	8.0	mV
Input Bias Current	I_B			110		nA
		0V ≤ V_{CM} ≤ 5V		180	350	nA
Input Offset Current	I_{OS}			3	50	nA
Input Resistance, CM	R_{IN}			104		MΩ
Common-Mode Rejection Ratio	CMRR	0V ≤ V_{CM} ≤ 4V	70	100		dB
		0V ≤ V_{CM} ≤ 5V	55	80		dB
Power Supply Rejection Ratio	PSRR	±2.5V ≤ V + ≤ ±12V	78	87		dB
Input Common-Mode Voltage Range	V_{CM}		0	-0.25 ~5.25	5.0	V
Large Signal Voltage Gain	A_V	R_L=10k	6	100		V/mV
Output Swing	V_{OH}	R_L=100k	4.93	4.98		V
		R_L=10k	4.85	4.94		V
		R_L =5k	4.85	4.9		V
	V_{OL}	R_L=100k		0.019	0.017	V
		R_L=10k		0.07	0.09	V
		R_L =5k		0.095	0.12	V
Output Short Circuit Current	I_{SC}	Sourcing	1	2		mA
		Sinking	0.7	1.3		mA
Supply Current	I_S	Per Amplifier		350	450	μA

Notes: 1. Electrical Table values apply only for factory testing conditions at the temperature indicated. Factory testing conditions result in very limited self-heating of the device such that T_J=T_A. No guarantee of parametric performance is indicated in the electrical tables under conditions of the internal self heating where T_J > T_A.
2. All voltage values, except differential voltage, are with respect to network ground terminal.
3. Typical values represent the most likely parametric norm.
4. All limits are guaranteed by testing or statistical analysis.
5. Input current must be limited by a resistor in series with the inputs.

■ 5V AC ELECTRICAL CHARACTERISTICS (Note 1)

(V^+ =5.0V, V^- =0V, V_{CM}=V_O=V^+/2 and R_L > 1MΩ to V^+/2, T_C=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 3)	TYP (Note 2)	MAX	UNIT
Slew Rate	SR	±4V @ V_s= ±6V, R_S > 1kΩ	5	14		V/μs
Gain-Bandwidth Product	GBW	f = 20kHz	7	10		MHz
Phase Margin	φm	R_L = 10k		33		Deg
Amp-to-Amp Isolation		R_L = 10k		10		dB
Input-Referred Voltage Noise	e_n	f =1kHz		27		nV/√Hz
Input-Referred Current Noise	i_n	f =1kHz		0.18		pA/√Hz

Notes: 1. Electrical Table values apply only for factory testing conditions at the temperature indicated. Factory testing conditions result in very limited self-heating of the device such that T_J=T_A. No guarantee of parametric performance is indicated in the electrical tables under conditions of the internal self heating where T_J > T_A.
2. Typical values represent the most likely parametric norm.
3. All limits are guaranteed by testing or statistical analysis.

■ 2.7V DC ELECTRICAL CHARACTERISTICS (Note 1)

(V^+ =2.7V, V^- =0V, V_{CM}=V_O=V^+/2 and R_L > 1MΩ to V^+/2, T_C=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 3)	TYP (Note 2)	MAX (Note 3)	UNIT
Input Offset Voltage	V_{OS}			0.12	12	mV
Input Bias Current	I_B	0V ≤ VCM ≤ 2.7V		90		nA
Input Offset Current	I_{OS}			2.8		nA
Input Resistance, C_M	R_{IN}			134		MΩ
Common-Mode Rejection Ratio	CMRR	0V ≤ V_{CM} ≤2.7V		82		dB
Power Supply Rejection Ratio	PSRR	±1.35V ≤ V + ≤ ±12V		80		dB
Input Common-Mode Voltage Range	V_{CM}		0		2.7	V
Large Signal Voltage Gain	A_V	R_L=10k		100		V/mV
Output Swing	V_{OH}	R_L=100kΩ	2.25	2.66		V
	V_{OL}	R_L=100kΩ		0.03	0.112	V
Supply Current	I_S	Per Amplifier		250		μA

Notes: 1. Electrical Table values apply only for factory testing conditions at the temperature indicated. Factory testing conditions result in very limited self-heating of the device such that T_J=T_A. No guarantee of parametric performance is indicated in the electrical tables under conditions of the internal self heating where T_J > T_A.
2. Typical values represent the most likely parametric norm.
3. All limits are guaranteed by testing or statistical analysis.

■ 2.7V AC ELECTRICAL CHARACTERISTICS (Note 1)

(V^+ =2.7V, V^- =0V, V_{CM}=V_O=V^+/2 and R_L > 1MΩ to V^+/2, T_C=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 3)	TYP (Note 2)	MAX	UNIT
Gain-Bandwidth Product	GBW	R_L = 10k, f = 20 kHz		7		MHz
Phase Margin	φ_m	R_L = 10k		23		Deg
Gain Margin	G_m			12		dB

Notes: 1. Electrical Table values apply only for factory testing conditions at the temperature indicated. Factory testing conditions result in very limited self-heating of the device such that T_J=T_A. No guarantee of parametric performance is indicated in the electrical tables under conditions of the internal self heating where T_J > T_A.
2. Typical values represent the most likely parametric norm.
3. All limits are guaranteed by testing or statistical analysis.

■ 24V ELECTRICAL CHARACTERISTICS (Note 1)

(V^+=24V, V^-=0V, V_{CM}=V_O=V^+/2 and R_L > 1MΩ to V^+/2, T_C=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 3)	TYP (Note 2)	MAX (Note 3)	UNIT
Input Offset Voltage	V_{OS}			1.7	9.0	mV
Input Bias Current	I_B			125		nA
Input Offset Current	I_{OS}			4.8		nA
Input Resistance, C_M	R_{IN}			210		MΩ
Common-Mode Rejection Ratio	CMRR	0V ≤ V_{CM} ≤24V		80		dB
Power Supply Rejection Ratio	PSRR	2.7V ≤ V^+ ≤ 24V		82		dB
Input Common-Mode Voltage Range	V_{CM}		0	-0.25~ 24.25	24	V
Large Signal Voltage Gain	A_V	R_L=10k		102		V/mV
Output Swing	V_{OH}	R_L=10kΩ	23.8	23.86		V
	V_{OL}	R_L=10kΩ		0.075	0.15	V
Supply Current	I_S	Per Amplifier		390	490	μA
Gain-Bandwidth Product	GBW	R_L = 10k, f = 20 kHz		11		MHz

Notes: 1. Electrical Table values apply only for factory testing conditions at the temperature indicated. Factory testing conditions result in very limited self-heating of the device such that T_J=T_A. No guarantee of parametric performance is indicated in the electrical tables under conditions of the internal self heating where T_J > T_A.
2. Typical values represent the most likely parametric norm.
3. All limits are guaranteed by testing or statistical analysis.