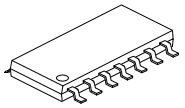
17 MHz RAIL-TO-RAIL INPUT-OUTPUT OPERATIONAL AMPLIFIERS



SOP-14

■ DESCRIPTION

The UTC **L6144** provides new levels of performance in applications where low voltage supplies or power limitations previously made compromise necessary. Operating on supplies of 2.7V to over 24V, the UTC **L6144** is an excellent choice for battery operated systems, portable instrumentation and others.

The greater than rail-to-rail input voltage range eliminates concern over exceeding the common-mode voltage range. The rail-to-rail output swing provides the maximum possible dynamic range at the output. This is particularly important when operating on low supply voltages.

High gain-bandwidth with 650μA/Amplifier supply current opens new battery powered applications where previous higher power consumption reduced battery life to unacceptable levels. The ability to drive large capacitive loads without oscillating functionally removes this common problem.

■ FEATURES

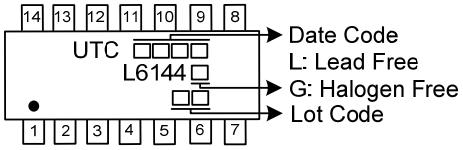
* For 5V supply, Typ. unless noted
* Rail-to-rail Input : -0.25V~5.25V
* Rail-to-Rail Output : 0.005V~4.995V
* Slew Rate:
  Small Signal, 5V/μs
  Large Signal, 30V/μs
* Low Supply Current 650μA/Amplifier
* Wide Supply Range: 2.7V~24V
* Gain 108dB with R_L=10k

■ ORDERING INFORMATION

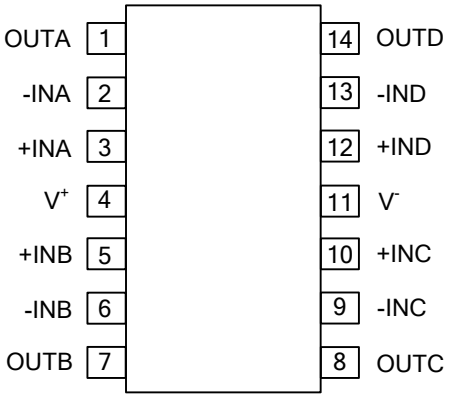
Ordering Number		Package	Packing
Lead Free	Halogen Free		
L6144L-S14-R	L6144G-S14-R	SOP-14	Tape Reel

L6144G-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



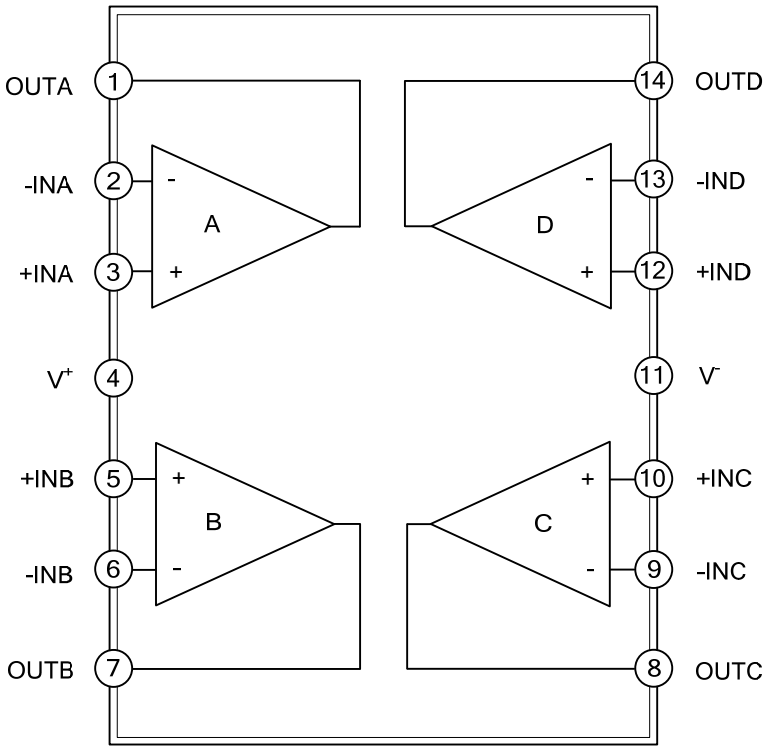
■ PIN CONFIGURATION



■ PIN DESCRIPTION

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

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

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		0.3	3.3	mV
Input Bias Current	I_B			170		nA
		0V ≤ V_{CM} ≤ 5V		180	526	nA
Input Offset Current	I_{OS}			3	80	nA
Input Resistance, CM	R_{IN}			126		MΩ
Common-Mode Rejection Ratio	CMRR	0V ≤ V_{CM} ≤ 4V	78	107		dB
		0V ≤ V_{CM} ≤ 5V	64	82		dB
Power Supply Rejection Ratio	PSRR	5V ≤ V^+ ≤ 24V	78	87		dB
Input Common-Mode Voltage Range	V_{CM}			-0.25 ~5.25		V
Large Signal Voltage Gain	A_V	R_L=10k	20	100		V/mV
Output Swing	V_{OH}	R_L=100k	4.93	4.995		V
		R_L=10k		4.97		V
		R_L=2k	4.8	4.9		V
	V_{OL}	R_L=100k		0.005	0.013	V
		R_L=10k		0.02		V
		R_L=2k		0.06	0.133	V
Output Short Circuit Current	I_{SC}	Sourcing	4	13		mA
		Sinking	4	5		mA
Supply Current	I_S	Per Amplifier		650	880	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	8 V_{PP} @ V^+ 12V, R_S > 1kΩ	9	25		V/μs
Gain-Bandwidth Product	GBW	f =50kHz	6	17		MHz
Phase Margin	φ_m			38		Deg
Amp-to-Amp Isolation				130		dB
Input-Referred Voltage Noise	e_n	f =1kHz		16		nV/√Hz
Input-Referred Current Noise	i_n	f =1kHz		0.22		pA/√Hz
Total Harmonic Distortion	THD	f =10kHz, R_L=10kΩ,		0.003		%

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}			0.4	5	mV
Input Bias Current	I_B			150	526	nA
Input Offset Current	I_{OS}			4	80	nA
Input Resistance, C_M	R_{IN}			128		MΩ
Common-Mode Rejection Ratio	CMRR	0V ≤ V_{CM} ≤ 1.8V		90		dB
		0V ≤ V_{CM} ≤ 2.7V		76		dB
Power Supply Rejection Ratio	PSRR	3V ≤ V^+ ≤ 5V		79		dB
Input Common-Mode Voltage Range	V_{CM}			-0.25~ 2.95		V
Large Signal Voltage Gain	A_V	R_L=10k		55		V/mV
Output Swing	V_{OH}	R_L=100kΩ	2.25	2.67		V
	V_{OL}	R_L=100kΩ		0.019	0.112	V
Supply Current	I_S	Per Amplifier		510	880	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	f = 50kHz		9		MHz
Phase Margin	φ_m			36		Deg
Gain Margin	G_m			6		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}			1.3	4.8	mV
Input Bias Current	I_B			174		nA
Input Offset Current	I_{OS}			5		nA
Input Resistance, C_M	R_{IN}			288		MΩ
Common-Mode Rejection Ratio	CMRR	0V ≤ V_{CM} ≤ 23V		114		dB
		0V ≤ V_{CM} ≤ 24V		100		dB
Power Supply Rejection Ratio	PSRR	0V ≤V_{CM} ≤ 24V		87		dB
Input Common-Mode Voltage Range	V_{CM}			-0.25~ 24.25		V
Large Signal Voltage Gain	A_V	R_L=10k		500		V/mV
Output Swing	V_{OH}	R_L=10kΩ	23.62	23.85		V
	V_{OL}	R_L=10kΩ		0.07	0.185	V
Supply Current	I_S	Per Amplifier		750	1150	μA
Gain-Bandwidth Product	GBW	f=50kHz		18		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.