UNISONIC TECHNOLOGIES CO., LTD

L6144

Preliminary

LINEAR INTEGRATED CIRCUIT

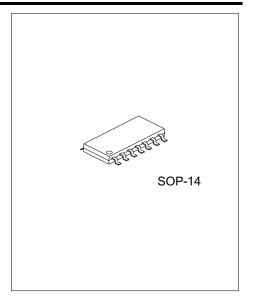
17 MHz RAIL-TO-RAIL INPUT-OUTPUT OPERATIONAL AMPLIFIERS

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

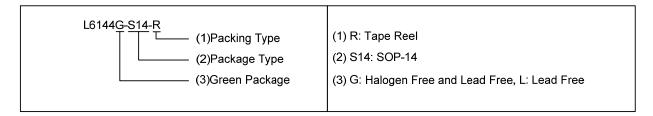
* Low Supply Current 650µA/Amplifier

* Wide Supply Range: 2.7V~24V

* Gain 108dB with R_L=10k

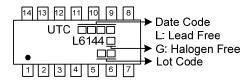
ORDERING INFORMATION

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

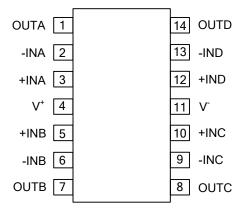


www.unisonic.com.tw 1 of 7

■ MARKING



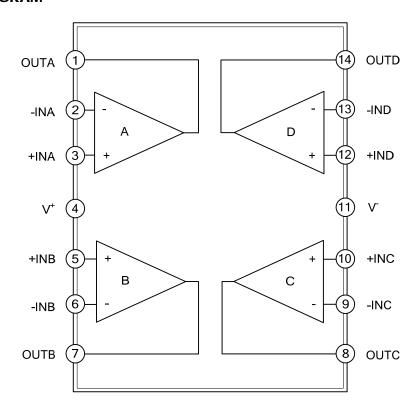
■ PIN CONFIGURATION



■ 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)

 $(V^{+}=5.0V, V^{-}=0V, V_{CM}=V_{O}=V^{+}/2 \text{ and } R_{L} > 1M\Omega \text{ to } V^{+}/2, T_{C}=25^{\circ}\text{C}, \text{ unless otherwise specified})$

(1 0101) 1 011 1011 10 1 1 011						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 3)	TYP (Note 2)	MAX (Note 3)	UNIT
Input Offset Voltage	Vos	T _A =25°C	,	0.3	3.3	mV
In and Bing Ourself				170		nA
Input Bias Current	I _B	0V ≤ V _{CM} ≤ 5V		180	526	nA
Input Offset Current	los			3	80	nA
Input Resistance, CM	R _{IN}			126		МΩ
Common Mada Dejection Datio	CMDD	$0V \le V_{CM} \le 4V$	78	107		dB
Common-Mode Rejection Ratio	CMRR	$0V \le V_{CM} \le 5V$	64	82		dB
Power Supply Rejection Ratio	PSRR	$5V \le V^{+} \le 24V$	78	87		dB
Input Common-Mode Voltage	V _{CM}			-0.25		V
Range	V CM			~5.25		V
Large Signal Voltage Gain	Av	R _L =10k	20	100		V/mV
	V _{OH}	R _L =100k	4.93	4.995		V
		R _L =10k		4.97		V
Output Swing		R _L =2k	4.8	4.9		V
Output Swing		R _L =100k		0.005	0.013	V
	V_{OL}	R _L =10k		0.02		V
		R _L =2k		0.06	0.133	V
Output Short Circuit Current		Sourcing	4	13		mA
Output Short Circuit Current	I _{SC}	Sinking	4	5		mA
Supply Current	Is	Per Amplifier		650	880	μΑ

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)

 $(V^{+}=5.0V, V^{-}=0V, V_{CM}=V_{O}=V^{+}/2 \text{ and } R_{L} > 1M\Omega \text{ to } V^{+}/2, T_{C}=25^{\circ}\text{C}, \text{ unless otherwise specified})$

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 3)	TYP (Note 2)	MAX	UNIT
Slew Rate	SR	$8 \text{ V}_{PP} \text{ @ V}^{+} 12 \text{ V}, \text{ R}_{S} > 1 \text{ k}\Omega$	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	$f = 10$ kHz, $R_L = 10$ kΩ,		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)

 $(V^{+}=2.7V, V^{-}=0V, V_{CM}=V_{O}=V^{+}/2 \text{ and } R_{L} > 1M\Omega \text{ to } V^{+}/2, T_{C}=25^{\circ}\text{C}, \text{ unless otherwise specified})$

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PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 3)	TYP (Note 2)	MAX (Note 3)	UNIT
Input Offset Voltage	Vos			0.4	5	mV
Input Bias Current	I_{B}			150	526	nA
Input Offset Current	Ios			4	80	nA
Input Resistance, C _M	R _{IN}			128		МΩ
Common-Mode Rejection Ratio	CMDD	$0V \le V_{CM} \le 1.8V$		90		dB
	CMRR	$0V \le V_{CM} \le 2.7V$		76		dB
Power Supply Rejection Ratio	PSRR	$3V \le V^+ \le 5V$		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
0.10.10.10	V_{OH}	R_L =100k Ω	2.25	2.67		V
Output Swing	V _{OL}	R_L =100k Ω		0.019	0.112	V
Supply Current	Is	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)

 $(V^{+}=2.7V, V^{-}=0V, V_{CM}=V_{O}=V^{+}/2 \text{ and } R_{L} > 1M\Omega \text{ to } V^{+}/2, T_{C}=25^{\circ}\text{C}, \text{ unless otherwise specified})$

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
170 UNETER	01111502	1201 GONDINGNO	(Note 3)	(Note 2)	1111 0 (0.4
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)

 $(V^{+}=24V, V^{-}=0V, V_{CM}=V_{O}=V^{+}/2 \text{ and } R_{L} > 1M\Omega \text{ to } V^{+}/2, T_{C}=25^{\circ}\text{C}, \text{ unless otherwise specified})$

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PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 3)	TYP (Note 2)	MAX (Note 3)	UNIT
Input Offset Voltage	Vos			1.3	4.8	mV
Input Bias Current	I _B			174		nA
Input Offset Current	Ios			5		nA
Input Resistance, C _M	R _{IN}			288		ΜΩ
O a marrier Maria Daia atiana Datia	OMPD	$0V \le V_{CM} \le 23V$		114		dB
Common-Mode Rejection Ratio	CMRR	$0V \le V_{CM} \le 24V$		100		dB
Power Supply Rejection Ratio	PSRR	0V ≤V _{CM} ≤ 24V		87		dB
Input Common-Mode Voltage	\/			-0.25~		V
Range	V _{CM}			24.25		V
Large Signal Voltage Gain	A_V	R _L =10k		500		V/mV
Output Curing	V _{OH}	$R_L=10k\Omega$	23.62	23.85		V
Output Swing	V_{OL}	$R_L=10k\Omega$		0.07	0.185	V
Supply Current	Is	Per Amplifier		750	1150	μΑ
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.

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