# UNISONIC TECHNOLOGIES CO., LTD

L6132

# LINEAR INTEGRATED CIRCUIT

# **LOW POWER 10 MHZ** RAIL-TO-RAIL I/O DUAL OPERATIONAL AMPLIFIERS

#### DESCRIPTION

The UTC L6132 provides new levels of speed vs power performance in applications where low voltage supplies or power limitations previously made compromise necessary. With only 350 µA/amp supply current, the 10 MHz gain-bandwidth of this device supports new portable applications where higher power devices unacceptably drain battery life.

The UTC L6132 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 L6132 can also drive large capacitive loads without oscillating.

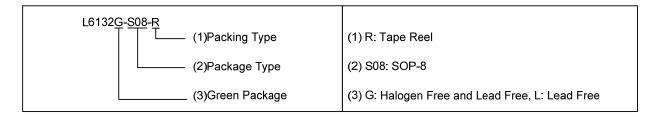
Operating on supplies from 2.7V to over 24V, the UTC L6132 is excellent for a very wide range of applications, from battery operated systems with large bandwidth requirements to high speed instrumentation.

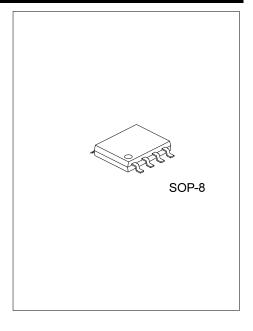


- \* (For 5V Supply, Typ. Unless Noted)
- \* Rail-to-rail Input: -0.25V ~ 5.25V
- \* Rail-to-Rail Output: 0.01V ~ 4.99V
- \* High Gain-Bandwidth, 10 MHz at 20 kHz
- \* Slew Ratel 12V/µs
- \* Low Supply Current 350 µA/Amplifier
- \* Wide Supply Range: 2.7V ~ 24V
- \* Gain 100dB with R<sub>L</sub>=10k

#### ORDERING INFORMATION

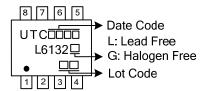
Ordering Number		Dookogo	Dooking
Lead Free	Halogen Free	Package	Packing
L6132L-S08-R	L6132G-S08-R	SOP-8	Tape Reel



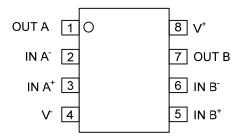


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## **■** MARKING



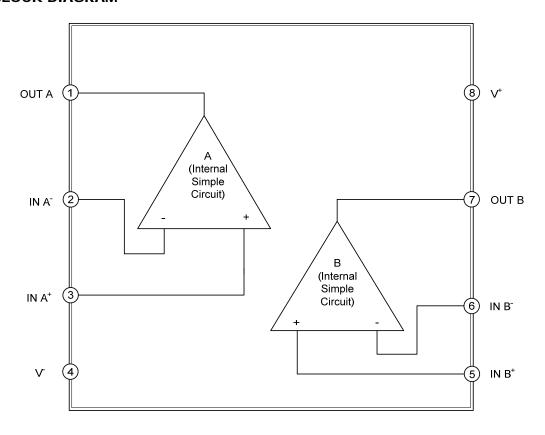
## **■ PIN CONFIGURATION**



#### **■ PIN DESCRIPTION**

PIN NO.	PIN NAME	DESCRIPTION
1	OUTA	Output for Channel 1
2	IN A	Negative Input for Channel 1
3	IN A <sup>+</sup>	Positive Input for Channel 1
4	$V^-$	Negative Supply Voltage
5	IN B⁺	Positive Input for Channel 2
6	IN B	Negative Input for Channel 2
7	OUT B	Output for Channel 2
8	V <sup>+</sup>	Positive Supply Voltage

# **■ BLOCK DIAGRAM**



#### ■ ABSOLUTE MAXIMUM RATINGS (Note1)

PARAMETER	SYMBOL	RATINGS	UNIT
Differential Input Voltage		±15	V
Voltage at Input/Output Pin		$(V^{+}) + 0.3, (V^{-}) - 0.3$	V
Supply Voltage (V <sup>+</sup> - V <sup>-</sup> )		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	TJ	+150	°C
Storage Temperature	T <sub>STG</sub>	-65 ~ <b>+</b> 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 <sup>+</sup>		2.7		24	V
Temperature Range	T <sub>A</sub>		-40		+85	°C

# ■ 5V DC ELECTRICAL CHARACTERISTICS (Note 1)

(Unless otherwise specified, all limits guaranteed for  $T_A$  =25°C,  $V^+$  =5.0V,  $V^-$  =0V,  $V_{CM}$  = $V_O$  = $V^+$ /2 and  $R_L$  > 1M $\Omega$  to  $V^+$ /2.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
170 UVIETEIX	OTWIDOL		(Note 3)	(Note 2)	(Note 3)	0
Input Offset Voltage	Vos	T <sub>A</sub> =25°C		4.0	8.0	mV
Innut Ding Coment				110		nA
Input Bias Current	I <sub>B</sub>	$0V \le V_{CM} \le 5V$		180	350	nA
Input Offset Current	Ios			3	50	nA
Input Resistance, CM	R <sub>IN</sub>			104		МΩ
Common Mada Daigation Batia	CMDD	$0V \le V_{CM} \le 4V$	70	100		dB
Common-Mode Rejection Ratio	CMRR	$0V \le V_{CM} \le 5V$	55	80		dB
Power Supply Rejection Ratio	PSRR	±2.5V ≤ V + ≤ ±12V	78	87		dB
Input Common-Mode Voltage Range	V <sub>CM</sub>		0	-0.25 ~5.25	5.0	V
Large Signal Voltage Gain	$A_V$	R <sub>L</sub> =10k	6	100		V/mV
		R <sub>L</sub> =100k	4.93	4.98		V
	$V_{OH}$	R <sub>L</sub> =10k	4.85	4.94		V
Out and Out in a		R <sub>L</sub> =5k 4.85	4.9		V	
Output Swing		R <sub>L</sub> =100k		0.019	0.017	V
	$V_{OL}$	R <sub>L</sub> =10k		0.07	0.09	V
		R <sub>L</sub> =5k		0.095	0.12	V
Outrout Short Circuit Comment	,	Sourcing	1	2		mA
Output Short Circuit Current	I <sub>SC</sub>	Sinking	0.7	1.3		mA
Supply Current	Is	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<sub>J</sub>=T<sub>A</sub>. No guarantee of parametric performance is indicated in the electrical tables under conditions of the internal self heating where T<sub>J</sub> > T<sub>A</sub>.

- 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)

(Unless otherwise specified, all limits guaranteed for  $T_A = 25^{\circ}C$ ,  $V^{+} = 5.0V$ ,  $V^{-} = 0V$ ,  $V_{CM} = V_{O} = V^{+}/2$  and  $R_L > 1M\Omega$  to  $V^{+}/2$ .)

			MIN	TYP		
PARAMETER	SYMBOL	TEST CONDITIONS	IVIIIN	ITP	MAX	UNIT
1700WETER	OTMBOL	TEST SONDITIONS	(Note 3)	(Note 2)	IVII U	01111
Slew Rate	SR	$\pm$ 4V @ V <sub>s</sub> = $\pm$ 6V, R <sub>S</sub> > 1kΩ	5	14		V/µs
Gain-Bandwidth Product	GBW	f = 20kHz	7	10		MHz
Phase Margin	φm	R <sub>L</sub> = 10k		33		Deg
Amp-to-Amp Isolation		R <sub>L</sub> = 10k		10		dB
Input-Referred Voltage Noise	e <sub>n</sub>	f =1kHz		27		nV/√Hz
Input-Referred Current Noise	i <sub>n</sub>	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)

(Unless otherwise specified, all limits guaranteed for  $T_A = 25^{\circ}C$ ,  $V^{+} = 2.7V$ ,  $V^{-} = 0V$ ,  $V_{CM} = V_{O} = V^{+}/2$  and  $R_L > 1M\Omega$  to  $V^{+}/2$ .)

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PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
			(Note 3)	(Note 2)	(Note 3)	
Input Offset Voltage	Vos			0.12	12	mV
Input Bias Current	$I_{B}$	0V ≤ VCM ≤ 2.7V		90		nΑ
Input Offset Current	los			2.8		nA
Input Resistance, C <sub>M</sub>	R <sub>IN</sub>			134		МΩ
Common-Mode Rejection Ratio	CMRR	0V ≤ V <sub>CM</sub> ≤2.7V		82		dB
Power Supply Rejection Ratio	PSRR	±1.35V ≤ V + ≤ ±12V		80		dB
Input Common-Mode Voltage Range	V <sub>CM</sub>		0		2.7	V
Large Signal Voltage Gain	$A_V$	R <sub>L</sub> =10k		100		V/mV
Outrat States	VoH	R <sub>L</sub> =100kΩ	2.25	2.66		V
Output Swing	V <sub>OL</sub>	$R_L=100k\Omega$		0.03	0.112	V
Supply Current	Is	Per Amplifier		250		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. 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)

(Unless otherwise specified, all limits guaranteed for  $T_A = 25^{\circ}C$ ,  $V^+ = 2.7V$ ,  $V^- = 0V$ ,  $V_{CM} = V_O = V^+/2$  and  $R_L > 1M\Omega$  to  $V^+/2$ .)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 3)	TYP (Note 2)	MAX	UNIT
Gain-Bandwidth Product	GBW	R <sub>L</sub> = 10k, f = 20 kHz		7		MHz
Phase Margin	φm	R <sub>L</sub> = 10k		23		Deg
Gain Margin	G <sub>m</sub>			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)

(Unless otherwise specified, all limits guaranteed for  $T_A$  =25°C,  $V^+$  =24V,  $V^-$  =0V,  $V_{CM}$  = $V_O$  = $V^+$ /2 and  $R_L$  > 1M $\Omega$  to  $V^+$ /2.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN (Note 3)	TYP (Note 2)	MAX (Note 3)	UNIT
Input Offset Voltage	Vos			1.7	9.0	mV
Input Bias Current	I <sub>B</sub>			125		nA
Input Offset Current	los			4.8		nΑ
Input Resistance, C <sub>M</sub>	R <sub>IN</sub>			210		МΩ
Common-Mode Rejection Ratio	CMRR	0V ≤ V <sub>CM</sub> ≤24V		80		dB
Power Supply Rejection Ratio	PSRR	2.7V ≤ V <sup>+</sup> ≤ 24V		82		dB
Input Common-Mode Voltage Range	V <sub>CM</sub>		0	-0.25~ 24.25	24	V
Large Signal Voltage Gain	A <sub>V</sub>	R <sub>L</sub> =10k		102		V/mV
Outroot Outro	V <sub>OH</sub>	$R_L=10k\Omega$	23.8	23.86		V
Output Swing	V <sub>OL</sub>	$R_L=10k\Omega$		0.075	0.15	V
Supply Current	Is	Per Amplifier		390	490	μA
Gain-Bandwidth Product	GBW	R <sub>L</sub> = 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.

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