



## ULC831

Preliminary

LINEAR INTEGRATED CIRCUIT

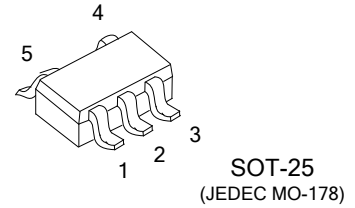
### MICRO-POWER, CMOS INPUT, RRIO, 1.4V, PUSH-PULL OUTPUT COMPARATOR

#### DESCRIPTION

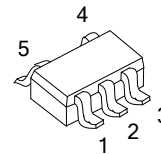
The UTC **ULC831** is a push-pull output comparator, allowing operation from 1.4V-5.5V. It has the best-in-class power supply current versus propagation delay performance. It features as low as 6µs response time with 100mV overdrive at 1.4V, and it has an ultra low power supply current of 300nA (TYP).

The UTC **ULC831** series is ideally suited for RC timers, Window Detectors, IR Receivers, Multivibrators, Alarm and Monitoring Circuits.

The UTC **ULC831** is available in Green SOT-25 space-saving packages. It is rated over the -40°C to +85°C temperature range.



SOT-25 (JEDEC MO-178)



SOT-23-5 (JEDEC TO-236)

#### FEATURES

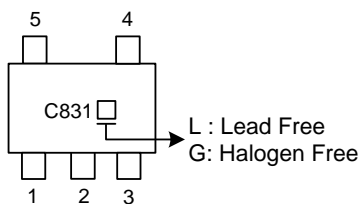
- \* Very Low Supply Current: 300nA (TYP) at  $V_S=1.4V$
- \* Wide Supply Voltage Range: 1.4V~5.5V
- \* Rail-to-Rail Input
- \* High Speed: 6µs (TYP) at  $V_S=1.4V$
- \* Push-Pull Output Current Drive: 19mA (TYP) at  $V_S=5V$
- \* -40°C~+85°C Operating Temperature Range

#### ORDERING INFORMATION

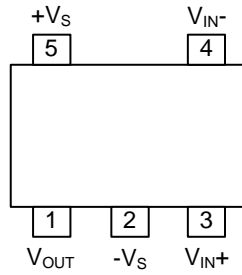
Ordering Number		Package	Packing
Lead Free	Halogen Free		
ULC831L-AE5-R	ULC831G-AE5-R	SOT-23-5	Tape Reel
ULC831L-AF5-R	ULC831G-AF5-R	SOT-25	Tape Reel

<p>ULC831G-AE5-R</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) R: Tape Reel</p> <p>(2) AE5: SOT-23-5, AF5: SOT-25</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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#### MARKING



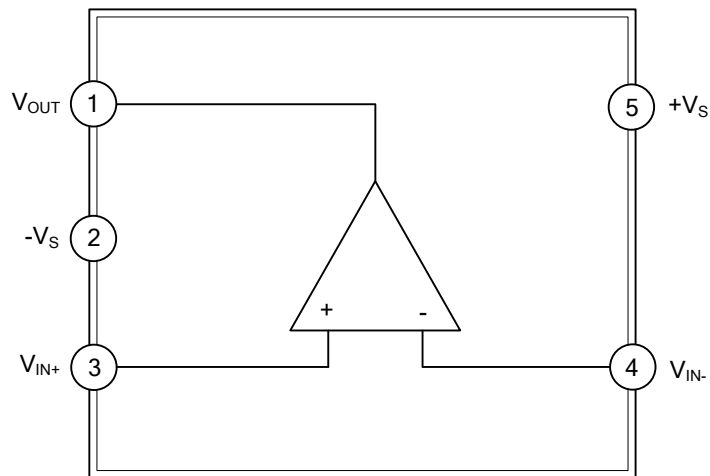
## ■ PIN CONFIGURATION



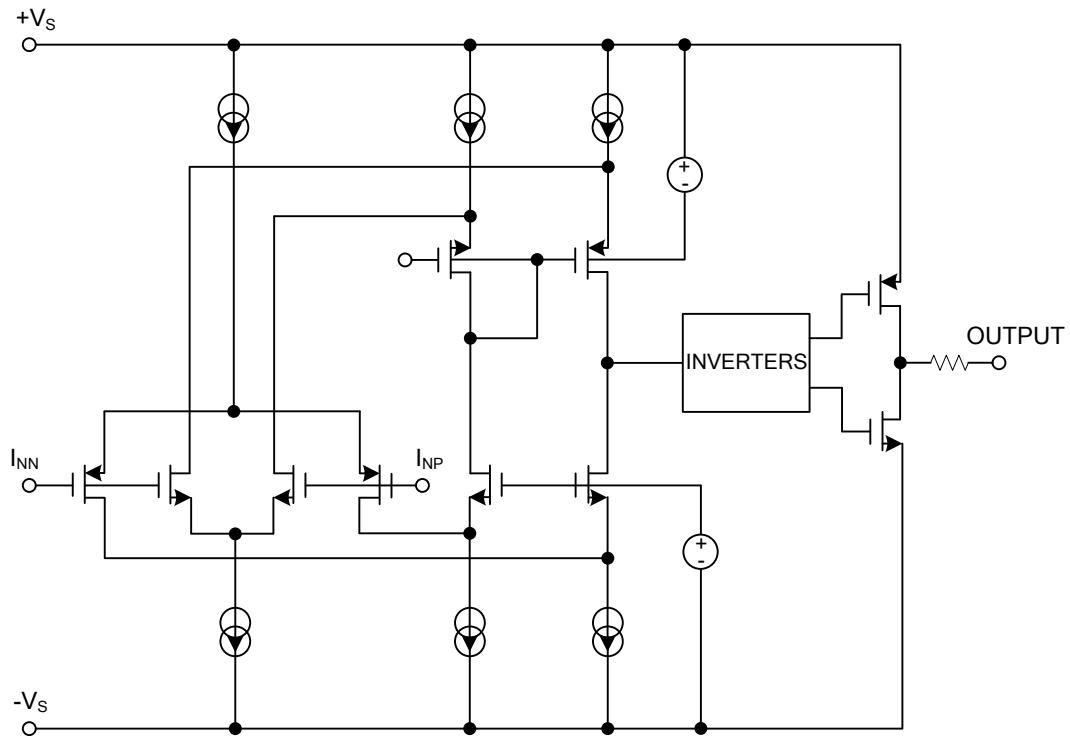
## ■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	$V_{OUT}$	Output pin of Comparator
2	$-V_S$	Negative supply
3	$V_{IN+}$	Positive Input pin of Comparator
4	$V_{IN-}$	Negative Input pin of Comparator
5	$+V_S$	Positive supply

## ■ BLOCK DIAGRAM



## ■ SIMPLIFIED SCHEMATIC DIAGRAM



### ■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage, +V <sub>S</sub> to -V <sub>S</sub>		6	V
V <sub>IN</sub> Differential		±2.5	V
Voltage at Input/Output Pins		(-V <sub>S</sub> ) - 0.3 ~ (+V <sub>S</sub> ) + 0.3	V
Junction Temperature	T <sub>J</sub>	+150	°C
Operating Temperature Range	T <sub>OPR</sub>	-40~ +85	°C
Storage Temperature	T <sub>STG</sub>	-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.

### ■ ELECTRICAL CHARACTERISTICS

(+V<sub>S</sub>=1.4V, -V<sub>S</sub>=0V, V<sub>CM</sub>=+V<sub>S</sub>/2 and V<sub>O</sub>=-V<sub>S</sub>, T<sub>A</sub>=25°C, unless otherwise noted.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Current	I <sub>S</sub>	V <sub>CM</sub> =0.3V		300	1200	nA
		V <sub>CM</sub> =1.1V		250	1200	nA
Input Offset Voltage	V <sub>OS</sub>	V <sub>CM</sub> =0V		0.5		mV
		V <sub>CM</sub> =1.4V		0.5		mV
Input Offset Average Drift				2		µV/°C
Common Mode Rejection Ratio	CMRR	V <sub>CM</sub> Stepped from 0V to 0.3V		65		dB
		V <sub>CM</sub> Stepped from 0.8V to 1.4V		75		dB
		V <sub>CM</sub> Stepped from 0V to 1.4V		75		dB
Power Supply Rejection Ratio	PSRR	V <sub>S</sub> =1.8V~5.5V, V <sub>CM</sub> =0V		95		dB
Large Signal Voltage Gain	A <sub>VO</sub>			100		dB
Output Swing High	V <sub>OH</sub>	V <sub>S</sub> =1.8V, I <sub>O</sub> =500µA	1.598	1.669		V
		-40°C ≤ T <sub>A</sub> ≤ +85°C	1.581			V
		V <sub>S</sub> =1.8V, I <sub>O</sub> =1mA	1.324	1.508		V
		-40°C ≤ T <sub>A</sub> ≤ +85°C	1.288			V
Output Swing Low	V <sub>OL</sub>	V <sub>S</sub> =1.8V, I <sub>O</sub> =-500µA		82	112	mV
		-40°C ≤ T <sub>A</sub> ≤ +85°C			127	mV
		V <sub>S</sub> =1.8V, I <sub>O</sub> =-1mA		167	225	mV
		-40°C ≤ T <sub>A</sub> ≤ +85°C			253	mV
Output Current	I <sub>OUT</sub>	Source		0.7		mA
		Sink		2.0		mA
Propagation Delay (High to Low)		Overdrive=10mV		12		µs
		Overdrive=100mV		6		µs
Propagation Delay (Low to High)		Overdrive=10mV		26		µs
		Overdrive=100mV		17		µs
Rise Time	t <sub>Rise</sub>	Overdrive=10mV, C <sub>L</sub> =30pF, R <sub>L</sub> =1MΩ		220		ns
		Overdrive=100mV, C <sub>L</sub> =30pF, R <sub>L</sub> =1MΩ		220		ns
Fall Time	t <sub>Fall</sub>	Overdrive=10mV, C <sub>L</sub> =30pF, R <sub>L</sub> =1MΩ		155		ns
		Overdrive=100mV, C <sub>L</sub> =30pF, R <sub>L</sub> =1MΩ		155		ns

### ■ ELECTRICAL CHARACTERISTICS (Cont.)

(+V<sub>S</sub>=2.5V, -V<sub>S</sub>=0V, V<sub>CM</sub>=+V<sub>S</sub>/2 and V<sub>O</sub>=-V<sub>S</sub>, T<sub>A</sub>=25°C, unless otherwise noted.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Current	I <sub>S</sub>	V <sub>CM</sub> =0.3V		310		nA
		V <sub>CM</sub> =2.2V		260		nA
Input Offset Voltage	V <sub>OS</sub>	V <sub>CM</sub> =0V		0.5		mV
		V <sub>CM</sub> =2.5V		0.5		mV
Input Offset Average Drift				2		μV/°C
Common Mode Rejection Ratio	CMRR	V <sub>CM</sub> Stepped from 0V to 1.4V		75		dB
		V <sub>CM</sub> Stepped from 1.9V to 2.5V		80		dB
		V <sub>CM</sub> Stepped from 0V to 2.5V		80		dB
Power Supply Rejection Ratio	PSRR	V <sub>S</sub> =1.8V~5.5V, V <sub>CM</sub> =0V		95		dB
Large Signal Voltage Gain	A <sub>VO</sub>			100		dB
Output Swing High	V <sub>OH</sub>	I <sub>O</sub> =500μA		2.419		V
		I <sub>O</sub> =1mA		2.333		V
Output Swing Low	V <sub>OL</sub>	I <sub>O</sub> =-500μA		66		mV
		I <sub>O</sub> =-1mA		133		mV
Output Current	I <sub>OUT</sub>	Source		5.3		mA
		Sink		7.7		mA
Propagation Delay (High to Low)		Overdrive=10mV		12		μs
		Overdrive=100mV		5		μs
Propagation Delay (Low to High)		Overdrive=10mV		28		μs
		Overdrive=100mV		19		μs
Rise Time	t <sub>Rise</sub>	Overdrive=10mV, C <sub>L</sub> =30pF, R <sub>L</sub> =1MΩ		120		ns
		Overdrive=100mV, C <sub>L</sub> =30pF, R <sub>L</sub> =1MΩ		120		ns
Fall Time	t <sub>Fall</sub>	Overdrive=10mV, C <sub>L</sub> =30pF, R <sub>L</sub> =1MΩ		85		ns
		Overdrive=100mV, C <sub>L</sub> =30pF, R <sub>L</sub> =1MΩ		70		ns

### ■ ELECTRICAL CHARACTERISTICS (Cont.)

(+V<sub>S</sub>=5.0V, -V<sub>S</sub>=0V, V<sub>CM</sub>=+V<sub>S</sub>/2 and V<sub>O</sub>=-V<sub>S</sub>, T<sub>A</sub>=25°C, unless otherwise noted.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Current	I <sub>S</sub>	V <sub>CM</sub> =0.3V		350	2000	nA
		V <sub>CM</sub> =4.7V		300	2000	nA
Input Offset Voltage	V <sub>OS</sub>	V <sub>CM</sub> =0V		0.5		mV
		V <sub>CM</sub> =5V		0.5		mV
Input Offset Average Drift				2		μV/°C
Common Mode Rejection Ratio	CMRR	V <sub>CM</sub> Stepped from 0V to 3.9V		85		dB
		V <sub>CM</sub> Stepped from 4.4V to 5.0V		85		dB
		V <sub>CM</sub> Stepped from 0V to 5.0V		85		dB
Power Supply Rejection Ratio	PSRR	V <sub>S</sub> =1.8V~5.5V, V <sub>CM</sub> =0V		95		dB
Large Signal Voltage Gain	A <sub>VO</sub>			105		dB
Output Swing High	V <sub>OH</sub>	I <sub>O</sub> =500μA	4.923	4.952		V
		-40°C ≤ T <sub>A</sub> ≤ +85°C	4.916			V
		I <sub>O</sub> =1mA	4.864	4.904		V
		-40°C ≤ T <sub>A</sub> ≤ +85°C	4.848			V
Output Swing Low	V <sub>OL</sub>	I <sub>O</sub> =-500μA		52	80	mV
		-40°C ≤ T <sub>A</sub> ≤ +85°C			90	mV
		I <sub>O</sub> =-1mA		104	130	mV
		-40°C ≤ T <sub>A</sub> ≤ +85°C			143	mV
Output Current	I <sub>OUT</sub>	Source	14	18		mA
		-40°C ≤ T <sub>A</sub> ≤ +85°C	12.1			mA
		Sink	15	19		mA
		-40°C ≤ T <sub>A</sub> ≤ +85°C	12.9			mA
Propagation Delay (High to Low)		Overdrive=10mV		13		μs
		Overdrive=100mV		6		μs
Propagation Delay (Low to High)		Overdrive=10mV		42		μs
		Overdrive=100mV		33		μs
Rise Time	t <sub>Rise</sub>	Overdrive=10mV, C <sub>L</sub> =30pF, R <sub>L</sub> =1MΩ		85		ns
		Overdrive=100mV, C <sub>L</sub> =30pF, R <sub>L</sub> =1MΩ		85		ns
Fall Time	t <sub>Fall</sub>	Overdrive=10mV, C <sub>L</sub> =30pF, R <sub>L</sub> =1MΩ		70		ns
		Overdrive=100mV, C <sub>L</sub> =30pF, R <sub>L</sub> =1MΩ		60		ns

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