

# IS31AP2010E

## MONO FILTER-LESS CLASS-D AUDIO POWER AMPLIFIER

Advanced Information

May 2012

### GENERAL DESCRIPTION

The IS31AP2010E is a high efficiency, mono filter-less class-D audio power amplifier. A low noise, filter-less PWM architecture eliminates the output filter, reduces external component count, system cost, and simplifying design.

In cellular handsets, the earpiece, speaker phone, and melody ringer speaker can each be driven by the IS31AP2010E. The gain of IS31AP2010E is externally configurable which allows independent gain control from multiple sources by summing signals from each function.

IS31AP2010E is available in UTQFN-9 packages. It operates from 2.7V to 5.5V over the temperature range of -40°C to +85°C.

### FEATURES

- Supply voltage from 2.7V ~ 5.5V
- High efficiency
- Less than 1µA shutdown current
- Optimized PWM output stage eliminates LC output filter
- Fully differential design reduces RF rectification and eliminates bypass capacitor
- Improved CMRR eliminates two input coupling capacitors
- Integrated click-and-pop suppression circuitry
- UTQFN-9 package
- RoHS compliant and 100% lead(Pb)-free

### APPLICATIONS

- Wireless or cellular handsets and PDAs
- Portable DVD player
- Notebook PC
- Portable radio
- Educational toys
- Portable gaming

### TYPICAL APPLICATION CIRCUIT

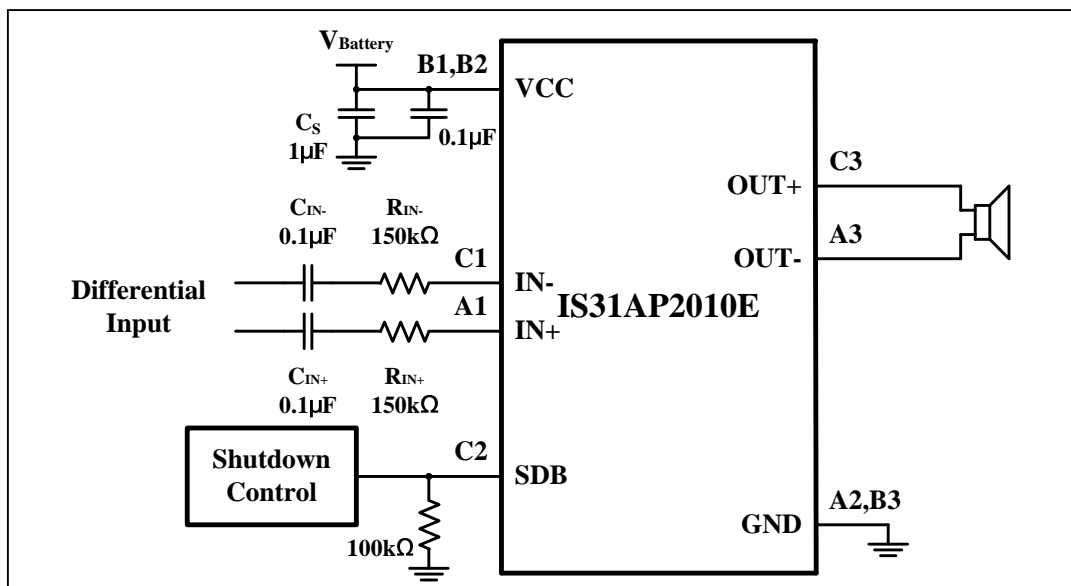


Figure 1 Typical Application Circuit (Differential Input)

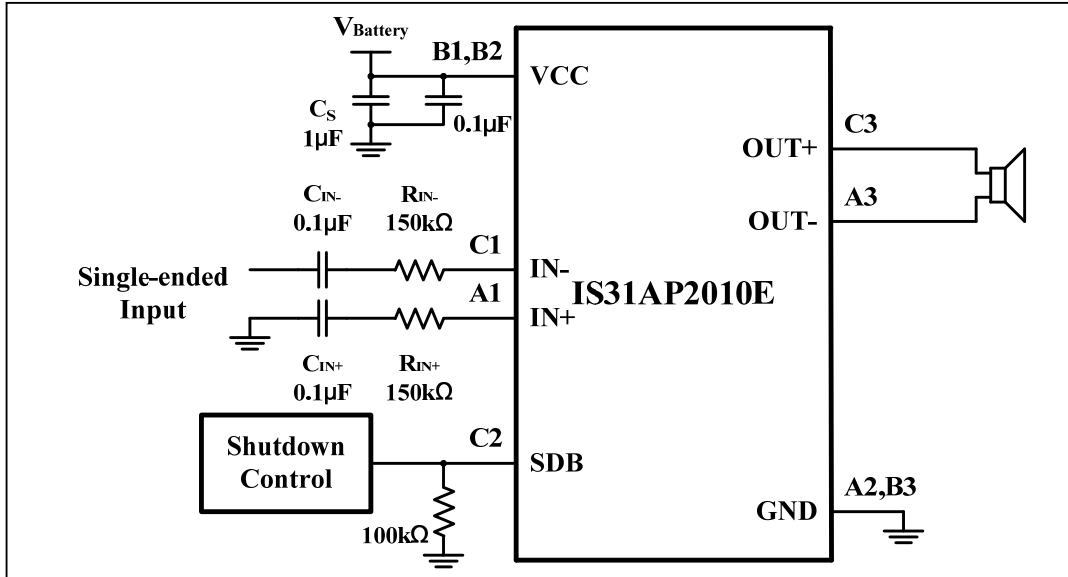
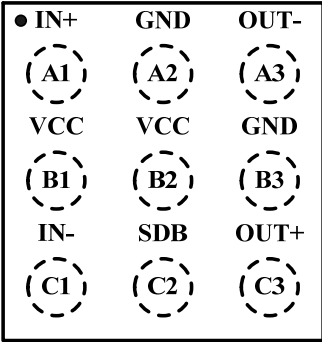


Figure 2 Typical Application Circuit (Single-ended Input)

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## PIN CONFIGURATION

Package	Pin Configuration (Top View)
UTQFN-9	

## PIN DESCRIPTION

No.	Pin	Description
A1	IN+	Positive audio input.
A2, B3	GND	Connect to ground.
A3	OUT-	Negative audio output.
B1, B2	VCC	Power supply.
C1	IN-	Negative audio input.
C2	SDB	Enter in shutdown mode when active low.
C3	OUT+	Positive audio output.

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# IS31AP2010E

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## ORDERING INFORMATION

Industrial Range: -40°C to +85°C

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Order Part No.	Package	QTY/Reel
IS31AP2010E-UTLS2-TR	UTQFN-9, Lead-free	3000

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# IS31AP2010E

## ABSOLUTE MAXIMUM RATINGS

Supply voltage, $V_{CC}$	-0.3V ~ +6.0V
Voltage at any input pin	-0.3V ~ $V_{CC}+0.3V$
Junction temperature, $T_{JMAX}$	+150°C
Storage temperature range, $T_{stg}$	-65°C ~ +150°C

**Note:**

- Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## ELECTRICAL CHARACTERISTICS

$V_{CC} = 2.7V \sim 5.5V$ ,  $T_A = 25^\circ C$ , unless otherwise noted. (Note 1)

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
$V_{CC}$	Supply voltage		2.7		5.5	V
$ V_{OS} $	Output offset voltage (measured differentially)	$V_{SDB} = 0V$ , $A_V = 2V/V$		10		mV
$I_{CC}$	Quiescent current	$V_{CC} = 5.5V$ , no load		2.6		mA
		$V_{CC} = 2.7V$ , no load		1.2		
$I_{SD}$	Shutdown current	$V_{SDB} = 0.4V$			1	$\mu A$
$f_{sw}$	Switching frequency			250		kHz
$R_{IN}$	Input resistor	Gain $\leq 20V/V$	15			k $\Omega$
Gain		$R_{IN} = 150k\Omega$		2		V/V
$V_{IH}$	High-level input voltage		1.4		$V_{CC}$	V
$V_{IL}$	Low-level input voltage		0		0.4	V

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## ELECTRICAL CHARACTERISTICS

$T_A = 25^\circ\text{C}$ , Gain = 2V/V,  $C_{IN} = 2\mu\text{F}$ , unless otherwise noted. (Note 2)

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
$P_O$	Output power	THD+N = 10% $f = 1\text{kHz}$ , $R_L = 8\Omega$	$V_{CC} = 5.0\text{V}$		1.68	W
			$V_{CC} = 4.2\text{V}$		1.2	
			$V_{CC} = 3.6\text{V}$		0.88	
		THD+N = 10% $f = 1\text{kHz}$ , $R_L = 4\Omega$	$V_{CC} = 5.0\text{V}$		3.0	W
			$V_{CC} = 4.2\text{V}$		2.0	
			$V_{CC} = 3.6\text{V}$		1.5	
		THD+N = 1% $f = 1\text{kHz}$ , $R_L = 8\Omega$	$V_{CC} = 5.0\text{V}$		1.4	W
			$V_{CC} = 4.2\text{V}$		1.0	
			$V_{CC} = 3.6\text{V}$		0.7	
		THD+N = 1% $f = 1\text{kHz}$ , $R_L = 4\Omega$	$V_{CC} = 5.0\text{V}$		2.4	W
			$V_{CC} = 4.2\text{V}$		1.68	
			$V_{CC} = 3.6\text{V}$		1.2	
THD+N	Total harmonic distortion plus noise	$V_{CC} = 4.2\text{V}$ , $P_O = 0.6\text{W}$ , $R_L = 8\Omega$ , $f = 1\text{kHz}$		0.18	%	
		$V_{CC} = 4.2\text{V}$ , $P_O = 1.1\text{W}$ , $R_L = 4\Omega$ , $f = 1\text{kHz}$		0.22		
$V_{NO}$	Output voltage noise	$V_{CC} = 4.2\text{V}$ , $f = 20\text{Hz}$ to $20\text{kHz}$ Inputs AC-grounded		80	$\mu\text{Vrms}$	
$T_{WU}$	Wake-up time from shutdown	$V_{CC} = 3.6\text{V}$		32	ms	
SNR	Signal-to-noise ratio	$P_O = 1.0\text{W}$ , $R_L = 8\Omega$ , $V_{CC} = 4.2\text{V}$		91	dB	
PSRR	Power supply rejection ratio	$f = 217\text{Hz}$ , $R_L = 8\Omega$ Input grounded	$V_{CC} = 5.0\text{V}$		-75	dB
			$V_{CC} = 4.2\text{V}$		-70	
			$V_{CC} = 3.6\text{V}$		-66	

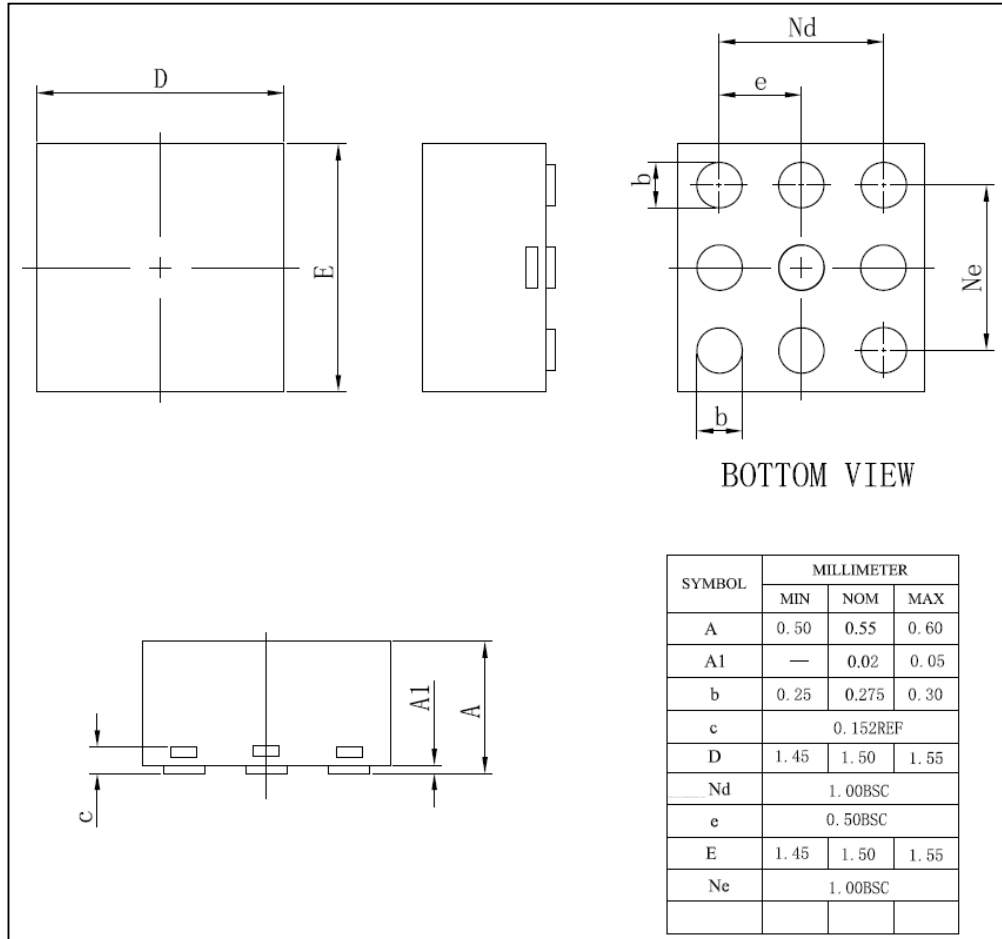
**Note 1:** All parts are production tested at  $T_A = 25^\circ\text{C}$ . Other temperature limits are guaranteed by design.

**Note 2:** Guaranteed by design.

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## PACKAGING INFORMATION

### UTQFN-9



Note: All dimensions in millimeters unless otherwise stated.