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

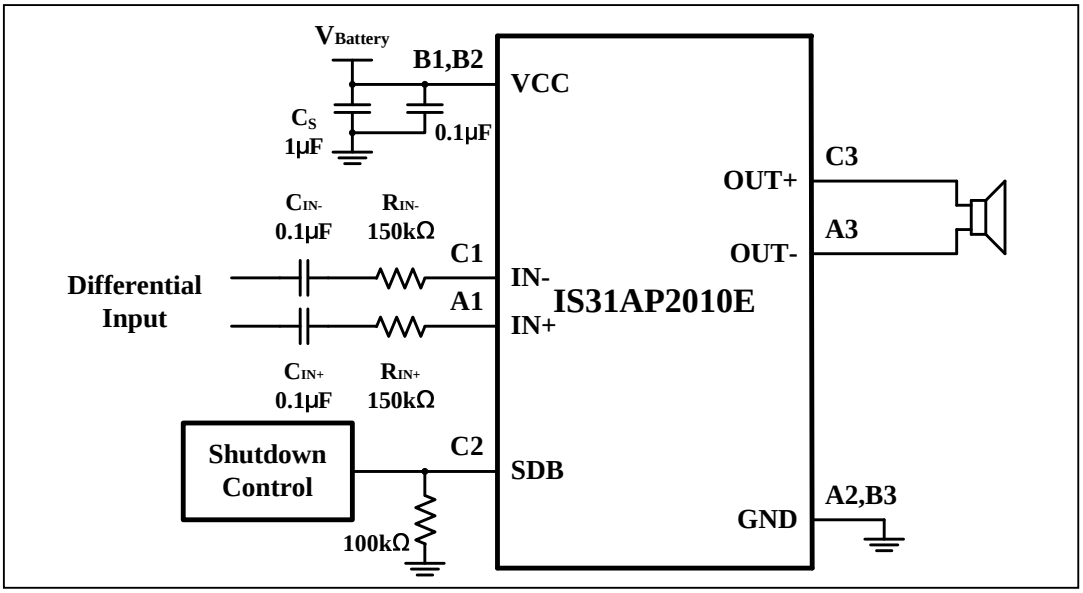


Figure 1 Typical Application Circuit (Differential Input)

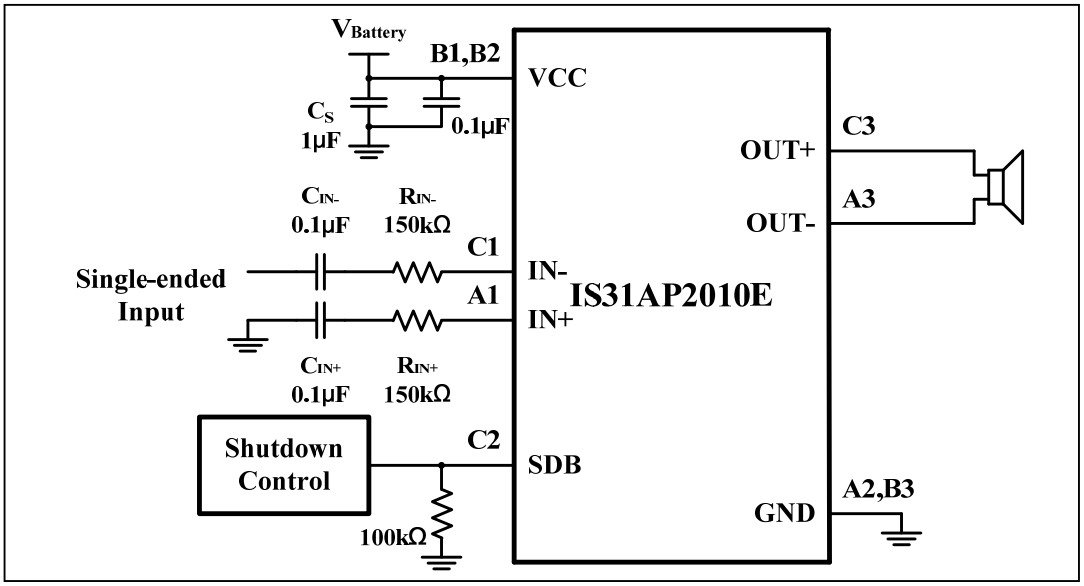
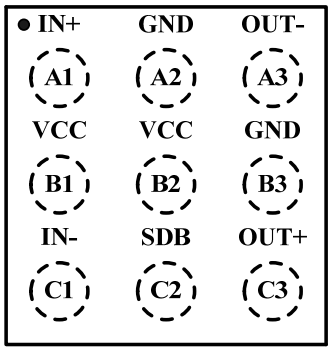


Figure 2 Typical Application Circuit (Single-ended Input)

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.

ORDERING INFORMATION

Industrial Range: -40℃ to +85℃

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

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, Tstg	−65°C ~ +150°C

Note:

1. 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 ~ 5.5V, T_A = 25°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	μA
f_{sw}	Switching frequency			250		kHz
R_{IN}	Input resistor	Gain ≤ 20V/V	15			kΩ
Gain		R_{IN} = 150kΩ		2		V/V
V_{IH}	High-level input voltage		1.4		V_{CC}	V
V_{IL}	Low-level input voltage		0		0.4	V

ELECTRICAL CHARACTERISTICS

T_A = 25°C, Gain = 2V/V, C_{IN} = 2µF, unless otherwise noted. *(Note 2)*

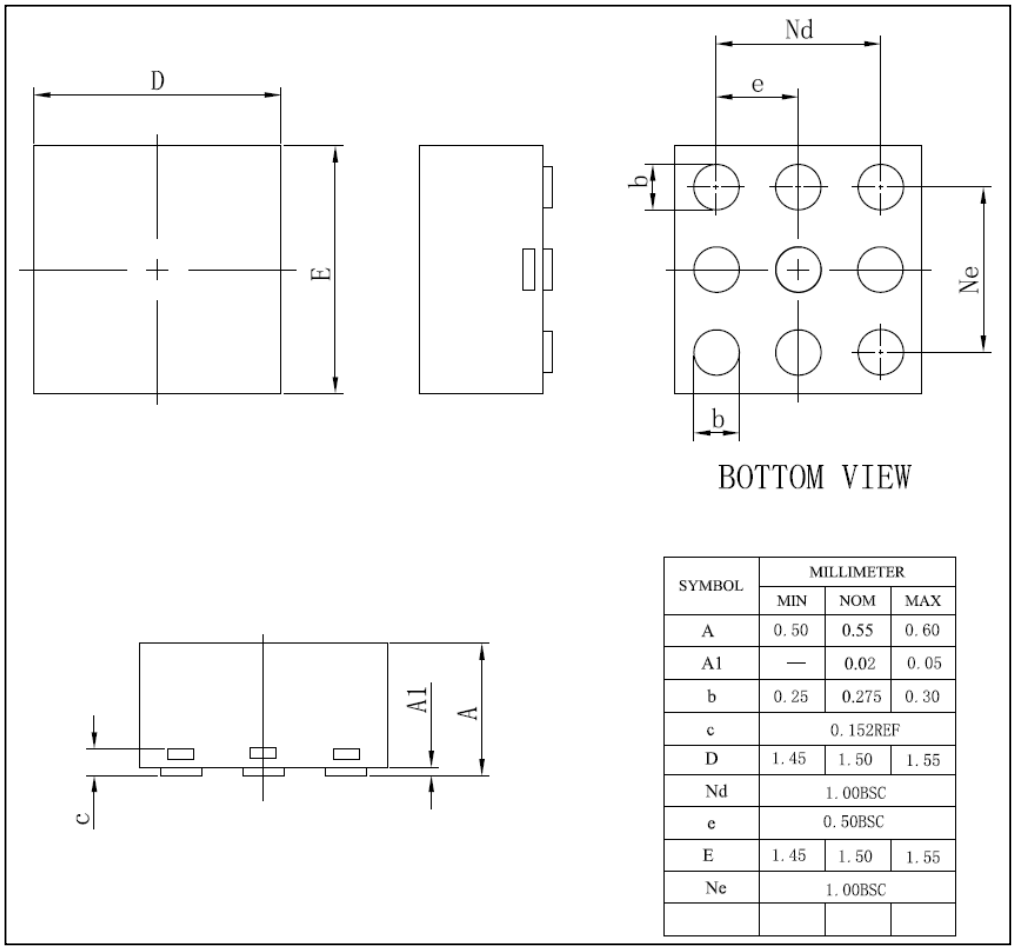
Symbol	Parameter	Condition		Min.	Typ.	Max.	Unit
P_O	Output power	THD+N = 10% f = 1kHz, R_L = 8Ω	V_{CC} = 5.0V		1.68		W
			V_{CC} = 4.2V		1.2		
			V_{CC} = 3.6V		0.88		
		THD+N = 10% f = 1kHz, R_L = 4Ω	V_{CC} = 5.0V		3.0		W
			V_{CC} = 4.2V		2.0		
			V_{CC} = 3.6V		1.5		
		THD+N = 1% f = 1kHz, R_L = 8Ω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

Note 1: All parts are production tested at T_A = 25°C. Other temperature limits are guaranteed by design.

Note 2: Guaranteed by design.

PACKAGING INFORMATION

UTQFN-9



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.50	0.55	0.60
A1	—	0.02	0.05
b	0.25	0.275	0.30
c	0.152REF		
D	1.45	1.50	1.55
Nd	1.00BSC		
e	0.50BSC		
E	1.45	1.50	1.55
Ne	1.00BSC		

Note: All dimensions in millimeters unless otherwise stated.