8W/CH STEREO CLASS-D AUDIO POWER AMPLIFIER

Advanced Information
July 2012

GENERAL DESCRIPTION

The IS31AP2117 is an 8W/CH, dual channel, Class-D stereo driver in our audio amplifier family. It is suitable for powering the audio components of various equipments, including typical consumer electronics, high performance audio speakers.

IS31AP2117 has several key features which distinguishes itself from other alternatives on the market. On-board AGC, EMI suppression, and 92% typical operating efficiency are key features of this part. EMI suppression circuit, which eliminates LC, filters at the outputs. These features simplify customer design, reduces system cost and PCB area.

The IS31AP2117 integrates automatic gain control function with adjustable power limit. When output power goes over the power limit, IS31AP2117 can reduce gain automatically to pull down the output power, so that keep the output power around power limit while the input level is high. The IS31AP2117 has short circuit and thermal protection features integrated on board.

FEATURES

- Mono 6W, at 8Ω @ 1% THD, V_{CC}=12V
- Mono 15W, at 8Ω @ 10% THD, V_{CC}=16V
- Dual 8W/CH, at 8Ω @ 10% THD, V_{CC} =24V
- 92% typical operating efficiency
- 8V< V_{IN} <26V
- Filter-less EMI suppression
- Integrated AGC with adjustable power limit
- Four selectable, gain preset levels: 20dB, 26dB, 32dB, 36dB
- High SNR, low THD+N
- Thermal and short-circuit protection
- Over/under-voltage protection
- Mute features
- Clock selection
- TSSOP-28 package

APPLICATIONS

- Consumer audio equipment
- HDTV, home theater equipment
- Automotive audio amplifier
- Performance stereo speakers

TYPICAL APPLICATION CIRCUIT

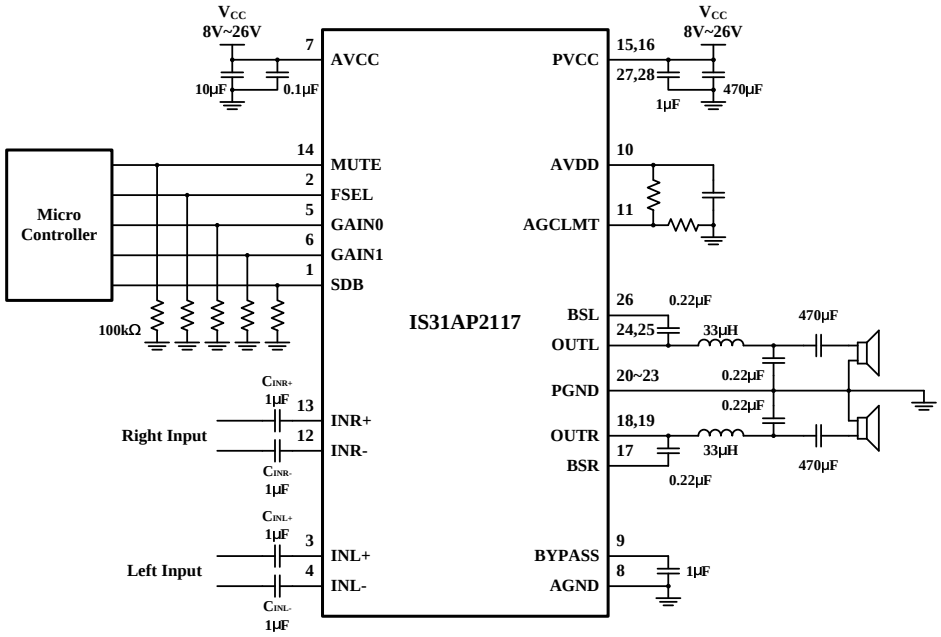


Figure 1 Typical Application Circuit (Stereo Mode Application)

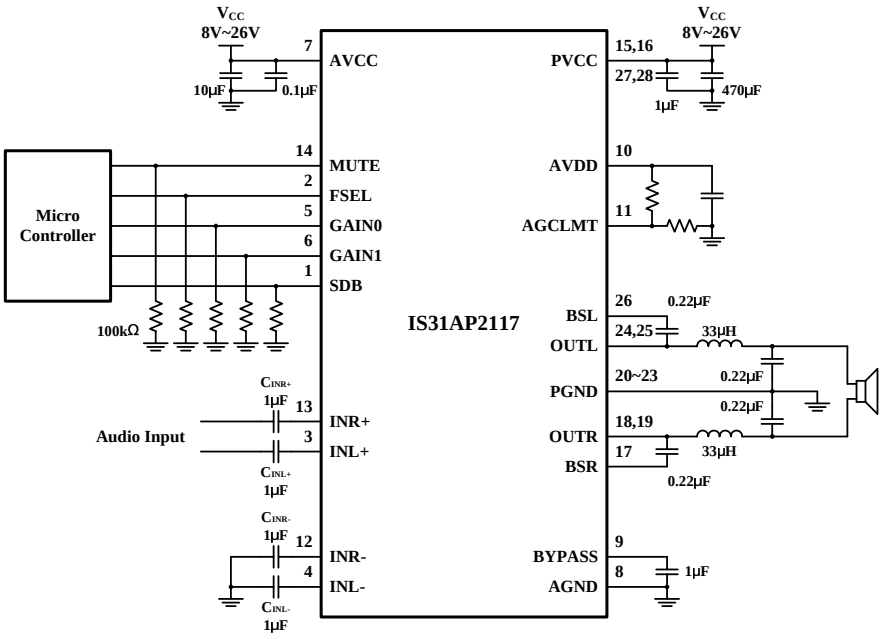
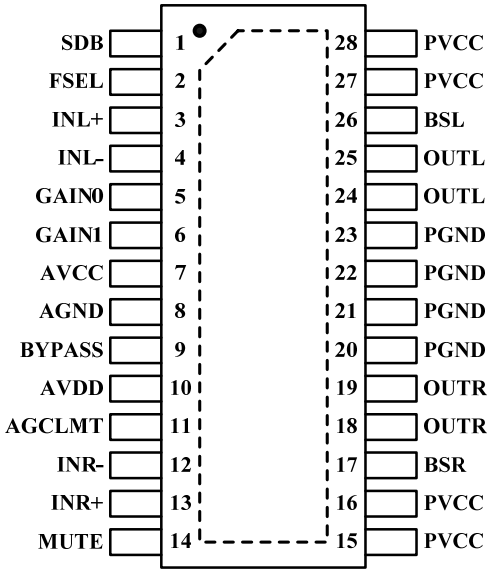


Figure 2 Typical Application Circuit (Mono Mode Application)

PIN CONFIGURATION

Package	Pin Configuration (Top View)
TSSOP-28	

ORDERING INFORMATION
INDUSTRIAL RANGE: -40℃ TO +85℃

Order Part No.	Package	QTY/Tube
IS31AP2117-ZLS2	TSSOP-28, Lead-free	30

PIN DESCRIPTION

No.	Pin	Description
1	SDB	Shutdown control. Active low.
2	FSEL	Frequency select input pin. (low = 300kHz, high = 400kHz)
3	INL+	Positive audio input for left channel.
4	INL-	Negative audio input for left channel.
5	GAIN0	Gain select least significant bit.
6	GAIN1	Gain select most significant bit.
7	AVCC	Analog power supply.
8	AGND	Analog signal ground.
9	BYPASS	Reference for pre-amplifier inputs. Nominally equal to AVDD/2.
10	AVDD	5V regulated output. Connect 2.2μF to AGND.
11	AGCLMT	Power limit level adjusting pin. Connect a resistor divider from AVDD to AGND to set power limit. Connect directly to AVDD for no power limit.
12	INR-	Negative audio input for right channel.
13	INR+	Positive audio input for right channel.
14	MUTE	Mute mode control.
15, 16	PVCC	Power supply for right channel H-bridge. PVCCR and PVCCL must be connected together on the PCB.
17	BSR	Bootstrap I/O for right channel, high-side FET.
18, 19	OUTR	Class-D H-bridge output for right channel.
20~23	PGND	Power ground for the H-bridges.
24, 25	OUTL	Class-D H-bridge output for left channel.
26	BSL	Bootstrap I/O for left channel, high-side FET.
27, 28	PVCC	Power supply for left channel H-bridge. PVCCR and PVCCL must be connected together on the PCB.
	Thermal Pad	Connect to GND.

ABSOLUTE MAXIMUM RATINGS

Supply voltage (AVCC, PVCC), V_{CC}	−0.3V ~ +30.0V
Voltage at SDB, GAIN0, GAIN1, FSEL, MUTE pins	−0.3V ~ V_{CC}+0.3V
Voltage at IN, AGCLMT pins	-0.3 to V_{AVDD}+0.3V
Voltage at OUTR, OUTL	-0.3 to V_{CC}+0.3V
Voltage at AVDD	−0.3V ~ +6.0V
Maximum junction temperature, T_{JMAX}	150°C
Storage temperature range, T_{STG}	−65°C ~ +150°C
Operating temperature range, T_A	−40°C ~ +85°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.

DC ELECTRICAL CHARACTERISTICS

V_{CC}=12V, T_A=25℃, R_L=8Ω (unless otherwise noted).

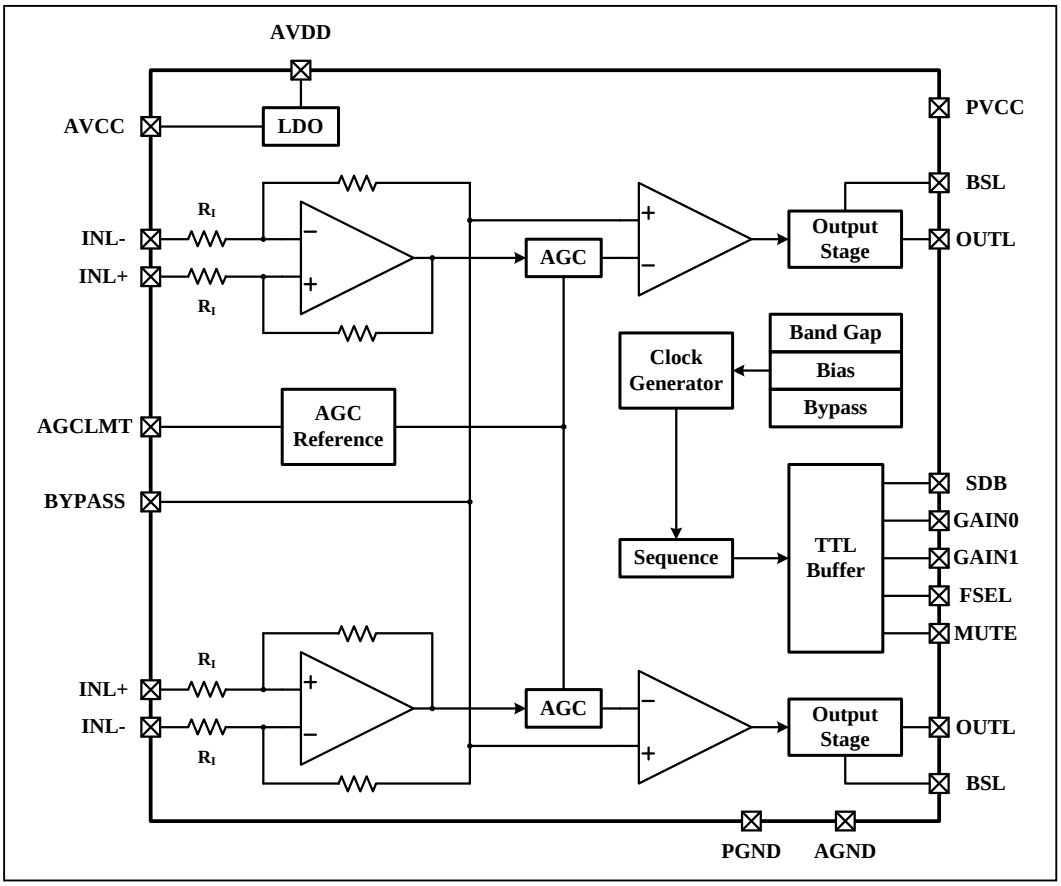
Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
V_{CC}	Supply voltage		8		26	V
I_{CC}	Quiescent current	V_{SDB} = 2V, no load (without LC)		12		mA
I_{SD}	Shutdown current	V_{SDB} = 0.8V		200		μA
$R_{DS(ON)}$	Drain-source on-state resistance	I_O = 500mA		150		mΩ
V_{OS}	Class-D output offset voltage (measured differentially)	V_I = 0, Gain = 36dB		1.5		mV
G	Gain	Gain1= 0.8V, Gain0= 0.8V		20		dB
		Gain1= 0.8V, Gain0= 2V		26		
		Gain1= 2V, Gain0= 0.8V		32		
		Gain1= 2V, Gain0= 2V		36		
t_{ON}	Turn-on time	V_{SDB} = 2V		50		ms
t_{OFF}	Turn-off time	V_{SDB} = 0.8V		2		μs
AVDD	Internal regulated output	I_O = 5mA		5		V
R_L	Speaker resistance		3.6			Ω
Logic Electrical Characteristics (SDB, FSEL, GAIN0, GAIN1, MUTE)						
V_{IH}	High level threshold voltage		2		AVCC	V
V_{IL}	Low level threshold voltage		0		0.8	V
I_{IH}	High level threshold current	V_I = 2V, V_{CC} = 18V		50		μA
I_{IL}	Low level threshold current	V_I = 0.8V, V_{CC} = 18V		5		μA

AC ELECTRICAL CHARACTERISTICS

V_{CC}=12V, T_A=25℃, R_L=8Ω (unless otherwise noted).

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
PSRR	Power Supply ripple rejection	200mV_{P-P} ripple at 1kHz, Gain = 20 dB, Inputs ac-coupled to AGND		-60		dB
P_O	Continuous output power	THD+N = 10%, f = 1kHz, R_L= 4Ω		5		W
THD+N	Total harmonic distortion + noise	f = 1kHz, P_O = 1W (half-power)		0.1		%
V_N	Output integrated noise	20Hz ~ 22kHz, A-weighted filter, Gain = 20dB		65		μV
SNR	Signal-to-noise ratio	Maximum output at THD+N < 1%, f = 1kHz, Gain = 20dB, A-weighted		102		dB
F_{OSC}	Oscillator frequency	V_{FSEL} = 0.8V		290		kHz
		V_{FSEL} = 2V		390		
	Thermal trip point			160		℃
	Thermal hysteresis			60		℃

FUNCTIONAL BLOCK DIAGRAM



FUNCTION DESCRIPTION

The IS31AP2117 is an 8W, dual channel, Class-D stereo which is suitable for powering the audio components of various equipments, including typical consumer electronics, high performance audio speakers.

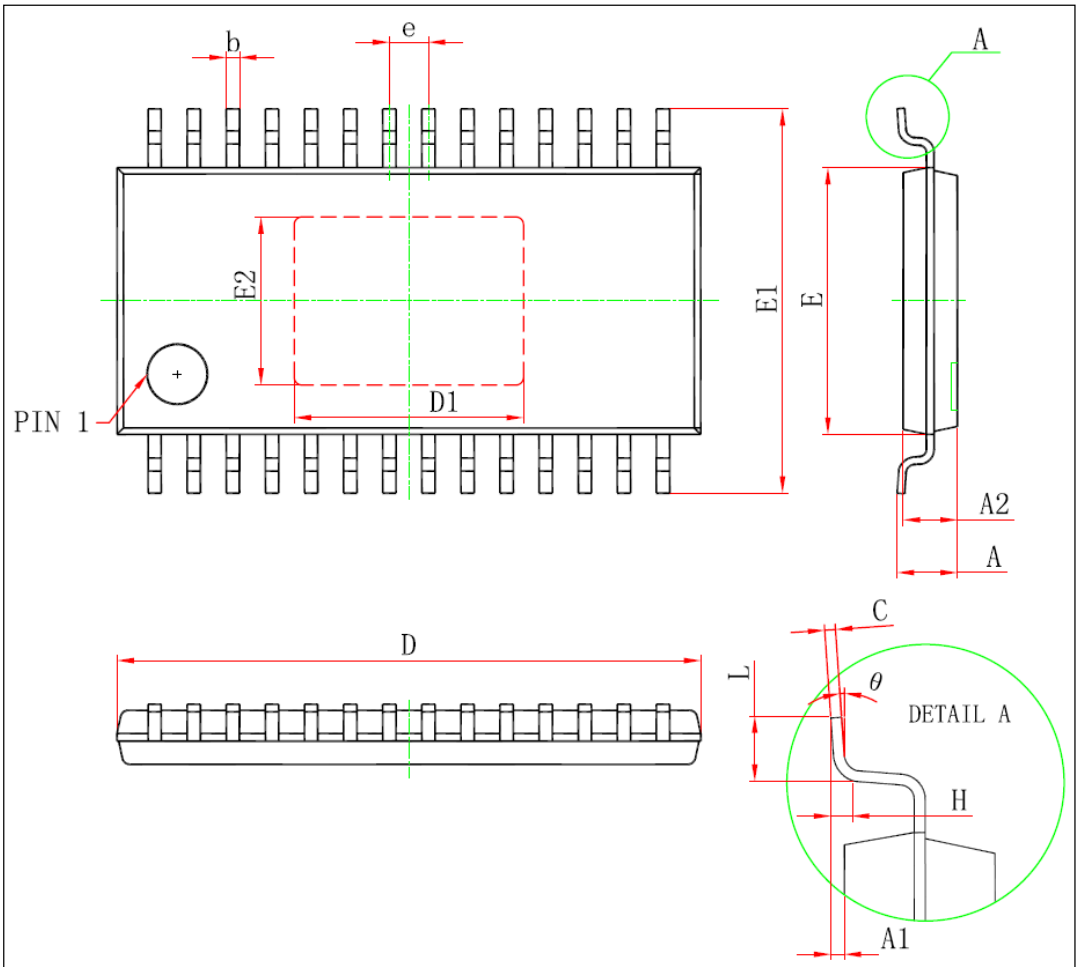
The MUTE pin is an input for controlling the output state of the IS31AP2117. A logic high on this terminal will shut down the outputs. A logic low on this pin enables the outputs.

The gain of the IS31AP2117 is set by two input terminals, GAIN0 and GAIN1. Different input logic for GAIN0 and GAIN1 cause input gain in 4 levels (20dB, 26dB, 32dB, 36dB).

The IS31AP2117 also provides thermal and over current protection functions to prevent permanent damage to the device.

PACKAGE INFORMATION

TSSOP-28



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	**Max**	**Min**	**Max**
D	9.600	9.800	0.378	0.386
D1	3.710	3.910	0.146	0.154
E	4.300	4.500	0.169	0.177
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
E1	6.250	6.550	0.246	0.258
E2	2.700	2.900	0.106	0.122
A		1.100		0.043
A2	0.800	1.000	0.031	0.039
A1	0.020	0.150	0.001	0.006
e	0.65 (BSC)		0.026(BSC)	
L	0.500	0.700	0.02	0.028
H	0.25(TYP)		0.01(TYP)	
θ	1°	7°	1°	7°

Note: All dimensions in millimeters unless otherwise stated.