

# IS31AP2117

## 8W/CH STEREO CLASS-D AUDIO POWER AMPLIFIER

Advanced Information  
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### 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

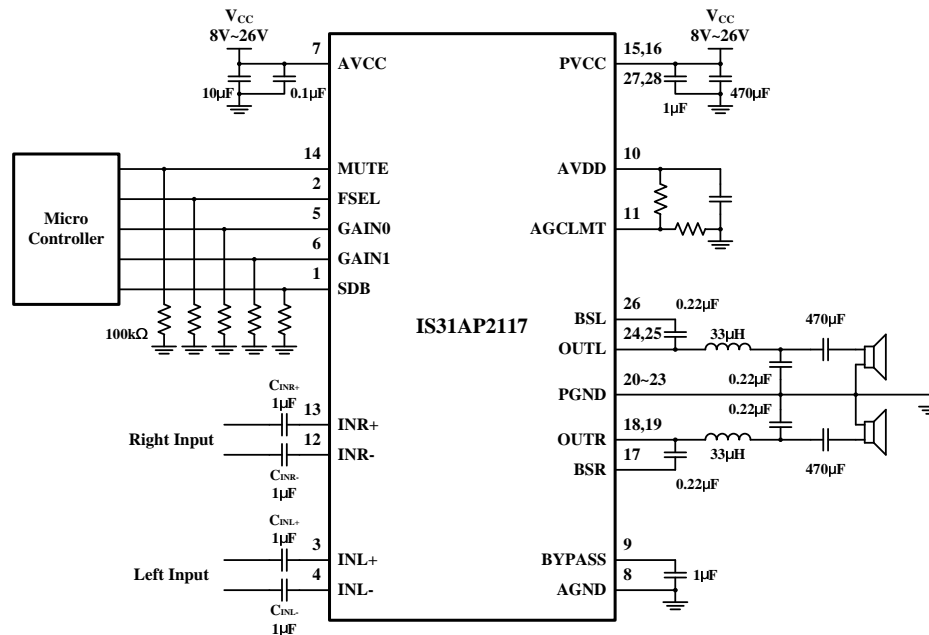
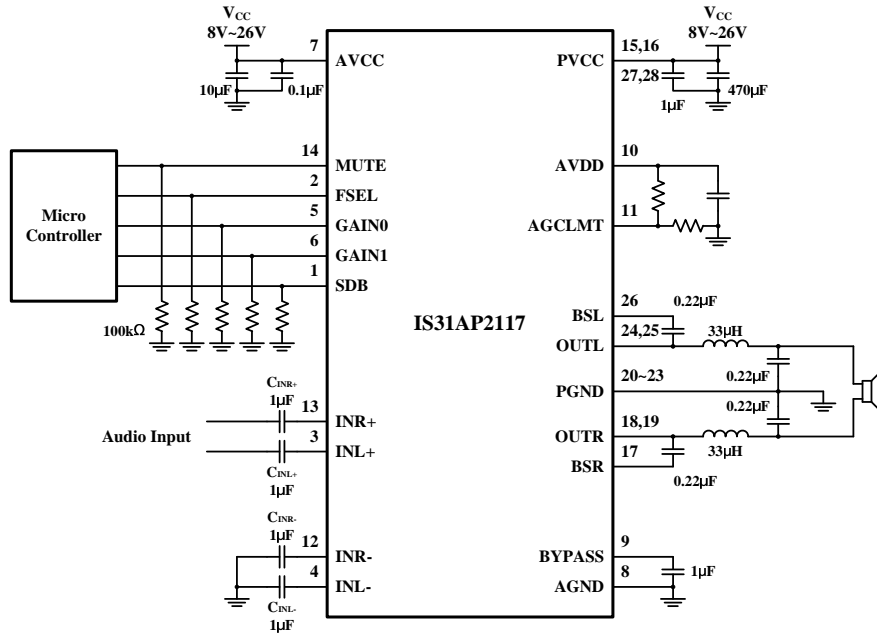


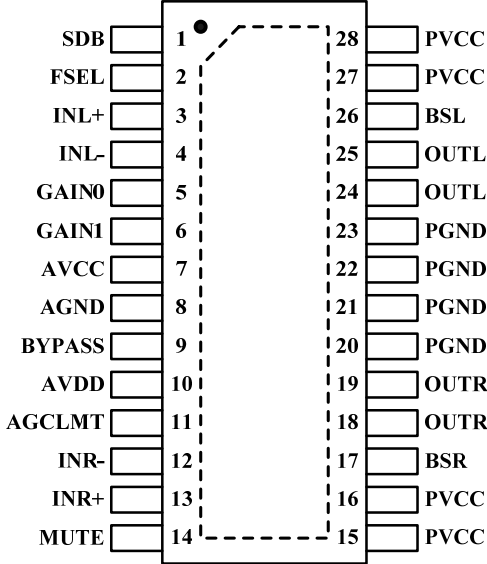
Figure 1 Typical Application Circuit (Stereo Mode Application)



**Figure 2** Typical Application Circuit (Mono Mode Application)

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## PIN CONFIGURATION

Package	Pin Configuration (Top View)
TSSOP-28	 <p>           SDB <input type="checkbox"/> 1    28 <input type="checkbox"/> PVCC            FSEL <input type="checkbox"/> 2    27 <input type="checkbox"/> PVCC            INL+ <input type="checkbox"/> 3    26 <input type="checkbox"/> BSL            INL- <input type="checkbox"/> 4    25 <input type="checkbox"/> OUTL            GAIN0 <input type="checkbox"/> 5    24 <input type="checkbox"/> OUTL            GAIN1 <input type="checkbox"/> 6    23 <input type="checkbox"/> PGND            AVCC <input type="checkbox"/> 7    22 <input type="checkbox"/> PGND            AGND <input type="checkbox"/> 8    21 <input type="checkbox"/> PGND            BYPASS <input type="checkbox"/> 9    20 <input type="checkbox"/> PGND            AVDD <input type="checkbox"/> 10    19 <input type="checkbox"/> OUTR            AGCLMT <input type="checkbox"/> 11    18 <input type="checkbox"/> OUTR            INR- <input type="checkbox"/> 12    17 <input type="checkbox"/> BSR            INR+ <input type="checkbox"/> 13    16 <input type="checkbox"/> PVCC            MUTE <input type="checkbox"/> 14    15 <input type="checkbox"/> PVCC         </p>

## ORDERING INFORMATION

**INDUSTRIAL RANGE: -40°C TO +85°C**

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

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- b.) the user assume all such risks; and
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## 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 2.2 $\mu$ F 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.

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## 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 OUTF, 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

$V_{CC}=12V$ ,  $T_A=25^\circ C$ ,  $R_L=8\Omega$  (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		$\mu A$
$R_{DS(ON)}$	Drain-source on-state resistance	$I_O = 500mA$		150		m $\Omega$
$V_{OS}$	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		$\mu s$
AVDD	Internal regulated output	$I_O = 5mA$		5		V
$R_L$	Speaker resistance		3.6			$\Omega$

## 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		$\mu A$
$I_{IL}$	Low level threshold current	$V_I = 0.8V$ , $V_{CC} = 18V$		5		$\mu A$



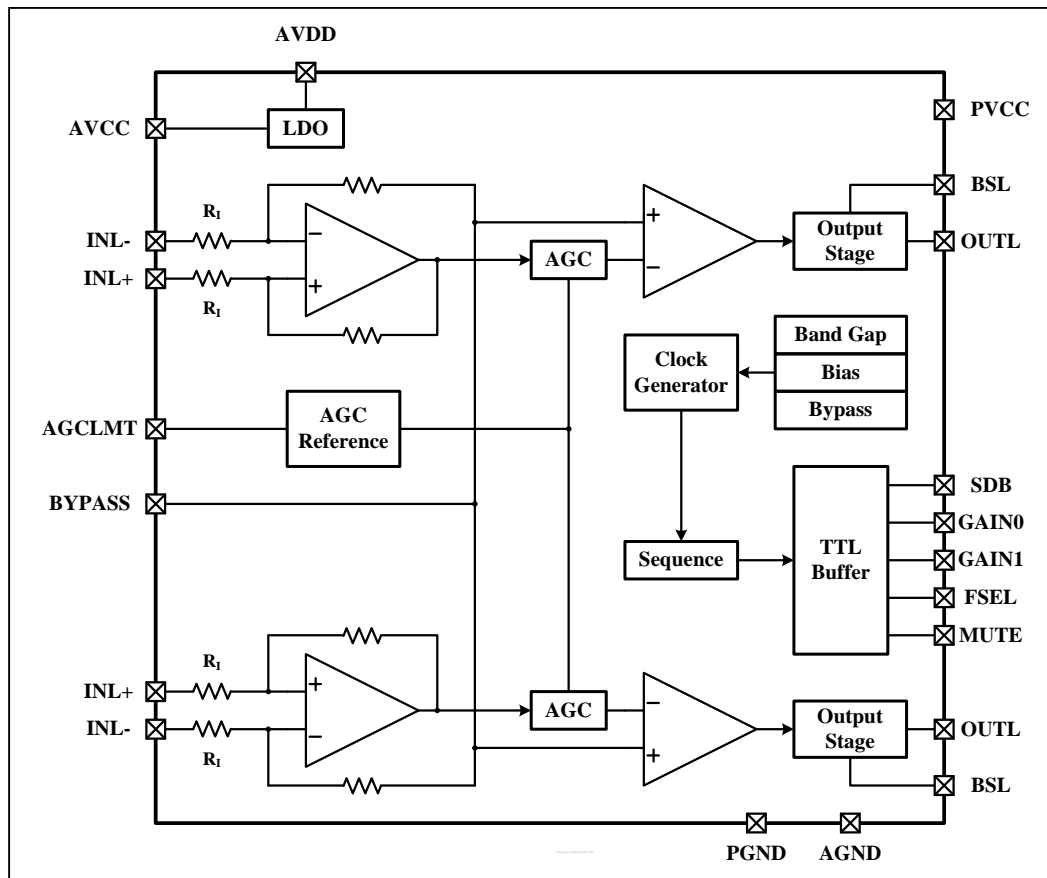
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## AC ELECTRICAL CHARACTERISTICS

$V_{CC}=12V$ ,  $T_A=25^{\circ}C$ ,  $R_L=8\Omega$  (unless otherwise noted).

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
PSRR	Power Supply ripple rejection	200mV <sub>P-P</sub> ripple at 1kHz, Gain = 20dB, Inputs ac-coupled to AGND		-60		dB
P <sub>O</sub>	Continuous output power	THD+N = 10%, f = 1kHz, R <sub>L</sub> = 4Ω		5		W
THD+N	Total harmonic distortion + noise	f = 1kHz, P <sub>O</sub> = 1W (half-power)		0.1		%
V <sub>N</sub>	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 <sub>OSC</sub>	Oscillator frequency	V <sub>FSEL</sub> = 0.8V		290		kHz
		V <sub>FSEL</sub> = 2V		390		
	Thermal trip point			160		°C
	Thermal hysteresis			60		°C

## FUNCTIONAL BLOCK DIAGRAM



# IS31AP2117

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## 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).

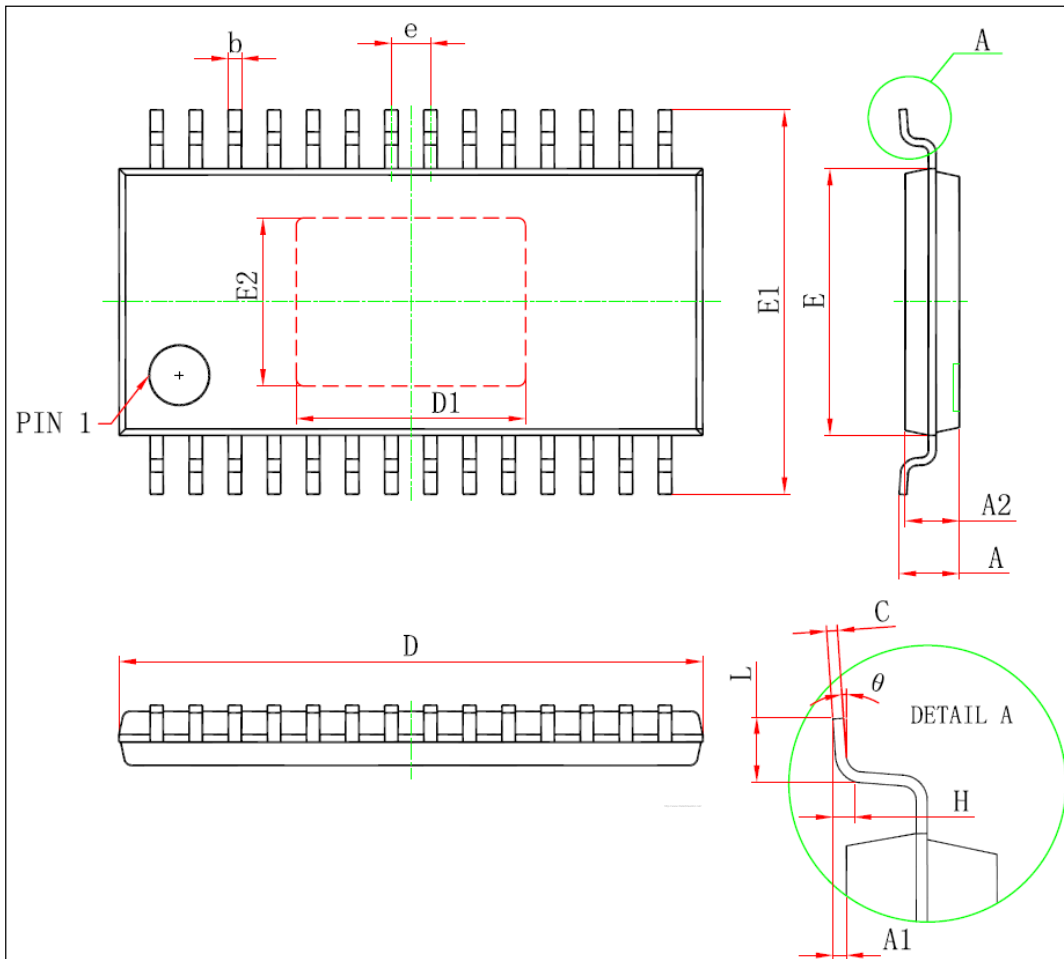
The IS31AP2117 also provides thermal and over current protection functions to prevent permanent damage to the device.



# IS31AP2117

## 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.