

# IS31AP2118

## 15W STEREO CLASS-D AUDIO POWER AMPLIFIER

Advanced Information  
June 2012

### GENERAL DESCRIPTION

The IS31AP2118 is a 15W, 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.

IS31AP2118 has several key features which distinguishes itself from other alternatives on the market. On-board AGC, EMI suppression, and 90% 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 IS31AP2118 integrates automatic gain control function with adjustable power limit. When output power goes over the power limit, IS31AP2118 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 IS31AP2118 has short circuit and thermal protection features integrated on board.

### FEATURES

- Dual 12W, at 4Ω @ 1% THD,  $V_{CC}=12V$
- Dual 15W, at 8Ω @ 10% THD,  $V_{CC}=16V$
- Mono 20W, at 8Ω @ 10% THD,  $V_{CC}=18V$
- 90% 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
- De-pop circuitry
- TSSOP-28 package

### APPLICATIONS

- Consumer Audio Equipment
- HDTV, Home Theater Equipment
- Automotive Audio Amplifier
- Performance Stereo Speakers

### TYPICAL APPLICATION CIRCUIT

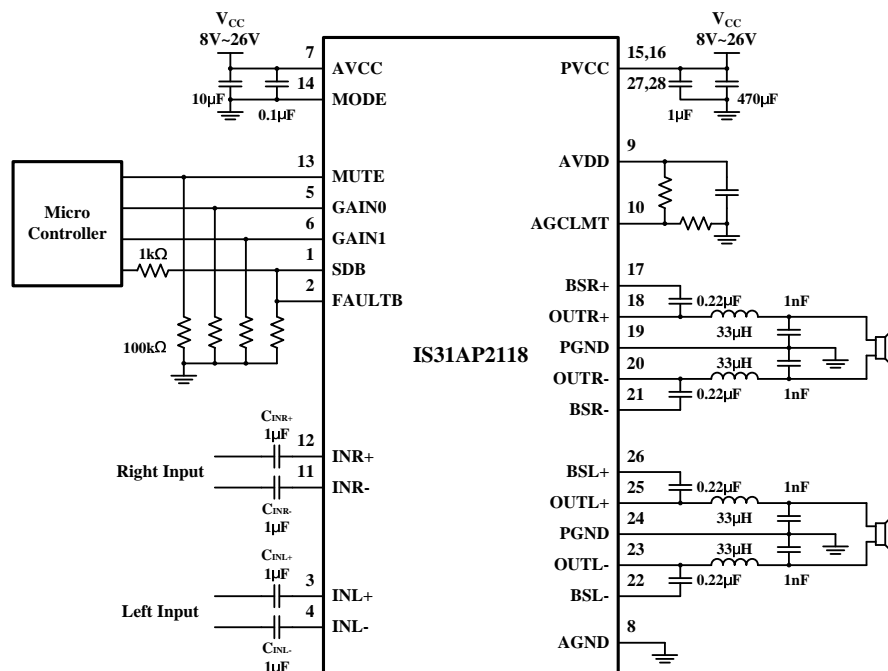


Figure 1 Typical Application Circuit (Stereo Mode Application)

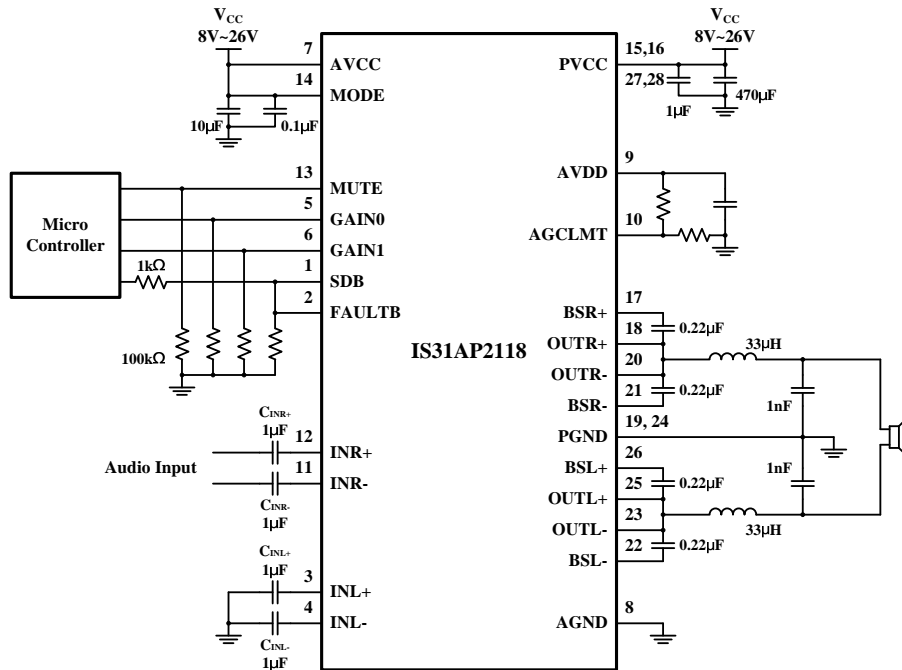
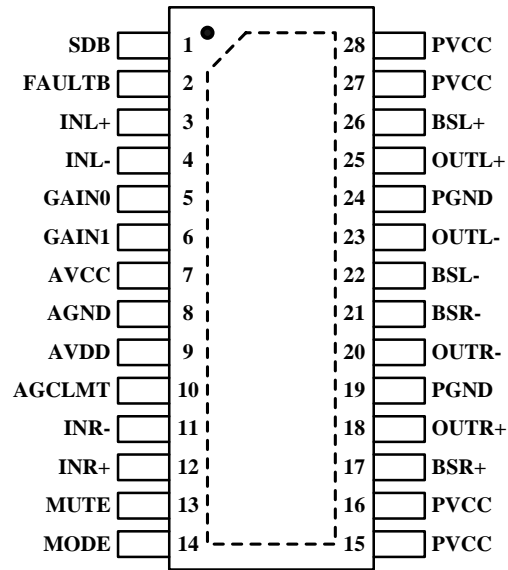


Figure 1 Typical Application Circuit (Mono Mode Application)

# IS31AP2118

## PIN CONFIGURATION

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

## ORDERING INFORMATION

**INDUSTRIAL RANGE: -40°C TO +85°C**

Order Part No.	Package	QTY/Tube
IS31AP2118-ZLS2	TSSOP-28, Lead-free	30

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- a.) the risk of injury or damage has been minimized;
- b.) the user assume all such risks; and
- c.) potential liability of Integrated Silicon Solution, Inc is adequately protected under the circumstances

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## PIN DESCRIPTION

No.	Pin	Description
1	SDB	Shutdown control. Active low.
2	FAULTB	Open drain output used to display short circuit or dc detect fault status. Voltage compliant to AVCC. Short circuit faults can be set to auto-recovery by connecting FAULT pin to SD pin. Otherwise, both short circuit faults and dc detect faults must be reset by cycling PVCC.
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	AVDD	5V regulated output. Connect 2.2 $\mu$ F to AGND.
10	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.
11	INR-	Negative audio input for right channel.
12	INR+	Positive audio input for right channel.
13	MUTE	Mute mode control.
14	MODE	Parallel BTL mode switch. (low = BTL mode, high = PBTL mode)
15, 16	PVCC	Power supply for right channel H-bridge.
17	BSPR	Bootstrap I/O for right channel, positive high-side FET.
18	OUTR+	Class-D H-bridge positive output for right channel.
19, 24	PGND	Power ground for the H-bridges.
20	OUTR-	Class-D H-bridge negative output for right channel.
21	BSR-	Bootstrap I/O for right channel, negative high-side FET.
22	BSL-	Bootstrap I/O for left channel, negative high-side FET.
23	OUTL-	Class-D H-bridge negative output for left channel.
25	OUTL+	Class-D H-bridge positive output for left channel.
26	BSL+	Bootstrap I/O for left channel, positive high-side FET.
27, 28	PVCC	Power supply for left channel H-bridge.
	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, MODE, MUTE pins	-0.3V ~ $V_{CC}+0.3V$
Voltage at INR-, INR+, INL-, INL+, AGCLMT pins	-0.3 to $V_{AVDD}+0.3V$
Voltage at OUTL+, OUTR+, OUTL-, OUTR-	-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
$I_{DD}$	Quiescent current	$V_{SDB} = 2V$ , No load (without LC)		20		mA
$I_{SD}$	Shutdown current	$V_{SDB} = 0.8V$		200		$\mu A$
$R_{DS(ON)}$	Drain-source on-state resistance	$I_O = 500mA$		240		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	$V_{SDB} = 2V$		14		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	BTL: PVCC > 15 V	4.8			$\Omega$
		BTL: PVCC $\leq$ 15 V	3.2			
		PBTL	3.2			

## Logic Electrical Characteristics (SDB, GAIN0, GAIN1, MUTE, MODE)

$V_{IH}$	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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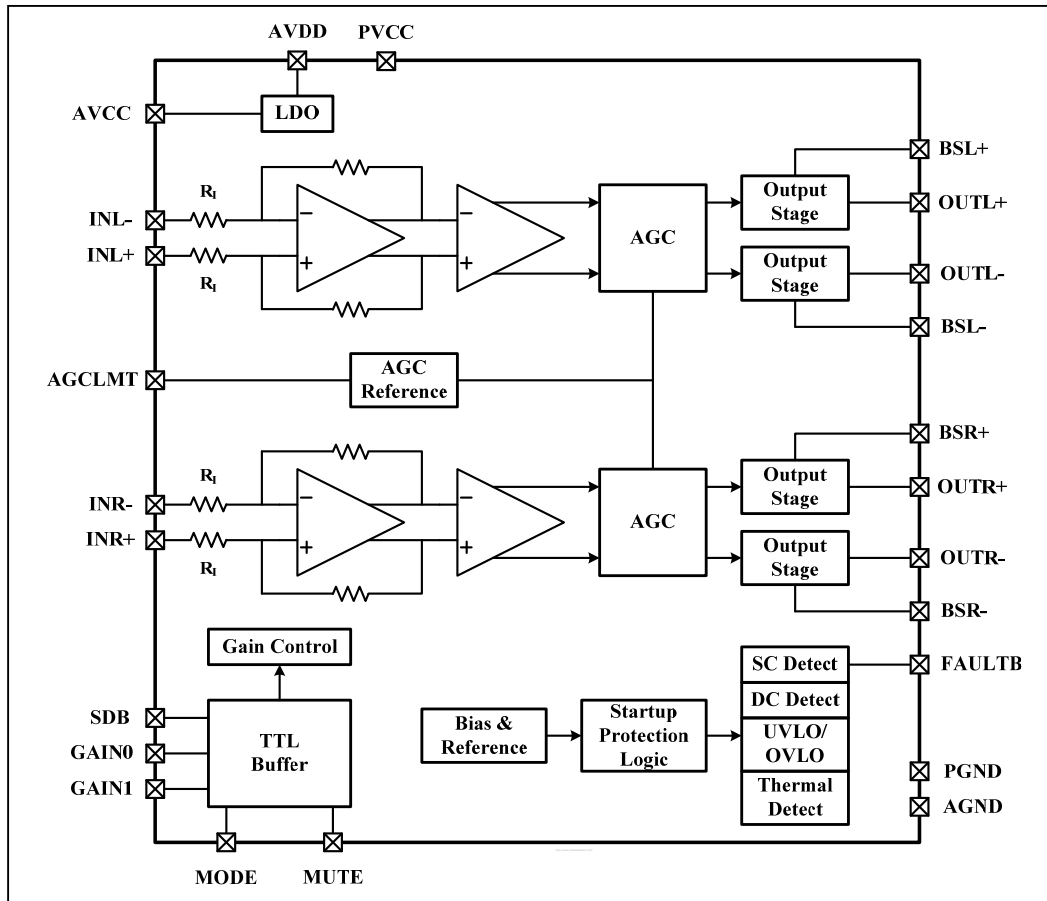
## AC ELECTRICAL CHARACTERISTICS

$V_{CC}=12V$ ,  $T_A=25^{\circ}C$ ,  $R_L=8\Omega$  (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		-70		dB
P <sub>O</sub>	Continuous output power	THD+N = 10%, f = 1kHz, VCC = 13V		10		W
THD+N	Total harmonic distortion + noise	VCC = 12V, f = 1kHz, PO = 5W (half-power)		0.1		%
V <sub>N</sub>	Output integrated noise	20Hz to 22kHz, A-weighted filter, Gain = 20dB		65		$\mu V$
X	Crosstalk	V <sub>O</sub> = 1Vrms, Gain = 20dB, f = 1kHz		-100		dB
SNR	Signal-to-noise ratio	Maximum output at THD+N < 1%, f = 1kHz, Gain = 20dB, A-weighted		102		dB
	Thermal trip point			160		$^{\circ}C$
	Thermal hysteresis			60		$^{\circ}C$

# IS31AP2118

## FUNCTIONAL BLOCK DIAGRAM





# IS31AP2118

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## FUNCTION DESCRIPTION

The IS31AP2118 is a 15W, dual channel, Class-D stereo driver 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 IS31AP2118. A logic high on this terminal will shut down the outputs. A logic low on this pin enables the outputs.

The gain of the IS31AP2118 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).

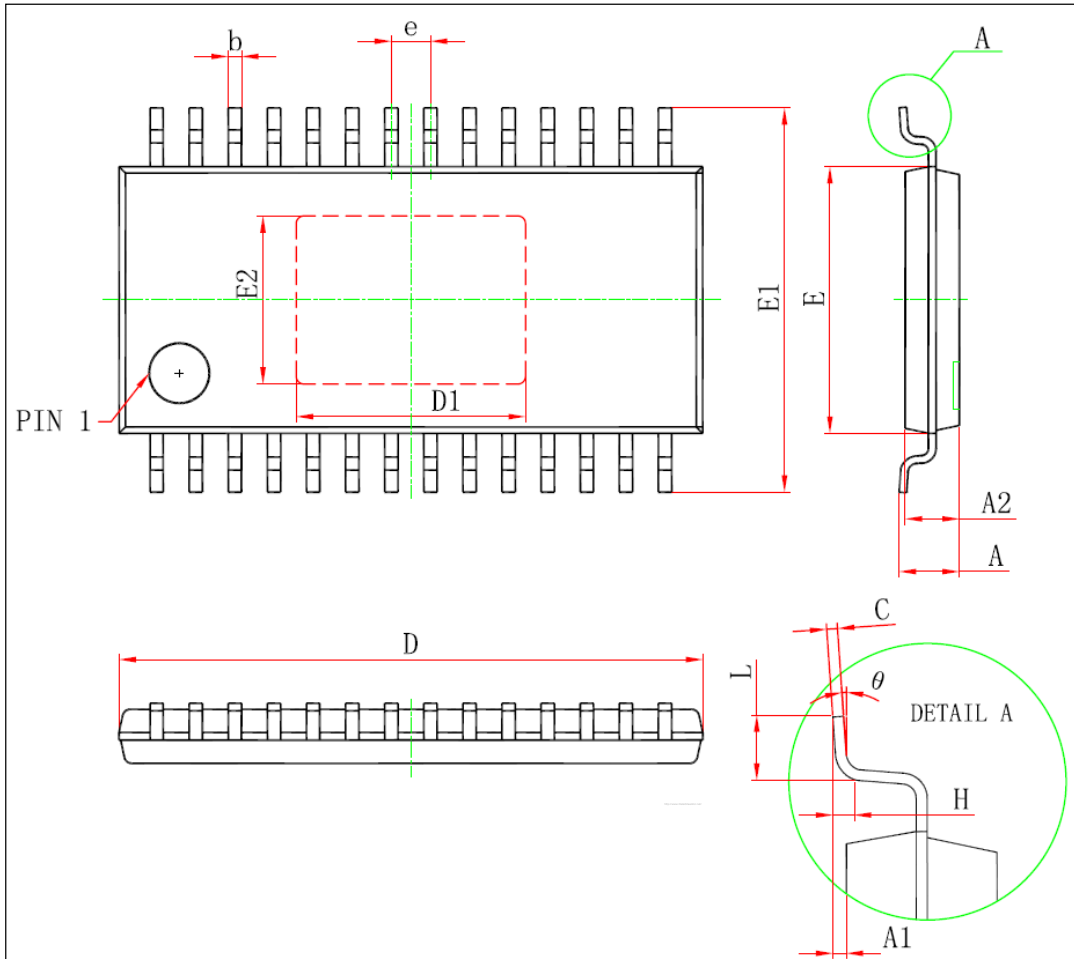
The IS31AP2118 also provides thermal and over current protection functions to prevent permanent damage to the device.



# IS31AP2118

## 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
e	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)	
$\theta$	1°	7°	1°	7°

**Note:** All dimensions in millimeters unless otherwise stated.