

**SANYO Semiconductors****DATA SHEET**

LA42351 — Monolithic Linear IC

5W 1-Channel AF Power Amplifier With DC Volume Control

Overview

LA42351 is 5W 1-channel AF power amplifier with DC volume control intended for televisions.

Features

- P_{O1} 5W×1ch (V_{CC} = 18V, R_L = 8Ω, THD = 10%)
- P_{O2} 3W×1ch (V_{CC} = 14V, R_L = 8Ω, THD = 10%)
- Built-in DC Volume Control.
- Built-in Standby function.
- Built-in overheat protection.

LA42000 series is power IC which made Pin compatible possible altogether in 3 to 15W. They consist of four kinds of power ICs. (mono, stereo, mono with volume function, stereo with volume function.). They realized PCB layout communalization of an audio power block of TV. Since some external parts are different, however, the pattern design must enable sharing of the substrate.

	P _O	Channel		Volume
		Mono	Stereo	
LA42051	5W	○		
LA42052	5W		○	
LA42351	5W	○		○
LA42352	5W		○	○
LA42071	7W	○		
LA42072	7W		○	
LA42152	15W		○	

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Specifications

Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max	No signal	24	V
Allowable power dissipation	P_d max	Infinite heat sink	15	W
Maximum junction temperature	T_j max		150	$^\circ\text{C}$
Thermal resistance	θ_{jc}		3	$^\circ\text{C}/\text{W}$
Operating temperature	T_{opr}		-25 to +75	$^\circ\text{C}$
Storage temperature	T_{stg}		-40 to +150	$^\circ\text{C}$

Operating Conditions at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		18	V
Recommended load resistance	R_L		8	Ω
Allowable operating voltage range	V_{CC} op		10 to 22	V

Operating Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = 18\text{V}$, $R_L = 8\Omega$, $V_{CONT} = 5\text{V}$, $f = 1\text{kHz}$, $R_g = 600\Omega$

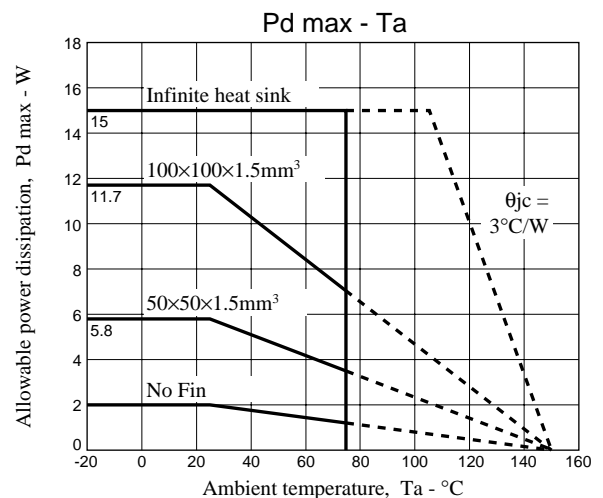
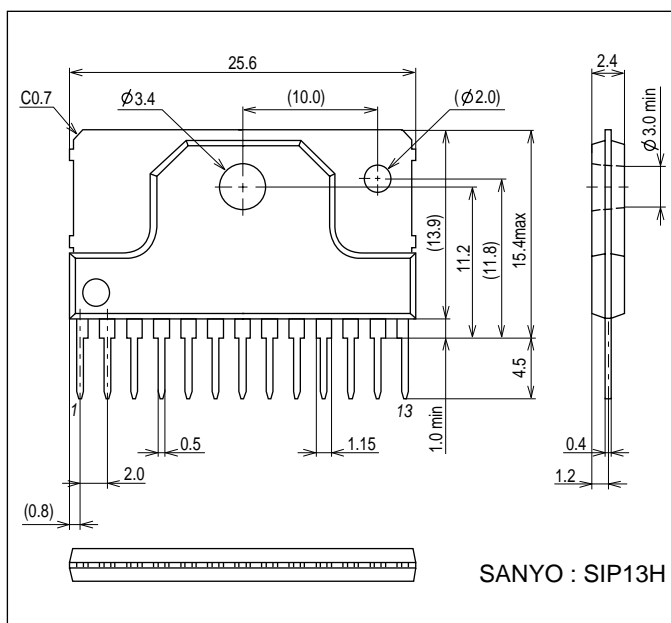
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Standby current	I_{STB}	Amplifier off		0	10	μA
Quiescent current	I_{CCO}	$R_g = 0\Omega$, Volume = 0V	15	35	70	mA
Output power	P_O	THD = 10%	4	5		W
Total harmonic distortion	THD	$P_O = 1\text{W}$		0.2	0.8	%
Voltage gain	VG	$V_O = 0\text{dBm}$	32.5	34.5	36.5	dB
Output noise voltage	V_{NO}	$R_g = 0\Omega$, $V_{CONT} = 0\text{V}$, $f = 20\text{Hz}$ to 20kHz		0.13	0.4	mVrms
Volume attenuation	ATT	$V_{IN} = 100\text{mV}$, $V_{CONT} = 0\text{V}$, with 1k-BPF	70	80		dB
Standby control voltage (The Pin 5 voltage)	V_{STB-H}	Amplifier on	2.5		10	V
	V_{STB-L}	Amplifier off	0		0.5	V
Input resistance	R_i		14	20	26	$\text{k}\Omega$

*0dBm = 1mW (600 Ω) = 774.6mVrms

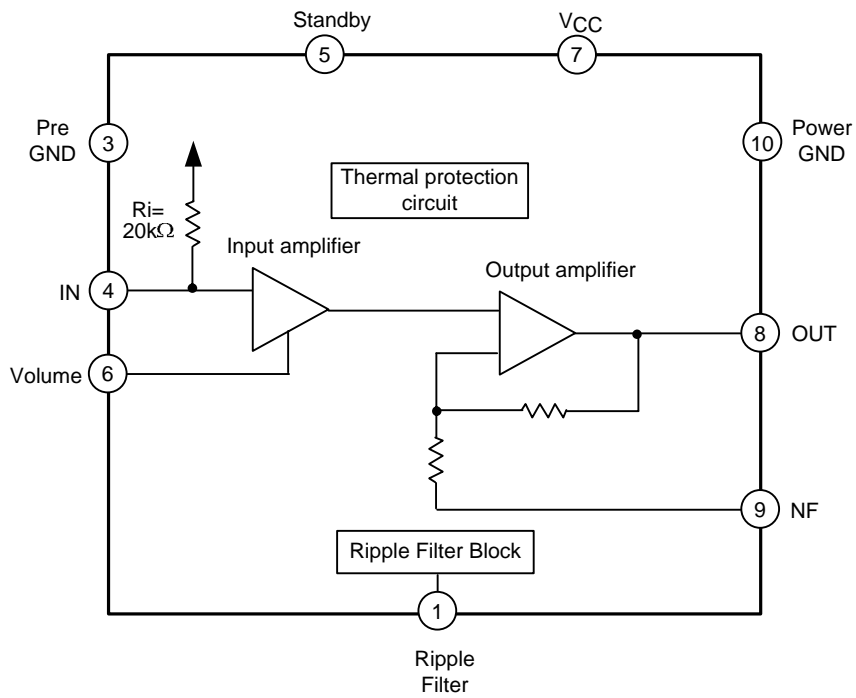
Package Dimensions

unit : mm (typ)

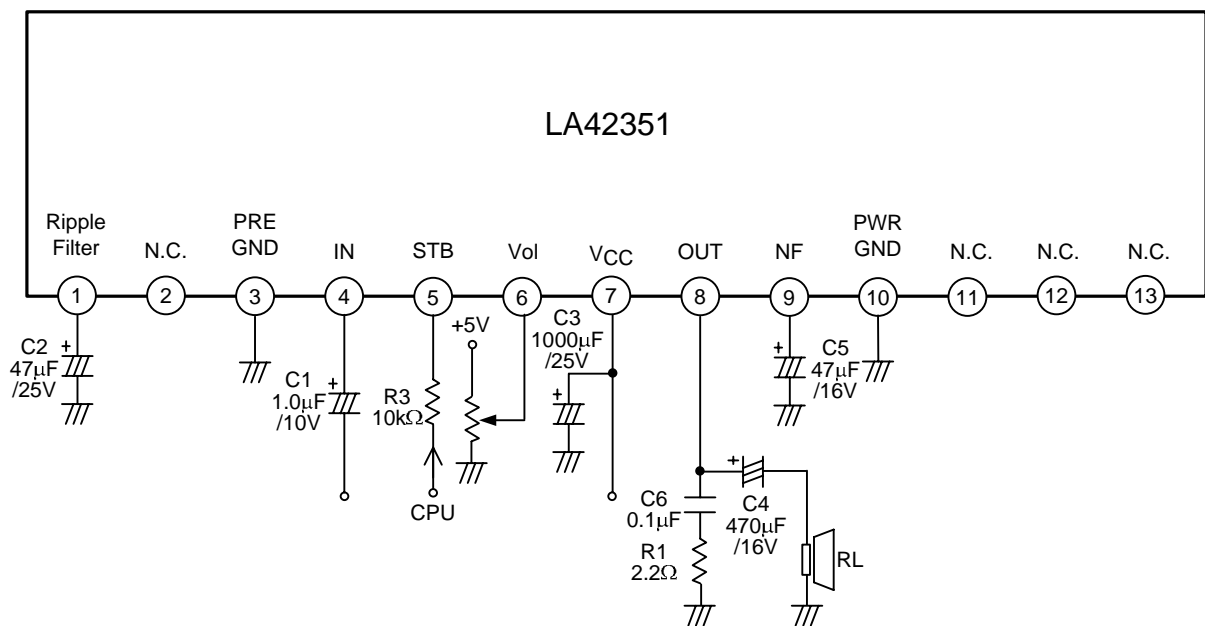
3107B



Block Diagram



Sample Application Circuit



Pin Description

Pin No	Symbol	Pin Voltage	Description	Equivalent Circuit
		At $V_{CC} = 18V$		
1	RF	17.6	<ul style="list-style-type: none"> Ripple filter reference 	
4	IN	4.4	<ul style="list-style-type: none"> Input pin 	
3	PRE_GND	0	<ul style="list-style-type: none"> Pre GND pin 	
5	STB	0 to 10V (Input voltage)	<ul style="list-style-type: none"> Standby pin The standby function is on when this pin at ground level 	
6	Vol	0 to 5V (Input voltage)	<ul style="list-style-type: none"> Control Volume 	
7	V_{CC}	18	<ul style="list-style-type: none"> Power supply 	

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Pin No	Symbol	Pin Voltage	Description	Equivalent Circuit
		At $V_{CC} = 18V$		
8	OUT	8.9	<ul style="list-style-type: none"> Output pin 	
9	NF	8.8	<ul style="list-style-type: none"> Negative feedback pin at Power amplifier Connect NF capacitor 	
10	PWR_GND	0	<ul style="list-style-type: none"> Power GND pin 	

Description of External parts

- C1 : Input capacitors. A value of $1.0\mu F$ is recommended for capacitors. Note that the low-frequency area characteristics can be adjusted by changing f_L .
- C2 : Ripple filter capacitor. A value of $47\mu F$ is recommended for capacitors. Decreasing the capacitance value excessively or removing this capacitor causes ripple to occur. However, increasing the capacitance value does not always cause ripple to reduced. Decreasing the capacitance value makes the starting time earlier.
- C3 : Power capacitor.
- C4 : Output capacitors. A value of $470\mu F$ is recommended for capacitors.
- C5 : Feedback capacitor. A value of $47\mu F$ is recommended for capacitors. Decreasing the capacitance value lowers the low frequency response. Increasing the capacitance value makes the starting time later.
- C6 : Oscillation blocking capacitor. Use a polyester film capacitor that is good in high frequency response and temperature characteristic.
- R1 : Resistor connected in series with oscillation blocking capacitor. Prevents phase shift attributable to the oscillation blocking capacitor so that oscillation is hard to occur.
- R3 : Standby switch current limiting resistor. A value of $10k\Omega$ is recommended for resistance (when the applied voltage for the standby switch is 3V to 10V). This resistor cannot be removed.

Features of IC Inside and Usage Note

Standby function

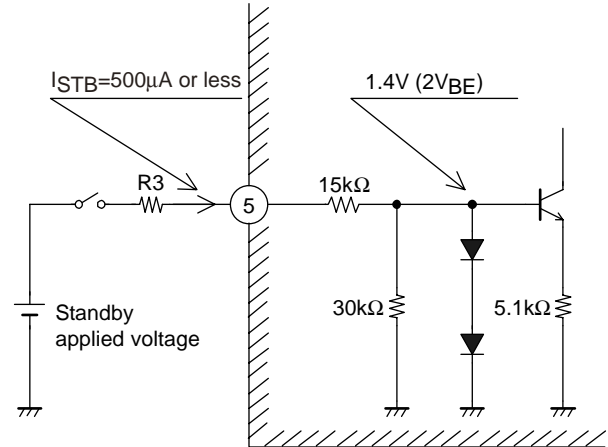
- Pin 5 is the standby switch pin. The amplifier is turned on by applying approximately 3V or more to this pin through an external resistor (R3).

$$I_{STB} = \frac{(5 - 2V_{BE})}{15k}$$

$$V_{BE} = \text{about } 0.7V$$

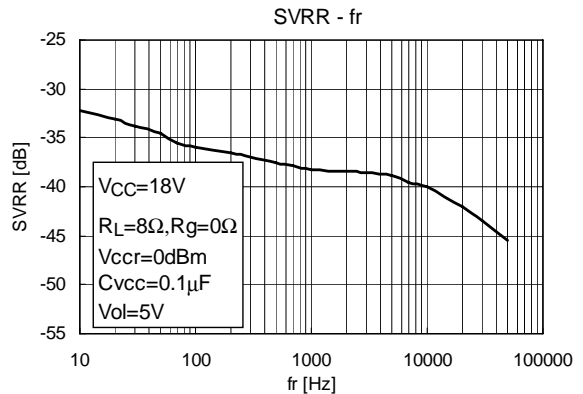
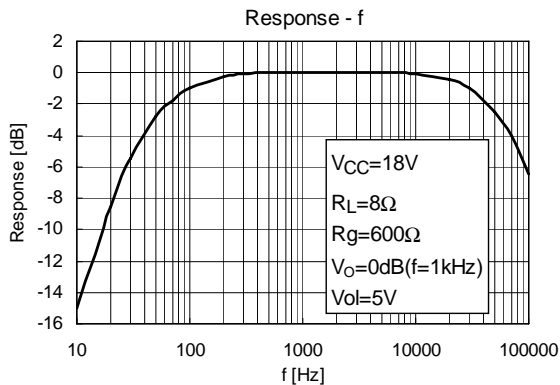
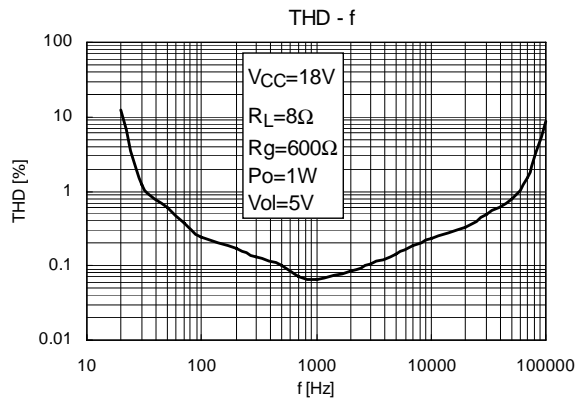
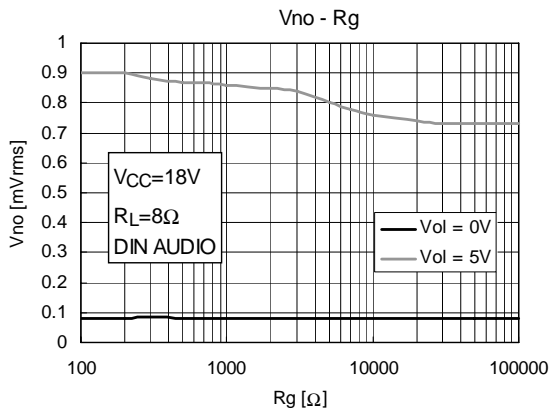
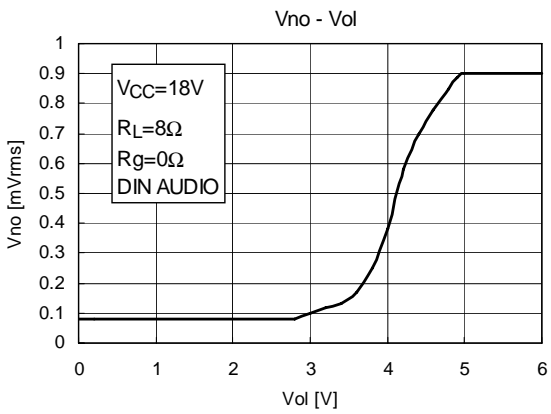
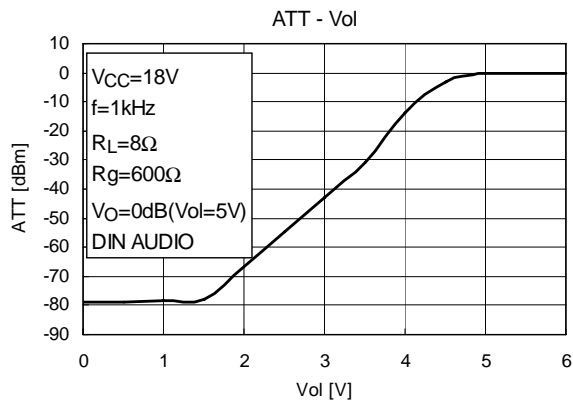
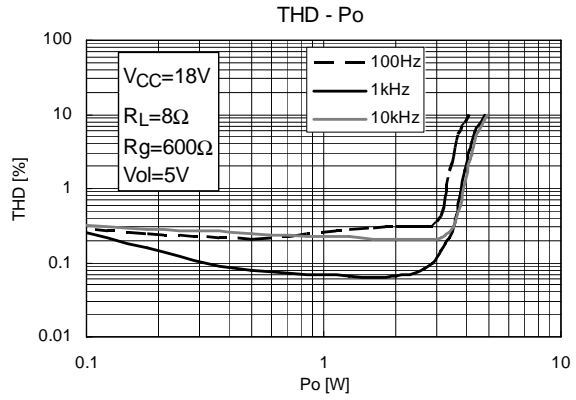
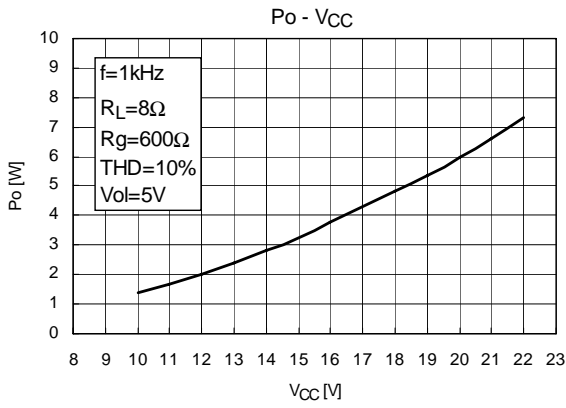
- If voltage in excess of 10V is to be applied to the standby switch, calculate the value of R3 using the following formula so that the current flowing into pin 5 is 500μA or less:

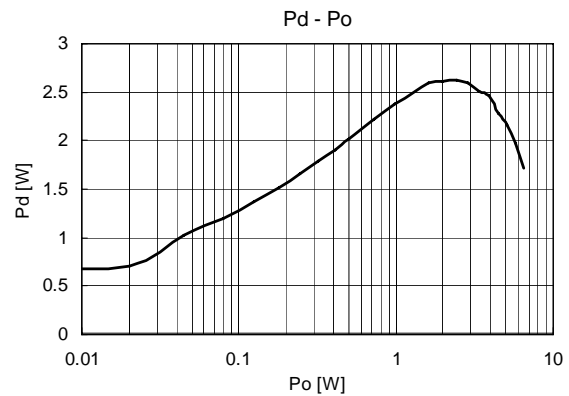
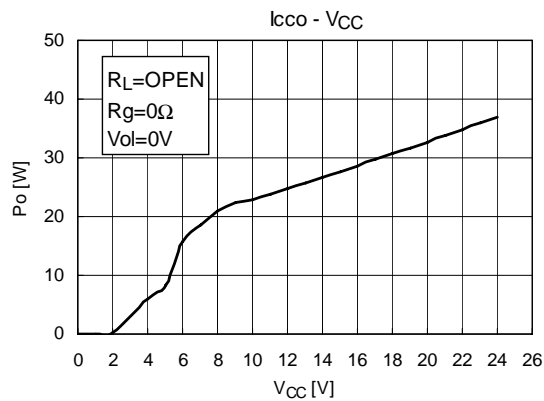
$$R3 = \frac{(\text{Applied voltage} - 2V_{BE})}{500\mu A} - 15k\Omega$$



Protector

- In order to prevent damage or degradation which may be caused by abnormally heated IC, the LA42351 has a thermal shutdown protector. Accordingly, if the IC junction temperature (T_j) climbs to around 160°C due to inadequate heat dissipation, the thermal shutdown protector will operate to control the output gradually into attenuation.





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