Ordering number : ENN7043

Monolithic Linear IC

LA4742

45 W Four-Channel (Bridge Circuit) Power Amplifier

Overview

The LA4742 is a 45 W 4-channel power amplifier IC for car stereo systems. It features a built-in bridge circuit and the ability to radically reduce the number of external components required.

Features

- Maximum output power: 45 W × 4 channels (V_{CC} = 14.4 V, 4 Ω load, 1 kHz)
- 40 W × 4 channels (V_{CC} = 13.7 V, 4 Ω load, 1 kHz)
- Requires only seven external components and does not require an oscillation prevention RC circuit, a noise filter, or a BS capacitor.

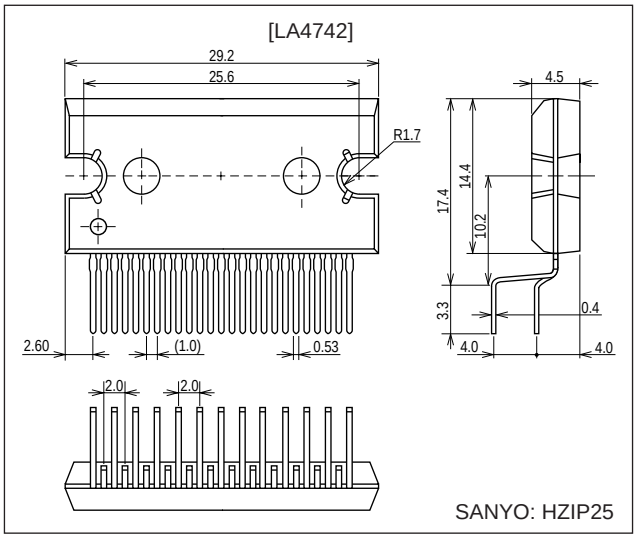
Functions

- Output offset detection function (DDL)
- Warning tone (beep) generation function
- Muting function
- Built-in standby switch
- Full complement of built-in protection circuits, including protection from shorting to V_{CC}, shorting to ground, load shorting, overvoltages, and overheating.
- Maximum supply voltage before damage in the open ground state: 16 V

Package Dimensions

unit: mm

3236-HZIP25



Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max1	Signal present	18	V
	V_{CC} max2	No signal (for 1 minute)	26	V
Maximum output current	$I_O$peak		4.5/ch	A
Allowable power dissipation	Pd max	With an arbitrarily large heat sink	50	W
Operating temperature	Topr		–40 to +85	°C
Storage temperature	Tstg		–40 to +150	°C
Package thermal resistance	θjc		1	°C/W

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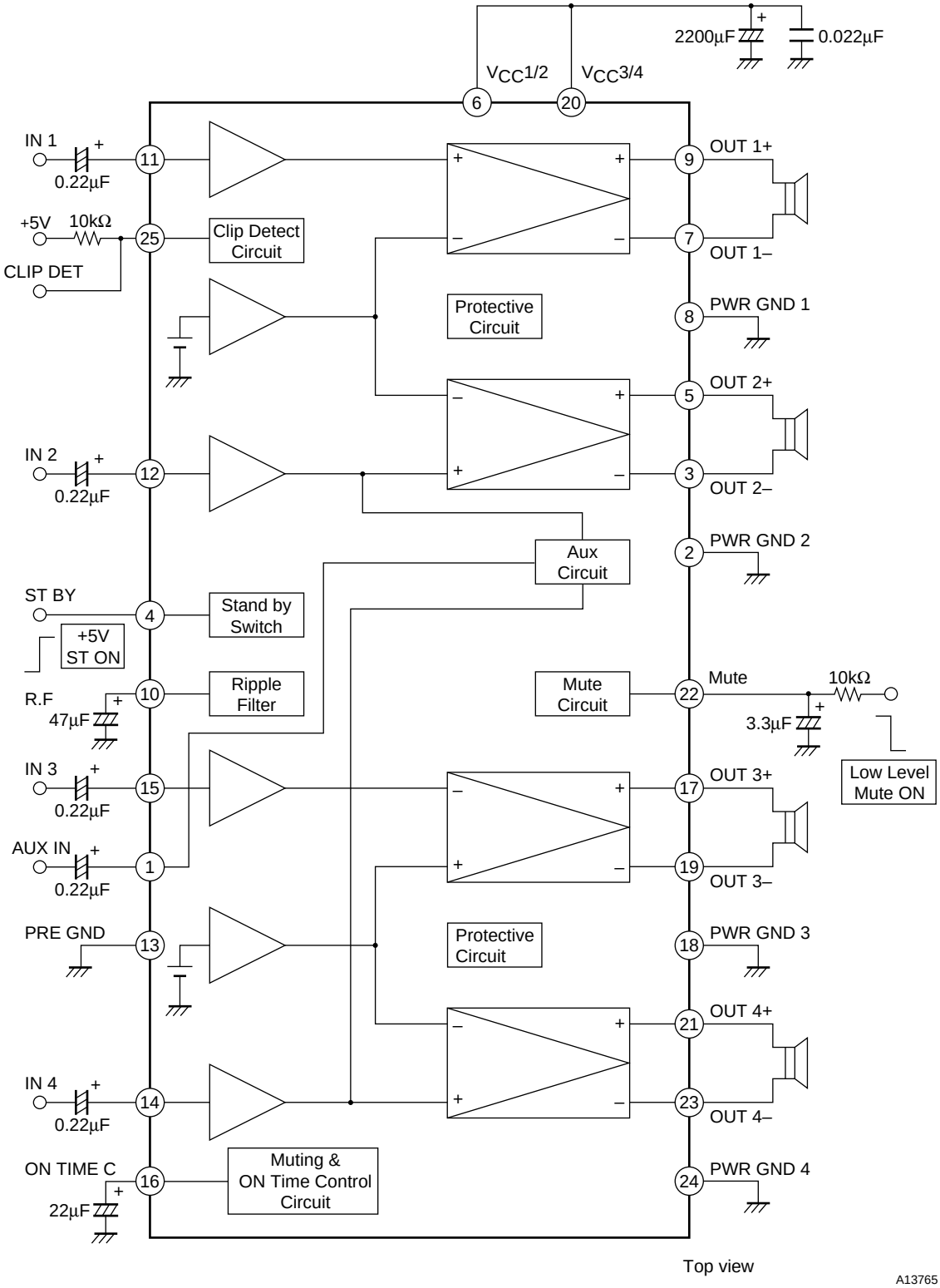
Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		14.4	V
Recommended load resistance	R_L		4	Ω
Operating supply voltage range	V_{CC} op		9 to 18	V

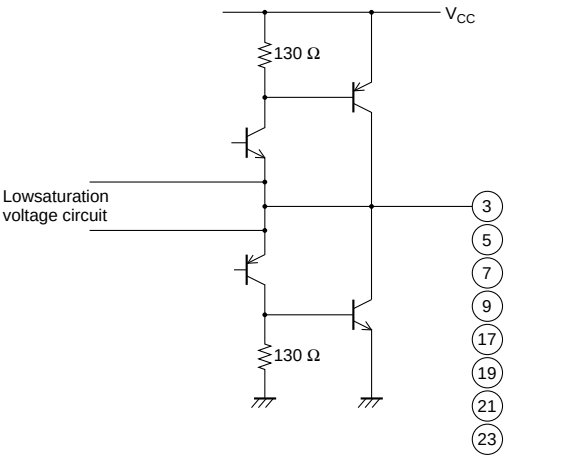
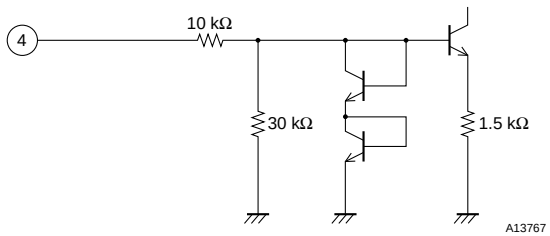
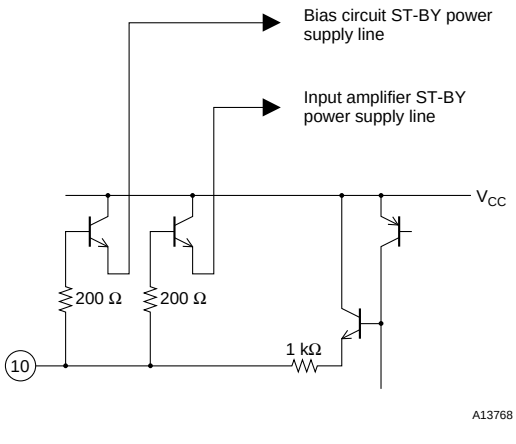
Operating Characteristics at Ta = 25°C, V_{CC} = 14.4 V, f = 1 kHz, R_L = 4 Ω, Rg = 600 Ω

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Quiescent current	I_{CCO}	R_L = ∞, Rg = 0	100	200	350	mA
Standby current	Ist	Vst = 0 V			10	μA
Output offset voltage	$V_N$offset	Rg = 0	–100		+100	mV
Voltage gain	VG	V_O = 0 dBm	25	26	27	dB
Voltage gain difference	ΔVG		–1		+1	dB
Output power	P_O1	THD = 10 %	23	28		W
	P_O max1	V_{CC} = 13.7 V, V_{IN} = 5 Vrms		40		W
	P_O max2	V_{IN} = 5 Vrms		45		W
Total harmonic distortion	THD	P_O = 4 W		0.05	0.4	%
Channel separation	CHsep	V_O = 0 dBm, Rg = 10 kΩ	55	65		dB
Ripple rejection ratio	SVRR	f_r = 100 Hz, V_R = 0 dBm, Rg = 0	50	60		dB
Output noise voltage	V_{NO}	Rg = 0, B.P.F. = 20 Hz to 20 kHz		100	200	μVrms
Muting attenuation	Mute(att)	V_O = 20 dBm	70	80		dB

Sample Application Circuit and Block Diagram



Pin Functions and Equivalent Circuits at V_{CC} = 14.4 V, ST-BY = 5 V

Pin No.	Function	DC voltage [V]	Notes	Internal equivalent circuit
1	AUX IN			
2 8 18 24	POWER GND			
3 5 7 9 17 19 21 23	–OUT2 +OUT2 –OUT1 +OUT1 +OUT3 –OUT3 +OUT4 –OUT4	2.7		
4	ST-BY		• The amplifier will be on when the applied voltage is between 2 V and V_{CC}.	
6 20	V_{CC}1/2 V_{CC}3/4			
10	SVR	13.2	• Low ripple power supply line for all internal IC blocks	

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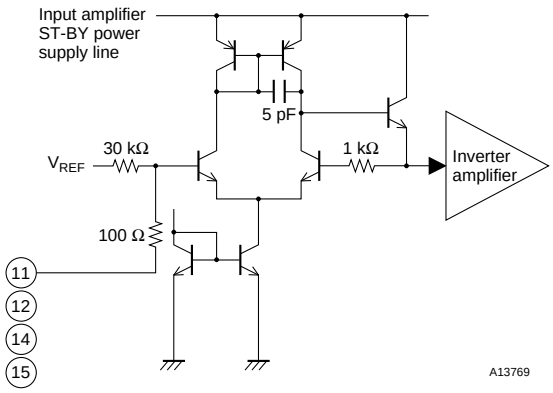
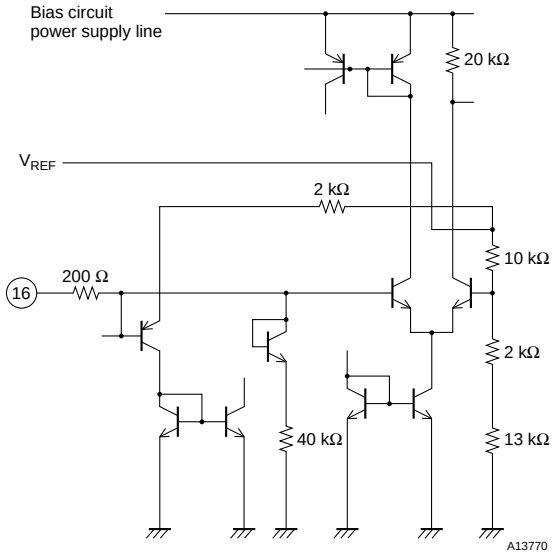
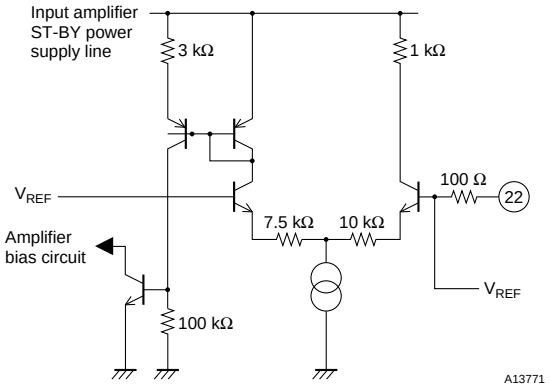
Pin No.	Function	DC voltage [V]	Notes	Internal equivalent circuit
11 12 14 15	IN1 IN2 IN4 IN3	3.1	• Input amplifiers that require no capacitor in the input noise filter.	
13	PRE GND			
16	ON TIME MUTE	2.6	• Amplifier turn-on time control circuit • Impulse noise prevention circuit • With a 22 µF capacitor, the turn-on time will be 0.6 s.	
22	MUTE	4.1	• The muting function is activated when the applied voltage is under 1 V.	
25	CLIPDET			

Notes on Usage and Handling

• Oscillator stabilization

In some cases, details of the printed circuit board layout may lead to induced parasitic oscillation. This oscillation can be prevented by adding any one of the following components. Verify the optimal values for these capacitors by testing in actual end products.

Technique 1 ... Connect Mylar capacitors (0.1 µF) between the BTL amplifier outputs.
Technique 2 ... Connect an RC circuit (2.2 Ω and 0.1 µF in series) between each output and ground.

• Audio quality (low band)

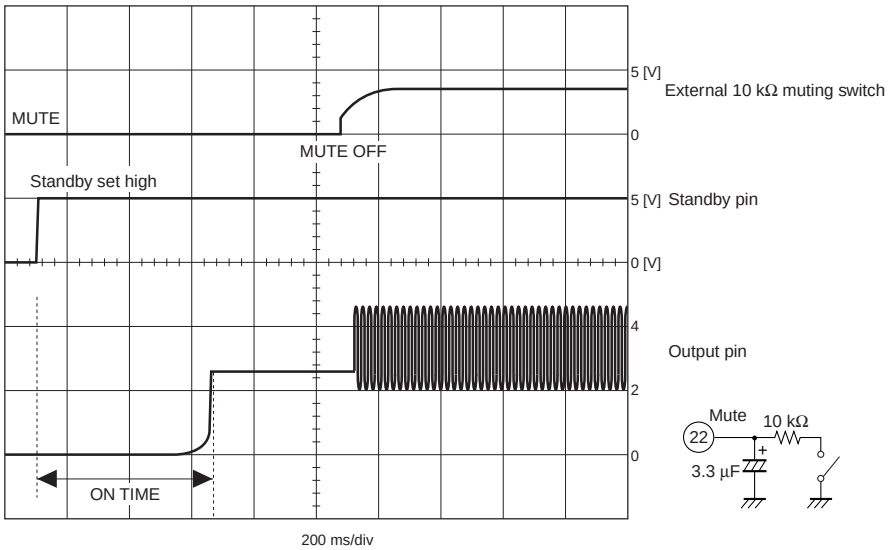
The low-band frequency characteristics can be improved by adjusting the values of the input capacitors. The recommended value is 2.2 µF.

• Impulse noise

The LA4742 includes a built-in impulse noise suppression circuit. However, further improvement can be achieved by using the muting circuit. When first applying power, activate the muting function at the same time as applying power. Then, after the output DC potential has stabilized, turn off the muting function. When turning off the power, first activate the muting function and then turn off the power. Sample transient responses are attached (see the timing charts).

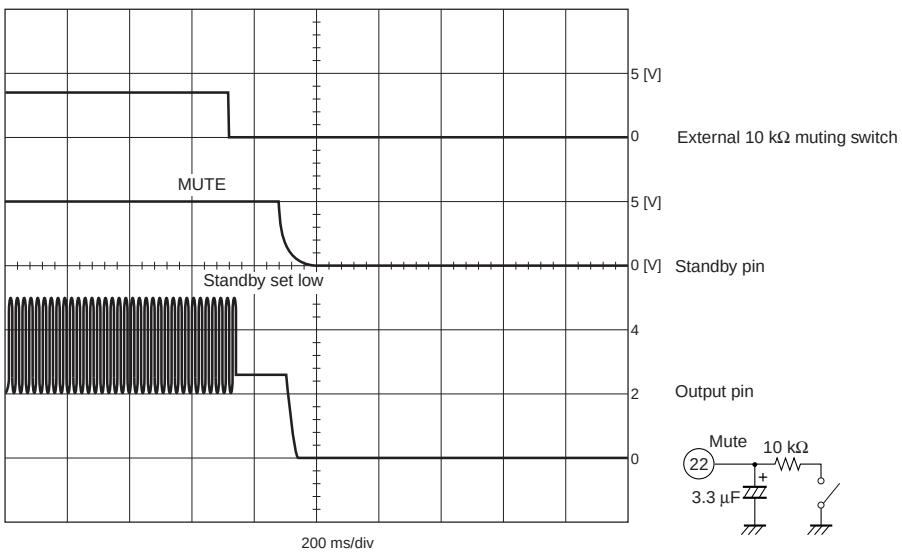
Transient Responses at Power On

Power on: Standby and muting activated at the same time.
Muting is turned off after the output has stabilized.

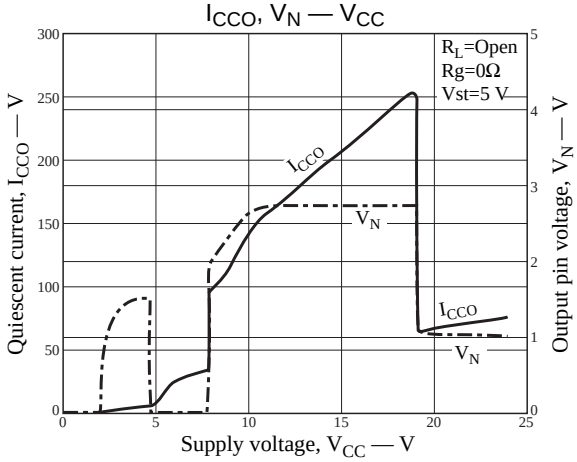


Transient Responses at Power Off

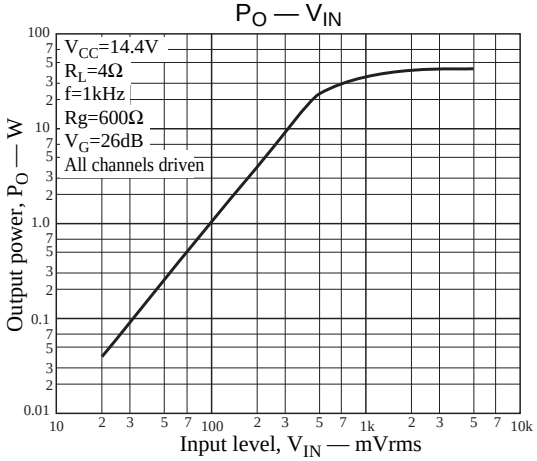
Power off: After activating the muting circuit, turn the power off.



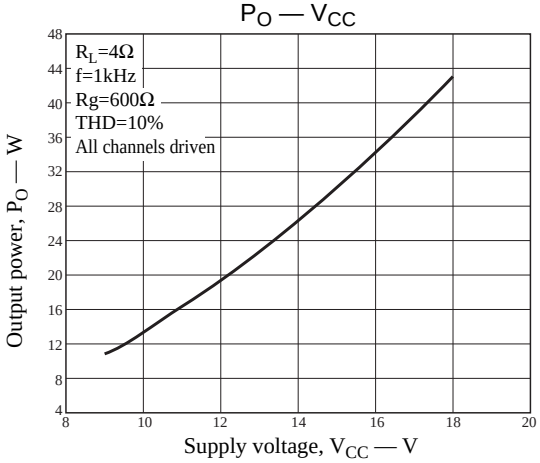
I_{CCO}, V_N — V_{CC}



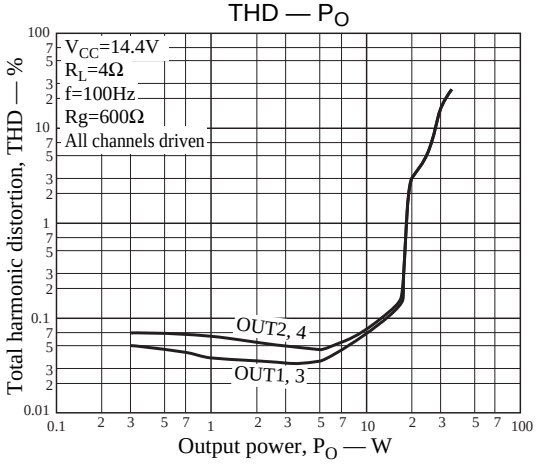
P_O — V_{IN}



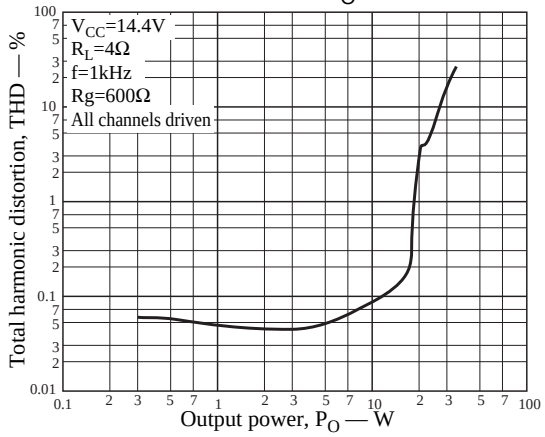
P_O — V_{CC}



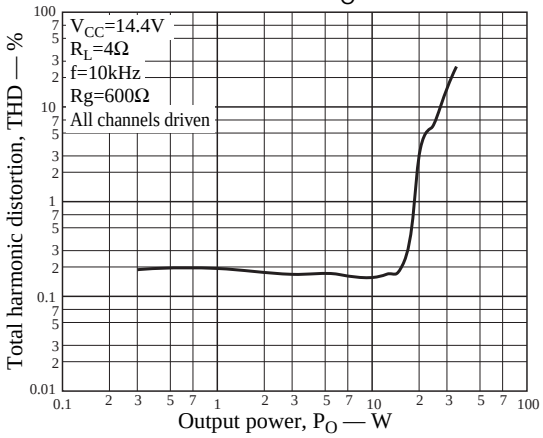
THD — P_O



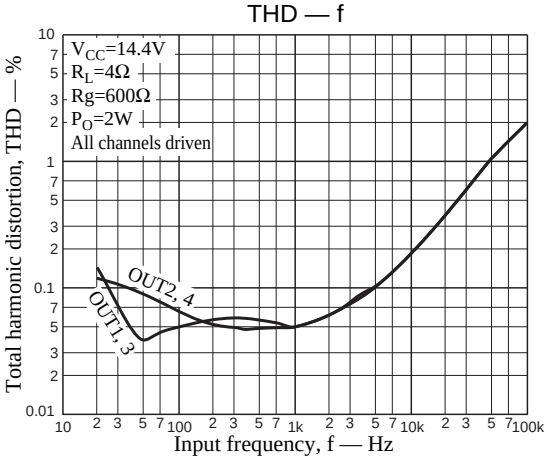
THD — P_O



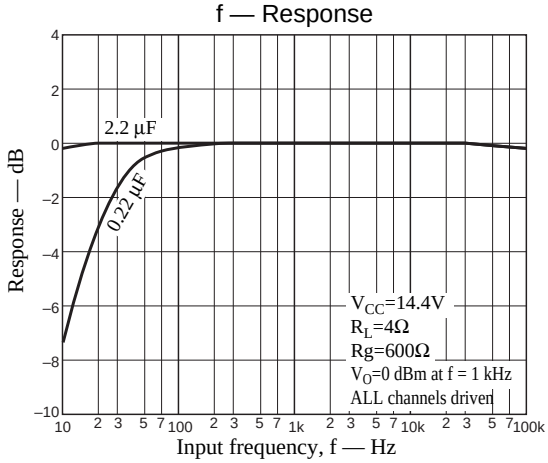
THD — P_O



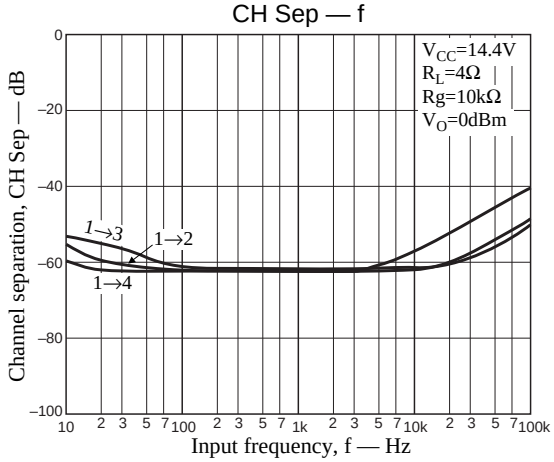
THD — f



f — Response



CH Sep — f



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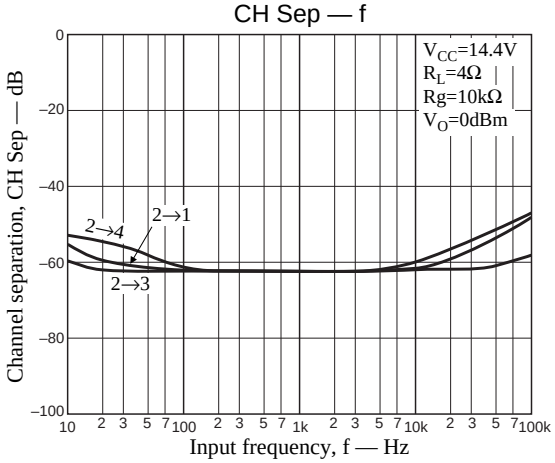

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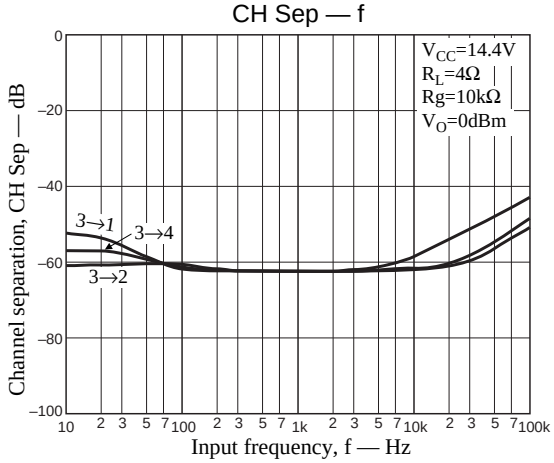

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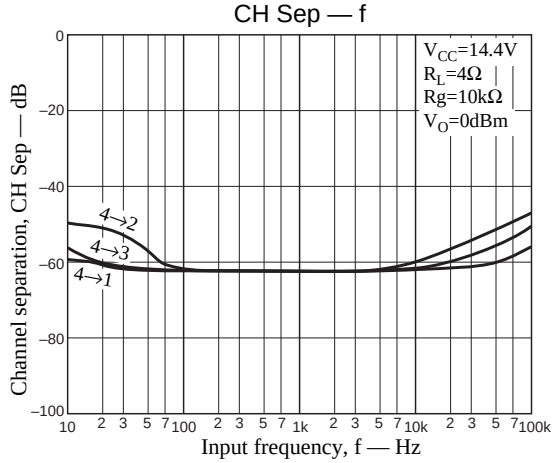
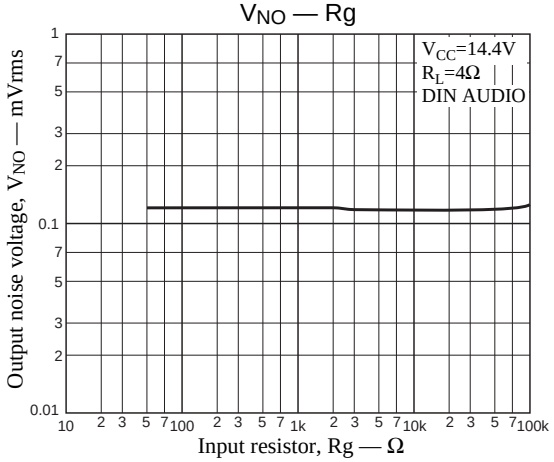
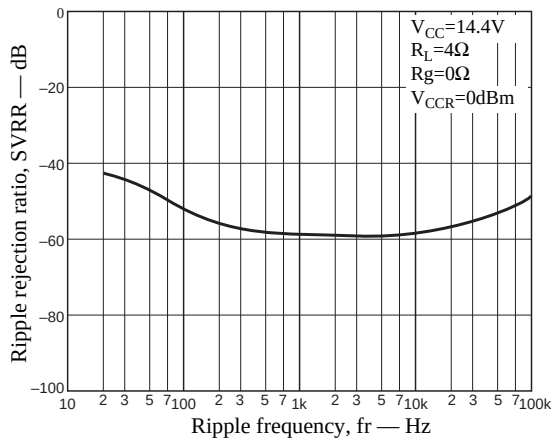


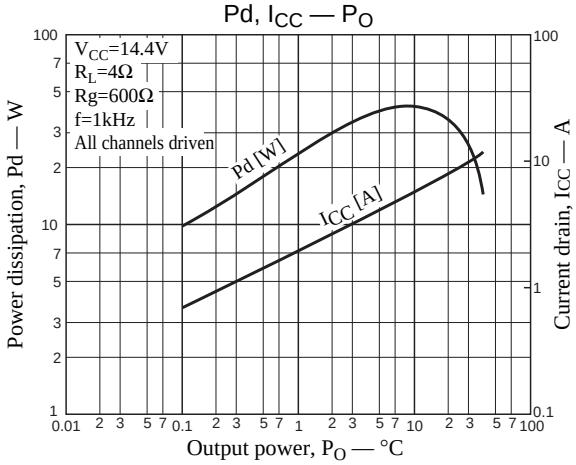
V_{NO} — Rg



SVRR — fr



Pd, I_{CC} — P_O



I_{CCO} — Ta