Ordering number : EN8307

SANYO Semiconductors

DATA SHEET

Monolithic Linear IC

LA47516 — Four-Channel 50W BTL Power Amplifier for Car Stereo Systems

Overview

The LA47516 is a four-channel 50W BTL power amplifier IC for car stereo systems. The output stage uses a pure complementary format with a V-PNP transistor on the upper side and an NPN transistor on the lower side, making it possible to obtain high power output and excellent sound quality.
This IC features an extensive set of functions required in car audio systems, including a standby switch, muting function, and a full complement of protection circuits.

Features

- Maximum output : 50W×4 (at V_{CC} = 14.4V, R_L = 4Ω)
- Very low external component count

Functions

- On-chip offset detector
- Electrically driven mirror noise countermeasure pin provided
- Mute function
- Standby switch
- Full compliment of protection circuits (including shorting to the power supply, shorting to ground, load short-circuit, overvoltage, thermal protection)

Usage Notes

Note 1 : This IC must not be connected incorrectly. Incorrect connection can lead to damage to or destruction of the IC.

Note 2 : The protection circuits can temporarily prevent damage to the IC from abnormal states such as incorrect output line connections, but they cannot guarantee that the IC will not be destroyed.
In particular, these protection circuits do not function outside the guaranteed operating ranges, and incorrect connection of the outputs can lead to destruction of the IC.

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max1	No signal, t = 1 minute	26	V
	V_{CC} max2	With signal	18	V

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Parameter	Symbol	Conditions	Ratings	Unit
Maximum output current	I_O peak		4.5	A
Allowable power dissipation	Pd max	With a infinity large heat sink (See note.)	50	W
Operating temperature	Topr		-40 to +85	°C
Storage temperature	Tstg		-40 to +150	°C
Junction-to-case thermal resistance	θj-c		1	°C/W

Note : Power consumption (Pd), junction-to-case thermal resistance (θj-c), heat sink thermal resistance (θf), junction temperature (Tj), case temperature (Tc), and ambient temperature (Ta) have the relationship shown in the following equation.

Tj = Pd (θj-c+θf) +Ta
= Pd×θj-c+Tc, *Tc = Pd×θf+Ta However, Tj max is limited by Tstg max (150°C).

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	Pd max shall not be exceeded.	9 to 18	V

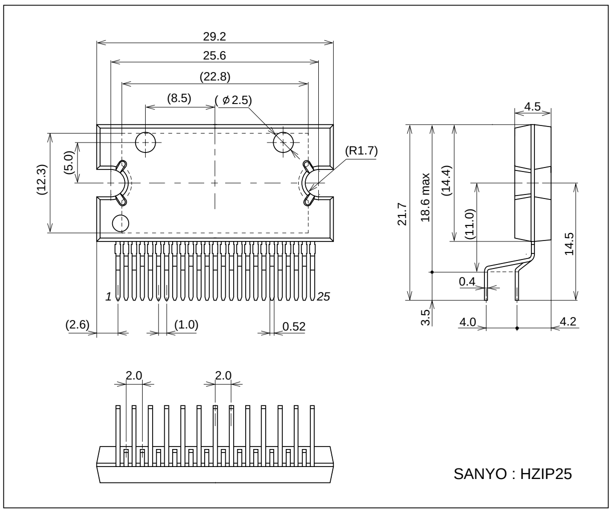
Electrical Characteristics at Ta = 25°C, V_{CC} = 14.4V, f = 1kHz, R_L = 4Ω, Rg = 600Ω

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Quiescent current	I_{CCO}	R_L = ∞, Rg = 0		200	350	mA
Standby current	Ist	Vst = 0V			10	μA
Output offset voltage	Vn offset	Rg = 0	-150		+150	mV
Voltage gain	VG	V_O = 0dBm	31	32	33	dB
Voltage gain difference	ΔVG		-1		+1	dB
Output power	P_O1	THD = 10%	24	29		W
	P_O max1	V_{CC} = 13.7V, V_{IN} = 2.5Vrms		43		W
	P_O max2	V_{IN} = 2.5Vrms		48		W
Total harmonic distortion	THD	P_O = 4W		0.1	0.4	%
Channel separation	CHsep	V_O = 0dBm, Rg = 10kΩ	55	65		dB
Ripple rejection ratio	SVRR	fr = 100Hz, Vr = 0dBm, Rg = 0 B.P.F = 20Hz to 20kHz	50	70		dB
Output noise voltage	V_{NO}	Rg = 0, B.P.F = 20Hz to 20kHz		80	200	μVrms
Mute attenuation	Ma	V_O = 20dBm	70	90		dB

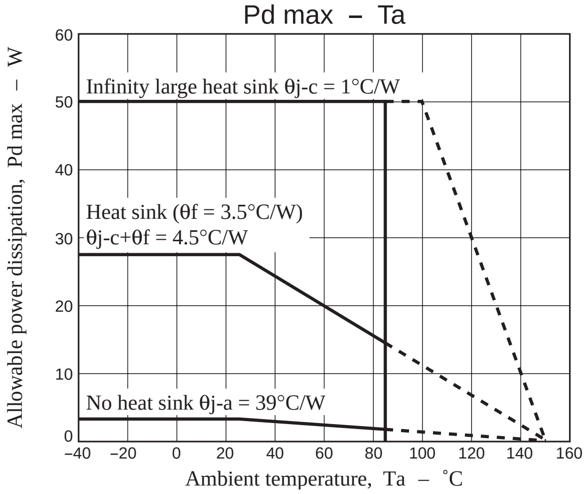
*0dBm = 0.775Vrms

Package Dimensions

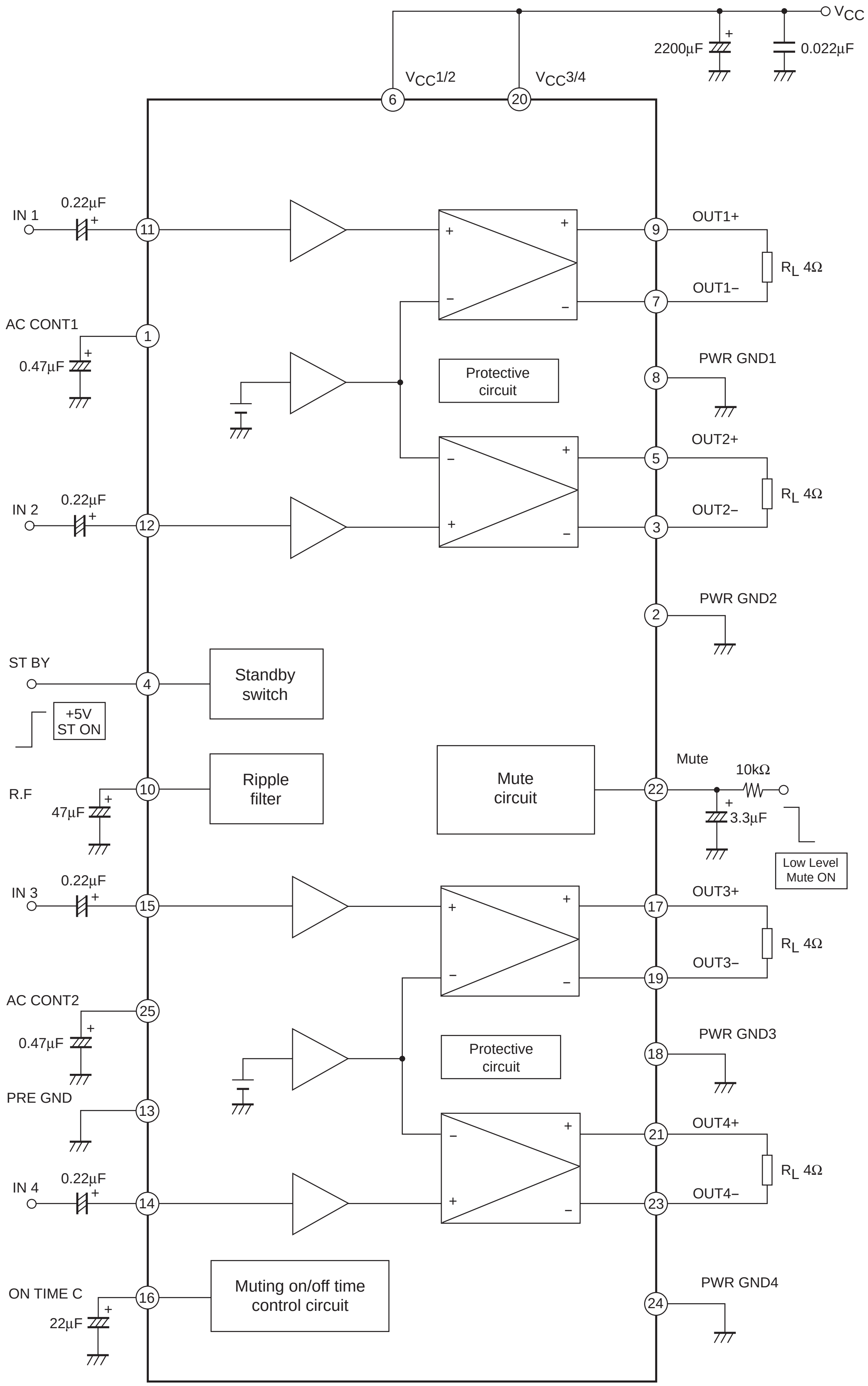
unit : mm (typ)
3236A



Pd max – Ta



Block and Test Circuit Diagram



Note : The components and constant values in the test circuit are used for confirmation of characteristics and do not guarantee that the application equipment will be free from malfunction or trouble

Description of Operation

1. Standby switch function (pin 4)
   The pin 4 threshold voltage is set to $2V_{BE}$; the amplifier turns on when Vst = 2.0V or higher, and off when Vst = 0.7V or lower. Note that pin 4 requires an operating current of 40μA or higher.
   Note : Do not ground the output with the Pin 4 voltage at approximately 1.4V. In addition, do not give the Pin 4 voltage a time constant.

2. Muting function
   The audio can be muted by connecting pin 22 to ground through a 10kΩ resistance. This sets the IC to the muted state. The mute time constant is determined by the external capacitor and resistor constants. The recommended external constants are C = 3.3μF, R = 10kΩ.

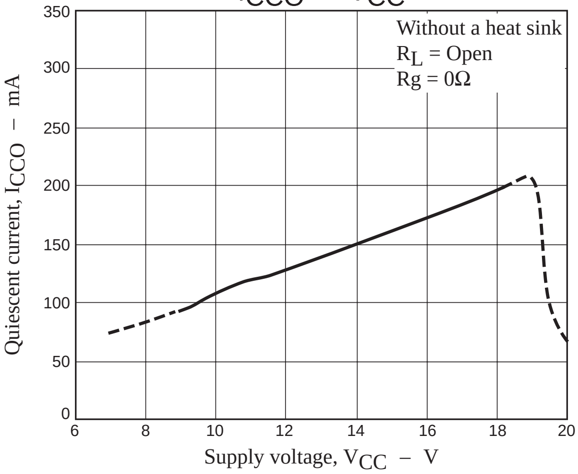
3. Oscillation stability
   Parasitic oscillation may be induced depending on the board layout.
   Countermeasures against oscillation can be taken by adding the following parts.
   Note that the following are only examples for reference, and that the optimum capacitance values must be confirmed in the mounted condition for each set.
   - Connect a Mylar capacitor (0.033μF) between the BTL outputs.
   - Connect a capacitor and a resistor (0.1μF and 2.2Ω in series) between each output and GND.

4. Sound quality (low frequencies)
   The frequency response in the low frequency range can be improved by varying the capacitance value of the input capacitor. The recommended value is 2.2μF or less.

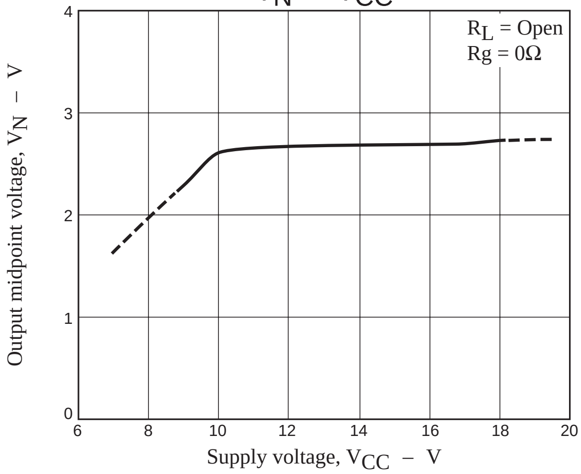
5. Impulse noise
   This IC includes a function for preventing impulse noise from appearing in the output. The effect of this function can be improved by using it in combination with the muting function.
   - When turning on the amplifier, turn the power supply and the mute function on at the same time.
     Then turn the mute function off after the output current potential has stabilized.
   - When turning off the amplifier, first turn on the muting function and then turn off the power.

6. Electric mirror noise suppression measures
   A capacitor about twice the size of the input capacitors must be used for the capacitor between pins 1 and 25 that is used to minimize noise from the electrically driven mirror.
   In the sample application circuit, a 0.47μF capacitor is used for 0.22μF input capacitors.
   Note that the capacitor connected between pins 1 and 25 must be connected to the same pre-ground as the input capacitors.

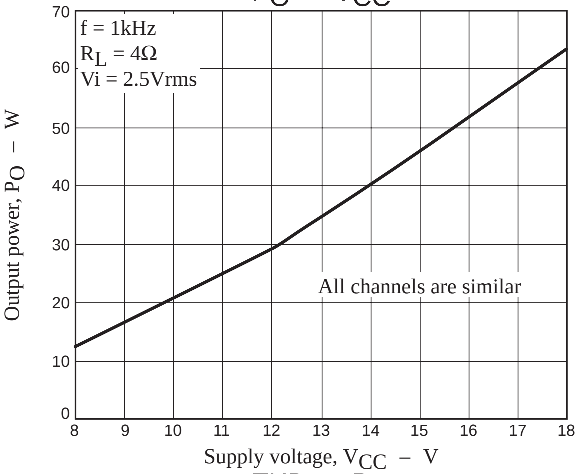
I_{CCO} – V_{CC}



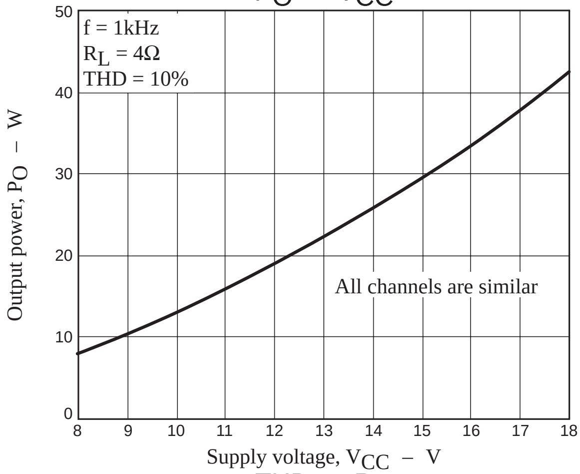
V_N – V_{CC}



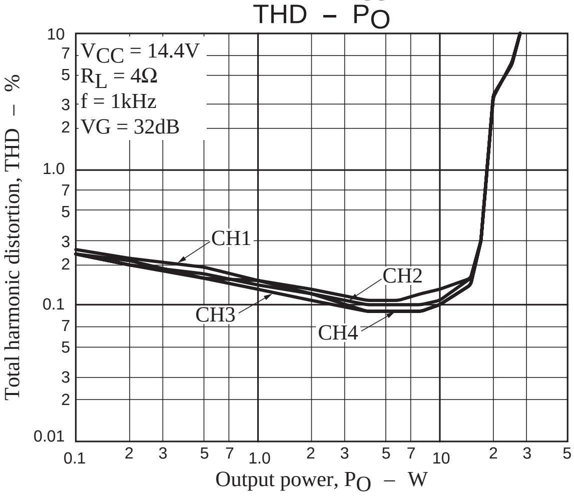
P_O – V_{CC}



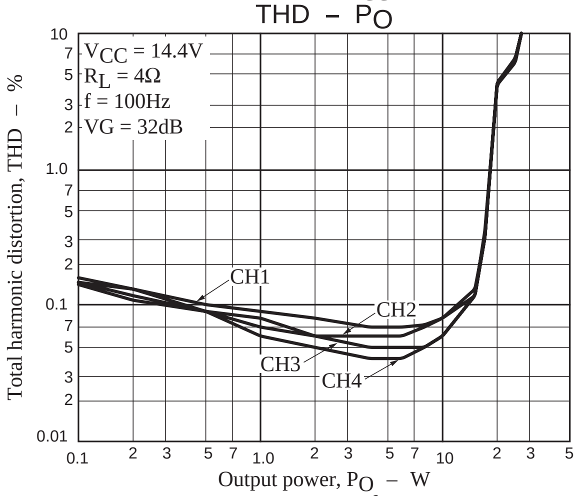
P_O – V_{CC}



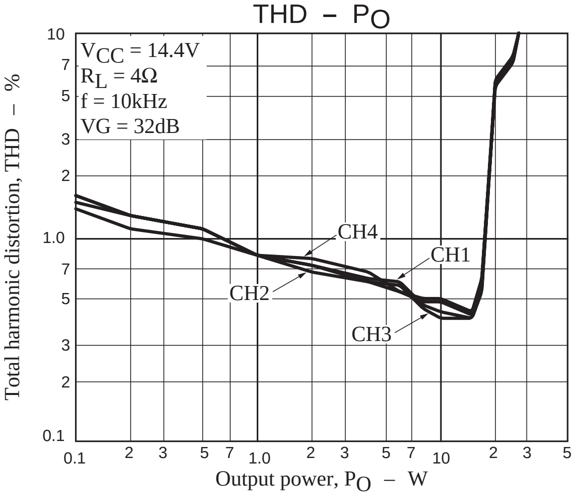
THD – P_O



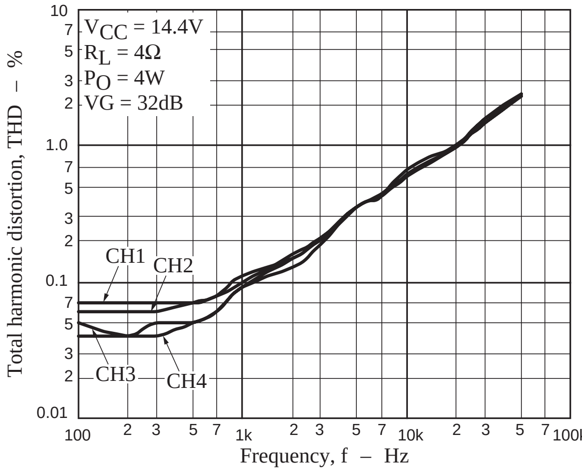
THD – P_O



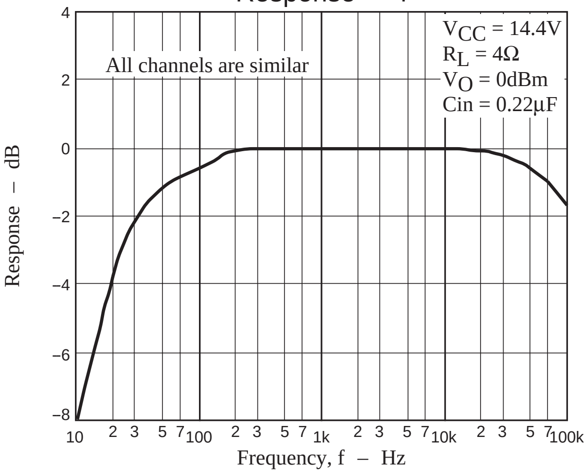
THD – P_O



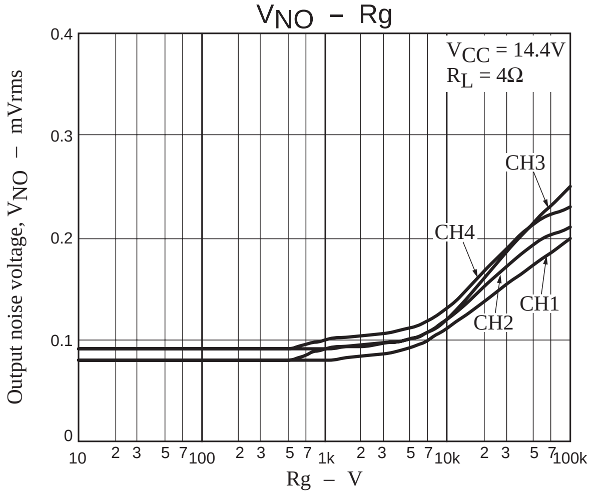
THD – f



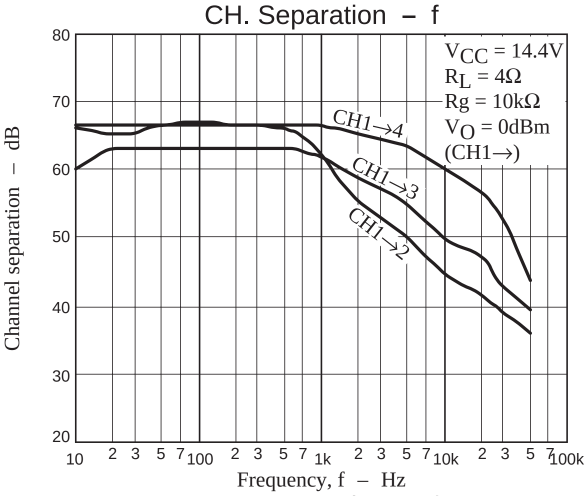
Response – f



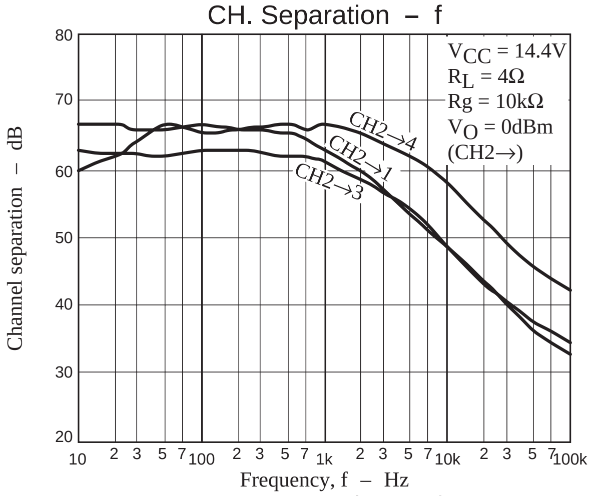
V_{NO} – Rg



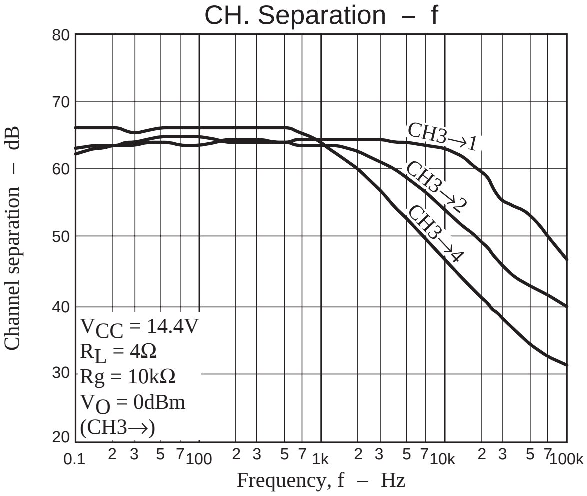
CH. Separation – f



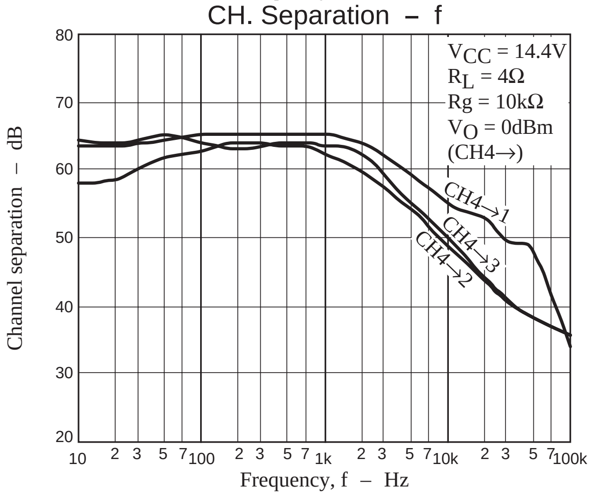
CH. Separation – f



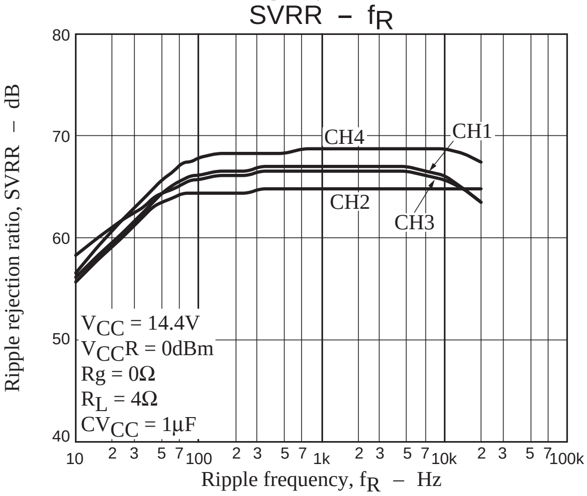
CH. Separation – f



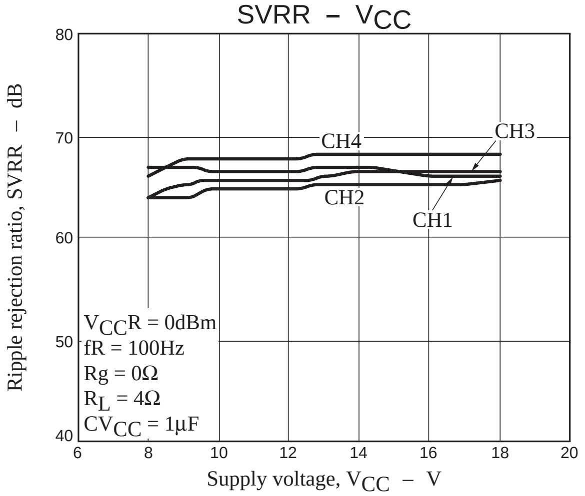
CH. Separation – f

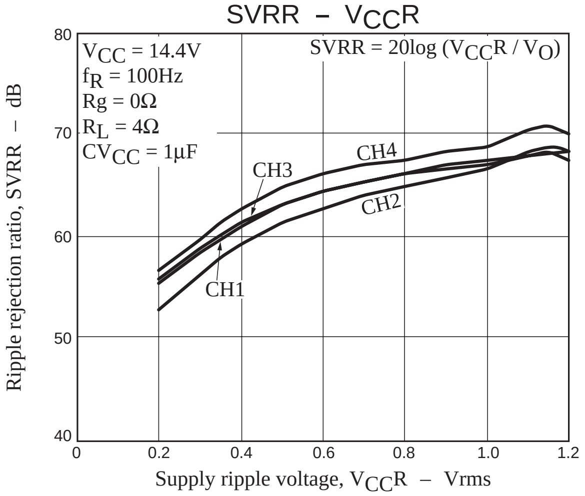


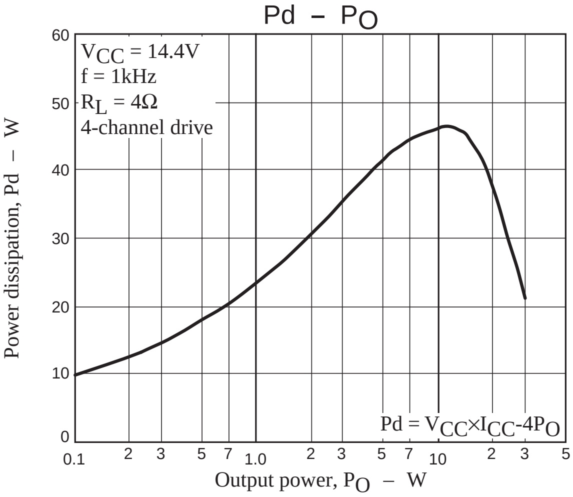
SVRR – f_R



SVRR – V_{CC}







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