Ordering number : ENN6631

Monolithic Linear IC

LA4625

Two-Channel 13.5 W BTL Audio Power Amplifier

Overview

The LA4625 is a 2-channel general-purpose BTL audio power amplifier provided in a miniature package. It was designed for the best possible audio quality and features an extended low band roll-off frequency provided by a newly-developed NF circuit that does not require an external capacitor. Furthermore, crosstalk, which can cause muddiness in the audio output, has been significantly reduced by both circuit and wiring pattern improvements. Thus this amplifier can provide powerful lows and clear highs.

Note that this device is pin compatible with the 20 W × 2-channel LA4628, and allows end products differentiated by their power rating to share the same printed circuit board.

Features

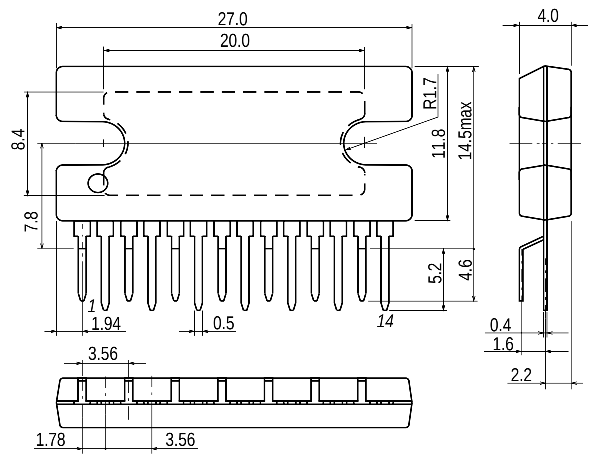
- Total output: 13.5 W + 13.5 W (at V_{CC} = 12 V, RL = 4 Ω, THD = 10%)
- PMPO reference data: 115 W × 2 (V_{CC} = 20 V, RL = 4 Ω)
- High-fidelity design (f_L < 10 Hz, f_H = 130 kHz)
- Extremely low impulse noise levels
- An arbitrary amplifier startup time can be set up with external components.
- Full complement of built-in protection circuits (includes circuits that protect against shorting to V_{CC}, shorting to ground, load shorting, overvoltages and excessive temperatures)

Package Dimensions

unit: mm

3113A-SIP14HZ

[LA4625]



SANYO: SIP14HZ

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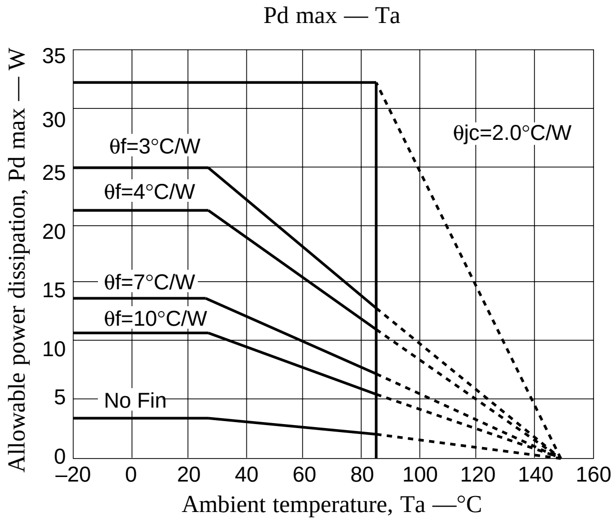
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN



Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max	No signal	24	V
Maximum output current	I_O peak	Per channel	3.5	A
Allowable power dissipation	Pd max	With an arbitrarily large heat sink	32.5	W
Operating temperature	Topr		–20 to +85	°C
Storage temperature	Tstg		–40 to +150	°C

Operating Conditions at Ta = 25°C

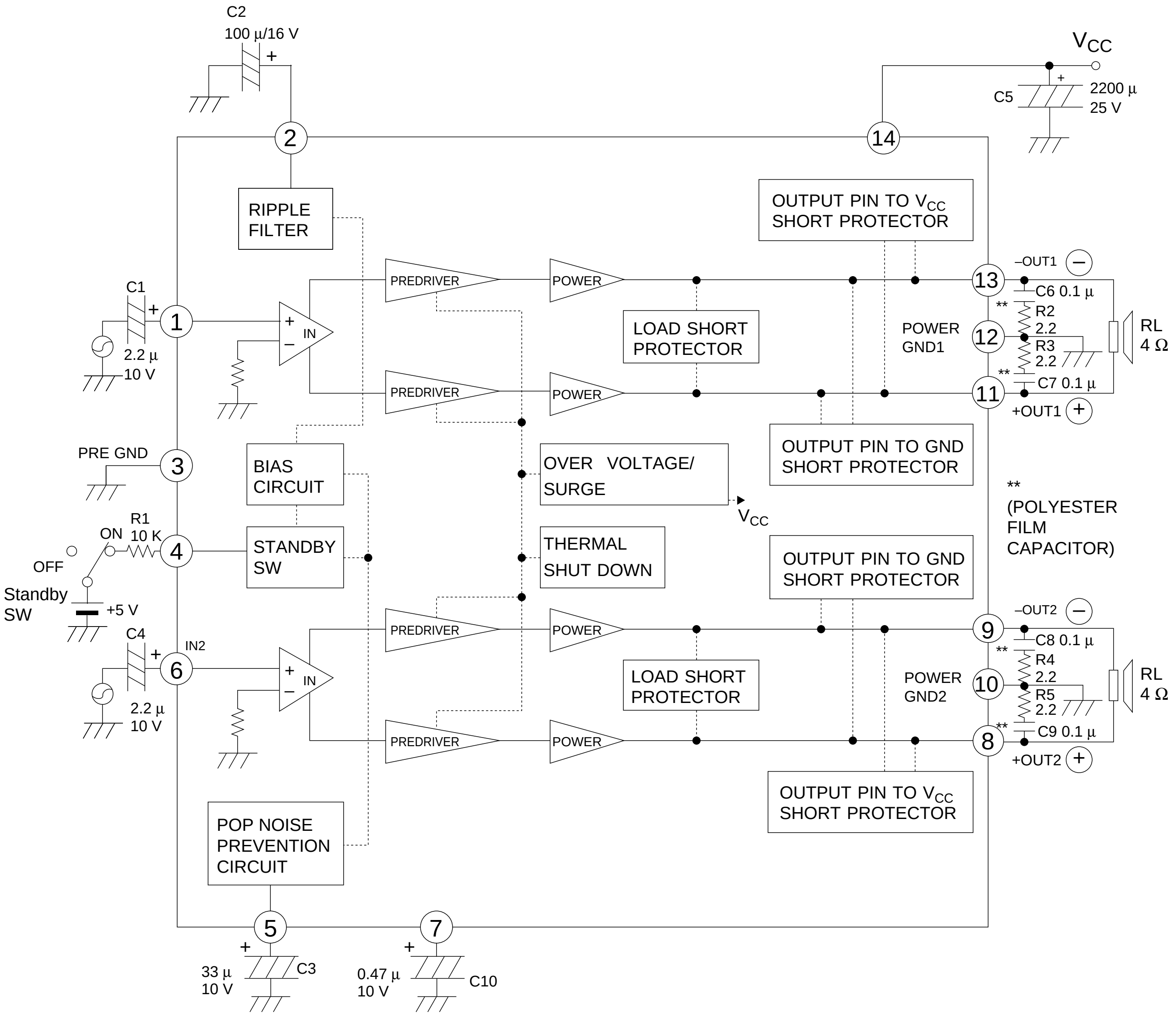
Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		12	V
Recommended load resistance range	RL op		4 to 8	Ω
Allowable operating supply voltage range	V_{CC} op		7.2 to 20	V

Note: With V_{CC}, RL, and the output level in ranges such that the Pdmax for the heat sink used is not exceeded.

Operating Characteristics at Ta = 25°C, V_{CC} = 12 V, RL = 4 Ω, f = 1 kHz, Rg = 600 Ω

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Quiescent current	I_{CCO}	Rg = 0	65	120	240	mA
Standby mode current drain	I_{st}	Standby mode (amplifier off), with no power supply capacitor.		10	60	µA
Voltage gain	V_G	V_O = 0 dBm	38	40	42	dB
Total harmonic distortion	THD	P_O = 1 W, Filter = FLAT		0.06	0.2	%
Output power	P_O1	THD = 10%	10	13.5		W
Output offset voltage	V_N offset	Rg = 0	–300		+300	mV
Output noise voltage	V_{NO}	Rg = 0, BPF = 20 Hz to 20 kHz		0.1	0.5	mV
Ripple rejection ratio	SVRR	Rg = 0, VR = 0 dBm, fR = 100 Hz	40	50		dB
Channel separation	CH Sep	Rg = 10 kΩ, V_O = 0 dBm	50	60		dB
Input resistance	Ri		21	30	39	kΩ
Standby pin applied voltage	V_{ST}	Amplifier on (applied through an external 10 kΩ resistor)	2.5		V_{CC}	V

Equivalent Circuit Block Diagram



C3
Sets the amplifier starting time
(Approximately 0.6 seconds when 33 µF)

C10
Impulse noise reduction
(Note: The device's ability to withstand shorting to V_{CC} or shorting to ground when V_{CC} is around 16 V may be reduced as the value of this capacitor is increased. We recommend 0.47 µF.)

Pin Voltages

V_{CC} = 12 V, with 5 V applied to STBY through a 10 kΩ resistor, RL = 4 Ω, Rg = 0

Pin No.	1	2	3	4	5	6	7
Pin	IN1	DC	PRE–GND	STBY	ON TIME	IN2	POP
Pin voltage	1.46 V	5.18 V	0 V	3.21 V	2.26 V	1.46 V	2.05 V

Pin No.	8	9	10	11	12	13	14
Pin	+OUT2	–OUT2	PWR–GND2	+OUT1	PWR–GND1	–OUT1	V_{CC}
Pin voltage	5.21 V	5.21 V	0 V	5.21 V	0 V	5.21 V	12 V

External Components

C1 and C4: Input capacitors. A value of 2.2 µF is recommended. Determine the polarity based on the DC potential of the circuit connected directly to the LA4625 front end. Note that the low band response can be adjusted by varying f_L with the capacitors C1 and C4.

C2: Decoupling capacitor (ripple filter)

C3: Sets the amplifier starting time, which will be approximately 0.6 seconds for a value of 33 µF. The starting time is proportional to the value of this capacitor, and can be set to any desired value.

C5: Power-supply capacitor

C6, C7, C8, and C9:

Oscillation prevention capacitors. Use polyester film capacitors (Mylar capacitors) with excellent characteristics. (Note that the series resistors R2, R3, R4, and R5 are used in conjunction with these capacitors to achieve stable amplifier operation.) A value of 0.1 µF is recommended.

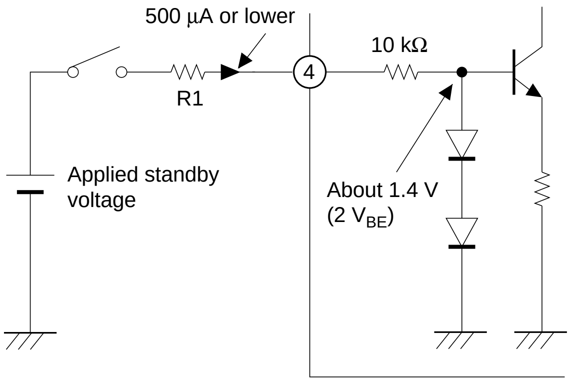
C10: Impulse noise reduction capacitor. A value of 0.47 µF is recommended. Caution is required when selecting the value for this capacitor, since increasing its value influences the operation of the circuits that protect against shorting the amplifier output pins to V_{CC} or to ground when higher V_{CC} voltages (approximately 16 V or higher) are used.

R1: Standby switch current limiting resistor. A value of 10 kΩ is recommended when a voltage in the range 2.5 to 12 V will be applied as the standby switching voltage. Note that this resistor is not optional: it must be included.

IC Internal Characteristics and Notes

1. Standby function
   - Pin 4 is the standby switch. A voltage of 2.5 V or higher must be applied through an external resistor to turn the amplifier on.
   - If a voltage of over 12 V will be applied as the standby mode switching voltage, use the following formula to determine the value of R_1 so that the current entering at pin 4 remains under 500 µA.

$$R_1 = \frac{\text{<applied voltage>} - 1.4}{500\ \mu\text{A}} - 10\ \text{k}\Omega$$



Pin 4 Internal Equivalent Circuit

2. Muting function
   - Pin 5 connects the capacitor that determines the starting time to prevent impulse noise. It can also be used to mute the amplifier output by shorting pin 5 to ground. When this function is used, the recovery time depends on C3.

3. Impulse noise improvements
   - While the LA4625 achieves a low level of impulse noise, if even further reductions in impulse noise at power on/off (and when switching into or out of standby mode) a 0.47 µF capacitor may be inserted between pin 7 and the PRE GND pin (pin 3). (Pin 7 is the output amplifier bias pin. Since the ability to withstand shorting the output pins to V_{CC} or ground is reduced for supply voltages over 16 V if the pin 7 capacitance is large, we recommend a value of 0.47 µF or lower for this capacitor.)

4. Protection circuits
   - Due to the system structure of the protection circuit for shorts to V_{CC} or ground, if there is a DC resistance between the amplifier output pins and ground, the protection circuit may operate when power is first applied and the amplifier may fail to turn on. The basic design approach we recommend is not to adopt any designs in which there is a DC resistance between the amplifier outputs and ground.

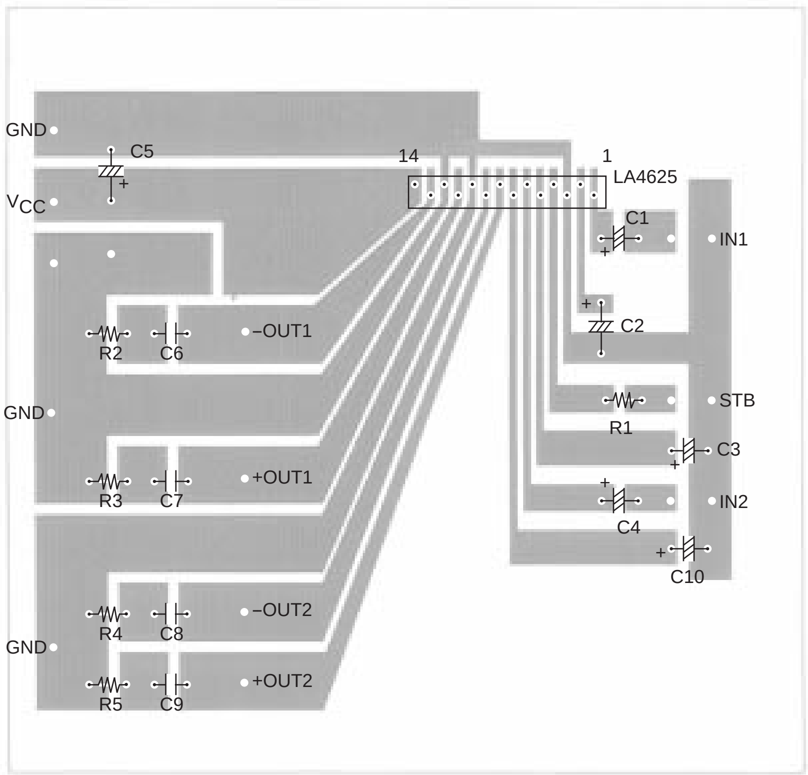
   - The LA4625 includes a built-in thermal protection circuit to prevent the IC from being damaged or destroyed if abnormally high temperatures occur. This thermal protection circuit gradually reduces the output if the IC junction temperature (Tj) reaches the range 170 to 180°C due to inadequate heat sinking or other problem. If the temperature falls, the amplifier will restart automatically.

   - The LA4625 also includes other protection circuits. Use of these circuits also requires care during end product design and testing.

5. Other notes
   - The LA4625 is a BTL power amplifier. When testing this device, the ground systems for the test equipment connected to IC inputs, and that for the test equipment connected to IC outputs, must be isolated. Do not use a common ground.

Printed Circuit Pattern

(copper foil side)



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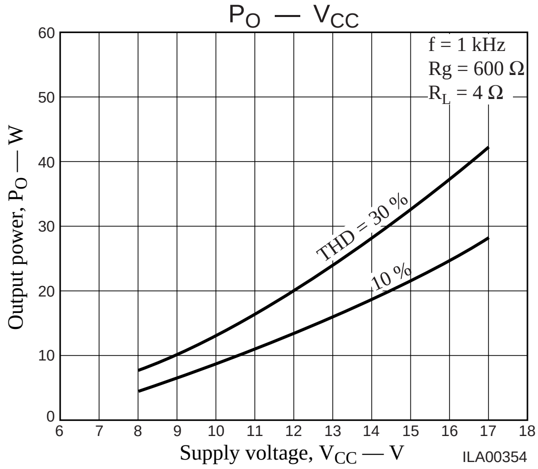
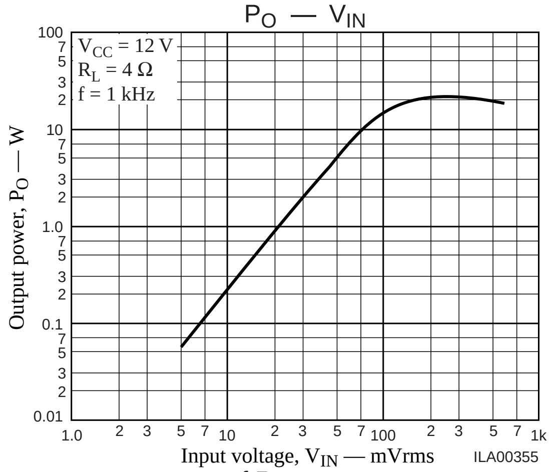
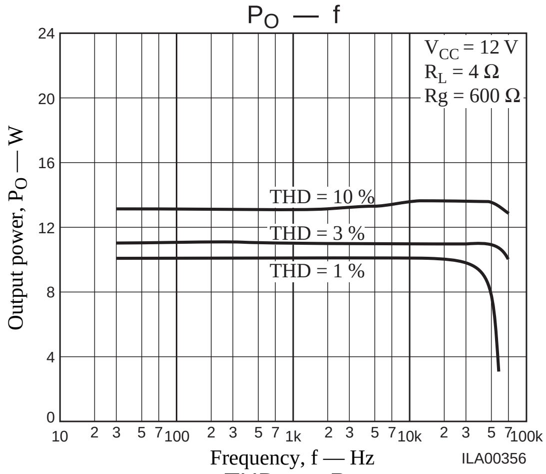
P_O — V_{CC}



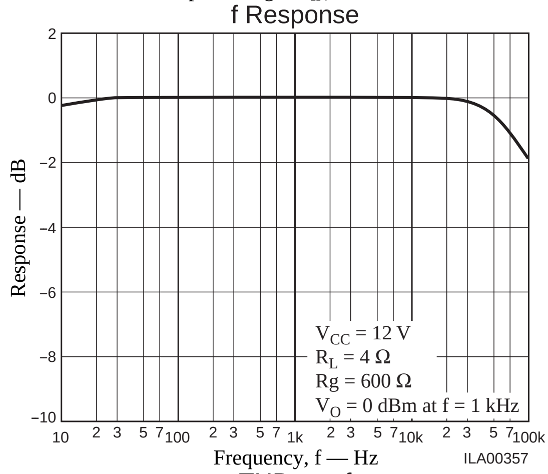
P_O — V_{IN}



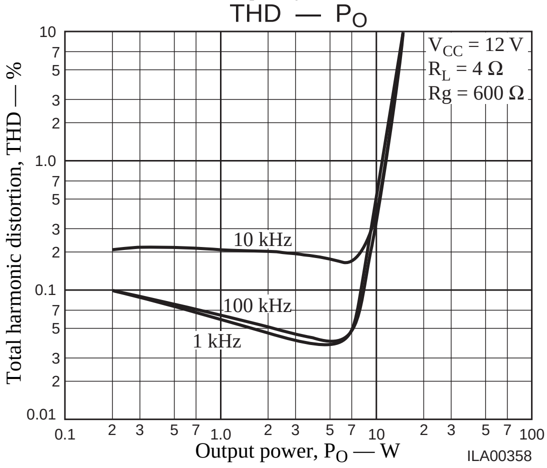
P_O — f



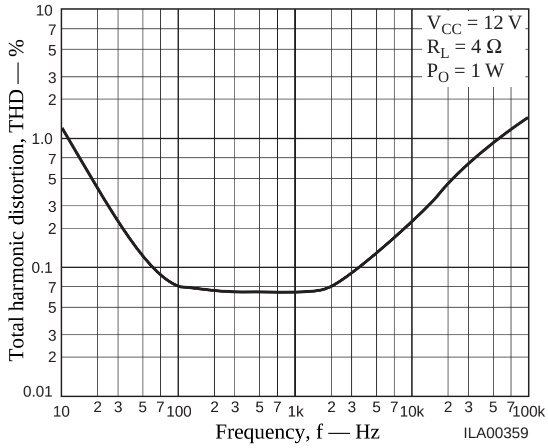
f Response



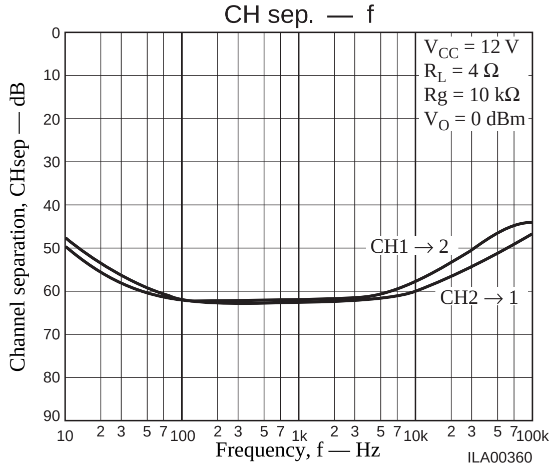
THD — P_O



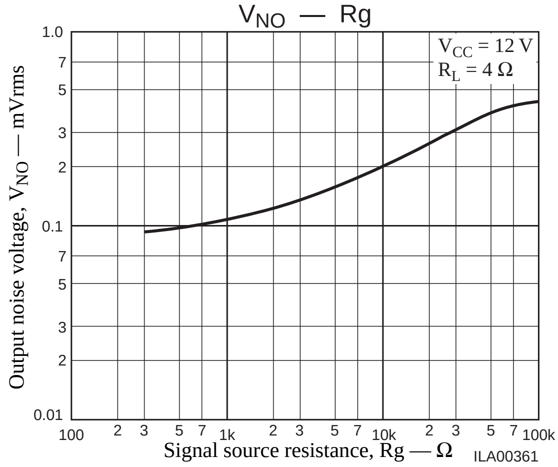
THD — f

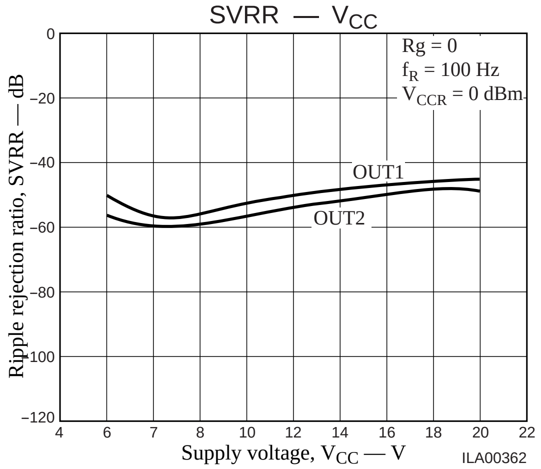


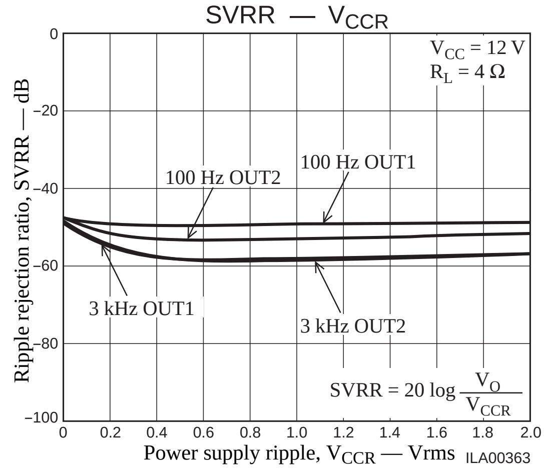
CH sep. — f

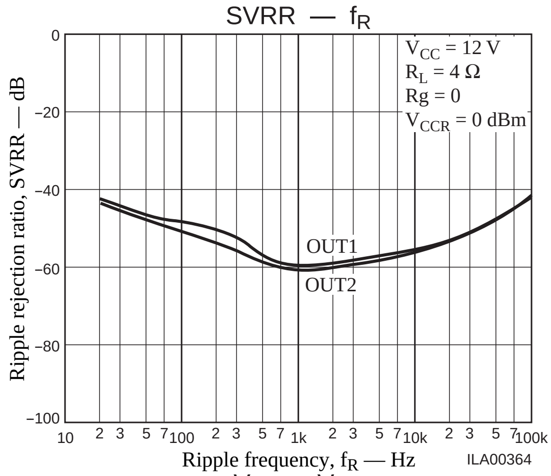


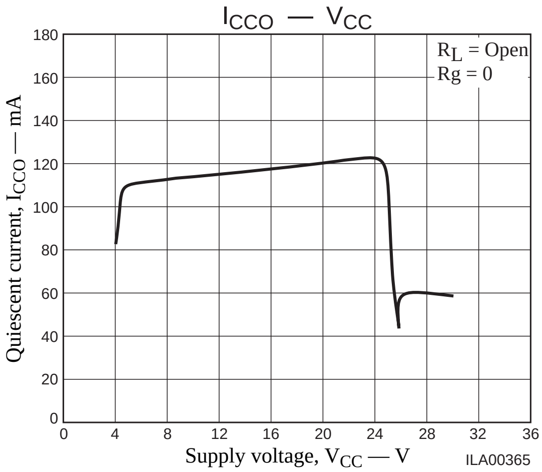
V_{NO} — Rg

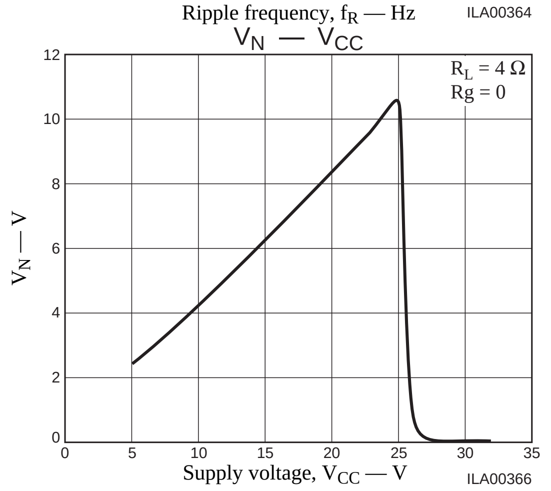


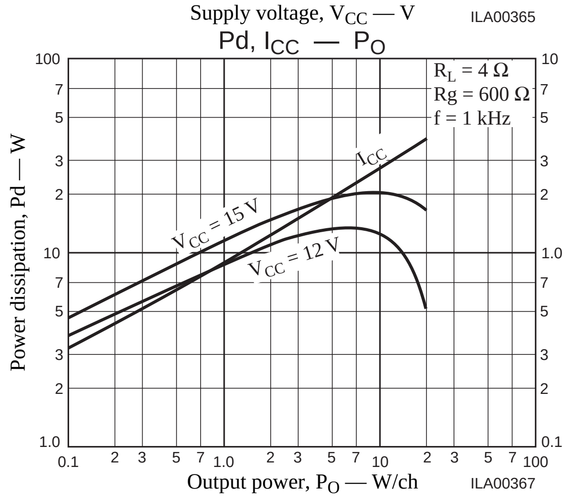

SVRR — VCC
Rg = 0
fR = 100 Hz
VCCR = 0 dBm
OUT1
OUT2
Ripple rejection ratio, SVRR — dB
Supply voltage, VCC — V
ILA00362

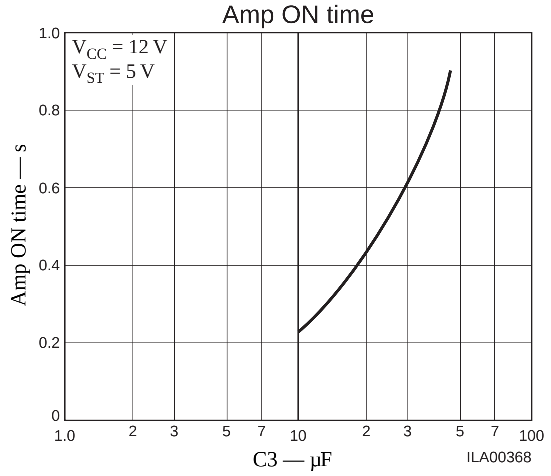

SVRR — VCCR
VCC = 12 V
RL = 4 Ω
100 Hz OUT1
100 Hz OUT2
3 kHz OUT1
3 kHz OUT2
SVRR = 20 log VO/VCCR
Ripple rejection ratio, SVRR — dB
Power supply ripple, VCCR — Vrms
ILA00363


SVRR — fR
VCC = 12 V
RL = 4 Ω
Rg = 0
VCCR = 0 dBm
OUT1
OUT2
Ripple rejection ratio, SVRR — dB
Ripple frequency, fR — Hz
ILA00364


ICCO — VCC
RL = Open
Rg = 0
Quiescent current, ICCO — mA
Supply voltage, VCC — V
ILA00365


VN — VCC
RL = 4 Ω
Rg = 0
VN — V
Supply voltage, VCC — V
ILA00366


Pd, ICC — PO
RL = 4 Ω
Rg = 600 Ω
f = 1 kHz
ICC
VCC = 15 V
VCC = 12 V
Power dissipation, Pd — W
Output power, PO — W/ch
ILA00367


Amp ON time
VCC = 12 V
VST = 5 V
Amp ON time — s
C3 — µF
ILA00368

This catalog provides information as of September, 2000. Specifications and information herein are subject to change without notice.