MEGAXESS
Megaxess GmbH Deutschland

Technical Data

TDA3009

Edition 09/00

25 W + 25 W Stereo Amplifier

Short Description

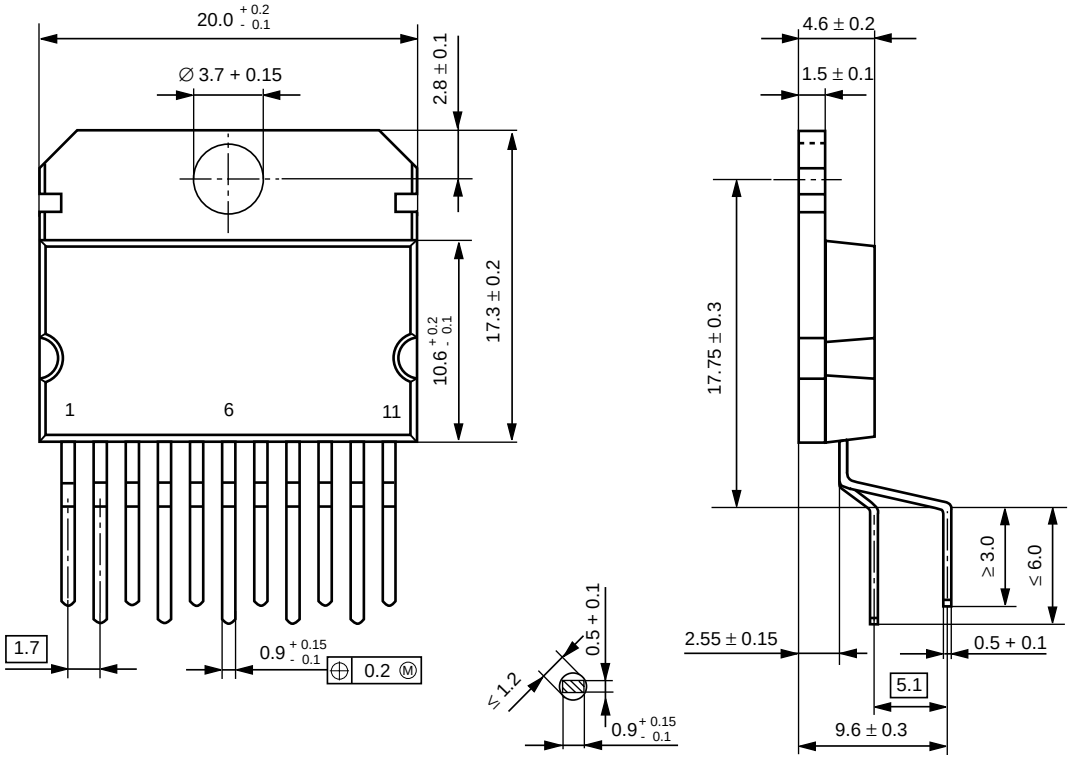
The integrated circuits TDA3009 S and TDA3009 M are dual audio power amplifiers for high quality audio equipment such as Hi - Fi - Stereo - amplifiers, TV amplifiers and high power bridge amplifiers.
The TDA3009 M is specially designed for bridge mode applications.

Features

- High output power
  (typ. 25 W each channel @ THD = 10 %)
- High output current capability (up to 4.5 A)
- AC short circuit protection
- Thermal overload protection
- SOAR protection
- Few external components
- Reduced switch-on / switch-off clicks
- Stand - by option

Package

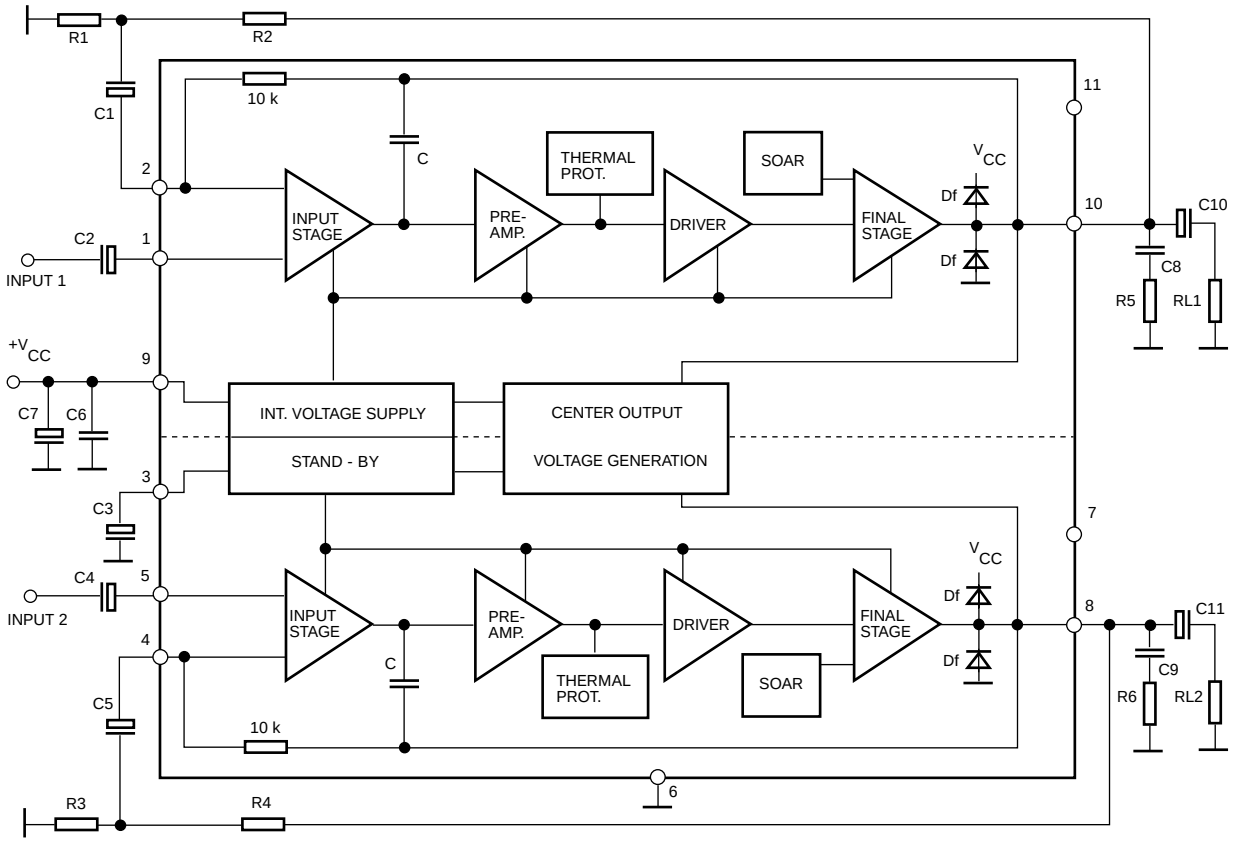
- TO 220 / 11



Pinning

1	Non-inverting input (channel 1)
2	Inverting input (channel 1)
3	Supply voltage rejection / Muting
4	Inverting input (channel 2)
5	Non-inverting input (channel 2)
6	Ground (connected to mounting tab)
7	not connected
8	Output (channel 2)
9	+ Supply voltage
10	Output (channel 1)
11	not connected

Block Diagram



Functional Description

The new high performance IC TDA3009 contains two complete power amplifiers supplied by a common voltage supply.
Each channel includes a low-noise input stage, a preamplifier, a driver and a final stage (output stage).
The band-gap-voltage-reference, included in the voltage supply unit, guarantees the supply of all stages with high stable voltages and currents over the full supply voltage range and over the full operating temperature range.
A thermal overload protection is also included.
The voltage gain is determined by the feedback of R1, R2, R3 and R4

$$G_V = 1 + \frac{R2}{R1} = 1 + \frac{R4}{R3}$$

For more accurate definition of voltage gain should be included the internal feedback resistance (approx. 10 kΩ), which is parallel to resistor R2 and R4.
The network R5/C8 and R6/C9 are the Boucherot cells that are needed for higher stability at high audio frequencies. Recommended values are R5, R 6 = one ... 2.7 Ω and C8, C9 = 100 ... 220 nF. Boucherot ceels should be connected immediately from the outputs to power ground. The ground points of the gain-definition-resistors should be connected to signal ground.
The capacitor C3 is needed for a good supply voltage rejection (SVR).
The supply voltage should be bypassed by a high-capacity electrolytic capacitor (C7) and a ceramic low-inductance capacitor (C6).
For better noise characteristics input stage is based on a common emitter stage. That means, the maximal input voltage is limited and should be less than 300 mV for low distortion.
If the voltage at pin three is less than 0.7 V, the internal voltage supply unit is switched off and the audio signal path is also switched off. In this case the supply current of the IC is reduced to values less than 10 mA.
The bridge mode operation of the IC is also available. In this case the voltage gain is determined by the equation

$$G_V = 1 + \frac{R2}{\frac{R1 \times R3}{R1 + R3}} + \frac{R4}{R3}$$

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Supply voltage	V_{CC}	44	V
Voltage on pin 3	V_3	V_{CC}	V
Voltages on pins 1, 2, 4 and 5	$V_{1,2,4,5}$	7	V
Output peak current (repetitive, f ≥ 20 Hz)	I_{OM}	3.5	A
Output peak current (non repetitive, t ≤ 100 µs)	I_{OM}	4.5	A
Power dissipation (T_{case} ≤ 70 °C)	P_{tot}	40	W
Junction temperature *)	T_j	150	°C
Storage temperature range	T_{stg}	-40 ... 150	°C
Thermal resistance	R_{thjc}	2	K/W

*) internally limited

Electrical Characteristics

V_{CC} = 32 V, G_V = 40 dB, f = 1 kHz, T_c = 20 ... 25 °C, unless otherwise specified

Parameters	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply voltage	V_{CC}		8	-	32	V
Quiescent output voltage	V_{OQ}	V_{CC} = 32 V; V_i = 0	11	15.7	-	V
Difference of the quiescent output voltage	ΔV_{OQ}	V_{CC} = 32 V; V_i = 0	-	0.1	0.5 *	V
					0.15 **	
Total quiescent current	I_Q	V_{CC} = 8 V	-	44	-	mA
		V_{CC} = 32 V	-	62	85	
		V_{CC} = 44 V	-	79	-	

* order code TDA3009 S, version for stereo mode applications

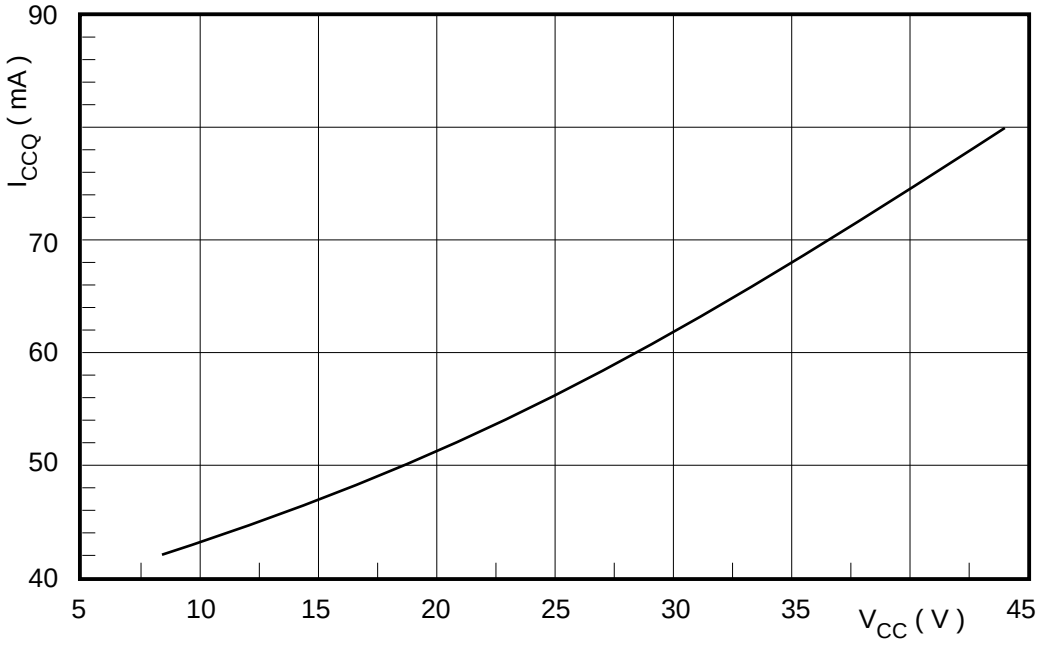
** order code TDA3009 M, version for bridge mode applications

Parameters	Symbol	Test Conditions	Min	Typ	Max	Unit
Stand-by quiescent current	I_{CCM}	V_3 = 0	-	3.5	5	mA
Stand-by threshold	V_M		0.7	1	-	V
Stand-by attenuation	A_M		70	100	-	dB
Output power (each channel)	P_o	THD=10%, V_{CC}=32V f=1kHz, R_L= 4 Ω	20	25	-	W
		THD=1%, V_{CC}=32V f=1kHz, R_L = 4 Ω	-	22	-	W
Distortion	THD	P_o = 0.1 to 15 W; R_L = 4 Ω	-	0.07	0.5	%
		P_o = 0.1 to 8 W; R_L = 8 Ω	-	0.07	0.5	%
Cross talk attenuation	a_{CT}	R_L = ∞ ; f = 1 kHz ; V_{OUT} = 4 V	-	62	-	dB
		f = 10 kHz	-	55	-	
Input saturation voltage (rms)	V_i		300	-	-	mV
Input resistance	R_i	f = 1 kHz non-inverting input	70	200	-	kΩ
Voltage gain (closed loop)	G_V	f = 1 kHz	39.5	40	40.5	dB
Closed loop gain matching	ΔG_V		-	0.5	-	dB
Total input noise voltage	e_N	R_G = 10 kΩ Δf = 22Hz to 22kHz	-	2.7	8	µV
Supply voltage rejection (each channel)	SVR	R_G=10kΩ; C_3=100µF f_{ripple} = 100 Hz V_{ripple} = 0.5 V	-	54	-	dB
Thermal shut-down (junction temperature)	T_j		-	145***	-	°C

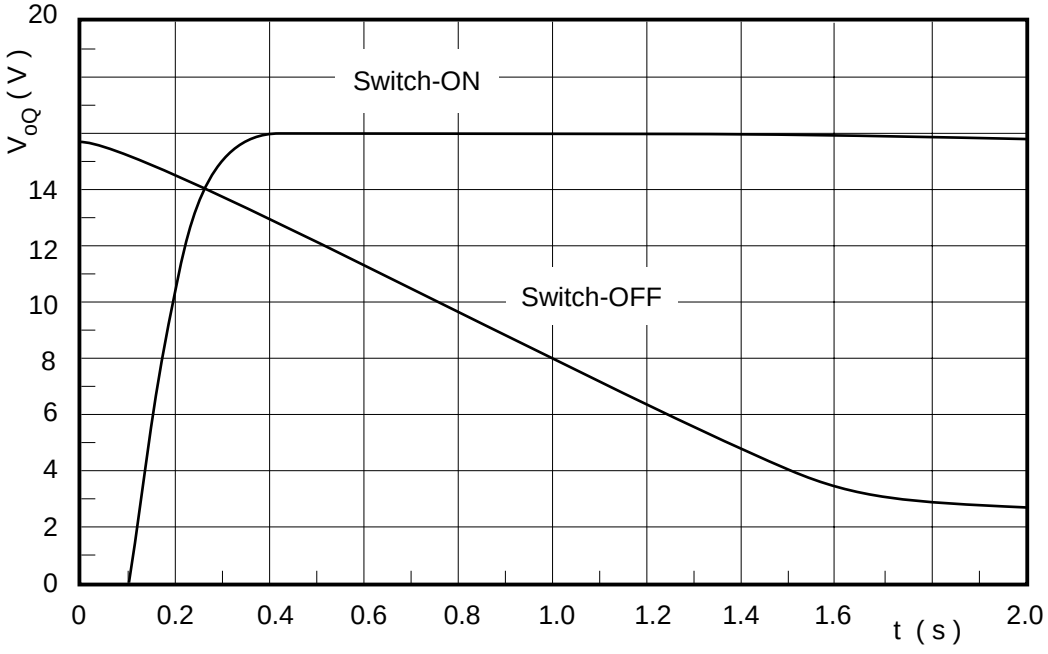
*** internally limited

Performance Curves

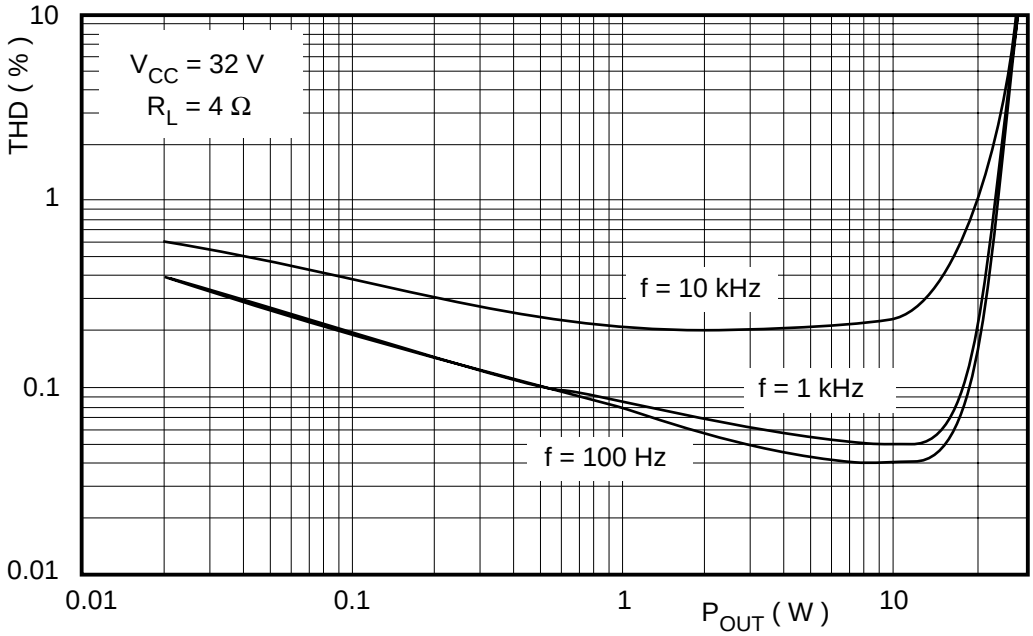
Total Quiescent Current vs. Supply Voltage



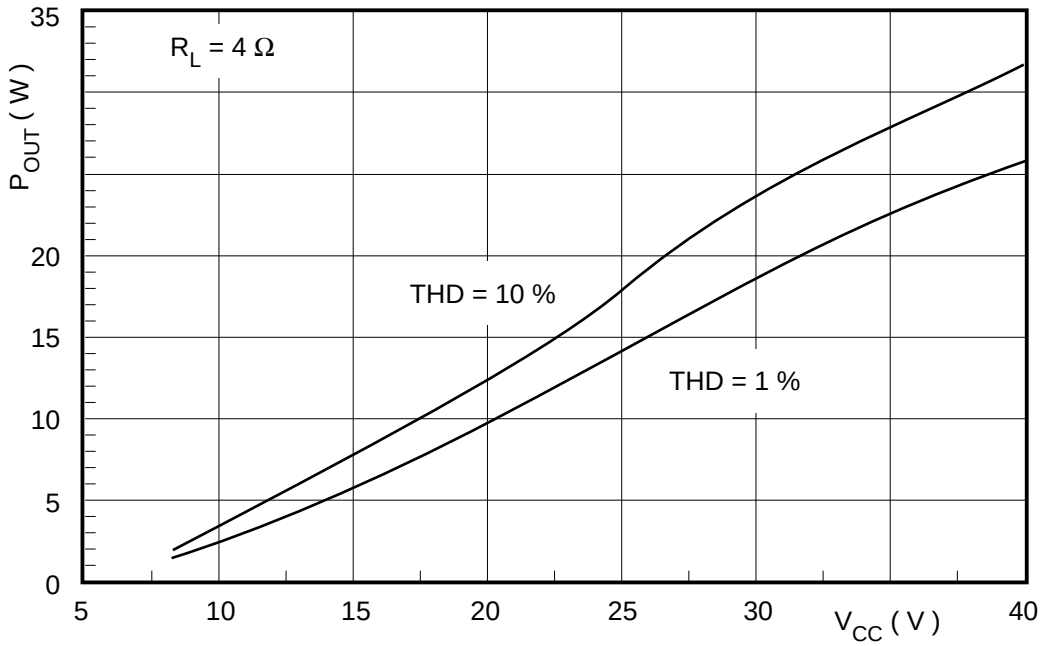
Switch - ON / OFF - Curve



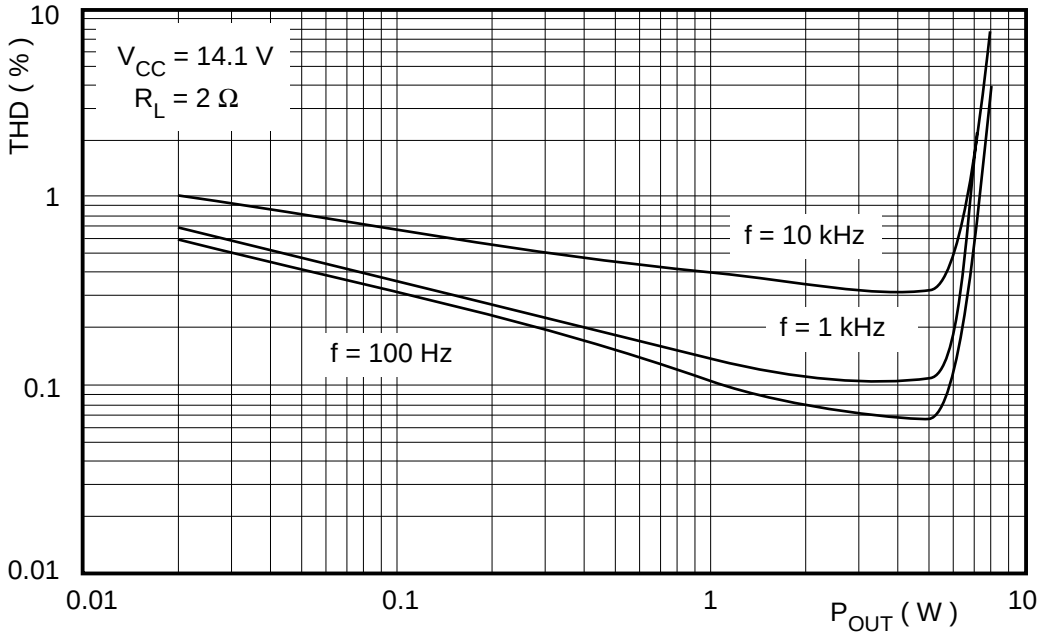
Total Harmonic Distortion vs. Output Power



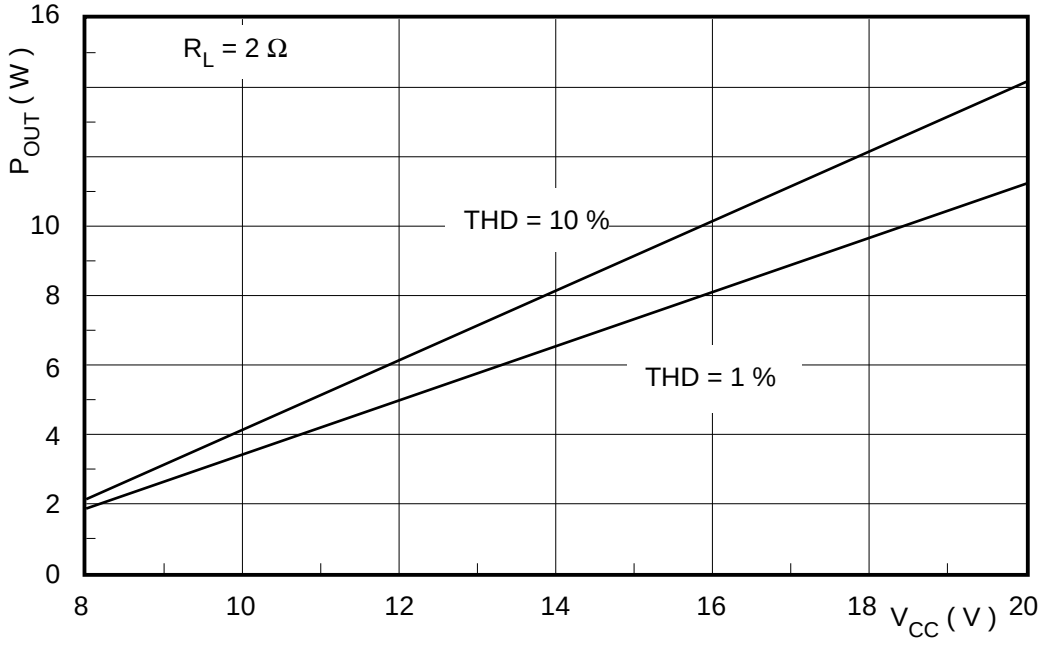
Output Power vs. Supply Voltage



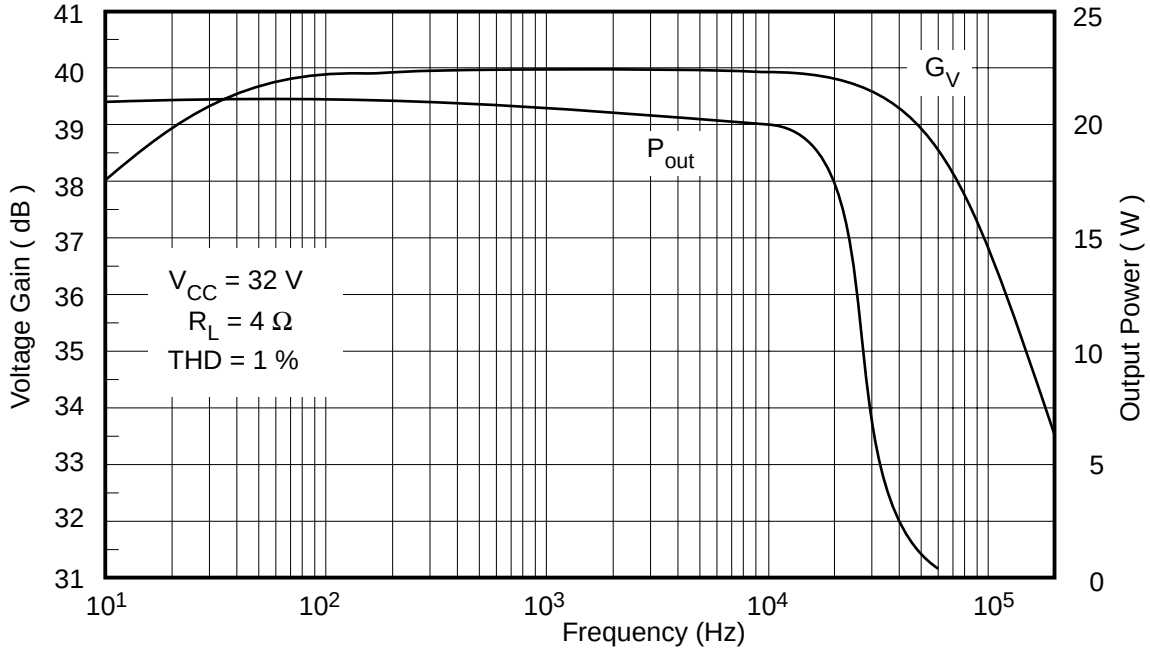
Total Harmonic Distortion vs. Output Power



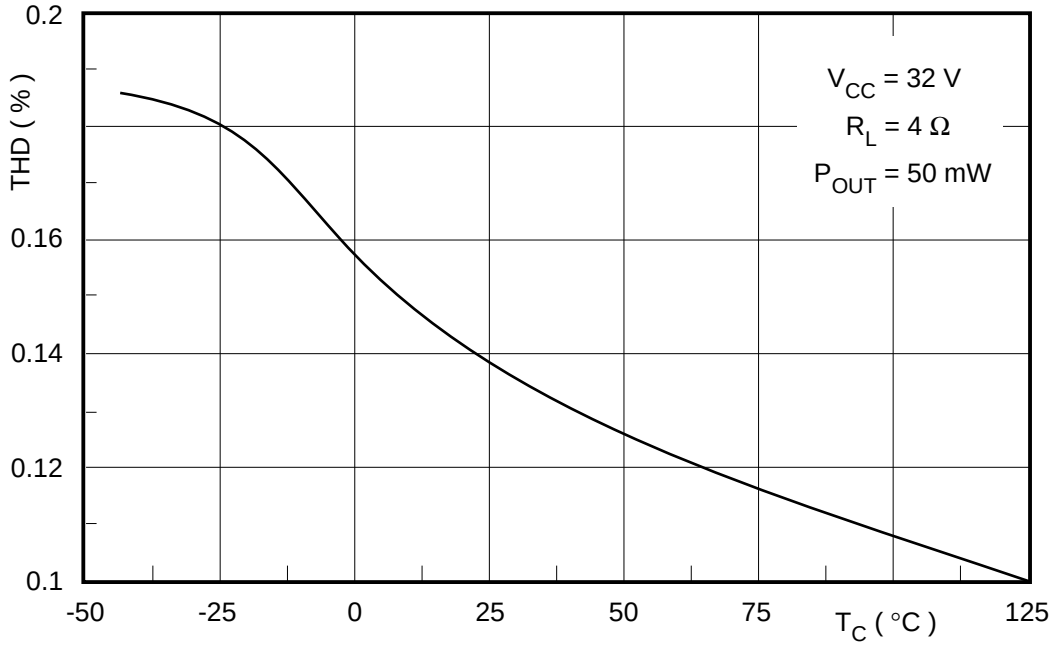
Output Power vs. Supply Voltage



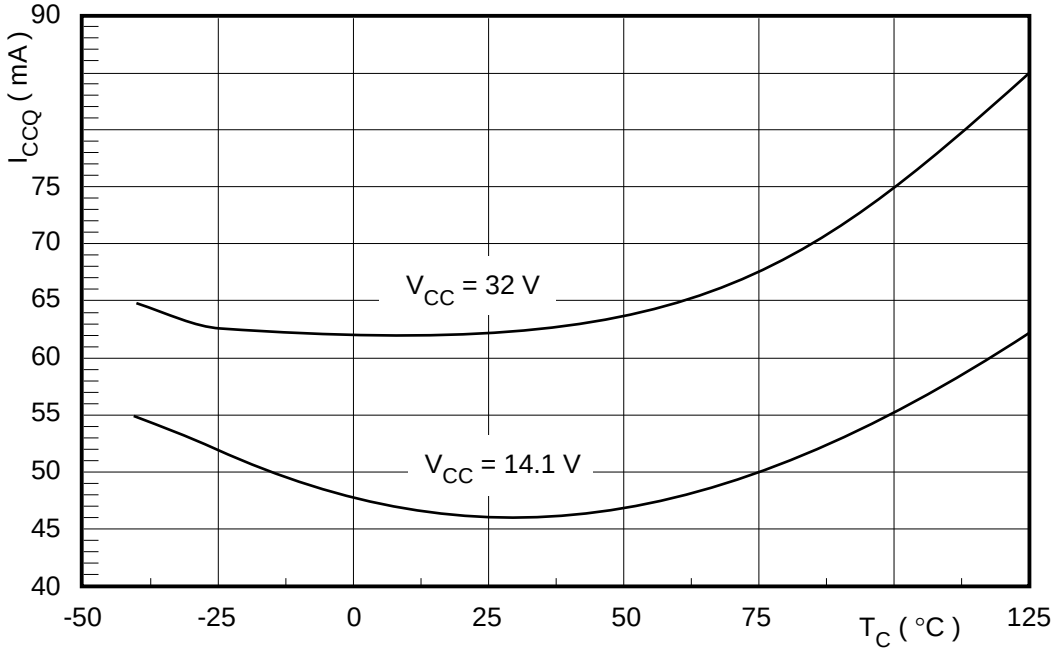
Voltage Gain and Power Output vs. Frequency



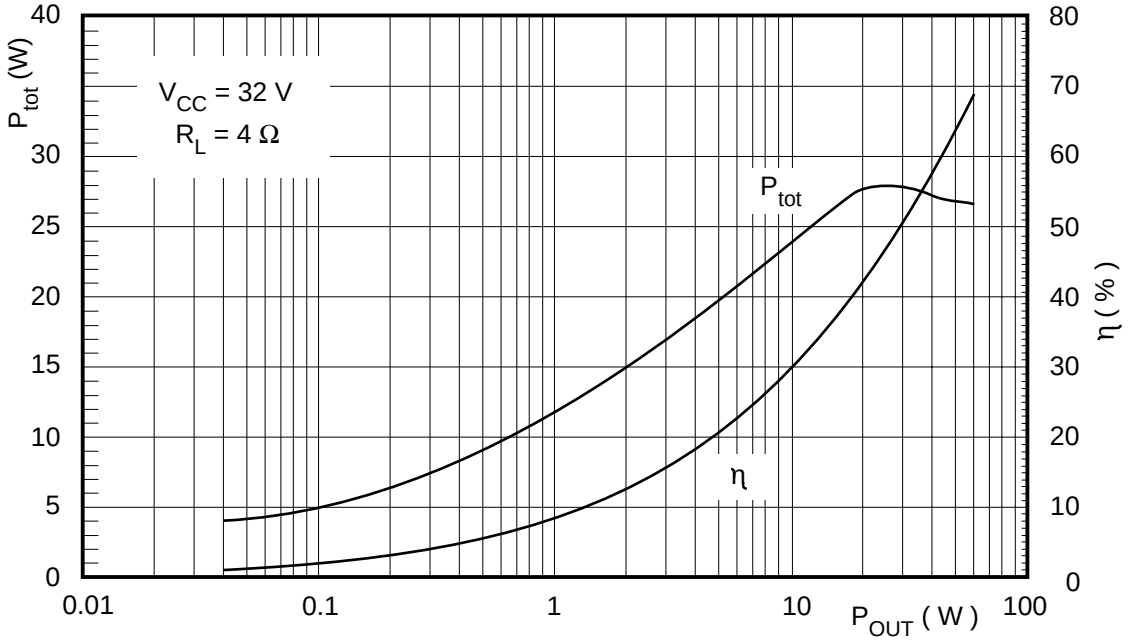
THD vs. Case Temperature



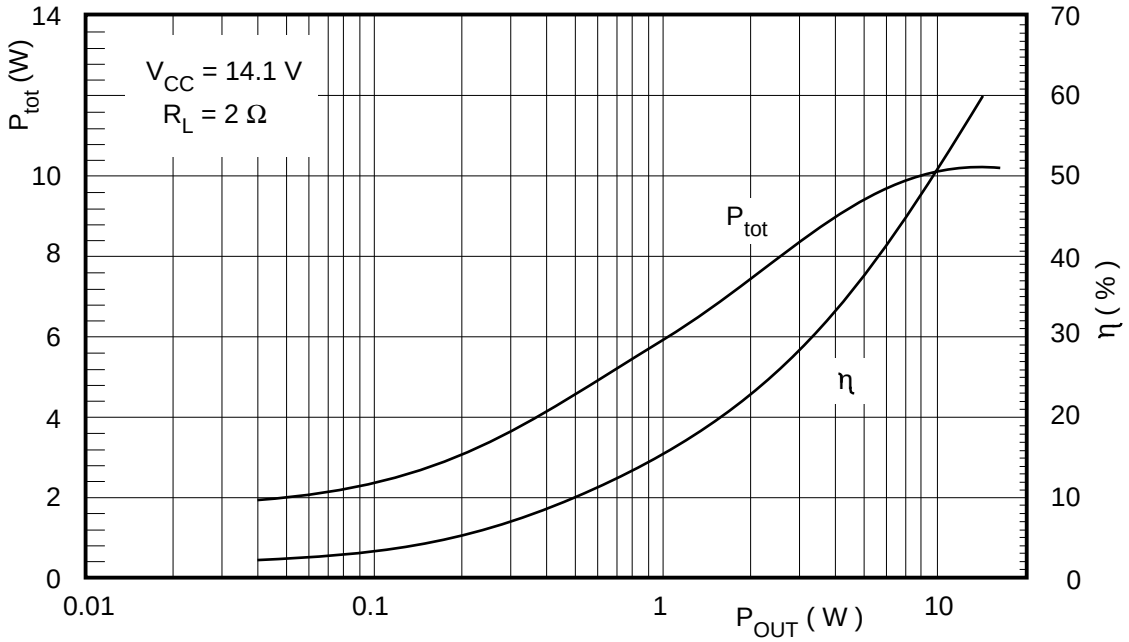
Total Quiescent Current vs. Case Temperature



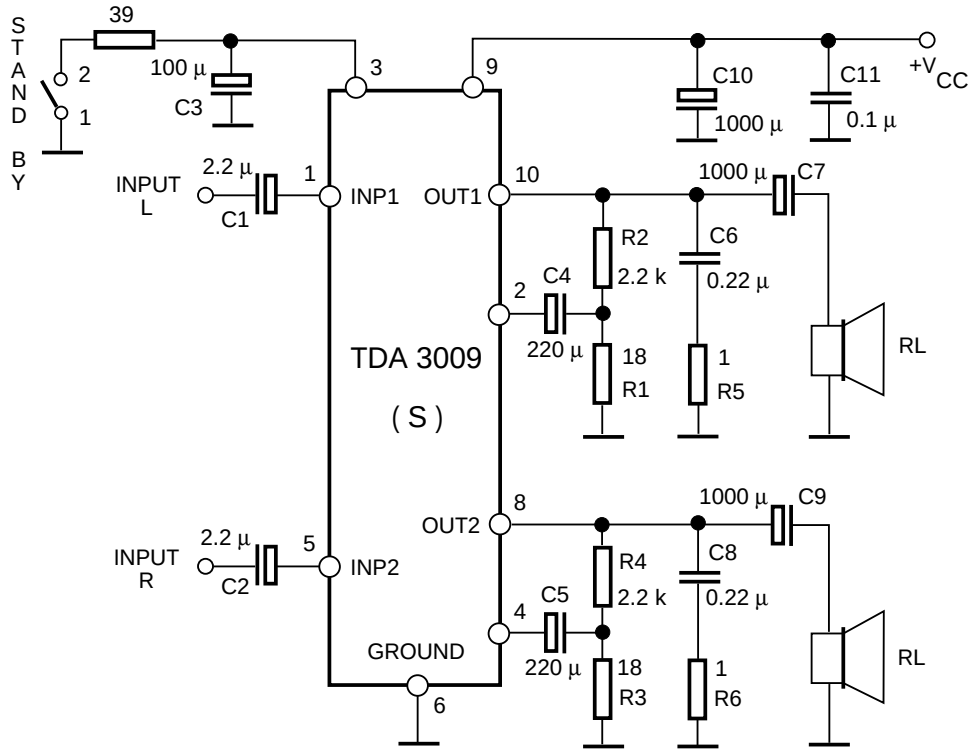
Efficiency and Power Dissipation vs. Output Power



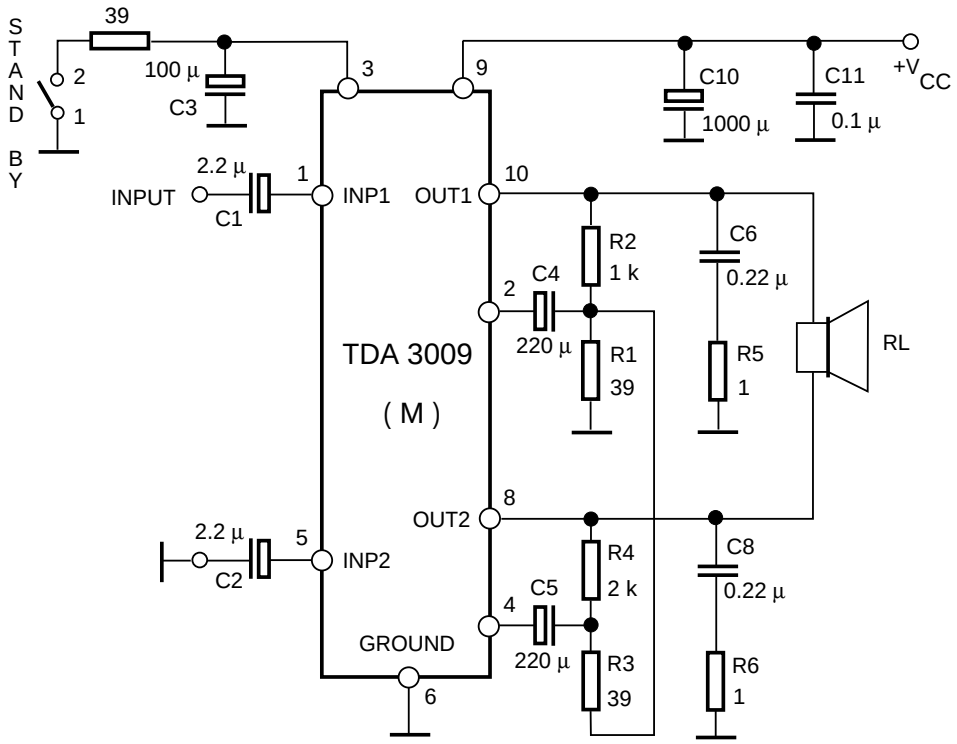
Efficiency and Total Power Dissipation vs. Output Power



Application Examples



Stereo Amplifier



Bridge Amplifier

Application Hints

- The IC TDA3009 requires a weel-filtered supply voltage, the recommended voltage range for safe operation is 8 ... 32 V.
- To avoid the danger of oscillations the supply voltage must be filtered by means of an electrolytic capacitor ≥ 1000 µF as near possible at the pin nine.
- The capacitor at pin 3 (≥ 10 µF) permits to increase the supply voltage ripple rejection (SVR), recommended value of this capacitor for good SVR is 100 µF.
- Via pin three the IC TDA3009 can be switched into standby mode, when the pin three is connected to ground or a voltage less than 0.7 V. In standby mode the current consumption decreases down to ≈ 4 mA.
- For a good frequency stability between output pins (eight and ten) and ground Boucherot cells should be connected. The values of these elements are recommended with R = 1 ... 2.7 Ω and C = 100 ... 220 nF.
- Input ground and output ground areas must be separately connected to pin six.
- The ground points of the feedback network (for voltage gain determination) must be connected to input ground.