TS4962

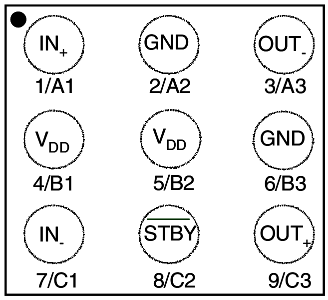
3W Filter-free Class D Audio Power Amplifier

PRELIMINARY DATA

- **Operating from Vcc=2.4V to 5.5V**
- **Standby mode active low**
- **Output power: 3W into 4Ω and 1.75W into 8Ω with 10% THD+N max and 5V power supply.**
- **Output power: 2.3W @5V or 0.75W @ 3.0V into 4Ω with 1% THD+N max.**
- **Output power: 1.4W @5V or 0.45W @ 3.0V into 8Ω with 1% THD+N max.**
- **Adjustable gain via external resistors**
- **Low current consumption 2mA @ 3V**
- **Efficiency: 88% typ.**
- **Signal to noise ratio: 85dB typ.**
- **PSRR: 63dB typ. @217Hz with 6dB gain**
- **PWM base frequency: 250kHz**
- **Low pop & click noise**
- **Thermal shutdown protection**
- **Available in flip-chip 9 x 300um in lead free***

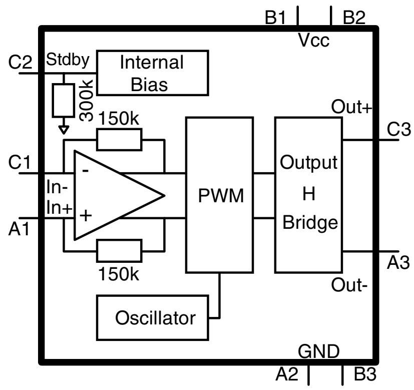
Pin Connections (top view)

TS4962EIJT



IN+: positive differential input
IN-: negative differential input
VDD: analog power supply
GND: power supply ground
STBY: standby pin (active low)
OUT+: positive differential output
OUT-: negative differential output

Block Diagram



Description

The TS4962 is a differential class-D B.T.L. power amplifier. Able to drive up to 2.3W into a 4Ω load and 1.4W into a 8Ω load at 5V. It achieves outstanding efficiency (88%typ.) compared to classical AB-class audio amps.

Gain of the device can be controlled via two external gain setting resistors. POP & CLICK reduction circuitry provides low on/off switch noise while allowing the device to start within 5ms.A standby function (active low) allows to lower the current consumption to 10nA typ.

Applications

- **Cellular Phone**
- **PDA**
- **Notebook PC**

Order Codes

Part Number	Temperature Range	Package	Packaging	Marking
TS4962IJT	-40, +85°C	Flip-Chip	Tape & Reel	A62
TS4962EIJT	-40, +85°C	Lead -Free Flip-Chip		A62
TS4962EKIJT	-40, +85°C	Lead Free + Back Coating		A62

1 Absolute Maximum Ratings

Table 1. Key parameters and their absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage [1]	6	V
V_i	Input Voltage [2]	G_{ND} to V_{CC}	V
T_{oper}	Operating Free Air Temperature Range	-40 to + 85	°C
T_{stg}	Storage Temperature	-65 to +150	°C
T_j	Maximum Junction Temperature	150	°C
R_{thja}	Thermal Resistance Junction to Ambient [3]	200	°C/W
Pd	Power Dissipation	Internally Limited[4]	
ESD	Human Body Model	2	kV
ESD	Machine Model	200	V
Latch-up	Latch-up Immunity	200	mA
V_{STB}	Standby pin voltage maximum voltage [5]	G_{ND} to V_{CC}	V
	Lead Temperature (soldering, 10sec)	260	°C

1) All voltages values are measured with respect to the ground pin.

2) The magnitude of input signal must never exceed V_{CC} + 0.3V / G_{ND} - 0.3V

3) Device is protected in case of over temperature by a thermal shutdown active @ 150°C.

4) Exceeding the power derating curves during a long period, involves abnormal operating condition.

5) The magnitude of standby signal must never exceed V_{CC} + 0.3V / G_{ND} - 0.3V

Table 2. Operating Conditions

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage[1]	2.4 to 5.5	V
V_{IC}	Common Mode Input Voltage Range[2]	0.5 to V_{CC}-0.8	V
V_{STB}	Standby Voltage Input : [3] Device ON Device OFF	$1.4 \leq V_{STB} \leq V_{CC}$ $G_{ND} \leq V_{STB} \leq 0.4$ [4]	V
RL	Load Resistor	≥ 4	Ω
R_{thja}	Thermal Resistance Junction to Ambient [5]	90	°C/W

1) For V_{CC} from 2.4V to 2.5V, the operating temperature range is reduced to 0°C≤ Tamb ≤70°C

2) For V_{CC} from 2.4V to 2.5V, the common mode input range must be set at $V_{CC}/2$.

3) Without any signal on V_{STB}, the device will be in standby

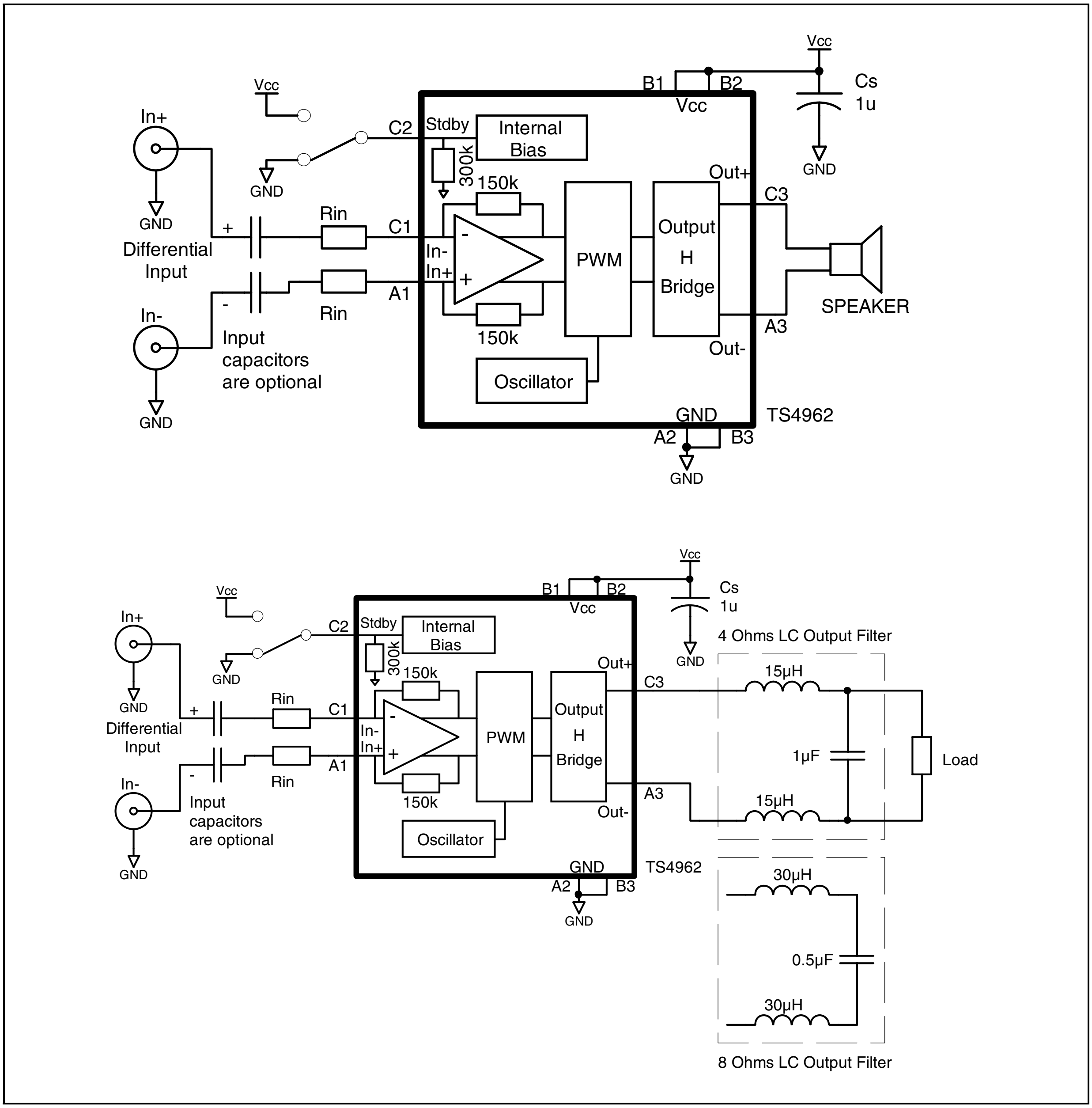
4) Minimum current consumption shall be obtained when V_{STB} = GND.

5) With heat sink surface = 125mm^2.

2 Application Component Information

Component	Functional Description
Cs	Bypass supply capacitor. To install as close as possible of the TS4962 to minimize high frequency ripple. A 100nF ceramic capacitor should be add to enhance the power supply filtering in high frequency.
Rin	Input resistor to program the TS4962 differential gain (Gain = 300kΩ/Rin with Rin in kΩ)
Input Capacitor	Thanks to common mode feedback, these input capacitors are optional. However, we can add then to form with Rin a 1st order high pass filter with -3dB cut-off frequency = 1/(2*π*Rin*Cin)

Figure 1. Typical application



3 Electrical Characteristics

Table 3. V_{CC} = +5V, GND = 0V, V_{ICM} = 2.5V, T_{amb} = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
I_{CC}	Supply Current No input signal, no load		2.3	3.3	mA
$I_{STANDBY}$	Standby Current [1] No input signal, V_{STBY} = GND		10	1000	nA
Voo	Output Offset Voltage No input signal, $R_L = 8\Omega$		3	25	mV
Po	Output Power, G=6dB THD = 1% Max, f = 1kHz, $R_L = 4\Omega$ THD = 10% Max, f = 1kHz, $R_L = 4\Omega$ THD = 1% Max, f = 1kHz, $R_L = 8\Omega$ THD = 10% Max, f = 1kHz, $R_L = 8\Omega$		2.3 3 1.4 1.75		W
THD + N	Total Harmonic Distortion + Noise Po = 900 mW_{RMS}, G = 6dB, 20Hz < f < 20kHz, $R_L = 8\Omega$ + 15µH, BW < 30kHz Po = $1W_{RMS}$, G = 6dB, f = 1kHz, $R_L = 8\Omega$ + 15µH, BW < 30kHz		1 0.4		%
Efficiency	Efficiency Po = 2 W_{RMS}, $R_L = 4\Omega + \geq 15\mu H$ Po =1.2 W_{RMS}, $R_L = 8\Omega + \geq 15\mu H$		78 88		%
PSRR	Power Supply Rejection Ratio with inputs grounded [2] f = 217Hz, $R_L = 8\Omega$, G=6dB, Vripple = $200mV_{pp}$		63		dB
CMRR	Common Mode Rejection Ratio, f = 217Hz, $R_L = 8\Omega$, G = 6dB, ΔVic = $200mV_{pp}$		57		dB
Gain	Gain value (R_{in} in kΩ)	$\frac{273k\Omega}{R_{in}}$	$\frac{300k\Omega}{R_{in}}$	$\frac{327k\Omega}{R_{in}}$	V/V
R_{STDBY}	Internal Resistance From Standby to GND	273	300	327	kΩ
F_{PWM}	Pulse Width Modulator Base Frequency	180	250	320	kHz
SNR	Signal to Noise ratio (A Weighting), Po = 1.2W, $R_L = 8\Omega$		85		dB
T_{WU}	Wake-up time		5	10	ms
T_{STB}	Standby time		5	10	ms
V_N	Output Voltage Noise f = 20Hz to 20kHz, G = 6dB Unweighted $R_L = 4\Omega$ A weighted $R_L = 4\Omega$ Unweighted $R_L = 8\Omega$ A weighted $R_L = 8\Omega$ Unweighted $R_L = 4\Omega$ + 15µH A weighted $R_L = 4\Omega$ + 15µH Unweighted $R_L = 4\Omega$ + 30µH A weighted $R_L = 4\Omega$ + 30µH Unweighted $R_L = 8\Omega$ + 30µH A weighted $R_L = 8\Omega$ + 30µH Unweighted $R_L = 4\Omega$ + Filter A weighted $R_L = 4\Omega$ + Filter Unweighted $R_L = 4\Omega$ + Filter A weighted $R_L = 4\Omega$ + Filter		85 60 86 62 83 60 88 64 78 57 87 65 82 59 90 66		μV_{RMS}

1) Standby mode is active when Vstdby is tied to GND.

2) Dynamic measurements - 20*log(rms(Vout)/rms(Vripple)). Vripple is the surimposed sinus signal to V_{cc} @ f = 217Hz.

Table 4. V_{CC} = +4.2V, GND = 0V, V_{ICM} = 2.1V, T_{amb} = 25°C (unless otherwise specified) [1]

Symbol	Parameter	Min.	Typ.	Max.	Unit
I_{CC}	Supply Current No input signal, no load		2.1	3	mA
$I_{STANDBY}$	Standby Current [2] No input signal, V_{STBY} = GND		10	1000	nA
Voo	Output Offset Voltage No input signal, $R_L = 8\Omega$		3	25	mV
Po	Output Power, G=6dB THD = 1% Max, f = 1kHz, $R_L = 4\Omega$ THD = 10% Max, f = 1kHz, $R_L = 4\Omega$ THD = 1% Max, f = 1kHz, $R_L = 8\Omega$ THD = 10% Max, f = 1kHz, $R_L = 8\Omega$		1.6 2 0.95 1.2		W
THD + N	Total Harmonic Distortion + Noise Po = 600 mW_{RMS}, G = 6dB, 20Hz < f < 20kHz, $R_L = 8\Omega + 15\mu H$, BW < 30kHz Po = 700mW_{RMS}, G = 6dB, f = 1kHz, $R_L = 8\Omega + 15\mu H$, BW < 30kHz		1 0.35		%
Efficiency	Efficiency Po = 1.45 W_{RMS}, $R_L = 4\Omega + \geq 15\mu H$ Po = 0.9 W_{RMS}, $R_L = 8\Omega + \geq 15\mu H$		78 88		%
PSRR	Power Supply Rejection Ratio with inputs grounded [3] f = 217Hz, $R_L = 8\Omega$, G=6dB, Vripple = 200mV_{pp}		63		dB
CMRR	Common Mode Rejection Ratio f = 217Hz, $R_L = 8\Omega$, G = 6dB, ΔVic = 200mV_{pp}		57		dB
Gain	Gain value (R_{in} in kΩ)	$\frac{273k\Omega}{R_{in}}$	$\frac{300k\Omega}{R_{in}}$	$\frac{327k\Omega}{R_{in}}$	V/V
R_{STDBY}	Internal Resistance From Standby to GND	273	300	327	kΩ
F_{PWM}	Pulse Width Modulator Base Frequency	180	250	320	kHz
SNR	Signal to Noise ratio (A Weighting), Po = 0.9W, $R_L = 8\Omega$		85		dB
T_{WU}	Wake-up time		5	10	ms
T_{STB}	Standby time		5	10	ms
V_N	Output Voltage Noise f = 20Hz to 20kHz, G = 6dB Unweighted $R_L = 4\Omega$ A weighted $R_L = 4\Omega$ Unweighted $R_L = 8\Omega$ A weighted $R_L = 8\Omega$ Unweighted $R_L = 4\Omega + 15\mu H$ A weighted $R_L = 4\Omega + 15\mu H$ Unweighted $R_L = 4\Omega + 30\mu H$ A weighted $R_L = 4\Omega + 30\mu H$ Unweighted $R_L = 8\Omega + 30\mu H$ A weighted $R_L = 8\Omega + 30\mu H$ Unweighted $R_L = 4\Omega$ + Filter A weighted $R_L = 4\Omega$ + Filter Unweighted $R_L = 4\Omega$ + Filter A weighted $R_L = 4\Omega$ + Filter		85 60 86 62 83 60 88 64 78 57 87 65 82 59 90 66		μV_{RMS}

1) All electrical values are guaranted with correlation measurements at 2.5V and 5V.

2) Standby mode is actived when Vstdby is tied to GND.

3) Dynamic measurements - 20*log(rms(Vout)/rms(Vripple)). Vripple is the surimposed sinus signal to Vcc @ f = 217Hz.

Table 5. V_{CC} = +3.6V, GND = 0V, V_{ICM} = 1.8V, T_{amb} = 25°C (unless otherwise specified) [1]

Symbol	Parameter	Min.	Typ.	Max.	Unit
I_{CC}	Supply Current No input signal, no load		2	2.8	mA
$I_{STANDBY}$	Standby Current [2] No input signal, V_{STBY} = GND		10	1000	nA
Voo	Output Offset Voltage No input signal, $R_L = 8\Omega$		3	25	mV
Po	Output Power, G=6dB THD = 1% Max, f = 1kHz, $R_L = 4\Omega$ THD = 10% Max, f = 1kHz, $R_L = 4\Omega$ THD = 1% Max, f = 1kHz, $R_L = 8\Omega$ THD = 10% Max, f = 1kHz, $R_L = 8\Omega$		1.15 1.51 0.7 0.9		W
THD + N	Total Harmonic Distortion + Noise Po = 500 mW_{RMS}, G = 6dB, 20Hz < f < 20kHz, $R_L = 8\Omega$ + 15µH, BW < 30kHz Po = 500mW_{RMS}, G = 6dB, f = 1kHz, $R_L = 8\Omega$ + 15µH, BW < 30kHz		1 0.27		%
Efficiency	Efficiency Po = 1 W_{RMS}, $R_L = 4\Omega + \geq 15$µH Po = 0.65 W_{RMS}, $R_L = 8\Omega + \geq 15$µH		78 88		%
PSRR	Power Supply Rejection Ratio with inputs grounded [3] f = 217Hz, $R_L = 8\Omega$, G=6dB, Vripple = 200mV_{pp}		62		dB
CMRR	Common Mode Rejection Ratio f = 217Hz, $R_L = 8\Omega$, G = 6dB, ΔVic = 200mV_{pp}		56		dB
Gain	Gain value (R_{in} in kΩ)	$\frac{273k\Omega}{R_{in}}$	$\frac{300k\Omega}{R_{in}}$	$\frac{327k\Omega}{R_{in}}$	V/V
R_{STDBY}	Internal Resistance From Standby to GND	273	300	327	kΩ
F_{PWM}	Pulse Width Modulator Base Frequency	180	250	320	kHz
SNR	Signal to Noise ratio (A Weighting), Po = 0.6W, $R_L = 8\Omega$		83		dB
T_{WU}	Wake-up time		5	10	ms
T_{STB}	Standby time		5	10	ms
V_N	Output Voltage Noise f = 20Hz to 20kHz, G = 6dB Unweighted $R_L = 4\Omega$ A weighted $R_L = 4\Omega$ Unweighted $R_L = 8\Omega$ A weighted $R_L = 8\Omega$ Unweighted $R_L = 4\Omega$ + 15µH A weighted $R_L = 4\Omega$ + 15µH Unweighted $R_L = 4\Omega$ + 30µH A weighted $R_L = 4\Omega$ + 30µH Unweighted $R_L = 8\Omega$ + 30µH A weighted $R_L = 8\Omega$ + 30µH Unweighted $R_L = 4\Omega$ + Filter A weighted $R_L = 4\Omega$ + Filter Unweighted $R_L = 4\Omega$ + Filter A weighted $R_L = 4\Omega$ + Filter		83 57 83 61 81 58 87 62 77 56 85 63 80 57 85 61		μV_{RMS}

1) All electrical values are guaranted with correlation measurements at 2.5V and 5V.

2) Standby mode is actived when Vstdby is tied to GND.

3) Dynamic measurements - 20*log(rms(Vout)/rms(Vripple)). Vripple is the surimposed sinus signal to Vcc @ f = 217Hz.

Table 6. V_{CC} = +3.0V, GND = 0V, V_{ICM} = 1.5V, T_{amb} = 25°C (unless otherwise specified) [1]

Symbol	Parameter	Min.	Typ.	Max.	Unit
I_{CC}	Supply Current No input signal, no load		1.9	2.7	mA
$I_{STANDBY}$	Standby Current [2] No input signal, V_{STBY} = GND		10	1000	nA
Voo	Output Offset Voltage No input signal, $R_L = 8\Omega$		3	25	mV
Po	Output Power, G=6dB THD = 1% Max, f = 1kHz, $R_L = 4\Omega$ THD = 10% Max, f = 1kHz, $R_L = 4\Omega$ THD = 1% Max, f = 1kHz, $R_L = 8\Omega$ THD = 10% Max, f = 1kHz, $R_L = 8\Omega$		0.75 1 0.5 0.6		W
THD + N	Total Harmonic Distortion + Noise Po = 350 mW_{RMS}, G = 6dB, 20Hz < f < 20kHz, $R_L = 8\Omega + 15\mu H$, BW < 30kHz Po = 350mW_{RMS}, G = 6dB, f = 1kHz, $R_L = 8\Omega + 15\mu H$, BW < 30kHz		1 0.21		%
Efficiency	Efficiency Po = 0.7 W_{RMS}, $R_L = 4\Omega + \geq 15\mu H$ Po = 0.45 W_{RMS}, $R_L = 8\Omega + \geq 15\mu H$		78 88		%
PSRR	Power Supply Rejection Ratio with inputs grounded [3] f = 217Hz, $R_L = 8\Omega$, G=6dB, Vripple = 200mV_{pp}		60		dB
CMRR	Common Mode Rejection Ratio, f = 217Hz, $R_L = 8\Omega$, G = 6dB, ΔVic = 200mV_{pp}		54		dB
Gain	Gain value (R_{in} in kΩ)	$\frac{273k\Omega}{R_{in}}$	$\frac{300k\Omega}{R_{in}}$	$\frac{327k\Omega}{R_{in}}$	V/V
R_{STDBY}	Internal Resistance From Standby to GND	273	300	327	kΩ
F_{PWM}	Pulse Width Modulator Base Frequency	180	250	320	kHz
SNR	Signal to Noise ratio (A Weighting), Po = 0.4W, $R_L = 8\Omega$		82		dB
T_{WU}	Wake-up time		5	10	ms
T_{STB}	Standby time		5	10	ms
V_N	Output Voltage Noise f = 20Hz to 20kHz, G = 6dB Unweighted $R_L = 4\Omega$ A weighted $R_L = 4\Omega$ Unweighted $R_L = 8\Omega$ A weighted $R_L = 8\Omega$ Unweighted $R_L = 4\Omega + 15\mu H$ A weighted $R_L = 4\Omega + 15\mu H$ Unweighted $R_L = 4\Omega + 30\mu H$ A weighted $R_L = 4\Omega + 30\mu H$ Unweighted $R_L = 8\Omega + 30\mu H$ A weighted $R_L = 8\Omega + 30\mu H$ Unweighted $R_L = 4\Omega$ + Filter A weighted $R_L = 4\Omega$ + Filter Unweighted $R_L = 4\Omega$ + Filter A weighted $R_L = 4\Omega$ + Filter		83 57 83 61 81 58 87 62 77 56 85 63 80 57 85 61		μV_{RMS}

1) All electrical values are guaranted with correlation measurements at 2.5V and 5V.

2) Standby mode is actived when Vstdby is tied to GND.

3) Dynamic measurements - 20*log(rms(Vout)/rms(Vripple)). Vripple is the surimposed sinus signal to Vcc @ f = 217Hz.

Table 7. V_{CC} = +2.5V, GND = 0V, V_{ICM} = 1.25V, T_{amb} = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
I_{CC}	Supply Current No input signal, no load		1.7	2.4	mA
$I_{STANDBY}$	Standby Current [1] No input signal, V_{STBY} = GND		10	1000	nA
Voo	Output Offset Voltage No input signal, $R_L = 8\Omega$		3	25	mV
Po	Output Power, G=6dB THD = 1% Max, f = 1kHz, $R_L = 4\Omega$ THD = 10% Max, f = 1kHz, $R_L = 4\Omega$ THD = 1% Max, f = 1kHz, $R_L = 8\Omega$ THD = 10% Max, f = 1kHz, $R_L = 8\Omega$		0.52 0.71 0.33 0.42		W
THD + N	Total Harmonic Distortion + Noise Po = 200 mW_{RMS}, G = 6dB, 20Hz < f < 20kHz, $R_L = 8\Omega$ + 15µH, BW < 30kHz Po = 200mW_{RMS}, G = 6dB, f = 1kHz, $R_L = 8\Omega$ + 15µH, BW < 30kHz		1 0.19		%
Efficiency	Efficiency Po = 0.47 W_{RMS}, $R_L = 4\Omega + \geq 15\mu H$ Po = 0.3 W_{RMS}, $R_L = 8\Omega + \geq 15\mu H$		78 88		%
PSRR	Power Supply Rejection Ratio with inputs grounded [2] f = 217Hz, $R_L = 8\Omega$, G=6dB, Vripple = 200mV_{pp}		60		dB
CMRR	Common Mode Rejection Ratio f = 217Hz, $R_L = 8\Omega$, G = 6dB, ΔVic = 200mV_{pp}		54		dB
Gain	Gain value (R_{in} in kΩ)	$\frac{273k\Omega}{R_{in}}$	$\frac{300k\Omega}{R_{in}}$	$\frac{327k\Omega}{R_{in}}$	V/V
R_{STDBY}	Internal Resistance From Standby to GND	273	300	327	kΩ
F_{PWM}	Pulse Width Modulator Base Frequency	180	250	320	kHz
SNR	Signal to Noise ratio (A Weighting), Po = 0.4W, $R_L = 8\Omega$		80		dB
T_{WU}	Wake-up time		5	10	ms
T_{STB}	Standby time		5	10	ms
V_N	Output Voltage Noise f = 20Hz to 20kHz, G = 6dB Unweighted $R_L = 4\Omega$ A weighted $R_L = 4\Omega$ Unweighted $R_L = 8\Omega$ A weighted $R_L = 8\Omega$ Unweighted $R_L = 4\Omega$ + 15µH A weighted $R_L = 4\Omega$ + 15µH Unweighted $R_L = 4\Omega$ + 30µH A weighted $R_L = 4\Omega$ + 30µH Unweighted $R_L = 8\Omega$ + 30µH A weighted $R_L = 8\Omega$ + 30µH Unweighted $R_L = 4\Omega$ + Filter A weighted $R_L = 4\Omega$ + Filter Unweighted $R_L = 4\Omega$ + Filter A weighted $R_L = 4\Omega$ + Filter		85 60 86 62 76 56 82 60 67 53 78 57 74 54 78 59		μV_{RMS}

1) Standby mode is actived when Vstdby is tied to GND.

2) Dynamic measurements - 20*log(rms(Vout)/rms(Vripple)). Vripple is the surimposed sinus signal to Vcc @ f = 217Hz.

Table 8. V_{CC} = +2.4V[1], GND = 0V, V_{ICM} = 1.2V, T_{amb} = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
I_{CC}	Supply Current No input signal, no load		1.7		mA
$I_{STANDBY}$	Standby Current [2] No input signal, V_{STBY} = GND		10		nA
Voo	Output Offset Voltage No input signal, $R_L = 8\Omega$		3		mV
Po	Output Power, G=6dB THD = 1% Max, f = 1kHz, $R_L = 4\Omega$ THD = 10% Max, f = 1kHz, $R_L = 4\Omega$ THD = 1% Max, f = 1kHz, $R_L = 8\Omega$ THD = 10% Max, f = 1kHz, $R_L = 8\Omega$		 0.48 0.65 0.3 0.38		W
THD + N	Total Harmonic Distortion + Noise Po = 200 mW_{RMS}, G = 6dB, 20Hz < f < 20kHz, $R_L = 8\Omega$ + 15µH, BW < 30kHz		1		%
Efficiency	Efficiency Po = 0.38 W_{RMS}, $R_L = 4\Omega + \geq 15\mu H$ Po = 0.25 W_{RMS}, $R_L = 8\Omega + \geq 15\mu H$		 77 86		%
CMRR	Common Mode Rejection Ratio f = 217Hz, $R_L = 8\Omega$, G = 6dB, ΔVic = 200mV_{pp}		54		dB
Gain	Gain value (R_{in} in kΩ)	$\frac{273k\Omega}{R_{in}}$	$\frac{300k\Omega}{R_{in}}$	$\frac{327k\Omega}{R_{in}}$	V/V
R_{STDBY}	Internal Resistance From Standby to GND	273	300	327	kΩ
F_{PWM}	Pulse Width Modulator Base Frequency		250		kHz
SNR	Signal to Noise ratio (A Weighting), Po = 0.25W, $R_L = 8\Omega$		80		dB
T_{WU}	Wake-up time		5		ms
T_{STB}	Standby time		5		ms
V_N	Output Voltage Noise f = 20Hz to 20kHz, G = 6dB Unweighted $R_L = 4\Omega$ A weighted $R_L = 4\Omega$ Unweighted $R_L = 8\Omega$ A weighted $R_L = 8\Omega$ Unweighted $R_L = 4\Omega$ + 15µH A weighted $R_L = 4\Omega$ + 15µH Unweighted $R_L = 4\Omega$ + 30µH A weighted $R_L = 4\Omega$ + 30µH Unweighted $R_L = 8\Omega$ + 30µH A weighted $R_L = 8\Omega$ + 30µH Unweighted $R_L = 4\Omega$ + Filter A weighted $R_L = 4\Omega$ + Filter Unweighted $R_L = 4\Omega$ + Filter A weighted $R_L = 4\Omega$ + Filter		 85 60 86 62 76 56 82 60 67 53 78 57 74 54 78 59		μV_{RMS}

1) Parameters guaranteed by evaluation and design, not by test.

2) Standby mode is actived when Vstdby is tied to GND.

Note: In the graphs that follow, the following abbreviations are used:
RL + 15µH or 30µH = pure resistor+ very low series resistance inductor
Filter = LC output filter (1µF+30µH for 4Ω and 0.5µF+60µH for 8Ω)
All measurements done with Cs1=1µF and Cs2=100nF except for PSRR where Cs1 is removed

Figure 2. Test diagram for measurements

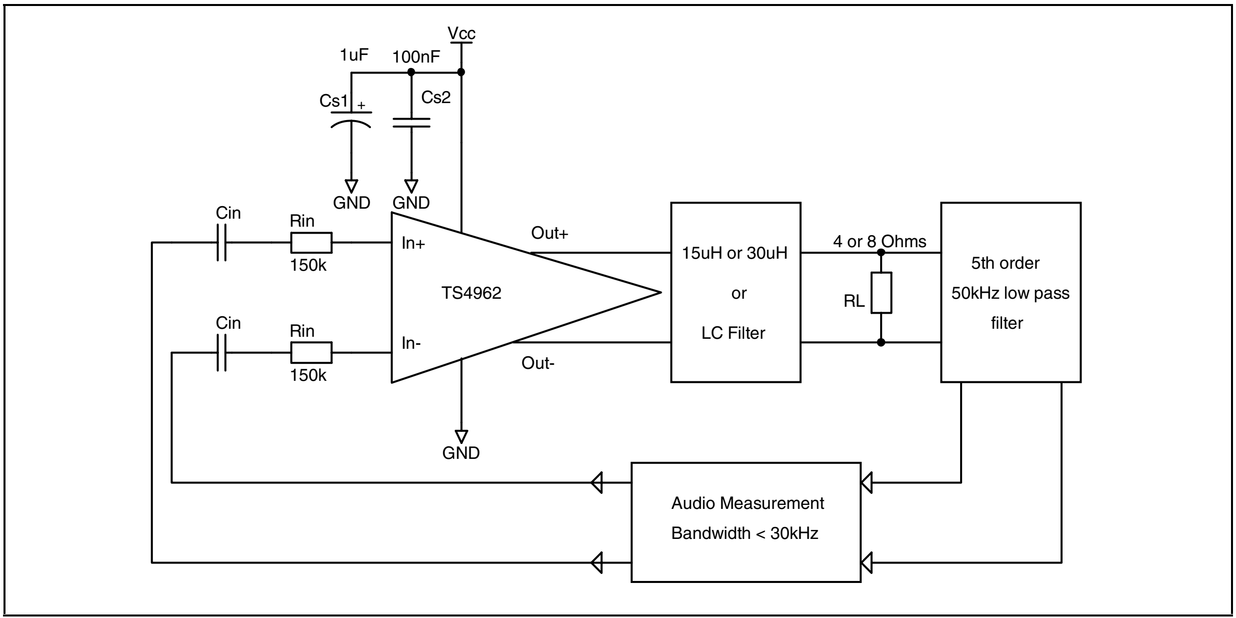


Figure 3. Test diagram for PSRR measurements

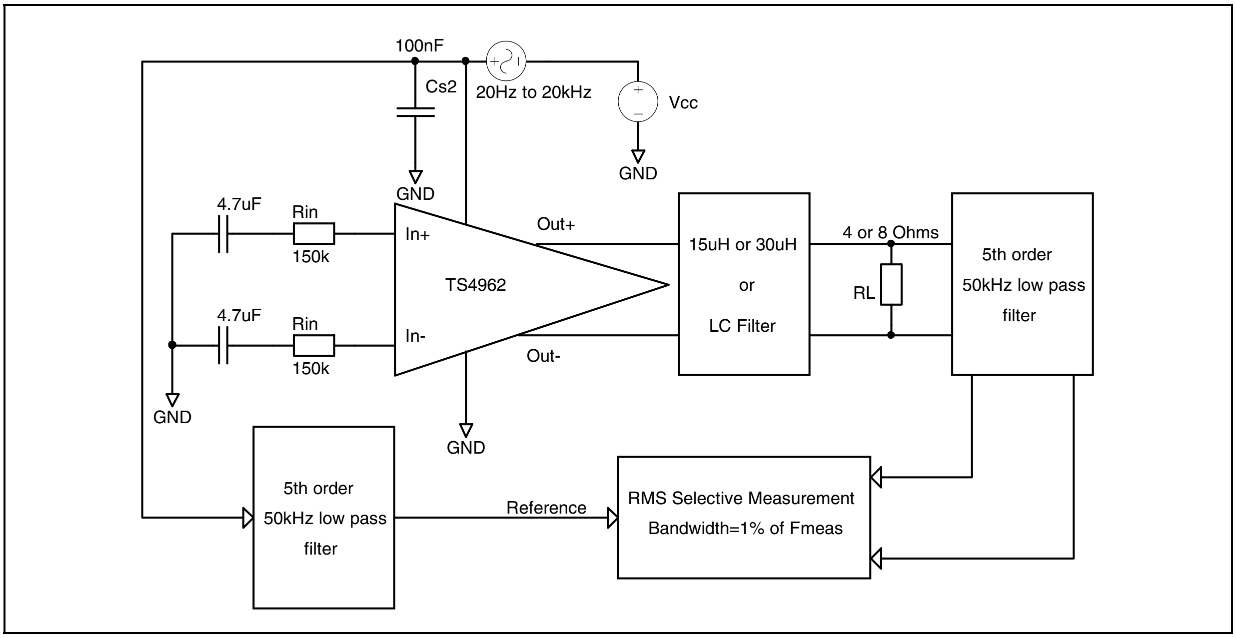


Figure 4. Current consumption vs power supply voltage

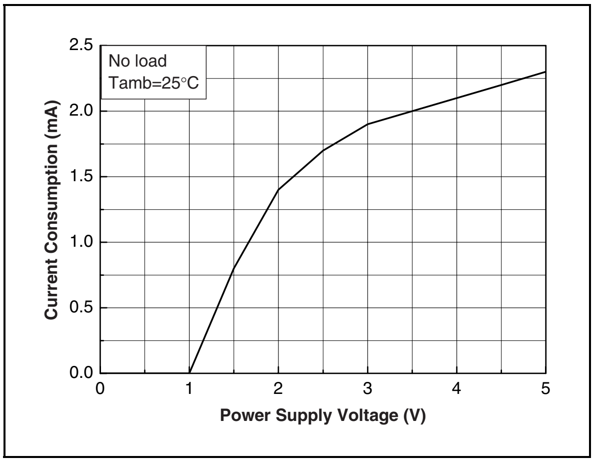


Figure 5. Current consumption vs standby voltage

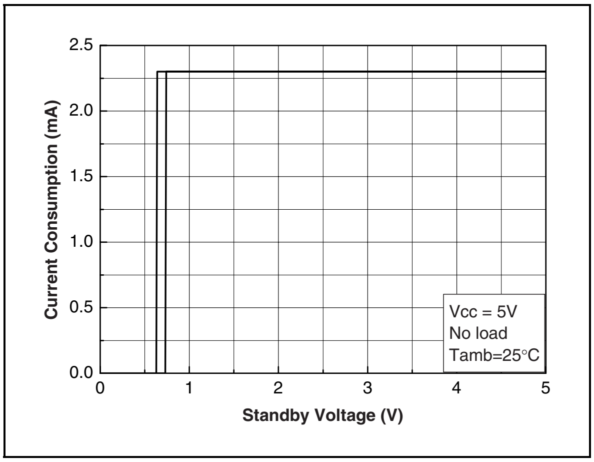


Figure 6. Current consumption vs standby voltage

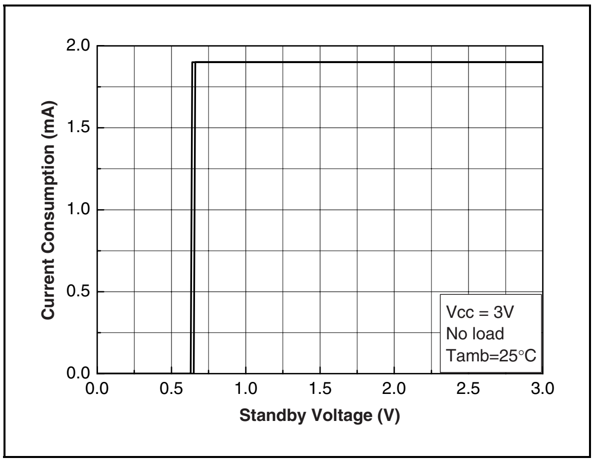


Figure 7. Output offset voltage vs common mode input voltage

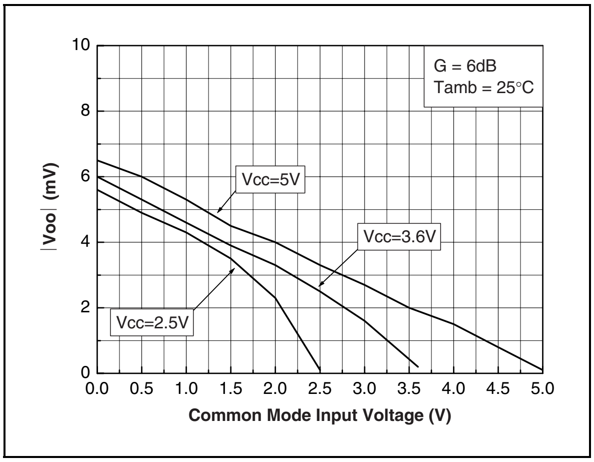


Figure 8. Efficiency vs output power

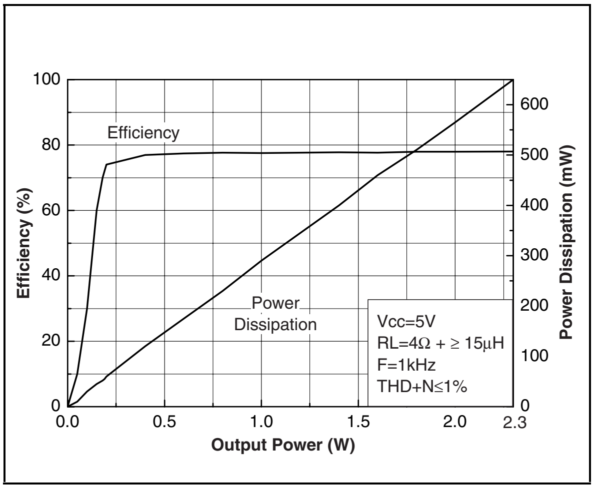


Figure 9. Efficiency vs output power

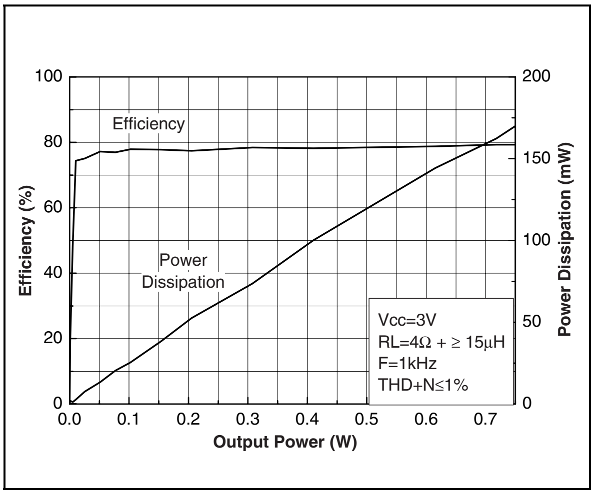


Figure 10. Efficiency vs output power

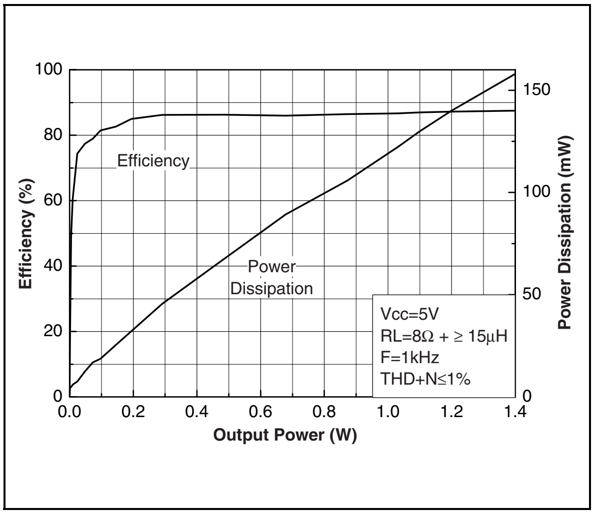


Figure 11. Efficiency vs output power

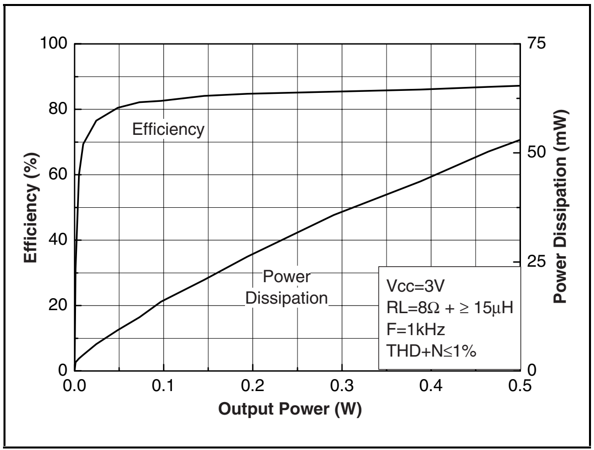


Figure 12. Output power vs power supply voltage

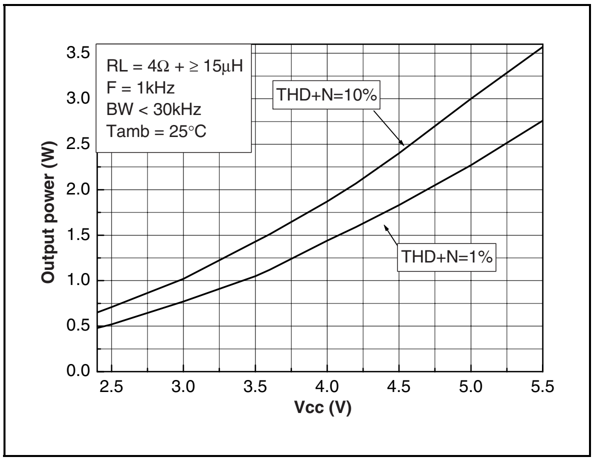


Figure 13. Output power vs power supply voltage

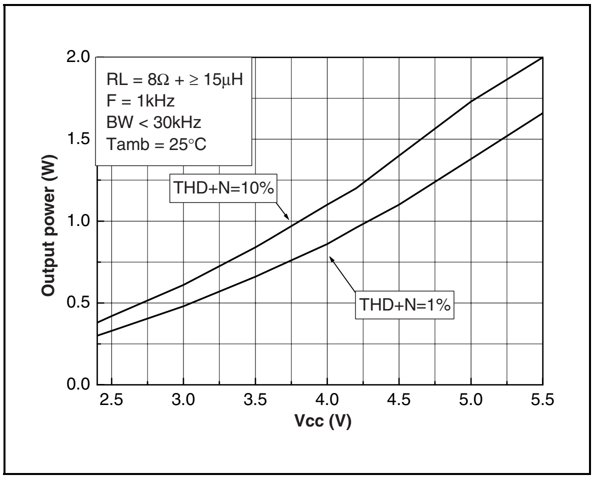


Figure 14. PSRR vs frequency

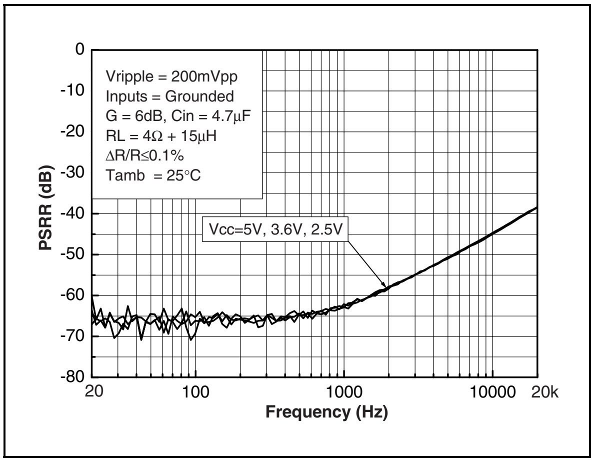


Figure 15. PSRR vs frequency

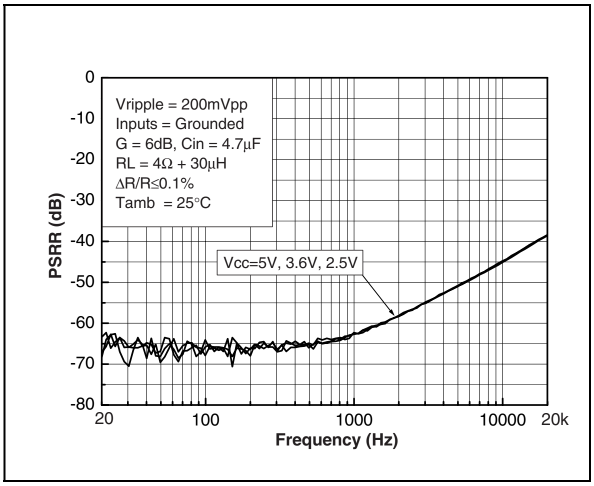


Figure 16. PSRR vs frequency

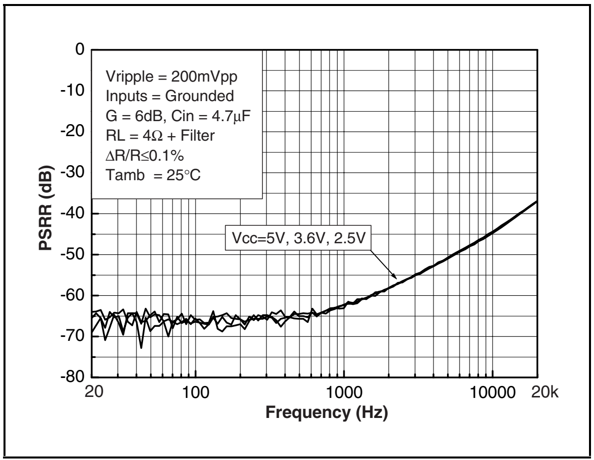


Figure 17. PSRR vs frequency

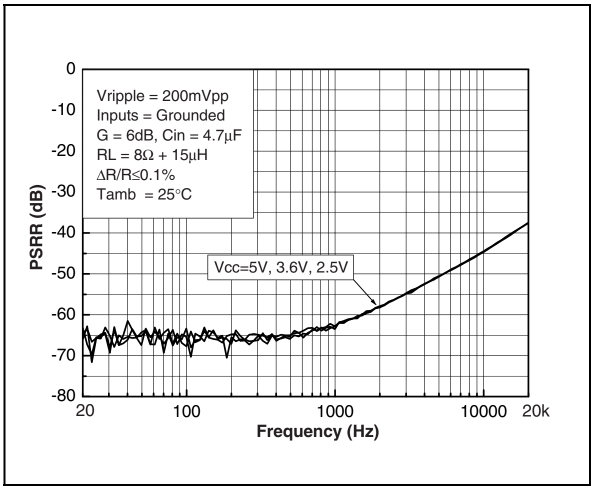


Figure 18. PSRR vs frequency

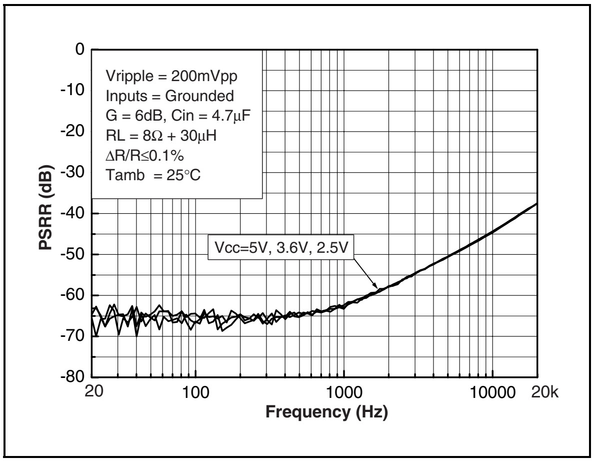


Figure 19. PSRR vs frequency

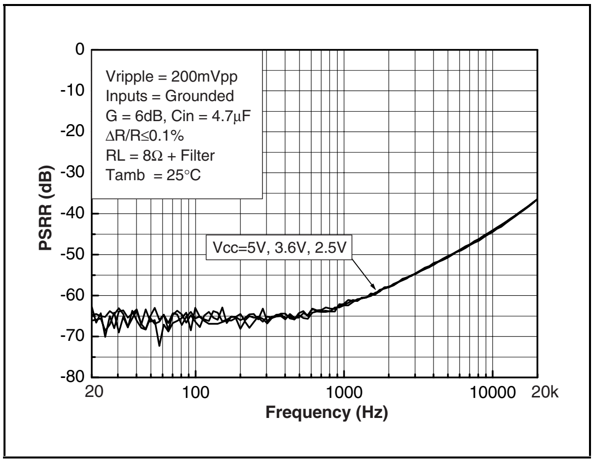


Figure 20. PSRR vs frequency Common Mode Input Voltage

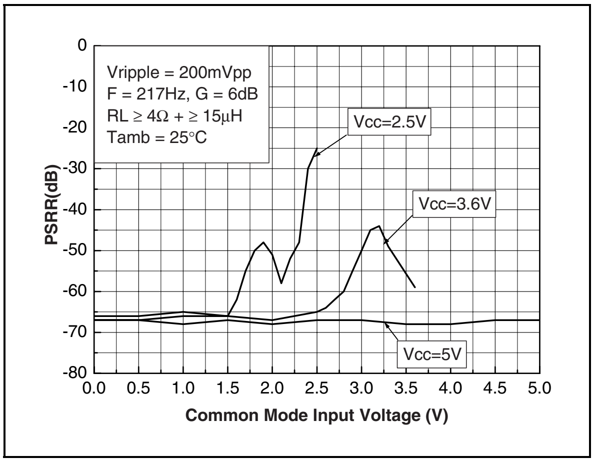


Figure 21. CMRR vs frequency

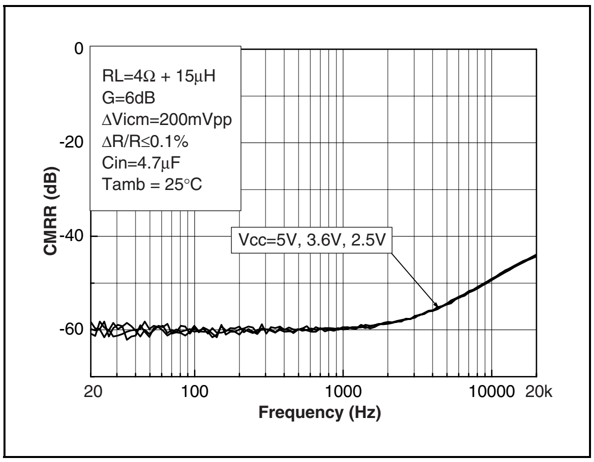


Figure 22. CMRR vs frequency

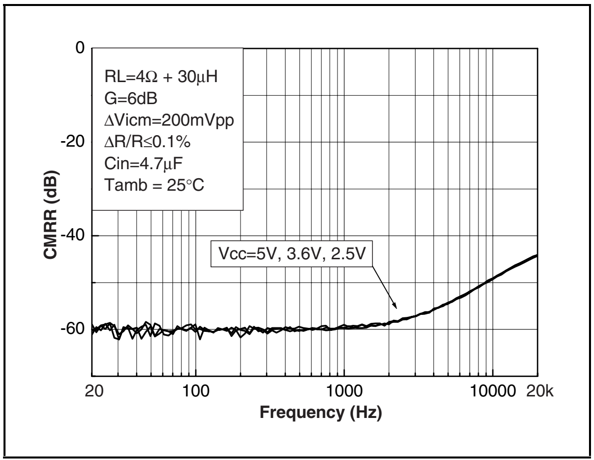


Figure 23. CMRR vs frequency

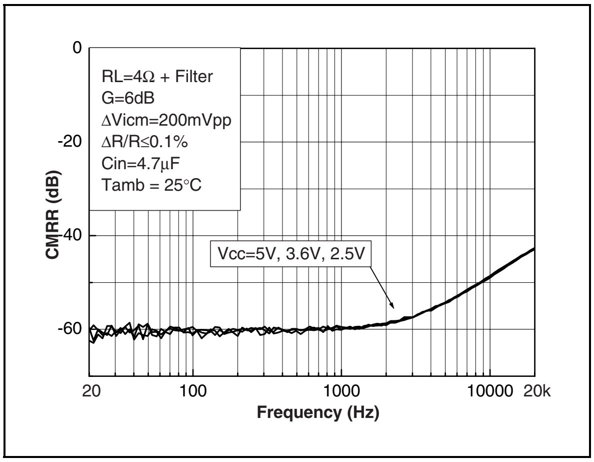


Figure 24. CMRR vs frequency

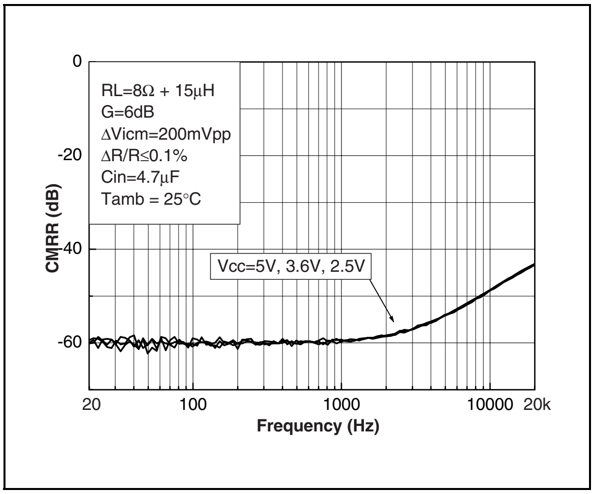


Figure 25. CMRR vs frequency

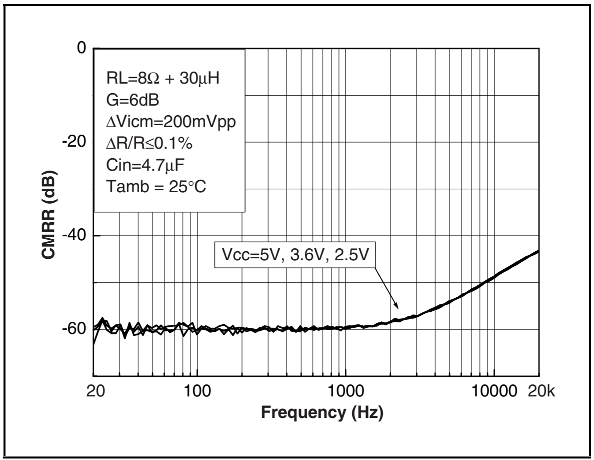


Figure 26. CMRR vs frequency

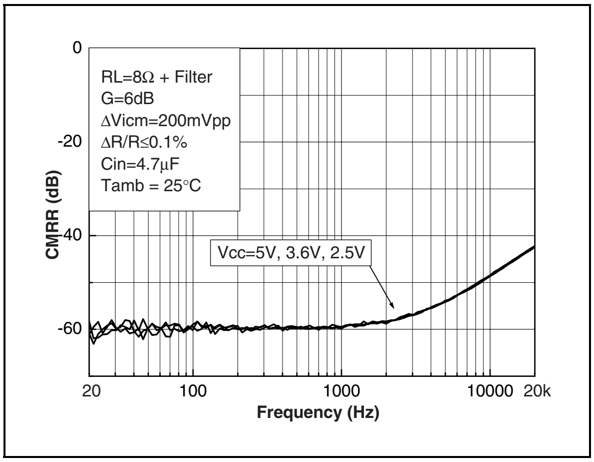


Figure 27. CMRR vs frequency Common Mode Input Voltage

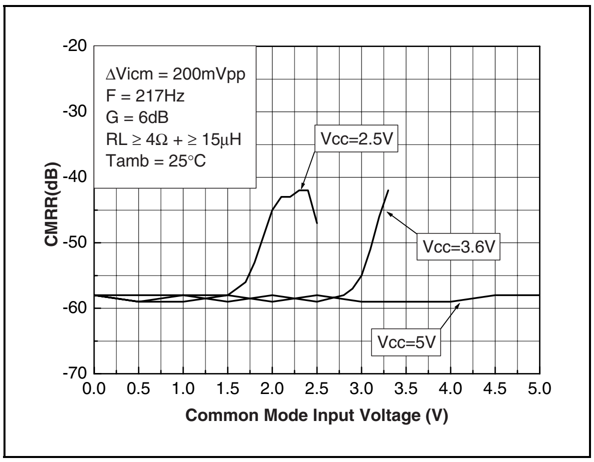


Figure 28. THD+N vs output power

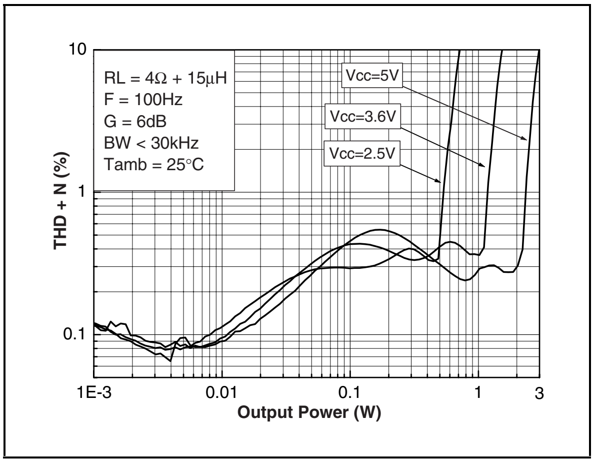


Figure 29. THD+N vs output power

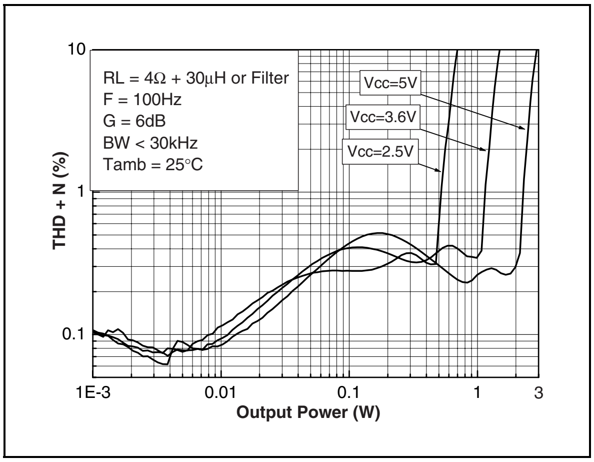


Figure 30. THD+N vs output power

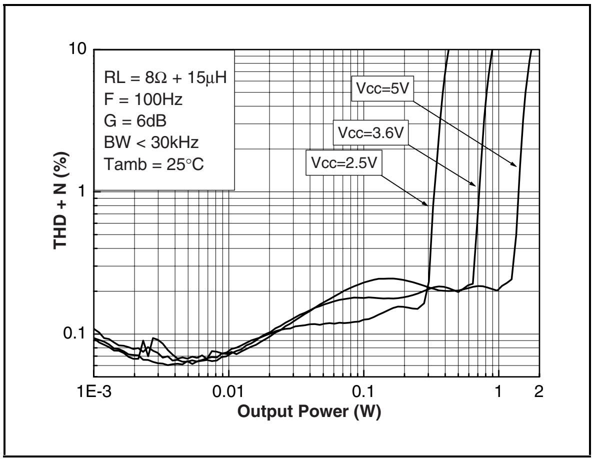


Figure 31. THD+N vs output power

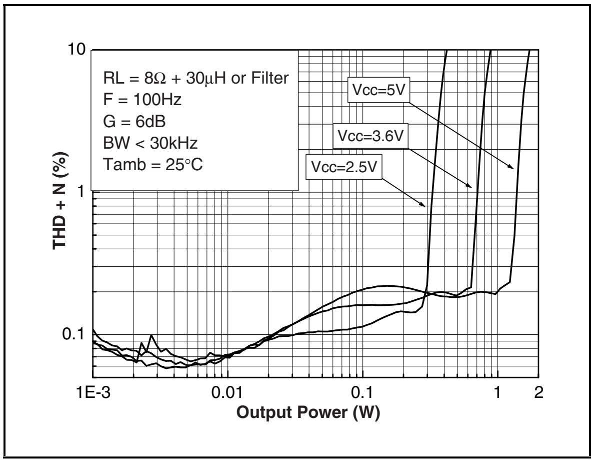


Figure 32. THD+N vs output power

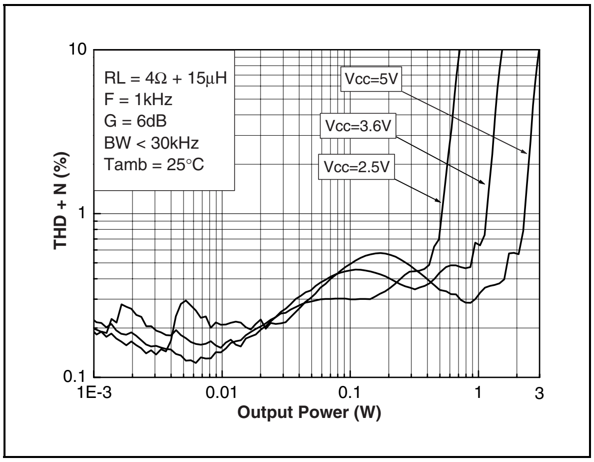


Figure 33. THD+N vs output power

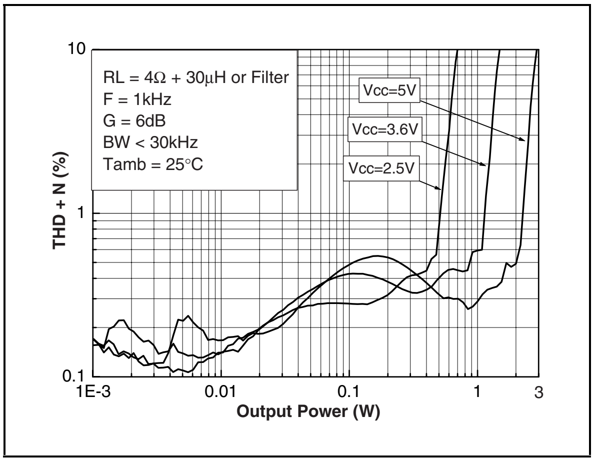


Figure 34. THD+N vs output power

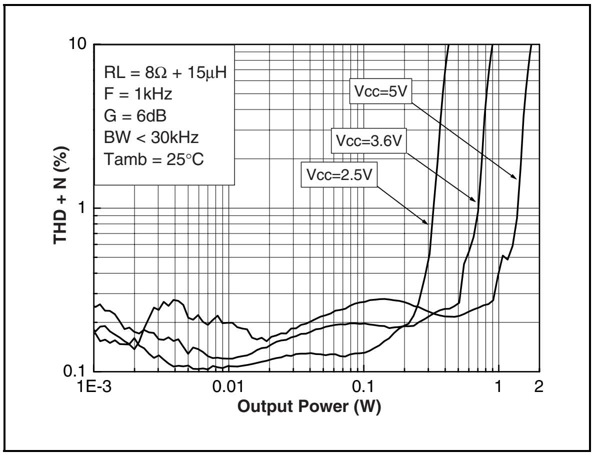


Figure 35. THD+N vs output power

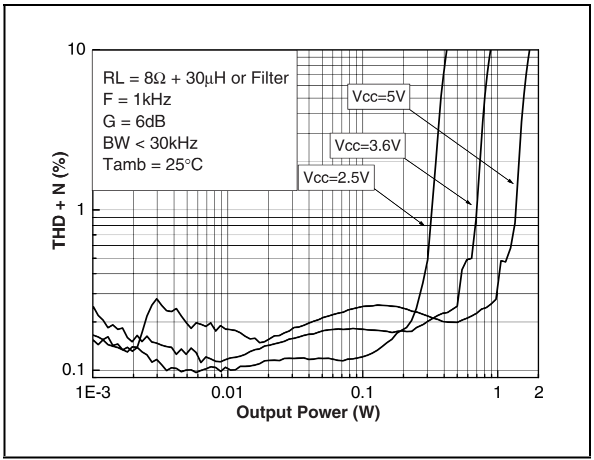


Figure 36. THD+N vs frequency

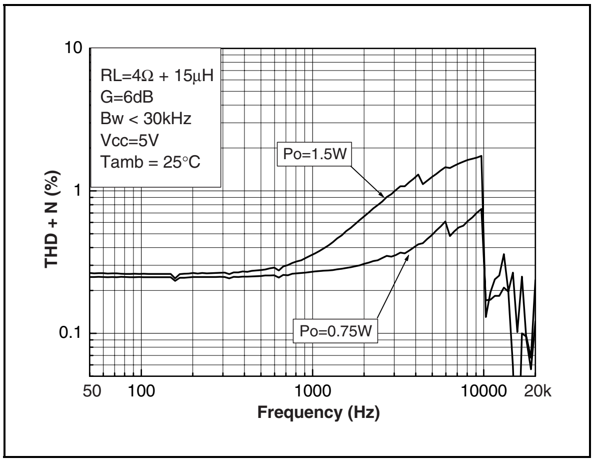


Figure 37. THD+N vs frequency

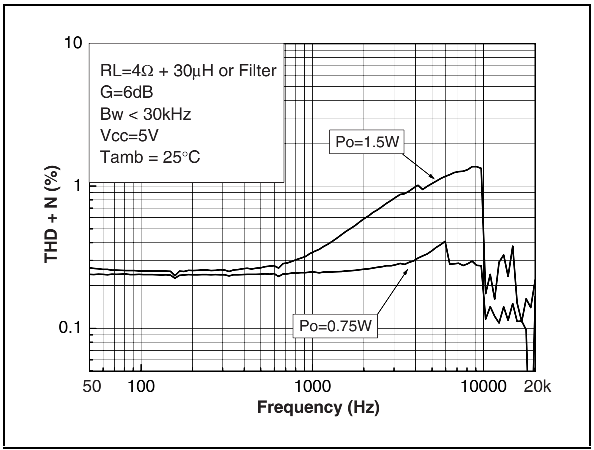


Figure 38. THD+N vs frequency

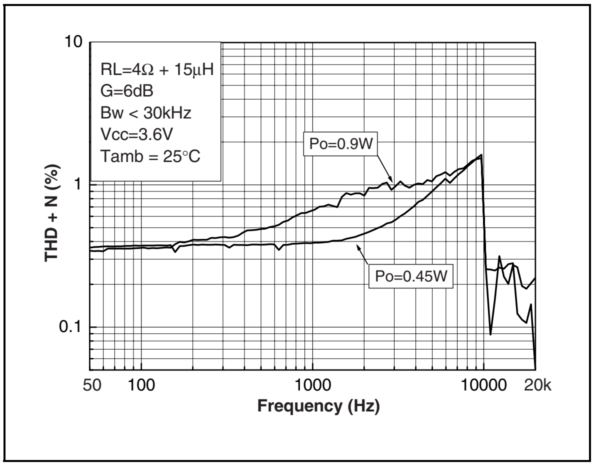


Figure 39. THD+N vs frequency

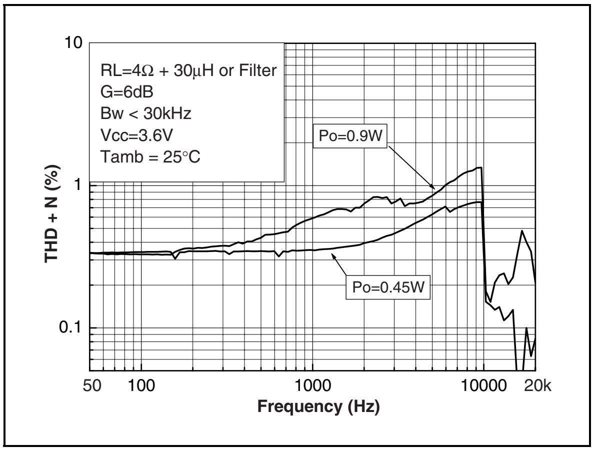


Figure 40. THD+N vs frequency

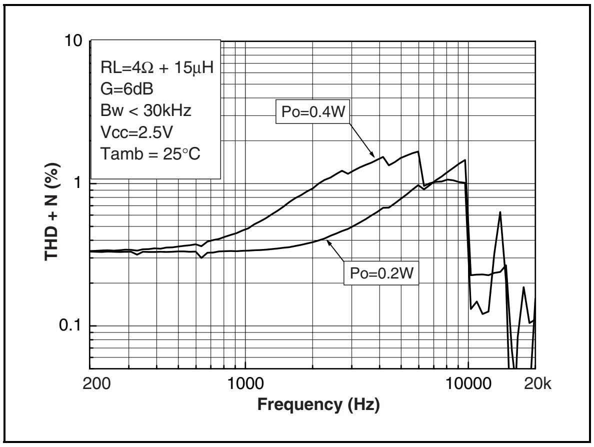


Figure 41. THD+N vs frequency

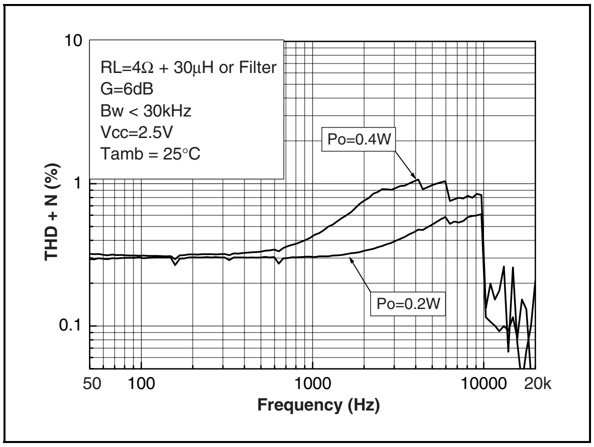


Figure 42. THD+N vs frequency

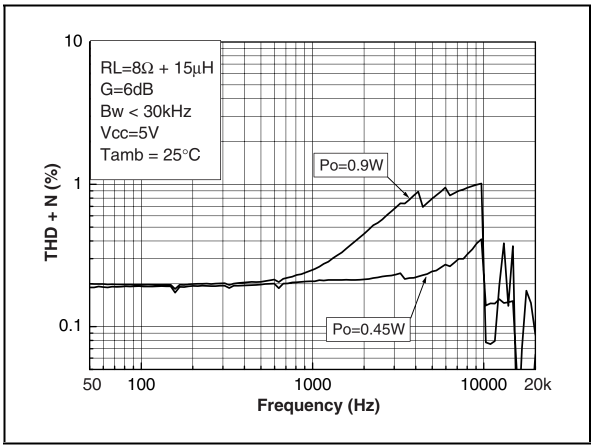


Figure 43. THD+N vs frequency

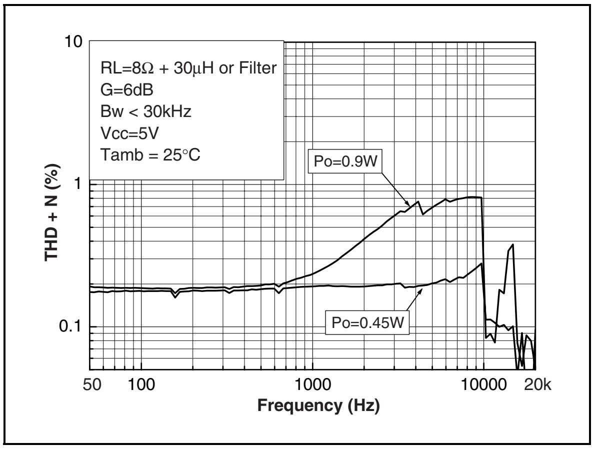


Figure 44. THD+N vs frequency

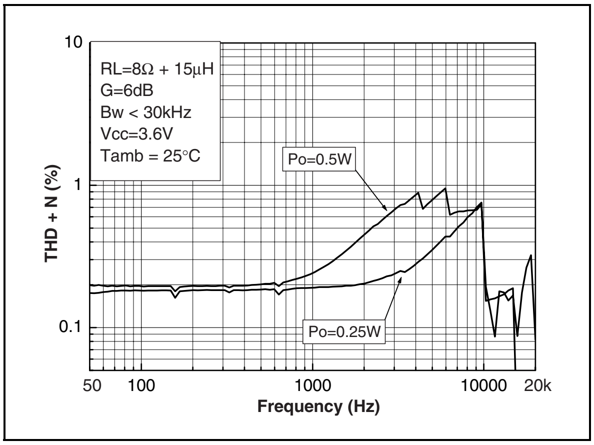


Figure 45. THD+N vs frequency

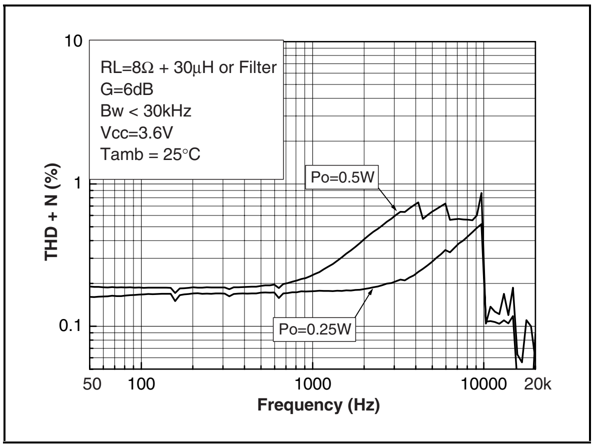


Figure 46. THD+N vs frequency

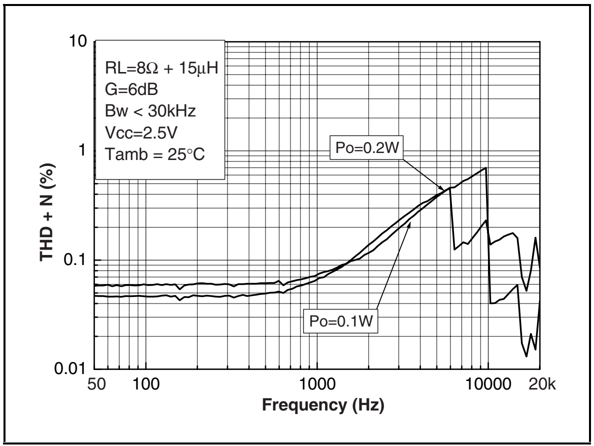


Figure 47. THD+N vs frequency

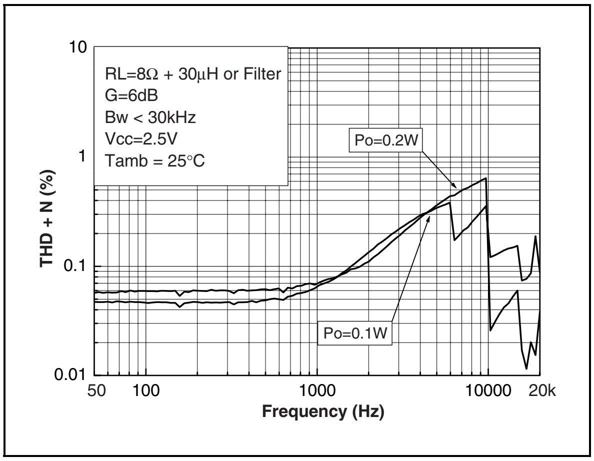


Figure 48. Gain vs frequency

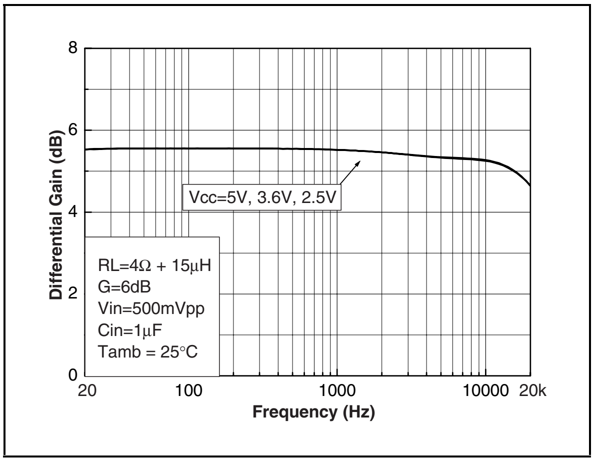


Figure 49. Gain vs frequency

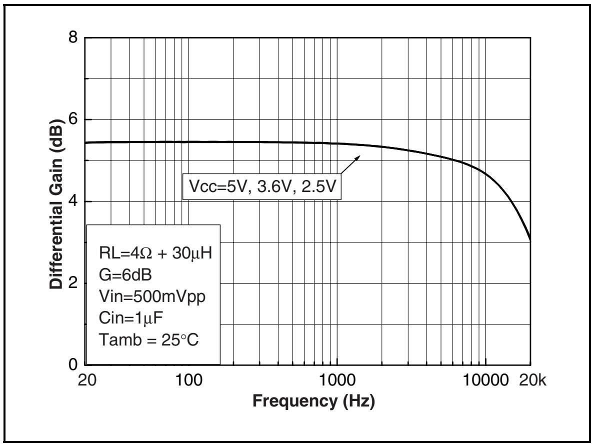


Figure 50. Gain vs frequency

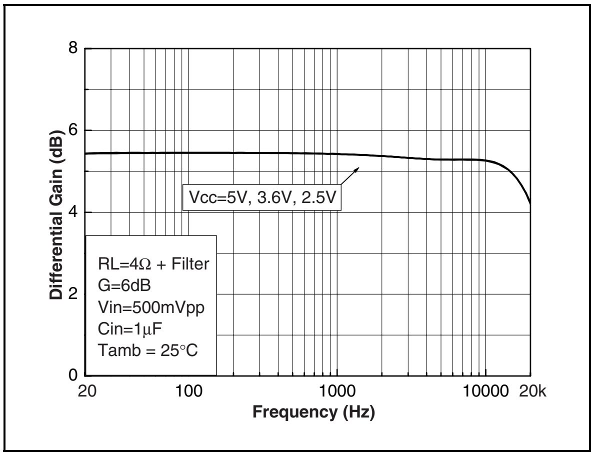


Figure 51. Gain vs frequency

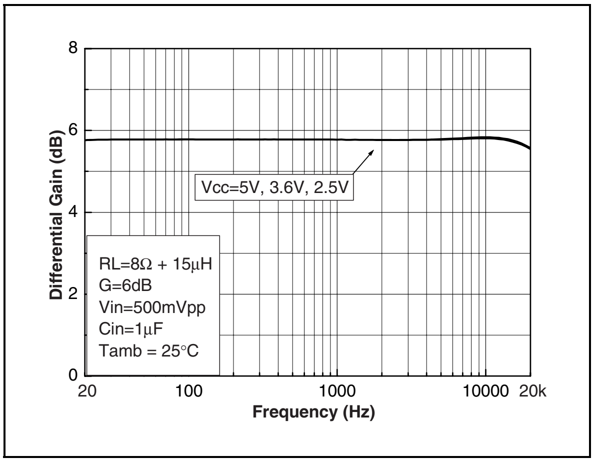


Figure 52. Gain vs frequency

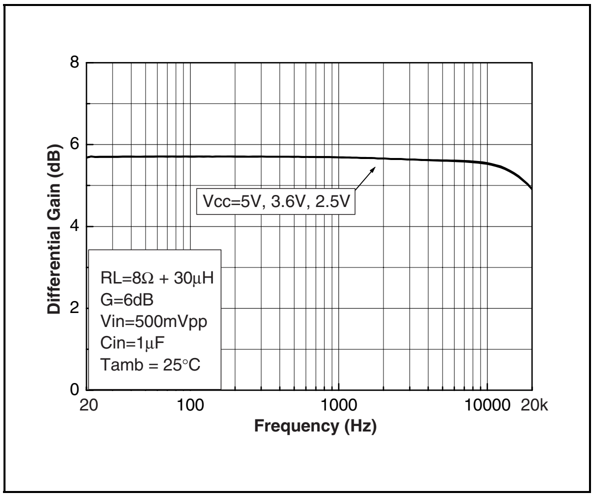


Figure 53. Gain vs frequency

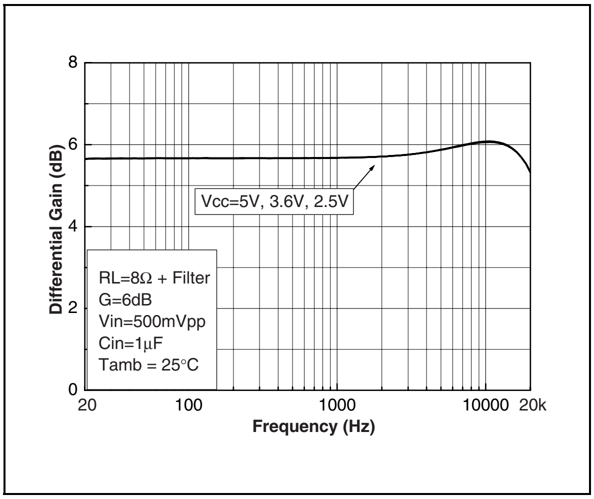


Figure 54. Gain vs frequency

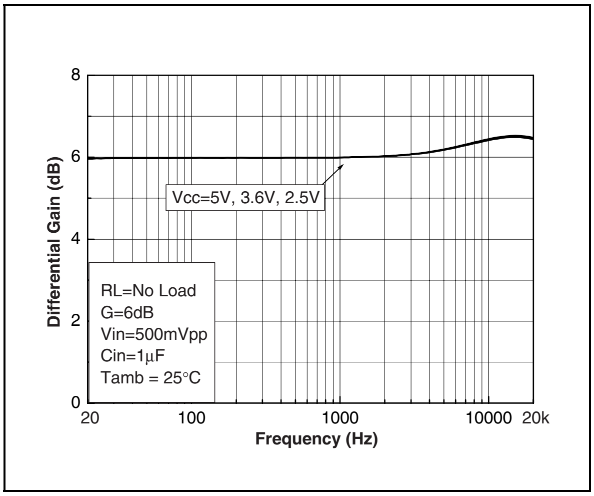


Figure 55. Startup & shutdown time Vcc=5V, G=6dB, C_{IN}=1µF (5ms/div)

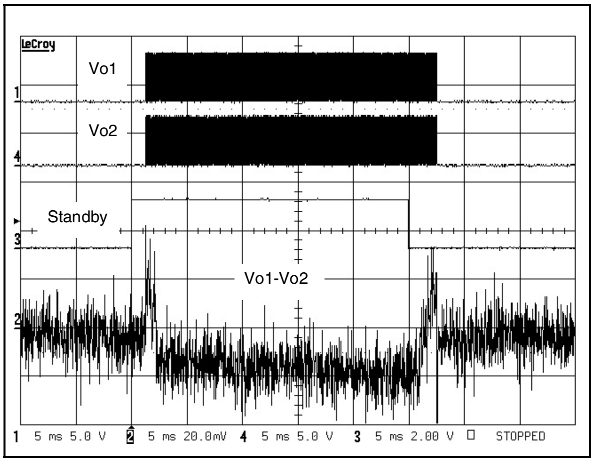


Figure 56. Startup & shutdown time Vcc=3V, G=6dB, C_{IN}=1µF (5ms/div)

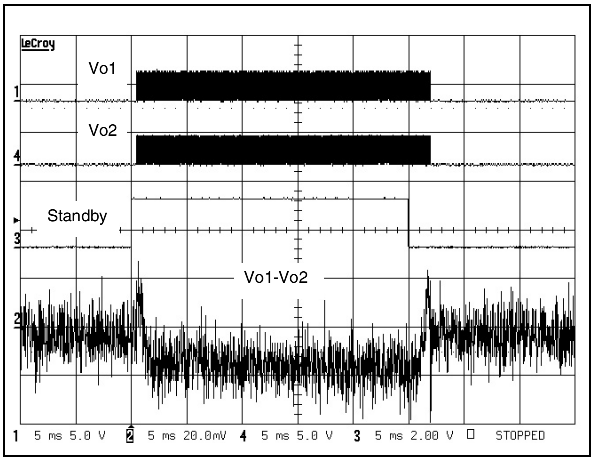


Figure 57. Startup & shutdown time Vcc=5V, G=6dB, C_{IN}=100nF (5ms/div)

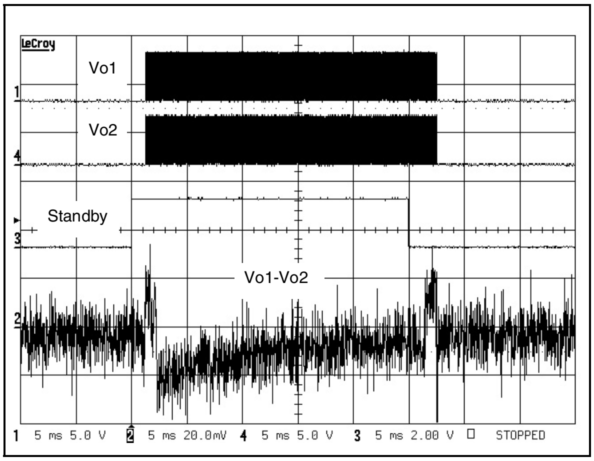


Figure 58. Startup & shutdown time
Vcc=3V, G=6dB, C_{IN}=100nF (5ms/div)

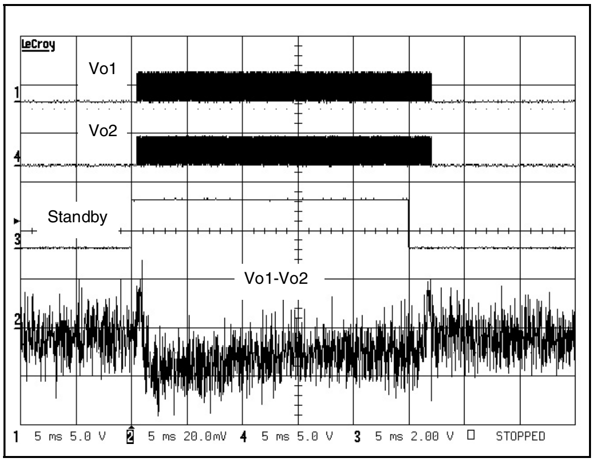


Figure 59. Startup & shutdown time
Vcc=5V, G=6dB, NoC_{IN} (5ms/div)

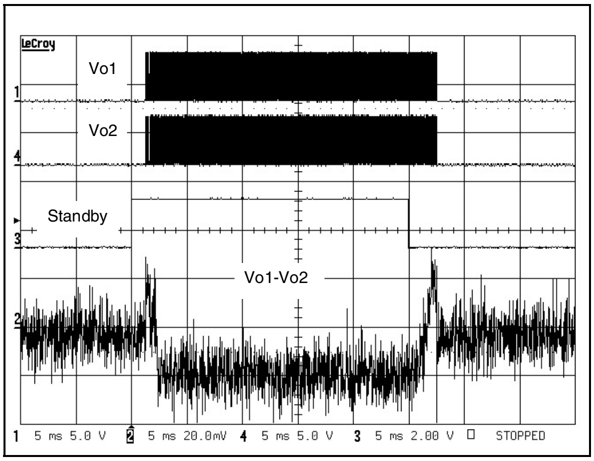
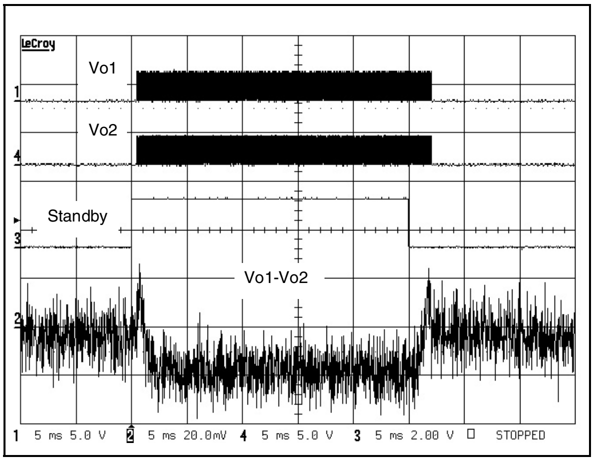


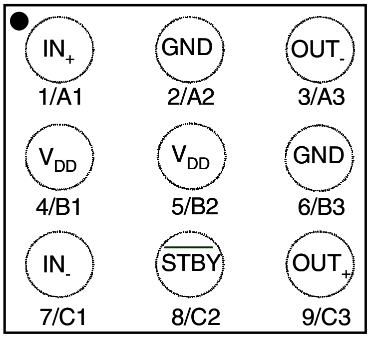
Figure 60. Startup & shutdown time
Vcc=3V, G=6dB, NoC_{IN} (5ms/div)



4 Package Mechanical Data

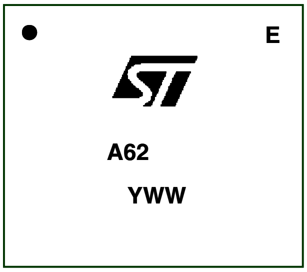
4.1 Pin-out and markings for 9-bump flip-chip

Figure 61. Pin-out for 9-bump flip-chip (top view)



- **Bumps are underneath**
- **Bump diameter = 300µm**

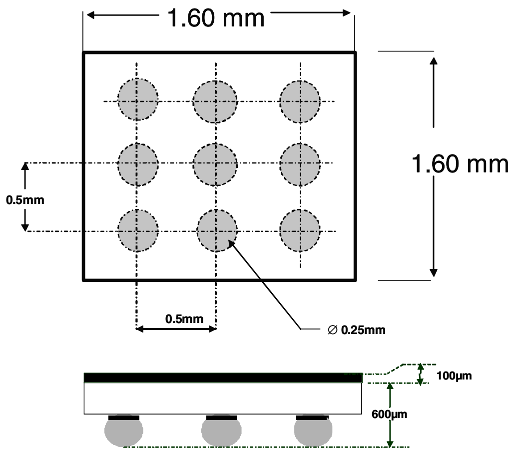
Figure 62. Marking for 9-bump flip-chip (top view)



Marking: A62

- ST Logo
- Part Number: A62
- Three digits Datecode: YWW
- E symbol for lead-free only
- The dot is for marking pin A1

4.2 Mechanical data for 9-bump flip-chip



- Die size: **1.6mm x 1.6mm** ±30µm
- Die height (including bumps): **600µm**
- Bump diameter: **315µm ±50µm**
- Bump diameter before Reflew: **300µm ±10µm**
- Bump height: **250µm** ±40µm
- Die Height: **350µm** ±20µm
- Pitch: **500µm ±50µm**
- *Back Coating layer Height: **100µm ±10µm**
- Coplanarity: **60µm max**

*** Optional**

5 Revision History

Date	Revision	Description of Changes
01 Sept. 2004	0.1	First release corresponding to Target Specification version of datasheet.
01 Oct. 2004	0.2	Update Gain Values.
01 Nov. 2004	1	First published version corresponding to Preliminary Data version of datasheet. Specific content changes as follows: • update Electrical Values + curves.
01 Jan. 2005	2	Technical parameter updated (Output Power at 3W).