- 2.7W Mono Fully Differential Audio Power Amplifier

General Description

The EMA2004 is a 2.7W mono fully differential amplifier designed to drive a speaker with at least 4Ω impedance while consuming only 20 mm^2 total
PCB area in most applications. The device operates from 2.5 V to 5.5 V, drawing only 5mA of quiescent supply current. The EMA2004 is available in the space-saving 3 mm x 3 mm TDFN package.

The EMA2004 is ideal for PDA/smart phone applications due to features such as -70dB supply voltage rejection from 20 Hz to 2 kHz, improved RF rectification immunity, small PCB area, and a fast startup with minimal pop.

Features

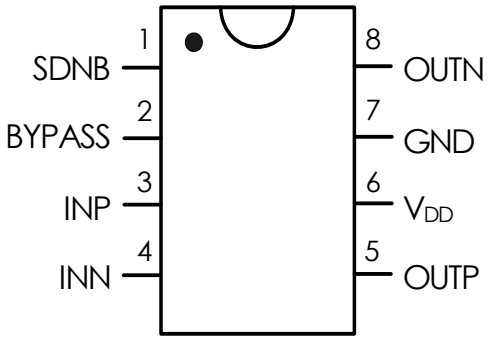
- Designed for Wireless or Cellular Handsets and PDAs
- 2.7 W Into 4Ω From a 5-V Supply at THD = 10% (Typ)
- Low Supply Current: 5mA (Typ) at 5 V
- Shutdown Current: 0.1 μA (Typ)
- Fast Startup With Minimal Pop
- Only Three External Components
- Improved PSRR (-70 dB) and Wide Supply Voltage (2.5 V to 5.5 V) for Direct Battery Operation
- Fully Differential Design Reduces RF Rectification
- -63 dB CMRR Eliminates Two Input Coupling Capacitors
- Pin to Pin Compatible With TPA6204A1 in TDFN Package
- Available in 3 mm X 3 mm TDFN Package

Applications

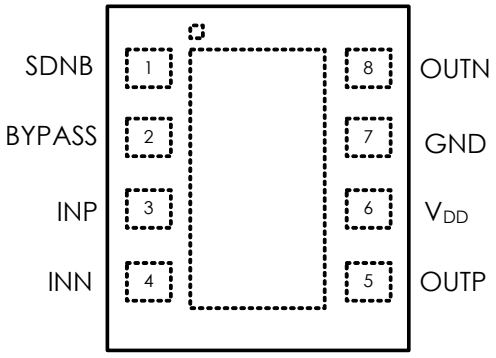
- Ideal for Wireless Handsets
- PDAs
- Notebook Computers

Connection Diagram

MSOP Package



TDFN Package



Order information

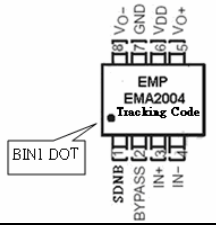
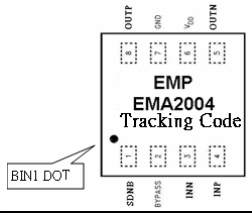
EMA2004-50MA08GRR/NRR

50	5.0V Operation
MA08	MSOP-8 Package
GRR	RoHS (Pb Free) Rating: -40 to 85°C Package in Tape & Reel
NRR	RoHS & Halogen free (By Request) Rating: -40 to 85°C Package in Tape & Reel

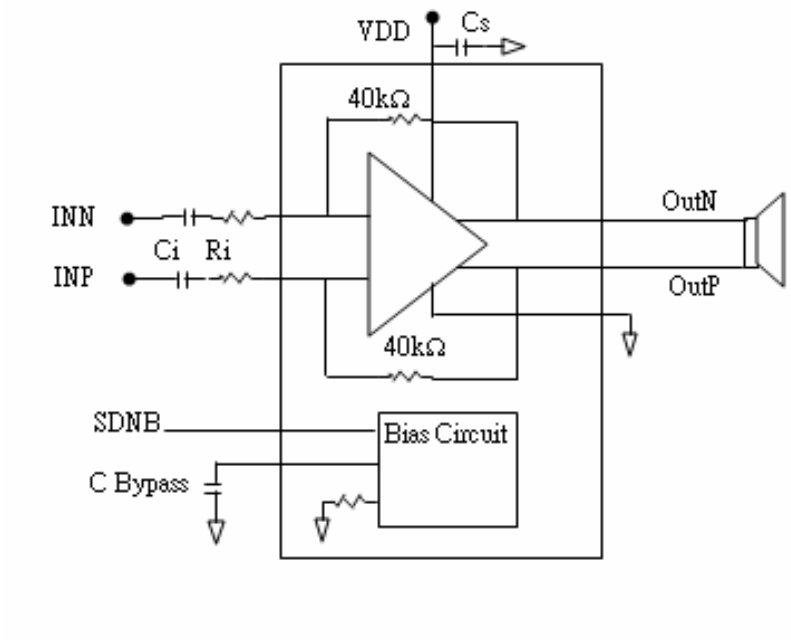
EMA2004-50FF08NRR

50	5.0V Operation
FF08	TDFN-8 Package
NRR	RoHS & Halogen free Rating: -40 to 85°C Package in Tape & Reel

Order, Mark & Packing Information

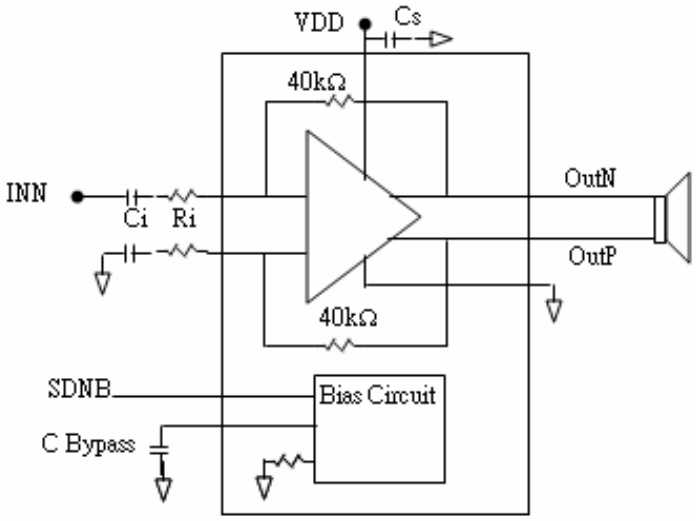
Package	Product ID	Marking	Packing
MSOP-8	EMA2004-50MA08GRR		3K units Tape & Reel
TDFN-8	EMA2004-50FF08NRR		5K units Tape & Reel

Typical Application



R_I=40kΩ,
C_I=0.39μF,
C_S=1μF
$C_{(BYPASS)}$=0.22μF

FIGURE 1. Typical Audio Amplifier Application Circuit with differential input



R_I=40kΩ,
C_I=0.22μF,
C_S=1μF
$C_{(BYPASS)}$=0.22μF

FIGURE 2. Typical Audio Amplifier Application Circuit with single-ended input

Absolute Maximum Ratings

Supply Voltage	6.0V	Thermal Resistance	
Storage Temperature	-65°C to +150°C	θ_{JA} (MSOP)	190°C/W
Input Voltage	-0.3V to VDD +0.3V	θ_{JA} (TDFN)	160°C/W
Power Dissipation	Internally Limited	Operating Ratings	
ESD Susceptibility	HBM 1.5KV	Temperature Range	-40°C ≦ TA ≦ 85°C
	MM 200V	Supply Voltage	2.2V ≦ VDD ≦ 5.5V
Junction Temperature	150°C		

Electrical Characteristics V_{DD} = 5V

The following specifications apply for V_{DD} = 5V ,A_V = 1 and R_L=8Ω unless otherwise specified. Limits apply for T_A = 25°C.

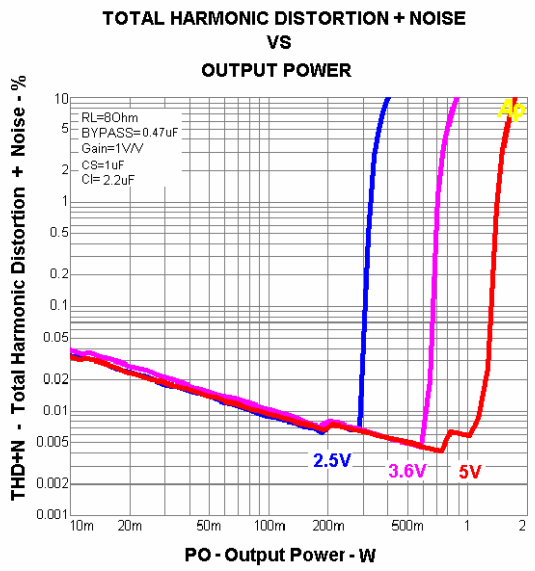
Symbol	Parameter	Conditions	Conditions		Units
			Typical	Limit	
I_{DD}	Quiescent Power Supply Current	V_{IN} = 0V, Io = 0A	5	8	mA
I_{SD}	Shutdown Current	V_{SDNB}=GND	0.1	1	μA
V_{OS}	Output offset voltage	V_i=0V differential, A_V=1 V/V, V_{DD} = 5.5 V	1	5	mV
P_O	Output Power	THD+N = 10 %(max), f = 1kHz R_L = 4Ω R_L = 8Ω	 2.7 1.7		W
		THD+N = 1%(max), f = 1kHz R_L = 4Ω R_L = 8Ω	 2.1 1.4		
THD+N	Total Harmonic Distortion + Noise	V_{DD} = 3.6V, R_L=8Ω, f = 1kHz P_O = 0.6 Wrms P_O= 0.25 Wrms P_O = 0.1 Wrms	 0.007 0.01 0.017		%
PSRR	Power Supply Rejection Ratio	V_{ripple}=200mV sine p-p, input ac-grounded			dB
		f=217Hz	-70		
		f=20 to 20kHz	-65		
CMRR	Common Mode Rejection Ratio	V_{DD} = 3.6V, V_{IC}=1V_{PP}, f = 217Hz	60		dB

Electrical Characteristics V_{DD} = 2.5V

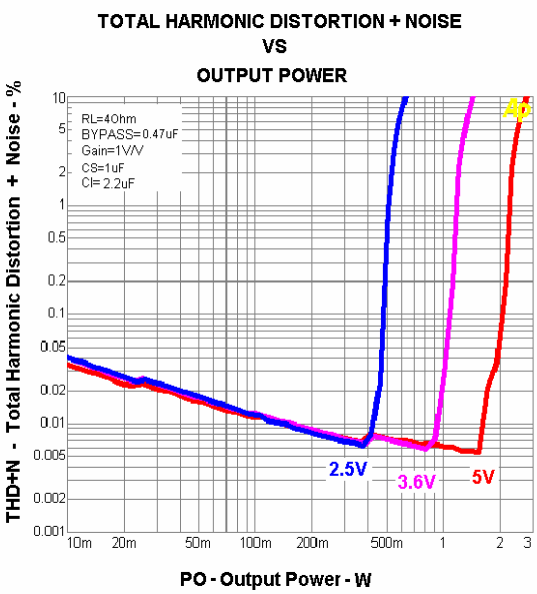
The following specifications apply for V_{DD}=2.5V,A_V=1 and R_L =8Ω unless otherwise specified. Limits apply for T_A = 25°C.

Symbol	Parameter	Conditions	Conditions		Units
			Typical	Limit	
I_{DD}	Quiescent Power Supply Current	V_{IN} = 0V, Io = 0A	4	8	mA
I_{SD}	Shutdown Current	V_{SDNB}=GND	0.1	1	μA
P_O	Output Power	THD+N = 10 %(max), f = 1kHz R_L = 4Ω R_L = 8Ω	 0.62 0.4		W
		THD+N = 1%(max), f = 1kHz R_L = 4Ω R_L = 8Ω	 0.5 0.3		
PSRR	Power Supply Rejection Ratio	V_{ripple}=200mV sine p-p, input ac-grounded			dB
		f=217Hz	-70		
		f=20 to 20kHz	-65		

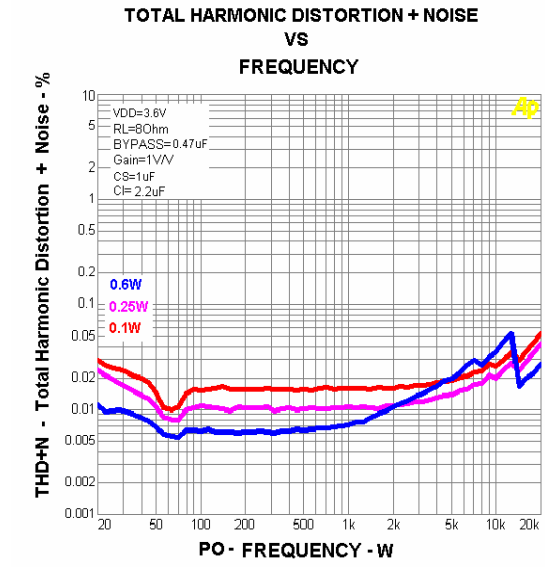
Typical Performance Characteristics



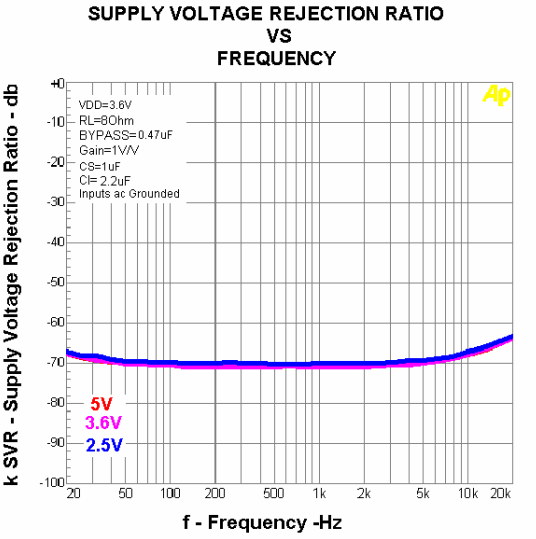
THD + Noise vs Output Power



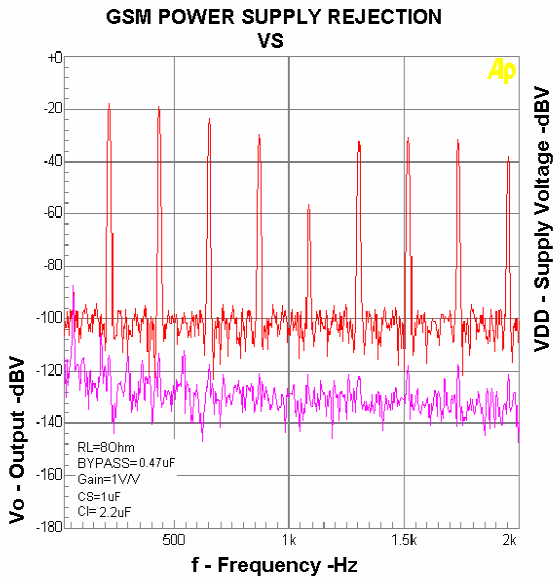
THD + Noise vs Output Power



THD + Noise vs Frequency



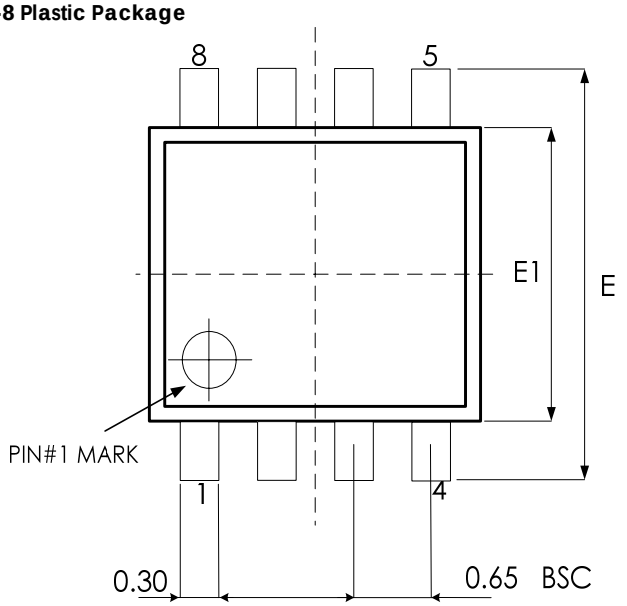
PSRR



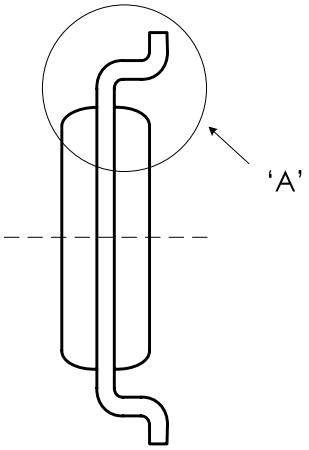
3.6V power supply with
square wave, 500mVp-p, f=217Hz, duty=20%

Physical Dimensions

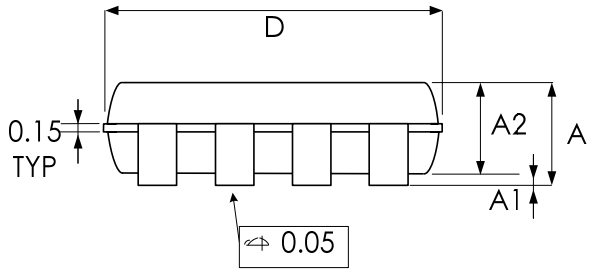
MSOP-8 Plastic Package



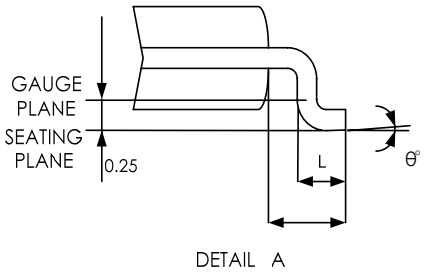
TOP VIEW



SIDE VIEW



BOTTOM VIEW

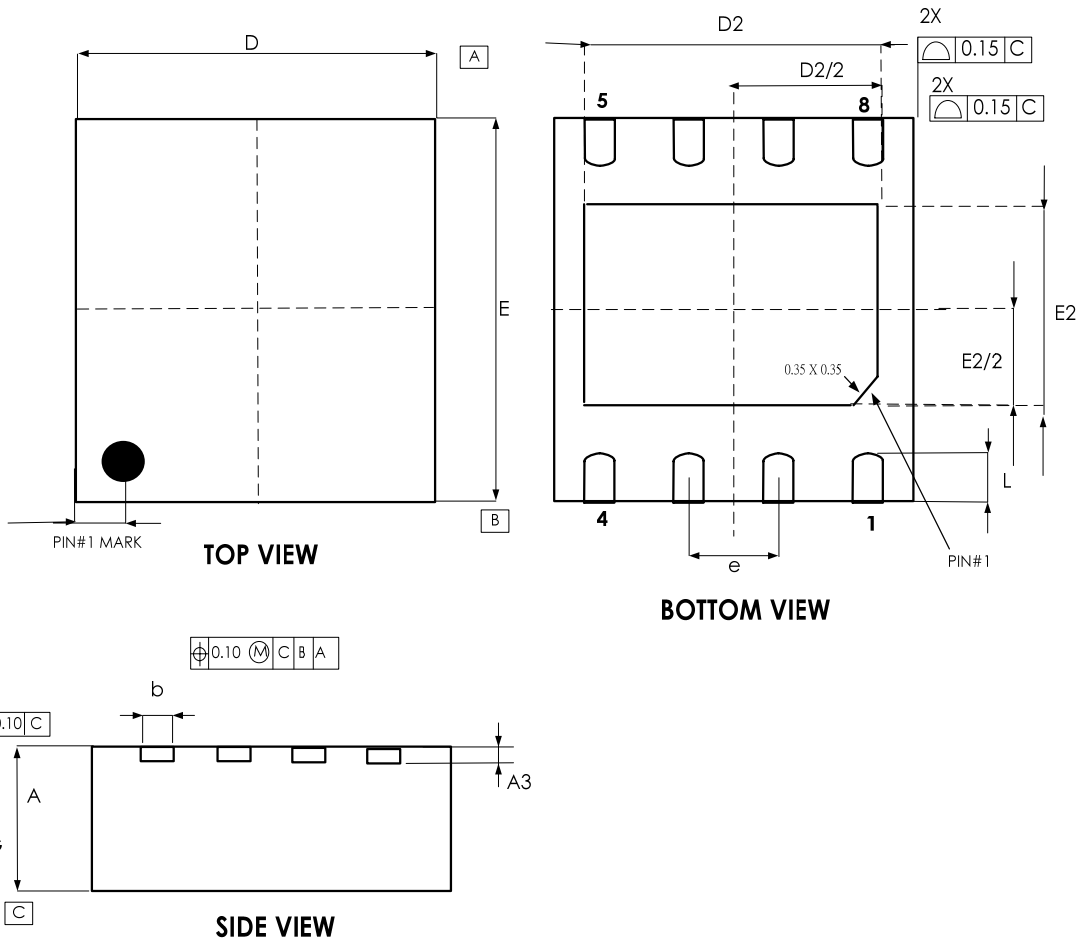


DETAIL A

SYMBOLS	MIN.	NOM.	MAX.
A	-	-	1.10
A1	0.00	-	0.15
A2	0.75	0.85	0.95
D	3.00 BSC		
E	4.90 BSC		
E1	3.00 BSC		
L	0.40	0.60	0.80
L1	0.95 REF		
θ°	0	-	8

UNIT: MM

TDFN-8



SYMBOL	COMMON					
	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.028	0.030	0.031
A3	0.203 BSC			0.008 BSC		
b	0.25	0.30	0.35	0.010	0.012	0.014
D	3.00 BSC			0.118BSC		
D2	1.60	-	2.50	0.063	-	0.098
E	3.00 BSC			0.118BSC		
E2	1.35	-	1.75	0.053	-	0.069
e	0.650 BSC			0.026 BSC		
L	0.30	0.40	0.50	0.012	0.016	0.020

Revision History

Revision	Date	Description
4.0	2009.07.15	EMP transferred from version 3.1
4.1	2010.10.07	Package dimension update

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