1W Fully Differential Audio Power Amplifier with Shutdown Select

General Description

The EMA1903 is a fully differential audio power amplifier primarily designed for demanding applications in mobile phones and other portable communication device applications. It is capable of delivering 1 watt of continuous average power to an 8Ω BTL load with less than 1% distortion (THD+N) from a $5V_{DC}$ power supply.

The EMA1903 does not require output coupling capacitors or bootstrap capacitors, and therefore is ideally suited for mobile phone and other low voltage applications where minimal power consumption is a primary requirement.

The EMA1903 features a low-power consumption shutdown mode. To facilitate this, shutdown may be enabled by either logic high or low depending on mode selection. Driving the shutdown mode pin either high or low enables the shutdown select pin to be driven in a likewise manner to enable Shutdown. Additionally, the EMA1903 features an internal thermal shutdown protection mechanism.

The EMA1903 contains advanced pop & click circuitry which eliminates noises which would otherwise occur during turn-on and turn-off transitions.

The EMA1903 is unity-gain stable and can be configured by external gain-setting resistors.

Key Specifications

• Improved PSRR at 217Hz	70dB(typ)
• Power Output at 5.0V,8Ω & 1% THD	1W(typ)
• Power Output at 2.6V,8Ω& 1% THD	300mW(typ)
• Shutdown current	0.1μA (typ)

Features

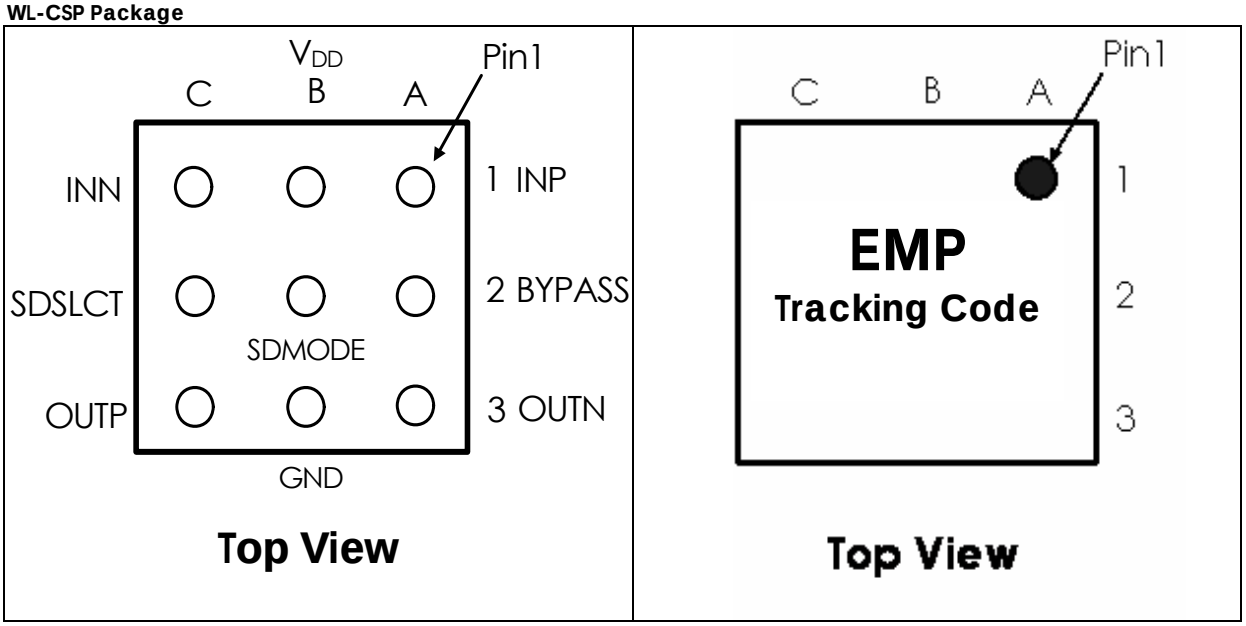
- Available in space-saving WL-CSP package
- Fully differential amplification
- Ultra low current shutdown mode
- Can drive capacitive loads up to 500 pF
- Improved pop & click circuitry eliminates noises during turn-on and turn-off transitions
- 2.2 - 5.5V operation
- No output coupling capacitors, snubber networks or bootstrap capacitors required
- Unity-gain stable
- External gain configuration capability
- Shutdown high or low selectivity
- High CMRR

Applications

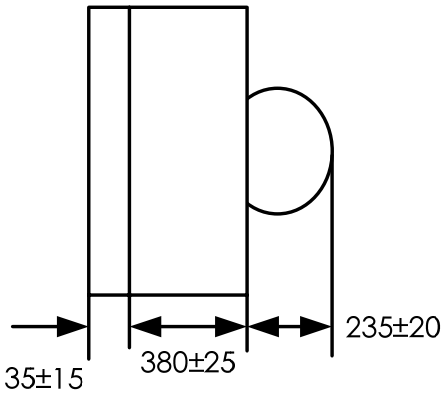
- Mobile phones
- PDAs
- Portable electronic devices

Connection Diagram

WL-CSP Package



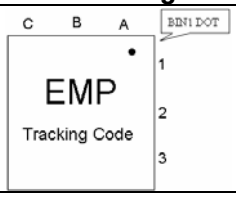
Remark: (Unit: μm)



EMA1903-50WL09GRR/NRR

50	5.0V Operation
WL09	WL_CSP 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

Order, Mark & Packing Information

Package	Product ID	Marking	Packing
WL-CSP	EMA1903-50WL09GRR		3K units Tape & Reel

Typical Application

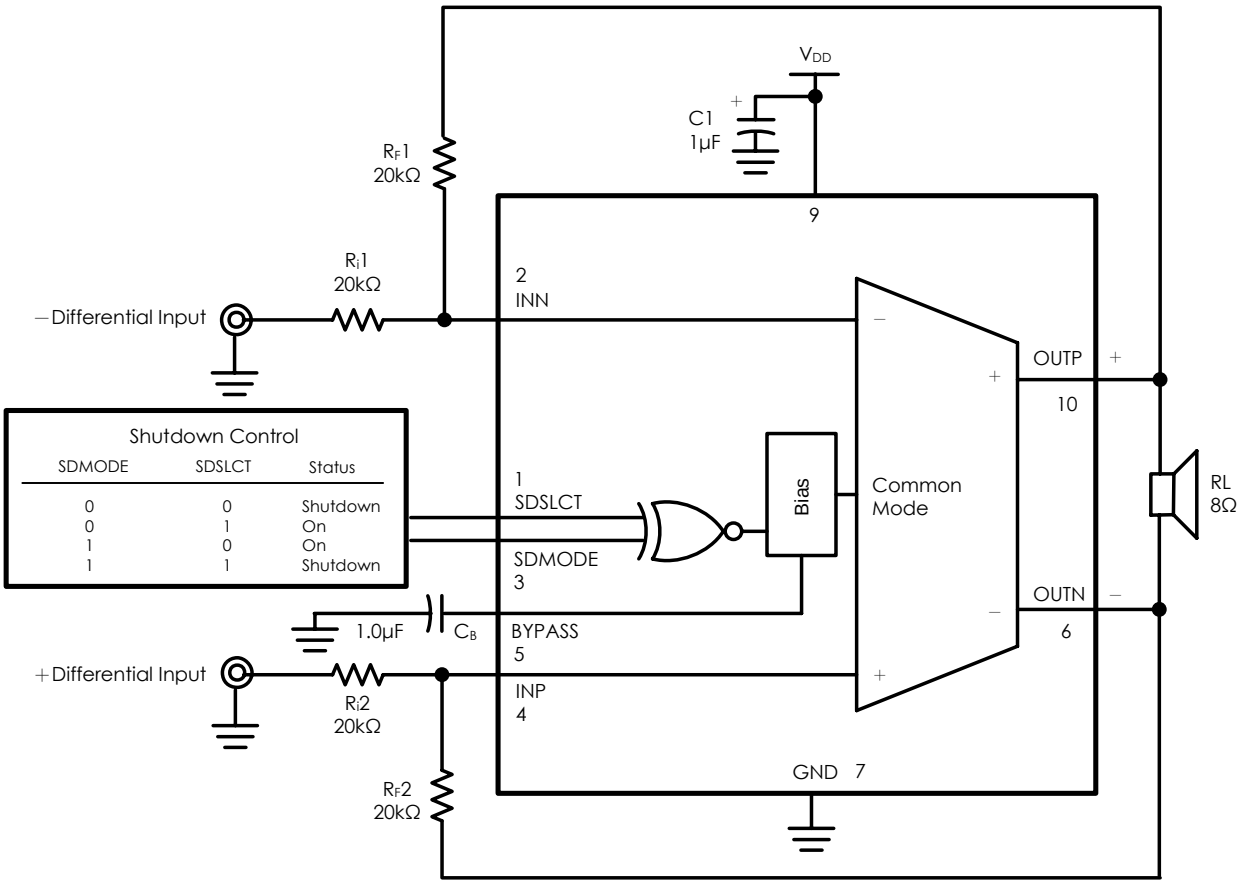


FIGURE 1. Typical Audio Amplifier Application Circuit

Absolute Maximum Ratings

Supply Voltage	6.0V	Thermal Resistance	
Storage Temperature	-65°C to +150°C	θ_{JA} (WL-CSP)	180°C/W
Input Voltage	-0.3V to VDD +0.3V	Operating Ratings	
Power Dissipation	Internally Limited	Temperature Range	-40°C ≦ TA ≦ 85°C
ESD Susceptibility	HBM 1.5KV 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.

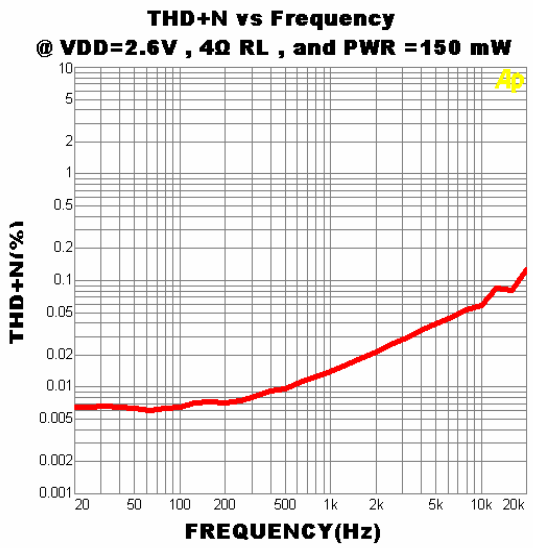
Symbol	Parameter	Conditions	Conditions		Units (Limits)
			Typical	Limit	
I_{DD}	Quiescent Power Supply Current	V_{IN} = 0V, Io = 0A	1.6	4	mA (max)
I_{SD}	Shutdown Current	V_{SDNB}=GND	0.1	1	µA (max)
P_O	Output Power	THD = 1 %(max), f = 1kHz	1	0.9	W (min)
THD+N	Total Harmonic Distortion + Noise	P_O = 0.4 Wrms ; f = 1kHz	0.008		%
PSRR	Power Supply Rejection Ratio	V_{ripple} = 200mV sine p-p			dB
		f = 217Hz (Un-terminated input)	73		
		f = 1kHz (Un-terminated input)	73		
		f = 217Hz (10Ω terminated input)	70		
		f = 1kHz (10Ω terminated input)	70		
CMRR	Common Mode Rejection Ratio	f = 217Hz	64		dB

Electrical Characteristics V_{DD} = 2.6V

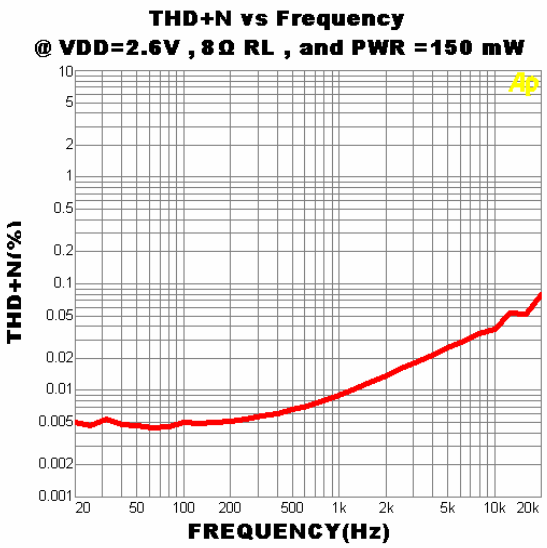
The following specifications apply for V_{DD} = 2.6V,A_V = 1 and R_L = 8Ω unless otherwise specified. Limits apply for T_A = 25°C.

Symbol	Parameter	Conditions	Conditions		Units (Limits)
			Typical	Limit	
I_{DD}	Quiescent Power Supply Current	V_{IN} = 0V, Io = 0A	1.3	2	mA (max)
I_{SD}	Shutdown Current	V_{SDNB}=GND	0.1	1	µA (max)
P_O	Output Power	THD = 1 %(max), f = 1kHz R_L = 4Ω R_L = 8Ω	 0.4 0.3	 0.38 0.28	W (min)
THD+N	Total Harmonic Distortion + Noise	P_O = 0.3 Wrms ; f = 1kHz, 4Ω	0.02		%
		P_O = 0.25 Wrms ; f = 1kHz, 8Ω	0.01		
PSRR	Power Supply Rejection Ratio	V_{ripple} = 200mV sine p-p			dB
		f = 217Hz (Un-terminated input)	73		
		f = 1kHz (Un-terminated input)	73		
		f = 217Hz (10Ω terminated input)	65		
		f = 1kHz (10Ω terminated input)	65		
CMRR	Common Mode Rejection Ratio	f = 217Hz	60		dB

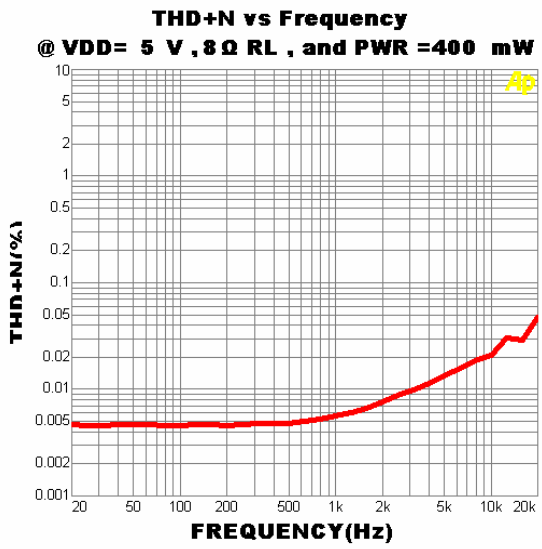
Typical Performance Characteristics



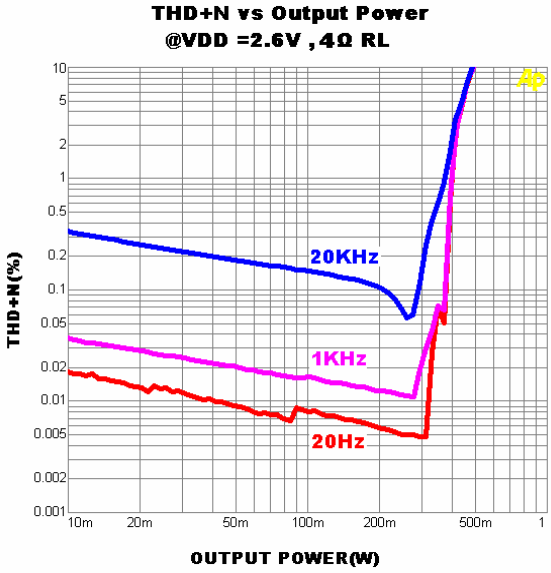
THD + Noise vs Frequency
@ V_{DD} = 2.6V, R_L = 4Ω, Po = 150mW



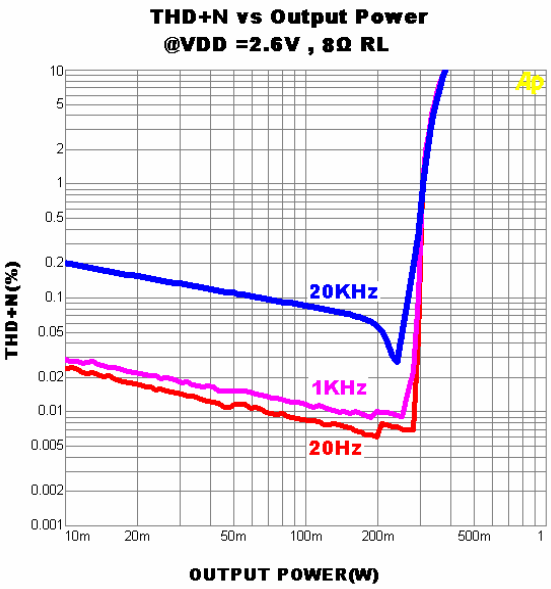
THD + Noise vs Frequency
@ V_{DD} =2.6V, R_L = 8Ω, Po = 150mW



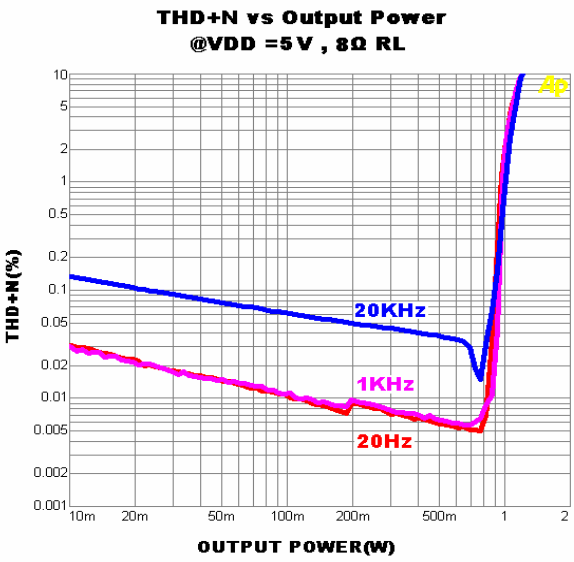
THD + Noise vs Frequency
@ V_{DD} = 5V, R_L = 8Ω, Po = 400mW



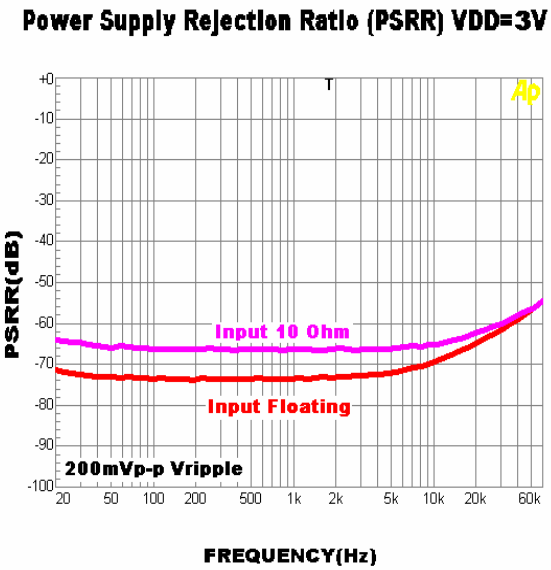
THD + Noise vs Output Power
@ V_{DD} =2.6V, R_L = 4Ω, BW=60kHz, A_V = 1



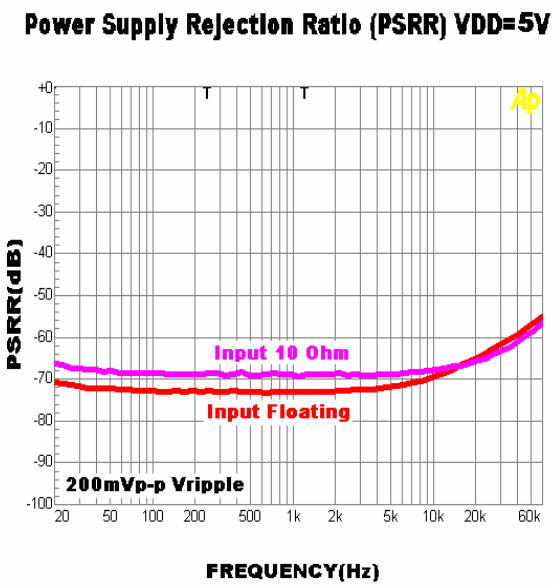
THD + Noise vs Output Power
@ V_{DD} =2.6V, R_L = 8Ω, BW=60kHz, A_V = 1



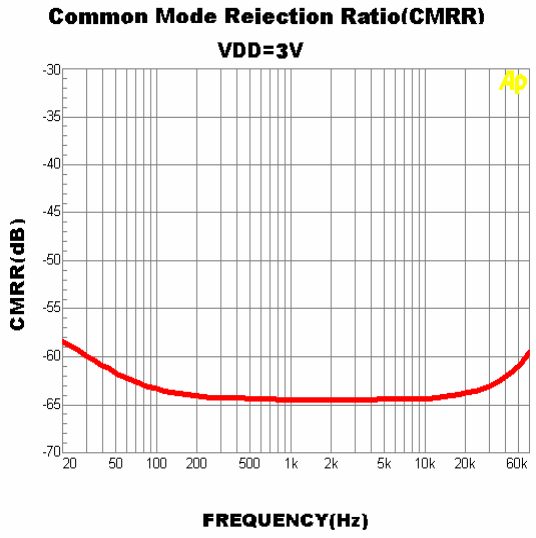
THD + Noise vs Output Power
@ V_{DD} =5V, R_L = 8Ω, BW=60kHz, A_V = 1



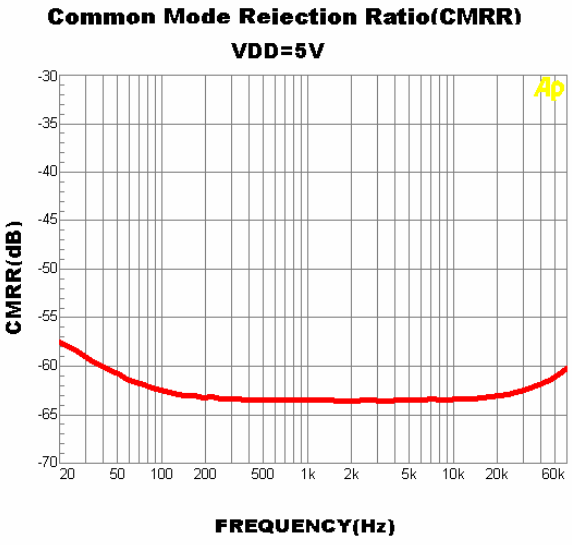
PSRR vs Frequency
@ V_{DD} =3V, R_L = 8Ω



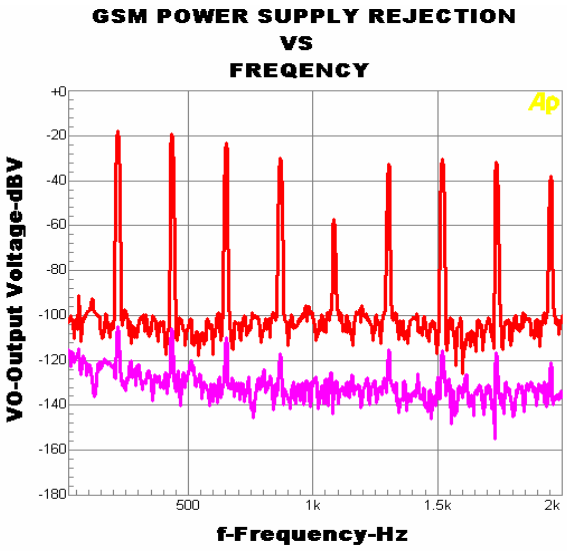
PSRR vs Frequency
@ V_{DD} =5V, R_L = 8Ω



CMRR vs Frequency
@ V_{DD} =3V

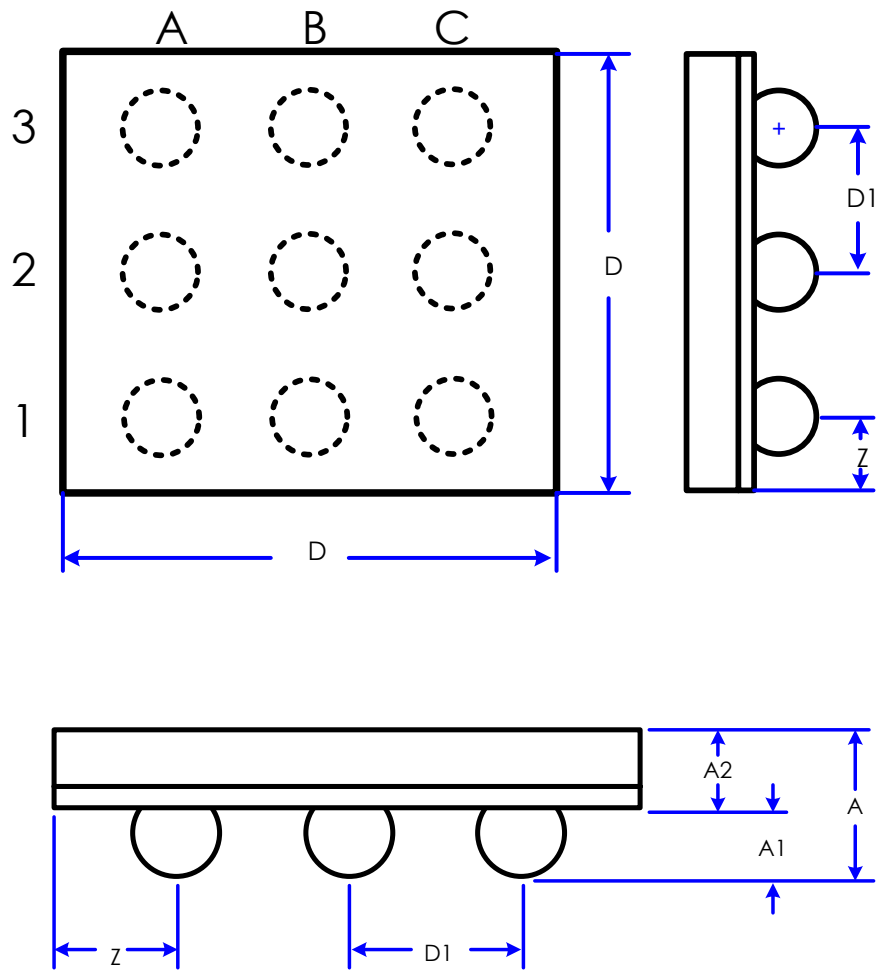


CMRR vs Frequency
@ V_{DD} =5V



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

Physical Dimensions (WL-CSP Package)



Symbol	Dimensions in millimeter		
	min.	typ.	max.
A	0.585	0.650	0.715
A1	0.210	0.235	0.260
A2	0.355	0.380	0.405
D	1.420	1.460	1.500
D1		0.5	
Z		0.23	

Revision History

Revision	Date	Description
2.0	2009.05.08	EMP transferred from version 1.0

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