1.2W Fully Differential Audio Power Amplifier with Shutdown Select

General Description

The EMA1003 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 1.2 watt of continuous average power to an 8Ω BTL load with less than 1% distortion (THD+N) from a 5VDC power supply.

The EMA1003 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 EMA1003 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 EMA1003 features an internal thermal shutdown protection mechanism.

The EMA1003 contains advanced pop & click circuitry which eliminates noises which would otherwise occur during turn-on and turn-off transitions.

The EMA1003 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	1.2W(typ)
• Power Output at 2.6V,8Ω & 1% THD	300mW(typ)
• Shutdown current	0.1μA (typ)

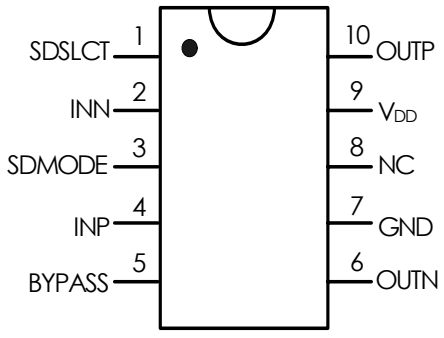
Features

- Fully differential amplification
- Available packages MSOP
- 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

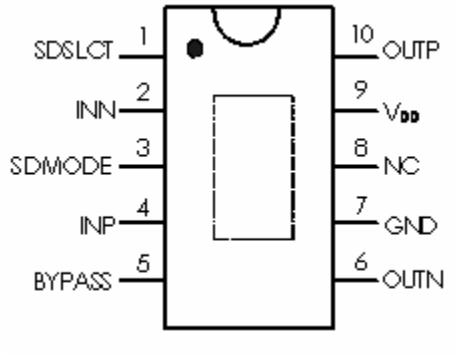


MSOP-10 Package

Order information

EMA1003-50MA10GRR/NRR

50	5.0V Operation
MA10	MSOP-10 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

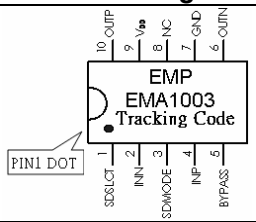
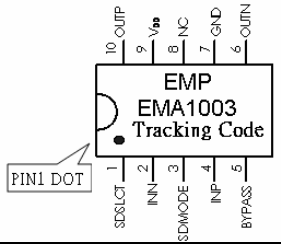


MSOP-10FD (Exposed Pad)Package

EMA1003-50ME10GRR

50	5.0V Operation
ME10	MSOP-10FD (Exposed Pad)Package
GRR	RoHS(Pb free) Commercial Grade Temperature Rating: -40 to 85°C Package in Tape & Reel
NRR	RoHS & Halogen free (By Request)

Order, Mark & Packing Information

Package	Marking	Product ID	Packing
MSOP-10		EMA1003-50MA10GRR	3K units Tape & Reel
MSOP-10FD (Exposed Pad)		By request	3K units Tape & Reel

Typical Application

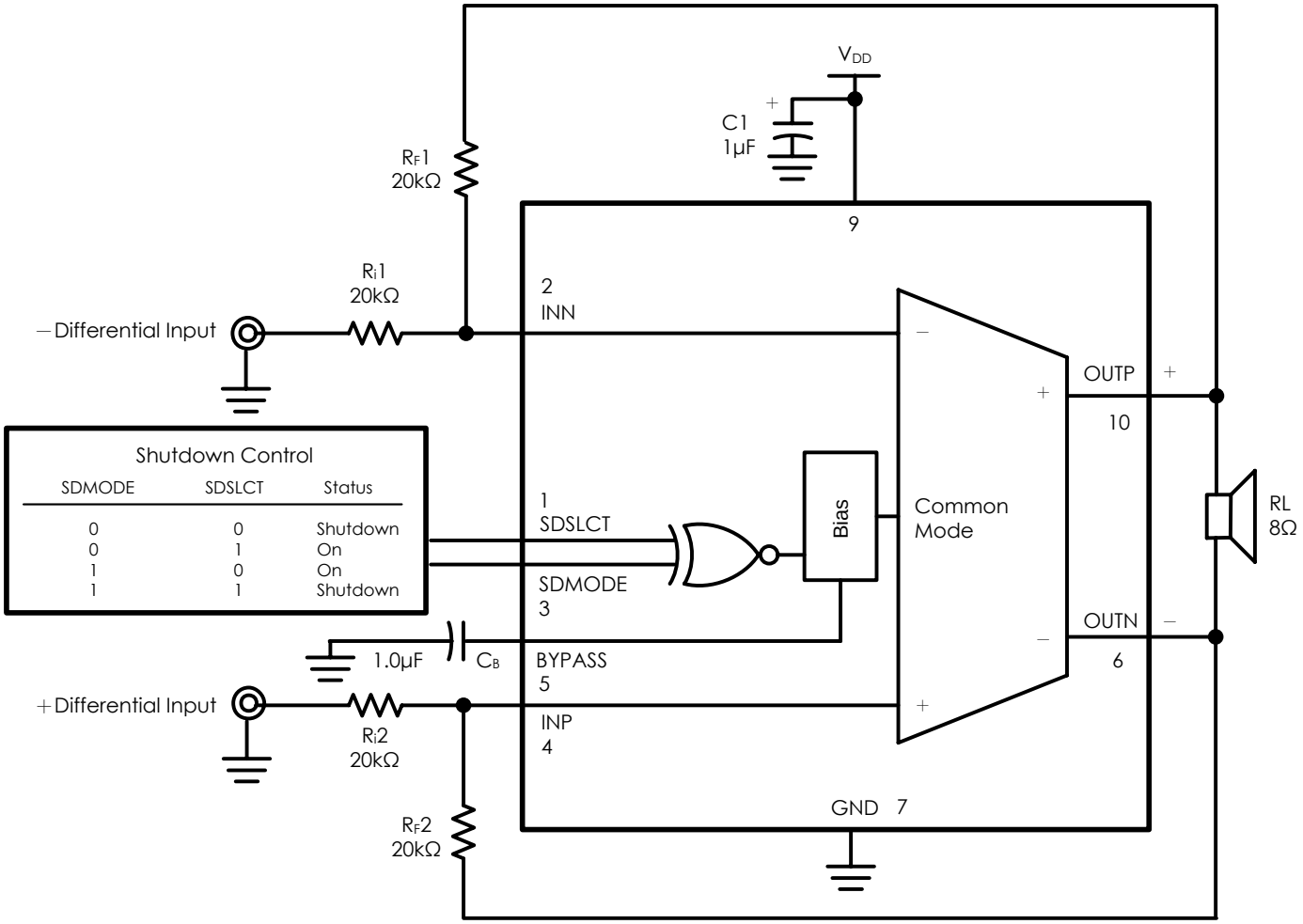


FIGURE 1. Typical Audio Amplifier Application Circuit

Absolute Maximum Ratings

Supply Voltage	6.0V	Thermal Resistance	
Storage Temperature	-65°C to +150°C	θ_{JA} (MSOP)	190°C/W
Input Voltage	-0.3V to VDD +0.3V		
Power Dissipation	Internally Limited	Operating Ratings	
ESD Susceptibility	HBM 2KV	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.

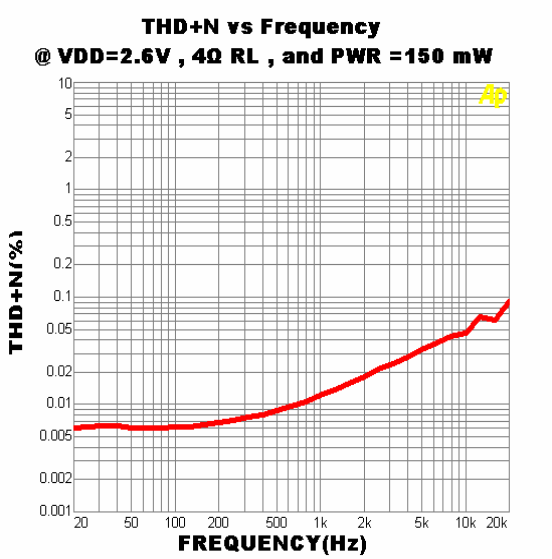
Symbol	Parameter	Conditions	Conditions		Units (Limits)
			Typical	Limit	
I_{DD}	Quiescent Power Supply Current	V_{IN} = 0V, Io = 0A	1.5	3	mA (max)
I_{SD}	Shutdown Current	V_{SDNB}=GND	0.1	1	µA (max)
P_O	Output Power	THD = 1 %(max), f = 1kHz R_L = 4Ω R_L = 8Ω	 1.7 1.2	 1.5 1	W (min)
THD+N	Total Harmonic Distortion + Noise	P_O = 0.8 Wrms ; f = 1kHz, 4Ω	0.008		%
		P_O = 0.4 Wrms ; f = 1kHz, 8Ω	0.008		
PSRR	Power Supply Rejection Ratio	V_{ripple} = 200mV sine p-p			dB
		f = 217Hz (Un-terminated input)	70		
		f = 1kHz (Un-terminated input)	70		
		f = 217Hz (10Ωterminated input)	70		
		f = 1kHz (10Ωterminated input)	70		
CMRR	Common Mode Rejection Ratio	f = 217Hz	57		dB

Electrical Characteristics V_{DD} = 2.6V

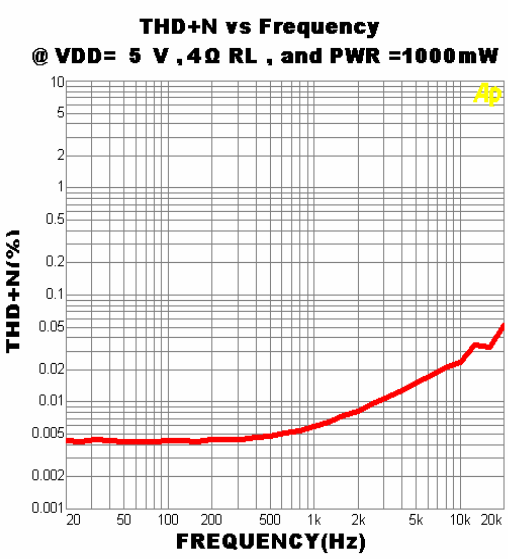
The following specifications apply for V_{DD} = 2.6V ,A_V = 1 and R_L = 8Ω unless otherwise specified. Limits apply for T_A = 25°C.

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	 0.45 0.3	 0.4 0.28	W (min)
THD+N	Total Harmonic Distortion + Noise	P_O = 0.35 Wrms ; f = 1kHz, 4Ω	0.015		%
		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)	70		
		f = 1kHz (Un-terminated input)	70		
		f = 217Hz (10Ωterminated input)	60		
		f = 1kHz (10Ωterminated input)	60		
CMRR	Common Mode Rejection Ratio	f = 217Hz	55		dB

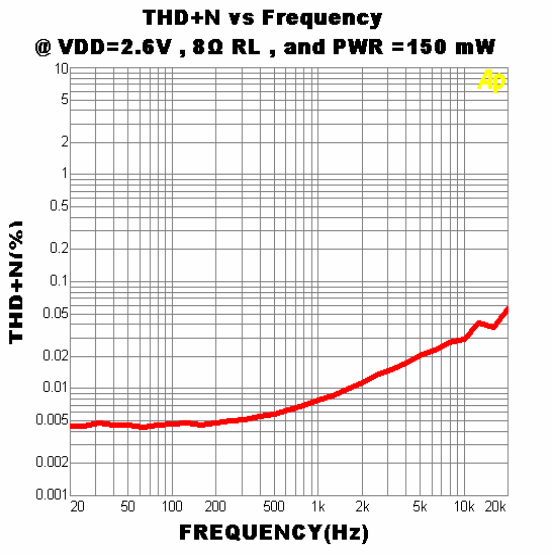
Typical Performance Characteristics



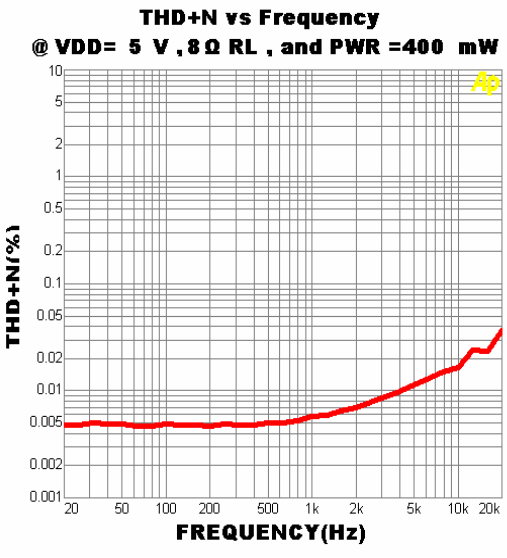
THD + Noise vs Frequency
@ V_{DD} = 2.6V, R_L = 4Ω, Po = 150mW



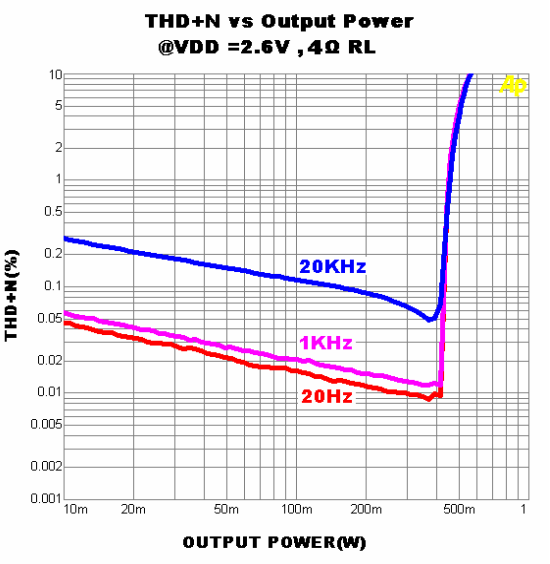
THD + Noise vs Frequency
@ V_{DD} = 5V, R_L = 4Ω, Po = 1W



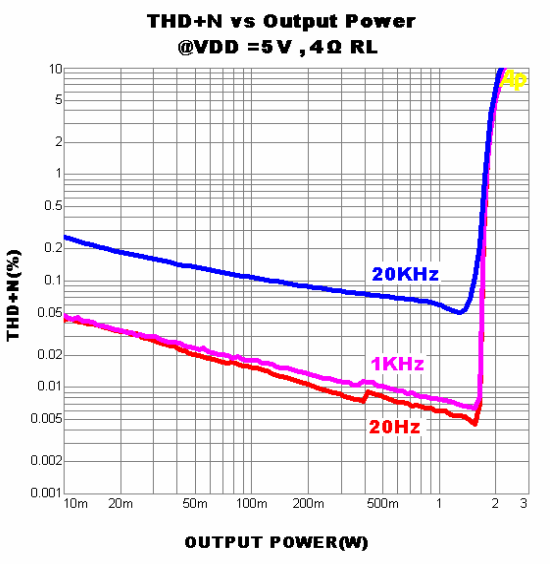
THD + Noise vs Frequency
@ V_{DD} = 2.6V, R_L = 8Ω, Po = 150mW



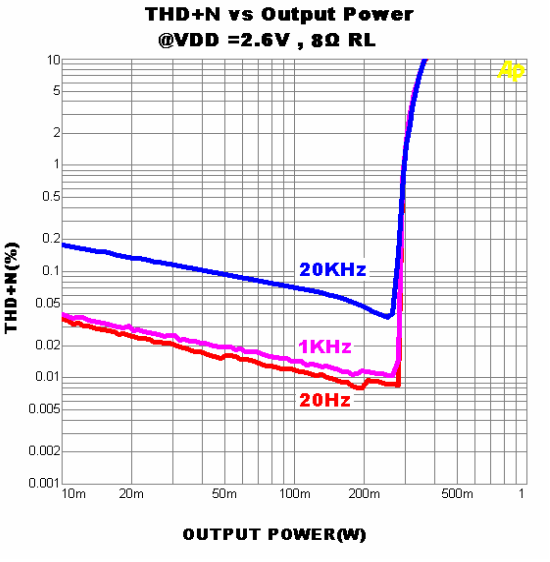
THD + Noise vs Frequency
@ V_{DD} = 5V, R_L =8Ω, Po = 400mW



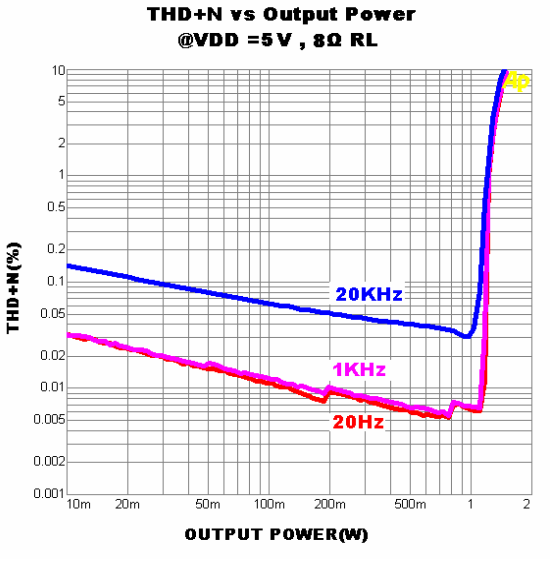
THD + Noise vs Output Power
@ V_{DD} =2.6V, R_L = 4Ω, BW=60kHz, A_V = 1



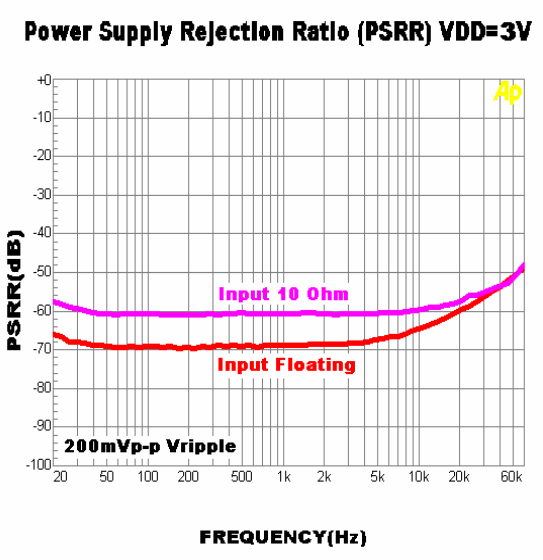
THD + Noise vs Output Power
@ V_{DD} =5V, R_L = 4Ω, BW=60kHz, A_V = 1



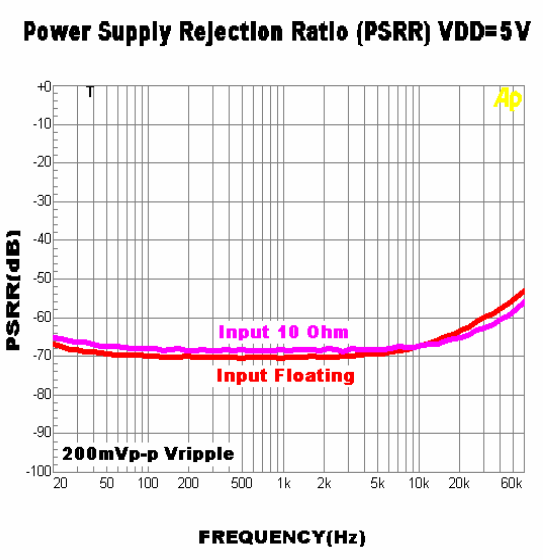
THD + Noise vs Output Power
@ V_{DD} =2.6V, R_L = 8Ω, BW=60kHz, A_V = 1



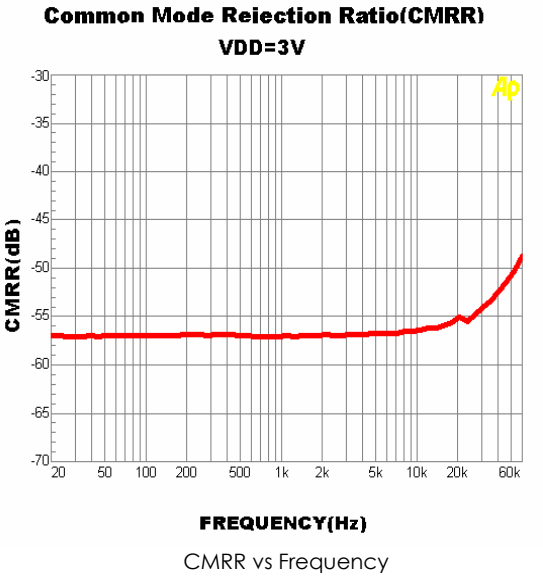
THD + Noise vs Output Power
@ V_{DD} =5V, R_L = 8Ω, BW=60kHz, A_V = 1



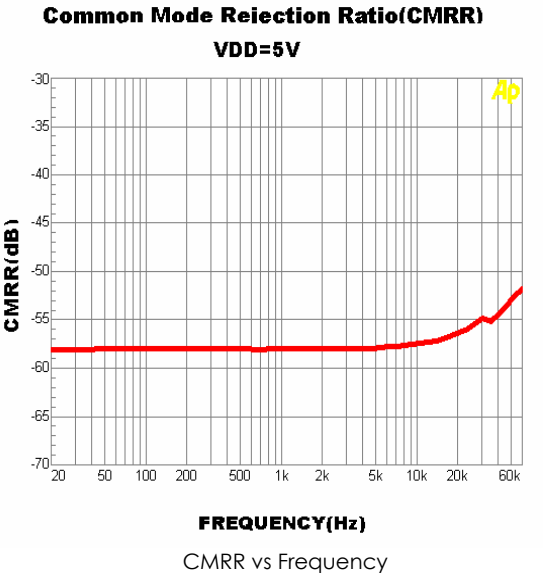
PSRR vs Frequency
@ V_{DD} =3V, R_L = 8Ω



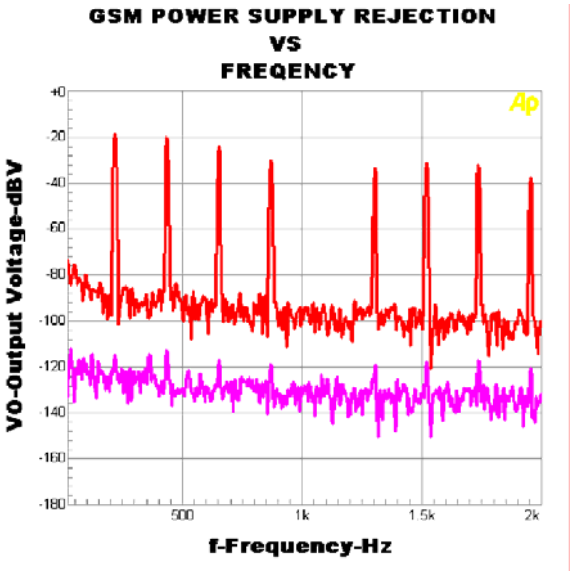
PSRR vs Frequency
@ V_{DD} =2.6V, R_L = 8Ω



CMRR vs Frequency
@ V_{DD} =3V



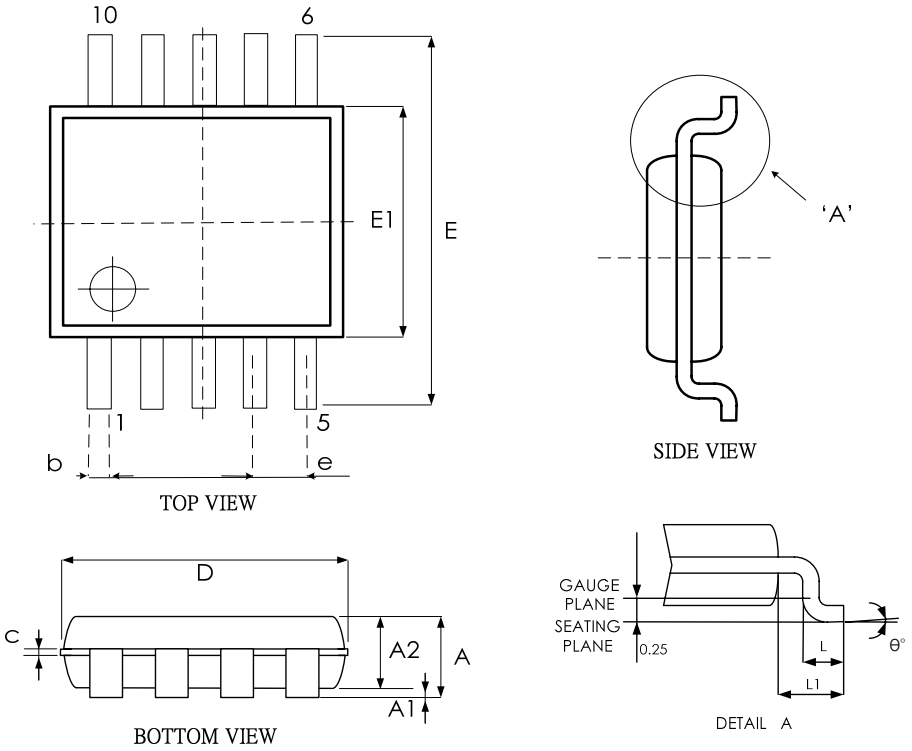
CMRR vs Frequency
@ V_{DD} =5V



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

Physical Dimensions

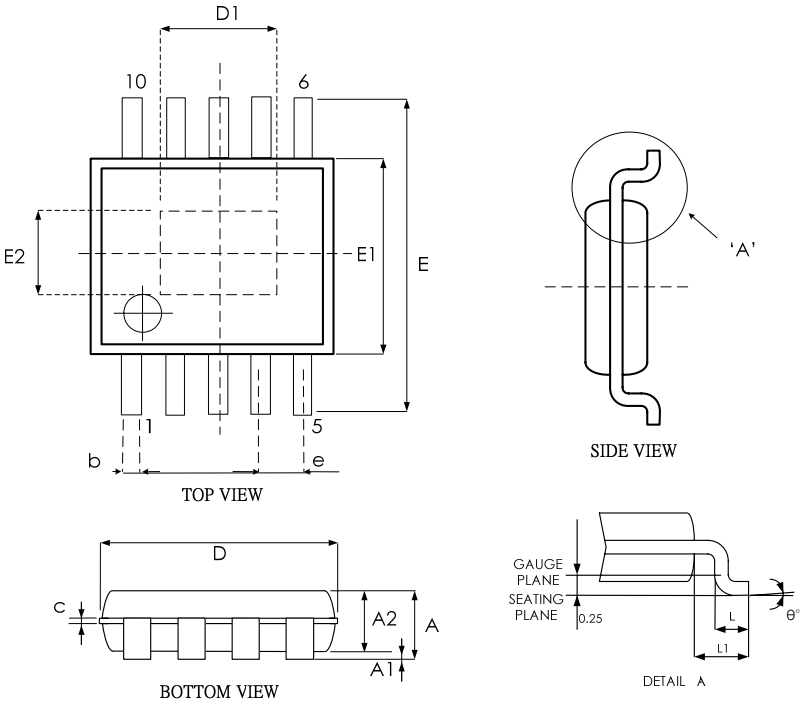
MSOP-10



SYMBPLS	MIN.	NOM.	MAX.
A	—	—	1.10
A1	0.00	—	0.15
A2	0.75	0.85	0.95
b	0.17	—	0.27
c	0.08	—	0.23
D	3.00 BSC		
E	4.90 BSC		
E1	3.00 BSC		
e	0.50 BSC		
L	0.40	0.60	0.80
L1	0.95 BSC		
θ°	0.00	—	8.00

UNIT: MM

MSOP-10FD (Exposed Pad)



SYMBPLS	MIN.	NOM.	MAX.
A	—	—	1.10
A1	0.00	—	0.15
A2	0.75	0.85	0.95
b	0.17	—	0.27
c	0.08	—	0.23
D	3.00 BSC		
E	4.90 BSC		
E1	3.00 BSC		
e	0.50 BSC		
L	0.40	0.60	0.80
L1	0.95 BSC		
θ°	0.00	—	8.00

PAD SIZE	E2	D1
75X70E	1715 REF	1.600 REF

UNIT: MM

Revision History

Revision	Date	Description
2.0	2009.05.05	EMP transferred from version 1.1

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