16-Bits Stereo Audio DAC
Low Power Consumption
Low Voltage, Excellent PSRR

FEATURES

- Operation range: 2.7V~6.5V.
- Excellent Power Supply Rejection Ratio(PSRR).
- Low power consumption
- Low distortion.
- No zero crossing distortion.
- Wide dynamic range(16-bit resolution).
- Voltage Output .
- Cost efficient.
- Fast setting time permits 2*, 4*, and 8* oversampling (serial input) or double speed operation at 4* oversampling .
- Output voltage swing is proportional to supply voltage (V_{OPP}=V_{DD}/2).
- Audio Format：Right Justified.
- Space saving package SOP8.
- Cost efficient

APPLICATIONS

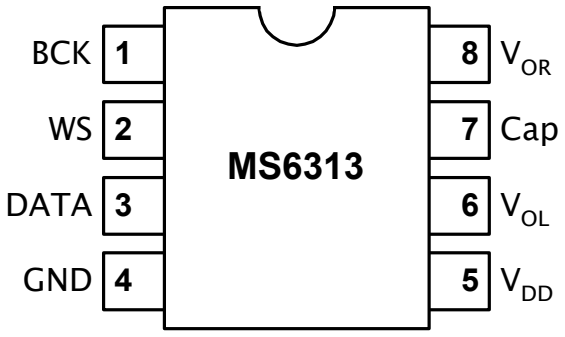
- Multimedia system
- MP3, PDA, Portable Digital Audio.

DESCRIPTION

The MS6313 is a 16-bit voltage-output Digital-to-Analog Converter(DAC). The MS6313 is with excellent Power Supply Rejection Ratio(PSRR). It is fabricated in a 0.8μm CMOS process and features extremely low power dissipation, small package size and easy application. The accuracy of the matched coarse current sources, combined with the unique symmetrical decoding method, preclude zero-crossing distortion and ensures high quality audio reproduction. These unique features, combined with its exceptional performance, make the MS6313 ideally suited for use in digital audio equipment. MS6313 is pin and function compatible with the Philips, TDA1311.

PIN CONFIGURATION

Symbol	Pin	Description
BCK	1	bit clock input
WS	2	word select input
DATA	3	data input
GND	4	ground
V_{DD}	5	positive supply voltage
V_{OL}	6	left channel output
Cap	7	Cap
V_{OR}	8	right channel output



Pin configuration

BLOCK DIAGRAM

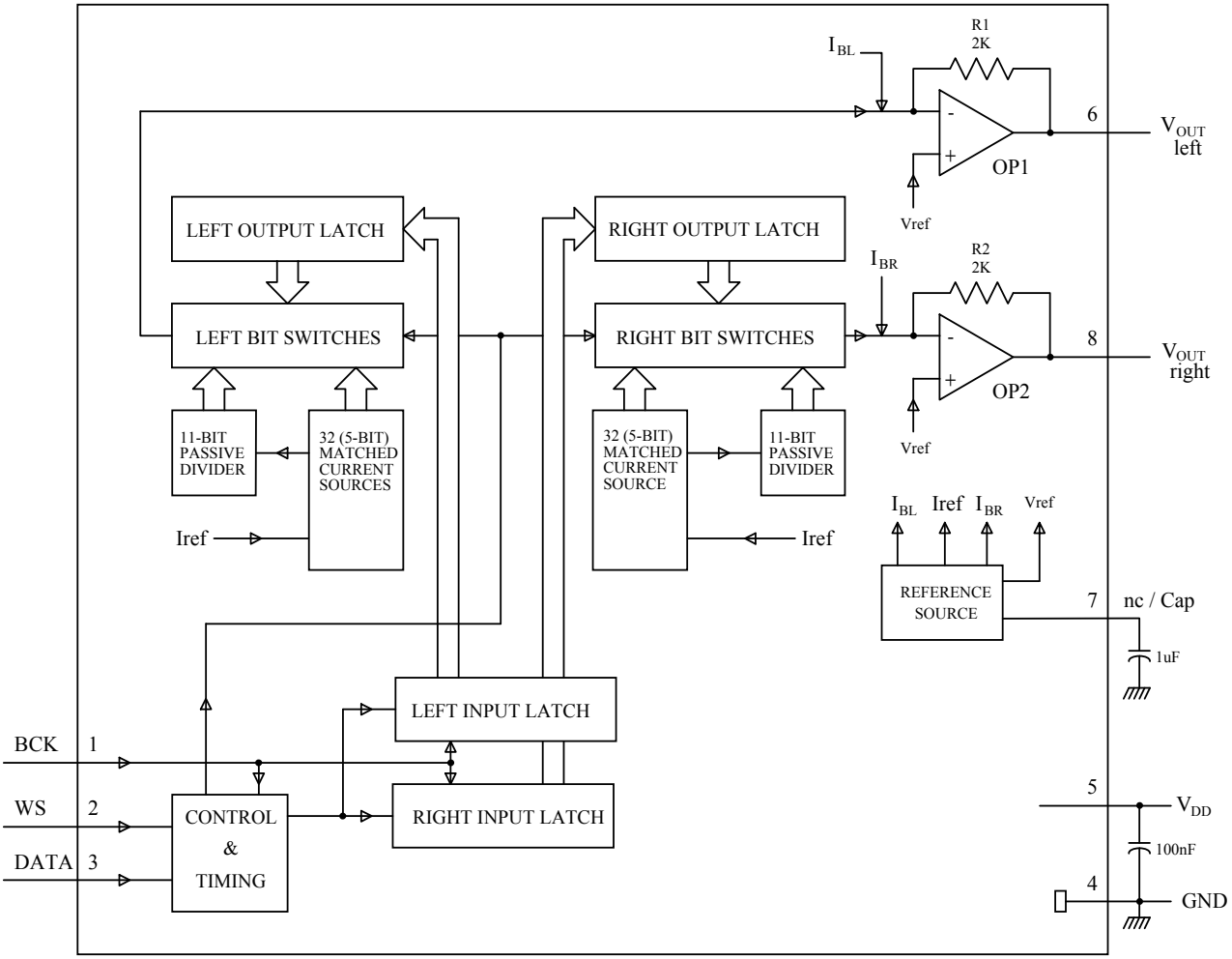


Fig.1 Block diagram.

ORDERING INFORMATION

Package	Part number	Marking	Transport Media
8-Pin SOP (lead free)	MS6313ASGTR	MS6313ASG	2.5k Units Tape and Reel
8-Pin SOP (lead free)	MS6313ASGU	MS6313ASG	100 Units Tube

RoHS Compliance

LIMITING VALUES

Symbol	Parameter	Rating	Unit
V_{DD}	Positive Supply Voltage	6.5	V
T_{STG}	Storage Temperature Range	-65 to 150	℃
T_A	Operating Ambient Temperature Range	-40 to 85	℃
T_J	Maximum Junction Temperature	150	℃
T_S	Soldering Temperature, 10 seconds	260	℃
T_{ESD}	Electrostatic Handling	-2000 to 2000	V
R_{THJA}	Thermal Resistance from Junction to Ambient in Free Air SOP8	210	℃/W

OPERATING RATINGS

Symbol	Parameter	Min	Typ	Max	Unit
V_{DD}	Supply Voltage	2.7	-	6.5	V

5V ELECTRICAL CHARACTERISTICS

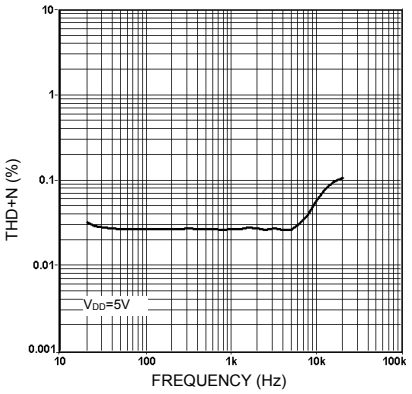
(Ta=25℃, V_{DD}=5V, f=1kHz, Cap=1uF; unless otherwise specified)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
DC Characteristics						
V_{DC}	Output DC level		2.45	2.5	2.55	V
V_{FS}	Full scale output voltage	V_{FS}=0.4V_{DD}	1.8	2.0	2.2	Vpp
I_Q	Quiescent current	At code 0000H	5.9	7	8.1	mA
I_{FS}	Maximum operation current	V_{FS}=0.4V_{DD}	6.1	7.2	8.4	mA
CS	Channel separation		80	85	-	dB
l dIo l	Unbalance Between Outputs	note 1	-	0.2	0.3	dB
l td l	Time Delay Between Outputs		-	±0.2	-	μs
AC Characteristics						
Res	Resolution		-	-	16	bits
THD+N	Total harmonic distortion plus noise		-	-68	-63	dB
			-	0.04	0.07	%
S/N	Signal-to-noise ratio	a-weighted at code 0000H	86	92	-	dB

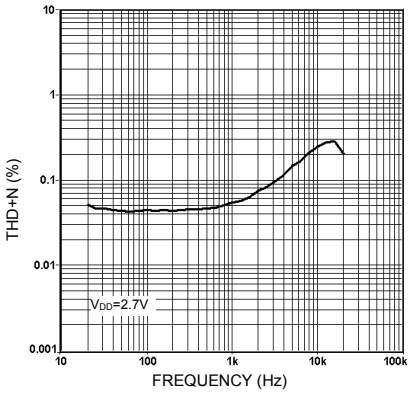
Note : 1.Measured with 1kHz sinewave generated at sampling rate of 192 kHz.

TYPICAL PERFORMANCE CHARACTERISTICS

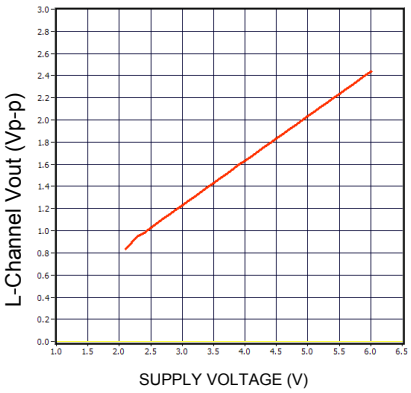
(Ta=25℃, f=1kHz, Cap=1uF, sampling rate=4fs; unless otherwise specified,)



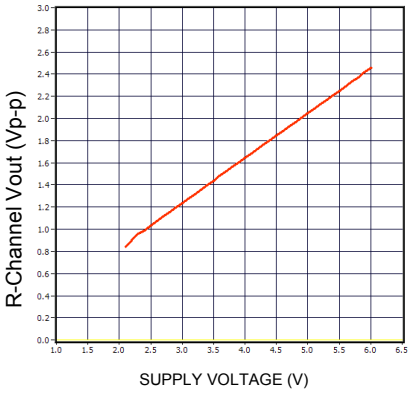
THD+N vs. frequency



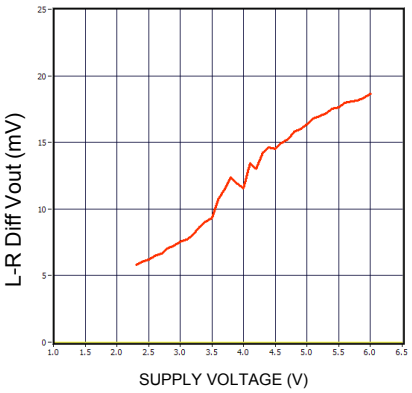
THD+N vs. frequency



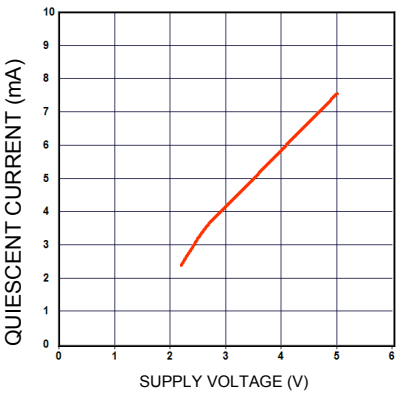
L-Vo vs supply voltage



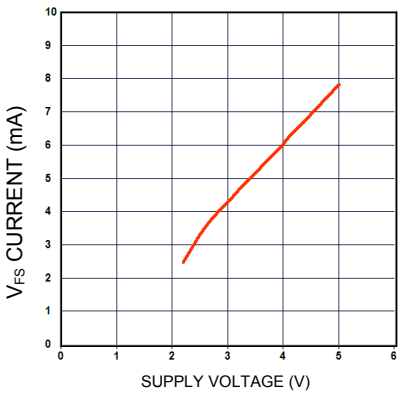
R-Vo vs supply voltage



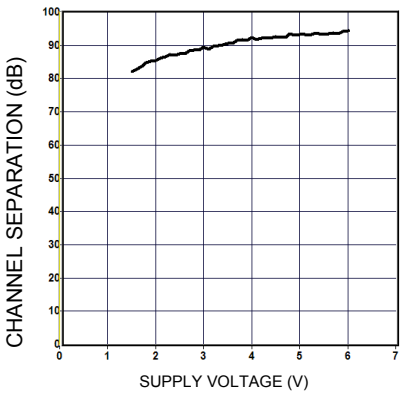
L-R Diff vs. supply voltage



Quiescent current vs. supply voltage



V_{FS} current vs. supply voltage



Channel separation vs. supply voltage

TIMING AND DATA FORMAT

The MS6313 accepts input serial data formats of 16-bit word length. Left and right data words are time multiplexed. The MSB (bit 1) must always be first. The format of data input is shown in Figs. 2 and 3. With a HIGH level on the word select input (WS), data is placed in the left input register and with LOW level on the WS input, data is placed in the right register (Fig. 1). The data in the input registers are simultaneously latched in the output registers which control the bit switches. Internal bias currents I_{BL} and I_{BR} are each added to the full scale output current I_{FS} in order to achieve the maximum dynamic range at the outputs of OP1 and OP2(Fig. 1). The reference voltage Vref (Fig. 1) is approximately 2/3 V_{DD}. In this way the maximum dynamic range is achieved over the entire power supply range.

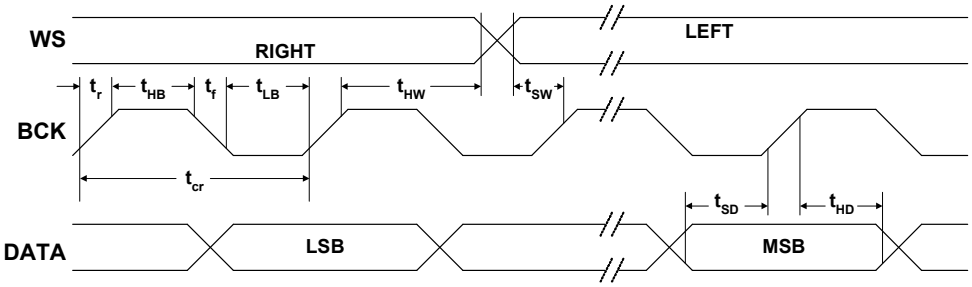


Fig.2 Timing and input signals.

Data format (BCK, WS, DATA)

Symbol	Parameter	Conditions	Min	Typ.	Max	Unit
V_{IL}	Input LOW level		-	-	0.8	V
V_{IH}	Input HIGH level		2	-	-	V
$\lvert I_{IL} \rvert$	Input Leakage Current LOW	V_I=0.8V	-	-	10	μA
$\lvert I_{IH} \rvert$	Input Leakage Current HIGH	V_I=2.4V	-	-	10	μA
f_{BCK}	Input Clock Frequency		-	-	18.4	MHz
BR	Bit Rate Data Input		-	-	18.4	Mbits/s
f_{WS}	Word Select Input		-	-	384	kHz
t_r	Rise Time		-	-	12	ns
t_f	Fall Time		-	-	12	ns
t_{Cr}	Bit Clock Cycle Time		54	-	-	ns
t_{HB}	Bit Clock High Time		15	-	-	ns
t_{LB}	Bit Clock Low Time		15	-	-	ns
t_{SD}	Data Set-up Time		12	-	-	ns
t_{HD}	Data Hold Time to Bit Clock		2	-	-	ns
t_{HW}	Word Select Hold Time		2	-	-	ns
t_{SW}	Word Select Set-up Time		12	-	-	ns

Right justified format

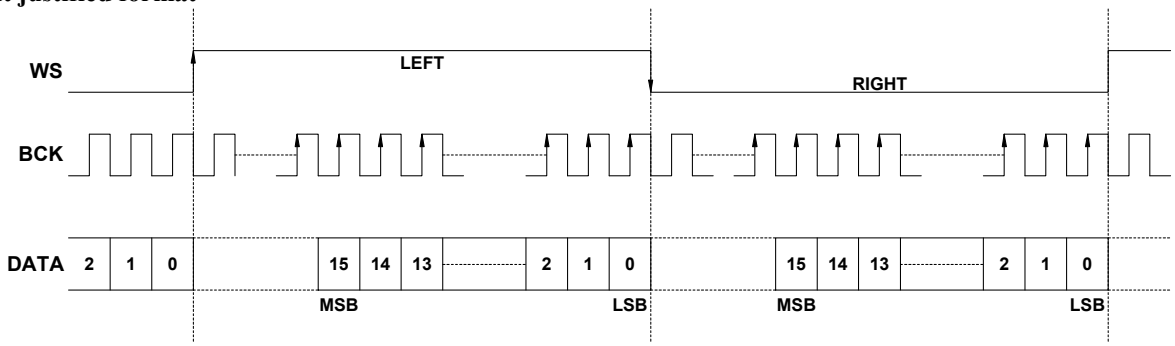


Fig.3 Right justified format

APPLICATION INFORMATION

MP3 digital to analog converting solution

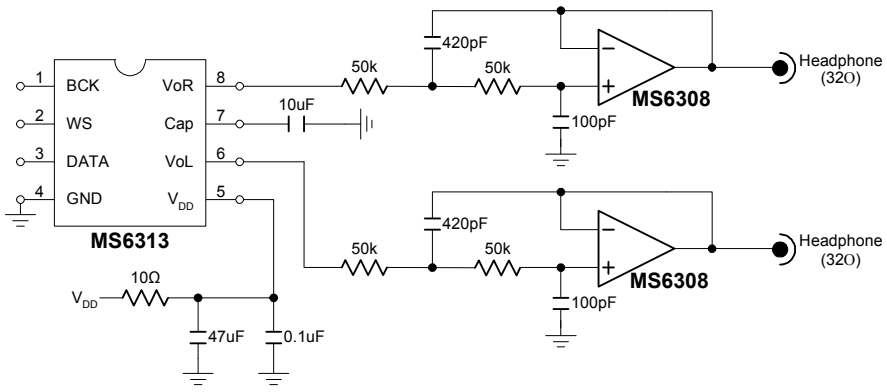


Fig.4 Example of a 2nd order filter application.

MP3 digital to analog converting solution.

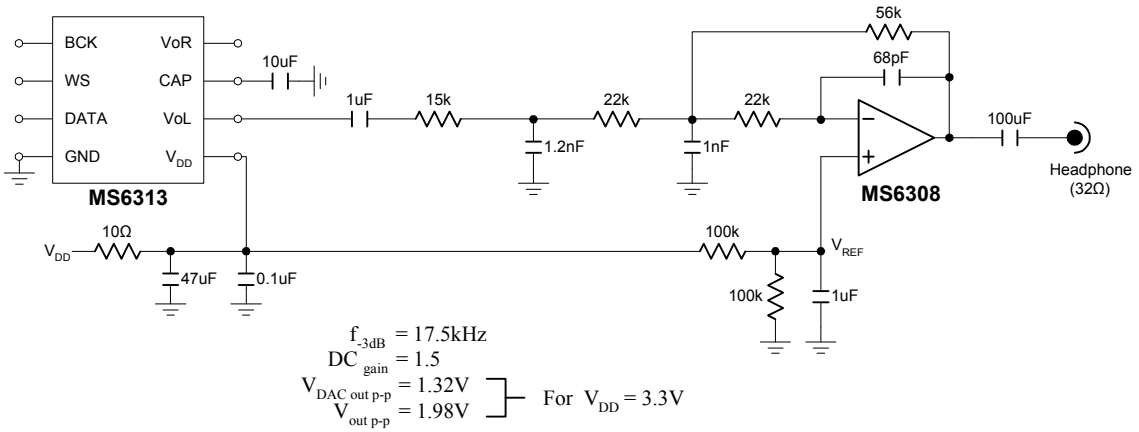
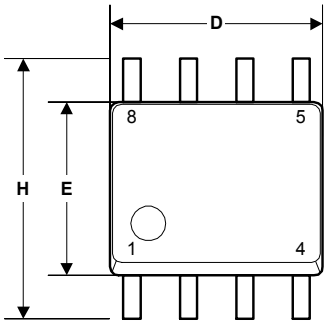
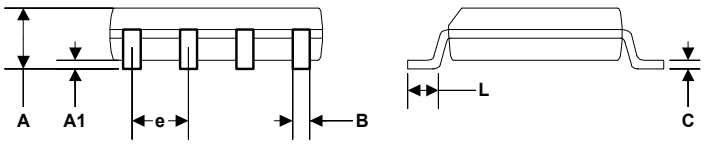


Fig.5 A third order lowpass filter (Smoothing filter) for DAC output

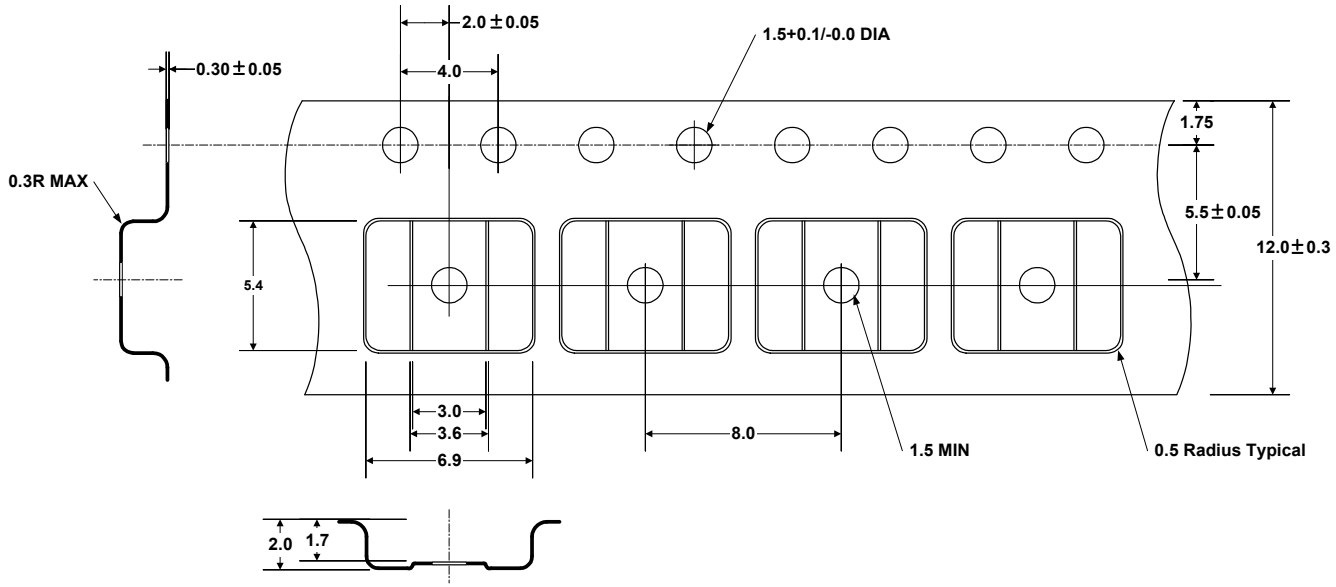
EXTERNAL DIMENSIONS



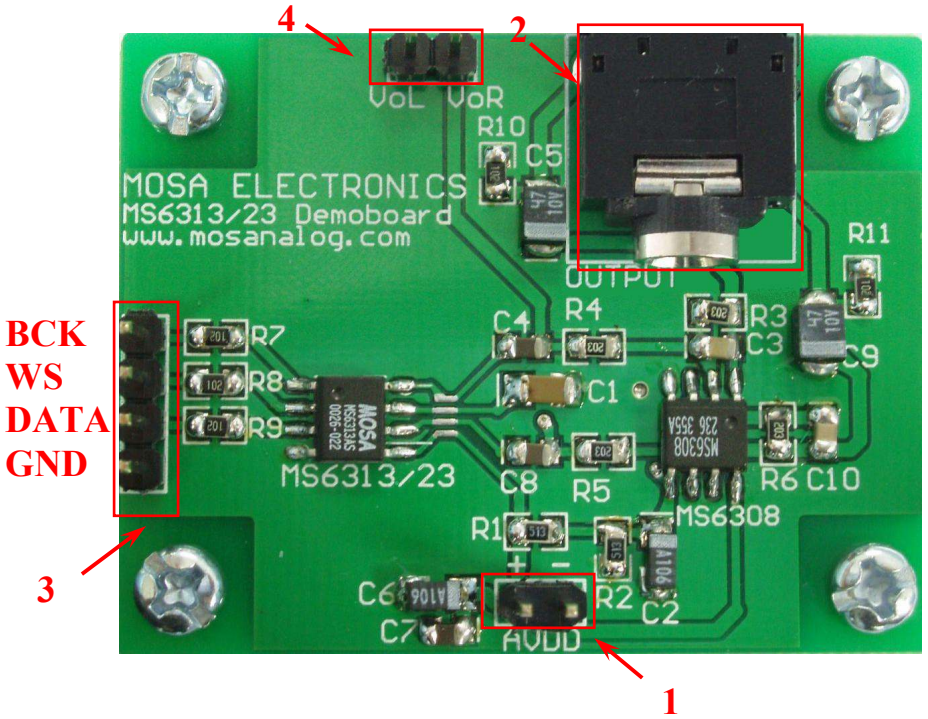
Symbol	Dimension in mm		Dimension in inch	
	Min	Max	Min	Max
A	1.35	1.75	0.0532	0.0688
A1	0.10	0.25	0.0040	0.0098
B	0.33	0.51	0.013	0.020
C	0.19	0.25	0.0075	0.0098
e	1.27 BSC		0.050 BSC	
D	4.80	5.00	0.1890	0.1968
H	5.80	6.20	0.2284	0.2440
E	3.80	4.00	0.1497	0.1574
L	0.40	1.27	0.016	0.050



TAPE AND REEL (Unit : mm)



Demoboard



Function description

Label 1: Supply Input
Supply voltage range is 2.7V to 6.5V.

Label 2: Headphone Jack
Used 3.5mm diameter of headphone with 32ohm

Label 3: Digital Signal Inputs
Connected to digital audio formats as Right Justified.

Label 4: MS6313 output
Test point.

Circuit