

4.1-Channel Audio Processor with Subwoofer

Features

- Controlled by I²C Interface
- 4 Stereo Inputs (including 1 quasi-differential input) with selectable input gain
- 2 Channels Electronic Volume: +15 to -79dB with 1dB/step
- 1 Subwoofer Output: +15 to -79dB with 1dB/step
- Adjustable crossover frequency for Subwoofer
- Tone Control (Bass and Treble): -15 to +15dB, 1dB/step
- Input Gain Control: 0 to +15dB, 1dB/step
- Loudness: 0 to -15dB, 1dB/step
- 4 independent speaker outputs: +15 to -79dB with 1dB/step & independent programmable mix input with 50% mixing ratio for front speakers
- Low Distortion and Low Noise
- LQFP44 package

Application

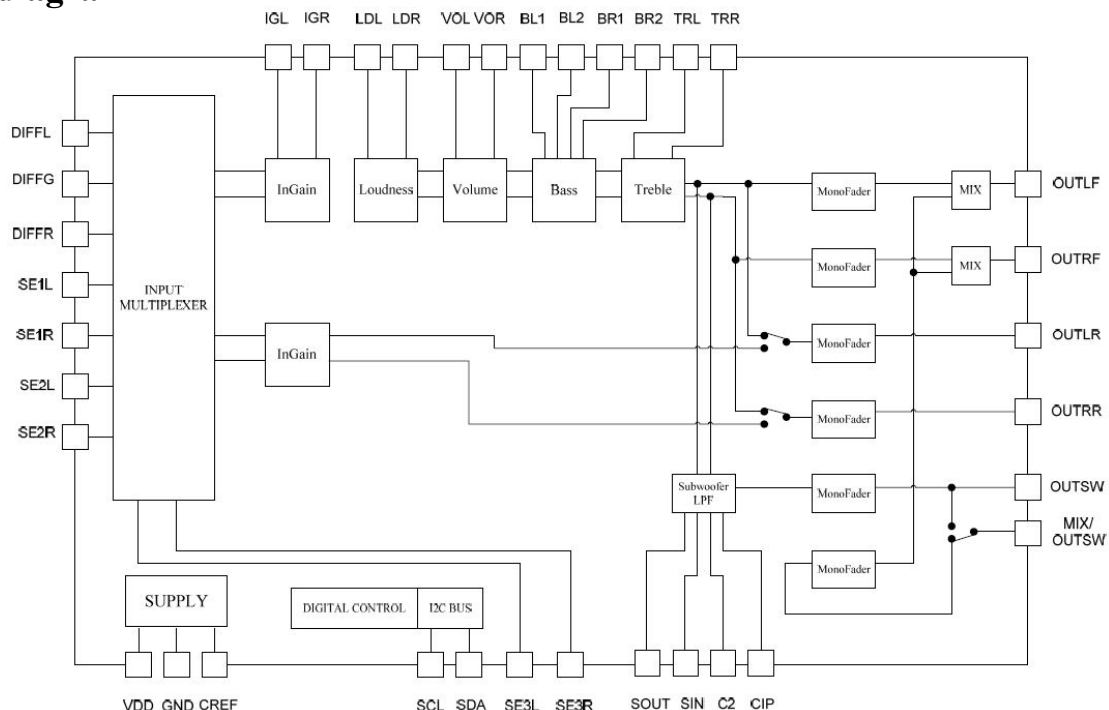
- Car Audio

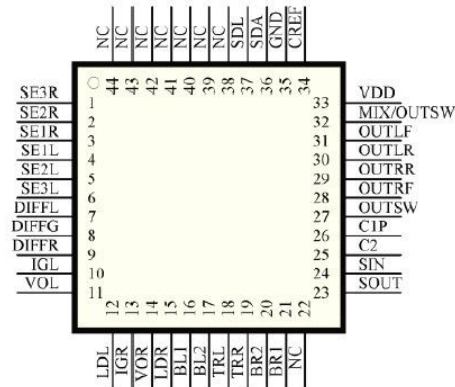
Description

The ZL3459 is a 4.1CH audio processor designed for Car Audio purpose. Using I2C interface controls all of the functions. Like most of audio processor, it equipped up to 4 stereo sources input with adjustable gain, master volume with adaptive loudness, treble and bass tone control.

In a car entertainment system needs front and rear seat individual control, the ZL3459 provides separate input source selection and output volume adjust ; a special design mixing amp is very easy combine the navigation system or cellular phone's voice into the car audio system.

Block diagram



4.1-Channel Audio Processor with Subwoofer
Pin configuration

Pin description

Pin Name	I/O	Description	Pin No.
SE 3R	I	Single-ended Right Channel Input 3	1
SE 2R	I	Single-ended Right Channel Input 2	2
SE 1R	I	Single-ended Right Channel Input 1	3
SE 1L	I	Single-ended Left Channel Input 1	4
SE 2L	I	Single-ended Left Channel Input 2	5
SE 3L	I	Single-ended Left Channel Input 3	6
DIFFL	I	Pseudo Differential Stereo Input Left	7
DIFFG	I	Pseudo Differential Stereo Input Common	8
DIFFR	I	Pseudo Differential Stereo Input Right	9
IGL	O	Left Channel Input Selector Output	10
VOL	I	Left Channel Volume Input	11
LDL	I	Left Channel Loudness Input	12
IGR	O	Right Channel Input Selector Output	13
VOR	I	Right Channel Volume Input	14
LDR	I	Right Channel Loudness Input	15
BL1	I	Left Channel Bass Cap 1	16
BL2	O	Left Channel Bass Cap 2	17
TRL	I	Left Channel Treble Cap	18
TRR	I	Right Channel Treble Cap	19
BR2	O	Right Channel Bass Cap 2	20
BR1	I	Right Channel Bass Cap 1	21
SOUT	O	R + L Output (-6db Gain)	23
SIN	I	Subwoofer Filter Input	24
C2	I	Subwoofer Filter Cap 2	25
C1P	I	Subwoofer Filter Cap 1	26
OUTSW	O	Subwoofer Output	27
OUTRF	O	Right Front Output	28
OUTRR	O	Right Rear Output	29
OUTLR	O	Left Rear Output	30
OUTLF	O	Left Front Output	31
MIX/OUTSW	I/O	Mix input / Subwoofer output	32
VDD	-	Supply Voltage	33
CREF	I	Analog Reference Voltage (1/2 VDD)	34
GND	-	Ground	35
SDA	I	SDA INPUT	36
SCL	I	SCL INPUT	37
NC		No connect	22, 38~44

4.1-Channel Audio Processor with Subwoofer
Absolute maximum ratings

Parameter	Symbol	Min.	Max.	Unit	
Operating supply voltage	Vs	-	10	V	
Latch up current	Iin	-150	+150	mA	
ESD level	Human body model	HBM	-2	+2	KV
	Machine model	MM	-0.2	+0.2	KV
Input voltage	Vin	-0.3	Vs+0.3	V	
Operating temperature	Topr	-40	+85	°C	
Storage temperature	Tstg	-65	+150	°C	

Electrical characteristics

(Unless specified: Ta=25°C, VCC=9V, RL=10KΩ, Rg = 40Ω, all controls flat (G=0), f=1KHz)

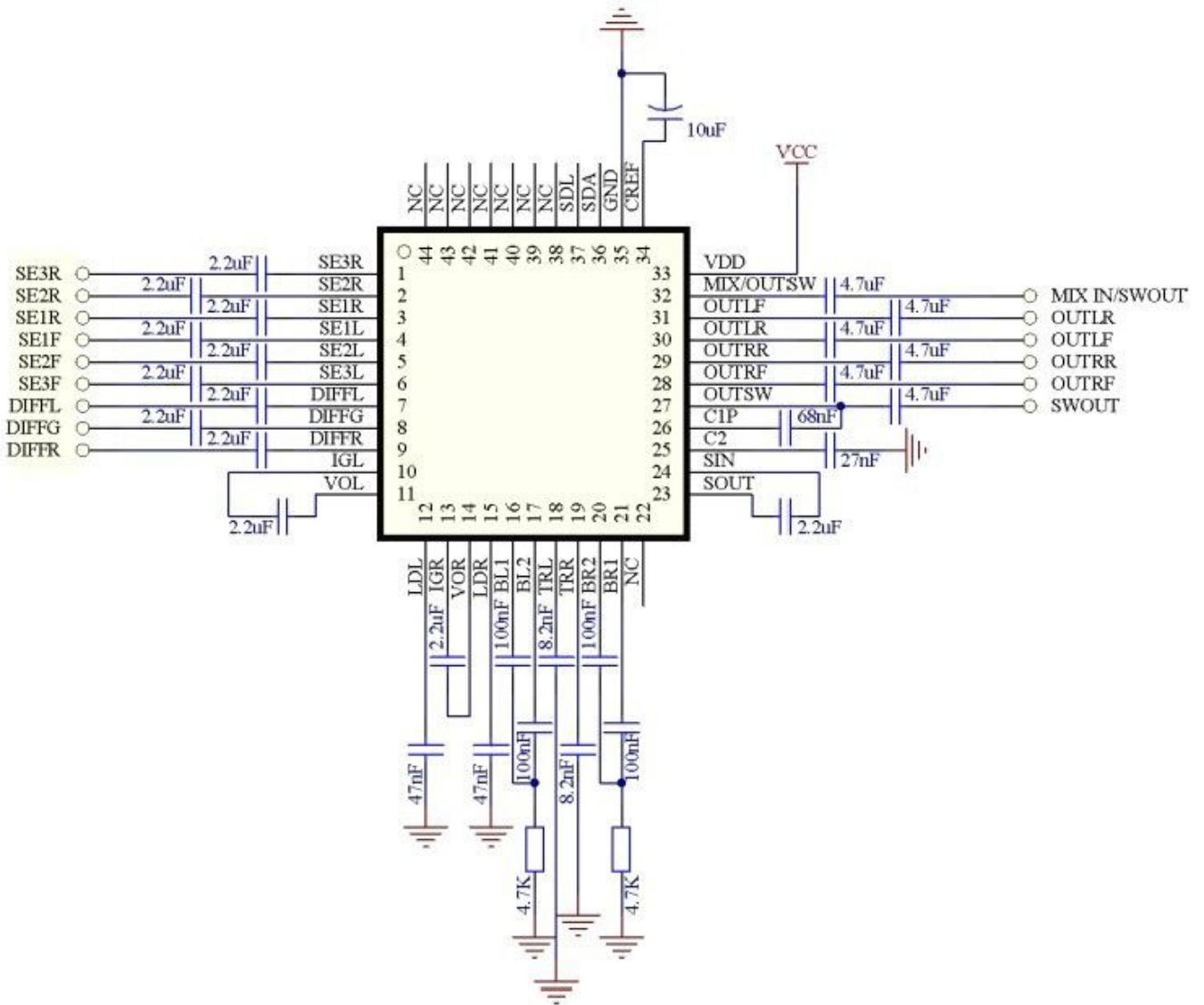
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit	
Supply							
Supply voltage	VDD	-	5	9	10	V	
Supply current	Is	-	23	30	40	mA	
PSRR	PSRR	Vr=200mV	-	-	-	-	
Input Selector							
Input resistance	R _{in}	SE/QD	35	50	65	KΩ	
Clipping level	V _{oL}	SE/QD Input	2	2.5		V _{rms}	
Channel separation	CS _{in}	SE	85	100		dB	
		QD	70	85			
Input separation	S _{in}	All Inputs	70	90		dB	
QD common mode rejection ratio	CMRR	V _{cm} = 1V _{rms} @1KHz	45	60		dB	
		V _{cm} = 1V _{rms} @10KHz	45	60			
Input gain	G _{inmin}	For Front & Rear Channel	Min	-1	0	1	dB
	G _{inmax}		Max	13	15	17	
Step resolution	A _{inSTEP}	-	-1	1	+1	dB	
Minimum load	RL	IGL, IGR	10	-	-	KΩ	
Mixing Control							
Max. attenuation	A _{mMAX}	-	-83	-79	-75	dB	
Max. gain	G _{mMAX}	-	13	15	17	dB	
Step resolution	A _{mSTEP}	-	0.5	1	1.5	dB	
Mixing ratio	Mlevel	Main & Mix-In source	-	-6	-	dB	
Loudness Control							
Min. attenuation	A _{lMAX}	-	-1	0	+1	dB	
Max. attenuation	A _{lMAX}	-	-17	-15	-13	dB	
Step resolution	A _{lSTEP}	-	0.5	1	1.5	dB	
Bass Control							
Control range	G _b	F=100Hz	±13	±15	±17	dB	
Step resolution	B _{STEP}	-	0.5	1	1.5	dB	

4.1-Channel Audio Processor with Subwoofer

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Treble Control						
Control range	Gt	F=15KHz	±13	±15	±17	dB
Step resolution	T _{STEP}		0.5	1	1.5	dB
Volume Control						
Input resistance	R _{in}	Loud=ON	70	100	130	kΩ
		Loud=OFF	20	30	40	
Max. gain	G _{VMAX}	-	13	15	17	dB
Max. attenuation	A _{VMAX}	-	-83	-79	-75	dB
Step resolution	A _{S STEP}	-	0.5	1	1.5	dB
Attenuation set error	E _A	Step= -20 to +20dB	-0.75	0	0.75	dB
		Step= -79 to -20dB	3		3	
Mute attenuation	A _{MUTE}	-	85	100	-	dB
Speaker Attenuator						
Max. gain	G _{MAX}	Front and Rear CH	13	15	17	dB
Max. attenuation	A _{MAX}	-	-83	-79	-75	dB
Step resolution	S _{S STEP}	-	0.5	1	1.5	dB
Attenuation set error	E _A	-	-	0	1	dB
Mute attenuation	A _{MUTE}	-	85	100	-	dB
Subwoofer Output						
Max. gain	G _{MAX}	-	14	15	16	dB
Max. attenuation	A _{MAX}	-	-83	-79	-75	dB
Step resolution	S _{S STEP}	-	0.5	1	1.5	dB
Attenuation set error	E _A	Step= -50 to -79dB	-0.5	-1	-2.5	dB
		Step=+15 to -50dB	-1	0.5	0	
Mute attenuation	A _{MUTE}	-	70	80	-	dB
f _{LP}	f _{P1}	Lowpass corner frequency	72	80	88	Hz
	f _{P2}		108	120	132	Hz
	f _{P3}		144	160	176	Hz
Audio Outputs						
Clipping level	V _{OCL}	d=0.3%	2	2.5	-	V _{rms}
Load resistance	R _L	Front, Rear, Sub-out	7	10	-	kΩ
Output noise	e _{no1}	Front, Sub, Rear(Main Source)	-	7	15	μV
	e _{no2}	Rear(Second Source)	-	5	10	
Signal to noise ratio	S/N ₁	Front, Sub, Rear(Main Source)	-	100	-	dBV
	S/N ₂	Rear(Second Source)	-	105	-	
Distortion	THD	V _{in} =1V _{rms} ; all gain=0dB	-	0.025	0.08	%
Channel separation	Sc		80	90	-	dB

4.1-Channel Audio Processor with Subwoofer

Application circuit

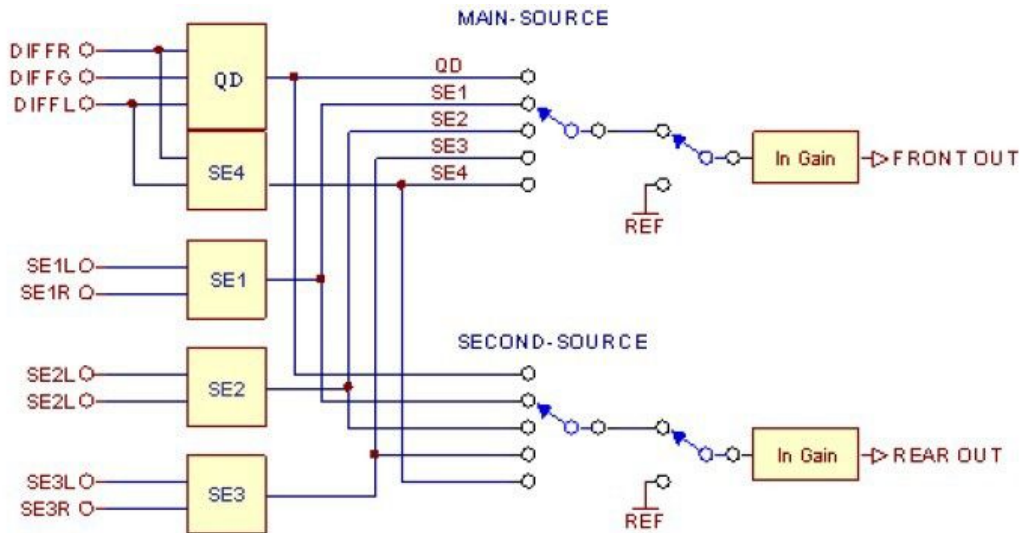


4.1-Channel Audio Processor with Subwoofer

Function descriptions

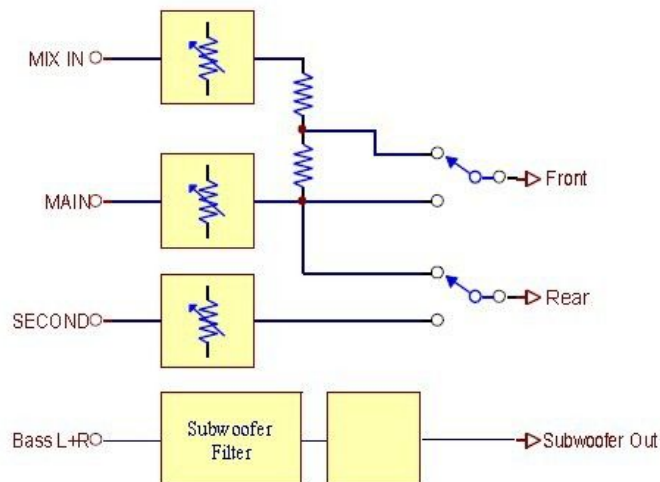
Input multiplexer

The ZL3459 provides pseudo-differential stereo input and single-ended stereo input, the pseudo differential input also could configured as single-ended input 4th, in this configuration the DIFFG pin is no connection.



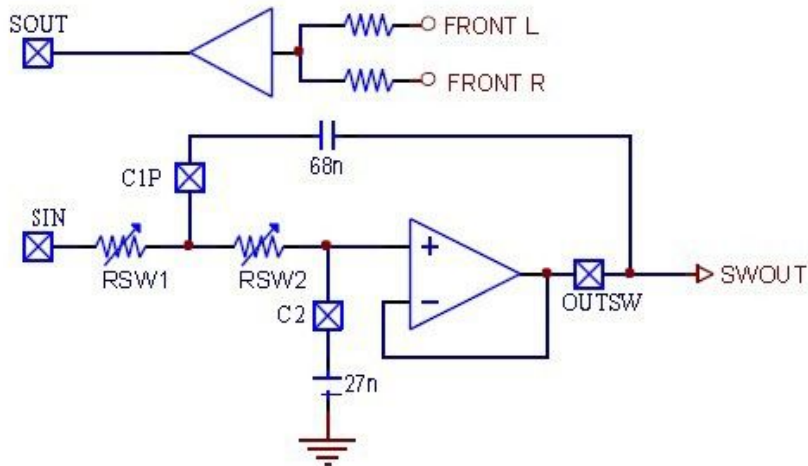
Output multiplexer

Pin 31 is bi-direction function, if D5 of data-byte 03H is 0 the pin 31 will becomes an input pin, an auxiliary source (such navigation system or cellular phone) can be mix with front channel output. Otherwise D5=1 the pin 31 will outputs subwoofer signal. The rear output signal is flexible from second sources selector or sync with front channel signal. Each channel's output level can be controlled from +15dB to -79dB and individually, it is well to be the balance and fader control.

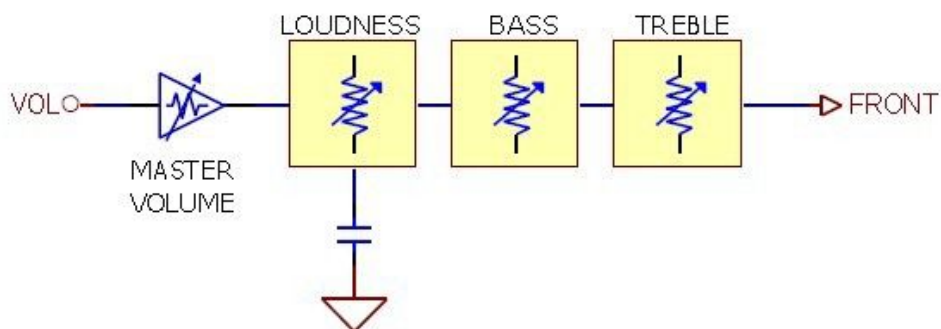


4.1-Channel Audio Processor with Subwoofer
Subwoofer filter

Built-in mono-mixer (with 50% mixture ratio) would mix both front channel outputs to SOUT and coupling with a capacitor to SIN, the subwoofer filter input. It is a 2nd order low pass filter with programmable cut off frequency, there have 3 cut off frequencies could be choosing: 80Hz, 120Hz and 160Hz, the output level of subwoofer filter is from +15dB to -79dB with 1dB step resolution.


Volume, loudness and tone control

Master volume controller is similar to others, provides from +15dB to -79dB range with 1dB step resolution; the loudness block is a 1st order filter configuration behind the volume output, provides 15dB gain with 1dB step resolution to boost up the bass response, in the flat mode is will performs as a ordinary attenuator. The bass and treble corner frequency is on the 100Hz and 10KHz, provides ±15dB gain and 1dB step resolution.


Control bus specification
Bus interface

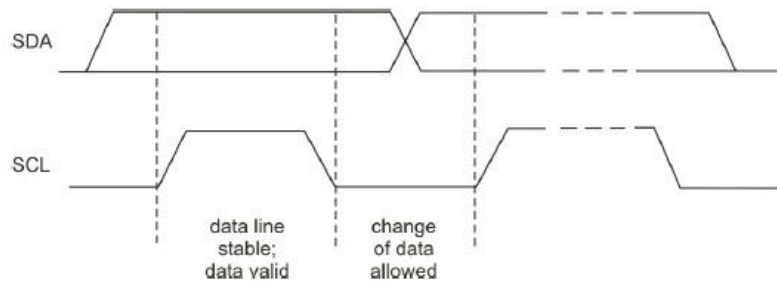
All functions of the ZL3459 are controlled by the I2C interface, the interface is consisting by SDA and SCL pins. Detail protocol of the I2C bus will discuss on the next section. It should be noted that the bus level pull-up resistors connected to the ZL3459 positive supply voltage may required in some application especially the MCU output high level is no

4.1-Channel Audio Processor with Subwoofer

enough.

Data validity

A data on the SDA Line is considered valid and stable only when the SCL Signal is in HIGH State. The HIGH and LOW State of the SDA Line can only change when the SCL signal is LOW. Please refer to the figure below.



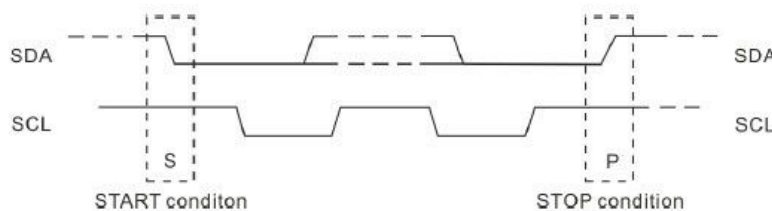
Start and stop conditions

A Start Condition is activated when

- 1) The SCL is set to HIGH and
- 2) SDA shifts from HIGH to LOW State.

The Stop Condition is activated when

- 1) SCL is set to HIGH and
- 2) SDA shifts from LOW to HIGH State. Please refer to the timing diagram below.



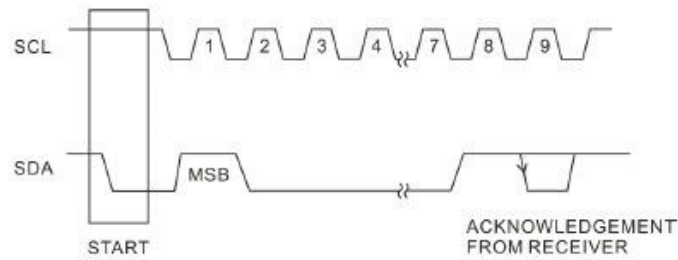
Byte format

Every byte transmitted to the SDA Line consists of 8 bits. Each byte must be followed by an Acknowledge Bit. The MSB is first transmitted.

Acknowledge

During the Acknowledge clock pulse (ACK), the SDA output port of the master device (μ P) would be sets on Hi-Z state, if peripheral device (ex: audio processor) recognize the I2C command the SDA line will be pull-down by slave device during the SCL clock pulse held in HIGH state period. Please refer to the diagram below. The slave device that has been addressed to generate an Acknowledge after receiving each byte, otherwise, the SDA Line will remain at the High level in period of the ninth (9th) clock pulse. In this case, the host controller will generate a STOP sign in order to abort the transfer mission.

4.1-Channel Audio Processor with Subwoofer



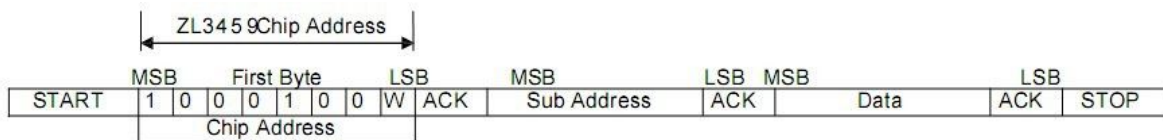
Transmission without acknowledge

If the application does not need to verify the Acknowledge signal that generated by the slave device is right or not, host controller can just bypass the acknowledge check and transmit next data byte to the slave device. If this approach is used, there are greater chances of faulty operation as well as decrease in noise immunity.

Interface protocol

The interface protocol sequence was defined in below section:

- A Start sign.
- A Chip Address of the desire slave device. The W Bit must be “0” (written). The ZL3459 will always response an Acknowledge on the end of each byte.
- A Data Sequence (N-Bytes + Acknowledge)
- A Stop Condition



If more than one Data Byte is transmitted, then the significant SUB ADDRESS bits are auto incremented.
 00H.Æ 01H.Æ 02H.Æ 03H.Æ 04H.Æ 05H.Æ 06H.Æ 07H.Æ 08H.Æ 09H.Æ 10H.Æ 11H

Data rate

The ZL3459 support Standard-Mode (100kbit/s) I2C data rate In all operation condition, in specified condition it also support Fast-Mode (400kbit/s) I2C data rate, please refer to the follow table:

MCU Level	ZL3459 VDD Voltage						
	4V	5V	6V	7V	8V	9V	10V
2.5V	F	F	X	X	X	X	X
3.3V	F	F	F	F	S	S	X
5V	X	F	F	F	F	F	F

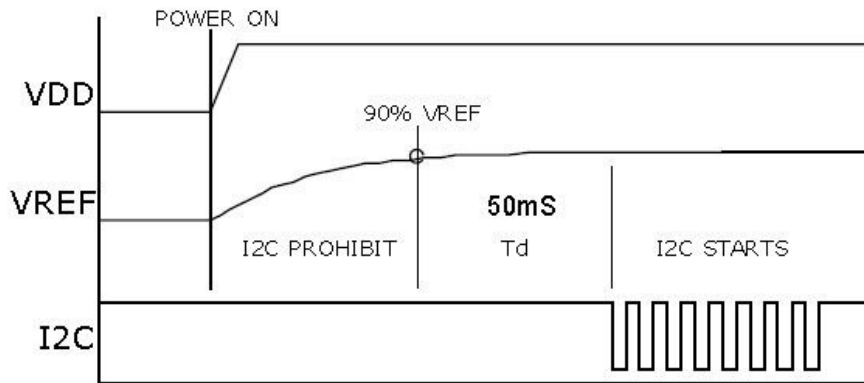
Notes:

1. x = Not allow in this combination, S = Standard Mode Supported, F = Fast Mode Supported.
2. Data rate specification is design guarantee and exams in test bench only, not fully tested in final production.

4.1-Channel Audio Processor with Subwoofer

I2C Bus initial time

The ZL3459 is controlled by the I2C bus command; each time the supply voltage applied to chip it needs an initial time to reset all of the internal decoder register, in this period access the I2C bus is prohibited. The initial time is determinate by capacitance it attached on CREF pin and Td. For proper operation user must check the I2C starts timing is fit this requirement and recommended Td timing shown on next page is 50mS.



Software specification

ZL3459 chip address

The ZL3459 chip address is 88H AND binary table is shown on below.

MSB								LSB
1	0	0	0	1	0	0	0	0

Sub address table

MSB							LSB	Function
D7	D6	D5	D4	D3	D2	D1	D0	Sub address
0	Input Gain			Main Input Selector				00H
0	Subwoofer		Loudness					01H
Volume								02H
Mix3	Mix2	Mix1	Bass					03H
0	0	0	Treble					04H
Mixing Level Control								05H
Speaker Attenuator Left Front								06H
Speaker Attenuator Right Front								07H
Speaker Attenuator Left Rear								08H
Speaker Attenuator Right Rear								09H
Subwoofer Attenuator								10H
R.Spkr	Input Gain			Second Input Selector				11H

4.1-Channel Audio Processor with Subwoofer
Data table description
Main input selector/input gain(OOH)

MSB							LSB		Function
D7	D6	D5	D4	D3	D2	D1	D0		
									Input Selector
0					0	0	0		QD/SE : QD
0					0	0	1		SE IN1
0					0	1	0		SE IN2
0					0	1	1		SE IN3
0					1	0	0		QD/SE : SE IN4
0					1	0	1		Mute
									Input Gain
0	0	0	0	0					0dB
0	0	0	0	1					+1dB
0	0	0	1	0					+2dB
0	0	0	1	1					+3dB
0	0	1	0	0					+4dB
0	0	1	0	1					+5dB
0	0	1	1	0					+6dB
0	0	1	1	1					+7dB
0	1	0	0	0					+8dB
0	1	0	0	1					+9dB
0	1	0	1	0					+10dB
0	1	0	1	1					+11dB
0	1	1	0	0					+12dB
0	1	1	0	1					+13dB
0	1	1	1	0					+14dB
0	1	1	1	1					+15dB



4.1-Channel Audio Processor with Subwoofer

Loudness/subwoofer(01H)

MSB								LSB		Function
D7	D6	D5	D4	D3	D2	D1	D0			
Loudness										
0				0	0	0	0	0dB		
0				0	0	0	1	-1dB		
0				0	0	1	0	-2dB		
0				0	0	1	1	-3dB		
0				0	1	0	0	-4dB		
0				0	1	0	1	-5dB		
0				0	1	1	0	-6dB		
0				0	1	1	1	-7dB		
0				1	0	0	0	-8dB		
0				1	0	0	1	-9dB		
0				1	0	1	0	-10dB		
0				1	0	1	1	-11dB		
0				1	1	0	0	-12dB		
0				1	1	0	1	-13dB		
0				1	1	1	0	-14dB		
0				1	1	1	1	-15dB		
0			0					Loudness On		
0			1					Loudness Off		
Subwoofer Cut-off Frequency										
0	0	1						80Hz		
0	1	0						120Hz		
0	1	1						160Hz		



4.1-Channel Audio Processor with Subwoofer

Volume (02H)

MSB								LSB		Function
D7	D6	D5	D4	D3	D2	D1	D0			
									Volume Gain	
0	0	0	0	0	0	0	0	0	0dB	
0	0	0	0	0	0	0	0	1	+1dB	
0	0	0	0	0	0	0	1	0	+2dB	
0	0	0	0	0	0	0	1	1	+3dB	
0	0	0	0	0	0	1	0	0	+4dB	
0	0	0	0	0	0	1	0	1	+5dB	
0	0	0	0	0	0	1	1	0	+6dB	
0	0	0	0	0	0	1	1	1	+7dB	
0	0	0	0	0	1	0	0	0	+8dB	
0	0	0	0	0	1	0	0	1	+9dB	
0	0	0	0	0	1	0	1	0	+10dB	
0	0	0	0	0	1	0	1	1	+11dB	
0	0	0	0	0	1	1	0	0	+12dB	
0	0	0	0	0	1	1	0	1	+13dB	
0	0	0	0	0	1	1	1	0	+14dB	
0	0	0	0	0	1	1	1	1	+15dB	
									Volume Attenuation	
				0	0	0	0	0	-0dB	
				0	0	0	0	1	-1dB	
				0	0	1	0	0	-2dB	
				0	0	1	1	0	-3dB	
				0	1	0	0	0	-4dB	
				0	1	0	1	0	-5dB	
				0	1	1	0	0	-6dB	
				0	1	1	1	0	-7dB	
0	0	0	1						-0dB	
0	0	1	0						-8dB	
0	0	1	1						-16dB	
0	1	0	0						-24dB	
0	1	0	1						-32dB	
0	1	1	0						-40dB	
0	1	1	1						-48dB	
1	0	0	0						-56dB	
1	0	0	1						-64dB	
1	0	1	0						-72dB	
1	1	1	1	0	0	0	0	0	Mute	



4.1-Channel Audio Processor with Subwoofer

Bass/MIX1/MIX2/MIX(03H)

MSB								LSB		Function
D7	D6	D5	D4	D3	D2	D1	D0			
									Bass Cut	
			0	0	0	0	0	0	0dB	
			0	0	0	0	1	1	-1dB	
			0	0	0	1	0	0	-2dB	
			0	0	0	1	1	1	-3dB	
			0	0	1	0	0	0	-4dB	
			0	0	1	0	1	1	-5dB	
			0	0	1	1	0	0	-6dB	
			0	0	1	1	1	1	-7dB	
			0	1	0	0	0	0	-8dB	
			0	1	0	0	1	1	-9dB	
			0	1	0	1	0	0	-10dB	
			0	1	0	1	1	1	-11dB	
			0	1	1	0	0	0	-12dB	
			0	1	1	0	1	1	-13dB	
			0	1	1	1	0	0	-14dB	
			0	1	1	1	1	1	-15dB	
									Bass Boost	
			1	0	0	0	0	0	0dB	
			1	0	0	0	1	1	+1dB	
			1	0	0	1	0	0	+2dB	
			1	0	0	1	1	1	+3dB	
			1	0	1	0	0	0	+4dB	
			1	0	1	0	1	1	+5dB	
			1	0	1	1	0	0	+6dB	
			1	0	1	1	1	1	+7dB	
			1	1	0	0	0	0	+8dB	
			1	1	0	0	1	1	+9dB	
			1	1	0	1	0	0	+10dB	
			1	1	0	1	1	1	+11dB	
			1	1	1	0	0	0	+12dB	
			1	1	1	0	1	1	+13dB	
			1	1	1	1	0	0	+14dB	
			1	1	1	1	1	1	+15dB	
		0							Mixing Enable on	
		1							Mixing Enable off *	
	0								Mixing to LF on	
	1								Mixing to LF off	
0									Mixing to RF on	
1									Mixing to RF off	

Note: Mixing Enable off means pin 31 as 2nd subwoofer output.



4.1-Channel Audio Processor with Subwoofer

Treble (04H)

MSB								LSB		Function
D7	D6	D5	D4	D3	D2	D1	D0			
									Treble Cut	
0	0	0	0	0	0	0	0	0	0dB	
0	0	0	0	0	0	0	0	1	-1dB	
0	0	0	0	0	0	0	1	0	-2dB	
0	0	0	0	0	0	0	1	1	-3dB	
0	0	0	0	0	0	1	0	0	-4dB	
0	0	0	0	0	0	1	0	1	-5dB	
0	0	0	0	0	0	1	1	0	-6dB	
0	0	0	0	0	0	1	1	1	-7dB	
0	0	0	0	0	1	0	0	0	-8dB	
0	0	0	0	0	1	0	0	1	-9dB	
0	0	0	0	0	1	0	1	0	-10dB	
0	0	0	0	0	1	0	1	1	-11dB	
0	0	0	0	0	1	1	0	0	-12dB	
0	0	0	0	0	1	1	0	1	-13dB	
0	0	0	0	0	1	1	1	0	-14dB	
0	0	0	0	0	1	1	1	1	-15dB	
									Treble Boost	
0	0	0	1	0	0	0	0	0	0dB	
0	0	0	1	0	0	0	0	1	+1dB	
0	0	0	1	0	0	1	0	0	+2dB	
0	0	0	1	0	0	1	1	0	+3dB	
0	0	0	1	0	1	0	0	0	+4dB	
0	0	0	1	0	1	0	1	0	+5dB	
0	0	0	1	0	1	1	0	0	+6dB	
0	0	0	1	0	1	1	1	0	+7dB	
0	0	0	1	1	0	0	0	0	+8dB	
0	0	0	1	1	0	0	1	0	+9dB	
0	0	0	1	1	0	1	0	0	+10dB	
0	0	0	1	1	0	1	1	0	+11dB	
0	0	0	1	1	1	0	0	0	+12dB	
0	0	0	1	1	1	0	1	0	+13dB	
0	0	0	1	1	1	1	0	0	+14dB	
0	0	0	1	1	1	1	1	0	+15dB	



4.1-Channel Audio Processor with Subwoofer

Mixinglevel (05H)/Speaker attenuator leftfront (06H) /Rightfront (07H) /Leftrear (08H)/Rightrear (09H) /Subwoofer (10H)

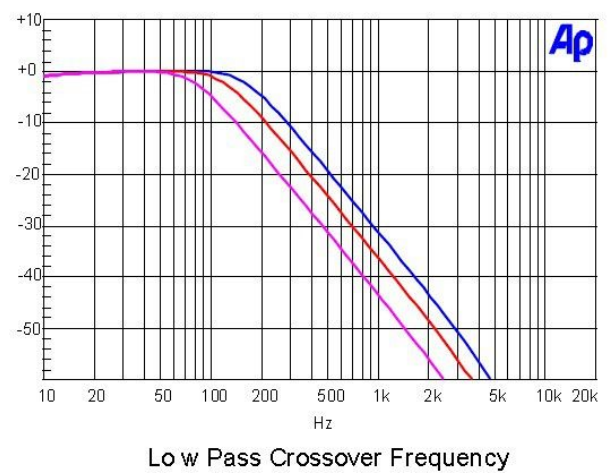
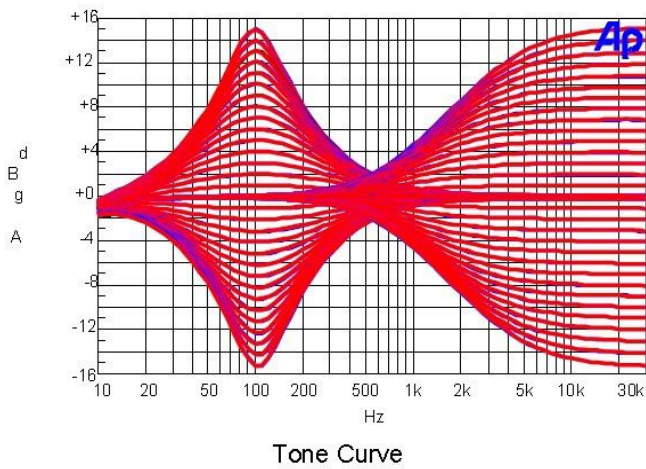
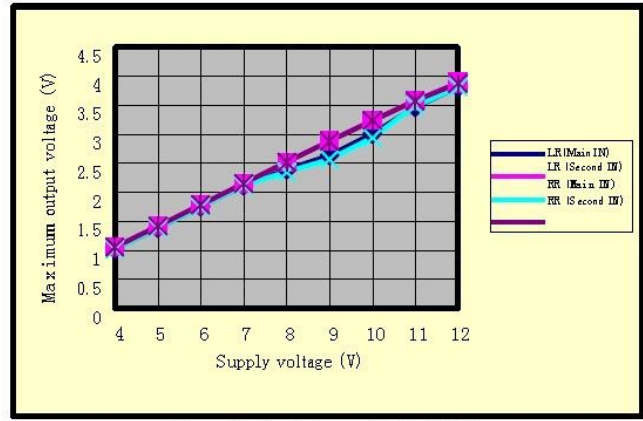
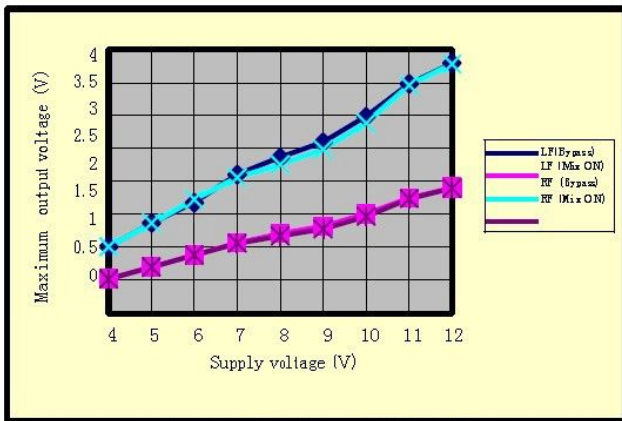
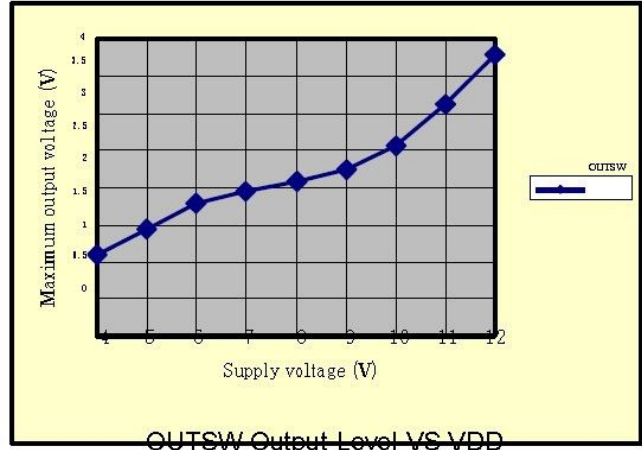
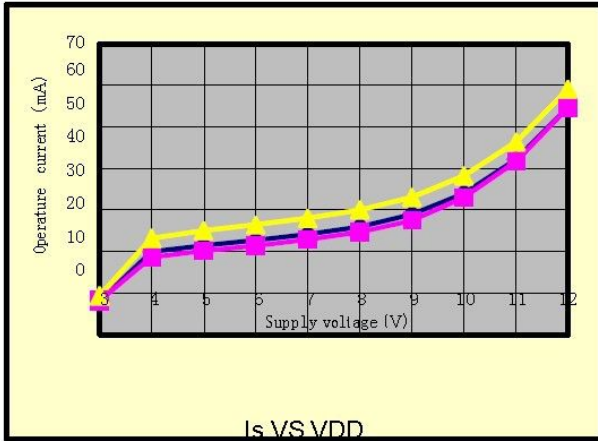
MSB								LSB		Function
D7	D6	D5	D4	D3	D2	D1	D0			
									Gain	
0	0	0	0	0	0	0	0	0	0dB	
0	0	0	0	0	0	0	0	1	+1dB	
0	0	0	0	0	0	0	1	0	+2dB	
0	0	0	0	0	0	1	1	1	+3dB	
0	0	0	0	0	1	0	0	0	+4dB	
0	0	0	0	0	1	0	1	1	+5dB	
0	0	0	0	0	1	1	1	0	+6dB	
0	0	0	0	0	1	1	1	1	+7dB	
0	0	0	0	1	0	0	0	0	+8dB	
0	0	0	0	1	0	0	1	1	+9dB	
0	0	0	0	1	0	1	0	0	+10dB	
0	0	0	0	1	0	1	1	1	+11dB	
0	0	0	0	1	1	0	0	0	+12dB	
0	0	0	0	1	1	0	1	1	+13dB	
0	0	0	0	1	1	1	1	0	+14dB	
0	0	0	0	1	1	1	1	1	+15dB	
									Attenuation	
				0	0	0	0	0	-0dB	
				0	0	0	1	1	-1dB	
				0	0	1	0	0	-2dB	
				0	0	1	1	1	-3dB	
				0	1	0	0	0	-4dB	
				0	1	0	1	1	-5dB	
				0	1	1	0	0	-6dB	
				0	1	1	1	1	-7dB	
0	0	0	1						-0dB	
0	0	1	0						-8dB	
0	0	1	1						-16dB	
0	1	0	0						-24dB	
0	1	0	1						-32dB	
0	1	1	0						-40dB	
0	1	1	1						-48dB	
1	0	0	0						-56dB	
1	0	0	1						-64dB	
1	0	1	0						-72dB	
1	1	1	1	0	0	0	0	0	Mute	

4.1-Channel Audio Processor with Subwoofer
Second input selector /Input gain (11H)

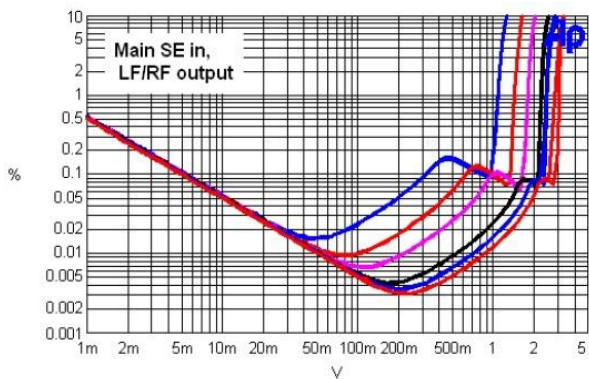
MSB							LSB	Function
D7	D6	D5	D4	D3	D2	D1	D0	
								Second Input Selector
					0	0	0	QD/SE:QD
					0	0	1	IN1
					0	1	0	IN2
					0	1	1	IN3
					1	0	0	QD/SE : SE IN4
					1	0	1	Mute
								Input Gain
	0	0	0	0				0dB
	0	0	0	1				+1dB
	0	0	1	0				+2dB
	0	0	1	1				+3dB
	0	1	0	0				+4dB
	0	1	0	1				+5dB
	0	1	1	0				+6dB
	0	1	1	1				+7dB
	1	0	0	0				+8dB
	1	0	0	1				+9dB
	1	0	1	0				+10dB
	1	0	1	1				+11dB
	1	1	0	0				+12dB
	1	1	0	1				+13dB
	1	1	1	0				+14dB
	1	1	1	1				+15dB
								Rear Speaker Source
0								Main Source
1								Second Source

4.1-Channel Audio Processor with Subwoofer

Typical Performance Characteristics

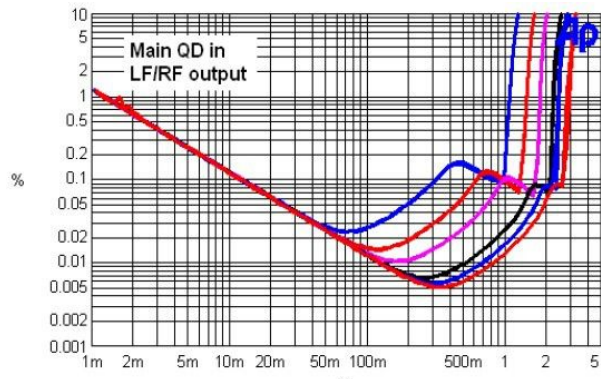


4.1-Channel Audio Processor with Subwoofer



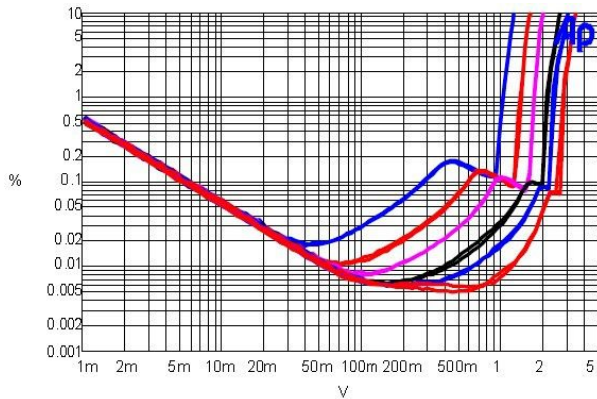
VDD=4,5,6,8,9,10V

Output THD VS VDD, SE IN



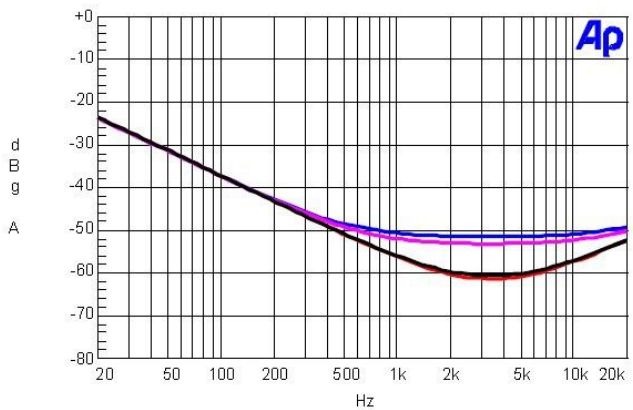
VDD=4,5,6,8,9,10V

Output THD VS VDD, QD IN

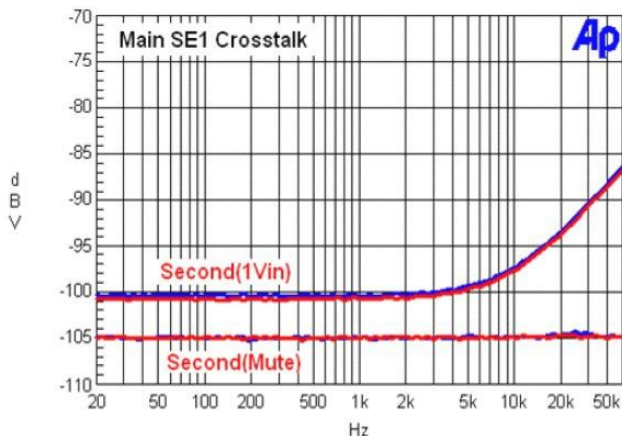


VDD=4,5,6,8,9,10V, f=80Hz, LPF=160Hz

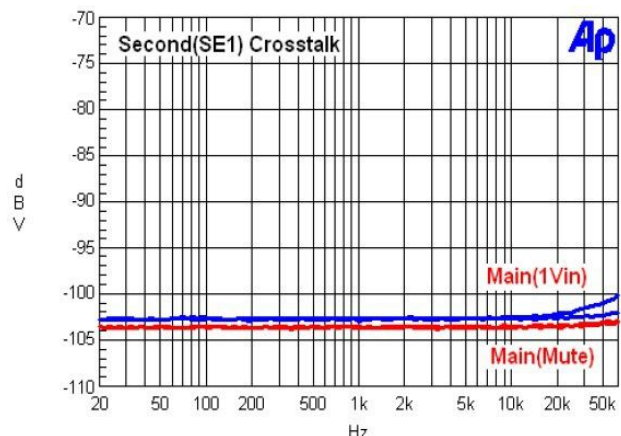
Subwoofer Output THD VS VDD



CMRR

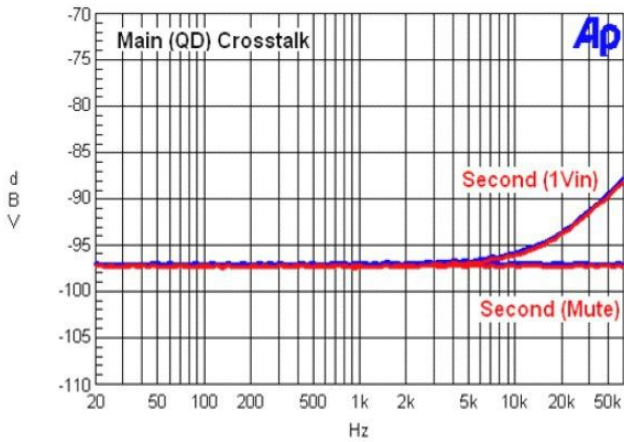


Crosstalk, Main, SE IN

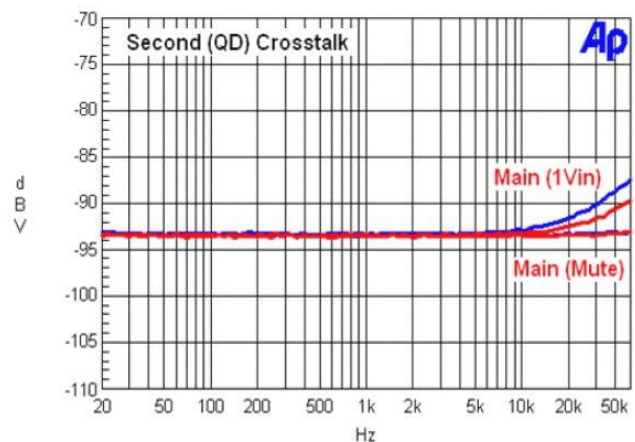


Crosstalk, Second, SE IN

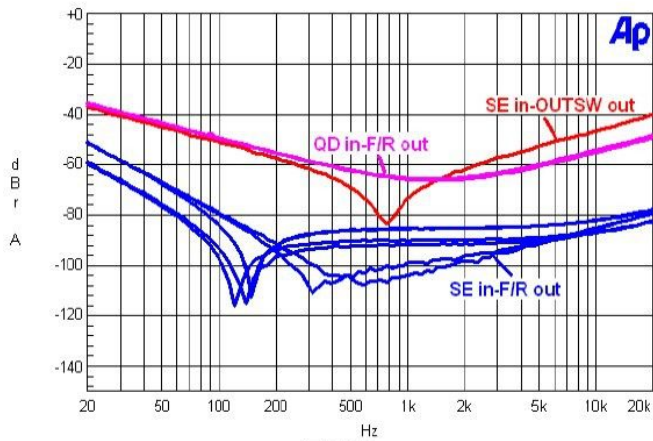
4.1-Channel Audio Processor with Subwoofer



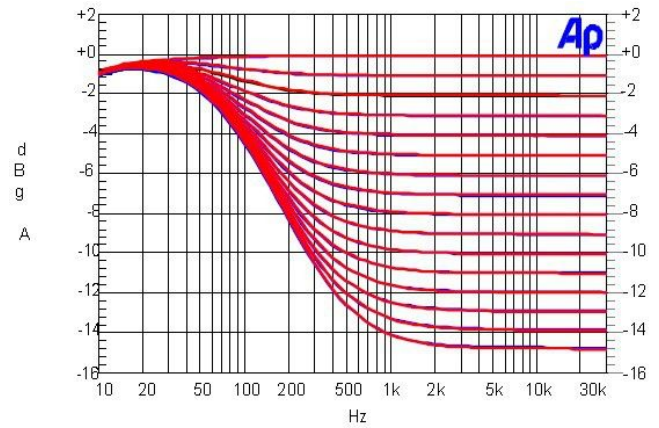
Crosstalk, Main, QD IN



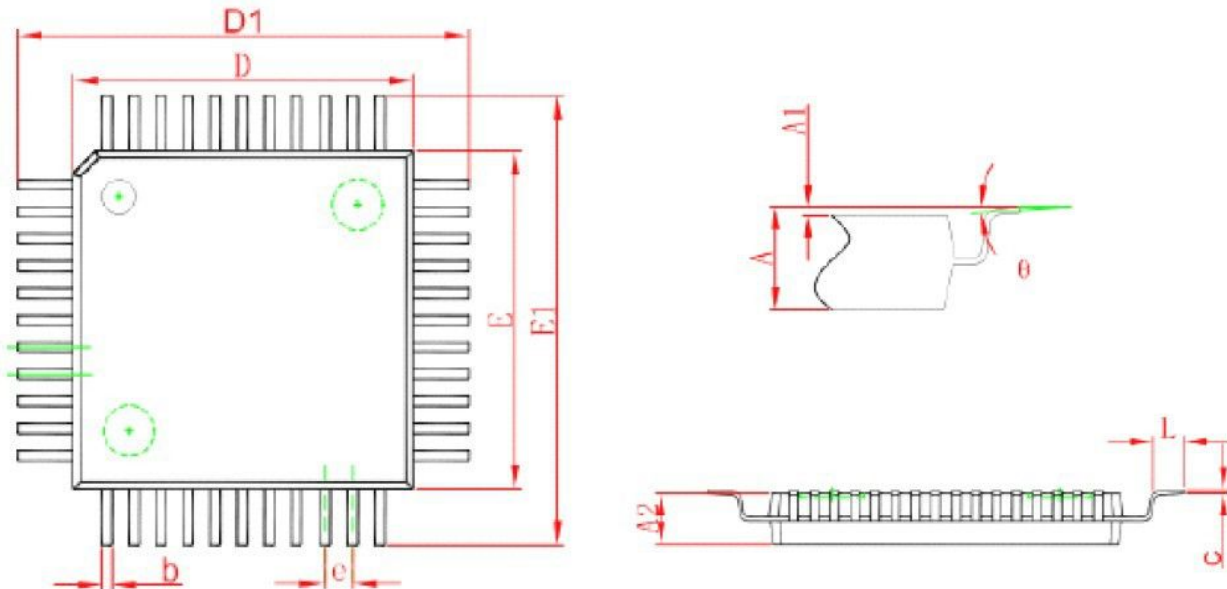
Crosstalk, Second, QD IN



PSRR



Loudness

Package information
LQFP44


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A		1.600		0.063
A1	0.050	0.150	0.002	0.006
A2	1.350	1.450	0.053	0.057
b	0.280	0.400	0.011	0.016
c	0.100	0.200	0.004	0.008
D	9.900	10.100	0.390	0.398
D1	11.850	12.150	0.467	0.478
E	9.900	10.100	0.390	0.398
E1	11.850	12.150	0.467	0.478
e	0.800 (BSC)		0.031 (BSC)	
L	0.450	0.750	0.018	0.030
theta	0°	7°	0°	7°