Sound Processor Series for Car Audio

Sound Processors with Built-in 3-band Equalizer

BD3484FS, BD3485FS, BD3486FS

●Description

BD3484FS, BD3485FS, BD3486FS are sound processors built-in 3-band equalizer and subwoofer-outputs for car audio. The Functions are stereo 4ch input selector, input-gain control, main volume, 3-band parametric equalizer, 6ch fader volume. Moreover, “Advanced switch circuit”, that is ROHM original technology, can reduce various switching noise (ex. No-signal, low frequency likes 20Hz & large signal inputs). “Advanced switch” makes control of microcomputer easier, and can construct high quality car audio system.

●Feature

1) Standardizing I^2C BUS resistor map of BD348X-series can make almost of program on microcomputer common.
2) Standardizing pin configuration of BD348X-series can make PCB common.
3) Reduce the switching noise of Main volume, Fader volume, Bass, Middle, Treble, Loudness(BD3484FS), Super bass(BD3485FS), Effect(BD3486FS) gain and attenuation by using advanced switch circuit. (Possible to control all steps.)
4) Decrease the number of external parts by built-in 3-band equalizer filter and low-pass filter for subwoofer. Possible to control Bass, Treble, Middle and LPF equalizer freely.
5) Built-in operational amplifier for Loudness. Possible to control gain setting. (BD3484FS)
6) Built-in operational amplifier for Super Bass function. Possible to control gain setting. (BD3485FS)
7) Built-in operational amplifier for Effect function. Possible to control gain setting. (BD3486FS)
8) It is equipped with output terminals of Subwoofer. Moreover, the stereo signal of the front and rear, too, can be output by the I^2C BUS control.
9) It is possible for the bass, middle, treble to correspond to the simple loudness, too, with the gain adjustment quantity of ±20dB and 1 dB step gain adjustment.
10) Built-in level meter (BD3485FS), 7-band spectrum analyzer (BD3486FS) making music more visible.
11) Bi-CMOS process
12) Built-in ground isolation amplifier inputs, ideal for external stereo input.
13) Package of these LSI is SSOP-A32. Putting input-terminals together and output-terminals together can make PCB layout easier and can makes area of PCB smaller.
14) It is possible to control by 3.3V / 5V for I^2C BUS and 2 wire serial controller.

●Use

It is suitable for car audio specially, audio equipment of mini Compo, micro-Compo, DVD, TV etc with all kinds.

●Product lineup

Item	BD3484FS	BD3485FS	BD3486FS
Loudness	○	—	—
Super bass	—	○	—
Effect	—	—	○
Level meter	—	○	—
Spectrum analyzer	—	—	○

○ : Built-in

— : Not built-in

※ BD3484FS/BD3485FS/BD3486FS are compatiable for pin configuration of power supply pin, gnd pin, control pins. The package of BD3484FS / BD3485FS / BD3486FS is SSOP-A32.

●Absolute Maximum Ratings (Ta=25℃)

Item	Symbol	Limits	Unit
Impressed Voltage	VCC	10.0	V
Input voltage	VIN	VCC+0.3～GND-0.3	V
Power Dissipation	Pd	950 ※1	mW
Storage Temperature	Tastg	-55～+150	℃

※1 At Ta=25°C or higher, this value is decreaced to 7.6 mW/°C. Thermal resistance θja=131.6℃.
When Rohm standard board is mounted.
Rohm standard board: size: 70×70×1.6 (mm^3) Material: FR4 glass-epoxy substrate (copper foil area: less than 3%).

●Operating Range

Item	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	VCC	7.0	–	9.5	V
Temperature	Topr	-40	–	+85	℃

※ Design against radiation-proof isn't made.

●Electrical Characteristic

(Unless specified particularly, Ta=25℃, VCC=8.5V, f=1kHz, Vin=1Vrms, Rg=600Ω, RL=10kΩ, A input, Input gain 0dB, Mute off, Volume 0dB, Tone 0dB, Loudness 0dB(BD3484FS), Super Bass 0dB(BD3485FS),Effect 0dB(BD3486FS) Fader Volume 0dB)

BLOCK	Item		Symbol	Limits			Unit	Condition
				Min	Typ	Max		
GENERAL	Current Upon no signal	BD3484FS	I_Q	–	36	50	mA	VIN=0Vrms
		BD3485FS						
		BD3486FS			37			
	Voltage gain		G_V	-1.5	0	1.5	dB	Gv=20log(VOUT/VIN)
	Channel balance		CB	-1.5	0	1.5	dB	CB = GV1-GV2
	Total harmonic distortion	BD3484FS	THD+N	–	0.007	0.05	%	VOUT=1Vrms BW=400-30KHz
		BD3485FS						
		BD3486FS			0.005			
	Output noise voltage ＊	BD3484FS	V_{NO}	–	10.5	25	μVrms	Rg = 0Ω BW = IHF-A
		BD3485FS						
		BD3486FS			9			
	Residual output noise voltage ＊	BD3484FS	V_{NOR}	–	2.5	10	μVrms	Fader = -∞dB Rg = 0Ω BW = IHF-A
		BD3485FS						
		BD3486FS			2			
	Cross-talk between channels ＊		CTC	–	-100	-90	dB	Rg = 0Ω CTC=20log(VOUT/VIN) BW = IHF-A
	Ripple rejection		RR	–	-70	-40	dB	f=100Hz VRR=100mVrms RR=20log(VOUT/VIN)
INPUT	Input impedance(A, B, C)		R_{IN}	70	100	130	kΩ	
	Maximum input voltage(A, B, C)		V_{IM}	2.1	2.3	–	Vrms	VIM at THD+N(VOUT)=1% BW=400-30KHz
	Cross-talk between selectors ＊		CTS	–	-100	-90	dB	Rg = 0Ω CTS=20log(VOUT/VIN) BW = IHF-A
	Minimum input gain		$G_{IN\ MIN}$	-2	0	+2	dB	Input gain 0dB VIN=100mVrms Gin=20log(VOUT/VIN)
	Maximum input gain		$G_{IN\ MAX}$	18	20	22	dB	Input gain 20dB VIN=100mVrms Gin=20log(VOUT/VIN)
	Step resolution		$G_{IN\ STEP}$	–	1	–	dB	GAIN=0～+20dB
	Gain set error		$G_{IN\ ERR}$	−2	0	+2	dB	GAIN=+1～+20dB
DIFFERENTIAL INPUT	Input impedance(DP, DN)		R_{IN}	200	250	325	KΩ	
	Maximum input voltage		V_{IM}	2.1	2.3	–	Vrms	VIM at THD+N(VOUT)=1% BW=400-30KHz
	Voltage gain		G_{VDIF}	-1.5	0	1.5	dB	Gv=20log(VOUT/VIN)
	Common mode rejectiom ratio ＊		CMRR	50	65	–	dB	DP1 and DN input DP2 and DN input CMRR=20log(VIN/VOUT) BW = IHF-A
MUTE	Mute attenuation ＊	BD3484FS	G_{MUTE}	–	-100	-85	dB	Mute ON Gmute=20log(VOUT/VIN) BW = IHF-A
		BD3485FS						
		BD3486FS			-105			

VOLUME	Maximum gain	$G_{V\ MAX}$	+13	+15	+17	dB	Volume = +15dB, VIN=100mVrms Gv=20log(VOUT/VIN)
	Maximum attenuation ✻	$G_{V\ MIN}$	—	-100	-85	dB	Volume = -∞dB Gv=20log(VOUT/VIN), BW = IHF-A
	Step resolution	$G_{V\ STEP}$	—	1	—	dB	GAIN & ATT=+15dB～-79dB
	Gain set error	$G_{V\ ERR}$	-2	0	2	dB	GAIN=+1～+15dB
	Attenuation set error 1	$G_{V\ ERR1}$	-2	0	2	dB	ATT=-1dB～-15dB
	Attenuation set error 2	$G_{V\ ERR2}$	-3	0	3	dB	ATT=-16dB～-47dB
	Attenuation set error 3	$G_{V\ ERR3}$	-4	0	4	dB	ATT=-48dB～-79dB
BASS	Maximum boost gain	$G_{B\ BST}$	18	20	22	dB	Gain=+20dB,VIN=100mVrms G_B=20log (VOUT/VIN)
	Maximum cut gain	$G_{B\ CUT}$	-22	-20	-18	dB	Gain=-20dB, VIN=1Vrms G_B=20log (VOUT/VIN)
	Step resolution	$G_{B\ STEP}$	-	1	-	dB	Gain=-20～+20dB
	Gain set error	$G_{B\ ERR}$	-2	0	2	dB	Gain=-20～+20dB
	Center frequency	f_{B1}	-	60	-	Hz	Gain=-20～+20dB
		f_{B2}	-	80	-		
		f_{B3}	-	100	-		
		f_{B4}	-	120	-		
	Quality factor	Q_{B1}	-	0.5	-	-	Gain=-20～+20dB
		Q_{B2}	-	1	-		
		Q_{B3}	-	1.5	-		
		Q_{B4}	-	2.0	-		
MIDDLE	Maximum boost gain	$G_{M\ BST}$	18	20	22	dB	Gain=+20dB, VIN=100mVrms G_B=20log (VOUT/VIN)
	Maximum cut gain	$G_{M\ CUT}$	-22	-20	-18	dB	Gain=-20dB,VIN=1Vrms G_B=20log (VOUT/VIN)
	Step resolution	$G_{M\ STEP}$	-	1	-	dB	Gain=-20～+20dB
	Gain set error	$G_{M\ ERR}$	-2	0	2	dB	Gain=-20～+20dB
	Center frequency	f_{M1}	-	500	-	Hz	Gain=-20～+20dB
		f_{M2}	-	1k	-		
		f_{M3}	-	1.5k	-		
		f_{M4}	-	2.5k	-		
	Quality factor	Q_{M1}	-	0.75	-	-	Gain=-20～+20dB
		Q_{M2}	-	1	-		
		Q_{M3}	-	1.25	-		
		Q_{M4}	-	1.5	-		
TREBLE	Maximum boost gain	$G_{T\ BST}$	17	20	23	dB	Gain=+20dB, VIN=100mVrms G_B=20log (VOUT/VIN)
	Maximum cut gain	$G_{T\ CUT}$	-23	-20	-17	dB	Gain=-20dB, VIN=1Vrms G_B=20log (VOUT/VIN)
	Step resolution	$G_{T\ STEP}$	-	1	-	dB	Gain=-20～+20dB
	Gain set error	$G_{T\ ERR}$	-2	0	2	dB	Gain=-20～+20dB
	Center frequency	f_{T1}	-	7.5k	-	Hz	Gain=-20～+20dB
		f_{T2}	-	10k	-		
		f_{T3}	-	12.5k	-		
		f_{T4}	-	15k	-		
	Quality factor	Q_{T1}	-	0.75	-	-	Gain=-20～+20dB
		Q_{T2}	-	1.25	-		
LPF	Cut-off frequency	f_{C1}	-	80	-	Hz	
		f_{C2}	-	120	-		
		f_{C3}	-	160	-		

Level meter (BD3485FS)	Maximum output voltage		$V_{L\ MAX}$	2.9	3.3	3.5	V	
	Output offset voltage		$V_{L\ OFF}$	-	0	50	mV	
Spectrum Analyzer (BD3486FS)	Maximum output voltage 1(EQ1～6)		$V_{S\ MAX1}$	2.8	3.1	3.3	V	VIN=2.3Vrms, EQ1～EQ6
	Maximum output voltage 2 (EQ7)		$V_{S\ MAX2}$	2.5	2.7	3.3	V	VIN=2.3Vrms, EQ7
	Output offset voltage		$V_{S\ OFF}$	-	0	50	mV	No signal
FADER	Maximum gain	BD3484FS	$G_{F\ BST}$	21	23	25	dB	Gain=23dB (BD3484FS) Gain=15dB (BD3485/86FS) V_{IN}=100mVrms G_F=20log(VOUT/VIN)
		BD3485FS		13	15	17		
		BD3486FS						
	Maximum attenuation ＊		$G_{F\ BST}$	—	-100	-90	dB	Fader = -∞dB G_F=20log(VOUT/VIN) BW = IHF-A
	Step resolution		$G_{F\ STEP}$	—	1	—	dB	Gain & ATT=+15～-79dB
	Gain set error		$G_{F\ ERR}$	-2	0	2	dB	Gain=+1~+23dB (BD3484FS) Gain=+1～+15dB (BD3485/86FS)
	Attenuation set error 1		$G_{F\ ERR1}$	-2	0	2	dB	ATT=-1～-15dB
	Attenuation set error 2		$G_{F\ ERR2}$	-3	0	3	dB	ATT=-16～-47dB
	Attenuation set error 3		$G_{F\ ERR3}$	-4	0	4	dB	ATT=-48～-79dB
	Output impedance		R_{OUT}	—	—	50	Ω	VIN=100mVrms
	Maximum output voltage		V_{OM}	2	2.2	—	Vrms	THD=1%, BW=400-30KHz
LOUDNESS (BD3484FS)	Maximum attenuation		$G_{L\ MAX}$	-23	-20	-17	dB	Gain=-20dB, VIN=100mVrms G_L=20log(VOUT/VIN)
	Step resolution		$G_{L\ STEP1}$	—	1	—	dB	Gain=0～-10dB
			$G_{L\ STEP2}$	—	2	—	dB	Gain=-10～-20dB
	Gain set error		$G_{L\ ERR}$	-2	0	2	dB	Gain=-1～-20dB
Super Bass (BD3485FS)	Maximum gain		$G_{E\ MAX}$	17	20	23	dB	Gain=+20dB, VIN=100mVrms G_E=20log(VOUT/VIN)
	Step resolution		$G_{E\ STEP1}$	—	1	—	dB	Gain=0～+10dB
			$G_{E\ STEP2}$	—	2	—	dB	Gain=+10～+20dB
	Gain set error		$G_{E\ ERR}$	-2	0	2	dB	Gain=+1～+20dB
EFFECT (BD3486FS)	Maximum gain		$G_{E\ MAX}$	13	15	17	dB	Gain 15dB VIN=100mVrms, f=20kHz G_E=20log(VOUT/VIN)
	Gain set error		$G_{E\ ERR}$	-2	0	2	dB	Gain=+1～+15dB, f=20KHz
ADVANCED SWITCH	Advanced switch time of Mute		T_{M1}	—	0.6	—	msec	Advanced switch ON
			T_{M2}	—	1.0	—		
			T_{M3}	—	1.4	—		
			T_{M4}	—	3.2	—		
	Advanced switch time of Volume, Fader, Tone control gain and att.		T_{VS1}	—	4.7	—	msec	Advanced switch ON
			T_{VS2}	—	11.2	—		
			T_{VS3}	—	14.4	—		
			T_{VS4}	—	19.7	—		
			T_{VS5}	—	25.7	—		
			T_{VS6}	—	30.3	—		
			T_{VS7}	—	42.0	—		
			T_{VS8}	—	53.5	—		

※VP-9690A(Average value detection, effective value display) filter by Matsushita Communication is used for ＊ measurement.
※Phase between input / output is same.

●Timing chart

Electrical specifications and timing for bus lines and I/O stages

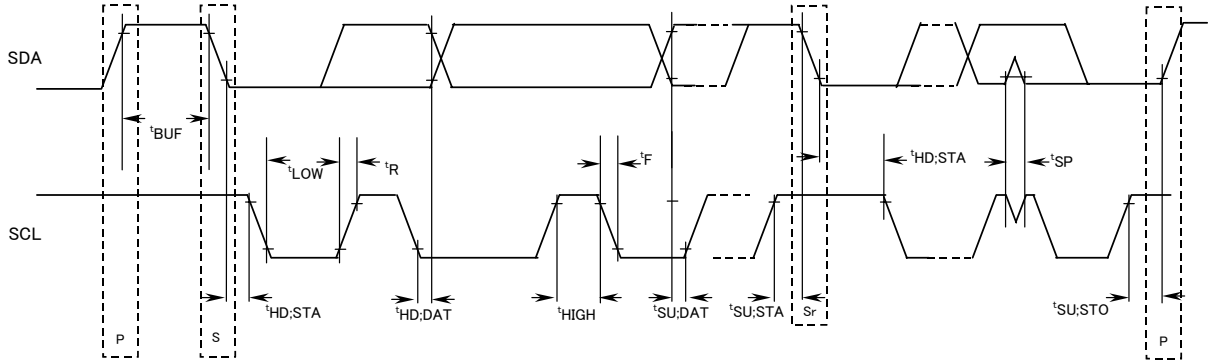


Fig.1 Definition of timing on the I^2C-bus

Table 1 Characteristics of the SDA and SCL bus lines for I^2C-bus devices

Item		Symbol	Fast-mode I^2C-bus		Unit
			Min.	Max.	
1	SCL clock frequency	f_{SCL}	0	400	kHz
2	Bus free time between a STOP and START condition	t_{BUF}	1.3	–	μS
3	Hold time (repeated) START condition. After this period, the first clock pulse is generated	$t_{HD;STA}$	0.6	–	μS
4	LOW period of the SCL clock	t_{LOW}	1.3	–	μS
5	HIGH period of the SCL clock	t_{HIGH}	0.6	–	μS
6	Set-up time for a repeated START condition	$t_{SU;STA}$	0.6	–	μS
7	Data hold time:	$t_{HD;DAT}$	0*	–	μS
8	Data set-up time	$t_{SU;DAT}$	100	–	ns
9	Rise time of both SDA and SCL signals	t_R	20+Cb	300	ns
10	Fall time of both SDA and SCL signals	t_F	20+Cb	300	ns
11	Set-up time for STOP condition	$t_{SU;STO}$	0.6	–	μS
12	Capacitive load for each bus line	Cb	–	400	pF

All values referred to $V_{IH\ min.}$ and $V_{IL\ max.}$ Levels (see Table 2).

* A device must internally provide a hold time of at least 300 ns for the SDA signal (referred to the V_{IH} min. of the SCL signal) in order to bridge the undefined region of the falling edge of SCL.

Table 2 Characteristics of the SDA and SCL I/O stages for I^2C-bus devices

Item		Symbol	Fast-mode devices		Unit
			Min.	Max.	
13	LOW level input voltage : fixed input levels	V_{IL}	-0.5	1	V
14	HIGH level input voltage : fixed input levels	V_{IH}	2.3	–	V
15	Hysterics of Schmitt trigger inputs : fixed input levels	V_{hys}	n/a	n/a	V
16	Pulse width of spikes which must be suppressed by the input filter.	T_{sp}	0	50	ns
17	LOW level output voltage (open drain or open collector): at 3mA sink current	V_{OL1}	0	0.4	V
18	Output fall time from VIHmin. to VIHmax. with a bus capacitance from 10 pF to 400pF : with up to 3mA sink current at VOL1	t_{OF}	20+0.1Cb *1)	250 *2)	ns
19	Input current each I/O pin with an input voltage between 0.4V and 0.9 VDDmax.	Ii	-10	10	μA
20	Capacitance for each I/O pin.	Ci	–	10	pF

n/a = not applicable

1) maximum $V_{IH}=V_{DDmax}+0.5V$, $V_{DDMAX}=5.5V$
2) Cb = capacitance of one bus line in pF.
3) Note that the maximum tF for the SDA and SCL bus lines quoted in Table 1 (300ns) is longer than the specified maximum tOF for the output stages (250ns). This allows series protection resistors (Rs) to be connected between the SDA/SCL pins and the SDA/SCL bus lines as shown in Fig. 1 without exceeding the maximum specified tF.

●CONTROL SIGNAL SPECIFICATION (BD3484FS)

Data

Item	Select Address (hex)	MSB Data LSB							
		D7	D6	D5	D4	D3	D2	D1	D0
Initial Setup 1	01	Advanced switch ON/OFF	Advanced switch time of Volume/Fader/Tone/Loudness			0	0	Advanced switch time of Mute	
Initial Setup 2	02	0	0	Subwoofer Output Selector		0	0	Subwoofer LPF fc	
Input Selector	04	0	0	0	0	0	Input Selector		
Input gain	06	Mute ON/OFF	0	0	Input Gain				
Volume gain	20	Volume Gain / Attenuation							
Fader 1ch Front	28	Fader Gain / Attenuation							
Fader 2ch Front	29	Fader Gain / Attenuation							
Fader 1ch Rear	2A	Fader Gain / Attenuation							
Fader 2ch Rear	2B	Fader Gain / Attenuation							
Fader 1ch Sub	2C	Fader Gain / Attenuation							
Fader 2ch Sub	2D	Fader Gain / Attenuation							
Bass setup	41	0	0	Bass fo		0	0	Bass Q	
Middle setup	44	0	0	Middle fo		0	0	Middle Q	
Treble setup	47	0	0	Treble fo		0	0	0	Treble Q
Bass gain	51	Bass Boost/Cut	0	0	Bass Gain				
Middle gain	54	Middle Boost/Cut	0	0	Middle Gain				
Treble gain	57	Treble Boost/Cut	0	0	Treble Gain				
Loudness attenuation	75	0	0	0	0	Loudness Attenuation			
Test Mode 1	80	1	0	0	0	0	0	0	1
Test Mode 2	F0	0	0	0	0	0	0	0	0
	F1	0	0	0	0	0	0	0	0
	F2	0	0	0	0	0	0	0	0
System Reset	FE	1	0	0	0	0	0	0	1

※In function changing of the hatching part, it works advanced switch.

Slave address

MSB LSB

A6	A5	A4	A3	A2	A1	A0	R/W
1	0	0	0	0	0	0	0

80H

※Please refer to 『BD3484FS User's Manual for I^2C BUS communication』 about the detail of control signal specification.

●CONTROL SIGNAL SPECIFICATION (BD3485FS)

Data

Item	Select Address (hex)	MSB Data LSB							
		D7	D6	D5	D4	D3	D2	D1	D0
Initial Setup 1	01	Advanced switch ON/OFF	Advanced switch time of Volume/Fader/Tone/ Super Bass			0	0	Advanced switch time of Mute	
Initial Setup 2	02	0	0	Subwoofer Output Selector		0	0	Subwoofer LPF fc	
Input Selector	04	0	0	0	0	0	Input Selector		
Input gain	06	Mute ON/OFF	0	0	Input Gain				
Volume gain	20	Volume Gain / Attenuation							
Fader 1ch Front	28	Fader Gain / Attenuation							
Fader 2ch Front	29	Fader Gain / Attenuation							
Fader 1ch Rear	2A	Fader Gain / Attenuation							
Fader 2ch Rear	2B	Fader Gain / Attenuation							
Fader 1ch Sub	2C	Fader Gain / Attenuation							
Fader 2ch Sub	2D	Fader Gain / Attenuation							
Bass setup	41	0	0	Bass fo		0	0	Bass Q	
Middle setup	44	0	0	Middle fo		0	0	Middle Q	
Treble setup	47	0	0	Treble fo		0	0	0	Treble Q
Bass gain	51	Bass Boost/Cut	0	0	Bass Gain				
Middle gain	54	Middle Boost/Cut	0	0	Middle Gain				
Treble gain	57	Treble Boost/Cut	0	0	Treble Gain				
Super Bass Gain	75	0	0	0	0	Super Bass Gain			
Test Mode 1	80	1	0	0	0	0	0	0	1
Test Mode 2	F0	0	0	0	0	0	0	0	0
	F1	0	0	0	0	0	0	0	0
	F2	0	0	0	0	0	0	0	0
System Reset	FE	1	0	0	0	0	0	0	1

※In function changing of the hatching part, it works advanced switch.

Slave address

MSB LSB

A6	A5	A4	A3	A2	A1	A0	R/W
1	0	0	0	0	0	0	0

80H

※Please refer to 『BD3485FS User's Manual for I^2C BUS communication』 about the detail of control signal specification.

●CONTROL SIGNAL SPECIFICATION (BD3486FS)

Data

Item	Select Address (hex)	MSB Data LSB							
		D7	D6	D5	D4	D3	D2	D1	D0
Initial Setup 1	01	Advanced switch ON/OFF	Advanced switch time of Volume/Fader/Tone/Effect			0	0	Advanced switch time of Mute	
Initial Setup 2	02	0	0	Subwoofer Output Selector		0	0	Subwoofer LPF fc	
Input Selector	04	0	0	0	0	0	Input Selector		
Input gain	06	Mute ON/OFF	0	0	Input Gain				
Volume gain	20	Volume Gain / Attenuation							
Fader 1ch Front	28	Fader Gain / Attenuation							
Fader 2ch Front	29	Fader Gain / Attenuation							
Fader 1ch Rear	2A	Fader Gain / Attenuation							
Fader 2ch Rear	2B	Fader Gain / Attenuation							
Fader 1ch Sub	2C	Fader Gain / Attenuation							
Fader 2ch Sub	2D	Fader Gain / Attenuation							
Bass setup	41	0	0	Bass fo		0	0	Bass Q	
Middle setup	44	0	0	Middle fo		0	0	Middle Q	
Treble setup	47	0	0	Treble fo		0	0	0	Treble Q
Bass gain	51	Bass Boost/Cut	0	0	Bass Gain				
Middle gain	54	Middle Boost/Cut	0	0	Middle Gain				
Treble gain	57	Treble Boost/Cut	0	0	Treble Gain				
Effect Gain	75	0	0	0	0	Effect Gain			
Test Mode 1	80	1	0	0	0	0	0	0	1
Test Mode 2	F0	0	0	0	0	0	0	0	0
	F1	0	0	0	0	0	0	0	0
System Reset	FE	1	0	0	0	0	0	0	1

※In function changing of the hatching part, it works advanced switch.

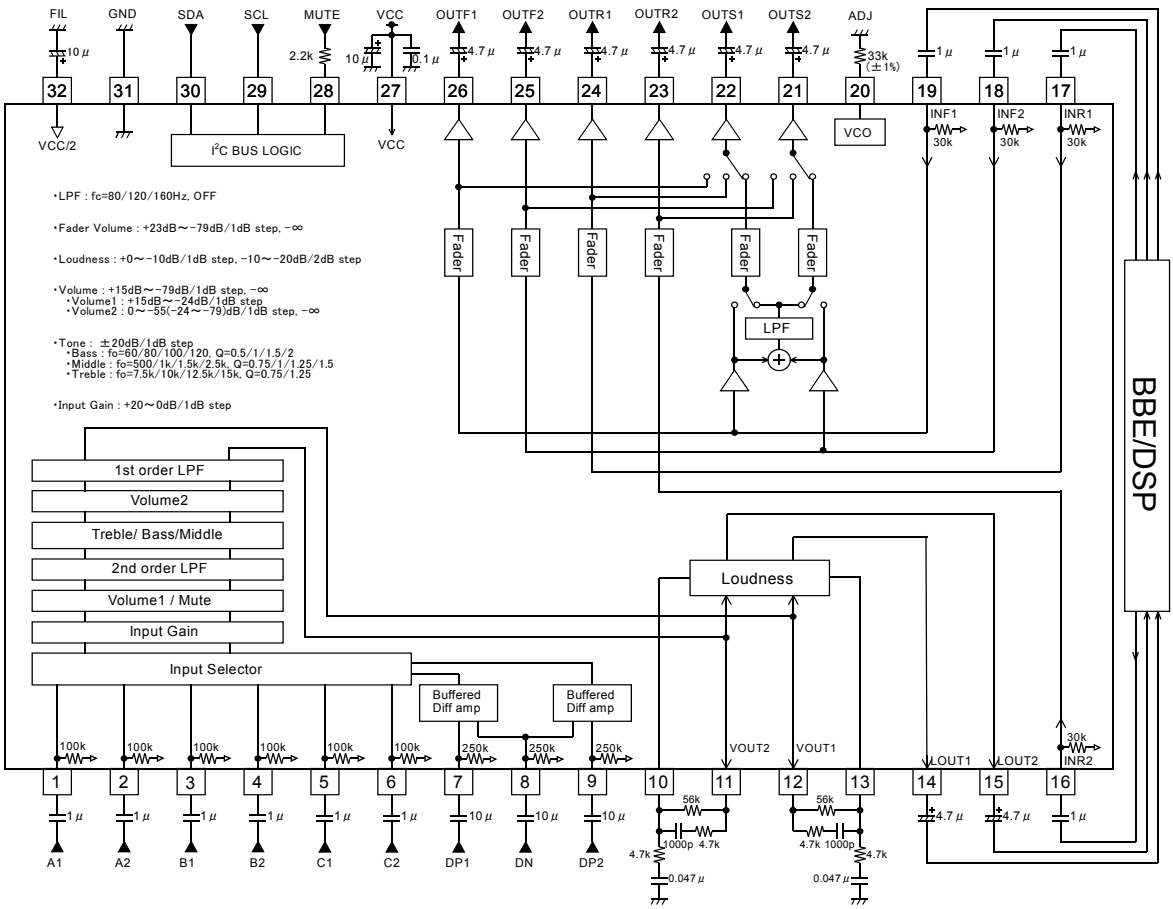
Slave address

MSB LSB

A6	A5	A4	A3	A2	A1	A0	R/W	
1	0	0	0	0	0	0	0	80H

※Please refer to『BD3486FS User's Manual for I^2C BUS communication』about the detail of control signal specification.

●Application Circuit Diagram (BD3484FS)



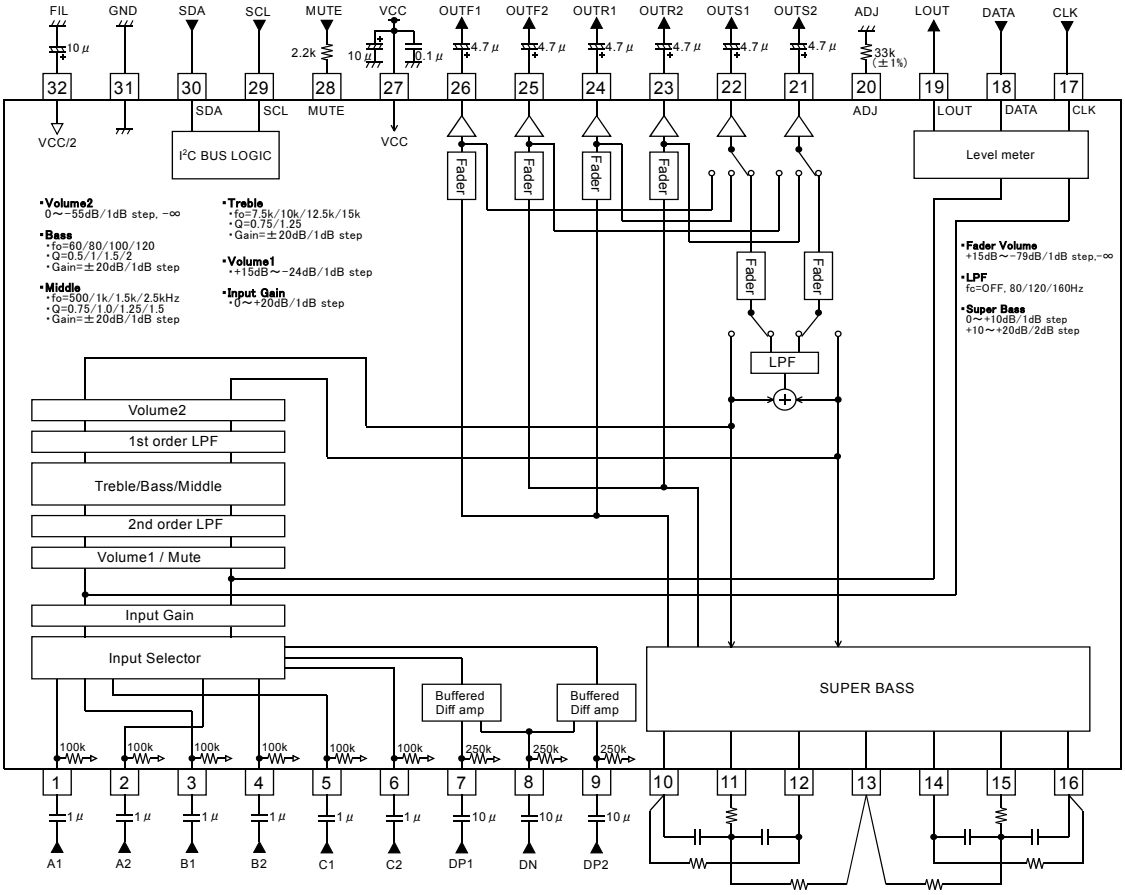
Unit
R : [Ω]
C : [F]

Fig.2 Application Circuit Diagram(BD3484FS)

●Descriptions of terminal

Terminal No.	Terminal Name	Description	Terminal No.	Terminal Name	Description
1	A1	A input terminal of 1ch	17	INR1	Rear input terminal of 1ch
2	A2	A input terminal of 2ch	18	INF2	Front input terminal of 2ch
3	B1	B input terminal of 1ch	19	INF1	Front input terminal of 1ch
4	B2	B input terminal of 2ch	20	ADJ	Adjust terminal of VCO frequency
5	C1	C input terminal of 1ch	21	OUTS2	Subwoofer output terminal of 2ch
6	C2	C input terminal of 2ch	22	OUTS1	Subwoofer output terminal of 1ch
7	DP1	D positive input terminal of 1ch	23	OUTR2	Rear output terminal of 2ch
8	DN	D negative input terminal	24	OUTR1	Rear output terminal of 1ch
9	DP2	D positive input terminal of 2ch	25	OUTF2	Front output terminal of 2ch
10	LIN2	Loudness input terminal of 2ch	26	OUTF1	Front output terminal of 1ch
11	VOUT2	Volume output terminal of 2ch	27	VCC	Power supply terminal
12	VOUT1	Volume output terminal of 1ch	28	MUTE	External compulsory mute terminal
13	LIN1	Loudness input terminal of 1ch	29	SCL	I^2C Communication clock terminal
14	LOUT1	Loudness output terminal of 1ch	30	SDA	I^2C Communication data terminal
15	LOUT2	Loudness output terminal of 2ch	31	GND	Grounding terminal
16	INR2	Rear input terminal of 2ch	32	FIL	VCC/2 terminal

●Application Circuit Diagram (BD3485FS)



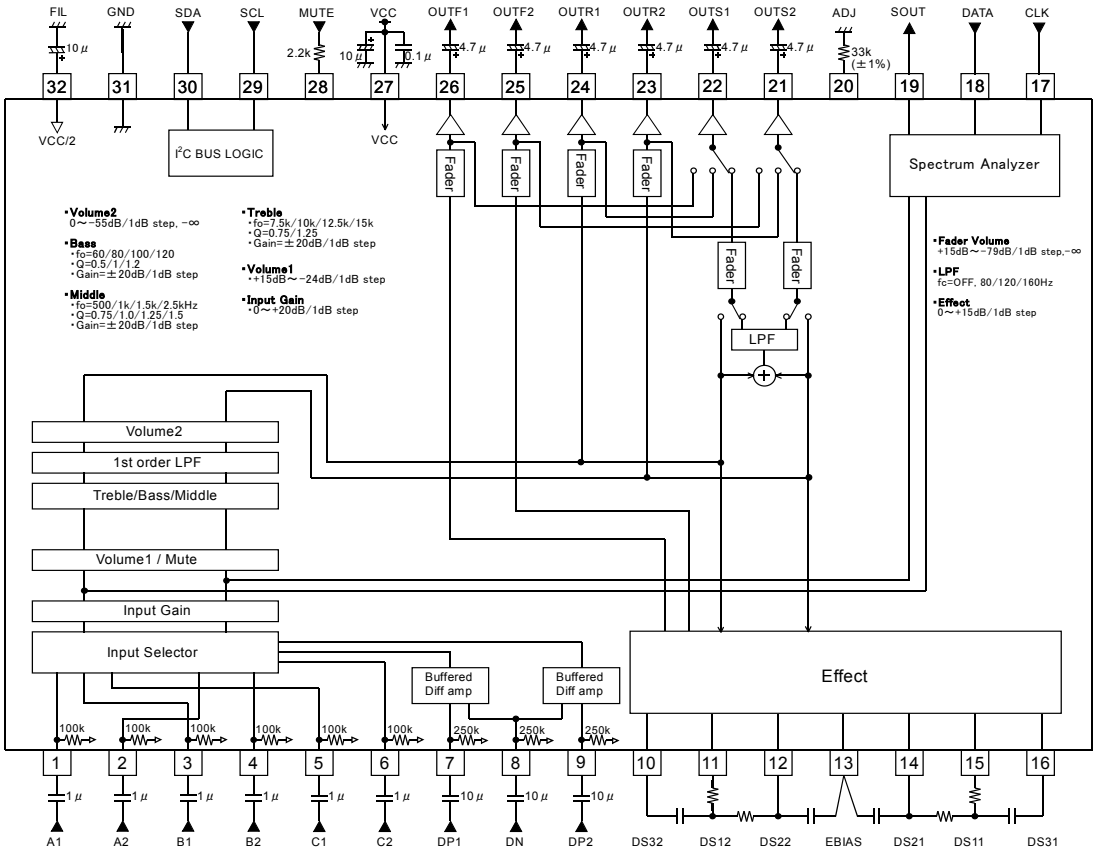
Unit
R : [Ω]
C : [F]

Fig.3 Application Circuit Diagram(BD3485FS)

●Descriptions of terminal

Terminal No.	Terminal Name	Description	Terminal No.	Terminal Name	Description
1	A1	A input terminal of 1ch	17	CLK	Clock terminal for Level meter
2	A2	A input terminal of 2ch	18	DATA	Data terminal for Level meter
3	B1	B input terminal of 1ch	19	LOUT	Output terminal for Level meter
4	B2	B input terminal of 2ch	20	ADJ	Adjust terminal of VCO frequency
5	C1	C input terminal of 1ch	21	OUTS2	Subwoofer output terminal of 2ch
6	C2	C input terminal of 2ch	22	OUTS1	Subwoofer output terminal of 1ch
7	DP1	D positive input terminal of 1ch	23	OUTR2	Rear output terminal of 2ch
8	DN	D negative input terminal	24	OUTR1	Rear output terminal of 1ch
9	DP2	D positive input terminal of 2ch	25	OUTF2	Front output terminal of 2ch
10	SB32	Terminal 3 for Super Bass of 2ch	26	OUTF1	Front output terminal of 1ch
11	SB12	Terminal 1 for Super Bass of 2ch	27	VCC	Power supply terminal
12	SB22	Terminal 2 for Super Bass 2ch	28	MUTE	External compulsory mute terminal
13	SBIAS	BIAS terminal for Supper Bass	29	SCL	I^2C Communication clock terminal
14	SB21	Terminal 2 for Super Bass of 1ch	30	SDA	I^2C Communication data terminal
15	SB11	Terminal 1 for Super Bass of 1ch	31	GND	Grounding terminal
16	SB31	Terminal 3 for Super Bass 1ch	32	FIL	VCC/2 terminal

●Application Circuit Diagram (BD3486FS)



Unit
R : [Ω]
C : [F]

Fig.4 Application Circuit Diagram(BD3486FS)

●Descriptions of terminal

Terminal No.	Terminal Name	Description	Terminal No.	Terminal Name	Description
1	A1	A input terminal of 1ch	17	CLK	Clock terminal for Spectrum Analyzer
2	A2	A input terminal of 2ch	18	DATA	Data terminal for Spectrum Analyzer
3	B1	B input terminal of 1ch	19	SOUT	Output terminal for Spectrum Analyzer
4	B2	B input terminal of 2ch	20	ADJ	Adjust terminal of VCO frequency
5	C1	C input terminal of 1ch	21	OUTS2	Subwoofer output terminal of 2ch
6	C2	C input terminal of 2ch	22	OUTS1	Subwoofer output terminal of 1ch
7	DP1	D positive input terminal of 1ch	23	OUTR2	Rear output terminal of 2ch
8	DN	D negative input terminal	24	OUTR1	Rear output terminal of 1ch
9	DP2	D positive input terminal of 2ch	25	OUTF2	Front output terminal of 2ch
10	DS32	Terminal 3 for Effect of 2ch	26	OUTF1	Front output terminal of 1ch
11	DS12	Terminal 1 for Effect of 2ch	27	VCC	Power supply terminal
12	DS22	Terminal 2 for Effect of 2ch	28	MUTE	External compulsory mute terminal
13	EBIAS	BIAS terminal for Effect	29	SCL	I^2C Communication clock terminal
14	DS21	Terminal 2 for Effect of 1ch	30	SDA	I^2C Communication data terminal
15	DS11	Terminal 1 for Effect of 1ch	31	GND	Grounding terminal
16	DS31	Terminal 3 for Effect of 1ch	32	FIL	VCC/2 terminal

●Data

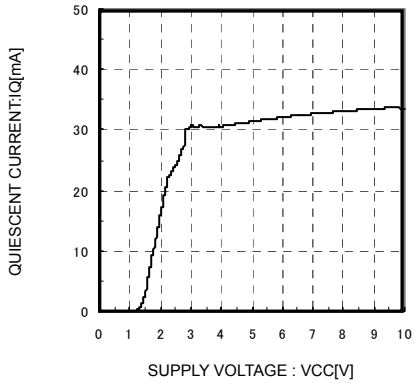


Fig.5 QUIESCENT CURRENT VS SUPPLY VOLTAGE

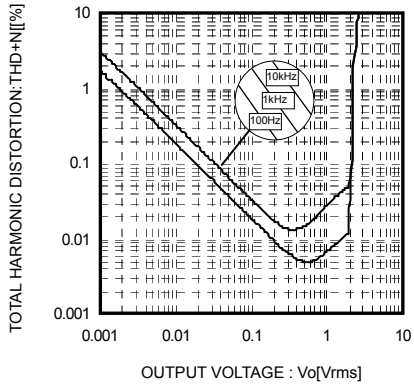


Fig.6 TOTAL HARMONIC DISTORTION VS OUTPUT VOLTAGE

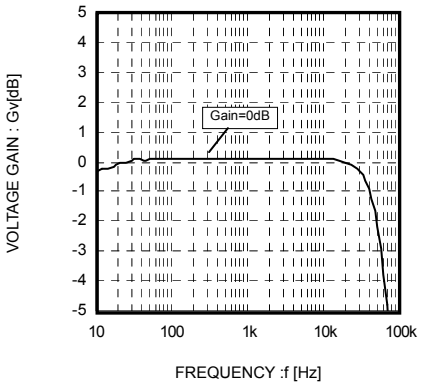


Fig.7 VOLTAGE GAIN VS FREQUECY

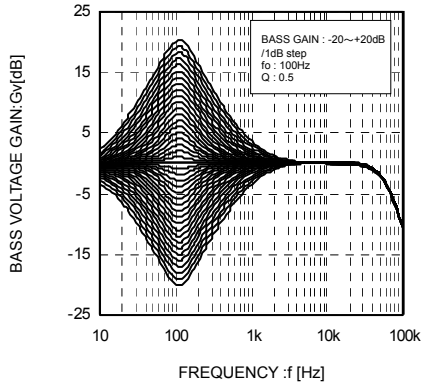


Fig.8 BASS VOLTAGE GAIN VS FREQUENCY 1

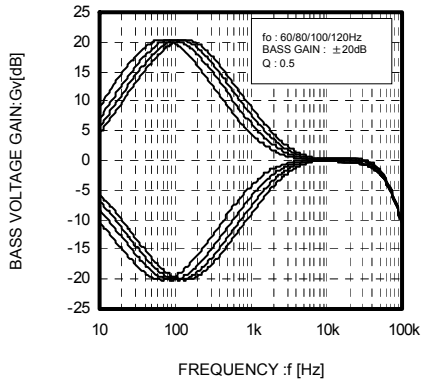


Fig.9 BASS VOLTAGE GAIN VS FREQUENCY 2(fo VARIABLE)

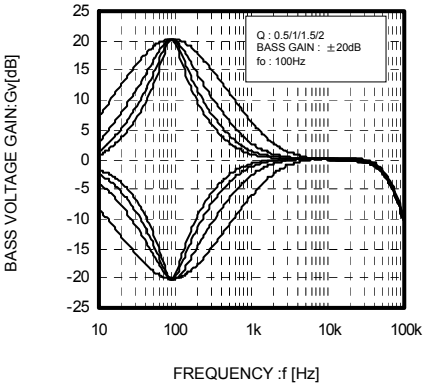


Fig.10 CMRR VS FREQUENCY 3(Q VARIABLE)

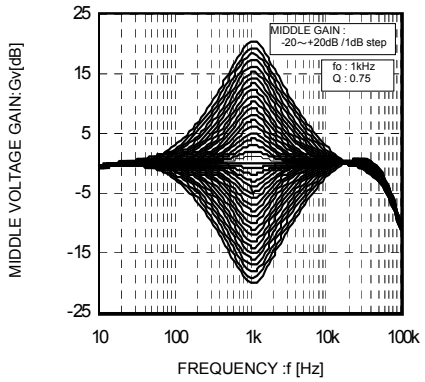


Fig.11 MIDDLE VOLTAGE GAIN vs FREQUENCY 1

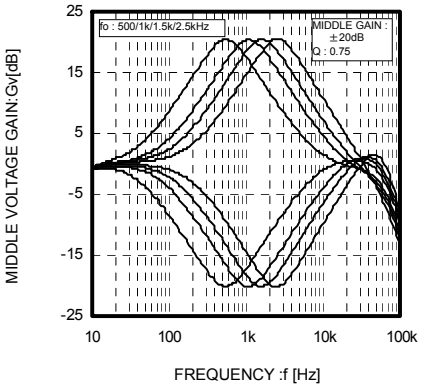


Fig.12 MIDDLE VOLTAGE GAIN vs FREQUENCY 2(fo VARIABLE)

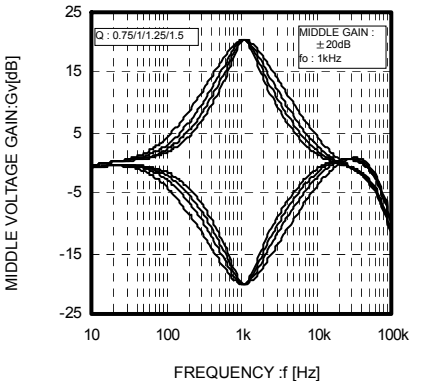


Fig.13 MIDDLE VOLTAGE GAIN vs FREQUENCY 3 (Q VARIABLE)

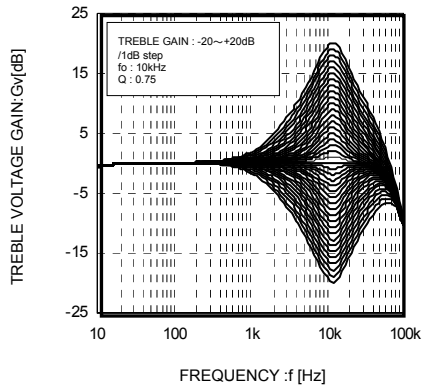


Fig.14 TREBLE VOLTAGE GAIN VS FREQUENCY 1

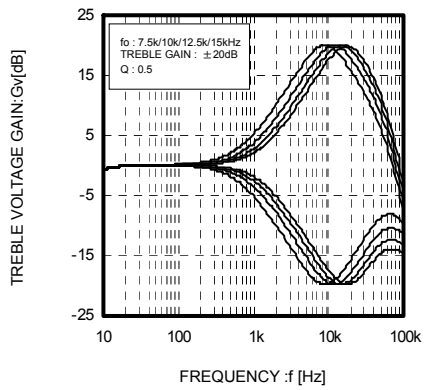


Fig.15 TREBLE VOLTAGE GAIN VS FREQUENCY 2(fo VARIABLE)

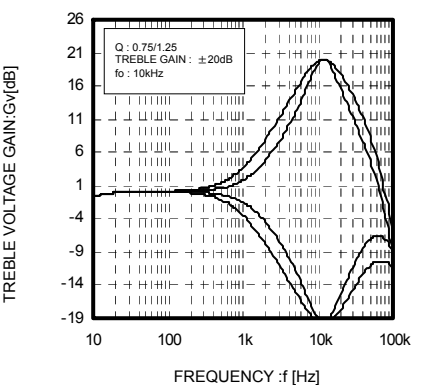


Fig.16 TREBLE VOLTAGE GAIN VS FREQUENCY 3(Q VARIABLE)

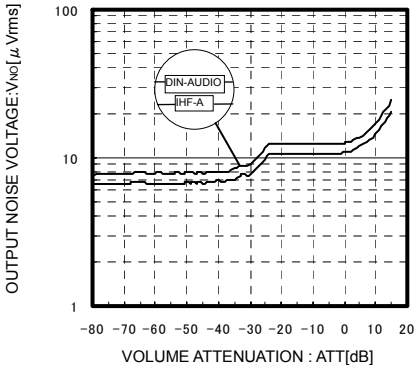


Fig.17 VOLUME ATTENUATION VS OUTPUT NOISE

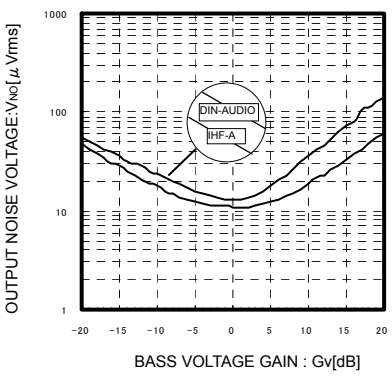


Fig.18 BASS VOLTAGE GAIN VS OUTPUT NOISE

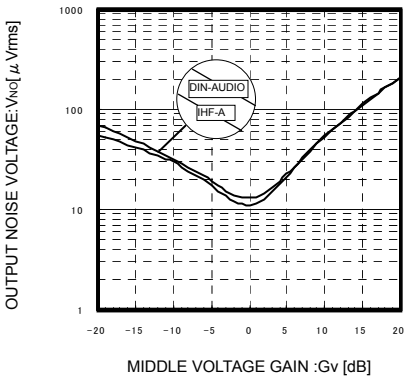


Fig.19 MIDDLE VOLTAGE GAIN VS OUTPUT NOISE

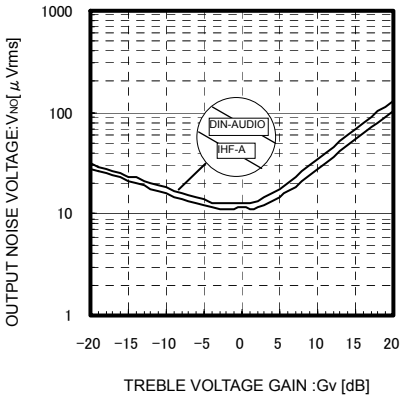


Fig.20 TREBLE VOLTAGE GAIN VS OUTPUT NOISE

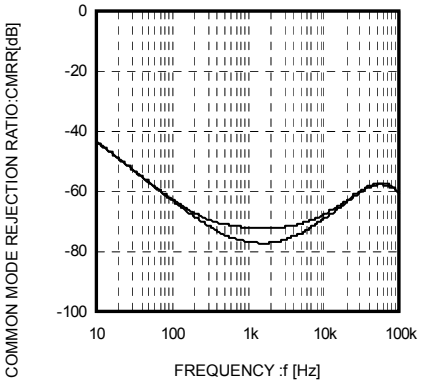


Fig.21 CMRR VS FREQUENCY

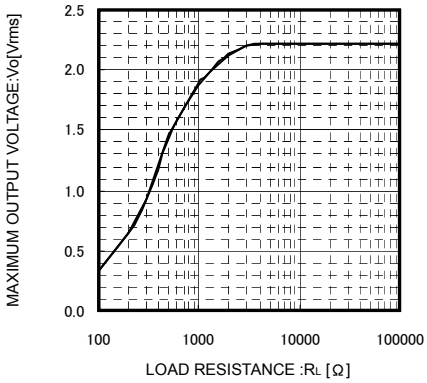


Fig.22 LOAD RESISITANCE VS MAXIMUM OUTPUT VOLTAGE

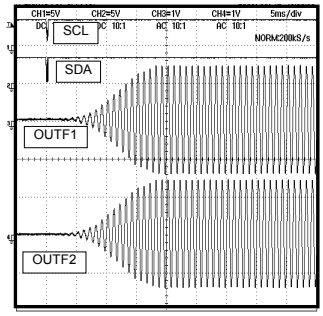


Fig.23 ADVANCED SWITCH WAVEFORM 1

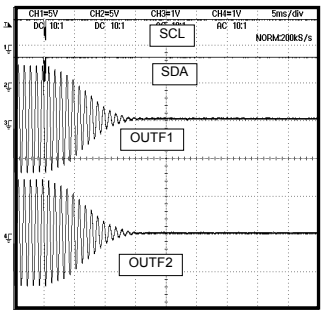


Fig.24 ADVANCED SWITCH WAVEFORM 2

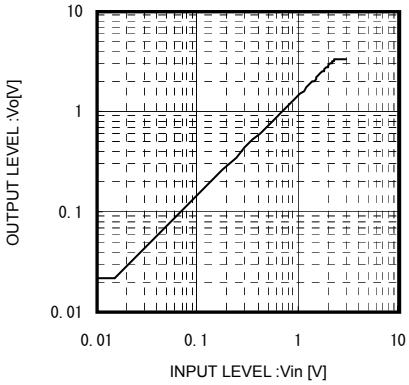


Fig.25 INPUT VOLTAGE VS LEVEL METER OUTPUT

● About selecting components for application

About resistor of “ADJ” terminal (20pin)

This resistor desides oscillation frequency of VCO.
Please select a resistor that has low temperature coefficiency and high accuracy.
And, the value of this resistor changes center frequency of tone control and also changes advanced switch time.
Please refer to the following table.

(Reference data)

Block		Item	Radj : TYP (33kΩ)	Radj : -18% (27kΩ)	Unit
Tone Control	Bass	fB1	60	73	Hz
		fB2	80	98	
		fB3	100	122	
		fB4	120	147	
	Middle	fM1	500	611	
		fM2	1 k	1.2k	
		fM3	1.5 k	1.8k	
		fM4	2.5 k	3.1k	
LPF		fc1	80	98	
		fc2	120	146	
		fc3	160	195	
MUTE		Advanced switch time	0.6	0.5	ms
			1	0.8	
			1.4	1.1	
			3.2	2.6	
Volume Tone control Loudness (BD3484FS) Super bass (BD3485FS) Effect (BD3486FS) Fader		Advanced switch time	4.7	3.8	
			11.2	9.2	
			14.4	11.8	
			19.7	16.1	
			25.7	21.0	
			30.3	24.8	
			42	34.3	
			53.5	43.8	

● Cautions on use

(1) Numbers and data in entries are representative design values and are not guaranteed values of the items.
(2) Although we are confident in recommending the sample application circuits, carefully check their characteristics further when using them. When modifying externally attached component constants before use, determine them so that they have sufficient margins by taking into account variations in externally attached components and the Rohm LSI, not only for static characteristics but also including transient characteristics.
(3) Absolute maximum ratings
If applied voltage, operating temperature range, or other absolute maximum ratings are exceeded, the LSI may be damaged. Do not apply voltages or temperatures that exceed the absolute maximum ratings. If you think of a case in which absolute maximum ratings are exceeded, enforce fuses or other physical safety measures and investigate how not to apply the conditions under which absolute maximum ratings are exceeded to the LSI.
(4) GND potential
Make the GND pin voltage such that it is the lowest voltage even when operating below it. Actually confirm that the voltage of each pin does not become a lower voltage than the GND pin, including transient phenomena.
(5) Thermal design
Perform thermal design in which there are adequate margins by taking into account the allowable power dissipation in actual states of use.
(6) Shorts between pins and misinstallation
When mounting the LSI on a board, pay adequate attention to orientation and placement discrepancies of the LSI. If it is misinstalled and the power is turned on, the LSI may be damaged. It also may be damaged if it is shorted by a foreign substance coming between pins of the LSI or between a pin and a power supply or a pin and a GND.
(7) Operation in strong magnetic fields
Adequately evaluate use in a strong magnetic field, since there is a possibility of malfunction.

●Selection of order type

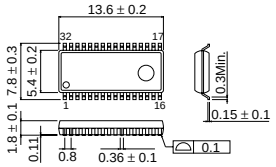
B	D	3	4	8	4	F	S	-	E	2

Part No.
BD3484FS
BD3485FS
BD3486FS

Package and forming specification

SSOP-A32

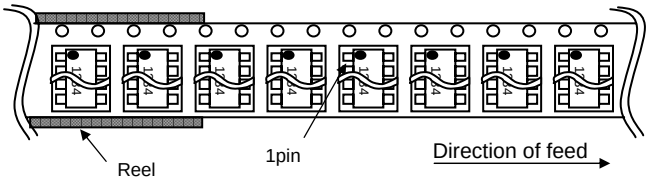
<Dimension>



(Unit:mm)

<Tape and Reel information>

Tape	Embossed carrier tape
Quantity	2000pcs
Direction of feed	E2 (The direction is the 1pin of product is at the upper left when you hold reel on the left hand and you pull out the tape on the right hand)



※When you order , please order in times the amount of package quantity.

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Wuxi	TEL: +86-510-82702693	FAX: +86-510-82702992
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Guangzhou	TEL: +86-20-8364-9796	FAX: +86-20-8364-9707
Shenzhen	TEL: +86-755-8307-3001	FAX: +86-755-8307-3003
Xiamen	TEL: +86-592-239-8382	FAX: +86-592-239-8380
Zhuhai	TEL: +86-756-3232-480	FAX: +86-756-3232-460
Taipei	TEL: +866-2-2500-6956	FAX: +866-2-2503-2869
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Penang	TEL: +60-4-6585084	FAX: +60-4-6585167
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Munich	TEL: +49-8161-48310	FAX: +49-8161-483120
Stuttgart	TEL: +49-711-72723710	FAX: +49-711-72723720
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Hungary	TEL: +36-1-4719338	FAX: +36-1-4719339
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Should you intend to use these products with equipment or devices which require an extremely high level of reliability and the malfunction of which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), please be sure to consult with our sales representative in advance.
It is our top priority to supply products with the utmost quality and reliability. However, there is always a chance of failure due to unexpected factors. Therefore, please take into account the derating characteristics and allow for sufficient safety features, such as extra margin, anti-flammability, and fail-safe measures when designing in order to prevent possible accidents that may result in bodily harm or fire caused by component failure. ROHM cannot be held responsible for any damages arising from the use of the products under conditions out of the range of the specifications or due to non-compliance with the NOTES specified in this catalog.

Thank you for your accessing to ROHM product informations.
More detail product informations and catalogs are available, please contact your nearest sales office.

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