Sound Processor Series for BOOM BOX / Mini-component Stereo

Plus /Minus Power Supply Sound Processor Built-in Pre Amplifier for Tape Recording and Play Back

BD3881FV, BD3882FV

●Description

The Sound Processor incorporates two built-in, operational amplifier circuits for recording and playing, minimizing external components. The shock sound at power-ON/OFF is absorbed and the reference voltage of signal systems is designed to be at ground level so that low offset voltage and low noise are achieved by both power sources.

●Features

1) Dual built-in record/play preamplifiers for cassette tapes
   Less external components resulting in a compact circuit board.
2) The shock sound at power-ON/OFF is absorbed by both power sources.
   The reference voltage of signal systems is designed to be a ground level so that low offset voltage and low noise are achieved.
3) Configuration of front/rear volumes allows high S/N in a circuit board design (BD3882FV).
4) Volume and tone implemented with the resistance ladder circuit (to achieve high performance with low noise and low distortion) by adopting the BiCMOS process. Switching shock sound is also absorbed.
5) Controlled through the 1-wire serial control (BD3881FV)
   Controlled through the 2-wire serial control (BD3882FV)
6) The package: SSOP-B28 contributes to a space-saving design (BD3881FV).
   The package: SSOP-B40 contributes to a space-saving design (BD3882FV).
7) Adopting the BiCMOS process achieves low-consumption current, which contributes to an energy-saving design.
   Using the BiCMOS process, has the advantage in quality over the scaling down of the internal regulators and heat controls.

●Applications

BOOM BOX, mini-audio systems and micro-audio systems.

●Product lineup

Parameter	BD3881FV	BD3882FV
Equalizer	2 band (BASS, TREBLE)	3 band (BASS, MIDDLE, TREBLE)
Volume	0 to -36dB/2dB step -36 to -84dB/4dB step, -∞dB	0 to -36dB/2dB step -36 to -76dB/4dB step, -∞dB
Rear Volume	No	0, -2, -4, -6, -8, -12, -16, -18dB
Cassette Recording/Playing Amplifier	Yes	Yes
Karaoke	Stereo, 1ch mono, 2ch mono, 1ch+2ch	Stereo, 1ch mono, 2ch mono, 1ch+2ch
Serial Control	1-wire serial	2-wire serial
Package	SSOP-B28	SSOP-B40

●**Absolute maximum ratings** (Ta=25°C)

Parameter	Symbol	Limits		Unit
		BD3881FV	BD3882FV	
Power Supply Voltage	VDD	5	5	V
	VEE	-5	-5	
Power Dissipation	Pd	850 *1	900 *2	mW
Operating Temperature	Topr	−20 to +75	−20 to +75	°C
Storage Temperature	Tstg	−55 to +125	−55 tp +125	°C

*1 Reduced by 8.5 mW/°C over 25°C, when installed on the standard board (Size: 70×70×1.6mm).

*2 Reduced by 9.0 mW/°C over 25°C, when installed on the standard board (Size: 70×70×1.6mm).

●**Operating voltage range**

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating Supply Voltage	VDD	3.5	4.5	4.75	V
	VEE	-4.75	-4.5	-3.5	

* Must function normally at Ta=25°C.

●**Electrical characteristics**

◎BD3881FV (Ta = 25°C, VDD = 4.5V, VEE = -4.5V, f = 1kHz, Vin = 50mVrms, Rg = 600Ω,
RL = 10kΩ, Input Selector = Ach, Volume=0dB, Bass=0dB, Treble=0dB, unless otherwise noted.)

Block	Parameter	Symbol	Limits			Unit	Condition
			Min.	Typ.	Max.		
GENERAL	VDD Circuit Current	IQVDD	-	3.0	8.0	mA	Vin = 0Vrms
	VEE Circuit Current	IQVEE	-8.0	-3.0	-		
	Maximum Input Voltage **1	Vim	0.6	0.8	-	Vrms	THD(Vout) = 1% Volume ATT=-24dB
	Maximum Input Voltage TP **1	Vimtp	0.6	0.8	-	Vrms	THD(Vout) = 1% GAIN = 10dB
	Maximum Output Voltage **1	Vom	2.2	2.5	-	Vrms	THD = 1%
	Voltage Gain	Gv	26	28	30	dB	GV = 20log(Vout/Vin)
	Channel Balance	CB	-1.5	0	1.5	dB	
	Total Harmonic Distortion Ratio**1	THD	-	0.02	0.1	%	
	Output Noise Voltage **2	Vno	-	12	20	μVrms	Volume = 0dB to -84dB Rg = 0Ω
	Residual Noise Voltage **2	Vmno	-	12	20	μVrms	Volume = -∞dB, Rg = 0Ω
	Cross-talk between Channels**2	CT	70	85	-	dB	CT = 20log(Vin/Vout) Rg = 0Ω
INPUT	Voltage Gain	Gv	8	10	12	dB	
	Cross-talk between Selectors **2	CTS	-	-110	-70	dB	Rg = 0Ω, Vin=500mVrms
	Output Impedance	Rsout	-	-	50	Ω	
REC EQ	Voltage Gain RC	Gvrc	38	40	42	dB	f=10kHz
	Maximum Output Voltage RC **1	Vomrc	2.2	2.5	-	Vrms	THD = 1%
	Input Conversion Noise Voltage RC **2	Vnorc	-	1.5	3.0	μVrms	Rg = 0Ω
	Slew Rate RC	Vtr	2	4	-	V/μS	
PB EQ	Voltage Gain TP **3	Gvtp	44	46	48	dB	f=10kHz
	Maximum Output Voltage TP **1	Vomtp	2.2	2.5	-	Vrms	THD = 1%
	Input Conversion Noise Voltage TP **2	Vnotp	-	1.1	2.0	μVrms	Rg = 2.2kΩ, Gv = 20dB

Block	Parameter	Symbol	Limits			Unit	Condition
			Min.	Typ.	Max.		
VOLUME	Volume Maximum Input Voltage **1	Vimv	2.2	2.5	-	Vrms	THD(Vout)=1%,Volume ATT=-24dB
	Volume Input Impedance	Rvin	14	20	26	kΩ	
	Volume Control Range **2	Vr	-87	-84	-81	dB	
	Volume Control Step 1	Sv1	-	2	-	dB	0dB to -36dB
	Volume Control Step 2	Sv2	-	4	-	dB	-36dB to -84dB
	Volume Setting Error 1	Ev1	-2	0	2	dB	0dB to -72dB
	Volume Setting Error 2	Ev2	-3	0	3	dB	-76dB to -84dB
	Volume Maximum Attenuation **2	ATTm	-	-118	-90	dB	Volume = -∞dB, Vin=3Vrms ATT=20log(Vout/Vin)-18dB
BASS	Bass Boost Control Range	Gbbr	+18	+21	+24	dB	f = 70Hz, Vin = 5mVrms BASS = +21dB
	Bass Control Step	Sbc	-	3	-	dB	f = 70Hz Vin = 5mVrms
	Bass Setting Error (0dB-12dB)	Ebs1	-2	0	2	dB	
	Bass Setting Error (15dB-21dB)	Ebs2	-3	0	3	dB	
TREBLE	Treble Boost Control Range	Gtbr	+12	+14	+16	dB	f = 10kHz, Vin = 5mVrms TREBLE = +14dB
	Treble Control Step	STC	-	2	-	dB	f = 10kHz, Vin = 5mVrms
	Treble Setting Error	ETS	-2	0	2	dB	

◎BD3882FV (Ta = 25°C, VDD = 4.5V, VEE = -4.5V, f = 1kHz, Vin = 50mVrms, Rg = 600Ω, RL = 10kΩ, Input Selector = Ach, Front Volume=0dB, Rear Volume=0dB, Bass=0dB, Middle=0dB, Treble=0dB, unless otherwise noted.)

Block	Parameter	Symbol	Limits			Unit	Condition
			Min.	Typ.	Max.		
GENERAL	VDD Circuit Current	IQVDD	-	4.5	10.0	mA	Vin = 0Vrms
	VEE Circuit Current	IQVEE	-10.0	-4.5	-		
	Maximum Input Voltage **1	Vim	0.6	0.8	-	Vrms	THD(Vout) = 1% Front Volume ATT=-6dB Rear Volume ATT=-18dB
	Maximum Input Voltage TP **1	Vimtp	0.6	0.8	-	Vrms	THD(Vout) = 1% GAIN = 10dB Front Volume ATT=-6dB Rear Volume ATT=-18dB
	Maximum Output Voltage **1	Vom	2.2	2.5	-	Vrms	THD = 1%
	Voltage Gain	Gv	26	28	30	dB	Gv = 20log(Vout/Vin)
	Channel Balance	CB	-1.5	0	1.5	dB	
	Total Harmonic Distortion Ratio**1	THD	-	0.01	0.1	%	
	Output Noise Voltage **2	Vno	-	22	60	μVrms	Rg = 0Ω
	Residual Noise Voltage **2	Vmno	-	3	8	μVrms	Volume = -∞dB, Rg = 0Ω
	Cross-talk between Channels**2	CT	70	85	-	dB	CT = 20log(Vin/Vout) Rg = 0Ω
	Output Impedance	Rout	-	-	50	Ω	
INPUT	Voltage Gain	Gv	8	10	12	dB	
	Cross-talk between Selectors **2	CTS	-	-110	-70	dB	Rg = 0Ω, Vin=500mVrms
	Selector Output Impedance	Rsout	-	-	50	Ω	
KARAOKE	Karaoke Voltage Gain 1ch mono	Gk1	8	10	12	dB	1ch mono
	Karaoke Voltage Gain 2ch mono	Gk2	8	10	12	dB	2ch mono
	Karaoke Voltage Gain 1ch + 2ch	Gk12	8	10	12	dB	1ch +2ch
REC EQ	Voltage Gain RC	Gvrc	38	40	42	dB	f=10kHz
	Maximum Output Voltage RC **1	Vomrc	2.2	2.5	-	Vrms	THD = 1%
	Input conversion Noise Voltage RC **2	Vnorc	-	1.5	3.0	μVrms	Rg = 0Ω
	Slew Rate RC	Vtr	2	4	-	V/μS	

Block	Parameter	Symbol	Limits			Unit	Condition
			Min.	Typ.	Max.		
PB EQ	Voltage Gain TP **3	Gvtp	44	46	48	dB	f=10kHz
	Maximum Output Voltage TP **1	Vomtp	2.2	2.5	-	Vrms	THD = 1%
	Input conversion Noise Voltage TP **2	Vnotp	-	1.1	2.0	μVrms	Rg = 2.2kΩ, Gv = 20dB
FRONT VOLUME	Volume Maximum Input Voltage **1	Vimv	1.5	1.9	-	Vrms	THD(Vout)=1% Front Volume ATT=-6dB Rear Volume ATT=-18dB
	Volume Input Impedance	Rvin	14	20	26	kΩ	
	Volume Control Range **2	Vr	-79	-76	-73	dB	
	Volume Control Step 1	Sv1	-	2	-	dB	0dB to -36dB
	Volume Control Step 2	Sv2	-	4	-	dB	-36dB to -76dB
	Volume Setting Error F	Evf	-2	0	2	dB	0dB to -76dB
	Volume Maximum Attenuation **2	ATTm	-	-116	-90	dB	Volume = -∞dB ATT=20log(Vout/Vin)-18dB
REAR	Volume Control Range **2	RVr	-20	-18	-16	dB	All steps
	Volume Setting Error R	Evr	-2	0	2	dB	0dB to -76dB
BASS	Bass Boost Control Range	Gbbr	+11	+14	+17	dB	f = 55Hz, Vin = 10mVrms BASS = +14dB
	Bass Cut Control Range	Gbcr	-17	-14	-11	dB	f = 55Hz, Vin = 10mVrms BASS = -14dB
	Bass Control Step	Sbc	-	2	-	dB	f = 55Hz Vin = 10mVrms
	Bass Setting Error (-12dB - +12dB)	Ebs1	-2	0	2	dB	
	Bass Setting Error (±14dB)	Ebs2	-3	0	3	dB	
MIDDLE	Middle Boost Control Range	Gmbr	+11	+14	+17	dB	f = 1kHz, Vin = 10mVrms MIDDLE = +14dB
	Middle Cut Control Range	Gmcr	-17	-14	-11	dB	f = 1kHz, Vin = 10mVrms MIDDLE = -14dB
	Middle Control Step	Smc	-	2	-	dB	f = 1kHz Vin = 10mVrms
	Middle Setting Error (-12dB - +12dB)	Ems1	-2	0	2	dB	
	Bass Setting Error (±14dB)	Ems2	-3	0	3	dB	
TREBLE	Treble Boost Control Range	Gtbr	+11	+14	+17	dB	f = 10kHz, Vin = 10mVrms TREBLE = +14dB
	Treble Cut Control Range	Gtcr	-17	-14	-11	dB	f = 10kHz, Vin = 10mVrms TREBLE = -14dB
	Treble Control Step	Stc	-	2	-	dB	f = 10kHz, Vin = 10mVrms
	Treble Setting Error (-12dB - +12dB)	Ets1	-2	0	2	dB	
	Treble Setting Error (±14dB)	Ets2	-3	0	3	dB	

**1 For measurement, BPF=400-30kHz is used.

**2 For measurement, VP-9690A (Average value wave detection, Effective value display) IHF-A filter by Matsushita Communication Industrial is used.

**3 The operational amplifier for PB should be used with a gain of 10dB or above.

*The input voltage over 1.9Vrms(Typ.) causes distortion on the output wave, when setting Front Volume=0dB. Therefore, using at 1.9Vrms or less is recommended.

*Phase relation between Input/Output signal terminals is the same.

*This IC is not designed to be radiation-resistant.

●**Block diagram, application circuit, pin assignment**

(BD3881FV) Unit: Resistance = Ω, Capacitor = F

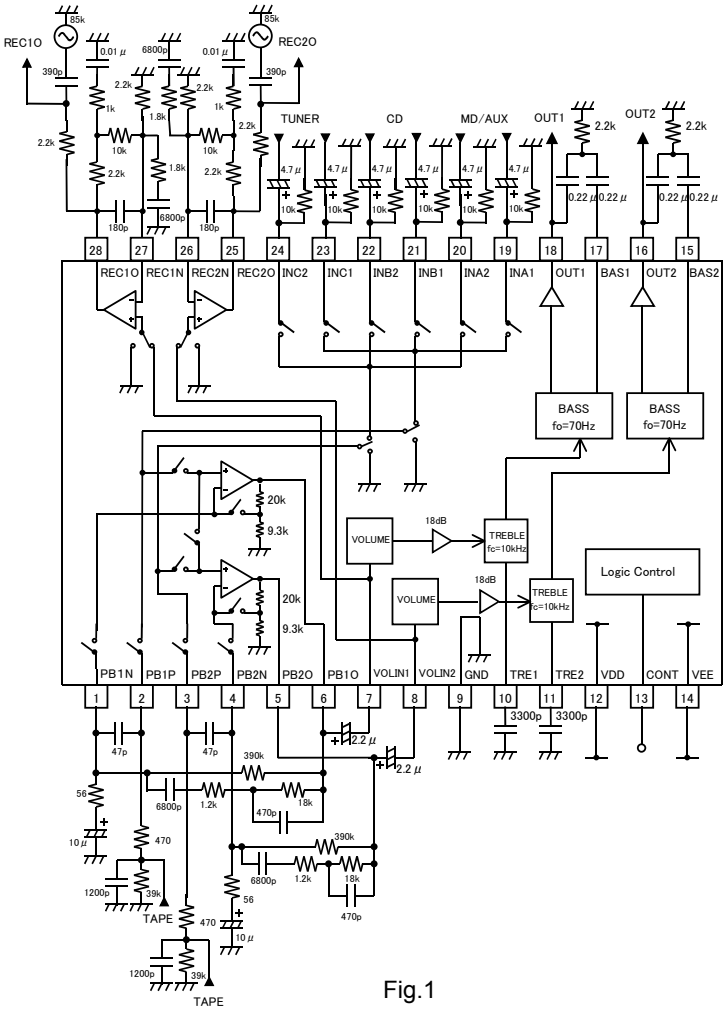


Fig.1

(BD3882FV) Unit: Resistance =Ω, Capacitor = F

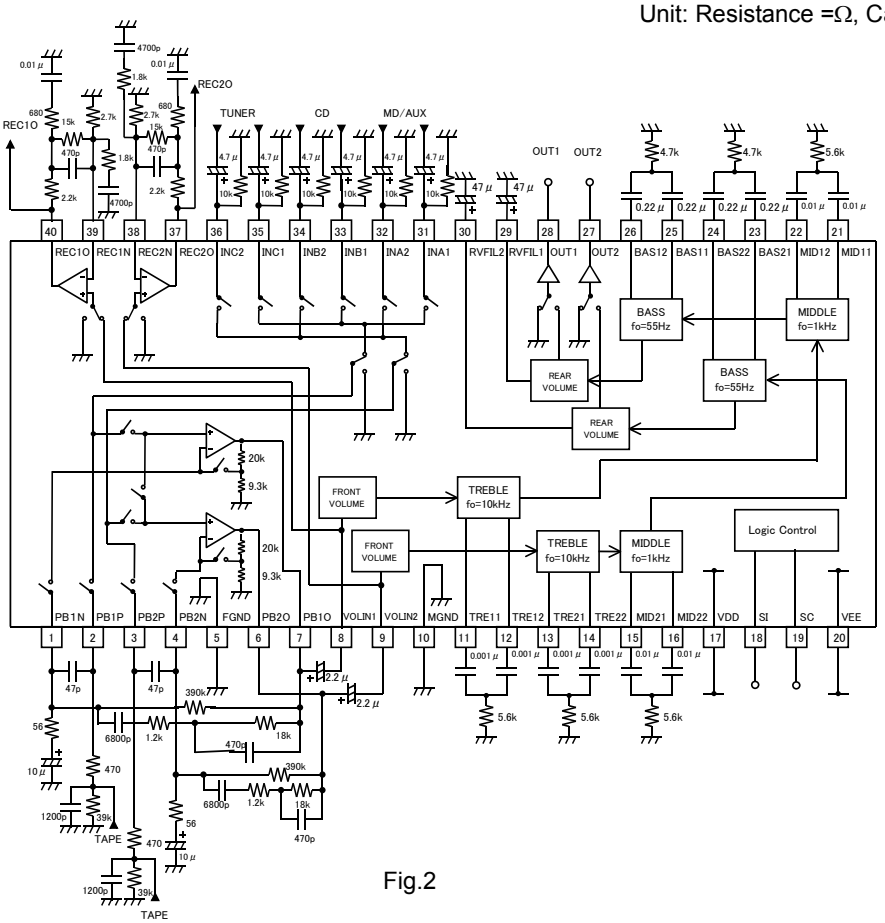


Fig.2

●**Reference data**

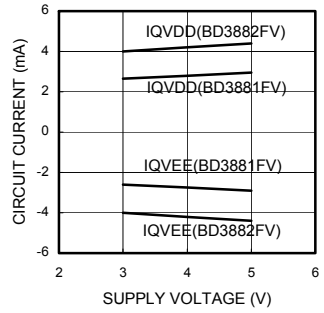


Fig.3 Circuit Current - Supply Voltage (BD3881FV, BD3882FV)

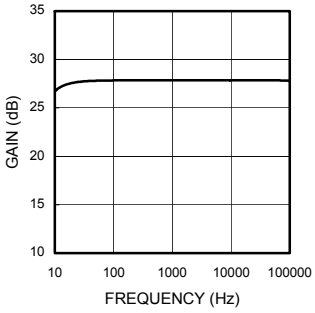


Fig.4 Voltage Gain - Frequency (BD3881FV ,BD3882FV)

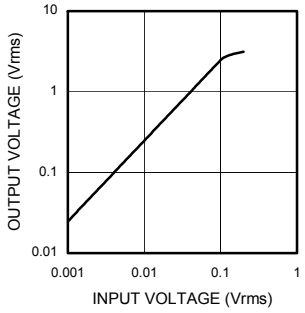


Fig.5 Output Voltage - Input Voltage (BD3881FV, BD3882FV)

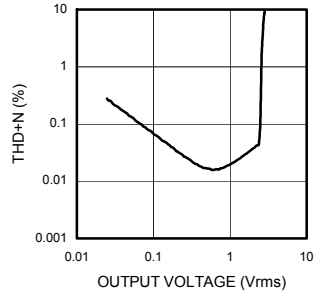


Fig.6 Total Harmonic Distortion - Output Voltage (BD3881FV)

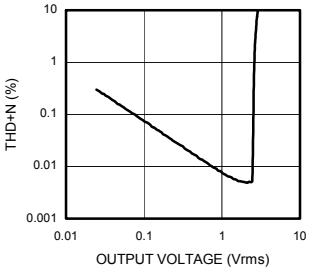


Fig.7 Total Harmonic Distortion - Output Voltage (BD3882FV)

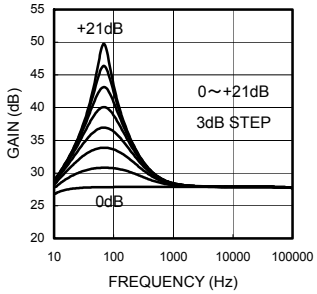


Fig.8 Bass Gain - Frequency (BD3881FV)

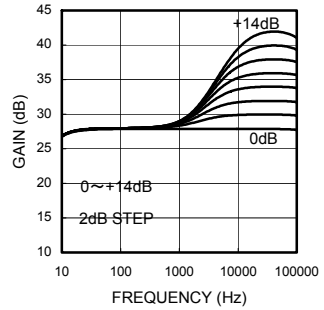


Fig.9 Treble Gain - Frequency (BD3881FV)

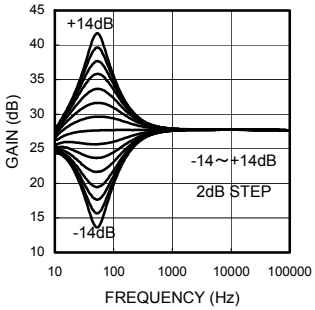


Fig.10 Bass Gain - Frequency (BD3882FV)

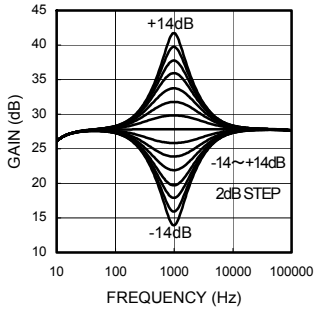


Fig.11 Middle Gain - Frequency (BD3882FV)

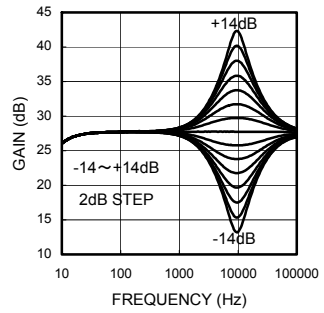


Fig.12 Treble Gain - Frequency (BD3882FV)

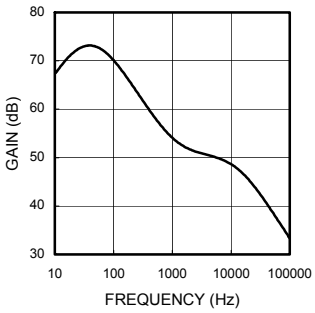


Fig.13 PB Amp Gain - Frequency (BD3881FV, BD3882FV)

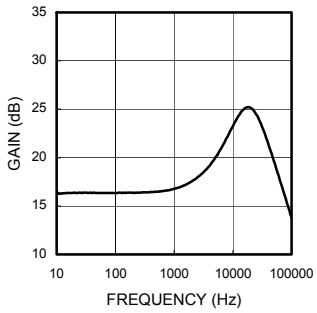


Fig.14 REC Amp Gain - Frequency (BD3881FV, BD3882FV)

●Cautions on use

1. Numbers and data in entries are representative design values and are not guaranteed values of the items.
2. Although ROHM is confident that the example application circuit reflects the best possible recommendations, be sure to verify circuit characteristics for your particular application. Modification of constants for other externally connected circuits may cause variations in both static and transient characteristics for external components as well as this Rohm IC. Allow for sufficient margins when determining circuit constants.
3. Absolute maximum ratings

   Use of the IC in excess of absolute maximum ratings, such as the applied voltage or operating temperature range (Topr), may result in IC damage. Assumptions should not be made regarding the state of the IC (short mode or open mode) when such damage is suffered. A physical safety measure, such as a fuse, should be implemented when using the IC at times where the absolute maximum ratings may be exceeded.
4. GND potential

   Ensure a minimum GND pin potential in all operating conditions. Make sure that no pins are at a voltage below the GND at any time, regardless of whether it is a transient signal or not.
5. Thermal design

   Perform thermal design, in which there are adequate margins, by taking into account the power dissipation (Pd) in actual states of use.
6. Short circuit between terminals and erroneous mounting

   Pay attention to the assembly direction of the ICs. Wrong mounting direction or shorts between terminals, GND, or other components on the circuits, can damage the IC.
7. Operation in strong electromagnetic field

   Using the ICs in a strong electromagnetic field can cause operation malfunction.
8. Operating Voltage Range and Operating Temperature Range

   Within the Operating Voltage Range and the Operating Temperature Range, while basic circuit functional operations are supposed to be guaranteed, the standard values of the electrical characteristics are guaranteed only when used under the specific conditions defined within these ranges. Thus, the users must verify those conditions before setting constants, elements, voltages, and temperatures. Note that the conditions of power dissipation are also affected with temperatures.
9. About power ON RESET

   A built-in circuit for performing initialization inside the IC at power-ON is provided. In unstable systems it is recommended that the data shall be sent to all the addresses during power-On, until this operation cycle is completed. Mute should be applied during this cycle.

Function	Initial Condition
Input Selector	MUTE
REC Output	REC MUTE
Karaoke	Stereo
Front Volume	-∞dB
Rear Volume (BD3882FV only)	-18dB
Treble Gain	0dB
Middle Gain (BD3882FV only)	0dB
Bass Gain	0dB

10. 1-Wire serial control (BD3881FV)

    As the CONT terminal is designed for inputting a high-frequency digital signal, the wiring and layout patterns should be routed as not to cause interference with the analog-signal-related lines.
11. 2-Wire serial control (BD3882FV)

    As the terminals of SI and SC are designed for inputting high-frequency digital signals, the wiring and layout patterns should be routed as not to cause interference with the analog-signal-related lines.
12. Power ON/OFF

    Shock sound absorbing measures at power ON/OFF are implemented on 5pin, 6pin, 16pin, 18pin, 25pin, and 28pin for BD3881FV, as well as on 6pin, 7pin, 27pin, 28pin, 37pin, and 40pin for BD3882FV.

    (a) At power ON/OFF, a shock sound will be generated. Therefore, use MUTE on the set.

    (b) When turning on power supplies, VEE and VCC should be powered on simultaneously, or VEE first followed by VCC. If the VCC side is started up first, an excessive current may flow from VCC to VEE.
13. Function switching (BD3881FV)

    For all functions except Volume, Bass, Treble, and REC Mute, MUTE must be applied during setup. To prevent switching shock sound during Karaoke, the bias resistances on 19pin through 24pin, should be set to 10kΩ or less.
14. Function switching (BD3882FV)

    For all functions except Front Volume, Rear Volume, Bass, Middle, Treble, Karaoke, and REC Mute, MUTE must be applied during setup.

●**Selection of order type**

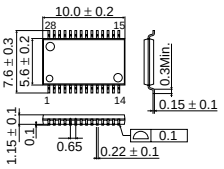
B	D	3	8	8	1	F	V	-	E	2

Part No. BD3881FV
BD3882FV

Package and forming specification

SSOP-B28

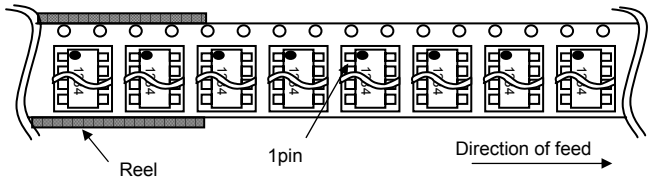
<Dimension>



(Unit:mm)

<Tape and Reel information>

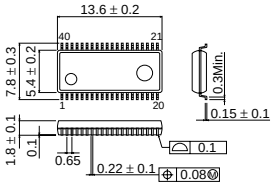
Tape	Embossed carrier tape
Quantity	2000pcs
Direction of feed	E2 (Correct direction: 1pin of product should be at the upper left when you hold reel on the left hand, and you pull out the tape on the right hand)



※Orders are available in complete units only.

SSOP-B40

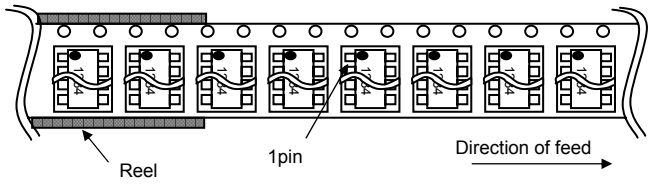
<Dimension>



(Unit:mm)

<Tape and Reel information>

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



※Orders are available in complete units only.

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