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Structure Silicon Monolithic Integrated Circuit  
 Product name Coupling Capacitorless Stereo Headphone Amp IC

Type **BD8820MUV**

- Package outline Fig.1. Package outline  
 Block diagram Fig.2. Block diagram  
 Function
- 2.4V to 4.5V Single-Supply Operation
  - No Bulky DC-Blocking Capacitors Required
  - No Degradation of Low-Frequency Response Due to Output Capacitors
  - Ground-Referenced Outputs
  - Variable gain with external resistors
  - Integrated Negative Power Supply
  - Low THD+N
  - Short-Circuit and Thermal-Overload Protection

○ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
SGND to PGND voltage	V <sub>gg</sub>	0	V
SVDD to PVDD voltage	V <sub>dd</sub>	-0.3~+0.3	V
SVSS to PVSS voltage	V <sub>ss</sub>	-0.3~+0.3	V
SGND or PGND to SVDD, PVDD voltage	V <sub>dg</sub>	-0.3~6	V
SVSS, PVSS to SGND or PGND voltage	V <sub>sg</sub>	-6~+0.3	V
SGND to IN <sub>-</sub> voltage	V <sub>in</sub>	(SVSS-0.3)~(SVDD+0.3)	V
SGND to OUT <sub>-</sub> voltage	V <sub>out</sub>	(SVSS-0.3)~(SVDD+0.3)	V
PGND to C1P <sub>-</sub> voltage	V <sub>c1p</sub>	(PGND-0.3)~(PVDD+0.3)	V
PGND to C1N <sub>-</sub> voltage	V <sub>c1n</sub>	(PVSS-0.3)~(PGND+0.3)	V
SGND to SHDNB <sub>-</sub> voltage	V <sub>sh</sub>	(SGND-0.3)~(SVDD+0.3)	V
Input current	I <sub>in</sub>	-10~10	mA
Power Dissipation	P <sub>d</sub>	620 *	mW
Storage Temperature Range	T <sub>stg</sub>	-55~+125	deg

\* In operating over 25 degree, de-rate the value to 4.96mW/degree.  
 This value is for mounted on 74.2mm x 74.2mm x 1.6mm grass-epoxy PCB.

○ Recommended operating range

Parameter	Symbol	Limit			Unit
		Min	Typ	Max	
Supply Voltage	PVDD	2.4	-	4.5	V
	SVDD	2.4	-	4.5	V
Operation Temperature Range	Topr	-40	-	+85	deg

© This chip is not designed to protect itself against radioactive rays.

Status of this document

The Japanese version of this document is the formal specification. A customer may use this translation version only for a reference to help reading the formal version. If there are any differences in translation version of this document, formal version takes priority.

○Electrical characteristics

Unless otherwise specified

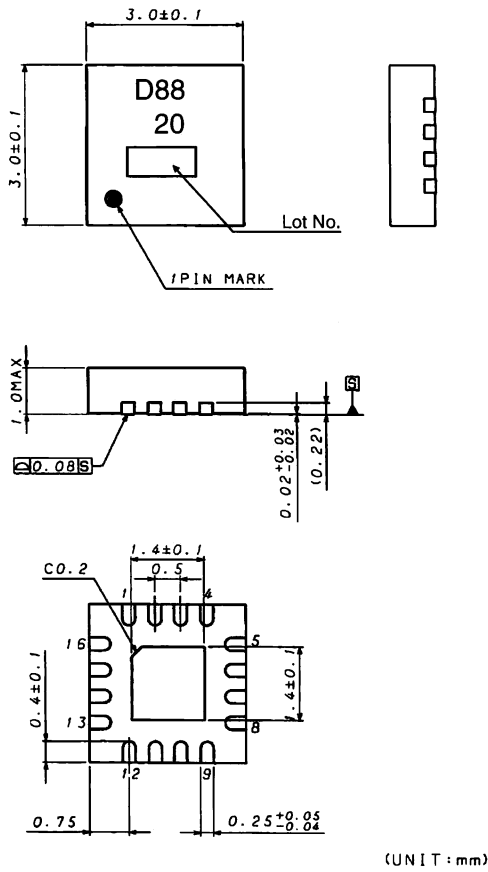
Ta=25deg, PVDD=SVDD=3.3V, PGND=SGND=0V, SHDNB=SVDD, C1=C2=1uF, RL=no load

GAIN=-1V/V (RIN=RF=10kΩ)

Parameter	Symbol	Limit			Unit	Condition
		MIN	TYP	MAX		
Current consumption						
Standby Current	IST	-	0.1	2	uA	SHDNB=L
Operating Current	IDD	-	3.6	7.4	mA	SHDNB=H, no signal, RL=no load
SHDNB Pin						
H Level Input Voltage	VIH	1.95	-	-	V	
L Level Input Voltage	VIL	-	-	0.7	V	
Input Leak Current	IIN	-	-	±1	uA	
Headphone amp						
Full Operation Time	tSON	-	80	-	us	SHDNB= L→H
Input Offset Voltage	VIS	-	±0.5	±7.5	mV	
Input Bias Current	IBIAS	-	50	-	nA	
Common-Mode Rejection Ratio	CMRR	-	70	-	dB	
Output Power	POUT	25	45	-	mW	RL=32Ω, THD+N≤-40dB
		15	35	-	mW	RL=16Ω, THD+N≤-40dB
Output Impedance in Shutdown	ZOUT	-	10	-	kΩ	SHDNB=L
THD+N	THD+N	-	-67	-50	dB	RL=32Ω, POUT=10mW, f=1kHz, 20kHz - LPF
		-	-62	-45	dB	RL=16Ω, POUT=10mW, f=1kHz, 20kHz - LPF
Noise	VN	-	-100	-90	dBV	20kHz LPF+JIS-A
Slew Rate	SR	-	0.5	-	V/us	
Maximum Capacitive Load	CL	-	200	-	pF	
Crosstalk	SP	-	-80	-70	dB	RL=32Ω, f=1kHz, VOUT=200mV <sub>P-P</sub> , 1kHz BPF
PSRR	PSRR	-	80	-	dB	f=217Hz, 100mV <sub>P-P</sub> - ripple
Charge-Pump Oscillator Frequency	fOSC	440	600	860	kHz	
Thermal-Shutdown Threshold	TSD	-	145	-	°C	
Thermal-Shutdown Hysteresis	-	-	5	-	°C	

※ The values indicated in headphone part are for single channel.

OPackage Outline

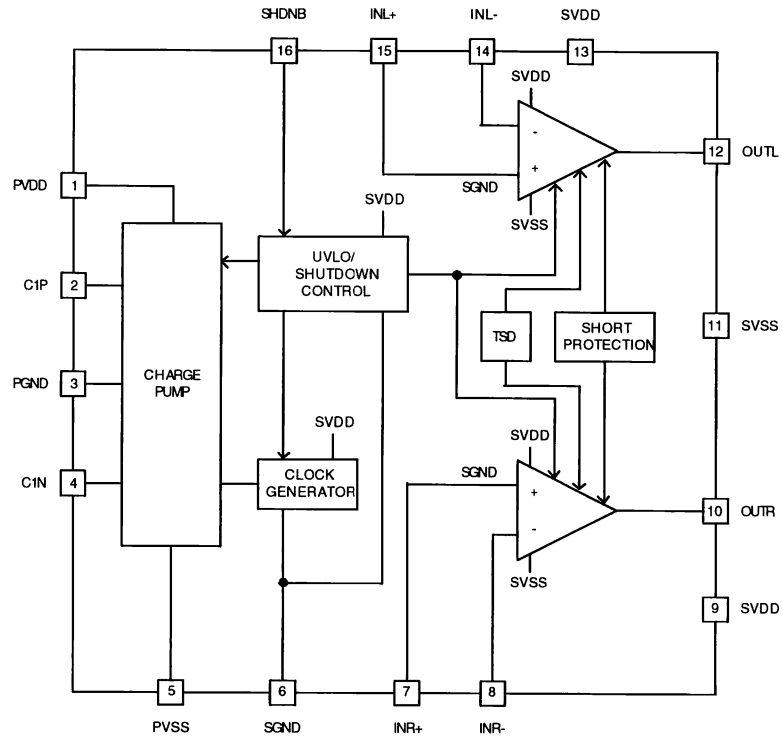


(Package: VQFN016V3030)

OPin assignment

No	Pin name	FUNCTION
1	PVDD	Positive Power Supply for Charge Pump
2	C1P	Flying Capacitor Positive
3	PGND	GND
4	C1N	Flying Capacitor Negative
5	PVSS	Charge Pump output
6	SGND	GND
7	INR+	Headphone Rch Non Inverting Input
8	INR-	Headphone Rch Inverting Input
9	SVDD	Positive Power Supply for Headphone
10	OUTR	Headphone Rch Output Pin
11	SVSS	Negative Power Supply Pin for Headphone
12	OUTL	Headphone Lch Output Pin
13	SVDD	Positive Power Supply for Headphone
14	INL-	Headphone Lch Inverting Input
15	INL+	Headphone Lch Non Inverting Terminal
16	SHDNB	Shutdown Control (Shutdown at L)

OBlock diagram



○ Cautions on use

(1) Absolute Maximum Ratings

An excess in the absolute maximum ratings, such as supply voltage, temperature range of operating conditions, etc., can break down devices, thus making impossible to identify breaking mode such as a short circuit or an open circuit. If any special mode exceeding the absolute maximum ratings is assumed, consideration should be given to take physical safety measures including the use of fuses, etc.

(2) Operating conditions

These conditions represent a range within which characteristics can be provided approximately as expected. The electrical characteristics are guaranteed under the conditions of each parameter.

(3) Reverse connection of power supply connector

The reverse connection of power supply connector can break down ICs. Take protective measures against the breakdown due to the reverse connection, such as mounting an external diode between the power supply and the IC's power supply terminal.

(4) Power supply line

Design PCB pattern to provide low impedance for the wiring between the power supply and the GND lines. In this regard, for the digital block power supply and the analog block power supply, even though these power supplies has the same level of potential, separate the power supply pattern for the digital block from that for the analog block, thus suppressing the diffraction of digital noises to the analog block power supply resulting from impedance common to the wiring patterns. For the GND line, give consideration to design the patterns in a similar manner.

Furthermore, for all power supply terminals to ICs, mount a capacitor between the power supply and the GND terminal. At the same time, in order to use an electrolytic capacitor, thoroughly check to be sure the characteristics of the capacitor to be used present no problem including the occurrence of capacity dropout at a low temperature, thus determining the constant.

(5) GND voltage

Make setting of the potential of the GND terminal so that it will be maintained at the minimum in any operating state. Furthermore, check to be sure no terminals are at a potential lower than the GND voltage including an actual electric transient.

(6) Short circuit between terminals and erroneous mounting

In order to mount ICs on a set PCB, pay thorough attention to the direction and offset of the ICs. Erroneous mounting can break down the ICs. Furthermore, if a short circuit occurs due to foreign matters entering between terminals or between the terminal and the power supply or the GND terminal, the ICs can break down.

(7) Operation in strong electromagnetic field

Be noted that using ICs in the strong electromagnetic field can malfunction them.

(8) Inspection with set PCB

On the inspection with the set PCB, if a capacitor is connected to a low-impedance IC terminal, the IC can suffer stress. Therefore, be sure to discharge from the set PCB by each process. Furthermore, in order to mount or dismount the set PCB to/from the jig for the inspection process, be sure to turn OFF the power supply and then mount the set PCB to the jig. After the completion of the inspection, be sure to turn OFF the power supply and then dismount it from the jig. In addition, for protection against static electricity, establish a ground for the assembly process and pay thorough attention to the transportation and the storage of the set PCB.

(9) Input terminals

In terms of the construction of IC, parasitic elements are inevitably formed in relation to potential. The operation of the parasitic element can cause interference with circuit operation, thus resulting in a malfunction and then breakdown of the input terminal. Therefore, pay thorough attention not to handle the input terminals, such as to apply to the input terminals a voltage lower than the GND respectively, so that any parasitic element will operate. Furthermore, do not apply a voltage to the input terminals when no power supply voltage is applied to the IC. In addition, even if the power supply voltage is applied, apply to the input terminals a voltage lower than the power supply voltage or within the guaranteed value of electrical characteristics.

(10) Ground wiring pattern

If small-signal GND and large-current GND are provided, it will be recommended to separate the large-current GND pattern from the small-signal GND pattern and establish a single ground at the reference point of the set PCB so that resistance to the wiring pattern and voltage fluctuations due to a large current will cause no fluctuations in voltages of the small-signal GND. Pay attention not to cause fluctuations in the GND wiring pattern of external parts as well.

(11) External capacitor

In order to use a ceramic capacitor as the external capacitor, determine the constant with consideration given to a degradation in the nominal capacitance due to DC bias and changes in the capacitance due to temperature, etc.

(12) About the rush current

For ICs with more than one power supply, it is possible that rush current may flow instantaneously due to the internal powering sequence and delays. Therefore, give special consideration to power coupling capacitance, power wiring, width of GND wiring, and routing of wiring.

(13) Others

In case of use this LSI, please peruse some other detail documents, we called ,Technical note, Functional description, Application note.

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