

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

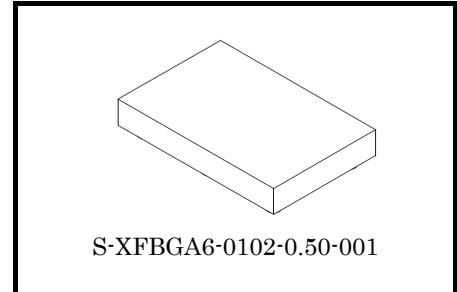
JBTC94B12-AS

Microphone Amplifier + 4th Delta-sigma ADC for Digital ECM

The JBTC94B12-AS is developed for ECM (Electret Condenser Microphone) IC. It is built in a microphone amplifier and a 4th Delta-sigma ADC.

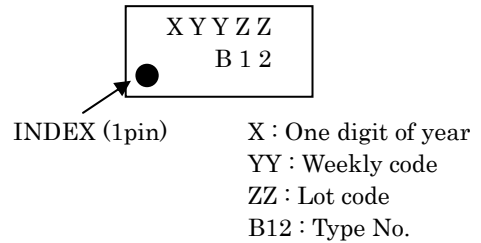
Feature

- Excellent Noise characteristic
 $V_{no} = -91.5\text{dBFS}$ (Typ.)
- Built-in a sleep mode
- Supply Current
 $I_{DDQ} = 7\ \mu\text{A}$ (Typ.)
 $I_{DD} = 470\ \mu\text{A}$ (Typ.)
- Operating Supply Voltage Range : $T_a=25^\circ\text{C}$
 $V_{DD(opr)} = 1.64\sim 3.65\text{V}$

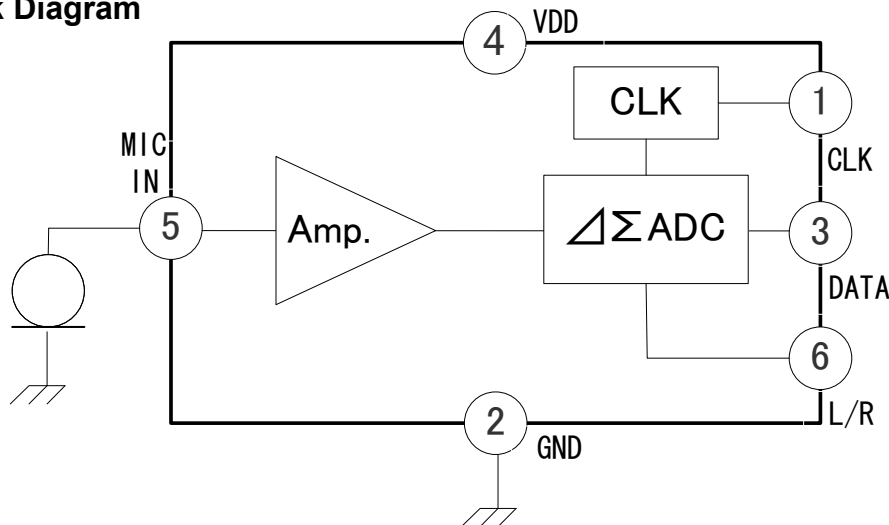


Weight : 0.64mg (Typ.)

Marking

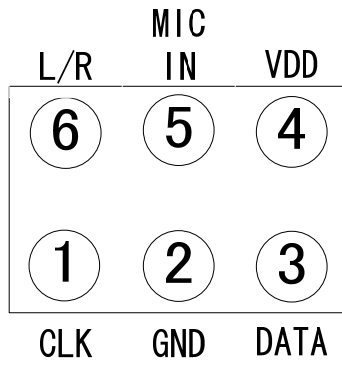


Block Diagram



Some of the functional blocks, circuits, or constants in the block diagram may be omitted or simplified for explanatory purpose.

Pin Assignment

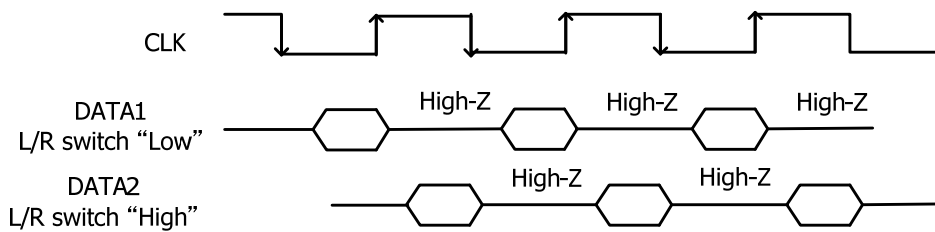


Top view (The bump is reverse side.)

Pin Function

No.	Name	I/O	Function	Note
1	CLK	I	Clock input	—
2	GND	-	GND	—
3	DATA	O	Output from PDM data	—
4	VDD	-	Power supply	—
5	MIC IN	I	Input to microphone amplifier	—
6	L/R	I	Channel selection H level : DATA2 output L level : DATA1 output	—

Functional Description



Timing charts may be simplified for explanatory purpose.

Absolute Maximum Ratings

(Unless otherwise specified, Referred to GND, Ta = 25°C)

Characteristics	Symbol	Rating	Unit	Note
Supply Voltage	VDD	-0.3 ~ 3.8	V	—
Applied Voltage of MIC IN pin	V(MIC)	-0.3 ~ 3.8	V	—
Applied Voltage of CLK pin	V(CLK)	-0.3 ~ 3.8	V	—
Applied Voltage of L/R pin	V(L/R)	-0.3 ~ 3.8	V	—
Operating temperature	T _{opr}	-30 to 85	°C	—
Storage Temperature	T _{stg}	-55 to 150	°C	—

The absolute maximum ratings of a semiconductor device are a set of specified parameter values, which must not be exceeded during operation, even for an instant.

If any of these rating would be exceeded during operation, the device electrical may be irreparably altered.

Moreover, these operations with exceeded ratings may cause break down, damage and/or degradation to any other equipment.

Applications using the device should be designed such that each maximum rating will never be exceeded in any operating conditions.

Before using, creating and/or producing designs refer to and comply with the precautions and conditions set forth in these documents.

Operating Conditions (Unless otherwise specified, Referred to GND, Ta = 25°C)

Characteristics	Symbol	Min.	Typ.	Max.	Unit
Operating Voltage	VDD(opr)	1.64	1.8	3.65	V
Clock Frequency	fCLK	1	2.4	3.25	MHz
Clock Duty	CLK(duty)	40	50	60	%
Output of data level "Low level"	VTH(L)	-0.3	-	0.35*VDD	V
Output of data level "High level"	VTH(H)	0.65* VDD	-	VDD+ 0.3V	V

Electrical Characteristics

(Unless otherwise specified, VDD=1.8V, fCLK=2.4MHz, f=1kHz, Referred to GND, Ta = 25°C)

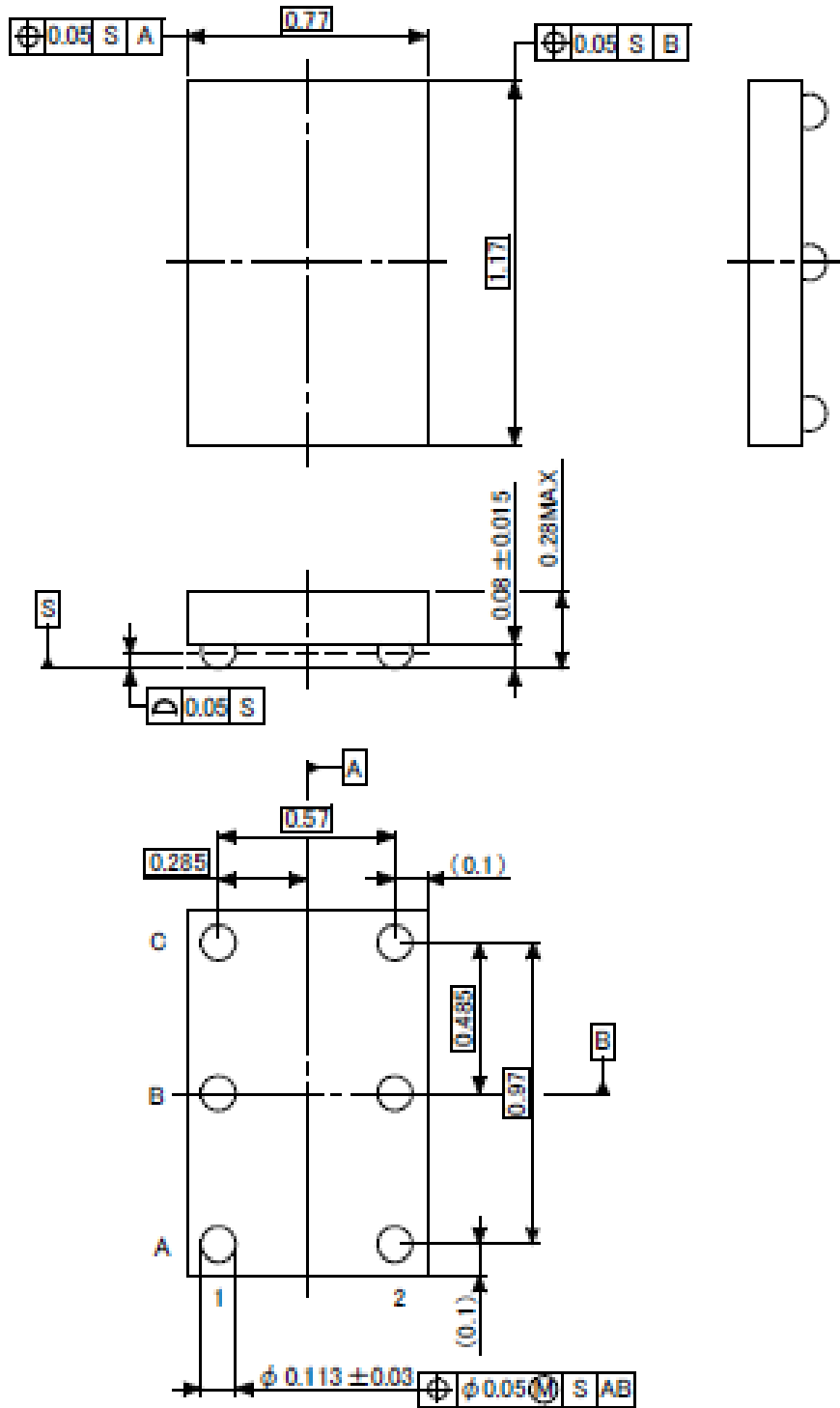
Characteristics	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Sleep Mode Supply Current	IDDQ	fCLK ≤ 1kHz	-	7	20	μA
Supply Current	IDD	Non-Load	-	470	550	μA
Voltage Gain	Gv	Vin=10mVrms	14.5	15.5	16.5	dB
Frequency Response 1	Δf(RES)	Vin=94dB SPL f=20Hz~20kHz 0dB : Output Level of f=1kHz	-	+0.3	-	dB
Total Harmonic Distortion	THD+N(1)	Vin=20mVrms	-	0.2	(1)	%
	THD+N(2)	Vin=112mVrms	-	0.9	(5)	%
	THD+N(3)	Vin=200mVrms	-	1.2	(10)	%
Output of Digital Noise Level	Vno	A-Weight	-	-91.5	-89.5	dBFS
Ripple Rejection Ratio	RR	fr=217Hz(Square wave), Vr=100mVp-p	-	-72	(-70)	dBFS
Load Capacitance	CL(Max)		-	-	(100)	pF
Wake-up time	Tstart	Sleep mode → Operation mode	-	-	(10)	ms
Fall-asleep time	Tsleep	Operation mode → Sleep mode	-	-	(10)	ms

Note : () Tested by internal verification

Dimensions

Unit : mm

S-XFBGA6-0102-0.50-001



- Use an appropriate power supply fuse to ensure that a large current does not continuously flow in case of over current and/or IC failure. The IC will fully break down when used under conditions that exceed its absolute maximum ratings, when the wiring is routed improperly or when an abnormal pulse noise occurs from the wiring or load, causing a large current to continuously flow and the breakdown can lead smoke or ignition. To minimize the effects of the flow of a large current in case of breakdown, appropriate settings, such as fuse capacity, fusing time and insertion circuit location, are required.
- If your design includes an inductive load such as a motor coil, incorporate a protection circuit into the design to prevent device malfunction or breakdown caused by the current resulting from the inrush current at power ON or the negative current resulting from the back electromotive force at power OFF. For details on how to connect a protection circuit such as a current limiting resistor or back electromotive force adsorption diode, refer to individual IC datasheets or the IC databook. IC breakdown may cause injury, smoke or ignition.
- Carefully select external components (such as inputs and negative feedback capacitors) and load components (such as speakers), for example, power amp and regulator. If there is a large amount of leakage current such as input or negative feedback condenser, the IC output DC voltage will increase. If this output voltage is connected to a speaker with low input withstand voltage, overcurrent or IC failure can cause smoke or ignition. (The over current can cause smoke or ignition from the IC itself.) In particular, please pay attention when using a Bridge Tied Load (BTL) connection type IC that inputs output DC voltage to a speaker directly.
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