ZBA049PESJ Datasheet

Zbit Semi, Inc

Version:1.0

Date:2024.01.05

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ZBA049PESJ Features

CPU

- 32bit DSP
- Maximum speed 192MHz
- 8 Levels interrupt priority

Memory

- ROM
- Optional built-in flash memory

Clocks

- On-chip 16 MHz clock
- On-chip 200KHz lower-temperature-drift clock

DSP Audio Processing

- Multi-band EQ configuration for voice Effects

Audio Codec

- One channel 16-bit DAC
  SNR ≥ 98dB@740mVrms
- One channel 16-bit ADC
  SNR ≥ 95dB@1Vrms
- Audio DAC Sampling rates of
  8KHz/11.025KHz/16KHz/22.05KHz/24KHz/ 32KHz/44.1KHz/48KHz/64KHz/88.2KHz/
  96KHz are supported
- Audio ADC Sampling rates of
  8KHz/11.025KHz/16KHz/22.05KHz/24KHz/ 32KHz/44.1KHz/48KHzare supported
- Support AMUX and ADC to DAC

Peripherals

- One full speed USB OTG controller
- One SD host controller for MMC/SD
- Three multi-function 32-bit timers, support capture and PWM mode
- UART controller supports DMA
- One IIC Master controller
- One SPI Master / Slaver controller with DMA
- One QDEC interface
- 5-channel 10-bit general purpose ADC
- Two pairs MCPWM
- 5 Individually programmable and multiplexed GPIO pins
- Digital peripheral crossbar
- Up to 5 external interrupt / wake-up source (low power available,can be multiplexed to any I/O)

PMU

- VPWR range : 2.7V to 5.5V
- IOVDD range : 2. 1V to 3.6V

Packages

- SOP8

Temperature

- Operating temperature: -40℃ to +85℃
- Storage temperature: -65℃ to +150℃

Applications

- Audio player
- Microcontrollers

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1 Block Diagram

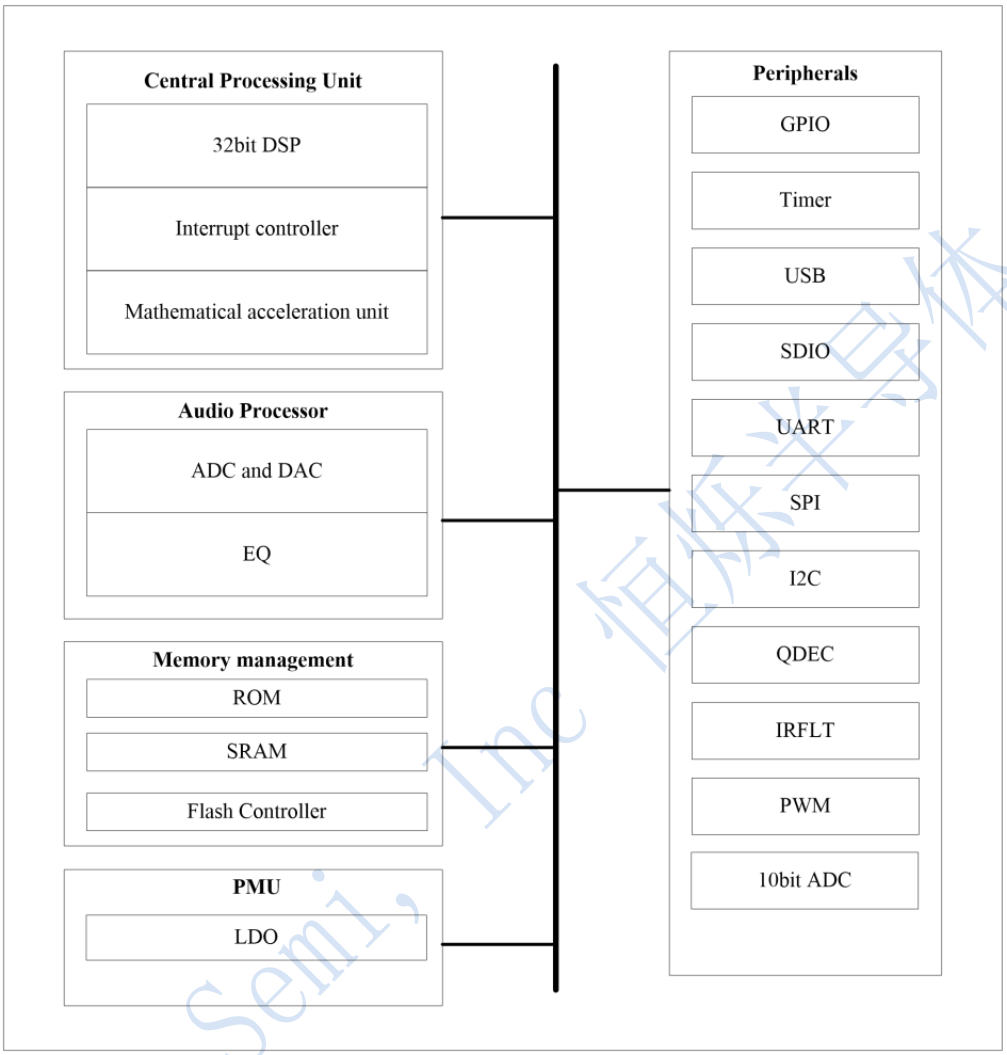

Figure 1-1 ZBA049PESJ Block Diagram

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2 Pin Definition

2.1 Pin Assignment

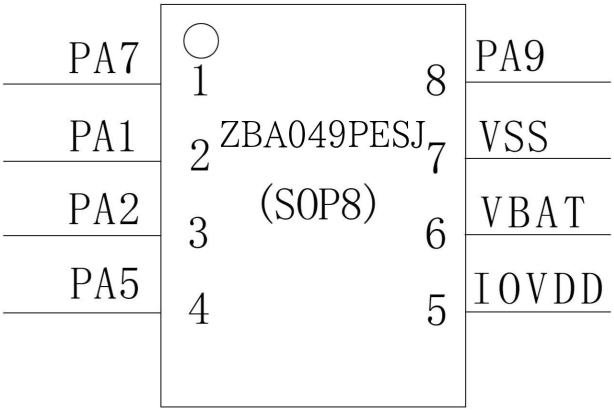

Figure 2-1 ZBA049PESJ Package Diagram

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2.2 Pin Description

Table 2-1 ZBA049PESJ Pin Description

PIN NO.	Name	Type	Function	Other Function
1	DACL	AO		Left channel audio output;
	PA7	I/O	GPIO	ADC7:ADC Input Channel 7; MICIN:MIC Input Channe; AUX1:Analog input Channel 1;
2	PA1	I/O	GPIO (pull up)	Long press reset; MCLR; ADC1:ADC Input Channel 1;
	PA4	I/O	GPIO	ADC4:ADC Input Channel 4; SPIOCLK(B):SPIO Clk(B);
	PA14	I/O	GPIO (VPP)	
3	PA2	I/O	GPIO	ADC2:ADC Input Channel 2; SPIODI(B):SPIO Data In(B);
	PA3	I/O	GPIO	ADC3:ADC Input Channel 3; SPIODO(B):SPIO Data Out(B);
	UDBDM	I/O	USB Negative Data (pull down)	ADC15:ADC Input Channel 15;
4	USBDP	I/O	USB Positive Data (pull down)	ADC14:ADC Input Channel 14;
	PA0	I/O	GPIO	ADC0:ADC Input Channel 0;
	PA5	I/O	GPIO	ADC5:ADC Input Channel 5; AUX3:Analog input Channel 3; SPIOCS(B):SPIO Chip Select(B);
5	IOVDD	PO	Power supply for GPIO	Built-in linear voltage regulator output;
6	VPWR	PI		Power supply input;
7	VSS	G		System ground;
8	PA8	I/O	GPIO	ADC8:ADC Input Channel 8; AUX0:Analog input Channel 0;
	PA9	I/O	GPIO	ADC9:ADC Input Channel 9; MICLDO:MIC linear voltage regulator output; MIC_BIAS:MIC Bias Output(Built-in resistor);

Pin Type	Description	Pin Type	Description
P	Power	I/O	Input or Output
PI	Power Input	AO	Analog Output
PO	Power Output	G	Ground

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CROSSBAR						
SPI1	**SDC**	**IIC**	**Q-decoder**	**UART0**	**UART1**	**MCPWM**
SPI1_CLK	SD_CLK	IIC_CLK	Q-decoder 0	UART0_TX	UART1_TX	PWMCH0H
SPI1_DI	SD_CMD	IIC_DAT	Q-decoder 1	UART0_RX	UART1_RX	PWMCH0L
SPI1_DO	SD_DAT				UART1_CTS	PWMCH1H
SPI1_DAT2					UART1_RTS	PWMCH1L
SPI1_DAT3						M_TMR0CK
						M_TMR1CK

Input Channel x8			Output Channel x8	
Timer0	CAP0	IRFLT	PWM0	CLK_OUT0
Timer1	CAP1		PWM1	CLK_OUT1
Timer2	CAP2		PWM2	CLK_OUT2
				CLK_OUT3

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3 Electrical Characteristics

3.1 Absolute Maximum Ratings

Table 3-1

Symbol	Parameter	Min	Max	Unit
Topt	Operating temperature	-40	+85	° C
Tstg	Storage temperature	-65	+150	° C
VPWR	Power supply input	-0.3	6.0	V
V_{IOVDD}	Voltage applied at IOVDD	-0.3	3.6	V
V_{GPIO}	Voltage applied to GPIO	-0.3	IOVDD+0.3	V

Note : The chip can be damaged by any stress in excess of the absolute maximum ratings listed below

3.2 ESD Protectio

Table 3-2

Parameter	Typ.	Test pin	Reference standard
Human Body Mode	±4KV	All pins	JEDEC EIA/JESD22-A114
Machine Mode	±200V	All pins	JEDEC EIA/JESD22-A115
Charge Device Model	±2KV	All pins	JEDEC EIA/JESD22-C101F
Latch up	±200mA	All GPIO pins	JEDEC STANDARD NO.78E
	1.5xVopmax	All power pins	

Note : 1.5xVopmax = 1.5 times maximum operating voltage.

3.3 PMU Characteristics

Table 3-3

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
VPWR	Charger supply Voltage	2.7	5.0	5.5	V	_
IOVDD	Voltage output	2.1	3.0	3.6	V	VPWR = 4.2V, 10mA loading
	Loading current	_	_	100	mA	IOVDD=3.3V@VPWR = 3.6V
V_{LVD}	Voltage input	1.8	2.5	2.5	V	Low-Voltage Detection ofIOVDD

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3.4 IO Input/Output Electrical Logical Characteristics Table 3-4

GPIO input characteristics						
Symbol	**Parameter**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**
V_{IL}	Low-Level Input Voltage	-0.3	_	0.3* IOVDD	V	IOVDD = 3.0V
V_{IH}	High-Level Input Voltage	0.7* IOVDD	_	IOVDD+0.3	V	IOVDD = 3.0V
GPIO output characteristics						
Symbol	**Parameter**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**
V_{OL}	Low-Level Input Voltage	_	_	0. 1* IOVDD	V	IOVDD = 3.0V
V_{OH}	High-Level Input Voltage	0.9*IOVDD	_	_	V	IOVDD= 3.0V

3.5 IO Output Drive Strength Pull Up/Down Characteristics

Table 3-5

Port	Drive Strength	Pull Up Resistance	Pull DownResistance	Test Conditions
PA0~PA5 PA7~PA9	00: 2mA 01: 6mA 10: 18mA 11: 45mA	10K/100K/1M	10K/100K/1M	IOVDD = 3.3V
PA14	8mA	10K/100K/1M	10K/100K/1M	IOVDD = 3.3V
DP	8mA	1.5K	15K	IOVDD = 3.3V
DM	8mA	180K	15K	IOVDD = 3.3V

Note1: precision of 10K/100K pull-up and pull-down resistor is ±30% Note2: precision of 1M pull-up and pull-down resistor is ±50%
Note3: PA1 default pull up,USBDM and USBDP default pull down

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3.6 Audio DAC Characteristics

Table 3-6

Parameter	Min	Typ	Max	Unit	Test Conditions
Frequency Response	20	_	20K	Hz	VPWR=5.0V Fin=1KHz/0dB Fin=1KHz/-60dB B/W=20Hz~20kHz A-Weighted Filter 10k ohm loading
Output Swing	_	740	_	mVrms	
THD+N	_	-77	_	dB	
S/N	_	98	_	dB	
Dynamic Range	_	92	_	dB	
Noise Floor	_	10	_	uVrms	

3.7 Audio ADC Characteristics

Table 3-7

Parameter	Min	Typ	Max	Unit	Test Conditions
Dynamic Range	_	72	_	dB	Gain=23dB Fsample=44.1KHz Fin=1KHz @57mVrms A-Weighted Filter B/W=20Hz-20KHz
S/N	_	71	_	dB	
THD+N	_	-68	_	dB	

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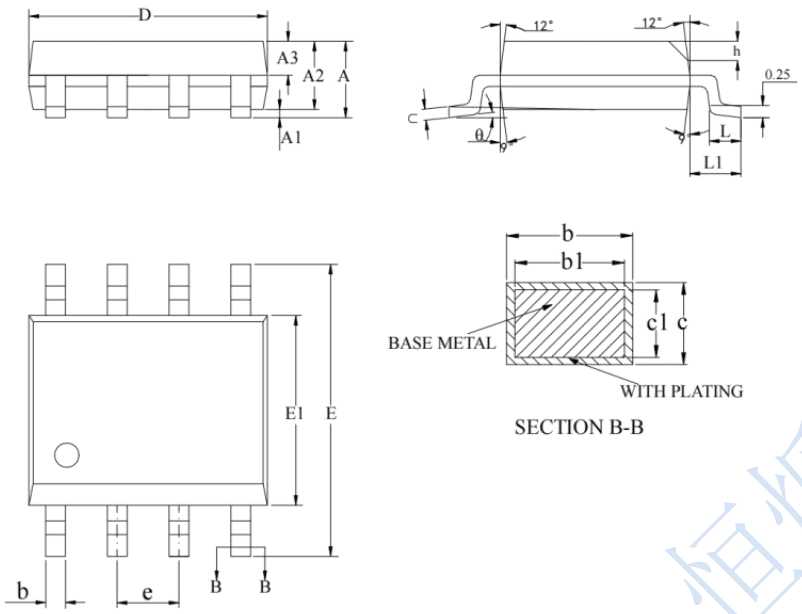
4 Package Information

4.1 SOP8



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.75
A1	0.10	—	0.225
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.39	—	0.47
b1	0.38	0.41	0.44
c	0.20	—	0.24
c1	0.19	0.20	0.21
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27BSC		
h	0.25	—	0.50
L	0.50	—	0.80
L1	1.05REF		
θ	0	—	8°

Figure 4-1 ZBA049PESJ Package

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5 Solder-Reflow Condition

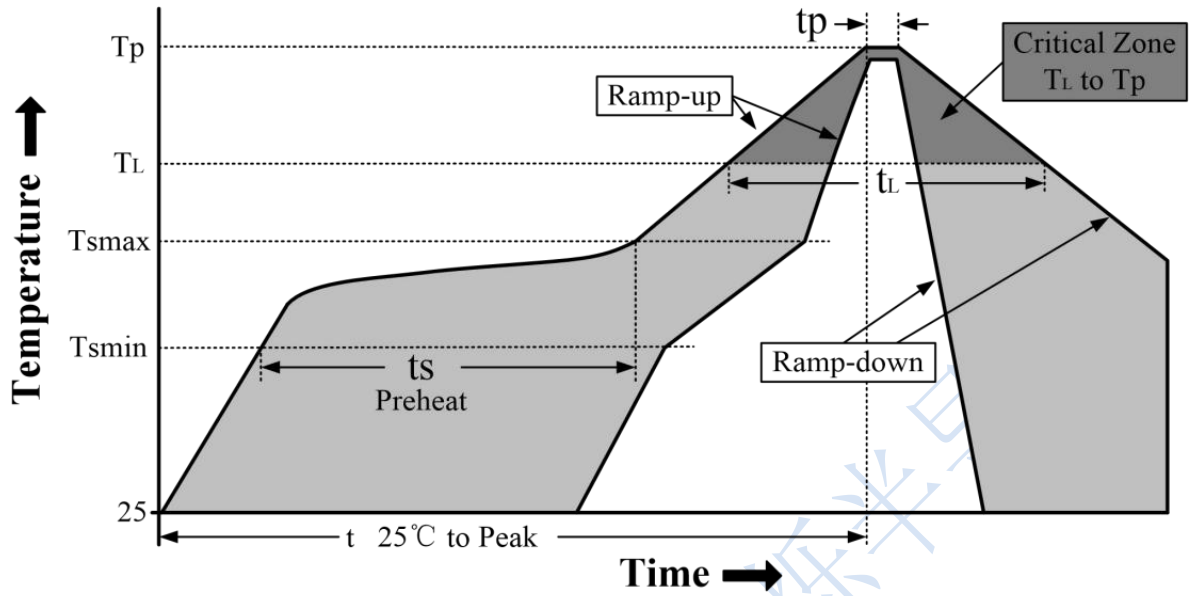

Figure 5-1 Classification Reflow Profile

Classification Profiles — Table 5-1

Profile Feature		Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat / Soak	Temperature Min (T_{smin})	100 ℃	150 ℃
	Temperature Max (T_{smax})	150 ℃	200 ℃
	Time (ts) from (T_{smin} to T_{smax})	60-120 seconds	60-180 seconds
Average ramp-up rate (T_{smax} to T_p)		3 ℃/second max	3 ℃/second max
Liquidous temperature (T_L) Time (t_L) maintained above T_L		183 ℃ 60-150 seconds	217 ℃ 60-150 seconds
Peak package body temperature (T_p)		See Table 5-2.	See Table 5-3.
Time within 5° C of actual Peak Temperature (tp)		10-30 seconds	20-40 seconds
Ramp-down rate (T_p to T_L)		6 ℃/second max.	6 ℃/second max.
Time 25 ℃ to peak temperature		6 minutes max.	8 minutes max.

Note 1: All temperatures refer to topside of the package, measured on the package body surface.

Note 2: Time within 5℃ of actual peak temperature (tp) specified for the reflow profiles is a "supplier" minimum and "user" maximum.

SnPb - Classification Temperature — Table 5-2

Package Thickness	Volume mm³ < 350	Volume mm³ ≥ 350
<2.5 mm	240 +0/-5 ℃	225 +0/-5 ℃
≥ 2.5 mm	225 +0/-5 ℃	225 +0/-5 ℃

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Pb-free - Classification Temperature Table 5-3

Package Thickness	Volume mm³ < 350	Volume mm³ 350 - 2000	Volume mm³ > 2000
< 1.6mm	260 ℃	260 ℃	260 ℃
1.6 mm - 2.5mm	260 ℃	250 ℃	245 ℃
> 2.5mm	250 ℃	245 ℃	245 ℃

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6 Storage Condition

6.1 Moisture Sensitivity Level

ZBA049PESJ is qualified to moisture sensitivity level MSL3 in accordance with JEDEC J-STD-033.

6.2 Storage Alert

1. Calculated shelf life in sealed bag 12 months at＜40° C and 90% relative humidity (RH).
2. Peak package body temperature≤260° C.
3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must be mounted within 168 hours of factory conditions≤30° C/60%RH or stored per J-STD-033.
4. Devices require bake before mounting if humidity indicator card reads ＞10% for level 2a-5a devices or＞60% for level 2 devices when read at 23±5° C, or 3a or 3b are not met.

Please refer to IPC/JEDEC J-STD-033 for baking procedure if necessary.

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7 Revision History

Date	Revision	Description
2024.01.05	V1.0	Initial Release.

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