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AK5558

115dB 768kHz 32-bit 8ch ΔΣ ADC with 4Filters

1. General Description

The AK5558 is a 32bit, 768kHz sampling, differential input A/D converter for digital audio systems. It integrates an 8-channel A/D converter, suitable for mixers and automotive amplifier units. The AK5558 achieves 115dB dynamic range, 106dB S/(N+D) and 118dB dynamic range in Mono mode while keeping low power consumption performance. Four types of digital filters are selectable according to the application. The AK5558 can be easily connected to a DSP by supporting TDM audio formats.

2. Features

- **Sampling Rate: 8kHz ~ 768kHz**
- **Full Differential Inputs**
- **32Bit Digital Filter**
  - **Sharp Roll-Off Filter**
  - **Slow Roll-Off Filter**
  - **Short Delay Sharp Roll-Off Filter**
  - **Short Delay Slow Roll-Off Filter**
- **S/(N+D): 106dB**
- **DR, S/N: 115dB (Mono Mode: 118dB)**
- **Digital HPF**
- **Power Supply: 4.75~ 5.25V(Analog), 1.7~1.98V or 3.0 ~ 3.6V(Digital)**
- **Output Format: 24/32bit MSB justified, I^2S or TDM**
- **Cascade TDM I/F: 16ch/48kHz, 8ch/96kHz, 4ch/192kHz**
- **DSD (64fs, 128fs, 256fs) Output Data**
- **Master & Slave Modes**
- **Overflow Flag**
- **3-wire Serial and I^2C µP I/F**
- **Power Consumption: 259.4mW (@AVDD=5.0V, TVDD=3.3V, fs=48kHz)**
- **Package: 64-pin QFN**

3. Block Diagram

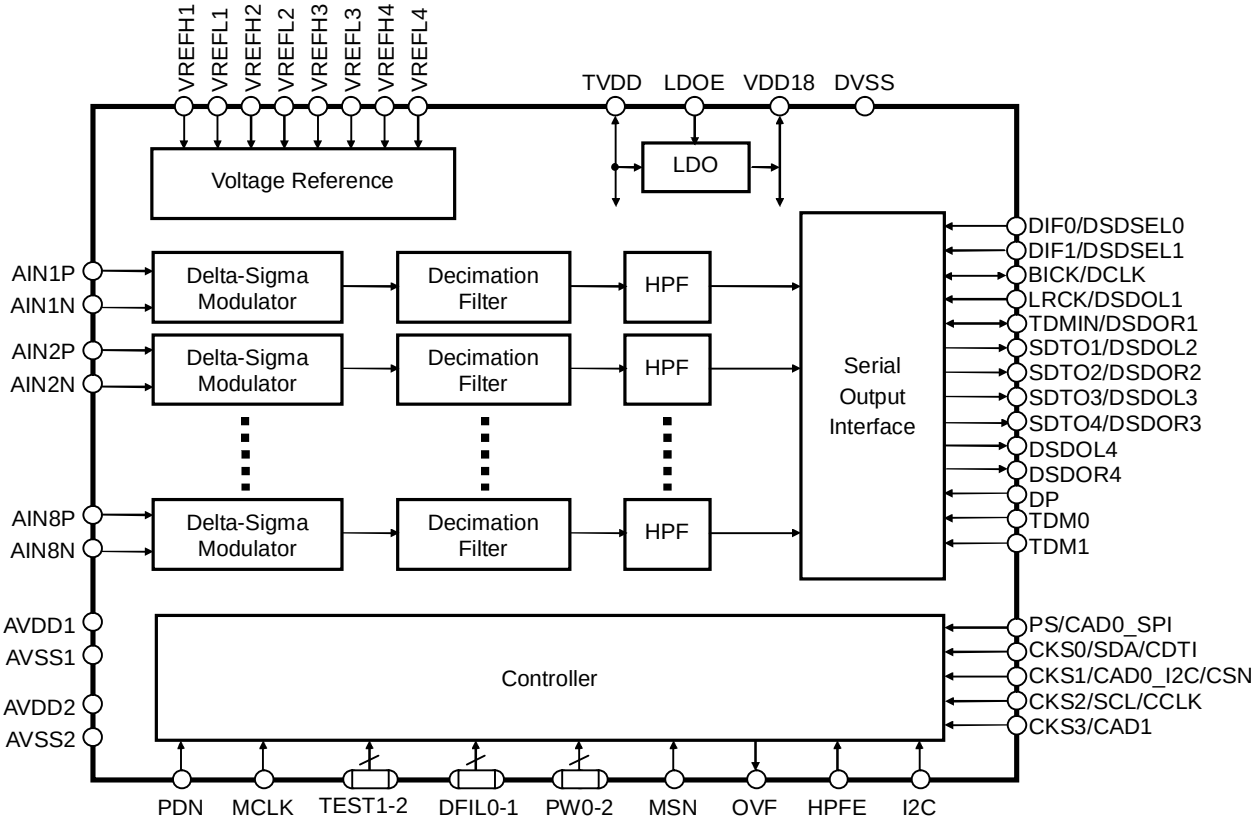

Figure 1. Block Diagram

4. Absolute Maximum Ratings

(VSS=0V; Note 1)

Parameter		Symbol	Min.	Max.	Unit
Power Supplies	Analog (AVDD pin)	AVDD	−0.3	6.0	V
	Digital (TVDD pin)	TVDD	−0.3	4.0	V
	Digital (VDD18 pin) (Note 2)	VDD18	−0.3	2.5	V
Input Current (Any Pin Except Supplies)		IIN	-	±10	mA
Analog Input Voltage (AIN1~8P, AIN1-8N pins)		VINA	−0.3	AVDD+0.3	V
Digital Input Voltage		VIND	−0.3	TVDD+0.3	V
Ambient Temperature (Power applied)					
When the back tab is connected to VSS		Ta	−40	105	°C
When the back tab is open		Ta	−40	85	
Storage Temperature		Tstg	−65	150	°C

Note 1. All voltages with respect to ground.

Note 2. The 1.8V LDO is off (LDOE pin = “L”) and an external power is supplied to the VDD18 pin.

WARNING: Operation at or beyond these limits may result in permanent damage to the device.
Normal operation is not guaranteed at these extremes.

5. Recommended Operation Conditions

(VSS=0V; Note 1)

Parameter		Symbol	Min.	Typ.	Max.	Unit
Power Supplies	Analog (AVDD pin)	AVDD	4.75	5.0	5.25	V
	(LDOE pin= “L”) (Note 3)					
	IO Buffer (TVDD pin) (Note 4)	TVDD	1.7	1.8	1.98	V
	Digital Core (VDD18 pin)	VDD18	1.7	1.8	1.98	V
	(LDOE pin= “H”) (Note 5)					
	IO Buffer (TVDD pin)	TVDD	3.0	3.3	3.6	V
Voltage Reference (Note 7)	“H” voltage Reference (Note 6)	VREFH1-4	4.75	5.0	5.25	V
	“L” voltage reference	VREFL1-4	-	AVSS	-	V

Note 1. All voltages with respect to ground.

Note 3. TVDD must be powered up before VDD18 when the LDOE pin = “L”. The power up sequence between AVDD and TVDD or AVDD and VDD18 is not critical.

Note 4. TVDD must not exceed VDD18±0.1V when LDOE pin= “L”.

Note 5. When LDOE pin = “H”, the internal LDO supplies 1.8V (typ). The power up sequences between AVDD and TVDD is not critical.

Note 6. VREFH1~4 pin must not exceed AVDD+0.1V.

Note 7. VREFL1-4 pins must be connected to AVSS.
Analog Input Voltage is proportional to {(VREFH) – (VREFL)}.
Vin (typ, @ 0dB) = ±2.8 × {(VREFH) – (VREFL)} / 5 [V].

* AKM assumes no responsibility for the usage beyond the conditions in this data sheet.

6. Analog Characteristics

(Ta=25°C; AVDD=5.0V; TVDD=3.3V, fs=48kHz, 96kHz; BICK=64fs; Signal Frequency=1kHz; 24bit Data; Measurement frequency=20Hz~20kHz at fs=48kHz, 40Hz~40kHz at fs=96kHz, 40Hz~40kHz at fs=192kHz, unless otherwise specified.)

Parameter			Min.	Typ.	Max.	Unit
Analog Input Characteristics:						
Resolution			-	-	32	Bits
Input Voltage		(Note 8)	±2.7	±2.8	±2.9	Vpp
S/(N+D)	fs=48kHz BW=20kHz	–1dBFS	100	106	-	dB
		–20dBFS		92	-	dB
		–60dBFS		52	-	dB
	fs=96kHz BW=40kHz	–1dBFS		106	-	dB
		–20dBFS		89	-	dB
		–60dBFS		49	-	dB
	fs=192kHz BW=40kHz	–1dBFS	-	106	-	dB
		–20dBFS		89	-	dB
		–60dBFS		49	-	dB
Dynamic Range (–60dBFS with A-weighted)		Stereo Mode	110	115	-	dB
		Mono Mode	-	118	-	
S/N (A-weighted)		Stereo Mode	110	115	-	dB
		Mono Mode	-	118	-	
Input Resistance			3.0	3.5	4.1	kΩ
Interchannel Isolation			110	120		dB
Interchannel Gain Mismatch				0	0.5	dB
Power Supply Rejection		(Note 9)		60	-	dB
Power Supplies						
Power Supply Current						
Normal Operation (PDN pin = "H")						
AVDD				45.8	TBD	mA
TVDD		(fs=48kHz)		16.9	TBD	mA
TVDD		(fs=96kHz)		TBD	TBD	mA
TVDD		(fs=192kHz)		TBD	TBD	mA
Power down mode (PDN pin = "L")		(Note 10)				
AVDD+TVDD				10	100	μA

Note 8. This value is (AINnP)–(AINnN) that the ADC output becomes full-scale (n=1~8). Input voltage is proportional to VREFH–VREFL.

Vin = 0.56 × (VREFHm–VREFLm) [Vpp]. (m=1~4)

Note 9. PSRR is applied to AVDD, TVDD with 1kHz, 20mVpp sine wave. The VREFH1~4 pins are held to the same voltage.

Note 10. All digital inputs are fixed to TVDD or TVSS.

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