



# AK5384

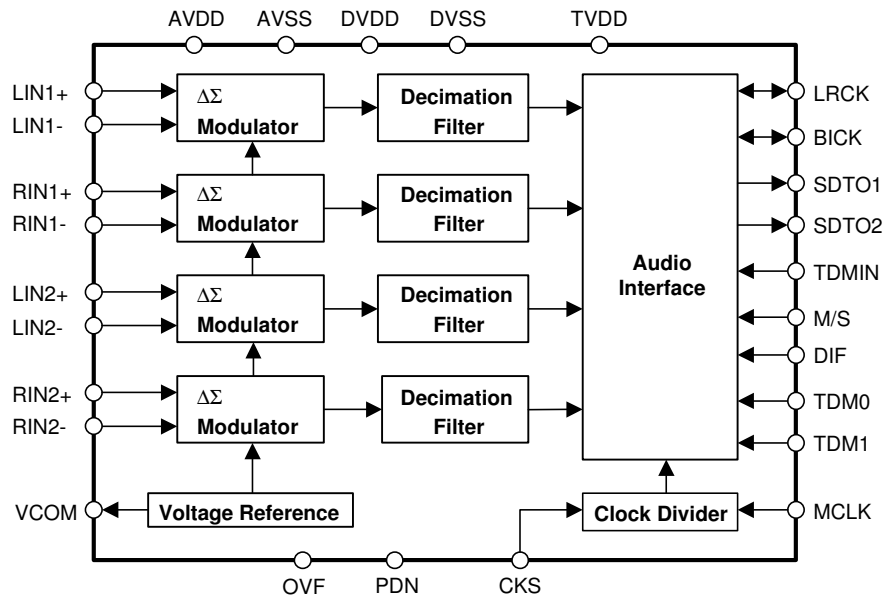
## 107dB 24-Bit 96kHz 4-Channel ADC

GENERAL DESCRIPTION

The AK5384 is a 4-channel A/D Converter with wide sampling rate of 8kHz ~ 96kHz and is suitable for Multi-channel audio system. The AK5384 achieves high accuracy and low cost by using Enhanced dual bit  $\Delta\Sigma$  techniques. The AK5384 supports master mode and TDM format. Therefore, the AK5384 is suitable for multi-channel audio system.

FEATURES

- 4-Channel  $\Delta\Sigma$  ADC
- Differential Inputs
- Digital HPF for DC-Offset Cancel
- S/(N+D): 100dB@5V for 48kHz
- DR: 107dB@5V for 48kHz
- S/N: 107dB@5V for 48kHz
- Sampling Rate Ranging from 8kHz to 96kHz
- Master Clock:
  - 256fs/384fs/512fs/768fs (~ 48kHz)
  - 256fs/384fs (~ 96kHz)
- TTL Digital Input Level
- Output format: 24bit MSB justified, I<sup>2</sup>S or TDM
- Cascade TDM Interface
- Master & Slave Mode
- Overflow Flag
- Power Supply: 4.75 to 5.25V
- Power Supply for output buffer: 3.0 to 5.25V
- Ta = -40 ~ 85°C
- 28pin VSOP



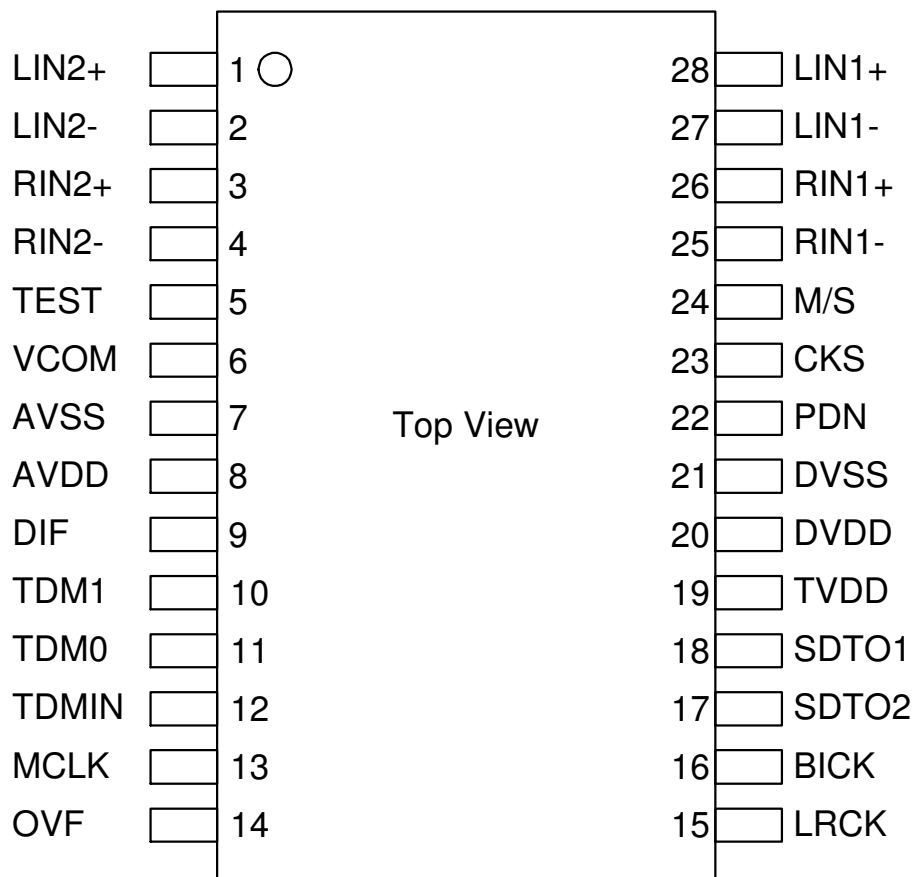
■ Ordering Guide

AK5384VF  
AKD5384

-40 ~ +85°C  
Evaluation Board for AK5384

28pin VSOP (0.65mm pitch)

■ Pin Layout



<b>PIN/FUNCTION</b>
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No.	Pin Name	I/O	Function
1	LIN2+	I	ADC2 Lch Positive Analog Input Pin
2	LIN2-	I	ADC2 Lch Negative Analog Input Pin
3	RIN2+	I	ADC2 Rch Positive Analog Input Pin
4	RIN2-	I	ADC2 Rch Negative Analog Input Pin
5	TEST	I	Test Pin (Connected to AVSS)
6	VCOM	O	Common Voltage Output Pin, AVDD/2 Normally connected to AVSS with a 0.1 $\mu$ F ceramic capacitor in parallel with an electrolytic capacitor less than 2.2 $\mu$ F.
7	AVSS	-	Analog Ground Pin
8	AVDD	-	Analog Power Supply Pin, 4.75 ~ 5.25V
9	DIF	I	Audio Interface Format Pin “L” : 24bit MSB justified, “H” : 24bit I <sup>2</sup> S Compatible
10	TDM1	I	TDM I/F BICK Frequency Select Pin “L” : 256fs, “H” : 128fs
11	TDM0	I	TDM I/F Format Enable Pin “L” : Normal Mode, “H” : TDM Mode
12	TDMIN	I	TDM Data Input Pin
13	MCLK	I	Master Clock Input Pin
14	OVF	O	Analog Input Overflow Detect Pin This pin goes to “H” if one of four analog inputs overflows.
15	LRCK	I/O	Output Channel Clock Pin “L” Output in Master Mode at Power-down mode.
16	BICK	I/O	Audio Serial Data Clock Pin “L” Output in Master Mode at Power-down mode.
17	SDTO2	O	ADC2 Audio Serial Data Output Pin “L” Output at Power-down mode.
18	SDTO1	O	ADC1 Audio Serial Data Output Pin “L” Output at Power-down mode.
19	TVDD	-	Output Buffer Power Supply Pin, 3.0 ~ 5.25V
20	DVDD	-	Digital Power Supply Pin, 4.75 ~ 5.25V
21	DVSS	-	Digital Ground Pin
22	PDN	I	Power-Down Mode Pin When “L”, the circuit is in power-down mode. The AK5384 should always be reset upon power-up.
23	CKS	I	Master Clock Select Pin “L” : 256fs, “H” : 512fs This pin is enabled in Master Mode.
24	M/S	I	Master / Slave Mode Pin “L” : Slave Mode, “H” : Master Mode
25	RIN1-	I	ADC1 Rch Negative Analog Input Pin
26	RIN1+	I	ADC1 Rch Positive Analog Input Pin
27	LIN1-	I	ADC1 Lch Negative Analog Input Pin
28	LIN1+	I	ADC1 Lch Positive Analog Input Pin

Note: All digital input pins should not be left floating.

<b>ABSOLUTE MAXIMUM RATINGS</b>
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(AVSS, DVSS=0V; Note 1)

Parameter		Symbol	min	max	Units
Power Supplies:	Analog	AVDD	-0.3	6.0	V
	Digital	DVDD	-0.3	6.0	V
	Output buffer	TVDD	-0.3	6.0	V
	AVSS - DVSS  (Note 2)	$\Delta$ GND	-	0.3	V
Input Current, Any Pin Except Supplies		IIN	-	$\pm$ 10	mA
Analog Input Voltage		VINA	-0.3	AVDD+0.3	V
Digital Input Voltage (Except BICK, LRCK pins)		VIND1	-0.3	DVDD+0.3	V
(BICK, LRCK pins)		VIND2	-0.3	TVDD+0.3	V
Ambient Temperature (Powered applied)		Ta	-40	85	°C
Storage Temperature		Tstg	-65	150	°C

Note 1. All voltages with respect to ground.

Note 2. AVSS and DVSS must be connected to the same analog ground plane.

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

<b>RECOMMENDED OPERATING CONDITIONS</b>
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(AVSS, DVSS=0V; Note 1)

Parameter		Symbol	min	typ	max	Units
Power Supplies (Note 3)	Analog	AVDD	4.75	5.0	5.25	V
	Digital	DVDD	4.75	5.0	5.25	V
	Output buffer	TVDD	3.0	5.0	5.25	V

Note 1. All voltages with respect to ground.

Note 3. The power up sequence between AVDD, DVDD and TVDD is not critical.

WARNING: AKM assumes no responsibility for the usage beyond the conditions in this datasheet.

<b>ANALOG CHARACTERISTICS</b>
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(Ta=25°C; AVDD=DVDD=TVDD=5.0V; AVSS=DVSS=0V; fs=48kHz, 96kHz; I/F format=Mode 0;  
Signal Frequency=1kHz; Measurement frequency=20Hz ~ 20kHz at fs=48kHz, 40Hz ~ 40kHz at fs=96kHz;  
unless otherwise specified)

Parameter		min	typ	max	Units
<b>ADC Analog Input Characteristics:</b>					
Resolution				24	Bits
S/(N+D)	(-1dBFS)	fs=48kHz	88	100	dB
		fs=96kHz	82	94	dB
DR	(-60dBFS)	fs=48kHz, A-weighted	100	107	dB
		fs=96kHz	94	102	dB
S/N		fs=48kHz, A-weighted	100	107	dB
		fs=96kHz	94	102	dB
Interchannel Isolation		90	110		dB
<b>DC Accuracy:</b>					
Interchannel Gain Mismatch			0.1	0.5	dB
Gain Drift			100	150	ppm/°C
Input Voltage	(Note 4)	±2.7	±2.9	±3.1	Vpp
Input Resistance		18	26		kΩ
		11	16		kΩ
Power Supply Rejection	(Note 5)		50	-	dB
<b>Power Supplies</b>					
Power Supply Current (AVDD+DVDD+TVDD)					
Normal Operation (PDN pin = "H", fs=48kHz)	(Note 6)		43	65	mA
Normal Operation (PDN pin = "H", fs=96kHz)	(Note 6)		55	83	mA
Power-down mode (PDN pin = "L")	(Note 7)		10	100	μA

Note 4. This value is the full scale (0dB) of the input voltage. This voltage is input to LIN(RIN)+ and LIN(RIN)- pin, and is proportional to AVDD. ( $V_{in} = 0.58 \times AVDD$ )

Note 5. PSR is applied to AVDD, DVDD and TVDD with 1kHz, 50mVpp.

Note 6. AVDD=28mA; DVDD=15mA@48kHz&5V, DVDD=26mA@96kHz&5V(typ).

Note 7. All digital input pins are fixed to DVDD or DVSS.