



REALTEK



CE Audio Solutions



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MELV

Driving IC Innovation

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► Selected Customer Wins



Nintendo Switch



SONY PS5 DualSense



Audeze Mobius



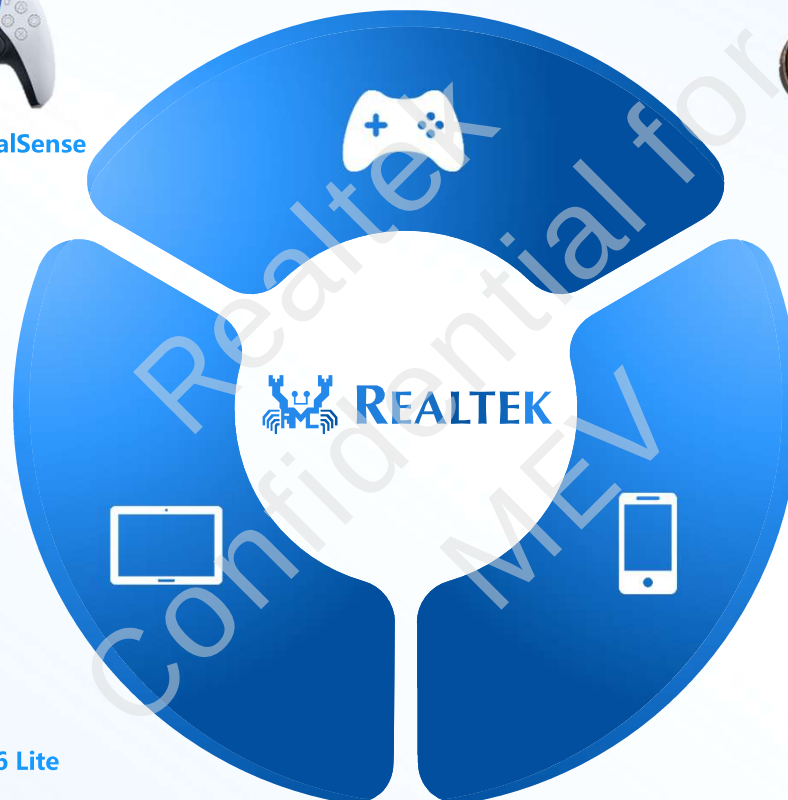
Oculus Quest2



Amazon Fire Tablet



Samsung Tab S6 Lite



Samsung M31 Series



Samsung A51 Series

Audio CODEC Roadmap

Released
Development
Concept

~2021

2022

Audio Jack IC



ALC5663

- I²S/PCM I/F (TDM)
- Stereo Headphone Amp (122dB DNR, -100dB THDN)
- 2.1Vrms@ 600 Ω load
- ADC SNR 98dB
- Smart Headset Detection / Impedance sensing / Global switch (GND/MIC) / Multi-button detection
- WLCSP-56; 3.3x2.8



ALC5682I-VD

- I²S/PCM I/F (TDM)
- Stereo Headphone Amp (103dB DNR, -85dB THDN)
- Parametric EQ & DRC
- Smart Headset Detection / Impedance sensing / Global switch (GND/MIC) / Multi-button detection
- QFN-40; 5x5



ALC5682/82W

- I²S/PCM I/F (TDM)
- 1*SdW I/F (SoundWire 1.1)
- Stereo Headphone out (114dB DNR, -95dB THDN)
- Parametric EQ & DRC
- Smart Headset Detection / Impedance sensing / Global switch (GND/MIC) / Multi-button detection
- QFN-40; 5x5 (ALC5682)
- WLCSP-47; 3.3x2.6 (ALC5682W)



ALC5689

- I²S/PCM I/F (TDM)
- PDM I/Fs
- Mono Headphone Amp (110dB DNR; < -90dB THDN)
- Parametric EQ
- WLCSP-22; 3.2x1.2



ALC5682I-VS

- I²S/PCM I/F (TDM)
- Stereo Headphone out (103dB DNR, -85dB THDN)
- Smart Headset Detection / Impedance sensing / Global switch (GND/MIC) / Multi-button detection
- QFN-40; 5x5;



Hub CODEC



ALC5660

- I²S/PCM I/F (TDM)
- MB DRC w/FE Analog PGA
- Stereo Line Out
- Smart wind noise reduction
- 650mW mono Class-D Amp
- QFN-32; 4x4



ALC5640

- I²S/PCM I/F (TDM)
- Stereo Headphone Amp (100dB DNR, -80dB THDN)
- 2.5W/CH stereo Class-D amp
- Parametric EQ & MB DRC
- Headset Detection
- QFN-48; 6x6



ALC5665

- I²S/PCM I/F (TDM)
- Stereo Headphone Amp (114dB DNR, -95dB THDN)
- Mono Earpiece amp (140mW@ -90dB THDN)
- Parametric EQ & DRC
- Smart Headset Detection / Impedance sensing / Global switch (GND/MIC) / Multi-button detection
- WLCSP-72; 3.6x3.3



ALC5616E

- I²S/PCM I/F
- Stereo Headphone Amp
- Mono Analog Input / Stereo Line Out
- QFN-32; 4x4



ALC5691

- I²S/PCM I/F
- Stereo Headphone Amp (117dB DNR, -95dB THDN)
- Mono Earpiece amp (110mW@ -90dB THD+N)
- Smart Headset Detection / Impedance sensing / Multi-button detection
- Water detection
- WLCSP-49; 2.5x2.5 (0.35pitch)

Essential CODEC



ALC5616

- I²S/PCM I/F
- Stereo Headphone Amp
- Stereo Analog Input / Stereo Line Out
- Parametric EQ & DRC
- QFN-32; 4x4



▶ Audio Jack IC Comparison

	ALC5663	ALC5682I	ALC5682	ALC5691
Digital Audio I/F	1*24-bits/192kHz I ² S	2* 24-bits/192kHz I ² S	1* SoundWire 2* 32-bits/384kHz I ² S	1* 32-bits/384kHz I ² S
ADC	1	1	1	3
DAC	2	2	2	3
MIC I/F	1* SE AMIC	1* SE AMIC, 1* DMIC	1* SE AMIC, 1* DMIC	2*SE AMIC, 1*DMIC
Headphone Out Performance	SNR=124dB DNR=120dB THD+N=-103dB	SNR=103dB DNR=103dB THD+N=-85dB	SNR=124dB DNR=114dB THD+N=-95dB	SNR=124dB DNR=116dB THD+N=-92dB
Headphone Out FSOV	2Vrms (RL=600 Ω) 1.5Vrms (RL=32 Ω)	1Vrms (RL=32 Ω)	1Vrms (RL=32 Ω)	0.9Vrms (RL=32 Ω)
Global Headset Switch(GND/MIC)	●	●	●	●
Headset Push Button Detection	● (Multi button)	● (Multi button)	● (Multi button)	● (Multi button)
Impedance Sensing	●	●	●	●
Package	WLCSP-56, 3.3*2.8mm ²	QFN-40, 5*5mm ²	QFN-40, 5*5mm ²	WLCSP-48, 2.87*2.11mm ²

► Hub CODEC Comparison

	ALC5660	ALC5650	ALC5665
Digital Audio I/F	1* 24-bits/192kHz I ² S	2 (1*TDM) 24-bits/192kHz I ² S	3 (1*TDM) 24-bits/192kHz I ² S
ADC	2	2	4
DAC	2	4	4
MIC I/F	2* SE AMIC, 1* DMIC	2* SE AMIC, 2* DMIC	4* SE/DF AMIC, 2* DMIC
Headphone Out Performance	N/A	SNR=124dB DNR=100dB THD+N=-83dB	SNR=124dB DNR=114dB THD+N=-95dB
Speaker Out Performance (Class-D)	Mono (2.1W/CH @5V, THDN=1%, 4ohm)	Stereo (2.1W/CH @5V, THDN=1%, 4ohm)	N/A
Receiver Amp	N/A	N/A	140mW@THD+N -90dB
Global Headset Switch(GND/MIC)	N/A	●	N/A
Headset Push Button Detection	N/A	● (Multi button)	● (Multi button)
Impedance Sensing	N/A	●	●
Equalizer	8-bands for L-ch / 8-bands for R-ch (shared for playback/record)	Playback: 7-bands for L-ch, 7-bands for R-ch Record: 6-bands	6-bands for L-ch / 6-bands for R-ch (shared for playback/record)
DRC	MB DRC	MB DRC	MB DRC
Package	QFN-32 4*4mm ²	QFN-48 6*6mm ²	WLCSP-72 3.6*3.3mm ²

► Essential CODEC Comparison

	ALC5616	ALC5616E (P2P w/ ALC5616)
Digital Audio I/F	1* 24-bits/192kHz I ² S	1* 24-bits/192kHz I ² S
ADC	2	1
DAC	2	2
MIC I/F	1* SE AMIC, 1* DF AMIC	1* SE/DF AMIC
Headphone Out Performance	SNR = 99dB DNR = 99dB THD+N = -82dB	SNR = 99dB DNR = 99dB THD+N = -82dB
Line In	Stereo	N/A
Line out	Stereo	Stereo
DRC	Yes	N/A
Equalizer	7-bands	N/A
Package	QFN-32 4*4mm ²	QFN-32 4*4mm ²

▶ ALC5682 Series Comparison



	ALC5682I-VD	ALC5682	ALC5682W	ALC5682I-VS
Digital Audio I/F	2x I ² S	2x I ² S + 1x SdW	2x I ² S	2x I ² S
ADC	1	1	1	1
DAC	2	2	2	2
MIC I/F	1* SE AMIC, 1* DMIC	1* SE AMIC, 1* DMIC	1* SE AMIC, 1* DMIC	1* SE AMIC, 1* DMIC
Headphone Out Performance	SNR= 103dB DNR=103dB THD+N=-85dB	SNR= 124dB DNR=114dB THD+N=-95dB	SNR= 124dB DNR=114dB THD+N=-95dB	SNR= 103dB DNR=103dB THD+N=-85dB
DAC Sample Rate	24bit/192kHz	24bit/384kHz	24bit/384kHz	24bit/192kHz
Stereo Class-G Headphone Amplifier	1	1	1	1
4-button detection (Android)	● multi-button detection	● multi-button detection	● multi-button detection	● multi-button detection
Headset/Headphone Detection (Android)	●	●	●	●
Headset Auto GND/Mic Switching (Android)	●	●	●	N/A
Impedance Sensing for headphone/line-in detection (Android)	●	●	●	●
Smart Jack Detection (Android)	●	●	●	●
Package Type	QFN-40 5*5mm ²	QFN-40 5*5mm ²	WLCSP-47 3.3*2.6mm ²	QFN-40 5*5mm ²

Audio & Context Hub DSP Roadmap

Released
Development
Concept

~2021

2022

Audio DSP w/ CODEC

Sensor Fusion

Light Audio DSP

ALC5679/80

- 2 DSP Cores: Hi-Fi 3 & Mini DSPs
- 568KB embedded RAM
- 3rd gen. VAD (Voice Activity Detect)
- 5x 32bits I²S/PCM/TDM & SLIMBus I/Fs
- Headphone out (120dB DNR, -100dB THD+N)
- Mono Earpiece amp
- SPI/I²C/JTAG/UART I/Fs
- PDM, DMIC, Analog I/O I/Fs
- WLCSP-113 4.4x4.4 (ALC5679)
- QFN-68; 8x8 (ALC5680)

ALC5520/21

- Dual-Core Hi-Fi 3 DSP (350MIPS each, 32b, FPU)
- Fusion F1 DSP (100MIPS, 32b FPU)
- 1.3MB embedded RAM
- 3rd gen. VAD (Voice Activity Detect)
- 3x 32bits I²S/PCM/TDM I/Fs
- SPI/I²C/JTAG/UART I/Fs
- PDM, DMIC, Analog I/O I/Fs
- QFN-68; 8x8 (ALC5520)
- WLCSP-105 ;4.8x4.9 (ALC5521)

ALC5526

- Hi-Fi 3z DSP
- Ultra-low Power
- FF/FB/Hybrid HW ANC
- Neural Network Accelerator
- Programmable ANC filter
- RealANC Tuning Tool

RTS3111

- Fusion F1 DSP (100 MIPS, 32-Bit, FPU)
- 560KB embedded memory
- 3rd gen. VAD (Voice Activity Detect)
- PWM output
- SPI/I²C/UART/JTAG control I/Fs
- I²S/TDM/PCM I/F
- WLCSP-64; 3.2x3.2

ALC5676/77

- Hi-Fi EP DSP (310MIPS, 24b)
- 768KB embedded RAM
- 1x PDM out, 1x SLIMBus
- 2x I²S/PCM/TDM I/Fs
- SPI/I²C/JTAG I/Fs
- 2nd gen. VAD (Voice Activity Detect)
- LQFP-78; 7x7 (ALC5676)
- WLCSP-81; 4x4 (ALC5677)



▶ ALC5676/80/ALC5520 Comparison

	ALC5676	ALC5680	ALC5520
DSP Core	HiFi-EP	HiFi-3 + Hi-Fi-Mini	Dual HiFi-3 + Fusion F1
Maximum DSP clock	310 MIPS	300 MIPS + 50 MIPS	350 MIPS*2 + 75MIPS
Memory Size	Total : 768KB - I-RAM = 128KB; D-RAM = 128KB - System RAM = 512KB	Total : 568KB - HIFI-3 : I-RAM=128KB; D-RAM=128KB I\$=64KB; D\$=16KB - HIFI-mini: I-RAM=40KB; D-RAM=80KB - Shared SRAM=192KB	Total : 1.3MB - HIFI-3 : I/D RAM =1MByte I\$=64KB ; D\$=16KB - Fusion F1 : I/D RAM=288KB
I/O Interface	I ² S(24-bit)/TDM SPI/I ² C I/F A-MIC*2/DMIC*4	I ² S(32-bit)/I ² C/SPI/UART/JTAG/SLIM Bus A-MIC*2/D-MIC*4/SPDIF In Support SPI Flash Controller	I ² S(32-bit)/TDM/DSD/PDM SPI/I ² C/UART/JTAG I/F A-MIC*6/DMIC*8 Support SPI Flash Controller
Realtek VAD Technology	2 nd Generation VAD	3 rd Generation VAD with Pitch Detect	3 rd Generation VAD with Pitch Detect
Chip size & pin count	LQFP 48, 7x7 mm ²	QFN-68, 8x8 mm ²	QFN-68, 8x8 mm ²
Analog Features	102dB ADC for A-MIC Inputs 100dB DAC SNR DAC	120dB SNR, 100dB THD+N DACs 103dB ADCs for MIC-In Headphone Amp, Receiver Amp	103dB ADC for A-MIC Inputs
Product Status	MP	MP	MP

► In-house Algorithm Capability Comparison

	ALC5676	ALC5520
Noise Suppression	Up to 20dB	Up to 35dB
Acoustic Echo Cancellation	Up to 45dB	Up to 60dB
Far-Field Pickup	5 – 10 m	5 – 7 m
Beamforming	●	●
De-reverb	●	●
Direction Of Arrival	●	●
UC Platform Compliant	None	MS Teams, Zoom
Applications	IP Cam Doorbell	Conference Call WoV device

USB Audio CODEC Roadmap

Released
Development
Concept

~2021

2022

Headset/ Headphone

Dongle

ALC5683

- UAC 1.0/2.0 & ADC 3.0
- **VPD (VPD power switch & PD SOP')**
- DAC-HPout: 114dB DNR, -95dB THD+N
- AMIC*1/ DMIC*1
- MIC IN to ADC: 99dB SNR, -90dB THD+N
- Burst mode with LPM/L1 mode
- 6 band EQ for L/R each and
- 6 band for A-MIC (Shared)
- DC-DC buck converter
- De-pop circuit
- Multi-button detection
- Global Headset (CTIA and OMTP)
- Impedance sensing
- WLCSP-95, 4.2*4.1mm²

ALC5686

- UAC 1.0/2.0 & ADC 3.0
- DAC-HPout: 114dB DNR, -95dB THD+N
- AMIC*1
- MIC IN to ADC: 99dB SNR, -90dB THD+N
- Burst mode with LPM/L1 mode
- 6 band EQ for L/R each
- 6 band for A-MIC (Shared)
- DC-DC buck converter
- De-pop circuit
- Multi-button detection
- Impedance sensing
- SPI Flash Controller
- Embedded flash
- QFN-48, 5*6.5mm²

ALC5685D

- UAC 1.0/2.0 & ADC 3.0
- **VPD (VPD power switch & PD SOP')**
- Differential headphone outs
- DAC-HPout: 117dB DNR, 100dB THD+N
- AMIC*1
- MIC IN to ADC: 99dB SNR, -90dB THD+N
- Crosstalk =< -135dB
- Burst mode with LPM/L1 mode
- 6 band EQ for L/R each
- 6 band for A-MIC (Shared)
- DC-DC buck converter
- De-pop circuit
- Multi-button detection
- SPI Flash Controller
- WLCSP-70, 3.9*3.3mm²

ALC5692

- UAC 1.0/2.0 & ADC 3.0
- Differential headphone outs
- DAC-HPout: 117dB DNR, -97dB THD+N
- AMIC*1
- MIC IN to ADC: 99dB SNR, -90dB THD+N
- Crosstalk =< -135dB
- Burst mode with LPM/L1 mode
- 6 band EQ for L/R each
- 6 band for A-MIC (Shared)
- De-pop circuit
- Built-in DCDC buck converter
- Multi-button detection
- SPI Flash Controller
- WLCSP-55, 3.3*2.8mm²
- ES: 3Q'20 / MP: 4Q'20

▶ ALC5683/86/85D/92 Comparison

	ALC5683	ALC5686	ALC5685D	ALC5692
Application	USBC dongle / headset single-ended ADC 3.0/ UAC 2.0	USBC dongle / headset single-ended ADC 3.0/ UAC 2.0	USBC headset Differential ADC 3.0/ UAC 2.0	USBC headset Differential ADC 3.0/ UAC 2.0
USB I/Fs	Audio data up to 32bit/384kHz	Audio data up to 32bit/384kHz	Audio data up to 32bit/384kHz	Audio data up to 32bit/384kHz
USB PD I/Fs	●	N/A	●	N/A
Other Digital Audio I/Fs	2*I ² S (1*TDM), 32-bit/384kHz	1*I ² S (192kHz/32bit)	1*I ² S (192kHz/32bit)	1*I ² S (192kHz/32bit)
AMIC	1	1	1	1
MIC IN to ADC	SNR= 99dB THD+N= -90dB	SNR= 99dB THD+N= -90dB	SNR= 99dB THD+N= -90dB	SNR= 99dB THD+N= -90dB
DMIC	1	N/A	N/A	N/A
Burst mode with LPM/L1	●	●	●	●
DSD (64/128/256) Decode	●	N/A	N/A	N/A
DC-DC Buck Converter	●	●	●	●
	(5V to 1.8V)	(5V to 1.8V)	(5V to 1.8V)	(5V to 1.8V)
Power switch for VPD (Vconn Powered Device)	●	N/A	●	N/A
Headphone Amp	SNR=124dB DNR=114dB	SNR=124dB DNR=114dB	SNR=124dB DNR=117dB	SNR=124dB DNR=117dB
DAC to HP-out	THD+N= -95dB	THD+N= -95dB	THD+N= -100dB	THD+N= -97dB
Headphone out FSOV	1Vrms (RL=32 Ω)	1Vrms (RL=32 Ω)	1Vrms (RL=32 Ω)	1Vrms (RL=32 Ω)
DAC crosstalk	100dB	100dB	<= 135dB	<= 135dB
CTIA/OMTP GND Switch	●	●	N/A	N/A
Headset Push Button Detection	●	●	●	●
	(Multi button)	(Multi button)	(Multi button)	(Multi button)
Impedance Sensing	●	●	N/A	N/A
Flash	External	Embedded	External	External
Side-tone	two bi-quad filters for the side-tone path	N/A	N/A	N/A
Package	WLCSP-95 (4.1*4.2)	QFN-48 (5*6.5)	WLCSP-70 (3.9*3.4)	WLCSP-55 (3.3*2.8)