SiI9437/SiI9438 ARC/Enhanced ARC Receiver and Transmitter

Data Brief

SiI-DB-02013-B

October 2017

1. General Description

The SiI9437/SiI9438 ARC/Enhanced ARC receiver/transmitter from Lattice Semiconductor adds higher bandwidth Enhanced Audio Return Channel (eARC) capability to HDMI®-based designs.

The SiI9437/SiI9438 ARC/Enhanced ARC receiver/transmitter support audio bit rates up to 98 Mb/s (36.8 Mb/s payload). Manufacturers of televisions, audio/video receivers, and sound bars can use these devices to implement eARC with up to 8-channels of 24-bit, 192 kHz audio.

This new high bit rate, low jitter audio interface transmits over standard HDMI with Ethernet cable using the available differential twisted pair of pins 14 and 19. The devices are backward-compatible with HDMI 1.4 Audio Return Channel, for connectivity with legacy ARC devices.

Implementing eARC into consumer electronics products helps to ensure greater interoperability and forward-compatibility without compromise. This is especially important as new devices with Dynamic HDR, Variable Refresh, and other HDMI 2.1 features come to market.

The SiI9437/SiI9438 include support for the eARC Common Mode Data Channel, used for Discovery, Capabiity Detection, Heartbeat, and Lipsync features of eARC.

The SiI9437/SiI9438 design enables integration in conjunction with existing HDMI transmitters and receivers, and operates independently of the HDMI frequency, mode, and encoding format. No HDMI 2.1 or HDMI 2.0 dependency exists; the devices can be integrated with HDMI transmitter/receivers using any version of HDMI.

Figure 1.1 on the next page shows a typical systems diagram of SiI9437/SiI9438 ARC/Enhanced ARC receiver/transmitter

1.1. Applications

- Televisions (SiI9438 Transmitter)
- AVRs (SiI9437 Receiver)
- Home Theater-in-a-Box (SiI9437 Receiver)
- Soundbars (SiI9437 Receiver)

1.2. Audio Interfaces

- SiI9438 Transmitter:
  - Four-lane I^2S inputs
  - IEC60958 (S/PDIF) input
  - HDMI eARC (differential signal) transmitter
  - HDMI Legacy ARC (Single Mode) output compatibility
- SiI9437 Receiver:
  - Four-lane I^2S outputs
  - IEC60958 (S/PDIF) output
  - HDMI eARC (differential signal) receiver
  - HDMI Legacy ARC (single mode or Common mode) input compatibility

1.3. Audio Support

- Dolby® Digital
- Dolby Digital Plus™
- Dolby® TrueHD
- DTS™
- DTS-HD
- DTS HD Master Audio™
- Dolby Atmos™
- DTS:X™
- PCM audio, up to 8 channels, 24-bit, 192 kHz

1.4. Programming Interface

Local I^2C bus

1.5. Packaging

- 32-pin, 4 mm × 4 mm, 0.4 mm pitch QFN package with an exposed pad (ePad)

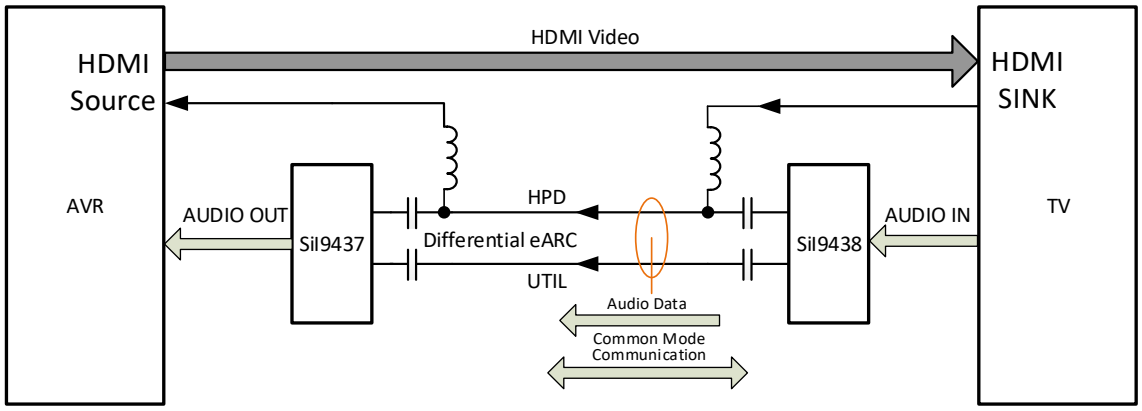
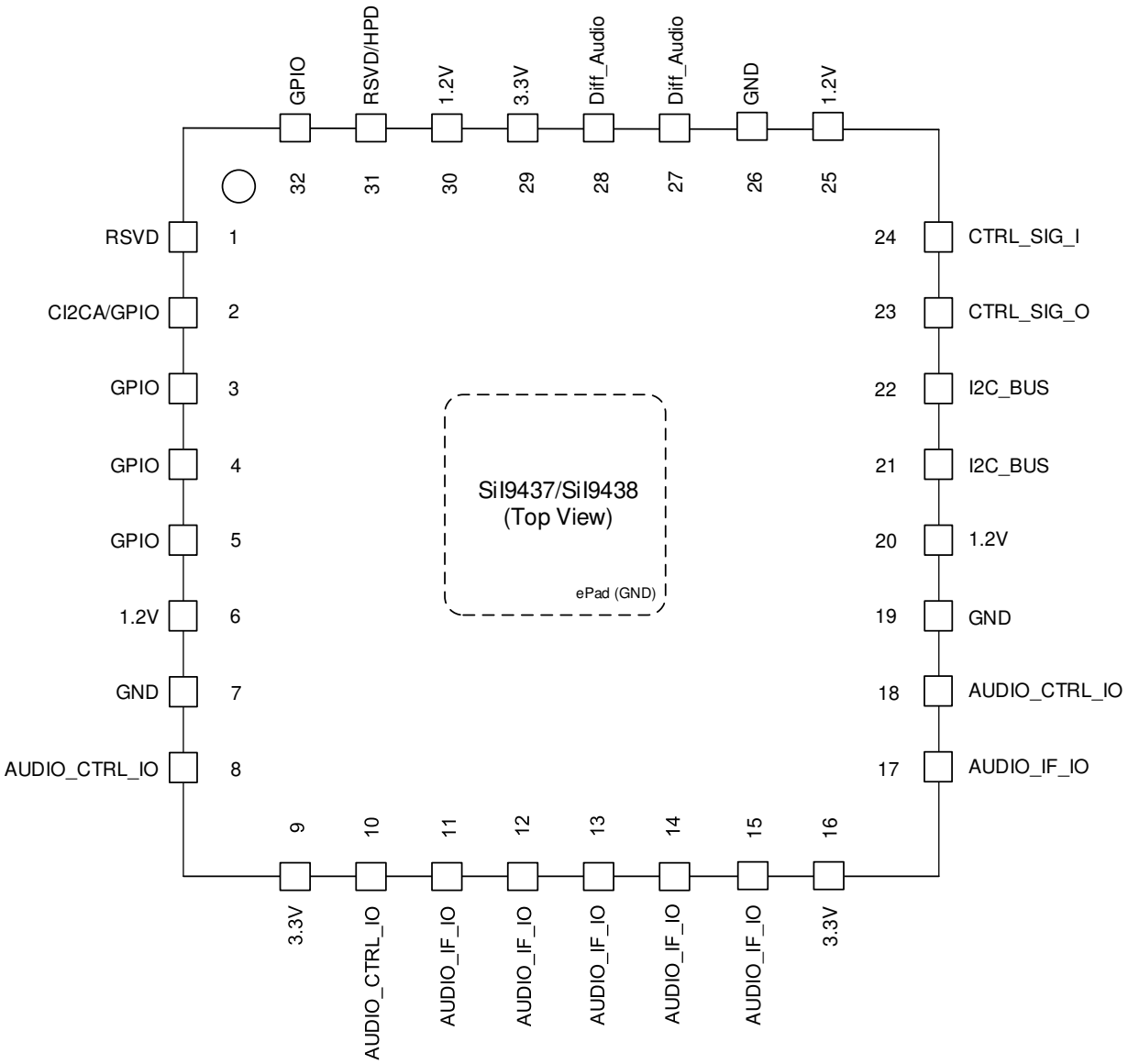


Figure 1.1. Typical System Diagram

2. Pin Diagram

Figure 2.1 shows the pin assignments of the SiI9437/SiI9438 device. The package is a 4 mm × 4 mm 32-pin QFN with an ePad. For best performance, the ePad ***should*** be soldered to a pad on the PC board that is electrically connected to ground, but it is not required to make an electrical ground connection since the package also has GND pins.

Pin names are generalized by type for this document. The list below the diagram describes the purpose of each type.



GPIO − General Purpose Input/Output
AUDIO_CTRL_IO − Audio Control Input/Output
AUDIO_IF_IO − Audio Interfacel Input/Output
CTRL_SIG_I − Control Input
CTRL_SIG_O − Control Output
I2C_BUS − I^2C Bus, 5 V Tolerant
HPD − Hot Plug Detect
RSVD − Reserved
GND − Ground

Figure 2.1. Pin Diagram

3. Package Information

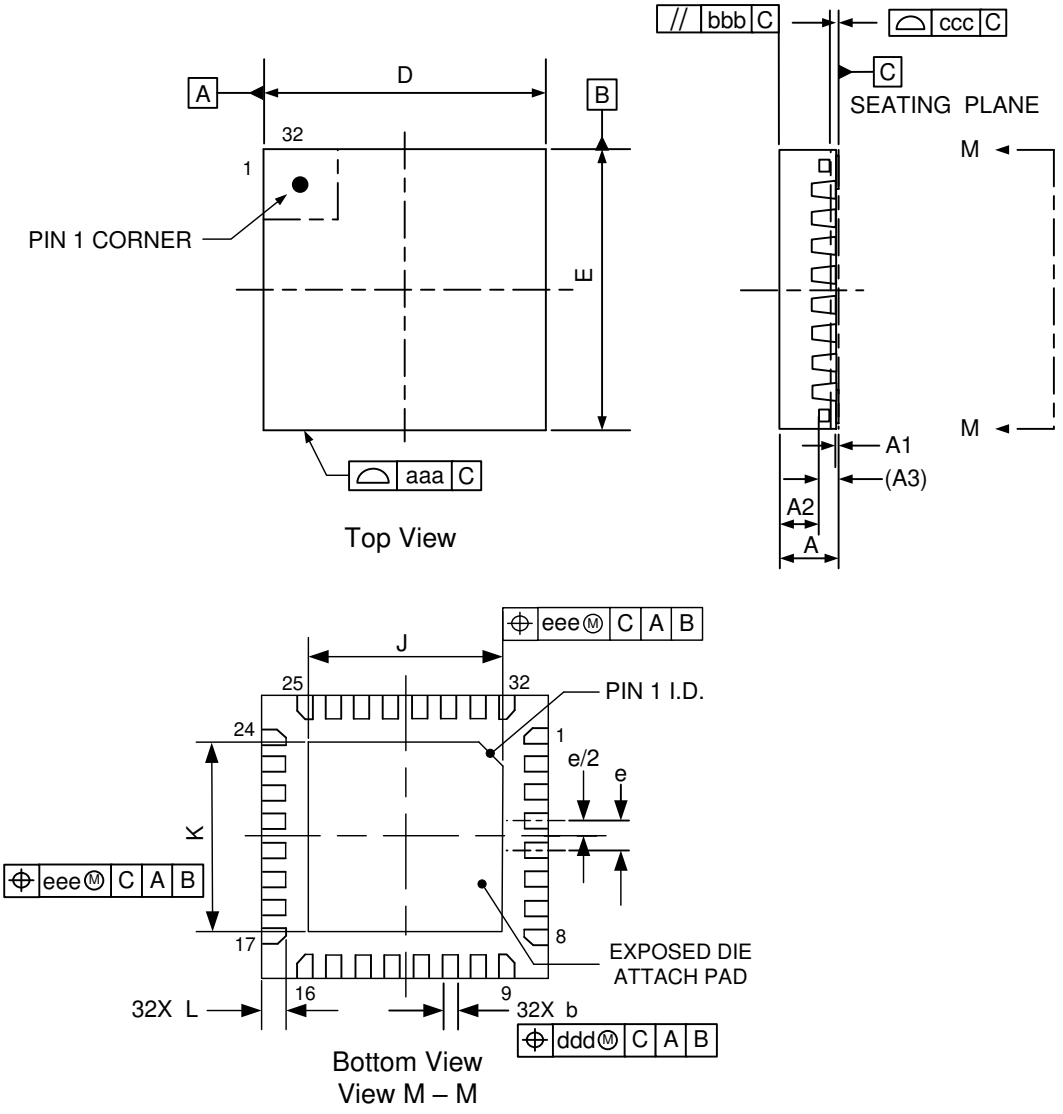
3.1. ePad Requirements

The SiI9437/SiI9438 receiver/transmitter is packaged in a 32-pin, 4 mm × 4 mm QFN package with an exposed pad (ePad) that is 2.7 mm × 2.7 mm (±0.1 mm). Soldering the ePad to the ground plane of the PCB is recommended for improved grounding and thermal transfer but is not required for typical applications.

Figure 3.1 on the next page shows the package dimensions of the SiI9437/SiI9438 receiver/transmitter.

3.2. Package Dimensions

These drawings are not to scale.



JEDEC Package Code- MO-220

Item	Description	Min	Typ	Max
A	Total Thickness	0.80	0.85	0.90
A1	Stand Off	0	0.035	0.05
A2	Mold Thickness	—	0.65	0.67
A3	L/F Thickness		0.203 REF	
D	Body Size		4 BSC	
E			4 BSC	
b	Lead Width	0.15	0.2	0.25
e	Lead Pitch		0.4 BSC	

Item	Description	Min	Typ	Max
J	Exposed Pad Size	2.6	2.7	2.8
K		2.6	2.7	2.8
L	Lead Length	0.25	0.3	0.35
aaa	Package Edge Tolerance		0.1	
bbb	Mold Flatness		0.1	
ccc	Coplanarity		0.08	
ddd	Lead Offset		0.1	
eee	Exposed Pad Offset		0.1	

Note: All dimensions are in millimeter.

Figure 3.1. Package Diagram

3.3. Marking Specification

The marking diagram for SiI9437 is shown in Figure 3.2. This drawing is not to scale.

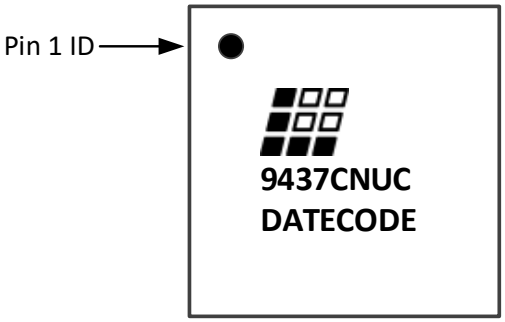


Figure 3.2. SiI9437 Marking Diagram

The marking diagram for SiI9438 is shown in Figure 3.3. This drawing is not to scale.

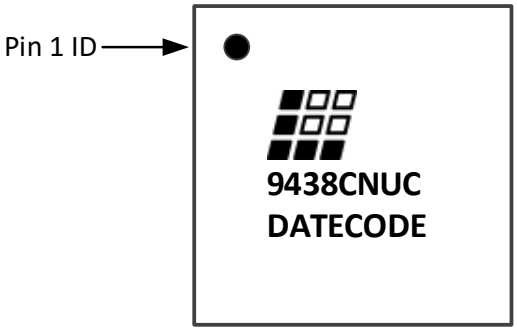


Figure 3.3. SiI9438 Marking Diagram

3.4. Ordering Information

Production Part Numbers:

Device	Part Number
SiI9437 Enhanced ARC Receiver	SiI9437CNUC
SiI9438 Enhanced ARC Transmitter	SiI9438CNUC

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