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General Description

The SiI9396 device is a superMHL™ 1.0/MHL® to HDMI 2.0 bridge with HDCP 2.2 repeater support targeted for superMHL and MHL dongle from Lattice Semiconductor. The SiI9396 device is also a superMHL 1.0/HDMI 2.0 transmitter targeted for superMHL source and Set Top Box (STB).

The SiI9396 receiver port can be configured into a superMHL compliant port, an MHL 3 compliant port, or an HDMI 2.0 compliant port.

The SiI9396 device can receive and decompress VESA Display Stream Compression (DSC) 1.1 video signals up to 4K x 2K @ 60 Hz.

As a bridge, the SiI9396 device supports superMHL and MHL input up to 4K x 2K @ 30 Hz with YCbCr 4:2:2.

As a superMHL transmitter, the SiI9396 device supports one output with three-lane superMHL. It also supports audio insertion through S/PDIF or 2-channel I²S input with downsampling.

As an HDMI transmitter, the SiI9396 device supports one output with HDMI 2.0 up to 18 Gb/s. The SiI9396 device can convert certain types of reduced blank formats such as a 337 MHz Transition Minimized Differential Signaling (TMDS™) input of 10-bit 4K @ 50/60 Hz 4:2:0 into an HDMI 2.0 standard 4K @ 50/60 Hz 4:2:2 10-bit output.

superMHL Input

- Configurable for one or three data lanes operating at 6 Gb/s per lane
- Three-lane superMHL input supports video resolution up to 4K x 2K @ 60 Hz with YCbCr 4:4:4/RGB
- One-lane superMHL input supports video resolution up to 4K x 2K @ 30 Hz with YCbCr 4:2:2
- One-lane superMHL input via DSC decompression can support up to 4K x 2K @ 60Hz with YCbCr 4:4:4/RGB

MHL Input

- Supports 6 Gb/s MHL 3 compatible input, backward compatible with MHL 1 and MHL 2

HDMI Input

- Supports 18 Gb/s HDMI 2.0 compatible input, backward compatible with HDMI 1.4

superMHL Output

- Supports three-lane superMHL output resolution up to 4K x 2K @ 60 Hz with superMHL connector
- Supports superMHL connector with reversible cable

HDMI Output

- Supports 18 Gb/s HDMI 2.0 compatible output, backward compatible with HDMI 1.4

Video Format Conversion

- BT.601/BT.709 color space conversion
- supports xvYCC colorimetry
- Supports 8-bit YCbCr 4:2:2 to YCbCr 4:4:4 chroma upsampling, 8-bit YCbCr 4:4:4 to YCbCr 4:2:2 chroma downsampling
- Supports 8/10-bit YCbCr 4:2:0 to YCbCr 4:2:2, and 8/10-bit YCbCr 4:2:2 to YCbCr 4:2:0 conversion
- Supports pixel reorder with 4K x 2K @ 30 Hz

DSC Decoder

- Supports 8-bit DSC decoder with YCbCr 4:4:4/RGB
- Supports 8/10-bit DSC decoder with YCbCr 4:2:0

Audio

- Supports audio insertion through one I²S input up to two channels or S/PDIF input
- Supports audio extraction up to eight channels through four I²S outputs or S/PDIF output
- Supports up to 192 kHz PCM and compressed audio formats
- Supports high bitrate (HBR) audio output up to 768 kHz

HDCP

- Built in HDCP 2.2/HDCP 1.4 decryption engine
- Built in HDCP 2.2/HDCP 1.4 encryption engine
- Supports HDCP 2.2 and HDCP 1.4 repeater

Host Interface

- Inter-Integrated Circuit (I²C)
- Serial Peripheral Interface (SPI)

Microprocessor

- Built-in enhanced microprocessor

Packaging

- 76-pin QFN (9 mm × 9mm) package
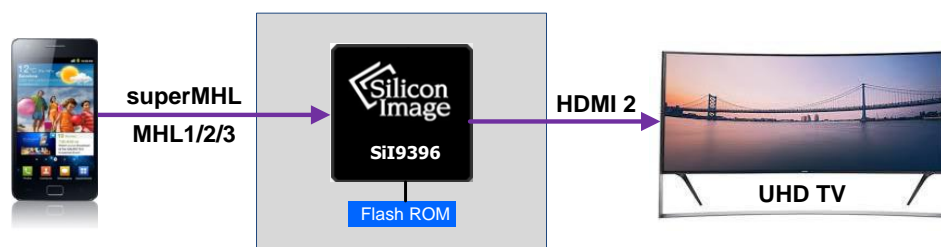- Standard part covers extended (−20 °C to + 85 °C) temperature range

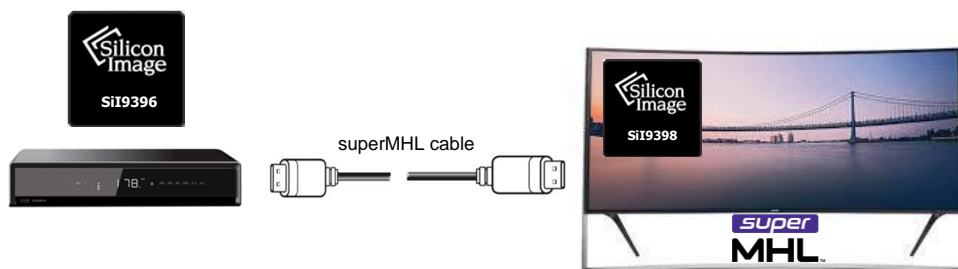**Figure 1. Typical Application for the SiI9396 Bridge**

Figure 2. Typical Application for the SiI9396 superMHL Transmitter

Pin Diagram

Figure 3 shows the pin diagram of the SiI9396 device. The SiI9396 device is the 76-pin, 9 mm × 9 mm QFN package with an exposed pad (ePad), which must be connected to ground.
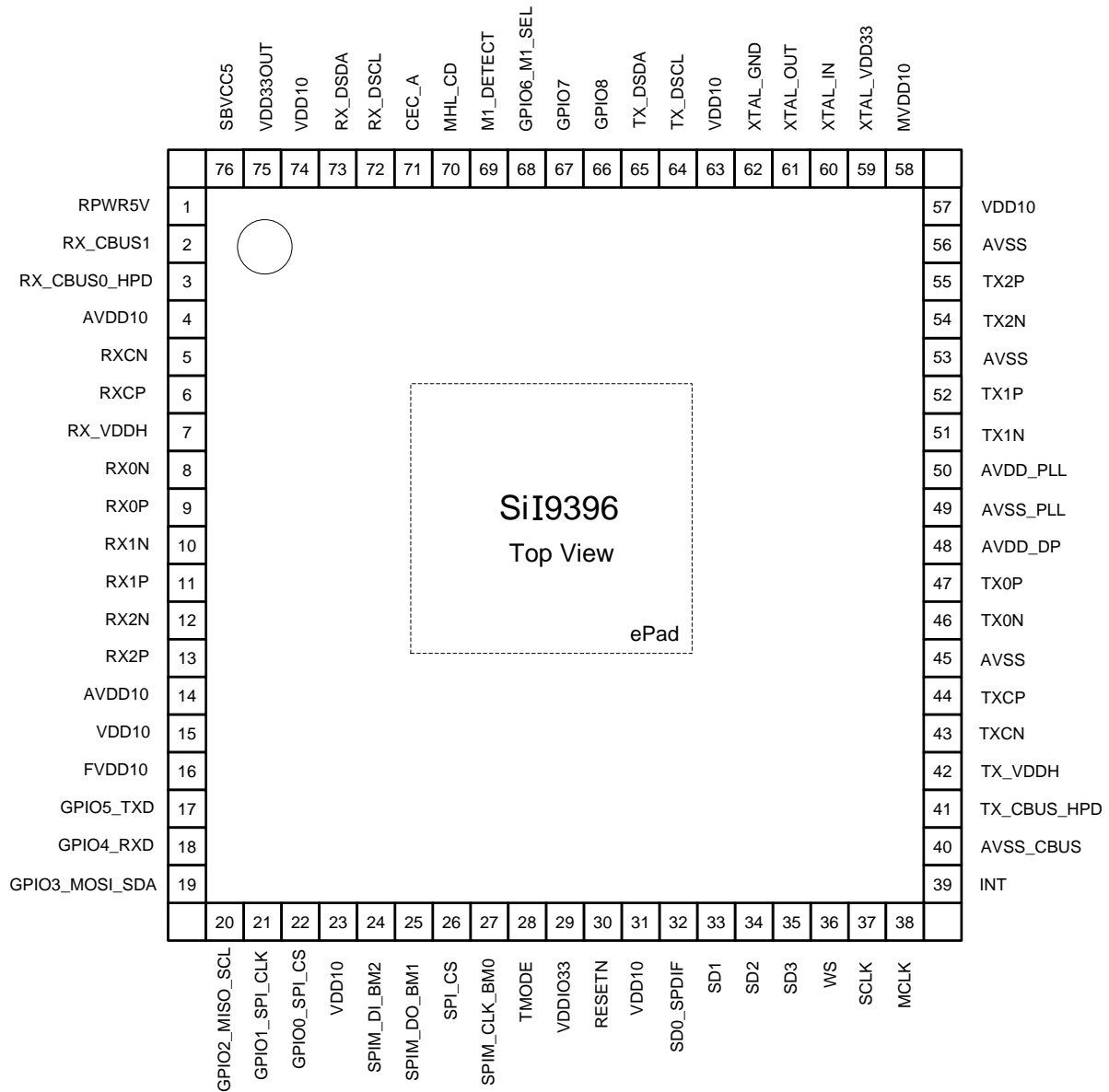

Figure 3. SiI9396 Pin Diagram

Packaging

ePad Requirements

The SiI9396 device is packaged in a 76-pin, 9 mm × 9 mm QFN package with an exposed pad (ePad) that is used for electrical ground of the device and for improving thermal transfer characteristics.

The ePad dimensions are 6.3 mm × 6.3 mm. Soldering the ePad to the ground plane of the PCB is required to meet package power dissipation requirements at full speed operation, and to correctly connect the device circuitry to electrical ground. As a general guideline, a clearance of at least 0.25 mm should be designed on the PCB between the edge of the ePad and the inner edges of the lead pads to avoid the possibility of electrical short circuit. Figure 4 on page 7 shows the package dimensions of the SiI9396 device.

Package Dimensions

Package drawings are not to scale.
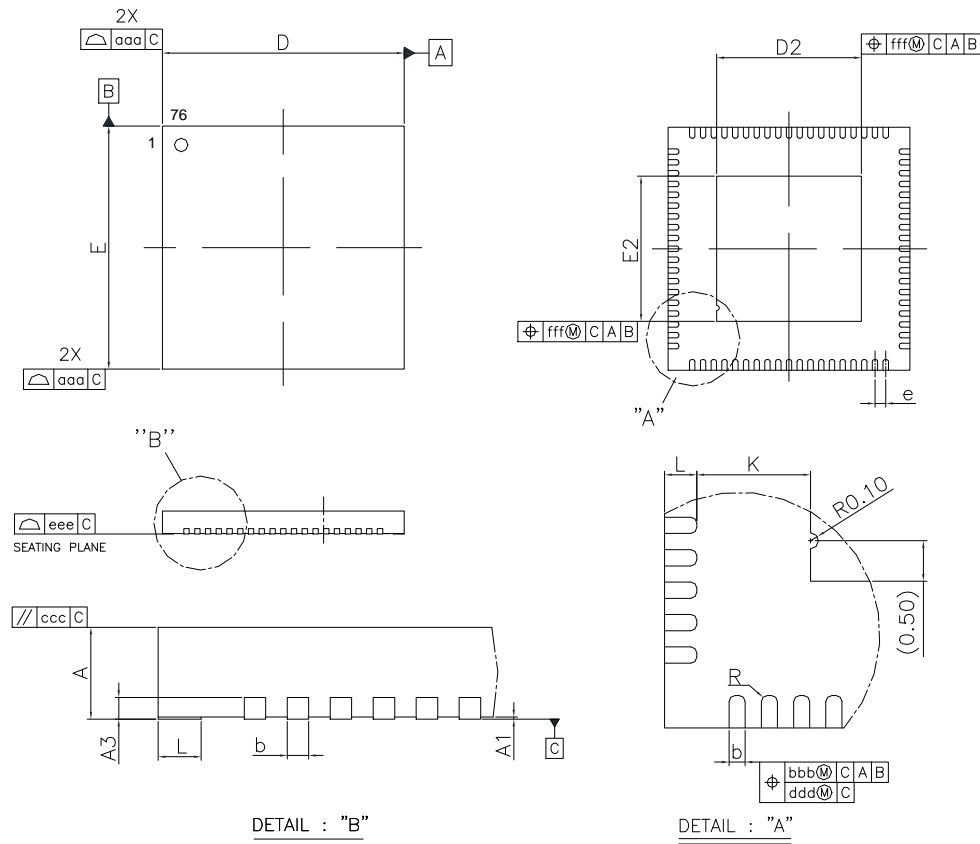
JEDEC Package Code MO-220

Symbol	Description	Min	Typ	Max
A	Thickness	0.80	0.85	0.90
A1	Stand-off	0.00	0.02	0.05
A$_3$	Base thickness	0.20 REF		
D / E	Body size	8.90	9.00	9.10
D2 / E2	ePad size	6.15	6.30	6.45
b	Plated lead width	0.15	0.20	0.25
e	Lead pitch	0.40 BSC		
L	Lead foot length	0.30	0.40	0.50
R	Lead tip radius	0.075	—	—
K	Lead to ePad clearance	0.20	—	—
aaa	—	0.10		
bbb	—	0.07		
ccc	—	0.10		
ddd	—	0.05		
eee	—	0.08		
fff	—	0.10		

All dimensions are in millimeters.

Figure 4. 76-pin QFN Package Diagram

Marking Specification

Marking drawing is not to scale. Figure 5 shows the marking diagram of the SiI9396 bridge.
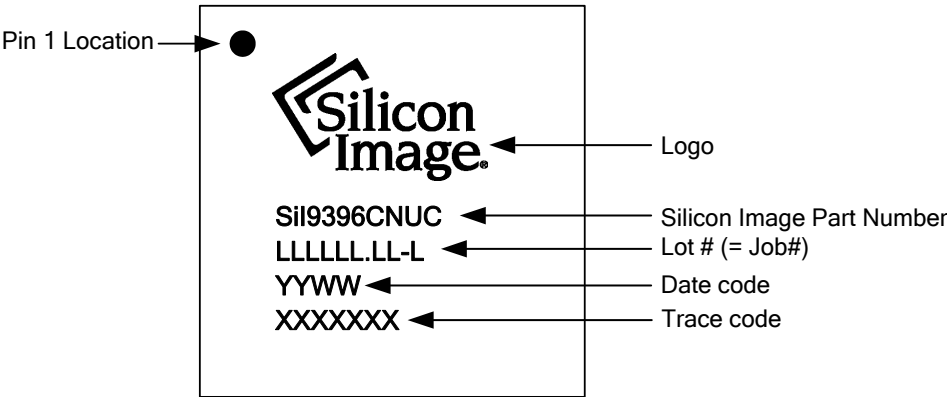

Figure 5. Marking Diagram

Ordering Information

Production Part Numbers:

Part Number	Device
SiI9396 CNUC	SiI9396 superMHL/MHL to HDMI Bridge and superMHL Transmitter with HDCP 2.2 Support

The universal package can be used in lead-free and ordinary process lines..

7th Floor, 111 SW 5th Avenue
Portland, OR 97204, USA
T 503.268.8000