



Sil9396 superMHL/MHL to HDMI Bridge and superMHL Transmitter with HDCP 2.2 Support

Data Brief

Sil-DB-02014-A

November 2016

Copyright Notice

Copyright © 2016 Lattice Semiconductor Corporation. All rights reserved. The contents of these materials contain proprietary and confidential information (including trade secrets, copyright, and other Intellectual Property interests) of Lattice Semiconductor Corporation and/or its affiliates. All rights are reserved. You are permitted to use this document and any information contained therein expressly and only for bona fide non-commercial evaluation of products and/or services from Lattice Semiconductor Corporation or its affiliates; and only in connection with your bona fide consideration of purchase or license of products or services from Lattice Semiconductor Corporation or its affiliates, and only in accordance with the terms and conditions stipulated. Contents, (in whole or in part) may not be reproduced, downloaded, disseminated, published, or transferred in any form or by any means, except with the prior written permission of Lattice Semiconductor Corporation and/or its affiliates. Copyright infringement is a violation of federal law subject to criminal and civil penalties. You have no right to copy, modify, create derivative works of, transfer, sublicense, publicly display, distribute or otherwise make these materials available, in whole or in part, to any third party. You are not permitted to reverse engineer, disassemble, or decompile any device or object code provided herewith. Lattice Semiconductor Corporation reserves the right to revoke these permissions and require the destruction or return of any and all Lattice Semiconductor Corporation proprietary materials and/or data.

Trademark Acknowledgment

Lattice Semiconductor Corporation®, the Lattice Semiconductor logo, Silicon Image®, the Silicon Image logo, Instaport®, the Instaport logo, InstaPrevue®, Simplay®, Simplay HD®, the Simplay HD logo, Simplay Labs™, the Simplay Labs logo, the SiBEAM Snap™, the SiBEAM Snap logo, UltraGig™, the UltraGig logo are trademarks or registered trademarks of Lattice Semiconductor Corporation in the United States and/or other countries. HDMI® and the HDMI logo with High-Definition Multimedia Interface are trademarks or registered trademarks of, and are used under license from, HDMI Licensing, LLC. in the United States or other countries. MHL® and the MHL logo with Mobile High-Definition Link are trademarks or registered trademarks of, and are used under license from, MHL, LLC. in the United States and/or other countries. WirelessHD®, the WirelessHD logo, WiHD® and the WiHD logo are trademarks, registered trademarks or service marks of SiBeam, Inc. in the United States or other countries. HDMI Licensing, LLC; MHL, LLC; Simplay Labs, LLC; and SiBeam, Inc. are wholly owned subsidiaries of Lattice Semiconductor Corporation. All other trademarks and registered trademarks are the property of their respective owners in the United States or other countries. The absence of a trademark symbol does not constitute a waiver of Lattice Semiconductor's trademarks or other intellectual property rights with regard to a product name, logo or slogan.

Export Controlled Document

This document contains materials that are subject to the U.S. Export Administration Regulations and may also be subject to additional export control laws and regulations (collectively "Export Laws") and may be used only in compliance with such Export Laws. Unless otherwise authorized by an officer of Lattice Semiconductor Corporation in writing, this document and the information contained herein (a) may not be used in relation to nuclear, biological or chemical weapons, or missiles capable of delivering these weapons, and (b) may not be re-exported or otherwise transferred to a third party who is known or suspected to be involved in relation to nuclear, biological or chemical weapons, or missiles capable of delivering these weapons, or to any sanctioned persons or entities.

Further Information

To request other materials, documentation, and information, contact your local Lattice Semiconductor sales office or visit the Lattice Semiconductor web site at www.latticesemi.com.

Disclaimers

These materials are provided on an "AS IS" basis. Lattice Semiconductor Corporation and its affiliates disclaim all representations and warranties (express, implied, statutory or otherwise), including but not limited to: (i) all implied warranties of merchantability, fitness for a particular purpose, and/or non-infringement of third party rights; (ii) all warranties arising out of course-of-dealing, usage, and/or trade; and (iii) all warranties that the information or results provided in, or that may be obtained from use of, the materials are accurate, reliable, complete, up-to-date, or produce specific outcomes. Lattice Semiconductor Corporation and its affiliates assume no liability or responsibility for any errors or omissions in these materials, makes no commitment or warranty to correct any such errors or omissions or update or keep current the information contained in these materials, and expressly disclaims all direct, indirect, special, incidental, consequential, reliance and punitive damages, including WITHOUT LIMITATION any loss of profits arising out of your access to, use or interpretation of, or actions taken or not taken based on the content of these materials. Lattice Semiconductor Corporation and its affiliates reserve the right, without notice, to periodically modify the information in these materials, and to add to, delete, and/or change any of this information.

Products and Services

The products and services described in these materials, and any other information, services, designs, know-how and/or products provided by Lattice Semiconductor Corporation and/or its affiliates are provided on "AS IS" basis, except to the extent that Lattice Semiconductor Corporation and/or its affiliates provides an applicable written limited warranty in its standard form license agreements, standard Terms and Conditions of Sale and Service or its other applicable standard form agreements, in which case such limited warranty shall apply and shall govern in lieu of all other warranties (express, statutory, or implied). EXCEPT FOR SUCH LIMITED WARRANTY, LATTICE SEMICONDUCTOR CORPORATION AND ITS AFFILIATES DISCLAIM ALL REPRESENTATIONS AND WARRANTIES (EXPRESS, IMPLIED, STATUTORY OR OTHERWISE), REGARDING THE INFORMATION, SERVICES, DESIGNS, KNOW-HOW AND PRODUCTS PROVIDED BY LATTICE SEMICONDUCTOR CORPORATION AND/OR ITS AFFILIATES, INCLUDING BUT NOT LIMITED TO, ALL IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND/OR NON-INFRINGEMENT OF THIRD PARTY RIGHTS. YOU ACKNOWLEDGE AND AGREE THAT SUCH INFORMATION, SERVICES, DESIGNS, KNOW-HOW AND PRODUCTS HAVE NOT BEEN DESIGNED, TESTED, OR MANUFACTURED FOR USE OR RESALE IN SYSTEMS WHERE THE FAILURE, MALFUNCTION, OR ANY INACCURACY OF THESE ITEMS CARRIES A RISK OF DEATH OR SERIOUS BODILY INJURY, INCLUDING, BUT NOT LIMITED TO, USE IN NUCLEAR FACILITIES, AIRCRAFT NAVIGATION OR COMMUNICATION, EMERGENCY SYSTEMS, OR OTHER SYSTEMS WITH A SIMILAR DEGREE OF POTENTIAL HAZARD. NO PERSON IS AUTHORIZED TO MAKE ANY OTHER WARRANTY OR REPRESENTATION CONCERNING THE PERFORMANCE OF THE INFORMATION, PRODUCTS, KNOW-HOW, DESIGNS OR SERVICES OTHER THAN AS PROVIDED IN THESE TERMS AND CONDITIONS.

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

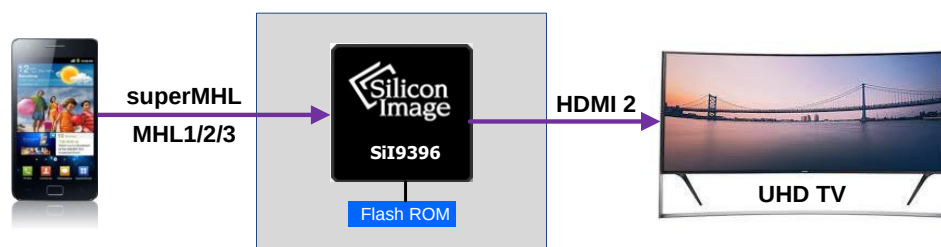


Figure 1. Typical Application for the SiI9396 Bridge

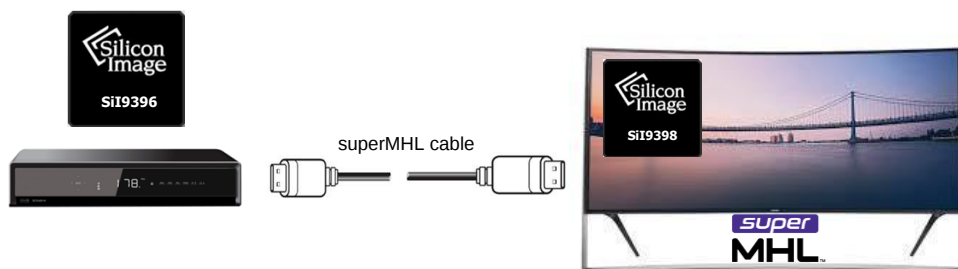


Figure 2. Typical Application for the SiI9396 superMHL Transmitter

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.

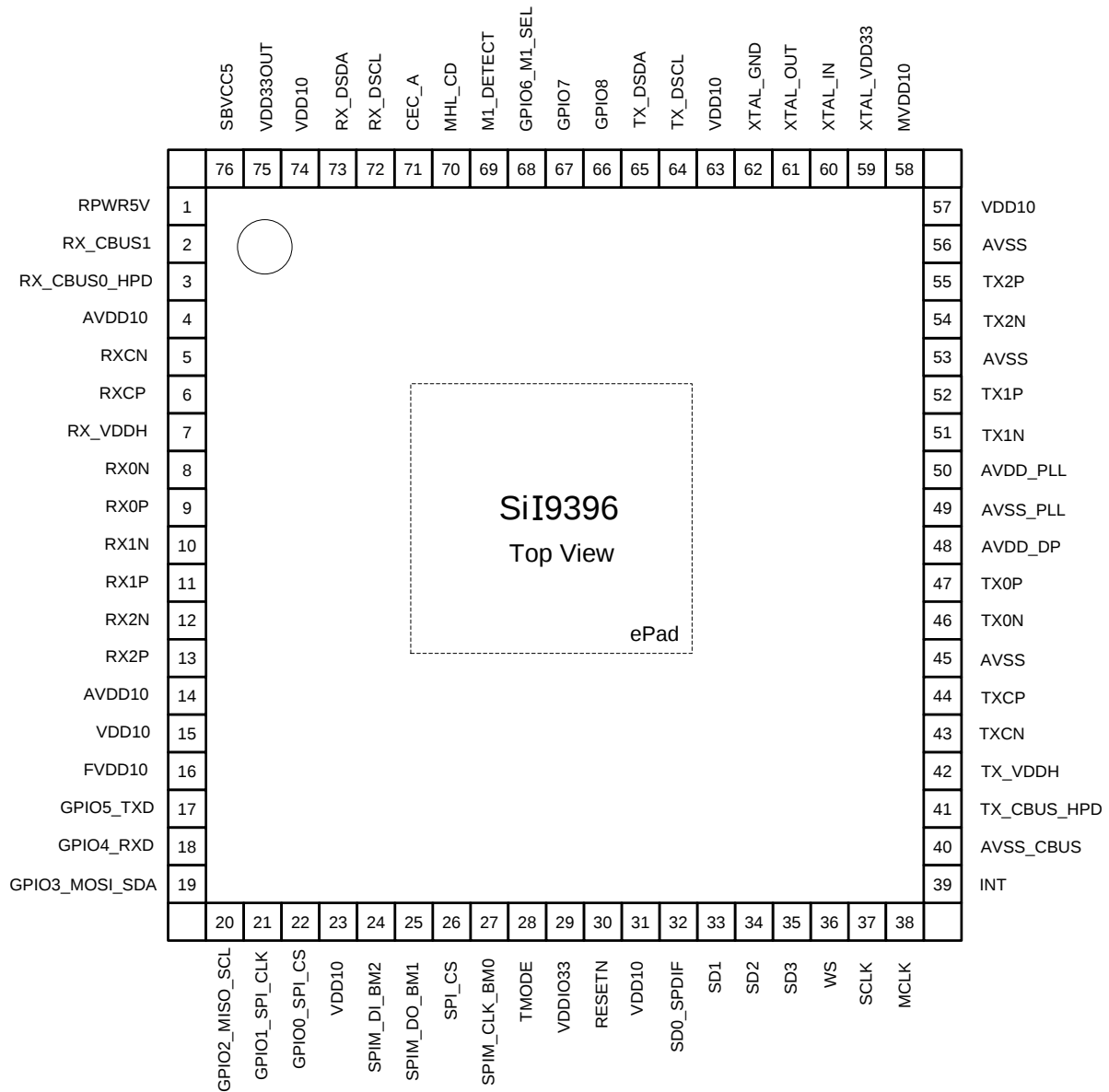


Figure 3. SiI9396 Pin Diagram

Packaging

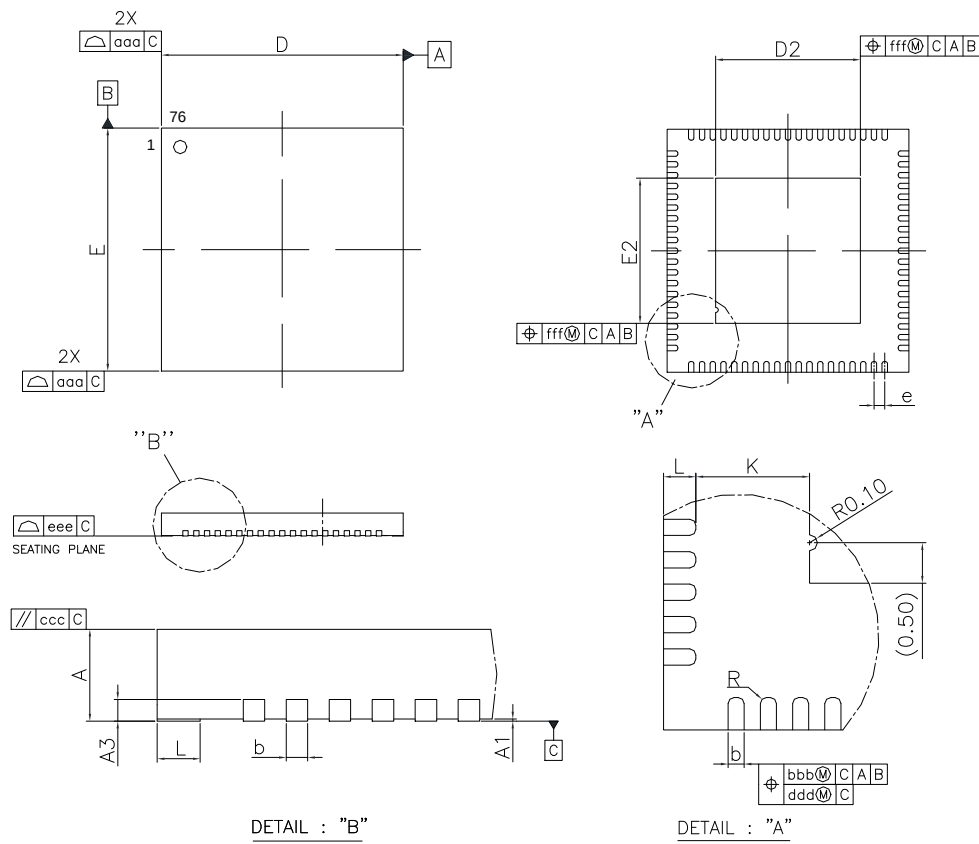
ePad Requirements

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.

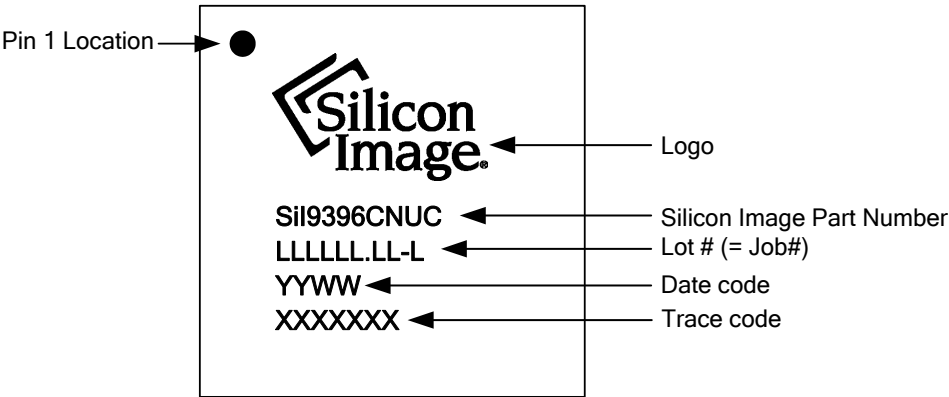


Figure 5. Marking Diagram

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
www.latticesemi.com