SiI9381A HDMI/MHL Port Processor

Data Brief

Document # SiI-DB-1085-A
General Description

The SiI9381A HDMI/MHL Port Processor is the second generation HDMI port processor with Audio-return Channel (ARC) support on one input port. It provides a simple, low-cost method of retransmitting protected digital audio, video, and Mobile High-definition Link (MHL™) signals, giving manufacturers a low-cost method of adding an ARC-capable port to the latest digital TVs. Backward compatibility allows these systems to connect to any existing HDMI and DVI 1.0 source.

This part supports the Audio Return Channel (ARC) described in the HDMI 1.4 Specification. ARC provides an S/PDIF link from an HDMI sink to an HDMI source in the opposite direction of the TMDS data flow.

Features

- One input port can implement Audio Return Channel, which allows an S/PDIF uplink from HDMI sink device to an HDMI source
- InstaPort™ viewing technology that reduces port switching time to less than one second
- Adaptive equalizer provides long cable support, even at Deep Color resolutions
- Standby power modes meet Energy Star and other power saving requirements, lower system cost, and optimize board design
- One input port can be set to MHL port

HDMI Inputs and Output

- Four HDMI input ports
- One HDMI output port
- HDMI, HDCP, and DVI compatible
- TMDS™ cores run at 2.25 Gbps
- Supports video resolutions up to 1080p, 60 Hz, 12-bit or 720p/1080i, 120 Hz, 12-bit
- MHL support for resolutions up to 1080i @ 60 Hz can be assigned to any one input port
- Pre-programmed with HDCP keys

Control Capability

- Consumer Electronics Control (CEC) interface incorporates an HDMI-compliant CEC I/O and an integrated Silicon Image CEC Programming Interface (CPI); these simplify design and lower costs and software overhead
- Integrated EDID and DDC support for the HDMI ports using a 512-byte NVRAM shared between ports that loads into separate 256-byte SRAM for each of four HDMI ports and 128-byte SRAM for VGA EDID
- Individual control of Hot Plug Detect (HPD) for each of the ports
- Controllable by the local I²C bus

Packaging

- 88-pin, 10 mm x 10 mm, 0.40 mm pitch QFN package with enhanced ePad™

Figure 1. Port Processor Application
Pin Diagram

Figure 2 shows the pin assignments of the Si9381A port processor in the 88-pin, 10 mm x 10 mm QFN package with an ePad. Pin names are generalized by type for this document. The list below the diagram describes the purpose of each type. The ePad must be soldered to ground.

**Figure 2. Pin Diagram (Top View)**
Package Information

ePad Requirements
The SiI9381A HDMI/MHL Port Processor chip is packaged in an 88-pin, 10 mm x 10 mm QFN package with an ExposedPad™ (ePad™) that is used for the electrical ground of the device and for improved thermal transfer characteristics. The ePad dimensions are 4.3 mm x 4.3 mm ±0.15 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 chip circuitry to electrical ground. 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 shorts.

The thermal land area on the PCB may use thermal vias to improve heat removal from the package. These thermal vias also double as the ground connections of the chip and must attach internally in the PCB to the ground plane. An array of vias should be designed into the PCB beneath the package. For optimum thermal performance, the via diameter should be 12 mils to 13 mils (0.30 mm to 0.33 mm) and the via barrel should be plated with 1-ounce copper to plug the via. This design helps to avoid any solder wicking inside the via during the soldering process, which may result in voids in solder between the pad and the thermal land. If the copper plating does not plug the vias, the thermal vias can be tented with solder mask on the top surface of the PCB to avoid solder wicking inside the via during assembly. The solder mask diameter should be at least 4 mils (0.1 mm) larger than the via diameter.

Package stand-off when mounting the device also needs to be considered. For a nominal stand-off of approximately 0.1 mm the stencil thickness of 5 mils to 8 mils should provide a good solder joint between the ePad and the thermal land.

Figure 3 on the next page shows the package dimensions of the SiI9381A port processor.
Package Dimensions
These drawings are not to scale.

JEDEC Package Code MO-2206

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Thickness</td>
<td>0.80</td>
<td>0.85</td>
<td>0.90</td>
</tr>
<tr>
<td>A1</td>
<td>Stand-off</td>
<td>0.00</td>
<td>0.02</td>
<td>0.05</td>
</tr>
<tr>
<td>A2</td>
<td>Body thickness</td>
<td>0.60</td>
<td>0.65</td>
<td>0.70</td>
</tr>
<tr>
<td>A3</td>
<td>0.20 REF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Footprint</td>
<td>0.90</td>
<td>10.00</td>
<td>10.10</td>
</tr>
<tr>
<td>E</td>
<td>Footprint</td>
<td>0.90</td>
<td>10.00</td>
<td>10.10</td>
</tr>
<tr>
<td>D1</td>
<td>Body size</td>
<td>9.75 BSC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E1</td>
<td>Body size</td>
<td>9.75 BSC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2</td>
<td>ePad</td>
<td>4.10</td>
<td>4.30</td>
<td>4.50</td>
</tr>
<tr>
<td>E2</td>
<td>ePad</td>
<td>4.10</td>
<td>4.30</td>
<td>4.50</td>
</tr>
<tr>
<td>b</td>
<td>Lead width</td>
<td>0.15</td>
<td>0.20</td>
<td>0.25</td>
</tr>
<tr>
<td>e</td>
<td>Lead pitch</td>
<td>0.15</td>
<td>0.20</td>
<td>0.25</td>
</tr>
<tr>
<td>L</td>
<td>Lead foot length</td>
<td>0.30</td>
<td>0.40</td>
<td>0.50</td>
</tr>
<tr>
<td>Θ</td>
<td>0°</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>Lead radius, inside</td>
<td>0.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>ePad clearance</td>
<td>0.20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dimensions in mm.

Figure 3. Package Diagram
Marking Specification

Figure 4 shows the markings of the SiI9381A package. This drawing is not to scale.

Ordering Information

<table>
<thead>
<tr>
<th>Device</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard port processor with ARC</td>
<td>SiI9381ACNUC</td>
</tr>
</tbody>
</table>
Disclaimers

These materials are provided on an “AS IS” basis. Silicon Image, Inc. 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. Silicon Image, Inc. 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.

Silicon Image, Inc. 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.

Notwithstanding the foregoing, these materials shall not, in the absence of authorization under U.S. and local law and regulations, as required, be used by or exported or re-exported to (i) any U.S. sanctioned or embargoed country, or to nationals or residents of such countries; or (ii) any person, entity, organization or other party identified on the U.S. Department of Commerce's Denied Persons or Entity List, the U.S. Department of Treasury's Specially Designated Nationals or Blocked Persons List, or the Department of State's Debarred Parties List, as published and revised from time to time; (iii) any party engaged in nuclear, chemical/biological weapons or missile proliferation activities; or (iv) any party for use in the design, development, or production of rocket systems or unmanned air vehicles.

Products and Services

The products and services described in these materials, and any other information, services, designs, know-how and/or products provided by Silicon Image, Inc. and/or its affiliates are provided on an “AS IS” basis, except to the extent that Silicon Image, Inc. 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, SILICON IMAGE, INC. AND ITS AFFILIATES DISCLAIM ALL REPRESENTATIONS AND WARRANTIES (EXPRESS, IMPLIED, STATUTORY OR OTHERWISE), REGARDING THE INFORMATION, SERVICES, DESIGNS, KNOW-HOW AND PRODUCTS PROVIDED BY SILICON IMAGE, INC. 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.

1060 E. Arques Avenue
Sunnyvale, CA 94085
T 408.616.4000  F 408.830.9530
www.siliconimage.com