Silicon Image

PanelLink®

Technology

dvi
digital visual interface

Orion and Maia ADD2 Card
User's Guide

Document # SiI-UG-0044-A

FCC NOTICE
INFORMATION FOR THE USER

Silicon Image, Inc.
FCC ID: SAX5397X

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation. This Product Certified to meet the Standards in the categories listed below:

Information Technology Equipment
EMI: FCC Part 15 Class B; ICAN ICES-003 Class B; EN55022 Class B
This Class B digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1) Reorient or relocate the receiving antenna.
2) Increase the separation between the equipment and receiver.
3) Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4) Consult the dealer or an experienced radio/TV technician for help.

The user may find the following publication prepared by the Federal Communications Commission helpful:

"How to Identify and Resolve Radio-TV Interference Problems" (Stock Number 004-000-00345-4).

Available exclusively from the Superintendent of Documents, Government Printing Office, Washington, DC 20402 (telephone 202-512-1800).

FCC WARNING

Changes or modifications not expressly approved by the party responsible for compliance to Part 15 of the FCC Rules could void the user's authority to operate the equipment.

Silicon Image, Inc.

SiI-UG-0044-A

May 2004

Application Information

To obtain the most updated Application Notes and other useful information for your design, please visit the Silicon Image web site at www.siliconimage.com or contact your local Silicon Image sales office.

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Revision History

Revision	Date	Comment
SiI-UG-0044-A	5/24/04	User's Guide – 1st Release.

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Introduction

This purpose of this document is to introduce the ADD2 (Advanced Digital Display, 2nd Generation) Card, its features and its usage. The ADD2 Card has been designed to work in Intel Motherboards that have PCI-Express slots and support SDVO (Serial Digital Video Output) technology. It will not work on motherboards or systems that support earlier DVO-based ADD (AGP Digital Display) Cards.

SDVO-based systems have 2 different layout options: non lane-reversed and lane-reversed, which require separate ADD2 Card layout. The Orion ADD2-N (non lane-reversed) and Maia ADD2-R (lane reversed) cards were designed for this requirement. They can be easily distinguished from their color code: ADD2-N is color coded BLUE (see Figure 1) and ADD2-R is color coded RED (see Figure 2). Both cards have been designed to meet the DVI (Digital Visual Interface) 1.0 standard.
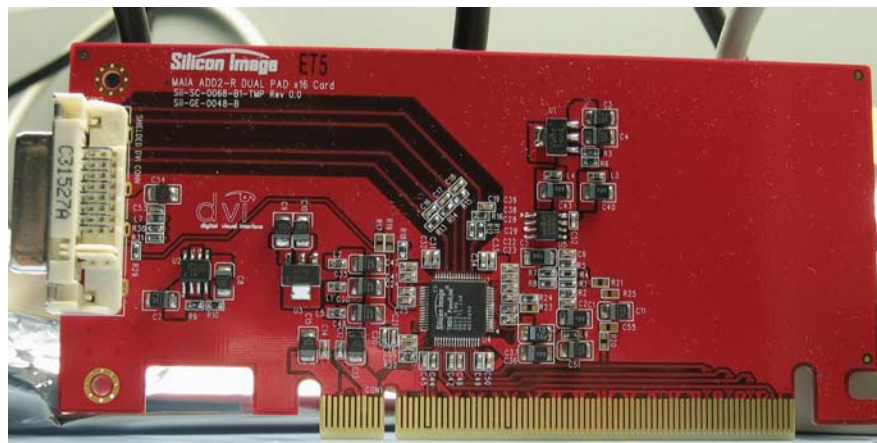

Figure 1. Orion ADD2-N Card - Blue

Figure 2. Maia ADD2-R Card - Red

The Orion ADD2-N and Maia ADD2-R cards share common features such as:

- Dual Pad: Supports either the 64-pin SiI1364 package or 48-pin SiI1362 package (see note below)

- Low Profile Card dimensions

- Retention mechanism for excellent board stability

- Four-layer PCB for good thermal and signal integrity.

- DVI Single Link with 100ohm differential impedance

- EMI shielding on Layer 1 and Layer 4 via copper pour

- Identical Bill of Materials and layout, with exception of ADD2+ enable pull up on ADD2-R and SDVO input

- 2KB serial EEPROM to store configuration information

- No special drivers required to enable card in an SDVO based system.

The Orion ADD2-N and Maia ADD2-R cards are available from Silicon Image as part of a Starter Kit. The Starter Kit includes all necessary items including high profile and low profile brackets for sampling and documents for mass production.

Available documents in Starter Kits SiI-SK-0025 for ADD2-N and SiI-SK-0026 or by request:

1. Layout in PowerPCB 5.0 format

2. Gerbers for both Orion ADD2-N and Maia ADD2-R with X-Y data for assembly

3. Bill of Materials with alternate vendor sources for discrete devices

4. Low Profile and High Profile bracket dimensions, along with vendor information.

Note on SiI1362 pads: The ADD2 cards provide 48-pin support for specialized applications only, since the SiI1362 package does not support the configuration EEPROM interface. The host system BIOS would require special enhancements by the OEM to support this configuration. Silicon Image does not provide any software support for use of the SiI1362 package on an ADD2 card.

Video Resolutions Supported

The ADD2 card will support all video modes that can be sent over a single link DVI connection, with pixel rates ranging from 25 MHz to 162 MHz. This includes, but is not limited to, the following VESA and industry standard modes. Note that some resolution selections may be disabled by the Grantsdale G drivers.

Table 1. Video Resolutions Supported

Resolution	Vertical Refresh Rate	Horizontal Frequency	Pixel Frequency
640 x 350	85 Hz	37.9 kHz	31.5 MHz
640 x 400	85 Hz	37.9 kHz	31.500 MHz
720 x 400	85 Hz	37.9 kHz	35.500 MHz
640 x 480	60 Hz	31.5 kHz	25.175 MHz
640 x 480	72 Hz	37.9 kHz	31.500 MHz
640 x 480	75 Hz	37.5 kHz	31.500 MHz
640 x 480	85 Hz	43.3 kHz	36.000 MHz
800 x 600	56 Hz	35.1 kHz	36.000 MHz
800 x 600	60 Hz	37.9 kHz	40.000 MHz
800 x 600	72 Hz	48.1 kHz	50.000 MHz
800 x 600	75 Hz	46.9 kHz	49.500 MHz
800 x 600	85 Hz	53.7 kHz	56.250 MHz
1024 x 768	60 Hz	48.4 kHz	65.000 MHz
1024 x 768	70 Hz	56.5 kHz	75.000 MHz
1024 x 768	75 Hz	60.0 kHz	78.750 MHz
1024 x 768	85 Hz	68.7 kHz	94.500 MHz
1152 x 864	75 Hz	67.5 kHz	108.000 MHz
1280 x 960	60 Hz	60.0 kHz	108.000 MHz
1280 x 960	85 Hz	85.9 kHz	148.500 MHz
1280 x 1024	60 Hz	64.0 kHz	108.000 MHz
1280 x 1024	75 Hz	80.0 kHz	135.000 MHz
1280 x 1024	85 Hz	91.1 kHz	157.500 MHz
1600 x 1200	60 Hz	75.0 kHz	162.000 MHz

Board Description

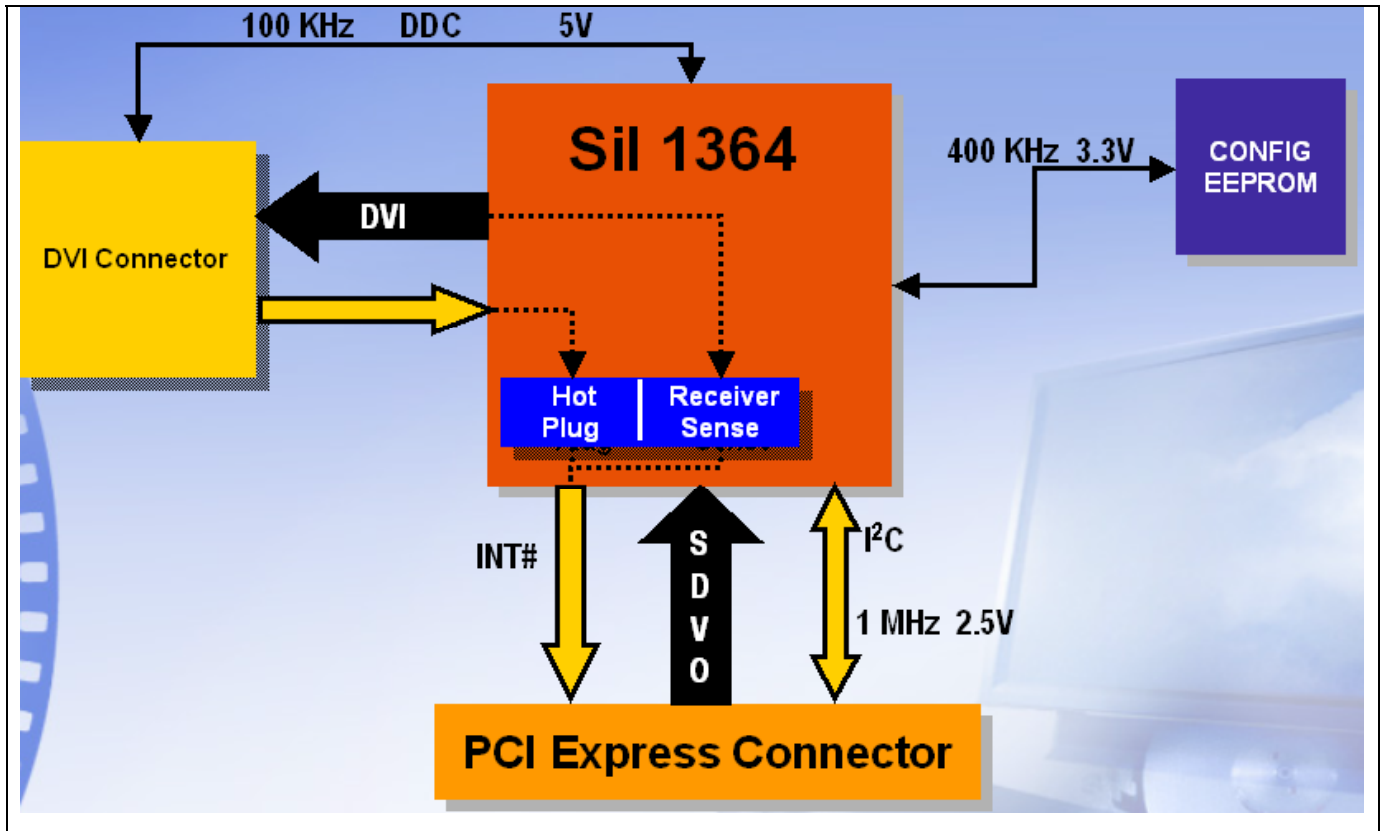The basic block diagram of the Orion and Maia ADD2 cards is illustrated in Figure 3. Each block is briefly explained below.

Figure 3. Functional Blocks of ADD2 Card

PCI-Express Connector:

The PCI-Express slot passes all SDVO signals including the 1MHz-speed 2.5V I^2C bus from the Grantsdale G chipset and SDVO signals, and returns INT# (Serial Interrupt) from the SiI 1364 Tx. Both ADD2-N and ADD2-R have x16 length PCI-Express card-edge connectors.

Configuration EEPROM

The Configuration EEPROM stores vital configuration header information for the Grantsdale G driver to recognize and configure the SiI 1364 Tx as an SDVO-based DVI device. The EEPROM I^2C bus from the SiI 1364 Tx operates at 400kHz at 3.3V. The SiI 1364 Tx has internal 3.3V pull-up resistors for this bus; therefore, no external pull-up resistors are stuffed. All ADD2 cards are shipped with a pre-programmed EEPROM installed. Refer to the Bill of Materials for additional EEPROM information.

SiI 1364 Tx and I^2C Circuits

The SiI 1364 Tx is the device that links the Grantsdale G platform to a DVI flat panel display. Grantsdale G reads the EDID of a connected display, or retrieves configuration information from the EEPROM, by way of the I^2C pass-through of the SiI 1364 Tx. This pass-through interface operates at a 100kHz rate and provides the required level shifting from the 2.5V Grantsdale G interface to either the 3.3V EEPROM interface or the 5V DDC interface. The SiI 1364 Tx also provides an interrupt signal to the Grantsdale G to signal a display attach/detach event using the DVI Hot Plug function.

Note that the 2.5V I^{2}C interface to the Grantsdale G chipset operates at speeds up to 1MHz when communicating with the on-chip registers.

Hot Plug and Receiver Sense

Either Hot Plug or Receiver Sense can indicate attachment of a Digital Display to the ADD2 Card.

- Hot Plug detects whether a display is attached by sensing when the display returns a 2V to 5V level on the DVI connector Hot Plug pin.

- Receiver Sense detects whether an attached display has applied power to its TMDS receiver by sensing the voltage on the TMDS lines.

With this technology, no external circuit is required. While the ADD2 card supports both functions, only one can be enabled at a time. At power-up time the Receiver Sense circuit is enabled, but the motherboard drivers typically program the chip so that the Hot Plug function is used instead.

Physical Dimensions and Devices

Figure 4 illustrates the physical dimensions of the ADD2-N and ADD2-R cards. The PCI Express Card Electromechanical Specification requires the maximum height of a low profile card to be 2.731inches(69.37mm) or lower. The Orion ADD2-N and Maia ADD2-R cards are designed to meet this specification at a height of 2.57inch (65.4mm).
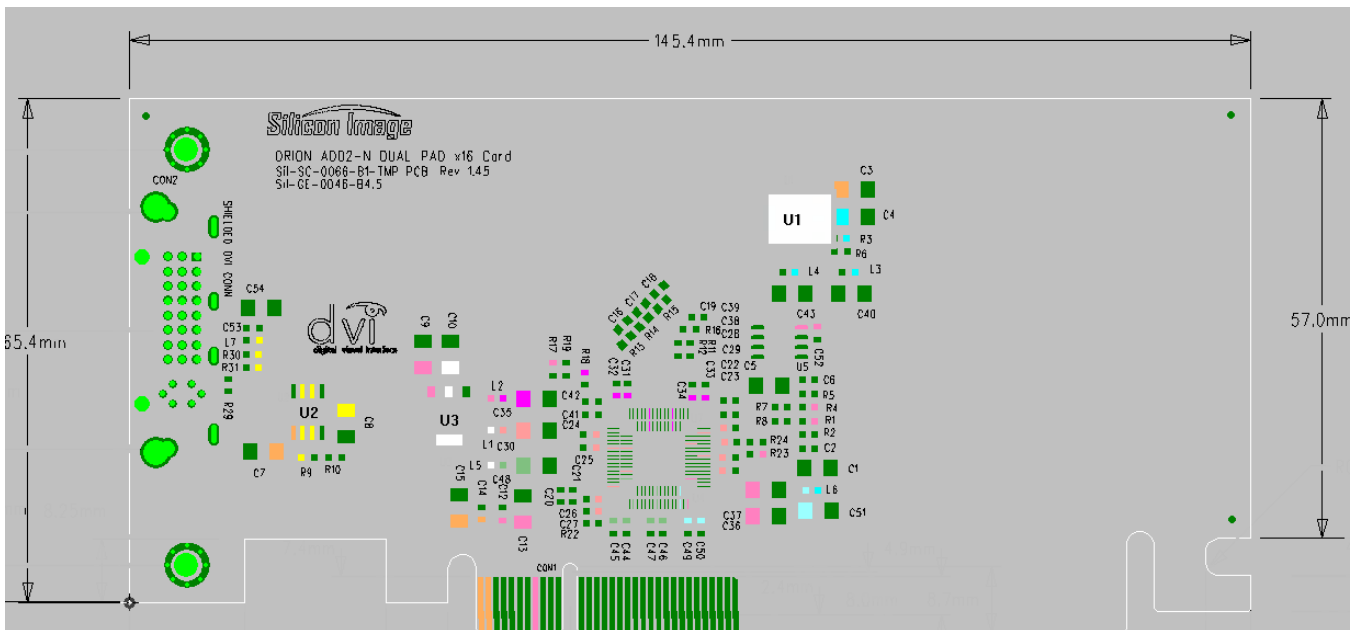

Figure 4. Physical Dimension and Device list

Table 2 describes the basic purpose of the devices shown in Figure 4. Both ADD2-N and ADD2-R have the same placement for the devices, with only minor changes to the reference designators.

Table 2. Device Description

ADD2-N Ref Designator	ADD2-R Ref Designator	Device	Purpose	Package Type
U1	U1	LM317EMP	12V to 3.3V regulation for PVCC	SOT 223
U2	U2	LM317L	12V to 5V for DDC I^{2}C and Hot Plug	SOIC 8
U3	U3	LM1117-1.8V	3.3V to 1.8V regulation for VCC and SVCC.	SOT 223
U4	U5	24LC02	2KB EEPROM to store configuration information.	SOIC 8
U5	U4	SiI 1364 Tx	DVI Transmitter (default)	64-pin TQFP
U7	U7	SiI 1362 Tx	DVI Transmitter (not used)	48-pin LQFP

Usage

Insert the card in the PCI-Express slot of the Grantsdale G system, attach a DVI flat panel display using a DVI cable, and boot the system. Use the correct ADD2 card (-N or -R) for the intended system. Using the wrong card will not cause any damage, but it will not be initialized or show a display. The system should have Grantsdale G drivers installed.

Enabling DVI Display and Changing Resolutions

All Grantsdale G video drivers provided by Intel have built in support to enable the ADD2 cards. No specialty drivers are required. It is important to note that Silicon Image does not release, generate, or provide drivers. All necessary drivers are available from Intel Corporation.

Download the latest Grantsdale G drivers from the Intel website or https:\\platformsw.intel.com. Install the driver using the setup.exe file. Once installed, reboot the system and follow the instructions below

The following section provides guidance in using this application to capture and generate a DVI compliance report.

a. Attach a DVI flat panel display to the ADD2 card. Ensure that the display is turned on.

b. On the Windows Desktop, right click and a dialog box will appear. Select "Graphics Options" and, if a digital flat panel is attached to the system, the "Output To" selection will be available. Select either the "Digital Display" option or the "Intel® Dual Display Clone" option to enable the digital flat panel.

Figure 5. Enabling Digital Display via Mouse

c. To see the dialog box shown in Figure 6, simultaneously press "SHIFT+CTRL+F12" and release. On the left column, icons list the available options for display. Select either Digital Display for single display only or Intel® Dual Display Clone for simultaneous Analog and Digital Display.
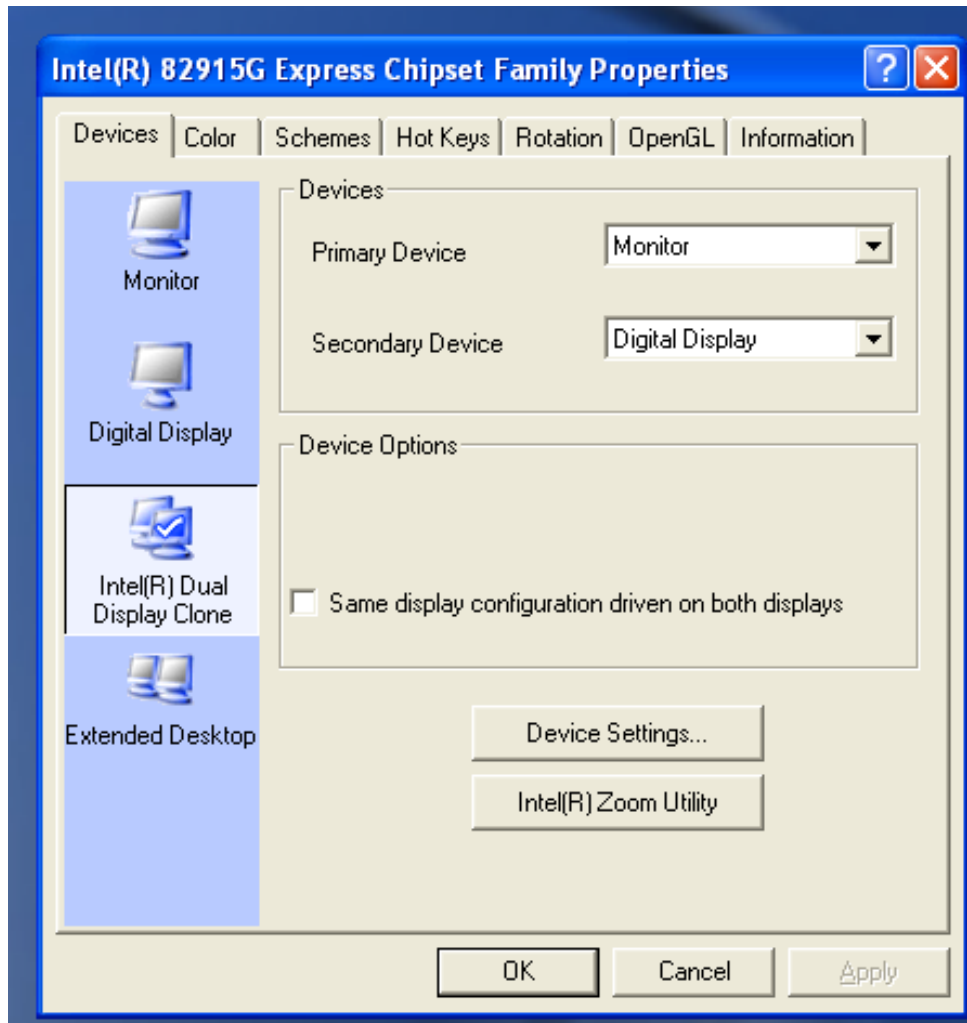

Figure 6. Enabling Digital Display via Keyboard

d. To change resolution, right click on the mouse and select Properties. Select the "Settings" tab as shown in Figure 7. The slider in the Screen Resolution box allows change of resolution. Slide the marker on the slider bar to the intended resolution and click OK.
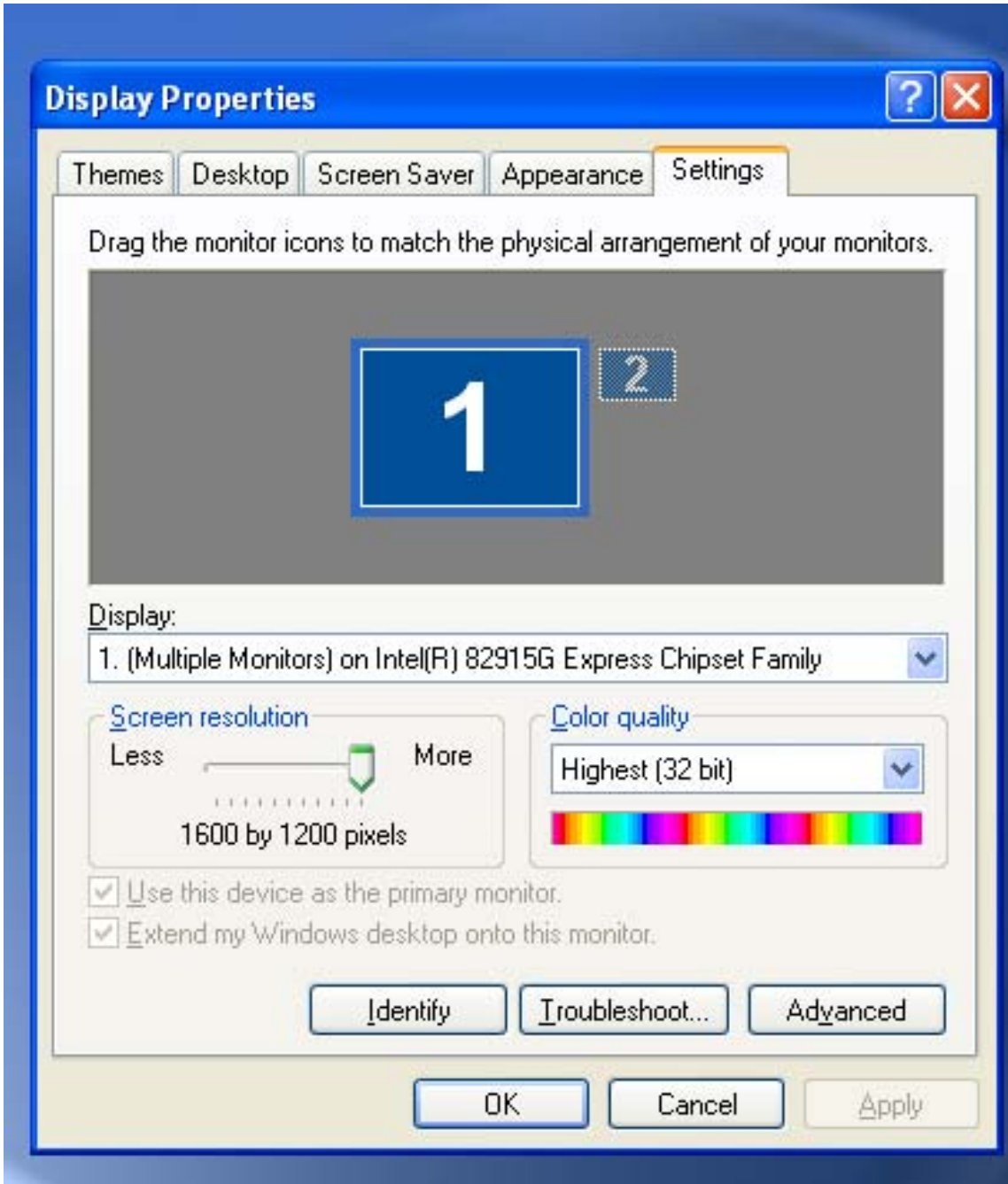

Figure 7. Changing Resolution

Layout Requirements

It is highly recommended that the provided layout and Gerber files be used for production of the ADD2 cards. The cards are certified for acceptable radiated emissions levels as long as they are built as directed. Changes to the silkscreen are allowed, but changes to layout, stack-up, or component selection will require the design to be re-certified.

Both Orion ADD2-N and Maia ADD2-R cards follow the same trace guidelines for high-speed signals. The high-speed traces consist of the SDVO input and the TMDS output of the SiI 1364 Tx. Figure 8 shows the appropriate dimensions used to achieve a 100-ohm differential impedance between the traces.
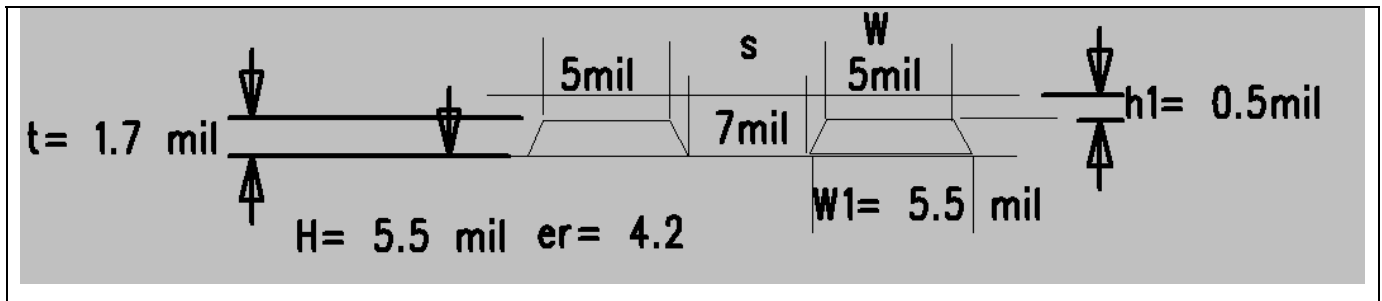

Figure 8. SDVO and TMDS Trace Guideline

As shown in Figure 8, the trace width should be kept at 5 to 5.5 mils at layer 1, and the gap at 7 mil between each pair. In addition, the stack-up between layer 1 and layer 2 should be kept at 5.5 mil. For detailed instructions on all board fabrication related questions, please refer to the appropriate Gerber file for the Orion ADD2-N card or the Maia ADD2-R card.

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