



## PA\_R4B1 Product Advisory

January 21, 1999

### **RAGE 128 VR/GL Rev A22 DESIGN UPDATES**

This product advisory describes a number of important updates which should be applied to all designs incorporating the A22 revision of the *RAGE 128 VR* and *RAGE 128 GL* graphics accelerators. The A22 is the second production revision of the RAGE 128 VR & GL, and is ramping for high volume production in a broad range of add-in card and motherboard designs. The design recommendations described below apply equally to the RAGE 128 VR in both the 272 and 329 BGA packages. The branding information at the bottom of this advisory provides the part numbers for the A22 revision components. The ATI reference schematics affected by this update include REF67 (for RAGE 128 VR in 272 BGA), REF73 (for RAGE 128 VR in 329 BGA) and REF(tbd) (for RAGE 128 GL in 328 BGA).

#### **Increase Core Power to 2.8v**

As previously indicated in the errata and branding advisory (ER\_R4D1 dated Jan 8/99), the A22 requires a 2.8v core voltage (as opposed to the 2.5v specified in the graphics controller spec and reference schematics). This change corrects a lower than desired I/O switching threshold level, and reduces the noise sensitivity in the receiver portion of the I/O logic. This eliminates the susceptibility to intermittent screen corruption or system hang failures. The supply pins which need to be changed to 2.8v include VDDC, AVDD, and PVDD. This means that the 2.5v regulator for VDDC and AVDD needs to be modified to 2.8v, as well as the separate regulator which supplies PVDD. ATI has validated that the 2.8v core voltage ensures reliable operation at all margin conditions. Furthermore, ATI's foundry has confirmed that the 2.8v is well within the operating margins of this technology.

#### **Heat Sink Recommended**

In depth thermal analysis of a number of graphics subsystem implementations has revealed peak case temperatures in the 100<sup>0</sup>C to 105<sup>0</sup>C range under certain high-stress 3D application loads (e.g., games such as Incoming, Turoc, and Forsaken, in particular) at room temperature. Some system specifications (e.g., AGP spec 2.0) describe worst case environmental conditions as high as 55<sup>0</sup>C ambient at 0 m/s airflow. In order to ensure sufficient margin with respect to the maximum allowed junction temperature of 125<sup>0</sup>C under worst case conditions, the addition of a heat sink is highly recommended. Low height heat sinks are excellent dissipators for both natural and forced convection applications for BGA packages, and have been demonstrated to significantly reduce case temperatures for the RAGE 128 (by 30<sup>0</sup>C, on average under high load conditions). The attachment of an omnidirectional pin fin heat sink from Wakefield Engineering (part number 658-35AB-T4) or equivalent with T3 (Chomerics Inc. T-410) pressure sensitive adhesive tape or equivalent is recommended.

## Maximum Memory/Engine Clock Frequencies

Timing and yield analysis of the A22 indicates that the maximum memory/engine clock frequencies (as set by the video BIOS) are 125/80 for the VR and 100/90 for the GL. These frequencies have been determined to deliver the best combination of performance and stability over the full range of temperature and voltage margins with the A22 design revision.

## Oscillator Preferred over Crystal

The use of an oscillator instead of a crystal has been demonstrated to be a more reliable source for the reference frequency (XTALIN) than a crystal. The use of a crystal increases the exposure to noise injection on the reference clock which feeds the PLLs. In A22, the input structure for the reference clock is powered by the core supply which can contain some noise during high draw engine activity. Noise superimposed on the reference clock can lead to excessive jitter on internal clocks and result in random or intermittent failures. In comparison, an oscillator with its own supply can provide a more reliable clock as a result of sharper edges and higher immunity to extraneous noise. Hence, all designs using the A22 must use an oscillator (or an equivalent clock source) for generating the reference frequency.

## Noise Filtering on Core Power Supply

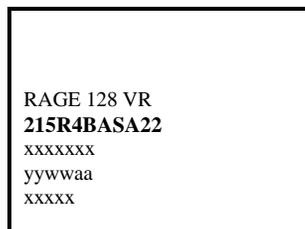
Due to the higher operating frequencies, increased logic complexity and lower operating voltage, RAGE 128 graphics subsystems are sensitive to power and ground noise. Particular attention needs to be paid to the power and ground plane layout and the number and position of the associated decoupling capacitors. ATI is developing a comprehensive layout design guideline which will be made available shortly. We strongly recommend that these guidelines be adhered to.

## RSET Changed to 374 Ohms

The value of the RSET resistor (connected to RSET input pin on the graphics controller) determines the 'white' voltage level at the RGB outputs. Statistical analysis of A22 silicon indicates that the appropriate RSET value to achieve the 0.7v white level is 374 ohms (as opposed to the value of 422 ohms currently shown in reference schematics REF67, REF72 and REF73). Designs should be updated to reflect the new RSET resistor value. Future revisions of the reference schematics will also include the updated RSET value.

## Branding Summary for Revision A22

### RAGE 128 VR (272 BGA package)



<--- ATI marketing name  
<--- ATI part number  
<--- lot number  
<--- date code and assembly and test location  
<--- country of origin

### RAGE 128 VR (329 BGA package)

RAGE 128 VR  
**215R4VASA22**  
xxxxxxx  
yywwaa  
xxxxx

<--- ATI marketing name  
<--- ATI part number  
<--- lot number  
<--- date code and assembly and test location  
<--- country of origin

**RAGE 128 GL (328 BGA package)**

RAGE 128 GL  
**215R4GASA22**  
xxxxxxx  
yywwaa  
xxxxx

<--- ATI marketing name  
<--- ATI part number  
<--- lot number  
<--- date code and assembly and test location  
<--- country of origin

***Document Revision History***

The document revisions are tracked by the last digit in the document number. As modifications are made, the trailing digit is incremented. The listing below identifies the document number, date of release, and the changes made.

**PA\_R4B1** January 21, 1999, Initial release of the reference design updates for RAGE 128 rev A22 controllers.

Please contact your field applications engineer or ATI technical representative if you have any questions about this advisory.