ECR #: 43
Title: I_{VDDQ}
Release Date: 4/1/98
Impact: Change
Spec Version: A.G.P. 1.0

Summary: ECR #23 states that the motherboard must provide 8A of VDDQ current. The ECR clarifies that requirement and states that the maximum average VDDQ current is 2A.

Background:

Because VDDQ is to be used only as an I/O voltage, graphics controllers will not need 8A of VDDQ. The 8A specification placed undue cost on the AGP motherboard. A more reasonable specification of 2A significantly reduces the cost of the VDDQ voltage regulator.

The 2A specification was derived using the following method:

$$\frac{Vcc_{\max}}{2} = Step\ Voltage$$

For 3.3V AGP-2X (highest IDDQ), Zo(min) = 30Ω

$$I_{\max\ pin} = \frac{1.75V}{30\Omega} = 58.3\ ma/pin$$

$$I_{\max_{total}} = I_{\max\ pin} * Number\ of\ pins\ =\ 58.3\ ma/pin * 62\ pins = 3.6A$$

$$\frac{Round\ Trip\ Flight\ Time}{Data\ Period} = \frac{2.5ns*2}{15ns} * 3.6A = 1.2A$$

Therefore, I_{max} = 3.6A however worst case average current is 1.2A. Therefore, 2A of VDDQ provided at the connector will provide sufficient average current for the I/O buffers. The AC current (3.6A) must be satisfied via local bulk capacitance.

Change Current Specification as shown:

AGP 1.0 Interface Specification; ECR#23

Existing:

Table 4-13: Add-in Card Power Supply Limits

Symbol	Parameter	Condition	Min	Max	Units	Notes
Vddq1.5	I/O Supply Voltage	I_{MAX} = 8.0 A	1.425	1.575	V	1
Vddq3.3	I/O Supply Voltage	I_{MAX} = 8.0 A	3.15	3.45	V	1
VCC3.3	3.3 V Power Supply	I_{MAX} = 6.0 A	3.15	3.45	V	
VCC5	5 V Power Supply	I_{MAX} = 2.0 A	4.75	5.25	V	
VCC12	12 V Power Supply	I_{MAX} = 1.0 A	11.4	12.6	V	

Note:

1. The Vddq current is due only to the AC switching transients of the A.G.P. I/O buffers. This level should not be seen in practice, but represents the current carrying capability of the connector. Actual currents will be less than 1.5 A.

Replace With:

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VCC12	12 V Power Supply	I_{MAX} = 1.0 A	11.4	12.6	V	

Note:

1. 2A is the maximum average VDDQ current that needs to be delivered through the connector. Sufficient bulk capacitance should be provided on the add-in card to provide for higher instantaneous current requirements. This allows each add-in card vendor to determine the correct bulk capacitance for their solution. The add-in card should consume no more than 2A at any time (from the motherboard). In addition, it is good design practice to limit the AC current through the AGP current to improve signal integrity. It is good practice to provide additional bulk capacitance on the motherboard near the AGP connector. VDDQ delivery recommendations can be found in the AGP Design Guide.