



3D Graphics Processing Unit

Features

Triangle Rasterization Engine
 SDRAM Controller
 VGA Output
 Dual Framebuffers
 Depth Buffer
 Transformation Engine

Clock Speeds

Core: 50 MHz
 SDRAM: 50MHz
 VGA Output: 33.3MHz

Video Timing

Horizontal Timing:		
Horizontal refresh	40.8 kHz	
Active	640 pixels	19.17µs
Front Porch	43 pixels	1.29 µs
Sync	46 pixels	1.38 µs
Back Porch	87 pixels	2.61 µs
Entire line	816 pixels	24.48 µs

Vertical Timing:		
Vertical refresh	76 Hz	
Active	480 lines	11.75 ms
Front Porch	9 lines	0.223 ms
Sync	3 lines	73.44 µs
Back Porch	30 lines	0.734 ms
Entire frame	522 lines	12.8 ms

Pinouts

SDRAM Module		
Pin Name	Direction	Number
Clock (CK)	output	2
Clock Enable (CKE)	output	2
Chip Select (S)	output	2
RAS, CAS, WE	output	3
Bank Address (BA)	output	2
Address (A)	output	13
Data (DQ)	input/output	64
Data I/O Mask (DQMB)	output	8
Serial Presence Detect (SDA)	input/output	1
Serial Presence Detect Clock (SCL)	output	1

Total: 98

VGA Module		
Pin Name	Direction	Number
Red	output	3
Green	output	3
Blue	output	2
Horizontal Sync	output	1
Vertical Sync	output	1

Total: 10

Transform Input		
Pin Name	Direction	Number
Rotate x	input (pushbuttons)	1
Rotate y	input (pushbuttons)	1
Rotate z	input (pushbuttons)	1

Total: 3

Grand total: 111

Clock Speed	50MHz
Burst Length	4
CAS Latency	2
Timings	JEDEC Standard ¹

SDRAM Controller

¹ JEDEC PC133 Design Spec 4-20-02R11b