

UNITED STATES PATENT AND TRADEMARK OFFICE

---

BEFORE THE PATENT TRIAL AND APPEAL BOARD

---

REALTEK SEMICONDUCTOR CORP.,  
Petitioner,

v.

ATI TECHNOLOGIES ULC  
Patent Owner.

---

Case No. IPR2023-00922  
U.S. Patent No. 8,760,454

---

**DECLARATION OF DR. WILLIAM MANGIONE-SMITH  
REGARDING U.S. PATENT NO. 8,760,454**

## TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION .....	1
II. SUMMARY OF CONCLUSIONS .....	2
A. Summary of Conclusions Regarding Reduction to Practice, Conception, and Diligence .....	2
B. Summary of Conclusions Regarding Validity .....	3
III. EXPERT QUALIFICATIONS.....	3
IV. HIGH LEVEL GRAPHICS PROCESSING OVERVIEW.....	7
A. Graphics Processors Use Vertex and Pixel Data to Create Display Images .....	7
B. Graphics Processors Use Instruction “Threads” To Transform Vertex and Pixel Data.....	10
C. Conventional Graphics Processors Executed Vertex And Pixel Threads Using Separate Vertex Shaders And Pixel Shaders .....	11
V. OVERVIEW OF THE '454 PATENT .....	14
A. The '454 Patent's Unified Shader .....	15
B. The '454 Patent's Unified Shader Determines Which Data to Process by Evaluating Storage Capacity and Additional Analyses As Seen In Claims 1, 3-10 .....	16
C. The Unified Shader Can Simultaneously Execute Vertex and Pixel Operations and Switch Quickly Between Operations at Various Degrees of Completion As In Claim 11 .....	18
D. The Invention of the '454 Patent Triggers Execution by Transmitting Data Rather Than Instructions As In Claim 2 .....	19
E. The '454 Patent's Challenged Claims .....	20
VI. RELEVANT LEGAL STANDARDS.....	20
A. Conception and Reduction to Practice .....	21
B. Claim Construction .....	22
C. Obviousness.....	23
VII. GENERAL DESIGN AND DEVELOPMENT PROCESS AT AMD .....	24
VIII. CONCEPTION.....	28
A. '454 Patent.....	30
1. Claim 1 .....	30

2.	Claim 2 .....	41
3.	Claim 3 .....	58
4.	Claim 4 .....	65
5.	Claim 5 .....	73
6.	Claim 6 .....	83
7.	Claim 7 .....	85
8.	Claim 8 .....	90
9.	Claim 9 .....	93
10.	Claim 10 .....	97
11.	Claim 11 .....	100
IX.	DILIGENCE IN REDUCING TO PRACTICE .....	107
X.	CONSTRUCTIVE REDUCTION TO PRACTICE .....	151
A.	'454 Patent .....	153
1.	Claim 1 .....	153
2.	Claim 2 .....	159
3.	Claim 3 .....	170
4.	Claim 4 .....	180
5.	Claim 5 .....	190
6.	Claim 6 .....	195
7.	Claim 7 .....	197
8.	Claim 8 .....	198
9.	Claim 9 .....	199
10.	Claim 10 .....	200
11.	Claim 11 .....	201
XI.	NO ABANDONMENT, SUPPRESSION, OR CONCEALMENT OF R400 .....	207
XII.	ASSERTED PRIOR ART .....	208
A.	Lindholm '685 .....	209
B.	Amanatides .....	211
C.	Selzer .....	212
XIII.	EVALUATION OF PETITIONER'S PROPOSED GROUNDS .....	214
A.	Ground 1: Lindholm '685 and Lindholm '913 Do Not Render the '454 Patent Obvious .....	214
1.	No Executing Operations Depending Upon an Amount Of Space Available In The Store (Claim 5), Much Less Performing Vertex Operations Or Pixel Operations Until Enough Storage Is Available For The Other Operation Type (Claims 1, 3, 4).....	214

2.	No Execution of Instructions “In Response to” Receiving Selected Data (Claim 2) .....	219
3.	No “Memory” Separate From the “Store” (Claim 6) .....	221
4.	No “Control Signal” (Claim 7) or “Arbiter” (Claim 10) .....	222
5.	No Processor Unit That Performs Vertex Manipulation Operations and Pixel Manipulation Operations At Various Degrees Of Completion Based On Switching Between Instructions In The Instruction Store (Claim 11).....	223
B.	Ground 2: Amanatides and Kohn Do Not Render the ’454 Patent Obvious .....	226
1.	No Executing Operations Depending Upon An Amount Of Space Available In The Store (Claim 5), Much Less Performing Vertex Operations Or Pixel Operations Until Enough Storage Is Available For The Other Operation Type (Claims 1, 3, 4).....	226
2.	No Processor Unit That Performs Vertex Manipulation Operations And Pixel Manipulation Operations At Various Degrees Of Completion Based On Switching Between Instructions In The Instruction Store (Claim 11).....	234
3.	No “Selected Data” (Claims 2, 5) .....	237
4.	Alleged “Selection Circuit” Is Not Within Alleged “Unified Shader” As Required (Claims 7, 10) .....	239
5.	No “Control Signal” (Claims 7, 10).....	242
6.	No “Selection Circuit” or “Arbiter,” “(Claim 10) .....	243
C.	Ground 3: Selzer and Fiske Do Not Render the ’454 Patent Obvious .....	245
1.	No Executing Operations Depending Upon An Amount Of Space Available In The Store (Claim 5), Much Less Performing Vertex Operations Or Pixel Operations Until Enough Storage Is Available For The Other Operation Type (Claims 1, 3, 4).....	246
2.	No Processor Unit That Performs Vertex Manipulation Operations And Pixel Manipulation Operations At Various Degrees Of Completion Based On Switching Between Instructions In The Instruction Store (Claim 11).....	251
3.	No Execution of Instructions “In Response to” Receiving Selected Data (Claim 2) .....	254
4.	Alleged “Sequencer,” “Instruction Store,” “Circuitry,” “Selection Circuit,” and “Arbiter” Are Not Within Alleged “Unified Shader” As Required (Claims 2, 5-7, 10, 11) .....	256
5.	Alleged “Sequencer” And “Instruction Store” Do Not Maintain Instructions (Claims 2, 5, and 11).....	258

6.	No “Arbiter” (Claim 10) or “Control Signal” (Claims 7, 10)	260
7.	No Motivation to Combine Selzer and Fiske and no Reasonable Expectation of Success in Doing So .....	261
XIV.	SECONDARY CONSIDERATIONS SUPPORT NON-OBVIOUSNESS OF THE '454 PATENT .....	265
A.	Initial Skepticism of ATI’s Unified Shader Technology .....	267
B.	Unexpected Results in Developing the Unified Shader Technology .....	272
C.	The Satisfaction of a Long-Felt Need by the Unified Shader of the Xenos GPU and Failed Attempts by Others .....	274
D.	Industry Praise of the Unified Shader in Xbox 360’s Xenos GPU .....	276
E.	Commercial Success of the Xbox 360 Containing ATI’s Unified Shader in the Xenos GPU .....	278
F.	Adoption by Others .....	280
XV.	CONCLUSION.....	281

# Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

## Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

## Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

## Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

## API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

## LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

## FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

## E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.