SUMMARY INFORMATION PROVIDED BY SELLER
AND PRESENTED BY OCEAN TOMO BID-ASK™ MARKET

# LOW POWER LOW LATENCY VIDEO CODEC – LOT 82

OCEAN TOMO®
BID-ASK™

# BRING TECHNOLOGY

Architected
Performance

# SUPER COMPUTING WITHIN A CHIP

BRING TECHNOLOGY

- Extreme application architecture
- Shattering paradigms
  - Ultra wide bus
  - Massive parallelism
  - Distributed memory
- Current design
  - Video Encoder – Code name: Eagle
- Although our patented architecture currently encodes video using the H.264 standard, it is extensible to more advanced and computationally demanding standards

# SHATTERING PARADIGMS

BRING TECHNOLOGY

- EAGLE'S SUPER LARGE WORD SIZE
  - Eagle - Main object bus is 3,072 bits wide
  - Commercial microprocessor - 32 or 64 bits wide
    - ✓Eagle can move 48x more data in its main bus, plus additional parallelism
- MFLOPS: EAGLE vs. ARM - the bottom line
  - Eagle - 1,253 MFLOPS/MHz
  - ARM 10 - 2 MFLOPS/MHz
    - ✓Eagle more than 600 times ARM performance per MHz

# MFLOPS: EAGLE vs. ARM

BRING TECHNOLOGY

## EAGLE[1]

- 638,000 variable-length integer computations[2] per macroblock
- 2.29 x $10^9$ operations[2] per 1280x720 pixel frame (3,600 macroblocks)
- 68.9 x $10^9$ variable-length integer operations for 720p at 30 FPS - 68,900 MFLOPS with 55MHz clock

## ARM 10

- 2 MFLOPS/MHz
- 110 MFLOPS - running at 55MHz (Eagle's clock) - insufficient computation.
- Must run at 34 GHz to perform 68,900 MFLOPS to match Eagle. Enormous challenge.

[1]H.264 video compression requires only integer and no floating point calculations.
[2]An Eagle operation is either add/subtract/multiply/compare/select

# NOT ALL VIDEO ENCODERS ARE ALIKE

BRING TECHNOLOGY

- Eagle's architecture yields the lowest possible Power Dissipation
  - Measured power in Rev. A silicon < 25 mW§
  - Measured power in Rev. B silicon < 70 mW¶
- Eagle has the shortest possible Latency
  - 698 μs for 720p at 30fps
- Architectural pillars behind Eagle's low power
  - Massively parallel processing
  - Distributed memory
- An effective embodiment of true VLSI
- Eagle is truly a video encoder/compression supercomputer on a chip

§At 15 FPS – no slave mode output FIFO DRAM
¶At 30 FPS – slave mode output FIFO DRAM turned on

# APPLICATIONS TO BE ENHANCED OR ENABLED BY EAGLE'S LOW POWER AND LOW LATENCY

BRING TECHNOLOGY

- Video Camera (miniature)
- Autonomous Vehicles
- Unmanned Aerial Vehicles
- Robotics
- Wearable Electronics
- In Body Imaging
- Remote Security

# EAGLE ARCHITECTURE

BRING TECHNOLOGY

- Silicon implementation without software or stored program microprocessor
- Algorithm mapped to silicon for massively parallel computation
- Distributed hierarchical memory avoids performance bottlenecks
- Encoding flexibility provided by internal registers programmable via SPI

# PATENT PORTFOLIO

BRING TECHNOLOGY

## Granted / Issued

- US – Patent - 8,503,534 - Multi-bus architecture for a video codec; August 6, 2013
- US – Patent - 8,566,515 - Memory Subsystem; October 22, 2013
- US – Patent - 8,660,193 - Parallel, Pipelined, Integrated-Circuit Implementation of a Computational Engine; February 25, 2014
- China – Patent - ZL 2009 8 0158006.9 - Memory Subsystem; November 5, 2014
- China – Patent - ZL 2011 1 0100518.9 - Multi-bus architecture for a video codec; January 6, 2016
- China – Patent - ZL 2009 8 0158022.8 - Parallel, Pipelined, Integrated-Circuit Implementation of a Computational Engine; April 20, 2016

## Pending Applications

- Germany – Application - 11 2009 004 320.8 - Memory Subsystem; December 21, 2009
- Germany – Application - 102011002098.5 - Multi-Bus Architecture for a Video Codec; April 15, 2011
- Germany – Application - 11 2009 004 344.5 - Parallel, Pipelined, Integrated-Circuit Implementation of a Computational Engine; December 21, 2009

# OPTIMUM SILICON UTILIZATION

BRING TECHNOLOGY

## ACHIEVEMENTS

- Maps the video compression algorithm directly onto the silicon
- Uses custom processors for each computational module
- Computations are tailored with the highest logic/transistor circuit efficiency
- Computation latency reduced by more than 90% over traditional computing architectures
- Silicon area is minimized
- Computations are performed with minimum power
- Allows lower internal clock frequencies making it easier to meet timing requirements

# OPTIMUM SILICON UTILIZATION

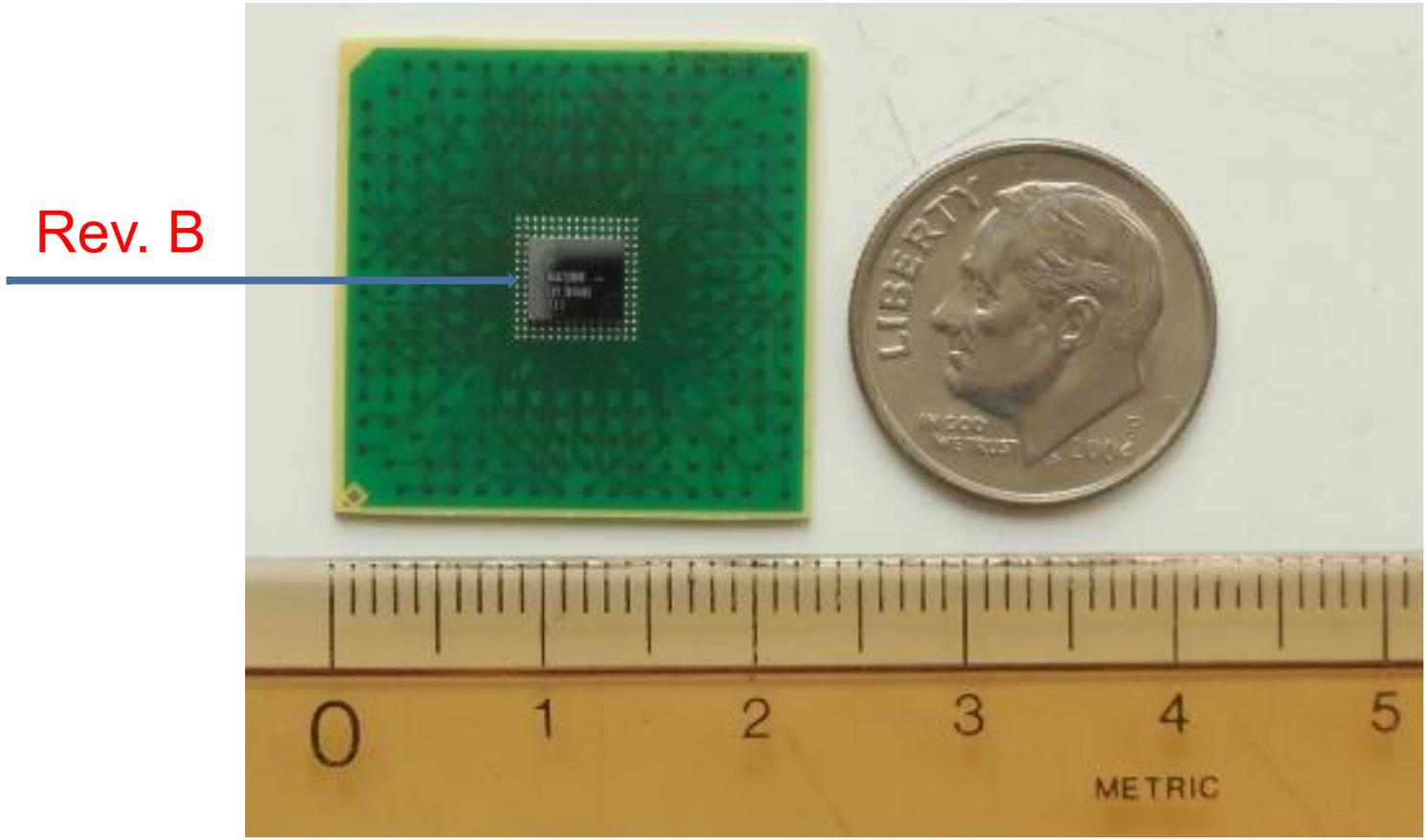
BRING TECHNOLOGY

## DEVIATIONS FROM TRADITIONAL PRACTICES

- No general purpose processors (multicore) on chip
- No silicon or power wasted in computational overhead such as instruction pre-fetch, instruction decoding, execution control in a general purpose data path
- Eliminates need to store software instructions
- Avoids the problems of performing arithmetic with circuitry designed for different word length

BRING TECHNOLOGY

# EAGLE IS A TINY CHIP



BRING

TECHNOLOGY

# CONTACT

**Outside China Contact:**

**Layna Guo**
+1 312 327 8179
lguo@oceantomo.com

**David Ghorbanpoor**
+1 414 350 4864
David@OTI.com

**Established in 2003, Ocean Tomo, LLC provides industry leading financial products and services related to intellectual property including financial expert testimony, valuation, strategy consulting, investment services, risk management products, innovation management services and transaction brokerage. Ocean Tomo assists clients – corporations, law firms, governments and institutional investors – in realizing Intellectual Capital Equity® value broadly defined.**

Our Opinion, Management, and Advisory Services are built upon more than two decades of experience valuing intellectual property in the most rigorous of venues – State, Federal and international courts. Our financial, market and technical experts provide a unique understanding of the contributory value of proprietary innovation. This is the cornerstone of our business. This insight permeates every practice.

Headquartered in Chicago, Ocean Tomo has offices in Greenwich, Houston, San Francisco and Shanghai. Ocean Tomo is creator of the live public open cry auction marketplace for intellectual property.

**Collectively, Ocean Tomo professionals have:**

- Executed over 1000 engagements involving IP worth in excess of $10 billion;
- Successfully closed transactions where disruptive technology played a key role, with cumulative value in excess of $750 million;
- Conducted over 300 valuation engagements and 500 financial damages expert testimony engagements.

**Ocean Tomo assists clients – corporations, law firms, governments and institutional investors – in realizing Intellectual Capital Equity® value broadly defined.**

OCEAN TOMO®

BID-ASK™

**OCEANTOMOBID-ASK.COM**