Embedded Intel® Atom™ Processor-based Platforms Introduction

Intel® Atom™ Processor E6xx & E6x5C Series Hands-On Training Event

Q1 2011
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WHAT DO YOU WANT TO KNOW?
What’s an Intel® Atom™ Processor?

FLEXIBLE
Flexible like origami

SMALL
As small as an Intel® Atom™ processor? No, but close! Die size of ~25 mm²

INTEGRATED
Highly & efficiently integrated allowing for small form factors

VALUE
All the goodness of Intel® architecture at a low price tag

LEADING
Built on as small as 32nm Transistor Technology

TECHNOLOGY

LOW POWER
As low as 1W of average power consumption

BEST
Has best performance per watt!

PERFORMANCE/WATT

FANLESS
Runs fanless!

SCALABLE
Allows for flexibility to design scalable platform

INTEL® ATOM™ PROCESSOR E6XX SERIES HANDS-ON TRAINING SERIES EVENT 2011
What does it do?

Powers millions of connected devices!!
Some used to exist only in our imagination..

IT’S UP TO YOU!!
A Continuum of Computing

Intel® Xeon® Processor and Chipset
- 6 Cores
- @ 2.8Ghz
- 288GB Max Memory
- 80 Watts Max TDP
- 1366 pins

Intel® Core™ i5 Processor
- 2 cores
- @ 2.4GHz
- 8GB Max Memory
- 35 Watts Max TDP
- 988 Pins
- 1366 pins

Intel® Atom™ Processor
- 1 core
- @ 1.6GHz
- 2GB Max Memory
- 5.5W Max TDP
- 559 pins

An ever increasing range of solutions
Why is Intel® Atom™ processor good for embedded?

7 YEAR Long Life

MAKE OR BUY?

TOOL LOANER PROGRAM
edc.intel.com
New Platform Partitioning – Intel® Atom™ Processor E6xx Series

2008 Architecture

- Processor Core
- FSB
- Memory Controller
- Graphics & Video
- Display Controller
- Audio
- LPC

INTEGRATION
IMPROVED
FEATURE SET
OPEN
STANDARDS
FLEXIBILITY

2010 Architecture

- Processor Core
- FSB
- Memory Controller
- Graphics & Video
- Display Controller
- Audio
- LPC

Intel® Atom™ Processor E6xx Series

PCIe* = PCI Express* Technology

FLEXIBLE

IOH, FPGA, or Discrete Component

*Other names and brands may be claimed as the property of others.
Intel® Atom™ Processor E6xx Series-based Platform
Unleashing Innovation for Optimization

**Intel® Atom™ Processor E6xx Series**

- Processor Core
- Memory Controller
- Graphics & Video
- Display Controller
- SPI/LPC
- Audio

**PCI Express**

- 4 x1

**Target Segment**

- **Target Segment**
  - Segment requiring standard, minimal I/O's e.g. IP Camera

- **Target Segment**
  - Customer with existing proprietary ASICs e.g. Print Imaging, PLC

- **Target Segment**
  - Segments with diverse I/O requirements e.g. Industrial Automation

- **Target Segment**
  - High volume segments with uniform I/O e.g. IVI, Media Phone, Premise Service Gateway

*Other names and brands may be claimed as the property of others.*
Key Features: Intel® Atom™ Processor E6xx Series

- Power Optimization
- Efficient Footprint
- Bill of Materials & TCO
- Meet Demand for more Capabilities
- Meet Demand for Faster Delivery
- High Reliability and Long Life
Help Provide More Tightly Integrated Solutions
Intel® Atom™ Processor E6x5C Series

Consolidate more functions into one chip

CPU
IOH
FPGA
DSP
ASIC

Military
Machine Vision
Portable Medical Equipment
Robotics
Sensors
Security
Transportation
Aerospace
Industrial Automation

Applications:
- Transportation
- Industrial Automation
- Military
- Aerospace
- Portable Medical Equipment
- Robotics
- Sensors
- Security
Introducing the Intel® Atom™ Processor E6x5C Series

A Configurable Intel® Processor

Flexibility

• **Configurable** with application-specific or proprietary I/O and algorithms
• **Single Design** supports multiple product derivatives
• **Multiple functions** combine into a single package for smaller form factor needs

Simplicity

• **Single Package** reduces footprint and helps lower costs
• **Ease of Design** with few chips and simplified inventory
• **Power of One** with one supplier, one package, and one support call

*Other names and brands may be claimed as the property of others.*
Intel® Atom™ Processor E6xx & E6x5C Series

Exceptional Flexibility

Intel® Atom™ Processor E6xx Series
✓ Integrated PCIe*
✓ Integrated Memory Controller
✓ Integrated Graphics Engine
✓ Integrated Hi-Def Video and Intel® High Definition Audio (Intel® HD Audio)
✓ Support of embedded Intel® architecture ecosystem

User programmable Altera* FPGA
✓ 6 High-speed transceivers
  > 350 I/O pins
✓ Dedicated DSP blocks
✓ Greater than sixty thousand logic elements.
✓ Programmable with standard Altera Quartus* II Subscription Edition tools

† PCIe* Soft IP licensed from 3rd party vendors

*Other names and brands may be claimed as the property of others.
Platform Software Enabling

Software

- Tools
- Device Drivers
- Operating Systems
- BIOS/Firmware

Intel® Atom™ Processor E6xx/T Series + Intel® Platform Controller Hub EG20T

GENERAL EMBEDDED

- GNU*
- Intel® C++ Compiler
- Intel® Debugger

UNIQUELY EMBEDDED

- QNX* Momentics*
- WR* Workbench*
- MacGraigor*/GHS*
- LauterBach*/Arium*

Intel® Embedded Media and Graphics Driver (Intel® EMGD)
3rd Party IOH Drivers

Windows* XP, Fedora*

AMI*, Insyde*, Phoenix Tech*, Byosoft*

WES2009*, WinCE 6.0, VxWorks*, Neutrino*, Meego*, WR Linux*

Intel® Boot Loader Development Kit (Intel® BLDK)

Ensure completeness of software platform ingredients for ECG’s product lines

*Other names and brands may be claimed as the property of others.
Intel® Atom™ Processors Roadmap for Embedded

- Intel® Atom™ Processor 400 & 500 Series
- Intel® Atom™ Processor E6xx Series
- Intel® Atom™ Processor E6xx Series + FPGA
- Oaktrail Lincroft
- Next Gen Performance
- Next Gen I/O Flexible
- Next Gen Power Optimized

- ECC Memory
- Dual Core
- Shipping
- POR
- Planning

Industrial Temp Available on some skus (-40 to +85 C)
WHAT DO YOU VALUE?
Robust Performance with Scalability

Dual-core Intel® Atom™ processor DS10 and single-core Intel® Atom™ processors N450 and D410 include integrated graphics and memory controllers.

EMBEDDED DESIGN CENTER - edc.intel.com

EMBEDDED SOLUTIONS ADVISOR

APPLICATION REFERENCE DESIGNS

CHOOSING & DESIGNING
What’s Does the Future Hold

PERFORMANCE OPTIMIZED
CPU & Graphics Performance to Cost Leadership

POWER OPTIMIZED
Fanless Performance to Watt Leadership

I/O FLEXIBLE
Flexible Application Specific Needs
Intel® Atom™ Processor Offerings

**PERFORMANCE OPTIMIZED**
CPU & Graphics Performance to Cost Leadership

**POWER OPTIMIZED**
Fanless Performance to Watt Leadership

**I/O FLEXIBLE**
Flexible for Specific Design Needs
...AND WHAT EVER YOU CAN DREAM UP
Sponsors of Tomorrow.
## Intel® Atom™ Processor E6xx Series SKUs

<table>
<thead>
<tr>
<th></th>
<th>Core Freq. (GHz)</th>
<th>Gfx Freq. (MHz)</th>
<th>Video Decode</th>
<th>Est. TDP (W) - kit</th>
<th>Ext. Temp</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>E680</strong></td>
<td>1.6</td>
<td>400</td>
<td>Yes</td>
<td>4.5</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>1.3</td>
<td>400</td>
<td>Yes</td>
<td>3.6</td>
<td>✓</td>
</tr>
<tr>
<td><strong>E640</strong></td>
<td>1.0</td>
<td>320</td>
<td>Yes</td>
<td>3.6</td>
<td>✓</td>
</tr>
<tr>
<td><strong>E620</strong></td>
<td>0.6</td>
<td>320</td>
<td>Yes</td>
<td>3.3</td>
<td>✓</td>
</tr>
</tbody>
</table>

Extended temp SKUs available
Denoted by the suffix ‘T’ e.g. E620T
## Intel® Atom™ Processor E6x5C Series SKUs

<table>
<thead>
<tr>
<th>Core Freq. (GHz)</th>
<th>Gfx Freq. (MHz)</th>
<th>Video Decode</th>
<th>Est. TDP (W) - kit</th>
<th>Ext. Temp</th>
</tr>
</thead>
<tbody>
<tr>
<td>E665C</td>
<td>1.3</td>
<td>400</td>
<td>Yes</td>
<td>3.6</td>
</tr>
<tr>
<td>E645C</td>
<td>1.0</td>
<td>320</td>
<td>Yes</td>
<td>3.6</td>
</tr>
<tr>
<td>E625C</td>
<td>0.6</td>
<td>320</td>
<td>Yes</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Extended temp SKUs available
Denoted by the suffix ‘T’ e.g. E625CT
Value Props Around Every Corner
If you only remember one thing per platform...

- **Intel® Atom™ Processor 400 & 500 Series**
  - Scales Fanless to Dual Core w/ Intel® Embedded Flex Design
  - Integrated Graphics and Memory Controller
  - DDR3

- **Intel® Atom™ Processor E6xx Series**
  - Flexibility using Open PCIe*
  - Video encode
  - Extended Temp

- **Intel Atom Processor E6xx Series + FPGA**
  - Configurable FPGA
  - Single Package Solution
  - BOM Consolidation

- **Oaktrail (Lincroft)**
  - Lowest kit TDP on ECG roadmap (<3.75W)
  - Battery Gadget Platform
  - Full HD Playback

*Other names and brands may be claimed as the property of others.
Intel® Atom™ Processor E6xx Series-based Platform for General Embedded Purposes

Additional Third-party IOHs for specific segment needs:
- **OKI Semiconductor***
  - ML7213 primarily for IVI
  - ML7223 for telecom terminals, e.g. media phones
- **STMicroelectronics***
  - ConneXt STA2X11 for IVI
- **Reaktek***
  - RTL8954C for CSGs & medical

Third-party PMIC / CLKGEN helps to simplify designs:
- **Dialog Semiconductor***
  - DA6011 (1 chip)
- **ROHM Co., Ltd**
  - BD9590MWV & BU7335MWV (2 chips)

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## Multi-Chip-Package Details

<table>
<thead>
<tr>
<th>Multi-Chip Package (MCP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ 37.5x37.5mm, 0.8mm ball pitch</td>
</tr>
<tr>
<td>✓ Commercial and Industrial Temp SKUs (-40C to 85C) available</td>
</tr>
<tr>
<td>✓ I/O Options:</td>
</tr>
<tr>
<td>SMBus; SPI; LPC</td>
</tr>
<tr>
<td>GPIO (14+)</td>
</tr>
<tr>
<td>PCIe* (2+)</td>
</tr>
</tbody>
</table>

- High speed Transceivers (6 total, up to 3.125 Gbps)
- Digital Signal Processing
  - Up to 312 multipliers (39 DSP block)

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### Intel® Atom™ Processor E6x5C Series
**Available January 2011**

<table>
<thead>
<tr>
<th>Processor</th>
<th>Core Freq</th>
<th>Graphics Speed</th>
<th>TDP**</th>
<th>Temperature Range</th>
<th>Pricing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel® Atom™ Processor E665C</td>
<td>1.3GHz</td>
<td>400MHz</td>
<td>3.6W</td>
<td>Commercial; 0° to 70° C</td>
<td>Contact Your Intel Sales Rep</td>
</tr>
<tr>
<td>Intel® Atom™ Processor E665CT</td>
<td>1.3GHz</td>
<td>400MHz</td>
<td>3.6W</td>
<td>Industrial; -40° to 85° C</td>
<td></td>
</tr>
<tr>
<td>Intel® Atom™ Processor E645C</td>
<td>1.0GHz</td>
<td>320MHz</td>
<td>3.6W</td>
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**Intel® Atom™ Processor E6x5C Series**
**Available Later in Q1 2011**

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<td>Intel® Atom™ Processor E625C</td>
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</tr>
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**TDP is for the CPU only, depending on FPGA programming, actual TDP will be higher**