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intel® JOULE™
DESIGN FASTER. PROTOTYPE EASIER. INVENT MORE.
Product Overview
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USAGE GUIDELINES

Purpose

- To impart an understanding of the value proposition, capabilities, and uses of the Intel® Joule™ module, for engagements with customers and distributors

Target Audience:

- Internal: Field Sales (FAEs/FSEs, RAMs, MDMs, etc), GMC, Geo Marketing, CMM, SSG, CCG
- External (under NDA): OEMs, ODMs, System Integrators, Distributors, Retailers, Developers, and Intel Marketing Agencies
- Not approved for audiences beyond those listed above. For other external customers, please contact Milton Walker
- No leave behind

Note: For performance data: competion.intel.com:

Document Valid Date: August 11, 2016

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NOT INTENDED FOR END-USER MESSAGING.

ALL INFORMATION IN THIS DOCUMENT IS EMBARGOED UNTIL AUGUST 16, 2016.

Note: Joule is the brand name for the product formerly known by its code name, Grosse Tête. The expansion board for Joule was formerly known by its codename, Tuchuck. Grosse Tête and Tuchuck are Intel's internal code names and not commercial product names and should no longer be used.

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No computer system can be absolutely secure.

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more complete information visit http://www.intel.com/performance.

Cost reduction scenarios described are intended as examples of how a given Intel- based product, in the specified circumstances and configurations, may affect future costs and provide cost savings. Circumstances will vary. Intel does not guarantee any costs or cost reduction.
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Note: Grosse Tete, Broxton, Snowfield Peak, Radon Plus, and Tuchuck are Intel's internal code names and not commercial product names.
*Other names and brands may be claimed as the property of others.

CONTENTS

INTEL'S MAKER AND INNOVATOR PRODUCTS OVERVIEW

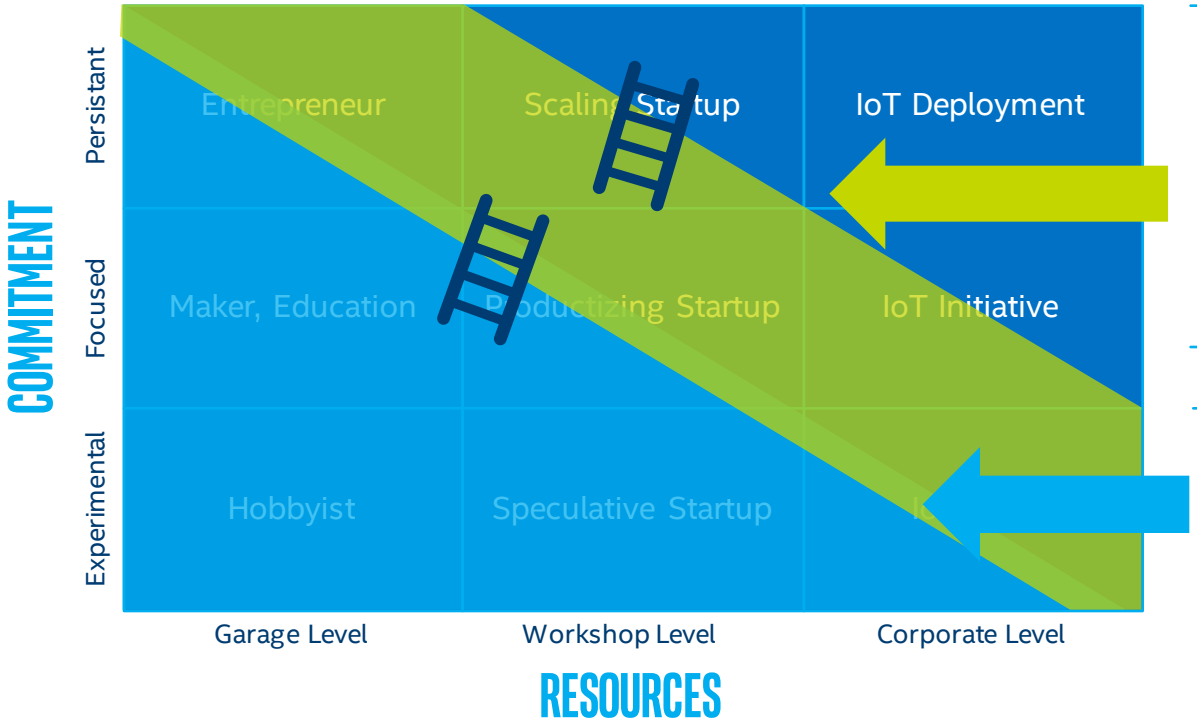
FEEDING THE LONG TAIL OF IOT INNOVATION

50 Billion connected devices by 2020[1]

...means **millions of developers** and hundreds of thousands of potential customers

1 Source: Gartner, IOT Drives Innovation in Semiconductor Industry, 07.28.15

MIG PRODUCTS FOR ENTREPRENEURS & INVENTORS



ENABLE FAST PROTOTYPE-TO-PRODUCTION, MINIMIZE CUSTOMER R&D COST & COMPLEXITY

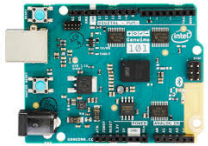
Highly integrated compute modules, vast software ecosystem for simple configuration & deployment, & smooth path to customized solution

DELIVER EASY, CAPABLE PRODUCTS FOR LEARNING & PROTOTYPING

Learning / Prototyping Boards, Easy Dev Tools, & Open Ecosystem

MAKER AND INNOVATOR PRODUCT LINE-UP

LEARNING / PROTOTYPING BOARDS



Arduino/Genuino 101 board

Entry-level

K12 education
Makers

Intel® Galileo Gen 2 board

Entry- to mid-level

Education
Makers

COMPUTE MODULES FOR FAST PROTOTYPE-TO-PRODUCTION

Intel® Edison compute module

Advanced compute module

Entrepreneurs
IoT developers
Expert makers

Intel® Curie™ compute module

Advanced board-down module

Entrepreneurs
IoT developers
Expert makers

NEW

Intel® Joule™ compute module

Advanced high-performance compute module

Entrepreneurs
IoT & embedded developers

INTEL® JOULE™ SYSTEM-ON-MODULE

Big compute in a tiny package for intelligent devices everywhere

High-end computing and large memory in a small form factor

capable of delivering human-like senses to a new generation of robots, drones, and IoT devices

- Scene Perception (Real-time Dense 3D Modelling) and Optimized SLAM
- Person Tracking and Interaction
- Object Recognition

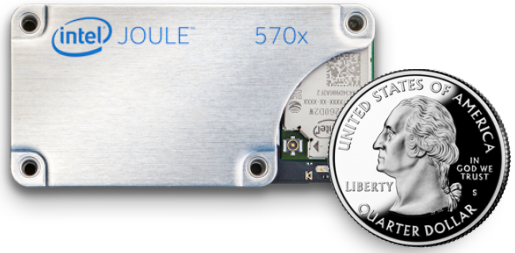
Seamless transition from prototype to scale

Prototype and get to market rapidly with the Intel® Joule™ module. Scale to high-volume via seamless transition to Intel® Atom™ (Broxton^) and full software compatibility and Intel engineering support

Vast hardware and software ecosystem

enabling developers to choose from multiple operating systems and take advantage of off-the-shelf libraries and peripherals for immediate productivity

intel JOULE™



Intel® Joule™ is Intel's newest and highest-compute module. It is a complete computer system integrated into a compact module, pre-certified in more than 80 countries, enabling IoT and embedded developers and entrepreneurs to take their ideas from concept to prototype to production in less time and for lower development and certification cost.

The Intel® Joule™ module features high-end compute and graphics and large memory in a tiny, a low-power package, making it an ideal platform for innovative IoT edge compute applications and products requiring advanced computer vision.

The Intel® Joule platform is supported by a vast software and hardware ecosystem, enabling developers to choose from multiple operating systems and take advantage of off-the-shelf libraries and peripherals to further accelerate development.

1.5 GHz or 1.7 GHz
Quad-Core Intel® Atom™ CPU

3 or 4 GB MEMORY	**8 or 16 GB** STORAGE
802.11ac WIRELESS	**USB3** **PCIe*** **MIPI*** **HDMI*** **Bluetooth*** 4.1
SUPPORTS **4K VIDEO** CAPTURE & DISPLAY	24 mm x 48 mm
Intel® HD Graphics	Yocto*-built Linux*

BUILD FASTER. PROTOTYPE EASIER.
GET TO MARKET SOONER.

TWO MODELS
INTEL® JOULE™ 550X
INTEL® JOULE™ 570X

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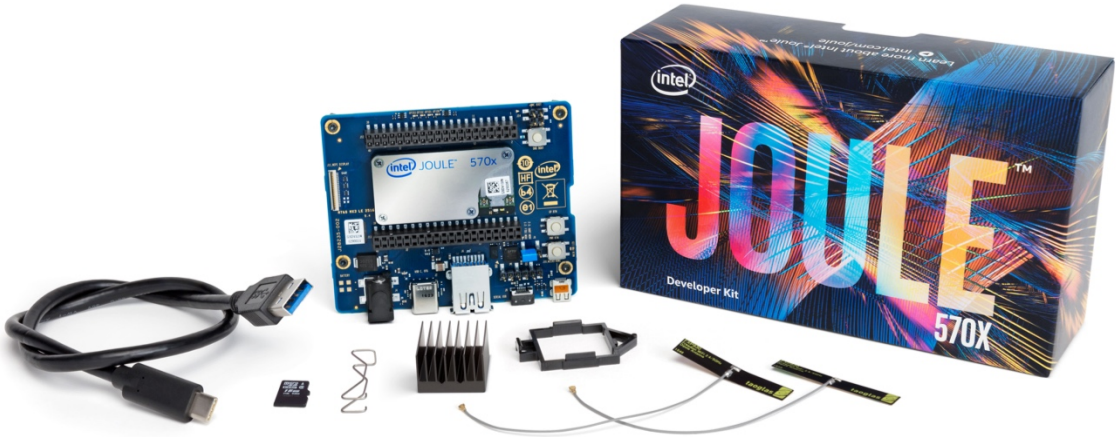
intel JOULE™

Developer Kit



The Intel® Joule™ developers kit provides the tools a developer needs to get started developing on the Intel® Joule™ platform

- Joule™ compute module (570x or 550x)
- Expansion board for Intel
- Two Wi-Fi antennas
- USB cable (C-to-C)
- Heatsink and fastening hardware
- SD card with pre-loaded software

Intel offers two developer kits, one for each model of module

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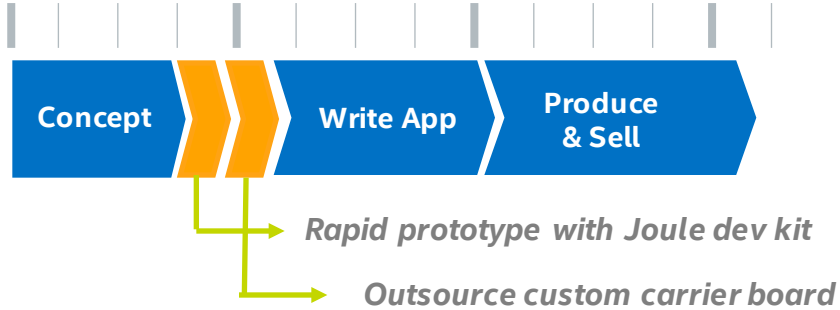
FASTER TIME-TO-MARKET, LOWER COST

Traditional Product Design:
Big dollars and long time to market…

With Joule, developers start with a complete, integrated system, reducing costs and time-consuming activities



- Fast concept-to-revenue
- Low development expense
- Easy migration to custom Intel® Atom™ design
  - *Hardware Design Guide*
  - *Intel FAE Support*
  - *OS & App Compatibility*

BENEFITS OF SYSTEM-ON-MODULE

Rapid Prototyping

The SoM is a highly integrated system, containing all major components, enabling a developer to get right into coding and prototyping.

Easy Transition to Production

Integrated module is product-ready. It plugs into custom carrier board and is rated 0-70 temperature range.

Product Longevity

Most accelerated-EOL components are on the module, which can be upgraded down the line for faster processor, more memory, etc.

Reduced Development and Certification Costs

Custom SOC-based designs require significant engineering investment; Low to mid volumes often cannot justify

Single-board-computer (like Raspberry Pi*) and device evaluation boards (like Galileo, D2000, Beaglebone Black*) require significant engineering work to become end-product

INTEL® JOULE™ MODULE VALUE PROP

Big compute in a tiny package for intelligent devices everywhere

For inventors and IoT developers who want to build out an embedded system or prototype and take to market a commercial product, Intel® Joule™ is a system-on-module that offers big compute in a tiny package, a vast ecosystem of hardware and software for rapid development, and lower development and certification expense.

High-end computing and large memory in a small form factor

capable of delivering human-like senses to a new generation of robots, drones, and IoT devices and systems

Up to 1.7GHz quad-core processor, and up to 2.4 GHz boost

Intel® HD Graphics with up to 4k video capture and display

Up to 4GB LPDDR4 RAM and 16GB Flash memory

Multiple high-speed hardware interfaces, including USB3, PCIe, HDMI, DSI, CSI*

Seamless transition from prototype to scale

Prototype and get to market rapidly with the Intel® Joule™ module. Scale to high-volume via seamless transition to Intel® Atom™ (Broxton*) and full software compatibility and Intel engineering support

Tiny, integrated, pre-certified module that significantly reduces development costs and shortens prototype-to-production time

Modular design optimizes development costs by reducing non-recurring engineering expenses

Certified for distribution in >80 countries, saving significant time and certification expense

Vast hardware and software ecosystem

which means you can choose from multiple operating systems and take advantage of off-the-shelf libraries and peripherals for immediate productivity

Includes complete suite of software and tools required to program the unit

Supports Reference Linux OS for IoT, Ubuntu (Q4), Snappy (Q4), Windows (Q4), and Android (1H'17)*

Fully supported up-streamed Linux kernel for quicker access to features, bug fixes, and drivers

Comes preloaded with a variety of commonly used Linux packages for immediate productivity

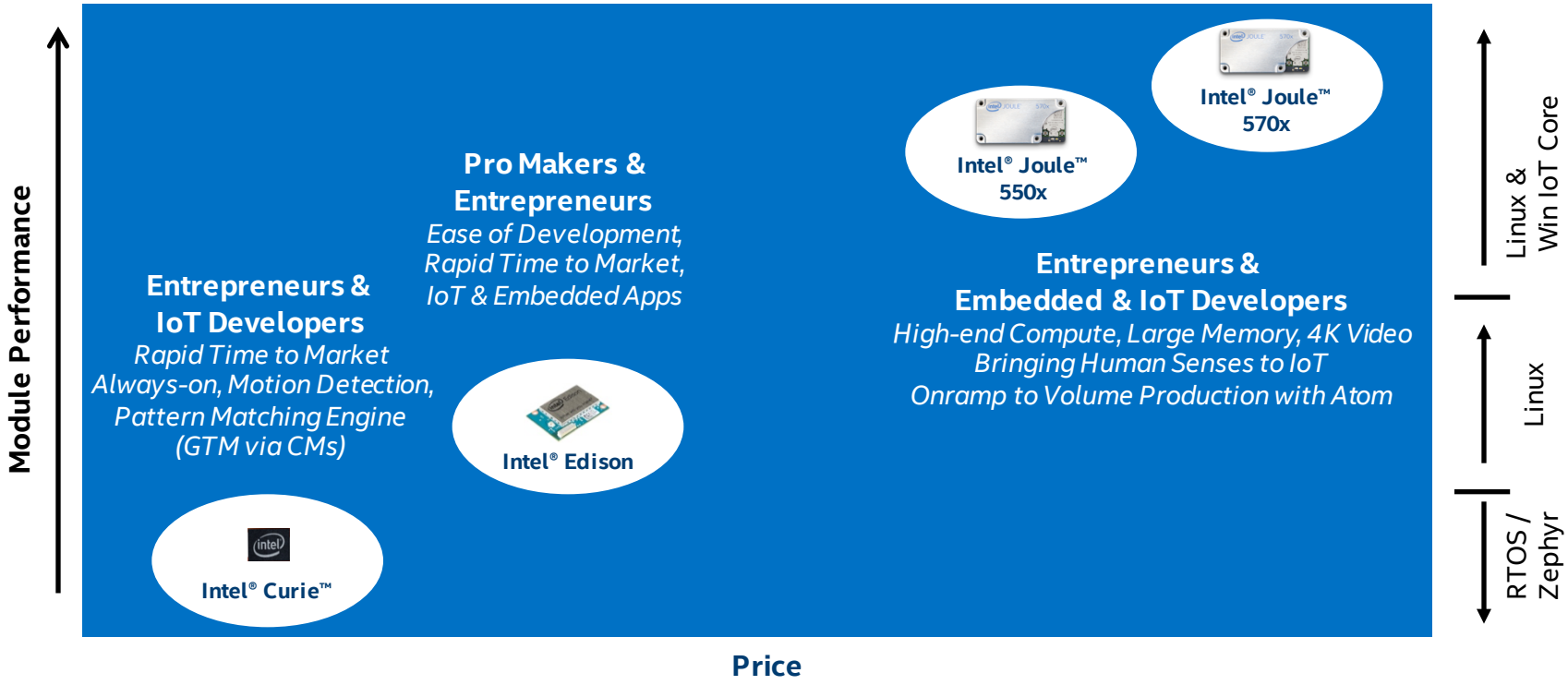
Support for Intel® RealSense™ cameras and libraries (Q4; Enhanced support with premium SKU)

INTEL® JOULE™: TWO MODELS

	PROCESSOR	MEMORY	STORAGE	INTEL® REALSENSE™ TECHNOLOGY	SIZE	WIRELESS	SOFTWARE	CONNECTIVITY	GRAPHICS
Intel® Joule™ 550x Compute Module	High-performance 1.5 GHz quad-core Intel® Atom™ SoC	3GB LPDDR4	8GB Flash memory	Support for Intel RealSense cameras and libraries ^	Modular design in a 24x48 mm package	• Integrated Wi-Fi certified in more than 100 countries • Bluetooth* 4.1 • 2 Wi-Fi antennas	Robust software ecosystem, including choice of Reference Linux* OS for IoT, Ubuntu, Snappy, Windows IoT Core, and Android.^	USB2, 2 USB3, PCIe*, 1x4 DSI, 1x4 CSI, 2 SPI, 3 I2C, I2S, DMIC, 2 UART, HDMI	Intel® HD Graphics with 4K video capture and display
Intel® Joule™ 570x Compute Module	High-performance 1.7 GHz quad-core Intel® Atom™ SoC with up to 2.4 GHz burst	4GB LPDDR4	16GB Flash memory	Enhanced support for Intel RealSense cameras and libraries					

^Support for Intel® RealSense cameras and libraries coming in Q4 2016. Launch OS is Reference Linux* OS for IoT. Ubuntu, Snappy, Win IoT Core coming in Q4 2016. Android coming in 1H 2017.

MIG MODULE LINE-UP AT A GLANCE



JOULE AND EDISON COMPARED

INTEL® EDISON
SYSTEM-ON-MODULE

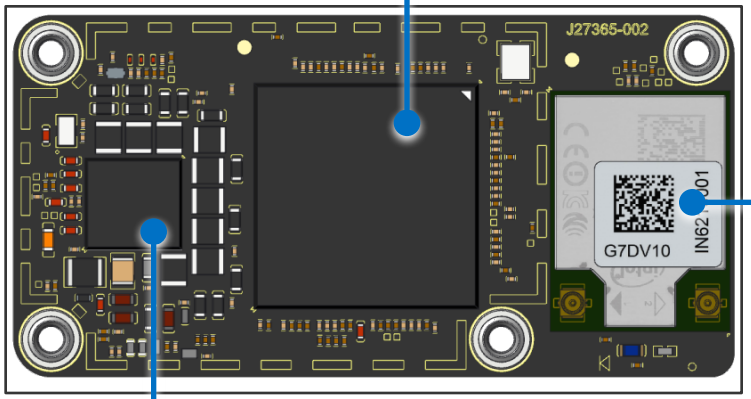
INTEL® JOULE™
SYSTEM-ON-MODULE

Strategy	Make Edison the leading small form factor IoT solution for prototyping and production.	Extend into the higher-end system-on-module market
Positioning	Performance, wireless, and ease of development for deeply embedded IoT	High-end computing, large memory, and 4K video capture and display in a small form factor capable of delivering human-like senses to range of devices
Developers	Expert Makers, IoT Developers, Entrepreneurs	IoT & Embedded Developers, Entrepreneurs
Verticals	Consumer IoT Light Industrial IoT Wearables	Robotics Drones Industrial Machine Vision IoT / Demanding Edge Computing

A BIG STEP UP IN CAPABILITY

	Intel® Edison	Intel® Joule™ 550x	Intel® Joule™ 570x
CPU Speed	500 MHz	1.5 GHz	1.7 GHz, Burst up to 2.4 GHz
CPU Cores	Dual-Core	Quad-Core	Quad-Core
Graphics	No Graphics	4K video capture and display	4K video capture and display
RAM	1 GB	3 GB	4 GB
Flash	4 GB	8 GB	16 GB
USB3	---	2	2
PCIe	---	1	1
MIPI Camera	---	Yes	Yes
MIPI Display	---	Yes	Yes
Intel® RealSense™ Technology	---	Support for Intel® RealSense™ technology	Enhanced Support for Intel® RealSense™ technology
S3	13 mW	8 mW	2 mW
OS	Yocto	Up-Streamed Reference Linux* for IoT	Up-Streamed Reference Linux* for IoT

MODULE ARCHITECTURE



Intel® Atom™ Processor T5700/T5500:

Quad-core 64-bit processor up to 1.7GHz
4 MB cache; 2 MB per core-pair
Intel Gen9 Graphics
3-4 GB of POP RAM on module

Intel® Dual Band Wireless-AC 8260:

802.11 ac Wi-Fi*
Dual band (2.4 & 5 GHz)
Bluetooth* Core 4.2 compliant
MHF4 connectors for external antennae

Power Management IC

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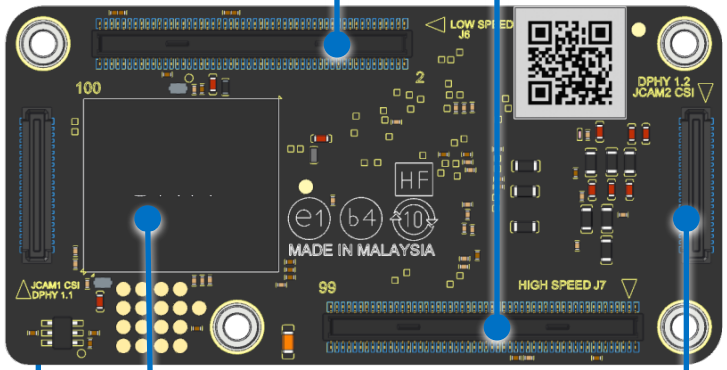
MODULE ARCHITECTURE – I/O



8-16 GB of eMMC 5.0

Wired (2 x 100-pin connector):

- (1) USB 3.0 On The Go
- (1) USB 3.0 / PCI Express* (Muxed)
- (2) USB 2.0; (1) with OTG
- (1) SDIO for SD Card 3.0
- (1) 4-lane MIPI* DSI
- (1) 1080p HDMI* 1.4a
- (1) I2S
- (2) Digital mic
- (2) I2C, (2) SPI, (2) UART
- (11) GPIO (/w 4 PWM)

Reserved (MIPI CSI)

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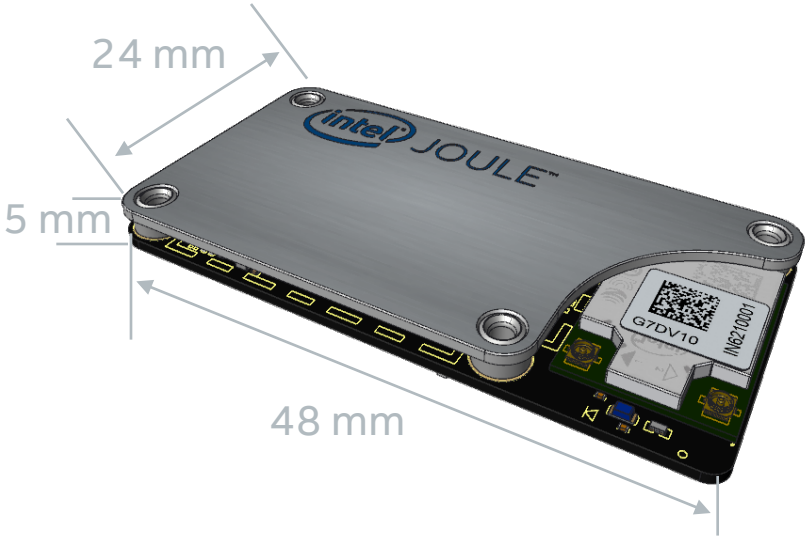
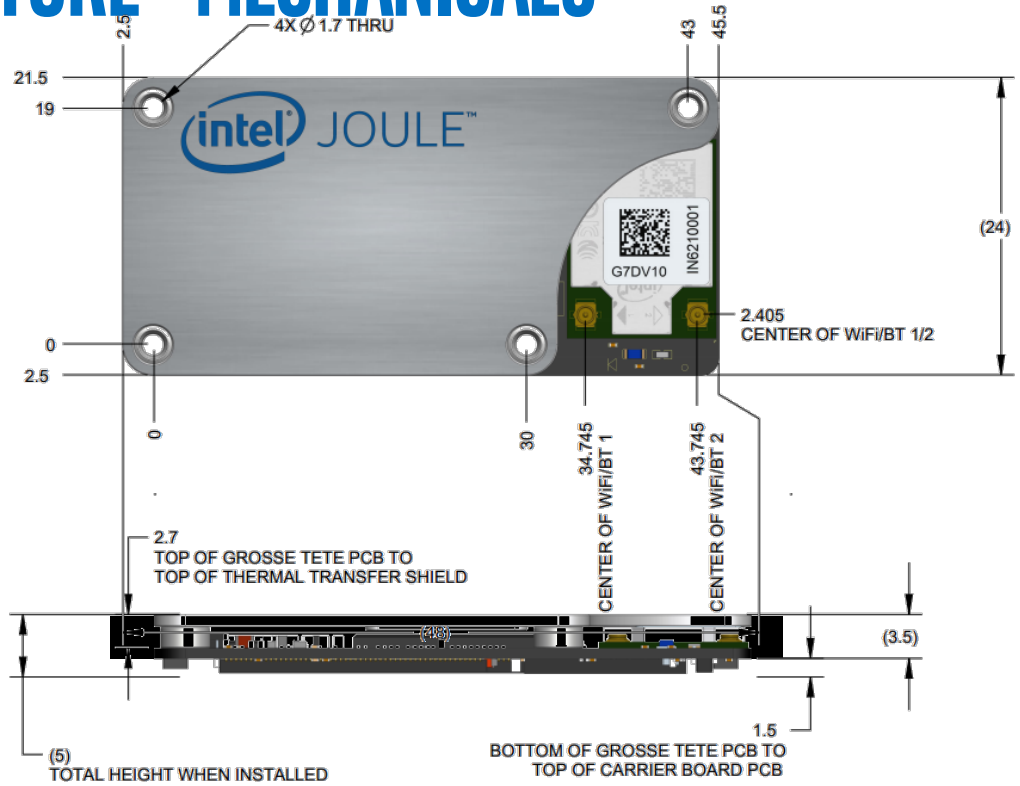
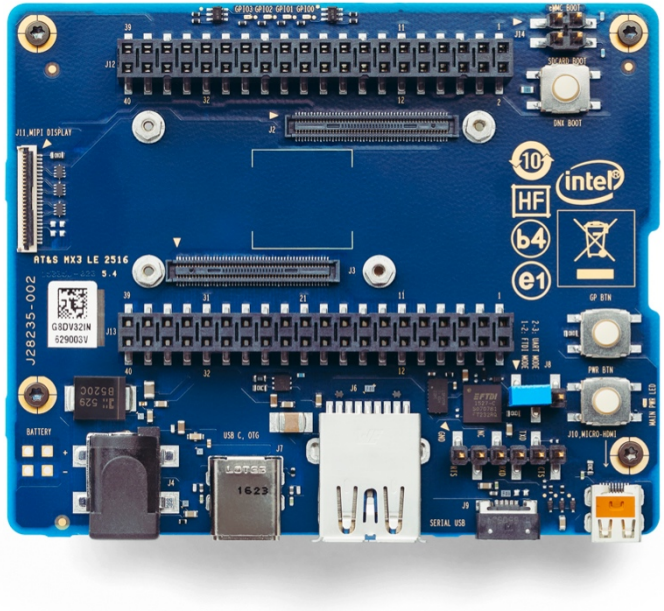
MODULE ARCHITECTURE - MECHANICALS

Thermal Transfer Shield
(Permanently Attached)





INTEL® JOULE™ BASE CARRIER BOARD



- **DC In (~12V, 3A)**
- **USB connectors**
  - 1 x Type-C with OTG
  - 1 x Type-A
- **Multimedia**
  - Micro HDMI
  - MIPI DSI display interface
- **Generic I/O connectors**
  - 2 x 40-pin, 100 mils I/O connectors
  - 3.3V (5V tolerant) level shifted I/O
- **Miscellaneous**
  - Micro USB to serial FTDI debug port
  - µSD card (3.0) compliant
  - 1S battery charger and fuel gauge
  - EEPROM for I/O configuration (BIOS settings)
  - 4 general purpose LEDs and 3 control buttons
  - Open source hardware (schematics and layout)

INTEL® JOULE™ COMPUTE MODULE

Physical	
Form Factor	SoM with two high-density 100-pin Hirose connectors and two MIPI CSI connectors
Dimensions	24 mm x 48 mm x 3.5 mm
Connectors	Hirose DF40 series plug (1.5 mm stack height)
Operating Temperature	0° – 70° C

External Interfaces		
Two 100-pin connectors		
1 USB 3.0 (support for OTG & Type C connector) or 1 USB 2 (support for OTG & Type A/B connector)	1 I2S Audio Interface	1 HDMI* 1.4b (4K @ 30 fps)
	2 Digital Microphones	Panel Back Light Control
1 USB 3.0/PCIe 2.0 (Muxed)	5 I2C	1 RTC Clock
	2 SPI	1 19.2 MHz Clock
1 SDIO for SD* Card 3.0	4 UART	4 PWM
Up to 48 GPIO	1 MIPI* DSI, 4-lane	
Two 4-Lane MIPI CSI Connectors		
Each with dedicated GPIO, I2C, and power lines		
Wireless		
802.11ac Wi-Fi*, dual-band (2.4 GHz & 5 GHz)		
Bluetooth* 4.1 compliant		
MHF4 connectors for external antennas		

Major Components	
Processor	14-nm, 64-bit, quad-core Intel® Atom™ processor at 1.5 GHz, or 1.7 GHz with 2.4 GHz burst
Graphics	On-chip Intel® HD Graphics 300 MHz, or 450 MHz with burst up to 650 MHz, and 4K video capture and display
RAM	3 GB or 4 GB LPDDR4 PoP memory
Flash Storage	8 GB or 16 GB eMMC 5.0
On-chip image signal processor	
Video Encode/Decode Accelerators	
Intel® Trusted Execution Engine (TXE)	

Firmware + Software	
CPU OS	Reference Linux* OS for IoT, with Linux* 4.4 Kernel Application Framework support for Node.js*, Python* and C/C++
BIOS	Open-source UEFI-compliant BIOS
Software Development Environments	Intel® IoT Developer Kit, including: Intel® System Studio IoT Edition Intel® XDK for JavaScript development Intel® XDK IoT Edition Intel® RealSense™ SDK

SOFTWARE STACK AVAILABLE AT LAUNCH

Demo application

IoT sample projects

Pre-built binaries for reference Linux* OS for IoT

Linux kernel 4.4

EUFI-compliant BIOS

Coming in Q4

Upstreamed Linux Kernal

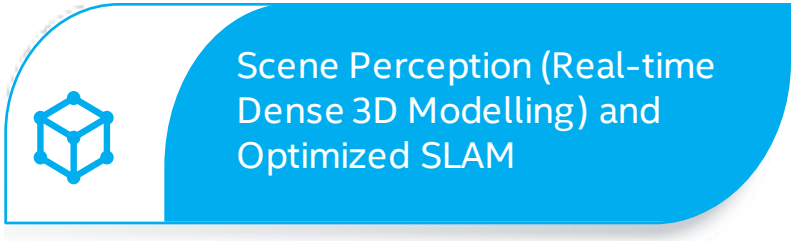
Additional OSs: Ubuntu, Snappy, Windows IoT Core, Android (1H'17)

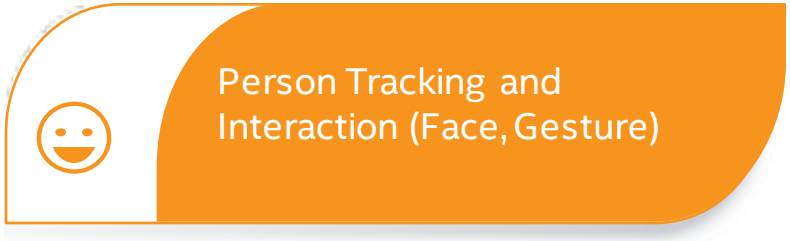
Software libraries for Intel® RealSense™ technology and integrated image signal processor

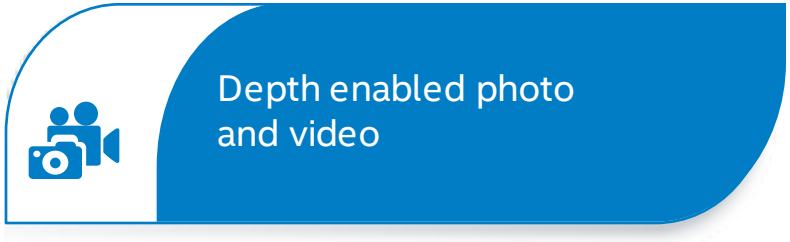
Intel® RealSense™ sample projects

ENABLING ADVANCED COMPUTER VISION APPLICATIONS

- Easy-to-use SDK enables rapid app development
- Available value-added software enables software building blocks
- Intel® RealSense™ camera ZR300 marries depth sensing and high-precision motion tracking (available Q4)







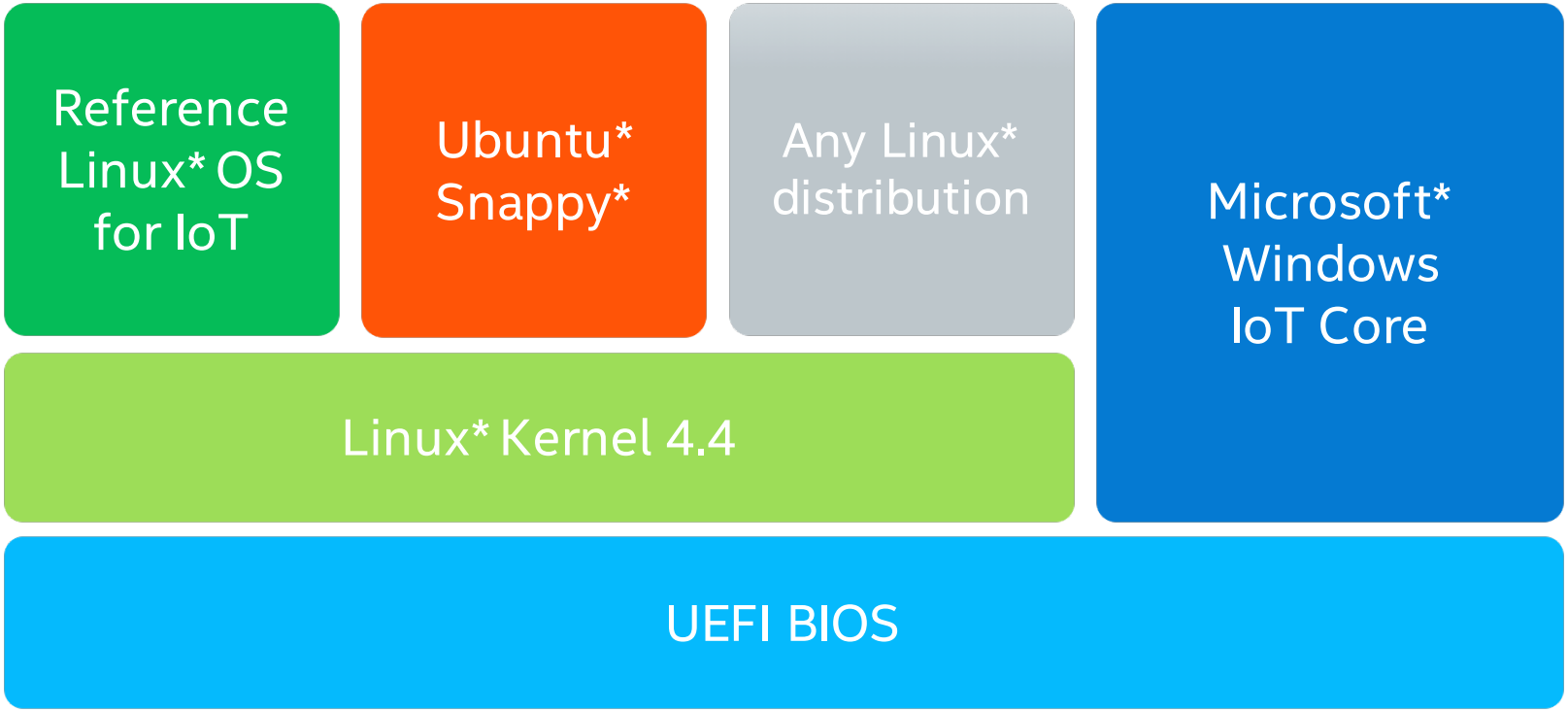
INTEL® REALSENSE™ SDK

Intel® RealSense™ SDK family will be the Intel® Joule™ compute module paired with segment-specific carrier boards and middleware

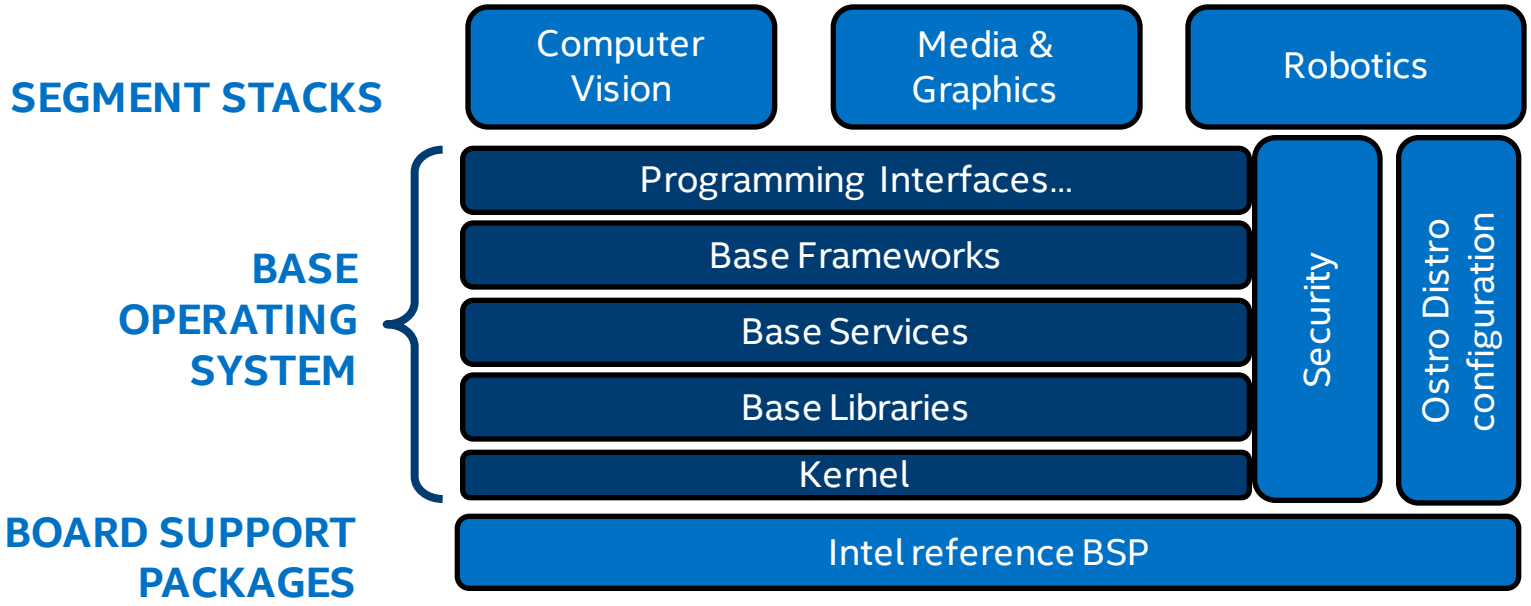
- Latest Intel SOC coupled with RealSense depth camera and middleware
- Provides developers fast TTM and production class solution
- Solutions to be available worldwide through range of broad channels
- All Intel branded developer kits across segments will align to this model (Robotics, AR/VR, drones, and future segments)

Intel® RealSense™ camera ZR300

REMOVING BIOS AND OPERATING SYSTEM BARRIERS

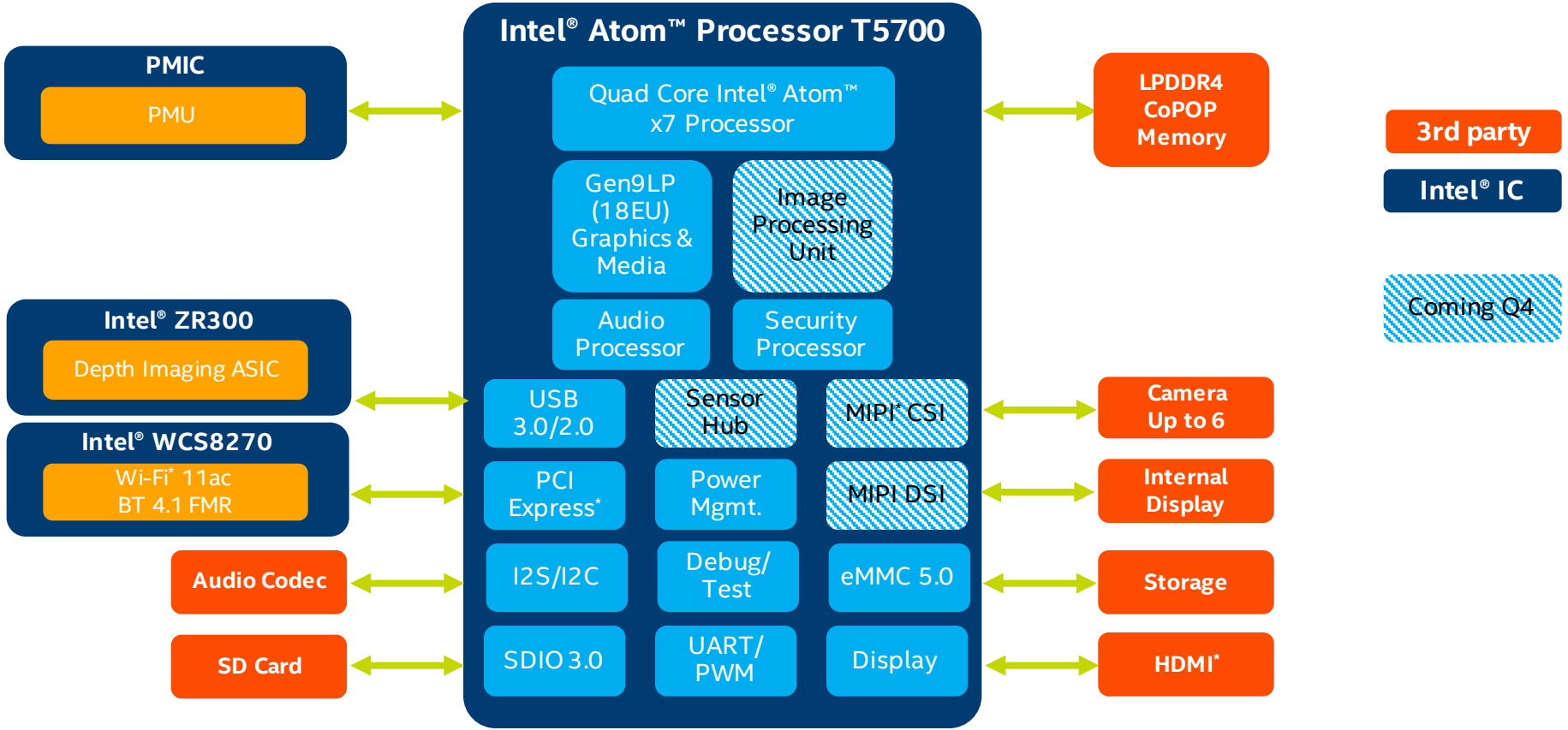


REFERENCE LINUX* OS FOR INTERNET OF THINGS



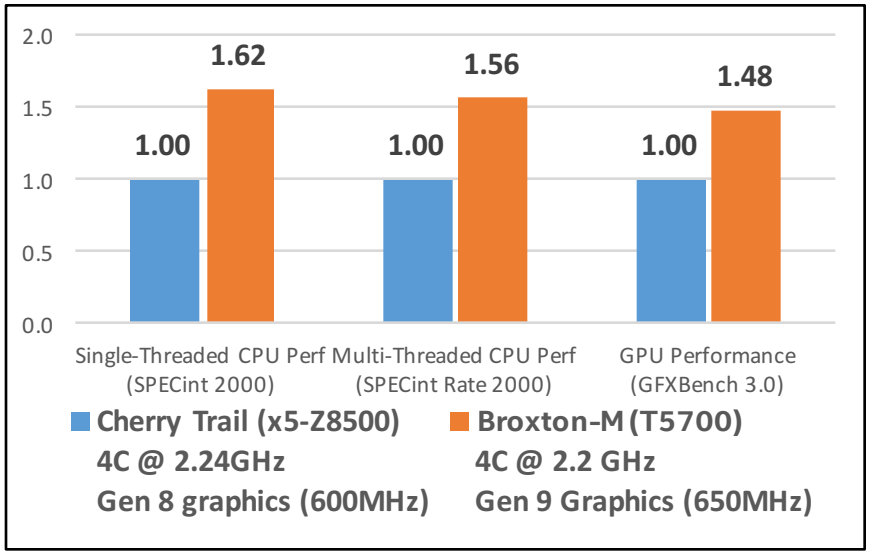
- Precompiled and configured OS tailored for Internet of Things applications
- Source code available for the developers to add or modify features
- Easy to customize

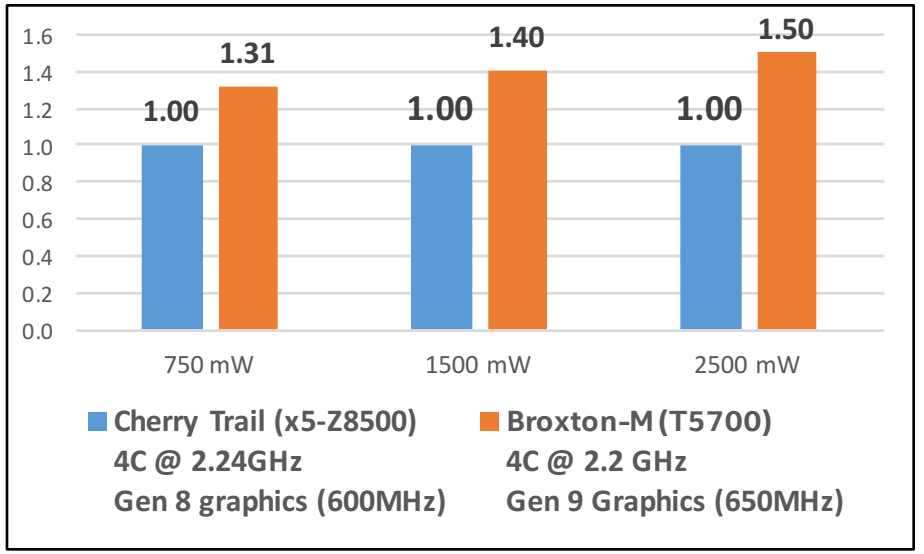
INTEL® ATOM™ PROCESSOR T5700/5500 SOC ARCHITECTURE



INTEL® ATOM™ PROCESSOR T5700/T5500 VS. INTEL® ATOM™ X5-Z8500

(PREVIOUS GEN ATOM SOC) CPU & GRAPHICS PERFORMANCE & POWER COMPARISON



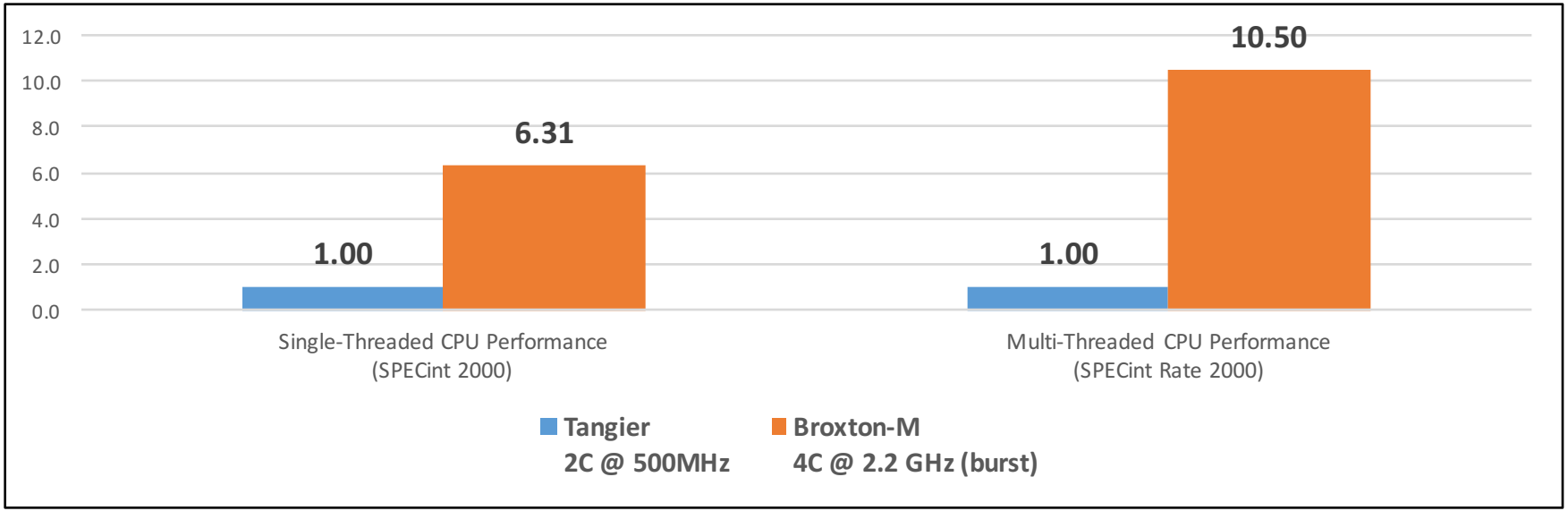


Intel® Atom™ Processor T5700/T5500 (Broxton-M) is expected to provide up to 60% better application performance than previous generation, Intel® Atom™ x5-Z8500 and up to 50% better performance at the same power

Source: Intel. All Intel® Atom™ processors burst up to specified frequency. Results may have been estimated.

INTEL® ATOM™ PROCESSOR T5700/T5500 VS. INTEL® ATOM™ Z34XX (INTEL® EDISON™)

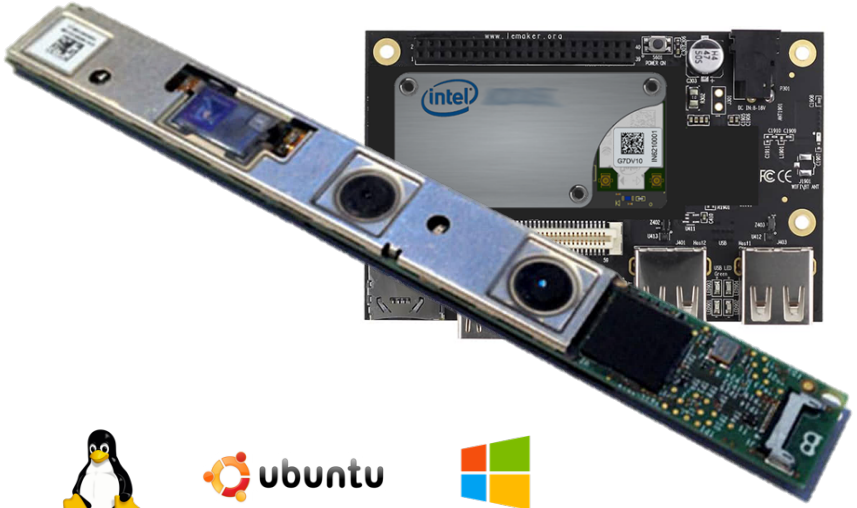
CPU & GRAPHICS PERFORMANCE COMPARISON

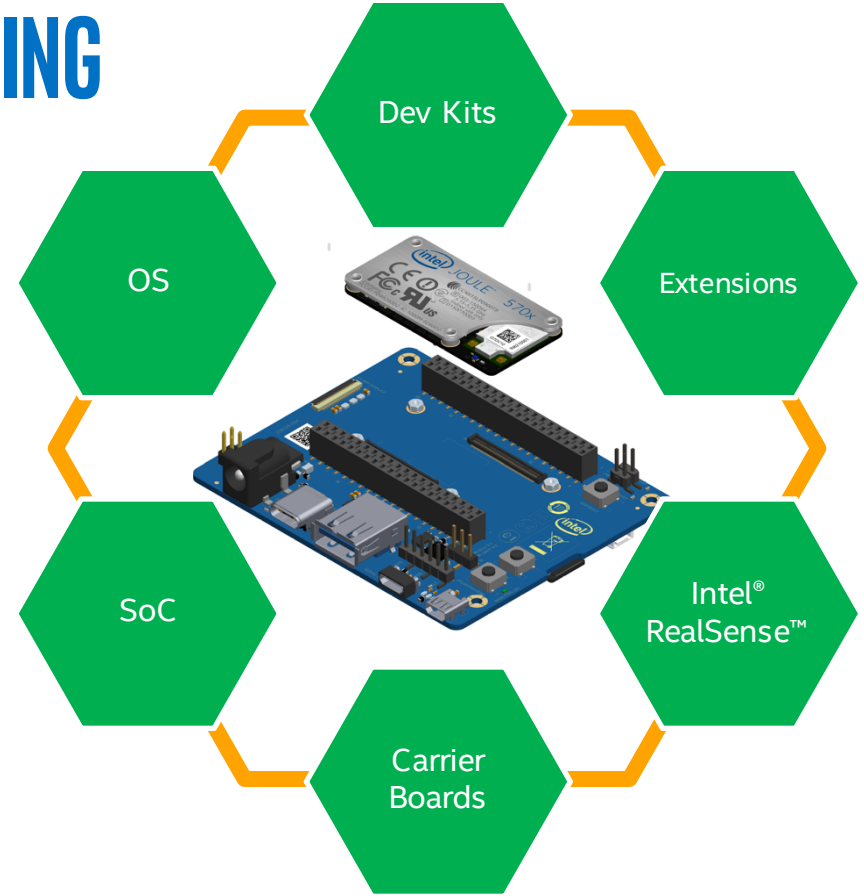


Broxton-M is expected to provide up to 10X better application performance than previous generation, Tangier and include new graphics support

Source: Intel. All Intel® Atom™ Processors burst up to specified frequency. Results may have been estimated.

CUSTOMIZATION & SCALING





TARGET VERTICAL MARKETS AND USAGES

ROBOTS

Key vision usages:
- Obstacle detection
- Collision avoidance
- Scene analytics
- Voice analytics

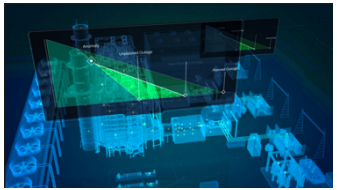
2020 TAM:
- 11mu consumer drones
- TBD commercial robots

UAVs

Key vision usages:
- Obstacle detection
- Collision avoidance
- Scene analytics

2020 TAM:
- 24mu consumer drones
- TBD commercial drones

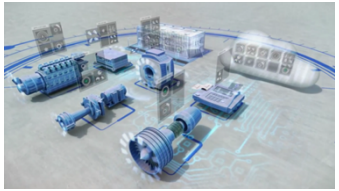
INDUSTRIAL CV



Key vision usages (AON):
- TBD

2020 TAM:
- TBD

MICROSERVERS / MICROGATEWAYS



Key vision usages:
- Industrial micro-gateways
- Consumer micro-gateways
- Commercial, portable servers
-

2020 TAM:
- TBD

AR/VR

Key vision usages (AON):
- Face detection/recognition
- Head/gaze tracking
- Gesture/pose recognition

2020 TAM:
- 18mu AR
- 132mu VR

VERTICAL MARKETS

Verticals
- Robots
- Drones
- Microservers & microgateways
- Industrial machine vision
- VR / AR

Applications
- Computer vision
- Speech processing
- Autonomous behavior
- Complex motor control
- Data processing
- Error checking
- Pro audio

Focused Enabling Program

Collateral, Workshops, Events

Contract Manufacturing Partners

Examples & Code Samples

OS & Services

Sensors

Carrier boards

Intel® Joule™ Compute Module

THE JOULE™ FAMILY

Supporting the long tail via Expansion Boards

Intel Expansion Boards

Partner Expansion Boards

Built to Order Expansion Boards

PERFORMANCE BENCHMARKS

LEGAL DISCLAIMER

Intel technologies may require enabled hardware, specific software, or services activation. Check with your system manufacturer or retailer.

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors.

Performance tests, such as SPEC* CPU2000 and GFXBench, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products.

For more complete information about performance and benchmark results, visit www.intel.com/benchmarks.

Intel is a sponsor and member of the BenchmarkXPRT Development Community, and was the major developer of the XPRT family of benchmarks. Principled Technologies is the publisher of the XPRT family of benchmarks. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases.

(for data marked '(e)'): Results have been estimated or simulated using internal Intel analysis or architecture simulation or modeling, and provided to you for informational purposes. Any differences in your system hardware, software or configuration may affect your actual performance.

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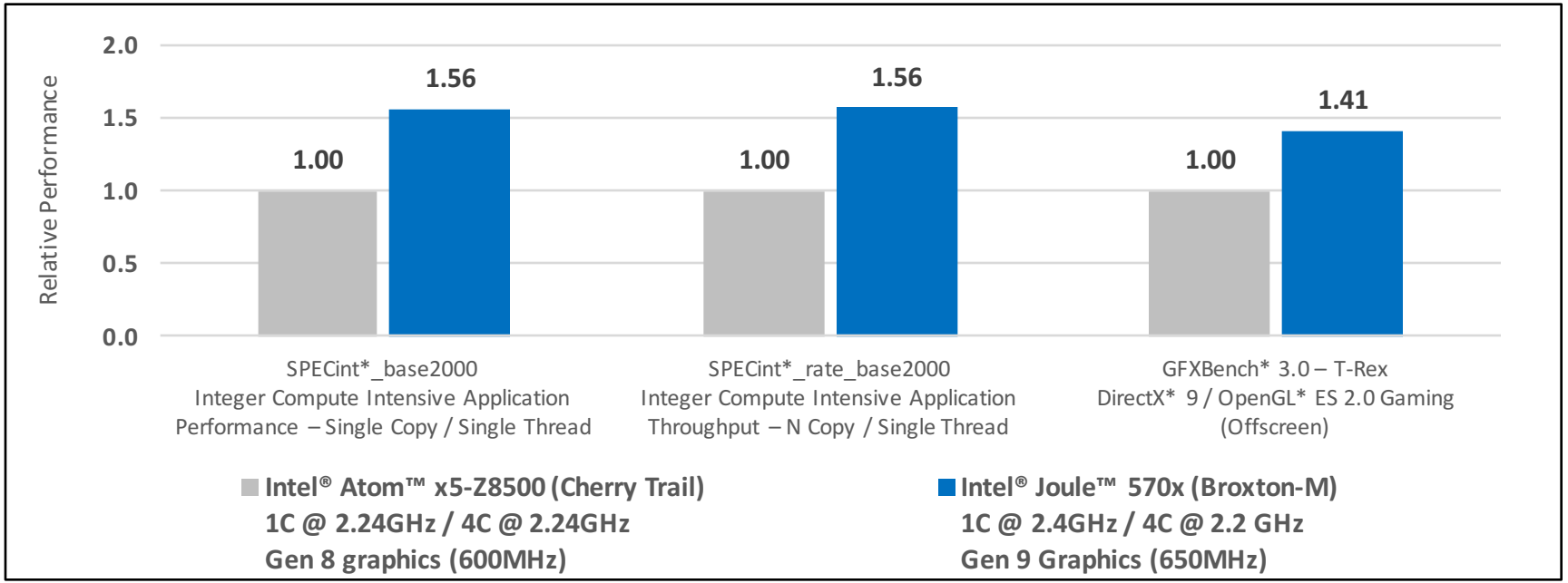
BROXTON-M VS. CHERRY TRAIL (PREVIOUS GENERATION SOC)

CPU Relative Performance Comparison

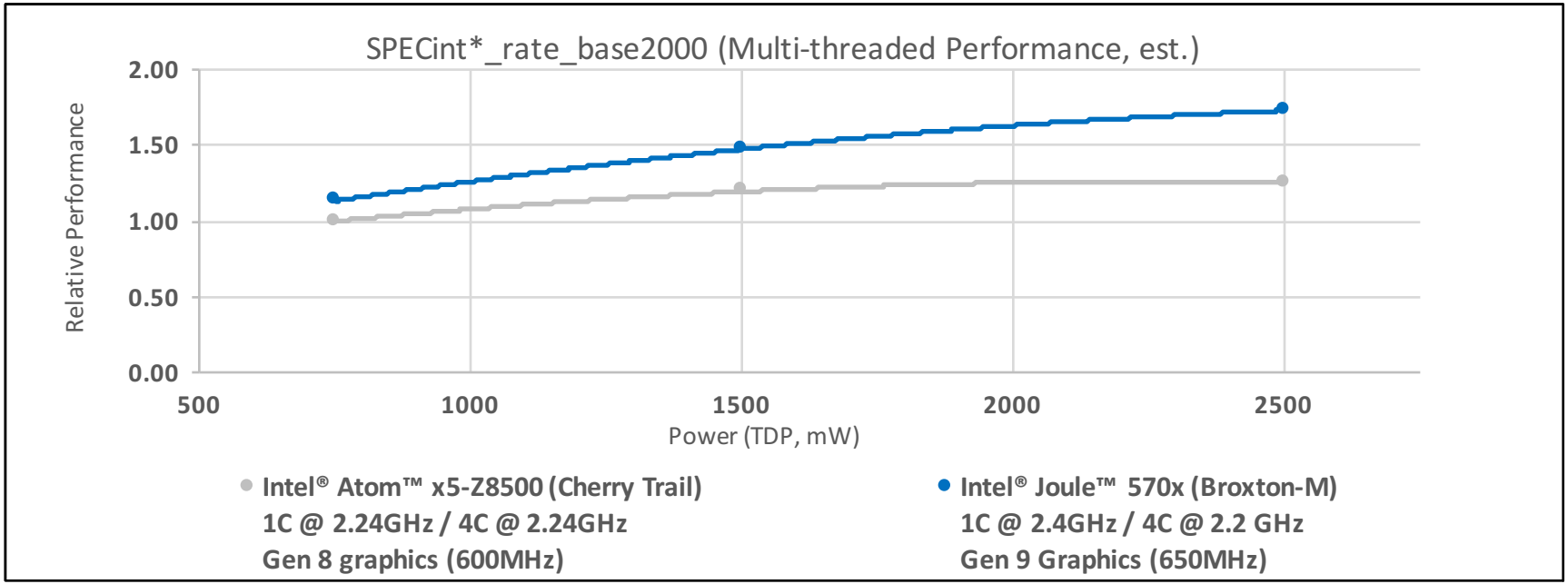


Source: Intel. All Intel processors burst up to specified frequency. Performance results are estimated and represent an actively-cooled processor at Burst Frequency. Estimates for SPEC CPU2000 based on binaries compiled with Intel Compiler 16.0.

Broxton-M is expected to provide up to 56% better application performance than the previous generation, Cherry Trail

BROXTON-M VS. CHERRY TRAIL (PREVIOUS GENERATION SOC)

Relative Performance vs Power (by TDP) Comparison

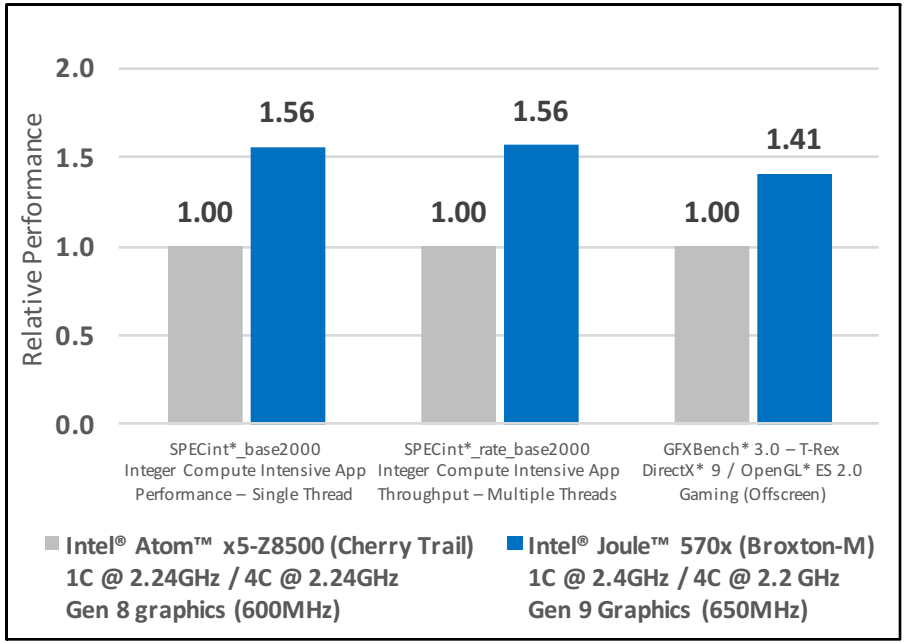


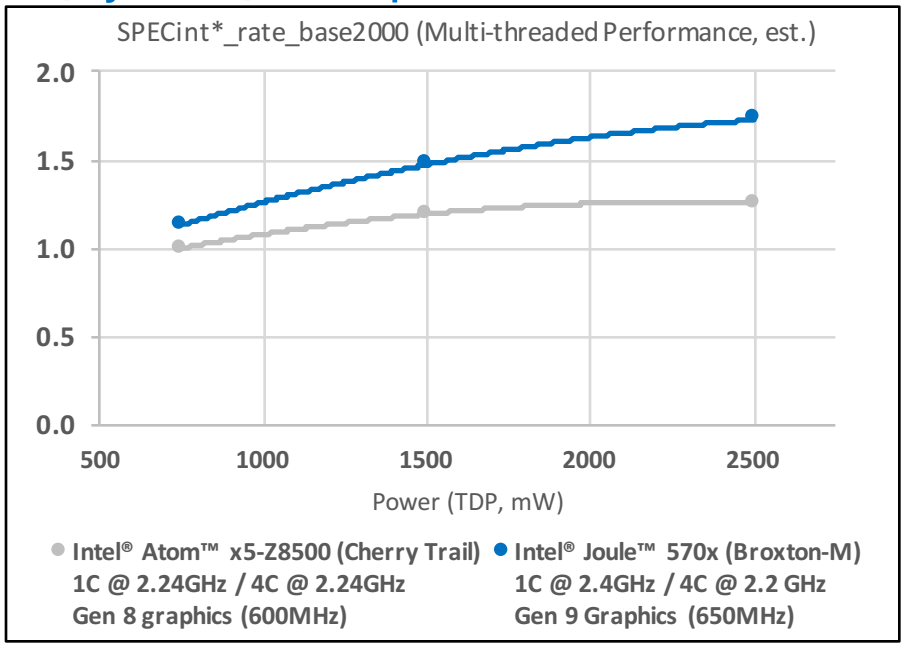
Source: Intel. All Intel processors burst up to specified frequency. Performance results are estimated and represent an actively-cooled processor at Burst Frequency. Estimates for SPEC CPU2000 based on binaries compiled with Intel Compiler 16.0.

Broxton-M is expected to provide superior application performance to the previous generation, Cherry Trail, at the same power

BROXTON-M vs. CHERRY TRAIL (PREVIOUS GENERATION SOC)

Performance and Performance vs Power (by TDP) Comparisons



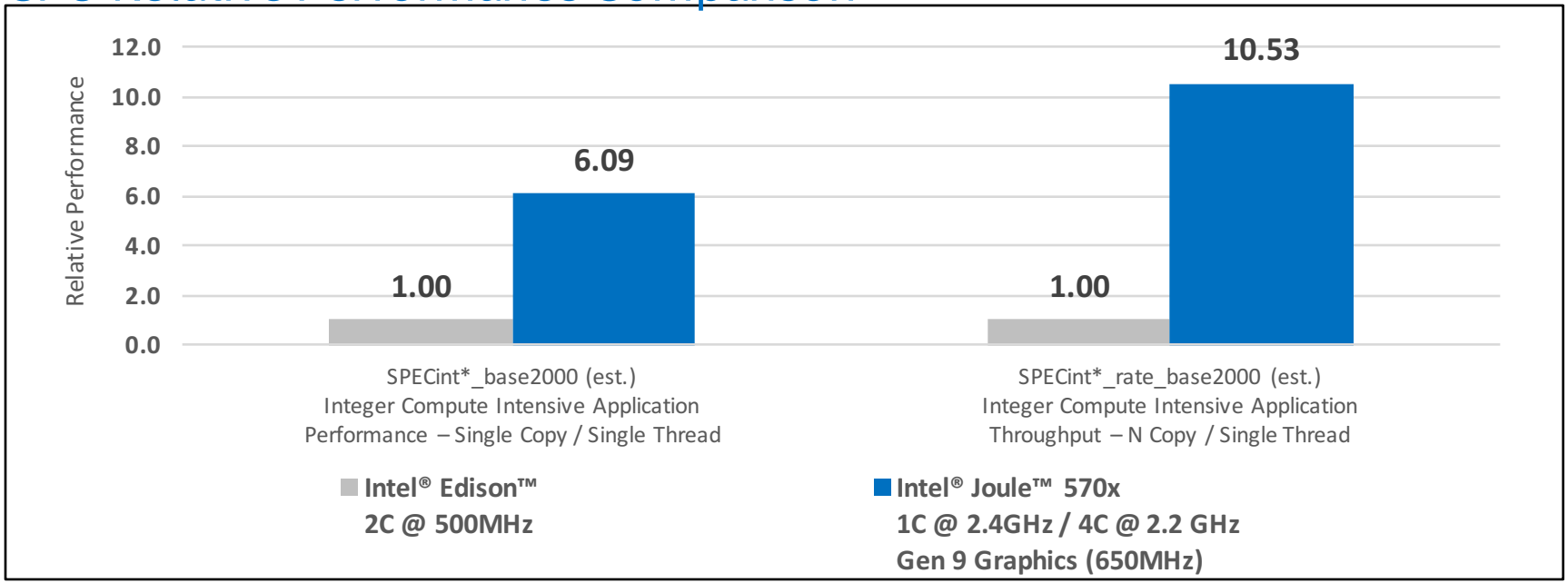


Source: Intel. All Intel processors burst up to specified frequency. Performance results are estimated and represent an actively-cooled processor at Burst Frequency. Estimates for SPEC CPU2000 based on binaries compiled with Intel Compiler 16.0.

Broxton-M is expected to provide up to 56% better application performance than the previous generation, Cherry Trail, and superior performance at the same power

INTEL® JOULE™ VS. INTEL® EDISON (PREVIOUS GENERATION SOM)

CPU Relative Performance Comparison

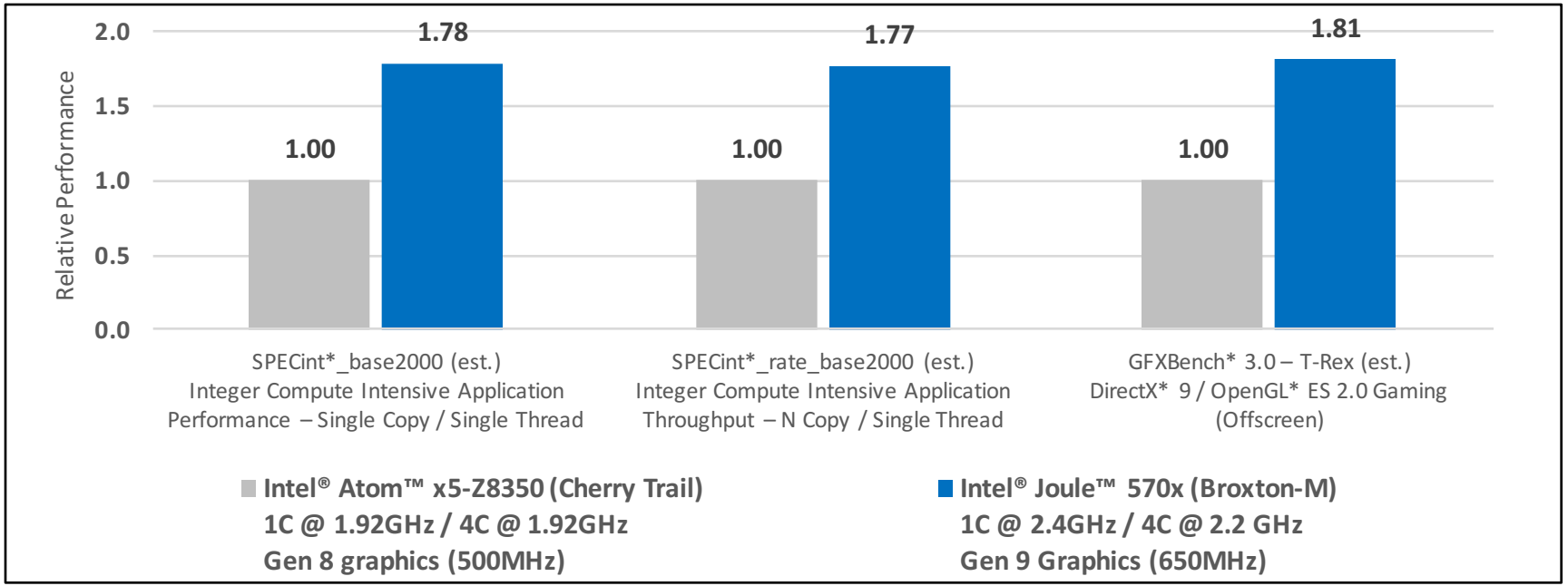


Source: Intel. All Intel processors burst up to specified frequency. Performance results are estimated and represent an actively-cooled processor at Burst Frequency. Estimates for SPEC CPU2000 based on binaries compiled with Intel Compiler 16.0.

Broxton-M is expected to provide up to 10X better application performance than previous generation, Tangier

BROXTON-M (JOULE) VS. CHERRY TRAIL (RDK)

CPU & Graphics Relative Performance Comparison

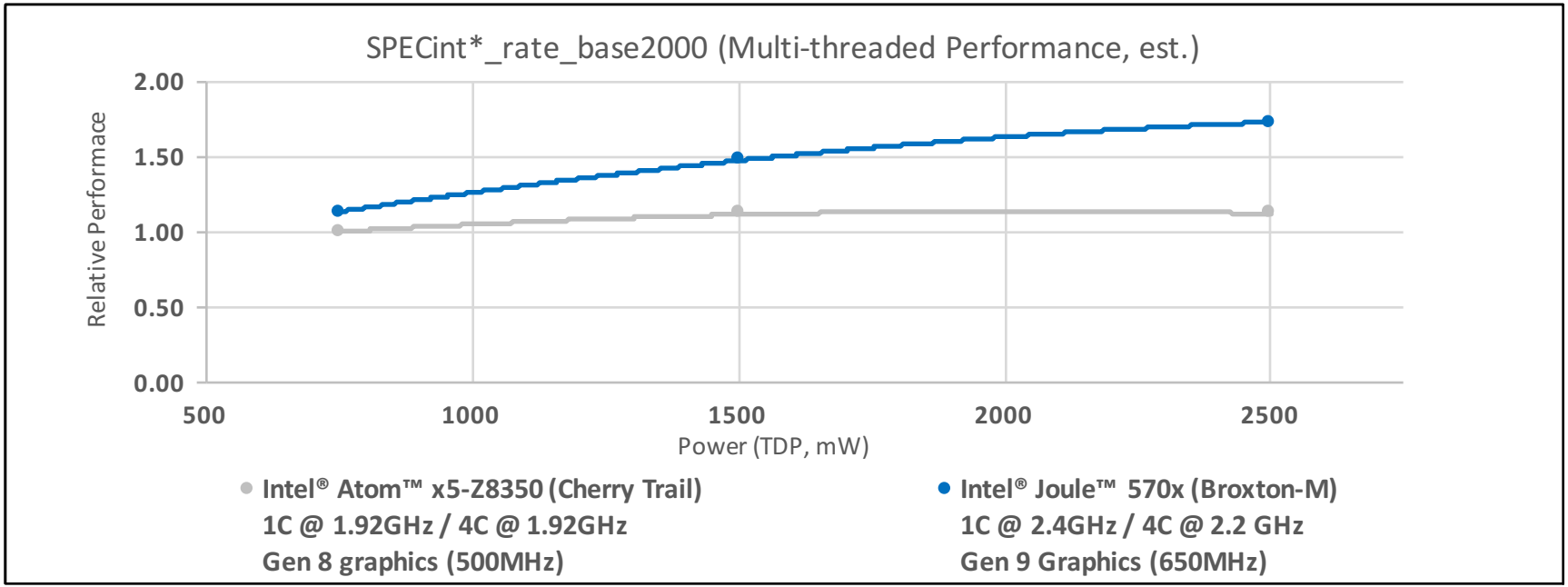


Source: Intel. All Intel processors burst up to specified frequency. Performance results are estimated and represent an actively-cooled processor at Burst Frequency. Estimates for SPEC CPU2000 based on binaries compiled with Intel Compiler 16.0.

Broxton-M is expected to provide over 70% better application performance than a Cherry Trail based development kit, and up to 80% better 3D graphics performance

BROXTON-M (JOULE) VS. CHERRY TRAIL (RDK)

Relative Performance vs Power (by TDP) Comparison



Source: Intel. All Intel processors burst up to specified frequency. Performance results are estimated and represent an actively-cooled processor at Burst Frequency. Estimates for SPEC CPU2000 based on binaries compiled with Intel Compiler 16.0.

Broxton-M is expected to provide superior application performance relative to a Cherry Trail development kit at the same power

PRODUCT AVAILABILITY

SKUS

Developer Kit (Retail Box)

For individuals
Available in premium & standard
MOQ 10

Includes:
Compute module
Expansion board
USB 3.0 Micro-SD* card
USB cable (Type C)
2 Wi-Fi antennas
Heatsink and fastener

Compute Module (Retail Box)

For individuals and kitters
Available in premium & standard
MOQ 10

Includes:
Compute module
2 Wi-Fi antennas

Compute Module (Bulk Pack)

For kitters and manufacturers
Available in premium & standard
MOQ 30

Includes:
Compute module

** Images of Intel Edison skus used here only for reference

INTEL® JOULE™ MODULE ESTIMATED AVAILABILITY

	IDF / WW34	SEPT / OCT 2016		Q4 2016 / Q1 2017
AVAILABLE AT IDF / PRODUCT LAUNCH	570x Dev Kit (retail box)			
AVAILABLE IN DISTRIBUTION CHANNEL (INITIAL COUNTRIES)	570x Dev Kit (retail box)	570x Module (retail box)	550x Dev Kit (retail box)	570x w/ RealSense Dev Kit (retail box)
		570x Module (bulk pack)	550x Module (retail box)	China-Specific SKUs
		3rd Party Carrier Boards	550x Module (bulk pack)	Global SKUs

GEO ROLLOUT PLAN

Launch SKU certified and available for shipment to >100 countries, including

- USA, Japan, and many in Europe
- China and Brazil notable exceptions

Subsequent global SKU to add additional country certifications

- “Global” certs, minus China
- Will eventually replace launch SKU (exact dates TBD)

China-specific SKU also comes later

- Different product name and lengthier cert process

EMBARGO

The Intel® Joule™ product is under strict embargo until launch, August 16, 2016.

Until the launch date, there shall be no communications about the product, except internal and under NDA, and only on a need to know basis.

As a general rule, Grosse Tête, the internal the code name, shall continue to be used in any internal and NDA communications up until launch on August 16, 2016.

Intel® Joule™ brand name is embargoed until the product is launched on, August 16, 2016.

Product photography and brand name will be released under NDA on August 8, 2016

MORE INFORMATION

WHICH INTEL MAKER & INNOVATOR PRODUCT DO I NEED?

If your goal is to:
- Learn
- Build for fun
- Teach making and coding

And you want to:
- Start with Arduino
- Explore some basic automation projects

Examples:
- Time your cat feeder
- Control that wirelessly through your phone

Arduino 101

And you want to:
- Go further with Arduino
- Learn about Linux
- Expand your knowledge about programming

Examples:
- Create a basic web server

Galileo Gen 2

If your goal is to:
- Build or prototype a product
- Develop a solution for a commercial application
- Start a company
- Teach college-level engineering & CS subjects

And you need:
- Motion sensing
- Bluetooth connectivity
- Arduino ecosystem
- Easy development environment

Good for
- Connected devices
- Smart toys

Arduino 101

And you need:
- An integrated compute module
- Machine learning
- Smart pattern matching
- Low power
- Bluetooth connectivity
- Real-Time OS

Good for
- Wearables
- Small connected devices
- Fitness monitors
- Smart toys

Tiny Tile,

If you need:
- An integrated compute module
- Good performance
- Wi-Fi or BT connectivity
- Don't need graphics
- Linux

Good for :
- Consumer IoT
- Light industrial IoT
- High-performance wearables

Edison

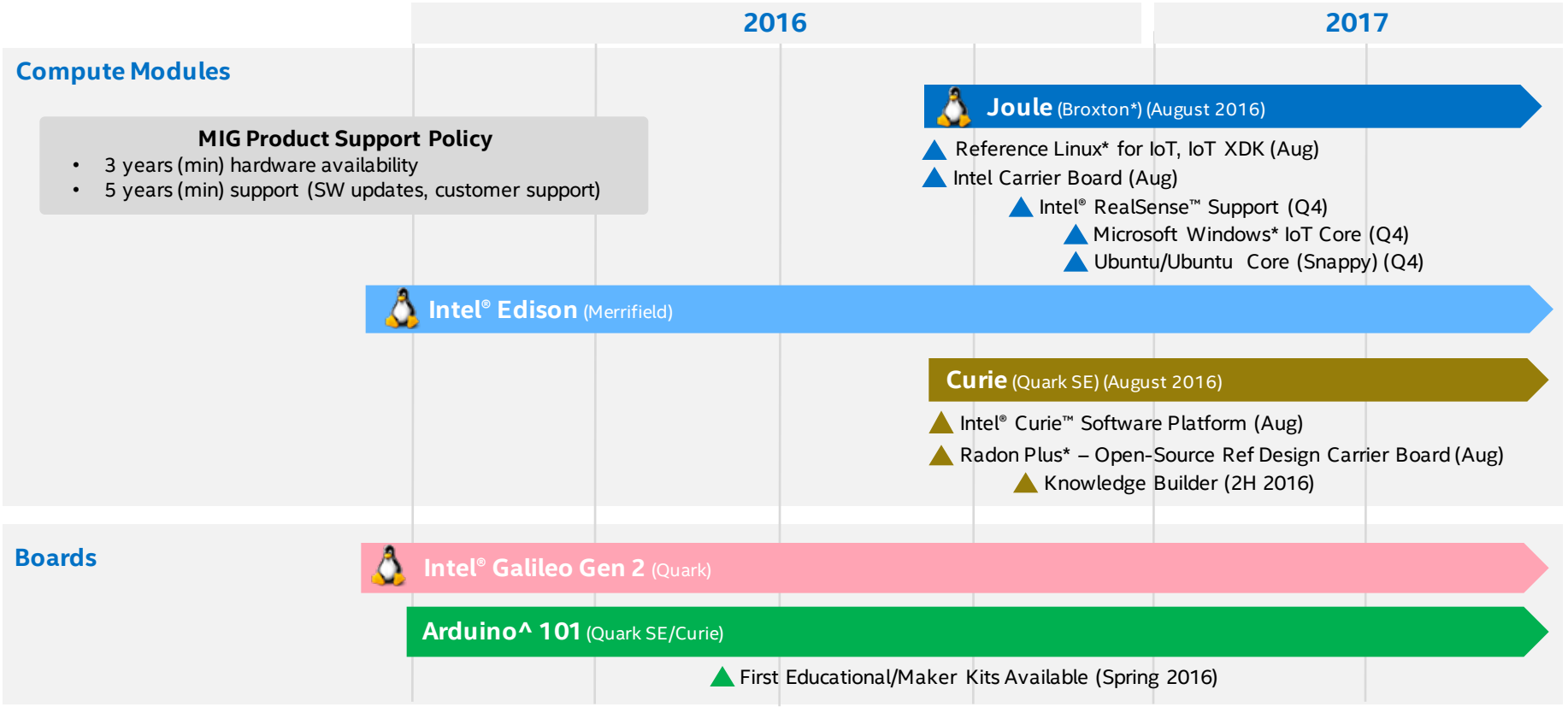
If you need:
- An integrated compute module
- High-end compute
- Large memory
- Graphics
- Wi-Fi or BT connectivity
- Linux

Good for:
- Computer vision applications
- Mobile robotics
- Drones
- Industrial machine vision

Joule

MIG PLATFORM ROADMAP

Dates and product plans are subject to change



INTEL'S SYSTEM ON MODULE (SOM) OFFERINGS

Intel provides solutions that *lower the barriers to entry* and *accelerate time-to-market* for developers of intelligent connected devices

INTEL OFFERS DIRECTLY

Compute module (Grosse Tête*)
Proprietary design; not open source hardware

Base carrier boards (open-source HW)
Eg. Tuchuck*

Complete suite of software tools
Intel® IoT Developer Kit
Reference Linux* OS for IoT -- access to thousands of open source packages

INTEL ENABLES THE ECOSYSTEM

Reference Designs
Intel provides open source reference designs so customers can create their own carrier boards

Open Source Software
Intel is primary contributor to open source Linux

Enabling
Intel teams enable developers and entrepreneurs (eg. at hackathons,...), large third-party ecosystem, and smooth transition to customized product

BENCHMARKING - WORKLOADS

SPEC* CPU2000 is a benchmark from the SPEC consortium that measures device performance and throughput using compute intensive application subtests. SPECint*_base2000 measures how fast a device completes a single integer compute task. SPECint*_rate_base2000 measures throughput, or how many integer compute tasks a device can accomplish in a given amount of time. OS support: Desktop Windows*. SPEC CPU2000 is supported on Windows*, UNIX*/Linux* and Mac* OS platforms; however it is possible to have an unofficial port to other operating systems.

GFXBench* 3.0 is a benchmark from Kishonti Informatics* that measures OpenGL* ES gaming performance. There are two major graphics tests: Manhattan (OpenGL ES 3.0) and T-Rex (OpenGL ES 2.0). OS support: Android* and iOS*.

BENCHMARKING - CONFIGURATIONS

Performance measurements on Intel Reference Platform.
Intel Reference Platform is an example new system. Products available from systems manufacturers will not be identical in design, and performance will vary.

Estimates for Intel® Joule™ 570x, 4W TDP, 4C4T, Up to 2.4GHz
Estimated performance values are representative of active heat sink cooling. Estimated performance values may not be achieved using passive cooling alone.
Estimates for Intel® Atom™ x5-Z8500, 2W SDP, 4C4T, Up to 2.24GHz, Intel® HD Graphics up to 600MHz Burst Frequency
Estimates for Intel® Atom™ x5-Z8350, 2W SDP, 4C4T, Up to 1.92GHz, Intel® HD Graphics up to 500MHz Burst Frequency

Intel® Edison, Intel® Atom™ CPU, 2C2T, 500MHz, Memory: 1GB LPDDR3-1600, Storage: 4GB Flash eMMC, OS: Yocto Linux