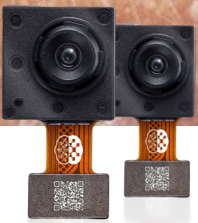**SynSense**

Speck™
an all-in-one dynamic vision SoC

Speck™ is a fully event-driven neuromorphic vision SoC. Speck™ supports large-scale spiking convolutional neural networks (sCNNs) with a fully asynchronous chip computational architecture.

Speck™ is fully configurable with up to a capacity of 320k neurons and integrates a state-of-art dynamic vision sensor (DVS), enabling fully event-driven, real-time, highly integrated solutions for a range of visual applications. For most applications, Speck™ provides intelligent visual processing at milli-Watt power levels, and with a response latency of down to a few ms.

Applications

Smart **Toy**
- Gesture control
- Smart tracking

Smart **Security**
- Fall detection
- Approach detection

Smart **Home**
- Gesture control
- Behaviour detection

Automotive
- Lane detection
- Sign recognition
- Driver attention tracking
- Attention detection
- Smart cabin

Drones
- Obstacle detection
- Object tracking
- Optic flow
- Ego motion

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SynSense

Approach detection solution based on Speck™ SoC

Application overview

SynSense's dynamic vision SoC series, Speck™, combines dynamic vision sensing and event-driven computing to provide a real-time, integrated and low-power dynamic vision solution for computing and sensing in edge applications.

Speck™ senses moving objects within 3 meters, and can detect and identify the approach and departure intentions of humans in real time with millisecond response time. SynSense's Speck™ chip uses event-driven technology to achieve efficient perception and computation, avoiding the waste of energy and computational resources caused by data redundancy and repeated computations in traditional vision systems.

SynSense's technology and products are widely used in smart home, smart security, smart logistics and other fields. Based on customer requirements for edge sensing and computing applications, SynSense empowers partners to build real-time, integrated, and low-power dynamic vision solutions for smart home, smart security, and other industries.

Applications

- Smart door locks
- Smart buildings
- Smart lighting
- Smart security
- Car sentry

- Gate and access management
- Headcounting in shopping malls,   museums, banks, etc.
- People control in public places

Key benefits

Ultra low cost
System cost <$7

Fast response
Response time <50ms (typical applications)

Highly integrated
On-chip integration of sensors and processors
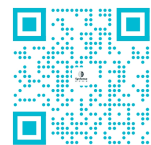High neuron density

Ultra-low power consumption
Power consumption <5mW (typical applications)

Privacy
Pure end-to-end computing of data streams:
no data transfer to the cloud

Specifications

Neurons	320,000
Integration	19,800/mm^2
Resolution	128*128
Dynamic range	90dB
Power consumption	<5mW (typical)

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Person flow monitor based on Speck™ SoC

Application overview

Speck™ is a dynamic vision system-on-chip (SoC) that integrates dynamic vision sensing and event-driven computing, providing highly integrated, real-time, and low-power dynamic vision solutions for edge perception and computing applications.

The Speck™ SoC includes hardware acceleration for highly efficient impulse neural networks (SNNs), enabling human-machine interaction and intelligent systems, such as a network of lighting and entry/exit gates and human flow calculation based on a human detection SNN model for side or top surveillance. Speck™ is an ultra low-power and ultra low-latency SoC with milliwatt-level power consumption and millisecond response times. Additionally, it provides dynamic recognition without compromising privacy.

SynSense empowers partners with its dynamic recognition technology, ultra low-power consumption, ultra low-latency, and inherent privacy. The solution also supports the implementation of human flow counting and monitoring functions based on recognition results, providing comprehensive support to customers in the smart home and security industries.

Applications

Household
Smart door
Smart home

Commercial
Clients flow monitoring
Security monitoring

Specifications

Circuit	Asynchronous digital circuit
Neurons	320,000
Integration	19,800/mm^2

Resolution	128*128
Dynamic range	90dB
Power consumption	<5mW

Key benefits

Ultra low cost
System cost <$7

Fast response
Response time <50ms (typical applications)

Dynamic recognition
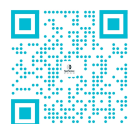On-chip inference

Highly integrated
On-chip integration of sensors and processors
High neuron density

Ultra-low power consumption
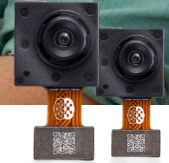Power consumption <5mW (typical applications)

No privacy violation
Pure end-to-end computing of data streams: no data transfer to the cloud

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Front face recognition solution based on Speck™ SoC

Application overview

Speck™, a dynamic vision SoC integrating sensing and computing, enables efficient sensing and real-time detection of moving objects, with milliwatt-level ultra-low power consumption and millisecond-level ultra-low latency. This technology brings more intelligent and convenient interaction methods to end user devices and a better user experience.

The dynamic vision sensor (DVS) embedded in Speck™ captures visual information that changes in real-time, such as suddenly appearing faces, hands covering eyes, and waving hands.Using spiking neural networks (SNNs), Speck can efficiently analyze dynamic visual information and perform detection and recognition of target objects, such as object classification, gesture recognition. All this can be done with milliwatt-level ultra-low power consumption and millisecond-level ultra-low latency.

The face detection model for Speck™ supports face detection within 0.4-0.8 meters and can be used in interactive scenarios such as smart toys and smart mirrors, allowing users to engage in handsfree human-machine interaction.

Specifications

Circuit	Asynchronous digital circuit		Resolution	128*128
Neurons	320,000		Dynamic range	90dB
Integration	19,800/mm^2		Power consumption	<5mW

Applications

Smart door locks **Smart toys** **Smart refrigerator** **Smart mirror**

Key benefits

Ultra low cost
System cost <$7

Fast response
Response time <50ms (typical applications)

Highly integrated
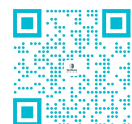On-chip integration of sensors and processors
High neuron density

Ultra-low power consumption
Power consumption <5mW (typical applications)

Privacy
Pure end-to-end computing of data streams:
no data transfer to the cloud

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Finger gesture recognition based on Speck™ SoC

Application overview

Speck™ is a system on chip (SoC) providing a dynamic visual solution that merges sensing and computing into a single platform. With ultra-low power consumption in the milliwatt range and ultra-low latency in the millisecond range, Speck™ can capture, recognize, and analyze target behaviors in real-time. This translates to a more intuitive and seamless interaction experience for end devices, significantly the enhancing user experience. In addition, the integration of sensing and computing improves data security and privacy by eliminating the need for data transfer to the cloud.

SynSense's Speck™ SoC includes a programmable spiking neural network (SNN) accelerator, enabling efficient inference for improved human-machine interaction. One example is the rock-paper-scissors gesture recognition algorithm, which facilitates gesture interaction between people and Speck™ smart gaming devices.

With its dynamic recognition technology, ultra-low power consumption, ultra-low latency, and inherent privacy, SynSense provides a comprehensive solution for partners in the toy and gaming industry.

Specifications

Hardware parameters

Circuitry	Asynchronous digital circuit
Resolution	128*128
Neurons	320,000
Integration	19,800/mm^2

Application parameters

Illumination range	30lux - 3,000lux
Dynamic range	90dB
Power consumption	<5mW (typical)

Applications

Game console
Game pads
Handheld game consoles

Smart toy
Interactive toys

Key benefits

Ultra low cost
System cost <$7

Fast response
Response time <50ms (typical applications)

Highly integrated
On-chip integration of sensors and processors
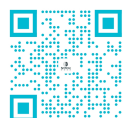High neuron density

Ultra-low power consumption
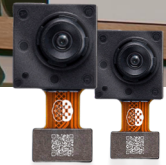Power consumption <5mW (typical applications)

Privacy
Pure end-to-end computing of data streams: no data transfer to the cloud

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Gesture recognition based on Speck™ SoC

SynSense

Application overview

Speck™, a dynamic vision SoC integrating sensing and computing, can capture, recognize and judge dynamic gestures with ultra-low latency with the milliwatt level power consumption, enabling efficient and accurate gesture recognition applications.

Speck™ enables handsfree gesture recognition for applications such as handsfree gesture recognition for smart home applications, smartphones, smartwatches, and more.

Simple gestures enable easy and convenient handsfree control for a range of applications.

Specifications

Hardware parameters

Circuit	Asynchronous digital circuit
Resolution	128*128
Neurons	320,000
Integration	19,800/mm^2

Application parameters

Recognition distance	0.3m - 1m
Illumination range	10lux - 3,000lux
Dynamic range	90dB
Power consumption	<5mW

Applications

Smart home

Environment: Air conditioners, curtains, lamps and lanterns
Multimedia: TV, audio
Furniture: Toilets, cabinets, etc.

Smart toy

Remote control cars
 Drones / flying machines
Interactive dolls

Smart cockpit

Audio
Air conditioning
Lighting

Electronics

Computers, pads

Key benefits

Ultra low cost
System cost <$7

Fast response
Response time <50ms (typical applications)

User friendly
Good adaptability to different gesture rates and ranges, with few user limitations

Highly integrated
On-chip integration of sensors and processors
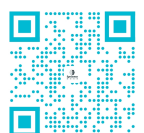High neuron density

Ultra-low power consumption
Power consumption <5mW (typical applications)

Privacy
Pure end-to-end computing of data streams:
no data transfer to the cloud

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