Infineon System Offering for
– AR devices / Smart Glasses

Rick Zhang

Infineon System Level Solution in AR Devices / Smart Glasses

Sensing

- XENSIV MEMS Mic & IVS
- Magnetic & Pressure Sensing
- ToF 3D Image Sensor REAL3™
- Radar for gestures

Processing

- PSOC™ Edge AI/ML MCU
- Computer Vision, Speech/Audio, & Sensing AI capabilities

Connectivity

- Ultra-Low Power Wi-Fi 6/6E/7
- BLE 5.x, 6.x, incl. High Data Throughput (HDT)
- RF Switch, LNA
- Ultra-Low Latency HID

Human Machine Interfacing

- CAPSENSE™ wear detection + Touch UI
- Magnetic Sensing Joysticks eliminate drift & dead zone

Display Technology

- MEMS Mirror + Driver IC for Laser Beam Scanning Display
- PSOC™ Edge AI/ML MCU w/ display driving capability

Security

- AI model protection w/ PSA L4
- Authentication and System security
- OTA
- eSIM

Power & USB

- Si, SiC, GaN from microamps to megawatts
- USB-C PD
- FETs & ESD

Wireless Connectivity

AIROC™ CYW55571/0 is right fit for AR devices / Smart Glasses

55573/2	55571/0	55513/2/1	55533/2/1	55913/2/1
2x2 80MHz	1x1 80MHz	1x1 20MHz	1x1 20MHz	1x1 20MHz
Tri-band / Dual-band 2.4/5 GHz	Tri-band / Dual-band 2.4/5/6 GHz	Tri-band / Dual-band 2.4/5/6 GHz	Tri-band / Dual-band 2.4/5/6 GHz	Tri-band / Dual-band 2.4/5/6 GHz
Max. Phy Tput: 1200Mbps	Max. Phy Tput: 600Mbps	Max. Phy Tput: 143Mbps	Max. Phy Tput: 143Mbps	Max. Phy Tput: 143Mbps
PCIe, SDIO	PCIe, SDIO	SDIO/GSPI	USB/ SDIO/GSPI	SDIO/GSPI
Hosted Wi-Fi	Hosted Wi-Fi	Hosted Wi-Fi	Hosted Wi-Fi	Wi-Fi Connected MCU
Bluetooth 5.3 (Hosted BT/LE Audio)	Bluetooth 5.3 (Hosted BT/ LE audio)	Bluetooth 5.4 (Embedded BT/LE Audio)	-	Bluetooth LE 5.4
FCBGA, WLCSP, WLBGA	FCBGA, 12 x 12 mm WLCSP, 5.32 x 5.67mm **WLBGA, 5.32 x 5.67mm**	WLBGA	WLBGA	WLBGA
MP Now	MP Now	MP Now	MP Now	MP Now

- **Integrated with iPA, iLNA, PMU to save BOM cost**
- **Small form factor**

CYW5557x Feature Overview

Applications

Smart speaker, surveillance cameras, gaming console, High-definition speaker, security hub, industrial gateway , VR/AR, AI enabled devices

Features

Wi-Fi/WLAN Features
- 802.11b/g/n/ac/ax compliant, Tri-band (55571), Dual-Band (55570)
- 5/6 GHz: 20/40/80 MHz, 1024-QAM, up to 1.2 Gbps data rate
- 2.4 GHz: 20/40 MHz, 1024-QAM, up to 287 Mbps date rate
- 802.11ax STA mode and Soft AP mode
- Supports 802.11d, h, k, r, v, w, ai
- WPA3: AP and STA

Bluetooth® Features
- Bluetooth® 5.3 (BR + EDR + BLE) certification
- All Bluetooth® 5.0 /5.1 / 5.2 optional features
- Dedicated Bluetooth® path for best Coex performance

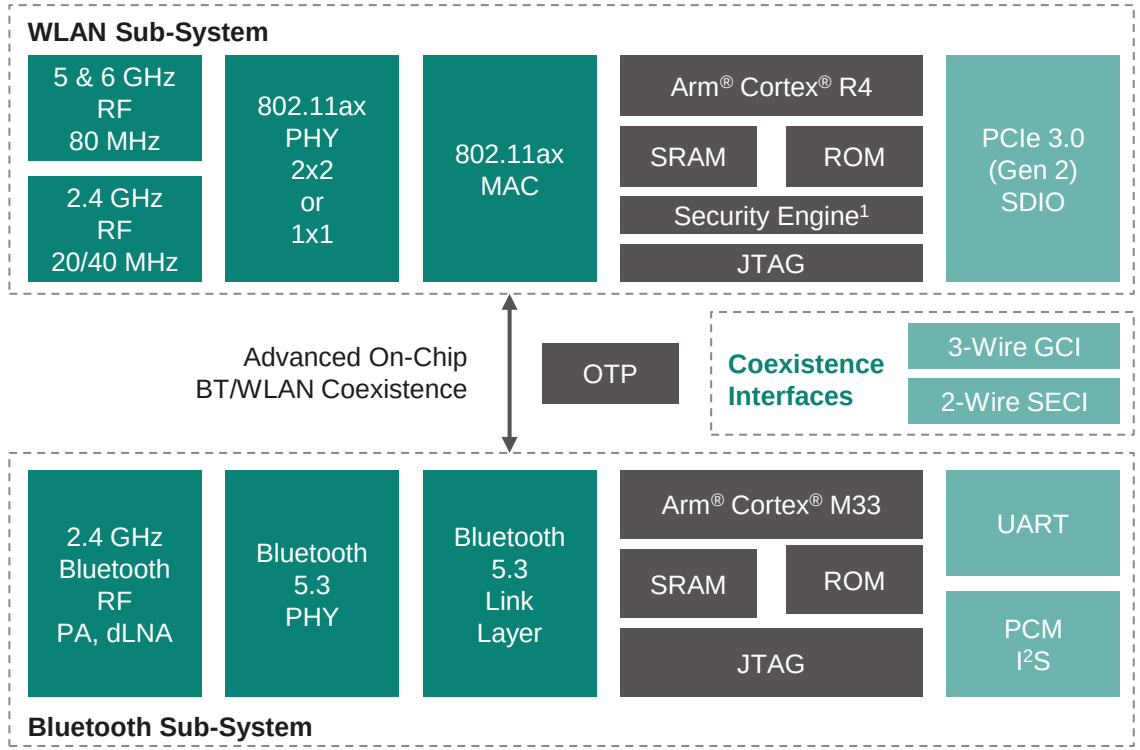
Interfaces
- PCIe Gen2 (3.0 Compliant), SDIO for WLAN
- HCI-UART, PCM/ I2S for BT

Coexistence
- Built-in advanced algorithms for Bluetooth®/WLAN coexistence
- 2-wire SECI for external third-party Bluetooth®/GPS/LTE/802.15.4 radios

Package
- FCBGA: 0.65 mm ball pitch
- WLBGA: Small form factor (0.35 mm ball pitch)

Temperature: -40°C to 85°C

Wireless Connectivity Family | 55573/2/1/0



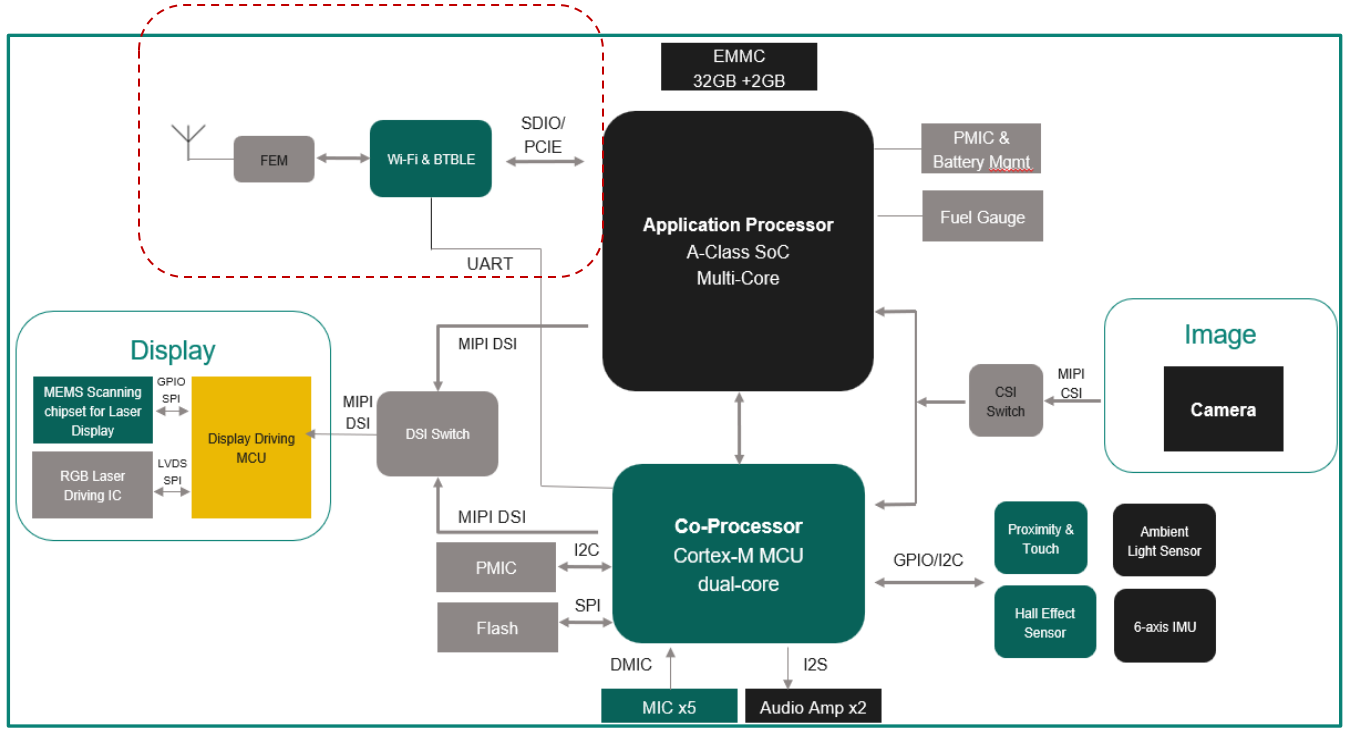
Availability

Samples: Now

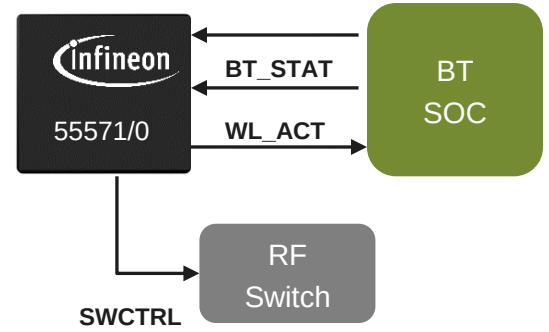
Production: Now

AR devices / Smart Glasses with CYW55571/0

1x1 80MHz Full Speed & Ultra-Low Power < 150mA



- 80MHz, 1x1 SISO
- Tri-bands 2.4/5/6GHz
- Max 600Mbps
- PCIe, SDIO
- Bluetooth 5.3



CYW55571/0 & BT SOC PTA (3 wire)

Condition – 100% Tx			Tx Power(dB)	Current Avg(mA)
11ax	5G	HE80	13	149
			10	139
			5	132
			0	128

Requirements

- HT80 for high throughput (400Mbps) for photo/video from AR to Smartphone
- Wi-Fi connection for live video streaming and big file transfer
- Low power consumption

CYW55571 Strength

- CYW55571 with 5dB, HT80 full speed @132mA which is 42% better than competitors (~230mA or even higher).

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Getting Started

Web Pages	– Wi-Fi 6/6E (802.11ax) – CYW55571, CYW55572, CYW55573
Development Kits, Module Partners, and Software	– Embedded Artist – Sona™ IF573 – Linux / Android Driver Download
Sales Enablement Collateral	– AIROC™ CYW5557x Presentation – AIROC™ CYW5557x Product Brief – Datasheet by request on: MyCases
Developer Community (For Technical Support)	– AIROC™ Wi-Fi and Wi-Fi Bluetooth Combos Forum
Other	– Module Selector Guide – Module Partner Catalog: Azurewave, Laird, Murata, USI

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Processing - PSOC Edge

PSOC™ Edge maximizes AI workloads running in low power domain; Roadmap enables Smart Glasses & Light AI w/o A-Class

PSOC™ Edge E84 - INNOVATION FOR AI Glasses

- **Ultra-low power,** "always-on" analog for Activity Detection **(60uW)**
- Audio pre-processing, VAD, Wake Word Detection in **low power compute domain (600uW)**
- **High performance compute** featuring **M55/U55** deliver AI/ML-based Computer Vision, Speech, Audio
- Deliver **Multi-Mic ML Voice**, **Object/Person Identification**, **SLAM** at the edge
- Scalable memory offering up to **6 MB RAM** to manage **multiple AI/ML models simultaneously**
- Highly **secure** platform from industry's leading embedded security supplier with **PSA L4 security**

System Power Modes: Active/Sleep | DeepSleep | Hibernate

High Performance CPU System

Compute Memory ML DSP

Arm® Cortex®-M55, Ethos™-U55, 50-400 MHz		
Helium™ DSP	FPU	MPU
NVIC	32 kB I-Cache	32 kB D-Cache
HPDMA	256 kB I-TCM	256 kB D-TCM

Up to 5 MB SRAM | 512 kB RRAM

Low Power CPU System

Compute Memory ML DSP

Arm® Cortex®-M33, 50-200 MHz		
NNLite	DMA	64 kB ROM
	1 MB SRAM	16 kB I-Cache

External Memory

2x Serial Memory IF, xSPI/Hyperbus, On-the-fly Encrypted XIP

2x SD Host Controller (SD/SDIO/eMMC)

ML Enhanced Next Gen HMI

Local Voice	Keyword Spotting	Vision
Cloud Voice	Wake Word Detection	Friction Free Interface and Safety
	2.5D GPU	

Peripherals & IO

12b ADC * 5/0.2 Msps	11x SCB (UART,I²C,SPI)	MIPI-DSI/DBI
2x 12b DAC	1x SCB (I²C,SPI)	10/100 Ethernet
2x 4b Prog. Ref.	2x TDM/I2S	2x CAN FD
2x PTCOMP	1x I3C	2x Smart IO
2x LPCOMP	6x PDM	USB HS/FS w/ PHY
4x Amplifiers	32x TCPWM	

Secure Enclave 25.4k Pts

Secure Key Storage	Side Channel Resistance
TRNG	Crypto Accel.
OTP	Secure JTAG
Secure Boot	Tamper Protect

System Resources

Power Mgmt Clock Mgmt

Sleep Control	Clock Control
POR BOD	PILO IHO
LVD	WCO ECO
Reset Control	3x DPLL
Retention LDOs	WDT | RTC
Active LDOs	3x LPTimer
Buck Converters	16x HFCLK DIV

* 5 Msps in Active/Sleep, 200 ksps in DeepSleep

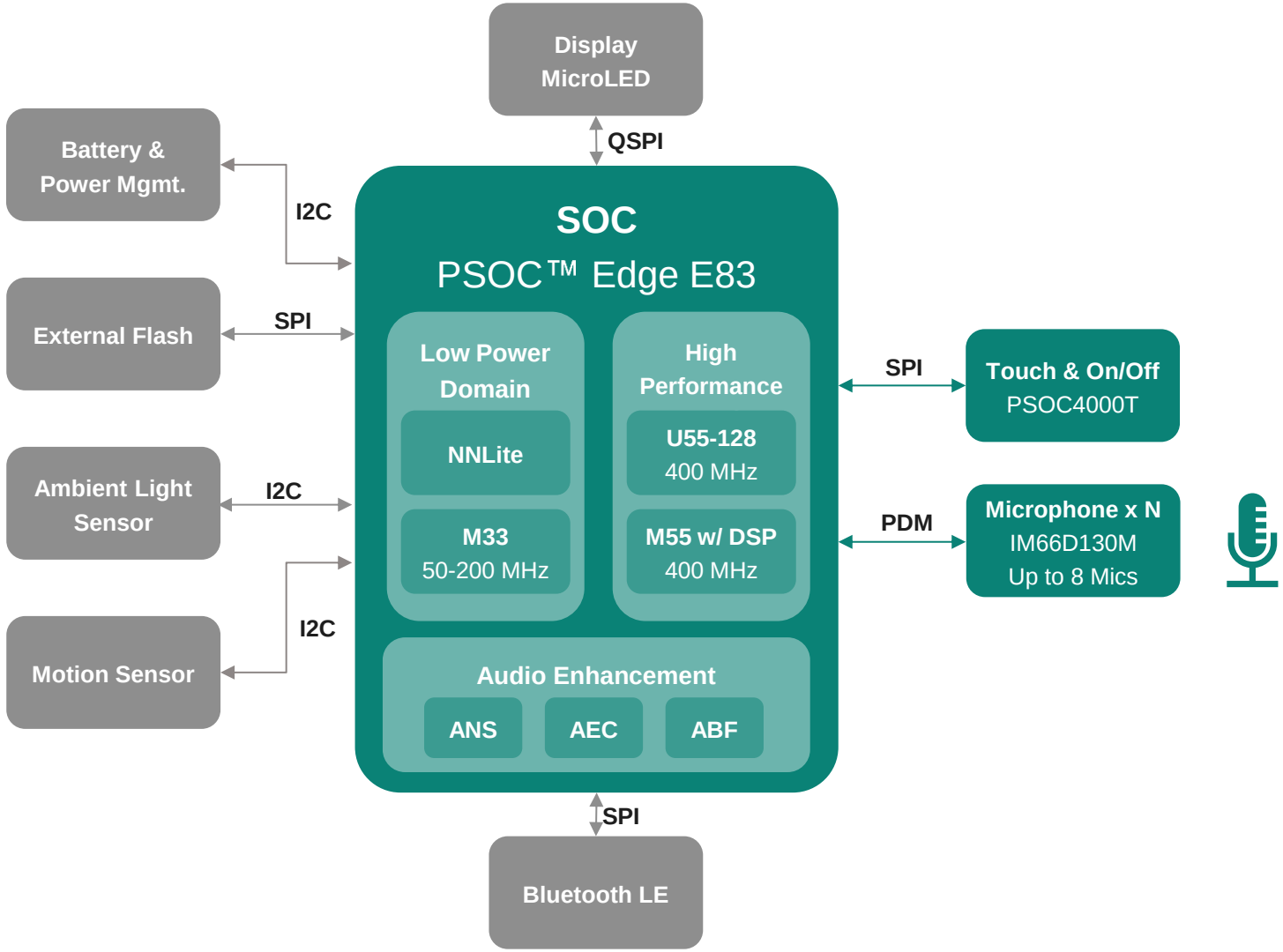
PSOC™ Edge Roadmap - INNOVATION FOR AI Glasses

- Adds **camera interface, & video subsystem** to enable single-chip **Smart Glass SoC**
- **20-40% improvement** for AI/ML workloads delivered by **U85-256**
- **Power & performance optimization** with innovative **DC-DRAM** memory architecture.
- Expanded memory up to 64MB to manage **more AI/ML models, Small Language Models**
- **Soundwire (SWI3S)** interface to reduce wires/complexity/weight, **improve hinge robustness**

Key Components of Audio Focused Smart Glasses (w/o Wi-Fi)

Emphasis on Infineon components

Functional Block Diagram



Insights

PSOC™ Edge E83 SOC:

- **Ultra-low power**, always-on analog for Activity Detection
- Audio pre-processing, VAD, Wake Word Detection in **low power compute domain**
- **High performance compute** featuring M55/U55-128 deliver AI/ML-based Audio, Speech, and DSP
- Corresponding software including **Low Power Wake Word Detection, Voice Assistant, Audio Enhancement, and Voice ID**
- First PSA L4 microcontroller in market

PSOC™4000T CAPSENSE™:

- Integrate on/off detection + Touch User Control in single device
- User Control – on/off, play/pause, volume, etc
- Scan-for-touch (or proximity) in deep sleep without core activation - < 6 uA
- Incredibly robust to environmental conditions – hair, water, sweat
- Ultra compact package – 1.96 x 2.05 WLCSP

IM66D130M MEMS Microphone:

- Low IDD 550/175, high AOP 130 dBSPL, 66 dB SNR
- Available in ultra compact package – 3 x 2 x 0.98 mm
- Infineon Vibration Sensor (IVS) for bone conduction audio without background noise

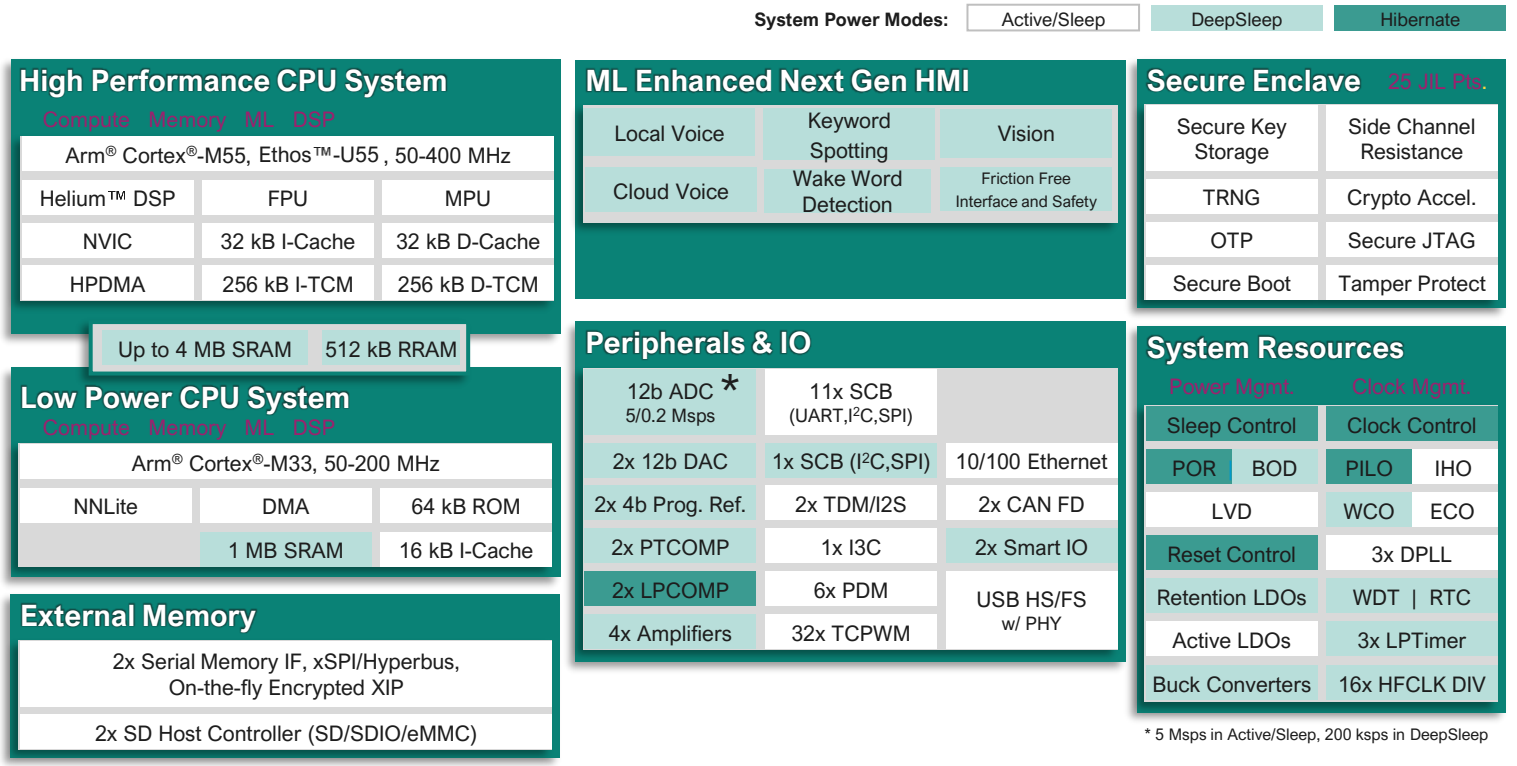
PSOC™ Edge E83: Next Gen, Low Power ML MCU with Voice/Vision

Well-suited for audio-rich Smart Glasses

Features

- **High performance real-time compute domain**
  - Cortex®-M55 w FPU + Helium DSP + Ethos-U55 for ML
  - Up to 4 MB System SRAM, 256 KB I&D TCMs
  - 512 kB RRAM
- **Low power compute domain**
  - Cortex®-M33 and DSP + IFX NNLite for ML
  - 1 MB SRAM
- **HMI**
  - Traditional MCU HMI
  - Local voice, cloud voice
  - Vision for friction free interface & safety
- **ML**
  - Low power voice / audio leveraging NNLite NPU
  - Advanced ML leveraging U55
- **Peripherals & IO**
  - USB, 10/100 Ethernet, CAN, SPI, UART, I2C, I3C, I2S
  - Ultra-low-power always-on analog
- **Security**
  - Secured Enclave @ 25 JIL pts, fit for ARM PSA L4

Target Applications: Wearables, AR & Smart Glass, Appliances, Thermostats, Residential AC, Speakers



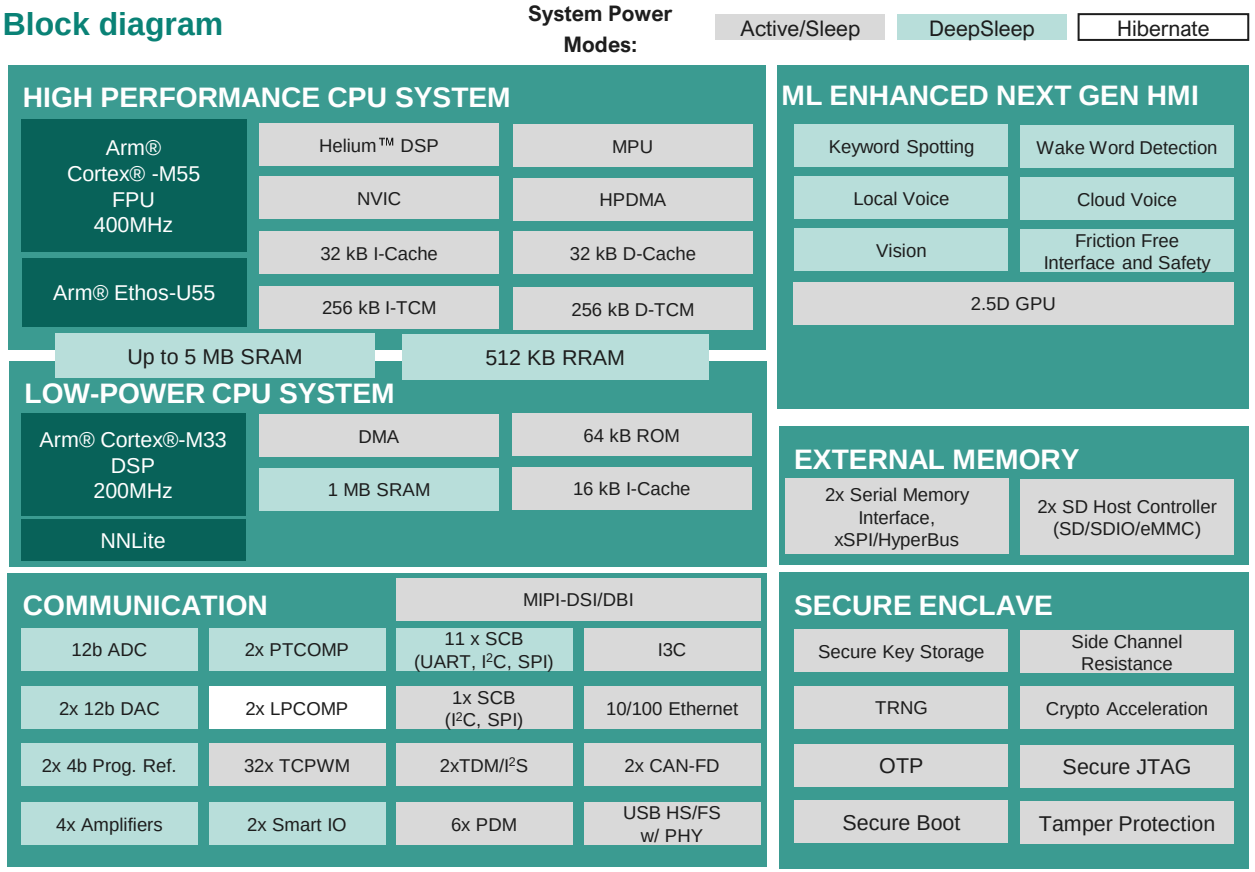
* 5 Msps in Active/Sleep, 200 ksps in DeepSleep

Availability: ES: Now MP: 3Q 2025

PSOC™ Edge E84

Next Generation, Low-Power ML MCU Adds Graphics

Block diagram



Status/Availability

- **In Development, prelim. DS available**
- **Samples & EVK** available (Edge E84)
- **Qualified samples** Q2 2025
- **SOP:** Q2 2025

Packages

WLB154
(4.3x5.3mm, 0.35mm)

eWLB235
(7x7mm, 0.4mm)

BGA220
(10x10mm, 0.65mm)

Applications and Target Markets

- Smart Home, Appliances, Residential AC, Wearables, Industrial HMI, Smart Speakers, etc.

Product Highlights

- **High performance, real-time compute domain:**
  - Cortex®-M55 w FPU + Helium™ DSP + Ethos-U55 for ML
  - **Up to 5 MB System SRAM**, 256 KB I&D TCMs
- **Low power, real-time compute domain:**
  - Cortex®-M33 and DSP + IFX NNLite for ML
  - 512 KB RRAM, 1 MB SRAM
- **HMI:**
  - Traditional MCU HMI
  - Local voice, cloud voice
  - Vision for friction free interface & safety
  - **Low power Graphics, up to 1024x768, MIPI-DSI/DBI**
- **ML:** Advanced ML leveraging Ethos-U55 and NNLite
- **Peripherals & IO:**
  - USB, 10/100 Ethernet, CAN, SPI, UART, I2C, I3C, I2S
  - Ultra-low-power always-on analog
- **Security:** Secured Enclave @ 25 JIL pts, fit for ARM PSA L2/L4

Operating Range

- -20 to 85°C Ta (Consumer), -40 to 105°C Ta (Industrial)

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HMI - PSoC 4000T Capsense

Infineon CAPSENSE™ enables sleek AR & Smart Glass form factors, stylish & indistinguishable from everyday eyewear

Reliable wear detection with robustness against **temperature & humidity drifts**

Inductive switch to enable **temple folding detection**

CAPSENSE™ slider or touchpad with in-built gestures, robust to **water, sweat, and wet hair**

Inductive force switch for waterproof, contactless operation

CAPSENSE™ touch button with tap, double tap, triple tap functionality.

FUNDAMENTAL INNOVATION FOR AR/VR

Small form factor to fit in the glass frame (25-WLCSP)

Ultra low power – scan for touch & proximity without core activation (< 6uA)

Highly robust to environmental conditions – water, sweat, & hair

Best-in-class SNR improves proximity detection, touch experience, & material forgiveness

Built-in configurable gesture engine supporting tap, double tap, directional swipes

Proven use in numerous leading AR & Smart Glass designs

Inductive Sensing provides both force switch & on/off switch functionality

PSoC™ 4000T - Lowest power touch and proximity, best-in-class SNR provides differentiated sensing capabilities

Applications

Touch controller for Wearable, Hearable, Smart devices and other consumer applications

Features

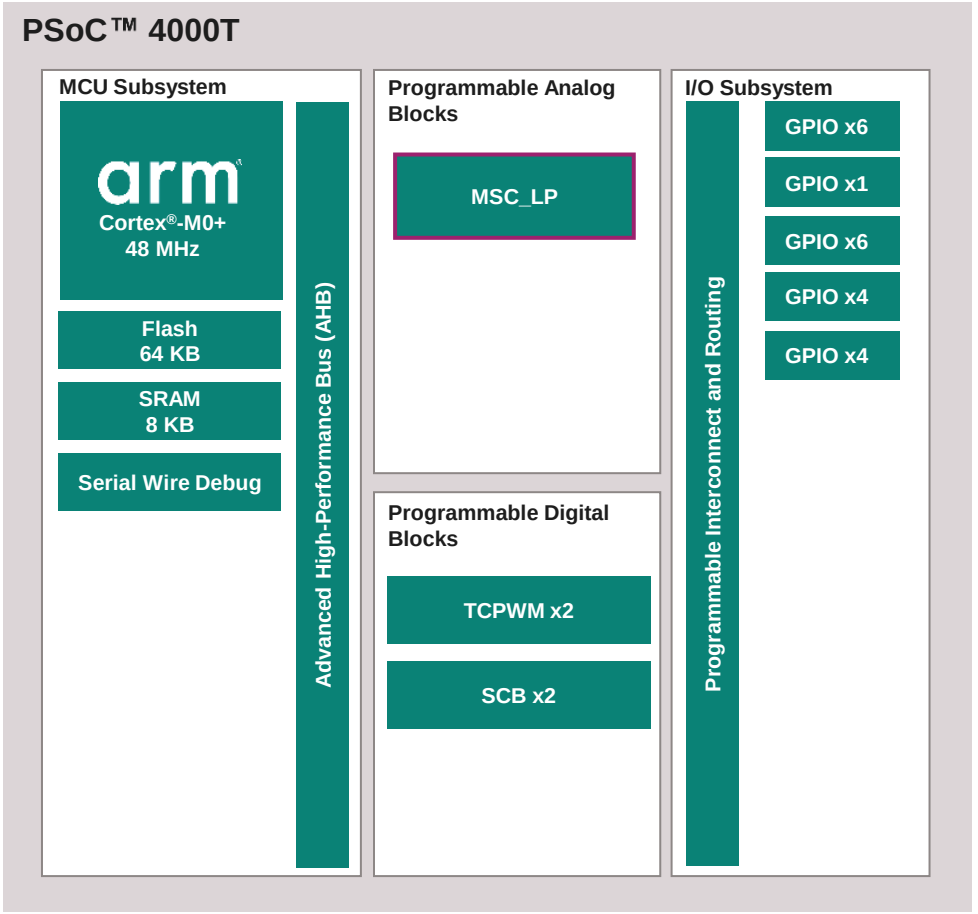
32-bit MCU Subsystem
- 48-MHz Arm® Cortex®-M0+ CPU
- 64 KB flash and 8 KB SRAM

MSC (Multi-Sense Convertor) with next-generation CAPSENSE(TM)®
- 5th Generation CAPSENSE™ sensing block
- "Always-ON" sensing enabled ultra-low power technology
- Supports self-cap, mutual-cap and inductive sensing technologies
- Supports up to 16 sensors

Programmable Digital Blocks
- Two 16-bit timer/counter/pulse-width modulator (TCPWM) blocks
- Two serial communication blocks (SCBs) that are configurable as I^2C, SPI, or UART

I/O Subsystem
- Up to 21 GPIOs, including 16 sensors

Packages
- 25-WLCSP, 24-QFN, 16-QFN



Collateral

Github BSP: https://github.com/Infineon/TARGET_CY8CKIT-040T

Availability

Sampling: NOW
Production: NOW

CAPSENSE™ Technology comparison 4th Gen vs. 5th Gen

Parameter	4th Gen (PSoC 4000S)	5th Gen (PSoC 4000T)	Comment	Conditions
Sensing Methods	Self, Mutual, Inductive		-	All 3 sensing methods in one device
Supply voltage	1.71 to 5.5 V		-	
Signal to Noise ratio	30:1	**450:1**	**15x Better**	4 sensors, 5pF, 128 Hz
Proximity Sensing Range	30 cm	**45+ cm**	**50% Better**	20 cm sensor loop/diameter
Average current – WoT	50 uA	**6 uA**	**88% Lower**	1 sensor, 10 Hz
Average current – Active1	2000 uA	**200 uA**	**90% Lower**	13 sensors, 5pF, 128 Hz
Average current – Active2	800 uA	**90 uA**	**88% Lower**	4 sensors, 5pF, 128 Hz
Noise Immunity – Power supply transient noise	< 26 %	**1%**	**25x Better**	VDD = 5v
Noise Immunity – CMN noise	< 15%	**5%**	**3x Better**	VDD = 5v

**Competitor product performance is comparable to 4th Gen benchmarks above

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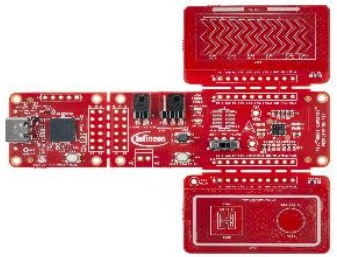
PSoC™ 4000T kits



	PSoC™ 4000T CAPSENSE Evaluation Kit	PSoC™ 4000T CAPSENSE™ Proto kit
Kit MPN	CY8CKIT-040T	CY8CPROTO-040T
Availability	Available now	Available now
KitProg3	Yes	Yes
Autonomous operation without CPU	Yes	Yes
Ultra-low power Always-ON sensing	Yes	Yes
CapSense Buttons	One self-cap CapSense touch button	One self-cap button, one mutual-cap button
CapSense Slider	No	5 segment linear slider, self and mutual sensing capable
CapSense Touchpad	4 x 4 Touchpad, self and mutual sensing capable	No
CapSense Proximity Sensor	Yes, Proximity sensor on PCB around the trackpad	Yes, Proximity sensor on PCB
Liquid Tolerance	Yes, Immersible in liquid, full liquid tolerance	No
Liquid Level sensing	No	No
Expansion connectors	Yes, limited	Yes, Fully flexible proto-typing kit
Best suited for	Liquid tolerant, low power, touch, proximity & trackpad interface on this kit, suited for **live demos**, and showcase 5th Generation CapSense capabilities	Traditional proto-typing kit that is easy to use, connect external sensors on your own hardware and enables quick proof of concept development and evaluation of 5th Gen CapSense

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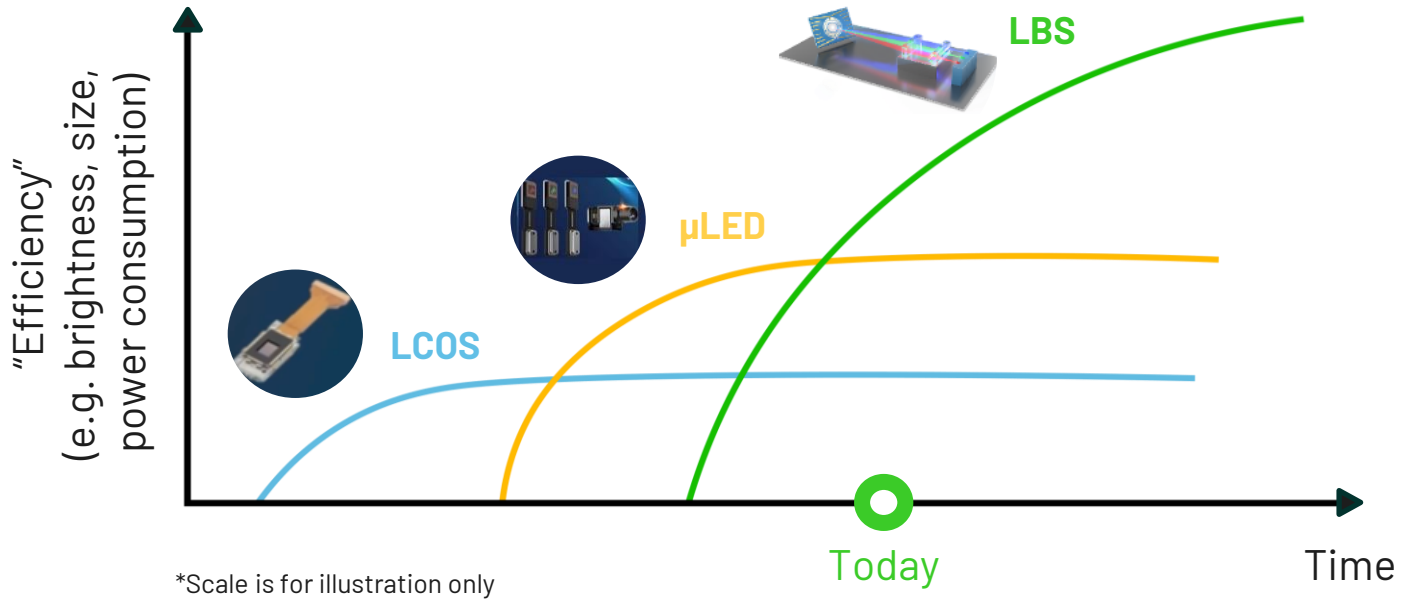
Display for AR Devices – LBS(Laser Beam Scanner)

LBS Display is confirmed by key industry players

Meta's view on AR Display Engines



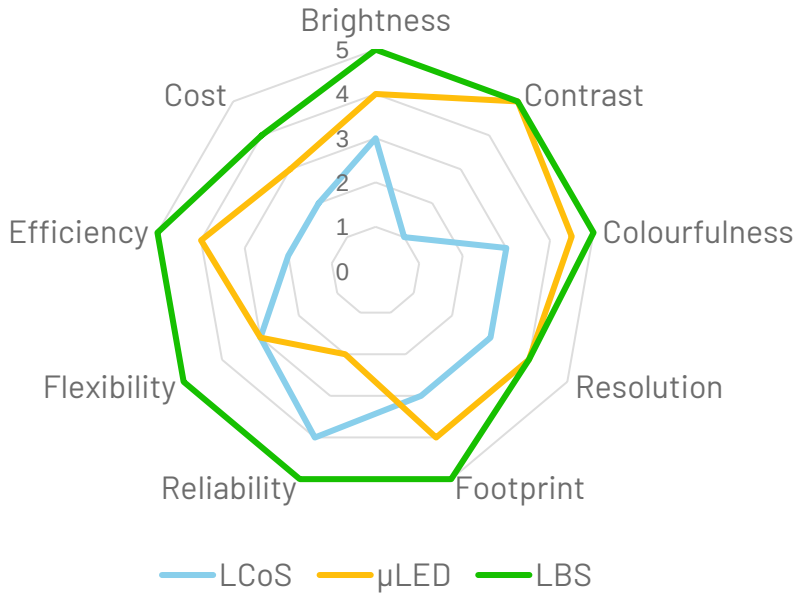
*Scale is for illustration only

Meta

Source: Jason Hartlove, VP of Display and Optics, Meta, SID Display Week 2024.

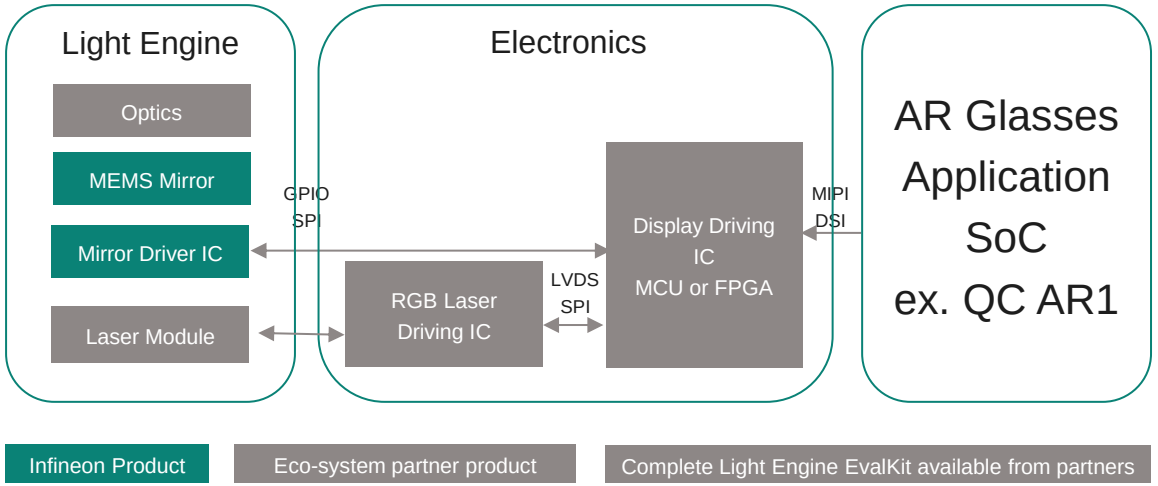
Display Technology Comparison

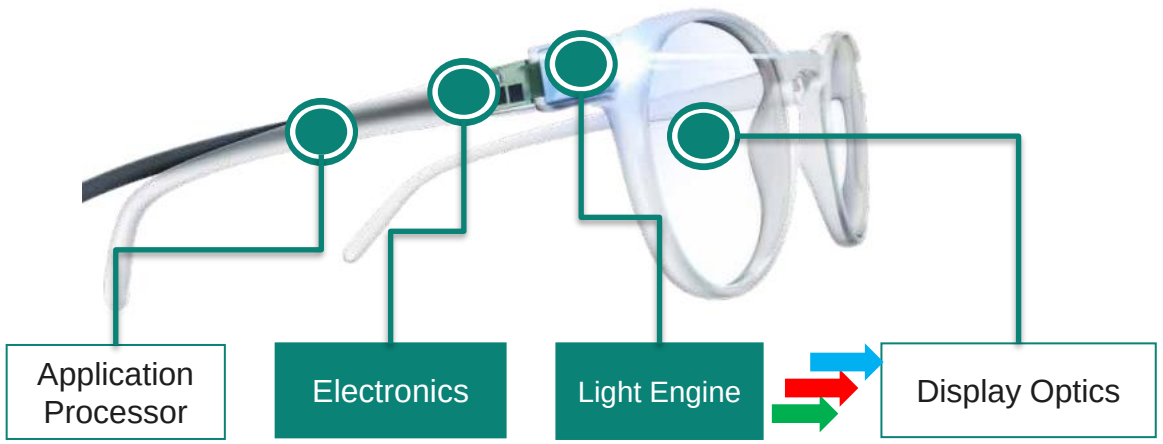
(Results of customer review)



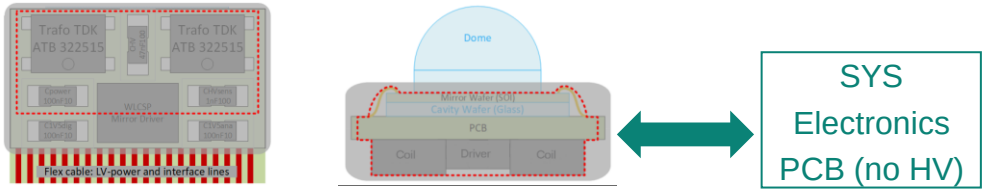
Hermetically packaged MEMS Mirror and WLCSP Driver IC compactly integrate with only 50mW added power consumption

MEMSLBS Display (Light Engine) Block Diagram

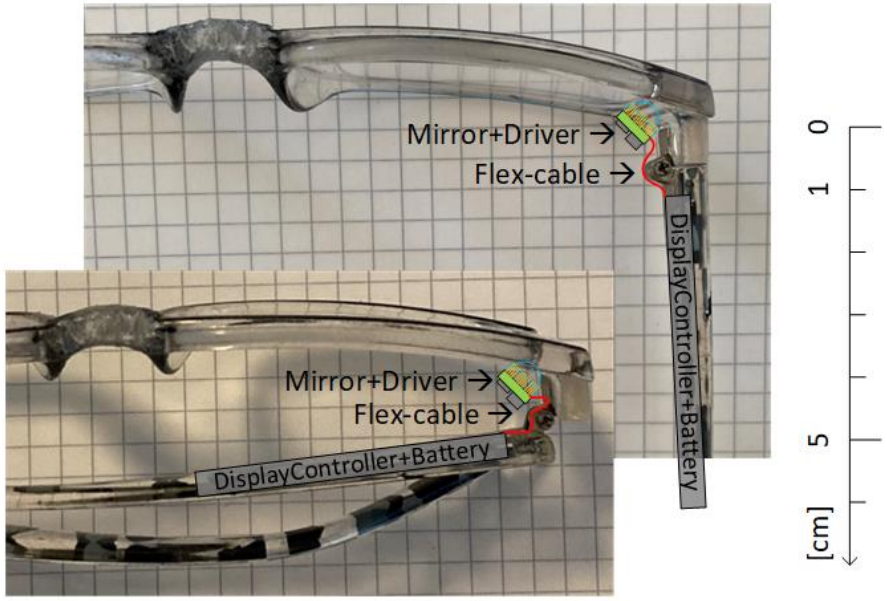




MEMS Scanner Integration

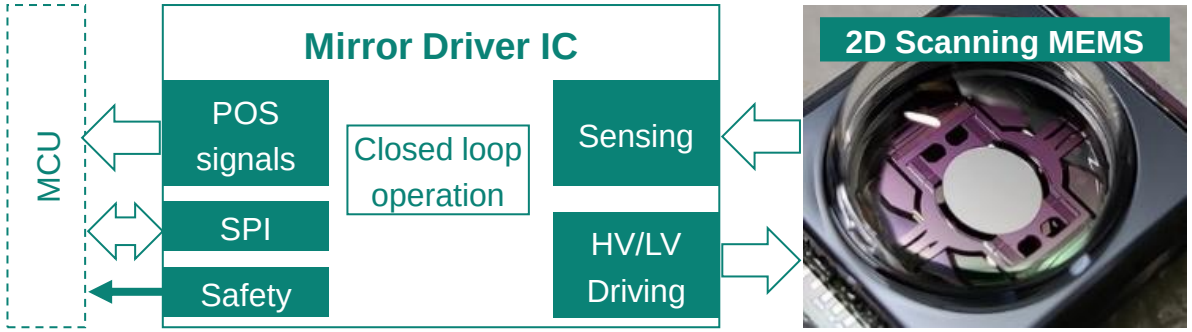


- **Scanner (Mirror + Driver) contribution to power budget ~50 mW**
- Mirror, Driver and respective HV generation circuit are compactly integrated into the Light Engine

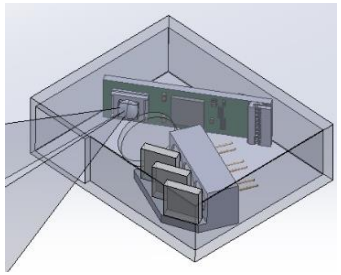


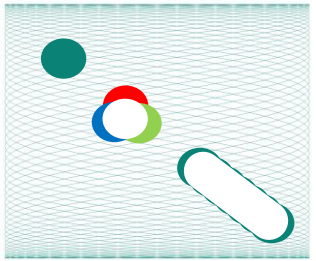
Infineon MEMS Scanning technology for Projection Displays, Ranging and Functional Light applications

Infineon **MEMS Mirror** and complementary **Mirror Driver IC** for **2D Lissajous** Scanning applications



High density scan pattern combined with temporal light modulation allows for projection of **complex light patterns**





- 1.4-1.5mm, 27+kHz, 6-10° amplitude
- Configurable scan pattern density and amplitude
- Vibration, Shock robustness

Displays

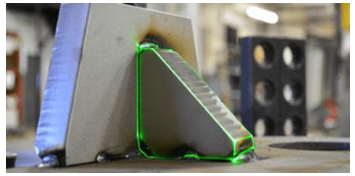
HUD and Side-window displays, AR Glasses, pop-up displays

Lights and Signage

Adaptive spot lights, ambient light, dynamic ground projection

Industrial laser scanners

Laser guide lights, structured light, laser marking

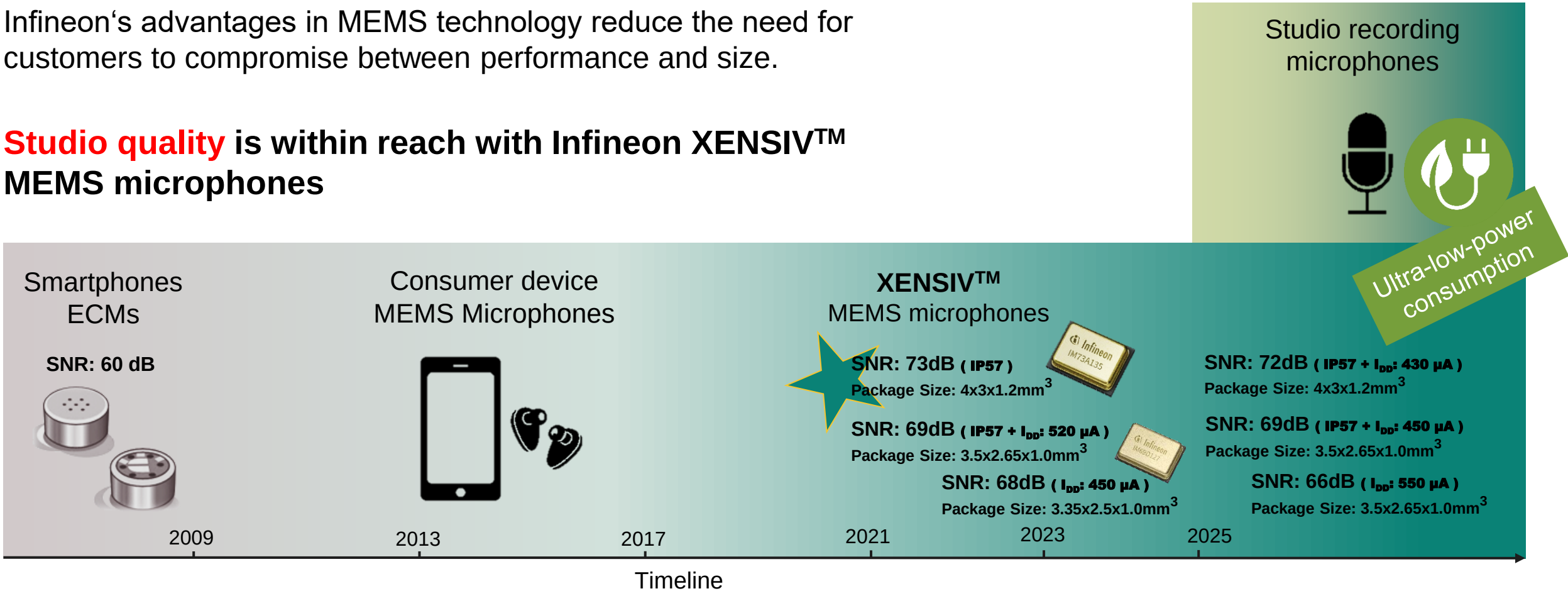


Sensing - Micphone and IVS

Infineon XENSIV™ MEMS microphones bring unprecedented performance to consumer devices at low power

Infineon‘s advantages in MEMS technology reduce the need for customers to compromise between performance and size.

Studio quality is within reach with Infineon XENSIV™ MEMS microphones



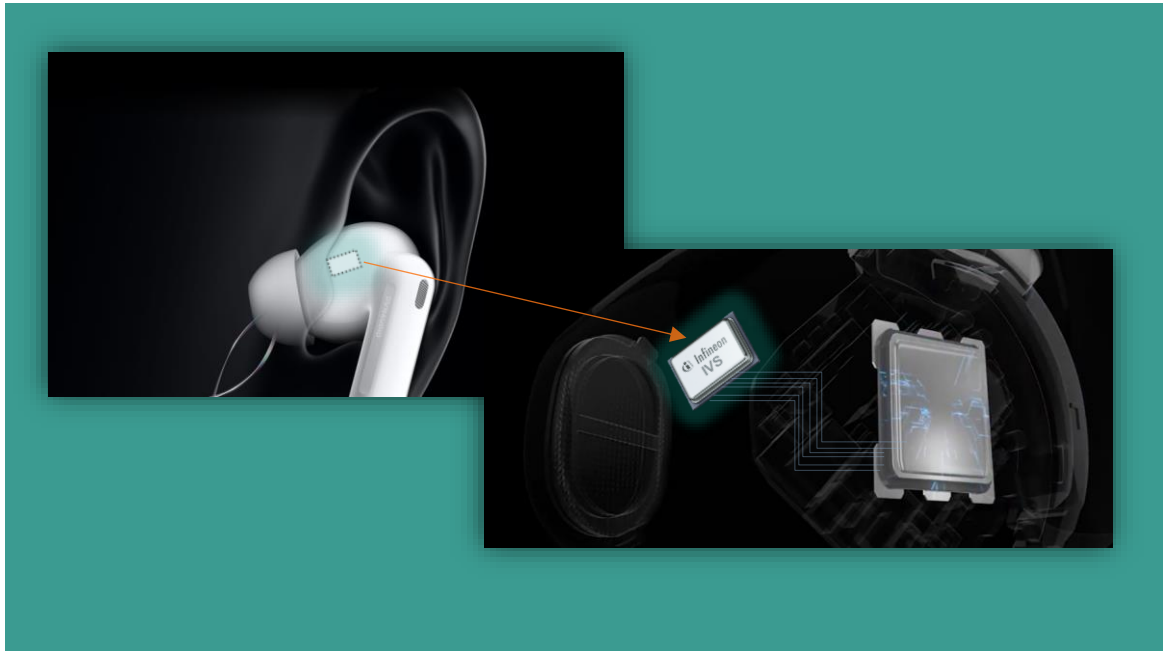
XENSIV™ microphones target mid to high-end consumer devices

Emerging	Use-cases	Microphone requirements	Recommendation
AR, VR , wearables 	– voice calling – voice control – audio recording	– Requires high and low end digital and analog microphones in a very small form factor and with lowest power consumption – Robustness and particle ingress protection	**IM69D128S, IM68D128B, IM66D130M**
Cameras, Surveillance 	– audio recording – far-field audio pick-up	– Requires good to high SNR and high acoustic overload point (AOP) and low power consumption for battery powered devices	**IM73D122, IM70D122, IM69D122J, IM73A135**
Content creation mics 	– high quality audio pick-up – background noise reduction	– Requires high to very high SNR and high acoustic overload point (AOP) and low power consumption for battery powered devices	**IM73A135, IM70A135**
Medical devices 	– vital sensing – sleep diagnostics – digital stethoscope	– Requires high SNR, high sensitivity and low power consumption for battery powered devices	**IM73A135, IM72D128V, IM68D128B**
Industrial applications 	– predictive and preventive maintenance	– Very tight part-to-part phase and sensitivity matching (± 1dB) for multi-mic application – Flat frequency response with a very low LFRO (low frequency roll-off)	**IM72D128V IM73A135 IM69D128S IM68D128B**

Infineon Vibration Sensor – IVS70DP01

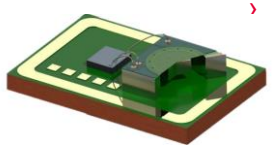
Enables next gen audio pick-up - made for all acoustic environments

Parameters	Prototype (available)	Target (available Q1 2023)
Sensitivity	-20 dBFS/g (PDM digital)	
Bandwidth [Hz]	100 -- 4000	
VDD [V]	1.8	
R- freq. [kHz]	6.8	
SNR [dBA]	70	
Current [µA]	1140	**410**
Target size* [mm³]	3.6 x 2.5 x 1.0	**3 x 2 x 0.87**

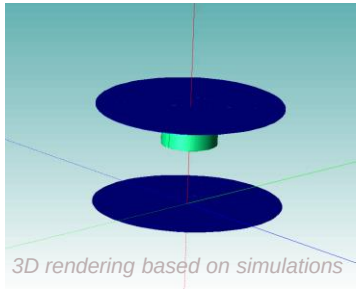


Infineon innovation:

Bone vibration capacitive sensor with proof-mass



- Based on proven Infineon low noise single backplate technology
- Combined with state-of-the art low noise analog and digital ASIC



- Spec review based on your needs
- Early samples and joint testing
- Software and algorithm development with you and/or your partners

First PDM prototype samples available
Product brief available

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