



## Application brief

# Smart speaker

## Design speakers for an intuitive and outstanding user experience

Once a novelty in households, smart speakers are more and more becoming increasingly commonplace. This rapid adoption is accompanied by rising user expectations. Frustration with devices that do not understand or hear commands is, however, leading to lower user adoption. Consequently, growth rates for smart speakers are failing to reach their full potential. Components such as MEMS microphones, touch controllers and new technologies such as radar are key to improving the user experience in the smart speaker segment.

Infineon has long-standing expertise in sensor, connectivity and power solutions that fulfill the consumer market requirements in terms of outstanding performance, reliability and energy efficiency.

### Choose Infineon to meet your application requirements for smart speakers



Best-in-class **voice recognition** and **intuitive sensing**

- › Highly sensitive XENSIV™ MEMS microphones to pick up whispered or far-field voice commands
- › Smart XENSIV™ radar sensors enabling precise object / presence detection



**Connectivity** for highest interoperability and performance

- › Best-in-class interoperability with the most widely deployed wireless IP
- › Ultra-low-power Wi-Fi designed with battery operation in mind
- › Whole home range with high throughput ensures clear audio streaming without audio dropouts anywhere in the home



Outstanding **audio performance**

- › MERUS™ Class D amplifier solutions provide best-in-class audio quality and have the lowest power consumption for extended battery playback time
- › Fewer filter / external components required due to its multi-level design, leading to less heat and overall BOM savings



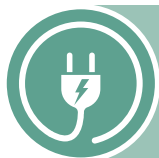
Reliable **touch interaction**

- › State-of-the-art noise immunity with capacitive touch for a reliable and durable speaker HMI
- › Advanced inductive touch sensors enable sleek, futuristic user interfaces with metallic overlays



Secured **cloud service provisioning**

- › Easy and secure provisioning services with OPTIGA™ Trust M to maintain speaker's unique identity and integrity
- › Different products unified under PKI architecture



**Power portfolio** for energy-efficient, space-saving designs

- › Wireless charging solutions for maximum performance, efficiency and safety
- › USB-C PD solutions for standardized power adapters
- › Extensive SMPS power portfolio for energy-efficient, space-saving designs
- › ESD devices for robust protection solutions with outstanding clamping

## Bring your smart speaker to the next level with Infineon's recommended product portfolio

Functional block	Product family	Topology	Product	Benefits
Audio input	Microphones	-	XENSIV™ MEMS micro-phones IM69D130	<ul style="list-style-type: none"> <li>High-performance microphone with low self-noise (high SNR) and low distortion, setting a new performance benchmark for a superior user experience</li> </ul>
Audio output	Class D amplifier	-	MERUS™ class D audio amplifiers MA120xx	<ul style="list-style-type: none"> <li>Cooler, smaller and lighter amplifiers designed to maximize power efficiency and dynamic range while providing best-in-class audio performance in compact form factors for great-sounding audio products</li> <li>Extended battery playback time or the reduction of battery size without compromising on battery playback time to save cost</li> </ul>
Sensing (radar)	Radar sensor	-	XENSIV™ 60 GHz radar sensor	<ul style="list-style-type: none"> <li>Accurate presence detection and vibration detection based on ability to track sub-millimeter motion at high speed and accuracy, both stand-alone chip as well as system solutions available</li> </ul>
Connectivity	Wi-Fi + Bluetooth combos	-	Cypress WICED Wi-Fi + Bluetooth combos	<ul style="list-style-type: none"> <li>Best-in-class interoperability with the most widely deployed wireless IP</li> <li>Whole home range with high throughput for multi-channel audio and RSDB (Real Simultaneous Dual Band) for speaker sub-networks</li> <li>Ultra-low-power technology designed with battery operation in mind</li> </ul>
Sensing (touch)	Capacitive touch sensing controller	-	CAPSENSE™ capacitive touch sensing controller	<ul style="list-style-type: none"> <li>State-of-the-art noise immunity (SNR &gt; 100:1) and water resistance have made CAPSENSE™ the industry leader</li> <li>Advanced inductive touch sensors enable sleek, futuristic user interfaces with metallic overlay</li> </ul>
Security	IoT security controller	-	OPTIGA™ Trust M	<ul style="list-style-type: none"> <li>Easy and secure provisioning services with OPTIGA™ Trust M to maintain speaker's unique identity and integrity</li> <li>Different products unified under PKI architecture</li> </ul>
Power	USB-C PD controller	-	EZ-PD™ USB-C controller	<ul style="list-style-type: none"> <li>USB-IF-certified with market-proven USB PD stack, ensuring spec compliance and interoperability</li> <li>Supports all USB PD profiles commonly used in USB-C power adapters and requires no firmware development</li> <li>A highly integrated solution that minimizes incremental BOM costs</li> </ul>
Power	ESD protection	-	ESD111, ESD245	<ul style="list-style-type: none"> <li>Outstanding low capacitance devices for best signal integrity</li> <li>Robust protection performance due to ultra-low clamping voltage</li> </ul>
Power	Wireless charging	-	15 W inductive wireless power transmitter	<ul style="list-style-type: none"> <li>Powerful and cost-effective wireless charging solutions for high performance, smart and secure charging solutions supported by Infineon's unique wireless power controllers</li> </ul>
Power: SMPS flyback converter	High-voltage MOSFETs	Flyback	700 V CoolMOS™ P7 (standard grade)	<ul style="list-style-type: none"> <li>Best price-competitive CoolMOS™ SJ MOSFET family</li> <li>Lower switching losses than a standard MOSFET</li> </ul>
		ACF, FMCI	600 V CoolMOS™ PFD7	<ul style="list-style-type: none"> <li>Lower <math>Q_{rr}</math>, lower hysteresis loss, low <math>R_{DS(on)}</math></li> </ul>
	Control ICs	QR flyback ICs	ICE5QSAG	<ul style="list-style-type: none"> <li>High efficiency and low standby power</li> </ul>
		FFR flyback IC	XDPS21071	<ul style="list-style-type: none"> <li>High power density and ideal for USB-PD</li> </ul>
Power: SMPS synchronous rectification	Low-voltage MOSFETs	Synchronous rectification	OptiMOS™ PD	<ul style="list-style-type: none"> <li>Low conduction losses and reduced overshoot</li> <li>Logic level switching / S308 / PQFN 3.3x3.3 packages available</li> </ul>
	Control ICs	Synchronous rectification	IR1161LTPBF	<ul style="list-style-type: none"> <li>High efficiency / simple external circuitry</li> </ul>
Power: SMPS load switch	Low-voltage MOSFETs	Load switch	OptiMOS™ 30 V	<ul style="list-style-type: none"> <li>Low conduction losses</li> <li>S308 / PQFN 3.3x3.3 packages available</li> </ul>

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