Scan Here
For additional Materials and Information.

Attracting Tomorrow

TDK

SmartSound™ Overview

Michael Tuttle
Microphone Customer Engineering Manager

michael.tuttle@tdk.com

Corporate Motto

Contribute to Culture and Industry Through Creativity

Corporate Principles

VISION
Always take a new step forward with a vision in mind.
Creation and construction are not born without vision.

COURAGE
Always perform with courage.
Performing power is born by confronting contradiction and overcoming it

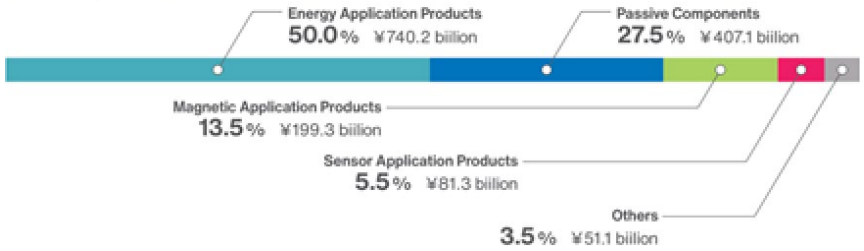
TRUST
Always try to build trust.
Trust is born from a spirit of honesty and service.

General Outline of TDK

As of March 31, 2021

Corporate Name	TDK Corporation
Corporate Headquarters	2-5-1 Nihonbashi, Chuo-ku, Tokyo, Japan
Date of Establishment	December 7, 1935
Securities Traded	Tokyo Stock Exchange (6762)
Consolidated Net Sales	1,479.0 billion yen
Consolidated Net Income	79.3 billion yen
Consolidated Number of Employees	129,284

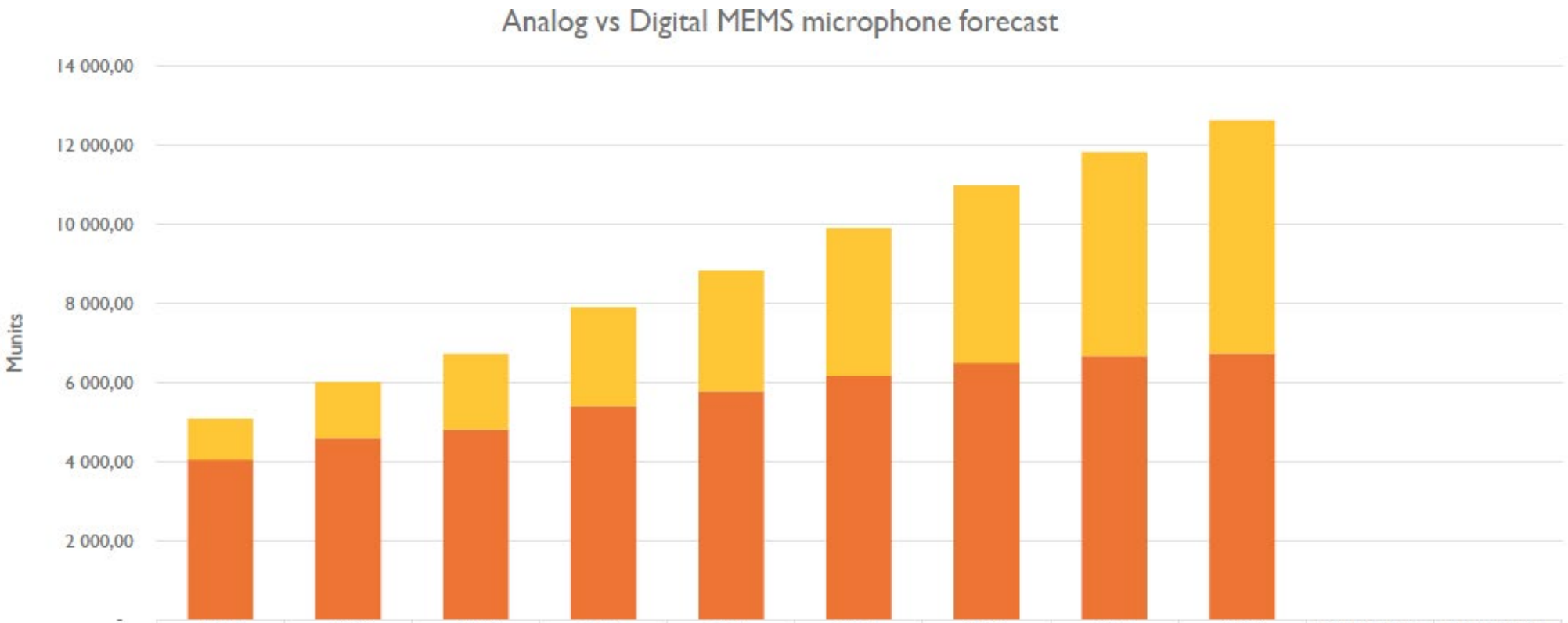
Sales by Product



Main Businesses and Group Companies

Digital Revolution is here

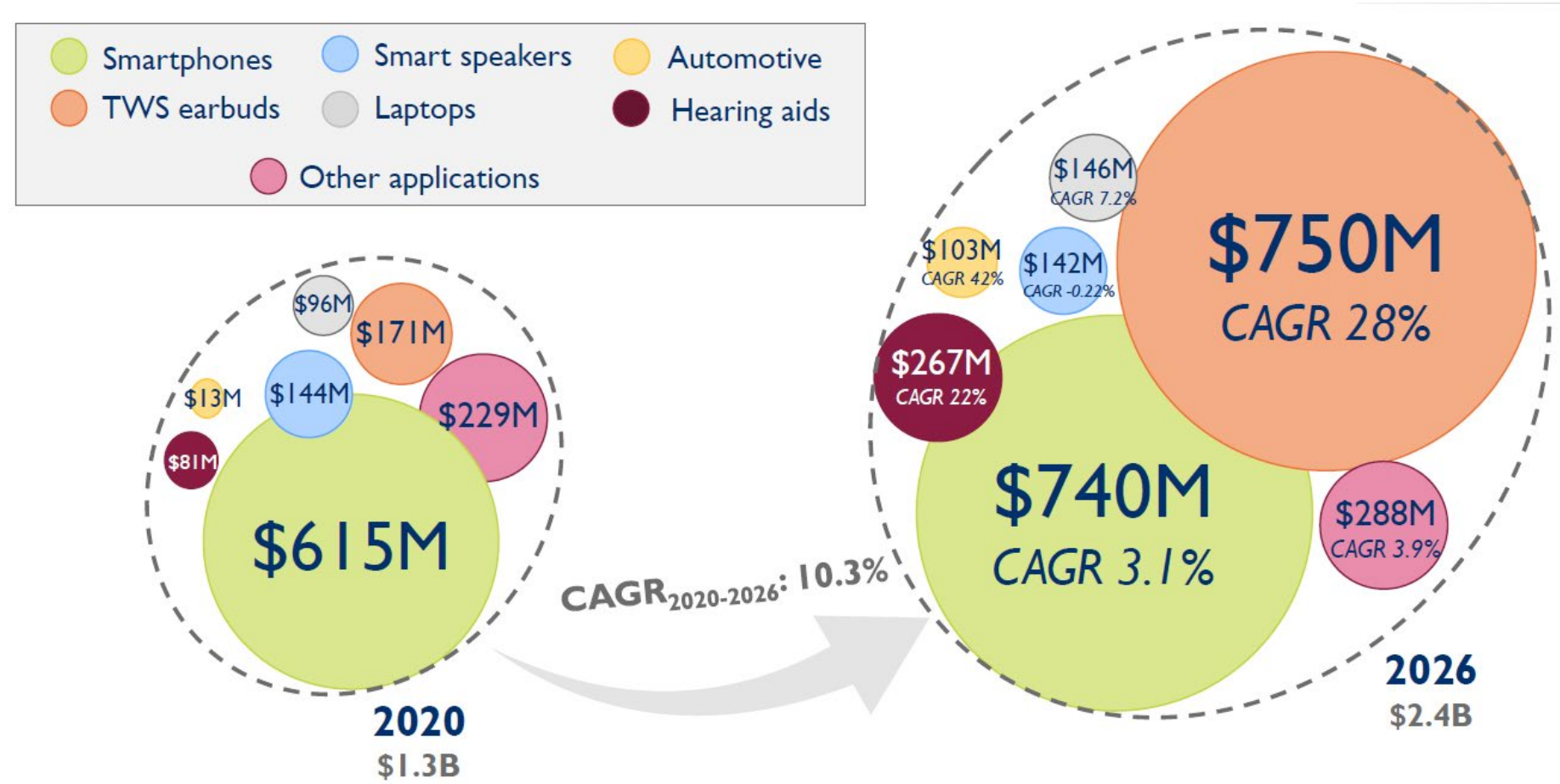
Attracting Tomorrow



	2018	2019	2020	2021	2022	2023	2024	2025	2026	CAGR 19-26	CAGR 20-26
Digital volume	1 036,74	1 423,23	1 918,73	2 493,52	3 059,03	3 738,52	4 490,90	5 151,06	5 902,55	23%	21%
Analog volume	4 040,96	4 591,65	4 807,42	5 399,81	5 770,30	6 169,02	6 486,59	6 667,43	6 731,37	6%	6%

Source: Yole 2021

Growth Drivers



Source: Yole 2021

Automotive Trends: Performance and Robustness

Attracting Tomorrow

Target Applications

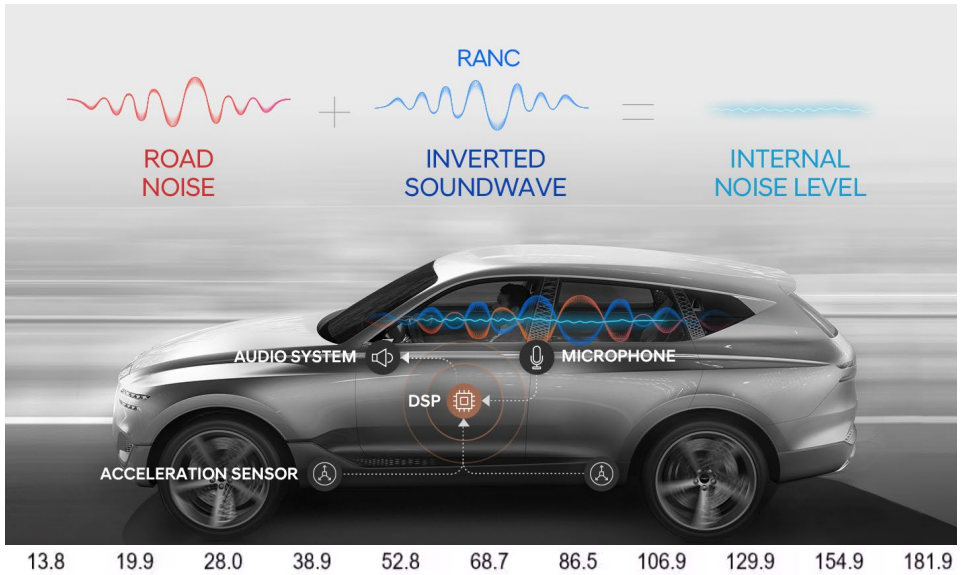
- In-Cabin Noise Cancellation
- Voice Interface for Infotainment
- Hands Free Calling

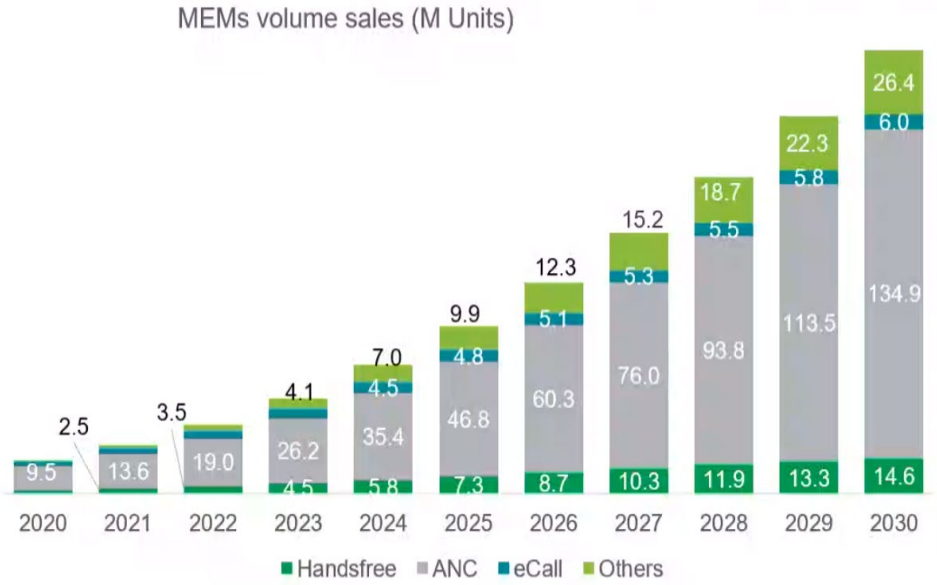
Drive Automotive Performance

- SNR
  - Digital: 68dB
  - Analog: 67dB
- LFRO: < 25Hz
- AOP: > 133dB

Meeting Automotive Standards

- AECQ100-103
- Operating Temp -40ºC to +105ºC
- PPAP support





T58xx Series Microphone
Best uW/SNR in the Industry

T58xx: Scalable Digital Microphone Series

Attracting Tomorrow

T5837	T5838	T5848
(PDM, w/o AAD)	(PDM, AAD)	(I2S, AAD)

T58xx: Value Proposition

Attracting Tomorrow TDK

High SNR
- 68dB

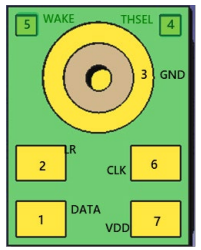
High AOP
- AOP = 133dBSPL
- Wide Dynamic Range = 107dB

Lowest Power
- 330µA HQM (High Quality Mode)
- 130µA LPM (Low Power Mode)

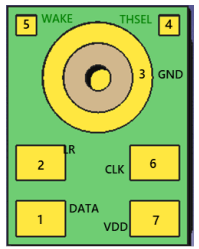
Interfaces
- PDM
- I2S

Acoustic Activity Detect (AAD)
- Wake on Sound
- Wake on Voice

Robust
- CAT
- Air Discharge ESD
- Particle Robustness



T5838 PDM
(AAD pins not connected)

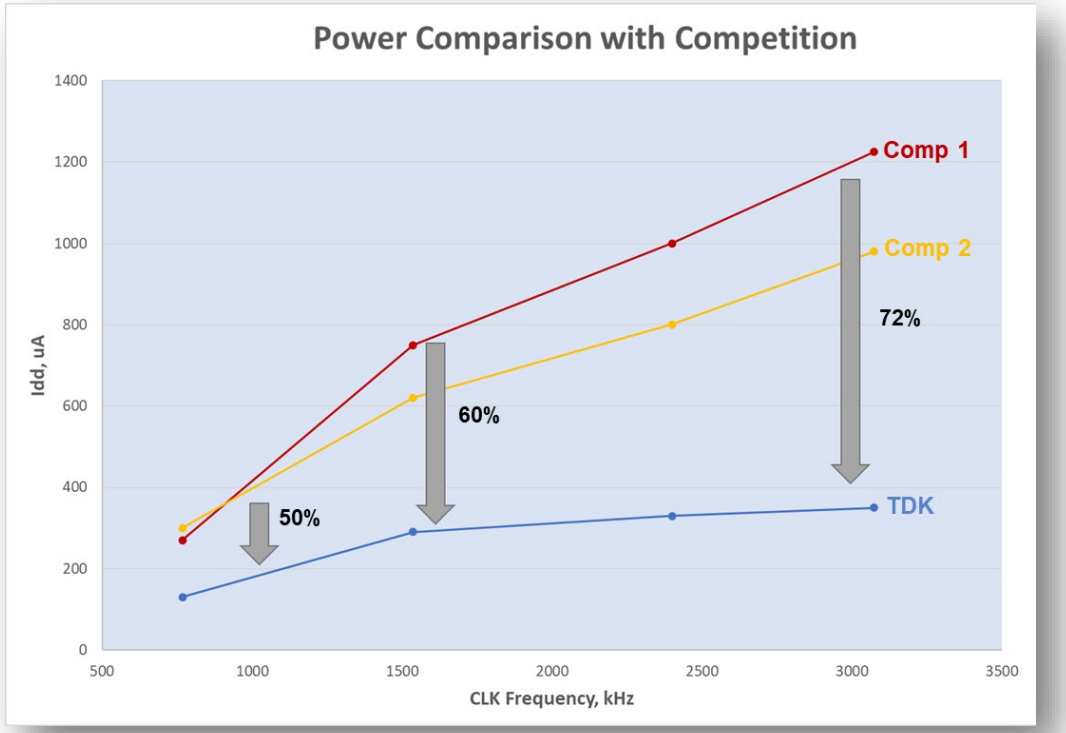


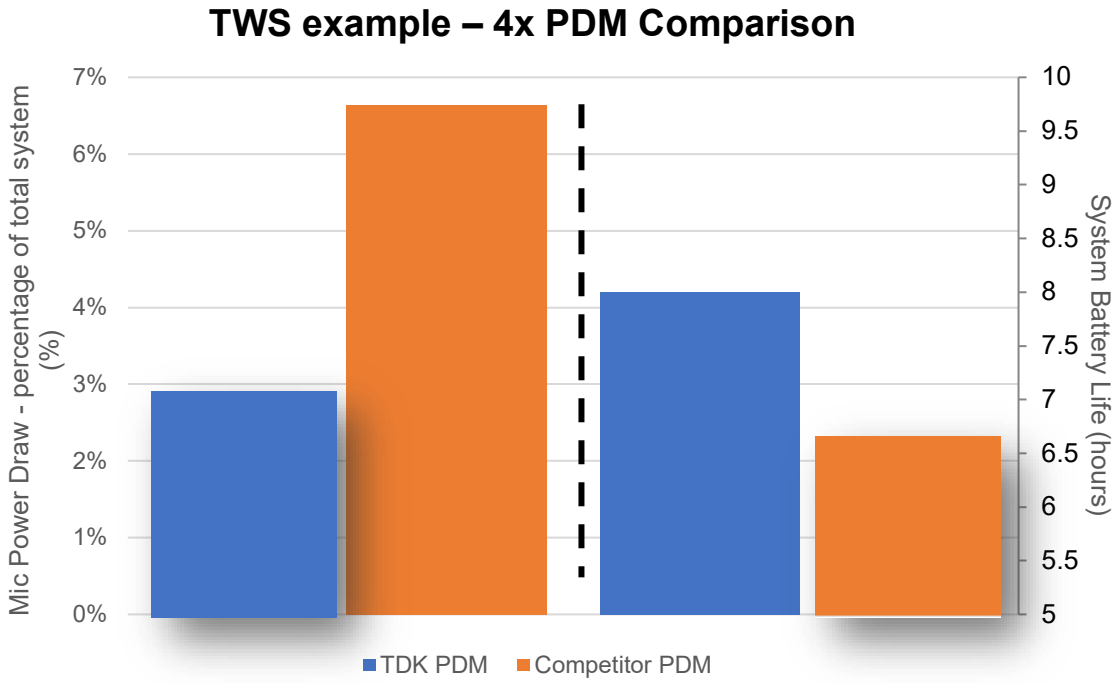
T5838 PDM + AAD
(AAD pins connected)

3.5mm x 2.65mm x 0.98mm

T58xx Series: Lowest Power Digital Microphone

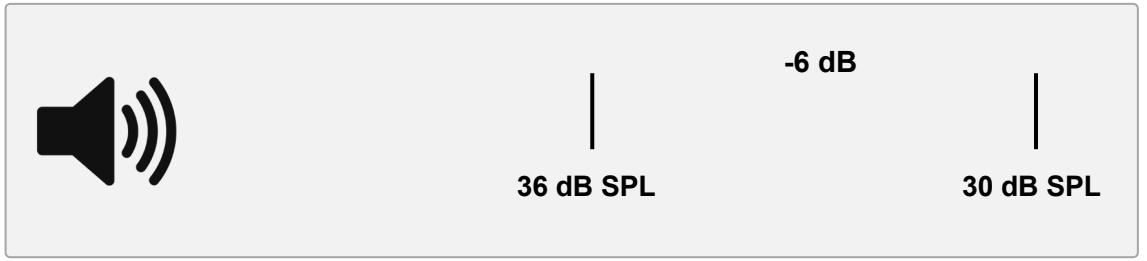
Attracting Tomorrow





T58xx : 68dB SNR

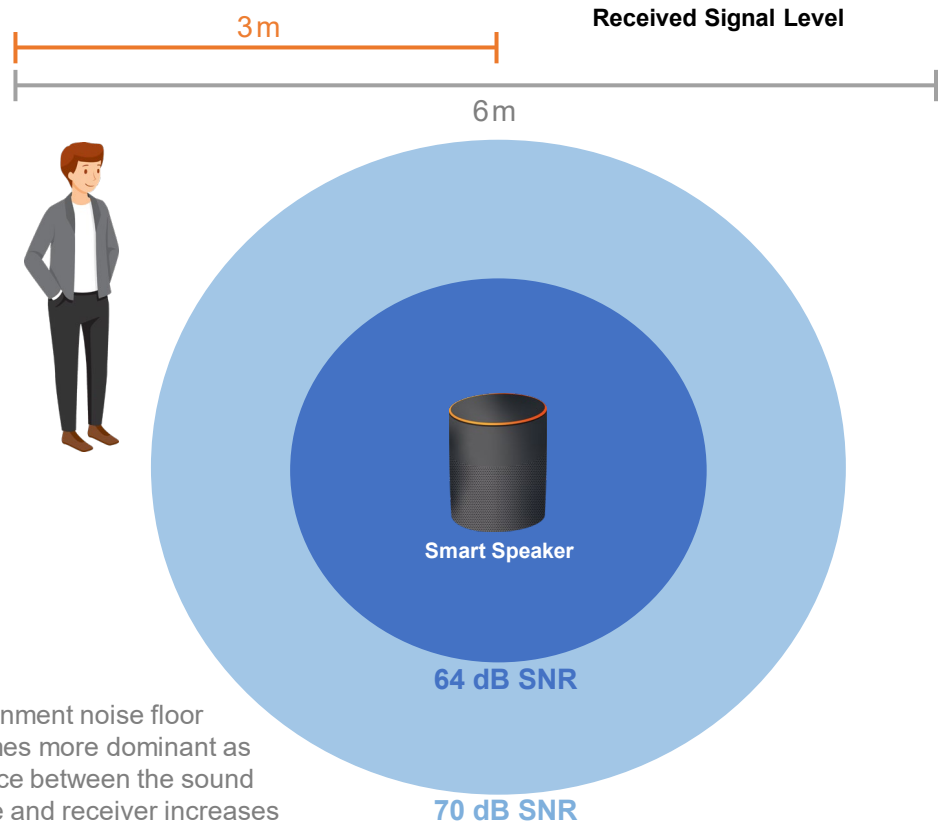
Attracting Tomorrow TDK



High SNR for :
Best performance
and
voice capture

Essential for:
Far field applications and
effectively increases the radius of
speech intelligibility

Digital:
- T5837/38 = 68 dB SNR



- Environment noise floor becomes more dominant as distance between the sound source and receiver increases

T5828/38/48 – Acoustic Activity Detect

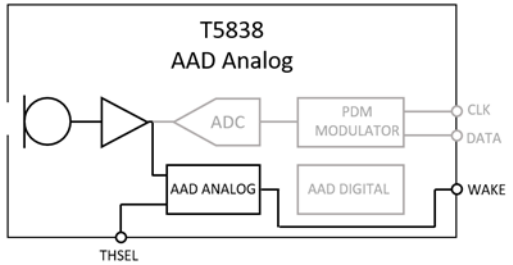
Attracting Tomorrow

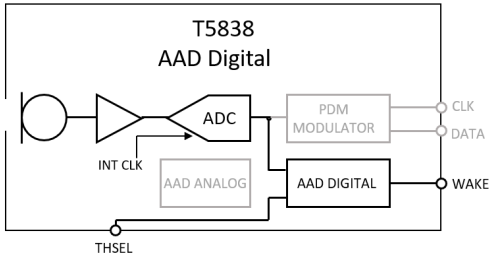
AAD to Conserve Power

- Wake on Sound and Voice via simple interrupt
- Native always-on sensing feature to conserve power

Flexible Configuration

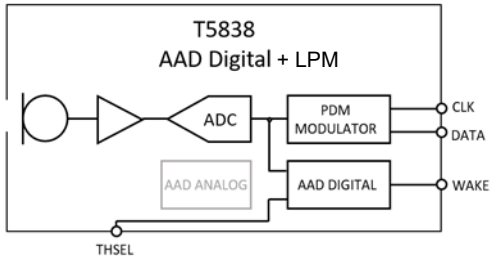
- Three modes of activity detect
- Dynamic configuration via digital I/O - Allow customers to set thresholds and filter settings





Wake on Sound

Wake on Voice



T58xx – Designed for Multiple Applications

Attracting Tomorrow TDK

Smartphones

Low Power True Wireless Stereo / Headsets

Low Power Voice Activated Devices

TV Remote

Smart Speaker

Robotics

Security

Wearables

Tablets

Gaming Consoles

Automotive

T5837 Summary

Ultra-Low Power, High SNR, Multi-Mode PDM Microphone

Attracting Tomorrow

In Production

Specifications

SPEC	HIGH QUALITY MODE	LOW-POWER MODE	ULTRASONIC MODE
Sensitivity	−37 dB FS ±1 dB	−21 dB FS ±1 dB	−37 dB FS ±1 dB
SNR	68 dBA	65.5 dBA	68 dBA
Current	330 µA	130 µA	440 µA
AOP	133 dB SPL	117 dB SPL	133 dB SPL
Clock	2.0 – 3.7 MHz	400 – 800 kHz	4.2 – 4.8 MHz
L.F. Rolloff	28 Hz		
Package	3.5 × 2.65 × 0.98 mm, Bottom Port		

▸ *Datasheet:* ***Contact your sales representative for datasheet***

Applications

- Smartphones
- Smart Speakers
- Headsets
- Voice-Enabled TV Remotes
- Smart TV / Set Top Box
- Wearables

Solution Benefits

- Industry leading low power consumption in high quality mode and low power mode, 50 – 70% lower than competitors
- High SNR and AOP in all operational modes
- –37dBFS sensitivity in HQM for drop-in replacement of other PDM mics

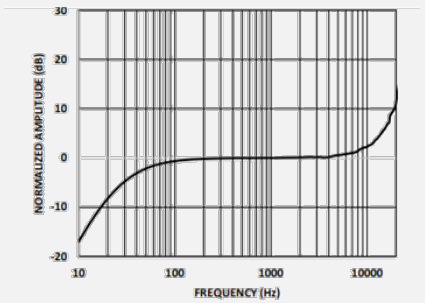


Fig 4. Typical Audio Frequency Response, High Quality Mode

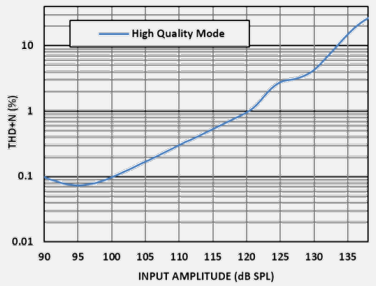
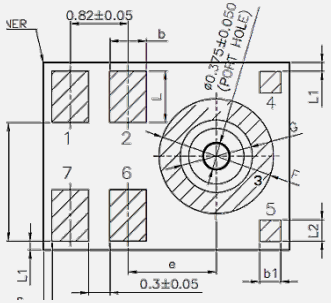


Fig 5. THD + N High Quality Mode



Bottom View

T5838 Summary

Ultra-Low Power, High SNR, Multi-Mode PDM Microphone with Acoustic Activity Detect

Attracting Tomorrow

In Production

Specifications

SPEC	HIGH QUALITY MODE	LOW-POWER MODE	ULTRASONIC MODE
Sensitivity	−41 dB FS ±1 dB	−26 dB FS ±1 dB	−41 dB FS ±1 dB
SNR	68 dBA	65 dBA	68 dBA
Current	330 µA	130 µA	440 µA
AOP	133 dB SPL	119 dB SPL	133 dB SPL
Clock	2.0 – 3.7 MHz	400 – 800 kHz	4.2 – 4.8 MHz
L.F. Rolloff	28 Hz		
Package	3.5 × 2.65 × 0.98 mm, Bottom Port		

▸ *Datasheet:* ***Contact your sales representative for datasheet***

Solution Benefits

- Industry leading low power consumption in high quality mode and low power mode, 50 – 70% lower than competitors
- High SNR and AOP in all operational modes
- Acoustic Activity Detect w/ programmable thresholds & filters with power consumption as low as 20 uA

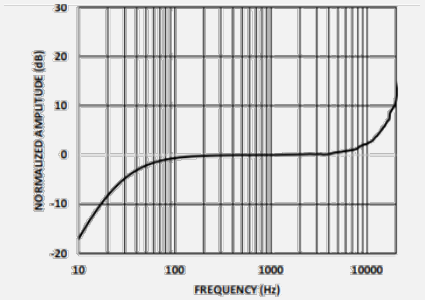


Fig 4. Typical Audio Frequency Response, High Quality Mode

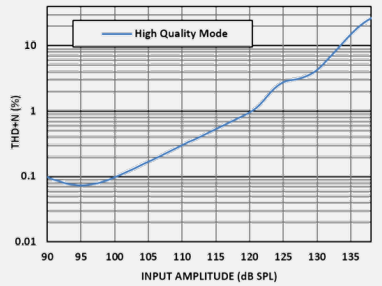
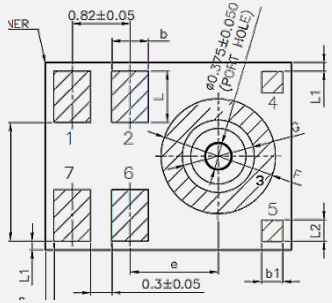


Fig 5. THD + N High Quality Mode



Bottom View

Applications

- Smartphones
- Smart Speakers
- Headsets
- Voice-Enabled TV Remotes
- Smart TV / Set Top Box
- Wearables

T5848

Ultra-Low Power, High SNR, Multi-Mode I2S Microphone

Attracting Tomorrow

In Production

Specifications

SPEC	HIGH QUALITY MODE	LOW-POWER MODE
Sensitivity	−37 dB FS ±1 dB	−26 dB FS ±1 dB
SNR	68 dBA	65 dBA
Current	330 µA	130 µA
AOP	133 dB SPL	119 dB SPL
Clock	2.0 – 3.3 MHz	400 – 800 kHz
Sample Rate	31.25 kHz to 51.56 kHz	8.33 kHz to 16.66 kHz
L.F. Rolloff	28 Hz	
Package	3.5 × 2.65 × 0.98 mm, Bottom Port	

▸ *Datasheet:* ***Contact your sales representative for datasheet***

Applications

- Smart Speakers
- Headsets
- Voice-Enabled TV Remotes
- Smart TV / Set Top Box
- SmartWatch / Wearables
- Machine Monitoring

Solution Benefits

- Industry leading, first high SNR and high dynamic range I2S output microphone, High SNR and AOP in all operational modes
- Ultra low power consumption in high quality mode and low power mode, 50 – 70% lower than competitors
- I2S output allows direct connection to a wide variety of SoCs, MCUs
- Acoustic Activity Detect w/ programmable thresholds & filters with power consumption as low as 20 uA

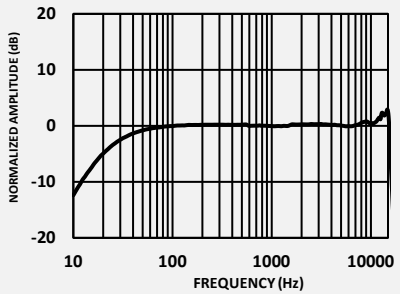


Fig 4. Typical Audio Frequency Response, High Quality Mode

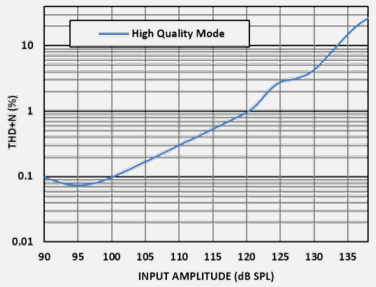
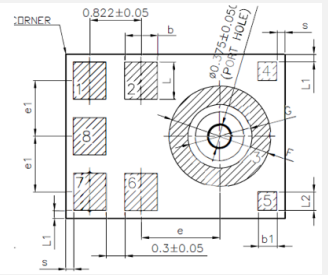


Fig 5. THD + N High Quality Mode



Bottom View

Get Early Access

- Go to https://invensense.tdk.com/smartsound/ for more info
- Samples are available
- Evaluation board with Flex PCB is available
- Datasheets are available
- Characterization data is available

Thank You!

For additional resources, and to download a copy of this presentation, please scan the QR code to the right.