

Attracting Tomorrow



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PiezoListen™ – a new kind of piezo speaker for new applications

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Integration of audio everywhere



Dashboards with built-in speaker functionality

New ultra-thin speaker solutions enhance existing applications and enable completely new acoustic solutions



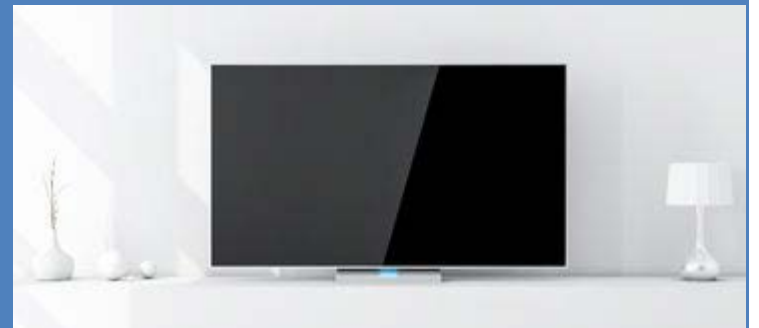
Compact wide-range audio for mobile devices



Mirrors as multimedia displays and speakers



Kitchen appliances and surfaces with integrated audio



TV screens that double as tweeters

Advantages of ultra-thin speaker solutions

Use displays to produce sound

Facilitate dust- and waterproofing

Feature long lifetime



Enable flexible acoustic design without changing exterior design

Enhance user experience by combining audio and video with ultra-thin speakers

Enable stylish and futuristic designs

Ultra-thin speakers will enable integrated multimedia in a wide range of applications

TDK's approach to integrated multimedia applications

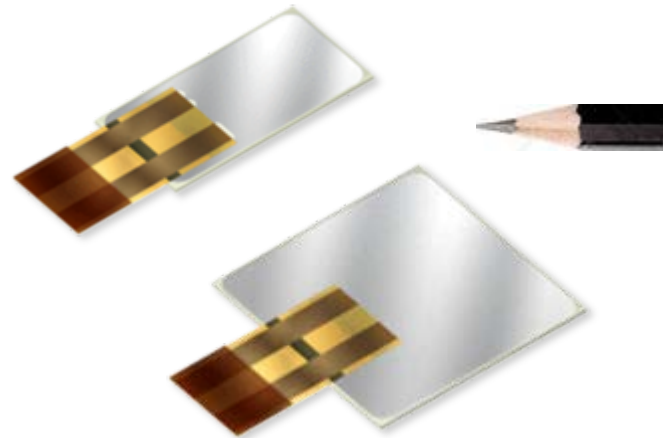
Realistic sound experience

- Enhanced acoustics in combination with conventional speakers
- Sound generated from the entire display, screen or other surfaces

Piezo speaker characteristics

- High sound pressure and wide frequency range.
- High quality speaker based on optimized materials and structures

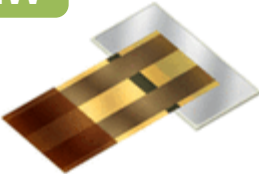

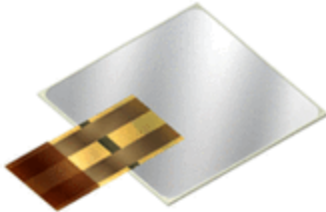

Ultra-thin piezo actuator based on advanced multilayer technology



Everything is a speaker!

- Any surface can be a speaker without changing the design
- Easy to integrate without sound emission holes
- Ideally suited for integrated multimedia applications

PiezoListen™ types for many applications

TYPE	<div>NEW</div> 	<div>NEW</div> 		<div>NEW</div> 
	PHUA2010	PHUA3015	PHUA3030	PHUA6630
Class	Speaker for ICT devices and positioning tweeter		High power, wide range for automotive, TV, displays and other surfaces	
Frequency range [Hz]	1000 to 20,000		400 to 20,000	
Footprint [mm]	20 x 10	30 x 15	30 x 30	66 x 30
Thickness [mm]	0.49	0.49	0.49	0.76
Max. Input voltage [V _{p-p}]	24 (±12)	24 (±12)	24 (±12)	48 (±24)
Capacitance [μF] (1 kHz, 1 V)	1 ±15%	2.3 ±15%	4.8 ±15%	7.8 ±15%
Output power [W _{rms}] (1 kHz, V _{max})	0.6	1.4	2.7	14.8

Unbeatable form factor and integration benefits

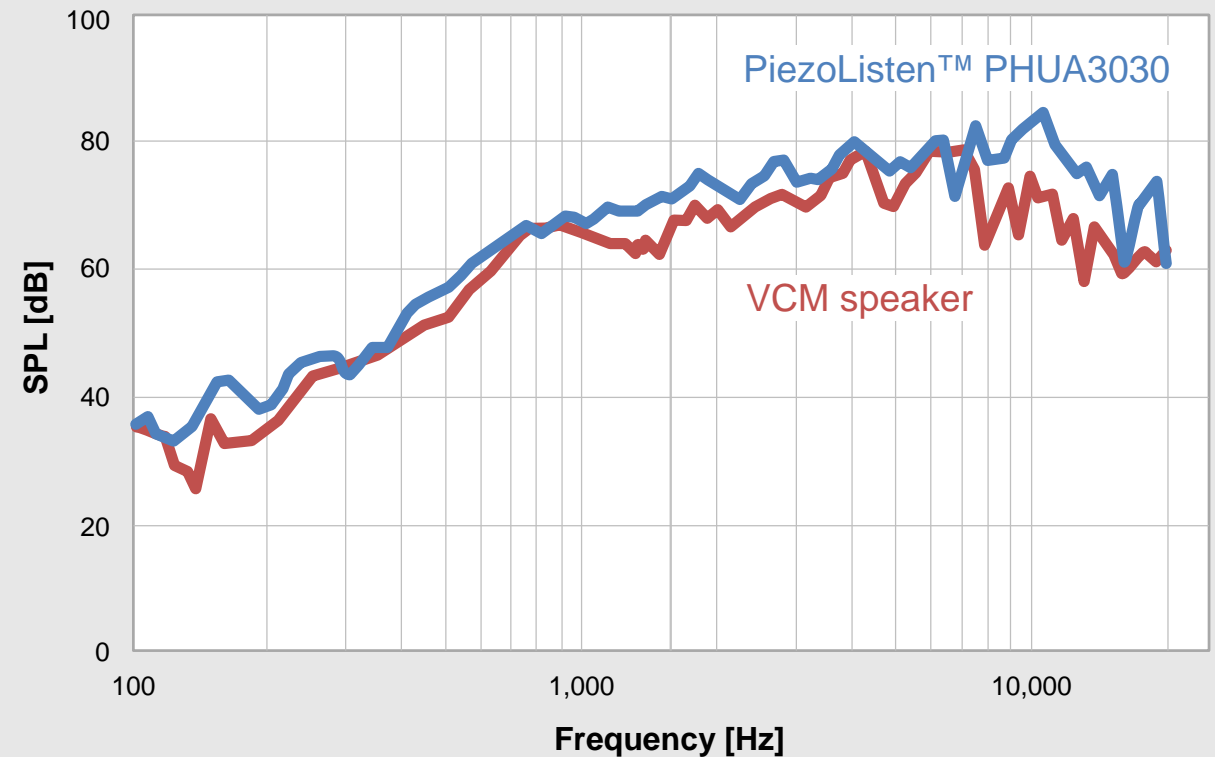
	Conventional electro-magnetic tweeter	PiezoListen™ tweeter	Benefits of PiezoListen™	
				
Thickness [mm]	19	0.49	50 times thinner	 
Volume [mm³]	16,300	220	98.6% less space required	 
Weight [g]	60	1.7	97% lighter	
Frequency range [Hz]	2,000 to 20,000	1,000 to 20,000	Wider range	
Output power [W_{rms}]	2	2	Reference value @ 20 kHz	
Average SPL [dB]	78	80	Equivalent	
Integration	Requires special mounting solution	On back surface	Easy to integrate into existing designs	 

PiezoListen™ vs. VCM wide-range speakers



Measurement conditions

- Anechoic chamber
- Sine wave 100 Hz to 20 kHz
- Mic distance 30 cm



PiezoListen delivers an SPL comparable to electromagnetic speakers

Outlook



2019

**TV and
surround sound systems**



2022

**Automotive and
surround sound systems**

Dashboards with built-in speaker functionality



www.tdk-electronics.tdk.com