Revised at 20th Jan, 2021

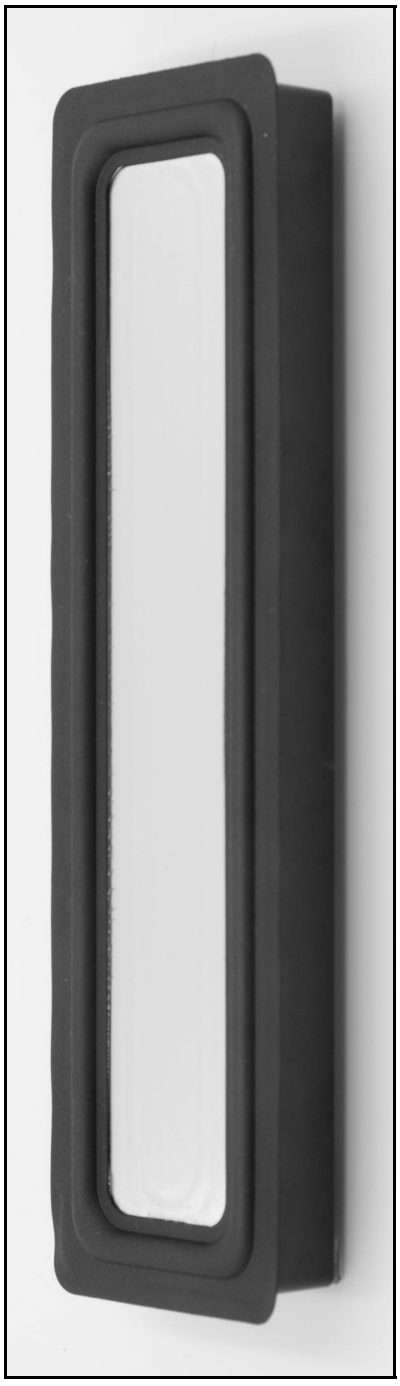
BGF-46166-18-4-003

FLAT-THIN-LONG GLASS-COMPOSITE-DIAPHRAGM WOOFER

STAPEZ™ brand FP-SPK-M glass-composite-diaphragm woofer is designed to work with extremely thin (≥20mm) and small (250cc ≤ V ≤ 1500cc) passive-radiator or sealed box, according to the miniMAX™ speaker principles.

FEATURE HIGHLIGHTS:

- Extra thin and long: 18mm x 166mm x 46mm
- Patented diaphragm structures: “Schott-AS87-Glass” – “Viscoelastomic-Damping-Layer” – “aluminum-alloy-foil composite” flat diaphragm in total thickness of 0.3mm and mass of 3.38 g.
- Enables audio systems with Deep Bass down to 20mm thickness
- Extreme peak-to-peak excursion of 8mm
- Highest in-industry Excursion-to-Thickness Index (E2T):
- Very high force motor: 2.84 kgF (continuous), 6.44kgF (transient)
- High power handling: 35W (continuous), 180W (transient)
- High Mms for low Fo both in free-air and in-box, plus high BL (BL=4.34) for maintaining the demanded sensitivity
- Large eff.-radiating-area (SD=4865 mm²) to overall area (64%)
- Programmable directivity. Vertical: Disperse; horizontal: Beam
- Relatively environmental friendly: less than 5.8g of neodymium (Nd) rare-earth metal used
- Water-proof version available upon request.



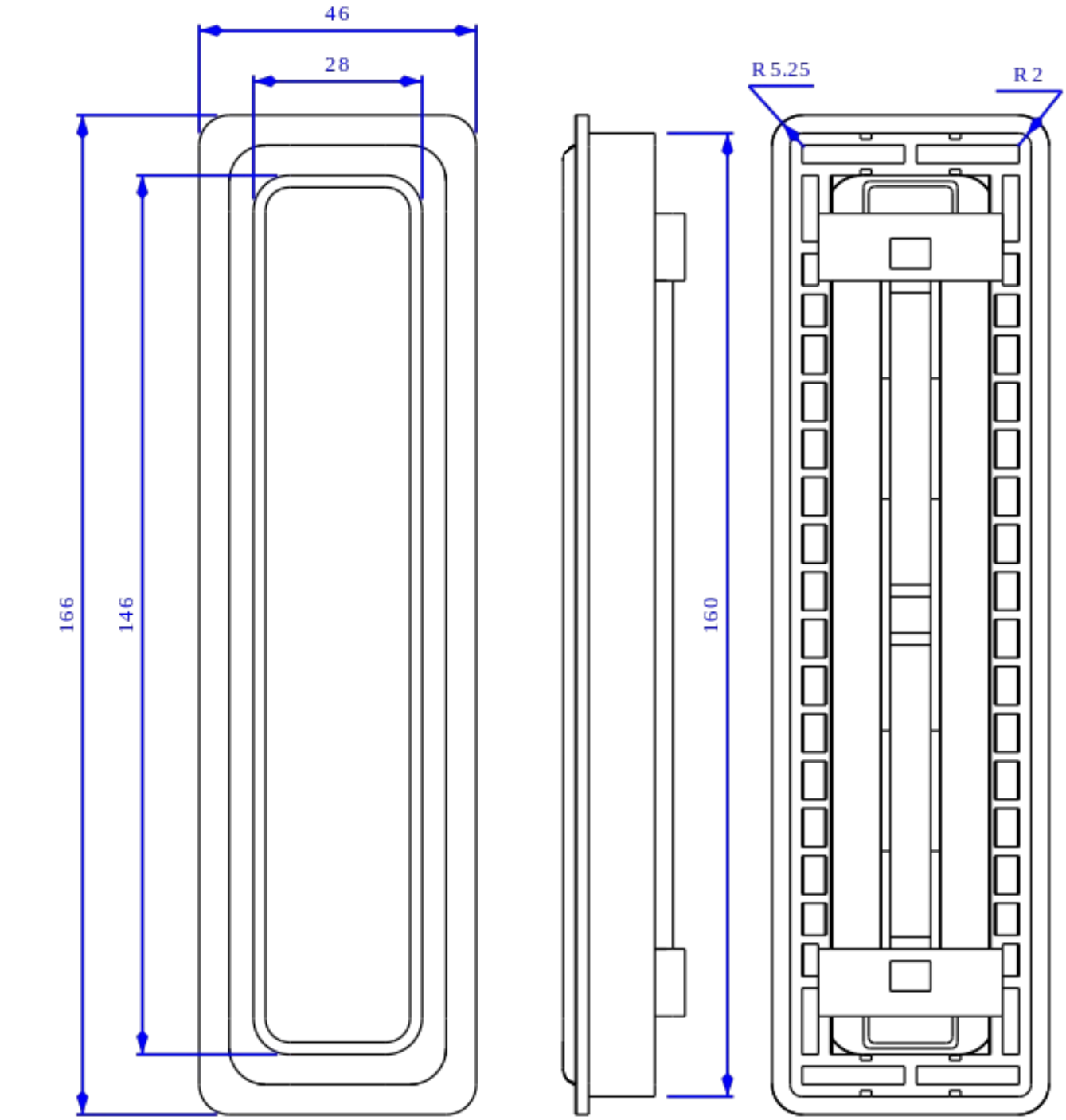
(Actual size when in A4 printout)

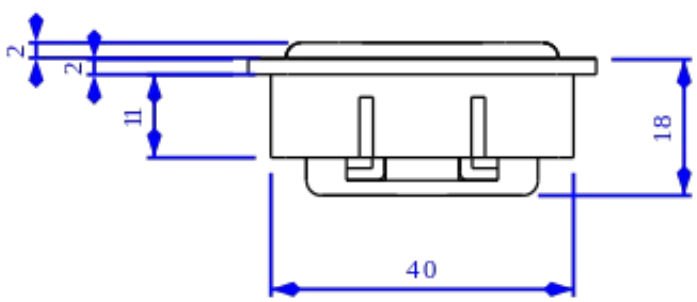
APPLICATIONS (b/o: battery-operated; l/p: line/system-powered; s/a: standalone):

- Portable Bluetooth / WiFi speakers (b/o)
- Computer monitors with high audio performance (l/p)
- Flat-panel / curved-panel TV (l/p, in a pair, or in array)
- Performance laptops and next generation tablets (b/o)
- Car audio, after-market or pre-installed (b/o, l/p, s/a)
- Motorcycles, bikes, e-bikes, personal transporters (b/o, l/p)
- Smart furniture, home automation (l/p)
- Guitar, digital-piano, synthesizer, other music instruments (b/o, l/p)
- Installations, public-addressing (s/a)
- Studio monitors, instrument amplification, concerts and shows (l/p)
- Artistic home-audio and HiFi (s/a in array)
- DIYers, Makers, and Robotics.
- Non-audio: micro-positioning platforms, as large flat area linear motor.

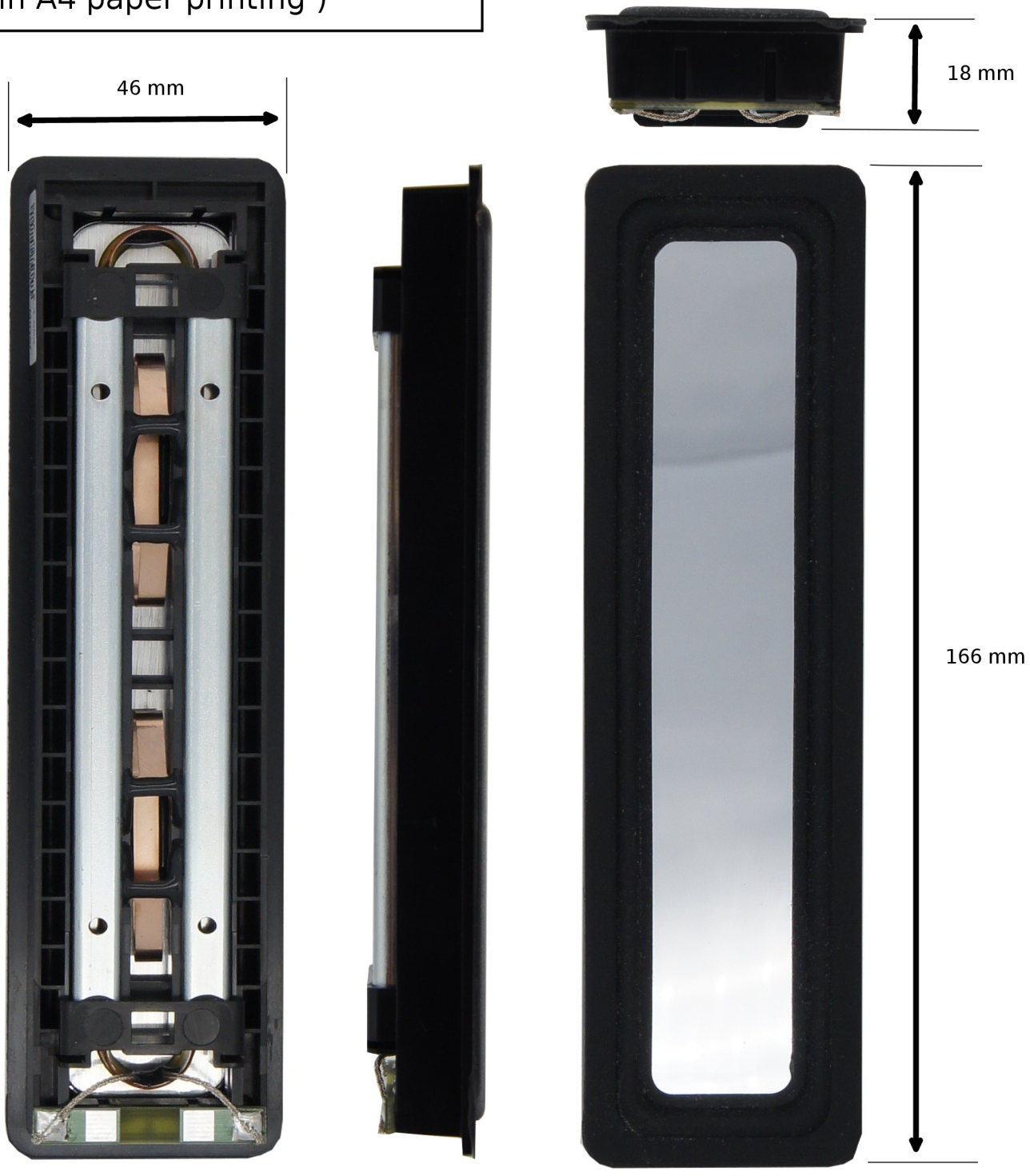
Drawings and Dimensions:

All units are in mm unless specified.





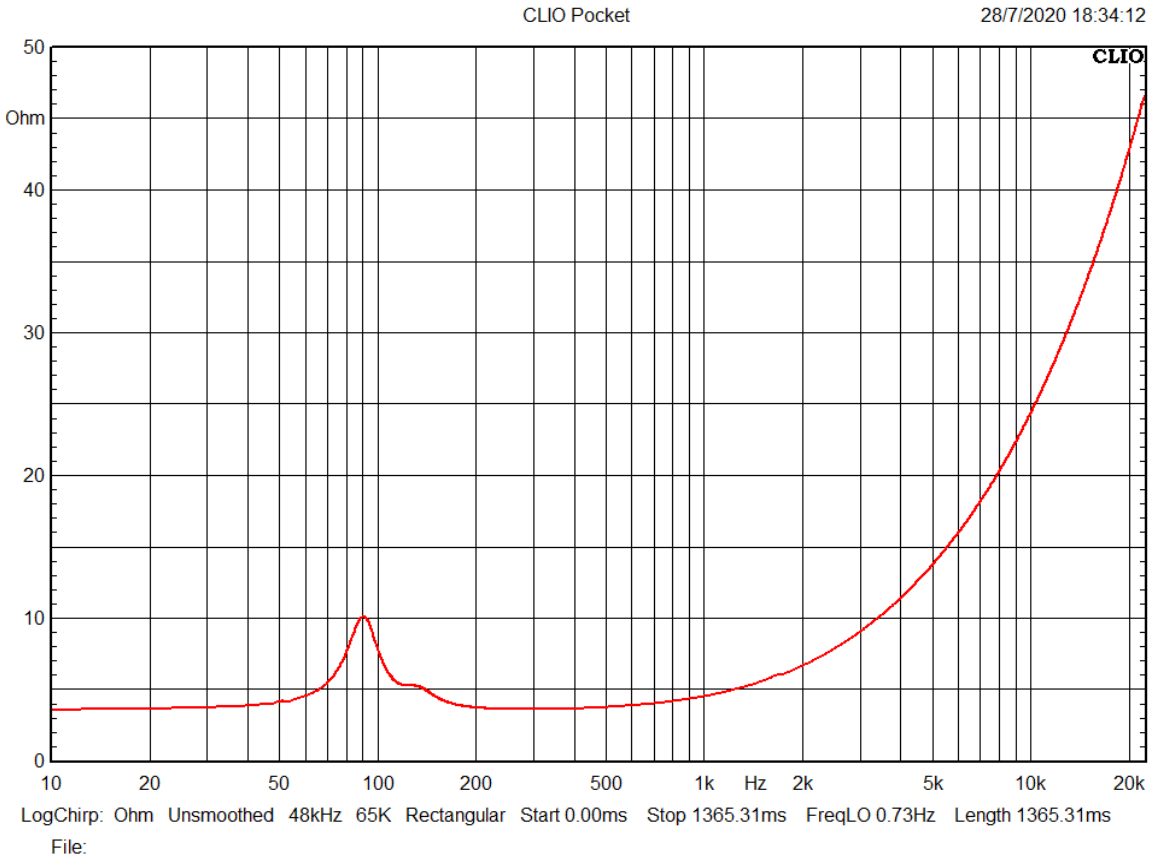
Product photo in actual size.
(in A4 paper printing)



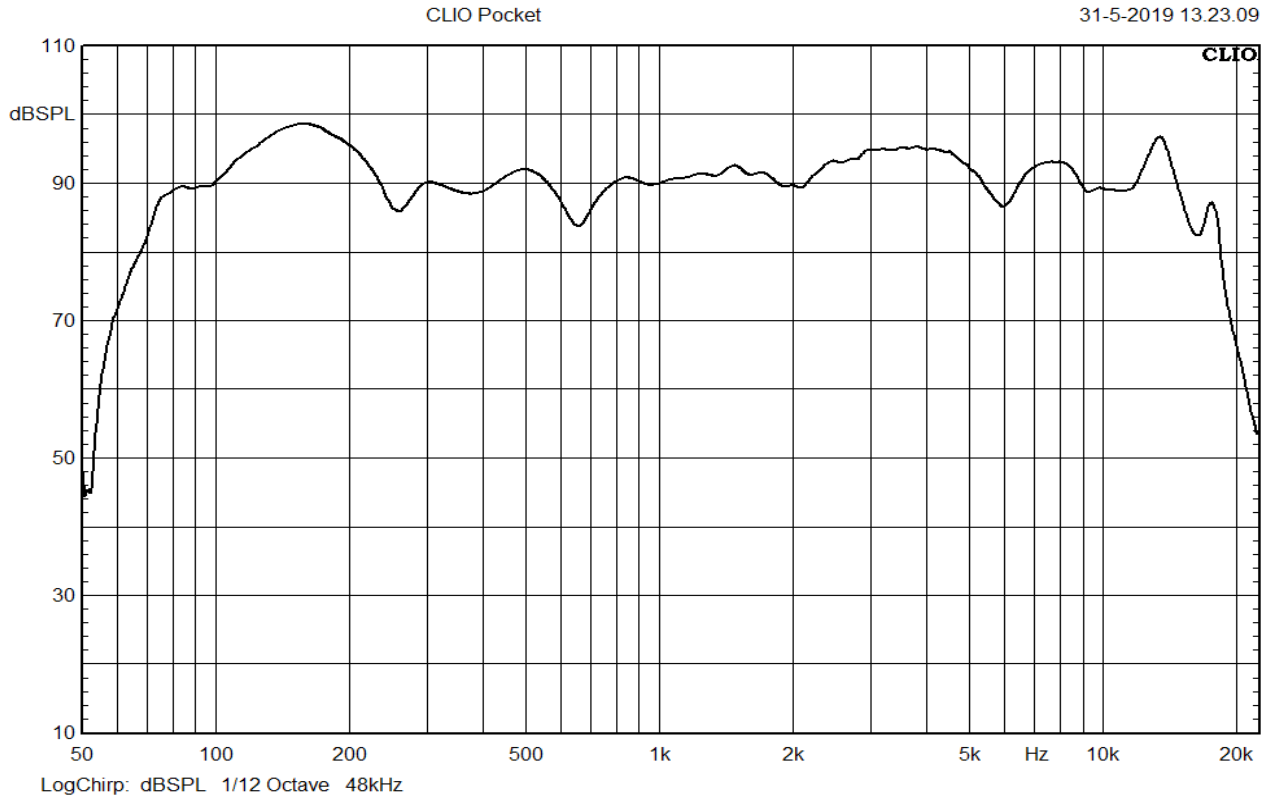
ELECTRICAL, ACOUSTICAL, AND THIELE/SMALL PARAMETERS:

Parameter	Min.	Typical	Max.	Testing Conditions
DC Resistance (Re)		3.4 ohm		
Resonance Frequency (Fs)		90Hz		
Continuous Power (thermal)		35W		
Max. Power (transient)		180W		
Excursion, peak-to-peak (Xmax)		8mm		
Moving Mass (Mms)		18g		
Effective Radiating-area (Sd)		46.65 cm^2		
Force Factor (BL)		4.34		
Specific Force Factor (BL/√Re)		2.35		
Compliance, free-air (Cms)		0.15mm/N		
Eqv. Compliance Volume (Vas)		0.52L		
Mechanical damping (Qms)		2.79		
Electrical damping (Qes)		1.92		
Qts		1.14		
Voice Coil Inductance (Le)		0.48mH		
Diaphragm Displacement Volume, peak-to-peak(Vd)		38.92 cm^3		
Sensitivity		75dBSpl		
NdFeB magnet rating		N42SH		
NdFeB magnet weight		20g		
Voice-coil magnet wire weight		11.2g		
Driver Weight		158g		
Voice-coil magnet wire grade		EISV		
Max. Voice-coil Temperature		180		
Operating Temperature		-10 to 40 ºC		
Storage Temperature		-20 to 70 ºC		

Impedance curve,



This is the frequency response of this woofer (BGF-46166-18-4-003) with our 40mm glass cone full range speake (BGC-D40-22-4-002) and PR in a 800ml box after speaker correction.



Appendix 1: Brief Introduction to miniMAX™ Speaker Driver Development Concepts and Keys:

Prior Arts:

Improving speaker performances by electronics (analog or digital, either or both) is not a new thing. From '60s of last century there had a lot of electronic equipments to improve a speaker sound. A famous example is the analog “equalization-box” come with best-selling Bose-901 speaker array. From '90s, more sophisticated and DSP(here, the “P” stands for “Processor”) based speaker correction unit were widely available. In high-end consumer side it can be represented by DEQX speaker processors (www.deqx.com) that may cost several thousand US dollars. On embedded solution side, Texas Instruments, the largest DSP(-er) provider worldwide, currently markets their speaker-correction-processors aggressively (below USD2.00 per chip).

How about in speaker driver unit designs? From the invention of moving-coil speakers by Rice and Kellogg in late 1910s, speaker design only evolves slowly. The major improvements are focused on:

a). Price (of course, always the first factor in any consumer product),
b). Frequency response: as wide and flat as possible,
c). Maximum output loudness: this is equivalent to maximum power handling times efficiency,
d). Size, geometry, and weight,
e). Reliability (mainly determined by production controls and craftmanships instead of designs),

By achieving the targets above, speaker experts are focused on material science instead of fundamental design changes, like magnets (from electromagnetic, Alnico, Ferrite, to Neodymium magnets), cone materials (paper, plastics, composite materials, polymer fibres, metals…), voice-coils (copper magnet wire with higher temperature rating, aluminium, or CCAW), bobbins, spiders, surrounds etc. The improvement by such material changes is only marginal.

What is miniMAX™?

Simply speaking, miniMAX is a system-level technology and a new approach (in terms of product designs, vertical integration manufacturing and business model) on improving audio system’s both quality-to-size and quality-to-price ratio: DSP friendly speakers, plus speaker-correction DSP (or ASP, Analog Signal Processor).

Making a good sounding speaker are thousands of experts, audio geeks and companies' dream, goals, skills, and knowledge. miniMAX business concept (or "technology") is, with "DSP-is-here" in-mind, from the ground-up in day one we can develop the speakers that all the speaker design aspects are *dis*-concerned if those the drawbacks can be effectively "corrected" by the DSP or ASP afterward, while remaining the design aspects in focus where the DSP have little help to improve. The major speaker design factors that are "DSP-friendly" are frequency response (that's almost what Thiele/Small parameters are are about), and harmonic distortion. The major "non-DSP friendly" factors are maximum excursion (“Xmax”), specific force factor (BL/√Re), sensitivity, and power handling. Say, just by disregard the frequency response in design stage, the speaker topology can be revolutionally changed: want it thin? Yes! Want it small? Yes! Want it long rectangle or tube shape? Yes! Want it sounds good? Done!