

Infineon Merus™ Class D Audio Amplifier Solutions



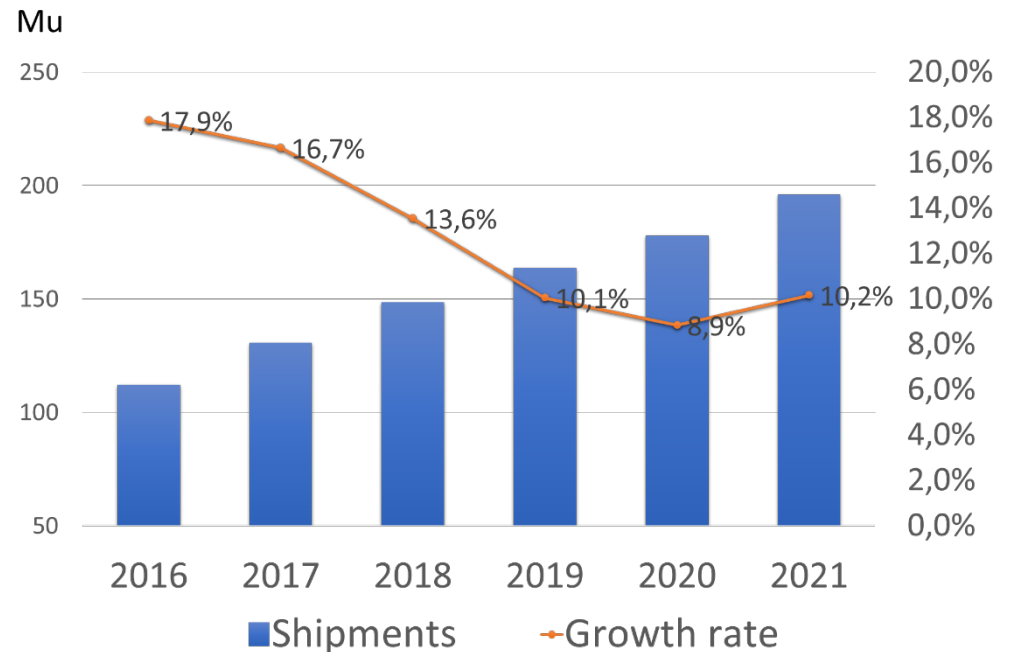
PORTABLE SPEAKER MARKET

EXPECTED SHIPMENTS AND GROWTH RATES



Market trends

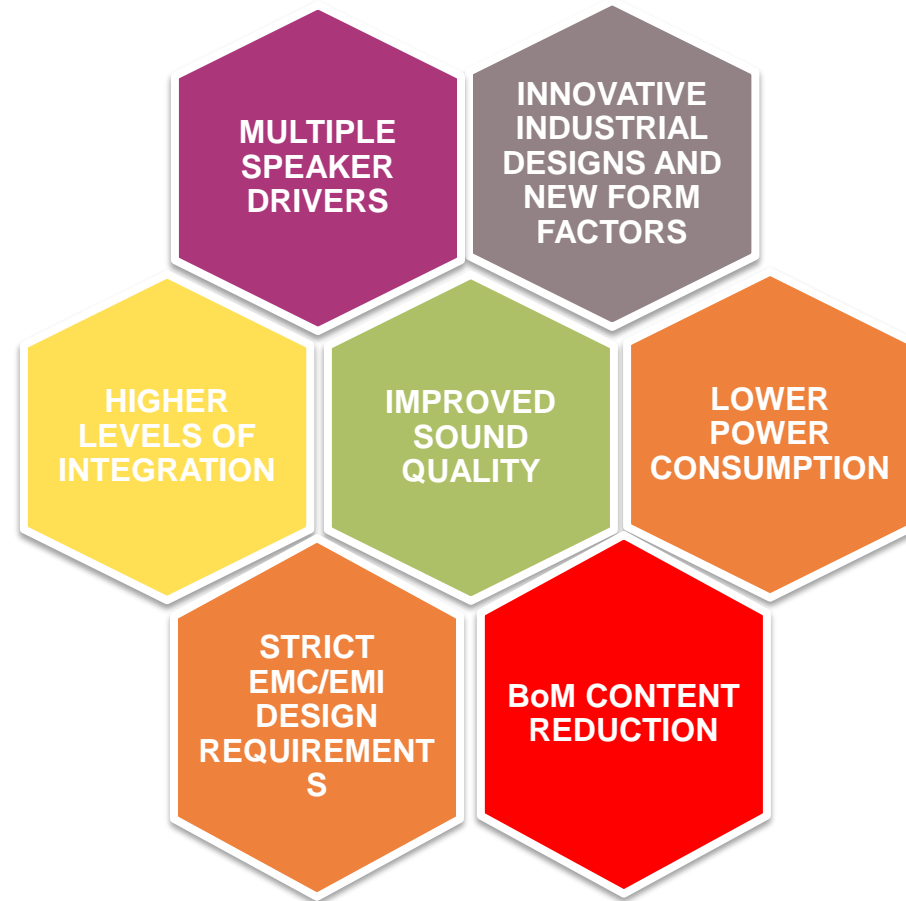
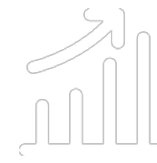
- > Parent market: Global smart home market
- > Approx. 132 million portable speakers shipped globally in 2017
- > Shipments expected to grow to over 200 million units by 2021 (>12% CAGR)



Source: Technavio Global Portable Speaker Market 2017-2021

ACTIVE SPEAKER TRENDS

CONTINUED NEED FOR HARDWARE DIFFERENTIATION –EXAMPLE



KEY PRODUCT FEATURES & BENEFITS



UNRIVALED POWER EFFICIENCY AND SOLUTION COMPACTNESS

LOW INTERFERENCE

EMC compliance without
use of large filter
components



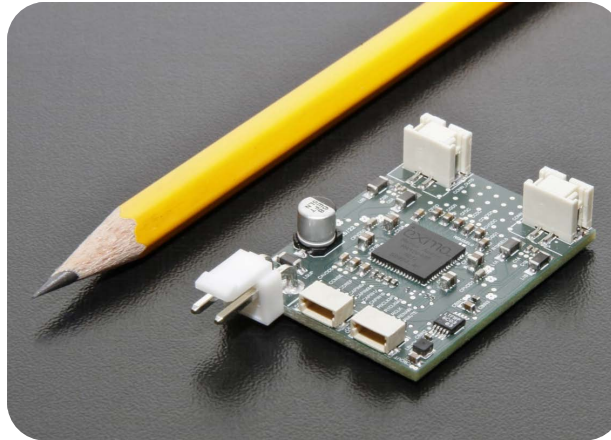
REDUCED BOM & COST

Reduction of battery sizes
No output filter components
Eliminate complex dynamic rail
tracking
No heatsinking required



COMPACT SOLUTIONS

High power in a very small
form factor



POWER EFFICIENT

Very low power losses
Cool operation



BEST IN CLASS PERFORMANCE

High dynamic range
Down to 0.003% distortion
Low noise

FLEXIBLE

Support for both analog and digital
audio input
Highly configurable for tailored
performance in individual applications



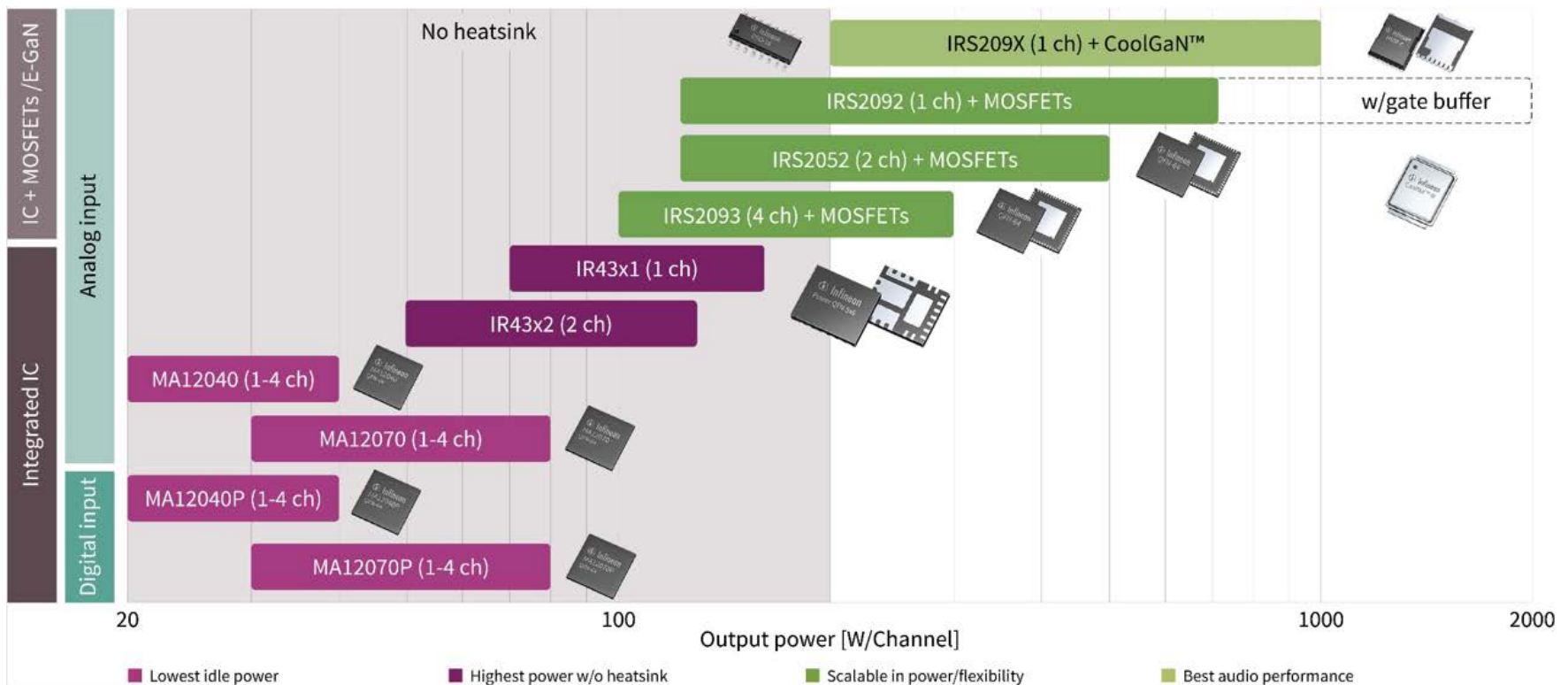
*The ultra-compact 2x40 W "Snowflake"
reference design featuring Merus Audio's
MA12040/40P IC*

Merus Audio amplifiers utilize proprietary and patented eximo® switching amplifier technology to address some of the most important challenges in consumer audio product design

Infineon Class D audio



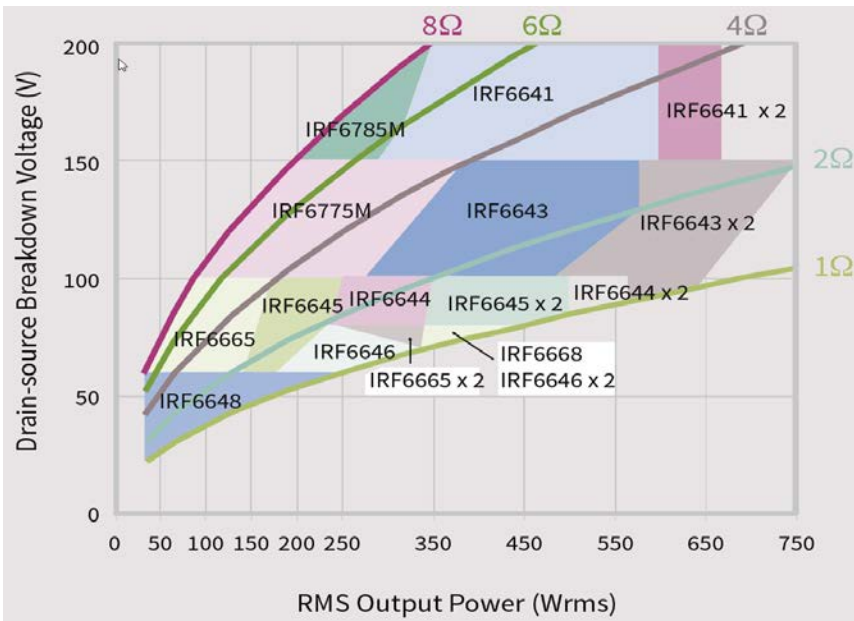
- > Integrated MCM and discrete IC + MOSFETs are ideally suited for output power >75 W / channel
- > Merus Audio products and technology ideally fit for output power <75 W / channel
- > Merus Audio offers digital and analog input vs PowIRaudio™ solutions offer analog input only



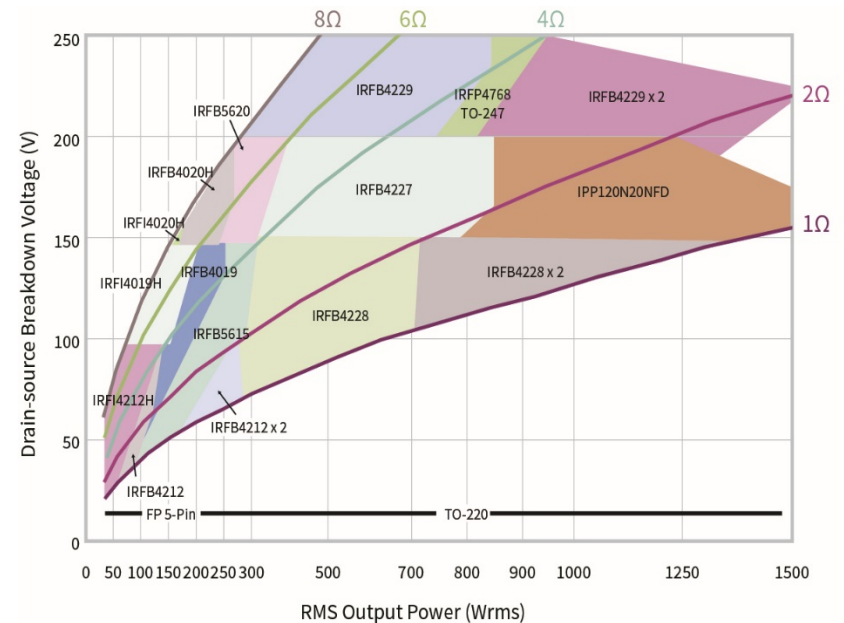
MOSFETs for Class D audio solutions

- › Key parameters when selecting FETs:
 - Maximum power per channel
 - Speaker impedance

Direct-FET / CanPAK™

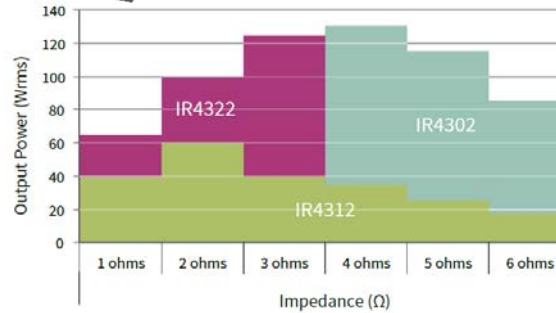


TO-220

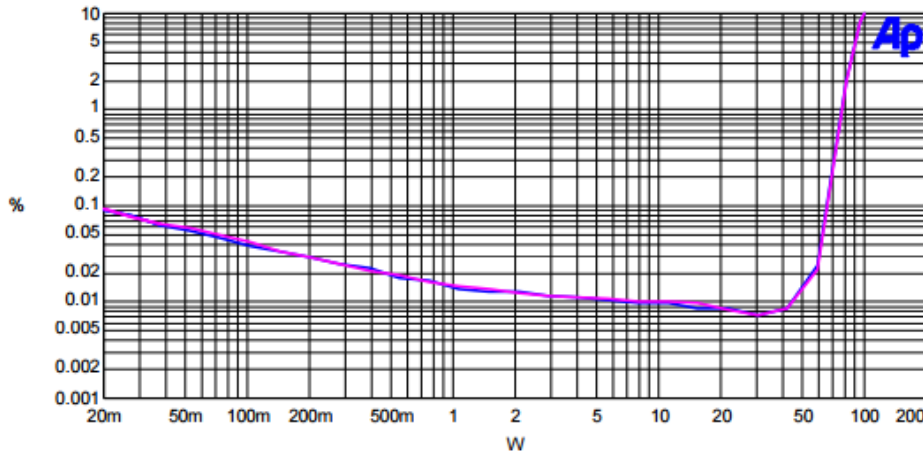


IR43xxM

Compact & heatsink-less solution for 50~130 W/channel



Input Signal=1 kHz
Load Impedance = 4 ohms



Power vs THD+N from IRAUDAMP17 evaluation board

Features

- › Integrated mid voltage MOSFET with low $R_{DS(ON)}$
- › High voltage/current headroom
- › Single or Split power supply capable
- › Internal logic scheme to reduce click/pop noise

Benefits

- › Enabling heatsink-less comparing to same power level monolithic solutions
- › Robust design with higher peak music power
- › Easier design, faster time to market with well-prepared reference designs

Product portfolio

MA120XX SERIES



MA12040P

Digital 2x40 W eximo® amplifier IC

- › I2S digital audio input
- › Digital volume control & limiter
- › 4-18 V supply voltage



MA12040

Analog 2x40 W eximo® amplifier IC

- › Analog audio input
- › Selectable Gain (20 dB/26 dB)
- › 4-18V supply voltage



MA12070P

Digital 2x80 W eximo® amplifier IC

- › I2S digital audio input
- › Digital volume control & limiter
- › 4-26 V supply voltage



MA12070

Analog 2x80 W eximo® amplifier IC

- › Analog audio input
- › Selectable gain (20 dB/26 dB)
- › 4—26 V supply voltage

Common features:

- › Multi-level eximo® switching technology with 3-level and 5-level modulation for ultra-high power efficiency and filter-less amplification
- › Fourth order closed loop feedback error control for HD audio quality and suppression of Supply voltage disturbance
- › Low idle power dissipation (100 – 160 mW)
- › Low THD+N (0.003% - 0.007%)
- › Low EMI emission
- › 64-pin thermally enhanced QFN package with pad-down exposed thermal pad (EPAD) for heatsink free operation

ALL ICs ARE FULLY QUALIFIED AND IN MASS PRODUCTION

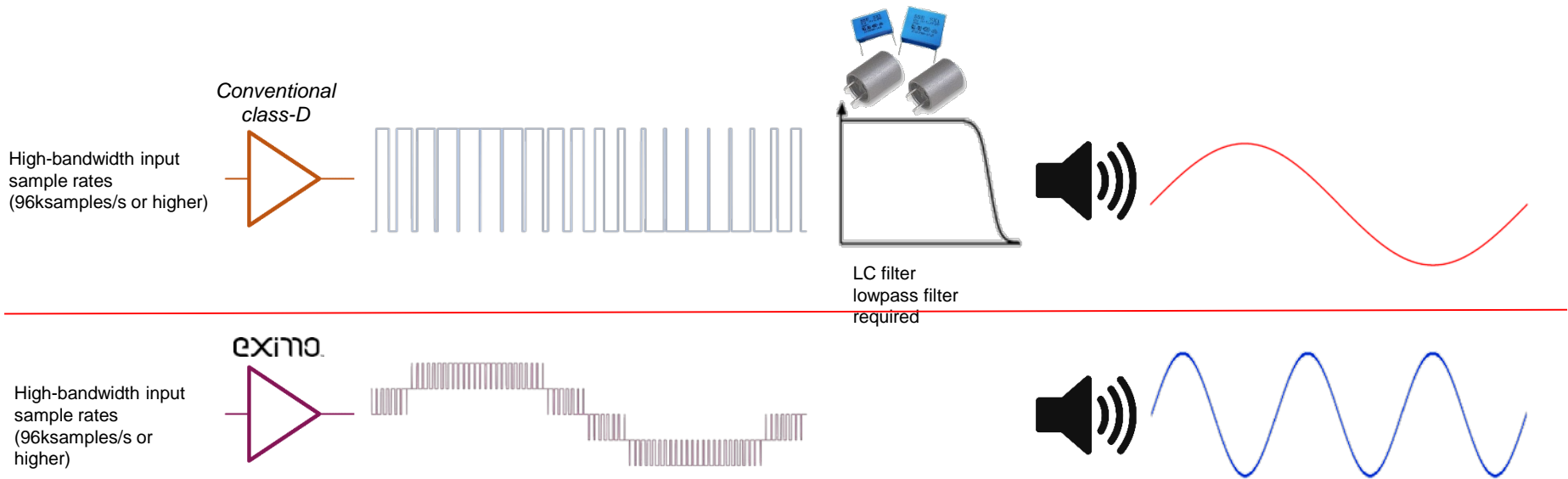


High-Resolution Audio

eximo® multilevel amplification provides **high output bandwidth, high efficiency and high output power.**

MA12040/MA12040P and MA12070/MA12070P are ideal for applications that require Hi-Res^{*)} audio performance.

- ✓ Amplification bandwidth: >40 kHz
- ✓ Signal processing: Up to 192kHz/24-bit



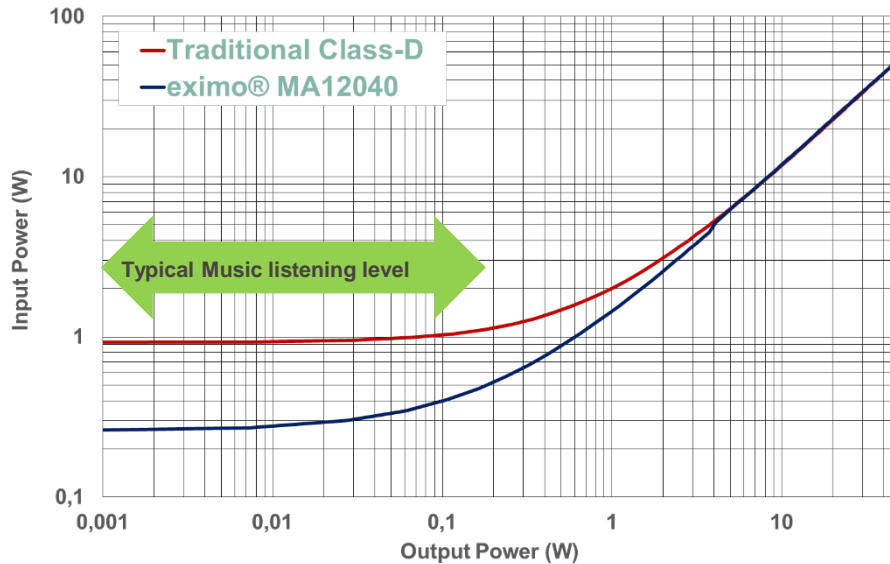
*) Definition of Hi-Resolution Audio by Japan Audio Society (JAS)

Power consumption advantage

CONVENTIONAL CLASS D AMPLIFIERS CONSUME UP TO 5X MORE POWER



Input vs. Output power, 18 V P_{vdd}¹, PMP0



low to medium

medium to max

headroom

Output volume indication for **MUSIC** playback

Amplifier to amplifier comparison

P _{vdd}	Output power ³	Consumption		
		Traditional Class D	Merus Audio	Traditional in % of Merus Audio
12V	Idle	0,46 W	0,21 W	220%
12V	0,1W	0,55 W	0,36 W	160%
18V	Idle	0,92 W	0,24 W ¹	380%
18V	0,1W	1,00 W	0,41 W ¹	250%
26V	Idle	1,80 W	0,31 W ²	580%
26V	0,1W	2,00 W	0,51 W ²	280%

Notes: Measured on EVKs, ¹ MA12040, ² MA12070, ³ Total output power for 2 channels

For portable speaker (system) this means:

- > **Up to 100% increased battery life or**
- > **Up to \$6 battery cost saving**

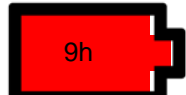
The Multi-level advantage

EXTENDED BATTERY LIFE



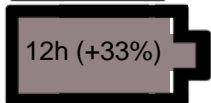
Popular battery-powered speakers retrofitted with Merus Audio amplifiers.
Comparison of battery life and BoM impact / cost saving

Brand A



9h

Original



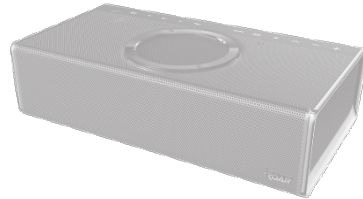
12h (+33%)

Merus Audio

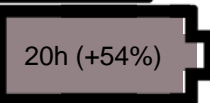
Battery cost saving

\$1.2

Brand B



13h



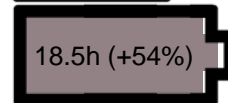
20h (+54%)

\$3.0

Brand C



12h



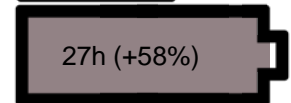
18.5h (+54%)

\$6.6

Brand D



18h



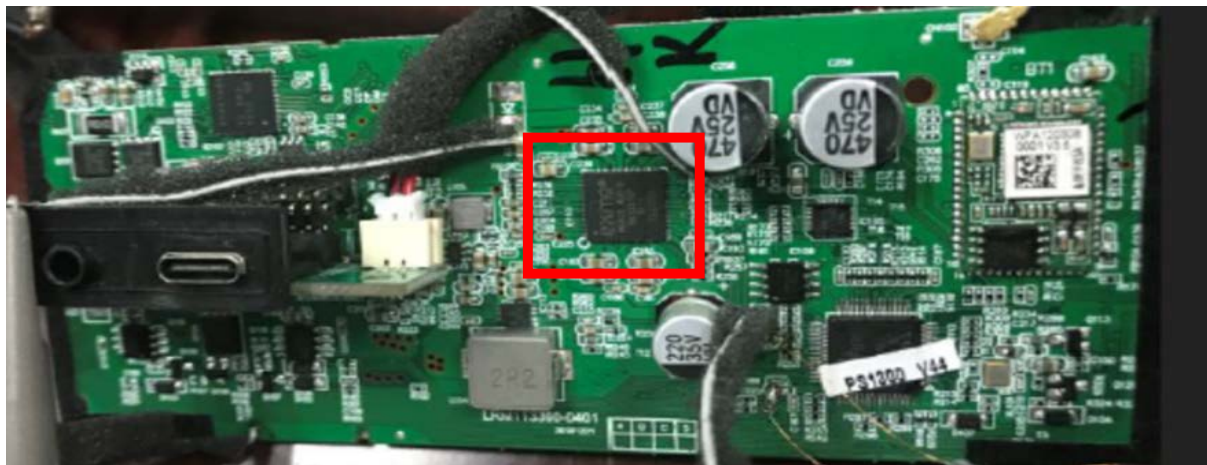
27h (+58%)

\$2.2

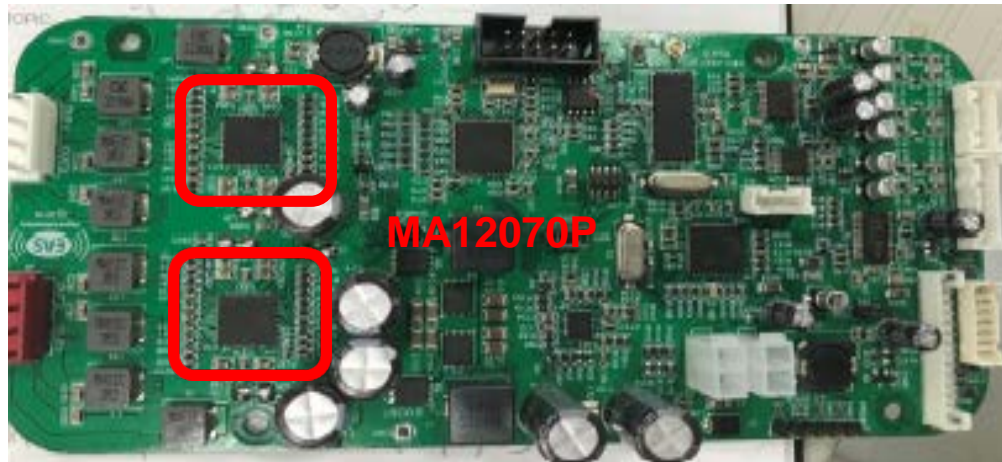
Success story – MA12070P in Marshall Stockwell II

- › **Customer:** (XXXXXXXXXX)
- › **Application:** Marshall Stockwell2 BT Speaker
- › **Use Case:** Portable active stereo speaker
- › **Product description:** MA12070P *1 used in design
- › **SOP:** Jan-2019
- › **BW value for 3 years:** 735K EUR
- › **Distribution Partner:**
- › **Competition:** TPA31xx

Playtime: > 20+ hrs






Success story – MA12070P in Soundboks 2



INNOVATIVE MODULAR BATTERY SYSTEM

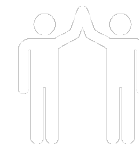
40 HOURS OF PARTY FREEDOM

Welcome to the next level of partying freedom. 40 hours of uncompromising battery life is more than a statistic, it's a license to party till the sun rises and longer! Add an extra BATTERYBOKS 2 and watch the party go on till the last man standing.

-  40-hour military grade battery
-  Quick 3.5 hour recharge
-  Swappable BATTERYBOKS 2 for endless partying

Soundboks

LOWER POWER CONSUMPTION AND EXTEND BATTERY LIFE

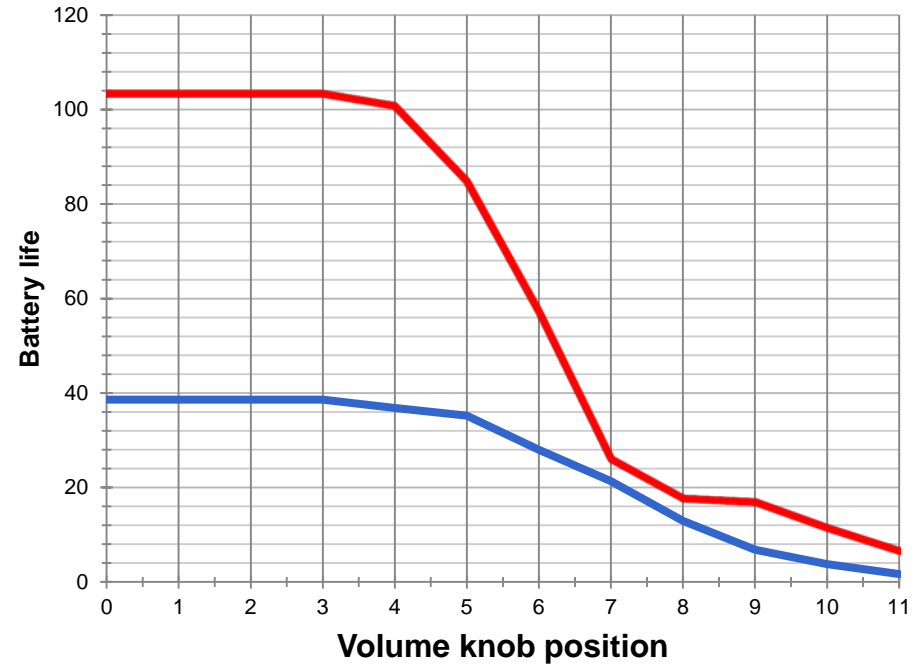


Soundboks 2:
~ 40 hours



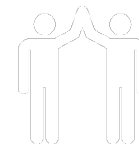
Soundboks 1:
~ 30 hours

BATTERY LIFE VS. AUDIO VOLUME



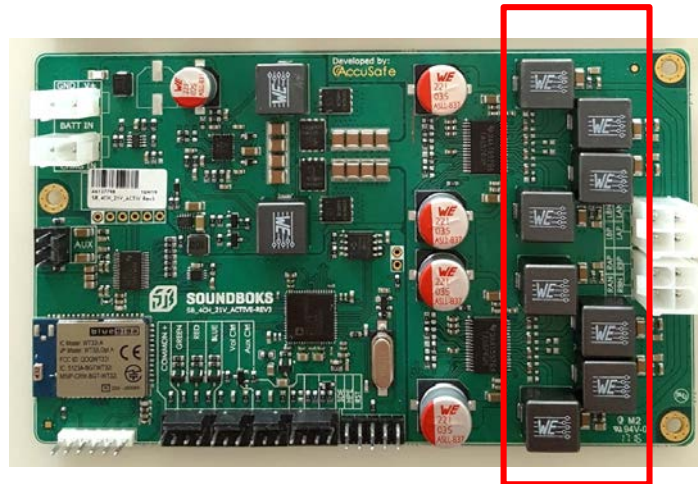
Soundboks

REDUCED BOM CONTENT AND COSTS



SOUNDBOKS 2 design

- › 2 x MA12070P (Merus Audio)
- › No LC filter
- › EMC ferrites filter cost (total): <\$0.6



SOUNDBOKS 1 design

- › 2 x TI TAS5760M (Texas Instruments)
- › 8x inductors for LC filter
- › Inductor cost (total): \$4.6



Support material

Collaterals and brochures

- > Product briefs
- > Selection guides
- > Application brochures

> <http://www.infineon.com/audiosolutions>

Technical material

- > Application notes
- > Technical articles
- > Simulation models
- > Datasheets

Evaluation boards

- > Evaluation boards
- > Demoboards
- > Reference designs

> www.infineon.com/evaluationboards

Videos

- > Technical videos
- > Product information videos

> <http://www.infineon.com/audiosolutions>



Part of your life. Part of tomorrow.