NXP docking-station reference design for SAA9870 and TDA8932

Compact GSM/MP3 docking station with USB 2.0, audio streaming, and microphone

This complete reference design provides everything a manufacturer needs to create a compact, medium-power docking station. It includes USB 2.0, audio streaming, and microphone functionality, and has a high-efficiency Class-D amplifier for superior sound from any set of speakers.

Key features
▸ Complete reference design
  - GSM-based docking station for mobile phone
  - MP3-based docking station for portable media player
  - PC speaker
▸ Superior speaker and microphone performance
  - NXP ARM7/DSP processor SAA9870
  - NXP amplifier TDA8932BTW
  - Software compensation for speaker characteristics
▸ Built-in USB 2.0 codec
  - Audio streaming to PC, MP3 player, phone
  - Headset, charging, PC synchronization, and
    accessory connection via a single standard interface
▸ Built-in microphone for hands-free conference calling
  with your phone or an Internet PC
▸ Integrated source selection
▸ Easy on-board interfacing via HID console
▸ Optional functions
  - FM radio
  - Audio streaming via 802.11 WLAN, Bluetooth®
▸ Small PCB footprint (55 x 60 mm)

This NXP reference design reduces development costs and speeds time-to-market for systems that bring together the functions of a GSM-based docking station for a mobile phone, an MP3-based docking station for a portable media player, and a PC speaker.

The design is built around two ICs, the NXP SAA9870 and the NXP TDA8932BTW. The SAA9870 is a single-chip solution that integrates a powerful ARM7 and a USB 2.0 codec with support for audio streaming and microphone functionality. The TDA8932BTW is a 2 x 15 W, high-efficiency, Class-D amplifier that delivers high-quality sound.

The demonstrator PCB measures only 55 x 60 mm, so the final design can be very compact.

Compared to conventional docking stations, which use the ultra-low-efficiency speakers built into the laptop, PC monitor, or mobile phone, this reference design provides distinctly superior sound and microphone performance.

NXP founded by Philips

For audio streaming to a PC, MP3 player, or phone, there is a built-in USB codec that supports full-speed (12 Mbps) USB 2.0 operation and is fully compliant with USB host and USB On-The-Go (OTG).
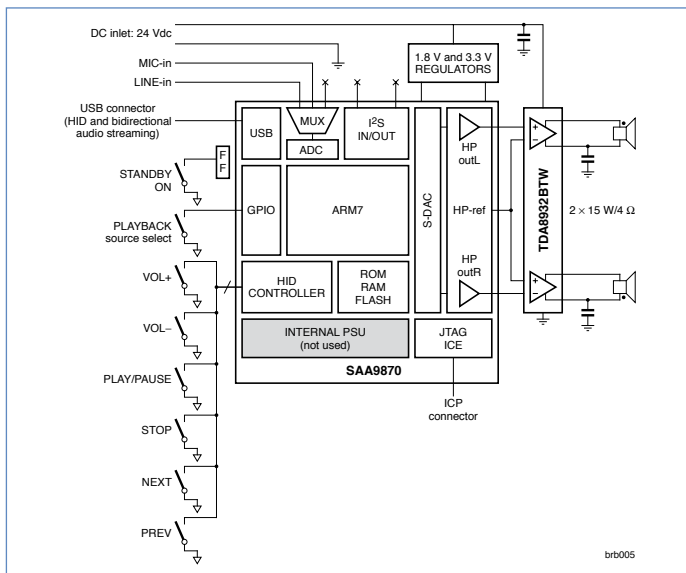
The USB interface also serves to consolidate functions, for a more streamlined design with fewer wires. It standardizes headset, charging, PC synchronization, and accessories onto a single interface, so manufacturers of speakers and mobile/portable designs can simplify their designs and reduce cost.

Built-in DSP software works with the ARM7 core and EQ functions to increase design flexibility and improve sound. The software compensates for speaker characteristics to create the best possible sound image within the confines of a small speaker cabinet. Optional software functions, including bass boost, are also available.

The built-in microphone enables hands-free conference-call functions, so there's no need for a separate headset. It also supports conference calls via the mobile phone and Internet calls via a PC.

Integrated source selection increases flexibility, with options for choosing USB or traditional line-in source data.

Easy on-board interfacing, provided by a Human Interface Device (HID) console, lets consumers select a song without using their phone/MP3 display or accessing Windows Media Player.

Optional functions, including FM radio and audio streaming via 802.11 WLAN or Bluetooth, can also be provided.

Product	Features
NXP DSP processor SAA9870	ARM7 TDMI core with 32-k SRAM, 32-k boot ROM, and optional 256-k NOR Flash
	Flexible core supported by easy-to-make software adjustments
	Bidirectional audio-class USB interfacing
	Stereo record and playback at 48-kHz sample rate
	Microphone input
	HID interface for easy consumer interaction
	Intelligent power management
	Wide range of connectivity and audio interface
	High suppression of source noise
	Full-speed (12 Mbps) USB device fully compliant with USB host or USB OTG
	Available sound software (bass boost, equalizer, etc.)
	88-pin TFBGA package
NXP stereo Class-D amplifier	Single-ended, fixed frequency amplifier
	High efficiency: 92%
	2 x 15 W at 30 V single-ended into 8-Ω at 10% THD
	2 x 15 W at 22 V single-ended into 4-Ω at 10% THD
	Asymmetrical power supply (10 to 36 V) and available symmetrical power supply (±5 to ±18 V)
	Smart protections with thermal foldback and current limiting to ensure audio performance during all conditions
	Frequency hopping for ease of use in combination with tuner
	32-pin HTSSOP package

Block diagram of docking-station reference design