

# Make road trips more fun

PNX953x-based audio/video system solutions  
for automotive





# Experience home entertainment in your car or Give your car a living room

Today's cars do more than just get us from one place to another. They let us relax with our favorite entertainment, whether it's high-end audio or high-definition video. We can listen to our favorite playlists or let the kids watch their favorite movie – with today's in-car entertainment systems, everyone can enjoy the ride.

At NXP, we give you the simplest, easiest way to create best-in-class multimedia systems, with proven technology and an extensive range of reference designs. Our PNX953x processing technology enables high performance and versatility, so you can create innovative audio/video systems faster than ever.

## **Movies, music, and images**

The NXP PNX953x automotive A/V reference design is the perfect foundation for creating differentiated, feature-filled entertainment systems. Your designs will let passengers enjoy high-quality entertainment from a variety of media, whether it's watching videos or playing music, and everyone can make their own

selection, with different options playing in the front and rear seats at the same time.

The A/V reference design lets passengers play video content from a wide range of sources, including embedded Flash and HDD storage, USB memory sticks, or SD (Secure Digital) Flash cards and other popular DVD formats. TV reception can even be an option, since the design covers all the main standards for in-car TV, plus video playback.

For audio, the A/V reference design enables playback from a variety of storage media, and offers comprehensive support of compressed audio files such as MP3, WMA, and AAC. The reference design handles multi-channel audio with ease, including AC3, for higher-end systems that create impressive, surround-sound environments. Multiple, simultaneous audio streams allow different combinations of audio delivery, including front/rear audio.

# Proven performance, flexibility, and scalability

The PNx953x family of PNx953x media processors makes it easy to bring highly advanced multimedia systems to market. They offer unprecedented flexibility and enable a wide range of exciting media technologies tailored to different markets.

Building on the advanced architecture, the PNx953x family is designed for scalability. Choose the processor that best fits your needs, based on processing speed, the number of video I/O, and the memory interface supported. The rest of the features, including the pinning and interfaces, are identical. The software platform is common for all the processors, too, so it's easy to deliver a range of performance options.

## PNx953x features

Video decoding <sup>1)</sup>	MPEG-1, MPEG-2 MPEG-4-ASP, XVID. video decoder H.264 (base and main profile) VC1 up to D1, Adv. including WMV9
Audio decoding <sup>1)</sup>	MPEG-1 layer I, II, III (MP3) MPEG-2 (stereo) WMA 7.8.9 AAC (LC, Plus, Plus V2) OggVorbis, Flac, CELP
Video encoding <sup>1)</sup>	H.264 encoding
Audio encoding <sup>1)</sup>	MP3 encoding
Image decoding <sup>1)</sup>	JPEG, BMP, and GIF
Connectivity networking	USB mass storage PCI and XIO for multipurpose connectivity Glue-less DVD/HDD connection over XIO HOST interface
Video processing and picture improvement <sup>2)</sup>	Sharpness enhancement Contrast boosting Display processing De-interlace Scaling Resolution improvement using natural motion up-conversion Scaling Film mode detection

<sup>1)</sup> Customers need to acquire license from corresponding patent holders; please contact NXP.

<sup>2)</sup> Available on dedicated request and commercial agreement; please contact NXP.

## Use cases

PNx953x processors are versatile enough to be used in just about any car entertainment system.

Some of the use cases and their concurrencies depend on the processor chosen. Applications and use cases are available from NXP partners.

## Application

Multi-format audio and video playback from different storage devices, including USB thumb drives, SD cards, and HDD
CD/DVD playback
Dual-zone video
Nice user interface
Parking assistance, including Bird View using four cameras
Media recognition technology
Digital TV, including ISDB-T (1, 3, or 13 seg), CMMB, DVB-T, T-DMB, and Sirius video broadcast
Picture browser
Software upgrade
Digital Living Network Association
iPod connectivity

## Reference designs

To help speed up time-to-market, reference platforms and development toolkits are available from NXP. Sample software implementations

for some of today's most popular in-car entertainment applications are either available from NXP or from NXP partners.

Reference design	Function(s)
AV media player	USB thumb drives, SD cards, HDD, CD/DVD
Dual H.264 decoding	SD resolution
Picture improvement 1	Sharpness enhancement
Picture improvement 2	ISDB-T 1 seg (15 Hz) plus natural motion temporal up-conversion to 30 Hz
Picture improvement 3	ATSC-M/H 1 set (24 Hz) plus natural motion temporal up-conversion to 60 Hz
DLNA demo	Picture taken on mobile phone can be viewed on MvF display via WLAN
Portable media player connectivity demo	Remote control from MvF touchscreen for connected media player, plus video playback from media player
Birdview demo	Four-camera stream recorded looking to front, rear, left, and right, with PNx9530 computing top "Bird" view
HD 720p video/audio decoding	Full HD output on HDMI expansion board or scaled-down MvF displays
Media recognition technology via Internet access	Album information is retrieved from a server on the Internet. Also supports audio fingerprinting, where a few seconds of an MP3 file are sent to the server and the server responds with track info such as title and artist.

# Complete hardware and software reference designs



## MuViFlex Reference Kit

Equipped with a PNX9530 processor, the MuViFlex Reference Kit includes several demo designs, and is available with expansion options and a software development environment.

### Standard kit contents

- ▶ PNX9530 MuViFlex reference board with 80 G hard disk, DVD-M5 drive, and mini PCI Wi-Fi module (802.11b/g)
- ▶ CD-ROM with quick-start guide, datasheets for major components, application notes, and pre-build application out files
- ▶ Remote control
- ▶ 7-inch WVGA LCD panel
- ▶ 7-inch WVGA LCD panel with touchscreen
- ▶ DC power supply (12 V, 5 A)
- ▶ Two LVDS cables
- ▶ DC power splitter



## Expansion options

PNX9530 I/O are available on headers for future expansion to items such as Host IF and WUSB. The following are available as hardware only; software features aren't supported.

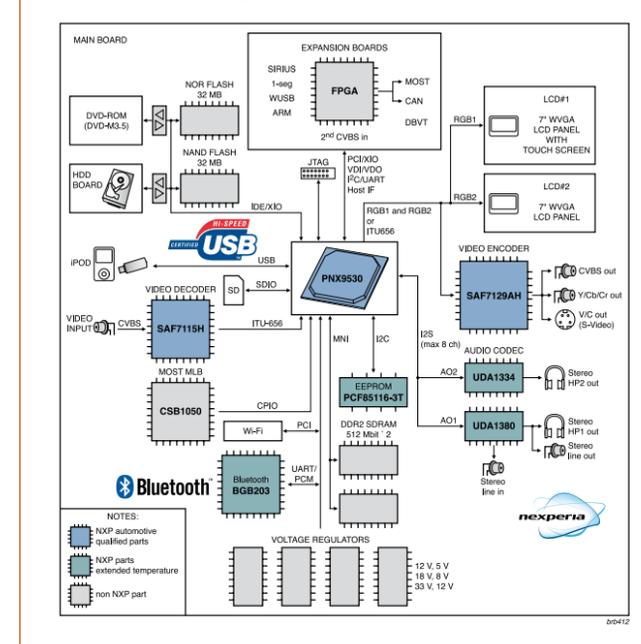
- ▶ Single LCD with Dual View adapter board (FPGA)
- ▶ HDMI expansion board

## Software development environment

The software development environment is available from <http://www.tcshelp.com/>, the SDK is available from NXP

- ▶ MuViFlex Software Development Kit (MVF SDK)
- ▶ Nexperia Development Kit (NDK)
- ▶ Media Processing Toolkit (MPTK)
- ▶ JTAG interface tool.

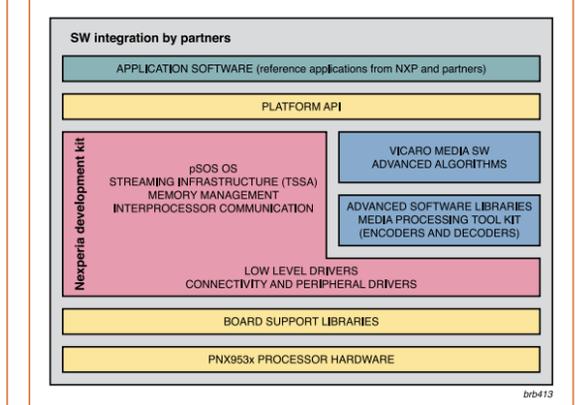
## Hardware Block Diagram



## Components of the PNX9530 MuViFlex Reference Board

- ▶ Audio/Video processor PNX9530
- ▶ Two DDR2 SDRAM: 64MBytes
- ▶ NOR Flash: 32 MBytes
- ▶ NAND Flash: 1 GByte
- ▶ EEPROM: 2Kbytes, PCF85116-3T
- ▶ Two USB slots (either enable micro AB or standard A receptacles)
- ▶ Techwell video decoder TW2865
- ▶ Video encoder SAF7129AH
- ▶ Audio codecs UDA1380TT, UDA1334TS
- ▶ 2-wire LVDS serializers
- ▶ SD/MMC/MS slot
- ▶ Mini-PCI connector
- ▶ 9-pin RCA connector
- ▶ S-Video connector
- ▶ Two 3.5 mm headphone jacks
- ▶ Two 2-wire LVDS connectors
- ▶ Six expansion connectors (0.5 mm FFC)
- ▶ DB9 connector
- ▶ DC Jack
- ▶ 14-pin JTAG connector
- ▶ 802.11b/g MiniPCI interface Wi-Fi module
- ▶ 4 video CVBS video input connectors
- ▶ MOST connector (not mounted)

## PNX953x software reference platform



## PNX953x software reference platform

This proven, production-quality platform is available with multiple reference applications by NXP or from partners of NXP.

[www.nxp.com](http://www.nxp.com)

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