

NPCP215x Audio Enhancing Engine and Power Amplifier Family

General Description

The Nuvoton NPCP215x device is a member of Nuvoton's Sound Enhancing family optimized for TV applications.

The NPCP215x integrates a Class-D power amplifier with Waves® MaxxAudio-3 sound enhancement algorithms. These are proprietary, patented, psychoacoustic algorithms that compensate for the acoustic limitations of small-dimensioned consumer electronics devices and speakers.








MaxxAudio-3 algorithms enable reproduction of rich content, with a wide dynamic range and a full frequency range, on a limited audio system. For low-frequency reproduction, MaxxBass® uses a patented psychoacoustic technique to create a perceived low bass, which can be extended up to 1.5 octaves lower than the original. This technique reproduces full and rich sounding bass tones. Power handling is done by MaxxVolume, which utilizes the power amplifiers and speakers to their full extent yet avoids clipping and distortions.

The MaxxAudio-3 software suite provides additional algorithms that enhance the overall sound quality, such as Maxx3D, which widens the stereo image, and MaxxTrebble for reproducing crystal clear high frequencies. To design a resonance-free audio system, MaxxEQ provides a flexible equalizer with 20 bands.

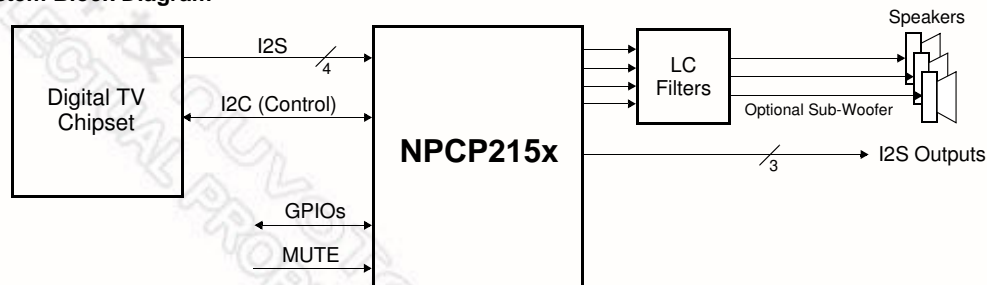
Specifically designed for devices such as TV, MaxxLeveler maintains a constant level of output for any given content. This feature is useful for maintaining the same volume during commercials or when switching TV channels.

The MaxxAudio Graphical User Interface (GUI) enables sound engineers to easily tune the device and customize presettings for different audio products.

Outstanding Features

- Improves audio quality for low-performance speakers
- System-level BOM savings
- Stereo or Stereo + Sub-woofer operation
- I2C controlled
- 24-bit accuracy
- Audio algorithms
 -  **MAXXBASS®**
 -  **MAXX3D**
 -  **MAXXTREBLE**
 -  **MAXXEQ**
 -  **MAXXVOLUME®**
 -  **MAXXLEVELER**
 -  **MAXXDIALOG**
- Audio input: up to four I2S or Synchronous Serial Interface (SSI) inputs
- Audio output:
 - Up to three I2S or SSI outputs
 - Class-D Power output up to 2 x 20W
 - 2.1 way power output up to 2 x 10W + 20W (internal generation of sub-woofer)
- 100 dB SNR
- Typical power efficiency of 90%
- Various protection sensors
- Several General-Purpose digital signals available to the application (GPIOs)
- Logic supply of 3.3V and Power supply up to 26.4V
- 7 x 7 mm, 48-pin Quad Flat No-Lead (QFN) package

System Block Diagram



Features

Bus Interfaces

- Synchronous Serial Interface (SSI)
 - Compatible with I2S
- I2C Interface
 - Compliant with *I2C-BUS Specification Revision 1.0, 1992*
 - Master or slave interface
 - Supports 7-bit address mode

Audio Enhancing Engine

- Processing Unit
 - 24-bit
 - 125 MIPs

Audio Algorithms

- MaxxBass®
 - Patented Waves MaxxBass psycho-acoustic bass extension delivers a more natural sound than traditional bass boost technologies, which use EQ and can overpower your system. MaxxBass analyzes low frequencies to create harmonics that are perceived as lower, deeper tones.
- Maxx3D
 - Maxx3D extends the span of stereo-side content while maintaining the integrity of unprocessed center content.
 - Maxx3D improves the stereo separation of speakers, widening the stereo field for optimal imaging.
- MaxxTreble
 - MaxxTreble delivers crystal clear high-frequency enhancement for increased RMS without exceeding the system ceiling. Its proprietary algorithm restores luster to over-compressed formats to provide the perfect listening experience.
- MaxxEQ
 - MaxxEQ provides the ability to design EQ curves and shape sound with surgical precision, using up to 20 programmable filters with bell, shelf, low pass, and high pass, plus adjustable frequency, gain, and Q parameters. MaxxEQ's intuitive Graphic User Interface makes click-and-drag filter design fast and easy.
- MaxxVolume®
 - MaxxVolume is an all-in-one volume control, with High-Level Compression to increase RMS levels, Low-Level Compression to increase the clarity of soft sounds, Noise Gating to eliminate signal and system noise, and Leveling to smooth out volume levels.
 - It includes:
 - Leveler - (replaces traditional AGC)
 - Low-level gain
 - Dynamic range curve controller
 - Noise gate

- MaxxLeveler
 - MaxxLeveler regulates the perceived volume of the audio, keeping all audio content at the same level.
- MaxxDialog
 - MaxxDialog is a revolutionary new technology that enables users to adjust center channel dialog levels without affecting the rest of the audio mix. Based on the Waves Center pro audio plug-in, MaxxDialog delivers clear, crisp dialog that does not disappear behind loud music and effects.
- Sub-Woofer
 - Enables separating low-frequency content and directing it into a third audio channel, for driving a sub-woofer.

Power Amplifier

- Class-D Power up to 2 x 20W to 6 Ω or 8 Ω (0.5% THD)
- 2.1 way power output up to 2 x 10W + 20W (internal generation of sub-woofer)
- Typical power efficiency of 90%
- 100 dB SNR
- Less than 0.4% THD at 1W
- Protection:
 - Over-current
 - Under-voltage
 - Over-temperature

Straps, Clocks, Supply and Package Information

- Strap Input Controlled Operating Modes
 - PLL reference clock select (REF strap)
 - Test mode select (nTEST strap)
 - I2C master or slave select (I2CMS strap)
 - Boot options
 - ROM code operation
 - Loadable algorithms for new functions or ROM code patching
- Input Clocks
 - SSI / I2S clock: 1 MHz - 5 MHz input
 - Optional crystal oscillator or input clock
- Power Supply
 - 3.3V Logic supply
 - 9V to 26.4V Power supply
- Power-Save Modes
 - Power-down of less than 100 mW
 - Power stage shut down
- Package
 - 7 x 7 mm, 48-pin Quad Flat No-Lead (QFN) package

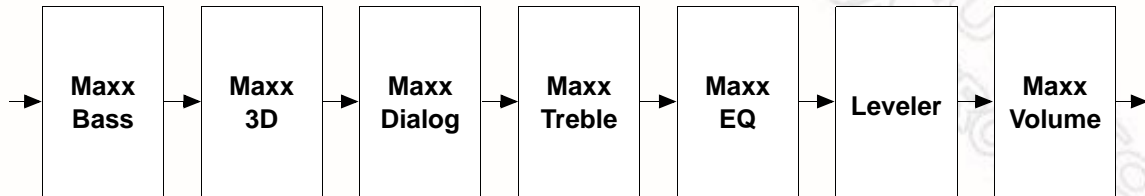
Features (Continued)

Derivative Table

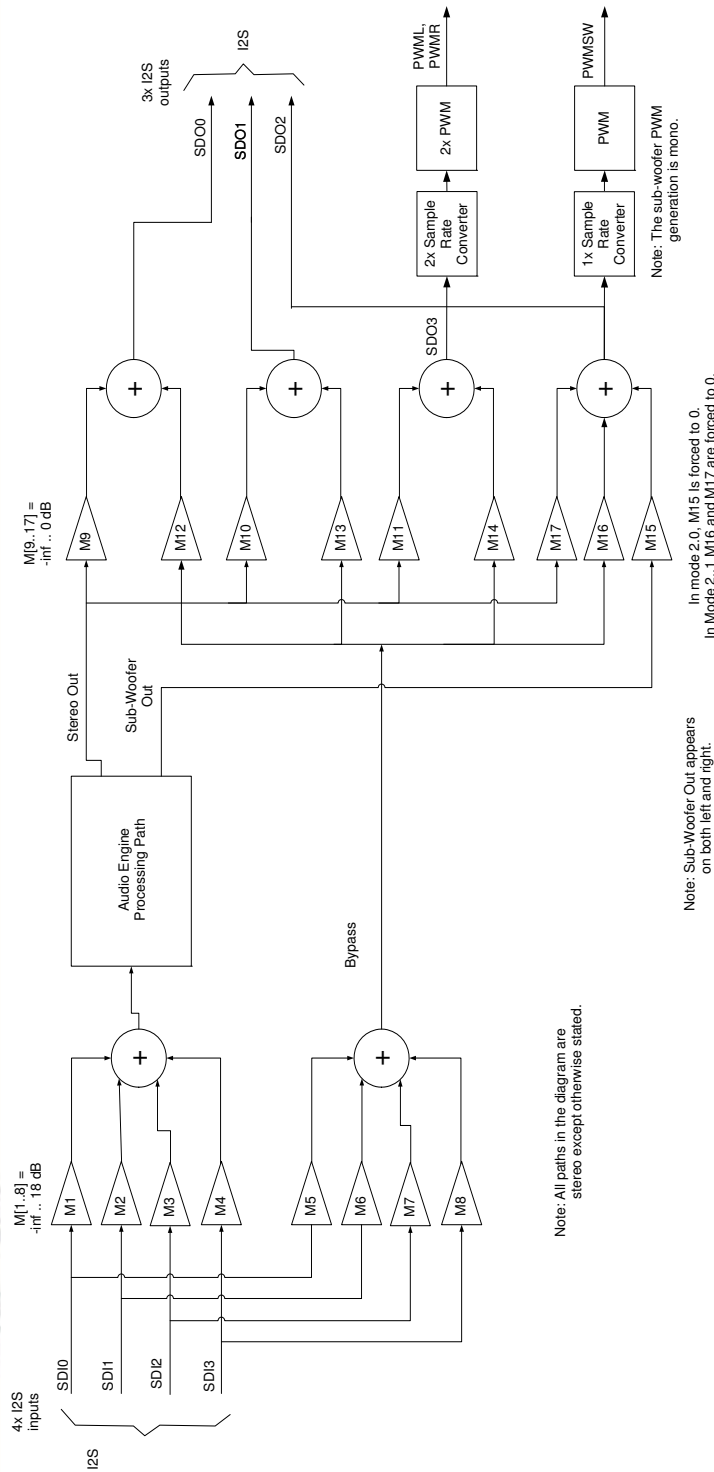
Product	ID ¹	Package	I2S Stereo Inputs	Output Power	Algorithms						
					Maxx Bass	Maxx EQ	Maxx Treble	Maxx Volume	Maxx Leveler	Maxx 3D & Maxx Dialog	Sub-Woofers Support
NPCP215F	0011	QFN48	4	2x20W or 2x10W + 20W	◆	◆	◆	◆	◆	◆	◆
NPCP215B	0010	QFN48	4	2x20W or 2x10W + 20W	◆	◆		◆			

1. Includes 4 bits: Bits 3-1 are the DEVSEL field, bit 0 is the ALLALGEN bit.

Algorithm Processing Chain



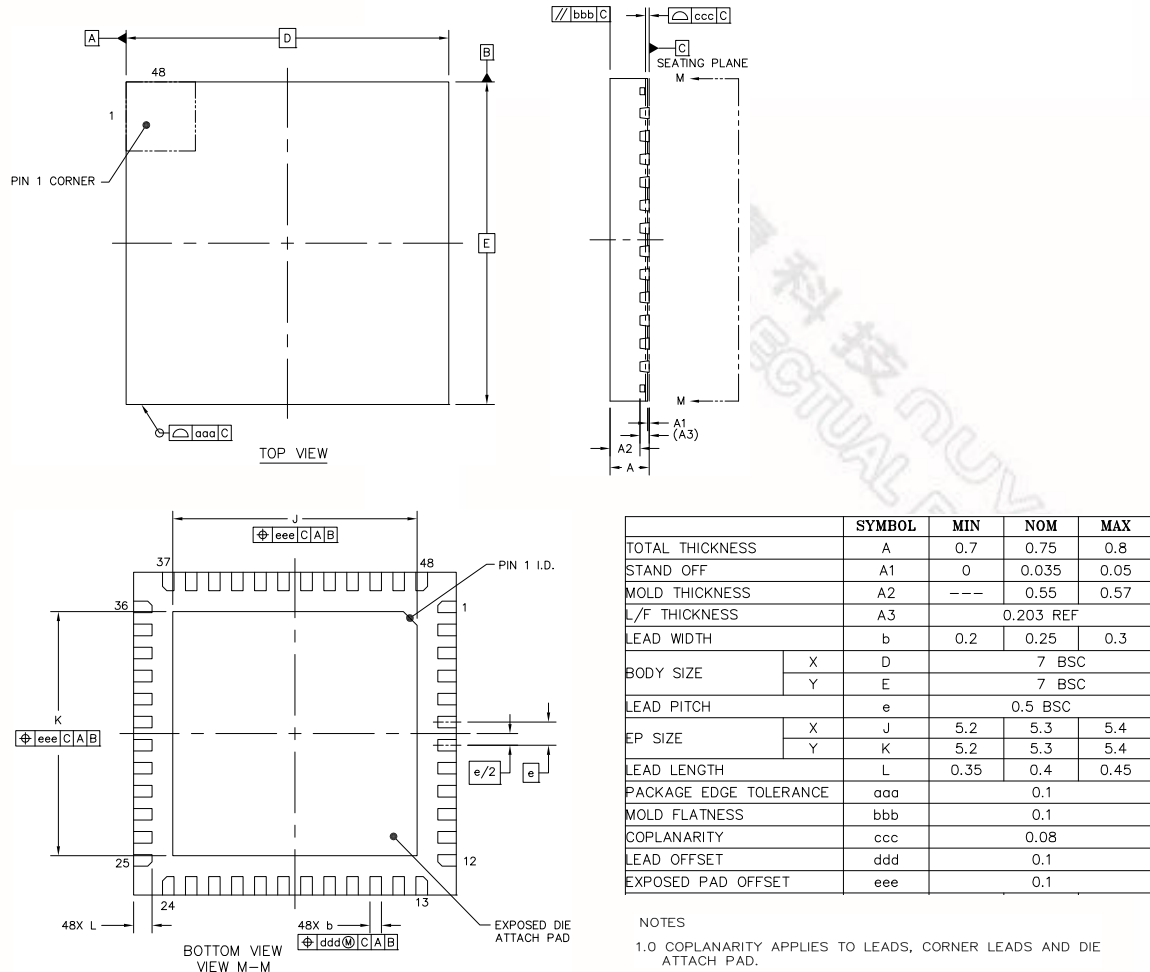
Features (Continued)



Device Audio Path Block Diagram

QFN48 Physical Dimensions

Control dimensions are in millimeters.



48-Pin Quad Flat No-Lead (QFN) Package Order Number: NPCP215BA0YX or NPCP215FA0YX

Device topside mark specification:

- 1st Line: Nuvoton Company Logo.
 - 2nd Line: Part number - NPCP215xA0YX (x is B or F)
(‘Y’: QFN package number; ‘X’: Green package finish indicator.)
 - 3rd Line: Assembly Lot Number - XXXXXXXX-XXX.
 - 4th Line: Tracking code - YWWXXXX, where YWW is the Date Code and XXXX is Nuvoton proprietary information.
- Date code: YWW, where Y is the year and WW is the week. For example, date code 235 indicates that device assembly was done on week 35, year 2012.



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