Product Brief
November 2011
Revision 1.0

NPCA110T Audio Enhancing Engine and DAC

General Description

The Nuvoton NPCA110T device is a member of Nuvoton's Sound Enhancing family optimized for TV applications.

The NPCA110T integrates Waves® MaxxAudio 3 sound enhancement algorithms. These are proprietary, patented, psychoacoustic algorithms that compensate for the acoustic limitations of small CE devices.

The 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 MaxxTreble for reproducing crystal clear high frequencies. To design a resonance-free audio system, MaxxEQ provides a flexible equalizer with 10 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 Maxx family of devices includes:

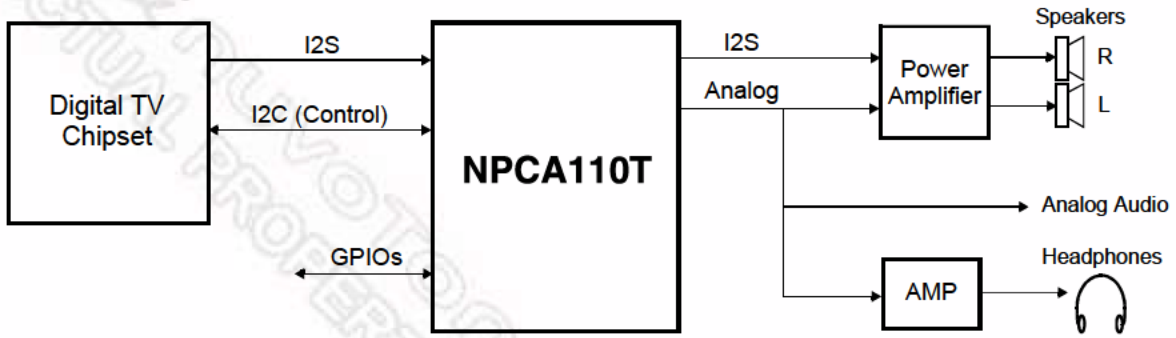
- High-performance, 24-bit audio enhancing engine pre-programmed with Waves MaxxAudio 3 algorithms
- Optional Audio DAC
- Optional Audio ADC
- Digital I/O and other features for high-performance audio systems

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 operation
- I2C controlled
- 24-bit accuracy
- Audio algorithms
  - MAXXBASS®
  - MAXX3D
  - MAXXTREBLE
  - MAXXEQ
  - MAXXVOLUME®
  - MAXXLEVELER
  - MAXXDIALOG
- Audio input
  - Up to three I2S or Synchronous Serial Interface (SSI) inputs
- Audio output
  - Optional generation of one bass channel
  - Up to three I2S or SSI outputs
  - Up to three analog outputs: typical SNR of 96 dB; typical THD of –86 dB
- Several General-Purpose digital signals available to the application (GPIOs)
- Typical operational power target of less than 0.2W
- Power-down target of less than 1 mW
- 3.3V operation

System Block Diagram



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Features

Bus Interfaces

- Synchronous Serial Interface (SSI)
  - Compatible with I2S
  - Master and slave timing support
- 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 accuracy
  - 125 MIPs

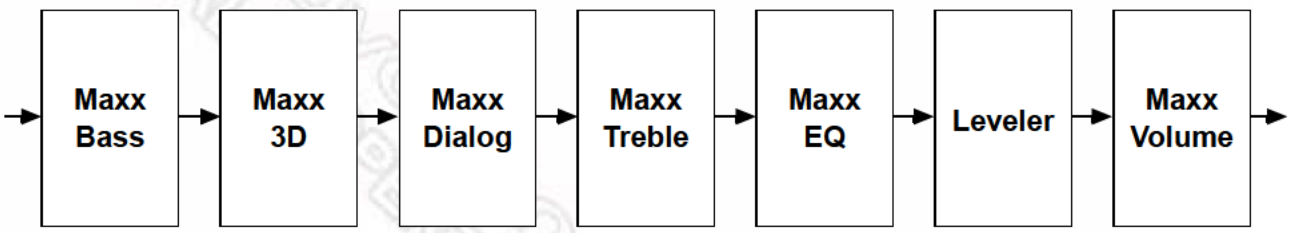
Audio Algorithms

- Sample frequency of 44.1 KHz or 48 KHz supported
- 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 for Speakers improves the stereo separation of speakers, widening the stereo field for optimal imaging.
  - Maxx3D for Headphones improves stereo perception, restoring the original listening balance to provide more natural sound.
- 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 10 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.
- 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 subwoofer.

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: 64x of sample frequency
  - Optional crystal oscillator or input clock
- Power Supply
  - 3.3V supply operation
- Power-Save Modes
  - Clock switch to a lower frequency
  - WAIT instruction (clock stopped)
  - PLL power-down
- Package
  - 5 x 5 mm, 32-pin Quad Flat No-Lead (QFN) package

Algorithm Processing Chain



Features (Continued)

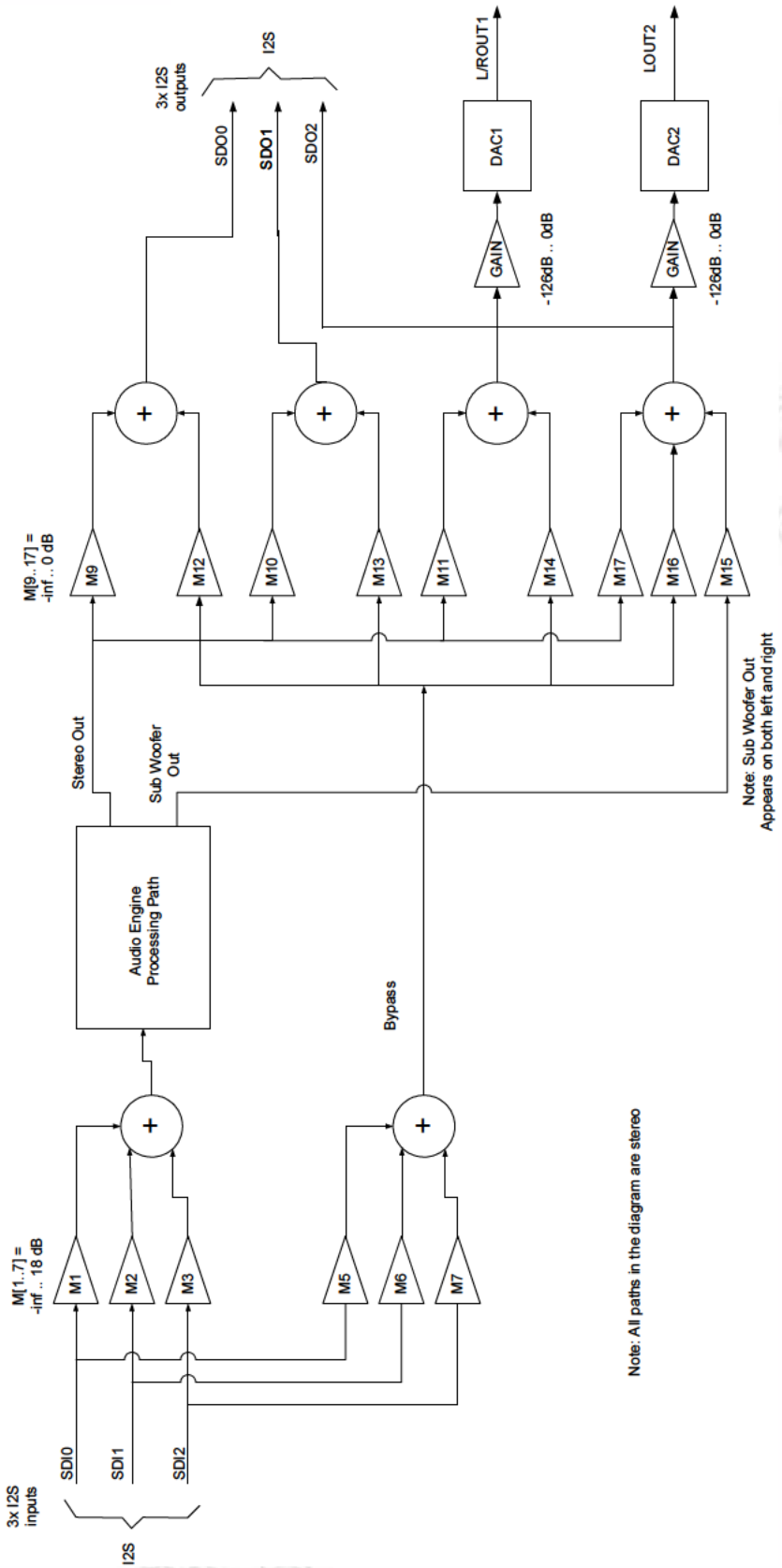
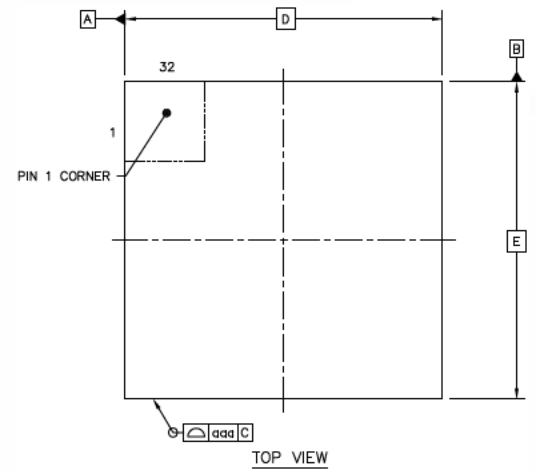
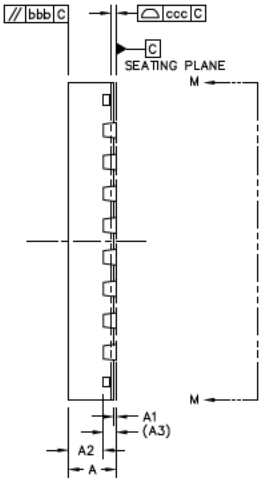


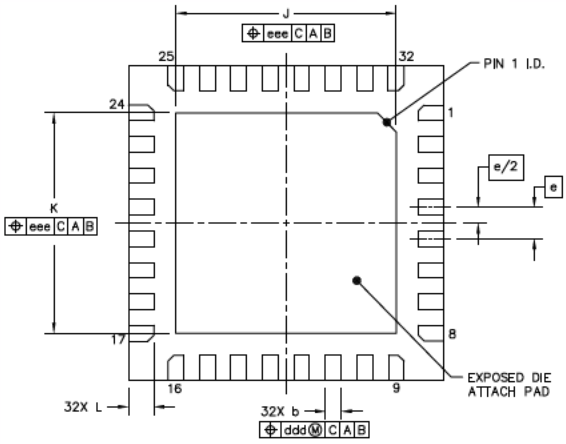
Figure 1. Device Block Diagram

Physical Dimensions

Control dimensions are in millimeters.







		SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS		A	0.7	0.75	0.8
STAND OFF		A1	0	0.035	0.05
MOLD THICKNESS		A2	---	0.55	0.57
L/F THICKNESS		A3		0.203 REF	
LEAD WIDTH		b	0.2	0.25	0.3
BODY SIZE	X	D		5 BSC	
	Y	E		5 BSC	
LEAD PITCH		e		0.5 BSC	
EP SIZE	X	J	3.4	3.5	3.6
	Y	K	3.4	3.5	3.6
LEAD LENGTH		L	0.35	0.4	0.45
PACKAGE EDGE TOLERANCE		aaa		0.1	
MOLD FLATNESS		bbb		0.1	
COPLANARITY		ccc		0.08	
LEAD OFFSET		ddd		0.1	
EXPOSED PAD OFFSET		eee		0.1	

NOTES

1.0 COPLANARITY APPLIES TO LEADS, CORNER LEADS AND DIE ATTACH PAD.

32-Pin Quad Flat No-Lead (QFN) Package
Order Number: NPCA110TA0YX

Device topside mark specification:

1st Line: **Part number - NPCA110T**
2nd Line: **A0YX YWW.**
A0 - End of part number; 'Y': QFN package indicator;
'X': Green package finish indicator.
YWW: Date Code.
3rd and 4th Lines: Nuvoton proprietary information.

Date code: **YWW, where Y is the year and WW is the week. For example, date code 035 indicates that device assembly was done on week 35, year 2010.**

NPCA110T
A0YX YWW
ZZ ZZZZZZ
ZZZZZ

Important Notice

Nuvoton products are not designed, intended, authorized or warranted for use as components in systems or equipment intended for surgical implantation, atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, or for other applications intended to support or sustain life. Furthermore, Nuvoton products are not intended for applications wherein failure of Nuvoton products could result or lead to a situation wherein personal injury, death or severe property or environmental damage could occur.

Nuvoton customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Nuvoton for any damages resulting from such improper use or sales.

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