CM6631A

USB 2.0 High-Speed True HD Audio Processor

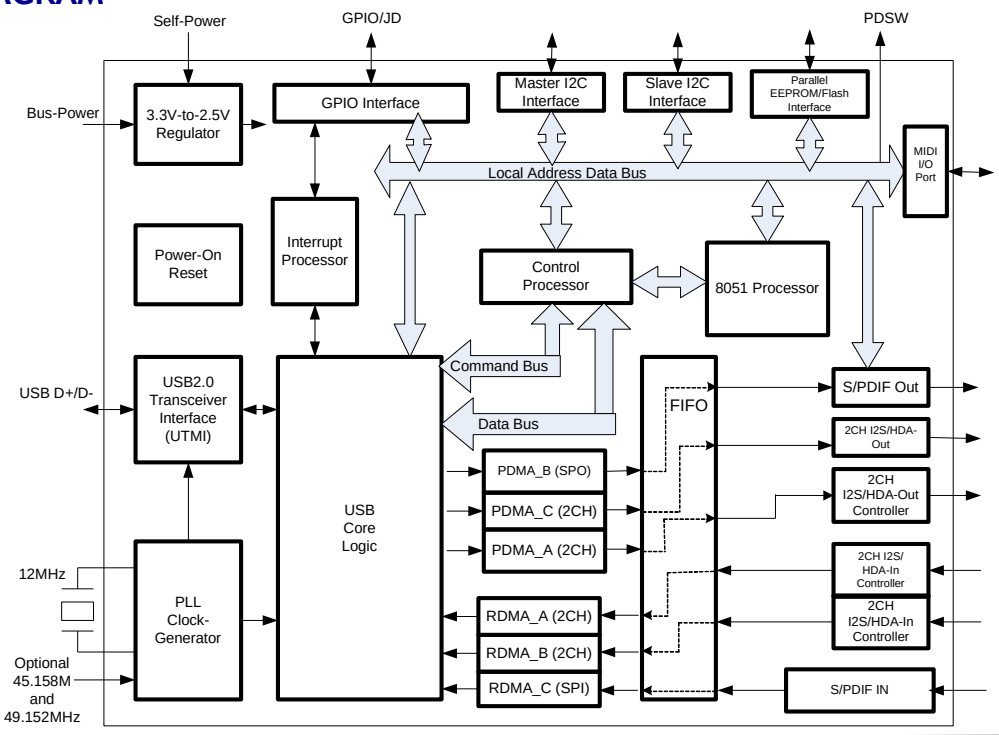
DESCRIPTION

Cmedia CM6631A is a USB2.0 true high-speed audio processor that can support the latest USB Audio Device Class Definition V2.0 and high-definition audio processing capability up to 192KHz/32bit. CM6631A provides the industrial standard I2S and HDA audio interface and also integrates 192KHz/24bit S/PDIF transmitter/receiver and MIDI I/O device. It's suitable for versatile, high-profile, typical 2-channel I/O audio applications. Furthermore, CM6631A has an embedded 8051 microprocessor that can enhance the best flexibility and functionality with external upgradeable F/W codes. CM6631A would be the most high-fidelity and powerful audio core for high-value USB2.0 audio products.

FEATURES

- USB Spec. Rev.2.0 high-speed/full-speed mode compatible
- Latest USB Audio Device Class Definition Release v.2.0/1.0 compatible
- USB Human Interface Device (HID) Class Definition Release 1.1 compliant
- Supports USB suspend/resume/reset functions
- Supports control, interrupt, bulk, and isochronous data transfers
- 2 pairs I2S or Left-Justified serial audio output /input interface
- I2S input/output support 192K/176.4K/96K/88.2K/48K/44.1KHz and 16/24/32-bit
- Built-in 192K/176.4K/96K/88.2K/48K/44.1KHz and 16/24-bit S/PDIF transceiver
- Supports S/PDIF IN-to-OUT loop-back path for signal transforming between TOSLINK and RCA connections

BLOCK DIAGRAM



Release Note

Revision	Date	Description
0.1	2012/05/04	-preliminary
0.2	2012/06/20	-update GPIO mapping
0.3	2012/07/24	-add optional sound effect -update power consumption value
0.31	2012/08/01	-re-organize chapter order
0.32	2012/09/28	-add I2S support master/slave description -add 24.576 and 22.5792 clock input
1.0	2012/10/25	-Formal released

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1 Description and Overview

Cmedia CM6631A is a USB2.0 true high-speed audio processor that can support the latest USB Audio Device Class Definition V2.0 and high-definition audio processing capability up to 192KHz/32bit. CM6631A provides the industrial standard I2S and HDA audio interface and also integrates 192KHz/24bit S/PDIF transmitter/receiver and MIDI I/O device. It's suitable for versatile, high-profile, typical 2-channel I/O audio applications. Furthermore, CM6631A has an embedded 8051 microprocessor that can enhance the best flexibility and functionality with external upgradeable F/W codes. CM6631A would be the most high-fidelity and powerful audio core for high-value USB2.0 audio products.

2 Features

USB Compliance

- USB Spec. Rev.2.0 high-speed/full-speed mode compatible
- Latest USB Audio Device Class Definition Release v.2.0/1.0 compatible
- USB Human Interface Device (HID) Class Definition Release 1.1 compliant
- Supports USB suspend/resume/reset functions
- Supports control, interrupt, bulk, and isochronous data transfers
- Asynchronous synchronization transfer to reduce clock jitter

Audio Engine

- Max. 3 Independent Playback Streams:
  - Default Sample Rates: 192K/176.4K/96K/88.2K/48K/44.1KHz (192K/176.4KHz are available only in USB Audio Class 2.0/High-speed mode)
  - Supported Bit Length: 16/24/32 bit
  - PDMA#A and C engines support 2-channel data to I2S/HDA output
  - PDMA#B supports S/PDIF output
- Max. 3 Independent Capture Streams:
  - Default Sample Rates: 192K/176.4K/96K/88.2K/48K/44.1KHz (192K/176.4KHz are available only in USB Audio Class
  - 2.0/High-speed mode)
  - Supported Bit Length: 16/24/32 bit
  - RDMA#A and B support 2-channel data from I2S/HDA input
  - RDMA#C supports S/PDIF input (192KHz is supported only with Crystal and PLL clock source)
- Digital mixing/routing engine to mix input streams to output streams

Audio I/O

- 2 pairs I2S or Left-Justified serial audio output interface

- 2 pairs I2S or Left-Justified serial audio input interface
- All the I2S input/output support master/slave mode
- Built-in 192K/176.4K/96K/88.2K/48K/44.1KHz and 16/24-bit S/PDIF transmitter
- Integrated 192K/176.4K/96K/88.2K/48K/44.1 and 16/24-bit S/PDIF receiver
- Supports S/PDIF IN-to-OUT loop-back path for signal transforming between TOSLINK and RCA connections

Integrated 8051 Micro-processor

- Embedded 8051 micro-processor to handle the comment/protocol transactions
- Connects to an external parallel Flash/EEPROM memory (Max. 64KB, 55ns access time is required) for firmware codes
- HID interrupts can be implemented via firmware codes
- Provides maximum HW configuration flexibility with firmware code upgrade
- VID/PID/Product String can be customized via firmware code programming

Control Interface

- Master I2C control interface for external audio devices or EEPROM access
- Slave I2C control interface and interrupt pin for external MCU/device communication
- 9 GPIO pins and 6 GPI pins
- External device power-down control and reset pins

General

- Embedded USB2.0 transceiver (up to 480MB bandwidth)
- Auto detection for high-speed/full-speed
- GPIO pin for USB Audio Class 2.0 and 1.0 application mode configuration
- Provides Self-power or Bus-power mode selection pin
- Only single 12MHz crystal input is required (embedded PLL function) or optional oscillator inputs for 49.152/24.576MHz(for x48KHz) and 45.1584/22.5792MHz (for x44.1KHz)
- Single 3.3V power supply (embedded 3.3V to 2.5V regulator for digital core)
- 3.3V digital I/O pads with 5V tolerance
- Industrial standard LQFP-100 package (16x16mm)

Optional Value-added Software Features:

- Cmedia vendor drivers supports USB Audio Class 2.0 and high-speed mode on Windows® XP, Windows® Vista, Windows® 7, Windows® 8 and Mac OS X 10.5.7 (or later) with Cmedia vendor drivers
- USB audio class 1.0 with full-speed/high-speed modes compatible with the Windows® XP, Windows® Vista, Windows® 7 and Windows® 8 UAA driver, Mac OS X and Linux embedded USB audio drivers

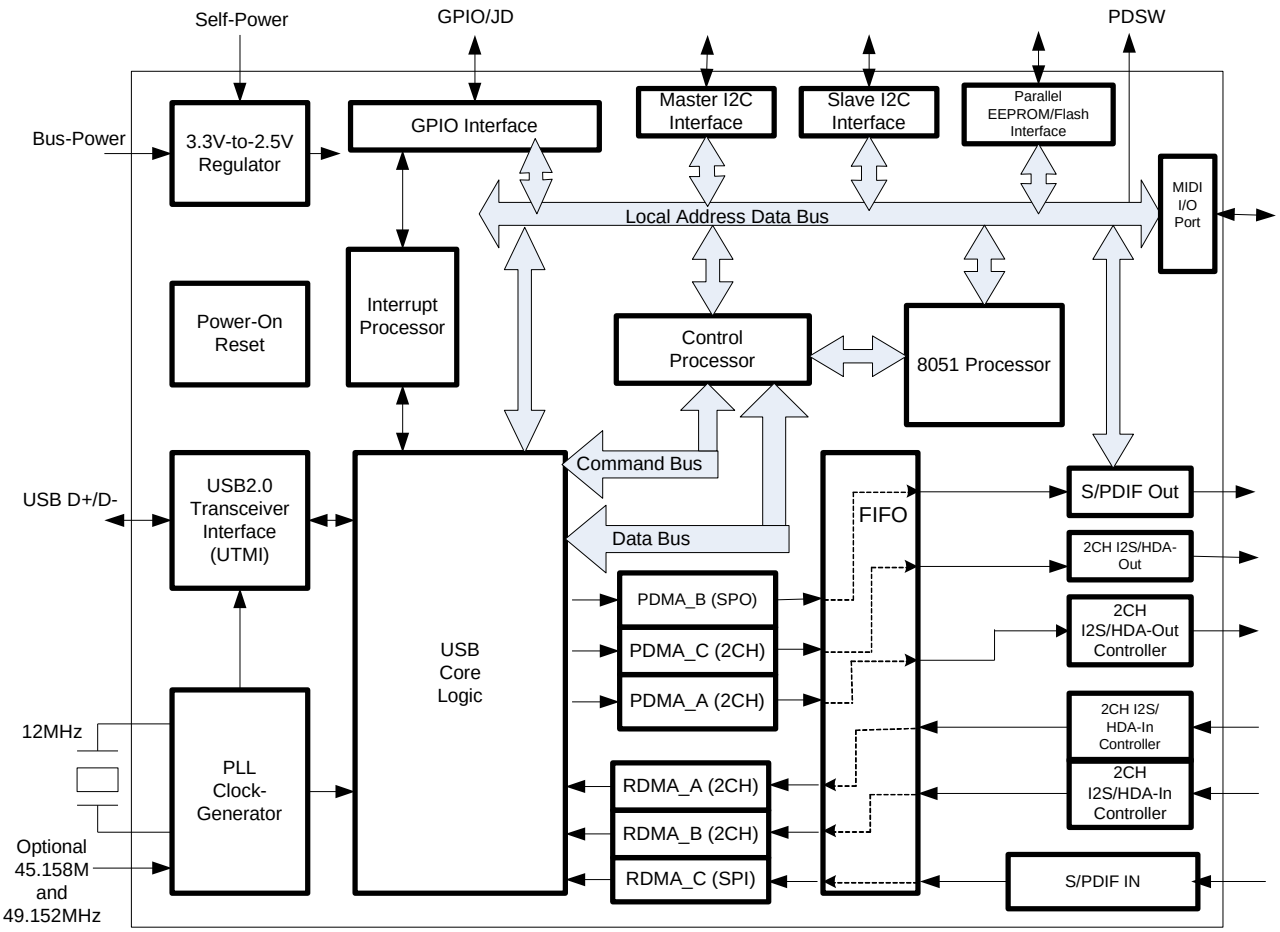
- For Windows, Cmedia drivers provide the following key features:
  - Playback feedback endpoints to control data transmission accuracy and maximize audio quality
  - Xear™ Pro
    - Support ASIO2.2 driver

3 Applications

- True HD USB DAC
- USB2.0 Headphone Amplifier
- Professional PC musician applications (recording interface, console, electrical guitar, etc.)
- Consumer stereo systems with embedded USB audio (Boom Box, portable CD/FM/MP3 players, Stereo Amplifier, etc.)
- ExpressCard compatible USB2.0 audio adaptor
- High-Fidelity USB2.0 wireless Headset
- High-Fidelity USB2.0 2CH headphone
- High-quality USB2.0 audio/gaming headset
- USB2.0 VideoCam or Video Capture Box with mic/audio features

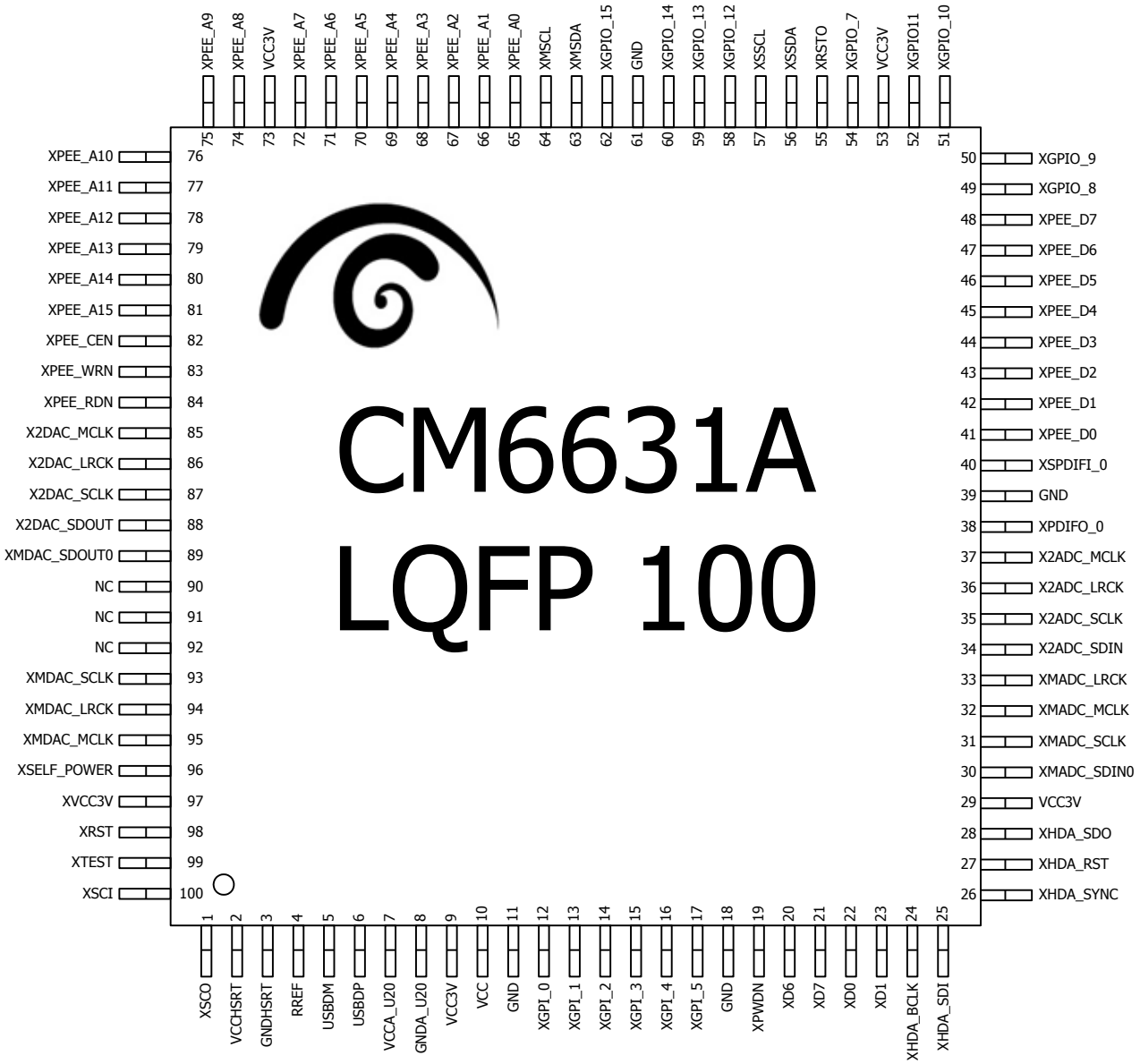
4 Block Diagram

CM6631A Functional Block Diagram



5 Pin Assignment

5.1 Pin-Out Diagram



5.2 Pin Description

Pin #	Symbol	I/O	Description
Clock			
1	XSCO	AO	12MHz crystal oscillator output
100	XSCI	AI	12MHz crystal oscillator input
20	XD6	DIO	49.152Mhz oscillator input(for 48, 96,192KHz)
21	XD7	DIO	45.158Mhz oscillator input(for 44.1KHz)
USB2.0 BUS Interface			
5	USBDM	AIO	USB 2.0 data negative (USB D- signal)
6	USBDP	AIO	USB 2.0 data positive (USB D+ signal)
Power/Ground			
2	VCCHSRT	AI	USB PHY analog power supply pin (3.3V)
3	GNDHSRT	AI	USB PHY analog ground
7	VCCA_U20	AI	USB PHY analog power supply pin (3.3V)
8	GNDA_U20	A	USB PHY analog ground
9	VCC3V	DI	Digital power supply pin (3.3V)
10	VCC	DO	Digital power filter pin (2.5V), connecting external filter capacitors
11	GND	D	Digital Ground
18	GND	D	Digital Ground
29	VCC3V	DI	Digital power supply pin (3.3V)
39	GND	D	Digital Ground
53	VCC3V	DI	Digital power supply pin (3.3V)
61	GND	D	Digital Ground
73	VCC3V	DI	Digital power supply pin (3.3V)
97	VCC3V	DI	Digital power supply pin (3.3V)
2-channel I2S ADC_1 Interface (RDMA_A)			
30	XMADC_SDIN0	DI	I2S serial data input for channel 0, 1 Programmable 3.3V input buffer, Schmitt trigger, pull-down
31	XMADC_SCLK	DIO	I2S bit clock Programmable 3.3V bidirectional buffer, pull-down
32	XMADC_MCLK	DO	I2S master clock Programmable 3.3V output buffer
33	XMADC_LRCK	DIO	I2S left/right clock Programmable 3.3V bidirectional buffer, pull-down
2-channel I2S ADC_2 Interface (RDMA_C)			
34	X2ADC_SDIN	DI	I2S serial data input for channel 0, 1 Programmable 3.3V input buffer, Schmitt trigger, pull-down
35	X2ADC_SCLK	DIO	I2S bit clock Programmable 3.3V bidirectional buffer, pull-down

36	X2ADC_LRCK	DIO	I2S left/right clock Programmable 3.3V bidirectional buffer, pull-down
37	X2ADC_MCLK	DO	I2S master clock Programmable 3.3V output buffer
S/PDIF I/O			
38	XSPDIFO_0	DO	S/PDIF transmitter Programmable 3.3V output buffer
40	XSPDIFI_0	DI	S/PDIF receiver 3.3v input buffer, Schmitt trigger, pull-down
Parallel EEPROM/Flash Memory Interface			
41	XPEE_D0	DIO	Parallel EEPROM/FLASH data in/out 0 Programmable 3.3V bidirectional buffer, pull-down
42	XPEE_D1	DIO	Parallel EEPROM/FLASH data in/out 1 Programmable 3.3V bidirectional buffer, pull-down
43	XPEE_D2	DIO	Parallel EEPROM/FLASH data in/out 2 Programmable 3.3V bidirectional buffer, pull-down
44	XPEE_D3	DIO	Parallel EEPROM/FLASH data in/out 3 Programmable 3.3V bidirectional buffer, pull-down
45	XPEE_D4	DIO	Parallel EEPROM/FLASH data in/out 4 Programmable 3.3V bidirectional buffer, pull-down
46	XPEE_D5	DIO	Parallel EEPROM/FLASH data in/out 5 Programmable 3.3V bidirectional buffer, pull-down
47	XPEE_D6	DIO	Parallel EEPROM/FLASH data in/out 6 Programmable 3.3V bidirectional buffer, pull-down
48	XPEE_D7	DIO	Parallel EEPROM/FLASH data in/out 7 Programmable 3.3V bidirectional buffer, pull-down
82	XPEE_CEN	DO	Parallel EEPROM/FLASH chip enable, active low Programmable 3.3V output buffer
83	XPEE_WRN	DIO	Parallel EEPROM/FLASH write enable, active low Programmable 3.3V bidirectional buffer, pull-down
84	XPEE_RDN	DIO	Parallel EEPROM/FLASH read enable, active low Programmable 3.3V bidirectional buffer, pull-down
65	XPEE_A0	DIO	Parallel EEPROM/FLASH address 0 Programmable 3.3V bidirectional buffer, pull-down
66	XPEE_A1	DIO	Parallel EEPROM/FLASH address 1 Programmable 3.3V bidirectional buffer, pull-down
67	XPEE_A2	DIO	Parallel EEPROM/FLASH address 2 Programmable 3.3V bidirectional buffer, pull-down
68	XPEE_A3	DIO	Parallel EEPROM/FLASH address 3 Programmable 3.3V bidirectional buffer, pull-down
69	XPEE_A4	DIO	Parallel EEPROM/FLASH address 4 Programmable 3.3V bidirectional buffer, pull-down
70	XPEE_A5	DIO	Parallel EEPROM/FLASH address 5 Programmable 3.3V bidirectional buffer, pull-down
71	XPEE_A6	DIO	Parallel EEPROM/FLASH address 6 Programmable 3.3V bidirectional buffer, pull-down
72	XPEE_A7	DIO	Parallel EEPROM/FLASH address 7 Programmable 3.3V bidirectional buffer, pull-down
74	XPEE_A8	DIO	Parallel EEPROM/FLASH address 8 Programmable 3.3V bidirectional buffer, pull-down
75	XPEE_A9	DIO	Parallel EEPROM/FLASH address 9 Programmable 3.3V bidirectional buffer, pull-down
76	XPEE_A10	DIO	Parallel EEPROM/FLASH address 10 Programmable 3.3V bidirectional buffer, pull-down
77	XPEE_A11	DIO	Parallel EEPROM/FLASH address 11 Programmable 3.3V bidirectional buffer, pull-down
78	XPEE_A12	DIO	Parallel EEPROM/FLASH address 12 Programmable 3.3V bidirectional buffer, pull-down
79	XPEE_A13	DIO	Parallel EEPROM/FLASH address 13 Programmable 3.3V bidirectional buffer, pull-down

80	XPEE_A14	DIO	Parallel EEPROM/FLASH address 14 Programmable 3.3V bidirectional buffer, pull-down
81	XPEE_A15	DIO	Parallel EEPROM/FLASH address 15 Programmable 3.3V bidirectional buffer, pull-down
GPI			
12	XGPI_0	DIO	General purpose input 0 Programmable 3.3V input buffer, Schmitt trigger, pull-down
13	XGPI_1	DIO	General purpose input 1 Programmable 3.3V input buffer, Schmitt trigger, pull-down
14	XGPI_2	DIO	General purpose input 2 Programmable 3.3V input buffer, Schmitt trigger, pull-down
15	XGPI_3	DIO	General purpose input 3 Programmable 3.3V input buffer, Schmitt trigger, pull-down
16	XGPI_4	DIO	General purpose input 4 Programmable 3.3V input buffer, Schmitt trigger, pull-down
17	XGPI_5	DIO	General purpose input 5 Programmable 3.3V input buffer, Schmitt trigger, pull-down
GPIO			
54	XGPIO_7	DIO	General purpose input/output 0 (default output). Programmable 3.3V/5V tolerance bidirectional buffer, pull-down
49	XGPIO_8	DIO	General purpose input/output 1 (default output). Programmable 3.3V/5V tolerance bidirectional buffer, pull-down
50	XGPIO_9	DIO	General purpose input/output 2 (default output). Programmable 3.3V/5V tolerance bidirectional buffer, pull-down
51	XGPIO_10	DIO	General purpose input/output 3 (default input). Programmable 3.3V/5V tolerance bidirectional buffer, pull-down
52	XGPIO_11	DIO	General purpose input/output 4 (default input). Programmable 3.3V/5V tolerance bidirectional buffer, pull-down
58	XGPIO_12	DIO	General purpose input/output 5 (default input). Programmable 3.3V/5V tolerance bidirectional buffer, pull-down
59	XGPIO_13	DIO	General purpose input/output 6 (default input). Programmable 3.3V/5V tolerance bidirectional buffer, pull-down
60	XGPIO_14	DIO	General purpose input/output 6 (default input). Programmable 3.3V/5V tolerance bidirectional buffer, pull-down
62	XGPIO_15	DIO	General purpose input/output 6 (default input). Programmable 3.3V/5V tolerance bidirectional buffer, pull-down
MIDI Interface			
22	XD0	DIO	MIDI RXD, Serial input port Programmable 3.3V/5V tolerance bidirectional buffer, pull-down
23	XD1	DIO	MIDI TXD, Serial output port Programmable 3.3V/5V tolerance bidirectional buffer, pull-down
High-Definition Audio Interface			
24	XHDA_BCLK	DO	HDA link bit clock (24MHz) Programmable 3.3V output buffer
25	XHDA_SDI	DI	HDA link serial data in Programmable 3.3V bidirectional buffer, pull-down
26	XHDA_SYNC	DO	HDA link frame synchronization Programmable 3.3V output buffer
27	XHDA_RST	DO	HDA link reset signal, active low Programmable 3.3V output buffer
28	XHDA_SDO	DO	HDA link serial data out Programmable 3.3V output buffer
2-channel I2S DAC_2 Interface (PDMA_C)			
85	X2DAC_MCLK	DO	I2S master clock Programmable 3.3V output buffer
86	X2DAC_LRCK	DIO	I2S left/right clock Programmable 3.3V bidirectional buffer, pull-down

87	X2DAC_SCLK	DIO	I2S bit clock Programmable 3.3V bidirectional buffer, pull-down
88	X2DAC_SDOUT	DO	I2S serial data output for channel 0, 1 Programmable 3.3V output buffer
2-channel I2S DAC_1 Interface (PDMA_A)			
89	XMDAC_SDOUT0	DO	I2S serial data output for channel 0, 1 Programmable 3.3V output buffer
93	XMDAC_SCLK	DIO	I2S bit clock Programmable 3.3V bidirectional buffer, pull-down
94	XMDAC_LRCK	DIO	I2S left/right clock Programmable 3.3V bidirectional buffer, pull-down
95	XMDAC_MCLK	DO	I2S master clock Programmable 3.3V output buffer
2-Wire Master Serial Bus (I2C)			
63	XMSDA	DIO	2-wire master serial data Programmable 3.3V/5V tolerant bidirectional buffer, pull-down
64	XMSCL	DIO	2-wire master serial clock Programmable 3.3V/5V tolerant bidirectional buffer, pull-down
2-Wire Slave Serial Bus (I2C)			
56	XSSDA	DIO	2-wire slave serial data Programmable 3.3V/5V tolerant bidirectional buffer, pull-down
57	XSSCL	DIO	2-wire slave serial clock Programmable 3.3V/5V tolerant bidirectional buffer, pull-down
Miscellaneous			
4	RREF	AI	Connect external reference resistor (12KΩ±1%)
19	XPWDN	DO	External device power down control signal (default tri-state) Programmable 3.3V/5V tolerance output buffer
55	XRSTO	DO	External codec reset (default tri-state) Programmable 3.3V/5V tolerance output buffer
96	XSEL_PWR	DI	Self Power used, 1:self power, 0:bus power Programmable 3.3V input buffer, Schmitt trigger, Pull-down
98	XRST	DI	CM6631A chip reset
99	XTEST	DI	Test Mode Select Pin: H: Test Mode L: Normal Operation
NC			
90	NC	DI	No connecting
91	NC	DI	No connecting
92	NC	DI	No connecting

6 Electrical Characteristics

6.1 Maximum Ratings

Test Conditions; V_{DD} = 3.3V, DGND =0V, TA=+25°C

Parameter	Symbol	Min	Typ	Max	Units
Storge temperature	-	-55	-	150	°C
Operating ambient temperature	-	0	25	75	°C
DC supply voltage	-	3.0	3.3	3.6	V
I/O pin voltage	-	GND	-	V_{DD}	V
Power dissipation	-	-	0.15	-	W

6.2 Recommended Operation Conditions

Test Conditions: VDD = 3.3V, DGND =0V, TA=+25°C

Parameter	Symbol	Min	Typ	Max	Units
Input voltage range	-	V_{DD}-0.3	V_{DD}	V_{DD}+0.3	V
Output voltage range	-	0	-	V_{DD}	V

6.3 Power Consumption

Test Conditions: DVDD = 3.3V, DGND =0V, TA=+25°C

Parameter	Symbol	Min	Typ	Max	Units
Supply current : power up	-	-	79.8	-	mA
Supply current : power down	-	-	1.91	-	mA

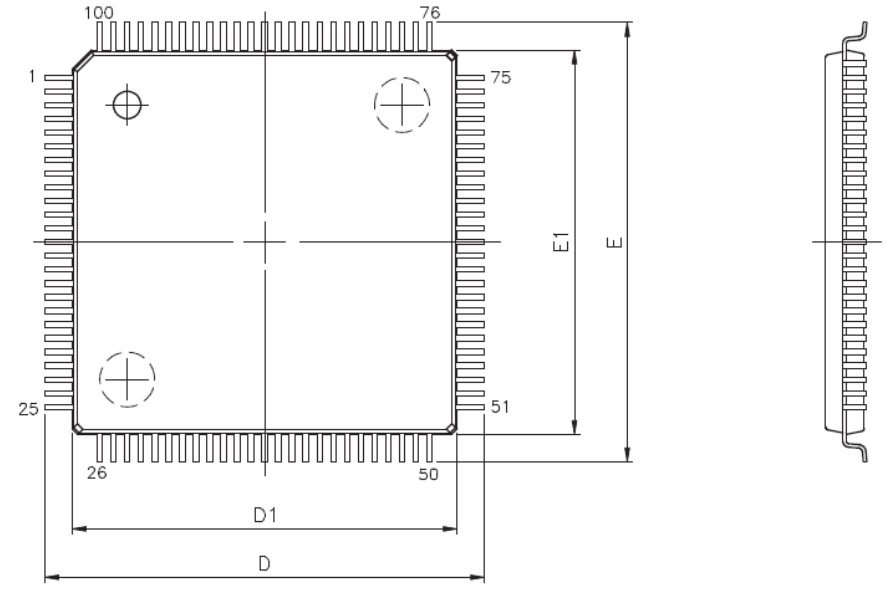
6.4 DC Characteristics

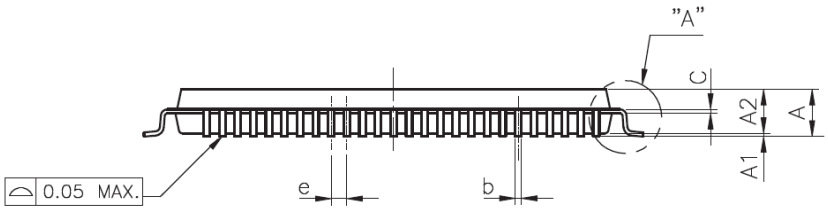
Test Conditions: DVDD = 3.3V, DGND =0V, TA=+25°C

Parameter	Symbol	Min	Typ	Max	Units
Input voltage range	Vin	V_{DD}-0.3	V_{DD}	V_{DD}+0.3	V
Output voltage range	Vout	0	-	V_{DD}	V
High level input voltage	Vih	0.7V_{DD}	-	-	V
Low level input voltage	Vil	-	-	0.3V_{DD}	V
High level output voitage	Voh	2.4	-	-	V
Low level output voltage	Vol		-	0.4	V
Input leakage current	Iil	-10	-	10	uA
Output leakage current	Iol	-10	-	10	uA
Output buffer driver current	-	-	8	-	mA
SPDIF transmit output driver current	-	-	8	-	mA

7 Package Dimension

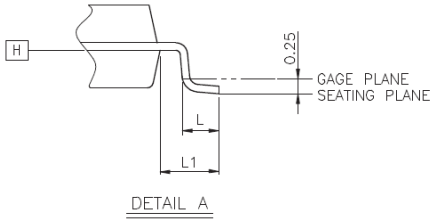
LQFP-100 (16x16mm)





VARIATIONS (ALL DIMENSIONS SHOWN IN MM)

SYMBOLS	MIN.	NOM.	MAX.
A	--	--	1.60
A1	0.05	--	0.15
A2	1.35	1.40	1.45
b	0.17	0.20	0.27
c	0.09	0.127	0.20
D	15.60	16.00	16.40
D1	13.90	14.00	14.10
E	15.60	16.00	16.40
E1	13.90	14.00	14.10
e	0.50 BSC		
L	0.45	0.60	0.75
L1	0.80	1.00	1.20



—End of Specifications—

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