CM6120-S

Best USB Audio Single Chip for PC Speakers Solution

DESCRIPTION

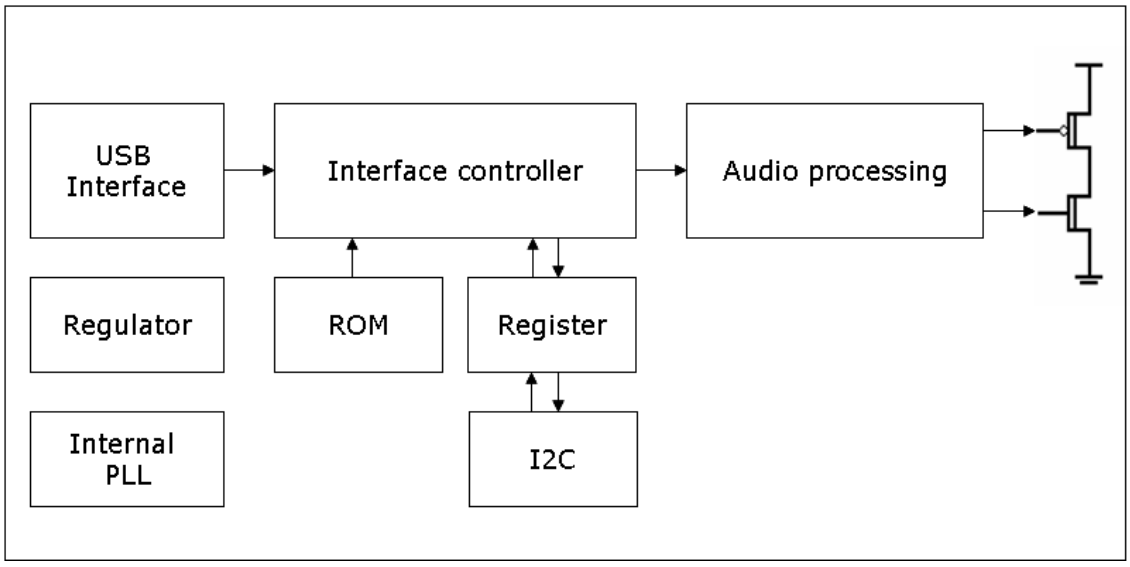
CM6120S series is a highly integrated single chip for USB speaker application with 2-Channel Class-D output. Minimum external components are needed for building an USB speaker system, which makes CM6120S a simple and very cost-effective solution. Since no driver is necessary for audio playback on all major OS. CM6120S provides a truly plug-and-play feature for external digital audio playback.

For energy saving, USB suspend mode and resume is supported by CM6120S. This new single chip not only support 44.1KHz and 48KHz sampling rate playback but also with X2 modulation for hi-frequency quality. Better yet, simplify anti-pop noise solution was embedded on chip for general pop noise issues. All of the functions have been approved by USB IF certification program.

FEATURES

- USB 2.0 Full speed compatible and USB IF certification
- USB audio device class specification v1.0 compatible
- USB bus powered 500mA, with no need for external power supply
- High performance 16-Bit stereo, 44.1 / 48 KHz sampling rate for audio playback
- High efficiency high performance 2W x 2-CH Class D amplifier, differential output with no pop-noise
- Embedded Power-On-Reset block
- Embedded 5V to 3.3V regulator for single 5V external power supply
- Self power / Bus power selectable (by EEPROM)
- Single 12MHz crystal input with embedded PLL
- Isochronous transfer using adaptive synchronization with internal PLL

BLOCK DIAGRAM



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1 Description and Overview

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For energy saving, USB suspend mode and resume is supported by CM6120S. This new single chip not only support 44.1KHz and 48KHz sampling rate playback but also with X2 modulation for hi-frequency quality. Better yet, simplify anti-pop noise solution was embedded on chip for general pop noise issues. All of the functions have been approved by USB IF certification program. This one chip solution not only embedded USB transceiver but also integrated digital control power amplifier function for USB digital sound application.

CM6120S support USB standard HID interface which provide Vol_up / Vol_dn / Play_mute / buttons for pure digital volume and media play control. CM6120S also provide EEPROM (24c02) connection interface for customers to define vendor specific VID / PID / Manufacture String / Product String, and even special hardware configuration.

2 Features

- USB 2.0 Full speed compatible and USB IF certification
- USB audio device class specification v1.0 compatible
- USB bus powered 500mA, with no need for external power supply
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- Self power / Bus power selectable (by EEPROM)
- Single 12MHz crystal input with embedded PLL
- Isochronous transfer using adaptive synchronization with internal PLL
- External 24c02 EEPROM interface for vendor specific VID / PID / Manufacture string / Product string / and Hardware configuration (volume for DAC / Line-in AA, etc.)
- EEPROM Read / Write function via vendor command or HID command
- USB HID digital volume control input for Vol_up / Vol_dn / Play_mute buttons and remote wakeup with HID buttons
- Playback with soft-mute function
- Digital volume boost function
- 3.3V IO with 5V tolerance.\
- Compact 28 pin SOP package in CM6120S

- Compatible with Windows XP / Vista / 7, Mac OS*, no additional drivers are required

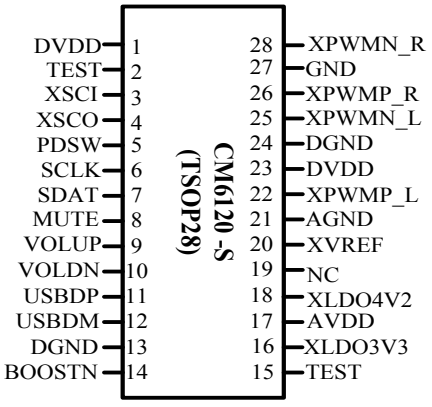
*Note: All Mac OS are supported except version 10.0.x

3 Pin/Signal Description

3.1 Pin Assignment by Pin Number

Pin #	Signal	Pin #	Signal
1	DVDD	28	XPWMN_R
2	TEST	27	DGND
3	XSCI	26	XPWMP_R
4	XSCO	25	XPWMN_L
5	PDSW	24	DGND
6	SCLK	23	DVDD
7	SDAT	22	XPWMP_L
8	MUTE	21	AGND
9	VOLUP	20	XVREF
10	VOLDN	19	NC
11	USBDP	18	XLDO4V2
12	USBDM	17	AVDD
13	DGND	16	XLDO3V3
14	BOOSTN	15	TEST

3.2 Pin-Out Diagram

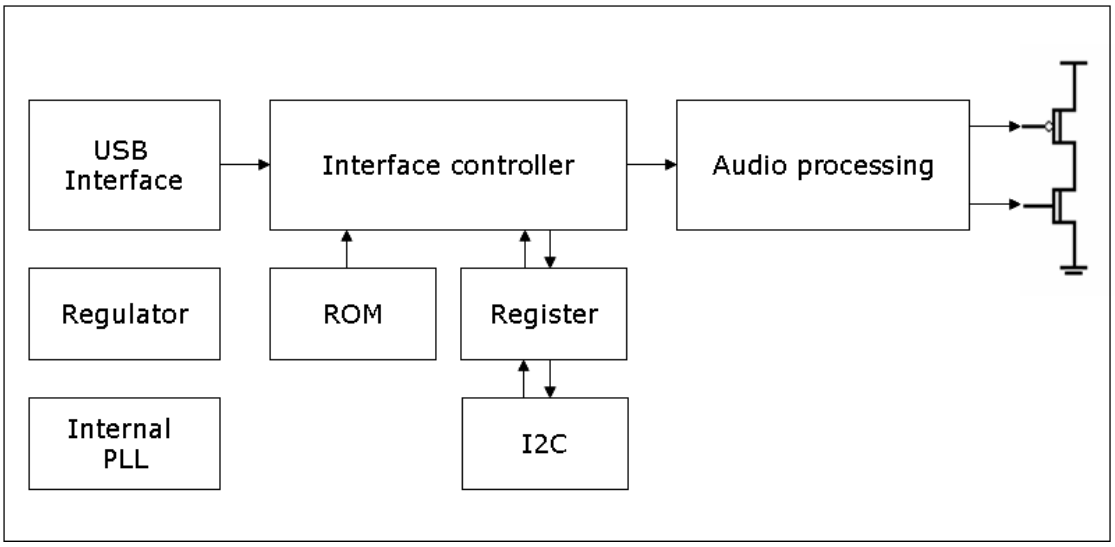


3.3 Pin Signal Description

Pin #	Symbol	Type	Description
1	DVDD	P	5V Power Supply for digital Circuit
2	TEST	DI, ST, PD	Test Mode Select Pin, Pull-Down in normal Operation
3	XSCI	AI	Input Pin for 12MHz Oscillator
4	XSCO	AO	Output Pin for 12MHz Oscillator
5	PDSW	DO, 8mA, SR	Power Down Switch Control Signal Output 1: Power Down Mode (Suspend Mode) 0: Normal Mode
6	SCLK	DIO, OD, 5V tor	I2C
7	SDAT	DIO, OD, 5V tor	I2C
8	MUTE	DI, PU	HID for playback mute
9	VOLUP	DI, PU	HID for playback volume up
10	VOLDN	DI, PU	HID for playback volume down
11	USBDP	AIO	USB Data D+
12	USBDM	AIO	USB Data D-
13	DGND	P	Digital Ground
14	BOOSTN	AI	Digital volume boost function (active Low, boost enable)
15	TEST	DI, ST, PD	Test Mode Select Pin, Pull-Down in normal Operation
16	XLDO3V3	AO	3.3V regulator output
17	AVDD	P	5V Power Supply
18	XLDO4V2	AO	4.2V regulator output
19	NC		
20	VREF	AO	Connecting to External Decoupling Capacitor for Embedded Band-gap Circuit; 2.25V Output
21	AGND	P	Analog Ground
22	XPWMP_L	AO	PWM output for channel L positive
23	DVDD	P	5V Power Supply
24	DGND	P	Digital Ground
25	XPWMN_L	AO	PWM output for channel L negative
26	XPWMP_R	AO	PWM output for channel R positive
27	DGND	P	Digital Ground
28	XPWMN_R	AO	PWM output for channel R negative

*Note: DI / DO / DIO – Digital Input / Output / Bi-Directional Pad
AI / AO / AIO – Analog Input / Output / Bi-Directional Pad
P – Power Pin
SR – Slew Rate Control
ST – Schmitt Trigger
PD / PU – Pull Down / Pull Up
5VT – 5 Volt Tolerant (3.3V Pad)

4 Block Diagram



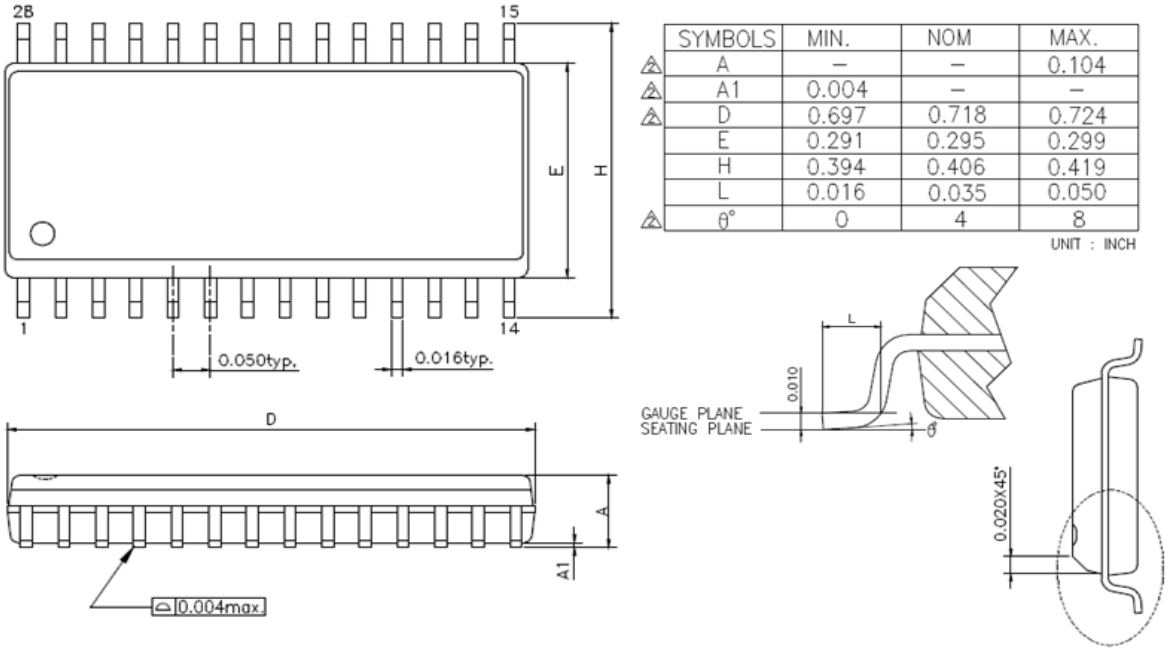
Block diagram of CM6120S/6120X

5 Ordering Information

Model Number	Package	Operating Ambient Temperature	Supply Range
CM6120S	28-Pin SOP	0 o C to +70 o C	DVdd = 5V, AVdd = 5V

Outline of Dimensions **Dimensions shown in inches and (mm)**

◆28- Pin SOP



SYMBOLS	MIN.	NOM	MAX.
A	–	–	0.104
A1	0.004	–	–
D	0.697	0.718	0.724
E	0.291	0.295	0.299
H	0.394	0.406	0.419
L	0.016	0.035	0.050
θ°	0	4	8

UNIT : INCH

6 Function Description

6.1 USB Interface

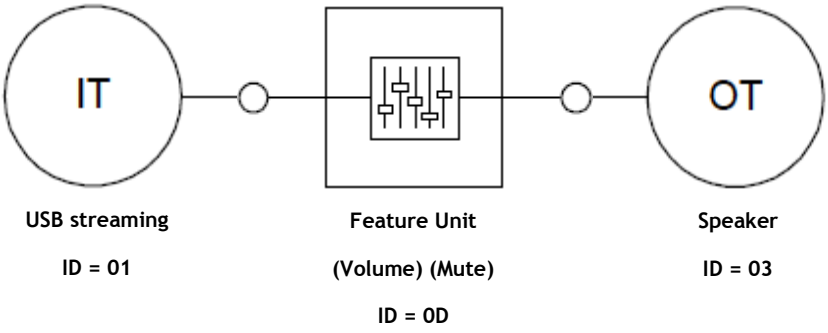
6.1.1 Device Description

Offset	Field	Size	Value (Hex)	Description
0	bLength	1	12	Total 18 Bytes
1	bDescriptorType	1	01	Device Descriptor
2	bcdUSB	2	0110	USB 1.1 compliant.
4	bDeviceClass	1	00	
5	bDeviceSubClass	1	00	
6	bDeviceProtocol	1	00	
7	bMaxPacketSize0	1	08	Endpoint Zero Size = 8 bytes
8	idVendor	2	0D8C	Vendor ID
10	idProduct	2	0126	Product ID
12	bcdDevice	2	0100	Device Release Number
14	iManufacturer	1	01	Index of string descriptor describing manufacturer -> *"C-Media INC."*
15	iProduct	1	02	Index of string descriptor describing product -> " *USB Audio device* "
16	iSerialNumber	1	00	Index of string descriptor describing the device's serial number
17	bNumConfigurations	1	01	Configurations number = 1

6.1.2 Configuration Descriptor

Offset	Field	Size	Value (Hex)	Description
0	bLength	1	09	Total 9 Bytes
1	bDescriptorType	1	02	Configuration Descriptor
2	wTotalLength	2	0086	Total length of data returned for this configuration: 249 bytes
4	bNumInterfaces	1	03	Number of interfaces supported by this Configuration.
5	bConfigurationValue	1	01	Configuration value
6	iConfiguration	1	00	Index of string descriptor describing this configuration
7	bmAttributes	1	a0 or 80 or e0 or c0	Bus Power and support Remote Wakeup: 8'ha0 (PWRSEL_1 = 1, HID_EN = 1) Bus Power and no Remote Wakeup: 8'h80 (PWRSEL_1 = 1, HID_EN = 0) Self Power and support Remote Wakeup: 8'he0 (PWRSEL_1 = 0, HID_EN = 1)) Self Power and no Remote Wakeup: 8'hc0 (PWRSEL_1 = 0, HID_EN = 0))
8	bMaxPower	1	FA	Maximum power consumption of the USB. 0xFA=500 mA

6.1.3 USB Audio Topology Diagram



7 Electrical Characteristics

7.1 Absolute maximum rating

Symbol	Parameter	Value	Unit
Dvmin	Min Digital Supply Voltage	- 0.3	V
Dvmax	Max Digital Supply Voltage	+ 6	V
Avmin	Min Analog Supply Voltage	- 0.3	V
Avmax	Max Analog Supply Voltage	+ 6	V
Dvinout	Voltage on any Digital Input or Output Pin	-0.3 to +5.5	V
Avinout	Voltage on any Analog Input or Output Pin	-0.3 to +5.5	V
T_{stg}	Storage Temperature Range	-40 to +125	P0PC
ESD (HBM)	ESD Human Body Mode	4000	V
ESD (MM)	ESD Machine Mode	200	V
Latchup	Latch Up Test	200	mA

7.2 Operation conditions

	Min	Typ	Max	Unit
Analog Supply Voltage	4.5	5.0	5.25	V
Digital Supply Voltage	4.5	5.0	5.25	V
Total Power Consumption	-	-	500*	mA
Suspend Mode Power Consumption	-	450	2400	uA
Operating ambient temperature	0	-	70	PoPC

*Note: The measurement condition was under 4ohm loading and boost disable.

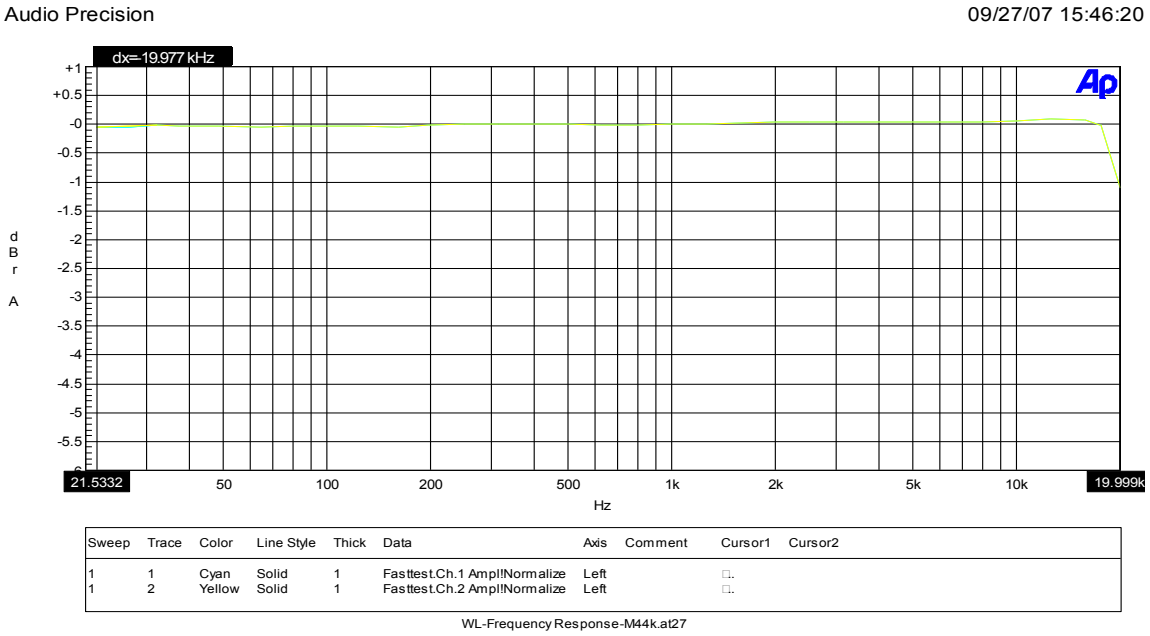
7.3 Audio Performance

	Min	Typ	Max	Unit
Resolution	--	16	--	Bits
Frequency response @ 48KHz	20	--	20K	Hz
Frequency Response @ 44.1KHz	20	--	20K	Hz
Passband Ripple @ 48 KHz	40	--	9.6K	Hz
Passband Ripple @ 44.1 KHz	40	--	8.8K	Hz
DAC (8 Ohm Loading)				
SNR	--	~ 120	--	dB
Dynamic Range	--	~ 80	--	dB
THD + N	-43.6	--	-69	dB
Output Voltage (rms)	-	2.73	-	Vrms
DAC (4 Ohm Loading)				
SNR	--	~ 120	--	dB
Dynamic Range	--	~ 80	--	dB
THD + N	-37.2	--	-66	dB
Output Voltage (rms)	-	2.37	-	Vrms

8 Audio Performance Curves

8.1 Frequency Response (8 ohm loading)

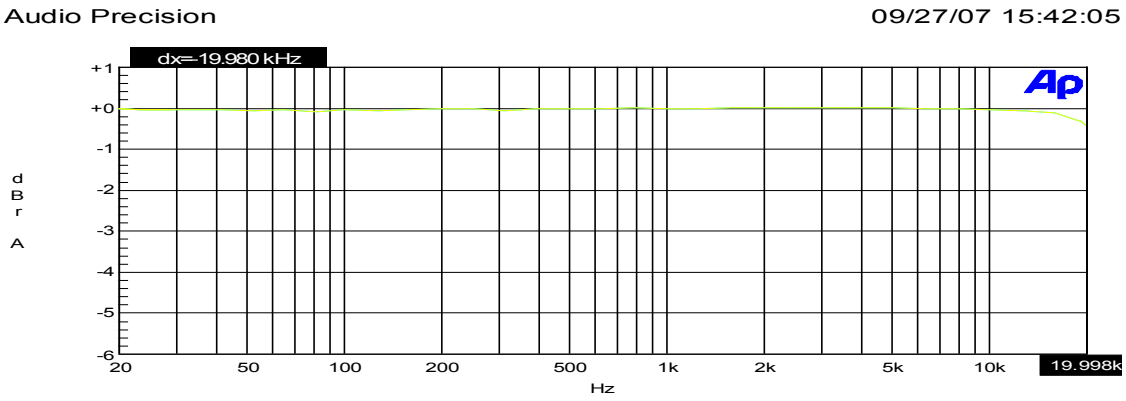
8.1.1 Frequency Response @ 44.1 ks/sec



Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment	Cursor1	Cursor2
1	1	Cyan	Solid	1	Fasttest.Ch.1 Ampl!Normalize	Left		□.	
1	2	Yellow	Solid	1	Fasttest.Ch.2 Ampl!Normalize	Left		□.	

WL-Frequency Response-M44k.at27

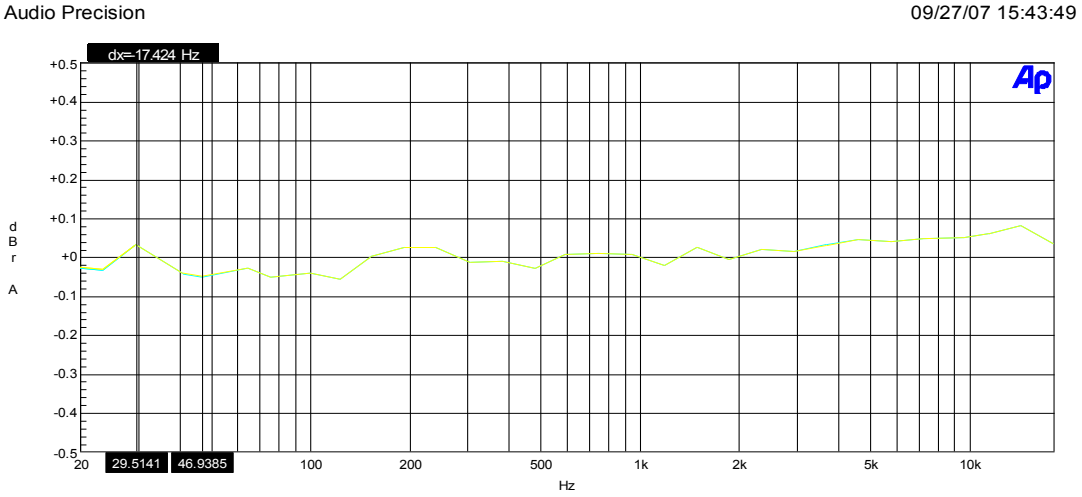
8.1.2 Frequency Response @ 48 ks/sec



Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Cyan	Solid	1	Fasttest.Ch.1 Ampl!Normalize	Left	
1	2	Yellow	Solid	1	Fasttest.Ch.2 Ampl!Normalize	Left	

Vista-Frequency Response-M48k.at27

8.1.3 Passband Ripple @ 48 ks/sec



Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment	Cursor1	Cursor2
1	1	Cyan	Solid	1	Fasttest.Ch.1 Ampl!Normalize	Left		□.	
1	2	Yellow	Solid	1	Fasttest.Ch.2 Ampl!Normalize	Left		□.	

Vista-Passband Ripple-M48k.at27

9 Reference

- Universal Serial Bus Specification, Version 2.0
- Universal Serial Bus Device Class Definition for Audio Devices, Version 1.0.
- Universal Serial Bus Device Class Definition for Human Interface Devices (HID), Version 1.11

—End of Specifications—

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