Burr-Brown Products from Texas Instruments

PCM2702

16-Bit Stereo
DIGITAL-TO-ANALOG CONVERTER
with USB Interface

FEATURES

- **INTEGRATED USB INTERFACE:**
  Full-Speed Transceiver Supports 12Mbps Data Transfer
  Fully Compliant with the USB 1.0 Specification
  Adaptive Mode for Isochronous Transfer
  Self-Powered Device
- **ACCEPTS 16-BIT STEREO AND MONO USB AUDIO DATA STREAMS**
- **ANALOG PERFORMANCE (V_{CC} = 5V):**
  Dynamic Range: 100dB (typ at 16-bit)
  SNR: 105dB (typ)
  THD+N: 0.002% (typ at 16-bit)
  Full-Scale Output: $3.1V_{PP}$
- **8X OVERSAMPLING DIGITAL FILTER:**
  Passband: $0.454f_S$
  Stopband: $0.546f_S$
  Passband Ripple: ±0.002dB
  Stopband Attenuation: –82dB
- **SAMPLING RATE (F_S): 32kHz, 44.1kHz, 48kHz**
- **ON-CHIP CLOCK GENERATOR WITH SINGLE 12MHz CLOCK SOURCE**
- **MULTI-FUNCTIONS:**
  Digital Attenuator: 0dB to –64dB, 1dB/step
  Soft Mute
  Zero Flag
  Suspend Flag
  Playback Flag
- **DUAL POWER SUPPLIES:**
  +5V for Analog Portion
  +3.3V for Digital Portion
- **PACKAGE: SSOP-28**

APPLICATIONS

- **STAND-ALONE USB AUDIO SPEAKERS**
- **CRT/LCD INTEGRATED USB AUDIO SPEAKERS**
- **USB AUDIO AMPLIFIERS**
- **OTHER USB AUDIO APPLICATIONS**

DESCRIPTION

The PCM2702 is a single chip digital-to-analog converter offering two D/A output channels and an integrated USB 1.0 compliant interface controller. The newly developed SpAct™ (Sampling Period Adaptive Controlled Tracking) system recovers a stable, low-jitter clock for internal PLL and DAC operation from the USB interface audio data.

The PCM2702 is based upon Texas Instruments Enhanced Multi-level Delta-Sigma Modulator, an 8x oversampling digital interpolation filter, and an analog output low-pass filter.

The PCM2702 can accept a 48kHz, 44.1kHz and 32kHz sampling rates, using either 16-bit stereo or monaural audio data. Digital attenuation and soft-mute features are included, and are controlled via USB audio class request.

Patents Pending.

SpAct™ is a trademark of Texas Instruments.

USB
UNIVERSAL SERIAL BUS

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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ABSOLUTE MAXIMUM RATINGS[(1)]

Supply Voltage[(2)]	+6.5V
Supply Voltage[(3)]	+4.0V
Supply Voltage Differences[(4)]	±0.1V
Supply Voltage Differences[(5)]	±0.1V
Ground Voltage Differences[(6)]	±0.1V
Digital Input Voltage[(7)]	$-0.3V$ to $V_{DD} + 0.3V$
Digital Input Voltage[(8)]	$-0.3V$ to 6.5V
Analog Input Voltage	$-0.3V$ to $V_{CC} + 0.3V$
Input Current (any pins except supplies)	±10mA
Operating Temperature	$-25°C$ to $+85°C$
Storage Temperature	$-55°C$ to $+125°C$
Junction Temperature	$+150°C$
Lead Temperature (soldering, 5s)	$+260°C$
Package Temperature (IR reflow, peak, 10s)	$+235°C$

NOTES: (1) Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum conditions for extended periods may affect device reliability. (2) V_{CC}, $V_{CC}L$, $V_{CC}R$, $V_{DD}P$. (3) V_{DD}, $V_{DD}C$. (4) Among V_{CC}, $V_{CC}L$, $V_{CC}R$, $V_{CC}P$. (5) Among V_{DD}, $V_{DD}C$. (6) Among AGND, AGNDL, AGNDR, AGNDP, DGND, DGNDC, and DGNDU. (7) XTI, D+, D–, $\overline{PLYBCK}$, $\overline{SSPND}$, ZERO, XTO. (8) V_{BUS}, TEST#, TEST2, TEST1, TEST0.
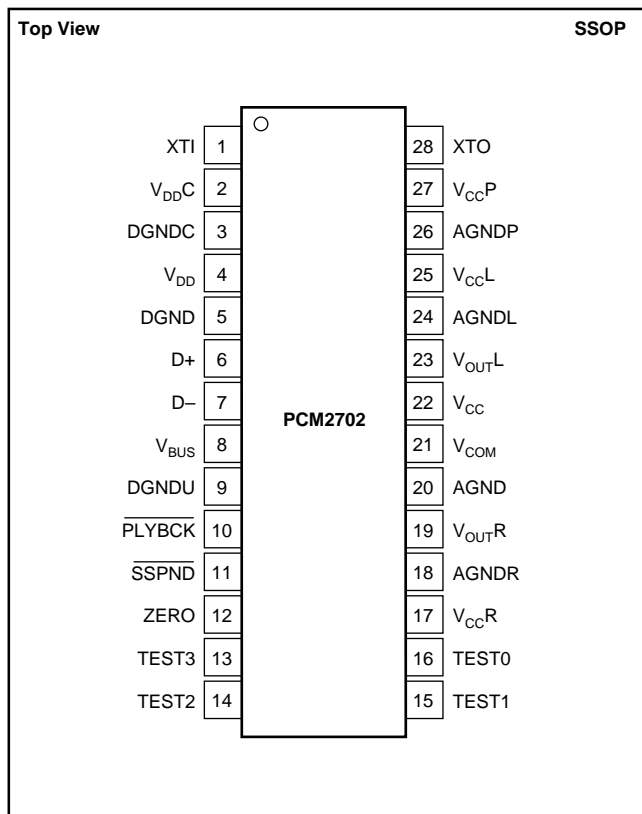
⚠ ELECTROSTATIC DISCHARGE SENSITIVITY

This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

PACKAGE/ORDERING INFORMATION[(1)]

PRODUCT	PACKAGE-LEAD	PACKAGE DESIGNATOR	SPECIFIED TEMPERATURE RANGE	PACKAGE MARKING	ORDERING NUMBER	TRANSPORT MEDIA
PCM2702E	SSOP-28	DB	0°C to +70°C	PCM2702E	PCM2702E	Rails
"	"	"	"	"	PCM2702E/2K	Tape and Reel

NOTE: (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at www.ti.com.

Top View   **SSOP**

```
        PCM2702
XTI    1          28  XTO
VDDC   2          27  VCCP
DGNDC  3          26  AGNDP
VDD    4          25  VCCL
DGND   5          24  AGNDL
D+     6          23  VOUTL
D–     7          22  VCC
VBUS   8          21  VCOM
DGNDU  9          20  AGND
PLYBCK 10         19  VOUTR
SSPND  11         18  AGNDR
ZERO   12         17  VCCR
TEST3  13         16  TEST0
TEST2  14         15  TEST1
```

PIN	NAME	TYPE	DESCRIPTIONS
1	XTI	IN	Crystal Oscillator Input.[(1)]
2	$V_{DD}C$	—	Digital Power Supply for Clock Generator, +3.3V.
3	DGNDC	—	Digital Ground for Clock Generator.
4	V_{DD}	—	Digital Power Supply, +3.3V.
5	DGND	—	Digital Ground.
6	D+	IN/OUT	USB Differential Input/Output Plus.
7	D–	IN/OUT	USB Differential Input/Output Minus.
8	V_{BUS}	IN	USB Bus Power (this pin NEVER consumes USB bus power).[(2)]
9	DGNDU	—	Digital Ground for USB Transceiver.
10	$\overline{PLYBCK}$	OUT	Playback flag, active LOW (LOW: playback, HIGH: idle).
11	$\overline{SSPND}$	OUT	Suspend flag, active LOW (LOW: suspend, HIGH: operational).
12	ZERO	OUT	Zero flag (LOW: Normal, HIGH: ZERO.)
13	TEST3	IN	Test pin 3. Connect to digital ground.[(2)]
14	TEST2	IN	Test pin 2. Connect to digital ground.[(2)]
15	TEST1	IN	Test pin 1. Connect to digital ground.[(2)]
16	TEST0	IN	Test pin 0. Connect to digital ground.[(2)]
17	$V_{CC}R$	—	Analog Supply for R-channel, +5V.
18	AGNDR	—	Analog Ground for R-channel.
19	$V_{OUT}R$	OUT	Analog Output for R-channel.
20	AGND	—	Analog Ground.
21	V_{COM}	—	DC Common-Mode Voltage for DAC.
22	V_{CC}	—	Analog Supply, +5V.
23	$V_{OUT}L$	OUT	Analog Output for L-channel.
24	AGNDL	—	Analog Ground for L-channel.
25	$V_{CC}L$	—	Analog Supply for L-channel, +5V.
26	AGNDP	—	Analog Ground for PLL.
27	$V_{CC}P$	—	Analog Supply for PLL, +5V.
28	XTO	OUT	Crystal Oscillator Output.

NOTES: (1) 3.3 V tolerant. (2) Schmitt trigger input with internal pull-down, 5V tolerant.

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ELECTRICAL CHARACTERISTICS

At T_A = +25°C, V_{CC} = V_{CC}L = V_{CC}R = V_{CC}P = 5.0V, V_{DD} = V_{DD}C = 3.3V, f_S = 44.1MHz, signal frequency = 1kHz and 16-bit data, unless otherwise specified.

PARAMETER		CONDITIONS	PCM2702E			UNITS
			MIN	TYP	MAX	
RESOLUTION				16		Bits
HOST INTERFACE			Supports USB revision 1.0, Full Speed			
DIGITAL FORMAT						
Audio Data Format			USB ISOCHRONOUS OUT			
Audio Data Bit Length			16			
Audio Data Channel			1, 2			
Sampling Frequency (f_S)			32, 44.1, 48			
DIGITAL INPUT/OUTPUT						
Input Logic Level	V_{IH}[1]		2.0			VDC
	V_{IL}[1]				0.8	VDC
	V_{IH}[2]		0.7 V_{DD}			VDC
	V_{IL}[2]				0.7 V_{DD}	VDC
Input Logic Current	I_{IH}[1]	V_{IN} = V_{DD}		+65	+100	μA
	I_{IL}[1]	V_{IN} = 0V			±10	μA
	I_{IH}[2]	V_{IN} = V_{DD}			±10	μA
	I_{IL}[2]	V_{IN} = 0V			±10	μA
Output Logic Level	V_{OH}[3]	I_{OH} = −1mA	2.8			VDC
	V_{OL}[3]	I_{OL} = +1mA			0.5	VDC
DYNAMIC PERFORMANCE[4]						
THD+N at V_{OUT} = 0dB				0.002	0.005	%
THD+N at V_{OUT} = −60dB				1.2		%
Dynamic Range		EIAJ, A-Weighted	96	100		dB
SIgnal-to-Noise Ratio		EIAJ, A-Weighted	100	105		dB
Channel Seperation			98	103		dB
DC ACCURACY						
Gain Error				±1.0	±3.0	% of FSR
Gain Mismatch, Channel-to-Channel				±1.0	±3.0	% of FSR
Bipolar Zero Error		V_{OUT} = 0.5 V_{CC} at BPZ		±30	±60	mV
ANALOG OUTPUT						
Output Voltage		Full-Scale(−0dB)		62% of V_{CC}		V_{PP}
Center Voltage				50% of V_{CC}		VDC
Load Impedance		AC-Load	5			kΩ
DIGITAL FILTER PERFORMANCE						
Passband		±0.002dB			0.454f_S	
Passband		−3dB			0.490f_S	
Stopband			0.546f_S			
Passband Ripple					±0.002	dB
Stopband Attenuation		Stopband = 0.546f_S	−75			dB
Stopband Attenuation		Stopband = 0.567f_S	−82			dB
Delay Time				34/f_S	11	s
ANALOG FILTER PERFORMANCE						
Frequency Response		at 20kHz		≠0.02		dB
POWER SUPPLY REQUIREMENTS						
Voltage Range	V_{DD}, V_{DD}C		+3.0	+3.3	+3.6	VDC
	V_{CC}, V_{CC}L, V_{CC}R, V_{CC}P		+4.5	+5.0	+5.5	VDC
Supply Current	I_{DD}	V_{DD} = V_{DD}C = 3.3V		22	30	mA
	I_{CC}	V_{CC} = V_{CC}L = V_{CC}R = V_{CC}P = 5.0V		18	25	mA
Power Dissipation		V_{DD} = V_{DD}C = 3.3V, and V_{CC} = V_{CC}L = V_{CC}R = V_{CC}P = 5.0V		165	225	mW
TEMPERATURE RANGE						
Operation Temperature			0		70	°C
Storage Temperature			−55		+125	°C
Thermal Resistance, θ_{JA}		SSOP-28		100		°C/W

NOTES: (1) Pins 8, 13, 14, 15, 16: V_{BUS}, TEST3 TEST2 TEST1, TEST0.
(2) Pin1: XTI.
(3) Pins 10, 11, 12, 28: PLYBCK, SSPND, ZERO, XTO.
(4) The dynamic performance is based upon ideal host signal quality, and may vary according to the system. Dynamic performance specifications are tested using a Shibasoku #725 THD Meter with 400Hz HPF, 30kHz LPF, Average Mode, and 20kHz Bandwidth limiting. The load connected to the analog output is 5kΩ, or larger, via AC coupling.
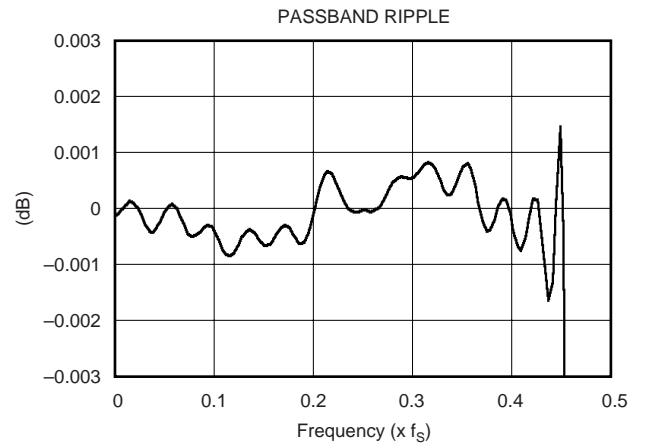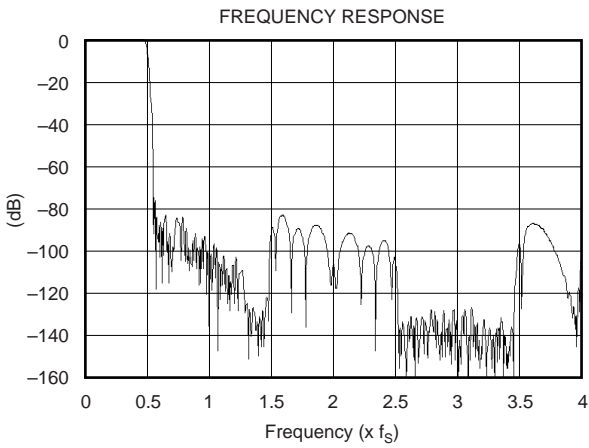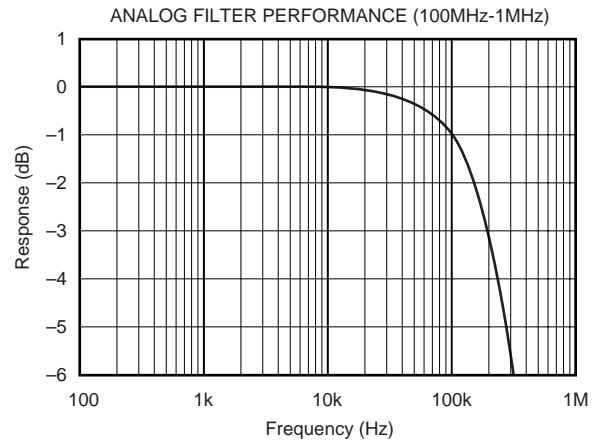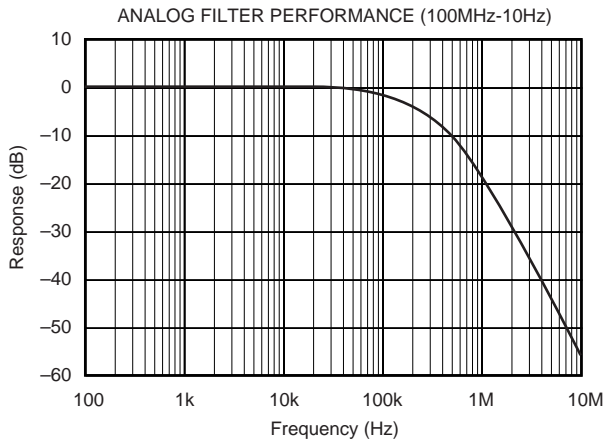
BLOCK DIAGRAM

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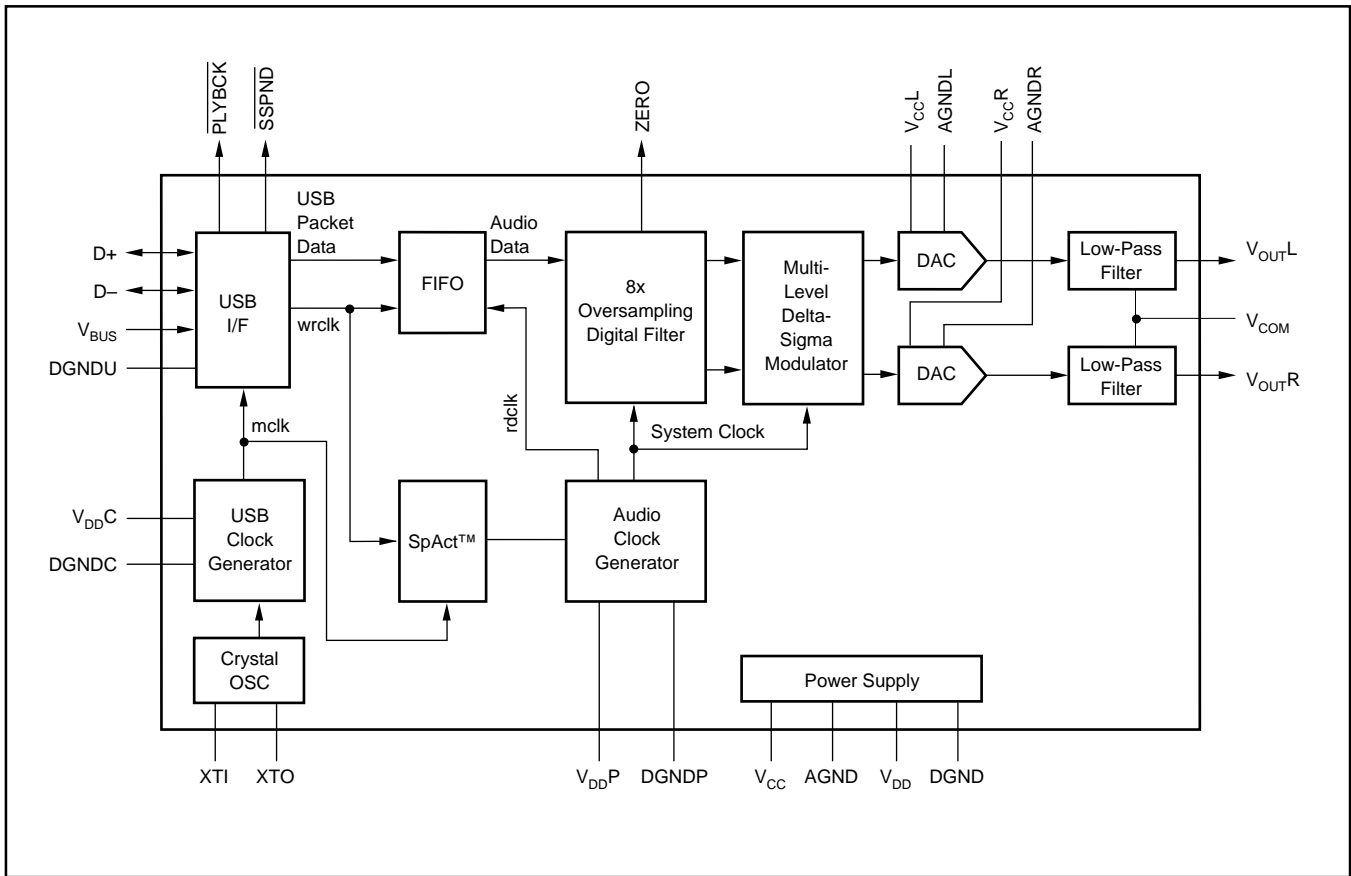
TYPICAL CHARACTERISTICS

All specifications at T_A = +25°C, V_{CC} = $V_{CC}L$ = $V_{CC}R$ = $V_{CC}P$ = 5.0V, V_{DD} = $V_{DD}C$ = 3.3V, f_S = 44.1MHz, signal frequency = 1kHz and 16-bit data, unless otherwise specified.

DIGITAL FILTER PERFORMANCE

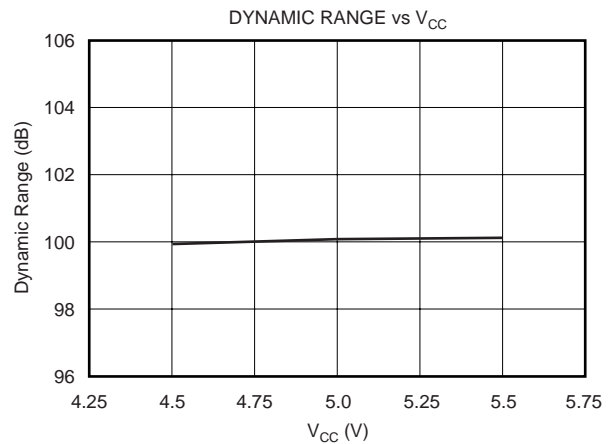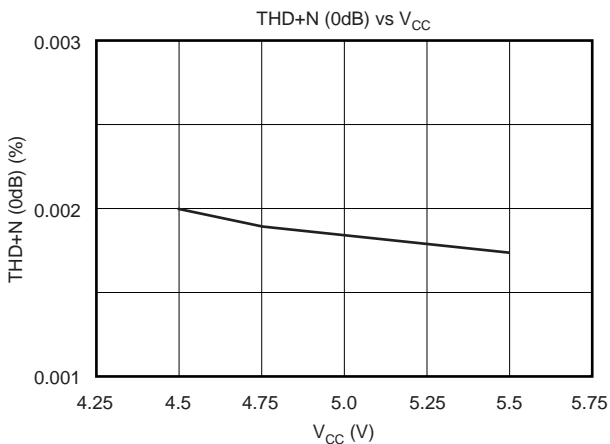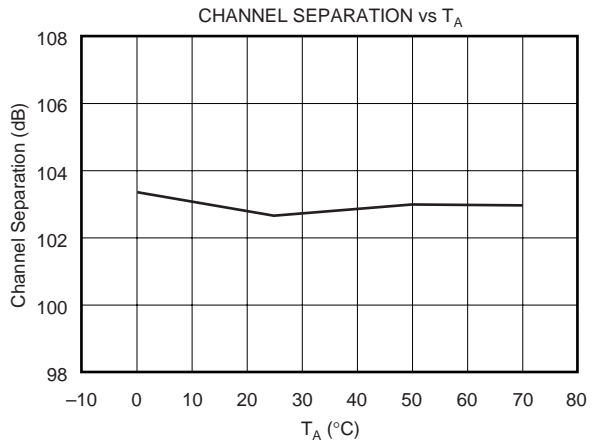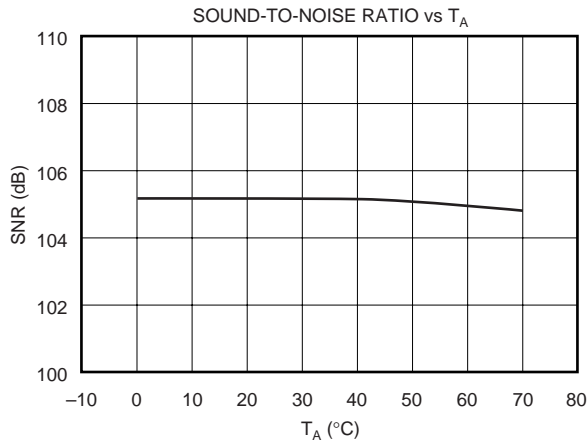FREQUENCY RESPONSE

PASSBAND RIPPLE

ANALOG FILTER PERFORMANCE

ANALOG FILTER PERFORMANCE (100MHz-10Hz)

ANALOG FILTER PERFORMANCE (100MHz-1MHz)

PCM2702

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TYPICAL CHARACTERISTICS (Cont.)

All specifications at T_A = +25°C, V_{CC} = $V_{CC}L$ = $V_{CC}R$ = $V_{CC}P$ = 5.0V, V_{DD} = $V_{DD}C$ = 3.3V, f_S = 44.1MHz, signal frequency = 1kHz and 16-bit data, unless otherwise specified.

ANALOG DYNAMIC PERFORMANCE
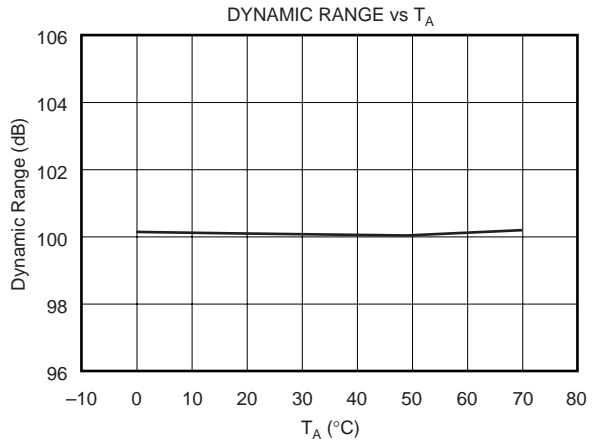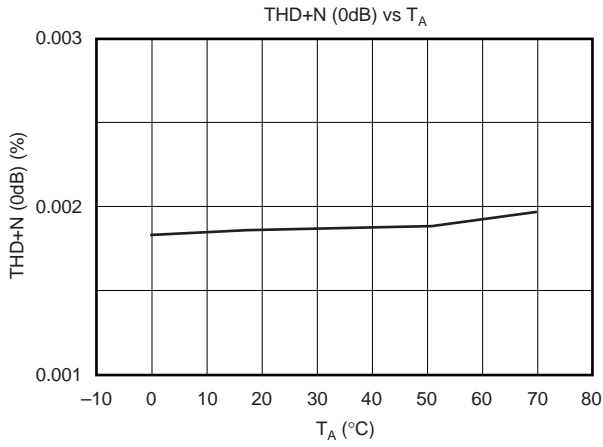
THD+N (0dB) vs T_A

DYNAMIC RANGE vs T_A

SOUND-TO-NOISE RATIO vs T_A

CHANNEL SEPARATION vs T_A

THD+N (0dB) vs V_{CC}

DYNAMIC RANGE vs V_{CC}

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TYPICAL CHARACTERISTICS (Cont.)

All specifications at T_A = +25°C, V_{CC} = $V_{CC}L$ = $V_{CC}R$ = $V_{CC}P$ = 5.0V, V_{DD} = $V_{DD}C$ = 3.3V, f_S = 44.1MHz, signal frequency = 1kHz and 16-bit data, unless otherwise specified.

SOUND-TO-NOISE RATIO vs V_{CC}

CHANNEL SEPARATION vs V_{CC}

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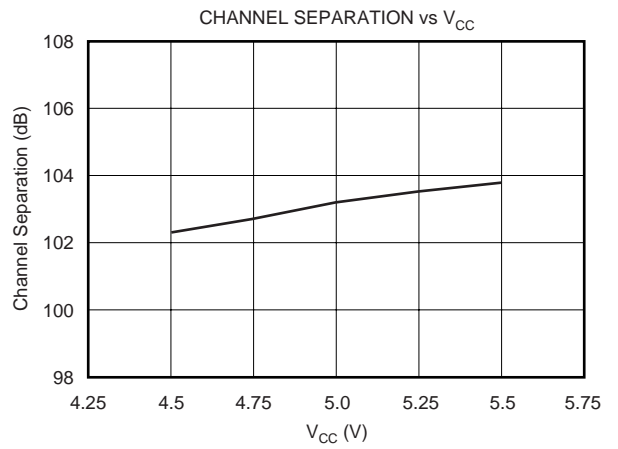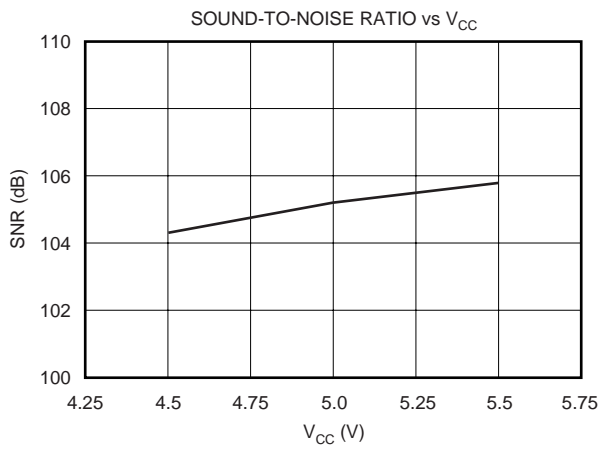
THEORY OF OPERATION

USB INTERFACE

The description of the USB interface complies with Universal Serial Bus specification Rev. 1.0.

Control and audio data are both transferred to the PCM2702 via D+ (pin 6) and D– (pin 7). All data to/from the PCM2702 are transferred at full-speed. V_{BUS} (pin 8) and DGNDU (pin 9) are also connected to the USB bus. V_{BUS} (pin 8) never consumes USB bus power, it is used only for detecting the connection of the USB bus. The following information is provided in the device descriptor.

USB Revision	1.0
Device Class	0x00 (device defined interface level)
Device Subclass	0x00 (not specified)
Device Protocol	0x00 (not specified)
Max Packet Size for Endpoint 0	8 byte
Vendor ID	0x08BB
Device ID	0x2702
Release	1.0

TABLE I. Device Definition.

DEVICE CONFIGURATION

Figure 1 illustrates USB audio function topology. The PCM2702 has two interfaces. Each interface is constructed by some alternative setting. Interface #0 has one alternative setting. Alternative setting #0 describes the standard audio control interface. The audio control interface is constructed by a terminal. The PCM2702 has the following three terminals.

• Input Terminal (IT)

• Output Terminal (OT)

• Feature Unit (FU)

The Input Terminal is defined as "USB stream" (terminal type 0x0101). The Input Terminal can accept 2-channel audio streams comprised of left and right channel data. The Output Terminal is defined as a "speaker" (terminal type 0x0301). The Feature Unit supports the following sound control features.

• Volume Control

• Mute Control

The built-in digital volume controller can be manipulated by an audio class specific request from 0.0dB to –64.0dB in steps of 1.0dB. Each channel can be set independently. The master volume control is also supported. The built-in digital mute controller can be manipulated by an audio class specific request. A master mute-control request is acceptable. A request to an individual channel will be stalled and ignored.

Interface #1 has three alternative settings. Alternative setting #0 is the Zero Bandwidth setting. Alternative setting #1 is the 16-Bit Stereo setting, and is an operational setting. Alternative setting #2 is the 16-Bit Monaural setting, and is also an operational setting. The PCM2702 has the following two endpoints.

• Control Endpoint (EP #0)

• Isochronous Audio Data Stream Endpoint (EP #2)

The Control Endpoint is a default endpoint and is used to control all functions of the PCM2702 by the standard USB request and the USB audio class specific request. The Isochronous Audio Data Stream Endpoint is an audio sink endpoint, which receives the PCM audio data, and accepts the adaptive transfer mode.

NOTE: IT = Input Terminal (Terminal ID #1); OT = Output Terminal (Terminal ID #2); FU = Feature Unit (Unit ID #3).

F I

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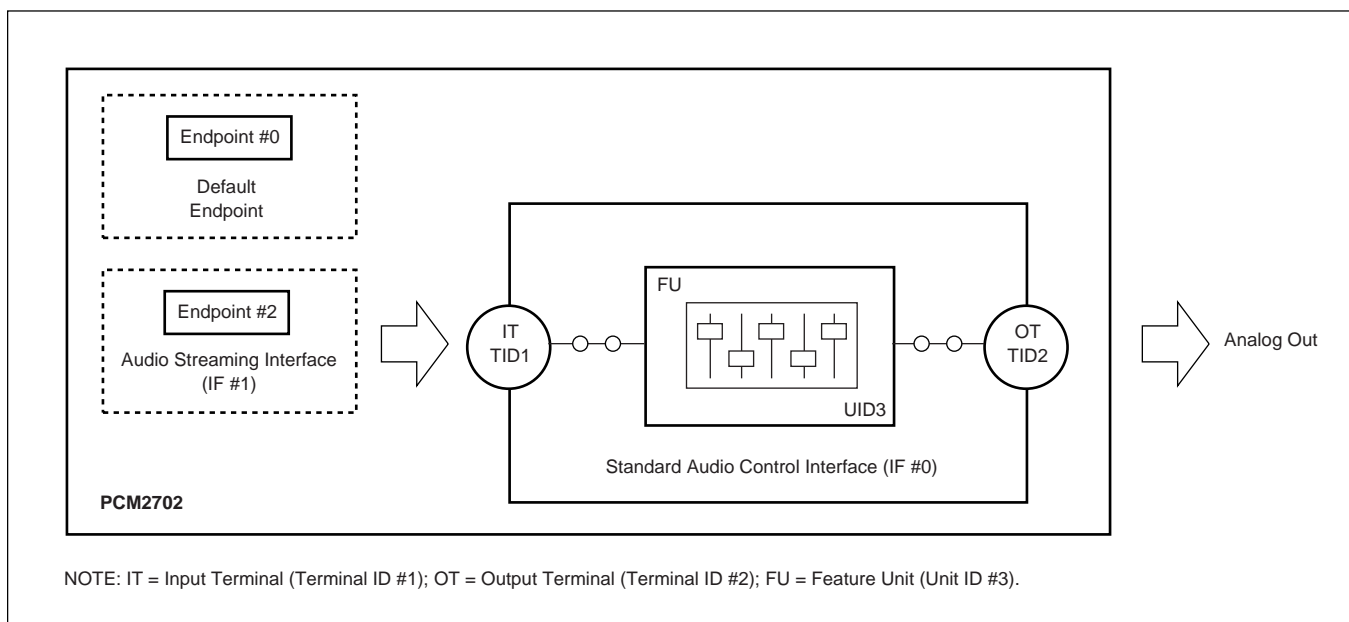
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CLOCK AND RESET

The PCM2702 requires a 12MHz (±500ppm) clock for USB and audio functions, which may be generated by an on-chip crystal oscillator with external 12MHz crystal resonator, or supplied by an external clock applied at XTI (pin1). The 12MHz crystal resonator must be connected to XTI (pin 1) and XTO (pin 28), along with a 1MΩ resistor and two small capacitors (value is dependent upon the specified load capacitance of the crystal resonator). If an external clock is used, the clock must be supplied at XTI, and XTO must be left open. The clock signal applied at XTI must be +3.3V logic level, as this input is not +5V tolerant. Figures 2 and 3 illustrate the circuit connections required for crystal and external clock options.

The PCM2702 includes an internal power-on reset circuit, which automatically initializes digital logic when V_{DD} exceeds 2.0V typical (range: 1.6V to 2.4V). Initialization requires approximately 350μs for completion. The V_{DD} supply must rise to 2.0V within 10ms for proper power-on sequence operation.

INTERFACE SEQUENCE
Power-on, Attach, and Playback Sequence

The PCM2702 is ready for setup when the reset sequence has finished and the USB bus is connected. After connection is established, the PCM2702 is ready to accept USB audio data. While waiting for audio data (idle state), the analog outputs are set to bipolar zero (BPZ) and the zero flag, ZERO (pin 12), is set to HIGH.

When receiving the audio data, the PCM2702 stores the first audio packet, which contains 1ms of audio data, into an internal storage buffer. The PCM2702 starts playing the audio data upon detection of the Start of Frame (SOF) packet.

See Figures 4 and 5 for the normal operation sequence.
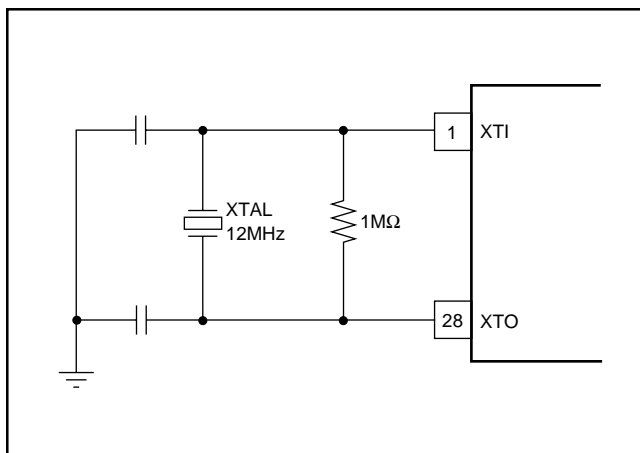
FIGURE 2. 12MHz Crystal Resonator Connection.
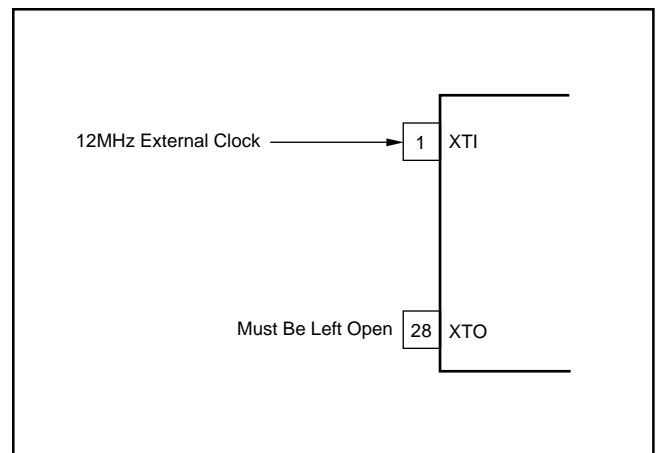
FIGURE 3. External 12MHz Clock Input Connection.

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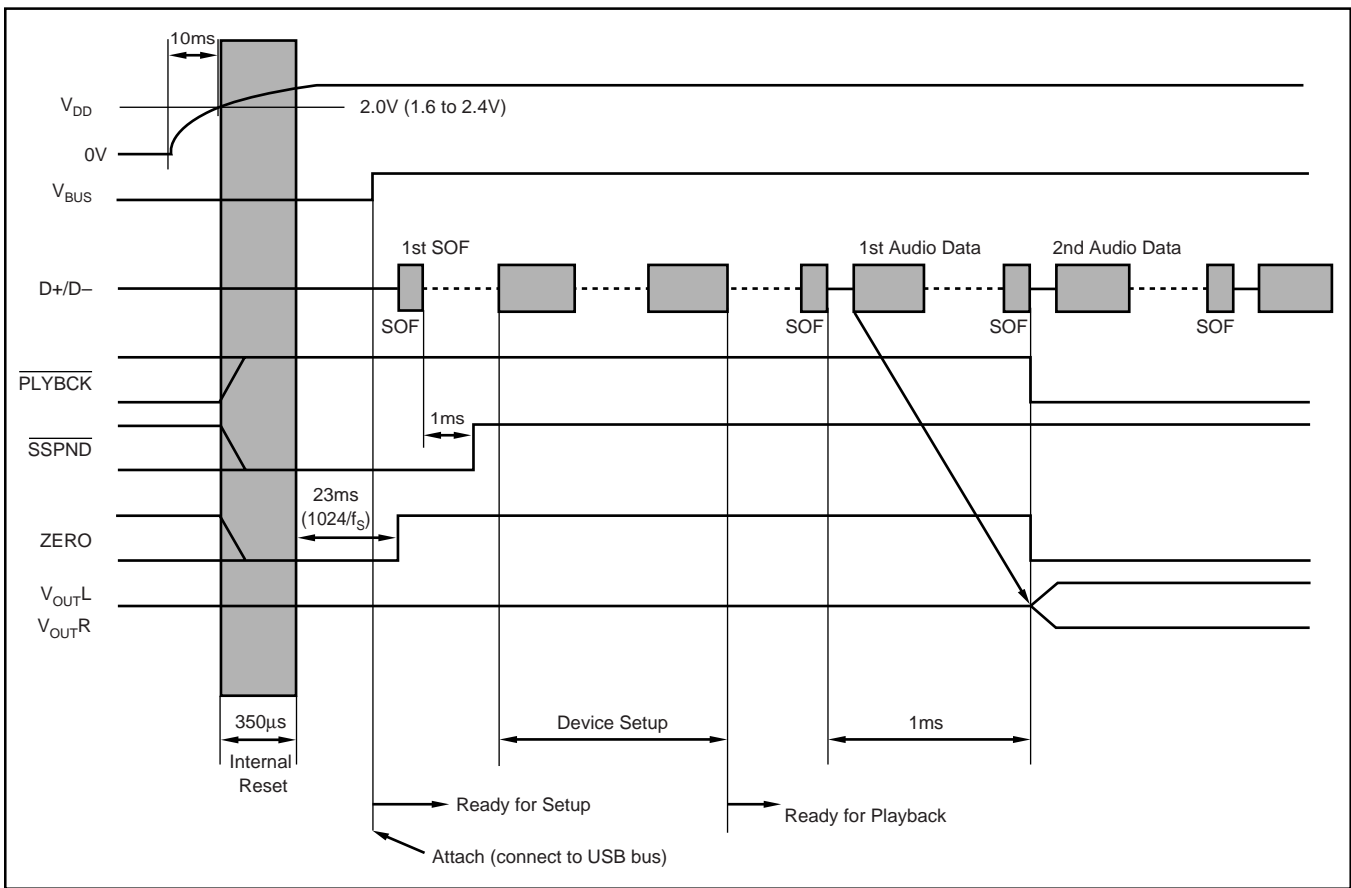
FIGURE 4. Connecting the PCM2702 to the USB Bus After Power-On.
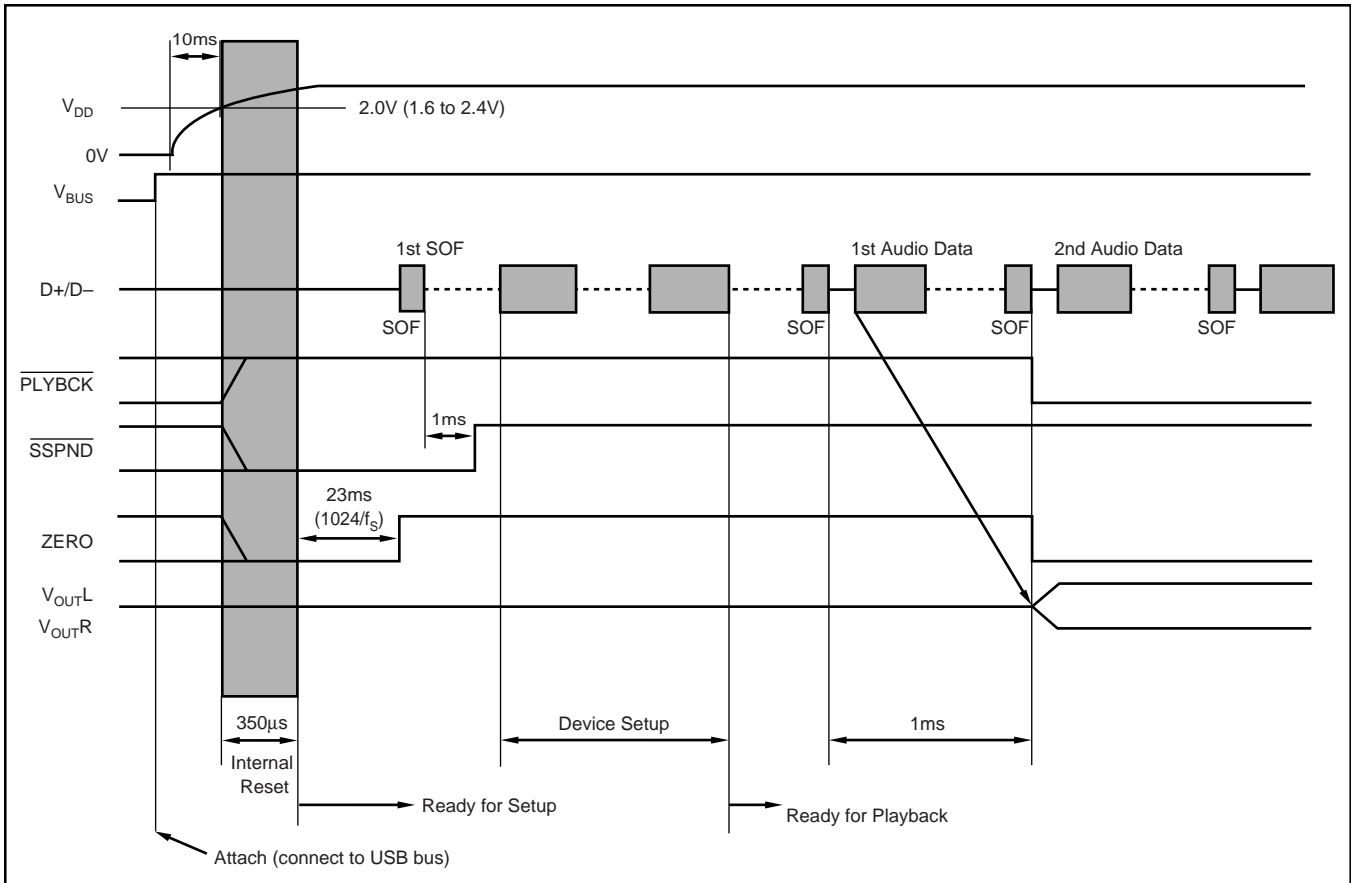
FIGURE 5. Connecting the PCM2702 to the USB Bus Prior to Power-On.

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Play, Stop, and Detach sequence

When host finishes or aborts audio playback, the PCM2702 will stop playing after the last transmitted audio data has been received. Figure 6 shows the operation sequence for play, stop, and detach.

$\overline{\text{PLYBCK}}$, $\overline{\text{SSPND}}$, AND ZERO FLAG

$\overline{\text{PLYBCK}}$, $\overline{\text{SSPND}}$, and Zero flag in Figures 4, 5, and 6 are defined as follows.

$\overline{\text{PLYBCK}}$—while PCM audio input data is playing back, $\overline{\text{PLYBCK}}$ (pin 10) is switched LOW.

$\overline{\text{SSPND}}$—upon detection of a suspend state on the USB port, $\overline{\text{SSPND}}$ (pin 11) is switched LOW.

ZERO—if the PCM audio input data is continuously zero for 1024 sampling periods $(1/f_S)$, ZERO (pin12) is switched to HIGH.

TEST PINS

The PCM2702 has four test pins—TEST0 (pin 16), TEST1 (pin 15), TEST2 (pin 14), and TEST3 (pin 13)—which are used solely for testing at the factory. These pins must be connected to a digital ground for proper operation.

OPERATING ENVIRONMENT INFORMATION

For information about the PC operating environment for the PCM2702, see Application Report SLAA374, *Updated Operating Environments for PCM270x, PCM290x Applications,* available for download at www.ti.com.
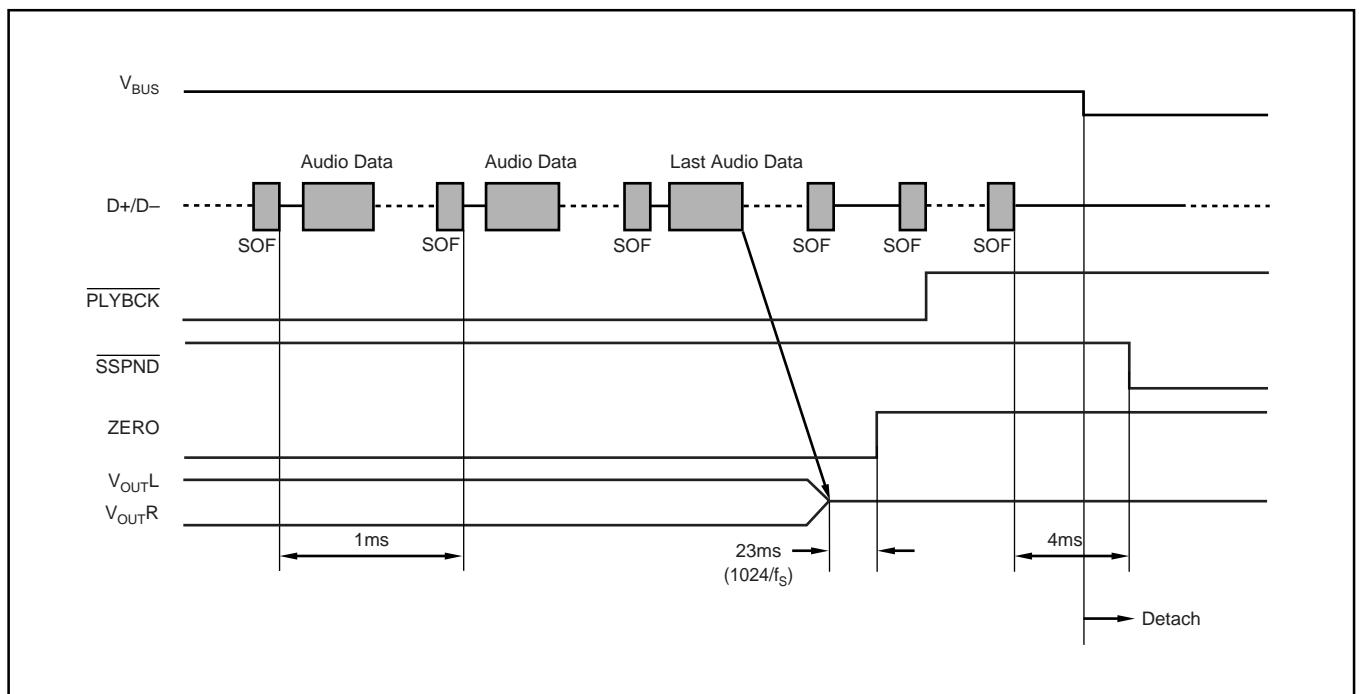
FIGURE 6. Play, Stop, and Detach.
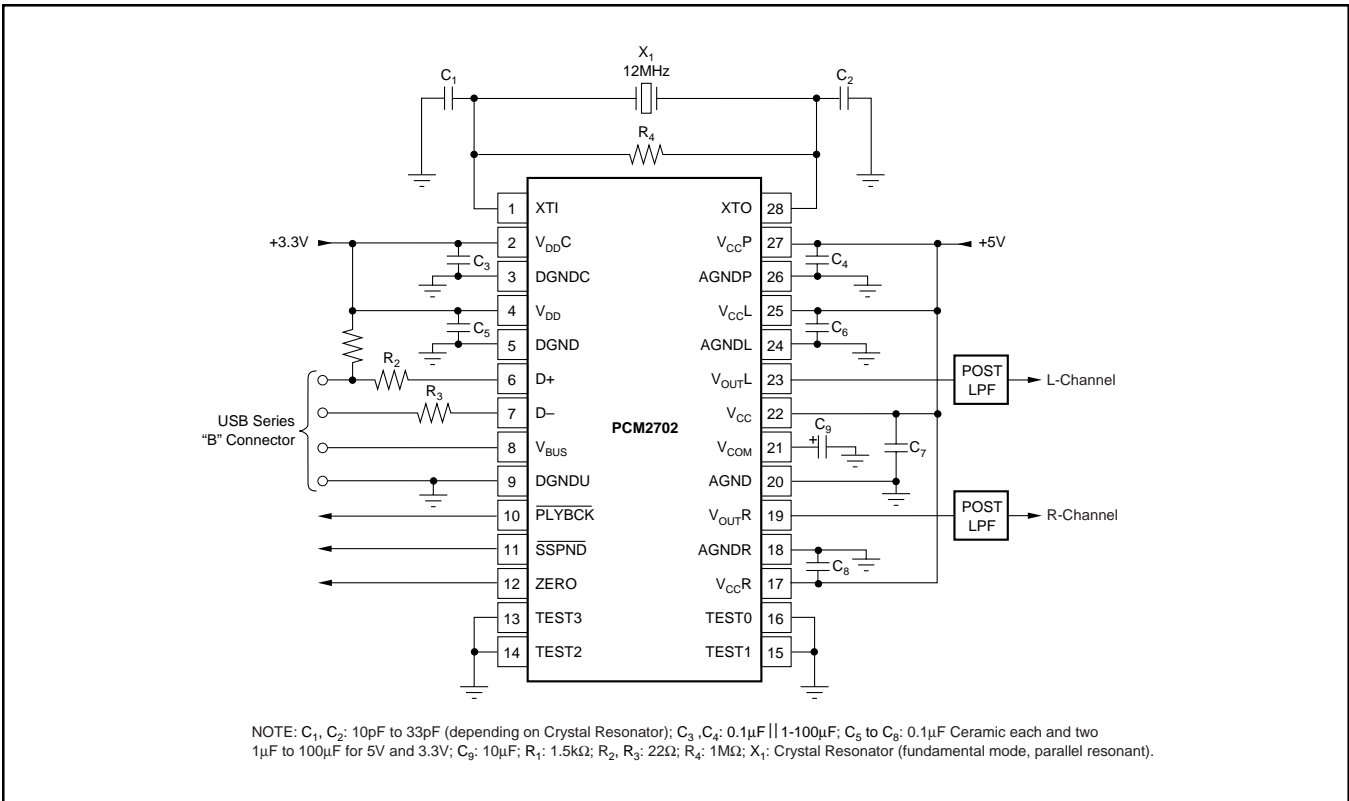
FIGURE 7. Typical Connection Diagram.

NOTE: C_1, C_2: 10pF to 33pF (depending on Crystal Resonator); C_3, C_4: 0.1µF ‖ 1-100µF; C_5 to C_8: 0.1µF Ceramic each and two 1µF to 100µF for 5V and 3.3V; C_9: 10µF; R_1: 1.5kΩ; R_2, R_3: 22Ω; R_4: 1MΩ; X_1: Crystal Resonator (fundamental mode, parallel resonant).

Revision History

DATE	REVISION	PAGE	SECTION	DESCRIPTION
11/07	A	—	—	Updated front page format.
		11	Operating Environment	Added section and reference to SLAA374.

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

PACKAGING INFORMATION

Orderable Device	Status [1]	Package Type	Package Drawing	Pins	Package Qty	Eco Plan [2]	Lead/Ball Finish	MSL Peak Temp [3]
PCM2702E	ACTIVE	SSOP	DB	28	47	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCM2702E/2K	ACTIVE	SSOP	DB	28	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCM2702E/2KG4	ACTIVE	SSOP	DB	28	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
PCM2702EG4	ACTIVE	SSOP	DB	28	47	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

[1] The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

[2] Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

[3] MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

TAPE DIMENSIONS

A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
PCM2702E/2K	SSOP	DB	28	2000	330.0	17.4	8.5	10.8	2.4	12.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS

*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
PCM2702E/2K	SSOP	DB	28	2000	336.6	336.6	28.6

MECHANICAL DATA

DB (R-PDSO-G**)　　　　　　　　　　　　　　　　　　　　　　　　**PLASTIC SMALL-OUTLINE**

28 PINS SHOWN

PINS ** DIM	14	16	20	24	28	30	38
A MAX	6,50	6,50	7,50	8,50	10,50	10,50	12,90
A MIN	5,90	5,90	6,90	7,90	9,90	9,90	12,30

4040065 /E 12/01

NOTES:　A.　All linear dimensions are in millimeters.
　　　　　B.　This drawing is subject to change without notice.
　　　　　C.　Body dimensions do not include mold flash or protrusion not to exceed 0,15.
　　　　　D.　Falls within JEDEC MO-150

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IMPORTANT NOTICE