



November 2006

# FSA221 USB2.0 High-Speed (480Mbps) and Audio Switches with Negative Signal Capability

## Features

- HS-USB: 4Ω Typical On Resistance
- Audio: 3Ω Typical On Resistance
- -3db Bandwidth: > 720MHz
- Low Power Consumption
- Packaged in Pb-free 10-Lead MicroPak™ (1.6 x 2.1mm), 10-pin MSOP (Preliminary)
- Power-off Protection on Common D+/R, D-/L Ports
- Automatically Detects  $V_{bus}$  for Switch Path Selection
- D+/R, D-/L Ports: 8pf Typical On Capacitance

## Applications

- Cell Phone, PDA, Digital Camera, and Notebook
- LCD Monitor, TV, and Set-top Box

## Description

The FSA221 is a Double-Pole, Double Throw (DPDT) multiplexer that combines a low-distortion audio and a USB2.0 High-Speed (HS) switch path. This configuration enables audio and USB data to share a common connector port. The architecture is designed to allow audio signals to swing below ground. This means a common USB and headphone jack can be used for personal media players and similar portable peripheral devices.

Since USB2.0 is an industry standard for shared data-path in portable devices, the FSA221 also incorporates a  $V_{bus}$  detection capability. The FSA221 includes a power-off feature to minimize current consumption when  $V_{bus}$  is not present. This power-off circuitry is available for the common D+/R, D-/L ports only. Typical applications involve switching in portables and consumer applications, such as cell phones, digital cameras, and notebooks with hubs or controllers.

## Ordering Information

Part Number	Package Number	Top Mark	Pb-Free	Package Description
FSA221L10X	MAC010A	GK	Yes	10-Lead MicroPak, JEDEC MO-255, 1.6 x 2.1mm
FSA221MUX (Preliminary)	MUA10A	FSA221	Yes	10-Lead MSOP JEDEC MO-187, 3.0 mm Wide
FSA221UMX (Preliminary)	MLP010A	GL	Yes	10-Lead Quad, Ultrathin MLP, 1.4 x 1.8mm

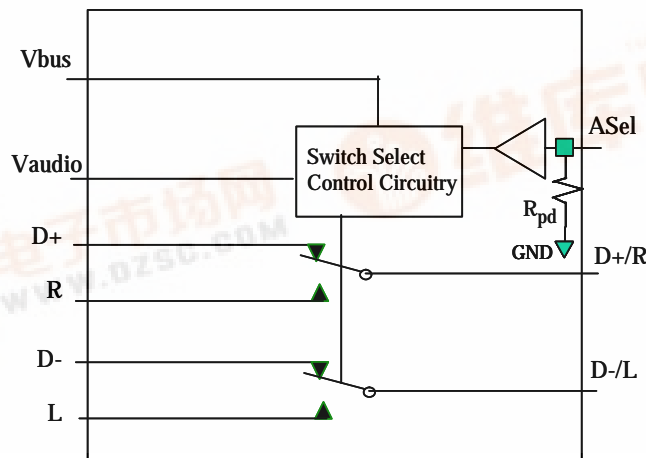


Figure 1. FSA221 Analog Symbol

FSA221 USB2.0 High-Speed and Audio Switches with Negative Signal Capability



## Pin Assignments

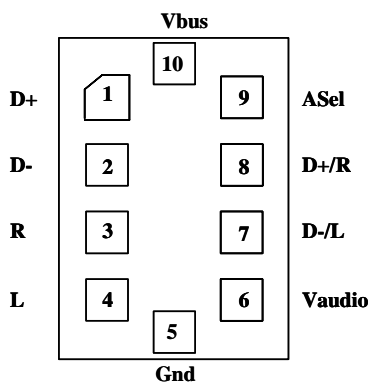


Figure 2. 10-Pin MicroPak

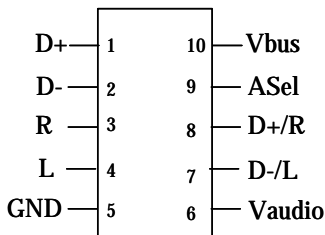


Figure 3. 10-Pin MSOP

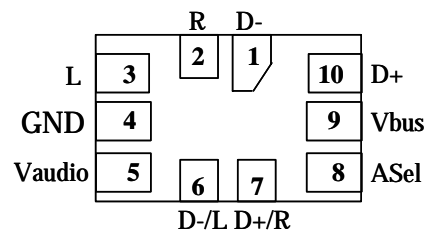


Figure 4. 10-Pin μMLP

## Pin Descriptions

Name	Description
$V_{\text{audio}}$	Power supply (audio)
$V_{\text{bus}}$	Power supply (USB) and auto USB switch-path select
$A_{\text{Sel}}$	Audio select to override auto USB detect when $V_{\text{AUDIO}}$ supply is present
D+, D-	USB data bus input sources
R, L	Audio right and left input sources
D+/R, D-/L	USB and audio common connector ports

## Truth Table

$A_{\text{Sel}}^{(1)}$	$V_{\text{audio}}$	$V_{\text{bus}}$	L, R	D+, D-
L	L	L	OFF	OFF
L	L	H <sup>(2)</sup>	OFF	ON
L	H <sup>(2)</sup>	L	ON	OFF
L	H <sup>(2)</sup>	H <sup>(2)</sup>	OFF	ON
H	L	L	OFF	OFF
H	L	H <sup>(2)</sup>	OFF	ON
H	H <sup>(2)</sup>	L	ON	OFF
H	H <sup>(2)</sup>	H <sup>(2)</sup>	ON	OFF

### Notes:

- $A_{\text{Sel}}$  - Internal resistor to GND provides auto- $V_{\text{bus}}$  detect if there is no external connection. Forcing  $A_{\text{Sel}}$  HIGH when  $V_{\text{AUDIO}}$  is present overrides the USB path even if  $V_{\text{bus}}$  is present.
- H - Value is the threshold as defined to meet USB2.0  $V_{\text{bus}}$  requirements and audio supply threshold in a system (see DC Tables).

## Functional Description

The FSA221 is a combined USB and audio switch that enables sharing the D+/D- lines of a USB connector with stereo audio CODEC outputs. The switch is optimized for high-speed USB signals and includes an automatic  $V_{bus}$ -detection circuit. When a USB connector, rather than a headphone, is connected to the ultra-portable device the switch is automatically configured for high-speed USB data transfer. If no  $V_{bus}$  is detected, and yet  $V_{AUDIO}$  is present, the switch is configured for the low-distortion audio switch path. The audio switch path also handles negative signals (down to -2V), which eliminates the need for large coupling capacitors.

For those applications where the  $V_{bus}$  is generated as a self-powered device or where  $V_{bus}$  is not removed, the  $A_{Sel}$  pin provides the ability to switch, under software

control, to the audio path. The  $A_{Sel}$  pin is internally terminated by a resistor to GND (typical value  $3M\Omega$ ) and requires no connection for the standard ultra-portable (cell-phone, MP3, or portable media player). In an application where the supply to the FSA221  $V_{bus}$  pin is not guaranteed to be removed, a GPIO pin can be used to switch out of high-speed USB mode into audio mode, using the  $A_{Sel}$  pin.

The FSA221  $V_{bus}$  pin must be connected directly to  $V_{bus}$  or a supply  $> 3.8V$ , not an LDO regulated down to 3.6V or a  $V_{bat}$ -generated supply that may fall below 3.8V in normal operation.

## Application Diagram

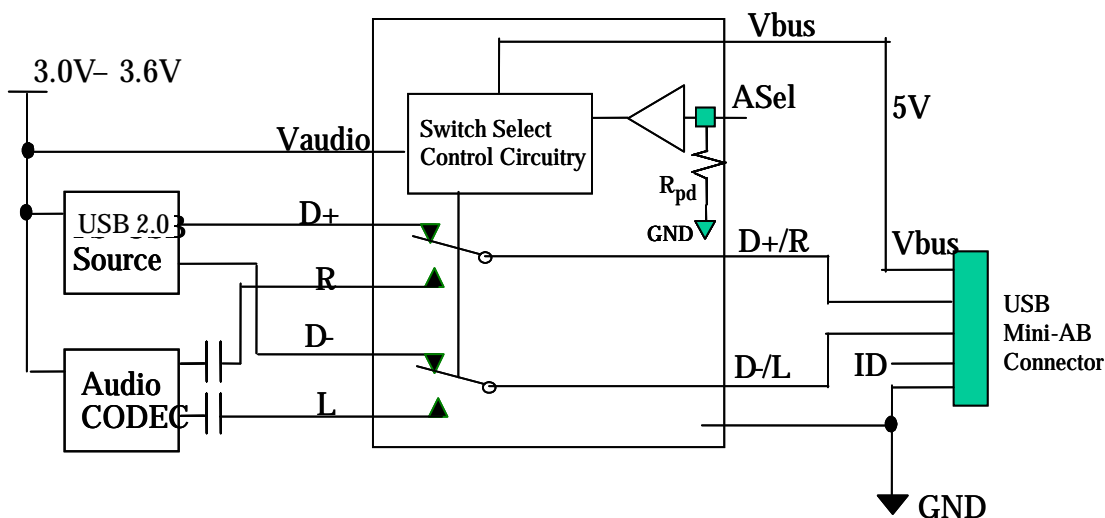


Figure 5. FSA221 Typical Application Diagram

## Absolute Maximum Ratings

The “Absolute Maximum Ratings” are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The “Recommended Operating Conditions” table defines the conditions for actual device operation.

Symbol	Parameter	Conditions	
$V_{Audio}$	Supply Voltage	-0.5V to 6.0V	
$V_{bus}$	Supply Voltage	-0.5V to 6.0V	
$V_{SW}$	Switch I/O Voltage <sup>(3)</sup>	R, L Pins ( $V_{audio-} - 7.0V$ ) to ( $V_{audio+} + 0.3V$ )	
		D+, D-, D+/R, D-/L Pins ( $V_{bus-} - 7.0V$ ) to ( $V_{bus+} + 0.3V$ )	
$A_{Sel}$	Control Input Voltage <sup>(3)</sup>	-0.5V to + 6.0V	
$I_{IK}$	Input Clamp Diode Current	- 50mA	
$I_{SW}$	Switch I/O Current (Continuous)	USB	50mA
		Audio	50mA
$I_{SWPEAK}$	Peak Switch Current (Pulsed at 1ms Duration, <10% Duty Cycle)	USB	100mA
		Audio	100mA
$T_{STG}$	Storage Temperature Range	-65°C to +150°C	
$T_J$	Maximum Junction Temperature	+150°C	
$T_L$	Lead Temperature (Soldering, 10 seconds)	+260°C	
ESD	Human Body Model (JEDEC: JESD22-A114)	I/O to GND	7000
		All Other Pins	7000
		$V_{Audio}$ $V_{bus}$ to GND	12000
	Charge Discharge Model (JEDEC-JESD-C101)	2000	

### Notes:

- The input and output negative ratings may be exceeded if the input and output diode current ratings are observed.

## Recommended Operating Conditions

Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding or designing to Absolute Maximum Ratings.

Symbol	Parameter	Minimum	Maximum
$V_{Audio}$	Supply Voltage	3.0V	3.6V
$V_{bus}$	Supply Voltage	4.25V	5.5V
$A_{Sel}$	Control Input Voltage	0V	$V_{Audio}$
$V_{SW}$	Switch I/O Voltage	$V_{Audio} - 6.5V$	$V_{Audio} - 0.3V$
		$V_{bus} - 6.5V$	$V_{bus}$
$T_A$	Operating Temperature	-40°C	85°C
$\theta_{JA}$	Thermal Resistance (free air)	MicroPak 10L package	330°C / W (estimated)

## DC Electrical Characteristics

All typical values are at 25°C unless otherwise specified.

Symbol	Parameter	V <sub>Audio</sub> (V)	Conditions	T <sub>A</sub> = - 40°C to +85°C			Unit
				Min.	Typ.	Max.	
<b>Common Pins</b>		V <sub>Audio</sub> (V)					
V <sub>IK</sub>	Clamp Diode Voltage	3.0	I <sub>IK</sub> = -18mA			-1.2	V
V <sub>IH</sub>	Control Input Voltage HIGH	3.0 to 3.6		1.2			
V <sub>IL</sub>	Control Input Voltage LOW	3.0 to 3.6				0.5	
I <sub>IN</sub>	A <sub>Sel</sub> Input HIGH Current	3.6	V <sub>IN</sub> = 3.6V	-1		10	μA
			V <sub>IN</sub> = 0V	-1		1	
I <sub>OFF</sub>	Power Off Leakage Current (Common Port Only D+/R, D-/L)	V <sub>audio</sub> = V <sub>bus</sub> = 0V	Common Port (D+/R, D-/L) V <sub>SW</sub> = 0V to 5.5V			10	μA
I <sub>NO(OFF)</sub>	Off-Leakage Current of Port D+, D-, R, L	3.6	V <sub>bus</sub> = 0V, 5.5V D+/R, D-/L = 0.3V, V <sub>AUDIO</sub> - 0.3V D+, D-, R, L = 0.3V, V <sub>AUDIO</sub> -0.3V or Floating See Figure 11	-50	1	50	nA
I <sub>NC(ON)</sub>	On-Leakage Current of Port D+/R or D-/L	3.6	V <sub>bus</sub> = 0V, 5.5V D+/R, D-/L = 0.3V, V <sub>AUDIO</sub> - 0.3V D+, D-, R, L = Floating See Figure 12	-50	1	50	nA
R <sub>PD</sub>	A <sub>Sel</sub> Internal Pull-Down Resistor				3		MΩ
<b>USB Switch Path</b>		V <sub>bus</sub> (V)					
	USB Analog Signal Range			0		3.6	V
R <sub>ONUSB</sub>	HS Switch On Resistance <sup>(4)</sup>	4.25	V <sub>D+/D-</sub> = 0V, 0.4V, I <sub>ON</sub> = -8mA, V <sub>AUDIO</sub> = 3V		4	6	Ω
Δ R <sub>ONUSB</sub>	HS Delta R <sub>ON</sub> <sup>(5,6)</sup>	4.25	V <sub>D+/D-</sub> = 0V, I <sub>ON</sub> = -8mA, V <sub>AUDIO</sub> = 3V		0.4		Ω
<b>Audio Switch Path</b>		V <sub>Audio</sub> (V)					
	Audio Analog Signal Range			V <sub>audio</sub> - 5.5		V <sub>audio</sub>	V
R <sub>ONAudio</sub>	Audio Switch On Resistance <sup>(4)</sup>	3.0	V <sub>L/R</sub> = -2V, 0V, 0.7V, V <sub>bus</sub> = 0V V <sub>AUDIO</sub> -0.7V, V <sub>AUDIO</sub> I <sub>ON</sub> = -26mA		3	5	Ω
Δ R <sub>ONAudio</sub>	Audio Delta R <sub>ON</sub> <sup>(5)</sup>	3.0	V <sub>L/R</sub> = 0.7V I <sub>ON</sub> = -26mA		0.4		Ω
R <sub>FLAT(Audio)</sub>	Audio R <sub>ON</sub> Flatness <sup>(7)</sup>	3.0	I <sub>ON</sub> = -26mA		1.5	2.5	Ω

Continued on following page...

### DC Electrical Characteristics (Continued)

All typical values are at 25°C unless otherwise specified.

Symbol	Parameter	V <sub>Audio</sub> (V)	Conditions	T <sub>A</sub> = - 40°C to +85°C			Unit
				Min.	Typ.	Max.	
<b>Power Supply</b>							
V <sub>busth</sub>	V <sub>bus</sub> Threshold Voltage			3.2		3.8	V
V <sub>audioth</sub>	V <sub>audio</sub> Threshold			0.5		1.5	V
I <sub>CC(Audio)</sub>	Quiescent Supply Current (Audio)	3.6	V <sub>ASel</sub> = 0 to V <sub>audio</sub> , I <sub>OUT</sub> = 0		6	10	μA
I <sub>CC(Vbus)</sub>	Quiescent Supply Current (V <sub>bus</sub> )		V <sub>ASel</sub> = 0 to V <sub>audio</sub> , I <sub>OUT</sub> = 0 V <sub>bus</sub> = 5.5V		12	20	μA
I <sub>CCT</sub>	Increase in I <sub>CC</sub> current per control voltage and V <sub>CC</sub>	3.6	V <sub>ASel</sub> = 2.6V, V <sub>bus</sub> = floating		10	15	μA
			V <sub>ASel</sub> = 1.8V, V <sub>bus</sub> = floating		14	18	

**Notes:**

4. On resistance is determined by the voltage drop between the A and B pins at the indicated current through the switch.
5.  $\Delta R_{ON} = R_{ON\ max} - R_{ON\ min}$  measured at identical V<sub>CC</sub>, temperature, and voltage. Worst-case signal path, audio or USB channel, is characterized.
6. Guaranteed by characterization, not production tested.
7. Flatness is defined as the difference between the maximum and minimum values of on resistance over the specified range of conditions.

## AC Electrical Characteristics

All typical value are for  $V_{\text{AUDIO}} = 3.3\text{V}$  and  $V_{\text{bus}} = 5.0$  at  $25^\circ\text{C}$  unless otherwise specified.

Symbol	Parameter	$V_{\text{audio}}/V_{\text{bus}}$ (V)	Conditions	$T_A = -40^\circ\text{C to } +85^\circ\text{C}$			Unit
				Min.	Typ.	Max.	
$t_{\text{ONAUDIO1}}$	Turn-On Time $V_{\text{AUDIO}} \uparrow$ to Output	$V_{\text{bus}} = 0\text{V}$	$V_{\text{D+}/\text{R}, \text{D-}/\text{L}} = 1.0\text{V}$ $R_L = 50\Omega, C_L = 50\text{pF}$ Figure 13, Figure 15			10	$\mu\text{s}$
$t_{\text{OFFAUDIO1}}$	Turn-Off Time $V_{\text{BUS}} \uparrow$ to Output	$V_{\text{AUDIO}} = 3.0$ for $V_{\text{bus}} \uparrow$	$V_{\text{D+}/\text{R}, \text{D-}/\text{L}} = 1.0\text{V}$ $R_L = 50\Omega, C_L = 50\text{pF}$ Figure 13, Figure 15			10	$\mu\text{s}$
$t_{\text{ONAUDIO2}}$	Turn-On Time $A_{\text{Sel}}$ to Output	$V_{\text{bus}} = 4.25\text{V}$ $V_{\text{AUDIO}} = 3.0$	$V_{\text{D+}/\text{R}, \text{D-}/\text{L}} = 1.0\text{V}$ $R_L = 50\Omega, C_L = 50\text{pF}$ Figure 13, Figure 14			2	$\mu\text{s}$
$t_{\text{OFFAUDIO2}}$	Turn-Off Time $A_{\text{Sel}}$ to Output	$V_{\text{bus}} = 4.25\text{V}$ $V_{\text{AUDIO}} = 3.0$	$V_{\text{D+}/\text{R}, \text{D-}/\text{L}} = 1.0\text{V}$ $R_L = 50\Omega, C_L = 50\text{pF}$ Figure 13, Figure 14			2	$\mu\text{s}$
$t_{\text{ONAUDIO3}}$	Turn-On Time $V_{\text{BUS}} \downarrow$ to Output	$V_{\text{AUDIO}} = 3.0$	$V_{\text{D+}/\text{R}, \text{D-}/\text{L}} = 1.0\text{V}$ $R_L = 50\Omega, C_L = 50\text{pF}$ Figure 13, Figure 15			10	$\mu\text{s}$
$t_{\text{ONUSB}}$	Turn-On Time $V_{\text{USB}} \uparrow$ to Output	$V_{\text{AUDIO}} = 3.0$	$V_{\text{D+}/\text{R}, \text{D-}/\text{L}} = 1.0\text{V}$ $R_L = 50\Omega, C_L = 0\text{pF}$ Figure 13, Figure 15			10	$\mu\text{s}$
$t_{\text{OFFUSB}}$	Turn-Off Time $V_{\text{USB}} \downarrow$ to Output	$V_{\text{AUDIO}} = 3.0$	$V_{\text{D+}/\text{R}, \text{D-}/\text{L}} = 1.0\text{V}$ $R_L = 50\Omega, C_L = 0\text{pF}$ Figure 13, Figure 15			10	$\mu\text{s}$
$t_{\text{PDUSB}}$	USB Switch Propagation Delay <sup>(8)</sup>	$V_{\text{AUDIO}} = 3.0$ $V_{\text{bus}} = 4.25\text{V}$	$R_L = 50\Omega, C_L = 0\text{pF}$ Figure 16		0.25		ns
$X_{\text{talkA}}$	Non-Adjacent Channel Crosstalk - Audio	$V_{\text{AUDIO}} = 3.0$ $V_{\text{bus}} = 4.25\text{V}$	$f = 20\text{kHz}, R_T = 32\Omega,$ $C_L = 0\text{pF}$ Figure 7, Figure 21		-110		dB
BW	-3db Bandwidth - USB	$V_{\text{AUDIO}} = 3.0$ $V_{\text{bus}} = 4.25\text{V}$	$R_T = 50\Omega, C_L = 0\text{pF},$ Signal 0dBm Figure 9, Figure 19		720		MHz
THD	Total Harmonic Distortion	$V_{\text{AUDIO}} = 3.0$ $V_{\text{bus}} = 0\text{V}$	$f = 20\text{Hz to } 20\text{kHz}$ $R_L = 32\Omega, V_{\text{IN}} = 2V_{\text{pp}}$ Figure 24		0.05		%

### Notes:

- Guaranteed by characterization, not production tested.

### USB High-Speed-Related AC Electrical Characteristics

Symbol	Parameter	$V_{\text{AUDIO}}/ V_{\text{bus}}(\text{V})$	Conditions	$T_A = -40^\circ\text{C to } +85^\circ\text{C}$			Unit
				Min.	Typ.	Max.	
$t_{\text{SK(O)}}$	Channel-to-Channel Skew <sup>(9)</sup>	$V_{\text{AUDIO}} = 3.0\text{V}$ $V_{\text{bus}} = 4.25\text{V}$	$t_R = t_F = 750\text{ps}$ (10-90%) at 240MHz $C_L = 0\text{pF}$ , $R_L = 50\Omega$ Figure 17, Figure 18		35		ps
$t_{\text{SK(P)}}$	Skew of Opposite Transitions of the Same Output <sup>(9)</sup>	$V_{\text{AUDIO}} = 3.0\text{V}$ $V_{\text{bus}} = 4.25\text{V}$	$t_R = t_F = 750\text{ps}$ (10-90%) at 240MHz $C_L = 0\text{pF}$ , $R_L = 50\Omega$ Figure 17, Figure 18		35		
$t_j$	Total Jitter <sup>(9)</sup>	$V_{\text{AUDIO}} = 3.0\text{V}$ $V_{\text{bus}} = 4.25\text{V}$	$R_L = 50\Omega$ , $C_L = 50\text{pF}$ , $t_R = t_F = 500\text{ps}$ (10-90%) at 480Mbps (PRBS = $2^{15} - 1$ )		130		ps

**Notes:**

9. Guaranteed by characterization, not production tested.

### Capacitance

Symbol	Parameter	$V_{\text{AUDIO}}/ V_{\text{bus}}(\text{V})$	Conditions	$T_A = -40^\circ\text{C to } +85^\circ\text{C}$			Unit
				Min.	Typ.	Max.	
$C_{\text{IN (ASel)}}$	Control Pin Input Capacitance ( $A_{\text{Sel}}$ )	$V_{\text{AUDIO}} = 3.0\text{V}$ $V_{\text{bus}} = 4.25\text{V}$	$V_{\text{Bias}} = 0.2\text{V}$		2.0		pF
$C_{\text{ON(D+R, D-L)}}$	D+/R, D-/L (Source Port) On Capacitance	$V_{\text{AUDIO}} = 3.0\text{V}$ $V_{\text{bus}} = 4.25\text{V}$ $A_{\text{Sel}} = 0\text{V}$ (CONUSB)	$V_{\text{Bias}} = 0.2\text{V}$ $f = 1\text{MHz}$ Figure 23		9.0		pF
		$V_{\text{AUDIO}} = 3.0\text{V}$ $V_{\text{bus}} = 4.25\text{V}$ $A_{\text{Sel}} = 3.0\text{V}$ (CONAudio)	$V_{\text{Bias}} = 0.2\text{V}$ $f = 1\text{MHz}$ Figure 23		10.0		
$C_{\text{OFF(D+, D-)}}$	USB Input Source Off Capacitance	$V_{\text{AUDIO}} = 3.0\text{V}$ $V_{\text{bus}} = 4.25\text{V}$ $A_{\text{Sel}} = 3.0\text{V}$	$f = 1\text{MHz}$ Figure 22		1.5		pF
$C_{\text{OFF(R/L)}}$	Audio Input Source Off Capacitance	$V_{\text{AUDIO}} = 3.0\text{V}$ $V_{\text{bus}} = 4.25\text{V}$ $A_{\text{Sel}} = 0\text{V}$	$f = 1\text{MHz}$ Figure 22		3.0		pF

Typical Characteristics

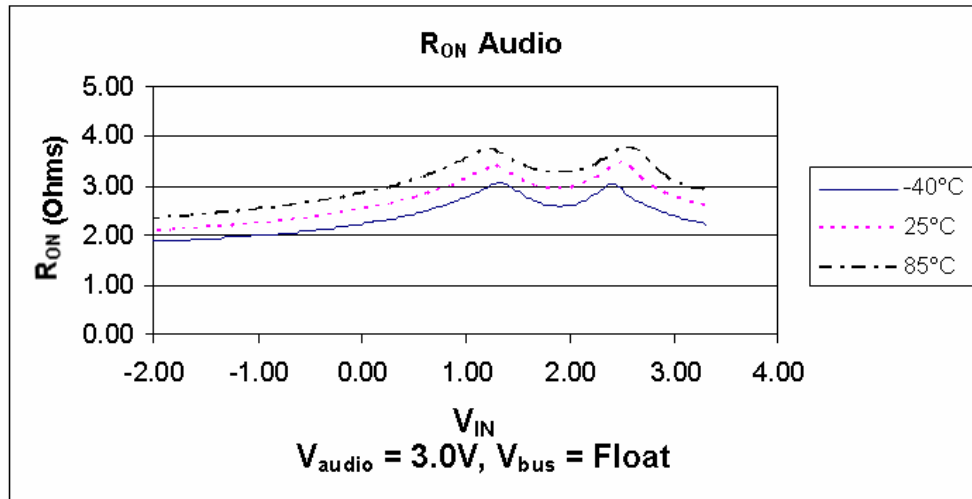


Figure 6. RON Audio,  $V_{Audio} = 3.0V, V_{BUS} = Float$

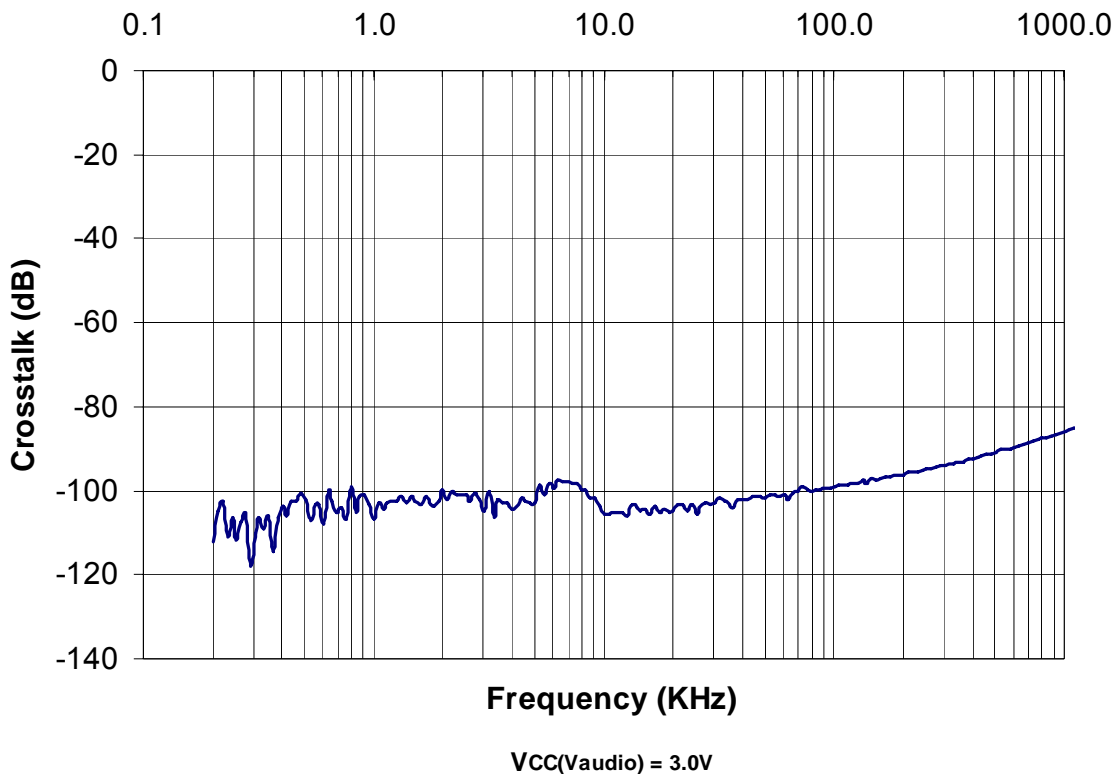
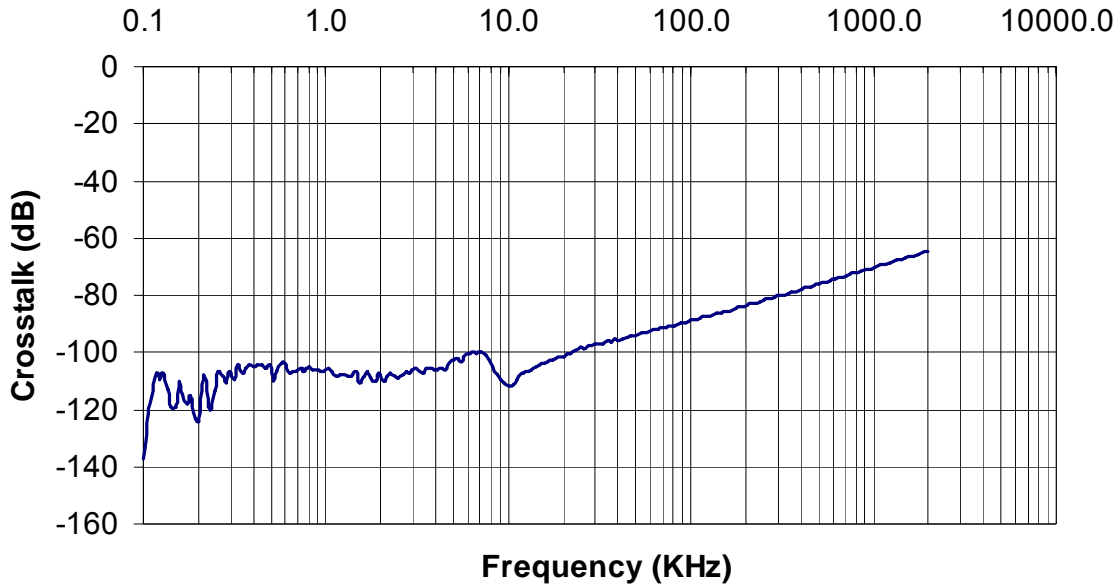


Figure 7. Non-Adjacent Channel Crosstalk – Audio

**Typical Characteristics** (Continued)



VCC(Vaudio) = 3.0V

**Figure 8. Off-Isolation - Audio**

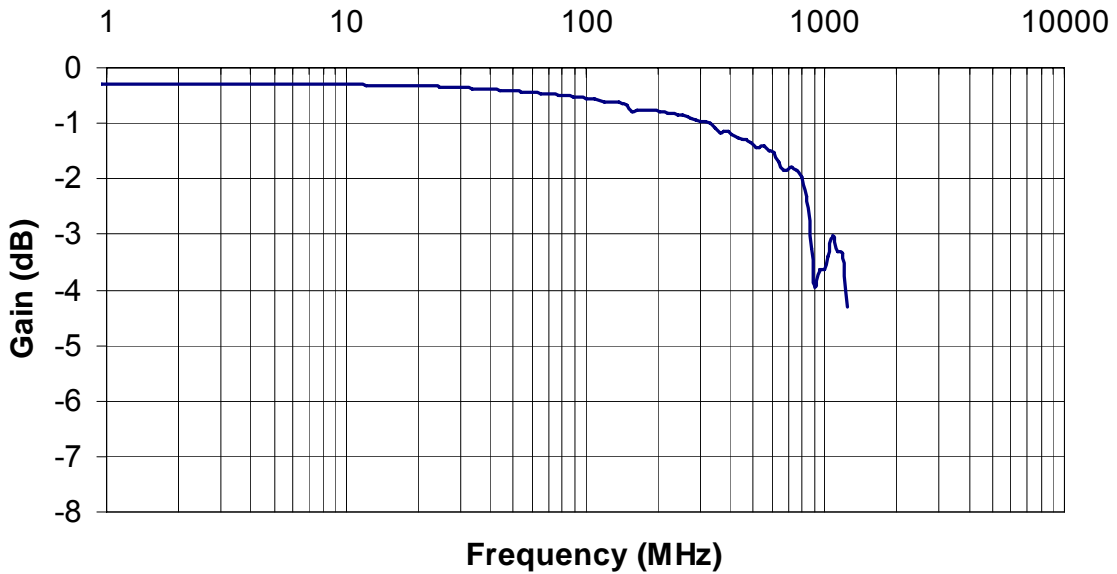


Figure #. Bandwidth Characterization, Frequency Response at CL=0pF,VCC (Vbus) = 4.25V

**Figure 9. Bandwidth, Gain vs. Frequency - USB**

### Test Diagrams

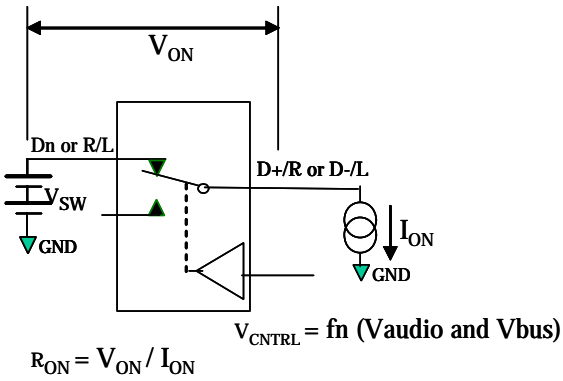


Figure 10. On Resistance

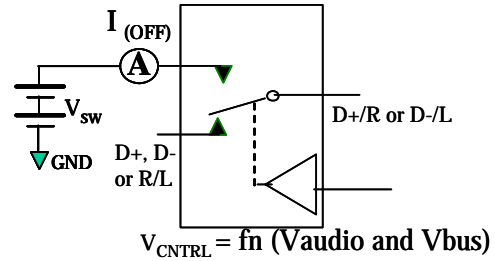


Figure 11. Off Leakage

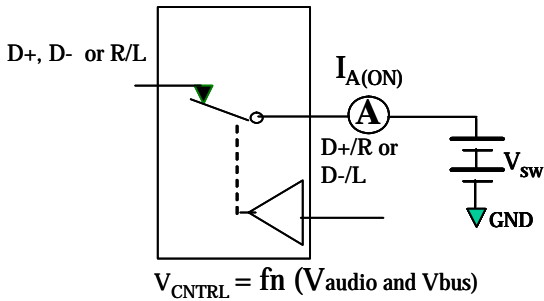


Figure 12. On Leakage

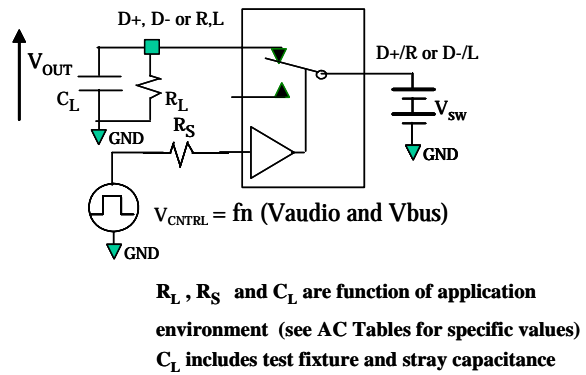


Figure 13. AC Test Circuit Load

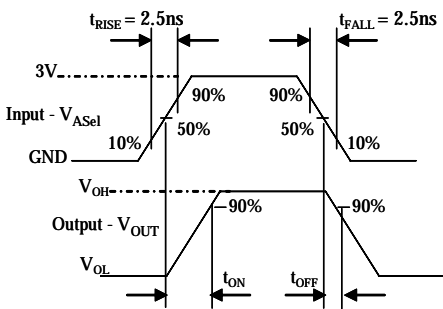


Figure 14. Turn-On / Turn-Off Waveforms ( $A_{Sel}$ )

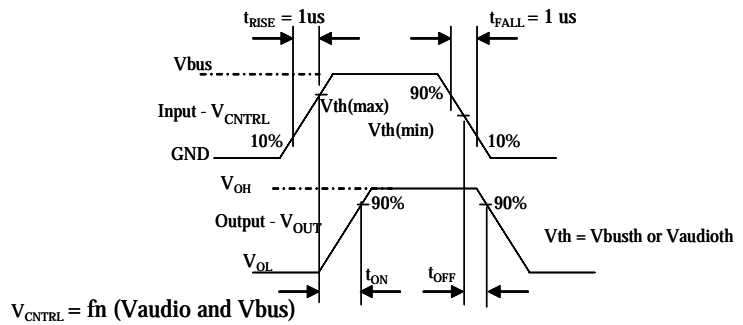


Figure 15. Turn-On / Turn-Off Waveforms (USB/Audio)

Test Diagrams (Continued)

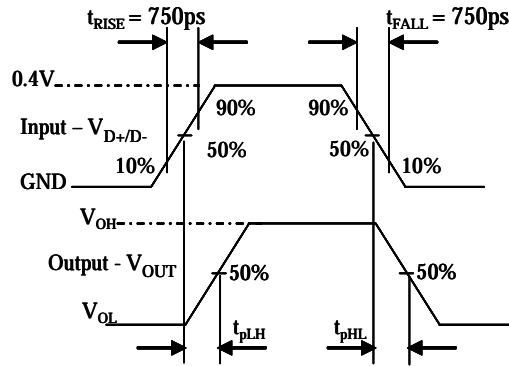


Figure 16. USB Switch Propagation Delay Waveforms

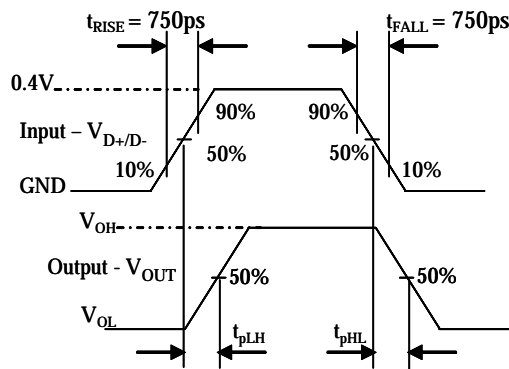


Figure 17. Pulse Skew:  $t_{SK(P)} = |t_{pHL} - t_{pLH}|$

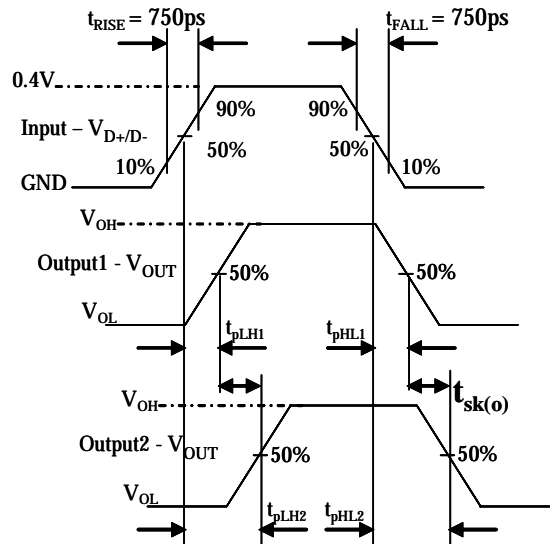
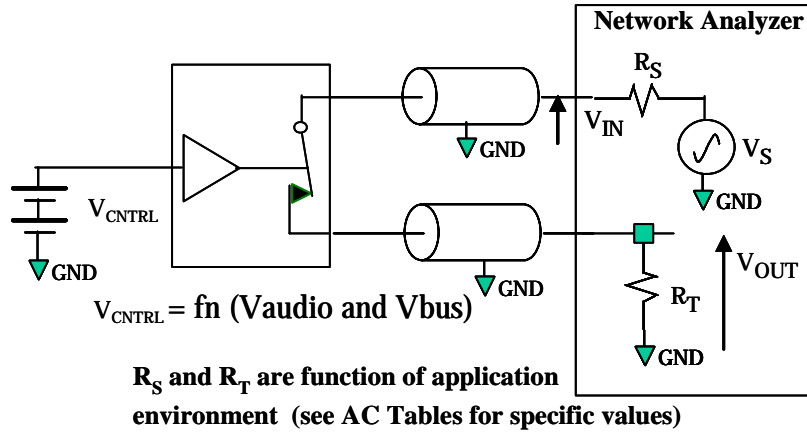
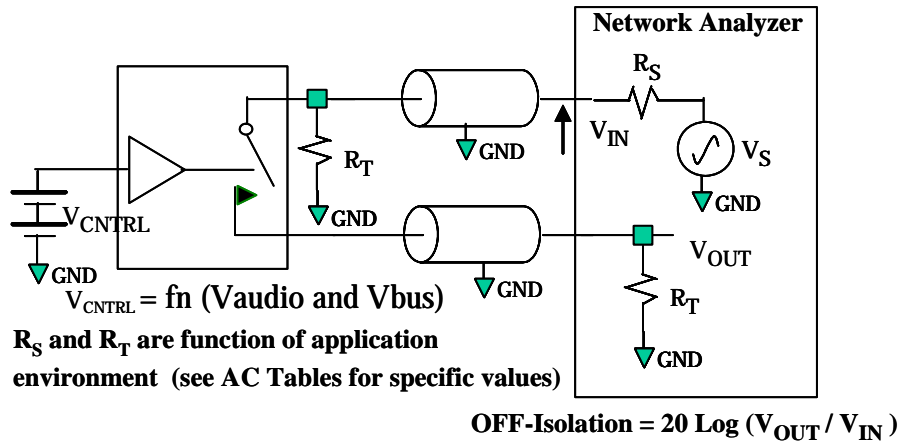


Figure 18. Output Skew:  $t_{SK(O)} = |t_{pLH1} - t_{pLH2}|$  or  $|t_{pHL1} - t_{pHL2}|$

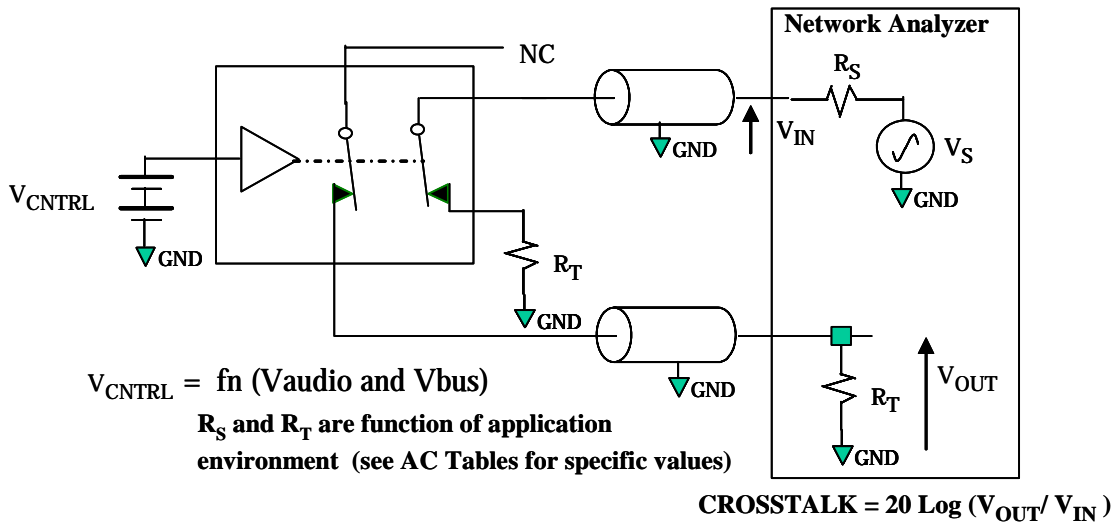
**Test Diagrams** (Continued)



**Figure 19. USB Bandwidth**



**Figure 20. Channel OFF Isolation**



**Figure 21. Non-Adjacent Channel-to-Channel Crosstalk**

Test Diagrams (Continued)

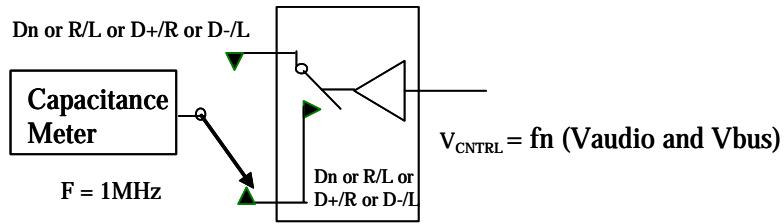


Figure 22. Channel OFF Capacitance

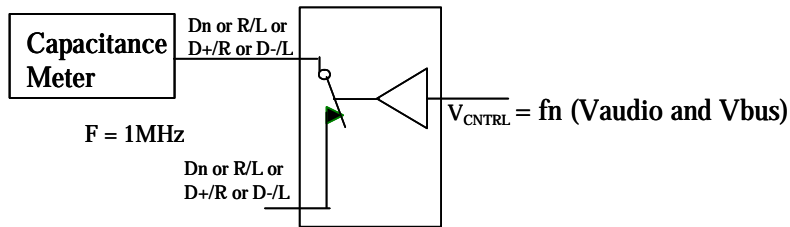


Figure 23. Channel ON Capacitance

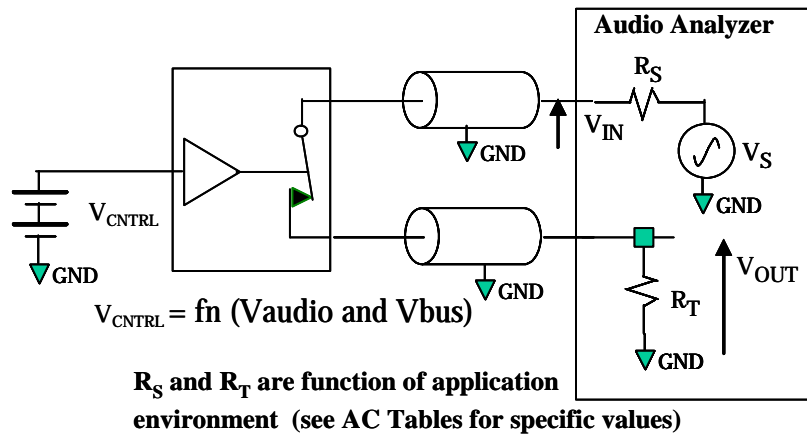
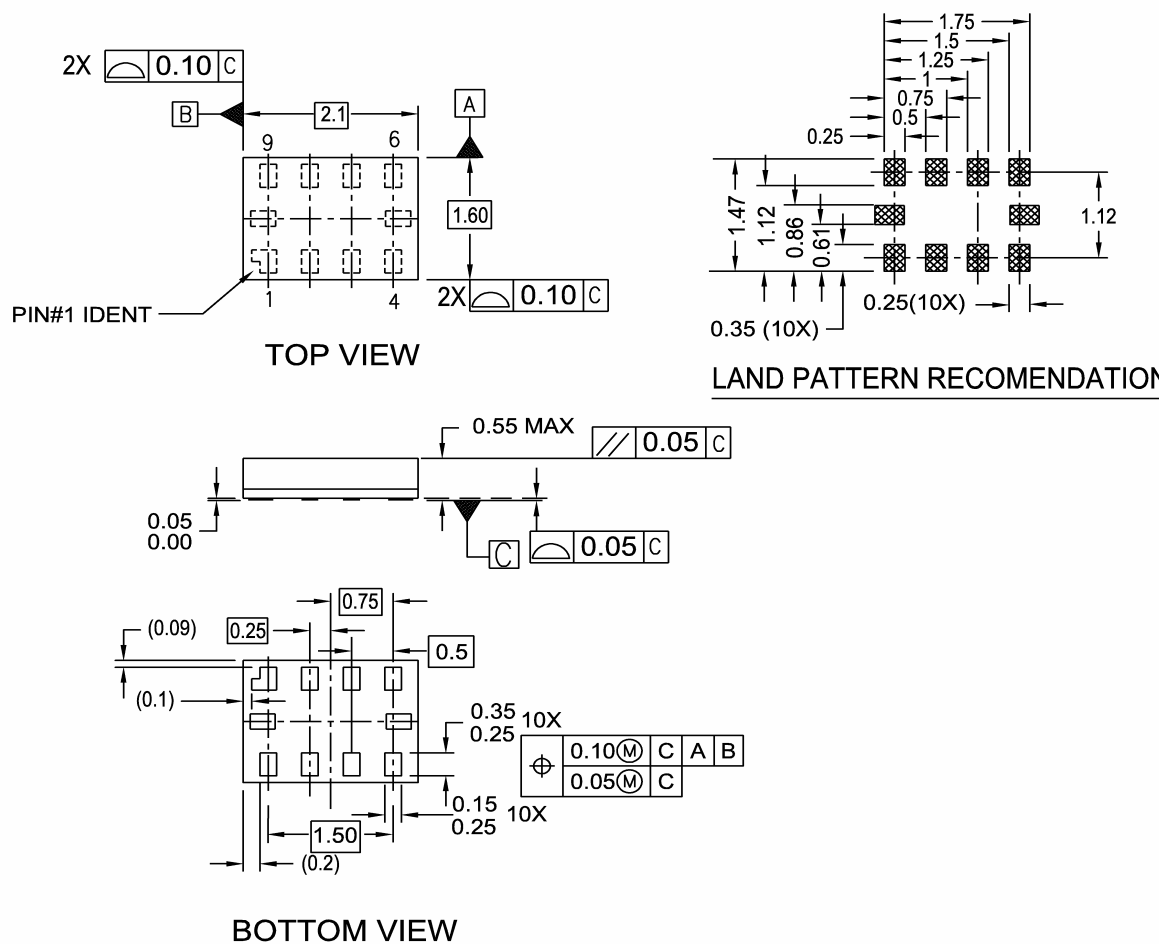


Figure 24. Total Harmonic Distortion

## Physical Dimensions

Dimensions are in millimeters unless otherwise noted.



### NOTES:

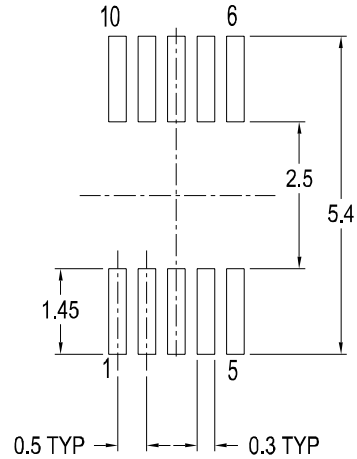
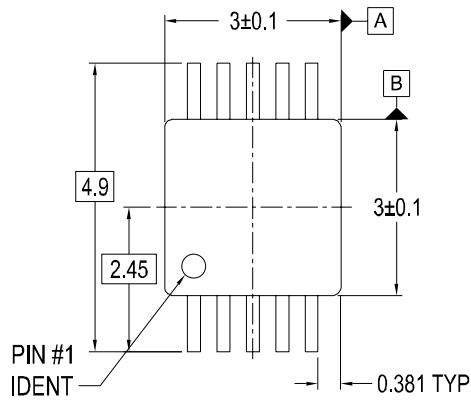
- A. PACKAGE CONFORMS TO JEDEC MO255, VARIATION UABD
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES CONFORMS TO ASME Y14.5M, 1994.

MAC010ARevB

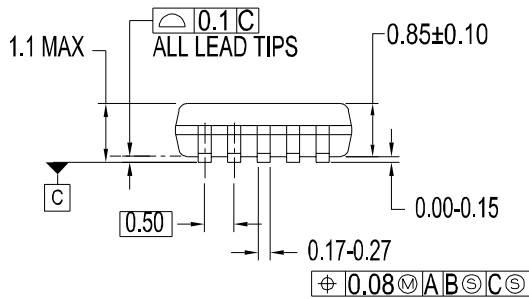
Figure 25. 10-Lead MicroPak FSA221

### Physical Dimensions

Dimensions are in millimeters unless otherwise noted.



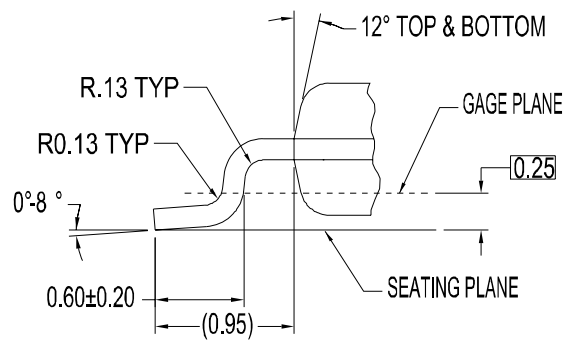
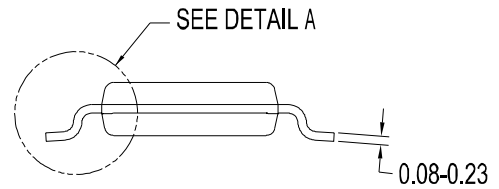
LAND PATTERN RECOMENDATION



DIMENSIONS ARE IN MILLIMETERS

**NOTES:**

- A. CONFORMS TO JEDEC REGISTRATION MO-187, VARIATION BA, REF NOTE 6, DATE 11/00.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.



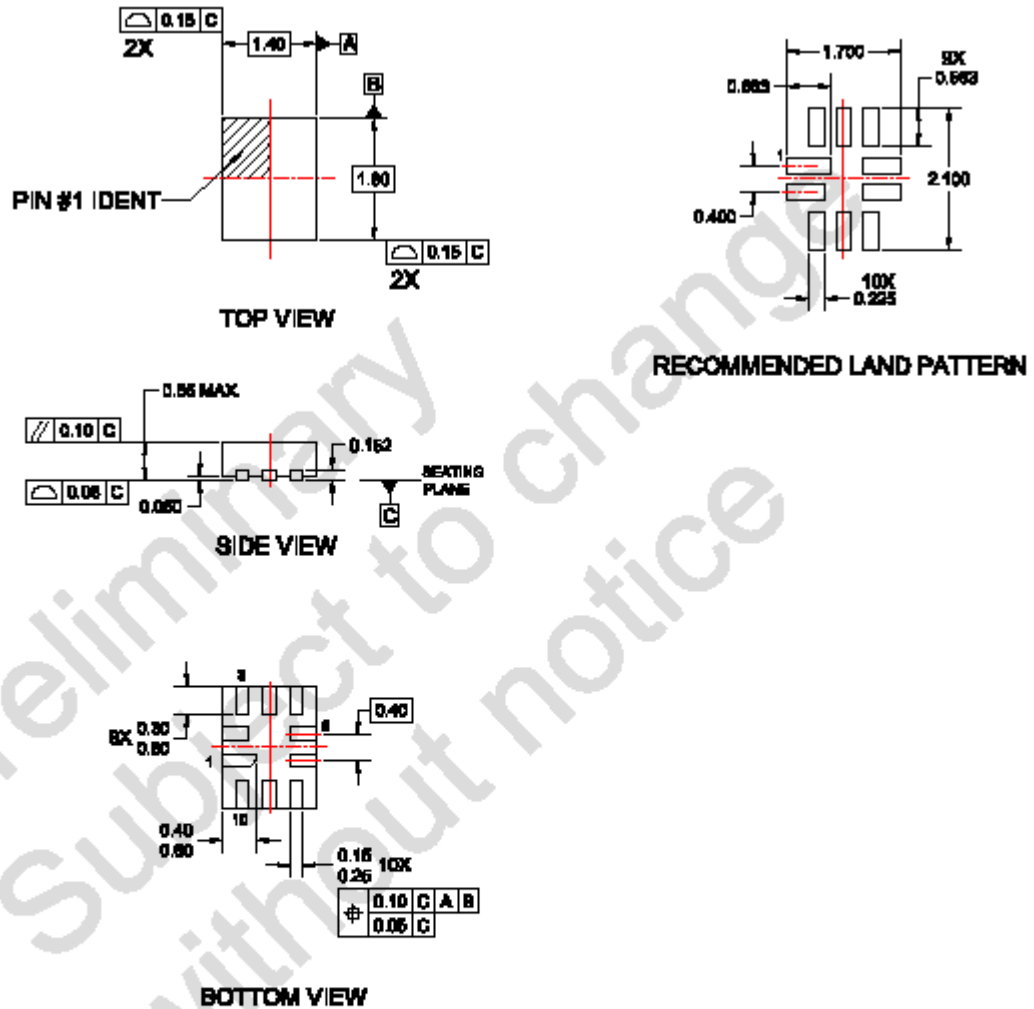
DETAIL A

MUA10AREVA

**Figure 26. 10-Lead MSOP FSA221 (Preliminary)**

## Physical Dimensions

Dimensions are in millimeters unless otherwise noted.



### NOTES:

- A. DIMENSIONS ARE IN MILLIMETERS.
- B. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

**MLP10 XXXX**

Figure 27. 10-Lead Quad Ultrathin FSA221 (Preliminary)

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Build it Now™	I <sup>2</sup> C™	PACMAN™	SPM™	TinyPower™
CoolFET™	<i>i-Lo</i> ™	POP™	Stealth™	TinyPWM™
CROSSVOLT™	ImpliedDisconnect™	Power247™	SuperFET™	TruTranslation™
DOME™	IntelliMAX™	PowerEdge™	SuperSOT™-3	UHC®
EcoSPARK™	ISOPLANAR™	PowerSaver™	SuperSOT™-6	UltraFET®
E <sup>2</sup> C MOS™	LittleFET™	PowerTrench®	SuperSOT™-8	UniFET™
EnSigna™	MICROCOUPLER™	QFET®	SyncFET™	VCX™
FACT®	MicroFET™	QS™	TCM™	Wire™
FACT Quiet Series™	MicroPak™	QT Optoelectronics™	TinyBoost™	
FAST®	MICROWIRE™	Quiet Series™		
FASTr™	MSX™	RapidConfigure™	Across the board. Around the world.™	
FPS™	MSXPro™	RapidConnect™	Programmable Active Droop™	
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